

# ROCK COVE ENVIRONMENTAL EVALUATION AND COMPREHENSIVE PLAN

**Prepared for:**

**Skamania County  
Department of Planning and Community Development**

**Prepared by:**

**Fishman Environmental Services  
with  
CDA Group  
GreenWorks PC  
Watershed Applications  
Water Resource Management**

**October 30, 1997**

**DRAFT**

**FES 96098**



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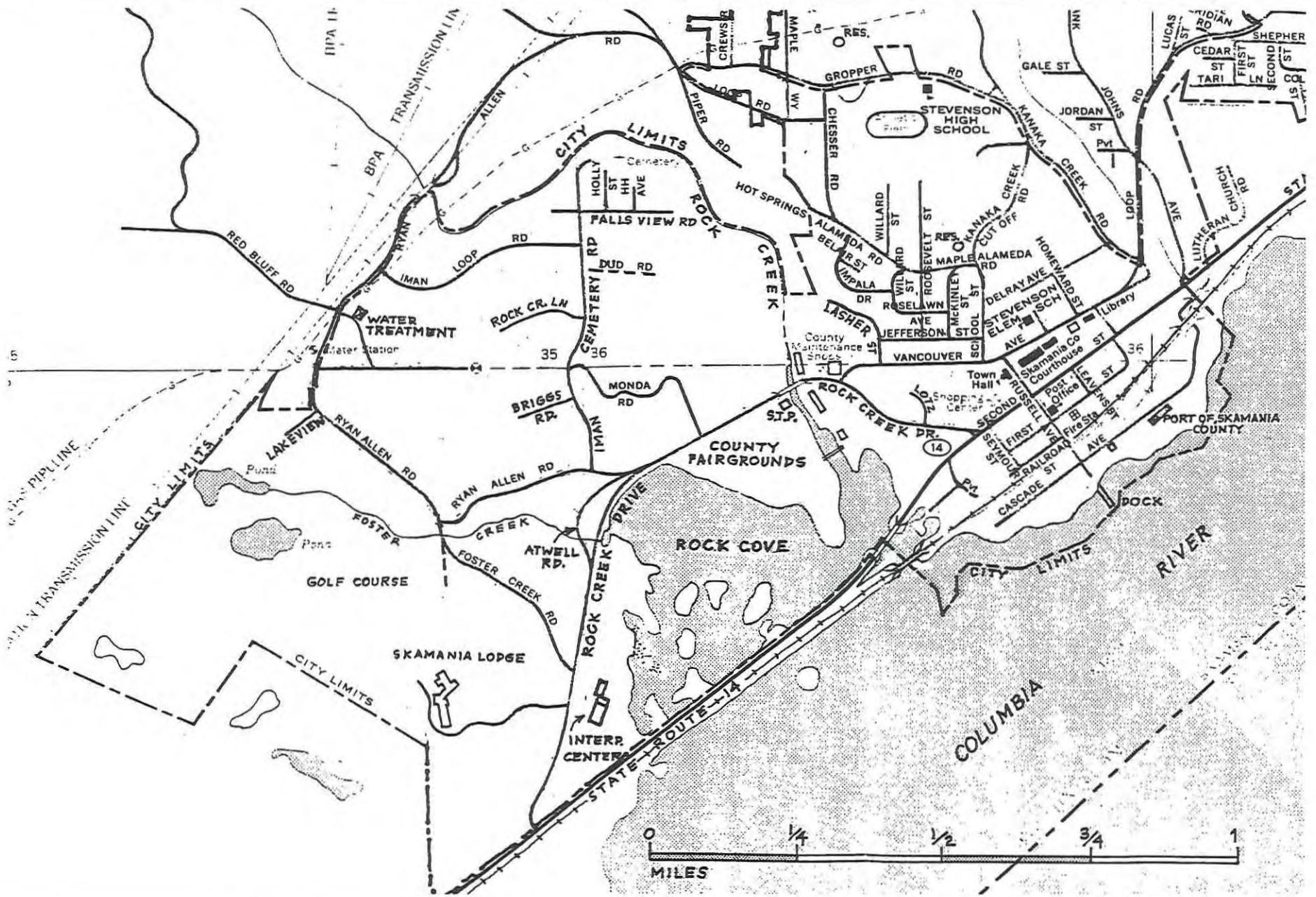
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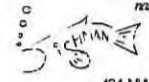
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**ROCK COVE ENVIRONMENTAL EVALUATION  
 AND COMPREHENSIVE PLAN**

Skamania County Department of  
 Planning and Community Development

**Project Vicinity Map**

**Figure 1-1**

Project: 96098

## 1 INTRODUCTION

The Rock Cove study area addressed in this report is viewed by Skamania County as an opportunity area for continued economic development in a community faced with substantial economic, social, recreational and environmental challenges. Recent declines in timber-related jobs and service industries are juxtaposed by a regional increase in recreation and ecotourism industries. Rock Cove has long served as a focus for local community activities; this report examines a number of aspects related to future growth and development in and around the Rock Cove study area.

The ultimate goal of this project is to provide information and recommendations that will allow Skamania County to reach comprehensive planning decisions that will guide development in and around the county Rock Cove property. Future development needs to be accomplished in ways that protect the natural resource values of the property, and result in the highest and best economic uses of developable lands.

The consultant team scope of work for this project specified the eight tasks listed below:

- Task 1. Conduct technical evaluations of: level of debris and sedimentation in cove; water quality baseline.
- Task 2. Evaluate ecological condition of cove and creek and determine potential impacts (positive and negative) resulting from proposed dredging.
- Task 3. Determine flood hazard using FEMA standards.
- Task 4. Assess existing and potential impacts on Rock Cove environment from existing and potential land uses.
- Task 5. Compile existing and collect new information to inventory existing facilities and uses in the study area. Determine future needs, expansion potentials, and use consistency.
- Task 6. Participate in formulation and facilitation of advisory committee; act as technical resource for committee.
- Task 7. Produce detailed maps and renderings to present project information and proposed alternative project designs.
- Task 8. Produce inventory of recreational opportunities in the study area and propose future alternatives for recreational uses in the study area.

All of these tasks have been completed. Reports for each of several topic areas are included as technical appendices at the end of this report. These appendices are:

- A. Rock Cove Physical Environment
- B. Rock Cove and Lower Rock Creek Fish and Wildlife Habitat
- C. Lower Rock Creek Geomorphic Assessment
- D. Rock Creek Flood Hazards Analysis

- E. Rock Cove Area Land Uses
- F. Facilities and Uses Economic Review
- G. Rock Cove Visual Assessment
- H. Recreational Uses and Opportunities
- I. GIS Mapping Summary

Each technical appendix presents detailed information, and is a stand-alone report. A summary section was produced because the amount of information is so extensive, and all of the project components need to be integrated. Section 2, Summary of Findings, therefore represents an integration of project information.

Section 3 of the report, Recommendations, presents a number of proposed goals for the county related to the Rock Cove study area. Each goal has one or more recommended actions or activities that can be implemented to achieve the goal. These goals and recommendations are the action part of this effort where the county officials and staff, and local citizens make decisions that not only determine the future of the Rock Cove properties, but greatly influence the economic and social fabric of the community.

## 2 SUMMARY OF FINDINGS

### 2.1 Overview

This summary section discusses the major findings of the various project tasks. The summaries are taken from the Technical Appendices that are included at the end of this document. The Technical Appendices generally contain a greater level of detail about each specific topic, and the reader is encouraged to read those that have particular interest.

Tables and figures referenced in this section are included at the end of the section if they have a number beginning with "2-". Tables and figures beginning with a letter (A-1, B-1, etc.) are found in the technical appendix with that letter.

### 2.2 Rock Cove Summary

#### Fish and Wildlife Habitat

Rock Cove is an area that has undergone a dramatic ecological change over the past 60 years. Prior to the completion of Bonneville Dam, the area that is now Rock Cove was agricultural bottomland traversed by at least two streams (see Figure A-6). Habitat types on this land before 1938 probably included upland and wetland meadow, streams, woodlands and marsh. Today the same area is a backwater of the Columbia River Bonneville Pool, and the habitat types include riparian forest, riparian blackberry, island (former hilltops), emergent wetland, aquatic open water, and upland meadow (lawn).

The cove provides habitat for a variety of fish and wildlife (see Figure B-2). The most often seen wildlife species are several species of waterbirds (including geese, ducks, coots, cormorants and mergansers), bald eagle and osprey. These species use the cove for feeding, resting, nesting and shelter. The cove is the most important wintering area for waterfowl on the Washington side of the Columbia River Gorge.

The cove also provides habitat for warm- and cold-water species of fish. Warm water fish species reported in the cove include bass and sunfish, suckers, catfish and others. Cold-water species include salmon and trout; juveniles of several salmonid species potentially use the cove for rearing. Coho and possibly chinook salmon have been reported in the lower creek/cove area, and there is recent information that coho might spawn in Foster Creek, tributary to the northwest part of the cove. Our sampling in 1997 found juvenile steelhead in the cove; cutthroat and reservoir rainbow trout might also be present during part of the year.

Fish habitat in the cove includes the shallow areas around the shorelines, including the aquatic plant beds, and deeper water in the central and southern parts of the system. Water quality appears to be adequate, with the possible exception of water temperature during July, August and possibly September. Limited data suggest that summer water temperatures might be too warm for salmonids.

### **Physical Environment**

Water levels in the cove fluctuate as often as hourly because of Bonneville Dam operations. These fluctuations can range to several feet. Fluctuating water levels influence habitat types and usability for fish and wildlife. The extensive aquatic plant beds in the northern part of the cove thrive in shallow water that has mud or sand bottom materials. Emergent wetland habitat, characterized by sedges, rushes and wetland grasses, is very scarce in the cove, presumably because of fluctuating water levels and topography.

Cove bottom materials vary from mud and sand in the deeper areas and along many shorelines, to wood chips and wood debris in the northwest arm, to rock along shorelines of the islands and the fairgrounds. Rock and wood chip substrates limit the abundance of aquatic invertebrates. Mud and sandy mud substrates have greater numbers of invertebrates. The aquatic plant beds support large concentrations of aquatic insects and other invertebrate forms.

### **Ecological Condition**

The ecological condition of Rock Cove is good; a subjective rating compared to "poor" or "excellent." Water quality and habitat quality are good, but could be better. High summer water temperatures might limit cove use by some fish species, but it would be difficult to improve (i.e. cool) this parameter. Plant species diversity could be improved through control of invasive non-native species such as Himalayan blackberry. Habitat type diversity could be improved by creating more habitat area of types that are scarce or absent from the cove, and by landscaping



bare areas, such as the fairground shoreline, with native trees, shrubs and groundcovers.

Existing or potential impacts to cove ecology are related to the level of human activity in and around the cove. Noise, movement and nighttime lighting in the park and fairgrounds can impact wildlife use of cove habitats. Inflows of untreated stormwater runoff from parking areas, fertilized and chemically treated landscaped areas, and other sources in the cove drainage basins can result in degraded water quality in the cove. Increased use of the cove for water activities, such as boating and fishing, will also impact wildlife numbers and behavior.

Goals and recommendations in Section 3 of the report address the issues of ecological impacts. Recommendations are offered that would improve habitat values and usability, reduce impacts to fish and wildlife and their habitat, and provide guidelines for future development on county property and, to an extent, private properties in the cove drainage basins.

### 2.3 Rock Creek Summary

#### Fish and Wildlife Habitat

The project study area includes the lower part of Rock Creek from the Columbia River to the first waterfall. The creek and associated corridor above (upstream of) the Rock Creek Drive bridge are relatively undisturbed by human development, primarily because of the steep valley walls. The corridor below the bridge is very disturbed by past and present development, including the fairgrounds and parking areas. The riparian zone below the bridge contains a very narrow band of vegetation along the creek, although some areas have no vegetation. The riparian zone above the bridge is more developed and is characteristically forest dominated by red alder. The valley narrows upstream towards the waterfall, and the high valley walls are failing in many places, contributing various classes of rock and associated vegetation to the stream.

The sparse riparian zone below the bridge provides limited habitat for birds, mammals and insects. Above the bridge, the riparian zone is utilized by many species of birds, mammals and other organisms.

Dace, sculpin and juvenile steelhead were collected in our fish sampling during July, 1997. Limited records provided by Washington Department of Fish and Wildlife indicate that adult steelhead and coho salmon have been observed in lower Rock Creek. Stream habitat type in this lower reach of the creek is primarily run with riffles that have drops in excess of one foot. We observed some areas in run sections and small pools off the main channel that had gravel considered adequate for salmonid spawning; most substrates were larger sized cobbles. Overall, our impression is that spawning gravels are limited in this reach. Side channels in the section above the bridge provide rearing and summer refuge habitat for juvenile salmonids. Water quality appears to be good in Rock Creek; temperature and dissolved oxygen levels recorded during the study are within acceptable ranges for salmonids.



## Physical Environment

The study reach of Rock Creek flows through a deep, steep-walled bedrock valley. The steep valley walls are failing in many locations, contributing a good supply of gravel, cobbles and boulders to the stream. The upper part of the study area is very confined with no floodplain; the valley widens downstream and has a narrow floodplain in the lower sections. The stream bottom appears to consist of bedrock closer to the falls and large materials such as rocks and boulders downstream. A fair amount of woody debris exists in the channel and narrow floodplain; this is the result of landslides contributing alders and conifers from the upper slopes. Very large wood, on the order of 3-6 ft diameter logs, are generally not present, and are not being generated in the watershed.

The size and distribution of rock materials in the stream system indicates the magnitude of high flow forces in Rock Creek. Large quantities of rock are moved through the system. Construction of Bonneville Dam, however, has resulted in a major change in the movement of bedload in Rock Creek. The depositional zone in the lower creek has shifted upstream as a result of the change in river surface elevations behind Bonneville Dam. The large quantities of material being transported downstream now appear to settle further upstream than they did historically. Examination of historic aerial photographs show this change (see Figures A-6 through A-9). The 1935 aerial photo, taken prior to completion of the dam, shows that Rock Creek had one main channel under the Rock Creek Drive bridge (along the right bank<sup>1</sup>) and a low gravel bar on the inner side (left bank) of the slight channel bend at that location. This is also evident in the cross section of the creek derived from the 1921 bridge design drawings (see Figure A-5). The 1921 cross section shows a deep channel along the right bank and a low terrace, a gravel bar, on the left bank. The cross section developed in 1997 shows that the entire streambed cross section at the bridge is a minimum of 2 feet and a maximum of about 12 feet higher than in 1921. The present cross section contains two channels separated by a high central gravel bar. This is clearly seen in the aerial photos from the 1970's and 1990's. The amount of material accumulated in the stream below the Rock Creek Drive bridge has apparently increased dramatically as a result of recent extreme high flow events.

The accumulation of rock at the bridge location poses potential problems of bridge stability and flood risk. The conveyance capacity at this location is greatly reduced from the bridge design condition. Wood debris racked up against the bridge during high flows could cause a backwater that could result in local flooding and bridge damage. Below the Rock Creek Drive bridge, the risk posed by accumulated rock is much less because of the greater channel width.

## Ecological Condition

The ecological condition of the Rock Creek study reach is good to very good (again, this is a

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<sup>1</sup> Right and left bank looking downstream.

subjective rating). The portion of the stream below Rock Creek Drive bridge is not as good in terms of habitat as the portion between the bridge and the waterfall. This lower section is a depositional zone (a delta) with braided channels meandering through gravel deposits. We assume that the channel geography in this lower section changes during larger flow events. There appears to be adequate channel depth during all seasons through the delta section and above for fish passage.

Fish and wildlife habitat is good in the stream and associated corridor, and there is limited disturbance by human development, with the lowest section being the most disturbed. There does not seem to be a great need for fish habitat enhancements in the stream; these would be difficult anyway because of the great flow forces during high water events. There are opportunities for habitat enhancement in the section below Rock Creek Drive, particularly within the riparian zone. Planting of riparian trees and shrubs, such as willow, cottonwood, alder and others, would provide bank stability, shade, and food (insects) for fish. Steep bank sections should be graded to a more stable angle and armored with rock at their bases before being planted.

#### 2.4 Flood Hazard Analysis

A flood hazard analysis was conducted to address concerns about the flood risks in the study area. One aspect of this concern is the relationship between the large accumulations of rock in the lower section of Rock Creek and flood elevations for various flood events. To address these concerns, the consultant team conducted hydrologic and hydraulic modeling, using the U.S. Army Corps of Engineers HEC-1 and HEC-2 models, respectively. We also met with Corps of Engineers staff to obtain 100-year floodplain data for the Bonneville Pool, and historical records of pool elevations at Stevenson.

The Rock Creek drainage basin consists of 43 square miles with 24 significant subbasins (see Figure D-1). Land use in 22 of the 24 subbasins was classified as commercial forest that is either clearcut or maturing second growth. The hydrologic model results were presented for two critical conditions: flow at the Rock Creek Drive bridge, and flow at the outlet of Rock Cove (SR14 bridge). Runoff from most of the basin flows under the bridge; however runoff from one smaller basin joins the creek within Rock Cove. Hydrologic modeling results are presented in Table D-3 for the 2, 5, 10, 25, 50 and 100 year events for the two conditions. Flows at the Rock Creek Drive bridge range from 1,954 cubic feet per second (cfs) for the 2-year event, to 7,199 cfs for the 100-year event. These amounts are slightly higher at the SR14 bridge: 2,029 cfs for the 2-year, and 7,538 cfs for the 100-year event.

The hydraulic modeling effort for Rock Creek is more complicated because of the Bonneville Pool influence. The model runs to date are based on input of topographic information gleaned from a variety of sources. These model results are considered preliminary because surveyed cross

sections of selected creek locations have not been completed.<sup>2</sup> The preliminary results, however, show that the event of greatest concern to the Rock Cove and lower Rock Creek area is the 100-year event on the Columbia River (see Table D-4). A 100-year event on Rock Creek that occurs when the Bonneville Pool is low (i.e. a 2-year event) will result in a water surface elevation at Rock Creek Drive bridge of about 80.4 feet MSL, and a water surface elevation in the pool of 78.8 ft MSL. A 100-year event on Rock Creek when the Bonneville Pool is at the 100-year event level raises the water surface elevation at the bridge by only about 0.2 feet.

A preliminary conclusion of this modeling effort is that the water surface elevation of the Bonneville Pool is the determining factor for water levels in lower Rock Creek and Rock Cove, regardless of the magnitude of flow from the Rock Creek watershed.

## 2.5 Dredging Considerations

One of the goals of this project is to evaluate the potential environmental impacts of dredging proposed in the creek and cove. Dredging has been a common topic of conversation with Rock Creek area citizens and officials of the county and city. The creek has been dredged in the past; in fact, much of the land occupied by the fairgrounds is apparently dredge material from the creek.

There are a number of potential reasons that might justify proposed dredging in Rock Creek and Rock Cove. These reasons include: improving flow conveyance in the creek to reduce flooding risk; protecting the Rock Creek Drive bridge; creating or maintaining channels in the creek and/or cove for navigation; improving fish passage or fish habitat in the creek; protecting streambanks along the fairgrounds; eliminating aquatic plants from the cove; and obtaining dredged material for creating developable land in the lower creek or cove. Each of these presumed justifications is discussed below.

Reducing flood risk. The preliminary hydraulic modeling results (see previous section and Technical Appendix D) indicate that the greatest flood risks to the study area are from high water levels in the Bonneville Pool, not from high flow events in Rock Creek. Dredging the creek, or the creek and cove, will not lower the high water levels in Bonneville Pool, and will therefore not reduce flooding risks in the study area. There could be some reduction of creek elevations resulting from dredging the lower creek for certain Rock Creek flow events when the Bonneville Pool is low; however, these events do not appear to pose much flood risk.

Protecting the Rock Creek Drive bridge. The large accumulation of material in the bridge area has significantly decreased the conveyance capacity of the channel, and poses risks of bridge

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<sup>2</sup> Surveyed stream cross section data are being collected by the county. Once these data are available, they will be input to the model, and the results will be more accurate.

damage and flooding caused by floating debris jams. Removing the gravel bar above and below the bridge would conceivably reduce these risks for events with high flows in Rock Creek and low surface elevations in the Bonneville Pool. Higher water surface elevations in the pool, however, such as those predicted for the 100-year event, create a backwater at the Rock Creek Drive bridge that potentially increases bridge damage and local flooding risks.

Navigation channels. The need for navigable channels in the creek and cove is for small watercraft, such as canoes, kayaks and small power boats. Power boats have the deepest draft of these watercraft; however, power boat traffic in the lower creek and cove is limited by a lack of launching and moorage facilities. The most frequent power boat usage in the cove is probably by local bass fishers. The economic justification for creating and maintaining navigable channels for small power boats would need further study.

Improved fish passage and habitat. Stream channel depths through the lower section of Rock Creek appear to be adequate for passage of adult salmonids, especially during times of the year when they are spawning. We have not seen any conditions that we consider impassable for these species. Removing rock deposits from the lower creek and delta area would create deeper water or pools; however, these would lack cover (no trees) and would quickly fill in during high flow events in the creek. It might be possible to conduct very selective dredging to create a complex of pools, riffles and islands downstream from the Rock Creek Drive bridge, but these improvements would be very temporary and probably not worth the expense.

Protecting streambanks. The mid-channel gravel bars in the lower creek direct stream flows along the streambanks. This is potentially a problem for poorly protected streambank sections along the fairgrounds. The simplest and probably least costly remedy would be to regrade these banks to a lower angle, armor their bases with large rock, and plant their upper portions with trees and shrubs. Removing the mid-channel bars would lessen the erosive forces on these banks, but the bars would probably re-form and need to be dredged periodically.

Eliminating aquatic plants. Extensive beds of aquatic plants in Rock Cove are a nuisance for certain human activities. Our data indicate that these plants grow in shallow water around the cove edge, and dredging these areas would certainly reduce or eliminate these plants. The benefits of this removal compared to the environmental impacts would need to be assessed. Shallow water provides habitat for fish and wildlife species, and aquatic plant beds also provide habitat values for many species.

Material for creating land. Material dredged from the creek and/or cove could be used to create additional upland in the lower creek or cove areas. While this would have an economic benefit, it would also have an environmental cost. Any proposed project of this kind would need to obtain state and federal permits for filling waters of the United States and state submerged lands. The permit process would require an analysis of alternatives documenting why filling these waters would be the most practicable alternative. The probability of obtaining these permits is low.

## 2.6 Land Uses and Facilities

City of Stevenson zoning designations on the Rock Cove study area are: public use and recreation (PR), commercial recreational (CR), and commercial (C1) (see Figure E-1). The PR designation covers most of the cove and county lands, and accomodates existing uses, minimizes possible conflicts of use, and maintains and conserves the environmental qualities of the Rock Cove area. The CR designation within the study area covers the undeveloped county land near the Interpretive Center and some of the Interpretive Center parking area. This zoning enhances opportunities for tourism and business via commercial and other facilities that compliment the natural and cultural attractions of the area without significant adverse effects to natural, cultural and historic resources. The C1 zone within the study area covers lands at the northeast end of the area along the highway and the bank of Rock Creek. Principal uses within this designation include residential, office, retail sales, banks, hotel/motel and others.

This zoning pattern sets the stage for future development and uses within the Rock Cove study area. The economic focus of Skamania County is changing from one of resource extraction to non-extractive uses. Tourism will become a predominant economic generator with related economic benefits. The county can increase tourism activities by making better use of the fairgrounds and focusing on the natural resource attractors in the Rock Cove study area, as well as nearby national forest lands and other resources. The Rock Cove area and associated facilities have the potential to become a focal point that can draw people to the area, and together with the City of Stevenson serve as a jumping-off point for people visiting the federal lands for recreational uses.

In our view, the key to this strategy is to focus on the cove and fairgrounds as an area centerpiece, and to forge strong links between the cove area and the Interpretive Center, Skamania Lodge, Rock Creek Park, Stevenson and the Columbia River waterfront. This will require maintaining a larger vision for the entire county that encompasses all of the natural resource and built elements that attract users.

The Cove, Interpretive Center, Skamania Lodge, Columbia River waterfront and the commercial core of Stevenson can be thought of as links in a chain. The entire chain is stronger than each individual link. In many ways, the Rock Creek Park and Fairgrounds is the key link. It is centrally located, it is what east-bound travelers see first from Highway 14, and it has the facilities and space to accomodate a wide variety of activities that can draw visitors in. If the physical and information connections between the park/fairground facilities are strengthened, they will encourage visitors to explore other links in the chain.

The concept stated above carries with it a number of concerns that need to be resolved by local residents. Every proposed use of the park and fairground facilities and surrounding lands has advantages and disadvantages. Activities and features that attract visitors also increase traffic and parking needs. There are conflicting aspects to on-site camping and RV parking with maintaining

viable and improved athletic fields. Greater numbers of people using the lands and facilities of the park and fairgrounds pose potential increases in water pollution or other adverse impacts to natural resources. Development of boat launching facilities requires a large increase in parking spece needed.

New development in the cove area needs to be undertaken using a comprehensive approach. Piecemeal development can limit future options and detract from the desired character of the area. Clear goals need to be developed now that will guide development activities in ways that are compatible with a shared vision and the natural resource setting. Future development on the three county short plats should contribute to, or least not detract from local recreation opportunities. New development on these sites should be compatible with natural resource elements and should actively contribute to maintaining the natural character of the cove.

A Rock Creek Park and Skamania County Fairgrounds Master Plan was completed in 1990. Some of the elements in the Plan have been constructed; we have examined the remaining elements and their costs within capital improvement phases (see Table F-1). In order to assess and update the Master Plan, we conducted a survey of local stakeholders. The survey results seem to suggest that Rock Creek Park is considered a local place that needs to be upgraded in order to maintain its family-oriented character and function as the site of the County Fair. Most of the top rated projects in the survey would upgrade the appearance of the park and improve its functioning (see Table F-2). The capital intensive large structural elements of the Master Plan appear in the bottom half of the survey ratings.

A revised master plan phasing scheme was developed by the consultant team. Three major assumptions were made for this revision: 1) the Performing Arts Center is tabled until funds become available for a feasibility study and for siting and construction of such a facility; 2) improving the appearance of the Rock Creek Park and its facilities is assumed to encompass adding walkways and landscaping, upgrading the ballfield, and improving the turf. 3) a new foot bridge is not included because there was very little interest by the community and because the existing footbridge can function better with improved pedestrian circulation at the Park. The revised Master Plan phasing and costs are shown in Tables F-4 through F-6. The revised Master Plan phasing results in a decrease of debt service for the Plan improvements (see Figure F-1).

It is unlikely that park and fairground activities can generate significant revenues beyond those needed to maintain the facilities; in fact, the numbers indicate that increased revenues generated by these facilities might not cover the cost of their operation. Other revenue sources can be explored to replace lost timber revenues to the County; these include new or increased taxes or fees on tourist activities, or local sources such as a local option gas tax.

## 2.7 Recommended Conceptual Plan

We have developed a Recommended Conceptual Plan for the Rock Cove study area. The plan is based on all of the project elements summarized above, and the additional elements of a Rock





Cove visual assessment and a recreational uses and opportunities evaluation. The importance of Rock Cove as a visual gateway to Stevenson for eastbound travelers on SR14 and Rock Creek Drive cannot be emphasized too strongly. This natural resource amenity, if properly enhanced, can dramatically announce Stevenson and project an image of an exciting community within a breathtaking natural landscape.

Figures G-1 through G-10 present the results of the visual assessment. Recommendations presented in these figures focus on "cleaning up" the appearance of study area lands and facilities using landscaping elements, removing unsightly or inappropriate structures, formalizing entrances and boundaries of facilities, and creating focal points.

The recreational uses and opportunities study (Technical Appendix H) evaluated the existing state of recreation development, identified the major opportunities and constraints, and culminates in a site plan which incorporates those ideas which could help establish the Cove as a significant recreation destination for residents and Gorge visitors alike.

The Concept Plan incorporates the existing distribution of active and passive recreational activities between the approximate west and east halves of the cove. This activity distribution is illustrated in the recreational opportunities and constraints diagram (Figure H-1). A key opportunity identified in the analysis is the linkage between the Columbia River waterfront, Stevenson commercial core, the Interpretive Center and Skamania Lodge. A basic building block of this linkage has already been established: the paved path that crosses the creek and extends along Rock Creek Drive to the Interpretive Center and Lodge. There are opportunities to fill the gaps in this "string of pearls" that are identified in the assessment. The results of a fairgrounds survey conducted by the consultant team are incorporated into the Concept Plan (see previous discussion).

A table was constructed that lists the proposed recreational activities in the cove study area, assesses the ability of existing facilities to support the activities, identifies additional needed facilities, and estimates associated costs (Table H-1).

The Recommended Concept Plan is illustrated as a Proposed Site Plan (Figure H-2) that incorporates recommendations for habitat improvements, visual enhancements and recreation development.

### 3 GOALS AND IMPLEMENTATION RECOMMENDATIONS

This section presents recommended goals and actions to achieve the goals. Justification for many of the goals is presented in a paragraph after the goal statements. Supporting comments for the recommended actions (Rec.) are included in parentheses.

**Goal 1. Protect and Enhance the Natural Appearance of the Cove**

The natural appearance of the cove is a critical element that makes the cove a focal point in the area.

- High Rec. 1-1 Rec<sup>(creek)</sup>establish a natural and durable shoreline around Cove, particularly on east bank. (see Goal 6)
- Rec. 1-2 Remove and control Himalayan blackberry and other invasive non-native plant species, and replace with native tree, shrub and groundcover vegetation. (Provide food and cover for wildlife, shading for aquatic habitat, textural and color visual diversity.)
- Rec. 1-3 Utilize only indigenous native plant species within 100' zone from high-water line of Cove. (Provides suitable habitat for native wildlife, illustrates native plant landscaping themes, and provides proper context for scenic views.)
- Rec. 1-4 Plant native riparian shrub and tree species along south park shoreline (see also Rec. 6-2). (Plantings should be established in a pattern that will discourage goose access to park lawns, provide directed public access to waters edge, and improve visual qualities from within and outside park.)

Note: See related recommendations 3-1, 3-2, and 6-2.

**Goal 2. Protect and Enhance Important Fish and Wildlife Habitats in Rock Cove and Rock Creek.**

The cove and creek provide important, and in some aspects, significant habitat for fish and wildlife populations. These, in turn, are an attractive feature for the region.

- Rec. 2-1 Limit and discourage human access to islands in Rock Cove. (Protect important nesting habitat for waterfowl and other wildlife species; encourage undisturbed habitat conditions.)
- Rec. 2-2 Establish minimum 25 foot environmental setback along cove and creek shorelines (greater distance in sensitive habitat areas) and identify allowed uses within the setback. (Protect riparian zone vegetation and habitat, provide shade for aquatic habitat, provide public access along shoreline.)

**Goal 3. Create additional fish and wildlife habitat to improve habitat diversity in Rock Cove.**

Improvements in habitat diversity will enhance the opportunities to view wildlife, and improve

the usability of the cove for a wider variety of species.

- Rec. 3-1 Create emergent marsh habitat at selected locations on cove shoreline. (Increase amount of scarce habitat in cove and provide diverse habitat for waterfowl, wading birds and fish.)
- Rec. 3-2 Create a new shallow marsh island in Cove to provide goose foraging habitat and to serve as a breakwater to protect cove shoreline from erosion. (Attractive goose foraging area will help keep geese off park lawns; the island will function as a breakwater to reduce wave energy generated by south and southwesterly winds directed towards the park shoreline.)

**Goal 4. Protect Rock Cove and Rock Creek Water Quality.**

Existing and future development can potentially have adverse impacts on water quality, which can result in degraded fish and wildlife habitat and recreational opportunities.

- Rec. 4-1 Require on-site stormwater treatment for all new development that exceeds a set area of impervious street or parking surface, or landscaped surface, within cove and creek drainage basins. (Runoff from paved parking areas and street surfaces should be routed through mechanical (i.e. catch basin, stormceptor), and/or biological (i.e. vegetated swale, wet pond) facilities to pre-treat runoff prior to discharge to cove or creek. Runoff from large landscaped areas that are maintained with landscaping chemicals, such as fertilizers and herbicides/pesticides, should also be pre-treated before discharge to receiving waters.)
- Rec. 4-2 Implement a program to retrofit existing developments, that have more than a specified amount of impervious street and parking area, or landscaped area, with stormwater treatment facilities, or provide regional facilities, for developments within cove and creek drainage basins. (see Rec. 4-1)

**Goal 5. Improve and maintain flood flow conveyance in lower Rock Creek.**

The reduced flow conveyance in the area of Rock Creek Drive bridge poses potential risks to the bridge and flood risks to the local area.

- Rec. 5-1 Remove all or a portion of the accumulated rock and sediment upstream and downstream of the Rock Creek Drive bridge and to the highway bridge. (The extent of material removal should be determined using flood conveyance modeling or other appropriate techniques. Environmental impacts associated with removal activities will need to be assessed. The project might also provide

opportunities for habitat creation or enhancement.)

**Goal 6. Protect Rock Creek and Rock Cove stream banks from erosion damage.**

Erosion along the creek can result in damage to structures and property loss.

- Rec. 6-1 Identify areas of streambank erosion (existing or potential) that pose problems for properties or structures and implement bank protection measures, using biotechnical or other appropriate environmentally sensitive techniques to the extent feasible. (Many areas can be treated by re-grading stream banks to a lower angle, placing rock materials at the toe of the bank, and planting with native riparian tree and shrub species. This will provide bank stability and improve riparian habitat and visual resource values.)
  
- Rec. 6-2 Use biotechnical and landscaping techniques to protect cove shorelines from erosion, and improve habitat and aesthetic values. (Eroding shorelines add sediment to cove, degrade shallow water and riparian zone habitat, present unpleasing visual qualities.)



**Goal 7. Improve Appearance of Fairgrounds Site**

Some of the existing facilities detract from the natural setting of the cove area.

- Rec. 7-1. Use vegetation to help screen existing buildings.
- Rec. 7-2 Repaint existing buildings including roofs, utilizing warm gray tones which complement colors in the surrounding natural landscape.
- Rec. 7-3 Develop an architectural theme and identity for all new buildings at fairgrounds. Incorporate additional architectural details as possible in upgrades of existing buildings. Utilize natural materials of peeled logs and stone masonry walls and building bases in the architectural theme.
- Rec. 7-4 Develop an improved "Concert Green" area which can be utilized for various events.
- Rec. 7-5 Create an improved landscaped pedestrian corridor along Rock Cove Drive at the Motor Pool and Grange hall area.
- Rec. 7-6 Monitor and protect oak trees in the grove along Rock Cove Drive around the Community Center.

**Goal 8. Expand and Improve Recreation Use of the Cove.**

- Rec. 8-1 Install an irrigation system and upgrade the baseball field.
- Rec. 8-2 Discourage use of lawn areas by geese (see Rec. 1-4, 3-1 and 3-2)
- Rec. 8-3 Develop additional section of shoreline trail around west peninsula within a publicly-owned shoreline easement. (see Rec. 2-2)
- Rec. 8-4 Provide barrier-free fishing opportunity.
- Rec. 8-5 Provide an improved beach area for launching non-motorized boats and sailboards.
- Rec. 8-6 Provide a permanent facility for rental of recreational equipment (boats, sailboards, roller blades, bikes, etc.).
- Rec. 8-7 Emphasize waterfowl watching opportunities in Cove by creating viewing blinds in two locations.



- Rec. 8-8 Develop an improved parking area at current Motor Pool site which can accommodate Farmer's Market and Craft Fair events as well as parking for County Fair and Concert events at the Fairgrounds.
- Rec. 8-9 Eliminate vehicle access to peninsulas in southwest portion of Cove because of safety concerns with SR 14 traffic.
- Rec. 8-10 Develop a vision statement and commit to a mission for the park. (The vision statement should be one that is developed through a coordinated effort with the community, city of Stevenson and the Port. The vision statement will assist in focusing efforts for improvement and use of the park.)

The park has historically been a community hub. Most of activities that currently take place at the park are community- and family-oriented. As use of the park continues, greater conflict will occur between community use versus the need for revenue generating activities. Committing to prioritize community-oriented uses would not prohibit using the park as a hub of regional activity, but it would probably not be compatible with the idea that the park facilities should pay for themselves.

- Rec. 8-11 As part of the long-range plan for the Cove, the Motor Pool/Maintenance Shop should be relocated. (The use as a motor pool conflicts with the goal of expanded recreation use in the Cove. This location is a key link between Rock Creek Park and downtown Stevenson, and it marks a gateway to park. The shop site is an ideal location for future expansion of the park to create greater opportunities for recreation, community livability and economic revitalization.
- Rec. 8-12 A stronger entrance to Rock Creek Park from Rock Cove Drive should be developed. The entrances to the park and the Cove should be enhanced to create visual gateways into these areas. Roadway improvements are recommended along the Fairground access that passes near the City Sewer Treatment Plant. The industrial appearance of the treatment plant can be mitigated by landscaping and screening.
- Rec. 8-13 The County should make a determination on the appropriateness of a boat launch in the cove. An unimproved boat launch is located on the "short plat" properties currently owned by the County. Because a boat launch and parking facilities require considerable land area, we recommend that the boat launch be discontinued at such time as more intensive use of the property can be made.



**Goal 9. Increase Awareness and Appreciation of Rock Cove**

- Rec. 9-1      Develop a "Rock Cove Greenway" logo for identification of the public use areas in signage, brochures and along path.
- Rec. 9-2      Strengthen the physical connection of paths in park and fairground with downtown Stevenson and Port property with clearly identified and signed route.
- Rec. 9-3      Increase the number of events at the Fairgrounds site to increase the use of Rock Cove Greenway and Cove.
- Rec. 9-4      Develop a brochure, to be made available at local merchants, which discusses the natural character and recreational opportunities at the Cove, including boating, wildlife viewing, sailboarding, walking, etc.
- Rec. 9-5      Work with Washington State DNR, Defenders of Wildlife and others to have the Cove recognized as a designated wildlife viewing site.
- Rec. 9-6      Develop an interpretive and informational sign plan for the Cove area.

**Goal 10. Evaluate land uses within and around the cove area.**

- Rec. 10-1      Any decision-making which could affect the physical, social, and economic character of the Rock Cove area should be accomplished through deliberate actions that consider future impacts. (The County and the City should cooperate to ensure that zoning codes permit appropriate uses and prohibit those uses that could have detrimental effects on the Cove area. Examples of land uses that would be detrimental along Rock Cove Drive include: auto-oriented strip commercial uses such as fast food establishments; warehouses; industrial uses; gas stations; strip malls, etc. )
- Rec. 10-2      Establish a list of specific uses that may be permitted on the properties known as the "short plat". (These uses should complement tourism and retail activities. If business uses are permitted, they should supply a high number of jobs per acre.)
- Rec. 10-3      Developable land is a premium along Rock Cove. Because of this, higher density, mixed-use development should be encouraged north of Rock Cove Drive. (This will make the park a focus of activity, and will assist in creating a strong mixed use activity area that will strengthen the local economy.)



Rec. 10-4 Develop an overlay zone which establishes an architectural theme and guidelines throughout the Cove area. (Rock Cove is a significant water feature. As such, new development should be designed to complement it. Amenities such as outdoor decks and patios should be required or at least encouraged on new retail developments. Windows should be required on all new retail or commercial uses. Windows should be oriented to take advantage of the views and should also be located on the street sides of each building.)

**Goal 11. Encourage economic vitality.**

Rec. 11-1 The County should coordinate with the City and the Port to market a vision for Rock Cove and the Stevenson area and what it can be in the future. (Adopting a vision statement will encourage intergovernmental cooperation and will be a good tool for attracting jobs and investment into the area.)

Rec. 11-2 Emphasize the Cove area as a public attraction. (see Goal 9) (Improvements to Rock Cove should be viewed as one element to the overall vitality of the entire Stevenson area.)

Rec. 11-3 The County should ensure that uses permitted on the short plat properties will increase the number of new jobs or tourist-retail uses. (Anchor retail uses should be encouraged on the short plat properties. The "right" use may take time to attract. The County should remain patient and be selective on the future development of these properties.)

Rec. 11-4 Develop strong visual and pedestrian connections throughout the cove and other community anchors, including Skamania Lodge, downtown Stevenson and the Columbia River. (Strong connections will strengthen economic opportunities throughout the area and will assist in leveraging community investments.)

Rec. 11-5 Continue to develop partnerships among stakeholders in the area in order to work toward one vision which encompasses not only the cove, but the entire Stevenson area. (This includes the Skamania Lodge, the Gorge Interpretive Center, the Chamber of Commerce, and the Forest Service, in addition to the Port and the City and County governments.)

Rec. 11-6 Encourage a mix of activities and uses at the park.

Rec. 11-7 Improve the appearance of the park and of the Cove area. (see goals 7 and 8)

- Rec. 11-8 Be selective in the addition of new structures to the park, both in design and siting (see Rec. 7-3). (The use of temporary structures may be appropriate for certain types of uses. Care should be taken that temporary structures do not become permanent features that reduce the aesthetic appeal of the cove.)
- Rec. 11-9 The construction of a structure to house a performing arts center does not appear to be economically viable at this point. (The County should encourage performing arts activities through the use of existing facilities or temporary stages.)
- Rec. 11-10 The County should encourage the use of colorful flags and banners in conjunction with events and activities in the cove. (Regular use of flags and banners will signal that an event is happening. These can attract attention and portray a festive ambiance, if done appropriately. A flag/banner "site" could be established on the fairgrounds south point that is highly visible from SR14. This site can be used to "announce" events with a banner and flags.)

**Goal 12. Strengthen transportation opportunities throughout the Cove area.**

Strengthening transportation systems in the Cove area will create better connections, and will be more welcoming to visitors.

- Rec. 12-1 Increase pedestrian linkages among attractions in the Cove. (Rock Creek Park is the key to making connections because of its anchoring central location. The pedestrian path around the Cove should be expanded through the park and into Stevenson.)
- Rec. 12-2 Relocate the Motor Pool/Maintenance Yard to reduce conflicts on Rock Cove Drive.
- Rec. 12-3 Develop the Rock Cove Greenway system, which will include the pathway around the Cove and the various attractions and public amenities in the area. (see Rec. 8-3, 8-7, 9-1, 9-2, 9-6)
- Rec. 12-4 Develop a map of local bicycle routes. (The map should include shorter rides, such as from Stevenson to the Skamania Lodge, as well as longer rides, some of which could connect to mountain biking trails in the Gifford Pinchot National Forest.)
- Rec. 12-5 Develop a pedestrian connection to the cove through the "short plat" County owned property.

4 Technical Appendices

- A. Rock Cove Physical Environment
- B. Rock Cove and Lower Rock Creek Fish and Wildlife Habitat
- C. Reconnaissance Geomorphic Assessment of Rock Creek
- D. Flood Hazard Analysis of Rock Creek Cove
- E. Land Use Impacts to Rock Cove
- F. Facilities and Uses Economic Review for Rock Cove Study Area
- G. Rock Cove Visual Assessment
- H. Recreational Uses and Opportunities
- I. GIS Mapping Summary



## TECHNICAL APPENDIX A. ROCK COVE PHYSICAL ENVIRONMENT

Prepared by: Peter Britz, Natural Resource Planner; Fishman Environmental Services

### INTRODUCTION

As part of the investigation of the physical environment of Rock Cove, data were collected to help get a better understanding of the parameters involved in the natural and human induced impacts and changes affecting Rock Cove. Below is a discussion of four areas: bathymetric map creation, debris mapping/technical investigation, Rock Creek Drive bridge channel profile, and aerial photo series.

The bathymetric map was created to get a better understanding of the processes which shape the Cove. The debris mapping and technical investigations allowed us to ascertain where debris exists in the cove in order to understand the possible dangers with recreation activities and potential fish and wildlife impacts to the Cove. The Rock Creek Drive bridge channel profile was created to gain an understanding of how the Rock Creek Channel has changed over time. The aerial photo series was collected in order to get a perspective on the historic land cover changes over time, and in order to make measurements and map the present day land cover.

### METHODS

#### Bathymetry Geographic Position System (GPS) Data Collection and Map Production Process

In order to collect bathymetry data on Rock Cove a Global Positioning System (GPS) was used in conjunction with a depth sounder on a small boat. The GPS data were correlated to the soundings to give depth readings at discrete locations in Rock Cove. The GPS was a Corvallis Microtechnology (CMT) unit which was able to store position information in files. The depth sounder was an Eagle Depthfinder. The GPS collected position information every second with a unique identification number. A field notebook was used to manually record depth information simultaneously with the position information. The unique identification number was written in the log book with the depth information.

The GPS collected real time position information which has inherent error (also known as selective availability) in the data, making the points accurate to plus or minus 15 meters. Through a process called post processing the data are correctable to plus or minus 5 meters. The post processing requires that a second GPS receiver be operating and collecting data at a known position at the same time the real time data is being collected. The National Geodetic Survey (NGS) of the National Oceanic and Atmospheric Administration has a GPS base station operating 24 hours per day at Fort Stevens State Park at the Mouth of the Columbia. This NOAA station was accessed through its web site (<http://www.ngs.noaa.gov/CORS/ngscors.html>)

and the data were downloaded and corrected to derive accurate position information. Simply speaking, the base station records GPS position information. Since its position is known it is able to account for the amount of offset or error. This offset is then applied or the error is subtracted from the data which were collected in the field to give an accurate position.

Once the data are post processed what remains is a number of files each consisting of x and y coordinates and an identification number. These coordinates are generated into a geographic information system (GIS) coverage in PC ARC/INFO. This GIS coverage contains a point location for each data point collected in the field. These data points still have the same identification number from the field. In addition to depth information a comment was also added to the position record when unique features were seen, thus allowing Cove features to be linked to the depth information. The depth information recorded for each identification number was then entered into a database and linked to the point data as annotations. This annotation data was then plotted with the point data to create a map of the bathymetry of Rock Cove which gives depths at various locations throughout the Cove (see Figure A-1).

To get an overall look at bathymetry in Rock Cove the point locations from the bathymetry map were used to create a generalized bathymetry map (see Figure A-2). This map is a contour map of Rock Cove with deeper water shaded a deeper shade of blue. Only the areas where depth data were collected during the GPS and depthsounder process were used to create this map, excluding the mouth of Rock Creek. A 1978 U.S. Army Corps of Engineers bathymetric map was created for Rock Cove (see figure A-3). These two contour maps can be used to evaluate how the bathymetry of Rock Cove has changed over time. It appears as if the most significant change is some shoaling near the mouth of the Cove where a channel historically was dredged to the mill.

### **Debris and Feature Mapping / Technical Investigation**

On October 9, 1996 FES staff conducted a field study of Rock Cove in order to gain a better understanding of the Physical Environment of Rock Cove. This trip coincided with a low pool elevation at the Bonneville Dam 72.0-72.5 feet Columbia River Datum. This low water level is approximately four feet below typical depths seen in Rock Cove, which enabled FES staff to see parts of the cove that were ordinarily covered by water. Seeing the Cove at low water levels gave us a better opportunity to see what types of debris were in the cove.

We used snorkeling gear to examine the area where people are most likely to swim. A good deal of wood debris was found. This wood appears to be ends of logs that likely made their way into the cove from either the mill or the timber festival. Much of the bottom adjacent to Rock Creek Drive off the southwest corner shoreline of the fairgrounds was littered with wood debris. The bottom of the cove slopes gradually from this shoreline across the cove not getting much deeper than five or six feet (during this low pool elevation). This gradual slope and shallow depth





takes this area suitable for watersports activities except for the wood debris in the water. Poor visibility (<2 feet) combined with silt accumulations on the bottom, which when disturbed reduced the visibility to nearly zero, and thick weed beds in some areas made this snorkel survey ineffective to conduct throughout the entire cove.

The rest of the cove was examined using a small boat, and debris and other features were noted and linked to the GPS information. These features included pilings, shoals, aquatic vegetation, wood and metal debris. The pilings are located throughout the cove and appear in rows. Historically, these piling were used as log storage for the mill and other timber operators in the area. Aquatic vegetation is most dense off-shore from the area where the timber festival activities occur. The aquatic vegetation appears to thrive in areas where the water depth is 4 feet or less and the substrate is muddy. The one area with debris causing the greatest concern is located near the mill site. In the long narrow lagoon west of the point of land at the boat ramp is a hazardous area for any type of water sports activities. Metal strapping, and scrap metal from an old structure are in the water. This debris could damage a boats engine, puncture rafts, or create other problems to boaters and water recreationists.

The locations of these features were stored in the GIS with polygons representing the weeds, wood debris, and piling and metal debris (see Figure A-4).

### **Rock Creek Drive Bridge Channel Profile**

On February 27, 1997 measurements were taken from the Rock Creek Drive Bridge which crosses Rock Creek. The measurements measured the distance from the bridge to the stream bottom in order to ascertain the topographic position of the Rock Creek Channel at the bridge. These measurements resulted in a channel profile. Engineering design drawings of the bridge were found at the City of Stevenson which show the position of the bridge in relation to the channel. From these drawings a 1921 channel profile was created and compared to the 1997 profile (see Figure A-5).

The figure clearly illustrates the change in channel configuration and the amount of rock and sediment that has accumulated since the construction of the Rock Creek Bridge. The channel is topographically higher across its entire section (with the exception of the west bank which is slightly lower due to some bank erosion). The historic channel position was in the center of the profile and has a fairly uniform "U" shape with a flat floodplain to the east. The present day channel is divided into two separate channels by a central bar with a much higher position topographically. Between 1921 and the present the channel elevation is an average of five feet higher across this section with the greatest difference as much as thirteen feet. This thirteen feet is the amount of accretion which occurred creating the bar which now divides the channels.

This accretion of material in the channel poses a potential threat to the bridge, and potential flood hazards for surrounding properties. During high water events, large logs or whole trees could pile up against the bridge and cause damage to or possibly destruction of the structure. A debris jam against the bridge could also result in overbank flows upstream of the bridge if the backwater elevation is elevated.

### Aerial Photo Series

The aerial photo series described below consists of four aerial photographs. Looking at aerial photographs over time provides a good understanding of how the project area has changed. The first or oldest aerial photograph is from 1935 (see Figure A-6). This photo shows the study area before the completion of the Bonneville Dam. The area we know of as Rock Cove was formerly pastureland used in conjunction with a dairy operation. This photograph clearly shows Rock Creek and its floodway. The channel appears as a straight feature all the way to the Columbia River and occupies a similar position to what appears today. Foster Creek appears on this aerial photo all the way through the present day Rock Cove as a meandering stream. It is interesting to note that there used to be an outlet for Foster Creek under the Railroad tracks. Today Foster Creek flows into Rock Cove and the only outlet is at the highway bridge.

The next photo in the series of air photos is a 1973 aerial of the project area (see Figure A-7). This photo is very interesting because it is post completion of Bonneville Dam, so Rock Cove has been created, but still shows lots of changes in the Rock Cove area from the present day. For instance, the mill site shows the operational mill. Interestingly, the lagoon west of the present day boat ramp has some type of conveyor structure going across it. Perhaps this is part of the metal debris found in the cove at this location. The area where the current fairgrounds is located has a shoreline which meanders and has two inlets. The present day shoreline is much straighter and has been filled along much of this stretch. Rock Creek looks quite different with a gravel bar extending down from the treatment plant but not as extensive as it appears today.

The next photo in the series is a 19?? aerial taken from the report titled "Fatal Flaw Analysis for Watercraft Recreation Sites" (see Figure A-8). This aerial photograph was included in order to show a dredging operation in progress at the mouth of Rock Creek. Also interesting to note on this photo is the absence of the Columbia River Interpretive Center.

The next photo in the series is the most current aerial from 1995 (see Figure A-9). This shows the Project area in its most current condition. This aerial was used as a field aerial to help us with work in the field and also as a basemap in the creation of some of the GIS layers.

### Recommendations

The Rock Cove bathymetric map was created using a fairly simple technique which could be easily duplicated. In order to keep track of the changes in depth an update of this map could be

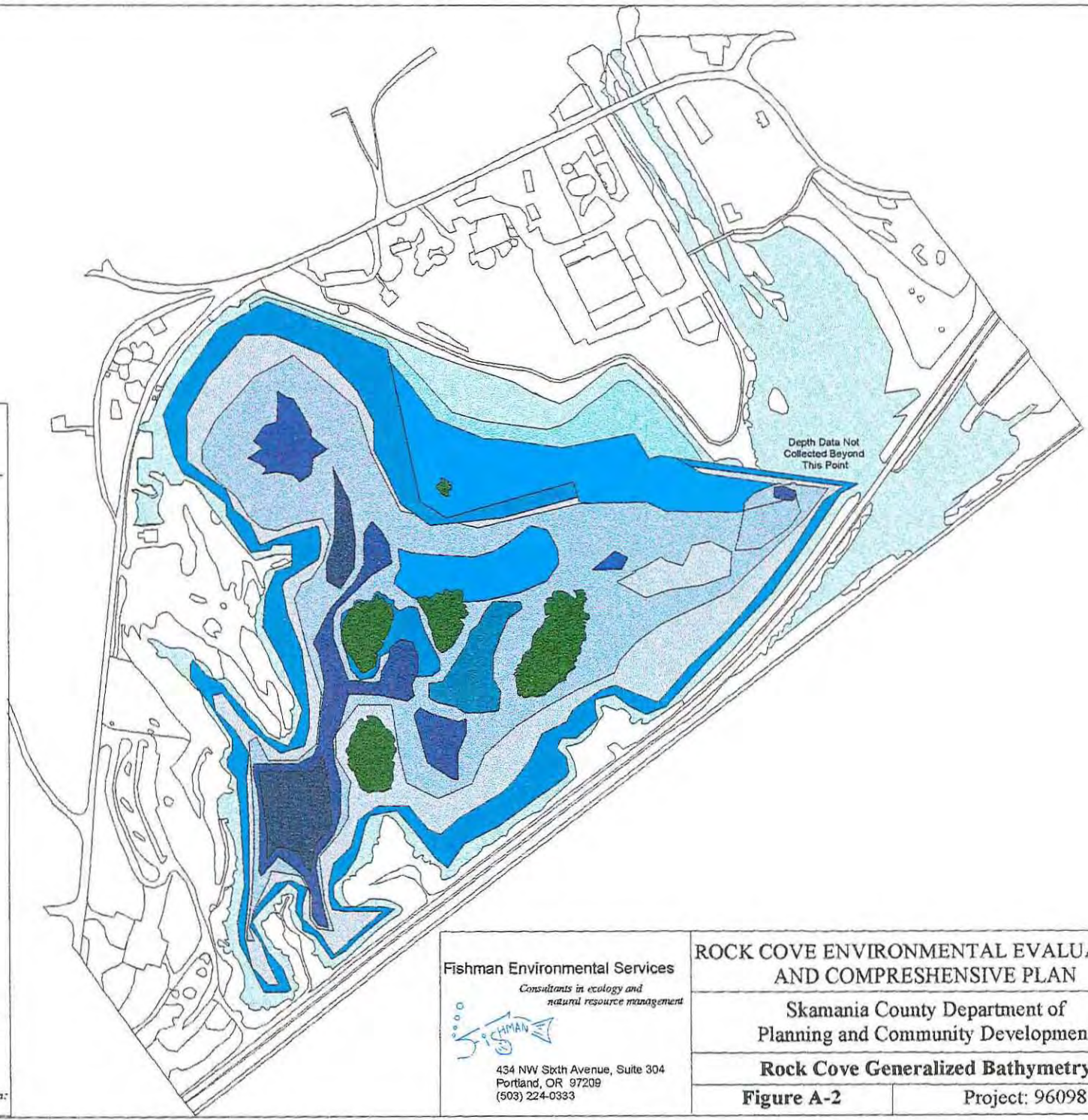
created every five years which would give a clear understanding of where the bottom profile changes occur. Understanding these processes more fully will provide important information pertinent to maintenance dredging projects which may be required in Rock Cove.

The debris mapping resulted in some useful information about the types and location of debris in Rock Cove. Most importantly and potentially most problematic is the area of metal debris located to the west of the boat ramp associated with the former mill site. This metal debris consists of strapping and scrap metal protruding out of the water and along the bank in several locations. This area should be avoided by in-water and shoreline recreation activities. Ideally, this debris would be removed from the water making the Cove a safer place for recreation activities overall. The aquatic weed beds are likely to be limited to depths of four feet or less. Aquatic weeds also prefer muddy substrates and low water circulation. If the depth of the Cove remains constant these weeds are likely to keep to the same locations. If the Cove accumulates more silt and gets shallower the weeds could increase in coverage. Dredging the Cove or improving circulation of the Cove may decrease the coverage of these aquatic weeds; however, there may be damage to fish and wildlife from these types of projects. If the weeds are an issue which is important to the County and users of Rock Cove, the issue should receive further study in order to come up with appropriate and environmentally acceptable solutions.

The channel profile figure of Rock Creek was created to get an idea of the degree of accretion of material in Rock Creek. Specifically, this graph shows the formation of the bar in the center of Rock Creek. It would be useful to look at the channel profile for several points in time between 1921 and 1997 rather than just the two points in time. A time series would provide some understanding of how the accretion of the bar has occurred, and several small events or as a gradual process over the years. If data are unavailable for a time series through the years, at least these data could be expanded upon in the future to try to better understand the processes acting on Rock Creek. Additionally, this figure could be used as a justification for getting funding to either remove the material from the bar or replace the bridge to a type that will not be threatened by flood events.



















# Legend

Depth in Feet

-  Islands
-  4
-  5
-  6
-  7
-  8
-  9
-  10
-  11
-  12
-  13
-  14



200 0 200 400 Feet



Bathymetric contours adjusted to a 75' pool elevation.

Map Projection:  
UTM Zone 10

Fishman Environmental Services  
Consultants in ecology and  
natural resource management



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ROCK COVE ENVIRONMENTAL EVALUATION  
AND COMPRESHENSIVE PLAN

Skamania County Department of  
Planning and Community Development

**Rock Cove Generalized Bathymetry**

**Figure A-2**

Project: 96098



**BACKWATER 2 - ROCK COVE**

Map developed from U.S. Army Corps of Engineers aerial photograph (May 7, 1978) at reservoir elevation 75.1 feet above mean sea level (msl). Soundings were taken in 1979 and corrected to 75.1 msl. Contours are in feet.

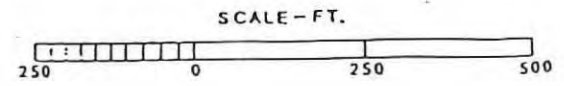
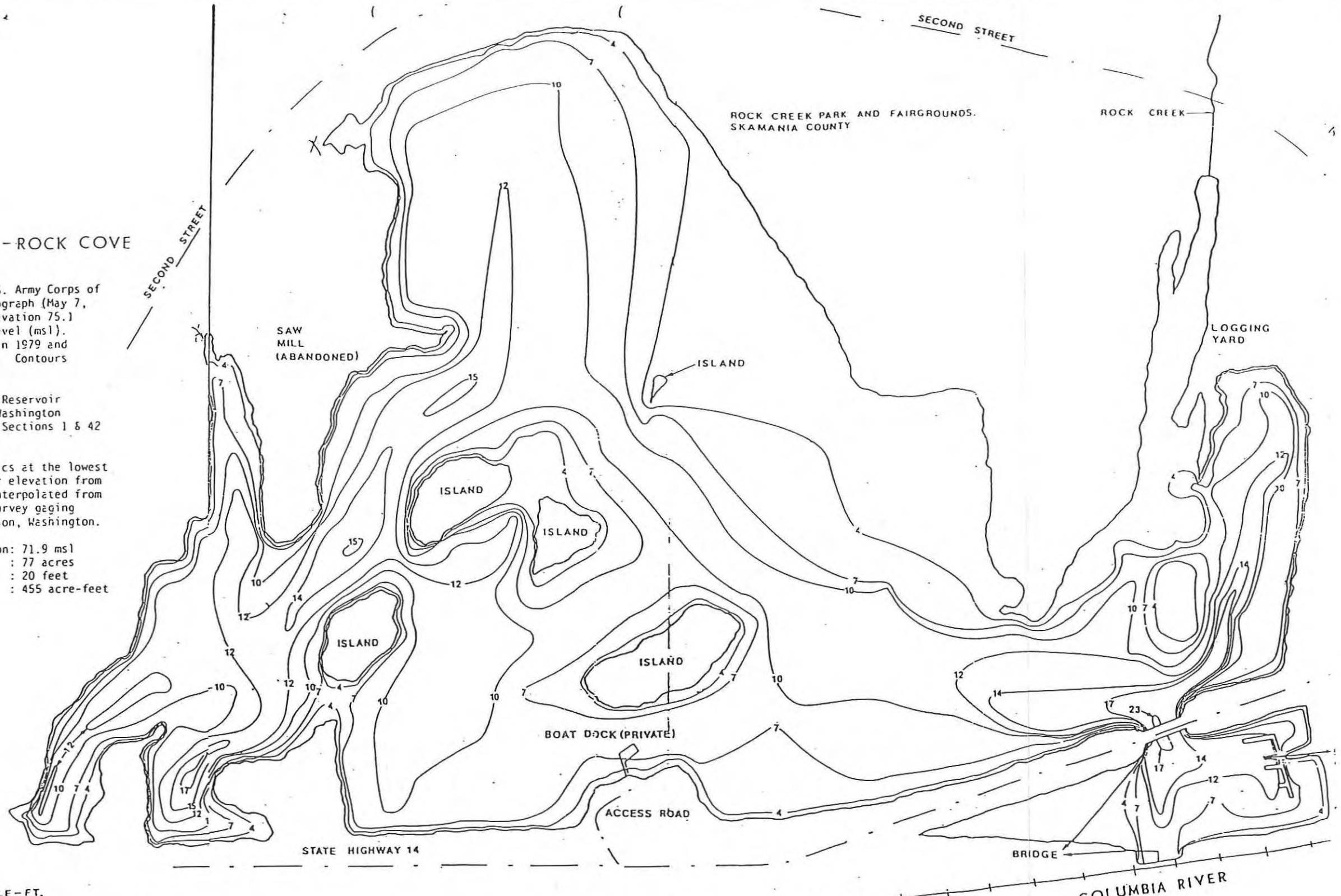
**LOCATION:** Bonneville Reservoir  
Skamania County, Washington  
T. 2 N., R. 7 E., Sections 1 & 42  
River Mile 150.0

Physical characteristics at the lowest recorded reservoir elevation from 1975 to 1979 as interpolated from U.S. Geological Survey gaging station at Stevenson, Washington.

Reservoir Elevation: 71.9 msl  
Surface Area : 77 acres  
Maximum Depth : 20 feet  
Volume : 455 acre-feet

**LEGEND**

---+--- Railroad  
- - - - Road



Map Source:  
US Army Corps of Engineers 1979

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**Rock Cove Bathymetry 1979**

Figure A-3





Project: 96098





# Legend

## Unique Features

-  Metal Debris
-  Piling
-  Submerged Aquatic Vegetation
-  Wood Chip Bottom

N



200 0 200 400 Feet



Map Projection:  
UTM Zone 10

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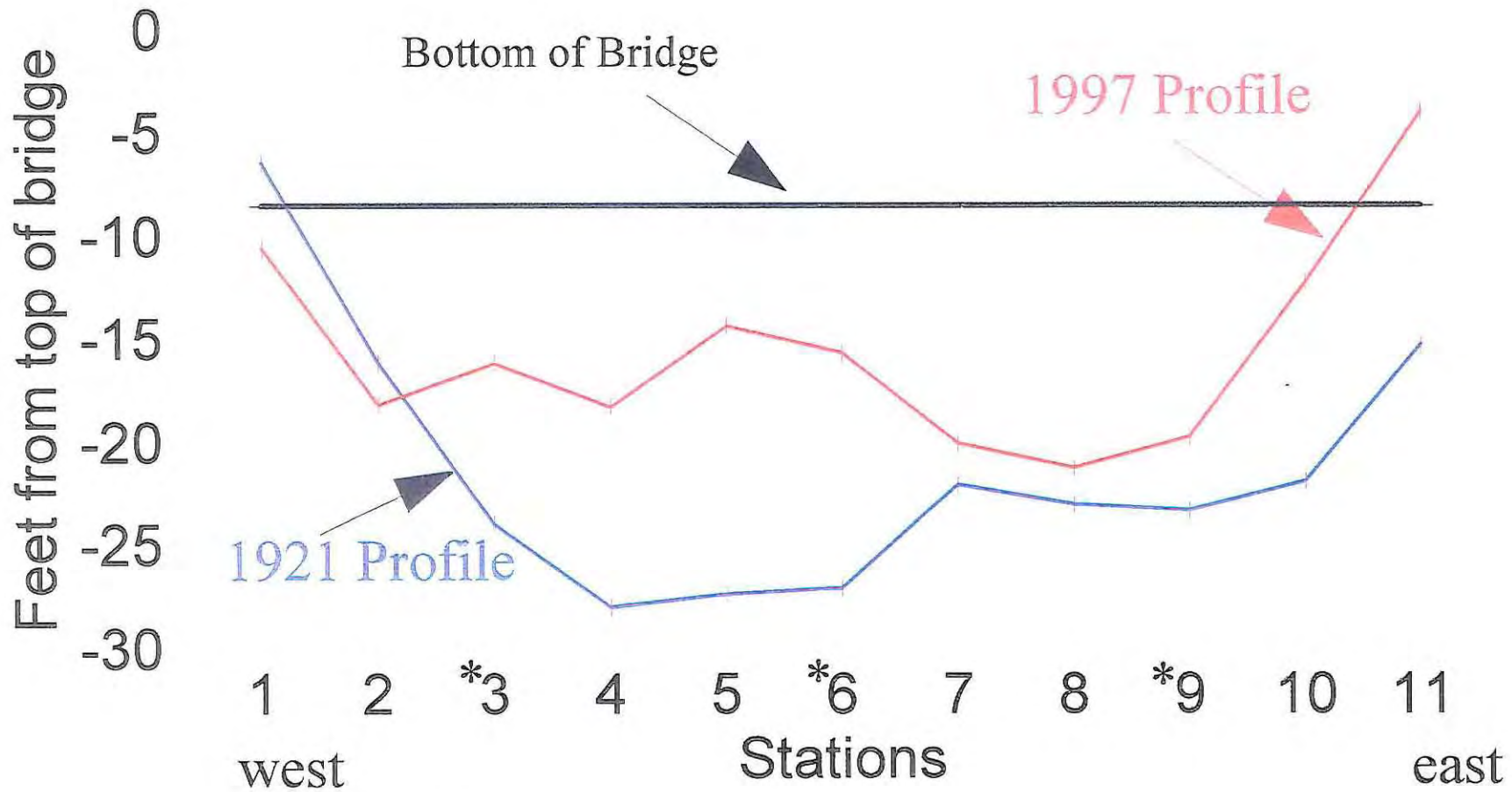
**Rock Cove Unique Features**

**Figure A-4**

**Project: 96098**

# Rock Creek Channel Cross Section

At Concrete Bridge



\* Bridge support locations

DRAWN: P. Britz

APPROVED: P. Fishman

DATE: 10/28/97

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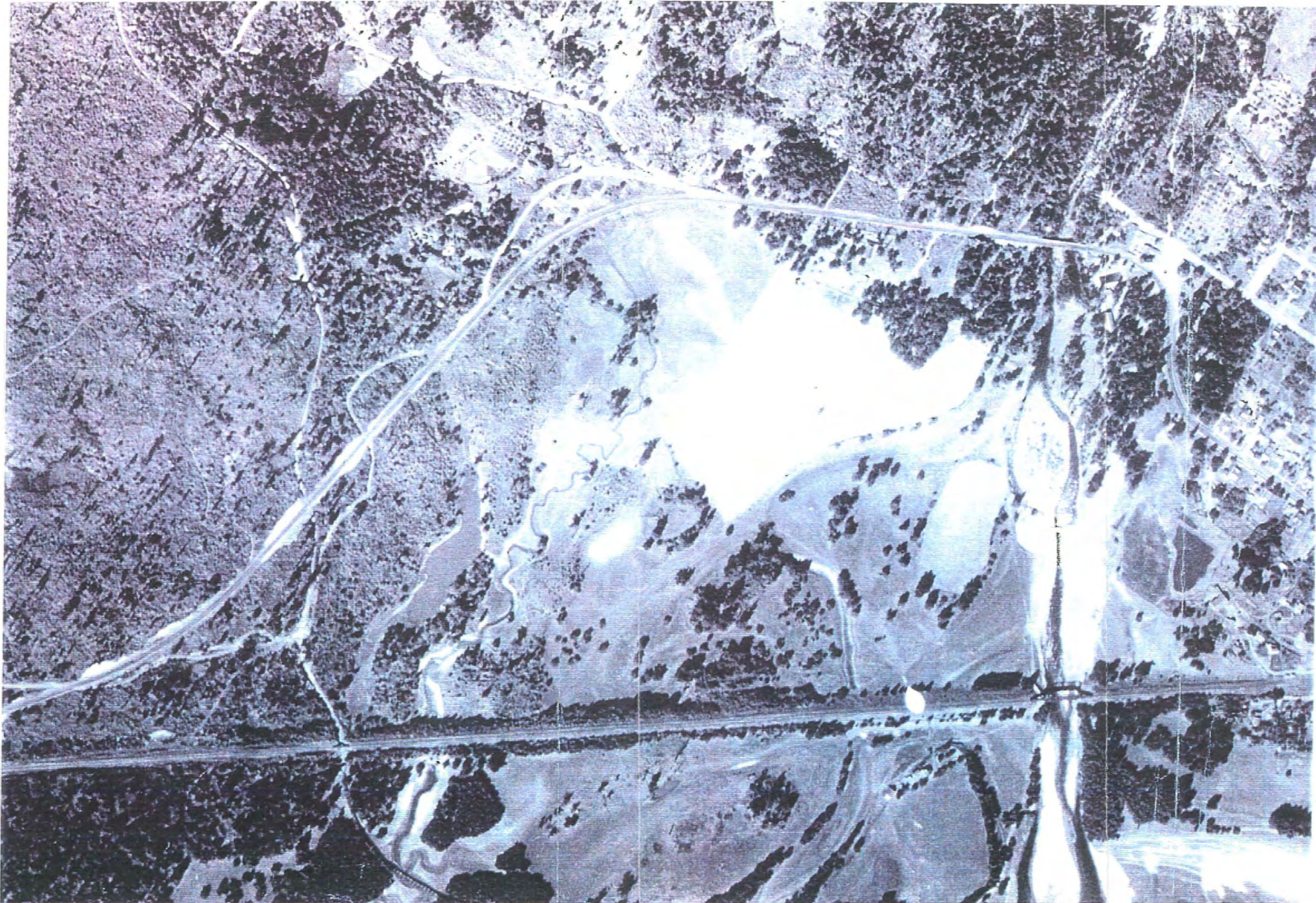
Skamania County Department of  
Planning and Community Development

**Rock Creek Channel Cross Section**

**Figure A-5**

Project: 96098





DRAWN: S. Benjamin  
 APPROVED: P. Fishman  
 DATE: 10/28/97  
 SCALE: Approx. 1" = 430'

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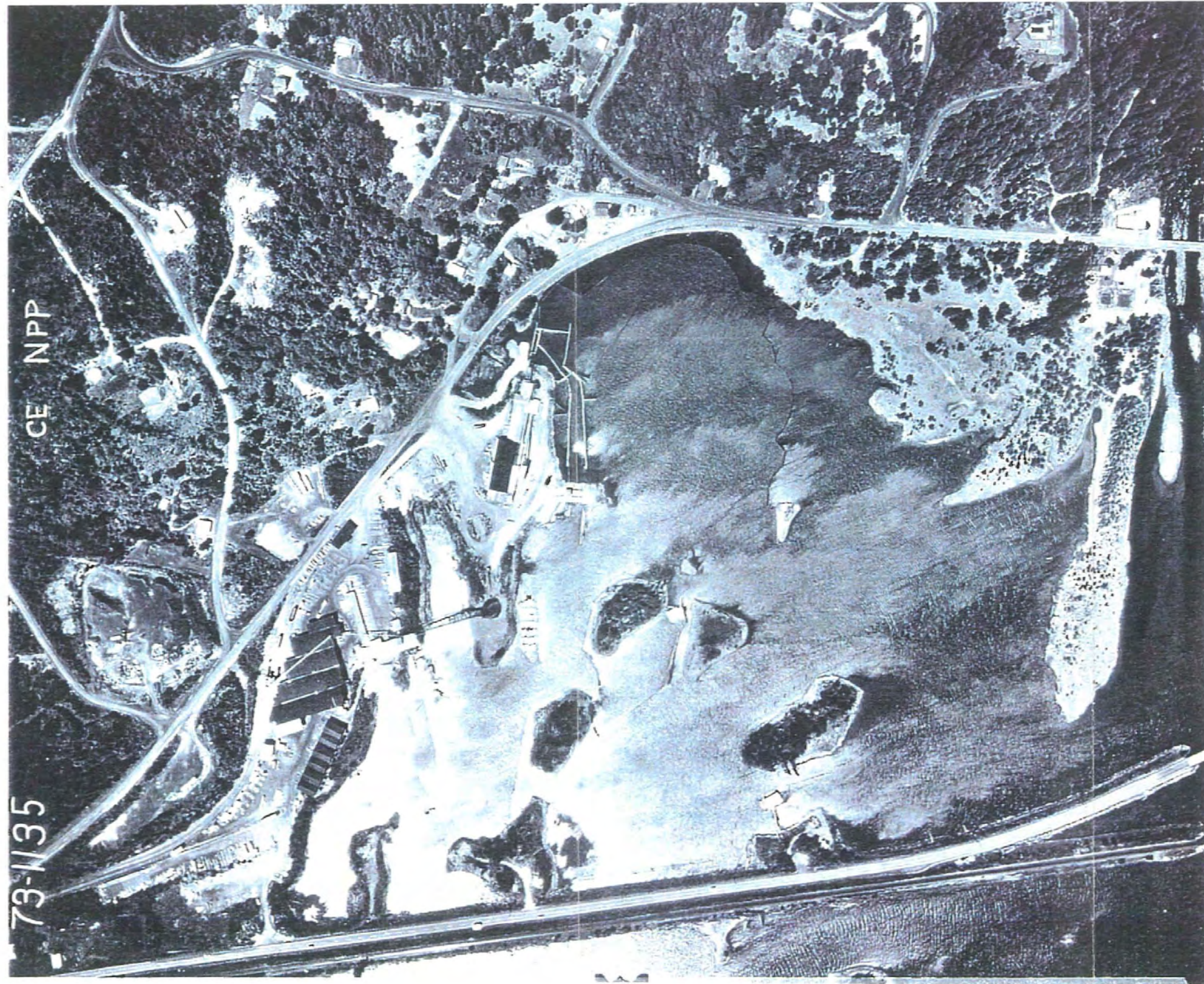
Skamania County Department of  
 Planning and Community Development

1935 Aerial Photo

Figure A-6

Project: 96098





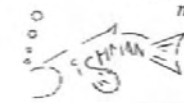
DRAWN: S. Benjamin

APPROVED: P. Fishman

DATE: 10/28/97

SCALE: Approx. 1" = 365'

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ROCK COVE ENVIRONMENTAL EVALUATION  
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1973 Aerial Photo

Figure A-7

Project: 96098



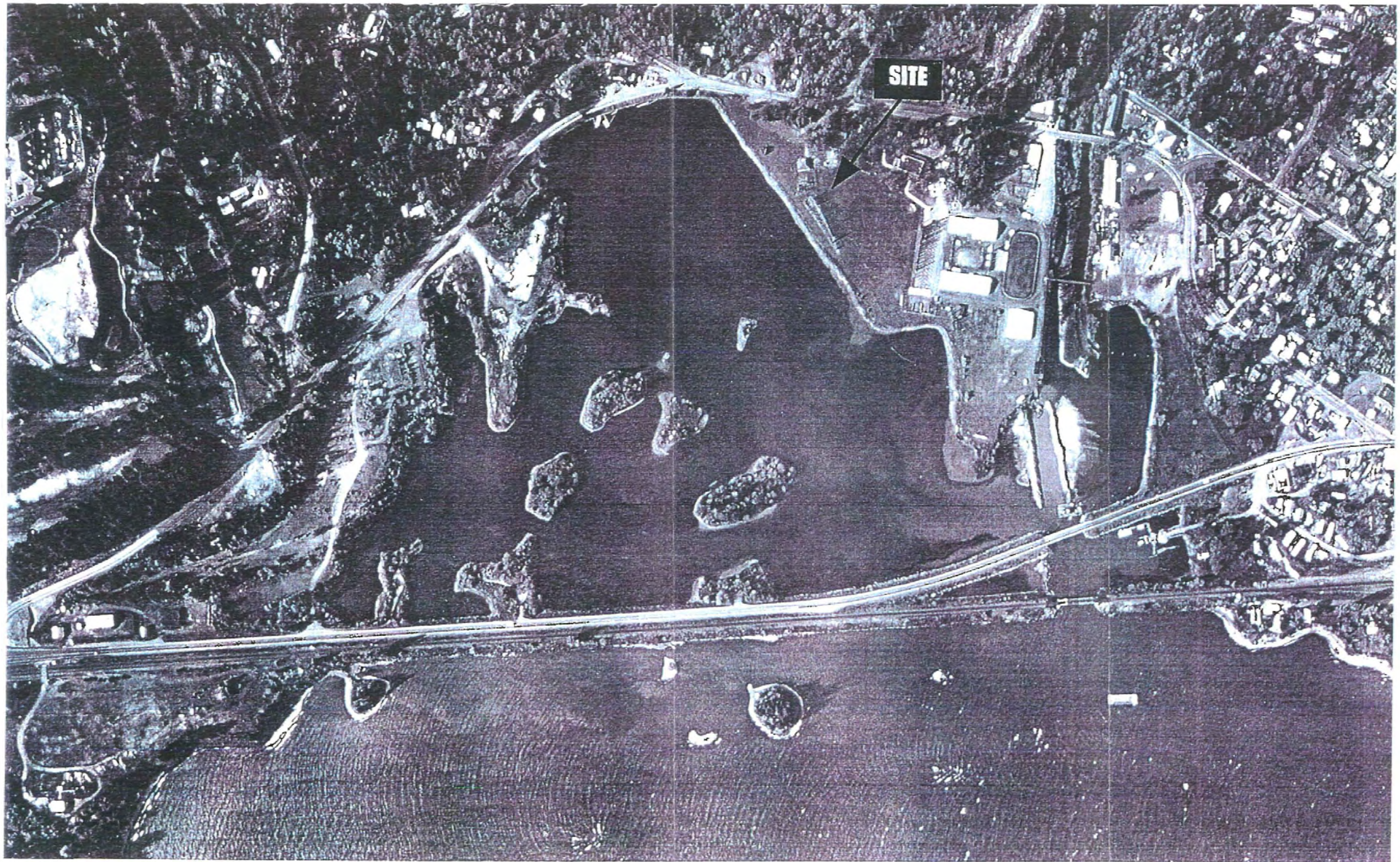


PHOTO DATE:  
1992

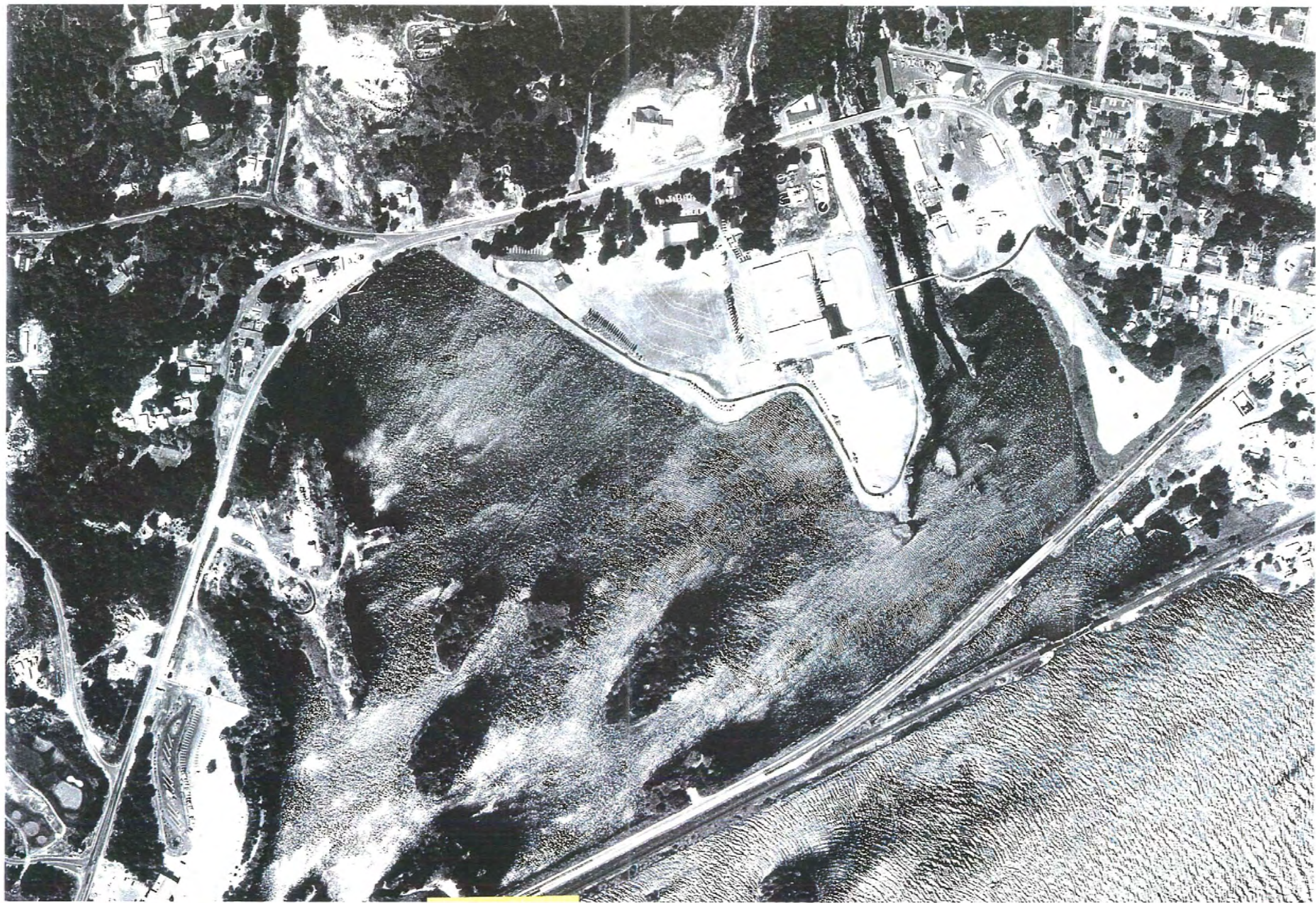


DRAWN: S. Benjamin  
 APPROVED: P. Fishman  
 DATE: 10/28/97  
 SCALE: Approx. 1" = 400'

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ROCK COVE ENVIRONMENTAL EVALUATION AND COMPREHENSIVE PLAN	
Skamania County Department of Planning and Community Development	
19?? Aerial Photo	
Figure A-8	Project: 96098





DRAWN: S. Benjamin  
APPROVED: P. Fishman  
DATE: 10/28/97  
SCALE: Approx. 1" = 330'

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ROCK COVE ENVIRONMENTAL EVALUATION  
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1995 Aerial Photo

Figure A-9

Project: 96098



## TECHNICAL APPENDIX B. ROCK COVE AND LOWER ROCK CREEK FISH AND WILDLIFE HABITAT

Prepared by: Steve Johnson, Aquatic Ecologist, and Christie Galen, Ecologist; Fishman Environmental Services

### Introduction

Task 2 in the project scope of work is to evaluate the ecological condition of Rock Cove and Rock Creek and determine the potential impacts of proposed dredging. There is some concern in the community that the deposits of rock and sediment in the lower part of Rock Creek and parts of the Cove may lead to flooding or accelerated erosion of streambanks. This Technical Appendix presents findings from field investigations of fish and wildlife habitat. Technical Appendix C discusses the geomorphic condition of lower Rock Creek.

### Methods

Ecological data were collected in Rock Cove and Rock Creek several times between October, 1996 and September, 1997. Sediment samples and specimens of aquatic plants were collected from the cove by Fishman Environmental Services staff on October 9, 1996. Water quality data were collected during October, 1996, February, June and July, 1997. A continuous record of water temperature was obtained for the cove using a recording temperature monitor beginning in July, 1997.

Fishman Environmental Services staff conducted an ecological survey of Rock Cove and associated habitats on July 2, 1997. Staff included Steve Johnson, Aquatic Ecologist, Christie Galen, Ecologist, and Peter Britz, Natural Resource Planner. A boat was used to access islands and shoreline habitat and to set a gill net to collect fish. A beach seine was also used to collect fish along shallow shorelines. Walking transects were conducted throughout the site to typify habitat and cover types. Vegetation species and dominance were recorded, fish and wildlife species were listed, and management recommendations were noted. Figure B-1 shows fish and water quality sampling locations.

Six habitat types were described for the cove: riparian forest, island, emergent wetland, aquatic, riparian blackberry and herbaceous. (Figure B-2)

### Habitat Information

Riparian Forest and Island Habitat: The riparian forest and island habitats support similar species and habitat structure. The canopy includes a narrow band of trees and shrubs dominated by Oregon white oak, red alder and Himalayan blackberry. A species list follows this discussion.



The islands in Rock Cove contain shallow soils and fairly diverse vegetation depending on the size of the island. The larger islands have greater numbers and species of trees and shrubs; smaller islands have fewer trees and less diversity. The smallest island that is situated across from the County Fairgrounds contains alder, Oregon ash, red-osier dogwood, rose, blackberry, pearly everlasting, St. John's wort, oxeye daisy and lupine. The center of this island is mounded with piles of goose wastes and most likely serves as an important nesting site and resting area for the Canada geese that frequent the fairgrounds. One of the largest islands has a canopy dominated by alder and Oregon white oak and includes Douglas fir and Oregon ash. Half of the Douglas fir have snaggy or broken tops that are used by osprey and bald eagle for perching. Vegetation in the interior of the island is multi-layered and provides a variety of food and cover for wildlife.

Emergent Wetlands: Small wetlands were observed on the fringe of the island west of the Douglas fir island and also on two peninsulas. Wetland vegetation is dominated by slough sedge and water purslane and also includes reed canarygrass, spikerush, and an unidentified grass. These emergent areas offer shoreline cover and feeding areas for waterfowl.

Aquatic: Aquatic habitat supports expansive beds of submersed rooted plants in the shallower areas of Rock Cove. Four species of aquatic plants were collected from Rock Cove: parrot's feather (*Myriophyllum aquaticum*), Canada waterweed (*Elodea canadensis*), curly pondweed (*Potamogeton crispus*), and sago pondweed (*Potamogeton pectinatus*). Plant samples and information are shown in Figures B-3 through B-6. Canada waterweed and sago pondweed are native to the Pacific northwest and are eaten by waterfowl, muskrat and beaver. The other two species are not native species, and the parrot's feather is an aggressive species that forms dense mats in shallow water. Aquatic weed beds provide habitat for aquatic invertebrates and small fish. Our field studies found that the aquatic weeds, particularly parrot's feather, only grows in the shallow water along shore that has sandy or silty bottom materials. These plants were not found in water deeper than 4 feet on a day when the water surface elevation was 72 feet MSL.<sup>3</sup>

Deeper areas of the cove, and shallow water areas that have rock or wood chip bottom material do not have aquatic plants. The northern part of the cove, the large bay bordered on the north by Rock Creek Drive, contains an extensive area of wood chips and wood debris on the bottom. The shoreline along the park is very rocky, with a lot of wood debris including log cut-offs.

Riparian blackberry: Himalayan blackberry, a non-native species, has invaded the disturbed shoreline habitat and forms a dense thicket. This thicket prevents other shrub or tree species from becoming established in these areas, resulting in low species diversity.

---

<sup>3</sup> Elevation expressed as mean sea level (MSL) indicates the height above mean sea surface elevation, as determined by the federal government.

Herbaceous Shoreline Vegetation: Herbaceous habitat is located along the park side of Rock Cove. Grasses and forbs are grazed by geese and mowed by maintenance staff.

Rock Creek: Riparian vegetation along Rock Creek is similar to the riparian forest habitats of Rock Cove.

Numerous waterfowl, shorebirds, fish eating raptors, song birds and mammals inhabit Rock Cove habitats. Osprey were observed fishing in the cove throughout the day; three or four birds were almost always visible. A large stick nest is present off-site in a tall lone Douglas fir northwest of the cove and is used by osprey. Other species observed include: immature bald eagle (fly by), Canada geese (including young), mallard, great blue heron, cormorants, killdeer, violet-green swallow, tern, Brewer's blackbird, cedar waxwing and European starling. American coot are frequently one of the more numerous bird species seen on the cove. Other waterfowl noted by the Washington department of Fish and Wildlife are American widgeon, scaup, bufflehead, common and hooded merganser. Beaver sign and two deer, a doe and a fawn, were observed on the island west of the Douglas fir island.

### **Wildlife**

Rock Creek riparian habitat supports many canopy species including black capped chickadees, cedar waxwing, warblers and flycatchers. Kingfishers and dippers are also common along the creek.

### **Rock Creek Stream Habitat Survey**

The one mile reach of Rock Creek below the first waterfall was surveyed on February 11, 1997 by Steve Johnson and Paul Fishman, Fishman Environmental Services, and Todd Moses and Scott Morris, Watershed Applications, to determine the current stream habitat status, observe stream channel geomorphology, and investigate possible remedies for the current aggrading channel situation.

The lower reach of Rock Creek transports high volumes of material (primarily cobble, boulder and large woody debris) generated primarily by the Troutdale-like geologic formation located in the vicinity of the falls. Erosion of steep slopes and consequent recruitment of material to the stream provides a continuous source of material to the lower portion of the stream. Based on the erosion taking place along slopes in the valley, it is likely that accretion of material will continue indefinitely.

Kick samples were taken in riffle and run areas to obtain a qualitative observation of the benthic invertebrate community. Invertebrate numbers were low in all samples. Taxa included caddis fly, stonefly, and mayfly nymphs. Few dipteran fly larvae were observed. No snails or worms were

taken in the samples. The invertebrate community is characteristic of clean water streams. The lack of high invertebrate numbers is possibly the result of recent high flows that scoured substrates and removed organisms from the rocks.

Several areas of potential fish spawning habitat were noted in the run areas and in small pools off the main channel. Most of the substrate observed was cobble/boulder. Only a few areas were dominated by gravel-sized substrates. These areas occurred adjacent to, but not in the main part of the channel, downstream of instream structure such as root wads, trees, and large boulders.

The streambank in this reach is heavily wooded and contains primarily red alder trees, many of which were damaged by recent storms and have fallen into the creek. In most areas the riparian vegetation is present up to the edge of the stream channel. The riparian floodplain gives rise to steep sided slopes from just below to approximately 1,000 feet below the waterfall. Vegetation is present on the tops of these slopes and is being recruited to the creek. Little vegetation is present adjacent to the channel.

Habitat type in this reach is primarily run with a series of riffles with drops in excess of one foot. Side channels are present above the Rock Creek Drive bridge and provide potential rearing habitat and summer refuge for juvenile fish.

Water samples taken from the pedestrian bridge near the fairgrounds indicated good water quality.

### **Fish Sampling**

Fish were sampled on July 2, 1997 using beach seine, gill net and backpack electro-fisher. No fish were collected in the gill net. Beach seine collections yielded the following:

Smallest Island: silty bottom with abundant aquatic vegetation (parrot feather)

large-mouth bass: 93mm, 80mm

prickly sculpin: 128mm, 108mm, 68mm, 63mm

red-eared sunfish: 120mm, 81mm

larval, sculpin, bass, cyprinids

Invertebrates: mayfly, water boatman, crawfish (1-6")

Wetland island (island with wetland west of large island with Douglas fir trees): substrate soft sediments. Doe and fawn observed; beaver sign.

large-mouth bass

prickly sculpin

squawfish

steelhead: 54mm

Invertebrates: dragonfly nymphs, crawfish



Mouth of Rock Creek: shoreline sandy with limited vegetation. Sand/gravel bar dominated by smartweed, oxeye daisy, mint, selfheal and willow.

large scale sucker: dead on bottom

prickly sculpin

invertebrates: caddisfly (stone casing), water boatman

Southwest corner below visitor center: soft substrate

large mouth bass: 115mm

bullhead (8 barbels): 66mm

prickly sculpins (4+):

cyprinid larvae

Invertebrates: water boatman

Electro-fisher sampling yielded the following:

Foster Creek at downstream side of Rock Cove culvert:

sculpin : 100mm

5 sculpin

7 sculpin fry

steelhead: 55mm

steelhead: 61mm

steelhead: 53mm

steelhead: 70mm

steelhead: 58mm

steelhead: 60mm

steelhead: 63mm

steelhead 50mm

steelhead 45mm

Rock Creek from 50' downstream of Rock Creek Drive Bridge to 100' upstream of bridge:

steelhead: 46mm

steelhead: 65mm

steelhead: 75mm

steelhead: 65mm

steelhead: 80mm

steelhead: 60mm

steelhead: 46mm

2 dace

2 sculpin

Rock Creek 500' upstream from Rock Creek Drive Bridge:

steelhead: 85mm

steelhead: 75mm

steelhead: 70mm

It was noteworthy that fish sampling did not yield larger warm water fish (game fish and non-game). Game fish might not be in the cove due to warming water temperature in July (see water quality section). Some larger fish were probably in the cove, but were not sampled in the gill net or shallow areas accessible to the beach seine. It is also noteworthy that juvenile steelhead were abundant in the lower section of Rock Cove and near the mouth of Foster Creek.

We had discussions with staff at Washington Department of Fish and Wildlife about fish use of Rock Cove and Rock Creek. Very little information is available; however, there are records of coho salmon and steelhead adults migrating into Rock Creek, and juvenile steelhead and sea-run cutthroat trout using the cove for rearing. Fall chinook salmon also might use Rock Creek. The Department also recently found indications that coho salmon are spawning in Foster Creek, a tributary that enters the north part of the cove under Rock Creek Drive.

### Water Quality

Water quality data have been collected during October, 1996, February, June and July, 1997 (Table B-3). Parameters sampled included: water temperature, dissolved oxygen, pH, conductivity, and turbidity. Temperatures fluctuate seasonally; cove and creek water temperatures are similar during winter, but the cove is warmer than the creek in the summer. Dissolved oxygen concentrations appear to be within the acceptable range for both warm and cold water fish. pH data appear normal, and turbidity levels are low (a late summer turbidity sample should be collected). Conductivity data are interesting in that the Foster Creek numbers are significantly higher than the cove and Rock Creek; no explanation is offered for this at this time.

Three recording temperature devices were installed on July 21, 1997: two in Rock Cove and one in Rock Creek (see Sampling Locations map). These instruments record water temperature every hour. We attempted to download data from the temperature recorders during early October, 1997. We found and downloaded data from the recorder along the southwest shore of the cove; these data are shown in Figure B-7. High water in the creek prevented us from finding the recorder placed in the creek location, and subsequent attempts during October failed to find the instrument. The other recorder placed in the cove, along the shore of a peninsula off SR 14, was apparently stolen.

The data in Figure B-7 show that water temperatures in the cove were in the 70's from late July through early September, 1997. Water temperatures decreased during September, and ranged in the 60's and 50's from early September through early October. The several data spikes in the figure probably represent occurrences when the recorder was out of water due to fluctuating water surface elevations.

Data will be downloaded from the remaining recorder during November.<sup>4</sup>

### **Habitat Enhancement Opportunities**

1. Enhance shoreline blackberry thickets by controlling blackberry and replacing with native trees, shrubs and herbaceous species that would provide food and cover for wildlife and shading of aquatic resources.
2. Limit access to islands. Islands provide important breeding areas for geese and other species; public access to islands should be discouraged.
3. Create additional emergent wetland habitat. Emergent wetlands are limited in Rock Cove and would benefit waterfowl and other wildlife species. The shallow bay (aquatic bed) on the southeast end of the park could be partially filled to create emergent habitat. Native emergent species observed in the Rock Creek drainage and Rock Cove should be planted.
4. Plant a portion of park shoreline with native trees and shrubs to encourage geese to forage in grassy areas further to the east.
5. Create fringing marsh habitat for waterfowl and juvenile fish.
6. Control aquatic vegetation in shoreline areas designated for small watercraft access by placing gravel or river rock on the bottom, and/or minimizing the extent of water shallower than 4 feet at minimum pool elevation.

---

<sup>4</sup> We might arrange with the County to leave the recorder in place for a longer period, and possibly to install another recorder in the Creek.



**TABLE B-1: PLANT SPECIES LIST: Riparian Forest (Shoreline and Island)**

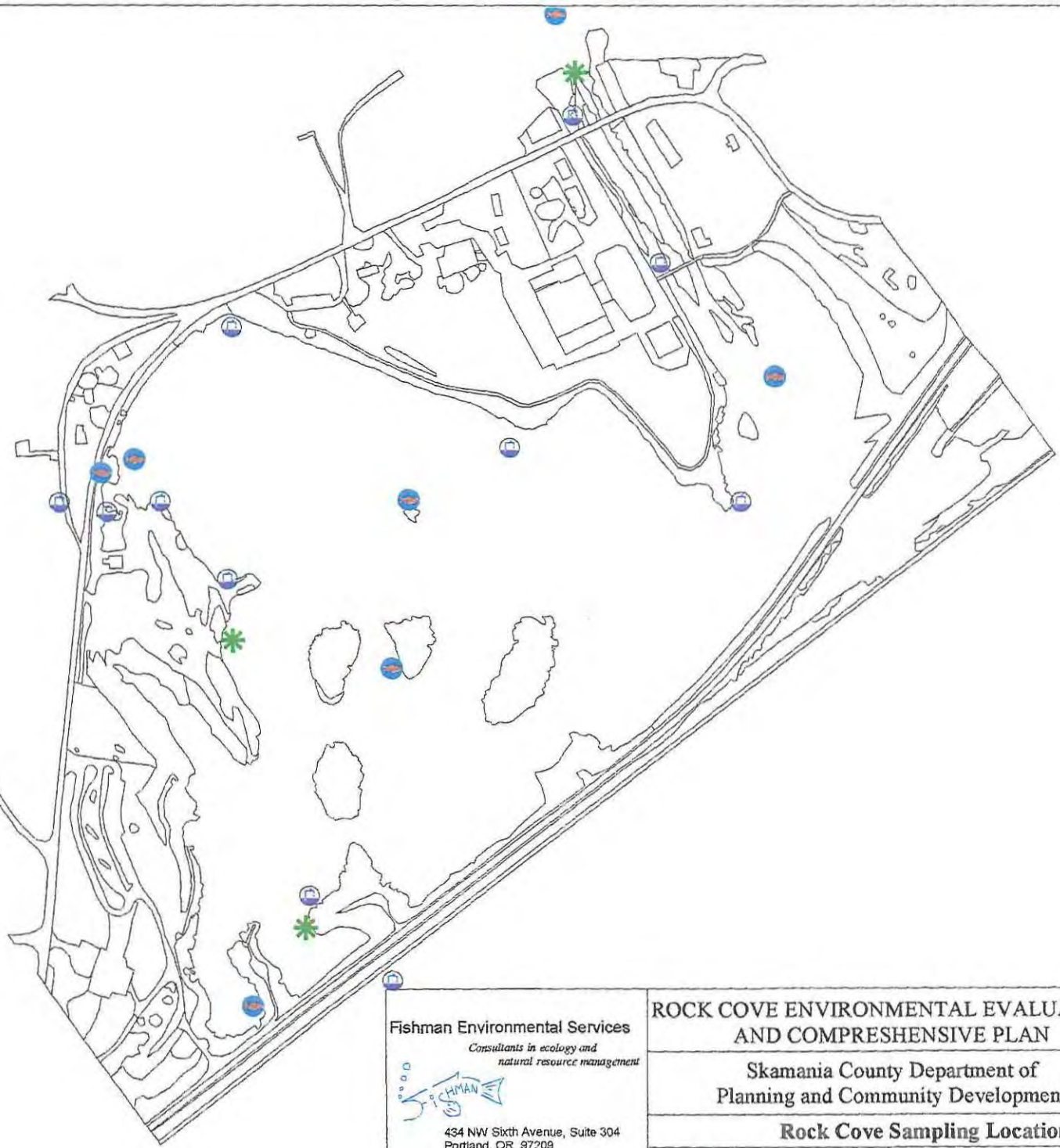
casacara	<i>Rhamnus purshiana</i> , FAC-
Douglas fir	<i>Pseudotsuga menziesii</i> , FACU
Oregon white oak	<i>Quercus garryana</i> , NOL
Oregon ash	<i>Fraxinus latifolia</i> , FACW
red alder	<i>Alnus rubra</i> , FAC
beaked hazelnut	<i>Corylus cornuta</i> , FACU
black hawthorn	<i>Crataegus douglasii</i> , FAC
clustered wild rose	<i>Rosa pisocarpa</i> , FAC
evergreen blackberry	<i>Rubus laciniatus</i> , FACU+
Himalayan blackberry	<i>Rubus discolor</i> , FACU
Nootka rose	<i>Rosa nutkana</i> , FAC
ocean spray	<i>Holodiscus discolor</i> , NOL
poison oak	<i>Rhus diversiloba</i>
red-osier dogwood	<i>Cornus stolonifera</i> , FACW
Saskatoon serviceberry	<i>Amelanchier alnifolia</i> , FACU
snowberry	<i>Symphoricarpos albus</i> , FACU
Wood's rose	<i>Rosa woodsii</i> , FACU
Canada thistle	<i>Cirsium arvense</i>
climbing nightshade	<i>Solanum dulcamara</i>
common St. John's wort	<i>Hypericum perforatum</i>
Lupine	<i>Lupinus</i> species
oxeye daisy	<i>Chrysanthemum leucanthemum</i>
Pacific blackberry	<i>Rubus ursinus</i>
peppermint	<i>Mentha piperita</i>
self-heal	<i>Prunella vulgaris</i>
silver hairgrass	<i>Aira caryophyllea</i>
slough sedge	<i>Carex obnupta</i>
small-flrd forget-me-not	<i>Myosotis laxa</i>
soft rush	<i>Juncus effusus</i>
spikerush	<i>Eleocharis</i> species
tansy ragwort	<i>Senecio jacobaea</i>

**TABLE B-2: PLANT SPECIES LIST: Rock Cove**

big-leaf maple	<i>Acer macrophyllum</i> , FACU
black cottonwood	<i>Populus trichocarpa</i> , FAC
Columbia river willow	<i>Salix fluviatilis</i> , FACW
Douglas fir	<i>Pseudotsuga menziesii</i> , FACU
Oregon ash	<i>Fraxinus latifolia</i> , FACW
Oregon white oak	<i>Quercus garryana</i> , NOL
Himalayan blackberry	<i>Rubus discolor</i> , FACU
Nootka rose	<i>Rosa nutkana</i> , FAC
ocean spray	<i>Holodiscus discolor</i> , NOL
red alder	<i>Alnus rubra</i> , FAC
red-osier dogwood	<i>Cornus stolonifera</i> , FACW
sandbar willow	<i>Salix exigua</i> , OBL
Sitka willow	<i>Salix sitchensis</i> , FACW
thimbleberry	<i>Rubus parviflorus</i> , FAC-
bearded fescue (?)	<i>Festuca subulata</i>
blue wildrye	<i>Elymus glaucus</i>
Canada thistle	<i>Cirsium arvense</i>
common monkey-flower	<i>Mimulus guttatus</i>
horsetail	<i>Equisetum palustre</i>
lady fern	<i>Athyrium filix-femina</i>
marsh hedgenettle	<i>Stachys cooleyae</i> [emersonii]
nipplewort	<i>Lapsana communis</i>
orchard grass	<i>Dactylis glomerata</i>
reed canarygrass	<i>Phalaris arundinacea</i>
dock	<i>Rumex</i> species
small-fruited bulrush	<i>Scirpus microcarpus</i>
sweet pea	<i>Lathyrus sylvestris</i>




B-3

Table 1 -- Rock Cove -- Water Quality Sampling -- Project 96098						
Date	Location	Temp Degrees C.	Turbidity N.T.U.	Dissolved O2 ppm	pH	Conductivity micromhos
10/09/96	Mouth of Rock Creek	17.2	3.75			
10/09/96	W. end of Rock Cove	17.2	2.6			
10/09/96	Weed beds off Fairgrnds	16.7	3.76			
02/11/97	Creek at Pedestrian Bridge	2.1	1.09	12.2	7.1	24.1
02/11/97	Rock Cove at Rock Creek Drive	2.2	3.55	11.7	7.1	42.6
02/11/97	Cove at SR14 west end	1.2	3.73	11.9	7.3	40.7
06/19/97	Rock Creek upstrm from Bridge	13.6	1.06	8.9	6.7	30.8
06/19/97	Creek at Pedestrian Bridge	13.5		9.4	6.7	29.4
06/19/97	Rock Cove at Rock Creek Drive	17.1	3.56	10.8	7.4	67.4
06/19/97	Foster creek above culvert	16.5	2.22	9.3	7.6	355
06/19/97	Rock Cove at mill site	16.5	2.38	10.6	7.4	57.2
06/19/97	Cove at SR14 west end	16.6	2.7	10.8	7.6	57.7
06/19/97	Col. River west end of cove	14.4	6.53	12.5	7.5	68.8
07/02/97	Cove at SR14 west end	16.6		10.3	7.57	60.1
07/02/97	Foster Creek Below Culvert	17.9		8.8	7.91	289
07/02/97	Foster Creek Mouth	18.4		9.2	7.17	205
07/02/97	Rock Creek at Ped Bridge	15.5		10.5	7.19	26.4



## Legend

### Sampling Locations

-  Fish
-  Temperature Recorder
-  Water Quality



200 0 200 400 Feet



Map Projection:  
UTM Zone 10

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**ROCK COVE ENVIRONMENTAL EVALUATION  
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**Rock Cove Sampling Locations**

**Figure B-1**

Project: 96098





# Legend

## Rock Cove Habitats

- Blackberry
- Building
- Canada Goose Habitat
- Emergent Wetland
- Forest/Shrub
- Gravel Bottom
- Gravel/Compacted Soil
- Herbaceous
- Island Habitat
- Muddy Shore
- Pavement
- Railroad
- Rocky Shore
- Submerged Aquatic Veg.
- Unconsolidated Bottom



200 0 200 400 Feet



Map Projection:  
UTM Zone 10

Habitats	Count	Sum Acres
Blackberry	15	8.3600
Building	24	3.4600
Canada Goose Habitat	1	0.0200
Emergent Wetland	2	0.0700
Forest/Shrub	64	22.8300
Gravel Bottom	1	6.4100
Gravel/Compacted Soil	29	15.4900
Herbaceous	19	18.3000
Island Habitat	5	3.5300
Muddy Shore	1	0.4600
Pavement	18	17.4400
Railroad	1	1.3300
Rocky Shore	1	0.6200
Submerged Aquatic Veg.	1	15.9500
Unconsolidated Bottom	6	63.7400

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## ROCK COVE ENVIRONMENTAL EVALUATION AND COMPRESHENSIVE PLAN

Skamania County Department of  
 Planning and Community Development

### Rock Cove Habitats

Figure B-2

Project: 96098





ROCK COVE, SKAMANIA COUNTY, WA  
October 9, 1996 P. Fishman

**Parrot's feather**  
*Myriophyllum aquaticum*

- non-native aggressive pest plant present year-round in lakes, ponds, reservoirs and marshes with sandy or silty bottoms
- fruits and leaves occasionally eaten by waterfowl and shorebirds and muskrats
- forms dense mats that obstruct swimmers and boaters

FISHMAN ENVIRONMENTAL SERVICES

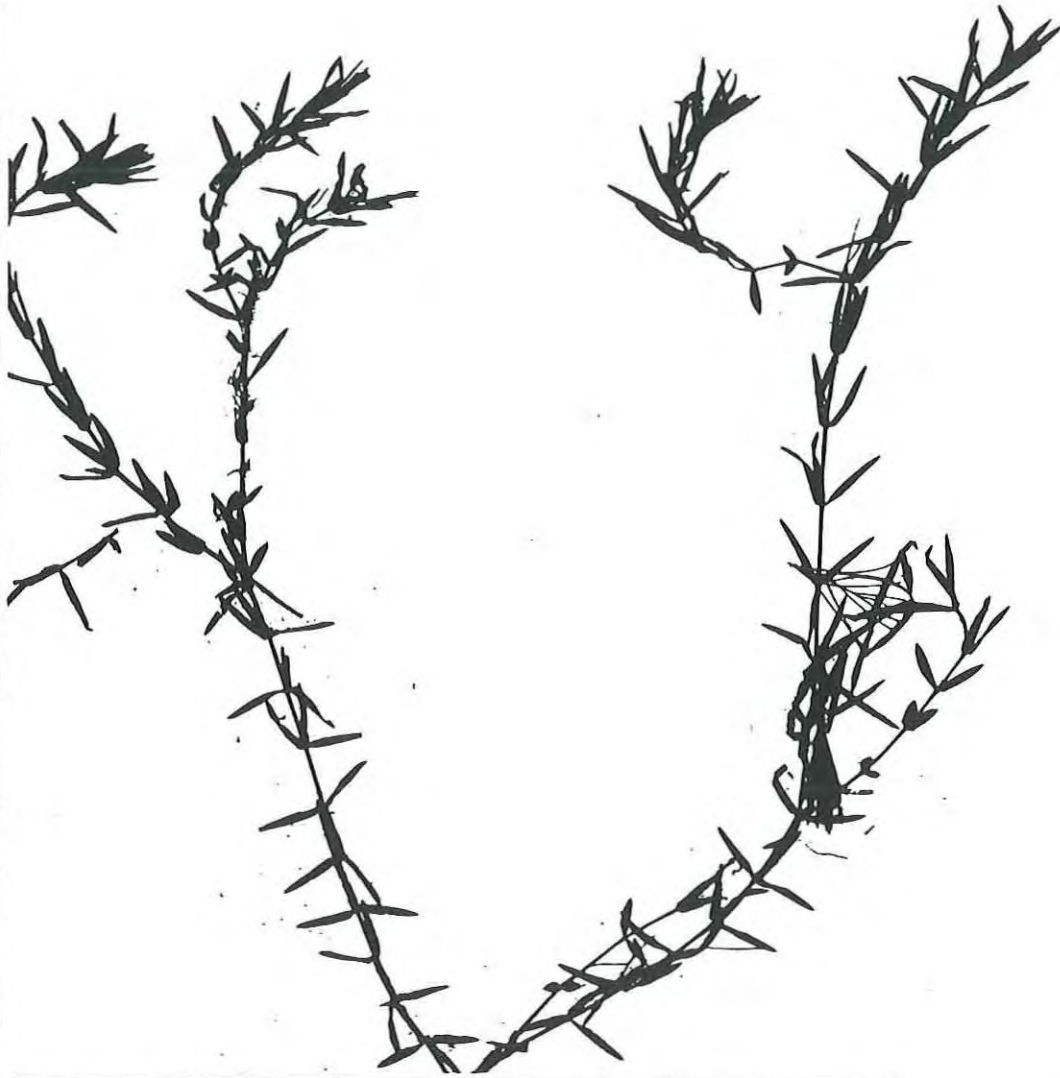
ROCK COVE ENVIRONMENTAL EVALUATION  
AND COMPREHENSIVE PLAN

Skamania County Department of  
Planning and Community Development

**Aquatic Plant: Parrot's Feather**

Figure B-3

Project: 96098



ROCK COVE, SKAMANIA COUNTY, WA  
October 9, 1996 P. Fishman

Canada waterweed (ditchmoss)  
*Elodea canadensis*

- native species, most abundant July-Sep in ponds, lakes, lagoons, sloughs and slow-moving streams
- provides habitat for small fish, insects and other small invertebrates
- leafy stems eaten by waterfowl (ducks), muskrats and beavers

FISHMAN ENVIRONMENTAL SERVICES

ROCK COVE ENVIRONMENTAL EVALUATION  
AND COMPREHENSIVE PLAN

Skamania County Department of  
Planning and Community Development

Aquatic Plant: Canada Waterweed

Figure B-4

Project: 96098





ROCK COVE, SKAMANIA COUNTY, WA  
October 9, 1996 P. Fishman

Curly pondweed  
*Potamogeton crispus*

- non-native plant mostly found from late June through August in lakes and streams; sometimes becomes a pest
- provides habitat for small fish and invertebrates

FISHMAN ENVIRONMENTAL SERVICES

ROCK COVE ENVIRONMENTAL EVALUATION  
AND COMPREHENSIVE PLAN

Skamania County Department of  
Planning and Community Development

Aquatic Plant: Curly Pondweed

Figure B-5

Project: 96098





ROCK COVE, SKAMANIA COUNTY, WA  
October 9, 1996 P. Fishman

Sago pondweed  
*Potamogeton pectinatus*

- native plant found in standing or slow-moving waters of pools, ponds, lakes and reservoirs
- small, starchy tubers eaten by waterfowl and muskrat

FISHMAN ENVIRONMENTAL SERVICES

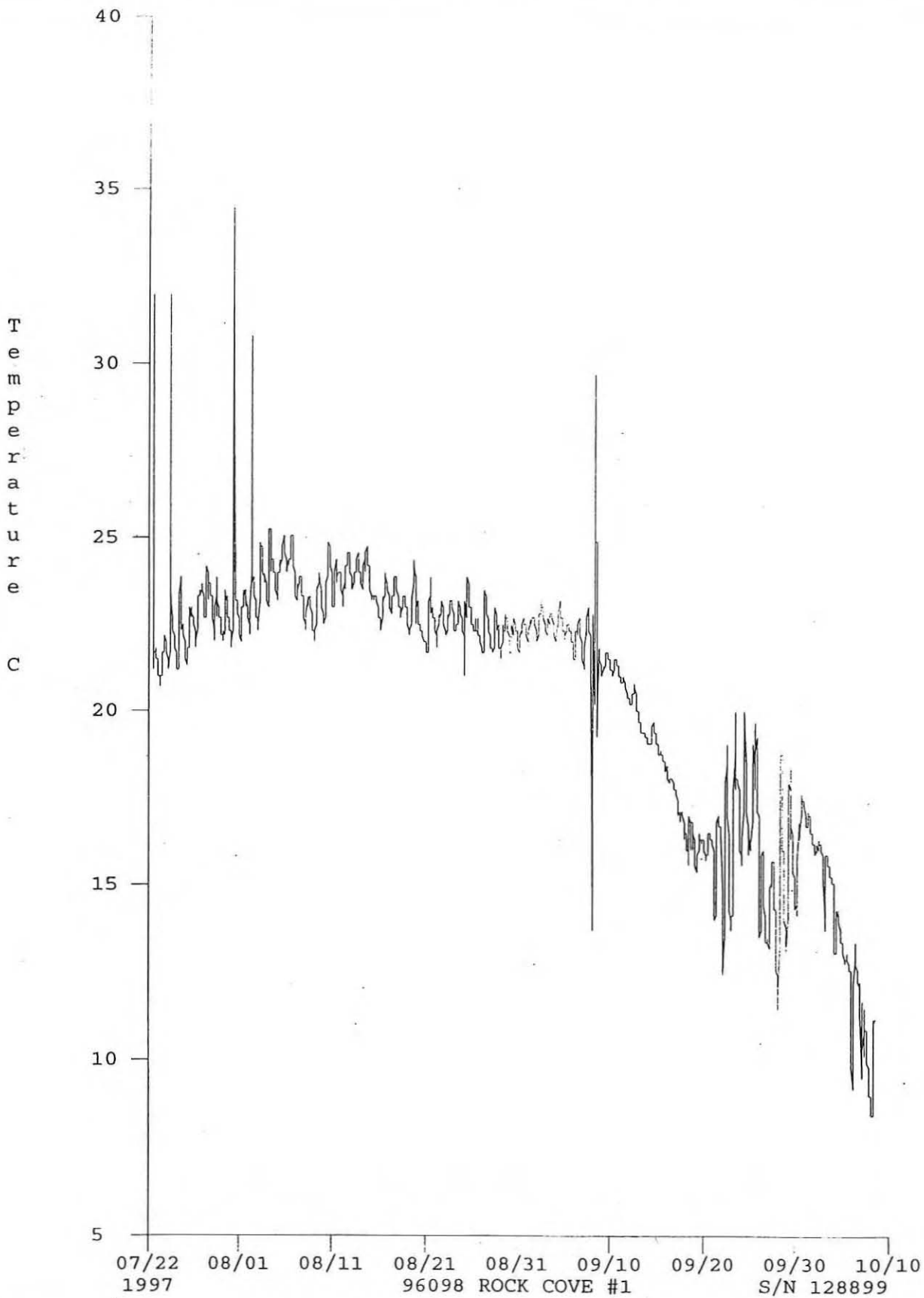
ROCK COVE ENVIRONMENTAL EVALUATION  
AND COMPREHENSIVE PLAN

Skamania County Department of  
Planning and Community Development

Aquatic Plant: Sago Pondweed

Figure B-6

Project: 96098



07/22 08/01 08/11 08/21 08/31 09/10 09/20 09/30 10/10  
 1997 96098 ROCK COVE #1 S/N 128899

DRAWN: S. Benjamin  
 APPROVED: P. Fishman  
 DATE: 10/28/97

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ROCK COVE ENVIRONMENTAL EVALUATION AND COMPREHENSIVE PLAN  
 Skamania County Department of Planning and Community Development  
**Rock Cove Water Temperature**  
 Figure B-7 Project: 96098

## TECHNICAL APPENDIX C. RECONNAISSANCE GEOMORPHIC ASSESSMENT OF ROCK CREEK

Prepared by: Todd Moses, Geomorphologist/Restoration Practitioner; Watershed Application, Ltd.

### Introduction

This report briefly describes our observations made during a reconnaissance assessment of stream and valley geomorphic conditions along lower Rock Creek on February 11, 1997. Scott Morris, a geomorphologist, assisted in the field evaluation on behalf of Watershed Applications. Our discussion focuses on conditions relevant to land use planning and management along Rock Creek and in Rock Cove, and is provided in the context of the Rock Creek Environmental Evaluation and Comprehensive Plan project being conducted by Fishman Environmental Services (FES) for Skamania County.

This was a reconnaissance-level assessment. We evaluated the creek during a single day under relatively high (wintertime) flow conditions and conducted no stream measurements. Although our observations are necessarily qualitative in nature and limited in scope, they are not cursory and we believe provide valuable preliminary information on issues pertinent to the planning and management of this area.

### Observations

Rock Creek below the first falls upstream of the Rock Creek Bridge (the upper limit of the study area) flows through a deep, steep-walled bedrock valley. (The reach of Rock Creek near the falls is here referred to as the "upper" creek.) Valley walls are comprised of interbeds of differing lithology and provenance, but include thick facies of cemented river rock. The mostly steep valley sideslopes are failing in many places and provide a good supply of gravel-, cobble- and boulder-sized material to the stream. Slope failures are occurring by a variety of processes, including shallow translational failures, topples, rockfall, ravel, and surface water erosion.

This upper part of the creek is also quite confined, with essentially no floodplain, the channel being hemmed in by both bedrock walls and steep colluvial slopes. Bedrock appears to form much of the streambed in the zone closest to the pool below the falls, with an apparently thin cover of coarse alluvium (including very large boulders) forming most of the streambed downstream of this. Although streambed conditions could not be closely inspected, it appears that the alluvial cover in the upper channel is composed primarily of large clasts, a result of periodic high stream power in this reach. Good quality spawning gravels (from a size standpoint) are probably scarce.



Many of the boulders on the valley floor are composed of the coarse conglomerate referred to previously. These boulders gradually release large clasts to the stream through normal attrition. The Rock Creek drainage basin appears to be sufficiently large and steep that it must be capable of generating quite large discharge events and, because of valley confinement, high stream power. That this stream is capable of at least intermittently transporting the large-caliber materials delivered to it is evident from the composition of the mid-channel bar in the vicinity of the bridge (see below).

Upper Rock Creek may well have retained larger quantities of coarse alluvium in the past, when very large woody debris (LWD) from old-growth timber was available to form jams in the valley bottom. In general, logs on the order of 3-6 feet in diameter (so-called "key members") would be required to substantively affect alluvial accumulations in the valley bottom and such logs are no longer present in the watershed. Although there are now numerous pieces of LWD within the channel and stranded along the shoreline, the quantity and caliber of this material is insufficient to form jams capable of damming up coarse alluvium and altering the streambed profile. Nevertheless, failures along the tops of valley walls and on colluvial slopes continue to deliver alder trees and relatively large conifers to the valley bottom and the creek. We noted many trees growing along the canyon rim that were perilously close to being undermined.

The principal management issue on Rock Creek concerns its interaction with Rock Creek Bridge. A large longitudinal mid-channel bar has formed upstream of this structure and it occupies by far the greater part of total active channel width here. The two channels of Rock Creek on either side of the bar experience a considerable drop in the vicinity of the bridge. Thus, a sizable wedge of sediment has accumulated upstream of the bridge and the bridge pile bents have probably exacerbated aggradation here.

The surface of this large bar consists primarily of coarse cobbles and small boulders, which armor it and protect it from mobilization by most stream flows. The bar is colonized by relatively young woody vegetation such as willows. Although the bar appears to have been inundated this winter it likewise appears to have remained stable for some time.

Channel aggradation in this vicinity is evident in an older aerial photo (1935) taken before the construction of Bonneville Dam. Nevertheless, the tendency for sediment deposition in the lowest reach of Rock Creek has unquestionably been aggravated by construction of the dam. The pool created by the dam has raised the local base level of the creek and thus the elevation at which net deposition would normally begin to dominate channel processes. This has in turn caused a fundamental shift of some magnitude in the longitudinal profile of the river as it adjusts, through deposition, to this change. Whether we are now at some quasi-stable stage with respect to this adjustment, whether the bar represents an over-adjustment due to some catastrophic event (e.g. the 1964 flood), or if further aggradation above the bridge is likely, is unknown. This would require considerable additional study to even estimate.

The mid-channel bar continues under the bridge and well downstream through the channelized reach of Rock Creek east of the County Fairgrounds. The vegetation growing on the bar below the bridge is more mature, evidently owing to the protection afforded by the bridge and probably greater overall channel capacity downstream.

The central problem at the bridge is the limited flow conveyance capacity remaining between the bottom of the bridge and the streambed: channel cross-sectional area is now much reduced from what it was at the time of bridge construction. Construction blueprints from 1921 indicate a height of 15-20 feet between the streambed and the bottom of the bridge, leaving about 8 feet of freeboard between the designated "ordinary high water" line and the bottom of the bridge. Presently, the distance between the top of the bar and the bottom of the bridge is as little as 6 feet. This reduction in clearance presents a considerable hazard. The racking up of debris on the upstream side of the bridge could cause a backwater, leading to local flooding and possible bridge damage or failure.

The coincidence of a large flood with an abundant supply of floated LWD, which could cause such a jam, is a likely scenario. Especially heavy precipitation and/or rain-on-snow events are often preceded by wet weather and saturated soils. These are the conditions which generate both floods and the slope failures which deliver trees to the stream channel. Floods also re-float LWD stranded above the ordinary water surface, adding to the available LWD supply. Sizable pieces of stranded LWD are now abundant in the canyon immediately upstream of the bridge.

Another possible issue concerns the potential for local scour along the abutments or pile bents at either end of the bridge. The presence of the more or less stable mid-channel bar splits the flow, with the greatest depth and therefore shear stresses localized in these two marginal channels during floods. Local scour in these areas could undermine bridge footings or otherwise damage the bridge.

### Recommendations

The obvious recommendation to alleviate the hazards associated with the Rock Creek Bridge is to dredge the channel to create better conveyance. All indications are that periodic maintenance of this sort would be required since both 1973 and 1995 aerial photography show a bar in this location. It is likely, however, that dredging would be an infrequent (not annual) event. All of these issues with respect to the bridge need to be carefully evaluated by an engineer.

With respect to any potential for fisheries enhancement in Rock Creek, we see little or no opportunity for meaningful physical habitat restoration from a geomorphic point of view. Scour associated with high flows in the canyon reach of Rock Creek would tend remove any structures



placed here and a prevalence of deposition in the lower segment would tend to bury installed structures. Physical habitat improvements may be unjustified in any case because of the stream's short length and limited potential carrying capacity (see the fisheries assessment by FES staff).

As far as current conditions go, deep bedrock pool habitat occurs in the upper part of creek. Additional geomorphically-appropriate (and non-artificially anchored) habitat enhancement in upstream areas would theoretically focus on the construction of large debris jams composed of very large wood. However, this is ill-advised because of 1) the high flow forces generated here, 2) access difficulties, and 3) the general unavailability of sufficiently large wood pieces to construct "stable" LWD complexes (smaller pieces would tend to be floated out of valley by typical high flows).

The alluvial, aggrading reach just above Rock Creek Bridge currently provides pocket water associated with large instream boulders and shallow eddy and scour pools along the channel margin. However, deeper water habitat, particularly during low-flow conditions, is currently lacking here. This depositional geomorphic setting precludes the practical introduction of such habitat.

Additional issues that have been brought to our attention by FES include erosion potential along the lower, channelized and riprapped reach of stream below the Rock Creek Bridge; the condition of the Fairgrounds shoreline within Rock Cove; and trail route selection up the canyon to the vicinity of the falls.

Bank erosion along the lower reach adjacent to the Fairgrounds does not currently appear significant. The banks here are protected with riprap (crudely installed) and vegetated to some degree, especially on the left bank. Dredging of the mid-channel bar in this area, which now tends to force the flow to the channel margins, would relieve pressure on the banks during floods. We do recommend that the banks be improved and reinforced by careful regrading and re-installation of the rock toe, and by intensive planting of native woody riparian species such as willow, alder and cottonwood. As much existing native woody vegetation as possible should be retained during bank reconstruction.

The Fairgrounds shoreline, which is barren and eroding in places due to wave action, could be protected and enhanced using a number of techniques, including biotechnical shoreline stabilization techniques. These methods should be carefully selected to improve stability, habitat and aesthetics and should be designed with a good understanding of wave action and bottom topography in the cove. One method of enhancement (not to be used exclusively) could be to create an "indented" shoreline consisting of irregularly staggered large boulder salients or points

with intervening scalloped recesses of cobble beach. Placement of a sufficiently thick blanket of cobble should insure a persistent cobble beach even if some wave erosion does occur. Plenty of gravel- and cobble-sized material can be salvaged from the dredging of Rock Creek. Use of this material in the cove will require only short distance hauling.

Routing a trail up to the falls is problematic and would have to be done with great care and probably a considerable number of trail structures such as bridges (or culverted crossings) and log or rock retaining walls. Although a much closer inspection will be required, there appear to be few trail routes within the valley which are both stable and avoid abrupt grade changes because of generally steep sideslopes which are interrupted by often hazardous, near-vertical cliffs. The absence of much of a floodplain probably precludes a trail along the valley floor. A trail along the valley rim would have to be very carefully sited and set well back from the edge (affording fewer view opportunities) to avoid precipitous and actively failing locations (of which there are many) along the canyon rim.



## TECHNICAL APPENDIX D. FLOOD HAZARD ANALYSIS OF ROCK CREEK COVE

Prepared by: David Gorman, P.E.; Water Resource Management

### INTRODUCTION

Flood hazard analysis has been conducted over the course of the last year for Rock Cove in Skamania County, Washington. The purpose of the analysis is to determine and record the level of flood hazard for the 100 year return interval event using the Federal Emergency Management Administration (FEMA) standards. The tasks conducted in the course of this analysis include the following:

1. Hydrologic modeling and analysis of the drainage basins contributing flow to Rock Cove using the U.S. Army Corps of Engineers' Hydrologic Engineering Center (HEC) HEC-1 hydrology model.
2. Meeting with the Army Corps of Engineers to obtain 100 year floodplain data for the Columbia River in the Bonneville Pool at Stevenson, Washington.
3. Discussions with the Army Corps of Engineers to obtain the historical record of pool elevations for the Bonneville Pool at Stevenson, Washington, and analysis of that data.
4. Hydraulic modeling and analysis of Rock Cove using the Corps of Engineers HEC-2 model.
5. Document and report findings.

### HYDROLOGIC MODELING

Model input data was gathered from readily available sources such as the US Geological Service 7.5 minute series quad maps, Washington State Department of Natural Resources *Yacolt Burn State Forest* map, National Oceanic and Atmospheric Administration *Atlas 2, Volume IX*, Soil Conservation Service *Soil Survey of Skamania County Area, Washington*, U.S. Forest Service *Gifford Pinchot National Forest* map, and field reconnaissance. Field reconnaissance was conducted on May 5, 1997. The field work included driving nearly all of the basin that is accessible by car, gathering channel cross section data and estimating existing flows at all mainstem Rock Creek locations and major tributaries that were readily accessible, assessing landuse type and condition, and gathering data to estimate the hydraulic roughness of stream channels.

Using the USGS topographic maps, the drainage basin boundary for Rock Cove was delineated. The basin was further divided into major tributaries to Rock Creek and some smaller subbasins that were areas not served by major tributaries. A total of 24 subbasins were delineated to be modeled to improve the accuracy and validity of the HEC-1 hydrologic model for the entire basin.

A base flow was calculated from streamflow data gathered in the field. Streamflows were estimated from streamflow velocity and approximated channel cross section dimensions. Due to limited access to many of the major tributaries, seven streamflows were used in the baseflow calculation. Subbasin size was measured with a planimeter from the USGS topography maps. Baseflows were calculated as flow in cubic feet per second (cfs) per square mile of drainage basin. The mean base flow was calculated to be 20.1 cfs/sq. mi.

A summary of general data on the basin is listed below.

ROCK CREEK DRAINAGE BASIN:

TOTAL BASIN AREA:	43 SQUARE MILES
MAINSTEM STREAM LENGTH:	14 MILES
AVERAGE SUBBASIN SIZE:	1.9 SQUARE MILES
NUMBER OF SIGNIFICANT SUBBASINS:	24
ESTIMATED WET WEATHER BASE FLOW:	20 CFS / SQUARE MILE

The following table (Table D-1) details the size of each subbasin, the length of the subbasin channel or flowlength to the lower end of the subbasin (which often includes portions of the mainstem channel), and the slope of the subbasin channel to the lower end of the subbasin (which often includes portions of the mainstem channel). Please see Figure D-1 for the shape and location of each subbasin relative to Rock Cove.

The soil type and hydrologic unit code were determined for each subbasin. Although there were often several or more soil types within each subbasin, a very high percentage of each subbasin was made up of soils having the same hydrologic unit code. Most of the soils in the Rock Creek basin are categorized as being in hydrologic soil group "B", and a small percentage of the soils fall into group "D". Only two subbasins had a significant amount of group "D" soils to affect the SCS curve number used for runoff calculations.

The land use in 22 of the 24 subbasins was classified as commercial forest. The condition of the commercial forest lands ranges from recently clearcut to maturing second growth. For purposes of modeling, the commercial forest land was classified as woods in good condition. For those subbasins that have primarily hydrologic group "B" soils an SCS runoff curve number of 55 was assigned. For those subbasins with a mix of group "B" and "D" soils, a runoff curve number of 60 was assigned. Subbasin 230, which contains the City of Stevenson, Washington, was considered mixed city and assigned a curve number of 75. Subbasin 240 was considered rural and assigned a curve number of 65.



TABLE D-1: ROCK CREEK SUBBASIN DATA:

SUBBASIN NUMBER	SUBBASIN AREA (SQUARE MILES)	APPROXIMATE CHANNEL LENGTH (FT)	APPROXIMATE CHANNEL SLOPE
10	5.6	27,000	0.08
20	1.2	12,000	0.13
30	0.27	4,000	0.12
40	2.6	13,600	0.12
50	0.72	4,600	0.25
60	2.8	9,300	0.20
70	1.1	10,000	0.16
80	0.53	3,500	0.24
90	0.82	7,700	0.18
100	0.28	1,400	0.43
110	2.0	14,300	0.14
120	0.42	2,500	0.56
130	4.5	21,500	0.07
140	0.84	6,500	0.30
150	3.1	14,000	0.12
160	0.09	1800	0.022
170	1.2	10,000	0.18
180	3.4	19,400	0.066
190	6.3	18,500	0.112
200	2.3	17,000	0.128
210	1.4	10,000	0.096
220	0.68	6000	0.033
230	0.26	3500	0.069
240	0.9	4000	0.08



Subbasin 230, which contains the City of Stevenson, was not modeled with the detail that would be used in a drainage master planning effort. The subbasin represents only 0.6 % of the entire Rock Creek drainage basin, and is located in the lower portion of the basin. The combination of its small size and location in the lower basin indicate that the subbasin will have little impact on flooding conditions on Rock Creek. The basin's runoff was assumed to discharge to Rock Creek upstream of the Rock Creek Dr. bridge, which is a conservative simplification for modeling purposes.

Although the 100 year storm is the event of primary importance, the model is capable of calculating runoff peaks for events with more frequent intervals. In anticipation of using the model to simulate those lesser events in addition to the 100 year event, the following table of 24 hour precipitation quantities was obtained from the NOAA atlas. The figures shown are for the approximate center of the drainage basin.

TABLE D-2: 24 HOUR PRECIPITATION FOR THE ROCK CREEK BASIN

RETURN INTERVAL (YEARS)	24 HOUR PRECIPITATION (INCHES)
2	4.50
5	5.25
10	5.75
25	7.00
50	7.50
100	8.25

The results of the hydrologic modeling effort are presented in Table D-3. Two separate flows are indicated for each return interval. This is because there are expected to be two critical conditions to consider during the hydraulic modeling effort. The first condition of importance to modeling the base flood elevation is at the Rock Creek Dr. Bridge, and the second is at the outlet of Rock Cove (at the Highway 14 bridge). Most of the runoff from the Rock Creek basin flows under the Rock Creek Dr. bridge. Runoff from subbasin 240 does not flow under the Rock Creek Dr. bridge, but joins Rock Creek within Rock Cove and flows under the Highway 14 bridge.



TABLE D-3: HYDROLOGIC MODELING RESULTS

PRECIPITATION (INCHES)	FLOW UNDER ROCK CR. DR. BRIDGE (CFS)	FLOW TO ROCK COVE at SR14 BRIDGE (CFS)
4.5 (2 YEAR EVENT)	1954	2029
5.25 (5 YEAR EVENT)	2582	2681
5.75 (10 YEAR EVENT)	3033	3149
7.00 (25 YEAR EVENT)	4728	4964
7.50 (50 YEAR EVENT)	5652	5923
8.25 (100 YEAR EVENT)	7199	7538

**HYDRAULIC MODELING**

The HEC-2 hydraulic model results are preliminary due to the lack of surveyed cross sections; the model will be run again once the survey data are available. The topographic data used in the HEC-2 model was gleaned and estimated from various available sources and therefore does not fully and accurately depict hydraulic conditions in the area of the cove. The preliminary results of the HEC-2 model do provide a relatively useful picture of the dominating hydraulic condition in the cove, which is the Bonneville Pool elevation. The dominance of the Bonneville pool elevation over water surface elevations in Rock Cove, combined with the level of human control over pool elevations at the Bonneville dam, creates enormous variability in a very critical model input item: the starting water surface elevation.

The HEC-2 hydraulic model simulates the backwater effects of a multitude of floodway and floodplain conditions that have an impact on flow in a stream. Conditions that will affect the efficiency of flow through a stream channel include the size and shape of the channel, the roughness and slope of the channel, the flow rate, channel obstructions such as bridges and culverts, etc. All of this information must be input to the model to describe the hydraulic conditions to be modeled. A condition that must be input and which is critical to the modeling of Rock Cove and the lowest reaches of Rock Creek is the starting water surface elevation. The computed 100 year water surface elevation of the Bonneville Pool was obtained from U.S. Army Corps of Engineers water surface profiles for the Columbia River. Those profiles indicate a water surface elevation of 84.6 feet MSL at Stevenson, Washington for the 100 year return interval event on the Columbia River. The initial hydraulic model results indicate water surface elevations in Rock Cove will not vary a considerable amount from the Bonneville Pool elevations, especially for the higher return interval events on the Columbia River.

84.6





Due to an apparent insignificant role of Rock Creek flows in the flood water surface elevations within the cove and the lack of detailed cross section data, reservoir routing has not yet been included in the model. It will be included if the model is refined with detailed cross sections.

To increase the accuracy of the results of the HEC-2 model will require some detailed surveying of the cove and the Rock Creek channel and overbanks. The specific survey needs to refine the HEC-2 model have been provided to Skamania County. If the County decides to proceed with the survey, Water Resource Management will update the HEC-2 model to reflect the more accurate information. If the County chooses not to conduct the survey, Water Resource Management will conduct a different hydraulic analysis, with an emphasis on the Rock Creek Dr. bridge, to provide the County with useful hydraulic information and recommendations for maintenance to reduce some of the risks associated with flooding on Rock Creek.

TABLE D-4. HYDRAULIC MODELING RESULTS  
WATER SURFACE ELEVATIONS UPSTREAM OF ROCK CR. DR. BRIDGE (FT. MSL)

BONNE-VILE POOL ELEV. * (FT. MSL)	78.7 (2 YEAR)	81.2 (10 YEAR)	83.7 (50 YEAR)	84.6 (100 YEAR)	87.3 (500 YEAR)
2 YEAR STORM	78.81	81.24	83.72	84.62	87.33
100 YEAR STORM	80.41	81.82	84.01	84.85	87.78

\* Pool elevations are in the vicinity of Stevenson, Washington

NOTE: The deck of the bridge is approximately at the 90 foot elevation, and the lower chord of the bridge is at approximately the 86.5 foot elevation.

Rock Cove can experience essentially two separate 100 year flooding events. The lesser of the two events is that caused by the peak flow in Rock Creek with a 100 year return interval. The greater of the two is that caused by the peak flow in the Columbia River and associated Bonneville Pool stage. The results indicate that the 100 year event flood of concern to the Rock Cove area will be caused by the 100 year flood on the Columbia River and the associated rise in the Bonneville Pool.



To obtain a clearer picture of Bonneville Pool elevations, some analysis was conducted of the pool elevations at the Bonneville Dam for the period of record, which is October 1, 1960 through May 11, 1997. The data was in four distinct data sets. Analysis was conducted on each data set and then combined. The results of the analysis are contained in the following table. (Table D-5)

TABLE D-5: BONNEVILLE POOL ELEVATION AVERAGES		
BONNEVILLE POOL ELEVATION AVERAGES BY DATA SET		
PERIOD OF RECORD	NUMBER OF DATA POINTS	AVERAGE POOL ELEVATION (FEET - MSL)
10/1/60 TO 12/31/76	5935	71.42
1/1/77 TO 12/31/92	5843	74.09
1/1/93 TO 7/31/96	1307	74.22
8/1/96 TO 5/11/97	283	74.26

The mean pool elevation for the entire period of record is 72.92 feet. But since the mean pool elevations appear to be more consistent in the last three data sets, the mean pool elevation for those sets was calculated separately to be 74.11. These are pool elevations at the Bonneville Dam Spillway Forebay, which is at river mile 145.5. The mouth of Rock Cove is located at river mile 150. The Corps of Engineers have calculated Columbia River flow profiles for various flows and forebay elevations. Water surface elevations were calculated for Cascade Locks at river mile 148.8 and Herman Creek at river mile 151.5. Straight line interpolation was used to calculate water surface elevations at Rock Cove and a water surface adjustment factor to convert water surface elevations at the Bonneville Spillway Forebay to water surface elevations at the Rock Cove mouth. The results of the interpolation are contained in Table D-6.

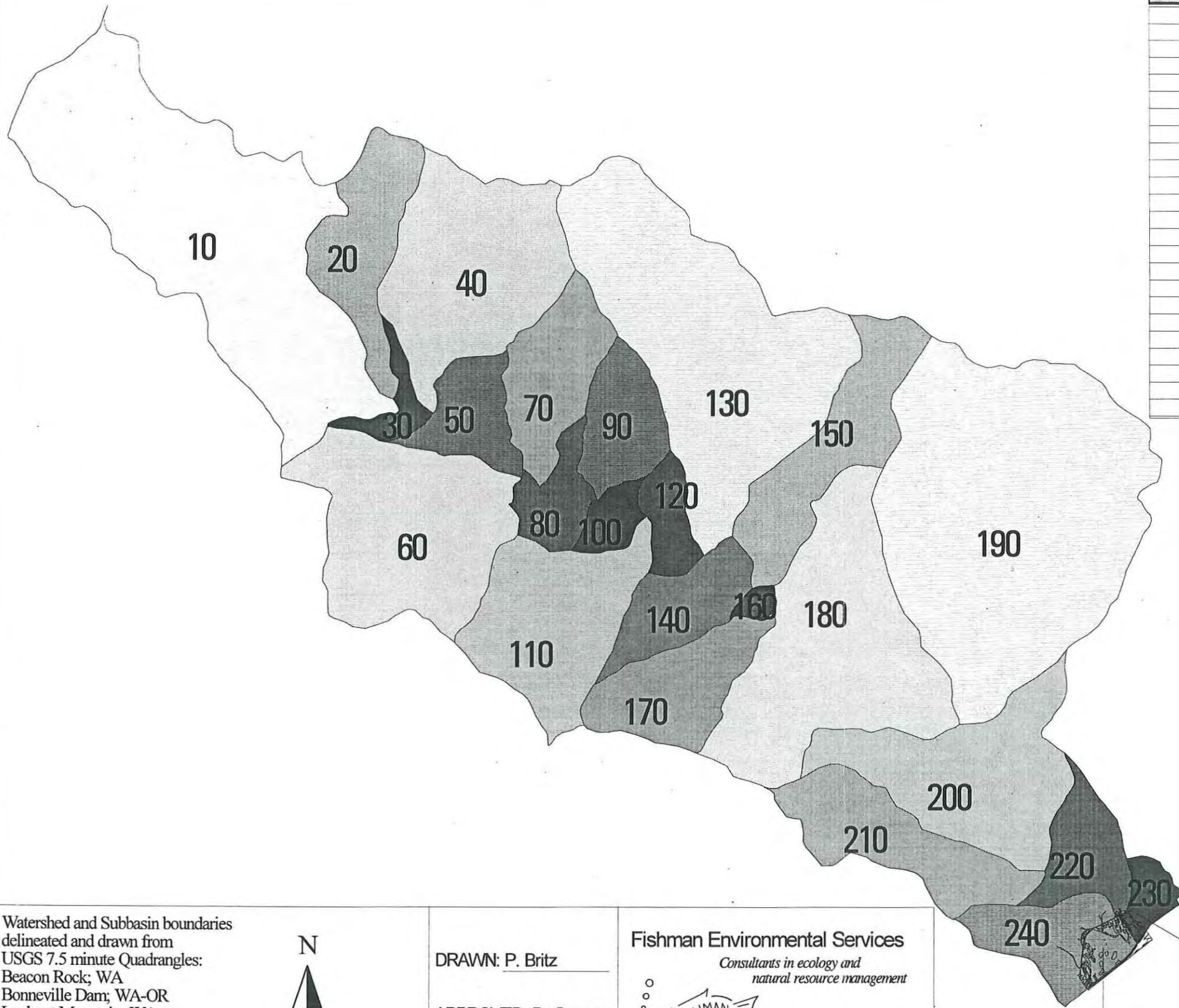


TABLE D-6: BONNEVILLE SPILLWAY TO ROCK COVE WATER SURFACE ELEVATION CONVERSION FACTORS			
COLUMBIA RIVER FLOW (CFS)	BONNEVILLE SPILLWAY FOREBAY WATER SURFACE ELEVATION (FT - MSL)	ROCK COVE WATER SURFACE ELEVATION (FT - MSL)	WATER SURFACE ADJUSTMENT FACTOR (FT)
100,000	74	74.444	0.444
200,000	74	75.044	1.044
300,000	74	75.789	1.789
400,000	74	77.089	3.089
500,000	75.5	79.678	4.178
600,000	75.5	81.178	5.678
700,000	75.5	82.678	7.178
800,000	75.5	84.222	8.722
900,000	75.5	85.822	10.322
1,000,000	75.5	87.422	11.922
1,240,000	75.5	93.167	17.667

Preliminary hydraulic modeling results for the 100 year Columbia River event indicate that water surface elevations in Rock Cove near the Rock Creek Dr. bridge are approximately 0.25 feet higher than the Bonneville Pool water surface elevation at the mouth of Rock Cove. If the hydraulic model is refined with current survey data and documents this to be true, water surface elevations in Rock Cove would be fairly simple to estimate using a few readily available data items. If the Bonneville Forebay water surface is known (available from the Corps of Engineers), the Columbia River flow is known (available from several sources), one could use the above table to determine the Bonneville Spillway to Rock Cove Water Surface Elevation Conversion Factors to calculate the water surface elevation at the mouth of the cove. This would provide either a good rough estimate (within 0.25 feet) of the water surface elevation at the Rock Creek Dr. bridge, or the beginning water surface elevation to plug into the hydraulic model to increase the accuracy of the estimate.







Subbasin #	Subbasin Acres	Subbasin Sq. Mi.	Approx Chnl Length (Ft)	Approx. Channel Slope
10	3654	5.60	27000	0.080
20	810	1.20	12000	0.130
40	1660	2.60	13600	0.120
130	2929	4.50	21500	0.070
70	723	1.10	10000	0.160
150	1012	3.10	14000	0.120
30	179	0.27	4000	0.120
90	536	0.82	7700	0.180
190	4085	6.30	18500	0.112
50	466	0.72	4600	0.250
80	337	0.53	3500	0.240
60	1786	2.80	9300	0.200
120	274	0.42	2500	0.560
180	2197	3.40	19400	0.066
100	185	0.28	1400	0.430
110	1284	2.00	14300	0.140
140	546	0.84	6500	0.300
160	61	0.09	1800	0.022
170	750	1.20	10000	0.180
200	1436	2.30	17000	0.128
220	460	0.68	6000	0.033
210	912	1.40	10000	0.096
230	168	0.26	3500	0.069
240	593	0.90	4000	0.080

Watershed and Subbasin boundaries delineated and drawn from USGS 7.5 minute Quadrangles: Beacon Rock; WA Bonneville Dam; WA-OR Lookout Mountain; WA Stabler; WA



1 0 1 Miles

DRAWN: P. Britz

APPROVED: D. Gorman

DATE: 10/28/97

Fishman Environmental Services

Consultants in ecology and natural resource management



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Stevenson

Rock Cove

ROCK COVE ENVIRONMENTAL EVALUATION AND COMPREHENSIVE PLAN

Skamania County Department of Planning and Community Development

Rock Creek Watershed and Subbasin Map

Figure D-1

Project: 96098

## TECHNICAL APPENDIX E. LAND USE IMPACTS TO ROCK COVE

Prepared by: Peter Britz, Natural Resource Planner; Fishman Environmental Services

The project area for this land use discussion includes Rock Cove waters, and the stream area from the Rock Creek Drive Bridge downstream to Rock Cove. The upland areas include Rock Cove and extend as far as the center of the roads adjacent to Rock Cove. The impacts and potential impacts from various land uses to Rock Cove will be described for this project area.

The study area falls almost exclusively within the City of Stevenson City Limits. There are three City of Stevenson zoning designations in the project study area: 1) Public Use and Recreation, 2) Commercial Recreation, and 3) Commercial. (Figure E-1)

The areas within the Public Use and Recreation (PR) zone include the Cove itself, the islands in the cove, the majority of the Columbia River Interpretive Center excluding its parking area, the Skamania County Fairgrounds, the City of Stevenson Wastewater Treatment Plant, the Senior Recreation Center, County shops and parking areas. The purpose of this zoning designation is to designate a central city area to accommodate existing uses, to minimize possible conflicts of use and maintain and conserve the environmental qualities of the Rock Cove area. Principal uses in the PR zone include but are not limited to: county fairgrounds; county, city, and state public works facilities; historical and educational structures; and provisions for wildlife habitat, non-motorized boats, and public and private recreation facilities.

The potential impacts to Rock Cove within the Public Use and Recreation zoning designation include potential water quality impacts due to animal waste coming from county fairgrounds facilities. However, this impact is lessened due to the fact that animals are only present on the site during the relatively short time of the County Fair, and the fact that rainfall (which raises the water table and delivers waste to the cove) for August is the lowest during the year. The City of Stevenson wastewater treatment plant takes the solid waste away to be treated and after secondary treatment of the wastewater the effluent is pumped into the Columbia River under the terms of a National Pollution Discharge Elimination System Permit. Other uses along Rock Cove in the PR zone include recreation, and educational/historical activities, including water sports and fishing in Rock Cove, and the educational activities which take place at the Columbia River Interpretive Center. The Interpretive Center has built bioswales to remove the oils and grease from the stormwater runoff in their parking areas. There is a potential oil and grease impact from the large parking lots along the east side of Rock Creek, from the parking of county vehicles, county employee vehicles and especially during events held at the County Fairgrounds.

The areas within the Commercial Recreation (CR) zone include some of the parking area from the Columbia River Interpretive Center and a piece of Skamania County land where a mill was formerly located. The purpose of the CR zone is to enhance the opportunities for tourism and



business in the City of Stevenson through development of commercial and other facilities that complement the natural and cultural attractions of the area without significant adverse effect to environmental features of natural, cultural, and historic resources and their settings (Ord. 894, 1994). Principal uses in the CR zone include but are not limited to: overnight lodging, educational, cultural and related facilities, food and drink service facilities, recreational services, places of public assembly for cultural events, and recreational and fitness facilities.

The stormwater which comes off the parking area of the Interpretive Center has a filtration system as discussed above in the PR zone. The abandoned mill site has a variety of land cover types including scrub/shrub vegetation, some paved areas, and some rip-rapped banks. There may be some potential for a small amount of oil and grease to make its way into the cove from incidental parking on the site. The mill site has a good deal of invasive blackberry and other species which, if replaced with some native species, could improve the habitat for this location. The mill site lot has been divided into four lots. One of these lots, closest to the interpretive center has an assisted living facility development planned. The three other lots are currently vacant and remain available for development. A 15 foot wide approximately 500 foot long pedestrian easement follows the top of the bank along Rock Cove connecting to the east sidewalk along Rock Creek Drive at the north and south. Currently, Lot 4 at this site is used as a boat launch for boaters accessing Rock Cove and the Columbia River. This is one of the few protected boat launches which provides access to the Columbia River. The development of this lot by Skamania County or a private interest could provide improved access to Rock Cove for small boats, could provide improved scenic views of the cove and Columbia River Gorge, and could improve shoreline and inwater habitats along this portion of Rock Cove. Improvement of the pedestrian easement into a sidewalk path could provide an aesthetically pleasing loop trail component to the recently completed Rock Creek pathway project.

According to the CR zoning designation the types of uses that are permitted to be located adjacent to the cove will be uses which tend to attract people to a service provided or an attraction. The potential for degradation to the cove from these types of uses could include aesthetic degradation, stormwater runoff from new parking areas and habitat degradation due to development which is not design with the improvement of habitat in mind.

The remainder of Rock Cove is zoned as Commercial. This includes the land at the east end of the cove along the highway and along the bank of Rock Creek at its mouth. In addition this zone includes Rock Cove Inlet, the area between the highway and the railroad tracks with a small boat dock. The principal uses in the Commercial Zone (C1) include: residential, retail sales, banks, office, food or beverage operation, hotel/motel, apartments, theater or public assembly, residential care facility. The C1 area within the project limits inside the highway includes an area that is undeveloped and is largely overgrown with blackberry along the bank of Rock Creek and



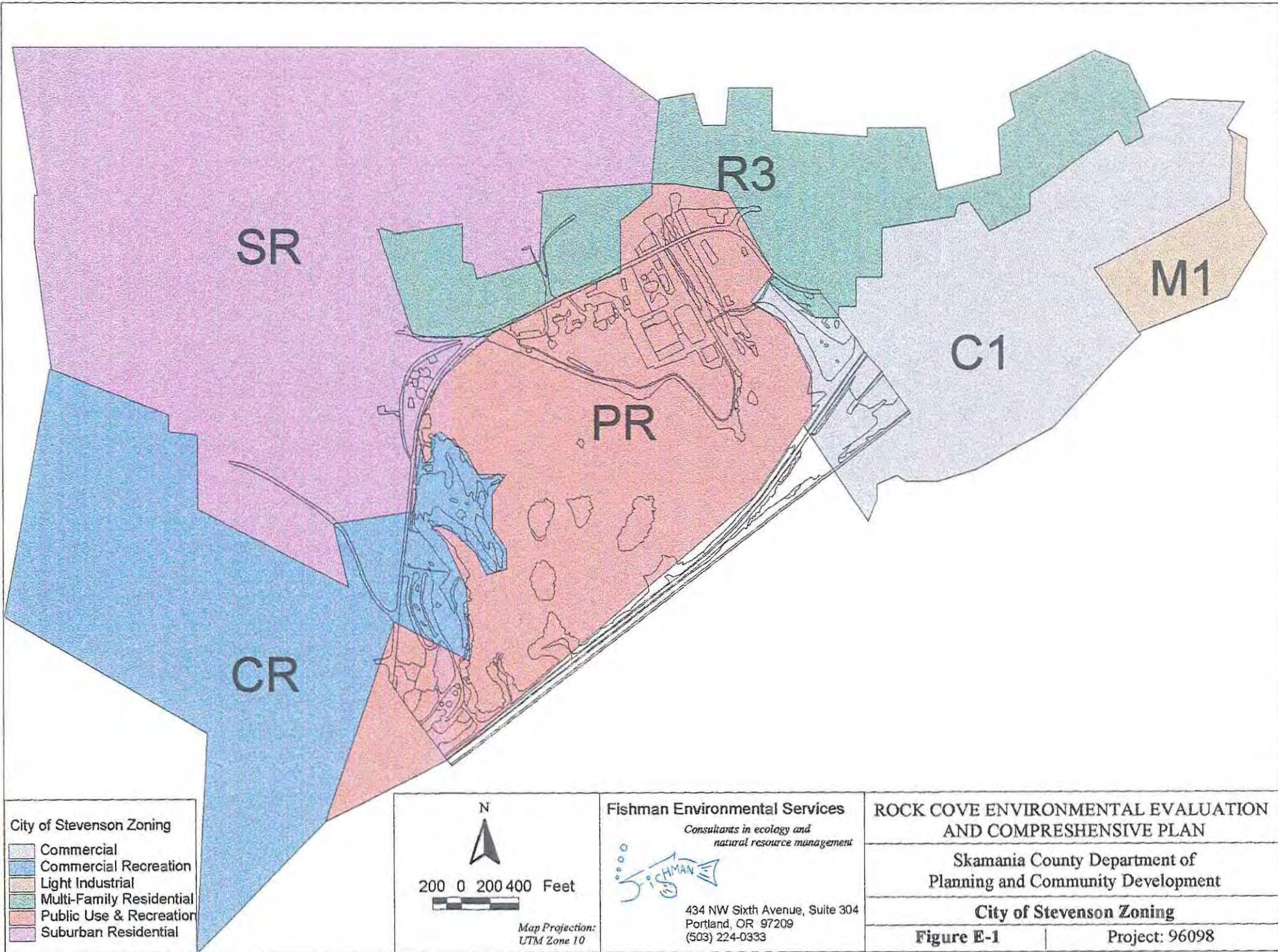
vegetated with grasses and a few trees on the level upland section. With the removal of the blackberry and some enhancement of the shoreline, the habitat would be greatly improved in this area. A mitigation plan has been developed to replace impacted wetlands from an SR14 improvement project (couplet project) which includes improving a thin band of habitat adjacent to SR14. There are no identifiable pollution sources within this area. Rock Cove Inlet is an area where a small number of work boats and recreational boats tie up. There is slight potential for degradation to this part of the cove if any of these vessels were to have a fuel or oil spill.

Ordinarily, the direction of flow is from Rock Cove into the Columbia River; in this situation, any spill would travel into the Columbia. During times when the reservoir level at the Bonneville Dam is rising and Rock Creek has a small flow volume the direction of flow could be into Rock Cove in which case a spill would impact the cove and its habitats.

Impacts to the cove could occur due to the close proximity of the highway and the railroad tracks to the cove. The highway does have stormwater runoff, which goes into the swale between the Highway and railroad, thereby draining any oil and grease from the road away from Rock Cove. However, the potential for spills from vehicular accidents on the highway and on the railroad tracks, although small, could cause irreparable harm to the cove, especially if a tanker car or truck loaded with hazardous materials were to spill contents into the cove.

Other potential impacts to the cove are specific to the 13 stormwater outfall pipes which enter the cove. Eight of these outfalls enter Rock Cove from Rock Creek Drive, four drain into Rock Creek and one drains into the Cove from Highway 14 at the mouth of the Cove. These outfalls drain Rock Creek Drive, Foster Creek, runoff from the golf course at the Skamania Lodge, the streets and impervious surfaces for much of the western part of the City of Stevenson. These outfalls have the potential to input oil and grease as well as sediments and other material which collect on the streets and impervious surfaces in the western portion of the City. The quality of the effluent from the stormwater could be improved through the use of bio-swales for filtration, catchment/collection systems, or redirection of the outfalls to a regional treatment facility.

In order to get a better understanding of the potential impacts to Rock Cove a land cover map was created (see Figure F-2). This map shows each land cover type as a different color. Since this map was created using GIS a table is associated with the map. The table here shows the acreage for each land cover type. Getting an understanding of the types of land cover and the percentage of each land cover is one starting point for understanding the degree of development and whether an area shows signs of environmental impact. For instance the degree to which an area is covered with impervious surfaces is indirectly proportional to the amount of plants which can grow in that same area. The impervious surfaces in the project area account for twelve percent of the total study area or twenty three percent of the non-water areas.





Land cover	Count	Sum Acres
Bare	30	15.5700
Building	24	3.4600
Grass	19	18.5000
Pavement	18	17.4400
Railroad	1	1.3300
Shrub	15	8.3600
Trees	69	25.8800
Water	6	86.0100



**Legend**

- Land Cover
- Bare
  - Building
  - Grass
  - Pavement
  - Railroad
  - Shrub
  - Trees
  - Water



200 0 200 400 Feet



Map Projection:  
UTM Zone 10

Fishman Environmental Services  
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**ROCK COVE ENVIRONMENTAL EVALUATION  
AND COMPRESHENSIVE PLAN**

Skamania County Department of  
Planning and Community Development

**Rock Cove Land Cover**

**Figure E-2**

**Project: 96098**

## TECHNICAL APPENDIX F. FACILITIES AND USES ECONOMIC REVIEW FOR ROCK COVE STUDY AREA

Prepared by: Clay Moorhead, Principal; CDA Group

*Rock Creek provides an "island" of social and economic opportunity for Skamania County within the boundaries of the City of Stevenson. Well planned and coordinated conservation and development activities in the Rock Creek area will potentially enable Skamania County to address formidable challenges posed by a substantially displaced work force, decreasing County revenues, inadequate living facilities for the elderly, and the imminent potential for environmental degradation caused by competing and incompatible land uses.*

— Skamania County RCAP grant application

### INTRODUCTION AND BACKGROUND

Revenue from timber sales has historically provided a significant percentage of Skamania County's income. With reduced harvest from Federal lands, the County's main source of revenue has been severely cut. The Federal government's revenue guarantee program has filled the gap for the last few years. However, funds to the County will be reduced each year through this program until the year 2004, when the County will again receive 25% of revenue from timber sales on Federal land within its boundaries. Timber sales have been declining, and the 25% revenue will not come close to historical incomes or to subsidies received through the revenue guarantee program. The County needs to find a new source of income to replace this lost timber revenue, and only has about five years to do so.

The Federal government owns 80% of Skamania County. Between the reduction in timber harvests due to changes in national forest policies and the designation of the Columbia Gorge as a National Scenic Area, the County has been hard hit economically. Despite the significant loss from timber sales, Skamania County has a fortunate location that can be used to its financial advantage as well as to the advantages of the City of Stevenson and the Port District. The Gifford Pinchot National Forest is one of the most visited National Forests in the country, with a fourfold increase in visitors within the last five years. Skamania County and neighboring Klickitat County are the top places for turkey hunting in Washington. Bird, deer, and elk hunting are also excellent in the County. In addition, Gifford Pinchot is a great spot for other types of outdoor recreation, such as hiking, camping, and recreational vehicle use. The City of Stevenson, adjacent to the Rock Cove area, is the gateway to the Gifford Pinchot. Rock Cove connects to the Columbia River at the Stevenson waterfront. The reach of the river near Stevenson is frequented by windsurfers. Sternwheelers dock at the Stevenson waterfront. The Wind River, known as an excellent place for water recreation including fishing and rafting, is only ten minutes away. Rock Cove itself contains the new Columbia Gorge Interpretive Center and opportunities to see eagles,

osprey, hawks, and migratory waterfowl. The Cove also offers salmon habitat, bass fishing, and has habitat for animals such as beavers and otters. Skamania Lodge is located on the hillside above the Cove. The Portland metropolitan area is only 45 minutes away, and contains a large population which is always on the lookout for nearby outdoor recreation opportunities.

A theme focusing on outdoor recreation already exists in Skamania County. The elements described above need to be pulled together in order make the County more welcoming to visitors and to encourage them to stop on their way to outdoor activities. The basic building blocks are already present, but, without some action to take advantage of them, will not provide the County with needed vitality. The Rock Cove area comprises 135 acres. Its location near the City of Stevenson and the Columbia River, its status as a significant portion of County land, and the presence of Rock Creek Park and Fairgrounds make the Cove an ideal focus for County efforts to create interest and attract more people to the area.

The County is in the midst of economic change. The economic focus will change to a non-extractive use of resources. Tourism will become a predominant economic generator. With tourism, other economic benefits can occur. Tourism can create a need for new businesses and jobs to replace those lost when logging in the County was drastically reduced. Tourism can attract more people to the County, increasing potential income from restaurant and hotel taxes and creating business opportunities. Tourism can also create an attractive vitality that complements the development of business and office activities.

By making better use of the fairgrounds, the County will continue to increase tourism activities. The County can increase rental income from the site, and more important, can provide a focal point or hub of activity that draws people to the area. The County can emphasize the Gifford Pinchot National Forest, which makes up most of the County, as a site for recreation rather than for timber harvest. The City of Stevenson and Rock Cove can become the jumping-off point for those who want to visit the Federal lands for hiking, recreational vehicle use, mountain biking, hunting, and other outdoor activities.

For example, currently, if a place exists in Stevenson where USGS maps of the Gifford Pinchot or charts of the Columbia can be purchased, a visitor would never know it. Identifying these types of needs or missing links and responding to them will make Skamania County a welcoming place for tourists to visit on the way to pursuing the abundant nearby recreation activities. Perhaps a partnership could be worked out with the Skamania Lodge, the Chamber of Commerce, or the Forest Service where information on the Gifford Pinchot National Forest is made available in Stevenson or at Rock Creek Park. This could be accomplished by something as simple as a small information sign containing a map and pamphlets, or as involved as a booth that is staffed during the summer season.

Because so many threads of an outdoor recreation theme are already present in Skamania County, and because a key value of Rock Cove identified by County residents was a "natural appearance", it makes sense for the County to focus on the fairgrounds and Rock Creek Park as a centerpiece to the area. Also, local residents support outdoor recreation. Having a sportsman show was rated the number one potential new activity at the fairgrounds by local residents in the Master Plan survey conducted by the consultant team (see Technical Appendix H: Recreational Uses and Opportunities). Small changes can be made to the fairgrounds and Rock Creek Park to emphasize their connection to the natural environment that surrounds them. Links can be forged between Skamania Lodge, the Interpretive Center, Rock Creek Park, Stevenson, and the Columbia River waterfront. Rock Creek Park is in a location that makes it the geographical center of all these elements, and it is also a focal point for arriving visitors because of the direct view of the fairgrounds across Rock Cove from Highway 14. Strengthening links with other facilities and emphasizing a connection with outdoor recreation will positively affect Rock Creek Park. However, these efforts will be much more effective if they are undertaken as part of a larger vision that encompasses all the elements previously listed. An improved park and fairgrounds on Rock Cove will not, on its own, provide the impetus to persuade people to stop as they pass through town, just as an improved waterfront will not be a significant draw if it is not linked to other nearby attractions. Maintaining a vision for the entire County will enable investments in one area to leverage investments in other areas, providing benefits to all parties.

## **MAKING BETTER USE OF THE PARK**

### **Connections**

Providing connections between attractions in the area is necessary to make the most of each of them. Linked together, the Cove, the Interpretive Center, the Lodge, the Columbia River waterfront, and Stevenson have much more power than if each of these entities stands alone. Rock Creek Park is the key to providing linkages among all the elements in the area. The Park is what people see from Highway 14 as they arrive in Stevenson, and it is centrally located among all the elements. Strengthening these linkages will be a major component of improving the Park and fairgrounds and making them a center of activity on the Cove. The Interpretive Center and Rock Creek Park are geographically on opposite sides of the Cove, and they also provide complementing experiences. The Interpretive Center provides a more natural experience in an area influenced by humans, while the Park provides a human experience in a natural setting.

Bicycle access and pedestrian access should be strengthened through the continuation of the bicycle path that the City of Stevenson has begun constructing along Rock Creek Drive. The path through the park can be upgraded using the same materials and construction details already present on the Stevenson section of the path. Eventually this path should connect all the way to the Columbia, and all sections of it should look the same to provide continuity. Improving the path through the park will make a clearer connection with the existing pedestrian bridge across



Rock Creek and will strengthen the connection from the fairgrounds to the other side of the creek. The visual unity of this path will connect the various elements in the area for passersby in cars as well. A person driving by will see the same stone bollards and lights throughout the area, and will realize that there are connections.

### Concerns

Some decisions need to be made by County residents about the types of activities they are willing to support in the Cove area and at the Park. Some local residents have expressed a need for a protected boat launch area, and have indicated that the Cove area would be a good place for this. The County should make a determination on the appropriateness of a boat launch in the Cove based on the wants and needs of all County residents. A boat launch can provide benefits, but it also has some drawbacks: a potential for increasing traffic in the Cove area, the creation of a need for a large parking area to accommodate trailers, the increased noise that comes from more motorized watercraft and the need to maintain a dredged channel to the Columbia River from any boat ramp area. Whether or not to include a boat ramp is a detail that needs to be worked out among all the stakeholders. If the County and stakeholders such as the City and the Port District can come to an agreement on how they will work together toward one vision that will increase the strength of each element, these kinds of decisions will be made much easier.

In 1995, the Port of Skamania County received a report from the J. D. White Company that examined the potential for locating watercraft recreation areas in the County. The study analyzed forty-three parcels for feasibility. Three sites within Rock Cove were included in this study, and all three were ranked among the top ten sites. Site S in the study was located at the Fairgrounds, and was included as one of the four sites recommended for further study. The conclusion of the report was that the fairgrounds site "is appropriate for a moderate to high intensity watercraft facility for motorized and non-motorized watercraft." The one potential problem noted was that there might be fisheries issues at this site which could cause difficulties for development.

On-site camping is a big draw for those attending the County Fair and other festivals at the Park. There is a conflict, though, between on-site camping as it occurs now and the desire for an improved baseball field. Even if only minor improvements are made to the field, perhaps current camping policies should be reexamined. For example, if tent campers were permitted to drop off their tents and equipment, but were required to park in another designated area, this would minimize damage to the lawn and would quite likely also improve the atmosphere for campers. RV parking now has a designated area with water and electric hookups. RVs and trailers probably should not be permitted on the lawn either if the turf is to be given some protection. As improvements are made to the park, the County must decide whether to expand RV facilities, to allow use in parking lots, or to limit RVs only to designated RV sites.

The geese that frequent the Park's lawn have been identified as the major problem in the Park by many local residents. The geese impede enjoyment of the Park because they destroy the lawn area and leave behind waste. Solutions to this problem should come through the design of the



Park, which is currently very attractive to geese because of the easy access from the water and the enticing grass lawn. The recommended park master plan aims at reducing the goose problem through the use of design techniques, such as creating attractive areas for the geese away from park users and adding planting areas to create barriers for the geese.

### **New Development**

A comprehensive approach to new development is needed for the entire Cove area. Piecemeal development will limit future options in the area. Developing clear goals now will allow phasing of ideas as funds become available, and will ensure that opportunities that are present now will not be lost due to current lack of funds. A comprehensive approach to planning for the Cove area, with a formal agreement by all stakeholders for types of linkages and connections, will ensure maintenance of the local character by setting guidelines so that future development will be compatible and will contribute to maintaining that character.

New development on the three additional County short plats should be seriously evaluated for compatibility with the Cove and with surrounding attractions. It will be important for development on these plats to contribute to local recreation opportunities or at the very least not detract from them. Natural aspects of the Cove should be emphasized and retained on these sites. New development should not conflict, and should actively contribute to maintaining the natural character of the Cove.

This land should be used for higher intensity land uses, with protection for the riparian zone and shoreline. Visitor-oriented commercial uses located here will provide employment opportunities and strengthened connectivity between the Skamania Lodge and downtown Stevenson. High density office commercial at the location will provide new jobs as well, but will limit the public enjoyment of the cove. For this reason, the County should cooperate with the City and the Port to attract the "right" development that best fits the overall vision. Whatever happens on these sites, new development, including the assisted living center, should take advantage of the natural setting, and should present a facade to the public and especially to Rock Cove that is in harmony with existing development and that contributes to the setting.

### **CAPITAL IMPROVEMENTS AT ROCK CREEK PARK**

The original Rock Creek Park and Skamania County Fairgrounds Plan was completed in 1990. An assumption has been made that this Master Plan and the three phases it outlined were intended to be accomplished in 20 years, with the Master Plan implemented by the year 2010. Some Master Plan elements have already been constructed at the Park. There are now 12 years left before the year 2010. In order to evaluate the economic viability of the plan, we have identified phases for completing the remainder of the Master Plan projects. Phase I extends to the year 2000; Phase II incorporates the years 2001 through 2005; and Phase III incorporates the years 2006 through 2010.

Some of the improvements detailed in the 1990 Master Plan have been completed: the horse barn addition, the electrical improvements and motor home hookups, and the water's edge walkway. These projects have therefore been left out of the discussion of Master Plan phasing and implementation.

The rock and gravel accumulation in Rock Creek is not caused by the park, although it occurs near the park. This problem affects the entire cove, and therefore is not considered to a "park improvement" for the purposes of this economic phasing study. A solution to the accumulation problem will be approached by the watershed and natural systems component of this project team, and is not included in the discussion of the design and function of the park and fairgrounds. Because of this, the problem and the cost for a solution have been left out of the discussion of costs for both the original 1990 Master Plan phasing and the revised recommended Master Plan phasing.

To make comparisons more easily, an assumption has been made that Skamania County will incur debt for the entirety of the projected cost for each phase of improvement, and that all terms will be twenty years in length. Two debt scenarios were calculated, one at a 5.5% interest rate and the other at an 8% interest rate. It is possible that the County might successfully seek grants or other funding to defray or entirely cover costs of the three phases. However, since this cannot be foreseen, it has been assumed that the County will need to cover the entire cost of the improvements in order to make comparisons.

**Table F-1. Rock Creek Park Improvements Phasing Based on the 1990 Master Plan**

Phase I: 1998 - 2000	
Park grounds irrigation	\$35,000.00
Baseball diamond	\$25,000.00
Pave walkways, walkway landscaping	\$20,000.00
<b>Phase I total</b>	<b>\$80,000.00</b>
Debt service per month at 5.5 %, Phase I	\$550.31
Debt service per month at 8%, Phase I	\$669.15



Table F-1, continued

Phase II: 2001 - 2005	
Performing Arts Center and parking	\$4,000,000.00
Outdoor Stage/ Timber Carnival	\$10,000.00
Exhibit Building	\$320,000.00
Show Arena Cover	\$320,000.00
Flag Pavilion	\$8,000.00
Pave walkways, walkway landscaping	\$20,000.00
<b>Phase II total</b>	<b>\$4,678,000.00</b>
<b>Debt service per month at 5.5%, Phase II</b>	<b>\$32,179.37</b>
<b>Debt service per month at 8%, Phase II</b>	<b>\$39,128.67</b>

Phase III: 2006 - 2010	
Boat docks	\$40,000.00
New bridge	\$100,000.00
Arena and grandstand cover	\$405,000.00
Stock barn addition	\$19,200.00
Paved parking lot	\$25,000.00
Paved walkways, walkway landscaping	\$20,000.00
<b>Phase III total</b>	<b>\$609,200.00</b>
<b>Debt service per month at 5.5%, Phase III</b>	<b>\$4,190.61</b>
<b>Debt service per month at 8%, Phase III</b>	<b>\$5,095.59</b>

**UPDATING THE 1990 MASTER PLAN**

The consultant team conducted a survey in April 1997 to determine priorities for implementing the projects outlined in the 1990 Rock Creek Park and Fairgrounds Master Plan. The results are listed below.



**Table F-2. Results of Survey Prioritizing 1990 Master Plan Elements**

GreenWorks Survey rating	1990 Master Plan Phase	Project	Projected cost, 1990 Master Plan
1	1	Dredging Rock Creek and the Cove	\$500,000.00
2	1	Paved walkways and landscaping	\$20,000.00
3	1	Improve baseball diamond	\$25,000.00
4	N/A	Improvement of site's appearance	N/A
5	3	Boat docks	\$40,000.00
6	1	Irrigation	\$25,000.00
7	2	Paved walkways and landscaping	\$20,000.00
8	N/A	Improvement of facilities' appearance	N/A
9	3	Arena and Grandstand cover	\$405,000.00
10	2	Show arena cover	\$320,000.00
11	2	Performing arts auditorium	\$4,000,000.00
12	2	Outdoor stage	\$10,000.00
13	2	Exhibit building	\$320,000.00
14	3	Paved walkways and landscaping	\$20,000.00
15	3	Paved parking lot	\$25,000.00
16	3	Stock barn	\$19,200.00
17	2	Flag pavilion	\$8,000.00
18	3	New bridge	\$100,000.00

Local citizens recognize the potential problems of the rock and gravel accumulation at the mouth of Rock Creek, and therefore have rated that as the first problem to be tackled. This is a problem for the entire Cove area, not just for the park. Because the accumulation is not caused by the park and affects other areas as well, a solution to the accumulation problem will be approached by the watershed and natural systems component of the project team, and is not included in the discussion of the design and function of the park and fairgrounds.

The category of "paved walkways and landscaping" appears several times because the 1990 Master Plan contained three phases of walkway improvements. Two projects were added to the survey in order to gauge the importance in relationship to other projects. These two projects are identified under the "1990 Master Plan Phase" column and noted as "N/A".

The survey suggests that Rock Creek Park is seen as a local place that needs to be cleaned up and upgraded in order to maintain its family-oriented character and its function as the site of the County Fair. This is a view of the fairgrounds that has not changed since the development of the Master Plan in 1990. Most of the projects that received top ratings in the survey will upgrade the appearance of Rock Creek Park and allow it to function better. Therefore, one goal for the future of Rock Creek Park should continue to be to improve the appearance of the site and the facilities.





Since the fair only accounts for 2% of the year's time at Rock Creek Park, improvements and upgrades should also improve the function on the other 98% of the year, when Rock Creek Park serves as the County's main park.

Except for the rock and gravel accumulation problem, the projects that were in the top half of the ratings were individually small projects that would contribute to improving the overall function and appearance of the park and fairgrounds. Throughout this study, responses were voiced regarding the appearance of the pole barn construction of the fair buildings. Although these buildings are very cost effective, their appearance has a more industrial look. Based on the response of the public and the priorities identified by the survey, the County should consider other alternatives to pole barn style construction on future building projects. Although other types of construction may be more expensive, a decision should be made considering both cost and appearance as it relates to the overall vision for improvement of the cove. Additionally, the appearance of the existing structures can be mitigated through the use of selective landscaping improvements.

The top rated projects have been incorporated into our recommended Concept Plan for Rock Creek Park. The 1990 Master Plan divided the landscaping and paving of walkways into three phases. In contrast, the recommended Concept Plan uses the paved path and landscaping to achieve highly desired overall improvements to the appearance of the Park and its facilities. The path and landscaping will continue through the length of the park. Because this improvement will affect the overall appearance of the Park and because undertaking the project in one phase is more cost-effective, the entire path and landscaping project has been included in the Revised Phasing as the major component of Phase I.

During the survey process, it was determined that there was strong support for maintaining camping at the Park and fairgrounds. Our recommended Concept Plan proposes some improvements to the field, but not to the degree proposed in the 1990 Master Plan. An investment in a tournament-class field, as proposed in the 1990 plan, would require banning camping in order to maintain the field's quality. Currently, the Building and Grounds Department is installing a \$60,000 irrigation system in the ballfield area. The investment in this new system reflects the interest in continuing the local baseball program, but it also brings to the forefront the question of camping on the ballfield.

Another major concern raised was the geese conflict. There is a large population of Canadian geese in the Cove, and they like the easy access to the grass lawn at the Park. The geese leave behind waste at the Park, which makes it difficult for people to enjoy recreation there. Since the geese are apparently not going to stop coming to the Cove, they can be discouraged from frequenting the areas that people use. Fishman Environmental Services proposes adding

emergent marsh areas to attract geese away from the lawns, and using planting materials in the path landscaping plan that will create a barrier for the geese between the cove and the lawn. The County should undertake an education program that includes signs explaining why people should not feed the geese.

Walkways, landscaping, turf improvements, and a more minor upgrade of the ballfield all will work toward improving the appearance of the park and fairgrounds and can also help to improve the appearance of the facilities by providing screening and by creating better connection among the buildings. Canoe and kayak boat docks and a rental kiosk could create an attraction at the park and increase the number of users. An overhead structure would make the Arena and Grandstand more comfortable and more usable in inclement weather. The priority of the Show Arena cover, which would also increase the function of an existing fairgrounds facility, fell just below the top half of the ratings.

The Performing Arts Auditorium is the one proposed facility that strongly diverges from the vision of the fairgrounds as a low-key, local place, and it did not even make it into the top half of the ratings. Based on the cost projected in the 1990 master plan, the Performing Arts Center would be costly, with a debt service of \$27,515.49 per month based on a 20-year term with 5% interest or \$33,457.60 per month based on a 20-year term with 8% interest. The projected cost of this facility is outdated, and the master plan gave no indication of the quality of the building. These two factors means that the debt service figures above are conservative at best. This is significant, especially if the Center is expected to pay for itself through rentals or performances.

The County should continue to evaluate the cost versus the benefit of such a facility. Certainly, the cost of such a major facility would be controversial in a County troubled with major decreases in revenue unless significant grants could be received to offset the price tag. Perhaps the County or the City of Stevenson would be better off encouraging private development of a music venue or movie theater in town. Additionally, other locations for this type of facility should be considered if funding did become available. Other locations, including downtown Stevenson or next to the River on Port property.

It is important to note that the Outdoor Stage and the Exhibit Building received the same total score as the Performing Arts Center. This shows that although people dream about having a major facility, they would be satisfied with an outdoor bandstand and an enclosed exhibit building, which would provide some of the same functions as a Performing Arts Auditorium at less than one-tenth the projected cost.

There was very little support for constructing a second walking bridge. Since there already exists a serviceable walking bridge, building a second bridge does seem rather redundant, particularly when it adds to the debt load with very little in the way of overall improvement to the function

and appearance of the fairgrounds complex. Our concept plan calls for clearer circulation and proposes path improvements. These should make the existing bridge more functional by creating better connections between the parking area and the Park.

### REVISED MASTER PLAN PHASING, BASED ON THE 1997 SURVEY

#### Assumptions Behind the Revised Master Plan Phasing:

1. The Performing Arts Center is tabled until funds become available for a feasibility study and for siting and construction of such a facility.
2. Improving the appearance of the Rock Creek Park and its facilities is assumed to encompass adding walkways and landscaping, upgrading the ballfield, and improving the turf. The recommended Concept Plan addresses these issues.
3. A new bridge is not included because there was very little interest by the community and because the existing footbridge can function better with improved pedestrian circulation at the Park.

The projects set out for Phases I and II are the highest priorities based on the results of the Master Plan survey. The one exception is the Show Arena cover, which would have been in Phase II based only on survey ratings. However, the cost of this structure is much more than the cost of the Outdoor Stage, which was rated just below it. Constructing the Show Arena cover at the same time as the Grandstand and Arena cover and the implementation of our Concept Plan for the parking area would substantially raise the cost of Phase II. In order to keep the costs of the three phases more balanced, the Show Arena cover has been listed as the first project of Phase III, and the Outdoor Stage has been listed as the last project of Phase II.

The updated projections of cost are based on the City of Stevenson's costs for construction of the Rock Creek Road bicycle path, and on a rough estimate of the materials needed to accomplish our recommended Rock Creek Park Concept Plan. These cost projections are very preliminary, and are based only on materials and labor costs. An actual cost estimate of a particular project can only be undertaken after design is complete, when more accurate drawings and actual planting plans are available. The updated figures included here are only intended to provide an approximation that is more applicable to Rock Creek Park's current needs and more reflective of current costs than the figures included in the 1990 Master Plan.

If funds remain insufficient to complete either Phase I or Phase II, uncompleted projects should be rolled over to the next phase, with the major building projects in Phase III being pushed to an undetermined future phase. By the beginning of Phase III in Year 2006, a clearer picture of the

potential for revenue from the fairgrounds should be available. Also by this time, the transition from timber dependency will be complete, and the economic status of the area and the success of efforts at revitalization will be clearer.

**Phase I ( Year 1998 - Year 2000)**

1. Implement recommended plan on Rock Creek Park:
  - Approximately 2000 ft of paved path connecting the pedestrian bridge and the Rock Creek Drive path constructed by the City of Stevenson
  - Landscaping the path, adding trees to provide screening and definition
  - Irrigating lawn areas to improve turf
  - Install kiosks and path ID signs
  - Plant marsh area for goose abatement to reduce current conflicts
  
2. Construct Boat Dock: This element may be removed from the Master Plan if the County decides to prohibit power boats in the Cove or if a boat ramp is sited elsewhere in the Cove.

Description	Quantity	Unit Cost	Total Cost
Pave path through park	Concrete: 2000 linear feet, 8 feet in width	2.80/sq ft	\$44,800.00
	Stone bollards: 20	1,000/bollard	\$20,000.00
	255 ft of chain	3/linear foot	\$765.00
Landscape path, add trees	50 trees	300/tree	\$15,000.00
	20,000 sq ft planting area	3/sq ft	\$60,000.00
Irrigate lawn area	cost given in 1990 Master Plan		\$25,000.00
Install kiosks and path ID signs	2 information kiosks	10,000/ kiosk	\$20,000.00
	3 path ID signs	500/ sign	\$1,500.00
Plant marsh area for goose abatement	40,000 sq ft marsh area	3/sq ft	\$120,000.00
Construct boat dock	cost given in 1990 Master Plan		\$40,000.00
<b>Phase I total</b>			<b>\$347,065.00</b>
<b>debt service per month at 5.5% for Phase I</b>			<b>\$2,387.42</b>
<b>debt service per month at 8% for Phase I</b>			<b>\$2,902.99</b>



**Phase II (Year 2001 - Year 2005)**

1. Implement Green Works plan for Parking Lot
  - Add sidewalk and curb to road edge to provide definition and improve appearance
  - Landscape and screen the parking lot to make it more functional and improve its appearance
  - Create a walkway near the Cove to connect the bicycle path closer to downtown Stevenson
  - Stripe the parking lot to provide clearer circulation
2. Construct the Arena and Grandstand Cover
3. Construct the Outdoor Stage

TABLE F-4, Revised Master Plan Phase II: 2001 - 2005			
Add sidewalk and curb to road edge	Concrete: 500 linear feet, 5 feet in width	2.80/sq ft	\$7,000.00
	Concrete curbing	10.30/linear ft	\$5,150.00
Create walkway near the Cove	Concrete: 250 linear feet, 8 feet in width	2.80/sq ft	\$5,600.00
	Stone bollards: 5	1,000/bollard	\$5,000.00
	65 ft of chain	3/ linear foot	\$195.00
Landscape the parking lot, add trees	30 trees	300/tree	\$9,000.00
	13,000 sq ft planting area	3/ sq ft	\$39,000.00
Improve parking lot with striping, etc.		\$15,000.00	\$15,000.00
Arena and Grandstand Cover	cost given in 1990 Master Plan		\$405,000.00
Outdoor Stage	cost given in 1990 Master Plan		\$10,000.00
Phase II total			\$500,945.00
debt service per month at 5.5% for Phase II			\$3,445.94
debt service per month at 8% for Phase II			\$4,190.10

**Phase III (Year 2006 - Year 2010)**

1. Construct the Show Arena Cover
2. Construct the Exhibit Building
3. Construct the Stock Barn
4. Construct the Flag Pavilion





**TABLE F-5. Revised Master Plan Phase III: 2006 - 2010**

Show Arena Cover	cost given in 1990 Master Plan		\$320,000.00
Exhibit Building	cost given in 1990 Master Plan		\$320,000.00
Stock Barn	cost given in 1990 Master Plan		\$19,200.00
Flag pavilion	cost given in 1990 Master Plan		\$8,000.00
		Phase III total	\$667,200.00
debt service per month at 5.5% for Phase III			\$4,589.58
debt service per month at 8% for Phase III			\$5,580.72

**COMPARING DEBT SERVICE SCENARIOS FOR THE TWO MASTER PLAN IMPLEMENTATION STRATEGIES**

The following table shows the debt service for the 1990 Master Plan Phases and for the Revised Master Plan Phases. The debt service calculations are based on a 20-year term, with 5.5% and 8% interest rates calculated.

**TABLE F-6. Debt Service for 1990 and Revised Master Plan**

Year	1990 Master Plan Phases		Revised Master Plan Phases	
	5.50%	8.00%	5.50%	8.00%
1998	\$550.31	\$669.15	\$2,387.42	\$2,902.99
1999	\$550.31	\$669.15	\$2,387.42	\$2,902.99
2000	\$550.31	\$669.15	\$2,387.42	\$2,902.99
2001	\$32,729.68	\$39,797.82	\$5,833.36	\$7,093.09
2002	\$32,729.68	\$39,797.82	\$5,833.36	\$7,093.09
2003	\$32,729.68	\$39,797.82	\$5,833.36	\$7,093.09
2004	\$32,729.68	\$39,797.82	\$5,833.36	\$7,093.09
2005	\$32,729.68	\$39,797.82	\$5,833.36	\$7,093.09
2006	\$36,920.29	\$44,893.41	\$10,422.94	\$12,673.81
2007	\$36,920.29	\$44,893.41	\$10,422.94	\$12,673.81
2008	\$36,920.29	\$44,893.41	\$10,422.94	\$12,673.81
2009	\$36,920.29	\$44,893.41	\$10,422.94	\$12,673.81
2010	\$36,920.29	\$44,893.41	\$10,422.94	\$12,673.81
2011	\$36,920.29	\$44,893.41	\$10,422.94	\$12,673.81
2012	\$36,920.29	\$44,893.41	\$10,422.94	\$12,673.81
2013	\$36,920.29	\$44,893.41	\$10,422.94	\$12,673.81
2014	\$36,920.29	\$44,893.41	\$10,422.94	\$12,673.81



Year	1990 Master Plan Phases		Revised Master Plan Phases	
	5.50%	8.00%	5.50%	8.00%
2015	\$36,920.29	\$44,893.41	\$10,422.94	\$12,673.81
2016	\$36,920.29	\$44,893.41	\$10,422.94	\$12,673.81
2017	\$36,920.29	\$44,893.41	\$10,422.94	\$12,673.81
2018	\$36,920.29	\$44,893.41	\$10,422.94	\$12,673.81
2019	\$36,369.98	\$44,224.26	\$8,035.52	\$9,770.82
2020	\$36,369.98	\$44,224.26	\$8,035.52	\$9,770.82
2021	\$36,369.98	\$44,224.26	\$8,035.52	\$9,770.82
2022	\$4,190.61	\$5,095.59	\$4,589.58	\$5,580.72
2023	\$4,190.61	\$5,095.59	\$4,589.58	\$5,580.72
2024	\$4,190.61	\$5,095.59	\$4,589.58	\$5,580.72
2025	\$4,190.61	\$5,095.59	\$4,589.58	\$5,580.72
2026	\$4,190.61	\$5,095.59	\$4,589.98	\$5,580.72

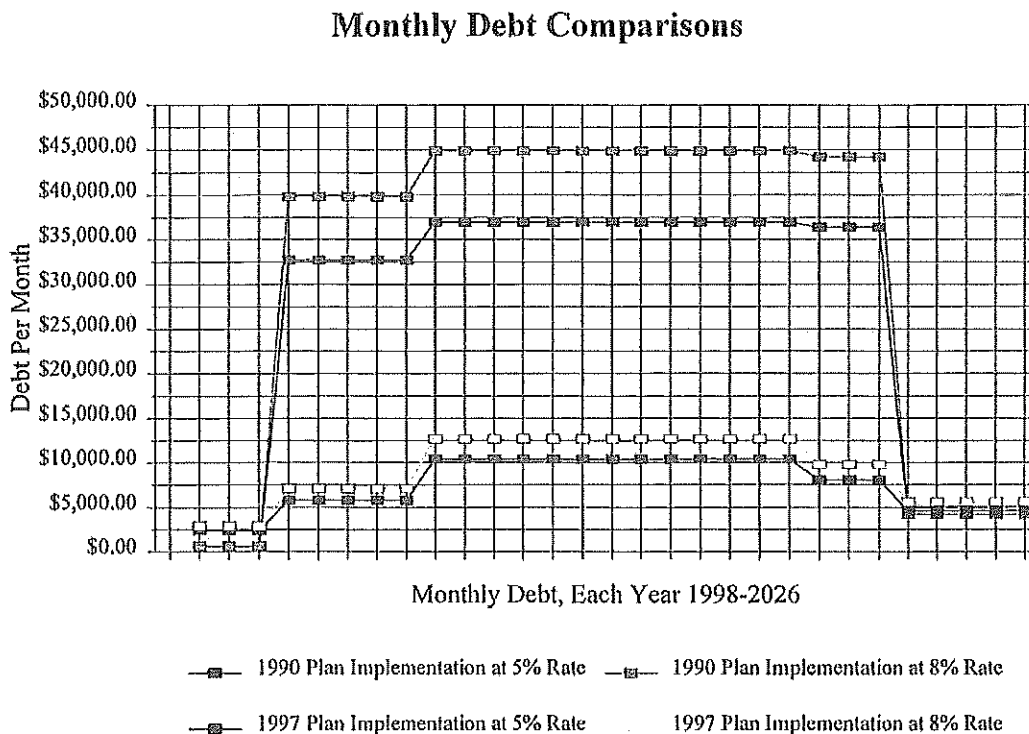
The assumption has been made that the entire cost of the improvements for each phase would be borrowed, so that the County would have three twenty-year notes, one for each phase. Other than grants, the likely source of funding would come from a capital improvement bond or existing budget revenues. The table shows what the total payment would be each month for every year until the third and final note is paid off in 2026. During the twenty-year period from 2001 to 2021, monthly payments are highest because there is overlapping of the notes. The graph below shows the comparison in monthly payments between the two phasing plans, at both the 5% and the 8% interest rates.

As the graph below illustrates, under the phases of the 1990 Master Plan, monthly debt service for Phase I is very low, then skyrockets once the monthly debt service for Phase II is added. Monthly debt service payments are even higher with the addition of Phase III debts beginning in 2006. There is only a very small decrease with the ending of the 20-year term for Phase I in 2019, but monthly payments drop significantly to \$4,190.61 at the 5% rate and \$5095.53 at the 8% rate with the ending of Phase II's 20-year term. Under this plan, between the years 2001 and 2005, Skamania County will pay \$392,756.16 at the 5% rate or \$477,573.84 at the 8% rate each year toward debt service. Between the years 2006 and 2018, the County will pay toward debt service \$443,043.48 at the 5% rate or more than \$500,000.00 each year at the 8% rate.

Under the Revised Master Plan Phasing, monthly debt service payments are higher to begin with than with the 1990 Master Plan Phasing, but the payments do not undergo such drastic increases. At the high point of debt between the years 2006 and 2018, when monthly payments must be made to each of the 20-year terms, Skamania County will pay each year toward debt service \$125,075.28 at 5% or \$152,085.72 at 8%, significantly less than under the 1990 Master Plan Phasing. The Revised Phasing allows for construction of the improvements identified through the survey as most important to residents.



FIGURE F-1. Monthly Debt Comparisons



## POTENTIAL REVENUE SOURCES

### Rock Creek Park as a Revenue Source

Skamania County must find new revenue sources to replace lost timber revenue by the year 2004, when Federal subsidies will end. There is much hope and expectation that the fairgrounds can be used to generate income for the County. It is anticipated by some people that, with increased marketing and some facility improvements, the fairgrounds could bring in a substantial amount of income. Unfortunately, this hope is most likely unfounded. Maintaining and operating Rock Creek Park, the Recreation Center, the fairgrounds complex, and the Skamania County Fair is an expensive proposition. If fairground rentals were increased significantly, it is possible that rental income could cover the cost of maintenance and operations, thus removing these items from the County budget and lowering County expenses for the Park. However, it is extremely unlikely that rental income could ever contribute enough to the County budget to offset timber revenue loss.





From 1985 to 1990, the County received a range of income from 2.5 to almost 6 million dollars a year from timber revenues, and the School District received an equal amount. Through the Federal guarantee program, the County received more than 4.5 million dollars in 1991, which decreased annually to approximately 3.39 million dollars in 1997. The guarantee amount will continue to decrease each year until 2003, when the program will end with an estimated payment of \$2,589,303. The County's 1996 budget was \$17,593,480, and the Rock Creek Park Complex accounted for only about 1.6% of this. The County's 1997 preliminary budget was \$18,405,469.

The table below shows County expenditures on the Rock Creek Park complex. Operations, repairs, and maintenance costs have remained fairly steady, although costs did increase after capital improvements were added in 1995. The major expense each year is putting on the County Fair. However, the Fair is a celebrated community event, and therefore this expense is considered a necessary and important part of the County budget.

**TABLE F-7. Rock Creek Park Expenditures**

Rock Creek Park Complex	Expense type	1994	1995	1996
Fairgrounds	Capital Expenditures	\$0.00	\$22,240.84	\$54,753.43
	Fair Board Expenditures	\$118,181.00	\$119,065.68	\$134,511.00
	Operations, Repairs & Maintenance	\$10,890.80	\$14,558.89	\$30,875.69
Rock Creek Park	Operations, Repairs & Maintenance	\$15,062.37	\$6,544.70	\$9,030.24
Rock Creek Rec Center	Operations, Repairs & Maintenance	\$41,264.93	\$47,131.68	\$49,078.47
<b>Total Operations, Repairs &amp; Maintenance</b>		<b>\$67,218.10</b>	<b>\$68,235.27</b>	<b>\$88,984.40</b>
<b>Total Expenses, Rock Creek Park Complex</b>		<b>\$185,399.10</b>	<b>\$209,541.99</b>	<b>\$278,248.83</b>

Custodial salary expenses doubled between 1995 and 1996. Custodial supplies expenses increased from \$525.55 to \$9095.38. Ground maintenance increased from \$5,277.85 to \$17,806.54, more than tripling. Building maintenance expenses increased from \$9,085.11 to \$13,058.30. These types of expenses will continue to increase as the County makes further improvements to the Park and Fairgrounds.

Skamania County does currently gain some revenue from its parks and programs. The table below was compiled from Parks and Recreation Department quarterly statistics and budget reports. The revenue in the events category came mainly from teen dances held at Rock Creek Community Center. The revenue in the facility rentals column comprises total rental fees for all Rock Creek Park facilities. The preregistered classes take place all over the County, and often outside its park boundaries. Because of this, income from classes and activities offered by Skamania County Parks and Recreation will not be included in the discussion of the revenue potential of the park, though classes do provide some income for the County.



year	events*	preregistered classes*	facility rentals*	total revenue	total revenue not including classes
1994	\$1,036.69	\$2,576.69	\$2,436.50	\$6,049.88	\$3,473.19
1995	\$1,396.84	\$507.61	\$6,595.99	\$8,500.44	\$7,992.83
1996	\$600.53	\$1,814.88	\$2,156.25	\$4,571.66	\$2,756.78

\*The statistics and budget reports do not indicate expenses incurred by the Park for each event, such as utilities or custodial services.

The table indicates that the highest revenues from the Park occurred in 1995. The main reason for this high revenue was the rental of the Park and fairgrounds to a Baptist church for a music festival. Two thousand people attended this weekend long event, and the balance received by Parks and Recreation for the Park and fairgrounds rental was \$3,522.50. This event did not occur at the Park in 1996. In 1996, the County also lost \$1,317.91 on a Youth Baseball Program, which accounts for the low revenue figure from the events category.

The quarterly reports show that most of Rock Creek Park's rental fees come from small, community-scale events. Many company picnics, family reunions, weddings, and small community events occur at the Park. Although these events individually bring in to the County minor rental fees, their sheer number causes the fees to add up to a few thousand dollars each year. Despite this, these types of events cannot be expected to bring in much more income because a significant increase in rental fees would drive many of these small-scale renters away from the Park. Perhaps by marketing the Park to the community, Parks and Recreation could attract more of these small-scale events, but even doubling their number would cause only a minor increase in rental revenues.

Probably the most important conclusion that can be drawn from the quarterly reports is that local citizens view Rock Creek Park as "their" place. This is shown by the popularity of the Park as a site for important family events. This attitude toward the Park was also reflected in the Master Plan survey, which showed that area residents view the Park as local place with a low-key, family-oriented character.

The Baptist music festival brought in the most revenue during the three-year history included in the table. However, the festival only occurred once at the Park. It is not known whether it was a one-time only event, or whether the festival organizers chose not to return to Rock Creek Park the following year. If more of this type of event could be brought to Rock Creek Park, the County could realize substantially more income from facility rental fees. If six or eight weekend



## **TECHNICAL APPENDIX G. ROCK COVE VISUAL ASSESSMENT**

Prepared by: Mike Abbaté and Jennifer Shipley, GreenWorks, P.C.

### **Introduction**

Rock Cove is clearly split into two halves. The western half is predominantly natural in appearance, with significant shoreline riparian vegetation, undulating shorelines and small islands which help to break up the expanse of the Cove and alternately reveal and conceal views. The eastern half of the Cove contains the Fairgrounds and has an industrial appearance that most of the people questioned dislike. Shorelines are straight, eroded and contain very little riparian vegetation. The expansive buildings of the fairgrounds dominate all views and contrast with the much softer, undulating forms across the Cove.

Rock Cove functions as the visual gateway into Stevenson for people arriving eastbound both from SR 14 and Rock Creek Drive. This gives the community a natural amenity that many similar towns eagerly desire - a feature that announces arrival into the town and communicates the image that the town would like residents and guests alike to identify. Properly enhanced, the Cove could dramatically announce Stevenson and project an image of an exciting community within a breathtaking natural landscape!

### **Methodology**

The process we undertook to assess the visual condition of the Cove consisted of the following steps:

1. Identify key viewpoints around Cove
2. Describe the significance of each selected viewpoint
3. Document and analyze views from each viewpoint
4. Create a list of recommendations to improve appearance for each viewpoint.

### **Objectives**

The following Visual Improvement Objectives were developed in order to develop recommendations:

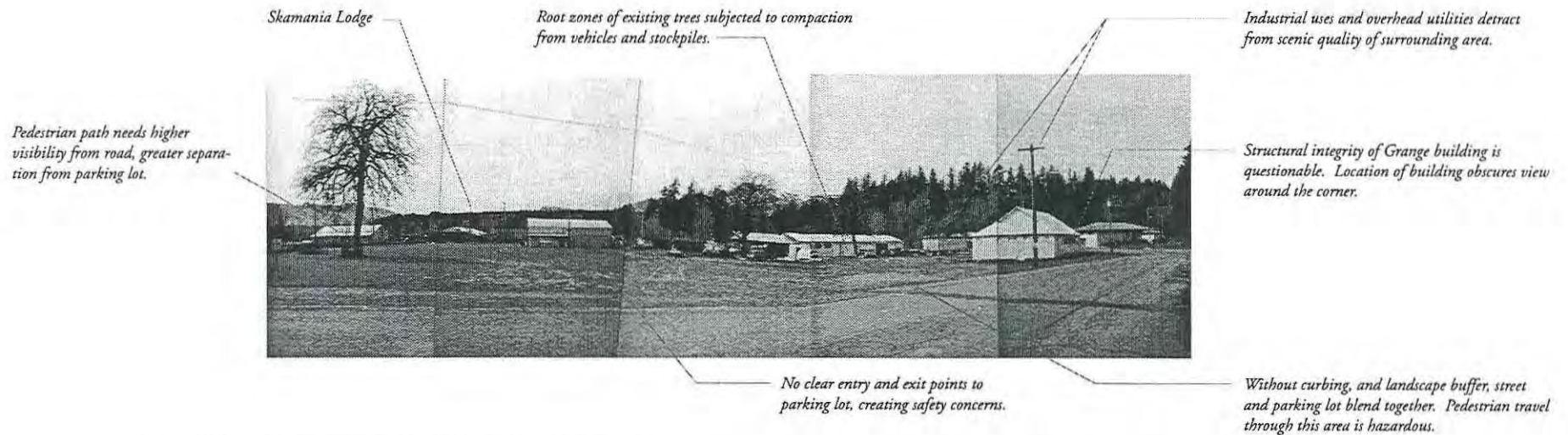
1. Protect, improve and expand the natural appearance of the Cove area.
2. Clearly identify a pedestrian route around the Cove.
3. Develop strategies that blend the natural and developed portions of the site into a visually cohesive whole.
4. Improve the "gateway" function of SR14 and Rock Creek Drive as they approach downtown Stevenson.

**Assessment**

The following figures (G-1 through G-10) document the results of the assessment process. Each of the ten viewpoints is represented in photos, map and text describing the existing visual condition of the view. Specific recommendations for each viewpoint are also outlined.





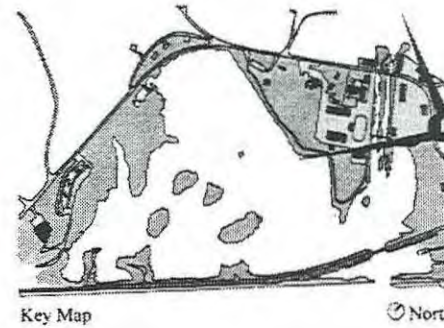


LOCATION: Westbound on Rock Creek Drive at Motor Pool Building.

VIEWPOINT SIGNIFICANCE: This site is the westbound gateway to the fairgrounds, Rock Creek and the Cove.

NOTES: The industrial character of the foreground dominates the space, contrasting sharply with its creekside setting, overwhelming distant view of the mountains and Skamania Lodge and giving no clue to the adjacent recreational opportunities. Broad expanses of pavement provide minimal definition of the various circulation routes through the space.

- RECOMMENDATIONS:
1. Relocate the Grange building.
  2. Create a landscape buffer between the road and the parking lot to screen industrial uses and to clearly define the road.
  3. Enhance pathway to existing pedestrian bridge and create a clear separation between the path and the parking lot. Use landscape materials and signs to clarify pathway to the fairgrounds.
  4. Protect existing trees with curbed planting beds within the driplines.
  5. Create clear entry and exit points to the parking lot to improve safety.
  6. Bury overhead utility lines.



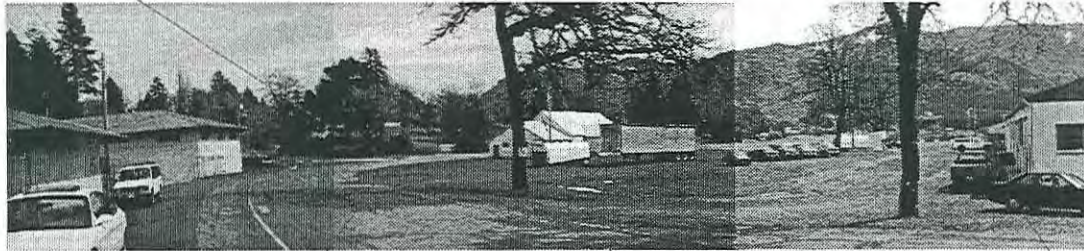
## Viewpoint #1



*Residential area looks directly into industrial area.*

*Structural integrity of Grange building is questionable.*

*Root zones of existing trees subjected to compaction from vehicles and stockpiles.*



*No clear entry and exit points into parking lot.*

*Poor drainage contributes to puddling.*

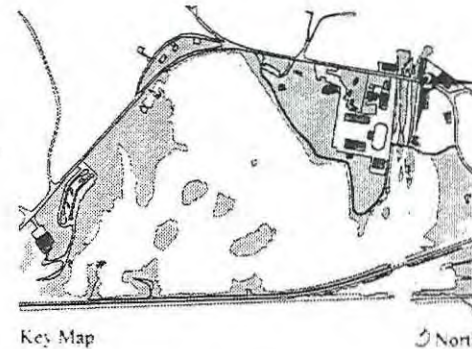
*Lack of defined parking spaces leads to haphazard parking.*

LOCATION: Eastbound on Rock Creek Drive at Motor Pool building.

VIEWPOINT SIGNIFICANCE: This site is the western gateway to Stevenson for travelers on Rock Creek Drive.

NOTES: The industrial character of the site contrasts sharply with what is expected after emerging from basalt bluff and park to the west and detracts from views of the Gorge to the south. Broad expanses of pavement provide minimal definition of the various circulation routes through the space. There is no screening of the industrial area from the adjacent residential zone.

- RECOMMENDATIONS:
1. Maximize efficiency and appearance of the parking lot with striping, landscape islands and improved drainage.
  2. Create separation between the buildings and the parking lot with landscaping.
  3. Relocate Grange building.
  4. Create a landscape buffer between the road and the parking lot to screen industrial uses and to clearly define the road. Provide a 5' wide sidewalk in conjunction with landscape buffer.
  5. Protect existing trees with curbed planting beds within the driplines.
  6. Create clear entry and exit points into the parking lot to improve safety.



## Viewpoint #2



*Western gateway to Stevenson.*

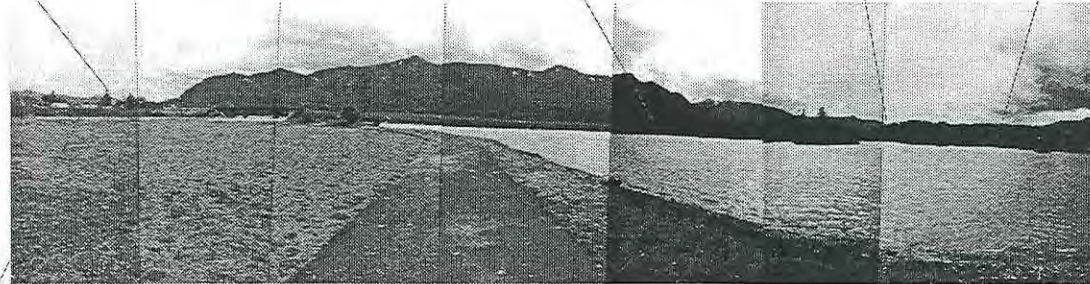
*Linear aspect of shoreline contrasts with natural appearance of adjacent islands.*

*Columbia Gorge Interpretive Center*

*Skamania Lodge*

*Lack of vegetation contributes to erosion at shoreline.*

*Poor spacial definition of this focal area for the fair and concerts.*



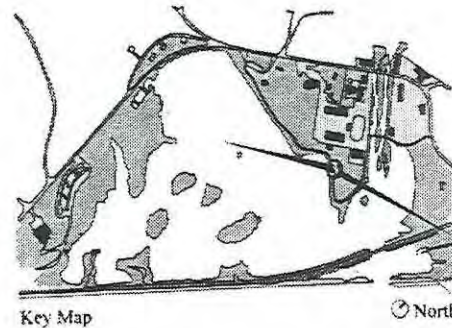
*Minimal separation of path from adjacent field.*

**LOCATION:** On pedestrian path along western edge of peninsula looking south.

**VIEWPOINT SIGNIFICANCE:** Major activity area during fair and festivals.

**NOTES:** This is a very open site with unobstructed views in every direction but with most attention focused on the south wall of the Gorge. The view to the west reveals the more natural side of the cove with Skamania Lodge and the Columbia Gorge Interpretive Center visible in the distance, while the view to the east provides a brief glimpse of boat traffic on the Columbia River and an introductory view of Stevenson.

- RECOMMENDATIONS:**
1. Stabilize shoreline with riparian vegetation.
  2. Plant vegetation in pockets within riprap at highway shoreline to create a more natural appearance.
  3. Use low berms and vegetation along inside edge of path to help define the edges and to focus views from pathway outward.
  4. Plant trees along path to provide foreground interest and to enhance views from highway into the fairgrounds.
  5. Consider the visual impact of future development at gateway to Stevenson.



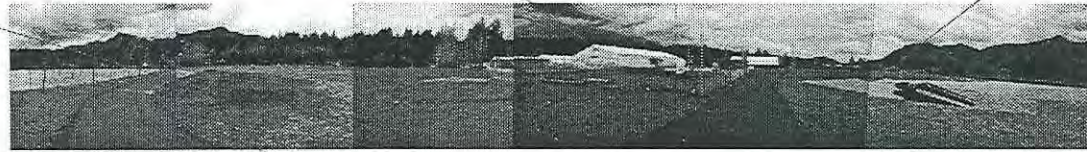
## Viewpoint #3



*Continued use of lawn by large numbers of geese contributes to erosion, health and aesthetic concerns.*

*Fairground buildings contrast with background vegetation.*

*Shoreline lacks riparian vegetation to reduce erosion and improve water quality.*



*Pathway lacks strong visual separation from adjacent lawn area.*

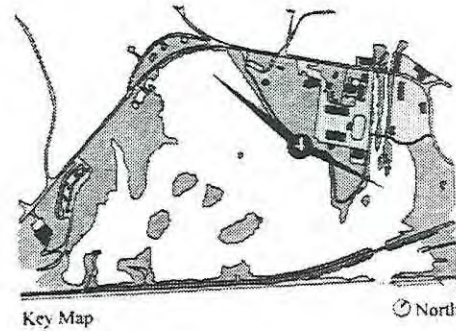
**LOCATION:** On pedestrian path at western edge of peninsula looking north.

**VIEWPOINT SIGNIFICANCE:** Area of high activity during festivals and fairs with pedestrian view into recreational complex including ballfield, playground, picnic area, swimming beach, Community Center and the Fairgrounds.

**NOTES:** Fairground buildings dominate the view due to their size and contrast with the background vegetation. The open expanses of lawn provide for a variety of recreational activities but lack separation from pathway.

**RECOMMENDATIONS:**

1. Consider eliminating chain link fence entirely. If this is not possible, move fence back 10' from pathway to create a landscape buffer between fence and pathway. Use shrubs and vines to soften appearance of fence.
2. Provide alternate areas for geese with riparian vegetation along shoreline.
3. Create visual interest in foreground and stronger separation of path from lawn area with low berms and vegetation.
4. Screen fairground buildings with strategically placed trees and shrubs.



Key Map

North

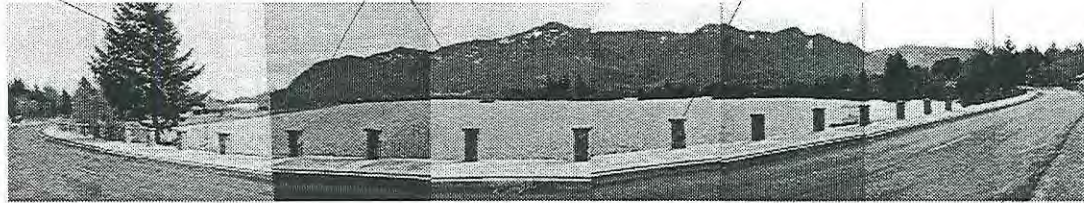
## Viewpoint #4



*Tall trees help to frame view of the Gorge.*

*Linear shorelines lacks visual interest.*

*Stone columns blend well with setting.*



*Retaining wall contrasts with natural setting. Planting on top and sides of wall would reduce contrast.*

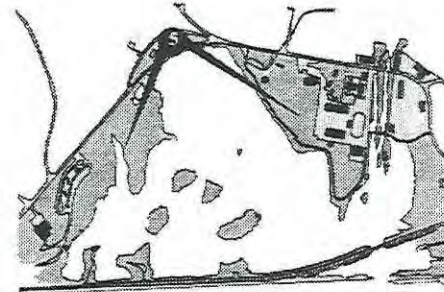
*No clear entry and exit points.*

**LOCATION:** North shore of cove at midpoint along Rock Creek Drive.

**VIEWPOINT SIGNIFICANCE:** This is a viewpoint of long duration for both vehicles and pedestrians with clear views of the cove and the Gorge beyond.

**NOTES:** The stone columns in the foreground blend well with the setting and create a visual interest in the foreground which draws the eye to the great view beyond. Irregular shoreline edges and vegetation patterns in the west half of the cove contrast with the linear patterns and sparse vegetation of the eastern half.

- RECOMMENDATIONS:**
1. Use riparian vegetation to create irregular shoreline edges that will complement the natural appearance of the islands in the cove.
  2. Plant vegetation on the other side of the stone columns to frame views and create additional foreground interest.
  3. Add curbs and define entry and exit points for traffic on the west side of Rock Creek Drive.
  4. Plant shrubs and vines to soften appearance of retaining wall.
  5. Establish street tree planting along west and north side of Rock Creek Drive.



Key Map

North

## Viewpoint #5



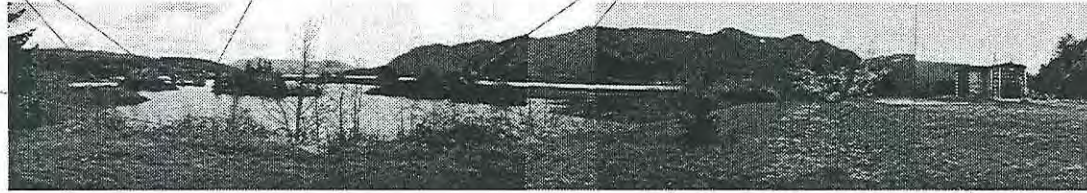
Fairground buildings

Stevenson

When leafed out, trees in foreground will obscure large portion of the view.

Blackberries compete with native vegetation.

Pathway would entice visitors to viewpoint which is not readily apparent from parking lot and building entry.



Excellent location for picnic tables.

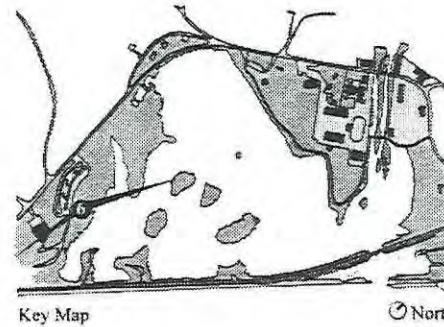
LOCATION: On front lawn of Columbia Gorge Interpretive Center looking east.

VIEWPOINT SIGNIFICANCE: Easily accessible view of natural end of Cove from site with strong tourist attraction.

NOTES: The elevation of the site provides excellent view of the Gorge, the cove and the Columbia River. Vegetation on the islands helps to screen the fairground buildings so that they become minor elements while Stevenson appears as a hillside village in the distance. Exterior colors used in the Interpretive Center blend well with the colors of the Gorge.

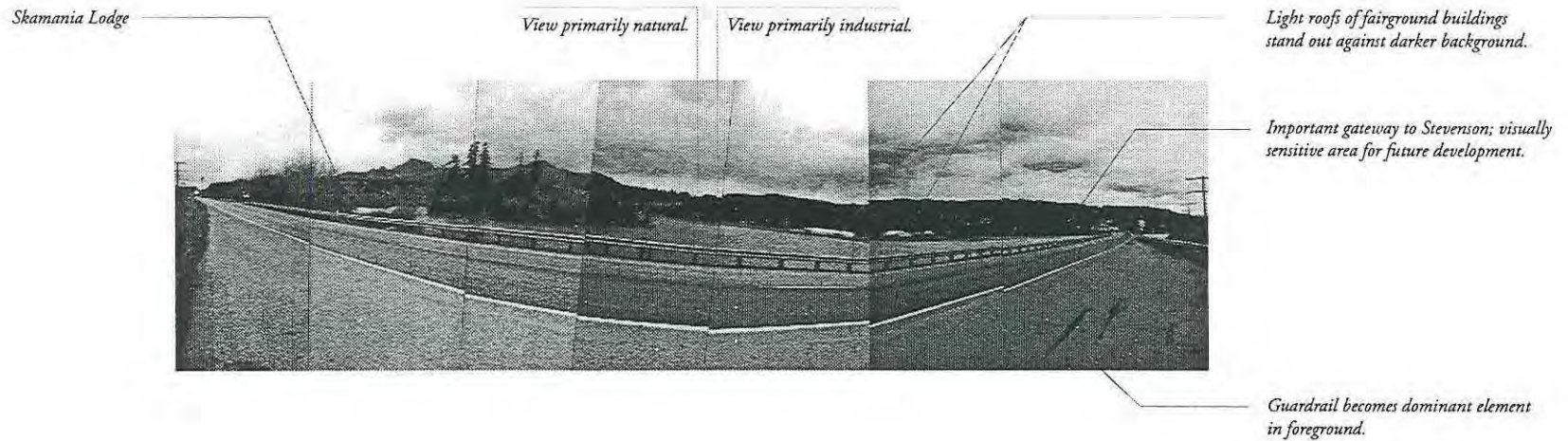
RECOMMENDATIONS:

1. Create pathway and provide picnic tables to draw visitors to the overlook.
2. Selectively remove vegetation to keep views open.
3. Control blackberries with an abatement program.



## Viewpoint #6



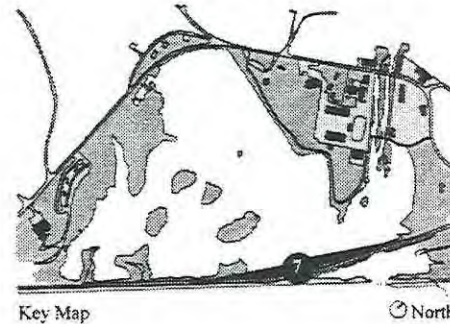


**LOCATION:** On Highway 14 at midpoint of Cove, looking north.

**VIEWPOINT SIGNIFICANCE:** High visibility of Cove from southern shore and long duration of view in both directions.

**NOTES:** Traveling west, the view becomes increasingly natural with the islands in the foreground against a backdrop of Skamania Lodge and the mountains while traveling east, the scenery changes abruptly to an industrial view. The fairground buildings contrast sharply with the surrounding vegetation and the bare, linear shoreline of the fairgrounds contrasts with the irregular, vegetated shoreline of the islands.

- RECOMMENDATIONS:**
1. Create a landscape buffer at the fairgrounds to screen buildings and to reduce the contrast with the background vegetation.
  2. Counteract the unnatural appearance of the shoreline by planting a variety of riparian vegetation.
  3. Reduce contrast of guardrails by replacing them with cor-ten guardrails.
  4. Consider visual impact of future development in areas of high visibility near gateway to Stevenson. Character of future development should help create a positive community image.

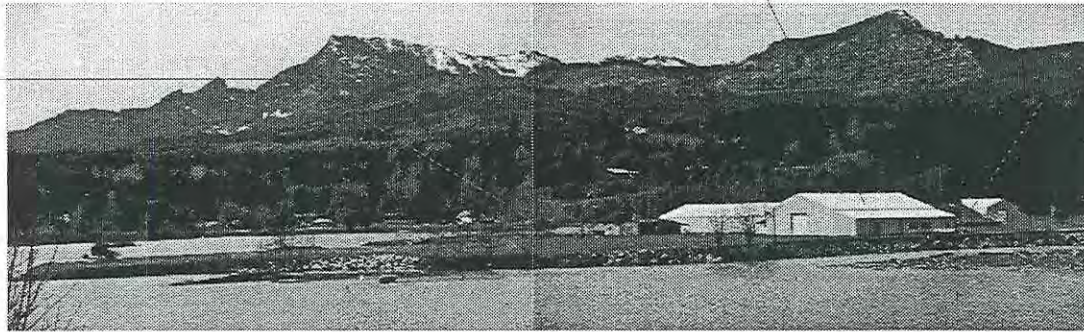


## Viewpoint #7



*White roofs and light green color of the Fairground buildings contrast with dark vegetation in the background.*

*Campers highly visible in this area during fairs and festivals.*



*Shoreline shows evidence of substantial erosion.*

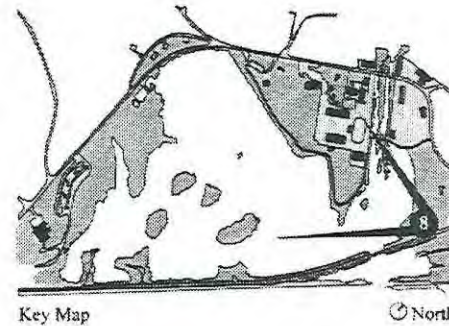
**LOCATION:** On east bank of Rock Creek looking toward Cove.

**VIEWPOINT SIGNIFICANCE:** This is the view of the fairgrounds from Stevenson.

**NOTES:** Mountains in the distance provide a dramatic backdrop for the fairgrounds. The smaller wooden building blends well with the surrounding vegetation while the lighter buildings contrast sharply. Linear shoreline and riprap create an unnatural appearance for the creek.

**RECOMMENDATIONS:**

1. Use riparian vegetation to create irregular edges for the shoreline and to reduce erosion potential.
2. Screen fairground buildings and large lawn areas with vegetation and low berms to improve visual compatibility with surrounding area.



Key Map

North

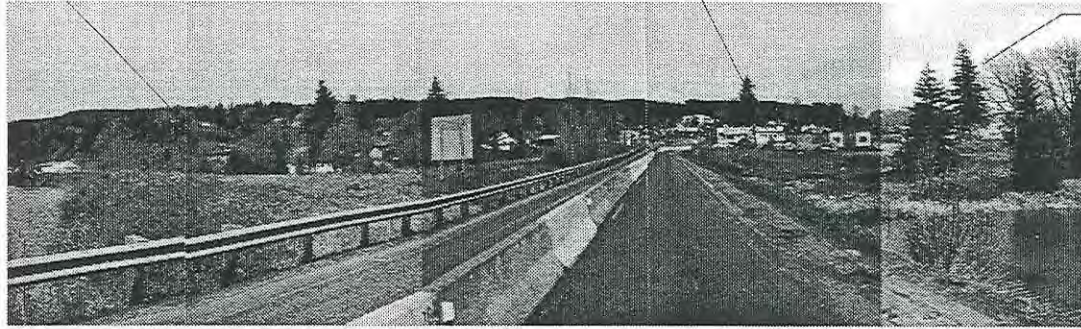
## Viewpoint #8



*Undeveloped land with high visibility and strong potential to enhance gateway to Stevenson.*

*Location of future split in the highway.*

*Tall trees help to focus attention in toward Stevenson.*

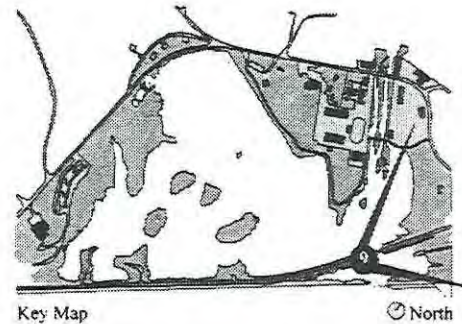


LOCATION: On Highway 14 entering Stevenson from the west.

VIEWPOINT SIGNIFICANCE: This is the western gateway to Stevenson.

NOTES: Current highway construction detracts from the appearance of this site; however, it creates an opportunity to develop a more welcoming gateway to the town. The view is mildly dominated by the road and the buildings along its edge.

- RECOMMENDATIONS:
1. Create an entry focal point at future split in the road.
  2. Use tall trees to frame and contain the view upon entering the gateway.
  3. Reduce contrast of guardrails by replacing them with cor-ten guardrails.
  4. Consider visual impact of future development in areas adjacent to gateway.
  5. Keep vegetation low in areas adjacent to road to maximize westbound views of Rock Creek.



Key Map

North

## Viewpoint #9

## **TECHNICAL APPENDIX H. RECREATIONAL USES AND OPPORTUNITIES**

Prepared by: Mike Abbaté and Jennifer Shipley, GreenWorks, PC

### **Introduction**

The Rock Cove area has a long history of recreational use. Prior to completion of Bonneville Dam in 1938, Skamania County had a park on the north shore of Rock Creek. A 1935 survey shows the following facilities in Skamania County Park: concrete swimming pool, dressing rooms and storeroom building, concert hall building, bandstand structure, refreshment stand, kitchen, children's wading pool, and an unlabeled structure. This area is now occupied by a gravel parking lot and the Motor Pool and Grange buildings. Boating, fishing and wildlife viewing have been popular ever since the Cove was created by the upriver pooling resulting from the construction of Bonneville Dam. More recently, the expansion of fairgrounds facilities, development of the Community Center and picnic/play area gave residents of the Stevenson area an important civic park amenity. In the last few years, the City, County and US Forest Service have cooperated to link the Cove to the recent destination tourist facilities of the Columbia Gorge Interpretive Center and Skamania Lodge.

And yet, there remains tremendous recreation potential in the Cove. This study evaluated the existing state of recreation development, identified the major opportunities and constraints, and culminates in a site plan which incorporates those ideas which could help establish the Cove as a significant recreation destination for residents and Gorge visitors alike.

identified the major opportunities and constraints, and culminates in a site plan which incorporates those ideas which could help establish the Cove as a significant recreation destination for residents and Gorge visitors alike.

### **Recreation Opportunities**

There are two categories of recreational activities currently in the Cove: active and passive. Active recreation includes baseball, concerts at the fairgrounds, play equipment, and sailboarding in the Cove. Passive recreation opportunities include walking, birdwatching, and just sitting and looking at views. Rock Cove is somewhat unique in the close proximity of these two different types of activity to each other. The Cove is currently divided with predominantly passive activities on the west half, and active recreation on the east half.

One of the key opportunities the site affords is to provide a linkage between the downtown Stevenson/waterfront area and the Interpretive Center and Lodge to the West. Because of the foresight of citizens, the foundation for this linkage has been constructed - the paved path that extends across Rock Creek on a pedestrian bridge, around the fairgrounds, up onto Rock Creek Drive around the Cove, then continuing to spurs for the Interpretive Center and Lodge.





This pathway has been compared with a “string of pearls”, with the various activities along the pathway being the pearls, and the pathway the strand which ties them all together. However, significant gaps in the string are obvious, and represent major opportunities to enhance both the recreational activities within the Cove and the image of the community.

A Recreation Opportunities and Constraints diagram (Figure H-1) was developed which illustrates potential improvements in the Cove area. This diagram identified areas for habitat improvement, recreation development, and pathway and landscape improvements.

### **County Fairgrounds**

A key facility in the Rock Cove area is the Fairgrounds. In March 1990, a consulting firm prepared a Master Plan for the County fairgrounds. The Master Plan anticipated three phases of facility development, with a total cost of approximately 6 million dollars.

In the course of this Environmental Assessment, we needed to assess the current relevancy of this previous Master Plan. We prepared a Fairgrounds Survey and asked twenty staff and citizens most familiar with the Fairgrounds operation to provide us with two pieces of information. First, we asked them to prioritize various future developments at the fairgrounds. Secondly, they were asked to provide ideas for new activities which could be staged at the fairgrounds. A copy of the survey and the compilation of the results are included at the end of this report.

### **Recreational Activity Matrix**

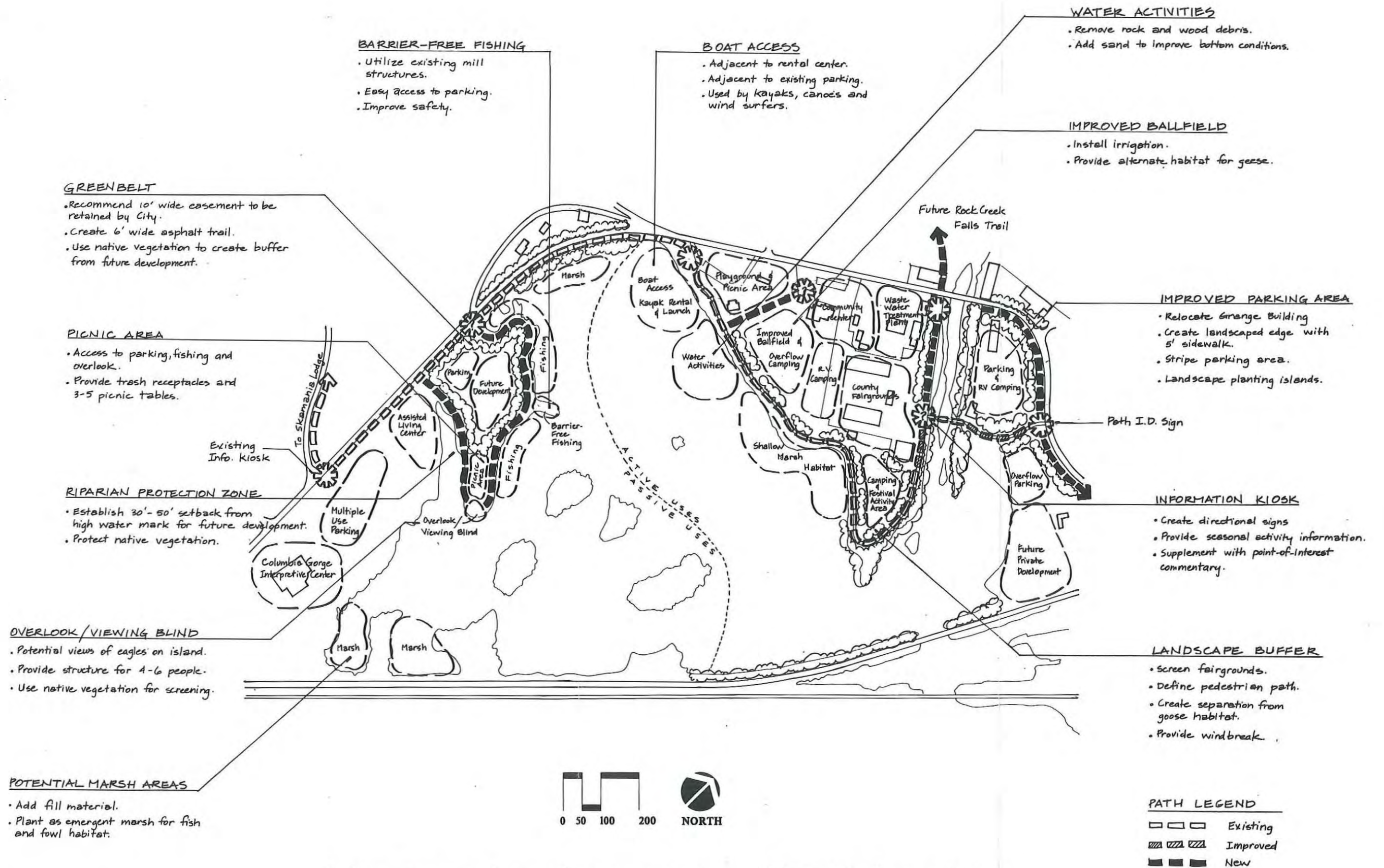
After extensive meetings with City, County and Port staff, as well as several public meetings to review the analysis work, an Activity Matrix was developed by the consultant team (Table H-1). This chart outlines all the recommended recreational activities in the Cove, assesses the ability of current facilities to support each activity, and identifies additional facilities that would be required. Estimated costs for each of the facilities is also projected.

### **Proposed Site Plan**

The Activity Matrix and Site Opportunities and Constraints Diagram formed the base for the Proposed Site Plan (Figure H-2). This plan illustrates a complete implementation of the various recommendations for the Cove in three major categories:

- Habitat Improvement
- Visual Enhancement
- Recreation Development





Skamania County, Washington  
**ROCK COVE ENVIRONMENTAL EVALUATION**  
 Recreational Opportunities and Constraints  
 June 1997  
 GreenWorks, P.C.

Figure H-1





Skamania Fairgrounds Master Plan Survey

April 2, 1997

Please help us to understand your vision for the Skamania County Fairgrounds by indicating your priorities for the various projects and activities which were addressed in the master plan.

Master Plan Projects	Estimated Budget	Completed ?	Priority					
			low				high	
Phase I								
Horse barn addition	\$63,000		1	2	3	4	5	
Parkgrounds irrigation	\$35,000		1	2	3	4	5	
Baseball Diamond	\$25,000		1	2	3	4	5	
Electrical improvements, motor home hookups	\$40,000		1	2	3	4	5	
Pave walkways, walkway landscaping	\$20,000		1	2	3	4	5	
Dredge Rock Creek and pond, stabilize shoreline	\$500,000		1	2	3	4	5	
Others:			1	2	3	4	5	
Improve appearance of fairground facilities			1	2	3	4	5	
Improve appearance of fairgrounds site			1	2	3	4	5	
			1	2	3	4	5	
			1	2	3	4	5	
			1	2	3	4	5	
			1	2	3	4	5	
			1	2	3	4	5	
			1	2	3	4	5	
			1	2	3	4	5	
Phase II								
Performing Arts auditorium and parking	\$4,000,000		1	2	3	4	5	
Outdoor stage/Timber Carnival	\$10,000		1	2	3	4	5	
Water's Edge walkway	\$30,000		1	2	3	4	5	
Exhibit Building	\$320,000		1	2	3	4	5	
Show area cover	\$320,000		1	2	3	4	5	
Flag Pavilion	\$8,000		1	2	3	4	5	
Pave walkways, walkway landscaping	\$20,000		1	2	3	4	5	
Others:			1	2	3	4	5	
			1	2	3	4	5	
			1	2	3	4	5	
			1	2	3	4	5	
			1	2	3	4	5	
			1	2	3	4	5	
			1	2	3	4	5	
			1	2	3	4	5	
			1	2	3	4	5	
Phase III								
Boat Docks	\$40,000		1	2	3	4	5	
New Bridge	\$100,000		1	2	3	4	5	
Arena and grandstand cover	\$405,000		1	2	3	4	5	
Stock barn addition	\$19,200		1	2	3	4	5	
Paved parking lot	\$25,000		1	2	3	4	5	
Paved walkways, walkway landscaping	\$20,000		1	2	3	4	5	
Others:			1	2	3	4	5	
			1	2	3	4	5	
			1	2	3	4	5	
			1	2	3	4	5	

**Interim Activities**

**Priority**  
**low high**

Wind sailing products show	1	2	3	4	5
Sportsman show	1	2	3	4	5
Llama shows	1	2	3	4	5
Junior Rodeo	1	2	3	4	5
Trade shows	1	2	3	4	5
Rollerskating	1	2	3	4	5
Flea Markets	1	2	3	4	5
Tour bus staging area	1	2	3	4	5
Summerstock Theater	1	2	3	4	5
Movies	1	2	3	4	5
Dancing	1	2	3	4	5
Others:	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5

Additional Comments:

Respondent's Name:

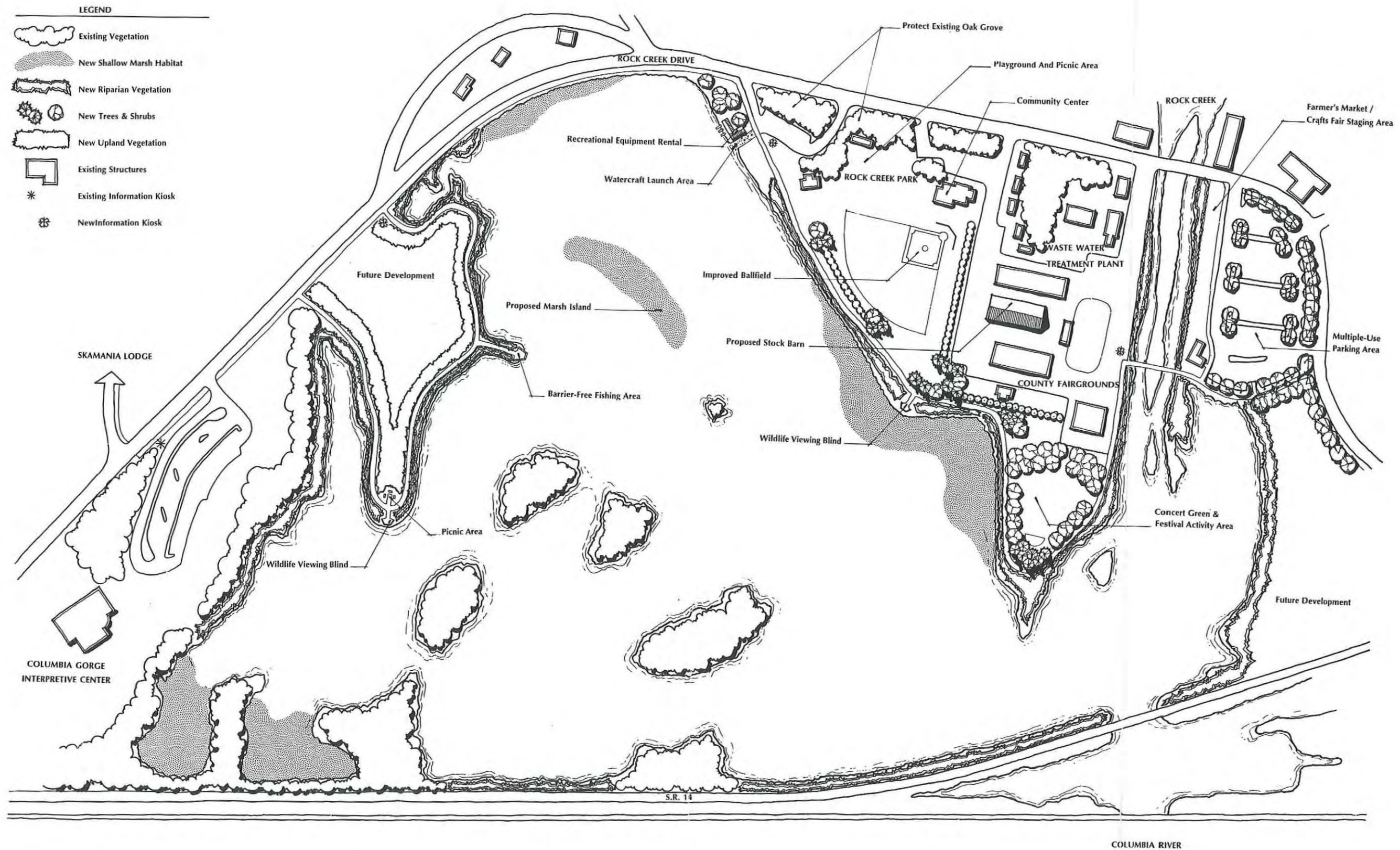
Address:

Phone #:

**TABLE H-1 RECREATION ACTIVITY MATRIX**

Activity	Existing Facilities	Additional Facilities Required	Estimated Construction Cost	Description
1 Small Watercraft Use	Eroded Shoreline	A. Launch & Staging Area B. Debris Removal C. Beach Construction	\$5,000 - \$25,000	
2 Recreational Equipment Rental	Eroded Shoreline	A. Improvements in 1. above B. Small Rental Building	B. Interim: \$10,000 B. Permanent : \$30,000	100 s.f. temporary building 250 s.f. of enclosed space and 250 s.f. of covered outdoor space
3 Barrier-Free Fishing	none	A. Accessible Platform	\$20,000	
4 Birdwatching	shoreline path	A. 2 Viewing Blinds / Viewpoints	\$20,000	
5 Outdoor Concerts	Fairgrounds South lawn Area	A. Upgraded "Concert Green"	\$100,000	includes infrastructure to accomodate stage, lighting, sound system, plantings, reinforced turf
6 Baseball/Softball	Unirrigated Field	A. Soil Improvements B. Automatic Irrigation System	A. \$20,000 B. \$40,000	
7 Farmer's Market / Crafts Fair	none	A. Multi-Use Parking and Event Staging Area B. Renovate Existing Maintenance Bldg. Parking C. Relocate Motor Pool & Grange Building	Phase 1: \$75,000 Phase 2: \$200,000	Streetscape improvements along Rock Cr. Dr. Move structures, redesign parking area
8 Walking Enhancements	paved path	A. New path & greenbelt around West Peninsula B. Develop connected series of interpretive spaces along path, incorporating art, text, & interpretive signage	A. \$30,000 B. \$100,000	1200 l.f. of 6' wide AC paved path
9 Picknicking	Tables near Community Bldg.	A. Additional Picnic Site on West Peninsula	\$10,000	
<b>TOTAL CONSTRUCTION COST</b>			<b>\$675,000</b>	





Skamania County, Washington  
**ROCK COVE ENVIRONMENTAL EVALUATION**  
 Proposed Site Plan

Fishman Environmental Services

October 1997

GreenWorks, P.C.

Figure H-2



**TECHNICAL APPENDIX I. GIS MAPPING SUMMARY**

Prepared by: Peter Britz, Natural Resource Planner; Fishman Environmental Services

**Introduction**

Throughout the development of the Rock Cove Environmental Assessment a number of data layers were created to display and analyze information pertinent to the Environmental Assessment. The data were collected and created from a variety of sources and compiled into a geographic information system (GIS) project file. Each set of data is described as a layer of data. Each layer is made up of two parts. One part is the spatial or map component and the other part is the database component. The map gives a scaled visual representation of the information while the database holds attribute information which relates to the features seen on the map. For instance the zoning layer has a spatial component showing the zoning around Rock Cove for the City of Stevenson with each zone represented by a different color polygon. The database component of the zoning layer has details about each polygon such as the type of zone and the area of each zone. The database information, also known as attribute information, can be used to label the spatial component.

**Methods**

The software that was used in the creation, viewing, and manipulation of the GIS data is ArcView version 3.0. PC ARC/INFO was also used in getting some data layers into a compatible format with ArcView. Both ArcView and PC ARC/INFO are produced by the Environmental Systems Research Institute (ESRI).

The data for the GIS take up a total of approximately thirty megabytes of storage space on a computer. The various layers are presented in tabular format below. Each data layer is stored in an ArcView shapefile format unless designated otherwise. The data will be stored in a format compatible with the County as an ArcView Project File linking all of the data layers into one project. This data set will then be turned over to the county for their use.



Table I-1. GIS Layers

Data Layer	Source	Method	Resolution of Source Data	Type of Layer	Date of Creation	Latest Update	Comments
Covefeat.shp	Field Recon.	Map Features	Approx.	Polygon	8/6/97	10/27/97	Map showing some of the interesting/useful features of Rock Cove.
Designol.shp	City of Stevenson Zoning Map	Map Features	Approx.	Polygon	3/14/97		City of Stevenson Design Overlay map.
Habitat.shp	Field Recon/Air Photo	Landcover Layer		Polygon	8/7/97		Habitat map of rock cove showing different habitat types as well as unique features such as debris and aquatic vegetation.
Landcvr.shp	1995 Aerial Photo	Tablet digitize	1" : 200'	Polygon	3-13/97		Layer shows all the type of land cover in and adjacent to Rock Cove with database information regarding size of each type.
Miscinfo.shp	Field recon.	Heads up digitize	Approx.	Polygon	7/28/97		One polygon showing a shoal in Rock Cove which was noticed in the field.
Reptcsum.shp	GPS	DGPS	+/- 5m	Point	7/28/97	8/20/97	Point locations of depths in Rock Cove.
*Rkanutm2	GPS	DGPS Post-process	+/- 5m	Annotation	7/28/97		Annotations of depth in Rock Cove. In PC ARC/INFO format to preserve annotations.





Data Layer	Source	Method	Resolution of Source Data	Type of Layer	Date of Creation	Latest Update	Comments
Rkbare.shp	USACOE Air Photo 7/25/95	Tablet Digitize	1" : 2000'	Polygon	4/11/97	3/12/97	Bare ground in Rock Cove used to create landcvr.shp.
Rkbldg.shp	USACOE Air Photo 7/25/95	Tablet Digitize	1" : 2000'	Polygon	4/11/97	3/12/97	Buildings in Rock Cove used to create landcvr.shp.
Rkcrsub.shp	USGS 7.5min Quad maps	Convert subbas8 to shapefile.	1" : 2000'	Polygon	10/23/97		ArcView file of Rock Creek subbasin map converted from PC ARC/INFO.
Rkpave.shp	USACOE Air Photo 7/25/95	Tablet Digitize	1" : 2000'	Polygon	4/11/97	3/12/97	Pavement in Rock Cove used to create landcvr.shp.
Rkrail.shp	USACOE Air Photo 7/25/95	Tablet Digitize	1" : 2000'	Polygon	4/11/97	3/12/97	Railroads in Rock Cove used to create landcvr.shp.
Rktrees.shp	USACOE Air Photo 7/25/95	Tablet Digitize	1" : 2000'	Polygon	4/11/97	3/12/97	Trees in Rock Cove used to create landcvr.shp.
Samplelo.shp	Field Recon.	Map Locate	Approx	Point	10/8/97		Sample locations for field monitoring stations.



Data Layer	Source	Method	Resolution of Source Data	Type of Layer	Date of Creation	Latest Update	Comments
Shrub.shp	USACOE Air Photo 7/25/95	Tablet Digitize	1" : 2000'	Polygon	4/11/97	3/12/97	Shrubs in Rock Cove used to create landcvr.shp.
Stormwtr.shp	City of Stevenson	Heads up digitize	Approx.	Line	5/21/97	8/16/97	Location of all known Rock Cove stormwater outfall locations with size of outfall pipe if known.
Stvzon.shp	City of Stevenson Zoning Map	Map Features	Approx	Polygon	3/14/97		Zoning map for the City of Stevenson.
*subbas8	USGS 7.5min Quad maps	Scan/Heads up digitize	1" : 2000'	Polygon	10/23/97		Map of all the subbasins in Rock Creek watershed. Area, slope and channel information in database.
*Utmcoord	USGS 7.5 min Quad Maps	Scan/Heads up digitize	1" : 2000'	Point	10/23/97		Locations of points used as georeferencing points to georeference digitized subbasins from Rock Creek watershed.
Wshed.tif	USGS 7.5min Quad Maps	Scan	1' : 2000'	Raster Image	10/18/97		Scan of the watershed boundary and subbasins as scanned from USGS 7.5 minute quadrangle maps.

