POWELL BUTTE
MASTER PLAN

July 2003

Conditional Use Master Plan, Conditional Use Permit,
Environmental Review, and Adjustments

LUR 00-00414 MS CU EN AD

Prepared for the
Portland Bureau of Water Works

In cooperation with the
Portland Bureau of Parks and Recreation

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SECTION I – INTRODUCTION
SECTION I
INTRODUCTION

A. Purpose

The purpose of the Powell Butte Master Plan is to provide a "big picture" view of future development on the Butte. It allows the City and interested parties to review development on the Butte as a whole, avoiding piecemeal review of individual projects. It includes conditions on development to ensure that the individual and cumulative impacts of future development will not conflict with the environmental resources on and around the Butte.

The Master Plan also is intended to simplify the development review process for the City. The Water and Parks Bureaus can avoid repeated conditional use reviews and environmental reviews for each future development by following the development provisions herein. This enhances the efficiency and coordination of the bureaus responsible for managing the Butte.

Powell Butte is a key element in the water supply system for the Portland metropolitan region due to its location, elevation and size. Its location provides for essential connections to the region’s two primary water supplies: the Bull Run Reservoir and the Columbia South Shore Wellfield. Its elevation assures that storage facilities on the Butte can distribute water by gravity flow to most of the major water supply system storage and distribution points in the region. Its size allows ample space for major water facilities. Its location allows relatively easily access for facility construction, operation and maintenance.

Powell Butte also offers unique recreational, educational and environmental opportunities to the citizens of Portland and the region. There are trails on the Butte for pedestrians, bicyclists and equestrians. Its upland meadow, forest and wetland habitats above Johnson Creek provide for a wide variety of plant and animal species. Powell Butte also provides aesthetic values from on and off-site. Most of the major peaks in the region, and much of the City, are visible from the Butte. In turn the open meadow on the summit and forested sides of the Butte are visible throughout much of the City, providing visual relief from the urban environment.

The City owns all but the fringes of the Butte. Given the unique attributes of the Butte, the City must plan for and manage it to protect the long-term public interests it serves.

B. Process History

This Conditional Use Master Plan implements the first 10-years of the planned water system and park amenities set forth in the 1996 Powell Butte Facilities Master Plan (Facilities Plan).
The Portland City Council adopted the 1996 Facilities Plan to provide a framework for the future of the Butte. The Facilities Plan was based on an extensive public involvement process that included representatives from various City Bureaus, City Commissioners’ offices, neighborhood associations, schools, environmental organizations, recreational interests, and water districts. The Facilities Plan also reflects input from the general public at several open houses and from meetings with neighborhood associations representing areas near Powell Butte.

Development of this Conditional Use Master Plan and its approval by the City Council required additional engineering and environmental analysis of planned facilities identified in the 1996 Facilities Plan. This additional technical information, contained herein, was required to address specific City Code requirements to gain Master Plan approvals. Further, some planned facilities identified in the 1996 Facilities Plan (ex. Radio Frequency Monopole Tower), are not included in the Conditional Use Master Plan because the City Council found them to be inconsistent with the City’s Zoning Code Standards. For these reasons, future development (YR 2003 – YR 2013) on Powell Butte should be guided by the provisions set forth in the Conditional Use Master Plan, not the 1996 Facilities Plan. Where there is a land use conflict between the two documents, the Conditional Use Master Plan shall prevail.

The Conditional Use Master Plan was initially approved by the City’s Hearings Officer on July 12, 2002. This decision was appealed to the City Council by the Centennial and Pleasant Valley Neighborhood Associations. On November 13, 2002 the City Council voted to deny the appeal, modified some of the conditions, and initially approved the Master Plan. The City Council decision was appealed to the Land Use Board of Appeals (LUBA) by the Centennial and Pleasant Valley Neighborhood Associations. In March, 2003 LUBA remanded the decision back to the City Council to address issues of cumulative impacts. On July 9, 2003 the City Council considered the remand from LUBA, voted unanimously to adopt revised findings to address the issue of cumulative impacts, and again approved the Conditional Use Master Plan as was originally approved on November 13, 2002. The final decision by the City Council was ordered on July 15, 2003. The revised findings are contained herein.

C. Organization of the Master Plan

There are four significant parts to the Master Plan. These include:

Section II – Summary of the approved water and park amenities including the approved site plan and conditions.

Section III – Detailed land use approval, history, findings, development standards and review process.

Section IV – Background and technical details on the approved water facilities and park amenities.

Appendices follow the text of the Master Plan.
SECTION II – SUMMARY OF APPROVED CUMP
SECTION II
SUMMARY OF APPROVED
CONDITIONAL USE MASTER PLAN

Project Phases and Schedule

The Powell Butte Conditional Use Master Plan (CUMP) sets forth a plan for water and park-related developments on Powell Butte in southeast Portland. The plan includes two phases for the purpose of implementation. Phase I projects are proposed to begin construction within 10 years of the date of the final Council Order of the CUMP which is July 15, 2013. This CUMP approval is only applicable to identified Phase I projects. Approvals for development or uses shown in the CUMP that have not begun by July 15, 2013 expire and those developments or uses are subject to the land use regulations in place at that time. (LUR 00-00414 CU MS EN EV AD)

Phase 2 projects may be constructed on Powell Butte beyond the 10 year CUMP schedule. Additional City land use approval, including a new Conditional Use Master Plan, will be required for all Phase 2 projects begun 10 or more years after July, 2013. (LUR 00-00414 CU MS EN EV AD)

The City Council adoption of the Powell Butte CUMP expires three years from the date it is recorded (July 15, 2003) unless:
- A building permit has been issued, or
- The approved activity has begun (LUR 00-00414 CU MS EN EV AD).

A building permit, occupancy permit, or development permit must be obtained before carrying out the approved CUMP projects. Permittees must demonstrate compliance with:
- All conditions imposed herein.
- All applicable development standards, unless specifically exempted as a part of this land use review.
- All requirements of the Building Code.
- All provisions of the Municipal Code of the City of Portland, and all other applicable ordinances, provisions and regulations of the City. (LUR 00-00414 CU MS EN EV AD)

Approval Process Changes

The CUMP was adopted and then a final Order was issued by the Portland City Council on July 15, 2003. This final approval incorporated CUMP changes and additional land use findings made during the hearings process, Land Use Board of Appeal (LUBA) review and subsequent final City Council adoption of the CUMP. These changes and additions from the land use record are incorporated herein and are reflected in the following summary.
Environmental and Adjustment Approvals

The adopted CUMP also includes development provisions and conditions that address Environmental Review for both proposed development and prior vegetation removal violations. Adjustments are allowed to remove trees greater than six inches in diameter, limited to species listed as Nuisance Plants or Prohibited Plants on the Portland Plant List, Hawthorn trees and trees shown in the CUMP as being removed for planned Phase I construction of water supply facilities. (LUR 00-00414 CU MS EN EV AD)

Substantial Conformance with Site Plan

Implementation of the CUMP water and park developments are allowed through a Type II land use review process subject to approval criteria set forth in Section III, Land Use Decision. The Type II land use process is applicable provided that the project as proposed is within substantial conformance with the CUMP site plan. The CUMP provides guidelines for substantial conformance. These guidelines include:

- The development or use is no greater than 110% larger or more intense than that shown on the approved Master Plan site plan, or
- The disturbance area is no greater than 110% of that shown on the approved Master Plan site plan.

Development which exceeds these guidelines requires review through a Type III land use process. (LUR 00-00414 CU MS EN EV AD)
SECTION II – A & B – WATER AND PARK

SYSTEM IMPROVEMENTS
Summary of Approved Development

Table 2-1 provides a summary of the approved water and park developments for Powell Butte. Brief notations of the major conditions that apply to each use are also identified. These are not all of the conditions that are applicable to the development. A detailed list of conditions is contained in Section III, Land Use Decision. The summary further notes the dates in which the planned development is required to be implemented.
<table>
<thead>
<tr>
<th>Approved Development</th>
<th>Conditions Required</th>
<th>Date Required</th>
<th>Figure Reference (if applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water System Improvements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revise CUMP Document</td>
<td>Include Approved Revisions</td>
<td>Prior to Any Permits</td>
<td>NA</td>
</tr>
<tr>
<td>Tree Mitigation (Violation)</td>
<td>Plant 101 Deciduous Trees</td>
<td>Within 1 year of CUMP Approval</td>
<td>NA</td>
</tr>
<tr>
<td>Mitigation Plantings</td>
<td>Insure 80% Survival After 3 Years</td>
<td>Ongoing</td>
<td>NA</td>
</tr>
<tr>
<td>Remove Himalayan Blackberry/English Ivy from 4 sites (Mitigation/Remediation)</td>
<td>Plant with Native Vegetation</td>
<td>Completed in 2002</td>
<td>NA</td>
</tr>
<tr>
<td>Construct Split Rail Fence/Kiosk East of Park Boundary (Mitigation/Remediation, Site 4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remove Small Shed in South Park North of Johnson Creek (Mitigation/Remediation, Site 2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improve Pedestrian Access to Park</td>
<td>6-ft. wide gravel surface</td>
<td>Prior to and development permits</td>
<td>Figure 2-C5</td>
</tr>
<tr>
<td>50 MG Seismic Upgrade Existing Reservoir</td>
<td>Revegetation/Construction Management Plan (CMP)</td>
<td>Up to 10 years</td>
<td>Figure 4-C2</td>
</tr>
<tr>
<td>50 MG New Reservoir (530')</td>
<td>Revegetation/CMP and coincident with park facilities – Parking lot improvements, Interpretive center, Restroom remodel, maintenance building/yard and relocate caretakers dwelling</td>
<td>Up to 10 years</td>
<td>Figure 4-C2, Figure 4-C3, Figure 4-C4</td>
</tr>
<tr>
<td>20 MG New Reservoir (600')</td>
<td>Revegetation/CMP</td>
<td>Up to 10 years</td>
<td>Figure 4-C2, Figure 4-C5</td>
</tr>
<tr>
<td>New Pump Station</td>
<td>Revegetation/CMP Pipeline Alts. Analysis to Preserve Maximum Douglas Fir Trees</td>
<td>Up to 10 years</td>
<td>Figure 4-C2, Figure 4-C7, Figure 4-C8</td>
</tr>
<tr>
<td>84” Emergency Overflow Pipe</td>
<td>Revegetation/CMP/Shared Trench</td>
<td>Up to 10 Years</td>
<td>Figure 4-C2, Figure 4-C9</td>
</tr>
<tr>
<td>84” Conduit 5</td>
<td>Revegetation/CMP/Shared Trench</td>
<td>Up to 10 Years</td>
<td>Figure 4-C2, Figure 4-C9</td>
</tr>
<tr>
<td>66” Regional Transmission Pipe</td>
<td>Revegetation/CMP</td>
<td>Up to 10 Years</td>
<td>Figure 4-C2</td>
</tr>
<tr>
<td>Traffic Survey</td>
<td>Revegetation/CMP</td>
<td>Every 5 Years</td>
<td>NA</td>
</tr>
<tr>
<td>Approved Development</td>
<td>Conditions Required</td>
<td>Date Required</td>
<td>Figure Reference (if applicable)</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>--------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td><strong>Park System Improvements</strong></td>
<td>Adam, Code/CUMP Standards</td>
<td>With 50 MG Reservoir</td>
<td>Figure 4-D2</td>
</tr>
<tr>
<td>Parking Lot Improvements</td>
<td>Adam, Code/CUMP Standards</td>
<td>Prior to permits for Park</td>
<td>Figure 4-D2</td>
</tr>
<tr>
<td>New Caretakers Dwelling</td>
<td>Adam, Code/CUMP Standards Restore Existing Dwelling Site to Natural Conditions</td>
<td>With 50 MG Reservoir</td>
<td>Figure 4-D2</td>
</tr>
<tr>
<td>New Trails</td>
<td>Adam, Code/CUMP Standards</td>
<td>Up to 10 years</td>
<td>Figure 4-D4</td>
</tr>
<tr>
<td>Maintenance Building/Yard</td>
<td>Building – not to exceed 5,000 square feet; Yard – not to exceed 40,000 square feet;</td>
<td>With 50 MG Reservoir</td>
<td>Figure 2-C3, Figure 2-C4</td>
</tr>
<tr>
<td>Interpretive Center/Kiosk</td>
<td>Adam, Code/CUMP Standards</td>
<td>With 50 MG Reservoir</td>
<td>Figure 4-D2</td>
</tr>
<tr>
<td>Outdoor Teaching Area</td>
<td>Adam, Code/CUMP Standards</td>
<td>Up to 10 years</td>
<td>Figure 4-D2</td>
</tr>
<tr>
<td>Vegetation Maintenance in Meadow</td>
<td>Adam, Code/CUMP Standards</td>
<td>Ongoing</td>
<td>Figure 4-D1, Figure 4-D3</td>
</tr>
<tr>
<td>ADA Improvements</td>
<td>Adam, Code Standards</td>
<td>With 50 MG Reservoir</td>
<td>Figure 4-D2</td>
</tr>
<tr>
<td>Wetland Enhancement</td>
<td>Adam, Code/CUMP Standards</td>
<td>For Stormwater – with facility</td>
<td>Figure 4-D1, Figure 4-D3</td>
</tr>
<tr>
<td>Establish 100 Acre Exclusive Wildlife</td>
<td>Adam, Code/CUMP Standards</td>
<td>Up to 10 years</td>
<td>Figure 4-D1, Figure 4-D3</td>
</tr>
<tr>
<td>Trail Improvements</td>
<td>Adam, Code/CUMP Standards</td>
<td>Up to 10 years</td>
<td>Figure 4-D4</td>
</tr>
</tbody>
</table>
List of Approved Development

The narrative list of approved CUMP development is presented below. This list was taken from the City Council decision documents and reflects the approved project dimensions, exclusions and changes made to the CUMP through the decision process.

Phase 1
Water System Improvements

1. Seismic upgrades to the existing underground storage reservoir.
2. Construction of 2 new underground reservoirs: 50 million gallon reservoir at the 530 foot elevation adjacent to the existing reservoir, and a 20 million gallon reservoir at the 600 foot elevation on the southeast side of the butte.
3. Construction of two new 84-inch diameter conduits in a shared trench on the east and north side of the butte. One pipeline will supply water to the reservoirs from the Bull Run Watershed east of the City. The second pipeline will be an emergency overflow from the new 530-foot reservoir. This pipeline will discharge at an existing outfall at Johnson Creek.
4. Construction of a 66-inch diameter conduit connecting the 600-foot reservoir to the regional water supply system to the south. Final alignment is dependent on further off-site analysis.
5. Construction of a new 30x100-foot pump station and hydropower generator for the east side of the butte. This facility will pump water to the 600-foot reservoir during the summer or periods of low water. During winter or periods of high rainfall, water would be gravity fed to the hydropower facility, generating electricity.

Park Improvements

1. Construction of one new trail and one new trail segment and closure and revegetation of several unauthorized trails. New trails will be widened, as will an improved asphalt trail that will have suitability spaced level areas in order to comply with ADA standards.
2. Minor re-contouring and stabilization for the existing slope southwest of the public parking area in order to create a grass amphitheater for an outdoor teaching area.
3. Removal of the mobile home west of the public parking lot that currently serves as the caretaker’s residence and construction of a new wood frame caretaker dwelling.
4. Construction of a new 5,000 square-foot one-story maintenance building and an uncovered storage area of approximately 40,000 square-feet. A double row of trees shall be planted on the south and west sides of the maintenance yard. The fence around the maintenance yard shall be painted to reduce its visual impact.
5. Redevelop the area currently used to store maintenance equipment as an information kiosk.
6. Pave and stripe the upper gravel parking area, including drop-off areas and two handicapped parking spaces.
7. Modify restroom facilities to comply with ADA standards.
8. Designate a 100+ or – acre area in the southeast of the park for wildlife. Visitor access to this area will be limited or prohibited.

Mitigation Improvements (Environmental Violation)

1. Removal of non-native Himalayan Blackberry and English Ivy from four site areas in the Environmental Overlay Zones south and east of the Park and north of Johnson Creek, as well as removal of these species from an area in a residential zone east of the Park. Each area will subsequently be planted with native trees, shrubs, and groundcovers as identified on Portland’s Native Plant List.
2. Construction of a split-rail fence and information kiosk east of the Park boundary in area designated Mitigation/Remediation Site 4 Middle on the site maps.
3. Removal of a small shed from area designated Mitigation/Remediation Site 2.

Adjustments to Zoning Code Standards for Phase I Development

1. To 33.535.205.A, to allow removal of trees greater than six inches in diameter.

Phase 2
Water System Improvements

1. Two additional 50 million gallon underground reservoirs.
2. An 84-inch transmission conduit from Bull Run Reservoir.
3. A water treatment plant if warranted by future studies, including a siting alternatives analysis.

Park Improvements

1. A second parking lot to the north of the existing parking lot if warranted based on future traffic studies.
SECTION II – C – SITE PLAN
Site Plan Drawings

The site plan for the Powell Butte Conditional Use Master Plan consists of multiple drawings which depict the various aspects of approvals. Further details of the site plan drawings are contained in Section IV of this plan. These individual site plans are contained as follows and include:

<table>
<thead>
<tr>
<th>Site Plan Drawings</th>
<th>Figure 2-Cx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zoning</td>
<td>Figure 2-C1</td>
</tr>
<tr>
<td>Water Facilities</td>
<td>Figure 2-C2</td>
</tr>
<tr>
<td>Park Facilities</td>
<td>Figure 2-C3</td>
</tr>
<tr>
<td>Storage Building/Maintenance Yard</td>
<td>Figure 2-C4</td>
</tr>
<tr>
<td>Pedestrian Connection to Park Center</td>
<td>Figure 2-C5</td>
</tr>
<tr>
<td>Mitigation/Remediation Site 1</td>
<td>Figure 2-C6</td>
</tr>
<tr>
<td>Mitigation/Remediation Site 2</td>
<td>Figure 2-C7</td>
</tr>
<tr>
<td>Mitigation/Remediation Site 4E</td>
<td>Figure 2-C8</td>
</tr>
<tr>
<td>Mitigation/Remediation Site 4W and 5</td>
<td>Figure 2-C9</td>
</tr>
<tr>
<td>Mitigation/Remediation Site 4M</td>
<td>Figure 2-C10</td>
</tr>
</tbody>
</table>
Figure 2-C5
Site Plan - Pedestrian Connection to Park Center
Powell Butte CUMP

POWELL BUTTE NATURE PARK
PEDESTRIAN CONNECTION TO PARK CENTER
LAYOUT AND GRADING
SECTION II – D – CONDITIONS OF APPROVAL
Conditions of Approval

The Powell Butte CUMP was approved with conditions. These conditions are in addition to the development standards set forth within Section III. The conditions of approval are as follows:

A. The Conditional Use Master Plan shall expire ten years from the date this approval becomes effective (July 15, 2003). Approvals for development or uses shown in the Master Plan that have not begun by the date of this Plan also expire and those developments or uses are subject to the land use regulations in place at that time.

B. Prior to issuance of any permit for any development or use approved by this Master Plan, the applicant shall update the Master Plan document and site plan, incorporating all modifications required by this approval and deliver four copies to the Land Use Review Section of the Office of Planning and Development Review.

C. Master Plan approval is limited to only those items listed in Phase I. The Master Plan document shall be modified as necessary to reflect this.

D. The Radio Frequency Transmission Facility, including the tower, shall be eliminated from the site plan and Master Plan.

E. The storage building shall be a maximum of 5,000 square feet within a maintenance yard of 40,000 square feet as shown on the site plan. The maintenance yard shall be in the location and general design as set forth on the site plan and landscaping shall exceed L3 landscaping standards on the south and west sides of the yard by planting a double row of trees on those sides generally consistent with the site plan. The fence around the maintenance yard shall be painted to reduce its visual impact.

F. The Master Plan site plan and all other applicable maps in the Master Plan document shall be modified to include those lands added to the Plan since initial Plan submittal (newly-acquired land and Bull Run pipeline and reservoir overflow line corridors).

G. Development standards are modified and contained within Section III.

H. The Development Review Process Table for future development is modified and contained within Section III.

I. All disturbance areas shall be revegetated with native groundcover. Planting can be either with potted growth or seeding, but must be at a level that will achieve 80% groundcover within one growing season. At least 8 species of plants must be used. Fifty percent of any seed mix must be grass and 50 percent flowers when measured by area covered. If cover and species requirements are not met within one year or two growing seasons from final inspection, replanting is required and the requirements of this section must be met within one year of replanting.

J. The applicant shall monitor the survival rate of all planting used for remediation for the environmental violation for at least three years. An 80% survival rate for trees and shrubs and 80% groundcover is required.
If the number of trees and shrubs or amount of groundcover drops below this level, new planting to achieve the required level shall be installed.

K. Improvement of the upper parking lot shall include striping of over-size stalls to accommodate bicycle loading/unloading, and striping of drop-off areas and handicapped parking spaces. Trees shall be planted uphill from the parking lot to provide shade to at least one-third of the parking lot surface. Selection of the species to be planted, and the spacing and locations of the trees shall be coordinated with the City Forester, with consideration to be given to balancing the desire for shade against avoiding adverse impacts on the designated vistas and scenic resources from uphill of the trees.

L. Prior to issuance of any development permit for any park or recreation improvement, including any parking lot improvements, applicant shall improve the existing pedestrian connection adjacent to the main access road between SE Powell Boulevard at SE 162nd Avenue and the park center, to provide a continuous 6-foot wide gravel surface.

M. Prior to issuance of any development permit for any park or recreation improvement, including any parking lot improvements, bicycle parking facilities shall be provided in the vicinity of the park center, consistent with Zoning Code requirements.

N. To assure an appropriate balance in scheduling the construction of new water system and park facilities, development of the 50 million gallon reservoir shall be coincident with development of the following parks facilities: parking lot improvements, interpretive center/public restroom remodeling, maintenance yard and storage building, and relocation of the caretaker residence.

O. Within one year of Master Plan approval, applicant shall plant trees to provide shade to the planned detention pond location. The trees shall consist of at least 101 deciduous native trees listed on the Portland Plant List. The trees shall be planted south and southwest (uphill) of the planned detention pond location that is indicated on the Phase 1 Hydrology Exhibit of the Powell Butte Hydrology, Detention and Water Quality Report. The trees shall be at least six feet in height and spaced at an average of 10 feet on centers. The trees shall be planted in a band approximately 16 feet deep with no root ball closer than six feet from the edge of the pond.

P. Within the tree removal corridor for the pump station, final design of the pipeline will continue to analyze alternative pipeline alignment options to preserve, if practical and feasible, large Douglas fir trees in the approved tree removal corridor. The mitigation/restoration plan for the pump station will include planting of Douglas fir trees on both sides of the pipeline trench. The access road and staging/parking area for the pump station shall be finished with a gravel surface. (LUR 00-00414 MS CU EN AD)
SECTION III – LAND USE DECISION
SECTION III – A & B – HISTORY OF LAND USE
DECISION/APPLICABLE DOCUMENTS
SECTION III
LAND USE DECISION

History of Land Use Decision

This Conditional Use Master Plan implements the first 10-years of the planned water system and park amenities set forth in the 1996 Powell Butte Facilities Master Plan.

The Portland City Council adopted the 1996 Facilities Plan to provide a framework for the future of the Butte. The Facilities Plan was based on an extensive public involvement process that included representatives from various City Bureaus, City Commissioners’ offices, neighborhood associations, schools, environmental organizations, recreational interests, and water districts. The Facilities Plan also reflects input from the general public at several open houses and from meetings with neighborhood associations representing areas near Powell Butte.

Development and City Council approval of the Conditional Use Master Plan required additional engineering and environmental analysis of planned facilities identified in the 1996 Facilities Plan. This additional technical information, contained herein, was required to address specific City Code requirements to gain Master Plan approvals. Further, some planned facilities identified in the 1996 Facilities Plan (ex. Radio Frequency Monopole Tower), are not included in the Conditional Use Master Plan because the City Council found them to be inconsistent with the City’s Zoning Code Standards. For these reasons, future development (YR 2003 – YR 2013) on Powell Butte should be guided by the provisions set forth in the Conditional Use Master Plan, not the 1996 Facilities Plan. Where there is a land use conflict between the two documents, the Conditional Use Master Plan shall prevail.

The Conditional Use Master Plan was initially approved by the City’s Hearings Officer on July 12, 2002. This decision was appealed to the City Council by the Centennial and Pleasant Valley Neighborhood Associations. On November 13, 2002 the City Council voted to deny the appeal, modified some of the conditions, and initially approved the Master Plan. The City Council decision was appealed to the Land Use Board of Appeals (LUBA) by the Centennial and Pleasant Valley Neighborhood Associations. In March, 2003 LUBA remanded the decision back to the City Council to address issues of cumulative impacts. On July 9, 2003 the City Council considered the remand from LUBA, voted unanimously to adopt revised findings to address the issue of cumulative impacts, and again approved the Conditional Use Master Plan as was originally approved on November 13, 2002. The final decision by the City Council was ordered on July 15, 2003. The revised findings are contained herein.
Applicable Land Use Decision Documents

The lengthy land use process for review and approval of the Powell Butte CUMP involved discussion and ultimately changes to some of the project elements. These changes are reflected in this document. The detailed history of these changes, the discussion that led to the changes and the decisions supporting the changes are contained within the following documents from the land use record:

- December 2000 Application – Powell Butte CUMP
- December 2000 Revised Application Document
- January 23, 2002 Revised Application to include Emmert Property
- July 12, 2002 Decision of the Hearings Officer
- October 2, 2002 Applicant’s Supplemental Material to Council
- November 12, 2002 Applicant’s Revision to Conditions
- November 13, 2002 City Council Decision to Deny Appeal
- July 9, 2003 City Council Decision to amend findings on cumulative impacts and approve the CUMP
- Record of Findings for decisions through the Appeal Process
Land Use Decision – Approval of the Powell Butte CUMP

The City Council decision that approved the Powell Butte CUMP is contained in the following July 15, 2003 action regarding LUR 00-00414 CU MS EN EV AD. The November 21, 2002 City Council decision is also included because it contains the complete list of conditions that are only referenced in the July 15, 2003 decision.
July 15, 2003

Robert Willis
Portland Bureau of Water Works
1120 SW 5th Avenue
Portland, Oregon 97204

RE: LUR 00-00414 CU MS EN EV AD

Consider the Land Use Board of Appeals remand of the application of the Portland Bureau of Water Works for the Powell Butte Conditional Use Master Plan to address the cumulative environmental impacts at 16198 and 15800 SE Powell Boulevard.

To Whom It May Concern:

Enclosed is a copy of Order of Council on LUR 00-00414 CU MS EN EV AD. This Order needs to be recorded with the Multnomah County Recorder within 10 days of receipt of this letter. Please send a check to this office for $36.00 payable to the Multnomah County Recorder, indicating the file number on your check.

City Council’s decision is the final review process available through the City. You may appeal this decision to the Oregon Land Use Board of Appeals (LUBA) by filing a Notice of Intent to Appeal with the Board within 21 days of the date of decision, as specified in the Oregon Revised Statute (ORS) 197.830. The Board’s address is: Public Utility Commission Building, 550 Capitol Street, Suite 235, Salem, OR 97310-2552, you may call the Land Use Board of Appeals at 1-503-373-1265 for further information on filing an appeal.

Yours sincerely,

Gary Blackmer
Auditor of the City of Portland

By: Karla Moore-Love, Council Clerk

Encl.
Cc: Jim Sjulin, Portland Parks Bureau
    Kevin Hanway / Becky Crockett, Montgomery Watson Harza, Inc.
ORDER OF COUNCIL ON APPEAL OF A
HEARINGS OFFICER’S DECISION APPROVING
LUR 00-00414 CU MS EN EV AD, 16198 AND 15800 SE POWELL BOULEVARD

Consider the Land Use Board of Appeals remand of the application of the Portland Bureau of Water Works for the Powell Butte Conditional Use Master Plan to address the cumulative environmental impacts at 16198 and 15800 SE Powell Boulevard.

APPLICANT: Robert Willis
Portland Bureau of Water Works
1120 SW 5th Avenue
Portland, Oregon 97204

APPLICANT’S REPRESENTATIVE: Montgomery Watson Harza, Inc.
111 SW 5th Avenue Suite 1770
Portland, Oregon 97204

LOCATION: 16198 and 15800 SE Powell Blvd.

TAX ACCOUNT Nos.: R025703610, R428500500, R428501850, R431100010, R816600170, R816600400, R816600480, R816600720, R992124320, R992124340, R992124390, R992130040, R992130050, R992130060, R993071210, R993075180, R993180520, R993180750, R993180870, R428501910

STATE ID Nos.: 1S2E13C 00600; 1S2E13D 00400, 00500, 00600, 00700, 00800; 1S2E12DA 01100, 01200; 1S2E12 00700; 1S2E13 00300, 00200; 1S3E07C 00400, 00500; 1S3E18C 03700; 1S3E18B 00900, 01700, 02300, 02401, 02500, 03400

NEIGHBORHOOD: Pleasant Valley Neighborhood Association

DISTRICT COALITION: East Portland Neighborhood Office

ZONING: OS (Open Space); R10 (Single-Dwelling Residential with 10,000 square foot lots), R7 (Single-Dwelling Residential with 7,000 square foot lots), R5 (Single-Dwelling Residential with 5,000 square foot lots), R2 (Single-Dwelling Residential with 2,000 square foot lots), c.p Conservation and Protection Environmental Overlays, a Alternative Design Density Overlay, note: Portions of the site are protected through the Scenic Resources Protection Plan. Implementation of this is through the Environmental Resources Zone and applicable reviews.

LAND-USE REVIEW: Type III, appealed to the City Council.
PROPOSAL: The applicant requested a Conditional Use Master Plan for water and park-related developments on Powell Butte in southeast Portland. The applicant proposed to implement the Master Plan in two or more phases. Phase 1 projects are proposed to begin construction within 10 years of the date that Council approves this application. Phase 2 projects may be constructed over the subsequent 40 years or more. Additional City land use approval, including a new Conditional Use Master Plan, will be required for all Phase 2 projects begun ten or more years after adoption of the Master Plan. During Phase 1, the applicant proposes mitigation for prior removal of non-native trees from an Environmental Zone. Following are the projects included in the master plan:

PHASE 1

Water system improvements
1. Seismic upgrades to the existing underground water storage reservoir;
2. Construction of 2 new underground reservoirs: 50 million gallon reservoir at the 530 foot elevation adjacent to the existing reservoir, and a 20 million gallon reservoir at the 600 foot elevation on the southeast side of the butte.
3. Construction of two new 84-inch diameter conduits in a shared trench on the east and north side of the butte. One pipeline will supply water to the reservoirs from the Bull Run Watershed east of the City. The second pipeline will be an emergency overflow from the new 530-foot reservoir. This pipeline will discharge at an existing outfall at Johnson Creek.
4. Construction of a 66-inch diameter conduit connecting the 600-foot reservoir to the regional water supply system to the south. Final alignment is dependent on further off-site analysis.
5. Construction of a new 30x100-foot pump station and hydropower generator for the east side of the butte. This facility will pump water to the 600-foot reservoir during the summer or periods of low water. During winter or periods of high rainfall, water would be gravity fed to the hydropower facility, generating electricity.
6. Location of a 175-foot tall RF monopole tower on the north side of the Butte, to relay information to other Water Bureau facilities in the area. A maximum eight-foot diameter dish and one or more surveillance cameras are proposed on the upper part of the tower. Two small associated buildings will be sited close to the tower.

Park improvements
1. Construction of one new trail and one new trail segment and closure and revegetation of several unauthorized trails. New trails will be widened, as will an improved asphalt trail that will have suitably spaced level areas in order to comply with ADA standards.
2. Minor re-contouring and stabilization for the existing slope southwest of the public parking area in order to create a grass amphitheater for an outdoor teaching area.
3. Removal of the mobile home west of the public parking lot that currently serves as the caretaker's residence and construction of a new wood frame caretaker dwelling.
4. Construction of a new 10,000 square-foot one-story maintenance building and an uncovered storage area of approximately 80,000 square feet west of the public parking lot. Uphill plantings will screen the storage area from the park center. This proposal was modified at the hearing with applicant requesting a 5,000 square foot storage building within a 40,000 square foot maintenance yard.
5. Redevelop the area currently used to store maintenance equipment as an information kiosk.
6. Pave and stripe the upper gravel parking area, including drop-off areas and two handicapped parking spaces.
7. Modify restroom facilities to comply with ADA standards.
8. Designate a 100+-acre area in the southeast of the park for wildlife. Visitor access to this area will be limited or prohibited.
Mitigation Improvements (Environmental Violation)
1. Removal of non-native Himalayan Blackberry and English Ivy from four site areas in the Environmental Overlay Zones south and east of the Park and north of Johnson Creek, as well as removal of these species from an area in a residential zone east of the Park. Each area will subsequently be planted with native trees, shrubs, and groundcovers as identified on Portland’s Native Plant List.
2. Construction of a split-rail fence and information kiosk east of the Park boundary in area designated Site 4 Middle, on Exhibit C-7.
3. Removal of small shed from area designated Site 2, on Exhibit C-5.

Phase 2
Water System Improvements
1. Two additional 50 million gallon underground reservoirs.
2. An 84-inch transmission conduit from Bull Run Reservoir.
3. A water treatment plant if warranted by future studies, including a siting alternatives analysis.

Park Improvements
1. A second parking lot to the north of the existing parking lot if warranted based on future traffic studies.

Adjustments to Zoning Code standards for Phase 1 development:
1. To 33.266.130.G.3.a(1), to eliminate the requirement for interior landscaping for parking.
2. To 33.535.205.A, to allow removal of trees greater than six inches in diameter

On October 2, 2002 at a regular Council session at 2:00 p.m. the Council considered an appeal of Centennial and Pleasant Valley Neighborhood Associations against Hearings Officer’s decision to approve the application of the Portland Bureau of Water Works for a conditional use master plan with environmental review and adjustments for water and park-related developments on Powell Butte at 16198 and 15800 SE Powell Boulevard based on the Hearings Officer’s decision on April 10, 2002. At the conclusion of the public hearing, the City Council made a tentative decision to deny the appeal and uphold the Hearings Officer’s decision with conditions and directed findings to be prepared for October 30, 2002 at 2:00 p.m. At a public hearing on October 30, 2002 at 2:00 p.m. an extension was requested as findings were not ready to be adopted, hearing no objection, the Mayor continued the hearing to November 6, 2002 at 2:00 p.m. for the consideration of findings and a final vote. On November 6, 2002 at 2:00 p.m., another extension was requested as findings were not ready to be adopted, hearing no objection, the Mayor continued the hearing to November 13, 2002 at 2:00 p.m. for the consideration of findings and a final vote. On November 13, 2002 at 2:00 p.m., City Council voted unanimously to deny the appeal and uphold the Hearings Officer’s decision with conditions and adopted the revised findings. This decision was appealed to the Land Use Board of Appeals (LUBA), who remanded it in March 2003 to address issues of cumulative impacts.

On July 9, 2003 at a regular Council session at 3:00 p.m. the Council considered the remand from LUBA of the application of the Portland Bureau of Water Works for the Powell Butte Conditional Use Master Plan to address the cumulative environmental impacts at 16198 and 15800 SE Powell Boulevard. At the conclusion of the public hearing, the City Council voted unanimously to adopt the revised findings and approve the master plan as originally approved by the City Council in November 2002.
Based on evidence in the record and adoption of the City Council Findings and Decision as its findings in Case File LUR 00-00414 CU MS EN EV AD and by this reference made a part of this Order, City Council hereby denies the appeals of the Pleasant Valley Neighborhood Association and the Centennial Community Neighborhood Association, and upholds the Hearings Officer's decision to approve the application of the Portland Bureau of Water Works for a conditional use master plan for Powell Butte Park and surrounding area. Environmental Review for both proposed development and vegetation removal violations. Adjustments to 33.535.205.A to allow removal of trees greater than inches in diameter. Approvals are subject to conditions generally:

- Updating the plan and site plan
- Modifying development standards
- Modifying approval criteria for future reviews
- Constructing transportation access improvements
- Specifying planting and restoration requirements

IT IS SO ORDERED:

[Signature]
Vera Katz, Mayor
Presiding Officer at Hearing of
July 9, 2003
2:00 p.m. Session
November 21, 2002

Robert Willis
Portland Bureau of Water Works
1120 SW 5th Avenue
Portland, Oregon 97204

RE: LUR 00-00414 CU MS EN EV AD

Appeal of Centennial and Pleasant Valley Neighborhood Associations against Hearings Officer’s decision to approve the application of the Portland Bureau of Water Works for a conditional use master plan with environmental review and adjustments for water and park-related developments on Powell Butte at 16198 and 15800 SE Powell Boulevard.

To Whom It May Concern:

Enclosed is a copy of Order of Council on LUR 00-00414 CU MS EN EV AD. This Order needs to be recorded with the Multnomah County Recorder within 10 days of receipt of this letter. Please send a check to this office for $61.00 payable to the Multnomah County Recorder, indicating the file number on your check.

City Council’s decision is the final review process available through the City. The decision may be challenged by filing a notice of intent to appeal with the State Land Use Board of Appeals within 21 days of the Order, pursuant to ORS 197.620 and 197.830. The Board’s address is: Public Utility Commission Building, 550 Capitol Street, NE, Salem, Oregon 97310, phone (503) 373-1265.

Yours sincerely,

Gary Blackmer
Auditor of the City of Portland

By:

Karla Moore-Love, Council Clerk

Enc:

Cc: Jim Sjolín, Portland Parks Bureau
    Kevin Hanway, Montgomery Watson Harza, Inc.
ORDER OF COUNCIL ON APPEAL OF A
HEARINGS OFFICER'S DECISION APPROVING
LUR 00-00414 CU MS EN EV AD, 16198 AND 15800 SE POWELL BOULEVARD

Appeal of Centennial and Pleasant Valley Neighborhood Associations against Hearings Officer’s decision to approve the application of the Portland Bureau of Water Works for a conditional use master plan with environmental review and adjustments for water and park-related developments on Powell Butte at 161 98 and 15800 SE Powell Boulevard.

APPLICANT: Robert Willis
Portland Bureau of Water Works
1120 SW 5th Avenue
Portland, Oregon 97204

Jim Sjulin
Portland Parks Bureau
1120 SW 5th Avenue
Portland, Oregon 97204

APPLICANT'S REPRESENTATIVE: Kevin Hanway (consultant)
Montgomery Watson Harza, Inc.
111 SW 5th Avenue Suite 1770
Portland, Oregon 97204

LOCATION: 16198 and 15800 SE Powell Blvd.

TAX ACCOUNT Nos.: R025703610, R428500500, R428501850, R431100010, R816600170, R816600400, R816600480, R816600720, R992124320, R992124340, R992124390, R992130040, R992130050, R992130060, R993071210, R993075180, R993180520, R993180750, R993180870, R428501910

STATE ID Nos.: 1S2E13C 00600; 1S2E13D 00400, 00500, 00600, 00700, 00800; 1S2E12DA 0100, 01200; 1S2E12 00700; 1S2E12 00300, 00200; 1S3E07C 00400, 00500; 1S3E18C 03700; 1S3E18B 00900, 01700, 02300, 02401, 02500, 03400

NEIGHBORHOOD: Pleasant Valley Neighborhood Association

DISTRICT COALITION: East Portland Neighborhood Office

ZONING: OS (Open Space); R10 (Single-Dwelling Residential with 10,000 square foot lots), R7 (Single-Dwelling Residential with 7,000 square foot lots), R5 (Single-Dwelling Residential with 5,000 square foot lots), R2 (Single-Dwelling Residential with 2,000 square foot lots), c.p Conservation and Protection Environmental Overlays, a Alternative Design Density Overlay, note: The site has been inventoried in and portions of it are protected through the Scenic Resources Protection Plan. Implementation of the Scenic Resource Protection Plan is through the Environmental Resources Zone and applicable reviews.

LAND-USE REVIEW: Type III CU MS (Conditional Use and Conditional Use Master Plan Review), EN (Environmental Review), EV (Environmental Violation Review), AD (Adjustment Review)
PROPOSAL: The applicant requested a Conditional Use Master Plan for water and park-related developments on Powell Butte in southeast Portland. The applicant proposed to implement the Master Plan in two or more phases. Phase 1 projects are proposed to begin construction within 10 years of the date that Council approves this application. Phase 2 projects may be constructed over the subsequent 40 years or more. Additional City land use approval, including a new Conditional Use Master Plan, will be required for all Phase 2 projects begun ten or more years after adoption of the Master Plan. During Phase 1, the applicant proposes mitigation for prior removal of non-native trees from an Environmental Zone. Following are the projects included in the master plan:

**PHASE 1**

**Water system improvements**

1. Seismic upgrades to the existing underground water storage reservoir;
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5. Construction of a new 30x100-foot pump station and hydropower generator for the east side of the butte. This facility will pump water to the 600-foot reservoir during the summer or periods of low water. During winter or periods of high rainfall, water would be gravity fed to the hydropower facility, generating electricity.
6. Location of a 175-foot tall RF monopole tower on the north side of the Butte, to relay information to other Water Bureau facilities in the area. A maximum eight-foot diameter dish and one or more surveillance cameras are proposed on the upper part of the tower. Two small associated buildings will be sited close to the tower.

**Park improvements**

1. Construction of one new trail and one new trail segment and closure and revegetation of several unauthorized trails. New trails will be widened, as will an improved asphalt trail that will have suitably spaced level areas in order to comply with ADA standards.
2. Minor re-contouring and stabilization for the existing slope southwest of the public parking area in order to create a grass amphitheater for an outdoor teaching area.
3. Removal of the mobile home west of the public parking lot that currently serves as the caretaker's residence and construction of a new wood frame caretaker dwelling.
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7. Modify restroom facilities to comply with ADA standards.
8. Designate a 100+ acre area in the southeast of the park for wildlife. Visitor access to this area will be limited or prohibited.
Mitigation Improvements (Environmental Violation)
1. Removal of non-native Himalayan Blackberry and English Ivy from four site areas in the Environmental Overlay Zones south and east of the Park and north of Johnson Creek, as well as removal of these species from an area in a residential zone east of the Park. Each area will subsequently be planted with native trees, shrubs, and groundcovers as identified on Portland’s Native Plant List.
2. Construction of a split-rail fence and information kiosk east of the Park boundary in area designated Site 4 Middle, on Exhibit C-7.
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PHASE 2
Water System Improvements
1. Two additional 50 million gallon underground reservoirs.
2. An 84-inch transmission conduit from Bull Run Reservoir.
3. A water treatment plant if warranted by future studies, including a siting alternatives analysis.

Park Improvements
1. A second parking lot to the north of the existing parking lot if warranted based on future traffic studies.

Adjustments to Zoning Code standards for Phase 1 development:
1. To 33.266.130.G.3.a(1), to eliminate the requirement for interior landscaping for parking.
2. To 33.315.205.A, to allow removal of trees greater than six inches in diameter

On October 2, 2002 at a regular Council session at 2:00 p.m. the Council considered an appeal of Centennial and Pleasant Valley Neighborhood Associations against Hearings Officer's decision to approve the application of the Portland Bureau of Water Works for a conditional use master plan with environmental review and adjustments for water and park-related developments on Powell Butte at 16198 and 15800 SE Powell Boulevard based on the Hearings Officer’s decision on April 10, 2002.

The hearing was opened in City Council Chambers, 1221 SW Fourth Avenue, on October 2, 2002 at 2:00 p.m. At the conclusion of the public hearing, the City Council made a tentative decision to deny the appeal and uphold the Hearings Officer’s decision with conditions and directed findings to be prepared for October 30, 2002 at 2:00 p.m. At a public hearing on October 30, 2002 at 2:00 p.m. an extension was requested as findings were not ready to be adopted, hearing no objection, the Mayor continued the hearing to November 6, 2002 at 2:00 p.m. for the consideration of findings and a final vote. On November 6, 2002 at 2:00 p.m., another extension was requested as findings were not ready to be adopted, hearing no objection, the Mayor continued the hearing to November 13, 2002 at 2:00 p.m. for the consideration of findings and a final vote. On November 13, 2002 at 2:00 p.m., City Council voted unanimously to deny the appeal and uphold the Hearings Officer’s decision with conditions and adopted the revised findings.

Based on evidence in the record and adoption of the City Council Findings and Decision as its findings in Case File LUR 00-00414 CU MS EN EV AD and by this reference made a part of this Order, City Council hereby denies the appeals of the Pleasant Valley Neighborhood Association and the Centennial Community Neighborhood Association, and upholds the Hearings Officer’s decision to approve the application of the Portland Bureau of Water Works for a conditional use master plan with environmental review and adjustments for water and park-related developments on Powell Butte at 16198 and 15800 SE Powell Boulevard for:

Approval of a Conditional Use Master Plan for Powell Butte Park and surrounding area as shown on the Site Plan, Exhibit C and as described in the Powell Butte Master Plan, Exhibit A1, and the boundary expansions
that include land reviewed for the environmental violation, Exhibit A2, for uses in the Open Space Zone, and
uses in utility corridors.

Approval of Environmental Review for development and activities included in the Powell Butte Master Plan.

Approval of Environmental Review for vegetation removal and ground disturbance violations within an
Environmental Zone.

Approval of an Adjustment to 33.535.205.A to allow removal of trees greater than six inches in diameter,
limited to species listed as Nuisance Plants or Prohibited Plants on the Portland Plant List, Hawthorne trees,
and trees shown in the Master Plan as being removed for construction of water supply facilities as approved
through this Master Plan.


Denial of an Adjustment to 33.266.130.G.3.a(1) to eliminate the requirement for interior landscaping for
parking.

Approvals shall be in substantial conformance with the site plan, Exhibit C, and are subject to the following
conditions:

A. The Conditional Use Master Plan shall expire ten years from the date this approval becomes effective.
   Approvals for development or uses shown in the Master Plan that have not begun by the date of Plan
   also expire and those developments or uses are subject to the land use regulations in place at that time.

B. Prior to issuance of any permit for any development or use approved by this Master Plan the applicant
   shall update the Master Plan document and site plan, incorporating all modifications required by this
   approval and deliver four copies to the Land Use Review Section of the Office of Planning and
   Development Review.

C. Master Plan approval is limited to only those items listed in Phase 1. The Master Plan document shall
   be modified as necessary to reflect this.

D. The Radio Frequency Transmission Facility, including the tower, shall be eliminated from the site plan
   and Master Plan.

E. The storage building shall be a maximum of 5,000 square feet within a maintenance yard of 40,000
   square feet as shown on the Site Plan. The maintenance yard shall be in the location and general design
   as set forth on Exhibit H.29 and landscaping shall exceed L3 landscaping standard on the south and
   west sides of the yard by planting a double row of trees on those sides generally consistent with Exhibit
   H.29. The fence around the maintenance yard shall be painted to reduce its visual impact.

F. The Master Plan site plan and all other applicable maps in the Master Plan document shall be modified
   to include those lands added to the Plan since initial Plan submittal (newly-acquired land and Bull Run
   pipeline and reservoir overflow line corridors).

G. Development standards are proposed in pages 26-29 of the Master Plan shall be modified as follows:
<table>
<thead>
<tr>
<th>Subject</th>
<th>Change (deletions are crossed out and additions are italicized)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Height (p 27)</td>
<td>There is no maximum building height.</td>
</tr>
<tr>
<td>Utility Lines and Corridors (p 27)</td>
<td>...(2) The remaining area must be planted with native groundcover using a minimum of four-inch pots on one-foot centers at a density of eight plants per ten square feet. Planting can be either with potted growth or seeding, but must be at a level that will achieve 90% groundcover within one growing season. At least 8 species of plants must be used. Fifty percent of any seed mix used must be grass and 50 percent flowers when measured by area covered. If cover and species requirements are not met within one year or two growing seasons from final inspection, replanting is required and the requirements of this section must be met within one year of replanting. (3)...</td>
</tr>
<tr>
<td>Tree preservation, removal, and replacement (p 27) (Cont’d.)</td>
<td>Trees may be removed without replacement if they are not in an Environmental Protection Zone and:</td>
</tr>
<tr>
<td></td>
<td>• Net on the Portland Plant List, Are species listed as Nuisance Plants or Prohibited Plants on the Portland Plant List, Hawthorne trees, or trees shown in the Master Plan as being removed for construction of water supply facilities as approved through this Mater Plan, or</td>
</tr>
<tr>
<td></td>
<td>• Within 20 ten feet of any proposed structure/building or within forty-five feet of the periphery of paving, outdoor activity areas driveways or utility line corridors shown on the approved Site Plan, or</td>
</tr>
<tr>
<td></td>
<td>• Smaller than six inches in diameter measured four feet above grade, or</td>
</tr>
<tr>
<td></td>
<td>• Outside of a “p” zone and may block views from scenic viewpoints as listed on page 68 of The Scenic Resources Protection Plan, as determined by the City Forester or</td>
</tr>
<tr>
<td></td>
<td>• Otherwise specifically allowed to be removed in the Conditional Use Master Plan.</td>
</tr>
<tr>
<td></td>
<td>Trees not on the Portland Plant List in the open meadow area shown on the Site Plan may be removed without replacement.</td>
</tr>
<tr>
<td></td>
<td>Other trees may be removed if the City Forester or a certified arborist finds that they are diseased or damaged or otherwise pose an immediate hazard to people or property.</td>
</tr>
<tr>
<td></td>
<td>A separate permit from the City Forester is required to plant, remove, prune, spray, or maintain any tree located on public property or the public right-of-way.</td>
</tr>
</tbody>
</table>
No tree removal is permitted within a "P" zone to accommodate a proposed building or activity. Except as provided above,

Except for trees removed from the open meadow area, trees that are removed shall be replaced with native species. A permit from the City Forester is required to plant, break, prune, spray, remove, or impact trees on City Property, including Powell Butte. Mitigation for permitted tree removal will be determined by the City Forester. Mitigation requirements will be consistent with mitigation requirements at other public properties and will not be less than the following:

- For every six inches of diameter of tree removed, at least three trees shall be replanted on the site at least ten feet from a paved surface and 20 feet from a structure.
- The replacement trees must be a minimum of one-half inch diameter and selected from the Plant List.

Street trees (p 28)

Street trees will be native species and shall otherwise be where practical as determined by the City Forester. No permit will be issued for trees listed as a nuisance plant or prohibited plant on the Portland Plant List. Tree placement will be determined by the City Forester. Street trees shall also comply with Portland City Code Chapter 20.40 and 33.430.

All Other Standards (to be added at the end of the table)

Standards that are not specifically stated here shall be those of the Zoning Code (base zone as modified by the plan district or overlay zone).

H. The following table shall replace the text found on pages 21-31 dealing with future reviews and Table 4 on page 32 of the Master Plan:

<table>
<thead>
<tr>
<th>Development, Use, or Action</th>
<th>Approval Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TYPE I REVIEW</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Contraction of Master Plan Boundaries | - The area to be removed from the Master Plan does not include any development, including environmental mitigation areas, that has been approved on the approved Master Plan site plan.  
  - All Zoning Code requirements and Master Plan requirements will continue to be met. This includes Zoning Code requirements (such as minimum lot size) for the area that is removed from the Master Plan.  
  - Scenic resources will be protected.  
  - Natural resource values, including wildlife corridors and important habitat areas, will be protected. |
| Expansion of Master Plan Boundaries when  
  - The expansion area is five acres or less in size | The purpose of the Master Plan and intended character of the Master Plan site will continue to be met with the expansion. |
- In combination with all other expansions since the effective date of Master Plan approval, total area of the proposed and all previous expansions do not exceed 10% of the Master Plan area.

**TYPE II REVIEW**

Allowed by the Master Plan and
- Does not require a higher level of review.
- Except for trail improvements, the development or use and disturbance area is outside of the Environmental Protection Zone.
- The development or use is no greater than 110% larger or more intense than that shown on the approved Master Plan site plan.
- The disturbance area is no greater than 110% of that shown on the approved Master Plan site plan.

- The development or use is in substantially the same area as shown on the approved Master Plan site plan.
- The construction management plan prevents adverse impacts to areas outside of the approved disturbance area.
- A mitigation/restoration plan ensures no net loss of resource values.
- Views from Scenic Viewpoints shown on page 68 of the Scenic Resources Protection Plan will not be blocked or impaired.
- Designated outdoor storage and maintenance areas and maintenance buildings will be landscaped to mitigate for adverse impacts to scenic views from Scenic Viewpoints shown on page 68 of the Scenic Resources Protection Plan.
- There are no additional traffic impacts that require traffic improvements or additional parking spaces.
- All Zoning Code requirements are met unless superseded by the Master Plan All Master Plan standards are met.

Construction of new trail or relocation of an existing trail

- The construction management plan prevents adverse impacts to areas outside of the approved disturbance area.
- A mitigation/restoration plan ensures no net loss of resource values.
- The trail is not in the Environmental Protection Zone.

**TYPE III REVIEW**

Allowed by the Master Plan and exceeds the thresholds for a Type I or Type II review.

- The development or use is in substantially the same area as shown on the approved Master Plan site plan.
- The applicable requirements of the Environmental Zone are met.
I. All disturbance areas shall be revegetated with native groundcover. Planting can be either with potted growth or seeding, but must be at a level that will achieve 80% groundcover within one growing season. At least 8 species of plants must be used. Fifty percent of any seed mix used must be grass and 50 percent flowers when measured by area covered. If cover and species requirements are not met within one year or two growing seasons from final inspection, replanting is required and the requirements of this section must be met within one year of replanting.

J. The applicant shall monitor the survival rate of all planting used for remediation for the environmental violation for at least three years. An 80% survival rate for trees and shrubs and 80% groundcover is required. If the number of trees and shrubs or amount of groundcover drops below this level, new planting to achieve the required level shall be installed.

K. Improvement of the upper parking lot shall include striping of over-size stalls to accommodate bicycle loading/unloading, and striping of drop-off areas and handicapped parking spaces. Trees shall be planted uphill from the parking lot to provide shade to at least one-third of the parking lot surface. Selection of the species to be planted, and the spacing and locations of the trees shall be coordinated with the City Forester, with consideration to be given to balancing the desire for shade against avoiding adverse impacts on the designated vistas and scenic resources from uphill of the trees.

L. Prior to issuance of any development permit for any park or recreation improvement, including any parking lot improvements, Applicant shall improve the existing pedestrian connection adjacent to the main access road between SE Powell Boulevard at SE 162nd Avenue and the park center, to provide a continuous 6-foot wide gravel surface.

M. Prior to issuance of any development permit for any park or recreation improvement, including any parking lot improvements, bicycle parking facilities shall be provided in the vicinity of the park center, consistent with Zoning Code requirements.
N. To assure an appropriate balance in scheduling the construction of new water system and park facilities, development of the 50 million gallon reservoir shall be coincident with development of the following parks facilities: parking lot improvements, interpretive center/public restroom remodeling, maintenance yard and storage building, and relocation of the caretaker residence.

O. Within one year of master plan approval, Applicant shall plant trees to provide shade to the planned detention pond location. The trees shall consist of at least 101 deciduous native trees listed on the Portland Plant List. The trees shall be planted south and southwest (uphill) of the planned detention pond location that is indicated on the Phase 1 Hydrology Exhibit of the Powell Butte Hydrology, Detention and Water Quality Report (Powell Butte Master Plan, Appendix D). The trees shall be at least six feet in height and spaced at an average of 10 feet on centers. The trees shall be planted in a band approximately 16 feet deep with no root ball placed closer than six feet from the edge of the pond.

P. Within the tree removal corridor for the pump station, final design of the pipeline will continue to analyze alternative pipeline alignment options to preserve, if practical and feasible, large Douglas fir trees in the approved tree removal corridor. The mitigation/restoration plan for the pump station will include planting of Douglas fir trees on both sides of the pipeline trench. The access road and staging/parking area for the pump station shall be finished with a gravel surface.

IT IS SO ORDERED:

NOV 21 2002

Date

Vera Katz, Mayor
Presiding Officer at Hearing of
November 13, 2002
2:00 p.m. Session
SECTION III – D – LAND USE REVIEW PROCESS & APPROVAL CRITERIA
Land Use Review Process and Approval Criteria

Future planned uses for the Powell Butte CUMP are allowed consistent with the following table. Table 3-D1 identifies the types of uses expected during the phased development of water and park facilities on Powell Butte. The land use review process required for each type of planned use is based on the potential impact the development is expected to have. The approval criteria to be used to evaluate each planned use are also set forth in the table. Most of the planned uses that are identified on the CUMP site plans are allowed through a Type II land use process. The approval criteria for these Type II planned uses requires that the planned development be consistent with the CUMP and is completed in a way that ensures that there is no net loss of resource values as a result of the development on Powell Butte.
## TABLE 3-D1
Land Use Review Process and Approval Criteria

<table>
<thead>
<tr>
<th>Development, Use, or Action</th>
<th>Approval Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TYPE I REVIEW</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Contraction of Master Plan Boundaries | - The area to be removed from the Master Plan does not include any development, including environmental mitigation areas, that has been approved on the approved Master Plan site plan.  
- All Zoning Code requirements and Master Plan requirements will continue to be met. This includes Zoning Code requirements (such as minimum lot size) for the area that is removed from the Master Plan.  
- Scenic resources will be protected.  
- Natural resource values, including wildlife corridors and important habitat areas, will be protected. |
| Expansion of Master Plan Boundaries when | - The purpose of the Master Plan and intended character of the Master Plan site will continue to be met with the expansion.  
- The expansion area is five acres or less in size  
- In combination with all other expansions since the effective date of Conditional Use Master Plan approval, total area of the proposed and all previous expansions do not exceed 10% of the Master Plan area. |
| **TYPE II REVIEW**          |                   |
| Allowed by the Master Plan and | - The development or use is in substantially the same area as shown on the approved Master Plan site plan.  
- The construction management plan prevents adverse impacts to areas outside of the approved disturbance area.  
- A mitigation/restoration plan ensures no net loss of resource values.  
- Views from Scenic Viewpoints shown on page 68 of the *Scenic Resources Protection Plan* will not be blocked or impaired.  
- Designated outdoor storage and maintenance areas and maintenance buildings will be landscaped to mitigate for adverse impacts to scenic views from Scenic Viewpoints shown on page 68 of the *Scenic Resources Protection Plan*. |
| - Does not require a higher level of review.  
- Except for trail improvements, the development or use and disturbance area is outside of the Environmental Protection Zone.  
- The development or use is no greater than 110% larger or more intense than that shown on the approved Master Plan site plan.  
- The disturbance area is no greater than 110% of that shown on the approved Master Plan site plan. |
<table>
<thead>
<tr>
<th>Construction of new trail or relocation of an existing trail</th>
<th>All Zoning Code requirements are met unless superceded by the Master Plan. All Master Plan standards are met.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TYPE III REVIEW</strong></td>
<td></td>
</tr>
<tr>
<td>Allowed by the Master Plan and exceeds the thresholds for a Type I or Type II review.</td>
<td>The development or use is in substantially the same area as shown on the approved Master Plan site plan. The applicable requirements of the Environmental Zone are met. Scenic resources are protected. The purpose of the Open Space Zone is met. Services are capable of serving the expanded development or use. Adverse impacts to surrounding residential areas are minimized. All Zoning Code requirements are met unless superceded by the Master Plan.</td>
</tr>
<tr>
<td>Expansion of Master Plan Boundaries when</td>
<td>Scenic resources are protected. The purpose and intended character of the Open Space Zone is met. Adverse impacts to surrounding residential areas are minimized.</td>
</tr>
<tr>
<td>- The expansion area is greater than five acres in size or</td>
<td></td>
</tr>
<tr>
<td>- In combination with all other expansions, total area of expansion is greater than 10% of the Master Plan area.</td>
<td></td>
</tr>
<tr>
<td>Uses not allowed by the Master Plan</td>
<td><strong>Major Amendment</strong> to a Conditional Use Master Plan</td>
</tr>
<tr>
<td>Contraction of Master Plan Boundaries that cannot meet the approval criteria for a Type I review</td>
<td><strong>Major Amendment</strong> to a Conditional Use Master Plan</td>
</tr>
</tbody>
</table>
SECTION III – E – DEVELOPMENT STANDARDS
Development Standards

The standards in Table 3E-1 apply to development in the Master Plan boundary. If a planned development is a permitted use (see Land Use Review Process and Approval Criteria Table above) under the CUMP, the development would be subject to the following standards.

These standards generally are a hybrid of the land use standards that would normally apply to allowed and conditional uses in the OS zone. When more than one standard in the City Code applies, the standards in the following table generally reflect the more stringent of the requirements, except when inconsistent with the purposes of the CUMP. Where the OS zone does not contain or cross-reference to a standard for a given subject, the CUMP generally proposes a standard consistent with or more stringent than that required for development in the Single Dwelling Residential zone or in PCC Chapter 33.200, et seq.

If a planned development for Powell Butte will not comply with the standards in the following table, it is permitted if the City approves an adjustment to the relevant standard(s) consistent with the standards and procedures in Portland City Code chapter 805.
**TABLE 3-E1**

**POWELL BUTTE CUMP DEVELOPMENT STANDARDS**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum building setback</td>
<td>20 feet from p-zoned lands, and 1 foot from the property boundary for every 1 foot of building height.</td>
</tr>
<tr>
<td>Minimum outdoor activity setback</td>
<td>25 feet from an R-zoned property if not illuminated; 50 feet from an R-zoned property if illuminated; 20 feet from p-zoned lands.</td>
</tr>
<tr>
<td>Minimum parking setback</td>
<td>10 feet from a site or p-zone boundary when improved to an L2 standard; 20 feet when improved to an L1 standard.¹</td>
</tr>
<tr>
<td>Extensions into setbacks</td>
<td>Minor building projections may extend into a setback as provided in PCC 33.110.220.C.</td>
</tr>
<tr>
<td>Exterior storage</td>
<td>Exterior storage of materials, equipment and solid waste shall comply with the setback standards for buildings. The periphery of such storage areas shall be landscaped to an L3 standard except at entries to such areas.</td>
</tr>
<tr>
<td>Mechanical equipment</td>
<td>The periphery of mechanical equipment located on the ground shall be landscaped to an L3 standard. Mechanical equipment on roofs shall be screened from view from the ground level of any abutting R-zoned lands.</td>
</tr>
<tr>
<td>Hazardous substances (see PCC 33.140.120 for definitions)</td>
<td>Storage and use of consumer quantities of hazardous substances is permitted consistent with applicable requirements of this Plan, the Building Code and the Fire Bureau. Temporary storage and use of package quantities of hazardous substances is permitted in conjunction with an emergency declared by the Director of the Water Bureau. If Portland City Code Title 33 is amended to allow it, storage and use of package quantities of hazardous substances not in conjunction with an emergency is permitted consistent with applicable standards.</td>
</tr>
<tr>
<td>Landscaping and screening</td>
<td>Required landscaping and screening shall comply with applicable provisions of Portland City Code sections 33.248.030 through 33.248.070. Plantings required for environmental mitigation shall comply with Portland City Code section 33.248.090 and 33.430.</td>
</tr>
<tr>
<td>Pedestrian and bicycle trails</td>
<td>Pedestrian and bicycle trails shall be improved to meet minimum standards of the Portland Pedestrian Guide (Office of Transportation Engineering and Development, 1998).</td>
</tr>
<tr>
<td>Equestrian trails</td>
<td>Equestrian trails shall be at least 5 feet wide and shall be surfaced with bark or wood chips or other suitable natural material.</td>
</tr>
</tbody>
</table>

¹ Topography and/or existing vegetation may fulfill landscape requirements when they result in equal or better screening.
<table>
<thead>
<tr>
<th>Building height</th>
<th>There is no maximum building height.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fences</td>
<td>Fences are permitted up to 8 feet high and of any material, provided they do not obstruct sight distance at intersections and are within approved disturbance areas.</td>
</tr>
<tr>
<td>Utility lines and outfalls</td>
<td>The disturbance area shall be no more than 40 feet wide for a public outfall or utility line with a diameter of 48 inches or more and shall be no more than 30 feet wide for a public outfall or utility line with a diameter less than 48 inches. Disturbance areas shall be planted with native species on the Portland Plant List according to the following densities: (1) Three different native shrub species are required at a minimum two gallon size on three foot centers planted at a density of two plants per ten square feet; (2) The remaining area must be planted with native groundcover; The remaining area must be planted with native groundcover Planting can be either with potted growth or seeding, but must be at a level that will achieve 90% groundcover within one growing season. At least 8 species of plants must be used. Fifty percent of any seed mix used must be grass and 50 percent flowers when measured by area covered. If cover and species requirements are not met within one year or two growing seasons from final inspection, replanting is required and the requirements of this section must be met within one year of replanting. (3) On slopes greater than 30 percent, live stakes 1/2 to 11/2 inches in diameter, may be substituted for (1) and (2) above. Stakes must be installed at a density of 2 to 4 stakes per square yard on two to three foot triangular spacing. Outfalls may discharge storm water or overflow into Johnson Creek if designed to reduce potential erosive effects and if authorized by applicable state and federal permits.</td>
</tr>
<tr>
<td>Tree preservation, removal and replacement</td>
<td>Trees may be removed if they are not in an Environmental Protection Zone and: - Are species listed as Nuisance Plants or Prohibited Plants on the Portland Plant List, hawthorne trees, or trees shown in the Master Plan as being removed for construction of water supply facilities as approved through this Mater Plan, or - Within ten feet of any proposed structure/building or five feet of the periphery of paving, outdoor activity areas driveways or utility line corridors shown on the approved Site Plan, or - Smaller than six inches in diameter measured four feet above grade, or - May block views from scenic viewpoints as listed on page</td>
</tr>
</tbody>
</table>
68 of The Scenic Resources Protection Plan, as determined by the City Forester or
- Otherwise specifically allowed to be removed in the Conditional Use Master Plan.

Trees not on the Portland Plant List in the open meadow area shown on the Site Plan may be removed without replacement.

Other trees may be removed if the City Forester finds that they are diseased or damaged or otherwise pose an immediate hazard to people or property.

A separate permit from the City Forester is required to plant, remove, prune, spray, or maintain any tree located on public property or the public right-of-way.

Except for trees removed from the open meadow area, trees that are removed shall be replaced with native species. A permit from the City Forester is required to plant, break, prune, spray, remove, or impact trees on City Property, including Powell Butte. Mitigation for permitted tree removal will be determined by the City Forester. Mitigation requirements will be consistent with mitigation requirements at other public properties and will not be less than the following:
- For every six inches of diameter of tree removed, at least three trees shall be replanted on the site at least ten feet from a paved surface and 20 feet from a structure.

The replacement trees must be a minimum of one-half inch diameter and selected from the Plant List.

<table>
<thead>
<tr>
<th>Excavations and fills</th>
<th>Excavations and fills shall comply with Portland City Code chapter 33.830. In addition, to the extent practicable given the needs of the structure in question, fills and structures shall balance excavations so that original contours are restored.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erosion control</td>
<td>Erosion Control shall conform to the Erosion Control Manual (2000), City of Portland, Bureau of Environmental Services, and PCC Chapter 24.70 (Clearing, Grading and Erosion Control). All development between November 1 and April 30 of any year which disturbs more than 500 square feet of ground, requires wet weather measures described in the City’s Erosion Prevention and Sediment Control Technical Guidance Handbook.</td>
</tr>
<tr>
<td>Traffic management and monitoring</td>
<td>At least every five years the applicant shall monitor traffic volume on the Butte on a daily basis during peak usage periods. The applicant shall submit a traffic impact study to the Office of</td>
</tr>
</tbody>
</table>
Transportation when monitoring shows that average daily vehicle trips to the site during peak usage exceeds 110 percent of the traffic volume reported in the traffic study conducted in support of the 2000 Master Plan. Based on the new traffic study, the Director of the Office of Transportation may require the applicant to improve the Powell Boulevard frontage of the site or other nearby street sections or intersections affected by the increased traffic to maintain the design capacity of those streets, to improve intersections functioning below a level of service D, or to remedy existing hazards in an amount roughly proportional to the impact of traffic associated with the Butte.

| Vehicle and bicycle parking | At least 40 vehicle parking spaces and at least 10 bus/trailer spaces shall be provided in phase 1, except that interior landscaping is not required. Parking spaces shall comply with Portland City Code Chapter 33.266.130. At least 10 short term bicycle parking spaces that comply with Portland City Code Chapter 33.266.220 shall be provided in phase 1. No bicycle spaces are required to be covered. Bicycle spaces shall be situated in the vicinity of the parking lot or activity areas. |
| Signs | Signs shall comply with Portland City Code Chapter 33.286, except that signs that are not oriented to or intended to be legible from off-site shall be exempt. |
| Street trees | Street trees will be native species where practical as determined by the City Forester. No permit will be issued for trees listed as a nuisance plant or prohibited plant on the Portland Plant List. Tree placement will be determined by the City Forester. Street trees shall also comply with Portland City Code Chapter 20.40 and 33.430. |
| Lighting | Exterior lights shall be designed, placed and operated so they do not shine into or onto p-zoned or R-zoned lands and so that they minimize their visibility from off-site. |
| All Other Standards (to be added at the end of the table) | Standards that are not specifically stated here shall be those of the Zoning Code (base zone as modified by the plan district or overlay zone). |
SECTION III – F & G – POWELL BUTTE CUMP
BOUNDARY & CUMP EXTENSIONS
Powell Butte CUMP Boundary

The Powell Butte CUMP boundary includes all contiguous land owned by the City or over whose use and development the City can exercise greater than possessory control. The boundary is depicted on Figure 3-G1.

The City may acquire additional land on and abutting Powell Butte, adjacent to or in the vicinity (within approximately 1,500 feet) of the existing plan boundary. Such land could be used to expand recreational facilities, to protect and buffer significant natural resources on the Butte, and/or to provide areas for additional public water facilities. The City will decide on a case by case basis whether to acquire additional property when such property comes onto the market. Expansion of the CUMP boundary is subject to specific land use approval criteria and the review process outlined within the above section titled “Standards and Review Process”.

Extension of the Term of the CUMP

Portland City Code Section 33.820.060 provides that the maximum term for a master plan is ten years. The term of the Powell Butte CUMP may be extended beyond ten years by submitting an application under PCC Chapter 430.820 at any time during the ten-year term of the CUMP.
SECTION III – H – LAND USE FINDINGS
Land Use Findings

The land use findings supporting the July 15, 2003 City Council decision to adopt the Powell Butte CUMP are contained herein. The findings have not been altered to match reference pages noted in the findings to those figures and tables contained within this final revised Powell Butte CUMP. Therefore, to the extent the reader is interested in matching the findings with the application, they will need to reference the Powell Butte Master Plan December, 2000 Application for a Conditional Use Master Plan, a Conditional Use Permit, Environmental Review, and Adjustments.
FINDINGS AND DECISION
OF THE CITY COUNCIL
LUR 00-00414

I. GENERAL INFORMATION

File No.: 00-00414 CU MS EN EV AD

Appellants: Louise Cody, Centennial Community Neighborhood Association, 1515 SE 151st Avenue, Portland, OR, 97233; Linda Bauer, Pleasant Valley Neighborhood Association, 6232 SE 158th, Portland 97236

Applicant/Property Owner: Robert Willis, Portland Bureau of Water Works, 1120 SW 5th Avenue, Portland, OR, 97204; Jim Sjulin, Portland Parks Bureau, 1120 SW 5th Avenue, Portland, OR 97204

Applicant's Representative: Kevin Hanway (consultant) Becky Crockett, Montgomery Watson Harza, Inc, 111 SW 5th, Suite 1770, Portland, OR, 97204

OPDR Staff Representatives: Duncan Brown and Stephen Shane

Site Address: 16198 and 15800 SE Powell Blvd.

Legal Description: TL 2300 Lot 1 Block 5, Anderegg Meadows; TL 3400 Lot 5&6, And TL 2500 Lot 13, Lot 14, and TL 2401 Split Plus R99318-0740 (R340541), Jennelynd Ac; Lot A, Johnson Creek Pk; Lot 5-10, Lot 11&12, Lot 13-18, And Lot 19, Sycamore Ac; TL 1100, TL 1200, And TL 700, Section 12 1S2E; TL 400, TL 300, And TL 200, Section 13 1S2E; TL 400, TL 500, Section 07 1S3E; TL 3700 Split Map 99318-0870, TL 900, And TL 1700 Split Map 99318-0520, Section 18 1S3E

Tax Account Nos.: R025703610, R428500500, R428501850, R431100010, R816600170, R816600400, R816600480, R816600720, R992124320, R992124340, R992124390, R992130040, R992130050, R992130060, R993071210, R993075180, R993180520, R993180750, R993180870, R428501910

State ID Nos.: 1S2E13C 00600; 1S2E13D 00400, 00500, 00600, 00700, 00800; 1S2E12DA 01100, 01200; 1S2E12 00700; 1S2E13 00300, 00200; 1S3E07C 00400, 00500; 1S3E18C 03700; 1S3E18B 00900, 01700, 02300, 02401, 02500, 03400

Quarter Sections: 3445, 3446, 3447, 3545, 3546, 3547, 3548, 3645, 3646

Neighborhood: Pleasant Valley
**District Coalition:** East Portland Neighborhood Office

**Plan District:** Johnson Creek Basin, South Subdistrict

**Other Designations:** Outer Southeast Community Plan

**Zoning:** OS (Open Space); R10 (Single-Dwelling Residential with 10,000 square foot lots), R7 (Single-Dwelling Residential with 7,000 square foot lots), R5 (Single-Dwelling Residential with 5,000 square foot lots), R2 (Single-Dwelling Residential with 2,000 square foot lots), c,p Conservation and Protection Environmental Overlays, a Alternative Design Density Overlay, note: The site has been inventoried in and portions of it are protected through the Scenic Resources Protection Plan. Implementation of the Scenic Resource Protection Plan is through the Environmental Resources Zone and applicable reviews.

**Land Use Review:** Type III CU MS (Conditional Use and Conditional Use Master Plan Review), EN (Environmental Review), EV (Environmental Violation Review), AD (Adjustment Review)

**Public Hearing:** The hearing was held on October 2, 2002, in the Portland City Council chambers. The record was closed at the end of the hearing.

**Testified at the Hearing:** Duncan Brown (OPDR Staff Representative); Kevin Hanway, Montgomery Watson Harza Inc., 111 SW 5th Avenue, #1770, Portland, OR, 97204; Louise Cody, Centennial NA, 1515 SE 151st Avenue, Portland, OR, 97233; Linda Bauer, Pleasant Valley NA, 6232 SE 158th, Portland 97236; Jim Sjulin, City of Portland, Bureau of Parks and Recreation; Robert Willis, City of Portland, Bureau of Water Works.

**FILE HISTORY**

**HEARINGS OFFICER’S DECISION:**
--Approval with conditions of a Conditional Use Master Plan, Environmental Reviews and an Adjustment to allow removal of trees greater than six inches in diameter.
--Denial of a Conditional Use for a Radio Frequency Transmission Facility and an Adjustment to eliminate the requirement for interior landscaping for parking.

**APPEAL:** Separate appeals were filed by the Centennial and Pleasant Valley neighborhood associations. Although some of the same points were raised in both appeals, the details of each appeal are listed below. The appeals forms filed by the two neighborhood associations are included in the record as Exhibits I-1 and I-2.

**Pleasant Valley Neighborhood Association** raised the following points in its appeal:
1. Limit approval of the adjustment for removal of trees greater than six inches in diameter to only nuisance trees listed on the Nuisance plant list for failure to comply with 33.805.040.E.
2. The conditional use master plan does not comply with 33.820 or 33.815.
3. Opposes development standards allowing removal of trees within 10 feet of a paved surface and 20 feet of a structure, rather than within 5 feet of a paved surface and 10 feet of a building.
4. Opposes Environmental Review approval for violations for failure to comply with 33.430.250.G.2.b.
5. Opposes Environmental Review approval for failure to comply with 33.430.250.A.1.
6. Opposes the approval of the area of the maintenance yard as requested by Applicant.

Centennial Community Association raised the following points in its appeal:
1. Failure to include water treatment plant in the conditional use master plan violates 33.820.050.
2. Approval of the adjustment for removal of trees greater than six inches in diameter violates 33.805.040.A, B, E, and F because the number of trees to be removed at the pump station site is excessive.
3. Approval of the maintenance yard and storage building as requested by Applicant violates prohibition on a permanent use justified by a use that is only temporary, creates impervious area in conflict with Johnson Creek Basin Plan, violates 33.535.010, and violates limitations on development in a viewshed.
4. Opposes approval of Resource Enhancement projects that involve the use of herbicides for failure to receive environmental review approval and violates 33.100.010.

PROPOSAL: The applicant requests a Conditional Use Master Plan for water and park-related developments on Powell Butte in southeast Portland. The applicant proposes to implement the Master Plan in two or more phases. Phase 1 projects are proposed to begin construction within 10 years of the date that Council approves this application. Phase 2 projects may be constructed over the subsequent 40 years or more. Additional City land use approval, including a new Conditional Use Master Plan, will be required for all Phase 2 projects begun ten or more years after adoption of the Master Plan. During Phase 1, the applicant proposes mitigation for prior removal of non-native trees from an Environmental Zone. Following are the projects included in the master plan:

PHASE 1
Water system improvements
1. Seismic upgrades to the existing underground water storage reservoir;
2. Construction of 2 new underground reservoirs: 50 million gallon reservoir at the 530 foot elevation adjacent to the existing reservoir, and a 20 million gallon reservoir at the 600 foot elevation on the southeast side of the butte.
3. Construction of two new 84-inch diameter conduits in a shared trench on the east and north side of the butte. One pipeline will supply water to the reservoirs from the Bull Run Watershed east of the City. The second pipeline will be an emergency overflow from the new 530-foot reservoir. This pipeline will discharge at an existing outfall at Johnson Creek.
4. Construction of a 66-inch diameter conduit connecting the 600-foot reservoir to the regional water supply system to the south. Final alignment is dependent on further off-site analysis.
5. Construction of a new 30x100-foot pump station and hydropower generator for the east side of the butte. This facility will pump water to the 600-foot reservoir during the summer or periods of low water. During winter or periods of high rainfall, water would be gravity fed to the hydropower facility, generating electricity.

6. Location of a 175-foot tall RF monopole tower on the north side of the Butte, to relay information to other Water Bureau facilities in the area. A maximum eight-foot diameter dish and one or more surveillance cameras are proposed on the upper part of the tower. Two small associated buildings will be sited close to the tower.

Park improvements
1. Construction of one new trail and one new trail segment and closure and revegetation of several unauthorized trails. New trails will be widened, as will an improved asphalt trail that will have suitably spaced level areas in order to comply with ADA standards.
2. Minor re-contouring and stabilization for the existing slope southwest of the public parking area in order to create a grass amphitheater for an outdoor teaching area.
3. Removal of the mobile home west of the public parking lot that currently serves as the caretaker’s residence and construction of a new wood frame caretaker dwelling.
4. Construction of a new 10,000 square-foot one-story maintenance building and an uncovered storage area of approximately 80,000 square feet west of the public parking lot. Uphill plantings will screen the storage area from the park center. This proposal was modified at the hearing with applicant requesting a 5,000 square foot storage building within a 40,000 square foot maintenance yard.
5. Redevelop the area currently used to store maintenance equipment as an information kiosk.
6. Pave and stripe the upper gravel parking area, including drop-off areas and two handicapped parking spaces.
7. Modify restroom facilities to comply with ADA standards.
8. Designate a 100+ acre area in the southeast of the park for wildlife. Visitor access to this area will be limited or prohibited.

Mitigation Improvements (Environmental Violation)
1. Removal of non-native Himalayan Blackberry and English Ivy from four site areas in the Environmental Overlay Zones south and east of the Park and north of Johnson Creek, as well as removal of these species from an area in a residential zone east of the Park. Each area will subsequently be planted with native trees, shrubs, and groundcovers as identified on Portland’s Native Plant List.
2. Construction of a split-rail fence and information kiosk east of the Park boundary in area designated Site 4 Middle, on Exhibit C-7.
3. Removal of small shed from area designated Site 2, on Exhibit C-5.
PHASE 2
Water System Improvements
1. Two additional 50 million gallon underground reservoirs.
2. An 84-inch transmission conduit from Bull Run Reservoir.
3. A water treatment plant if warranted by future studies, including a siting alternatives analysis.

Park Improvements
1. A second parking lot to the north of the existing parking lot if warranted based on future traffic studies.

Adjustments to Zoning Code standards for Phase 1 development:
1. To 33.266.130.G.3.a(1), to eliminate the requirement for interior landscaping for parking.
2. To 33.535.205.A, to allow removal of trees greater than six inches in diameter

APPROVAL CRITERIA  In order to be approved, the proposal must meet the following approval criteria:

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II. ANALYSIS

Site and Vicinity: Powell Butte is situated in southeast Portland between SE Powell Boulevard and SE Foster Road and between roughly SE 143rd and 163rd Avenues. It is just north of Johnson Creek and the Springwater Corridor. Its forested side slopes rising about 400 feet above the surrounding terrain make the Butte a dominant visual element in the region.

Site Development and Activities. Figures 4 and 5 of the Plan, Exhibit A, show existing uses and development on the Butte and surrounding properties. The majority of the Butte is undeveloped and relatively undisturbed. The steep side slopes of the Butte are forested with a mix of deciduous and evergreen forest. The summit of the Butte consists of mostly open grassy meadow and an abandoned orchard. The meadow in the southwest corner of the Butte summit has been substantially overrun by invasive non-native hawthorn trees and Himalayan blackberries.
There are now four water reservoirs on the Butte. The Powell Valley Water District owns and operates three above-ground reservoirs with capacities of 7, 3 and 0.2 million gallons. The Portland Water Bureau owns a 50 million gallon underground reservoir, situated in the north-central portion of the site. Water is delivered to the Water Bureau’s facility by gravity flow from the Bull Run reservoir through three large-diameter underground pipelines located on the east face of the Butte. These pipelines were constructed between 1911 and 1935 and have a combined capacity of 210 million gallons per day.

In addition to water facilities, the Butte is developed for recreational uses. Located at the northeast corner of the summit is a gravel-covered lot that provides parking for about 39 vehicles in the upper area. The lower portion of the lot is for horse trailers and bus parking. A small building adjacent to the parking lot provides public rest rooms, park information and storage. A caretaker’s dwelling, consisting of a double-wide manufactured home, is situated to the northwest (downhill) of the parking lots. Trails surfaced with asphalt, gravel or bark provide access throughout the Butte and off-site for pedestrians, equestrians, and bicyclists. There also are numerous unofficial “volunteer” trails created by park users.

Stormwater runoff in the area of the Water Bureau’s reservoir and the Park Bureau facilities is collected in drainage channels and a concrete drainage swale adjoining the existing City reservoir. These drainage improvements were developed to reduce the potential for landslides along the less stable slopes on the north side of the Butte. Smaller turf- or metal-lined swales occur elsewhere on the Butte. Stormwater from these facilities is directed to Johnson Creek. Runoff from the access drive is collected in grassy swales alongside the drive and discharged to the north to the City’s storm sewer system.

There are numerous fences on the Butte, some in use and some abandoned. The above-ground reservoirs on the Butte are enclosed by cyclone fences. The pond in the southeast portion of the summit meadow is fenced to protect ducks and other wildlife in the pond from park users’ dogs. Other sections of livestock fencing remain from when the Butte was used for agriculture. These historic fences occur throughout the Butte, along the site boundaries, at the edge of the meadow/forest and within the meadow area.

Surrounding Land Uses and Zoning. The Butte is surrounded largely by residential development on a variety of lot sizes. Future development potential in the vicinity is limited. Most surrounding lots are developed to the extent permitted by zoning or are constrained by natural features, access limits or other conditions.

West of the site is a 2 million gallon reservoir owned by the Powell Valley Road Water District. The Springwater Corridor Trail skirts the south edge of the Butte. Johnson Creek is south of the trail. The Portland Gun Club is roughly one-quarter-mile east of the site.

While most of the land on Powell Butte is zoned Open Space (OS), much of the land around the Butte is zoned R5, R7 (or LR7 on lands not yet annexed into Portland) or R10
(Single Dwelling Residential). There are small areas of R2 and R3 (Multi Dwelling Residential) to the east and R20 (Single Dwelling Residential) across Johnson Creek to the south. Land south of the Butte also is in the Environmental Overlay Zone and the Johnson Creek Plan District.

**Access to the Butte.** Vehicular access to the Butte is provided by means of a paved 20-foot wide driveway that extends south from SE Powell Boulevard at SE 162nd Avenue (both arterial streets). The driveway rises from about 225 feet above mean sea level at SE Powell Boulevard to about 500 feet above mean sea level at the parking lot. Bicycle and pedestrian access is or will be provided from SE Powell Boulevard via the driveway and existing and planned trails from SE 148th and 158th Avenues to the north, SE Ellis, Raymond and Holgate Streets to the west, and SE Circle Avenue to the east. Trail access to the Butte also is provided to and from the Springwater Corridor Trail south of the Butte.

**History of the Butte.** The Butte is one of a series of volcanic lava domes in the eastern part of the metropolitan Portland area referred to collectively as the Boring/East Buttes Lava Domes. In April, 1925, the City of Portland purchased a portion of the Butte, the 556-acre Wilson Homestead, to preserve a site for future water reservoirs. Subsequent purchases of abutting properties expanded the City’s holdings to the current 600+ acres. After the initial purchase the City leased the property to the owners of the Meadowland Dairy, who grazed livestock on the Butte until about 1980.

Development of public water facilities on Powell Butte began in the 1960’s with the construction of the first of the Powell Valley Road Water District’s two above-ground reservoirs. The second reservoir was constructed in the 1970’s. Construction of the City of Portland’s 50 million gallon (mg) underground reservoir was completed in 1980. The City built drainage channels on the Butte in 1982 to alleviate landslide problems on its north slope. In 1983, the City built a 66-inch diameter water transmission line from the Butte to serve Portland and Washington County customers.

The Butte also provides important recreational amenities, including significant wildlife habitat and panoramic views. These amenities have always attracted informal (and until 1990, unauthorized) use by hikers, horseback riders, bird watchers and various other users. In 1987 the City officially established the Butte as a natural resource-based park, managed by the Portland Bureau of Parks and Recreation. The park was opened to the public in 1990.

The Parks Bureau prepared the first Powell Butte Facilities Plan in 1986. The City Council adopted that plan the following year. The 1986 Facilities Plan provided for development and use of the Butte by the Parks Bureau for park and recreation purposes and by the Water Bureau for water service-related uses. In 1996 the City updated the Facilities Plan, providing more detail regarding the size, location and timing of specific uses proposed in the Conditional Use Master Plan. The Portland City Council adopted the 1996 Powell Butte Facilities Plan on December 4, 1996. The document was not
approved as a land use planning document and contains no conditions which are required to be satisfied in this land use application.

**Land Use History:** There have been a number of quasi-judicial land use reviews on the site:

- CU 95-73: Conditional Use Request for water storage area on Powell Butte.
- CU 29-77: CU request to construct one 50 million or two 25 million gallon storage reservoirs with a future expansion to a capacity of 200 million gallons.
- CU 15-89: Approval of a Conditional Use in order to establish a Powell Butte Nature Park generally in accordance with the proposed Powell Butte Master Plan.
- 94-00705 EN: Controlled burn of open meadow portions of Powell Butte Nature Park.
- 00-00275: Construction of water pumping station, disinfectant tank and emergency overflow detention facility (on land adjacent to Center St).
- BLD 96-02497: Test boring for future Powell Butte reservoir development (Environmental Plan check).

**Agency Review:** A “Request for Response” was mailed April 23, 2002, prior to the initial public hearing. The following responses were received:

- Bureau of Environmental Services stated:
  - Sanitary sewer service is nearby and adequate to serve the proposed use.
  - Stormwater requirements not part of the Zoning Code may change during the life of the master plan.
  - Stormwater discharge from the site shall meet the conditions of the Johnson Creek Basin Plan District, and any new stormwater discharge entering Johnson Creek will be reviewed by Environmental Services and must meet any DEQ requirements or permits.
  - On-site stormwater management requires documentation from OPDR verifying the suitability of on-site disposal.
  - No justification to eliminate the interior landscaping requirement has been provided by the applicant. The Adjustment discussion fails to address how excess surface runoff volume, impervious surfaces and increased surface runoff temperatures will be mitigated.
  - The Adjustment for tree removal should be limited to the area of the environmental violation and removal of weedy species in the meadow area of Powell Butte
- Water Bureau stated that services are available and adequate for the proposed use.
Site Development Section of OPDR noted that details on proposed projects are lacking (stormwater disposal, sanitary service, construction management plan), and that inspections associated with the requirements of the land use review will be conducted through the building permit process.

Bureau of Transportation Engineering and Development commented on how the proposal meets transportation-related requirements. These comments are included in findings under the applicable approval criteria.

Forestry Division of the Bureau of Parks and Recreation noted that a permit is required from the City Forester to plant, remove, prune, spray, or maintain trees located in City parks or other public areas and that the Powell Butte Conditional Use Master Plan does not address these requirements. It then suggested several changes to the Plan in order to incorporate these regulations (discussed in findings below).

Neighborhood Review: A “Notice of Proposal in Your Neighborhood” was mailed on May 6, 2002. No written responses were received from either the Neighborhood Association or notified property owners in response to the proposal. Testimony from neighbors was received by the Hearings Officer as oral and written testimony at the hearing and in written form after the hearing during the open comment period.

### ZONING CODE APPROVAL CRITERIA

**33.815  CONDITIONAL USES**

**33.815.010 Purpose.** Certain uses are conditional uses instead of being allowed outright, although they may have beneficial effects and serve important public interests. They are subject to the conditional use regulations because they may, but do not necessarily, have significant adverse effects on the environment, overburden public services, change the desired character of an area, or create major nuisances. A review of these uses is necessary due to the potential individual or cumulative impacts they may have on the surrounding area or neighborhood. The conditional use review provides an opportunity to allow the use when there are minimal impacts, to allow the use but impose mitigation measures to address identified concerns, or to deny the use if the concerns cannot be resolved.

**Comment:** Multiple uses are proposed under the Conditional Use Master Plan. As a result three sets of Conditional Use approval criteria apply: 33.815.100 (Uses in the Open Space Zone) for the reservoir and park facilities; 33.815.225 (Radio Frequency Transmission Facilities) for the RF monopole and equipment; and 33.815.230 (Rail Lines and Utility Corridors) for the water supply pipeline. The master plan identifies the individual and cumulative impacts of the proposed uses and the mitigation measures, where necessary or appropriate, for those impacts. Below are the criteria, each followed by findings of how they are met by the proposal.
33.815.100 Uses in the Open Space Zone. These approval criteria apply to all conditional uses in the OS zone except those specifically listed in other sections below. The approval criteria allow for a range of uses and development which are not contrary to the purpose of the Open Space zone. The approval criteria are:

A. Character and impacts.

1. The proposed use is consistent with the intended character of the specific OS zoned area and with the purpose of the OS zone;

[The purpose of the OS zone is set forth in the Code as follows:

33.100.010 Purpose. The Open Space zone is intended to preserve and enhance public and private open, natural, and improved park and recreational areas identified in the Comprehensive Plan. These areas serve many functions including:
- Providing opportunities for outdoor recreation;
- Providing contrasts to the built environment;
- Preserving scenic qualities;
- Protecting sensitive or fragile environmental areas; and
- Preserving the capacity and water quality of the stormwater drainage system.]

Findings: The intended character of the Powell Butte site is a natural open space and park, as well as a site for water reservoirs and other transmission and distribution facilities.

The City of Portland purchased the Wilson Homestead in 1925 to preserve a site for future water reservoirs. At that time, the Anderegg family was farming the property under a lease from the Wilsons. The Andereggs continued to farm the land, operating under a lease from the City until 1946, then without a lease but with an understanding that they would act as caretakers of the property until farming ceased prior to 1980. Although the City considered several alternative uses for the property throughout this period, the City each time reconfirmed its plans to develop water reservoirs at the site. Development of Powell Butte for water facilities began in the 1960’s when the Powell Valley Road Water District developed its first above-ground reservoir. The District developed a second above-ground reservoir in the 1970’s. The City of Portland began the design of the existing 50 million gallon buried reservoir in 1977, and the construction of that facility was completed in 1980. A major transmission pipeline, the Washington County Supply Line, was built in 1983.

In 1983 the Water Bureau and the parks Bureau agreed to participate in a collaborative effort to develop and manage the Butte both as a park and for water facilities, because of the inherent compatibility between the two uses. A Master
Plan for Powell Butte was developed by Parks Bureau staff in 1986, funded in part by the Water Bureau and through a grant from the federal Land and Water Conservation fund. The plan provided for park uses that would be consistent with existing plans and requirements of the Water Bureau. In 1987 the City adopted an Interbureau agreement between the Water and Parks Bureaus setting forth the specific roles, responsibilities and uses of Powell Butte. Key provisions of the agreement include:

- The Water Bureau shall retain ownership of the Butte;
- The Parks Bureau will use and develop Powell Butte as a public park based on the development plan described in the 1986 Powell Butte Master Plan. Amendments to that plan shall be reviewed and approved by the Water Bureau and be consistent with U.S. Department of Interior regulations dealing with property developed with Land and Water Conservation funds. The central “crown” area of the Butte shall be designated as a “critical water supply area” subject to the Water Bureau’s unrestricted right to place water service facilities on or beneath its surface, subject to a requirement that the Water Bureau provide six months notice prior to construction of water facilities on the Butte; and
- The agreement is in perpetuity, with the parties acknowledging that the City’s water needs are paramount and will require the placement of future water facilities on or beneath the surface of Powell Butte in both the critical and non-critical water use areas.

Powell Butte Park is developed as a large natural area for wildlife and recreation. The uses which would be permitted by the proposed Master Plan are consistent with the intended character of the specific OS-zoned area because the vast majority of the Butte will continue to be a large natural area for wildlife and recreation in the midst of urban development, while at the same time meeting the unique needs of the region for a central water supply facility.

The proposed Master Plan is consistent with the purpose of the OS zone because it will maintain a sizable public open space and natural area in an urban area, providing contrasts to the surrounding built environment; provide opportunities for public recreation and environmental education focused on the resources of the Butte; preserve the more fragile forested portions of the Butte in its natural state; and protect water quality by providing new and enhanced stormwater quality treatment measures (such as swales) and options for the City. Further, the master plan carries out the historically established compatible uses of municipal water system management and public use of an urban open space.

The majority of the proposed water storage and transmission facilities are consistent with the intended character of the Butte because they will be underground, with the surface revegetated and restored to pre-existing grades, so that the open space and scenic qualities of the butte are maintained. These proposed facilities will be located toward the top of the butte and will not impact or disturb the sensitive
forested areas near the boundaries that are identified by the City for preservation through application of the Environmental Protection Zone.

Park-related development is in an area already being used for similar activities, and represents a limited expansion with some relocation to serve recreation activities more efficiently, provide greater accessibility, and reduce environmental and scenic impacts. Relocation of the caretaker house will continue to allow on-site 24-hour security while being less obtrusive.

The location and height of the proposed RF tower within a significant scenic site and viewshed from the top of Powell Butte to the northeast ( inventoried and protected under the Scenic Resources Protection Plan) may not be consistent with the purpose of the OS zone. In spite of proposed perimeter landscaping, the 175-foot-high monopole will extend well above any shrubs or trees and into the view of visitors on the site. The applicant has not provided adequate justification for the RF facility. It is expected that the tower would have adverse visual impacts on scenic views on the Butte. At the initial public hearing before the Hearings Officer the Water Bureau indicated that, if this portion of its proposal were denied, it would in the future resubmit a detailed proposal for a master plan amendment to allow a monopole.

The maintenance yard described in the Plan text is proposed to be 80,000 square feet (almost two acres, or 200 x400 feet) with a 10,000 square-foot maintenance building. However, the Master Plan Site Plan shows a maintenance yard of only 3200 square feet (40x80 feet) with a building of about 500 square feet in it. At the initial public hearing the applicant modified its proposal to a 5,000 square foot building included in a 40,000 square foot maintenance yard. Neighbors testifying at the initial hearing and submitting written testimony during the open comment period supported the staff recommendation of a 3,200 square foot maintenance facility.

The Applicant acknowledged that its application contained a site map with a 3,200 square foot maintenance yard. However, the applicant stated that the master plan documents referenced a 10,000 square foot one-story building within a maintenance yard area of about 80,000 square feet (the facility to be shared by Parks and Water). The applicant asserts that the 3,200 square foot staff recommended maintenance yard is “overly restrictive.” Applicant goes on (Exhibit H.28, page 2) and states:

“An enclosed yard of 80’ x 40’ (3,200 sq.ft.), leaves approximately 2,200 sq.ft. of usable area after deducting the area consumed by a 5’ setback around the perimeter. That balance – approximately the size of a house – will allow only enough area for a very small storage shed and parking and maneuvering space for one or two vehicles. There would be no benefit to either of the bureaus in developing such a limited site. The expense involved in the development would outweigh the benefits.
The purpose of developing the maintenance yard and storage building is to enhance the ability of the bureaus to maintain their facilities at the park. If they are only able to store a very limited quantity of supplies and a small piece of equipment in the building, and park one or two vehicles while they visit the park, their maintenance abilities will not be enhanced to any degree. Instead, they would be better off continuing to store all materials and equipment offsite, and having crews continue the current inefficient method of starting their days at those locations and hauling their equipment and supplies to the park.”

At the initial public hearing before the Hearings Officer the applicant reduced its request to a 5,000 square foot building within a 40,000 square foot yard. Further, after that hearing the applicant, in response to questioning by the Hearings Officer, submitted additional evidence demonstrating the need for a 5,000 square foot building and 40,000 square foot maintenance yard.

The Applicant’s suggested demonstration of need for the 5,000 square foot building and 40,000 square foot maintenance yard can be found, in full, in Exhibits H.13 (pages 3 to 8, plus diagrams) and H.28 (pages 2 to 4). The applicant’s statements which demonstrate need for the facility are summarized here:

- Currently there is a shortage of storage, staging, and crew parking facilities at the Park; and
- The Water Bureau’s maintenance/storage yard is located a substantial distance from the Park (North Interstate Avenue close to the Rose Garden); and
- The proposed storage building would be shared by the Water Bureau and Parks Bureau for office space and storage space in support of operating and maintenance of the Park; and
- Water and Parks would each have an office; and
- Equipment and supplies to be stored onsite in the building would be a generator, backhoe and tractor, brush cutters, chainsaws, pesticide applicators, survey equipment and small open-seated Cushman vehicles, open storage bins, locked storage for water bureau chemicals, portable toilet, firefighting equipment, portable water tank and other items; and
- The paved maintenance yard would provide space for parking spaces for crew and volunteer worker vehicles, sand and gravel stockpiles, storage for recycled utility poles and railroad ties, storage of plants for restoration and revegetation projects; and other uses.

The applicant also included, in its justification of need for the maintenance yard, construction activities and other temporary uses. The Council finds that the construction activities and temporary uses are not justification for a permanent development.

With the greater number of facilities on the butte, the Water Bureau’s maintenance obligations will substantially increase over current levels. As Powell Butte is the hub between the City’s water sources and the distribution system to City residents...
and to the City’s regional wholesale customers, maintaining these facilities is a critical task.

The Parks Bureau’s maintenance obligations will also increase to assure that the enhancements gained from the planned trail improvements and the resource enhancement projects (such as removal of hawthorne trees) are not lost to encroachments from hawthorne, ivy, blackberries and other nuisances allowed to re-invade the meadow due to lack of grounds maintenance.

Employee and volunteer parking and outdoor storage uses to satisfy these increased maintenance obligations will consume most or all of the available space in the maintenance yard. Applicant noted a number of uses for the yard area: outdoor storage of gravel and sand for ongoing trail maintenance and road application; storage of plants for restoration projects; storage of large utility poles for access management within the park; temporary storage of large equipment; and 4 parking spaces for city-owned vehicles. In addition, parking will be available for the personal vehicles of the water and parks crews, so they can report to work at the park office rather than to existing offsite central offices.

Employees of the Water Bureau and the Parks Bureau also presented evidence on the need for a 40,000 sq. ft. maintenance yard in oral testimony before the City Council. The Parks Bureau employee stated that additional maintenance facilities are needed at Powell Butte Park because of the size of the park and the scale of the maintenance needs. He stated that the area of the proposed yard is appropriate because it is comparable to that of an existing Parks yard that serves maintenance uses of a similar scale to that proposed for the Powell Butte yard. The Water Bureau employee stated that onsite storage of maintenance equipment and supplies will be necessary to meet the increased maintenance needs of the additional water facilities. He also stated that the area of the yard is needed to serve the park and water uses included only in phase one of the master plan, and that the yard had not been oversized to meet potential uses that might be added to the park in later phases.

The evidence provided by the applicant, and summarized briefly above, demonstrates that there is a need for a building and outside storage area within Powell Butte Park. Applicant presented extensive evidence supporting the size of the proposed maintenance yard and storage building. The Council finds that a 5,000 square foot building within a 40,000 square foot yard, located within Powell Butte Park, is needed and supported by the evidence.

The Council also finds that the location of the proposed 5,000 square foot building within a 40,000 square foot maintenance yard will allow for adequate open space for park uses. It was suggested before the Hearings Officer that the yard could be located within the master plan boundary at the Emmert site, since that site is already developed for similar kinds of uses. The Emmert site is not appropriate, for several reasons. First, there is no direct access through the park between the Emmert site
and the park center and the adjacent water facilities. The Emmert site is isolated on the south boundary of the park. Before any maintenance activities at the park center or the adjacent reservoirs and conduits could be performed, crews and materials would have to be transported from the Emmert site around the park on city streets to the main access road and the park center. The transport activities would increase traffic on surrounding streets and on the access road in and out of the park center. The efficiencies sought by locating the storage and yard at the park would also be lost by locating them at a site such as the Emmert site, away from the areas where most of the work will be needed. In addition, the Emmert site was procured for restoration purposes to increase the natural areas of the park. Once the Emmert site has been restored, the park’s native vegetation and wildlife corridor connection to Johnson Creek will be greatly enhanced. Development of a maintenance and storage yard at that site would be incompatible with those functional values.

Locating the yard in the vicinity of the park center will place the crews, equipment and supplies close to the parks and water facilities that will be most in need of maintenance and operations support. This site will have the least impact on the natural and scenic resources of the Butte.

The site that is proposed achieves that goal through a combination of topography and screening. The proposed yard is located adjacent to the treeline at the northwest corner of the park center. This location is set off from the park center without being too far from the park and water facilities. Improvements at the site already demonstrate that a large facility at this location can be thoroughly screened from view. Immediately adjacent to the proposed yard site are two reservoirs owned by Powell Valley Water District. These reservoirs, which together cover an area nearly twice the size of the proposed yard (approximately 200’x400’), are totally hidden from view by the surrounding trees (see Exhibit I-6).

A similar buffer of trees will be equally effective at screening the proposed yard from view. The Bureaus propose to exceed the L3 landscaping standard on the south and west sides of the yard by planting a double row of trees on those sides, rather than the single row required by code. Those trees could be planted immediately so that they could become well established for screening by the time the Bureaus are ready to proceed with construction of the yard.

The topography of the proposed site also will aid in screening the yard and building from views from trails above the yard. The site is not flat, but drops off to the northwest across the site and away from view from higher points on the Butte. This grade will enhance the effectiveness of the landscape screen, which will be planted on the slope above the yard. The final design for the yard and building may also conclude that the storage building could be located on the northern, lower portion of the yard. This would allow the grade to assist in reducing its visual impact.

While other sites in the park center vicinity could accommodate the proposed yard, their impact on scenic resources would be much greater. Review of other sites indicate they are closer to and more plainly visible from the access road and the park center, and they would also be clearly visible from the trails and other overlooks at higher elevations on the butte. While the sites could be screened with
trees and landscaping, that would still create visual impacts because the other sites are located in what are now open meadow areas with no structures or trees. Because the proposed site backs up to the treeline and is located away from the main access road and park center, its visual impact is significantly reduced in comparison to these alternate sites.

Therefore, the proposed site will create the least adverse impact on scenic resources of the available sites near the park center.

In addition, the proposed site will have minimal impacts on other resource values. The site has a few small trees that will need to be removed, but it is on the edge of the open meadow area. (See Exhibit H-9) The yard will exceed the minimum setback from the treed area in the “p” overlay zone on the Butte. Use of the meadow edge by the yard will be mitigated by the meadow restoration activities (clearing of hawthorn trees) that are also a part of the master plan application. Additional mitigation may be proposed at the time of the application for development of the yard. The site has become overgrown with Himalayan blackberries and non-native Hawthorns. The proposed yard is located adjacent to an existing Water Bureau access road leading past the Powell Valley Water District reservoirs.

Access to the yard does not require construction of a new road. Runoff from the yard will be managed in accordance with the plans provided in the Hydrology and Stormwater Management Plan (Appendix D to the CUMP application).

Therefore, the proposed yard and storage building will have less impact on scenic resources than would other nearby sites. The proposed site also will have minimal impacts on other natural resources. Those impacts will be managed through on-site landscaping and a stormwater management plan. Mitigation for scenic and other resource impacts will be provided through screening at the proposed site and through restoration of open meadow elsewhere on the Butte.

With conditions requiring elimination of the RF facility and limiting the storage/office/maintenance building to 5,000 square fee within a 40,000 square foot maintenance as shown on Exhibit H.29, this criterion [33.8115.100.A.1] is met.

2. Adequate open space is being maintained so that the purpose of the OS zone in that area and the open or natural character of the area is retained;

Findings: The proposed major development on the site will be underground reservoirs. This allows ground above the reservoirs to be seeded in native grasses. This will result in the open space character of the Butte being maintained. Most other buildings and development such as the new caretaker’s house, parking lot, pump station for the 20 million gallon reservoir, and kiosk are very small in proportion to the site and will not detract from the open and natural character of the site. What is of concern, however, is the location and size of the proposed maintenance facility and RF tower. The RF tower within a designated significant scenic viewshed from the top of Powell Butte to the northeast. The 175-foot-high
monopole will extend well above existing and proposed shrubs or trees and well within view of visitors on the site. Applicant did not appeal the Hearings Officer’s denial of the RF facility.

The maintenance yard described in the Plan text was originally proposed to be 80,000 square feet (almost two acres, or 200x400 feet) with a 10,000 square-foot maintenance building. However, the Master Plan Site Plan shows a maintenance yard of only 3,200 square feet. Applicant revised its request for the proposed building to be a maximum of 5,000 square feet within a 40,000 square foot maintenance yard. The justification given for the 5,000 square foot building within a 40,000 square foot yard is discussed in response to 33.815.010 A.1 above and is incorporated by this reference into this finding.

With conditions requiring elimination of the RF facility and limiting the storage/office/maintenance building to 5,000 square foot within a 40,000 square foot maintenance yard as shown on Exhibit H.29, this criterion is met.

3. City-designated environmental resources, such as views, landmarks, or habitat areas, are protected or enhanced.

**Findings:** The proposed maintenance facility and RF tower are proposed to be located within a designated significant scenic viewshed from the top of Powell Butte to the northeast. The 175-foot-high monopole will extend well above any existing or proposed shrubs or trees and into the view of visitors on the site.

The maintenance yard described in the Plan text was originally proposed to be 80,000 square feet (almost two acres, or 200 x 400 feet) with a 10,000 square-foot maintenance building. However, the Master Plan Site Plan shows a maintenance yard of only 3,200 square feet. The applicant revised its request for the proposed building to be a maximum of 5,000 square feet within a 40,000 square foot maintenance yard. The justification given for the 5,000 square foot building within a 40,000 square foot yard is discussed in 33.815.010 A.1 above and is incorporated by this reference into this finding.

Applicant demonstrated in testimony before the Council that the maintenance yard has been sited to avoid a drainage wetland area south of the maintenance yard site. Applicant also presented photographs demonstrating that the maintenance yard will not interfere with views, and will, in fact, be visible only against the trees behind the site and only from a small area adjacent to the location of the proposed yard. Further, the topography of the park will obscure the yard from park visitors’ views from above the existing reservoir, which forms a bench overlooking and blocking the view of the maintenance yard.

With conditions requiring elimination of the RF facility and limiting the storage/office/maintenance building to 5,000 square foot within a 40,000 square foot maintenance as shown on Exhibit H.29, this criterion is met.
B. Public services.

1. The proposed use is in conformance with either the Arterial Streets Classification Policy or the Downtown Parking and Circulation Policy, depending upon location;

2. The transportation system is capable of safely supporting the proposed use in addition to the existing uses in the area. Evaluation factors include street capacity and level of service, access to arterials, transit availability, on-street parking impacts, access requirements, neighborhood impacts, and pedestrian safety;

Findings: The site has multiple pedestrian, bicycle, and equestrian access points for park and recreation activities. All access points except the main entrance are from Local Service Streets except SE Holgate Boulevard. The access at Holgate enters the west side of the Park and is a designated City Walkway. The only motor vehicle entrance point is a private road extending from the intersection of SE 162nd Avenue and SE Powell Boulevard. Southeast 162nd Avenue is a designated District Collector Street, Minor Transit Street, City Bikeway, City Walkway, and Minor Truck Street. Southeast Powell Boulevard is a designated Neighborhood Collector, Minor Transit Street, City Bikeway, City Walkway, and Major Truck Street.

The applicant has prepared an analysis of parking and transportation conditions at Powell Butte Park. The analysis (Lancaster Engineering, 1999) demonstrates that the parking supply on the site is adequate for current and expected park visitor parking demand. The analysis further demonstrates that the intersection of SE Powell Boulevard at SE 162nd Avenue, which serves the main entrance to the park, operates at an acceptable level of service consistent with City requirements. The Bureau of Transportation Engineering and Development has reviewed the proposal for its conformance with street designations and for potential impacts upon transportation services and concluded that the public transportation system is capable of safely supporting the proposed uses.

This criterion is met.

3. Public services for water supply, police and fire protection are capable of serving the proposed use, and proposed sanitary waste disposal and stormwater disposal systems are acceptable to the Bureau of Environmental Services.

Findings: The Water Bureau has provided documentation into the Record that services are available. The Bureau of Environmental Services has provided documentation into the Record that sanitary sewer service is available and adequate to serve the site, that stormwater discharge from the site must meet both BES requirements and regulations of the Johnson Creek Plan District, and that on-site
stormwater disposal requires documentation from OPDR verifying the suitability of on-site disposal. The BES requirements are capable of being satisfied at the time of development. The Fire and Police Bureaus received notice of the proposal and did not submit comments or object to the application. This criterion is met.

C. Livability. The proposal will not have significant adverse impacts on the livability of nearby residential-zoned lands due to:

1. Noise, glare from lights, late-night operations, odors, and litter; and
2. Privacy and safety issues.

Findings: Uses proposed in the Master Plan will not adversely affect the livability of nearby residential-zoned lands, because:

- Nearby residentially-zoned land is defined, for the purposes of this decision, as those residential properties located within 400 feet of the proposed Master Plan boundary. The required legal notice area extends 400 feet from the site boundaries, and in this case, because the Powell Butte property is so large and surrounded by residential uses a street by street description is impractical. The 400 foot distance includes the majority of residences which could be adversely impacted by this Master Plan.

- Residential-zoned lands are physically separated from the proposed development and associated uses by substantial distances, and are screened by topography and/or vegetation. The northwest corner of the 50 million gallon reservoir is approximately 175 feet from a residential zone, and the pump station is approximately 50 feet from a residential zone. In both cases, the areas between the planned structure and the property line is screened from the adjacent residential zone by dense woods. The uses at the park center and the other master plan developments are a minimum of 1000 feet from adjacent residential areas. Therefore, to the extent the proposed uses generate any additional activity, noise or other impacts, the impacts of those uses would dissipate to an undetectable level by the time they reach adjoining residentially-zoned lands.

- Additional native vegetation will be planted along the boundary of the site east of the park center to further screen and buffer adjacent residential construction there.

- Water facilities in Phase 1 of the Master Plan are passive in nature. After construction and onsite environmental restoration or mitigation is complete, the operation of the facilities will not generate noise, glare from lights, odors or the potential for litter, and will not require late-night maintenance operations except during emergencies. Noise generated within the pump station will be undetectable to residents of adjacent properties through the combination of the structure’s setback from the property line, the forested buffer to be retained

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within that setback, and by the structure itself. The proposed water facilities are not occupied by Water Bureau personnel, they do not attract members of the general public, and they do not pose a hazard. Therefore, they will not raise privacy or safety issues. Above-ground portions of the facilities will be fenced and buffered as needed to protect the public and to deter vandalism and theft.

- Potential impacts on livability due to increased public activities from proposed park development in Phase 1 of the Master Plan are addressed. They include isolation of recreational activities from surrounding private property; minimizing night operations and management practices, including a full-time resident caretaker; and use of surveillance cameras, if needed.

All proposed park activity areas are situated well away from surrounding residential-zoned property except where trails enter the park. This achieves greater isolation and proportionately reduces the potential for perceptible impacts to surrounding residents. Trail connections exist and will be retained at SE 148th Avenue, SE Holgate Street, SE Raymond Street, SE Ellis Street, Springwater Junction, SE Anderegg, and SE Powell Boulevard. Having multiple trail access points results in spreading the impacts of access over the various connections so that no single connection point is unreasonably burdened. Each connection is at a public right-of-way and does not require or encourage access across adjoining private property. Therefore these connections do not raise safety or privacy impacts.

Current park operations and management techniques that limit potential impacts to surrounding residents will continue. The park is closed to the public from dusk to dawn, avoiding potential impacts from light and glare or security concerns from nighttime use. The resident caretaker provides surveillance on the site and enforcement of park rules. Trash receptacles and rest room facilities are provided and maintained in the park center to limit potential litter problems. No odor-producing activities currently exist or are proposed.

This criterion is met.

D. Area plans. The proposal is consistent with any area plans adopted by the City Council such as neighborhood or urban renewal plans.

Findings: The proposed project site is included within the area covered by the Pleasant Valley Neighborhood Plan. That plan was adopted by City Council on March 25, 1996. It contains policies and objectives that guide development and land uses throughout the neighborhood. The proposed Conditional Use Master Plan is a continuation and expansion of uses and activities that are supported and encouraged by the Pleasant Valley Neighborhood Plan. The proposed Conditional Use Master Plan preserves and enhances the ecosystem by planting and maintaining native vegetation, provides expanded recreation opportunities for Powell Butte, and
supports long-term expansion plans for the regional water system. This criterion is met.

**Conclusion:** The proposed Conditional Use Master Plan for Powell Butte is largely extending existing uses and activities, expanding recreation opportunities within the carrying capacity of the site, enhancing natural resources, and supporting long-term expansion of the regional water supply. The RF facility is not justified at this time. As future needs are identified in greater detail, amendments to the Master Plan that include these items can be proposed. However, until that need is established, the applicable approval criteria cannot be met for the RF facility. The other uses proposed in phase 1 of the master plan do meet the approval criteria for conditional uses.

### 33.815.225 Radio Frequency Transmission Facilities

These approval criteria allow Radio Frequency Transmission Facilities in locations where there are few impacts on nearby properties. The approval criteria are:

**Comment:** The applicant requests approval for a 175-foot-tall monopole RF facility on the northeast corner of the site. Part of the justification for the pole location (although not the height) is the desire to add security cameras to allow remote monitoring of the park. Accessory uses of the pole are not criteria for approval of the RF facility; each need must stand on its own. Therefore, reference of the security camera facility is not included in this section, but is discussed under the general approval criteria for uses in the OS zone, above.

**B.** Approval criteria for facilities operating at 100 watts ERP or less, proposing to locate on a tower in an OS or R zone, or in a C, E, or I zone within 50 feet of an R zone:

1. The applicant must prove that a tower is the only feasible way to provide the service;

**Findings:** The applicant states that the RF monopole must be located at that site “...to achieve the necessary line-of-site to other water facility telemetry installations at Mt Scott, Lookout Point, Rocky Butte and/or Council Crest and to have the necessary physical relationship to water systems on the Butte.” The applicant further states that there are no other nearby towers that can serve the needs of the Water Bureau. No inventory of nearby towers has been given. No discussion of use of towers in a less obtrusive location or several smaller towers in less visible locations has been given. No diagrams or maps were included showing the location of other Water Bureau facilities and their relationship to the proposed tower location. Because there is insufficient information it cannot be determined that this criterion is met.

2. The tower, including mounting technique, must be sleek, clean, and uncluttered;
**Findings:** The proposed monopole will be freestanding and, according to the applicant, the smallest diameter possible. Antenna mounting technique has not been decided, so this criterion cannot be met at this time.

3. The visual impact of the tower on the surrounding area must be minimized. This can be accomplished by one or more of the following methods:
   a. Limiting the tower height as much as possible given the technical requirements for providing service and other factors such as whether the tower will provide co-location opportunities;
   b. Planting trees around the tower as a way to soften its appearance. The variety and spacing of the trees will be determined based on the site characteristics, tower height, and other co-location factors; or
   c. Other methods that adequately minimize visual impact;

**Findings:** The tower location is in the center of a designated significant viewshed from the top of Powell Butte, inventoried as part of the City’s Goal 5 Scenic Resource Protection Plan. As noted above, the applicant has not provided enough information to determine if the tower height and location is necessary. The tower base will be landscaped to L3 standards, screening the lower part, but potentially blocking the scenic view. Although the applicant states that the tower “…will be painted to soften its visual impacts…,” no color or paint scheme has been proposed. This criterion is not met based on the findings above.

4. Accessory equipment associated with the facility must be adequately screened. If a new structure will be built to store the accessory equipment, the new structure must be designed to be compatible with the desired character of the surrounding area;

**Findings:** The equipment shelter will be screened and landscaped to L3 standards, but the shelter housing elevations, size, and location are not shown in the Plan, so there is insufficient information to determine if this criterion is met.

5. Public benefits of the use outweigh any impacts which cannot be mitigated; and

**Findings:** The proposed RF communication facility will relay essential information regarding reservoir water levels and transmission pipeline flow rates necessary to coordinate water facility operations throughout the region. However, aesthetics, views, and natural character of the Butte will be adversely impacted from the proposed 175-foot-high tower. Although the public benefit may be substantial, the applicant has not shown under criterion 3 above how impacts are minimized. Until that is done, it is not possible to determine if this criterion can be met.
6. The regulations of Chapter 33.274, Radio Frequency Transmission Facilities are met.

**Findings:** Following are the applicable requirements of 33.274, each followed by comments as to how they are or are not met.

### 33.274.040 Development Standards

**A. Purpose.** The development standards:
- Ensure that Radio Frequency Transmission Facilities will be compatible with adjacent uses;
- Reduce the visual impact of towers in residential and open space zones whenever possible;
- Protect adjacent populated areas from excessive radio frequency emission levels; and
- Protect adjacent property from tower failure, falling ice, and other safety hazards.

**B. When standards apply.** Unless exempted by 33.274.030, above, the development standards of this section apply to all Radio Frequency Transmission Facilities. Applications to modify existing facilities regulated by this chapter are only required to meet the standards of Paragraphs C. 3, C.4, C.5, C.6, and C.9, below, in addition to any previous conditions of approval. Increasing the height of a tower is not considered modification of an existing facility.

**C. General requirements**

1. **Tower sharing.** Where technically feasible, new facilities must co-locate on existing towers or other structures to avoid construction of new towers. Requests for a new tower must be accompanied by evidence that application was made to locate on existing towers or other structures, with no success; or that location on an existing tower or other structure is infeasible.

The applicant states that no towers exist in the area that can serve the proposed activity, but has provided no inventory of existing towers, or evidence that application was made to locate on existing towers or other structures with no success.

The applicant also states that the tower is needed at this location to provide security through mounting surveillance cameras. Camera location is not an RF use and, if necessary, cameras can be located on other structures or other (lower) poles. Location of the tower must be justified on communication needs alone.
This requirement is not met.

2. Grouping of towers. The grouping of towers that support facilities operating at 1,000 watts ERP or more on a site is encouraged where technically feasible. However, tower grouping may not result in radio frequency emission levels exceeding the standards of this chapter.

Only a single tower is proposed, so this requirement does not apply.

3. Tower finish. For towers not regulated by the Oregon Aeronautics Division or Federal Aviation Administration, a finish (paint/surface) must be provided that reduces the visibility of the structure.

Although the applicant states that the tower “...will be painted to soften its visual impacts...,” no color or paint scheme has been proposed. It should be noted that the tower, as proposed, will extend significantly above the summit of the Butte, so it is likely that the Federal Aviation Administration will require a bright color scheme. This requirement is not met.

4. Tower illumination. Towers must not be illuminated except as required for the Oregon State Aeronautics Division or the Federal Aviation Administration.

The tower will not be illuminated unless required by the Federal Aviation Administration. It should be noted that the tower, as proposed, will extend significantly above the summit of the Butte, so it is likely that the Federal Aviation Administration will require a flashing lighting arrangement.

5. Radio frequency emission levels. All existing and proposed Radio Frequency Transmission Facilities are prohibited from exceeding or causing other facilities to exceed the radio frequency emission standards specified in Table 274-1, except as superseded by Part 1, Practice and Procedure, Title 47 of the Code of Federal Regulations, Section 1.1310, Radio Frequency Radiation Exposure Limits.
Table 274-1

Radio Frequency Emission Standards [1]

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Mean Squared Electric Field Strength (V^2/m^2) [2]</th>
<th>Mean Squared Magnetic Field Strength (A^2/m^2) [3]</th>
<th>Equivalent Plan-Wave Power Density (mW/cm^2) [4]</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 KHz – 3 MHz</td>
<td>80,000</td>
<td>0.5</td>
<td>20</td>
</tr>
<tr>
<td>3 MHz – 30 MHz</td>
<td>4,000 (180/ft^2) [5]</td>
<td>0.025 (180/ft^2)</td>
<td>180/f^2</td>
</tr>
<tr>
<td>30 MHz – 300 MHz</td>
<td>800</td>
<td>0.005</td>
<td>0.2</td>
</tr>
<tr>
<td>300 MHz – 1500 MHz</td>
<td>4,000 (f/1500)</td>
<td>0.025 (f/1500)</td>
<td>f/1500</td>
</tr>
<tr>
<td>1500 MHz – 300 GHz</td>
<td>4,000</td>
<td>0.025</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Notes:  
[1] All standards refer to root mean square (rms) measurements gathered by an approved method.  
[2] V^2/m^2 = Volts squared per meter squared.  
[4] mW/cm^2 = Milliwatts per centimeter squared.  

No calculations are given to show that this requirement is met.

6. Antenna requirements. The antenna on any tower or support structure must meet the minimum siting distances to habitable areas of structures shown in Table 274-2. Measurements are made from points A and B on the antenna to the nearest habitable area of a structure normally occupied on a regular basis by someone other than the immediate family or employees of the owner/operator of the antenna. Point A is measured from the highest point of the antenna (not the tower) to the structure, and Point B is measured from the closest point of the antenna to the structure.
Table 274-2
Distance Between Antenna and Habitable Area of Structure
(Where f is frequency in megahertz.)

<table>
<thead>
<tr>
<th>Effective Radiated Power</th>
<th>Frequency (MHz)</th>
<th>Point A: Minimum Distance from Highest point of Antenna to Habitable Area of Structure (feet)</th>
<th>Point B: Minimum Distance from Closest Portion of Antenna to Habitable Area of Structure (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;100 watts</td>
<td></td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>100 watts to 999 watts</td>
<td></td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>1000 watts to 9.999 Kw</td>
<td>&lt;7</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>7-30</td>
<td>(f/0.67)</td>
<td>(f/1.5)</td>
</tr>
<tr>
<td></td>
<td>30-300</td>
<td>45</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>300-1500</td>
<td>(780/vf)</td>
<td>(364/vf)</td>
</tr>
<tr>
<td></td>
<td>&gt;1500</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>10 Kw plus</td>
<td>&lt;7</td>
<td>17.5</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>7-30</td>
<td>(f/0.4)</td>
<td>(f/0.91)</td>
</tr>
<tr>
<td></td>
<td>30-300</td>
<td>75</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>300-1500</td>
<td>(1300/vf)</td>
<td>(572/vf)</td>
</tr>
<tr>
<td></td>
<td>1500</td>
<td>34</td>
<td>15</td>
</tr>
</tbody>
</table>

The applicant states that this requirement will be met, and it is likely, because of the 175-foot height of the monopole that the antenna array will be high enough. However, the antenna design and location on the monopole has not been chosen, so it cannot be determined at this time if this requirement is met.

7. Setbacks. All towers must be set back at least a distance equal to 20 percent of the height of the tower or 15 feet, whichever is greater, from all abutting R and OS zoned property and public streets. Accessory equipment or structures must meet the base zone setback standards.
The monopole will be set back 200 feet or more from the site boundaries and from the nearest R-zoned land. Accessory equipment and structures will meet the OS base zone setback standards. This requirement is met.

8. Guy anchor setback. Tower guy anchors must meet the main building setback requirements of the base zone.

The monopole will be freestanding, with no guy wires. This requirement does not apply.

9. Landscaping and screening. The base of a tower and all accessory equipment or structures located at grade must be fully screened from the street and any abutting sites as follows:

...b. In OS or R zones or within 50 feet of an R zone.

A tower and all accessory equipment or structures located in an OS or R zone or within 50 feet of an R zoned site must meet the following landscape standards:

(1) Tower landscaping. A landscaped area that is at least 15 feet deep and meets the L3 standard must be provided around the base of the tower.

(2) Accessory equipment and structures. A landscaped area that is at least 10 feet deep and meets the L3 standard must be provided around the base of all accessory equipment or structures located at grade.

The applicant states that this requirement will be met but does not provide detailed landscape plans to show how.

10. Tower design.

a. For a tower accommodating a Radio Frequency Transmission Facility of 100,000 watts or more, the tower must be designed to support at least two additional transmitter/antenna systems of equal or greater power to that proposed by the applicant and one microwave facility, and at least three two-way antennas for every 40 feet of tower over 200 feet of height above ground.

b. For any other tower, the design must accommodate at least three two-way antennas for every 40 feet of tower, or at least one two-way antenna for every 20 feet of tower and one microwave facility.
c. The requirements of Subparagraphs a. and b. above may be modified by the City to provide the maximum number of compatible users within the radio frequency emission levels.

The applicant states that the tower is capable of accommodating additional transmitter/antenna systems as required, but will not allow the additional arrays because of security camera locations on the tower. An Adjustment is required to deviate from this requirement, but has not been applied for. Until an Adjustment is granted this requirement is not met.

11. Mounting device. The device or structure used to mount facilities operating at 100 watts ERP or less to an existing building or other non-broadcast structure may not project more than 10 feet above the roof of the building or other non-broadcast structure.

The proposed facility will be free-standing. This criterion does not apply.

12. Abandoned facilities. A tower erected to support one or more Federal Communication Commission licensed Radio Frequency Transmission Facilities must be removed from a site if no facility on the tower has been in use for more than six months.

When the tower is abandoned, this criterion will apply.

D. Additional requirements in OS, R, C, and EX zones and EG and I zones within 50 feet of an R zone.

1. Purpose. These additional regulations are intended to ensure that facilities operating at 100 watts ERP or less have few visual impacts. The requirements encourage facilities that look clean and uncluttered.

2. Standards. In addition to the regulations in Subsection C., above, facilities operating at 100 watts ERP or less located in OS, R, C, or EX zones or EG or I zones within 50 feet of an R zone must meet all of the following standards:
   a. Antennas mounted on towers. Triangular “top hat” style antenna mounts are prohibited. Antennas must be mounted to a tower either on davit arms that are no longer than 5 feet, flush with the tower, within a unicell style top cylinder, or other similar mounting technique that minimizes visual impact.
   b. Antennas mounted on existing buildings or other non-broadcast structures. This standard only applies to facilities
located in OS or R zones or within 50 feet of an R zone. The visual impact of antennas that are mounted to existing buildings or other non-broadcast structures must be minimized. For instance, on a pitched roof, an antenna may be hidden behind a false dormer, mounted flush to the facade of the building and painted to match; mounted on a structure designed with minimal bulk and painted to fade into the background; or mounted by other technique that equally minimizes the visual impact of the antenna. The specific technique will be determined by the conditional use review.

c. Lattice. Lattice towers are not allowed.

The applicant states that a triangular “top hat” antenna will not be used. The tower will be freestanding and not attached to a building. The tower will be a monopole and not a lattice-type structure.

**Conclusion:** Although an RF tower and facility to transmit data may be desirable, it is clear from the lack of information provided by the applicant that the request is premature. There is insufficient detail at this time to be able to determine if the applicable standards and approval criteria are met. It is suggested that the applicant wait until specific communication needs are determined, and then amend the Master Plan as necessary. Until that time, the RF request must be denied.

### 33.815.230 Rail Lines And Utility Corridors

These approval criteria allow Rail Line And Utility Corridor uses where their location will not unduly interfere with other land uses and with the street system. The approval criteria are as follows:

A. The proposed rail line or utility corridor is sufficiently separated from nearby land uses so as to allow for buffering of the uses, especially in residential areas. In the case of railroad lines, separation distances should consider the expected number, speed, size, types, and times of trains; and

B. The rail line or utility corridor will not substantially interfere with present or probable future road systems and traffic volumes.

**Findings:** The master plan includes a utility corridor for the conduits from Bull Run starting at the eastern boundary of the park along Circle Avenue and continuing up the hill to the planned reservoirs. Under PCC Section 33.815.230 the utility corridor may not substantially interfere with present or probable future road systems and traffic volumes. A Street Connectivity Study recommends that a street connection be made from Circle Avenue through to Powell Butte Estates as part of any new development. Such a street would cross the utility corridor. There is no street currently over the conduit corridor at that location.

The utility corridor is sufficiently separated from nearby uses to allow for appropriate buffering. The utility corridor is a 50-100-foot-wide series of tracts owned by the Water Bureau or on easements extending through the Powell Butte.
Estates, Powell Butte Heights, and Anderegg Meadows subdivisions on the east flank of Powell Butte and east to the Portland City Limits. Except for a pump station that is located on Tax Lot 2500 1S3E18B, south of Powell Butte Heights and west of 5335 SE Circle Avenue (just inside the east boundary of Powell Butte Park), future water supply lines in the corridor will be underground and will not have an impact on surrounding residences. The pump station will be set back 40 feet from the nearest residential lot, and maintenance parking will be on the south side of the building, away from the homes. Evergreen trees will be planted on the periphery of the pump house, helping to screen the building and minimize visual impacts. No noise beyond that of the electric motors from the pump house will be generated.

The utility corridor will not present any interference if the recommendation for a street connection from Circle Avenue to Powell Butte Estates is implemented. The conduits will cross under many streets before reaching Powell Butte, many of which will carry higher traffic levels and heavier loads. The design criteria for the buried pipeline at those points, and at a Circle Avenue crossing, will address the additional cover and materials requirements necessary to assure that stresses from vehicle traffic do not damage the conduits or require any limitations on the loads over the new connection. The conduit utility corridor does not interfere with any existing street and will not interfere with future road systems and traffic volumes if a connection is required from Circle Avenue to Powell Butte Estates.

These criteria are met.

33.820 CONDITIONAL USE MASTER PLANS

33.820.10 Purpose. A conditional use master plan is a plan for the future development of a use that is subject to the conditional use regulations. Expansions of the use may have impacts on surrounding neighborhoods and on public services that are better addressed through the review of the master plan than through reviewing the expansions individually over time. In addition, by creating long term plans, some impacts may be prevented that would have occurred with uncoordinated piecemeal expansions. The development of a master plan is intended to provide the surrounding neighborhoods and the City with information about, and an opportunity to comment on, the use's plans for future development. The plan also enables the operator of the use and the City to address the effects of the future development. Finally, an approved master plan is intended to ensure that the use will be allowed to develop in a manner consistent with the plan. Master plans may be completed at various levels of detail. Generally, the more specific the plan, the less review that will be required as the future uses and development are built.

Findings: The master plan presents the plans for the future development of water and parks facilities at Powell Butte Nature Park, allowing a single review of the cumulative impacts of those uses by the City and by surrounding neighborhoods.
The master plan identifies the impacts that are likely to occur as a result of the construction of the proposed developments, and also how those impacts will be mitigated. The level of detail included in the plan is appropriate for the types and scale of uses that are proposed. That is, the proposed facilities and their locations are identified with sufficient detail to allow the impacts of those developments to be evaluated, and to confirm that the proposed mitigation measures are adequate to address the development impacts. Future reviews will be required for the final designs of the proposed facilities. The plan includes development standards and identifies the procedures for future review of the approved developments.

This criterion is met.

33.820.20 What is covered by a Master Plan

A. Present uses. A conditional use master plan is for the entire use, including portions of the use on lands where the use is allowed by right, and all affiliates on or abutting the site. For the purpose of this chapter, an affiliate means any entity that is related to the use in such a way that either the use or the entity controls the other, or both are under control of a third party. Control means the power to decide and direct the use of land, structures, and other resources.

B. Proposed and potential uses. The conditional use master plan covers any specific uses or development proposals being requested, called the "proposed use" in this chapter, and possible future uses or development, called the "possible future uses."

C. Boundaries. The conditional use master plan may encompass lands not presently controlled by the use. The plan will not take effect for those lands until they are under control of the applicant.

Findings: The master plan covers all of the existing uses at Powell Butte. These uses include, but are not limited to, the existing 50 million gallon reservoir, the two Powell Valley Road Water District reservoirs, water transmission lines, stormwater management and drainage improvements, and the outfall at Johnson Creek, as well as the existing developed trail system, trail markers and rest areas, fencing, the parking lot and park center improvements, and the caretaker’s residence. The site boundaries controlled by the master plan are shown in exhibit H-29; all of the area within these boundaries are under the control of the applicants.

The master plan covers the proposed phase 1 uses. The Master Plan proposes numerous development and activity elements in two phases: the first within a ten-year period, and the second during the subsequent forty years. The phase one uses are described in pages 43-57 of the Plan and summarized in Table 1, page 15, of the Plan and include:
Phase 1 (within ten years of Plan adoption)

Water system improvements

- Seismic upgrades to the existing underground water storage reservoir;
- Construction of two underground reservoirs: a 50 million gallon reservoir at the 530 foot elevation adjacent to the existing reservoir, and a 20 million gallon reservoir at the 600 foot elevation on the southeast side of the Butte.
- Construction of two 84-inch diameter conduits in a shared trench on the east and north side of the Butte. One pipeline will supply water to the reservoirs from the Bull Run Watershed east of the City. The second pipeline will be an emergency overflow from the new 530-foot reservoir, and will discharge at an existing outfall into Johnson Creek.
- Construction of a 66-inch diameter conduit connecting the 600-foot reservoir to the regional water supply system to the south, and an overflow pipeline from the new reservoir to the new 84-inch emergency overflow pipe. Final alignment is dependent on further off-site analysis.
- Construction of a combination pump station/hydropower generator for the east side of the Butte. This facility will pump water to the 600-foot reservoir during the summer or periods of low water. During winter or periods of high rainfall, water would be gravity fed to the hydropower facility, generating electricity.
- Location of a 175-foot tall RF monopole tower on the north side of the Butte, to transmit information to other Water Bureau facilities in the area. A maximum eight-foot diameter dish and one or more surveillance cameras are proposed on the upper part of the tower. Two associated buildings will be sited close to the tower.

Park improvements

- Construction of five new trails, and closure and revegetation of several unauthorized trails. New trails will be widened, as will an improved asphalt trail that will have suitably spaced level areas in order to comply with ADA standards.
- Minor re-contouring and stabilization for the existing slope southwest of the public parking area in order to create a grass amphitheater for an outdoor teaching area.
- Removal of the mobile home west of the public parking lot that currently serves as the caretaker’s residence and construction of a new wood frame caretaker dwelling.
- Construction of a new 5,000 square-foot one-story maintenance building and an uncovered storage area of...
approximately 40,000 square feet west of the public parking lot. Uphill plantings will screen the storage area from the park center.

- Redevelop the area currently used to store maintenance equipment as an information kiosk.
- Pave and stripe the upper gravel parking area, including drop-off areas and two handicapped parking spaces.
- Modify restroom facilities to comply with ADA standards.
- Designate a 100-acre area in the southeast of the park for wildlife. Visitor access to this area will be limited or prohibited.

Mitigation Improvements (Environmental Violation)

- Removal of non-native Himalayan Blackberry and English Ivy from four site areas in the Environmental Overlay Zones south and east of the Park and north of Johnson Creek, as well as removal of these species from an area in a residential zone east of the Park. Each area has been replanted with native trees, shrubs, and groundcovers as identified on Portland’s Native Plant List.
- Construction of a split-rail fence and information kiosk east of the Park boundary in area designated Site 4 Middle.
- Removal of small shed from area designated Site 2.

Because 33.820.060 limits Plan duration to a maximum of ten years, the second phase cannot be approved as part of the Plan, but is included to provide a long-term perspective of the Water Bureau goals. Listing in this document of developments that may occur in phase 2 does not, in any way, suggest that they should or could be approved in a future land use application. The phase 2 uses identified in the master plan are:

**Phase 2 (more than ten years from Plan adoption-not approved as part of the Plan)**

**Water System Improvements**
- Two additional 50 mg underground reservoirs.
- An 84-inch transmission conduit from Bull Run Reservoir.
- A water treatment plant if warranted by future studies.

**Park Improvements**
- A second parking lot to the north of the existing parking lot if warranted based on future traffic studies.

Because these uses are so speculative or are likely to occur beyond the term of the master plan, these uses do not qualify as “possible future uses.” Applicant’s decision not to include a water treatment plant among the possible uses in phase 1 of the master plan is consistent with the phasing approach for a master plan as defined in the Code. The possibility that a new water treatment plant will be sited
at the park is too speculative at this time to require that it be included among the “possible future uses” that must be included in the ten-year conditional use master plan application. Development of a new water treatment plant is not included in the Water Bureau’s 10-year capital improvement program; funding has been identified only for a public involvement program, a siting study, and development of a plan for implementing the resulting treatment decisions. The Council has not selected from among the potential sites that have been identified for such a facility.

The purpose of the requirement for including all possible future uses – to allow for a comprehensive review of the cumulative impacts of the proposed uses – is also satisfied without the inclusion of the treatment plant at this time. The cumulative impacts of the uses included in phase 1 have been identified and evaluated in the master plan. Although some objections have been raised to the impacts of the maintenance yard and the pump station as individual facilities, no objections have been raised to the cumulative impacts of the entire group of facilities that are included in phase 1. Therefore, we conclude that the cumulative impact of these facilities is acceptable. If the Council’s decision after a public process on the siting of a water treatment plant ultimately is to locate the plant at the park, a major amendment to the master plan would be required. The additional and cumulative impact of that treatment plant will be addressed during the review of that amendment request.

With a condition limiting master plan approval to only those elements listed in phase 1 [with the exception of the RF tower], this criterion is satisfied.

33.820.050 Approval Criteria. Requests for conditional use master plans will be approved if the review body finds that the applicant has shown that all of the following approval criteria are met:

A. The master plan contains the components required by 33.820.070;

Findings: Below are listed the Plan components required Section 33.820.070, each followed by a discussion of how they are met.

33.820.070 Components of a Master Plan. The applicant must submit a master plan with all of the following components. The review body may modify the proposal, especially those portions dealing with development standards and review procedures. The greater the level of detail in the plan, the less need for extensive reviews of subsequent phases. Conversely, the more general the details, the greater the level of review that will be required for subsequent phases.
A. **Boundaries of the use.** The master plan must show the current boundaries and possible future boundaries of the use for the duration of the master plan.

Boundaries of the Master Plan are shown on Figure 6 of the Plan document, Exhibit A. It includes all contiguous land owned by the City or over whose use and development the City can exercise greater than possessory control (such as easements). Since Plan submission, the boundaries have been expanded to include land to the east and south of Powell Butte. These areas were included in the public notice.

In the future the City may acquire additional land adjacent to the Plan area to expand recreation facilities, protect and buffer significant natural resources, or provide additional water facilities that are unforeseen at this time. The applicant requests authority to expand Plan boundaries subject to approval criteria and review procedures contained in the Plan. This request is discussed under Component K below.

Any modifications resulting from this review will need to be incorporated into the Master Plan so there is a single document available that contains all approvals. Prior to any development under this plan, a new Master Plan document incorporating all required changes must be produced and four copies delivered to the City.

With a condition requiring creation of a revised final Master Plan document incorporating all changes required by this land use review, this requirement is satisfied.

B. **General statement.** The master plan must include a narrative that addresses the following items:

1. A description in general terms of the use's expansion plans for the duration of the master plan;
2. An explanation of how the proposed uses and possible future uses comply with the conditional use approval criteria; and
3. An explanation of how the use will limit impacts on any adjacent residentially zoned areas. The impacts of the removal of housing units must also be addressed.

The Plan describes the developments that are proposed to be developed during the term of the master plan. See the listing under the discussion of the previous criterion. The Plan also describes how the Conditional Use approval criteria of Zoning Code Chapter 33.815 are met. That item is discussed previously in this decision.

The phase 1 proposed uses will not adversely impact adjacent residential areas because the park activity is generally separated from the neighborhoods by
relatively large distances, significant topographic changes, and substantial vegetation. Proposed park uses will not generate significant noise and will be limited by park operating hours to daytime operations. Parking, trailheads, and pedestrian pathways are provided in numbers and locations sufficient to reduce the likelihood that park users will trespass on or otherwise interfere with the privacy or security of adjoining residential property. With the exception of trailhead access points, proposed park development is in the park interior, away from adjacent residences. The main park entry is a private driveway that connects directly to SE Powell Boulevard, an arterial street, and does not have access to adjacent residential property.

The water reservoir is also toward the park interior, so ongoing operations after construction will use the park entry road and be separated from the residential area. Water supply pipelines will extend from the park east toward Johnson Creek, and be in a utility corridor that passes through the adjacent residential area. With the exception of a pump station on the east park boundary, most pipeline-related facilities will be underground and have no impact on residential uses or activities. The only residence that will be removed as part of this Plan will be the Powell Butte Park caretaker’s manufactured home, which will be replaced with a more permanent structure.

Impacts on adjacent residential development are also discussed earlier in this decision under the Conditional Use approval criteria of 33.815.

With a condition limiting Master Plan approval to only those elements listed in Phase 1, this requirement is satisfied.

C. Uses and functions. The master plan must include a description of present uses, affiliated uses, proposed uses, and possible future uses. The description must include information as to the general amount and type of functions of the use such as office, classroom, recreation area, housing, etc. The likely hours of operation, and such things as the approximate number of members, employees, visitors, special events must be included. Other uses within the master plan boundary but not part of the conditional use must be shown.

The Plan describes present uses and development, and proposes numerous development and activity elements in two phases: the first within a ten-year period, and the second during the subsequent forty years. (Because 33.820.060 limits Plan duration to a maximum of ten years, the second phase cannot be approved as part of the Plan, but is included to provide a long-term perspective of the Water Bureau goals.) Proposed uses have been described in the Master Plan and listed above in discussion relating to the Conditional Use criteria. The master plan, supported by evidence presented in the hearings, details the planned locations, dimensions, and capacities of the proposed developments, and describes the hours of use and how
they will be used. This includes detailed information on the types of uses that will be included in the maintenance yard / storage building facility, such as the number and types of vehicles that will be parked and stored there, and the various types of equipment and supplies that will be stored there. [These uses were described earlier in this decision under the criteria for Conditional Uses.] By listing the proposed developments and uses in the Master Plan, and by presenting evidence on the manner in which the developments will be used or operated, this requirement is satisfied.

**D. Site plan.** The master plan must include a site plan, showing to the appropriate level of detail, buildings and other structures, the pedestrian, bicycle, and vehicle circulation system, vehicle and bicycle parking areas, open areas, and other required items. This information must cover the following:
1. All existing improvements that will remain after development of the proposed use;
2. All improvements planned in conjunction with the proposed use; and
3. Conceptual plans for possible future uses.
4. Pedestrian, bicycle, and transit facilities including pedestrian and bicycle circulation between:
   a. Major buildings, activity areas, and transit stops within the master plan boundaries and adjacent streets and adjacent transit stops; and
   b. Adjacent developments and the proposed development.

A site plan that includes all of the required elements listed above has been included in the application. The level of detail provided is appropriate for the master plan. Water transmission and storage facilities have not been fully engineered pending Conditional Use approval, so detailed appearance and location of above-ground structures such as vents and access points are unknown. However, the capacities, locations and dimensions of the water facilities are clearly identified. Park facilities such as the parking lot design, caretaker’s residence, maintenance facility, and park buildings, are also shown only in conceptual form, although the locations and dimensions of those facilities are also clearly shown. There will be review of Master Plan elements prior to construction (pages 21-32 of the Master Plan, Exhibit A). The future review aspects of the Plan are discussed below under Section E (Development Standards). This requirement is met.

**E. Development standards.** The master plan may propose standards that will control development of the possible future uses that are in addition to or substitute for the base zone requirements and the requirements of Chapters 32.32 and 32.34 of the Sign Code. These may be such things as height limits, setbacks, FAR limits, landscaping requirements, parking requirements, sign programs, view corridors, or facade...
Development standards are proposed in the Plan (pages 26-29 of the Master Plan, Exhibit A). They are generally consistent with as the OS base zone standards, although there are several exceptions. In order to retain the open space and natural resource character of the site, several modifications to Table 3 (Proposed Master Plan Development Standards) on pages 26-29 of the Plan, Exhibit A, must be made. The following is a list of the changes and the reasons for them:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Reason for Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building Height (p 27)</strong></td>
<td>This section should be deleted. There is a 50-foot maximum height limit for buildings in the OS zone. None of the proposed buildings need to exceed this limit. Towers are exempted under certain circumstances. Zoning Code standards are adequate and should be used.</td>
</tr>
<tr>
<td><strong>Utility Lines and Corridors (p 27)</strong></td>
<td>Major purposes of the groundcover include erosion control and biodiversity. Recommended changes emphasize the need to achieve maximum groundcover in the minimum time, reducing erosion potential and stormwater contamination. They also allow a choice of planting methods that will achieve the desired end result, and can take into account availability of plants or seeds, season, topography, and other variables that affect plant growth and survival rates. Specifying number of species increases the variety of food for native birds and animals, provides scenic and amenity values, and generally adds to the biodiversity of the area. These requirements are the same as those of Transition Area revegetation for the Columbia South Shore Plan District.</td>
</tr>
<tr>
<td><strong>Tree</strong></td>
<td>Trees may be removed if they are not in sc</td>
</tr>
<tr>
<td>Preservation, removal, and replacement (p 27)</td>
<td>an Environmental Protection Zone and:</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>Tree preservation, removal, and replacement (cont.)</td>
<td>- Are species listed as Nuisance Plants or Prohibited Plants on the Portland Plant List, hawthorne trees, or trees shown in the Master Plan as being removed for construction of water supply facilities as approved through this Master Plan, or</td>
</tr>
<tr>
<td></td>
<td>- Within ten feet of any proposed structure/building or five feet of the periphery of paving, outdoor activity areas driveways or utility line corridors shown on the approved Site Plan, or</td>
</tr>
<tr>
<td></td>
<td>- Smaller than six inches in diameter measured four feet above grade, or</td>
</tr>
<tr>
<td></td>
<td>- May block views from scenic viewpoints as listed on page 68 of The Scenic Resources Protection Plan, as determined by the City Forester or</td>
</tr>
<tr>
<td></td>
<td>- Otherwise specifically allowed to be removed in the Conditional Use Master Plan.</td>
</tr>
</tbody>
</table>

Trees not on the Portland Plant List in the open meadow area shown on the Site Plan may be removed without replacement.

Other trees may be removed if the City Forester finds that they are diseased or damaged or otherwise pose an immediate hazard to people or property.

A separate permit from the City Forester is required to plant, remove, prune, spray, or maintain any tree located on public property or the public right-of-way.

Except for trees removed from the open meadow area, trees that are removed shall be replaced with native species. A permit from the City Forester is required to plant, break, prune, spray, remove, or
impact trees on City Property, including Powell Butte. Mitigation for permitted tree removal will be determined by the City Forester. Mitigation requirements will be consistent with mitigation requirements at other public properties and will not be less than the following:

- For every six inches of diameter of tree removed, at least three trees shall be replanted on the site at least ten feet from a paved surface and 20 feet from a structure.
- The replacement trees must be a minimum of one-half inch diameter and selected from the Plant List.

### Street trees (p 28)

Street trees will be native species where practical as determined by the City Forester. No permit will be issued for trees listed as a nuisance plant or prohibited plant on the Portland Plant List. Tree placement will be determined by the City Forester. Street trees shall also comply with Portland City Code Chapter 20.40 and 33.430.

Suggested by the City Forester.

### All Other Standards (to be added at the end of the table)

Standards that are not specifically stated here shall be those of the Zoning Code (base zone as modified by the plan district or overlay zone)

This addition should clarify that there will continue to be development standards not specifically mentioned in the Master Plan that will have to be met.

With these changes this requirement is met.

**F. Phasing of development.** The master plan must include the proposed development phases, probable sequence for proposed developments, estimated dates, and interim uses of property awaiting development. In addition the plan should address any proposed temporary uses or locations of uses during construction periods.

Two development phases are proposed: one for projects up to ten years from Plan approval, and the second for others beyond ten years. Zoning Code section 33.820.060 limits the Master Plan to those projects or activities that are begun within ten years, so Phase 2 cannot be approved as part of this Plan. Therefore, only one phase, with all Phase 1 projects listed in Table 1 on page 15 of the Plan, is necessary for this master plan. The Bureaus have noted that funding limitations
will determine the precise schedule for the development of each of the facilities, although all of the developments will occur within ten years. The conditions of approval require certain improvements to be made prior to the identified phase 1 uses. They include an improved pedestrian connection from the park center and the addition of bicycle parking facilities. The conditions also require the parking lot improvements, interpretive center/public restroom remodeling, maintenance yard and storage building, and relocation of the caretaker residence to occur coincident with development of the 50 million gallon reservoir.

The master plan identifies the interim uses of all property awaiting development as park use. The plan addresses stormwater management facilities as temporary uses during construction of phase 1 facilities as well as temporary construction-period disturbance areas and parking requirements.

With a condition limiting Master Plan approval to only those items listed in Phase 1, this requirement is satisfied.

G. Transportation and parking. The master plan must include information on the following items for each phase.

1. Projected transportation impacts. These include the expected number of trips (peak and daily), an analysis of the impact of those trips on the adjacent street system, and proposed mitigation measures to limit any projected negative impacts. Mitigation measures may include improvements to the street system or specific programs to reduce traffic impacts such as encouraging the use of public transit, carpool, vanpool, and other alternatives to single occupancy vehicles.

2. Projected parking impacts. These include projected peak parking demand, an analysis of this demand compared to proposed on-site and off-site supply, potential impacts to the on-street parking system and adjacent land uses, and mitigation measures.

The applicant has prepared an analysis of parking and transportation conditions at Powell Butte Park. That analysis (Lancaster Engineering, 1999) demonstrates that parking supply on the site is adequate for current and expected park visitors. The analysis further demonstrates that the intersection of SE Powell Boulevard at SE 162nd Avenue, which serves the main entrance to the park, operates at an acceptable level of service consistent with City requirements. This is adequate to serve the needs of projected future parks and water facilities at Powell Butte. The master plan includes requirements to conduct new traffic analyses at five-year intervals. Providing parking for City vehicles and equipment, and for city employee’s vehicles, in the maintenance yard will assure that the park center parking lot will be adequate to serve the needs of park visitors. This criterion is met.
**H. Street vacations.** The master plan must show any street vacations being requested in conjunction with the proposed use and any possible street vacations which might be requested in conjunction with future development. (Street vacations are under the jurisdiction of the City Engineer. Approval of the master plan does not prejudice City action on the actual street vacation request.)

No street vacations are requested with the Plan.

**I. Adjustments.** The master plan must specifically list any adjustments being requested in conjunction with the proposed use or overall development standards and explain how each adjustment complies with the adjustment approval criteria.

Two Adjustments are requested: elimination of the interior landscape requirements for the parking lot, and a request to remove trees less than six inches in diameter. The Plan includes a discussion of how the approval criteria are met; this decision reviews the requested adjustments in a separate section under Adjustments. To the extent that the Adjustment approval criteria are met, this requirement is also met.

**J. Other discretionary reviews.** When design review or other required reviews are also being requested, the master plan must specifically state which phases or proposals the reviews apply to. The required reviews for all phases may be done as part of the initial master plan review, or may be done separately at the time of each new phase of development. The plan must explain and provide enough detail on how the proposals comply with the approval criteria for the review.

In addition to the Conditional Use Master Plan and Adjustment reviews, Environmental Review for both proposed work in the Environmental Zone and for past violations of Environmental Zone requirements are part of the review of this one-phase master plan. The master plan includes explanations on how both required environmental reviews are satisfied; these reviews are discussed later in this report. To the extent that the applicable approval criteria for the environmental reviews are met, this requirement is, therefore, also met.

**K. Review procedures.** The master plan must state the procedures for review of possible future uses if the plan does not contain adequate details for those uses to be allowed without a conditional use review.

Because of the large scale of the plan and relatively long term for implementation (the full ten years is expected for Plan elements, and a much longer time period - forty years or more for additional water system development), it is not possible to
accurately determine full design details and impacts at this time. As the various Plan elements are financed and designed, alterations from the Plan (including expansion of Plan boundaries) may be necessary. To accommodate both minor and major unanticipated events, additional reviews are proposed for virtually all future development. The Plan identifies review levels for a variety of uses and activities, but does not include any criteria for granting approval of the proposed uses and activities. Review approval criteria must be included to ensure that the appropriate Code approval criteria continue to be met with the specific design as they were with the Master Plan and more conceptual proposal. For development and uses approved under the Master Plan this requires enough additional information to show that the size, location, and method of development of the use will meet the purpose of the Open Space zone, protect significant scenic views, result in no loss of resource values, and not overburden City services (especially traffic). Those reviews, however, should not revisit issues that have been resolved through the Master Plan itself. For example, for a development that is no more than 110% of the size and is at the location approved in the master plan, the appropriateness of the basic use, its intensity and general location, and compliance with environmental review criteria have already been demonstrated and cannot be revisited.

Below are the levels of review and master plan approval criteria for phase 1 developments or for amendments to the plan. They would replace the Master Plan text found on pages 21-31 dealing with future reviews and Table 4 on page 32.
<table>
<thead>
<tr>
<th>Development, Use, or Action</th>
<th>Approval Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TYPE I REVIEW</strong></td>
<td></td>
</tr>
<tr>
<td>Contraction of Master Plan Boundaries</td>
<td>The area to be removed from the Master Plan does not include any development, including environmental mitigation areas, that has been approved on the approved Master Plan site plan.</td>
</tr>
<tr>
<td></td>
<td>All Zoning Code requirements and Master Plan requirements will continue to be met. This includes Zoning Code requirements (such as minimum lot size) for the area that is removed from the Master Plan.</td>
</tr>
<tr>
<td></td>
<td>Scenic resources will be protected.</td>
</tr>
<tr>
<td></td>
<td>Natural resource values, including wildlife corridors and important habitat areas, will be protected.</td>
</tr>
<tr>
<td>Expansion of Master Plan Boundaries when</td>
<td>The purpose of the Master Plan and intended character of the Master Plan site will continue to be met with the expansion.</td>
</tr>
<tr>
<td>• The expansion area is five acres or less in size</td>
<td></td>
</tr>
<tr>
<td>• In combination with all other expansions since the effective date of Conditional Use Master Plan approval, total area of the proposed and all previous expansions do not exceed 10% of the Master Plan area.</td>
<td></td>
</tr>
<tr>
<td><strong>TYPE II REVIEW</strong></td>
<td></td>
</tr>
<tr>
<td>Allowed by the Master Plan and</td>
<td>The development or use is in substantially the same area as shown on the approved Master Plan site plan.</td>
</tr>
<tr>
<td>• Does not require a higher level of review.</td>
<td>The construction management plan prevents adverse impacts to areas outside of the approved disturbance area.</td>
</tr>
<tr>
<td>• Except for trail improvements, the development or use and disturbance area is outside of the Environmental Protection Zone.</td>
<td>A mitigation/restoration plan ensures no net loss of resource values.</td>
</tr>
<tr>
<td>• The development or use is no greater than 110% larger or more intense than that shown on the approved Master Plan site plan.</td>
<td>Views from Scenic Viewpoints shown on page 68 of the Scenic Resources Protection Plan will not be blocked or impaired.</td>
</tr>
<tr>
<td>• The disturbance area is no greater than 110% of that shown on the approved Master Plan site plan.</td>
<td>Designated outdoor storage and maintenance areas and maintenance buildings will be landscaped to mitigate for adverse impacts to scenic views from Scenic Viewpoints shown on page 68 of the Scenic Resources Protection Plan.</td>
</tr>
<tr>
<td>There are no additional traffic impacts that require traffic improvements or additional parking spaces.</td>
<td>The construction management plan prevents adverse impacts to areas outside of the approved disturbance area. All Zoning Code requirements are met unless superceded by the Master Plan standards are met.</td>
</tr>
<tr>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Construction of new trail or relocation of an existing trail</td>
<td>The construction management plan prevents adverse impacts to areas outside of the approved disturbance area. A mitigation/restoration plan ensures no net loss of resource values. The trail is not in the Environmental Protection Zone</td>
</tr>
<tr>
<td>TYPE III REVIEW</td>
<td></td>
</tr>
<tr>
<td>Allowed by the Master Plan and exceeds the thresholds for a Type I or Type II review.</td>
<td>The development or use is in substantially the same area as shown on the approved Master Plan site plan. The applicable requirements of the Environmental Zone are met. Scenic resources are protected. The purpose of the Open Space Zone is met. Services are capable of serving the expanded development or use. Adverse impacts to surrounding residential areas are minimized All Zoning Code requirements are met unless superceded by the Master Plan</td>
</tr>
</tbody>
</table>
| Expansion of Master Plan Boundaries when  
- The expansion area is greater than five acres in size or  
- In combination with all other expansions, total area of expansion is greater than 10% of the Master Plan area. | Scenic resources are protected. The purpose and intended character of the Open Space Zone is met. Adverse impacts to surrounding residential areas are minimized |
| Uses not allowed by the Master Plan | Major Amendment to a Conditional Use Master Plan |
| Contraction of Master Plan Boundaries that cannot meet the approval criteria for a Type I review | Major Amendment to a Conditional Use Master Plan |

As amended, the master plan requires a Type II review for most developments. This level of review is appropriate because the impacts of the phase 1 uses do not justify requiring a public hearing on every development. Environmental review and the other discretionary reviews of the master plan are completed in the current decision; this decision concludes that the proposed phase 1 uses are appropriate for
the park and comply with the applicable code criteria, that no significant detrimental impacts are caused by the phase 1 developments, and that the mitigation that has been proposed for the impacts that do occur will be adequate. Therefore, automatically requiring a public hearing for each phase 1 development is unnecessary. The Type II review that is provided assures that an administrative review is conducted in compliance with the development standards, that interested parties will have an opportunity for input on issues of interest to them, and also assures the right to appeal if that party disagrees with the administrative decision.

The approval criteria included in this revised table are adequate to assure that the development is consistent with what is approved in the master plan and that the purposes of the Code are achieved in the final designs of the proposed developments. They do so by:

- Confirming that the proposed development is substantially similar to and is in substantially the same location as is approved in the master plan. This ensures that the impacts of the development will be consistent with those that have been reviewed by the Council for this decision.
- Confirming that the measures to be taken – the construction management plan and the mitigation/restoration plan – to minimize or mitigate for impacts include the measures described in the master plan. This decision concludes that these measures are adequate, if implemented, to prevent significant detrimental impacts to natural resources and functional values on the site, and to prevent other adverse impacts to adjacent properties and uses. The construction management plan must prevent adverse impacts to areas outside of the approved disturbance area, and the mitigation/restoration plan must include measures that ensure no net loss of resource values as a result of the development.
- Assuring that particular attention will be paid to protection of views from scenic viewpoints. Under a Type II procedure, a proposed development may be up to 10% larger or more intense than what is approved in the master plan. Under these approval criteria, those modifications may not result in modifications to the structures that will impair views, and the maintenance yard must be landscaped to mitigate for any potential impacts on views from designated scenic viewpoints. For proposed developments that exceed the threshold of the Type II review, additional environmental review will be required to assure that resource impacts are adequately evaluated, and other reviews (such as a traffic analysis) may be required to evaluate potential impacts on surrounding areas.
- Assuring compliance with all standards of the master plan and all zoning code requirements that are not superceded by the master plan.

With the changes reflected in the table above, this requirement is met.

B. The proposed uses and possible future uses in the master plan comply with the applicable conditional use approval criteria;
Findings: The Plan describes how the Conditional Use approval criteria of Zoning Code Chapter 33.815 are met. This item was discussed previously in this decision under the Conditional Use criteria; the Council concluded that the master plan complies with the applicable conditional use criteria. To the extent that the applicable approval criteria are met as previously discussed, this criterion is also met.

C. The proposed uses and possible future uses will be able to comply with the applicable requirements of this Title, except where adjustments are being approved as part of the master plan.

Findings: Two Adjustments are proposed: elimination of interior landscape requirements for parking lots and permission to remove trees greater than six inches in diameter. The Plan demonstrates how, with granting of Adjustments and other reviews requested in this application, the applicable requirements of the Zoning Code can be met. This decision reviews the master plan’s approach to compliance with the applicable requirements of the code. A number of conditions and changes to the Plan are also included in this decision. With these conditions and changes, this criterion is met.

33.820.060 Duration of the Master Plan. The master plan must include proposed uses and possible future uses that might be proposed for at least 3 years and up to 10 years. An approved master plan remains in effect until development allowed by the plan has been completed or the plan is amended or superceded.

Findings: As noted previously, the Master Plan proposes two phases: one for projects begun within ten years of Plan adoption, and the second for projects after the ten-year period. Zoning Code section 33.820.060 limits Master Plan duration to a maximum of ten years, so Phase 2 cannot be approved as part of this Plan. Additionally, there has been no analysis of projects proposed under Phase 2, so it cannot be concluded that the land use approval criteria are met for those projects. Therefore, only one phase, with all Phase 1 projects listed in Table 1 on page 15 of the Plan, can be done.

The inclusion of a water treatment plant in phase 2 of the master plan is appropriate. The possibility that a new water treatment plant will be sited at the park is too speculative at this time to require that it be included among the phase 1 “possible future uses” that must be included in a conditional use master plan application. Development of a new water treatment plant is not included in the Water Bureau’s 10-year capital improvement program; funding has been identified only for a public involvement program, a siting study, and development of a plan for implementing the resulting treatment decisions. The Council has not selected from among the potential sites that have been identified for such a facility.
With a condition limiting Master Plan approval to only those elements listed in Phase 1, this requirement is satisfied.

33.537 JOHNSON CREEK BASIN PLAN DISTRICT

33.537.010 Purpose
The Johnson Creek Basin plan district provides for the safe, orderly, and efficient development of lands which are subject to a number of physical constraints, including significant natural resources, steep and hazardous slopes, flood plains, wetlands, and the lack of streets, sewers, and water services. At certain locations, the density of development is limited by applying special regulations to new land division proposals. In addition, restrictions are placed on all new land uses and activities to reduce stormwater runoff, provide groundwater recharge, reduce erosion, enhance water quality, and retain and enhance native vegetation throughout the plan district. At other locations, development is encouraged and mechanisms are included that provide relief from environmental restrictions.

This plan district is intended to be used in conjunction with environmental zoning placed on significant resources and functional values in the Johnson Creek basin, to protect resources and functional values in conformance with Goal 8 of the Comprehensive Plan and Statewide Planning Goal 5.

Findings: Appellant Centennial Community Association contends in their appeal that the maintenance yard violates the purpose of the Johnson Creek Basin Plan District. The applicable portions of the Purpose section are the statements regarding limitations on all new land uses and the direction that the plan be used in conjunction with the environmental zone. Compliance with the environmental zone is addressed in a separate section of this decision. The restrictions imposed on new development are stated in PCC 33.537.205 and are discussed below. To the extent that the maintenance yard complies with the environmental zone and 33.537.205, this criterion is met.

33.537.205 Site Development Standards
A. Tree removal. Trees greater than six inches in diameter may be removed only in the following situations:
   1. When they are within 10 feet of an existing or proposed building or 5 feet of a paved surface;
   2. When they are diseased or pose an immediate danger, as determined by the City Forester or a certified arborist; or
   3. When they are below the ordinary high water level of Johnson Creek.
B. Impervious surface. No more than 50 percent of any site may be developed in impervious surface. Building eaves are included in the calculation of impervious surface.

C. Stormwater collection. All storm water originating on the site must be managed to ensure that development on the site does not contribute to flooding. Stormwater collection systems must be designed so that the post-development stormwater flow rate off the site is no greater than the pre-development flow rate off the site.

Findings: Development of the maintenance yard does not require the removal of any trees greater than six inches in diameter. The Powell Butte site totals approximately 600 acres; the maintenance yard has an area of approximately one acre, approximately half of which will be impervious surface. This impervious area is far below the 50% limit of this criterion. The stormwater management plan provides for collection of runoff from this site for diversion to the comprehensive stormwater treatment and discharge system for the park. These measures will limit post-development flow to pre-development rates. This criterion is met.

33.430 ENVIRONMENTAL ZONES

33.430.010 Purpose. Environmental zones protect resources and functional values that have been identified by the City as providing benefits to the public. The environmental regulations encourage flexibility and innovation in site planning and provide for development that is carefully designed to be sensitive to the site's protected resources. The environmental regulations also carry out Comprehensive Plan policies and objectives.

The Master Plan addresses compliance with the environmental review regulations. The application was found complete by the City of Portland Bureau of Development Services.

33.430.80 Items Exempt From These Regulations
The following items, unless prohibited by Section 33.430.090, below, are exempt from the regulations of this chapter:

C. Existing development, operations, and improvements, including the following activities:
   5. Removing a tree listed on the Nuisance or Prohibited Plant Lists. Removing other trees or portions of trees when they pose an immediate danger, as determined by the City Forester or a certified arborist. Removing these portions is exempt only if all sections of wood greater than 12 inches in diameter remain, or are placed, in the resource area of the same ownership on which they are cut.

Appellants contend that the use of herbicides is not permitted because no environmental review of the use of herbicides was included in the master plan application. Applicant has submitted documentation (Exhibit I-5) demonstrating that herbicides will be used to remove plants on the Nuisance and Prohibited Plants list. Removal of plants on the list is
exempt from environmental review. PCC 33.430.080.C.5. Applicant’s documentation also includes the Parks Bureau’s Integrated Pest Management program policies which assure that water resources and Water Bureau facilities are protected against contamination from herbicide uses. These policies assure that this activity will not result in significant detrimental impacts on the resources or functional values of Powell Butte. The proposed plant removal, by use of herbicides or any other method, is exempt from environmental review, and Appellant’s claim is denied.

33.430.240 Supplemental Application Requirements
In addition to the application requirements of Section 33.730.060, the following information is required for an environmental review application:

A. Supplemental site plan requirements. One copy of each plan must be at a scale of at least one inch to 100 feet. Site plans must show existing conditions, conditions existing prior to a violation, proposed development, and construction management. A mitigation site plan is required whenever the proposed development will result in unavoidable significant detrimental impact on the identified resources and functional values. A remediation site plan is required whenever significant detrimental impacts occur in violation of the Code and no permit was applied for. The Director of OPDR may waive items listed in this Subsection if they are not applicable to the specific review; otherwise they must be included. Additional information such as wetland characteristics or soil type may be requested through the review process.

1. Site plans must show the following:
   a. For the entire site:
      • 100-year floodplain and floodway boundaries;
      • Boundaries of the resource area and the transition area. These boundaries may be scaled in relation to property lines from the Official City Zoning Maps;
      • Topography shown by contour lines at two foot vertical contours in areas of slopes less than ten percent and at five foot vertical contours in areas of slopes ten percent or greater;
      • Drainage patterns, using arrows to indicate the direction of major drainage flow; and
      • Existing improvements such as structures, or buildings, utility lines, fences, etc.
   b. In areas of the site that have been or will be disturbed:
      • Distribution outline of shrubs and ground covers, with a list of most abundant species;
      • A grading plan showing proposed alteration of the ground at two foot vertical contours in areas of slopes less than ten percent and at five foot vertical contours in areas of slopes ten percent or greater; and
      • Trees greater than six inches in diameter, identified by species. In the case of violations also indicate those that were cut or damaged by stump diameter and species.
c. In areas of the site that are and will remain undisturbed: Tree crown cover outline, and generalized species composition.

2. A construction management site plan including:
   • Areas that will be disturbed, including equipment maneuvering areas;
   • Areas where existing topography and vegetation will be left undisturbed;
   • Location of site access and egress;
   • Equipment and material staging and stockpile areas;
   • Erosion control measures; and
   • Measures to protect trees and vegetation.

3. A mitigation or remediation site plan including:
   • Dams, weirs, or other in-water structures;
   • Distribution outline, species composition, and percent cover of ground cover to be seeded or planted;
   • Distribution outline, species composition, size, and spacing of shrubs to be planted;
   • Location, species, and size of each tree to be planted;
   • Stormwater management features, including retention, infiltration, detention, discharges, and outfalls;
   • Water bodies to be created, including depth;
   • Water sources to be used, including volumes; and
   • Information showing compliance with Section 33.248.090, Mitigation and Restoration Plantings.

Figures 7 through 12 of the master plan (Exhibit A-1) contain the site plan information required by A.1. Appendix B of the master plan is a construction management plan that addresses the requirements of A.2. The code requires a mitigation plan only for developments that have significant detrimental impacts. [33.430.240.B.3 states that “the purpose of a mitigation or remediation plan is to compensate for unavoidable significant detrimental impacts that result from the chosen development alternative or violation as identified in the impact violation.”] Later in this decision, we conclude that the proposed phase 1 developments do not result in any significant detrimental impacts; therefore, no mitigation plan is required of this master plan.

The application was found complete by the City of Portland Bureau of Development Services.

B. Supplemental Narrative. The following is required:
   1. Impact evaluation. An impact evaluation is required to determine compliance with the approval criteria and to evaluate development alternatives for a particular site. The alternatives must be evaluated on the basis of their impact on the resources and functional values of the site. In the case of a violation, the impact evaluation is used to determine the nature and scope of the significant detrimental impacts. To the extent that the site resources and
functional values are part of a larger natural system such as a watershed, the evaluation must also consider the cumulative impacts on that system. The impact evaluation is based on the resources and functional values identified as significant in the reports listed in section 33.430.020;

a. An impact evaluation includes:
(1) Identification, by characteristics and quantity, of the resources and their functional values found on the site;
(2) Evaluation of alternative locations, design modifications, or alternative methods of development to determine which options reduce the significant detrimental impacts on the identified resources and functional values of the site; and
(3) Determination of the alternative that best meets the applicable approval criteria and identify significant detrimental impacts that are unavoidable.

The Powell Butte Master Plan area is almost entirely within an Environmental Zone. Natural resources identified on the Butte include aesthetic and scenic resources, opportunities for education and recreation and a diversity of wildlife and wildlife habitats. Following is a summary of resources and their functional values.

**Vistas**

Powell Butte provides expansive vistas in all directions with very high scenic quality. Mt. St. Helens, Mt. Rainier, Mt. Adams, Mt. Hood, the forests of the Clackamas, Sandy and Bull Run watersheds, and most of the surrounding Boring Lava buttes are visible from the upper slopes of the Butte. The Scenic Resources Protection Plan, adopted by the City Council in March 1991 designates six scenic viewpoints for protection on the Butte.

**Vegetation and Wildlife Habitat**

The Butte provides a wide range of vegetation and wildlife habitats ranging from an expansive open grassy meadow on the top, and a shrub scrub transition area on the upper slopes to the south and west, to a mid-serial stage forest area around the base and steep side slopes. There also is an abandoned orchard on the west side of the summit that provides unique habitat opportunities. This broad range of vegetation habitats provide forage, perch, roost and nesting opportunities for a variety of wildlife species. The Butte provides very important wildlife habitat within Johnson Creek and the Portland metropolitan area. The combination of forest and grassland, located adjacent to Johnson Creek, is rare in the urban area.
Education and Recreation

The Butte also provides a range of unique education and recreation opportunities. Existing pedestrian, bicycle and equestrian trails provide opportunities for exercise and enjoyment of the natural area and scenic vistas available on the Butte, as well as connections to the adjacent Springwater Corridor. The broad range of flora and fauna that live on or pass through the site provide educational opportunities for park users.

Impact on Resources

Construction within the “c” zone on the Butte will impact environmental resources and their functional values. Construction will involve removal of existing vegetation and alterations to the existing topography in the "c" zone. Vegetation removal will be primarily limited to grasses, shrubs and blackberries, and to removal of trees listed on the City’s Nuisance and Prohibited Plants Lists. Construction of the pump station will require the removal of approximately 50 mature trees (primarily alder and maple, but also including several fir and cherry trees) over 6” in diameter.

The areas of disturbance for the water facility improvements planned for the next ten years is shown on Figures 8, 15, and 17 of the Master Plan. Disturbed areas will be re-contoured to generally match the existing topography and re-vegetated with native plants, restoring and improving the habitat. The pump station disturbance area may not have the original contours restored, depending on whether the pump station structure is partially buried. However, that site will be graded to manage surface water so that it drains to the detention pond to be constructed nearby.

Construction will generate dust, noise and traffic on the Butte. However these impacts will be short term and will be mitigated through compliance with the proposed construction management plan. No substantial impacts are anticipated after development is complete.

The development in the proposed Master Plan will have only minor impacts on existing aesthetic and scenic resources, and some will be positive. Most of the water facilities will be underground and invisible once construction is complete. Some of the above ground facilities are intended to enhance uses already in existence in the park, such as the maintenance building and caretaker dwelling. Although new structures are proposed in new locations, the structures will be designed to reflect their setting in the park, and they will be sited and landscaped to minimize their visual impacts.

The proposed trails will provide new legal access to the Butte, increasing the potential for human disturbance of wildlife. These impacts will be mitigated by selecting trail alignments that avoid potentially sensitive wildlife areas and steep slopes. Existing “volunteer” trails are likely to have greater adverse impacts as they often travel straight downhill, increasing erosion potential from storm water runoff. “Volunteer” trails will be removed and re-vegetated to eliminate their adverse impacts.
Replacement and relocation of the existing caretaker dwelling will have no long term adverse impact on environmental resources. The proposed new site is approximately 150 feet south of the existing residence. The proposed location for the residence takes advantage of the topography of the Butte to make it less visible from off-site. The proposed site also will allow the caretaker to better monitor activities in the park center. The disturbance area for the relocated facility will not exceed the size of the existing disturbed area. The existing disturbed area will be re-graded and re-vegetated consistent with surrounding natural conditions.

While paving the existing gravel parking lot may have adverse visual impacts by converting the existing rural character of the parking lot to a more urban character, these impacts will be substantially outweighed by reductions in dust, noise and the frequency of maintenance required. Paving the existing packed gravel parking lot will cause a slight increase in storm water runoff. Curbing will be limited to minimize concentration of runoff and maintain existing sheet flow storm water discharge. Runoff from the parking lot will be detained and treated before discharge. The increase in runoff will be offset by the proposed planting of trees in the vicinity of the parking lot, consistent with Bureau of Environmental Services (BES) Stormwater Manual standards.

The interpretive center/information kiosk will be entirely contained within an existing structure. This facility will have no adverse impacts once modification of the structure is completed. In addition, the information provided by this facility may help reduce adverse impacts caused by park users by educating them about the potential impacts of their activities, e.g., that leaving the designated trails can contribute to erosion problems and disturbance of wildlife.

The proposed 5,000 square foot storage/office building within a 40,000 square foot maintenance/storage yard will have some visual impact upon the Park. Exhibit H.13 contains a “Powell Butte Master Plan Maintenance Yard and Storage Building Conceptual Site Plan” showing the location of this facility in relationship to the existing Powell Valley Water “existing tank.” Also included in Exhibit I-4 is a series of photos showing, from different vantage points, the maintenance facility location. These photos demonstrate that the yard will be visible from only a small area of the park adjacent to the yard, and that existing topographic features on the butte obscure the site from the view of most of the park uphill from the maintenance yard site.

The conceptual site plan, photos, and Figure B-3 of the 1996 Master Plan demonstrate the following: (1) the proposed maintenance facility is in close proximity to the Powell Valley above ground water tanks; and (2) the tanks and proposed maintenance building and yard are not within the shaded areas of impact of a designated scenic viewpoint (per Figure B-3); and (3) the applicant’s proposed landscaping will effectively screen the view of the facility from most locations within the park. And, the Council finds that, with the conditions of approval in this decision, the maintenance facility will have only a small impact on resources.
The impact of the developments on the functional values of the park are as follows:

The Johnson Creek Basin Protection Plan identifies 9 significant resource values provided by Powell Butte: water, storm drainage, aesthetics, scenic, pollution and nutrient retention and removal, sediment trapping, recreation, education, and heritage. The following narrative summarizes these resources and their functional values, and evaluates the impacts on them of the proposed master plan developments. Where appropriate, some of these resource values have been combined into a single listing.

**Water**

The master plan identifies several wetlands and potential wetlands around the butte. Swales around the fringe of the butte serve as drainageways. One of these drainage areas is located near the site of the maintenance yard. Johnson Creek, a perennial stream, flows below the park, but there are no flowing streams in the park.

**Impact**

The water resources in the park will not be impacted by the master plan developments. The maintenance yard and other park and water facilities have been sited to avoid wetlands and drainageways. The development of master plan facilities may allow enhancement of some wetlands by diversion of surface flows. The construction management plan and stormwater management plan will prevent impacts to Johnson Creek from erosion and contaminated runoff.

**Storm Drainage / Pollution and Nutrient Retention and Removal / Sediment Trapping**

The largely undeveloped 600-acre nature park provides open meadow and tree-covered slopes that serve important stormwater management and water quality protection functions to the Johnson Creek Basin. The butte consists of two major types of habitat: an open grassland (approximately 400 acres) and a mid-serial stage forest (approximately 200 acres). Existing impervious surfaces are extremely limited. They include only the access road, the park center building, the caretaker’s residence, and the existing Water Bureau reservoir. The large pervious area provides extensive recharge opportunities. This minimizes uncontrolled surface flows, which can be erosive and carry sediment and other contaminants to Johnson Creek. The shrubs and ground cover vegetation on the slopes protect the soil from erosion, and also serve to trap sediment carried by the small amount of surface flow, preventing it from being carried to the creek. The trees, which cover approximately one-third of the site, also assist in removing pollutants from the air.

**Impact**

The water quality and pollution removal functions of the butte will not experience significant detrimental impacts due to master plan developments. The proposed master plan developments will increase impervious surfaces on the butte by approximately 12 acres, or 2% of the 600-acre park area. The impacts of that development are minor and will be mitigated. Most of the development area (approximately 8 acres) consists of buried reservoirs and pipelines; the surfaces above those facilities will be restored to natural contours and revegetated with native grasses to retain the sediment-trapping and erosion control functions. A storm water management plan has been prepared to collect
and detain stormwater runoff from all of the facilities, to allow contaminants to be filtered out of the water before it is discharged to Johnson Creek and to manage the temperature of the discharge.

Aesthetics / Scenic

The view of the forest and meadows on the butte provide offsite scenic values. Satisfying the need for opportunities to view open areas that provide a visual break from continuous development is an important function. Vistas within the park also provide aesthetic values. The value of the vistas from the Butte to areas offsite is discussed in the master plan application.

Impact

Aesthetic and scenic resources on the butte will not experience significant detrimental impacts. Disturbance areas will be visible onsite during the construction period, but most of the new facilities will not be visible after construction. The new reservoirs will be buried, with the original topographic contours and surface vegetation restored. The pump station site is not visible from off the butte, and it will be screened from the view of adjacent properties by a forested buffer. The maintenance yard and storage building will impact the view onsite only from a small area of the park, limited to the trails in the immediate vicinity of the yard. The fence around the maintenance yard will be painted in a neutral color to minimize its visual impact, and the yard will also be heavily screened by newly planted trees around its perimeter. As these trees mature, they will totally screen the facility from onsite views in the same manner as has occurred with the Powell Valley Road Water District reservoirs on the adjacent site.

Heritage / Recreation / Education

The butte was purchased by the City in 1925 as a future site for its water reservoirs and distribution facilities, but was leased for grazing purposes until 1980. Some of the fences erected by the dairy remain, and the retained open meadow reflects the use of the butte for grazing. Pedestrian, equestrian and bicycle trails provide recreational access throughout the park, providing opportunities for exercise, enjoyment of the vistas on and from the Butte, as well as providing a connection to the adjacent Springwater Corridor, along Johnson Creek.

The plants and wildlife on the butte provide opportunities for exploration and research on resources that are not typically prevalent in urban areas. These resources include native plants, native wildlife, urban/natural area interaction, watershed enhancement and surface water management. These resources and the water system facilities also provide opportunities for educational activities about the City’s water distribution system.

Impact

The master plan will not have any significant detrimental impacts on the heritage, recreation and education resources. The proposed developments will not impact any of the remaining fences, and eliminating the invasive hawthorne trees to restore the open meadow will enhance the open meadow heritage. Improvement of the trail system will enhance the recreational opportunities and will reduce conflicts between different user groups. Access to some areas of the park will be temporarily disrupted during
construction of the proposed master plan facilities; however most of the park will remain open and accessible throughout construction. The new facilities will not interfere with educational opportunities, and the amphitheater to be created at the park center will improve the educational experience for small groups visiting the butte.

Because denial is recommended for the Radio Frequency Transmission Facility, this use is not discussed under the environmental review portion of the decision.

Following is a summary of alternative locations, design modifications, and alternative methods to reduce impacts on natural resources:

- **Existing 50 mg reservoir**: The existing 50 mg reservoir must be reinforced to comply with current seismic design requirements. Because this is an existing facility on the Butte, no alternatives are available.

- **Maintenance Building**: The need for a maintenance yard at this location was discussed earlier in this decision under the Conditional Use criteria. The park maintenance building must be located on the Butte to house necessary general maintenance equipment for Butte activities. Locating this structure elsewhere would create additional adverse impacts by increasing the number of vehicle trips to and from the Butte to obtain necessary equipment. Locating the maintenance facilities offsite will also reduce the ability of the Parks and Water Bureaus to perform the increased maintenance responsibilities that will result from the improvements to the park that will be made by the phase 1 master plan improvements. This facility will be constructed adjacent to the existing above ground reservoirs owned by the Powell Valley Road Water District. The trees behind this site will reduce the visual impact of the yard. Additional trees and shrubs will be planted to screen this facility from view. The topography of the site, sloping downhill and away from the rest of the park, will also minimize the portions of the development that will be visible. Although the Council finds that the yard is needed, it encourages applicant, when the final design is prepared, to investigate the potential to reduce the area of the yard and to minimize impervious are.

- **Proposed reservoirs and conduits**: The proposed new water storage, transmission and distribution facilities must be constructed on the Butte in order to connect to existing and planned gravity flow facilities and to allow coordination and integration with existing water facilities on and near the Butte. The existing facilities at Powell Butte are the hub of the City’s water storage and distribution system. All of the City’s water supply flows through Powell Butte on its way to the City’s customers. Water is transported by gravity flow from the Bull Run reservoir to the facilities on the Butte for storage and distribution. Water from the City’s Columbia South Shore well field is also pumped to these facilities for distribution. Water is then distributed by gravity flow to ultimate users throughout the region. Gravity flow would be impossible if this facility is at a lower elevation elsewhere in the region. Without the elevation provided by the facilities on the Butte, pump stations would be required throughout the distribution system. These facilities
would be extremely costly to build and to operate, and pumped facilities are less reliable than transmission systems that rely on gravity flows. The new facilities are intended to work together with the existing and proposed future water facilities to provide ultimate storage capacity of 200 million gallons to serve the identified needs of the system. In order to achieve this integration, the new reservoirs must be constructed on the Butte adjacent to the existing reservoir.

The water storage reservoirs are sized to meet the demands identified by the Water Bureau. Even as broad-based water conservation programs implemented by the Bureau (e.g., the BIG program, aimed at improving water use efficiency by Business, Industry and Government users, the Businesses for an Environmentally Sustainable Tomorrow/BEST conservation awards program, residential customer media and workshop education programs) improve water use efficiency, projected population growth in the City and in the other communities served by the Portland water supply system will require an overall increase in water supply capabilities. Adding a new conduit from Bull Run and increasing storage capacity are necessary to achieve that objective. These facilities must be located at Powell Butte to assure gravity flows can be provided to the entire region served by the system.

The alternatives to building the proposed reservoirs at the proposed capacities are to build more, smaller facilities or a single larger facility. Building smaller reservoirs would create greater impact on the Butte because it would require an increase in the number and duration of construction activities. This added construction activity would result in increased physical disturbance of the site and prolonged disturbance of the recreational and scenic resources at the Butte.

On the other hand, the three proposed reservoirs could not be combined into a single reservoir without greatly increasing the impact on the Butte’s resources. The 20 mg reservoir at the 600-foot level is necessary to provide sufficient elevation to serve part of the City water system’s territory. The 530-foot elevation of the other two proposed reservoirs is adequate to serve the rest of the system with gravity flows. The configuration and sizing of the proposed reservoirs minimizes the impact on the resources of the Butte by clustering the facilities in the 530-foot elevation area already disturbed, and minimizing the size of the facility and disturbance at the 600’ elevation. Burying the reservoirs also results in the least impact on functional values, compared to any above-ground construction options.

The short term construction impacts of these facilities will be minimized by adherence to the development standards and construction management plan which provides for excavation to occur during the dry season, off-site disposal of the majority of excavated material, and erosion control measures and other techniques to limit construction impacts on resources and functional values within the “c” zone. The long term impacts of the facilities are minimized by placing them underground, and by re-grading and re-vegetating the disturbed areas to replicate or improve existing conditions.
Pump Station: The pump station and hydropower generator is necessary to pump water from the 530-foot elevation reservoirs to the proposed 600-foot elevation reservoir. The gravity-fed conduits from Bull Run are not capable of delivering water to the higher reservoir elevation during summer months when the Bull Run reservoir water elevation is drawn down. For the pumps to operate properly, they must be placed at an elevation at least 30 feet below the bottom of the 530-foot reservoirs. The bottom of the 530-foot reservoirs is at 487 feet, requiring an elevation of no higher than 457 feet for the pump station. If the pumps are placed at a higher elevation, air pockets could form within the water being pumped, destroying the pumps. The ground elevation at the pump station site is between 440 and 450 feet, which is a minimum of 37 feet below the bottom elevation of the 530-foot reservoirs.

Alternative sites were examined. The pumps could be located anywhere along the conduit corridor between the 530-foot reservoirs and the proposed location, providing that the elevation is appropriate. The elevations within the park west of the proposed location are too high to satisfy the operating requirements described above. The conduit corridor itself is not an appropriate location because the pump station structure would be too large to fit within the corridor without creating conflicts with the conduits. Those limitations restrict the siting to a location between the proposed location and where the 600-foot reservoir inlet pipe meets the conduit corridor. The location where the outlet pipe and conduits meet would have greater adverse impacts. The pump station (approximately 100x30 feet) would be visible to adjacent residences and from within the conduit corridor to the east; a facility of that size would be hard to effectively screen from the view of the adjacent residences, many of which will be two stories. The proposed site is the most appropriate site because it is located at the rear of a bench and will remain surrounded by mature trees, eliminating any offsite visual impacts from the clearing of the site. Exhibit 22 shows the tree line extends about 40 feet north from the proposed pump station site, and remaining intact. The surrounding area will also be revegetated with shrubs and trees from the native plant list to mitigate the views toward the site of any park users who approach the eastern park boundary.

Applicant evaluated the potential to reduce impacts by burying the facility; however, the evaluation demonstrated that this would not reduce the number of trees to be removed or the width of the disturbance corridor, because the pipelines to and from the reservoir will still require a corridor of that width.

Conduit Corridor: No significant detrimental impacts will occur as a result of developing the conduit corridor. The corridor has already been cleared of trees and replanted with native vegetation. The conduits will be totally buried so will create no visual impacts. The stormwater management plan will prevent detrimental impacts from runoff during and after construction. No suitable alternative locations are available for the conduits. Coming from the City’s Bull Run source, they must enter the park from the east. The proposed alignment is adjacent to existing residential development as it approaches the park and follows existing residential developments as it extends toward the park center. A corridor farther south along
the park boundary would have greater detrimental impacts because those areas are currently less disturbed, and such an alignment would also require a crossing of Johnson Creek. The existing residences to the north of this alignment would preclude any other alignment except for one that extends directly south from Powell Boulevard. Such an alignment would create greater impacts on functional values. It would have to cross the park center to reach the existing and proposed reservoirs. Construction of that segment would significantly disrupt recreational use of the park, since the existing access road, which provides the only vehicle access to the park, would be closed for the construction period. Such an alignment would also be much less efficient for the operation of the water system, as it would require several redirections in the flow to serve the new 600’ elevation reservoir.

- **Construction Activities**: A condition of this decision requires certain parks improvements to be made at the same time as the development of the 50 MG reservoir occurs. This will result in coordination of construction activities and will minimize the period of disturbance on the Butte. The construction management plan identifies disturbance areas and areas to be left undisturbed, site access and egress locations, staging and stockpile areas, erosion control measures, and measures to protect existing trees and vegetation.

As was discussed in the previous section of this decision, no mitigation plan is required for this master plan since we find that no significant detrimental impacts will occur as a result of the phase 1 developments.

The application was found complete by the City of Portland Bureau of Development Services. PCC 33.240(B)(1) submittal requirements were complete at the time of application submittal.

In addition to the completed submittal requirements of PCC 33.240(B)(1), the following findings from the record show how the Phase I Powell Butte Conditional Use Master Plan projects cumulatively do not result in significant detrimental impacts to the site. This can be shown because the projects individually have neutral to beneficial environmental impacts and therefore, cumulatively, have neutral to beneficial impacts.

The following findings from the record address various aspects of the Phase I development and conclude that they do not have a significant detrimental impact on resources or functional values:

**A. Public safety facilities, roads, driveways, walkways, outfalls, utilities, land divisions, and planned unit developments (PUDs)**. Within the resource areas of environmental zones, the applicant's impact evaluation must demonstrate that all of the general criteria in Paragraph A.1 and the applicable specific criteria of Paragraphs A.2, 3, or 4, below, have been met:

1. General criteria for public safety facilities, roads, driveways, walkways, outfalls, utilities, land divisions, and PUDs;
b. There will be no significant detrimental impact on resources and functional values in areas designated to be left undisturbed;

**Findings:** Areas designated to be left undisturbed will not suffer significant detrimental impacts from the development of the phase 1 elements. Construction will generate dust, noise and traffic on the Butte. However these impacts will be short term and will be mitigated through compliance with the proposed construction management plan. The stormwater management plan will also assure that runoff from construction areas will not adversely affect other areas on the butte. The development proposed in the Master Plan will have only minor impacts on existing aesthetic and scenic resources, and some will be positive. Most of the water facilities will be underground and effectively invisible once construction is complete.

No substantial impacts are anticipated after development is complete. The storm water system will not have a significant detrimental impact on resources or functional values in those areas, because any portion of that area disturbed during construction will be replanted with native-species vegetation, and because the storm water in the system will pass through those areas (if at all) in a pipe, reducing the potential for erosion over time and increasing plant survival.

The buried utility connections will not have a significant detrimental impact on resources or functional values in those areas, because any portion of that area disturbed during construction will be replanted with native-species vegetation, and because the utility connections will be underground, rather than above ground where the principal resources and functional values are situated.

c. The mitigation plan demonstrates that all significant detrimental impacts on resources and functional values will be compensated for;

**Findings:** Construction within the “c” zone on the Butte will temporarily impact environmental resources and their functional values. Construction will involve removal of existing vegetation and alterations to the existing topography in the "c" zone. Vegetation removal will be primarily limited to grasses, shrubs and blackberries, and to removal of trees listed on the City’s Nuisance and Prohibited Plants Lists. Construction of the pump station will require the removal of approximately 50 mature trees (primarily alder and maple, but also including some fir and cherry trees) over 6” in diameter.

None of the development will result in significant detrimental impacts on the resources and functional values of the park. Disturbed areas will be re-contoured to match the existing topography to the extent feasible, and re-vegetated with native plants, restoring and improving the habitat. The areas of disturbance for the water facility improvements planned for the next ten years are shown on Figures 8, 15, and 17 of the Master Plan. The pump station disturbance area may not have the original contours restored, depending on whether the pump station structure is
partially buried. However, that site will be graded to manage surface water so that it drains to the detention pond to be constructed nearby. Although the development of the pump station will result in the removal of approximately 50 trees, the disturbance area will remain surrounded by trees, and native plantings will be made at this site and elsewhere in the park to mitigate for the necessary tree removal.

All mitigation will be performed on Powell Butte within the boundaries of the property owned by the City, which is all within the Johnson Creek watershed. The impact of the buried utilities is limited to the temporary trenching for the utility lines and the construction activity associated with trenching and laying the lines. The construction management plan addresses those impacts by requiring regrading to the original grades and replanting of the disturbed area with native plants, but does not include plant specifications.

The stormwater management facilities will be planted with appropriate native plants, and will be lined with impervious material to prevent percolation that could destabilize the north slope of the Butte.

3. Roads, driveways, walkways, outfalls, and utilities;

   a. The location, design, and construction method of any outfall or utility proposed within the resource area of an environmental protection zone has the least significant detrimental impact to the identified resources and functional values of other practicable alternatives including alternatives outside the resource area of the environmental protection zone;

Findings: There are no other practicable locations for the proposed storm water features of the project, because they are needed to accommodate storm water from impervious surfaces where the storm water is generated. Moreover, storm water systems rely on gravity; water flows downhill. Therefore storm water facilities must extend downslope of new impervious surfaces. However, the geology of the north face of the Butte further constrains where storm water can be directed. Discharge of storm water to the north risks further destabilizing of that slope, which would endanger the residential development below. The methods used to address storm water are intended to minimize adverse impacts. There is no significantly different practicable alternative to storm water management that would have less impact. The Stormwater Management Plan minimizes the disturbance of the site by planning for the proposed phased construction. The detention and water quality facilities are conservatively sized but are located to serve the construction of phase 2 facilities, after they have served the same purposes for phase 1 facilities. The design and calculations for the storm water facilities are also based on Johnson Creek Basin Plan requirements limiting the increase of flows to Johnson Creek, and utilize DEQ best management practices. The detention and water quality ponds will also be shaped and landscaped to minimize their impact on the scenic characteristics of the Butte.
Similarly the buried utility facilities and connections have to be located as proposed to connect to the relevant elements of the regional water system in an efficient and safe way. There is no place else other than Powell Butte where the water from Bull Run can be routed. There are no significantly different alternative routes on the Butte that would have less impact. The impact of the major pipelines is minimized by using existing utility corridors. Any alternative route on the Butte would have greater adverse impacts.

b. There will be no significant detrimental impact on water bodies for the migration, rearing, feeding, or spawning of fish; and

**Findings:** There are no fish-bearing streams on Powell Butte. The only fish-bearing stream that could potentially be impacted by the development is Johnson Creek, located south of the Butte. The reservoirs, conduits, and buried utility connections will have no impact on fish, due to the measures provided in the stormwater management plan included in the master plan. The Water Bureau will discharge some storm water to Johnson Creek as it has in the past, but the stormwater management plan provides for detention facilities to prevent an increase in stormwater discharge over what is now occurring. The applicant will treat storm water from the Butte before it is discharged, as directed in the stormwater management plan (Appendix D of the Master Plan), so that the quality of the water will not have a detrimental impact on fish habitat. In addition, the applicant has volunteered to plant trees uphill of the detention pond site prior to development of the detention facility. This will allow the trees to mature before putting the pond into use, so that the trees will be more effective at preventing the detained water from gaining heat prior to discharge to Johnson Creek. The discharge at the Johnson Creek outfall is well established and does not cause erosion or other adverse effects to the habitat. Therefore storm water impacts will not be significantly adverse to fish habitat. This criterion is met.

**B. Resource enhancement projects.** In resource areas of environmental zones, resource enhancement projects will be approved if the applicant's impact evaluation demonstrates that all of the following are met:

1. There will be no loss of total resource area;
2. There will be no significant detrimental impact on any resources and functional values;
3. There will be a significant improvement of at least one functional value.

**Findings:** Vegetative management projects, including tree removal from the meadow area, are considered resource enhancement projects. The resource enhancement activities will not reduce the total resource area. They will not change the size of the resource area. However, they will improve the quality of the habitat resources on the site. The resource enhancement activities will result in significant improvement of at least one functional value. The open grassy meadow is a significant distinguishing feature of the Butte summit. However this open area is
being invaded by Himalayan blackberries and non-native hawthorn. Left unchecked, these invading species will eventually take over the open meadow portion of the Butte. Implementation of the vegetation management project will check this invasion. Non-native plants will be removed and replaced with native grasses on the Portland Plant List, maintaining and enhancing the resource values of the open meadow habitat on the Butte. As noted earlier in this decision, removal of plants on the Nuisance and Prohibited Plants lists is not subject to environmental review. Therefore, the use of herbicide as one means of eradicating the hawthornes and blackberries from the meadow is permitted without environmental review. These criteria are met.

2. The public benefits of the proposal outweigh all significant detrimental impacts;

Findings: The public recreation facilities may have some minor impacts, but they will not have significant detrimental impacts. On the contrary the trail work will reduce degradation of existing trail areas. By removing and revegetating “volunteer” trails, and by better defining the separation of user types on trails, the areas disturbed by trails and users will be reduced, resulting in significant improvement of those areas downhill of existing trails. The interpretive facility and teaching area will enhance public education about the sensitivity of the Butte, potentially reducing unintentional user effects. Trails on the Butte have a variety of design guidelines and criteria. As trails become designated for specific park users, trail design guidelines can become more specific to meet their needs and the site conditions. All trail improvements are scheduled within the first ten year time period, except where future water facilities directly affect the work.

There will be additional benefits. The improved ADA asphalt trail will require grading adjustments for resting/pausing points and width increases to function additionally as a multi-purpose trail. Widths for the multi-purpose trails will vary from 3-5 feet depending on location and anticipated use. For example, the Orchard Loop Trail could be designed to feel like a “country road,” working with the historical character of the place and yet still providing access. Remote trails will be kept to a minimum for the site conditions and usage.

Pedestrian access is permitted on all trails, and has the maximum flexibility for design criteria, while satisfying the requirements of the Portland Pedestrian Guide. The minimum trail standards for pedestrians are a 2-foot width and an undefined trail surface that provides good drainage and/or minimum soil loss. Initially the trail surface is excavated +/- 3 inches, with gravel used where necessary for trail stability; this applies to all trails except the ADA trail. The clearance zone width is a minimum of 4 feet with a height of 8 feet. Several surfaces may be used on the trails; this will depend on cost, availability, and the amount and type of use.

To encourage bicycle use on the designated trails, trail construction and design will create a variety of experiences. The minimum bicycle trail standard while sharing
with pedestrians is a 2-3 foot path width, and clearance zones of 4 feet wide and 8 feet of height.

Equestrian trails will be shared with pedestrians. Equestrians will only ride with bicyclists on the multi-purpose trails, never sharing a narrow trail exclusively with bicyclists. Equestrian trails will need a greater clearance zone in height of 12 feet and a minimum width of 5-6 feet. Equestrian trails will carefully consider the site conditions that could cause soil disturbance and compaction. Trails will need good drainage and compacted surface material for solid footing.

A large majority of the trails identified in the Master Plan currently exist on the Butte. These existing trails will be maintained and improved. Four trails for hiking and bicycling are proposed: a revised Goldfinch Trail, 148th Entry to Holgate Trail, a connection for Raymond Street Entry to the junction of Cedar Grove and Mt. Hood Trails, and improving an existing habit trail between Mt. Hood Trail and Wild Hawthorn Trail. The proposed trails will consider the site conditions and minimize the disturbance resulting from constructing the trails. Trails will be constructed with hand tools or with small low impact machinery equipped with wheels instead of tracks. Wheeled vehicles have less impact on the ground and vegetation than do tracked vehicles.

The one identified trail to be abandoned is a portion of the Wildhorse Trail on the west side. This trail is located in a sensitive area. Abandoned trails will also include “volunteer” or “habit” trails. Abandoning existing trails will involve repairing the site of the impact by site and plant restoration, signage/education, and enforcement. The construction tools used for this task are much of the same as those used in restoring a site that has been damaged.

4. There will be no significant detrimental impact on resources and functional values in areas designated to be left undisturbed.

**Findings:** The areas to be left undisturbed are shown on Figure 9 of the Master Plan. Trail construction will be conducted in accordance with the construction management plan, which defines the types of equipment to be used, the limits of the construction areas, and the methods to be followed to minimize disturbance through grading and other activities.

Proposed trails will provide access to the Butte from surrounding areas. Public access creates the potential for adverse environmental impacts. However such impacts will not be significant. Informal access is available under existing conditions via the informal “volunteer” trails. These “volunteer” trails frequently travel straight up and down hills, increasing potential runoff and erosion. Replacing these illegal trails with properly designed and constructed trails will reduce the environmental impacts on the Butte. Enhanced signing and enforcement will limit creation of new volunteer trails. Therefore the new facilities will not cause
significant adverse impacts and will reduce the impacts that occur under existing conditions.

33.430.250 E. Other development in the Environmental Conservation zone or within the Transition Area only. In Environmental Conservation zones or for development within the Transition Area only, the applicant's impact evaluation must demonstrate that all of the following are met:
1. Proposed development minimizes the loss of resources and functional values, consistent with allowing those uses generally permitted or allowed in the base zone without a land use review;
2. Proposed development locations, designs, and construction methods are less detrimental to identified resources and functional values than other practicable and significantly different alternatives;
3. There will be no significant detrimental impact on resources and functional values in areas designated to be left undisturbed;
4. The mitigation plan demonstrates that all significant detrimental impacts on resources and functional values will be compensated for;
5. Mitigation will occur within the same watershed as the proposed use or development and within the Portland city limits except when the purpose of the mitigation could be better provided elsewhere; and
6. The applicant owns the mitigation site; possesses a legal instrument that is approved by the City (such as an easement or deed restriction) sufficient to carry out and ensure the success of the mitigation program; or can demonstrate legal authority to acquire property through eminent domain.

Development within the Environmental Conservation overlay zone (“c” zone) occurred at Site 1 and Site 4 West. Site 4 West is zoned R10 ‘c’ and the southwest portion of Site 1 is zoned OS ‘c’. In the Open Space Zone, Agricultural and Open Space (including parks) are the only uses permitted without a land use review. The removal of non-native plants on site 1 is consistent with agricultural and open space use, and replanting with native shrubs and grasses will not affect the potential for those uses on that site. In the R10 zone, agricultural use and single-family residential uses are the only uses allowed without a review. Removal of trees and invasive non-native vegetation is consistent with those uses, and planting of native grasses will not affect potential residential uses for this site.

The functional values identified for both sites can be found in the Johnson Creek Basin Protection Plan (JCBPP) within the area designated Site 29. Functional
values for this area include water, storm drainage, scenic views, pollution and nutrient retention and removal, sediment trapping, recreation, education, and heritage. Additional functional values at sites 1 and 4W included foraging and cover habitat for birds and small mammals. There were no significant detrimental impacts to functional values at either site. The loss of resources that did occur due to this development was minimized by the restricted areas in which the development occurred and due to the mitigation plantings made on the two sites as part of the development.

The principal activity at both sites involved the removal of non-native Himalayan blackberry. Other than the trees that were removed on site 4W, vegetation removal was limited to non-native plants that occurred throughout both sites. These invasive species detracted from the overall functional value of the sites, detracting from scenic values and sediment trapping / pollution and nutrient retention and removal functions. The functional value of Site 1 has been improved by planting five species of native shrubs from the Portland Plant List. Plant diversity has been improved and food sources for wildlife have increased. Scenic values along the Springwater Corridor have improved due to the replacement of non-native vegetation with native species. None of the other functional values identified for Site 1 were negatively impacted.

It was necessary to also remove 19 red alders from Site 4 West in order to facilitate the proposed placement of the reservoir conduit. The majority of the removed trees were under 10 inches in diameter and provided slope stability and cover for wildlife. Slope stabilization (critical to the functional values of sediment trapping and pollution and nutrient retention and removal) has been maintained by the establishment of native grasses specifically designed for erosion control. The wildlife habitat resources provided by these trees – cover, roosting and foraging – continues to be provided by the existing mature trees and undergrowth which extend over large areas both north and south of the conduit corridor. Two Douglas fir trees have also been planted on this site as mitigation for those resources. Removal of the trees improved the scenic and aesthetic values of Site 4W, continuing the meadow at the bottom of the hill on site 4E.

The impacts of the development were limited to the two sites, and no significant detrimental impacts on resources or functional values occurred as a result of this development in areas designated to be left undisturbed. The mitigation plantings were well suited to soil conditions at the two sites and established quickly. Erosion control measures were in place until that time.

Mitigation plantings were made on these sites and the other violation sites, all within the same watershed. The City owns all of these mitigation areas and all mitigation plantings occurred on the same sites that were cleared of vegetation. Since these sites are within areas regularly maintained by City personnel, the continued success of the mitigation plantings can be monitored on a consistent basis.
In conclusion, all of the approval criteria listed above are met.

33.430.250.F. Other development in the Environmental Protection zone. In Environmental Protection zones the applicant's impact evaluation must demonstrate that all of the following are met:
1. All sites within the Portland city limits, in which the proposed use or development is possible, are also in the resource areas of Environmental Protection zones;
2. Of these sites, development on the proposed site would have the least significant detrimental environmental impact;
3. There is a public need for the proposed use or development;
4. The public benefits of the proposed use or development outweigh all significant detrimental impacts;
5. There will be no significant detrimental impact on resources and functional values in areas designated to be left undisturbed;
6. The mitigation plan demonstrates that all significant detrimental impacts on resources and functional values will be compensated for;
7. Mitigation will occur within the same watershed as the proposed use or development and within the Portland city limits except when the purpose of the mitigation could be better provided elsewhere; and
8. The applicant owns the mitigation site; possesses a legal instrument that is approved by the City (such as an easement or deed restriction) sufficient to carry out and ensure the success of the mitigation program; or can demonstrate legal authority to acquire property through eminent domain.

Development within the Environmental Protection Zone ("p" zone) occurred at Site 2, Site 4 East and Site 5. Site 2 and Site 4 East are zoned R5p and are in the Johnson Creek Floodplain. SE Circle Avenue separates the two sites. Site 5 is zoned R7p and is located on the eastern boundary of Powell Butte Nature Park. Each site is within the Portland city limits.

Development activities at each site did not have significant impacts to the overall functional values that were present. One western red cedar tree was removed from Site 2 and five hardwood trees were removed from Site 4 East. In each case, cumulative canopy cover for each site was not adversely affected. Eleven trees were removed from Site 5 for the purpose of providing a cleared space for locating the pump station and associated conduit. The site remains primarily wooded, similar to
the surrounding area. Tree removal occurred in the interior of the site, leaving wooded buffers screening the cut trees from the view of adjacent properties. Scenic values of the site were thus not impacted.

The only development structures erected at the site were wooden split-rail fences at the boundaries of sites 2, 4 East and 5. The purpose of the structures is to provide delineation between the Park and the adjacent private properties. By using wooden materials rather than a chain-link fence, the wildlife mobility resource and the functional value of scenic appearances are maintained. The scenic appearance of Site 2 was also improved by the removal of an existing wooden shed.

No resources or functional values were lost as a result of the restoration work. Any detrimental impacts were minimal and were outweighed by the public benefit of improving the functional value of the areas bordering Powell Butte and restoring diversity of native habitat. Grading at all sites was limited to the removal of 2 cubic yards of topsoil from site 2 from the boundary area of the Environmental Protection Zone. The loss of two yards of topsoil is a negligible impact to the overall site area. Non-native vegetation was replaced in each site area with native vegetation listed on the Portland Plant List, thereby improving the species and habitat diversity of each site. This mitigation planting and the erosion control measures in place during and after development, assured that there were no significant detrimental impacts on resources and functional values in areas designated to be left undisturbed.

A public need exists for the conduit that will be extended through Site 4 East and Site 5. There are currently two conduits that deliver water to Powell Butte and subsequently to the City from the Bull Run Reservoir. Both must be in operation to satisfy the water demands of the City. A third conduit is necessary to provide for a back-up facility in the event of a structural failure of the existing conduit. Potential alternate locations for the conduit were discussed earlier in this decision. All of these alternates would also involve crossing environmental protection zones. Because this alignment follows existing residential development and better serves the operational needs of the water system, the Council finds that this alignment will have the least environmental impact. Site 5 is also the location for the pump station needed to provide water to the proposed 20 million gallon reservoir during periods of low water, particularly during the summer months. This reservoir and the affiliated development will provide gravity flow service to development at higher elevations surrounding the butte. A public need for the development is therefore demonstrated. This decision addressed earlier under the environmental review of the phase 1 developments the potential alternate sites for the pump station and found that this site would have the least impact on resources.

All mitigation occurred on the same properties on which the clearing took place. The three sites discussed above are owned by the City of Portland.

The above findings from the record show how the Phase I Powell Butte Conditional Use Master Plan projects cumulatively do not result in significant detrimental
impacts to the site. This can be shown because the projects individually have neutral beneficial environmental impacts and therefore, cumulatively have neutral to beneficial impacts.

33.430.250 Approval Criteria. An environmental review application will be approved if the review body finds that the applicant has shown that all of the applicable approval criteria are met. When environmental review is required because a proposal does not meet one or more of the development standards of Section 33.430.140 through .170, then the approval criteria will only be applied to the aspect of the proposal that does not meet the development standard or standards.

A. Public safety facilities, roads, driveways, walkways, outfalls, utilities, land divisions, and planned unit developments (PUDs). Within the resource areas of environmental zones, the applicant's impact evaluation must demonstrate that all of the general criteria in Paragraph A.1 and the applicable specific criteria of Paragraphs A.2, 3, or 4, below, have been met:

1. General criteria for public safety facilities, roads, driveways, walkways, outfalls, utilities, land divisions, and PUDs;
   a. Proposed development locations, designs, and construction methods have the least significant detrimental impact to identified resources and functional values of other practicable and significantly different alternatives including alternatives outside the resource area of the environmental zone;

Findings: The discussion in the previous section of this decision (33.430.240.B.1) addressed the potential alternative locations, designs and construction methods for then phase 1 developments.

   b. There will be no significant detrimental impact on resources and functional values in areas designated to be left undisturbed;

Findings: Areas designated to be left undisturbed will not suffer significant detrimental impacts from the development of the phase 1 elements. Construction will generate dust, noise and traffic on the Butte. However these impacts will be short term and will be mitigated through compliance with the proposed construction management plan. The stormwater management plan will also assure that runoff from construction areas will not adversely affect other areas on the butte. The development proposed in the Master Plan will have only minor impacts on existing aesthetic and scenic resources, and some will be positive. Most of the water facilities will be underground and effectively invisible once construction is complete.

No substantial impacts are anticipated after development is complete. The storm water system will not have a significant detrimental impact on resources or
functional values in those areas, because any portion of that area disturbed during construction will be replanted with native-species vegetation, and because the storm water in the system will pass through those areas (if at all) in a pipe, reducing the potential for erosion over time and increasing plant survival.

The buried utility connections will not have a significant detrimental impact on resources or functional values in those areas, because any portion of that area disturbed during construction will be replanted with native-species vegetation, and because the utility connections will be underground, rather than above ground where the principal resources and functional values are situated.

This criterion is met.

c. The mitigation plan demonstrates that all significant detrimental impacts on resources and functional values will be compensated for;
d. Mitigation will occur within the same watershed as the proposed use or development and within the Portland city limits except when the purpose of the mitigation could be better provided elsewhere; and
e. The applicant owns the mitigation site; possesses a legal instrument that is approved by the City (such as an easement or deed restriction) sufficient to carry out and ensure the success of the mitigation program; or can demonstrate legal authority to acquire property through eminent domain.

Findings: Construction within the “c” zone on the Butte will temporarily impact environmental resources and their functional values. Construction will involve removal of existing vegetation and alterations to the existing topography in the "c" zone. Vegetation removal will be primarily limited to grasses, shrubs and blackberries, and to removal of trees listed on the City’s Nuisance and Prohibited Plants Lists. Construction of the pump station will require the removal of approximately 50 mature trees (primarily alder and maple, but also including some fir and cherry trees) over 6” in diameter.

None of the development will result in significant detrimental impacts on the resources and functional values of the park. Disturbed areas will be re-contoured to match the existing topography to the extent feasible, and re-vegetated with native plants, restoring and improving the habitat. The areas of disturbance for the water facility improvements planned for the next ten years are shown on Figures 8, 15, and 17 of the Master Plan. The pump station disturbance area may not have the original contours restored, depending on whether the pump station structure is partially buried. However, that site will be graded to manage surface water so that it drains to the detention pond to be constructed nearby. Although the development of the pump station will result in the removal of approximately 50 trees, the disturbance area will remain surrounded by trees, and native plantings will be made at this site and elsewhere in the park to mitigate for the necessary tree removal.
All mitigation will be performed on Powell Butte within the boundaries of the property owned by the City, which is all within the Johnson Creek watershed. The impact of the buried utilities is limited to the temporary trenching for the utility lines and the construction activity associated with trenching and laying the lines. The construction management plan addresses those impacts by requiring regrading to the original grades and replanting of the disturbed area with native plants, but does not include plant specifications.

The stormwater management facilities will be planted with appropriate native plants, and will be lined with impervious material to prevent percolation that could destabilize the north slope of the Butte.

This criterion is met.

3. Roads, driveways, walkways, outfalls, and utilities;
   a. The location, design, and construction method of any outfall or utility proposed within the resource area of an environmental protection zone has the least significant detrimental impact to the identified resources and functional values of other practicable alternatives including alternatives outside the resource area of the environmental protection zone;

**Findings:** There are no other practicable locations for the proposed storm water features of the project, because they are needed to accommodate storm water from impervious surfaces where the storm water is generated. Moreover, storm water systems rely on gravity; water flows downhill. Therefore storm water facilities must extend downslope of new impervious surfaces. However, the geology of the north face of the Butte further constrains where storm water can be directed. Discharge of storm water to the north risks further destabilizing of that slope, which would endanger the residential development below. The methods used to address storm water are intended to minimize adverse impacts. There is no significantly different practicable alternative to storm water management that would have less impact. The Stormwater Management Plan minimizes the disturbance of the site by planning for the proposed phased construction. The detention and water quality facilities are conservatively sized but are located to serve the construction of phase 2 facilities, after they have served the same purposes for phase 1 facilities. The design and calculations for the storm water facilities are also based on Johnson Creek Basin Plan requirements limiting the increase of flows to Johnson Creek, and utilize DEQ best management practices. The detention and water quality ponds will also be shaped and landscaped to minimize their impact on the scenic characteristics of the Butte.

Similarly the buried utility facilities and connections have to be located as proposed to connect to the relevant elements of the regional water system in an efficient and safe way. There is no place else other than Powell Butte where the water from Bull
Run can be routed. There are no significantly different alternative routes on the Butte that would have less impact. The impact of the major pipelines is minimized by using existing utility corridors. Any alternative route on the Butte would have greater adverse impacts.

This criterion is met.

b. There will be no significant detrimental impact on water bodies for the migration, rearing, feeding, or spawning of fish; and

Findings: There are no fish-bearing streams on Powell Butte. The only fish-bearing stream that could potentially be impacted by the development is Johnson Creek, located south of the Butte. The reservoirs, conduits, and buried utility connections will have no impact on fish, due to the measures provided in the stormwater management plan included in the master plan. The Water Bureau will discharge some storm water to Johnson Creek as it has in the past, but the stormwater management plan provides for detention facilities to prevent an increase in stormwater discharge over what is now occurring. The applicant will treat storm water from the Butte before it is discharged, as directed in the stormwater management plan (Appendix D of the Master Plan), so that the quality of the water will not have a detrimental impact on fish habitat. In addition, the applicant has volunteered to plant trees uphill of the detention pond site prior to development of the detention facility. This will allow the trees to mature before putting the pond into use, so that the trees will be more effective at preventing the detained water from gaining heat prior to discharge to Johnson Creek. The discharge at the Johnson Creek outfall is well established and does not cause erosion or other adverse effects to the habitat. Therefore storm water impacts will not be significantly adverse to fish habitat. This criterion is met.

c. Water bodies are crossed only when there are no practicable alternatives with fewer significant detrimental impacts.

Findings: No water bodies will be crossed. This criterion does not apply.

B. Resource enhancement projects. In resource areas of environmental zones, resource enhancement projects will be approved if the applicant's impact evaluation demonstrates that all of the following are met:

1. There will be no loss of total resource area;
2. There will be no significant detrimental impact on any resources and functional values;
3. There will be a significant improvement of at least one functional value.

Findings: Vegetative management projects, including tree removal from the meadow area, are considered resource enhancement projects. The resource enhancement activities will not reduce the total resource area. They will not change the size of the resource area. However, they will improve the quality of the habitat
resources on the site. The resource enhancement activities will result in significant improvement of at least one functional value. The open grassy meadow is a significant distinguishing feature of the Butte summit. However this open area is being invaded by Himalayan blackberries and non-native hawthorn. Left unchecked, these invading species will eventually take over the open meadow portion of the Butte. Implementation of the vegetation management project will check this invasion. Non-native plants will be removed and replaced with native grasses on the Portland Plant List, maintaining and enhancing the resource values of the open meadow habitat on the Butte. As noted earlier in this decision, removal of plants on the Nuisance and Prohibited Plants lists is not subject to environmental review. Therefore, the use of herbicide as one means of eradicating the hawthornes and blackberries from the meadow is permitted without environmental review. These criteria are met.

C. Public recreational facilities. In resource areas of environmental zones, public recreational trails, rest points, view points, and interpretative facilities will be approved if the applicant's impact evaluation demonstrates that all of the following are met:

1. Proposed development locations, designs, and construction methods are less detrimental to identified resources and functional values than other practicable and significantly different alternatives;

Findings: Following is a summary of alternative locations, design modifications, and alternative methods to reduce impacts on natural resources:

- **Park Facilities:** The park facilities must be located in the “e-p” and “e-c” overlay areas in order to serve their intended function of providing opportunities for natural resource-based public recreation and education. With the exception of the trails, these facilities are concentrated in the currently developed northeast area of the Butte. This will minimize development and activity elsewhere on the Butte. The caretaker dwelling must be located on the Butte in the vicinity of the park center to serve its intended function of enhancing security and enforcement of park rules. Relocating the dwelling will provide a better view of the parking lots and facilities, increasing security in this area of the Butte. The existing caretaker residence is connected to the City’s sanitary sewer system, and the new residence will use that connection as well. Revegetating the existing disturbance area, and any trenching necessary for connecting the new residence to the sewer, will ensure that this development results in no loss of resource value.

- **Parking Lot Surfacing:** Paving the parking lot will reduce noise and dust compared to the existing improvements and will help bring the parking lot into compliance with city code and ADA requirements. By providing for more efficient use of existing parking through clearly marking parking spaces,
the improvement will also avoid the potential need for expanding the supply of parking at the Butte. Alternatives to paving include limiting paving to the spaces required for ADA compliance, the use of a pervious parking surface, or simply not paving the area, in order to preserve the rural character of the site. The Parks Bureau has committed to the neighborhood associations in the vicinity of the Butte to further explore those alternatives before proceeding with any parking area improvements. The proposed paving limits the impacts on the Butte and avoids the need for expanding the parking area. The lot will not be curbed, and this application requests an adjustment to the requirement for interior landscaping. Through these features, the proposed parking lot design best meets the applicable code requirements and minimizes the impacts on the character of Powell Butte.

- *Trails:* The proposed trails must be developed in the “e-p” and “e-c” overlay zone in order to serve their intended function of providing opportunities for natural resource-based public recreation and education. The trails provide access to the designated viewpoints and provide park users an opportunity to observe the wide variety of flora and fauna which exists on the Butte. The proposed routes and access points provide user access to a large portion of the park. Existing trails must be modified to comply with current ADA requirements and to enhance access to the park for people of all physical abilities.

Trail alignments, materials, drainage and construction methods were selected to limit the potential impacts of the proposed trails, based on the intended users, i.e., hiking, bicycles, equestrian or multi-use. Existing unauthorized trails will be eliminated by re-grading and replanting the impacted areas. Enhanced signage, education and enforcement will be provided to limit creation of additional unauthorized trails. Trails are routed away from the proposed designated wildlife area to prevent intrusions and other impacts from human activities in this area in the southeast corner of the site. This exclusive wildlife habitat area will provide a “safe” area for wildlife during vulnerable life stages such as nesting and rearing offspring and will also provide cover areas for wildlife species that are more sensitive to the presence of humans and pets.

This criterion is met.

2. The public benefits of the proposal outweigh all significant detrimental impacts;

**Findings:** The public recreation facilities may have some minor impacts, but they will not have significant detrimental impacts. On the contrary the trail work will reduce degradation of existing trail areas. By removing and revegetating “volunteer” trails, and by better defining the separation of user types on trails, the areas disturbed by trails and users will be reduced, resulting in significant
improvement of those areas downhill of existing trails. The interpretive facility and teaching area will enhance public education about the sensitivity of the Butte, potentially reducing unintentional user effects. Trails on the Butte have a variety of design guidelines and criteria. As trails become designated for specific park users, trail design guidelines can become more specific to meet their needs and the site conditions. All trail improvements are scheduled within the first ten year time period, except where future water facilities directly affect the work.

There will be additional benefits. The improved ADA asphalt trail will require grading adjustments for resting/pausing points and width increases to function additionally as a multi-purpose trail. Widths for the multi-purpose trails will vary from 3-5 feet depending on location and anticipated use. For example, the Orchard Loop Trail could be designed to feel like a “country road,” working with the historical character of the place and yet still providing access. Remote trails will be kept to a minimum for the site conditions and usage.

Pedestrian access is permitted on all trails, and has the maximum flexibility for design criteria, while satisfying the requirements of the Portland Pedestrian Guide. The minimum trail standards for pedestrians are a 2-foot width and an undefined trail surface that provides good drainage and/or minimum soil loss. Initially the trail surface is excavated +/- 3 inches, with gravel used where necessary for trail stability; this applies to all trails except the ADA trail. The clearance zone width is a minimum of 4 feet with a height of 8 feet. Several surfaces may be used on the trails; this will depend on cost, availability, and the amount and type of use.

To encourage bicycle use on the designated trails, trail construction and design will create a variety of experiences. The minimum bicycle trail standard while sharing with pedestrians is a 2-3 foot path width, and clearance zones of 4 feet wide and 8 feet of height.

Equestrian trails will be shared with pedestrians. Equestrians will only ride with bicyclists on the multi-purpose trails, never sharing a narrow trail exclusively with bicyclists. Equestrian trails will need a greater clearance zone in height of 12 feet and a minimum width of 5-6 feet. Equestrian trails will carefully consider the site conditions that could cause soil disturbance and compaction. Trails will need good drainage and compacted surface material for solid footing.

A large majority of the trails identified in the Master Plan currently exist on the Butte. These existing trails will be maintained and improved. Four trails for hiking and bicycling are proposed: a revised Goldfinch Trail, 148th Entry to Holgate Trail, a connection for Raymond Street Entry to the junction of Cedar Grove and Mt. Hood Trails, and improving an existing habit trail between Mt. Hood Trail and Wild Hawthorn Trail. The proposed trails will consider the site conditions and minimize the disturbance resulting from constructing the trails. Trails will be constructed with hand tools or with small low impact machinery equipped with wheels instead.
of tracks. Wheeled vehicles have less impact on the ground and vegetation than do tracked vehicles.

The one identified trail to be abandoned is a portion of the Wildhorse Trail on the west side. This trail is located in a sensitive area. Abandoned trails will also include “volunteer” or “habit” trails. Abandoning existing trails will involve repairing the site of the impact by site and plant restoration, signage/education, and enforcement. The construction tools used for this task are much of the same as those used in restoring a site that has been damaged.

This criterion is met.

3. Areas disturbed during construction, that do not contain permanent development, will be restored with native vegetation that is similar to the vegetation existing on the site and found on the Portland Plant List; and

Findings: Construction of the proposed trails and interpretive facilities will not create significant disturbance areas beyond the existing disturbance area in the park center and the edge of the trails. Any disturbance areas that extend beyond the trail surface will be replanted with native vegetation consistent with that currently onsite and found on the Portland Plant List.

The teaching area will not involve any “permanent development.” Construction will be limited to minor re-grading and stabilization of the existing topography to create a grass amphitheater. The disturbance area will be replanted with native grasses.

This criterion is met.

4. There will be no significant detrimental impact on resources and functional values in areas designated to be left undisturbed.

Findings: The areas to be left undisturbed are shown on Figure 9 of the Master Plan. Trail construction will be conducted in accordance with the construction management plan, which defines the types of equipment to be used, the limits of the construction areas, and the methods to be followed to minimize disturbance through grading and other activities.

Proposed trails will provide access to the Butte from surrounding areas. Public access creates the potential for adverse environmental impacts. However such impacts will not be significant. Informal access is available under existing conditions via the informal “volunteer” trails. These “volunteer” trails frequently travel straight up and down hills, increasing potential runoff and erosion. Replacing these illegal trails with properly designed and constructed trails will reduce the environmental impacts on the Butte. Enhanced signing and enforcement will limit creation of new volunteer trails. Therefore the new facilities will not cause
significant adverse impacts and will reduce the impacts that occur under existing conditions.

This criterion is met.

G. **Corrections to violations.** For corrections to violations of this Chapter the application must meet all applicable approval criteria stated in subsections A through F above (in this review, applicable criteria are A through C), and paragraphs 1, 2.b and 2.c, below. If these criteria cannot be met, then the applicant’s remediation plan must demonstrate that all of the following (Criteria 1 and 2a, 2b, and 2c) are met:

**Findings:** In February 2000, the Water Bureau applied for a permit for maintenance clearing, minor development and mitigation planting at several sites within or near Powell Master Plan Area located in southeast Portland. One site is in the southeast corner of the park, adjacent to the Springwater Corridor trail. The other sites were on the eastern boundary of the Park, located within the Conduit 5 corridor and adjacent to Johnson Creek. The activities at each of these sites consisted of clearing invasive non-native vegetation, primarily English ivy and Himalayan blackberry, and replanting with native shrubs and ground covers. A number of trees were removed, including trees in the hillside corridor of Conduit 5. The work also included erection of a split-rail fence along segments of the Conduit 5 corridor. The purpose of the project was to remove non-native vegetation and, on several sites, removal of trees in the path of anticipated future pipeline development. The work was completed in December of 2001.

Although a site development permit was issued, OPDR later determined that the application should have been processed through an environmental review and has deemed the activities to be a violation of the Environmental Review Requirements. The Water Bureau did not attempt to evade City regulations; the work was done with a site development permit issued by the Office of Planning and Development Review.

Several development standards for Environmental Review were not met when the violation occurred. Specifically, the disturbance areas within the sites exceeded the maximum allowed (33.430.140 A), the disturbance areas did not meet all setback requirements (33.430. 140 B and C), the total diameter of trees removed exceeded allowable limits (33.430. 140 G), and replacement shrubs were smaller than required (33.430.140 H). However, the restoration work did not impair the functional values on these sites. Site habitat was generally improved by the removal of non-native invasive vegetation and the establishment of a mix of native plants and trees that will improve site diversity and quality. The replanting program as a whole also exceeded that required by Table 430-2. As mitigation for smaller replacement plants, more than 30 times as many shrubs (1,892) were planted as opposed to the 69 that are required by Table 430-2.
For violations of the regulations of Zoning Code Chapter 33.430, the applicant must demonstrate that the approval criteria in Section 33.430.250 G are met. The criteria of Section 33.430.250.G require that the violation first be examined in light of the approval criteria that would have normally applied to the violation activity if a permit had been applied for prior to the activity. The relevant subsections in this case are Sections 33.430.250 E and F.

Site Area Descriptions:

Site 1: Site 1 is adjacent to the Springwater Corridor and is approximately 500 feet in length. The zoning for this site is OSc, p. The area was densely overgrown with Himalayan Blackberry, which was removed. The site has been replanted with native vegetation including vine maple, blue elderberry and native grasses. The plantings are well established.

Site 2: Site 2 is a mesic area zoned R5p that occurs between SE Circle Avenue and Johnson Creek. This site was also overgrown with Himalayan blackberry, which was cleared from the site. One red cedar tree with an approximate caliper of 16 inches was removed from the site. The wetlands portion of the site was left undisturbed. The site has been replanted with 18 native trees (Oregon ash and western red cedar), native shrub species and groundcover.

Site 3: This area south of Johnson Creek was part of the project but is an unincorporated area outside the Urban Growth Boundary. Therefore, it is not part of this review.

Site 4 East: This site is also zoned R5p. The area was overgrown with Himalayan blackberry at its eastern and western edges. The interior of the site is wooded and had contiguous areas of English ivy both on the ground and climbing the trees. Both of these non-native plants were removed from the site. In addition, five trees that were located in the planned easement for conduit 5 were removed. Both a meadow mix and forest mix of native vegetation were planted at this site.

Site 4 Middle: This site is zoned R10. Work in this area included removal of nuisance vegetation and a fence. Open areas were revegetated using a meadow mix and 17 Douglas firs were planted along the north and south boundary of the site. Two trails, an information kiosk and erection of split-rail fences on the north and south boundary of the site were also installed. Since no Environmental overlay designation applies to this site, it is not subject to environmental review and is not part of the violation.

Site 4 West: This hillside site is zoned R10 and R10c. The route for conduit 5 extends through this site. Areas of blackberries were removed as were 19 alder trees to facilitate future placement of the pump station and associated conduit. Native groundcover that develops a dense and quickly spreading root system has been chosen to stabilize the impacted slope. A split-rail fence was constructed on the
south boundary of the site that connects to the fence on the south boundary of Site 4 Middle.

**Site 5:** This site is zoned R7p. The site is proposed for the location of a pump station and associated conduit which will serve Water Bureau facilities in the park. Eleven trees were removed from the corridor for the new conduit route and access to the pump station. As mitigation, 11 Douglas firs were planted in locations not affected by the planned development. Snowberry was planted to stabilize slopes at the lower end of the site and a meadow mix was planted above this area.

The criteria found under Section E and F below apply to the removal of vegetation from the site areas discussed above. The approval criteria provide a mechanism to determine if any of the completed work could have been approved if the applicant had applied for a land use review. The applicant must address all of Section G (1, 2a, 2b, and 2c), below, including the criterion for no permanent loss of any type of resource or functional value.

**33.430.250 E. Other development in the Environmental Conservation zone or within the Transition Area only.** In Environmental Conservation zones or for development within the Transition Area only, the applicant's impact evaluation must demonstrate that all of the following are met:

1. Proposed development minimizes the loss of resources and functional values, consistent with allowing those uses generally permitted or allowed in the base zone without a land use review;
2. Proposed development locations, designs, and construction methods are less detrimental to identified resources and functional values than other practicable and significantly different alternatives;
3. There will be no significant detrimental impact on resources and functional values in areas designated to be left undisturbed;
4. The mitigation plan demonstrates that all significant detrimental impacts on resources and functional values will be compensated for;
5. Mitigation will occur within the same watershed as the proposed use or development and within the Portland city limits except when the purpose of the mitigation could be better provided elsewhere; and
6. The applicant owns the mitigation site; possesses a legal instrument that is approved by the City (such as an easement or deed restriction) sufficient to carry out and ensure the success of the mitigation program; or can demonstrate legal authority to acquire property through eminent domain.
Development within the Environmental Conservation overlay zone (“c” zone) occurred at Site 1 and Site 4 West. Site 4 West is zoned R10 ‘c’ and the southwest portion of Site 1 is zoned OS ‘c’. In the Open Space Zone, Agricultural and Open Space (including parks) are the only uses permitted without a land use review. The removal of non-native plants on site 1 is consistent with agricultural and open space use, and replanting with native shrubs and grasses will not affect the potential for those uses on that site. In the R10 zone, agricultural use and single-family residential uses are the only uses allowed without a review. Removal of trees and invasive non-native vegetation is consistent with those uses, and planting of native grasses will not affect potential residential uses for this site.

The functional values identified for both sites can be found in the Johnson Creek Basin Protection Plan (JCBPP) within the area designated Site 29. Functional values for this area include water, storm drainage, scenic views, pollution and nutrient retention and removal, sediment trapping, recreation, education, and heritage. Additional functional values at sites 1 and 4W included foraging and cover habitat for birds and small mammals. There were no significant detrimental impacts to functional values at either site. The loss of resources that did occur due to this development was minimized by the restricted areas in which the development occurred and due to the mitigation plantings made on the two sites as part of the development.

The principal activity at both sites involved the removal of non-native Himalayan blackberry. Other than the trees that were removed on site 4W, vegetation removal was limited to non-native plants that occurred throughout both sites. These invasive species detracted from the overall functional value of the sites, detracting from scenic values and sediment trapping / pollution and nutrient retention and removal functions. The functional value of Site 1 has been improved by planting five species of native shrubs from the Portland Plant List. Plant diversity has been improved and food sources for wildlife have increased. Scenic values along the Springwater Corridor have improved due to the replacement of non-native vegetation with native species. None of the other functional values identified for Site 1 were negatively impacted.

It was necessary to also remove 19 red alders from Site 4 West in order to facilitate the proposed placement of the reservoir conduit. The majority of the removed trees were under 10 inches in diameter and provided slope stability and cover for wildlife. Slope stabilization (critical to the functional values of sediment trapping and pollution and nutrient retention and removal) has been maintained by the establishment of native grasses specifically designed for erosion control. The wildlife habitat resources provided by these trees – cover, roosting and foraging – continues to be provided by the existing mature trees and undergrowth which extend over large areas both north and south of the conduit corridor. Two Douglas fir trees have also been planted on this site as mitigation for those resources.
Removal of the trees improved the scenic and aesthetic values of Site 4W, continuing the meadow at the bottom of the hill on site 4E.

The impacts of the development were limited to the two sites, and no significant detrimental impacts on resources or functional values occurred as a result of this development in areas designated to be left undisturbed. The mitigation plantings were well suited to soil conditions at the two sites and established quickly. Erosion control measures were in place until that time.

Mitigation plantings were made on these sites and the other violation sites, all within the same watershed. The City owns all of these mitigation areas and all mitigation plantings occurred on the same sites that were cleared of vegetation. Since these sites are within areas regularly maintained by City personnel, the continued success of the mitigation plantings can be monitored on a consistent basis.

In conclusion, all of the approval criteria listed above are met.

(The following discussion of section F applies to Sites 1, 2, 4 East and 5, which are within the ‘p’ overlay zone.)

**33.430.250.F. Other development in the Environmental Protection zone.** In Environmental Protection zones the applicant's impact evaluation must demonstrate that all of the following are met:

1. All sites within the Portland city limits, in which the proposed use or development is possible, are also in the resource areas of Environmental Protection zones;
2. Of these sites, development on the proposed site would have the least significant detrimental environmental impact;
3. There is a public need for the proposed use or development;
4. The public benefits of the proposed use or development outweigh all significant detrimental impacts;
5. There will be no significant detrimental impact on resources and functional values in areas designated to be left undisturbed;
6. The mitigation plan demonstrates that all significant detrimental impacts on resources and functional values will be compensated for;
7. Mitigation will occur within the same watershed as the proposed use or development and within the Portland city limits except when the purpose of the mitigation could be better provided elsewhere; and
8. The applicant owns the mitigation site; possesses a legal instrument that is approved by the City (such as an easement or deed restriction) sufficient to carry out and ensure the success of the mitigation program; or can demonstrate legal authority to acquire property through eminent domain.

Development within the Environmental Protection Zone (“p” zone) occurred at Site 2, Site 4 East and Site 5. Site 2 and Site 4 East are zoned R5p and are in the Johnson Creek Floodplain. SE Circle Avenue separates the two sites. Site 5 is zoned R7p and is located on the eastern boundary of Powell Butte Nature Park. Each site is within the Portland city limits.

Development activities at each site did not have significant impacts to the overall functional values that were present. One western red cedar tree was removed from Site 2 and five hardwood trees were removed from Site 4 East. In each case, cumulative canopy cover for each site was not adversely affected. Eleven trees were removed from Site 5 for the purpose of providing a cleared space for locating the pump station and associated conduit. The site remains primarily wooded, similar to the surrounding area. Tree removal occurred in the interior of the site, leaving wooded buffers screening the cut trees from the view of adjacent properties. Scenic values of the site were thus not impacted.

The only development structures erected at the site were wooden split-rail fences at the boundaries of sites 2, 4 East and 5. The purpose of the structures is to provide delineation between the Park and the adjacent private properties. By using wooden materials rather than a chain-link fence, the wildlife mobility resource and the functional value of scenic appearances are maintained. The scenic appearance of Site 2 was also improved by the removal of an existing wooden shed.

No resources or functional values were lost as a result of the restoration work. Any detrimental impacts were minimal and were outweighed by the public benefit of improving the functional value of the areas bordering Powell Butte and restoring diversity of native habitat. Grading at all sites was limited to the removal of 2 cubic yards of topsoil from site 2 from the boundary area of the Environmental Protection Zone. The loss of two yards of topsoil is a negligible impact to the overall site area. Non-native vegetation was replaced in each site area with native vegetation listed on the Portland Plant List, thereby improving the species and habitat diversity of each site. This mitigation planting and the erosion control measures in place during and after development, assured that there were no significant detrimental impacts on resources and functional values in areas designated to be left undisturbed.

A public need exists for the conduit that will be extended through Site 4 East and Site 5. There are currently two conduits that deliver water to Powell Butte and subsequently to the City from the Bull Run Reservoir. Both must be in operation to satisfy the water demands of the City. A third conduit is necessary to provide for a
back-up facility in the event of a structural failure of the existing conduit. Potential alternate locations for the conduit were discussed earlier in this decision. All of these alternates would also involve crossing environmental protection zones. Because this alignment follows existing residential development and better serves the operational needs of the water system, the Council finds that this alignment will have the least environmental impact. Site 5 is also the location for the pump station needed to provide water to the proposed 20 million gallon reservoir during periods of low water, particularly during the summer months. This reservoir and the affiliated development will provide gravity flow service to development at higher elevations surrounding the butte. A public need for the development is therefore demonstrated. This decision addressed earlier under the environmental review of the phase 1 developments the potential alternate sites for the pump station and found that this site would have the least impact on resources.

All mitigation occurred on the same properties on which the clearing took place. The three sites discussed above are owned by the City of Portland.

This criterion is met.

**33.430.250.G Corrections to Violations** For corrections to violations of this Chapter the application must meet all applicable approval criteria state in subsections A through F above, and paragraphs 1, 2.b and 2.c below. If these criteria cannot be met, then the applicant’s remediation plan must demonstrate that all of the following are met.

The council finds that all applicable criteria (subsections E and F of 33.430.250) have been met. The requirements of subsection G are addressed below.

1. The remediation is done in the same area as the violation; and

**Findings:** All remediation activity was undertaken on the same sites where the clearing violations occurred. This criterion is met.

2. The remediation plan demonstrates that after its implementation there will be:

   a. No permanent loss of any type of resource or functional value;

   **Findings:** The Council finds that all of the criteria in subsections E and F are met; therefore, demonstrating compliance with subsection G.2.a is not required under the Code. However, the requirements of that subsection are met by this development, as described below.

   The primary activity at the sites in question was the removal of nuisance vegetation. A total of 36 trees were also removed, with the majority removed from a public utility corridor in anticipation of future placement of a water conduit. The intent of the applicant was to minimize the impact to natural resources from the water-related
improvements currently under review as part of the proposed Powell Butte Master Plan, while improving habitat and species diversity. The primary development was tree removal from Site 4 west and Site 5. Nineteen red alder trees were removed from Site 4 in order to facilitate the placement of the proposed conduit and 11 trees (9 alders and two cherry trees) were removed from Site 5. These trees provided the functions of cover, roosting and perching, and probable food source for migratory and resident birds.

The applicant has planted 58 replacement trees and 1,892 replacement shrubs. More than 30 times as many shrubs (1,892) were planted as the 69 that are required by the Code. These plantings occurred over all 5 of the violation sites, and are adequate to mitigate for the impact resulting from the development on resources and on the related habitat, plant diversity, pollution and nutrient retention and removal, and erosion control values. The applicant reviewed the planting plan with the BES revegetation coordinator for the Johnson Creek basin, who agreed that the plan was appropriate and sufficient to mitigate for the impacts of the development.

To assure continued compliance with this criterion, a monitoring and maintenance plan must be set in place ensuring 80% groundcover, shrub, and tree survival rate for at least three years. At that time plants should be established and able to resist invasive species overwhelming them. With this as a condition of approval, this criterion is met.

b. A significant improvement of a least one functional value; and

**Findings:** The remediation plan has resulted in significant improvement of at least one functional value. The remediation plan improves habitat functions of these sites by increasing the diversity of native species and plants used by wildlife for food, cover and forage on the sites. Habitat diversity has been improved by the opening of a forested area in Site 5, which will benefit birds and small mammals using meadow-type habitat. Scenic values have been improved by the elimination of non-native plant species from each of the sites. Other existing functional values have either been retained or will suffer no negligible impacts from the mitigation. Overall, the sites retain their natural appearance and their value as scenic resources adjacent to a city park. No structures other than two wooden fences have been built on the sites.

This criterion is met.

c. There will be minimal loss of resources and functional values during remediation until the full remediation program is established

**Findings:** There will be minimal loss of resources and functional values during remediation because the sites all remain in natural resource use, and because the activities that resulted in the violation did not significantly impact the functional values of the sites. Extensive revegetation of the developed sites, including
planting of grasses, shrubs and trees as described under the previous criterion, mitigated for the vegetation that was removed. Invasive nuisance vegetation was removed from each site and most sites were revegetated with a diverse mix of native grasses and shrubs from the Portland Native Plant List. The grasses and shrubs have been quickly established. The site areas will continue to be monitored by Parks Bureau employees for long-term remediation success of all of the revegetation.

To assure continued compliance with this criterion, a monitoring and maintenance plan must be set in place ensuring 80% groundcover, shrub, and tree survival rate for at least three years. At that time plants should be established and able to resist invasive species overwhelming them. With this as a condition of approval, this criterion is met.

33.480.040 A. View Corridors. All development and vegetation with a view corridor designation in the Scenic Resources Protection Plan are subject to the regulations of this Subsection.
1. Purpose. The intent of the view corridor designation is to establish maximum heights within view corridors to protect significant views from specific viewpoints.
2. Standard. All development within the designated view corridors are subject to the height limits of the base zone, except when a more restrictive height limit is established by the view corridor. In those instances, the view corridor height limit applies to both development and vegetation. Public safety facilities are exempt from this standard.

Findings: The Scenic Resources Protection Plan designates a view corridor from the crest of the butte for the view to the north and northwest. The view corridor prevents developments that would extend above the treeline to interfere with the existing view. Phase 1 developments within this corridor include the antenna tower, the 50 MG reservoir, the maintenance yard and storage building, and the park center improvements. The antenna tower, at 175 feet, would extend well above the treeline and would interfere with the view. The other developments are all within the base zone building height and would not extend into the view corridor. In particular, The maintenance yard and storage building will be low profile uses located low on the slope near the edge of the open meadow and will not be visible from the designated viewing area. In addition, they will not block the view to areas offsite from areas lower on the slope where the maintenance yard will be visible. Therefore the size and location of the maintenance yard is consistent with the requirements for development in a view corridor. This criterion is not met for the antenna tower. This criterion is met as to all the other phase 1 developments.
33.805 ADJUSTMENTS

Two Adjustments are requested: elimination of the requirement for interior landscaping for parking (33.266.130.G.3.a[1]), and removal of trees greater than six inches in diameter (33.535.205.A). The tree removal adjustments can be further broken down as (1) the removal of 50+ trees of greater than 6” to accommodate the proposed pump station; and (2) removal of invasive non-native trees to restore the upper meadow; and (3) to reflect the violation of the Johnson Creek Plan violation and environmental zone violation when trees were removed as part of site clearing and maintenance. Following are the Adjustment approval criteria, each followed by separate comments, where applicable, on how they are met, not met, or are met with conditions.

33.805.010 Purpose. The regulations of the zoning code are designed to implement the goals and policies of the Comprehensive Plan. These regulations apply city-wide, but because of the city's diversity, some sites are difficult to develop in compliance with the regulations. The adjustment review process provides a mechanism by which the regulations in the zoning code may be modified if the proposed development continues to meet the intended purpose of those regulations. Adjustments may also be used when strict application of the zoning code's regulations would preclude all use of a site. Adjustment reviews provide flexibility for unusual situations and allow for alternative ways to meet the purposes of the code, while allowing the zoning code to continue to provide certainty and rapid processing for land use applications.

33.805.040 Approval Criteria. The approval criteria for signs are stated in Title 32. All other adjustment requests will be approved if the review body finds that the applicant has shown that either approval criteria A. through F. or approval criteria G. through I., below, have been met. Adjustments to the ground floor window requirements of this Title must also meet the additional requirements stated in the ground floor window sections in the base zones.

A. Granting the adjustment will equally or better meet the purpose of the regulation to be modified; and

Findings: Parking Lot Landscaping. Purpose of the requirement for interior landscaping is found in 33.266.130.A, which states:

33.266.130 Development Standards for All Other Uses
A. Purpose. The development standards promote vehicle areas which are safe and attractive for motorists and pedestrians. Vehicle area locations are restricted in some zones to promote the desired character of those zones. Together with the transit street building setback standards in the base zone chapters, the vehicle area restrictions for sites on transit streets and in pedestrian districts:
  • Provide a pedestrian access that is protected from auto traffic; and
• Create an environment that is inviting to pedestrians and transit users.

The parking area layout standards are intended to promote safe circulation within the parking area, provide for the effective management of stormwater runoff from vehicle areas, and provide for convenient entry and exit of vehicles. The setback and landscaping standards:
• Improve and soften the appearance of parking areas;
• Reduce the visual impact of parking areas from sidewalks, streets, and especially from adjacent residential zones;
• Direct traffic in parking areas;
• Shade and cool parking areas;
• Reduce the amount and rate of stormwater runoff from vehicle areas;
• Reduce pollution and temperature of stormwater runoff from vehicle areas; and
• Decrease airborne and waterborne pollution.

The parking lot presently consists of two functional areas (upper area is for car parking and the lower portion of the lot is for horse trailers) connected by a perimeter drive. Within that area is a large landscaped island about twice the size of the parking lot (spaces and maneuvering area). According to the definition of interior landscaping (33.266.130.G.3.f. and g.), the island is considered interior landscaping. Potential future parking is proposed in this landscape island area, but the remainder is estimated by OPDR staff to still be well above the minimum requirement of ten percent of the parking and maneuvering area. Elimination of interior landscaping would result in a paved lot that could be as large as 300 x 300 feet without any visual relief. Stormwater runoff would have to be treated outside of the lot area, potentially conflicting with park activities. Lack of landscaped areas would also eliminate pedestrian refuges and increase conflicts between pedestrians and cars. Lack of landscaping would allow the parking area to overheat due to lack of shading and create a major adverse visual impact from the inventoried scenic viewpoints at the summit of the Butte, and along trails, reducing the recreational experience of park users. This criterion is not met.

Tree Removal. Purpose of the tree removal limitation is found in 33.535.010, which states:

33.535.010 Purpose
The Johnson Creek Basin plan district provides for the safe, orderly, and efficient development of lands which are subject to a number of physical constraints, including significant natural resources, steep and hazardous slopes, flood plains, wetlands, and the lack of streets, sewers, and water services.
At certain locations, the density of development is limited by applying special regulations to new land division proposals. Class I and II lands are given priority for designation as common open space in PUDs and cluster subdivisions, and preservation of existing vegetation on Class I, II, and III lands is encouraged. In addition, restrictions are placed on all new land uses and activities to reduce stormwater runoff, provide groundwater recharge, reduce erosion, enhance water quality, and retain and enhance native vegetation throughout the plan district. At other locations, development is encouraged and mechanisms are included that provide relief from environmental restrictions.

This plan district is intended to be used in conjunction with environmental zoning placed on significant resources and functional values in the Johnson Creek basin, to protect resources and functional values in conformance with Goal 8 of the Comprehensive Plan and Statewide Planning Goal 5.

**Findings:** The Water Bureau requests an adjustment to the requirements of PCC 33.535.205.A. because the Master Plan proposes the removal of approximately 50 trees over six inches in diameter to accommodate the pump station and conduits and associated excavation and grading. The Master Plan also proposes the general removal of invasive non-native trees to restore open meadow areas. Additionally, a number of trees were removed from the water supply pipeline right-of-way from Bull Run without proper permits (discussed as an Environmental Violation elsewhere in this report), and an “after-the-fact” Adjustment is required.

Permitting tree removal within the pipeline right-of-way, pump house boundaries, and the meadow meets the purposes of the Plan District.

The general removal of invasive non-native trees in the open meadow area will expand and restore the open meadow habitat on that part of the Butte while eliminating threats to native trees and other native vegetation from the invasive and non-native species. Cleared areas will be replanted with native meadow grasses to reduce runoff and erosion.

The removal of trees at the pump station location will permit the orderly development of a necessary facility where no alternative location is feasible. The Stormwater Management Plan includes detention and treatment facilities to control and treat runoff from the cleared area, and to control erosion during the construction period. The mitigation plan provides for plantings of native grasses and trees to restore native vegetation and to control erosion after construction is complete.

Granting the adjustment to authorize tree removal within the violation area (pipeline right-of-way) also meets the purposes of the Johnson Creek Basin Plan District.
because the trees have been replaced within the general area of their original location and because the functional values provided by these trees is preserved by the retention of the surrounding trees and by the mitigation plantings. The primary purpose for these restrictions is, in conjunction with the Environmental Zone, to protect significant resources and functional values. Functional values that were provided by the trees have been preserved through remediation plantings and by preserving the surrounding tree cover. The full tree canopy remains intact over the area within this project. Only Site 4 West, where a number of alders were removed, is now cleared of trees. However, the tree cover and perching opportunities provided by trees on both sides of that corridor remain intact, and the habitat function of the corridor has been improved by removal of the invasive nuisance vegetation that was below the trees.

This criterion is met.

B. If in a residential zone, the proposal will not significantly detract from the livability or appearance of the residential area, or if in an OS, C, E, or I zone, the proposal will be consistent with the desired character of the area; and

Findings: Intended character of the area is determined by the purpose of the basic zones and allowed uses within them. The vast majority of the site is within the OS Open Space zone and is intended to be used as a park (allowed outright in all base zones applied to the site) and water storage facility (a basic utility and utility corridor, allowed as a Conditional Use). Purpose of the OS Open Space Zone, is found in 33.100.010 and states:

33.100.010 Purpose
The Open Space zone is intended to preserve and enhance public and private open, natural, and improved park and recreational areas identified in the Comprehensive Plan. These areas serve many functions including:
- Providing opportunities for outdoor recreation;
- Providing contrasts to the built environment;
- Preserving scenic qualities;
- Protecting sensitive or fragile environmental areas; and
- Preserving the capacity and water quality of the stormwater drainage system.

Parking Lot Landscaping. Elimination of interior landscaping for the parking lot would allow large areas of paving without relief. The parking lot presently consists of two functional areas (upper area is for car parking and the lower portion of the lot is for horse trailers) connected by a perimeter drive. Within that area is a large landscaped island about twice the size of the parking lot (spaces and maneuvering area). According to the definition of interior landscaping (33.266.130.G.3.f. and g.), the island qualifies as interior landscaping. Potential future parking is proposed in this landscape island area, but the remainder is estimated by OPDR staff to still
be well above the minimum requirement of ten percent of the parking and maneuvering area. Elimination of interior landscaping would result in a paved lot that could be as large as 300x300 feet without any visual relief. Stormwater runoff would have to be treated outside of the lot area, potentially conflicting with park activities. Lack of landscaped areas would also eliminate pedestrian refuges and increases conflicts between pedestrians and cars. Lack of landscaping would allow the parking area to overheat due to lack of shading and create a major adverse visual impact from the inventoried scenic viewpoints at the summit of the Butte, as well as trails, reducing the recreational experience of park users. The Bureau of Environmental Services also objects to the proposed Adjustment, stating that they are needed to provide for water quality needs for the Johnson Creek basin and to detain stormwater flows and reduce flooding. This criterion is not met.

**Tree Removal.** Purpose of the request is to remove invasive trees from a large meadow, remove trees from a water system right-of-way to allow construction of a new supply line and pump station, and for maintenance of the right-of-way to allow equipment access (which resulted in the Zoning Code violation).

The meadow area is within an Open Space Zone. Tree removal will allow meadow restoration, helping to keep trees out of an area devoted to recreation and protecting this rare (in an urban area) and sensitive open meadow habitat.

The pump station is within a residential zone. The proposed tree removal is screened from the adjacent residential development by retention of a tree buffer north of the site approximately 40 feet in width. The clearing is also surrounded on the three other sides by existing mature trees. In addition, the clearing is located at the rear of a relatively level bench on the slope, so that trees retained east of the clearing will screen the clearing from view to the east, even at a distance. Impacts from the pump station itself (potential impacts include noise) will be prevented by designing the structure to contain noise and by selecting equipment that minimizes the noise produced during operations. The pump station development will also include landscaping of this site to enhance its attractiveness. As a result, the proposed tree removal does not detract from the appearance or livability of the residential area.

The pipeline right-of-way in which the trees have already been removed is zoned for low density residential use, and is characterized by large lots of a semi-rural nature, with gardens and pastures. Tree removal created a meadow-like appearance along the right-of-way, but in an artificial linear manner. Mitigation and restoration in the form of tree and groundcover planting softened the visual impact that might otherwise have detracted somewhat from the livability of the area. Because of this mitigation the livability and residential appearance of the area is retained and this criterion is met.
C. If more than one adjustment is being requested, the cumulative effect of the adjustments results in a project which is still consistent with the overall purpose of the zone; and

**Findings:** Two Adjustments are proposed: elimination of interior parking lot landscaping and removal of trees over six inches in diameter. It is not the cumulative impacts that cause an inconsistency with the purpose of the zone, but the failure of one request (interior parking lot landscaping) to meet the purpose that cause this criterion to be not met. With denial of the Adjustment for eliminating interior landscaping for the parking lot this criterion is met.

The remaining adjustment requests, for tree removal, are unrelated to each other both in location and in impacts. The park is a 600-acre site, and these two activities are separated from each other by a great distance. The meadow area is on the top of the butte, generally on the west and southerly sides of the park area. Tree removal in this area has no detrimental impacts and serves to enhance the resources and functional values of the park. The tree removal for the pump station and the violation areas occurred on the eastern fringe of the butte. These areas are not visible from the open meadow area where the nuisance tree removal will occur. The impact of removing these trees is not heightened in any manner by the removal of the nuisance trees. This criterion is met for the tree removal.

D. City-designated scenic resources and historic resources are preserved; and

**Findings:** Parking Lot Landscaping. Elimination of the requirement for interior landscaping would have a major visual impact from an important scenic viewpoint inventoried under the City’s Scenic Resources Protection Plan. Existing parking lot boundaries are about 300x300 feet, and removal of the landscape island that presently exists would result in a large parking area without any visual relief, out of proportion in scale to surrounding park facilities such as the restrooms, caretaker’s house, and maintenance building and yard (as shown on the Site Plan). No mitigation is proposed. This criterion is not met for the parking lot landscaping.

**Tree Removal.** Removal of non-native vegetation in the meadow will enhance the scenic resource of that viewshed by expanding the natural meadow available for viewing, and by eliminating threats to the native trees in the adjacent forested area posed by the invasive species. The proposed tree removal at the pump station site will be screened from the view from the crest of the Butte by the trees that will be retained on the steep slope above (west of) the pump station site. Proposed tree removal areas does not affect designated historic resources.

No designated scenic resources or historic resources are located in the area on which the tree removal violation occurred. This criterion is met for tree removal.
E. Any impacts resulting from the adjustment are mitigated to the extent practical; and

**Findings:** Parking Lot Landscaping. Additional native vegetation is proposed around portions of the parking area as mitigation. However, the large unbroken area of the possible parking area will still be visible from the park, and other impacts such as lack of shade, stormwater disposal, and pedestrian safety are not addressed. This criterion is not met.

Tree Removal. Tree removal in the meadow area will not have any detrimental impacts but instead will enhance a native habitat that is rare within an urban area, mitigating for lost values provided by the hawthorne trees (some food, perching, resting, and nesting habitat for birds). Tree removal within the pipeline right-of-way and pump house location are mitigated by removing invasive and non-native plants, and planting native trees, shrubs, and groundcover nearby (detailed in the Environmental Review portion of this report). These actions increase biological diversity and enhance habitat. Applicant has also agreed to continue to evaluate, during final design, the potential for adjustments to the alignment of the conduit route from the pump station to the 600’ elevation reservoir to reduce the number of trees that must be removed; the evaluation that has been performed determined that the corridor necessary to accommodate the pump station and pipelines could not be narrowed. This criterion is met for tree removal.

F. If in an environmental zone, the proposal has as few significant detrimental environmental impacts on the resource and resource values as is practicable;

**Findings:** Parking Lot Landscaping. The applicant states that the reduction in the number of trees and landscaped area when compared to the park as a whole is insignificant, but does not address other environmental impacts such as cooling of the parking lot through shading, stormwater detention and disposal, water quality, and scenic amenities. This criterion is not met.

Tree Removal. Removal of invasive trees from the meadow area will not have detrimental impacts and will increase habitat diversity and overall resource values of Powell Butte Park. Tree removal from the pipeline right-of-way and pump station location are necessitated by the dual nature of Powell Butte - a park and a location for regional water supply facilities. This tree removal will not have any significant detrimental impacts since all of the functional values provided by these trees continue to be met by the surrounding trees in undisturbed areas, and by the mitigation plantings of trees, grasses and shrubs that has occurred. With the mitigation proposed and restoration already provided, impacts to the resource are minimized and this criterion is met for tree removal.

**Conclusion:** The criteria for approval of adjustments for the requested tree removal are met. Powell Butte is a recreation area, natural resource and scenic site, and location for regional water supply facilities. Because of the multiple use nature of the Butte, compromises and balancing of needs must be made. Tree removal
requirements are generally intended to help retain and protect the natural environment and character of the area. However, there may be situations where an equal or greater need (domestic water supply) may necessitate tree removal. The applicant proposes limited tree removal to allow greater capacity to the water system, and is offsetting it with mitigation and restoration that will result in no significant detrimental impacts and no net loss of resource values. Tree removal in the meadow on top of the Butte will also result in an enhancement of the area, providing greater environmental diversity, enhanced scenic views, and recreation opportunities. This Adjustment has merit and is approved.

The Adjustment to parking lot interior landscaping, however, does not meet the purpose of the requirement. The existing parking pattern provides a large interior island with landscape extensions further into the existing parking areas, meeting landscape requirements. Even with the proposed lot expansion, the interior landscape requirements would continue to be met, so the Adjustment is unnecessary. In summary, there is no merit to the Adjustment and it should be denied.

DEVELOPMENT STANDARDS
Unless specifically required in the approval criteria listed above, this proposal does not have to meet the development standards in order to be approved during this review process. The plans submitted for a building or zoning permit must demonstrate that all development standards of Title 33 can be met, or have received an Adjustment or Modification via a land use review prior to the approval of a building or zoning permit.

PLANS AND POLICIES

TRANSPORTATION ELEMENT OF THE COMPREHENSIVE PLAN
Ordinance No. 165851, passed by the City Council on September 23, 1992, resulted in an updating of the City Arterial Streets Classification Policy (ASCP) and an amendment to Title 33, the Portland Zoning Code. In reviewing land use requests done as Goal Exceptions, Comprehensive Plan Map Amendments, Zone Changes in compliance with the Comprehensive Plan, Conditional Uses and Master Plans, the Classification Descriptions, and the Maps are used as mandatory approval criteria.

Findings: The Bureau of Transportation Engineering and Development has reviewed the proposal for its conformance with the Transportation Element of the Comprehensive Plan, and for potential impacts upon transportation services. The applicant has prepared an analysis of parking and transportation conditions at Powell Butte Park. That analysis (Lancaster Engineering, 1999) demonstrates that parking supply on the site is adequate for current and expected park visitor parking demand. The analysis further demonstrates that the intersection of SE Powell Boulevard at SE 162nd Avenue, which serves the main entrance to the park, operates at an acceptable level of service consistent with City requirements.
Park improvements include paving of the upper parking lot and striping for parking stalls, drop-off areas and handicapped parking spaces. Because there is a substantial amount of bicycle loading and unloading that occurs at the park, the applicant’s engineer recommended that the striped parking stalls be designed slightly oversize in length and width. This recommendation is appropriate and should be implemented.

Comprehensive Plan Transportation Policies are used as approval criteria for this review. The proposed water system and park improvements are generally consistent with those policies. However, to fully meet the intent of Policy 6.11 Pedestrian Transportation, and Policy 6.12 Bicycle Transportation, additional pedestrian and bicycle improvements are necessary as part of Phase 1 improvement of the park. While a new pedestrian connection from Powell Boulevard to the park center would be desirable, the topography and site boundaries make such a connection unfeasible. Applicant presented evidence to the Council (Exhibit I-6) demonstrating that a pedestrian path complying with ADA design requirements would be too steep and involve too many switchbacks to be feasible for use by pedestrians and persons with disabilities. Further, the proposed path would likely attract skateboarders or bicyclists attempting dangerously fast trips down the steep winding path. Improvement of the existing pedestrian connection will serve the purpose of the plan policy. With the addition of the following improvements all relevant Transportation Policies can be met.

1. Improve the existing pedestrian connection adjacent to the main access road between SE Powell Boulevard at SE 162nd Avenue and the park center, to provide a 6-foot wide gravel surface.

2. Provide bicycle parking facilities in the vicinity of the park center.

Conclusion: The proposed Master Plan for Powell Butte can meet all applicable transportation-related approval criteria, provided the following pedestrian and bicycle improvements are provided as part of park development:

1. Improvement of the upper parking lot shall include striping of over-size stalls to accommodate bicycle loading/unloading, and striping of drop-off areas and handicapped parking spaces.

2. The pedestrian connection adjacent to the main access road between SE Powell Boulevard at SE 162nd Avenue and the park center shall be improved to provide a 6-foot wide gravel surface.

3. Bicycle parking facilities shall be provided in the vicinity of the park center, consistent with Zoning Code requirements.
III. CONCLUSIONS

The request is for approval of a Conditional Use Master Plan and related reviews to carry out the updated master plan for Powell Butte that was adopted by City Council in 1996. The 1996 master plan calls for renovation, relocation, replacement, or expansion of existing water supply and recreation developments. Included is a maintenance program to enhance the scenic and natural resources that are an important element in neighborhood character as well as the environmental health and vitality of the Johnson Creek basin. Although major upgrading and expansion of the water reservoir and distribution system is proposed, little impact on the surrounding area will occur after construction. Proposed changes to park facilities represent only a moderate expansion of low-impact or passive recreation activities, so any increase in traffic, noise, and other impacts to the neighborhood will be negligible. The disturbance areas for construction of the expanded development will be substantial (particularly with the water reservoirs), but the long term impacts will be minimized by the measures called for in the construction management plan and the stormwater management plan. Restoration of the disturbance areas and ongoing enhancement and maintenance efforts will prevent significant detrimental impacts and will increase the quality of existing natural resources on Powell Butte.

Because of the large scale of the Master Plan, it is not possible to have the details necessary to give full land use approvals at this time. Future land use reviews will be necessary to ensure that all land use requirements are met. As modified by applicant at the hearing before the Council, the development standards and the review processes for these developments will meet the purpose of the applicable land use regulations and requirements, simplify and clarify future reviews, and emphasize the items that are of greatest importance (environmental protection, scenic protection, and minimization of off-site impacts).

The proposed RF tower and equipment facility lacks justification and cannot be included in the Plan at this time. As Master Plan development proceeds, more specific needs for wireless communication facility can be determined, and applicant can request a plan amendment to accommodate this element, if warranted.

Finally, the Adjustment for interior landscaping does not meet approval criteria and should be denied. However, as was pointed out in the findings, the center landscaped island in the existing lot meets the definition for interior landscaping and, even if the parking area is expanded as proposed, will be significantly larger than what is required.

It is important to note that only those items specifically identified and approved for Phase I of this application are part of the approved Master Plan. Elements noted in Phase II are only included as an insight into what the applicant may propose in the future and any mention of an item or element from Phase II in this decision is not approved or given an advantage in any subsequent land use application process.
Much of the Council’s interest in this hearing was focused on the proposed maintenance yard. Based on the evidence presented by Applicant in the master plan and at the previous hearing, and on the testimony of the Parks Bureau and Water Bureau representatives before the Council, the Council finds that there is a need for the maintenance yard and storage building with the area and dimensions proposed by the applicant. Furthermore, the Council concludes that the location of the yard on the butte and the proposed landscape screening minimize any visual impacts resulting from this development. The yard will be visible from only a small area on the butte, and will soon be screened from view by the landscape buffer, as has been demonstrated by the adjacent Powell Valley Water District reservoirs. However, the Council encourages applicant, during the final design of this facility, to look for opportunities to reduce the area of the yard and particularly to reduce the impervious paved area within the yard. These measures, if feasible, will further reduce the impact of this facility on the visual and other resources in the park.

Applicant requested the consideration and approval of a concept of “mitigation banking.” The rationale in support of mitigation banking is set forth in Exhibit H.13. OPDR staff, although acknowledging that the concept had merit, recommended against approving the specific mitigation plan (See Exhibit H.26, June 20, 2002 Wenger Memo). The Council also acknowledges that the mitigation banking concept may well be entirely appropriate to be included in the Master Plan. However, the Council agrees with OPDR staff that approval of the plan proposed mitigation banking by the applicant is premature and additional conceptual and point by point procedural discussion is necessary. Therefore, the Council did not include the recommended “mitigation banking” condition as proposed by the applicant in this approval. The concept of the proposed mitigation bank has promise, and Applicant is encouraged to further develop the concept as part of the review of any mitigation/restoration plan or resource enhancement plan development proposed for mitigation banking.

The Master Plan is well prepared and adequately detailed. It is approved with conditions.

IV. DECISION

Deny the appeals of the Pleasant Valley Neighborhood Association and the Centennial Community Neighborhood Association, and uphold the Hearings Officer’s decision for:

Approval of a Conditional Use Master Plan for Powell Butte Park and surrounding area as shown on the Site Plan, Exhibit C and as described in the Powell Butte Master Plan, Exhibit A1, and the boundary expansions that include land reviewed for the environmental violation, Exhibit A2, for uses in the Open Space Zone, and uses in utility corridors.

Approval of Environmental Review for development and activities included in the Powell Butte Master Plan.
Approval of Environmental Review for vegetation removal and ground disturbance violations within an Environmental Zone.

Approval of an Adjustment to 33.535.205.A to allow removal of trees greater than six inches in diameter, limited to species listed as Nuisance Plants or Prohibited Plants on the Portland Plant List, hawthorne trees, and trees shown in the Master Plan as being removed for construction of water supply facilities as approved through this Master Plan.


Denial of an Adjustment to 33.266.130.G.3.a(1) to eliminate the requirement for interior landscaping for parking.

Approvals shall be in substantial conformance with the site plan, Exhibit C, and are subject to the following conditions:

A. The Conditional Use Master Plan shall expire ten years from the date this approval becomes effective. Approvals for development or uses shown in the Master Plan that have not begun by the date of Plan also expire and those developments or uses are subject to the land use regulations in place at that time.

B. Prior to issuance of any permit for any development or use approved by this Master Plan the applicant shall update the Master Plan document and site plan, incorporating all modifications required by this approval and deliver four copies to the Land Use Review Section of the Office of Planning and Development Review.

C. Master Plan approval is limited to only those items listed in Phase 1. The Master Plan document shall be modified as necessary to reflect this.

D. The Radio Frequency Transmission Facility, including the tower, shall be eliminated from the site plan and Master Plan.

E. The storage building shall be a maximum of 5,000 square feet within a maintenance yard of 40,000 square feet as shown on the Site Plan. The maintenance yard shall be in the location and general design as set forth on Exhibit H.29 and landscaping shall exceed L3 landscaping standard on the south and west sides of the yard by planting a double row of trees on those sides generally consistent with Exhibit H.29. The fence around the maintenance yard shall be painted to reduce its visual impact.

F. The Master Plan site plan and all other applicable maps in the Master Plan document shall be modified to include those lands added to the Plan since initial Plan submittal (newly-acquired land and Bull Run pipeline and reservoir overflow line corridors).

G. Development standards are proposed in pages 26-29 of the Master Plan shall be modified as follows:
<table>
<thead>
<tr>
<th>Subject</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Height (p 27)</td>
<td>...(2) The remaining area must be planted with native groundcover. Planting can be either with potted growth or seeding, but must be at a level that will achieve 90% groundcover within one growing season. At least 8 species of plants must be used. Fifty percent of any seed mix used must be grass and 50 percent flowers when measured by area covered. If cover and species requirements are not met within one year or two growing seasons from final inspection, replanting is required and the requirements of this section must be met within one year of replanting. (3)...</td>
</tr>
<tr>
<td>Utility Lines and Corridors (p 27)</td>
<td>Trees may be removed if they are not in an Environmental Protection Zone and:</td>
</tr>
<tr>
<td></td>
<td>● Are species listed as Nuisance Plants or Prohibited Plants on the Portland Plant List, hawthorne trees, or trees shown in the Master Plan as being removed for construction of water supply facilities as approved through this Mater Plan, or</td>
</tr>
<tr>
<td></td>
<td>● Within ten feet of any proposed structure/building or five feet of the periphery of paving, outdoor activity areas driveways or utility line corridors shown on the approved Site Plan, or</td>
</tr>
<tr>
<td></td>
<td>● Smaller than six inches in diameter measured four feet above grade, or</td>
</tr>
<tr>
<td></td>
<td>● may block views from scenic viewpoints as listed on page 68 of The Scenic Resources Protection Plan, as determined by the City Forester or</td>
</tr>
<tr>
<td></td>
<td>● Otherwise specifically allowed to be removed in the Conditional Use Master Plan.</td>
</tr>
<tr>
<td></td>
<td>Trees not on the Portland Plant List in the open meadow area shown on the Site Plan may be removed without replacement.</td>
</tr>
<tr>
<td></td>
<td>Other trees may be removed if the City Forester finds that they are diseased or damaged or otherwise pose an immediate hazard to people or property.</td>
</tr>
<tr>
<td></td>
<td><em>A separate permit from the City Forester is required to plant, remove, prune, spray, or maintain any tree located on public property or the public right-of-way.</em></td>
</tr>
</tbody>
</table>
|                                                    | Except for trees removed from the open meadow area, trees that are removed shall be replaced with native species. A permit from the...
City Forester is required to plant, break, prune, spray, remove, or impact trees on City Property, including Powell Butte. Mitigation for permitted tree removal will be determined by the City Forester. Mitigation requirements will be consistent with mitigation requirements at other public properties and will not be less than the following:

- For every six inches of diameter of tree removed, at least three trees shall be replanted on the site at least ten feet from a paved surface and 20 feet from a structure.
- The replacement trees must be a minimum of one-half inch diameter and selected from the Plant List.

Street trees (p 28)  
Street trees will be native species where practical as determined by the City Forester. No permit will be issued for trees listed as a nuisance plant or prohibited plant on the Portland Plant List. Tree placement will be determined by the City Forester. Street trees shall also comply with Portland City Code Chapter 20.40 and 33.430.

All Other Standards (to be added at the end of the table)  
Standards that are not specifically stated here shall be those of the Zoning Code (base zone as modified by the plan district or overlay zone).

H. The following table shall replace the text found on pages 21-31 dealing with future reviews and Table 4 on page 32 of the Master Plan:

<table>
<thead>
<tr>
<th>Development, Use, or Action</th>
<th>Approval Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TYPE I REVIEW</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Contraction of Master Plan Boundaries | - The area to be removed from the Master Plan does not include any development, including environmental mitigation areas, that has been approved on the approved Master Plan site plan.  
- All Zoning Code requirements and Master Plan requirements will continue to be met. This includes Zoning Code requirements (such as minimum lot size) for the area that is removed from the Master Plan.  
- Scenic resources will be protected.  
- Natural resource values, including wildlife corridors and important habitat areas, will be protected. |
| Expansion of Master Plan Boundaries when the expansion area is five acres or less in size | The purpose of the Master Plan and intended character of the Master Plan site will continue to be met with the expansion.  
- In combination with all other expansions since the effective date of |
Master Plan approval, total area of the proposed and all previous expansions do not exceed 10% of the Master Plan area.

**TYPE II REVIEW**

<table>
<thead>
<tr>
<th>Allowed by the Master Plan and</th>
<th>The development or use is in substantially the same area as shown on the approved Master Plan site plan.</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Does not require a higher level of review.</td>
<td>- The construction management plan prevents adverse impacts to areas outside of the approved disturbance area.</td>
</tr>
<tr>
<td>- Except for trail improvements, the development or use and disturbance area is outside of the Environmental Protection Zone.</td>
<td>- A mitigation/restoration plan ensures no net loss of resource values.</td>
</tr>
<tr>
<td>- The development or use is no greater than 110% larger or more intense than that shown on the approved Master Plan site plan.</td>
<td>- Views from Scenic Viewpoints shown on page 68 of the <em>Scenic Resources Protection Plan</em> will not be blocked or impaired.</td>
</tr>
<tr>
<td>- The disturbance area is no greater than 110% of that shown on the approved Master Plan site plan.</td>
<td>- Designated outdoor storage and maintenance areas and maintenance buildings will be landscaped to mitigate for adverse impacts to scenic views from Scenic Viewpoints shown on page 68 of the <em>Scenic Resources Protection Plan</em>.</td>
</tr>
</tbody>
</table>

**Construction of new trail or relocation of an existing trail**

<table>
<thead>
<tr>
<th>The construction management plan prevents adverse impacts to areas outside of the approved disturbance area.</th>
<th>- There are no additional traffic impacts that require traffic improvements or additional parking spaces.</th>
</tr>
</thead>
<tbody>
<tr>
<td>- A mitigation/restoration plan ensures no net loss of resource values.</td>
<td>- All Zoning Code requirements are met unless superceded by the Master Plan.</td>
</tr>
<tr>
<td>The trail is not in the Environmental Protection Zone.</td>
<td>All Master Plan standards are met.</td>
</tr>
</tbody>
</table>

**TYPE III REVIEW**

<table>
<thead>
<tr>
<th>Allowed by the Master Plan and exceeds the thresholds for a Type I or Type II review.</th>
<th>The development or use is in substantially the same area as shown on the approved Master Plan site plan.</th>
</tr>
</thead>
<tbody>
<tr>
<td>- The applicable requirements of the Environmental Zone are met.</td>
<td>- The applicable requirements of the Environmental Zone are met.</td>
</tr>
</tbody>
</table>
Scenic resources are protected.
- The purpose of the Open Space Zone is met.
- Services are capable of serving the expanded development or use.
- Adverse impacts to surrounding residential areas are minimized.
- All Zoning Code requirements are met unless superceded by the Master Plan.

<table>
<thead>
<tr>
<th>Expansion of Master Plan Boundaries when</th>
<th>Major Amendment to a Conditional Use Master Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>● The expansion area is greater than five acres in size or</td>
<td>● Scenic resources are protected.</td>
</tr>
<tr>
<td>● In combination with all other expansions, total area of expansion is greater than 10% of the Master Plan area.</td>
<td>● The purpose and intended character of the Open Space Zone is met.</td>
</tr>
<tr>
<td></td>
<td>● Adverse impacts to surrounding residential areas are minimized.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Uses not allowed by the Master Plan</th>
<th>Major Amendment to a Conditional Use Master Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>J. The applicant shall monitor the survival rate of all planting used for remediation for the environmental violation for at least three years. A 80% survival rate for trees and shrubs and 80% groundcover is required. If the number of trees and shrubs or amount of groundcover drops below this level, new planting to achieve the required level shall be installed.</td>
<td></td>
</tr>
</tbody>
</table>

I. All disturbance areas shall be revegetated with native groundcover. Planting can be either with potted growth or seeding, but must be at a level that will achieve 80% groundcover within one growing season. At least 8 species of plants must be used. Fifty percent of any seed mix used must be grass and 50 percent flowers when measured by area covered. If cover and species requirements are not met within one year or two growing seasons from final inspection, replanting is required and the requirements of this section must be met within one year of replanting. 

J. Improvement of the upper parking lot shall include striping of over-size stalls to accommodate bicycle loading/unloading, and striping of drop-off areas and handicapped parking spaces. Trees shall be planted uphill from the parking lot to provide shade to at least one-third of the parking lot surface. Selection of the species to be planted, and the spacing and locations of the trees shall be coordinated with the City Forester, with consideration to be given to balancing the desire for shade against avoiding adverse impacts on the designated vistas and scenic resources from uphill of the trees.
L. Prior to issuance of any development permit for any park or recreation improvement, including any parking lot improvements, Applicant shall improve the existing pedestrian connection adjacent to the main access road between SE Powell Boulevard at SE 162\textsuperscript{nd} Avenue and the park center, to provide a continuous 6-foot wide gravel surface.

M. Prior to issuance of any development permit for any park or recreation improvement, including any parking lot improvements, bicycle parking facilities shall be provided in the vicinity of the park center, consistent with Zoning Code requirements.

N. To assure an appropriate balance in scheduling the construction of new water system and park facilities, development of the 50 million gallon reservoir shall be coincident with development of the following parks facilities; parking lot improvements, interpretive center/public restroom remodeling, maintenance yard and storage building, and relocation of the caretaker residence.

O. Within one year of master plan approval, Applicant shall plant trees to provide shade to the planned detention pond location.

P. Within the tree removal corridor for the pump station, final design of the pipeline will continue to analyze alternative pipeline alignment options to preserve, if practical and feasible, large Douglas fir trees in the approved tree removal corridor. The mitigation/restoration plan for the pump station will include planting of Douglas fir trees on both sides of the pipeline trench. The access road and staging/parking area for the pump station shall be finished with a gravel surface.
Dated this 15th day of July, 2003.

City Council of Portland Oregon

_______________________________________

Mayor Vera Katz

The application for this land use review was determined to be complete on April 10, 2002.

Recording the final decision. If this Land Use Review is approved, the final decision must be recorded by the Multnomah County Recorder before the approved use is permitted, any building or zoning permits are issued, or any changes to the Comprehensive Plan Map or Zoning Map are made.

The applicant, builder, or a representative may record the final decision as follows:

- By Mail: Send the two recording sheets (sent in separate mailing) and the final Land Use Review decision with a check made payable to the Multnomah County Recorder to: Multnomah County Recorder, P.O. Box 5007, Portland OR 97208. The recording fee is identified on the recording sheet. Please include a self-addressed, stamped envelope.

- In Person: Bring the two recording sheets (sent in separate mailing) and final Land Use Review decision with a check made payable to the Multnomah County Recorder to the County Recorder’s office located at 501 SE Hawthorne Boulevard, #158, Portland OR 97214. The recording fee is identified on the recording sheet.

For further information on recording, please call the County Recorder at (503) 988-3034.

Expiration of this approval. This decision expires three years from the date it is recorded unless:

- A building permit has been issued, or
- The approved activity has begun, or
- In situations involving only the creation of lots, the land division has been recorded.

Applying for your permits. A building permit, occupancy permit, or development permit must be obtained before carrying out this project. At the time they apply for a permit, permittees must demonstrate compliance with:

- All conditions imposed here.
• All applicable development standards, unless specifically exempted as part of this land use review.
• All requirements of the Building Code.
• All provisions of the Municipal Code of the City of Portland, and all other applicable ordinances, provisions and regulations of the City.
EXHIBITS
Not Attached Unless Indicated

A. Applicant’s Statement:
   1. Original Submittal (December 2000)
   2. Additional Submittal for Environmental Violation
   3. 120-day waiver

B. Zoning Maps (5) (attached)

C. Site Plans
   1. General Master Plan (Powell Butte) (attached)
   2. Park Center (attached)
   3. General Map for Environmental Violation Sites
   4. Environmental Violation Site 1 (attached)
   5. Environmental Violation Site 2 (attached)
   6. Environmental Violation Site 4E (attached)
   7. Environmental Violation Site 4M (attached)
   8. Environmental Violation Site 4W and 5 (attached)

D. Notification information:
   1. Request for response
   2. Posting letter sent to applicant
   3. Notice to be posted
   4. Applicant’s statement certifying posting
   5. Mailing list
   6. Mailed notice

E. Agency Responses:
   Bureau of Environmental Services
   Bureau of Transportation Engineering and Development Review
   Water Bureau
   Site Development Review Section of OPDR
   Bureau of Parks, Forestry Division

G. Other:
   1. Original LUR Application
   2. Site History Research

Hearings Officer Exhibits:
Received Before the Hearing
H. 1. OPDR Staff Report
   2. Linda Bauer Memo
   3. Phiamo Elias Letter
   4. Robert Willis Letter
   5. Loren Morse Letter
   6. John Morse Letter
   7. Sarah Morse Letter
   8. Amendments to Staff Report

Received During the Hearing
   9. Powerpoint Presentation
   10. Aerial View of Area
Received After the Hearing
11. Duncan Brown Memo
12. Louise Cody Letter
13. Applicant’s Response to Hearings Officer Question
14. Louise Cody Memo (corrected)
15. Jim Urbaniak Letter
16. Linda Bauer Letter
17. Supplemental Hearings Officer Order
18. Richard Hall Letter
19. Louise Cody Letter
20. Ric Balfour Letter
22. George S. Winslow Letter
23. Linda Bauer Letter
24. Linda Bauer Letter
25. Frank Krawczyk Letter
26. Duncan Brown Memo with attachment
27. Pleasant Valley NA Letter
28. Kevin Hanway Letter
29. Conceptual Site Plan – reduced-size copy of page from Exhibit H-13

Received by City Council
1. Centennial Community Association decision appeal
2. Pleasant Valley Neighborhood Association decision appeal
3. Staff report – Powerpoint presentation
4. Centennial Community Association materials
5. Applicant’s Supplemental Materials
6. Applicant’s Powerpoint presentation
7. Parks Bureau Memorandum – Herbicide use at Powell Butte, and Integrated Pest Management policy
8. Plan view of proposed pedestrian path
SECTION IV – DETAILED DESCRIPTION OF APPROVED FACILITIES
SECTION IV
DETAILED DESCRIPTION OF APPROVED FACILITIES

Existing Conditions

Location of Powell Butte

Powell Butte (the “Butte”) is situated in southeast Portland between Powell Boulevard and Foster Road and between roughly SE 143rd and 163rd Avenues. It is just north of Johnson Creek and the Springwater Corridor. See Figure 4-A1, Vicinity Map. Its forested side slopes rising about 400 feet above the surrounding terrain make the Butte a dominant visual element in the region. See Figure 4-A2, aerial photo with topography.

History of the Butte

The Butte is one of a series of volcanic lava domes in the eastern part of the metropolitan Portland area referred to collectively as the Boring/East Buttes Lava Domes. In April, 1925, the City of Portland purchased a portion of the Butte, the 556-acre Wilson Homestead, to preserve a site for future water reservoirs. Subsequent purchases of abutting properties expanded the City’s holdings to the current 578 acres. The City leased the property to the owners of the Meadowland Dairy, who grazed livestock on the Butte until about 1980.

Development of public water facilities on Powell Butte began in the 1960’s with the construction of the first of the Powell Valley Road Water District’s two above-ground reservoirs. The second reservoir was constructed in the 1970’s. Construction of the City of Portland’s 50 million gallon (mg) underground reservoir was completed in 1980. The City built drainage channels on the Butte in 1982 to alleviate landslide problems on its north slope. In 1983, the City built a 66-inch diameter water transmission line from the Butte to serve Portland and Washington County customers.

The Butte also provides important recreational amenities, including significant wildlife habitat and panoramic views. These amenities have always attracted informal (and until 1990, unauthorized) use by hikers, horseback riders, bird watchers and various other users. In 1987 the City officially established the Butte as a natural resource-based park, managed by the Portland Bureau of Parks and Recreation (the “Parks Bureau”). The park was opened to the public in 1990.

The Parks Bureau prepared the first Powell Butte Master Plan in 1986 (the “1986 Facilities Plan”). The City Council adopted that plan the following year. The 1986 Facilities Plan provided for development and use of the Butte by the Parks Bureau for park and recreation purposes and by the Water Bureau for water service-related uses.

The 1996 Facilities Plan is an update to 1986 Facilities Plan. The 1996 Facilities Plan provides more detail regarding the size, location and timing of specific uses identified in the Conditional Use Master Plan. The Portland City Council adopted the
1996 Facilities Plan on December 4, 1996. (See Resolution No. 35571 in the Facilities Plan document.)

**Comprehensive Plan Map Designations and Zoning of the Butte**

Most of Powell Butte is designated Open Space on the City Comprehensive Plan Map, and it has a base zone of OS (Open Space). A small area on the east-central edge of the site has a plan map designation of Low Density Single Family and a base zone of R-10 (Single Dwelling Residential). The north roughly 450 feet of the Butte driveway and a small triangular area in the northeast corner of the site has a plan map designation of Medium Density Single Family and a base zone of R-2 (Multi Dwelling Residential). See Figure 4-A3 Zoning Map.

The entire site, except the R-2-zoned portion, is subject to the Environmental Overlay District. The forested slopes on the west and south sides of the Butte are in the “p” (protection) zone, and the remainder of the Butte is in the “c” (conservation) zone. The Environmental District protects significant resource values on the Butte, which include water quality, storm drainage, aesthetic and scenic relief, pollution control, nutrient retention and removal, sediment trapping, recreation, education and heritage. The site is in the Johnson Creek Basin Plan District, which also protects the Butte’s natural resource and flood control values.

The site also is in the Pleasant Valley subdistrict of the Outer Southeast Community Plan area.

**Existing Uses and Development on the Butte**

The majority of the Butte is undeveloped and relatively undisturbed. The steep side slopes of the Butte are forested with a mix of deciduous and evergreen forest. The summit of the Butte consists of mostly open grassy meadow and an abandoned orchard. The meadow in the southwest corner of the Butte summit has been substantially overrun by invasive non-native hawthorn trees and Himalayan blackberries. Multiple scenic view points are located on the Butte (see Figure 4-A4, Scenic Viewpoints) which provide scenic vistas to several local land features in the city.

There are now four water reservoirs on the Butte. The Powell Valley Water District owns and operates three above-ground reservoirs with capacities of 7 mg, 3 mg and 0.2 mg, respectively. The Portland Water Bureau owns a 50 mg underground reservoir, situated in the north-central portion of the site. Water is delivered to the Water Bureau’s facility by gravity flow from the Bull Run reservoir through three large-diameter underground pipelines. These pipelines were constructed between 1911 and 1935 and have a combined capacity of 210 million gallons per day.

In addition to water facilities, the Butte is developed for recreational uses. At the northeast corner of the summit is a gravel-covered lot that provides parking for about 39

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2 The 0.2 mg reservoir is not currently operated.
Figure 4-A3
Zoning Map

Powell Butte CUMP
vehicles. A second gravel lot for horse trailers and bus parking is located to the north, downhill, of the main parking lot. A small building adjacent to the parking lot provides public rest rooms, park information and storage. A caretaker’s dwelling, consisting of a double-wide manufactured home, is situated to the northwest (downhill) of the parking lots. Trails surfaced with asphalt, gravel or bark provide access throughout the Butte and off-site for pedestrians, equestrians and bicycles. There also are numerous unofficial “volunteer” trails created by park users.

Storm water runoff in the area of the Water Bureau’s reservoir and the Park Bureau facilities is collected in drainage channels and a concrete drainage swale situated adjoining the existing City reservoir. These drainage improvements were developed to reduce the potential for landslides along the less stable slopes on the north side of the Butte. Smaller turf- or metal-lined swales occur elsewhere on the Butte. Storm water from these facilities is directed to Johnson Creek. Runoff from the access drive is collected in grassy swales alongside the drive and discharged to the north to the City’s storm sewer system.

There are numerous fences on the Butte, some in use and some abandoned. The above-ground reservoirs on the Butte are enclosed by cyclone fences. The pond in the southeast portion of the summit meadow is fenced to protect ducks and other wildlife in the pond from park users’ dogs. Other sections of field fencing remain from when the Butte was used for agriculture. These historic fences occur throughout the Butte, along the site boundaries, at the edge of the meadow/forest and within the meadow area.

Access to the Butte

Vehicular access to the Butte is provided by means of a paved 20-foot wide driveway that extends south from SE Powell Boulevard, a neighborhood collector street, at SE 162nd Avenue. The driveway rises from about 225 feet above mean sea level at Powell Boulevard to about 625 feet above mean sea level at the summit. Bicycle and pedestrian access is or will be provided from Powell Boulevard via the driveway and existing and planned trails from SE 148th and 158th Avenues to the north, SE Ellis, Raymond and Holgate Streets to the west, and SE Circle Avenue to the east. Trail access to the Butte also is provided to and from the Springwater Corridor Trail south of the Butte.

Surrounding Land Uses and Zoning

The Butte is surrounded largely by residential development on a variety of lot sizes. The development potential in the vicinity is limited. Most surrounding lots are developed to the extent permitted by zoning or are constrained by natural features, access limits or other conditions.

West of the site is a 2 mg reservoir owned by the Powell Valley Road Water District. The Springwater Corridor Trail skirts the south edge of the Butte. Johnson Creek is south of the trail. The Portland Gun Club is roughly 1/4-mile east of the site.
Most of the land around the Butte is zoned R5, R7 (or LR7 in the County) or R10 (Single Dwelling Residential). There are small areas of R2 and R3 (Multi Dwelling Residential) to the east and R20 (Single Dwelling Residential) across Johnson Creek to the south. Land south of the Butte also is in the Environmental Overlay Zone and the Johnson Creek Plan District. See Figure 4-A3, Zoning Map.
SECTION IV – B – DEVELOPMENT SCHEDULE & PROJECT PHASING
CUMP Projects and Phasing

1996 Facilities Master Plan Process

The 1996 Facilities Plan is the basis for the Powell Butte Conditional Use Master Plan. The 1996 Facilities Plan was drafted, reviewed and revised in an 18-month long planning process led by the Water Bureau in partnership with the Parks Bureau. Many stakeholders interested in the Butte participated, including representatives of recreational groups, environmental interests, neighborhood associations, schools, other City bureaus and other water agencies.

Preparation and City Council approval of the Conditional Use Master Plan required additional engineering and environmental analysis of planned facilities identified in the 1996 Facilities Plan. This additional technical information, contained herein, was required to address specific City Code requirements to gain Master Plan approvals. Further, some planned facilities identified in the 1996 Facilities Plan (ex. Radio Frequency Monopole Tower), are not included in the Conditional Use Master Plan because the City Council found them to be inconsistent with the City’s Zoning Code Standards. For these reasons, future development (YR 2003 – YR 2013) on Powell Butte should be guided by the provisions set forth in the Conditional Use Master Plan, not the 1996 Facilities Plan. Where there is a land use conflict between the two documents, the Conditional Use Master Plan shall prevail.

The process the City used to produce the 1996 Facilities Plan reflects a broad consensus of the public and interested bureaus. The City informed and consulted the public early and often. This process and public reviews of the Master Plan at several neighborhood association meetings fulfill the requirements for bureau and public involvement in formulation of a conditional use master plan (Section 33.820.040).

Proposed Projects and Phasing

The Master Plan is to be implemented in two or more phases. Phase 1 projects are proposed to begin construction within 10 years, i.e., by 2013. Phase 2 projects may be constructed over the subsequent 40 years or more, i.e., between 2013 and 2050. When and if Phase 2 projects are developed depends on the future water needs of the region and, in some cases, the results of additional studies. Additional City land use approval will be required for Phase 2 projects. Information regarding Phase 2 projects is provided here simply to provide context for Phase 1 projects and for proposed standards and procedures for administration of the Master Plan.

Table 4-B1 lists the development projects proposed in each phase. A more detailed description of each listed project follows the table.
<table>
<thead>
<tr>
<th>Phase</th>
<th>Water System Improvements</th>
<th>Park Improvements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (thru 2013)</td>
<td>- Seismic upgrading of the existing 50 mg reservoir</td>
<td>- Construction of new trails</td>
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<tr>
<td></td>
<td>- A 50 mg underground reservoir at the 530 foot elevation</td>
<td>- Improvements to existing trails</td>
</tr>
<tr>
<td></td>
<td>- A 20 mg underground reservoir at the 600 foot elevation</td>
<td>- Improvements to comply with the ADA</td>
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<td></td>
<td>- A pump station and hydropower generator</td>
<td>- Construction of an interpretive center/information kiosk</td>
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<td></td>
<td>- An 84-inch diameter transmission conduit from Bull Run reservoir (Conduit 5)</td>
<td>- Parking lot improvements</td>
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<tr>
<td></td>
<td>- A 66-inch diameter regional transmission pipeline</td>
<td>- Replacement of the existing caretaker's dwelling</td>
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<tr>
<td></td>
<td>- An 84-inch diameter emergency overflow line</td>
<td>- Construction of a maintenance building and storage yard</td>
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<tr>
<td></td>
<td>- An emergency overflow and dechlorination facility</td>
<td>- Vegetation management</td>
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<td></td>
<td>- An outdoor teaching area</td>
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<td>- Establishment of an exclusive wildlife area</td>
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<tr>
<td>2 (after 2013)</td>
<td>- Two additional 50 mg underground reservoirs</td>
<td>- A second parking lot to the north, downhill, of the existing parking lot if warranted based on the results of future traffic studies</td>
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<tr>
<td></td>
<td>- An 84-inch transmission conduit from Bull Run reservoir (Conduit 6)</td>
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<td></td>
<td>- A water treatment plant if warranted by future studies</td>
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</tr>
</tbody>
</table>

3 Park improvements will be implemented in conjunction with water system improvements. For instance, all Phase I park improvements will be completed before or concurrent with completion of all Phase I water system improvements.
SECTION IV – C – WATER SYSTEM FACILITIES
Phase 1 Water Facilities:

The water facilities planned for Powell Butte over the next 10 years are illustrated on Figure 4-C1. Details of these facilities are described below and further shown on subsequent drawings contained herein (Figure 4-C1 – Figure 4-C12).

Seismic Upgrading of the Existing Reservoir - The existing 50 mg reservoir must be reinforced to comply with current, more stringent, seismic design requirements. This will involve digging a four- to six-foot deep trench around the existing reservoir and strengthening the then-exposed reservoir walls.

Second 50 mg Underground Reservoir - A second buried 50 mg reservoir will be built west of the existing reservoir. Its location is constrained along the north/south axis by topography and the need to maintain a reservoir overflow elevation of 530 feet. The reservoir would cover approximately 380 x 645 feet (245,100 square feet). It is critical that storm water be removed from this area of the Butte to prevent landslides and significant property damage such as have occurred in the past on the steep north slopes. Storm water runoff from this reservoir will be collected and detained in water quality ponds and then discharged to Johnson Creek via the existing storm water/overflow pipe serving the existing 530-foot reservoir.

600-Foot Underground Reservoir - A 20 mg buried reservoir may be constructed on the Butte with an overflow elevation of 600 feet. This higher reservoir is needed to provide gravity flow service to development at higher elevations surrounding the Butte and to better serve the region as a whole. The reservoir would measure approximately 440 x 220 feet (96,800 square feet).

Pump Station/Hydropower Generator - This facility will be used to pump water to the new reservoir at the 600-foot elevation from the existing 530-foot elevation storage reservoir during summer months when water levels in the Bull Run Reservoir are too low to permit gravity flow to the 600-foot reservoir. During winter months water will flow from the 600-foot reservoir to the lower reservoirs through a turbine generator to generate electricity. The generator will be housed in a roughly 30- by 100-foot underground or partially-buried structure on land at the central eastern edge of the Master Plan boundary.

Conduit 5 - Conduit 5 is an estimated 84-inch diameter underground pipeline that will supply water to the reservoirs on the Butte directly from the Bull Run Watershed. The conduit will approach the Butte from the east within city limits within an existing 100-foot wide right-of-way. The on-site segment of the pipeline will follow approximately the alignment shown on Figure 4-C2.

Emergency Overflow Pipeline - An estimated 84-inch diameter underground pipeline for routing of emergency overflow from the new 530-foot reservoir. This pipe will be installed in the same trench as Conduit 5, and will provide a connection for overflows from the proposed 600-foot reservoir. The pipeline will discharge at an existing outfall at Johnson Creek.
Regional Transmission Pipeline - This facility will consist of a roughly 66-inch diameter pipeline connecting the 600-foot reservoir to the regional water supply system to the south. This pipeline will travel off the Butte to the east before turning southeast towards an as-yet undetermined destination. The final alignment for this facility is dependent on further analysis of off-site alignments. However the on-site segment of the pipeline is likely to follow approximately the alignment shown in Figure 4-C2.

Phase 2 Water Facilities:

Two Additional 50 mg Underground Reservoirs - The City expects to build two additional underground reservoirs on the Butte to meet the long term water storage needs of the region. These reservoirs will be situated west of the second 50 mg reservoir proposed for construction in phase 1. These reservoirs must be on the Butte at an elevation of approximately 530 feet in order to function in coordination with the existing and proposed reservoirs.

Conduit 6 - The City expects to develop another major conduit from Bull Run to replace existing conduits and/or to support water transmission from additional storage in the Bull Run Watershed. The route and capacity of this underground pipeline will be similar to Conduit 5.

Water Treatment Plant - A 500 million gallon per day (mgd) capacity water treatment plant may be constructed on the Butte, subject to completion of a detailed environmental assessment process. The treatment plant now is expected to consist of about nine structures placed above or partially underground and situated south of (or uphill from) the reservoirs, at the 550-foot elevation. See Figure 4-C13 for an illustration of a possible location for a water treatment plant.
Figure 4 - C7
Pump Station Site
Powell Butte CUMP
SECTION IV – D – PARK AMENITIES
Phase 1 Park Facilities:

The park amenities planned for Powell Butte over the next 10 years are illustrated on Figure 4-D1 – Figure 4-D7. Details of these park feature are further described below.

Parking Lot Improvements - The City will improve the existing upper gravel parking lot surface. Surfacing the lot will reduce dust and noise, and will also allow the City to paint stripes to define parking spaces. By identifying parking spaces, rather than allowing the haphazard parking arrangement that now occurs, the lot area will be used more efficiently, reducing the potential need for expanding this lot or paving the existing lower lot. Two handicapped parking spaces and a drop-off area will also be provided to comply with ADA guidelines. These improvements will bring the parking lot more into compliance with City Code requirements.

Caretaker Dwelling - The City will remove the existing caretaker dwelling, a double-wide mobile home. The dwelling site will be graded and replanted to restore it to pre-existing natural conditions. The City will build a new wood frame caretaker dwelling west of the parking lot. The frame structure will be designed in a farmhouse style to reflect the agricultural history of the Butte. Relocating the dwelling site will enhance the caretaker’s view of the parking lot and rest room area, improving on-site security. The forested slopes and topography of the Butte will screen the relocated structure from view from off-site.

Trail Improvements - Five new pedestrian and bicycle trails will be constructed on the Butte. See Figure 4-D for trails to be abandoned or improved. With the new trails in place, some of the unofficial “volunteer” trails created by park users and a portion of the existing Wildhorse Trail will be abandoned and restored to natural conditions. The remainder of the existing trails will be maintained and improved as needed.

Maintenance Building - The City will build a new maintenance building and yard west of the existing Powell Valley Water District reservoir. The building will cover roughly 5,000 square feet, and the storage area will contain about 40,000 square feet. The Parks and Water Bureaus will share this facility. The storage yard will provide secured short term parking for Water and Park Bureau vehicles (cars and light trucks) while City staff inspect and maintain facilities on the Butte. Overnight parking is not proposed. The facility will be screened from off-site view by existing vegetation and topography. Proposed plantings uphill from the facility will screen it from view from the park center.

ADA Improvements - Various improvements are necessary to comply with current ADA standards. These include the parking lot improvements noted above; reconstruction of trails to widen them, reduce grades and provide level resting areas; and modifications to the existing restroom facilities.

Interpretive Center/Information Kiosk - The Parks Bureau now uses the east part of the existing restroom building to store park maintenance equipment. After the Parks
Bureau relocates this storage to the proposed park maintenance building, it will redevelop the vacated area for use as an interpretive center/information kiosk that will display information about the history of the park, wildlife and habitat, trails, park rules and other relevant information.

**Vegetation Management** - Non-native vegetation, including hawthorn and Himalayan blackberries, have taken over portions of the existing meadow. The City will remove these plants and will replace them with native vegetation to restore the predominantly grassy meadow. A variety of revegetation techniques may be used including, but not limited to, controlled burning, hand-held and motorized equipment and hand clearing.

**Outdoor Teaching Area** - The City proposes to build an outdoor teaching and group gathering area, consisting of a small grass amphitheater southwest of the parking area. This amphitheater will be created through minor re-contouring and stabilization of the existing slopes to provide outdoor seating for groups of less than 100 people.

**Exclusive Wildlife Area** - The Parks Bureau will designate a roughly 100-acre area in the southeast portion of the Butte summit exclusively for wildlife habitat. Visitor access to this area will be limited or prohibited to create an area of undisturbed habitat for species that may be especially sensitive to human disturbance.

**Phase 2 Park Facilities:**

**Vegetation Management** - The City will continue to remove non-native vegetation and to replant those areas with native species in order to maintain the existing predominantly grassy meadow.

**Second Parking Lot** - The City may build an additional parking area below the existing parking lot if necessary to accommodate future increases in park use.
APPENDIX A – POWELL BUTTE FACILITIES MASTER PLAN

(CONTAINED WITHIN THE LAND USE RECORD)
Conditional Use Master Plan  
Powell Butte  
Portland Water Bureau  

Construction Management Site Plan  

Summary  

The construction management site plan for Powell Butte presents a preliminary description of areas which would be disturbed during possible future construction of water facilities over the next 10 years. This document also references standards which will be followed to mitigate erosion and to control sediment during construction. 

This analysis assumes that future facilities construction on Powell Butte will be carried out in three phases within the 10-year life of the Master Plan. The first phase of construction will consist of seismic reinforcement of the existing reservoir. The second phase will consist of construction of a new 50-MG reservoir adjacent to the existing buried reservoir, a pipe to route water to the reservoir, and a pipe to collect overflow from the new and existing reservoirs. The third phase will consist of construction of a new 20-MG reservoir, inlet, outlet and overflow pipes, and a transmission pipeline to convey water from the Powell Butte reservoirs to the south metropolitan area. 

This construction management site plan addresses the following information, as required by the City of Portland:

- areas that will be disturbed, including equipment maneuvering areas;
- areas where existing topography and vegetation will be left undisturbed;
- location of site access and egress;
- equipment and material staging and stockpile areas;
- erosion control measures; and
- measures to protect trees and vegetation.

Phase I - Seismic Reinforcement of Existing Reservoir  

Figure 1 illustrates the preliminary site plan for this phase. The existing reservoir will be seismically upgraded by improving the structural connections between the cover and the wall along the perimeter of the reservoir. This will require excavation of a trench along the perimeter of the structure. A conservative estimate of the trench width at ground level is 20 ft. The trench would be approximately 5 ft. in depth. This temporary construction trench will be backfilled and compacted after seismic upgrades to the structure are completed. A staging and stockpile area will be located to the northwest of the reservoir. The size of this area is estimated to range from 1 to 2 acres, with a maximum area of 2
acres. This is approximately 15 to 35% of the area of the existing reservoir. An existing access road to this area will be utilized.

The disturbed perimeter area will be re-vegetated in accordance with City standards, as referenced below. There are no existing trees in the area to be disturbed.

**Phase II - Construction of New 50-MG Reservoir, Conduit 5, and Overflow Pipe**

Phase II impacts are shown on Figure 2. The new buried reservoir will be constructed at the northwest side of the Butte, adjacent to the existing buried reservoir. The disturbed area is occupied by non-native grasses and hawthorne, and has no trees. The size of the area to be disturbed for reservoir construction will range from 10 - 20 acres, with a maximum disturbance area of 20 acres. An existing service road which runs near and parallel to the north property boundary will be utilized to access the reservoir construction area. The new inlet pipe, Conduit 5, will share a common trench with a new overflow pipe. Both pipes are preliminarily sized at 84-in. A conservative estimate of the trench width at ground level is 25 ft. New pipelines will follow an existing pipeline route and easement off of the Butte to the east.

During the excavation for the new reservoir, topsoil to a depth of approximately 2 feet (approximately 18,000 cuyd) will be stockpiled separately from the deeper material. Backfill and stockpiled topsoil will be re-applied to the surface of the reservoir and surrounding area following construction. Soil will be applied to blend the facility with the existing ground contours. Planting of the reservoir cover will be accomplished with native plant materials, in accordance with City standards and with guidance from the Parks Bureau.

**Phase III - Construction of New 20-MG Reservoir, & Inlet/Outlet, South Transmission Line**

Phase III impacts are presented on Figure 3. The new reservoir will be constructed in the southeastern quadrant of the open meadow area, near an area previously utilized as a disposal site during excavation of the existing buried reservoir. A new access road would be temporarily constructed along existing trails to serve the construction area. The size of the area to be disturbed for reservoir construction is estimated to be from 6 to 13 acres, with a maximum disturbance area of 13 acres. Piping will be routed from the new reservoir to beyond the eastern property line. New pipes will consist of a 66-in inlet pipe, a 48-in outlet pipe, and a 66-in transmission main. The three pipes will be contained within a common trench, which is conservatively sized at 25 ft in width at ground level.

During the excavation for the new reservoir, topsoil to a depth of approximately 2 feet will be stockpiled separately from the deeper material. Backfill and stockpiled topsoil will be re-applied to the surface of the reservoir and surrounding area following construction. Soil will be applied to match the existing ground contours. Planting of the reservoir cover will be accomplished with native plant materials, in accordance with City standards and with guidance from the Parks Bureau.
LEGEND

- DISTURBED AREA: EXCAVATED & BACKFILLED
- DISTURBED AREA: CONTRACTOR STAGING AND STOCKPILING
- EXISTING ACCESS ROAD

SCALE: 1" = 600'

Powell Butte - Phase 1
Seismic Reinforcement
Of Existing Reservoir
Figure 1
Legend:

- **Disturbed Area**: Excavated & Backfilled, Or Stockpiled
- **Disturbed Area**: Piping
- **Proposed Access Road**

Scale: 1" = 600'

Montgomery Watson

Powell Butte - Phase 3
Const. Of New 20 MG Reservoir, 66" Inlet Pipe, 48" Outlet Pipe, And 66" Pipe To Clackamas
Figure 3
Trail Improvements, Construction and Abandonment

The Master Plan identified approximately 10 miles of trails to be retained and improved on the Butte for pedestrians, bikers and equestrians. The majority of these trails already exist on the Butte; the trails to be retained will be improved. Limited new trail construction is proposed through the forest on the west side of Powell Butte; no trees will be removed as part of this trail construction activity. Four trails for hiking and bicycling are proposed: a revised Goldfinch Trail; 148th Entry to Holgate Trail; a connection for Raymond Street Entry to the junction of Cedar Grove and Mt. Hood Trails; and improving an existing habitat trail between Mt. Hood Trail and Wild Hawthorn Trail. New trail improvements will be sited with consideration of site conditions and to minimize disturbance associated with trail construction.

Figure 24 indicates the clearing limits for the different trail types within the forest or meadow. The depth of soil disturbance for the trail improvements will be from 3 to 6 inches. Trails will be constructed using small low-impact wheeled machinery. Machinery will be narrower than the width of the permitted trail section. Work within existing stands of trees and on 2:1 slopes will be done by hand tools and labor.

The trail surface will vary according to the topography. Surfaces to be used include compacted indigenous soil and a gravel/soil binder. Other construction methods will address water flow across and along the sides of trails. Site-specific trail erosion structures will be installed. The sides of the trails will be planted with native grasses (at the meadow) or with native shrubs and ground covers (at the forest). The sides of the trails will be maintained periodically to keep the plants from undermining the trail surface.

Volunteer or “desire” trails cut into slopes and bends by improper use are causing additional erosion and unsafe conditions for users. The volunteer trails that are included in the Master Plan program will be improved. Volunteer trails not included in the Master Plan will be abandoned, by installing barriers at both ends of the trail and replanting the trails with native grasses. The barriers will be removed when the vegetation has been established.

At many trail intersections it is difficult to determine what type of use is approved on the trail. Figures 25 and 26 illustrate the signage system that will be installed to identify trails and the types of users (pedestrian, bicycle, equestrian) permitted on each trail. A kiosk will be installed at every entry to the park showing the approved trail system and other information regarding proper trail use at the park. The interpretive center will also include information about proper trail use and the adverse impacts of improper trail use.
Interpretive Center Improvements

Figure 10 represents the proposed plantings for the Interpretive Center. The layout of the center is similar to the existing condition. The existing gravel areas will be paved to reduce dust. Surface water will flow to a water quality pond near the entry.

The proposed Interpretive Center plan attempts to work with the existing site conditions, including an interpretive display, new caretakers residence, restrooms, paved access road and parking, and strategically placed native plantings. Measures have been taken to minimize the impact on the site: "parking terraces", located along the contours and providing views outward; minimizing concentrated flows and impervious paving, maintaining existing runoff patterns and using curbing only where necessary; and native plantings used to effectively support the site’s improvements and provide screening from encroaching development to the east. The new caretaker's residence and tower equipment structure will be in character with the farming history of the site architecturally, and will be reinforced by historical period plantings in combination with native plantings. The native plantings will be installed to minimize exposed soil during construction. The area will be planted with native grasses and maintained to reduce the encroachment of nuisance plants, such as Himalayan blackberries.

Landscaping, Erosion and Sediment Control at Reservoirs, Pipelines and Water Quality Ponds

During the Master Plan process, it was determined that the existing meadow grass landscape should be preserved. The proposed plantings at the majority of the areas disturbed by construction will be native grasses. The pump station, interpretive center and the forest trails will be planted with additional native trees and shrubs.

Prior to each phase of construction, the limit of clearing activities will be staked and a vegetation protection fence will be installed per City of Portland standards. Sediment fences will be installed around all stockpiled soil, which will also be covered with straw or mulch (during wet weather) and native grass (during dry weather). A hydro-slurry mix of grass and tacifier can be sprayed on to bare soil to prevent wind erosion. A temporary irrigation system can be installed to promote grass germination during the dry season. All vegetation areas and zones impacted by water facilities construction will be seeded or planted with native plants as approved from the City of Portland Native Plant List and identified for Powell Butte. The existing fill area at the existing reservoir and all areas disturbed by reservoir and pipe construction activity will be recontoured to provide sufficient drainage; topsoil will be added to support plant growth and will be seeded with native grasses and wildflowers. The following list of methods will be used to mitigate erosion and control sedimentation during the construction process:

- Design horizontal and vertical alignments to minimize soil erosion from the site. These alignments should be consistent with safety criteria, fit into the natural landscape, and minimize the size of cuts and fills.
- Develop an Erosion Control plan. Identify and anticipate potential erosion problems.
- Implement control measures through a written inspection and maintenance program.
- Install wheel wash at construction site entry and egress.
- Provide gravel construction access roads through the meadow to the reservoir construction sites.
- Perform major excavation work during summer months to reduce surface water runoff.
- Install sediment fence at toe of the stockpiled soil.
- Grade parallel to slopes to promote furrows so grass seed does not wash away.
- Provide temporary irrigation to help establish vegetation.
- Hydro seed bare soil 24 hours after excavation with tackifier to promote good soil to seed contact.
- Reseed areas where the grass did not germinate.
- Install straw or mulch cover over bare soil to depths indicated by City Standards during wet weather.
- Reapply straw or mulch to required depths.
- Blend straw or mulch into soil to enhance water-holding capacity.
- Stake erosion blankets or bio bags in addition to mulch on slopes greater than 2:1.
- Identify all storm drains and channels and surround with bio bags per City standards.
- Avoid concentrating storm water runoff.
- Remove silt fence and other erosion and sediment control measures after construction is complete and vegetation thoroughly covers all bare soil.

A typical water quality pond (shown in Figure 14) is another method of controlling sedimentation which will be used because of the quantities of water to be generated. The actual size, depth, and configuration of the ponds will be determined by City Standards and by how they fit into the natural landscape.
APPENDIX C – GEOLOGIC RECONNAISSANCE
Technical Memorandum 1.1

TO: Lisa Obermeyer, P.E.
Montgomery Watson

FROM: Kim Elliott, C.E.G. Fujitani Hilts & Associates

DATE: November 7, 1996

SUBJECT: Literature Review and Geologic Reconnaissance, Powell Butte

Previous Studies

Several early investigations contributed to the geology of the Portland area including Diller (1896, 1915), who performed the first geological reconnaissance in the area. Darton (1909) discussed available building materials (sand, gravel, and building stone), and Washburne (1914) and Williams (1916) made limited observations on the geology of the Portland area. Bretz (1925, 1928) and Allison (1932, 1935) discussed the origin of the unconsolidated Pleistocene deposits that cover most of east Portland, and Hodge (1938) named and described the Troutdale Formation. Only a few geologic maps have been published that cover east Portland and the Powell Butte area. The first was a reconnaissance map by Treasher (1942), and the most detailed mapping to date was by Trimble (1963). Mapping was also performed by Hogenson and Foxworthy (1965) in their ground water study of east Portland. The most recent mapping was prepared by Madin (1990) who emphasized unconsolidated surficial deposits and their accompanying seismic hazards, but he also refined previous bedrock mapping by incorporating considerable subsurface data obtained from numerous bore holes drilled throughout the Portland area.

Previous geotechnical studies on Powell Butte include a geologic reconnaissance performed by L. R. Squier, Inc. (1975), which was undertaken for conceptual design studies for a future water storage complex on Powell Butte. A second geologic reconnaissance was performed by Shannon & Wilson (1978a) as part of the preliminary geotechnical study for the new existing 50 million gallon Bureau of Water Works’ reservoir, and the final geotechnical investigation which was completed later that year (Shannon & Wilson, 1978b). Shannon & Wilson (1981, 1982) was also involved in drainage and slope stability studies along the north and northwest slopes of Powell Butte.

In the current study to investigate foundation conditions and evaluate seismic hazards in areas proposed for future expansion of the Bureau of Water Works' transmission and storage system, five borings were drilled on Powell Butte on August 22 and 23, 1996 (Fujitani Hilts & Associates, report in preparation).

The locations of current and previous geotechnical borings and test pits on Powell Butte are shown on the Location Plan, Figure 1. Copies of the boring and test pit logs are included in Attachments A through C.
MEMORANDUM
November 7, 1996
Page 2

General Geology of Powell Butte and Vicinity

Powell Butte, at approximately 625 feet elevation, rises about 400 feet more or less above the general level of East Portland. It is one of several such hills in east and southeast Portland, and is composed almost entirely of sandstone and conglomerate of the Troutdale Formation. The Troutdale Formation consists of materials transported into the Portland-Vancouver area by the ancestral Columbia River and its tributaries during the Pliocene epoch (approximately 6 to 3 million years ago). Some of the sediment, characterized by an abundance of quartzite pebbles, was transported from far up the Columbia River. Much of the formation, however, particularly south and east of Portland, was shed from the Cascade Range and transported into the area by the ancestral Sandy and Clackamas River systems.

From late Pliocene to early Pleistocene time (about 3 million years to 700,000 years ago) the Troutdale Formation was intruded by basaltic lavas which erupted on the earth’s surface to form small volcanic cones. Rocky Butte, Mount Tabor, Kelly Butte, and Powell Butte, among many others are examples of these volcanoes. These eruptions produced small cinder cones and basaltic lava eruptions of limited extent. Collectively, the products of these eruptions are termed the Boring Lavas. A Boring Lava vent was probably located on the northwest portion of Powell Butte where basaltic flow rock and associated ash and cinder deposits are exposed.

In response to a general uplift of the earth’s surface in northwest Oregon and southwest Washington in late Pliocene time, rivers and streams began eroding deeper channels on their way to the sea. In the Portland area, several hundred feet of the Troutdale Formation was removed by erosion. In the process, the Boring volcanoes were largely eroded also. The volcanic buttes of east Portland, Rocky Butte, Mount Tabor, Kelly Butte, and Powell Butte, are erosional remnants of this Pliocene period of erosion. The Troutdale Formation, which comprises the bulk of each of these buttes, remains largely because of the protection provided by the capping volcanic deposits. Only a small deeply weathered portion of the Powell Butte volcano remains on the lower northwest slope of the butte.

During the Pleistocene epoch (about 1.5 million until about 10,000 years ago), also known as the “Ice Age,” wind blown silt, or loess, derived from glacial sediments in the upper reaches of the Columbia River drainage basin, were carried by easterly winds and deposited on hill tops in the Portland area. These loessal deposits have probably contributed to surface soils on Powell Butte. Near the end of the ice age, catastrophic flooding on the Columbia River system inundated the Portland-Vancouver area numerous times between about 19,000 and 12,000 years ago. In at least 40 separate floods which formed temporary lakes over the Portland-Vancouver area, 100 feet more or less of sand, gravel, cobbles, and boulders were deposited, burying the Troutdale Formation below an elevation of about 280 feet. These flood deposits surround the base of Powell Butte.
Site Reconnaissance

Our initial site reconnaissance was performed on May 1, 1996 with supplemental visits on June 30 and October 30, 1996.

Most of Powell Butte is underlain by sandstone and conglomerate of the Troutdale Formation with a relatively small area on the northwest portion of the butte being underlain by Boring Lava. The Troutdale/Boring surface is mantled to a varying depth by a younger mantle of colluvial, alluvial and debris deposits, wind blown silt (loess), and residual soils.

Test pits by L. R. Squier (1975) were widely scattered across the upper portions of Powell Butte, and were generally consistent with later explorations except that they identified a 1.5 to 6-foot thick layer of medium stiff to very stiff, tan to brown silt that they interpreted as weathered volcanic ash. The ash layer was found directly below dark brown silty top soil, and overlying the dense gravel. Volcanic ash was not present in test pits on the extreme north side of Powell Butte.

Borings and test pits accomplished by Shannon & Wilson (1978b), were limited to the area of the existing 50 million gallon reservoir. They revealed a surface mantle of loose to medium dense, reddish brown sandy silt generally 2 to 4 feet thick, but up to 10 feet thick in a limited area. Locally, a layer of gravelly, sandy silt was encountered beneath the sandy silt. Very dense gravel of the Troutdale Formation was encountered beneath the surficial units.

The Troutdale Formation consists of moderately to well indurated gravel and cobbles in a red- to yellow-brown, silty sand matrix. Minor soft to medium dense sandstone layers are interbedded with the conglomerate locally. The Troutdale gravels are severely weathered near the ground surface, but grade downward to moderately weathered. Based on existing boring logs (Shannon & Wilson, 1978b; Fujitani Hills, in preparation), the zone of extreme weathering varies from as little as 2 up to about 13 feet in thickness.

Most of Powell Butte is surrounded by a thick deposit of residual coarse gravel in a matrix of clay, silt and sand. This residual debris, or colluvium, forms an “apron” on the lower slopes of Powell Butte, and is derived from weathering of the Troutdale Formation on the upper slopes of the Butte. The colluvium is thought to have accumulated mostly through mass wasting, the process where weathered rock debris is slowly transported down slope under the influence of gravity. Rapid slope failures, i.e. mud slides and debris flows may have contributed to the deposit as well. Shannon & Wilson, (1978a) mapped two such debris flows north and northwest of the existing reservoir.

It appears that much of the colluvial slope is near its natural angle of repose (30° to 35°) and that local failures similar to the debris flows mentioned above are not unusual occurrences over geologic time, and may be responsible for deposition of much of the lowermost portion of the colluvial slopes.
Numerous examples of past shallow soil failures were noted during this reconnaissance on the lower northwest slopes of Powell Butte. They consisted of narrow, steep sided gullies with very steep head walls just below the upper topographic break which separates the gentle upper slopes and the steeper lower slopes on the forested northwest side of the butte. Large diameter fir trees were commonly found growing adjacent to these slide areas, but not within them, suggesting that the slides have occurred during the past 50 to 75 years or so. Debris slides occurred in this area in November 1981 and February 1982, the latter causing significant damage to a residence below the slope (Shannon & Wilson, 1981, 1982a). Trees with bowed trunks, including some very large fir trees, were also common along the steeper slopes of the northwest side of the butte, indicating that down slope creep of surface soils is an ongoing process.

The lowlands surrounding Powell Butte are underlain by unconsolidated sand and gravel deposits of the late Pleistocene epoch that were deposited during a series of catastrophic floods on the Columbia River. The deposits overlie the Troutdale Formation. The flood deposits consist primarily of coarse gravel and cobbles, often with a silty sand matrix filling the spaces between the larger clasts, but sand layers are present locally. The gravels are not exposed at the ground surface, but are hidden beneath a thin (usually 3 to 6 feet, but may be less) cover of silty soil.

Just west of Boring B-1 (see Figure 1), a large portion of the upper end of a small valley has been filled in. The fill is likely spoils from the excavation of the existing 50 million gallon reservoir. The fill is probably thickest toward the west and thins eastward up the former valley to near the location of Boring B-1. A comparison of topographic maps prepared before and after construction of the existing reservoir, suggests that at Boring B-1 the fill is no more than about 7 feet thick, while at about 450 west of Boring B-1, the fill reaches a maximum thickness of about 50 feet.

The log of Boring B-1 indicates that loose to medium dense, well graded sand, gravel, and cobbles extends to a depth of about 50 feet. This material may be fill, although that interpretation does not appear to be consistent with the topographic mapping. An alternative interpretation is that the relatively flat topography at the head of this valley has produced poor drainage conditions, that have allowed the Troutdale Formation the opportunity to weather deeper than at other locations.

Ground Water

Ground water on Powell Butte is primarily perched ground water which has been trapped by impervious strata composed of silty or clayey soils. Such strata are present in the Troutdale Formation and may form closed basins which collect downward percolating seepage. Shallow ground water may also be found in areas of topographic depressions where surface water also tends to pond.
A large surface pond was noted in the shallow depression just west of Boring B-1 during our initial reconnaissance in May. By mid-summer it had dried up. The surface south of the existing reservoir, surrounding the location of Boring B-4, was also saturated in May. Some minor drainage channels were present, but the surface appeared to be very slow draining.

No ground water has been recognized in any of the borings on Powell Butte (Shannon & Wilson, 1978b; Fujitani Hilts, in preparation). However, seepage was noted in some of the test pits (L. R. Squier, 1975; Shannon & Wilson, 1978b).

Slope Hazards

The lower portions of the slopes surrounding Powell Butte are formed largely in colluvial deposits. Past studies (L. R. Squier, 1975; Shannon & Wilson, 1978a, 1978b, 1981, 1982a) have documented recent failures in this unit, particularly on the north and northwest sides of the butte. Above the head of the colluvial deposits, slopes locally steepen to nearly 1:1 (45°) where in-place residual soils are exposed. The residual soils result from deep weathering of the underlying Troutdale Formation. They are at best marginally stable. Many of the past slope failures observed on the north and northwest slopes began in residual soils just below the upper slope break.

Local failure of slopes underlain by colluvial and residual soils will undoubtedly occur in the future, probably precipitated by periods of heavy or prolonged rainfall. Modification of these slopes, by over steepening, for example, during trenching or road construction or by placing fills, increases the risk that failures will occur.

Recommendations

The upper, more gentle slopes of Powell Butte, should not, in our opinion, present significant slope hazards to the construction of new facilities. It is recommended, however, that attention be made to the design of drainage systems to collect and channel surface and subsurface water away from structures and colluvial slopes.

Where pipelines must be routed parallel to the contours, excavations should not be made closer than 50 feet from the break between the gentle upper slopes (4 to 6 degrees) and the steeper side slopes 30 to 45 degrees). To determine a safe buffer between the slope break and pipelines, we assumed the 30° to 35° colluvial slopes are stable as long as they do not become saturated by concentrated runoff. The upper portions of the slope that are steeper than 35 degrees (locally near 45°) are considered marginally stable, and small local failures will likely occur over time, in our opinion. If the steeper slopes fail back to match the more stable 30° slope below, the resulting slope break would be about 25± feet back from its present position. Adding another 25 feet for safety gives a recommended minimum buffer of 50 feet between pipelines and slope break.
Where pipeline routing across the colluvial slopes is required, the orientation should be as near perpendicular to the slope as possible to minimize steep back slopes during construction. Surface drainage should also be carefully controlled so that excessive water is not added to the colluvium during or after construction.

Another drainage consideration: previous studies (Shannon & Wilson 1982b) have demonstrated that ground water collects in the pipe zone backfill (which is more permeable than the surrounding soil). The existing SE Feeder Main closely parallels the slope break along the northwest side of Powell Butte directly above an area where slope failures occurred in November 1981 and February 1982. Although a direct connection between water in the pipe zone backfill and the slope failures was never proven, it is certainly possible that ground water from the pipeline trench may have drained out onto the lower colluvial slopes and contributed to the slope failures. Where pipeline trenches parallel the slope break, therefore, they should be designed and constructed with a means of draining the ground water that collects there, and conducting it down slope to storm drains or sumps. The water should not be allowed to discharge onto unprotected slopes.
References Cited


Attachment 1

Logs of Exploratory Test Pits

L. R. Squier, Inc.
January 14, 1975

Geological Reconnaissance
Powell (Camps) Butte

Prepared for:
Bureau of Water Works
Portland, Oregon
Attachment 2

Logs of Exploratory Borings and Test Pits

Shannon & Wilson, Inc.
September 11, 1978

Geotechnical Investigation
Powell Butte Reservoir

Prepared for:
James M. Montgomery, Consulting Engineers
Attachment 3

Logs of Exploratory Borings

Fujitani Hiits & Associates, Inc.
In Preparation

Geotechnical Studies
Powell Butte

Prepared for:
Montgomery Watson
GEOLOGIC INTERPRETATION

Elevation ~ 598

SAND, GRAVEL and COBBLE FILL, loose to medium dense, well graded, likely dumped excavation spoil from existing reservoir construction.

SILT, SAND and GRAVEL, medium dense becoming very dense at 58' depth, likely cemented, abundant cobbles. (Troutdale Formation)

Refusal at 77' depth, (1100 BPF)
Boring Completed September 23, 1996.

LEGEND:
BPF - Blows Per Foot, Becker Blowcount, as recorded in the field.
BCP - Bounce Chamber Pressure.
N60 - Corrected Becker Blowcount, (to constant combustion).
N60 - Corresponding Standard Penetration Test (SPT, N value).

DRILL RIG: Becker Hammer, Model Number AP-1000, Closed Bit,
Casing Diameter - 8-5/8" OD.

N60 - Relative Density
4-10 BPF = Loose
10-30 BPF = Medium Dense
30-50 BPF = Dense
50 + BPF = Very Dense
B-2
GEOLOGIC INTERPRETATION

Elevation ~ 545

3. SANDY SILT, dense (compacted), dry, graced surficial soils, haul route.

13. SANDY SILT, loose to medium dense, moist, trace to some gravel. (Colluvium)

SAND and GRAVEL with cobbles, medium dense becoming very dense at 17", silty and weathered in upper few feet, moist. (Troutdale Formation)

Refusal at 57' depth, (1100 BPF)
Boring Completed September 22, 1986

LEGEND:
BPF - Blows Per Foot, Becker Blowcount, as recorded in the field.
BCP - Bounce Chamber Pressure.
Nac - Corrected Becker Blowcount, (to constant combustion).
N60 - Corresponding Standard Penetration Test (SPT, N value).

DRILL RIG: Becker Hammer, Model Number AP-1000, Closed Bit,
Casing Diameter - 6-5/8" OD.

N60 - Relative Density
4-10 BPF = Loose
10-30 BPF = Medium Dense
30-50 BPF = Dense
50 + BPF = Very Dense
B-3
GEOLOGIC INTERPRETATION

Elevation ~ 530

SANDY SILT, loose to medium dense, moist, trace to some gravel. (Colluvium)

SAND and GRAVEL with cobbles, medium dense becoming very dense at 17', silty and weathered in upper few feet, moist. (Troutdale Formation)

Refusal at 39' depth, (1100 BPF)
Boring Completed September 22, 1996

LEGEND:
BPF - Blows Per Foot, Becker Blowcount, as recorded in the field.
BCP - Bounce Chamber Pressure.
N60 - Corrected Becker Blowcount, (to constant combustion).
N90 - Corresponding Standard Penetration Test (SPT, N value).

DRILL RIG: Becker Hammer, Model Number AP-1000, Closed Bit, Casing Diameter - 8-5/8” OD.

N60 - Relative Density
4-10 BPF = Loose
10-30 BPF = Medium Dense
30-50 BPF = Dense
50+ BPF = Very Dense

Powell Butte Master Plan
Portland, Oregon

LOG OF BORING B-3
BECKER PENETRATION TEST RESULTS
October, 1996
Fujitani Hills & Associates
Geotechnical Consultants
Portland, Oregon

FIG. 4
GEOLOGIC INTERPRETATION

Elevation ~ 558

SANDY SILT, loose to medium dense, moist, trace to some gravel. (Colluvium)

SAND and GRAVEL with cobbles, medium dense becoming very dense at 25', silty and weathered in upper few feet, moist. (Troutdale Formation)

Refusal at 41' depth, (1100 BPF)
Boring Completed September 22, 1996

LEGEND:
BPF - Blows Per Foot, Becker Blowcount, as recorded in the field.
BCP - Bounce Chamber Pressure.
Nac - Corrected Becker Blowcount, (to constant combustion).
N60 - Corresponding Standard Penetration Test (SPT, N value).

DRILL RIG: Becker Hammer. Model Number AP-1000. Closed Bit,
Casing Diameter - 6-5/8" OD.

LOG OF BORING B-4
BECKER PENETRATION TEST RESULTS
October 1996

N60 - Relative Density
4-10 BPF = Loose
10-30 BPF = Medium Dense
30-50 BPF = Dense
50 + BPF = Very Dense

Powell Butte Master Plan
Portland, Oregon
Fujitani Hills & Associates
Geotechnical Consultants
Portland, Oregon
FIG. 5
CLASSIFICATION OF MATERIAL

Sandy Silt, dense, moist, brown, nonplastic to low plasticity.

Sandy Silt with Gravel, medium dense, gray; gravel is fine to medium, weathered. Contains layers of Silty Sand/Sandy Silt, medium dense, brown, moist.

Silty Sandy Gravel, very dense, moist, silt and sand are yellow, red, and brown. Gravel is medium to coarse size.

Cobbles in remainder of boring.

Sand with Silt, Gravel, and Cobbles, very dense, moist, gravel is fine to medium size, cobbles are medium size, rounded, and approximately 10 to 20 percent, gravel percent increasing with depth to Gravelly Sand.

Sandy Gravel/Gravelly Sand, very dense, moist, brown, gravel is medium to coarse, subrounded to rounded, cobbles are approximately 15 to 25 percent.

LEGEND

I = 2.0" O.D. Split Spoon Sample
II = 3.0" O.D. Thin-Walled Sample
# = Sample Not Recovered
X = Grab Sample: Drill Cuttings
X = Core Rock Sample

NOTE:

Lines between soil/rock units are approximate and transition may be gradual.
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<th>Remarks</th>
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<th>Log Depth in Feet</th>
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**LEGEND**
- = 2.0" O.D. Split Spoon Sample
- = 3.0" O.D. Thin-Walled Sample
- = Sample Not Recovered
- = Grab Sample: Drill Cuttings
- = Core Rock Sample

**NOTE:**
- Lines between soilrock units are approximate and transition may be gradual.

**FHA**

**Powell Butte Master Plan**
Portland, Oregon

**LOG OF BORING B-5**
page 1 of 1

October, 1996

FULTANI HILTS & ASSOCIATES
Geotechnical Consultants
Portland, Oregon

FIG. 6
Technical Memorandum 2.1

TO: Lisa Obermeyer, P.E.
    Montgomery Watson

FROM: Kim Elliott, C.E.
    Fujitani Hills & Associates

DATE: November 15, 1996

SUBJECT: Field Explorations and Laboratory Testing, Powell Butte

Field Explorations

Five borings were drilled on Powell Butte on August 22 and 23, 1996 as part of a program to investigate foundation conditions and evaluate seismic hazards in areas proposed for future expansion of the Bureau of Water Works' transmission and storage system. The five borings, designated B-1 through B-5, were drilled at the locations shown on the Site Plan, Figure 1. The borings were drilled from 39 to 80 feet below the ground surface by Layne-Christensen, Inc. of Tacoma, Washington using a truck mounted Becker drill. A Fujitani Hills & Associates, Inc., geologist was present during the exploratory work to collect samples and prepare descriptive field logs. The boring locations, as shown on Figure 1, are approximate and based on a pace and compass survey from nearby reference points. The elevations shown on the boring logs are also approximate and based on the topographic base map provided by Montgomery Watson.

The Becker drill uses a diesel pile hammer to drive a steel casing into the ground. Four of the five borings, utilized casing with a “closed bit.” No samples are recovered in this method. The number of hammer blows per foot of casing penetration into the ground was recorded and can be related to the density of the soil. The blow count data will also be used to determine the response of the soil to earthquake shaking.

Boring B-5 was drilled utilizing an “open bit” and dual-wall casing. The casing is driven with the diesel hammer as in the first method, but the open bit allows compressed air to be circulated down-hole through the annulus between the casing walls. The air is returned to the surface through the inside of the casing along with soil cuttings which are then collected and classified. Boring B-5 was drilled adjacent to Boring B-2, a closed bit boring, so that blow count data could be correlated with actual samples of the soil material being penetrated.

In addition to the returned cuttings, samples were obtained at approximately 5-foot depth intervals in Boring B-5. Sampling was accomplished using a standard 3-inch O.D. split-spoon sampler driven by a 140-pound drop-hammer. All samples were sealed in glass jars to retain moisture and returned to our laboratory for additional examination and testing.

Summary boring logs are presented in Figures 2 through 5. Soil descriptions and interfaces on the logs are interpretive and actual changes may be gradual. Subsurface conditions between the borings may also be different from what is described on the logs. The left-hand portion of the
boring logs presents our interpretation of the soils encountered during the field exploration program. The right-hand, graphic portion of the boring logs shows blow count data, and for Boring B-5, sample locations and water contents.

Laboratory Testing

All samples recovered in Boring B-5 were visually examined in our laboratory to refine the field classifications. Natural water contents were determined on all applicable samples. The results are shown on the Boring Log, Figure 6. No other tests were considered necessary for this investigation.

General Geology of Powell Butte

Powell Butte is composed almost entirely of sandstone and conglomerate of the Troutdale Formation. The Troutdale Formation consists of sand and gravel transported into the Portland-Vancouver area by the ancestral Columbia River and its tributaries during the Pliocene epoch (approximately 6 to 3 million years ago).

From late Pliocene to early Pleistocene time (about 3 million years to 700,000 years ago) the Troutdale Formation was intruded by basaltic lavas which erupted on the earth’s surface to form small volcanic cones. These eruptions produced small cinder cones and basaltic lava eruptions of limited extent. Collectively, the products of these eruptions are termed the Boring Lavas. A Boring Lava vent was probably located on the northwest portion of Powell Butte where basaltic flow rock and associated ash and cinder deposits are exposed.

In response to a general uplift of the earth’s surface in northwest Oregon and southwest Washington in late Pliocene time, rivers and streams began eroding deeper channels on their way to the sea. In the Portland area, several hundred feet of the Troutdale Formation were removed by erosion. In the process, the Boring volcanoes were largely eroded also. Powell Butte is an erosional remnant of this period.

Subsurface Conditions

Borings B-2 through B-5 encountered similar conditions consisting of three general soil layers. A surface layer of loose to medium dense sandy silt soil with a small percentage of scattered gravel, derived from extreme weathering of the underlying Troutdale Formation and wind blown silt, and probably modified by colluvial processes, extends from the surface to depths of between 10 and 20 feet. A second soil layer, approximately 20 feet in thickness, is derived from deep weathering of the underlying Troutdale Formation and consists of medium dense gravel and cobbles in a silty sand matrix. The second layer grades to the third layer consisting of dense to very dense, moderately weathered, cemented sand, gravel and cobbles.
MEMORANDUM
November 15, 1996
Page 3

The soil profile in Boring B-1, was somewhat different from the other borings. In Boring B-1 loose to medium dense sand, gravel, and cobbles extend to a depth of about 35 feet. Below a depth of 35 feet, the Becker penetration data appears very similar to data generated from the ground surface in the other borings. The first 35-feet of material in this boring may be the result of deeper weathering at this location, or may be uncompacted fill placed here during foundation excavation for the existing 50-million gallon reservoir. The Becker penetration data appears to favor the latter interpretation.

Seismic Velocity Measurements

At the completion of drilling and sampling in Boring B-5, a 3-inch I.D. PVC flush-joint casing was installed in the open bore hole to a depth of 78 feet. The casing was tremie-grouted in place so that a tight coupling was made between the casing and the surrounding formation. Down-hole shear wave velocity measurements were made in the casing on August 28, 1996 under the direction of Dr. Michael Feves of Earth Dynamics in order to determine the shear wave velocity profile in the soil column at this site.

The resulting data defined 3 distinct seismic zones in the formation that correlate to the geology as described on the boring log. The shear wave velocity gradually increases from about 800 feet-per-second (fps) near the ground surface to approximately 1,800 fps at a depth of 75 feet. Below 75 feet, shear wave velocity increases rapidly with depth. Dr. Feves' report of the seismic study is included as Attachment 1 to this memorandum.

CONCLUSIONS

Evaluation of the field data is continuing, but a preliminary review suggests that, with respect to soils and geology, there are no limitations to the siting or construction of currently proposed facilities on Powell Butte.
GEOLOGIC INTERPRETATION

Elevation ~ 598

SAND, GRAVEL and COBBLE FILL, loose to medium dense, well graded, likely dumped excavation spoil from existing reservoir construction.

SILT, SAND and GRAVEL, medium dense becoming very dense at 58' depth, likely cemented, abundant cobbles. (Troutdale Formation)

Refusal at 77' depth, (1100 BPF)
Boring Completed September 23, 1996

LEGEND:
BPF - Blows Per Foot, Becker Blowcount, as recorded in the field.
BCP - Bounce Chamber Pressure.
NBC - Corrected Becker Blowcount, (to constant combustion).
N60 - Corresponding Standard Penetration Test (SPT, N value).

DRILL RIG: Becker Hammer, Model Number AP-1000, Closed Bit, Cutting Diameter - 5-5/8" OD.

RAW FIELD DATA
Becker Blows Per Foot

CORRECTED DATA (Harder, 1986)
Blows Per Foot

N60 - Relative Density
4-10 BPF = Loose
10-30 BPF = Medium Dense
30-50 BPF = Dense
50+ BPF = Very Dense
**GEOLOGIC INTERPRETATION**

Elevation ~ 545

<table>
<thead>
<tr>
<th>Layer Description</th>
<th>Depth (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandy Silt, dense (compacted), dry, graded surficial soils, haul route.</td>
<td>3</td>
</tr>
<tr>
<td>Sandy Silt, loose to medium dense, moist, trace to some gravel. (Colluvium)</td>
<td>13</td>
</tr>
<tr>
<td>Sand and Gravel with cobbles, medium dense becoming very dense at 17°, silty and weathered in upper few feet, moist. (Troutdale Formation)</td>
<td>67</td>
</tr>
</tbody>
</table>

Refusal at 67' depth, (1100 BPF)
Boring Completed September 22, 1996

**LEGEND:**

BPF - Blows Per Foot, Becker Blowcount, as recorded in the field.
BCP - Bounce Chamber Pressure.
Nec - Corrected Becker Blowcount, (to constant combustion).
N60 - Corresponding Standard Penetration Test (SPT, N value).

**BECKER PENETRATION TEST RESULTS**

<table>
<thead>
<tr>
<th>N60 - Relative Density</th>
<th>BPF</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-10</td>
<td>Loose</td>
</tr>
<tr>
<td>10-30</td>
<td>Medium Dense</td>
</tr>
<tr>
<td>30-50</td>
<td>Dense</td>
</tr>
<tr>
<td>50+</td>
<td>Very Dense</td>
</tr>
</tbody>
</table>

**DRILL RIG:** Becker Hammer, Model Number AP-1000, Closed Bit,
Casing Diameter - 5-5/8" OD.
GEOLOGIC INTERPRETATION

Elevation ~ 530

SANDY SILT, loose to medium dense, moist, trace to some gravel. (Colluvium)

SAND and GRAVEL with cobbles, medium dense becoming very dense at 17', silty and weathered in upper few feet, moist. (Troutdale Formation)

Refusal at 39' depth, (1100 BPF)
Boring Completed September 22, 1996

LEGEND:
BPF - Blows Per Foot, Becker Blowcount, as recorded in the field.
BCP - Bounce Chamber Pressure.
Nbc - Corrected Becker Blowcount, (to constant combustion).
N60 - Corresponding Standard Penetration Test (SPT, N value).

DRILL RIG: Becker Hammer, Model Number AP-1000, Closed Bit,
Casing Diameter - 6-5/8" OD.

N60 - Relative Density
4-10 BPF = Loose
10-30 BPF = Medium Dense
30-50 BPF = Dense
50+ BPF = Very Dense

LOG OF BORING B-3
BECKER PENETRATION TEST RESULTS
October, 1996
Fujikura Hills & Associates
Geotechnical Consultants
Portland, Oregon

FIG. 4
GEOLOGIC INTERPRETATION

Elevation ~ 558

SANDY Silt, loose to medium dense, moist, trace to some gravel. (Colluvium)

SAND and GRAVEL with cobbles, medium dense becoming very dense at 25', silty and weathered in upper few feet, moist. (Troutdale Formation)

Refusal at 41' depth, (1100 BPF)
Boring Completed September 22, 1996

LEGEND:
BPF - Blows Per Foot, Becker Blowcount, as recorded in the field.
BCP - Bounce Chamber Pressure.
NBC - Corrected Becker Blowcount, (to constant combustion).
N60 - Corresponding Standard Penetration Test (SPT, N value).

DRILL RIG: Becker Hammer, Model Number AP-1000, Closed Bit,
Casing Diameter - 8-5/8" OD.

POWELL BUTTE MASTER PLAN
Portland, Oregon

LOG OF BORING B-4
BECKER PENETRATION TEST RESULTS
October, 1996

Fujsten Hills & Associates
Geotechnical Consultants
Portland, Oregon

FIG. 5
CLASSIFICATION OF MATERIAL

<table>
<thead>
<tr>
<th>Ground Water Not Observed</th>
<th>Remarks</th>
<th>Elev. Depth Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SANDY SILT, medium dense, moist, brown, low plasticity.</td>
<td>540.0</td>
</tr>
<tr>
<td></td>
<td>SANDY SILT, loose to medium dense, gray to brown, moist, low plasticity; contains layers of silty sand to sandy silt; traces fine to medium gravel.</td>
<td>533.0</td>
</tr>
<tr>
<td></td>
<td>GRAVEL with CLAY and SAND, medium dense becoming dense at 18 feet, moist; clayey sand matrix is yellow, red, and brown, low plasticity; gravel is medium to coarse, rounded. Contains cobbles below 20 feet.</td>
<td>468.5</td>
</tr>
<tr>
<td></td>
<td>SAND with SILT and GRAVEL, very dense, gray-brown, wet; sand is medium to coarse grained; gravel is fine to medium, rounded.</td>
<td>493.5</td>
</tr>
<tr>
<td></td>
<td>GRAVEL with CLAY and SAND, very dense, gray-yellow-brown, moist, rounded medium gravel; fine to medium sand. Clay content decreasing with depth.</td>
<td>479.5</td>
</tr>
<tr>
<td></td>
<td>GRAVEL with SAND to SAND with GRAVEL, very dense, moist, brown; gravel is medium to coarse, subrounded to rounded with cobbles; sand is fine to medium grained.</td>
<td>485.3</td>
</tr>
</tbody>
</table>

Bottom of Boring, Completed 9/22/98

LEGEND

udden Seal (Bentonite)  
Cement Grout  
Random Backfill  
Granular Backfill  
Ground Water Level on Date Shown  
Piezometer/Induction Tubing  
Perforated Zone

ATTERBERG LIMITS

Liquid Limit  
Natural Water Content  
Plastic Limit

Powell Butte Master Plan  
Portland, Oregon

LOG OF BORING B-5

October, 1999  
FLUSTAN HITE & ASSOCIATES  
Geotechnical Consultants  
PORTLAND, OREGON

F-2821.01  
FIG. 6
Attachment 1

Downhole Seismic Exploration
Powell Butte
Portland, Oregon

Earth Dynamics
September 3, 1996

Prepared for:
Fujitani Hilts & Associates, Inc.
Portland, Oregon
Mr. Kim Elliott  
Fujitani Hills & Associates, Inc.  
2255 SW Canyon Road  
Portland, OR 97201  

RE: Downhole Seismic Exploration  
Powell Butte  
Portland, OR  

Dear Mr. Elliott:

We are pleased to submit the following report to you on the seismic velocity profile for the above referenced project. Three velocity zones were identified in the seismic profile. These velocity zones correlate with the geology at the site as identified by your boring log.

INTRODUCTION

At the request of Fujitani Hills & Associates (FHA), a downhole seismic exploration was completed at the Powell Butte Reservoir in Portland, OR. This work was authorized under a service agreement dated July 19, 1996. The field work was completed under the direction of Dr. Michael Feves on August 28, 1996. This report describes the methodology and the results of the exploration.

SCOPE OF WORK

The purpose of this project was to determine the velocity of compressional and shear waves as a function of depth in a 78 foot deep boring. These data are needed to help evaluate the predicted response of the site to earthquake loading. Velocity measurements were obtained every five feet from the surface to the maximum depth of the boring.
METHOD

The test boring was prepared by installing three inch I.D. flush-joint PVC casing. The PVC casing was grouted in place to provide the required seismic coupling between the casing and the surrounding formation. All depths are measured from the ground surface.

In a downhole seismic survey, a seismic source is placed on the surface near a borehole, and two geophones are placed at selected depths in the borehole. The raw data obtained from a downhole survey are the travel times for compressional and shear waves from the source to the geophones and the distance between the source and geophones.

Compressional waves were generated by striking a steel plate with a sledge hammer. The steel plate was located five feet from the boring. Shear waves travel slower than compressional waves. Therefore, compressional waves often interfere with shear waves. This interference sometimes makes identification of the first shear wave arrival difficult. To improve the resolution of the shear wave arrival, the seismic source is designed to produce a signal which contains a large shear wave component, and a signal enhancement seismograph is used to process the signals received from the geophone. The shear wave source for this study consisted of sledge hammer impacts on alternate ends of a 8"x8"x8' wooden beam with steel end plates. The beam was coupled to the ground by weighing it down with the front tires of the field recording truck. The beam was offset a distance of five feet from the borehole to minimize direct coupling of the seismic energy to the casing.

The downhole sensors consisted of two Bison Instruments Type 1462 triaxial geophone assemblies. Each assembly contains three sensing elements: one vertical and two orthogonal horizontal elements. The geophone assemblies were separated by a distance of ten feet. Two geophone assemblies at a fixed separation are used so that interval velocities can be determined from the same set of impulses. The use of two geophone assemblies provides at least two compressional and two shear wave travel times at each measurement level. This method reduces timing errors caused by differences in seismic triggering and variations in source impulse characteristics. In
this study, most travel time values are accurate to ±0.25 msec. Due to the shape of
the seismic signal, some of the shear wave arrival times are accurate to ±0.50 msec.

The recording procedure consisted of placing the geophone assemblies at the
desired depths in the borehole. The geophone assemblies were locked to the inside of
the casing wall by inflating a pneumatic rubber packer. An E.G. & G. Geometrics
Model ES-1210F signal enhancement seismograph was used to record signals from
the geophones. The travel times are determined in the field and the data are checked
for consistency before proceeding to the next measurement depth.

The data are analyzed by determining the interval velocity for each geophone
placement. The interval velocity is computed by dividing the difference in distance
between the geophones by the difference in travel times. The interval velocity is then
plotted as a function of depth.

The data are also analyzed by plotting the travel time versus distance. These
plots are commonly referred to as travel-time plots. In the travel-time plots, the data
points are joined by line segments which are computed using linear regression
analysis. The slope of the line segment is proportional to the average velocity of the
material within the depth corresponding to the line segment.

RESULTS

The travel-time plots and computed interval velocities are shown in Figure 1. The
dotted lines on each side of the interval velocity plots correspond to the travel time
error for each interval. The interval velocities for each measurement depth are
tabulated in Table 1, and the velocities based upon regression analysis are listed in
Table 2.

DISCUSSION

The velocity of seismic waves in geologic material is a function of the density,
moisture content and elastic properties of the material. Generally, velocity increases
with increasing density and elastic modulus. Compressional wave velocity increases
with increasing moisture content, but shear wave velocity is not affected by moisture content.

The regression results in Figure 1 indicate that three seismic zones are encountered at the boring. The velocities for these three zones are listed in Table 2. The depth intervals for the seismic zones can be correlated to the geology at the site using the FHA boring log. The FHA boring log indicates that sandy silt is present from the surface to a depth of approximately 13 feet. This layer has a compressional wave velocity of 2,330 fps and a shear wave velocity of 990 fps. Silty, sandy gravel exists from 13 feet to 50 feet, and sand with silt and gravel is present below 50 feet. These two layers have a compressional wave velocity of 5,040 fps. The shear wave velocity of the upper layer is 2,150 fps and the shear wave velocity of the lower layer is 2,900 fps. A change in shear wave velocity with no change in compressional wave velocity indicates that the bulk density and Young's modulus of both layers are the same, while the shear modulus is higher in the lower layer than in the upper layer.

Thank you for the opportunity to work with you on this project. If you have any questions, please do not hesitate to call.

Sincerely,

EARTH DYNAMICS

Michael Feves, Ph.D.
President
Table 1. Summary of interval velocities.

<table>
<thead>
<tr>
<th>DEPTH INTERVAL (ft)</th>
<th>VELOCITY (fps)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>COMPRESSION</td>
<td>SHEAR</td>
<td></td>
</tr>
<tr>
<td>5 - 15</td>
<td>2,300</td>
<td>890</td>
<td></td>
</tr>
<tr>
<td>10 - 20</td>
<td>2,550</td>
<td>1,570</td>
<td></td>
</tr>
<tr>
<td>15 - 25</td>
<td>2,550</td>
<td>1,210</td>
<td></td>
</tr>
<tr>
<td>20 - 30</td>
<td>3,920</td>
<td>2,450</td>
<td></td>
</tr>
<tr>
<td>25 - 35</td>
<td>4,930</td>
<td>2,470</td>
<td></td>
</tr>
<tr>
<td>30 - 40</td>
<td>5,210</td>
<td>2,300</td>
<td></td>
</tr>
<tr>
<td>35 - 45</td>
<td>4,960</td>
<td>1,980</td>
<td></td>
</tr>
<tr>
<td>40 - 50</td>
<td>4,970</td>
<td>1,810</td>
<td></td>
</tr>
<tr>
<td>45 - 55</td>
<td>5,530</td>
<td>3,320</td>
<td></td>
</tr>
<tr>
<td>50 - 60</td>
<td>6,640</td>
<td>3,320</td>
<td></td>
</tr>
<tr>
<td>55 - 65</td>
<td>6,640</td>
<td>3,320</td>
<td></td>
</tr>
<tr>
<td>60 - 70</td>
<td>6,230</td>
<td>2,620</td>
<td></td>
</tr>
<tr>
<td>65 - 75</td>
<td>5,250</td>
<td>3,320</td>
<td></td>
</tr>
<tr>
<td>70 - 78</td>
<td>5,320</td>
<td>2,660</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Summary of regression results.

<table>
<thead>
<tr>
<th>DEPTH INTERVAL (ft)</th>
<th>VELOCITY (fps)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>COMPRESSION</td>
<td>SHEAR</td>
<td></td>
</tr>
<tr>
<td>0 - 20</td>
<td>2,330</td>
<td>990</td>
<td></td>
</tr>
<tr>
<td>20 - 50</td>
<td>5,040</td>
<td>2,150</td>
<td></td>
</tr>
<tr>
<td>50 - 78</td>
<td>5,040</td>
<td>2,900</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX D – TRAFFIC & PARKING ANALYSIS
October 11, 1999

Kevin Hanway
Monomery Watson
111 SW 5th Avenue, Suite 1770
Portland, OR 97204

Dear Mr. Hanway:

We have completed our analysis of parking and transportation conditions at Powell Butte Park in Southeast Portland. This letter provides a summary of the study procedures, the data collection, and the analysis results.

Location Description

The main entrance to Powell Butte Park is from 162nd Avenue, immediately south of Powell Boulevard. The south leg of the intersection of Powell Boulevard and 162nd Avenue serves an adjacent manufactured home park as well as Powell Butte Park. The intersection of Powell Boulevard and 162nd Avenue is controlled by a five phase traffic signal. Protected left-turn phasing is in place on Powell Boulevard while all traffic on 162nd Avenue shares a single signal phase.

The paved access road to the park is a steep winding roadway that is approximately 22 feet in width. There are no curbs or sidewalks and along the majority of the road and there are no significant shoulders outside of the paved roadway. There is a footpath that runs parallel to the access road to serve pedestrians, bicycles, and horses. The posted speed near the parking lots at the top of the hill is 15 miles per hour. The road dead-ends at the park. A vicinity map of the area is shown in the appendix to this report.

On-site parking is provided by way of two tiered gravel parking areas. The upper lot is intended to serve passenger vehicles. This is the busiest parking area. The lower parking area is intended to serve buses and horse trailers. A schematic drawing showing the parking lot and adjacent street layout is shown on the following page. Photographs showing the park access road are shown on page three.
Looking north (downhill) approximately midway up the access road

Looking north (downhill) near the lower parking lot
Methodology

Our work on this project consisted of essentially two areas: a parking analysis of the main parking lot and a capacity analysis at the park’s entrance at the intersection of Powell Boulevard and 162nd Avenue. While it can be reasonably assumed that the peak times for park traffic are on weekends, the busiest periods at the intersection of Powell Boulevard and 162nd Avenue are during the weekday morning and evening peak hours. For this reason, traffic counts were made on a weekday from 7:00 to 9:00 AM and from 4:00 to 6:00 PM. The morning and evening peak hour volumes were shown previously on page two. Detailed count information is included in the technical appendix following this report. A capacity analysis was done using the peak hour traffic volumes to assess the operation of the intersection.

To assess the adequacy of on-site parking and the park’s peak trip generation, detailed observations were made on-site. The number of vehicles in the parking lot was recorded once an hour between 10:00 and 3:00 on a Saturday and a Sunday to determine current parking demand. To measure the peak trip generation of the park, entering and exiting vehicles, as well as the number of occupants in each vehicle were measured for a continuous 12-hour period from 7:30 AM to 7:30 PM on a Saturday.

Intersection Analysis and Results

The peak hours of the intersection of Powell Boulevard and 162nd Avenue were measured to be from 7:00 to 8:00 AM and from 4:30 to 5:30 PM. As discussed previously, these periods represent the heaviest traffic conditions at the intersection, even though park traffic may be the heaviest on the weekends.

To assess the operation of the intersection, a level of service analysis was conducted. Level of service is a measure of intersection performance that is based on the average amount of delay each vehicle experiences at an intersection. The level of service can range from A, which indicates very little or no delay, to level F, which indicates a high degree of congestion and delay. A common guideline for minimum acceptable levels of service is level of service D for signalized intersections and level of service E for unsignalized intersections.
The intersection was analyzed using the signalized intersection capacity analysis methodologies from the Highway Capacity Manual. The results of the analysis show that the intersection is currently operating between levels of service B and C during the morning peak hour and at level of service C during the evening peak hour. Detailed capacity analysis calculations are shown in the appendix to this report.

The intersection of Powell Boulevard and 162nd Avenue is operating at favorable levels of service and no improvements or mitigations are recommended.

Parking Demand and Capacity

The on-site parking demand was measured on Saturday, August 28 and Sunday, September 5, 1999. Observations were planned for August 28th and 29th, however in-clement weather on the 29th caused the postponement to September 5th. For both observation periods, parking demand was measured once per hour from 10:00 AM until 3:00 PM. These times were chosen based on information regarding park usage given by the resident caretaker. The counts on Saturday, August 28th varied from 13 parked cars at 3:00 to a peak of 28 parked cars at 11:00. The observations made on September 5th were similar and showed a minimum of 12 vehicles at 10:00 and a maximum of 28 vehicles at 3:00. A summary of the observations is shown in the following table.

<table>
<thead>
<tr>
<th>Time</th>
<th>Saturday (8/28/99)</th>
<th>Sunday (9/5/99)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Parked Vehicles</td>
<td>Parked Vehicles</td>
</tr>
<tr>
<td>10:00</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td>11:00</td>
<td>28</td>
<td>22</td>
</tr>
<tr>
<td>12:00</td>
<td>25</td>
<td>17</td>
</tr>
<tr>
<td>1:00</td>
<td>14</td>
<td>18</td>
</tr>
<tr>
<td>2:00</td>
<td>14</td>
<td>24</td>
</tr>
<tr>
<td>3:00</td>
<td>13</td>
<td>28</td>
</tr>
</tbody>
</table>
It should be noted that the parking demand measurements made on Sunday, September 5th were made during Labor Day weekend. As the previous table shows, the demand on the non-holiday weekend was very similar to that during the Labor Day weekend. The resident caretaker at the park confirmed that park traffic is fairly consistent throughout the weekend.

The following chart shows the parking demand for both lots versus time for both Saturday and Sunday conditions.

As explained previously, the on-site gravel parking lot is tiered with an upper and lower lot. The upper lot was observed to be used primarily for passenger vehicles and the lower lot was used for trailer and bus parking. The majority of the trailers in the lower lot were horse trailers, although one bicycle trailer was observed. No dedi-
cated on-site bicycle parking is available. Some bicycles were observed riding up the hill to the parking areas although the majority were brought in via automobile. It is expected that the majority of bikes at the park are there for the purpose of cycling in the park. There is likely a very small demand for on-site bicycle parking.

Neither lot exceeded its capacity during the observation periods. While the upper lot became crowded during the peak periods and there was a small amount of capacity remaining, parking was still available in the lower lot. Also, if both lots were to become full, there would still be a significant amount of parking available on the shoulders of the gravel roadways that connect the two parking areas.

If both parking areas were used more efficiently, some additional parking spaces could be gained. It is my understanding that the parking areas are planned to be paved and striped. With this improvement, these additional spaces may be realized. A large amount of bicycle loading and unloading was observed. To account for this, it is recommended that the striped parking stalls be designed slightly oversized in length and width.

The photographs on page eight show the upper and lower parking areas. As the photos show, the upper lot is the most heavily used with a significant amount of bicycle loading and unloading.
Looking west from eastern end of upper parking lot

Lower parking lot viewed from northwest corner of upper lot
Park Trip Generation and Vehicle Occupancy

On Saturday, September 11, 1999, the trip generation and vehicle occupancy were measured between 7:30 AM and 7:30 PM. The total number of entering and exiting vehicles as well as the occupancy of each vehicle was directly measured. The amount of pedestrian, bicycle, and equestrian traffic was also measured. A detailed summary of the collected data is included in the technical appendix to this report, however in the interest of brevity, a short summary of the data is provided below. A chart showing the entering and exiting traffic volumes versus time is shown on page ten. The trip generation and vehicle occupancy survey does not include traffic from the manufactured home park that takes access to 162nd Avenue at the bottom of the hill near Powell Boulevard.

<table>
<thead>
<tr>
<th>TRIP GENERATION &amp; OCCUPANCY SUMMARY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Powell Butte Park</strong></td>
</tr>
<tr>
<td>Total Entering Vehicles (12-Hour Total) ............... 216</td>
</tr>
<tr>
<td>Total Entering Persons (12-Hour Total) ............... 370</td>
</tr>
<tr>
<td>Average Occupancy Rate .................. 1.71 Persons per Vehicle</td>
</tr>
<tr>
<td>Peak Hour of Entering Traffic .......... 2:30 - 3:30 (27 vehicles)</td>
</tr>
<tr>
<td>Peak Hour of Exiting Traffic .......... 12:00 - 1:00 (28 vehicles)</td>
</tr>
</tbody>
</table>

*Other Park Traffic*
- Total Entering Pedestrians ....................... 14
- Total Entering Bicycles ........................ 14
- Total Entering Equestrians (excluding trailers) ... 3

*Traffic entering via 162nd Avenue. Other trail access locations not included*
Comparing the trip generation table on page nine to the parking demand summary on page five shows that the peak hour for entering traffic the day the trip generation study was done overlaps the last measurement of parking demand by 30 minutes. That is, the peak hour for entering traffic was 2:30 to 3:30 and the final parking demand measurement was made at 3:00. It is expected that the peak hour for entering traffic, as well as parking demand, fluctuates from day to day on weekends. For example, the peak parking demand was determined to be at 11:00 on a Saturday, but was 3:00 on a Sunday. In any event, the parking lot did not reach capacity at any time during field observations and the 30-minute overlap in peak periods does not change the findings of this report.

It is important to note that the data in the table on page nine and the chart on the previous page pertains to the main park entrance via 162nd Avenue. Various trails within the park have access to several surrounding local streets, including the Springwater Trail Corridor. The intent of this report is to examine the current traffic and parking conditions at the main entrance. Since the parking facilities examined in this report are not over capacity and there is no parking “overflow”, these outlying access points were not examined. Any parking on local streets near other trail access locations is likely due to visitor convenience and not a result of inadequate facilities in the main parking areas.

Summary and Findings

The intersection of Powell Boulevard and 162nd is currently operating at acceptable levels of service during the morning and evening weekday peak hours when intersection traffic is the heaviest. No improvements to this intersection are recommended.

Based on extensive data collection and field observations, the existing park facilities are adequate to satisfy the demand of the park users. No parking “overflows” were observed at the main park entrance and gravel parking lot. Paving and striping the parking areas will likely add to the efficiency of the parking, resulting in a possible increase in overall parking capacity. Because of the large amount of observed bicycle loading and unloading, it is recommended that the striped parking stalls be designed slightly oversize in length and width.
If you have any questions regarding this information, or if we can be of any further assistance, please do not hesitate to give us a call.

Sincerely,

Todd E. Mobley, EIT
Senior Transportation Analyst

attachment: technical appendix
INTERSECTION TURN MOVEMENT COUNT SUMMARY REPORT
162ND AVENUE AT POWELL BOULEVARD

<table>
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<th>NORTH BOUND</th>
<th>WEST BOUND</th>
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% Trucks: 8.3, 7.4, 4.3, 2.7, 0.25, 0.176, 0.31, 0.515, 0.5, 0.5, 0.25, 0.9, 0.322
Stopped Buses: 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
Peds: 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0

Hourly Totals:
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07:15-08:15: 3500, 3088, 282, 63, 1, 78, 16, 8, 3, 540, 184, 1553
07:30-08:30: 7736, 3686, 699, 623, 1, 77, 13, 9, 1, 540, 184, 1553
07:45-08:45: 4103, 409, 365, 101, 1, 92, 13, 10, 1, 540, 184, 1553
08:00-09:00: 4103, 410, 365, 101, 1, 92, 13, 10, 1, 540, 184, 1553
### INTERSECTION TURN MOVEMENT COUNT SUMMARY REPORT

**192ND AVENUE AT POWELL BOULEVARD**

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<th>NORTH BOUND</th>
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Total Survey: 17,1573

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**Total:** 266,359
**HCM: SIGNALIZED INTERSECTION SUMMARY**

**Version 2.4f**

**09-13-1999**

**Lancaster Engineering**

---

**Streets:** (E-W) POWELL BOULEVARD  
(N-S) 162ND AVENUE

**Analyst:** TODD E. MOBLEY

**Area Type:** Other

**Comment:** EXISTING CONDITIONS

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**Signal Operations**

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**Performances:**

- **Green:** 4.0A 1.0A 55.0A 4.0A 14.0A
- **Yellow/AR:** 4.0 4.0 4.0 4.0 4.0
- **Cycle Length:** 90 secs
- **Phase Combination:** #1 #2 #3 #5

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**Intersection Performance Summary**

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**Intersection Delay = 14.7 sec/veh**  
**Intersection LOS = B**

**Lost Time/Cycle:** 9.0 sec  
**Critical v/c(x) = 0.749**
HCM: SIGNALIZED INTERSECTION SUMMARY  Version 2.4f  09-13-1999
Lancaster Engineering

Streets: (E-W) POWELL BOULEVARD  (N-S) 162ND AVENUE
Analyst: TODD B. MOBLEY  File Name: PBEKPM.HC9
Area Type: Other  9-13-99 PM PEAK
Comment: EXISTING CONDITIONS

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Cycle Length: 90 secs  Phase combination order: #1 #2 #3 #5

Intersection Performance Summary

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Intersection Delay = 17.6 sec/veh  Intersection LOS = C
Lost Time/Cycle, L = 9.0 sec  Critical v/c(x) = 0.752
**POWELL BUTTE NATURE PARK  SATURDAY SEPTEMBER 11, 1999**

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**Occupancy Rate** 1.71 Persons/Vehicle

**NOTE:** Occupancy Rate does not include pedestrians, bikes or equestrians.
POWELL BUTTE NATURE PARK  SATURDAY SEPTEMBER 11, 1999

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Total   93    93    10    2    1  199  323  1.62  11  17  0

Occupy Rate  1.62 Persons/Vehicle

NOTE: Occupancy Rate does not include pedestrians, bikes or equestrians.
APPENDIX E – POWELL BUTTE HYDROLOGY, DENTENTION AND WATER QUALITY REPORT (STORMWATER MANAGEMENT PLAN)
Powell Butte Hydrology, Detention & Water Quality Report

October 6, 2000

Prepared by: Laura Cociasu, EIT
Checked by: Gregory T. Kurahashi, PE

KURAHASHI & ASSOCIATES, INC.
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DISCUSSION AND RECOMMENDATIONS

Purpose

The main objective of this report is to provide a stormwater management plan during construction of the water system and park improvements at Powell Butte. This report is attached in support of a Conditional Use Master Plan submitted to the Portland Water Bureau for proposed development of Powell Butte. The project is divided into two phases for facilities to be constructed within 10 years and for facilities planned beyond a 10-year time frame (Table 1 — Project List by Phase and Nature of Development). More details on proposed projects and timeframe are contained in the Conditional Use Application.

Erosion and sediment control as well as water quality measures for a project this size take up a significant amount of space and are a major portion of the construction costs. These preventive measures extend the time of construction and affect the visual quality of the site, therefore requiring advanced planning and consideration at this stage.

The attached calculations were completed for the project site. They include hydrology, detention, and water quality for each phase in compliance with the Bureau of Environmental Services (BES) 1999 Stormwater Management and 2000 Erosion Control Manuals. Water will be temporarily stored, treated, and released to Johnson Creek to minimize its impact. After construction of each phase, the area will be returned to original grassed state and gradation to drain in the same direction as it did before construction.

Site Location and Composition

Powell Butte is a 578-acre property that lies in Southeast Portland, between Powell Blvd. and Foster Road. 162nd Avenue is the access road leading to the site.

Previous geotechnical investigations were required as background information for this report since they directly affect erosion and sediment control as well as hydrology, water quality, and detention. They were obtained from the City of Portland Planning Office (File numbers 3447, 3448, and 3547).

The soil reports completed for the existing 50 MG underground reservoir and recent site development on the adjacent properties indicate that the soil is fairly permeable. However, we recommend a geotechnical investigation for each phase. If the investigation at the time proves contrary to the previous soil reports, erosion and sediment control as well hydrology, water quality and detention will have to be adjusted accordingly.
Design Standards

1. To maximum extent possible, send water in the same direction as the existing conditions.
2. Meet Johnson Creek Basin Plan requirements.
5. Since this is a phased project, use the Phase I detention and water quality facilities to treat future reservoirs in Phase 2.
6. Temporary diversion can be approved with mitigation using detention and treatment with runoff limited to the existing flow amounts.

Hydrologic Analysis

The Santa Barbara Urban Hydrograph (SBUH) method was used to determine runoff hydrographs. A DOS-based computer program, HYD, developed by King County, Washington, Department of Public Works completed the SBUH calculations, as preferred by City of Portland.

The calculations are divided in two stages: during and after construction. During construction the flows are draining from undisturbed areas, bare ground, and impervious areas. After construction, the project site will be regraded and replanted, and the flows draining off the site will be similar to the condition before construction.

Hydrology Exhibits 1 and 2 were created according to the hydrology calculations to show the development impacts during each phase.
Detention Sizing and Water Quality Treatment

20 and 50 MG Underground Reservoirs (Phases 1 and 2)
During construction, the 25-year storm event is detained, and the 2-year storm event before construction is released. The HYD software routes the storm hydrographs from the hydrology analysis and creates detention pond volumes. For water quality treatment, the 2-year storm event during construction is treated in sediment ponds. The detention and sediment ponds were placed at an appropriate location and elevation to handle the flows from both phases. The soil types in this area require the ponds to be lined in order to protect downstream owners and avoid slope destabilization. The flows released from the construction site will drain away from existing homes to the north and into Johnson Creek, using the existing reservoir bypass.

After construction, overland flow will drain off the site as it did before, and the percolated runoff from the buried reservoirs will drain into an underground drainage system (see Hydrology Exhibit 3). Since the soil permeability only allows partial infiltration, the peak is detained in permanent detention ponds.

Conduits (Phases 1 and 2)
During construction of the new conduits, an assumed 100-ft wide disturbed area will be exposed along each conduit. The sections of pipe construction will be treated by placing heavy matting on the disturbed area and have temporary drainage with cross trenches and area drains to the existing 48" bypass line. This bypass line will then drain to a detention and sediment control pond at the bottom of the hill. After the first sections of the conduits are placed, we propose that they be used for additional temporary detention and water quality. Also, for further additional detention and water quality treatment, the 48" the emergency overflow conduits can be used with a design for automatic release of water if bypass from the reservoir is required.

Improvements on the Caretaker’s Home and Driveway, New Interpretive Center/Information Kiosk, New Maintenance Building and Storage Yard (Phase 1)
The proposed park improvements and new buildings will not require detention and water quality treatment due to the small amount of new impervious area. This impervious area can be mitigated for water quality with trees as allowed by BES. The roof and pavement can be drained through trapped catch basins to sumps as long as BES and DEQ accept ground injection of flow.

Pump Station and Hydropower Generator (Phase 1)
Detention and water quality treatment on the proposed pump station and hydropower generator will be provided in a similar manner as proposed for the park improvements.

Parking Lot Improvements (Phase 1 and 2)
An underground detention pipe and a water quality swale will detain and treat the parking lot improvements in Phase 1. If a second parking lot is warranted based on the results of future traffic studies, it will be treated by adding to the facilities used for the first parking lot.
Preliminary Design Plans

Construction drawings should include the following stages of erosion and sediment control as per BES 1999 Stormwater Management and 2000 Erosion Control Manuals:

1. Erosion and sediment control during construction.
2. Erosion and sediment control after construction and before grass has been reestablished.
3. Detention and water quality during construction.
4. Detention and water quality prior to the final phase of development.
5. Permanent detention and water quality facilities.
6. Water treatment by polyaluimnum chloride and Precip tanks are a final option if all other methods fail to meet turbidity standards.
7. Remove temporary ponds once the final phase of development is completed.

Design and Construction Recommendations

1. The water quality and detention ponds shown on the Hydrology Exhibits 1 and 2 accurately depict the volumes of water that must be treated, according to calculations performed consistent with the BES 1999 Stormwater Management and 2000 Erosion Control Manuals. However, the shapes and dimensions of those ponds as shown are only schematic approximations. The actual shapes and dimensions of each pond can be determined at the construction stage, consistent with the calculated pond volumes and BES design limitations. For reference, we have attached the Appendix relevant pages of the BES 1999 Stormwater Management and 2000 Erosion Control Manuals.
2. Sediment control facilities should be constructed prior to any major excavation onsite.
3. Temporary diversion structures to the detention ponds must be sized to handle large storms. We would recommend the 25-year storm event to be appropriate for the construction stage.
4. Placement of soils over the site should be done in such a manner to promote permeability. This includes but is not limited to, sorting backfill to maximize permeability of the final fill material.
5. Placement of all backfill on top of the reservoirs with low pressure equipment and trenches to create a permeable surface equal to that which existed prior to construction. Additional soil evaluation specifically for this decision is recommended.
6. Adding permeable material to soil surface layer or seepage trenches to allow deeper saturation if suitable onsite backfill cannot be found.
7. Dual-purpose percolation footing drains shown on the Preliminary Schematic of Collection & Percolation System (Hydrology Exhibit 3) should be protected from construction silt.
8. Sediment fences and erosion control measures will have to be removed and reinstalled several times to provide protection during the grading and excavation sequence. Each erosion control layout must be carefully designed, planned, and executed to be effective.
9. Rainstorms are unpredictable and the size of the disturbed area is large. Therefore, significant erosion and sediment control will need to be in place no matter what time of the year work is being accomplished. Measures should incorporate winter condition protection as covered by the BES Erosion Control Manual.
10. A pad area should be prepared for water treatment facilities. If facilities (Precip tanks, pumps, and polyaluimnum chloride) are difficult to obtain on an on-call basis, supplies should be obtained and stored offsite. At minimum a large-scale Precip tank test should be run at the beginning of the project, prior to mass grading, to determine its effectiveness, the treatment capacity, and operating characteristics of the system. The Precip tanks should not be operated until they are actually needed to improve water quality, because they produce sediment that requires pumping, drying (optional), and removal to a landfill.
Conclusion

The main concerns for the Powell Butte site development were about erosion and sediment control, detention, and water quality during construction. Also, further consideration had to be given to the hydrologic characteristics of the site, which have to be restored to the conditions prior to construction.

The measures proposed in this report to mitigate for land disturbance during and after construction are effective and comply with BES standards and requirements.
Exhibits
<table>
<thead>
<tr>
<th>Phase</th>
<th>Water System Improvements</th>
<th>Park Improvements(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (2010)</td>
<td>Seismic upgrading of the existing 50 mg reservoir</td>
<td>Construction of new trails</td>
</tr>
<tr>
<td></td>
<td>A 50 mg underground reservoir at the 530 foot elevation</td>
<td>Improvements to existing trails</td>
</tr>
<tr>
<td></td>
<td>A 20 mg underground reservoir at the 600 foot elevation</td>
<td>Improvements to comply with the ADA</td>
</tr>
<tr>
<td></td>
<td>A pump station and hydropower generator</td>
<td>Construction of an interpretive center/information kiosk</td>
</tr>
<tr>
<td></td>
<td>An 84-inch diameter transmission conduit from Bull Run reservoir (Conduit 5)</td>
<td>Parking lot improvements</td>
</tr>
<tr>
<td></td>
<td>A 66-inch diameter regional transmission pipeline</td>
<td>Replacement of the existing caretaker’s dwelling</td>
</tr>
<tr>
<td></td>
<td>A tower less than 200 feet tall on which an antenna and a camera will be placed</td>
<td>Construction of a maintenance building and storage yard</td>
</tr>
<tr>
<td></td>
<td>An 84-inch diameter emergency overflow line</td>
<td>Vegetation management</td>
</tr>
<tr>
<td></td>
<td>An emergency overflow and dechlorination facility</td>
<td>An outdoor teaching area</td>
</tr>
<tr>
<td>2 (after 2010)</td>
<td>Two additional 50 mg underground reservoirs</td>
<td>Wetland enhancement</td>
</tr>
<tr>
<td></td>
<td>An 84-inch transmission conduit from Bull Run reservoir (Conduit 6)</td>
<td>Establishment of an exclusive wildlife area</td>
</tr>
<tr>
<td></td>
<td>A water treatment plant if warranted by future studies</td>
<td>A second parking lot to the north, downhill, of the existing parking lot if warranted based on the results of future traffic studies</td>
</tr>
</tbody>
</table>

\(^1\) Park improvements will be implemented in conjunction with water system improvements. For instance, all Phase 1 park improvements will be completed before or concurrent with completion of all Phase 1 water system improvements.
Calculations
## Summary of Detention and Water Quality Impacts during Construction

<table>
<thead>
<tr>
<th>PHASE 1</th>
<th></th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basin 1: 50 MG Reservoir (#2)</td>
<td>1. Impact Area (acres)</td>
<td>43.39</td>
</tr>
<tr>
<td></td>
<td>2. Detention (ft³)</td>
<td>121,500 *</td>
</tr>
<tr>
<td></td>
<td>3. Water Quality (ft³)</td>
<td>308,000 *</td>
</tr>
<tr>
<td>Basin 2: 20 MG Reservoir (#3)</td>
<td>1. Impact Area (acres)</td>
<td>16.87</td>
</tr>
<tr>
<td></td>
<td>2. Detention (ft³)</td>
<td>54,500 *</td>
</tr>
<tr>
<td></td>
<td>3. Water Quality (ft³)</td>
<td>116,000 *</td>
</tr>
<tr>
<td>Conduits</td>
<td>1. Impact Area (acres)</td>
<td>9.08</td>
</tr>
<tr>
<td></td>
<td>2. Detention (ft³)</td>
<td>31,000</td>
</tr>
<tr>
<td></td>
<td>3. Water Quality (ft³)</td>
<td>58,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PHASE 2:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Basin 1: 50 MG Reservoir (#4)</td>
<td>1. Impact Area (acres)</td>
<td>19.28</td>
</tr>
<tr>
<td></td>
<td>2. Detention (ft³)</td>
<td>48,000</td>
</tr>
<tr>
<td></td>
<td>3. Water Quality (ft³)</td>
<td>145,000</td>
</tr>
<tr>
<td>Basin 2: 50 MG Reservoir (#5)</td>
<td>1. Impact Area (acres)</td>
<td>20.66</td>
</tr>
<tr>
<td></td>
<td>2. Detention (ft³)</td>
<td>65,000 ***</td>
</tr>
<tr>
<td></td>
<td>3. Water Quality (ft³)</td>
<td>164,000 ***</td>
</tr>
</tbody>
</table>

* = Proposed Phase 1, Basin 1 Maximum Temporary Facility Size
** = Proposed Phase 1, Basin 1 Minimum Temporary Facility Size
*** = Proposed Phase 1 and 2, Basin 1 and 2 Temporary Facility Size

## Summary of Detention Impacts after Construction

Total detention volume requirement during the 25-year 24-hour storm event: 0.570 in

Site with three new 50 MG Reservoirs:

\[
0.570 \text{ in} / 12 \text{ in} \times 3 \times 650 \text{ ft} \times 400 \text{ ft} = 37050 \text{ ft}^3
\]

Use 50,000 ft³

Site with one new 20 MG Reservoir:

\[
0.570 \text{ in} / 12 \text{ in} \times 1 \times 440 \text{ ft} \times 220 \text{ ft} = 4598 \text{ ft}^3
\]

Use 10,000 ft³
HYDROLOGIC ANALYSIS FOR PHASE 1, BASIN 1 during CONSTRUCTION

PROJECT: Powell Butte
DATE: April 25, 2000
Checked: Greg Kurashashi

Pervious Area: \(137,000 \text{ ft}^2 = 31.45 \text{ acres}\)
Impervious Area: \(52,000 \text{ ft}^2 = 11.94 \text{ acres}\)

Pervious CN: 95.07
Impervious CN: 98

Precipitation:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>P (in)</td>
<td>2.4</td>
<td>2.9</td>
<td>3.4</td>
<td>3.8</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Time of Concentration for Sheet Flow:

\[ T_{ct} = \frac{0.42(nL)^{0.6}}{1.58s^{0.4}} = 3.60 \text{ min} \]

where:
\( L = \text{Length} = 300 \text{ ft} \)
\( s = \text{Slope} = 0.03 \text{ ft/ft} \) (representative value)
\( n = \text{Manning's n} = 0.015 \) (bare ground, chart 8)

Time of Concentration for Shallow Concentrated Flow:

\[ T_{cs} = \frac{L}{(60^*V)} = 3.25 \text{ min} \]

where:
\( s = \text{Slope} = 0.064 \text{ ft/ft} \) (representative value)
\( L = \text{Length} = 800 \text{ ft} \)
\( V = \text{Velocity} = 4.1 \text{ ft/s} \) (chart 9)

Time of Concentration for Pipe System:

\[ T_{cp} = \frac{L}{(60^*V)} = 6.67 \text{ min} \]

where:
\( L = \text{Length} = 1600 \text{ ft} \)
\( V = \text{Velocity} = 4 \text{ ft/s} \)

Total Time of Concentration:

\[ T_{ct} = T_{ct} + T_{cs} + T_{cp} = 13.52 \text{ min} \]

SBUH Calculated Flow:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow (cfs)</td>
<td>20.72</td>
<td>25.85</td>
<td>30.95</td>
<td>35.02</td>
<td>41.09</td>
</tr>
</tbody>
</table>
## Santa Barbara Urban Hydrograph Computation for Phase 1, Basin 1 during Construction

### 2-Year 24-Hour Storm (2.40" Total Precip.):

**INPUT:**
- `S.C.S. TYPE-1A RAINFALL DISTRIBUTION`
- `ENTR: FREQ<YEAR>, DURATION<HOURL>, PRECIP<INCHES>`
- `2.29.2.4`

**DATA PRINT-OUT:***

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<th>AREA (ACRES)</th>
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<th>IMPERVIOUS</th>
<th>TC (MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>43.4</td>
<td>31.5</td>
<td>95.1</td>
</tr>
<tr>
<td></td>
<td>11.9</td>
<td>98.0</td>
<td>13.5</td>
</tr>
</tbody>
</table>

**ENTER [d:1]path[filename].ext FOR STORAGE OF COMPUTED HYDROGRAPH:**
- `c:\projects\phase1bi\184542`

### 5-Year 24-Hour Storm (2.90" Total Precip.):

**INPUT:**
- `S.C.S. TYPE-1A RAINFALL DISTRIBUTION`
- `ENTR: FREQ<YEAR>, DURATION<HOURL>, PRECIP<INCHES>`
- `5.24.2.9`

**DATA PRINT-OUT:**

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<tr>
<th>AREA (ACRES)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TC (MINUTES)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>43.4</td>
<td>31.5</td>
<td>95.1</td>
</tr>
<tr>
<td></td>
<td>11.9</td>
<td>98.0</td>
<td>13.5</td>
</tr>
</tbody>
</table>

**ENTER [d:1]path[filename].ext FOR STORAGE OF COMPUTED HYDROGRAPH:**
- `c:\projects\phase1bi\184546`

### 10-Year 24-Hour Storm (3.48" Total Precip.):

**INPUT:**
- `S.C.S. TYPE-1A RAINFALL DISTRIBUTION`
- `ENTR: FREQ<YEAR>, DURATION<HOURL>, PRECIP<INCHES>`
- `10.24.3.4`

**DATA PRINT-OUT:**

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<tr>
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<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TC (MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>43.4</td>
<td>31.5</td>
<td>95.1</td>
</tr>
<tr>
<td></td>
<td>11.9</td>
<td>98.0</td>
<td>13.5</td>
</tr>
</tbody>
</table>

**ENTER [d:1]path[filename].ext FOR STORAGE OF COMPUTED HYDROGRAPH:**
- `c:\projects\phase1bi\1845410`
PROJECT: Powell Butte
DATE: April 26, 2000
Checked: Greg Kurahashi

Pervious Area: \( 1890000 \text{ ft}^2 = 43.39 \text{ acres} \)

Pervious CN: 86.22

Precipitation:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P ) (in)</td>
<td>2.4</td>
<td>2.9</td>
<td>3.4</td>
<td>3.8</td>
<td>4.4</td>
</tr>
</tbody>
</table>

\[
T_{c1} = \frac{0.42(nL)^{0.8}}{1.586^{0.4}} = 42.16 \quad \text{min} > 25 \text{ min; use:} \quad 28.00 \ \text{min}
\]

where:
L = Length = 300 ft
s = Slope = 0.03 ft/ft (representative value)
Manning's n = 0.33 (ranges between bermuda and dense grasses, chart 8)

Time of Concentration for Shallow Concentrated Flow:

\[
T_{a0} = \frac{L}{(60^\circ \times V)} = 3.25 \ \text{min}
\]

where:
L = Length = 800 ft
V = Velocity = 4.1 ft/s (chart 9)

Time of Concentration for Pipe System:

\[
T_{a0} = \frac{L}{(60^\circ \times V)} = 0.00 \ \text{min}
\]

where:
L = Length = 0 ft
V = Velocity = 4 ft/s

Total Time of Concentration:

\[
T_C = T_{c1} + T_{a0} + T_{a0} = 28.25 \ \text{min}
\]

SBUH Calculated Flow:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow (cfs)</td>
<td>8.53</td>
<td>12.19</td>
<td>16.04</td>
<td>19.22</td>
<td>24.08</td>
</tr>
</tbody>
</table>

14
Santa Barbara Urban Hydrograph Computation for Phase 1, Basin 1 after Construction

SPECIFY STORM OPTION:

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(STORM), DURATION(HOUR), PRECIP(INCHES)
2.24.2.4

--------------------- S.C.S. TYPE-1A DISTRIBUTION ---------------------
---------------------- 2-YEAR 24-HOUR STORM ==== 2.40" TOTAL PRECIP. ------

ENTER: A<PERU>, CN<PERU>, A<IMPERU>, CN<IMPERU>, TC FOR BASIN NO. 1
43.39, 86.22, 0.98, 28.25

DATA PRINT-OUT:

<table>
<thead>
<tr>
<th>AREA (ACRES)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TC (MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>43.4</td>
<td>43.4</td>
<td>86.2</td>
<td>0.98</td>
</tr>
</tbody>
</table>

PEAK-Q(CFS) T-PEAK(HRS) VOL(CY-FT)
8.53 7.63 104125

ENTER [d:\path\filename.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\project\phase1b\1345a5

SPECIFY STORM OPTION:

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(STORM), DURATION(HOUR), PRECIP(INCHES)
5.24.2.9

--------------------- S.C.S. TYPE-1A DISTRIBUTION ---------------------
---------------------- 5-YEAR 24-HOUR STORM ==== 2.90" TOTAL PRECIP. ------

ENTER: A<PERU>, CN<PERU>, A<IMPERU>, CN<IMPERU>, TC FOR BASIN NO. 1
43.39, 86.22, 0.98, 28.25

DATA PRINT-OUT:

<table>
<thead>
<tr>
<th>AREA (ACRES)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TC (MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>43.4</td>
<td>43.4</td>
<td>86.2</td>
<td>0.98</td>
</tr>
</tbody>
</table>

PEAK-Q(CFS) T-PEAK(HRS) VOL(CY-FT)
12.19 7.63 249469

ENTER [d:\path\filename.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\project\phase1b\1345a5

SPECIFY STORM OPTION:

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(STORM), DURATION(HOUR), PRECIP(INCHES)
18.24.3.4

--------------------- S.C.S. TYPE-1A DISTRIBUTION ---------------------
---------------------- 10-YEAR 24-HOUR STORM ==== 3.40" TOTAL PRECIP. ------

ENTER: A<PERU>, CN<PERU>, A<IMPERU>, CN<IMPERU>, TC FOR BASIN NO. 1
43.39, 86.22, 0.98, 28.25

DATA PRINT-OUT:

<table>
<thead>
<tr>
<th>AREA (ACRES)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TC (MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>43.4</td>
<td>43.4</td>
<td>86.2</td>
<td>0.98</td>
</tr>
</tbody>
</table>

PEAK-Q(CFS) T-PEAK(HRS) VOL(CY-FT)
16.84 7.63 317611

ENTER [d:\path\filename.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\project\phase1b\1345a10

15
SPECIFY STORM OPTION:

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
25, 24.3, 8

----------------------------------- S.C.S. TYPE-1A DISTRIBUTION -----------------------------------

----------------------------------- 25-YEAR 24-HOUR STORM ***** 3.80" TOTAL PRECIP. -----------------------------------

ENTER: A<PERU>, CN<PERU>, A<IMPERU>, CN<IMPERU>, TC FOR BASIN NO. 1
43.39, 86.22, 0.98, 28.25

DATA PRINT-OUT:

AREA(ACRES) PERVIOUS IMPERVIOUS TO(MINUTES)
43.4 43.4 86.2 0 98.0 28.3

PEAK-Q(CFS) T-PEAK(HRS) VOL(CH-PT)
24.68 7.63 459335

ENTER [d:\path\filename[.ext]] FOR STORAGE OF COMPUTED HYDROGRAPH:
c:\projects\phangib\1845a25_

SPECIFY STORM OPTION:

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
100, 24.4, 4

----------------------------------- S.C.S. TYPE-1A DISTRIBUTION -----------------------------------

----------------------------------- 100-YEAR 24-HOUR STORM ***** 4.40" TOTAL PRECIP. -----------------------------------

ENTER: A<PERU>, CN<PERU>, A<IMPERU>, CN<IMPERU>, TC FOR BASIN NO. 1
43.39, 86.22, 0.98, 28.25

DATA PRINT-OUT:

AREA(ACRES) PERVIOUS IMPERVIOUS TO(MINUTES)
43.4 43.4 86.2 0 98.0 28.3

PEAK-Q(CFS) T-PEAK(HRS) VOL(CH-PT)
24.68 7.63 459335

ENTER [d:\path\filename[.ext]] FOR STORAGE OF COMPUTED HYDROGRAPH:
c:\projects\phangib\1845a100_
HYDROLOGIC ANALYSIS FOR PHASE 1, BASIN 1 MINIMUM AREA IMPACTED during CONSTRUCTION

PROJECT: Powell Butte
DATE: April 25, 2000
Checked: Greg Kurahashi

Pervious Area: 50,000 ft² = 11.48 acres
Impervious Area: 52,000 ft² = 11.94 acres

Pervious CN: 95.07
Impervious CN: 98

Precipitation:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>P (in)</td>
<td>2.4</td>
<td>2.9</td>
<td>3.4</td>
<td>3.8</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Time of Concentration for Sheet Flow:

\[ T_{c1} = \frac{0.42(mL)^{0.6}}{1.58s^{0.4}} = 3.60 \text{ min} \]

where:
- \( L = \) Length = 300 ft
- \( s = \) Slope = 0.03 ft/ft (representative value)
- Manning's \( n = \) 0.015 (bare ground, chart 8)

Time of Concentration for Shallow Concentrated Flow:

\[ T_{cs} = \frac{L}{(60^\circ V)} = 0.81 \text{ min} \]

where:
- \( s = \) Slope = 0.255 ft/ft (representative value)
- \( L = \) Length = 200 ft
- \( V = \) Velocity = 4.1 ft/s (chart 9)

Time of Concentration for Pipe System:

\[ T_{cp} = \frac{L}{(60^\circ V)} = 6.67 \text{ min} \]

where:
- \( L = \) Length = 1600 ft
- \( V = \) Velocity = 4 ft/s

Total Time of Concentration:

\[ T_{ct} = T_{c1} + T_{cs} + T_{cp} = 11.08 \text{ min} \]

SBUH Calculated Flow:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow (cfs)</td>
<td>11.98</td>
<td>14.83</td>
<td>17.56</td>
<td>19.92</td>
<td>23.30</td>
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</tbody>
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17
SPECIFY STORM OPTION:

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ<YEAR>, DURATION<Hour>, PRECIP<INCHES>
25, 24, 3.8

25-YEAR 24-HOUR STORM === 3.88" TOTAL PRECIP. ====

ENTER: A<PERRU>, CN<PERRU>, A<IMPERU>, CN<IMPERU>, TC FOR BASIN NO. 1 11.48, 95, 87, 11.94, 98, 11.08

DATA PRINT-OUT:

<table>
<thead>
<tr>
<th>AREA&lt;ACRES&gt;</th>
<th>Pervious A CN</th>
<th>Imperious A CN</th>
<th>T&lt;MINUTES&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.4</td>
<td>11.5 95.1</td>
<td>11.9 98.0</td>
<td>11.1</td>
</tr>
</tbody>
</table>

PEAK-Q<CFPS> T-PEAK<HRS> VOL<CU-FT>
19.92 7.83 289420

ENTER [dir]\pathname\filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
\projects\phase\1845825

SPECIFY STORM OPTION:

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ<YEAR>, DURATION<Hour>, PRECIP<INCHES>
100, 24, 4.4

100-YEAR 24-HOUR STORM === 4.4" TOTAL PRECIP. ====

ENTER: A<PERRU>, CN<PERRU>, A<IMPERU>, CN<IMPERU>, TC FOR BASIN NO. 1 11.48, 95, 87, 11.94, 98, 11.08

DATA PRINT-OUT:

<table>
<thead>
<tr>
<th>AREA&lt;ACRES&gt;</th>
<th>Pervious A CN</th>
<th>Imperious A CN</th>
<th>T&lt;MINUTES&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.4</td>
<td>11.5 95.1</td>
<td>11.9 98.0</td>
<td>11.1</td>
</tr>
</tbody>
</table>

PEAK-Q<CFPS> T-PEAK<HRS> VOL<CU-FT>
23.38 7.83 344820

ENTER [dir]\pathname\filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
\projects\phase\1845825
HYDROLOGIC ANALYSIS FOR PHASE 1, BASIN 1 MINIMUM AREA IMPACTED after CONSTRUCTION

PROJECT: Powell Butte
DATE: April 25, 2000
Checked: Greg Kurahashi

Pervious Area: \[ 1020000 \text{ ft}^2 = 23.42 \text{ acres} \]

Pervious CN: 86.22

Precipitation:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>P (in)</td>
<td>2.4</td>
<td>2.9</td>
<td>3.4</td>
<td>3.6</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Time of Concentration for Sheet Flow:

\[
T_{c1} = \frac{0.42(nL)^{0.8}}{1.56s^{0.8}} = 42.16 \text{ min} > 25 \text{ min}, \text{ use: } 25.00 \text{ min}
\]

where:
- \( L = \text{Length} = 300 \text{ ft} \)
- \( s = \text{Slope} = 0.03 \text{ ft/ft} \) (representative value)
- \( n = \text{Manning's n} = 0.33 \) (ranges between bermuda and dense grasses, chart 8)

Time of Concentration for Shallow Concentrated Flow:

\[
T_{c2} = \frac{L}{(60^\circ V)} = 0.81 \text{ min}
\]

where:
- \( s = \text{Slope} = 0.255 \text{ ft/ft} \) (representative value)
- \( L = \text{Length} = 200 \text{ ft} \)
- \( V = \text{Velocity} = 4.1 \text{ ft/s} \) (chart 9)

Time of Concentration for Pipe System:

\[
T_{c3} = \frac{L}{(60^\circ V)} = 0.00 \text{ min}
\]

where:
- \( L = \text{Length} = 0 \text{ ft} \)
- \( V = \text{Velocity} = 4 \text{ ft/s} \)

Total Time of Concentration:

\[ T_{cT} = T_{c1} + T_{c2} + T_{c3} = 25.81 \text{ min} \]

SBUH Calculated Flow:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow (cfs)</td>
<td>4.79</td>
<td>6.84</td>
<td>8.99</td>
<td>10.76</td>
<td>13.47</td>
</tr>
</tbody>
</table>
Santa Barbara Urban Hydrograph Computation for Phase I, Basin 1 Minimum Area
Impacted after Construction

SPECIFY STORM OPTION:

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ<YEAR>, DURATION< HOUR>, PRECIP< INCHES>
\( 2.24.2.4 \)

S.C.S. TYPE-1A DISTRIBUTION

\( 2 \)-YEAR 24-HOUR STORM \( \Rightarrow \) 2.48" TOTAL PRECIP.

ENTER: A<PERU>, CN<PERU>, A<IMPERU>, CN<IMPERU>, IC FOR BASIN NO. 1
\( 23.42.86.22.0.98.25.81 \)

DATA PRINT-OUT:

<table>
<thead>
<tr>
<th>AREA&lt;ACRES&gt;</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TO&lt;MINUTES&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.4</td>
<td>25.4</td>
<td>86.2</td>
<td>0.98.8</td>
</tr>
</tbody>
</table>

PEAK-Q<INCHES> T-PEAK<INCHES> VOL<IN-FT>

4.79         7.83       99474

ENTER: d:\path\filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
c:\projects\phase1\phase1\1845a10

SPECIFY STORM OPTION:

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ<YEAR>, DURATION< HOUR>, PRECIP< INCHES>
\( 5.24.2.9 \)

S.C.S. TYPE-1A DISTRIBUTION

\( 5 \)-YEAR 24-HOUR STORM \( \Rightarrow \) 2.98" TOTAL PRECIP.

ENTER: A<PERU>, CN<PERU>, A<IMPERU>, CN<IMPERU>, IC FOR BASIN NO. 1
\( 23.42.86.22.0.98.25.81 \)

DATA PRINT-OUT:

<table>
<thead>
<tr>
<th>AREA&lt;ACRES&gt;</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TO&lt;MINUTES&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.4</td>
<td>23.4</td>
<td>86.2</td>
<td>0.98.8</td>
</tr>
</tbody>
</table>

PEAK-Q<INCHES> T-PEAK<INCHES> VOL<IN-FT>

6.84         7.63       134795

ENTER: d:\path\filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
c:\projects\phase1\phase1\1845a10

SPECIFY STORM OPTION:

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ<YEAR>, DURATION< HOUR>, PRECIP< INCHES>
\( 10.24.3.4 \)

S.C.S. TYPE-1A DISTRIBUTION

\( 10 \)-YEAR 24-HOUR STORM \( \Rightarrow \) 3.40" TOTAL PRECIP.

ENTER: A<PERU>, CN<PERU>, A<IMPERU>, CN<IMPERU>, IC FOR BASIN NO. 1
\( 23.42.86.22.0.98.25.81 \)

DATA PRINT-OUT:

<table>
<thead>
<tr>
<th>AREA&lt;ACRES&gt;</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TO&lt;MINUTES&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.4</td>
<td>23.4</td>
<td>86.2</td>
<td>0.98.8</td>
</tr>
</tbody>
</table>

PEAK-Q<INCHES> T-PEAK<INCHES> VOL<IN-FT>

8.99         7.63       171686

ENTER: d:\path\filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
c:\projects\phase1\phase1\1845a10
**SPECIFY STORM OPTION:**

1

**S.C.S. TYPE-IA RAINFALL DISTRIBUTION**

ENTER: FREQ<YEAR>, DURATION(HOUR), PRECIP(INCHES)

25.2, 24, 3.8

---

**S.C.S. TYPE-IA DISTRIBUTION**

---

**25-YEAR 24-HOUR STORM **** 3.80" TOTAL PRECIP. ****

ENTER: A(PERU), CN(PERU), A(IMPERU), CN(IMPERU), TC FOR BASIN NO. 1

2.42, 86.22, 0.98, 25.81

**DATA PRINT-OUT:**

<table>
<thead>
<tr>
<th>AREA(ACRE)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TC(MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.4</td>
<td>23.4</td>
<td>86.2</td>
<td>98.0</td>
</tr>
</tbody>
</table>

**PEAK-Q(CFS) T-PEAK(HRS) VOL(CU-FT)**

19.76 7.83 281482

ENTER [d:\path\filename] FOR STORAGE OF COMPUTED HYDROGRAPH:

---

**SPECIFY STORM OPTION:**

1

**S.C.S. TYPE-IA RAINFALL DISTRIBUTION**

ENTER: FREQ<YEAR>, DURATION(HOUR), PRECIP(INCHES)

100, 24.4

---

**S.C.S. TYPE-IA DISTRIBUTION**

---

**100-YEAR 24-HOUR STORM **** 4.40" TOTAL PRECIP. ****

ENTER: A(PERU), CN(PERU), A(IMPERU), CN(IMPERU), TC FOR BASIN NO. 1

2.42, 86.22, 0.98, 25.81

**DATA PRINT-OUT:**

<table>
<thead>
<tr>
<th>AREA(ACRE)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TC(MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.4</td>
<td>23.4</td>
<td>86.2</td>
<td>98.0</td>
</tr>
</tbody>
</table>

**PEAK-Q(CFS) T-PEAK(HRS) VOL(CU-FT)**

13.47 7.83 247637

ENTER [d:\path\filename] FOR STORAGE OF COMPUTED HYDROGRAPH:

---
HYDROLOGIC ANALYSIS FOR PHASE 1, BASIN 2 during CONSTRUCTION

PROJECT: Powell Butte
DATE: April 25, 2000
Checked: Greg Kurashishi

Pervious Area: 537000 ft² = 12.33 acres
Impervious Area: 188000 ft² = 4.55 acres

Pervious CN: 94.14
Impervious CN: 98

Precipitation:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>P (in)</td>
<td>2.4</td>
<td>2.9</td>
<td>3.4</td>
<td>3.8</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Time of Concentration for Sheet Flow:

\[ T_{\text{cs}} = \frac{0.42(nL)^{0.8}}{1.58s^{0.4}} = 3.98 \text{ min} \]

where:
L = Length = 300 ft
s = Slope = 0.02 ft/ft (representative value)
Manning’s n = 0.015 (bare ground, chart 8)

Time of Concentration for Shallow Concentrated Flow:

\[ T_{\text{cd}} = \frac{L}{(60^\circ \text{V})} = 2.94 \text{ min} \]

where:
s = Slope = 0.043 ft/ft (representative value)
L = Length = 600 ft
V = Velocity = 3.4 ft/s (chart 9)

Time of Concentration for Pipe System:

\[ T_{\text{cp}} = \frac{L}{(60^\circ \text{V})} = 0.00 \text{ min} \]

where:
L = Length = 0 ft
V = Velocity = 4 ft/s

Total Time of Concentration:

\[ T_{\text{ct}} = T_{\text{cs}} + T_{\text{cd}} + T_{\text{cp}} = 6.92 \text{ min} \]

SBUH Calculated Flow:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow (cfs)</td>
<td>8.52</td>
<td>10.49</td>
<td>12.85</td>
<td>14.57</td>
<td>17.15</td>
</tr>
</tbody>
</table>
Santa Barbara Urban Hydrograph Computation for Phase I, Basin 2 during Construction

**HYD.EXE**

SPECIFY STORM OPTION:

1

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ<YEAR>, DURATION< HOUR>, PRECIP< INCHES>
2.24.2.4

S.C.S. TYPE-1A DISTRIBUTION

--- 2-YEAR 24-HOUR STORM --- 2.48" TOTAL PRECIP. ---

**DATA PRINT-OUT:**

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<thead>
<tr>
<th>AREA&lt;ACRES&gt;</th>
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<th>IMPERVIOUS</th>
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<tbody>
<tr>
<td></td>
<td>A CN</td>
<td>A CN</td>
<td></td>
</tr>
<tr>
<td>16.9</td>
<td>12.3</td>
<td>94.1</td>
<td>4.6 98.8</td>
</tr>
<tr>
<td>PEAK-Q&lt;CFPS&gt;</td>
<td>T-PEAK&lt; HRS&gt;</td>
<td>VOL&lt;CU-FT&gt;</td>
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<td>8.62</td>
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ENTER [d:1path\filename.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:

**HYD.EXE**

SPECIFY STORM OPTION:

1

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ<YEAR>, DURATION< HOUR>, PRECIP< INCHES>
5.24.2.9

S.C.S. TYPE-1A DISTRIBUTION

--- 5-YEAR 24-HOUR STORM --- 2.90" TOTAL PRECIP. ---

**DATA PRINT-OUT:**

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<tr>
<th>AREA&lt;ACRES&gt;</th>
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<th>IMPERVIOUS</th>
<th>TCMINUTES</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>A CN</td>
<td>A CN</td>
<td></td>
</tr>
<tr>
<td>16.9</td>
<td>12.3</td>
<td>94.1</td>
<td>4.6 98.8</td>
</tr>
<tr>
<td>PEAK-Q&lt;CFPS&gt;</td>
<td>T-PEAK&lt; HRS&gt;</td>
<td>VOL&lt;CU-FT&gt;</td>
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<tr>
<td>18.69</td>
<td>7.83</td>
<td>145533</td>
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ENTER [d:1path\filename.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:

**HYD.EXE**

SPECIFY STORM OPTION:

1

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ<YEAR>, DURATION< HOUR>, PRECIP< INCHES>
10.24.3.4

S.C.S. TYPE-1A DISTRIBUTION

--- 10-YEAR 24-HOUR STORM --- 3.48" TOTAL PRECIP. ---

**DATA PRINT-OUT:**

<table>
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<tr>
<th>AREA&lt;ACRES&gt;</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TCMINUTES</th>
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<tbody>
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<td></td>
<td>A CN</td>
<td>A CN</td>
<td></td>
</tr>
<tr>
<td>16.9</td>
<td>12.3</td>
<td>94.1</td>
<td>4.6 98.8</td>
</tr>
<tr>
<td>PEAK-Q&lt;CFPS&gt;</td>
<td>T-PEAK&lt; HRS&gt;</td>
<td>VOL&lt;CU-FT&gt;</td>
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ENTER [d:1path\filename.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
SPECIFY STORM OPTION:

**S.C.S. TYPE-1A RAINFALL DISTRIBUTION**

ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)

25, 24, 3.8

**25-YEAR 24-HOUR STORM ** 3.88" TOTAL PRECIP. **

ENTER: A(<PERU>), CN(<PERU>), A(<IMPERU>), CN(<IMPERU>). TC FOR BASIN NO. 1

12.33, 94.14, 4.55, 98.6, 92

**DATA PRINT-OUT:**

<table>
<thead>
<tr>
<th>ARE(ACRES)</th>
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<th>IMPERVIOUS</th>
<th>TCMINUTES</th>
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</thead>
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<tr>
<td>16.9</td>
<td>12.3</td>
<td>94.1</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>98.0</td>
<td></td>
<td>6.9</td>
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**PEAK-Q(CF/S) T-PEAK(HRS) VOL(CU-FT)**

14.57

7.83

199557

ENTER [\path\filename.txt] FOR STORAGE OF COMPUTED HYDROGRAPH:

C:\projects\phase1\245\data

---

**SPECIFY STORM OPTION:**

**S.C.S. TYPE-1A RAINFALL DISTRIBUTION**

ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)

100, 24, 4.4

**100-YEAR 24-HOUR STORM ** 4.48" TOTAL PRECIP. **

ENTER: A(<PERU>), CN(<PERU>), A(<IMPERU>), CN(<IMPERU>). TC FOR BASIN NO. 1

12.33, 94.14, 4.55, 98.6, 92

**DATA PRINT-OUT:**

<table>
<thead>
<tr>
<th>ARE(ACRES)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TCMINUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.9</td>
<td>12.3</td>
<td>94.1</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>98.0</td>
<td></td>
<td>6.9</td>
</tr>
</tbody>
</table>

**PEAK-Q(CF/S) T-PEAK(HRS) VOL(CU-FT)**

17.15

7.83

235681

ENTER [\path\filename.txt] FOR STORAGE OF COMPUTED HYDROGRAPH:

C:\projects\phase1\245d\100
HYDROLOGIC ANALYSIS FOR THE PHASE 1, BASIN 2 after CONSTRUCTION

PROJECT: Powell Butte
DATE: April 25, 2000
Checked: Greg Kurahashi

Pervious Area: 735000 ft² = 16.87 acres

Pervious CN: 84

Precipitation:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>P (in)</td>
<td>2.4</td>
<td>2.9</td>
<td>3.4</td>
<td>3.8</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Time of Concentration for Sheet Flow:

\[ T_{ct} = \frac{0.42(nL)^{0.6}}{1.55s^{0.4}} = 46.62 \text{ min} > 25 \text{ min}, \text{ use: } 25.00 \text{ min} \]

where:
- L = Length = 300 ft
- s = Slope = 0.02 ft/ft (representative value)
- Manning's n = 0.33 (ranges between bermuda and dense grasses, chart 8)

Time of Concentration for Shallow Concentrated Flow:

\[ T_{ct} = \frac{L}{(60^\circ V)} = 2.94 \text{ min} \]

where:
- s = Slope = 0.043 ft/ft (representative value)
- L = Length = 600 ft
- V = Velocity = 3.4 ft/s (chart 9)

Time of Concentration for Pipe System:

\[ T_{ct} = \frac{L}{(60^\circ V)} = 0.00 \text{ min} \]

where:
- L = Length = 0 ft
- V = Velocity = 4 ft/s

Total Time of Concentration:

\[ T_{ct} = T_{ct} + T_{ct} + T_{ct} = 27.94 \text{ min} \]

SBUH Calculated Flow:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow (cfs)</td>
<td>2.74</td>
<td>4.08</td>
<td>5.51</td>
<td>6.70</td>
<td>8.54</td>
</tr>
</tbody>
</table>
Santa Barbara Urban Hydrograph Computation for Phase 1, Basin 2 after Construction

**SPECIFY STORM OPTION:**

1

**S.C.S. TYPE-IA RAINFALL DISTRIBUTION**

**ENTER:** FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)

| 2.42:2.4 |

**========================================== S.C.S. TYPE-IA DISTRIBUTION ===================================**

**2-YEAR 24-HOUR STORM ** = 2.48" TOTAL PRECIP. **

**ENTER:** a(PERU), CN(PERU), a(IMPERV), CN(IMPERV), TC FOR BASIN NO. 1

76.87, 64.0, 27.9

DATA PRINT-OUT:

<table>
<thead>
<tr>
<th>AREA(ACRES)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TC(MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.9</td>
<td>16.9</td>
<td>84.0</td>
<td>98.0</td>
</tr>
</tbody>
</table>

PEAK-Q(CFS) 7.74 8.83 63327

**ENTER [d:\path\filename.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:**

e:\ projects\phase1b2\1845a5

**========================================== S.C.S. TYPE-IA DISTRIBUTION ===================================**

**5-YEAR 24-HOUR STORM ** = 2.96" TOTAL PRECIP. **

**ENTER:** a(PERU), CN(PERU), a(IMPERV), CN(IMPERV), TC FOR BASIN NO. 1

76.87, 64.0, 27.9

DATA PRINT-OUT:

<table>
<thead>
<tr>
<th>AREA(ACRES)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TC(MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.9</td>
<td>16.9</td>
<td>84.0</td>
<td>98.0</td>
</tr>
</tbody>
</table>

PEAK-Q(CFS) 4.88 7.83 87095

**ENTER [d:\path\filename.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:**

e:\ projects\phase1b2\1845a5

**========================================== S.C.S. TYPE-IA DISTRIBUTION ===================================**

**10-YEAR 24-HOUR STORM ** = 3.48" TOTAL PRECIP. **

**ENTER:** a(PERU), CN(PERU), a(IMPERV), CN(IMPERV), TC FOR BASIN NO. 1

76.87, 64.0, 27.9

DATA PRINT-OUT:

<table>
<thead>
<tr>
<th>AREA(ACRES)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TC(MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.9</td>
<td>16.9</td>
<td>84.0</td>
<td>98.0</td>
</tr>
</tbody>
</table>

PEAK-Q(CFS) 5.51 7.83 112693

**ENTER [d:\path\filename.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:**

e:\ projects\phase1b2\1845a10
Specify Storm Option:

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: PREQ<YEAR>, DURATION(HOUR), PRECIP(INCHES)
25.24, 3

================================ S.C.S. TYPE-1A DISTRIBUTION =================================
================================== 25-YEAR 24-HOUR STORM ======= 3.80" TOTAL PRECIP. ========

ENTER: A<PERM>, CN<PERM>, A<IMPENU>, CN<IMPENU>, TC FOR BASIN NO. 1
16.87, 0.93, 96, 27.94

DATA PRINT-OUT:

AREA<ACRES> PERVIOUS IMPERVIOUS TC(MINUTES)
A  CN  A  CN
16.9  0.93  96.0  27.94

PEAK-Q<CCF> T-PEAK(HRS) VOL<CH-FT)
6.70  7.03  13390

ENTER [filepath\filename] FOR STORAGE OF COMPUTED HYDROGRAPH:
\projects\phase1\1845a2e

---

Specify Storm Option:

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: PREQ<YEAR>, DURATION(HOUR), PRECIP(INCHES)
100, 24, 4.4

================================ S.C.S. TYPE-1A DISTRIBUTION =================================
================================== 100-YEAR 24-HOUR STORM ======= 4.48" TOTAL PRECIP. ========

ENTER: A<PERM>, CN<PERM>, A<IMPENU>, CN<IMPENU>, TC FOR BASIN NO. 1
16.87, 0.93, 96, 27.94

DATA PRINT-OUT:

AREA<ACRES> PERVIOUS IMPERVIOUS TC(MINUTES)
A  CN  A  CN
16.9  0.93  96.0  27.94

PEAK-Q<CCF> T-PEAK(HRS) VOL<CH-FT)
8.54  7.83  166870

ENTER [filepath\filename] FOR STORAGE OF COMPUTED HYDROGRAPH:
\projects\phase1\1845a108
HYDROLOGIC ANALYSIS FOR PHASE 1 CONDUITS during CONSTRUCTION

PROJECT: Powell Butte
DATE: April 25, 2000
Checked: Greg Kurasashi

Pervious Area: $395500 \text{ ft}^2 = 9.06 \text{ acres}$

Pervious CN: 93.85

Precipitation:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>P (in)</td>
<td>2.4</td>
<td>2.9</td>
<td>3.4</td>
<td>3.8</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Time of Concentration for Sheet Flow:

$$T_{ct} = \frac{0.42(nL)^{0.8}}{1.58s^{0.4}} = 2.20 \text{ min}$$

where:
L = Length = 300 ft
s = Slope = 0.10 ft/ft (representative value)
Manning's n = 0.015 (bare ground, chart 8)

Time of Concentration for Shallow Concentrated Flow:

$$T_{cs} = \frac{L}{(60^\circ V)} = 8.67 \text{ min}$$

where:

s = Slope = 0.097 ft/ft (representative value)
L = Length = 2600 ft
V = Velocity = 5.0 ft/s (chart 9)

Time of Concentration for Pipe System:

$$T_{cp} = \frac{L}{(60^\circ V)} = 0.00 \text{ min}$$

where:
L = Length = 0 ft
V = Velocity = 4 ft/s

Total Time of Concentration:

$$T_{cr} = T_{ct} + T_{cs} + T_{cp} = 10.87 \text{ min}$$

SBUH Calculated Flow:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow (cfs)</td>
<td>4.09</td>
<td>6.21</td>
<td>6.34</td>
<td>7.24</td>
<td>8.58</td>
</tr>
</tbody>
</table>
### S.C.S. Type-1A Rainfall Distribution

#### 2-Year 24-Hour Storm

<table>
<thead>
<tr>
<th>AREA (ACRES)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TIC (MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1</td>
<td>9.1</td>
<td>93.8</td>
<td>0.8 98.8</td>
</tr>
</tbody>
</table>

**Peak Q (CPS):** 4.69 **Peak HRS:** 7.63 **Vol. (CU-FT):** 57981

**Enter:** \{d:1\}path\filename.ext \ For Storage of Computed Hydrograph:

`E:\projects\phase1\1845d2`

### S.C.S. Type-1A Rainfall Distribution

#### 5-Year 24-Hour Storm

<table>
<thead>
<tr>
<th>AREA (ACRES)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TIC (MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1</td>
<td>9.1</td>
<td>93.8</td>
<td>0.8 98.8</td>
</tr>
</tbody>
</table>

**Peak Q (CPS):** 5.21 **Peak HRS:** 7.63 **Vol. (CU-FT):** 73745

**Enter:** \{d:1\}path\filename.ext \ For Storage of Computed Hydrograph:

`E:\projects\phase1\1845d2`

### S.C.S. Type-1A Rainfall Distribution

#### 10-Year 24-Hour Storm

<table>
<thead>
<tr>
<th>AREA (ACRES)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TIC (MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1</td>
<td>9.1</td>
<td>93.8</td>
<td>0.8 98.8</td>
</tr>
</tbody>
</table>

**Peak Q (CPS):** 6.34 **Peak HRS:** 7.63 **Vol. (CU-FT):** 89688

**Enter:** \{d:1\}path\filename.ext \ For Storage of Computed Hydrograph:

`E:\projects\phase1\1845d2`
SPECIFY STORM OPTION:

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
25.24.3.8

================================== S.C.S. TYPE-1A DISTRIBUTION =================================
================================== 25-YEAR 24-HOUR STORM ===== 3.88" TOTAL PRECIP. ======

ENTER: ACPERU), CN(IPERU), A(IMPERU), CN(IPERU), IC FOR BASIN NO. 1
9.88,93.85,89,86,10.87

DATA PRINT-OUT:

AREA(ACRES)  PERVERIOUS IMPEROUSIOUS TIC(MINUTES)
    9.1   9.1 93.8  0 98.8  18.9

PEAK-Q(CFS)  T-PEAK(HRS)  VOL(CU-FT)
    7.24    7.78  162931

ENTER [d:\path\filename.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
E:\projects\phase1\1845235

SPECIFY STORM OPTION:

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
100.4.4.4

================================== S.C.S. TYPE-1A DISTRIBUTION =================================
================================== 100-YEAR 24-HOUR STORM ===== 4.40" TOTAL PRECIP. ======

ENTER: ACPERU), CN(IPERU), A(IMPERU), CN(IPERU), IC FOR BASIN NO. 1
9.88,93.85,89,86,10.87

DATA PRINT-OUT:

AREA(ACRES)  PERVERIOUS IMPEROUSIOUS TIC(MINUTES)
    9.1   9.1 93.8  0 98.8  10.9

PEAK-Q(CFS)  T-PEAK(HRS)  VOL(CU-FT)
    8.50    7.83  221896

ENTER [d:\path\filename.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
E:\projects\phase1\1845235
HYDROLOGIC ANALYSIS FOR PHASE 1 CONDUTS after CONSTRUCTION

PROJECT: Powell Butte
DATE: April 25, 2000
Checked: Greg Kurashahi

Pervious Area: 395500 ft² = 9.08 acres
Pervious CN: 83.35
Precipitation:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>P (in)</td>
<td>2.4</td>
<td>2.9</td>
<td>3.4</td>
<td>3.8</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Time of Concentration for Sheet Flow:

\[
T_{c1} = \frac{0.42(mL)^{0.4}}{1.6654} \quad = 25.79 \text{ min} > 25 \text{ min, use: } 25.00 \text{ min}
\]

where:
L = Length = 300 ft
s = Slope = 0.10 ft/ft (representative value)
Manning's n = 0.33 (ranges between bermuda and dense grasses, chart 8)

Time of Concentration for Shallow Concentrated Flow:

\[
T_{c2} = \frac{L}{(S0.5V)} \quad = 8.67 \text{ min}
\]

where:
s = Slope = 0.097 ft/ft (representative value)
L = Length = 2600 ft
V = Velocity = 5.0 ft/s (chart 9)

Time of Concentration for Pipe System:

\[
T_{c3} = \frac{L}{(S0.5V)} \quad = 0.00 \text{ min}
\]

where:
L = Length = 0 ft
V = Velocity = 4 ft/s

Total Time of Concentration:

\[
T_{cf} = T_{c1} + T_{c2} + T_{c3} = 33.67 \text{ min}
\]

SBUH Calculated Flow:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow (cfs)</td>
<td>1.27</td>
<td>1.92</td>
<td>2.62</td>
<td>3.21</td>
<td>4.12</td>
</tr>
</tbody>
</table>
### HYDLEX

#### SPECIFY STORM OPTION:

1

#### S.C.S. TYPE-1A RAINFALL DISTRIBUTION

**ENTER:** FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)

<table>
<thead>
<tr>
<th>FREQ</th>
<th>DURATION</th>
<th>PRECIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.24</td>
<td>24</td>
<td>4</td>
</tr>
</tbody>
</table>

---------- 5-YEAR 24-HOUR STORM = 2.98" TOTAL PRECIP. 

**ENTER:** A(PELU), CN(PELU), A(IMPERU), CN(IMPERU), IC FOR BASIN NO. 1

9.0 83.5 0.98 33.67

**DATA PRINT-OUT:**

<table>
<thead>
<tr>
<th>AREA (ACRES)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TC (MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1</td>
<td>9.1</td>
<td>0.8</td>
<td>98.8</td>
</tr>
</tbody>
</table>

**PEAK-Q (CFS)**

1.27

**T-PEAK(HRS)**

9.0

**VOL(CU-FT)**

32193

**ENTER [id:1path\filename1.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:**

```text
E:\projects\maclen\1845a2
```
**HYD EXE**

**SPECIFY STORM OPTION:**

1

**S.C.S. TYPE-1A RAINFALL DISTRIBUTION**

**ENTER:** PREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)

| 25, 24.3 |

---

**S.C.S. TYPE-1A DISTRIBUTION**

**25-YEAR 24-HOUR STORM **** 3.80" TOTAL PRECIP. *******

**ENTER:** A(PERU) = CN(PERU) = A(IMPERU) = CN(IMPERU), TC FOR BASIN NO. 1

9.08, 83.35, 8, 98.8, 33.67

**DATA PRINT-OUT:**

<table>
<thead>
<tr>
<th>AREA (ACRES)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TC (MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1</td>
<td>9.1</td>
<td>83.3</td>
<td>8.0 98.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PEAK-Q (CFS)</th>
<th>T-PEAK(HRS)</th>
<th>VOL (CU-FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.21</td>
<td>7.63</td>
<td>70166</td>
</tr>
</tbody>
</table>

**ENTER id:[filepathfilename].ext FOR STORAGE OF COMPUTED HYDROGRAPH:**

`\projects\phelan\1845a29k`

---

**S.C.S. TYPE-1A RAINFALL DISTRIBUTION**

**ENTER:** PREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)

100, 24.4

---

**S.C.S. TYPE-1A DISTRIBUTION**

**100-YEAR 24-HOUR STORM **** 4.48" TOTAL PRECIP. *******

**ENTER:** A(PERU) = CN(PERU) = A(IMPERU) = CN(IMPERU), TC FOR BASIN NO. 1

9.08, 83.35, 8, 98.8, 33.67

**DATA PRINT-OUT:**

<table>
<thead>
<tr>
<th>AREA (ACRES)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TC (MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1</td>
<td>9.1</td>
<td>83.3</td>
<td>8.0 98.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PEAK-Q (CFS)</th>
<th>T-PEAK(HRS)</th>
<th>VOL (CU-FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.12</td>
<td>7.63</td>
<td>87237</td>
</tr>
</tbody>
</table>

**ENTER id:[filepathfilename].ext FOR STORAGE OF COMPUTED HYDROGRAPH:**

`\projects\phelan\1845a108`
HYDROLOGIC ANALYSIS FOR PHASE 2, Basin 1 during CONSTRUCTION

PROJECT Powell Butte
DATE April 25, 2000
Checked Greg Kurahashi

Pervious Area: 320000 ft² = 7.35 acres
Impervious Area: 520000 ft² = 11.34 acres

Pervious CN: 95.5
Impervious CN: 98

Precipitation:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>P (in)</td>
<td>2.4</td>
<td>2.9</td>
<td>3.4</td>
<td>3.8</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Time of Concentration for Sheet Flow:

\[ T_{cl} = \frac{0.42(nL)^{0.6}}{1.58s^{0.2}} = 3.11 \text{ min} \]

where:
L = Length = 300 ft
s = Slope = 0.04 ft/ft (representative value)
Manning’s n = 0.015 (bare ground, chart 8)

Time of Concentration for Shallow Concentrated Flow:

\[ T_{c3} = \frac{L}{(60^\circ V)} = 0.93 \text{ min} \]

where:
s = Slope = 0.050 ft/ft (representative value)
L = Length = 200 ft
V = Velocity = 3.6 ft/s (chart 9)

Time of Concentration for Pipe System:

\[ T_{c3} = \frac{L}{(60^\circ V)} = 9.56 \text{ min} \]

where:
L = Length = 2300 ft
V = Velocity = 4 ft/s

Total Time of Concentration:

\[ T_{t} = T_{c1} + T_{c2} + T_{c3} = 13.62 \text{ min} \]

SBUH Calculated Flow:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow (cfs)</td>
<td>9.69</td>
<td>11.94</td>
<td>14.18</td>
<td>15.95</td>
<td>19.49</td>
</tr>
</tbody>
</table>

35
### SPECIFY STORM OPTION:

**S.C.S. TYPE-1A RAINFALL DISTRIBUTION**

**ENTER:** `FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)`

<table>
<thead>
<tr>
<th>Type</th>
<th>Freq</th>
<th>Duration</th>
<th>Precip</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2.24</td>
<td>2.4</td>
<td></td>
</tr>
</tbody>
</table>

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### S.C.S. TYPE-1A DISTRIBUTION

**ENTER:** `A(PERC), CN(PERC), A(IMPER), CN(IMPER), TC` FOR BASIN NO. 1

<table>
<thead>
<tr>
<th>Area (Acres)</th>
<th>Pervious</th>
<th>Impervious</th>
<th>T(Minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.3</td>
<td>7.3</td>
<td>95.5</td>
<td>11.9</td>
</tr>
</tbody>
</table>

**FEAK-Q(CFS) T-Peak(HRS) UOL(CU-FT)**

<table>
<thead>
<tr>
<th>Peak Q</th>
<th>T-Peak</th>
<th>UOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.69</td>
<td>7.83</td>
<td>14499</td>
</tr>
</tbody>
</table>

**ENTER [dir:][path][filename].ext FOR STORAGE OF COMPUTED HYDROGRAPH:**

`C:\projects\phase2\18454b2`  

### SPECIFY STORM OPTION:

**S.C.S. TYPE-1A RAINFALL DISTRIBUTION**

**ENTER:** `FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)`

<table>
<thead>
<tr>
<th>Type</th>
<th>Freq</th>
<th>Duration</th>
<th>Precip</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>2.24</td>
<td>2.9</td>
<td></td>
</tr>
</tbody>
</table>

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### S.C.S. TYPE-1A DISTRIBUTION

**ENTER:** `A(PERC), CN(PERC), A(IMPER), CN(IMPER), TC` FOR BASIN NO. 1

<table>
<thead>
<tr>
<th>Area (Acres)</th>
<th>Pervious</th>
<th>Impervious</th>
<th>T(Minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.3</td>
<td>7.3</td>
<td>95.5</td>
<td>11.9</td>
</tr>
</tbody>
</table>

**FEAK-Q(CFS) T-Peak(HRS) UOL(CU-FT)**

<table>
<thead>
<tr>
<th>Peak Q</th>
<th>T-Peak</th>
<th>UOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.94</td>
<td>7.83</td>
<td>179527</td>
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**ENTER [dir:][path][filename].ext FOR STORAGE OF COMPUTED HYDROGRAPH:**

`C:\projects\phase2\18456g6`  

### SPECIFY STORM OPTION:

**S.C.S. TYPE-1A RAINFALL DISTRIBUTION**

**ENTER:** `FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)`

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<thead>
<tr>
<th>Type</th>
<th>Freq</th>
<th>Duration</th>
<th>Precip</th>
</tr>
</thead>
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<tr>
<td>1</td>
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<td>3.4</td>
<td></td>
</tr>
</tbody>
</table>

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### S.C.S. TYPE-1A DISTRIBUTION

**ENTER:** `A(PERC), CN(PERC), A(IMPER), CN(IMPER), TC` FOR BASIN NO. 1

<table>
<thead>
<tr>
<th>Area (Acres)</th>
<th>Pervious</th>
<th>Impervious</th>
<th>T(Minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.3</td>
<td>7.3</td>
<td>95.5</td>
<td>11.9</td>
</tr>
</tbody>
</table>

**FEAK-Q(CFS) T-Peak(HRS) UOL(CU-FT)**

<table>
<thead>
<tr>
<th>Peak Q</th>
<th>T-Peak</th>
<th>UOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.18</td>
<td>7.83</td>
<td>214975</td>
</tr>
</tbody>
</table>

**ENTER [dir:][path][filename].ext FOR STORAGE OF COMPUTED HYDROGRAPH:**

`C:\projects\phase2\18454g10`
SPECIFY STORM OPTION:

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
25.24.3.8

S.C.S. TYPE-1A DISTRIBUTION

25-YEAR 24-HOUR STORM --- 3.88" TOTAL PRECIP.

ENTER: A(PERU), CN(PERU), A(IMPERU), CN(IMPERU), TC FOR BASIN NO. 1
7.35.96.5.11.94.98.13.62

DATA PRINT-OUT:

<table>
<thead>
<tr>
<th>AREA(ACRES)</th>
<th>PENETRIOUS</th>
<th>IMPERVIOUS</th>
<th>TCMINUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.3</td>
<td>7.3</td>
<td>95.5</td>
<td>11.9</td>
</tr>
<tr>
<td></td>
<td>98.0</td>
<td>13.6</td>
<td></td>
</tr>
<tr>
<td>PEAK-Q(CFS)</td>
<td>T-PEAK(HRS)</td>
<td>VOL(CU-FT)</td>
<td></td>
</tr>
<tr>
<td>15.96</td>
<td>7.83</td>
<td>281950</td>
<td></td>
</tr>
</tbody>
</table>

ENTER [d:[\path\filename.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
c:\projects\phase2\1845425

SPECIFY STORM OPTION:

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
188.24.4.4

S.C.S. TYPE-1A DISTRIBUTION

188-YEAR 24-HOUR STORM --- 4.46" TOTAL PRECIP.

ENTER: A(PERU), CN(PERU), A(IMPERU), CN(IMPERU), TC FOR BASIN NO. 1
7.35.96.5.11.94.98.10.62

DATA PRINT-OUT:

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<th>AREA(ACRES)</th>
<th>PENETRIOUS</th>
<th>IMPERVIOUS</th>
<th>TCMINUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.3</td>
<td>7.3</td>
<td>95.5</td>
<td>11.9</td>
</tr>
<tr>
<td></td>
<td>98.0</td>
<td>13.6</td>
<td></td>
</tr>
<tr>
<td>PEAK-Q(CFS)</td>
<td>T-PEAK(HRS)</td>
<td>VOL(CU-FT)</td>
<td></td>
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<tr>
<td>19.49</td>
<td>7.83</td>
<td>283866</td>
<td></td>
</tr>
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ENTER [d:[\path\filename.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
c:\projects\phase2\18454186
HYDROLOGIC ANALYSIS FOR THE PHASE 2, Basin 1 after CONSTRUCTION

PROJECT: Powell Butte
DATE: April 25, 2000
Checked: Greg Kurahashi

Pervious Area: \(840000 \text{ ft}^2 = 19.28 \text{ acres}\)

Pervious CN: 87.5

Precipitation:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>P (in)</td>
<td>2.4</td>
<td>2.9</td>
<td>3.4</td>
<td>3.8</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Time of Concentration for Sheet Flow:

\[ T_{c1} = \frac{0.42(L)^{0.8}}{1.58n^{0.4}} = 36.40 \text{ min} > 25 \text{ min}, \text{ use: } 25.00 \text{ min} \]

where:
\[ L = \text{Length} = 300 \text{ ft} \]
\[ s = \text{Slope} = 0.04 \text{ ft/ft} \] (representative value)
\[ n = \text{Manning's} = 0.33 \] (ranges between bermuda and dense grasses, chart 8)

Time of Concentration for Shallow Concentrated Flow:

\[ T_{c3} = \frac{L}{(50^oV)} = 0.93 \text{ min} \]

where:
\[ s = \text{Slope} = 0.050 \text{ ft/ft} \] (representative value)
\[ L = \text{Length} = 200 \text{ ft} \]
\[ V = \text{Velocity} = 3.6 \text{ ft/s} \] (chart 9)

Time of Concentration for Pipe System:

\[ T_{c2} = \frac{L}{(60^oV)} = 0.00 \text{ min} \]

where:
\[ L = \text{Length} = 0 \text{ ft} \]
\[ V = \text{Velocity} = 4 \text{ ft/s} \]

Total Time of Concentration:
\[ T_{cT} = T_{c1} + T_{c2} + T_{c3} = 25.93 \text{ min} \]

SBUH Calculated Flow:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow (cfs)</td>
<td>4.36</td>
<td>6.10</td>
<td>7.91</td>
<td>9.40</td>
<td>11.65</td>
</tr>
</tbody>
</table>
Santa Barbara Urban Hydrograph Computation for Phase 2, Basin 1 after Construction

**SPECIFY STORM OPTION:**

**S.C.S. TYPE-1A RAINFALL DISTRIBUTION**

ENTER: PREC(YEAR), DURATION(HOUR), PRECIP(INCHES)

2.26, 24.9

<table>
<thead>
<tr>
<th>AREA(ACRE)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TCMINUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.3</td>
<td>19.3</td>
<td>97.5</td>
<td>0.98.0</td>
</tr>
</tbody>
</table>

PEAK-Q(CFS) | T-PEAK(HRS) | VOL(CU-FT) |
4.36        | 7.93        | 87564      |

**DATA PRINT-OUT:**

ENTER [d:\path\filename1.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:

C:\projects\phase2\1945a2

**SPECIFY STORM OPTION:**

**S.C.S. TYPE-1A RAINFALL DISTRIBUTION**

ENTER: PREC(YEAR), DURATION(HOUR), PRECIP(INCHES)

5.24, 2.9

<table>
<thead>
<tr>
<th>AREA(ACRE)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TCMINUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.3</td>
<td>19.3</td>
<td>97.5</td>
<td>0.98.0</td>
</tr>
</tbody>
</table>

PEAK-Q(CFS) | T-PEAK(HRS) | VOL(CU-FT) |
6.10        | 7.83        | 117743     |

**DATA PRINT-OUT:**

ENTER [d:\path\filename2.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:

C:\projects\phase2\1845c2

**SPECIFY STORM OPTION:**

**S.C.S. TYPE-1A RAINFALL DISTRIBUTION**

ENTER: PREC(YEAR), DURATION(HOUR), PRECIP(INCHES)

10.24, 3.4

<table>
<thead>
<tr>
<th>AREA(ACRE)</th>
<th>PERVIOUS</th>
<th>IMPERVIOUS</th>
<th>TCMINUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.3</td>
<td>19.3</td>
<td>97.5</td>
<td>0.98.0</td>
</tr>
</tbody>
</table>

PEAK-Q(CFS) | T-PEAK(HRS) | VOL(CU-FT) |
7.71        | 7.83        | 148729     |

**DATA PRINT-OUT:**

ENTER [d:\path\filename3.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:

C:\projects\phase2\1845a10
**HYDRO**

**SPECIFY STORM OPTION:**

1

**S.C.S. TYPE-1A RAINFALL DISTRIBUTION**

ENTER: PREC<(YEAR)>, DURATION(HOUR), PRECIP(INCHES)

*Example: 25.24, 3.8*

---

**25-YEAR 24-HOUR STORM **** 3.60" TOTAL PRECIP. **

---

**ENTER: A(PERU), CN(PERU), A(IMPERU), CN(IMPERU), TC FOR BASIN NO. 1**

19.28, 87.5, 98, 25.93

**DATA PRINT-OUT:**

<table>
<thead>
<tr>
<th>AREA (ACRES)</th>
<th>PERVIOUS A</th>
<th>CN</th>
<th>IMPERVIOUS A</th>
<th>CN</th>
<th>TC (MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.3</td>
<td>19.3</td>
<td>87.5</td>
<td>.0</td>
<td>98.0</td>
<td>25.9</td>
</tr>
</tbody>
</table>

**PEAK-Q(CFS) | T-PEAK(HRS) | VOL(CU-FT)***

9.40 | 7.83 | 173711

**ENTER [d:\path\filename.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:**

c:\projects\phase2\1845a25

---

**SPECIFY STORM OPTION:**

1

**S.C.S. TYPE-1A RAINFALL DISTRIBUTION**

ENTER: PREC<(YEAR)>, DURATION(HOUR), PRECIP(INCHES)

*Example: 180, 24, 4.4*

---

**100-YEAR 24-HOUR STORM **** 4.40" TOTAL PRECIP. **

---

**ENTER: A(PERU), CN(PERU), A(IMPERU), CN(IMPERU), TC FOR BASIN NO. 1**

19.28, 87.5, 98, 25.93

**DATA PRINT-OUT:**

<table>
<thead>
<tr>
<th>AREA (ACRES)</th>
<th>PERVIOUS A</th>
<th>CN</th>
<th>IMPERVIOUS A</th>
<th>CN</th>
<th>TC (MINUTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.3</td>
<td>19.3</td>
<td>87.5</td>
<td>.0</td>
<td>98.0</td>
<td>25.9</td>
</tr>
</tbody>
</table>

**PEAK-Q(CFS) | T-PEAK(HRS) | VOL(CU-FT)***

11.65 | 7.83 | 212367

**ENTER [d:\path\filename.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:**

c:\projects\phase2\1845a108

---

40
HYDROLOGIC ANALYSIS FOR PHASE 2, Basin 2 during CONSTRUCTION

PROJECT: Powell Butte
DATE: April 25, 2000
Checked: Greg Kurahashi

Pervious Area: 380000 ft² = 8.72 acres
Impervious Area: 520000 ft² = 11.94 acres

Pervious CN: 95.26
Impervious CN: 98

Precipitation:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>P (in)</td>
<td>2.4</td>
<td>2.9</td>
<td>3.4</td>
<td>3.8</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Time of Concentration for Sheet Flow:

\[ T_{ct} = \frac{0.42(nL)^{0.5}}{1.58e^{0.4}} = 2.09 \text{ min} \]

where:
- \( L = \) Length = 300 ft
- \( s = \) Slope = 0.12 ft/ft (representative value)
- \( n = \) Manning's \( n = 0.015 \) (bare ground, chart 8)

Time of Concentration for Shallow Concentrated Flow:

\[ T_{c5} = \frac{L}{(50^*V)} = 2.08 \text{ min} \]

where:
- \( s = \) Slope = 0.038 ft/ft (representative value)
- \( L = \) Length = 400 ft
- \( V = \) Velocity = 3.20 ft/s (chart 9)

Time of Concentration for Pipe System:

\[ T_{cp} = \frac{L}{(50^*V)} = 9.58 \text{ min} \]

where:
- \( L = \) Length = 2300 ft
- \( V = \) Velocity = 4 ft/s

Total Time of Concentration:

\[ T_{ct} = T_{c5} + T_{cp} = 13.76 \text{ min} \]

SBUH Calculated Flow:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>6 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
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</thead>
<tbody>
<tr>
<td>Flow (cfs)</td>
<td>16.26</td>
<td>12.67</td>
<td>15.06</td>
<td>16.97</td>
<td>19.83</td>
</tr>
</tbody>
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41
### S.C.S. TYPE-1A RAINFALL DISTRIBUTION

#### ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)

<table>
<thead>
<tr>
<th>Year</th>
<th>Duration</th>
<th>Precip (inches)</th>
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<tbody>
<tr>
<td>25</td>
<td>24</td>
<td>3.80</td>
</tr>
</tbody>
</table>

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#### ENTER: AREAS, CNRATES, IMPRATES, TC(MINUTES)

<table>
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<tr>
<th>Area (acres)</th>
<th>CN</th>
<th>Imperious CN</th>
<th>TC (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>28.7</td>
<td>8.7</td>
<td>95.3</td>
<td>11.9</td>
</tr>
<tr>
<td></td>
<td>98.0</td>
<td>13.8</td>
<td></td>
</tr>
</tbody>
</table>

#### PEAK-Q(CF/S), T-PEAK(HRS), VOL(CU-FT)

<table>
<thead>
<tr>
<th>Peak-Q (CF/S)</th>
<th>T-Peak (HRS)</th>
<th>Volume (CU-FT)</th>
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</thead>
<tbody>
<tr>
<td>16.97</td>
<td>7.83</td>
<td>25746</td>
</tr>
</tbody>
</table>

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#### ENTER [d:i]path[/filename_ext] FOR STORAGE OF COMPUTED HYDROGRAPH:

- C:\projects\phase3\1845d100
HYDROLOGIC ANALYSIS FOR THE PHASE 2, Basin 2 after CONSTRUCTION

PROJECT: Powell Butte
DATE: April 25, 2000
Checked: Greg Kurahashi

Pervious Area: \(900000 \text{ ft}^2 = 20.66 \text{ acres}\)

Pervious CN: 86.75

Precipitation:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>P (in)</td>
<td>2.4</td>
<td>2.9</td>
<td>3.4</td>
<td>3.8</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Time of Concentration for Sheet Flow:

\[ T_{ct} = \frac{0.42(nL)^{0.4}}{1.58s^{0.4}} = 24.49 \text{ min} \]

where:

\(L = \text{Length} = 300 \text{ ft}\)

\(s = \text{Slope} = 0.12 \text{ ft/ft} \) (representative value)

\(m = \text{Manning's } n = 0.33 \) (ranges between bermuda and dense grasses, chart 8)

Time of Concentration for Shallow Concentrated Flow:

\[ T_{ct} = \frac{L}{(60^0V)} = 2.08 \text{ min} \]

where:

\(s = \text{Slope} = 0.038 \text{ ft/ft} \) (representative value)

\(L = \text{Length} = 400 \text{ ft}\)

\(V = \text{Velocity} = 3.20 \text{ ft/s} \) (chart 9)

Time of Concentration for Pipe System:

\[ T_{ct} = \frac{L}{(60^0V)} = 0.00 \text{ min} \]

where:

\(L = \text{Length} = 0 \text{ ft}\)

\(V = \text{Velocity} = 4 \text{ ft/s}\)

Total Time of Concentration:

\[ T_{ct} = T_{ct1} + T_{ct2} + T_{ct3} = 26.57 \text{ min} \]

SBUH Calculated Flow:

<table>
<thead>
<tr>
<th>Storms</th>
<th>2 year</th>
<th>5 year</th>
<th>10 year</th>
<th>25 year</th>
<th>100 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow (cfs)</td>
<td>4.36</td>
<td>6.17</td>
<td>8.07</td>
<td>9.63</td>
<td>12.01</td>
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</tbody>
</table>
Santa Barbara Urban Hydrograph Computation for Phase 2, Basin 2 after Construction

**SPECIFY STORM OPTION:**

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOURS), PRECIP(INCHES)
2.24, 2.9

------------------------------- S.C.S. TYPE-1A DISTRIBUTION ----------------------------

--- 2-YEAR 24-HOUR STORM --- 2.49" TOTAL PRECIP. ---

ENTER: A(PERU), CN(PERU), A(IMPERU), CN(IMPERU), TC FOR BASIN NO. 1
20.66, 86.75, 8.98, 26.57

DATA PRINT-OUT:

<table>
<thead>
<tr>
<th>AREA (ACRES)</th>
<th>PERVEROUS</th>
<th>IMPERVIOUS</th>
<th>TCMINUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>20.7</td>
<td>28.7</td>
<td>86.8</td>
</tr>
</tbody>
</table>

PEAK-Q(CPS)  T-PK(HRS)  VOL(CU-FT)
4.36 7.83 98338

ENTER [!\path\filename!] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\projects\phase3\1845a.jpg

**SPECIFY STORM OPTION:**

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOURS), PRECIP(INCHES)
5.24, 2.9

------------------------------- S.C.S. TYPE-1A DISTRIBUTION ----------------------------

--- 5-YEAR 24-HOUR STORM --- 2.98" TOTAL PRECIP. ---

ENTER: A(PERU), CN(PERU), A(IMPERU), CN(IMPERU), TC FOR BASIN NO. 1
20.66, 86.75, 8.98, 26.57

DATA PRINT-OUT:

<table>
<thead>
<tr>
<th>AREA (ACRES)</th>
<th>PERVEROUS</th>
<th>IMPERVIOUS</th>
<th>TCMINUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>20.7</td>
<td>28.7</td>
<td>86.8</td>
</tr>
</tbody>
</table>

PEAK-Q(CPS)  T-PK(HRS)  VOL(CU-FT)
5.17 7.83 121842

ENTER [!\path\filename!] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\projects\phase3\1845a.jpg

**SPECIFY STORM OPTION:**

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOURS), PRECIP(INCHES)
16.24, 3.4

------------------------------- S.C.S. TYPE-1A DISTRIBUTION ----------------------------

--- 10-YEAR 24-HOUR STORM --- 3.40" TOTAL PRECIP. ---

ENTER: A(PERU), CN(PERU), A(IMPERU), CN(IMPERU), TC FOR BASIN NO. 1
20.66, 86.75, 8.98, 26.57

DATA PRINT-OUT:

<table>
<thead>
<tr>
<th>AREA (ACRES)</th>
<th>PERVEROUS</th>
<th>IMPERVIOUS</th>
<th>TCMINUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>20.7</td>
<td>28.7</td>
<td>86.8</td>
</tr>
</tbody>
</table>

PEAK-Q(CPS)  T-PK(HRS)  VOL(CU-FT)
8.07 7.83 154614

ENTER [!\path\filename!] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\projects\phase3\1845a.jpg
**HYD.EXE**

**SPECIFY STORM OPTION:**

1

**S.C.S. TYPE-1A RAINFALL DISTRIBUTION**

**ENTER:** FREQ(YEAR), DURATION(HOURS), PRECIP(INCHES)

**25.24.3.8**

**------------------------------- S.C.S. TYPE-1A DISTRIBUTION -------------------------------**

**25-YEAR 24-HOUR STORM ***** 3.80" TOTAL PRECIP. *****

**ENTER: A(PERU), CN(PERU), A(IMPERU), CN(IMPERU), TC FOR BASIN NO. 1**

20.65 86.75 0.98 26.57

**DATA PRINT-OUT:**

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t:
\projects\phase3\1845a25

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**HYDLINE**

**SPECIFY STORM OPTION:**

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**S.C.S. TYPE-1A RAINFALL DISTRIBUTION**

**ENTER:** FREQ(YEAR), DURATION(HOURS), PRECIP(INCHES)

**100.24.4.4**

**------------------------------- S.C.S. TYPE-1A DISTRIBUTION -------------------------------**

**100-YEAR 24-HOUR STORM ***** 4.40" TOTAL PRECIP. *****

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</tr>
<tr>
<td>1270 - 1280</td>
<td>0.40</td>
<td>0.015</td>
<td>93.60</td>
<td>3.557</td>
<td>0.015</td>
<td>0.000</td>
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<tr>
<td>1280 - 1290</td>
<td>0.40</td>
<td>0.015</td>
<td>94.00</td>
<td>3.572</td>
<td>0.015</td>
<td>0.000</td>
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<tr>
<td>1290 - 1300</td>
<td>0.40</td>
<td>0.015</td>
<td>94.40</td>
<td>3.587</td>
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<td>1300 - 1310</td>
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<td>0.015</td>
<td>94.80</td>
<td>3.602</td>
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<tr>
<td>1310 - 1320</td>
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<td>0.015</td>
<td>95.20</td>
<td>3.618</td>
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<td>0.000</td>
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<tr>
<td>1320 - 1330</td>
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<td>0.015</td>
<td>95.60</td>
<td>3.633</td>
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<tr>
<td>1330 - 1340</td>
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<td>0.015</td>
<td>96.00</td>
<td>3.648</td>
<td>0.015</td>
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<tr>
<td>1340 - 1350</td>
<td>0.40</td>
<td>0.015</td>
<td>96.40</td>
<td>3.663</td>
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<td>1350 - 1360</td>
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<td>1360 - 1370</td>
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<td>97.20</td>
<td>3.694</td>
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<td>1370 - 1380</td>
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<td>97.60</td>
<td>3.709</td>
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<td>0.000</td>
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<tr>
<td>1380 - 1390</td>
<td>0.40</td>
<td>0.015</td>
<td>98.00</td>
<td>3.724</td>
<td>0.015</td>
<td>0.000</td>
</tr>
<tr>
<td>1390 - 1400</td>
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<td>0.015</td>
<td>98.40</td>
<td>3.739</td>
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<td>0.000</td>
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<td>0.015</td>
<td>98.80</td>
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<td>99.20</td>
<td>3.770</td>
<td>0.015</td>
<td>0.000</td>
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<td>1420 - 1430</td>
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<td>0.015</td>
<td>99.60</td>
<td>3.785</td>
<td>0.015</td>
<td>0.000</td>
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<tr>
<td>1430 - 1440</td>
<td>0.40</td>
<td>0.015</td>
<td>100.00</td>
<td>3.800</td>
<td>0.015</td>
<td>0.000</td>
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</tbody>
</table>

Total infiltrated inches in 24 hours: 3.230 in
Total detention volume requirement: 0.570 in
Appendix
### PHASE I

<table>
<thead>
<tr>
<th>E.O. No.</th>
<th>Basin</th>
<th>%</th>
<th>C/O</th>
<th>Date</th>
<th>Hg</th>
<th>PPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>37 B</td>
<td>C</td>
<td>7</td>
<td>39.9%</td>
<td>95 86</td>
<td>7</td>
<td>95.07/86.22</td>
</tr>
<tr>
<td>37 C</td>
<td>J</td>
<td>3</td>
<td>4.3%</td>
<td>96 89</td>
<td>57</td>
<td>92.79</td>
</tr>
<tr>
<td>25 D</td>
<td>B</td>
<td>2</td>
<td>0.5%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### PHASE II

#### Basin 1

| 37 B    | C     | 50% | 95 86 | 7 | 95.5/87.5 |
| 37 C    | C     | 75% | 95 86 | 7 | 95.25/86.75 |

#### Basin 2

| 37 B    | C     | 25% | 95 86 | 7 | 95.07/86.22 |
| 37 C    | D     | 50% | 96 89 | 57 | 92.79   |
| 25 D    | B     | 2 | 0.5%  |      |    |         |

### CAUCUS:

- 37 C
- 25 B
- 25 D
- 57 B

<table>
<thead>
<tr>
<th>%</th>
<th>C/O</th>
<th>Date</th>
<th>Hg</th>
<th>PPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>40%</td>
<td>92 79</td>
<td>93.85/83.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55%</td>
<td>95 86</td>
<td>5%</td>
<td>96 89</td>
<td>92 79</td>
</tr>
<tr>
<td>Phase</td>
<td>Flow</td>
<td>Volume</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
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<td>--------</td>
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</tr>
<tr>
<td>1</td>
<td>35.02</td>
<td>12,131,7</td>
<td>12,500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14.57</td>
<td>5,413,9</td>
<td>5,500</td>
<td></td>
</tr>
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<td></td>
<td>15.96</td>
<td>4,36</td>
<td>47,634</td>
<td>48,000</td>
</tr>
<tr>
<td></td>
<td>16.97</td>
<td>4.36</td>
<td>54,579</td>
<td>55,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase</th>
<th>Flow</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30,754</td>
<td>30,800</td>
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<tr>
<td></td>
<td>17,204</td>
<td>17,300</td>
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<td></td>
<td>11,683</td>
<td>116,000</td>
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<td>144,997</td>
<td>145,000</td>
</tr>
<tr>
<td></td>
<td>153,737</td>
<td>154,000</td>
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</table>

<table>
<thead>
<tr>
<th>Conversion</th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
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</thead>
<tbody>
<tr>
<td>Unit</td>
<td>579.81</td>
<td>58,000</td>
<td>2.51</td>
</tr>
<tr>
<td>Material</td>
<td>Permeability</td>
<td>Column Height</td>
<td>Flow Rate</td>
</tr>
<tr>
<td>----------</td>
<td>--------------</td>
<td>---------------</td>
<td>-----------</td>
</tr>
<tr>
<td>37B, C, D</td>
<td>0.3 - 2.0 (0 - 14 in)</td>
<td>0.2 - 0.6 (14 - 60 m)</td>
<td></td>
</tr>
<tr>
<td>25B, D</td>
<td>0.3 - 2.0 (0 - 56 in)</td>
<td>2.0 - 6.0 (56 - 60 m)</td>
<td></td>
</tr>
<tr>
<td>29G</td>
<td>0.3 - 2.0 (0 - 39 in)</td>
<td>6.0 - 20 (39 - 60 m)</td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>0.3 - 2.0 (0 - 10 in)</td>
<td>0.2 - 0.6 (10 - 60 m)</td>
<td></td>
</tr>
</tbody>
</table>

\[ \text{Water capacity } = 0.2 \text{ in/hr} \]

\[ 0.2 \text{ in/hr} \times \frac{1.25 \text{ in}}{60 \text{ in/hr}} \times 10 \text{ min} = 0.033 \text{ in/10 min} \]

While 0.033 in/10 min is not sufficient, other 25 years 0.4\%
Applicants who use the design criteria in Chapters 4.0, 5.0, and 6.0 will not be expected to provide the City with additional documentation or meet additional BES design requirements for 303(d) listings. The requirements of this manual are also assumed to be in compliance with the requirements of the City’s NPDES permit and other City policies and directives.

Development projects in watersheds with established TMDLs may use the simplified or presumptive approach for pollution reduction. However, these approaches are intended to be applied citywide, and do not specifically address TMDLs, which vary from stream to stream. For this reason, the applicant shall also demonstrate through the performance approach (see Section 5.2.3) that the development proposal is consistent with specific TMDL requirements.

5.5 PRESUMPTIVE APPROACH CRITERIA

APPLICABILITY: The presumptive approach may be used for projects that fall under Management Level 2, 3, or 4.

As discussed in Chapter 1, Section 1.4.2, applicants for Management Level 3 projects may use the presumptive approach and will be presumed to be in compliance with all pollution reduction requirements. They may also choose to manage stormwater under the provisions of the City’s former interim policy, which requires at least 50 percent TSS removal. In that case, they must use the performance approach discussed in Section 5.2.3, above.

5.5.1 Hydrologic Analysis

Hydrologic analysis for pollution reduction facilities is based on the Santa Barbara Urban Hydrograph (SBUH) method. The SBUH method is described in Appendix 5-A.

If the SBUH method is not used, the Bureau of Environmental Services (BES) must pre-approve the alternative method of hydrologic calculations for pollution reduction facilities, before the calculations are submitted. Regardless of how the hydrologic calculations are performed, all hydrologic submittals shall include pervious and impervious areas, runoff curve numbers applicable to the site, and time of concentration (Tc) calculations to facilitate BES’s checks of submittals, which will use the SBUH model.

Unless the facility is designed as an “off-line” facility, it must be able to pass the entire stormwater quantity design storm (25-year) without damaging the facility or reducing the facility’s ability to treat subsequent stormwater quality flows.
PRE-DEVELOPMENT VS. POST-DEVELOPMENT CONDITIONS

For projects that fall under Management Levels 2 and 3, two sets of hydrologic calculations shall be submitted for a development. The first set of calculations shall show the hydrologic conditions for the site as it currently exists. This is known as the pre-development condition. The second set shall show hydrologic calculations for the planned site after development (the post-development condition). The developer shall be responsible for treating the difference between the pre-development and the post-development condition. If a facility will convey more than the increase in discharge resulting from development, the facility must be sized to treat the entire flow delivered to it during the design storm of 0.83 inches in 24 hours.

EXAMPLE

An undeveloped site has a time of concentration of 19 minutes and a peak flow rate of 0.83 cfs. The site after development will be 65% impervious. The time of concentration will change to 14 minutes and the peak flow rate will increase to 1.45 cfs. What are the design requirements?

Design flow rate = Peak post-development flow rate - Peak pre-development flow rate

Design flow rate = 1.45 cfs - 0.83 cfs = 0.62 cfs

(Note: this requirement applies to both peak flow rate and flow volume, where applicable.)

This pre-development/post-development requirement applies to flow control calculations as well as to pollution reduction calculations. See Chapter 6.0 for more information regarding flow control calculations.

For projects that fall under Management Level 4, the developer shall be responsible for treating all the water generated from the post-development condition.

5.5.2 Infiltration Testing

Where soils infiltration is a part of the required operation of the proposed facility, the infiltration rate shall be determined using the standard test method for “field measurement of infiltration rate using a double ring infiltrometer with a sealed-inner ring” (ASTM D5093-90), performed and certified by an approved geotechnical testing laboratory. The test shall be performed in the strata in which infiltration is anticipated to occur.
Appendix 5-A
SANTA BARBARA URBAN HYDROGRAPH (SBUH)

INTRODUCTION

The Santa Barbara Urban Hydrograph (SBUH) method was developed by the Santa Barbara County Flood Control and Water Conservation District to determine a runoff hydrograph for an urbanized area. It is a simpler method than some other approaches, as it computes a hydrograph directly without going through intermediate steps (i.e., a unit hydrograph) to determine the runoff hydrograph.

The SBUH method is a popular method for calculating runoff, since it can be done with a spreadsheet or by hand relatively easily. The SBUH method is the method approved by the Bureau of Environmental Services (BES) for determining runoff when doing water quality calculations (Chapter 5.0.) It is one of the approved methods for doing water quantity (flow control) calculations (Chapter 6.0.)

Note: a DOS-based computer program, HYD, was developed by the King County, Washington, Department of Public Works to do Santa Barbara hydrograph calculations. BES recommends using this software to do SBUH calculations, and uses this software to verify the SBUH calculations it receives. Copies of HYD are available from BES at no cost.

ELEMENTS OF THE SBUH METHOD

The SBUH method depends on several variables:

- Pervious ($A_p$) and impervious ($A_{imp}$) land areas
- Time of concentration ($T_c$) calculations
- Runoff curve numbers (CN) applicable to the site
- Design storm

These elements shall all be presented as part of the submittal process for review by BES staff. In addition, maps showing the pre-development and post-development conditions shall be presented to BES to help in the review.

Land Area

The total area, including the pervious and impervious areas within a drainage basin, shall be quantified in order to evaluate critical contributing areas and the resulting site runoff. Each area within a basin shall be analyzed separately and their hydrographs
combined to determine the total basin hydrograph. Areas shall be selected to represent homogenous land use/development units.

Time of Concentration

Time of concentration, $T_c$, is the time for a theoretical drop of water to travel from the furthest point in the drainage basin to the facility being designed. (In this case, $T_c$ is derived by calculating the overland flow time of concentration and the channelized flow time of concentration.) $T_c$ depends on several factors, including ground slope, ground roughness, and distance of flow. The following formula for determining $T_c$ is taken from Chart 1 of BES's *Sewer Design Manual*. (All chart references below are from the *Sewer Design Manual*.)

**Formula**

$$T_c = T_{i} + T_{e} + \ldots + T_{m}$$

$$T_i = \frac{L}{60V} \quad \text{(Conversion of velocity to travel time)}$$

$$V = 16.1345 (s)^{0.8} \quad \text{(Unpaved surfaces)}$$

$$V = 20.3282 (s)^{0.6} \quad \text{(Paved surfaces)}$$

$T_i$ = flow time, minutes

$T_e$ = total time of concentration, minutes (minimum $T_e = 5$ minutes)

$L$ = flow length, feet

$V$ = average velocity of flow, feet per second

$n$ = Manning’s roughness coefficient for various surfaces (see Chart 10)

$s$ = slope of the hydraulic grade line (land or watercourse slope), feet per foot

Where,

When calculating $T_c$, the following limitations apply:

- Overland sheet flow (flow across flat areas that does not form into channels or rivulets) shall not extend for more than 300 feet, and travel time shall not exceed 25 minutes.

- For flow paths through closed conveyance facilities such as pipes and culverts, standard hydraulic formulas shall be used for establishing velocity and travel time. (See the *Sewer Design Manual* for more data on pipe flow rates and velocities.)

- Flow paths through lakes or wetlands may be assumed to be zero (i.e. $T_c = 0$).
### Manning's n Values

<table>
<thead>
<tr>
<th>Surface Description</th>
<th>Design Value</th>
<th>Surface Description</th>
<th>Design Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheet Flow (Max. 300')</td>
<td>.11</td>
<td>Paved Streets &amp; Gutters</td>
<td>.012</td>
</tr>
<tr>
<td>Concrete or asphalt</td>
<td>.01</td>
<td>Concrete gutter, trowel finish</td>
<td>.012</td>
</tr>
<tr>
<td>Bare sand</td>
<td>.01</td>
<td>Asphalt pavement</td>
<td>.013</td>
</tr>
<tr>
<td>Gravelly surface</td>
<td>.02</td>
<td>Smooth texture</td>
<td>.013</td>
</tr>
<tr>
<td>Bare clay - loam (eroded)</td>
<td>.02</td>
<td>Rough texture</td>
<td>.018</td>
</tr>
<tr>
<td>Grass (short grass prairie)</td>
<td>.15</td>
<td>Conc. gutter w/ asph. pavement</td>
<td>.013</td>
</tr>
<tr>
<td>(dense grass - lawn)</td>
<td>.24</td>
<td>Smooth</td>
<td>.013</td>
</tr>
<tr>
<td>(bromuda grass)</td>
<td>.41</td>
<td>Rough</td>
<td>.015</td>
</tr>
<tr>
<td>Woods (light underbrush)</td>
<td>.40</td>
<td>Concrete pavement</td>
<td>.014</td>
</tr>
<tr>
<td>(dense)</td>
<td>.80</td>
<td>Float finish</td>
<td>.016</td>
</tr>
</tbody>
</table>

Notes: 1. The sheet flow n values are from Ref. No. 7, Page 3-3 and include information compiled by Ergman (1965). Ref. No. 6. 2. These n values are for sheet flow only and are not appropriate for channel flow. 3. When selecting n for wooded areas, consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

<table>
<thead>
<tr>
<th>Open Channel (Natural)</th>
<th>Design Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean, straight, full stage, no pools</td>
<td>.029</td>
</tr>
<tr>
<td>As above with weeds and stones</td>
<td>.035</td>
</tr>
<tr>
<td>Winding, pools &amp; shallows, clean</td>
<td>.039</td>
</tr>
<tr>
<td>As above at low stages</td>
<td>.047</td>
</tr>
<tr>
<td>Winding, pools &amp; shallows, weeds &amp; stones</td>
<td>.042</td>
</tr>
<tr>
<td>As above, shallow stages, large stones</td>
<td>.052</td>
</tr>
<tr>
<td>Sluggish, weedy, with deep pools</td>
<td>.065</td>
</tr>
<tr>
<td>Very weedy and sluggish</td>
<td>.112</td>
</tr>
</tbody>
</table>

Note: The open channel (natural) n values are from Linsley, Kohler, Paulhus (1982), Ref. No. 16.

<table>
<thead>
<tr>
<th>Open Channel (Artificial Changes)</th>
<th>Depth, feet</th>
<th>Design Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (broom or float finish)</td>
<td>0.0 - 0.5</td>
<td>.015</td>
</tr>
<tr>
<td></td>
<td>0.5 - 2.0</td>
<td>.013</td>
</tr>
<tr>
<td></td>
<td>&gt; 2.0</td>
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<tr>
<td>Gunite</td>
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</tr>
<tr>
<td></td>
<td>.020</td>
<td></td>
</tr>
<tr>
<td>Grouted riprap</td>
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</tr>
<tr>
<td></td>
<td>.030</td>
<td></td>
</tr>
<tr>
<td>Stone masonry</td>
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</tr>
<tr>
<td></td>
<td>.032</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>.022</td>
<td></td>
</tr>
<tr>
<td>Asphalt</td>
<td>.018</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.016</td>
<td></td>
</tr>
<tr>
<td>Bare soil</td>
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</tr>
<tr>
<td></td>
<td>.020</td>
<td></td>
</tr>
<tr>
<td>Rock cut</td>
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</tr>
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<td></td>
<td>.035</td>
<td></td>
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<td></td>
<td>.025</td>
<td></td>
</tr>
<tr>
<td>Gravel, 1 inch, Dso</td>
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</tr>
<tr>
<td></td>
<td>.033</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.030</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.022</td>
<td></td>
</tr>
<tr>
<td>Rock riprap, 2 inch, Dso</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>.041</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.034</td>
<td></td>
</tr>
<tr>
<td>Rock riprap, 6 inch, Dso</td>
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</tr>
<tr>
<td></td>
<td>.059</td>
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</tr>
<tr>
<td></td>
<td>.035</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.078</td>
<td></td>
</tr>
<tr>
<td>Rock riprap, 12 inch, Dso</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.040</td>
<td></td>
</tr>
</tbody>
</table>

Note: From Ref. No. 15, Page 37.
**AVERAGE VELOCITIES FOR SHALLOW CONCENTRATED FLOW**

Average Velocity, Feet Per Second

Water course Slope, Feet Per Foot

* For slopes less than 0.005 ft/ft, use the following equations:
  \[ V = 16.1345 \times (S)^{0.5} \text{ fps (Unpaved surfaces)} \]
  \[ V = 20.3282 \times (S)^{0.5} \text{ fps (Paved surfaces)} \]

From Ref. No. 7, Fig. 3-1, Page 3-2 & Appendix F, Page F-1

BES August 7, 1990
Runoff Curve Numbers

Runoff curve numbers were developed by the Natural Resources Conservation Service (NRCS) after studying the runoff characteristics of various types of land. Curve numbers (CN) were developed to reduce diverse characteristics such as soil type, land usage, and vegetation into a single variable for doing runoff calculations. The runoff curve numbers approved by BES for water quantity/quality calculations are included as Table A-2 of this appendix.

The curve numbers presented in Table A-2 are for wet antecedent moisture conditions. Wet conditions assume previous rainstorms have reduced the capacity of soil to absorb water. Given the frequency of rainstorms in the Portland area, wet conditions are most likely, and give conservative hydrographic values.

Design Storm

The SBUH method also requires a design storm to perform the runoff calculations. For water quality and flow control calculations, BES uses a NRCS Type 1A 24-hour storm. The depth of rainfall for the water quality storm is 0.85 inches of water. This storm is shown in Figure A-1 and Table A-3.

<table>
<thead>
<tr>
<th>Table A-1</th>
<th>24-HOUR RAINFALL DEPTHS AT PORTLAND AIRPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recurrence Interval, Years</td>
<td>2</td>
</tr>
<tr>
<td>24-Hour Depths, Inches</td>
<td>2.4</td>
</tr>
<tr>
<td>LAND USE DESCRIPTION</td>
<td>CURVE NUMBERS BY HYDROLOGIC SOIL GROUP</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Cultivated land:</td>
<td>89</td>
</tr>
<tr>
<td>Mountain open areas:</td>
<td>68</td>
</tr>
<tr>
<td>Meadow or pasture:</td>
<td>68</td>
</tr>
<tr>
<td>Wood or forest land:</td>
<td>45</td>
</tr>
<tr>
<td>Orchard:</td>
<td>75</td>
</tr>
<tr>
<td>Open spaces, lawns,</td>
<td>59</td>
</tr>
<tr>
<td>Good condition:</td>
<td>69</td>
</tr>
<tr>
<td>Fair condition:</td>
<td>84</td>
</tr>
<tr>
<td>Poor condition:</td>
<td>89</td>
</tr>
<tr>
<td>Gravel roads and</td>
<td>88</td>
</tr>
<tr>
<td>parking lots</td>
<td>88</td>
</tr>
<tr>
<td>Dirt roads and</td>
<td>99</td>
</tr>
<tr>
<td>parking lots</td>
<td>100</td>
</tr>
<tr>
<td>Impervious surfaces,</td>
<td>99</td>
</tr>
<tr>
<td>pavement, roofs, etc.</td>
<td>100</td>
</tr>
<tr>
<td>Open water bodies:</td>
<td>100</td>
</tr>
</tbody>
</table>

Single Family Residential (2)

<table>
<thead>
<tr>
<th>Dwelling Unit/Gross Acre</th>
<th>% Impervious (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 DU/GA</td>
<td>15</td>
</tr>
<tr>
<td>1.5 DU/GA</td>
<td>20</td>
</tr>
<tr>
<td>2.0 DU/GA</td>
<td>25</td>
</tr>
<tr>
<td>2.5 DU/GA</td>
<td>30</td>
</tr>
<tr>
<td>3.0 DU/GA</td>
<td>34</td>
</tr>
<tr>
<td>3.5 DU/GA</td>
<td>38</td>
</tr>
<tr>
<td>4.0 DU/GA</td>
<td>42</td>
</tr>
<tr>
<td>4.5 DU/GA</td>
<td>46</td>
</tr>
<tr>
<td>5.0 DU/GA</td>
<td>48</td>
</tr>
<tr>
<td>5.5 DU/GA</td>
<td>50</td>
</tr>
<tr>
<td>6.0 DU/GA</td>
<td>52</td>
</tr>
<tr>
<td>6.5 DU/GA</td>
<td>54</td>
</tr>
<tr>
<td>7.0 DU/GA</td>
<td>56</td>
</tr>
</tbody>
</table>

Planned unit developments, condominiums, apartments, commercial business and industrial areas.

% impervious must be computed

Separate curve number shall be selected for pervious and impervious portion of the site or basin.

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(2) Assumes roof and driveway runoff is directed into street/storm system.
(3) The remaining pervious areas (lawn) are considered to be in good condition for these curve numbers.
6.7.1 Detention Ponds

Open ponds for flow control are encouraged when the site constraints allow. The City also encourages applicants to design flow control ponds to function as multi-purpose facilities (e.g., parks, open space, recreation facilities, or parking lots), provided that any alternative uses are compatible with the primary stormwater functions and maintenance standards.

The City prefers that stormwater runoff control occur on-site at its source. If site constraints prevent the construction of flow control facilities on-site, the City encourages the construction of regional ponds to serve multiple residences or developments. Such facilities can be effective for flow control management and also serve to improve water quality. Combination facilities can be more cost effective to design, construct, and maintain, and can more easily serve as a multi-purpose facility. (See Chapter 5.0, Section 5.5.5: Dual Use Facilities.)

The City does not encourage instream ponds or facilities. If used, they require special approvals from the National Marine Fisheries Service, Oregon Department of Fish and Wildlife, Division of State Lands, and City of Portland, in addition to water rights from the Division of Water Rights.

DESIGN REQUIREMENTS

The following design criteria apply to open ponds.

Site Constraints

- All open ponds to be maintained by the City of Portland shall be located in a separate tract dedicated to the City. Open ponds shall not be located in dedicated public road rights-of-way.

- Open ponds designed to function as multi-use/recreational facilities shall be located in a separate tract (e.g., Tract A), defined easement, or designated open space.

Geometry

- Minimum freeboard shall be 1 foot above the 100-year peak water surface elevation, or the highest design water surface elevation, or the 100-year peak flow elevation, whichever is greater.

- Maximum distance shall be provided between the inlet and outlet to assist sedimentation. The optimum length-to-width ratio is at least 2:1, at the maximum water surface elevation. Although the facility's overall flow control characteristics
are not affected by the pond geometry, this configuration enhances the water quality benefits that can be derived by a pond. Higher length-to-width ratios may be required for dual-use (pollution reduction and flow control) facilities.

- All outlet pipes shall be provided with a debris barrier (see Exhibit 6-4).

- Ponds shall be designed with an upstream forebay for the purpose of trapping and containing debris and sediment. The forebay bottom shall be flat and designed to provide 0.5 feet of dead storage for sediment accumulation. This dead storage may not be included in the calculation of the total available storage for the pond. The sediment capacity of the forebay is based on the forebay volume being one-half of the total pond volume. If the forebay is less than this amount, the sediment storage depth shall be proportionately increased to provide the equivalent volume of sediment storage. Additional forebay sizing criteria may be required for dual use (pollution reduction and flow control) facilities.

Signing

- During construction of public ponds, a Clean River Works sign shall be displayed and placed so it is clearly visible and legible from all adjacent streets, sidewalks, or paths. Signs shall meet the design requirements illustrated in Exhibit 6-5.

Setbacks

Ponds shall be constructed to maintain the following setback distances from structures and other facilities. (All distances are measured from the edge of the water surface for the 100-year flood elevation. The setback limit applies to ponds near the top of slope, not the bottom.)

- Minimum distance from the edge of the pond water surface to property lines and structures: 10 feet.

- Distance from the toe of the pond berm embankment to the nearest property line: one-half of the berm height (minimum distance of 5 feet).

- Minimum distance from the edge of the pond water surface to septic tank or a distribution box: 10 feet.

- Minimum distance from the edge of the pond water surface to a septic tank drainfield: 30 feet.
Sediment Traps and Ponds

PURPOSE -> To collect and store sediment eroded from exposed ground surfaces disturbed during site development. Designers are encouraged to consider if ponds created to control sediment and other pollutants during site development could be used to manage post development stormwater runoff.

NOTE: Given the NW climate and clay soils, most sediment traps and ponds when used by themselves will not meet “clear water” discharge standards. It is recommended that a licensed Oregon Professional Engineer be used to design pond and trap systems.

CONDITIONS WHERE PRACTICE APPLIES ->
- Downhill of areas with exposed soils.
- Sediment Traps: Each trap shall have a tributary drainage area limited to 3 acres or less (but not including one and two family residences constructed individually, on existing lots of record), and slopes of less than 50 percent.
- Sediment Ponds: Each pond shall have a tributary drainage area of 10 acres or less and slopes of less than 50 percent.

Multiple traps or ponds may be needed to control sediments from leaving the site.

DESIGN CRITERIA/SPECIFICATIONS -> Because of site and soil variability, traps and ponds must be designed to meet specific site conditions. Facility size, configuration and flow limits vary based on particle size and settleability of site soils. In general, these facilities should be designed with adequate holding time to settle fine soils. Designers are encouraged to use multi-cell systems.

Temporary interceptor dikes or swales may be constructed to divert runoff to sediment traps or ponds.

SITING -> The designer should consider sediment control needs during design – especially the need for sediment traps and ponds. In general these facilities should:
- Be located off line from any natural site drainages.
- Be located at the end of a site drainage control structure.
- Be located on the lowest portion of the site.
- Have no groundwater flows that could limit facility effectiveness.
- Have stabilized inlet, outlet and side slope structures capable of withstanding predicted flows prior to the facility receiving flow.
- Have depth markers within sediment basin to easily measure sediment deposits after water settling.
- Have a drainage system that dewater's the pond within 24 hours for maintenance.
- Have adequate access for maintenance procedures.
- Be demarcated or otherwise flagged or fenced to protect the pond from construction vehicles.

The designer is also encouraged to consider use of any post development stormwater management facilities for stormwater control and/or partial sediment control during the site's development phase. Post development stormwater management facilities are not sufficient to handle flows during the site construction phase. They may be used for polishing of flows, but not for primary stormwater and sediment control.

INLETS / OUTLETS -> All inlet and outlet structures shall be adequately stabilized for predicted flows. The designer is encouraged to use armoring or erosion control blankets rated to withstand predicted flows. All inlet and outlet structures shall be completely stabilized prior to receiving any site flows. See post-development stormwater design manuals of your local jurisdiction for more guidance on inlet and outlet structures.
The designer is encouraged to use a floating skimmer or a perforated riser with a gravel jacket, or their equivalent, to further filter outlet discharge from the trap or pond.

Pond and trap discharges shall be at least 1 foot below the spillway.

SEDIMENT TRAPS ➔ The sediment trap may be formed completely by excavation or by construction of a compacted embankment. It shall have a sediment storage depth not to exceed 1.5 feet, topped by a maximum 2 foot deep settlement zone. Sediment trap side slopes shall be 3:1 or flatter. The outlet of the trap should be a weir/spillway, providing a minimum 1 foot overflow depth between the spillway and embankment.

A turbidity curtain, fabric wrapped outlet or similar filter must be constructed to filter runoff from the trap prior to discharge from the construction site.

Calculate the required sediment storage volume using the USDA Natural Resources Conservation Service Universal Soil Loss Equation or Revised Universal Soil Loss Program as described in Appendix C and assume a minimum one year sediment accumulation period for design purposes. For the purposes of this calculation assume one cubic foot of sediment weighs 100 lbs.

Determine the bottom surface area of the sediment trap using the calculated sediment volume and the maximum 1.5 foot depth and 3:1 side slope requirements.

Determine the total trap dimensions by adding an additional 2 feet of depth for settling volume (before overtopping of spillway) above the sediment storage volume, while not exceeding 3:1 side slopes. Consider using free board within the spillway design to trap additional sediment.

A 3:1 ratio of trap length to width is desirable. Length is defined as the average distance from the inlet to the outlet of the trap. Residence time will be soil dependent and should be sufficient to allow for adequate settling. A good rule of thumb is 36 hours of residence time within the system.

See Detail Drawing 4.3 F for details.

SEDIMENT PONDS ➔ A sediment pond may be formed by partial excavation and/or by construction of a compacted embankment. It may have one or more inflow points carrying polluted runoff. Baffles to spread the flow, giving it longer residence time, throughout the pond should be included. A securely anchored riser pipe is the recommended principal discharge mechanism, with an emergency overflow spillway. The riser pipe should be perforated and covered with filter fabric and gravel “cone” for filtration; or solid with a 1 inch diameter dewatering hole and perforated drain pipe. Outlet protection shall be provided to reduce erosion at the pipe outlet. A turbidity curtain, fabric wrapped outlet or similar filter must be constructed to filter runoff from the pond prior to discharge from the construction site.

The sediment pond shall have a sediment storage depth no greater than 3 feet, topped by a 2-foot (minimum) to 4-foot (maximum) deep settlement zone and an additional 1 foot minimum of freeboard. The pond side slopes shall be 3:1 or flatter. Fencing of the facility may be required.

The sediment storage volume is determined in the same manner as mentioned above for sediment traps.

The pond riser pipe and outlet pipe shall be sized to carry the 10-year design storm or shall meet the sizing criteria otherwise required by the local jurisdiction.

A 3:1 ratio between the pond length and width is desirable. Length is defined as the average distance from the inlet to the outlet of the trap. Use baffles in the pond to help prevent short-circuiting and to increase the effective pond length where site conditions prohibit constructing a pond with a direct 3:1 length to width ratio.

See Detail Drawing 4.3 G for details.

MAINTENANCE REMOVAL GUIDANCE ➔ Traps and ponds shall remain in place until an adequate portion of the site is stabilized or adequately protected by other erosion prevention and sediment control BMP's. If the applicant wishes to remove these facilities prior to complete site stabilization, the permitting authority shall determine when and under what conditions these traps and ponds may be removed.