FLOOD INSURANCE STUDY

CLACKAMAS COUNTY, OREGON

AND INCORPORATED AREAS

Volume 1 of 3

Community Name	Community Number
BARLOW, CITY OF	410013
CANBY, CITY OF	410014
DAMASCUS, CITY OF	410006
*ESTACADA, CITY OF	410016
GLADSTONE, CITY OF	410017
HAPPY VALLEY, CITY OF	410026
*JOHNSON CITY, CITY OF	410267
LAKE OSWEGO, CITY OF	410018
MILWAUKIE, CITY OF	410019
*MOLALLA, CITY OF	410020
OREGON CITY, CITY OF	410021
RIVERGROVE, CITY OF	410022
SANDY, CITY OF	410023
WEST LINN, CITY OF	410024
WILSONVILLE, CITY OF	410025
CLACKAMAS COUNTY (UNINCORPORATED AREAS)	415588

*Non-floodprone

EFFECTIVE: JUNE 17, 2008

Federal Emergency Management Agency
FLOOD INSURANCE STUDY NUMBER
41005CV001A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Old Zone	New Zone
A1 through A30	AE
V1 through V30	VE
B	X
C	X

Part or all of this Flood Insurance Study may be revised and republished at any time. In addition, part of this Flood Insurance Study may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the Flood Insurance Study. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current Flood Insurance Study components.

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FLOOD INSURANCE STUDY
CLACKAMAS COUNTY AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Clackamas County, including the Cities of Barlow, Canby, Damascus, Estacada, Gladstone, Happy Valley, Johnson City, Lake Oswego, Milwaukie, Molalla, Oregon City, Rivergrove, Sandy, West Linn, Wilsonville and the unincorporated areas of Clackamas County (referred to collectively herein as Clackamas County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

Please note that the Cities of Rivergrove, Tualatin, and Wilsonville are geographically located in Clackamas and Washington Counties, the City of Milwaukie is geographically located in Clackamas and Multnomah Counties, and the Cities of Lake Oswego and Portland are geographically located in Clackamas, Multnomah, and Washington Counties. The Cities of Lake Oswego, Milwaukie, Rivergrove and Wilsonville are included in their entirety in this FIS report. The Cities of Portland and Tualatin are published separately.

Please note that the Cities of Estacada, Johnson City, and Molalla are non-floodprone.

In some States or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria or regulations take precedence, and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this FIS report are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for the original FIS for the City of Barlow, City of Canby, the unincorporated areas of Clackamas County, City of Lake Oswego, City of Oregon City, City of Rivergrove, and the City of Wilsonville, were performed by James M. Montgomery, Consulting Engineers, Inc., for the Federal Emergency Management Agency (FEMA), under Contract Nos. H-4583 and H-4582. These studies were completed in December, 1979, January, 1983, November, 1984, March, 1984, June, 1978, November, 1984, and November, 1979, respectively. For the City of Milwaukie, analyses for the original FIS were performed by the United States Army Corps of Engineers (USACE)-Portland District, under contract No. IAA-H-16-75-P019. That study was completed in July, 1978. The USACE-Portland District also completed a channel improvement project in 1983 within the reach of the Tualatin River directly upstream of the City of Rivergrove.

The hydrologic and hydraulic analyses for Seely Ditch were performed by Westech Engineering, Inc. These analyses were completed in May, 1985.

The hydrologic and hydraulic analyses for Tickle Creek were performed by Ogden Beeman & Associates, Inc., for FEMA, under Contract No. EMS-96-C0-0078-TA04. The Analyses were completed in September, 1998.

Curran-McLead, Inc. submitted data to remove an area of shallow flooding and ponding in the City of Gladstone. A LOMR was issued on October 18, 1996.

The City of Portland submitted data to revise flood hazards on a portion of Johnson Creek in Clackamas County and the City of Milwaukie. A LOMR was issued on December 21, 2000.

Harper Houf Righellis, Inc. performed hydrologic and hydraulic analyses of Kellogg Creek to obtain a LOMR dated March 1, 2001.

Parsons, Brinkerhoff, Quade, and Douglas, Inc. performed hydrologic and hydraulic analyses of the Salmon River in Clackamas County to obtain a LOMR dated August 11, 2005.

The hydrologic and hydraulic analyses for Rock and Richardson Creeks were performed by Pacific Water Resources, Inc., for Clean Water Services (CWS) of Clackamas County, a participant in FEMA's Cooperating Technical Partners (CTP) Program. These studies were completed in June 2005.

The hydrologic and hydraulic analyses for the Tualatin River Basin were also completed by Pacific Water Resources, Inc., under contract with CWS. This study was completed in December, 2005.

1.3 Coordination

The results of the analyses performed for this countywide study were reviewed at the final CCO meeting held on January 18, 2007, and attended by representatives of Clackamas County and FEMA.

City of Barlow

Streams requiring detailed study for the original FIS were identified at a meeting held in June 1977, attended by representatives of FEMA, the study contractor, and the City of Barlow. Results of the hydrologic analyses were coordinated with the USACE-Portland District, the U.S. Geological Survey (USGS), and the U.S. Soil Conservation Service (SCS). The results of the original study were reviewed at a final consultation coordination officer's (CCO) meeting held on May 28, 1980. Attending the meeting were representatives of FEMA, the study contractor, and the city.

City of Canby

Streams requiring detailed study for the original FIS were identified at a meeting held in June, 1977, attended by representatives of FEMA, the study contractor, and the City of Canby. Results of the hydrologic analyses were coordinated with the USACE, the USGS, and the U.S. SCS. An intermediate CCO was held in the Canby City Hall on October 16, 1979, and was attended by representatives of the city, FEMA , and the study contractor. The final CCO meeting was held on July 18, 1983, and was attended by representatives of FEMA, the study contractor, and the City of Canby.

Clackamas County (Unincorporated Areas)

In June 1977, areas requiring study by detailed methods for the original FIS were identified at a meeting attended by representatives of FEMA, the study contractor, and Clackamas County. Results of the hydrologic analyses for the county were coordinated with the USACE, USGS, and U.S. SCS. Preliminary results of the study were presented at an intermediate CCO meeting held on May 9, 1984, and attended by representatives of FEMA, the study contractor, Clackamas County, and the State of Oregon. On August 21, 1986, the results of the study were discussed at the final CCO meeting, which was attended by representatives of FEMA, the study contractor, and Clackamas County.

City of Gladstone

An initial coordination meeting with local officials and representatives of the Federal Insurance Administration and the State of Oregon was held for the original FIS on September 26, 1974, to identify data sources, to establish communication, and coordination procedures, and to explain the basic concepts and scope of the study. A final coordination meeting to review flood area maps and proposed floodway limits was held on March 8, 1976. As a result of that meeting, the floodway downstream of U.S. Highway I-205 on the Clackamas River right bank was modified to reflect earthfill.

City of Lake Oswego

Areas to be studied by detailed methods for the original FIS were identified at a meeting held in June 1977, and attended by representatives of FEMA, the study contractor, and the City of Lake Oswego. Results of the hydrologic analyses for Lake Oswego were coordinated with the USACE, USGS, and U.S. SCS. Preliminary results of the study were presented to the community at an intermediate CCO meeting held on May 10, 1984, and attended by representatives of the community, the study contractor, and FEMA. On August 20, 1986, the final results of the study were discussed at the final CCO meeting, which was attended by representatives of FEMA, the study contractor, and the community.

City of Milwaukie

An initial CCO meeting was held on March 5, 1975 for the original FIS with representatives of FEMA, the USACE, the City of Milwaukie, and the State of Oregon to identify streams to be studied, explain the study concepts, identify data sources, and establish communication and coordination procedures. An intermediate meeting was held on January 18, 1978, to allow local officials to review drafts of water surface profiles, floodway limits, and inundation maps. The results of this study were reviewed at a final CCO meeting held on May 17, 1979. Attending the meeting were representatives of FEMA, the study contractor, and the city.

City of Oregon City

Streams requiring detailed study for the original FIS were identified at a meeting held in June 1977, attended by representatives of the study contractor, FEMA, and the City of Oregon City. Results of the hydrologic analyses were coordinated with the USACE, USGS, and U.S. SCS. The results of this study were reviewed at a final CCO meeting held on October 11, 1978. Attending the meeting were representatives of FEMA, the study contractor, and the city.

City of Rivergrove

Areas to be studied by detailed methods for the original FIS were identified at a meeting held in June, 1977, and attended by representatives of FEMA, the study contractor, and the City of Rivergrove. Results of the hydrologic analysis for the original study were coordinated with the USACE, USGS, and the U.S. SCS. Preliminary results of the original study were presented at an intermediate CCO meeting held on May 10, 1984, and attended by representatives of the community, study contractor, and FEMA. On August 21, 1986, the results of the original study were discussed at the final COO meeting, which was attended by representatives of FEMA, the study contractor, and the community.

City of Sandy

The results of the original study were reviewed at the final CCO meeting held on July 13, 1999, and attended by representatives of the City of Sandy, Ogden Beeman & Associates, Inc., and FEMA.

City of West Linn

An initial CCO meeting with local officials and representatives from FEMA and the State of Oregon was held October 9, 1974, to identify data sources, establish communication and coordination procedures, and explain the basic concepts and scope of the original study. A final CCO meeting was held on March 5, 1975, to review maps of flood-prone areas and proposed floodway limits that were provided in a draft report dated October, 1974. Certain revisions were made and are reflected in this report.

City of Wilsonville

Streams requiring detailed and approximate study for the original FIS were identified at a meeting held in June 1977, attended by representatives of the study contractor, FEMA, and the city. Results of the hydrologic analyses were coordinated with the USACE, USGS, and U.S. SCS. The final CCO meeting for the original study was held at the Wilsonville City Hall on January 29, 1981, and was attended by representatives of FEMA, the study contractor, the city, and local developers. In July 1985, the original FIS was revised to incorporate data prepared for Seely Ditch.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS report covers the geographic area of Clackamas County, Oregon, including the incorporated communities listed in Section 1.1.

The areas studied by detailed methods were selected with priority given to all known flood hazards and areas of projected development.

The flooding sources studied by detailed methods are shown in Table 1, “List of Detailed Studied Streams”.

Boeckman Creek, Henry Creek, Oswego Creek, and Western Tributary of Springbrook Creek were studied by approximate methods.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon, by FEMA and Clackamas County CWS.

The results of the LOMRs listed in Section 1.2 above have been incorporated into this countywide FIS.

2.2 Community Description

Clackamas County is located in northwestern Oregon and is bordered to the west by Washington, Yamhill, and Marion Counties; to the east by Hood River and Wasco Counties; to the north by Multnomah County; and to the south by Marion County.

The county is in the northeastern portion of the Willamette valley. The eastern third of the county is part of Mt. Hood National Forest, extending from the foothills to the crest of the Cascade Range. The Willamette River lies immediately to the west of the county along most of its western boundary, and runs through the northwestern section of the county.

The Willamette Valley was one of the earliest settled areas in the Pacific Northwest. It was frequently visited by fur trappers in the l820s and l830s, and large-scale emigration over the Oregon Trail began in 1843.

Clackamas County was created by the provisional Government Legislative Committee on July 3, 1843, 16 years before Oregon obtained statehood. The county was named for the resident Clackamas Indians. The county boundaries encompass 1,890 square miles, including Oregon City, the county seat.

Most of Clackamas County is within a 1-hour drive of the City of Portland, making it a prime development area. The population of the county has increased rapidly since World War II. In 1980 the population was 241,919. In 1990 the county population increased to 278,850, and it grew to 338,391 in 2000 (Reference 1).

Elevations within the county range from sea level at Milwaukie to 11,235 feet at the peak of Mt. Hood at the eastern county boundary. The average temperature is 65 degrees Fahrenheit (°F) in July and 43°F in January. Annual precipitation ranges from 32 inches to 100 inches.

Main transportation arteries serving Clackamas County include Interstate Highways 5 and 205, U.S. Highway 26, and State Highway 99E.

Abernethy Creek flows for approximately 16 miles through the hills east and north of Oregon City, joining the Willamette River from the east. The total drainage area of Abernethy Creek is 30 square miles.

The Clackamas River flows northwesterly for approximately 70 miles from its headwaters in the Cascade Range, then westerly for 10 miles to its confluence with the Willamette River. The total drainage area of the Clackamas River is 937 square miles.
The Clackamas River experiences a significant overflow during flood events near River Mile (R.M.) 7.6. The overflow follows a 1.2-mile-long natural channel that returns to the Clackamas River at R.M. 5.6.

Clear Creek flows southwesterly from its headwaters in the northeastern corner of the county to its confluence with the Sandy River, north of Zigzag. The total drainage area of Clear Creek is 9.3 square miles.

Deer Creek flows northwesterly to its confluence with Mt. Scott Creek, south of Harmony. The total drainage area of Deer Creek is 1.5 square miles.

Eagle Creek flows northwesterly to its confluence with the Clackamas River near Bonnie Lure. The total drainage area of Eagle Creek is 83.0 square miles.

Henry Creek flows westerly to its confluence with the Zigzag River, near Rhododendron. The total drainage area of Henry Creek is 3.6 square miles.

Johnson Creek flows southwesterly. It has a total drainage area of 54 square miles at its confluence with the Willamette River.

Kellogg Creek flows northwesterly for approximately 4.5 miles from its headwaters to its confluence with the Willamette River. The total drainage area of Kellogg Creek is 16.6 square miles.

Milk Creek flows westerly for 28 miles from its headwaters in the foothills of the Cascade Range to its confluence with the Molalla River. The total drainage area of Milk Creek is 108.0 square miles.

The Molalla River flows northerly for 50 miles from its headwaters near the southern county boundary to its confluence with the Willamette River. The total drainage area of the Molalla River is 878.0 square miles.

Mt. Scott Creek flows westerly from its headwaters to its mouth at Kellogg Creek. The total drainage area of Mt. Scott Creek is 10.2 square miles.

Oswego Canal connects Oswego Lake to the Tualatin River at R.M. 6.7. The canal flows northerly toward the lake for approximately 1.6 miles near the City of Lake Oswego.

Phillips Creek flows 1.5 miles southerly from its headwaters near Harmony Point to its confluence with Mt. Scott Creek, south of Harmony. The total drainage area of Phillips Creek is 2.4 square miles.

The Pudding River is a tributary of the Molalla River, flows northerly, and has a total drainage area of 530.0 square miles.

Rock Creek drains a watershed with a total area of close to 10 square miles and is the lowest contributing sub-basin to the Clackamas River.

Richardson Creek enters the Clackamas River approximately 2 miles upstream of the Rock Creek confluence. Its watershed is less than half the size of the Rock Creek Watershed with a drainage area of little more than 3 square miles.

The Salmon River flows southwesterly from its headwaters near Mt. Hood, then northerly to its confluence with the Sandy River near Brightwood. The total drainage area of the Salmon River is 114.4 square miles.

The Salmon River North Channel is a 0.4-mile-long overflow channel of the Salmon River that breaks away from the main channel near R.M. 4.8 and rejoins it near R.M. 4.2.

The Sandy River flows westerly from its headwaters near Mt. Hood, then northerly into Multnomah County, north of Sandy. The total drainage area of the Sandy River upstream of its confluence with Alder Creek is 251.5 square miles.

Still Creek flows northwesterly from its headwaters near Government Camp to its confluence with the Zigzag River near Rhododendron. The total drainage area of Still Creek is 23.0 square miles.

The Tualatin River is one of the larger tributaries of the Willamette River. Its basin is bounded by the Coast Range on the west, the Tualatin Mountains on the north and east, and several short mountain ranges on the south. The river flows easterly for more than 75 miles from its headwaters at the eastern edge of the Coast Range to its mouth at the Willamette River, near the City of West Linn. The total drainage area of the Tualatin River is 711 square miles.

The Willamette River, one of the principal rivers in Oregon, drains approximately 11,200 square miles of northwestern Oregon. Originating upstream of the City of Eugene at the confluence of its Middle and Coast Forks, the river flows 187 miles before entering the Columbia River downstream of Portland. Both the Clackamas and Molalla Rivers are tributaries of the Willamette River and are significantly affected by backwater from floods on that river.

The Zigzag River flows southwesterly from its headwaters near Mt. Hood, then northwesterly to its confluence with the Sandy River, near Zigzag. The total drainage area of the Zigzag River is 60 square miles.

City of Barlow

Barlow, a residential community on the western edge of Clackamas County, is approximately 18 miles south of Portland. The City of Canby lies approximately 1 mile to the northeast. Barlow is surrounded by unincorporated areas of Clackamas County. The total land area contained within the city limits is 35.39 acres or 0.06 square miles. According to U.S. Census Bureau figures, the population increased from 81 in 1960 to 110 in 1977, and by 2000 had grown to 140 (Reference 1).

The topography of the Barlow area is generally level. Any grade in the area is very slight. Soil of the area is well-drained, sandy alluvium on valley terraces. Natural vegetation is coniferous Douglas fir and deciduous willows and alder (Reference 2).

City of Canby

Canby is located in western Clackamas County, approximately 17 miles south of Portland. The City of Canby is completely surrounded by unincorporated Clackamas County. The total land area contained within the corporate limits is approximately 3.77 square miles. According to U.S. Census figures, the population of Canby increased from 3,813 in 1970 to 7,659 in 1980. By 2000, the population had reached 12,790 (Reference 1).

The Willamette River flows along a portion of the northern boundary of Canby. Approximately 9,300 square miles of its drainage area is located upstream from Canby.

The Molalla River flows northerly and forms the western boundary of Canby.

Approximately 71% of the city has been developed. Within the floodplain, there is very little agricultural or urban development; however, the areas are zoned primarily for industrial use. Less than 1% of the total city housing lies within the floodplain.

The topography of the Canby area is generally very level. Any grade is very slight. The soil is a well-drained, sandy alluvium on valley terraces. Natural vegetation is coniferous Douglas fir and deciduous willows and alder
(Reference 2).

City of Damascus

Damascus is located east of Happy Valley and Interstate 205 and west of Boring; its northern boundary is the Multnomah County line.

According to *Oregon Geographic Names*, Damascus can date its existence as a community back to 1867, when a post office by that name was established. That post office was closed in 1904, but re-opened in February 2007, inside a coffee house. The original heart of the community is along Oregon Highway 212, which as of 2004 serves as part of the city's southern boundary.

It is part of the North Clackamas School District and the Gresham-Barlow School District.

A 2000 decision by Metro to expand Portland's urban growth boundary into the area prompted some citizens of the community to submit Measure 3-138, a measure on the ballot for the 2004 general election. The initiative's passage resulted in the incorporation of the former unincorporated communities of Damascus and Carver into the City of Damascus, a step which prevents nearby cities from annexing the community.

In a special election on September 21, 2005, a city charter was approved by 88 percent of voters.

City of Gladstone

Gladstone, a rapidly growing suburb of the Portland, Oregon, metropolitan area, is located at the confluence of the Willamette and Clackamas Rivers. The community's commercial development is primarily a strip along Highway 99E, which extends north and south through the city and was for many years the main access to Willamette Valley. Now, the city is bypassed by HighwayI-205. Nearly all of the residential development extends eastward from Highway 99E. West of the highway, low-lying river frontage is used for agricultural and recreational purposes.

Gladstone's population has grown dramatically in recent years. In 1940 and 1960, the population was 1,629 and 3,584 respectively. The 1974 population was 8,705.

The climate consists of warm, dry summers and mild, wet winters. Termperatures are usually moderate, ranging from an average monthly minimum in January of 33°F to an average monthly maximum in July of 82°F. The average annual percipation is 45.3 inches,

with 86 percent of precipitation occurring form October to May.

The Willamette and Clackamas Rivers form Gladstone's corporate boundaries on the west and south. Willamette River, a tributary to the Columbia River, drains 11,200 square miles and has its origin at the confluence of its Middle and Coast Forks near Eugene, Oregon. Clackamas River, a tributary to Willamette River, drains 937 square miles and originates high in the Cascade Mountains.

Gladstone's 100-year floodplain is relatively undeveloped, except for a few residences and farms in the reach of Clackamas River upstream of Highway I-205. A 500-year flood would inundate a much larger area, including many residences on the east side of Highway 99E and a mobile home complex, apartments, a golf course and various businesses on the west side of the highway.

City of Happy Valley

Happy Valley is a city in Clackamas County, just east of Damascus. It has a total area of 2.7 square miles. The population was 4,519 at the 2000 Census. Happy Valley is part of the North Clackamas School District.

Happy Valley was originally called Christilla Valley, named after its first residents, Christian and Matilda Deardorff. The city was officially incorporated in 1965. It remained a small community until the late 1990s, when urbanization of the surrounding area became inevitable. Happy Valley became one of the fastest-growing cities in Oregon. Portland State University's Population Research Center estimated the population to be 7,275 on July 1, 2005, a 61 percent increase over the 2000 Census. Due to phenomenal growth, the U.S. Postal Service issued Happy Valley its own zip code, 97086, effective July 1, 2006. Previously, it shared with other surrounding cities.

The City has a mayor, along with four other city council members. There is also a planning commission, as well as a a Park Advisory/Urban Forestry Commission and Citizen Traffic and Public Safety Committee.

Mount Scott, and extinct volcano that is part of the Boring Lava Field, is the highest point in Happy Valley, at 1,050 feet.

City of Lake Oswego

Lake Oswego is located in the northwestern corner of Clackamas County, Oregon. It shares its northern boundary with of the City of Portland. There are 15.6 square miles (10,000 acres) within Lake Oswego's urban growth boundary. According to U.S. Census Bureau figures, the population increased from 8,882 in 1960 to 22,868 in 1980, and grew to 35,278 in 2000 (Reference 1).

The Willamette River forms the eastern boundary of the City of Lake Oswego. Approximately 11,105 square miles of its drainage area are upstream of the City of Lake Oswego.

The Tualatin River flows easterly along the southern corporate limits of the city to its mouth at the Willamette River southeast of Lake Oswego. Approximately 690 square miles of its

drainage area are upstream of the City of Lake Oswego.

Oswego Lake is impounded by Oswego Dam, which is operated by the Lake Oswego Corporation for recreation and hydropower. Oswego Lake, which covers 0.7 square mile, divides the community into northern and southern sections. Blue Heron Bay, Lakewood Bay, and West Bay are extensions of the Lake. Oswego Creek drains the lake from Oswego Dam to the Willamette River.

Oswego Canal flows northerly for approximately 1.6 miles and connects Oswego Lake to the Tualatin River at River Mile (R.M.) 6.7.

The comprehensive plan for the city is based on the urban growth boundary, which includes areas outside the corporate limits that are to be annexed in the future. As of 1987, a total of 15.6 square miles (10,000 acres) of land are located within the city's urban growth boundary. Sixty-five percent of this area has been developed. The area within the Willamette River flood plain is zoned for heavy industry, with 87.9 percent of that land actually developed for heavy industrial use. Development in the Tualatin River flood plain is completely residential.

The Tualatin Valley is generally flat or gently sloping. Soils in the area have poor drainage characteristics. Trees, grass and shrubs are the dominant vegetation.

City of Milwaukie

Milwaukie is located in the northwest corner of Clackamas County, along the Clackamas and Multnomah County line. It is situated immediately southeast of Portland, on the east bank of the Willamette River. Milwaukie's 2000 population was 20,490, up from the 1977 population of 17,715. In 1960, only 9,099 people inhabited Milwaukie (Reference 1).

The Willamette River flows north along the western corporate limits. Upstream of Milwaukie, it drains approximately 11,130 square miles of central Oregon.

Johnson Creek drains a highly urbanized area northeast of Milwaukie. It has a total drainage area of 54 square miles, of which 45 square miles contribute directly to Johnson Creek runoff. The remaining 9 square miles drain into a depression upstream of the study area.

Kellogg Creek flows northwesterly along Milwaukie's southern corporate limits and has a drainage area of 16.6 square miles.

Commercial and industrial areas are primarily located in the southern and western portions of Milwaukie, while residential development is spread throughout the community. Milwaukie’s central business district is located along Southeast McLoughlin Boulevard, near the Willamette River. Development within the flood plains include industrial sites along Johnson Creek and scattered business and residential structures along Willamette River and Johnson and Kellogg Creeks. Residential development has also occurred in a flood-prone depression near Southeast 46th Avenue and Southeast King Road.

City of Oregon City

Oregon City is situated in the upper northwest corner of Clackamas County. The City of Gladstone is directly north of Oregon City on the opposite side of the Clackamas River, and West Linn is directly northwest of Oregon City on the opposite side of the Willamette River.

Oregon City is located on the southeast periphery of the Portland, Oregon, metropolitan urban area. The total land area contained within the corporate limits is 8.4 square miles. According to U.S. Census figures, the population increased from 8,000 in 1960 to 14,100 in 1977, to 25,754 in 2000 (Reference 1).

The Willamette River flows northerly through Oregon City and forms its western corporate limits. Approximately 10,100 square miles of its drainage area are upstream of Oregon City.

The Clackamas River flows westerly and forms part of the northern corporate limits of Oregon City.

Abernethy Creek, also a tributary of the Willamette River, flows westerly through Oregon City. It extends approximately 16 miles and has a total drainage area of 30 square miles.

Approximately 70% of the city has been developed. Within the floodplains studied, development is mainly commercial as well as light and heavy industry. Less than 1% of the total city housing lies within the floodplain.

Oregon City is located along a gorge of the Willamette River. Development began adjacent to the river and progressed up and away from the river. The topography has formed a lower commercial-industrial area, an intermediate area with mixed commercial-residential development and an upper area that is predominantly residential.

Other than the rocky broken ground in the southeast portion of the city, the soil is typically silt loam or clay loam which naturally supports deciduous trees and shrubs, with a mix of coniferous trees.

City of Rivergrove

Rivergrove is a southern suburb of Portland, in the northwestern corner of Clackamas County. The total land area contained within the corporate limits is 0.18 square mile. According to the U.S. Census Bureau figures, the population increased from 319 when the city was incorporated in 1971 to 350 in 1979. According to Census figures from 2000, Rivergrove's population had dropped to 324 inhabitants (Reference 1). Approximately 63% of the city has been developed. Development within the Tualatin River basin is mainly residential. 55% of the housing in the city lies within the floodplain (Reference 3).

Located in the Tualatin Valley, the topography of Rivergrove is relatively flat and gently sloping. Soils in the area have poor drainage characteristics. Trees, grass, and shrubs are the predominant vegetation.

City of Sandy

The City of Sandy is located in the Willamette Valley. The Willamette Valley was one of the earliest settled areas in the PacifIc Northwest. It was frequently visited by fur trappers in the 1820's and 1830s, and large-scale emigration over the Oregon Trail began in 1843. Sandy's first post office was established in 1873 and the village became an incorporated City in 1913.

As of 2000, the City of Sandy had a population of 5,385 (Reference 1), and is located on the Mt. Hood Highway (U.S. Highway 26), midway between Portland and Mt. Hood.

Residents of the City enjoy a mild climate, clean air, good water, beautiful scenic views in a country setting, and all the advantages of small-town living while being only 45 minutes from the urban amenities of downtown Portland.

Though the City of Sandy's heritage was logging and saw milling, today's economic activity ranges from light industrial manufacturing to service businesses. Many Sandy residents commute to jobs in nearby Portland. Agricultural crops in the surrounding area are primarily nursery stock and a variety of berries.

U.S. Highway 26 remains a major thoroughfare for travelers and for commerce. Agriculture is central to the area's economic stability, and industrial activity is increasing.

City of West Linn

West Linn, a rapidly growing suburb of Portland, is located at the confluence of the Willamette and Tualatin Rivers. The city stretches for 6 miles along the west bank of the Willamette River in an area characterized by rolling hills and random development. Several concentrations of residential development occur throughout the area. Commercial development is centered near the Oregon City-West Linn Bridge, and an industrial district fronts on Willamette River upstream of the bridge. Major industries located at one time there included a paper mill and a hydroelectric plant adjacent to Willamette Falls. At Willamette Falls, a navigational lock enables river traffic to bypass the 45-foot falls. Highway transportation is provided by State Highway 43 and I-205.

Settlement of the West Linn area, once known as Robins Nest, began in 1840. In 1850, the legislature named the area Linn City. In 1923, the area was incorporated under the name West Linn.

The population of West Linn grew dramatically in the mid-1900s and continues to do so today. The estimated 1974 population was 8,630. In 2000, the population grew to 22,261 (Reference 1).

City of Wilsonville

Wilsonville is situated in the northwestern corner of Clackamas County and the southeastern corner of Washington County, in northwestern Oregon. Oregon City is approximately 9 miles northeast of Wilsonville, and the City of Canby lies approximately 5 miles southeast. Wilsonville is bordered by unincorporated areas of Clackamas County on all sides except the north where it borders unincorporated Washington County. The total land area contained within the corporate limits is 5.92 square miles. The population of Wilsonville increased from 1,009, when it was incorporated in 1969, to 2,040 in 1977. According to U.S. Census Bureau figures, Wilsonville had a 1980 population of 2,920 people. By 2000, the Wilsonville population had ballooned to 13,991 people, most of who

reside in Clackamas County (Reference 1).

Seely Ditch, which flows southerly, is a minor tributary of the Willamette River. It extends approximately 5.2 miles from its origin to Willamette River. The total drainage area of Seely Ditch is 8.2 square miles.

Boeckman Creek, also a tributary of the Willamette River, flows southerly through Wilsonville. It extends approximately 4.2 miles and has a total drainage area of approximately 2.0 square miles.

Corral Creek, also a tributary flowing southeasterly to the Willamette River, is 6.8 miles long and has a total drainage area of 10.9 square miles.

Approximately 19 percent of the city has been developed. Within, the flood plains studied, development is residential, commercial, and light industrial.

The terrain in the Wilsonville area is generally flat, with slopes of less than 3 percent. There are some areas of low, gently rolling hills. Soil consists of a large deposit of lacustrine gravel (bouldry pebble and cobble gravel in silt and coarse sand) for approximately 1 mile north of Willamette River. A young alluvium (sand and clay) has been deposited over Willamette silt (unconsolidated sediments, silt, and fine sand) along stream banks and floodplain areas. A wide variety of trees is common in the area. This includes ash, cottonwood, maple, willow, dogwood, oak, Douglas fir, hemlock, cedar, sycamore, and poplar. A variety of grasses and smaller plants forms the understory. Undergrowth, bushes, and trees are especially dense along the Willamette River, Boeckman Creek, and Seeley Ditch (Reference 4).

Table 1- Detailed Study Streams

Flooding Source	Limit of Study
Abernethy Creek	From its confluence with the Willamette River to approximately 920 feet upstream of the Redland Road Bridge
Clackamas River	From its confluence with the Willamette River to approximately 800 feet downstream of the River Mill powerhouse
Clear Creek	From its confluence with the Sandy River to approximately 700 feet upstream of its confluence with Minikanda Creek
Dear Creek	From its confluence with Mt. Scott Creek to approximately 350 feet downstream of Interstate Highway 205
Eagle Creek	From its confluence with the Clackamas River to approximately 1,400 feet upstream of Eagle Creek County Road
Johnson Creek	From the Portland corporate limits to the Clackamas-Multnomah County line, 950 feet upstream of Southeast Luther Road
Kellogg Creek	From its confluence with the Willamette River to approximately 150 feet upstream of Southeast Marel Avenue
Milk Creek	From its confluence with the Molalla River to Beaver Creek Road, near Four Corners
Molalla River	From its confluence with the Willamette River to 150 feet upstream of the private road southwest of Dickey prairie
Mt. Scott Creek	From its confluence with Kellogg Creek to approximately 550 feet upstream of Interstate Highway 205
Nyberg Slough	From its divergence from the Tualatin River to Nyberg Road
Oswego Canal	From its divergence from the Tualatin River to its confluence with Lake Oswego
Phillips Creek	From its confluence with Mt. Scott Creek to approximately 600 feet downstream of Southeast 82nd Avenue
Pudding River	From its confluence with the Molalla River to U.S. Highway 99
Rock Creek	From its confluence with the Clackamas River upstream to Tillstrom Road
Rock Creek Hemrick Road Tributary	From its confluence with Rock Creek to the upstream face of Tillstrom Road
Rock Creek North Golf Course Tributary	From its confluence with Rock Creek to the upstream face of 162nd Avenue
Rock Creek South Golf Course Tributary	From its confluence with Rock Creek to the upstream face of 162nd Avenue
Rock Creek 172nd Avenue Tributary	From its confluence with Rock Creek to a point approximately 1.53 miles upstream of the confluence with Rock Creek
Rock Creek Highway 224 Tributary	From its confluence with Rock Creek to the upstream face of Goose Hollow Drive
Richardson Creek	From its confluence with the Clackamas River to a point approximately .4 mile upstream of Royer Road
Richardson Creek Royer Road Tributary	From its confluence with Richardson Creek upstream to Royer Road
Richardson Creek Anderson Road Tributary	From its confluence with Richardson Creek to upstream face if Sunnyside Road
Richardson Creek Keller Road Tributary	From it's confluence with Richarson Creek to upstream face of Keller Road
Salmon River	From its confluence with the Sandy River to approximately River Mile (R.M.) 0.9 upstream of Cheeney Creek
Salmon River North Channel	From its confluence with the Salmon River to its divergence from the Salmon River, near Camp Arrah Wanna
Sandy River	From 820 feet upstream of the Clackamas-Multnomah County line to approximately R.M. 21.2, east of Sandy
Sandy River	From approximately 150 feet upstream of R.M. 23 to approximately 1,000 feet upstream of Revenue Bridge

Table 1- Detailed Study Streams

Flooding Source	Limit of Study
Sandy River	From approximately 150 feet downstream of R.M. 33 to approxi¬mately 2,000 feet southeast of the intersection of Lolo Pass and Muddy Fork Roads
Still Creek	From its confluence with the Zig Zag River to approximately 1,600 feet downstream of its confluence with Cool Creek
Tickle Creek	From approximately 1,500 feet downstream of Southeast 362nd street upstream to Langensand Road
Tualatin River	From its confluence with the Willamette River to approximately 850 feet downstream of R.M. 8, at the Clackamas-Washington County line
Willamette River	From the Portland corporate limits near Golf Junction to the Clackamas-Yamhill-Marion county line, 1,200 feet upstream of its confluence with Ryan Creek
Zig Zag River	From its confluence with the Sandy River to approximately 2,500 feet northeast of the Bruin Run campground

2.3 Principal Flood Problems

Historically, flooding within Clackamas County normally occurs from October through April. Cyclonic winter storms from the Pacific Ocean sometimes produce intense rainfall on drainage basins of the Pacific Northwest. When these storm fronts move in a downstream direction, greater discharges are produced. If this condition is accompanied by rapid snowmelt and frozen ground in the upper watersheds, large floods can result.

Floods in the study area are normally widespread rather than limited to a few streams. Because of longer travel times between the upstream headwaters and the study area, crests on larger rivers occur several days later than those on some of the smaller tributaries. For example, the Willamette River remains above the bankfull stage for approximately 10 days following a major flood, whereas most tributaries recede to within their banks in 4 or 5 days. The Tualatin River is an exception because there is considerable ponding in the middle and lower reaches.

The February, 1996 flood on the Tualatin River produced the highest flows ever recorded, with an estimated 84-year return period and an annual probability of recurrence of 1.2%. However, for almost all of the smaller urbanized Tualatin River tributaries that were studied, the November 1996 flood is thought to be the largest flood ever observed with an estimated 25-year return period and an annual probability of recurrence of 4%. Other major floods have occurred on the Tua1atin River (Reference 6). Prior to the floods of 1996, a flood occurred on January 18, 1974, and had peak discharge of 21,400 cfs. On December 23, 1933, a flood occurred that had a recorded flow of 23,300 cfs at the West Linn gage and 6,000 cfs at the Oswego Canal gage.

A number of major floods have occurred on the Willamette River (References 5, 6, and 7). The largest recent flood occurred as the result of a December 1964 storm that dropped 6 to 10 inches of rainfall over the watershed and caused the freezing level to rise to the 10,000-foot elevation. A peak discharge of 403,000 cubic feet per second (cfs) for this flood was observed on December 24, 1964, at the Wil1amette Locks Upper Gage in Oregon City. This discharge exceeded the projected 100-year (1-percent-annual-chance) floodflow of 341,000 cfs. The flood of December 1861 is believed to be the greatest historical flood, with a peak discharge at the same gaging station estimated at 590,000 cfs. The second largest historical flood, in 1890, had an estimated discharge of 510,000 cfs. Both floods exceeded the 500-year (0.2-percent-annual-chance) floodflow of 469,000 cfs. The January 9, 1923, peak discharge of 357,000 cfs and the January 3, 1943, peak discharge of 324,000 cfs are the fourth and fifth largest recorded floods, for the Wi11amette River at the Wi11amette Locks Upper Gage.

Major floods have also occurred on the Mo1a11a River (Reference 5). The largest recorded flood at the gage near Canby occurred on December 22, 1964, and had a peak discharge of 43,600 cfs. Other major floods on the Molal1a River occurred in January 1972 and January 1974, and had peak discharges of 36,200 cfs and 31,200 cfs, respectively. The estimated 1-percent-annual-chance flood discharge for the Mo1a1la River at the gaging station near Canby is 41,200 cfs.

The largest recorded flood on the Clackamas River at the gage near the City of Clackamas occurred on December 22, 1964, and had a peak discharge of 120,000 cfs (Reference 6). The estimated 1-percent-annual-chance flood discharge at this point is 110,000 cfs.

Industrial, commercial, and residential developments in the flood plains of the streams

studied are found only near the incorporated communities in the northwestern corner of the county. Elsewhere, the flood plains are generally devoted to agricultural use.

City of Barlow

Major floods have occurred on the Pudding River. The largest recorded flood at the gaging station at Aurora occurred on December 23, 1964, with a peak discharge of 26,200 cfs. This discharge is less than the estimated 1%-annual-chance flow of 30,100 cfs (Reference 5). Other major floods on Pudding River occurred in December, 1937 and February, 1949, with peak discharges of 25,400 cfs and 22,200 cfs, respectively.

City of Canby

The major developed area of the City of Canby lies almost entirely above the historic high-water levels of Willamette and Molalla Rivers. The flood damages that have occurred within the city have been limited to agricultural lands in the Willamette and Molalla River flood plains. High channel velocities on Molalla River have caused erosion and, in some cases, channel migration.

City of Gladstone

Floods in Gladstone are caused by bank overflow from both the Willamette and Clackamas Rivers and to a lesser extent, by ponding resulting from local storm runoff. The annual frlood season extends from October through April, the period of the greatest storm activity. Major riverine floods usually result from intense rainfall augmented by snowmelt.

Many large floods have occurred on the Willamette and Clackamas Rivers in the past. Severe floods of approximately 100-year frequency occurred on both streams in December 1964; however, Gladstone experienced only moderate damages, mainly because the areas susceptible to flooding were generally known and development was avoided. The regulated peak flow of the Willamette River during that flood was 435, 00 cfs, while Clackamas River peaked at 120,000 cfs. Floods on Clackamas River and Willamette River usually occur together, although Clackamas River crests 1 to 2 days prior to Willamette River.

City of Lake Oswego

Flooding on Oswego Canal is a result of overflow from the Tualatin River.

The flood of February 1996 caused extensive property damage within the City of Lake Oswego, particularly areas affected by unusually high flooding from the Willamette and Tualatin Rivers. Flooding along the rivers was understandable, but many people were surprised at the extensive flooding of areas along the Oswego Canal and the shore of Oswego Lake (including portions of downtown Lake Oswego along McVey and State Streets) when a significant volume of floodwater spilled from the Tualatin River over the canal headgate and through the Tualatin River Overflow to Rivergrove, flooding the Oswego Canal and overwhelming the capacity of the Oswego Lake Dam. The resulting lake level was almost 4 feet higher than normal high water (Reference 8).

City of Milwaukie

The largest flood this century on Willamette River occurred in December 1964. The peak discharge in the vicinity of Milwaukie was 440,000 cubic feet per second (cfs), with an estimated recurrence interval of 120 years. Business and residential areas along Willamette River, as well as the city's sewage treatment plants, were inundated. Willamette River backwater extended approximately 1 mile up both Johnson and Kellogg Creeks, flooding industrial and residential areas along those streams. Figure 2 shows flooding in December 1964. Other large floods on Willamette River occurred in January 1923 (421,000 cfs) and January 1943 (367,000 cfs) (Reference 7).

Flood discharges above 2,000 cfs have been recorded four times on Johnson Creek since the USGS established a stream gage at Sycamore, approximately 9 miles upstream of Milwaukie, in 1940. The largest discharge, 2,620 cfs, occurred in December 1964. That flood had an estimated recurrence interval of only 15 years. Additional discharges greater than 2,000 cfs were 2,220 cfs in January 1969, 2,180 cfs in November 1960, and 2,110 cfs in February 1949. Those floods caused minor damages in Milwaukie. Several bridges present severe restrictions to flow, which result in localized increases in flood heights.

The largest discharge on Kellogg Creek also occurred in December 1964. There are no stream gages on Kellogg Creek, but it was estimated that the December 1964 flood had a discharge of 1,570 cfs and a recurrence interval of 25 years. That flood caused little damage along Kellogg Creek, outside of the area affected by the Willamette River backwater. There are no constrictions on Kellogg Creek that aggravate flooding problems in Milwaukie.

Flooding from Mount Scott Creek, a tributary to Kellogg Creek, has occurred near the intersection of Rusk and Lake Roads. There are no recorded discharges on Mount Scott Creek, but it was estimated that the peak discharge in December 1964 was 1,160 cfs. There was minor residential flooding along Mount Scott Creek during that flood.

Local ponding has occurred in the depression near Southeast 46th Avenue and Southeast King Road, but it has been limited to the flooding of streets and has not involved any structures. Runoff from approximately 450 acres is trapped in the depression.

City of Oregon City

Major floods have occurred on the Clackamas River. The largest recorded flood at the gage near Oregon City occurred on December 22, 1964, with a peak discharge of 120,000 cfs. Other major floods on the Clackamas River occurred in March 1931, January 1923, and November 1960, with peak discharges of 82,000 cfs, 80,000 cfs and 73,000 cfs, respectively. The estimated 1%-annual-chance discharge for the Clackamas River at the gaging station near Oregon City s is 110,000 cfs.

Oregon City has sustained damage from flooding of the Willamette and Clackamas Rivers. The 1861 Willamette River flood inundated the main streets of Oregon City with 4 feet of water. Although the 1890 Willamette River flood had a smaller discharge than the 1861 flood, water from the later flood rose to a level 2.1 feet above the earlier flood, due to the presence of buildings along the river which reduced the channel capacity in Oregon City. The December 1964 flood also caused extensive damage in Oregon City. Waterfront industry and shopping areas along the Willamette and Clackamas Rivers received significant damage from this flood.

City of Rivergrove

Major floods have occurred on the Tualatin River. The largest recent flood occurred on February 10, 2006, with a peak discharge of 26,400 cfs (reference 12). The estimated 1-%-annual-chance flow at the West Linn gage on the Tualatin River is 23,455 cfs.

City of Sandy

Since 1979 when the original approximate study of Tickle Creek in the City of Sandy was performed, the City has annexed new areas along the creek. Development is progressing at a rapid pace as evidenced by newly constructed roads and new subdivisions.

One unnamed tributary along Tickle Creek, an urban creek, is confined to culverts of irregular sizes in many places. The unnamed tributary causes flooding problems of approximately 6 inches in places where it daylights, but the water does not presently threaten any living spaces and is primarily nuisance flooding of some streets. City planners are concerned about the flows and flooding increasing due to the increasing development and larger areas of impermeable ground.

City of West Linn

The largest flood of historical record on Willamette River occurred in December, 1861, with a estimated flow of 590,000 cfs at West Linn. Many large floods have occurred since then. The next 5 largest floods, in order of descending magnitude, occurred in February 1890, December 1964, January 1923, January 1943, and December 1955. The Willamette River flood of December 1964, had it not been regulated by upstream storage projects, would have been approximately equal to the 1861 flood. The December 1964 flood reached approximately a 1-%-annual-chance magnitude and had a peak flow at West Linn of 403,000 cfs. A corresponding crest elevation of 70.1 feet MSL, 1947 adjustment, was recorded at the Willamette Falls upper gage.

The December 1964 flood caused considerable damage to the study area. The paper mill on Moores Island and those low-lying residences were especially hard hit.

City of Wilsonville

Floods have been observed on Seely Ditch, and Boeckman and Corral Creeks; however, there are no gaging stations on these streams, and as a result, no records of major floods are available.

2.4 Flood Protection Measures

Willamette River flood stages have been reduced significantly by 14 storage projects operated by the USACE. These projects have been placed in operation since 1942 and provide a total flood-storage capacity of 1.7 million acre-feet. Three more reservoirs are authorized and are in preliminary planning stages as of 2005.

The Tualatin River basin has one multipurpose storage project available for flood control. Henry Hagg Lake Project, constructed by the U.S. Bureau of Reclamation, began operation during the 1974—75 flood seasons. It provides 30,000 acre-feet of flood storage, starting in November of each year. The flood-storage capacity is reduced as the winter flood season

terminates, and the reservoir is filled each spring in anticipation of the summer irrigation demand. The effect of the Henry Hagg Lake Project on flood storage has been considered in the calculation of water-surface profiles for the segment of the Tualatin River near the City of Lake Oswego. Located approximately 50 miles upstream, this storage facility is distant enough that the effect it would have on the 1- and 0.2-percent-annual-chance floods is negligible. The U.S. Bureau of Reclamation has completed a draft feasibility study of two alternative storage projects on the Tualatin River near the Town of Gaston that could provide additional flood storage in the Tualatin River basin. Those projects, however, are still in the planning stages and are not reflected in this study.

There are no flood control structures on Johnson, Kellogg, or Mount Scott Creeks. In an effort to reduce flood losses, The City of Milwaukie has established a flood hazard zoning ordinance that requires planning commission approval for building permits within the 1%-annual-chance flood plain. When reviewing a building permit application, the planning commission considers such factors as the danger to life and property due to increased flood heights or velocities caused by encroachments, the ability of water supply and sanitation systems to prevent unsanitary conditions, and the availability of alternative locations not subject to flooding (Reference 10).

Regulatory measures have been adopted by the City of Oregon City to guide new development in the floodplain consistent with the hazards involved (Reference 11). Finished floors must be at least 2 feet higher than the 1%-annual-chance flood, and development within the floodway which would hinder flow is not permitted.

Regulatory measures have been adopted by the City of Rivergrove to guide new development in the floodplain consistent with the hazards involved (Reference 3). New residential development must be adequately protected from flooding, and development within the floodway that would hinder flow is not permitted.
In West Linn, Levees provide flood protection for industrial waste lagoons on the left bank, upstream of Willamette Falls. Those levees, although constructed above 500-year flood levels, are not recognized by the National Flood Insurance Program consequently are not reflected on the Flood Insurance Rate Map. West Linn has also adopted land use regulatory measures to guide new development in the floodplain consistent with the hazard involved. Current ordnances require that building foundations be at least 1 foot higher than the 1%-annual-chance flood.

Regulatory measures have been adopted by the City of Wilsonville to prevent construction within 5 feet of the 1%-annual-chance flood elevation on the Willamette River in Wilsonville.

River stage forecasting for Clackamas County is the responsibility of the Portland River Forecast Center, National Weather Service. Forecasts and flood warnings prepared by the center are disseminated through Clackamas County Emergency Services, radio, television, and other news media. Forecasts are prepared for the USGS gages on the Clackamas River near Clackamas and on the Tualatin River at West Linn. Forecasts are also prepared for the USACE gages above and below Willamette Falls on the Willamette River.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood-hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance

for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of the study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the county.

The flood peak discharges used for mapping the flooding along the main stem of the Tualatin River including the Tualatin River Overflow to Rivergrove and the Oswego Canal were based on a flood frequency analysis of historic gaged annual peak flows after accounting for the effect of the upstream regulation at Hagg Lake (Reference 12). Flow losses observed at the Tualatin River Overflow to Rivergrove and the Oswego Canal were considered at downstream locations along the Tualatin River. A stream gage on Oswego Canal has been maintained by USGS since 1928 to measure outflow from the Tualatin River. The flood peak discharges for mapping the flooding along the tributary waterways of the Tualatin River were based on HEC-HMS hydrologic modeling of these watersheds (Reference 13). The Tualatin River basin study included a new analysis of lake levels, inflow, and outflow for lake Owego. As a result, new flood elevations were determined. These elevations are reported in Table 2, "Summary of Stillwater Elevations."

Table 2 - Summary of Stillwater Elevations

	Elevation (feet NAVD 88)			
Flooding Source	10%-Annual Chance	2%-Annual Chance	1%-Annual Chance	0.2%-Annual Chance
Oswego Lake	102.5	104.4	106.9	109.8

Peak discharge-frequency relationships for Abernethy, Deer, Kellogg, Mt. Scott, and Phillips Creeks were developed by a regional hydrologic analysis using previously computed discharge-frequency information and statistical analyses of recorded runoff data for other nearby streams. Because there are no long-term gaging stations on these streams, the hydrologic analysis could not be based on the statistical approach that was used for streams with gage data. The regional analysis was performed using discharge-frequency curves developed by the USACE (References 6 and 7). The curves were adjusted slightly on the basis of the discharge-frequency curves for Johnson Creek, at the Sycamore gaging station.

Clackamas River discharge-frequency data (Reference 14) were based on records from the USGS gaging station at R.M. 4.9. Those records have been continuous since October 1962, the date of installation. Another gage, at Estacada (at R.M. 23.1), has had a continuous record since 1908. Flood data before 1962 were extrapolated by correlation with the Estacada gage.

Discharge-frequency data for the following streams were developed using methodology developed by USGS (Reference 9). Clear Creek, Eagle Creek, Henry Creek, Milk Creek, Salmon River, Sandy River, Still Creek, and Zigzag River. The 10-, 50-, and 1-percent-annual-chance flood discharge frequencies were obtained using this methodology, whereas the .2%-annual-chance flood discharge frequencies were determined by extrapolating the lower recurrence interval data on a log-probability plot.

The peak discharges for floods on the Molalla and Willamette Rivers and Johnson Creek were determined by statistical analysis of river-gage records, using the standard log-Pearson Type III method as outlined by the U.S. Water Resources Council (Reference 15).

Molalla River discharge-frequency data were based on records from the USGS gaging stations at Goods Bridge, near Canby (No. 14200000), and above Pine Creek near Wilhoit (No. 14198500) (Reference 16). The records for these two gages are continuous from the times that records were first kept, October 1929 and October 1936, respectively. The Goods Bridge gage, was discontinued in May 1979. The Pine Creek gage is still in operation.

Peak discharges for the Willamette River were based on stage-frequency curves for gages at Willamette Falls Locks and Wilsonville, (References 17 and 18, respectively). The flows were derived by correlation of stream flow records (Reference 19) and the discharge-frequency curve (Reference 20) for the gage upstream of the study area at the City of Salem, Oregon.

Willamette River stages were first recorded in 1879, at the Portland Morrison Bridge, by the U.S. Weather Bureau (Reference 21). The gages at Willamette Falls Locks and Salem have also had long periods of record, dating back to 1915 and 1909, respectively. The gage at Wilsonville was established in 1948. Willamette Falls Locks gage is operated by the USACE, and the other gages are operated by the USGS.

Flows into Nyberg Slough and Salmon River North Channel were determined through divided flow analyses using rating curves developed for the hydraulic analysis.

Discharge-frequency data for the Pudding River were obtained from a 1970 USACE Flood Plain Information report (Reference 5).

The discharge-frequency data for Tickle Creek were developed using a set of USGS regional regression equations that relate basin characteristics to streamflow characteristics for western Oregon (Reference 9). Using the size of the drainage area and the regression equations, the discharges at two locations in the study reach were determined for the various flood events.

The June 2005 hydrologic study of Rock and Richardson Creek, which was performed by Pacific Water Resources, Inc. (PWR), was developed using USGS regional regression equations. The 10-, 2-, and 1-percent-annual-chance flood discharge frequencies were obtained using the USGS developed equation. PWR extended the equation to estimate values for the 0.2-percent chance flow.

Peak discharge-drainage area relationships for the streams studied by detailed methods in Clackamas County are shown in Table 3, “Summary of Discharges.”

Table 3 - Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharge (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Abernethy Creek					
At mouth	30.0	2,460	3,930	4,560	6,600
Clackamas River					
At mouth	937.0	65,000	95,000	110,000	145,000
Upstream of confluence with Eagle Creek	683.0	46,900	68,900	78,700	102,800
Clear Creek					
At mouth	9.3	1,400	2,000	2,300	3,100
Deer Creek					
At mouth	1.5	130	220	285	405
Eagle Creek					
At mouth	83.0	6,800	10,000	11,500	15,100
Henry Creek					
At mouth	3.6	500	800	900	1,200
Johnson Creek					
At mouth	54.0	1,900	2,600	2,900	3,390
At the upstream study limits	49.0	1,870	2,590	2,770	3,080
Kellogg Creek					
At mouth	16.6	1,290	1,780	1,990	2,500
Upstream of confluence with Mt. Scott Creek	2.8	—[1]	—[1]	555	—[1]
Milk Creek					
At mouth	108.0	8,100	12,100	14,000	18,900
Upstream of confluence with Cedar Creek	67.7	6,200	9,200	10,600	14,100
Molalla River					
At mouth	878.0	47,000	63,500	73,000	97,000
At confluence with Pudding River	346.0	25,000	36,000	41,200	54,500
Upstream of confluence with Milk Creek	215.0	20,100	29,000	33,000	43,000

[1] Data not available

[2] Data not computed

Table 3 - Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharge (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Mt. Scott Creek					
At mouth	10.2	940	1,300	1,440	1,750
Oswego Canal					
At Bryant Road	—[1]	250	2,700	5,700	12,500
At divergence from Tualatin River	—[1]	250	1,600	2,800	6,200
Phillips Creek					
At mouth	2.4	210	270	310	370
Pudding River					
At mouth	530.0	—[2]	—[2]	32,000	—[2]
Richardson Creek					
Upstream of Confluence with Clackamas River	4.2	466	618	677	761
Downstream of Confluence with Richardson Creek Anderson Road Tributary	3.5	393	522	571	641
Downstream of Confluence with Richardson Creek Royer Road Tributary	2.3	259	346	376	423
Richardson Creek Royer Road Tributary					
Upstream of Confluence with Richardson Creek	0.8	95	128	138	155
Richardson Creek Anderson Road Tributary					
Upstream of Confluence with Richardson Creek	0.7	87	118	127	143
Richardson Creek Keller Road Tributary					
Upstream of Confluence with Richardson Creek	0.4	45	61	65	73

[1] Data not available

[2] Data not computed

Table 3 - Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharge (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Rock Creek					
Upstream of Confluence with Clackamas River	10.3	1,071	1,408	1,555	1,747
Downstream of Confluence with Rock Creek 172nd Avenue Tributary	8.5	902	1,188	1,310	1,472
Downstream of Confluence with Rock Creek South Golf Course Tributary	7.4	787	1,038	1,143	1,284
Downstream of Confluence with Rock Creek North Golf Course Tributary	6.2	669	883	971	1,091
Downstream of Confluence with Rock Creek Hemrick Road Tributary	5.4	586	775	850	955
At Private Road	2.4	271	361	393	442
Rock Creek Hemrick Road Tributary					
Upstream of Confluence with Rock Creek	2.1	240	320	348	391
Rock Creek North Golf Course Tributary					
Upstream of Confluence with Rock Creek	0.5	58	79	85	95
Rock Creek South Golf Course Tributary					
Upstream of Confluence with Rock Creek	0.4	54	73	78	88
Rock Creek 172nd Avenue Tributary					
Upstream of Confluence with Rock Creek	0.6	80	108	116	130
Rock Creek Highway 224 Tributary					
Upstream of Confluence with Rock Creek	0.8	101	136	147	165
Salmon River					
At mouth	114.4	13,200	19,600	22,500	29,800

[1] Data not available

[2] Data not computed

Table 3 - Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharge (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Salmon River North Channel					
At divergence from Salmon River	—[1]	4,500	7,200	8,500	12,000
Sandy River					
Upstream of confluence with Alder Creek	251.5	25,700	38,000	43,700	58,200
Upstream of confluence with Clear Creek	42.7	5,800	8,500	9,800	12,900
Seely Ditch					
At confluence with Willamette River	8.2	493	706	777	950
At Wilsonville Road	—[1]	398	516	581	730
Still Creek					
At mouth	23.0	3,400	5,000	5,700	7,600
Tickle Creek					
At downstream study limit (Approximately 2,600 feet downstream of Northeast 362nd Street)	3.9	368	549	633	807
Upstream of confluence with Unnamed Tributary (Highway 211)	1.7	176	263	303	388
Tualatin River					
At mouth	706.0	15,750	24,200	27,900	36,000
Downstream of overflow through Rivergrove	698	16,000	25,800	30,700	42,200
Downstream of confluence with Nyberg Slough	698.0	16,000	26,900	33,600	48,500
Tualatin River overflow to Rivergrove	—[1]	—[1]	1,100	2,900	6,300

[1] Data not available

[2] Data not computed

Table 3 - Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharge (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Willamette River					
At Milwaukie	11,130	251,000	329,000	375,000	495,000
At Willamette Locks Upper Gage	10,100	219,000	295,000	341,000	469,000
At Fish Eddy	9,300	209,200	284,200	328,000	457,000
At downstream of Wilsonville corporate limits	8,400	178,000	250,000	287,000	420,000
Zigzag River					
At mouth	60.0	7,800	11,500	13,100	17,400
Upstream of confluence with Still Creek	30.0	4,300	6,300	9,800	10,400

[1] Data not available

[2] Data not computed

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the Flood Insurance Rate Map (FIRM) represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data tables in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

The hydraulic analyses for Johnson Creek and portions of Clackamas River, Kellogg Creek, and Willamette River were obtained from USACE-Portland District.

Water-surface elevations (WSELs) of the selected recurrence intervals along the streams studied by detailed methods of the original studies were computed using the USACE HEC-2 step-backwater computer program (Reference 22). Cross sections were obtained photogrammetrically from aerial photographs at a photographic scale of approximately 1:10,200 (Reference 23).

WSELs of Oswego Canal, Rock Creek and its tributaries, Richardson Creek and its tributaries, Tickle Creek, the Tualatin River, and Tualatin River Overflow to Rivergrove, were determined with the use of the USACE HEC-RAS program (References 24 and 25). Cross sections were field surveyed and supplemented with topographic maps in the overbank areas. The below-water sections were obtained by hydrographic survey. Bridge dimensions and elevations were obtained from design drawings and field measurements.

Cross section data for the Pudding River were obtained from the USACE. For Henry Creek, Still Creek and the Zigzag River, surveyed cross sections were utilized in the hydraulic analysis.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles. For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the FIRM.

Manning's "n" roughness values used in the hydraulic computations were generally chosen by engineering judgment and based on field observations of the streams and flood plain areas and comparisons with previous studies. In the case of the Clackamas, Molalla, and Willamette Rivers, roughness values were calibrated using stage-discharge information at gaging stations. For other streams that crossed gaging locations, the hydraulic analyses were compared to available stage-discharge information, but no calibrations of roughness values were warranted.

Roughness values used for the main channel of Rock Creek and its tributaries range from 0.02 to 0.09 and were estimated to be 0.06 for Richardson Creek and its tributaries. Overbank roughness values range from 0.02 to 0.20 for Rock Creek and its tributaries and from 0.04 to 0.10 for Richardson Creek and its tributaries (Reference 26).

Roughness values were estimated at 0.1 in the channel and 0.6 to 0.1 in the overbank areas for the Tualatin River study (including Oswego Canal and Tualatin River Overflow to Rivergrove) (Reference 27).

Roughness values for the Willamette River were verified by comparing computed profiles with high-water marks from known discharges for the December 1964 flood. Channel roughness values for the Molalla River were verified using high-water marks at Goods Bridge. Clackamas River roughness values were verified using the rating curve for the gage at Estacada.

The Willamette River backwater model from Fish Eddy to R.M. 41.4 was first adjusted by modeling the 1964 flood and matching the elevations obtained at R.M.s 34.4, 38.5, and 41.4 to the high-water marks at these three locations. Because the elevations for the 10-, 2-, 1-, and 0.2-percent-annual-chance floods are known from the gage records at the Wilsonville gage (R.M. 38.5), successive starting WSELs were approximated at Fish Eddy to obtain the known elevations at the gage for each of the flood frequencies.

Starting WSELs for Abernethy Creek, Clear Creek, Eagle Creek, Henry Creek, Milk Creek, Molalla River, Phillips Creek, Salmon River, Sandy River, Still Creek, and Zigzag River were based on slope-area calculations. Starting WSELs for the Clackamas River, Johnson Creek and Kellogg Creek were based on confluence elevations with Willamette River. Starting WSELs for Deer Creek were based on elevations at the confluence with Mt. Scott Creek. Starting WSELs for Mt. Scott Creek were based on elevations at the confluence with Kellogg Creek. Starting WSELs for both the upstream and downstream elevations of Nyberg Slough were obtained from a known WSEL. Starting WSELs for the Pudding River were based on elevations at the confluences with the Molalla and Willamette Rivers. The starting WSELs for the Salmon River North Channel were obtained from Salmon River profile elevations at the entrance of the overflow channel.

Starting WSELs for Oswego Canal, the Tualatin River, and Tualatin River Overflow to Rivergrove were based on Normal Depth calculations (Reference 27).

The starting WSELs for Rock Creek and Richardson Creek were determined by normal depth analysis. Starting WSELs for their tributaries were calculated by HEC-RAS considering backwater from the main stem (Reference 26).

The hydraulic analyses for Henry Creek resulted in the computation of shallow 1-percent chance flooding outside the channel, with depths of less than 1 foot.

Near Cross Section A on Milk Creek, the 1-percent-annual-chance flood overtops Canby Mulino Road, resulting in shallow flooding in the northern overbank of the river, extending westerly across the Southern Pacific Railroad tracks.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the Flood Profiles (Exhibit 1) are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail. The exception to this is a structure found on a private road along Rock Creek. This multiple-culvert structure was found to have a broken pipe joint on one culvert, a collapsed bank blocking a second pipe, and a third unobstructed pipe. This culvert system was modeled with obstructions in-place (Reference 26).

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created

or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD). With the completion of the North American Vertical Datum of 1988 (NAVD), many FIS reports and FIRMs are now prepared using NAVD as the referenced vertical datum.

Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the NGVD and NAVD, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

Vertical Network Branch, N/CG13
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

The conversion factors for flooding sources studied in Clackamas County are listed in Table 4, "Clackamas County Vertical Datum Conversion Table."

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS report provides 1-percent-annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent-annual-chance flood elevations; delineations of the 1- and 0.2-percent-annual-chance floodplains; and a 1-percent-annual-chance floodway. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:4,800 and 1:12,000, with a contour interval of 5 feet (Reference 28); 1:24,000, enlarged to 1:4,800 and 1:12,000, with

Table 4. Clackamas County Vertical Datum Conversion
(In Feet Above NGVD 29 Datum)

Stream Name	Conversion Factor
Abernethy Creek	+3.5 feet
Clackamas River	+3.5 feet
Clear Creek	+3.5 feet
Deer Creek	+3.5 feet
Johnson Creek	+3.5 feet
Kellogg Creek	+3.5 feet
Mt. Scott Creek	+3.5 feet
Nyberg Slough	+3.5 feet
Oswego Canal	+3.5 feet
Philips Creek	+3.5 feet
Salmon River	+3.5 feet
Spring Brook Creek	+3.5 feet
Still Creek	+3.5 feet
Tickle Creek	+3.5 feet
Tualatin River	+3.5 feet
Tualatin River Overflow to Rivergrove	+3.5 feet
Willamette River	+3.5 feet
Zigzag River	+3.5 feet
Richardson Creek	+3.46 feet
Richardson Creek Royer Road Tributary	+3.46 feet
Richardson Creek Anderson Road Tributary	+3.46 feet
Richardson Creek Keller Road Tributary	+3.46 feet
Rock Creek	+3.46 feet
Rock Creek Hemrick Road Tributary	+3.46 feet
Rock Creek N Golf Course Tributary	+3.46 feet
Rock Creek S Golf Course Tributary	+3.46 feet
Rock Creek 172nd Avenue Tributary	+3.46 feet
Rock Creek Highway 224 Tributary	+3.46 feet
Eagle Creek	+3.4 feet
Milk Creek	+3.4 feet
Molalla River	+3.4 feet
Pudding River	+3.4 feet
Sandy Creek	+3.4 feet
Seely Ditch	+3.4 feet

contour intervals of 10, 20, and 40 feet (Reference 29); 1:4,800, with a contour interval of 2 feet (Reference 30); and 1:4,800, with a contour interval of 10 feet (Reference 31). Contours generated from LIDAR data with an interval of 1 foot (Reference 32) have been used to determine floodplain boundaries in the Rock Creek and Richardson Creek drainages. 2-foot topographic data was used to delineate floodplain boundaries for the Tualatin River Basin study (Reference 33).

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM. On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards Zones A, AE, AO, and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations, but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM.

Approximate 1-percent-annual-chance floodplain boundaries in some portions of the study area were taken directly from the Flood Hazard Boundary Map for Cities of Barlow, Canby, Gladstone, Happy Valley, Lake Oswego, Milwaukie, Oregon City, Portland, Rivergrove, Sandy, West Linn, Wilsonville, Tualatin, and Clackamas County (References 34 through 47, respectively).

Base map information shown on this FIRM was provided in digital format by USGS (Reference 48), Pacific Water Resources, Inc (References 33, 49, and 50). Non-revised floodplains were reviewed for accuracy in relation to this new base and re-fit where appropriate. In accordance with FEMA's *Guidelines and Specifications for Flood Hazard Mapping Partners, Procedure Memo 36*, titled "Profile Baselines on Digital Flood Insurance rate Maps with Orthophoto Bases," dated July 7, 2005, profile baselines have been applied all areas of detailed study. Profile baselines are shown in the location of the original work without regard to the redelineation or floodplain adjustment to the new base map. This is done to maintain relationship to the hydraulic models, floodway data tables, and flood profiles.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the base flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal-conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (see Table 3, Floodway Data). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the WSEL of the base flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

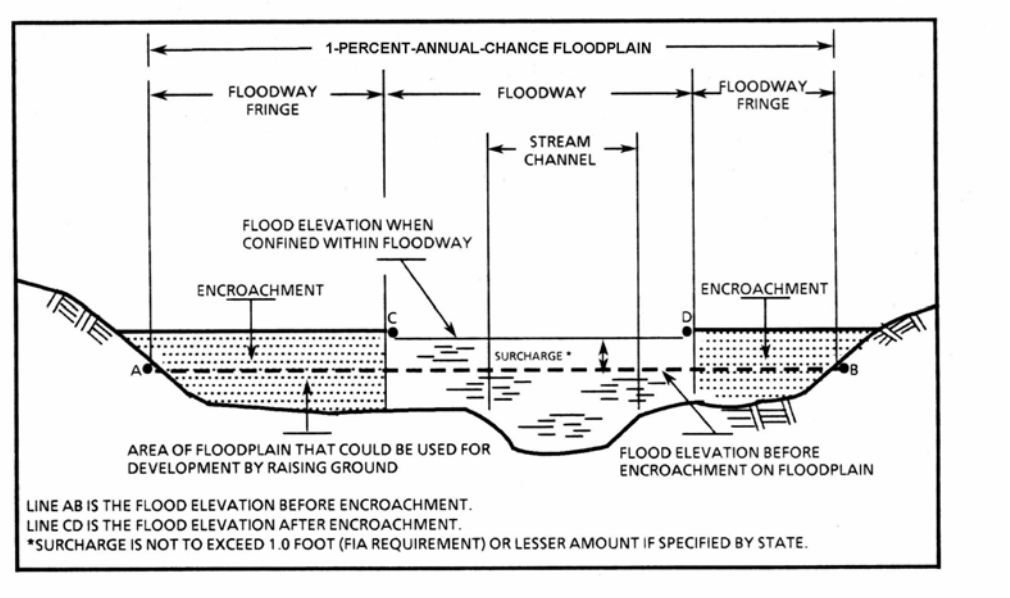

Figure 1. Floodway Schematic

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY[2]	WITH FLOODWAY[2]	INCREASE
					FEET (NAVD)			
ABERNETHY CREEK								
A	200	50	345	13.2	48.3	18.1	18.1	0.0
B	255	21	317	14.4	48.3	25.2	25.3	0.1
C	890	21	287	15.9	48.3	28.0	28.4	0.4
D	965	47	733	6.2	48.3	33.4	33.4	0.0
E	1,055	137	1,390	3.3	48.3	33.9	33.9	0.0
F	1,235	72	1,144	4.0	48.3	33.9	34.5	0.6
G	1,355	109	1,298	3.5	48.3	34.0	34.6	0.6
H	1,505	64	979	4.7	48.3	34.0	34.6	0.6
I	1,985	67	864	5.3	48.3	34.2	34.7	0.5
J	2,585	69	994	4.6	48.3	34.9	35.5	0.6
K	3,085	62	967	4.7	48.3	35.3	35.9	0.6
L	3,785	46	737	6.2	48.3	35.7	36.3	0.6
M	4,975	148	1,151	4.0	48.3	36.8	37.4	0.6
N	5,995	102	1,004	4.5	48.3	37.5	38.1	0.6
O	6,095	100	918	5.0	48.3	37.8	38.6	0.8
P	6,275	175	1,246	3.7	48.3	38.1	38.8	0.7
Q	8,015	441	2,609	1.7	48.3	38.9	39.6	0.7
R	9,375	316	1,664	2.4	48.3	39.2	39.9	0.7
S	11,215	48	553	7.2	48.3	40.6	41.2	0.6
T	11,695	128	1,039	3.8	48.3	43.7	44.4	0.7
U	12,165	84	714	5.6	48.3	44.0	44.7	0.7
V	12,595	78	906	4.4	48.3	45.4	46.0	0.6
W	12,785	68	866	4.6	48.3	45.7	46.3	0.6

[1] Stream distance in feet above confluence with Willamette River

[2] Water surface elevations computed without consideration of backwater effects from Willamette River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

ABERNETHY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
CLACKAMAS RIVER								
A	1,320	530	16,747	6.6	47.8	44.5[2]	44.7[2]	0.2
B	2,534	470	12,161	9.1	47.8	44.7[2]	44.8[2]	0.1
C	3,590	541	12,753	8.6	47.8	44.9[2]	45.6[2]	0.7
D	4,171	380	9,137	12.1	47.8	44.9[2]	45.6[2]	0.7
E	5,170	530	11,102	9.9	47.7	46.6[2]	46.6[2]	0.0
F	6,280	370	8,030	13.7	47.7	47.0[2]	47.5[2]	0.5
G	6,550	380	7,987	13.8	47.7	47.5[2]	48.0[2]	0.5
H	7,290	360	6,891	16.0	49.9	49.9	50.2	0.3
I	7,760	475	11,825	9.3	55.6	55.6	55.6	0.0
J	8,030	420	13,492	8.2	58.1	58.1	58.3	0.2
K	9,080	950	24,885	4.4	59.3	59.3	59.6	0.3
L	10,240	810	14,963	7.4	59.5	59.5	59.7	0.2
M	11,140	650	13,279	8.3	59.9	59.9	60.3	0.4
N	12,090	620	11,468	9.6	60.1	60.1	60.9	0.8
O	12,990	820	13,395	8.2	61.5	61.5	62.1	0.6
P	13,940	635	11,652	9.4	63.1	63.1	63.1	0.0
Q	14,940	680	11,564	9.5	63.8	63.8	64.2	0.4
R	15,945	734	12,668	8.7	64.3	64.3	65.2	0.9
S	16,845	480	10,297	10.7	64.8	64.8	65.8	1.0
T	18,005	478	11,882	9.3	66.4	66.4	67.4	1.0
U	19,045	665	12,976	8.5	67.5	67.5	68.4	0.9
V	20,070	757	15,258	7.2	69.9	69.9	70.8	0.9
W	20,930	779	15,092	7.3	70.6	70.6	71.5	0.9
X	21,930	755	13,997	7.9	71.7	71.7	72.6	0.9
Y	23,010	719	14,058	7.8	73.9	73.9	74.9	1.0
Z	24,045	566	11,446	9.6	75.2	75.2	76.2	1.0

[1] Stream distance in feet above confluence with Willamette River

[2] Water-surface elevations computed without consideration of backwater effects from Willamette River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

CLACKAMAS RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
CLACKAMAS RIVER								
AA	25,095	608	10,271	10.7	77.2	77.2	77.9	0.7
AB	25,975	656	10,712	10.3	79.4	79.4	80.0	0.6
AC	27,015	819	12,481	8.8	81.1	81.1	82.1	1.0
AD	28,030	930	16,988	6.5	82.9	82.9	83.9	1.0
AE	29,660	1,210	17,420	6.3	84.3	84.3	85.3	1.0
AF	30,710	1,064	14,288	7.7	85.3[2]	85.3	86.3	1.0
AG	32,830	1,874	22,084	5.0	88.6[2]	88.6	89.6	1.0
AH	37,820	1,862	2,014	5.5	99.8[2]	92.1	92.9	0.8
AI	38,650	888	7,799	14.1	100.7[2]	92.6	93.2	0.6
AJ	40,110	553	9,207	11.9	102.9	101.0	101.0	0.0
AK	41,080	535	9,430	1l.7	104.0	102.8	103.2	0.4
AL	41,970	400	8,881	12.4	105.4	104.6	105.1	0.5
AM	42,820	330	10,359	10.6	108.2	107.6	108.1	0.5
AN	43,475	322	9,402	10.6	108.8	108.3	108.6	0.3
AO	44,215	318	7,713	12.9	109.0	108.6	109.0	0.4
AP	45,095	1,113	19,690	5.1	111.4	111.4	112.1	0.7
AQ	45,775	1,187	16,087	6.2	111.5	111.5	112.1	0.6
AR	46,480	1,280	17,377	5.7	112.6	112.6	113.5	0.9
AS	48,480	914	14,700	6.8	115.9	115.9	116.5	0.6
AT	49,850	692	8,877	1l.2	117.2	117.2	117.6	0.4
AU	50,050	573	8,600	11.6	117.7	117.7	118.1	0.4
AV	51,470	516	6,598	15.1	120.8	120.8	121.6	0.8
AW	52,895	1,260	15,157	6.6	127.1	127.1	127.9	0.8
AX	53,575	890	12,177	8.2	127.9	127.9	128.8	0.9
AY	55,735	816	10,723	9.3	130.6	130.6	131.4	0.8
AZ	57,305	503	7,081	14.1	131.9	131.9	132.9	1.0

[1] Stream distance in feet above confluence with Willamette River

[2] Water-surface elevations based on consideration of levee

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

CLACKAMAS RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
CLACKAMAS RIVER								
BA	58,130	538	8,367	11.9	136.7	136.7	137.3	0.6
BB	58,580	541	10,114	9.9	138.9	138.9	139.9	1.0
BC	59,160	683	10,273	9.7	139.0	139.0	139.9	0.9
BD	60,560	1,469	16,450	6.1	143.5	143.5	144.3	0.8
BE	62,200	1,431	14,922	6.7	146.0	146.0	147.0	1.0
BF	63,800	2,096	18,506	5.4	147.8	147.8	148.8	1.0
BG	65,700	1,061	7,475	12.0	149.5	149.5	149.9	0.4
BH	66,350	560	8,444	10.6	154.2	154.2	154.6	0.4
BI	68,350	620	7,721	11.6	158.6	158.6	159.3	0.7
BJ	69,925	403	5,548	16.1	162.6	162.6	163.5	0.9
BK	70,660	323	5,856	15.3	169.9	169.9	169.9	0.0
BL	73,110	833	11,463	7.8	175.9	175.9	176.4	0.5
BM	76,010	2,767	18,541	4.8	180.6[2]	180.5	181.4	0.9
BN	78,050	2,070	17,233	5.2	185.4[2]	183.1	183.6	0.5
BO	78,890	2,385	18,157	4.9	186.8[2]	184.2	184.8	0.6
BP	80,730	1,921	11,220	8.0	190.0[2]	187.6	188.0	0.4
BQ	82,250	1,643	16,165	5.5	194.0[2]	193.1	194.1	1.0
BR	83,220	1,668	15,092	5.9	195.5[2]	195.1	196.1	1.0
BS	84,270	949	8,766	10.2	196.4[2]	196.2	197.0	0.8
BT	86,000	917	12,184	7.3	201.4	201.4	202.4	1.0
BU	87,630	1,058	10,138	8.8	204.0	204.0	205.0	1.0
BV	88,910	1,082	9,665	9.3	207.8	207.8	208.6	0.8
BW	89,675	1,011	7,229	10.9	212.0	212.0	212.1	0.1
BX	90,395	1,083	15,160	5.2	216.8	216.8	217.6	0.8
BY	91,225	1,150	14,726	5.3	218.0	218.0	218.7	0.7
BZ	92,205	1,366	12,370	6.4	218.5	218.5	219.5	1.0

[1] Stream distance in feet above confluence with Willamette River

[2] Water-surface elevations based on consideration of levee

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

CLACKAMAS RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
CLACKAMAS RIVER								
CA	93,715	1,227	10,985	7.2	222.5	222.5	222.7	0.2
CB	95,025	427	4,624	17.0	227.6	227.6	227.6	0.0
CC	96,355	1,150	13,263	5.9	236.8	236.8	237.1	0.3
CD	98,425	509	6,363	12.4	239.9	239.9	240.9	1.0
CE	101,285	600	7,220	10.9	250.3	250.3	250.9	0.6
CF	104,095	400	6,651	11.8	257.3	257.3	257.9	0.6
CG	105,545	500	7,577	10.4	260.5	260.5	261.5	1.0
CH	107,395	1,137	8,943	8.8	265.9	265.9	266.9	1.0
CI	108,595	579	6,389	12.3	268.9	268.9	269.7	0.8
CJ	109,475	803	9,631	8.2	273.0	273.0	273.3	0.3
CK	110,175	749	5,099	15.4	273.5	273.5	273.5	0.0
CL	111,095	1,136	9,255	8.5	280.0	280.0	280.2	0.2
CM	111,665	638	6,124	12.9	281.2	281.2	281.2	0.0
CN	112,445	698	7,598	10.4	284.7	284.7	285.3	0.6
CO	113,175	353	5,762	13.7	285.8	285.8	286.5	0.7
CP	114,125	215	3,845	20.5	287.1	287.1	287.5	0.4
CQ	115,095	695	9,735	8.1	295.1	295.1	295.4	0.3
CR	116,075	729	5,273	14.9	295.5	295.5	295.9	0.4
CS	117,295	259	4,189	18.8	302.0	302.0	302.6	0.6
CT	118,855	402	4,889	16.1	313.2	313.2	313.2	0.0
CU	119,695	278	6,338	12.4	319.3	319.3	319.6	0.3
CV	121,615	329	5,913	13.3	322.8	322.8	323.4	0.6

[1] Stream distance in feet above confluence with Willamette River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

CLACKAMAS RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
CLEAR CREEK								
A	340	224	363	6.3	1,462.4	1,462.4	1,462.6	0.2
B	1,250	52	228	10.1	1,474.2	1,474.2	1,474.2	0.0
C	1,630	36	246	9.3	1,481.6	1,481.6	1,482.1	0.5
D	1,950	70	306	7.5	1,488.3	1,488.3	1,488.9	0.6
E	2,580	64	396	5.8	1,495.9	1,495.9	1,496.7	0.8
F	3,050	75	262	8.8	1,501.9	1,501.9	1,502.3	0.4
G	4,240	75	305	7.5	1,525.2	1,525.2	1,525.2	0.0
H	4,530	84	237	9.7	1,531.7	1,531.7	1,531.7	0.0
I	5,130	78	294	7.8	1,545.4	1,545.4	1,545.4	0.0

[1] Stream distance in feet above confluence with Sandy River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
DEER CREEK								
A	845	40	130	2.2	96.0	95.3[2]	96.3[2]	1.0
B	1,205	34	168	1.7	96.7	96.7[2]	97.1[2]	0.4
C	1,460	31	137	1.5	97.0	96.7[2]	97.2[2]	0.5
D	1,607	72	185	1.1	97.5	97.5[2]	97.9[2]	0.4
E	1,837	66	263	0.8	97.5	97.5	97.9	0.4
F	1,938	55	182	1.1	97.8	97.8	98.6	0.8
G	2,188	15	69	2.9	97.8	97.8	98.6	0.8
H	2,988	29	81	2.5	100.3	100.3	100.9	0.6

[1] Stream distance in feet above confluence with Mt. Scott Creek

[2] Water-surface elevations computed without consideration of backwater effects from Mt. Scott Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

DEER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
EAGLE CREEK								
A	2,225	387	1,350	8.5	210.4	209.9[2]	210.5[2]	0.6
B	2,825	187	1,172	9.8	215.5	215.5	215.5	0.0
C	3,195	135	1,168	9.8	219.7	219.7	219.7	0.0
D	3,895	161	1,166	9.9	222.9	222.9	223.9	1.0
E	4,870	449	2,974	3.9	228.6	228.6	229	0.4
F	5,695	191	914	12.6	233.4	233.4	234.4	1.0
G	6,045	256	1,634	7.0	237.3	237.3	237.7	0.4
H	6,745	241	1,631	7.0	240.6	240.6	241.6	1.0
I	7,495	317	2,012	5.7	245.1	245.1	246	0.9
J	8,445	163	1,113	10.3	250.3	250.3	251.2	0.9
K	9,170	255	1,387	8.3	256.1	256.1	256.3	0.2
L	9,770	225	1,603	7.2	260.2	260.2	261.2	1.0
M	11,370	183	915	12.6	270.5	270.5	270.5	0.0
N	12,320	102	906	12.7	278.1	278.1	279.1	1.0
O	12,845	235	2,180	5.3	284.3	284.3	284.4	0.1
P	13,720	215	1,048	11.0	287.5	287.5	287.5	0.0
Q	14,720	295	1,807	6.4	294.9	294.9	295.8	0.9
R	15,420	202	2,135	5.4	300.7	300.7	300.7	0.0
S	16,030	131	1,032	11.1	301.6	301.6	302.2	0.6
T	16,660	107	1,153	10.0	306.5	306.5	306.8	0.3

[1] Stream distance in feet above confluence with Clackamas River

[2] Water-surface elevations computed without consideration of backwater effects from Clackamas River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

EAGLE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
JOHNSON CREEK								
A	554	31	735	3.9	35.8[2]	34.6	34.7	0.1
B	840	38	825	3.5	35.8[2]	34.6	34.8	0.2
C	2,344	82	964	3.0	35.8[2]	34.8	35.6	0.8
D	2,809	80	757	3.8	35.8[2]	34.9	35.6	0.7
E	3,200	80	617	4.5	35.8[2]	35.1	35.8	0.7
F	3,633	45	412	6.8	35.8[2]	35.6	36.4	0.8
G	3,828	79	481	5.8	36.1	36.1	36.8	0.7
H	4,483	56	416	6.7	38.8	38.8	39.4	0.6
I	4,842	62	391	7.1	39.5	39.5	40.3	0.8
J	5,085	48	288	9.7	40.3	40.3	40.9	0.6
K	5,945	67	348	8.0	45.7	45.7	45.9	0.2
L	16,796	55[3]	425	6.6	106.9	106.9	107.2	0.3
M	17,276	205	1,023	2.7	108.1	108.1	108.9	0.8
N	17,767	54	295	9.5	109.5	109.5	110.2	0.7
O	18,274	74	400	7.0	113.1	113.1	113.5	0.4
P	18,834	39	234	12.0	116.2	116.2	116.2	0.0
Q	19,298	75	459	6.1	119.3	119.3	120.3	1.0
R	19,869	48	404	8.6	123.4	123.4	124.0	0.6
S	20,511	122	422	6.6	128.7	128.7	128.8	0.1
T	20,697	50	868	3.2	136.1	136.1	137.0	0.9
U	21,622	102	645	4.3	136.6	136.6	137.4	0.8
V	22,699	264	557	5.0	142.9	142.9	143.5	0.6
W	22,938	111	354	7.8	147.4	147.4	147.4	0.0
X	23,399	57	519	5.3	151.3	151.3	151.8	0.5
Y	24,008	74	268	10.3	152.4	152.4	152.6	0.2
Z	24,360	125	383	7.2	155.4	155.4	155.9	0.5

[1] Stream distance in feet above confluence with Willamette River

[2] Water-surface elevations computed without consideration of backwater effects from Willamette River

[3] Floodway located entirely outside county limits

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

JOHNSON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET (NAVD))	WITH FLOODWAY (FEET (NAVD))	INCREASE
JOHNSON CREEK								
AA	24,851	122	424	6.5	159.0	159.0	159.9	0.9
AB	25,308	70	318	8.7	162.7	162.7	163.1	0.4
AC	25,487	93	637	4.9	164.8	164.8	165.7	0.9
AD	25,764	101	330	8.4	166.2	166.2	166.4	0.2
AE	26,374	68	392	7.1	170.9	170.9	171.5	0.6
AF	26,935	51	281	9.9	173.7	173.7	173.8	0.1
AG	27,414	54	256	10.8	176.5	176.5	176.6	0.1
AH	28,567	40	220	13.5	187.1	187.1	187.1	0.0
AI	109,032	200[2]	451	2.2	446.0	446.0	447.0	1.0
AJ	109,138	258[2]	1,669	0.6	450.4	450.4	451.2	0.8
AK	117,274	29/14[3]	90	6.4	497.8	497.8	498.4	0.6

[1] Stream distance in feet above confluence with Willamette River

[2] Floodway lacated entirely outside county limits

[3] Width/width within corporate limits

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

JOHNSON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
KELLOGG CREEK								
A	370	25	381	5.2	36.3	35.3[2]	36.3[2]	1.0
B	1,795	130	2,904	0.7	36.3	35.8[2]	36.7[2]	0.9
C	2,530	130	2,509	0.8	36.1	35.8[2]	36.7[2]	0.9
D	3,915	140	1,878	1.1	36.1	35.8[2]	36.7[2]	0.9
E	4,971	156	1,547	1.3	36.1	35.9[2]	36.9[2]	1.0
F	5,636	98	557	3.6	36.1	35.9[2]	36.9[2]	1.0
G	6,194	80	296	6.7	37.3	37.3	37.7	0.4
H	6,882	77	293	6.8	41.3	41.3	41.3	0.0
I	7,762	70	321	6.2	44.9	44.9	45.1	0.2
J	8,682	62	298	6.7	48.6	48.6	48.8	0.2
K	9,402	41	331	6.0	54.2	54.2	54.2	0.0
L	9,997	60	325	5.5	55.3	55.3	55.4	0.1
M	10,632	59	336	5.3	56.4	56.4	56.7	0.3
N	10,822	60	322	5.6	56.8	56.8	57.0	0.2
O	11,082	40	296	1.3	57.2	57.2	57.9	0.7
P	12,500	30	119	4.6	63.7	63.7	64.5	0.8
Q	12,687	42	184	3.0	64.5	64.5	65.4	0.9
R	13,125	16	62	9.0	67.5	67.5	67.7	0.2
S	13,399	35	167	3.3	69.1	69.1	69.9	0.8
T	13,622	35	159	3.0	69.5	69.5	70.3	0.8
U	13,769	20	90	5.4	70.6	70.6	71.6	1.0
V	14,605	53	276	1.8	75.3	75.3	76.3	1.0
W	14,738	70	726	0.7	87.5	87.5	88.0	0.5
X	17,100	46	108	3.3	94.7	94.7	95.3	0.6
Y	17,201	110	290	1.2	96.2	96.2	96.2	0.0
Z	17,844	121	186	1.9	97.0	97.0	97.1	0.1

[1] Stream distance in feet above confluence with Willamette River

[2] Water-surface elevations computed without consideration of backwater effects from Willamette River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

KELLOGG CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
KELLOGG CREEK								
AA	18,184	13	39	9.2	100.4	100.4	100.4	0.0
AB	18,740	37	86	4.2	104.4	104.4	104.8	0.4
AC	18,888	40	131	2.7	105.2	105.2	105.8	0.6
AD	19,380	55	199	1.8	106.9	106.9	106.9	0.0
AE	19,516	58	125	1.8	107.0	107.0	107.0	0.0
AF	19,711	97	424	0.5	107.0	107.0	107.1	0.1
AG	21,054	13	57	4.0	109.0	109.0	109.8	0.8
AH	21,492	223	557	0.4	109.3	109.3	110.1	0.8
AI	22,569	289	670	0.3	109.5	109.5	110.2	0.7
AJ	23,407	39	168	0.8	112.3	112.3	112.5	0.2

[1] Stream distance in feet above confluence with Willamette River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

KELLOGG CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
MILK CREEK								
A	4,275	737	3,003	4.7	155.1	155.1	155.1	0.0
B	5,405	642	4,658	3.0	157.3	157.3	157.9	0.6
C	6,060	970	4,648	3.0	158.0	158.0	158.7	0.7
D	6,170	1,050	5,713	2.5	158.1	158.1	159.0	0.9
E	8,065	750	2,759	5.1	160.1	160.1	160.7	0.6
F	8,395	715	3,734	3.7	162.9	162.9	163.2	0.3
G	10,475	548	4,353	3.2	164.7	164.7	165.4	0.7
H	10,990	224	2,277	6.1	165.2	165.2	165.8	0.6
I	12,970	227	1,722	8.1	170.0	170.0	170.9	0.9
J	14,870	336	2,178	6.4	177.2	177.2	178.1	0.9
K	16,780	144	1,854	7.5	182.4	182.4	183.2	0.8
L	17,980	156	2,076	6.7	185.0	185.0	186.0	1.0
M	20,350	486	3,397	4.1	189.2	189.2	190.1	0.9
N	21,300	516	3,386	4.1	190.5	190.5	191.3	0.8
O	24,475	329	1,937	7.2	196.1	196.1	196.8	0.7
P	28,585	220	2,343	6.0	205.5	205.5	206.1	0.6
Q	30,825	496	5,613	2.5	207.7	207.7	208.5	0.8
R	32,105	565	5,378	2.6	208.3	208.3	209.1	0.8
S	32,615	503	3,855	3.6	209.3	209.3	209.3	0.0
T	34,275	388	3,185	3.7	210.6	210.6	211.0	0.4
U	38,045	584	5,595	2.5	212.8	212.8	213.5	0.7
V	39,565	438	4,645	2.5	213.4	213.4	214.1	0.7
W	40,265	495	5,306	2.1	214.2	214.2	215.0	0.8
X	42,120	639	4,540	2.5	215.5	215.5	216.1	0.6
Y	43,385	250	1,560	7.3	216.5	216.5	217.2	0.7
Z	44,195	730	3,795	3.0	220.3	220.3	221.1	0.8

[1] Stream distance in feet above confluence with Molalla River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

MILK CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
MILK CREEK								
AA	44,835	782	4,717	2.4	222.6	222.6	223.1	0.5
AB	47,445	627	2,391	4.8	225.9	225.9	226.6	0.7
AC	49,355	117	1,369	8.3	232.1	232.1	233.1	1.0
AD	51,055	143	1,367	8.3	237.8	237.8	238.5	0.7
AE	51,685	231	2,064	5.5	245.4	245.4	245.4	0.0
AF	52,345	338	3,399	3.4	246.5	246.5	246.6	0.1
AG	53,455	625	3,537	3.2	247.3	247.3	247.3	0.0
AH	55,685	261	1,295	8.8	249.0	249.0	250.0	1.0
AI	56,985	440	2,865	4.0	253.5	253.5	254.0	0.5
AJ	57,145	490	2,785	4.1	254.3	254.3	254.4	0.1
AK	59,095	850	3,998	2.7	256.3	256.3	256.8	0.5
AL	59,335	792	3,163	3.4	256.5	256.5	257.1	0.6
AM	61,805	379	1,275	8.3	262.8	262.8	262.8	0.0
AN	63,085	424	2,502	4.2	268.2	268.2	268.8	0.6
AO	63,720	289	1,725	6.1	269.6	269.6	270.3	0.7
AP	65,510	550	1,656	6.4	275.6	275.6	276.2	0.6
AQ	65,845	500	2,509	4.2	277.6	277.6	278.3	0.7
AR	67,225	580	3,374	3.1	281.4	281.4	281.6	0.2
AS	67,955	132	1,100	9.6	281.9	281.9	282.2	0.3
AT	70,255	400	1,848	5.7	291.6	291.6	292.5	0.9
AU	71,695	109	942	11. 2	298.7	298.7	299.0	0.3
AV	73,455	791	3,491	3.0	306.9	306.9	307.2	0.3
AW	75,165	308	2,135	5.0	310.8	310.8	310.8	0.0
AX	77,065	273	1,796	5.9	317.1	317.1	318.0	0.9

[1] Stream distance in feet above confluence with Molalla River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

MILK CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
MOLALLA RIVER								
A	4,180	3,215	32,501	2.2	91.1	81.2[2]	82.1[2]	0.9
B	6,760	2,300	19,881	3.7	91.1	82.8[2]	83.8[2]	1.0
C	8,400	1,480	11,012	3.9	91.1	84.8[2]	85.8[2]	1.0
D	9,520	1,447	6,935	6.2	91.1	85.4[2]	86.4[2]	1.0
E	11,380	1,263	6,311	6.8	91.2	91.2	91.2	0.0
F	13,580	1,300	12,974	3.3	95.4	95.4	96.1	0.7
G	14,120	1,345	14,061	3.0	97.7	97.7	98.5	0.8
H	16,320	1,520	16,396	2.6	98.9	98.9	99.9	1.0
I	18,180	838	8,226	5.2	100.0	100.0	101.0	1.0
J	19,790	570	5,660	7.6	102.0	102.0	102.9	0.9
K	21,670	1,530	7,832	5.5	106.8	106.8	107.3	0.5
L	24,530	1,470	13,811	3.1	109.7	109.7	110.6	0.9
M	26,310	1,075	7,610	5.6	111.3	111.3	112.0	0.7
N	28,210	2,345	11,888	3.6	115.8	115.8	116.8	1.0
O	30,110	1,520	10,159	4.2	120.2	120.2	121.2	1.0
P	31,470	825	6,139	6.7	122.3	122.3	122.9	0.6
Q	34,240	1,800	12,595	3.3	129.2	129.2	129.2	0.0
R	35,420	2,480	17,606	2.3	129.7	129.7	129.9	0.2
S	37,700	2,448	14,420	2.9	130.7	130.7	131.2	0.5
T	39,660	2,250	10,128	4.1	135.3	135.3	136.3	1.0
U	42,300	1,670	8,404	3.9	143.4	143.4	143.7	0.3
V	44,540	830	6,243	5.3	148.8	148.8	149.6	0.8
W	46,540	590	4,924	6.7	154.3	154.3	155.1	0.8
X	48,620	455	3,480	9.5	161.5	161.5	162.3	0.8
Y	49,980	400	3,762	8.8	167.8	167.8	168.8	1.0
Z	51,300	480	4,856	6.8	173.2	173.2	174.1	0.9

[1] Stream distance in feet above confluence with Willamette River

[2] Water-surface elevations computed without consideration of backwater effects from Willamette River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

MOLALLA RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
MOLALLA RIVER								
AA	51,830	413	5,590	5.9	177.4	177.4	177.9	0.5
AB	53,830	435	5,182	6.4	180.1	180.1	180.9	0.8
AC	55,750	420	2,763	11.9	184.3	184.3	184.8	0.5
AD	57,950	546	5,400	6.1	194.2	194.2	194.9	0.7
AE	59,150	210	2,630	12.5	197.1	197.1	198.1	1.0
AF	61,510	460	5,267	6.3	205.4	205.4	206.1	0.7
AG	62,210	430	4,223	7.8	206.6	206.6	207.4	0.8
AH	64,010	519	5,137	6.4	210.9	210.9	211.8	0.9
AI	65,935	714	7,843	4.2	213.5	213.5	214.4	0.9
AJ	68,015	468	2,602	12.7	221.9	221.9	221.9	0.0
AK	70,155	665	5,339	6.2	232.1	232.1	232.8	0.7
AL	73,155	477	3,765	8.8	239.7	239.7	240.3	0.6
AM	74,055	572	5,230	6.3	243.3	243.3	243.6	0.3
AN	76,405	781	4,305	7.7	249.7	249.7	250.2	0.5
AO	79,255	182	2,529	13.0	266.5	266.5	267.5	1.0
AP	80,605	1,840	18,603	1.8	271.4	271.4	271.9	0.5
AQ	81,605	1,908	13,299	2.5	271.6	271.6	272.1	0.5
AR	82,980	1,655	5,087	6.5	273.5	273.5	274.3	0.8
AS	84,780	1640	8,579	3.8	281.1	281.1	282.0	0.9
AT	87,130	1355	5,369	6.1	287.3	287.3	287.8	0.5
AU	88,155	956	7,644	4.3	290.8	290.8	291.4	0.6
AV	90,355	1008	5,913	5.6	298.6	298.6	299.6	1.0
AW	91,655	579	5,311	6.2	303.6	303.6	304.5	0.9
AX	93,355	537	5,041	6.5	307.9	307.9	308.8	0.9
AY	94,675	554	6,065	5.4	310.7	310.7	311.6	0.9
AZ	95,750	796	3,932	8.4	313.0	313.0	313.9	0.9

[1] Stream distance in feet above confluence with Willamette River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

MOLALLA RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
MOLALLA RIVER								
BA	97,875	810	4,518	7.3	324.8	324.8	325.8	1.0
BB	98,850	528	6,309	5.2	330.2	330.2	330.9	0.7
BC	99,850	583	5,662	5.8	331.5	331.5	332.2	0.7
BD	100,830	850	5,077	6.5	335.9	335.9	336.6	0.7
BE	101,890	885	4,351	7.6	341.9	341.9	342.1	0.2
BF	103,640	524	4,189	7.9	350.5	350.5	351.3	0.8
BG	105,090	418	3,846	8.6	357.2	357.2	357.8	0.6
BH	106,690	520	2,688	12.3	366.0	366.0	366.0	0.0
BI	108,365	829	6,072	5.4	376.8	376.8	377.6	0.8
BJ	108,790	836	6,830	4.8	381.3	381.3	382.2	0.9
BK	110,340	370[2]	3,799	8.7	384.5	384.5	385.5	1.0
BL	111,465	1,472	4,785	6.9	389.7	389.7	390.5	0.8
BM	112,540	1,120	5,832	5.7	396.2	396.2	396.8	0.6
BN	114,415	1,127	7,495	4.4	403.9	403.9	404.6	0.7
BO	116,215	908	5,171	6.4	412.1	412.1	412.6	0.5
BP	117,915	933	11,408	2.9	422.9	422.9	423.9	1.0
BQ	119,365	290	2,338	14.1	426.4	426.4	426.8	0.4

[1] Stream distance in feet above confluence with Willamette River

[2] Values calculated from original model prior redelineation

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

MOLALLA RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
MT. SCOTT CREEK								
A	660	27	136	10.6	57.7	57.7	58.1	0.4
B	1,970	43	222	5.4	62.9	62.9	63.8	0.9
C	3,800	117	450	3.2	69.9	69.9	70.6	0.7
D	5,983	79	496	2.6	77.3	77.3	78.2	0.9
E	7,983	113	367	3.6	81.1	81.1	81.9	0.8
F	10,853	423	685	1.9	89.9	89.9	90.3	0.4
G	12,899	12	78	4.8	97.0	97.0	97.3	0.3
H	14,500	18	85	5.7	103.6	103.6	104.1	0.5
I	15,020	34	122	3.9	106.4	106.4	106.5	0.1
J	16,120	21	64	7.5	111.1	111.1	111.8	0.7
K	16,730	37	207	2.3	123.7	123.7	123.7	0.0
L	17,150	30	59	8.1	143.5	143.5	143.5	0.0

[1] Stream distance in feet above confluence with Kellog Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

MT. SCOTT CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
~~OSWEGO CANAL~~								
~~A~~	~~280~~	~~132~~	~~1,302~~	~~2.7~~	~~104.5~~	~~104.5~~	~~104.5~~	~~0.0~~
~~B~~	~~660~~	~~122~~	~~701~~	~~5.1~~	~~104.5~~	~~104.5~~	~~104.5~~	~~0.0~~
~~C~~	~~1,860~~	~~125~~	~~576~~	~~6.2~~	~~107.7~~	~~107.7~~	~~107.7~~	~~0.0~~
~~D~~	~~3,090~~	~~100~~	~~915~~	~~3.9~~	~~110.8~~	~~110.8~~	~~111.4~~	~~0.6~~
~~E~~	~~3,930~~	~~110~~	~~740~~	~~4.8~~	~~113.6~~	~~113.6~~	~~114.0~~	~~0.4~~
~~F~~	~~4,870~~	~~200~~	~~1,285~~	~~2.8~~	~~115.6~~	~~115.6~~	~~116.4~~	~~0.8~~
~~G~~	~~6,540~~	~~305~~	~~1,366~~	~~2.6~~	~~117.5~~	~~117.5~~	~~118.5~~	~~1.0~~
~~H~~	~~7,090~~	~~80~~	~~654~~	~~3.2~~	~~118.7~~	~~118.7~~	~~119.3~~	~~0.6~~
~~I~~	~~7,230~~	~~75~~	~~792~~	~~2.7~~	~~119.2~~	~~119.2~~	~~119.7~~	~~0.5~~
~~J~~	~~8,170~~	~~37~~	~~563~~	~~3.8~~	~~119.7~~	~~119.7~~	~~120.3~~	~~0.6~~
~~K~~	~~8,460~~	~~62~~	~~1,126~~	~~1.9~~	~~120.0~~	~~120.0~~	~~120.7~~	~~0.7~~

THIS DATA IS IN ERROR. SEE ATTACHED FEMA LETTER AND REVISED TABULAR DATA BELOW.

[1] Stream distance in feet above Lake Oswego

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

OSWEGO CANAL

Federal Emergency Management Agency

Washington, D.C. 20472

NOTICE 1

NOTICE TO FLOOD INSURANCE RATE MAP USER

Enclosed is one copy of the Floodway Data Table for the Oswego Canal. We have revised the Floodway Data Table that will become effective on June 17, 2008 to correct an entry in a table included in the FIS report.

Please replace the copy of the Floodway Data Table for the Oswego Canal provided to you previously with the enclosed copy. Under separate cover, we are providing additional copies of the enclosed table to the Community Map Repository for the subject community.

We apologize for any inconvenience this may have caused you and thank you for your cooperation. Additional copies of the enclosed FIRM panel(s) may be ordered from our Map Service Center either by telephone, toll free, at 1-800-358-9616, or via the Map Service Center Website at http://www.fema.gov/msc.

Sincerely,

Doug Bellomo, P.E., Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness
and Response Directorate

Enclosure – Floodway Data Table Oswego Canal

ERROR. Should be 106.87' NAVD '88

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET (NAVD))	WITH FLOODWAY (FEET (NAVD))	INCREASE
OSWEGO CANAL								
A	697	125	901	6.3	106.3	106.3	106.3	0.0
B	731	126	934	6.1	106.6	106.6	106.6	0.0
C	1365	74	591	10.2	108.2	108.2	108.2	0.0
D	1540	75	653	9.4	109.1	109.1	109.2	0.1
E	2073	67	697	9.0	110.9	110.9	110.9	0.0
F	2280	64	695	9.1	111.3	111.3	111.3	0.0
G	2820	95	1007	7.3	112.3	112.3	112.9	0.6
H	3180	88	975	7.2	112.9	112.9	113.4	0.5
I	3498	90	1037	6.6	113.3	113.3	113.8	0.5
J	3977	156	824	8.6	115.5	115.5	115.9	0.4
K	4020	155	1354	6.6	116.6	116.6	116.7	0.1
L	4391	92	916	7.8	116.8	116.8	116.9	0.1
M	4562	97	1042	6.7	117.4	117.4	117.6	0.2
N	4912	105	1116	6.1	118.5	118.5	118.8	0.3
O	5443	238	2047	3.2	119.4	119.4	120.0	0.6
P	5707	347	2696	2.7	119.5	119.5	120.4	0.9
Q	5950	373	2796	2.0	119.7	119.7	120.5	0.8
R	6482	391	2557	2.7	120.1	120.1	120.9	0.8
S	7207	84	897	3.2	121.0	121.0	121.8	0.8
T	7465	84	900	3.2	121.6	121.6	122.6	1.0
U	7747	80	995	2.8	121.8	121.8	122.8	1.0
V	8533	56	839	3.5	122.5	122.5	123.3	0.8

[1] Stream distance in feet above Lake Oswego

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR AND INCORPORATED AREAS

FLOODWAY DATA

OSWEGO CANAL

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
PHILLIPS CREEK								
A	140	17	42	7.4	92.8	92.8	92.8	0.0
B	440	84	69	4.5	96.4	96.4	96.4	0.0
C	670	14	50	6.2	96.7	96.7	97.7	1.0
D	820	16	56	5.5	99.6	99.6	100.5	0.9
E	1,440	33	46	6.8	113.3	113.3	113.3	0.0
F	2,130	13	34	9.2	132.7	132.7	132.7	0.0
G	2,590	14	22	8.9	142.7	142.7	142.7	0.0
H	2,745	28	39	7.5	146.9	146.9	146.9	0.0
I	3,255	19	60	5.2	153.2	153.2	153.2	0.0
J	3,555	47	86	2.5	154.2	154.2	154.2	0.0
K	4,125	32	63	3.8	156.8	156.8	156.8	0.0
L	4,410	29	80	3.9	157.8	157.8	157.8	0.0
M	5,100	39	59	5.3	161.7	161.7	161.7	0.0
N	5,850	38	86	3.6	168.0	168.0	168.0	0.0
O	6,460	23	40	5.9	171.6	171.6	171.6	0.0
P	6,560	11	50	6.2	173.2	173.2	173.2	0.0

[1] Stream distance in feet above confluence with Mt. Scott Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

PHILLIPS CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
PUDDING RIVER								
A	15,840	1,182	7,657	4.2	96.9	89.7[3]	90.5[3]	0.8
B	25,340	2,163/2,060[2]	10,346	3.1	98.6	96.6[3]	97.6[3]	1.0
C	40,120	598/220[2]	6,645	4.5	102.2	102.2	103.1	0.9
D	42,760	438/190[2]	6,530	4.6	104.7	104.7	105.7	1.0

[1] Stream distance in feet above confluence with Molalla River

[2] Width/width within study area

[3] Water-surface elevations computed without consideration of backwater effects from Molalla River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

PUDDING RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					FEET (NAVD)			
Richardson Creek								
A	407	83	422	1.6	116.0	106.5[2]	107.3[2]	0.8
B	857	70	337	2.0	116.0	106.9[2]	107.7[2]	0.8
C	1,839	103	137	5.0	116.8	116.8	116.8	0.0
D	2,217	13	130	5.2	130.2	130.2	130.0	0.0
E	2,636	18	64	10.6	139.3	139.3	140.3	1.0
F	3,383	27	116	5.9	159.5	159.5	160.5	1.0
G	4,233	29	67	8.6	199.4	199.4	199.3	0.0
H	4,972	32	89	6.4	220.9	220.9	221.9	1.0
I	5,747	20	61	9.4	243.6	243.6	243.6	0.0
J	6,669	20	86	6.7	266.7	266.7	267.2	0.5
K	7,318	22	61	9.4	290.5	290.5	290.6	0.1
L	7,960	18	62	6.1	309.0	309.0	309.4	0.4
M	8,675	18	43	8.8	331.8	331.8	331.8	0.0
N	8,992	31	61	6.2	353.4	353.4	353.7	0.3
O	9,657	18	57	6.6	369.7	369.7	369.6	0.0
p	10,356	17	47	7.9	392.2	392.2	392.5	0.3
Q	11,099	12	20	7.3	424.5	424.5	424.5	0.0
R	11,254	20	122	1.2	434.2	434.2	434.3	0.1
S	11,802	12	20	7.3	453.1	453.1	453.2	0.1
T	12,352	16	27	5.5	474.9	474.9	475.3	0.4
U	12,876	8	14	7.0	492.5	492.5	492.6	0.1
V	12,931	8	13	7.4	494.7	494.7	494.7	0.0
W	13,301	14	22	4.5	506.7	506.7	507.0	0.3
X	14,022	20	20	4.9	527.9	527.9	528.0	0.1
Y	14,339	11	19	5.1	537.9	537.9	538.3	0.4
Z	15,110	11	15	6.4	565.2	565.2	565.2	0.0

[1] Stream distance in feet above confluence with Clackamas River

[2] Water-surface elevation computed without consideration of backwater effects from Clackamas River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

RICHARDSON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
Richardson Creek								
AA	15,188	10	30	3.4	568.1	568.1	569.1	1.0
AB	15,511	13	75	1.3	589.9	589.9	590.8	0.9

[1] Stream distance in feet above confluence with Clackamas River

[2] Water-surface elevation computed without consideration of backwater effects from Clackamas River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

RICHARDSON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					FEET (NAVD)			
Richardson Creek - Anderson Road Tributary								
A	673	15	39	3.2	328.3	328.3	328.6	0.3
B	956	9	16	7.8	345.8	345.8	345.7	0.0
C	1,426	9	16	7.7	360.0	360.0	359.9	0.0
D	2,138	23	28	4.5	387.6	387.6	387.8	0.2
E	2,732	14	13	5.4	414.0	414.0	413.9	0.0
F	3,004	11	12	5.8	451.6	451.6	451.6	0.0
G	3,324	9	11	5.9	502.2	502.2	502.3	0.1
H	3,798	14	25	2.7	509.5	509.5	509.7	0.2
I	3,913	6	20	3.3	511.3	511.3	511.8	0.5
J	4,315	15	60	1.5	516.8	516.8	517.0	0.2
K	4,649	12	30	2.3	516.8	516.8	517.6	0.8
L	4,851	9	32	2.1	520.4	520.4	520.7	0.3
M	5,276	9	11	6.3	524.1	524.1	524.1	0.0
N	5,694	15	24	2.8	531.5	531.5	531.6	0.1
O	5,742	15	55	1.2	533.3	533.3	534.2	0.9

[1] Stream distance in feet above confluence with Richardson Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

RICHARDSON CREEK - ANDERSON ROAD TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					FEET (NAVD)			
Richardson Creek - Keller Road Tributary								
A	380	6	9	7.2	211.7	211.7	211.7	0.0
B	743	6	23	2.8	275.3	275.3	275.5	0.2
C	1,000	28	15	4.2	294.8	294.8	294.8	0.0
D	1,773	18	16	4.0	330.1	330.1	330.2	0.1
E	2,523	13	11	2.8	367.3	367.3	367.5	0.2
F	2,712	12	7	4.4	374.2	374.2	374.2	0.0
G	2,839	7	18	1.7	377.5	377.5	378.2	0.7

[1] Stream distance in feet above confluence with Richardson Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

RICHARDSON CREEK - KELLER ROAD TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					FEET (NAVD)			
Richardson Creek - Royer Road Tributary								
A	730	12	20	6.9	419.6	419.6	419.8	0.2
B	1,529	10	23	6.0	447.8	447.8	448.1	0.3

[1] Stream distance in feet above confluence with Richardson Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

RICHARDSON CREEK - ROYER ROAD TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					FEET (NAVD)			
Rock Creek								
A	351	47	212	7.3	94.0	84.0[2]	84.2	0.2
B	833	44	195	8.0	94.0	91.1[2]	91.3	0.2
C	1,606	31	168	7.8	103.0	103.0	103.6	0.6
D	1,906	29	154	8.5	108.4	108.4	108.9	0.5
E	2,138	27	185	7.1	111.4	111.4	112.3	0.9
F	2,201	25	167	7.8	112.2	112.2	113.1	0.9
G	2,975	30	167	7.9	123.0	123.0	123.4	0.4
H	3,594	18	105	12.5	134.9	134.9	134.8	0.0
I	4,091	37	270	4.9	141.9	141.9	142.9	1.0
J	4,957	34	123	10.7	152.1	152.1	152.4	0.3
K	5,479	3	215	6.1	160.9	160.9	161.6	0.7
L	6,548	22	107	12.3	200.7	200.7	201.1	0.4
M	7,560	36	189	6.9	219.8	219.8	220.6	0.8
N	7,925	35	161	8.2	225.4	225.4	225.9	0.5
O	8,495	35	162	7.1	235.9	235.9	236.8	0.9
p	9,346	40	162	7.1	248.1	248.1	249.0	0.9
Q	9,995	34	146	7.8	258.2	258.2	259.1	0.9
R	10,369	26	139	8.3	264.7	264.7	265.2	0.5
S	10,559	54	258	4.4	268.8	268.8	269.1	0.3
T	10,837	40	250	4.6	273.9	273.9	274.5	0.6
U	11,116	33	181	6.3	275.9	275.9	276.5	0.6
V	11,792	37	168	6.8	283.5	283.5	284.2	0.7
W	12,302	41	195	5.9	289.3	289.3	289.8	0.5
X	12,654	36	182	6.3	291.9	291.9	292.8	0.9
Y	12,882	46	240	4.0	295.6	295.6	295.6	0.0
Z	13,075	32	171	5.7	297.2	297.2	297.2	0.0

[1] Stream distance in feet above confluence with Clackamas River

[2] Water-surface elevation computed without consideration of backwater effects from Clackamas River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

ROCK CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
Rock Creek								
AA	13,562	32	143	6.8	300.9	300.9	301.4	0.5
AB	13,976	28	142	6.0	304.9	304.9	305.8	0.9
AC	14,210	27	119	7.1	307.0	307.0	307.3	0.3
AD	14,581	19	160	5.3	309.7	309.7	310.1	0.4
AE	14,742	19	155	5.5	310.2	310.2	311.0	0.8
AF	15,092	48	312	2.7	311.3	311.3	312.0	0.7
AG	15,571	54	286	3.0	312.0	312.0	313.0	1.0
AH	16,083	54	216	3.9	313.1	313.1	313.8	0.7
AI	16,137	42	202	4.2	313.5	313.5	314.2	0.7
AJ	16,571	42	250	3.4	314.4	314.4	315.2	0.8
AK	17,039	17	81	4.8	315.2	315.2	316.1	0.9
AL	17,829	19	90	4.4	320.7	320.7	321.3	0.6
AM	18,486	20	77	5.1	325.2	325.2	326.1	0.9
AN	18,942	24	76	5.2	331.6	331.6	331.8	0.2
AO	19,035	23	105	3.7	335.0	335.0	335.1	0.1
AP	19,294	26	70	5.6	337.4	337.4	337.6	0.2
AQ	19,441	27	80	4.9	340.8	340.8	340.9	0.1
AR	19,922	19	87	4.5	349.0	349.0	349.5	0.5
AS	20,035	20	71	5.5	349.4	349.4	350.1	0.7
AT	20,411	20	104	3.8	357.8	357.8	358.6	0.8
AU	20,535	19	81	4.9	358.4	358.4	359.1	0.7
AV	20,733	16	86	4.6	361.0	361.0	361.9	0.9
AW	21,072	20	87	4.5	364.6	364.6	365.1	0.5
AX	21,643	29	116	3.4	369.3	369.3	369.8	0.5
AY	22,146	29	82	4.8	374.1	374.1	374.4	0.3
AZ	22,225	35	194	2.0	377.1	377.1	378.1	1.0

[1] Stream distance in feet above confluence with Clackamas River

[2] Water-surface elevation computed without consideration of backwater effects from Clackamas River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

ROCK CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
Rock Creek								
BB	22,778	26	121	3.3	379.5	379.5	379.9	0.4
BB	23,024	17	99	4.0	382.3	382.3	382.7	0.4
BC	23,421	48	237	1.3	385.9	385.9	386.3	0.4
BD	23,837	15	38	7.9	386.6	386.6	386.7	0.1
BE	24,264	25	101	3.0	392.8	392.8	393.2	0.4
BF	24,837	27	73	4.2	397.8	397.8	398.0	0.2
BG	25,179	45	109	2.8	402.1	402.1	402.1	0.0
BH	25,937	45	94	3.2	407.5	407.5	408.3	0.8
BI	26,646	21	90	3.4	415.2	415.2	415.7	0.5
BJ	26,718	29	227	1.3	418.6	418.6	419.6	1.0
BK	26,954	34	145	2.1	418.8	418.8	419.8	1.0
BL	27,465	14	35	8.6	428.7	428.7	428.7	0.0
BM	27,941	12	58	5.3	442.7	442.7	442.9	0.2
BN	28,174	29	66	5.7	447.6	447.6	448.2	0.6
BO	28,311	22	79	3.8	453.2	453.2	453.9	0.7

[1] Stream distance in feet above confluence with Clackamas River

[2] Water-surface elevation computed without consideration of backwater effects from Clackamas River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

ROCK CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					FEET (NAVD)			
Rock Creek - Hemrick Road Tributary								
A	90	17	116	3.0	314.6	314.6	315.4	0.8
B	607	24	106	3.3	315.4	315.4	316.3	0.9
C	686	47	203	1.7	318.0	318.0	318.9	0.9
D	896	23	141	2.5	318.2	318.2	319.1	0.9
E	1,079	38	145	2.4	319.5	319.5	320.4	0.9
F	1,676	25	64	5.4	322.0	322.0	322.3	0.3
G	1,914	32	103	3.4	323.6	323.6	324.3	0.7
H	2,292	12	67	5.6	331.3	331.3	331.7	0.4
I	2,534	61	214	1.6	331.7	331.7	332.6	0.9
J	2,799	34	90	3.2	331.7	331.7	332.7	1.0
K	3,515	57	165	1.7	333.4	333.4	333.9	0.5
L	4,029	40	46	6.1	335.4	335.4	335.4	0.0
M	4,480	12	59	2.2	343.2	343.2	344.0	0.8
N	4,829	21	78	1.7	343.8	343.8	344.6	0.8
O	5,136	13	19	6.9	346.8	346.8	346.9	0.1
P	5,295	13	69	1.9	352.1	352.1	352.5	0.4
Q	5,897	19	41	3.2	354.1	354.1	355.0	0.9
R	6,414	14	51	2.6	358.3	358.3	358.7	0.4
S	6,654	24	54	2.4	359.4	359.4	360.1	0.7
T	7,019	14	26	5.0	365.0	365.0	364.8	0.0
U	7,126	150	534	0.3	374.8	374.8	374.8	0.0
V	7,409	61	201	0.7	374.8	374.8	374.8	0.0
W	8,059	22	23	5.8	376.8	376.8	376.8	0.0
X	8,279	9	40	3.3	381.8	381.8	382.6	0.8
Y	8,810	19	40	3.3	388.4	388.4	389.4	1.0
Z	9,080	4	49	2.7	407.1	407.1	407.4	0.3

[1] Stream distance in feet above confluence with Rock Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

ROCK CREEK - HEMRICK ROAD TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					FEET (NAVD)			
Rock Creek - Highway 224 Tributary								
A	274	4	14	10.4	105.7	105.7	105.9	0.2
B	916	7	31	4.7	139.2	139.2	140.2	1.0
C	1,310	6	22	6.8	151.6	151.6	152.5	0.9
D	1,647	5	16	10.2	166.9	166.9	166.9	0.0
E	1,801	18	167	0.9	180.0	180.0	180.0	0.0
F	2,443	8	18	8.3	185.8	185.8	185.8	0.0
G	3,295	17	55	2.7	198.6	198.6	198.7	0.1
H	3,488	34	214	0.7	213.3	213.3	213.8	0.5

[1] Stream distance in feet above confluence with Rock Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

ROCK CREEK - HIGHWAY 224 TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
Rock Creek - North Golf Course Tributary								
A	148	9	13	6.8	304.3	304.3	304.4	0.1
B	504	55	147	0.6	326.5	326.5	326.5	0.0
C	636	13	14	6.0	327.7	327.7	327.7	0.0
D	821	108	556	0.2	339.3	339.3	339.6	0.3
E	1,055	98	389	0.2	343.4	343.4	343.6	0.2
F	1,185	50	173	0.5	343.4	343.4	343.6	0.2
G	1,563	92	539	0.2	354.8	354.8	354.9	0.1
H	1,810	74	314	0.3	354.8	354.8	354.9	0.1
I	1,908	120	589	0.1	360.9	360.9	360.8	0.0
J	2,536	30	107	0.8	370.5	370.5	371.0	0.5
K	2,865	13	81	1.0	381.4	381.4	381.7	0.3

[1] Stream distance in feet above confluence with Rock Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

ROCK CREEK - NORTH GOLF COURSE TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					FEET (NAVD)			
Rock Creek - South Golf Course Tributary								
A	232	9	7	5.2	298.3	298.3	298.4	0.1
B	547	20	9	3.9	325.6	325.6	325.9	0.3
C	677	20	16	2.3	334.1	334.1	334.3	0.2
D	883	51	242	0.3	352.9	352.9	352.9	0.0
E	1,082	10	6	4.6	347.5	347.5	347.5	0.0
F	1,425	10	6	4.6	357.7	357.7	358.1	0.4
G	1,800	10	6	4.6	371.6	371.6	372.1	0.5
H	2,169	30	117	0.7	383.1	383.1	383.9	0.8

[1] Stream distance in feet above confluence with Rock Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

ROCK CREEK - SOUTH GOLF COURSE TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					FEET (NAVD)			
Rock Creek - 172nd Avenue Tributary								
A	520	11	17	6.9	241.3	241.3	241.3	0.0
B	1,023	18	22	5.3	265.0	265.0	265.1	0.1
C	1,474	11	19	6.2	282.2	282.2	282.3	0.1
D	2,084	13	19	6.1	306.8	306.8	306.9	0.1
E	2,183	50	272	0.4	324.2	324.2	324.3	0.1
F	2,487	15	49	2.4	324.3	324.3	324.3	0.0
G	2,685	13	27	4.4	327.8	327.8	328.5	0.7

[1] Stream distance in feet above confluence with Rock Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

ROCK CREEK - 172ND AVENUE TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
SALMON RIVER								
A	660	280	2,086	10.8	1,029.8	1,029.8	1,029.8	0.0
B	2,450	139	1,696	13.3	1,051.9	1,051.9	1,051.9	0.0
C	3,870	199	2,195	10.3	1,060.7	1,060.7	1,061.1	0.4
D	4,640	138	1,562	14.4	1,066.0	1,066.0	1,066.2	0.2
E	5,550	201	2,634	7.2	1,074.0	1,074.0	1,074.8	0.8
F	6,270	137	1,230	15.4	1,076.6	1,076.6	1,076.6	0.0
G	6,920	165	1,719	11.1	1,084.1	1,084.1	1,085.0	0.9
H	8,260	200	1,414	13.4	1,095.2	1,095.2	1,095.3	0.1
I	9,490	102	1,542	12.3	1,104.8	1,104.8	1,104.9	0.1
J	11,190	442	5,116	3.7	1,113.4	1,113.4	1,114.1	0.7
K	12,520	160	1,401	13.6	1,116.1	1,116.1	1,116.1	0.0
L	13,180	187	1,874	10.1	1,123.9	1,123.9	1,124.2	0.3
M	13,750	176	1,408	13.5	1,127.7	1,127.7	1,128.1	0.4
N	14,900	146	1,228	15.5	1,141.8	1,141.8	1,142.1	0.3
O	15,670	130	1,224	15.5	1,155.3	1,155.3	1,155.3	0.0
P	16,800	151	1,754	10.8	1,166.9	1,166.9	1,167.3	0.4
Q	18,459	160	1,411	13.5	1,178.8	1,178.8	1,179.2	0.4
R	19,180	250	2,166	8.8	1,186.6	1,186.6	1,187.1	0.5
S	19,900	240	2,101	9.0	1,192.1	1,192.1	1,192.8	0.7
T	20,720	208	1,586	12.0	1,200.6	1,200.6	1,200.6	0.0
U	21,700	210	2,181	8.9	1,209.3	1,209.3	1,210.0	0.7
V	22,380	198	2,195	8.7	1,213.2	1,213.2	1,213.7	0.5
W	23,180	241	2,452	4.3	1,217.7	1,217.7	1,218.3	0.6
X	23,530	222	1,666	6.3	1,218.6	1,218.6	1,219.1	0.5
Y	24,500	188	1,144	9.2	1,224.7	1,224.7	1,225.4	0.7
Z	25,240	188	1,578	12.0	1,233.9	1,233.9	1,234.6	0.7

[1] Stream distance in feet above confluence with Sandy River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET (NAVD))	WITH FLOODWAY (FEET (NAVD))	INCREASE
SALMON RIVER								
AA	26,090	127	1,323	14.4	1,245.1	1,245.1	1,245.9	0.8
AB	26,720	144	1,622	11.7	1,251.5	1,251.5	1,252.5	1.0
AC	27,370	103	1,486	12.5	1,256.1	1,256.1	1,256.8	0.7
AD	27,830	119	1,577	11.8	1,259.0	1,259.0	1,259.7	0.7
AE	28,440	108	1,222	15.2	1,263.0	1,263.0	1,263.8	0.8
AF	29,490	232	2,070	9.0	1,273.2	1,273.2	1,274.1	0.9
AG	30,030	336	1,957	9.5	1,276.3	1,276.3	1,276.7	0.4
AH	31,440	705	3,748	5.0	1,284.5	1,284.5	1,285.2	0.7
AI	32,400	381	1,986	9.4	1,293.3	1,293.3	1,293.3	0.0
AJ	33,020	395	2,286	8.1	1,298.9	1,298.9	1,299.7	0.8
AK	33,330	384	2,808	6.6	1,303.5	1,303.5	1,304.5	1.0
AL	34,030	483	2,233	8.3	1,306.7	1,306.7	1,306.7	0.0
AM	34,720	553	2,622	7.1	1,312.6	1,312.6	1,313.6	1.0
AN	35,480	367	1,907	9.8	1,321.0	1,321.0	1,321.0	0.0
AO	36,220	662	2,723	6.8	1,331.3	1,331.3	1,331.5	0.2
AP	36,790	568	2,597	7.2	1,340.4	1,340.4	1,340.6	0.2
AQ	36,995	380	1,877	9.9	1,341.9	1,341.9	1,342.0	0.1
AR	37,475	489	2,184	8.5	1,346.8	1,346.8	1,347.2	0.4
AS	38,005	175[3]	1,610	9.4	1,351.2	1,351.2	1,352.1	0.9
AT	38,295	300[3]	1,624	9.3	1,356.4	1,356.4	1,356.4	0.0
AU	38,675	336[3]	2,837	4.5	1,359.4	1,359.4	1,360.2	0.8
AV	38,975	351[3]	1,561	8.3	1,362.0	1,362.0	1,362.0	0.0
AW	39,405	405[3]	1,514	8.5	1,370.8	1,370.8	1,371.8	1.0
AX	39,945	300[2]	1,446	11.3	1,381.4	1,381.4	1,381.8	0.4
AY	40,325	230[2]	1,692	9.7	1,387.3	1,387.3	1,388.2	0.9
AZ	40,675	102	1,131	14.5	1,391.0	1,391.0	1,391.6	0.6

[1] Stream distance in feet above confluence with Sandy River

[2] Width includes island

[3] Width of main channel floodway (does not include right overbank)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
SALMON RIVER								
BA	41,405	124	1,411	11.6	1,400.3	1,400.3	1,401.0	0.7
BB	42,125	91	1,256	13.1	1,406.9	1,406.9	1,407.7	0.8
BC	42,625	86	1,016	16.1	1,411.5	1,411.5	1,412.1	0.6

[1] Stream distance in feet above confluence with Sandy River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

SALMON RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
SALMON RIVER NORTH CHANNEL								
A	700	308	2,045	4.2	1,217.6	1,217.6	1,218.3	0.7
B	1,090	141	752	11.3	1,219.5	1,219.5	1,219.8	0.3
C	1,540	143	1,029	8.3	1,226.0	1,226.0	1,226.7	0.7

[1] Stream distance in feet above confluence with Salmon River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
SANDY RIVER								
A	820	321	3,833	17.7	196.5	196.5	196.5	0.0
B	1,470	358	5,687	11.9	204.2	204.2	205.2	1.0
C	2,310	342	5,335	12.7	210.0	210.0	210.3	0.3
D	3,020	310	4,501	15.1	213.9	213.9	214.5	0.6
E	3,760	264	4,154	16.3	219.5	219.5	220.5	1.0
F	4,410	232	4,553	14.9	223.5	223.5	224.4	0.9
G	5,720	275	5,954	11.4	229.9	229.9	230.6	0.7
H	6,460	262	4,649	14.6	231.5	231.5	232.0	0.5
I	7,390	274	6,095	11.1	239.3	239.3	240.3	1.0
J	8,000	243	3,738	18.2	240.0	240.0	240.0	0.0
K	9,060	309	6,119	11.1	251.5	251.5	251.7	0.2
L	10,460	391	3,884	12.7	257.5	257.5	258.4	0.9
M	10,760	350	3,848	12.8	261.0	261.0	261.0	0.0
N	11,490	229	2,876	17.2	264.2	264.2	264.2	0.0
O	11,960	298	4,348	11.4	270.9	270.9	270.9	0.0
P	12,470	293	4,242	11. 6	272.5	272.5	273.3	0.8
Q	12,780	349	4,676	10.6	274.6	274.6	275.2	0.6
R	13,940	383	4,230	11. 7	280.1	280.1	280.6	0.5
S	14,610	373	3,995	12.4	285.9	285.9	285.9	0.0
T	15,740	439	4,513	10.9	297.0	297.0	297.1	0.1
U	16,270	392	6,689	7.4	303.2	303.2	304.0	0.8
V	17,550	286	3,439	14.4	312.4	312.4	312.4	0.0
W	18,270	375	5,926	8.3	319.8	319.8	320.0	0.2
X	18,630	406	5,578	8.9	320.4	320.4	320.6	0.2
Y	19,100	318	3,348	14.7	321.5	321.5	321.8	0.3
Z	19,740	329	3,736	13.2	326.2	326.2	326.6	0.4

[1] Stream distance in feet above Multnomah-Clackamas County boundary

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

SANDY RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
SANDY RIVER								
AA	20,300	222	2,636	18.7	329.0	329.0	329.0	0.0
AB	20,690	273	3,697	13.4	334.2	334.2	334.6	0.4
AC	21,010	297	3,680	13.4	336.8	336.8	336.8	0.0
AD	22,370	223	3,158	15.6	343.7	343.7	344.4	0.7
AE	23,030	310	5,147	9.6	349.9	349.9	350.4	0.5
AF	33,360	256	3,778	12.4	424.7	424.7	424.9	0.2
AG	34,140	257	3,862	12.2	428.9	428.9	429.4	0.5
AH	35,050	394	5,096	9.2	434.0	434.0	434.4	0.4
AI	35,780	225	2,879	16.3	436.5	436.5	437.5	1.0
AJ	37,040	210	3,640	12.9	446.7	446.7	447.0	0.3
AK	38,000	188	4,060	11. 6	462.8	462.8	463.3	0.5
AL	38,440	202	5,292	8.9	467.2	467.2	468.0	0.8
AM	39,020	316	5,313	8.8	468.3	468.3	469.2	0.9
AN	86,000	233	2,745	17.1	819.8	819.8	820.7	0.9
AO	88,140	201	2,802	16.8	836.2	836.2	837.0	0.8
AP	88,710	151	2,699	17.4	847.2	847.2	847.2	0.0
AQ	89,900	275	4,591	9.5	862.0	862.0	862.4	0.4
AR	91,750	278	2,691	16.2	873.5	873.5	873.5	0.0
AS	93,270	940	5,551	7.7	889.1	889.1	889.7	0.6
AT	93,470	659	4,284	10.0	891.5	891.5	891.6	0.1
AU	94,380	613	4,199	10.2	897.4	897.4	898.4	1.0
AV	95,200	527	3,810	11. 3	905.0	905.0	905.9	0.9
AW	98,150	521	4,491	9.6	927.0	927.0	928.0	1.0
AX	99,570	616	4,545	9.2	940.7	940.7	940.7	0.0
AY	101,960	619	3,307	13.0	958.8	958.8	958.8	0.0
AZ	103,750	455	3,187	13.5	975.0	975.0	975.0	0.0

[1] Stream distance in feet above Multnomah-Clackamas County boundary

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

SANDY RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
SANDY RIVER								
BA	104,810	113	1,860	23.1	983.8	983.8	983.8	0.0
BB	105,400	476	6,495	6.6	995.4	995.4	995.4	0.0
BC	106,880	592	3,699	11.6	998.8	998.8	998.8	0.0
BD	108,300	332	3,308	13.0	1,013.0	1,013.0	1,013.0	0.0
BE	109,270	855	5,153	8.3	1,022.2	1,022.2	1,022.9	0.7
BF	111,490	229	1,625	14.8	1,037.5	1,037.5	1,038.5	1.0
BG	112,510	737	3,778	6.4	1,050.3	1,050.3	1,051.3	1.0
BH	113,520	490	2,206	10.9	1,059.0	1,059.0	1,059.5	0.5
BI	114,360	443	2,315	10.4	1,071.4	1,071.4	1,071.7	0.3
BJ	114,970	400	2,643	9.1	1,076.8	1,076.8	1,077.7	0.9
BK	115,770	368	1,640	14.7	1,085.3	1,085.3	1,085.3	0.0
BL	116,690	147	1,486	16.2	1,094.7	1,094.7	1,095.4	0.7
BM	117,650	153	1,610	15.0	1,105.8	1,105.8	1,106.8	1.0
BN	118,650	516	2,624	9.2	1,119.3	1,119.3	1,119.5	0.2
BO	119,820	228	1,635	14.7	1,132.8	1,132.8	1,132.8	0.0
BP	120,800	329	2,789	8.6	1,142.4	1,142.4	1,143.0	0.6
BQ	121,750	136	1,338	18.0	1,153.3	1,153.3	1,153.5	0.2
BR	123,000	413	2,288	10.5	1,169.4	1,169.4	1,170.3	0.9
BS	124,160	651	1,897	12.7	1,186.0	1,186.0	1,186.0	0.0
BT	125,340	425	2,932	8.2	1,206.2	1,206.2	1,207.0	0.8
BU	126,730	250	1,897	12.7	1,220.7	1,220.7	1,220.9	0.2
BV	128,100	185	1,589	15.2	1,235.1	1,235.1	1,235.6	0.5
BW	129,050	764	2,902	8.3	1,247.4	1,247.4	1,248.1	0.7
BX	129,950	193	1,506	16.0	1,258.2	1,258.2	1,258.5	0.3
BY	131,010	630	3,488	6.9	1,273.6	1,273.6	1,274.3	0.7
BZ	131,870	765	1,550	14.6	1,283.9	1,283.9	1,284.8	0.9

[1] Stream distance in feet above Multnomah-Clackamas County boundary

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

SANDY RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
SANDY RIVER								
CA	132,930	672	2,603	9.3	1,299.8	1,299.8	1,299.8	0.0
CB	133,730	199	1,623	14.9	1,313.8	1,313.8	1,313.8	0.0
CC	134,750	129	1,347	17.9	1,329.5	1,329.5	1,329.5	0.0
CD	135,460	163	1,741	13.8	1,339.5	1,339.5	1,339.9	0.4
CE	135,990	387	2,789	8.6	1,344.8	1,344.8	1,345.0	0.2
CF	136,760	124	1,309	18.4	1,352.8	1,352.8	1,353.6	0.8
CG	137,510	140	1,359	17.7	1,368.3	1,368.3	1,368.3	0.0
CH	138,370	208	2,007	12.0	1,380.5	1,380.5	1,381.5	1.0
CI	139,410	205	1,067	11.5	1,394.4	1,394.4	1,394.4	0.0
CJ	140,070	114	823	15.0	1,406.7	1,406.7	1,406.7	0.0
CK	140,750	265	1,081	11.4	1,421.4	1,421.4	1,421.8	0.4
CL	141,520	128	837	14.7	1,433.8	1,433.8	1,433.8	0.0
CM	142,480	79	778	15.8	1,449.0	1,449.0	1,449.1	0.1
CN	142,880	188	1,198	8.2	1,456.8	1,456.8	1,456.8	0.0
CO	143,400	86	614	15.9	1,462.0	1,462.0	1,462.8	0.8
CP	144,030	228	1,024	9.6	1,474.9	1,474.9	1,475.2	0.3
CQ	144,890	93	648	15.1	1,490.0	1,490.0	1,490.3	0.3
CR	145,630	125	827	11.9	1,503.7	1,503.7	1,504.6	0.9
CS	146,410	153	795	12.3	1,519.5	1,519.5	1,520.5	1.0
CT	146,890	480	2,208	4.4	1,526.9	1,526.9	1,527.8	0.9
CU	147,040	655	1,057	9.3	1,530.5	1,530.5	1,531.2	0.7
CV	148,140	415	1,102	8.9	1,554.0	1,554.0	1,554.0	0.0
CW	148,490	132	730	13.4	1,559.4	1,559.4	1,559.4	0.0
CX	148,940	304	1,186	8.3	1,568.4	1,568.4	1,568.4	0.0
CY	149,340	243	1,156	8.5	1,576.1	1,576.1	1,576.9	0.8
CZ	149,770	189	781	12.6	1,585.7	1,585.7	1,585.7	0.0

[1] Stream distance in feet above Multnomah-Clackamas County boundary

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

SANDY RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
SANDY RIVER								
DA	150,450	349	711	10.8	1,599.6	1,599.6	1,600.2	0.6
DB	151,150	445	1,085	9.0	1,616.3	1,616.3	1,616.3	0.0
DC	151,530	626	1,377	7.3	1,623.3	1,623.3	1,623.5	0.2
DD	152,480	115	782	12.5	1,639.9	1,639.9	1,639.9	0.0
DE	153,080	315	1,109	8.8	1,650.4	1,650.4	1,650.5	0.1
DF	153,480	102	669	14.7	1,658.8	1,658.8	1,659.5	0.7
DG	154,070	101	584	14.3	1,672.9	1,672.9	1,672.9	0.0
DH	154,650	269	1,148	8.5	1,685.2	1,685.2	1,685.3	0.1
DI	155,700	211	723	11.2	1,705.9	1,705.9	1,705.9	0.0
DJ	156,870	453	579	8.6	1,728.7	1,728.7	1,729.7	1.0
DK	158,240	131	723	13.5	1,760.1	1,760.1	1,760.1	0.0
DL	159,420	129	579	10.7	1,783.7	1,783.7	1,784.4	0.7
DM	159,980	89	470	13.2	1,799.2	1,799.2	1,799.2	0.0
DN	160,700	110	505	12.3	1,822.6	1,822.6	1,822.9	0.3
DO	161,180	157	577	10.8	1,834.8	1,834.8	1,834.9	0.1
DP	161,700	120	545	11.4	1,848.6	1,848.6	1,848.7	0.1
DQ	162,570	163	642	9.7	1,876.1	1,876.1	1,877.0	0.9

[1] Stream distance in feet above Multnomah-Clackamas County boundary

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

SANDY RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
SEELY DITCH								
A	80	21	77	10.1	94.4	68.4[2]	68.5[2]	0.1
B	160	28	79	9.9	94.4	72.0[2]	72.0[2]	0.0
C	428	32	132	5.9	94.4	77.1[2]	77.5[2]	0.4
D	688	26	112	6.9	94.4	79.8[2]	80.3[2]	0.5
E	886	26	78	10.0	94.4	84.1[2]	84.2[2]	0.1
F	1,158	25	103	7.6	94.4	90.6[2]	91.4[2]	0.8
G	1,286	29	101	7.7	94.4	92.9[2]	93.6[2]	0.7
H	1,407	31	84	9.3	97.6	97.6	97.6	0.0
I	1,511	22	74	10.4	102.5	102.5	103.1	0.6
J	1,727	23	76	10.3	112.4	112.4	112.6	0.2
K	1,879	21	73	10.6	118.8	118.8	118.9	0.1
L	1,989	18	70	11.2	124.9	124.9	125	0.1
M	2,154	25	100	7.8	129.6	129.6	130.3	0.7
N	2,289	49	300	2.6	135.5	135.5	135.7	0.2
O	2,597	47	234	3.3	135.7	135.7	135.8	0.1
P	3,265	43	207	3.8	138.2	138.2	138.2	0.0
Q	3,479	41	184	4.2	139.5	139.5	139.5	0.0
R	3,776	24	117	6.7	139.7	139.7	139.8	0.1
S	3,952	47	202	2.9	140.6	140.6	140.6	0.0
T	4,202	38	147	4.0	140.7	140.7	140.8	0.1
U	4,412	40	153	3.8	141.0	141.0	141	0.0
V	4,713	39	162	3.6	141.5	141.5	141.5	0.0
W	5,318	37	165	3.5	142.0	142.0	142	0.0
X	6,098	28	127	4.6	143.1	143.1	143.1	0.0

[1] Stream distance in feet above confluence with Willamette River

[2] Water surface elevations computed without consideration of backwater effects from Willamette River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

SEELY DITCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
STILL CREEK								
A	100	70	429	13.3	1,578.3	1,578.0[2]	1,578.0[2]	0.0
B	330	75	448	12.7	1,583.3	1,583.3	1,583.5	0.2
C	650	57	504	11.3	1,590.5	1,590.5	1,591.5	1.0
D	1,020	62	436	13.1	1,598.9	1,598.9	1,598.9	0.0
E	1,380	42	356	16.0	1,607.3	1,607.3	1,607.3	0.0
F	1,610	76	458	12.4	1,614.4	1,614.4	1,615.0	0.6
G	2,240	38	412	13.8	1,627.8	1,627.8	1,628.6	0.8
H	2,910	67	448	12.7	1,645.3	1,645.3	1,645.8	0.5
I	3,710	84	673	8.5	1,661.1	1,661.1	1,661.7	0.6
J	4,460	75	439	13.0	1,688.5	1,688.5	1,688.6	0.1
K	4,990	73	483	11.8	1,703.6	1,703.6	1,704.6	1.0
L	5,760	71	641	8.9	1,716.4	1,716.4	1,716.4	0.0
M	6,360	64	455	12.5	1,721.2	1,721.2	1,721.5	0.3
N	6,870	90	554	10.3	1,727.2	1,727.2	1,727.7	0.5
O	7,080	143	1,413	4.0	1,734.1	1,734.1	1,734.1	0.0
P	7,670	141	1,471	3.9	1,734.4	1,734.4	1,734.8	0.4
Q	8,080	99	631	9.0	1,735.0	1,735.0	1,735.5	0.5
R	9,040	91	542	10.5	1,744.1	1,744.1	1,745.0	0.9
S	9,950	94	819	7.0	1,750.8	1,750.8	1,751.6	0.8
T	10,840	110	676	8.4	1,755.3	1,755.3	1,756.1	0.8
U	11,950	117	757	7.5	1,769.9	1,769.9	1,770.5	0.6
V	12,970	95	490	11.6	1,783.4	1,783.4	1,783.4	0.0
W	13,850	152	650	8.8	1,797.2	1,797.2	1,798.0	0.8
X	14,670	103	647	8.8	1,809.3	1,809.3	1,809.8	0.5

[1] Stream distance in feet above confluence with Zig Zag River

[2] Water-surface elevations computed without consideration of backwater effects from Zig Zag River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

STILL CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION[2]			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
TICKLE CREEK								
A	24,093	23	75	8.5	697.5	697.5	698.0	0.5
B	24,958	52	104	6.1	715.4	715.4	715.5	0.1
C	25,463	24	67	9.5	731.9	731.9	732.0	0.1
D	26,588	27	76	8.3	750.1	750.1	750.1	0.0
E	27,708	23	68	9.3	772.8	772.8	773.1	0.3
F	28,163	24	73	8.7	782.9	782.9	783.1	0.2
G	29,163	34	221	2.9	802.8	802.8	802.8	0.0
H	30,063	50	236	4.0	811.7	811.7	812.6	0.9
I	30,503	32	72	8.8	819.1	819.1	819.1	0.0
J	30,628	115	369	2.8	823.2	823.2	823.9	0.7
K	30,953	80	196	5.3	823.1	823.1	824.1	1.0
L	32,598	32	82	7.7	858.7	858.7	859.0	0.3
M	33,108	33	81	7.8	867.9	867.9	868.0	0.1
N	33,952	30	72	8.8	889.8	889.8	889.8	0.0
O	35,093	29	43	7.0	913.7	913.7	913.7	0.0
P	35,533	31	44	6.8	925.8	925.8	925.8	0.0
Q	36,343	49	288	1.1	954.4	954.4	954.5	0.1
R	37,218	32	45	6.8	974.1	974.1	974.1	0.0
S	38,093	30	44	6.9	999.1	999.1	999.1	0.0

[1] Stream distance in feet above mouth

[2] Water-surface elevations computed without consideration of backwater effects

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

TICKLE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
TUALATIN RIVER								
A	17	432	4,878	5.7	75.3	70.3[2]	70.3[2]	0.0
B	766	175	2,455	12.0	75.3	72.6[2]	72.6[2]	0.0
C	1,062	176	2,473	14.1	75.3	74.3[2]	74.5[2]	0.2
D	2,838	170	2,796	12.0	85.5	85.5	86.1	0.6
E	5,519	173	2,566	11.3	98.9	98.9	99.3	0.4
F	7,036	473	5,301	7.5	105.2	105.2	105.6	0.4
G	8,607	211	3,531	7.9	107.7	107.7	108.1	0.4
H	8,827	220	3,443	8.1	108.5	108.5	108.9	0.4
I	11,403	624	9,234	4.9	110.9	110.9	111.2	0.3
J	12,897	602	7,702	5.9	111.2	111.2	111.5	0.3
K	14,143	605	7,276	3.8	111.8	111.8	112.2	0.4
L	16,267	281	4,701	8.4	113.1	113.1	113.6	0.5
M	18,088	291	5,169	7.7	114.6	114.6	115.2	0.6
N	18,188	241	3,143	9.6	116.6	116.6	116.6	0.0
O	18,453	201	3,130	9.4	117.0	117.0	117.0	0.0
P	21,714	199	5,663	5.1	119.1	119.1	119.2	0.1
Q	22,002	233	5,523	5.1	119.2	119.2	119.3	0.1
R	22,260	265	5,966	4.8	119.6	119.6	119.7	0.1
S	22,928	254	5,614	5.1	119.8	119.8	119.9	0.1
T	25,332	226	5,671	5.1	120.8	120.8	120.9	0.1
U	27,404	267	4,785	6.6	121.7	121.7	121.8	0.1
V	28,016	265	6,471	4.3	122.5	122.5	122.6	0.1
W	28,211	283	6,547	4.4	122.6	122.6	122.7	0.1
X	29,049	303	6,142	4.9	122.8	122.8	122.9	0.1
Y	30,032	440	7,861	3.3	123.3	123.3	123.4	0.1
Z	31,357	605	9,279	3.2	123.5	123.5	123.7	0.2

[1] Stream distance in feet above confluence with Willamette River

[2] Water-surface elevations computed without consideration of backwater effects from Willamette River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

TUALATIN RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
TUALATIN RIVER								
AA	34,487	232	5,117	5.5	124.4	124.4	124.5	0.1
AB	34,874	295	5,702	5.5	124.7	124.7	124.8	0.1
AC	35,845	410	6,834	5.5	125.0	125.0	125.1	0.1
AD	37,920	509	7,008	6.3	125.3	125.3	125.4	0.1
AE	38,516	446	6,462	6.4	125.5	125.5	125.5	0.0
AF	40,752	380	6,074	5.9	125.9	125.9	126.1	0.2

[1] Stream distance in feet above confluence with Willamette River

[2] Water-surface elevations computed without consideration of backwater effects from Willamette River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					FEET (NAVD)			
Tualatin River Overflow to Rivergrove								
A	678	475	1,942	1.7	121.2	121.2	122	0.8
B	931	511	3,360	0.9	121.4	121.4	122.3	0.9
C	1,157	284	1,781	1.7	122.2	122.2	123.1	0.9
D	1,741	428	3,064	1.0	123.2	123.2	124.0	0.8

[1] Feet above Oswego Canal

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

TUALATIN RIVER OVERFLOW TO RIVERGROVE

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET (NAVD))	WITH FLOODWAY (FEET (NAVD))	INCREASE
WILLAMETTE RIVER								
A	91,661	964/460[2]	58,628	6.4	34.7	34.7	35.4	0.7
B	94,161	985/390[2]	63,554	5.9	35.3	35.3	36.0	0.7
C	96,691	815/220[2]	51,043	7.3	35.6	35.6	36.3	0.7
D	98,381	1,325/500[2]	85,767	4.4	36.3	36.3	37.0	0.7
E	100,861	1,519/1,020[2&3]	63,590	5.9	36.4	36.4	37.0	0.6
F	104,979	955	52,697	7.1	36.7	36.7	37.4	0.7
G	105,719	778	47,756	7.9	36.7	36.7	37.4	0.7
H	106,469	1,005	62,300	6.0	37.4	37.4	38.1	0.7
I	110,312	895	43,115	8.7	37.6	37.6	38.1	0.5
J	111,912	550	44,879	8.4	38.1	38.1	38.9	0.8
K	113,540	520	31,029	12.1	39.3	39.3	40.0	0.7
L	115,130	820	54,496	6.9	42.7	42.7	43.4	0.7
M	118,034	578	37,630	10.0	44.0	44.0	44.7	0.7
N	122,034	1,440	64,809	5.8	46.1	46.1	46.8	0.7
O	125,434	800	46,296	8.1	46.2	46.2	46.9	0.7
P	126,834	1,370	55,501	6.8	46.8	46.8	47.5	0.7
Q	129,034	1,230	52,785	7.1	47.2	47.2	47.9	0.7
R	131,034	1,335	48,241	7.8	47.7	47.7	48.4	0.7
S	143,020	888	42,725	8.0	74.5	74.5	74.7	0.2
T	145,970	1,040	47,541	7.2	74.9	74.9	75.1	0.2
U	149,170	1,050	51,473	6.6	75.2	75.2	75.3	0.1
V	165,070	665	31,973	10.3	84.3	84.3	85.3	1.0
W	168,300	1,450	66,319	4.9	86.4	86.4	87.3	0.9
X	170,950	1,057	47,397	6.9	86.6	86.6	87.5	0.9
Y	174,825	1,100	52,109	6.3	87.5	87.5	88.4	0.9
Z	176,685	705	37,988	8.6	87.5	87.5	88.4	0.9

[1] Stream distance in feet above mouth

[2] Width/width within study area

[3] Values calculated from original model prior redelineation

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

WILLAMETTE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
WILLAMETTE RIVER								
AA	180,960	818	36,339	9.0	88.7	88.7	89.5	0.8
AB	184,535	760	33,080	9.9	89.8	89.8	90.6	0.8
AC	188,435	2,740[2]	35,841	8.0	91.7	91.7	92.5	0.8
AD	193,410	750	43,652	6.6	92.8	92.8	93.6	0.8
AE	200,200	747	42,342	6.8	93.6	93.6	94.3	0.7
AF	203,665	710	42,872	6.7	94.2	94.2	95.0	0.8
AG	205,610	731	38,605	7.4	94.5	94.5	95.3	0.8
AH	209,645	716	38,580	7.4	95.3	95.3	96.1	0.8
AI	213,795	690	42,290	6.7	96.1	96.1	97.0	0.9
AJ	217,760	680	41,838	6.9	96.6	96.6	97.5	0.9
AK	221,910	710	43,332	6.6	97.2	97.2	98.1	0.9
AL	223,590	730	43,718	6.6	97.4	97.4	98.3	0.9
AM	225,235	700	43,336	6.6	97.6	97.6	98.4	0.8
AN	227,010	709	43,605	6.6	97.8	97.8	98.6	0.8
AO	228,615	680	39,287	7.3	97.9	97.9	98.7	0.8

[1] Stream distance in feet above mouth.

[2] Width includes portion of Molalla River floodway

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

WILLAMETTE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
ZIGZAG RIVER								
A	220	161	1,026	12.8	1,390.9	1,390.9	1,391.1	0.2
B	695	239	1,438	9.1	1,397.7	1,397.7	1,398.1	0.4
C	1,050	169	1,154	11.3	1,404.3	1,404.3	1,404.9	0.6
D	2,155	151	1,085	12.1	1,421.2	1,421.2	1,421.2	0.0
E	2,745	185	1,269	10.3	1,429.5	1,429.5	1,429.8	0.3
F	3,205	169	996	13.2	1,437.1	1,437.1	1,437.3	0.2
G	3,555	191	1,120	11. 7	1,442.8	1,442.8	1,442.9	0.1
H	4,170	230	1,243	10.5	1,449.6	1,449.6	1,450.4	0.8
I	4,870	223	1,360	9.6	1,461.2	1,461.2	1,461.4	0.2
J	5,720	318	1,451	9.0	1,477.6	1,477.6	1,478.6	1.0
K	6,485	410	1,739	7.5	1,490.7	1,490.7	1,491.7	1.0
L	7,625	349	1,970	6.7	1,506.2	1,506.2	1,507.0	0.8
M	8,150	343	1,411	9.3	1,513.7	1,513.7	1,514.0	0.3
N	8,845	377	1,727	7.6	1,526.8	1,526.8	1,527.1	0.3
O	9,820	601	2,170	6.0	1,540.9	1,540.9	1,541.9	1.0
P	11,160	158	882	13.5	1,570.5	1,570.5	1,570.6	0.1
Q	11,560	116	776	12.6	1,579.1	1,579.1	1,579.1	0.0
R	12,205	80	657	14.9	1,592.6	1,592.6	1,592.6	0.0
S	12,505	151	809	12.1	1,598.5	1,598.5	1,598.5	0.0
T	12,735	86	674	14.5	1,605.0	1,605.0	1,605.0	0.0
U	13,375	154	1,046	9.4	1,616.5	1,616.5	1,616.5	0.0
V	13,755	118	703	13.9	1,628.2	1,628.2	1,628.2	0.0
W	13,955	105	686	14.3	1,633.3	1,633.3	1,633.3	0.0
X	14,410	118	704	13.9	1,650.9	1,650.9	1,650.9	0.0
Y	14,900	256	876	11.2	1,676.9	1,676.9	1,676.9	0.0
Z	15,350	163	1,254	7.8	1,683.5	1,683.5	1,683.5	0.0

[1] Stream distance in feet above confluence with Sandy River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

ZIGZAG RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
ZIGZAG RIVER								
AA	15,800	118	714	13.7	1,703.6	1,703.6	1,703.7	0.1
AB	16,040	131	1,030	9.5	1,709.3	1,709.3	1,709.3	0.0
AC	16,610	164	923	10.6	1,722.0	1,722.0	1,722.0	0.0
AD	16,915	230	1,093	9.0	1,730.1	1,730.1	1,730.2	0.1
AE	17,250	226	1,148	8.5	1,737.4	1,737.4	1,737.4	0.0
AF	17,990	342	1,264	7.8	1,745.3	1,745.3	1,745.3	0.0
AG	18,410	213	1,086	9.0	1,763.1	1,763.1	1,763.4	0.3
AH	19,090	192	1,091	9.0	1,777.0	1,777.0	1,777.1	0.1
AI	19,660	108	770	12.7	1,801.1	1,801.1	1,801.1	0.0
AJ	20,465	100	741	13.2	1,823.1	1,823.1	1,823.1	0.0
AK	21,325	175	1,476	6.6	1,837.2	1,837.2	1,837.2	0.0
AL	22,050	207	572	9.6	1,873.5	1,873.5	1,873.5	0.0
AM	22,760	85	431	12.8	1,901.9	1,901.9	1,901.9	0.0
AN	23,500	89	485	11.3	1,922.8	1,922.8	1,922.8	0.0
AO	23,780	155	636	8.6	1,930.1	1,930.1	1,930.1	0.0
AP	24,325	44	344	16.0	1,946.6	1,946.6	1,946.7	0.1
AQ	26,075	81	425	12.9	2,000.2	2,000.2	2,000.2	0.0
AR	27,295	208	521	10.6	2,037.8	2,037.8	2,037.8	0.0
AS	28,555	86	502	11.0	2,063.5	2,063.5	2,063.8	0.3
AT	28,845	67	411	13.4	2,072.0	2,072.0	2,072.1	0.1
AU	29,350	86	365	11.5	2,116.6	2,116.6	2,116.6	0.0
AV	29,775	155	389	10.8	2,141.7	2,141.7	2,141.7	0.0
AW	30,940	91	423	9.9	2,177.5	2,177.5	2,177.5	0.0
AX	31,775	136	463	9.1	2,226.1	2,226.1	2,226.1	0.0
AY	32,170	84	365	11.5	2,236.5	2,236.5	2,236.5	0.0
AZ	32,770	70	338	12.4	2,266.8	2,266.8	2,266.8	0.0

[1] Stream distance in feet above confluence with Sandy River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

ZIGZAG RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						FEET (NAVD)		
ZIGZAG RIVER								
BA	33,850	92	390	10.8	2,312.4	2,312.4	2,312.4	0.0
BB	34,685	100	417	10.1	2,340.4	2,340.4	2,340.4	0.0
BC	35,455	81	393	10.7	2,380.5	2,380.5	2,380.5	0.0
BD	36,330	91	368	11.4	2,429.1	2,429.1	2,429.1	0.0

[1] Stream distance in feet above confluence with Sandy River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR
AND INCORPORATED AREAS

FLOODWAY DATA

ZIGZAG RIVER

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base (1-percent-annual-chance) flood elevations (BFEs) or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by detailed methods. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to areas of 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile (sq. mi.), and areas protected from the base flood by levees. No BFEs or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent-annual-chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The countywide FIRM presents flooding information for the entire geographic area of Clackamas County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the County identified as flood-prone. This countywide FIRM also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community are presented in Table 6, "Community Map History."

7.0 OTHER STUDIES

A USACE Flood Plain Information report for the Canby-Barlow-Wilsonville area was published in 1970 (Reference 5). The report includes high water profiles for the Willamette, Molalla, and pudding Rivers. In that report, the 1-percent-annual-chance flood elevations on the Willamette River were approximately 3 feet higher than the 1-percent-annual-chance flood elevations used in this study. On the Molalla River, at some locations, the 1-percent-annual-chance flood elevations were lower in the USACE study. The greatest difference was approximately 2 feet at Knights Bridge. On the Pudding River, the 1-percent-annual-chance flood profiles vary less than 1 foot between the report and this study. Differences in flood heights between the Flood Plain Information report and this study are attributed to the updated flow data for this study, which were based on longer stream records, and to the refinement of the hydraulic analysis by using additional cross sections.

A USACE Flood Plain Information report for the Milwaukie-Oak Grove-Lake Oswego area was published in 1970 (Reference 7). The 1-percent-annual-chance flood elevations for the Willamette River vary by less than 1 foot between the Flood Plain Information report and this study. For Johnson Creek, the 1-percent-annual-chance flood elevations vary by approximately 1 foot. The differences in flood heights are attributed to the improved data obtained for this study.

A USACE Flood Plain Information report for the Oregon City-West Linn-Gladstone-Jennings Lodge area was published in 1970 (Reference 6). The 1-percent-annual-chance flood elevations for the Willamette, Tualatin, and Clackamas Rivers and Abernethy Creek vary by 1 foot or less between the Flood Plain Information report and this study. The differences in flood heights are attributed to the improved data obtained for this study.

The SCS has published a flood hazard analysis report for the Upper Sandy River and its tributaries (Reference 51). The 1-percent-annual-chance flood elevations presented in the SCS report for the Salmon River, Sandy, and Zigzag Rivers and Still Creek vary slightly from those presented in this study. These differences are due to improved hydrologic and topographic data and the use of a more detailed hydraulic model in this study.

This countywide FIS incorporates the results of previously-issued FISs within Clackamas County and Adjacent counties. This FIS report either supercedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the NFIP.

No previous studies have been prepared for Cities of Damascus, Estacada, Johnson City, and Molalla.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISION DATE(S)
Barlow, City of	January 10, 1975		May 5, 1981	
Canby, City of	November 16, 1973	November 28, 1975	June 15, 1984	
Damascus, City of	March 1, 1978 (Clackamas County)		March 1, 1978 (Clackamas County)	
*Estacada, City of	NA		NA	
Gladstone, City of	April 5, 1974	June 25, 1976	March 15, 1977	
Happy Valley, City of	December 20, 1974		December 4, 1979	
*Johnson City, City of	NA		NA	
Lake Oswego, City of	June 14, 1974	June 11, 1976 May 25, 1982	August 4, 1987	
Milwaukie, City of	April 5, 1974	June 25, 1976	June 18, 1980	
*Molalla, City of	NA		NA	
Oregon City, City of	December 28, 1973	June 4, 1976	February 15, 1980	
Rivergrove, City of	December 6, 1974	April 22, 1977	August 4, 1987	
Sandy, City of	April 12, 1974	December 19, 1975	December 11, 1979	July 19, 2000
West Linn, City of	December 17, 1973	August 20, 1976	March 15, 1977	
Wilsonville, City of	March 29, 1974	August 6, 1976	January 6, 1982	
Clackamas County Unincorporated Areas	March 1, 1978		March 1, 1978	August 4, 1987 July 19, 2000

*Non-floodprone

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

CLACKAMAS COUNTY, OR AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting Federal Insurance and Mitigation Division, FEMA Region X, Federal Regional Center, 130 228th Street, Southwest, Bothell, Washington 98021-9796.

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