Section 3: Study Area Characteristics

3.1 General

The City of Canby is located 25 miles south of Portland, Oregon in the northern Willamette Valley. The City is characterized by near level terrain, on a low terrace between the Willamette River to the north and the Molalla River to the south and west. The City covers approximately 2,084 acres within City limits, and approximately 3,384 acres within the UGB. The 2010 census estimates 15,829 citizens in the City.

Much of the text in Sections 3.1 and 3.2 is taken directly from the 1994 City of Canby Storm Drainage Master Plan completed by Curran-McLeod, Inc. Consulting Engineers [SDMP 1994}. The text has been edited and updated, where appropriate.

3.1.1 Economy

The City lies in the heart of very productive agricultural lands and accordingly, the City's economic growth has traditionally been tied to local agriculture. The study area is surrounded by large farm tracts which produce a variety of products, most notably row crops, fruits, nuts, and berries, as well as nursery stock. More recently, the City has experienced growth due to the demand for housing from the nearby metropolitan area.

Economic development resulting in employment opportunities in the urban area of the City has been slow. This is due, in part, to the demographics of the population and the relatively close location of other larger employment centers which encourages commuting. The City has taken steps towards diversification into commercial, industrial, professional, and other service related opportunities to actively promote employment opportunities within the City.

Canby's small town, rural atmosphere also attracts individuals desiring to escape more congested urban areas. This is reflected by the fact that approximately 75 percent of the working residents in Canby commute to nearby communities such as Wilsonville, Salem or the Greater Portland area for employment. Again, a contributing factor to this phenomenon is the lack of locally available employment opportunities and the willingness of individuals to commute from the Canby area to other communities.

3.2 Existing Environment

3.2.1 Geography

The City of Canby is located in the Willamette Valley which is the population center of the State of Oregon. The Willamette Valley is nestled between the Coast and Cascade Mountain Ranges and is from 20 to 40 miles wide and 130 miles long extending from Eugene-Springfield in the south to Portland in the north [SDMP 1994a].

The Canby area is bordered to the east and south by the Molalla River and to the north by the Willamette River. The Molalla River converges with the Willamette River northwest of the City.

The Willamette River is the major waterway in the Willamette Valley draining a total of 11,200 square miles [SDMP 1994a]. The Willamette provides significant recreational opportunities, serves as a major transportation link, provides water for agricultural, municipal and industrial uses and provides habitat for significant wildlife populations.

The City is accessible from the Interstate 5 corridor and Interstate 205 via state Hwy 99E. The transportation system provides direct connections to the surrounding communities of Oregon City, Woodburn, and Salem as well as the greater Portland metropolitan area. The City is also on the main north-south Union Pacific Rail line.

3.2.2 Topography

The community of Canby is located on a relatively flat terrace overlooking the Willamette and Molalla Rivers. With few exceptions, only gentle changes in the topography of less than 30 feet occur within the City limits and UGB (between 120 to 170 feet above mean sea level). This can be easily observed throughout the residential, industrial and commercial districts.

South and West of the City, the landscape drops abruptly at the Molalla River to an elevation of approximately 80 feet. This is very evident when approaching the City from the west on Knights Bridge Rd or Hwy 99E or from the south across Goods Bridge on Ivy Street (St). This drop along the Molalla River establishes a natural boundary for the area.

At the northern extreme of the UGB, where the UGB extends to the Willamette River, the topography gradually changes. This area slopes to the Willamette River, dropping from an elevation of approximately 130 feet to an elevation of 100 feet at the City's wastewater treatment facility.

To the east of Canby, the topography changes very little until beyond the UGB, where the ground has undulating gentle hills in the southeastern areas and steep rocky cliffs in the northeastern areas along the Willamette River.

3.2.3 Geology

The area we know today as the Willamette Valley was at one time part of the Oligocene ocean continental shelf extending from the cascades to beyond the current coast line. With uplifting of the Coast Range during the Miocene epoch, the trough like shape of the Willamette Valley was created. Later, during the Miocene, basaltic lava from fissures and vents in northeastern Oregon poured into the Willamette Valley where they reached as far south as Salem [SDMP 1994a]. Volcanic activity was renewed along the western edge of the Cascade Mountains at the close of the Miocene epoch, culminating in the deposition of the Sardine Formation. This formation is composed of agglomerates, flow breccias, mud flows, and lavas.

Low lands and lakes were formed by folding that occurred during the Pliocene. The low lands and lakes later filled with sediments from upland areas. These sediments, the Sandy River Mudstone and overlaying Troutdale Formation were then subjected to warping and subsequent erosion. Also, during the Pliocene, volcanism preceded the viscous lavas, agglomerates, and flow breccias of the Boring Lava. In present-day areas of Clackamas County (County) where

these lava flows are exposed and thin, weathering has nearly completely altered the lava flows to red clay soils.

Following the Boring Lava event, gravel and finer sediments were deposited in the Portland area. Glacial floods produced channeled scab lands and deltaic deposits of torrentially cross-bedded gravels. Continued erosion by Willamette Valley river systems, earthquakes and weathering of the area through geologic time, continued to carve and shape the Willamette Valley into its shape today. In the Canby area, this has resulted in a terrace overlooking the Willamette and Molalla Rivers.

The Oregon Department of Geology and Mineral Industries identified the prominent Surficial Geologic Units in the Canby Area [SDMP 1994b]. The results of the study were published in 1979. From the study, there are predominantly Alluviums and Lacustrine Sediments underlying the Canby urban area. The Lacustrine Sediments are unconsolidated cross-bedded to graded sedimentary beds deposited by the late Pleistocene glacial floods. There are three classifications of these sediments: Qws, Qls and Qdg. The characteristics of the Alluvium and Lacustrine Sediments are identified in Table 3.1 and the approximate limits of each of these series are depicted in Figure 1.

Table 3.1 Surficial Geologic Units

Classification	Characteristics
Lacustrine Sediments	
Qws	Lacustrine fine sandy silt and clay deposited up to 350 feet elevation. Beds range from a few inches to several feet thick. Occurs along the valleys of the Tualatin and other tributaries of the Willamette River.
Qls	Lacustrine and fluvial unconsolidated stratified to cross bedded sand and silt and occasional lenses of pebbles to gravel. Occurs along the Willamette River. Equivalent to lacustrine sands (Qls) and sand and silt deposits (Qs).
Qdg	Deltaic deposits of sand, gravel, and boulders up to 8 feet in diameter; torrential cross-bedding.
Alluvium	
Qal/Pt	Unconsolidated sand, gravel, and cobbles within stream channels and on adjacent flood plains; sandy silt up to 10 feet thick overlies gravel on flood plains.

In general, the Lacustrine Sediments are well drained when on terraces. However, when located in concave areas and within drainage ways, they are poorly drained. From Figure 1 it can be seen that the Alluvium is located adjacent to the Willamette River. This area has, in the past, been subject to flooding and has a high groundwater table. Thus, the Alluvium surficial unit is anticipated to be poorly drained during winter wet weather periods.

Additional description of the existing local geology underlying the City of Canby is provided in GSI's report "Groundwater Protectiveness Demonstrations and Risk Prioritization for Underground Injection Control (UIC) Devices" attached as Appendix C. This describes the

geology where the City's UICs are located as the "coarse-grained facies of the catastrophic flood deposits (unit Qfc)."

3.2.4 Soils

United States Department of Agriculture, Soil Conservation Service (SCS) information was used in identifying soil types in Canby. The approximate extent of each soil type is shown in Figure 2. SCS classifications indicate the effects the soil features will have on the infiltration and drainage of stormwater in the Canby area [City of Canby, 2012]. Soil characteristics were used to calculate infiltration rates during modeling of pervious areas.

As can be seen from Figure 2, the predominate soils are Canderly Sandy Loam (12A) and Latourell Loam (53A, 53B, and 53C) with small inclusions of Amity Silt loam (3) and McBee Silt Clay Loam (56), Newberg Fine Sandy Loam (67), Newberg Loam (68), Willamette Silt Loam (68A) and Xerochrepts and Haploxerolls (92F).

3.2.4.1 Canderly Sandy Loam, (12A)

The Canderly Series consists of deep somewhat excessively drained soils on terraces to a depth of 60 inches or more. These soils have moderately rapid permeability of from 2.0 to 6.0 inches per hour and have an available water capacity of about 5.5 to 7.0 inches. Runoff from this series is slow and the likelihood of erosion is slight. Depth to ground water is greater than 60 inches. This soil series is of a capability Class II.

3.2.4.2 Latourell Loam Series (53A, 53B and 53C)

Latourell Loam Series are deep well drained soils, having a moderate permeability of from 0.6 to 2.0 inches per hour in the first 48 inches of the soil to a permeability similar to that of the Canderly soils of about 2.0 to 6.0 inches at depths greater than 48 inches. These soils are typically more than 60 inches deep. Latourell soils have greater water availability than that of the Canderly Series with a range of about 8 to 12 inches. Runoff from this series is also slow and the potential for erosion is again slight. Depth to groundwater is generally greater than 60 inches. This soil has capability rating Class I.

3.2.4.3 Amity Silt Loam (3)

Only two small inclusions of Amity Silt Loam are present in the Canby area. These are somewhat poorly drained soils having a moderately slow permeability of from 0.6 to 2.0 inches per hour in the upper layer declining from 0.2 to 0.6 inches per hour in the lower. This soil can extend to a depth of 60 inches or more. The Depth to Water Table is from 6 to 18 inches in the winter and spring. Capability rating for this soil type is a Class II.

3.2.4.4 McBee Silty Clay Loam (56)

The McBee Silt Clay Loam is a deep moderately well drained soil having a moderate permeability of from 0.6 to 2.0 inches per hour. Runoff is slow and erosion is unlikely. However, the water table is generally at a depth of from 24 to 36 inches in the winter and early spring and the soils are located in areas subject to occasional but brief periods of flooding in the winter.

Only one isolated location northeast of Canby is characterized as this soil type. Capability rating for this series is Class II.

3.2.5 Groundwater Supplies

The Canby area is bounded on three sides by river basins that are at slightly lower elevations. As a result, groundwater is plentiful and accessible at relatively shallow depths. Due to the topography and soil composition, groundwater is estimated to be similar to the pattern documented for the Willamette River Valley. This indicates that there is an unconfined shallow aquifer that varies dramatically with the seasonal weather, and a much deeper confined aquifer with higher quality water supplies. There are a substantial number of domestic wells within the Canby area. The majority of these wells exceed 100 foot depths, although numerous wells are logged at as little as 30 feet to 40 feet deep. Well logs indicate a confining barrier is present, varying in depth but less than 100 feet below the ground surface. Refer to the report "Groundwater Protectiveness Demonstrations and Risk Prioritization for Underground Injection Control (UIC) Devices" prepared by GSI and attached as Appendix C for more detailed analysis of groundwater at the City of Canby.

3.2.6 Climate

The climate in the study area is temperate. Summers are warm with daily temperatures averaging from 70 to 75 degrees with occasional hot days where the temperature exceeds 100 degrees. Winters are cool with average daily temperatures of about 40 degrees Fahrenheit. Freezing temperatures occur periodically throughout the winter with lows in the teens [SDMP 1994c].

Due to the temperate climate, snowfall is rare, but can occur annually. Accumulations of from 1 to 4 inches of snow have been recorded during December and January [SDMP 1994c]. Unofficially, accumulations of as much as 12 inches of snow have been reported in the Canby area for short periods of time.

Normal rainfall, as recorded at the North Willamette Experimental Station, for the period from 1961 through 1990, averages 41 inches per year [SDMP 1994d]. The driest months of the year are July and August, with normal precipitation of less than one inch per month. During these two months, several weeks may pass without precipitation. The balance of the year, frequent rain showers occur with the wettest months being November, December and January. During these three months, rainfall normally exceeds six inches per month.

3.2.7 Flooding (Risk Analysis)

Due to Canby's natural terrace above the major waterways and the City's isolation from larger contributing area, flooding from the rivers is a relatively infrequent occurrence. Flooding has occurred for short periods of time in the lower elevations along the Willamette River, Molalla River contributing streams near the City limits, and on Willow Creek at NE Territorial Rd. As a result, access to and from Canby is obstructed; however, the study area is generally not impacted directly.

Numerous areas of poor drainage are documented in this report. These areas of poor drainage can exhibit ponded water during heavy precipitation. These areas are localized and typically occur due to obstruction of drywells or catch basins. An inventory of drywells, identified by the City as exhibiting failure characteristics, is presented in Table 3.2. These drywells may not be performing adequately due to high groundwater, slow infiltration rates, or large contributing drainage basins. Excessive overland flow is generally very limited due to the high permeability and water capacity of the native soils.

Table 3.2 Drywells/UICs Observed to Exhibit Failure Characteristics

Drywell ID #	Location	Condition
No ID	N Baker St and N Alder St	Slow Draining
B-8	NW 9th Ave. and N Ash St.	Slow Draining
B-11	NW 9th Ave. and N Cedar St	Slow Draining
D-61	NE 12th Ave	Slow Draining
A-5	SW 13th Ave and S Cedar	Slow Draining
D-63	NW 10th and N. Pine St	Slow Draining, Standing Water
D-26	NE 12th Pl and N Pine St	Slow Draining, Potential for Standing Water
D-28	NE 11th Pl and N Pine St	Potential for Standing Water
D-23	NE 13th Ave and N Pine St	Slow Draining, Standing water
D-31	NE 10th Ave and N Oak St	Slow Draining, Standing water
D-35	N Maple St at Maple St City Park	Slow Draining, Potential for Standing Water
F-7	N Birch St and NW Territorial Rd	Slow Draining, Potential for Standing Water

Due to the relatively short duration of the impacts of flooding and the minimal risk to property, a low intensity storm is used as the design standard for future stormwater infrastructure sizing. The City of Canby's Public Works design standards require conveyance systems to be designed to pass the 10-year storm event without surcharge, and the 25-year event with surcharge while maintaining the hydraulic grade lines below the manhole lids. The 10-year return frequency design storm is used as the standard for calculating runoff rates and volumes, which is, in turn, used for sizing all conveyance system improvements. The cost escalates dramatically with the selection of a less frequent storm event, as a result of requiring larger size conveyance systems.

Recent flooding events described by the City are generally of localized areas flooding during larger rainfall events and consist of street and intersection flooding. The areas that flood are most commonly associated either with a relatively large drainage basin contributing to a single drywell, or with a drywell that has been identified as having wet feet or being slow draining. In some cases, lack of maintenance of adjacent privately-owned stormwater systems was identified as contributing to flooding. Specific characteristics of areas that flood are described as part of the relevant CIP in Section 6. Flooding generally subsides within approximately six hours, but can last for two or three days and impairs access.

3.3 System Mapping

As part of the SWMP, system maps have been developed using the most current GIS data and incorporating available record drawings. These maps incorporate many aspects central to the Master Planning effort including; roadways, rivers, parcels, comprehensive plan zones, and other local information. Additionally, more stormwater-system specific information was added to the GIS map when available. These additions include existing pipes, manholes, catch basins, UICs, major drainage basins, and subbasins. The existing and future conveyance system maps developed, using the GIS, are the primary source for development of the hydrologic and hydraulic models.

It should be noted that the GIS system is considered a “work in progress”. While a significant amount of information was added to the GIS as part of this project, including pipe sizes, location of UIC’s, manholes and catchbasins, as well as surveyed invert elevations of selected manholes, it is not all inclusive. Further, the information available from record drawings was incomplete. Therefore, as more information is gathered, it should be added to the GIS system and the mapping updated. This is common practice for mapping and GIS systems.

3.4 Service Area and Basin Boundaries

The comprehensive plan, acknowledged in 1984 and updated in 2007, identifies the total area within the UGB as 3,384 acres. The area is divided into three generic land use types: residential, commercial and industrial. Residential land use includes the comprehensive plan designations of low density residential, medium density residential and high density residential acres as well as private residential, public owned, and flood/steep slopes due to the runoff characteristics. The commercial area includes downtown commercial, convenience commercial, residential commercial, highway commercial and commercial manufacturing. Industrial acreage includes light and heavy industrial.

The residential community has a mixture of low, medium, and high density land uses. Low density residential zoning allows for construction of one single family dwelling per lot, whereas medium density allows for construction of duplexes or triplexes on each lot, and high density permits construction of multifamily dwellings, boarding houses, or placement of no more than eight manufactured homes, per acre. Commercial development, in the urban area, has occurred in the existing downtown area and along Hwy 99E. Canby continues to encourage light industrial development within the urban area. However, less than 30 percent of the designated light industrial area has been developed. No heavy industry has been developed in the urban area. All areas of future development that were modeled in this plan as contributing additional stormwater runoff to surface stormwater systems were residential, and the right of way area was assumed to be the same for both low, medium, and high density.

Analysis and modeling for the SWMP includes all area within the UGB draining to City outfalls or UICs. Delineation of specific drainage basins and runoff modeling was completed for six discrete surface drainage outfalls. Areas draining to UICs or surface infiltration locations were not delineated. City design guidelines require that private development not increase offsite discharge rates and volumes over pre-development levels. The City’s storm drainage systems are generally designed to manage runoff from the right-of-way. Due to this design standard, the

models of subbasins for analysis were defined primarily based on the right-of-way and assumed to be 100 percent (%) impervious with exceptions noted below.

The general basin boundaries for these major surface basins and the modeled impervious subbasin boundaries are shown in Figure 3. In general, it is assumed that future development in the northwestern part of the City and south of Hwy 99E will not contribute additional surface discharges to City conveyance systems. Areas, where construction of new streets to service future residential development anticipated in the vicinity of NE Territorial Road, were added to the future surface drainage system model.

The basin boundary for N Maple Street includes an upslope agricultural area that drains toward the street and is known to contribute runoff to the City's conveyance system. These agricultural areas were assumed to be 100% pervious crops. Two surface drainage basins for Hwy 99E are shown on Figure 3. These basins contain both impervious and pervious land cover and drain to discrete surface discharge points. These drainage basins were not included in the conveyance system analysis because they are owned and maintained by Oregon Department of Transportation (ODOT). The South Hwy 99E basin drains to the Molalla River and the North Highway 99E basin eventually drains to Willow Creek. The three other drainage basins draining to Willow Creek were not included in the conveyance analysis either, but were defined based on their current land use for the purposes of modeling runoff contributing to the proposed Fish Eddy

3.4.1 Storm Drainage Basins

The following six surface drainage basins with discrete outfalls were delineated and modeled. Current City staff concerns include; current areas experiencing flooding events, ongoing problematic maintenance needs, and areas of expected growth guided the modeling efforts. The model examines the current hydraulic capacity of each system and provides an understanding of future system hydraulics for systems that are anticipated to require additional capacity.

The basin areas presented below represent the total area contributing runoff to the modeled conveyance system. It is generally assumed that all rain falling on private land is infiltrated or otherwise managed onsite. Thus, the basin areas generally correspond to the area within the street right of way, with exceptions noted below. This area is assumed to represent the impervious surface directly connected to surface conveyance systems. The overall basin boundaries and the modeled basin boundaries are presented in Figure 3.

3.4.1.1 Canby Downtown

This storm system drains the downtown commercial area and is the oldest part of the City's stormwater infrastructure. The system discharges to the Molalla River in the western part of the community. The total area of the existing basin as determined using GIS mapping, and as modeled, is 48.9 acres. In addition to the typical right of way areas, this basin also includes the entire developed downtown area between Northwest (NW) 1st Avenue (Ave) and NW 3rd Ave, between NW Elm Street and N Ivy Street. A portion of land located near Wait Park drains to existing UICs and infiltration areas and does not contribute to total basin flow, so it is therefore not included in the basin. The outfall from the Canby Downtown basin is a surface water

discharge point via a detention pond, grassy swale, and natural drainage way adjacent to the new police station at the west end of NW 3rd Ave.

3.4.1.2 N Baker Drive

The N Baker Dr basin drains to a pipe outfall that discharges runoff collected from the south end of N Baker Dr, and extends from NW 6th Place (Pl), and NW 6th Ave. The area of the existing basin, as modeled, is 2.1 acres. The outfall is near the steep bank on the Molalla River, upstream of Knights Bridge Road. There is limited data for the conveyance system in this area and there may be additional outfalls that are not currently mapped. CIP #1 addresses known issues in this basin.

3.4.1.3 Knights Bridge Road

This system drains approximately 1500 feet of Knights Bridge Road and immediate adjacent areas of intersecting streets. The total area modeled for the existing basin is 3.5 acres. The outfall for this storm system is an open pipe located underneath the bridge on which Knights Bridge Rd crosses the Molalla River. The pipe is supported by the bridge structure underneath the road way and has a free outfall approximately 30 feet above the Molalla River, above the approximate centerline of the river. The conveyance system includes a Contech Model CDS2015-4 hydrodynamic separator for particulate separation, located near N Ash St at a manhole prior to the discharge point.

3.4.1.4 Southwest Berg Parkway

This conveyance system drains the 3.2 acres of Southwest (SW) Berg Parkway to an outfall near the Molalla River.

3.4.1.5 N Maple Street

This system collects stormwater in a number of UICs connected in series along N Maple Street, which is located in the northern part of the City. Runoff from adjacent agricultural land is also collected at the north end of N Maple Street in a second pipe system that is connected underneath NE 34th Pl. The combined runoff then discharges directly to the Willamette River beyond the end of NE 34th Pl. The impervious area of the basin consists of a total of 5.6 acres, and the agricultural area contributing to the basin is 123 acres. The system discharges through a deeply buried pipe at approximately the water surface elevation of the Willamette River.

3.4.1.6 Redwood/Willow Creek

This system drains N Redwood St and adjacent side streets from NE Territorial Rd to Hwy 99E, as well as a portion of the Molalla Forest Rd, and parts of the residential streets on the east side of N Pine St and NE Territorial Rd from N Maple St to Willow Creek. The existing drainage basin modeled for this report consists of 22.2 acres of impervious. The system's outfall is to Willow Creek on the north side of NE Territorial Road, where it combines with flow from the main stem of Willow Creek and flows onto the Fish Eddy property.

3.4.2 Existing Stormwater System

3.4.2.1 Conveyance System

The existing conveyance systems throughout the City are comprised of gravity storm drainage pipes, open drainage ways or ditches, trench drains, and UICs. The existing stormwater system is shown in Figure 4. Approximately 125,000 feet of storm pipeline has been identified in the system inventory. Approximately half of this pipe drains to surface outfalls and half drains to infiltration areas, including UICs. The City is responsible for slightly less than 108,800 feet of pipe; however, the exact amount is unknown due to the fact that the current mapping does not distinguish private and county owned infiltration structures or minor surface systems from those that are owned by the City. Less than 1.5 percent of the pipelines in the system have documented diameter or pipe material type. Known diameters of existing pipes range from 4 inches to 36 inches. The majority of pipes that have known diameters are between 10 and 24 inches.

Approximately 16,000 feet of pipeline within the City is under the jurisdiction of ODOT or County, and captures and conveys runoff through surface drainage systems on Hwy 99E within City limits. Clackamas County is also responsible for an unknown number of UICs within the City, but these are not clearly defined and the locations are not known exactly. Pipeline that is not the responsibility of the City is not included in modeling in this report. Table 3.3 summarizes pipe in the system.

Table 3.3 Storm System Inventory

Category	Total Length of Pipe (feet)
Within City Limits	124,800
Surface Basins	60,800
Infiltration Systems/Private Systems	64,000
Total City Responsibility (Approximate)	108,800
ODOT/Clackamas County (Hwy 99E and S Ivy St)	16,000

3.4.2.2 Existing Drywells/UICs

The City has identified 384 existing UICs which are shown in Figure 5. Of these UICs, 284 are named and labeled with their identification (ID), and 100 are not named or labeled and are given the ID “None” in the City’s database. The majority of the City’s UIC’s (357) appear to be functioning well and, through modeling, have been demonstrated to be protective of groundwater quality. Refer to the GSI Water Solutions report “Groundwater Protectiveness Demonstrations and Risk Prioritization for Underground Injection Control (UIC) Devices” (GWPD) attached as Appendix C for more detail concerning UICs and groundwater modeling.

A total of eight UICs have been identified for decommissioning and these are listed in Table 3.4. The UICs that the City has observed to exhibit failure characteristics were previously listed in Table 3.2, but not all of these require decommissioning as discussed below. GSI classified six UICs as high risk and requiring decommissioning. The Groundwater Protectiveness

Demonstration (GWPD) modeling identified four high risk UICs that must be decommissioned to protect groundwater quality, due to their vertical and horizontal separation from seasonal high groundwater and a water well, respectively. Two UICs were identified by the City as being located close to potential pollutant sources and these are also classified as high risk and to be decommissioned. Finally, the City identified two additional UICs to be decommissioned based on other reasons. All eight of these UICs are addressed in the CIPs in Section 6. One additional UIC at NE 2nd Ave and N Ivy St is also recommended for decommissioning because of its proximity to a UIC identified as high risk. It has been included in CIP # 7, but not listed in Table 3.4.

Table 3.4: Drywells/UICs to Be Decommissioned

Drywell ID #	Location	Reason
D-63	NW 10th Ave and N Pine St	High Risk – GWPD (wet feet)
None	NE 2nd Ave and N Ivy St	High Risk – GWPD
None	NW 3rd Ave and N Holly St	High Risk – GWPD
D-48	NW 3rd Ave and N Holly St	High Risk – GWPD
E-8	1480 NE Territorial Rd (WWTP)	High Risk – Pollutant Source
E-11	1490 NE Territorial Rd (PW Complex)	High Risk – Pollutant Source
None	NW 2nd Ave Cinema Complex Parking Lot	Not Currently in Use
None	N 1st Ave and N Ivy St	Required to be rebuilt or decommissioned

The City has identified seven UICs that have wet feet (listed in Table 3.2), and groundwater modeling identified an additional 20 UICs that have the potential for wet feet based on the depth below surface of the groundwater table. One of the seven wet feet UICs identified by the City (D-63) is listed above in the high risk category. The remaining are assigned to the moderate risk category because they are close to or directly connected to groundwater. The moderate risk UICs, as demonstrated through modeling, were determined to be protective of groundwater quality but have some higher potential risk than UICs that are not connected to groundwater. ORDEQ does not require decommissioning of these UICs.

3.4.2.3 Stormwater Management Structures

In addition to the conveyance system and UICs, several other stormwater management structures are located within the City, including two detention basins and one Contech Model CDS2015-4 hydrodynamic separator. The City and private developers have implemented low impact development (LID) best management practices (BMPs) in several areas. These practices include pervious pavement, vegetated swales, gravel or rock swales, and rain gardens. These structures and their locations are listed in Table 3.5.

Table 3.5: Stormwater Management Structures

Location	Stormwater Feature/Structure
Central System, NW 3rd Ave	Detention Pond (Police Station Area)
N Knights Bridge Rd at N Ash St	Contech Model CDS2015-4 hydrodynamic separator
N Knights Bridge Rd, Grant Street to N Ash St	Pervious Pavement on North Side of Street
NW Territorial Rd at N Birch St	Swale, Rock, located on the South Side of Territorial Rd and on Both Sides of N Birch St
NW Territorial Rd at N Juniper St	Rock Swale
N Juniper St at N Juniper Pl (S)	Rock Swale
NW 13th Ave between N Ash St and N Birch St	Pervious Pavement , both sides of the street (~100 ft)
NW 9th Ave at N Elm St	250 ft of Pervious Pavement, both sides of the street
NW 9th Ave at N Cedar Ct	Pervious Pavement, both sides of the street
NW Hawthorne Ct at NW 13th Ave	Pervious Pavement
N Baker St at N Alder St	Vegetated Swale
NW 11th Ave N Alder St to N Ash St	Vegetated Swales, Both Sides of Street
NE 11th Ave east of N Ivy St	Pervious Pavement, South Side ~ 1 block
N Locust St at NW 9th Ave	50 ft Pervious Pavement, West Side (w/ Gravel Shoulders)
Auburn Farms Subdivision, NE 22nd Ave at N Locust St	Vegetated Swales and Trench Drains
NW Territorial Rd at N Redwood St	Proposed Dog Park with Pervious Parking Lot
NW Territorial Rd at Willow Creek	Proposed 'Fish Eddy' Constructed Stormwater Treatment Wetland
Fairgrounds Area, NE 4th Ave	Pervious Pavement
Wait City Park	Pervious Pavement in all Parking Surrounding Park
NW 3rd Ave at N Elm St	Pervious Pavement
Apollo Subdivision near NW 1st Ave	Vegetated Swale
NW 1st Ave and N Fir St	Vegetated Swales
NW 8th Place	Pervious Pavement
NE 19th Ave Cul-de-sac	Pervious Pavement
NE 10th Ave at NE Oak Circle	Pervious Pavement
NE Laurelwood Loop	Pervious Pavement
NE Vine St	Pervious Pavement
Canby Cinema NE 2nd Ave at N Knott St	Rain Gardens, Swales on NE 2nd Ave and Pervious Parking Lot
Countryside Living NW 2nd Ave at N Fir St	Rain Gardens
Fred Meyer and Commercial Development S Sequoia Parkway and SE 1st Ave	Retention Pond (private) near Spring Source of Willow Creek, receives overflow from Fred Meyer private drywells and some public right-of-way

Location	Stormwater Feature/Structure
SE Hazeldell	Trench Drains
S Sequoia Parkway at SE Township Rd	Vegetated swales and Trench Drains
S Walnut St	Vegetated swales
S Pine St	Pervious Pavement
SW 13th Ave	Pervious Pavement
NW Territorial Rd at N Redwood St	Proposed Dog Park with Pervious Parking Lot
NW Territorial Rd at Willow Creek	Proposed 'Fish Eddy' Constructed Stormwater Treatment Wetland

3.4.2.4 Known Issues with the Existing System

Existing stormwater system mapping data was reviewed during a meeting with City Public Works employees, the City environmental service manager, and planning staff. This review was used to identify known features, understand the history of the system, and identify issues and problems within the current system. Table 3.6 lists areas identified as having problems and summarizes the issues or known deficiencies. The areas are generally listed starting at Hwy 99E on the west side of the City and proceeding in a clockwise direction.

Table 3.6: Stormwater System Issues and Known Deficiencies

Location	Identified Issues or Deficiencies
End of NW 3rd Ave, near the Police Station	This system is likely to require a redesign when the police station access is paved, but current conditions create no issues
NW 2nd Ave (downtown)	This section pipe is currently is satisfactory condition until N Fir St, downstream of which, it is likely to be undersized and in poor condition
NW 3rd Ave	This section of pipe is in poor condition
NW 6th Ave (downtown)	This 8" pipe is contains large amounts of tree roots, may be undersized, and should be replaced
N Baker Dr, NW Baker St to NW 6th Pl *	40-foot high steep bank of Molalla River is unstable, and the areas surrounding have many different types of pipes. The pipes are shallow and bursting may heave roads. This is a high priority area for repair, and most likely will require connecting the basin to Knights Bridge Rd pipe system.
N Knights Bridge Road, Molalla River to N Aspen Ct	The hydrodynamic separator for this segment of pipe has had de-gritting issues, but otherwise functions well with regular street sweeping 8" concrete pipe in area in poor condition with misaligned joints 8" corrugated pipe in area is in poor condition and deteriorating catch basins tie in to the main line at blind tees flooding runs down Grant St and unplugging the line is difficult
NW 9th Ave at NW Ash Ave	This area incurs flooding due to failure of UICs, with relatively large drainage areas contributing to each UIC. The flooding often requires 6 hours to 3 days to recede. Flooding has currently been mitigated through cleaning of the drywells; however this is not expected to be a permanent solution.
NW 9th Ave at NW Aspen Ct	The area incurs flooding due to failure of UICs, with relatively large drainage area to each UIC. The flooding often requires 6 hours to 3 days to recede. Flooding has currently been mitigated through cleaning of the drywells; however this is not expected to be a permanent solution.
NW 9th Ave at N Holly St	Buried 90 degree pipe bend needs manhole added
NW 9th Ave between N Holly St and N Ivy St	The sedimentation manhole in this area creates flooding
NW 13th Ave between N Ash St and N Birch St	Limited pervious pavement has been constructed in this area, but flooding still occurs along the west side of the street.

Location	Identified Issues or Deficiencies
10th Ave from N Locust St to N Pine St *	Significant flooding currently occurs in this area and is expected to be worse once the existing gravel shoulders are paved. The road is owned by Clackamas County and any projects will require coordination with the County.
N Maple St at NW 34th Pl	ORDEQ may require a hydrodynamic separator for this outfall – the pipe is approximately 16 feet deep at the last manhole
NW Territorial Rd at N Holly St *	Trench drains in the private development are anticipated to fail and are located along property lines and therefore inaccessible.
12th Ave and N Pine St *	Flooding occurs in this area
NE 11th Ave at N Pine St	Flooding occurs in this area
N Maple St at NE 10th Ave, Maple St Park	Maple St Park's parking lot floods and the area currently has gravel shoulders
NE 5th Ave and N Juniper St	Flooding occurs in this area (City would like to redo sidewalks and paving with pervious).
Canby Cinema NE 2nd Ave at N Knott St	The existing rain gardens are experience maintenance problems; plugging and trash
SE Hazeldell Way *	This area incurs flooding 2 -3" deep in the vicinity of the trench drains
S Pine St at SE 2nd Ave, behind Canby Builders	Flooding occurs in this area - Unmaintained UICs in adjacent private development
S Ivy St at SE 2nd Ave	This area consists of a county system with no manholes and inaccessible; it is probably full of mud, ties into ODOT system along 99E - unknown condition
SW 2nd Ave	The pipe in this area is in marginal condition and contains some roots
SW 7th Ave and S Ivy St	Flooding occurs in this area and pipe in poor condition
SW 13th Ave and S Cedar St	Flooding occurs at UIC A-5 (the adjacent right-of-way have adequate space available for a swale)
SW 13th Ave south of Canby High School	Flooding occurs in this area (easement may be available for a swale)
Village on the Lochs Area, S Elm St	Flooding occurs at UIC A-11 when private UICs in the adjacent park fail

Note:

* indicates an area identified as high priority