City of Sutherlin
Douglas County, Oregon

STORM DRAINAGE MASTER PLAN

MARCH 2014

The Dyer Partnership
Engineers & Planners, Inc.

Coos Bay Office
1330 Teakwood Avenue
Coos Bay, Oregon 97420
(541) 269-0732 ◘ Fax (541) 269-2044
www.dyerpart.com

Sutherlin Office
759 West Central Avenue
Sutherlin, Oregon 97479
(541) 459-4619 ◘ Fax (541) 459-4679
Project No. 146.11

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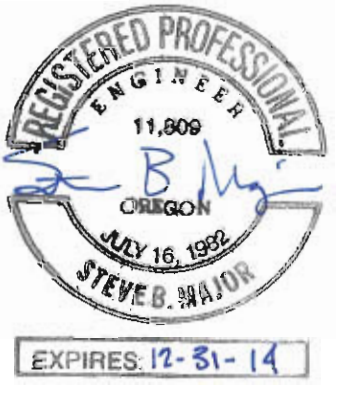

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Section 1

Introduction

1.1 BACKGROUND AND NEED

The City of Sutherlin is a rapidly growing community in Douglas County, Oregon. Located approximately 12 miles north of Roseburg along Interstate 5, the City has experienced significant growth over the past few years. New residents are drawn to the City for various reasons, including nearby outdoor recreation opportunities, proximity to larger urban centers and relatively low cost of living. In recent years, these qualities have made the City attractive to new residents and commercial developers. Although the recent growth has been a positive influence on the local economy and community, it has also placed a greater burden on the City's storm water infrastructure. The City continues to evaluate the quality of its infrastructure in order to provide excellent services to its residents. This Storm Water Master Plan will establish the City's strategy for its storm water management.

The purpose of this Storm Water Master Plan is to provide a comprehensive plan to assist the City in the management of its storm water for the next 20 years. This study will utilize a previous Stormwater Engineering Study (HGE, 1997) as a basis for renewed evaluation. The City has grown significantly since the previous study, which necessitates an updated plan for the future.

1.2 SCOPE OF STUDY

The Dyer Partnership has been authorized by the City of Sutherlin to provide master planning and engineering services as further described below. These services will develop a Storm Drainage Master Plan that will address the storm water issues facing the City as it continues to grow in the coming years. The following items are included in the scope of this study.

1.2.1 Watershed Map Of The Drainage Basins

Base maps of the watershed basin study area were developed based on current topographic maps, aerial photos, developers' plans, field investigations and City staff information. The existing drainage system was incorporated based on utility drawings, developers' subdivision plans investigations, and City staff knowledge. The maps include the boundaries of subbasins, direction of drainage, improved streets, existing storm drain facilities, and waterways.

1.2.2 Hydrology Study For Projected Future Land Uses

A hydrology study of the area was performed, including an assessment of local soils based on current Douglas County soils maps, existing development and impervious area, projected

development based on current city planning documents, local topography, City staff input, site investigations, and hydrograph data. The drainage area was broken into appropriate subbasins and the information for each basin is presented in tabular format.

1.2.3 Hydraulic Model To Size Culverts And Ditches

The information obtained in the previous steps was used to build a hydraulic model of the drainage system using HydroCAD Stormwater Modeling system computer software. The model includes data sets for 25-year storms for projected conditions based on a 20-year study period. The model input and output data is tabulated and presented. Areas of current projected deficiencies are identified and discussed. A drainage basin map was developed illustrating the location of each deficiency.

1.2.4 Prioritized Capital Improvements

The projects recommended are prioritized and described. A map delineating the recommended projects is included. A tabular presentation of the project, in order of priority, has been prepared. Cost estimates include a breakout between anticipated construction, engineering, administrative, and contingency costs.

1.3 PREVIOUS STUDIES AND INFORMATION

This Master Plan has utilized a previous Stormwater Study (Water, Wastewater, and Stormwater Engineering Study, HGE, 1997) as a reference in producing this updated document. Existing aerial and survey mapping were utilized in the execution of dynamic water models supporting the results of this plan. Soils information was obtained from the Soil Survey of Douglas County, Oregon by the USDA Soil Conservation Service.

1.4 AUTHORIZATION

The Dyer Partnership, Engineers & Planners, Inc. was retained by the city of Sutherlin to prepare a "Storm Drainage Master Plan" and authorized to proceed with services on January 1, 2009.

1.5 ACKNOWLEDGMENTS

The development of Sutherlin's Storm Drainage Master Plan is the result of the combined efforts of a number of individuals and agencies. The participation of these parties in collecting data, answering questions, reviewing drafts, and providing guidance for this plan is greatly appreciated.

We particularly wish to acknowledge the efforts of Jerry Gillham, City Manager; Vicki Luther, Community Development Director; Chris Berkquist, Aaron Swan and the rest of the City staff who assisted us in many ways.

Study Area

Section

2

Section 2

Study Area

2.1 Location and Definition of Study Area

The City of Sutherlin is located adjacent to Interstate 5 (I-5) in the north central portion of Douglas County, approximately 55 miles south of Eugene and 12 miles north of Roseburg. Sutherlin is surrounded on the north and south by forested hills and to the west and east by the Sutherlin Valley that consists of spotted timber, open agricultural, and minor rural development. The area has a number of nearby water resources including Sutherlin Creek, Calapooya Creek, Cooper Creek, Umpqua River, Cook Creek, Cooper Creek Reservoir, Plat I Reservoir, and Ford's Pond. A location map is shown in Figure 2.1.1.

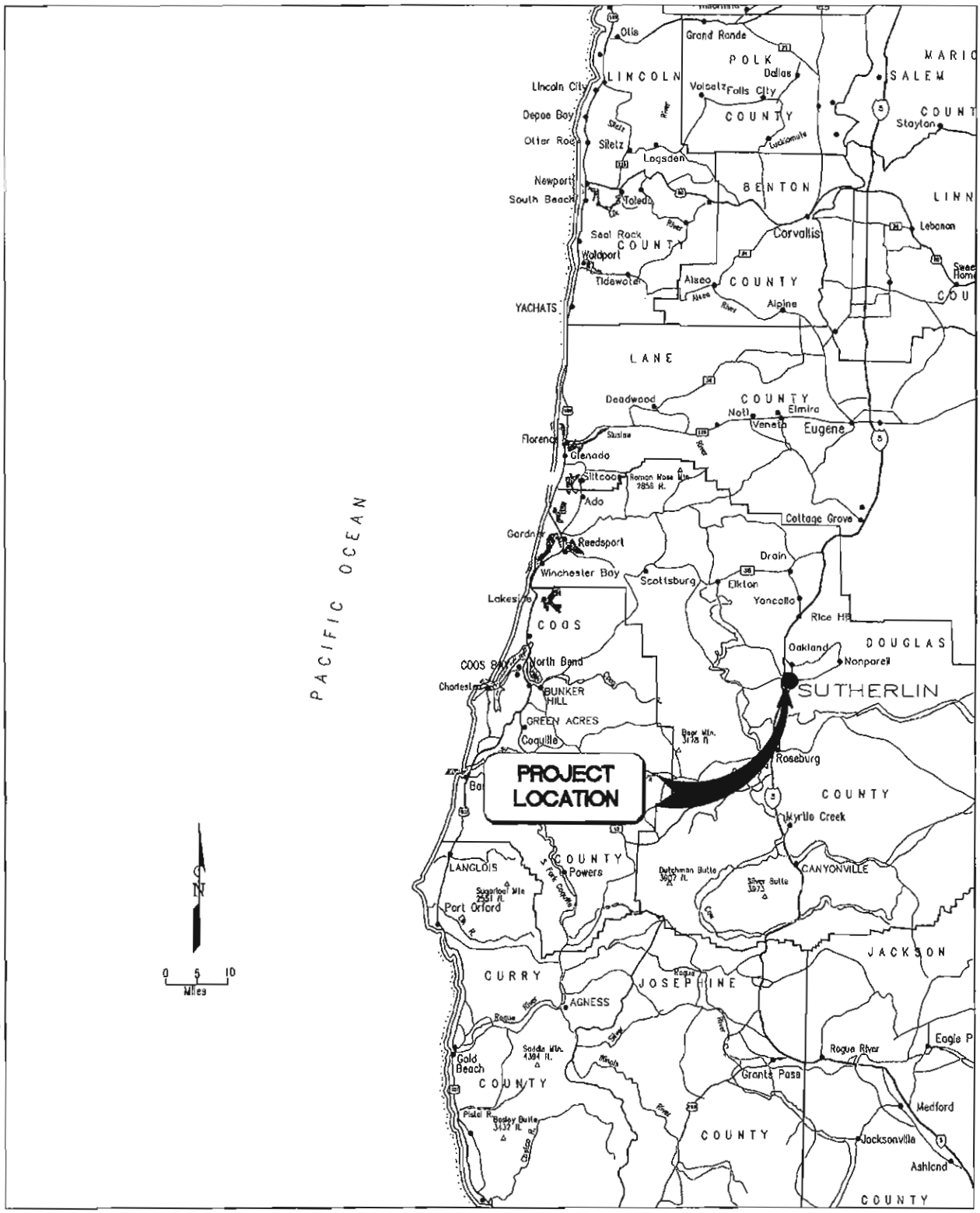
The area within the city limits is approximately 3,900 acres or over 6 square miles. The study area for this Master Plan includes the City Limits and the Urban Growth Boundary (UGB). See Figure 2.5.1 for the City Zoning Map at the end of this Section.

2.2 Study Area Characteristics

2.2.1 Climate

Sutherlin is located in a climatic zone that produces a wide variety of weather patterns. Most of Sutherlin's precipitation occurs from November through April. Although partially protected by the Coast Range from maritime weather patterns, Sutherlin experiences a significant amount of rainfall (approximately 40 inches per year). Rainfall amounts for November, December and January average approximately 18.4 inches per month. The wettest month historically has been December with average rainfall amounts of approximately 6.5 inches in 24 hours. The driest month historically has been July with average rainfall amounts of approximately 0.57 inches. Figure 2.2.1 includes the Oregon precipitation map (25-year event). Figure 2.2.2 includes the Oregon Isopluvial Map.

Sutherlin is in a transition climate area between the climate zones of the Willamette Valley and the drier Rogue Basin. However, based on its extended dry periods and vegetation types, it more closely resembles the Mediterranean-like patterns of the Rogue Basin. Temperatures average 41° F in January and 68° F in August. The yearly mean temperature is approximately 54° F. The average low temperature is 34° F, while the average high temperature is 84° F. Extreme temperatures range from 5°F to106°F. Sutherlin experiences prevailing winds averaging approximately 7 miles per hour for most of the year.



THE DYER PARTNERSHIP ENGINEERS & PLANNERS, INC.	***CITY OF SUTHERLIN*** ***STORM DRAINAGE MASTER PLAN***	FIGURE NO. ***2.1.1***
DATE: MAY, 2011 PROJECT NO.: 146.11	***PROJECT LOCATION MAP***	

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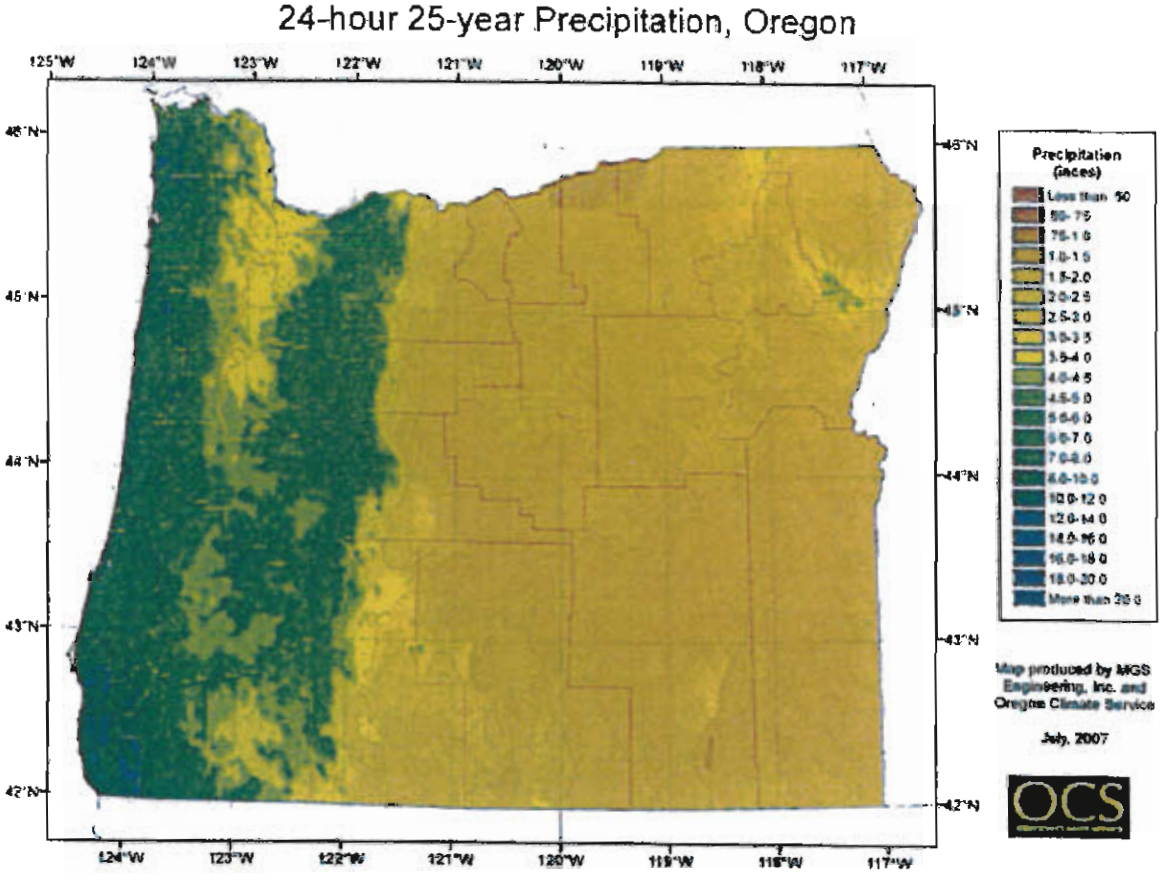
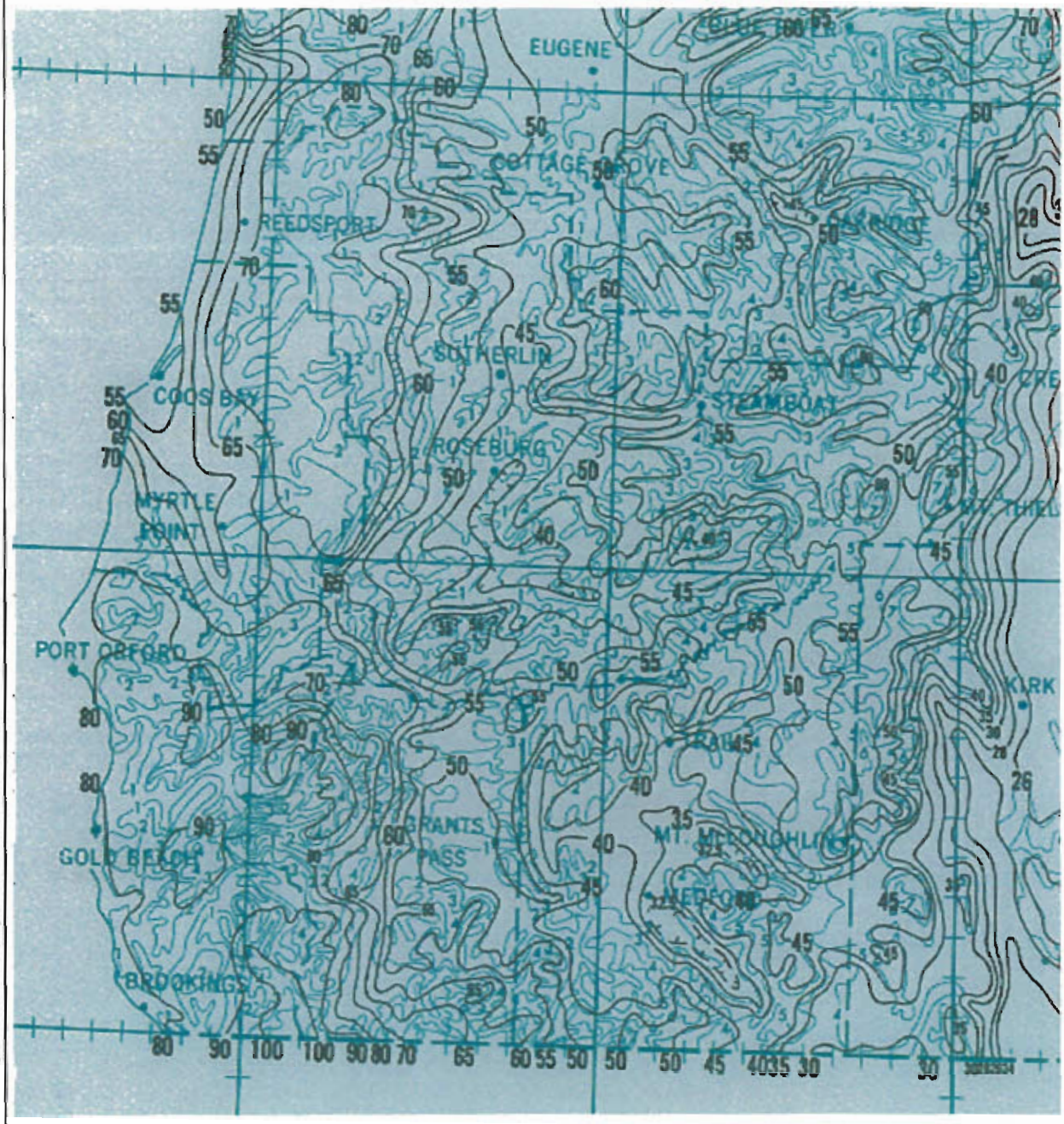


THE DYER PARTNERSHIP ENGINEERS & PLANNERS, INC.	***CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN***	**FIGURE NO.**
DATE: MAY, 2011	***PRECIPITATION MAP***	***2.2.1***
PROJECT NO.: 146.11		



ISOPLUVIALS OF 25-YR 24-HR
PRECIPITATION IN TENTHS OF AN INCH

THE DYER PARTNERSHIP ENGINEERS & PLANNERS, INC.	***CITY OF SUTHERLIN*** ***STORM DRAINAGE MASTER PLAN***	FIGURE NO. ***2.2.2***
DATE: MAY, 2011 PROJECT NO.: 146.11	***ISOPLUVIAL MAP***	

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2.2.2 Topography & Natural Drainage Courses

The study area for the city rests on typical Willamette Valley sedimentary materials, which in turn overlay basaltic rock formations. Laying directly to the west is the eastern boundary of the Oregon Coast Range. The City is surrounded by forested hillside terrain. Cooper Creek, Sutherlin Creek and Calapooya Creek discharge eventually into the combined Umpqua River. Cooper Creek discharges into Cooper Creek Reservoir, then continues westward through southern Sutherlin to discharge into Sutherlin Creek directly north of the Sutherlin Public Works Building. Sutherlin Creek discharges into Plat I Reservoir, then continues westward through southern Sutherlin. Its waters continue southward adjacent to Interstate 5 until it reaches the community of Wilbur, where it crosses under I-5. From Wilbur, it continues on to discharge into the North Umpqua River. Calapooya Creek provides raw water for Nonpareil Water Treatment Plant, and then continues westward toward the city, where it veers towards the northwest. It flows north of Sutherlin and through Oakland before it turns southwest flowing along the west end of the City limits. From there, it continues southwestward to eventually discharge into the combined Umpqua River. Mean elevations for the Sutherlin valley are approximately 500 feet, with surrounding peaks approximately 1000 feet high.

Basin boundaries and runoff patterns were defined with the use of the previous Stormwater Master Plan (H.G.E. 1998), current aerial photography, USGS mapping, City topographic maps, Subdivision PUD plans, and existing survey data. For the purposes of this plan, the study area was divided into 37 major drainage basins. The basins are described in Section 3.

2.2.3 Soils

There are many general classifications of surficial geologic formations found within the study area. The soil types for each drainage basin are listed in Section 6 of this study. The soil types are divided into four hydrologic groups represented by the letters A, B, C, and D.

Group A soils are identified as deep sand, deep loess, and aggregated silts and are defined as having a minimum infiltration rate of 0.30 to 0.45 inches/hour. Group B soils include shallow loess and sandy loam with infiltration rates ranging from 0.15 to 0.30 inches/hour. Group C soils are those low in organic content and usually high in clay, including clay loams and shallow sandy loams with an infiltration rate in the range of 0.05 to 0.15 inches/hour. Group D soils are those that swell significantly when wet including fat (highly plastic) clays and certain saline soils, and are identified as having an infiltration rate less than 0.05 inch/hour.

The NRCS Soil Survey for Douglas County identifies a variety of soils within the study area. For modeling purposes, soil types identified by the Soil Survey as having very rapid to rapid permeability were classified as Group A soils; soil types identified as having moderately rapid to moderate permeability were classified as Group B soils; soil types identified as having slow to very slow permeability were classified as Group C soils, and soil types identified as having very slow to no permeability were classified as Group D soils. The general geological soil formations within the entire study area and their associated hydrologic group are described as follows.

- **Nonpareil Series** - The Nonpareil series consists of shallow, well drained soils that formed in colluvium and residuum weathered from sandstone and siltstone. Nonpareil soils are on

ridge tops, hill slopes and convex foot slopes and have slopes ranging from 3 to 90 percent. These soils are classified as hydrologic group D.

- **Conser Series** - The Conser series consists of very deep, poorly drained soils that formed in silty and clayey mixed alluvium from sedimentary and basic igneous materials. Conser soils are in depressions on low alluvial stream terraces. Slopes are 0 to 3 percent. These soils are classified as hydrologic group D.

- **Sutherlin Series** - The Sutherlin series consists of very deep, moderately well drained soils that formed in mixed alluvium and colluvium over residuum weathered from sandstone and siltstone. Sutherlin soils are on foot slopes, hill slopes and drainageways and have slopes of 3 to 60 percent. These soils are classified as hydrologic group C.

- **Oakland Series** - The Oakland series consists of moderately deep, well drained soils that formed in colluvium and residuum weathered from sedimentary rocks. Oakland soils are on hillsides and broadly convex footslopes and ridges and have slopes of 3 to 60 percent. These soils are classified as hydrologic group C.

- **Waldo Series** - The Waldo series consists of very deep, poorly drained soils that formed in alluvium from mixed, but dominantly basic igneous materials. These soils are on narrow flood plains and fans. Slopes are 0 to 3 percent. These soils are classified as hydrologic group C.

- **Coburg Series** - The Coburg series consists of very deep, moderately well drained soils that formed in mixed alluvium. Coburg soils are on stream terraces and have slopes of 0 to 7 percent. These soils are classified as hydrologic group C.

- **Speaker Series** - The Speaker series consists of moderately deep, well drained soils that formed in colluvium weathered from sedimentary and metamorphic rocks. Speaker soils are on low rolling foot slopes and side slopes and have gradients of 2 to 75 percent. These soils are classified as hydrologic group C.

- **Pengra Series** - The Pengra series consists of very deep, somewhat poorly drained soils that formed in clayey alluvium. These soils are on foot slopes, toe slopes or alluvial fans of foothills. Slopes are 1 to 30 percent. These soils are classified as hydrologic group C.

- **Rosehaven Series** - The Rosehaven series consists of very deep, well drained soils that formed in colluvium and residuum weathered from sandstone, conglomerate sandstones, and siltstone. Rosehaven soils are on uplands and have slopes ranging from 3 to 90 percent. These soils are classified as hydrologic group B.

- **Atring Series** - The Atring series consists of moderately deep, well drained soils that formed in colluvium and residuum weathered from sandstone, siltstone and metasedimentary rocks. Atring soils are on ridges and side slopes of mountains. Slopes are 12 to 90 percent. These soils are classified as hydrologic group B.

- **Larmine Series** - The Larmine series consists of shallow, well drained soils that formed in colluvium weathered from sandstone and siltstone. Larmine soils are on mountainsides and ridgetops and have slopes of 12 to 90 percent. These soils are classified as hydrologic group B.

- **Bateman Series** - The Bateman series consists of very deep, well drained soils that formed in colluvium weathered from sandstone and siltstone. Bateman soils are on foothills and mountains. Slopes are 3 to 60 percent. These soils are classified as hydrologic group B.

- **Stockel Series** - The Stockel series consists of very deep, somewhat poorly drained soils that formed in mixed alluvium and colluvium. Stockel soils are on footslopes and in swales and narrow drainageways dissecting old alluvial terraces and have slopes of 3 to 12 percent.These soils are classified as hydrologic group D.

- **Dickerson Series** - The Dickerson series consists of very shallow, well drained soils that formed in material weathered from sandstone and siltstone. Dickerson soils are on rounded ridgetops, foothills and mountains. Slopes are 3 to 90 percent. These soils are classified as hydrologic group D.

- **Sibold Series** - The Sibold series consists of very deep, somewhat poorly drained soils that formed in mixed alluvium. Sibold soils are on high flood plains and have slopes of 0 to 5 percent. These soils are classified as hydrologic group C.

- **Malabon Series** - The Malabon series consists of very deep, well drained soils formed in mixed alluvium. Malabon soils are on stream terraces. Slopes are 0 to 3 percent. These soils are classified as hydrologic group C.

- **Veneta Series** - The Veneta series consists of very deep, moderately well drained soils that formed from old mixed alluvium. Veneta soils are on old alluvial terraces and have slopes of 0 to 20 percent. These soils are classified as hydrologic group D.

- **Packard Series** - The Packard series consists of very deep, well drained soils that formed in alluvium. They are on low stream terraces and flood plains and have slopes of 0 to 5 percent. These soils are classified as hydrologic group B.

In general, where city services are not available, the soil types are not considered capable of supporting development that requires numerous wells and septic tanks. Drainage in the majority of the study area is poor, resulting in regular localized ponding. However, there are some sections of moderately draining soils are distributed throughout the study area. A map showing the hydrologic group of the soils in each basin within the study area is included in Figure 2.2.3.

2.2.4 Geologic Hazards

There are several areas within Sutherlin that are susceptible to geologic hazards. These hazards include river flooding, earthquakes, high groundwater and erosion. A discussion of each hazard and expected locations are discussed below.

- **River Flooding.** The Federal Emergency Management Agency (FEMA) has declared the City of Sutherlin a 'No Special Flood Hazard Area.' All areas within the UGB have been designated Zone C, areas of minimal flood hazard (FEMA Map Specialist 2005).

- **Earthquakes.** Earthquakes are the products of deep-seated geologic faulting and the subsequent release of large amounts of energy. The relative earthquake hazard includes factors such as earthquake-induced landslides, liquefaction and shaking amplification. Based on earthquake hazard maps developed by the Oregon Department of Geology and Mineral Industries (Madin and Wang 2000), there are no liquefaction or amplification hazards within the area examined in and around Sutherlin. With respect to landslides, medium to high hazard risks exist on the hills surrounding Sutherlin. The high landslide hazard areas are found on some of the slopes southwest of the City, southwest of Cooper Creek on the upper ridge, and northeast of town on the Union Gap side of the ridge.

  As summarized in these maps, areas of relatively steep slope that reside directly north, south and southeast of town present the greatest relative hazard.

- **High Groundwater.** High groundwater is apparent in specific areas within the Sutherlin UGB. This water may be due to land contours, springs, hillside seepage, or saturated soil conditions following periods of wet weather.

- **Erosion.** Erosion within the UGB of Sutherlin does not present a significant geologic hazard.

2.2.5 Environmentally Sensitive Areas

Sutherlin not only lies near sensitive environmental areas, but also affects those downstream. The combination of forests, rangeland, pasture and other wetlands provide a unique surrounding for the City and within the Study Area that should be considered and protected in facilities planning. A discussion of environmentally sensitive areas and environmental topics pertinent to public facilities planning is presented below:

Wetlands
There are a number of significant wetland areas within the City. Areas within the Study Area that are considered significant wetlands include Sutherlin Creek to the south of town, between Exit 135 and Wilbur area (10 acres); the upper end of Copper Creek Reservoir at its inlet (10 acres); Fords Pond located on the west end of Sutherlin (2 acres); and Plat I Reservoir (40 acres, Douglas County 1997). All of these wetlands are considered to be good to excellent quality. To ensure that significant wetlands are adequately protected, the County will apply a 50-foot setback standard around these wetlands.

BASIN 36
BASIN 37
BASIN 3
BASIN 1
BASIN 35
BASIN 27
BASIN 5
BASIN 7
BASIN 10
BASIN 8
BASIN 6
BASIN 4
BASIN 2
BASIN 34
BASIN 25
BASIN 13
BASIN 12
BASIN 9
BASIN 14
BASIN 26
BASIN 11
BASIN 15
BASIN 17
BASIN 16
BASIN 33
BASIN 32
BASIN 28
BASIN 24
BASIN 21
BASIN 18
BASIN 19
BASIN 31
BASIN 29
BASIN 23
BASIN 20
BASIN 30
BASIN 22

N

SCALE: 1" = 1800'±

LEGEND

- DRAINAGE BASIN BOUNDARY
- CITY LIMITS
- SOIL HYDROLOGIC GROUP - B
- SOIL HYDROLOGIC GROUP - C
- SOIL HYDROLOGIC GROUP - D
- RESERVOIR

FIGURE NO. 2.2.3

CITY OF SUTHERLIN
STORM DRAINAGE MASTER PLAN
SOIL HYDROLOGIC GROUP MAP

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Riparian Zones
The transition zone between creeks and uplands are also sensitive. They should be protected for erosion control, cover for animals, and shading for reducing water temperatures. In addition to exceeding the physical tolerance levels of fish, high temperatures lower the oxygen concentration, increase disease potential for aquatic life, and produce conditions for competing fish.

Douglas County has adopted a Riparian Vegetation Corridor Overlay Zone that applies to lands located 50 feet from the bank of all identified perennial and intermittent water courses. This Overlay Zone requires all structural development to have a 50-foot setback from the streambank, unless Oregon Department of Fish and Wildlife staff agree that this setback is unnecessary, or a reduction in the setback would not jeopardize streambank, stability, water quality, etc. (Douglas County 1997).

Special Bird Habitats
The natural surroundings in Douglas County supports a wide range of bird habitats, four of which the County (1997) has designated as requiring special consideration: eagle nesting sites; great blue heron rookeries; osprey nest sites; and pigeon mineral springs. Within the Study Area, osprey nest sites have been identified adjacent to Cooper Creek Reservoir and just north of Cooper Creek. To assist in the protection of osprey special bird habitats for activities not regulated by the Forests Practice Act (FPA), Douglas County will apply a Special Bird Habitat Overlay Zone (BH). Within these overlay zones, the County will manage the osprey special bird habitats through consultation with ODFW.

Scenic Views and Sites
Douglas County (1997) has identified and inventoried a number of outstanding scenic views and sites. Within the Study Area, one scenic view/site was identified: Cooper Creek Reservoir. The County has a day use park on the northwest end of the reservoir.

Natural Areas
Within its Comprehensive Plan, Douglas County (1997) has also identified Natural Areas to assist in protecting ecologically distinct ecosystems, habitats, and organisms. One such site has been identified within the Study Area: Wilbur-Rodgers Road White Camas Site. This site, which is approximately 21 acres in area, is located east of Interstate 5 between the Interstate and Old Highway 99. This site, being adjacent to Sutherlin Creek, provides excellent habitat for growing the white camas variety endemic to the Roseburg area (Leichtlin's white camas, or *Camassia leichtlinii* var. *lechtlinii*). The County has employed a Natural Area Overlay designation to protect this white camas site. This overlay zone shall permit only uses which would not permanently destroy the white camas habitat. The overlay zone may allow conditional use for such temporary uses as gravel stockpiling or grazing provided that these uses do not occur between February and June 1, the growing season for the white camas.

2.3 Economic Conditions & Trends

Regional economic conditions and trends will likely affect population growth and future water consumption in the City of Sutherlin. Major industrial or commercial development can create a large, immediate demand for water and sewer services. On the other hand, depressed economic

conditions can affect employment opportunities and the number of families moving into a community.

To a very large extent, the economy of Sutherlin is tied to the regional economy. Lumber and wood products, agriculture, trade and service industries are considered the primary industries in and around Sutherlin. The most dominant economic sector in Douglas County is the lumber and wood products industry. Nearly 70 percent of the County's economy is dependent upon this industry. Future growth in this sector will be challenged by reductions in the available timber supply both from public and private industry lands. Agriculture in the Sutherlin Valley will continue to contribute to the local economy. However, growth in this sector is limited to the existing soils and availability of water. Trade and services industries will likely increase in importance since the demand for goods and services is increasing rapidly with the rise in the standard of living. Continued development of the City's industrial zone lands will also contribute to employment opportunities for City residents. The largest employers within the City include Murphy Plywood (wood products industry), and Orenco Systems, Inc., a manufacturer of on-site sewage systems and equipment.

Based on the Year 2012 Census, median household income level in Sutherlin was slightly higher than that of Douglas County ($42,769 vs. $40,096).

2.4 Population

The current population (Year 2013) within the City of Sutherlin is estimated at 7,905.

Historic Population
Since 1990 Sutherlin has experienced a growth rate higher than most other communities in Oregon. Economic conditions were difficult in the early 1980s due to the decline of the forest products industry, and some uncertainty remains over the availability of timber and lumber. However, Sutherlin's livability characteristics, especially for retired persons and those enjoying outdoor recreation, have attracted a long-term growing populace regardless of the local economic climate.

Based on United States Census data, the City of Sutherlin's population increased from 5,020 to 6,669 between 1990 and 2000. This increase equates to an average annual growth rate of 2.9%. During this same period, the average County growth rate was only 0.6%.

Future Population
Growth is expected to continue at or exceed a rate similar to that experienced in the community during the last decade. The coordinated population projection of 1.5% per year has been selected by Douglas County in its Comprehensive Plan (1997) for the next 25 years (to the Year 2035). Table 2.4.1 summarizes the population projections over the next 20 years, using the 2013 city population of 7,905 as the base figure.

TABLE 2.4.1
CURRENT POPULATION ESTIMATE AND POPULATION PROJECTIONS

Year	2013	2015	2020	2025	2030	2035
Residential Population	7,905	7,950	8,693	9,365	10,088	10,868

2.5 Land Use

Land use within Sutherlin is categorized into five general categories: residential, commercial, industrial, public facilities and special district and other lands. There is an estimated 3,259 acres within the current UGB. Figure 2.5.1 includes the City of Sutherlin zoning map. The land use categories are briefly discussed below:

Residential Lands
Sutherlin residential lands are located throughout the community and on each side of Interstate 5. Residential lands also occupy the elevated surrounding hills on the north side of the UGB, and new subdivisions are being constructed in the areas surrounding town. Residential land use ranges from single-family dwellings to multi-family dwellings to bed and breakfast and motel land uses. Detailed descriptions of each residential land use zone are described below.

- **RH – Residential Hillside District**
  The goal of this district is to preserve the visual and physical identity of the hills and the native geologic conditions, while permitting controlled residential development.

- **R-1 – Low-density Residential District**
  This district is a low-density area, where it is the goal to protect residential quality, value and identity. Environmental privacy, air and outdoor space are meant to support the residential quality of the area.

- **R-2 – Medium-density Residential District**
  This district is a medium-density area, where the goal is to protect residential quality, value and identity. Environmental privacy, air and outdoor space are meant to support the residential quality of the area.

- **R-3 – Multifamily Residential District**
  This district is a medium to high-density area meant to serve as a general residential district, allowing a large variety of housing and densities without conflict, with allowance for certain nonresidential uses.

Commercial Lands
The commercial properties are clustered around Interstate 5 and Highway 138 (Central Avenue). Commercial activities generally include retail and tourist related services. Small shops and restaurants catering to the tourist market make up the majority of the commercial properties in the City.

- **C-1 – Commercial Downtown District**
  This district is intended to serve as a downtown retail and service center providing the more common everyday goods and services for both potential and existing city and adjacent area needs and to concentrate uses for the walking public. All commercial uses shall be conducted wholly within an enclosed building.

- **C-3 – Commercial Community District**
  This district is intended to be a general commercial zone, providing large goods and services to the area residents and traveling public. Off-street parking is required as well as design curtailments of adverse effects.

- **C-S – General Commercial District**
  This zone is intended to provide for a broad mixing of commercial uses, and for wholesale and heavier commercial uses in older, close-in sections of the community.

Industrial Lands
The industrial properties are dispersed throughout the City, but specifically around Interstate 5 and Highway 138 (Central Avenue). Commercial activities generally include retail and tourist related services. Small shops and restaurants catering to the tourist market make up the majority of the commercial properties in the City.

- **M-1 – Industrial Light District**
  This district is intended for the location of non-noxious industry. Such industries that do not produce noise, odor, smoke, fumes or other nuisances will be permitted to locate in this area. Should there be any doubt concerning the creation of a nuisance by a particular building or use, the planning commission shall determine whether a specific use or structure shall be permitted.

- **M-2 – Industrial Heavy District**
  This district is intended for the location of heavier industry, but in no case shall an industry which would create any noise, odor, smoke or other nuisances having an effect on nearby nonindustrial areas be allowed to locate in this district.

Public Facilities Lands
Public lands consist of those required for government offices, schools, hospital, transportation facilities, parks, and recreation areas. The wastewater treatment plant and city shops are included within the public facilities lands.

Special District and Other Lands
The City has adopted special district and other zoning land use types. A summary of these zoning types is below.

- **FR-75 – Forest Resource District**
  The forestry classification is intended to preserve lands with high forest resource potential. The resource zone is applied to rural areas where urbanization is untimely and services cannot be provided in the immediate future.

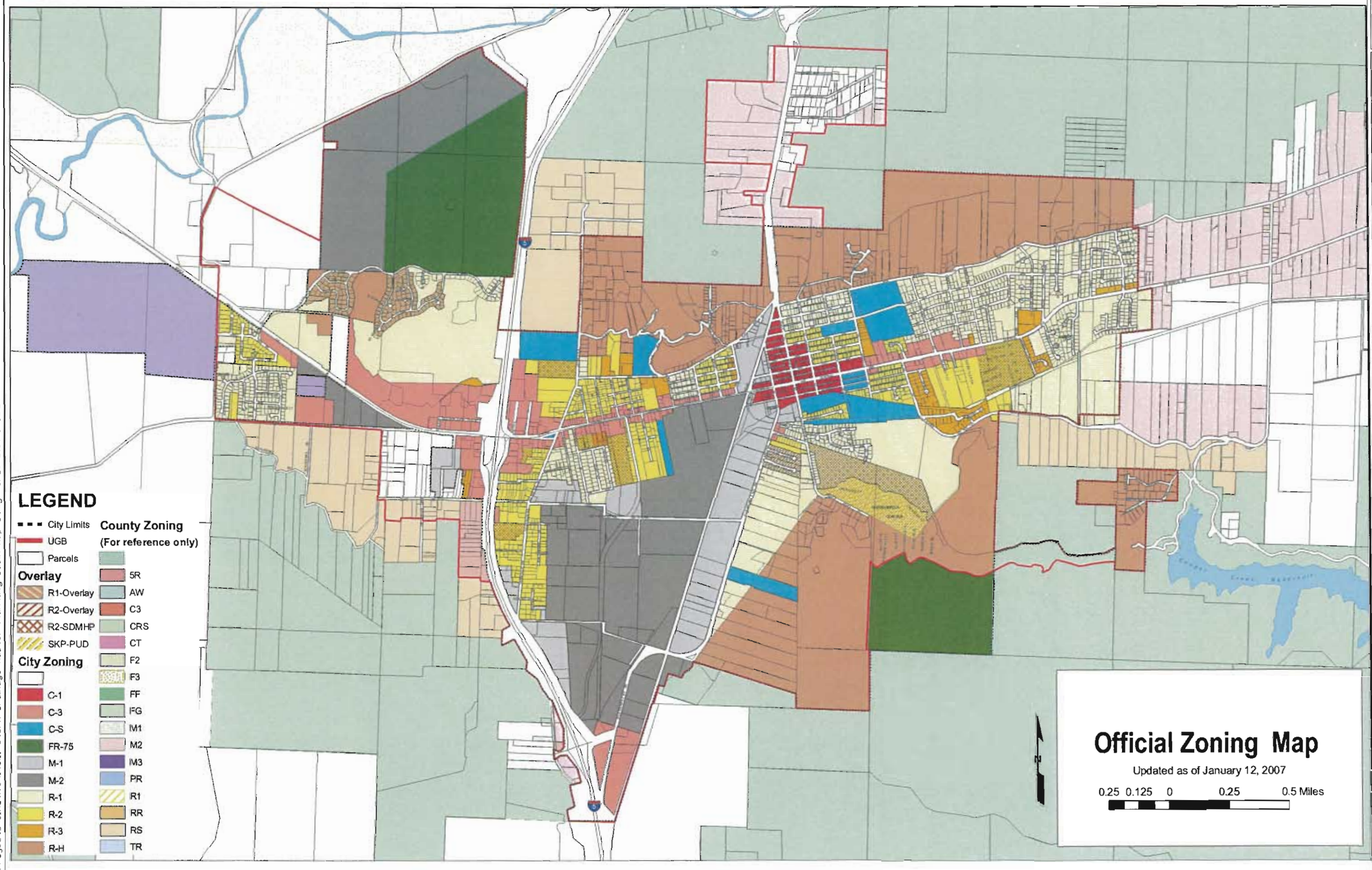

FIGURE NO. 2.5.1

CITY OF SUTHERLIN
STORM DRAINAGE MASTER PLAN

ZONING MAP

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: MARCH, 2014

PROJECT NO.: 146.11

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Section

3

Existing Conditions

Section 3

Existing Conditions

3.1 Existing Drainage Basins

Within this Storm Drainage Master Plan there are thirty-seven drainage basins. Figure 3.1.1 shows the limits of each basin and the approximate general flow patterns for surface runoff within these basins. The basins were broken down into smaller subbasin areas to increase the level of accuracy within the computer model. A map showing the smaller subbasins (subcatchments) is located in Figure 3.1.2. The slopes and terrain in some areas make absolute boundaries between basins subjective in some cases. Additional basin descriptions can be found in Section 6 of this study.

The typical storm drain basin for Sutherlin begins at the top of the surrounding Cascade Mountain foothills. Most of the upper hillsides are forested with slopes exceeding 20 percent grade. Development increases towards the lower sections of the basins and storm water collects in roadside ditches and culverts. The lower sections of the basins are developed with mostly residential housing and small commercial development in select areas. The arterial ditches and culverts connect to larger culverts that convey storm water to the major waterways in the area.

3.2 Existing Storm Drainage Facilities

The majority of the major storm drain infrastructure for the City of Sutherlin is located along Central Avenue. The infrastructure along Central Avenue is shared by one of three entities, the City of Sutherlin, ODOT, or Douglas County Road Department. Runoff transported by the storm water infrastructure conveys the runoff water to Sutherlin Creek. Portions of the infrastructure were first installed in the 1940s, and have exceeded their life expectancy.

In the 1997, the H.G.E. Stormwater Engineering Study compiled a major drainage infrastructure map. As part of this study, additional culverts and drainage facilities were added to the map. Copies of the updated existing storm water infrastructure maps are located in Appendix A.

Persistent flooding problems occur is a few specific areas within the City of Sutherlin. The primary areas noted below as prone to flooding are Priority One improvements:

1. Jade and Central Avenue
2. Opal Street and Central Avenue
3. 4th Avenue and Arvilla Way
4. Sherwood Street between 5th and 6th Avenues
5. Sherwood Street and Central Avenue
6. State Street and 3rd Avenue

7. Calapooia Street and Central Avenue
8. Everett Avenue, west of Calapooia Street
9. West 6th Avenue, 150-feet east of Branton Street
10. 2nd Avenue between Grant and Branton Streets

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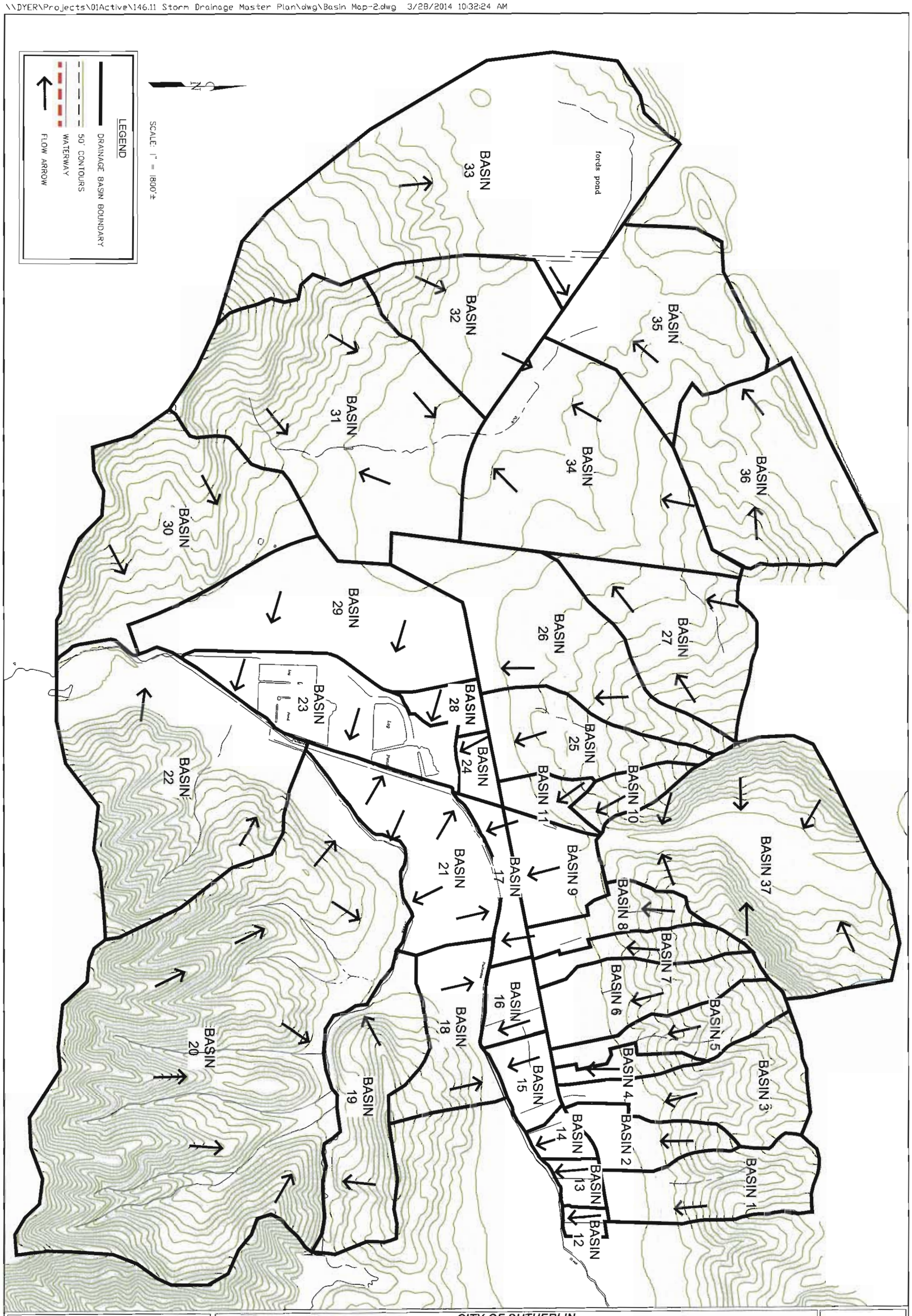

THE DYER PARTNERSHIP ENGINEERS & PLANNERS	*CITY OF SUTHERLIN* *STORM DRAINAGE MASTER PLAN*	FIGURE NO.
DATE: MARCH, 2014	***DRAINAGE BASIN MAP***	***3.1.1***
PROJECT NO.: 146.11		

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THE DYER PARTNERSHIP ENGINEERS & PLANNERS	*CITY OF SUTHERLIN* *STORM DRAINAGE MASTER PLAN*	FIGURE NO.
OATE: MARCH, 2014	***DRAINAGE SUB-BASIN MAP***	***3.1.2***
PROJECT NO.: 146.11		

Section

4

Planning Criteria

Section 4

Planning Criteria

4.1 Federal & State Regulations

The State of Oregon does not regulate storm water discharge from small cities or municipalities; however, as cited in 40 CFR 122.26, the Federal government may require permits for some storm water discharge. These permits are required as part of the National Pollutant Discharge Elimination System (NPDES) program. The purpose of this program is to monitor and prevent storm water runoff from polluting the waters of the state. Currently, permits are required for storm water discharge points from large municipalities--populations of 250,000 or more, medium municipalities--populations between 100,000 and 250,000, and industrial facilities.

As currently regulated, the City of Sutherlin is not required by Federal Law to permit or monitor its storm water discharges. However, specific industrial facilities or businesses, located within the City itself, may be required to hold such permits for their storm water discharge. These facilities should already be regulated by the DEQ according to CFR regulations. Otherwise, storm water discharges occurring within the City are not regulated by outside agencies. Given the current trends in environmental control, the City can anticipate future requirements on its storm water discharge points.

4.2 Local Drainage Regulations & Review Procedures

The City of Sutherlin currently has ordinances and regulations pertaining to storm water for new development. The City of Sutherlin Municipal Code Sections 8.16.150 and 13.20, and Section 3.5.140 of the Development Code pertain to storm drain regulations. The City requires that a developer address storm water issues by providing adequate facilities for runoff generated from the proposed site. The intention of these ordinances is to protect lower developments from excess flows.

Review procedures require the developer to provide for all on-site drainage as well as participate in the improvement of downstream drainage systems if the runoff from the improved property causes these downstream facilities to be overloaded. It requires all new drainage facilities to be sized to accommodate future runoff from potential upstream developments. A brief description of common drainage review criteria is provided below.

4.2.1 General Provisions

The review body should approve a development request only when adequate provisions for storm and flood water runoff have been made as determined by the City Engineer. The storm water drainage system must be separate and independent of any sanitary sewerage system. Where possible, inlets should be provided, ensuring that surface water is not carried across

intersections or allowed to flood streets. Surface water drainage patterns and proposed storm drainage must be shown on every development proposal plan. All proposed storm sewer plans and systems must be approved by the City Engineer as part of the tentative plat or site plan review process.

Ditches will not be allowed without specific approval of the City Engineer. Open natural drainage ways of sufficient width and capacity to provide for flow and maintenance may be permitted. By definition, an open natural drainage way is a natural path that has the specific function of transmitting natural stream water or storm water run-off from a point of higher elevation to a point of lower elevation.

4.2.2 Easements

Where a subdivision or development property is traversed by a water course, drainage way, channel or stream, a public storm water easement or drainage right-of-way conforming substantially with the lines of such water course shall be provided, and such further width as the City Engineer determines will be adequate for conveyance and maintenance shall also be provided. Improvements to the drainage way, or streets or parkways parallel to the water course may be required.

4.2.3 Accommodation Of Upstream Drainage

A culvert or other drainage facility shall be large enough to accommodate potential runoff from its entire upstream drainage area, whether inside or outside of the development. The City Engineer will review and approve the size required of the facility, based on provisions of the City of Sutherlin's Storm Drain Master Plan, and sound engineering principles, assuming conditions of maximum potential watershed development permitted by the City of Sutherlin Comprehensive Plan.

4.2.4 Effect On Downstream Drainage

Where it is anticipated by the City Engineer that additional runoff resulting from the development will overload an existing drainage facility, the review body should withhold approval of the development until provisions have been made for improvement of said potential condition.

4.2.5 Drainage Management Practices

Development must employ drainage management practices approved by the City Engineer which minimize the amount and rate of surface water run-off into receiving streams or drainage facilities, or onto adjoining properties. Drainage management practices must include, but are not limited to, one or more of the following:

- Temporary ponding or detention of water;
- Permanent storage basins;
- Minimization of impervious surfaces;

- Emphasis on natural drainage ways;
- Prevention of water flowing from the development in an uncontrolled fashion;
- Stabilization of natural drainage ways as necessary below drainage and culvert discharge points for a distance sufficient to convey the discharge without channel erosion;
- Run-off from impervious surfaces must be collected and transported to a natural drainage facility with sufficient capacity to accept the discharge; and
- Other practices and facilities designed to transport storm water and improve water quality.

4.2.6 Design Requirements For New Development

All new development within the City must, where appropriate, make provisions for the continuation or appropriate projection of existing storm sewer lines or drainage ways serving surrounding areas. Extensions may be required through the interior of a property to be developed where the City determines that the extension is needed to provide service to upstream properties.

4.2.7 NPDES Permit Requirements

A National Pollutant Discharge Elimination System (NPDES) permit must be obtained from the Department of Environmental Quality (DEQ) for construction activities which include clearing, grading, and excavation that disturbs one or more acres of land. The developer must complete NPDES General Permit form 1200-C for storm water discharge associated with construction activities. For construction activities disturbing 20 or more acres, the plan must be prepared and stamped by an Oregon Registered Professional Engineer, Oregon Registered Landscape Architect, or Certified Professional in Erosion and Sediment Control. Addition information regarding the NPDES Storm Water Regulations for Construction Activities may be found on the Internet at:

http://www.deq.state.or.us/wq/stormwater/stormwater.htm

4.2.8 Small MS4 Requirements

Small MS4 stands for Small Municipal Separate Storm Sewer System. It is defined as a publicly owned conveyance or system of conveyances from ditches, curbs or underground pipes that divert storm water into the surface waters of the state. A small MS4 is subject to storm water regulation if it is located within an "Urbanized Area" as defined by the U.S. Census Bureau in the 2000 (or later) census. The Bureau of the Census has defined an "Urbanized Area" as a central place (or places) adjacent to a densely settled surrounding territory that together have a residential population of at least 50,000 and an average density of at least 1,000 people per square mile. Sutherlin does not currently appear to meet the definition of an urbanized area, but

should anticipate future inclusion since the history of this set of regulations has been to include small areas with time. Communities subject to this regulation are required to design their programs to do the following: reduce the discharge of pollutants to the "maximum extent practicable" (MEP); protect water quality; and satisfy the appropriate water quality requirements of the Clean Water Act. Implementation of the MEP standard will require the development and implementation of best management practices and the achievement of measurable goals to satisfy each of the following six minimum control measures:

- **Public Education and Outreach**
  Distributing educational materials and performing outreach to inform citizens about the impacts polluted storm water runoff discharges can have on water quality.

- **Public Participation/Involvement**
  Providing opportunities for citizens to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging citizen representatives on a storm water management panel.

- **Illicit Discharge Detection and Elimination**
  Developing and implementing a plan to detect and eliminate illicit discharges to the storm sewer system (includes developing a system map and informing the community about hazards associated with illegal discharges and improper disposal of waste).

- **Construction Site Runoff Control**
  Developing, implementing and enforcing an erosion and sediment control program for construction activities that disturb one or more acres of land (Controls could include silt fences and temporary storm water detention ponds.).

- **Post-Construction Runoff Control**
  Developing, implementing and enforcing a program to address discharges of post-construction storm water runoff from new development and redevelopment areas. Applicable controls could include preventive actions such as protecting sensitive areas (e.g., wetlands) or the use of structural BMPs such as grassed swales or porous pavement.

- **Pollution Prevention/Good Housekeeping**
  Developing and implementing a program with the goal of preventing or reducing pollutant runoff from municipal operations. The program must include municipal staff training on pollution prevention measures and techniques, e.g. regular street sweeping, reduction in the use of pesticides or street salt, or frequent catch-basin cleaning.

Additional information may be obtained from the Internet regarding the Small MS4 program at:

http://cfpub.epa.gov/npdes/stormwater/permreq.cfm

4.3 Civil Law Criteria

Storm drainage for non-urbanized areas is not regulated by state or federal agencies. However, the State of Oregon provides civil laws pertaining to drainage. Civil drainage laws prescribe the entitlement of a property owner to have normal natural drainage ways maintained. Under this doctrine, a landowner must accept water that naturally flows across his property, but the owner is entitled to not have the natural drainage changed or substantially increased. Similarly, this law provides that a landowner must not obstruct the natural drainage way if the upper drainage way is properly discharged.

The Oregon Department of Transportation Hydraulics Manual provides a summary of Oregon drainage law. The three basic elements of drainage that must be followed, according to civil law, as interpreted by ODOT are:

- A landowner may not divert water to adjoining land that would not otherwise flow there. Diverted water is further described by ODOT as water routed from one drainage area to another and water collected and discharged that would normally infiltrate, pond, or evaporate.

- A landowner may not divert or change the place where water flows onto a lower property. ODOT interprets this element to limit diversion of water from grading and paving work and/or improvements to storm water collection systems.

- An upper landowner may not accumulate large quantities of water, then release it, greatly accelerating the flow onto a lower property. The ODOT interpretation notes that noncompliance with this element occurs when the flow of water has been substantially increased.

Clearly, violations of Oregon drainage law are subjective. Where questions arise, ODOT recommends that its engineering staff acquire easements to avoid the potential for litigation. Natural drainage ways have been impacted by development and, consequently, are no longer readily apparent. In such cases, corrections made by the City should be particularly sensitive to the potential for rerouting drainage to properties that cannot be proven as the original drainage way. Future developments within the City, and City improvements to the existing drainage system, should be required to prescribe to the City's legal interpretation of the Oregon drainage law. Where questionable conditions may exist, the City should seek or require acquisition of easements.

Section

5

Hydrological Analysis

Section 5

Hydrological Analysis

5.1 Storm Frequency

An essential part of storm water analysis is selection of the design storm or storm frequency that will be used. Selection of the design storm includes economic and statistical relations. The frequency chosen for a storm depends upon such factors as the existing drainage system, the nature of the contributing areas, and the cost of storm drainage improvements.

The design storm is the total amount of rainfall that will occur over a period of time based on the statistical evaluation of precipitation records. Typical intervals for storm frequencies are 2, 5, 10, 25, 50, and 100 years. A 25-year storm can be expected to occur once within a 25-year period. The 25-year storm could occur any year during a 25-year time span, although each year it only has a 4 percent chance of occurring. The 25-year storm could conceivably occur for several years, or even twice in a given year, even though, statistically, it would not be probable.

Economic factors are considered when selecting the design storm in the engineering analysis. For instance, a drainage system sized for the 100-year storm will result in a larger, more costly drainage system than for a more frequent storm. Conversely, a drainage system designed for the frequent storm, though less costly, may not prevent property flooding, damage to public facilities, and potential loss of life. Costs of improvements must be compared to potential risks.

Selection of the storm frequency for this analysis is based on individual basins and projects. Based on the State of Oregon Department of Transportation Hydraulics Manual, a 50-year recurrent storm should be utilized for facilities draining through state highways and a 25-year storm can be used for smaller city streets. In cases where roadway overtopping is a problem, the 100-year storm may be used.

For development anticipated within the study area, a storm with a recurrent interval of 25 years is selected as appropriate for City Streets and Neighborhoods. The rainfall total for this storm is 4.6 inches in a 24-hour period.

Figure 2.2.1 includes the Oregon precipitation map (25-year event). Figure 2.2.2 includes the Oregon Isopluvial Map.

5.2 Channelization

As storm water flows downstream, it travels in some type of channel, for example, such as a ditch, culvert, natural creek, or pipes. A common mathematical formula used to characterize the hydraulic behavior of these conduits is Manning's Equation, which is generally expressed as:

$$Q=(1.49/n)*A*R^{2/3}*S^{1/2}$$

Where:
Q=Channel Flow (cfs)
A=Cross-Sectional Area (sf)
R=Hydraulic Radius=A/P (ft)
P=Wetted Perimeter (ft)
S=Channel Slope (ft/ft)
n=Manning's Roughness Coefficient

Channels vary widely in their hydraulic performance. The roughness coefficient "n" is used to describe the texture of the channel in terms of the material of construction. Materials differ in surface friction. If a channel is made up of a rough surface, there is more friction as the water flows through the channel, and more energy is used to overcome that friction. The result is lower water velocities and therefore lower flows. Table 5.2 lists some commonly used Manning's "n" values for different pipe and channel surfaces.

TABLE 5.2.1
TYPICAL MANNING'S ROUGHNESS COEFFICIENTS

SURFACE OR MATERIAL	MANNING'S "n"
Finished Concrete	0.012
Unfinished Concrete	0.014
PVC Plastic Pipe	0.009
ADS N-12 Corrugated HDPE Pipe	0.012
Brick	0.016
Cast Iron	0.015
Concrete Pipe	0.015
Bare Earth	0.022
Corrugated Metal Flumes	0.025
Corrugated Metal Pipe	0.026
Rubble	0.030
Earth with Stones and Weeds	0.035

5.3 Analysis Method

The term "storm water" typically refers to rainfall runoff, snowmelt runoff, and surface runoff and drainage. Effective storm water management includes the accurate sizing of storm water conveyance systems, specifically, culverts, catch basins, detention/retention ponds, and storm drainage pipelines. Sizing for conveyance systems is generally estimated by using instantaneous peak runoff from a storm of specified frequency.

There are numerous methods for estimating peak runoff. For purposes of this study, the Rational Method and the Soil Conservation Service Runoff Method (SCS TR-20 model) are used to estimate peak runoff values.

While the Rational Method is in common use for engineering analysis of drainage basins, its use is most applicable for analyzing areas with simple drainage systems. For this study, an alternate analysis tool, the SCS Method was used for developed areas with complex drainage system.

The following sections describe the methods in the analysis.

5.3.1 Rational Method

The Rational Method is based upon the concept of mass balance and relates rainfall intensity to runoff intensity. The Rational Method incorporates the use of the rational formula, which is generally expressed as:

$$Q_p = CIA$$

Where:
Q_p = peak discharge (cfs)
C = runoff coefficient (dimensionless)
I = rainfall intensity (in/hr)
A = watershed area (ac)

Once values for runoff coefficient, rainfall intensity, and watershed area have been determined, peak discharge (Q_p) values for drainage basins in the area are calculated. Each of the parameters in the formula is described below.

Runoff Coefficients
Values for C, the runoff coefficient, are readily available in most hydrology or engineering handbooks. Some common C values are listed in Table 5.3.1.

TABLE 5.3.1
COMMON RUNOFF COEFFICIENTS

AREA DESCRIPTION	RUNOFF COEFFICIENT
Downtown Business	0.70 to 0.95
Neighborhood	0.50 to 0.70
Single Family (Residential)	0.30 to 0.50
Detached Multi-units (Residential)	0.40 to 0.60
Attached Multi-units (Residential)	0.60 to 0.75
Light Industrial	0.50 to 0.80
Parks, Cemeteries	0.10 to 0.25
Unimproved	0.10 to 0.30

Rainfall Intensity
Rainfall intensity (I) is the intensity (inches per hour) of rainfall for a given design storm at a given time in the storm. Intensity is typically determined from Rainfall Intensity Duration

Frequency (IDF) curves. IDF curves are used to determine rainfall intensity associated with a specific storm frequency.

Time of Concentration

Rainfall duration in a drainage basin is computed by determining the time of concentration for that drainage basin. Time of concentration (t_c) is defined as the longest travel time it takes a particle of water to reach a discharge point in a watershed. While traveling towards a discharge point, a water particle may experience sheet flow, shallow concentrated flow, open channel flow, or a combination of these. Once the drainage route and surfaces have been identified, Manning's equation is used to calculate the travel time of a water particle through a drainage basin.

$$T_c = \frac{L}{.6} \quad \text{where} \quad L = \frac{l^{.8}\,(s+1)^{.7}}{1900\,Y^{.5}}$$

$$\text{and} \quad S = \frac{1000}{CN} - 10$$

T_c = Time of concentration [hours]
L = Lag time [hours]
l = Hydraulic length of watershed [feet]
Y = Average land slope [percent]
S = Potential maximum retention [inches]
CN = Weighed Curve Number

Area

The final variable in the rational formula is the watershed area (A). Watershed area is determined from topographic maps of the area.

5.3.2 Soil Conservation Service Method

The SCS method, commonly referred to as SCS TR-20, is a more sophisticated storm water analysis tool than the Rational Method. Rather than simply determining the peak discharge, TR-20 utilizes a synthetic rainfall distribution to generate a hydrograph showing the runoff peak and volume. This method provides a more accurate assessment of the runoff volume because it sums the total volume discharged from the basin, rather than just the peak discharge.

The SCS method is based on combining unit hydrographs resulting from bursts of rainfall that vary in magnitude, but occur in a predictable pattern. This pattern is defined by SCS as a rainfall distribution curve. Though variations in the storm intensity are synthetic, runoff generated from the storm is based on local characteristics such as regional rainfall totals, soil permeability classifications, intensity of development, drainage slopes, area of impact, and even the time lag created by conveyance of flows through the drainage elements.

The benefits of the SCS method are that areas within a basin, called subbasins, can be simultaneously modeled with other subbasins by combining hydrographs using excess runoff and

time to peak runoff. This process allows for a more accurate prediction of the peak discharge and calculation of the total runoff volume.

In comparison, the simplicity of the Rational Method requires the results to be more conservative than the SCS Method. Consequently, by using the more complex method, smaller pipe may be used if sufficient detail of the basin is available. A brief description of the fundamentals of the SCS method is provided below.

Synthetic storm distribution
The basis of the TR-20 Method is the "synthetic storm." This storm is based on SCS research that suggests the intensity of rainfall within a storm occurs in a predictable pattern. The SCS has applied this to the entire continental United States and developed rainfall mass distributions for four geographic locations. Storms occurring in Sutherlin and most of the Pacific Northwest have been classified as type 1A storms. Type 1A storms represent the Pacific maritime climate with wet winters and dry summers. Rainfall gradually increases until about the 10-hour point and then gradually decreases. The NRCS storm type distribution is illustrated in Figure 5.3.2. The rainfall distribution hydrograph for a Type 1A 24-hour storm is illustrated in Figure 5.3.3.

FIGURE 5.3.2
AREA NRCS RAINFALL DISTRIBUTIONS

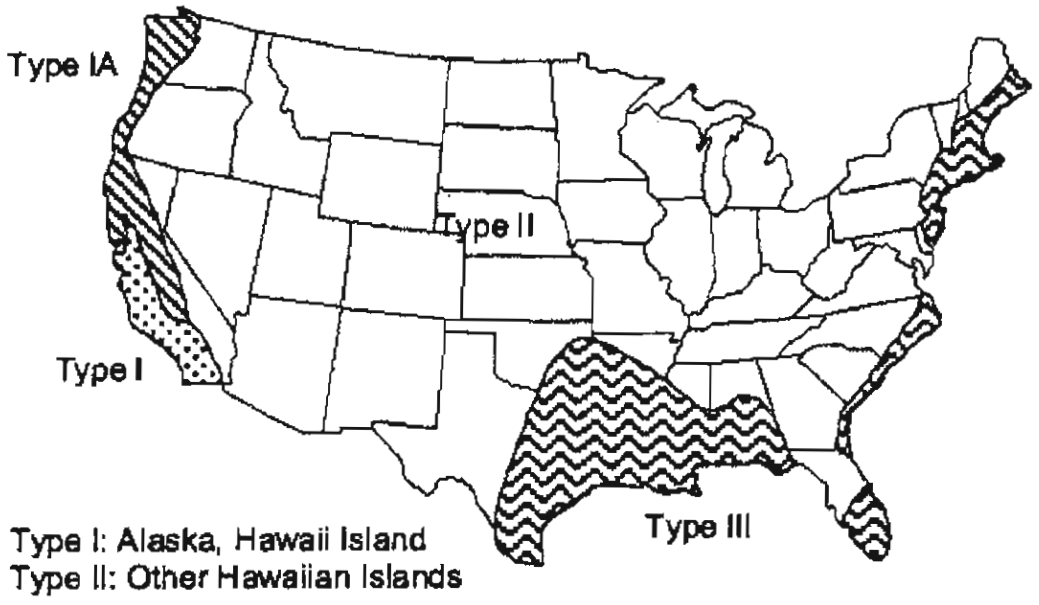
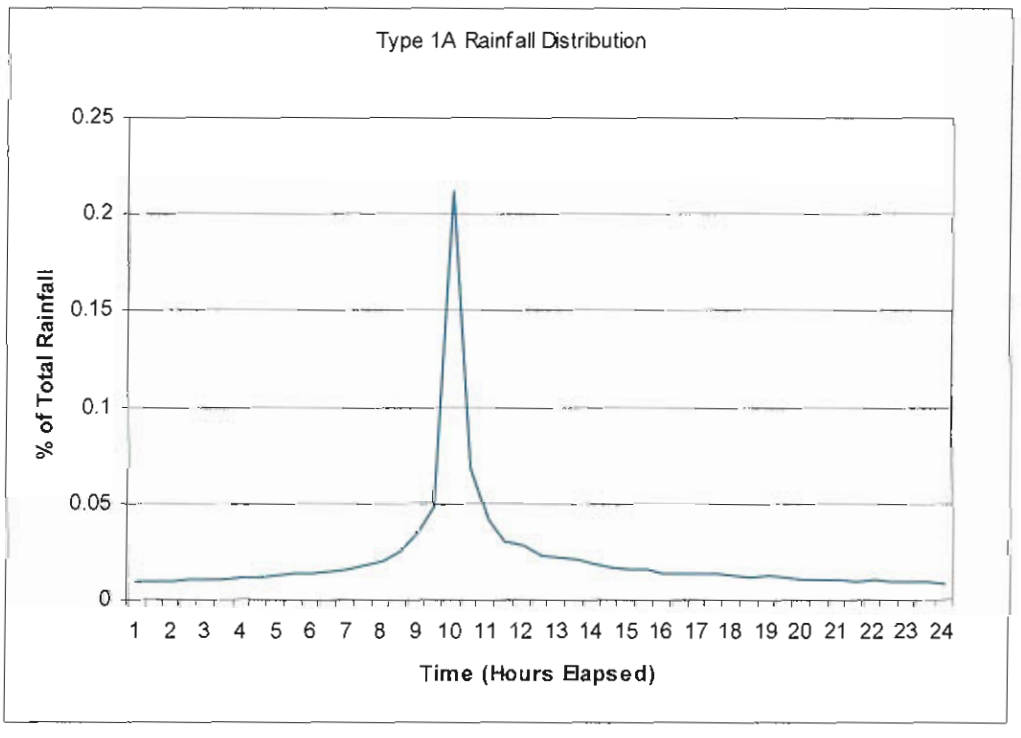


FIGURE 5.3.3
RAINFALL DISTRIBUTION FOR A TYPE 1A 24-HOUR STORM



Soil classification
The type of soil and ground cover occurring within a basin are used in the SCS Method. This information determines the amount of rainfall retained on the surface and the excess rainfall generating runoff. Soil and ground covers are classified by curve numbers (CN) similar to the coefficient of runoff, C, used with the Rational Method. Typical CN values used for the City of Sutherlin are provided below in Table 5.3.2. Soil within the current study area is largely classified as either poor or very poor draining, requiring use of curve numbers for soil groups C and D in the analysis of the City's drainage system.

TABLE 5.3.2
TYPICAL SCS CN VALUES

GROUND COVER CHARACTERISTICS		CURVE NUMBER FOR SOIL GROUP			
Ground Cover Type and Condition	Percent Impervious	A well drained	B moderate	C poor	D very poor
Streets, Roads, Parking Lots	100	98	98	98	98
Urban Commercial Districts	85	89	92	94	95
Residential: 1/8 acre or less	65	77	85	90	92
Residential: 1/4 acre	38	61	75	83	87
Residential: 1/3 acre	30	57	72	81	86
Residential: > acre	25	54	70	80	85
Wooded: No Forest Litter	Poor	45	66	77	83
Wooded: Some Forest Litter	Fair	36	60	73	79
Wooded: Heavily Forested	Good	30	55	70	77

Rainfall
Storm rainfall is determined from the design frequency or design storm as previously mentioned. Total rainfall for the design storm used in Sutherlin is based on the National Oceanic and Atmospheric Administration (NOAA) Precipitation Maps for the Western United States.

Time of concentration
As in the Rational Method, the time of concentration is an important parameter in the SCS Method. Unlike the Rational Method, the SCS utilizes t_c to determine the time to peak discharge rather than the time of peak rainfall.

Time to Peak
The Time to Peak, T_p, is the amount of time to the peak discharge. The time to peak is calculated with the unit hydrograph and time of concentration. The time to peak is not equal to the time of concentration.

Peak Runoff
The peak runoff is the peak amount of runoff discharged during a rainfall event. The peak runoff is calculated with the SCS method, and varies greatly with the slope and land use of the area in the drainage area. The peak flow is usually in cubic feet per second, and is used to size structures associated with the storm drain system.

$$Q = \frac{(P-.2S)^2}{P+.8S} \quad (Q=0 \text{ if } P<.2S)$$

$$\text{where} \quad S = \frac{1000}{CN} - 10$$

Q = Precipitation excess (runoff) [inches]
P = Cumulative precipitation [inches]
S = Potential maximum retention [inches]
CN = SCS Curve Number[1]

5.3.3 Unit Hydrograph

Runoff generated from a storm can be described by a hydrograph. A hydrograph is a predicted discharge wave that, similar to a bell curve, starts slowly then increases with time to a peak before decreasing to its pre-storm levels.

A unit hydrograph is a dimensionless hydrograph, hypothetically generated by one inch of excess precipitation resulting from a uniformly distributed storm of uniform duration over a uniform area. The peak discharge (the y ordinate) and the time of peak discharge (the x axis) for the unit hydrograph is plotted as fractions of the peak and time to peak runoff, respectively. This standardized hydrograph is used to generate site-specific hydrographs by combining rainfall and time to the unit values. The calculation, called runoff generation, is performed as described below.

Runoff Generation
In order to dimension the unit hydrograph and generate runoff according to TR-20 predictions, rainfall is assumed to fall on an area in a "burst." The burst of rain is assumed to flow downstream where it is collected and discharged from the area over an extended time interval.

The duration of the discharge is extended because not all of the rainfall reaches the discharge at the same time. Some of the flow is retained because of soil characteristics; some is delayed because of distance and velocity of travel.

At the same time that the water from farthest point of the basin reaches the discharge point, the lower areas of drainage are also contributing to the flow. The sum creates the peak discharge, which is shown on the y axis of the hydrograph. The time of the peak is similarly based on the time of travel and plotted as the x axis. Both the discharge and time of travel are utilized to dimension the unit hydrograph.

Once dimensioned, the unit hydrograph provides the runoff from one interval of the storm's duration. To predict the impact from an entire storm, it is necessary to generate and sum hydrographs for each storm interval. Each new hydrograph generated is based on the mass of rainfall occurring at that particular time, as predicted by the SCS synthetic rainfall distribution curve. As each burst of rainfall generates a new runoff hydrograph, it is added to the preceding

hydrograph with its axis displaced by the time between bursts. Once the entire storm is summed, a single hydrograph results. This hydrograph depicts the runoff prediction for that subbasin.

Hydrograph routing
Within each basin, there are often several subbasins, each generating a runoff hydrograph. In order to observe the effects of a storm on an entire basin, it is necessary to route each subbasin hydrograph throughout the system. Since each hydrograph is based on the time of concentration, it is possible to add each subbasin hydrograph at its discharge point. The process is repeated until all of the hydrographs have been routed through the entire basin and summed at the point of discharge. This process is called hydrograph routing.

5.3.4 Computer Model

The storm drain analysis was done using HydroCad™ packaged computer applications. Consequently, a large level of detail was applied to establish runoff characteristics. In addition to calculating the peak discharge, the SCS method can also calculate the total quantity of water produced from the storm. This information is useful to determine the extent of downstream flooding or the pond sizes to contain and release runoff without creating significant increases in the quantity of discharged water. Data sheets from the computer model are included in the Storm Drain Model Results under separate cover.

Section

6

Storm Drain Model

Section 6

Storm Drain Model

6.1 Projected Developed Conditions

The existing storm drainage systems within the study area have been modeled to determine the existing capacity of various system components as well as the existing and future stormwater discharges that are likely to occur from each basin modeled. Factors affecting the modeling were evaluated; these factors include, but are not limited to, land use, soil type, and both surface condition and vegetation in undeveloped areas. Each storm drain basin identified in this section has been modeled based on the estimated drainage area as determined from the City's aerial topographic mapping. Ground surface slopes, existing development, and the presence of drainage facilities is based on the aerial mapping, previous studies, field investigations, and information provided by City staff. Present and future discharges have been calculated using information from the zoning and land use maps, City's plat maps, proposed development plan maps, aerial photos, utility atlas maps, and discussion with City staff.

As described in Section 5, we have used the SCS (TR-20) Method to calculate stormwater discharge volumes for each basin. The SCS Method utilizes curve numbers to rate the runoff potential of an area based on the land use, cover condition and soil type.

6.2 Discharge Estimates

Present and future discharge estimates for each drainage basin were developed according to the methodology in Section 5. The HydroCad™ computer program was used to forecast peak storm flows for the buildout (developed) condition. A summary of the existing and future flow projections and basin parameters for fully developed land use in each basin is provided in Table 6.2.1. Complete modeling results for each subbasin (subcatchment), culverts, and ditches is located under separate cover titled Storm Drain Model Results.

Please note that runoff values are for flow generated within each basin and do not include flow entering the basin from upstream. The total runoff for each basin consists of the sum of the runoff values within it. Total runoff from upstream or contributing basins was taken into account for infrastructure sizing and was used in the project recommendations.

TABLE 6.2.1
FLOWS & BASIN PARAMETERS

Basin	Area Acres	Average Basin Length (feet)	Average Slope	Exist'g CN #	Existing Time to Peak (min)	Existing Runoff Volume (cfs)	Buildout CN #	Buildout Time to Peak (min)	Buildout Runoff (cfs)	% Increase in Runoff
1	135.8	2310	14.4%	81	21.7	84.1	81	21.5	84.9	5%
2	69.1	1094	9.4%	83	16.3	51.5	84	16.3	51.5	0%
3	157.0	2699	11.3%	76	35.2	69.6	76	34.6	70.1	5%
4	28.6	3177	11.7%	81	53.6	14.0	81	53.6	14.0	0%
5	87.0	2540	14.3%	80	22.9	52.4	80	22.6	54.6	5%
6	120.8	2711	12.9%	81	26.8	75.1	82	26.6	76.6	5%
7	58.5	2316	14.7%	80	21.6	36.1	81	21.3	37.2	6%
8	62.8	2069	12.3%	84	21.4	46.9	84	21.4	46.9	0%
9	82.4	1600	3.9%	87	22.9	65.3	88	22.4	67.1	8%
10	40.0	2880	15.9%	75	21.6	19.2	75	21.6	19.2	0%
11	36.2	1582	5.8%	85	20.9	27.3	86	20.4	28.3	5%
12	12.9	938	0.7%	86	29.5	9.4	87	28.5	9.8	4%
13	22.5	1350	0.6%	85	44.2	13.9	87	41.1	15.4	11%
14	22.6	1268	0.8%	87	35.1	16.3	87	35.1	16.3	0%
15	46.8	1218	0.4%	92	41.3	36.7	92	41.3	36.7	0%
16	43.2	1222	0.2%	85	82.3	21.2	87	78.4	23.1	17%
17	44.6	611	0.4%	89	27.5	37.4	90	27.1	37.8	5%
18	123.5	2371	16.4%	72	33.1	44.7	74	31.1	50.6	81%
19	200.3	2231	18.7%	76	25.0	104.6	76	25.0	104.8	1%
20	1167.4	5692	17.4%	58	60.5	110.4	59	59.1	124.5	46%
21	173.5	1154	0.6%	88	40.1	124.3	88	38.4	126.9	11%
22	474.0	2392	19.2%	66	54.8	103.8	66	53.5	111.1	30%
23	181.0	2691	0.2%	84	178.9	72.1	86	164.1	80.7	40%
24	25.0	1401	1.1%	92	25.6	22.9	93	24.5	23.8	4%
25	128.0	1565	9.2%	79	16.1	76.6	80	15.8	79.6	24%
26	242.6	5332	8.8%	29	52.8	123.3	82	51.6	128.1	11%
27	200.4	4341	11.3%	68	56.6	47.9	69	55.8	49.8	11%
28	31.0	1938	1.0%	87	42.6	21.0	88	41.0	22.0	5%
29	297.9	2404	0.7%	86	104.1	143.2	88	97.0	155.8	50%
30	345.8	4505	14.0%	70	53.1	99.6	70	53.1	99.6	0%
31	535.3	4120	16.9%	76	45.9	193.1	76	45.4	205.6	16%
32	189.1	1909	8.3%	76	30.4	88.1	79	27.9	105.6	148%
33	668.6	3714	11.1%	79	43.5	330.0	80	42.4	359.8	21%
34	396.0	3661	4.3%	83	45.6	223.6	86	42.4	251.1	56%
35	263.8	3150	4.3%	82	56.0	127.8	83	54.3	137.1	27%
36	278.9	3446	5.9%	78	46.3	125.6	81	42.2	149.1	19%
37	472.8	3224	16.1%	69	52.4	32.1	70	50.5	134.6	20%

6.3 Model Basin Results

The following subsection provides graphical descriptions of the drainage requirements for each basin. For each basin, culvert sizes and ditch sizes are recommended to accommodate the anticipated future flow through the main drainage course. This information is useful as it provides a quick check of the fundamental drainage requirement for each basin against future plans for development, which may vary from a more detailed plan. Project costs for each recommended project are located in Section 7, Table 7.4.1. A map showing each improvement project location is located in Section 7, Figure 7.4.1.

Modeling was conducted by assuming that all existing culverts and ditches have a minimum slope that would produce a velocity of 2.0 ft/s. Culverts of unknown material were modeled assuming a friction factor equal to that of corrugated metal pipe (CMP). All proposed culverts were modeled with a Manning friction factor of 0.012, which corresponds to the design roughness coefficient of N-12 ADS pipe and finished concrete surfaces. The assumed slope was selected such that the pipe would experience a minimum velocity of 2.0 ft/s during the design storm event. The ditches were modeled as grass/earth ditches winding in direction, and with a trapezoidal shape having a 1:1 slope on the sides. The ditches were also modeled with a slope that would produce a velocity of 2.0 ft/s. In some instances the natural grade and condition of the basins will differ from the grades used in the study. Recalculation and design efforts will be required to ensure that adequate drainage is obtained. These situations should be resolved during design when improvements or developments are made.

A brief summary of findings for each basin is provided below:

Basin No. 1

Basin 1 is a 136-acre parcel bound to the west by Opal Street, by the hilltops to the north, the urban growth boundary on the east, and E. Central Avenue on the south. Most of the drainage area flows down to E. Central Avenue, where it is then transported to Sutherlin Creek by open channels.

Soil Type
Sibold Fine Sandy Loam
Stockel Fine Sandy Loam
Nonpareil-Oakland Complex
Nonpareil Loam

Slope
1-27%

Current Land Use

Small Residential	48.19 acres
Forest/Brush	87.56 acres

Peak Runoff
Current 25-Year Storm: 84.07 CFS
Future 25-Year Storm: 84.82 CFS

Existing System
The general route of runoff appears to be overland surface flow from the hilltops down to E. Sixth Avenue. From E. Sixth Avenue down to E. Central Avenue all runoff is collected and conveyed through a network of catch basins, manholes, and pipes where it discharges into open channels along E. Central Avenue. Approximately 50% of the surface area of the catchment flows to a 48-inch CMP culvert under E. Central Avenue, which then discharges into an open channel that bisects Basin 12 prior to the outfall into Sutherlin Creek. The remaining 50% of the runoff flows westerly along E. Central Avenue to a box culvert under E. Central Avenue which discharges into an open channel running through Basin 13 prior to emptying into Sutherlin Creek. The City of Sutherlin is responsible for the all storm infrastructure within Basin 1.

Present Day Problems
Project Nos. 3 and 5 are the only two Priority 1 projects in this basin.

Project No. 3 is located on Jade Street, north of Central Avenue and consists of replacing the existing 12-inch CMP pipe with 90 lineal feet of 24-inch ADS N-12 pipe, and installation of one catch basin, and one outfall structure.

Project No. 5 is located at the intersection of Sherwood Street and E. Central Avenue. This project consists of replacing the existing 24-inch by 36-inch CMP arch pipe with 40 lineal feet of 30-inch ADS N-12 pipe, replacing the existing 36-inch by 48-inch CMP arch pipe with 130 lineal feet of 48-inch ADS N-12 pipe, installing one ditch inlet with trash rack and one 60-inch manhole, saw-cutting the existing SD junction box to accommodate the new 48-inch pipe, and repairing 160 lineal feet of street trench.

Future System
Although there is little projected growth within Basin 1, Project Nos. 3, 5 and 18 are recommended for this basin. These projects are needed primarily because this culvert system is approaching or has surpassed its design life.

Project No. 18 entails realigning a significant portion of storm drain piping down the length of Opal Street and increasing the pipe size from the existing 28-inch CMP pipe to a 30-inch ADS pipe. The need for this improvement is partially due to undersized storm drain infrastructure.

Summary of projects recommended in this basin: Project Nos. 3, 5, and 18.

Basin No. 2

Basin 2 is approximately 69 acres in size and is located to the west of Basin 1. The basin drains to the south through Basin 14 on its way into Sutherlin Creek. The upper portion of the basin is bound by the hilltops to the north, and to the south by E. Central Avenue.

Soil Type
Sibold Fine Sandy Loam
Stockel Fine Sandy Loam
Nonpareil Loam

Slope
1-26%

Current Land Use

Commercial	4.52 acres
Grassland	3.38 acres
Large Residential	10.75 acres
Small Residential	38.37 acres
Forest/Brush	12.17 acres

Peak Runoff
Current 25-Year Storm: 51.69 CFS
Future 25-Year Storm: 51.69 CFS

Existing System
The route of runoff for Basin 1 is primarily overland surface flow from the hilltops down to E. Sixth Avenue. From East Sixth Avenue down to E. Central Avenue, the majority of the runoff is collected and conveyed through a network of driveway culverts, catch basins, manholes, and pipes along Arvilla Way, making a short easterly turn onto E. Fourth Avenue, before turning south and paralleling Arvilla Court where it eventually discharges into a 24-inch CMP interceptor line in E. Central Avenue. From E. Central Avenue the flow travels from east to west. The 24-inch interceptor conveys all runoff from Basin 2 and discharges into an open channel that flows through Basin 14 and eventually into Sutherlin Creek. The city of Sutherlin is responsible for all existing storm drainage within Basin 2.

Present Day Problems
There are two Priority 1 projects in this basin. Project No. 11 involves upsizing the existing 18-inch pipe to a 24-inch ADS pipe. This project is bound by E. First Avenue to the north, Grove Street to the east, Pear Lane to the west, and E. Central Avenue to the south.

Project No. 14, located in Johns Street between E. Central Avenue and E. Fourth Avenue, entails replacing the existing 12-inch CMP culvert with 108 lineal feet of 15-inch ADS N-12 pipe, replacing the existing 12-inch culvert with 35 lineal feet of 24-inch ADS N-12 pipe, and installation of two ditch inlets and one outfall structure.

Future System
Although there is little projected growth within Basin 2, Project Nos. 19 and 20 are recommended for this basin. The need for these improvements will be due to storm drain infrastructure that becomes undersized as future development occurs.

Project No. 19 entails increasing pipe size for two pipe segments in the intersection of E. Fourth Avenue and Arvilla Way. The existing 18-inch ADS pipes should be upsized to 30-inch ADS pipe. The need for this improvement is due to undersized storm drain infrastructure.

Project No. 20, located southeast of Arvilla Court and bound by Central Avenue, entails replacing the existing 24-inch split N-12 pipe with 200 lineal feet of open channel having the following characteristics: bottom width of 2.0 feet, depth of 1.0 foot, and 2:1 channel side slopes.

Summary of projects recommended in this basin: Project Nos. 11, 14, 19, and 20.

Basin No. 3

Basin 3 is approximately 157 acres in size and is located to the west of Basin 2. The basin drains to the south through the eastern portion of Basin 15 on its way into Sutherlin Creek. The upper portion of the basin is bound by the hilltops to the north, and to the south by E. Central Avenue.

Soil Type
Bateman Silty Loam
Nonpareil Loam
Sibold Fine Sandy Loam
Rosehaven Loam

Slope
1-17%

Current Land Use

Grassland	2.97 acres
Large Residential	19.75 acres
Small Residential	12.61 acres
Forest/Brush	121.63 acres

Peak Runoff
Current 25-Year Storm: 69.66 CFS
Future 25-Year Storm: 70.16 CFS

Existing System
The general route of runoff for overland surface flow for Basin 3 is from the hilltops down to E. Sixth Avenue. From E. Sixth Avenue down to E. Central Avenue, the majority of the runoff is collected and conveyed through a major collector along E. Fourth Avenue, before turning down the common backyard property line between Casa De Loma Street and Crown Point Court. The major collector discharges into an open channel at the intersection of E. First Avenue and Pear Lane. The open channel flows into two 36-inch by 48-inch CMP arch pipes that convey flow under E. Central Avenue into an open channel, and eventually into Sutherlin Creek. The city of Sutherlin is responsible for all existing storm drainage within Basin 3.

Present Day Problems
The entire collector, as mentioned above, appears to be undersized and is past its design life. This improvement, identified as Project No. 1, entails replacing the entire length of the 36-inch pipe within E. Fourth Avenue with a 60-inch ADS N-12, as well as replacing the entire length of 24-inch pipe along the common property line with a 36-inch ADS N-12. This project is a Priority 1 improvement and was identified as a problem area by City staff.

Future System
Project No. 42, a Priority 3 improvement, is located under E. Sixth Street at the upper end of Casa De Loma Street. This project consists of replacing the existing 30-inch CMP culvert with 50 lineal feet of 36-inch ADS N-12 pipe, installation of one ditch inlet with trash rack, and one outfall structure. The need for this improvement will be due to storm drain infrastructure that becomes undersized as future development occurs.

Summary of projects recommended in this basin: Project Nos. 1 and 42.

Basin No. 4

Basin 4 is approximately 29 acres in size and is located to the west of Basin 3. The basin drains to the south on its way into Sutherlin Creek. The upper portion of the basin is bound by the hill-tops to the north, and by E. Central Avenue to the south.

Soil Type
Sibold Fine Sandy Loam
Stockel Fine Sandy Loam

Slope
0-20%

Current Land Use

Residential	16.15 acres
Forest Brush	12.44 acres

Peak Runoff
Current 25-Year Storm: 14.01 CFS
Future 25-Year Storm: 14.01 CFS

Existing System
The general route of runoff for overland surface flow for Basin 4 is from the hilltops down to E. Fourth Avenue. From E. Fourth Avenue down to E. Central Avenue, the majority of the runoff is collected and conveyed through a minor collector that runs in a north/south orientation between Crown Point Court and Emerald Street. Once on the south side of Central Avenue, the runoff is conveyed by a series of culverts and open channels prior to flowing into Sutherlin Creek. The city of Sutherlin is responsible for all existing storm drainage within Basin 4.

Present Day Problems
According to the storm model and City staff, there are no significant problems with the existing system at this time.

Future System
No significant amount of development is predicted for this basin throughout the planning period.

There are no projects recommended for this basin.

Basin No. 5

Basin 5 is approximately 87 acres in size and is located to the west of Basin 4. The upper portion of the basin is bound by the hilltops to the north, and to the south by E. Central Avenue. The basin drains to the south on its way into Sutherlin Creek.

Soil Type
Bateman Silty Loam
Nonpareil Loam
Sutherlin-Oakland Complex
Speaker Loam

Slope
1-19%

Current Land Use

Small Residential	18.50 acres
Forest/Brush	68.46 acres

Peak Runoff
Current 25-Year Storm: 54.56 CFS
Future 25-Year Storm: 54.56 CFS

Existing System
The general route of runoff for overland surface flow in Basin 5 is from the hilltops down to a collection point near Sherwood Street, between E. Fourth and E. Sixth Avenues. From the point of collection down to E. Central Avenue, the majority of the runoff is conveyed through a series of culverts and roadside ditches that run alongside Sherwood Street. Once on the south side of Central Avenue, the runoff is conveyed by a series of pipes, culverts and open channels prior to flowing into Sutherlin Creek. The city of Sutherlin is responsible for all existing storm drainage within Basin 5.

Present Day Problems
Project No. 2, a Priority 1 improvement was identified as a problem area by the storm drain modeling, as well as by City staff.

Project No. 2 is located along Sherwood Street between E. Sixth Avenue and E. Fourth Avenue. This project entails replacing the existing 16-inch by 18-inch CMP culverts with 132 lineal feet of 24-inch ADS N-12 pipe, and installing one 60-inch manhole and one 6-foot by 8-foot junction box.

Future System
Project No. 21, a Priority 2 improvement, is located along E. Sixth Avenue west of Sherwood Street. This project consists of replacing the existing 18-inch culvert with 30 lineal feet of 24-inch ADS N-12 pipe and installing one ditch inlet with trash rack. The need for this improvement will be due to storm drain infrastructure that becomes undersized as future development occurs.

Summary of projects recommended in this basin: Project Nos. 2 and 21.

Basin No. 6

Basin 6 is approximately 121 acres in size and is located to the west of Basin 5. The basin is bound by the hilltops to the north, and to the south by E. Central Avenue. The basin drains to the south into Sutherlin Creek.

Soil Type
Bateman Silty Loam
Sutherlin-Oakland Complex
Speaker Loam

Slope
2-19%

Current Land Use

Commercial	5.00 acres
Large Residential	16.44 acres
Small Residential	43.72 acres
Grassland	3.21 acres
Forest/Brush	52.41 acres

Peak Runoff
Current 25-Year Storm: 75.03 CFS
Future 25-Year Storm: 76.60 CFS

Existing System
The general route of runoff for Basin 6 is overland flow from the hilltops down to a collection point just north of E. Fourth Avenue, between Terrace Street and Mardonna Street. From the point of collection down to E. Central Avenue, the majority of the runoff is conveyed through a series of pipes within Mardonna Street. The flow is then conveyed by a 42-inch CMP interceptor to the west along E. Central Avenue prior to discharge into an open channel that flows into Sutherlin Creek. The city of Sutherlin is responsible for all storm drain infrastructure within Basin 6.

Present Day Problems
Project No. 12, a Priority 1 improvement, entails replacing the existing 28-inch CMP pipe in E. Fourth Avenue between Terrace Street and Mardonna Street with a 30-inch ADS pipe. The need for this improvement is due to undersized existing storm drain infrastructure.

Future System
Although there is little projected growth within Basin 6, Project Nos. 12, 22, 23, and 61 are recommended for this basin in the future. The need for these improvements will be due to storm drain infrastructure that becomes undersized as future development occurs.

Project No. 22, a Priority 2 improvement located on E. First Avenue between Terrace Street and Mardonna Street, consists of replacing the existing 18-inch CMP culvert with 621 lineal feet of 24-inch ADS N-12 pipe and installing one 48-inch manhole.

Project No. 23, a Priority 1 improvement, involves replacing the existing 18-inch CMP pipe in East First Avenue and the 28-inch pipe in Mardonna Street with a 30-inch ADS pipe. The existing 42-inch interceptor pipe will also need to be replaced with a 60-inch ADS pipe from Mardonna Street to the existing open channel, which is approximately 120 lineal feet to the west. The need for this improvement is also due to undersized storm drain infrastructure.

Project No. 61, a Priority 3 improvement located 480 feet north of E. Fourth Avenue between Terrace Street and Mardonna Street, consists of replacing the existing 18-inch CMP culvert with 34 lineal feet of 18-inch ADS N-12 pipe, installing one ditch inlet with trash rack, and one outfall structure.

Summary of projects recommended in this basin: Project Nos. 12, 22, 23 and 61.

Basin No. 7

Basin 7 is approximately 58 acres in size and is located to the west of Basin 6. The basin is bound by the hilltops to the north, and to the south by E. Central Avenue. The basin drains to the south on its way into Sutherlin Creek.

Soil Type
Speaker Loam
Nonpareil Loam
Sutherlin-Oakland Complex

Slope
1-22%

Current Land Use

Commercial	6.84 acres
Grassland	5.62 acres
Forest/Brush	33.73 acres
Small Residential	8.57 acres

Large Residential 3.78 acres

Peak Runoff
25-Year Storm: 36.14 CFS
Future 25-Year Storm: 37.24 CFS

Existing System
The general route of runoff for Basin 7 is overland flow from the hilltops down to a collection point just north of E. Sixth Avenue, between Umatilla Street and Mardonna Street. From the point of collection down to E. Central Avenue, the majority of the runoff is by a minor collector that runs through the high school and middle school properties. The flow is then conveyed by a series of open channels and culverts along Waite Street prior to discharge into Sutherlin Creek. The city of Sutherlin is responsible for all storm drain infrastructure within Basin 7.

Present Day Problems
City staff has reported no significant problems with the existing system at this time. Hydraulic Modeling indicates that some of the basin infrastructure is undersized for future runoff conditions.

Future System
Project Nos. 24 and 62 are recommended for this basin. The need for these improvements will be due to storm drain infrastructure that becomes undersized as future development occurs.

Project No. 24, a Priority 2 improvement, is located west of Mardonna Street and is bound by E. Sixth Avenue and E. Central Avenue. This project includes replacing the existing 24-inch CMP pipe with 1700 lineal feet of 24-inch ADS N-12 pipe, replacing the existing 27-inch by 43-inch arch CMP pipe with 70 lineal feet of 36-inch ADS N-12 pipe, installing one 48-inch manhole, and one outfall structure.

Project No. 62, a Priority 3 improvement, is located along Central Avenue south of Eagle Court. This project entails replacing the existing 24-inch pipe with 117 lineal feet of 24-inch ADS N-12 pipe and installing one ditch inlet with trash rack.

Summary of projects recommended in this basin: Project Nos. 24 and 62.

Basin No. 8

Basin 8 is approximately 63 acres in size and is located to the west of Basin 7. The basin is bound by the hilltops to the north, and to the south by E. Central Avenue. The basin drains to the south on its way into Sutherlin Creek.

Soil Type
Nonpareil Loam
Speaker Loam
Sutherlin-Oakland Complex
Conser Silty Clay Loam

Slope
1-20%

Current Land Use

Commercial	7.82 acres
Grassland	8.71 acres
Forest/Brush	19.67 acres
Small Residential	26.53 acres

Peak Runoff
25-Year Storm: 46.88 CFS
Future 25-Year Storm: 46.89 CFS

Existing System
The general route of runoff for overland surface flow for Basin 8 is from the hilltops down to a collection point just north of E. Sixth Avenue, between Umatilla Street and Willamette Street. From the point of collection down to Sutherlin Creek, the majority of the runoff is conveyed by a minor collector that lies along the rear property line of the residences that front Umatilla Street, before turning into and following Umatilla Street to the outfall. The city of Sutherlin is responsible for all storm drain infrastructure within Basin 8.

Present Day Problems
Project No. 6 is the only Priority 1 improvement identified within Basin 8. This improvement is located along Umatilla Street and is bound by E. Fourth Avenue and E. Sixth Avenue. Project No. 6 involves replacing the existing 12-inch CMP pipe and culvert with 510 lineal feet of 18-inch ADS N-12 pipe, replacing the existing 12-inch CMP pipe with 255 lineal feet of 24-inch ADS N-12 pipe, replacing existing 24-inch CMP pipe with 48 lineal feet of 24-inch ADS N-12, installing two 48-inch manholes, one ditch inlet with trash rack for the 18-inch pipe, and two catch basins. This project was identified as a problem area by the storm drain modeling, as well as by City staff.

Future System
Project No. 25, a Priority 2 improvement also identified in Basin 8, is located along Arch Street west of Magnolia Street. Project No. 25 includes replacing the existing 12-inch CMP pipe with 42 lineal feet of 18-inch ADS N-12 pipe and installing one ditch inlet with trash rack. The need for this improvement will be due to storm drain infrastructure that becomes undersized as future development occurs.

Project No. 64 is a Priority 3 improvement also identified within Basin 8. This improvement is located along Umatilla Street and is bound by E. Fourth Avenue and E. Sixth Avenue. Project No. 64 involves replacing existing 24-inch CMP pipe with 489 lineal feet of 24-inch ADS N-12, replacing the existing 36-inch CMP pipe with 545 lineal feet of 30-inch ADS N-12 pipe, replacing the existing 36-inch pipe with 380 lineal feet of 36-inch ADS N-12, replacing the existing 36-inch pipe with 310 lineal feet of 48-inch ADS N-12, two catch basins, and one outfall structure at the creek, and repairing 1790 lineal feet of street trench.

Summary of projects recommended in this basin: Project Nos. 6, 25, and 64.

Basin No. 9

Basin 9 is approximately 82 acres in size and is located to the west of Basin 8. The basin is bound by E. Sixth Avenue to the north, by E. Central Avenue to the south, and the railroad tracks to the west. The basin drains to the south and through Basin 17 on its way into Sutherlin Creek.

Soil Type
Sutherlin-Oakland Complex
Conser Silty Clay Loam

Slope
1-9%

Current Land Use

Commercial	19.75 acres
Grassland	7.23 acres
Small Residential	55.43 acres

Peak Runoff
25-Year Storm: 65.31 CFS
Future 25-Year Storm: 67.12 CFS

Existing System
The general route of runoff for Basin 9 is from E. Sixth Avenue down to E. Central Avenue via minor collector pipes in Willamette, Umpqua, N. State, and Calapooia Streets. Each minor collector extends through Basin 17 prior to its outfall into Sutherlin Creek. The city of Sutherlin is responsible for all storm drain infrastructure within Basin 9.

Present Day Problems
There are two Priority 1 improvements within Basin 9. These projects were identified as problem areas by the storm drain modeling, and by City staff.

The first improvement is located along N. State Street between E. Third Avenue and E. Central Avenue. This improvement is identified as Project No. 7, and it entails replacing the existing 12-inch and 18-inch RCP pipes with 817 lineal feet of 24-inch ADS N-12 pipe, replacing the 28 lineal feet of existing open channel with 12-inch ADS N-12 pipe to pick up the ditch along E. Second Avenue, installing one ditch inlet with trash rack, two catch basins, and repairing 845 lineal feet of street trench.

The second improvement, identified as Project No. 8, is located along N. Calapooia Street north of E. Central Avenue. This project involves replacing the existing 18-inch CMP pipe with 285 lineal feet of 24-inch ADS N-12 pipe, replacing the existing 12-inch CMP pipe with 130 lineal feet of 12-inch ADS N-12 pipe, installing four catch basins, and repairing 415 lineal feet of street trench.

Future System
Although there is little projected growth within Basin 9, Priority 2 improvement Project Nos. 26 and 27 are recommended for this basin as future development occurs. The need for these improvements will be due to storm drain infrastructure being undersized. These projects lay partially within Basin 9 and Basin 17.

Project No. 26 lies entirely within Willamette Street and is bound by E. Third Avenue and Sutherlin Creek. This project consists of replacing the existing 36-inch CMP pipe with 445 lineal feet of 36-inch ADS N-12 pipe, replacing the existing 18-inch CMP pipe with 180 lineal feet of 24-inch ADS N-12 pipe, replacing the existing 10-inch and 12-inch culverts with 278 lineal feet of 24-inch ADS N-12 pipe, reshaping 420 lineal feet of existing open channel to a bottom width of 2.0 feet, and installing one outfall structure at Sutherlin Creek, two catch basins, and two 60-inch manholes.

Project No. 27 lays entirely within Umpqua Street and is bound by E. Fourth Avenue and Sutherlin Creek. This project entails replacing the existing 24-inch CMP pipe with 413 lineal feet of 30-inch ADS N-12 pipe, replacing the existing 18-inch CMP pipe with 266 lineal feet of 24-inch ADS N-12 pipe, replacing the existing 18-inch CMP pipe with 100 lineal feet of 24-inch ADS N-12 pipe, replacing the existing 12-inch CMP culverts with 93 lineal feet of 18-inch ADS N-12 pipe, and installing one outfall structure at Sutherlin Creek, two catch basins, one 48-inch manhole, and six ditch inlets with trash racks.

Summary of projects recommended in this basin: Project Nos. 7, 8, 26, and 27.

Basin No. 10

Basin 10 is approximately 40 acres in size and is located to the north of Basin 11. The basin drains to the north through Basin 37 on its way into Calapooya Creek. The basin is bound by W. Sixth Avenue to the south and the hilltops to the north.

Soil Type
Speaker-Nonpareil Complex
Speaker Loam
Nonpareil Loam

Slope
10-15%

Current Land Use

Large Residential	7.02 acres
Forest/Brush	32.96 acres

Peak Runoff
25-Year Storm: 19.22 CFS
Future 25-Year Storm: 19.22 CFS

Existing System
The general route of runoff for overland surface flow for Basin 10 is from the hilltops down to W. Sixth Avenue where it is conveyed to Basin 37 by open channel. The city of Sutherlin is responsible for all storm drain infrastructure within Basin 10.

Present Day Problems
According to the storm model and City staff, there are no significant problems with the existing system at this time.

Future System
Project No. 28, a Priority 2 improvement, is located within Basin 10. This project is on W. Sixth Avenue west of the railroad tracks and includes replacing the existing 12-inch CMP culvert with 26 lineal feet of 24-inch ADS N-12 culvert and installing one ditch inlet. The need for this improvement will be due to storm drain infrastructure that becomes undersized as future development occurs.

Summary of projects recommended in this basin: Project No. 28.

Basin No. 11

Basin 11 is approximately 36 acres and is located to the south of Basin 10 and west of Basin 9. The basin drains to the north through Basin 37 on its way into Calapooya Creek. The basin is bound by W. Sixth Avenue to the north and W. Central Avenue to the south.

Soil Type
Nonpareil Loam
Sutherlin-Oakland Complex
Conser Silty Loam

Slope
3-13%

Current Land Use

Commercial	2.25 acres
Grassland	8.86 acres
Industrial	6.69 acres
Small Residential	7.13 acres
Large Residential	11.28 acres

Peak Runoff
25-Year Storm: 27.38 CFS
Future 25-Year Storm: 28.29 CFS

Existing System
The general route of runoff for overland surface flow for Basin 11 is from E. Fourth Avenue down to the railroad tracks, where it is conveyed to Basin 34 by open channel. The city of

Sutherlin is responsible for all storm drain infrastructure within Basin 11.

Present Day Problems
City staff has reported no significant problems with the existing system at this time. Hydraulic Modeling indicates that some of the basin infrastructure is undersized for future runoff conditions.

Future System
Project No. 29 is a Priority 2 improvement located within Basins 11, 17 and 24. This project lies along the portion of the railroad tracks that is bound by W. Sixth Avenue, Oak Street, and W. Central Avenue. Project No. 29 entails replacing the existing 24-inch CMP pipe with 915 lineal feet of 30-inch ADS N-12 culvert, reshaping 1500 lineal feet of existing open channel to a bottom width of 6.0 feet, installing one ditch inlet with trash rack and one outfall structure. The need for this improvement is due to undersized storm drain infrastructure and/or the design life of the infrastructure has been exceeded.

Summary of projects recommended in this basin: Project No. 29.

Basin No. 12

Basin 12 is approximately 13 acres in size and is bound to the north by Basin 1, to the east by the urban growth boundary, to the west by Basin 13, and to the south by Sutherlin Creek. The basin drains to the south via overland flow and channelized flow prior to entering Sutherlin Creek.

Soil Type
Conser Silty Clay Loam

Slope
0-1%

Current Land Use

Small Residential	6.43 acres
Grassland	6.43 acres

Peak Runoff
25-Year Storm: 9.38 CFS
Future 25-Year Storm: 9.79 CFS

Existing System
The general route of runoff appears to be channelized flow within Montclair Street and Aspen Avenue. The runoff is collected and conveyed through a network of catch basins, manholes, and pipes to where it discharges into Sutherlin Creek. Approximately 50% of the basin is not developed and flows directly into the open channel that bisects the basin. This open channel also conveys a significant portion of the runoff from Basin 1. The City of Sutherlin is responsible for the all storm infrastructure within Basin 12.

Present Day Problems
Project No. 13 is a Priority 1 improvement located within Basin 12. This project is located east of Montclair Street and is bound by E. Central Avenue and Sutherlin Creek. Project No. 13 entails reshaping 757 lineal feet of open channel to a bottom width of 5.0 feet, installing 150 lineal feet of 30-inch ADS N-12 pipe alongside existing 30-inch CMP culverts, and installing one ditch inlet and one outfall structure.

Future System
No significant amount of development is predicted for this basin throughout the planning period.

Summary of projects recommended in this basin: Project No. 13

Basin No. 13

Basin 13 is approximately 23 acres in size and is bound to the north by Basin 1, to the east by Basin 12, to the west by Basin 14, and to the south by Sutherlin Creek. The basin drains to the south via overland flow that is channelized prior to entering Sutherlin Creek.

Soil Type
Conser Silty Clay Loam

Slope
0-1%

Current Land Use

Small Residential	9.91 acres
Grassland	12.54 acres

Peak Runoff
25-Year Storm: 13.91 CFS
Future 25-Year Storm: 15.37 CFS

Existing System
The general route of runoff appears to be channelized flow within Cypress Street and Aspen Avenue. The runoff is collected and conveyed through a network of catch basins, manholes, and pipes where it then discharges into Sutherlin Creek. Approximately two-thirds of the surface area of the basin, which is undeveloped, flows into the open channel that runs from north to south into Sutherlin Creek. This open channel also conveys a significant portion of the runoff from Basin 1. The city of Sutherlin is responsible for all the storm infrastructure within Basin 12.

Present Day Problems
According to the storm model and City staff, there are no significant problems with the existing system at this time.

Future System
Project No. 41 is the only Priority 3 improvement identified within Basin 13. This improvement is located south of the intersection of E. Central Avenue and Opal Street. Project No. 41 involves replacing the existing open channel with 1000 lineal feet of 48-inch ADS N-12 pipe, and installing two 72-inch manholes, one ditch inlet with trash rack, and one outfall structure. This project was identified as a problem area by the storm drain modeling, as well as by City staff.

Summary of projects recommended in this basin: Project No. 41.

Basin No. 14

Basin 14 is approximately 23 acres in size and is bound to the north by Basin 2, to the east by Basin 13, to the west by Basin 15, and to the south by Sutherlin Creek. The basin drains to the south via two minor collectors in Nicholas Court and Grove Street before making its way to Sutherlin Creek.

Soil Type
Conser Silty Clay Loam

Slope
0-1%

Current Land Use

Small Residential	21.52 acres
Grassland	1.03 acres

Peak Runoff
25-Year Storm: 16.25 CFS
Future 25-Year Storm: 16.25 CFS

Existing System
The general route of runoff travels via channelized flow within Nicholas Court and Grove Street. The runoff is collected and conveyed through a network of catch basins, manholes, and pipes before discharging into Sutherlin Creek. Approximately 50% of the surface area of the basin drains into the open channel that runs from north to south into Sutherlin Creek. This open channel also conveys a significant portion of the runoff from Basin 2. The city of Sutherlin is responsible for all storm infrastructure within Basin 14.

Present Day Problems
According to the storm model and City staff, there are no significant problems with the existing system at this time.

Future System
No significant amount of development is predicted for this basin throughout the planning period.

There are no projects recommended for this basin.

Basin No. 15

Basin 15 is approximately 47 acres in size and is bound to the north by Basins 3, 4, 5, and 6, to the east by Basin 14, to the west by Basin 16, and to the south by Sutherlin Creek. The basin drains to the south via two major collectors and one minor collector before making its way into Sutherlin Creek.

Soil Type
Conser Silty Clay Loam

Slope
0-0.5%

Current Land Use

Small Residential	45.37 acres
Grassland	1.40 acres

Peak Runoff
25-Year Storm: 36.75 CFS
Future 25-Year Storm: 36.75 CFS

Existing System
The runoff from the eastern third of the basin is collected by curb inlets along Sunny Lane and is sent directly into the existing open channel that parallels the street on its way into Sutherlin Creek. The middle third of Basin 15 drains to a series of open channels and culverts that direct runoff into Sutherlin Creek. The western-most third of Basin 15 drains to a minor collector that eventually discharges into an open channel that cuts across Basin 16 on its way into Sutherlin Creek. This collector and open channel also conveys a significant portion of the runoff from Basin 5. The city of Sutherlin is responsible for the all storm infrastructure within Basin 15.

Present Day Problems
Project No. 4 is the only Priority 1 improvement identified within Basin 15. This project is located along E. Central Avenue between Jade Street and Opal Street. Project No. 4 involves replacing the existing 18-inch culverts with 180 lineal feet of 30-inch ADS N-12 pipe, reshaping 483 lineal feet of existing open channel to a bottom width of 4.5 feet, installing three ditch inlets with trash racks, and repairing 122 lineal feet of street trench. This project was identified as a problem area by the storm drain modeling, as well as by City staff.

Future System
No significant amount of development is predicted for this basin throughout the planning period.

Summary of projects recommended in this basin: Project No. 4.

Basin No. 16

Basin 16 is approximately 43 acres in size and is bound to the north by Basins 5 and 6, to the east by Basin 15, to the west by Basin 17, and to the south by Sutherlin Creek. The basin drains to the south via one major collector, one minor collector, and a series of open channels and culverts along Waite Street before making its way to Sutherlin Creek.

Soil Type
Conser Silty Clay Loam

Slope
0-0.2%

Current Land Use

Large Residential	7.04 acres
Small Residential	16.6 acres
Grassland	19.54 acres

Peak Runoff
25-Year Storm: 21.60 CFS
Future 25-Year Storm: 23.15 CFS

Existing System
The runoff from the eastern half of Basin 16 flows as overland flow into a major open channel. This same open channel also conveys the runoff from Basins 5 and 6 to Sutherlin Creek. The remaining 50% of Basin 16 is split into two separate conveyance systems. The first system is a series of catch basins, manholes, and pipes along Easy Street that flows south into Sutherlin Creek. The second system consists of a series of open channels and culverts that also transport the runoff to the south into Sutherlin Creek. The City of Sutherlin is responsible for the all storm infrastructure within Basin 16.

Present Day Problems
City staff has not reported any significant problems with the existing system at this time nor does the storm drain model show any significant problems.

Future System
Project Nos. 30 and 31, identified by storm drain modeling, are Priority 2 improvements within Basin 16. The need for these improvements will be due to storm drain infrastructure that becomes undersized as future development occurs.

Project No. 30, located along Beecroft Street, consists of replacing the existing 36-inch CMP culvert with 50 lineal feet of 48-inch ADS N-12 culvert and installing one ditch inlet with trash rack.

Project No. 31, located along Waite Street and bound by Everett Avenue and Sutherlin Creek, entails replacing the existing 36-inch CMP culverts with 130 lineal feet of dual 36-inch ADS N-

12 culvert, and installing four ditch inlets with trash racks and one outfall structure at Sutherlin Creek.

Summary of projects recommended in this basin: Project Nos. 30 and 31.

Basin No. 17

Basin 17 is approximately 45 acres in size and is bound to the north by Basin 9, to the east by Basin 16, and to the south by Sutherlin Creek. The basin drains to the south via two major collectors and one minor collector before making its way into Sutherlin Creek.

Soil Type
Conser Silty Clay Loam

Slope
0-2%

Current Land Use

Commercial	12.65 acres
Industrial	6.42 acres
Small Residential	19.88 acres
Grasslands	5.77 acres

Peak Runoff
25-Year Storm: 37.25 CFS
Future 25-Year Storm: 37.65 CFS

Existing System
Basin 17 is divided into five sub-basins and each sub-basin has its own storm drain system. Runoff patterns from all five sub-catchments behave in much the same way, with the majority of the flow getting collected by local catch basins, which is then routed to a collector pipe that bisects each basin on its way into Sutherlin Creek. The remaining runoff finds its way into Sutherlin Creek via overland flow. All five collector pipes are classified as major collectors since they also convey runoff from the basins above.

Present Day Problems
According to the storm modeling and to City staff, there are no significant problems with the existing system at this time.

Future System
There are three Priority 2 improvements within Basin 17. These improvements, identified as Project Nos. 26, 27 (discussed in Basin 9) and 29 (discussed in Basin 11). The need for these improvements will be due to storm drain infrastructure that becomes undersized as future development occurs.

Summary of projects recommended in this basin: Project Nos. 26, 27 and 29.

Basin No. 18

Basin 18 is approximately 124 acres in size and is bound to the north by Basins 15 and 16, and to the west by Basin 21. The basin drains to the north, towards Southside Road, on its way into Sutherlin Creek.

Soil Type
Conser Silty Clay Loam
Oakland-Sutherlin-Nonpareil Complex
Sutherlin Silty Loam
Sibold Fine Sandy Loam
Rosehaven Loam

Slope
1-23%

Current Land Use

Small Residential	8.35 acres
Large Residential	2.29 acres
Grassland	51.78 acres
Forest/Brush	60.44 acres

Peak Runoff
25-Year Storm: 44.69 CFS
Future 25-Year Storm: 50.62CFS

Existing System
The majority of runoff in Basin 18 flows to the south as overland flow until it nears Southside road where it becomes channelized flow. The channelized flow is conveyed under Southside Road by several 12-inch CMP culverts where it discharges into open channels on the way to Sutherlin Creek. At the intersection of Sea Street and Southside Road, runoff flows under Southside Road through a 12-inch CMP culvert and then into an open channel that is picked up by a minor collector. The 15-inch CMP minor collector directs the runoff into Sutherlin Creek.

Present Day Problems
According to the storm model and to City staff, there are no significant problems with the existing system at this time.

Future System
Project Nos. 32 and 33 are Priority 2 improvements located within Basin 18. The need for these improvements will be due to storm drain infrastructure that becomes undersized as future development occurs.

Project No. 32, located along Southside Road east of Sea Street, entails replacing the existing 12-inch CMP culvert with 30 lineal feet of 15-inch ADS N-12 culvert, and installing one ditch inlet with trash rack, and one outfall structure at Sutherlin creek.

Project No. 33, located along Southside Road (1000 feet east of Sea Street), entails replacing the existing 12-inch CMP culvert with 30 lineal feet of 15-inch ADS N-12 culvert, and installing one ditch inlet with trash rack and one outfall structure at creek

Summary of projects recommended in this basin: Project Nos. 32 and 33.

Basin No. 19

Basin 19 is approximately 124 acres in size and is bound to the north by Basin 18 and to the south by Cooper Creek. The basin drains to the south into Cooper Creek.

Soil Type
Rosehaven Loam
Atring Gravelly Loam
Sutherlin Silty Loam
Sibold Fine Sandy Loam
Nonpareil Loam
Waldo Silty Clay Loam

Slope
2-31%

Current Land Use

Small Residential	42.83 acres
Grassland	11.11 acres
Forest/Brush	145.92 acres

Peak Runoff
25-Year Storm: 104.50 CFS
Future 25-Year Storm: 104.70 CFS

Existing System
The majority of runoff in Basin 19 is overland flow that drains directly into Cooper Creek. The only exception is the recently constructed Forest Heights Subdivision on the west side of Basin 19. The subdivision's storm water collection system consists of catch basins, curb inlets, and manholes, all of which appears to be adequately sized. Once collected in the system, the runoff is conveyed by an 18-inch ADS pipe that drains into Cooper Creek.

Present Day Problems
According to the storm model and to City staff, there are no significant problems with the existing system at this time.

Future System
No significant amount of development is predicted for this basin throughout the planning period.

There are no improvements recommended for the basin.

Basin No. 20

Basin 20 is approximately 1,167 acres in size and is bound to the north by Basin 19 and to the south by the hilltops to the south of town. The basin drains to the north into Cooper Creek.

Soil Type
Rosehaven Loam
Atring Gravelly Loam
Speaker Loam
Nonpareil Loam
Dickerson Loam
Conser Silty Clay Loam
Sibold Fine Sandy Loam

Slope
2-23%

Current Land Use

Commercial	9.01 acres
Large Residential	12.14 acres
Small Residential	57.27 acres
Forest	1035.70 acres
Grassland	53.27 acres

Peak Runoff
25-Year Storm: 110.43 CFS
Future 25-Year Storm: 124.60 CFS

Existing System
The majority of runoff in Basin 20 starts as overland flow that makes its way into the numerous draws that face Cooper Creek. The runoff in the draws becomes concentrated flow before entering Cooper Creek. The exception to this is SKP Park, located at the northwest corner of the basin. The SKP Park's collection system consists of two 36-inch CMP pipes that convey the runoff into two separate open channels that eventually merge with Cooper Creek.

Present Day Problems
According to the storm model and to City staff, there are no significant problems with the existing system at this time.

Future System
Project No. 43 is a Priority 3 improvement located within Basin 20. The need for this improvement will be due to storm drain infrastructure that becomes undersized as future development occurs.

Project No. 43 is located along Highway 99 adjacent to the City of Sutherlin Public Works Building and consists of replacing the existing 30-inch CMP culvert with 55 lineal feet of 30-inch ADS N-12 culvert, and installing one ditch inlet with trash rack and one outfall structure.

Summary of projects recommended in this basin: Project No. 43.

Basin No. 21

Basin 21 is approximately 184 acres in size and is bound to the north by Sutherlin Creek, to the south by Cooper Creek, and to the west by the railroad tracks. The majority of the basin drains to the northwest into Sutherlin Creek.

Soil Type
Conser Silty Clay Loam

Slope
0-1%

Current Land Use

Industrial	10.18 acres
Commercial	10.33 acres
Small Residential	66.52 acres
Large Residential	9.77 acres
Grassland	87.09 acres

Peak Runoff
25-Year Storm: 124.36 CFS
Future 25-Year Storm: 134.67 CFS

Existing System
Basin 21 was divided into several sub-basins. Each sub-basin has its own storm water collection system and, to a lesser degree, its own receiving stream. The Sub-basin 21-1 collection system consists of several 10-inch CMP minor collectors with catch basins that drain directly to Cooper Creek. Sub-basin 21-2 drains to either a minor collector along S. State Street or an open channel between Raintree Avenue and Heavenly Court. Both the open channel and minor collector enter a major collector, running east to west, before flowing into Sutherlin Creek. Sub-basin 21-3 collection system consists of one 12-inch CMP minor collector with catch basins that drain directly to Sutherlin Creek. The runoff for Sub-basin 21-4 flows into Sutherlin Creek as overland flow with minimal concentrated flow. The Sub-basin 21-5 collection system consists of catch basins located at the end of Camas and Valley Courts and Valentine Avenue. From these catch basins, the storm water enters a major collector that runs down Calapooia Street prior to discharging into Cooper Creek. Due to the relatively flat topography of Sub-basin 21-6, the majority of storm runoff is considered overland surface flow. The surface flow continues across Sub-basin 21-6, from east to west, until it is collected in an open channel that parallels the railroad tracks. The open channel flows south eventually making its way into Sutherlin Creek. The point of confluence is not known. Runoff from Sub-basin 21-7 is generally overland flow

that becomes concentrated flow at Calapooia Street, and is then collected by area drains that are connected to the major collector in the street.

Present Day Problems
According to the storm model and to City staff, there are no significant problems with the existing system at this time.

Future System
Project Nos. 44, 45, 46 and 65 are Priority 3 improvements located within Basin 21. The need for these improvements will be due to storm drain infrastructure that becomes undersized as future development occurs.

Project No. 44, located along Calpooia Street and bound by Camas Court and Cooper Creek, consists of replacing the existing 24-inch CMP pipe with 207 lineal feet of 36-inch ADS N-12 pipe, replacing the existing 30-inch CMP pipe with 800 lineal feet of 36-inch ADS N-12 pipe, replacing the existing 36-inch CMP pipe with 500 lineal feet of 42-inch ADS N-12 pipe, and installing thirteen curb inlets, one outfall structure, two 60-inch manholes, and 1200 lineal feet of 5-foot sidewalk.

Project No. 45, located at the end of Golden Court, entails replacing existing 12-inch CMP pipe with 373 lineal feet of 12-inch ADS N-12 pipe and installing one outfall structure.

Project No. 46, located between Golden Court and Raintree Avenue, consists of reshaping 1600 lineal feet of existing channel to a bottom width of 3.5 feet.

Project No. 65 involves replacing the existing 36-inch CMP pipe, just south of Heavenly Court west to Sutherlin Creek, with 72 lineal feet of dual 42-inch ADS pipe or equivalent, replacing the existing 30-inch CMP pipe that crosses under S. State Street with 44 lineal feet of 38-inch by 57-inch CMP arch pipe or equivalent, and replacing the existing 28-inch by 40-inch CMP arch pipe with 1000 lineal feet of 33-inch by 49-inch CMP arch pipe or equivalent.

Summary of projects recommended in this basin: Project Nos. 44, 45, 46 and 65.

Basin No. 22

Basin 22 is approximately 474 acres in size and is bound to the north and east by Basin 20 and to the west by Sutherlin Creek. The majority of the basin drains to the northwest down to Highway 99/Calapooia Street where it enters a series of open channels, culverts, and pipes on its way to Sutherlin Creek.

Soil Type
Conser Silty Clay Loam
Sibold Fine Sandy Loam
Dickerson Loam
Rosehaven Loam
Speaker Loam

Slope
0-34%

Current Land Use

Industrial	5.14 acres
Commercial	11.46 acres
Large Residential	7.67 acres
Forest/Brush	394.10 acres
Grassland	55.56 acres

Peak Runoff
25-Year Storm: 103.78 CFS
Future 25-Year Storm: 111.10 CFS

Existing System
As runoff travels from the upper forested areas of the basin, the storm water collects into the existing creek channel. Sutherlin Creek is picked up by the collection system at the corner of Highway 99 known as "Cliffs Corner." The runoff travels through several culverts and open channels along Highway 99 prior to entering Sutherlin Creek. The remaining area at the southern end of Basin 22 has no manmade storm water infrastructure. All of this runoff is overland surface flow that eventually makes its way into Sutherlin Creek.

Present Day Problems
According to the storm model and to City staff, there are no significant problems with the existing system at this time.

Future System
Project Nos. 47 and 48 are Priority 3 improvements located within Basin 22. The need for these improvements will be due to storm drain infrastructure that becomes undersized as future development occurs.

Project No. 47, located along Highway 99 (800 feet south of the Public Works Building) entails replacing the existing 18-inch CMP pipe with 42 lineal feet of 24-inch ADS N-12 pipe, installing one ditch inlet with trash rack, one outfall structure, and repairing 30 lineal feet of street trench.

Project No. 48, located at the intersection of the railroad tracks and Highway 99, consists of reshaping 805 lineal feet of existing open channel to a bottom width of 8.0 feet.

Summary of projects recommended in this basin: Project Nos. 47 and 48.

Basin No. 23

Basin 23 is approximately 181 acres in size and is bound to the east by Basins 20, 21 and 22 and to the west by Taylor Street. The majority of the basin drains to the southeast through small meandering ditches and relatively large open channels on its way into Sutherlin Creek.

Soil Type
Conser Silty Clay Loam

Slope
0-0.5%

Current Land Use

Industrial	14.54 acres
Forest/Brush	114.09 acres
Water Feature	52.44 acres

Peak Runoff
25-Year Storm: 72.10 CFS
Future 25-Year Storm: 80.70 CFS

Existing System
The majority of the runoff in Basin 23 starts off as overland flow. The flow is collected and concentrated in numerous shallow swales and open channels; these swales and channels ultimately make their way into Sutherlin Creek. There is some minor storm drain infrastructure at the intersection of Hastings Avenue and Taylor Street, which appears to be adequately sized.

Present Day Problems
According to the storm model and to City staff, there are no significant problems with the existing system at this time.

Future System
No significant deficiencies for this basin are expected throughout the planning period.

There are no projects recommended for this basin.

Basin No. 24

Basin 24 is approximately 25 acres in size and is bound on the south by Basin 23, on the north by W. Central Avenue, on the east by Basin 17, and on the west by Basin 28. The majority of the basin drains to a major collector, which runs predominately from west to east, before emptying into an open channel that flows into Sutherlin Creek.

Soil Type
Conser Silty Clay Loam

Slope
0-1%

Current Land Use

Grassland	5.24 acres
Industrial	19.80 acres

Peak Runoff
25-Year Storm: 22.92 CFS
Future 25-Year Storm: 23.78 CFS

Existing System
The runoff from Basin 24 is collected by a series of catch basins that direct the flow into a major collector pipe. This pipe also conveys the entire runoff from Basin 25. Prior to entering Sutherlin Creek, the runoff flows from the major collector pipe into an open channel.

Present Day Problems
The major collector pipe that drains Basins 24 and 25 is undersized. City staff has noted problems between Grant Street and Branton Street (Project No. 9) and between Sherman Street and Branton Street (Project No.17). Both projects drain into Project 66, which runs through Murphy Mill property. In addition to the major collector, the minor collectors that feed into the major collector also appear to be undersized. Project Nos. 17 and 66 will be discussed further in the summary for Basin 25. Project No. 9 will be discussed further in the summary for Basin 26.

Future System
Project No. 29 is a Priority 2 improvement identified within Basin 24. This improvement was also identified in Basin 11, where it was discussed in detail.

Summary of projects recommended in this basin: Project Nos. 9, 17, 29 and 66.

Basin No. 25

Basin 25 is approximately 127 acres in size and is located to the west of Basins 10 and 11. The basin is bound by the hilltops to the north, and to the south by E. Central Avenue. The basin drains to the south where the flow is picked up by local collector pipes and then conveyed to Sutherlin Creek through Basin 24.

Soil Type
Conser Silty Clay Loam
Speaker Loam
Sutherlin-Oakland Complex
Nonpareil-Oakland Complex

Slope
3-14%

Current Land Use

Small Residential	34.29 acres
Forest	80.25 acres
Commercial	13.38 acres

Peak Runoff
25-Year Storm: 76.58 CFS

Future 25-Year Storm: 79.55 CFS

Existing System

The majority of the runoff from the hilltops down to W. Central Avenue starts as overland flow. As the runoff moves down the hillside, the topography forces the flow into draws and creases that concentrate the flow. As runoff travels along the north side of W. Sixth Avenue, it becomes channelized flow and is diverted into two culverts under W. Sixth Avenue. The first culvert, of unknown size and material that receives the majority of the flow, is located on the west side of the basin. From this culvert, the runoff flows through a series of open channels and culverts that are located one block east of Branton Street and that flow in from north to south. Before W. Central Avenue, the runoff is picked up by a minor 18-inch CMP collector that directs the flow to the east along W. Central Avenue. The minor collector changes over to an 18-inch CMP major collector at midblock between Sherman Street and Ash Street. The second culvert, a 30-inch CMP pipe under W. Sixth Street, is located at Pine Street. This culvert is directly connected to a 24-inch CMP minor collector that runs alongside Pine Street all of the way down to W. Central Avenue. Once the runoff reaches W. Central Avenue, the minor collector pipe directs the flow to the west and into a 30-inch CMP major collector as mentioned above. With the combined flows of the two collector lines, as well as runoff collected from catch basins along W. Central Avenue, a 36-inch CMP major collector routes the runoff to the southeast through Basin 24 on its way into Sutherlin Creek.

Present Day Problems

There is only one Priority 1 improvement within Basin 25. This project was identified as a problem area by storm drain modeling, as well as by City staff.

Project No. 17 is located between Sherman Street and Branton Street and bound by W. Sixth Avenue and W. Central Avenue. This project consists of replacing the existing 12-inch CMP pipe with 35 lineal feet of 18-inch ADS N-12 pipe and replacing the existing 18-inch CMP pipe with 380 lineal feet of 18-inch ADS N-12 pipe.

Future System

Project No. 50 is a Priority 2 improvement identified within Basin 25. This improvement is located along W. Central Avenue between Pine Street and Sherman Street. This project involves replacing the existing 30-inch CMP pipe with 775 lineal feet of 30-inch ADS N-12 pipe and repairs to 775 lineal feet of street trench. The need for this improvement will be due to storm drain infrastructure that becomes undersized as future development occurs.

Project No. 66 is along W. Central Avenue between Ash Street and Branton Street. Project No. 66 involves replacing the existing 18-inch and 21-inch CMP pipes with 238 lineal feet of 30-inch ADS N-12 pipe, replacing an existing pipe (size unknown) with 658 lineal feet of 36-inch ADS N-12 pipe, replacing the existing 30-inch CMP pipe with 40 lineal feet of 36-inch ADS N-12 pipe, replacing the existing 36-inch CMP pipe with 716 lineal feet of 36-inch ADS N-12 pipe, replacing the existing 36-inch CMP pipe with 669 lineal feet of 48-inch ADS N-12 pipe, removing and replacing 612 lineal feet of 5-foot sidewalk, and repairing 386 lineal feet of street trench.

Summary of projects recommended in this basin: Project Nos. 17, 50, and 66.

Basin No. 26

Basin 26 is approximately 243 acres in size and is located to the west of Basin 25. The basin is bound by the hilltops to the north, to the south by E. Central Avenue, and to the west by Interstate 5. The basin drains to the southwest where the flow is picked up by a series of local collector pipes, major collector pipes, and open channels. From here the runoff is either conveyed to Cook Creek through Sub-basin 34-1 if on the west side of the basin, or to Sutherlin Creek through Sub-basin 29-2 if on the east side of the basin.

Soil Type
Nonpareil-Oakland Complex
Oakland Silt Loam
Speaker Loam
Sutherlin-Oakland Complex

Slope
3-13%

Current Land Use

Commercial	43.55 acres
Small Residential	37.65 acres
Large Residential	40.53 acres
Forest	73.69 acres
Grassland	47.15 acres

Peak Runoff
25-Year Storm: 123.31 CFS
Future 25-Year Storm: 128.06 CFS

Existing System
The runoff produced on the eastern third of Basin 26 makes its way down to W. Sixth Avenue primarily as overland flow. The majority of the runoff is then conveyed under W. Sixth Avenue by an existing 24-inch CMP culvert halfway between Branton Street and Grant Street. The runoff flows down to West First Avenue via a series of open channels and culverts where it is then taken up by a minor collector pipe. The 24-inch CMP minor collector transports the runoff to a major collector pipe at the intersection of W. Central Avenue and Taylor Street and eventually into Sutherlin Creek. The runoff produced in the middle third of Basin 26 flows through a series of open channels and culverts down Robinson and Kruse Streets. Once the runoff reaches W. Central Avenue, it enters a minor collector pipe that runs west along W. Central Avenue. At the intersection of N. Comstock Street and W. Central Avenue, the 12-inch CMP minor collector combines with an 18-inch CMP minor collector along N. Comstock Street, thus becoming a major collector. This 15-inch CMP major collector follows W. Central Avenue to just before Interstate 5 where it turns north and discharges into a substantial open channel that flows to the north. This open channel terminates at an existing 24-inch CMP culvert under the

freeway. It also collects the runoff generated by the western most third of Basin 26. On the way to the open channel, the majority of this runoff flows off the hillside and is captured by several small CMP culverts along N. Comstock Street. These culverts convey the runoff under the street and discharge into several small open channels that flow in southwest to the substantial open channel as mentioned above. From the existing 24-inch CMP pipe under the freeway, the runoff flows through a series of open channels, culverts, and pipes on its way into Cook Creek in Basin 34.

Present Day Problems
There are two Priority 1 improvements within Basin 26. These projects were identified as problem areas by the storm drain modeling, as well as by City staff.

Project No. 9 is located at mid-block between Branton and Grant Streets and is bound by W. Second Avenue and W. Central Avenue. This project requires replacing the existing 12-inch CMP culvert with 38 lineal feet of 30-inch ADS N-12 pipe and replacing the existing 24-inch CMP pipe with 385 lineal feet of 30-inch ADS N-12 pipe. A portion of Project No. 9 lays within Basin No. 24.

Project No. 15 is located along W. Central Avenue between N. Comstock Street and Interstate 5. This project involves replacing the existing 15-inch CMP pipe with 675 lineal feet of 24-inch ADS N-12 pipe, replacing the existing 18-inch CMP pipe with 70 lineal feet of 24-inch ADS N-12 pipe, reshaping 462 lineal feet of open channel to a bottom width of 4.0 feet, and ramming 200 lineal feet of casing for a 36-inch ADS N-12 under the freeway and alongside the existing 24-inch culvert.

Future System
There are two additional improvement projects located within Basin 26. The need for these improvements will be due to storm drain infrastructure that becomes undersized as future development occurs.

The first, Project No. 34, is a Priority 2 improvement located along W. Central Avenue between N. Comstock Street and Kruse Street. This project entails replacing the existing 12-inch pipe with 810 lineal feet of 18-inch ADS N-12 pipe, installing three 48-inch manholes, and repairing 810 lineal feet of street trench.

The second, Project No. 51, a Priority 3 improvement, is located near the intersection of Branton Street and W. Sixth Avenue. This project consists of replacing the existing 8-inch RCP pipe with 116 lineal feet of 12-inch ADS N-12 pipe and repairing 60 lineal feet of street trench.

Summary of projects recommended in this basin: Project Nos. 9, 15, 34, and 51.

Basin No. 27

Basin 27 is approximately 200 acres and is located to the north of Basin 26. The basin is bound by the hilltops to the east, and to the west by Interstate 5. The basin drains to the southwest via several minor open channels that converge at a collection point on the western boundary of Basin 27.

Soil Type
Bateman Silt Loam
Rosehaven Loam
Speaker Loam
Nonpareil Loam
Oakland Loam

Slope
4-17%

Current Land Use

Large Residential	21.92 acres
Grassland	32.89 acres
Forest	145.58 acres

Peak Runoff
25-Year Storm: 47.94 CFS
Future 25-Year Storm: 49.85 CFS

Existing System
The storm water runoff follows natural contours and drainage ways within the basin. The flow is primarily overland flow until it reaches N. Comstock Street. Here the flow is conveyed under the street by numerous small-diameter culverts. The runoff continues down the hillside through many minor open channels that direct the flow to the toe of the fill slope that was formed during the construction of I-5. The "toe of slope" forms a natural channel that the runoff follows to a collection point at mid-basin. From here, the storm water enters an existing culvert, of unknown size and material, under I-5. At the outfall of the culvert, the runoff is conveyed by open channels, pipes, and culverts as it travels through Basin 34 on its way to Cook Creek.

Present Day Problems
According to the storm model and to City staff, there are no significant problems with the existing system at this time.

Future System
Project No. 52 is a Priority 3 improvement identified within Basin 27. This improvement is located at mid-basin under Interstate 5. The project entails ramming 200 lineal feet of steel casing to accept an 18-inch ADS N-12 pipe alongside the existing culvert. The need for this improvement will be due to storm drain infrastructure that becomes undersized as future development occurs.
Summary of projects recommended in this basin: Project No. 52.

Basin No. 28

Basin 28 is approximately 31 acres in size and is located to the north of Basin 23. The basin is bound by Basins 23 and 24 to the east, and to the north by W. Central Avenue. The basin drains to the south where it enters an open channel that eventually flows into the storm drain system along Taylor Street.

Soil Type
Conser Silty Clay Loam
Sutherlin-Oakland Complex

Slope
0-1%

Current Land Use

Industrial	1.68 acres
Commercial	5.32 acres
Small Residential	10.47 acres
Grassland	13.53 acres

Peak Runoff
25-Year Storm: 20.95 CFS
Future 25-Year Storm: 22.01 CFS

Existing System
The storm water runoff generally moves across the basin as overland flow where it is collected by an open channel that lies on the west side of the mill pond embankment. The runoff follows the embankment around to the southwest corner of the basin where it enters the storm drain system along Taylor Street on its way to Sutherlin Creek.

Present Day Problems
According to the storm model and to City staff, there are no significant problems with the existing system at this time.

Future System
No significant deficiencies for this basin are expected throughout the planning period.

There are no improvements recommended for this basin.

Basin No. 29

Basin 29 is approximately 298 acres in size and is located to the west of Basins 23 and 28. The basin is bound by Taylor Street to the east, Interstate 5 to the west, and to the north by W. Central Avenue. The basin drains to the southeast where it enters a network of open channels that eventfully flow out into Sutherlin Creek.

Soil Type
Conser Silty Clay Loam
Sutherlin-Oakland Complex
Sutherlin Silt Loam
Packard Gravelly Loam
Rosehaven Loam
Sibold Fine Sandy Loam

Slope
0-4%

Current Land Use

Industrial	23.81 acres
Commercial	19.57 acres
Small Residential	97.49 acres
Grassland	138.18 acres
Forest	18.76 acres

Peak Runoff
25-Year Storm: 143.18 CFS
Future 25-Year Storm: 155.84 CFS

Existing System
Sub-basins 29-1 and 29-2 both drain to the south through their respective residential areas by way of open channel and driveway culverts. The runoff is then captured by a 32-inch CMP major collector pipe in Duke Avenue. The collector pipe, which runs west to east, discharges into an open channel that intersects Taylor Street. Dual 36-inch CMP culverts convey the runoff under Taylor Street where it is again transported by open channel into Sutherlin Creek. The runoff from Sub-basin 29-3, which moves primarily as overland flow, also flows into the dual 36-inch CMP culverts as mentioned above. The residential runoff from Sub-basin 29-4 is also conveyed by open channels and driveway culverts where it is collected by several well defined open channels that run in a north to south fashion. These open channels all flow into a major open channel along Page Avenue. This major open channel passes under Taylor Street via dual 36-inch CMP culverts. These culverts discharge into an open channel, the same open channel that receives Sub-basins 29-1, 29-2, and 29-3; these converge with Sutherlin Creek. The majority of the runoff from Sub-basin 29-5 flows overland where it is caught by two open channels that converge at Taylor Street. The flow then passes under Taylor Street through a 24-inch CMP culvert where it flows into a relatively undefined open channel that flows into Sutherlin Creek.

Present Day Problems
According to the storm model and to City staff, there are no significant problems with the existing system at this time except for the flooding of Taylor Street.

Future System
Project Nos. 35, 36, 37, 38, 49, and 63 are recommended for this basin. All of these improvements are designated Priority 2, except for Project Nos. 49 and 63, which are Priority 3

improvements. The need for these improvements will be due to storm drain infrastructure that becomes undersized as future development occurs.

Project No. 35 is located at the east end of Duke Avenue and is bound by Taylor Street to the east. This project consists of replacing the existing 32-inch CMP pipe with 555 lineal feet of 36-inch ADS N-12 pipe, replacing the existing 32-inch CMP pipe with 593 lineal feet of dual 36-inch ADS N-12 pipe, replacing the existing dual 36-inch CMP culverts with 168 lineal feet of dual 48-inch ADS N-12 pipe, replacing the existing 12-inch and 18-inch culverts with 28 lineal feet of 36-inch and 24-inch ADS pipe respectively, and reshaping 630 lineal feet of existing open channel to a bottom width of 9.0 feet.

Project No. 36 is located along Taylor Street. The improvement starts approximately 350 feet north of Hastings Avenue and continues south along Taylor Street to Page Avenue. This project entails replacing several of the existing 36-inch CMP culverts with 390 lineal feet of 36-inch ADS N-12 pipe.

The majority of Project No. 37 is located along Page Avenue and is bound by Taylor Street to the east and I-5 to the west. This project consists of ramming a steel casing under I-5 and installing 125 lineal feet of 36-inch ADS N-12 pipe, replacing the existing 24-inch CMP pipe with 450 lineal feet of 36-inch ADS N-12 pipe, replacing the existing dual 30-inch by 42-inch CMP culverts with 282 lineal feet of 30-inch ADS N-12 pipe, installing 63 lineal feet of 36-inch ADS N-12 pipe alongside the existing 36-inch CMP culvert under Taylor Street, reshaping 450 lineal feet of existing open channel to a bottom width of 5.0 feet, and reshaping 1750 lineal feet of existing open channel to a bottom width of 7.0 feet.

Project No. 38 is located at the intersection of Taylor Street and Hastings Avenue. This project consists of replacing the existing 12-inch, 18-inch, and 24-inch CMP pipes with 126 lineal feet of 36-inch ADS N-12 pipe, installing three curb inlets, one ditch inlet with trash rack, one outfall structure, repairing 41 lineal feet of street trench, and replacing 85 lineal feet of curb and gutter/asphalt concrete.

Project No. 49 is located to the northeast of the intersection of Taylor Road and S. Comstock Street. This project entails replacing the existing 24-inch culvert with 64 lineal feet of 36-inch ADS N-12 pipe, reshaping 680 lineal feet of the existing open channel to a bottom width of 12.0 feet, installing one ditch inlet with trash rack and one outfall structure, and repairing 43 lineal feet of street trench.

Project No. 63 is located along Taylor Street south of Page Avenue. Taylor Street is an obvious problem area with significant street flooding at the southern end of the street. There are no inexpensive solutions to the problem due to the fact that the finish grade of Taylor Street was built too close to the top of bank elevation of Sutherlin Creek. It should also be noted that currently there is not any real or personal property at risk due to the flooding. The only impact that the flooding currently has is to vehicular and pedestrian traffic so, for this reason, the improvement has been assigned a Priority 3 designation. This project will consist of raising approximately 1,200 feet of roadway and installing a 24-inch culvert at 50-foot intervals along the roadway.

Summary of projects recommended in this basin: Project Nos. 35, 36, 37, 38, 49, and 63.

Basin No. 30

Basin 30 is approximately 346 acres in size and is located to the west of Basins 22 and 29. The basin is bound by I-5 to the east, hilltops to the west, and to the north by Trails End Lane. The basin drains to the northeast where the flow splits, with half going to the north and the other half turning to the south. Both flows leave the basin by way of open channels to Sutherlin Creek.

Soil Type
Sutherlin Silt Loam
Rosehaven Loam
Nonpareil-Oakland Complex
Nonpareil Loam
Bateman Silt Loam

Slope
3-24%

Current Land Use

Commercial	11.03 acres
Large Residential	27.00 acres
Grassland	14.52 acres
Forest	293.27 acres

Peak Runoff
25-Year Storm: 99.59 CFS
Future 25-Year Storm: 99.59 CFS

Existing System
A ridge located in the middle of Basin 30 forces approximately half of the runoff to follow an open channel along Parkhill Lane. This open channel terminates at the intersection of Parkhill Lane and Trails End Lane. Here the flow is taken up by a 36-inch CMP culvert that conveys it under I-5. The runoff now flows through Basin 29 on its way into Sutherlin Creek. The southern half of Basin 30 flows into an open channel that follows the western edge of the I-5 right-of-way until it reaches Exit 135 where it enters into an 18-inch CMP culvert under the paved road between Rathburn Road and I-5. Once on the south side of Exit 135 the runoff enters an 18-inch CMP pipe that directs the flow to the southeast, passing under the freeway where it discharges into Sutherlin Creek.

Present Day Problems
According to the storm model and to City staff, there are no significant problems with the existing system at this time.

Future System
No significant deficiencies for this basin are expected throughout the planning period.

There are no projects recommended for this basin.

Basin No. 31

Basin 31 is approximately 516 acres in size and is located to the west of Basins 29 and 30. The basin is bound by I-5 to the east, hilltops to the south, and to the north by Highway 138. The basin drains to the northeast towards Highway 138 where culverts convey the runoff underneath the highway and then into Cook Creek.

Soil Type
Sutherlin Silt Loam
Nonpareil Loam
Stockel Fine Sandy Loam
Nonpareil-Oakland Complex
Oakland Silt Loam
Rosehaven Loam
Conser Silty Clay Loam
Sutherlin-Oakland Complex

Slope
5-30%

Current Land Use

Commercial	19.15 acres
Small Residential	13.61 acres
Large Residential	104.15 acres
Grassland	142.76 acres
Forest	235.99 acres

Peak Runoff
25-Year Storm: 193.18 CFS
Future 25-Year Storm: 199.27 CFS

Existing System
The basin drains to the northeast where the majority of the runoff flows into several open channels that are oriented in a southeast to northwest direction. These open channels transport the runoff to the northern boundary of the basin where two culverts transfer the flow to the north side of Highway 138 where it discharges to Cook Creek.

Present Day Problems
According to the storm model and to City staff, there are no significant problems with the existing system at this time.

Future System
Project Nos. 53 and 54, both Priority 3 improvements, are recommended for this basin. The need for these improvements will be due to storm drain infrastructure that becomes undersized as future development occurs.

Project No. 53 is located within the I-5 right-of-way, 480 feet south of Duke Avenue. This project consists of boring 200 lineal feet of new 18-inch ADS N-12 pipe alongside the existing 18-inch CMP culvert, and installing one ditch inlet with trash rack, one outfall structure, and one catch basin centered over the new 18-inch culvert.

Project No. 54 is located 550 feet east of the intersection of "M" Road and W. Duke Avenue extending to the south to Ft. McKay Road. This project entails replacing two existing 24-inch CMP culverts with 108 lineal feet of 24-inch ADS N-12 pipe, reshaping 1600 lineal feet of existing open channel to a bottom width of 5.0 feet, installing one ditch inlet with trash rack and one outfall structure, and repairing 25 lineal feet of 6-foot wide street trench.

Summary of projects recommended in this basin: Project Nos. 53 and 54.

Basin No. 32

Basin 32 is approximately 189 acres in size and is located to the northwest of Basin 31. The basin is bound by Highway 138 to the north, and the hilltops to the south. The basin drains to the north towards Highway 138 where culverts convey the runoff underneath the highway and into Cook Creek.

Soil Type
Conser Silty Clay Loam
Oakland Silt Loam
Rosehaven Loam
Venta Loam
Nonpareil-Oakland Complex

Slope
2-18%

Current Land Use

Commercial	10.37 acres
Small Residential	39.44 acres
Large Residential	12.34 acres
Grassland	87.15 acres
Forest	39.77 acres

Peak Runoff
25-Year Storm: 87.99 CFS
Future 25-Year Storm: 102.37 CFS

Existing System
The southern portion of Basin 31 drains to the north as overland flow down to Ft. McKay Road. Here the runoff concentrates at two low points along Ft. McKay Road and is routed underneath the road by two culverts, of unknown size and material, spaced roughly 550 feet apart. The eastern culvert discharges into an open channel that runs due south to Highway 138. The western- most culvert is connected to a storm water system that collects the runoff from the newer developments within this basin. The storm water system and the open channel discharge into a roadside ditch along the highway. The roadside ditch flows to a low point where a 36-inch CMP culvert transports the runoff underneath the highway and directly into Cook Creek.

Present Day Problems
Project No. 10 is a Priority 1 improvement identified in Basin 32. This improvement, located along Highway 138 (east of the fire hall), involves ramming a steel casing and installing 58 lineal feet of 30-inch ADS N-12 under the highway and alongside the existing 36-inch CMP culvert, and replacing the existing 24-inch CMP culvert with 44 lineal feet of dual 30-inch ADS N-12 pipes. This project was identified as a problem area by the storm drain modeling and City staff.

Future System
No significant deficiencies for this basin are expected throughout the planning period.

Summary of projects recommended in this basin: Project No. 10.

Basin No. 33

Basin 33 is approximately 660 acres in size and is located to the west of Basins 31 and 32. The basin is bound by Highway 138 to the north, and the hilltops to the south. The basin drains to the north towards Highway 138 where an open channel conveys the runoff alongside the highway and eventually into Calapooya Creek.

Soil Type
Conser Silty Clay Loam
Nonpareil-Oakland Complex
Venta Loam
Sutherlin Silt Loam
Pengra Silt Loam
Speaker Loam
Oakland Silt Loam
Oakland-Nonpareil-Sutherlin Complex

Slope
1-17%
Current Land Use

Commercial	3.35 acres
Small Residential	27.53 acres
Large Residential	11.87 acres

Grassland	157.18 acres
Forest/Brush	348.70 acres
Impervious	120.07 acres

Peak Runoff
25-Year Storm: 329.94 CFS
Future 25-Year Storm: 359.94 CFS

Existing System
The upper reaches of Basin 33 drain toward Ft. McKay Road, primarily as overland flow. At Ft. McKay Road the flow becomes more concentrated and collects at three low points along the road. These low points are drained by three culverts of unknown diameter and type that pass under Ft. McKay Road. Once on the north side of the road, the culverts discharge into three open channels that meander downhill and flow into Ford's Pond. The spillway for the pond is located near the northwest corner. The pond discharge flows along an open channel that runs north to the highway, then turns to the west and converges with Calapooya Creek.

Present Day Problems
According to the storm model and to City staff, there are no significant problems with the existing system at this time.

Future System
Project No. 40 is a Priority 2 improvement located within Basin 33. This project is located to the west of Church Road along Highway 138. Project No. 40 entails replacing the existing 18-inch CMP culvert with 50 lineal feet of 24-inch ADS N-12 pipe, replacing the existing 15-inch CMP culvert with 80 lineal feet of 30-inch ADS N-12 pipe, installing two ditch inlets with trash racks and two outfall structures, and repairing 30 lineal feet of street trench. The need for this improvement will be due to storm drain infrastructure that becomes undersized as future development occurs.

Summary of projects recommended in this basin: Project No. 40.

Basin No. 34

Basin 34 is approximately 396 acres in size and is located to the north of Basins 31 and 32. The basin is bound by Highway 138 to the south and Basin 36 to the north. The basin drains to the south towards Highway 138, through the Umpqua Golf Resort, eventually being picked up by Cook Creek.

Soil Type
Nonpareil Loam
Nonpareil-Oakland Complex
Oakland Silt Loam
Speaker Loam
Conser Silt Clay Loam

Slope
2-9%

Current Land Use

Commercial	23.73 acres
Small Residential	66.05 acres
Grassland	195.22 acres
Forest/Brush	110.87 acres

Peak Runoff
25-Year Storm: 223.58 CFS
Future 25-Year Storm: 250.99 CFS

Existing System
The upper reaches of Basin 34 drain toward Highway 138 primarily as overland flow. At the bottom of the Umpqua Golf Resort the flow becomes more concentrated and is collected in a series of open channels that discharge into Cook Creek.

Present Day Problems
According to the storm model and to City staff, there are no significant problems with the existing system at this time.

Future System
Project Nos. 16, 39 and 55 are recommended for this basin. Project Nos. 16 and 39 are Priority 2 improvements and Project No. 55 is a Priority 3 improvement. The need for these improvements will be due to storm drain infrastructure that becomes undersized as future development occurs.

Project No. 16 is located along Hwy 138 east of Recreation Lane. This improvement involves boring 52 lineal feet of 36-inch ADS N-12 pipe under the highway and alongside the existing 48-inch CMP culvert, installing 55 lineal feet of 48-inch ADS N-12 pipe under Recreation Lane and alongside the existing 48-inch CMP culvert, reshaping 260 lineal feet of open channel to a bottom width of 10.0 feet, installing one ditch inlet with trash rack for the new 36-inch pipe, placing rip-rap at the outfall of the new 36-inch pipe, and repairing 32 lineal feet of street trench. This project was identified as a problem area by the storm drain modeling and City staff.

Project No. 39 is located to the east of Recreation Lane and to the north of Highway 138. This project entails reshaping the existing 28-inch CMP culvert with 60 lineal feet of 30-inch ADS N-12 pipe, replacing two existing 36-inch culverts that cross under Ft. McKay Road with 116 lineal feet of 42-inch ADS N-12 pipe, replacing the existing 18-inch culvert under "M" Road with 144 lineal feet of 30-inch ADS N-12 pipe, reshaping 1200 lineal feet of existing open channel to a bottom width of 10.0 feet, reshaping 280 lineal feet of existing open channel to a bottom width of 6.0 feet, installing three ditch inlets with trash racks and four outfall structures, and repairing 75 lineal feet of street trench.

Project No. 55 is located at the bottom of the Umpqua Golf Resort along Cook Creek within Basin 34. This project consists of reshaping 1850 lineal feet of existing open channel to a bottom

width of 4.0 feet and reshaping 630 lineal feet of existing open channel to a bottom width of 4.5 feet.

Summary of projects recommended in this basin: Project Nos. 16, 39, and 55.

Basin No. 35

Basin 35 is approximately 305 acres in size and is bound to the south by Basin 33. The basin is bound to the east by Basin 34 and to the north by the study boundary and Basin 36. The edge of the study boundary forms the western edge of the basin boundary.

Soil Type
Conser Silt Clay Loam
Nonpareil Loam
Nonpareil-Oakland Complex
Waldo Silt Clay Loam
Oakland-Sutherlin Complex
Stockel Fine Sandy Loam

Slope
0.5-8%

Current Land Use

Industrial	2.79 acres
Small Residential	9.81 acres
Large Residential	10.00 acres
Grassland	148.49 acres
Forest/Brush	92.67 acres

Peak Runoff
25-Year Storm: 127.75 CFS
Future 25-Year Storm: 137.12 CFS

Existing System
The upper reaches of Basin 35 drain toward Highway 138, primarily as overland flow. The flow becomes concentrated as it makes its way through the relative flat that surrounds the wastewater treatment plant. Here the runoff is collected in a series of open channels that discharge into Cook Creek.

Present Day Problems
According to the storm model and to City staff, there are no significant problems with the existing system at this time.

Future System
Project No. 56 is a Priority 3 improvement located within Basin 35. The need for this improvement is due to storm drain infrastructure that becomes undersized as future development occurs.

Project No. 56 is located to the west of the wastewater treatment plant and to the north of Highway 138. This project entails replacing the existing 15-inch CMP culvert with 88 lineal feet of 24-inch ADS N-12 pipe, installing one ditch inlet with trash rack, installing one outfall structure, and repairing 30 lineal feet of street trench. The need for this improvement will be due to storm drain infrastructure that becomes undersized as future development occurs.

Summary of projects recommended in this basin: Project No. 56.

Basin No. 36

Basin 36 is approximately 279 acres bound by the study boundary to the north and west and by Basins 34 and 35 to the south.

Soil Type
Nonpareil-Oakland Complex
Conser Silt Clay Loam
Oakland-Sutherlin Complex
Speaker Loam
Pengra Silt Loam
Dickerson Loam
Coburg Silty Clay Loam
Waldo Silty Clay Loam
Malabon Silty Clay Loam

Slope
3-8%

Current Land Use
Forest/Brush 278.87 acres

Peak Runoff
25-Year Storm: 125.58 CFS
Future 25-Year Storm: 149.09 CFS

Existing System
The upper reaches of Basin 36 drain towards the northwest primarily as overland flow. The flow becomes concentrated and is collected in a series of open channels along Stearns Lane before flowing into Cook Creek.

Present Day Problems
According to the storm model and to City staff, there are no significant problems with the

existing system at this time.

Future System
No significant deficiencies for this basin are expected throughout the planning period.

There are no projects recommended for this basin.

Basin No. 37

Basin 37, approximately 473 acres in area, is located primarily within the Union Gap area of Sutherlin and is bound by Basins 8, 9, and 10 to the south and the Sutherlin city limits to the north.

Soil Type
Rosehaven Loam
Atring-Larmine Complex
Oakland-Sutherlin Complex
Sutherlin Silt Loam
Speaker Loam
Nonpareil-Oakland Complex
Nonpareil Loam
Speaker-Nonpareil Complex

Slope
1-22%

Current Land Use

Commercial	4.62 acres
Small Residential	50.04 acres
Large Residential	23.23 acres
Forest/Brush	394.90 acres

Peak Runoff
25-Year Storm: 128.15 CFS
Future 25-Year Storm: 134.40 CFS

Existing System
The upper reaches of Basin 37 drain towards the center of the basin primarily as overland flow. The flow becomes concentrated at the toe of the hillside and is collected in a series of open channels and culverts that parallel Highway 99 and the railroad tracks before flowing into Calapooya Creek.

Present Day Problems
According to the storm model and to City staff, there are no significant problems with the existing system at this time.

Future System

Project Nos. 57, 58, 59, and 60 are located within Basin 37 and are designated Priority 3 improvements. The need for these improvements will be due to storm drain infrastructure that becomes undersized as future development occurs.

Project No. 57 is located along Highway 99 in the Union Gap area. This project entails removing and replacing one section of railroad track, installing 50 lineal feet of 3-foot by 8-foot box culvert under the railroad tracks, replacing the existing 32-inch CMP culvert under the highway with 74 lineal feet of dual 42-inch ADS N-12 pipe, installing one ditch inlet with trash rack and one outfall structure, and repairing 30 lineal feet of 10-foot wide street trench.

Project No. 58 is also located along the east side of Highway 99 approximately 80 feet outside of the right-of-way. This project entails replacing the existing dual 24-inch CMP culverts with 84 lineal feet of dual 30-inch ADS N-12 pipe, and installing one ditch inlet with trash rack and one outfall structure.

Project No. 59 is located on Union Gap Road just east of the highway and wrecking yard. This project entails replacing existing 32-inch CMP culvert with 228 lineal feet of dual 36-inch ADS N-12 pipe, installing one ditch inlet with trash rack and one outfall structure, and repairing 24 lineal feet of 8-foot wide street trench.

Project No. 60 is located under Highway 99 near the northern end of the city limits. This project entails replacing the existing 32-inch CMP culvert under the highway with 57 lineal feet of dual 48-inch ADS N-12 pipe, installing one ditch inlet with trash rack, one outfall structure, and repairing 24 lineal feet of 10-foot wide street trench.

Summary of projects recommended in this basin: Project Nos. 57, 58, 59, and 60.

Section

7

Recommended Plan

Section 7

Recommended Plan

7.1 Proposed Storm Drain Improvements

With the use of the hydraulic storm model, consideration of existing and planned development, and City staff input, a recommended improvement plan has been established for the City of Sutherlin Storm Water System. This section contains the estimated costs for improvements anticipated within the next 20 years in the City of Sutherlin Study Area.

A number of factors were considered in developing projects. Due to the smooth-wall nature of the plastic pipe material, it is recommended that drainage culverts include the use of PVC or N-12 HDPE pipe rather than CMP, to avoid future problems with corrosion and to provide much greater storm flow capacity per inch of culvert diameter.

The existing system condition was not fully evaluated as part of this Study. Infrastructure integrity issues and degradation were noted through limited field investigations and through reports generated by City Staff. No television records or internal conditions of piping and infrastructure were reviewed, evaluated, or prepared. It is recommended in Section 7.5 of this study that the City adopt a regular maintenance program that would provide internal inspection of the existing storm water infrastructure.

7.2 Basis of Cost Estimates

The magnitude cost estimates in the plan have four components: construction costs, engineering costs, legal and administrative costs, and property acquisition costs. The cost estimates are preliminary in nature and are based on large-scale planning detail. As projects enter the individual planning stage, and are closer to being realized, more information will be gathered and the cost estimates will be refined. Actual costs will differ from what is shown here.

7.2.1 Construction Cost

The magnitude construction costs in this capital improvement plan are based on current averages of actual bidding results from similar work. Future changes in the cost of labor, equipment, and materials will require that these costs be updated. The Engineering News Record (ENR) Construction Cost Index is the most common method of updating construction cost estimates. The index for February 2014 was 9,681. Future yearly ENR indices can be used to calculate the cost of projects for their construction year based on the ratio of the ENR index at that time, divided by the ENR index of 9,681.

A contingency factor of 20 percent of the construction and engineering costs was added to the total project cost. Because the cost estimates presented are based on low precision mapping and

conceptual layouts, allowances must be made for variations in final quantities, bidding market conditions, adverse construction conditions, and other difficulties which were not included but may occur.

7.2.2 Engineering Cost

The cost of engineering services for projects typically include special investigations, a pre-design report, surveying, geotechnical exploration, preparation of contract drawings and specifications, bidding services, construction management, inspection, construction staking, start-up services, and the preparation of operation and maintenance manuals. Depending on the size and type of project, engineering costs may range from 15 to 25 percent of the contract cost when all of the above services are provided. The lower percentage applies to large projects without complicated mechanical systems. The higher percentage applies to small, complicated projects. The engineering costs for design and construction used in this study average 20 percent of the construction cost.

7.2.3 Environmental Review and Permits

A number of the recommended projects involve replacing piping that crosses Highway 138 and Interstate 5. The State of Oregon Highway Department will require a permit for each highway crossing within their jurisdiction. The Department of State Lands (DSL) requires a permit for any project in a wetland or body of water that involves more than 50 cubic yards of fill or removal.

It is assumed that DSL permits will not be required for the recommended projects.

7.2.4 Legal and Administrative Cost

An allowance of three percent of construction costs was added for legal and administrative services. This allowance is intended to include internal project planning and budgeting.

7.2.5 Property Acquisition Cost

Costs for property acquisition and easements were not included in the cost estimate. At the beginning of each project, an evaluation of existing easements, both recorded and prescriptive should be made. It may be necessary to purchase easements or properties for routing storm drainage.

7.3 Project Priorities

The project priorities are ranked from Priority 1 through Priority 3, with Priority 1 being the highest priority projects. Each classification group is loosely defined as follows:

Priority 1: These are the highest priority projects that should be undertaken as soon as adequate funding is available. It is recommended that these projects be undertaken within the next five years with highest projects on the list to be addressed in the next year or two.

Priority 2: While not of the highest priority, these projects should be in the City's capital improvement planning window beyond the 5-year horizon. As Priority 1 projects are completed, Priority 2 projects should be moved to Priority 1 status. System degradation or failures, project coordination, or other occurrences may require the movement of Priority 2 projects to Priority 1 status ahead of schedule. New projects that are developed that are not critical should be grouped in Priority 2 until funding is available.

Priority 3: Priority 3 projects are either of low priority or are dependent on development. If development in an area necessitates the implementation of a Priority 3 improvement, the project should be moved to Priority 1 status, assuming that adequate funding is available. Some projects may remain in Priority 3 indefinitely if the need for the project or the development requiring it never arises.

7.4 Cost Estimates & Priorities

Table 7.4.1 includes a summary table for all of the projects recommended for the city of Sutherlin. The costs do not include storm water treatment or commercial development features for wetlands mitigation, detention basins, or bio-swale costs which are borne by the developer and are unique for each planned development. Storm drain maintenance costs are also not included within the recommended projects; however, a maintenance system is recommended in Section 7.5. The unit costs are in 2014 dollars and, as such, must be updated for future projects.

A map showing the location of proposed improvements projects and project priorities is included in Figure 7.4.1 at the end of this section.

Table 7.4.1 includes a summary of the project costs. Detailed cost estimates for each project were developed for each site improvement and are located in Appendix B.

A total of 69 projects have been developed totaling nearly $15 million . Priority 1 projects for the storm drain system are estimated to be over $2.3 million .

TABLE 7.4.1
PROJECT COSTS AND PRIORITIES

Project Number	Description	Cost (Dollars)	Priority
1	E. Fourth Ave., between Crown Point & Grove St.	$738,529	1
2	Sherwood St., bound by E. Sixth St. & E. Fourth St.	$80,409	1
3	Jade St., north of Central Ave.	$41,731	1
4	Central Ave., between Jade St. & Opal St.	$111,206	1
5	Sherwood St. & E. Central Ave.	$110,784	1
6	Umatilla St., bound by E. Fourth Ave. & Sixth Ave.	$208,972	1
7	N. State St., bound by E. Central Ave. & Third Ave.	$230,845	1
8	N. Calapooia St, north of E. Central Ave.	$108,795	1
9	Between Grant St. & Branton St., bound by W. Second Ave. & W. Central Ave.	$166,396	1
10	Hwy. 138, east of Fire Hall	$94,764	1

Project Number	Description	Cost (Dollars)	Priority
11	West of Grove St., bound by E. First Ave. & E. Central Ave.	$117,649	1
12	E. Fourth Ave., between Terrace St. & Mardonna St.	$146,638	1
13	East of Montclair St., bound by E. Central Ave. & Sutherlin Creek	$98,510	1
14	Johns St., between Central Ave. & Fourth Ave.	$66,323	1
15	W. Central Ave. between N. Comstock St. & I-5	$343,601	2
16	Along Hwy 138, east of Recreation Ln.	$118,881	2
17	Between Sherman St. & Branton St., bound by W. Sixth Ave. & W. Central Ave.	$108,699	2
18	Opal St., between Central Ave. & Garnet Ct.	$422,040	2
19	Fourth Ave & Arvilla Way	$83,668	2
20	SE of Arvilla Ct. to Central Ave.	$15,670	2
21	E. Sixth Ave., west of Sherwood St.	$36,612	2
22	E. First Ave., between Terrace St. & Mardonna St.	$156,386	2
23	Mardonna St., south of E. First St.	$295,019	2
24	Bound by E. Sixth Ave., E. Central Ave., Mardonna St., and Umatilla St.	$460,025	2
25	Arch St., west of Magnolia St.	$32,855	2
26	Willamette St., bound by Third Ave. & Sutherlin Creek	$298,614	2
27	Umpqua St., bound by E. Fourth Ave. & Sutherlin Creek	$326,852	2
28	W. Sixth Ave., west of railroad tracks	$23,768	2
29	Adjacent to railroad tracks, bound by W. Sixth Ave., Oak St., & W. Central Ave.	$332,417	2
30	Beecroft St., south of power sub-station	$49,020	2
31	Waite St., bound by Everett Ave. & Sutherlin Creek	$146,428	2
32	Southside Rd., east of Sea St.	$25,897	2
33	Southside Rd., 1000 ft. east of Sea St.	$25,897	2
34	W. Central Ave., between N. Comstock St. & Kruse St.	$200,005	2
35	E. Duke Ave. to Taylor St.	$892,068	2
36	Taylor St., 350 ft. north of Hastings Ave.	$210,193	2
37	I-5 & Trails End Rd., east to S. Comstock St., & ends at Page Rd. & Taylor St.	$637,490	2
38	Taylor St. & Hastings Ave.	$94,011	2
39	Hwy. 138, between Dakota St. to Recreation Ln.	$262,685	2
40	Church Rd. & Hwy. 138	$91,648	2
41	South of E. Central Ave. & Opal St.	$475,750	2
42	E. Sixth Ave., east of Casa De Loma	$51,975	2
43	Hwy. 99, adjacent to the City of Sutherlin Public Works Building	$49,589	3
44	Calapooia St., bound by Camas Ct. & Cooper Creek	$693,019	3
45	End of Golden Ct.	$53,431	3
46	Between Golden Ct. & Raintree Ave.	$43,734	3
47	Hwy. 99, 800 ft. south of the Public Works Building	$40,908	3
48	Begins at Hwy. 99 & the railroad tracks	$34,264	3
49	NE of Taylor Rd. & S. Comstock St.	$91,082	3
50	W. Central Ave., between Pine St. & Sherman St.	$297,057	3
51	Branton St. & W. Sixth Ave.	$18,608	3
52	Under freeway	$84,690	3
53	Under freeway 480 ft. south of Duke Ave.	$87,635	3
54	550 ft. east of "M" Rd. & W. Duke Ave., south to Ft. McKay Rd.	$107,483	3

Project Number	Description	Cost (Dollars)	Priority
55	Cook Creek	$76,345	3
56	Under driveway to WWTP	$51,064	3
57	Crosses under railroad Tracks & Hwy. 99	$222,162	3
58	East of Hwy. 99 in Basin 37	$79,756	3
59	Under Union Gap Loop, east of Wrecking Yard	$146,748	3
60	Under Hwy 99, north of Union Gap Loop	$101,366	3
61	480 ft. north of E. Fourth Ave., between Terrace St. & Mardonna St	$31,584	3
62	E. Central Ave., south of Eagle Ct.	$57,143	3
63	Taylor St. S. of Page St.	$1,536,452	3
64	Umatilla St., bound by E. Fourth Ave. & Sixth Ave.	$584,631	3
65	S. State St. & Heavenly Ct., west to Sutherlin Creek	$748,208	3
66	W. Central Ave., between Ash St. & Branton St.	$861,251	3
	Subtotal Priority 1 Projects	**$2,321,550**	
	Subtotal Priority 2 Projects	**$6,218,172**	
	Subtotal Priority 3 Projects	**$6,098,211**	
	Total Of All Projects	**$14,637,933**	

7.5 Storm Drain System Maintenance and Management

It is recommended that the city of Sutherlin adopt a Storm Drain System Maintenance and Management program to reduce major system overhauls, replacement projects, and costly infrastructure failures. The storm drain system is continuously deteriorating and the state of deterioration is unique to each section of pipe based on the age of the pipe, soil conditions, and characteristics of flows within the pipe.

The City should develop a program to regularly and systematically televise the entire system. It is recommended that the maintenance program thoroughly clean and televise the existing culverts to allow for a careful engineering evaluation and development of projects to correct any existing deficiencies discovered during inspection. This work can be completed using city equipment or by entering into a contract with a cleaning and televising contractor.

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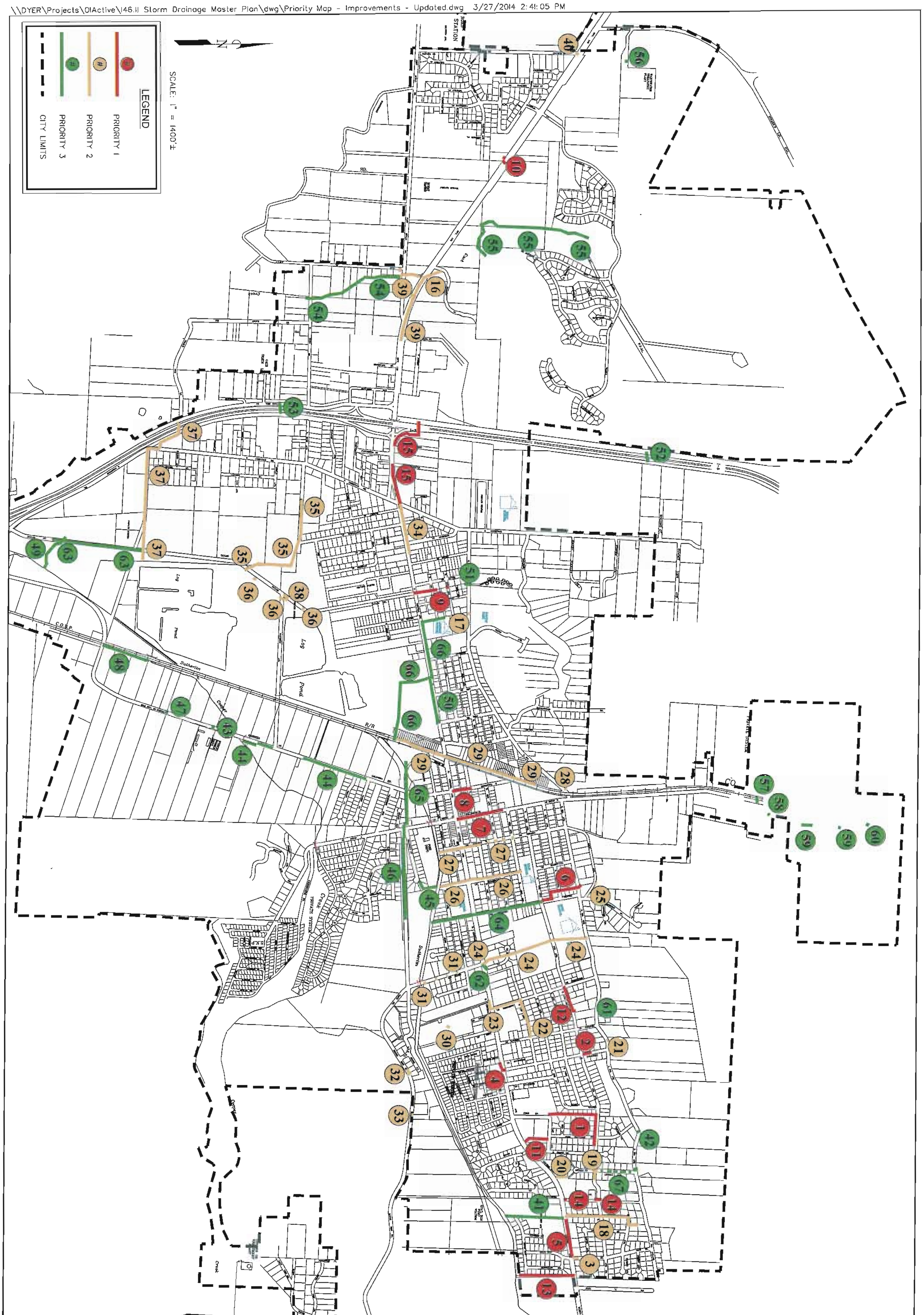

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: MARCH, 2014

PROJECT NO.: 146.11

CITY OF SUTHERLIN
STORM DRAINAGE MASTER PLAN
IMPROVEMENT MAP

FIGURE NO.
7.4.1

Appendices

APPENDIX

Figures

Existing Storm Drainage System, Figure E-1

Existing Storm Drainage System, Figures E-A1 through E-H4

E-A1 | E-B1 | E-C1 | E-D1 | E-E1 | E-F1 | E-G1 | E-H1

E-A2 | E-B2 | E-C2 | E-D2 | E-E2 | E-F2 | E-G2 | E-H2

E-A3 | E-B3 | E-C3 | E-D3 | E-E3 | E-F3 | E-G3 | E-H3

E-B4 | E-C4 | E-D4 | E-E4 | E-F4 | E-G4 | E-H4

E-C5 | E-D5 | E-E5

E-C6 | E-D6

N

NOT TO SCALE

LEGEND

- 18" EXISTING STORM DRAIN
- 18" EXISTING CULVERT
- EXISTING OPEN CHANNEL
- EXISTING CATCH BASIN
- EXISTING STORM DRAIN MANHOLE

FIGURE NO. E-1

CITY OF SUTHERLIN
STORM DRAINAGE MASTER PLAN
EXISTING STORM DRAINAGE SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: MARCH, 2014

PROJECT NO.: 146.11

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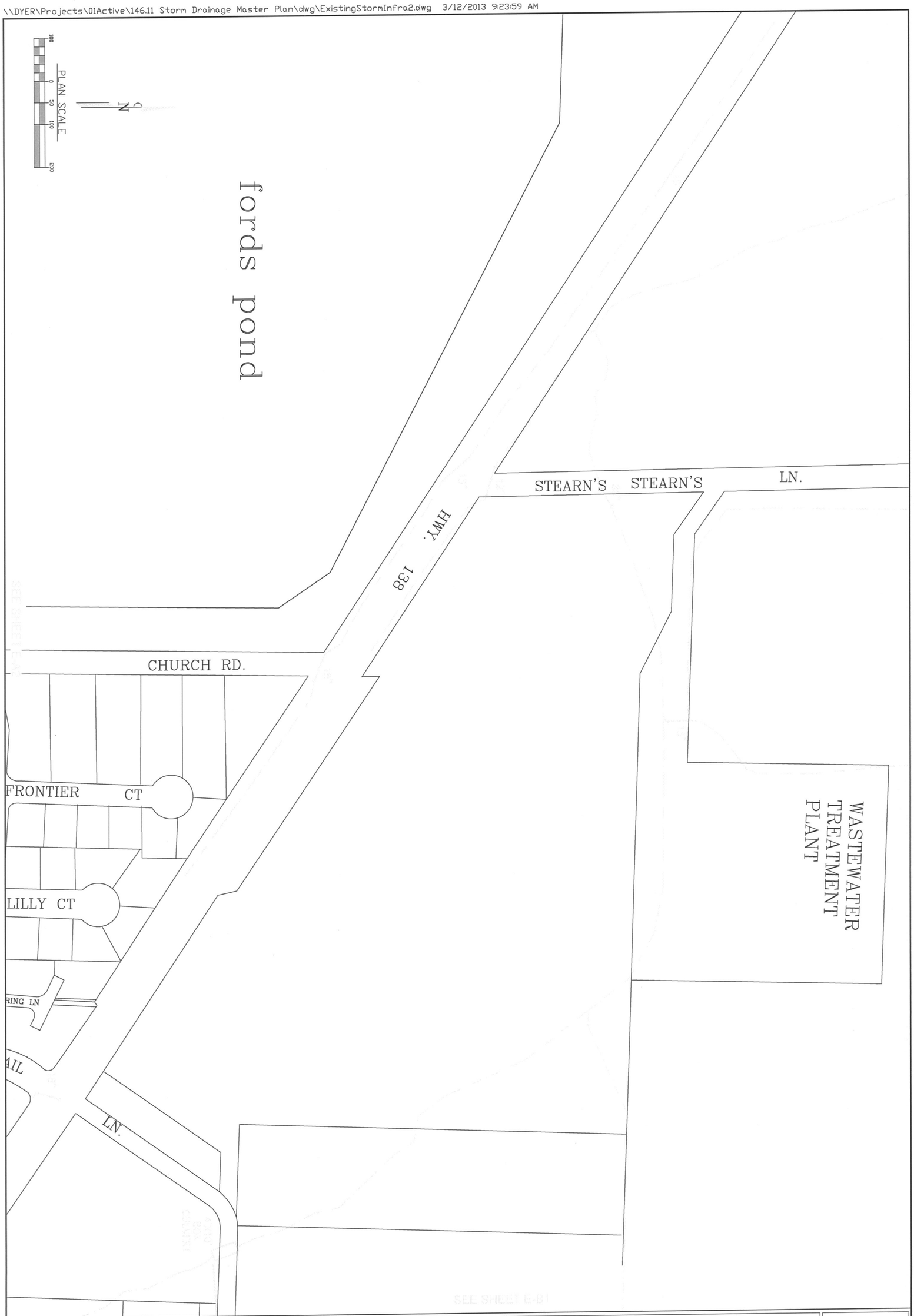

THE DYER PARTNERSHIP ENGINEERS & PLANNERS DATE: MARCH, 2014 PROJECT NO.: 146.11	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN EXISTING STORM DRAINAGE SYSTEM	FIGURE NO. E-A1

N

PLAN SCALE

100 0 50 100 200

CHURCH ROAD

PUMP STATION

GOLFVIEW AVE.

WESTLAKE

GREYFOX DR

DOVETAIL AVE

KIT LN

GREYFOX DR

CHURCH RD.

GOLFVIEW AVE.

CANDIS CT.

GOLFVIEW AVE.

ASHWOOD ST.

GREYSTONE ST.

CAMBRIDGE ST.

RIDGWAY ST.

PARKWAY AVE.

LEXINGTON AVE.

CHURCH RD.

GOLFVIEW ct.

FORT MCKAY RD.

FIGURE NO. E-A2

CITY OF SUTHERLIN
STORM DRAINAGE MASTER PLAN
EXISTING STORM DRAINAGE SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: MARCH, 2014

PROJECT NO.: 146.11

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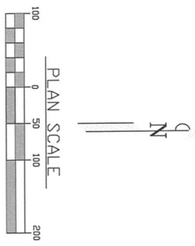

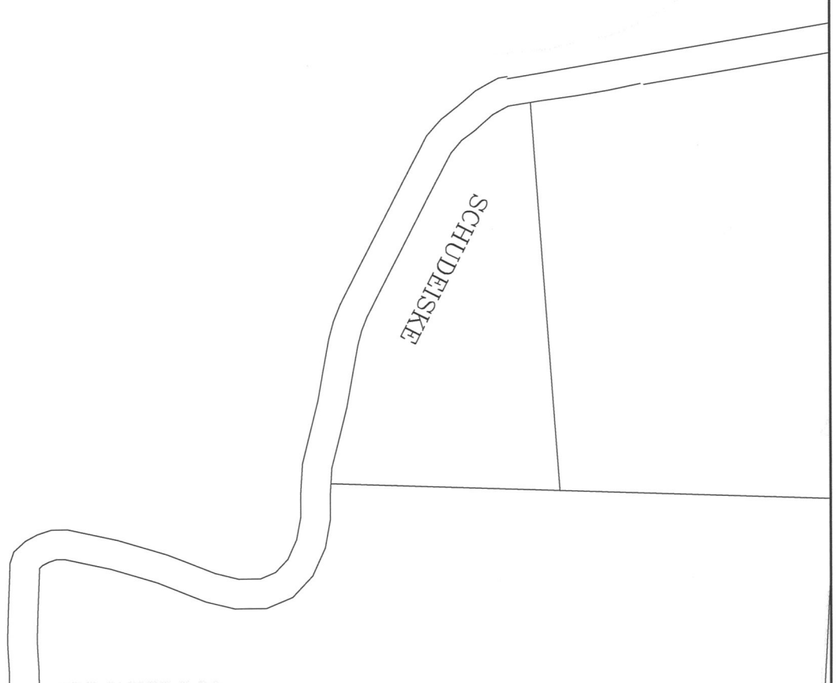

THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-A3
PROJECT NO.: 146.11		

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THE DYER PARTNERSHIP ENGINEERS & PLANNERS DATE: MARCH, 2014 PROJECT NO.: 146.11	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN **EXISTING STORM DRAINAGE SYSTEM**	FIGURE NO. **E-B1**

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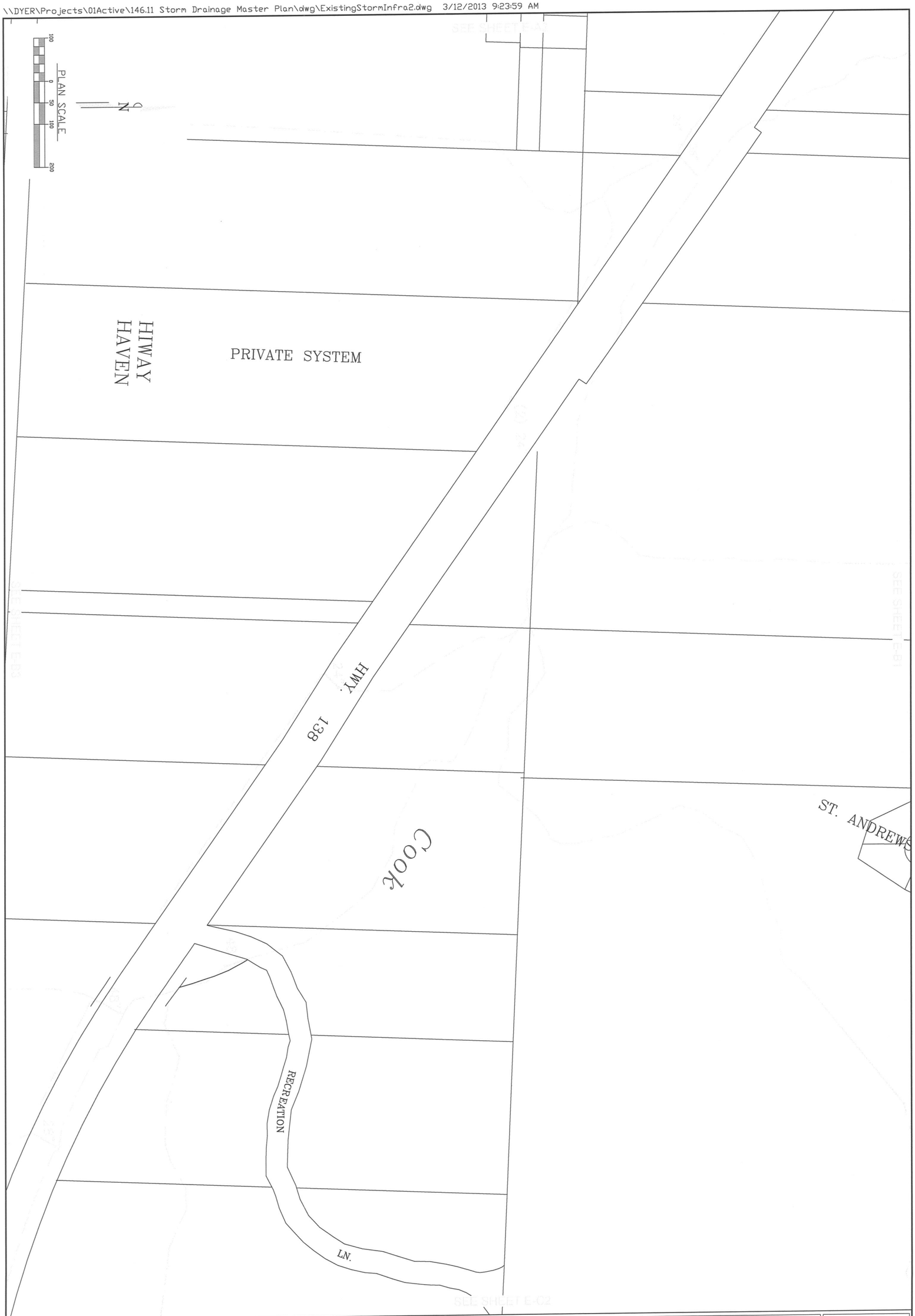

THE DYER PARTNERSHIP ENGINEERS & PLANNERS DATE: MARCH, 2014 PROJECT NO.: 146.11	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN EXISTING STORM DRAINAGE SYSTEM	FIGURE NO. E-B2

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THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-B3
PROJECT NO.: 146.11		

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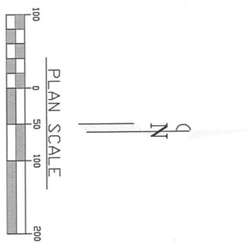

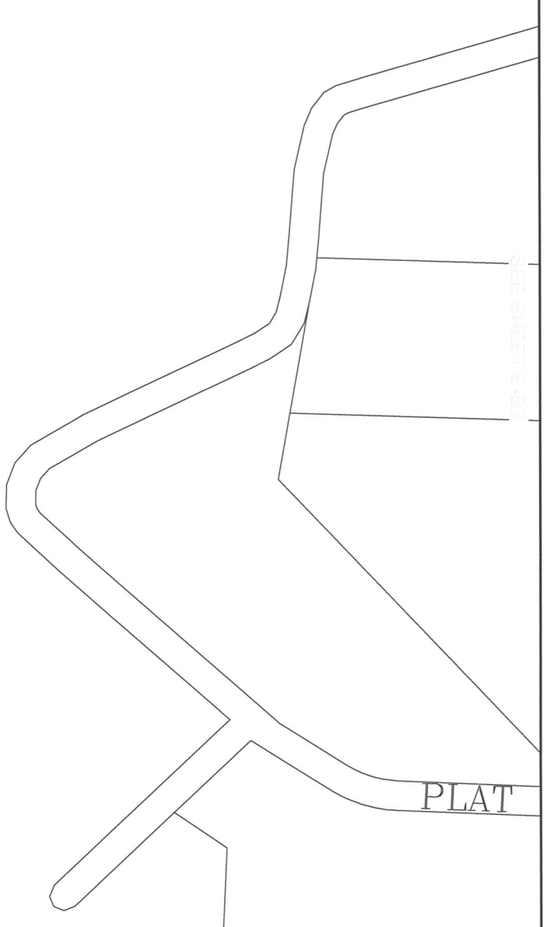

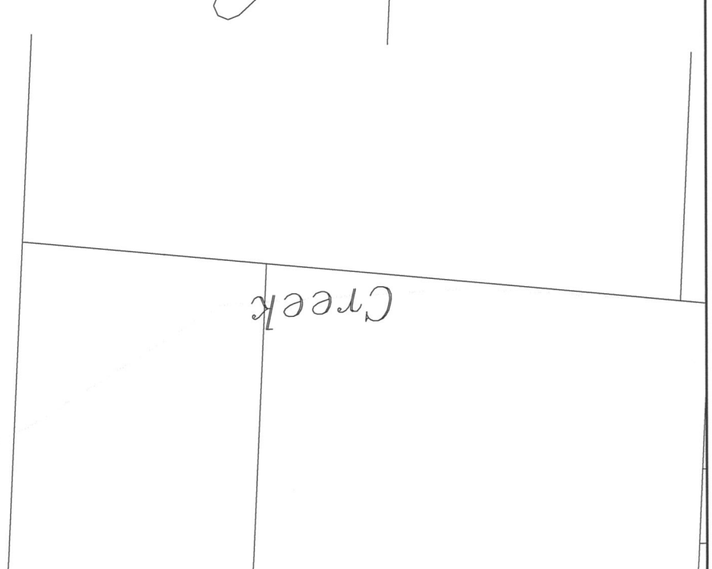

THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-B4
PROJECT NO.: 146.11		

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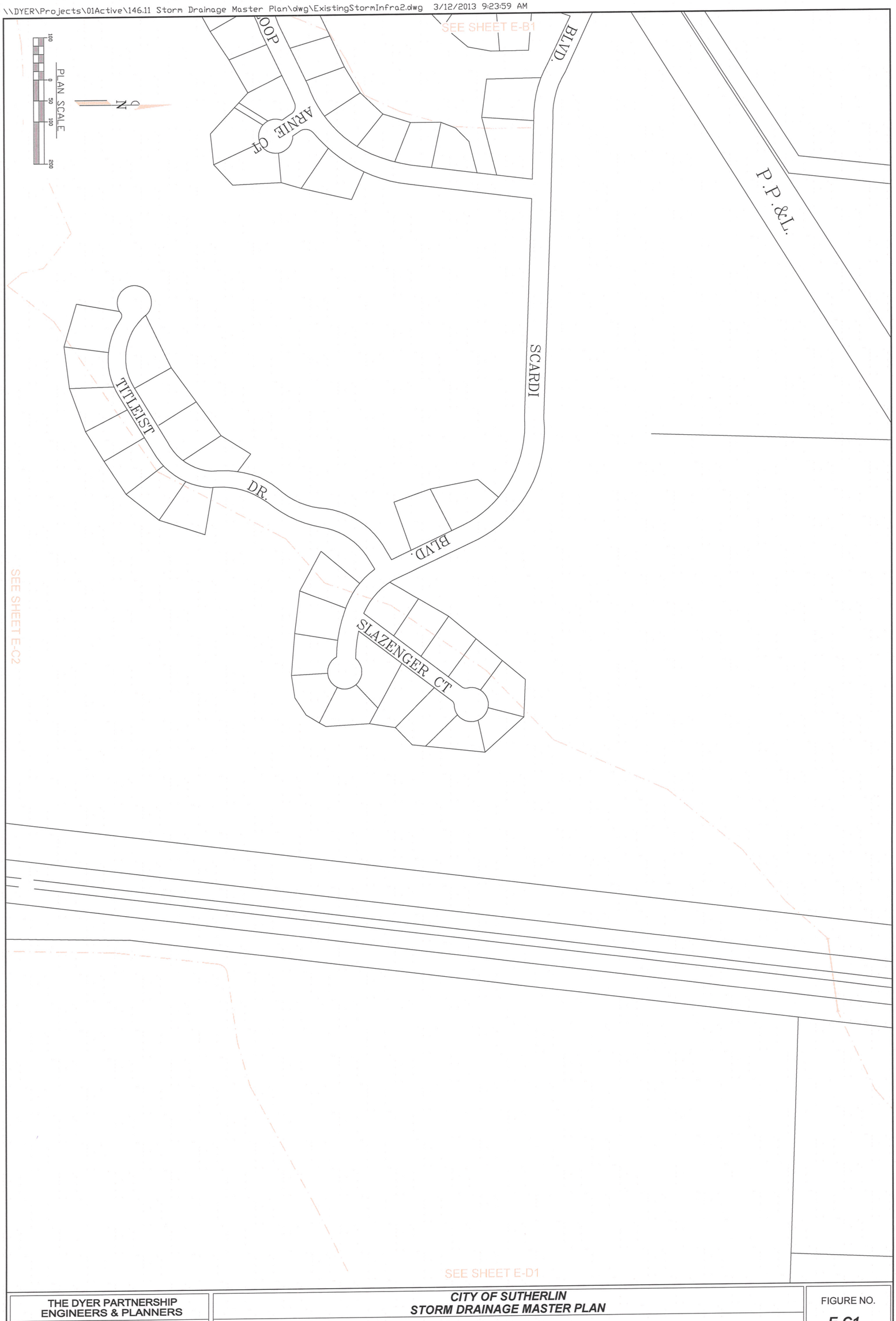

THE DYER PARTNERSHIP ENGINEERS & PLANNERS	*CITY OF SUTHERLIN* *STORM DRAINAGE MASTER PLAN*	FIGURE NO.
DATE: MARCH, 2014	*EXISTING STORM DRAINAGE SYSTEM*	*E-C1*
PROJECT NO.: 146.11		

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THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-C2
PROJECT NO.: 146.11		

SEE SHEET E-C2

HWY. 138

CRESTVIEW ST.

HUTCHINS WAY

W. CENTRAL

PONDEROSA DR

HOSPITALITY WAY

S. COMSTOCK RD.

GLEASON AVE.

E. DUKE AVE.

W. DUKE RD.

SEE SHEET E-B3

SEE SHEET E-D3

SEE SHEET F-C4

36" 24" 24" 24" 15" 24" 24" 12" 24" 18" 12" 18" 18" 24" 24" 24" 24" 15" 8" 24" RCP 8" 32" 32"

N

PLAN SCALE

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FIGURE NO. E-C3

CITY OF SUTHERLIN
STORM DRAINAGE MASTER PLAN

EXISTING STORM DRAINAGE SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: MARCH, 2014

PROJECT NO.: 146.11

SEE SHEET E-C3

OKIE DOKIE LN.

PARK HILL LN.

BUTTERCUP LN.

GROVE

FIR

SEE SHEET E-B4

TRAIL'S END LN.

BEBEAU LN.

COMSTOCK LN.

S. COMSTOCK RD.

AIRWAY AVE.

LANDING ST.

CUB AVE.

SEE SHEET E-D4

KOLENO AVE.

LESTER ST.

18" CONC.

24" CONC.

12" CONC.

24" CONC.

SEE SHEET E-C5

N

PLAN SCALE

100 0 50 100 200

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FIGURE NO. E-C4

CITY OF SUTHERLIN
STORM DRAINAGE MASTER PLAN

EXISTING STORM DRAINAGE SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: MARCH, 2014

PROJECT NO.: 146.11

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THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-C5
PROJECT NO.: 146.11		

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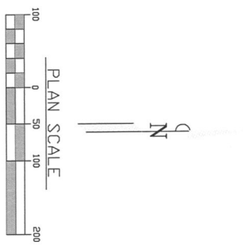

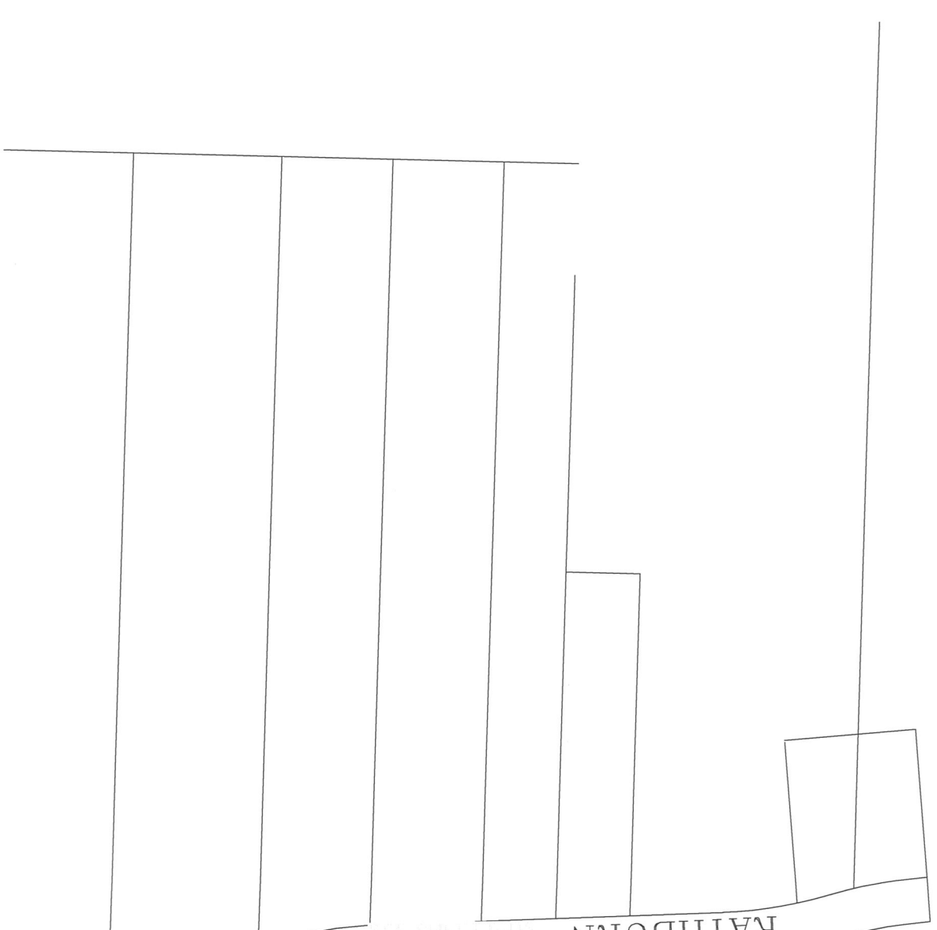

THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-C6
PROJECT NO.: 146.11		

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THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-D1
PROJECT NO.: 146.11		

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THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-D2
PROJECT NO.: 146.11		

SEE SHEET E-D2

AVE.

PRIVATE SYSTEM

W. DEAN AVE.

SUNSET ST.

HAWTHORNE ST.

EDDY ST.

JOHNSON ST.

PRIVATE SYSTEM

TAYLOR ST.

W. DEAN AVE.

SEE SHEET E-D3

T AVE.

SEE SHEET E-D3

FIR AVE

E. DUKE AVE.

PRIVATE SYSTEM

ST.

SEE SHEET E-D4

HASTINGS AVE

Log

N

PLAN SCALE

100 0 50 100 200

FIGURE NO.
E-D3

CITY OF SUTHERLIN
STORM DRAINAGE MASTER PLAN

EXISTING STORM DRAINAGE SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: MARCH, 2014

PROJECT NO.: 146.11

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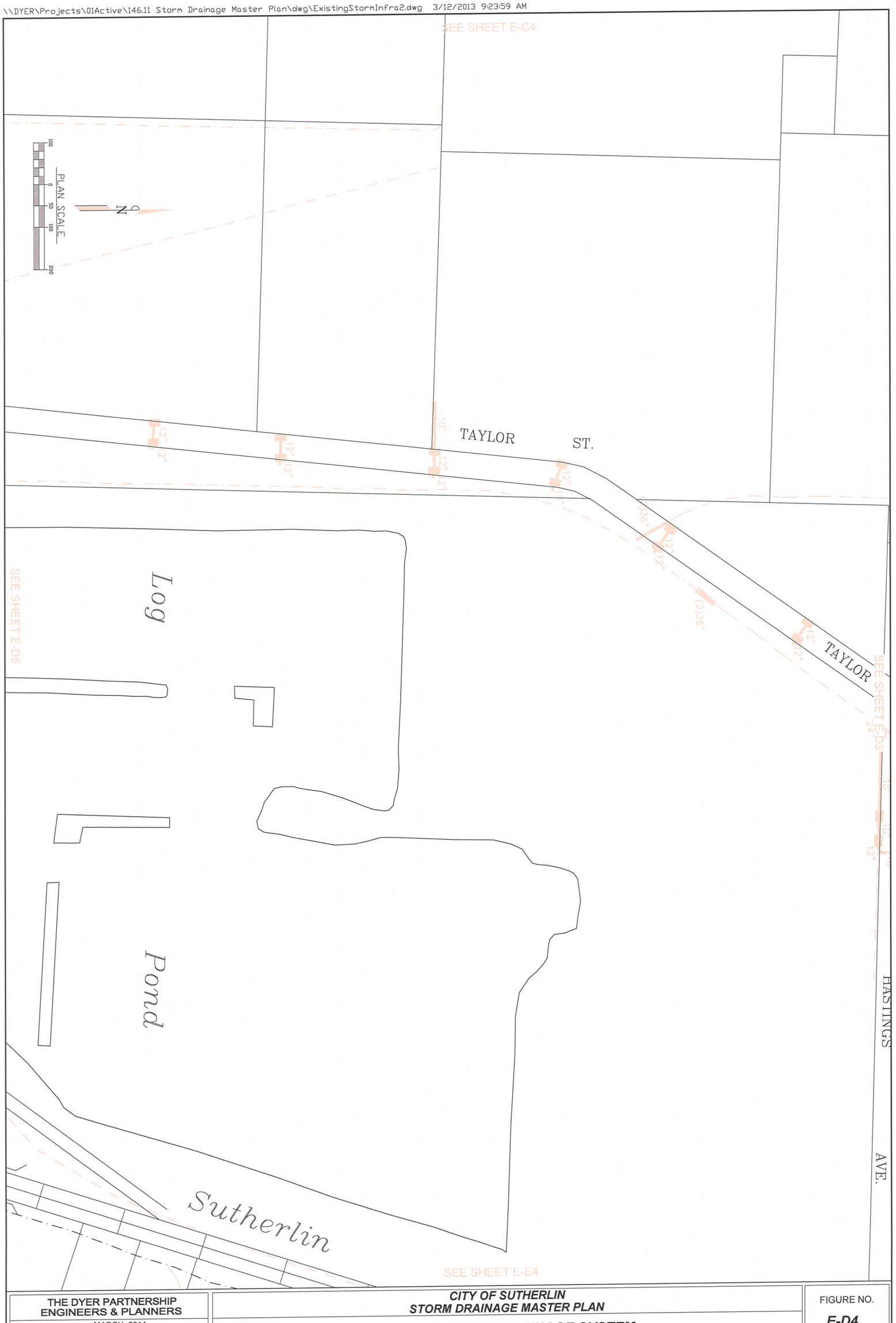

THE DYER PARTNERSHIP ENGINEERS & PLANNERS DATE: MARCH, 2014 PROJECT NO.: 146.11	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN **EXISTING STORM DRAINAGE SYSTEM**	FIGURE NO. **E-D4**

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THE DYER PARTNERSHIP ENGINEERS & PLANNERS DATE: MARCH, 2014 PROJECT NO.: 146.11	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN **EXISTING STORM DRAINAGE SYSTEM**	FIGURE NO. **E-D5**

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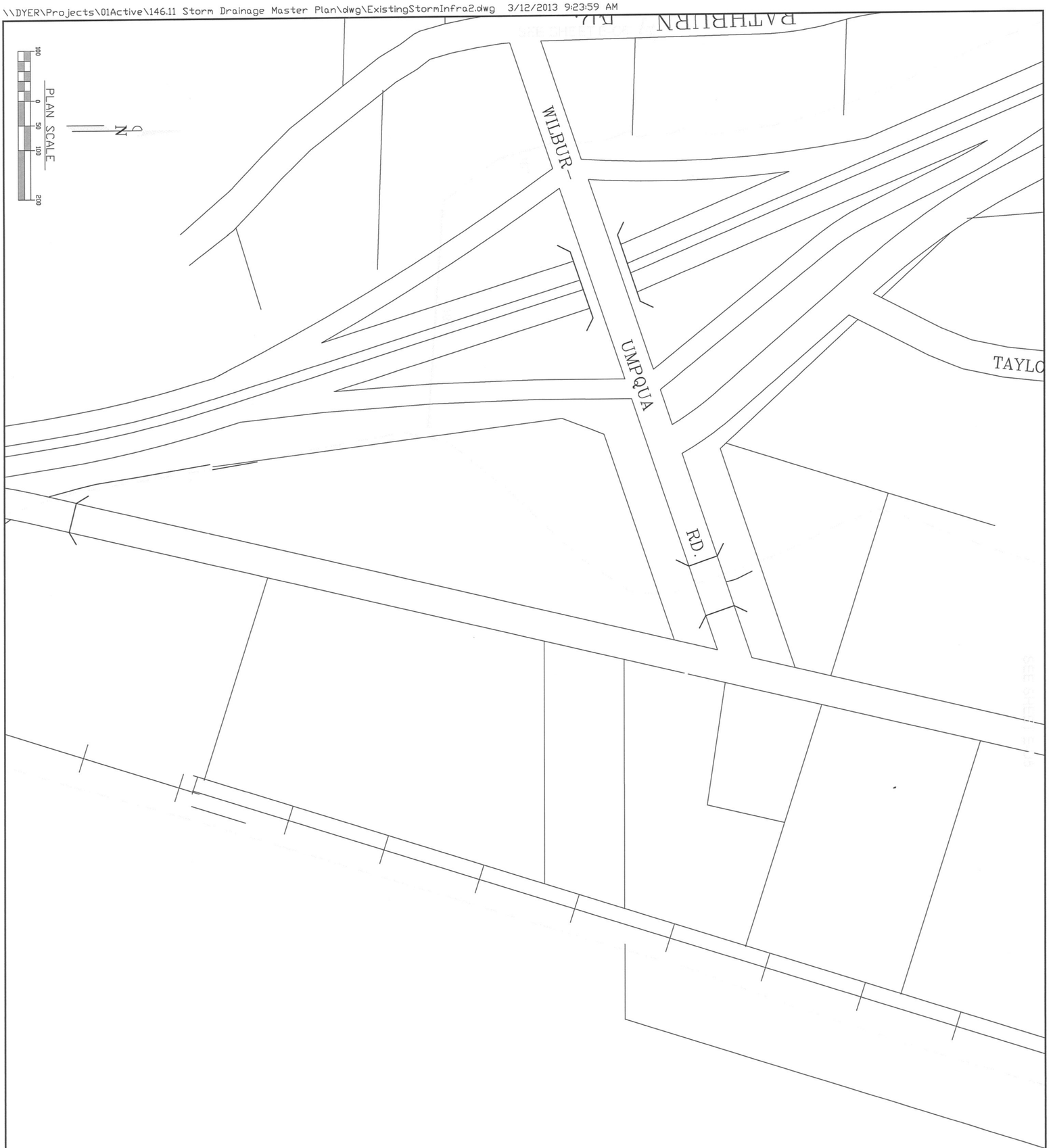

THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-D6
PROJECT NO.: 146.11		

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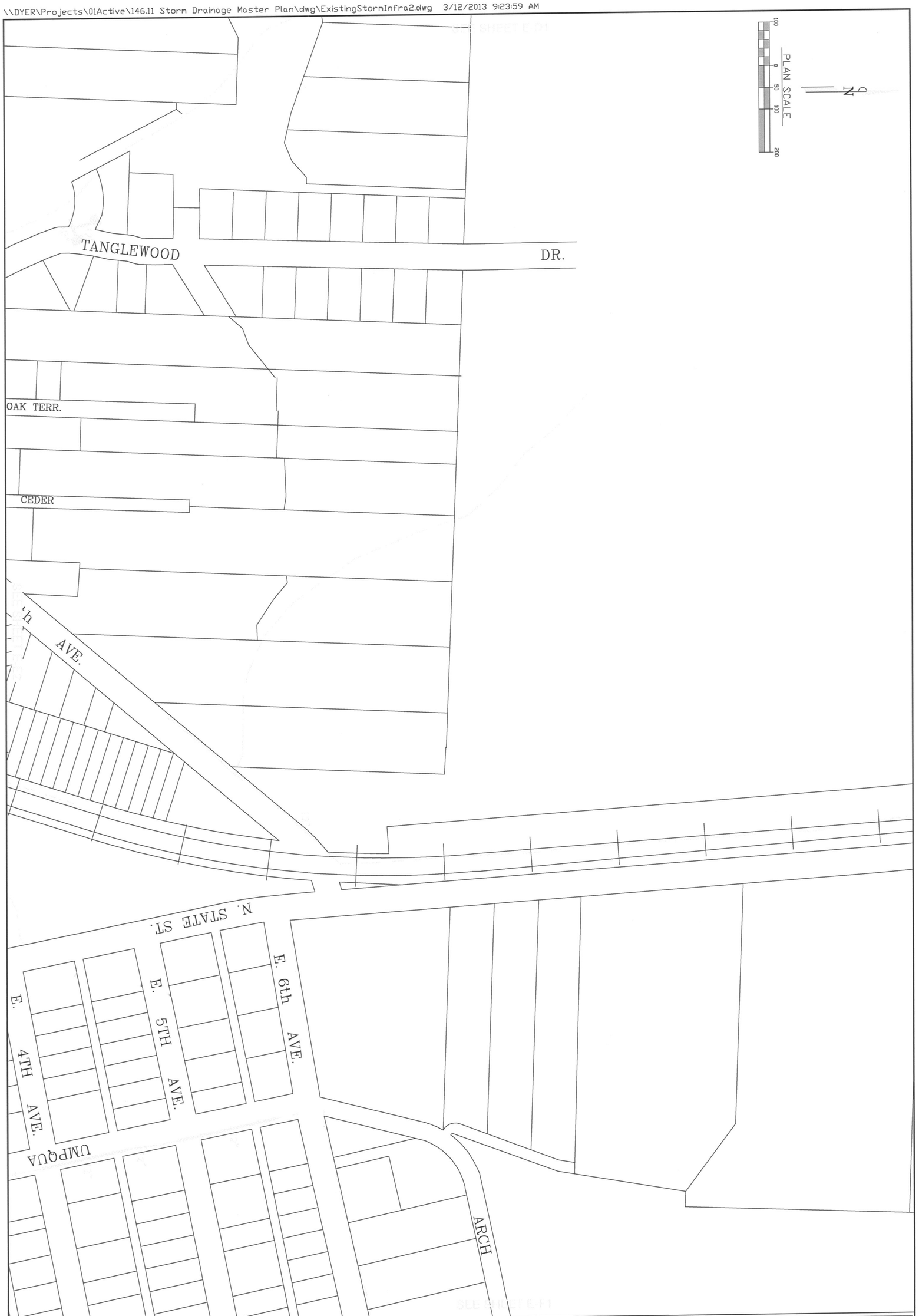

THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014 PROJECT NO.: 146.11	EXISTING STORM DRAINAGE SYSTEM	E-E1

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THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-E2
PROJECT NO.: 146.11		

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THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-E3
PROJECT NO.: 146.11		

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THE DYER PARTNERSHIP ENGINEERS & PLANNERS DATE: MARCH, 2014 PROJECT NO.: 146.11	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN **EXISTING STORM DRAINAGE SYSTEM**	FIGURE NO. **E-E4**

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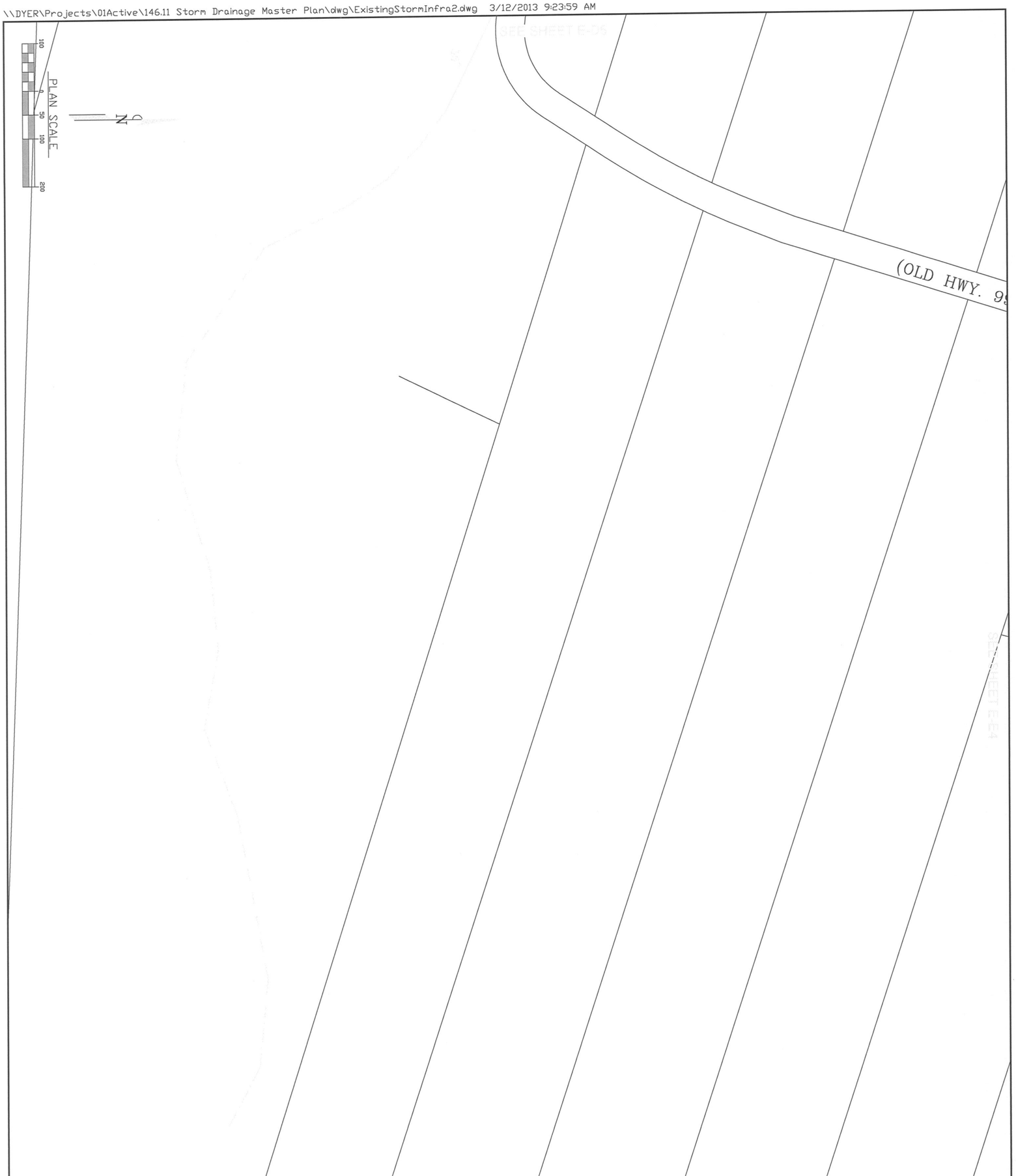

THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-E5
PROJECT NO.: 146.11		

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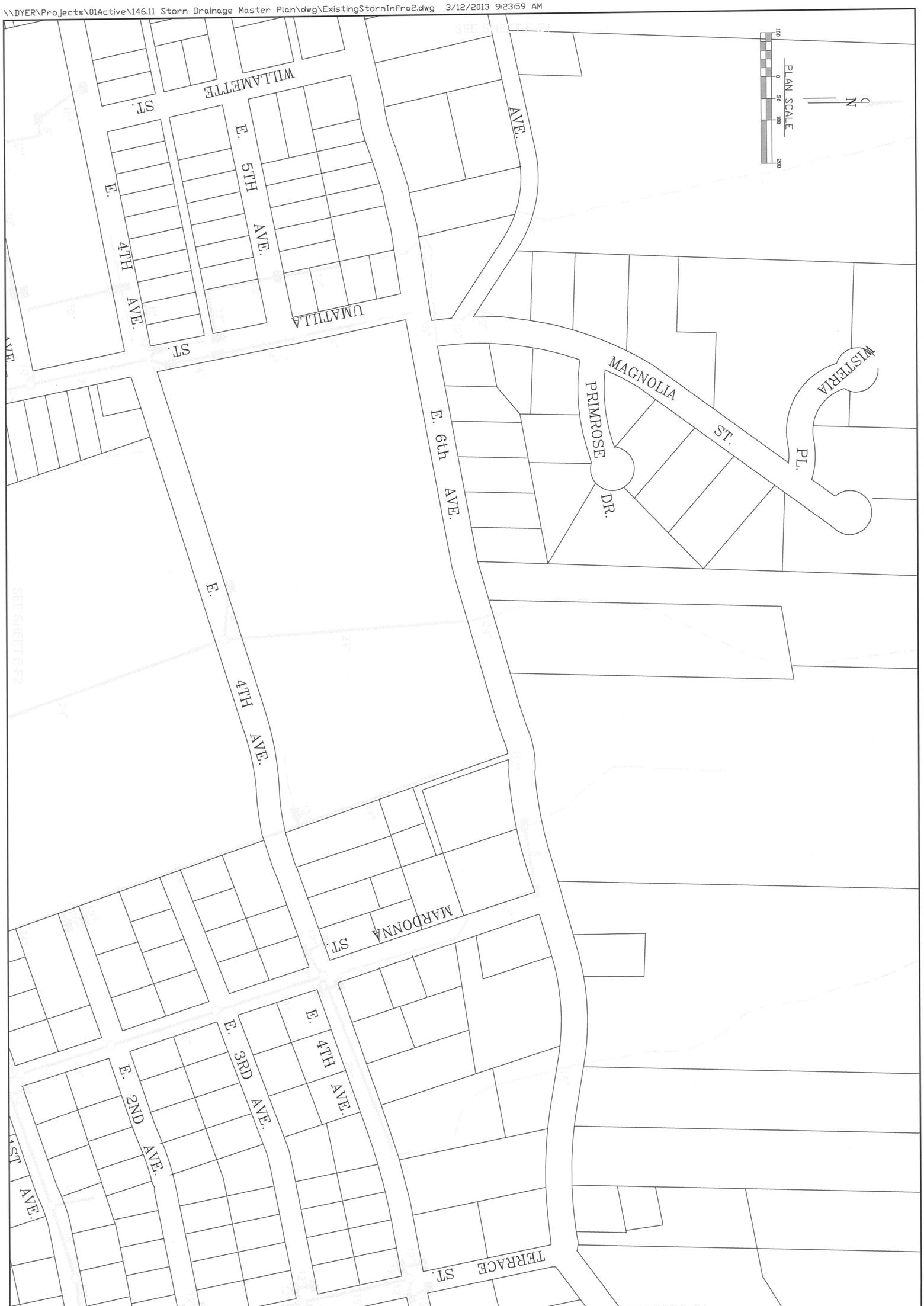

THE DYER PARTNERSHIP ENGINEERS & PLANNERS DATE: MARCH, 2014 PROJECT NO.: 146.11	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN **EXISTING STORM DRAINAGE SYSTEM**	FIGURE NO. **E-F1**

E. 3RD AVE.

E. 2ND AVE.

WILLAMETTE

E. 1ST AVE.

ST.

UMATILLA ST.

EA GL E

CT.

E. 1ST

MARDONNA ST.

E. CENTRAL AVE.

EVERETT AVE.

E. DEAN AVE.

GLEN AVE.

WAITE

EASY ST.

E. CENTRAL

BEECROFT ST.

AVE.

LIBRARY

SENIOR

Sutherlin

NOT A THROUGH STREET

PLAN SCALE
100 0 50 100

SEE SHEET E-F1

SEE SHEET E-F3

SEE SHEET E-F2

\\DYER\Projects\01Active\146.11 Storm Drainage Master Plan\dwg\ExistingStormInfra2.dwg 3/12/2013 9:23:59 AM

FIGURE NO. **E-F2**

CITY OF SUTHERLIN
STORM DRAINAGE MASTER PLAN
EXISTING STORM DRAINAGE SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: MARCH, 2014

PROJECT NO.: 146.11

THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-F3
PROJECT NO.: 146.11		

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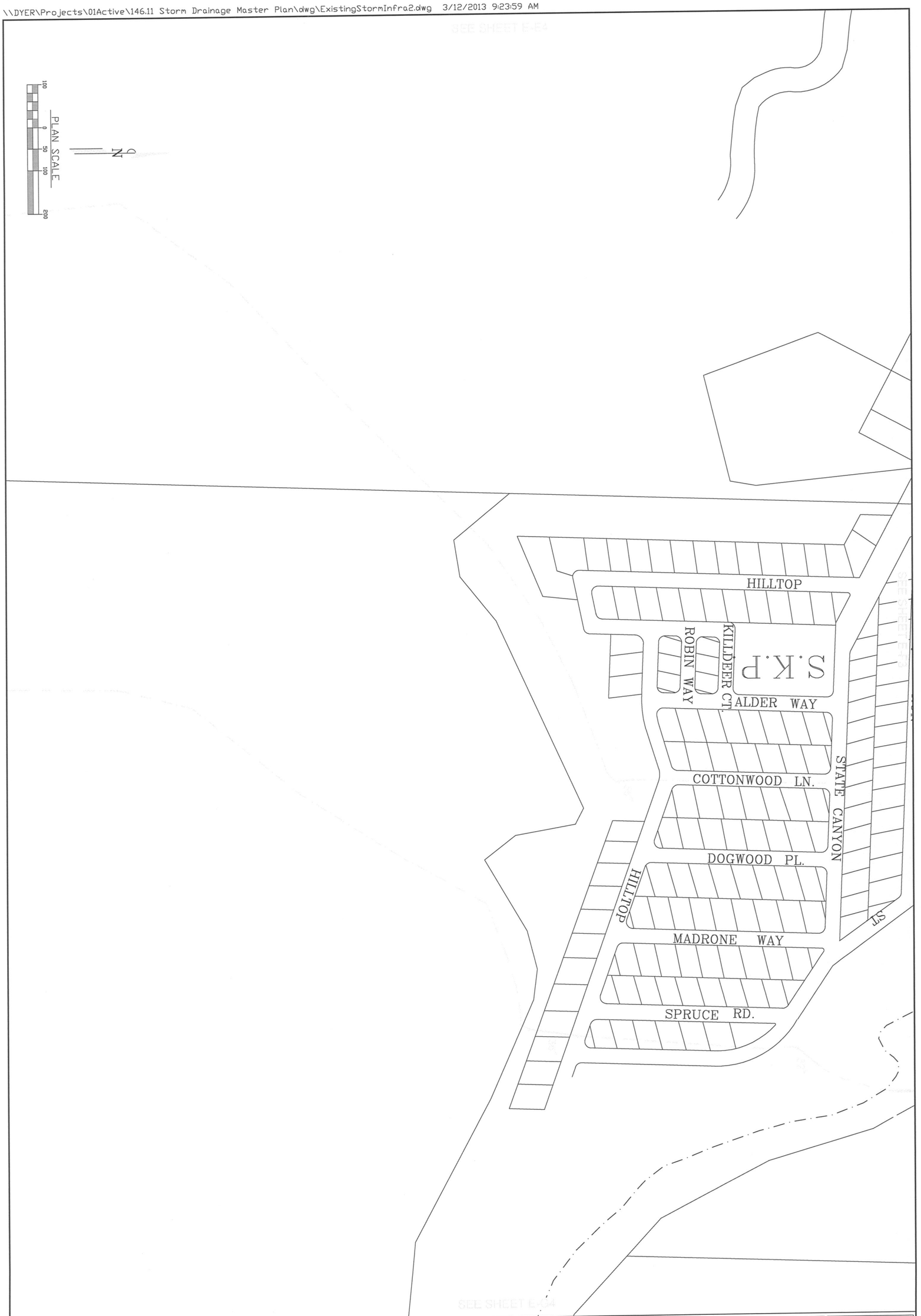

THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014 PROJECT NO.: 146.11	EXISTING STORM DRAINAGE SYSTEM	E-F4

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THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-G1
PROJECT NO.: 146.11		

TERRACE ST.
ERWOOD ST.
ST.
CENTRAL AVE.
E.
COTTONWOOD DR.
SILVER GLEN DR.
LANE ST.
SANDALWOOD DR.
WILDWOOD
DRIFTWOOD DR.
SUNNY LN.
GROVE LN.
DON MAR CT.
FARRAH CT.
GROVE LN. CT.
SUNNY CT.
QUAIL PU STA
OAKWOOD
SILVER GLEN DR.
SILVER GLEN DR.
DOGWOOD
MYRTLEWOOD
REDWOOD
DR.
PRIVATE SYSTEM
PRIVATE SYSTEM
SEE SHEET E-G1
SEE SHEET E-G2
SEE SHEET E-G3
SEA SHORE ST.
SEA SIDE RD.
N
PLAN SCALE
100 0 50 100 200

FIGURE NO. E-G2

CITY OF SUTHERLIN
STORM DRAINAGE MASTER PLAN
EXISTING STORM DRAINAGE SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS
DATE: MARCH, 2014
PROJECT NO.: 146.11

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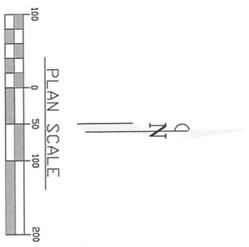

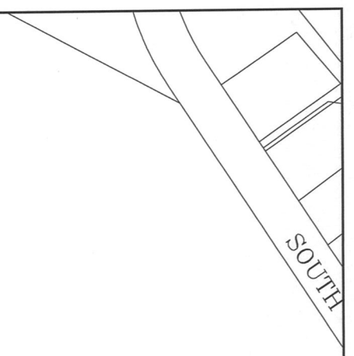

SEE SHEET E-F3
SEE SHEET E-G1
SEE SHEET E-G2
SEE SHEET E-H3

THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-G3
PROJECT NO.: 146.11		

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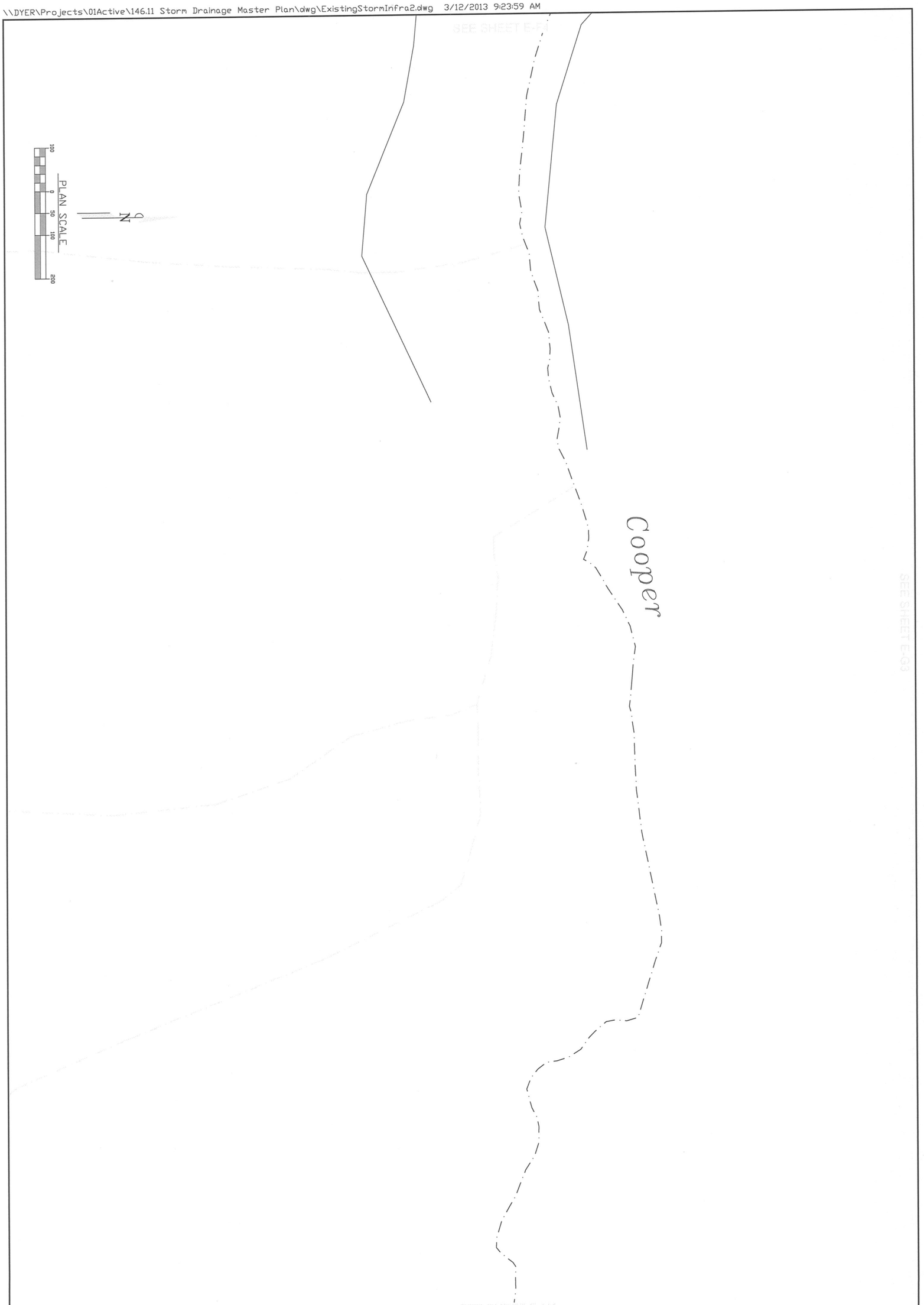

THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-G4
PROJECT NO.: 146.11		

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THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-H1
PROJECT NO.: 146.11		

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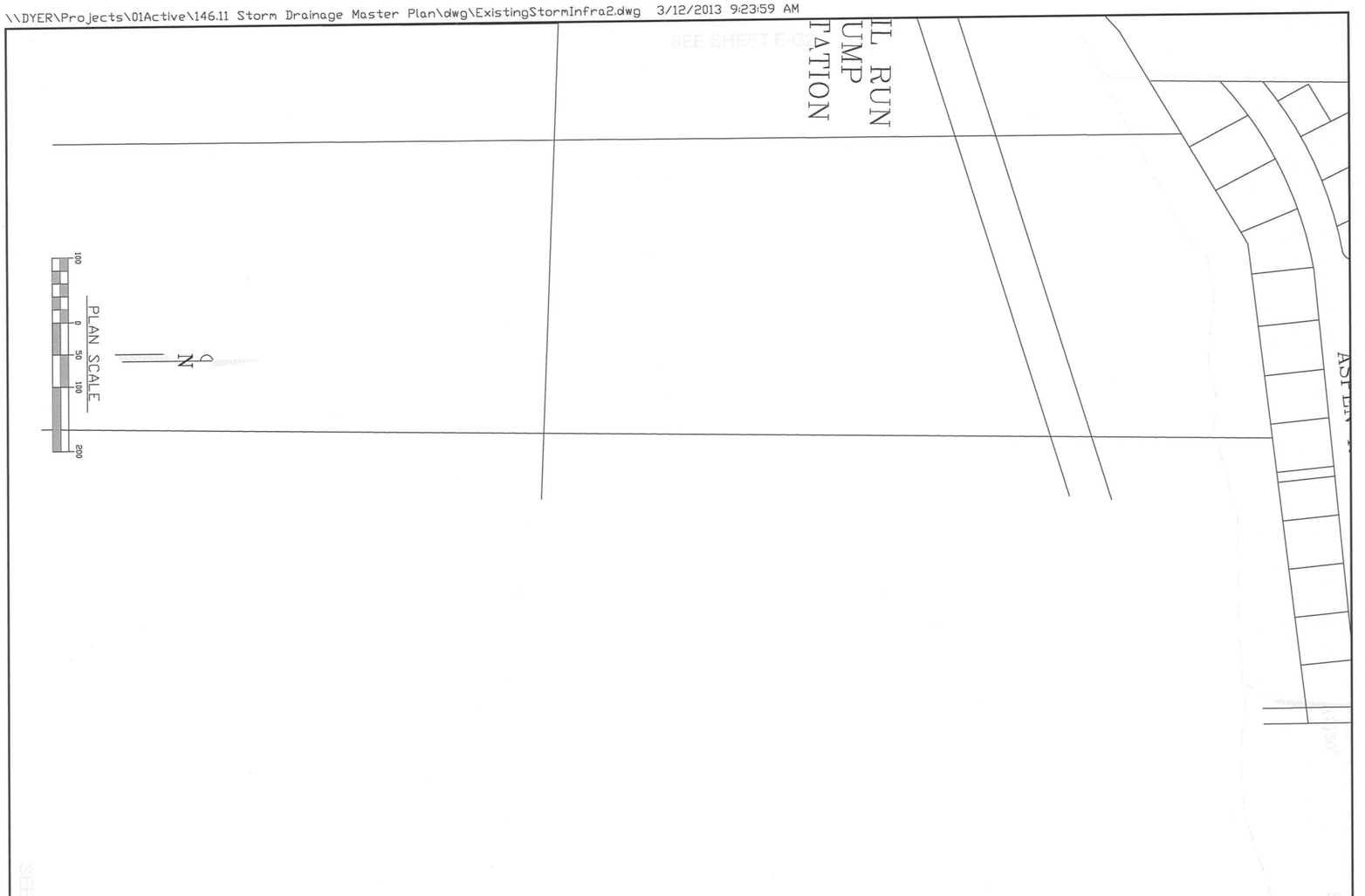
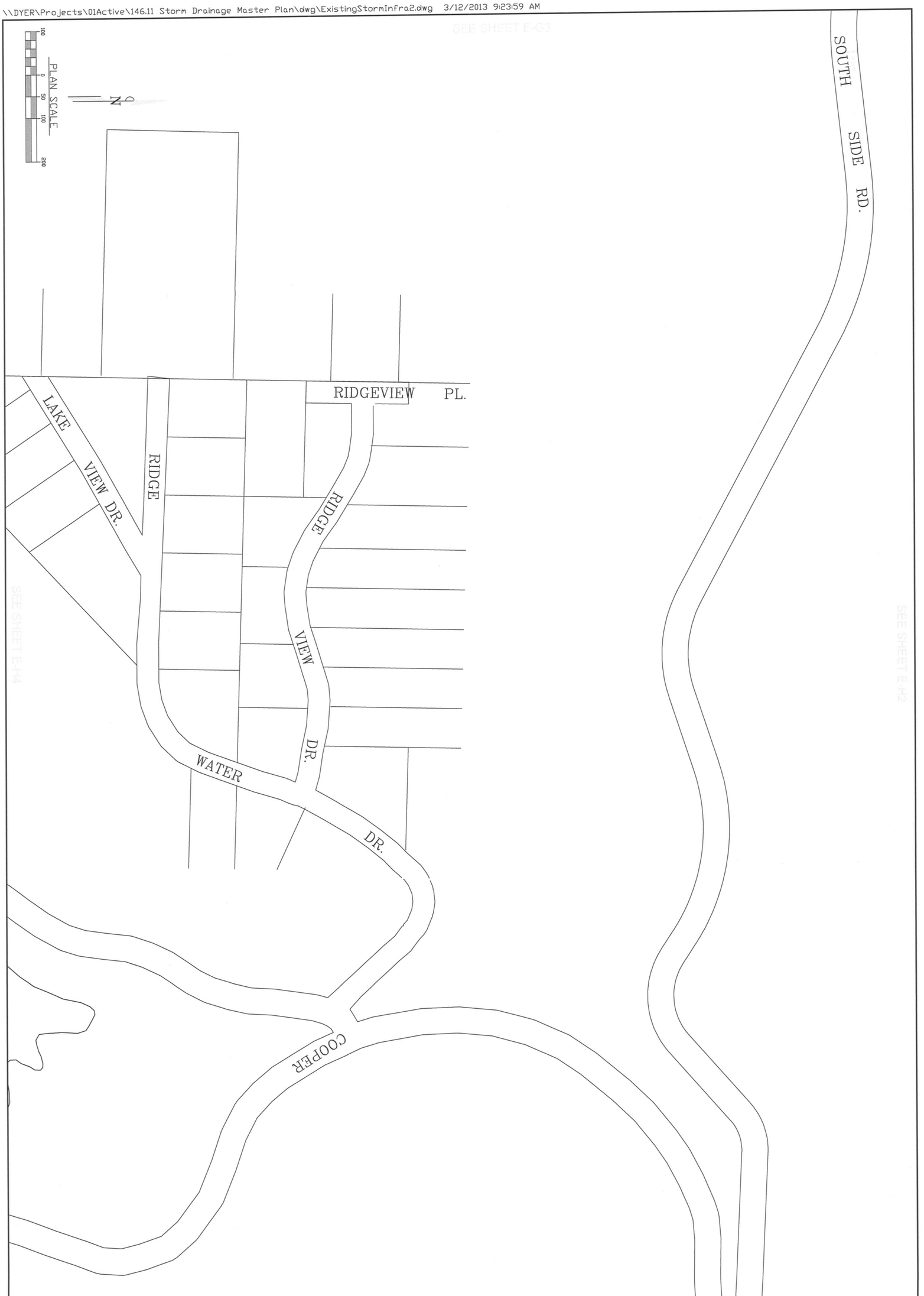


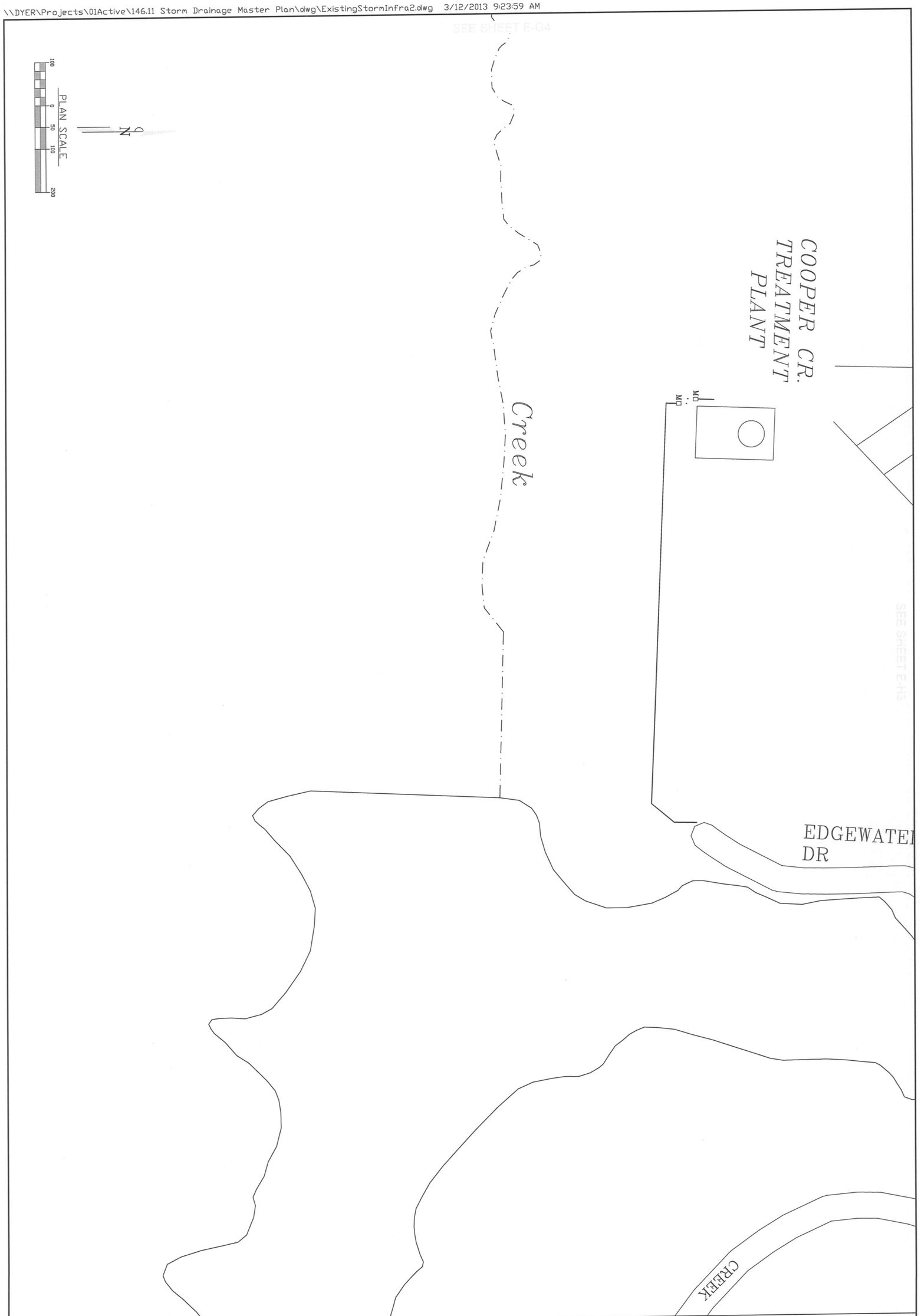
THE DYER PARTNERSHIP ENGINEERS & PLANNERS DATE: MARCH, 2014 PROJECT NO.: 146.11	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN EXISTING STORM DRAINAGE SYSTEM	FIGURE NO. E-H2

\\DYER\Projects\01Active\146.11 Storm Drainage Master Plan\dwg\ExistingStormInfra2.dwg 3/12/2013 9:23:59 AM



THE DYER PARTNERSHIP ENGINEERS & PLANNERS DATE: MARCH, 2014 PROJECT NO.: 146.11	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN EXISTING STORM DRAINAGE SYSTEM	FIGURE NO. E-H3

\\DYER\Projects\01Active\146.11 Storm Drainage Master Plan\dwg\ExistingStormInfra2.dwg 3/12/2013 9:23:59 AM



THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF SUTHERLIN STORM DRAINAGE MASTER PLAN	FIGURE NO.
DATE: MARCH, 2014	EXISTING STORM DRAINAGE SYSTEM	E-H4
PROJECT NO.: 146.11		

APPENDIX

B

Cost Estimates

Priority 1 Projects

Priority 2 Projects

Priority 3 Projects

Priority 1 Projects

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #1 E. 4th Ave., between Crown Point & Grove St.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$50,200.00	$50,200
2	Demolition and Site Preparation	LS	ALL	$30,100.00	$30,100
3	Misc. Appurtenances	LS	ALL	$20,100.00	$20,100
4	36" Storm Drain - Class C Backfill	LF	770	$160.50	$123,585
5	42" Storm Drain - Class C Backfill	LF	1010	$192.60	$194,526
6	60" Storm Drain Manhole	EA	1	$6,420.00	$6,420
7	84" Storm Drain Manhole	EA	3	$9,095.00	$27,285
8	42" Inlet Structure	EA	1	$10,700.00	$10,700
9	42" Outfall Structure	EA	1	$10,700.00	$10,700
10	6' Wooden Fence	LF	770	$10.70	$8,239
11	AC Pavement R&R	TON	135	$128.40	$17,334
12	Rip Rap	CY	50	$64.20	$3,210
	Construction Total				**$502,399**
	Engineering				**$100,480**
	Contingency				**$120,580**
	Legal & Administration				**$15,070**
	Total Project Cost				**$738,529**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #2 Sherwood St., bound by E. 6th St. & E. 4th St.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$5,500.00	$5,500
2	Demolition and Site Preparation	LS	ALL	$3,300.00	$3,300
3	Misc. Appurtenances	LS	ALL	$2,200.00	$2,200
4	24" Storm Drain - Class C Backfill	LF	132	$128.40	$16,949
5	60" Storm Drain Manhole	EA	2	$6,420.00	$12,840
6	6' X 8' Junction Box	EA	1	$10,700.00	$10,700
7	Rip Rap	CY	50	$64.20	$3,210
	Construction Total				**$54,699**
	Engineering				**$10,940**
	Contingency				**$13,130**
	Legal & Administration				**$1,640**
	Total Project Cost				**$80,409**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #3 Jade St., north of Central Ave.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$2,800.00	$2,800
2	Demolition and Site Preparation	LS	ALL	$1,700.00	$1,700
3	Misc. Appurtenances	LS	ALL	$1,100.00	$1,100
4	24" Storm Drain - Class C Backfill	LF	90	$128.40	$11,556
5	Catch Basin	EA	1	$1,605.00	$1,605
6	24" Outfall Structure	EA	1	$6,420.00	$6,420
7	Rip Rap	CY	50	$64.20	$3,210
	Construction Total				**$28,391**
	Engineering				**$5,680**
	Contingency				**$6,810**
	Legal & Administration				**$850**
	Total Project Cost				**$41,731**

City of Sutherlin
Storm Drain Master Plan
Project #4 Central Ave., between Jade St. & Opal St.

April 3, 2014

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$7,600.00	$7,600
2	Demolition and Site Preparation	LS	ALL	$4,500.00	$4,500
3	Misc. Appurtenances	LS	ALL	$3,000.00	$3,000
4	30" Storm Drain - Class C Backfill	LF	180	$149.80	$26,964
5	Ditching 4.5 ft btm	LF	483	$16.05	$7,752
6	30" Inlet Structure w/ Trash Rack	EA	3	$7,490.00	$22,470
7	AC Pavement R&R	TON	14	$10.70	$150
8	Rip Rap	CY	50	$64.20	$3,210
			Construction Total		$75,646
			Engineering		$15,130
			Contingency		$18,160
			Legal & Administration		$2,270
			Total Project Cost		$111,206

City of Sutherlin
Storm Drain Master Plan
Project #5 herwood St. & E. Central Ave.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$8,500.00	$8,500
2	Demolition and Site Preparation	LS	ALL	$4,500.00	$4,500
3	Misc. Appurtenances	LS	ALL	$3,000.00	$3,000
4	30" Storm Drain - Class C Backfill	LF	40	$149.80	$5,992
5	48" Storm Drain - Class C Backfill	LF	130	$214.00	$27,820
6	60" Storm Drain Manhole	EA	1	$6,420.00	$6,420
7	48" Inlet Structure w/ Trash Rack	EA	1	$12,840.00	$12,840
8	AC Pavement R&R	TON	24	$128.40	$3,082
9	Rip Rap	CY	50	$64.20	$3,210
			Construction Total		$75,364
			Engineering		$15,070
			Contingency		$18,090
			Legal & Administration		$2,260
			Total Project Cost		$110,784

City of Sutherlin
Storm Drain Master Plan
Project #6 Umatilla St., bound by E. 4th Ave. & 6th Ave.

April 3, 2014

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$14,200.00	$14,200
2	Demolition and Site Preparation	LS	ALL	$8,500.00	$8,500
3	Misc. Appurtenances	LS	ALL	$5,700.00	$5,700
4	18" Storm Drain - Class C Backfill	LF	510	$96.30	$49,113
5	24" Storm Drain - Class C Backfill	LF	303	$128.40	$38,905
9	48" Storm Drain Manhole	EA	2	$5,350.00	$10,700
10	Catch Basin	EA	2	$1,605.00	$3,210
11	18" Inlet Structure w/ Trash Rack	EA	1	$5,350.00	$5,350
13	6' Wooden Fence	LF	510	$10.70	$5,457
14	AC Pavement R&R	TON	8	$128.40	$1,027
			Construction Total		$142,162
			Engineering		$28,430
			Contingency		$34,120
			Legal & Administration		$4,260
			Total Project Cost		$208,972

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #7 N. State St., bound by E. Central Ave. & 3rd Ave.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$17,800.00	$17,800
2	Demolition and Site Preparation	LS	ALL	$9,300.00	$9,300
3	Misc. Appurtenances	LS	ALL	$6,200.00	$6,200
4	12" Storm Drain - Class C Backfill	LF	28	$53.50	$1,498
5	24" Storm Drain - Class C Backfill	LF	817	$128.40	$104,903
8	Catch Basin	EA	2	$1,605.00	$3,210
9	24" Inlet Structure w/ Trash Rack	EA	1	$6,420.00	$6,420
11	AC Pavement R&R	TON	60	$128.40	$7,704
		Construction Total			**$157,035**
		Engineering			**$31,410**
		Contingency			**$37,690**
		Legal & Administration			**$4,710**
		Total Project Cost			**$230,845**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #8 N. Calapooya St, north of E. Central Ave.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$8,400.00	$8,400
2	Demolition and Site Preparation	LS	ALL	$4,400.00	$4,400
3	Misc. Appurtenances	LS	ALL	$2,900.00	$2,900
4	12" Storm Drain - Class C Backfill	LF	130	$53.50	$6,955
5	24" Storm Drain - Class C Backfill	LF	285	$128.40	$36,594
6	Catch Basin	EA	4	$1,605.00	$6,420
7	AC Pavement R&R	TON	40	$128.40	$5,136
8	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$74,015**
		Engineering			**$14,800**
		Contingency			**$17,760**
		Legal & Administration			**$2,220**
		Total Project Cost			**$108,795**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #9 Between Grant St. & Branton St., bound by W. Second Ave. & W. Central Ave.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$11,300.00	$11,300
2	Demolition and Site Preparation	LS	ALL	$6,800.00	$6,800
3	Misc. Appurtenances	LS	ALL	$4,500.00	$4,500
4	30" Storm Drain - Class C Backfill	LF	423	$149.80	$63,365
5	30" Inlet Structure w/ Trash Rack	EA	2	$7,490.00	$14,980
6	30" Outfall Structure	EA	1	$7,490.00	$7,490
7	AC Pavement R&R	TON	12	$128.40	$1,541
8	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$113,186**
		Engineering			**$22,640**
		Contingency			**$27,170**
		Legal & Administration			**$3,400**
		Total Project Cost			**$166,396**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #10 Hwy. 138, east of Fire Hall

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$6,400.00	$6,400
2	Demolition and Site Preparation	LS	ALL	$3,900.00	$3,900
3	Misc. Appurtenances	LS	ALL	$2,600.00	$2,600
4	30" Storm Drain - Class C Backfill	LF	44	$149.80	$6,591
5	30" Storm Drain - Bore	LF	58	$192.60	$11,171
6	30" Inlet Structure w/ Trash Rack	EA	2	$7,490.00	$14,980
7	30" Outfall Structure	EA	2	$7,490.00	$14,980
8	AC Pavement R&R	TON	5	$128.40	$642
9	Rip Rap	CY	50	$64.20	$3,210
				Construction Total	**$64,474**
				Engineering	**$12,890**
				Contingency	**$15,470**
				Legal & Administration	**$1,930**
				Total Project Cost	**$94,764**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #11 West of Grove St., bound by E. First Ave. & E. Central Ave.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$8,000.00	$8,000
2	Demolition and Site Preparation	LS	ALL	$4,800.00	$4,800
3	Misc. Appurtenances	LS	ALL	$3,200.00	$3,200
4	24" Storm Drain - Class C Backfill	LF	384	$128.40	$49,306
5	48" Storm Drain Manhole	EA	1	$5,350.00	$5,350
6	Catch Basin	EA	2	$1,605.00	$3,210
7	AC Pavement R&R	TON	23	$128.40	$2,953
8	Rip Rap	CY	50	$64.20	$3,210
				Construction Total	**$80,029**
				Engineering	**$16,010**
				Contingency	**$19,210**
				Legal & Administration	**$2,400**
				Total Project Cost	**$117,649**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #12 E. 4th Ave., between Terrace St. & Mardonna St.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$10,000.00	$10,000
2	Demolition and Site Preparation	LS	ALL	$6,000.00	$6,000
3	Misc. Appurtenances	LS	ALL	$4,000.00	$4,000
4	30" Storm Drain - Class C Backfill	LF	461	$149.80	$69,058
5	30" Inlet Structure w/ Trash Rack	EA	1	$7,490.00	$7,490
6	Rip Rap	CY	50	$64.20	$3,210
				Construction Total	**$99,758**
				Engineering	**$19,950**
				Contingency	**$23,940**
				Legal & Administration	**$2,990**
				Total Project Cost	**$146,638**

Priority 1 Projects

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #13 East of Montclair St., bound by E. Central Ave. & Sutherlin Creek

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$6,700.00	$6,700
2	Demolition and Site Preparation	LS	ALL	$4,000.00	$4,000
3	Misc. Appurtenances	LS	ALL	$2,700.00	$2,700
4	30" Storm Drain - Class C Backfill	LF	150	$149.80	$22,470
5	Ditching 5 ft btm	LF	757	$17.12	$12,960
6	30" Inlet Structure	EA	1	$7,490.00	$7,490
7	30" Outfall Structure	EA	1	$7,490.00	$7,490
8	Rip Rap	CY	50	$64.20	$3,210
				Construction Total	**$67,020**
				Engineering	**$13,400**
				Contingency	**$16,080**
				Legal & Administration	**$2,010**
				Total Project Cost	**$98,510**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #14 Johns St., between Central Ave. & 4th Ave.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$4,500.00	$4,500
2	Demolition and Site Preparation	LS	ALL	$2,700.00	$2,700
3	Misc. Appurtenances	LS	ALL	$1,800.00	$1,800
4	15" Storm Drain - Class C Backfill	LF	108	$74.90	$8,089
5	24" Storm Drain - Class C Backfill	LF	35	$128.40	$4,494
6	4' x 4' Junction Box	EA	1	$3,210.00	$3,210
7	15" Inlet Structure	EA	1	$4,280.00	$4,280
8	24" Inlet Structure	EA	1	$6,420.00	$6,420
9	24" Outfall Structure	EA	1	$6,420.00	$6,420
10	Rip Rap	CY	50	$64.20	$3,210
				Construction Total	**$45,123**
				Engineering	**$9,020**
				Contingency	**$10,830**
				Legal & Administration	**$1,350**
				Total Project Cost	**$66,323**

Construction Total	**$1,579,300**
Engineering	**$315,850**
Contingency	**$379,040**
Legal & Administration	**$47,360**
Total Project Cost - Priority 1 Projects	**$2,321,550**

Priority 2 Projects

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #15 W. Central Ave. between N. Comstock St. & I-5

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$26,500.00	$26,500
2	Demolition and Site Preparation	LS	ALL	$13,800.00	$13,800
3	Misc. Appurtenances	LS	ALL	$9,200.00	$9,200
5	24" Storm Drain - Class C Backfill	LF	745	$128.40	$95,658
6	36" Storm Drain - Bore	LF	200	$192.60	$38,520
7	Ditching 4 ft btm	LF	462	$14.98	$6,921
8	48" Storm Drain Manhole	EA	1	$5,350.00	$5,350
9	36" Inlet Structure w/ Trash Rack	EA	1	$8,560.00	$8,560
10	24" Outfall Structure	EA	1	$6,420.00	$6,420
11	36" Outfall Structure	EA	1	$8,560.00	$8,560
12	AC Pavement R&R	TON	86	$128.40	$11,042
13	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$233,741**
		Engineering			**$46,750**
		Contingency			**$56,100**
		Legal & Administration			**$7,010**
		Total Project Cost			**$343,601**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #16 Along Hwy 138, east of Recreation Ln.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$8,100.00	$8,100
2	Demolition and Site Preparation	LS	ALL	$4,900.00	$4,900
3	Misc. Appurtenances	LS	ALL	$3,200.00	$3,200
4	36" Storm Drain - Bore	LF	52	$321.00	$16,692
5	48" Storm Drain - Class C Backfill	LF	55	$214.00	$11,770
6	Ditching 10 ft btm	LF	260	$25.68	$6,677
7	48" Inlet Structure w/ Trash Rack	EA	2	$12,840.00	$25,680
8	AC Pavement R&R	TON	5	$128.40	$642
9	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$80,871**
		Engineering			**$16,170**
		Contingency			**$19,410**
		Legal & Administration			**$2,430**
		Total Project Cost			**$118,881**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #17 Between Sherman St. & Branton St., bound by W. 6th Ave. & W. Central Ave.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$7,400.00	$7,400
2	Demolition and Site Preparation	LS	ALL	$4,400.00	$4,400
3	Misc. Appurtenances	LS	ALL	$3,000.00	$3,000
4	18" Storm Drain - Class C Backfill	LF	415	$96.30	$39,965
5	Catch Basin	EA	2	$1,605.00	$3,210
6	18" Inlet Structure w/ Trash Rack	EA	2	$5,350.00	$10,700
7	AC Pavement R&R	TON	16	$128.40	$2,054
8	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$73,939**
		Engineering			**$14,790**
		Contingency			**$17,750**
		Legal & Administration			**$2,220**
		Total Project Cost			**$108,699**

Priority 2 Projects

City of Sutherlin — April 3, 2014
Storm Drain Master Plan
Project #18 Opal St., between Central Ave. & Garnet Ct.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$29,300.00	$29,300
2	Demolition and Site Preparation	LS	ALL	$17,600.00	$17,600
3	Misc. Appurtenances	LS	ALL	$11,700.00	$11,700
4	30" Storm Drain - Class C Backfill	LF	1300	$149.80	$194,740
5	48" Storm Drain Manhole	EA	3	$5,350.00	$16,050
6	Catch Basin	EA	3	$1,605.00	$4,815
7	AC Pavement R&R	TON	122	$128.40	$15,665
8	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$293,080**
		Engineering			**$58,620**
		Contingency			**$70,340**
		Legal & Administration			
		Total Project Cost			**$422,040**

City of Sutherlin — April 3, 2014
Storm Drain Master Plan
Project #19 4th Ave & Arvilla Way

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$5,700.00	$5,700
2	Demolition and Site Preparation	LS	ALL	$3,400.00	$3,400
3	Misc. Appurtenances	LS	ALL	$2,300.00	$2,300
4	30" Storm Drain - Class C Backfill	LF	186	$149.80	$27,863
5	Catch Basin	EA	1	$1,605.00	$1,605
6	30" Inlet Structure	EA	1	$7,490.00	$7,490
7	Sidewalk R&R	SF	500	$10.70	$5,350
8	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$56,918**
		Engineering			**$11,380**
		Contingency			**$13,660**
		Legal & Administration			**$1,710**
		Total Project Cost			**$83,668**

City of Sutherlin — April 3, 2014
Storm Drain Master Plan
Project #20 SE of Arvilla Ct. to Central Ave.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$1,100.00	$1,100
2	Demolition and Site Preparation	LS	ALL	$600.00	$600
3	Misc. Appurtenances	LS	ALL	$400.00	$400
4	Ditching 2 ft btm. x 1 ft deep	LF	200	$10.70	$2,140
5	12" Inlet Structure w/ Trash Rack	EA	1	$3,210.00	$3,210
6	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$10,660**
		Engineering			**$2,130**
		Contingency			**$2,560**
		Legal & Administration			**$320**
		Total Project Cost			**$15,670**

Priority 2 Projects

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #21 E. 6th Ave., west of Sherwood St.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$2,500.00	$2,500
2	Demolition and Site Preparation	LS	ALL	$1,500.00	$1,500
3	Misc. Appurtenances	LS	ALL	$1,000.00	$1,000
4	24" Storm Drain - Class C Backfill	LF	30	$128.40	$3,852
5	24" Inlet Structure w/ Trash Rack	EA	1	$6,420.00	$6,420
6	24" Outfall Structure	EA	1	$6,420.00	$6,420
7	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$24,902**
		Engineering			**$4,980**
		Contingency			**$5,980**
		Legal & Administration			**$750**
		Total Project Cost			**$36,612**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #22 E. 1st Ave., between Terrace St. & Mardonna St.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$10,600.00	$10,600
2	Demolition and Site Preparation	LS	ALL	$6,400.00	$6,400
3	Misc. Appurtenances	LS	ALL	$4,300.00	$4,300
4	24" Storm Drain - Class C Backfill	LF	621	$128.40	$79,736
5	48" Storm Drain Manhole	EA	1	$5,350.00	$5,350
		Construction Total			**$106,386**
		Engineering			**$21,280**
		Contingency			**$25,530**
		Legal & Administration			**$3,190**
		Total Project Cost			**$156,386**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #23 Mardonna St., south of E. 1st St.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$22,700.00	$22,700
2	Demolition and Site Preparation	LS	ALL	$11,900.00	$11,900
3	Misc. Appurtenances	LS	ALL	$7,900.00	$7,900
4	30" Storm Drain - Class C Backfill	LF	481	$149.80	$72,054
5	60" Storm Drain - Class C Backfill	LF	135	$321.00	$43,335
6	7' x 7' Junction Box	EA	2	$11,770.00	$23,540
7	60" Outfall Structure	EA	1	$16,050.00	$16,050
8	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$200,689**
		Engineering			**$40,140**
		Contingency			**$48,170**
		Legal & Administration			**$6,020**
		Total Project Cost			**$295,019**

Priority 2 Projects

City of Sutherlin — April 3, 2014
Storm Drain Master Plan
Project #24 Bound by E. 6th Ave., E. Central Ave., Mardonna St., and Umatilla St.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$35,500.00	$35,500
2	Demolition and Site Preparation	LS	ALL	$18,500.00	$18,500
3	Misc. Appurtenances	LS	ALL	$12,300.00	$12,300
4	24" Storm Drain - Class C Backfill	LF	1700	$128.40	$218,280
5	36" Storm Drain - Class C Backfill	LF	70	$160.50	$11,235
6	48" Storm Drain Manhole	EA	1	$5,350.00	$5,350
7	36" Outfall Structure	EA	1	$8,560.00	$8,560
8	Rip Rap	CY	50	$64.20	$3,210
				Construction Total	**$312,935**
				Engineering	**$62,590**
				Contingency	**$75,110**
				Legal & Administration	**$9,390**
				Total Project Cost	**$460,025**

City of Sutherlin — April 3, 2014
Storm Drain Master Plan
Project #25 Arch St., west of Magnolia St.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$2,200.00	$2,200
2	Demolition and Site Preparation	LS	ALL	$1,300.00	$1,300
3	Misc. Appurtenances	LS	ALL	$900.00	$900
4	18" Storm Drain - Class C Backfill	LF	42	$96.30	$4,045
5	18" Inlet Structure w/ Trash Rack	EA	1	$5,350.00	$5,350
6	18" Outfall Structure	EA	1	$5,350.00	$5,350
7	Rip Rap	CY	50	$64.20	$3,210
				Construction Total	**$22,355**
				Engineering	**$4,470**
				Contingency	**$5,360**
				Legal & Administration	**$670**
				Total Project Cost	**$32,855**

City of Sutherlin — April 3, 2014
Storm Drain Master Plan
Project #26 Willamette St., bound by 3rd Ave. & Sutherlin Creek

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$20,300.00	$20,300
2	Demolition and Site Preparation	LS	ALL	$12,200.00	$12,200
3	Misc. Appurtenances	LS	ALL	$8,100.00	$8,100
4	24" Storm Drain - Class C Backfill	LF	458	$128.40	$58,807
5	36" Storm Drain - Class C Backfill	LF	445	$160.50	$71,423
6	Ditching 2 ft btm	LF	420	$10.70	$4,494
7	60" Storm Drain Manhole	EA	2	$6,420.00	$12,840
8	Catch Basin	EA	2	$1,605.00	$3,210
9	36" Outfall Structure	EA	1	$8,560.00	$8,560
10	Rip Rap	CY	50	$64.20	$3,210
				Construction Total	**$203,144**
				Engineering	**$40,630**
				Contingency	**$48,750**
				Legal & Administration	**$6,090**
				Total Project Cost	**$298,614**

Priority 2 Projects

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #27 Umpqua st., bound by E. 4th Ave. & Sutherlin Creek

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$22,200	$22,200
2	Demolition and Site Preparation	LS	ALL	$13,300	$13,300
3	Misc. Appurtenances	LS	ALL	$8,900.00	$8,900
4	18" Storm Drain - Class C Backfill	LF	93	$96	$8,956
5	24" Storm Drain - Class C Backfill	LF	366	$128	$46,994
6	30" Storm Drain - Class C Backfill	LF	413	$150	$61,867
7	Ditching 2 ft btm	LF	420	$11	$4,494
8	48" Storm Drain Manhole	EA	1	$5,350	$5,350
9	Catch Basin	EA	2	$1,605	$3,210
10	18" Inlet Structure w/ Trash Rack	EA	2	$5,350	$10,700
11	24" Inlet Structure w/ Trash Rack	EA	4	$6,420	$25,680
12	30" Outfall Structure	EA	1	$7,490	$7,490
13	Rip Rap	CY	50	$64	$3,210
			Construction Total		**$222,352**
			Engineering		**$44,470**
			Contingency		**$53,360**
			Legal & Administration		**$6,670**
			Total Project Cost		**$326,852**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #28 W. 6th Ave., west of railroad tracks

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$1,600.00	$1,600
2	Demolition and Site Preparation	LS	ALL	$1,000.00	$1,000
3	Misc. Appurtenances	LS	ALL	$600.00	$600
4	24" Storm Drain - Class C Backfill	LF	26	$128.40	$3,338
5	24" Inlet Structure	EA	1	$6,420.00	$6,420
6	Rip Rap	CY	50	$64.20	$3,210
			Construction Total		**$16,168**
			Engineering		**$3,230**
			Contingency		**$3,880**
			Legal & Administration		**$490**
			Total Project Cost		**$23,768**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #29 Adj. to railroad tracks, Bound by W. 6th Ave., Oak St., & W. Central Ave.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$22,600.00	$22,600
2	Demolition and Site Preparation	LS	ALL	$13,600.00	$13,600
3	Misc. Appurtenances	LS	ALL	$9,000.00	$9,000
4	30" Storm Drain - Class C Backfill	LF	915	$149.80	$137,067
5	Ditching 6 ft btm	LF	1500	$17.12	$25,680
6	30" Inlet Structure w/ Trash Rack	EA	1	$7,490.00	$7,490
7	30" Outfall Structure	EA	1	$7,490.00	$7,490
8	Rip Rap	CY	50	$64.20	$3,210
			Construction Total		**$226,137**
			Engineering		**$45,230**
			Contingency		**$54,270**
			Legal & Administration		**$6,780**
			Total Project Cost		**$332,417**

Priority 2 Projects

City of Sutherlin — April 3, 2014
Storm Drain Master Plan
Project #30 Beercroft St., south of power sub-station

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$3,300.00	$3,300
2	Demolition and Site Preparation	LS	ALL	$2,000.00	$2,000
3	Misc. Appurtenances	LS	ALL	$1,300.00	$1,300
4	48" Storm Drain - Class C Backfill	LF	50	$214.00	$10,700
5	48" Inlet Structure w/ Trash Rack	EA	1	$12,840.00	$12,840
6	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$33,350**
		Engineering			**$6,670**
		Contingency			**$8,000**
		Legal & Administration			**$1,000**
		Total Project Cost			**$49,020**

City of Sutherlin — April 3, 2014
Storm Drain Master Plan
Project #31 Waite St., bound by Everett Ave. & Sutherlin Creek

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$10,000.00	$10,000
2	Demolition and Site Preparation	LS	ALL	$6,000.00	$6,000
3	Misc. Appurtenances	LS	ALL	$4,000.00	$4,000
4	36" Storm Drain - Class C Backfill	LF	260	$149.80	$38,948
5	30" Inlet Structure w/ Trash Rack	EA	4	$7,490.00	$29,960
6	30" Outfall Structure	EA	1	$7,490.00	$7,490
7	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$99,608**
		Engineering			**$19,920**
		Contingency			**$23,910**
		Legal & Administration			**$2,990**
		Total Project Cost			**$146,428**

City of Sutherlin — April 3, 2014
Storm Drain Master Plan
Project #32 Southside Rd., east of Sea St.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$1,800.00	$1,800
2	Demolition and Site Preparation	LS	ALL	$1,100.00	$1,100
3	Misc. Appurtenances	LS	ALL	$700.00	$700
4	15" Storm Drain - Class C Backfill	LF	30	$74.90	$2,247
5	15" Inlet Structure w/ Trash Rack	EA	1	$4,280.00	$4,280
6	15" Outfall Structure	EA	1	$4,280.00	$4,280
7	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$17,617**
		Engineering			**$3,520**
		Contingency			**$4,230**
		Legal & Administration			**$530**
		Total Project Cost			**$25,897**

Priority 2 Projects

City of Sutherlin
Storm Drain Master Plan
Project #33 Southside Rd., 1000 ft. east of Sea St.

April 3, 2014

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$1,800.00	$1,800
2	Demolition and Site Preparation	LS	ALL	$1,100.00	$1,100
3	Misc. Appurtenances	LS	ALL	$700.00	$700
4	15" Storm Drain - Class C Backfill	LF	30	$74.90	$2,247
5	15" Inlet Structure w/ Trash Rack	EA	1	$4,280.00	$4,280
6	15" Outfall Structure	EA	1	$4,280.00	$4,280
7	Rip Rap	CY	50	$64.20	$3,210
				Construction Total	**$17,617**
				Engineering	**$3,520**
				Contingency	**$4,230**
				Legal & Administration	**$530**
				Total Project Cost	**$25,897**

City of Sutherlin
Storm Drain Master Plan
Project #34 W. Central Ave., between N. Comstock St. & Kruse St.

April 3, 2014

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$16,000.00	$16,000
2	Demolition and Site Preparation	LS	ALL	$8,000.00	$8,000
3	Misc. Appurtenances	LS	ALL	$5,300.00	$5,300
4	18" Storm Drain - Class C Backfill	LF	810	$96.30	$78,003
5	48" Storm Drain Manhole	EA	3	$5,350.00	$16,050
6	AC Pavement R&R	TON	74	$128.40	$9,502
7	Rip Rap	CY	50	$64.20	$3,210
				Construction Total	**$136,065**
				Engineering	**$27,210**
				Contingency	**$32,650**
				Legal & Administration	**$4,080**
				Total Project Cost	**$200,005**

City of Sutherlin
Storm Drain Master Plan
Project #35 E. Duke Ave. to Taylor St.

April 3, 2014

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$60,700.00	$60,700
2	Demolition and Site Preparation	LS	ALL	$36,400.00	$36,400
3	Misc. Appurtenances	LS	ALL	$24,300.00	$24,300
4	24" Storm Drain - Class C Backfill	LF	28	$128.40	$3,595
5	36" Storm Drain - Class C Backfill	LF	1769	$160.50	$283,925
6	48" Storm Drain - Class C Backfill	LF	336	$214.00	$71,904
7	Ditching 9 ft btm	LF	633	$21.40	$13,546
8	60" Storm Drain Manhole	EA	1	$6,420.00	$6,420
9	10' x 10' Junction Box	EA	3	$16,050.00	$48,150
10	36" Inlet Structure w/ Trash Rack	EA	3	$8,560.00	$25,680
11	48" Inlet Structure w/ Trash Rack	EA	1	$12,840.00	$12,840
12	48" Outfall Structure	EA	1	$12,840.00	$12,840
13	AC Pavement R&R	TON	26	$128.40	$3,338
14	Rip Rap	CY	50	$64.20	$3,210
				Construction Total	**$606,848**
				Engineering	**$121,370**
				Contingency	**$145,640**
				Legal & Administration	**$18,210**
				Total Project Cost	**$892,068**

Priority 2 Projects

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #36 Taylor St., 350 ft. north of Hastings Ave.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$14,300.00	$14,300
2	Demolition and Site Preparation	LS	ALL	$8,600.00	$8,600
3	Misc. Appurtenances	LS	ALL	$5,700.00	$5,700
4	36" Storm Drain - Class C Backfill	LF	390	$160.50	$62,595
5	Catch Basin	EA	2	$1,605.00	$3,210
6	36" Inlet Structure w/ Trash Rack	EA	2	$8,560.00	$17,120
7	36" Outfall Structure	EA	3	$8,560.00	$25,680
8	AC Pavement R&R	TON	20	$128.40	$2,568
9	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$142,983**
		Engineering			**$28,600**
		Contingency			**$34,320**
		Legal & Administration			**$4,290**
		Total Project Cost			**$210,193**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #37 I-5 & Trails End Rd., east to S. Comstock St., & ends at Page Rd. & Taylor St.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$47,200.00	$47,200
2	Demolition and Site Preparation	LS	ALL	$25,800.00	$25,800
3	Misc. Appurtenances	LS	ALL	$17,200.00	$17,200
4	30" Storm Drain - Class C Backfill	LF	282	$149.80	$42,244
5	36" Storm Drain - Class C Backfill	LF	513	$160.50	$82,337
6	36" Storm Drain - Bore	LF	125	$321.00	$40,125
7	Ditching 5 ft btm	LF	450	$17.12	$7,704
8	Ditching 7 ft btm	LF	1750	$18.19	$31,833
9	30" Inlet Structure w/ Trash Rack	EA	2	$7,490.00	$14,980
10	36" Inlet Structure w/ Trash Rack	EA	6	$8,560.00	$51,360
11	30" Outfall Structure	EA	2	$7,490.00	$14,980
12	36" Outfall Structure	EA	6	$8,560.00	$51,360
13	AC Pavement R&R	TON	26	$128.40	$3,338
14	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$433,670**
		Engineering			**$86,730**
		Contingency			**$104,080**
		Legal & Administration			**$13,010**
		Total Project Cost			**$637,490**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #38 Taylor St. & Hastings Ave.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$7,500.00	$7,500
2	Demolition and Site Preparation	LS	ALL	$3,800.00	$3,800
3	Misc. Appurtenances	LS	ALL	$2,500.00	$2,500
4	36" Storm Drain - Class C Backfill	LF	126	$160.50	$20,223
5	Catch Basin - Curb Inlet Type	EA	3	$1,605.00	$4,815
6	36" Inlet Structure w/ Trash Rack	EA	1	$8,560.00	$8,560
7	36" Outfall Structure	EA	1	$8,560.00	$8,560
8	AC Pavement R&R	TON	16	$128.40	$2,054
9	Curb & Gutter R&R	LF	85	$32.10	$2,729
10	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$63,951**
		Engineering			**$12,790**
		Contingency			**$15,350**
		Legal & Administration			**$1,920**
		Total Project Cost			**$94,011**

Priority 2 Projects

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #39 Hwy 138, between Dakota St. to Recreation Ln.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$17,900.00	$17,900
2	Demolition and Site Preparation	LS	ALL	$10,700.00	$10,700
3	Misc. Appurtenances	LS	ALL	$7,100.00	$7,100
4	30" Storm Drain - Class C Backfill	LF	144	$149.80	$21,571
5	30" Storm Drain - Bore	LF	60	$0.00	$0
6	42" Storm Drain - Class C Backfill	LF	116	$192.60	$22,342
7	Ditching 6 ft btm	LF	280	$17.12	$4,794
8	Ditching 10 ft btm	LF	1200	$25.68	$30,816
9	30" Inlet Structure w/ Trash Rack	EA	2	$7,490.00	$14,980
10	42" Inlet Structure w/ Trash Rack	EA	1	$10,700.00	$10,700
11	30" Outfall Structure	EA	3	$7,490.00	$22,470
12	42" Outfall Structure	EA	1	$10,700.00	$10,700
13	AC Pavement R&R	TON	11	$128.40	$1,412
14	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$178,695**
		Engineering			**$35,740**
		Contingency			**$42,890**
		Legal & Administration			**$5,360**
		Total Project Cost			**$262,685**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #40 Church Rd. & Hwy 138

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$6,200.00	$6,200
2	Demolition and Site Preparation	LS	ALL	$3,700.00	$3,700
3	Misc. Appurtenances	LS	ALL	$2,500.00	$2,500
4	24" Storm Drain - Class C Backfill	LF	50	$128.40	$6,420
5	30" Storm Drain - Class C Backfill	LF	80	$149.80	$11,984
6	24" Inlet Structure w/ Trash Rack	EA	1	$6,420.00	$6,420
7	30" Inlet Structure w/ Trash Rack	EA	1	$7,490.00	$7,490
8	24" Outfall Structure	EA	1	$6,420.00	$6,420
9	30" Outfall Structure	EA	1	$7,490.00	$7,490
10	AC Pavement R&R	TON	4	$128.40	$514
11	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$62,348**
		Engineering			**$12,470**
		Contingency			**$14,960**
		Legal & Administration			**$1,870**
		Total Project Cost			**$91,648**

Construction Total	**$3,877,027**
Engineering	**$775,400**
Contingency	**$930,490**
Legal & Administration	**#VALUE!**
Total Project Cost - Priority 2 Projects	**$5,690,447**

Priority 3 Projects

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #41 South of E. Central Ave. & Opal St.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$32,400.00	$32,400
2	Demolition and Site Preparation	LS	ALL	$19,400.00	$19,400
3	Misc. Appurtenances	LS	ALL	$12,900.00	$12,900
4	48" Storm Drain - Class C Backfill	LF	1000	$214.00	$214,000
5	72" Storm Drain Manhole	EA	2	$8,025.00	$16,050
6	48" Inlet Structure w/ Trashrack	EA	1	$12,840.00	$12,840
7	48" Outfall Structure	EA	1	$12,840.00	$12,840
8	Rip Rap	CY	50	$64.20	$3,210
	Construction Total				**$323,640**
	Engineering				**$64,730**
	Contingency				**$77,670**
	Legal & Administration				**$9,710**
	Total Project Cost				**$475,750**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #42 E. 6th Ave., east of Casa De Loma

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$3,500.00	$3,500
2	Demolition and Site Preparation	LS	ALL	$2,100.00	$2,100
3	Misc. Appurtenances	LS	ALL	$1,400.00	$1,400
4	36" Storm Drain - Class C Backfill	LF	50	$160.50	$8,025
5	36" Inlet Structure w/ Trash Rack	EA	1	$8,560.00	$8,560
6	36" Outfall Structure	EA	1	$8,560.00	$8,560
7	Rip Rap	CY	50	$64.20	$3,210
	Construction Total				**$35,355**
	Engineering				**$7,070**
	Contingency				**$8,490**
	Legal & Administration				**$1,060**
	Total Project Cost				**$51,975**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #43 Hwy 99, adjacent to the City of Sutherlin Public Works Building

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$4,000.00	$4,000
2	Demolition and Site Preparation	LS	ALL	$2,000.00	$2,000
3	Misc. Appurtenances	LS	ALL	$1,300.00	$1,300
4	30" Storm Drain - Class C Backfill	LF	55	$149.80	$8,239
5	30" Inlet Structure w/ Trash Rack	EA	1	$7,490.00	$7,490
6	30" Outfall Structure	EA	1	$7,490.00	$7,490
7	Rip Rap	CY	50	$64.20	$3,210
	Construction Total				**$33,729**
	Engineering				**$6,750**
	Contingency				**$8,100**
	Legal & Administration				**$1,010**
	Total Project Cost				**$49,589**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #44 Calapooya St., bound by Camas Ct. & Cooper Creek

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$55,500.00	$55,500
2	Demolition and Site Preparation	LS	ALL	$27,700.00	$27,700
3	Misc. Appurtenances	LS	ALL	$18,500.00	$18,500
4	36" Storm Drain - Class C Backfill	LF	1007	$160.50	$161,624
5	42" Storm Drain - Class C Backfill	LF	500	$192.60	$96,300
6	60" Storm Drain Manhole	EA	2	$6,420.00	$12,840
7	Catch Basin - Curb Inlet Type	EA	13	$1,605.00	$20,865
8	42" Outfall Structure	EA	1	$10,700.00	$10,700
9	Sidewalk R&R	SF	6000	$10.70	$64,200
10	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$471,439**
		Engineering			**$94,290**
		Contingency			**$113,150**
		Legal & Administration			**$14,140**
		Total Project Cost			**$693,019**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #45 End of Golden Ct.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$3,600.00	$3,600
2	Demolition and Site Preparation	LS	ALL	$2,200.00	$2,200
3	Misc. Appurtenances	LS	ALL	$1,500.00	$1,500
4	12" Storm Drain - Class C Backfill	LF	373	$53.50	$19,956
5	12" Outfall Structure	EA	1	$3,210.00	$3,210
6	6' Wooden Fence	LF	250	$10.70	$2,675
7	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$36,351**
		Engineering			**$7,270**
		Contingency			**$8,720**
		Legal & Administration			**$1,090**
		Total Project Cost			**$53,431**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #46 Between Golden Ct. & Raintree Ave.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$3,000.00	$3,000
2	Demolition and Site Preparation	LS	ALL	$1,800.00	$1,800
3	Misc. Appurtenances	LS	ALL	$1,200.00	$1,200
4	Ditching 3.5 ft btm	LF	1600	$12.84	$20,544
5	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$29,754**
		Engineering			**$5,950**
		Contingency			**$7,140**
		Legal & Administration			**$890**
		Total Project Cost			**$43,734**

Priority 3 Projects

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #47 Hwy 99, 800 ft. south of the Public Works Building

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$3,300.00	$3,300
2	Demolition and Site Preparation	LS	ALL	$1,600.00	$1,600
3	Misc. Appurtenances	LS	ALL	$1,100.00	$1,100
4	24" Storm Drain - Class C Backfill	LF	42	$128.40	$5,393
5	24" Inlet Structure w/ Trash Rack	EA	1	$6,420.00	$6,420
6	24" Outfall Structure	EA	1	$6,420.00	$6,420
7	AC Pavement R&R	TON	3	$128.40	$385
8	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$27,828**
		Engineering			**$5,570**
		Contingency			**$6,680**
		Legal & Administration			**$830**
		Total Project Cost			**$40,908**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #48 Begins at Hwy 99 & the railroad tracks

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$2,300.00	$2,300
2	Demolition and Site Preparation	LS	ALL	$1,400.00	$1,400
3	Misc. Appurtenances	LS	ALL	$900.00	$900
4	Ditching 8 ft btm	LF	805	$19.26	$15,504
5	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$23,314**
		Engineering			**$4,660**
		Contingency			**$5,590**
		Legal & Administration			**$700**
		Total Project Cost			**$34,264**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #49 NE of Taylor Rd. & S. Comstock St.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$6,200.00	$6,200
2	Demolition and Site Preparation	LS	ALL	$3,700.00	$3,700
3	Misc. Appurtenances	LS	ALL	$2,500.00	$2,500
4	36" Storm Drain - Class C Backfill	LF	64	$160.50	$10,272
5	Ditching 12 ft btm	LF	680	$26.75	$18,190
6	36" Inlet Structure w/ Trash Rack	EA	1	$8,560.00	$8,560
7	36" Outfall Structure	EA	1	$8,560.00	$8,560
8	AC Pavement R&R	TON	6	$128.40	$770
9	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$61,962**
		Engineering			**$12,390**
		Contingency			**$14,870**
		Legal & Administration			**$1,860**
		Total Project Cost			**$91,082**

Priority 3 Projects

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #50 W. Central Ave., between Pine St. & Sherman St.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$20,200.00	$20,200
2	Demolition and Site Preparation	LS	ALL	$12,100.00	$12,100
3	Misc. Appurtenances	LS	ALL	$8,100.00	$8,100
4	30" Storm Drain - Class C Backfill	LF	775	$149.80	$116,095
5	Sidewalk R&R	SF	3900	$10.70	$41,730
6	AC Pavement R&R	TON	5	$128.40	$642
7	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$202,077**
		Engineering			**$40,420**
		Contingency			**$48,500**
		Legal & Administration			**$6,060**
		Total Project Cost			**$297,057**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #51 Branton St. & W. 6th Ave.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$1,300.00	$1,300
2	Demolition and Site Preparation	LS	ALL	$800.00	$800
3	Misc. Appurtenances	LS	ALL	$500.00	$500
4	12" Storm Drain - Class C Backfill	LF	116	$53.50	$6,206
5	AC Pavement R&R	TON	5	$128.40	$642
6	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$12,658**
		Engineering			**$2,530**
		Contingency			**$3,040**
		Legal & Administration			**$380**
		Total Project Cost			**$18,608**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #52 Under freeway

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$5,800.00	$5,800
2	Demolition and Site Preparation	LS	ALL	$3,500.00	$3,500
3	Misc. Appurtenances	LS	ALL	$2,300.00	$2,300
4	18" Storm Drain - Bore	LF	200	$160.50	$32,100
5	18" Inlet Structure w/ Trash Rack	EA	1	$5,350.00	$5,350
6	18" Outfall Structure	EA	1	$5,350.00	$5,350
7	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$57,610**
		Engineering			**$11,520**
		Contingency			**$13,830**
		Legal & Administration			**$1,730**
		Total Project Cost			**$84,690**

Priority 3 Projects

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #53 Under freeway 480 ft. south of Duke Ave.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$6,000.00	$6,000
2	Demolition and Site Preparation	LS	ALL	$3,600.00	$3,600
3	Misc. Appurtenances	LS	ALL	$2,400.00	$2,400
4	18" Storm Drain - Bore	LF	200	$160.50	$32,100
5	Catch Basin	EA	1	$1,605.00	$1,605
6	18" Inlet Structure w/ Trash Rack	EA	1	$5,350.00	$5,350
7	18" Outfall Structure	EA	1	$5,350.00	$5,350
8	Rip Rap	CY	50	$64.20	$3,210
	Construction Total				**$59,615**
	Engineering				**$11,920**
	Contingency				**$14,310**
	Legal & Administration				**$1,790**
	Total Project Cost				**$87,635**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #54 550 ft. east of "M" Rd. & W. Duke Ave., south to Ft. Mckay Rd.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$7,200.00	$7,200
2	Demolition and Site Preparation	LS	ALL	$5,200.00	$5,200
3	Misc. Appurtenances	LS	ALL	$2,900.00	$2,900
4	24" Storm Drain - Class C Backfill	LF	108	$128.40	$13,867
5	Ditching 5 ft btm	LF	1600	$17.12	$27,392
6	24" Inlet Structure w/ Trash Rack	EA	1	$6,420.00	$6,420
7	24" Outfall Structure	EA	1	$6,420.00	$6,420
8	AC Pavement R&R	TON	4	$128.40	$514
9	Rip Rap	CY	50	$64.20	$3,210
	Construction Total				**$73,123**
	Engineering				**$14,620**
	Contingency				**$17,550**
	Legal & Administration				**$2,190**
	Total Project Cost				**$107,483**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #55 Cook Creek

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$5,100.00	$5,100
2	Demolition and Site Preparation	LS	ALL	$3,700.00	$3,700
3	Misc. Appurtenances	LS	ALL	$2,100.00	$2,100
4	Ditching 4 ft btm	LF	1850	$14.98	$27,713
5	Ditching 4.5 ft btm	LF	630	$16.05	$10,112
6	Rip Rap	CY	50	$64.20	$3,210
	Construction Total				**$51,935**
	Engineering				**$10,390**
	Contingency				**$12,460**
	Legal & Administration				**$1,560**
	Total Project Cost				**$76,345**

Priority 3 Projects

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #56 Under driveway to WWTP

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$3,500.00	$3,500
2	Demolition and Site Preparation	LS	ALL	$2,100.00	$2,100
3	Misc. Appurtenances	LS	ALL	$1,400.00	$1,400
4	24" Storm Drain - Class C Backfill	LF	88	$128.40	$11,299
5	24" Inlet Structure w/ Trash Rack	EA	1	$6,420.00	$6,420
6	24" Outfall Structure	EA	1	$6,420.00	$6,420
7	AC Pavement R&R	TON	3	$128.40	$385
8	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$34,734**
		Engineering			**$6,950**
		Contingency			**$8,340**
		Legal & Administration			**$1,040**
		Total Project Cost			**$51,064**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #57 Crosses under railroad Tracks & Hwy. 99

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$21,600.00	$21,600
2	Demolition and Site Preparation	LS	ALL	$8,600.00	$8,600
3	Misc. Appurtenances	LS	ALL	$5,800.00	$5,800
4	42" Storm Drain -Class C Backfill	LF	148	$192.60	$28,505
5	42" Storm Drain - Bore	LF	30	$428.00	$12,840
6	Pre-Fab 3' x 8' Box Culvert	LF	50	$535.00	$26,750
7	42" Inlet Structure w/ Trash Rack	EA	1	$10,700.00	$10,700
8	42" Outfall Structure	EA	1	$10,700.00	$10,700
9	Railroad R&R	LS	ALL	$21,400.00	$21,400
10	AC Pavement R&R	TON	8	$128.40	$1,027
11	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$151,132**
		Engineering			**$30,230**
		Contingency			**$36,270**
		Legal & Administration			**$4,530**
		Total Project Cost			**$222,162**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #58 East of Hwy. 99 in Basin 37

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$5,400.00	$5,400
2	Demolition and Site Preparation	LS	ALL	$3,300.00	$3,300
3	Misc. Appurtenances	LS	ALL	$2,200.00	$2,200
4	30" Storm Drain - Class C Backfill	LF	168	$149.80	$25,166
5	30" Inlet Structure w/ Trash Rack	EA	1	$7,490.00	$7,490
6	30" Outfall Structure	EA	1	$7,490.00	$7,490
7	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$54,256**
		Engineering			**$10,850**
		Contingency			**$13,020**
		Legal & Administration			**$1,630**
		Total Project Cost			**$79,756**

City of Sutherlin — April 3, 2014
Storm Drain Master Plan
Project #59 Under Union Gap Loop, east of Wrecking Yard

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$14,000.00	$14,000
2	Demolition and Site Preparation	LS	ALL	$16,800.00	$16,800
3	Misc. Appurtenances	LS	ALL	$5,600.00	$5,600
4	36" Storm Drain - Class C Backfill	LF	456	$160.50	$73,188
5	36" Inlet Structure w/ Trash Rack	EA	2	$8,560.00	$17,120
6	36" Outfall Structure	EA	2	$8,560.00	$17,120
7	AC Pavement R&R	TON	10	$128.40	$1,284
8	Rip Rap	CY	50	$64.20	$3,210
				Construction Total	**$148,322**
				Engineering	**$29,660**
				Contingency	**$35,600**
				Legal & Administration	**$4,450**
				Total Project Cost	**$218,032**

City of Sutherlin — April 3, 2014
Storm Drain Master Plan
Project #60 Under Hwy 99, north of Union Gap Loop

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$8,100.00	$8,100
2	Demolition and Site Preparation	LS	ALL	$4,100.00	$4,100
3	Misc. Appurtenances	LS	ALL	$2,700.00	$2,700
4	48" Storm Drain - Class C Backfill	LF	114	$214.00	$24,396
5	48" Inlet Structure w/ Trash Rack	EA	1	$12,840.00	$12,840
6	48" Outfall Structure	EA	1	$12,840.00	$12,840
7	AC Pavement R&R	TON	6	$128.40	$770
8	Rip Rap	CY	50	$64.20	$3,210
				Construction Total	**$68,956**
				Engineering	**$13,790**
				Contingency	**$16,550**
				Legal & Administration	**$2,070**
				Total Project Cost	**$101,366**

City of Sutherlin — April 3, 2014
Storm Drain Master Plan
Project #61 480 ft. north of E. 4th Ave., between Terrace St. & Mardonna St

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$2,100.00	$2,100
2	Demolition and Site Preparation	LS	ALL	$1,300.00	$1,300
3	Misc. Appurtenances	LS	ALL	$900.00	$900
4	18" Storm Drain - Class C Backfill	LF	34	$96.30	$3,274
5	18" Inlet Structure w/ Trash Rack	EA	1	$5,350.00	$5,350
6	18" Outfall Structure	EA	1	$5,350.00	$5,350
7	Rip Rap	CY	50	$64.20	$3,210
				Construction Total	**$21,484**
				Engineering	**$4,300**
				Contingency	**$5,160**
				Legal & Administration	**$640**
				Total Project Cost	**$31,584**

Priority 3 Projects

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #62 E. Central Ave., south of Eagle Ct.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$3,900.00	$3,900
2	Demolition and Site Preparation	LS	ALL	$2,300.00	$2,300
3	Misc. Appurtenances	LS	ALL	$1,600.00	$1,600
4	24" Storm Drain - Class C Backfill	LF	117	$128.40	$15,023
5	60" Storm Drain Manhole	EA	1	$6,420.00	$6,420
6	24" Inlet Structure w/ Trash Rack	EA	1	$6,420.00	$6,420
7	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$38,873**
		Engineering			**$7,770**
		Contingency			**$9,330**
		Legal & Administration			**$1,170**
		Total Project Cost			**$57,143**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #63 Taylor St. S. of Page St.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$110,000.00	$110,000
2	Demolition and Site Preparation	LS	ALL	$55,000.00	$55,000
3	Misc. Appurtenances	LS	ALL	$146,700.00	$146,700
4	Roadway Subgrade	Ton	11642	$26.75	$311,434
5	AC Pavement R&R	Ton	1333	$128.40	$171,132
6	24" Culvert	LF	1600	$85.60	$136,960
7	Curb R&R	LF	2640	$8.56	$22,598
8	Rip rap	Ton	400	$64.20	$25,680
9	Asphalt Grinding	SF	45560	$1.07	$48,749
10	Road Striping	LF	5280	$3.21	$16,949
		Construction Total			**$1,045,202**
		Engineering			**$209,040**
		Contingency			**$250,850**
		Legal & Administration			**$31,360**
		Total Project Cost			**$1,536,452**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #64 Umatilla St., bound by E. 4th Ave. & 6th Ave.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$39,800.00	$39,800
2	Demolition and Site Preparation	LS	ALL	$23,900.00	$23,900
3	Misc. Appurtenances	LS	ALL	$15,900.00	$15,900
5	24" Storm Drain - Class C Backfill	LF	489	$128.40	$62,788
6	30" Storm Drain - Class C Backfill	LF	545	$149.80	$81,641
7	36" Storm Drain - Class C Backfill	LF	380	$160.50	$60,990
8	48" Storm Drain - Class C Backfill	LF	310	$214.00	$66,340
10	Catch Basin	EA	2	$1,605.00	$3,210
12	48" Outfall Structure	EA	1	$12,840.00	$12,840
14	AC Pavement R&R	TON	211	$128.40	$27,092
15	Rip Rap	CY	50	$64.20	$3,210
		Construction Total			**$397,711**
		Engineering			**$79,540**
		Contingency			**$95,450**
		Legal & Administration			**$11,930**
		Total Project Cost			**$584,631**

Priority 3 Projects

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #65 S. State St. & Heavenly Ct., west to Sutherlin Creek

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$50,700.00	$50,700
2	Demolition and Site Preparation	LS	ALL	$30,400.00	$30,400
3	Misc. Appurtenances	LS	ALL	$20,300.00	$20,300
4	42" Storm Drain - Class C Backfill	LF	144	$192.60	$27,734
5	38" x 57" CMP Arch Pipe	LF	44	$299.60	$13,182
6	33" x 49" CMP Arch Pipe	LF	1000	$267.50	$267,500
7	60" Storm Drain Manhole	EA	1	$6,420.00	$6,420
8	8' x 8' Junction Box	EA	3	$12,840.00	$38,520
9	Catch Basin	EA	3	$1,605.00	$4,815
10	42" Inlet Structure w/ Trash Rack	EA	2	$10,700.00	$21,400
11	33" x 49" Arch Outfall Structure	EA	1	$10,700.00	$10,700
12	6' Wooden Fence	LF	800	$10.70	$8,560
13	AC Pavement R&R	TON	28	$128.40	$3,595
14	Rip Rap	CY	50	$64.20	$3,210
				Construction Total	**$507,037**
				Engineering	**$101,410**
				Contingency	**$121,690**
				Legal & Administration	**$15,210**
				Total Project Cost	**$745,347**

City of Sutherlin — **April 3, 2014**
Storm Drain Master Plan
Project #66 W. Central Ave., between Ash St. & Branton St.

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	ALL	$58,600.00	$58,600
2	Demolition and Site Preparation	LS	ALL	$35,200.00	$35,200
3	Misc. Appurtenances	LS	ALL	$23,400.00	$23,400
4	30" Storm Drain - Class C Backfill	LF	238	$149.80	$35,652
5	36" Storm Drain - Class C Backfill	LF	1414	$160.50	$226,947
6	48" Storm Drain - Class C Backfill	LF	669	$214.00	$143,166
7	Catch Basin	EA	4	$1,605.00	$6,420
8	48" Outfall Structure	EA	1	$12,840.00	$12,840
9	Sidewalk R&R	SF	3060	$10.70	$32,742
10	AC Pavement R&R	TON	60	$128.40	$7,704
11	Rip Rap	CY	50	$64.20	$3,210
				Construction Total	**$585,881**
				Engineering	**$117,180**
				Contingency	**$140,610**
				Legal & Administration	**$17,580**
				Total Project Cost	**$861,251**

Construction Total	**$4,046,942**
Engineering	**$809,390**
Contingency	**$971,280**
Legal & Administration	**$121,400**
Total Project Cost - Priority 3 Projects	**$5,949,012**