Preliminary Storm Drainage Report

Pine Street Mixed-Use

Sherwood, Oregon

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PRELIMINARY
OREGON
JULY 13, 2004
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VALID THROUGH 12/31/2022

Date: February 8, 2021
Prepared by: Luke Lappin, P.E.
PDG Job No. 382-001

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TECHNICAL APPENDIX

1.0 INTRODUCTION

This report represents the **preliminary** storm drainage and stormwater analysis for the Pine Street Mixed Use development project. The basis of this report is to comply with the City of Sherwood, Clean Water Services (CWS), and the State of Oregon's regulations and engineering standards as well as the latest edition of the Oregon Plumbing Specialty Code (OSPC). Compiled in this report are the design criteria for the site, the hydrologic methodology, and the **preliminary** drainage analysis.

2.0 SITE DESCRIPTION AND LOCATION

The proposed project is a 5-unit live-work for multi-family attached townhomes. The property is identified as tax lot 3100 of Tax Map 2S132BC and is approximately 0.11 acres. The site is currently addressed as 22415 SW Pine Street and is located at the southwest corner of the intersection of ZSW Pine Street and SW Second Street. The property lies within the Old Town Smockville Overlay area and is zoned Retail Commercial (RC) by the City of Sherwood's land use ordinance.

3.0 EXISTING CONDITIONS

The site is currently vacant with grass cover and a remnant of a small concrete pad that will be removed with the project.

The site has frontage along SW Pine Street and SW Second Street and a public alley to the south. Existing City storm, sanitary and water systems surround the property and are available to serve the development.

3.1 Site Topography

The property is relatively flat, sloping from the center of the south property line. The high point of the site is in the northeast corner of the property at an elevation of approximately 195.5 feet with a relative low point along the east property line at an approximate elevation of 194.9 feet.

The properties abutting the site are all zoned Retail Commercial. Parcels across SW 2nd Street, west of the site, are zoned Medium Density Residential Low (MDRL).

3.2 Soil Type

The predominant soil found on site is Aloha silt loam with the corresponding hydrologic soil group (HSG) designation 'C/D', as shown on the attached Natural Resources Conservation Service (NRCS) soil survey for Washington County. The entire site is assumed to have 'D' soils for the purposes of this report.

Table 3-2: Hydrologic Soil Group Ratings		
NRCS Map Unit Symbol	**NRCS Map Unit Name**	**Hydrologic Soil Group Rating**
1	Aloha silt loam	C/D

3.3 Runoff Curve Numbers

Predeveloped pervious areas will use a Runoff Curve Number (RCN) of 80 corresponding to "Open Space" cover type (HSG designation 'D') in good condition while developed pervious areas will use a Runoff Curve Number (RCN) of 89 corresponding to "Open Space" cover type (HSG designation 'D') in fair condition A runoff curve number of 98 will be used for all predeveloped and developed impervious areas (refer to the *SCS Runoff Curve Numbers* Exhibit).

Table 3.3 – Runoff Curve Numbers		
Land Description	**Existing RCN**	**Proposed RCN**
Open Space, Fair Condition	--	84
Open Space, Good Condition	80	--
Impervious	98	98

4.0 PROPOSED IMPROVEMENTS

We will be constructing impervious surfaces as a result of the public and private street improvements, and private driveways along with the eventual buildings and sidewalks. Public utilities will be extended throughout the site for the use of the proposed lots. This project proposes to construct a trapped catch basin located in the southwest corner of the site to accommodate for water quality treatment and detention for the currently proposed subdivision.

We will be constructing impervious surfaces as a result of the public street improvements and private driveway along with the eventual townhomes and sidewalks. Private utilities will be extended into the site for the use of the mixed-use development.

The project will treat its collected runoff in a proprietary single cartridge stormfilter catch basin. The proposed storm drainage system will convey runoff into an existing public main located in SW 2nd Street.

4.1 Hydrology/Hydraulic Methodology

Using the Santa Barbara Urban Hydrograph (SBUH) method based on a Type 1A rainfall distribution, the site has been analyzed to determine the proposed peak runoff rates for the 2, 5, 10, and 25-year 24-hour storm event. The SBUH method uses runoff curve numbers in conjunction with the property's hydrologic soil group to model the site's permeability.
A predeveloped time of concentration of 11.73 minutes and a developed time of concentration of 5.00 minutes were calculated using the methodology outlined in the TR-55 technical manual *(refer to the Time of Concentration Calculations and Exhibits)*.

Rainfall depths for all storm events used in the calculations and design of the proposed storm drainage system are found in latest edition of Clean Water Services (CWS) Design and Construction Standards and as shown below.

Table 4.1 – 24-Hour Rainfall Depth (CWS)				
Recurrence Interval, Years	2	5	10	25
24-Hour Depths, Inches	2.50	3.10	3.45	3.90

4.2 Water Quality

As required by Clean Water Services, we will treat runoff from any new impervious surface created as a result of the proposed development and for any existing impervious areas to remain. The water quality facility will be designed to treat storm water generated by 0.36 inches of precipitation falling in 4 hours with an average storm return period of 96 hours. The water quality facility, in conjunction with the sumped catch basins, will remove a minimum of 65% of the Total Phosphorous (TP) from the storm water runoff.

Owners of new development and other activities which create or modify 1,000 square feet or greater of impervious surfaces, or increase the amount of stormwater runoff or pollution leaving the site, are required to implement or fund permanent water quality approaches to reduce contaminants entering the storm and surface water system.

Runoff from the roof of the proposed building and drive aisle (5,006 sq. ft.) will be conveyed into a proprietary single cartridge stormfilter catch basin manufactured by Contech Engineered Solutions for treatment *(refer to Appendix 'C' – Stormfilter Catch Basin Detail)*.

The water quality catch basin will provide treatment for all contributing impervious surfaces in accordance with the Clean Water Services' *"Design and Construction Standard's for Sanitary and Storm Water Management"* (R&O 19-22) Section 4.04.

The new impervious area (2,816 sq. ft.) created by the half street improvement of SW 2nd Street and the pavement replacement for the utility trenches in SW Pine Street are not collected and will not be treated. A water quality fee-in-lieu payment for these areas is requested with the project.

Table 4.2 – Basin Cover Type (Existing)		
Cover Type	**Area (sq. ft.)**	**Area (acres)**
Modified Impervious Area	2,426	0.06
Pervious Area	5,655	0.13
Total	8,081	0.19

Table 4.2.1 – Basin Cover Type (Proposed)		
Cover Type	**Area (sq. ft.)**	**Area (acres)**
Impervious Area	7,822	0.18
Pervious Area	259	0.01
Total	8,081	0.19

As required by CWS, Section 4.08.1.d.1, the proposed development is required to treat all new impervious surfaces and three times the modified impervious surface, up to the total existing impervious surface on the site. The area requiring treatment is shown in the formula below:

Treatment Area = New Impervious + 3(Modified Impervious)
Treatment Area = 5,396 + 3(2,426) = 12,674 sq. ft., use 2,426 sq. ft. for ex. imp. area.
Treatment Area = 7,822 sq. ft

4.3 Detention

Water quantity control is not proposed as part of this development (See *Section 5.0 – Downstream Analysis* below)

4.4 Hydromodification

Section 4.03.1 of Clean Water Services' Design and Construction Standard's for Sanitary and Storm Water Management (R&O 19-22) requires that owners of new development and other activities which create and/or modify 1,000 square feet or greater of impervious surface are required to implement or fund techniques to reduce impacts to the downstream receiving water body.

The proposed development is requesting a fee-in-lieu payment for construction or implementation of a Hydromodification Approach in accordance with District Rates and Charges and Section 4.03.2a listed below.

a. The project results in the addition and/or modification of less than 12,000 square feet of impervious surface.

4.5 Conveyance

The conveyance system for the site consists of an underground pipe system, roof drains, and a filtered catch basin. Stormwater from the site will be conveyed to an existing 18" storm system located in SW 2nd Avenue. As per the requirements of CWS, the drainage system will be designed to convey the 25-year storm event and comply with the requirements of the Uniform Plumbing Code.

Using a Manning's 'n' value of 0.013, the minimum slope required to convey the 25-year storm event in a 6", 8", 10", and a 12" PVC pipe for this development is 0.0110, 0.0075, 0.0060, and 0.005 ft./ft. respectively (refer to the *Stormwater Conveyance Calculations*).

5.0 DOWNSTREAM ANALYSIS

Per CWS Section 2.04.2.m.3.A, any development constructing new impervious surface of greater than 5,280 square feet, or collecting and discharging greater than 5,280 square feet of impervious area shall perform a capacity and condition analysis of existing downstream storm facilities and conveyance elements receiving flow from the proposed development. The analysis shall extend downstream shall continue for one-quarter (1/4) of a mile; or until the additional flow constitutes less than 5 percent of the total tributary drainage flow.

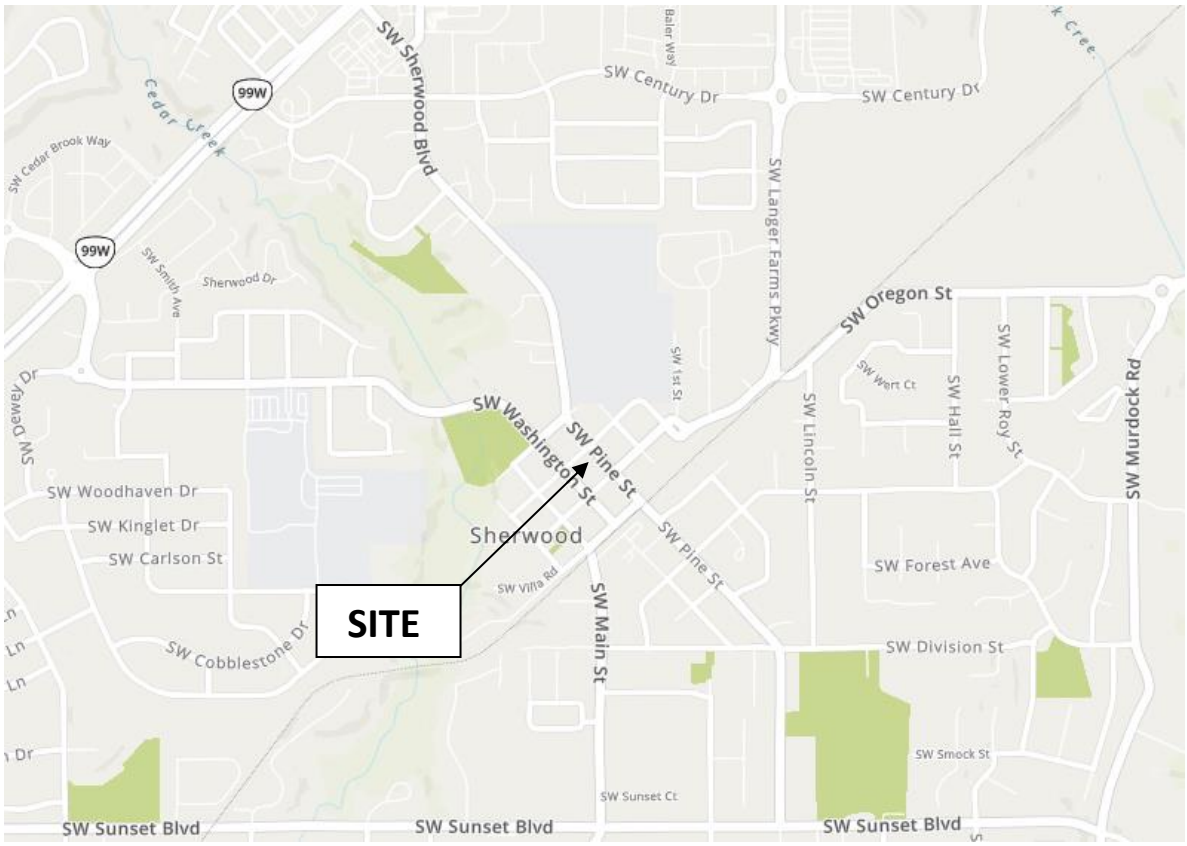
Runoff from the development is discharged into an existing 18-inch storm main in SW 2nd Street. The existing main conveys stormwater downstream approximately 740 feet southwest from the subject site where it is upsized to a 36-inch reinforced concrete pipe. Runoff from the project is ultimately outfalls into an existing swale in Stella Olson Park. As shown on the CWS Hydromodification mapping, the receiving reach has a moderate risk level.

As shown in *Appendix 'D' – Stormwater Management Report for the Sherwood Downtown Streetscape Improvements Phase A*, a downstream analysis of existing and future stormwater improvements for this storm network was conducted determining the system had capacity to convey runoff from the proposed development.

6.0 CONCLUSION

Based on the supporting stormwater calculations and attached analysis, it is the opinion of Pioneer Design Group that the development of the Pine Street Mixed Use development project will not adversely affect the existing downstream drainage system or adjacent property owners. A proprietary water quality stormfilter catch basin will provide treatment for the proposed building and driveway. A fee-in-lieu payment is proposed for hydromodification and the uncollected, modified impervious areas in SW 2nd and Pine Streets. Water quantity control is not required as there are no capacity restrictions on the downstream receiving conveyance system. Therefore, all the requirements associated with the City of Sherwood and Clean Water Services' design and construction standards have been met for this project.

7.0 VICINITY MAP



ENGINEERING CALCULATIONS AND SPREADSHEETS

Map Scale: 1:256 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 3 7 14 21

Feet: 0 10 20 40 60

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Washington County, Oregon
Survey Area Data: Version 18, Jun 11, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 19, 2018—Oct 20, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Aloha silt loam	C/D	0.1	100.0%
Totals for Area of Interest			**0.1**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

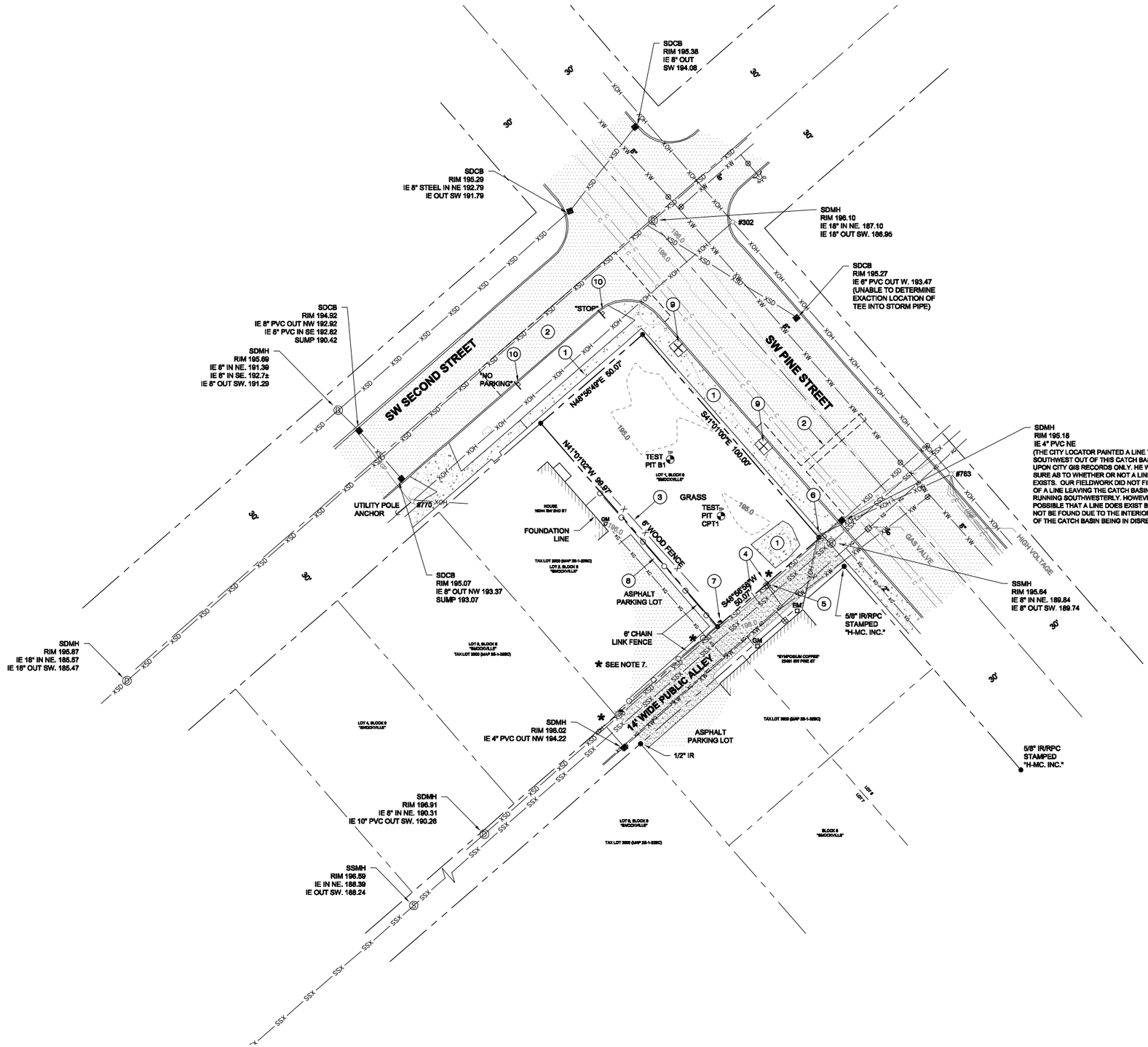
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



LEGEND

- RIGHT-OF-WAY LINE
- BOUNDARY LINE
- EXISTING LOT LINE
- CENTER LINE
- SD — STORM DRAINAGE LINE
- XSS — SANITARY SEWER LINE
- XW — WATER LINE
- XG — GAS LINE
- XCOM — COMMUNICATION LINE
- XE — UNDERGROUND POWER LINE
- XOH — OVERHEAD WIRE
- CHAIN LINK FENCE (AS NOTED)
- WOOD FENCE (AS NOTED)
- 201 — EXISTING 1' CONTOUR
- 200 — EXISTING 5' CONTOUR
- CONIFEROUS TREE (DBH)
- DECIDUOUS TREE (DBH)
- CATCH BASIN/DRAIN INLET
- STORM DITCH INLET
- STORM MANHOLE
- SANITARY MANHOLE
- WATER VALVE
- FIRE HYDRANT ASSEMBLY
- WATER METER
- GAS VALVE
- GAS METER
- STREET SIGN
- MAILBOX
- ELECTRIC PEDESTAL
- LIGHT POLE
- POWER POLE
- COMMUNICATION VAULT
- TELECOMMUNICATION PEDESTAL
- UTILITY EXTENSION
- FOUND SURVEY MONUMENT AS NOTED
- EXISTING CONCRETE
- EXISTING ASPHALT PAVEMENT
- EXISTING BUILDING FOOTPRINT
- EXISTING TREE TO BE REMOVED
- -1.0% — EXISTING SLOPE DIRECTION

DEMOLITION NOTES

1. REMOVE EXISTING CONCRETE.
2. REMOVE EXISTING ASPHALT PAVING.
3. REMOVE EXISTING WOOD FENCE INCLUDING FOOTINGS, POSTS AND ASSOCIATED APPURTENANCES.
4. REMOVE EXISTING SANITARY LATERAL.
5. REMOVE EXISTING WATER METER AND SERVICE. COORDINATE WITH THE CITY OF SHERWOOD.
6. REMOVE AND RELOCATE EXISTING TELEPHONE PEDESTAL. COORDINATE WITH APPROPRIATE FRANCHISE UTILITY COMPANY.
7. RELOCATE EXISTING UTILITY POLE. CONTRACTOR TO COORDINATE WITH APPROPRIATE FRANCHISE UTILITY COMPANY.
8. PROTECT EXISTING CHAIN LINK FENCE ON ADJACENT PROPERTY.
9. REMOVE EXISTING STREET TREE.
10. REMOVE AND REPLACE EXISTING SIGN AND POSTS.

SCALE
20 0 10 20
1 INCH = 20 FEET

PIONEER DESIGN GROUP
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EXISTING CONDITIONS AND DEMOLITION PLAN

PINE STREET MIXED USE
SHERWOOD, OREGON

Designed by	MLS	Date	02/2021
Drawn by	BDH	Date	02/2021
Reviewed by	MLS	Date	02/2021
Project No.	382-001	REF.	
Horiz. Scale:			
Vert. Scale:			

No.	Date	Revision	By

Project
PINE STREET
No.
382-001
Type
PLANNING
Sheet
P2

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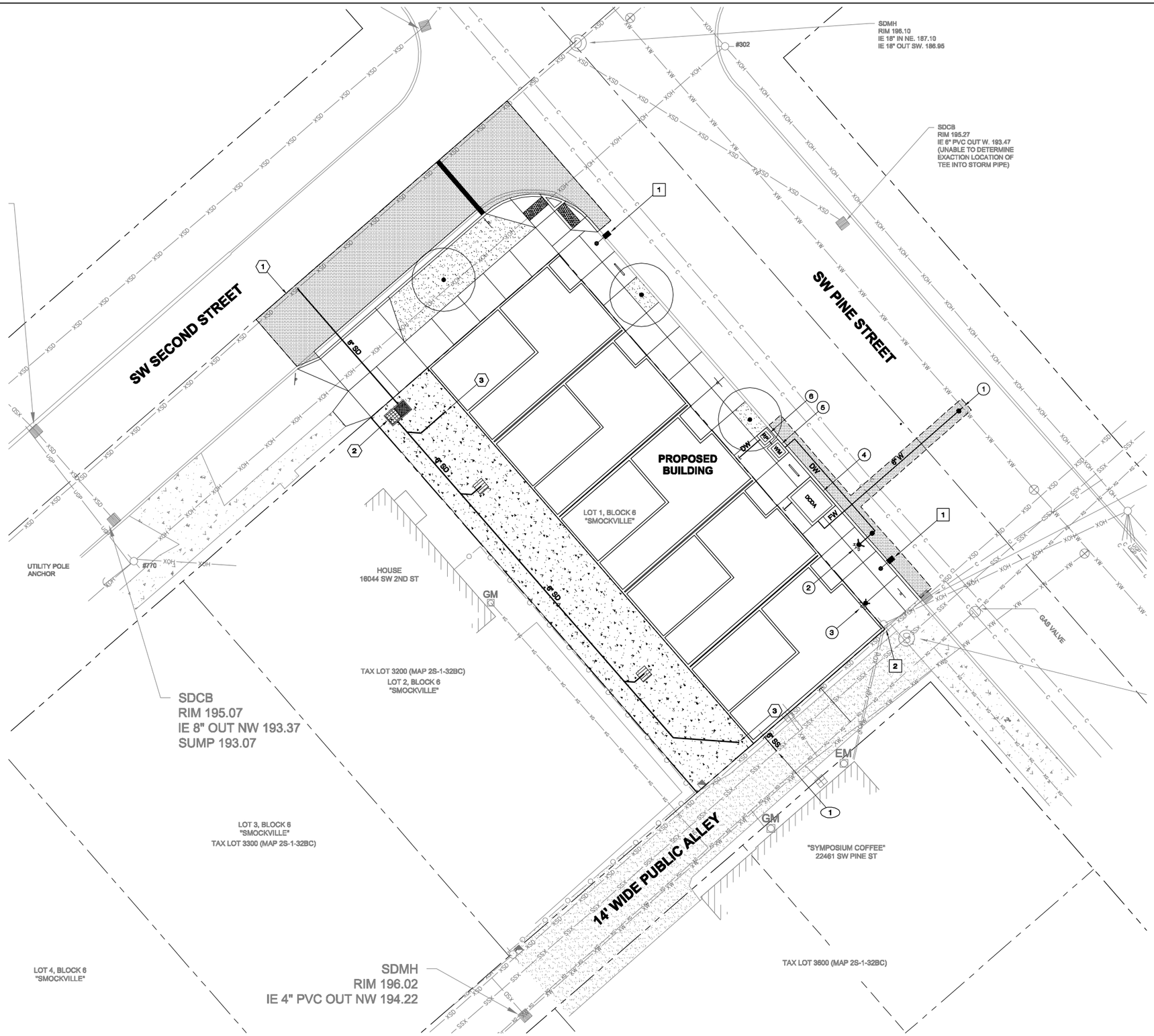

LEGEND

- PROPOSED EASEMENT LINE
- PROPOSED CENTERLINE
- PROPOSED RIGHT-OF-WAY
- PROPOSED LOT LINE
- BOUNDARY LINE
- PROPOSED CONCRETE SIDEWALK
- PROPOSED ASPHALT PAVEMENT
- PROPOSED CONCRETE PAVEMENT
- PROPOSED STANDARD CURB
- PROPOSED CURB AND GUTTER
- SD — PROPOSED STORM LINE
- SS — PROPOSED SANITARY LINE
- FW — PROPOSED FIRE WATER SERVICE
- DW — PROPOSED DOMESTIC WATER SERVICE
- PROPOSED FIRE HYDRANT
- PROPOSED FIRE DEPARTMENT CONNECTION
- DCDA — PROPOSED DOUBLE CHECK DETECTOR ASSEMBLY
- RP — PROPOSED REDUCED PRESSURE BACKFLOW ASSEMBLY
- WM — PROPOSED WATER METER
- APPROXIMATE STREET LIGHT LOCATION (FINAL LOCATION WILL BE DESIGNED BY A LIGHTING ENGINEER).

WATER NOTES

1. HOT TAP EXISTING 8" WATER MAIN.
2. INSTALL FIRE HYDRANT.
3. INSTALL WALL MOUNTED FIRE DEPARTMENT CONNECTION.
4. INSTALL DOUBLE CHECK DETECTOR ASSEMBLY.
5. INSTALL DOMESTIC WATER METER.
6. INSTALL REDUCED PRESSURE BACKFLOW DEVICE.

SANITARY NOTES

1. PROPOSED CONNECTION TO EXISTING SANITARY MAIN WITH INSERTA-TEE.

STORM NOTES

1. PROPOSED CONNECTION TO EXISTING STORM MAIN WITH INSERTA-TEE.
2. CONCRETE STORMFILTER CATCH BASIN (6-FT DEEP). FILTER MEDIA: ZPG
3. CONNECT ROOF DOWNSPOUTS TO FILTERED CATCH BASIN

GENERAL UTILITY NOTES

1. INSTALL WESTBROOKE 75 WATT STREET LIGHT.
2. REMOVE EXISTING UTILITY POLE.

SCALE
10 0 5 10
1 INCH = 10 FEET

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COMPOSITE UTILITY PLAN

PINE STREET MIXED USE
SHERWOOD, OREGON

Designed by	MLS	Date	02/2021
Drawn by	BDH	Date	02/2021
Reviewed by	MLS	Date	REF.
Project No.	382-001		
Horiz. Scale:			
Vert. Scale:			

No.	Date	Revision	By

Project
PINE STREET
No.
382-001
Type
PLANNING
Sheet
P4

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SOIL FEATURES FOR WASHINGTON COUNTY

Soil name and map symbol	Hydro-logic group	Flooding		
		Frequency	Duration	Months
Aloha:				
1	C	NONE	NONE	NONE
Amity:				
2	C	NONE	NONE	NONE
Astoria:				
3E, 3F	B	NONE	NONE	NONE
Briedwell:				
4B, 5B, 5C, 5D	B	NONE	NONE	NONE
Carlton:				
6B, 6C	B	NONE	NONE	NONE
Cascade:				
7B, 7C, 7D, 7E, 7F	C	NONE	NONE	NONE
Chehalem:				
8C	C	NONE	NONE	NONE
Chehalis:				
9, 10	B	COMMON	BRIEF	NOV-MAR
Cornelius:				
11B, 11C, 11D, 11E, 11F:				
Cornelius part	C	NONE	NONE	NONE
Kinton part	C	NONE	NONE	NONE
Cornelius Varient:				
12A, 12B, 12C	C	NONE	NONE	NONE
Cove:				
13, 14	D	COMMON	BRIEF	DEC-APR
Dayton:				
15	D	NONE	NONE	NONE
Delena:				
16C	D	NONE	NONE	NONE
Goble:				
17B, 17C, 17D, 17E, 18E, 18F	C	NONE	NONE	NONE
Helvetia:				
19B, 19C, 19D, 19E	C	NONE	NONE	NONE
Hembre:				
20E, 20F, 20G	B	NONE	NONE	NONE
Hillsboro:				
21A, 21B, 21C, 21D	B	NONE	NONE	NONE
Hubberly:				
22	D	NONE	NONE	NONE
Jory:				
23B, 23C, 23D, 23E, 23F	C	NONE	NONE	NONE
Kilchis:				
24G				
Kilchis part	C	NONE	NONE	NONE
Klickitat part	B	NONE	NONE	NONE

RUNOFF CURVE NUMBERS (TR55)

Table 2-2a: Runoff curve numbers for urban areas [1]

Cover description		CN for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area[2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3]:					
Poor condition (grass cover <50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover >75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5]	77	86	91	94	
Idle lands (CNs are determined using cover types similar to those in table 2-2c)					

1: Average runoff condition, and $I_a = 0.2S$.

2: The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas hava a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

3: CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

4: Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

5: Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

MANNING'S "n" VALUES

SHEET FLOW EQUATION MANNING'S VALUES	n_s
Smooth Surfaces (concrete, asphault, gravel, or bare hand packed soil)	0.011
Fallow Fields or loose soil surface (no residue)	0.05
Cultivated soil with residue cover (≤ 20%)	0.06
Cultivated soil with residue cover (> 20%)	0.17
Short prairie grass and lawns	0.15
Dense grasses	0.24
Bermuda grasses	0.41
Range (natural)	0.13
Woods or forrest with light underbrush	0.40
Woods or forrest with dense underbrush	0.80

SHALLOW CONCENTRATED FLOW (after initial 300 ft of sheet flow, R = 0.1)	k_s
Forrest with heavy ground litter and meadows (n = 0.010)	3
Brushy ground with some trees (n = 0.060)	5
Fallow or minimum tillage cultivation (n = 0.040)	8
High grass (n = 0.035)	9
Short grass, pasture and lawns (n = 0.030)	11
Nearly bare ground (n = 0.25)	13
Paved and gravel areas (n = 0.012)	27

CHANNEL FLOW (Intermittent) (At the beginning of all visible channels, R = 0.2)	k_c
Forested swale with heavy ground cover (n = 0.10)	5
Forested drainage course/ravine with defined channel bed (n = 0.050)	10
Rock-lined waterway (n = 0.035)	15
Grassed waterway (n = 0.030)	17
Earth-lined waterway (n = 0.025)	20
CMP pipe (n = 0.024)	21
Concrete pipe (n = 0.012)	42
Other waterways and pipe 0.508/n	

CHANNEL FLOW (continuous stream, R = 0.4)	k_c
Meandering stream (n = 0.040)	20
Rock-lined stream (n = 0.035)	23
Grass-lined stream (n = 0.030)	27
Other streams, man-made channels and pipe (n = 0.807/n)	

PIONEER DESIGN GROUP

IMPERVIOUS AREA CALCULATIONS

JOB NUMBER: 382-001
PROJECT: Pine Street Mixed Use
FILE: 3821_hydro_planning

NEW IMPERVIOUS AREA (ON-SITE)

PROPOSED BUILDING	3,500.00 ft^2	
STREET PAVEMENT (PRIVATE)	1,506.00 ft^2	
	5,006.00 ft^2	**0.11 ac**

NEW IMPERVIOUS AREA (OFF-SITE)

STREET PAVEMENT (PUBLIC)	1,319.00 ft^2	
SIDEWALKS (PUBLIC)	1,497.00 ft^2	
	2,816.00 ft^2	**0.06 ac**

EXISTING IMPERVIOUS AREA

STREET	1,237.00 ft^2	
SIDEWALKS	1,189.00 ft^2	
	2,426.00 ft^2	**0.06 ac**

Total Shed Area	**8,081.00 ft^2**	**0.19 ac**
Existing Impervious Area	**2,426.00 ft^2**	**0.06 ac**
% Impervious		**30.0 %**
Proposed Impervious Area	**7,822.00 ft^2**	**0.18 ac**
% Impervious		**96.8 %**

NOTE:

W.Q. IMPERVIOUS AREA = NEW IMP AREA + 3*(MODIFIED), UP TO TOTAL EXISTING IMPERVIOUS

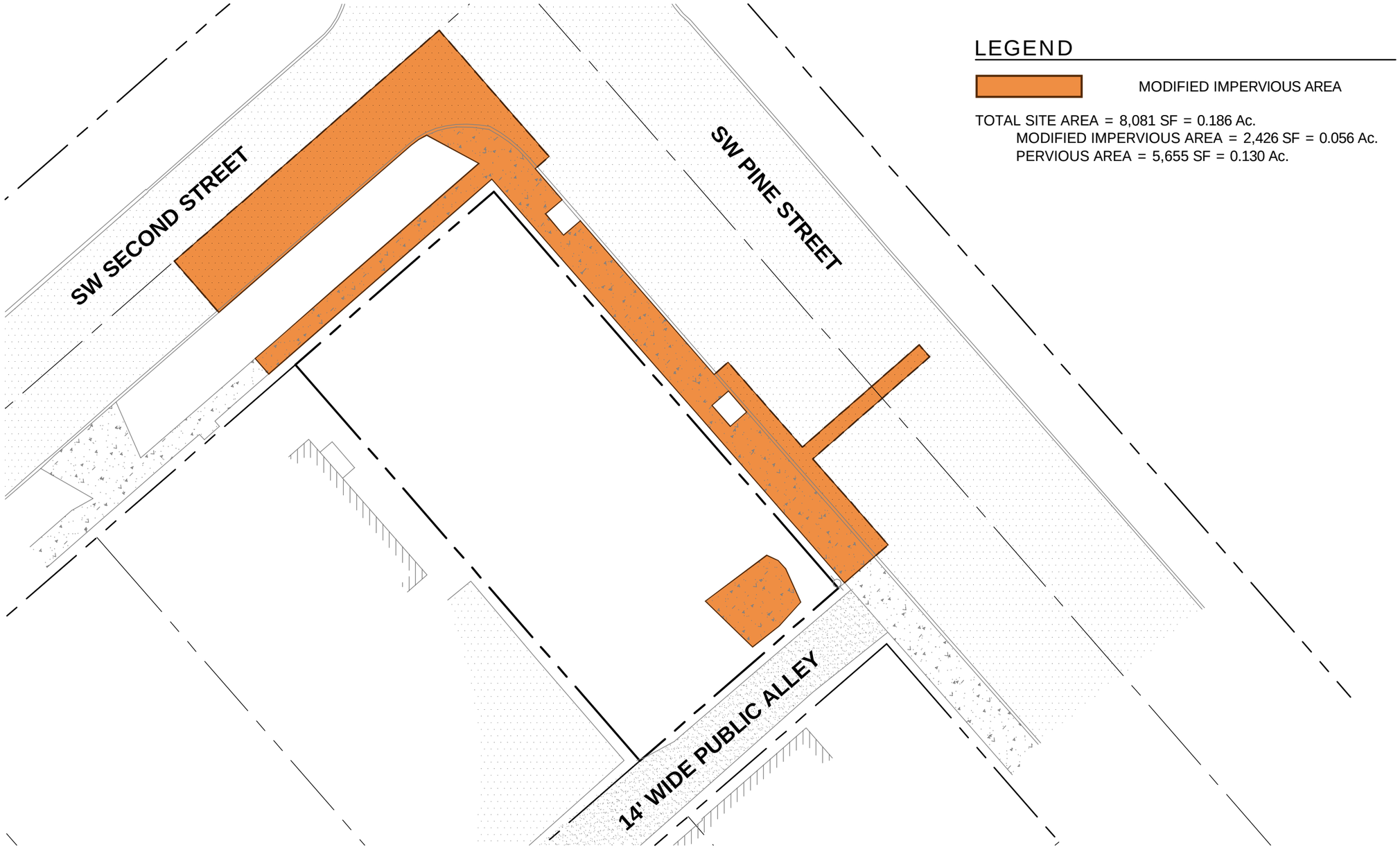
W.Q. IMPERVIOUS AREA = 5,396 + 7,278
(Therefore, use 2,426 sf of existing impervious area)

W.Q. IMPERVIOUS AREA = 5,396 + 2426

W.Q. IMPERVIOUS AREA REQUIRING TREATMENT =	**7,822**	**ft^2**

Existing Conditions Impervious Area

PINE STREET MIXED USE



LEGEND

MODIFIED IMPERVIOUS AREA

TOTAL SITE AREA = 8,081 SF = 0.186 Ac.
MODIFIED IMPERVIOUS AREA = 2,426 SF = 0.056 Ac.
PERVIOUS AREA = 5,655 SF = 0.130 Ac.

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WWW.PD-GRP.COM

Designed by	LRL	Date	2/2021
Drawn by	CFS	Date	2/2021
Reviewed by	LRL	Date	2/2021
Project No.	382-00	REF.	
Horiz. Scale:			
Vert. Scale:			

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Project
PINE STREET MIXED USE

No.
382-001

Type
EXHIBIT

Sheet
1 of 2

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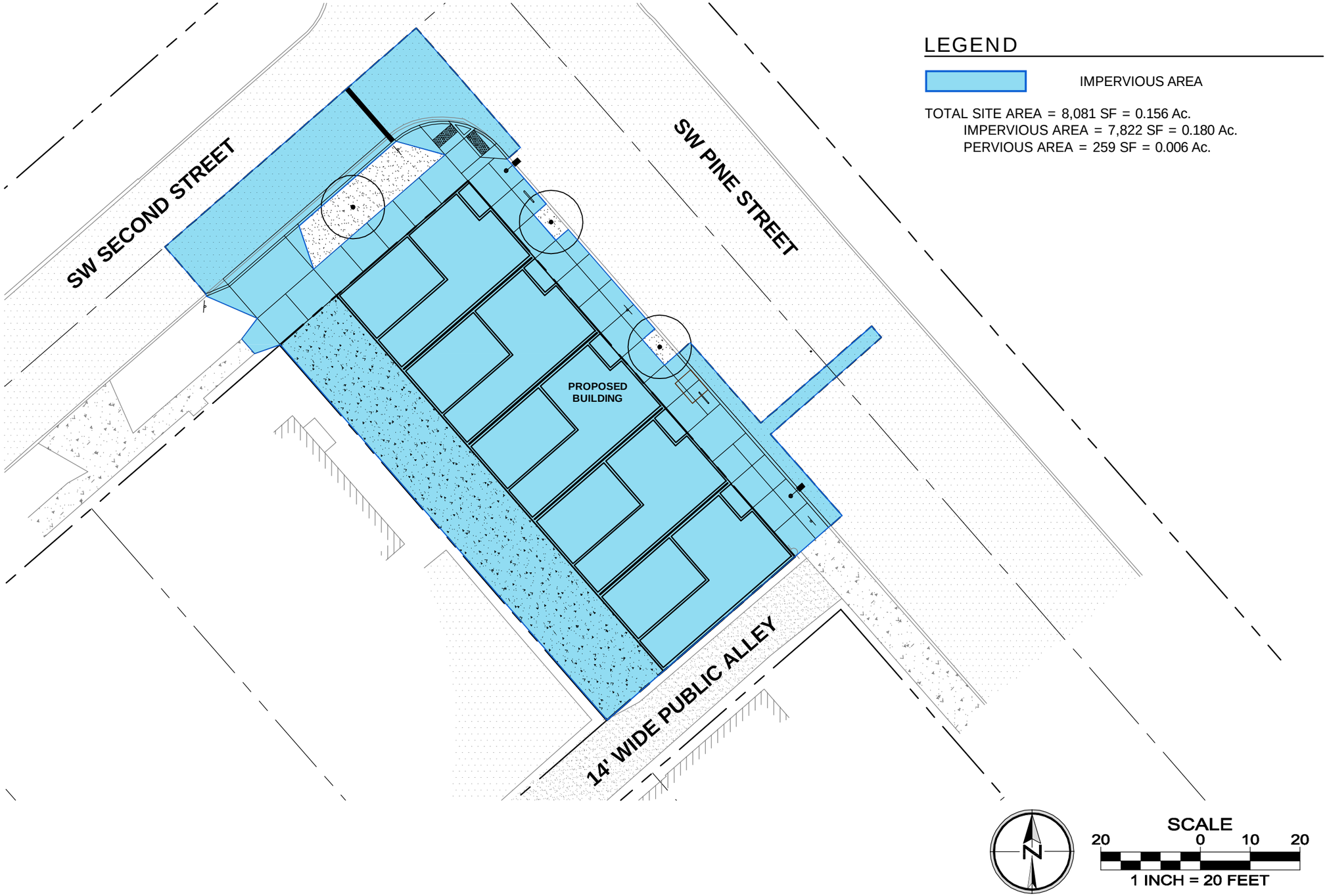
Developed Impervious Area

PINE STREET MIXED USE



LEGEND

IMPERVIOUS AREA

TOTAL SITE AREA = 8,081 SF = 0.156 Ac.
IMPERVIOUS AREA = 7,822 SF = 0.180 Ac.
PERVIOUS AREA = 259 SF = 0.006 Ac.

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Designed by	LRL	Date	2/2021
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Reviewed by	LRL	Date	2/2021
Project No.	382-00	REF.	
Horiz. Scale:			
Vert. Scale:			

iMPERVIOUS AREA.DWG

Project
PINE STREET MIXED USE

No.
382-001

Type
EXHIBIT

Sheet
2 of 2

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PIONEER DESIGN GROUP

PREDEVELOPED TIME OF CONCENTRATION

JOB NUMBER: 382-001
PROJECT: Pine Street Mixed Use
FILE: 3821_hydro_planning

			Accum. Tc
LAG ONE: SHEET FLOW (FIRST 72 FEET)			
Tt = Travel time			
Manning's "n " =	0.15		
Flow Length, L =	72 ft	(300 ft. max.)	
P = 2-year, 24hr storm =	2.5 in		
Slope, S_0 =	0.009 ft/ft		
$T_T = \frac{(0.42)(n * L)^{0.8}}{(P)^{0.5}(S_0)^{0.4}}$	11.73 min.		11.73 min.

TOTAL PREDEVELOPED TIME OF CONCENTRATION (Tc) = 11.73 min.

PIONEER DESIGN GROUP

DEVELOPED TIME OF CONCENTRATION

JOB NUMBER: 382-001
PROJECT: Pine Street Mixed Use
FILE: 3821_hydro_planning

Catchment Time	5 min.
Longest Run of Pipe	0 ft
Velocity of Flow	3 ft/s
Time in Pipe = (0 ft)/(3.00 ft/s) =	0 s
TOTAL DEVELOPED Tc =	**5 min.**

PIONEER DESIGN GROUP

WATER QUALITY CALCULATIONS
(Stormfilter Catch Basin)

JOB NUMBER: 382-001
PROJECT: Pine Street Mixed Use
FILE: 3821_hydro_planning

REFERENCES:
1. Clean Water Services R&O 19-22.
2. Discussions with City of Sherwood and Clean Water Services.

REQUIRED WATER QUALITY TREATMENT: 65% Phosphorus Removal.

PROPOSED TREATMENT METHODS:

1. Sumped Catch Basins		15%
2. Bio-Filtration Swale		50%
	total	65%

DESIGN STORM:

Precipitation:	0.36	inches
Storm Duration:	4	hours
Storm Return Period:	96	hours
Storm Window:	2	weeks

IMPERVIOUS AREA:

Watershed Area:	0.18	acres
Percent imp:	100	%
Impervious Area:	0.18	acres

Design Inflow = (0.18 ac)*(43560 ft^2/ac)*(0.36 in / 4.0 hrs) = **0.02 cfs**

PIONEER DESIGN GROUP

SANTA BARBARA URBAN HYDROGRAPHS

JOB NUMBER: 382-001
PROJECT: Pine Street Mixed Use
FILE: 3821_hydro_planning

DESCRIPTION	DESIGN STORM (YR)	DURATION (HR)	PRECIP (IN)	AREA TOTAL (AC)	% IMP	AREA PERV. (AC)	CN PER.	AREA IMP. (AC)	CN IMP.	TIME (MIN)	Q (CFS)
PREDEVELOPED 2-YEAR PEAK DISCHARGE	2	24	2.5	0.19	30.00	0.13	80	0.06	98	11.73	0.05
DEVELOPED 2-YEAR PEAK DISCHARGE	2	24	2.5	0.19	96.80	0.01	84	0.18	98	5.00	0.12
PREDEVELOPED 10-YEAR PEAK DISCHARGE	10	24	3.45	0.19	30.00	0.13	80	0.06	98	11.73	0.09
DEVELOPED 10-YEAR PEAK DISCHARGE	10	24	3.45	0.19	100.00	0.00	84	0.19	98	5.00	0.17
PREDEVELOPED 25-YEAR PEAK DISCHARGE	25	24	3.9	0.19	30.00	0.13	80	0.06	98	11.73	0.11
DEVELOPED 25-YEAR PEAK DISCHARGE	25	24	3.9	0.19	100.00	0.00	84	0.19	98	5.00	0.19
PREDEVELOPED 100-YEAR PEAK DISCHARGE	100	24	4.5	0.19	30.00	0.13	80	0.06	98	11.73	0.13
DEVELOPED 100-YEAR PEAK DISCHARGE	100	24	4.5	0.19	96.79	0.01	84	0.18	98	5.00	0.22

PIONEER DESIGN GROUP

STORMWATER CONVEYANCE CALCULATIONS

JOB NUMBER: 382-001
PROJECT: Pine Street Mixed Use

FILE: 3821_hydro_planning
Design Storm: 25 YR
Storm Duration: 24 HRS
Precipitation: 3.9 IN
Manning's "n" 0.013

LINE	INC. AREA (AC)	AREA TOTAL (AC)	% IMP.	AREA PERV. (AC)	CN PER.	AREA IMP. (AC)	CN IMP.	TIME (MIN)	Q (CFS)	PIPE SIZE (IN)	SLOPE (FT/FT)	Qf (CFS)	Q/Qf (%)	Vf (FPS)	V/Vf (%)	ACTUAL V (FPS)
ENTIRE SHED	0.19	0.19	96.8	0.01	84	0.18	98	5.00	0.19	4	0.0200	0.27	0.69	3.09	1.11	3.42
ENTIRE SHED	0.19	0.19	96.8	0.01	84	0.18	98	5.00	0.19	6	0.0110	0.59	0.32	3.01	0.86	2.59
ENTIRE SHED	0.19	0.19	96.8	0.01	84	0.18	98	5.00	0.19	8	0.0075	1.05	0.18	3.01	0.70	2.10
ENTIRE SHED	0.19	0.19	96.8	0.01	84	0.18	98	5.00	0.19	10	0.0056	1.64	0.11	3.01	0.60	1.80

16,461 sq. ft. @ 1.3 in./hr/ (6" Pipe)

SIZING OF HORIZONTAL RAINWATER PIPING[1, 2]

SIZE OF PIPE	FLOW (⅛ inch per foot slope)	MAXIMUM ALLOWABLE HORIZONTAL PROJECTED ROOF AREAS AT VARIOUS RAINFALL RATES (square feet)					
inches	gpm	1 (in/h)	2 (in/h)	3 (in/h)	4 (in/h)	5 (in/h)	6 (in/h)
3	34	3288	1644	1096	822	657	548
4	78	7520	3760	2506	1880	1504	1253
5	139	13 360	6680	4453	3340	2672	2227
6	222	21 400	10 700	7133	5350	4280	3566
8	478	46 000	23 000	15 330	11 500	9200	7670
10	860	82 800	41 400	27 600	20 700	16 580	13 800
12	1384	133 200	66 600	44 400	33 300	26 650	22 200
15	2473	238 000	119 000	79 333	59 500	47 600	39 650

8,154 sq. ft. @ 1.3 in./hr/ (4" Pipe)

SIZE OF PIPE	FLOW (¼ inch per foot slope)	MAXIMUM ALLOWABLE HORIZONTAL PROJECTED ROOF AREAS AT VARIOUS RAINFALL RATES (square feet)					
inches	gpm	1 (in/h)	2 (in/h)	3 (in/h)	4 (in/h)	5 (in/h)	6 (in/h)
3	48	4640	2320	1546	1160	928	773
4	110	10 600	5300	3533	2650	2120	1766
5	196	18 880	9440	6293	4720	3776	3146
6	314	30 200	15 100	10 066	7550	6040	5033
8	677	65 200	32 600	21 733	16 300	13 040	10 866
10	1214	116 800	58 400	38 950	29 200	23 350	19 450
12	1953	188 000	94 000	62 600	47 000	37 600	31 350
15	3491	336 000	168 000	112 000	84 000	67 250	56 000

SIZE OF PIPE	FLOW (½ inch per foot slope)	MAXIMUM ALLOWABLE HORIZONTAL PROJECTED ROOF AREAS AT VARIOUS RAINFALL RATES (square feet)					
inches	gpm	1 (in/h)	2 (in/h)	3 (in/h)	4 (in/h)	5 (in/h)	6 (in/h)
3	68	6576	3288	2192	1644	1310	1096
4	156	15 040	7520	5010	3760	3010	2500
5	278	26 720	13 360	8900	6680	5320	4450
6	445	42 800	21 400	14 267	10 700	8580	7140
8	956	92 000	46 000	30 650	23 000	18 400	15 320
10	1721	165 600	82 800	55 200	41 400	33 150	27 600
12	2768	266 400	133 200	88 800	66 600	53 200	44 400
15	4946	476 000	238 000	158 700	119 000	95 200	79 300

For SI units: 1 inch = 25 mm, 1 gallon per minute = 0.06 L/s, ⅛ inch per foot = 10.4 mm/m, 1 inch per hour = 25.4 mm/h, 1 square foot = 0.0929 m^2

Notes:

[1] The sizing data for horizontal piping are based on the pipes flowing full.

[2] For rainfall rates other than those listed, determine the allowable roof area by dividing the area given in the 1 inch per hour (25.4 mm/h) column by the desired rainfall rate.

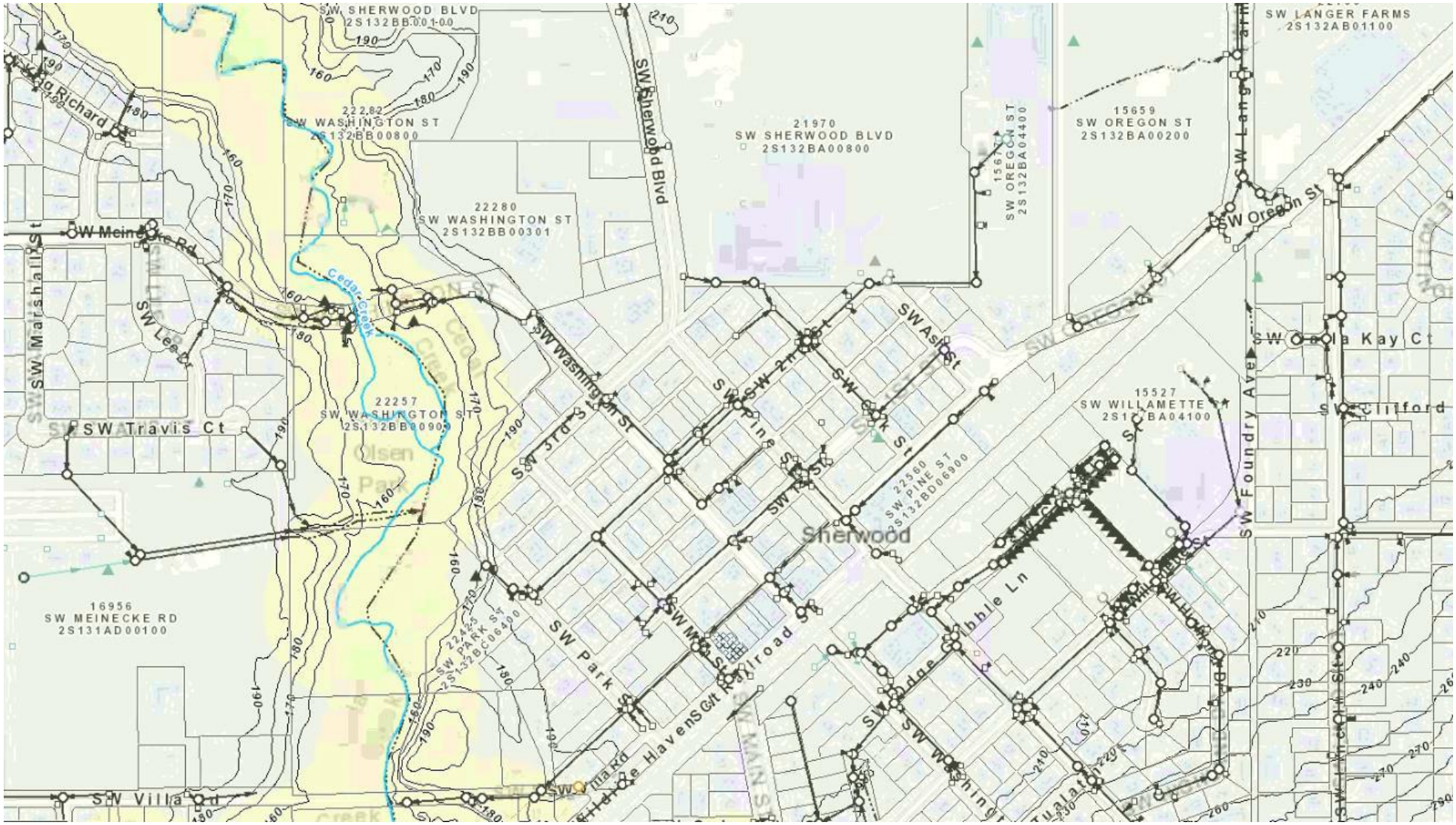
APPENDIX 'A' – CITY OF SHERWOOD UTILITY MAPS

22415 SW PINE ST

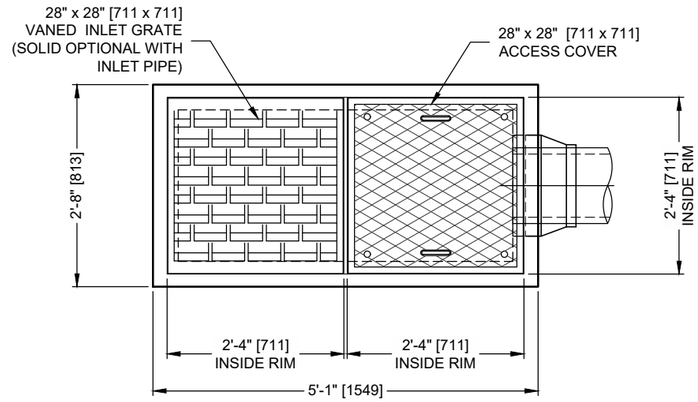
22415 SW PINE ST

22415 SW PINE ST

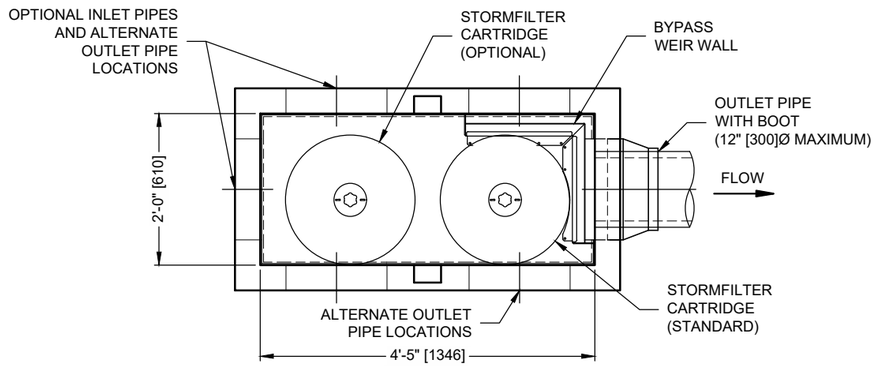
APPENDIX 'B' – HYDROMODIFICATION MAP


SW SHERWOOD BLVD
2S132BB00100
22282
SW WASHINGTON ST
2S132BB00800
22280
SW WASHINGTON ST
2S132BB00301
21970
SW SHERWOOD BLVD
2S132BA00800
15659
SW OREGON ST
2S132BA00200
SW LANGER FARMS
2S132AB01100
SW Sherwood Blvd
SW Oregon St
SW Langer Farms Pkwy
SW Foundry Ave
SW Marshall St
SW Meinecke Rd
SW Lee Ct
SW Travis Ct
Cedar Creek
22257
SW WASHINGTON ST
2S132BB00900
Olsen Park
SW Washington St
SW 3rd St
SW Pine St
SW Ash St
SW 2nd St
SW 1st St
22560
SW PINE ST
2S132BD06900
15527
SW WILLAMETTE ST
2S1 BA04100
Sherwood
SW Clifford
SW Cipola Kay Ct
16956
SW MEINECKE RD
2S131AD00100
SW 22425
SW PARK ST
2S132BC06400
SW Park St
SW Main St
SW Railroad St
SW Villa Rd
SW Ridge Haven Ct
SW Ridge Pebble Ln
SW Washington St

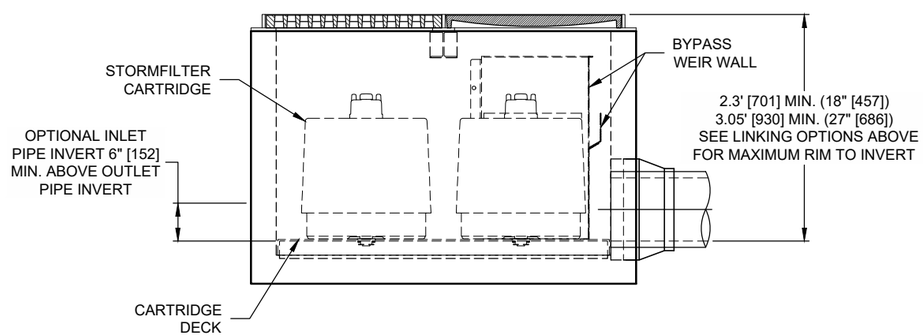
APPENDIX 'C' – STORMFILTER CATCH BASIN DETAIL



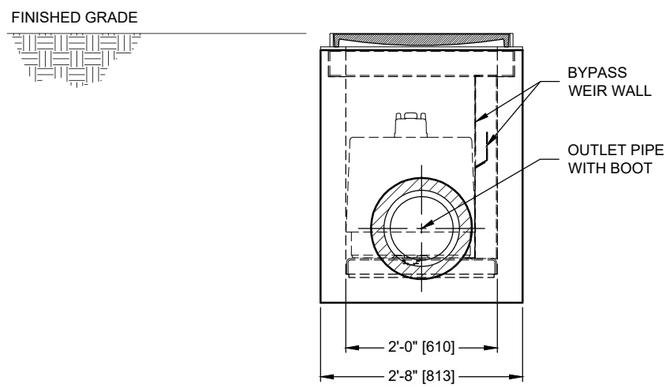
PLAN VIEW



PLAN VIEW
CASTINGS NOT SHOWN



ELEVATION VIEW



RIGHT SIDE VIEW

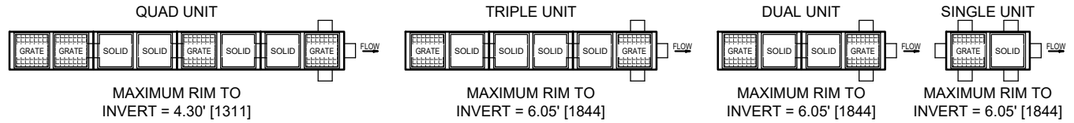
STORMFILTER DESIGN NOTES

- CONCRETE CATCHBASIN STORMFILTER TREATMENT CAPACITY VARIES BY CARTRIDGE COUNT AND LOCAL APPROVALS
- PEAK CONVEYANCE CAPACITY IS 1.3 CFS
- CONCRETE CATCHBASIN STORMFILTER IS AVAILABLE WITH UP TO TWO (2), 18" [457] OR 27" [686] TALL CARTRIDGES
- UP TO 4 INDIVIDUAL UNITS MAY BE LINKED FOR AN ULTIMATE CAPACITY OF EIGHT (8) CARTRIDGES

CARTRIDGE SIZE (in. [mm])	27 [686]			18 [457]		
ACTIVATION HEAD (ft. [mm])	3.05 [930]			2.3 [701]		
SPECIFIC FLOW RATE (gpm/sf [L/s/m^2])	2 [1.36]	1.67* [1.13]*	1 [0.68]	2 [1.36]	1.67* [1.13]*	1 [0.68]
CARTRIDGE FLOW RATE (gpm [L/s])	22.5 [1.4]	18.79 [1.19]	11.25 [0.71]	15 [0.95]	12.53 [0.79]	7.5 [0.47]

* 1.67 gpm/sf [1.13 L/s/m^2] SPECIFIC FLOW RATE IS APPROVED WITH PHOSPHOSORB® (PSORB) MEDIA ONLY

LINKING OPTIONS SHOWN BELOW. FLEXIBLE INLET PIPE, GRATED AND SOLID COVER PLACEMENT. MAXIMUM HEIGHT FOR LINKED UNITS VARIES. CONTACT YOUR CONTECH REPRESENTATIVE FOR MORE INFORMATION



GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. ALTERNATE DIMENSIONS ARE MILLIMETERS [mm] UNLESS NOTED OTHERWISE.
4. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
5. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
6. FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. RADIAL MEDIA DEPTH SHALL BE 7-INCHES [178]. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST 38 SECONDS.
7. SPECIFIC FLOW RATE IS THE MEASURE OF THE FLOW (GPM [L/S]) DIVIDED BY THE MEDIA SURFACE CONTACT AREA (SF [m^2]).
8. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 0'-2" [51] AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.

INSTALLATION NOTES

1. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
2. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE.
3. CONTRACTOR TO PROVIDE AND INSTALL PIPES. MATCH PIPE INVERTS SHOWN ON PROJECT SPECIFIC DRAWINGS.
4. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (cfs [L/s])	
PEAK FLOW RATE (cfs [L/s])	
RETURN PERIOD OF PEAK FLOW (yrs)	
CARTRIDGE SIZE (27, 18)	
CARTRIDGE FLOW RATE	
MEDIA TYPE (PERLITE, ZPG, PSORB)	
NUMBER OF CARTRIDGES REQUIRED	
RIM ELEVATION	

PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			

NOTES/SPECIAL REQUIREMENTS:

The Stormwater Management StormFilter®

CONTECH® ENGINEERED SOLUTIONS LLC
www.ContechES.com
11815 NE Glenn Widing Drive, Portland, OR 97220
800-548-4667 503-240-3393 800-561-1271 FAX

CONCRETE CATCHBASIN STORMFILTER STANDARD DETAIL

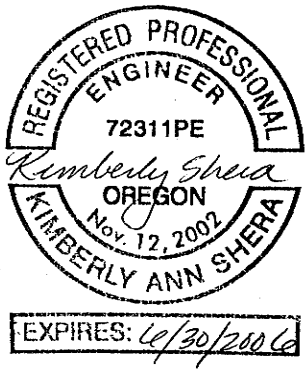
APPENDIX 'D' – STORMWATER MANAGEMENT REPORT for the SHERWOOD DOWNTOWN STREETSCAPE IMPROVEMENTS PHASE A

C-50 Brown File

Sherwood Downtown Streetscape Improvements
Phase A
Stormwater Management Report

Prepared For:

City of Sherwood Oregon



Prepared By:

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Fax (503) 221-1171
Kimberly A. Shera, P.E. – Project Engineer/Manager
Ben Austin – Project Designer

With Contributions From:
Carter and Burgess

JULY 2005

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Weir Calculations

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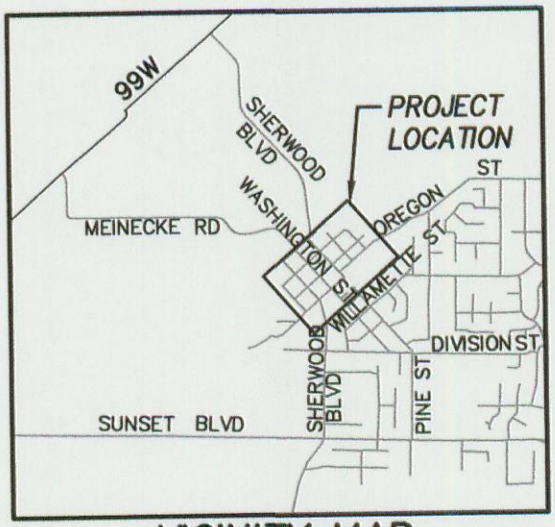
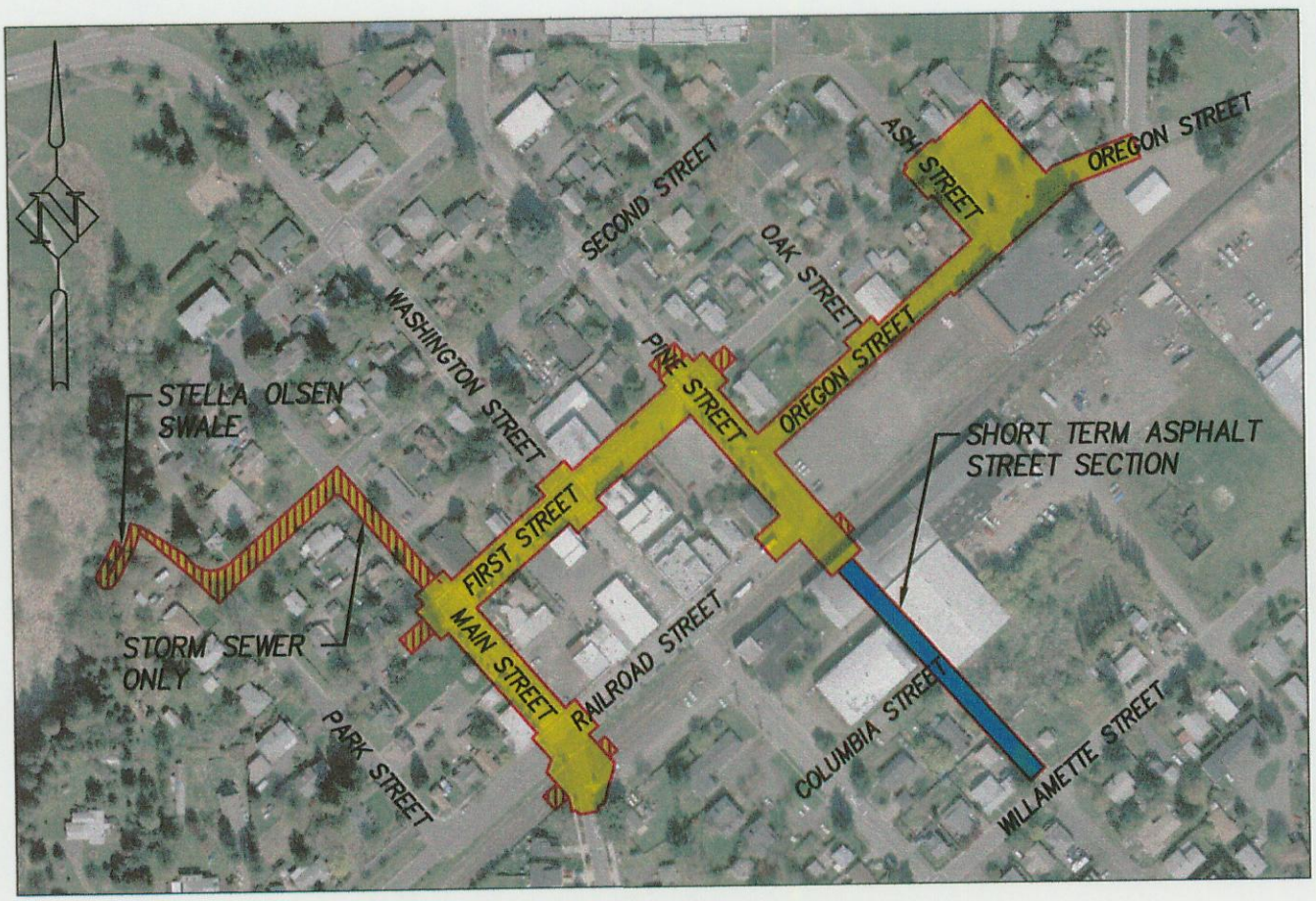
SHERWOOD DOWNTOWN STREETSCAPE IMPROVEMENTS – PHASE A



VICINITY MAP

N.T.S.



PROJECT AREA MAP

T.2.S. R.1.W. SECTION 32

SCALE: 1" = 300'

Introduction

Project Description

The City of Sherwood is constructing streetscape improvements in the Old Town section of the city, following the "Streetscape Master Plan" adopted in 2003. The project will implement a concept of curbless streets, called "woonerf". Generally, surface water drainage sheds from the buildings at the right of way line across the sidewalk and parking area to an inverted crown section or valley gutter. Typically, storm water is carried in the inverted crown section in the center of the street, but in a few cases, in order to match the existing elevations at the right of way line and maintain acceptable cross slopes, the low point is located at the edge of the parking area and the furnishing zone. A typical street section which shows both cases and a detail sheet showing the valley gutter section are located in Appendix A.

The limits of the Streetscape Project are shown on the Project Area Map. The area highlighted in yellow will be reconstructed from building face to building face. The entire area inside the right of way will be reconstructed with concrete pavement. Approximately 325 ft. of Pine Street, 350 ft. of Main Street and 600 ft. of 1st Street will be reconstructed with an inverted crown section. Approximately 475 ft. of Oregon Street next to the new Civic Building will be constructed as a bicycle/pedestrian plaza with a valley gutter along the south side. A roundabout will be constructed at the Oregon Street/Ash Street/1st Street intersection that will have curb and gutter. This project also includes closing the existing crossing of the Pacific and Western Railroad at Washington Street, building a new crossing at Pine Street and reconstructing the existing crossing at Main Street. The area shown in blue on the Project Area Map will be constructed with a short term asphalt cross section that sheds to the east side of the street to a proposed curb.

The area highlighted on the Project Area Map in red hatching is an area where only storm sewer improvements are proposed. This area also includes constructing a regional water quality facility in Stella Olsen Park near the Park Street entrance. This water quality swale was designed to treat the impervious surface for this project within the right of way, impervious surface from the Sherwood Civic Building currently under construction and future impervious surface created by redevelopment within the drainage basin.

For simplicity, and to match the Streetscape Master Plan, this document refers to project cardinal directions aligning with the downtown's diagonal street grid. True north is approximately 22 degrees from project north. In project cardinal directions Pine Street runs north/south and 1st Street runs east/west.

Purpose and Objectives

This report is intended to serve as the technical report for design and facilities reviews with respect to drainage and water quality improvements as part of the Sherwood Downtown Streetscape Improvements Phase A Project. This report

also serves as a guideline for incorporating future downtown improvements into the conveyance system and water quality facilities. The project was designed in accordance with City of Sherwood Standards and Clean Water Services (CWS) Design and Construction Standards Resolution and Order 04-9.

Basin Characteristics

Existing Drainage

Storm water from downtown Sherwood currently outfalls to Cedar Creek. There are three existing outfall locations from the existing drainage basins: 1) the North Basin has an existing outfall at the north end of Park Street near the Stella Olsen Park entrance, 2) the Villa Road Basin has an outfall west of Park Street on the south side of the pedestrian bridge crossing at Cedar Creek and 3) the South Basin has an outfall on the west side of South Sherwood Boulevard upstream of the railroad tracks. See the Existing Basin Map in Appendix A for these outfall locations.

The majority of the project work is located in the North and Villa Road Basins. Drainage in the Villa Road Basin south of 1st Street is collected in a storm sewer system in the alley between 1st Street and Railroad Street and is piped to the Villa Road outfall. Drainage in the North Basin north of 1st Street is collected in a storm sewer system in 2nd Street and is piped to the outfall at Stella Olsen Park. The School Basin is an upstream basin of the North Basin. Storm water from the School Basin passes through an existing water quality swale before it connects to the existing storm sewer in 2nd Street at Ash Street.

Soils Characteristics

The Soil Conservation Service (SCS) Soil Survey of Washington County, Oregon describes the soils within the project area as Hydrologic Soil Type B and C. Soils are categorized into Hydrologic Soil Groups based on an estimate of the amount of runoff after rainfall. These groupings assume that the soils are saturated and receive precipitation from long duration storms. This rainfall to runoff relationship is complex and includes the drainage and permeability characteristics of the soil. Soil Group B has a moderate infiltration rate when thoroughly wet. Soil Group C has a low infiltration rate when thoroughly wet.

The soils in the project area include Aloha silt loam and Hillsboro loam. Areas along the banks of Cedar Creek are mostly Scaponia-Braun silt loam (Hydrologic Soil Type B). Soils in the South Basin are Huberly silt loam (Hydrologic Soil Type D). A soils map and additional information is included in Appendix A.

Water Quality

Water Quality Design Storm

Clean Water Services requires that storm water quality facilities shall be designed to remove 65 percent of the total phosphorous from the runoff of 100 percent of the newly constructed impervious surfaces. CWS gives full credit for phosphorous removal for a vegetated swale designed per CWS Standards. The proposed water quality swale in Stella Olsen Park was designed per CWS Standards for a dry weather storm event totaling 0.36 inches of rainfall falling within 4-hours with a return period of 96 hours. Calculations for water quality flows are included in Appendix B.

In a meeting with Clean Water Services during preliminary design of the project it was determined that the minimum treatment area required by CWS Standards on this project would be the street and sidewalk that is to be reconstructed. Even though the existing street area is entirely hard surface and is currently not treated for water quality, the streetscape project is considered redevelopment and all new impervious surfaces need to be treated even if the existing surfaces were impervious.

Water Quality Basins

The storm water flows from the Pine Street extension south of the Railroad to Willamette Street are not being conveyed to the Stella Olsen Swale. Storm water from these short term road improvements is being conveyed to the existing storm sewer in Pine Street and Columbia Street within the South Basin. Therefore, 0.29 acres of existing impervious area in the adjacent North Basin will be treated on a temporary basis. When the Cannery area is developed and Pine Street is repaved with the full inverted crown section, the new impervious surface will be treated by mechanical treatment or a water quality facility in the South Basin.

See Appendix B for the Water Quality Basin Map. The water quality basins represent the area that could be treated for water quality as redevelopment occurs. The project area was divided into two water quality basins the Villa Swale Water Quality Basin and the Stella Olsen Swale Water Quality Basin. The impervious surface within the water quality basins was calculated based on the current zoning designation with some minor changes noted below. See the current zoning map in Appendix B.

In the Stella Olsen Water Quality (WQ) Basin the area adjacent to 1st Street from Ash Street to Pine Street was assumed to have a future impervious area similar to Retail Commercial (RC) rather than its current zoning designation of Medium Density Residential Low (MDRL). RC areas were considered 100% impervious because landscape requirements for this zone are based on the proposed off street parking area and off street parking is not required within the Old Town Area. The impervious area within the MDRL zoning was calculated using the

maximum density allowed at 8 units per acre and the CWS Standard of 2640 SF impervious surface per single family residential unit. This worked out to approximately 48% impervious. A 20,000 SF area within the existing MDRL zoning was spot checked against this assumption. The existing impervious area within the 20,000 SF area was 8625 SF which is approximately 43% impervious. Therefore, the existing impervious surface appears to be lower than the possible impervious surface allowed by the current zoning.

Below is a table summarizing the impervious areas within the water quality basins for Stella Olsen Swale and Villa Swale:

TABLE 1-Water Quality Basins Impervious Area Summary

	Stella Olsen (acres)	Villa (acres)
Area Zoned RC*	14.88	5.21
Zone RC Impervious Area (100%)	***14.88***	***5.21***
Area Zoned MDRL	9.01	0.00
Zone MDRL Impervious Area (@.48 acres impervious area per acre)	***4.32***	***0.00***
Total Basin Area	23.89	5.21
Total Impervious Area	***19.20***	***5.21***
RC=Retail Commercial		
MDRL=Medium Density Residential Low		
*Note that this number includes an area bounded by Pine, the alley between 1st and 2nd, Ash, and Oregon Streets that is currently zoned MDRL but is likely to be developed RC.		

Water Quality Facilities

The Streetscape Master Plan included the construction of a storm water treatment facility in Stella Olsen Park to treat the majority of the surface runoff from the downtown area prior to discharge to Cedar Creek. The final design of the storm water treatment facility includes a vegetated swale with a 10' wide bottom and a total length of 169 feet. The proposed Stella Olsen Swale will also treat the Civic Building which is currently under construction. A site plan showing the Civic Building impervious area is included in Appendix B for reference.

The proposed Stella Olsen Swale includes three drop down structures which are not included in the treatment length of 157 feet. The grade change structures were necessary to reduce the fill within the 100 year floodway. The structures also act as intermediate flow spreaders in the swale. The 100 year floodway elevation is shown on the Water Quality Swale Plan in Appendix C. The structures are concrete curbs that drop a total of 2' at each of the three locations. A detail of these structures is located in Appendix C.

The following table outlines the characteristics of the proposed Stella Olsen Swale as well as the existing Villa Swale:

TABLE 2-Water Quality Swale Characteristics

	Stella Olsen Swale	Villa Swale
Length (ft)	157	100*
Bottom Width (ft)	10	n/a
Side Slopes (ft:ft)	4:1	n/a
Channel Slope (ft/ft)	0.005	0.010*
Depth (ft)	0.5	n/a
Velocity (fps)	0.25	n/a
Treatment Flow (CFS)	1.49	0.73*
Treatment Volume (CF)	21,458	10,455*
Impervious Area Treatment Capacity (AC)	**16.42**	**8.0***

* Information from Villa Road Swale Hydrology Report, see Appendix F.

Villa Swale has a treatment capacity of 8 acres per the Villa Road Swale Hydrology Report. The water quality treatment flow and volume was calculated based on the impervious area within the Villa Water Quality Basin (shown as the hatched area on the Water Quality Basin Map). The Water Quality Flow for this impervious area of 5.21 acres is 0.47 cfs. Based on this flow and the geometry of the swale given in the Villa Road Swale Hydrology Report the resultant velocity creates a residence time less than the 9 minutes required by CWS. Please refer to the detailed calculations in Appendix B.

The areas in Table 1 include the existing street areas. The Stella Olsen Water Quality Basin contains 19.2 acres (See Table 1) of impervious surface if it redevelops at the assumed zoning designation, but the proposed swale has the capacity to treat approximately 16.4 acres (See Table 2) of impervious surface. Due to site constraints at the proposed location of the Stella Olsen Swale it is not wide enough to treat all the impervious area within the drainage basin, but it could treat the entire area within the RC zone as shown on the Water Quality Basin Map in Appendix B. It is recommended that the remaining available treatment of 12.4 acres (See Table 3) be used as a water quality treatment bank as the area develops since it is hard to predict which areas in the basin will redevelop first.

See the following table for a breakdown of the impervious surface to be treated by the proposed Stella Olsen Swale:

TABLE 3-Stella Olsen Swale Impervious Area Summary

	Impervious Area (SF)	Impervious Area (AC)
Total Treatment Capacity of Swale	**715,255**	**16.42**
Civic Building Impervious Area	-39,810	-0.91
Streetscape Project Impervious Area	-120,410	-2.76
Pine St. South of Railroad Impervious Area*	-12,632	-0.29
Remaining for Future Development	**542,403**	**12.45**
*Area may be credited to available treatment in swale when this area is connected to the Cannery Development water quality treatment.		

Peak Flow Calculations for Water Quality Swale and Weir Conveyance
The peak flows were generated using Hydraflow Hydrographs software by Intelisolve to analyze the weir box and swale for storm events larger than the water quality event. The Santa Barbara Urban Hydrograph (SBUH) method was used along with the rainfall distribution listed in Appendix A of the CWS Design Standards. Hydrographs were generated for a Type 1A, 24 hour storm for the Stella Olsen Water Quality Swale Basin. The Stella Olsen Water Quality Swale Basin contains 5 subbasins (A,B,C,D, and E) that are shown on the Overall Proposed Basin Map in Appendix C. The hydrographs which show the peak flows for the 2, 10, 25, 50, and 100 year storm events are located in Appendix C for reference.

A curve number of 98 was assigned to the area within the RC zone which includes parking lots, roofs, driveways and streets. A curve number of 90 was assigned to the area within the MDRL residential zone areas. A curve number of 74 was used for the ball fields and grassy area of the school property. Refer to Appendix C for the Curve Number Table.

The TR55 method and equations were used to calculate the time of concentration for sheet flow, shallow concentrated flow and channel flow. These equations and sample time of concentration calculations for each of the basins is included in Appendix C for reference. The path of the longest time of concentration for each basin is shown on the Overall Proposed Basin Map in Appendix C.

The peak flows for the following storm events were calculated for the Stella Olsen Water Quality Basin (37.56 acres). 13.96 acres of this total area is the Sherwood Middle School site that has water quality treatment but no detention and therefore was included to check the conveyance of the swale and weir box in the larger storms but not included to size the water quality manhole.

Stella Olsen Basin Peak Flows (Includes Subbasins A, B, C, D, and E):

Storm Event	Peak Flow
2-Year	13.10 cfs
10-Year	19.81 cfs
25-Year	23.05 cfs
50-Year	25.23 cfs
100-Year	27.41 cfs

The hydrographs are located in Appendix C for reference.

Pollution Control Manhole

The proposed pollution control manhole for pretreatment sediment removal is 6 feet in diameter and has a sump that is 5 feet deep. CWS standards for water quality manholes require 20 cubic feet per 1.0 cfs of flow into the manhole up to the 25 year flow. The 25 year flow for Stella Olsen Basin (not including the school property) is 18 cfs, but the 25 year flow for the Streetscape Project Area is 3.3 cfs. The proposed pollution control manhole has a sump volume of 141.37 CF to treat a flow up to 7 cfs which is more than the 25 year storm for the project area but less than the 25 year storm for the entire basin. The remaining 4 cfs of capacity will treat future right of way improvements within the basin. Additional pollution control manholes should be added as areas redevelop and connect to the new storm sewer line. These additional pollution control manholes should be located on 1st Street east of Pine and on 2nd Street east of Main Street. Private improvements should have sumped inlets to trap sediment, oil and floatables prior to entering the public storm sewer. All project inlets with the exception of the decorative area drains and trench drains have sumps.

Weir Box/Flow Splitter

The following equation for a broad crested weir was used to calculate the capacity of the water quality weir and overflow weir at various water surface elevations in the weir box:

$$Q = CbH^{3/2}$$

H = Head on the weir, feet
b = Width of weir opening, feet
C = Coefficient of discharge, dimensionless

The velocity of approach at the weir was considered insignificant because of the sump and rip rap in the weir box that provide energy dissipation.

A spreadsheet showing the capacity of the water quality weir and the overflow weir along with the relationship to the design storms is included in Appendix C. Also included in Appendix C is a table with values of the coefficient of discharge which varies from 2.34 to 2.70 based on the head on the weir and the width of the weir opening.

The depth of the water in the swale was calculated for the 10, 25, 50 and 100 year storm events and are as follows:

Storm Event	Depth in Swale
2-Year	1.36'
10-Year	1.67'
25-Year	1.81'
50-Year	1.89'
100-Year	2.02'

The top of the proposed concrete walls were set based on the 1' freeboard requirement above the 25 year design water surface elevation. The velocities in the swale were checked for the 2, 10, 25, 50 and 100 year peak flows and remained below the 2 fps maximum velocity as outlined in Appendix B of CWS Standards. Detailed calculations are included in Appendix C.

The water quality facility includes a water quality manhole, weir box/flow splitter and a vegetated swale. A plan and details of the water quality facility are included in Appendix C.

Conveyance System

Existing Conveyance System

Within the project area there is existing storm sewer on Main Street and Oregon Street but there is not any existing storm sewer on Pine Street or First Street. Generally storm water in Pine and 1st is conveyed in the existing gutter to existing catch basins located near the storm sewer system in the alley between Railroad Street and First Street. See the map in Appendix D from the Streetscape Master Plan that shows the existing storm system and the anticipated proposed storm sewer improvements associated with the Streetscape Project.

Proposed Conveyance System
The alignment of the storm drainage layout was altered from the master plan to accommodate storm sewer connections for future private development and to provide additional capacity in 2nd Street from Main Street to the water quality facility. An exhibit showing the proposed storm water conveyance system is included in Appendix D.

Hydraulic Analysis
The proposed storm system is designed to convey the 10-year storm event calculated using the rational method. The system was designed to include the storm sewer flows from additional phases of the streetscape project as well as storm sewer services for future private development in the downtown area. The basin areas and corresponding c values are shown on the Conveyance and Inlet Basin Map located in Appendix D.

Time of concentration was calculated for several of the larger inlet basins and was found to be less than five minutes, so a five minute time of concentration was used for all inlet basins. The time of concentration was calculated at the high point of the conveyance system for the project at Oregon St. and Ash St. (Basin 19). This time of concentration was found to be less than five minutes, so a five minute time of concentration was used for the first inlet in the conveyance spreadsheet. The calculation for the time of concentration for Basin 19 is shown below:

Basin 19 (for shallow concentrated flow on pavement):

$$V = 20.3282(S)^{0.5} = 20.3282(.007)^{0.5} = 1.7\,fps$$

$$T_C = \frac{L}{60V} = \frac{220}{60(1.7)} = 2.2\,\text{min} \therefore 5\,\text{min}$$

The runoff coefficient (c value) used for the inlet basins was 0.90 for impervious areas (roof areas and pavement), 0.5 for residential areas, and 0.25 for landscaping areas. Composite c values were calculated for each basin area.

A spreadsheet with conveyance calculations is included in Appendix D for reference.

Storm Sewer Services
Storm sewer services were provided to existing lots along the storm sewer alignment for future roof drain connections. The connections were generally located near the center of the lots right of way frontage, or in a location that will not create conflicts with the existing buildings. The private laterals were all sized based on the plumbing code. A 6" service at a 2% minimum slope was provided for each lot based on these calculations. See Appendix D for additional information and calculations.

Inlet Design

Inlet design and placement was analyzed using the 10 year rational method storm event. Mannings equation was used to calculate the capacity of the inverted crown section and resulting depth and spread. The spreadsheet showing the depth and spread before each inlet is included in Appendix D. FHWA formulas for inlet capacity were used to determine the stormwater intercepted and bypassed at each inlet. These formulas and a spreadsheet showing the flow intercepted at each inlet are included in Appendix D.

The Streetscape Master Plan specified an acceptable flow depth of 1 inch and a spread of 8.3 feet wide for a 2 year storm event. The maximum depth and spread in a 10 year event was 0.11 feet deep with a total spread of 11 feet wide. The typical street section included in Appendix A shows the two 11' travel lanes. Generally the street and sidewalk slope up from the center of the street at 2%. Thus, the elevation at the right of way line at the back of sidewalk is approximately 0.6' higher than the low point at the center of the street. When the valley gutter is used approximately 1" of the depth is contained within the valley gutter because it has a cross slope of 8% rather than the standard 2%. The depth and spread were also checked for the 100 year event, and were found to be 0.13' deep with a total spread of 13' wide.

The City required that all inlets within the streetscape area be ADA compliant. ADA grates do not have any openings larger than ½ " and are more susceptible to plugging than standard grates with larger openings. A 50% reduction in capacity due to plugging was factored into the design calculations for all inlets. If the City is concerned about the added maintenance and increased plugging of the ADA grates at the center of the intersections, an alternative would be to install grates with larger openings and cover or switch out the grate during events when the streets are blocked off and people will be walking in the center of the intersection.

There are five types of inlets shown on the plans: ditch inlets, CG-2 (curb & grate inlets), lynch basins, decorative area drains and trench drains. The decorative area drains and trench drains are located within the streetscape area. The CG-2 inlets are located near the roundabout at Ash and 1st Street. The ditch inlets are located at the proposed railroad crossing at Pine. The lynch basins are located at the temporary low spots created by the transition from the "woonerf" section to the existing crown section. Detail drawings of the various inlet types are included in the Construction Drawings.

The typical intersection design includes an area drain at the center of the intersection and trench drains located upstream of the crosswalks. The trench drains were set at an elevation that would prevent water from backing up into the adjacent buildings should the area drain in the center of the intersection become plugged. The spreadsheet in Appendix D lists the rim elevation of the inlet grate and the ponding elevation in the 10 year event. The peak flows for the 100 year

storm event were also generated to verify that the ponding elevations were lower than the surrounding building finish floor elevations.

Hydraulic Analysis

The proposed storm pipe is PVC C900, PVC ASTMD 3034, or reinforced concrete pipe. A Mannings n value of 0.013 was used to calculate the velocity in the pipe. The storm system will convey the 10 year rational method peak flow without surcharging the system. Refer to the conveyance spreadsheet in Appendix D for more detailed information.

A minimum velocity of 3 fps was maintained in the system. The storm system was checked for an interim peak flow that did not include the flow from the properties along 1st Street that would connect to the storm sewer laterals in the future. A minimum velocity of 3 fps was maintained in the system for the lower interim flows.

Overland Route

Peak flows were calculated for the 100 year storm event to analyze how the storm system would function in a large storm event. Hydraflow Storm Sewer software by Intelisolve was used to determine the hydraulic grade line and water surface elevation at points along the system. Refer to the Water Surface Profile in Appendix D. The storm sewer is surcharged in this large storm event but the water surface elevation remained below the ground surface until it reached the intersection of Pine and 1st Street where the storm sewer is not as deep. At this point the hydraulic grade line is above the proposed inlet elevations, and the street becomes part of the storm system in a 100 year storm event. The direction the storm water would travel from the upstream low points is noted below:

Stormwater at 1st and Pine would flow north on Pine Street before it would pond outside of the street section. It would then flow west on Second Street, north on Washington Street, and west on 3rd Street to the outfall at Stella Olsen Park. If the inlets at 1st and Pine would plug during a minor storm, the stormwater would flow into the temporary low point catch basins just north of the intersection or continue north to the existing inlets at the alley between 1st and 2nd Street. Stormwater near the intersection of Pine and Oregon would flow north on Pine Street in the center of the street to the intersection of Pine and 1st Street. Stormwater in Oregon Street at the low points would pond at the trench drains, and then flow north on Oak Street, and west on Oregon into Pine Street before it would back up into the Civic Building.

Downstream Analysis

Site Investigation

A downstream analysis was performed in accordance with CWS Standards including a visual investigation of the channel downstream of the proposed outfall. There is an existing outfall with a concrete runout that will be replaced with a flow splitter and water quality swale. Storm water from this outfall travels overland approximately 250 feet at approximately 3% slope to the defined channel of Cedar Creek. It then flows north approximately 1500 feet in an open channel to the existing 84 inch culvert at Washington Street. Cedar Creek continues to the northwest and crosses under Highway 99 before it flows into Chicken Creek which flows into the Tualatin River. Photos of the Washington Street Culvert and Cedar Creek channel upstream and downstream of the outfall are included in Appendix E.

Hydrologic Analysis

The Cedar Creek Basin upstream of the outfall was delineated on Metro Regional Land Information System (RLIS) 10' Contour data. The basin is approximately 5,200 acres and is split by the Urban Growth Boundary (UGB). Areas within the UGB were evaluated using the current zoning, except for the area currently zoned rural residential at the edge of the UGB. This area was considered single family residential for these calculations. Areas outside of the UGB are generally rural agricultural areas. A basin map showing the zoning and a spreadsheet with detailed breakdown of the area in each zone is included in Appendix E for reference. The spreadsheet also shows the curve numbers used in the calculations.

The TR55 method was used to calculate the time of concentration for sheet flow, shallow concentrated flow and channel flow. These time of concentration calculations are included in Appendix E for reference. The path of the longest time of concentration for the basin is shown on the Cedar Creek Basin Map in Appendix E.

The peak flows were generated using Hydraflow Hydrographs software by Intelisolve. The Santa Barbara Urban Hydrograph (SBUH) method was used along with the rainfall distribution listed in Appendix A of the CWS Design Standards. Hydrographs were generated for a Type 1A, 24 hour storm. The hydrographs are located in Appendix E for reference.

The Stella Olsen Basin Existing 25-year peak flow is based on the current land use which is mostly residential with the exception of a three acre area in the center of downtown that is commercial. The Stella Olsen Basin Proposed 25-year peak flow is based on the anticipated redevelopment of the residential area to retail commercial as shown on the Water Quality Basin Map in Appendix B.

Summary and Conclusions
Downstream Analysis Peak Flows:

Existing 25-year Peak Flow for the Stella Olsen Basin	21.60 cfs
Proposed 25-year Peak Flow for the Stella Olsen Basin	23.05 cfs
Cedar Creek Basin 25-year Peak Flow	370 cfs
Percent Increase in Cedar Creek Basin	0.5%

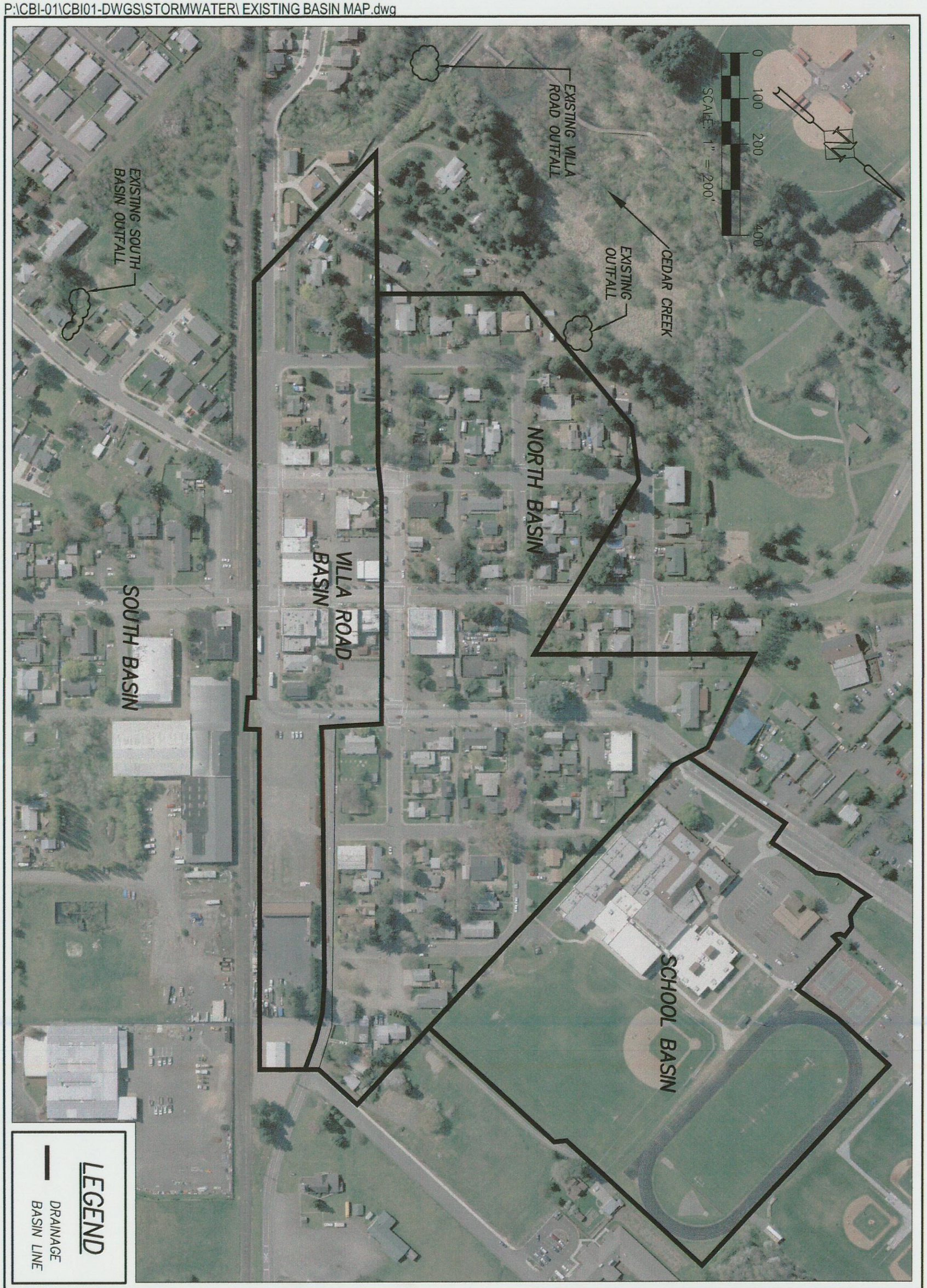
The percent increase to Cedar Creek is less than 1% and will not cause a negative impact on the existing downstream system or cause flooding of the downstream properties. The outfall is located in Stella Olsen Park, which is approximately 12 acres in size of which over half is in the flood plain of Cedar Creek. This area is ideal for providing natural detention during large storm events. The culvert is located at a low spot in Washington Street. The low point elevation in the road is approximately 158, which is the 100-year flood elevation. See FEMA Flood Plain Map in Appendix E. If the creek was to overtop Washington Street at this location, it would be isolated to the low spot in the road and would not affect the neighboring properties.

APPENDIX A

TYPICAL STREET SECTION
EXISTING BASIN MAP
SOILS DATA

HHPR

P:\CBI-01\CBI01-DWGS\STORMWATER\ EXISTING BASIN MAP.dwg



LEGEND

DRAINAGE BASIN LINE

JOB NO.	SHEET NO.	OF
CBI-0	1	1

DATE	NO.	DESCRIPTION

REVISIONS

DESIGNED: KAS
DRAWN: JTL
CHECKED: KAS
DATE: JULY 2005

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EXISTING BASIN MAP

SHERWOOD DOWNTOWN STREETSCAPE

SHERWOOD, OR

Water Quality Calculations

Per Appendix B of the Clean Water Services Design and Construction Standards:

The water quality storm is the storm required by regulations to be treated. The storm defines both the volume and rate of runoff.

a. Water Quality Storm: Total precipitation of 0.36 inches falling in 4 hours with a storm return period of 96 hours.

   Water Quality volume (WQV) is the volume of water that is produced by the water quality storm.

b. Water Quality Volume (WQV): 0.36-inches over 100-percent of the new impervious area.

$$\textit{Water Quality Volume –WQV (cf)} = \frac{\textit{0.36(in) x Impervious Area (sf)}}{\textit{12 (in/ft)}}$$

c. Water Quality Flow-WQF (cfs): The average design flow anticipated from the water quality storm.

$$\textit{Water Quality Flow (cfs)} = \frac{\textit{Water Quality Volume (cf)}}{\textit{14,400 Sec}}$$

Stella Olsen Water Quality Swale

Impervious Area Treatment Capacity Based on Swale Geometry:

WQF = 1.49 cfs for 10' swale bottom with 4:1 side slopes flowing with a maximum depth of 0.5'

WQV = WQF x 14,400 Sec

WQV = 21456 cf

$$\text{Impervious Area} = \frac{\text{WQV x 12 in/ft}}{\text{0.36 in}}$$

Impervious Area swale can provide treatment for = 715,200 sf = 16.42 acres

Check for Residence Time:
Velocity = 0.25 ft/s for Q=1.49 cfs (See attached calculations using mannings)

Swale Treatment Length = 157 ft

Residence Time = $\frac{157\,ft}{0.25\,ft/s \times 60s/\min}$

Residence Time = **10.5 min** > 9 min ∴ Meets CWS Requirements

Villa Road Water Quality Swale

Check residence time based on impervious area within Villa Water Quality Basin:

Impervious Area within Villa Water Quality Basin = 5.21 Acres = 226,948 SF

$$WQV = \frac{0.36(in) \times 226{,}948\,(sf)}{12\,(in/ft)}$$

WQV = 6808 cf

$$WQF = \frac{6808\,(cf)}{14{,}400\,Sec}$$

WQF = 0.47 cfs

Velocity = 0.26 ft/s for Q=0.47 cfs (See attached calculations using mannings assuming 4' bottom width with 4:1 side slopes. Longitudinal slope = 1% per Villa Swale Hydrology Report)

Swale Treatment Length = 100 ft per Villa Swale Hydrology Report

Residence Time = $\frac{100\,ft}{0.26\,ft/s \times 60s/\min}$

Residence Time = **6.4 min** < 9 min ∴ Does not meet CWS Reqmts.

WATER QUALITY BASINS
SHERWOOD DOWNTOWN STREETSCAPE IMPROVEMENTS - PHASE A
SHERWOOD, OREGON

AREA WITHIN TREATMENT BASIN OF THE STELLA OLSEN SWALE

EXISTING ZONING, SEE LEGEND

R.O.W. IMPERVIOUS AREA WITHIN STREETSCAPE PROJECT LIMITS TREATED BY STELLA OLSEN SWALE

PROPOSED STELLA OLSEN SWALE

EXISTING VILLA SWALE

0 40 80 160
SCALE: 1" = 80'

MDRL
(5.72 ACRES)

RC
(14.88 ACRES)

MDRL
(3.29 ACRES)

RC
(5.21 ACRES)

IP
(0.47 ACRES)

2ND STREET
MAIN STREET
WASHINGTON STREET
PINE STREET
OAK STREET
ASH STREET
1ST STREET
PARK STREET
OREGON STREET
RAILROAD STREET

AREA TO BE TREATED BY EXISTING VILLA SWALE

CIVIC BUILDING IMPERVIOUS AREA INCLUDED IN STELLA OLSEN SWALE TREATMENT

AREA TO HAVE INTERIM TREATMENT IN THE STELLA OLSEN SWALE

ZONING LEGEND

RC = RETAIL COMMERCIAL

MDRL = MEDIUM DENSITY RESIDENTIAL LOW

IP = INSTITUTIONAL PUBLIC

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NOV. 12, 1981
KIMBERLY ANN SHERA
72,311
EXPIRES: 6/30/2006

DESIGNED:	BRA
DRAWN:	JTL
CHECKED:	KAS
DATE:	JULY 2005

REVISIONS

DATE	NO.	DESCRIPTION

SHEET NO. 1 OF 1

JOB NO. CBI-01

P:\CBI-01\CBI01-DWGS\STORMWATER\ CBI01-WQ.DWG

Downtown Sherwood Streetscape

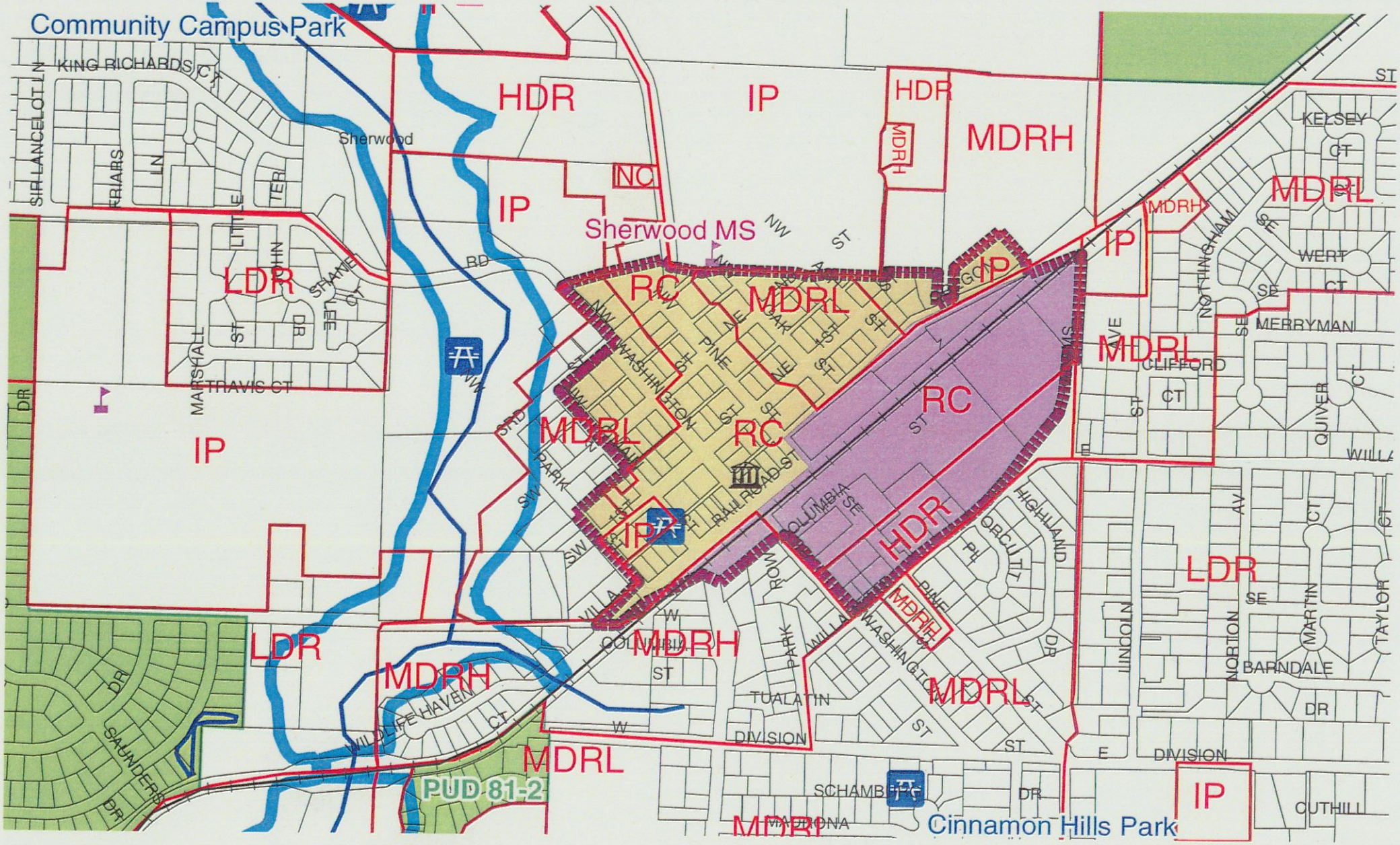
Stella Olsen Water Quality Swale

Man-Made Channels

CIVIL TOOLS PRO
English Units
07-28-2005 12:59:51

Results

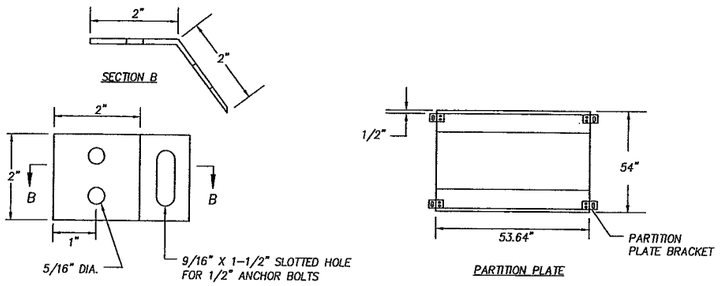
Flow Depth	=	0.50 ft
Flowrate	=	1.49 cfs
Bottom Width	=	10.00 ft
Side Slope (H:V)	=	4.0000 H:V
Channel Slope (V:H)	=	0.0050 V:H
Manning's N	=	0.240
Wetted Area	=	6.02 sq ft
Wetted Perimeter	=	14.14 ft
Velocity	=	0.25 fps *
Froude No.	=	0.07
Flow Regime	=	Sub-Critical


Community Campus Park
HDR
IP
HDR
MDRH
MDRH
NC
IP
Sherwood MS
IP
LDR
RC
MDRL
IP
MDRL
RC
RC
IP
MDRL
RC
HDR
IP
LDR
MDRH
MDRH
MDRL
MDRL
PUD 81-2
MDRL
IP
Cinnamon Hills Park
Sherwood
KING RICHARDS CT
SIR LANCELOT LN
FRIARS LN
LITTLE TER
SHANE CT
MARSHALL ST
TRAVIS CT
RD
NW
PINE ST
WASHINGTON ST
RAILROAD ST
COLUMBIA ST
SW PARK
ROW
HIGHLAND DR
ORCUTT PL
LINCOLN AV
KELSEY CT
WERT CT
NOTTINGHAM
MERRYMAN
CLIFFORD CT
QUIVER CT
NORTON
MARTIN
TAYLOR
BARNDALE DR
OUTHILL
WILDLIFE HAVEN CT
SAUNDERS DR
TUALATIN
DIVISION
SCHAMBERG DR
MADRONA

APPENDIX C

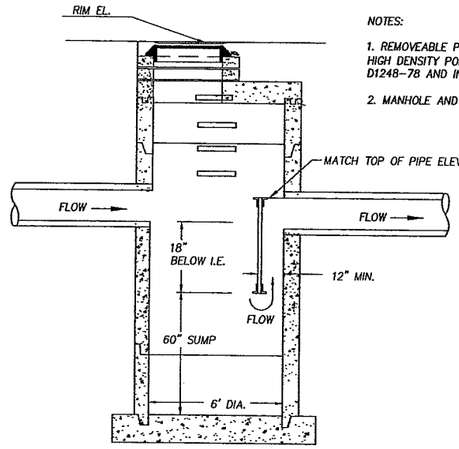
WATER QUALITY FACILITY PLANS
PROPOSED BASIN MAP
BASIN HYDROGRAPHS
RUNOFF CURVE NUMBER TABLE
TIME OF CONCENTRATION CALCULATIONS
WEIR CALCULATIONS

HHPR



POLLUTION CONTROL PARTITION PLATE

N.T.S.



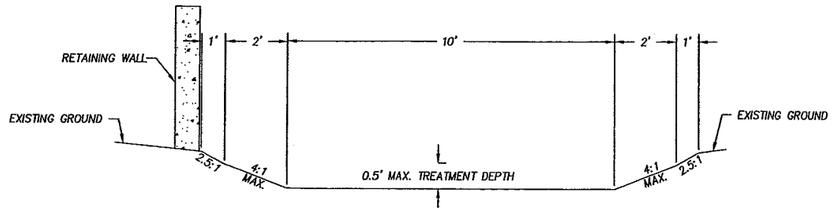
NOTES:

1. REMOVEABLE PARTITION PLATE TO BE CONSTRUCTED OF HIGH DENSITY POLYETHELENE (HDPE), 1/2" THICK ASTM D1248-78 AND INSTALLED PRIOR TO MANHOLE CONE OR TOP.

2. MANHOLE AND BASE 6' DIA. MANHOLE.

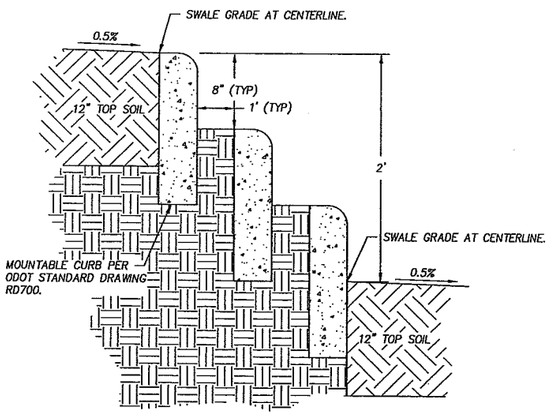
CONCRETE POLLUTION CONTROL MANHOLE

N.T.S.



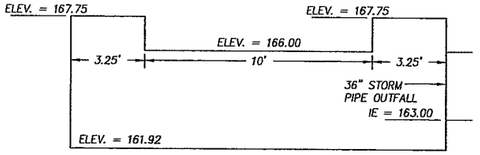
WATER QUALITY SWALE TYPICAL GRADING SECTION

N.T.S.



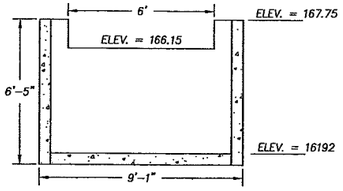
WATER QUALITY SWALE GRADE CHANGE

N.T.S.



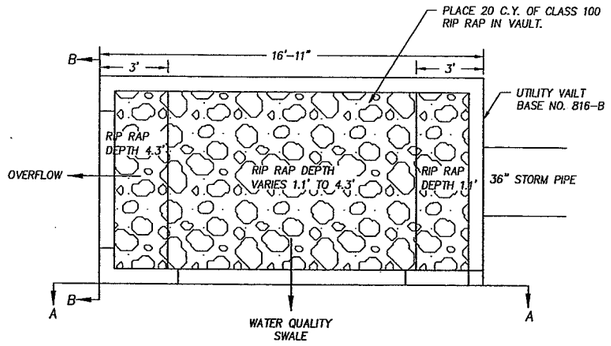
SECTION A-A

N.T.S.



SECTION B-B

N.T.S.



WEIR BOX PLAN VIEW

N.T.S.

Sheet Revisions			
R-	/ /		
R-	/ /		
R-	/ /		
R-	/ /		
R-	/ /		

REGISTERED PROFESSIONAL ENGINEER 72,311 OREGON NOV. 12, 2002 KIMBERLY ANN SHERA
EXPIRES: 6/30/2006

Sherwood Downtown Streetscape Improvements–Phase A

City of Sherwood Oregon

Engineering Department
15527 S. W. Willamette St.
Sherwood, OR 97140
Phone: (503) 925-2305
FAX: (503) 625-0679

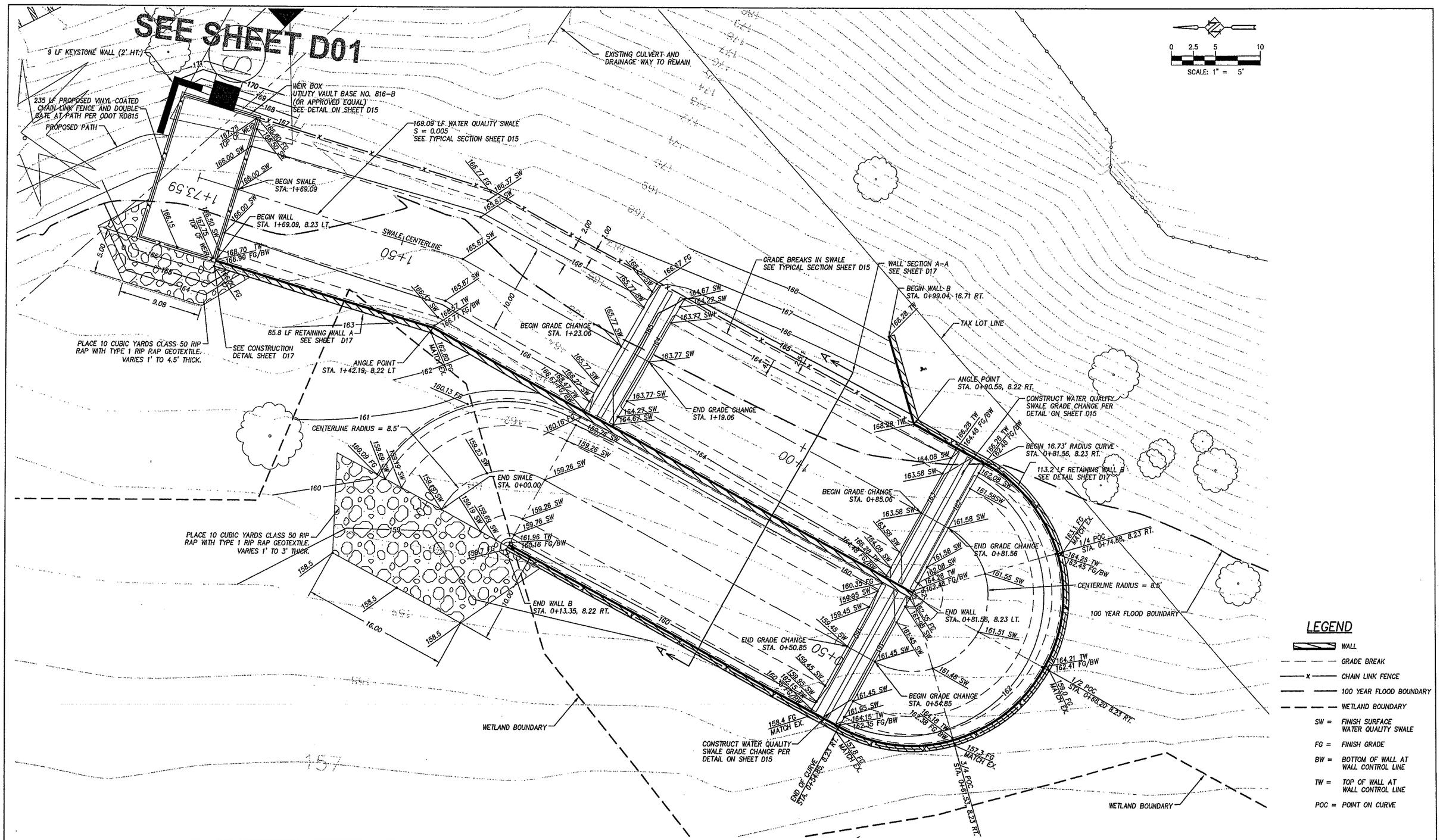
HHPR Harper Houf Peterson Righellis Inc.
ENGINEERS • PLANNERS • SURVEYORS
5200 SW MACADAM AVENUE, SUITE 580, PORTLAND, OR 97239
TEL 503.221.1131 www.hhpr.com FAX 503.221.1171

As Constructed	
No Revisions:	/ /
Revised:	/ /
Void:	/ /

WATER QUALITY DETAILS

Designer:		Structure Numbers	
Detailer:			
Sheet Subset:		Subset Sheets:	

Project No./Code	
071668.100	
City of Sherwood CIP #-41	
Sheet Number	D15



Sheet Revisions		
R-1	7/22/05	ADDENDUM #2
R-	/ /	
R-	/ /	
R-	/ /	
R-	/ /	

REGISTERED PROFESSIONAL ENGINEER 72,311 OREGON Kimberly Ann Sherar NOV. 12, 2002 EXPIRES: 6/30/2006

Sherwood Downtown Streetscape Improvements–Phase A

City of Sherwood Oregon

Engineering Department
15527 S. W. Willamette St.
Sherwood, OR 97140
Phone: (503) 925-2305
FAX: (503) 625-0679

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ENGINEERS • PLANNERS • SURVEYORS
5200 SW Macadam Avenue, Suite 580, Portland, OR 97239
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As Constructed	
No Revisions:	/ /
Revised:	/ /
Void:	/ /

WATER QUALITY SWALE

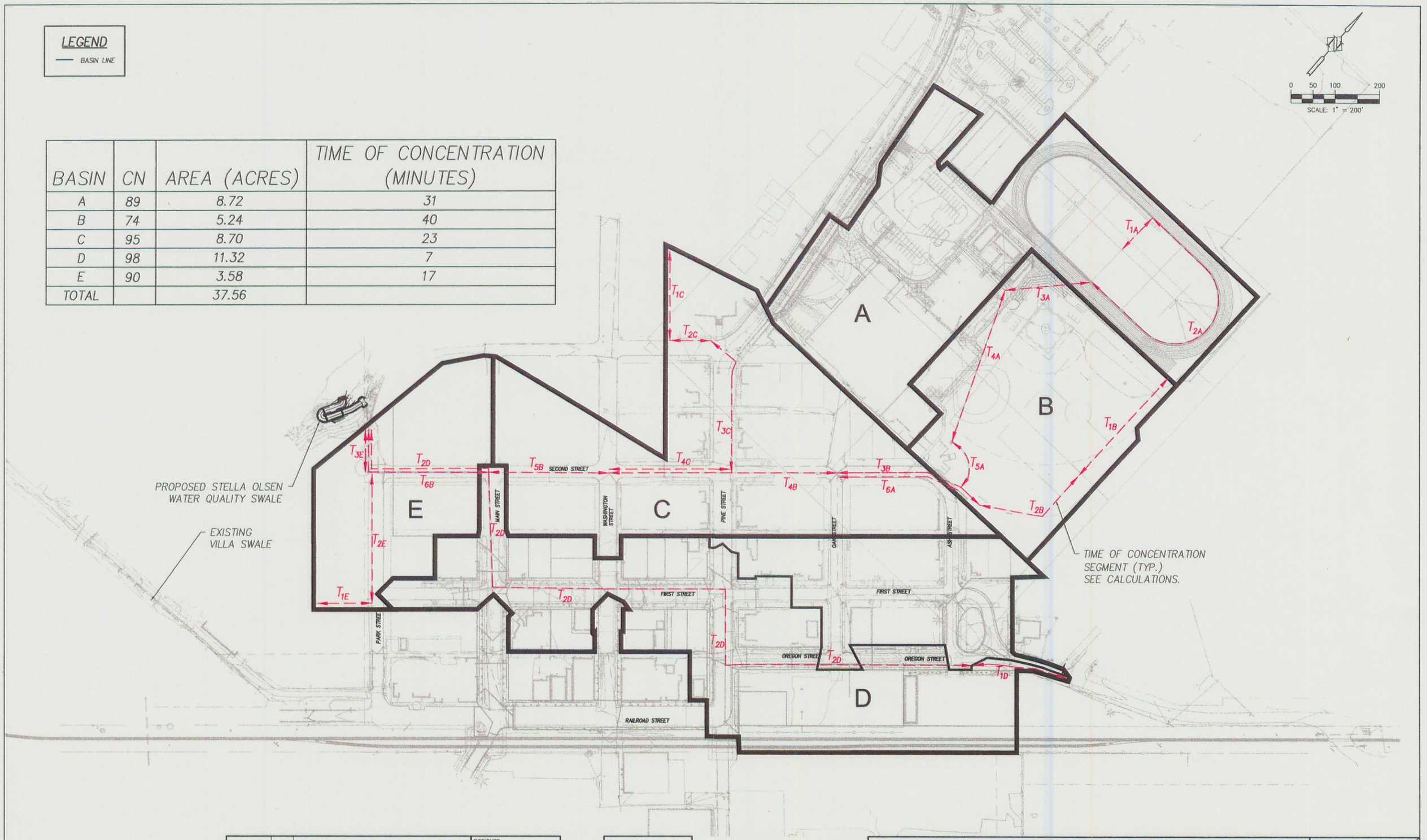
Designer:		Structure Numbers	
Detailer:			
Sheet Subset:		Subset Sheets:	

Project No./Code	
071668.100	
City of Sherwood CIP #-41	
Sheet Number	D16

LEGEND

— BASIN LINE

BASIN	CN	AREA (ACRES)	TIME OF CONCENTRATION (MINUTES)
A	89	8.72	31
B	74	5.24	40
C	95	8.70	23
D	98	11.32	7
E	90	3.58	17
TOTAL		37.56	



DATE	NO.	DESCRIPTION

REVISIONS

DESIGNED: —
DRAWN: —
CHECKED: —
DATE: —

HHPR Harper Houf Peterson Righellis Inc.
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5200 SW MACADAM AVENUE, SUITE 580, PORTLAND, OR 97239
TEL. 503.221.1131 www.hhpr.com FAX 503.221.1171

SHERWOOD DOWNTOWN STREETSCAPE IMPROVEMENTS - PHASE A

OVERALL PROPOSED BASIN MAP

SHERWOOD, OREGON

SHEET NO. 1 OF 1

JOB NO. CBI-01

STELLA OLSEN WATER QUALITY BASIN
HYDROGRAPHS FOR 2, 5, 10, 25, 50, 100 YEAR STORM EVENTS

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Friday, Aug 12 2005, 10:57 AM

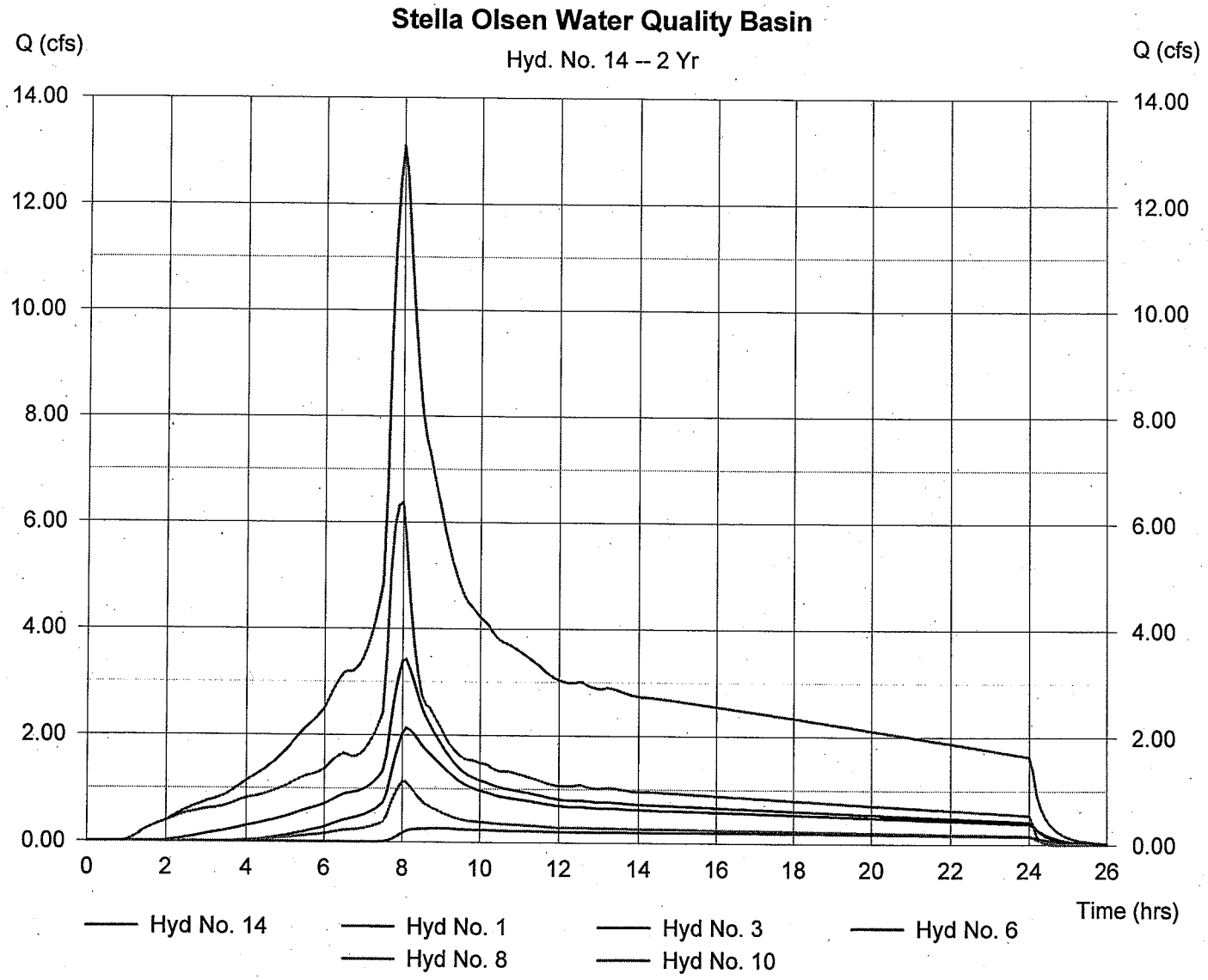
Hyd. No. 14

Stella Olsen Water Quality Basin

Hydrograph type = Combine
Storm frequency = 2 yrs
Inflow hyds. = 1, 3, 6, 8, 10

Peak discharge = 13.10 cfs
Time interval = 6 min

Hydrograph Volume = 232,822 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Friday, Aug 12 2005, 10:57 AM

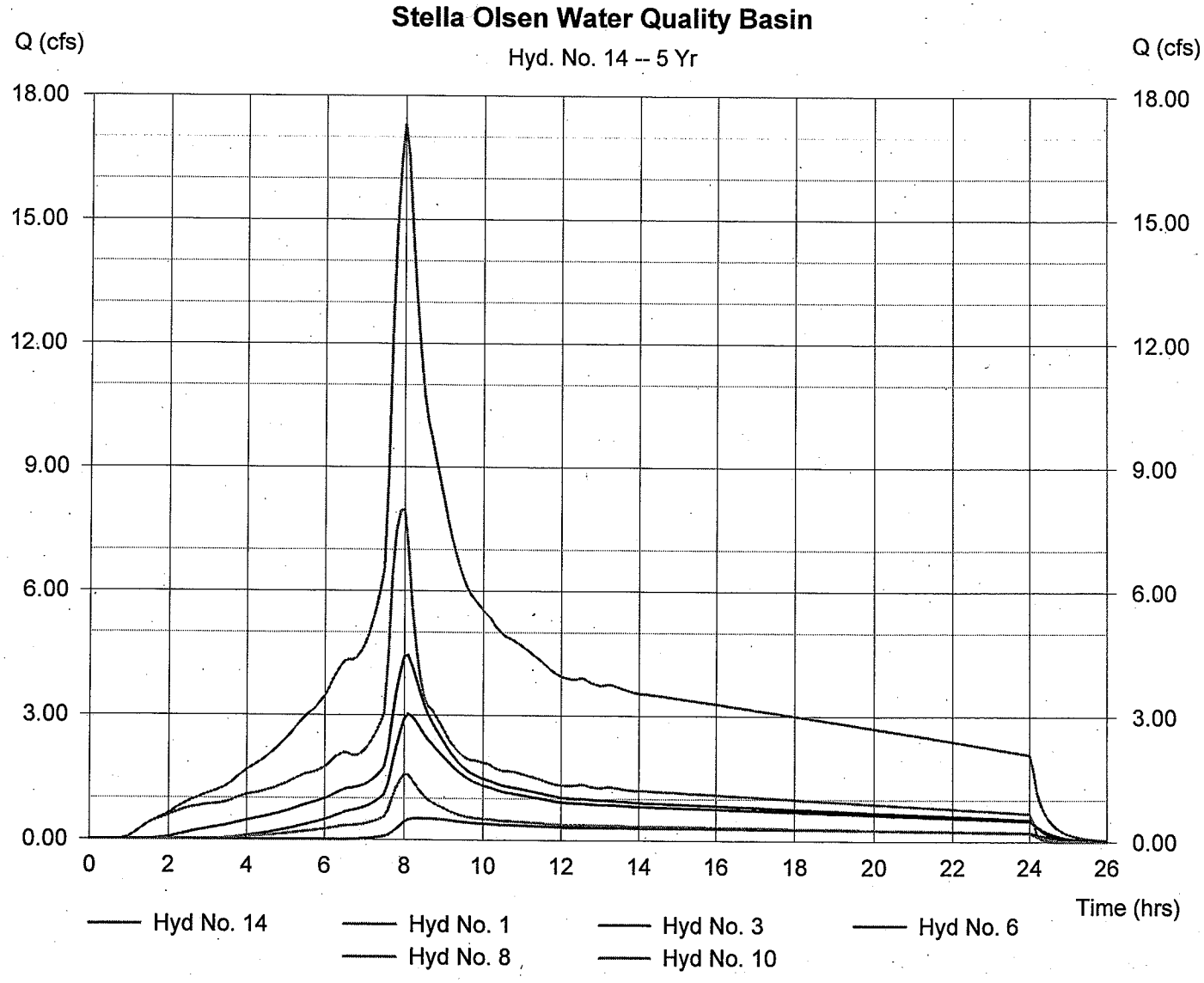
Hyd. No. 14

Stella Olsen Water Quality Basin

Hydrograph type = Combine
Storm frequency = 5 yrs
Inflow hyds. = 1, 3, 6, 8, 10

Peak discharge = 17.31 cfs
Time interval = 6 min

Hydrograph Volume = 306,765 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Friday, Aug 12 2005, 10:57 AM

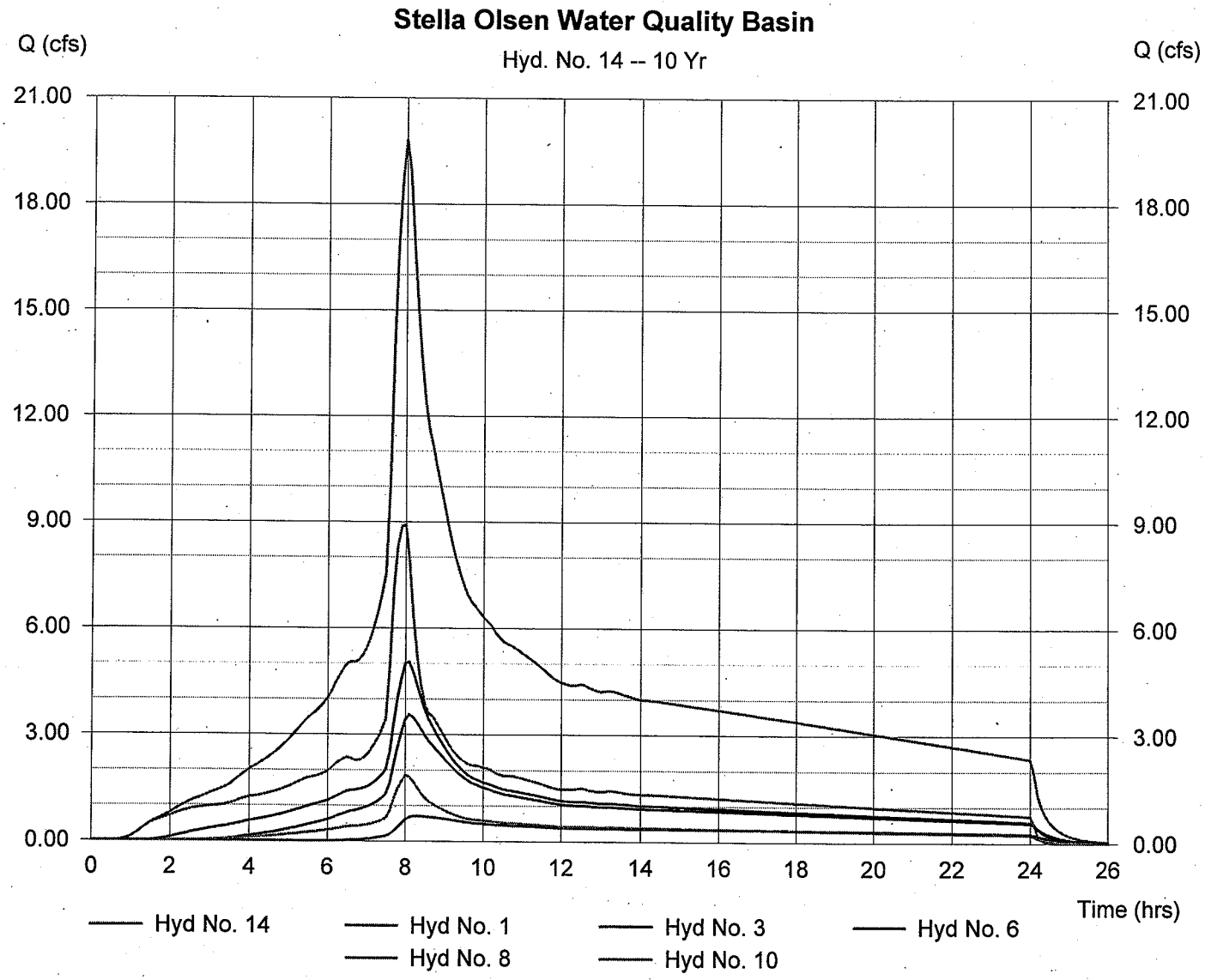
Hyd. No. 14

Stella Olsen Water Quality Basin

Hydrograph type = Combine
Storm frequency = 10 yrs
Inflow hyds. = 1, 3, 6, 8, 10

Peak discharge = 19.81 cfs
Time interval = 6 min

Hydrograph Volume = 350,732 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Friday, Aug 12 2005, 11:8 AM

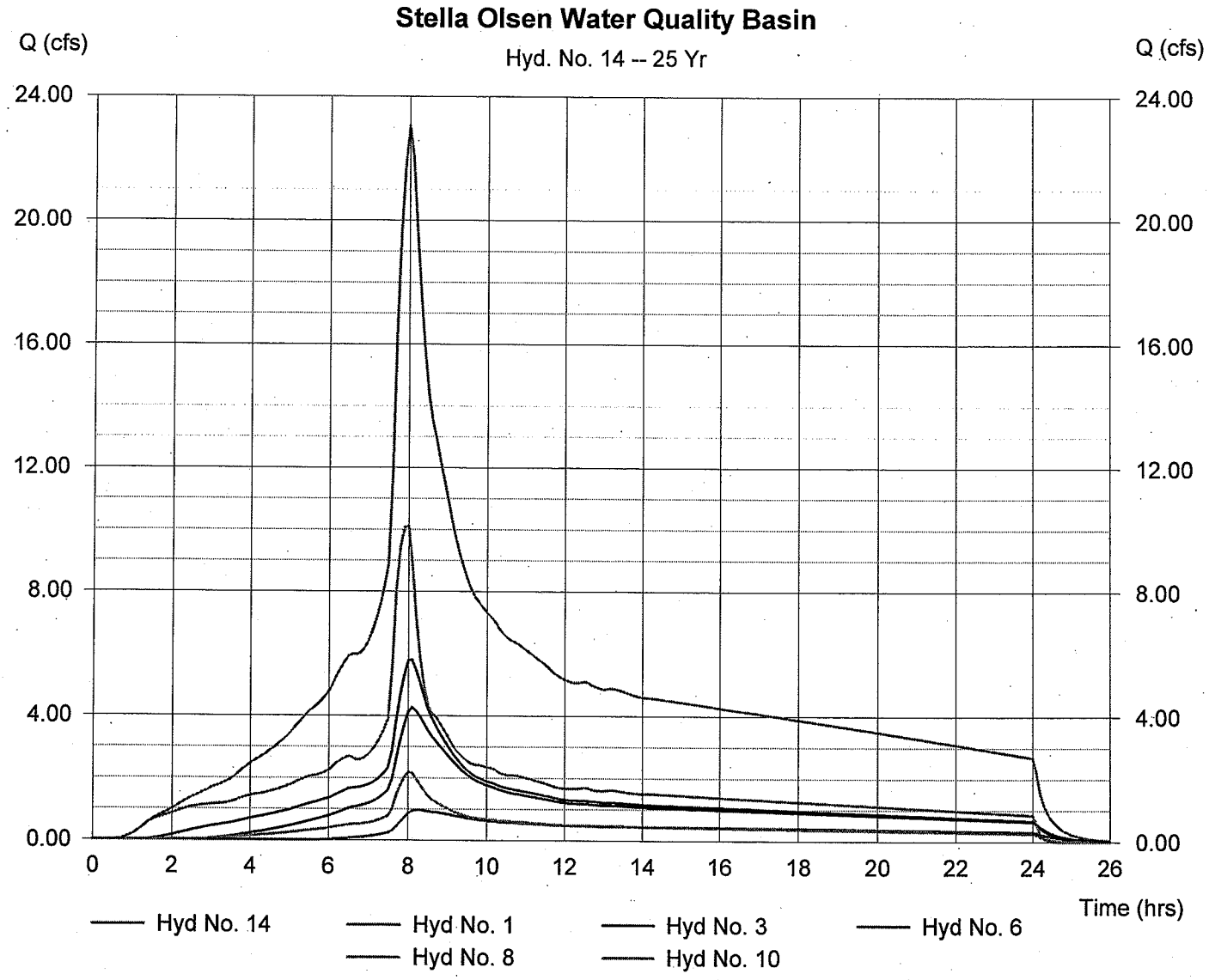
Hyd. No. 14

Stella Olsen Water Quality Basin

Hydrograph type = Combine
Storm frequency = 25 yrs
Inflow hyds. = 1, 3, 6, 8, 10

Peak discharge = 23.05 cfs
Time interval = 6 min

Hydrograph Volume = 407,933 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Friday, Aug 12 2005, 10:57 AM

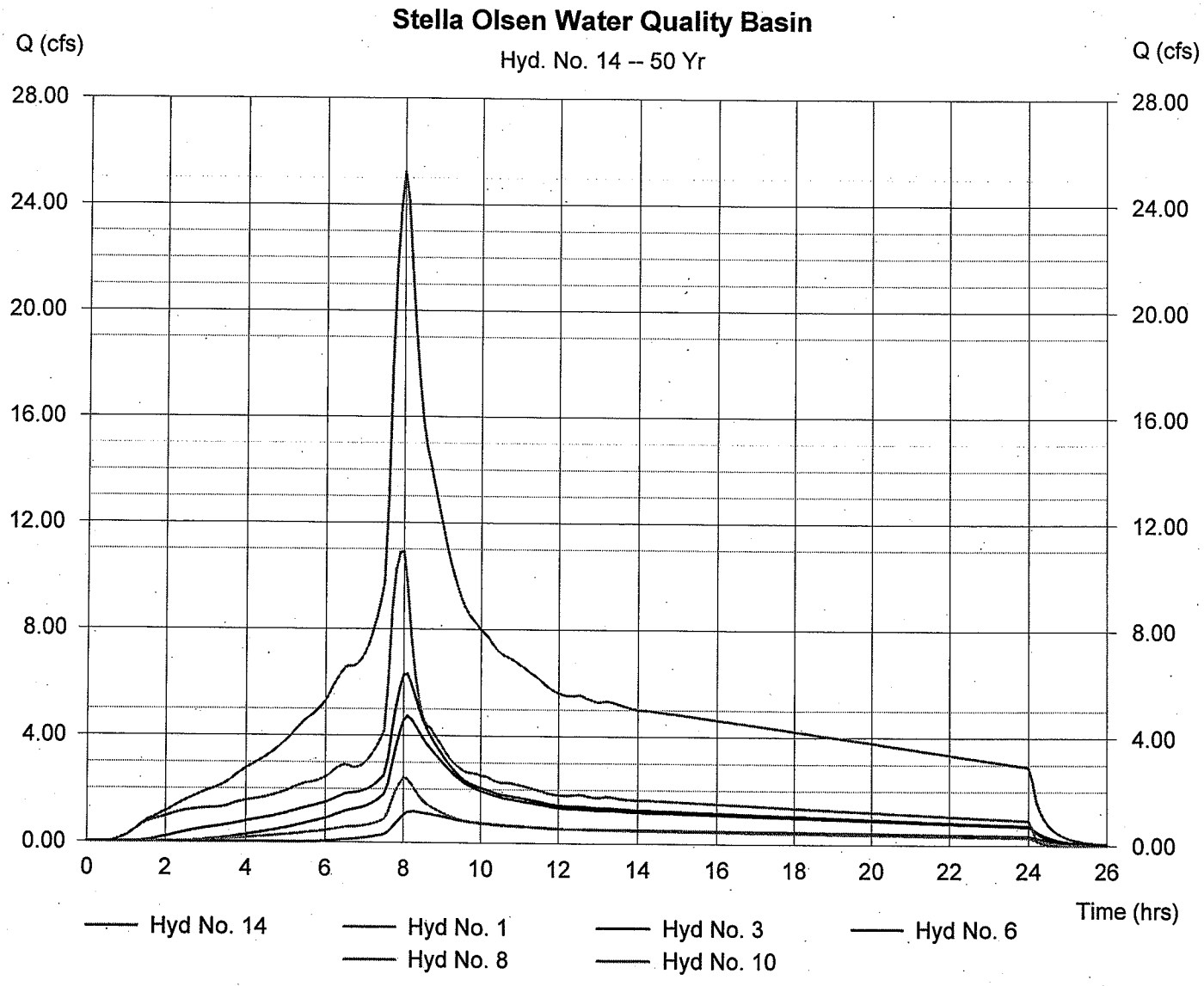
Hyd. No. 14

Stella Olsen Water Quality Basin

Hydrograph type = Combine
Storm frequency = 50 yrs
Inflow hyds. = 1, 3, 6, 8, 10

Peak discharge = 25.23 cfs
Time interval = 6 min

Hydrograph Volume = 446,409 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Friday, Aug 12 2005, 10:57 AM

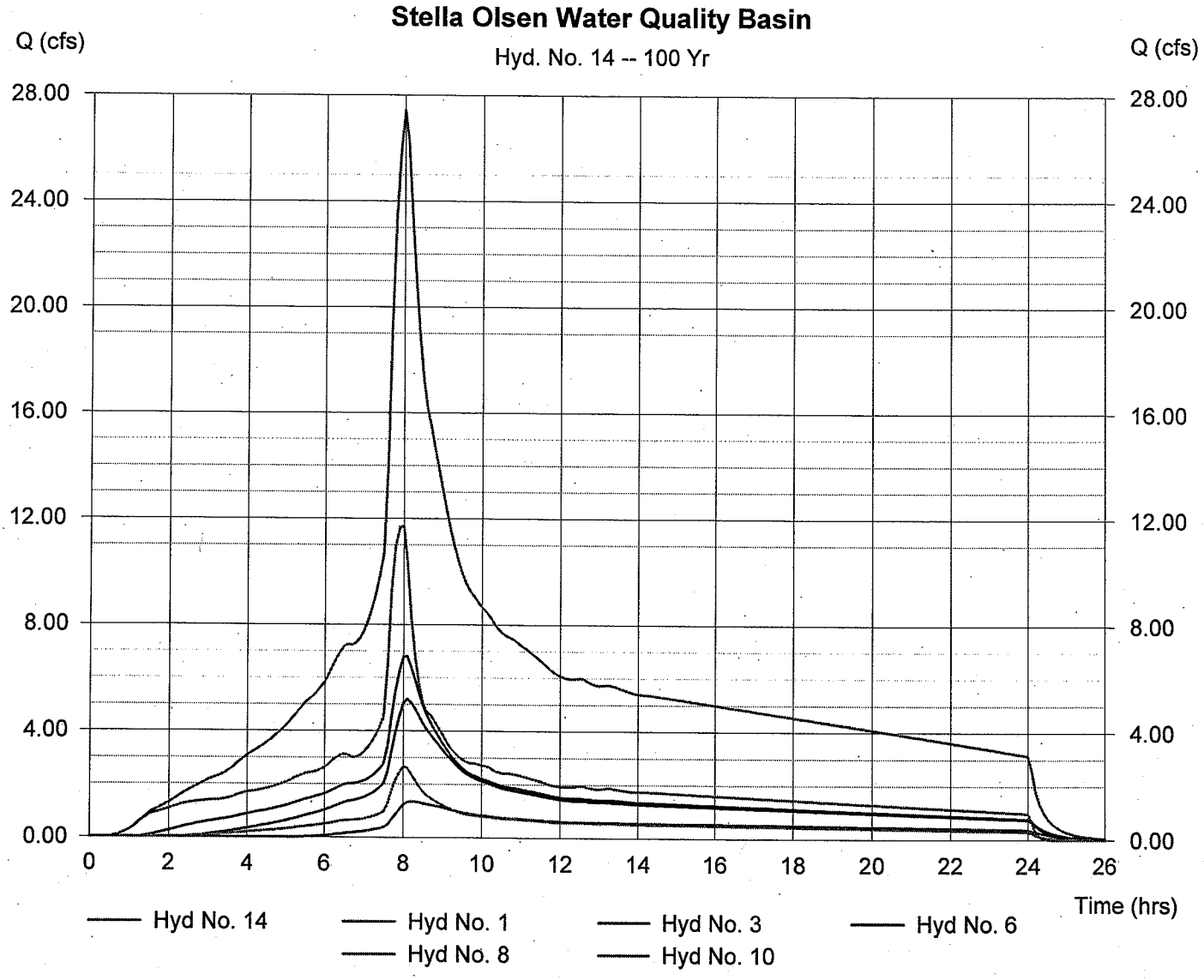
Hyd. No. 14

Stella Olsen Water Quality Basin

Hydrograph type = Combine
Storm frequency = 100 yrs
Inflow hyds. = 1, 3, 6, 8, 10

Peak discharge = 27.41 cfs
Time interval = 6 min

Hydrograph Volume = 485,112 cuft



STELLA OLSEN WATER QUALITY BASIN
25 YEAR HYDROGRAPHS FOR SUBBASINS A, B, C, D, AND E

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Thursday, Aug 11 2005, 4:5 PM

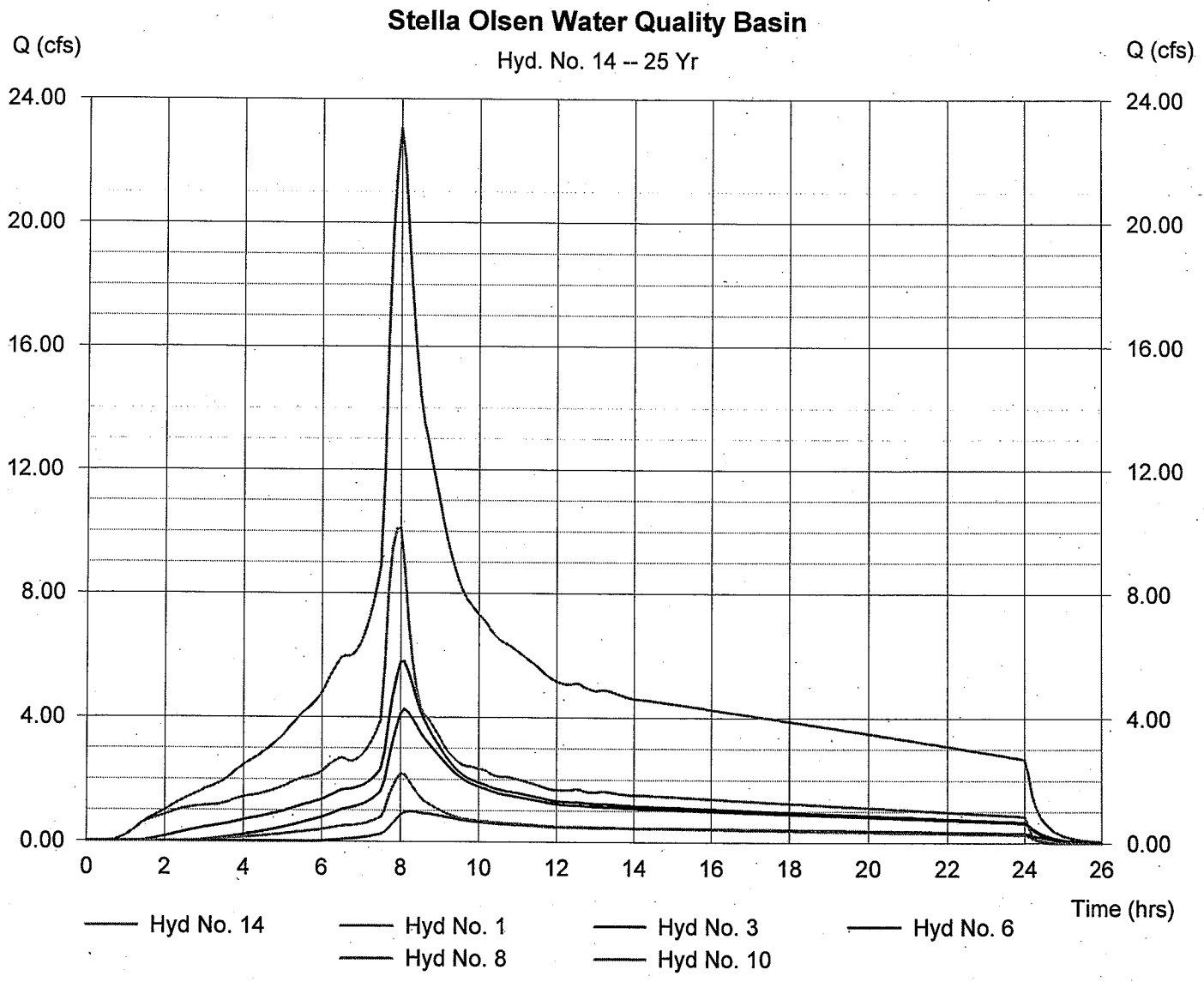
Hyd. No. 14

Stella Olsen Water Quality Basin

Hydrograph type = Combine
Storm frequency = 25 yrs
Inflow hyds. = 1, 3, 6, 8, 10

Peak discharge = 23.05 cfs
Time interval = 6 min

Hydrograph Volume = 407,933 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

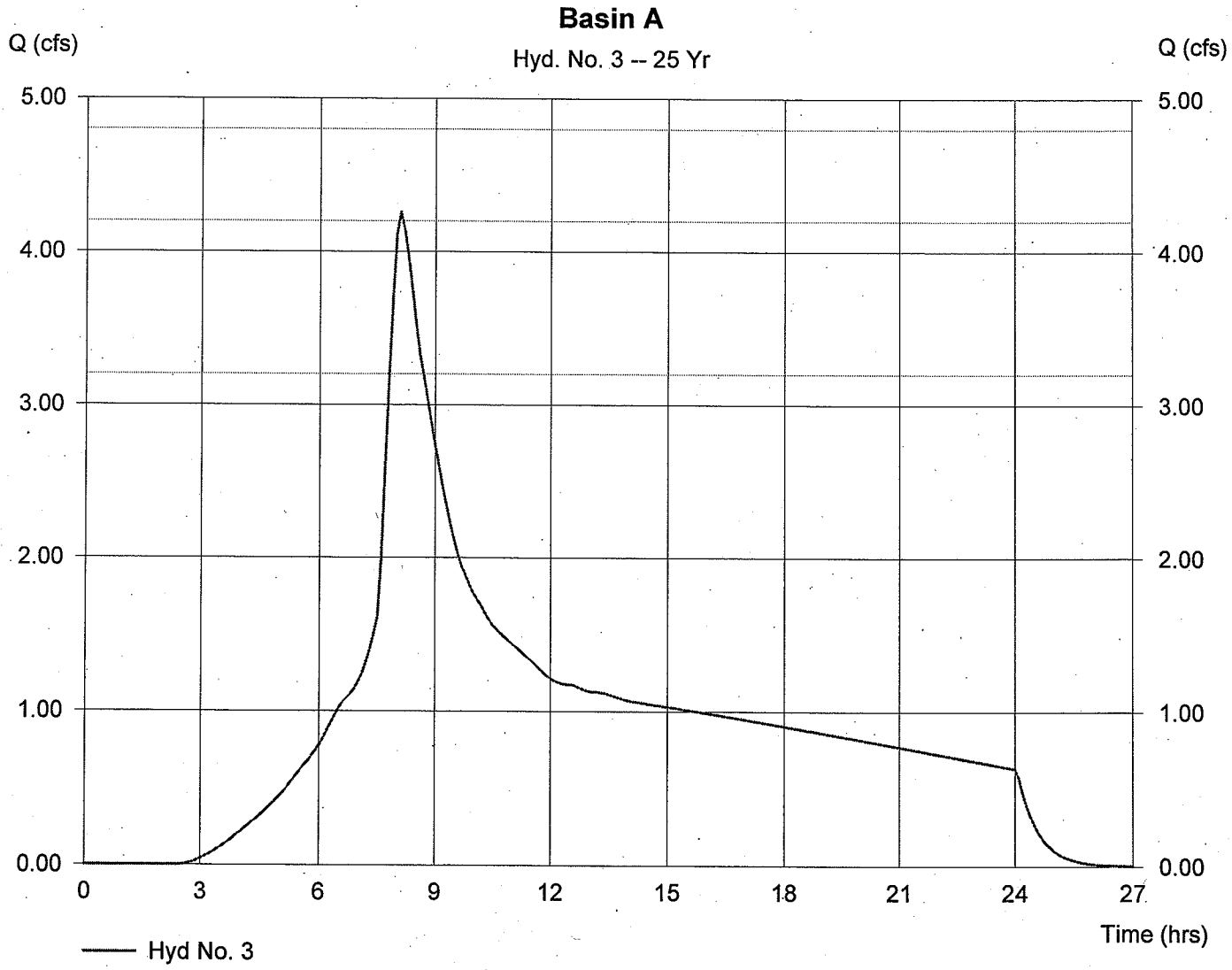
Thursday, Aug 11 2005, 3:33 PM

Hyd. No. 3

Basin A

Hydrograph type	= SBUH Runoff	Peak discharge	= 4.26 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 8.72 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 31 min
Total precip.	= 3.90 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= N/A

Hydrograph Volume = 86,393 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

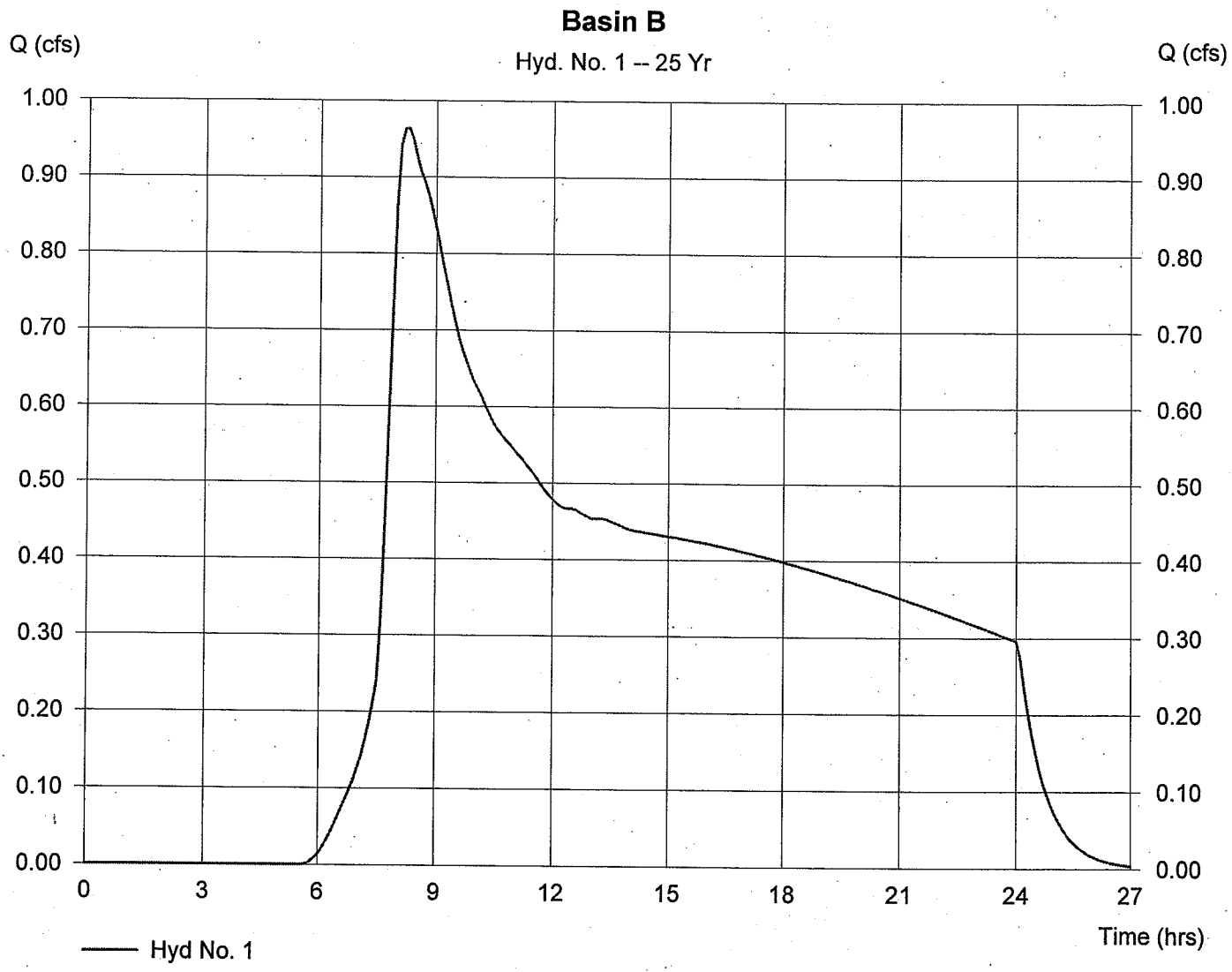
Thursday, Aug 11 2005, 3:33 PM

Hyd. No. 1

Basin B

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.96 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 5.24 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 40 min
Total precip.	= 3.90 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= N/A

Hydrograph Volume = 28,975 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

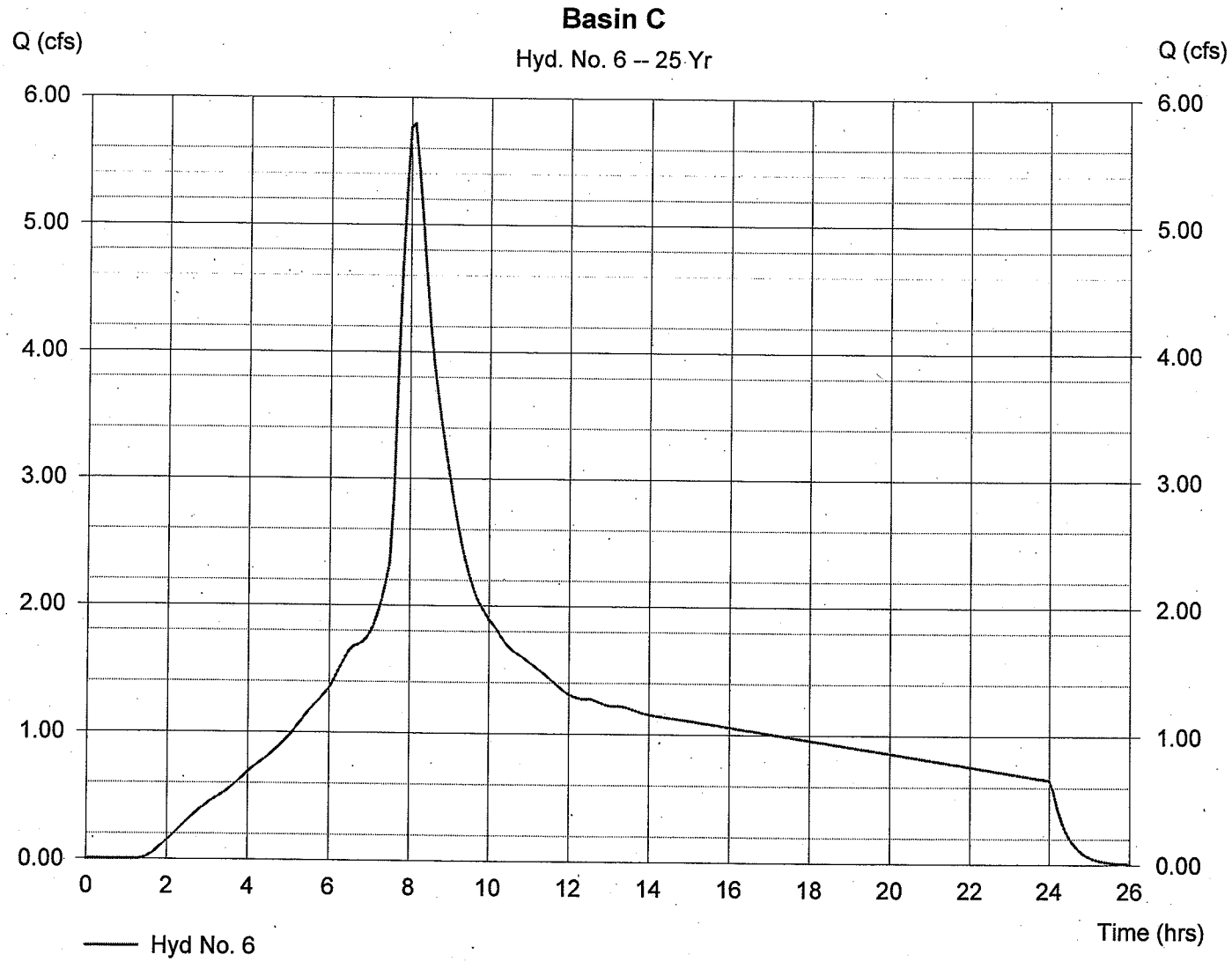
Thursday, Aug 11 2005, 3:36 PM

Hyd. No. 6

Basin C

Hydrograph type	= SBUH Runoff	Peak discharge	= 5.80 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 8.70 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 23.3 min
Total precip.	= 3.90 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= N/A

Hydrograph Volume = 105,245 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

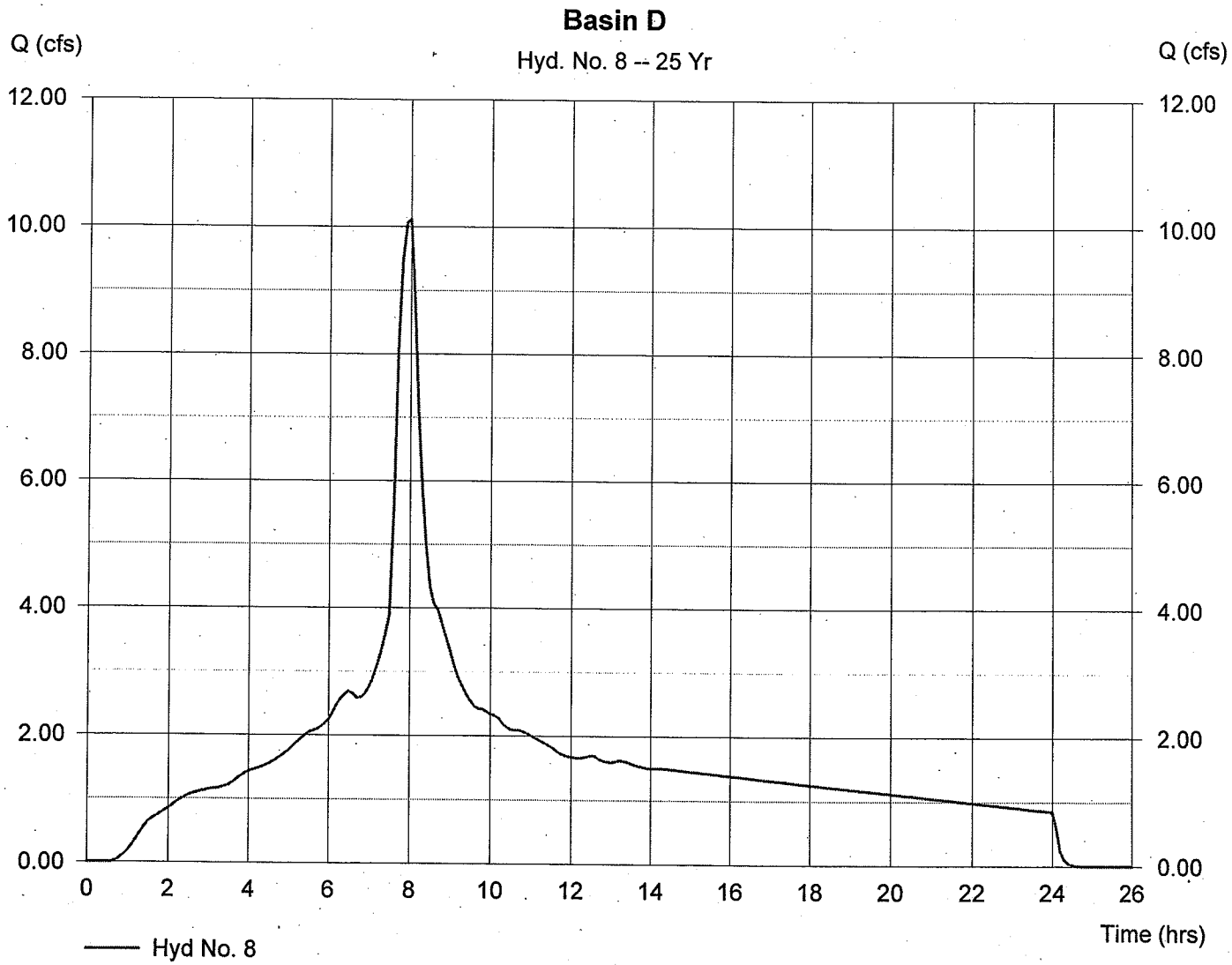
Thursday, Aug 11 2005, 3:36 PM

Hyd. No. 8

Basin D

Hydrograph type	= SBUH Runoff	Peak discharge	= 10.12 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 11.32 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 7 min
Total precip.	= 3.90 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= N/A

Hydrograph Volume = 150,615 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

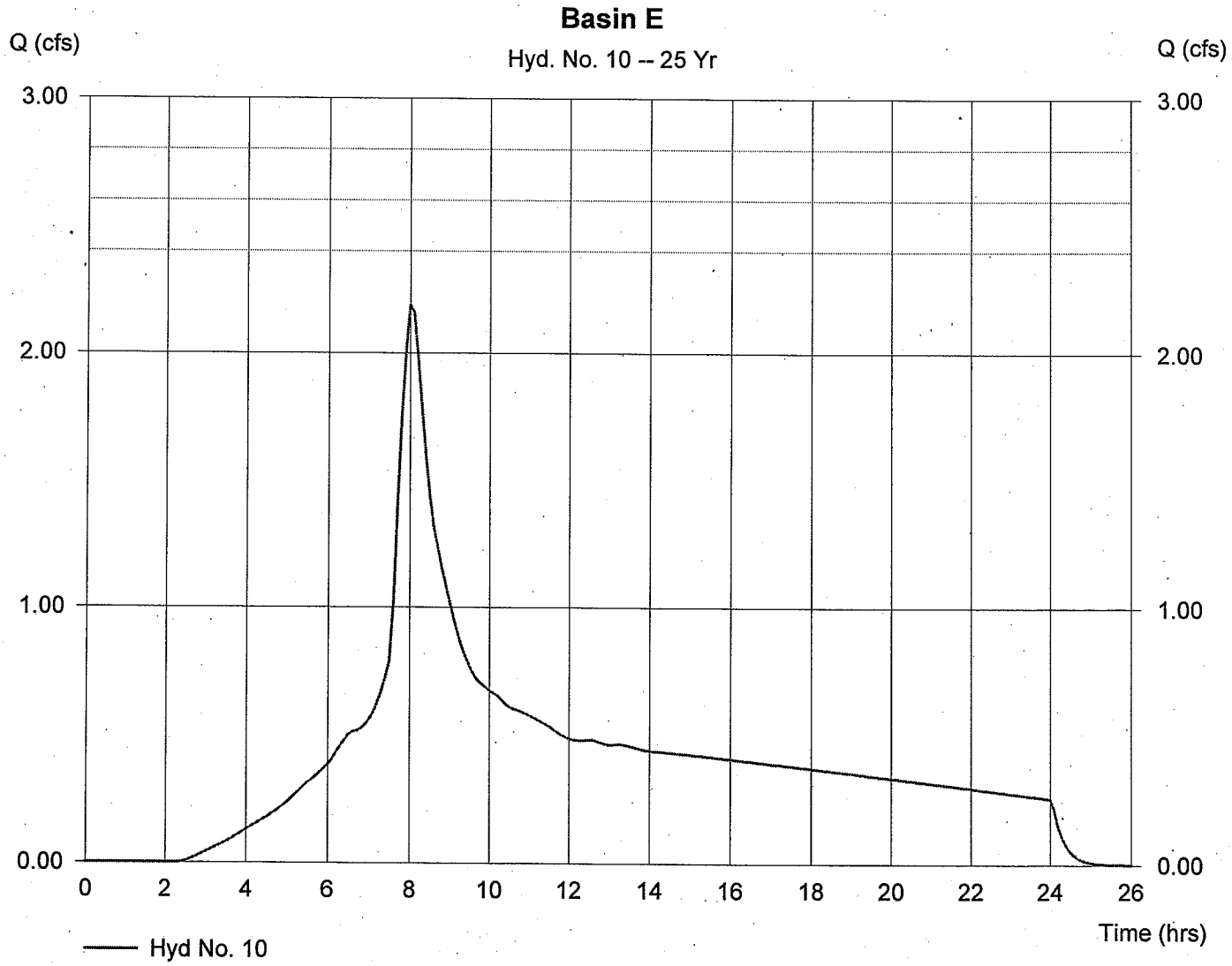
Thursday, Aug 11 2005, 3:38 PM

Hyd. No. 10

Basin E

Hydrograph type	= SBUH Runoff	Peak discharge	= 2.19 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 3.58 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 17 min
Total precip.	= 3.90 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= N/A

Hydrograph Volume = 36,705 cuft



Sherwood Downtown Streetscape

Weir Stage Calculations

Prepared by Harper Houf Peterson Righellis Inc.
Job No. CBI-01
July 2005

Elevation At Weir Box	H (ft) at WQ Weir	C Value for WQ Weir See Table 2	Q (cfs) WQ Weir	H (ft) at Overflow Weir	C Value for Overflow Weir See Table 2	Q (cfs) Overflow Weir	Total Q (cfs) of Both Weirs	Storm Event	Swale Depth (ft)
166.00	0.00	2.49	0.000						0.00
166.10	0.10	2.49	0.787						0.34
166.15	0.15	2.49	1.447						0.48
166.151	**0.151**	**2.49**	**1.455**	0.001	**2.340**	0.000	**1.455**	**WQ**	**0.49**
166.20	0.20	2.49	2.227	0.050	2.340	0.157	2.384		0.61
166.30	0.30	2.53	4.157	0.150	2.420	0.844	5.001		0.86
166.40	0.40	2.56	6.476	0.250	2.500	1.875	8.351		1.09
166.50	0.50	2.63	9.298	0.350	2.600	3.230	12.529		1.32
166.513	**0.513**	**2.63**	**9.671**	0.363	**2.610**	3.429	**13.100**	**2-yr**	**1.35**
166.60	0.60	2.69	12.502	0.450	2.700	4.890	17.392		1.56
166.650	**0.650**	**2.69**	**14.087**	0.500	**2.700**	5.722	**19.810**	**10-yr**	**1.66**
166.70	0.70	2.69	15.754	0.550	2.690	6.583	22.338		1.77
166.715	**0.715**	**2.68**	**16.198**	0.565	**2.690**	6.852	**23.050**	**25-yr**	**1.80**
166.75	0.75	2.69	17.472	0.600	2.690	7.501	24.973		1.88
166.757	**0.757**	**2.68**	**17.634**	0.607	**2.680**	7.595	**25.230**	**50-yr**	**1.89**
166.797	**0.797**	**2.68**	**19.051**	0.647	**2.680**	8.359	**27.410**	**100-yr**	**1.97**

$Q = CbH^{3/2}$

H = Head on the weir, feet	*Measured from Elevation 166.00 for Water Quality Weir and Elevation 166.15 for Overflow Weir*
b = Width of weir opening, feet	*10 feet for Water Quality Weir, 6 feet for Overflow Weir*
C = Coefficient of discharge, dimensionless	*Varies with H, Estimated Value Based on Table 2*

TABLE 2. VALUES OF C IN BROAD-CRESTED WEIR FORMULA

Out of Brater : King's Handbook of Hydraulics

Water Quality Overflow

Broad Crested →

← Sharp Crested

Measured Head, H ft	Breadth of Crest of Weir, ft										
	0.50	0.75	1.00	1.50	2.00	2.50	3.00	4.00	5.00	10.00	15.00
0.2	2.80	2.75	2.69	2.62	2.54	2.48	2.44	2.38	2.34	2.49	2.68
0.4	2.92	2.80	2.72	2.64	2.61	2.60	2.58	2.54	2.50	2.52 2.56	2.70
0.6	3.08	2.89	2.75	2.64	2.61	2.60	2.68	2.69	2.70	2.62 2.69	2.70
0.8	3.30	3.04	2.85	2.68	2.63	2.60	2.67	2.68	2.68	2.68	2.64
1.0	3.32	3.14 3.087	2.98	2.75	2.66	2.64	2.65	2.67	2.68	2.69	2.63
1.2	3.32	3.20	3.08	2.86	2.70	2.65	2.64	2.67	2.66	2.67	2.64
1.4	3.32	3.26	3.20	2.92	2.77	2.68	2.64	2.65	2.65	2.64	2.64
1.6	3.32	3.29	3.28	3.04	2.84	2.71	2.68	2.66	2.63	2.64	2.63
1.8	3.32	3.32	3.30	3.07	2.88	2.74	2.68	2.66	2.63	2.64	2.63
2.0	3.32	3.32	3.31	3.14	2.95	2.76	2.72	2.68	2.65	2.64	2.63
2.5	3.32	3.32	3.32	3.28	3.07	2.89	2.81	2.72	2.66	2.64	2.63
3.0	3.32	3.32	3.32	3.32	3.20	3.05	2.92	2.73	2.67	2.64	2.63
3.5	3.32	3.32	3.32	3.32	3.32	3.19	2.97	2.76	2.68	2.64	2.63
4.0	3.32	3.32	3.32	3.32	3.32	3.32	3.07	2.79	2.70	2.64	2.63
4.5	3.32	3.32	3.32	3.32	3.32	3.32	3.32	2.88	2.74	2.64	2.63
5.0	3.32	3.32	3.32	3.32	3.32	3.32	3.32	3.07	2.79	2.64	2.63
5.5	3.32	3.32	3.32	3.32	3.32	3.32	3.32	3.32	2.88	2.64	2.63

Downtown Sherwood Streetscape

2-yr Storm in Water Quality Swale

Natural Channels

CIVIL TOOLS PRO
English Units
09-15-2005 11:32:12

Data Entered

Flow Rate	=	9.67 cfs
Channel Slope	=	0.0050 V:H

from weir stage calculations

Distance (ft)	Elevation (ft)	Manning's N
-8.01	2.90	0.240
-8.00	0.90	0.240
-7.00	0.50	0.240
-5.00	0.00	0.240
5.00	0.00	0.240
7.00	0.50	0.240
8.00	0.90	0.240
8.01	2.90	0.240

Results

Flow Depth	=	1.35 ft
Flow Rate	=	9.67 cfs
Channel Slope	=	0.0050 V:H
Wetted Area	=	19.23 sq ft
Wetted Perimeter	=	17.18 ft
Flow Velocity	=	0.50 ft/s
Froude's Number	=	0.08
Flow Regime	=	sub-critical flow

← Depth for flow rate = 9.67cfs based on swale geometry

Downtown Sherwood Streetscape

10-yr Storm in Water Quality Swale

Natural Channels

CIVIL TOOLS PRO
English Units
09-15-2005 11:33:50

Data Entered

Flow Rate	=	14.09 cfs
Channel Slope	=	0.0050 V:H

Distance (ft)	Elevation (ft)	Manning's N
-8.01	2.90	0.240
-8.00	0.90	0.240
-7.00	0.50	0.240
-5.00	0.00	0.240
5.00	0.00	0.240
7.00	0.50	0.240
8.00	0.90	0.240
8.01	2.90	0.240

Results

Flow Depth	=	1.66 ft
Flow Rate	=	14.09 cfs
Channel Slope	=	0.0050 V:H
Wetted Area	=	24.24 sq ft
Wetted Perimeter	=	17.81 ft
Flow Velocity	=	0.58 ft/s
Froude's Number	=	0.08
Flow Regime	=	sub-critical flow

Downtown Sherwood Streetscape

25-yr Storm in Water Quality Swale

Natural Channels

CIVIL TOOLS PRO
English Units
09-15-2005 11:34:43

Data Entered

Flow Rate	=	16.20 cfs
Channel Slope	=	0.0050 V:H

Distance (ft)	Elevation (ft)	Manning's N
-8.01	2.90	0.240
-8.00	0.90	0.240
-7.00	0.50	0.240
-5.00	0.00	0.240
5.00	0.00	0.240
7.00	0.50	0.240
8.00	0.90	0.240
8.01	2.90	0.240

Results

Flow Depth	=	1.80 ft
Flow Rate	=	16.20 cfs
Channel Slope	=	0.0050 V:H
Wetted Area	=	26.41 sq ft
Wetted Perimeter	=	18.08 ft
Flow Velocity	=	0.61 ft/s
Froude's Number	=	0.08
Flow Regime	=	sub-critical flow

Downtown Sherwood Streetscape

50-yr Storm in Water Quality Swale

Natural Channels

CIVIL TOOLS PRO
English Units
09-15-2005 11:35:37

Data Entered

Flow Rate	=	17.63 cfs
Channel Slope	=	0.0050 V:H

Distance (ft)	Elevation (ft)	Manning's N
-8.01	2.90	0.240
-8.00	0.90	0.240
-7.00	0.50	0.240
-5.00	0.00	0.240
5.00	0.00	0.240
7.00	0.50	0.240
8.00	0.90	0.240
8.01	2.90	0.240

Results

Flow Depth	=	1.89 ft
Flow Rate	=	17.63 cfs
Channel Slope	=	0.0050 V:H
Wetted Area	=	27.81 sq ft
Wetted Perimeter	=	18.25 ft
Flow Velocity	=	0.63 ft/s
Froude's Number	=	0.08
Flow Regime	=	sub-critical flow

Downtown Sherwood Streetscape

100-yr Storm in Water Quality Swale

Natural Channels

CIVIL TOOLS PRO
English Units
09-15-2005 11:36:13

Data Entered

Flow Rate	=	19.05 cfs
Channel Slope	=	0.0050 V:H

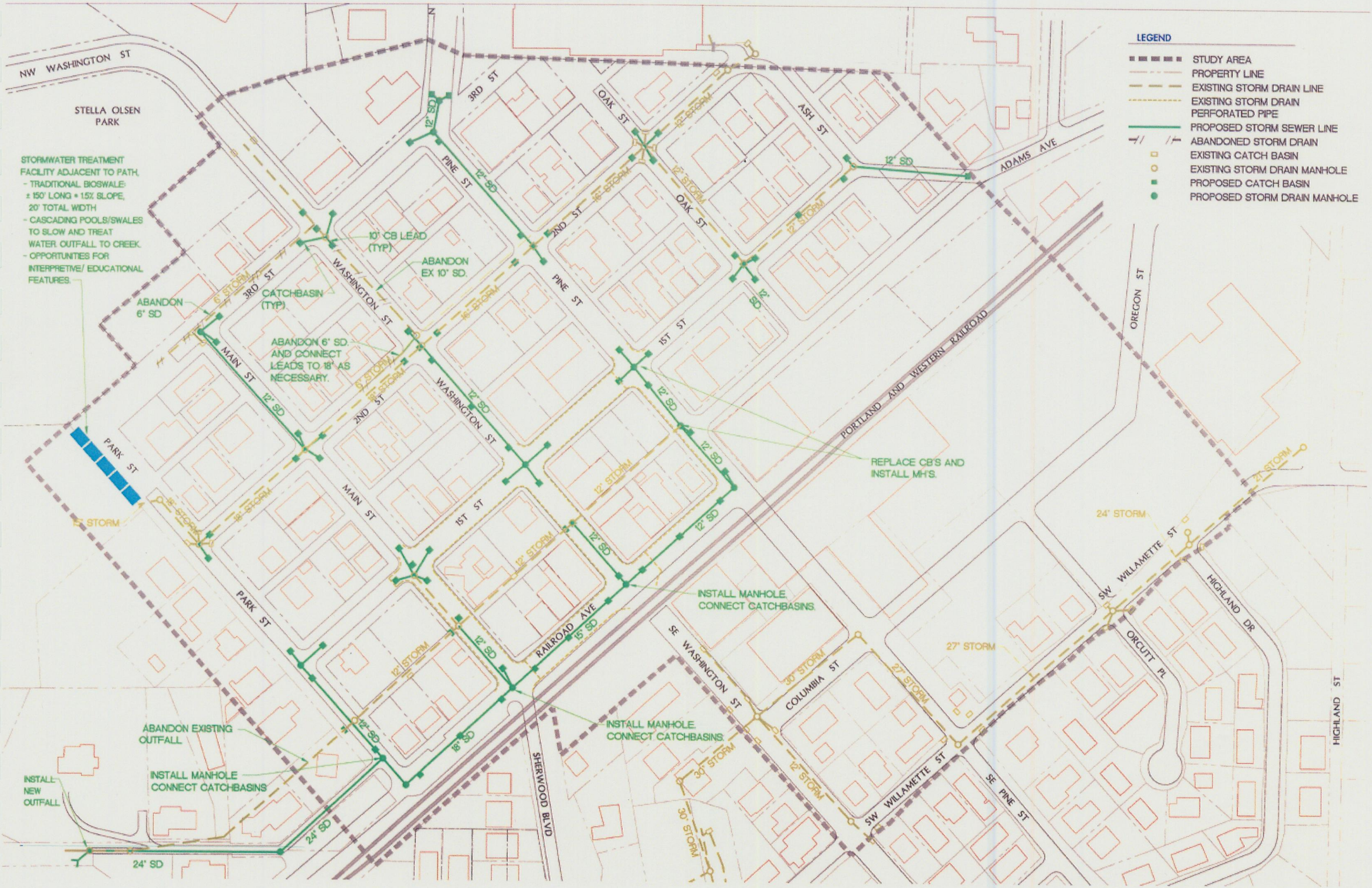
Distance (ft)	Elevation (ft)	Manning's N
-8.01	2.90	0.240
-8.00	0.90	0.240
-7.00	0.50	0.240
-5.00	0.00	0.240
5.00	0.00	0.240
7.00	0.50	0.240
8.00	0.90	0.240
8.01	2.90	0.240

Results

Flow Depth	=	1.97 ft
Flow Rate	=	19.05 cfs
Channel Slope	=	0.0050 V:H
Wetted Area	=	29.15 sq ft
Wetted Perimeter	=	18.42 ft
Flow Velocity	=	0.65 ft/s
Froude's Number	=	0.09
Flow Regime	=	sub-critical flow

APPENDIX D

STREETSCAPE MASTERPLAN STORM SEWER
OVERALL BASIN MAP
CONVEYANCE AND INLET BASIN MAP
CONVEYANCE CALCULATIONS
STORM SEWER SERVICES
DEPTH AND SPREAD FORMULAS
INLET CAPACITY FORMULAS
DEPTH, SPREAD AND INLET CAPACITY SPREADSHEET (10 YEAR EVENT)
DEPTH, SPREAD AND INLET CAPACITY SPREADSHEET (100 YEAR EVENT)
WATER SURFACE PROFILE


NW WASHINGTON ST
STELLA OLSEN PARK
STORMWATER TREATMENT FACILITY ADJACENT TO PATH.
- TRADITIONAL BIOSWALE: ± 150' LONG • 1.5% SLOPE, 20' TOTAL WIDTH
- CASCADING POOLS/SWALES TO SLOW AND TREAT WATER. OUTFALL TO CREEK.
- OPPORTUNITIES FOR INTERPRETIVE/ EDUCATIONAL FEATURES.
ABANDON 6" SD
6" STORM
3RD ST
10" CB LEAD (TYP)
CATCHBASIN (TYP)
WASHINGTON ST
ABANDON EX 10" SD.
ABANDON 6" SD. AND CONNECT LEADS TO 18" AS NECESSARY.
MAIN ST
12" SD
PARK ST
18" STORM
2ND ST
15" STORM
PINE ST
1ST ST
OAK ST
ASH ST
ADAMS AVE
OREGON ST
PORTLAND AND WESTERN RAILROAD
REPLACE CB'S AND INSTALL MH'S.
INSTALL MANHOLE, CONNECT CATCHBASINS.
RAILROAD AVE
15" SD
18" SD
ABANDON EXISTING OUTFALL
INSTALL MANHOLE CONNECT CATCHBASINS
INSTALL NEW OUTFALL
24" SD
SHERWOOD BLVD
SE WASHINGTON ST
COLUMBIA ST
30" STORM
27" STORM
24" STORM
SW WILLAMETTE ST
SE PINE ST
ORCUTT PL
HIGHLAND DR
HIGHLAND ST
LEGEND
STUDY AREA
PROPERTY LINE
EXISTING STORM DRAIN LINE
EXISTING STORM DRAIN PERFORATED PIPE
PROPOSED STORM SEWER LINE
ABANDONED STORM DRAIN
EXISTING CATCH BASIN
EXISTING STORM DRAIN MANHOLE
PROPOSED CATCH BASIN
PROPOSED STORM DRAIN MANHOLE

LEGEND

- (12) MANHOLE ID
- (23) BASIN ID
- BASIN LINE

0 40 80 160

SCALE: 1" = 80'

PROPOSED STELLA OLSEN WATER QUALITY SWALE

EXISTING VILLA SWALE

2ND STREET

1ST STREET

RAILROAD STREET

OREGON STREET

MAIN STREET

WASHINGTON STREET

PINE STREET

OAK STREET

ASH STREET

PARK STREET

DATE	NO.	DESCRIPTION
		REVISIONS

DESIGNED: BRA

DRAWN: JTL

CHECKED: KAS

DATE: JULY 2005

REGISTERED PROFESSIONAL ENGINEER 72,311 OREGON NOV. 12, 2002 KIMBERLY ANN SHERMAN

EXPIRES: 6/30/2006

HHPR Harper Houf Peterson Righellis Inc.

ENGINEERS • PLANNERS • SURVEYORS

5200 SW MACADAM AVENUE, SUITE 580, PORTLAND, OR 97239

TEL 503.221.1131 www.hhpr.com FAX 503.221.1171

SHERWOOD DOWNTOWN STREETSCAPE IMPROVEMENTS - PHASE A

OVERALL CONVEYANCE MAP

SHERWOOD, OREGON

SHEET NO. 1 OF 1

JOB NO. CBI-01

NOTE: SEE OVERALL CONVEYANCE MAP FOR EXTENTS OF THESE BASINS

0 20 40 80
SCALE: 1" = 80'

2ND STREET
MAIN STREET
WASHINGTON STREET
PINE STREET
1ST STREET
OREGON STREET
RAILROAD STREET
PARK STREET

SEE SHEET 2

LEGEND
- (12) MANHOLE ID
- [28] INLET ID
- (4) BASIN ID
- DRAINAGE BASIN LINE
- DRAINAGE ARROWS

CONVEYANCE AND INLET BASIN MAP
SHERWOOD DOWNTOWN STREETSCAPE IMPROVEMENTS - PHASE A
SHERWOOD, OREGON

Harper Houf Peterson Righellis Inc.
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REGISTERED PROFESSIONAL ENGINEER
OREGON JULY 12, 1977
KIMBERLY ANN SHERMAN
EXPIRES: 6/30/2006

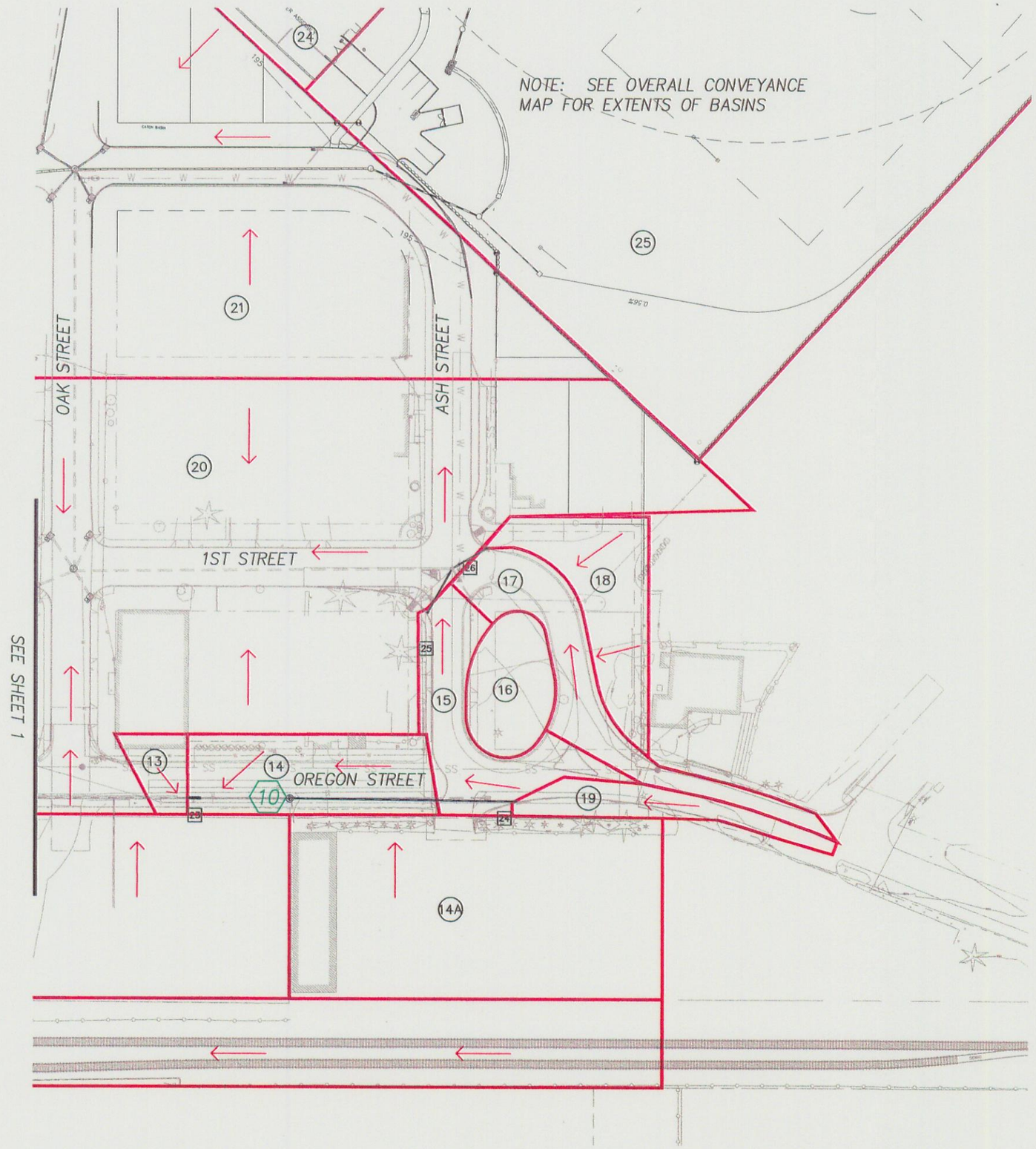
DESIGNED:	BRA	DATE:	JULY 2005
DRAWN:	JTL		
CHECKED:	KAS		

REVISIONS

NO.	DESCRIPTION	DATE

SHEET NO. 1 OF 2

JOB NO. CBI-01



BASIN ID	AREA	C VALUE
1A	0.09 AC	0.9
1B	0.13 AC	0.9
1C	0.36 AC	0.9
1D	0.05 AC	0.9
2A	0.11 AC	0.9
2B	0.11 AC	0.9
3	0.16 AC	0.9
3A	0.29 AC	0.9
3B	0.06 AC	0.9
3C	0.29 AC	0.9
3D	0.20 AC	0.9
4	0.33 AC	0.9
4A	0.10 AC	0.9
4B	0.11 AC	0.9
4C	0.10 AC	0.9
4D	0.20 AC	0.9
4E	0.21 AC	0.9
5	0.13 AC	0.9
6	0.05 AC	0.9
7	0.24 AC	0.9
7A	0.13 AC	0.9
7B	0.09 AC	0.9
7C	0.11 AC	0.9
7D	0.10 AC	0.9
7E	0.10 AC	0.9
7F	0.11 AC	0.9
7G	0.10 AC	0.9
8	0.19 AC	0.9
8A	0.04 AC	0.9
8B	0.05 AC	0.9
8C	0.13 AC	0.9
9	0.21 AC	0.9
10	0.26 AC	0.9
10A	0.05 AC	0.9
10B	0.86 AC	0.5
10C	0.53 AC	0.9
11	0.12 AC	* 0.68
11A	0.24 AC	0.9
11B	0.14 AC	0.9
12	0.07 AC	* 0.71
12A	0.89 AC	* 0.66
13	0.05 AC	* 0.77
14	0.21 AC	* 0.71
14A	0.73 AC	0.9
15	0.18 AC	0.9
16	0.11 AC	0.25
17	0.19 AC	0.9
18	0.18 AC	* 0.61
19	0.09 AC	0.9
20	2.62 AC	0.9
21	8.70 AC	0.5
22	1.80 AC	0.5
23	1.78 AC	0.5
24	4.17 AC	0.90
25	8.44 AC	0.50

* COMPOSITE C VALUE

LEGEND

- (12) MANHOLE ID
- [28] INLET ID
- (4) BASIN ID
- DRAINAGE BASIN LINE
- DRAINAGE ARROWS

CONVEYANCE AND INLET BASIN MAP
SHERWOOD DOWNTOWN STREETSCAPE IMPROVEMENTS - PHASE A
SHERWOOD, OREGON

Harper Houf Peterson Righellis Inc.
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TEL 503.221.1131 www.hhpr.com FAX 503.221.1171

REGISTERED PROFESSIONAL ENGINEER OREGON JULY 12, 2002 KIMBERLY ANN Kimberly Ann Sherar EXPIRES: 6/30/2006

DESIGNED:	BRA	CHECKED:	KAS
DRAWN:	JTL	DATE:	JULY 2005

NO.	DESCRIPTION	DATE
	REVISIONS	

SHEET NO. 2 OF 2

JOB NO. CBI-01

Sherwood Downtown Streetscape

Conveyance Calculations - 10-Year Rational Method

Prepared by Harper Houf Peterson Righellis Inc.
Job No. CBI-01
July 2005

Pipe Segment	Basins Added	Pipe Segment Length	Total Added Area (ac)	C (--)	Combined Area (ac)	Combined C (--)	T_c (min)	T_t Travel Time in Pipe (min)	Rainfall Intensity (in/hr)	Pipe Size (in)	N (--)	Q_{10} (cfs)	Slope (%)	$Q_{CAPACITY}$ (cfs)	Min. Slope (%)	Velocity Full (fps)
CB 24 TO MH 10	19	154.69	0.09	0.90	0.09	0.90	5.0	0.64	3.00	10	0.013	0.24	1.00%	2.19	0.01%	4.02
MH 10 TO MH 9	14,14A,13,12,12A,11	368.00	1.81	0.77	1.90	0.78	6.0	1.15	2.84	12	0.013	4.19	1.39%	4.20	1.38%	5.35
MH 9 TO MH 8	10C	37.04	0.53	0.90	2.43	0.80	7.0	0.07	2.68	15	0.013	5.23	2.83%	10.87	2.83%	8.86
MH 8 TO MH 7	10,10A,10B,11A	170.67	1.41	0.66	3.84	0.75	7.0	0.48	2.68	18	0.013	7.72	1.00%	10.51	0.54%	5.95
MH 7 TO MH 6	9,8,8A,8B,8C,7,7A,7B,7C,7D, 7E,7F,7G,15,16,17,18,20	266.26	4.88	0.87	8.72	0.82	7.0	0.71	2.68	24	0.013	19.10	0.76%	19.73	0.71%	6.28
MH 6 TO MH 5	6,5,4A,4B,4C,4D,4E	260.86	0.90	0.90	9.62	0.83	8.0	0.60	2.52	24	0.013	20.00	1.02%	22.86	0.78%	7.28
MH 5 TO MH 4	4,3,3A,3B,3C,3D	259.01	1.33	0.90	10.95	0.83	9.0	1.02	2.36	36	0.013	21.56	0.20%	29.84	0.10%	4.22
MH 4 TO MH 3	22,21	235.20	10.50	0.76	21.45	0.80	10.0	0.73	2.20	36	0.013	37.65	0.32%	37.74	0.32%	5.34
MH 3 TO MH 2	23	55.91	1.78	0.50	23.23	0.78	10.0	0.17	2.20	36	0.013	39.61	0.32%	37.74	0.35%	5.34
MH 2 TO MH 1	N/A	102.09	0.00	0.00	23.23	0.78	10.0	0.05	2.20	36	0.013	39.61	15.63%	263.78	0.35%	37.32
MH 1 TO OUTFALL	N/A	10.00	0.00	0.00	23.23	0.78	10.0	0.01	2.20	36	0.013	39.61	2.00%	94.36	0.35%	13.35
DI 1 TO MH 8A	10B	42.21	0.86	0.50	0.86	0.50	5.0		3.00	12	0.013	1.29	1.99%	5.03	0.13%	6.40
MH 8A TO MH 8	10,10A	125.32	0.31	0.90	1.17	0.61	5.0		3.00	12	0.013	2.13	2.00%	5.04	0.36%	6.42
CO 3 TO MH 12	1C	55.91	0.36	0.90	0.36	0.90	5.0		3.00	12	0.013	0.97	0.50%	2.52	0.07%	3.21
MH 12 TO EX. MH	1A,1B,1D,2A,2B	125.58	0.50	0.90	0.86	0.90	5.0		3.00	12	0.013	2.32	0.50%	2.52	0.42%	3.21

Note: C values are as follows: Impervious (0.9), Medium Density Residential (0.5), and Landscaping (0.25).

Sherwood Downtown Streetscape
100-Year Rational Method Storm Event

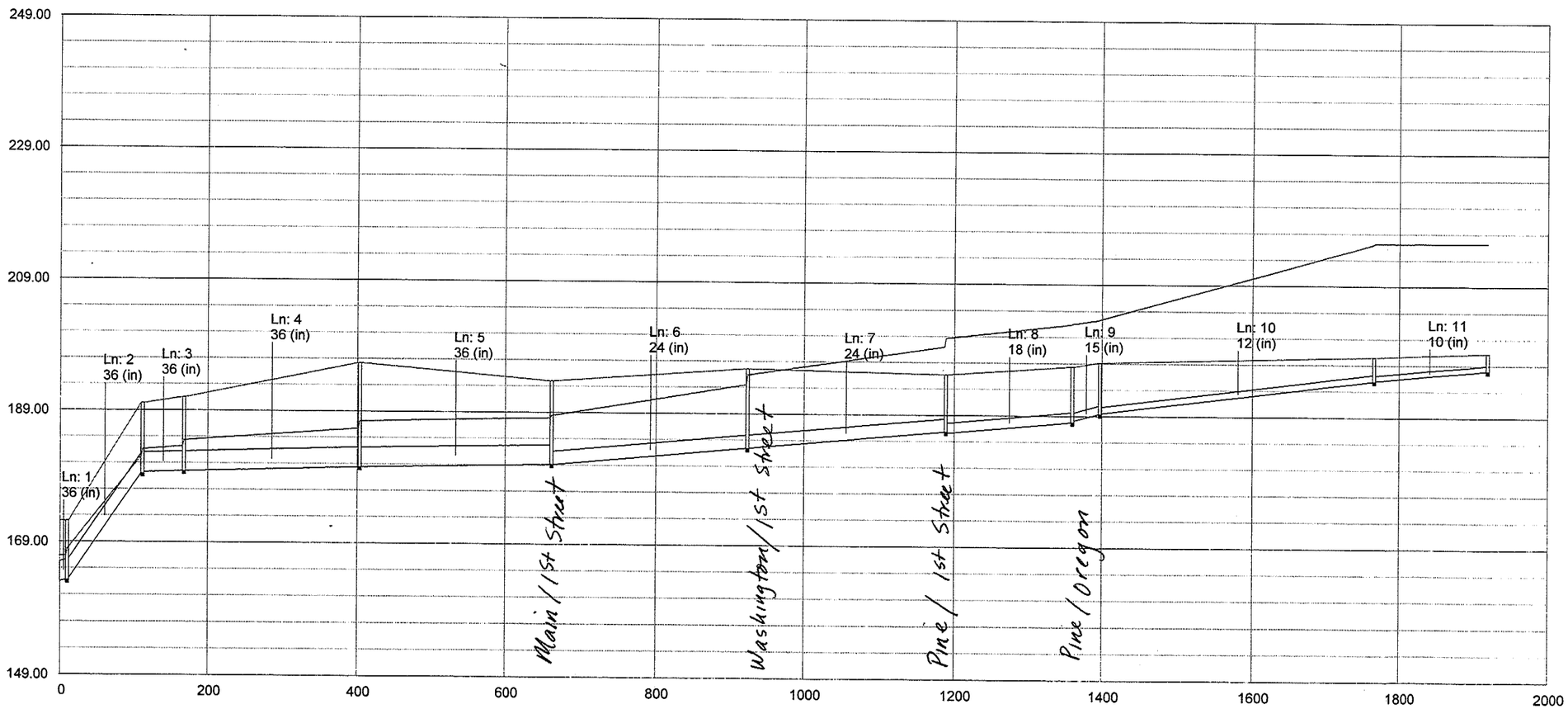
Peak Flow Calculations							Depth and Spread Calculations					Inlet Capacity Calculations														
Inlet Number (See the Conveyance and Inlet Basin Map for Inlet Location)	Basin Area (acres)	Time of Conc (min)	100 yr Intensity (in/hr)	C-value	Q_{10} (cfs)	Q_{TOTAL} (Includes byapass) (cfs)	Longitudinal Slope, S (ft/ft)	Cross Slope, S_X (ft/ft)	**Depth, d (ft)**	$T_{/2}$ (ft)	**Spread, T (ft)**	Velocity (fps)	**Grate Type**	Grate Open Area (sf)	Q_o (cfs) Orifice	Perimeter (Area) Length (Trench)	Q_w (cfs) Weir	**Q_i (cfs) Intercepted**	Q_i/Q_{10}	Q_b (cfs) Bypass	$d_{o,\ depth}$ for orifice flow (ft)	$d_{w,\ depth}$ for weir flow (ft)	d, design depth (ft)	Comments	Rim Elevation	**Ponding Elevation for 100 Yr Event**
1ST and Main																										
8	0.16	5	4.5	0.9	0.65	1.07	0.007	0.015	**0.04**	2.67	**5.33**	10.01	**AREA**	0.27	n/a	5.00	n/a	**0.36**	34%	0.71					193.65	
9	0.33	5	4.5	0.9	1.34	1.34	0.0079	0.02	**0.13**	6.41	**12.82**	1.63	**TRENCH**	0.39	n/a	4.50	n/a	**0.92**	69%	0.42					193.88	
1st and Washington																										
10	0.13	5	4.5	0.9	0.53	0.53	0.0053	0.02	**0.10**	4.87	**9.74**		**AREA**	0.27	0.45	5.00	0.46	**0.45**	86%	0.07					195.73	
11	0.05	5	4.5	0.9	0.20	0.20	Low Pt	Low Pt	**0.08**				**AREA**	0.27	n/a	5.00	n/a	**0.20**	100%		0.08	0.09	0.08	Low Point	195.63	**195.71**
1st and Pine																										
12	0.24	5	4.5	0.9	0.97	0.97	0.004	0.02	**0.13**	6.46	**12.92**	1.16	**TRENCH**	0.39	n/a	4.50	n/a	**0.77**	79%	0.20					195.51	
13	0.19	5	4.5	0.9	0.77	1.20	Low Pt	Low Pt	**0.29**				**AREA**	0.27	n/a	5.00	n/a	**1.20**	100%		2.71	0.29	0.29	Low Point	194.98	**195.27**
14	0	5	4.5	0.9	0.00	0.00	0.0052	0.02	**0.00**	0.00	**0.00**	n/a	**TRENCH**	0.39	n/a	4.50	n/a	**0.00**	100%	0.00			0.15	Backup	195.12	
17	0.21	5	4.5	0.9	0.85	0.85	0.0078	0.02	**0.11**	5.42	**10.85**	1.45	**TRENCH**	0.39	n/a	4.50	n/a	**0.62**	73%	0.23					195.20	
Pine and Oregon																										
20	0.26	5	4.5	0.9	1.05	1.05	0.005	0.02	**0.13**	6.39	**12.77**		**TRENCH**	1.17	2.25	13.50	1.85	**0.92**	88%	0.13				Low Point	195.92	**196.05**
Oregon St.																									0.00	
21	0.19	5	4.5	0.9	0.77	0.77	0.005	0.02	**0.11**	5.68	**11.35**		**TRENCH**	0.78	1.41	9.00	1.03	**1.03**	134%	-0.26				Low Point	196.80	**196.91**
22	0	5	4.5	0.9	0.00	0.00							**ADS**												196.90	
23	0.26	5	4.5	0.9	1.05	1.05	0.005	0.02	**0.13**	6.39	**12.77**		**TRENCH**	0.78	1.50	9.00	1.23	**1.23**	117%	-0.18				Low Point	197.03	**197.16**
Roundabout																										
24	0.09	5	4.5	0.9	0.36																				198.81	
25	0.29	5	4.5	0.9	1.17																				197.98	
26	0.37	5	4.5	0.9	1.50																				197.56	
Main and Railroad																										
27	0.11	5	4.5	0.9	0.45	0.45	0.012	0.02	**0.08**	3.92	**7.85**	1.45	**TRENCH**	0.39	n/a	4.50	n/a	**0.33**	75%	0.11					192.30	
28	0.24	5	4.5	0.9	0.97	1.08	Low Pt	Low Pt	**0.28**				**AREA**	0.27	n/a	5.00	n/a	**1.08**	100%		2.22	0.28	0.28	Low Point	192.05	**192.33**
29	0.09	5	4.5	0.9	0.36	0.36	0.005	0.02	**0.09**	4.29	**8.58**		**TRENCH**	2.73	4.30	31.50	2.37	**2.37**	652%	-2.01					192.27	**192.36**
30	0.05	5	4.5	0.9	0.20	0.20	0.0076	0.02	**0.06**	3.18	**6.36**		**TRENCH**	1.04	1.41	12.00	0.58	**0.58**	285%	-0.38					192.39	**192.45**
Temporary Low Points																										
4	0.17	5	4.5	0.9	0.69	0.69																				
5	0.18	5	4.5	0.9	0.73	0.73																				
6	0.14	5	4.5	0.9	0.57	0.57																				
7	0.15	5	4.5	0.9	0.61	0.61																				
15	0.04	5	4.5	0.9	0.16	0.16																				
16	0.05	5	4.5	0.9	0.20	0.20																				
18	0.06	5	4.5	0.9	0.24	0.24																				
19	0.07	5	4.5	0.9	0.28	0.28																				
31	0.18	5	4.5	0.9	0.73	0.73																				
32	0.18	5	4.5	0.9	0.73	0.73																				

Notes: All inlet calculations include reduction factor for 50% plugging. A 2% cross slope was used at valley gutter locations.

Storm Sewer Profile

Proj. file: 100-yr Pipe Design.stm

Water Surface Profile
100 year storm event
(Rational Method)



Sherwood Downtown Streetscape
10-Year Rational Method Storm Event

Peak Flow Calculations							Depth and Spread Calculations					Inlet Capacity Calculations														
Inlet Number (See the Conveyance and Inlet Basin Map for Inlet Location)	Basin Area (acres)	Time of Conc (min)	10 yr Intensity (in/hr)	C-value	Q_{10} (cfs)	Q_{TOTAL} (Includes byapass) (cfs)	Longitudinal Slope, S (ft/ft)	Cross Slope, S_X (ft/ft)	**Depth, d (ft)**	$T_{/2}$ (ft)	**Spread, T (ft)**	Velocity (fps)	**Grate Type**	Grate Open Area (sf)	$Q_{o\ (cfs)}$ Orifice	Perimeter (Area) Length (Trench)	$Q_{w\ (cfs)}$ Weir	**$Q_{i\ (cfs)}$ Intercepted**	Q_i/Q_{10}	$Q_{b\ (cfs)}$ Bypass	$d_{o,\ depth}$ for orifice flow (ft)	$d_{w,\ depth}$ for weir flow (ft)	d, design depth (ft)	Comments	Rim Elevation	**Ponding Elevation for 10 Yr Event**
1ST and Main																										
8	0.16	5	3	0.9	0.43	0.67	0.007	0.015	**0.03**	2.00	**4.00**	11.24	**AREA**	0.27	n/a	2.00	n/a	**0.26**	39%	0.41					193.65	
9	0.33	5	3	0.9	0.89	0.89	0.0079	0.02	**0.11**	5.50	**11.01**	1.47	**TRENCH**	0.39	n/a	4.50	n/a	**0.65**	73%	0.24					193.88	
1st and Washington																										
10	0.13	5	3	0.9	0.35	0.35	0.0053	0.02	**0.08**	4.18	**8.37**	1.00	**AREA**	0.27	0.42	5.00	0.36	**0.36**	103%	-0.01					195.73	
11	0.05	5	3	0.9	0.14	0.14	Low Pt	Low Pt	**0.07**			0.00	**AREA**	0.27	n/a	5.00	n/a	**0.14**	100%		0.07	0.07	0.07	Low Point	195.63	**195.70**
1st and Pine																										
12	0.24	5	3	0.9	0.65	0.65	0.004	0.02	**0.11**	5.55	**11.10**	1.05	**TRENCH**	0.39	n/a	4.50	n/a	**0.54**	83%	0.11					195.51	
13	0.19	5	3	0.9	0.51	0.75	Low Pt	Low Pt	**0.22**				**AREA**	0.27	n/a	5.00	n/a	**0.75**	100%		1.08	0.22	0.22	Low Point	194.98	**195.20**
14	0	5	3	0.9	0.00	0.00	0.0052	0.02	**0.00**	0.00	**0.00**	n/a	**TRENCH**	0.39	n/a	4.50		**0.00**	100%	0.00			0.08	Backup	195.12	
17	0.21	5	3	0.9	0.57	0.57	0.0078	0.02	**0.09**	4.66	**9.32**	1.31	**TRENCH**	0.39	n/a	4.50	n/a	**0.44**	77%	0.13					195.20	
Pine and Oregon																										
20	0.26	5	3	0.9	0.70	0.70	0.005	0.02	**0.11**	5.49	**10.97**		**TRENCH**	1.17	2.08	13.50	1.47	**0.74**	105%	-0.03				Low Point	195.92	**196.03**
Oregon St.																										
21	0.19	5	3	0.9	0.51	0.51	0.005	0.02	**0.10**	4.88	**9.75**		**TRENCH**	0.78	1.31	9.00	0.82	**0.82**	160%	-0.31				Low Point	196.80	**196.90**
22	0	5	3	0.9	0.00	0.00							**ADS**												196.90	
23	0.26	5	3	0.9	0.70	0.70	0.005	0.02	**0.11**	5.49	**10.97**		**TRENCH**	0.78	1.39	9.00	0.98	**0.98**	140%	-0.28				Low Point	197.03	**197.14**
Roundabout																										
24	0.09	5	3	0.9	0.24								**CG-2**													198.81
25	0.29	5	3	0.9	0.78								**CG-2**													197.98
26	0.37	5	3	0.9	1.00								**CG-2**													197.56
Main and Railroad																										
27	0.11	5	3	0.9	0.30	0.30	0.012	0.02	**0.07**	3.37	**6.74**	1.31	**TRENCH**	0.39	n/a	4.50	n/a	**0.23**	79%	0.06					192.30	
28	0.24	5	3	0.9	0.65	0.71	Low Pt	Low Pt	**0.21**				**AREA**	0.27	n/a	5.00	n/a	**0.71**	100%		0.96	0.21	0.21	Low Point	192.05	**192.26**
29	0.09	5	3	0.9	0.24	0.24	0.005	0.02	**0.07**	3.68	**7.37**		**TRENCH**	2.73	3.98	31.50	1.89	**1.89**	778%	-1.65				Low Point	192.27	**192.34**
30	0.05	5	3	0.9	0.14	0.14	0.0076	0.02	**0.05**	2.73	**5.47**		**TRENCH**	1.04	1.31	12.00	0.46	**0.46**	341%	-0.32				Low Point	192.39	**192.44**
Temporary Low Points																										
4	0.17	5	3	0.9	0.46								**LYNCH**													
5	0.18	5	3	0.9	0.49								**LYNCH**													
6	0.14	5	3	0.9	0.38								**LYNCH**													
7	0.15	5	3	0.9	0.41								**LYNCH**													
15	0.04	5	3	0.9	0.11								**LYNCH**													
16	0.05	5	3	0.9	0.14								**LYNCH**													
18	0.06	5	3	0.9	0.16								**LYNCH**													
19	0.07	5	3	0.9	0.19								**LYNCH**													
31	0.18	5	3	0.9	0.49								**LYNCH**													
32	0.18	5	3	0.9	0.49								**LYNCH**													

Notes: All inlet calculations include reduction factor for 50% plugging. A 2% cross slope was used at valley gutter locations.

Sherwood Downtown Streetscape
100-Year Rational Method Storm Event

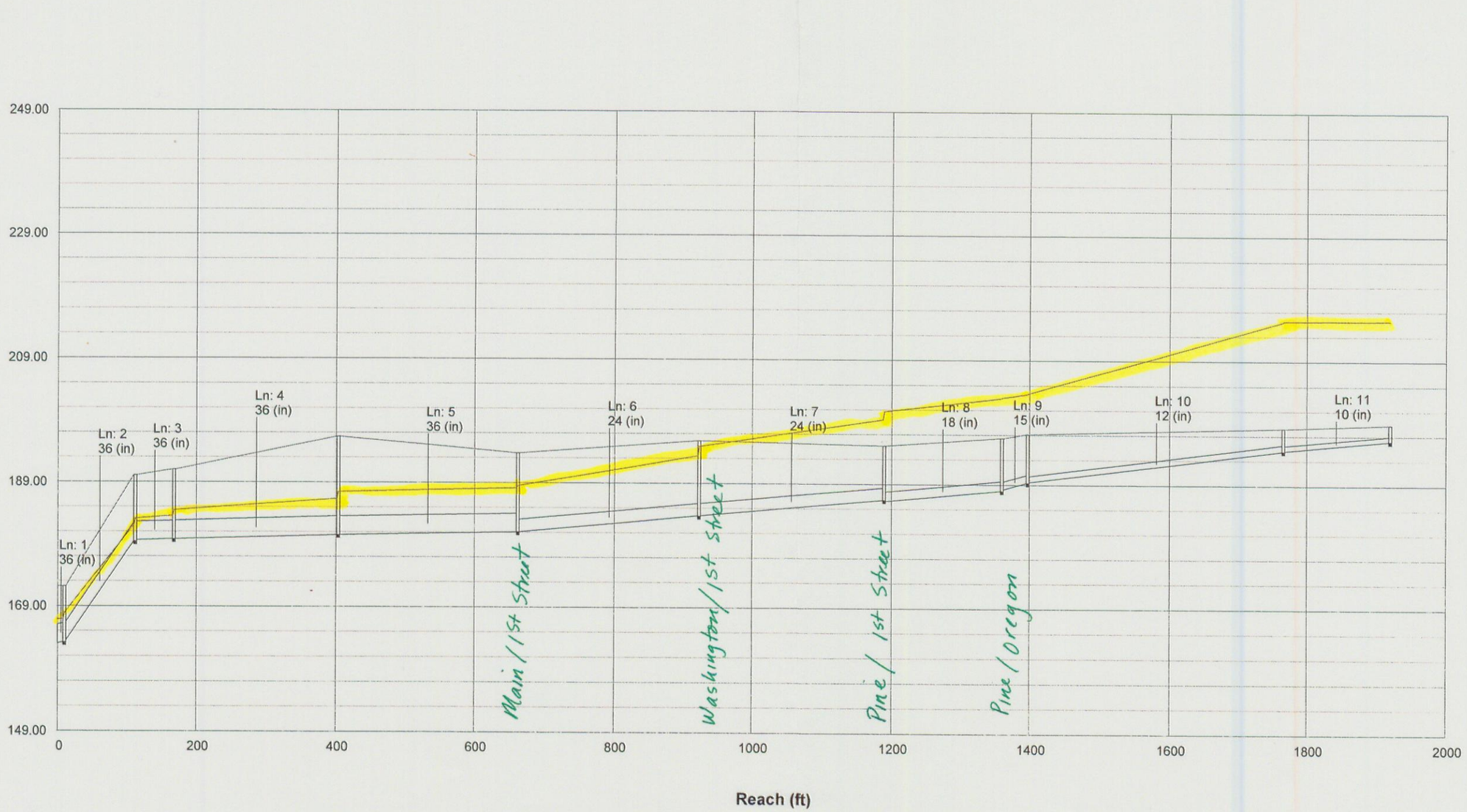
Peak Flow Calculations							Depth and Spread Calculations					Inlet Capacity Calculations															
Inlet Number (See the Conveyance and Inlet Basin Map for Inlet Location)	Basin Area (acres)	Time of Conc (min)	100 yr Intensity (in/hr)	C-value	Q_{10} (cfs)	Q_{TOTAL} (Includes byapass) (cfs)	Longitudinal Slope, S (ft/ft)	Cross Slope, S_X (ft/ft)	**Depth, d (ft)**	$T_{/2}$ (ft)	**Spread, T (ft)**	Velocity (fps)	Grate Type	Grate Open Area (sf)	$Q_{o\ (cfs)}$ Orifice	Perimeter (Area) Length (Trench)	$Q_{w\ (cfs)}$ Weir	$Q_{i\ (cfs)}$ Intercepted	Q_i/Q_{10}	$Q_{b\ (cfs)}$ Bypass	$d_{o,\ depth\ for\ orifice\ flow\ (ft)}$	$d_{w,\ depth\ for\ weir\ flow\ (ft)}$	d, design depth (ft)	Comments	Rim Elevation	**Ponding Elevation for 100 Yr Event**
1ST and Main																											
8	0.16	5	4.5	0.9	0.65	1.07	0.007	0.015	**0.04**	2.67	**5.33**	10.01	**AREA**	0.27	n/a	5.00	n/a	**0.36**	34%	0.71					193.65	
9	0.33	5	4.5	0.9	1.34	1.34	0.0079	0.02	**0.13**	6.41	**12.82**	1.63	**TRENCH**	0.39	n/a	4.50	n/a	**0.92**	69%	0.42					193.88	
1st and Washington																											
10	0.13	5	4.5	0.9	0.53	0.53	0.0053	0.02	**0.10**	4.87	**9.74**		**AREA**	0.27	0.45	5.00	0.46	**0.45**	86%	0.07					195.73	
11	0.05	5	4.5	0.9	0.20	0.20	Low Pt	Low Pt	**0.08**				**AREA**	0.27	n/a	5.00	n/a	**0.20**	100%		0.08	0.09	0.08	Low Point	195.63	**195.71**
1st and Pine																											
12	0.24	5	4.5	0.9	0.97	0.97	0.004	0.02	**0.13**	6.46	**12.92**	1.16	**TRENCH**	0.39	n/a	4.50	n/a	**0.77**	79%	0.20					195.51	
13	0.19	5	4.5	0.9	0.77	1.20	Low Pt	Low Pt	**0.29**				**AREA**	0.27	n/a	5.00	n/a	**1.20**	100%		2.71	0.29	0.29	Low Point	194.98	**195.27**
14	0	5	4.5	0.9	0.00	0.00	0.0052	0.02	**0.00**	0.00	**0.00**	n/a	**TRENCH**	0.39	n/a	4.50	n/a	**0.00**	100%	0.00			0.15	Backup	195.12	
17	0.21	5	4.5	0.9	0.85	0.85	0.0078	0.02	**0.11**	5.42	**10.85**	1.45	**TRENCH**	0.39	n/a	4.50	n/a	**0.62**	73%	0.23					195.20	
Pine and Oregon																											
20	0.26	5	4.5	0.9	1.05	1.05	0.005	0.02	**0.13**	6.39	**12.77**		**TRENCH**	1.17	2.25	13.50	1.85	**0.92**	88%	0.13				Low Point	195.92	**196.05**
Oregon St.																									0.00	
21	0.19	5	4.5	0.9	0.77	0.77	0.005	0.02	**0.11**	5.68	**11.35**		**TRENCH**	0.78	1.41	9.00	1.03	**1.03**	134%	-0.26				Low Point	196.80	**196.91**
22	0	5	4.5	0.9	0.00	0.00							**ADS**												196.90	
23	0.26	5	4.5	0.9	1.05	1.05	0.005	0.02	**0.13**	6.39	**12.77**		**TRENCH**	0.78	1.50	9.00	1.23	**1.23**	117%	-0.18				Low Point	197.03	**197.16**
Roundabout																											
24	0.09	5	4.5	0.9	0.36																				198.81	
25	0.29	5	4.5	0.9	1.17																				197.98	
26	0.37	5	4.5	0.9	1.50																				197.56	
Main and Railroad																											
27	0.11	5	4.5	0.9	0.45	0.45	0.012	0.02	**0.08**	3.92	**7.85**	1.45	**TRENCH**	0.39	n/a	4.50	n/a	**0.33**	75%	0.11					192.30	
28	0.24	5	4.5	0.9	0.97	1.08	Low Pt	Low Pt	**0.28**				**AREA**	0.27	n/a	5.00	n/a	**1.08**	100%		2.22	0.28	0.28	Low Point	192.05	**192.33**
29	0.09	5	4.5	0.9	0.36	0.36	0.005	0.02	**0.09**	4.29	**8.58**		**TRENCH**	2.73	4.30	31.50	2.37	**2.37**	652%	-2.01					192.27	**192.36**
30	0.05	5	4.5	0.9	0.20	0.20	0.0076	0.02	**0.06**	3.18	**6.36**		**TRENCH**	1.04	1.41	12.00	0.58	**0.58**	285%	-0.38					192.39	**192.45**
Temporary Low Points																											
4	0.17	5	4.5	0.9	0.69	0.69																					
5	0.18	5	4.5	0.9	0.73	0.73																					
6	0.14	5	4.5	0.9	0.57	0.57																					
7	0.15	5	4.5	0.9	0.61	0.61																					
15	0.04	5	4.5	0.9	0.16	0.16																					
16	0.05	5	4.5	0.9	0.20	0.20																					
18	0.06	5	4.5	0.9	0.24	0.24																					
19	0.07	5	4.5	0.9	0.28	0.28																					
31	0.18	5	4.5	0.9	0.73	0.73																					
32	0.18	5	4.5	0.9	0.73	0.73																					

Notes: All inlet calculations include reduction factor for 50% plugging. A 2% cross slope was used at valley gutter locations.

Storm Sewer Profile

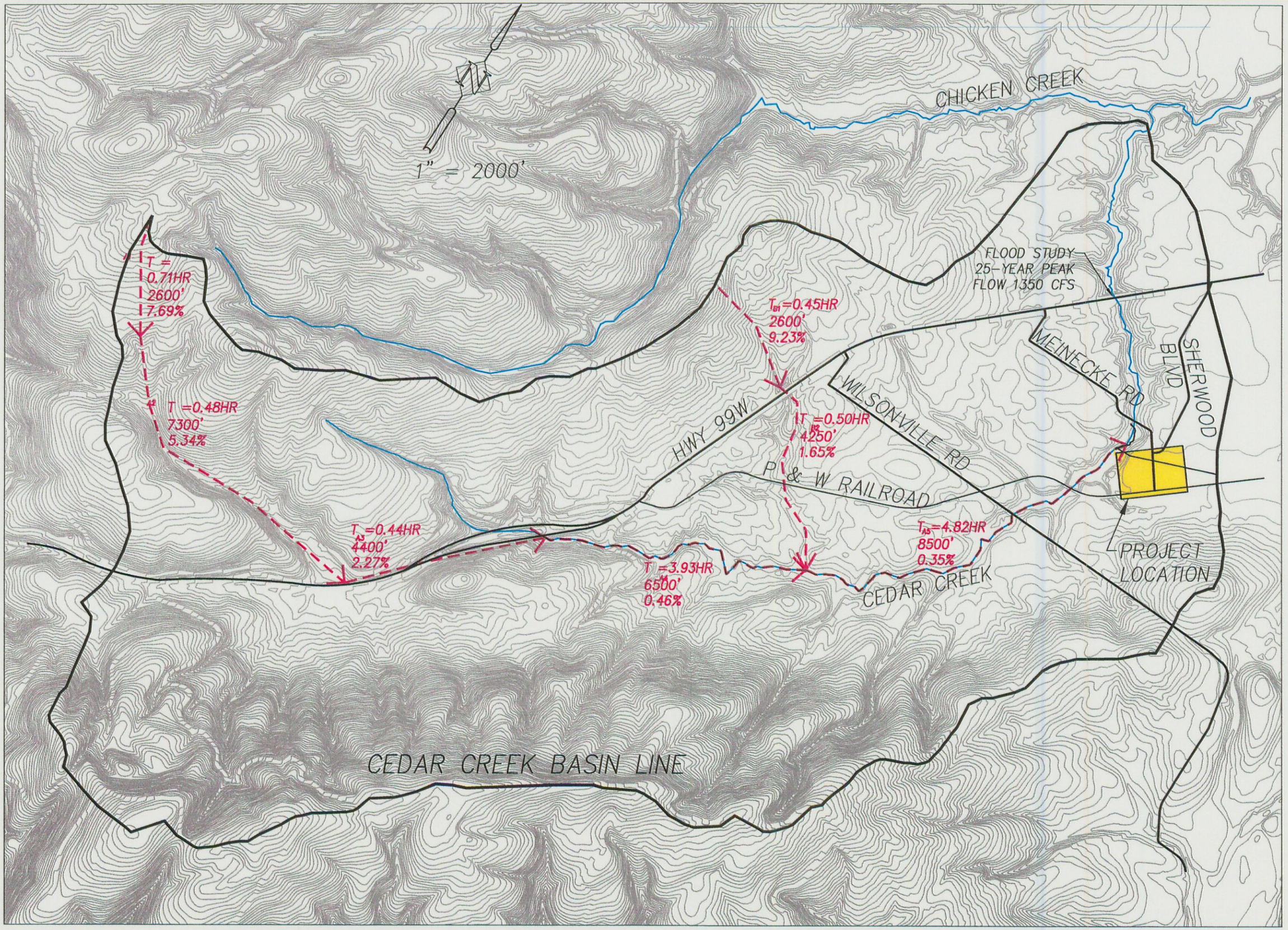
Proj. file: 100-yr Pipe Design.stm

Water Surface Profile
100 year storm event
(Rational Method)



APPENDIX E

CEDAR CREEK BASIN MAP
CEDAR CREEK BASIN LAND USE MAP AND TABLE
CEDAR CREEK BASIN TIME OF CONCENTRATION CALCULATIONS
HYDROGRAPHS
CEDAR CREEK PHOTO LOG
FEMA FLOOD PLAIN MAP



CEDAR CREEK BASIN MAP

SHERWOOD DOWNTOWN STREETSCAPE

SHERWOOD, OREGON

Harper Houf Peterson Righellis Inc.
ENGINEERS PLANNERS SURVEYORS
5200 SW MACADAM AVENUE, Suite 360, PORTLAND, OR 97239
TEL 503.221.1131 www.3hpr.com FAX 503.221.1171

DESIGNED:	KAS
DRAWN:	JTL
CHECKED:	KAS
DATE:	8/1/2005

REVISIONS

NO.	DESCRIPTION	DATE

SHEET NO.

JOB NO. CBI-01

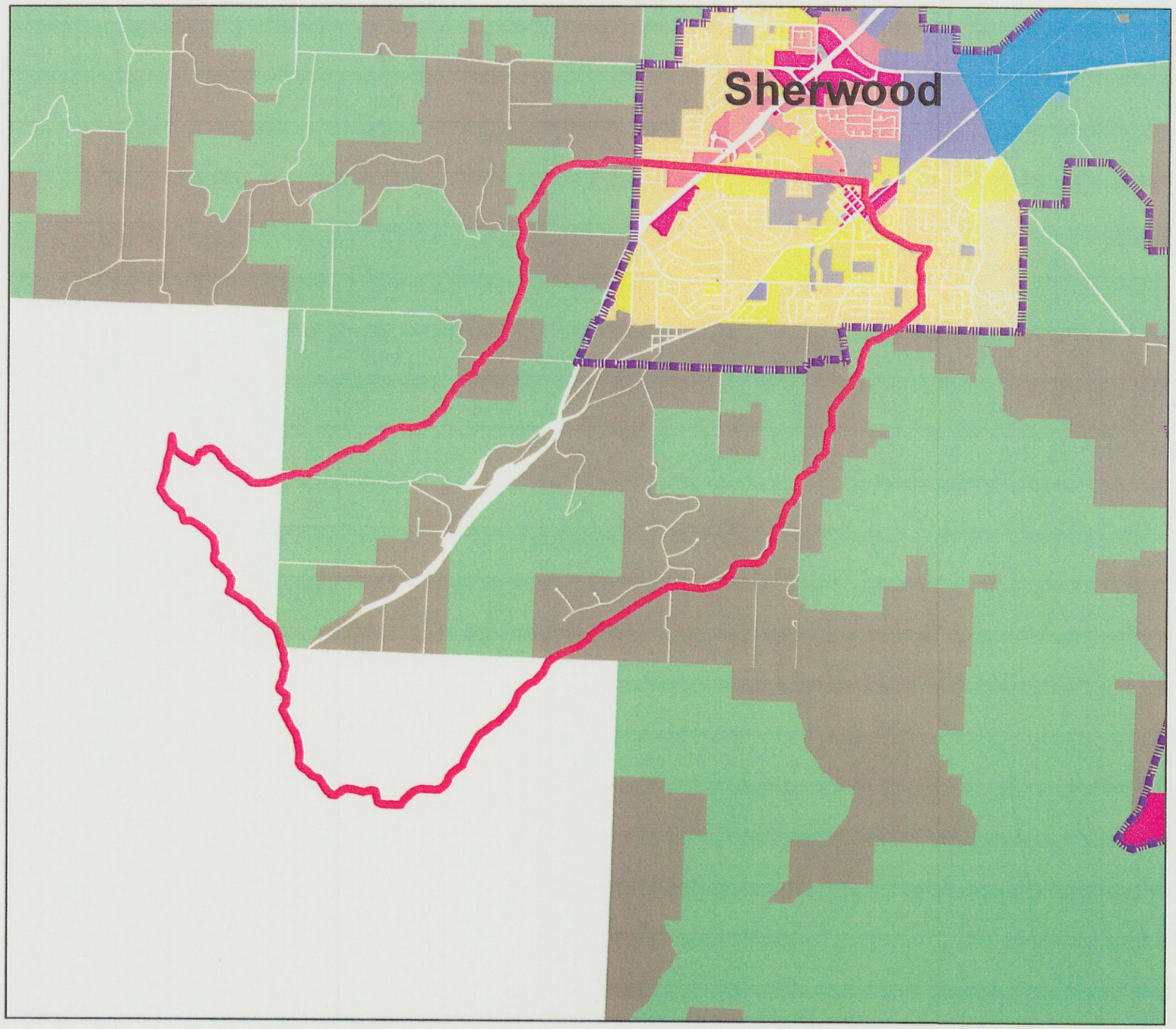
P:\CBI-01\CB101-DWGS\Aerials\ CEDAR CREEK DRAINAGE BASIN.DWG

Cedar Creek Drainage Basin Upstream of Stella Olsen Water Quality Facility

Information from GIS Data for Approximate Areas of Each Zoning Designation for use in Downstream Analysis

Zone	Description	Total Area (SF)	Total Area (AC)	Buildable Area	Impervious Area (AC)	Curve Number	Pervious Area (AC)	Curve Number
AF5	within UGB, assumed MDRL	124,494	2.86	50%	1.43	98	1.43	74
FD 20	within UGB, assumed MDRL	7,894,370	181.23	50%	90.61	98	90.61	74
HDR		41,682	0.96	75%	0.72	98	0.24	74
IP		3,022,538	69.39	30%	20.82	98	48.57	74
LDR		18,110,582	415.76	50%	207.88	98	207.88	74
LI		235,390	5.40	85%	4.59	98	0.81	74
MDRH		5,322,716	122.19	50%	61.10	98	61.10	74
MDRL		2,793,851	64.14	50%	32.07	98	32.07	74
OC		730,474	16.77	85%	14.25	98	2.52	74
R6		528,899	12.14	50%	6.07	98	6.07	74
RC		243,901	5.60	85%	4.76	98	0.84	74
Streets	within UGB	8,298,741	190.51	100%	190.51	98	0.00	74
Rural	outside UGB	176,861,537	4060.18	0%	0.00	98	4060.18	74
Total		**224209174.6**	**5147.13**		**635**	**98**	**4,512**	**74**

Cedar Creek Drainage Area
Landuse



- Cedar Creek Watershed
- Urban Growth Boundary
- Central Commercial
- General Commercial
- Neighborhood Commercial
- Office Commercial
- Agricultural or Forestry
- Industrial Area
- Heavy Industrial
- Light Industrial
- Mixed Use Industrial
- Multi Family (low density)
- Multi Family (medium density)
- Multi Family (high density)
- Multi Family (highest density)
- Mixed Use (low density)
- Mixed Use (low density)
- Mixed Use (high density)
- Public Facilities
- Parks & Open Spaces
- Rural Residential or Future Urban
- Single Family (lowest density)
- Single Family (low density)
- Single Family (low-medium density)
- Single Family (medium density)
- Single Family (medium-high density)
- Single Family (high density)
- Single Family (highest density)

Created by KBJ
9/13/05
Source: Metro RLIS

HHPR
Harper
Houf Peterson
Righellis Inc.

Time of Concentration Calculations

Path A

Sheet and Shallow Flow

$$T_{A1}=\frac{(0.007)*(0.4*300)^{0.8}}{(2.5^{0.527})*(0.0769^{0.4})}+\frac{2300}{3600\left(16.1345\sqrt{0.0769}\right)}=0.71\text{hr}$$

Ditch Flow

$$T_{A2}=\frac{7{,}300}{3600\times 4.22}=0.48\text{hr}$$

(Velocity = Manning's, n=0.03, s=0.0534, Width=0, 2:1 sides, d=0.5')

Ditch Flow

$$T_{A3}=\frac{4{,}400}{3600\times 2.75}=0.44\text{hr}$$

(Velocity = Manning's, n=0.03, s=0.0227, Width=0, 2:1 sides, d=0.5')

Creek Flow

$$T_{A4}=\frac{6{,}500}{3600\times 0.46}=3.93\text{ hr}$$

(Velocity = Manning's, n=0.15, s=0.0046, Width=4, 2:1 sides, d=0.75')

Creek Flow

$$T_{A5}=\frac{8{,}500}{3600\times 0.49}=4.82\text{hr}$$

(Velocity = Manning's, n=0.15, s=0.0227, Width=6, 2:1 sides, d=1.0')

Total T_A= 10.4 hr = 624 min

Path B

Sheet and Shallow Flow

$$T_{B1}=\frac{(0.007)*(0.4*300)^{0.8}}{(2.5^{0.527})*(0.0923^{0.4})}+\frac{2300}{3600\left(16.1345\sqrt{0.0923}\right)}=0.45\text{hr}$$

Ditch Flow

$$T_{B2}=\frac{4{,}250}{3600\times 2.34}=0.50\text{hr}$$

(Velocity = Manning's, n=0.03, s=0.0165, Width=0, 2:1 sides, d=0.5')

Creek Flow

$$T_{A5}=\frac{8{,}500}{3600\times 0.49}=4.82\text{hr}$$

(Velocity = Manning's, n=0.15, s=0.0227, Width=6, 2:1 sides, d=1.0')

Total T_B= 5.77 hr = 346 min

EXISTING CEDAR CREEK BASIN
25 YEAR HYDROGRAPH

Hydrograph Plot

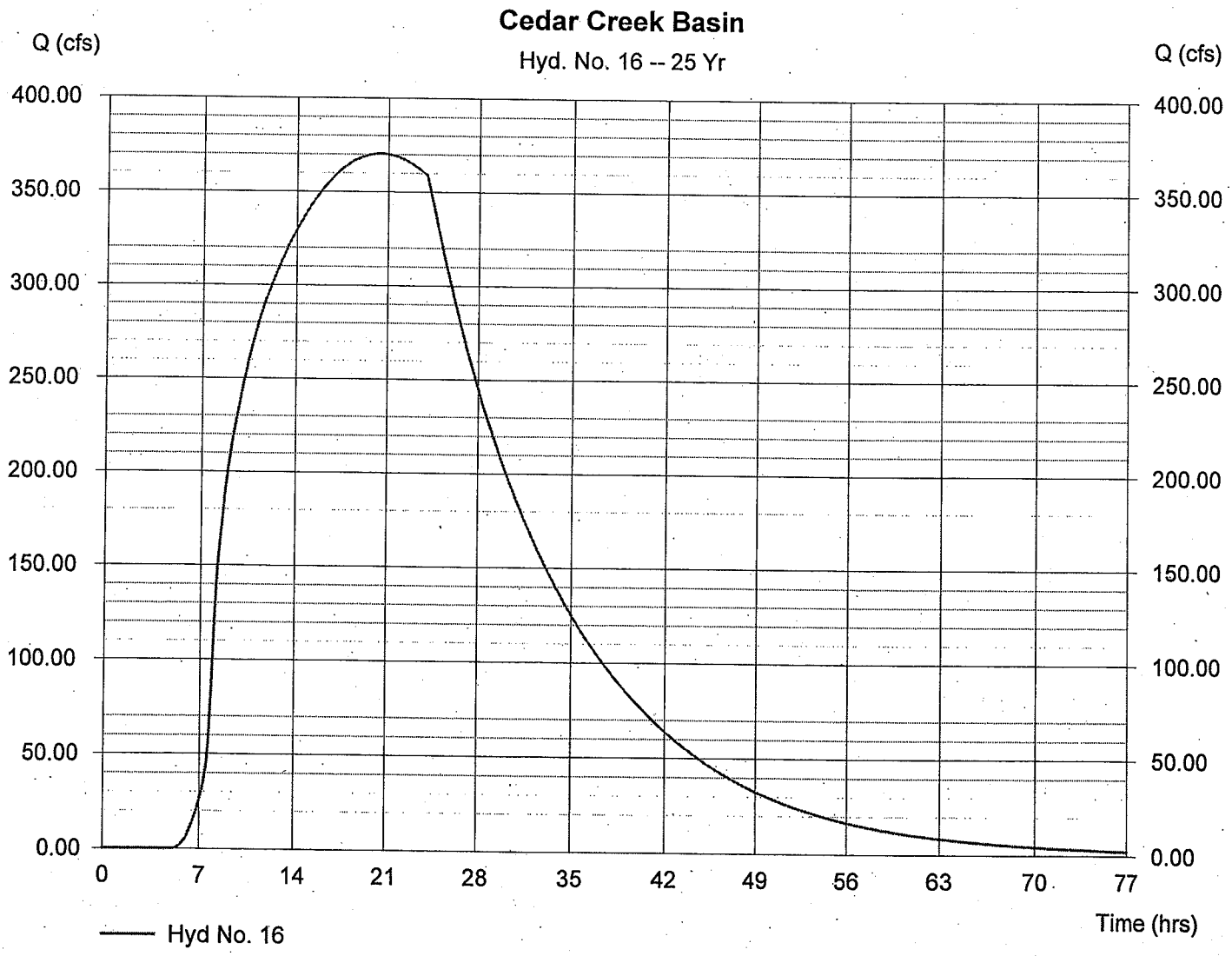
Hydraflow Hydrographs by Intelisolve

Hyd. No. 16

Cedar Creek Basin

Hydrograph type	= SBUH Runoff	Peak discharge	= 370.35 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 5147.00 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 624 min
Total precip.	= 3.90 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= N/A

Hydrograph Volume = 32,400,200 cuft



EXISTING PROJECT BASIN (STELLA OLSEN WQ BASIN)
25 YEAR HYDROGRAPHS FOR SUBBASINS A, B, C, D, AND E

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

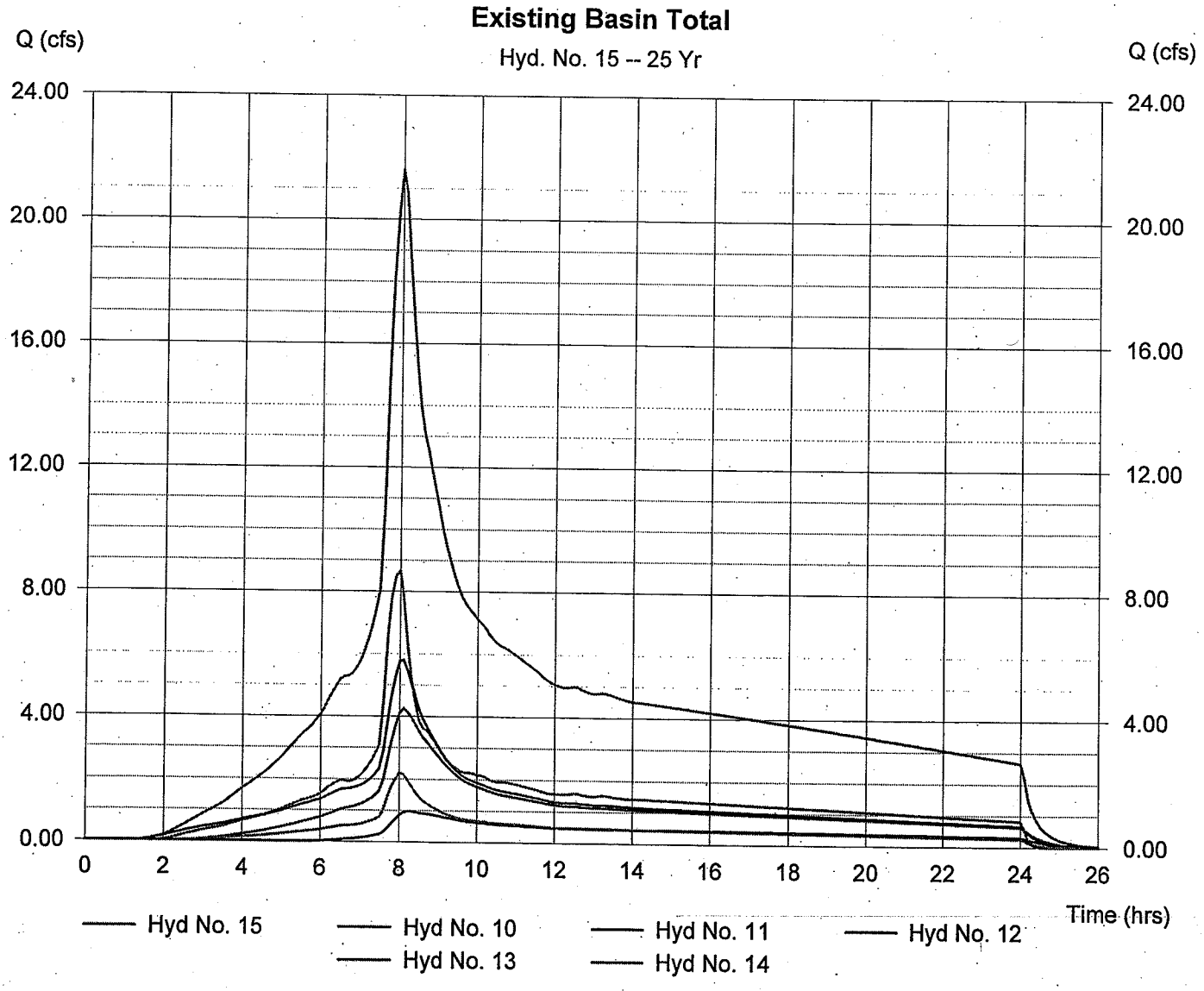
Hyd. No. 15

Existing Basin Total

Hydrograph type = Combine
Storm frequency = 25 yrs
Inflow hyds. = 10, 11, 12, 13, 14

Peak discharge = 21.60 cfs
Time interval = 6 min

Hydrograph Volume = 381,458 cuft



Hydrograph Plot

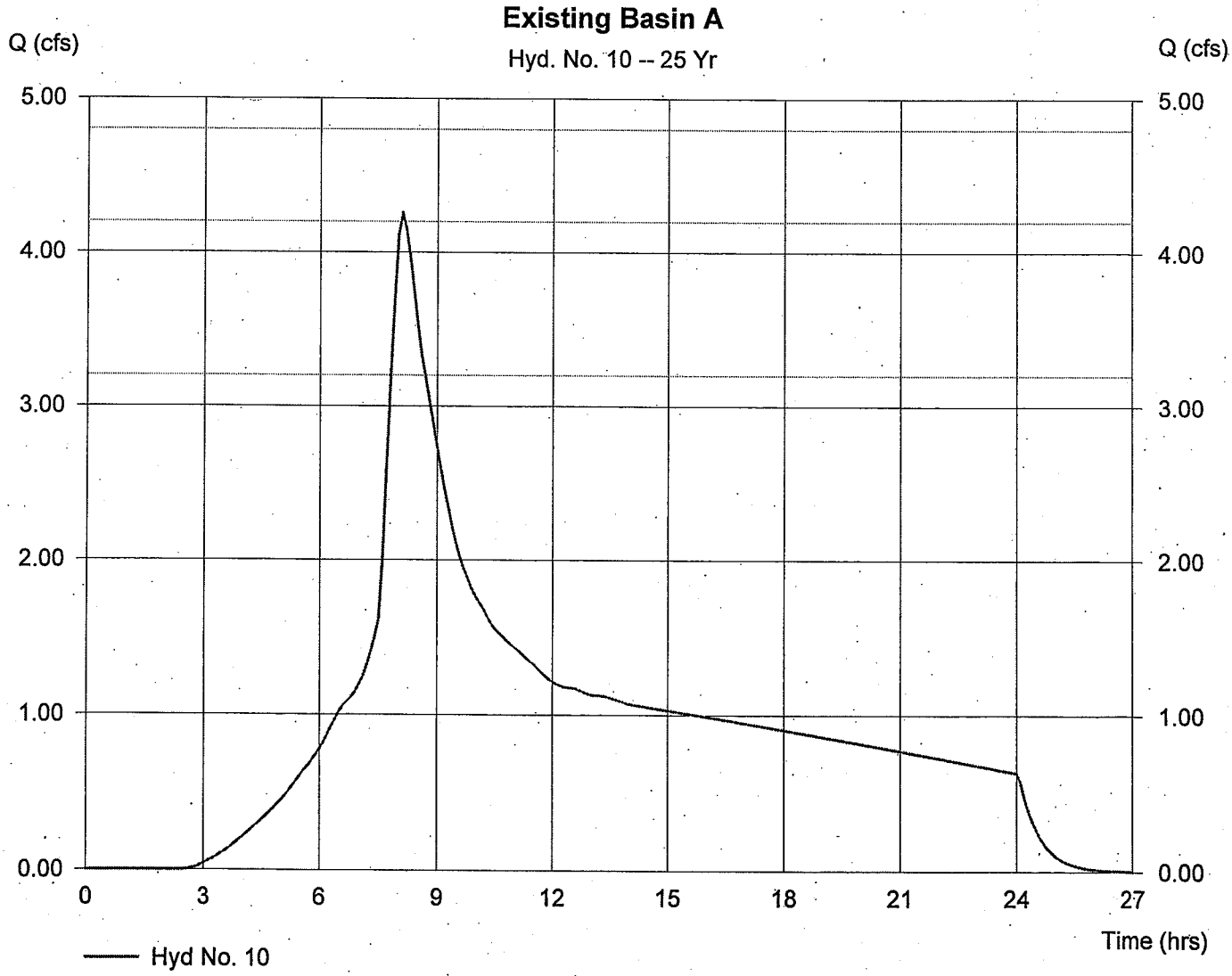
Hydraflow Hydrographs by Intelisolve

Hyd. No. 10

Existing Basin A

Hydrograph type	= SBUH Runoff	Peak discharge	= 4.26 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 8.72 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 31 min
Total precip.	= 3.90 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= N/A

Hydrograph Volume = 86,393 cuft



Hydrograph Plot

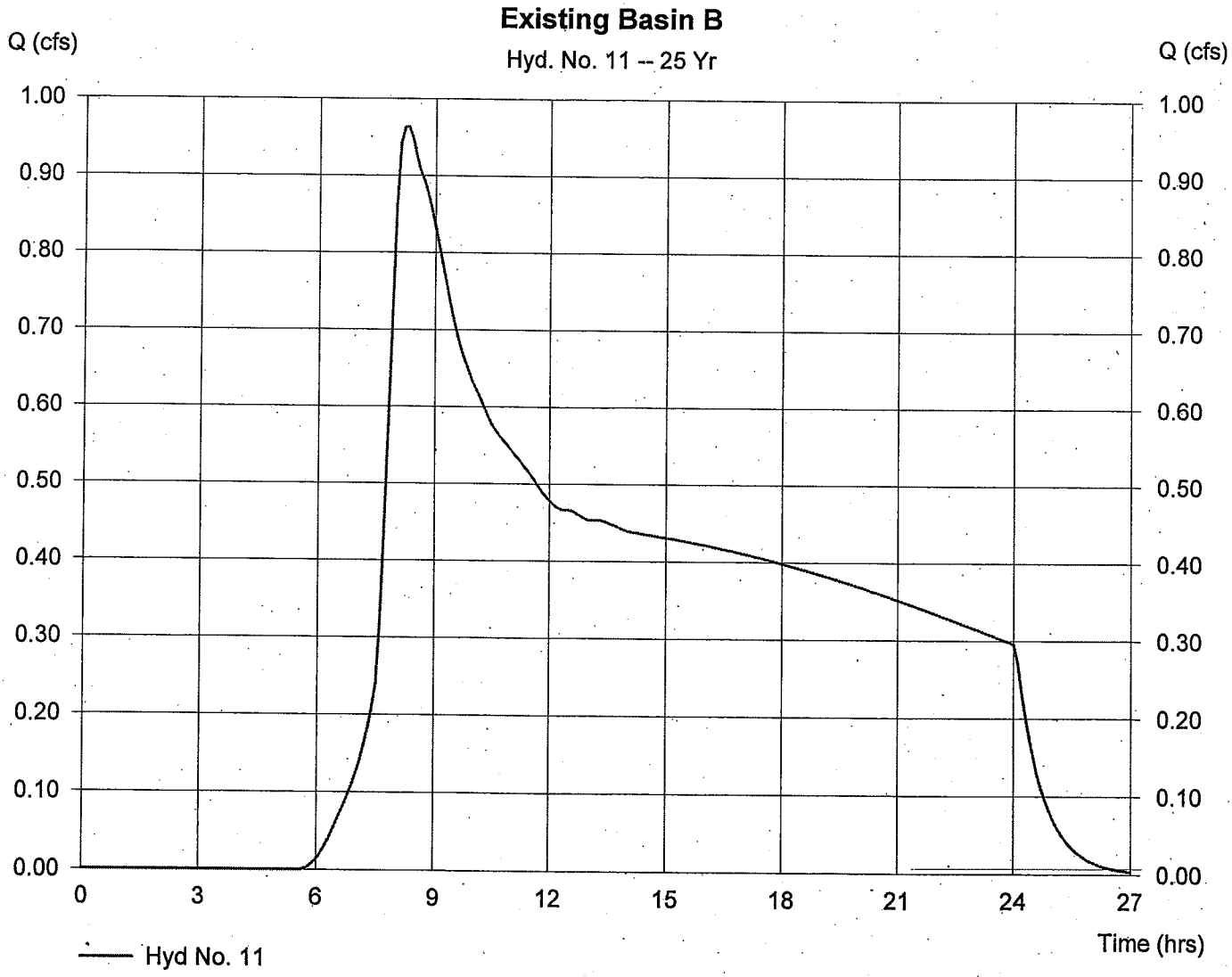
Hydraflow Hydrographs by Intelisolve

Hyd. No. 11

Existing Basin B

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.96 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 5.24 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 40 min
Total precip.	= 3.90 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= N/A

Hydrograph Volume = 28,975 cuft



Hydrograph Plot

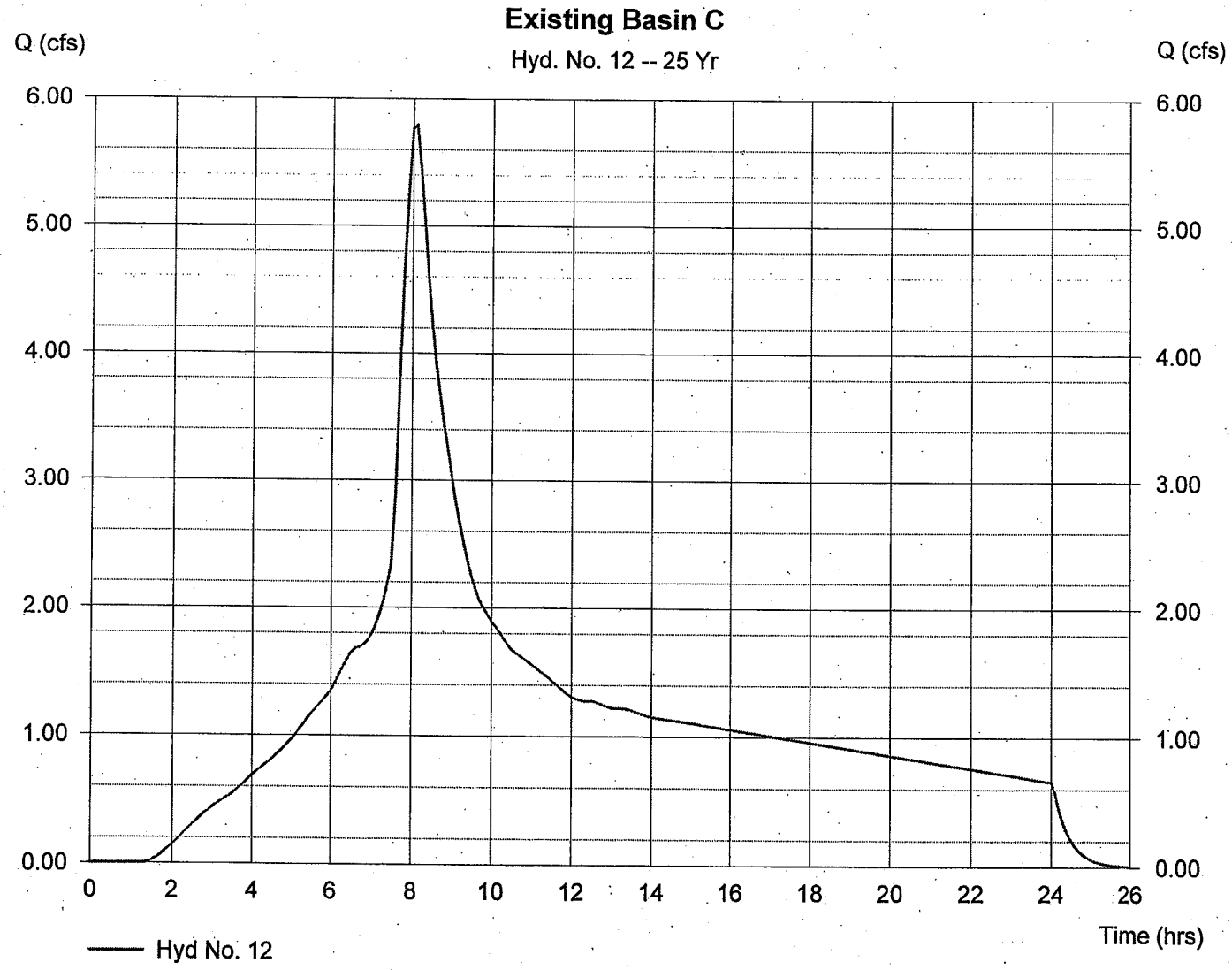
Hydraflow Hydrographs by Intelisolve

Hyd. No. 12

Existing Basin C

Hydrograph type	= SBUH Runoff	Peak discharge	= 5.80 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 8.70 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 23.3 min
Total precip.	= 3.90 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= N/A

Hydrograph Volume = 105,245 cuft



Hydrograph Plot

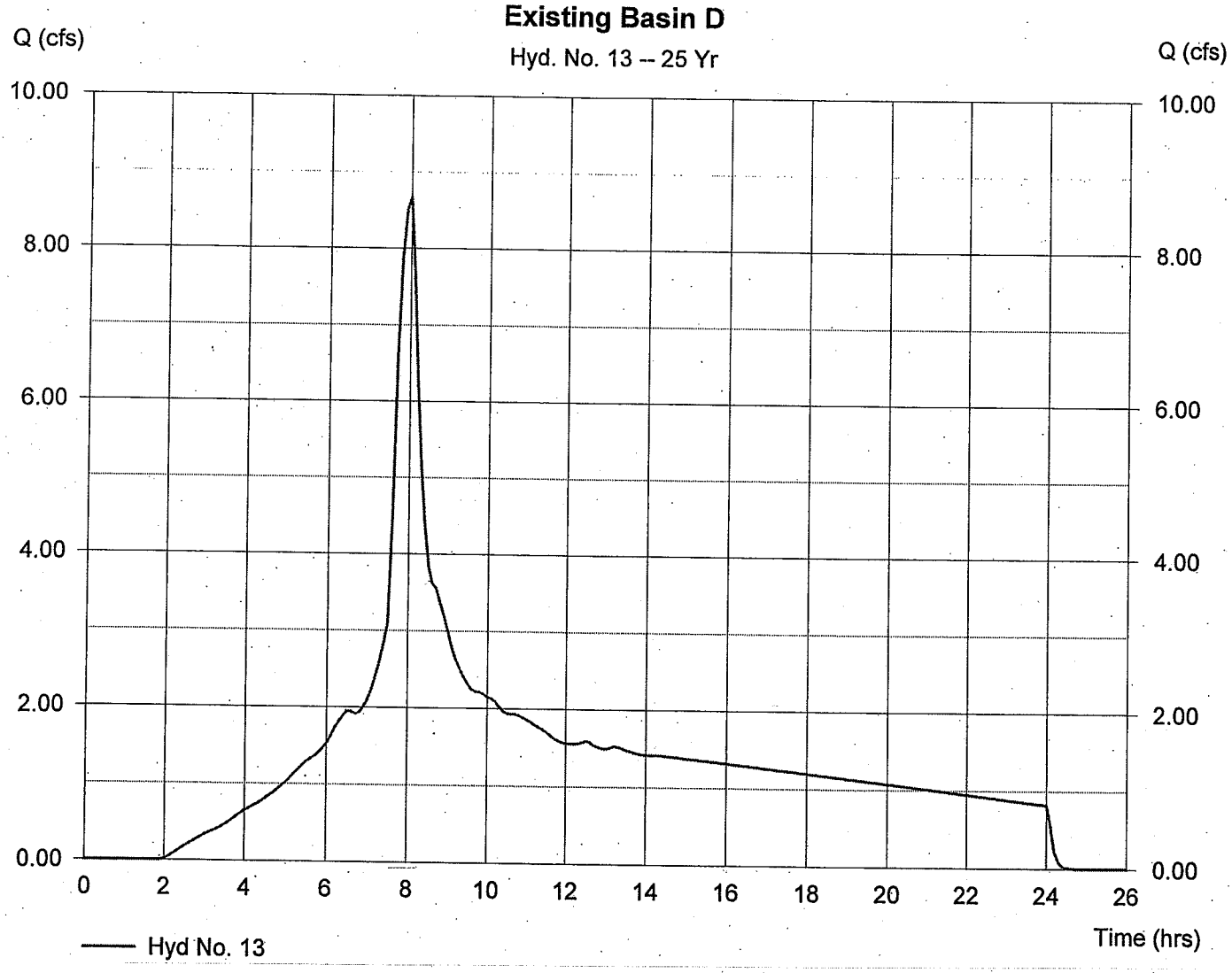
Hydraflow Hydrographs by Intelisolve

Hyd. No. 13

Existing Basin D

Hydrograph type	= SBUH Runoff	Peak discharge	= 8.67 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 11.32 ac	Curve number	= 92
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 7 min
Total precip.	= 3.90 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= N/A

Hydrograph Volume = 124,140 cuft



Hydrograph Plot

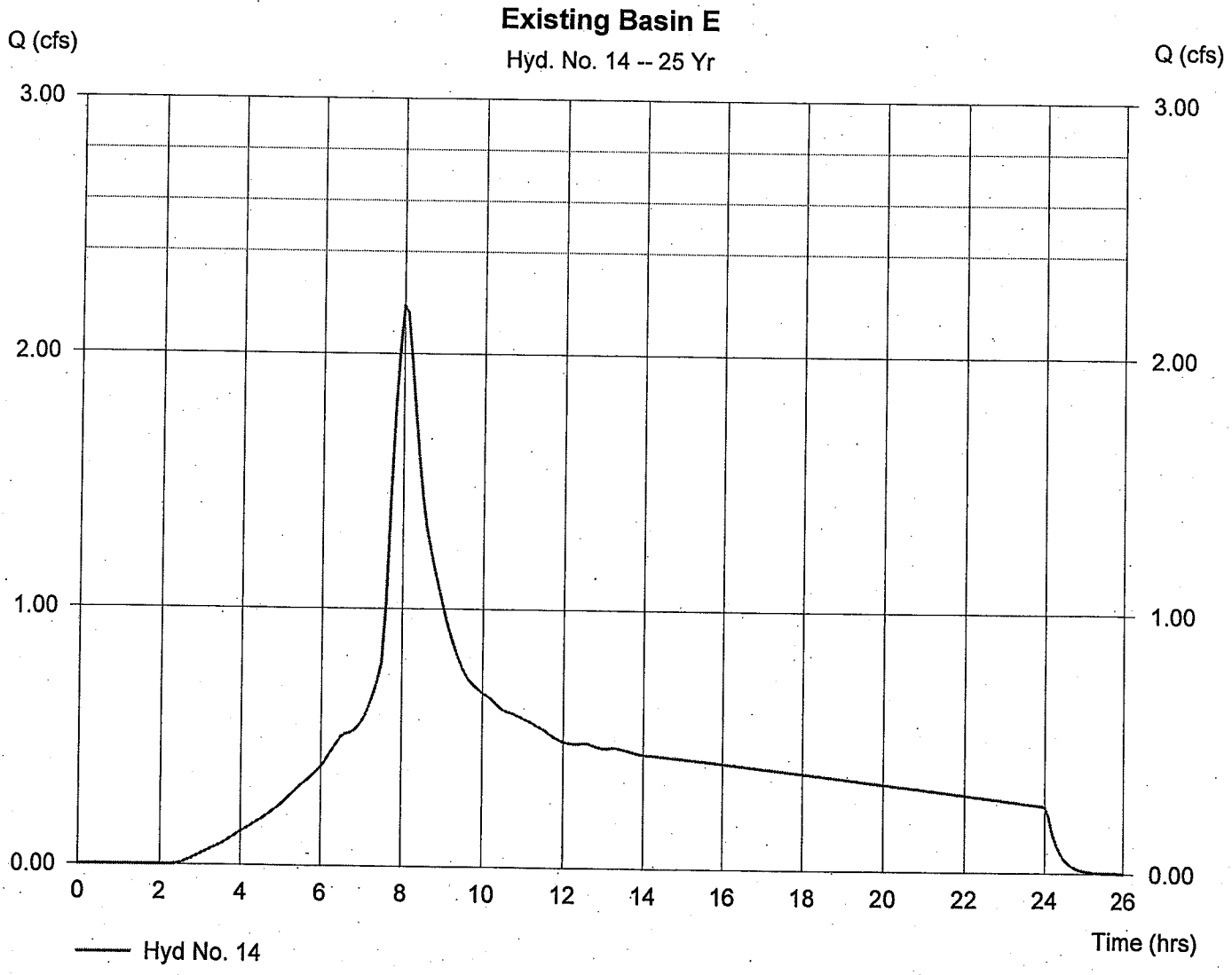
Hydraflow Hydrographs by Intelisolve

Hyd. No. 14

Existing Basin E

Hydrograph type	= SBUH Runoff	Peak discharge	= 2.19 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 3.58 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 17 min
Total precip.	= 3.90 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= N/A

Hydrograph Volume = 36,705 cuft



PROPOSED PROJECT BASIN (STELLA OLSEN WQ BASIN)
25 YEAR HYDROGRAPHS FOR SUBBASINS A, B, C, D, AND E

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Thursday, Aug 11 2005, 4:5 PM

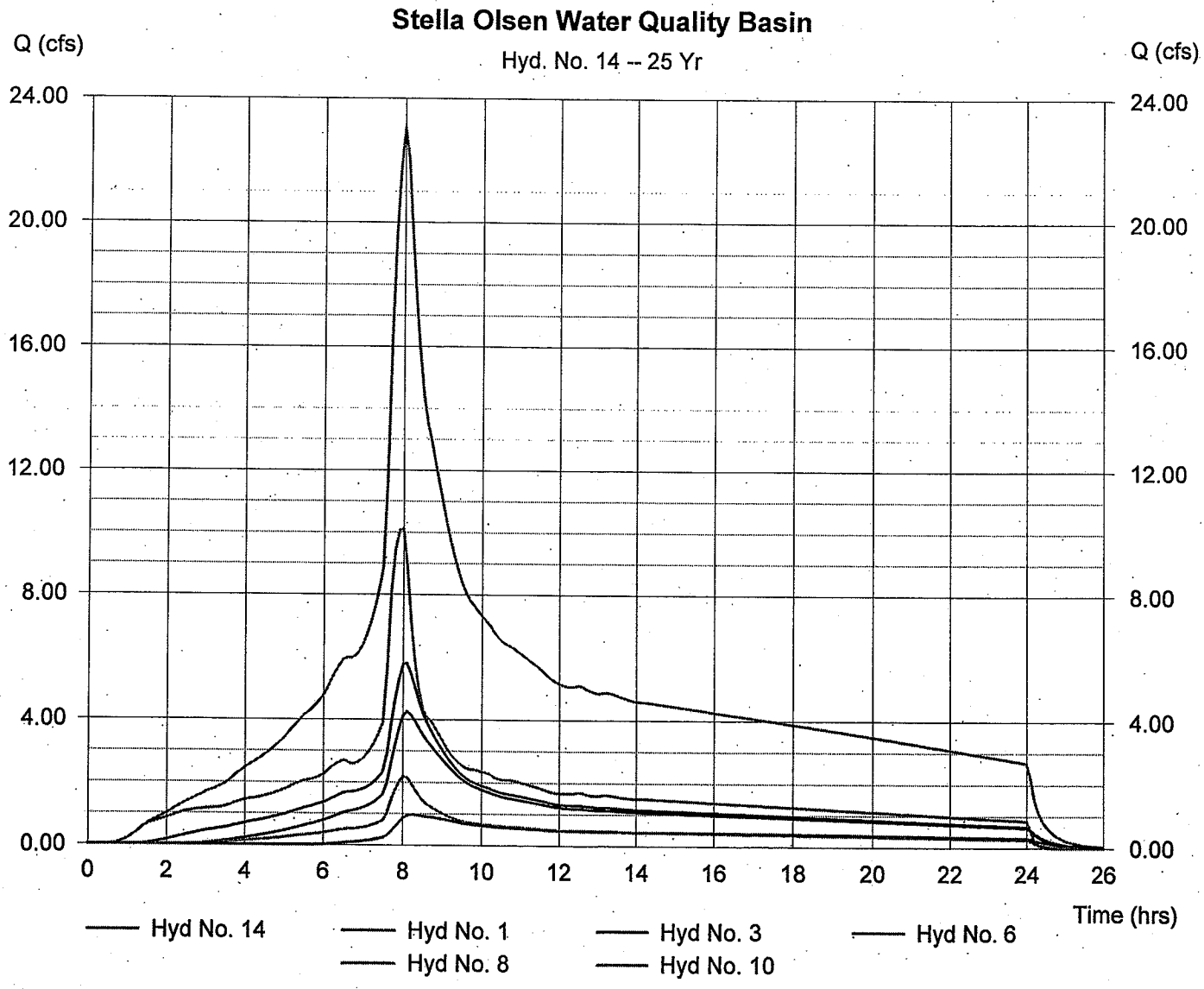
Hyd. No. 14

Stella Olsen Water Quality Basin

Hydrograph type = Combine
Storm frequency = 25 yrs
Inflow hyds. = 1, 3, 6, 8, 10

Peak discharge = 23.05 cfs
Time interval = 6 min

Hydrograph Volume = 407,933 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

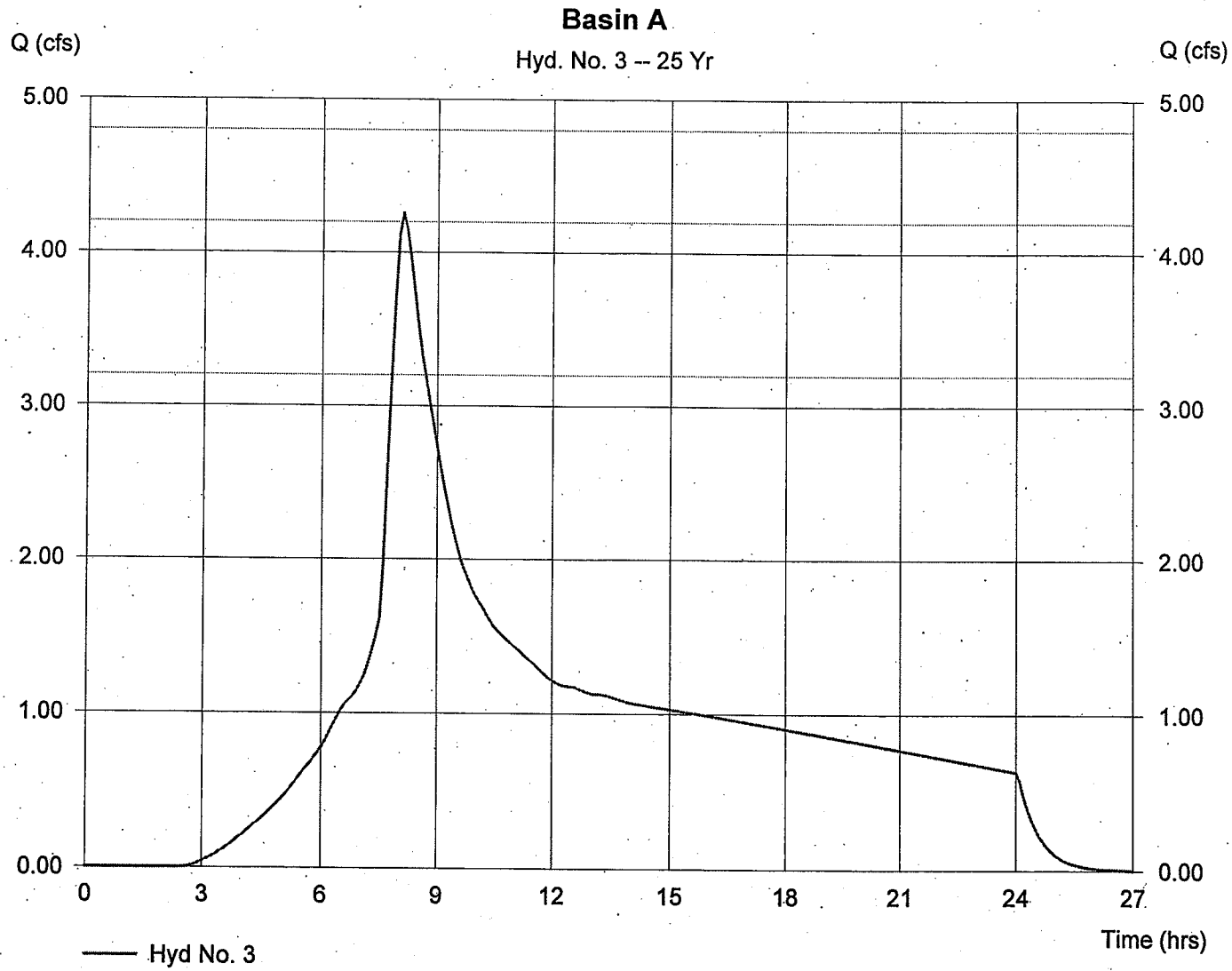
Thursday, Aug 11 2005, 3:33 PM

Hyd. No. 3

Basin A

Hydrograph type	= SBUH Runoff	Peak discharge	= 4.26 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 8.72 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 31 min
Total precip.	= 3.90 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= N/A

Hydrograph Volume = 86,393 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

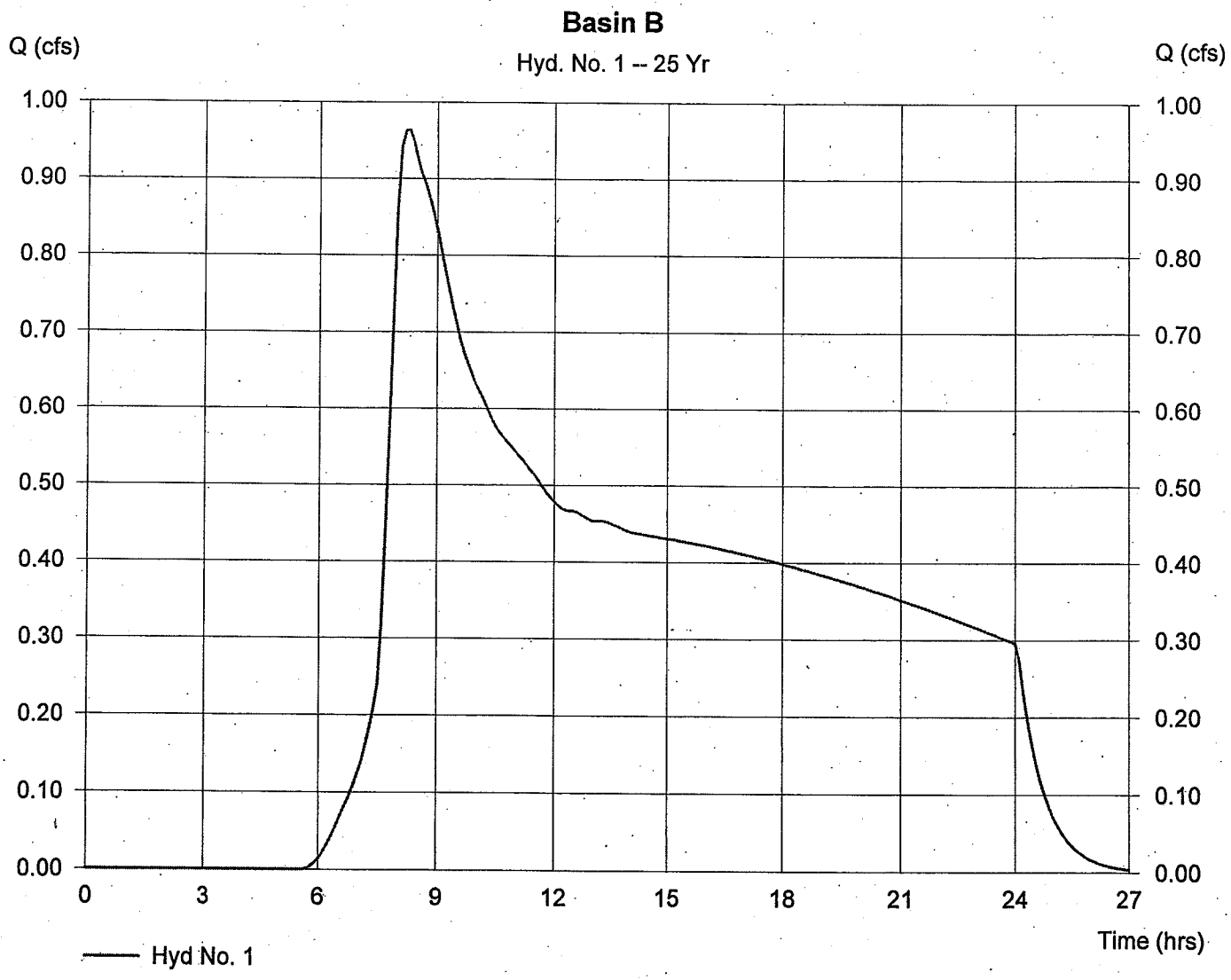
Thursday, Aug 11 2005, 3:33 PM

Hyd. No. 1

Basin B

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.96 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 5.24 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 40 min
Total precip.	= 3.90 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= N/A

Hydrograph Volume = 28,975 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

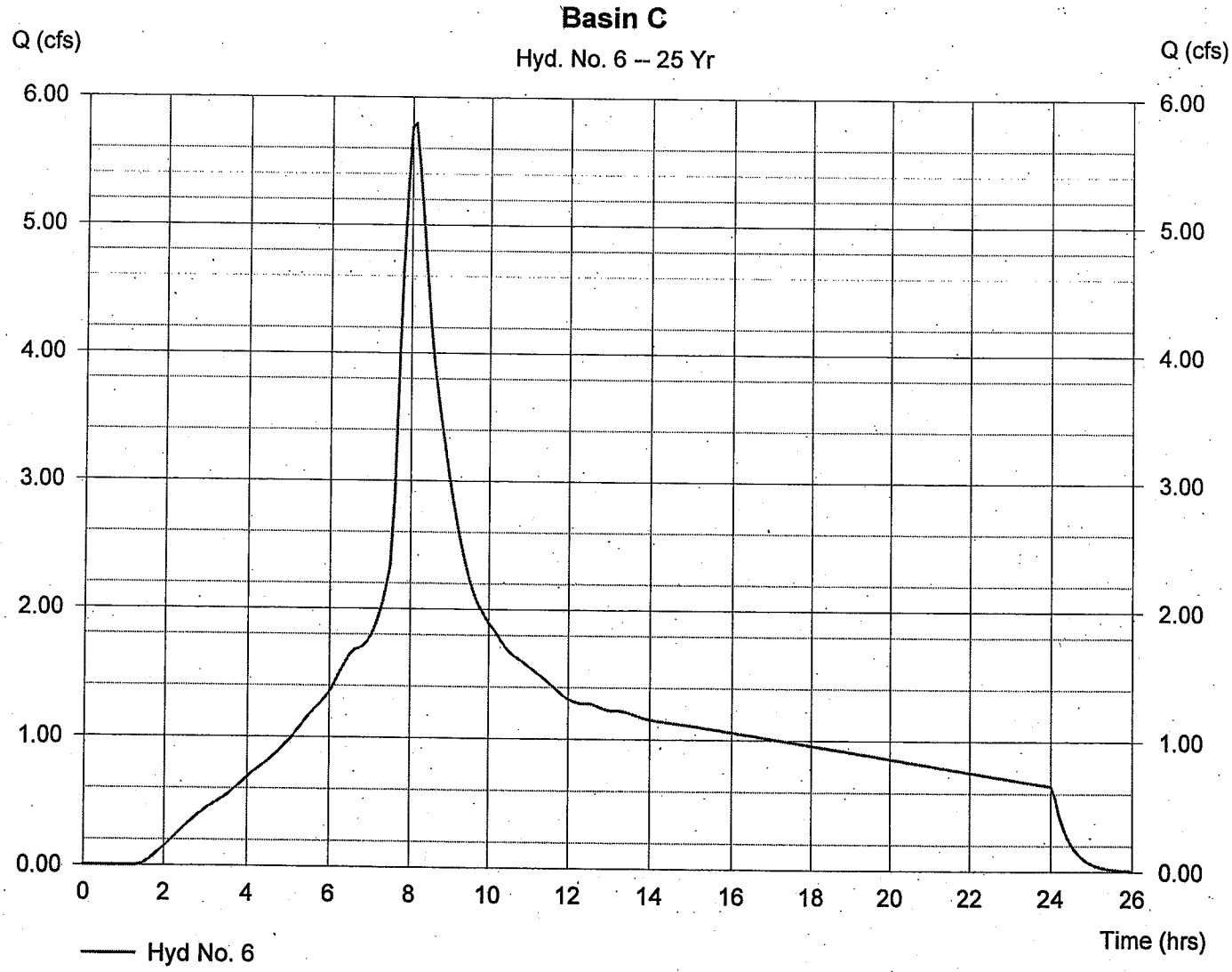
Thursday, Aug 11 2005, 3:36 PM

Hyd. No. 6

Basin C

Hydrograph type	= SBUH Runoff	Peak discharge	= 5.80 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 8.70 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 23.3 min
Total precip.	= 3.90 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= N/A

Hydrograph Volume = 105,245 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

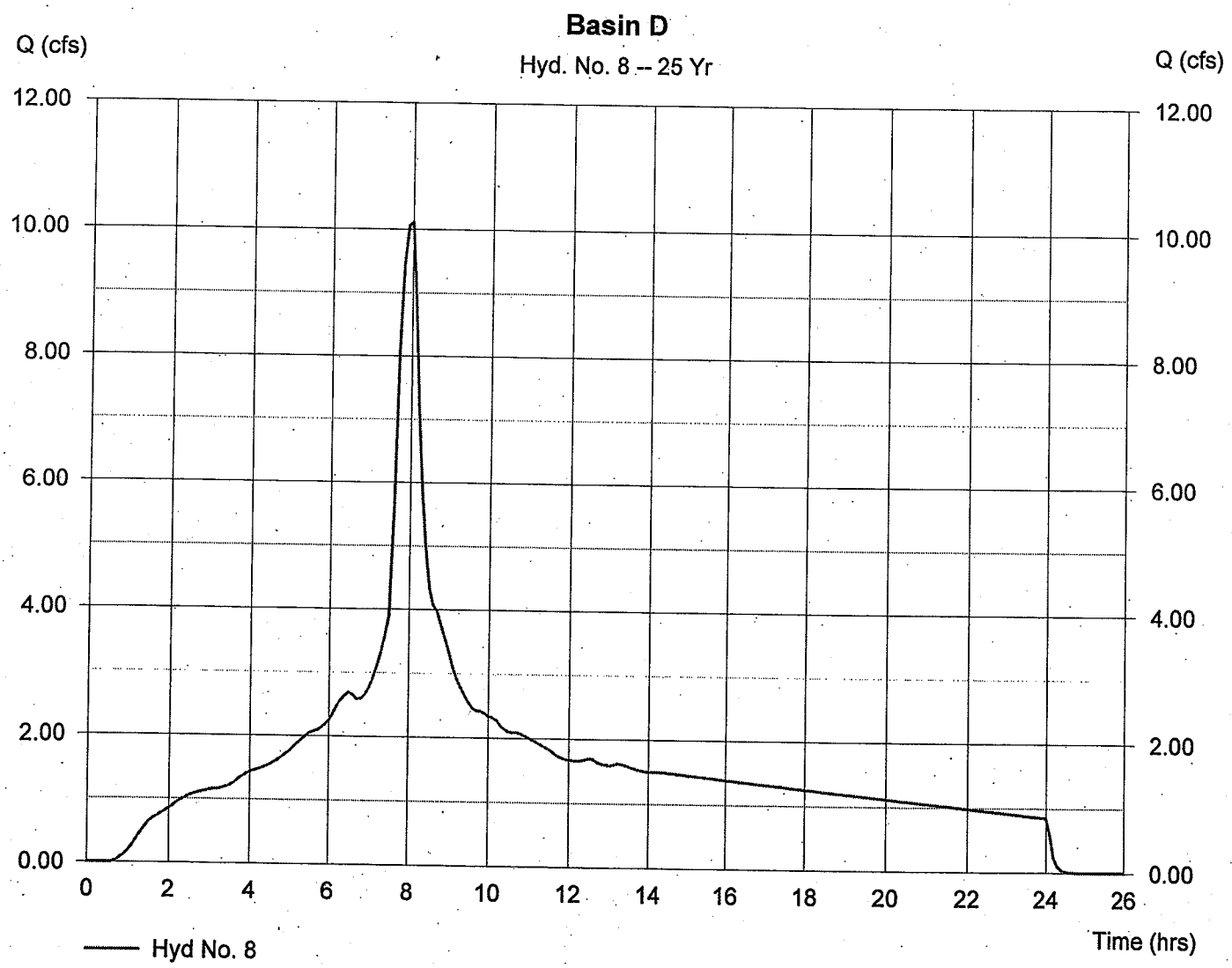
Thursday, Aug 11 2005, 3:36 PM

Hyd. No. 8

Basin D

Hydrograph type	= SBUH Runoff	Peak discharge	= 10.12 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 11.32 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 7 min
Total precip.	= 3.90 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= N/A

Hydrograph Volume = 150,615 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

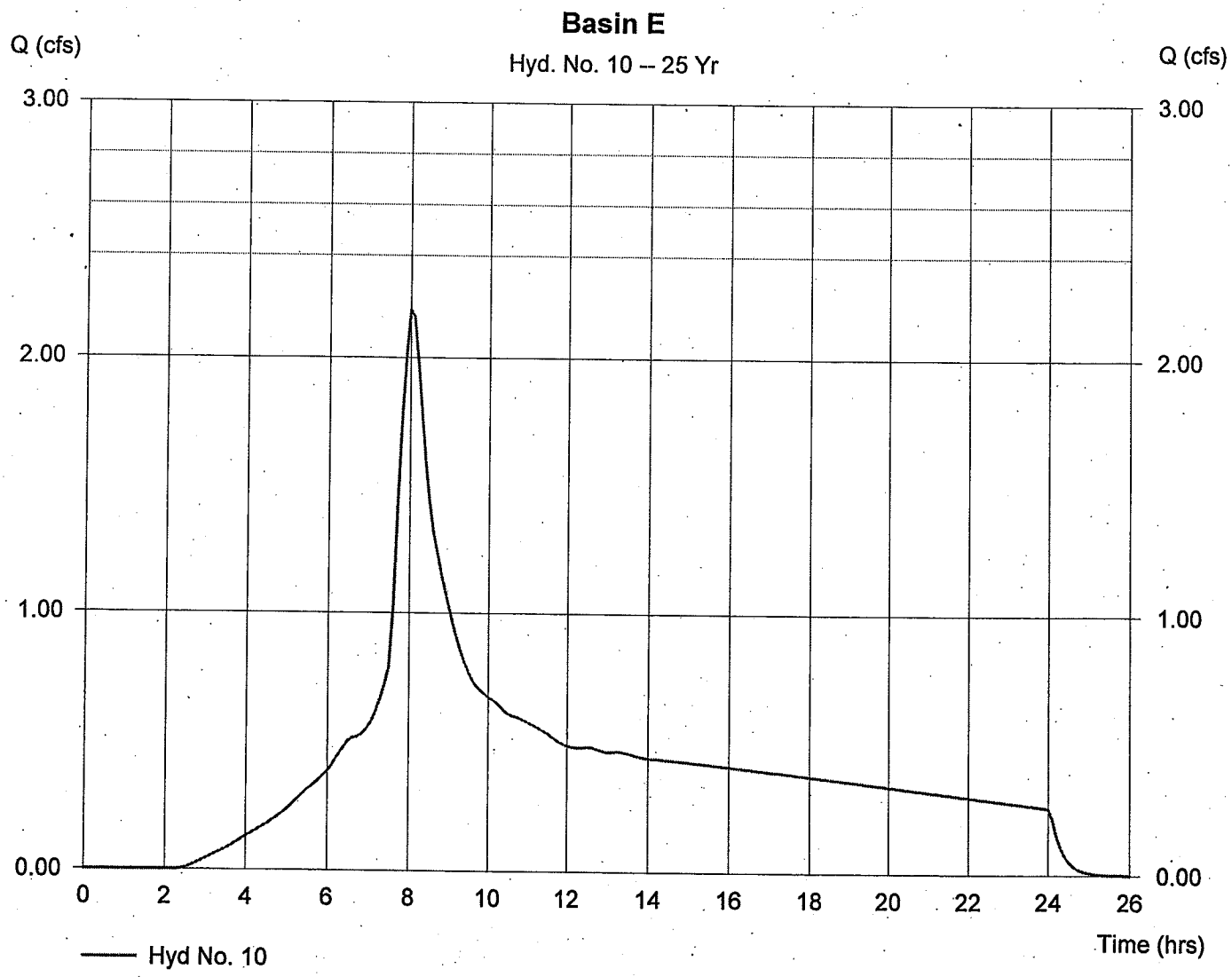
Thursday, Aug 11 2005, 3:38 PM

Hyd. No. 10

Basin E

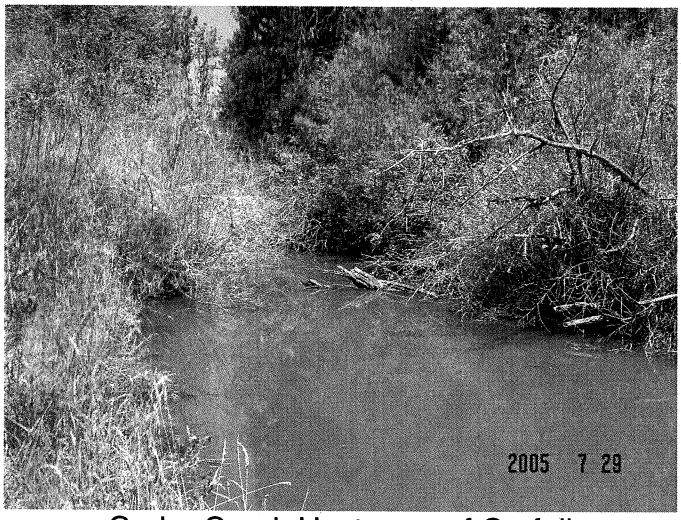
Hydrograph type	= SBUH Runoff	Peak discharge	= 2.19 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 3.58 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 17 min
Total precip.	= 3.90 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= N/A

Hydrograph Volume = 36,705 cuft

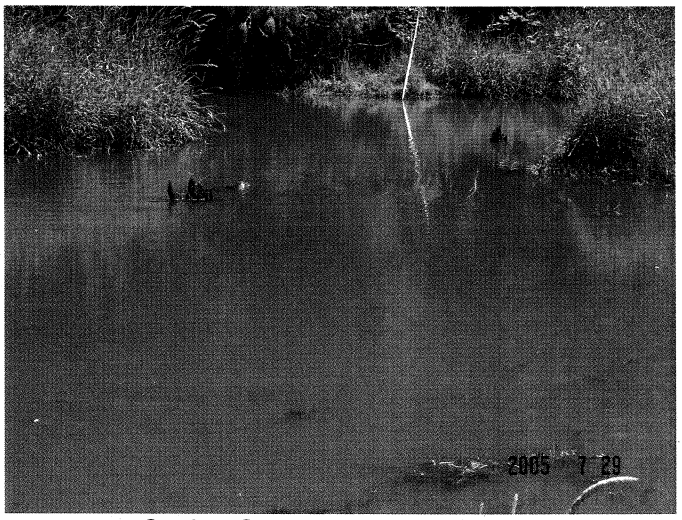


Cedar Creek Photo Log

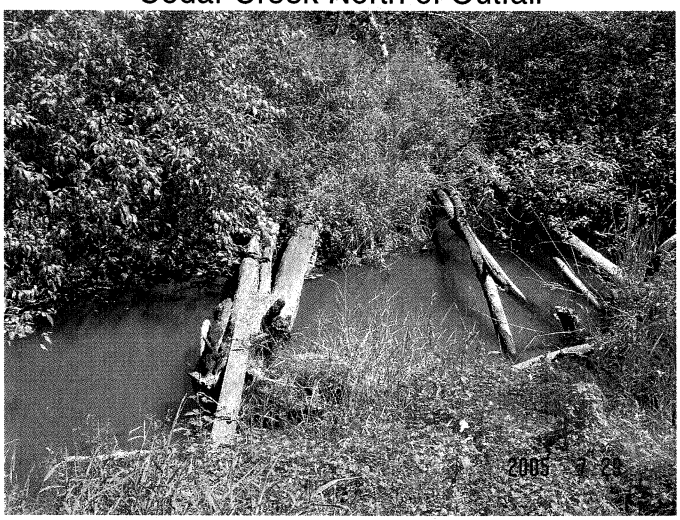
Villa Swale



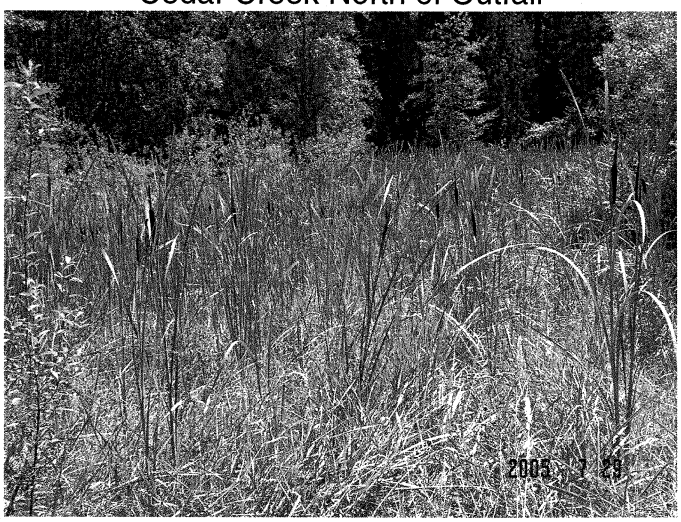
Cedar Creek Upstream of Outfall



Cedar Creek North of Outfall



Cedar Creek North of Outfall

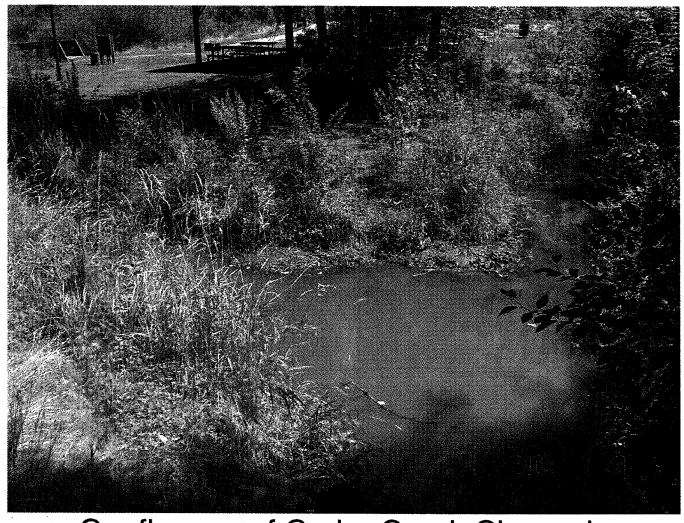


Cedar Creek Floodplain Near Outfall

Cedar Creek Below Outfall

Cedar Creek Below Outfall

Foot Bridge in Stella Olsen Park

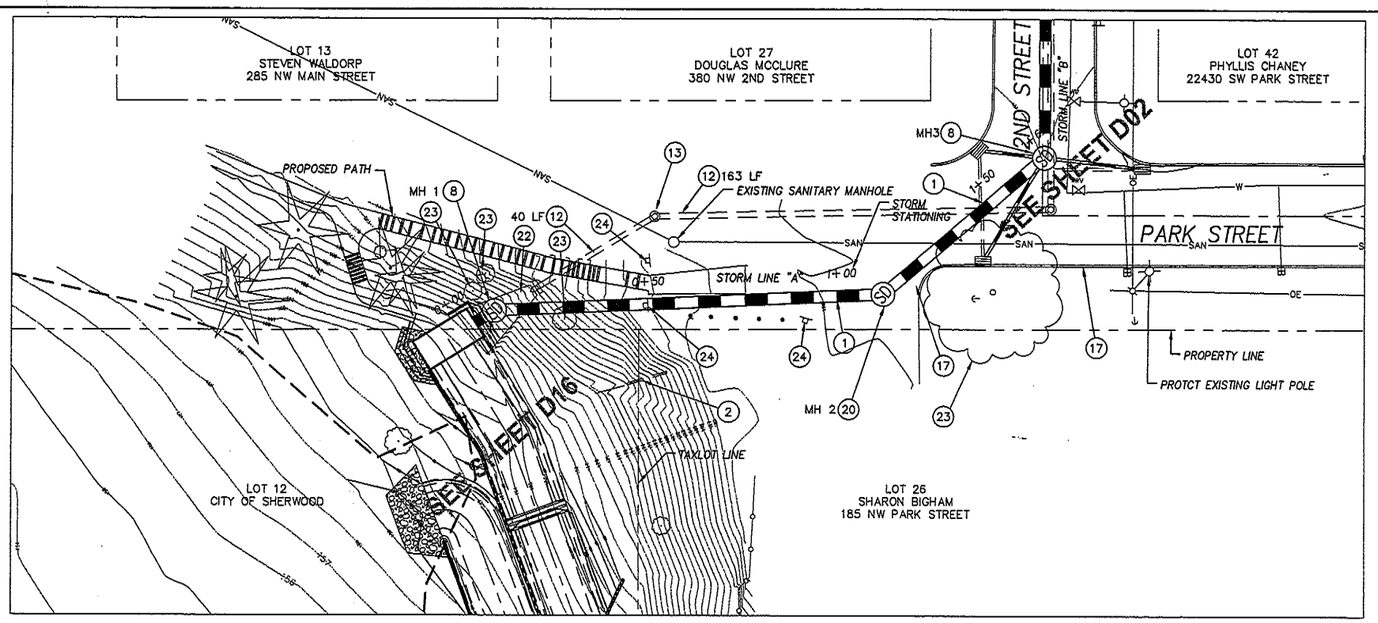


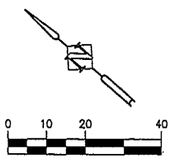
Confluence of Cedar Creek Channels

Washington Street Culvert

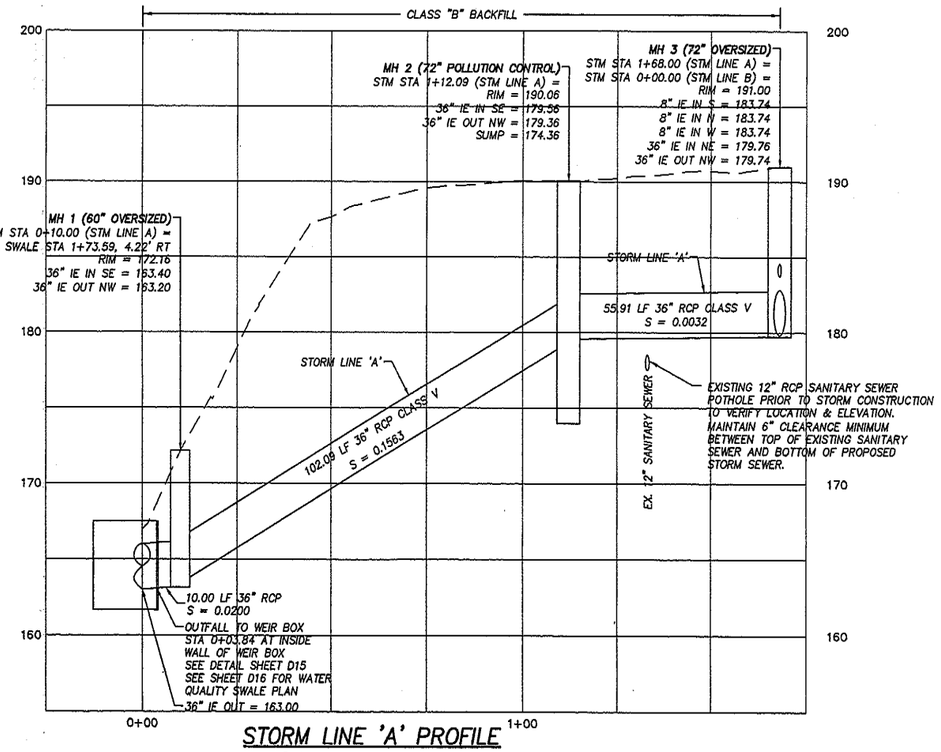
APPENDIX G
CONSTRUCTION PLANS

HHPR





ABBREVIATIONS
MH – MANHOLE
CB – ALL INLETS INCLUDING CATCH BASIN, AREA DRAIN, AND TRENCH DRAIN.
CO – CLEANOUT
DI – DITCH INLET



STORM LINE 'A' PROFILE

FULL SIZE SCALE: HOR. 1" = 20'
VER. 1" = 5'

GENERAL NOTES:

LENGTH OF PIPE AS SHOWN ON THE PLANS IS MEASURED FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE. STATION AND OFFSET ARE MEASURED FROM CENTER OF STRUCTURE FOR MANHOLES AND AREA DRAINS AND CENTER OF STRUCTURE AT FRONT FACE OF CURB FOR CURB INLETS.

ALL WORK SHALL CONFORM TO CITY OF SHERWOOD AND CLEAN WATER SERVICES STANDARDS.

ALL WORK SHALL CONFORM TO THE PERMITS ISSUED BY CITY OF SHERWOOD, CLEAN WATER SERVICES, ARMY CORP OF ENGINEERS, AND THE OREGON DIVISION OF STATE LANDS.

THE CONTRACTOR SHALL COMPLY WITH ALL REQUIREMENTS OR ORS 757.541 TO 757.571. THE CONTRACTOR SHALL NOTIFY EACH UNDERGROUND UTILITY AT LEAST 48 BUSINESS-DAY HOURS PRIOR TO EXCAVATING, BORING, OR POTHOLING. ALL UTILITY CROSSINGS SHALL BE POTHOLED AS NECESSARY PRIOR TO EXCAVATING OR BORING TO ALLOW THE CONTRACTOR TO PREVENT GRADE OF ALIGNMENT CONFLICTS.

STATIONING SHOWN IN THE PLAN VIEW IS NOTED AS STREET STATIONING OR STORM STATIONING. ALL STATIONING SHOWN IN THE PROFILE VIEW IS STORM STATIONING. BOTH STREET AND STORM STATIONING ARE PROVIDED FOR THE MANHOLES IN THE PROFILE. LOCATION FOR THE INLETS ARE BASED ON STREET STATIONING ONLY.

THE LOCATION AND DESCRIPTIONS OF EXISTING UTILITIES SHOWN ARE COMPILED FROM AVAILABLE RECORDS AND /OR FIELD SURVEYS. THE CITY OR UTILITY COMPANIES DO NOT GUARANTEE THE ACCURACY NOR THE COMPLETENESS OF SUCH RECORDS. EXISTING TOPOGRAPHIC INFORMATION SHOWN IS BASED ON SURVEY PERFORMED BY HARPER HOUF PETERSON RIGHELLIS INC.

CONTRACTOR TO CONNECT ALL EXISTING STORM LINES TO NEW SYSTEM. LOCATIONS OF ALL EXISTING LINES ARE UNKNOWN. CONTRACTOR SHALL RECONNECT ALL EXISTING LINES TO NEW STORM SYSTEM PRIOR TO ABANDONING EXISTING LINES.

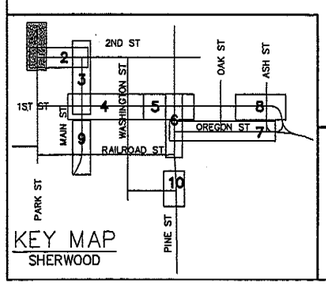
NOT ALL KEY NOTES ARE USED ON ALL PLAN SHEETS.

VERIFY RIM ELEVATIONS WITH STREET PLANS PRIOR TO CONSTRUCTION.

ALL SLOPES ARE LISTED IN FT. PER 100 FT.

CONSTRUCTION NOTES

1. *INSTALL STORM PIPE MAIN W/ BACKFILL AS NOTED. PIPE LENGTH, SIZE AND SLOPE IS SHOWN ON THE PROFILE. STORM LATERAL INFORMATION SHOWN IN CATCH BASIN AND LATERAL TABLE.*
2. *EXISTING CATCH BASIN, MANHOLE, OR STORM PIPE TO REMAIN.*
3. *INSTALL AREA DRAIN PER DETAIL ON SHEET D13. REFER TO CATCH BASIN AND LATERAL TABLE ON THIS SHEET.*
4. *INSTALL TRENCH DRAIN PER DETAIL ON SHEET D13. REFER TO CATCH BASIN AND LATERAL TABLE ON THIS SHEET.*
5. *INSTALL CG-2 CATCH BASIN PER DETAIL ON SHEET D13. REFER TO CATCH BASIN AND LATERAL TABLE ON THIS SHEET.*
6. *INSTALL LYNCH CATCH BASIN PER DETAIL ON SHEET D13. REFER TO CATCH BASIN AND LATERAL TABLE ON THIS SHEET.*
7. *INSTALL STANDARD MANHOLE PER DETAIL ON SHEET D11. REFER TO PROFILE ON THIS SHEET FOR MANHOLE DATA.*
8. *INSTALL OVERSIZED MANHOLE PER DETAIL ON SHEET D11. SEE PROFILE FOR MANHOLE SIZE.*
9. *INSTALL ADS AREA DRAIN PER DETAIL ON SHEET D13. REFER TO CATCH BASIN AND LATERAL TABLE ON THIS SHEET.*
10. *CONSTRUCT STORM SEWER FLAT-TOP MANHOLE PER STD. DETAIL ON SHEET D11. REFER TO PROFILE FOR INVERTS AND PIPE DATA.*
11. *CONNECT TO EXISTING PIPE, CATCH BASIN, OR MANHOLE PER STD. PIPE CONNECTION DETAIL. REFER TO CATCH BASIN AND LATERAL TABLE FOR INVERTS AND PIPE DATA.*
12. *REMOVE EXISTING CULVERT OR STORM PIPE. BACKFILL VOID WITH COMPACTED CRUSHED ROCK. ABANDON IN PLACE IF NOTED.*
13. *REMOVE EXISTING STORM MANHOLE OR CATCH BASIN. BACKFILL VOID WITH COMPACTED CRUSHED ROCK. SALVAGE INLET GRATES AND MANHOLE LIDS AND DELIVER TO THE PUBLIC WORKS YARD.*
14. *CAUTION! UTILITY CROSSING. POTHOLE OR VERIFY ALL CROSSINGS PRIOR TO CONSTRUCTION TO ENSURE CLEARANCE OF UTILITIES. COORDINATE WITH APPROPRIATE UTILITY AGENCY.*
15. *INSTALL 6" STORM SERVICE LATERAL. REFER TO STORM SERVICE LATERAL TABLE, THIS SHEET. SEE STORM SERVICE LATERAL DETAIL SHEET D14.*
16. *CONNECT EXISTING ROOF DRAIN TO STORM SEWER. SEE DETAIL SHEET UD31 FOR ROOF DRAIN CONNECTION.*
17. *SAWCUT AND REPLACE EXISTING A.C. PAVEMENT PER DETAIL ON SHEET D12. SAWCUT AND REPLACE EXISTING CURB AND DRIVEWAY AS NECESSARY FOR STORM CONSTRUCTION. RESTORE LAWN AREA TO ORIGINAL CONDITION.*
18. *CULVERT CONSTRUCTION, LOCATION, AND END TREATMENT TO BE COORDINATED WITH P&W RAILROAD.*
19. *INSTALL STORM CLEANOUT PER DETAIL SHEET D14. REFER TO PROFILE FOR INVERT AND PIPE DATA.*
20. *INSTALL CONCRETE POLLUTION CONTROL MANHOLE PER DETAIL SHEET D15. REFER TO PROFILE FOR INVERTS AND PIPE DATA.*
21. *INSTALL DITCH INLET PER DETAIL ON SHEET D14. REFER TO PROFILE ON THIS SHEET FOR INLET INFORMATION. LOCATIONS TO BE COORDINATED WITH RAILROAD DESIGN.*
22. *REMOVE EXISTING CONCRETE AT EXISTING STORM OUTFALL. BACKFILL WITH COMPACTED CRUSHED ROCK.*
23. *PROTECT EXISTING TREE.*
24. *REMOVE AND REINSTALL EXISTING SIGN AS NECESSARY FOR STORM SEWER CONSTRUCTION. (INCIDENTAL TO STORM SEWER CONSTRUCTION.)*
25. *SAWCUT ALONG THE PROPOSED STORM SEWER ALIGNMENT BEFORE PAVEMENT REMOVAL. INSTALL COLD PATCH AC FOR TEMPORARY SURFACING IN STREETSCAPE AREA.*
26. *CONNECT EXISTING STORM LINE TO NEW MAIN WITH FERNCO CONNECTION AND 6" PVC ASTM D3034. LENGTH NOTED ON PLAN.*



KEY MAP
SHERWOOD

Sheet Revisions		
R-	/ /	
R-	/ /	
R-	/ /	
R-	/ /	
R-	/ /	

REGISTERED PROFESSIONAL ENGINEER
72,311
OREGON
JULY 14, 2000
KIMBERLY ANN SHERA
9-2-05
EXPIRES: 6/30/2006

Sherwood Downtown Streetscape Improvements–Phase A

City of Sherwood Oregon

Engineering Department
15527 S. W. Willamette St.
Sherwood, OR 97140
Phone: (503) 925-2305
FAX: (503) 625-0679

HHPR
Harper Houf Peterson Righellis Inc.
ENGINEERS • PLANNERS • SURVEYORS
5200 SW MACADAM AVENUE, SUITE 580, PORTLAND, OR 97239
TEL 503.221.1131 www.hhpr.com FAX 503.221.1171

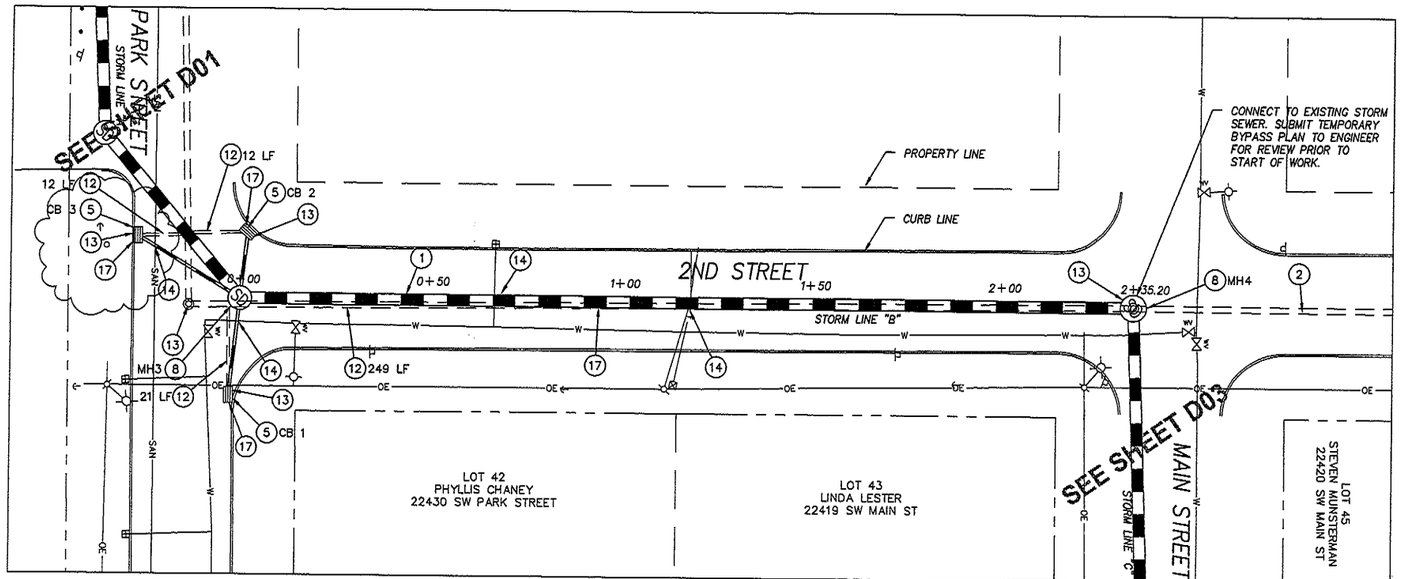
As Constructed		
No Revisions:	/ /	
Revised:	/ /	
Void:	/ /	

DRAINAGE PLAN & PROFILE
PARK STREET

Designer:		Structure Numbers	
Detailer:			
Sheet Subset:		Subset Sheets:	

Project No./Code	
071668.100	
City of Sherwood CIP #-41	
Sheet Number	D01

CBI-01-C



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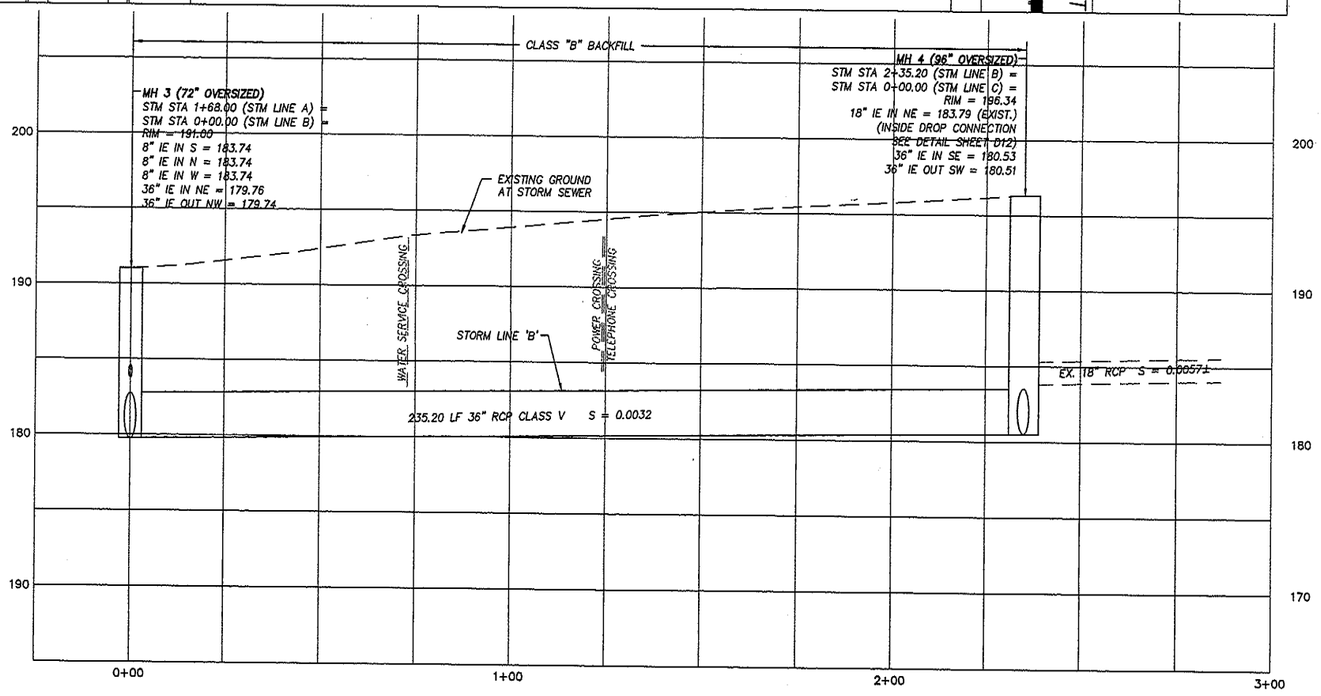
SCALE: 1" = 20'



STORM LINE 'B' PROFILE

FULL SIZE SCALE: HOR. 1" = 20'
VER. 1" = 5'

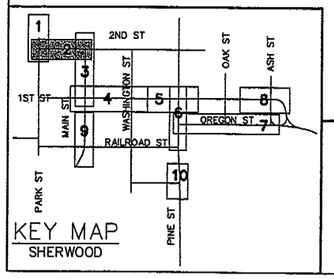
CONSTRUCTION NOTES

1. INSTALL STORM PIPE MAIN W/ BACKFILL AS NOTED. PIPE LENGTH, SIZE AND SLOPE IS SHOWN ON THE PROFILE. STORM LATERAL INFORMATION SHOWN IN CATCH BASIN AND LATERAL TABLE.
2. EXISTING CATCH BASIN, MANHOLE, OR STORM PIPE TO REMAIN.
3. INSTALL AREA DRAIN PER DETAIL ON SHEET D13. REFER TO CATCH BASIN AND LATERAL TABLE ON THIS SHEET.
4. INSTALL TRENCH DRAIN PER DETAIL ON SHEET D13. REFER TO CATCH BASIN AND LATERAL TABLE ON THIS SHEET.
5. INSTALL CG-2 CATCH BASIN PER DETAIL ON SHEET D13. REFER TO CATCH BASIN AND LATERAL TABLE ON THIS SHEET.
6. INSTALL LYNCH CATCH BASIN PER DETAIL ON SHEET D13. REFER TO CATCH BASIN AND LATERAL TABLE ON THIS SHEET.
7. INSTALL STANDARD MANHOLE PER DETAIL ON SHEET D11. REFER TO PROFILE ON THIS SHEET FOR MANHOLE DATA.
8. INSTALL OVERSIZED MANHOLE PER DETAIL ON SHEET D11. SEE PROFILE FOR MANHOLE SIZE.
9. INSTALL ADS AREA DRAIN PER DETAIL ON SHEET D13. REFER TO CATCH BASIN AND LATERAL TABLE ON THIS SHEET.
10. CONSTRUCT STORM SEWER FLAT-TOP MANHOLE PER STD. DETAIL ON SHEET D11. REFER TO PROFILE FOR INVERTS AND PIPE DATA.
11. CONNECT TO EXISTING PIPE, CATCH BASIN, OR MANHOLE PER STD. PIPE CONNECTION DETAIL. REFER TO CATCH BASIN AND LATERAL TABLE FOR INVERTS AND PIPE DATA.
12. REMOVE EXISTING CULVERT OR STORM PIPE. BACKFILL VOID WITH COMPACTED CRUSHED ROCK. ABANDON IN PLACE IF NOTED.
13. REMOVE EXISTING STORM MANHOLE OR CATCH BASIN. BACKFILL VOID WITH COMPACTED CRUSHED ROCK. SALVAGE INLET GRATES AND MANHOLE LIDS AND DELIVER TO THE PUBLIC WORKS YARD.
14. CAUTION! UTILITY CROSSING. POTHOLE OR VERIFY ALL CROSSINGS PRIOR TO CONSTRUCTION TO ENSURE CLEARANCE OF UTILITIES. COORDINATE WITH APPROPRIATE UTILITY AGENCY.
15. INSTALL 6" STORM SERVICE LATERAL. REFER TO STORM SERVICE LATERAL TABLE, THIS SHEET. SEE STORM SERVICE LATERAL DETAIL SHEET D14.
16. CONNECT EXISTING ROOF DRAIN TO STORM SEWER. SEE DETAIL SHEET UD31 FOR ROOF DRAIN CONNECTION.
17. SAWCUT AND REPLACE EXISTING A.C. PAVEMENT PER DETAIL ON SHEET D12. SAWCUT AND REPLACE EXISTING CURB AND DRIVEWAY AS NECESSARY FOR STORM CONSTRUCTION. RESTORE LAWN AREA TO ORIGINAL CONDITION.
18. CULVERT CONSTRUCTION, LOCATION, AND END TREATMENT TO BE COORDINATED WITH P&W RAILROAD.
19. INSTALL STORM CLEANOUT PER DETAIL SHEET D14. REFER TO PROFILE FOR INVERT AND PIPE DATA.
20. INSTALL CONCRETE POLLUTION CONTROL MANHOLE PER DETAIL SHEET D15. REFER TO PROFILE FOR INVERTS AND PIPE DATA.
21. INSTALL DITCH INLET PER DETAIL ON SHEET D14. REFER TO PROFILE ON THIS SHEET FOR INLET INFORMATION. LOCATIONS TO BE COORDINATED WITH RAILROAD DESIGN.
22. REMOVE EXISTING CONCRETE AT EXISTING STORM OUTFALL. BACKFILL WITH COMPACTED CRUSHED ROCK.
23. PROTECT EXISTING TREE.
24. REMOVE AND REINSTALL EXISTING SIGN AS NECESSARY FOR STORM SEWER CONSTRUCTION. (INCIDENTAL TO STORM SEWER CONSTRUCTION.)
25. SAWCUT ALONG THE PROPOSED STORM SEWER ALIGNMENT BEFORE PAVEMENT REMOVAL. INSTALL COLD PATCH AC FOR TEMPORARY SURFACING IN STREETSCAPE AREA.
26. CONNECT EXISTING STORM LINE TO NEW MAIN WITH FERNCO CONNECTION AND 6" PVC ASTM D3034. LENGTH NOTED ON PLAN.

CATCH BASIN AND LATERAL TABLE

NO	TYPE	LOCATION	RIM ELEV.	I.E.	PIPE LATERAL LENGTH/SIZE/SLOPE
CB-1	CG-2	MATCH EXISTING	190.01	185.64	25.7'/8"/0.0739
CB-2	CG-2	MATCH EXISTING	190.39	185.33	17.5'/8"/0.0909
CB-3	CG-2	MATCH EXISTING	190.09	185.02	31.5'/8"/0.0406

NOTE: ALL LATERALS SHALL BE ASTM D3034 WITH CLASS "B" BACKFILL UNLESS OTHERWISE NOTED ON PLAN.



Sheet Revisions		
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R-	/ /	
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REGISTERED PROFESSIONAL ENGINEER 72,311 OREGON NOV. 12, 2002 KIMBERLY ANN SHERA
EXPIRES: 6/30/2006
9205

Sherwood Downtown Streetscape Improvements-Phase A

City of Sherwood Oregon

Engineering Department
15527 S. W. Willamette St.
Sherwood, OR 97140
Phone: (503) 925-2305
FAX: (503) 625-0679

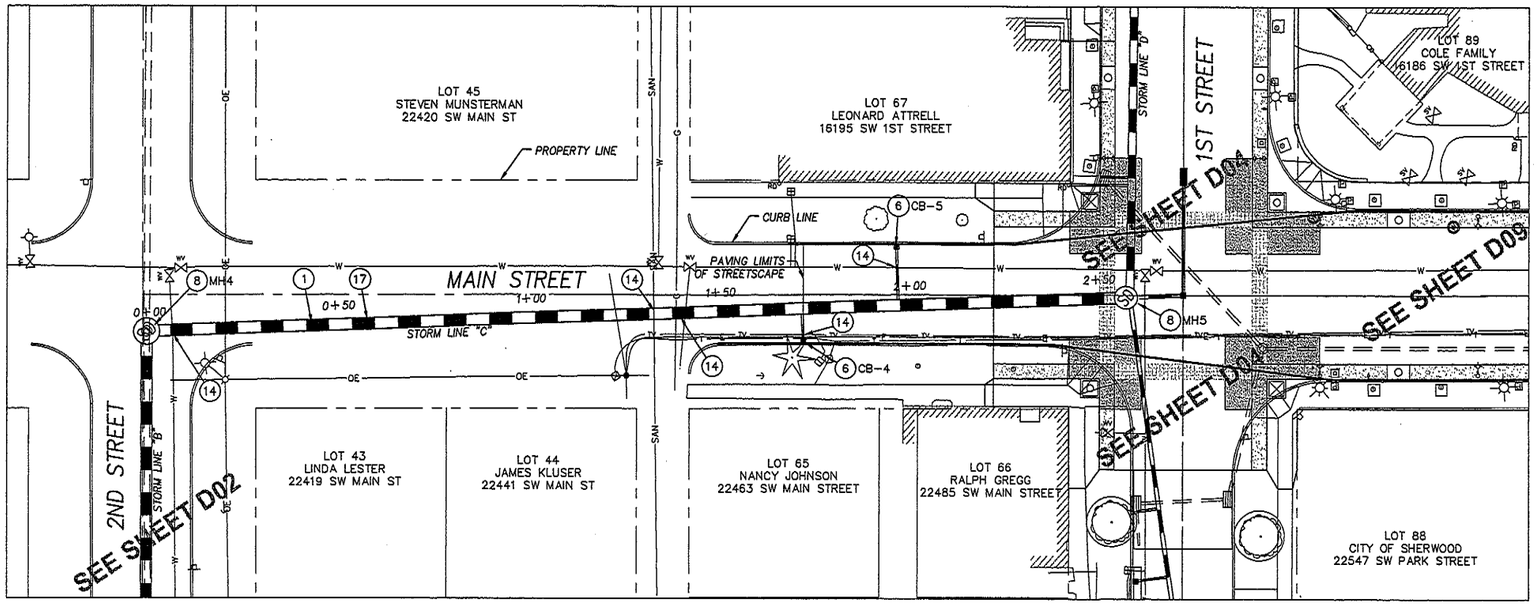
HHPR Harper Houf Peterson Righellis Inc.
ENGINEERS • PLANNERS • SURVEYORS
5200 SW MACADAM AVENUE, SUITE 580, PORTLAND, OR 97239
TEL 503.221.1131 www.hhpr.com FAX 503.221.1171

As Constructed		
No Revisions:	/ /	
Revised:	/ /	
Void:	/ /	

DRAINAGE PLAN & PROFILE
2ND STREET

Designer:		Structure Numbers	
Detailer:			
Sheet Subset:		Subset Sheets:	

Project No./Code: 071668.100
City of Sherwood CIP #-41
Sheet Number D02



0 10 20 40
SCALE: 1" = 20'

CONSTRUCTION NOTES

1. INSTALL STORM PIPE MAIN W/ BACKFILL AS NOTED. PIPE LENGTH, SIZE AND SLOPE IS SHOWN ON THE PROFILE. STORM LATERAL INFORMATION SHOWN IN CATCH BASIN AND LATERAL TABLE.
2. EXISTING CATCH BASIN, MANHOLE, OR STORM PIPE TO REMAIN.
3. INSTALL AREA DRAIN PER DETAIL ON SHEET D13. REFER TO CATCH BASIN AND LATERAL TABLE ON THIS SHEET.
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12. REMOVE EXISTING CULVERT OR STORM PIPE. BACKFILL VOID WITH COMPACTED CRUSHED ROCK. ABANDON IN PLACE IF NOTED.
13. REMOVE EXISTING STORM MANHOLE OR CATCH BASIN. BACKFILL VOID WITH COMPACTED CRUSHED ROCK. SALVAGE INLET GRATES AND MANHOLE LIDS AND DELIVER TO THE PUBLIC WORKS YARD.
14. CAUTION! UTILITY CROSSING. POTHOLE OR VERIFY ALL CROSSINGS PRIOR TO CONSTRUCTION TO ENSURE CLEARANCE OF UTILITIES. COORDINATE WITH APPROPRIATE UTILITY AGENCY.
15. INSTALL 6" STORM SERVICE LATERAL. REFER TO STORM SERVICE LATERAL TABLE, THIS SHEET. SEE STORM SERVICE LATERAL DETAIL SHEET D14.
16. CONNECT EXISTING ROOF DRAIN TO STORM SEWER. SEE DETAIL SHEET UD31 FOR ROOF DRAIN CONNECTION.
17. SAWCUT AND REPLACE EXISTING A.C. PAVEMENT PER DETAIL ON SHEET D12. SAWCUT AND REPLACE EXISTING CURB AND DRIVEWAY AS NECESSARY FOR STORM CONSTRUCTION. RESTORE LAWN AREA TO ORIGINAL CONDITION.
18. CULVERT CONSTRUCTION, LOCATION, AND END TREATMENT TO BE COORDINATED WITH P&W RAILROAD.
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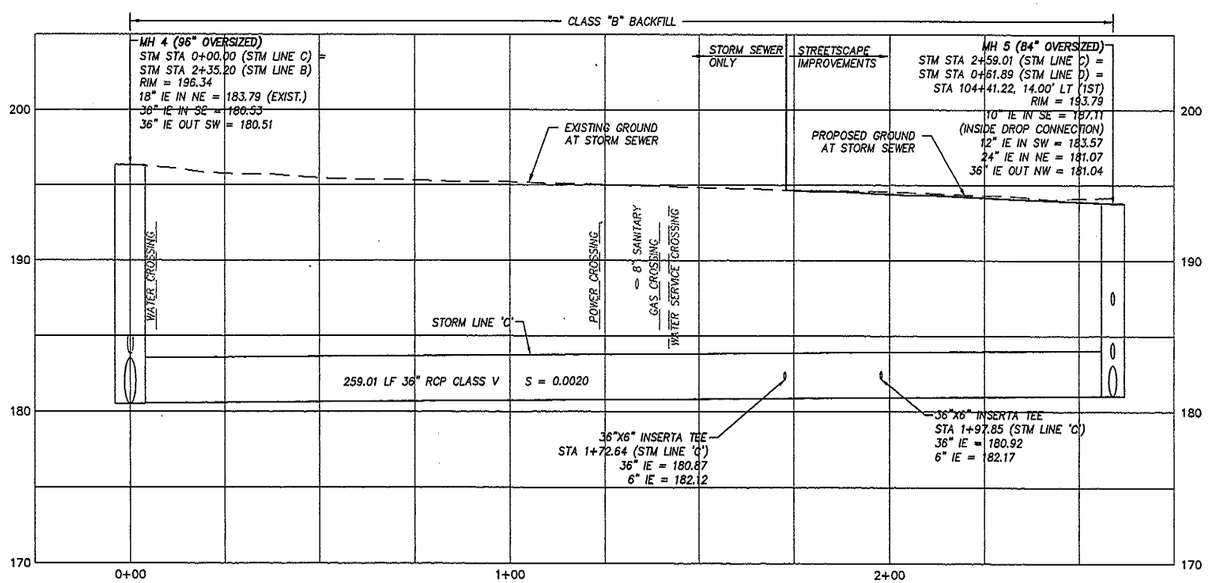
23. PROTECT EXISTING TREE.
24. REMOVE AND REINSTALL EXISTING SIGN AS NECESSARY FOR STORM SEWER CONSTRUCTION. (INCIDENTAL TO STORM SEWER CONSTRUCTION.)
25. SAWCUT ALONG THE PROPOSED STORM SEWER ALIGNMENT BEFORE PAVEMENT REMOVAL. INSTALL COLD PATCH AC FOR TEMPORARY SURFACING IN STREETSCAPE AREA.
26. CONNECT EXISTING STORM LINE TO NEW MAIN WITH FERNCO CONNECTION AND 6" PVC ASTM D3034. LENGTH NOTED ON PLAN.



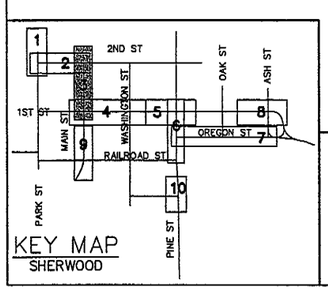
STORM LINE 'C' PROFILE

FULL SIZE SCALE: HOR. 1" = 20'
VER. 1" = 5'

CATCH BASIN AND LATERAL TABLE

NO	TYPE	LOCATION	RIM ELEV.	I.E.	PIPE LATERAL LENGTH/SIZE/SLOPE
CB-4	LYNCH	STA. 1+72.64, 9.12' RT. (STORM LINE 'D')	194.25±	192.75	8.5'/6"/1.2506
CB-5	LYNCH	STA. 1+97.85, 16.06' LT. (STORM LINE 'D')	194.13±	192.63	15.4'/6"/0.6792

NOTE: ALL LATERALS SHALL BE ASTM D3034 WITH CLASS "B" BACKFILL UNLESS OTHERWISE NOTED ON PLAN.



KEY MAP
SHERWOOD

Sheet Revisions		
R-1	/ /	
R-2	/ /	
R-3	/ /	
R-4	/ /	
R-5	/ /	

REGISTERED PROFESSIONAL ENGINEER
72,311
OREGON
NOV. 12, 2002
KIMBERLY ANN SHERA
EXPIRES: 6/30/2006
9-2005

Sherwood Downtown Streetscape Improvements–Phase A

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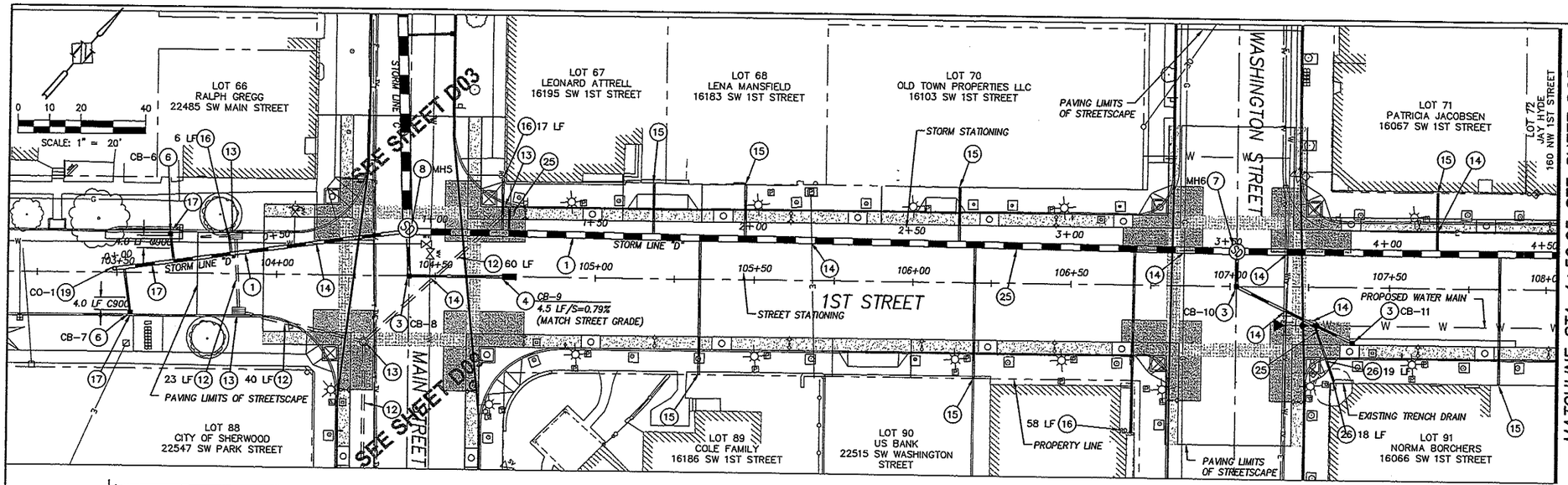
DRAINAGE PLAN & PROFILE MAIN STREET

Designer:		Structure Numbers	
Detailer:			
Sheet Subset:		Subset Sheets:	

Project No./Code	
071668.100	
City of Sherwood CIP #-41	
Sheet Number	D03



MATCHLINE STA 4+56.05 SEE SHEET D05

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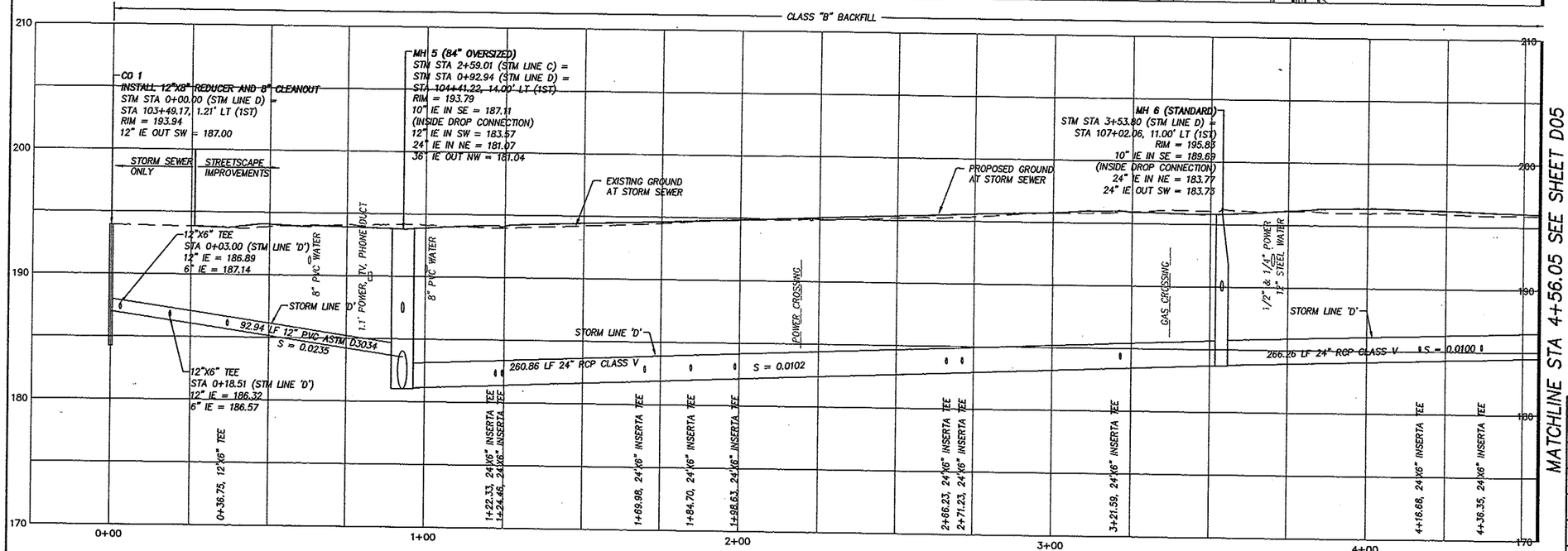


STORM LINE 'D' PROFILE

FULL SIZE SCALE: HOR. 1" = 20'
VER. 1" = 5'

MATCHLINE STA 4+56.05 SEE SHEET D05

STORM SERVICE LATERAL TABLE

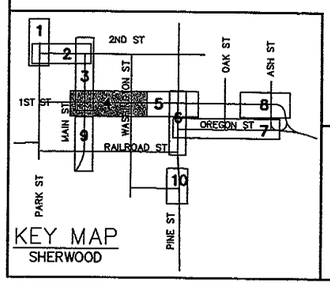
LOT NO.	STATION OF TEE	IE @ MAIN	LENGTH	DEPTH @ END
67	1+69.98	182.60	17' LT	6'
89	1+84.70	182.75	43' RT	6'
68	1+98.63	182.89	17' LT	6'
70	2+66.23	183.58	18' LT	6'
90	2+71.23	183.64	42' RT	6'
71	4+16.68	185.00	19' LT	6'
91	4+36.35	185.14	41' RT	6'

NOTE:
ALL SERVICE LATERALS ARE 6" WITH A MINIMUM SLOPE OF 2%.
DISTANCE FROM FINISH GROUND TO FLOWLINE OF LATERAL AT END OF SERVICE (DEPTH AT END) SHALL BE A MINIMUM OF 5'.
PIPE TYPE FOR SERVICE LATERALS SHALL BE PVC ASTM D3034.

CATCH BASIN AND LATERAL TABLE

NO	TYPE	LOCATION	RIM ELEV.	I.E.	PIPE LATERAL LENGTH/SIZE/SLOPE
CB-6	LYNCH	STA. 103+66.31, 13.00' LT. (1ST)	193.39	191.89	8.7'/6"/0.6115
CB-7	LYNCH	STA. 103+54.09, 13.11' RT. (1ST)	193.43	191.93	14.2'/6"/0.3775
CB-8	AREA DRAIN	STA. 104+41.83, 0.00' (1ST)	193.65	189.32 IN / 189.22 OUT	14.0'/10"/0.1500
CB-9	TRENCH DRAIN	STA. 104+70.83, 0.00' (1ST)	193.88	189.71	29.0'/8"/0.0134
CB-10	AREA DRAIN	STA. 107+02.06, 0.00' (1ST)	195.73	190.89 IN / 190.79 OUT	11.0'/10"/0.1000
CB-11	AREA DRAIN	STA. 107+38.74, 17.35' RT. (1ST)	195.63	191.30	40.6'/10"/0.0100

NOTE: ALL LATERALS SHALL BE PVC ASTM D3034 WITH CLASS "B" BACKFILL UNLESS OTHERWISE NOTED ON PLAN.



Sheet Revisions		
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R-	/ /	
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R-	/ /	
R-	/ /	

REGISTERED PROFESSIONAL ENGINEER 72,311 OREGON JULY 12, 1995 KIMBERLY ANN SHERA 9-2-05
EXPIRES: 6/30/2006

Sherwood Downtown Streetscape Improvements–Phase A

City of Sherwood Oregon

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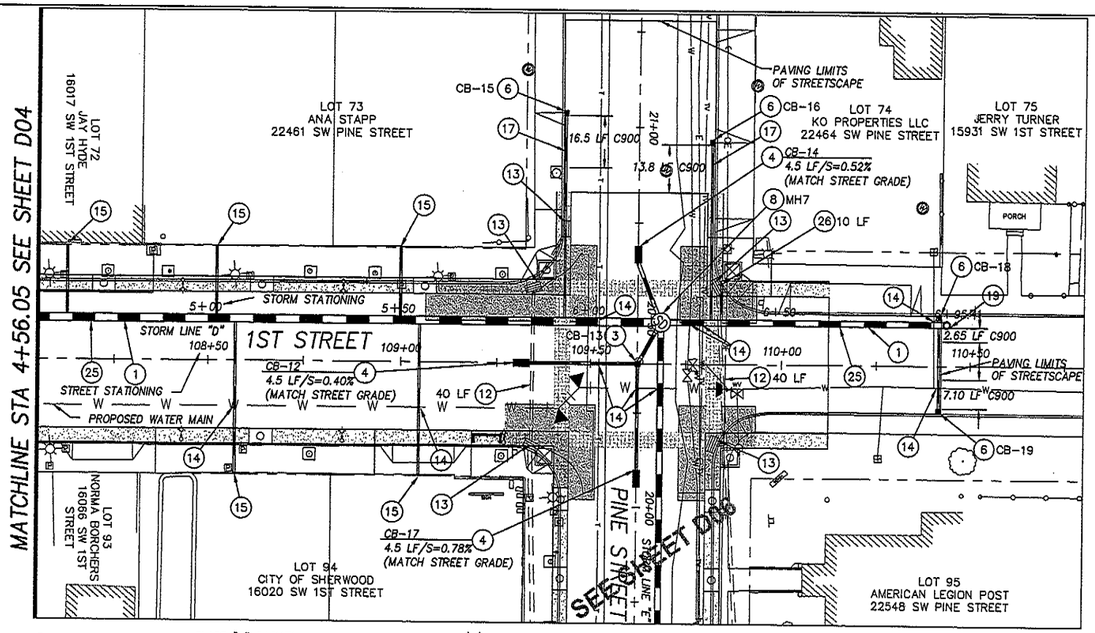
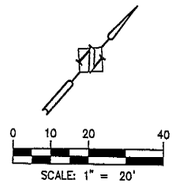
As Constructed		
No Revisions:	/ /	
Revised:	/ /	
Void:	/ /	

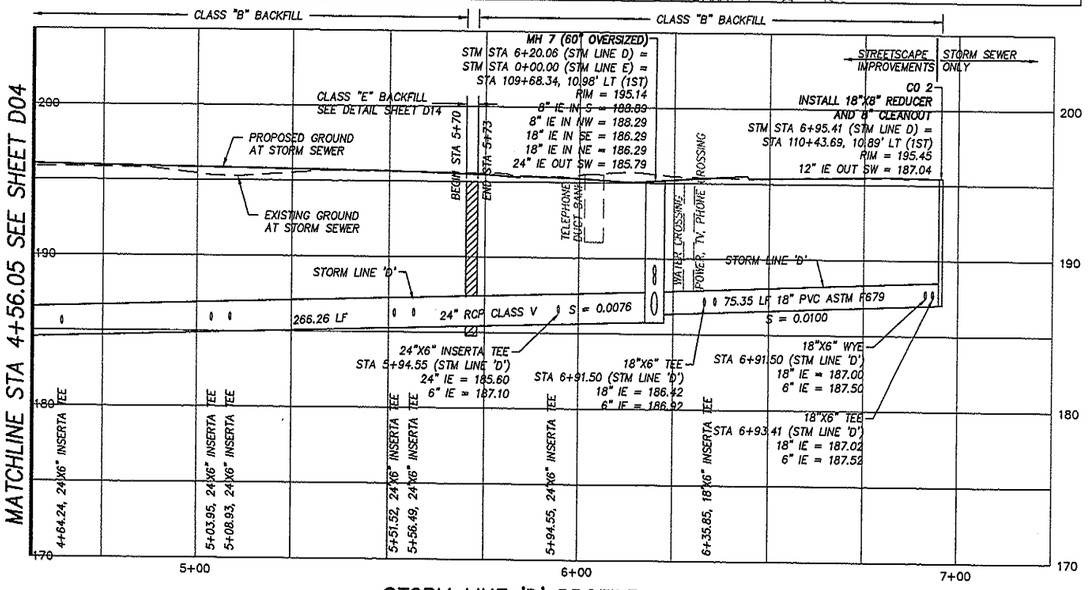
DRAINAGE PLAN & PROFILE
1ST STREET

Designer:		Structure Numbers	
Detailer:			
Sheet Subset:		Subset Sheets:	

Project No./Code: 071668.100
City of Sherwood CIP #-41
Sheet Number: D04







STORM LINE 'D' PROFILE

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STORM SERVICE LATERAL TABLE

LOT NO.	STATION OF TEE	IE @ MAIN	LENGTH	DEPTH @ END
72	4+64.24	185.36	19' LT.	6'
73	5+03.95	185.66	19' LT.	6'
94	5+08.93	185.69	41' RT.	6'
73	5+56.49	186.05	19' LT.	6'
94	5+51.52	186.02	41' RT.	6'

NOTE:
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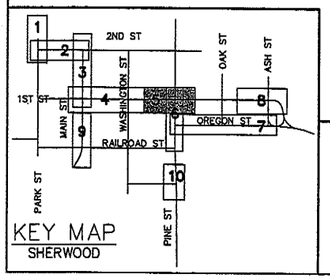
CATCH BASIN AND LATERAL TABLE

NO	TYPE	LOCATION	RIM ELEV.	I.E.	PIPE LATERAL LENGTH/SIZE/SLOPE
CB-12	TRENCH DRAIN	STA. 109+33.69, 0.00' (1ST)	195.51	189.53	28.61'/8"/0.0100
CB-13	AREA DRAIN	STA. 109+62.30, 0.00' (1ST)	194.98	189.24 IN / 189.14 OUT	12.53'/8"/0.0200
CB-14	TRENCH DRAIN	STA. 20+64.44, 0.00' (PINE)	195.12	190.95	16.66'/8"/0.1597
CB-15	LYNCH	STA. 21+03.53, 20.17' LT. (PINE)	195.23	193.73	54.63'/6"/0.1213
CB-16	LYNCH	STA. 20+96.16, 19.73' RT. (PINE)	195.24	193.74	47.24'/6"/0.1444
CB-17	TRENCH DRAIN	STA. 20+09.95, 0.00' (PINE)	195.20	191.03	27.97'/8"/0.0640
CB-18	LYNCH	STA. 110+41.66, 13.42' LT. (1ST)	195.39	193.89	2.65'/6"/2.4113
CB-19	LYNCH	STA. 110+41.66' 12.56' RT. (1ST)	195.39	193.89	22.8'/6"/0.2794

NOTE: ALL LATERALS SHALL BE PVC ASTM D3034 WITH CLASS "B" BACKFILL UNLESS OTHERWISE NOTED ON PLAN.



KEY MAP
SHERWOOD

Sheet Revisions

R1	/ /		
R2	/ /		
R3	/ /		
R4	/ /		
R5	/ /		

REGISTERED PROFESSIONAL ENGINEER
OREGON
72,311
KIMBERLY ANN SHERA
NOV. 12, 1986
EXPIRES: 6/30/2006
9-2-05

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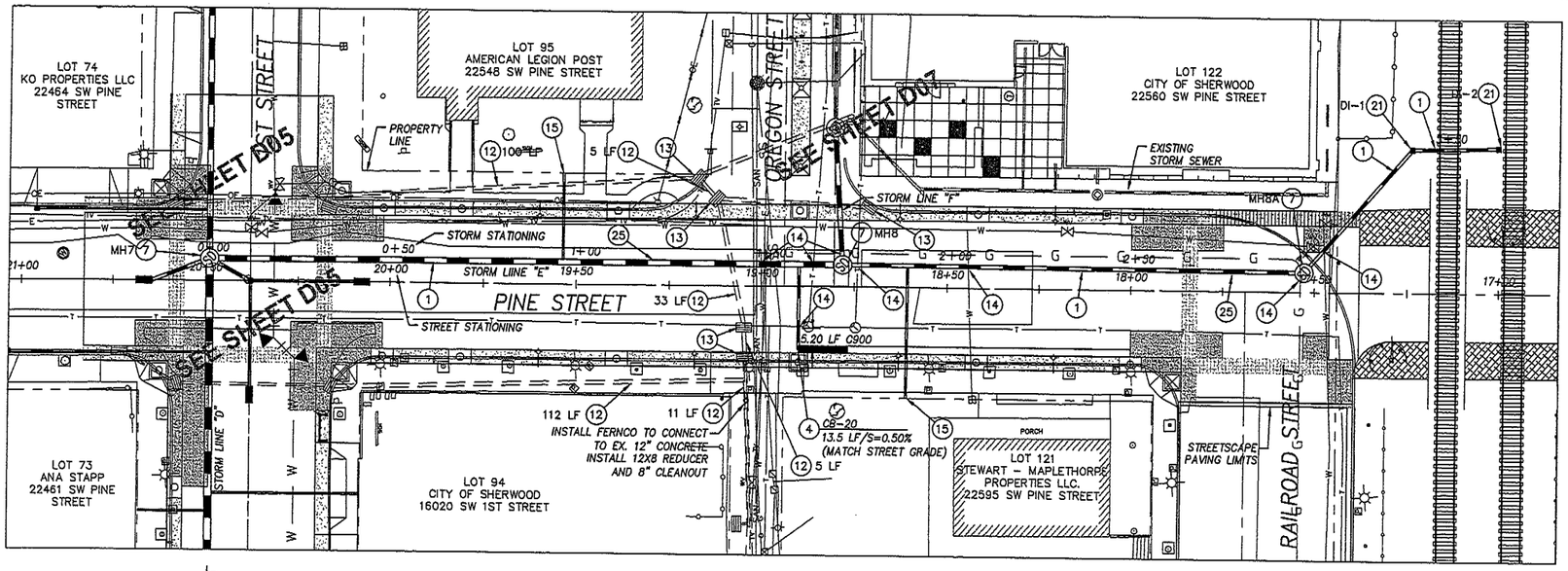

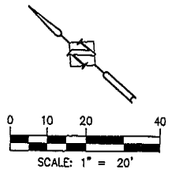

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8. INSTALL OVERSIZED MANHOLE PER DETAIL ON SHEET D11. SEE PROFILE FOR MANHOLE SIZE.
9. INSTALL ADS AREA DRAIN PER DETAIL ON SHEET D13. REFER TO CATCH BASIN AND LATERAL TABLE ON THIS SHEET.
10. CONSTRUCT STORM SEWER FLAT-TOP MANHOLE PER STD. DETAIL ON SHEET D11. REFER TO PROFILE FOR INVERTS AND PIPE DATA.
11. CONNECT TO EXISTING PIPE, CATCH BASIN, OR MANHOLE PER STD. PIPE CONNECTION DETAIL. REFER TO CATCH BASIN AND LATERAL TABLE FOR INVERTS AND PIPE DATA.
12. REMOVE EXISTING CULVERT OR STORM PIPE. BACKFILL VOID WITH COMPACTED CRUSHED ROCK. ABANDON IN PLACE IF NOTED.
13. REMOVE EXISTING STORM MANHOLE OR CATCH BASIN. BACKFILL VOID WITH COMPACTED CRUSHED ROCK. SALVAGE INLET GRATES AND MANHOLE LIDS AND DELIVER TO THE PUBLIC WORKS YARD.
14. CAUTION! UTILITY CROSSING. POTHOLE OR VERIFY ALL CROSSINGS PRIOR TO CONSTRUCTION TO ENSURE CLEARANCE OF UTILITIES. COORDINATE WITH APPROPRIATE UTILITY AGENCY.
15. INSTALL 6" STORM SERVICE LATERAL. REFER TO STORM SERVICE LATERAL TABLE, THIS SHEET. SEE STORM SERVICE LATERAL DETAIL SHEET D14.
16. CONNECT EXISTING ROOF DRAIN TO STORM SEWER. SEE DETAIL SHEET UD31 FOR ROOF DRAIN CONNECTION.
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18. CULVERT CONSTRUCTION, LOCATION, AND END TREATMENT TO BE COORDINATED WITH P&W RAILROAD.
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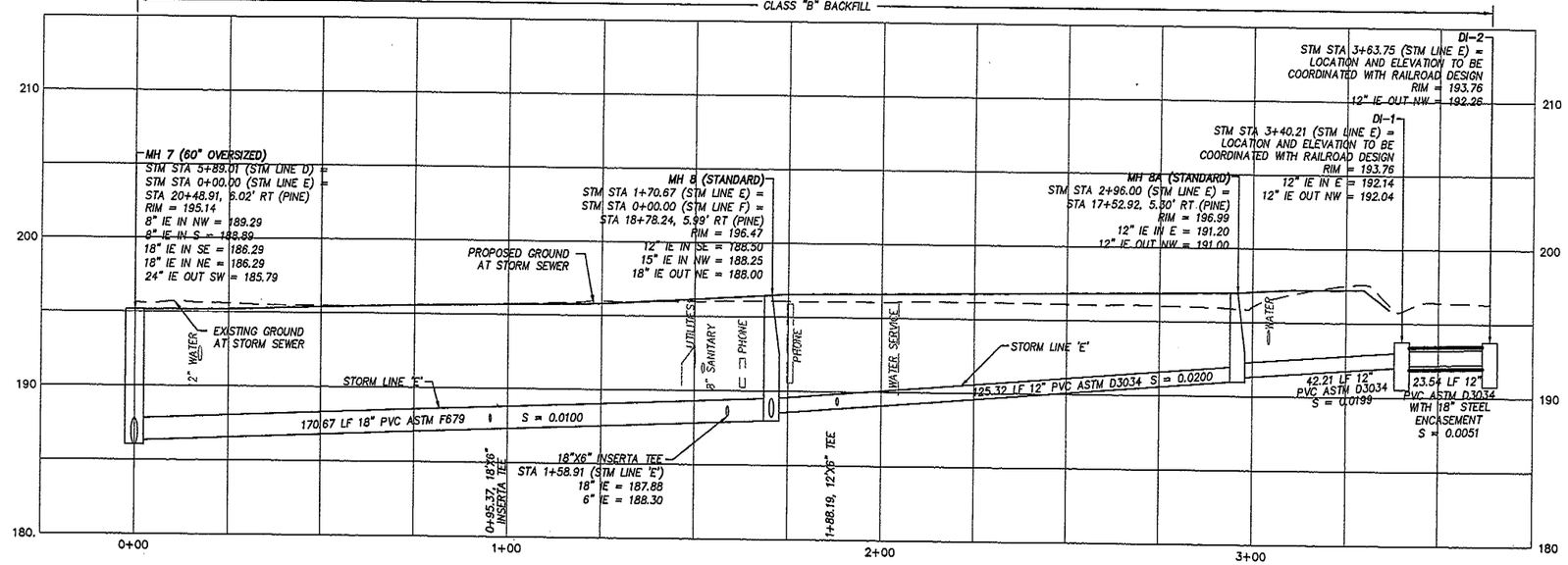
22. REMOVE EXISTING CONCRETE AT EXISTING STORM OUTFALL. BACKFILL WITH COMPACTED CRUSHED ROCK.
23. PROTECT EXISTING TREE.
24. REMOVE AND REINSTALL EXISTING SIGN AS NECESSARY FOR STORM SEWER CONSTRUCTION. (INCIDENTAL TO STORM SEWER CONSTRUCTION.)
25. SAWCUT ALONG THE PROPOSED STORM SEWER ALIGNMENT BEFORE PAVEMENT REMOVAL. INSTALL COLD PATCH AC FOR TEMPORARY SURFACING IN STREETSCAPE AREA.
26. CONNECT EXISTING STORM LINE TO NEW MAIN WITH FERNCO CONNECTION AND 6" PVC ASTM D3034. LENGTH NOTED ON PLAN.



STORM LINE 'E' PROFILE

FULL SIZE SCALE: HOR. 1" = 20'
VER. 1" = 5'

STORM SERVICE LATERAL TABLE

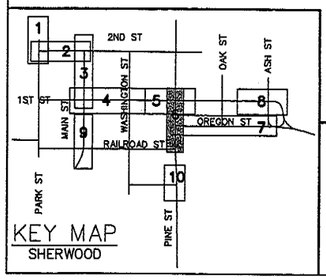
LOT NO.	STATION OF TEE	IE @ MAIN	LENGTH	DEPTH @ END
95	0+95.37	187.75	23' LT	6'
121	1+88.19	189.10	35' RT	5'

NOTE:
ALL SERVICE LATERALS ARE 6" WITH A MINIMUM SLOPE OF 2%.
DISTANCE FROM FINISH GROUND TO FLOWLINE OF LATERAL AT END OF SERVICE (DEPTH AT END) SHALL BE A MINIMUM OF 5'.
PIPE TYPE FOR SERVICE LATERALS SHALL BE PVC ASTM D3034.

CATCH BASIN AND LATERAL TABLE

NO	TYPE	LOCATION	RIM ELEV.	I.E.	PIPE LATERAL LENGTH/SIZE/SLOPE
CB-20	TRENCH DRAIN	STA. 18+90.00, 17.00' LT. (PINE)	195.92	193.42	23.0'/8"/0.2227

NOTE: ALL LATERALS SHALL BE PVC ASTM D3034 WITH CLASS "B" BACKFILL UNLESS OTHERWISE NOTED ON PLAN.



Sheet Revisions		
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REGISTERED PROFESSIONAL ENGINEER
72,311
Kimberly Sheya
OREGON
NOV. 12, 2002
KIMBERLY ANN SHEYA
EXPIRES: 6/30/2006
9-2-05

Sherwood Downtown Streetscape Improvements-Phase A

City of Sherwood Oregon

Engineering Department
15527 S. W. Willamette St.
Sherwood, OR 97140
Phone: (503) 925-2305
FAX: (503) 625-0679

HHPR Harper Houf Peterson Righellis Inc.
ENGINEERS • PLANNERS • SURVEYORS
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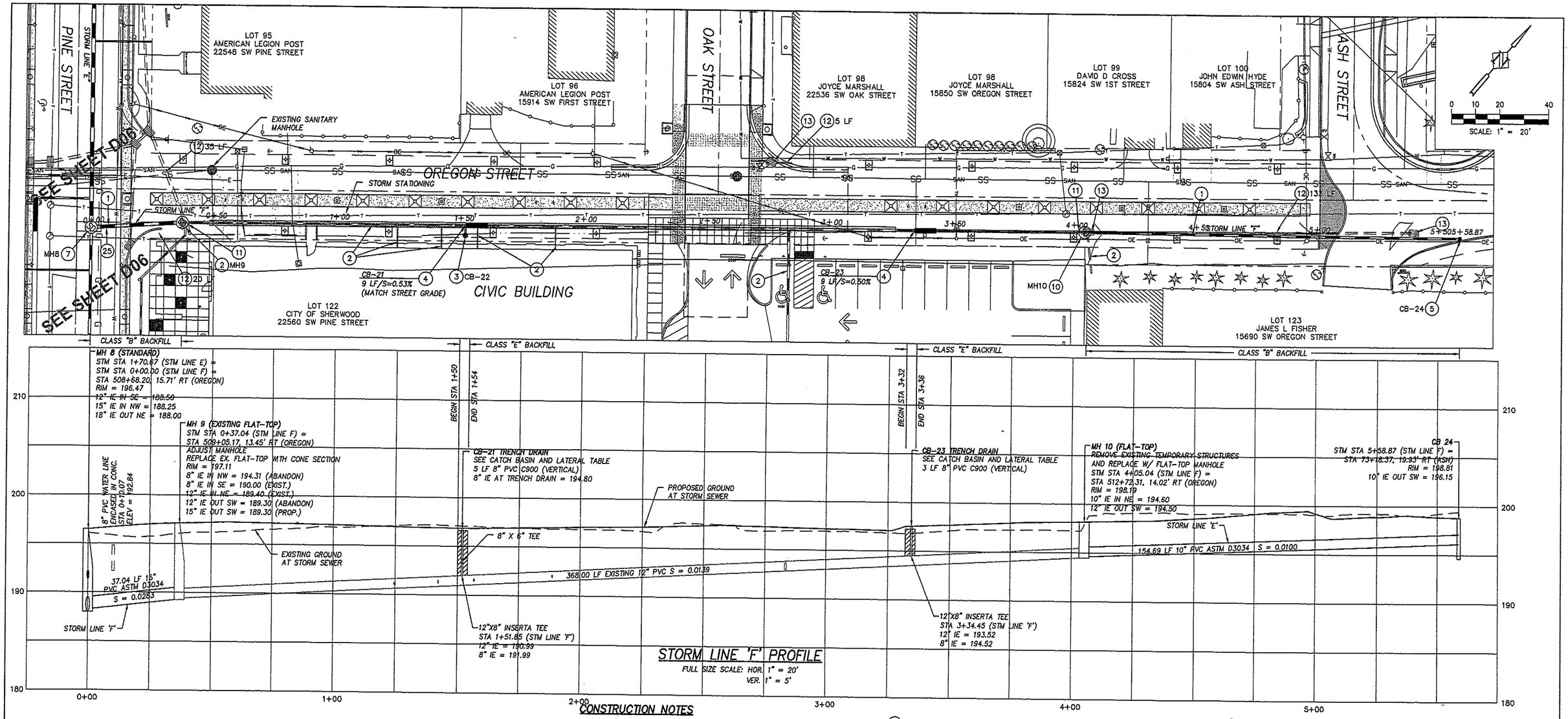
TEL 503.221.1131 www.hhpr.com FAX 503.221.1171

As Constructed		
No Revisions:	/ /	
Revised:	/ /	
Void:	/ /	

DRAINAGE PLAN & PROFILE PINE STREET

Designer:		Structure Numbers	
Detailer:			
Sheet Subset:		Subset Sheets:	

Project No./Code	071668.100
City of Sherwood CIP #-41	
Sheet Number	D06



STORM LINE 'F' PROFILE

FULL SIZE SCALE: HOR. 1" = 20'
VER. 1" = 5'

CATCH BASIN AND LATERAL TABLE

NO	TYPE	LOCATION	RIM ELEV.	I.E.	PIPE LATERAL LENGTH/SIZE/SLOPE
CB-21	TRENCH DRAIN	STA. 510+20, 0.12' RT. (OREGON)	196.80	SEE PROFILE FOR ADDITIONAL INFORMATION	
CB-22	LANDSCAPE DRAIN	STA. 510+20, 4.12' RT. (OREGON)	196.90±	193.40	4.00'/6"/0.0500
CB-23	TRENCH DRAIN	STA. 512+02.59, 0.41' (OREGON)	197.03	SEE PROFILE FOR ADDITIONAL INFORMATION	
CB-24	CG-2 DRAIN	STA. 73+18.37, 19.93' (ASH)	198.81	SEE PROFILE FOR ADDITIONAL INFORMATION	

NOTE: ALL LATERALS SHALL BE PVC ASTM D3034 WITH CLASS "B" BACKFILL UNLESS OTHERWISE NOTED ON PLAN.

CONSTRUCTION NOTES

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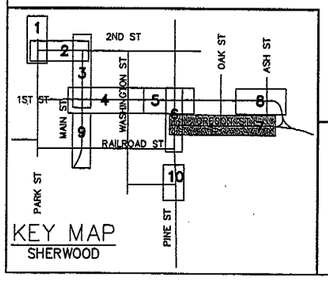

Sheet Revisions			
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REGISTERED PROFESSIONAL ENGINEER 72,811 OREGON JULY 12, 2002 KIMBERLY ANN SHERA
EXPIRES: 6/30/2006
7/05

Sherwood Downtown Streetscape Improvements–Phase A

City of Sherwood Oregon

Engineering Department
15527 S. W. Willamette St.
Sherwood, OR 97140
Phone: (503) 925-2305
FAX: (503) 625-0679

HHPR Harper Houf Peterson Righellis Inc.
ENGINEERS • PLANNERS • SURVEYORS
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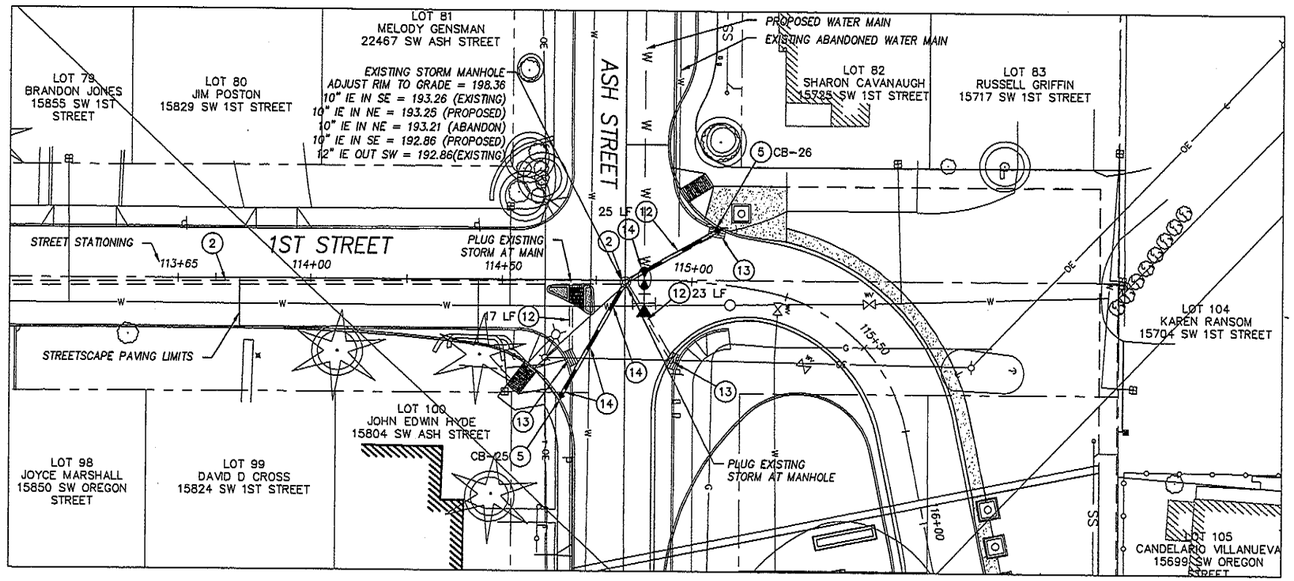
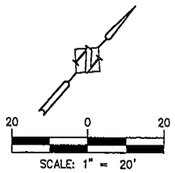
As Constructed
No Revisions: / /
Revised: / /
Void: / /

DRAINAGE PLAN & PROFILE OREGON STREET

Designer:
Detailer:
Sheet Subset:
Structure Numbers
Subset Sheets:

Project No./Code: 071668.100
City of Sherwood CIP #-41
Sheet Number: D07





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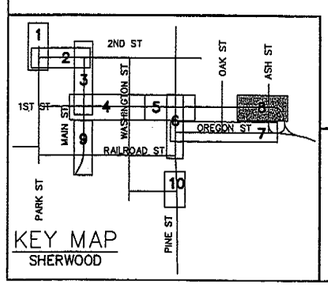
CATCH BASIN AND LATERAL TABLE

NO	TYPE	LOCATION	RIM ELEV.	I.E.	PIPE LATERAL LENGTH/SIZE/SLOPE
CB-25	CG-2	STA. 114+65.27, 31.06' RT. (RND-1ST)	197.98	193.03	34.5'/10"/0.0050
CB-26	CG-2	STA. 115+05.43, 14.61' LT. (RND-1ST)	197.56	193.39	27.6'/10"/0.0050

NOTE: ALL LATERALS SHALL BE PVC ASTM D3034 WITH CLASS "B" BACKFILL UNLESS OTHERWISE NOTED ON PLAN.



Sheet Revisions			
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REGISTERED PROFESSIONAL ENGINEER 72,911 OREGON JULY 12, 2002 KIMBERLY ANN SHERA
9-2-05
EXPIRES: 6/30/2006

Sherwood Downtown Streetscape Improvements–Phase A

City of Sherwood Oregon

Engineering Department
15527 S. W. Willamette St.
Sherwood, OR 97140
Phone: (503) 925-2305
FAX: (503) 625-0679

HHPR Harper Houf Peterson Righellis Inc.
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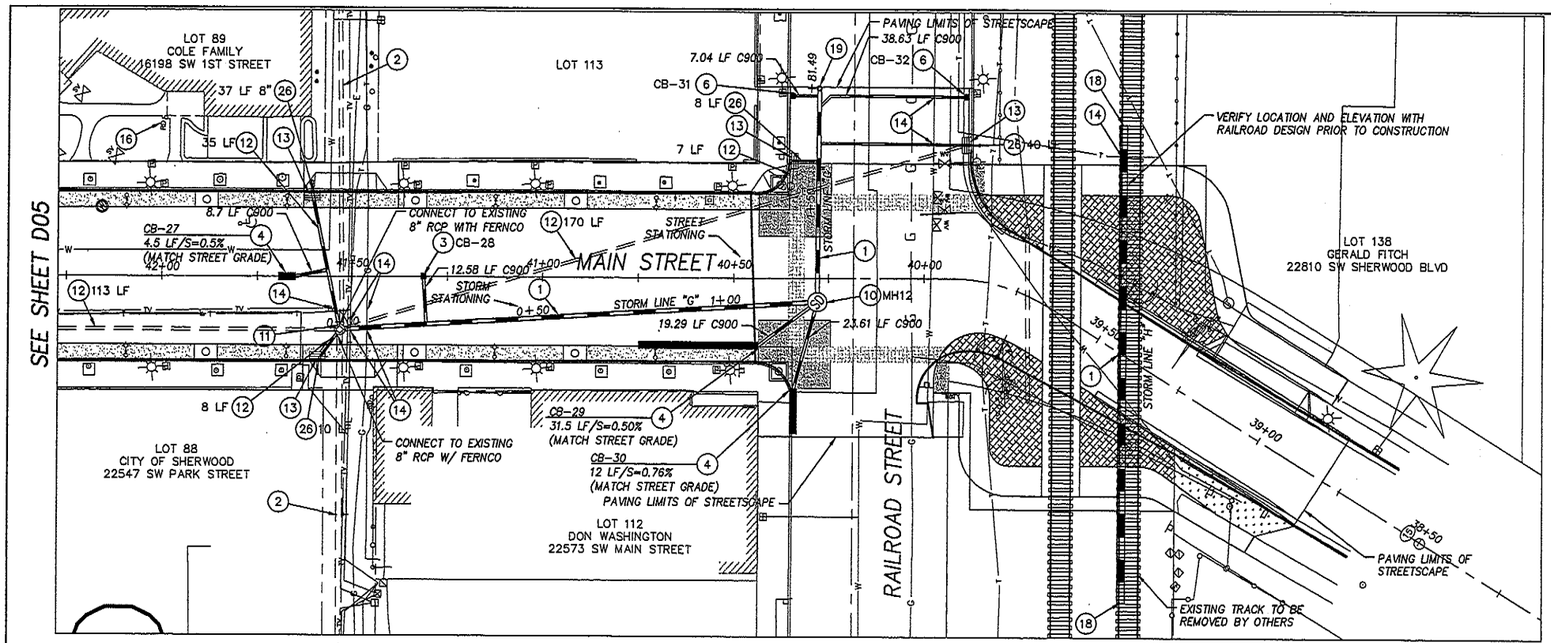
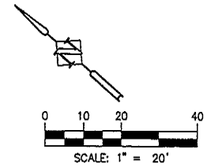
As Constructed		
No Revisions:	/ /	
Revised:	/ /	
Void:	/ /	

DRAINAGE PLAN & PROFILE
1ST STREET

Designer:	Structure Numbers	
Detailer:		
Sheet Subset:	Subset Sheets:	

Project No./Code	071668.100
City of Sherwood CIP #-41	
Sheet Number	D08





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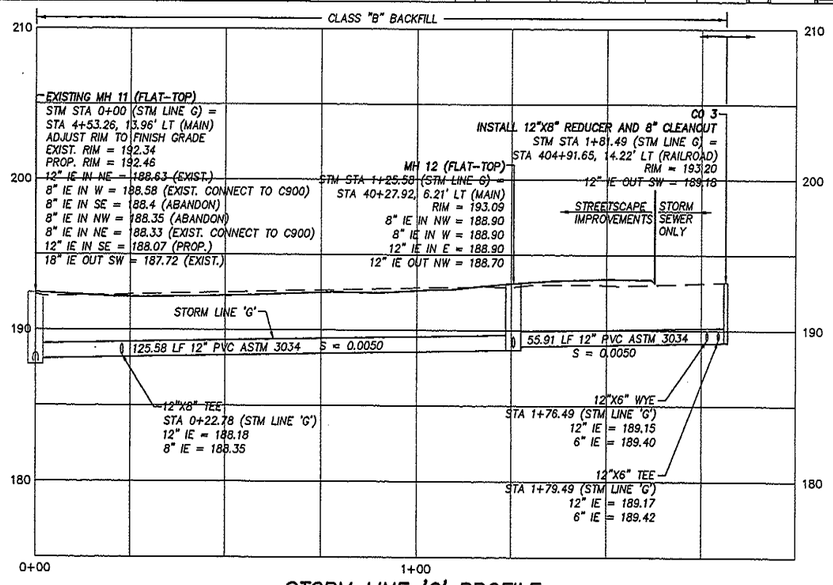
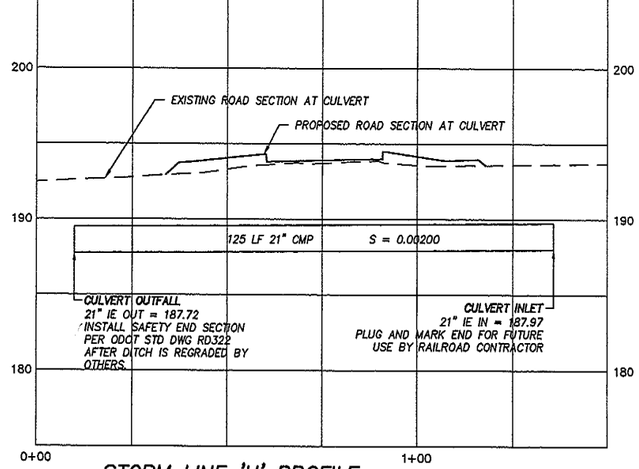


STORM LINE 'G' PROFILE

SCALE: HOR. 1" = 20'
VER. 1" = 5'



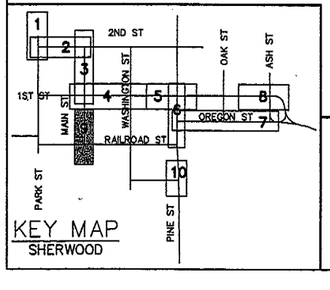
STORM LINE 'H' PROFILE

SCALE: HOR. 1" = 20'
VER. 1" = 5'

CATCH BASIN AND LATERAL TABLE

NO	TYPE	LOCATION	RIM ELEV.	I.E.	PIPE LATERAL LENGTH/SIZE/SLOPE
CB-27	TRENCH DRAIN	STA. 41+65.00, 0.00' (MAIN)	192.18	189.68	8.7'/8"/0.0356
CB-28	AREA DRAIN	STA. 41+31.30, 0.00' (MAIN)	192.05	188.53	12.58'/8"/0.0143
CB-29	TRENCH DRAIN	STA. 40+43.43, 17.67' LT. (MAIN)	192.27	189.09	19.29'/8"/0.0100
CB-30	TRENCH DRAIN	STA. 404+12.94, 20.59' LT. (RAILROAD)	192.39	189.14	23.61'/8"/0.0100
CB-31	LYNCH	STA. 404+89.68, 21.27' LT. (RAILROAD)	192.02	190.52	7.04'/6"/0.1563
CB-32	LYNCH	STA. 404+89.49, 24.40' RT. (RAILROAD)	193.04	191.54	38.63'/6"/0.0554

NOTE: ALL LATERALS SHALL BE PVC ASTM D3034 WITH CLASS "B" BACKFILL UNLESS OTHERWISE NOTED ON PLAN.



Sheet Revisions		
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R-	/ /	

REGISTERED PROFESSIONAL ENGINEER
72,311
OREGON
JULY 12, 2005
KIMBERLY ANN SHEETS
EXPIRES: 6/30/2006
9205

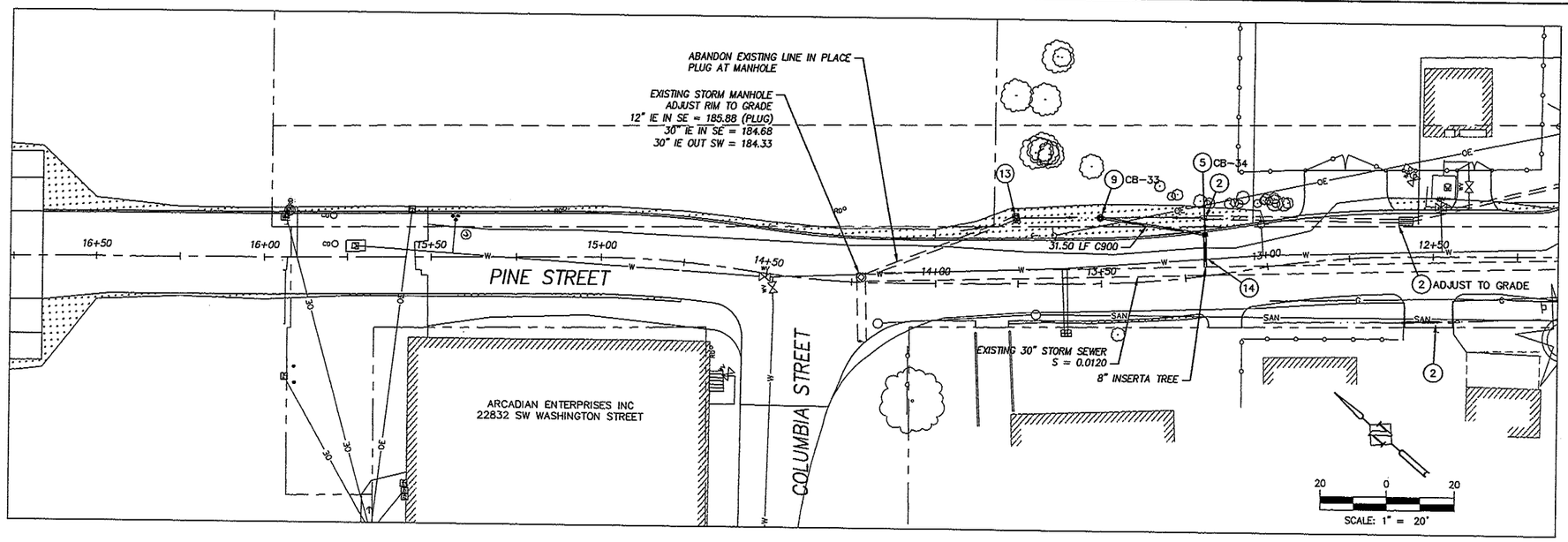
Sherwood Downtown Streetscape Improvements–Phase A

City of Sherwood Oregon

Engineering Department
15527 S. W. Willamette St.
Sherwood, OR 97140
Phone: (503) 925-2305
FAX: (503) 625-0679

HHPR
Harper Houf Peterson Righellis Inc.
ENGINEERS • PLANNERS • SURVEYORS
5200 SW MACADAM AVENUE, SUITE 550, PORTLAND, OR 97239
TEL 503.221.1131 www.hhpr.com FAX 503.221.1171

As Constructed	DRAINAGE PLAN & PROFILE MAIN STREET		Project No./Code 071668.100
No Revisions: / /			
Revised: / /	Designer:	Structure Numbers	City of Sherwood CIP #-41
Void: / /	Detailer:		
	Sheet Subset:	Subset Sheets:	Sheet Number D09



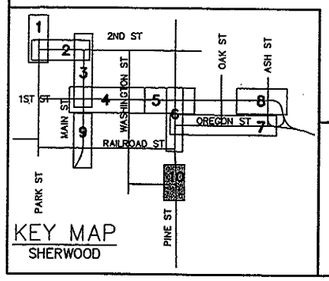
CONSTRUCTION NOTES

1. INSTALL STORM PIPE MAIN W/ BACKFILL AS NOTED. PIPE LENGTH, SIZE AND SLOPE IS SHOWN ON THE PROFILE. STORM LATERAL INFORMATION SHOWN IN CATCH BASIN AND LATERAL TABLE.
2. EXISTING CATCH BASIN, MANHOLE, OR STORM PIPE TO REMAIN.
3. INSTALL AREA DRAIN PER DETAIL ON SHEET D13. REFER TO CATCH BASIN AND LATERAL TABLE ON THIS SHEET.
4. INSTALL TRENCH DRAIN PER DETAIL ON SHEET D13. REFER TO CATCH BASIN AND LATERAL TABLE ON THIS SHEET.
5. INSTALL CG-2 CATCH BASIN PER DETAIL ON SHEET D13. REFER TO CATCH BASIN AND LATERAL TABLE ON THIS SHEET.
6. INSTALL LYNCH CATCH BASIN PER DETAIL ON SHEET D13. REFER TO CATCH BASIN AND LATERAL TABLE ON THIS SHEET.
7. INSTALL STANDARD MANHOLE PER DETAIL ON SHEET D11. REFER TO PROFILE ON THIS SHEET FOR MANHOLE DATA.
8. INSTALL OVERSIZED MANHOLE PER DETAIL ON SHEET D11. SEE PROFILE FOR MANHOLE SIZE.
9. INSTALL ADS AREA DRAIN PER DETAIL ON SHEET D13. REFER TO CATCH BASIN AND LATERAL TABLE ON THIS SHEET.
10. CONSTRUCT STORM SEWER FLAT-TOP MANHOLE PER STD. DETAIL ON SHEET D11. REFER TO PROFILE FOR INVERTS AND PIPE DATA.
11. CONNECT TO EXISTING PIPE, CATCH BASIN, OR MANHOLE PER STD. PIPE CONNECTION DETAIL. REFER TO CATCH BASIN AND LATERAL TABLE FOR INVERTS AND PIPE DATA.
12. REMOVE EXISTING CULVERT OR STORM PIPE. BACKFILL VOID WITH COMPACTED CRUSHED ROCK. ABANDON IN PLACE IF NOTED.
13. REMOVE EXISTING STORM MANHOLE OR CATCH BASIN. BACKFILL VOID WITH COMPACTED CRUSHED ROCK. SALVAGE INLET GRATES AND MANHOLE LIDS AND DELIVER TO THE PUBLIC WORKS YARD.
14. CAUTION! UTILITY CROSSING. POTHOLE OR VERIFY ALL CROSSINGS PRIOR TO CONSTRUCTION TO ENSURE CLEARANCE OF UTILITIES. COORDINATE WITH APPROPRIATE UTILITY AGENCY.
15. INSTALL 6" STORM SERVICE LATERAL. REFER TO STORM SERVICE LATERAL TABLE, THIS SHEET. SEE STORM SERVICE LATERAL DETAIL SHEET D14.
16. CONNECT EXISTING ROOF DRAIN TO STORM SEWER. SEE DETAIL SHEET UD31 FOR ROOF DRAIN CONNECTION.
17. SAWCUT AND REPLACE EXISTING A.C. PAVEMENT PER DETAIL ON SHEET D12. SAWCUT AND REPLACE EXISTING CURB AND DRIVEWAY AS NECESSARY FOR STORM CONSTRUCTION. RESTORE LAWN AREA TO ORIGINAL CONDITION.
18. CULVERT CONSTRUCTION, LOCATION, AND END TREATMENT TO BE COORDINATED WITH P&W RAILROAD.
19. INSTALL STORM CLEANOUT PER DETAIL SHEET D14. REFER TO PROFILE FOR INVERT AND PIPE DATA.
20. INSTALL CONCRETE POLLUTION CONTROL MANHOLE PER DETAIL SHEET D15. REFER TO PROFILE FOR INVERTS AND PIPE DATA.
21. INSTALL DITCH INLET PER DETAIL ON SHEET D14. REFER TO PROFILE ON THIS SHEET FOR INLET INFORMATION. LOCATIONS TO BE COORDINATED WITH RAILROAD DESIGN.
22. REMOVE EXISTING CONCRETE AT EXISTING STORM OUTFALL. BACKFILL WITH COMPACTED CRUSHED ROCK.
23. PROTECT EXISTING TREE.
24. REMOVE AND REINSTALL EXISTING SIGN AS NECESSARY FOR STORM SEWER CONSTRUCTION. (INCIDENTAL TO STORM SEWER CONSTRUCTION.)
25. SAWCUT ALONG THE PROPOSED STORM SEWER ALIGNMENT BEFORE PAVEMENT REMOVAL. INSTALL COLD PATCH AC FOR TEMPORARY SURFACING IN STREETSCAPE AREA.
26. CONNECT EXISTING STORM LINE TO NEW MAIN WITH FERNCO CONNECTION AND 6" PVC ASTM D3034. LENGTH NOTED ON PLAN.

CATCH BASIN AND LATERAL TABLE

NO	TYPE	LOCATION	RIM ELEV.	I.E.	PIPE LATERAL LENGTH/SIZE/SLOPE
CB-33	ADS DRAIN	STA. 13+50, 19.60' RT (PINE)	187.78	186.28	31.5'/6"/0.0200
CB-34	CG-2	STA. 13+17.58, 13.00' RT (PINE)	189.82	185.65 IN / 185.55 OUT	9.8'/8"/0.0390

NOTE: ALL LATERALS SHALL BE PVC ASTM D3034 WITH CLASS "B" BACKFILL UNLESS OTHERWISE NOTED ON PLAN.



KEY MAP
SHERWOOD

Sheet Revisions		
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R-	/ /	
R-	/ /	
R-	/ /	
R-	/ /	

REGISTERED PROFESSIONAL ENGINEER
72,311
OREGON
NOV. 12, 1982
KIMBERLY ANN SHERA
EXPIRES: 6/30/2006

Sherwood Downtown Streetscape Improvements–Phase A

City of Sherwood Oregon

Engineering Department
15527 S. W. Willamette St.
Sherwood, OR 97140
Phone: (503) 925-2305
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As Constructed	
No Revisions:	/ /
Revised:	/ /
Void:	/ /

DRAINAGE PLAN & PROFILE
PINE STREET

Designer:	Structure Numbers	
Detailer:		
Sheet Subset:	Subset Sheets:	

Project No./Code	071668.100
City of Sherwood CIP #-41	
Sheet Number	D10

APPENDIX E' – PRIVATE STORMWATER FACILITY AGREEMENT

After Recording Return to:
Clean Water Services
2550 SW Hillsboro Hwy.
Hillsboro, OR 97123

PRIVATE STORMWATER FACILITIES AGREEMENT

This Agreement is made and entered into this _____ day of _____ 20___, by and between Clean Water Services (District) and _____ (Owner) whose address is _____.

RECITALS

A. Owner has developed or will develop the Facilities listed below. (List the type of private stormwater facilities on site and the quantity of each type).

Facility type (list each) _____ Quantity_____

B. The Facilities enable development of property while mitigating the impacts of additional surface water and pollutants associated with stormwater runoff prior to discharge from the property to the public stormwater system. The consideration for this Agreement is connection to the public stormwater system.

C. The property benefited by the Facilities and subject to the obligation of this Agreement is described below or in Exhibit A (Property) attached hereto and incorporated by reference.

D. The Facilities are designed by a registered professional engineer to accommodate the anticipated volume of runoff and to detain and treat runoff in accordance with District's Design and Construction Standards.

E. Failure to inspect and maintain the Facilities can result in an unacceptable impact to the public stormwater system.

NOW, THEREFORE, it is agreed by and between the parties as follows:

1. OWNER INSPECTIONS District shall provide Owner an Operations and Maintenance Plan (O&M Plan) for each Facility. Owner agrees to operate, inspect and maintain each Facility in accordance with the current O&M Plan and any subsequent modifications to the Plan. Owner shall maintain a log of inspection activities. The log shall be available to District upon request or during District inspections.

2. DEFICIENCIES All aspects in which the Facilities fail to satisfy the O&M Plan shall be noted as "Deficiencies".

3. OWNER CORRECTIONS All Deficiencies shall be corrected at Owner's expense within thirty (30) days after completion of the inspection. If more than 30 days is reasonably needed to correct a Deficiency, Owner shall have a reasonable period to correct the Deficiency so long as the correction is commenced within the 30-day period and is diligently prosecuted to completion.

4. DISTRICT INSPECTIONS Owner grants District the right to inspect the Facilities. District will endeavor to give ten (10) days prior written notice to Owner, except that no notice shall be required in case of an emergency. District shall determine whether Deficiencies need to be corrected. Owner (at the address provided in this Agreement, or such other address as Owner may designate in writing to District) will be notified in writing through the US Mail of the Deficiencies and shall make corrections within 30 days of the date of the notice.

5. DISTRICT CORRECTIONS If correction of all Owner or District identified Deficiencies is not completed within thirty (30) days after Owner's inspection or District notice, District shall have the right to have any Deficiencies corrected. District (i) shall have access to the Facilities for the purpose of correcting such Deficiencies and (ii) shall bill Owner for all costs reasonably incurred by District for work performed to correct the Deficiencies (District Correction Costs) following Owner's failure to correct any Deficiencies in the Facilities. Owner shall pay District the District Correction Costs within thirty (30) days of the date of the invoice. Owner understands and agrees that upon non-payment, District Correction Costs shall be secured by a lien on the Property for the District Correction Cost amount plus interest and penalties.

6. EMERGENCY MEASURES If at any time District reasonably determines that the Facilities create any imminent threat to public health, safety or welfare, District may immediately and without prior notice to Owner take measures reasonably designed to remedy the threat. District shall provide notice of the threat and the measures taken to Owner as soon as reasonably practicable, and charge Owner for the cost of these corrective measures.

7. FORCE AND EFFECT This Agreement has the same force and effect as any deed covenant running with the land and shall benefit and bind all owners of the Property present and future, and their heirs, successors and assigns.

8. AMENDMENTS The terms of this Agreement may be amended only by mutual agreement of the parties. Any amendments shall be in writing, shall refer specifically to this Agreement, and shall be valid only when executed by the owners of the Property, District and recorded in the Official Records of the county where the Property is located.

9. PREVAILING PARTY In any action brought by either party to enforce the terms of this Agreement, the prevailing party shall be entitled to recover all costs, including reasonable attorney's fees as may be determined by the court having jurisdiction, including any appeal.

10. SEVERABILITY The invalidity of any section, clause, sentence, or provision of this Agreement shall not affect the validity of any other part of this Agreement, which can be given effect without such invalid part or parts.

IN WITNESS WHEREOF, Owner and District have signed this Agreement.

NOTARIZE DOCUMENT BELOW

INDIVIDUAL OWNERS SIGN BELOW

_____
Owner (Individual)

_____
Owner (Individual)

CORPORATE, LLC, PARTNERSHIP, TRUST OR OTHER LEGAL ENTITY SIGN BELOW

_____
(Entity name)

By: _____
(Sign here for entity)

Title: _____

CLEAN WATER SERVICES

By: _____
General Manager or Designee

APPROVED AS TO FORM

_____
District Counsel

[Use this notary block if OWNER is an individual.]

STATE OF _____)
)
County of _____)

This instrument was acknowledged before me this _____day of _____, 20____, by _____.

_____
Notary Public

[Use this notary block if OWNER is an entity.]

STATE OF _____)
)
County of _____)

This instrument was acknowledged before me on _____(date) by_____(name of person) as _____ (title) of _____(name of entity).

_____
Notary Public