

**ORDINANCE NO. 2015-07  
CORNELIUS, OREGON**

**AN ORDINANCE AMENDING THE CITY OF CORNELIUS COMPREHENSIVE PLAN TO IDENTIFY PUBLIC IMPROVEMENTS NECESSARY TO ALLOW FOR URBANIZATION AND ESTABLISHING THE COMPREHENSIVE PLAN DESIGNATION FOR LANDS ADDED TO THE NORTHEAST URBAN GROWTH BOUNDARY IN 2014**

**FINDINGS:**

1. On April 1<sup>st</sup>, 2014 approximately 345 acres of land was added to the Metro Urban Growth Boundary for the benefit of the City of Cornelius.
2. Prior to allowing land within the Urban Growth Boundary to annex into the City of Cornelius the City must demonstrate how utilities and services can be provided.
3. The State of Oregon acknowledged the City of Cornelius Comprehensive Plan on July 3<sup>rd</sup> 1978 after its adoption via Ordinance 500.
4. The City of Cornelius Water Master Plan (a component of the Comprehensive Plan) was deemed acknowledged on March 1<sup>st</sup> 2004 via the adoption of Ordinance 846.
5. The City of Cornelius Sanitary Sewer System Master Plan (a component of the Comprehensive Plan) was deemed acknowledged on September 20<sup>th</sup>, 2004 via the adoption of Ordinance 853.
6. The City of Cornelius Transportation System Plan (a component of the Comprehensive Plan) was deemed acknowledged on June 20<sup>th</sup> 2005 via the adoption of Ordinance 860.
7. The City of Cornelius Parks Master Plan (a component of the Comprehensive Plan) was deemed acknowledged on November 2<sup>nd</sup>, 2009 via the adoption of Ordinance 911.
8. The City desires to adopt comprehensive plan designations to guide the rezoning of property during the annexation process.
9. The City desires to amend the City of Cornelius Comprehensive Plan and supporting plans to identify future improvements necessary to serve the area of land added to the Northeast Urban Growth Boundary.
10. The City has analyzed the utility needs of the expanded Urban Growth Boundary and has identified public improvements necessary to support urbanization and is amending the Comprehensive Plan to include those improvements.
11. The City has analyzed the Transportation System within the community consistent with The Oregon Transportation Planning Rule and concluded that additional improvements may be necessary beyond those currently planned for the future and identified within the Comprehensive Plan.
12. The City has examined the Parks and Open Space needs of the community relative to the Urban Growth Boundary expansion and has proposed specific amendments to the Parks Master Plan to reflect the need for additional parks facilities.
13. The 2014 Urban Growth Boundary Findings and Summary dated October 5, 2015 is incorporated via reference as findings in support of this ordinance.

**NOW THEREFORE, BASED ON THE FOREGOING, THE CITY OF CORNELIUS ORDAINS AS FOLLOWS:**

Section 1. The City of Cornelius Comprehensive Plan Map is amended as outlined in Exhibit A

Section 2. The City of Cornelius Parks Master Plan, Appendix G of the Comprehensive Plan is amended as outlined in Exhibit B.

Section 3. The City of Cornelius Sanitary Sewer System Master Plan, Appendix H of the Comprehensive Plan is amended as outlined in Exhibit C

Section 4. The City of Cornelius Water Master Plan, Appendix I of the Comprehensive Plan is amended as outlined in Exhibit D.

Section 5. The City of Cornelius Transportation System Plan, Appendix M of the Comprehensive Plan is amended as outlined in Exhibit E.

Section 6. The City of Cornelius Storm Drainage/Surface Water Management Master Plan, Appendix H of the Comprehensive Plan is amended as outlined in Exhibit F.

Section 7. Prior to annexation of land within the NE UGB each applicant shall complete a wetland determination of the property.

Section 8. Land annexed into the City shall have a Natural Resource Overlay Zone applied and be subject to applicable provisions of the Cornelius City Code for those areas that contain wetlands and/or are within the vegetated corridor of Council Creek and/or its tributaries.

Section 9. Upon adoption by the Cornelius City Council, this ordinance shall take effect in 30 days.

PRESENTED AND ADOPTED this \_\_\_ day of \_\_\_\_\_, 2015.

City of Cornelius, Oregon

By: \_\_\_\_\_  
Jeffrey C. Dalin, Mayor

ATTEST:

By: \_\_\_\_\_  
Debby Roth, MMC, City Recorder-Treasurer

# Exhibit A

## Comprehensive Plan Map Amendments

**2014 UGB NE Expansion Area  
Proposed Zoning Alternative #1  
(Commercial South of TV Hwy Only)  
Draft 5-20-15**



150 75 0 150 Feet

**Comprehensive Plan / Zoning**

Low-density Residential / R-7 (90 Acres)

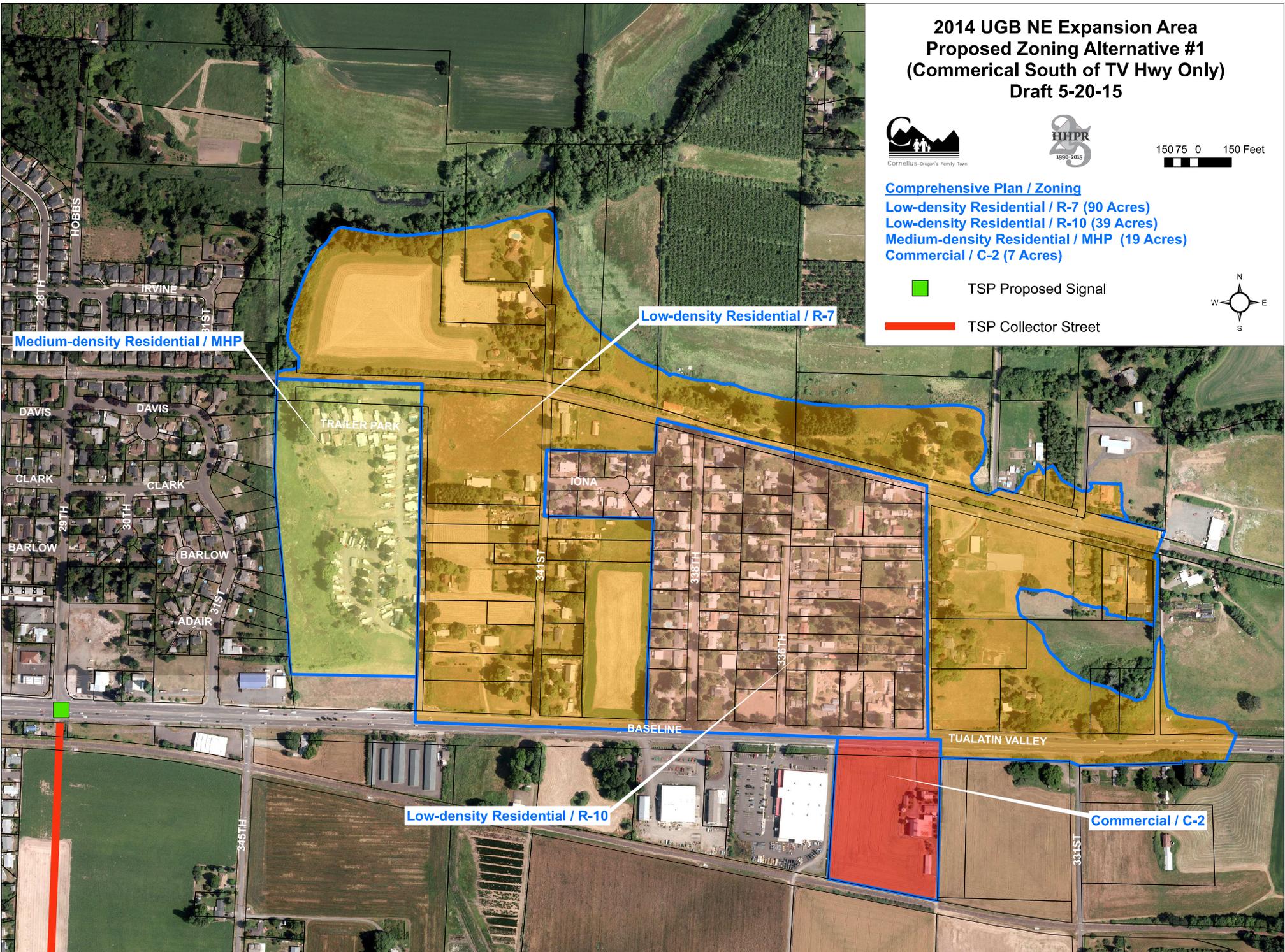
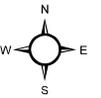
Low-density Residential / R-10 (39 Acres)

Medium-density Residential / MHP (19 Acres)

Commercial / C-2 (7 Acres)

TSP Proposed Signal

TSP Collector Street



Medium-density Residential / MHP

Low-density Residential / R-7

Low-density Residential / R-10

Commercial / C-2

# Exhibit B

## Amendments to the City of Cornelius Parks Master Plan (Appendix G)



# CITY OF CORNELIUS

---

## Amendments to 2009 Parks Master Plan:

The following amendments are recommended to the 2009 Parks Master Plan, Appendices G of the Comprehensive Plan:

1. Remove the portion of the proposed trail along the Council Creek corridor that coincides with private land ownership as show on attached Map 6.
2. Include the following improvements identified in Council Creek Master Plan as components of the City of Cornelius Parks Master Plan
  - a. The proposed east-west trail alignment along the northern railroad right-of-way as shown on Council Creek Regional Trail Master Plan Segment 5 Jobes Ditch
  - b. The proposed North-South trail alignment following 29th Avenue as shown on Council Creek Regional Trail Master Plan Segment 5 Jobes Ditch
  - c. Include Trailhead Locations as shown on Council Creek Regional Trail Master Plan Segment 5 Jobes Ditch
  - d. Include trail design cross sections as shown on the attached excerpt of the Council Creek Trail Master Plan.
3. Change the planned Community Park in the NE area (CP-1) to a Neighborhood Park (NP)

# Exhibit C

## Amendments to the City of Cornelius Sanitary Sewer Master Plan (Appendix H)

## TECHNICAL MEMORANDUM

**Date:** August 10, 2015  
**To:** Michael Cerbone, Community Development Director, City of Cornelius  
Terry Keyes, City Engineer, City of Cornelius  
**From:** Ken Condit, PE, through Keith Jones, AICP  
**Project:** City of Cornelius Comprehensive Plan Amendment –  
Urban Growth Boundary Expansion Areas  
**Subject:** Conceptual Analysis of Wastewater Facilities Extensions

### A. EXECUTIVE SUMMARY – KEY FINDINGS

#### 1. Southeast Urban Growth Boundary Expansion Area

- a. The extension of sewer service to the Southeast Urban Growth Boundary (UGB) Expansion Area (South Area) will require a pump station and force main.
- b. A central location for the South-Area pump station appears feasible and offers the most flexibility in developing the layout of the future South-Area collector sewers.
- c. It is preferable to have the wastewater (WW) generated by the new school in the northeast portion of the South Area conveyed by gravity to the new pump station serving the South Area.
- d. Under this concept, only the northwest portion of the South Area will be served by direct, gravity flow to the City's existing sewer system.
- e. The WW generated in the South Area will be conveyed to the City's existing South Trunk Sewer under Ginger Street. The preferred point of connection to the South Trunk is at 20th Avenue and Ginger.

#### 2. South Trunk Sewer Upgrade

- a. Our analysis confirms that the upper reaches of the South Trunk must be increased in size to handle existing and projected peak flows. These sewer reaches extend from Heather Street, through Free Orchards Park to Emerald Loop, and east along Ginger to 23rd Avenue.
- b. Within the scope of this study, we have identified 3,005 linear feet of the South Trunk that needs to be increased in size. The scope of our analysis excluded the South Trunk reaches downstream of Heather.

#### 3. Northeast Urban Growth Boundary Expansion Area

- a. A conceptual sewer layout has been developed for the Northeast Urban Growth Boundary Expansion Area (North Area) to show the feasibility of extending gravity sewer service to the area.
- b. The conceptual layout divides the North Area into four sewer sub-basins that would convey WW to the existing North-South Trunk Sewer and/or the existing Council Creek Trunk Sewer.

### B. INTRODUCTION

This technical memorandum describes the results of the analysis we performed to address sanitary sewer service extensions into the areas covered by the recent UGB expansion. The analysis was performed as part of the Comprehensive Planning process that is required for lands within the UGB.

Planning-level concepts have been developed to document the feasibility of providing WW facilities in the UGB expansion areas and connecting these facilities to the existing WW infrastructure. The projected impacts of connecting these service extensions to the City's existing sewer system have also been identified.

Clean Water Services (CWS) will need to conduct a separate facilities planning process to address the projected impacts on downstream WW components owned by that agency.

## C. SOUTHEAST UGB EXPANSION AREA SERVICE CONCEPT

### 1. General Concept

- a. The sewer service concept for the South Area assumes future developments will generally follow existing local topography.
- b. Due to the general topography (sloping down toward the river), most of the South Area cannot be served by gravity sewers that would be tributary to the City's existing sewer system. Therefore, gravity sewers for the South Area will need to be tributary to a future South Cornelius Pump Station (SCPS).
- c. The force main for the SCPS will discharge WW into the City's existing South Trunk sewer located under Ginger Street (see Item 5 below for discharge options).
- d. The alignments of future South-Area gravity sewers and the SCPS force main will be affected by development patterns. Alignments shown in our conceptual layout are provided for illustration purposes.

### 2. Projected WW Production

- a. Projected Build-Out Development:
  - Projected Residential – 1,200 DU
  - Projected Institutional (High School) – 2,500 Students
  - Projected Commercial & Industrial – None
- b. CWS Flow Criteria from West Basin Facilities Plan (Carollo, 2012) and other CWS input:
  - Average Residential Occupancy – 2.6 People/Dwelling Unit (DU)
  - Average Per Capita WW Flow – 67 Gallons per Capita/Day
  - I/I contributions from future developments on currently undeveloped land:
    - Near-term I/I Contribution Factor (25 years for PS planning) – 1,650 gpd/acre (gpad)
    - Long-term I/I Contribution Factor (50 years for sewer planning) – 4,000 gpad
- c. Projected Average Dry-Weather WW Flows at Build-Out.
  - Projected Build-Out Population – 3,120 People
  - Projected Average WW Production – 209,000 Gallons per Day (gpd)
  - Projected Institutional (High School) – 30,000 gpd (12 gpd/student)
  - Projected Total Average WW Flow – 239,000 gpd
- d. Projected Peak Build-Out WW Flows.
  - Estimated Peaking Factor – 3.0 (Peak-to-Average Flow Ratio)
  - Projected Peak WW Contribution – 720,000 gpd
  - Peak Infiltration/Inflow Allowances
    - Near-term I/I Contribution – 297,000 gpd (1,650 gpad x 180 net acres)
    - Long-term I/I Contribution – 720,000 gpd (4,000 gpad x 180 net acres)
    - Net acreage excludes low-lying land along southerly boundary of South Area and half of school site that is assumed to be playing fields.
  - Projected Peak Flow –
    - Near-term (25-year) Planning for PS Capacity – 1,020,000 gpd ≈ 710 gallons per minute (gpm)
    - Long-term (50-year) Planning for Sewer Capacity – 1,440,000 gpd ≈ 1,000 gpm

### 3. South Cornelius Pump Station

- a. Concept-Level PS Capacity – 750 gpm (Preliminary Projection for Build-Out and Near-term I/D).
- b. Approximate Minimum Elevation for Development – 156-160 feet
- c. Approximate PS Floor Level (Top of Wetwell) – Elevation 154-158 feet
- d. Approximate Sewer Inverts at Wetwell – Elevation 140-142 feet
- e. Potential PS Sites Identified for Planning (see Exhibit 1)
  - Site 1 – Central Location near swale south of 26th Avenue
  - Site 2 – SE Location between 345th Avenue and Tualatin River
  - Site 3 – SW Location near swale outlet to river
- f. Site 1 is identified as the preferred site for planning purposes.
  - The more centralized site offers more flexibility in developing the tributary gravity sewers.
  - The central site helps to limit the maximum depth of the tributary gravity sewers.
  - The other two sites would probably require a lower inlet invert at the PS wetwell.

### 4. School Site Service Options

- a. Sewer service to the school can be extended from the new South-Area collection system or potentially from the existing City sewer system to the west (see Exhibit 1).
- b. Gravity Flow South: This option would have WW from the school conveyed by gravity into the sewer system for the South Area tributary to the future SCPS.
- c. Gravity Flow West:
  - This option would have WW from the school conveyed by gravity into the City's sewer system at the east end of existing Dogwood Street.
  - Flows through the Dogwood sewer eventually reach the South Trunk Sewer at 23rd Avenue.
  - The ability to serve the school site from Dogwood would depend on the actual location and elevation of the school, as well as the elevation, capacity and accessibility of the existing sewer in Dogwood.
- d. For planning purposes we show the school being served by the future South-Area sewers and SCPS. The reasons for this assumption are described below.
  - This approach provides a more conservative projection for the PS capacity.
  - There are concerns about accessibility for maintenance if sewer service were extended from Dogwood.
  - Because the WW contribution from the school is a small portion of the overall South-Area WW flow, future impacts on the existing South Trunk Sewer would likely be similar for either option.

### 5. South-Area Connection to City's Existing Sewer System

- a. South-Area WW can be discharged into the existing South Trunk Sewer at either 20th Avenue or Webb/26th Avenue (see Exhibit 1)
- b. It is preferable to connect to the South Trunk Sewer at 20th Avenue because that is further downstream and will not impact the existing pipe between 26th and 20th.
- c. The force main from the SCPS can discharge to a gravity sewer in the South Area that will extend west and then north to the intersection of Ginger and 20th as shown in Exhibit 1. Based on the preliminary projection for the SCPS capacity and minimum sewer slope, this South-Area outlet sewer will need to be 12 inches in diameter.

## 6. Assumptions for Conceptual Layout

- a. The layout assumes the gravity sewers tributary to the SCPS would be 8 inches in diameter with a minimum slope of 0.5%.
- b. The layout assumes a minimum depth to the sewer invert of about 6 feet.

## D. IMPACT OF SOUTH AREA ON EXISTING SYSTEM

### 1. Scope

Our study of downstream impacts from the South Area was limited to an analysis of the effect the projected peak hourly flow from projected development will have on an upper reach of the existing South Trunk Sewer. This section of the existing sewer extends under Ginger Street, Emerald Loop and the Free Orchards City Park to Heather Street, near 15th Avenue (see Exhibit 1).

### 2. Background

The 2012 CWS West Basin Facilities Plan (WBFP) previously identified capacity deficiencies in most of the South Trunk Sewer and recommended replacement of about 3,800 feet of this upper reach with larger pipe sizes.

### 3. Purpose

The purpose of our impact analysis is to provide updated recommendations for pipe replacements. The update is based on the peak flow projections we generated from the current land-use plan for the South Area (see Section C above) and more-recent information on I/I contributions provided by CWS.

### 4. South Trunk Field Survey

A field survey was performed of the manholes along the upper reach of the South Trunk from Heather Street to 26th Avenue. This survey established current data for existing pipe sizes, invert elevations and manhole rim elevations that were used to generate an updated model of this upper reach. The data is shown in Appendix A.

### 5. South Trunk Analysis

- a. We evaluated the upper reach of the South Trunk by applying estimates of peak WW and infiltration/inflow contributions from currently developed areas and applying the projected near-term and long-term SCPS flow capacities at the preferred discharge point.
- b. We generated flow estimates from existing, tributary developments using criteria for WW generation listed in the WBFP and updated I/I criteria supplied by CWS. These estimates assume no redevelopment will occur in the tributary areas to significantly increase WW flows.
- c. Breakdowns of the estimated flows into the South Trunk are listed in Table 1 (following page) and shown in Exhibit 2. The projected peak WW flows from developed areas are similar to the WBFP, but do not coincide exactly. The projected I/I contributions are lower than the WBFP because CWS identified a lower, per-acre I/I contribution based on more-recent flow data the agency obtained for the South Trunk sub-basin.

### 6. Results of Analysis

The pipe replacements identified in our planning-level analysis of the South Trunk are listed in Table 2 (following page). The results of our analysis are further described in the following paragraphs.

- a. Our results generally coincide with the recommendations of the WBFP from Heather (MH #20045) upstream to 20th and Ginger (MH #20034). An 18-inch sewer pipe is needed to convey projected peak flows through these segments for both the near-term and long-term I/I contributions from the South Area.

The 18-inch pipe size assumes the existing, inverted siphons in Free Orchards Park will be replaced with straight, gravity sewers that will be laid aboveground across the low-lying swales. These sewers will need to be supported from pedestrian boardwalks or similar structures through these locations.

Pipe bursting could potentially be used to replace the existing buried 12-inch sewer with an 18-inch pipe. However, the existing South Trunk has a fairly shallow depth of burial under Emerald Loop and where Ginger transitions to 18th Avenue. Consequently, surface heaving could be a major concern with pipe bursting in this stretch. Installation methods will need to be further addressed at a later stage of project development.

- b. Our analysis indicates a 12-inch pipe is needed for the pipe reach in Ginger between 20th and 23rd Avenues based on the average slope. This conclusion contrasts with the WBFP recommendation for a 15-inch pipe along this reach. The difference may result from the lower I/I contribution provided by CWS and a shift of the South-Area sewer connection further downstream along the South Trunk.

It should be noted our survey of the MHs along the South Trunk shows one sewer length in this reach, between MHs #20031 and #20032, has a very mild slope of 0.07%. If this pipe were replaced through pipe bursting, it would continue to have a mild slope, which would reduce the pipe capacity and could promote solids deposition. This issue will need to be considered when evaluating installation methods for this reach.

<b>Table 1</b>										
<b>South Trunk Sewer - Projected Flow Contributions</b>										
SFR Land Use Factor = 1,200.0 gpad for existing developments (WBFP, TM 2.3, Table 2)										
Peaking Factor = 3.0 (multiplier applied to residential flow)										
Avg. I/I Contribution = 5,150.0 gpad avg. for Basin FG-6 (CWS Input - July 2015)										
Area	Inlet MH#	Acreage	Flows from Currently Developed Areas (gpm)				Future SCPS Flow (gpm)		Cumulative Flows (gpm)	
			Base WW	Peak WW	Peak I/I	Total Peak	Near Term	Long Term	Near Term	Long Term
1	22461	20	17	50	72	122	0	0	122	122
2	20030	85	74	223	304	527	0	0	649	649
3	20034	20	17	50	72	122	750	1,000	1,521	1,771
4	20036	55	46	138	197	335	0	0	1,856	2,106
5	20043	8	7	20	29	49	0	0	1,905	2,155
		<b>188</b>	<b>160</b>	<b>481</b>	<b>672</b>	<b>1,155</b>	<b>750</b>	<b>1,000</b>	<b>1,905</b>	<b>2,155</b>
									<b>2.75 MGD</b>	<b>3.10 MGD</b>

<b>Table 2</b>									
<b>South Trunk Sewer - Probable Requirements for Pipe Replacements</b>									
Pipe Reach	Upstrm MH#	Dnstrm MH#	Location	Existing Size (in.)	Proposed Size (in.)	Reach Length (ft)	Approx. Avg. Slope	Pipe Capacity (gpm) ***	
1	20030	20034	23th-20th Ave.	10	12	825	0.25%	775	
2	20034	20036	20th-19th Ave.	12	18	510	0.15%	1,780	
3	20036	20040	19th Ave-Emerald	12	18	805	0.22%	2,150	
4	20040	20043	Emerald-Fawn **	6, 10 & 12	18	420	0.28%	2,425	
5	20043	20045	Fawn-Heather **	6 & 10	18	445	0.34%	2,675	
<b>Total Length - 3,005</b>							<b>Linear Feet</b>		
<b>12" Pipe - 825</b>							<b>Linear Feet</b>		
<b>18" Pipe - 2,180</b>							<b>Linear Feet</b>		
** Free Orchards Park      *** New Pipe w/Max. Depth 80% of Pipe Diameter									

**E. NORTH EXPANSION AREA SERVICE CONCEPT****1. General Concept:**

- a. The conceptual sewer layout would provide gravity service to the North Area. The layout is shown in Exhibit 3.
- b. The sewer layout is generally based on current development patterns (layout of lots, streets & railroad) with most sewers following an existing R-O-W.
- c. The gravity sewers would be divided into four separate sub-basins: Northwest, Northeast, Southwest and Southeast.
- d. All four sub-basins would be tributary to the Clean Water Services' Council Creek Trunk Sewer.

**2. Projected WW Production**

- a. Projected Build-Out Development:
  - Projected Residential – 480 DU
  - Projected Commercial – 6 acres
  - Projected Industrial & Institutional – None
- b. CWS Flow Criteria from West Basin Facilities Plan (Carollo, 2012) and other CWS input:
  - Average Residential Occupancy – 2.6 People/Dwelling Unit (DU)
  - Average Per Capita WW Flow – 67 Gallons per Capita/Day
  - Average flow contribution from commercial land – 1,000 gpd/acre (gpad)
  - Long-term I/I contribution from currently undeveloped land – 4,000 gpd/acre (gpad)
- c. Projected Average Dry-Weather WW Flows at Build-Out.
  - Projected Build-Out Population – 1,250 People
  - Projected Residential – 83,620 Gallons per Day (gpd)
  - Projected Commercial – 6,000 gpd
  - Projected Total Average WW Flow – 89,620 gpd
- d. Projected Peak Build-Out WW Flows.
  - Estimated Peaking Factor – 4.0 (Peak-to-Average Flow Ratio)
  - Projected Peak WW Contribution – 358,500 gpd
  - Peak Infiltration/Inflow Allowance – 300,000 gpd (4,000 gpad x 75 net acres)
  - Projected Peak Flow – 660,000 gpd  $\approx$  460 gallons per minute (gpm)

**3. Sewer Drainage Pattern**

- a. NW Sub-basin
  - This sub-basin would drain to the west along the existing ODOT railroad R-O-W.
  - WW flows would discharge into an existing sewer that extends down from the Trailer Park to the existing North-South Trunk Sewer.
  - The east boundary of the NW sub-basin is limited by a highpoint in the RR line between 338th and 341st Avenues. East of this point the RR grade slopes down to Dairy Creek.

- b. NE Sub-basin
  - This sub-basin would serve areas that generally slope to the north and east toward Council Creek or Dairy Creek.
  - WW flows would discharge through a gravity sewer extending across the RR line and north along 334th Avenue to the existing Council Creek Trunk Sewer.
- c. SW Sub-basin
  - This sub-basin would generally drain west to the existing sewer along East Lane just north of Baseline Street. The service concept is laid out to minimize the amount of area served by the SW Sub-basin due to constraints posed by existing utilities in the Baseline R-O-W.
  - The existing sewer extending along Baseline is on the south side of the R-O-W. Gravity sewer service from the area north of Baseline is prevented from discharging into this existing sewer by the 72-inch water transmission main under the north side of Baseline.
  - Existing utilities along the north side of the Baseline R-O-W limit the space that would be available for a new parallel sewer on the north side of Baseline.
  - The mobile home park on East and West Lanes is currently served by existing gravity sewers.
- d. SE Sub-basin
  - This Sub-basin would serve a small area on the south side of Baseline, east of the current City limit.
  - The area would be served by an extension of the existing 8-inch sewer that extends along the south side of Baseline. The Baseline sewer discharges into the north-south trunk sewer.

**4. Approximate Peak WW Flow Distribution to Existing Trunk Sewers**

- a. Approximate flow to N-S Trunk (NW, SW & SE Sub-basins) – 290,000 gpd (60%)
- b. Approximate flow directly to Council Creek Trunk (NE Sub-basin) – 195,000 gpd (40%)

**5. Assumptions for Conceptual Layout**

- a. The layout assumes gravity sewers would be 8 inches in diameter with a minimum slope of 0.5%.
- b. The layout assumes a minimum depth to the sewer invert of 6 feet and a maximum depth of about 15 feet.

**F. IMPACT OF NORTH AREA ON EXISTING SYSTEM**

**1. City’s Baseline Street Sewer**

A small amount of additional WW from projected commercial development in the SE Sub-basin will discharge into the City’s existing sewer along the south side of Baseline. This projected WW contribution will be too minor to impact the existing sewer system.

**2. North-South Trunk Sewer**

The conceptual layout for the North Area would convey projected flows from the NW and SW Sub-basins into the existing CWS North-South Trunk Sewer. CWS records show this line extending from East Lane, just north of Baseline, up to the Council Creek Trunk Sewer. These records also show the line as an 8-inch pipe with most sections between manholes laid at a slope of 0.4%. The North-South Trunk sewer currently receives flows from collector sewers in Baseline and two other City collector sewers north of Baseline.

If future development is evenly distributed throughout the North Area, the NW and SW Sub-basins could carry more than half the projected flows. Since an 8-inch pipe with a 0.4% slope has a capacity of about 0.5 MGD before surcharging, future flows from the NW and SW Sub-basins could surcharge the line. Future CWS facilities planning efforts will need to model the line to verify whether the North-South Trunk will be adequate.

**3. Council Creek Trunk Sewer**

The sewer service concept for the North Area results in all future WW flows generated in the area being conveyed to the Council Creek Trunk Sewer. The NE Sub-basin will drain directly to this line and the other sub-basins will be conveyed to this line through the North-South Trunk Sewer.

CWS records show the Council Creek line as a 42-inch pipe between the North-South Trunk and 334th Avenue. This existing 42-inch pipe line would need to be at or very near capacity to be impacted at all by the projected WW flows from the North Area. Future CWS modeling of this line will need to address the potential for any impacts from the North Area.

**G. ORDER-OF-MAGNITUDE ESTIMATE OF PROBABLE COST**

As part of the comprehensive planning process, we developed estimates of the probable project costs for the SCPS, the associated PS force main and downstream South-Area gravity sewer, and the South Trunk Sewer replacements. We used cost information presented in the WBFPP as the basis for the estimates and then applied an inflation factor based on the 20-City Average Construction Cost Index (CCI) published by Engineering News Record (ENR).

The probable project costs include a 30% allowance for construction contingencies and a 35% allowance for non-construction costs (engineering, environmental and legal services and project administration).

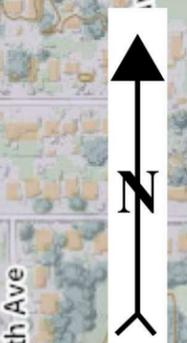
<b>Table 3</b>	
<b>Estimates of Probable Project Costs (July 2015 **)</b>	
<b>Project Description</b>	<b>Probable Cost</b>
750-gpm South Cornelius Pump Station	\$ 880,000
8-inch Force Main & 12-inch Downstream Gravity Sewer	\$ 650,000
South Trunk – Reach 1 Replacement (12-inch Sewer)	\$ 280,000
South Trunk – Reach 2-5 Replacement (18-inch Sewer)	\$ 1,450,000
<b>Total Estimated Probable Project Costs</b>	<b>\$ 3,260,000</b>

\*\* July 2015 ENR CCI = 10,037

The level of detail of these cost estimates is consistent with Estimate Class 4 described by the Association for the Advancement of Cost Engineering International (Recommended Practice #18R-97, Rev. November 2011). Accordingly, the accuracy is anticipated to be within –25% to +35% of the actual cost.

The actual cost of the improvements will depend on project scope, design development, and actual market conditions at bid time. Costs will also depend on specific site conditions and other variable factors. More detailed estimates of the probable costs will need to be prepared as part of further project planning and design efforts.

**CONCEPTUAL SANITARY SEWER LAYOUT  
ALTERNATIVE PUMP STATION & FORCE MAIN LOCATIONS  
FOR SOUTH UGB EXPANSION AREA**



NO SCALE

POTENTIAL SERVICE OPTIONS FOR SCHOOL

- POTENTIAL PUMP STATION LOCATIONS  
APPROX RIM EL ~ 155-158  
APPROX INLET IE ~ 138-142
- EXAMPLE FORCE MAIN ALIGNMENTS
- ALTERNATE FM DISCHARGE @26TH
- POTENTIAL GRAVITY TRUNK SEWER TO CITY SYSTEM & FLOW DIRECTION
- SOUTH AREA COLLECTOR SEWER (ILLUSTRATION ONLY-ROUTING TBD)
- EXISTING DRAINAGE PATTERN

EXIST. S. TRUNK SEWER

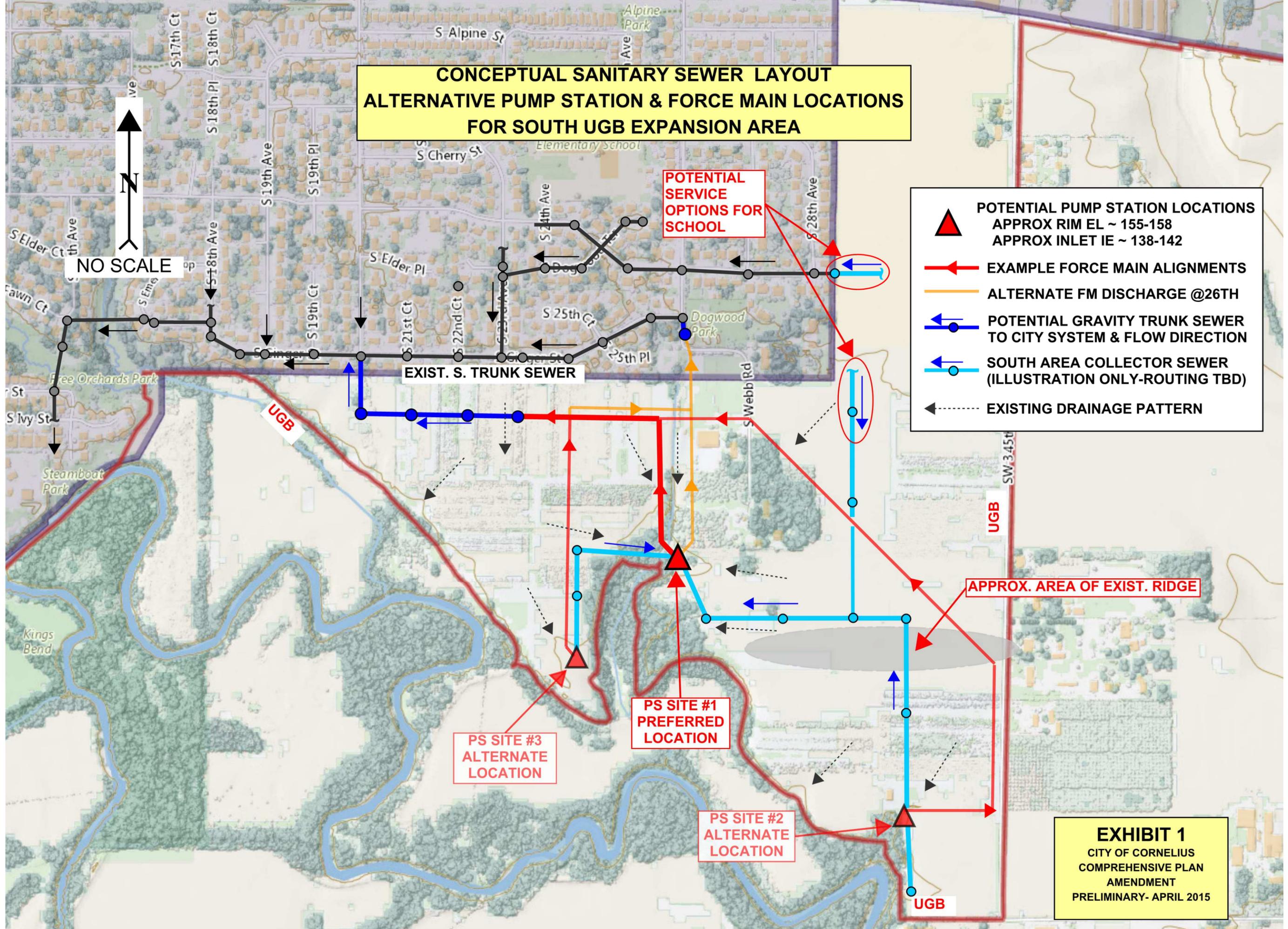
APPROX. AREA OF EXIST. RIDGE

PS SITE #3  
ALTERNATE  
LOCATION

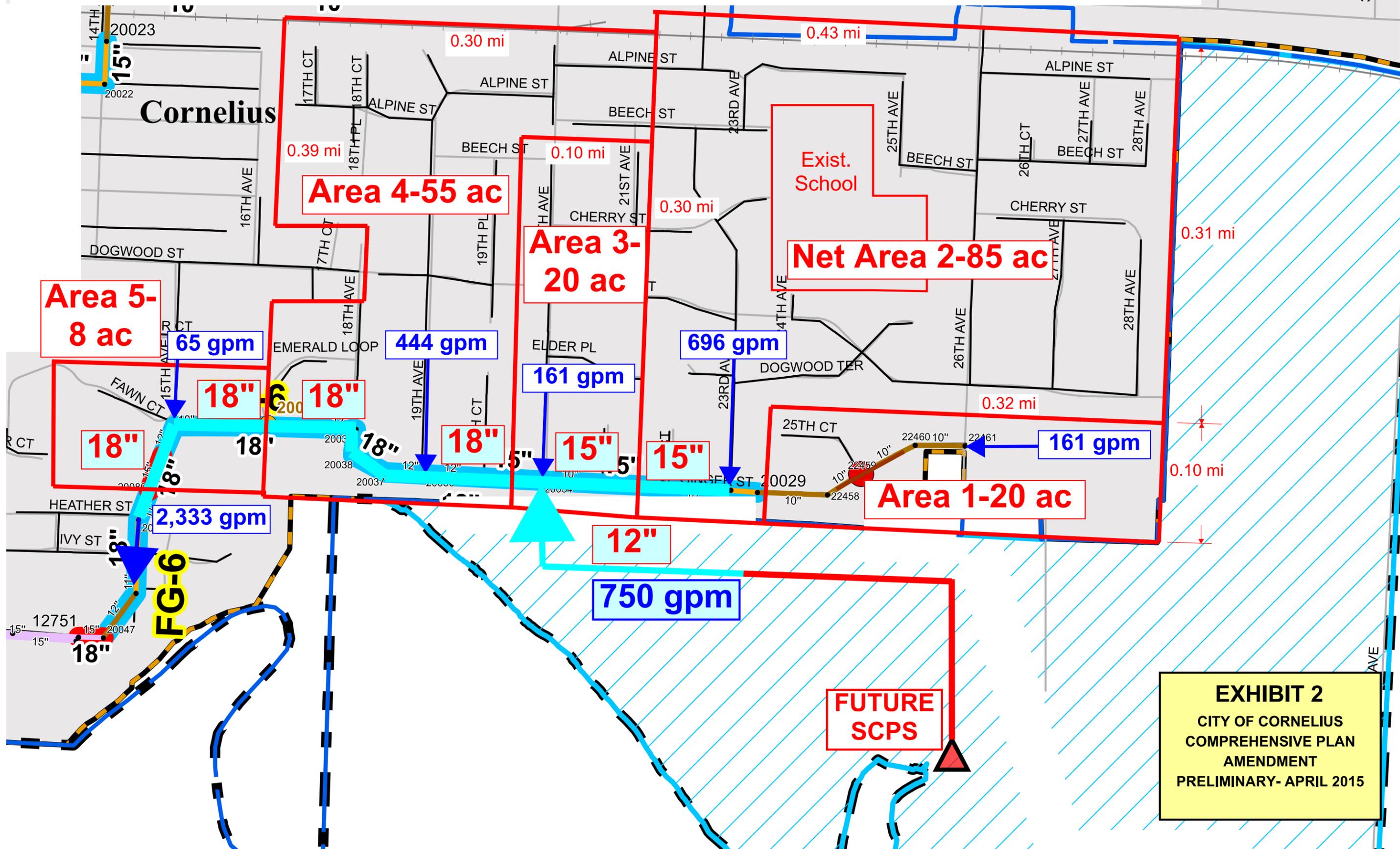
PS SITE #1  
PREFERRED  
LOCATION

PS SITE #2  
ALTERNATE  
LOCATION

**EXHIBIT 1**  
CITY OF CORNELIUS  
COMPREHENSIVE PLAN  
AMENDMENT  
PRELIMINARY- APRIL 2015

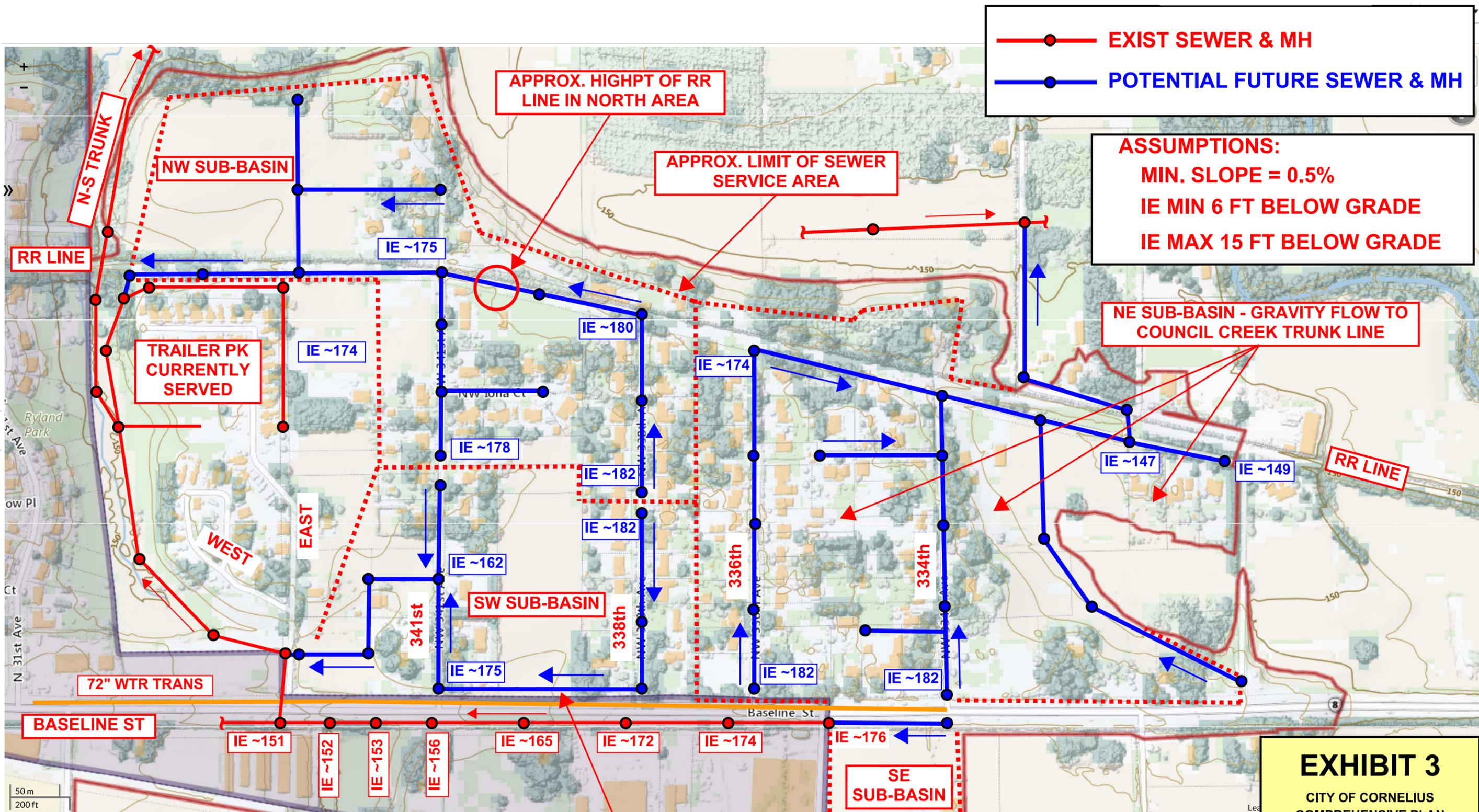


# SOUTH TRUNK SEWER EVALUATION ESTIMATED TRIBUTARY AREAS & FLOWS



**EXHIBIT 2**  
CITY OF CORNELIUS  
COMPREHENSIVE PLAN  
AMENDMENT  
PRELIMINARY- APRIL 2015

# CONCEPTUAL SANITARY SEWER LAYOUT FUTURE SERVICE FOR NORTH UGB EXANSION AREA



—●— **EXIST SEWER & MH**  
—●— **POTENTIAL FUTURE SEWER & MH**

**ASSUMPTIONS:**  
 MIN. SLOPE = 0.5%  
 IE MIN 6 FT BELOW GRADE  
 IE MAX 15 FT BELOW GRADE

**NE SUB-BASIN - GRAVITY FLOW TO COUNCIL CREEK TRUNK LINE**

**MIN. ALLOWABLE SEWER SLOPES: \*\***  
 8" DIA 0.40%  
 10" DIA 0.28%  
 12" DIA 0.22%  
 \*\* FOR 2.0 FPS VELOCITY

**POTENTIAL PARALLEL SEWER IN NEW EASEMENT TO AVOID HWY CROSSINGS & UTILITIES**

**EXHIBIT 3**  
 CITY OF CORNELIUS  
 COMPREHENSIVE PLAN  
 AMENDMENT  
 PRELIMINARY- APRIL 2015

**APPENDIX A**

**City of Cornelius  
South Trunk Sewer Survey Data**

Model Pipe#	MH#	Location	Rim Elev	MH Inlet			MH Outlet			Run	Slope (ft/ft)
				Size & Mat'l	Dip	IE	Size & Mat'l	Dip	IE		
6122	22461	26th/Ginger	175.77	10"PVC(S)	10	165.77	10"PVC(W)	10.1	165.67	216.61	0.0028
6124	22460		173.21	10"PVC(E)	8.14	165.07	10"PVC(SW)	8.25	164.96	263.44	0.0022
6090	22459	25th/Ginger	174.91	10"PVC(NE)	10.53	164.38	10"PVC(SW)	10.7	164.21	168.04	0.0035
6088	22458		174.25	10"PVC(NE)	10.62	163.63	10"PVC(W)	10.79	163.46	307.38	0.0034
1	20029		173.35	10"PVC(E)	10.95	162.4	10"CSP(W)	11.05	162.3	108.56	0.0027
2	20030	23rd/Ginger	173.23	10"CSP(E)	11.22	162.01	10"CSP(W)	11.29	161.94	260.11	0.0029
3	20031		174.14	10"CSP(E)	12.95	161.19	10"CSP(W)	13.09	161.05	156.34	0.0007
4	20032		173.21	10"CSP(E)	12.27	160.94	10"CSP(W)	12.39	160.82	122.03	0.0029
5	20033		172.54	10"CSP(E)	12.07	160.47	10"CSP(W)	12.19	160.35	282.94	0.0028
6	20034	20th/Ginger	170.84	10"CSP(E)	11.29	159.55	12"CSP(W)	11.39	159.45	254.93	0.0014
7	20035		168.6	12"CSP(E)	9.5	159.1	12"CSP(W)	9.58	159.02	254.70	0.0017
8	20036	19th/Ginger	166.61	12"CSP(E)	8.03	158.58	12"CSP(W)	8.13	158.48	149.79	0.0019
9	20037		163.79	12"CSP(E)	5.6	158.19	12"CSP(NW)	5.7	158.09	152.39	0.0026
10	20038		162.04	12"CSP(SE)	4.34	157.7	12"CSP(N)	4.4	157.64	118.03	0.0038
11	20039	18th/Emerald	164.47	12"CSP(S)	7.28	157.19	12"CSP(W)	7.35	157.12	383.81	0.0019
12	20040	Emerald	160.72	12"CSP(E)	4.33	156.39	12"CSP(W)	4.38	156.34	22.56	0.0080
	20042	Emerald	161.16	12"CSP(E)	5	156.16	10" ??(W) 10" ??(W)	5.15 4.82	156.01 156.34		
13 & 15	<i>(Ignore MH# 20079 - blowoff)</i>									394.50	0.0023
	20043	15th/Fawn	160.34	10"CSP(E)	5.25	155.09	12"CSP(SW)	5.3	155.04		
14				10"CSP(E)	5.25	155.09				130.08	0.0035
	20044	Sou. of Fawn	159.08	12"CSP(NE)	4.5	154.58	12"CSP(SW) 8"CSP(SW)-??	4.4 NOT SURVEYED	154.68		
213 & 16	<i>(Ignore MH# 20079 - blowoff)</i>									313.56	0.0040
	20045	Heather	157.95	12"CSP(NE) 8"CSP(NE)	4.51 4.55	153.44 153.40	10"CSP(S)	4.53	153.42	(Should be 12" Out?)	
???	64144		160.03	12"CSP(N)	6.98	153.05	12"CSP(S)	7.05	152.98	141.59	0.0026

# Exhibit D

## Amendments to the City of Cornelius Water Master Plan (Appendix I)

# Cornelius Urban Growth Boundary Expansion

## Water Plan

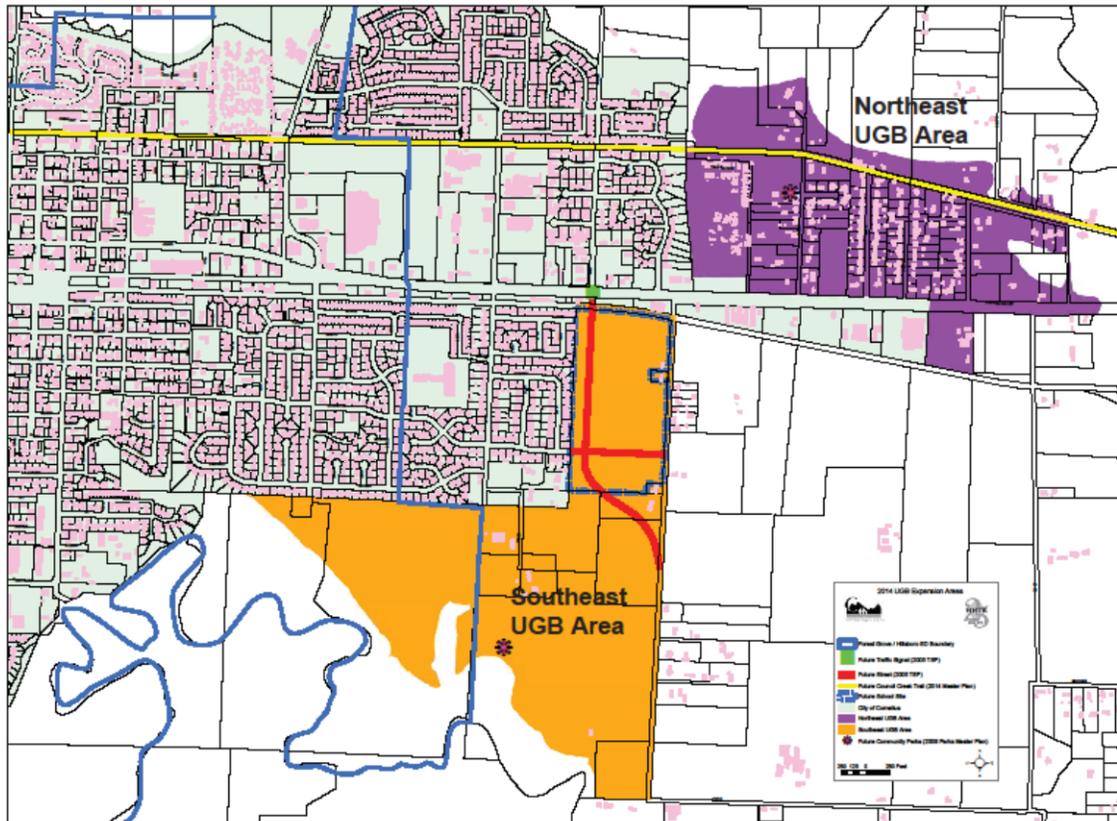
August 28, 2015



Terry Keyes, PE  
City Engineer  
City of Cornelius

## Study Area

The Urban Growth Expansion (UGB) area consists of two parts. The Northeast UGB area is primarily north of Baseline and south of the Council Creek flood plain, just east of the current City limits. The Southeast UGB area is north of the Tualatin River flood plain and west of 345<sup>th</sup> Avenue. These areas are shown in the map below.



## Water Infrastructure – Northeast UGB Area

The City of Hillsboro currently provides water service to the Northeast UGB. Attachment 1 shows the current system. While Hillsboro and Cornelius have had very preliminary talks regarding Cornelius taking over the water system in this area, the City of Cornelius has been cool to the idea because much of the system in the area is undersized and does not meet current standards.

Attachment 2 shows the improvements that are likely needed to bring the water system in this area up to City of Cornelius standards. Most of the improvements involve upgrading the existing lines to 8" and adding fire hydrants. The line on 341<sup>st</sup> is shown as a 12" line based on the assumption that without a looped system, any significant development north of the railroad will need a 12" line to achieve adequate flow.

The cost of bringing the water infrastructure in this area up to current standards is approximately:

$$4,000 \text{ LF @ } \$130/\text{LF} = \mathbf{\$520,000}$$

This cost cannot be justified based on the limited amount of water user fee revenue the area would produce. Therefore, if the Northeast UGB area is annexed to the City of Cornelius, the annexation will likely occur in small chunks as development occurs. With each annexation, Cornelius will take over the portion of the water system needed to serve that area. The development necessitating the annexation will be primarily responsible for improving the annexed part of the Hillsboro water system to Cornelius standards.

Storage needs for the Northeast UGB area can be easily handled by the City's current 1.5 MG (million-gallons) above ground reservoir and its 50+MG Aquifer Storage and Recovery (ASR) System scheduled to come on line in 2017.

Flow needs for this area can be handled from three sources.

1. 12" Cornelius main line on the north side of Baseline that currently ends at East Lane
2. 12" Cornelius main line on the south side of Baseline that currently ends at the Coastal Farm Store at about 336<sup>th</sup> Avenue
3. Existing but unused transfer station from the Hillsboro 72" transmission line in Baseline to the Cornelius system at East Lane

In summary, the City of Cornelius can easily serve the Northeast UGB area. The primary concern is the fact that most pipes in this area are substandard. Bringing this area up to current standards is an expensive proposition that is not currently programmed into the Cornelius water rate structure. Therefore, improvements to the water infrastructure in this area will be required at the time of development. Until areas are annexed into the City the system within this area will remain within Hillsboro's service district and will be maintained and operated by Hillsboro.

#### **Water Infrastructure Needs – Southeast UGB Area**

The Southeast UGB area represents a clean slate in that the area contains almost no existing water infrastructure. The only public water facility in the area is a 2" plastic line from Baseline south along 345<sup>th</sup> to serve approximately 8 residents within ¼ mile of Baseline. Since most of these residents are outside the UGB expansion area, the City does not intend to upgrade this 2" plastic line in the foreseeable future. However, the south end of this line may be looped into the new water infrastructure in the UGB area to protect against an emergency such as a line break.

When developed, the Southeast UGB area will be served by 12" mains under the planned collector streets. The collector streets are expected to include: 29<sup>th</sup> south of Baseline, 26<sup>th</sup> and 20<sup>th</sup> south of Ginger, Dogwood east of 28<sup>th</sup>, and a new east-west collector south of the current city limits that connects 20<sup>th</sup>, 26<sup>th</sup> and 29<sup>th</sup>. All local streets will be underlain with 8" water mains, the minimum standard required by Cornelius.

In addition, to provide adequate flow and pressure to this area at build-out, some improvements in the City's existing water system may be required. The needed improvements will be determined when the City completes its water master plan update later this year. However, the improvements to the existing system that are likely to be needed at full development of the UGB area include:

- 12" line to replace existing 8" line in Dogwood from 18<sup>th</sup> to 20<sup>th</sup>
- 12" line to replace 8" line in 20<sup>th</sup> from Dogwood to Southeast UGB area
- 12" line to replace 8" line in 26<sup>th</sup> from Dogwood to Southeast UGB area

These improvements are not needed initially, but will be required as the area nears build-out. When the City's water master plan update is completed in late 2015, the amount of development the existing system can support will be determined. For development that occurs before the master plan update is complete, the developer will be responsible for proving that the existing system can provide adequate flow and pressure to the UGB area. If adequate flow and pressure cannot be attained, the developer will need to make the improvements noted above.

Storage needs for the Southeast UGB area can be handled by the City's current 1.5 MG above ground reservoir and its 50+MG Aquifer Storage and Recovery (ASR) System scheduled to come on line in 2017.

### **Water Infrastructure Costs – Southeast UGB Area**

All the new water mains in the Southeast UGB area will be installed and funded by developers. However, the City must pay for oversizing of lines greater than 8" size. In other words, while the developers are responsible for funding the installation of 8" lines under all the streets in this area, the City must fund the additional cost of 12" lines where they are needed. The cost of this upsizing of lines to 12" is estimated to be:

12" oversize cost in UGB area = ~10,000 LF @ \$20/LF = \$200,000

Furthermore, the City must fund improvements to piping outside the UGB area. These improvements are listed above and will cost approximately:

12" replacement lines inside UGB area = ~2,200 LF @ \$140/LF = \$300,000

Water SDCs from the southeast UGB area are expected to be:

1,100 single family residences @ \$3,884 SDC per residence = ~\$4M

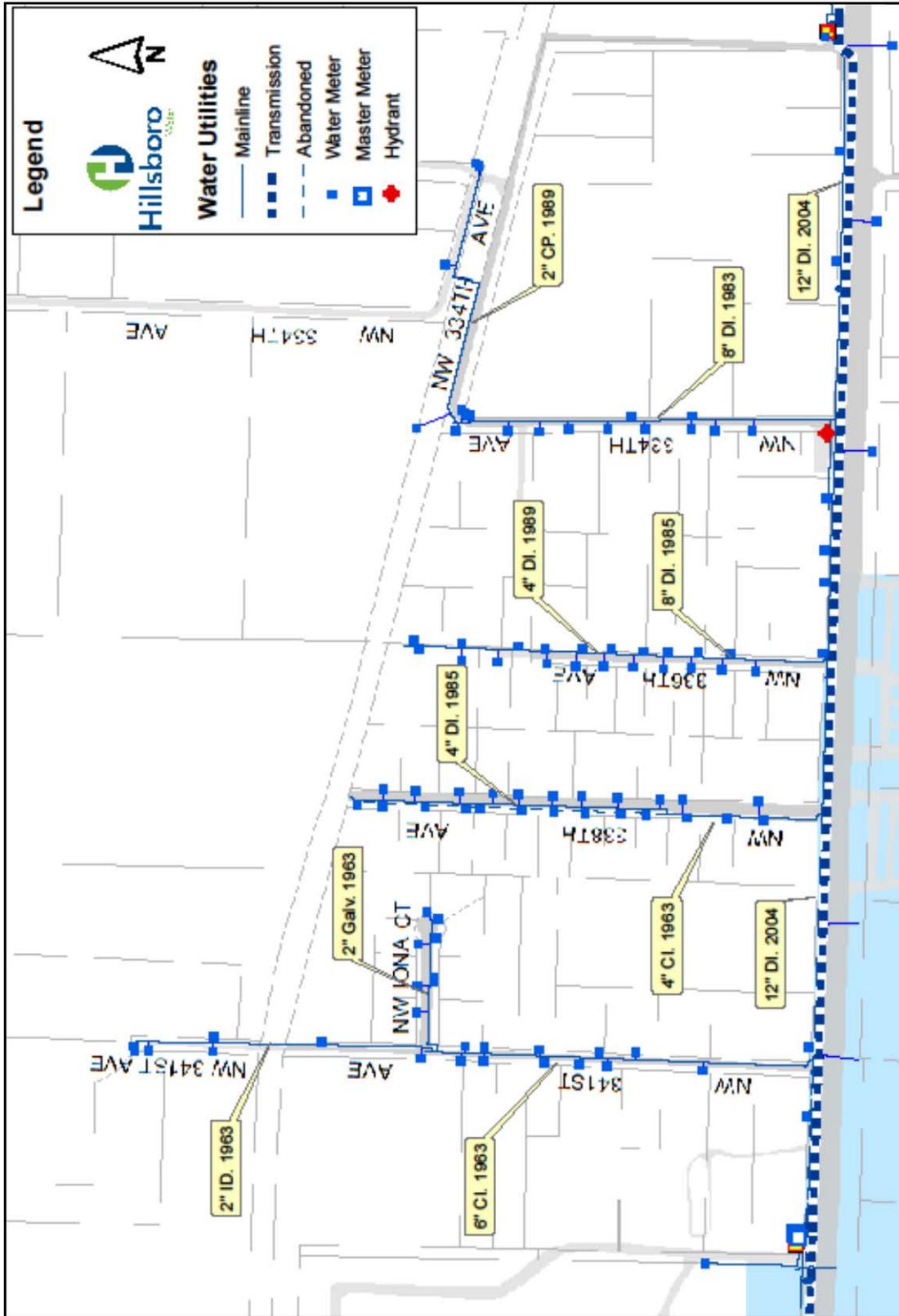
Therefore, the water SDCs captured from the new development in the southeast UGB area are more than adequate to fund the improvements to pipes needed to serve this area.

### **Recommendations**

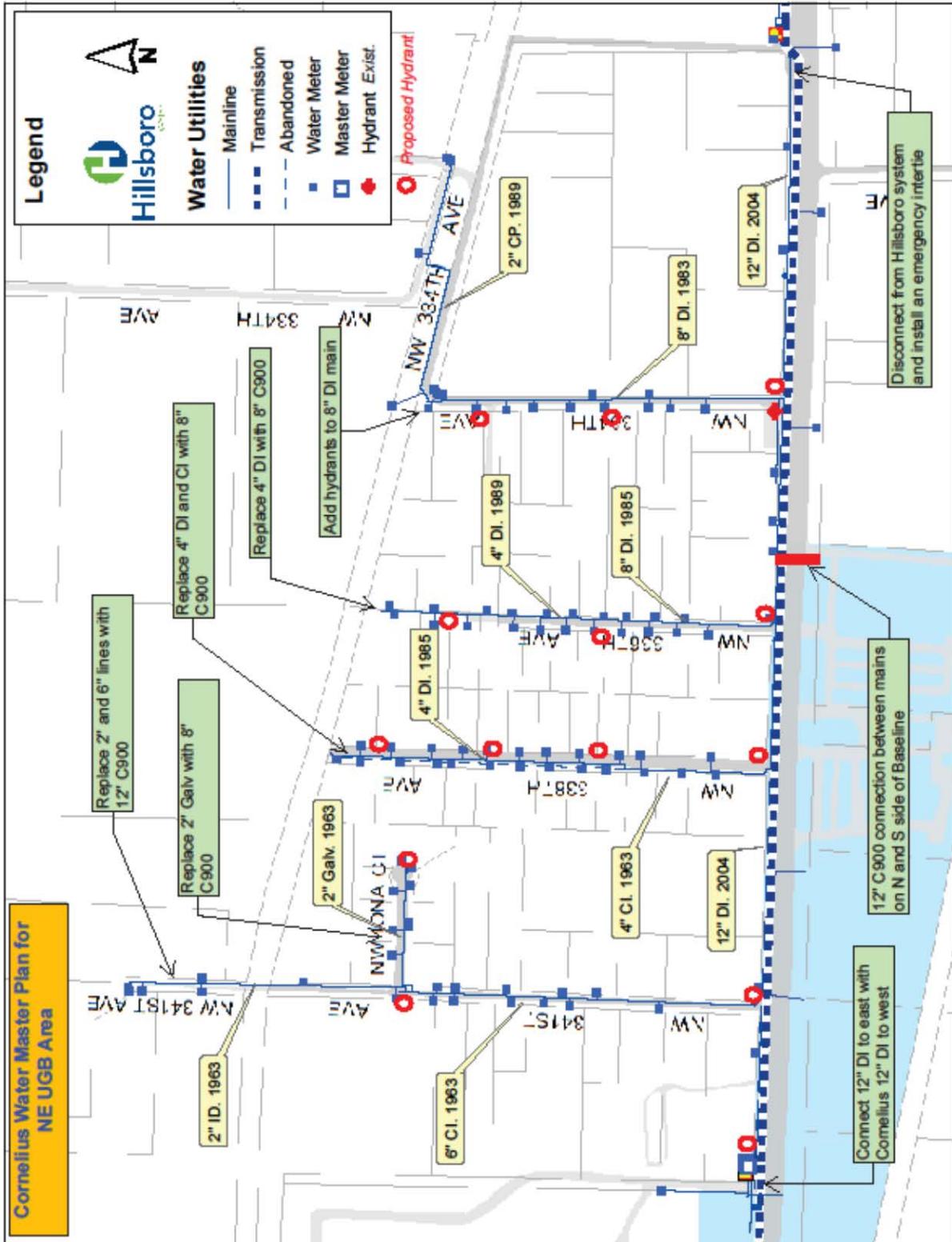
In the Northeast UGB area, staff recommends the area continue to be served by the City of Hillsboro until parcels are annexed. At the time parcels are annexed into the City of Cornelius, Cornelius should take over the portion of Hillsboro's system needed to serve the annexed parcel. Developers should pay for all improvements needed to bring lines up to City of Cornelius standards.

In the Southeast UGB area, developers should design and install all water mains. The City shall pay for oversizing mains under collectors to 12" from the 8" standard size. The City shall also design, build, and fund improvements necessary to the water mains within the current City boundaries.

Attachment 1 – Hillsboro Water System in Northeast UGB Area



Attachment 2 – Cornelius Water Improvement Needs for Northeast UGB Area



# Exhibit E

## Amendments to the City of Cornelius Transportation System Plan (Appendix M)

## RECOMMENDATIONS

### Transportation Planning Rule Findings

The traffic analysis completed for the proposed Cornelius UGB expansion areas found the potential vehicle trip increase would not significantly impact the surrounding transportation system and would satisfy the requirements of OAR 660-012-0060. No capacity improvements to existing facilities beyond those identified in the RTP and Cornelius TSP are required to support the UGB expansion areas. Further analysis of Tualatin Valley Highway west of 345<sup>th</sup> Avenue should be included in the upcoming Cornelius TSP update to identify specific projects to serve fronting property needs for access, capacity and safety.

### Local Improvements

Local roadway projects would be required to support the UGB expansion areas and provide adequate access and internal circulation. Based on the City’s functional classification designations<sup>13</sup> and the future 2040 PM peak hour volume forecasts, recommended local improvements were identified as shown in Table 11. Planning level cost estimates were developed for each roadway project based on the collector cross-section with parking on both sides of the street (shown in Figure 9). If the collector facilities were constructed with a narrower cross-section (shown in Figures 10 and 11) the costs would be lower.

**Table 11: Local Improvements to Support UGB Expansion**

Project	Description	Planning Level Cost Estimate
20 <sup>th</sup> Avenue Extension	Construct a collector facility south of Ginger Street then east to 29 <sup>th</sup> Avenue extension	\$7,450,000
26 <sup>th</sup> Avenue Extension	Construct a collector facility south of Ginger Street to the 20 <sup>th</sup> Avenue extension east-west alignment	\$1,300,000
29 <sup>th</sup> Avenue Extension	Construct a collector facility south of Tualatin Valley Highway to realignment with 345 <sup>th</sup> Avenue, install railroad crossing treatments on 29 <sup>th</sup> Avenue, close railroad crossing on 345 <sup>th</sup> Avenue	\$6,800,000

<sup>13</sup> Cornelius Transportation System Plan, DKS Associates, adopted June 20, 2005, Figure 8-3.



Dogwood Street Extension	Construct a collector facility east to 345 <sup>th</sup> Avenue (east UGB expansion area boundary)	\$1,600,000
29 <sup>th</sup> Avenue/Tualatin Valley Highway Signal	Install a traffic signal, interconnect with adjacent railroad crossing	\$600,000

Note: Collector facility cost estimate based on Figure 9 cross-section

The remaining roadways needed to support future development would function as local streets. The preliminary alignment for the recommended collector facilities are shown on Figure 7. These alignments are conceptual and will be refined with further engineering analysis prior to construction.

**Policies and Standards**

New policies and standards should be adopted to support the UGB expansion areas:

- Development should be limited to 130 residential units connecting to 20<sup>th</sup> Avenue and 260 residential units connecting to 26<sup>th</sup> Avenue prior to construction of the 29<sup>th</sup> Avenue connection to Tualatin Valley Highway. With a roadway connection between 20<sup>th</sup> and 26<sup>th</sup> Avenue, a combined development limit of 390 residential units should be applied.
- Roadway and trail cross-sections shown in Figures 9 to 14 should be incorporated into the Cornelius TSP.

# Exhibit F

## Amendments to the City of Cornelius Storm Drainage/Surface Water Master Plan (Appendix H)

# Cornelius Urban Growth Boundary Expansion

## Stormwater Plan

August 26, 2015

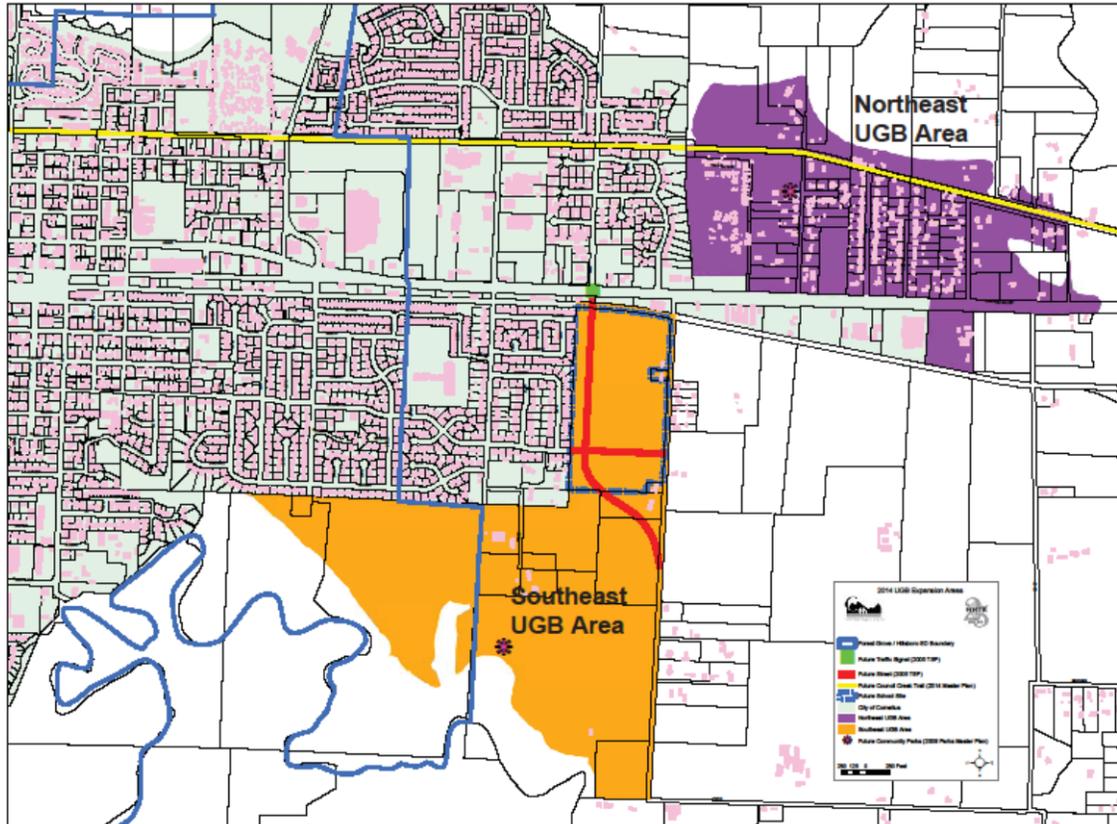


RENEWS 6/30/2017

Terry Keyes, PE  
City Engineer  
City of Cornelius

## Study Area

The Urban Growth Expansion (UGB) area consists of two parts. The Northeast UGB area is primarily north of Baseline and south of the Council Creek flood plain, just east of the current City limits. The Southeast UGB area is north of the Tualatin River flood plain and west of 345<sup>th</sup> Avenue. These areas are shown in the map below.



The terrain in these two areas is generally flat. The Northeast area largely slopes to the north toward Council Creek. The only waterway in this area is a large wetland area that separates the UGB expansion area from the current City boundary. This wetland area drains north toward Council Creek.

The Southeast area primarily slopes to the south toward the Tualatin River. The only waterway in this area is an agricultural ditch that starts where 26<sup>th</sup> Avenue turns into Webb Road and then traverses in a south-southwest direction toward the Tualatin River.

### **Existing Stormwater Facilities**

The only existing stormwater facilities in the Northeast UGB area are roadside and trackside ditches along Baseline, the north-south streets traversing the area, and the railroad north of Baseline.

The stormwater facilities in the Southeast UGB area are limited to the roadside ditches on 345<sup>th</sup> Avenue and railroad ditches along the railroad south of Baseline.

As development occurs, these facilities are expected to be replaced with facilities meeting current Clean Water Service (CWS) standards.

### **Stormwater Standards Overview**

Any new development in the UGB expansion areas must at a minimum meet the current *Design and Construction (D&C) Standards for Sanitary Sewer and Surface Water Management* issued by CWS.

Some UGB expansion areas in Washington County, notably Tigard's River Terrace and the unincorporated North Bethany, created additional stormwater standards that go beyond the D&C Standards. In the case of River Terrace, severe erosion in the stream corridors coming off the south side of Bull Mountain necessitated a more stringent approach to stormwater control in the area.

In North Bethany's case, CWS desired to incorporate extensive LIDA (low-impact development practices) into the area and pre-built a number of large regional facilities. This was deemed more desirable to the creation of individual stormwater facilities in each development phase.

One downside of the North Bethany approach is that CWS has had difficulty keeping ahead of development with new facilities. Also, by CWS constructing regional facilities rather than each developer constructing their own facilities, North Bethany has a large stormwater fee or system development charge that is unique in Washington County.

Finally, the D&C Standards issued by CWS are expected to change significantly as a result of a new MS4 permit from the State of Oregon, Department of Environmental Quality (DEQ) to CWS. One change in the new MS4 permit will be an increased level of treatment for stormwater. However, the most significant change in the standards is expected to be a requirement to deal with hydro-modification. Instituting this type of requirement is expected to create the need for very large detention and retention facilities on new development sites.

### **Cornelius Plan**

Because Cornelius does not face the problems Tigard does on Bull Mountain and because the City does not have the staff to plan, design, and build regional facilities, as CWS is doing in North Bethany, Cornelius will require developers to meet the current stormwater standards issued by CWS. While this approach is not innovative, it has been used successfully for decades in urban Washington County to manage stormwater runoff.

The only variations from the CWS standards are:

1. Prohibition on the use of proprietary treatment systems, e.g., Stormfilters, for treatment on parts of the system that the City must maintain in the future, i.e., facilities to be dedicated to the City.
2. Unless required by CWS rules, prohibition on single-family residential lot LIDA facilities.

The reason for the prohibition on proprietary systems is the additional maintenance burden these pose for the City at a time when stormwater maintenance funding is extremely limited. Likewise, the single-family lot LIDA facilities require on-going City inspection and oversight that the City does not have funding to undertake.

### **Costs**

Since developers will be responsible for designing and constructing stormwater facilities in the new UGB areas, the City will incur zero capital costs for these systems. The City will, however, incur, increased maintenance costs long-term, but these costs are funded by monthly stormwater fees payable by the new residents and businesses in the area.

### **Recommendations**

Staff recommends the City use the CWS D&C Standards that are applicable at the time of development to address stormwater issues in the UGB areas. Staff further recommends, the following two conditions be placed on all new development in these areas:

1. Prohibition on the use of proprietary treatment systems for treatment on parts of the system that the City must maintain in the future.
2. Unless required by CWS rules, prohibition on single-family residential lot LIDA facilities being used to meet subdivision stormwater quality or quantity requirements.