

CITY OF TIGARD, OREGON  
TIGARD CITY COUNCIL  
RESOLUTION NO. 14- 35

A RESOLUTION TO AMEND THE WATER SYSTEM MASTER PLAN TO INCLUDE PROJECTS NECESSARY FOR THE DEVELOPMENT OF RIVER TERRACE

---

WHEREAS, the City of Tigard annexed the River Terrace area west of Bull Mountain in 2011 and 2012; and

WHEREAS, the City of Tigard has an existing Water System Master Plan that does not include the River Terrace area, and

WHEREAS, the City of Tigard has completed a Water System Master Plan Addendum specific to the River Terrace area, contributing to the city's broader goal of completing the River Terrace Community Plan and meeting state requirements for public facility planning, and

WHEREAS, water public facility projects have been identified as part of the Water System Master Plan Addendum, and

WHEREAS, these projects are appropriate and necessary additions to the City of Tigard Water System Master Plan, and

WHEREAS, the City of Tigard may desire to use water system development charges to fund part or all of these projects, and

WHEREAS, a comprehensive finance strategy for all public facility projects in River Terrace will be developed as part of the River Terrace Community Plan. This strategy will include a list of projects to complete in the near term and their respective funding sources.

NOW, THEREFORE, BE IT RESOLVED by the Tigard City Council that:

SECTION 1: The River Terrace Water System Master Plan Addendum (Exhibit A) is hereby adopted as part of the City of Tigard Water System Master Plan.

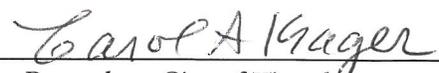
SECTION 2: The projects identified in the River Terrace Water System Master Plan Addendum shall be eligible for funding from water system development charges (SDCs) collected in the Tigard Water Service Area as allowed under section 3.24.060 of the Tigard Municipal Code.

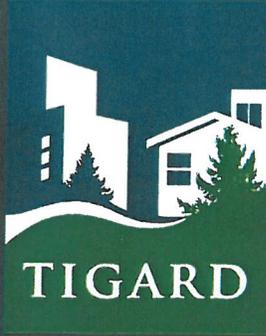
SECTION 3: This resolution is effective immediately upon passage.

PASSED: This 24<sup>th</sup> day of June 2014.

  
\_\_\_\_\_  
Mayor - City of Tigard

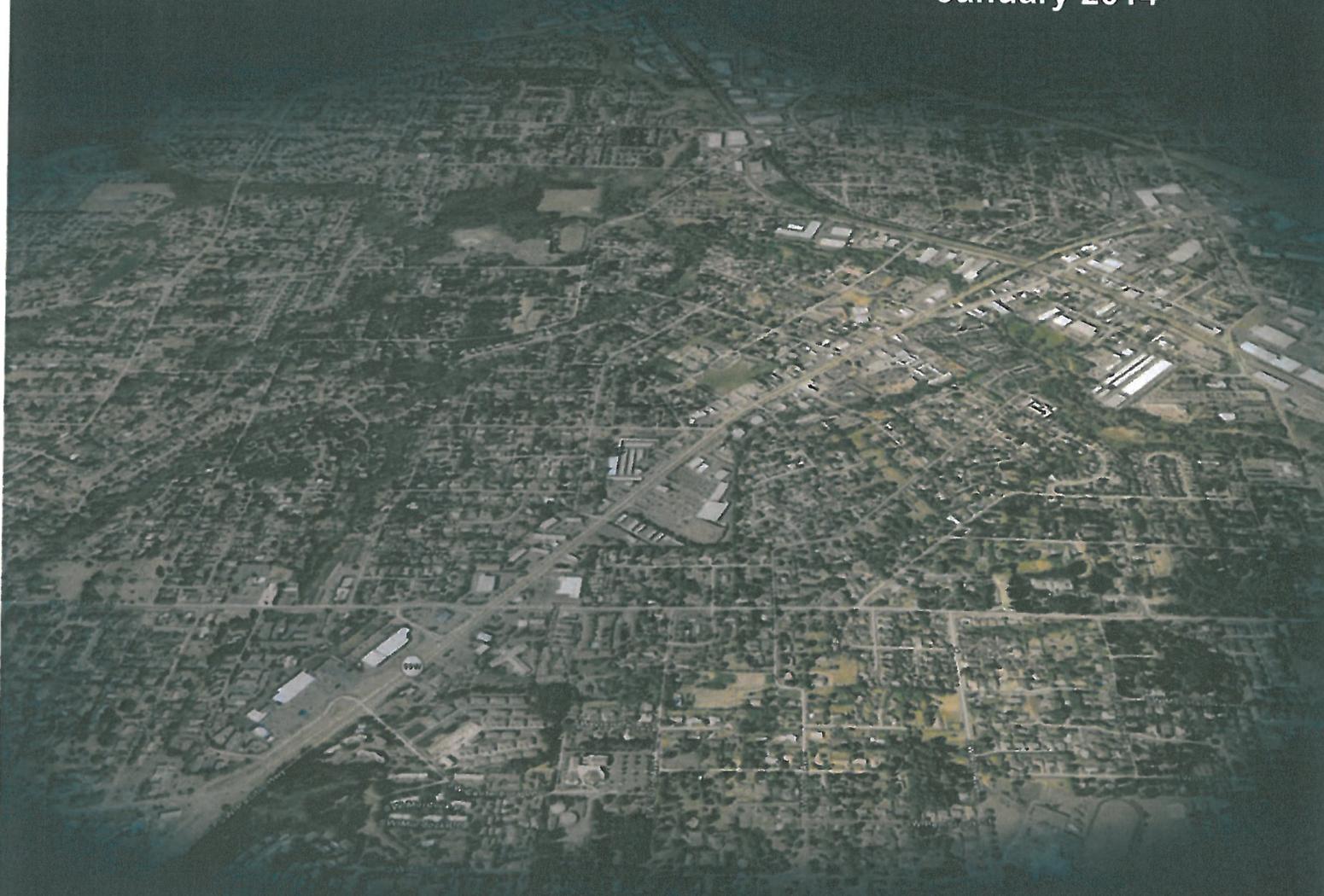
ATTEST:

  
\_\_\_\_\_  
City Recorder - City of Tigard



# Water System Master Plan Addendum

January 2014



## ACKNOWLEDGEMENTS

We would like to thank the many citizens, staff, and community groups who provided extensive input into the development of this Water Plan Addendum. Special thanks are due to the members of the River Terrace Technical Advisory Committee and Stakeholder Working Group.

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January 2014

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**MSA**



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## **SUMMARY OF RECOMMENDATIONS**

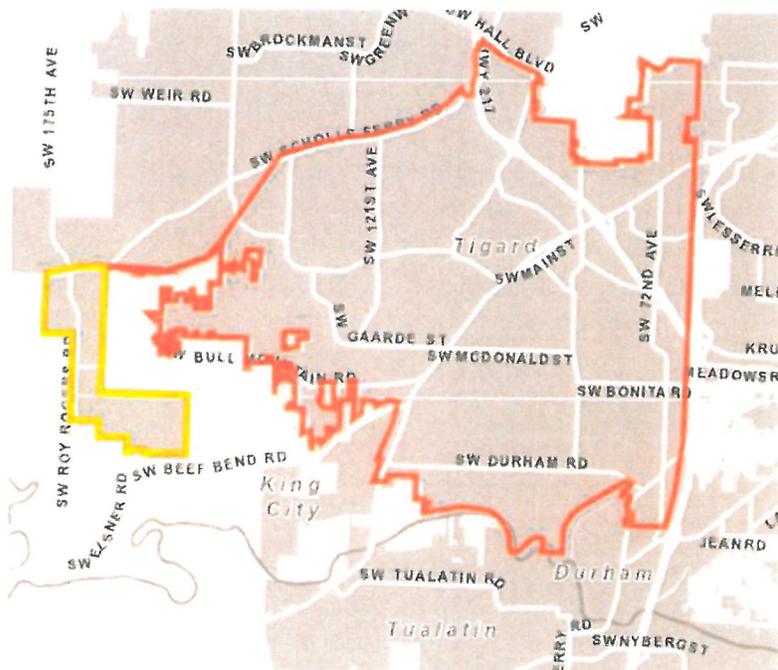
The focus of this Water System Master Plan Addendum is on providing water service to the River Terrace Community, which is a new area that the City of Tigard's 2010 Water System Master Plan addressed only for overall water supply capacity needs. The proposed changes do not affect the 2010 Water System Master Plan except for minor modification of the forecasted system-wide water demands.

The River Terrace Community is divided into the three pressure zones extending across the area, for the purposes of analysis, identified as the 410 Zone, 713 Zone and 550 Zone. Recommendations for the 410 Zone include construction of a transmission loop extending north to south across the River Terrace area, connecting to existing transmission piping at SW Barrows Road and at SW Beef Bend Road. Recommendations for the 550 Zone include new transmission, storage and pumping facilities. An analysis of water service recommendations and alternatives is provided in the following pages.

## I. INTRODUCTION

In 2010, the City of Tigard updated the community's Water System Master Plan, hereafter referred to as the Water Plan. The Water Plan is the document that guides water system infrastructure improvements in the city's water service area. It was presented to the Intergovernmental Water Board and the Tigard City Council in 2010.

Since the adoption of the Water Plan in 2010, the West Bull Mountain Concept Plan (WBMCP) was completed and adopted by Washington County and the city. The area now known as River Terrace (and formerly known as West Bull Mountain) was also annexed to the city. This addendum provides an update to the Water Plan specific to the River Terrace study area and contributes to the city's broader goal of completing a River Terrace Community Plan.



**Figure 1 River Terrace Study Area (Outlined in Yellow)**

The WBMCP Alternative Water Supplies analysis provides the basis for water system planning in River Terrace, which consists of transmission, pumping and storage improvements. This Water Plan Addendum refines the WBMCP by evaluating specific facility needs to provide service to the study area, identified in Figure 1, through improvements to the existing Tigard water system.

## II. BASIS OF PLANNING AND WATER DEMAND PROJECTIONS

This Water Plan Addendum follows the City of Tigard's 2010 Water System Master Plan and assumes 2.48 persons per dwelling unit. The City of Tigard projects 2,587 dwelling units within River Terrace for an estimated build-out population of 6,416 in 2035.

### *River Terrace Water Demands*

Projected water demands in million gallons per day (mgd) for the River Terrace Community are calculated for this addendum by multiplying projected River Terrace population at build-out by estimated per capita demands. Water facilities recommended to serve River Terrace are sized to meet ultimate capacity needs at build-out as discussed later in this addendum. Per capita water demands are as follows, consistent with the 2010 Water System Master Plan:

- Average Day Demand (ADD) = 110 gallons per capita per day (gpcd)
- Peak Day Demand (PDD) = 231 gpcd

The River Terrace water demand at build-out is allocated to the city's 410, 713 and 550 pressure zones according to the percentage of River Terrace land at elevations similar to those of existing Tigard water customers in these pressure zones. Proposed pressure zone boundaries within the River Terrace Community are illustrated on Figure 4. The distribution of River Terrace water demands by zone is as follows:

- 410 Zone = 50 percent
- 713 Zone = 10 percent
- 550 Zone = 40 percent

Forecasted River Terrace water demands at build-out are summarized in Table 1.

**Table 1**  
**River Terrace Projected Water Demand at Build-Out**

<b>Pressure Zone</b>	<b>ADD (mgd)</b>	<b>PDD (mgd)</b>
410	0.35	0.74
713	0.07	0.15
550	0.28	0.59
<b>TOTAL</b>	<b>0.70</b>	<b>1.48</b>

### III. SYSTEM ANALYSIS AND RIVER TERRACE WATER SYSTEM CAPACITY

In order to provide water service to the River Terrace Community, the city must evaluate necessary supply and storage capacity as well as transmission piping.

#### *Water Supply Capacity*

The city is currently developing a large, long-term supply source through the Lake Oswego-Tigard Water Partnership. The forecasted River Terrace build-out peak demand comprises an insignificant fraction of this supply source capacity. No additional supply facilities are anticipated to serve River Terrace.

#### *Storage Capacity*

The city's 2010 Water System Master Plan defined criteria for assessing adequate storage capacity in each of Tigard's pressure zones. Required storage capacity is divided into three major components – operational storage, fire flow storage and emergency storage – which are defined as follows:

- Operational Storage – 25 percent of PDD
- Fire Flow Storage – land use with highest fire flow requirement within the zone
  - Residential
    - Low Density = 1,500 gallons per minute (gpm) for 2 hours
    - Medium Density = 2,500 gpm for 2 hours
    - High Density = 3,000 gpm for 3 hours
  - Commercial and Industrial
    - 3,000 gpm for 3 hours
- Emergency Storage – 2 times ADD

Based on these criteria, adequate storage is available in the 410 and 713 pressure zones to serve the relatively small additional demands from River Terrace. Storage capacity assessment in the 550 Zone depends upon the selected River Terrace 550 water service alternative as discussed later in this memo.

#### **River Terrace Proposed Water System Facilities**

##### *410 Zone*

The Tigard 410 Zone serves a majority of existing Tigard customers. Large diameter transmission piping has been extended west with development of the Bull Mountain area in anticipation of the ultimate extension of the 410 Zone to serve the River Terrace area. It is recommended that existing 18-inch diameter piping on SW Roy Rogers Road at SW Scholls Ferry Road to the north and on SW Beef Bend Road near SW 150th Avenue to the south be extended as new 20-inch diameter pipe west into River Terrace. The existing 18-inch

diameter piping to the north was recently installed in SW Scholls Ferry Road to serve the River Terrace area.

Given the likelihood that the earliest development in the 410 Zone may not all occur near the north or south connections to existing 410 Zone transmission, provisions should be made for extending service into the 410 Zone areas in advance of major transmission piping in SW Roy Rogers Road. It is recommended that a new pressure reducing valve (PRV) station be constructed near the intersection of SW Bull Mountain Road and SW Roy Rogers Road to allow for interim service and for future supply redundancy to this area.

Conceptual level cost estimates for the recently installed 18-inch diameter transmission piping, the proposed 20-inch diameter transmission piping, and the proposed PRV station are presented later in this addendum. Cost estimates are based on an assumed transmission main alignment which generally follows SW Roy Rogers Road from existing transmission piping south to the proposed River Terrace rights-of-way shown on Figure 4. These proposed River Terrace rights-of-way will carry transmission piping west to SW 150th Avenue at SW Woodhue Street and south on SW 150th Avenue to existing transmission piping on SW Beef Bend Road.

### ***713 Zone***

A small area of the River Terrace Community northwest of SW 150th Avenue and SW Woodhue Street will be served by the Tigard 713 Zone as shown on Figure 4. It is recommended that this area be served by extending distribution mains from existing 8-inch and 12-inch diameter piping on SW 150th Avenue. No additional transmission piping or other facilities are anticipated to serve this area.

### ***550 Zone Service Alternatives***

The existing Tigard 550 pressure zone is divided into sub-zones 550A through 550H which form a partial ring at the base of Bull Mountain. Establishment of these sub-zones in the Tigard water system allowed customers at this elevation to be served as development occurred without constructing looped transmission piping all the way around Bull Mountain at this elevation. Large diameter transmission piping has been extended through each of these sub-zones to facilitate completion of a transmission loop around Bull Mountain with the development of the River Terrace Community. Due to incomplete transmission piping in some parts of the 550 sub-zones, completing this transmission loop may not be the most effective way to serve customers in River Terrace. Two facility alternatives were developed to provide service to the River Terrace portion of the 550 Zone. These alternatives are illustrated on Figures 5 and 6.

- **Alternative 1** – construct two missing 550 transmission connections near King City and complete transmission loop through River Terrace

- **Alternative 2** – construct 550 pump station and reservoir to deliver water from existing 410 Zone Menlor Reservoir and connect River Terrace transmission piping to existing 550 Zone transmission

For both Alternatives 1 and 2, approximately 8,000 lineal feet (LF) of 16-inch diameter mains would provide north-south transmission through the River Terrace 550 Zone. The alignment of this transmission piping would follow proposed rights-of-way through River Terrace with connections to existing 550 Zone piping at three locations: SW Venezia Terrace, SW Bull Mountain Road and SW 161st Avenue. This proposed 550 transmission piping is illustrated on Figure 6.

Alternative 1 would require additional transmission piping within River Terrace and between existing sub-zones 550A, 550G and 550H. Within River Terrace, transmission piping described in the previous paragraph would be extended approximately 4,000 LF south and west from SW 161st Avenue to connect to existing 12-inch piping at SW 150th Avenue and SW Woodhue Street. In order to complete 550 Zone transmission around the west side of Bull Mountain, sub-zone 550A must be connected with 550H east of SW Colyer Way and sub-zone 550H must be connected with 550G east of SW Peachtree Drive near King City. Both of these connections require potentially complex crossings of Clean Water Services (CWS) designated stream corridors outside of existing public right-of-way. In addition to construction feasibility issues, significant land acquisition would likely be required to facilitate construction of stream crossings.

Alternative 2 uses proposed River Terrace 550 Zone transmission piping to connect existing sub-zones 550A, 550B and 550C. The expanded West Bull Mountain 550 Zone would be supplied by a proposed reservoir on the city-owned Cach properties. A new pump station adjacent to the city's 410 Zone Menlor Reservoir would supply the proposed Cach Reservoir. Until the proposed pump station is completed, the reservoir could be filled by an existing temporary pump station at the Menlor site which was constructed for the city's Pump Station 10 expansion project. Alternative 2 would also require installation of transmission piping from the proposed Cach Reservoir site to connect to existing 550B piping on SW 158th Terrace at SW Baker Lane. Proposed transmission piping from 550B to the proposed reservoir site would require crossing a CWS designated stream corridor in the city-owned Cach Park Natural Area. Unlike Alternative 1, no property acquisition is anticipated to facilitate construction of this stream crossing.

*Recommendation: Alternative 2*

It is recommended that the River Terrace Community 550 Zone be served from a new reservoir and pump station as described in Alternative 2. Alternative 2 would provide adequate fire and emergency storage within the 550 Zone rather than relying on pressure reducing valves to provide supply from the 713 Zone reservoirs which have inadequate existing capacity to serve forecasted 550 Zone demands as presented in the 2010 Water Plan.

### *Proposed 550 Zone Cach Reservoir Storage Capacity*

The proposed Cach Reservoir, required for recommended 550 Zone service Alternative 2, must be sized to provide adequate storage capacity for sub-zones 550A, 550B, 550C and the River Terrace 550 Zone area. Projected demands for sub-zones 550A through C in 2030 are taken from the 2010 Tigard Water System Master Plan. River Terrace 550 build-out demands are presented in Table 1 of this addendum.

Storage capacity criteria are consistent with the 2010 Water Plan as described earlier in this addendum. Required fire flow capacity is 3,000 gpm for 3 hours based on the proposed school in the River Terrace 550 Zone. It is recommended that the Cach Reservoir have an approximate capacity of 3.0 million gallons (MG) as summarized in Table 2.

**Table 2  
Proposed 550 Zone Cach Reservoir Capacity**

West Bull Mt 550 Zone	ADD (mgd)	PDD (mgd)	Required Storage (MG)			
			Operational	Fire	Emergency	TOTAL
550A	0.09	0.19	0.05		0.18	
550B	0.34	0.71	0.18		0.68	
550C	0.24	0.50	0.13		0.48	
River Terrace	0.28	0.59	0.15		0.56	
<b>TOTAL</b>	<b>0.95</b>	<b>1.99</b>	<b>0.51</b>	<b>0.54</b>	<b>1.9</b>	<b>2.95</b>

**Notes:**

1. Sub-zone 550A and 550C demands are taken from the 2010 Water System Master Plan demand tables for the year 2030.
2. Sub-zone 550B 2030 demands have been re-calculated for this Addendum to exclude land which is now part of the River Terrace Community.
3. Operational storage is estimated as 25 percent of PDD.
4. Fire storage is based on a required fire flow of 3,000 gpm for 3 hours due to the proposed school in the River Terrace 550 Zone.
5. Emergency storage is estimated as 2 times ADD.

### *Proposed 550 Zone Pump Station Capacity*

The proposed 550 Zone pump station at the Menlor Reservoir site should have adequate firm capacity to supply PDD for the proposed West Bull Mountain 550 Zone. Firm capacity is defined as the total pump station capacity with the largest pump out of service. This criterion for pump station sizing is consistent with the city's 2010 Water System Master Plan. As shown in Table 2, total PDD for the West Bull Mountain 550 Zone, a combination of 550A, B, C and River Terrace sub-zones, is 1.99 mgd or 1,382 gpm. It is recommended that the proposed 550 pump station on the Menlor site have an approximate firm capacity of 1,400 gpm.

The existing temporary pump station at the Menlor Reservoir site has a single pump with a 1,500 gpm design capacity. The temporary pump station is equipped with a variable frequency drive (VFD). Although this pump station is capable of supplying adequate flow to

the proposed Cach Reservoir it lacks the redundancy provided by multiple pumps, thus a permanent pump station is required to replace the existing station.

### *Future Service to Urban Reserve Areas*

Water service to the Urban Reserve Area (URA), URA6C (North), URA 6C (Middle) and URA 6C (South) assumes that the recommended 410-foot pressure transmission piping for the River Terrace area is constructed. All three URA areas are at an elevation that can be served directly from the 410-foot pressure zone. Existing storage facilities and proposed transmission piping for the River Terrace area are adequate to extend the water distribution piping grid to these areas for water service. It is anticipated that looped 8-inch to 12-inch diameter piping will be adequate for residential development in these areas. Larger transmission piping may be required if high density residential, commercial or industrial development is planned in these areas.

## **IV. CAPITAL IMPROVEMENT PLAN**

### **Summary of Recommendations and Conceptual Level Costs**

It is recommended that water service be provided to the River Terrace Community by extending transmission and distribution mains from the City of Tigard's existing 410, 713 and 550 pressure zones. The 713 Zone includes only a small area of the River Terrace area that can be effectively served by extending existing distribution mains with no additional transmission required. Proposed piping would be placed in public rights-of-way to be dedicated as part of the River Terrace development. Proposed public rights-of-way are illustrated on Figure 4.

Adequate storage is available in the 410 and 713 Zones to serve proposed customers in River Terrace. It is recommended that a 3.0 MG storage reservoir be constructed to serve the River Terrace 550 Zone as part of a larger West Bull Mountain 550 Zone which would include the existing 550A, 550B and 550C sub-zones. This proposed 550 Zone reservoir would be constructed on the city-owned Cach properties. The reservoir would be filled through a new pump station with a firm capacity of 1,400 gpm located at the 410 Zone's Menlor Reservoir site. Until the proposed pump station is completed, the proposed Cach Reservoir may be filled from an existing temporary pump station on the Menlor site with a design capacity of 1,500 gpm. Service from the proposed Cach Reservoir would also require installation of transmission piping from the reservoir site to existing 550B piping on SW 158th Terrace at SW Baker Lane.

Conceptual level costs for proposed water facilities to serve the River Terrace Community are presented in Table 3. Cost estimates represent opinions of cost only, acknowledging that final costs of individual projects will vary depending on actual labor and material costs, market conditions for construction, regulatory factors, final project scope, project schedule and other factors. The American Association of Cost Engineers (AACE) classifies cost estimates depending on project definition, end usage and other factors. The cost estimates presented here are considered Class 4 with an end use being a study or feasibility evaluation

and an expected accuracy range of -30 percent to +50 percent. This range represents the potential variability of project costs and should not be applied directly to the estimates presented in Table 3. Estimated costs include approximate construction costs and an allowance for administrative, engineering and other project related costs. Unit costs for transmission piping are based on unit costs presented in the 2010 Tigard Water System Master Plan.

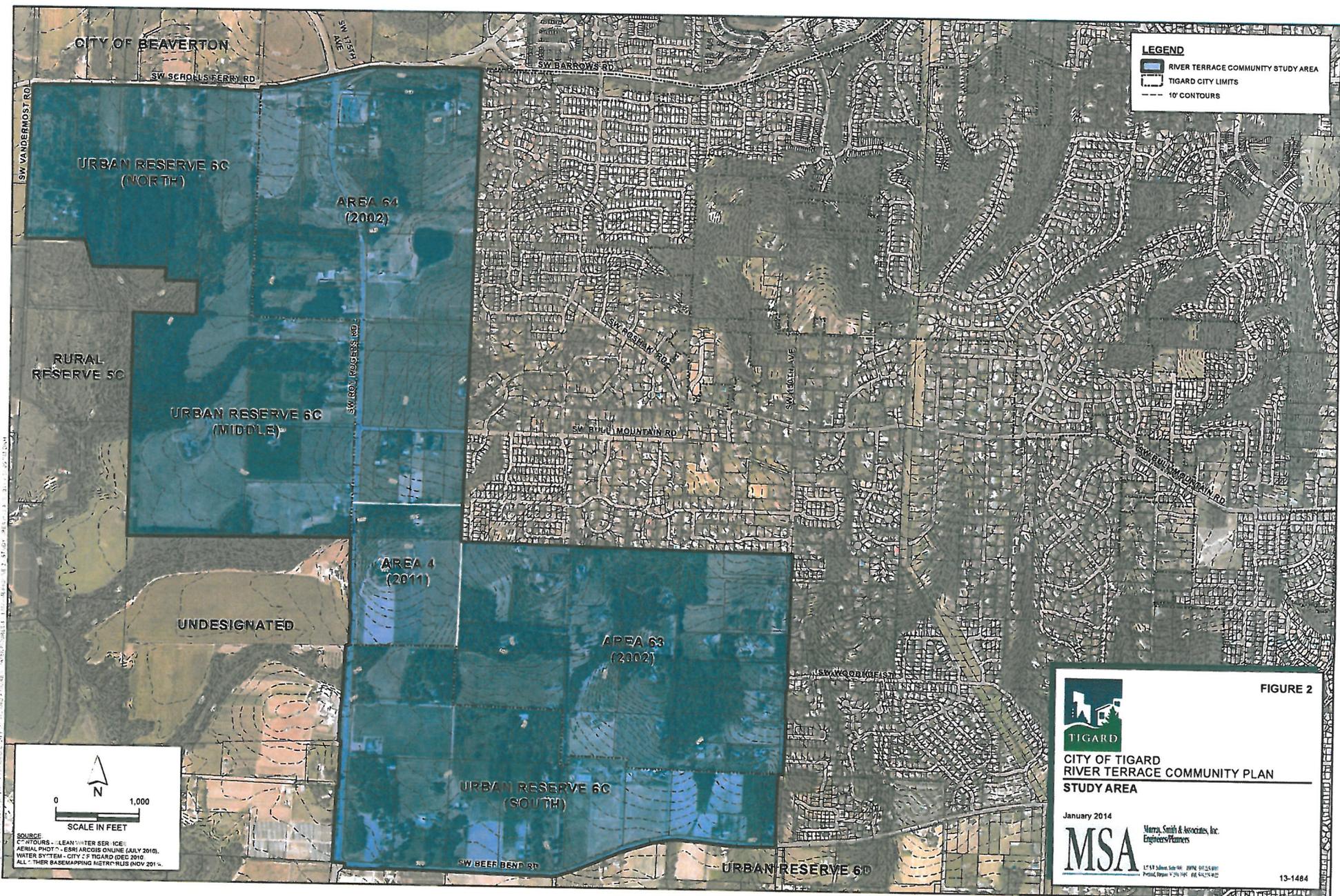
Since construction costs change periodically, an indexing method to adjust present estimates in the future is useful. The Engineering News-Record (ENR) Construction Cost Index (CCI) is a commonly used index for this purpose. For purposes of future cost estimate updating, the current ENR CCI for Seattle, Washington is 10135 (November 2013).

**Table 3**  
**River Terrace Proposed Water Facilities Conceptual Cost Estimates**

Proposed Facility	Qty	Unit	Unit Cost	Total Conceptual Cost
<b>410 Zone:</b>				
18-inch Transmission Main	2,500	LF	-	\$1,398,500 <sup>(1)</sup>
20-inch Transmission Mains	15,200	LF	\$400	\$6,080,000
550 Zone to 410 Zone PRV	1	LS	\$200,000	\$200,000
<b>713 Zone:</b>				
None	-	-	-	-
<b>550 Zone (Alternative 2):</b>				
16-inch Transmission Mains through River Terrace	8,000	LF	\$350	\$2,800,000
3.0 MG Cach Reservoir	1	LS	\$5,400,000	\$5,400,000
16-inch Transmission from Reservoir to 550B	1,700	LF	\$350	\$595,000
1,400 gpm (firm capacity) Pump Station	1	LS	\$1,100,000	\$1,100,000

Note:

1. This cost is the City of Tigard's budgeted amount for the installation of this pipe.



**LEGEND**

- RIVER TERRACE COMMUNITY STUDY AREA
- TIGARD CITY LIMITS
- 10' CONTOURS

0 1,000  
SCALE IN FEET

N

SOURCE:  
 10' CONTOURS - LEAN WATER SERVICE  
 AERIAL PHOTO - ESRI ARCOIS ONLINE (JULY 2010)  
 WATER SYSTEM - CITY OF TIGARD (DEC 2010)  
 ALL OTHER BASEMAPPING METRICS (NOV 2011)

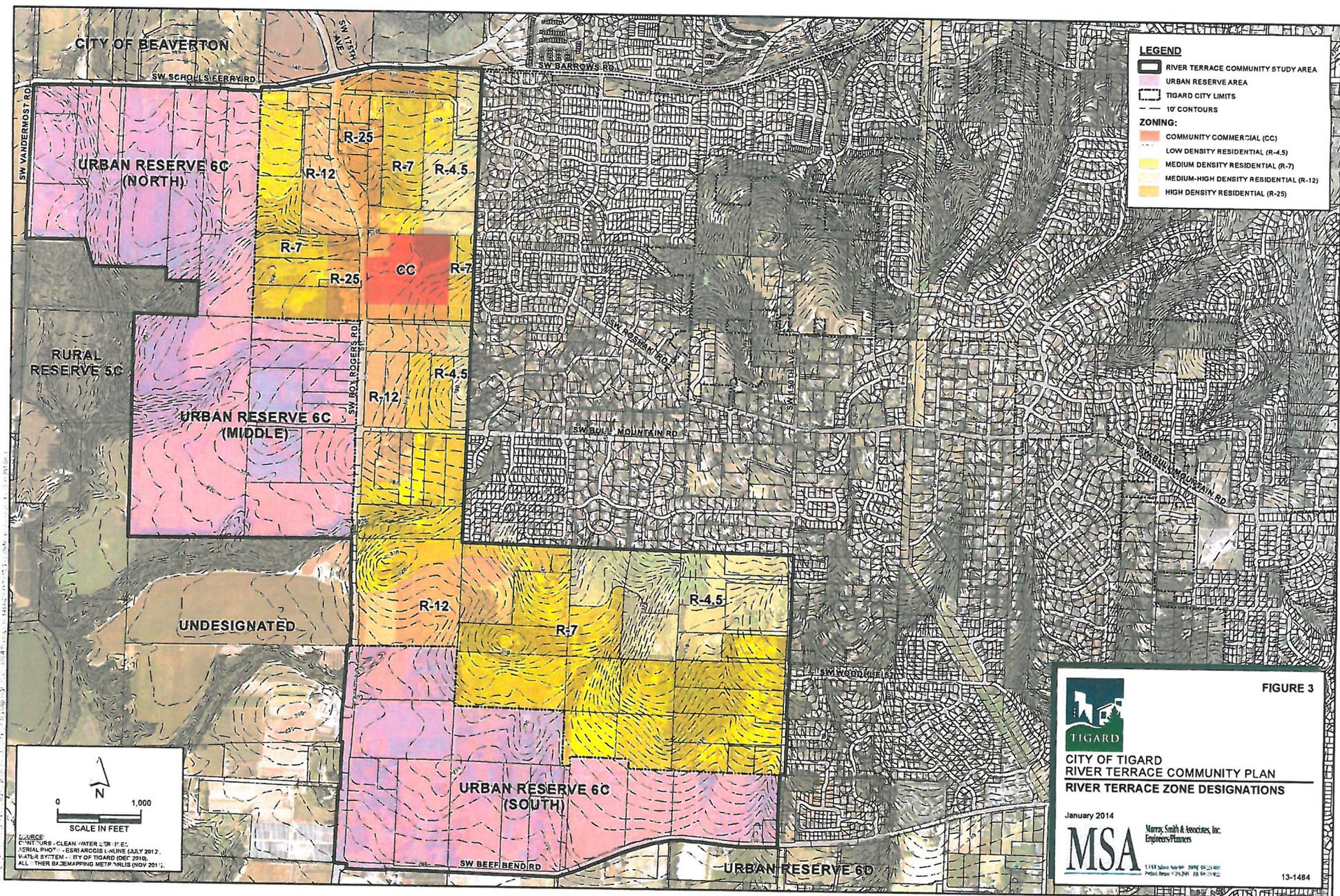
**FIGURE 2**

  
**CITY OF TIGARD**  
**RIVER TERRACE COMMUNITY PLAN**  
**STUDY AREA**

January 2014

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 Engineers/Planners

13-1484



**LEGEND**

- RIVER TERRACE COMMUNITY STUDY AREA
- URBAN RESERVE AREA
- TIGARD CITY LIMITS
- 10' CONTOURS

**ZONING:**

- COMMUNITY COMMERCIAL (CC)
- LOW DENSITY RESIDENTIAL (R-4.5)
- MEDIUM DENSITY RESIDENTIAL (R-7)
- MEDIUM-HIGH DENSITY RESIDENTIAL (R-12)
- HIGH DENSITY RESIDENTIAL (R-25)

**FIGURE 3**



**CITY OF TIGARD  
RIVER TERRACE COMMUNITY PLAN  
RIVER TERRACE ZONE DESIGNATIONS**

January 2014

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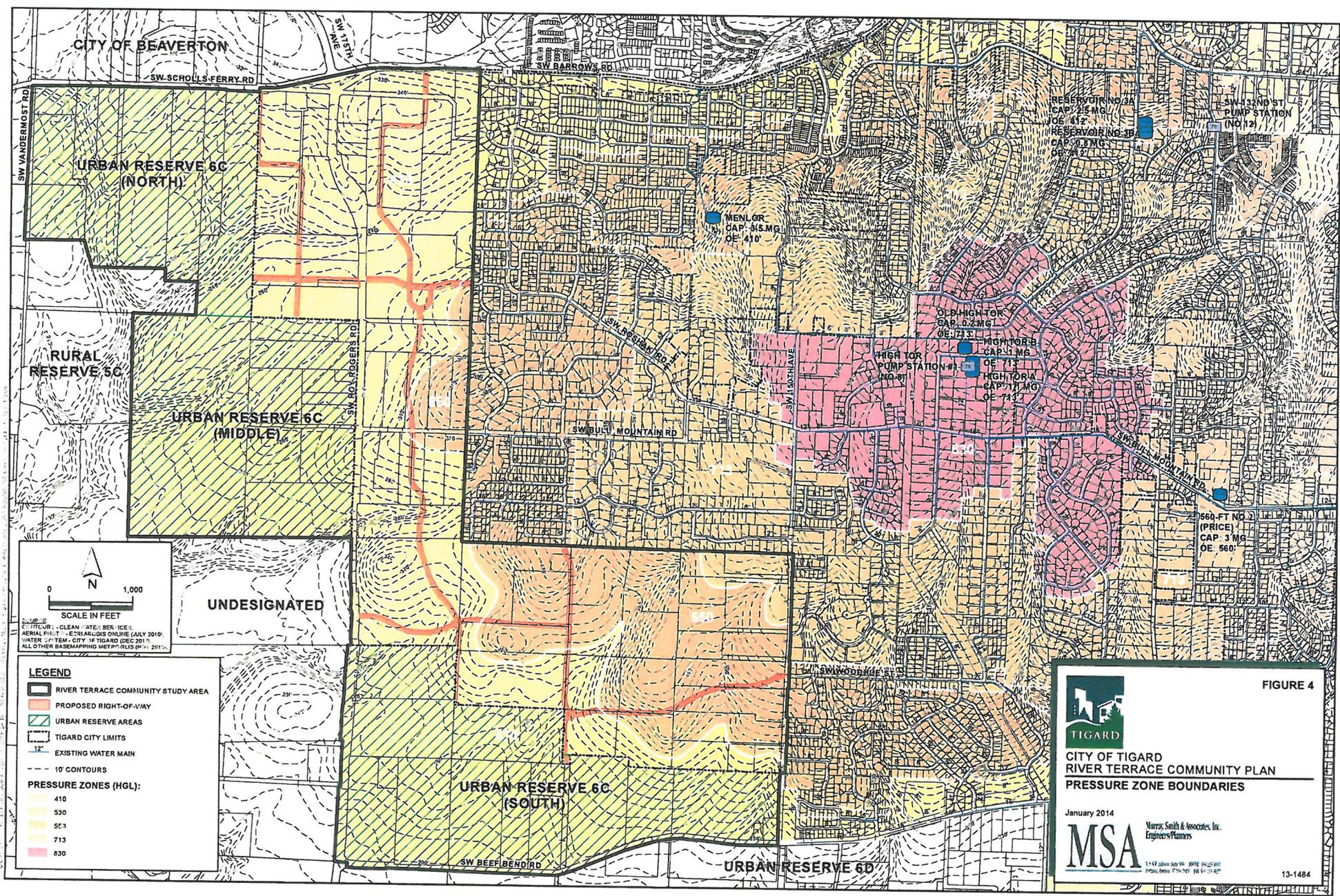


FIGURE 4


  
**CITY OF TIGARD**  
 RIVER TERRACE COMMUNITY PLAN  
 PRESSURE ZONE BOUNDARIES

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 Engineers & Planners

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FIGURE 5



CITY OF TIGARD  
RIVER TERRACE COMMUNITY PLAN

RIVER TERRACE 550-ZONE  
SERVICE ALTERNATIVE 1

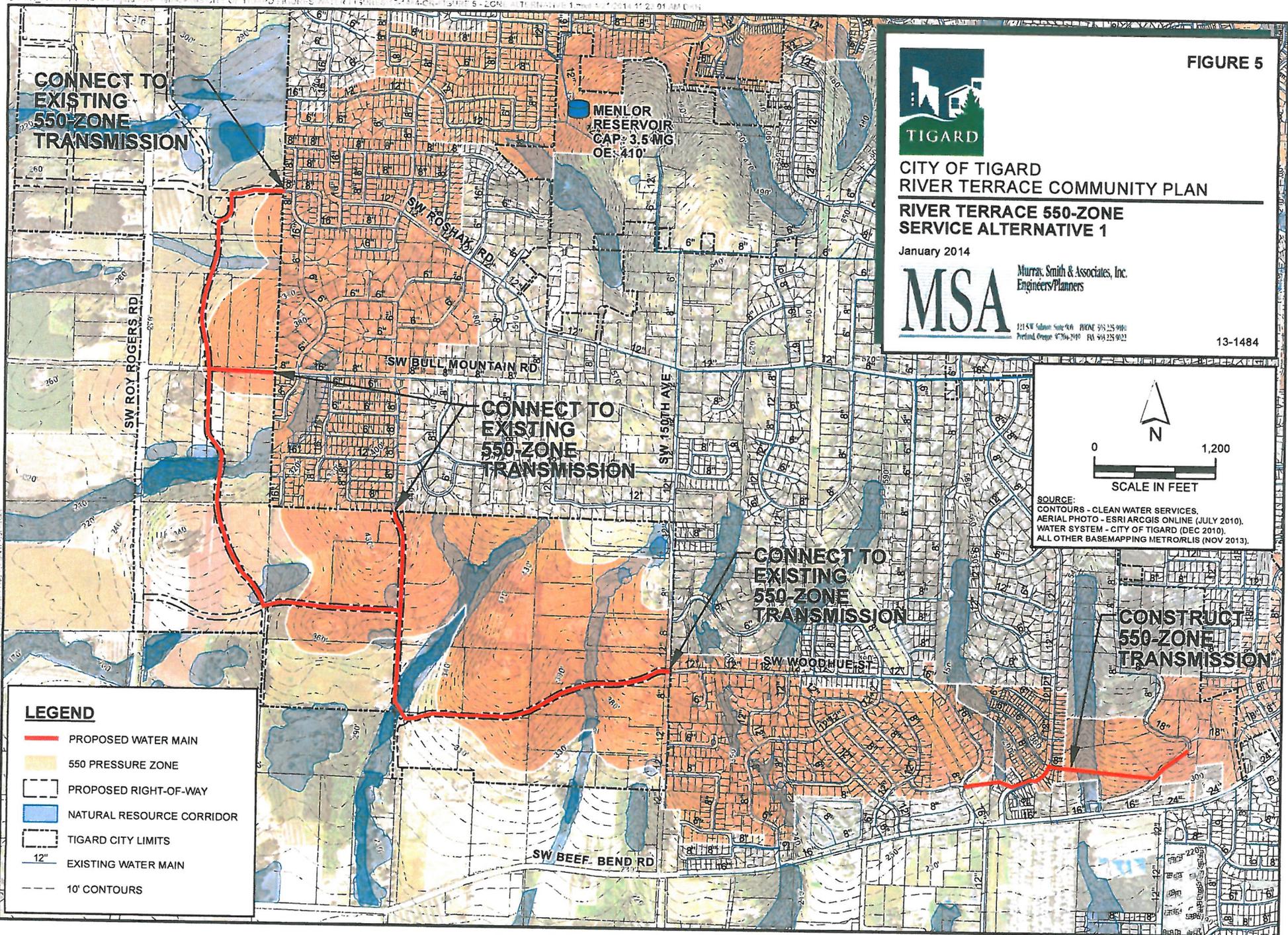
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13-1484



CONNECT TO  
EXISTING  
550-ZONE  
TRANSMISSION

MENLOR  
RESERVOIR  
CAP: 3.5 MG  
OE: 410'

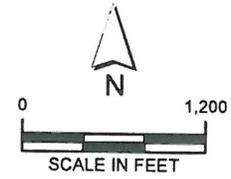
CONNECT TO  
EXISTING  
550-ZONE  
TRANSMISSION

CONNECT TO  
EXISTING  
550-ZONE  
TRANSMISSION

CONSTRUCT  
550-ZONE  
TRANSMISSION

**LEGEND**

-  PROPOSED WATER MAIN
-  550 PRESSURE ZONE
-  PROPOSED RIGHT-OF-WAY
-  NATURAL RESOURCE CORRIDOR
-  TIGARD CITY LIMITS
-  12" EXISTING WATER MAIN
-  10' CONTOURS



SOURCE:  
CONTOURS - CLEAN WATER SERVICES,  
AERIAL PHOTO - ESRI/ARCGIS ONLINE (JULY 2010),  
WATER SYSTEM - CITY OF TIGARD (DEC 2010),  
ALL OTHER BASEMAPPING METROLIS (NOV 2013).

FIGURE 6



CITY OF TIGARD  
RIVER TERRACE COMMUNITY PLAN  
RIVER TERRACE 550-ZONE  
SERVICE ALTERNATIVE 2

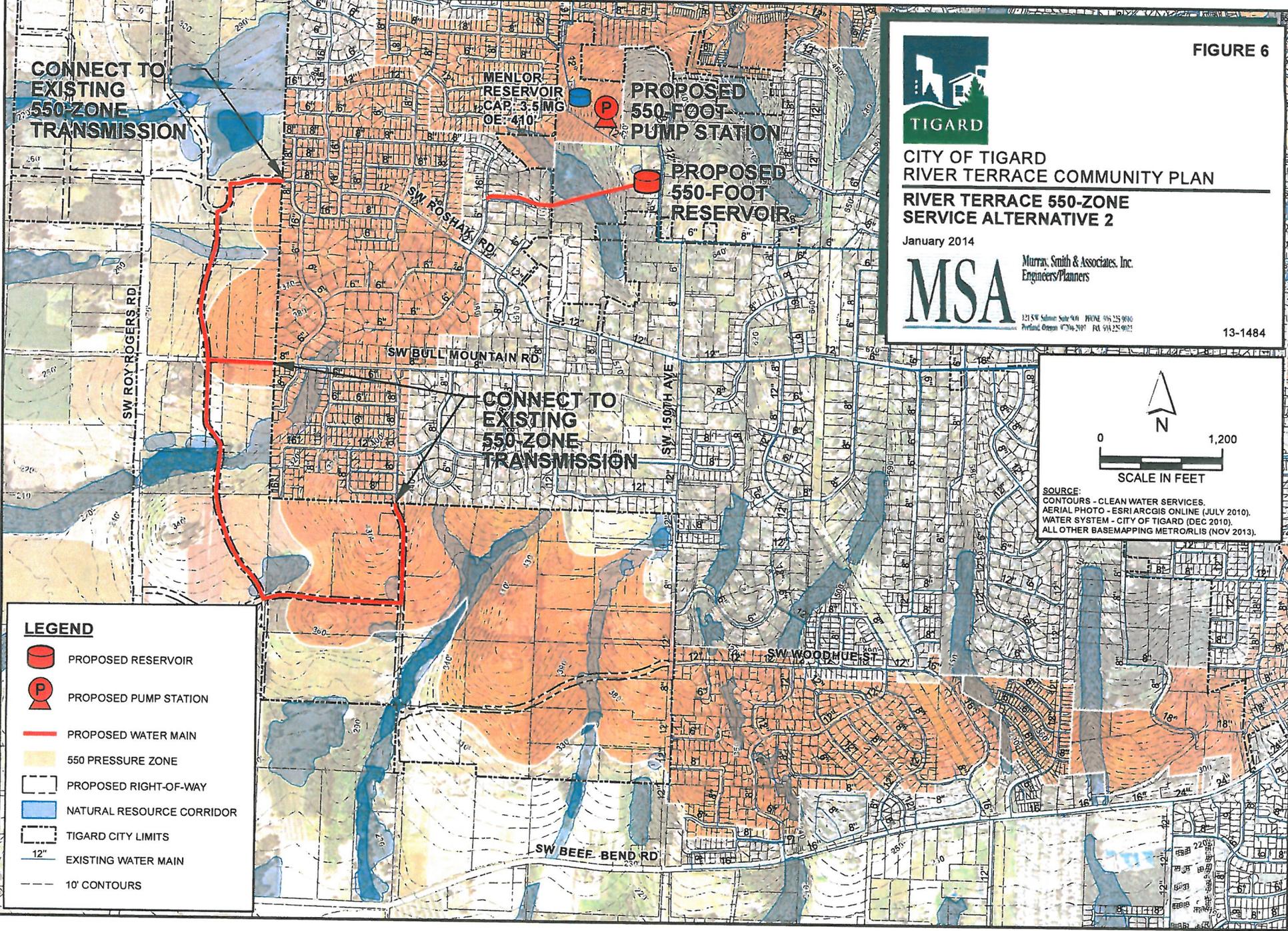
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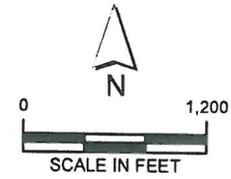
321 SW Salmon Suite 900 PHONE 503.255.9000  
Portland, Oregon 97204-2019 FAX 503.255.9023

13-1484



**LEGEND**

-  PROPOSED RESERVOIR
-  PROPOSED PUMP STATION
-  PROPOSED WATER MAIN
-  550 PRESSURE ZONE
-  PROPOSED RIGHT-OF-WAY
-  NATURAL RESOURCE CORRIDOR
-  TIGARD CITY LIMITS
-  12" EXISTING WATER MAIN
-  10' CONTOURS



SOURCE:  
CONTOURS - CLEAN WATER SERVICES.  
AERIAL PHOTO - ESRI/ARCGIS ONLINE (JULY 2010).  
WATER SYSTEM - CITY OF TIGARD (DEC 2010).  
ALL OTHER BASEMAPPING METROLIS (NOV 2013).

FIGURE 7



CITY OF TIGARD  
RIVER TERRACE COMMUNITY PLAN  
RIVER TERRACE PROPOSED  
WATER SYSTEM IMPROVEMENTS

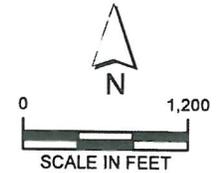
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Portland, Oregon 97204-2199 Fax 503.225.9023

13-1484



SOURCE:  
CONTOURS - CLEAN WATER SERVICES.  
AERIAL PHOTO - ESRI/ARCGIS ONLINE (JULY 2010).  
WATER SYSTEM - CITY OF TIGARD (DEC 2010).  
ALL OTHER BASEMAPPING METRO/RLIS (NOV 2013).

CONNECT TO  
EXISTING  
410-ZONE  
TRANSMISSION

PROPOSED  
550-FOOT  
PUMP STATION

MENLOR  
RESERVOIR  
CAP: 3.5 MG  
OE: 410'

PROPOSED  
550-FOOT  
RESERVOIR

550-ZONE TO  
410-ZONE PRV

CONNECT TO  
EXISTING  
550-ZONE  
TRANSMISSION

CONNECT TO  
EXISTING  
410-ZONE  
TRANSMISSION

**LEGEND**

- PROPOSED RESERVOIR
- PROPOSED PUMP STATION
- PROPOSED WATER MAINS
- 410 PRESSURE ZONE
- 550 PRESSURE ZONE
- PROPOSED RIGHT-OF-WAY
- NATURAL RESOURCE CORRIDOR
- TIGARD CITY LIMITS
- 12" EXISTING WATER MAINS
- 10' CONTOURS

