

APPENDIX C

FUTURE PRESSURE ZONE BOUNDARY CHANGES

Proposed Zone 2H – Loop Existing Zones 2HK and 2HT

Description

Connect distribution piping in existing constant pressure pumped Zones 2HK and 2HT to create a single Zone 2H. The proposed Zone 2H would be served by constant pressure pumping from the existing Hilltop Pump Station at an approximate hydraulic grade line (HGL) of 1,225 ft with service elevations between 990 and 1,140 ft.

The existing 2HK and 2HT zones are served independently from the Harbeck and Hilltop Pump Stations respectively. With the combined Zone 2H, the existing undersized Harbeck Pump Station could be abandoned. The existing Zone 1, 8-inch diameter main on Grandview Avenue and existing Zone 1 customers in the Harbeck Heights area would also be connected to the proposed Zone 2H to raise service pressures and improve looping.

It is anticipated that this zone boundary change would be largely development driven as the proposed loop piping alignment is through currently undeveloped or partially developed properties. For planning purposes, capital improvements required to complete this zone boundary change are assumed to occur at the 20-year planning window.

Benefits:

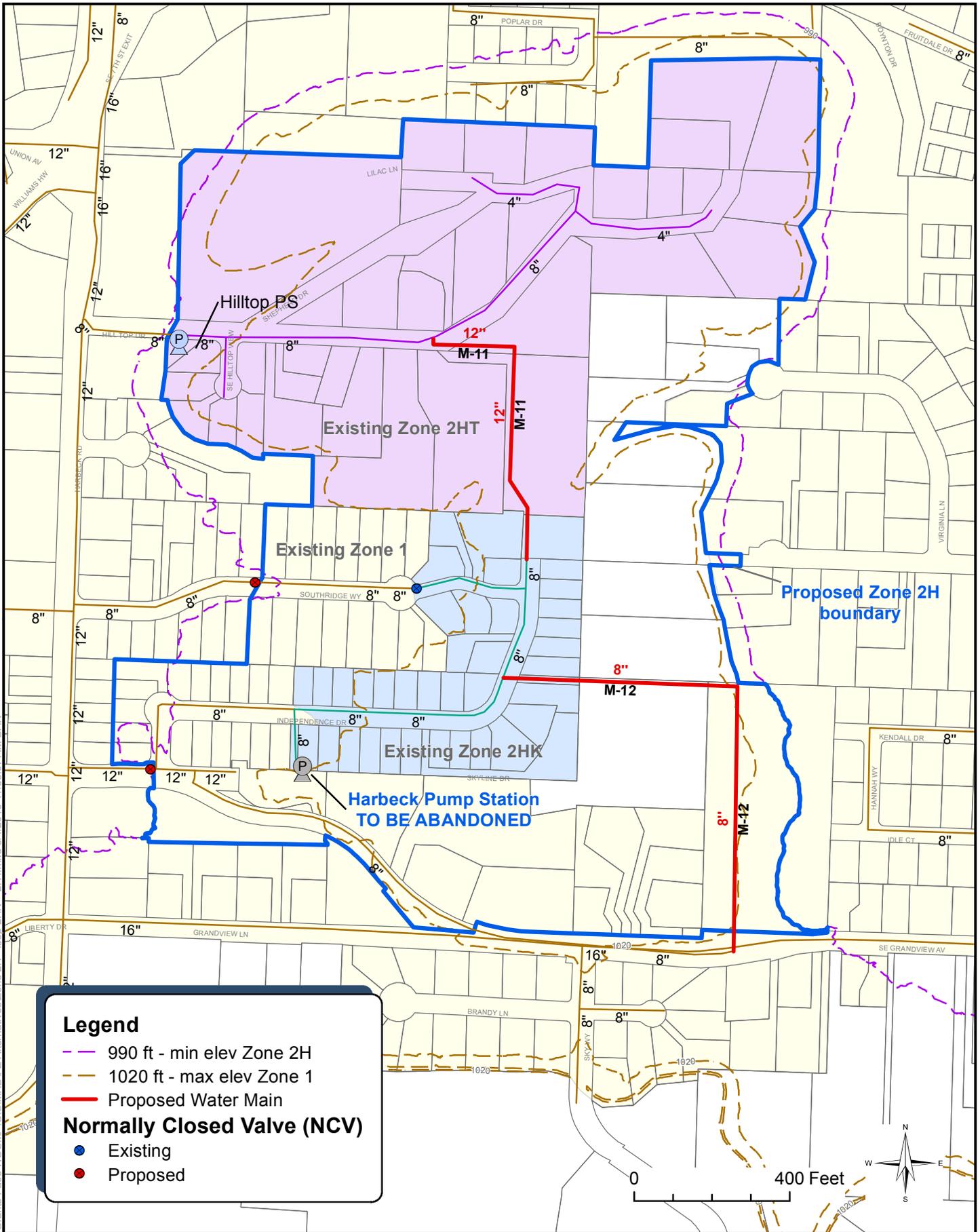
- Improved looping in both existing Zones 2HK & 2HT
- Higher service pressure to existing Zone 1 Harbeck Heights customers
- Abandoned undersized Harbeck Pump Station

Considerations:

- Serving currently undeveloped Grandview Boulevard high density zoned properties from Zone 2H requires higher fire flow availability from Hilltop PS (2,000 gpm vs 1,500 gpm existing).
- **Existing 8-inch mains in the proposed Zone 2H cannot supply 2,000 gpm fire flow while maintaining system pressure and keeping velocity under 10 fps.**
 - It is recommended that City staff plan facilities (as shown) to provide a 1,500 gpm fire flow to proposed Zone 2H and coordinate with the fire marshal to ensure adequate fire coverage.
- Proposed pipe looping would require easements on private property or coordination with future development of large parcels

**Table C-1
Zone 2H Required CIP Projects**

Project ID	Project Description	Estimated Cost
M-11	Loop Zone 2HK & 2HT - Construct 12-inch diameter main from existing 8-inch dead end at SE Independence Drive & Southridge Way northwest to existing 8-inch main on SE Hilltop Drive	\$ 222,000
M-12	Loop proposed Zone 2H & Zone 1 - Construct 8-inch diameter main from existing 8-inch dead end at SE Grandview Avenue north and west to existing 8-inch main on SE Independence Drive	\$ 310,000
	Abandon and demolish Harbeck Pump Station	\$ 10,000
	TOTAL	\$ 542,000



Legend

- 990 ft - min elev Zone 2H
- 1020 ft - max elev Zone 1
- Proposed Water Main

Normally Closed Valve (NCV)

- Existing
- Proposed



Water Distribution System Master Plan

**Figure C-1
Proposed Zone 2H
loop existing zones
2HK & 2HT**



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Zone 2 East Expansion – Foothill Boulevard and Spalding Industrial Area

Description:

Expand the Zone 2 service boundary to serve existing Zone 1 customers along NE Foothill Boulevard and potential Spalding Industrial Area development south of the intersection of Hwy 199 and I-5. The proposed expansion would be served by:

1. New 12-inch diameter Zone 2 main on NE A Street from NE Oregon Avenue east to connect to existing Zone 1 mains on NE Foothill Boulevard southeast of NE Royal Drive (CIP No. M-22).
 - a. New NE A Street main to be constructed parallel to existing 8-inch diameter Zone 1 main which will remain in service.
 - b. Some existing higher-elevation services along this section of NE A Street may be moved to the new Zone 2 main to improve service pressures.
2. Converting existing 8-inch diameter Zone 1 mains on NE Foothill Boulevard to Zone 2 mains by closing existing isolation valves at:
 - a. NE Foothill Boulevard at NE A Street
 - b. NE D Street at NE Terry Lane
 - c. NE Foothill Boulevard/Agness Avenue north of NE Fairview Avenue
3. New 12-inch diameter Zone 2 piping from NE Foothill Boulevard at NE Fairview Avenue southeast across Hwy 199, including:
 - a. Adjacent to Holiday Inn property on the north side of Hwy 199, easement acquisition required (CIP No. M-13).
 - b. Trenchless (auger-bored) crossing under Hwy 199 from Holiday Inn property to Foothill Boulevard at the Masonic Cemetery (CIP No. M-14).
4. Construction of a new Zone 2 storage reservoir east of Ament Road (CIP No. R-19)
5. New large diameter looped piping along Ament Road and Foothill Boulevard south of Hwy 199, extent of piping depends on development (CIP Nos. M-15 to M-21)

Future Zone 1 looping at the lower-elevation, south end of the future Spalding Industrial Area would be achieved through a proposed PRV on Ament Road and large diameter looped Zone 1 piping (shown in green on attached map).

It is anticipated that this Zone 2 boundary east expansion and related facilities would be largely development driven as service to the future Spalding Industrial Area is the primary reason for the zone change. For planning purposes, capital improvements required to complete this zone boundary change are assumed to occur at the 20-year planning window.

Benefits:

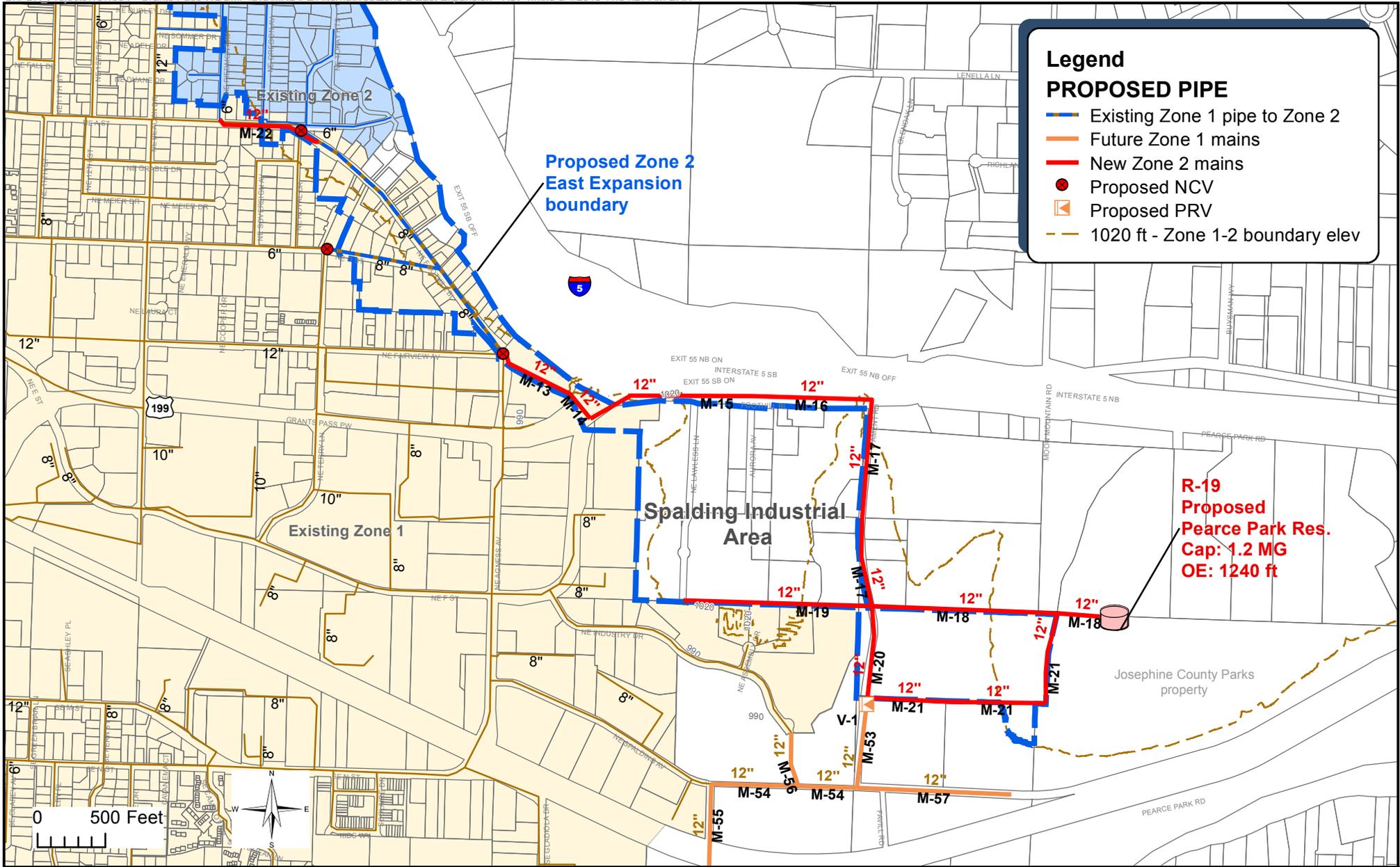
- Provide water service to potential Spalding Industrial Area development at I-5 and Hwy 199
- Raise service pressures to existing customers along Foothill Boulevard north of Hwy 199

Considerations:

- The future industrial area cannot be provided adequate service pressure from the existing adjacent Zone 1 distribution mains.
- Hydraulic modeling of the proposed Zone 2 expansion indicates that **the future Spalding Industrial Area cannot be provided adequate fire flow or residual pressure without the proposed storage reservoir**. Upsizing existing distribution mains along NE Foothill Boulevard and extending them to serve this area will not provide adequate pressure under fire flow conditions.
- In order to provide adequate fire storage for a 4,000 gallon per minute (gpm) industrial fire flow, the proposed Zone 2 storage reservoir must have a minimum capacity of 1.0 million gallons (MG). City staff may wish to consider evaluating this reservoir as a replacement for Reservoir No. 4 which has some condition issues per the 2013 DN Tanks report.
- Properties within the future Spalding Industrial Area and existing customers on the north side of Foothill Boulevard generally fall in between the ideal service elevations for Zones 1 and 2. **Zone 1 service pressures are lower and Zone 2 service pressures are higher than ideal for these customers**. While it may be beneficial for system looping and water quality to expand the existing Zone 2 boundary rather than creating a new pressure zone to serve this area, serving these customers at a Zone 2 hydraulic grade line (HGL) of 1240 feet will result in service pressures over the *Oregon Plumbing Specialty Code* limit of 80 pounds per square inch (psi). Thus, this proposed Zone 2 expansion may require additional cost to install individual PRVs for customers with pressures over 80 psi.
- Conversion of existing Zone 1 mains along NE Foothill Boulevard to Zone 2 pressures may require additional cost to evaluate existing fire booster pumps at the Holiday Inn property.
- Proposed pipe looping, particularly CIP No. M-13 adjacent to the existing Holiday Inn property, would require easements on private property or coordination with future development of large parcels.
- Construction of the proposed Zone 2 reservoir would require property acquisition, the proposed site is currently owned by Josephine County Parks.

**Table C-2
Zone 2 East Expansion Required CIP Projects**

Project ID	Project Description	Estimated Cost
M-13 & M-14	Construct new Zone 2 12-inch main from Foothill Blvd southeast across Hwy 199 to Foothill Blvd adjacent to Masonic Cemetery. Assumes auger bored crossing under Hwy 199.	\$ 395,000
M-15 to M-20	Construct new 12-inch mains to loop Foothill Blvd, Ament Rd and proposed Reservoir R-19 to serve future industrial development	\$ 2,102,000
M-21	Construct new 12-inch mains to loop south end of Zone 2 in future Spalding Industrial area and provide PRV connection to future Zone 1 piping	\$ 555,000
M-22	Construct new 12-inch main along NE A St to extend Zone 2 piping from NE Oregon Ave to NE Foothill Blvd southeast of NE Royal Dr	\$ 111,000
R-19	Construct approximately 1.2 MG finished water storage reservoir near Pearce Park. Assumes prestressed concrete tank, property or easement acquisition not included in estimate.	\$ 3,600,000
TOTAL		\$ 6,763,000



Legend

PROPOSED PIPE

- Existing Zone 1 pipe to Zone 2
- Future Zone 1 mains
- New Zone 2 mains
- Proposed NCV
- ◻ Proposed PRV
- - - 1020 ft - Zone 1-2 boundary elev



Water Distribution System Master Plan

**Figure C-2
Proposed Zone 2
East Expansion**



Zone 3 and 4 Future Looping north of the Interstate 5 freeway (I-5)

Adjust and expand existing Zone 3 and 4 boundaries and provide facilities to serve future growth within the Urban Growth Boundary (UGB) on the north side of I-5.

Overview:

The UGB expansion approved by the City in 2015 includes a large area with “Employment” zoning centered at the intersection of Granite Hill Road and NW Scenic Drive. This area, north of I-5 and west of Scoville Road, falls generally within the existing Zone 3 service elevations. Based on performance criteria developed for this Water Distribution System Master Plan, areas with employment zoning must be capable of providing a minimum fire flow of 4,000 gallons per minute (gpm) while maintaining a minimum residual pressure of 20 pounds per square inch (psi).

The City’s current UGB north of I-5 also includes existing and potential future low density residential development east of Scoville Road along Scenic Drive, Oak Dale Drive, Spring Mountain Road and Greenfield Drive. This area, north of I-5 and east of Scoville Road, falls generally within the existing Zone 4 service elevations. Based on performance criteria developed for this Water Distribution System Master Plan, areas with low density residential zoning must be capable of providing a minimum fire flow of 1,500 gpm while maintaining a minimum residual pressure of 20 psi.

In order to provide consistent service pressure and fire protection to existing and future customers in Zones 3 and 4, it is recommended that piping and facilities to serve the UGB north of I-5 be looped with existing Zone 3 and 4 piping to the extent practical.

Three water service options are proposed to meet the service pressure, fire flow and looping goals for the City’s current UGB north of I-5 between Scenic Drive and Hillcrest:

- **Option A** – New Zone 3 reservoir on Granite Hill Road, Zone 4A constant pressure pumped, no changes to existing Zone 4
- **Option B** - New Zone 3 reservoir on Granite Hill Rd, new Zone 4 Ausland Pump Station and Reservoir, lower elevation existing Zone 4 customers served from Zone 3
- **Option C** - No Zone 3 reservoir, Zone 3 pipe crossing under I-5 to loop Granite Hill with Vine St, new Zone 4 Ausland PS and Reservoir, lower elevation existing Zone 4 customers to Zone 3

Option A Description:

A proposed Zone 3 approximately 1.0 million gallon (MG) storage reservoir near Granite Hill Road & Mallory Heights Drive (CIP No. R-18) supplies looped 12-inch diameter mains serving employment-zoned areas west of Scoville Road. Additional looping with existing Zone 3 mains is completed by extending 12-inch mains southeast down Greenfield Drive and under I-5 to connect with existing Zone 3 piping on Cedar Loop. Service to future Zone 3 customers along Oak Dale Drive is provided by an 8-inch loop from Scoville to Greenfield Drive along Oak Dale Drive and Spring Mountain Road.

All existing Zone 4 piping and facilities remain in place. Future Zone 4 service to residentially zoned land above approximately 1280 feet elevation within the UGB north of NE Greenfield Drive is supplied as an independent constant pressure Zone 4A (approx. HGL = 1500 ft) from the proposed Ausland Pump Station (P-3a). The proposed pump station would draw suction supply from proposed looped Zone 3 piping at NE Ausland Drive and Scoville Road.

Option A – Proposed facility notes:

1. Zone 3 proposed Granite Hill Reservoir 16-inch transmission main (CIP No. M-23): Transmission mains larger than 12 inches in diameter are recommended from the proposed Zone 3 Granite Hill Reservoir (CIP No. R-18) to customers on Granite Hill Road in order to maintain minimum service pressures while providing required 4,000 gpm fire flows to the highest Zone 3 service elevations.
2. Zone 3 looped main under I-5 from Greenfield Drive to Cedar Loop (CIP No. M-32): This proposed main provides a second Zone 3 crossing under I-5. This improvement is not necessary to provide adequate Zone 3 service pressure to customers north of I-5 with the proposed Granite Hill Reservoir. However, it mitigates an existing fire flow deficiency on Cedar Loop south of I-5 behind Diamond Home Improvement. It may also be needed to serve new development along NE Hillcrest Drive south of I-5 depending on the required fire flow for the proposed development.
3. Proposed Zone 4A hydraulic grade line (HGL): The proposed Zone 4A would have a slightly higher HGL than existing Zone 4. The proposed HGL of approximately 1500 feet meets the normal service pressure range (35 to 80 psi) for most properties within the proposed zone.

Option A Benefits:

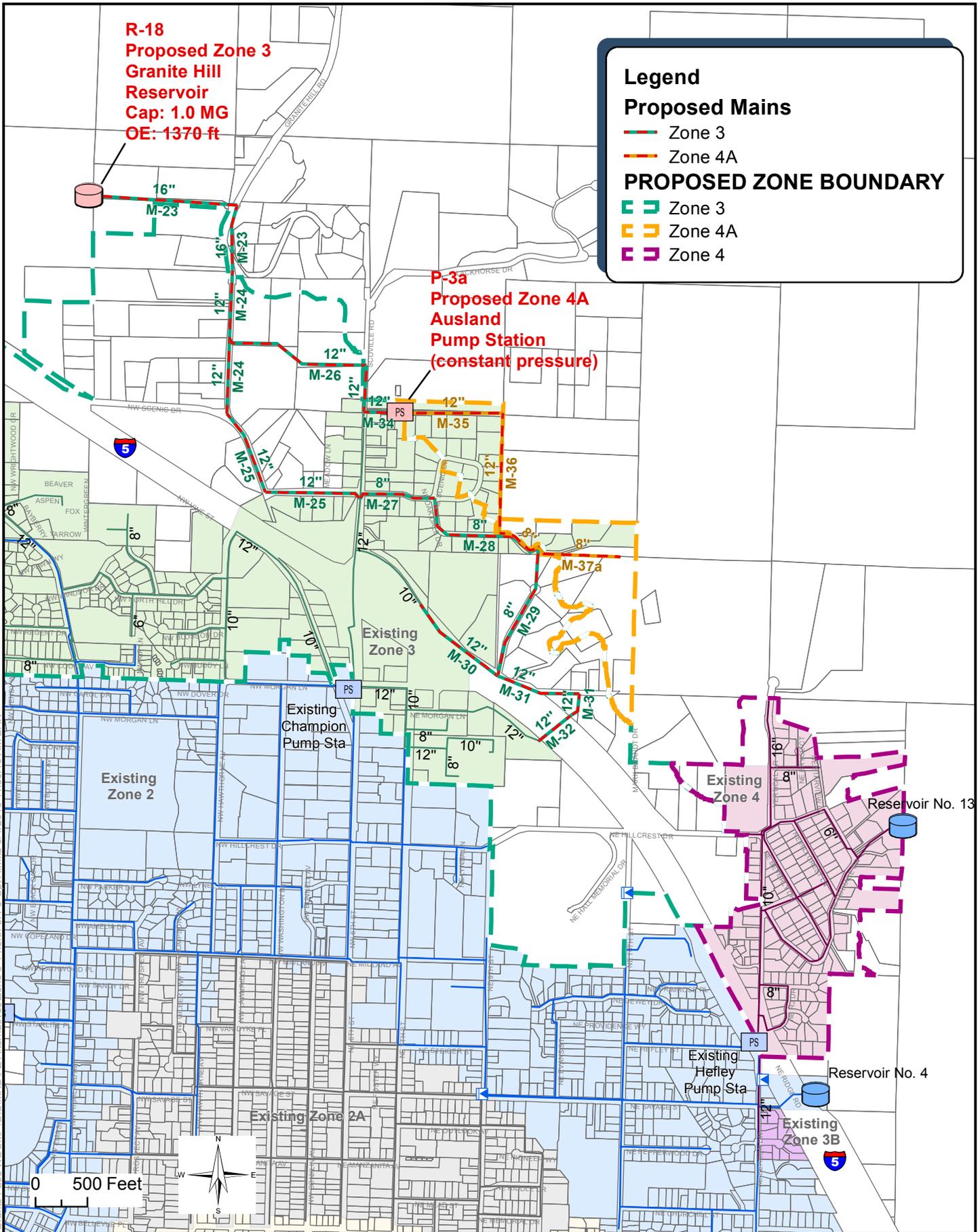
- Provide water service to potential employment development along Granite Hill Road north of I-5
- Mitigate existing Zone 3 storage deficiency with construction of proposed reservoir (CIP No. R-18)
- Provide suction supply to proposed Ausland Pump Station (CIP No. P-3a) in order to serve future Zone 4 customers within the UGB
- Lowest cost option to provide Zone 4 water service pressure and fire flow to existing large homes and potential future residential development along NE Scenic Drive within the UGB.
- Provides an interim step to fully looped Zone 4 as described in Options B and C.

Option A Considerations:

- The future Zone 3 employment area along Granite Hill Road cannot be provided adequate fire flow from existing Zone 3 distribution mains on Scoville Road.
- The projected 30-year storage deficit for Zone 3 is approximately 0.8 MG, which is the minimum recommended capacity for the proposed Zone 3 storage reservoir. However, to provide local fire storage for a 4,000 gpm fire flow in this employment-zoned area, it is recommended that the proposed Zone 3 reservoir have an approximate capacity of 1.0 MG.
- Construction of the proposed Zone 3 reservoir would require property acquisition.
- Proposed Zone 4A cannot be supplied adequate service pressure by extending distribution piping from existing Zone 4 facilities, additional pumping or storage is required.
- **Existing non-looped Zone 3 piping on Scoville Road cannot provide adequate suction pressure to supply the proposed constant pressure Ausland Pump Station (P-3a).**
- Proposed pipe looping in both zones would require easements on private property or coordination with future development of large parcels.

**Table C-3A
Zone 3 & 4 north of I-5 - Option A - Required CIP Projects**

Project ID	Project Description	Estimated Cost
R-18	Proposed 1.0 MG Zone 3 Granite Hill Reservoir	\$3,000,000
M-23	Proposed Zone 3 16-inch transmission main from proposed reservoir to Granite Hill Road	\$ 724,000
M-24 & M-25	Zone 3 12-inch main on Granite Hill Road and Scenic Drive from proposed reservoir transmission (M-23) to existing Scoville Road mains	\$ 890,000
M-26	Zone 3 north loop: 12-inch main connecting proposed Granite Hill Road mains (M-24 & M-25) with existing Scoville Road main at Ausland Drive	\$ 525,000
M-27, 28 & 29	Scenic, Oak Dale, Spring Mountain loop: Zone 3 8-inch mains connecting existing Scoville Road mains at Scenic Drive east to Spring Mountain Road and south to Greenfield Drive	\$ 819,000
M-30	Greenfield Drive loop: extend existing Zone 3 12-inch main on Greenfield Drive east of Scoville Road to proposed Spring Mountain Road main (M-29)	\$ 288,000
M-31	Zone 3 mains on Greenfield Drive east of proposed Spring Mountain Road main (M-29) to proposed I-5 crossing (M-32)	\$ 300,000
M-32	Trenchless crossing under I-5 connecting proposed Greenfield Drive mains (M-31) with existing Zone 3 piping on Cedar Loop	\$ 380,000
P-3a	Ausland Pump Station - approx. 1600 gpm constant pressure station	\$1,200,000
M-34	Zone 3 12-inch main, suction piping to proposed Ausland Pump Station from Scoville Road	\$ 98,000
M-35 & M-36	Zone 4A 12-inch Ausland Drive loop to Oak Dale Drive	\$ 603,000
M-37a	Zone 4A 8-inch main serving future residential development east of Spring Mountain Road	\$ 304,000
OPTION A TOTAL		\$9,131,000



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**Water Distribution
System Master Plan**

**Figure C-3A
Future Zone 3 and 4
north of I-5 - Option A**



Option B Description:

A proposed Zone 3 approximately 1.0 MG storage reservoir near Granite Hill Road & Mallory Heights Drive (CIP No. R-18) supplies looped 12-inch diameter mains serving employment-zoned areas west of Scoville Road (CIP Nos. M-24, 25, 26). Additional looping with existing Zone 3 mains is completed by extending 12-inch piping southeast down Greenfield Drive (CIP No. M-30, 31) and under I-5 (CIP No. M-32) to connect with existing Zone 3 piping on Cedar Loop. On the south side of I-5 Zone 3 piping is extended from Cedar Loop southeast to Hillcrest Drive (CIP No. M-33). Service to future Zone 3 customers along Oak Dale Drive is provided by an 8-inch loop from Scoville to Greenfield along Oak Dale Drive and Spring Mountain Road (CIP Nos. M-27, 28, 29).

A proposed Zone 4 approximately 0.6 MG storage reservoir (CIP No. R-13) on the City-owned Ausland Drive property supplies potential future development on Ausland Drive, Scenic Drive and Spring Mountain Road as well as existing Zone 4 customers in the Hillcrest area above approximately 1280 feet elevation. The proposed Ausland Reservoir would have an overflow elevation (OE) of approximately 1500 feet, higher than the existing Reservoir No. 13 which would be abandoned. The proposed reservoir is supplied by the proposed Ausland Pump Station (CIP No. P-3b) pumping from proposed Zone 3 distribution mains on Ausland Drive at Scoville Road (CIP No. M-34). Zone 4 12-inch mains parallel to proposed Zone 3 piping on Oak Dale Drive, Spring Mountain Road, Greenfield Drive and across I-5 connect the proposed Ausland Reservoir to existing Zone 4 customers (CIP No. M-37b, 38, 39, 40, 52).

Existing low elevation Zone 4 customers are transferred to Zone 3 service pressure by closing existing isolation valves in the Hillcrest neighborhood and connecting existing dead-end mains on Hillcrest Drive at Beacon Drive to proposed Zone 3 12-inch mains on Hillcrest Drive (CIP No. M-33). The existing Hefley Pump Station is to be abandoned in coordination with this zone change and abandonment of existing Reservoir No. 13. Existing Zone 3B customers are transferred to Zone 3 by abandoning the Beacon Drive PRV.

Option B – Proposed facility notes:

1. Zone 3 proposed Granite Hill Reservoir 16-inch transmission main (CIP No. M-23): Transmission mains larger than 12 inches in diameter are recommended from the proposed Zone 3 Granite Hill Reservoir (CIP No. R-18) to customers on Granite Hill Road in order to maintain minimum service pressures while providing required 4,000 gpm fire flows to the highest Zone 3 service elevations.
2. Proposed Zone 4 hydraulic grade line (HGL): The proposed Ausland Reservoir OE of approximately 1500 feet would raise the existing Zone 4 HGL. Zone 4 is currently supplied from Reservoir No. 13 and Hefley Pump Station at an HGL of approximately 1455 feet. The higher proposed HGL will provide improved service pressure to higher elevation customers in the Hillcrest neighborhood. Lower elevation

Hillcrest customers are not anticipated to be negatively impacted because they will be transferred to Zone 3 service pressure.

3. Existing Zone 4 mains transferred to Zone 3 service pressure: In the Hillcrest neighborhood, existing mains on Beverly, Roseanna, Beacon and Terrace Drives are transferred to Zone 3 service pressure by closing existing isolation valves at:
 - a. 16-inch diameter main on NE Hillcrest Drive/Vertical Drive on the north side of NE Beacon Drive
 - b. NE Hillcrest Drive on the west side of NE Hillcrest Lane (parallel Zone 4 main to be constructed to maintain Zone 4 service between Vertical Drive and Hillcrest Lane)
 - c. NE Roseana Drive on the north side of NE Beverly Drive
 - d. NE Terrace Drive north of NE Beverly Drive
4. Abandon Hefley Pump Station: Hefley cannot effectively supply proposed Zone 4 reservoir replacement on Ausland Drive.

Option B Benefits:

- Provide water service to potential employment development along Granite Hill Road north of I-5
- Mitigate existing Zone 3 storage deficiency with construction of proposed reservoir (CIP No. R-18)
- Provide suction supply to proposed Ausland Pump Station (CIP No. P-3b) in order to supply future Zone 4 reservoir on Ausland Drive
- Provide Zone 4 water service and fire flow to existing homes and potential future residential development within the UGB but too high in elevation to be served from extension of existing Zone 3 mains on Scoville Road.
- Mitigate existing Zone 4 storage deficiency and replace aging Reservoir 13 with construction of proposed Ausland Drive reservoir (CIP No. R-13).
- Reduce high service pressures to existing low-elevation customers in the Hillcrest area.
- Raise Zone 4 HGL to improve service pressures to existing Hillcrest customers and provide for long term growth in the UGB.

Option B Considerations:

- The future Zone 3 employment area along Granite Hill Road cannot be provided adequate fire flow from existing Zone 3 distribution mains on Scoville Road.
- The projected 30-year storage deficit for Zone 3 is approximately 0.8 MG, which is the minimum recommended capacity for the proposed Zone 3 storage reservoir. However, to provide local fire storage for a 4,000 gpm fire flow in this employment-zoned area, it is recommended that the proposed Zone 3 reservoir have an approximate capacity of 1.0 MG.
- Construction of the proposed Zone 3 reservoir would require property acquisition.
- Proposed Zone 4 expansion cannot be supplied adequate service pressure only by extending distribution piping from existing Zone 4 facilities, additional pumping or storage is required.
- Existing non-looped Zone 3 piping on Scoville Road cannot provide adequate suction pressure to supply the proposed Ausland Pump Station (P-3b).
- The proposed Zone 4 reservoir site on Ausland Drive is an undeveloped, City-owned property.
- Proposed pipe looping in both zones would require easements on private property or coordination with future development of large parcels.

**Table C-3B
Zone 3 & 4 north of I-5 - Option B - Required CIP Projects**

Project ID	Project Description	Estimated Cost
R-18	Proposed 1.0 MG Zone 3 Granite Hill Reservoir	\$ 3,000,000
M-23	Proposed Zone 3 16-inch transmission main from proposed reservoir to Granite Hill Road	\$ 724,000
M-24 & M-25	Zone 3 12-inch main on Granite Hill Road and Scenic Drive from proposed reservoir transmission (M-23) to existing Scoville Road mains	\$ 890,000
M-26	Zone 3 north loop: 12-inch main connecting proposed Granite Hill Rd mains (M-24 & M-25) with existing Scoville Rd main at Ausland Drive	\$ 525,000
M-27, 28 & 29	Scenic, Oak Dale, Spring Mountain loop: Zone 3 8-inch mains connecting existing Scoville Road mains at Scenic Drive east to Spring Mountain Road and south to Greenfield Drive	\$ 819,000
M-30	Greenfield Drive loop: extend existing Zone 3 12-inch main on Greenfield Drive east of Scoville Road to proposed Spring Mountain Road main (M-29)	\$ 288,000
M-31	Zone 3 mains on Greenfield Drive east of proposed Spring Mountain Road main (M-29) to proposed I-5 crossing (M-32)	\$ 300,000
M-32	Trenchless crossing under I-5 connecting proposed Greenfield Drive mains (M-31) with existing Zone 3 piping on Cedar Loop	\$ 380,000
M-33	Cedar Loop to Hillcrest Drive proposed Zone 3 12-inch main on the southside of I-5 connects with existing Zone 4 piping to transfer existing low elevation Zone 4 Hillcrest customers to Zone 3	\$ 654,000
P-3b	Ausland Pump Station - approx. 300 gpm	\$ 500,000
M-34	Zone 3 12-inch main, suction piping to proposed Ausland Pump Station from Scoville Road	\$ 98,000
M-35 & M-36	Zone 4 12-inch Ausland Drive loop to Oak Dale Drive	\$ 603,000
M37b & M-38	Zone 4 12-inch Spring Mountain Road main connecting Oak Dale Drive (M-36) to Greenfield Drive (M-39)	\$ 500,000
M-39	Zone 4 12-inch main connecting Spring Mountain Road (M-38) to I-5 crossing	\$ 310,000
M-52	Zone 4 12-inch I-5 trenchless crossing	\$ 377,000
M-40	Zone 4 12-inch main connecting I-5 crossing to Hillcrest Drive	\$ 700,000
M-42	Zone 4 12-inch connection Hillcrest Drive from Vertical Drive to Hillcrest Lane, maintains Zone 4 distribution grid after conversion of customers on Beacon, Beverly and Roseanna Drives to Zone 3	\$ 72,000
R-13	0.6 MG Zone 4 Reservoir replacement on Ausland Drive	\$ 2,100,000
M-41	R-13 Ausland Reservoir Zone 4 12-inch transmission main	\$ 345,000
OPTION B TOTAL		13,185,000

Option C Description:

A proposed 16-inch diameter trenchless crossing under I-5 (CIP No. M-44) connects proposed Zone 3 looped 12-inch diameter mains serving employment-zoned areas west of Scoville Road and north of the freeway (CIP Nos. M-24, 25, 26, 43) with existing and proposed 12-inch diameter Zone 3 mains on NW Vine Street between NW Hawthorne and Highland Avenues south of the freeway (CIP Nos. M-45, 46). The proposed crossing under I-5 is approximately southwest of the intersection of Granite Hill Road and NW Scenic Drive.

Additional looping with existing Zone 3 mains is completed by extending 12-inch piping southeast down Greenfield Drive (CIP No. M-30, 31) and under I-5 (CIP No. M-32) to connect with existing Zone 3 piping on Cedar Loop. On the south side of I-5 Zone 3 piping is extended from Cedar Loop southeast to Hillcrest Drive (CIP No. M-33). Service to future Zone 3 customers along Oak Dale Drive is provided by an 8-inch loop from Scoville to Greenfield along Oak Dale Drive and Spring Mountain Road (CIP Nos. M-27, 28, 29).

A proposed Zone 4 approximately 0.6 MG storage reservoir (CIP No. R-13) on the City-owned Ausland Drive property supplies potential future development on Ausland Drive, Scenic Drive and Spring Mountain Road as well as existing Zone 4 customers in the Hillcrest area above approximately 1280 feet elevation. The proposed Ausland Reservoir would have an OE of approximately 1500 feet, higher than the existing Reservoir No. 13 which would be abandoned. The proposed reservoir is supplied by the proposed Ausland Pump Station (CIP No. P-3b) pumping from proposed Zone 3 distribution mains on Ausland Drive at Scoville Road (CIP No. M-34). Zone 4 12-inch mains parallel to proposed Zone 3 piping on Oak Dale Drive, Spring Mountain Road, Greenfield Drive and across I-5 connect the proposed Ausland Reservoir to existing Zone 4 customers (CIP No. M-37b, 38, 39, 40, 52).

Existing low elevation Zone 4 customers are transferred to Zone 3 service pressure by closing existing isolation valves in the Hillcrest neighborhood and connecting existing dead-end mains on Hillcrest Drive at Beacon Drive to proposed Zone 3 12-inch mains on Hillcrest Drive (CIP No. M-33). The existing Hefley Pump Station is to be abandoned in coordination with this zone change and abandonment of existing Reservoir No. 13. Existing Zone 3B customers are transferred to Zone 3 by abandoning the Beacon Drive PRV.

Option C – Proposed facility notes:

1. **Zone 3 fire flow availability north of I-5: Without Zone 3 storage, booster pumping or upsizing of long sections of existing 12-inch mains; the required 4000 gpm fire flow for employment-zoned Zone 3 developable land in the UGB north of I-5 cannot be provided above approximately 1260 feet elevation.**
2. **Proposed Zone 4 hydraulic grade line (HGL):** The proposed Ausland Reservoir OE of approximately 1500 feet would raise the existing Zone 4 HGL. Zone 4 is currently supplied from Reservoir No. 13 and Hefley Pump Station at an HGL of

approximately 1455 feet. The higher proposed HGL will provide improved service pressure to higher elevation customers in the Hillcrest neighborhood. Lower elevation Hillcrest customers are not anticipated to be negatively impacted because they will be transferred to Zone 3 service pressure.

3. Existing Zone 4 mains transferred to Zone 3 service pressure: In the Hillcrest neighborhood, existing mains on Beverly, Roseanna, Beacon and Terrace Drives are transferred to Zone 3 service pressure by closing existing isolation valves at:
 - e. 16-inch diameter main on NE Hillcrest Drive/Vertical Drive on the north side of NE Beacon Drive
 - f. NE Hillcrest Drive on the west side of NE Hillcrest Lane (parallel Zone 4 main to be constructed to maintain Zone 4 service between Vertical Drive and Hillcrest Lane)
 - g. NE Roseana Drive on the north side of NE Beverly Drive
 - h. NE Terrace Drive north of NE Beverly Drive
4. Abandon Hefley Pump Station: Hefley cannot effectively supply proposed Zone 4 reservoir replacement on Ausland Drive.

Option C Benefits:

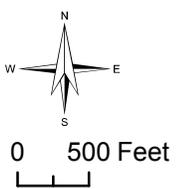
- Lowest cost option to provide water service to potential Zone 3 employment development along Granite Hill Road north of I-5 (approx.. \$1.6 million for I-5 crossing and Vine Street loop vs. \$3.7 million for Zone 3 storage and transmission)
- Provide suction supply to proposed Ausland Pump Station (CIP No. P-3b) in order to supply future Zone 4 reservoir on Ausland Drive
- Provide Zone 4 water service and fire flow to existing homes and potential future residential development within the UGB but too high in elevation to be served from extension of existing Zone 3 mains on Scoville Road.
- Mitigate existing Zone 4 storage deficiency and replace aging Reservoir No. 13 with construction of proposed Ausland Drive reservoir (CIP No. R-13).
- Reduce high service pressures to existing low-elevation customers in the Hillcrest area.
- Raise Zone 4 HGL to improve service pressures to existing higher-elevation Hillcrest customers and provide for long term growth in the UGB.

Option C Considerations:

- **Without Zone 3 storage, booster pumping or upsizing of long sections of existing 12-inch mains; the required 4000 gpm fire flow for employment-zoned Zone 3 developable land in the UGB north of I-5 cannot be provided above approximately 1260 feet elevation.**
- The future Zone 3 employment area along Granite Hill Road cannot be provided adequate fire flow from existing Zone 3 distribution mains on Scoville Road.
- Without a second Zone 3 storage reservoir, the projected 30-year storage deficit for Zone 3 is approximately 0.8 MG.
- Proposed Zone 4 expansion cannot be supplied adequate service pressure only by extending distribution piping from existing Zone 4 facilities, additional pumping or storage is required.
- Existing non-looped Zone 3 piping on Scoville Road cannot provide adequate suction pressure to supply the proposed Ausland Pump Station (P-3b).
- The proposed Zone 4 reservoir site on Ausland Drive is an undeveloped, City-owned property.
- Proposed pipe looping in both zones would require easements on private property or coordination with future development of large parcels.

**Table C-3C
Zone 3 & 4 north of I-5 - Option C - Required CIP Projects –**

Project ID	Project Description	Estimated Cost
M-24 & M-25	Zone 3 12-inch main on Granite Hill Road and Scenic Drive to existing Scoville Road mains	\$ 890,000
M-26	Zone 3 north loop: 12-inch main connecting proposed Granite Hill Road mains (M-24 & M-25) with existing Scoville Road main at Ausland Drive	\$ 525,000
M-27, 28 & 29	Scenic, Oak Dale, Spring Mountain loop: Zone 3 8-inch mains connecting existing Scoville Road mains at Scenic Drive east to Spring Mountain Road and south to Greenfield Drive	\$ 819,000
M-30	Greenfield Drive loop: extend existing Zone 3 12-inch main on Greenfield Drive east of Scoville Road to proposed Spring Mountain Road main (M-29)	\$ 288,000
M-31	Zone 3 mains on Greenfield Drive east of proposed Spring Mountain Road main (M-29) to proposed I-5 crossing (M-32)	\$ 300,000
M-32	Trenchless crossing under I-5 connecting proposed Greenfield Drive mains (M-31) with existing Zone 3 piping on Cedar Loop	\$ 380,000
M-33	Cedar Loop to Hillcrest Drive proposed Zone 3 12-inch main on the southside of I-5 connects with existing Zone 4 piping to transfer existing low elevation Zone 4 Hillcrest customers to Zone 3	\$ 654,000
P-3b	Ausland Pump Station - approx. 300 gpm	\$ 500,000
M-34	Zone 3 12-inch main, suction piping to proposed Ausland Pump Station from Scoville Road	\$ 98,000
M-35 & M-36	Zone 4 12-inch Ausland Drive loop to Oak Dale Drive	\$ 603,000
M37b & M-38	Zone 4 12-inch Spring Mountain Road main connecting Oak Dale Drive (M-36) to Greenfield Drive (M-39)	\$ 500,000
M-39	Zone 4 12-inch main connecting Spring Mountain Road (M-38) to I-5 crossing	\$ 310,000
M-52	Zone 4 12-inch I-5 trenchless crossing	\$ 377,000
M-40	Zone 4 12-inch main connecting I-5 crossing to Hillcrest Drive	\$ 700,000
M-41	R-13 Ausland Reservoir Zone 4 12-inch transmission main	\$ 345,000
M-42	Zone 4 12-inch connection Hillcrest Drive from Vertical Drive to Hillcrest Lane, maintains Zone 4 distribution grid after conversion of customers on Beacon, Beverly and Roseanna Drives to Zone 3	\$ 72,000
R-13	0.6 MG Zone 4 Reservoir replacement on Ausland Drive	\$ 1,800,000
M-43	Zone 3 16-inch connection from Granite Hill Road & Scenic Drive to I-5 trenchless crossing	\$ 240,000
M-44	Zone 3 16-inch trenchless crossing under I-5 from M-43 to Vine Street	\$ 330,000
M-45 & M-46	Complete 12-inch Zone 3 loop on Vine Street between Highland and Hawthorne Avenues	\$ 996,000
OPTION C TOTAL		\$ 10,727,000



Max service elevation for Zone 3 fire flow availability (1260 feet)

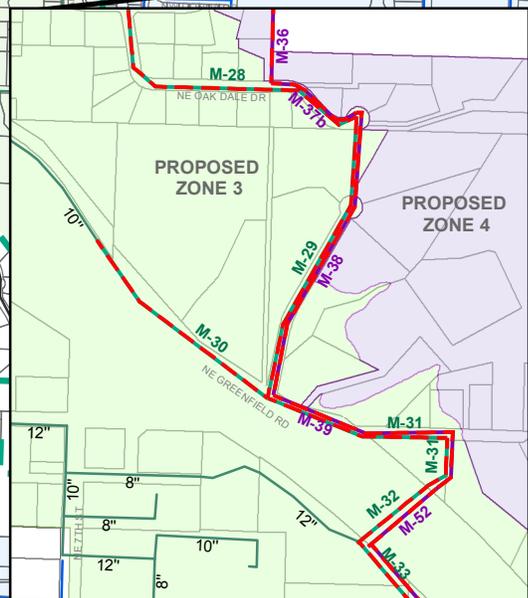
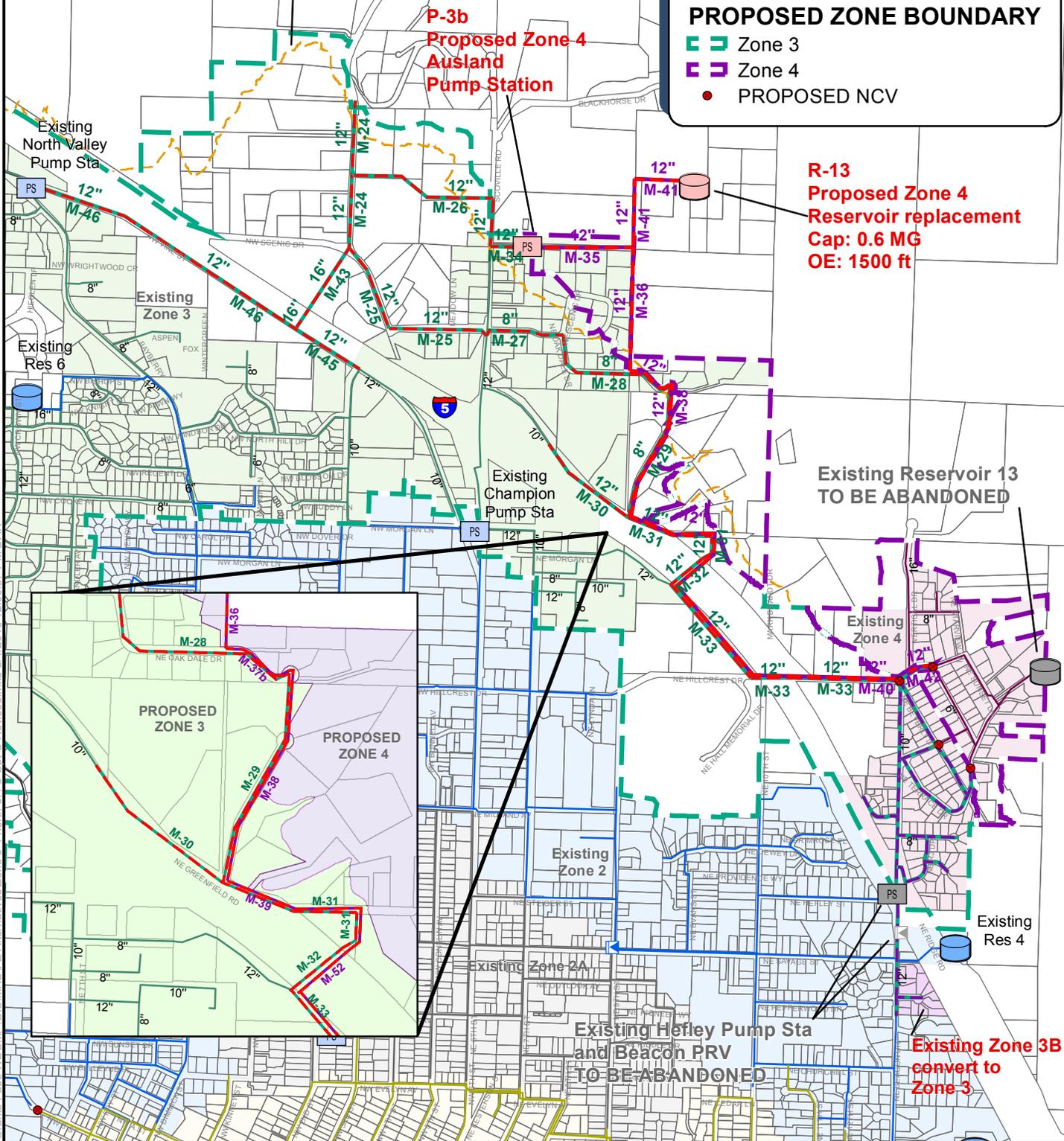
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Water Mains

- Zone 3 Proposed
- Zone 4 Proposed
- Convert Zone 4 mains to Zone 3
- To be Abandoned

PROPOSED ZONE BOUNDARY

- Zone 3
- Zone 4
- PROPOSED NCV



Water Distribution System Master Plan

**Figure C-3C
Future Zone 3 and 4
north of I-5 - Option C**



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Proposed Zone 4N Service

Zone 4N Description:

Provide water service to potential future customers at employment-zoned properties within the UGB north of the current city limits along I-5 and Highland Avenue between Pony Lane and Morewood Lane. This area, with ground elevations between approximately 1,285 and 1,400 feet, is too high to receive adequate service pressure from either adjacent Zone 3 or existing North Valley transmission mains on Highland Avenue. A new pressure Zone 4N is proposed to serve these properties at an approximate hydraulic grade line (HGL) of 1,500 feet. Proposed facilities to serve a future Zone 4N include:

6. New constant pressure pump station (CIP No. P-4) on the existing North Valley Reservoir No. 15 site.
 - a. Suction supply to the proposed station is from the existing North Valley Reservoir No. 15.
 - b. The proposed constant pressure station must have a minimum firm capacity of approximately 4,100 gallons per minute (gpm) in order to meet the 4,000 gpm fire flow criteria for employment-zoned properties. Estimated future non-emergency peak demands are approximately 70 gpm.
7. New 16-inch Zone 4N mains (CIP No. M-47 to M-51) on Highland Avenue with trenchless crossing under I-5 (CIP No. M-49)
 - a. Proposed Zone 4N mains follow the alignment of the existing North Valley transmission main on Highland Ave from Pony Lane north to the Reservoir No. 15 site.
8. New Highland Ave PRV (CIP No. V-2) with pressure relief valve at southern boundary of Zone 4N to provide emergency pressure relief and circulation for water quality under low demands for Zone 4N

It is anticipated that Zone 4N and related facilities would be largely development driven as there is currently no City water service to this area. For planning purposes, capital improvements required to complete this zone boundary change are assumed to occur at the 20-year planning window.

Zone 4N Benefits:

- Provide water service to future customers in the City's northern UGB who cannot be served by existing pressure zones
- Improve North Valley reservoir turnover as Zone 4N water consumption increases

Zone 4N Considerations:

- Elevations in the future Zone 4N service area cannot be provided adequate service pressure from the existing 8-inch diameter North Valley (Zone NV) distribution mains on Highland Avenue even if the North Valley Reservoir No. 15 were to be operated full. Due to slow reservoir turnover and modest demand in Zone NV, Reservoir No. 15 is currently operated approximately 20 percent full.
- In order to provide adequate fire storage of 960,000 gallons for a 4,000 gpm industrial (Zone NV) and employment (Zone 4N) fire flow, the existing North Valley Reservoir No. 15 should be operated at a minimum water height of 22 feet, approximately 74 percent full.
- For planning purposes, the proposed pipe crossing under I-5 at Highland Avenue (CIP No. M-49) is assumed to be constructed using trenchless methods. During the predesign process, the City should evaluate the feasibility of hanging the proposed main from the existing Highland Avenue overpass at lower cost.
- There is very limited potential for looping within the current UGB in proposed Zone 4N. In order to provide 4,000 gpm fire flow without looping, proposed mains must be 16-inch diameter.

**Table C-4
Zone 4N Required CIP projects:**

Project ID	Project Description	Estimated Cost
P-4	Zone 4N constant pressure 4,100 gpm pump station adjacent to existing Reservoir No. 15	\$ 1,200,000
M-47 & M-48	16-inch diameter Zone 4N distribution mains on Highland Ave between Moorewood Lane, proposed pump station (CIP No. P-4) and Highland Ave overpass	\$ 526,000
M-49	16-inch diameter trenchless crossing under I-5 at Highland Avenue overpass	\$ 510,000
M-50 & M-51	16-inch diameter Zone 4N distribution mains on Highland Ave between overpass and proposed PRV near Pony Lane (CIP No. V-2)	\$ 960,000
V-2	Highland Ave PRV with pressure relief valve at southern boundary of Zone 4N near Pony Lane	\$ 150,000
ZONE 4N TOTAL		\$ 3,346,000

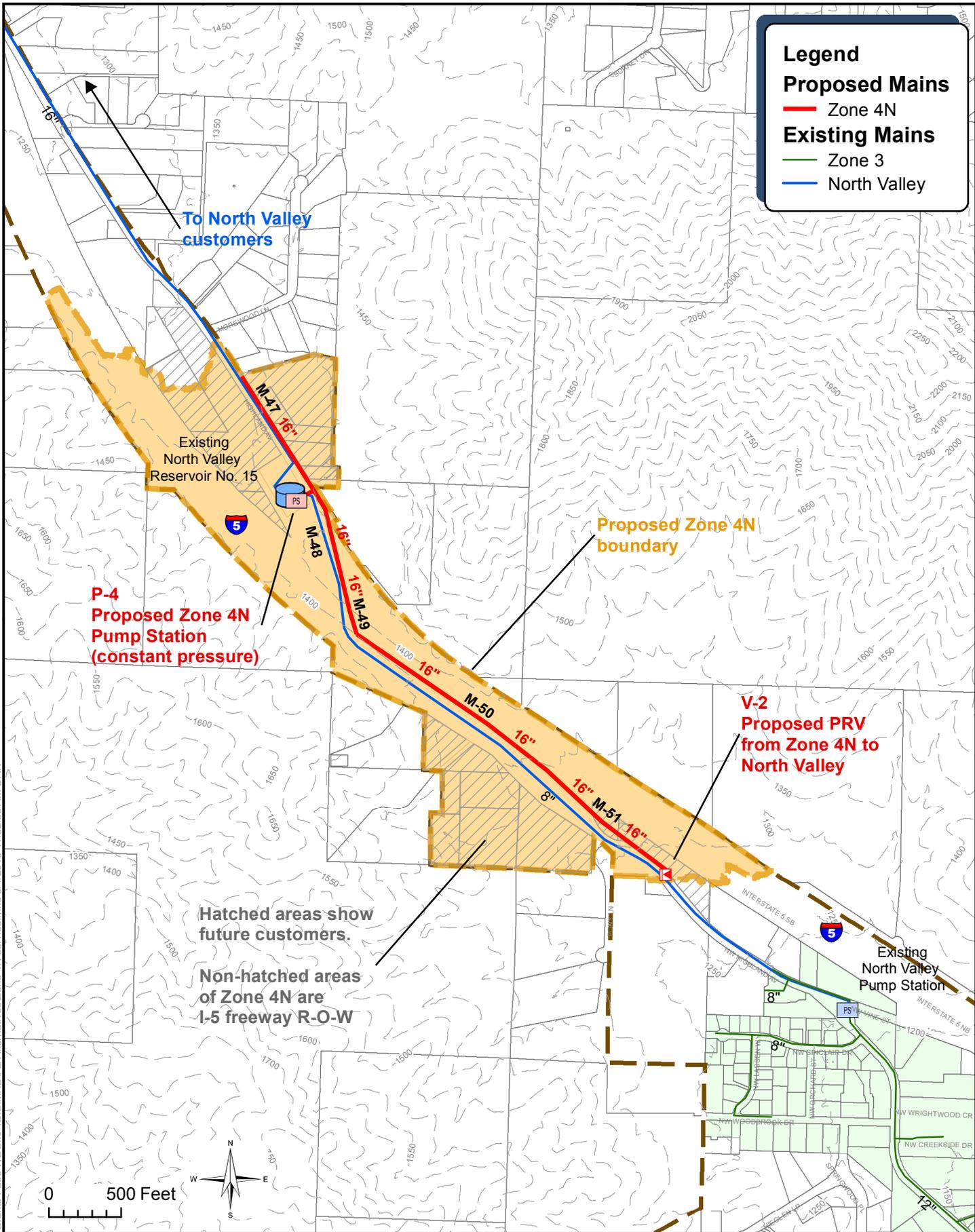
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Proposed Mains

- Zone 4N

Existing Mains

- Zone 3
- North Valley



Hatched areas show future customers.
 Non-hatched areas of Zone 4N are 1-5 freeway R-O-W



Water Distribution System Master Plan

Figure C-4 Proposed Zone 4N



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