PLANNING COMMISSION
WEDNESDAY, DECEMBER 13, 2017
6:00 PM

AGENDA

I. 6:00 PM CALL TO ORDER - ROLL CALL

Jerry Greenfield, Chair   Eric Postma, Vice Chair Peter Hurley
Al Levit   Kamran Mesbah   Phyllis Millan
Simon Springall

PLEDGE OF ALLEGIANCE

CITIZEN'S INPUT

This is the time that citizens have the opportunity to address the Planning Commission regarding any item that is not already scheduled for a formal Public Hearing tonight. Therefore, if any member of the audience would like to speak about any Work Session item or any other matter of concern, please raise your hand so that we may hear from you now.

CONSIDERATION OF THE MINUTES

A. Consideration Of The Nov. 8, 2017 PC Minutes

Documents:

I. A. Consideration Of The Nov. 8, 2017 PC Minutes.pdf

II. 6:15 PM WORK SESSION

A. Water Treatment Plant Master Plan

Documents:

II. A. Water Treatment Plant Master Plan.pdf
II.A. WRWTP_2017 Full Electronic Copy Only.pdf

II.A. Water Treatment Plant Master Plan Presentation

Documents:

121317 PCWS Briefing.pdf

B. Industrial Form-Based Code

Documents:

II. B. Industrial Form-Based Code.pdf

II.B. Industrial Form-Based Code Presentation

Documents:

CC FBC Slides_121317.Pdf

III. 7:45 PM LEGISLATIVE HEARING

A. Year 2000 URA - Boeckman Creek Bridge

Documents:

III. A. Year 2000 URA - Boeckman Creek Bridge.pdf

III. A. Year 2000 URA Presentation

Documents:

Y2000 PC Hearing 2017.12.13.Pdf

IV. 8:30 PM INFORMATIONAL

A. City Council Action Minutes 11/06/17 & 11/20/17

Documents:

IV. A. City Council Action Minutes 11.06.17 _ 11.20.2017.Pdf

B. 2018 Planning Commission Work Program

Documents:

IV. B. 2018 Planning Commission Work Program.pdf

V. 8:45 PM ADJOURNMENT

Time frames for agenda items are not time certain.

Public Testimony

The Commission places great value on testimony from the public. People who want to testify are encouraged to:

- *Provide written summaries of their testimony*
- *Recognize that substance, not length, determines the value of testimony*
- *Endorse rather than repeat testimony of others*

Thank you for taking the time to present your views.

For further information on Agenda items, call Tami Bergeron, Planning Administrative Assistant, at (503) 570-1571 or e-mail her at bergeron@ci.wilsonville.or.us.

Assistive Listening Devices (ALD) are available for persons with impaired hearing and can be scheduled for this meeting.

The City will also endeavor to provide the following services, without cost, if requested at least 48 hours prior to the meeting:

*Qualified sign language interpreters for persons with speech or hearing impairments
*Qualified bilingual interpreters.

To obtain services, please call the Planning Administrative Assistant at (503) 682-4960

PLANNING COMMISSION

WEDNESDAY, DECEMBER 13, 2017

I. CONSIDERATION OF THE MINUTES

A. Consideration of the November 8, 2017 Planning Commission minutes.

PLANNING COMMISSION
WEDNESDAY NOVEMBER 8, 2017
6:00 P.M.

DRAFT
Will be viewed and approved at the 12/13/17 PC Meeting

Wilsonville City Hall
29799 SW Town Center Loop East
Wilsonville, Oregon

Minutes

I. CALL TO ORDER - ROLL CALL

Chair Greenfield called the meeting to order at 6:02 p.m. Those present:

Planning Commission: Jerry Greenfield, Eric Postma, Al Levit, Peter Hurley, Phyllis Millan, Kamran Mesbah, and Simon Springall.

City Staff: Chris Neamtzu, Miranda Bateschell, Amanda Guile-Hinman, Nancy Kraushaar, Jordan Vance, and Susan Cole

PLEDGE OF ALLEGIANCE

The Pledge of Allegiance was recited.

CITIZEN'S INPUT

There was none.

CONSIDERATION OF THE MINUTES

A. Consideration of the October 11, 2017 Planning Commission minutes

The October 11, 2017 Planning Commission minutes were accepted as presented.

II. WORK SESSIONS

A. Year 2000 URA – Boeckman Creek Bridge (Vance)

Chris Neamtzu, Planning Director, announced the project team would present a substantial amendment to the Year 2000 Urban Renewal Plan.

Jordan Vance, Economic Development Manager, explained the substantial amendment to the Year 2000 Urban Renewal District would increase the maximum indebtedness of the District to fund a capital project, the Boeckman Dip Bridge Project. This major transportation project located on Boeckman Rd just east of Canyon Creek Rd would help allow for development in the area. The project team received direction from City Council and the Urban Renewal Task Force to assess the financial viability of increasing the urban renewal district, and tonight' briefing was in preparation of the upcoming hearing in December.

Scott Vanden Bos, Elaine Howard Consulting, LLC, and Nick Popenuk, Tiberius Solutions, LLC, presented the proposed Year 2000 Urban Renewal Plan 11th Amendment via PowerPoint, describing the background, purpose, and process related to the amendment and reviewing the Y2000 Finance Plan details.

Nancy Kraushaar, Community Development Director, added that the Planning Commission's role in reviewing the amendment was to ensure it was consistent with the Comprehensive Plan and that the various components reflected in the Year 2000 Plan that refer to the Comprehensive Plan were still consistent with the Comprehensive Plan. She responded to Commissioner questions as follows:

- She confirmed the decisions the Planning Commission made concerning Frog Pond implied a direction of increasing the maximum indebtedness to facilitate development and therefore, the Commission had been in

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conformity all along. The amendment would be a formal recognition of that direction, should the Commission find that to be true for this particular project.

- The bridge could be finished in 2023. Quite a lot of environmental permitting was involved with the project. Once the amendment was approved by the various agencies, the project team would work with the City's finance director to obtain the funding and hire a consultant. Keeping Boeckman Rd open as much as possible was a key consideration. The City would speak with contractors about how to stage the project to avoid closing Boeckman Rd for the two to three years needed to construct the bridge.

B. Town Center Plan (Bateschell)

Miranda Bateschell, Planning Manager, recalled that at the joint City Council/Planning Commission meeting in May, the vision and goals developed with the community for the Town Center Plan were solidified. Staff continued engaging the community at various events over the summer to gather input on how to achieve the vision and goals. The result of all the public engagement and community input, including ideas from the Design Workshop, Community Block Party, and Visual Preference Survey, was a concept for the future of the Town Center. The Town Center Task Force reviewed the ideas received, and helped the project team formulate a draft community design concept for Town Center, which was provided in the Commission packet.

- She introduced Alex Dupey and Molly Cooney-Mesker, both from MIG, and noted the project team would gather additional public input in early 2018 regarding the draft design concept in order to verify that the team heard the community's ideas correctly and to refine the concept further. The Commission and City Council would discuss the draft concept during the joint work session on December 4th, 2017.

Alex Dupey, presented the Town Center Community Design Concept Discussion via PowerPoint, reviewing the many public outreach events and describing how the public was engaged to provide input on many key design elements to inform the draft Town Center Design Concept. He described the building blocks, green spaces, connectivity, and land use, which were developed to organize the public input received and used as key categories when developing the draft design concept. He also discussed the key outcomes from the last Task Force meeting, noting consistent results were received from the two groups of Task Force members working independently to develop the community concept. The project team sought the Commission's input on whether the design concept was at a point where the team could take it to the public for further refinement and on things that needed to be considered moving forward, both in the look of the design and from a zoning and regulatory standpoint.

Comments and input from the Planning Commission was as follows with responses to Commissioner questions as noted:

- Bike access to Town Center was a concern. If the pedestrian bridge was built over I-5 as indicated in the design concept (Slide 22), it would not work unless that part of Town Center loop was changed. Villebois would use it as bike access. Bikes could access the Town Center from the east and north sides of town, but access from the west side remained very difficult. Was there a way to make an easy transition to Wilsonville Rd?
    - Opening up Parkway Ave for bikes to go south from Wilsonville Rd, where it was currently cut off, and routing bikes down near the Clock Tower and cross directly to a bike access across the road would be shorter than trying to cross Wilsonville Rd and go up to the I-5 overpass.
- While the team tested images of different styles of hotels on the Visual Preference Survey to see what the community would like to see of a building like a convention center hotel located in Town Center; however, the project team was not looking at specific buildings in specific locations at this point, though the discussion had been to allow entertainment, office, and tourist-type uses.
- In the Survey, the existing office building near the movie theater was consistently rated as not appealing, likely because people had no reason to go there. Popular locations were such because people had reasons to be there.

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- The bar charts seemed to present positive feedback on everything, even for things that were less than 50 percent positive. Was the team able to determine if some people were voting no on everything, because some people just did not want change?
  - While it was likely some people did vote no on everything, the team did not look at specific user data. Many that were close to 50 percent, were either 'worth considering' or 'not wanted', but if 'worth considering' was the larger percentage, the team read that, not necessarily as positive, but as that those development types needed further exploration, not totally excluded.
- On the Community Design Concept diagram (Slide 22), Parkway would be the main street. Parkway needed to carry traffic and also be very walkable. It would be the area to focus development with cafés and markets with people strolling along that area. People driving through Town Center to get somewhere else should not use Parkway. The question is are there ways to have them use Town Center Loop East?
  - The team was still trying to determine how the intersections at Parkway, Town Center Lp E, and Town Center Lp W would interact with Wilsonville Rd. Could those intersections work together to help with the traffic flow and also create a gateway into Town Center? The team was just starting to address the technical piece and are working with a traffic consultant to consider different ways to deal with the intersections, such as how the signals could function together.
- Although repositioning Town Center Lp W would cut Fry's Electronics off from its large parking area, if only 5 or 10 percent of the parking lot was being used, could that parking be better organized to help with future infill development at that location? With infill development, the area would become a more urban location, and the road would still be a slow, pedestrian-friendly street. A lot still needed to be figured out in terms of design, but how could the City start being more effective in the land use, while not restricting existing development? Pedestrian safety was a paramount factor, as it was not a safe environment now.
  - The Town Center Plan was a vision document and concept plan intended for the long term, 20 to 25 years from now. The reality was the Town Center Lp W would probably be repositioned when the Fry's site redeveloped, not when Fry's customers needed to cross to the parking lot. The road would be put in when a different type of development form occurred on both sides of the road. In addition, the cross sections, which had not yet been discussed, would likely have on street parking and could provide door front parking spaces for some of the capacity for some of the existing buildings and new businesses.
- The process itself seemed to assume, superficially, a blank slate, which did not exist. While the team diagrams showed recognizable buildings, the input process seemed to be designed around what the public could easily misconstrue as a blank slate. The existing structures and landowners were an underappreciated constraint and it was unknown how the transition might roll out.
  - Trying to add more connectivity to an already developed area where the land use pattern did not necessarily support that connectivity is an iterative process. This was a vision document. Ultimately, the Plan would state where eventually the City wanted its road network to be, but it did not preclude existing uses from happening now. If development occurred and a road connection was needed, Staff could point to this document in support of requiring street right-of-way and connections in a given location.
    - Seeing lines on a map could be scary, especially to existing business owners. The City needed to do a good job emphasizing that this was a long-term vision and it did not preclude a business from staying or growing over 20 years to stay competitive. Similarly, 40 years ago, this Plan showed where things were moving from a pedestrian and accessibility standpoint. Businesses today were looking to locate in these types of uses without parking right in front of the businesses. The consumer could park once and then walk to multiple stores or even live in the district.
  - Such transformations were usually done a block at a time, beginning with the most desirable locations developing as anchors. Development then spread around the anchors or up and down the main street as it became a focus for pedestrians, window-shopping, cafés with outdoor seating, etc. It was a slow process definitely driven by the market forces. This process was happening in Lake Oswego.

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- Both Bridgeport and Lake Oswego have blocks where the vehicles were excluded. Lake Oswego was built around a parking lot and parking structure and Bridgeport was vacant land before its development. Wilsonville Town Center was an existing area with vehicles going around the loop.

- The extensions of Parkway and Canyon Creek into Town Center, could result in Town Center being a major route for north-south traffic from Wilsonville Rd, and therefore, I-5 to the rest of Wilsonville and the residential area on the east side. How could these traffic networks be supported while still having a walkable, pedestrian- and bicycle-friendly neighborhood in the center, given the substantial amount of traffic expected on the streets? While the reason for rerouting Town Center Lp W was understood, perhaps routing traffic primarily around Town Center Lp E rather than through Parkway would benefit the walkability at the center itself.
  - Routing traffic onto Town Center Lp E was exactly what the concept plan would do. One issue was Town Center Lp W was right next to the freeway interchange. Traffic stacked up because people coming from the tech firms up north cut through Town Center to get to the freeway. Changing that traffic pattern would begin shifting traffic to the east. If Parkway was to be a walkable area, it was important that Parkway did not become a freeway. Keeping Parkway as a walkable area could be accomplished through design as a slow, narrow street with on street parking. People trying to cut through Town Center would then take the easiest route, which would be Town Center Lp E, since it would essentially stay the same as it was today.
  - The technical traffic analysis would help the team understand how some of these changes would work and how to deal with Wilsonville Rd from an intersection and signalization standpoint. Understanding those factors would help ensure the design resulted in a walkable district in the central spot and no traffic where it was not wanted. The last thing people wanted was a nice street grid with people zooming by and that was unsafe for pedestrians.
- Having an illustration of the design of the main street would be helpful. The streets design needed to be traffic-calming. Narrowing the street, slowed people down because their perception of speed was heightened due to visual cues like on-street parking, trees, and people present engaged in activities. The design of the main street would be critical in making it operate that way.
  - Facilitating traffic flow on Wilsonville Rd was also discussed. The traffic study would show how traffic would change. The more the main traffic was moved east, the more capacity Wilsonville Rd would have to stack cars. Moving traffic to the East Loop would provide a longer path for drivers to adjust and move in the right direction, rather than stacking on the West Loop and having to cut across to traffic lanes to get to the I-5 onramp. The traffic analysis would show whether the plan would work or it would negatively affect some other area, which was not the intent.
  - Task Force meeting discussions considered how pedestrian and bike traffic would cross Wilsonville Rd. People at the concentration of activities and interests on the north side of Wilsonville Rd would want to go south to the library, shopping centers, and activities on the south side of Wilsonville Rd. This issue also needed to be addressed through design. The idea was to design the main street as an old-fashioned, small town main street with parallel parking, for example, that people would stay away from if in a hurry.
- Bicycle connectivity was also needed to the existing bike trails on the north side connecting to Town Center Lp W that were not greatly used at this time because there was nothing to go to there. What kind of mechanisms, other than stoplights, could enable bicycle and pedestrian connectivity north/south across Wilsonville Rd to bring the library and retail areas south of Wilsonville Rd into the network? A small footbridge or bike bridge would be great.
  - Bicycle connections south of Wilsonville Rd were needed for safe access across Wilsonville Rd in order for Town Center to become the hub or the heart of the city. Making sure intersections on Wilsonville Rd were safe and provided for multiple connection points for pedestrians, cyclists, and vehicles was necessary. The next step was figuring out how those intersections would start to function. If Town Center Lp W, with its double left turns hostile to pedestrians was treated differently than today, would the road become a better connection to the south? If Parkway were extended, how could the intersection be designed to make people feel safe crossing over to Town Center? The traffic analysis was needed,

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but the team wanted to ensure the Commission agreed the concept plan was generally on the right track in order to start thinking more critically about some of the pieces.

- The team did discuss Courtside as a potential main street running east to west as a pedestrian-only street. From a retail or restaurant standpoint, traffic was not a bad thing if the traffic were slow, safe, and used on-street parking. With Parkway as the main street, it would become the gateway into Town Center as people turned off Wilsonville Rd. The Courtside/Parkway intersection was key because Town Center Park was right next to it. That area could become the center for development, so from an entry standpoint, Parkway was important.
  - The idea of Courtside being pedestrian-only did not come up in any conversations, either with the public or Task Force. Currently, Courtside was the only east-west connection and had the potential to cut through with little to no impacts to buildings at this point; parking lots and lot lines could be worked around. Taking that east-west connection away without an easy vehicular east-west connection might be difficult to the transportation system. The idea could be tested through a sensitivity analysis, if more interest was expressed about the idea.
- Because the Plan created the opportunity to vacate Park Place, one Task Force group discussed Park Place becoming a pedestrian mall as part of a discussion about the southwest corner of Town Center. All the small restaurants there have very difficult access and was usually bogged down with traffic.
  - In the Design Concept (Slide 22), the circulation modified the Loop and put the main street on Parkway punching through to Wilsonville Rd. This would eliminate Park Place, which would help a lot by diverting cut-through traffic that caused safety issues at the intersection and with the backing up of traffic due to the proximity to the interchange. Both Task Force small groups identified Park Place as an opportunity for a greenway and pedestrian mall.
- No real aggregation of parcels or businesses was needed to achieve the proposed design in the southwest corner of Town Center; the intent was to make the access there better for existing businesses. The area was a great location for new businesses just starting out and needing small spaces, but it was easy to get lost in there. The intent was to maintain some of the energy in the near-term, so such businesses continued to come into Town Center and thrive. However, pedestrian and vehicle connectivity was difficult in the area. The idea was to put in a more formal connection without taking out a business or building. The team had drawn a line in that quadrant trying to fit a connection in, but it would be a very narrow space, possibly an existing unstriped parking lot that would allow passage.
  - Building connectivity in the southwest corner would be challenging, given the existing development pattern, and should be looked more in depth with the Task Force, Planning Commission, and others to figure out the best circulation pattern.
  - The team's best attempt to address that challenge was the narrow loop drive through the southwest quadrant (Slide 22) which would consolidate some of the existing accesses into something more formal so drivers would know better know where they were as opposed to simply driving through a parking lot.
- The City's Transportation System Plan (TSP) currently included and City funding was allocated for the bicycle/pedestrian bridge, which was a key component of this concept plan. The emerald chain of green spaces looked nice, but the pedestrian bridge had a problem because it would also have to go over Boones Ferry Rd. The ADA slope requirements meant the bridge would extend a good way on either side of I-5 and the little green space shown on the concept plan seemed insufficient for the design, which meant dumping people on to the Loop road. The Loop road would have to change to create a safe environment.
  - Currently, there was no design for the pedestrian bridge across I-5, but there had been conversations about ADA compliance and the slope requiring the bridge to be longer than desired. However, the bridge provided the opportunity to get people across the Loop and it lined up well with the concept plan that modified the Loop. Dumping people between the Loop and I-5 was not a good option because there was insufficient space, it was unsafe, and it did not work well for Town Center.
  - The Task Force preferred moving the Loop, which provided potentially more space to consider different designs that bring people into Town Center. People crossing the bridge would land in a plaza space, small park, etc., and would also bring them into the Loop and Town Center, which

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provided an opportunity for more place making. While the Town Center project team was working in close coordination with the Boeckman Bridge project team, but no specific bridge design could be added yet since the Bridge project did not start until next fall. Still, the team knew the direction would be to look at a landing on the other side of the Loop.

- The team needed to find a better way to move people across Wilsonville Rd to Memorial Park, the library, senior center, and other activities, especially the East Loop was used as the more centralized way to move traffic. Currently, there was not a safe connection for seniors with mobility issues to get between the senior center and the park. Since moving the senior center was unlikely in the foreseeable future, it was important to provide these connections if the traffic increased on the East Loop. Creekside Apartments had the same issue.
  - The issue was really about being able to walk effectively and safely through Town Center. While tonight's comments regarding the bridge, safely crossing Wilsonville Rd, and connecting the Town Center, all focused on pedestrians and bicycles. As the team moved forward, that was a critical element and defining feature for what the road network/connections patterns would look like. If the team designed to that scale, then the other pieces could fall into place.
- The parking problem would be a big issue in the sequencing of development. One workshop group favored strategically located, multi-story parking structures, which would be a solution to taking all the parking from Fry's. In terms of sequencing, would the parking structures be built first and developers invited to develop around the structures, or should parking structures be part of a development proposal regardless of the existing development or traffic pattern?
  - Parking was a challenging topic. A cursory parking analysis was done on how parking was being used throughout Town Center, and the Safeway shopping center was the only location seeing a lot of use. Most parking in the rest of the Town Center was either empty or almost empty throughout the day. Moving forward, right-sizing the parking would be important from a zoning and regulatory standpoint.
  - Changing technology was another consideration that would challenge some of the existing paradigms of how parking was paid for and used in the near future. Currently, Portland and Pittsburgh were asking businesses to provide proposals for autonomous vehicles on their streets. No one knew what the impacts on transportation and parking would be; thinking strategically about how to do parking long-term was important moving forward, so an expensive four- to five-story parking garage did not sit three-quarters empty in ten years.
- The Commission briefly discussed whether the Wilsonville community would walk, bike, or use transit to and within Town Center. While cold, rainy weather was a major factor in deterring people riding bicycles, they would likely walk despite such weather. Public transit also needed to be considered in the Concept Plan.
  - The more bicycle-accessible the Plan was, the more people would use bikes because they would not feel threatened, but that would depend on how that accessibility was provided. Bicyclists felt safer with separated bike lanes than bike lanes on the side of the road.
  - All the demographics of the community must be considered. A high school was within the plan study and high school students and others without cars used transit, biked, or walked to access Town Center. Hearing from this segment of the community had been important for the team to understand where the main disconnects and big safety issues were, and where additional access would be most valuable.
  - Electronic cars charging stations were also a consideration.
- The emerald chain of open space was admirable and nixing the Town Center Lp W was a good idea.
- Putting in larger Class A office/retail was suggested along I-5, and thoughts about residential development seemed unlikely unless it was on the east side of Town Center. Given the 30,000-ft view of the Design Concept, there was opinion that by the time Town Center Lp W was repositioned, Fry's may not still be in its current format or location. Even if the building remains there, it would be under a different use. Separating the building from that parking lot does not seem to be an issue when thinking about the long-term nature of the plan.
- The connection to Wilsonville Rd was a big challenge. Given that a larger percentage of people were accessing Wilsonville Rd via Town Center Lp W from the high tech businesses to the north, putting in a 'cut

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and cover' might be a solution. D.C. neighborhoods have used cuts and covers for decades as they allowed for a vibrant neighborhood on top and a tunnel underneath.

- Depending on the geology around Parkway, the current lack of buildings there could allow for a two-lane cut and cover to bring people north from Wilsonville Rd near the freeway interchange and into the high-tech sector. The narrow tunnel would simply be a bypass and not function like a business loop. A cut and cover would likely improve business because it would remove the rush hour commuting traffic from Town Center.
- It was uncertain how changes in the technology of self-driving cars or ride sharing might change things in the future as well.
- Since parking structures were expensive and hard to pay for, they should be designed so the top two of the five floors could be easily converted to something else.
- Pedestrian and bike buffers did make people feel more secure. It was frightening to walk where Town Center Loop currently came out at the corner of Chipotle's, but installing a buffer and routing traffic through a tunnel might encourage people to cross there.

- Breaking up the hard turns on Town Center Lp W would have some traffic-calming effect. However, a lot of real estate would be created to the west of the repositioned Loop road, which meant a lot of vehicles and traffic, given the entertainment, mixed use with office/retail/restaurant land uses, so putting high intensity vehicle traffic back at that location might counteract the traffic-calming effect.
- Creating a main street out of Parkway with traffic-calming notions, like restaurants with outdoor seating and small shops, was ideal, but was that realistic? Siphoning traffic over to the east was unrealistic because people would have to go two intersections passed the interstate they were trying to reach. If traffic could not be siphoned to the east, the traffic-calming effects of the main street feel would be negated and, traffic-calming was an important component of a pedestrian-friendly center.
  - Pushing the repositioned West Loop a bit closer to the interstate would reduce the real estate west of the road, so the size of the uses there could be limited, and perhaps calm things a bit more.
- While the idea was to have small, local, non-chain businesses, nothing had been discussed about what the market could actually bear and create. It would be impossible to have rents low enough for small businesses to afford spaces in the expensive structures being considered. Rents were not maximized for either residential or commercial markets when those properties were combined too frequently. The possible result was a lot of residential and commercial vacant space, and economically the area would either be stagnate or have high rent prices.
  - Residential was proposed all over the area, but the Plan should be more focused on where residential should be located. If residential was allowed everywhere, what was being created? How could anyone afford to build it and ensure it was not largely vacant?
  - Not tying the desired land uses, like more restaurants, to the market relationship between building expenses and rents would result in a utopian, unbuildable community, which was a frightening possibility. While there had been a lot of discussion about what was wanted, there had not been enough discussion about what was realistic and practical.
    - The scope of work did include a market analysis. Once the project team had a better understanding of the land uses and the types and designs of buildings wanted, the team would pick some key integral sites for each type of use and building and have market and fiscal analyses done to determine if any gaps existed in the plan with regard to the current market. If so, the size of the gap, the timeframe to fill the gap, and efforts the City could make to help fill the gap, such as regulatory changes or financial incentives, would be discussed, along with any potential tradeoffs. Those discussions would occur when implementation actions.
  - The concern was that the conversations with the public were creating unrealistic expectations about what Town Center might become because currently, there were no budget constraints. While the market analysis would be part of another phase, it could not be ignored in this phase.
    - When presenting the Concept Plan to the public, the team should be better about clarifying the visionary aspect of the Plan and explaining that the plan would occur over time as elements not market feasible in the short-term became more market feasible in the long-term.

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- The existing Town Center Master Plan was very rigid about where different types of commercial uses could go. Further discussion by the Commission was suggested about the proposed Plan having more flexible verbiage to not be so specific about which uses could go in a given quadrant or parcel. For example, not locating residential right next to the freeway, but rather closer to the park or the existing residential neighborhood on the east side, and not allowing all the types of uses because the team wanted to remove some of the uses from being adjacent. At this point, the team had only made two distinctions; that residential was not on the freeway and there were fewer commercial uses on the east side. The team had not been as limiting to say they wanted to allow the market to determine, to some degree, a mix of uses appropriate for a main street district/town center type development and was more open to the private sector determining where and how that was implemented, but certain unwanted uses would be removed. Determining whether certain areas should have more specific direction was a valuable conversation that could evolve through public discussion or with the Commission and City Council.
    - Certainly, a balance was needed between being specific enough and yet not too specific. From conversations about these issues over the years, the public was very wary of apartment construction and development. The concern was that every square inch of space that could be potentially designated as residential, would be designated residential and then turn into an apartment complex, and that was exactly what could happen. The situation could get too big, too fast, and become uncontrollable because the City did not take the opportunity to control it.
        - It was important to not be too specific and allow the market to have a better role in determining what developed, but a lack of trust also existed that if the Commission was not more specific, some market elements would run away with it. The concept plan did not provide any balance with respect to residential based on how terrified citizens were about being too open with what could be residential and what it would look like.
        - Starting to look at specific uses with respect to scale and location within Town Center would be a great discussion for the next Task Force meeting.
- Building incentives into the development design standards as tradeoffs for developers was suggested to allow the market to decide what it wanted, while retaining some City control without being too prescriptive. For example, getting a green light faster in the permitting process if certain developments were proposed, such as restaurants along Parkway.

Ms. Bateschell confirmed the team received a lot of helpful feedback, especially on what particular challenges the Commission saw facing the team as it moved forward. The issues and concerns raised by the Commission would be taken back to the Task Force for further refinement before the December 4th Joint Planning Commission/City Council Work Session. An initial sensitivity analysis would also be done on traffic to make sure any red flags were addressed before the draft concept plan went public. The team hoped to present a concept plan recommendation to the public at the beginning of next year for further refinement, input, and confirmation, as well as to address any issues raised in response the Plan.

C. I-5 Exit 283-282 Interchange Facilities Plan (Kraushaar)

Nancy Kraushaar, Community Development Director, stated the City and Oregon Department of Transportation (ODOT) recently started a joint study of I-5 between the Wilsonville Road, Canby, and Hubbard interchanges, which was an area that experienced extreme congestion. She was the City's Project Manager while Mr. Makler was ODOT's Project Manager. In order to include something in the 2018 Regional Transportation Plan (RTP), ODOT needed a public process and an area study to see if there was a solution that could become a project to add to the RTP. ODOT asked the City to provide the public involvement piece for the joint study, which would be manageable and done within the next six months. The first step in the public involvement process was briefing the Planning Commission about the project.

Jon Makler, Region 1 Planning Manager, Oregon Department of Transportation (ODOT), noted the intent of tonight's presentation was to ensure this planning activity reflected both the City's and State's interests with regard to I-5 in the subject area. Given the numerous emails and phone calls received from business owners

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and residents about traffic on I-5 and the interchanges, ODOT was well aware of the effect this facility had on the vitality, livability, and safety of the Wilsonville community and businesses.

- He presented the I-5 Wilsonville Facility Plan via PowerPoint, describing the issue and contributing factors, and highlighting the purpose, scope, and schedule of the proposed facilities project, which would include widening and seismically upgrading the Boone Bridge.

Discussion and feedback from the Planning Commission and responses to Commissioner questions were as follows:

- The traffic data showed that 10,000 cars, or 15 percent of the 62,000 vehicles a day, went south on I-5 via Exit 283. Mr. Makler would research how the numbers changed in the Peak Hour and provide that to the Commission.
- In light of the considerable regional importance of the project, a considerable amount of public and stakeholder outreach was proposed (Slide 6). The Technical advisory committee would be comprised of staff from ODOT, the City, and Clackamas and Washington Counties. Washington County recently completed a freight study, so the information and findings of that study would be available.
    - The stakeholder group outreach would include the Wilsonville Chamber of Commerce, Oregon Freight Advisory Committee, and the French Prairie Forum, a long-standing forum that included representatives from many other counties, special districts, and others south of Wilsonville. An assembly of Wilsonville citywide homeowner association (HOA) presidents would be formed as another stakeholder group.
    - The Planning Commission, as the Committee for Citizen Involvement, would also hold an open house.
    - Advocates opposed to any kind of freeway expansion might become involved as word got out. Technically, the project was intended to significantly improve operations.
- Once the joint study was completed and if the I-5 project ended up in the RTP, there were no promises for funding, as the project would have to compete with the other needs throughout the corridor and the Portland region. Priorities already set included Highway 217, the Abernathy Bridge, widening I-205 between Oregon City and I-5, and the huge Rose Quarter project. It could take years before the project was designed and constructed, but this was the first step in the process.
- This was not just a Wilsonville problem. ODOT had heard most from Clackamas County about the congestion on I-5. Clackamas County had been working on several ways to improve connections between Canby and I-5, but regardless of which route driver take to I-5, this section was the next critical bottleneck for traffic. Therefore, Clackamas County was the next stakeholder, geographically.
- The stakeholders in this project ranged from California to Seattle, especially in light of tourism and football games at Oregon and Oregon State. The project was critical for Wilsonville for safety, convenience, and commerce.
- The City of Wilsonville would host an information page on the City's website, though the results of the study were expected rather quickly.
- The project would actual widen the freeway to add another lane, as there was insufficient room on the Boone Bridge to simply paint another lane.
- The project would be coordinated with the French Prairie Bridge project to ensure access for bicyclists and pedestrians currently using the Boone Bridge.
- Years ago, a transit master plan discussed trying to hang a pedestrian/bicycle bridge off the existing Boone Bridge, but comments were made about the bridge not being strong enough because it had to be wide enough for an ODOT sweeper to cross. Comments were also made that one side of the bridge was weaker than the other because the footings were wood.
    - One project feature was to retrofit the Boone Bridge to be seismically resilient, so these were all valid issues to consider as found when working on the Abernathy Bridge recently. Retrofitting the Boone Bridge would be similar to the Abernathy Bridge, which involved reinforcing footings and columns, and even creating considerably larger footings for the bridge, which was a big cost driver on the Abernathy Bridge as much of that work was below the water line. Retrofitting the Boone Bridge would be an expensive project, initially estimated at $150 million, but retrofitting and adding a lane on the Abernathy Bridge was about $200 to $250 million.

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- With regard to funding options for the project, there were two avenues to consider.
  - Metro's RTP process first required agencies to identify the revenue needed and then which projects the agency would add if that revenue amount were doubled. ODOT anticipated needing $1.5 billion in revenue over the life of the 2018 to 2040 RTP. This I-5 project was in that second category, and would be add if that revenue amount was double, so in Metro-speak, it was way out there.
  - The Legislature seemed to engage on transportation about every six to ten years, and the most recent package was completed in 2017. For a project of this scale, it would take an act of the legislature to move the project up in line or create a program to address seismic risk projects and pick this project. The reality was the project was in competition with other compelling seismic risks around the state.
- There was discussion during the last legislative session about doing a larger study of the I-5 corridor, which could potentially be discussed when the legislature convened in February. That larger study should not be confused with this joint study, which would look at the Boone Bridge and how to reduce the friction between these two major interchanges in the hopes of improving operations. The I-5 corridor study would look at a broader perspective, such as how to get better transit further to the north and south.

III. INFORMATIONAL

A. City Council Action Minutes: (10.02.2017 and 10.16.2017)

There were no comments.

B. 2017 & 2018 Planning Commission Work Program

Chris Neamtzu, Planning Director, noted a lot of items were still coming in for the Commission's 2018 work program, including the citywide Parks and Recreation Master Plan and the Equitable Housing Grant. Staff would prepare a more thoughtful work program for discussion at the Commission's next meeting. He addressed clarifying questions.

- With regard to work in 2018 on the French Prairie Bridge, he noted *The Spokesman*'s front-page article reported about the bridge, the archaeological study, and short-term challenges. Until Staff, the consultants, and the Federal Highway Administration finished working through the issues, it was difficult to set a schedule. He would work with Zach Weigel to prepare a program with some dates for open houses and work sessions.

Chair Greenfield expressed concern about not having a joint work session with City Council on the Old Town

- Mr. Neamtzu reported City Council approved the Old Town Design Standards on first reading and was appreciative of the Planning Commission's thorough work. The record the Commission built around the Old Town Neighborhood Plan was helpful. Council made essentially no amendments to the Design Standards, perhaps two small word clarifications on the text itself, and the Pattern Book was approved as recommended by the Commission.

IV. ADJOURNMENT

The meeting was adjourned at 8:27 p.m.

Respectfully submitted,

By Paula Pinyerd of ABC Transcription Services, Inc. for
Tami Bergeron, Administrative Assistant - Planning

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PLANNING COMMISSION

WEDNESDAY, DECEMBER 13, 2017

II. WORK SESSION

A. Water Treatment Plant Master Plan (Mende) (45 minutes)

PLANNING COMMISSION WORKSESSION MEETING
STAFF REPORT

<table>
<tr><td>Meeting Date: December 13, 2017</td><td colspan="2">Subject: 2017 Water Treatment Plant Master Plan Update

Staff Member: Eric Mende, PE, Capital Projects Engineering Manager
Department: Community Development</td></tr>
<tr><td>Action Required</td><td colspan="2">Advisory Board/Commission Recommendation</td></tr>
<tr><td>☐ Motion
☐ Public Hearing Date:
☐ Ordinance 1st Reading Date:
☐ Ordinance 2nd Reading Date:
☐ Resolution
☒ Information or Direction
☐ Information Only
☐ Council Direction
☐ Consent Agenda</td><td colspan="2">☐ Approval
☐ Denial
☐ None Forwarded
☒ Not Applicable
Comments:</td></tr>
<tr><td colspan="3">Staff Recommendation: n/a</td></tr>
<tr><td colspan="3">Recommended Language for Motion: n/a</td></tr>
<tr><td colspan="3">Project / Issue Relates To: [Identify which goal(s), master plans(s) your issue relates to.]</td></tr>
<tr><td>☐Council Goals/Priorities</td><td>☐Adopted Master Plan(s)</td><td>☐Not Applicable</td></tr>
</table>

ISSUE BEFORE PC: Initial review of the Draft 2017 Water Treatment Plant Master Plan Update. Staff and Consultants will provide a short briefing and powerpoint, with most of the time reserved for questions from the Commission.

EXECUTIVE SUMMARY: The 2017 Willamette River Water Treatment Plant Master Plan Update (2017 Update) supplements and expands upon a more intensive and detailed 2015 Willamette River Water Treatment Plant Master Plan Update (2015 Plan) performed by Tualatin Valley Water District (TVWD), and completed in December 2016. The 2015 Plan focused primarily on long range regional water supply issues, with particular attention given to the feasibility of constructing a second, independent water treatment facility on the upper portion of the treatment plant site to provide service to Hillsboro, Beaverton and the TVWD. At the time of it's completion in December 2016, it was felt that the non-Wilsonville focus of the 2015 Plan did not warrant consideration by the Wilsonville Planning Commission, and subsequent adoption into Wilsonville's Comprehensive Plan.

The current 2017 Update before Planning Commission focusses directly on the existing water treatment plant, and considers near term and longer term expansion of the plant driven by growth, as well as the associated repairs, replacements and operational improvements needed to ensure a high quality and reliable source of water for the City. Where appropriate, such as for seismic retrofits to protect the raw water intake, elements of the 2015 Plan are incorporated into the 2017 Update.

EXPECTED RESULTS:
The 2017 Update is intended to be adopted by City Council and become part of the City's Comprehensive Plan.

TIMELINE:

Planning Commission Hearing in February.
City Council Hearing in March.

CURRENT YEAR BUDGET IMPACTS: None. The 2017 Update is budget, and will be completed this fiscal year.

FINANCIAL REVIEW / COMMENTS:
Reviewed by: Date:

LEGAL REVIEW / COMMENT:
Reviewed by: Date:

COMMUNITY INVOLVEMENT PROCESS: Planning Commission and City Council Hearings. No city-wide open houses are being conducted.

POTENTIAL IMPACTS or BENEFIT TO THE COMMUNITY (businesses, neighborhoods, protected and other groups): Continued reliable and clean drinking water supply.

ALTERNATIVES:

CITY MANAGER COMMENT:

ATTACHMENTS:

Attachment A: Executive Summary of Draft 2017 Master Plan Update.

(Full Draft Document is available via electronic PC Packet

https://or-wilsonville.civicplus.com/AgendaCenter)

ATTACHMENT A

City of Wilsonville

Willamette River Water Treatment Plant

2017 MASTER PLAN UPDATE

DRAFT | December 2017

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City of Wilsonville
Willamette River Water Treatment Plant

2017 MASTER PLAN UPDATE

Jude D. Grounds,
December 6, 2017,
State of Oregon,
P.E. No. 74678

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Contents

Appendices

To be added at a later date

Tables

Figures

Abbreviations

2015 MPU	2015 WRWTP Master Plan Update
BRP	Blue Ribbon Panel
C	Celsius
Caisson	Raw Water Intake Pump Station Caisson
CECs	Contaminants of Emerging Concern
CECs	contaminants of emerging concern
CFD	computational fluid dynamic
City	City of Wilsonville
DPB	disinfection by-product
EBMUD	East Bay Municipal Utility District
EPA	Environmental Protection Agency
ESA	Endangered Species Act
EWEB	Eugene Water and Electric Board
FERC	Federal Energy Regulatory Commission
ft	Feet
GAC	granular activated carbon
HABs	harmful algal blooms
IBC	International Building Code
JWC	Joint Water Commission
LOS	level of service
LOX	liquid oxygen
MCC	motor control centers
MCL	maximum contaminant level
mg/L	milligrams per liter
mgd	million gallons per day
MPU	Master Plan Update
mWh	megawatt hours
NAVD	North American Vertical Datum
NCOD	National Contaminant Occurrence Database
nm	nanometers
NMFS	National Marine and Fisheries Service
NTU	Nephelometric Turbidity Units
OAR	Oregon Administrative Rule
ODFW	Oregon Department of Fisheries and Wildlife
OHA	Oregon Health Authority
ORP	Oregon Resilience Plan

ORS	Oregon Revised Statutes
OSSAC	Oregon Seismic Safety Advisory Committee
OSSC	State of Oregon Structural Specialty and Fire and Life Safety Code
OWUC	Oregon Water Utility Council
PGE	Portland General Electric
PNW	Pacific Northwest
PPCPs	personal care products
ppd	pounds per day
PWB	Portland Water Bureau
RM	Richter Scale Magnitude
RWF	Raw Water Facility
SCADA	Supervisory Control and Data Acquisition
SCM	Streaming Current Monitor
SDWA	Safe Drinking Water Act
the Act	Oregon Drinking Water Quality Act
TOC	total organic carbon
TVWD	Tualatin Valley Water District
TVWD	Tualatin Valley Water District
UBC	Uniform Building Code
UCM	Unregulated Contaminant Monitoring
UCMR	Unregulated Contaminant Monitoring Rule
USGS	United States Geological Survey
WRWTP	Willamette River Water Treatment Plant
WRWTP	Willamette River Water Treatment Plant
WWSA	Willamette River Water Supply Agency
WWSP	Willamette Water Supply Program
µg/L	micrograms per liter

EXECUTIVE SUMMARY

ES.1 Introduction

The 2017 Willamette River Water Treatment Plant (WRWTP) Master Plan Update (2017 MPU) is presented herein for the cities of Wilsonville and Sherwood. The 2017 MPU defines the strategy to meet future demands, increase supply resiliency/reliability, and facilitate responsible growth.

The WRWTP was commissioned in 2002 for a treatment capacity of 15 mgd. To accommodate future drinking water needs of their own, the Tualatin Valley Water District (District) invested in the original construction of the WRWTP, oversizing many of the plant's facilities beyond the original capacity needs to more easily enable future expansion. Initially, both the District and the City of Wilsonville owned the WRWTP, owning 5 mgd and 10 mgd of the capacity, respectively. In 2012, the City of Sherwood purchased the District's 5 mgd capacity of the existing water treatment plant.

The existing property, located in Wilsonville along the Willamette River, is irregularly shaped, essentially creating two semi-contiguous parcels referred to as the Lower Site and an Upper Site. During original design, the Lower Site, home to the existing treatment plant, was planned to facilitate a future expansion of up to 70 mgd. The Upper Site plan was originally identified for future development in the *Willamette River Water Treatment Plant Master Plan* (MWH, 2006). That Master Plan demonstrated enough space for at least 100 mgd in additional capacity at the Upper Site. Combined, both sites have a 170 mgd potential total capacity.

Since the 2006 Master Plan, several events have occurred that changed planning-level construction and operational decisions for expanding the WRWTP. These include:

- In 2012, the District sold 5 mgd of the plant's capacity to the City of Sherwood.
- In 2013, the District and the City of Hillsboro identified the mid-Willamette supply alternative as its preferred supplemental supply option, which laid the foundation for the Willamette Water Supply Program (WWSP).
- In 2014, the City of Wilsonville led a coalition of utilities that petitioned the Oregon Health Authority (OHA) for the right to recognize the disinfection benefits intermediate ozonation.
- In 2015, the City and WWSP stakeholders updated the WRWTP Master Plan (MWH, 2006) to determine how the existing plant could be expanded to meet future demands.
- As of 2017, the WRWTP is expected to exclusively supply Wilsonville and Sherwood. However, the oversized river intake and raw water pumping station will be expanded to provide raw water to both the WRWTP and the proposed WWSP treatment facilities.

The 2015 WRWTP MPU is updated herein to address these changes.

The 2017 MPU has the following key planning objectives:

1. Outline steps needed to expand the existing WRWTP infrastructure to maximize the return on previous investments.
2. Optimize process selection and layout to meet capacity and water quality goals at the expanded WRWTP.

3. Establish the near- and long-term plant expansion strategy for the 20-year planning horizon; establish a cash-flow strategy to guide future financial planning.
4. Ensure WWSP-related facilities, including raw water pumping, surge and standby power infrastructure, do not prevent the cities of Wilsonville and Sherwood from meeting their ultimate/build-out demands via expansion of the existing WRWTP on the current site.

ES.2 Plant Expansion and Level of Service Goals

In addition to these objectives, the levels of service (LOS) goals were used to establish the preliminary site plans and associated construction and operations cost estimates.

Municipal utilities in the United States and elsewhere commonly use LOS standards to evaluate whether the physical system and operations are functioning to an adequate level. LOS can be defined in terms of the customer's experience of utility service and/or technical standards based on professional expertise of utility staff.

LOS standards can help guide investments in maintenance, repair, and replacement; and for new assets can be used to establish design criteria and prioritize needs. Using a structured decision process that incorporates LOS can help a utility achieve desired service outcomes while minimizing life-cycle costs.

The LOS goals are intended to address only the facilities required to operate the expanded WRWTP and do not apply to City infrastructure outside of the WTP fence line. The goals, first developed with the Participants of the ***2015 MPU*** during a project workshop, and adopted by the Partcipants' governing bodies. These goals, which were revisited and re-confirmed during a ***2017 MPU*** workshop, are shown in Table ES.1.

Table ES.1 City of Wilsonville and Sherwood Treatment LOS Goals

LOS Goal	Regional Event (Seismic)	Local Event (Non-Seismic)
"Following a W catastrophic event ...	2,500 year	Per occurrence
...within X days/weeks of the event...	48 hours	14 days
...deliver Y % of average day demand...	50% of nameplate capacity	100% of nameplate capacity
...with Z water quality."	Potable (at minimum regulatory requirement)	Potable (at plant's intended treatment processes and procedures)

An example LOS goal from Table ES.1 is that 48 hours after a 2,500-year regional (seismic) event, 50 percent of the nameplate treatment plant production capacity will be available with potable water quality that meets minimum regulatory requirements. Within 14 days after a local (non-seismic) event, 100 percent of the nameplate production capacity will be available with potable water quality (at plant's intended treatment processes and procedures).

The costs associated with achieving these LOS goals were developed and confirmed to fall within the Cities' affordability and risk tolerances. As such, it is recommended these LOS goals continue to guide the WRWTP planning efforts.

ES.3 Existing Facilities and Operational Performance

When the 2006 WRWTP Master Plan was completed (approximately four years after plant start-up), the City of Wilsonville was the only consumer of WRWTP finished water. In mid-2012, the City of Sherwood started using finished water from the WRWTP as its primary supply. With demand from both cities, the plant moved from operating on a daily start/stop basis for 8 to 16 hours per day, depending on demand, to operating 24 hours per day, year-round. Because hours of operation impact plant operations and the expanded plant will continue to operate continuously, the plant performance data evaluated for this Master Plan Update was limited to 2012 through 2014, as included in the 2015 MPU; no additional plant performance data was analyzed as part of this 2017 MPU.

2015 MPU review of the plant performance data demonstrates exceptional operational plant performance for turbidity removal, disinfection levels, TOC removal, and low disinfection by-product (DBP) formation potential. The extremely narrow range between the 5 and 95 percentile value for key water quality parameters such as turbidity, pH, and chlorine residual is a testament to the plant's robust design and its operators' attention to continuous optimal performance.

ES.4 Historical Raw and Finished Water Quality

Raw water quality data from May 2006 through 2014 was collected, reviewed and compared to the data collected and presented in the 2006 Master Plan and 2015 MPU. The few contaminants detected in the raw water at trace levels have not been measured in the finished water.

The historical finished water quality data confirms that the plant consistently surpasses existing finished water regulatory requirements. The high-quality source water, coupled with the robust treatment process result in excellent finished water quality delivered to the customers. The current treatment steps are expected to continue to meet anticipated future regulatory requirements with minor modifications to the treatment process procedures.

ES.5 Existing Infrastructure

To supplement previous efforts and help continue to lay the groundwork for future expansions, additional electrical, seismic, life-safety, and electrical survey of the WRWTP was completed as part of the ***2017 MPU***.

ES.5.1 Electrical Supply and Distribution CIP

To meet the 2022 site capacity of nominally 20 mgd, the plant's electrical supply and distribution system will need significant upgrades. Preliminary engineering for the 20 mgd capacity expansion at the WRWTP will require a detailed analysis of electrical supply alternatives, including backup power requirements. Improving the overall 'backbone' of electrical and standby power supply is recommended to occur in parallel with the upcoming 20 mgd capacity expansion project.

ES.5.2 Seismic Evaluation CIP

The preliminary structural analysis identified both structural and non-structural vulnerabilities that may impact plant performance in a regional catastrophic seismic event. Preliminary engineering analysis at the WTWTP results in recommendations of inclusion of seismic retrofits to minimize 'down time' of existing infrastructure, and ensure plant performance following a catastrophic event.

ES.5.3 Life-Safety Evaluation CIP

The preliminary life-safety analysis identified issues related to building code or structural improvement requirements. Recommendations to implement these modifications to protect worker safety following a catastrophic seismic event are included in this 2017 MPU.

ES.6 WRWTP Expansion CIP

Projected demands were submitted by the Cities of Wilsonville and Sherwood based on each city's individual planning studies. To meet the ultimate combined maximum day demand of both cities of 30 mgd by 2036 as shown in Figure ES.1, the recommended plant capacity expansion, and phasing strategy is as follows:

- Preliminary design of the near-term expansion will likely begin in 2019 to bring the plant capacity of the WRWTP from 15 mgd to 20 mgd by 2022.
- Total raw water intake capacity for both WRWTP and WWSP will be between 80 mgd and 84 mgd by 2026.
- Preliminary design of the 30 mgd expansion will likely begin in 2032 to bring the nameplate capacity of the WRWTP from 20 mgd to 30 mgd by 2035.
- Capacity expansion projects are assumed to be completed two years before the capacity is needed to allow flexibility – the 20 mgd capacity expansion will be completed in 2022, and the 30 mgd capacity expansion will be completed in 2036.

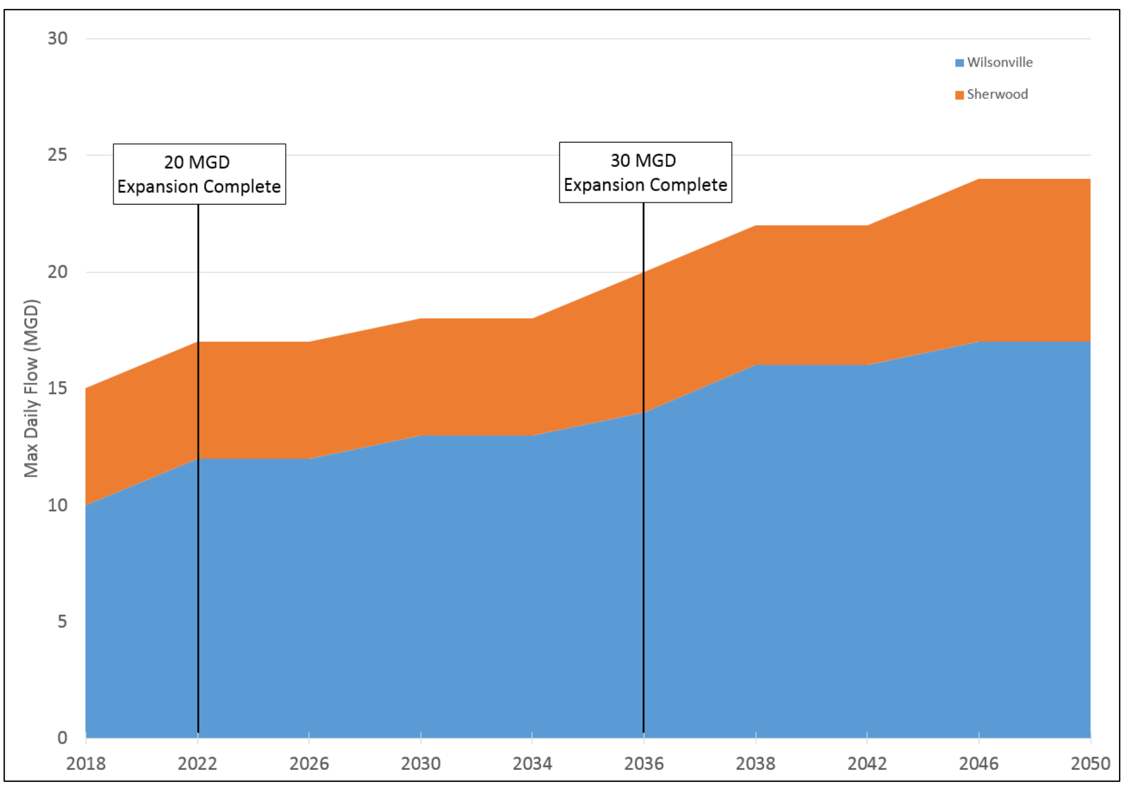

Figure ES.1 WRWTP Capacity Projections and Recommended Expansion Phasing

ES.6.1 20-MGD Expansion CIP

As outlined in the 2015 MPU, the 20 mgd WRWTP expansion will be accomplished by uprating the existing treatment processes rather than constructing additional basins. For the primary treatment processes, the uprating will include the following:

- Increasing the Actiflo® flow rate from 7.5 mgd per basin to 10 mgd per basin
- Increasing the ozonation basin flow rate from 7.5 mgd per basin to 10 mgd per basin. This will decrease the ozone contact time from 15 minutes to 11 minutes, which still allows sufficient contact time for 1-log *Cryptosporidium* inactivation, provided increased levels of ozone can be dosed in the contactor.
- Increasing the filtration rate to a nominal rate of 5.7 gpm/sf and a maximum rate of 7.5 gpm/sf with one filter off-line to a nominal rate of 7.5 gpm/sf and a maximum rate of 10 gpm/sf when one basin is offline. This increased filtration rate will require approval from OHA prior to increasing plant capacity. To support OHA approval, a full-scale pilot study should be conducted in which the filtration rate is gradually increased and water quality is closely monitored.

Figure ES.2 depicts the site layout following completion of the 20-mgd capacity expansion.

ES.6.2 30-MGD Expansion CIP

Two alternatives were considered for the 30 mgd expansion:

1. Installation of one additional process train (i.e., 1 Actiflo® basin, 1 ozone basin, and 2 filters)
2. Installation of two additional treatment process trains(i.e., 2 Actiflo® basins, 2 ozone basins, and 4 filters)

Both alternatives would need the LOS goal in the event of a regional seismic event, but Alternative 1 would have limited treatment rates during equipment maintenance. For example, during filter backwash, the maximum filtration rate of 12 gpm/sf would limit finished water production to 8 mgd. However, the capital and operating costs required for Alternative 2 make it undesirable as it would result in higher rates for residents of Wilsonville and Sherwood. Therefore, it is recommended that the WRWTP construct Alternative 1 and identify an additional water supply that may be used to help meet the LOS goal after a regional seismic event.

Based on the selection of Alternative 1, the 30 md expansion includes the following major construction projects:

- Construction of one Actiflo® basin.
- Construction of one ozonation basin.
- Construction of two filters.
- Construction of one 35-foot diameter gravity thickener.

Figure ES.3 depicts the site layout following completion of the 30-mgd capacity expansion. As recommended in the 2015 MPU, space is dedicated for future AOP process (e.g., UV treatment, etc.) for these steps improves the ability of the future expanded WRWTP to be able to treat constituents of emerging concern.

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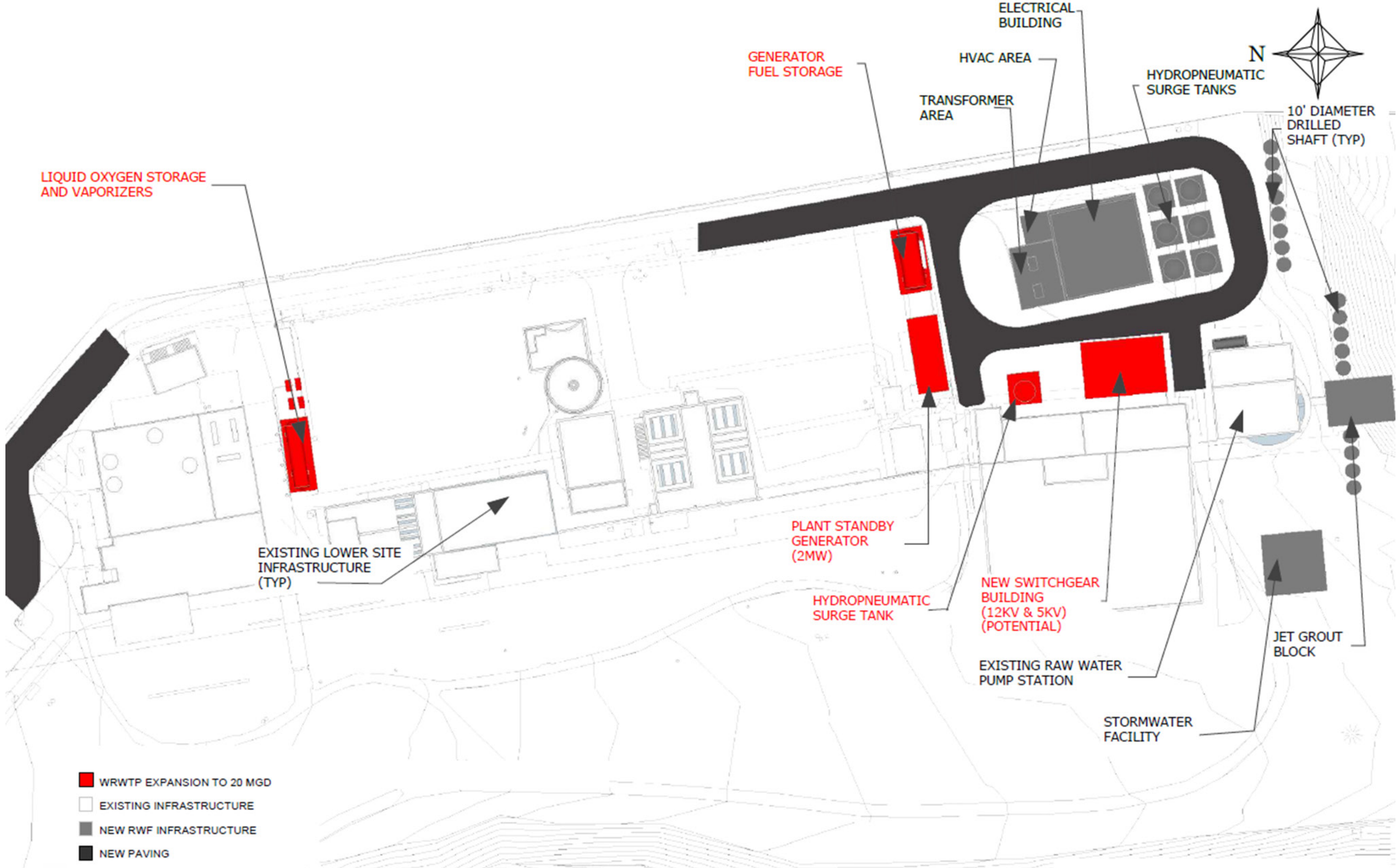

Figure ES.2 Site Plan – 20-MGD Capacity Expansion

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ATTACHMENT A

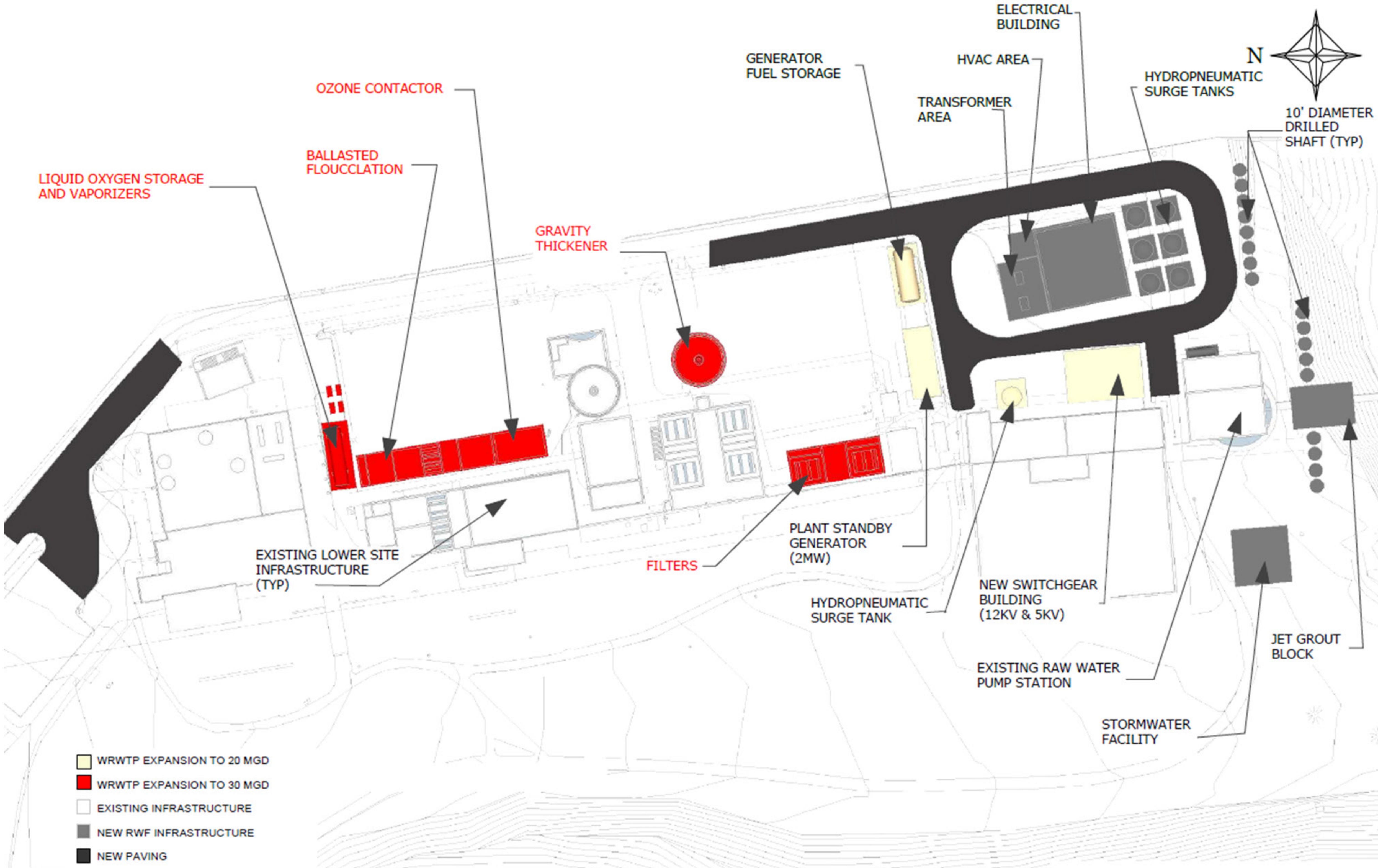

Figure ES.3 Site Plan – 30-MGD Capacity Expansion

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ES.6.3 Electrical Expansion CIP

The electrical system is loaded above 80% of listed capacity and is considered overloaded. Additionally, the existing emergency generator is not connected to all WRWTP equipment (for example, it is only wired to Actiflo® Basin 2) and only has sufficient capacity to power the 4 mgd raw and finished water pumps.

Based on these evaluations, it is recommended that the plant upgrade its existing electrical equipment as part of the 20 mgd expansion to ensure service is not interrupted due to electrical fault. The following upgrades are recommended:

- **Switchgear Replacement**: Recommend replacement with a 15 KV metering switchgear and 5 KV transformer, which should be sufficient to power the WRWTP through 60 MGD
- **Emergency Generator Replacement**: Recommend replacement with a 2 MW generator wired directly to the 15 KV metering switchgear. This replacement will allow all plant equipment to be run on the emergency generator.
- **Plant Rewiring**: Recommend connection of all finished water pumps to the 5 KV transformer/switchgear, which will leave sufficient capacity on the remaining transformers to provide power to the rest of the plant.

ES.6.4 Repair and Replacement CIP

In addition to the seismic and life-safety CIP, the WRWTP requires on-going maintenance/repair and replacement (R&R) of its existing infrastructure to ensure normal operations level of service goals. This ***2017 MPU*** presents a summary of repair and replacement projects for the WRWTP across a 20-year planning horizon.

ES.6.5 CIP Cost Estimates Summary

The existing WRWTP will require an interim expansion to 20 mgd by 2022 and a second expansion to 30 mgd by 2036.

Table ES.2 breaks down the capital costs the two expansions as well as related repair and replace projects, electrical equipment upgrades, life safety repairs, and seismic retrofits necessary to maintain plant operation. Table ES.3 provides additional detail for the repair and replace projects by year and dollar amount. The construction cost estimate presented herein is an American Association of Cost Engineers (AACE) Class 4 estimate, which is considered a concept/feasibility level estimate with approximately 5 percent of the design defined with an expected accuracy range of +50 percent to -30 percent.

Table ES.2 Estimated CIP Costs (2017 Dollars)

Project	Cost(1)	% Water Operations	% SDCs
20 mgd Expansion	$3,893,165	--	100%
30 mgd Expansion	$32,518,600	--	100%
Life Safety Repairs	$616,153	100%	--
Seismic Retrofits	$1,151,866	100%	--
Electrical Upgrades	$11,082,506	100%	--
Operations - Repair and Replace	$19,045,704	100%	--

Notes:
(1) Includes 15% design fee and 10% administrative cost.

Table ES.3 Operations – Repair and Replace Estimated CIP Cost (2017 Dollars)

Repair and Replace Year	Cost(1)	% Water Operations	% SDCs
2019	$2,035,169	100%	--
2020	$2,135,061	100%	--
2021	$12,513	100%	--
2022	$4,384,143	100%	--
2023	$12,513	100%	--
2024	$12,513	100%	--
2025	$12,513	100%	--
2026	$12,513	100%	--
2027	$5,213,450	100%	--
2028	$12,513	100%	--
2029	$12,513	100%	--
2030	$12,513	100%	--
2031	$12,513	100%	--
2032	$2,476,513	100%	--
2033	$12,513	100%	--
2034	$12,513	100%	--
2035	$12,513	100%	--
2036	$2,651,218	100%	--

Notes:
(1) Includes 10% administrative cost.

ES.7 Implementation Plan

To meet the growing water demands from Wilsonville and Sherwood, the existing WRWTP will first be expanded to a capacity of 20 mgd, followed by a 30 mgd expansion near the end of this planning horizon. A preliminary and final design and construction schedule is summarized in Table ES.4.

Table ES.4 WRWTP Expansion Design and Construction Schedule

Project	Approx Service Year	Duration (Months))		Start Date
		Design	Construction	
Operations - Repair and Replace	2020	8	8	2018
20 MGD Capacity Expansion	2022	12	18	2019
Life Safety Repairs	2022	6	6	2021
Repair and Replace	2022	6	8	2020
Seismic Retrofits	2022	4	6	2021
Repair and Replace	2027	4	6	2026
Repair and Replace	2032	4	6	2031
Repair and Replace	2036	4	6	2035

30 MGD Capacity Expansion	2036	10	24	2033
20 MGD Capacity Expansion	2022	12	18	2019
Life Safety Repairs	2022	6	6	2021
Seismic Retrofits	2022	4	6	2021
Electrical Upgrades	2022	6	8	2020
30 MGD Capacity Expansion	2036	10	24	2033
Operations – Repair and Replace				
Year I	2018	0	0	--
Year II	2019	0	6	2018
Year III	2020	0	6	2019
Year IV	2021	0	3	2021
Year V	2022	6	9	2020
Year VI	2023	0	3	2023
Year VII	2024	0	3	2024
Year VIII	2025	0	3	2025
Year IX	2026	0	3	2026
Year X	2027	0	9	2026
Year XI	2028	0	3	2028
Year XII	2029	0	3	2029
Year XIII	2030	0	3	2030
Year XV	2031	0	3	2031
Year XVI	2032	0	9	2031
Year XVII	2033	0	3	2033
Year XVIII	2034	0	3	2034
Year XIV	2035	0	3	2035
Year XX	2036	0	12	2035

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City of Wilsonville

Willamette River Water Treatment Plant

2017 MASTER PLAN UPDATE

DRAFT | December 2017

City of Wilsonville
Willamette River Water Treatment Plant

2017 MASTER PLAN UPDATE

Jude D. Grounds,
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Appendices

To be added at a later date

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Abbreviations

2015 MPU	2015 WRWTP Master Plan Update
BRP	Blue Ribbon Panel
C	Celsius
Caisson	Raw Water Intake Pump Station Caisson
CECs	Contaminants of Emerging Concern
CECs	contaminants of emerging concern
CFD	computational fluid dynamic
City	City of Wilsonville
DPB	disinfection by-product
EBMUD	East Bay Municipal Utility District
EPA	Environmental Protection Agency
ESA	Endangered Species Act
EWEB	Eugene Water and Electric Board
FERC	Federal Energy Regulatory Commission
ft	Feet
GAC	granular activated carbon
HABs	harmful algal blooms
IBC	International Building Code
JWC	Joint Water Commission
LOS	level of service
LOX	liquid oxygen
MCC	motor control centers
MCL	maximum contaminant level
mg/L	milligrams per liter
mgd	million gallons per day
MPU	Master Plan Update
mWh	megawatt hours
NAVD	North American Vertical Datum
NCOD	National Contaminant Occurrence Database
nm	nanometers
NMFS	National Marine and Fisheries Service
NTU	Nephelometric Turbidity Units
OAR	Oregon Administrative Rule
ODFW	Oregon Department of Fisheries and Wildlife
OHA	Oregon Health Authority
ORP	Oregon Resilience Plan

ORS	Oregon Revised Statutes
OSSAC	Oregon Seismic Safety Advisory Committee
OSSC	State of Oregon Structural Specialty and Fire and Life Safety Code
OWUC	Oregon Water Utility Council
PGE	Portland General Electric
PNW	Pacific Northwest
PPCPs	personal care products
ppd	pounds per day
PWB	Portland Water Bureau
RM	Richter Scale Magnitude
RWF	Raw Water Facility
SCADA	Supervisory Control and Data Acquisition
SCM	Streaming Current Monitor
SDWA	Safe Drinking Water Act
the Act	Oregon Drinking Water Quality Act
TOC	total organic carbon
TVWD	Tualatin Valley Water District
TVWD	Tualatin Valley Water District
UBC	Uniform Building Code
UCM	Unregulated Contaminant Monitoring
UCMR	Unregulated Contaminant Monitoring Rule
USGS	United States Geological Survey
WRWTP	Willamette River Water Treatment Plant
WRWTP	Willamette River Water Treatment Plant
WWSA	Willamette River Water Supply Agency
WWSP	Willamette Water Supply Program
µg/L	micrograms per liter

EXECUTIVE SUMMARY

ES.1 Introduction

The 2017 Willamette River Water Treatment Plant (WRWTP) Master Plan Update (2017 MPU) is presented herein for the cities of Wilsonville and Sherwood. The 2017 MPU defines the strategy to meet future demands, increase supply resiliency/reliability, and facilitate responsible growth.

The WRWTP was commissioned in 2002 for a treatment capacity of 15 mgd. To accommodate future drinking water needs of their own, the Tualatin Valley Water District (District) invested in the original construction of the WRWTP, oversizing many of the plant's facilities beyond the original capacity needs to more easily enable future expansion. Initially, both the District and the City of Wilsonville owned the WRWTP, owning 5 mgd and 10 mgd of the capacity, respectively. In 2012, the City of Sherwood purchased the District's 5 mgd capacity of the existing water treatment plant.

The existing property, located in Wilsonville along the Willamette River, is irregularly shaped, essentially creating two semi-contiguous parcels referred to as the Lower Site and an Upper Site. During original design, the Lower Site, home to the existing treatment plant, was planned to facilitate a future expansion of up to 70 mgd. The Upper Site plan was originally identified for future development in the *Willamette River Water Treatment Plant Master Plan* (MWH, 2006). That Master Plan demonstrated enough space for at least 100 mgd in additional capacity at the Upper Site. Combined, both sites have a 170 mgd potential total capacity.

Since the 2006 Master Plan, several events have occurred that changed planning-level construction and operational decisions for expanding the WRWTP. These include:

- In 2012, the District sold 5 mgd of the plant's capacity to the City of Sherwood.
- In 2013, the District and the City of Hillsboro identified the mid-Willamette supply alternative as its preferred supplemental supply option, which laid the foundation for the Willamette Water Supply Program (WWSP).
- In 2014, the City of Wilsonville led a coalition of utilities that petitioned the Oregon Health Authority (OHA) for the right to recognize the disinfection benefits intermediate ozonation.
- In 2015, the City and WWSP stakeholders updated the WRWTP Master Plan (MWH, 2006) to determine how the existing plant could be expanded to meet future demands.
- As of 2017, the WRWTP is expected to exclusively supply Wilsonville and Sherwood. However, the oversized river intake and raw water pumping station will be expanded to provide raw water to both the WRWTP and the proposed WWSP treatment facilities.

The 2015 WRWTP MPU is updated herein to address these changes.

The 2017 MPU has the following key planning objectives:

1. Outline steps needed to expand the existing WRWTP infrastructure to maximize the return on previous investments.
2. Optimize process selection and layout to meet capacity and water quality goals at the expanded WRWTP.

3. Establish the near- and long-term plant expansion strategy for the 20-year planning horizon; establish a cash-flow strategy to guide future financial planning.
4. Ensure WWSP-related facilities, including raw water pumping, surge and standby power infrastructure, do not prevent the cities of Wilsonville and Sherwood from meeting their ultimate/build-out demands via expansion of the existing WRWTP on the current site.

ES.2 Plant Expansion and Level of Service Goals

In addition to these objectives, the levels of service (LOS) goals were used to establish the preliminary site plans and associated construction and operations cost estimates.

Municipal utilities in the United States and elsewhere commonly use LOS standards to evaluate whether the physical system and operations are functioning to an adequate level. LOS can be defined in terms of the customer's experience of utility service and/or technical standards based on professional expertise of utility staff.

LOS standards can help guide investments in maintenance, repair, and replacement; and for new assets can be used to establish design criteria and prioritize needs. Using a structured decision process that incorporates LOS can help a utility achieve desired service outcomes while minimizing life-cycle costs.

The LOS goals are intended to address only the facilities required to operate the expanded WRWTP and do not apply to City infrastructure outside of the WTP fence line. The goals, first developed with the Participants of the ***2015 MPU*** during a project workshop, and adopted by the Partcipants' governing bodies. These goals, which were revisited and re-confirmed during a ***2017 MPU*** workshop, are shown in Table ES.1.

Table ES.1 City of Wilsonville and Sherwood Treatment LOS Goals

LOS Goal	Regional Event (Seismic)	Local Event (Non-Seismic)
"Following a W catastrophic event ...	2,500 year	Per occurrence
...within X days/weeks of the event...	48 hours	14 days
...deliver Y % of average day demand...	50% of nameplate capacity	100% of nameplate capacity
...with Z water quality."	Potable (at minimum regulatory requirement)	Potable (at plant's intended treatment processes and procedures)

An example LOS goal from Table ES.1 is that 48 hours after a 2,500-year regional (seismic) event, 50 percent of the nameplate treatment plant production capacity will be available with potable water quality that meets minimum regulatory requirements. Within 14 days after a local (non-seismic) event, 100 percent of the nameplate production capacity will be available with potable water quality (at plant's intended treatment processes and procedures).

The costs associated with achieving these LOS goals were developed and confirmed to fall within the Cities' affordability and risk tolerances. As such, it is recommended these LOS goals continue to guide the WRWTP planning efforts.

ES.3 Existing Facilities and Operational Performance

When the 2006 WRWTP Master Plan was completed (approximately four years after plant start-up), the City of Wilsonville was the only consumer of WRWTP finished water. In mid-2012, the City of Sherwood started using finished water from the WRWTP as its primary supply. With demand from both cities, the plant moved from operating on a daily start/stop basis for 8 to 16 hours per day, depending on demand, to operating 24 hours per day, year-round. Because hours of operation impact plant operations and the expanded plant will continue to operate continuously, the plant performance data evaluated for this Master Plan Update was limited to 2012 through 2014, as included in the 2015 MPU; no additional plant performance data was analyzed as part of this 2017 MPU.

2015 MPU review of the plant performance data demonstrates exceptional operational plant performance for turbidity removal, disinfection levels, TOC removal, and low disinfection by-product (DBP) formation potential. The extremely narrow range between the 5 and 95 percentile value for key water quality parameters such as turbidity, pH, and chlorine residual is a testament to the plant's robust design and its operators' attention to continuous optimal performance.

ES.4 Historical Raw and Finished Water Quality

Raw water quality data from May 2006 through 2014 was collected, reviewed and compared to the data collected and presented in the 2006 Master Plan and 2015 MPU. The few contaminants detected in the raw water at trace levels have not been measured in the finished water.

The historical finished water quality data confirms that the plant consistently surpasses existing finished water regulatory requirements. The high-quality source water, coupled with the robust treatment process result in excellent finished water quality delivered to the customers. The current treatment steps are expected to continue to meet anticipated future regulatory requirements with minor modifications to the treatment process procedures.

ES.5 Existing Infrastructure

To supplement previous efforts and help continue to lay the groundwork for future expansions, additional electrical, seismic, life-safety, and electrical survey of the WRWTP was completed as part of the ***2017 MPU***.

ES.5.1 Electrical Supply and Distribution CIP

To meet the 2022 site capacity of nominally 20 mgd, the plant's electrical supply and distribution system will need significant upgrades. Preliminary engineering for the 20 mgd capacity expansion at the WRWTP will require a detailed analysis of electrical supply alternatives, including backup power requirements. Improving the overall 'backbone' of electrical and standby power supply is recommended to occur in parallel with the upcoming 20 mgd capacity expansion project.

ES.5.2 Seismic Evaluation CIP

The preliminary structural analysis identified both structural and non-structural vulnerabilities that may impact plant performance in a regional catastrophic seismic event. Preliminary engineering analysis at the WTWTP results in recommendations of inclusion of seismic retrofits to minimize 'down time' of existing infrastructure, and ensure plant performance following a catastrophic event.

ES.5.3 Life-Safety Evaluation CIP

The preliminary life-safety analysis identified issues related to building code or structural improvement requirements. Recommendations to implement these modifications to protect worker safety following a catastrophic seismic event are included in this 2017 MPU.

ES.6 WRWTP Expansion CIP

Projected demands were submitted by the Cities of Wilsonville and Sherwood based on each city's individual planning studies. To meet the ultimate combined maximum day demand of both cities of 30 mgd by 2036 as shown in Figure ES.1, the recommended plant capacity expansion, and phasing strategy is as follows:

- Preliminary design of the near-term expansion will likely begin in 2019 to bring the plant capacity of the WRWTP from 15 mgd to 20 mgd by 2022.
- Total raw water intake capacity for both WRWTP and WWSP will be between 80 mgd and 84 mgd by 2026.
- Preliminary design of the 30 mgd expansion will likely begin in 2032 to bring the nameplate capacity of the WRWTP from 20 mgd to 30 mgd by 2035.
- Capacity expansion projects are assumed to be completed two years before the capacity is needed to allow flexibility – the 20 mgd capacity expansion will be completed in 2022, and the 30 mgd capacity expansion will be completed in 2036.

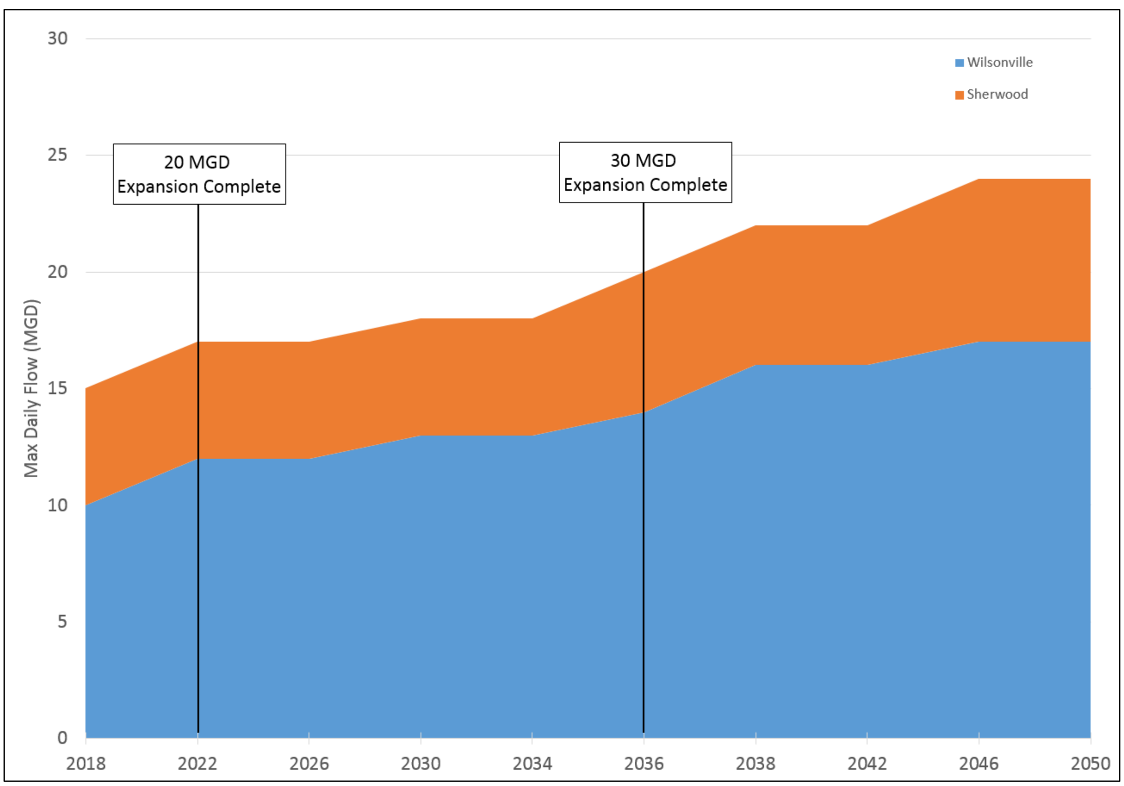

Figure ES.1 WRWTP Capacity Projections and Recommended Expansion Phasing

ES.6.1 20-MGD Expansion CIP

As outlined in the 2015 MPU, the 20 mgd WRWTP expansion will be accomplished by uprating the existing treatment processes rather than constructing additional basins. For the primary treatment processes, the uprating will include the following:

- Increasing the Actiflo® flow rate from 7.5 mgd per basin to 10 mgd per basin
- Increasing the ozonation basin flow rate from 7.5 mgd per basin to 10 mgd per basin. This will decrease the ozone contact time from 15 minutes to 11 minutes, which still allows sufficient contact time for 1-log *Cryptosporidium* inactivation, provided increased levels of ozone can be dosed in the contactor.
- Increasing the filtration rate to a nominal rate of 5.7 gpm/sf and a maximum rate of 7.5 gpm/sf with one filter off-line to a nominal rate of 7.5 gpm/sf and a maximum rate of 10 gpm/sf when one basin is offline. This increased filtration rate will require approval from OHA prior to increasing plant capacity. To support OHA approval, a full-scale pilot study should be conducted in which the filtration rate is gradually increased and water quality is closely monitored.

Figure ES.2 depicts the site layout following completion of the 20-mgd capacity expansion.

ES.6.2 30-MGD Expansion CIP

Two alternatives were considered for the 30 mgd expansion:

1. Installation of one additional process train (i.e., 1 Actiflo® basin, 1 ozone basin, and 2 filters)
2. Installation of two additional treatment process trains(i.e., 2 Actiflo® basins, 2 ozone basins, and 4 filters)

Both alternatives would need the LOS goal in the event of a regional seismic event, but Alternative 1 would have limited treatment rates during equipment maintenance. For example, during filter backwash, the maximum filtration rate of 12 gpm/sf would limit finished water production to 8 mgd. However, the capital and operating costs required for Alternative 2 make it undesirable as it would result in higher rates for residents of Wilsonville and Sherwood. Therefore, it is recommended that the WRWTP construct Alternative 1 and identify an additional water supply that may be used to help meet the LOS goal after a regional seismic event.

Based on the selection of Alternative 1, the 30 md expansion includes the following major construction projects:

- Construction of one Actiflo® basin.
- Construction of one ozonation basin.
- Construction of two filters.
- Construction of one 35-foot diameter gravity thickener.

Figure ES.3 depicts the site layout following completion of the 30-mgd capacity expansion. As recommended in the 2015 MPU, space is dedicated for future AOP process (e.g., UV treatment, etc.) for these steps improves the ability of the future expanded WRWTP to be able to treat constituents of emerging concern.

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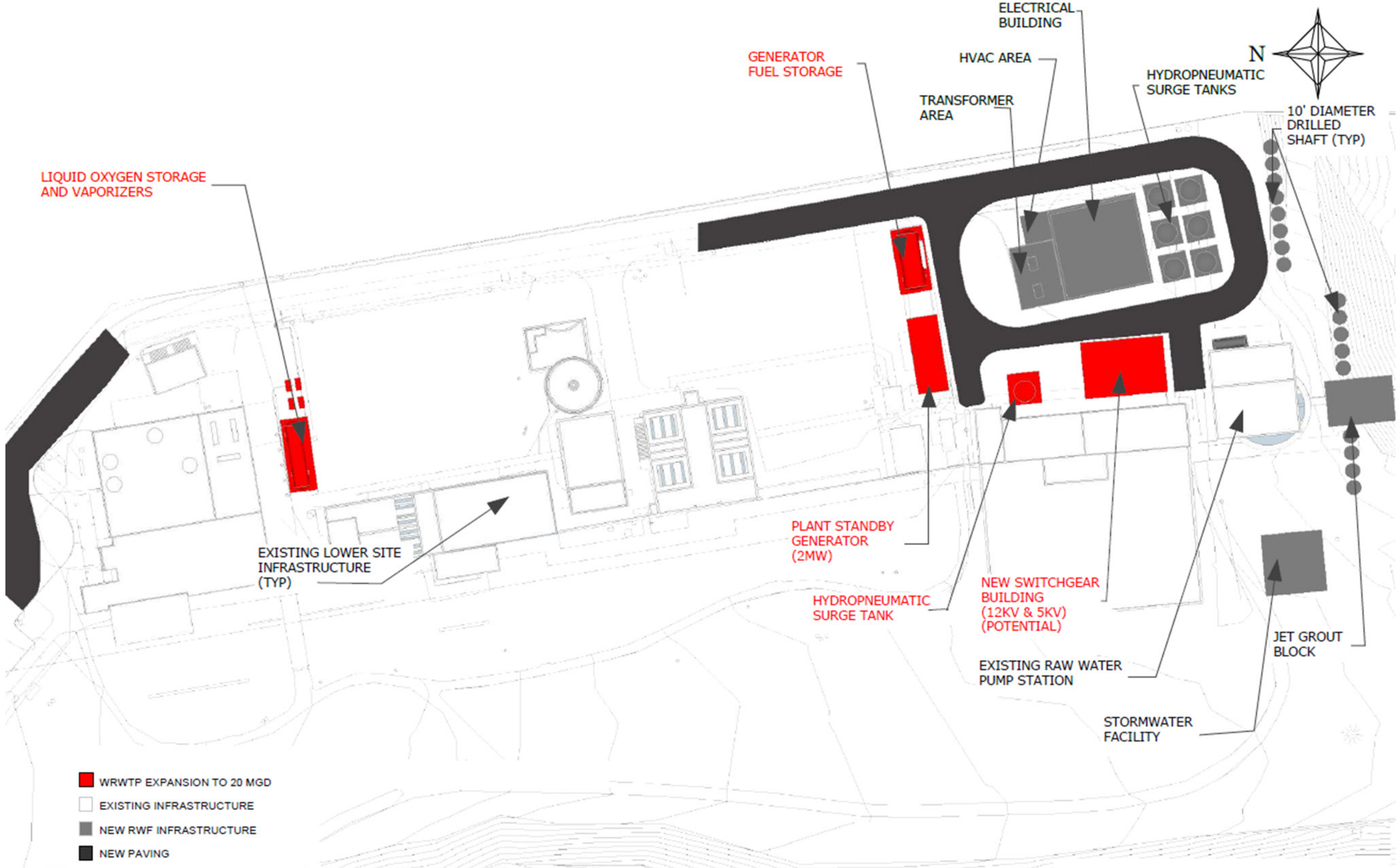

Figure ES.2 Site Plan – 20-MGD Capacity Expansion

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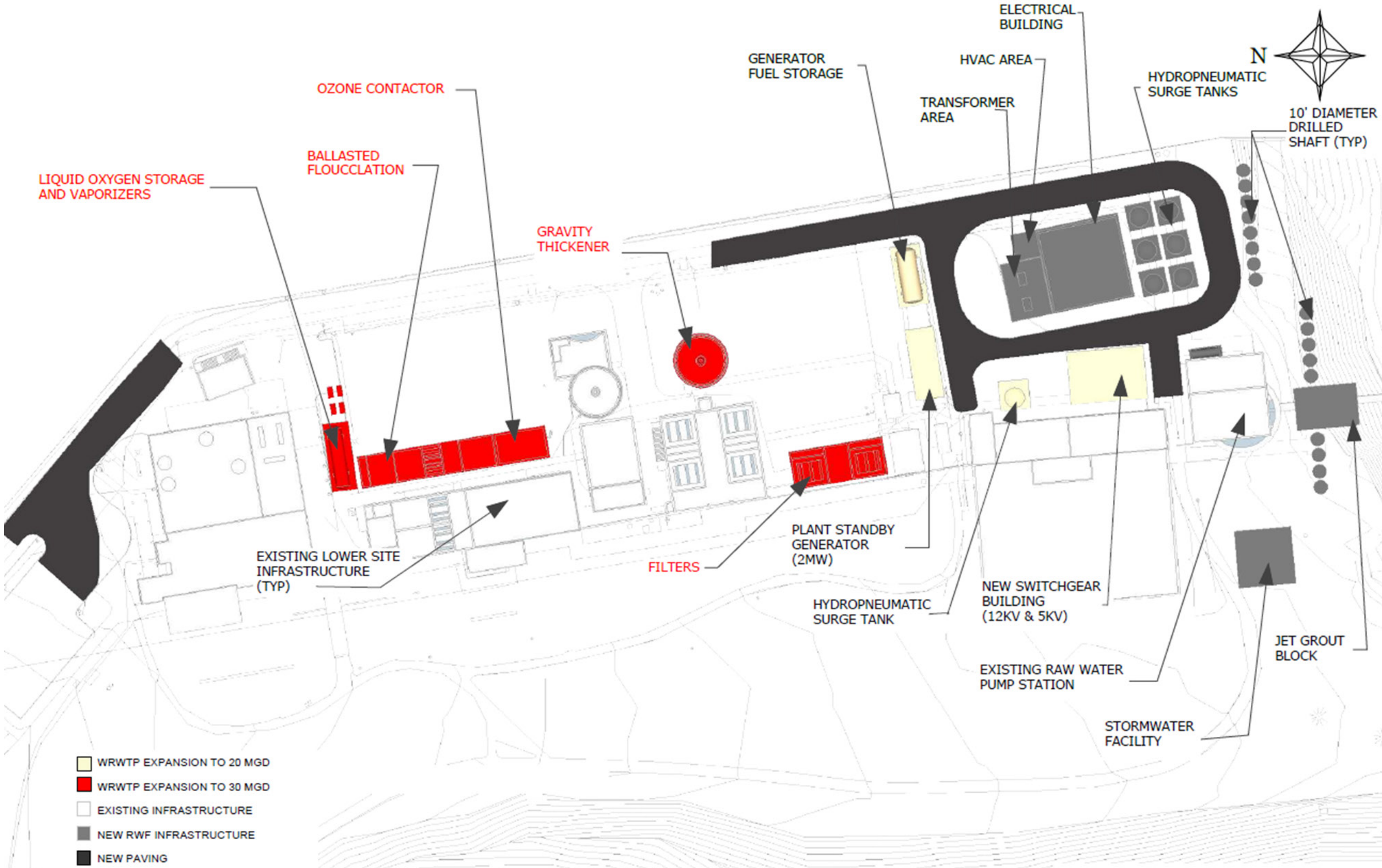

Figure ES.3 Site Plan – 30-MGD Capacity Expansion

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ES.6.3 Electrical Expansion CIP

The electrical system is loaded above 80% of listed capacity and is considered overloaded. Additionally, the existing emergency generator is not connected to all WRWTP equipment (for example, it is only wired to Actiflo® Basin 2) and only has sufficient capacity to power the 4 mgd raw and finished water pumps.

Based on these evaluations, it is recommended that the plant upgrade its existing electrical equipment as part of the 20 mgd expansion to ensure service is not interrupted due to electrical fault. The following upgrades are recommended:

- **Switchgear Replacement**: Recommend replacement with a 15 KV metering switchgear and 5 KV transformer, which should be sufficient to power the WRWTP through 60 MGD
- **Emergency Generator Replacement**: Recommend replacement with a 2 MW generator wired directly to the 15 KV metering switchgear. This replacement will allow all plant equipment to be run on the emergency generator.
- **Plant Rewiring**: Recommend connection of all finished water pumps to the 5 KV transformer/switchgear, which will leave sufficient capacity on the remaining transformers to provide power to the rest of the plant.

ES.6.4 Repair and Replacement CIP

In addition to the seismic and life-safety CIP, the WRWTP requires on-going maintenance/repair and replacement (R&R) of its existing infrastructure to ensure normal operations level of service goals. This ***2017 MPU*** presents a summary of repair and replacement projects for the WRWTP across a 20-year planning horizon.

ES.6.5 CIP Cost Estimates Summary

The existing WRWTP will require an interim expansion to 20 mgd by 2022 and a second expansion to 30 mgd by 2036.

Table ES.2 breaks down the capital costs the two expansions as well as related repair and replace projects, electrical equipment upgrades, life safety repairs, and seismic retrofits necessary to maintain plant operation. Table ES.3 provides additional detail for the repair and replace projects by year and dollar amount. The construction cost estimate presented herein is an American Association of Cost Engineers (AACE) Class 4 estimate, which is considered a concept/feasibility level estimate with approximately 5 percent of the design defined with an expected accuracy range of +50 percent to -30 percent.

Table ES.2 Estimated CIP Costs (2017 Dollars)

Project	Cost[1]	% Water Operations	% SDCs
20 mgd Expansion	$3,893,165	--	100%
30 mgd Expansion	$32,518,600	--	100%
Life Safety Repairs	$616,153	100%	--
Seismic Retrofits	$1,151,866	100%	--
Electrical Upgrades	$11,082,506	100%	--
Operations - Repair and Replace	$19,045,704	100%	--

Notes:
(1) Includes 15% design fee and 10% administrative cost.

Table ES.3 Operations – Repair and Replace Estimated CIP Cost (2017 Dollars)

Repair and Replace Year	Cost[(1)]	% Water Operations	% SDCs
2019	$2,035,169	100%	--
2020	$2,135,061	100%	--
2021	$12,513	100%	--
2022	$4,384,143	100%	--
2023	$12,513	100%	--
2024	$12,513	100%	--
2025	$12,513	100%	--
2026	$12,513	100%	--
2027	$5,213,450	100%	--
2028	$12,513	100%	--
2029	$12,513	100%	--
2030	$12,513	100%	--
2031	$12,513	100%	--
2032	$2,476,513	100%	--
2033	$12,513	100%	--
2034	$12,513	100%	--
2035	$12,513	100%	--
2036	$2,651,218	100%	--

Notes:
(1) Includes 10% administrative cost.

ES.7 Implementation Plan

To meet the growing water demands from Wilsonville and Sherwood, the existing WRWTP will first be expanded to a capacity of 20 mgd, followed by a 30 mgd expansion near the end of this planning horizon. A preliminary and final design and construction schedule is summarized in Table ES.4.

Table ES.4 WRWTP Expansion Design and Construction Schedule

Project	Approx Service Year	Duration (Months))		Start Date
		Design	Construction	
Operations - Repair and Replace	2020	8	8	2018
20 MGD Capacity Expansion	2022	12	18	2019
Life Safety Repairs	2022	6	6	2021
Repair and Replace	2022	6	8	2020
Seismic Retrofits	2022	4	6	2021
Repair and Replace	2027	4	6	2026
Repair and Replace	2032	4	6	2031
Repair and Replace	2036	4	6	2035

30 MGD Capacity Expansion	2036	10	24	2033
20 MGD Capacity Expansion	2022	12	18	2019
Life Safety Repairs	2022	6	6	2021
Seismic Retrofits	2022	4	6	2021
Electrical Upgrades	2022	6	8	2020
30 MGD Capacity Expansion	2036	10	24	2033
Operations – Repair and Replace				
Year I	2018	0	0	--
Year II	2019	0	6	2018
Year III	2020	0	6	2019
Year IV	2021	0	3	2021
Year V	2022	6	9	2020
Year VI	2023	0	3	2023
Year VII	2024	0	3	2024
Year VIII	2025	0	3	2025
Year IX	2026	0	3	2026
Year X	2027	0	9	2026
Year XI	2028	0	3	2028
Year XII	2029	0	3	2029
Year XIII	2030	0	3	2030
Year XV	2031	0	3	2031
Year XVI	2032	0	9	2031
Year XVII	2033	0	3	2033
Year XVIII	2034	0	3	2034
Year XIV	2035	0	3	2035
Year XX	2036	0	12	2035

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Chapter 1

INTRODUCTION

The Willamette River is a source of high-quality and plentiful drinking water. As such, many agencies in the Portland metropolitan area view it as a regional water source.

In 1997, several agencies in the Portland area formed the Willamette River Water Supply Agency (WWSA) to assess the technical and financial feasibility of using the Willamette River as a regional source. This effort involved conducting extensive pilot testing and water quality sampling to verify the supply's quality and treatability, as well as developing preliminary engineering plans for facilities required, estimating associated costs, and identifying potential governance and financing options to fund and manage the system. Members of the WWSA used the information gathered to compare other options for a regional water supply and to develop long-term strategic plans that best meet their needs.

Around the same time that the WWSA was formed, the City of Wilsonville (City) initiated a citywide moratorium on new construction until an additional drinking water supply could be identified and established – the City's historical groundwater supply was being over-drafted. In response, the City and the Tualatin Valley Water District (TVWD) initiated the design and construction of a new drinking water treatment plant on the Willamette River using the design-build project delivery method.

The Willamette River Water Treatment Plant (WRWTP) was commissioned in 2002, with a treatment capacity of 15 mgd. Veolia is the contract operator, and contracted directly with the City. Of the 15 mgd original capacity, the City owns 10 mgd. To accommodate future drinking water needs of their own, TVWD invested in the original construction of the WRWTP, oversizing many of the plant's facilities beyond the original need to more easily enable future expansion, as well as investing in 5 mgd of plant capacity. TVWD sold its rights to plant capacity to the City of Sherwood, which began receiving WRWTP water in 2012.

Today, the WRWTP owners, consisting of the cities of Wilsonville and Sherwood , have collaborated to update the 2015 WRWTP Master Plan Update (2015 MPU). The 2017 Update outlines the strategy for meeting future demands, increasing supply resiliency/reliability, coordinating with the upcoming requirement to pump raw water to the Willamette Water Supply Program (WWSP) treatment plant, now located in the City of Sherwood, and facilitating responsible growth within existing urban growth boundaries.

1.1 WRWTP AND SOURCE BACKGROUND

Key objectives for the original plant design included:

1. Produce high-quality drinking water at all times using a multi-barrier treatment process approach, exceed 2002 regulatory treatment and water quality standards, to enhance consumer confidence.
2. Minimize the treatment plant footprint, maximizing space for public amenities.
3. Provide flexibility for cost-effective future treatment plant capacity expansions.

4. Operate quietly, respectfully, and not negatively impact the surrounding neighborhood.
5. Complete design and construction in under three years to meet the City's schedule requirements for startup in 2002.
6. Design of the facility to meet "critical facility" seismic and structural criteria.

To meet these goals, the WRWTP employed innovative and robust treatment technologies, including high-rate clarification (ballasted flocculation), intermediate ozonation, deep-bed granular activated carbon (GAC)/sand filtration, and mechanical dewatering (centrifuges). When the WRWTP was commissioned in 2002, it was the first to use all four advanced technologies for drinking water treatment in the Pacific Northwest.

The existing WRWTP property along the river is irregularly shaped, creating what is referred to as the Lower and Upper Sites. As part of the original design, the Lower Site, home to the existing treatment plant, was planned to facilitate future expansion of up to 60 mgd of total capacity. The Upper Site, owned by TVWD, was not master-planned until after the District-led WRWTP Master Plan (MWH, 2006) was completed. The 2006 Master Plan demonstrated that sufficient space was available at the Upper Site to accommodate at least 100 mgd in additional capacity. Therefore, the combined WRWTP production capacity that could be constructed on the Upper and Lower sites is as high as 160 mgd.

Since the 2006 WRWTP Master Plan, several events have unfolded that influence planning-level construction and operational decisions for the expanded plant, requiring an update to the 2006 Master Plan. These events include:

- In 2012, the City of Sherwood began purchasing WRWTP finished water. The plant, which had historically been operated in "start/stop" mode to meet Wilsonville's daily demands alone, is now operated 24 hours per day, seven days a week.
- In 2013, the District and the City of Hillsboro identified the mid-Willamette Supply alternative as its preferred supplemental supply option, which laid the foundation for the WWSP.
- As a result of the WRWTP Tracer Study (MWH, 2014), the City is leading a coalition of Oregon's current and potential ozone users that petitioned the Oregon Health Authority (OHA) for disinfection credit for intermediate ozonation, eliminating the requirement for costly chlorine contact basins or UV treatment for future WRWTP expansions. This potential to no longer require contact basins was considered when developing scenarios for treatment plant expansion. OHA has not made a decision about this request at the time of publication.
- In 2015, the City and WWSP stakeholders updated the WRWTP Master Plan (MWH, 2006) to determine how the existing plant could be expanded to meet future demands of all stakeholders. Though the WRWTP Master Plan 2015 Update (Carollo, 2016) succeeded in evaluating these possibilities, it was later determined that the WWSP treatment facilities would be optimized at an alternative location several miles north of the WRWTP, in the City of Sherwood. Moving forward, the WRWTP is expected to exclusively supply Wilsonville and Sherwood. However, the oversized river intake and raw water pumping station will be expanded to provide raw water to both the WRWTP and the proposed WWSP treatment facilities.

The 2015 Master Plan Update documented future water needs, level of service (LOS) goals, regulatory requirements, reliability and resiliency of the distribution system, and preliminary seismic evaluation of shared WRWTP and WWSP facilities. The goal of the 2017 Master Plan Update is to supplement and expand upon information presented in the 2015 Master Plan Update that applies to the WRWTP facilities, creating a stand-alone document that accommodates the growing communities of Wilsonville and Sherwood while coordinating with the future WWSP treatment facility.

1.2 MASTER PLAN UPDATE OBJECTIVES AND ORGANIZATION

This report presents the 2017 Master Plan Update (MPU) for expanding the WRWTP to meet the long-term water supply needs of Wilsonville, Sherwood, and potential future partners. The MPU presents various options for expanding the facilities and identifies a recommended treatment and implementation plan to meet the Cities of Wilsonville and Sherwood's planning objectives. These objectives are:

Objective #1: Maintain water supply by completing the WRWTP 20 mgd and 30 mgd expansion projects by 2020 and 2034, respectively.

Objective #2: Optimize process selection and layout to meet capacity and water quality goals at the expanded WRWTP.

Objective #3: Chart the course for expanding the existing WRWTP infrastructure to maximize the return on previous investments.

As a planning document, the primary purpose is to establish a baseline for the following major project concepts:

- Development of treated water quality goals.
- Evaluate preliminary process requirements to meet water quality goals.
- Identify preliminary capacity requirements to meet long-term water supply needs.
- Verify space requirements to site facilities.
- Develop planning level cost estimates.
- Develop preliminary implementation schedule.
- Develop permitting strategy.

By developing these concepts, the Cities of Wilsonville and Sherwood will have the information they need to properly plan their use of the Willamette River water as a primary or secondary source of their drinking water supply. Additional preliminary design efforts to further vet the 2017 MPU recommendations are also included.

The Master Plan Update is organized into the following Chapters.

- Chapter 1 – Introduction
- Chapter 2 – Plant Expansion and Level of Service Goals
- Chapter 3 – Existing Facilities and Operational Performance
- Chapter 4 – Historical Water Quality and Regulatory Compliance
- Chapter 5 – Existing Infrastructure
- Chapter 6 – Expansion Alternatives Analysis
- Chapter 7 – Implementation Plan

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Chapter 2

PLANT EXPANSION AND LEVEL OF SERVICE GOALS

2.1 Introduction

This chapter establishes the "guiding principles" for developing, evaluating, and comparing alternatives throughout the ***2017 MPU*** and summarizes the water supply demands and expansion phasing strategy.

Furthermore, the Chapter reviews the three alternative treatment procedures developed as part of the 2015 MPU, based on workshops with the Participants. It also provides the methodology for evaluating the alternatives and summarizes the level of service (LOS) goals for the plant expansion.

2.2 Water Demands and Expansion Strategy

Prepared in 1999, the Willamette River Water Supply System (WRWSS) Plan identified the potential need to withdraw up to 120 mgd from the existing WRWTP site based on combined projected demands from potential member agencies. The WRWSS Plan was updated in 2004, increasing the ultimate demand projection to 158 mgd. The 2006 WRWTP Master Plan bracketed the ultimate demand projection between 103 mgd and 156 mgd.

As part of the original project, Wilsonville partnered with the Tualatin Valley Water District (TVWD) to provide funding to oversize key infrastructure to better accommodate the WRWTP plant expansion to help meet the needs of the combined communities. In 2015, Wilsonville, along with other stakeholders, updated the WRWTP Master Plan (MWH, 2006) to determine how the existing plant could be expanded to meet the future demands of the emerging Willamette Water Supply Program (WWSP); this effort developed the WRWTP 2015 Master Plan Update (2015 MPU) (Carollo, 2016). However, it was determined after the completion of the 2015 MPU that the WWSS treatment facilities would be optimized at an alternate site, located several miles north of the existing WRWTP, in the City of Sherwood. The raw water intake and pump station for the WWSS WTP will be co-located/shared with the existing WRWTP, requiring careful coordination.

Adjustments to the 2015 MPU assumptions for projected demand/capacity requirements and the timing of the capacity needs affect the planning of the future expanded WRWTP site. The following 2017 MPU summarizes these efforts, as summarized in the following subsections discuss these issues.

2.2.1 Demand Projections and Hydraulic Requirements

Two water agencies are considering continued use of the expanded WRWTP as their primary or supplemental source of drinking water supply: the City of Wilsonville and the City of Sherwood.

Figure 2.1 presents projected annual peak daily demand through 2050 for these two cities and a combined ultimate build-out demand projection in 2050. It also shows a phased expansion strategy, which is detailed in the following subsections. Figure 2.2 presents the projected annual peak demand for the WRWTP and proposed WWSP treatment facility. The projected WWSP demands were developed based on the agency's planning project and is separate from this Master Plan Update. However, it is relevant to the upgrade of certain shared WRWTP facilities as described in subsequent sections.

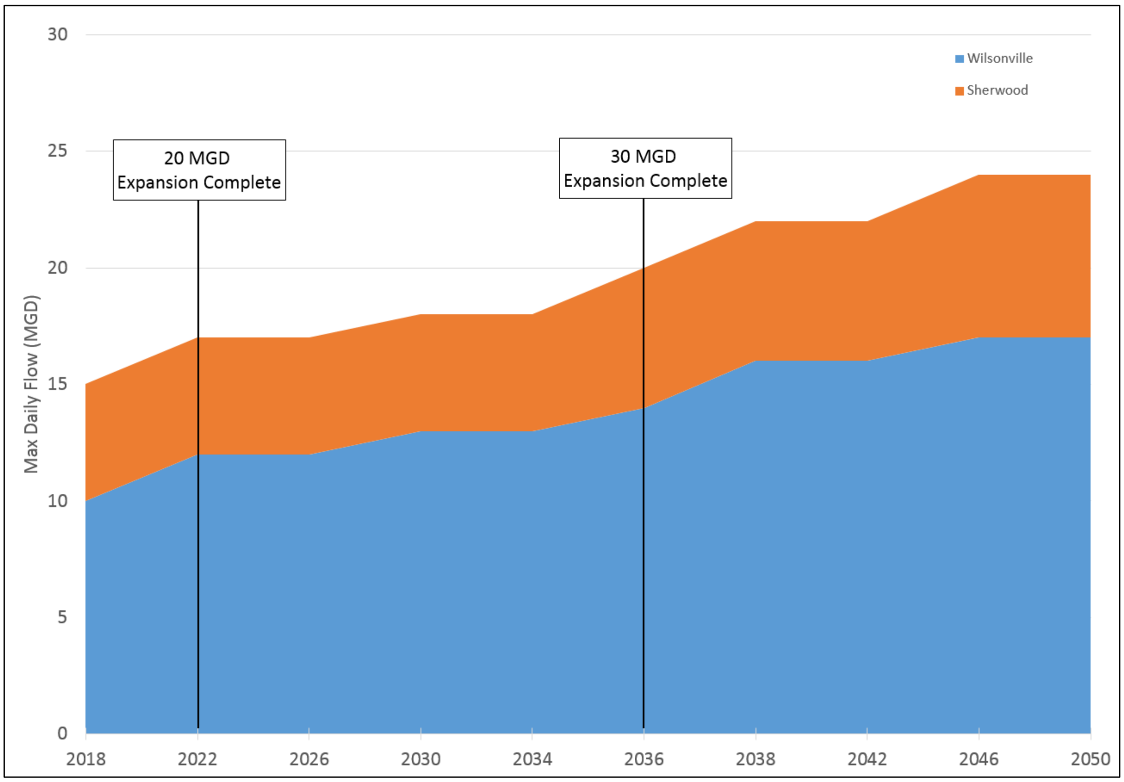

Figure 2.1 WRWTP Capacity Projections and Recommended Expansion Phasing

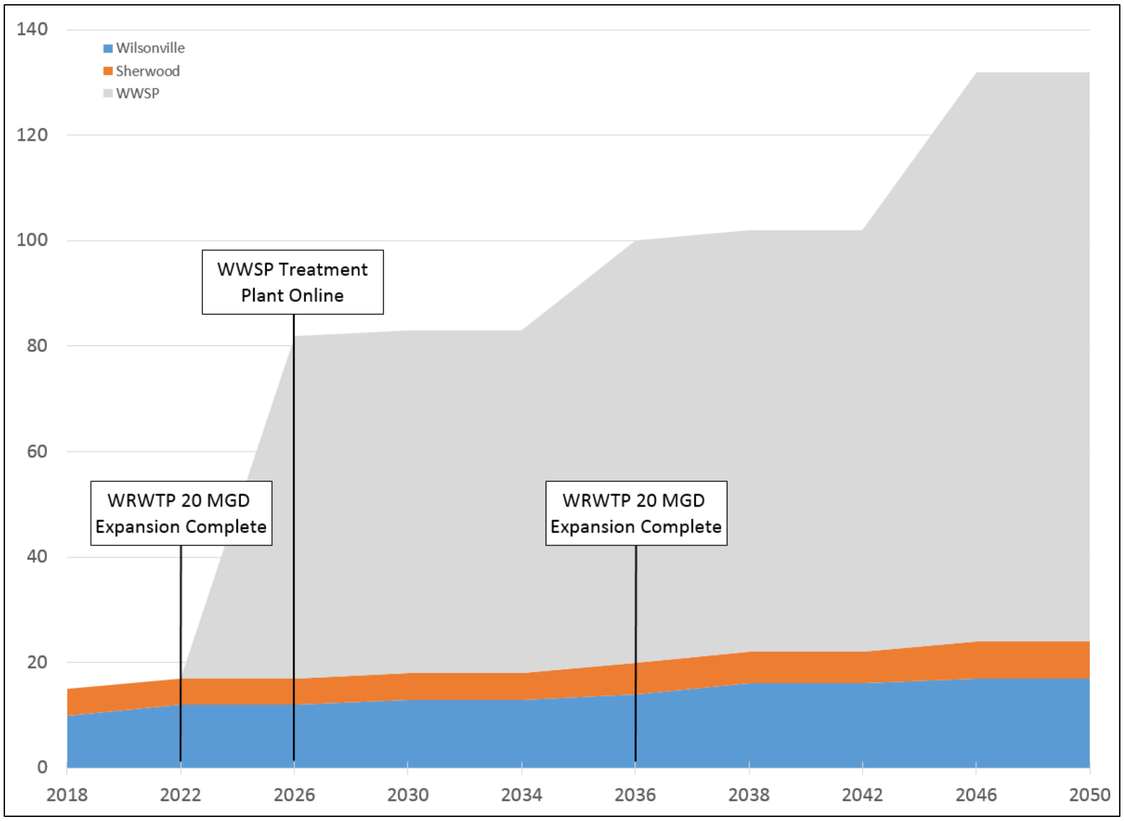

Figure 2.2 WRWTP and WWSP Water Demand Projections

Table 2.1 summarizes the anticipated demands and the hydraulic elevation that each City will likely require to serve its respective system.

Table 2.1 Hydraulic and Capacity Requirements of the WRWTP Participants

Participant	Hydraulic Elevation (ft)	2026 Max Day Demand (mgd)	2036 Max Day Demand (mgd)	2046 Max Day Demand (mgd)	Future Max Day Demand (mgd)
Wilsonville	400	12	14	17	30
Sherwood	380	5	6	7	13
Total		**17**	**20**	**24**	**43**

Notes:
(1) Projected demands obtained from independent City planning exercises.

2.2.2 Capacity Expansion and Phasing Strategy

Figures 2.1 and 2.2 presents projected WRWTP plant production capacity and total raw water withdrawls, respectively. Highlights of these projections include:

- An initial expansion of the existing WRWTP is required to meet combined demands for the Cities of Wilsonville and Sherwood. This expansion will increase WRWTP capacity to 20 mgd in 2020, two years before the capacity is required in 2022.

- Construction to support the WWSP Raw Water Facility (RWF) connection to the WRWTP intake structure and Raw Water Pump Station. This modification is expected to be complete by 2024, two years before the capacity is required in 2026.
- A subsequent expansion of the existing WRWTP to meet combined demands from the Cities of Wilsonville and Sherwood. This expansion will increase WRWTP capacity to 30 mgd in 2034, two years before the capacity is required in 2036.
- Capacity expansion projects are assumed to be completed two years before the capacity is needed to allow flexibility for future unknowns.
- On-going repair and replacement projects to address aging infrastructure that has exceeded its service life or has become unreliable are required and are integrated into the overall expansion plan.
- Seismic retrofits to address changes in the seismic design criteria since the WRWTP was constructed in 2002 are also required. Due to changes in the USGS data between 2002 and 2008, projected ground accelerations in the region have increased up to 28%, significantly increasing the structural design requirements.
- Life safety upgrades necessary to protect the operations staff and maintain compliance with safety and building code requirements are required.

Based on a capital, operational, and technical evaluation performed during the ***2015 MPU***, the WRWTP 20 mgd capacity expansion will be achieved by uprating major process trains and providing for installed redundancy wherever feasible; no additional basins will be constructed as part of this expansion. The details of this evaluation are summarized in Chapters 2 and 6 of the ***2015 MPU***. The 30 mgd capacity expansion evaluations included a discussion of pre- and post-regional seismic event resiliency to determine the scope of the expansion. A description and evaluation of these WRWTP expansions that fall within the 20-year planning horizon of this ***2017 MPU*** are included in Chapter 6.

2.3 Hazard Analysis and Associated Level of Service Goals

This section describes the methodology used to identify hazards and develop corresponding LOS goal recommendations for the WRWTP expansion. As part of the 2015 MPU planning process, preliminary LOS goals were used to establish the preliminary site plans and associated construction and operations cost estimates. After confirming these preliminary results were consistent with the Cities of Wilsonville and Sherwood, the recommendation of this report is to adopt these LOS goals as part of the 2017 MPU.

The LOS goals are intended to address only the facilities required to operate the WRWTP and do not apply to facilities outside of the WTP fence line, such as transmission and distribution system piping. The goals herein were developed during the ***2015 MPU*** and confirmed with the Cities during a ***2017 MPU*** project workshop.

2.3.1 LOS Goal Objective

LOS goals are typically stated as follows:

"Following a W catastrophic event, within X days/weeks of the event, the WTP will deliver Y percent of average day demand with Z water quality."

This statement represents a policy-level statement for recovering the facilities after a catastrophic event, in terms of water quality, quantity, and recovery time. The objective of this section is to first identify the various types of catastrophic events, then develop LOS goals that correspond to each event.

2.3.2 Catastrophic Event

To guide the selection of LOS goals following a catastrophic event, the Clackamas County Natural Hazards Mitigation Plan (December 2012) was reviewed for hazards of concern to the County. Additional hazards were also identified based on similar work performed by Ballantyne Consulting LLC, and potential WTP impacts were considered as part of the ***2015 MPU***. These impacts may be different than those affecting the County overall. Table 2.2 presents the identified hazards and the potential impacts on the WRWTP.

Table 2.2 Catastrophic Hazards Events and Potential Impact on the WRWTP

Hazard	Potential WTP Impacts
Seismic – Geotechnical	• Liquefaction at site causes differential settlement that compromises facilities. • Lateral spreading / landslide at river bank compromises slope stability and / or RW Intake.
Seismic – Structural	• Raw Water Pump Station structural damage. • High Service Pump Station / Clearwell structural damage. • Connections of process piping and electrical duct banks at process facilities compromised due to shearing.
Flood	• Erosion of river bank. • Plugging and / or damage of raw water intake.
Volcano	• Ash fall or water-transported debris compromises ability of plant to treat water.
Spills/Contaminants in River	• Raw sewage discharge from upstream communities compromises ability of plant to treat water. • Oil spill compromises ability of plant to treat water. • Other chemical spill compromises ability of plant to treat water.
Wild Fire	• Decreases the water quality of Willamette River watershed. • Impact on river bank compromises raw water pump station.
Wind, Ice, Snow	• Local or regional power outage compromises the plants ability to treat water. • Reduces staff availability.
Terrorism/Cyber Attack	• Reduces IT security and operational control. • Compromises control over finished-water quality.

Of these hazards, the seismic hazards (geotechnical and structural) are expected to also affect other water supply facilities serving the region. The remaining hazards are expected to affect only the WRWTP with two exceptions: volcanic ash and regional power disruption.

Volcanic ash fall could affect the City of Portland, City of Lake Oswego/Tigard, and Joint Water Commission (JWC) surface water supplies, depending on the volcano that erupted and the wind direction. Table 2.3 shows the relative likelihood of volcanic ash from an eruption of Three Sisters, Mount Hood, or Mount St. Helens, which would affect the four regional supply watersheds with the predominant southwest prevailing wind. As Table 2.3 shows, a volcanic event would likely not affect all four regional supplies.

Table 2.3 Likelihood of Volcanic Ash Having Substantial Impact on Watersheds with a Southwest Wind

River/Volcano	Three Sisters	Mount Hood	Mount St. Helens
Willamette River	High	Low	Low
Clackamas River	Moderate	High	Moderate
Bull Run River	Moderate	High	Moderate
Tualatin River	Low	Low	Low

A wind or ice storm could affect the regional power supply if it downed multiple high-voltage circuits crossing the Cascades. This hazard would be categorized the same way as seismic hazards. Based on this understanding, seismic hazards affecting all the regional water supply facilities shall be addressed separately from the local hazards that would affect only the WRWTP.

2.3.2.1 Hazards Affecting All Regional Facilities

Seismic hazards are commonly discussed in terms of an event's likelihood of occurring in a 50-year period and the associated return period. This timeframe is used because it represents the typical life expectancy for a building. (Equipment has a life expectancy of 20 years, and buried pipelines have a life expectancy of 100 years.) For example, an earthquake with a 10 percent chance of occurring in 50 years has a 500-year return period; one with a 5 percent chance has a 1,000-year return period, and one with a 2 percent chance has a 2,475-year return period.

On average, Cascadia Subduction Zone earthquake occurs every 500 years. However, other earthquake sources also contribute to a 500-year return probabilistic ground motion; the probabilistic 500-year return ground motions are a bit higher.

The Minimum Design Loads for Buildings and Other Structures (ASCE, 2010), which is a consensus-based standard, is used in conjunction with the International Building Code (IBC) to guide structural design. Both start with a 2,475-year probabilistic ground motion, multiply it by two-thirds, and then use that ground motion estimate as the ground motion to design most facilities. This base ground motion level would be used to achieve life safety for Category II facilities, such as residential and commercial structures.

ASCE 2010 assigns a risk category to various types of structures ranging from I to IV. Specifically, Risk Category II has an Importance Factor of 1.0; Risk Category III, 1.25; and Risk Category IV, 1.5. These factors are applied to the ground motion. With the Importance Factor applied, the code intends that structures designed to Risk Categories III and IV requires returning only minor repairs into operation (Category III) or having them remain operational after a 500-year return event. The IBC requires "qualifying" equipment used in Category IV to demonstrate their ability to remain operable after an earthquake.

The Importance Factors are based on building observations and engineering judgement. Water facilities, particularly water treatment plants, are complicated systems made up of many geotechnical considerations, structural and non-structural components, and systems that may be vulnerable to earthquakes. Applying an Importance Factor of 1.5 does not necessarily address all of these various elements, and does not guarantee post-earthquake operation after a 500-year return earthquake. To increase the likelihood of post-earthquake operation, a detailed facility system seismic vulnerability analysis is recommended.

To be more conservative, the owner may request to design for 2,475-year return ground motions. These are 1.5 times the ground motions used for most structures, the same as the Category IV 1.5 Importance Factor. If the goal is to design for post-earthquake operation after a 2,475-year return event, applying the same methodology as used for a base level earthquake, 2,475-year ground motions should be used in conjunction with an Importance Factor of 1.5. Adding these factors would result in a ground motion design of 1 + 0.5 + 0.5 = 2.0 times the base ground motion.

Because it addresses only facility structural elements, this increase may not achieve post-earthquake facility functionality. To reach a recovery level of "days" following a 2,475-year return event, conducting a detailed facility system seismic vulnerability assessment and applying one 0.5 factor of safety is recommended instead of applying both 0.5 factors of safety.

The design ground motion, Importance Factor, and Facility System Seismic Analysis drive the Recovery Level, which is the time it takes to get back in operation. The Recovery Level is the key parameter affecting the impact on a community. Table 2.4 shows the expected recovery level for combinations of ground motion design level, the Importance Factor, and a Facility System Seismic Analysis.

Table 2.4 Water Treatment Facility Recovery Levels for Various Earthquake Hazard Levels as Implied by Current Codes and Standards for New Construction

	Ground Motion Design Level					
	500-year	500-year	500-year	2,475-year	2,475-year	2,475-year
Importance Factor	1	1.5	1.5	1	1.5	1.5
Facility System Seismic Analysis	No	No	Yes	No	No	Yes
Subjected to:	**Resume Service in:**					
500-Year Return Period Earthquake	Months to Years	Days to Weeks	Days	Days to Weeks	Days	Days
2,475-Year Return Period Earthquake	Years	Months to Years	Months to Years	Months to Years	Days to Weeks	Days

In the overall cost of the project, the cost difference of building new structures for Risk Category IV versus Risk Category III is nominal (estimated at 2 to 3 percent of total project cost to achieve Category IV for the structures only). The cost of conducting a detailed facility seismic vulnerability analysis should be less than $100,000 plus the mitigation of identified deficiencies. Therefore, it is recommended that the future expanded WRWTP facilities be designed to Category IV seismic design loading for a 500-year return event with no additional increase for a 2,475-year probabilistic ground motion. A detailed facility seismic vulnerability analysis of the existing facilities, as well as a summary of Oregon seismic requirements and standards in place during the original construction of the WRWTP, are discussed in Chapter 5.

The code requires "qualifying" equipment in facilities designed to Risk Category IV. This means they must be tested to ensure they will remain functional after the prescribed earthquake loading. Some standard WTP equipment, such as motor control centers, has been previously qualified. However, some specialized equipment has not been previously qualified and would require testing. Specifying the qualified equipment is recommended, where available, with no additional testing needed for equipment not previously qualified.

Loss of regional power is expected to affect all the regional supplies in earthquake and potential wind and ice storm events. Some of the other regional supply facilities are noted to have backup power, but they may be damaged in an earthquake. Therefore, expanding the existing backup power facilities at the WRWTP is required to meet the desired LOS goals.

2.3.2.2 Hazards Only Affecting the WRWTP

Flood, volcanic debris flow, water quality events, wild fire, wind/ice/snow storms (excluding regional power outage), and terrorism/cyberattacks are expected to affect only the WRWTP. These local hazards have the largest impact on the intake (raw water quality) or finished-water quality.

Unlike seismic events in which the shaking intensity increases for an event with a longer return period (lower probability), these local hazards lack different intensities for events with different return periods such as chemical spills or terrorist attacks. Therefore, it is recommended that no return period be attached to this group of hazards. These events do, however, have a reasonable likelihood of occurring during the life of the WRWTP.

2.3.3 Regional Precedents

To guide selection of seismic LOS goals, regional precedence for large regional water supply systems were reviewed and described below.

2.3.3.1 East Bay Municipal Utility District (Oakland, California)

The East Bay Municipal Utility District (EBMUD) in Oakland, California, considered a thought leader in seismic reliability, established LOS goals for a probable and maximum earthquake event. These goals are for an existing system that includes supply, treatment, and distribution. Table 2.5 presents these LOS goals.

Table 2.5 East Bay Municipal Utility District Level of Service Goals

Category	Probable Earthquake	Maximum Earthquake
General	All water introduced into the distribution system fully treated, but minimally disinfected.	All water introduced into the distribution system fully treated, but minimally disinfected.
Fire Service	Service to all hydrants within 20 days.	Service to all hydrants within 100 days.
Hospitals and Disaster Collection Centers	Minimum service to affected area within 1 day (water available via backbone distribution system near each facility).	Minimum service via distribution system or truck within 3 days.

Table 2.5 East Bay Municipal Utility District Level of Service Goals (Continued)

Category	Probable Earthquake	Maximum Earthquake
Domestic Users	Potable water via distribution system or truck within 1 day.	Impaired service within 30 days (water available via distribution system to each facility, possibly at reduced pressures).
Commercial, Industrial and Other Users	Impaired service to affected area within 3 days (water available via distribution system to each commercial or industrial user, possibly at reduced pressures).	Potable water at central locations for pick up within 1 week. Minimum service to 70% of customers within 10 days. Impaired service to 90% of customers within 30 days.

2.3.3.2 Oregon Resiliency Plan

The Oregon Seismic Safety Advisory Committee (OSSAC) developed the Oregon Resilience Plan (ORP) per the Oregon State Legislature's request. The ORP includes goals for specific functions of water systems, as shown in Table 2. 6. For WTPs, the ORP recommends that 20 to 30 percent of the potable supply be available within 24 hours of the event and be at near-full restoration within 1 to 2 weeks.

Table 2.6 Oregon Resilience Plan Recommended LOS Goals for Water Systems

	Event Occurs							
System Function	0-24 hours	1-3 days	3-7 days	1-2 weeks	2-4 weeks	1-3 months	3-6 months	6-12 months
Potable water available at supply source	▲	●		■			✖	
Main transmission facilities, pipes, pump stations, and reservoirs operational	■					✖		
Water supply to critical facilities available	●	■				✖		
Water for fire suppression at key supply points	■		✖					
Water for fire suppression at fire hydrants			▲	●	■			✖
Water available at community distribution centers/points		●	■	✖				
Distribution system operational		▲	●	■				✖

Notes:
(1) ■ Desired time to restore component to 80-90% operational.
(2) ● Desired time to restore component to 50-60% operational.
(3) ▲ Desired time to restore component to 20-30% operational.
(4) ✖ Current state (90% operational).

2.3.3.3 Joint Water Commission (JWC) (Hillsboro, Oregon)

The JWC developed LOS goals for its existing WTP for three earthquake return periods (72, 475, and 2,475 years) with goals for immediate and short-term capacity as well as short-term restoration. In all cases, the water quality produced was intended to be potable. For the JWC WTP, the expected performance of various unit processes during a seismic event governed the capacity. Table 2.7 shows the JWC's LOS goals.

Table 2.7 Joint Water Commission WTP LOS Goals

Seismic Events	Immediate Capacity mgd	Short-Term Capacity mgd	Short-Term Restoration Time days	Water Quality
72 Year Event	42[1]	42[1]	0	Potable
475 Year Event	0	24	1	Potable
2,475 Year Event	0	12	3	Potable
		28[2]	7 to 14	
		42[1]	60 to 90	

Notes:
(1) Average Day Demand is 42 mgd.
(2) Average Winter Demand is 28 mgd.

2.3.4 Recommended Preliminary LOS Goals for WRWTP Expansion

As previously discussed, two categories of preliminary LOS goals are recommended for the expanded WRWTP: 1) a regional event (seismic) that potentially affects all regional supplies where the Participants rely on the WRWTP and 2) local events that affect only the WRWTP supply (i.e., other regional supplies remain on-line) and allow the Participants to rely on other regional supplies.

The recommended LOS goals in this section were developed in a workshop setting that included the TAC. Because it is a regional facility, the LOS goals need to be verified with each agency during design for compatibility with their distribution and storage LOS goals. The LOS goals developed as part of the ***2015 MPU*** were adopted by the governing bodies of both Wilsonville and Sherwood.

Hazard Return Period

For the regional event, design new facilities and any facility upgrades for 2,475-year return period ground motions in accordance with the IBC Risk Category IV. When available, prequalified equipment should be specified.

For the local hazard events affecting only the WRWTP, no return period is recommended. Scenarios for each event type should be considered.

WTP Outage Time

For the regional event, the region will depend on the WRWTP. The plant should be operable within 48 hours after the event.

For the local hazard events, the Cities of Wilsonville and Sherwood will rely on their existing groundwater supplies in the near-term, and potential interties with other regional water purveyors in the long-term. The WRWTP should be returned to operation within 14 days of the event.

Delivery Capacity Percentage

For the regional event, the WTP should be capable of delivering 50 percent of its full capacity. This number controls the amount of backup power required and size of chemical storage facilities.

For the local hazard event, the WTP should be at full capacity when service resumes.

Water Quality

Whenever operational, The WTP should produce potable water for both the regional and local hazard events.

Table 2.8 summarizes the final LOS goals recommended for the expanded WRWTP facilities.

Table 2.8 Adopted LOS Goals for the WRWTP

LOS Goal	Regional Event (Seismic)	Local Event (Non-Seismic)
"Following a W catastrophic event ...	2,475 year	Per occurrence
...within X days/weeks of the event...	48 hours	14 days
...deliver Y % of average day demand...	50% of nameplate	100% of nameplate
...with Z water quality."	Potable (at minimum regulatory requirement)	Potable (at plant treatment processes and procedures)

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Chapter 3

EXISTING FACILITIES AND OPERATIONAL PERFORMANCE

3.1 Introduction

The 2006 WRWTP Master Plan was completed approximately four years after initial plant start-up in 2002. At that time, the City of Wilsonville was the only consumer of WRWTP water.

In mid-2012, the City of Sherwood started using water from the WRWTP as its primary supply. With this additional demand, theWRWTP moved from operating on a daily start/stop basis for 8 to 16 hours per day, depending on demand, to operating 24-hrs per day.

This Chapter describes each major plant component and summarizes the existing WRWTP treatment facilities, previous studies, and historical operating performance. Because hours of operation affect plant operations and the expanded plant will operate continuously, the plant performance data considered for the ***2015 MPU*** was limited to 2012 through 2014; no additional water quality data was analyzed as part of this ***2017 MPU***. Discussion on the existing facility infrastructure, including seismic and life-safety analysis, is located in Chapter 5.

3.2 Summary of Previous Studies

WRWTP planning began in the early 1990s with preliminary raw water quality sampling. The existing 15 mgd WRWTP facility was constructed from 2000 to 2002. The studies reviewed for the 2015 MPU include:

- WWSA – Raw Water Quality Monitoring Program (WRWSA/MWH, 1994-2002).
- Willamette River Pilot Plant Study (MWH, 1994) – Summarizes bench- and pilot-scale studies verifying the treatability of the Willamette River.
- Willamette River Water Supply System, Preliminary Engineering Report (MSA/MWH, 1998) – Summarizes and consolidates several planning-level documents for the WRWTP, including water user permits and intergovernmental agreements, intake and river hydraulics, alternative RWPS layouts, preliminary geotechnical work, and water treatment plant schematic designs. Evaluates the treatment needs, treatment processes and procedures, and project and O&M costs for an initial 35 mgd WTP, ultimately expanding to 120 mgd. Findings enabled the project participants to determine how to meet future drinking water needs.
- Actiflo® Pilot Study Report (MWH, April 2000) - To evaluate performance of the combined Actiflo® and filtration treatment trains on the Willamette River, Actiflo® was piloted from February 24 through March 10, 2000 at the WRWTP site, in conjunction with a filter column modeling the proposed full-scale filter beds.
- *Source Water Assessment Report of Surface Water Supply* (MWH, September 2002) – Assesses the surface water source area upstream of the proposed WTP intake. Primary objectives include delineating sensitive areas requiring special consideration to protect

water quality, recording potential contaminant sources, and assessing the susceptibility of the supply to contamination.

- *Wilsonville Water Treatment Plant, Geotechnical Analysis* (Squire Associates, 2000) – Presents the results of a third-party geotechnical analysis and recommendations to support the WRWTP 30 percent level design-build documents.
- *Water Treatment Plant 3rd Party Peer Review* (Degenkolb, 2000) – Presents the findings and records the resulting design changes of a third-party peer review of the structural design.
- *WRWTP Record Drawings and O&M Manual* (MWH, 2002) – Offers the final record drawings and Operations and Maintenance Manual from the design-build contractor following start-up and commissioning of the original plant facilities.
- *WRWTP Tracer Study* (CH2MHill, 2002) – Summarizes the results of the original tracer study of the WRWTP used by clearwell to obtain OHA approval for finished water flows up to 10 mgd.
- *WRWTP Master Plan* (MWH, 2006) – Planning-level document to help the District decide on long-term water supply needs. The report recommends treatment technologies, provides treatment procedures, construction and O&M cost estimates, and offers an implementation plan for the expansion of the WRWTP.
- *WRWTP Surge Analysis* (MWH, 2009) – Shows results of preliminary hydraulic calculations to determine the WRWTP finished water flow rates that would trigger the need for surge protection at the plant.
- *Water Treatment Plant CT Model* (MWH, 2011) - A disinfection calculation tool for performing real-time CT calculations at the WRWTP.
- *Willamette River WTP Disinfection (CT) Analysis* (MWH, 2011) - Updating and further defining the CT capacity of the existing WRWTP.
- *Hydraulic Transient Analysis (MWH, 2011) - Updated modeling efforts focused on surge analysis at the existing WRWTP.*
- *City of Wilsonville Water Master Plan* (Keller & Associates, 2012) – In part, this report summarizes finished water quality and disinfection strategies for the WRWTP, Wilsonville's primary water supply. This document focused on the distribution system, but did summarize WQ issues.
- *WRWTP Tracer Study* (MWH, 2014) – Summarizes the results of the second tracer study of the WRWTP clearwell, which was used to obtain OHA approval for finished water flows up to 15 mgd.
- *WRWTP 2015 Master Plan Update (Carollo, 2016) – Summarizes the planning efforts for the incorporation of the WWSS WTP at the existing site of the WRWTP, including: development of LOS goals for the plant, an update to raw water and finished water quality and plant performance, select structural and life-safety analysis and an implementation plan/schedule.*

3.3 Major Plant Components

3.3.1 General

The WRWTP on the Willamette River in Wilsonville at approximately River Mile 39 is irregularly shaped and includes a narrow bottleneck separating the site into Upper and Lower Sites. The existing treatment plant and Willamette River Water Treatment Plant Park are on the Lower Site.

When the plant was designed in 1999-2000, the WRWTP was master-planned for an ultimate capacity of 70 mgd, with features and infrastructure in the plant design and construction to facilitate expansion. The intake pipeline, which was tunneled from the raw water caisson to the river, and the 85-foot-deep circular caisson were designed and sized to accommodate approximately 100 mgd, estimated to be the ultimate capacity of the WWSP treatment plant at build-out.

Primary water treatment processes for the WRWTP effectively treat the raw Willamette River water and comply with existing and anticipated future drinking water regulations. A multi-barrier approach currently addresses key "contaminants of concern," including:

- Turbidity
- Pathogenic microorganisms
- T&O
- Trace organics

The WRWTP intake includes two cylindrical tee-shaped screens, raw water intake pipe and caisson, raw water pump station and flow metering, flash mixing, a ballasted flocculation (Actiflo®) system, ozonation, filtration using deep-bed GAC/sand media, a 2.9-million-gallon clearwell, high-service pump station and flow metering, backwash equalization, solids thickening, and a centrifuge solids dewatering facility. Table 3.1 summarizes plant treatment processes and procedures. Figures 3.1 through 3.3 give an overview of existing facilities.

Table 3.1 WRWTP Existing Facilities Treatment Processes and Procedures

Description	Units	Value
Plant Design Flow	mgd	15
Willamette River		
Minimum River Level	FT	52.5
100 Year Flood Elevation	FT	91.1
500 Year Flood Elevation	FT	102.3
Intake Screens		
Type: Horizontal Cylindrical		
Number	#	2
Capacity, total	mgd	70
Diameter	IN	66
Screen Opening Size	mm	1.75
Maximum Face Velocity	FPS	0.4
Top of Screen Elevation	FT	42.75

Table 3.1 WRWTP Existing Facilities Treatment Processes and Procedures (Continued)

Description	Units	Value
Screen Cleaning		
Cleaning Method: Air Burst		
Number of Compressors	#	2
Compressor Capacity	CFM	200
Air Receiver Volume	CF	2,200
Motor Size per Compressor	HP	50
Raw Water Pumps		
Type: Vertical Turbine, Single-Stage		
Number	#	4
Total Capacity with Standby	mgd	26.5
Capacity (each)		
1 VFD-Driven Pump (on backup power)	mgd	4
2 VFD-Driven Pumps	mgd	7.5
1 Constant-Speed Pump	mgd	7.5
Total Dynamic Head (15 mgd)	FT	107
Total Motor Horsepower	HP	1@100, 3@200
Initial Flash Mix		
Type: Pumped		
Number (Installed)	#	1
Mixing Energy	sec^{-1}	1,000
Pump Capacity	gpm	1,000
Total Dynamic Head	FT	16
Total Motor Horsepower	HP	7.5
Clarification Process		
Type: Ballasted Flocculation (Actiflo®)		
Number of Basins	#	2
Design Flow (per basin)	mgd	7.5
Maximum Process Hydraulic Flow (per basin)	mgd	15
Mixing/Flocculation		
Coagulation Chamber Volume	CF	2,000
Coagulation Chamber HRT	MIN	2.9
Injection Chamber Volume	CF	2,165
Injection Chamber HRT	MIN	3.1
Maturation Chamber Volume	CF	6,330
Maturation Chamber HRT	MIN	9.1

Table 3.1 WRWTP Existing Facilities Treatment Processes and Procedures (Continued)

Description	Units	Value
Clarification		
Settling Chamber Volume	CF	7,570
Settling Chamber HRT	MIN	9.6
Lamella Tube Settlers, surface area	SQ. FT.	520
Design Surface Loading Rate	GPM/SF	20
Maximum Surface Loading Rate	GPM/SF	40
Sand Slurry Recirculation System		
Number of Sludge Recirculation Pumps per Basin	#	2
Sludge Recirculation Rate	%	3
Capacity per Pump	GPM	165
Total Design Head	FT	75
Pump Horsepower	HP	10
Number of Sand Hydrocyclones (per basin)	#	2
Anticipated Sand Loss	LB/MG	25
Ozone Contact Basins		
Type: 8-Stage Counter-Co-Counter with Fine-Bubble Diffusers		
Number of Basins	#	2
Detention Time at 15 mgd with Both Basins in Service	MIN	14.9
Average Water Depth	FT	21
Inside Dimensions (each basin)	FT x FT	6 x 10
Volume (total)	CF	20,800
Ozone Generators		
Number	#	2
Feed Gas Vaporized From LOX	-	GOX
Capacity (each)	ppd	300
% Ozone by Weight (maximum)	%	10
Design Ozone Dose at 15 mgd	mg/L	2.5
Filters		
Type: Deep Bed, Dual Granular Media		
with Influent Flow Splitting		
Number of Filters	#	4
Number of Bays/Filter	#	1
Filter Bay Dimensions	FT x FT	20 x 23
Filter Area (each filter)	SF	460
Total Filter Area	SF	1,840

Table 3.1 WRWTP Existing Facilities Treatment Processes and Procedures (Continued)

Description	Units	Value
Maximum Filtration Rate (Q/A)		
All Filters On-Line at 15 mgd	GPM/SF	5.7
One Filter Off-Line at 15 mgd	GPM/SF	7.5
Hydraulic Maximum	GPM/SF	12
Filter Media		
GAC		
Depth	IN	72
Effective Size	MM	1.4
Uniformity Coefficient		<1.4
Depth: Diameter (L:D)		1,306
Minimum Empty Bed Contact Time (EBCT)		
All Filters On-Line at 15 mgd	MIN	7.9
One Filter Off-Line at 15 mgd	MIN	5.9
Sand		
Depth	IN	12
Effective Size	MM	0.45
Uniformity Coefficient		<1.4
Depth: Diameter (L:D)	MM:MM	677
Total Media		
Depth (maximum)	IN	84
Depth: Diameter (L:D)	MM:MM	1,984
Filter Wash System		
Air Scour Blowers		
Number	#	2
Air Scour Rate	CFM/SF	3.2
Blower Capacity (each)	SCFM	2,000
Blower Horsepower (each)	HP	100
Backwash Pumps		
Number	#	2
Maximum Backwash Rate	GPM/SF	20
Pump Capacity (each)	GPM	9,200
Pump Horsepower (each) – constant speed	HP	150
Clearwell		
Type: Buried, Reinforced Concrete		
Active Volume	MIL GAL	2.9
Max Operating Side Water Depth	FT	21.5

Table 3.1 WRWTP Existing Facilities Treatment Processes and Procedures (Continued)

Description	Units	Value
Dimensions	FT x FT	135 x 135
Detention Time (HRT) at 15 mgd When Full	HOURS.	4.6
Hydraulic Efficiency up to 9.6 mgd	T10:HRT	0.16
Hydraulic Efficiency 9.6-15.0 mgd	T10:HRT	0.11
Treated Water Pumps		
Type: Vertical Turbine, Two-Stage		
Number	#	4
Total Capacity with Standby	mgd	26.5
Capacity (each)		
1 VFD-Driven Pump (on backup power)	mgd	4
2 VFD-Driven Pumps	mgd	7.5
1 Constant-Speed Pump	mgd	7.5
Total Dynamic Head	FT	312
Motor Size	HP	3@500, 1@300
Waste Washwater Equalization and Pump Station		
Equalization Basins		
Type: Concrete		
Number of Basins	#	1
Volume	GAL	244,000
Washwater Recycle Pumps		
Type: Vertical Turbine		
Number	#	3
Total Capacity with Standby	GPM	1,500
Capacity (each)		
2 VFD-Driven Pumps	GPM	500
1 Constant-Speed Pump	GPM	500
Total Dynamic Head	FT	25
Motor Horsepower	HP	3 @ 5
Solids Treatment		
Type: Gravity Thickener and Centrifuges		
Estimated Maximum Solids Production (dry) at 15 mgd	LBS/DAY	2,000
Gravity Thickener (circular)		
Number of Units	#	1
Side Water Depth	FT	12
Diameter	FT	35

Table 3.1 WRWTP Existing Facilities Treatment Processes and Procedures (Continued)

Description	Units	Value
Maximum Solids Loading Rate	PPD/SF	8
Maximum Hydraulic Loading Rate	GPM/SF	1
Solids Mixing		
Type: Vertical Non-Clog		
Number of Pumps	#	1
Pumping Capacity	GPM	600
Pump Horsepower	HP	5
Total Dynamic Head	FT	12
Solids Pump Station		
Type: Progressive Cavity		
Number of Pumps	#	2
Pumping Capacity (each)	GPM	60
Motor Size (each)	HP	5
Total Dynamic Head	FT	60
Centrifuges		
Type	-	Horz. Scroll
Number of Units	#	2
Minimum Solids Cake Concentration	%	18
Capacity (each)	GPM	60
Maximum Solids Loading (each)	LB/HR	750
Motor Horsepower-Scroll (each)	HP	40
Motor Horsepower-Back Drive (each)	HP	15
Chemical Storage		
Primary Coagulant (49% alum solution)		
Number of Tanks	#	2
Storage Capacity, total	GAL	13,000
Storage (average dose x maximum flow)	DAYS	40
Average Dosage	mg/L	15
Solution Strength (alum)	#/gal	5.4
Cationic Polymer (dry polymer)		
Type	-	Dry Feeder
Feed Capacity	#/hr	17.6
% solution	%	1
Mixing Time	min	30
Sodium Hypochlorite (12.5% NaOCl solution)		
Number of Tanks	#	2

Table 3.1 WRWTP Existing Facilities Treatment Processes and Procedures (Continued)

Description	Units	Value
Storage Capacity, total	GAL	10,000
Storage (average dose x maximum flow)	DAYS	80
Average Dosage	mg/L	10
Solution Strength	#/gal	1.0
Caustic Soda (25% NaOH solution)		
Number of Tanks	#	1
Storage Capacity, total	GAL	6,500
Storage (average dose x maximum flow)	DAYS	20
Average Dosage	mg/L	5
Solution Strength	#/gal	2.65
Liquid Oxygen (100% LOX)		
Number of Tanks (with vaporizers)	#	1
Storage Capacity, total	GAL	6,000
Storage (average dose x maximum flow)	DAYS	17
Average Dosage	mg/L	26
Aqueous Ammonia (19% NH_4OH solution)		
Number of Tanks	#	1
Storage Capacity, total	GAL	1,400
Anionic Polymer		
Number of Drums	#	1
Storage Capacity, total	GAL	55
Storage (average dose x maximum flow)	DAYS	> 1 year
Average Dosage	mg/L	0.4
Non-Ionic Polymer		
Number of Drums	#	1
Storage Capacity, total	GAL	55
Storage (average dose x maximum flow)	DAYS	> 1 year
Average Dosage	mg/L	-
Calcium Thiosulfate		
Number of Totes	#	2
Storage Capacity, total	GAL	440
Storage (average dose x maximum flow)	DAYS	20
Average Dosage	mg/L	0.6
Solution Strength	#/gal	3.6

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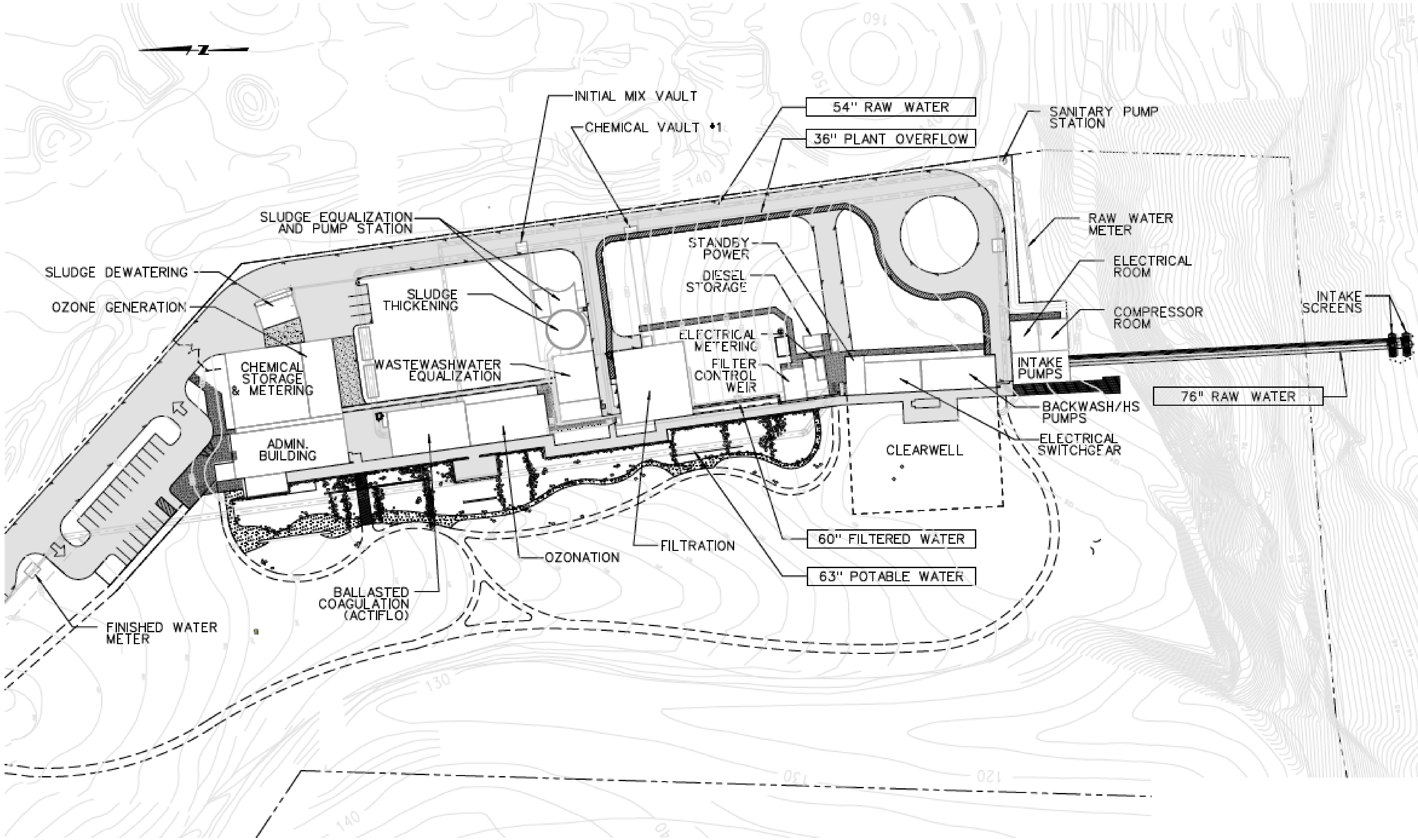

Figure 3.1 WRWTP Existing Site Plan

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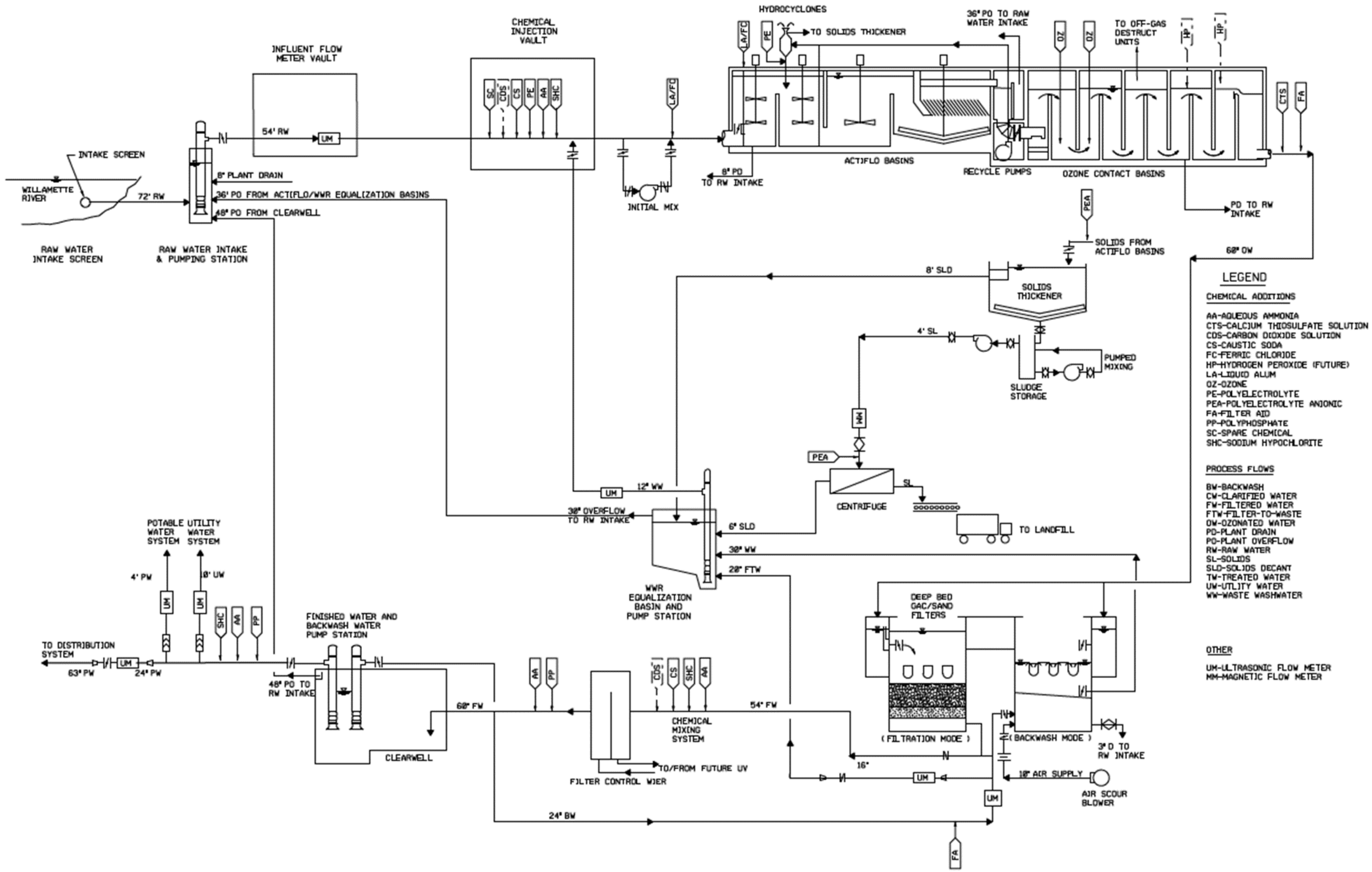

Figure 3.2 WRWTP Process Flow Diagram

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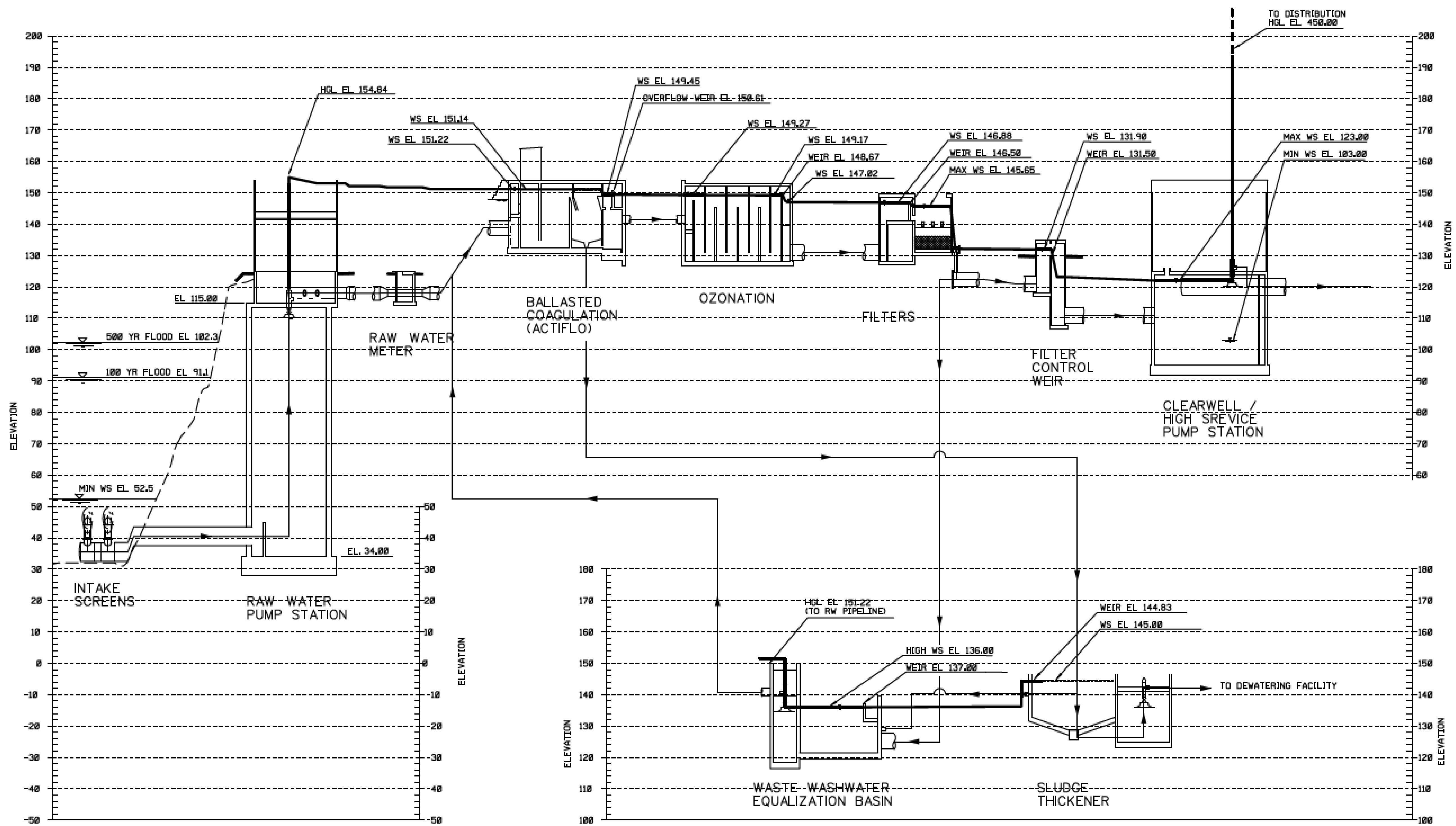

Figure 3.3 WRWTP Hydraulic Profile

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3.3.2 Raw Water Facilities

At the river end of the intake pipeline, cylindrical tee-shaped screens prevent debris and aquatic species from being drawn into the treatment plant. The screen system protects anadromous juvenile fish in flows up to 70 mgd, using Oregon Department of Fisheries and Wildlife (ODFW) and National Marine and Fisheries Service (NMFS) standards to meet Endangered Species Act (ESA) requirements.

The screens are cleaned with an airburst system, which releases pressurized air into the screen interior. Two compressors and an air receiver tank in the raw water pump station deliver air to the screens via two 12-inch air pipelines. Plant staff determines the frequency of screen-cleaning according to intake flow, debris in the river, and the season of the year.

The raw water pump station consists of an 85-foot-deep circular caisson wet well below a pump station superstructure. All raw water pumps are vertical turbines. Pump columns extend to within a few feet of the bottom of the caisson.

The wet well and pump station were designed for an ultimate flow of approximately 120 mgd; the initial installed firm capacity is 19 mgd (with the largest pump out of service); and total raw water pumping capacity is 26.5 mgd. Three of the pumps have variable frequency drives (VFDs), allowing for a wide range of pumping rates. The backup power generator can serve one 4 mgd pump.

To recycle flows within the plant and avoid surface discharge, an 8-inch plant drain pipe to empty water-retaining process basins, a 36-inch plant overflow pipe, and a 48-inch clearwell overflow pipe penetrate the raw water caisson.

The raw water pumps discharge to two separate manifolds that connect to the main 54-inch raw water pipeline to the treatment facility. The 54-inch pipeline is sized to deliver 70 mgd. A 24-inch magnetic flowmeter measures raw water flow rate, and the flow signal is transmitted to the Supervisory Control and Data Acquisition (SCADA) system to control downstream plant operations.

A sample tap on the raw water pipeline discharge header monitors raw water continuously at the raw water pump station. Turbidity, particle counts, pH, temperature, and hydrocarbon concentrations are monitored with on-line analyzers, and results are transmitted to SCADA.

3.3.3 Chemical Injection Vault and Initial Mixing Facility

A chemical injection vault upstream of the ballasted flocculation system is a point for adding the following chemicals:

- Alum or ferric chloride (not used) for primary coagulant.
- Sodium hydroxide for pH adjustment, if needed for optimized coagulation.
- Cationic polymer for the Actiflo® process.
- Sodium hypochlorite (for disinfection residual).

In addition, while not used currently, the chemical injection vault can add the following in the future:

- Aqueous ammonia if chloramines are used in the future in lieu of free chlorine.
- Carbon dioxide for future pH adjustment, if needed for optimized coagulation.

Alum, the primary coagulant, is added at the initial mixing vault upstream of the Actiflo® process. In the vault, raw water is suctioned from the raw water pipeline upstream of chemical injection and pumped back to the pipeline through a 90-degree spray nozzle. Primary coagulant is added at the "eye" of the spray cone to instantly mix coagulant into the raw water flow stream. As a backup, primary coagulant can also be added at the coagulation chamber of the Actiflo® basin, where the 36-inch raw water pipeline penetrates the structure. Coagulant addition is flow-paced using data from the raw water flowmeter. It can also be paced based on a signal from the Streaming Current Monitor (SCM), located in the Sludge Thickener Building.

Sampling for the SCM from the raw water pipeline is done just downstream of the Initial Mix Vault. The only chemical typically added at the initial mix vault is alum. The other chemical injection points in the injection vault are used seasonally.

3.3.4 Ballasted Flocculation (Actiflo®) System

Coagulated water flows into the Actiflo® inlet channel and is distributed to the two Actiflo® basins via 36-inch diameter inlet isolation valves. Designed for 7.5 mgd (at 20 gm/sf surface loading rate), each Actiflo® basin consists of four separate chambers: coagulation, injection, maturation, and settling. The first three chambers contain vertical shaft mechanical mixers. The coagulation chamber provides intense mixing and serves as an alternate feed point for primary coagulant addition (as described in Section 3.3.3). The injection chamber also provides intense mixing for adding coagulant-aid polymer and microsand. This intense mixing is critical to ensure that the floc and microsand adhere to each other.

Microsand added to the injection chamber is separated from the sludge via the hydrocyclones in a building above the injection chamber. The maturation chamber allows slower mixing of the coagulated water for floc formation and attachment of the microsand to the floc. Enmeshment of the microsand in the floc creates a high-density material, known as "ballasted floc."

The ballasted, or weighted, floc is then settled out in the settling chamber, which contains plastic lamella tube settlers to enhance settling and a rotating scraper arm to collect settled sludge. The sludge/microsand mixture collected in the settling chamber is pumped back to the head of the process where the microsand is separated in the hydrocyclones and returned to the injection chamber. The separated sludge is discharged to the gravity thickener. The hydrocyclones are housed inside of the Sand Storage Building on top of the Actiflo® coagulation and injection chambers.

Settled water from the Actiflo® process collects in rectangular weir troughs and flows into an effluent channel. The channel has a slide gate to isolate the effluent of each of the Actiflo® basins. Flow from the effluent channel is diverted to the ozone contact basins via a 30-inch-diameter pipeline with an isolation butterfly valve. Sample taps are located on each of the effluent pipelines, which route water through a turbidity meter and a pH/temperature probe. A settled water sample is also pumped to the laboratory sample sink.

The slide gate and isolation valves allow for operational flexibility. If one of the two ozone contact basins is out of service, settled water from both Actiflo® basins can flow to either ozone contact basin. If an Actiflo® basin is out of service, settled water can flow from one Actiflo® basin to both ozone contact basins. The slide gate also allows the operator to bring one basin on-line and to overflow to waste while the other is in operation.

The Actiflo® process also contains an overflow weir and channel, which can be used to divert flow back to the raw water caisson during initial start-up of the Actiflo® process or if the quality of the clarified water exceeds an operator setpoint. To dewater the basins, mud valves are located in each coagulation and maturation chamber to drain the basins while the recirculation pumps deliver flow back to the injection chamber.

3.3.5 Ozonation System

Though not currently recognized by the state of Oregon, ozonation following clarification (termed "intermediate ozonation") disinfects and inactivates *Giardia*, viruses, and *Cryptosporidium*. Ozonation also oxidizes the mild T&O compounds that occur nearly year-round in Willamette River water and oxidizes trace organic compounds that may occasionally be present. Ozone also improves the downstream filtration process by altering the surface charge of particles and making them more filterable. While not required by OHA, since start-up in 2002, Wilsonville has decided to operate the ozonation system to achieve a minimum of 1.0-log of *Cryptosporidium* inactivation based on the United States Environmental Protection Agency (EPA) CT (product of concentration [C] and contact time [T]) tables.

Clarified water is conveyed from the Actiflo® process to the two ozone contact basins through individual pipes from the Actiflo® effluent channel. The individual pipes have motorized valves, which can isolate each ozone contact basin if necessary. The ozonation system operates with both basins in service for a total treatment capacity of 15 mgd, or 7.5 mgd per basin. The nominal ozone contact time is 15 minutes at 15 mgd.

Multiple sample ports connected to on-line ozone residual monitors detect the dissolved ozone concentration throughout the contact basin. Three residual ozone monitors are each connected to two to four sample locations. Additionally, the ozone contactor gallery contains ambient air/oxygen and ozone monitors to detect any gas release into the gallery area. In addition to local visual and audio alarms, each of the units is alarmed to the SCADA system to notify operators. Ozone off-gas in the contactor headspace is conveyed to one of two ozone destruct units in the Ozone Contactor Gallery. Here the ozone is destroyed prior to venting to the atmosphere.

At the ozone effluent channel, calcium thiosulfate is added to the process stream to reduce any dissolved ozone residual in the settled water prior to entering the filters. This prevents off-gassing of ozone at the filters and protects the piping, valves, and GAC filter media from the potentially degrading effects of ozone. A sample line connected to an ozone residual monitor in the filter influent channel to detect any residual ozone in the filter influent water.

Non-ionic filter aid polymer can also be added to the ozone effluent to reduce filter-to-waste durations and improve filtration/solids capture. Filter aid polymer is not currently used as the filtration process has historically performed well without it.

The Ozone Generation Room in the Administration Building complex contains two ozone generators, each rated at 300 pounds per day (ppd) with sufficient capacity to treat 15 mgd. The ozone generators are cooled using utility water from the treatment plant. Also in this room are the nitrogen boost system, ambient air oxygen and ozone monitors to detect any release of gas into the area, and heating and ventilation equipment. Each of the monitors is alarmed to the SCADA system for operator notification and to local visual and audio alarms. A 6,000 gallon liquid oxygen (LOX) tank is located outdoors just south of this room.

3.3.6 Filtration System

The filters are located downstream of the Ozone Contact Basins. Filtration through a deep-bed dual media (GAC over sand) removes any material carried over from the Actiflo® basin and allows time for adsorption of dissolved organic material, such as SOCs, onto the GAC.

The GAC media is an optimal surface for the growth of bio-organisms for biofiltration, which is another mechanism for removing trace organic compounds. An inlet weir at each filter allows uniform distribution of flow to each of the four filter cells. At the current 15 mgd plant capacity, the filters are rated at 7.5 gpm/sf with one filter out of service for backwashing and a nominal filtration rate of 5.7 gpm/sf when all four filters are in service.

The GAC filter media depth provides an EBCT of 7.5 minutes when all filters are on-line and 5.6 minutes with one filter out of service. The GAC filter adsorbs trace organic compounds, which may occur infrequently at trace concentrations in the raw water supply, and act as another barrier against T&O. Veolia replaces this GAC media ~ every four years, to maintain optimal adsorption capacity.

The treated water exits the filters through the underdrain system and ultimately flows into a common filter effluent pipeline under the filter gallery slab. Filter-to-waste is provided by diverting filtered water back through the backwash header and over to the washwater equalization basin. A filter control weir structure is located between the filters and the clearwell to control the downstream hydraulic gradeline of the filters.

At the combined filter effluent pipeline, sodium hypochlorite is added to provide free chlorine residual for disinfection, and sodium hydroxide is added to adjust the pH for corrosion control.

Space and hydraulic head were allocated in the original 1999-2000 designs and 2002 construction between the filters and clearwell to accommodate a potential future UV disinfection system.

Filters are backwashed based on an operator set time, effluent turbidity, or maximum head loss as measured by filter differential pressure. Analytical instruments monitor the filtered water turbidity and particle counts on each filter effluent and a turbidity of the combined filtered effluent.

The cleaning cycle for each filter includes air scour and water backwash. At the start of a wash cycle, the water level is drained to a few inches above the media, and air scour begins. Following an operator-adjustable time, the backwash pump is activated at a low flow for concurrent air scour and wash water. When the water level rises to an operator-set level below the lip of the washwater troughs, the air scour is terminated, and the backwash rate is increased to an operator-adjustable high rate level.

3.3.7 Liquid Chemical Storage and Feed Facilities

The treatment plant has bulk storage space allocated for the following liquid treatment chemicals. The Chemical Storage Room in the Administration Building complex contains the following chemical storage facilities:

- Two 6,500-gallon tanks for liquid alum (or ferric chloride).
- One 4,400-gallon tank and one 3,900-gallon tank for liquid sodium hypochlorite.
- One 6,500-gallon tank for sodium hydroxide.

- One 1,400-gallon tank for aqueous ammonia (not used).
- Two 55-gallon drums for sludge conditioning polymer.
- Two 220-gallon totes for calcium thiosulfate.
- Two 55-gallon drums for filter aid polymer.
- One dry feeder and mixing tank for Actiflo® polymer.

Primary coagulant (alum) is used to coagulate the suspended solids and dissolved organic carbon in the raw water. The coagulant is added at the initial mix vault for efficient contact with the raw water. A secondary addition point in coagulation chamber of the Actiflo® basin is typically not used but is available as potential back-up for the initial mix vault.

Liquid alum is stored as a 49-percent solution. The tanks are piped to the diaphragm metering pumps, which transfer the alum solution to the dosing location. The metering pumps have manual stroke adjustments and automatic speed control for flow-pacing based on the raw water flowmeter signal. All chemical systems share this common feature for chemical feed rate control.

A coagulant aid polymer used in the coagulation process is vital to the proper function of the Actiflo® process because it creates a floc that adheres to the microsand. High-molecular-weight cationic polymer is added at both the Hydrocyclone Collection Box and the effluent of the injection chamber. In case of a mechanical failure, another application point for temporary use is located upstream of the Actiflo® process at the chemical vault. Dry polymer is automatically batched into a dilute solution using the dry chemical feed system, which includes a dry hopper, mixing tank, and aging tank. The resulting solution is pumped to the appropriate location(s) with chemical metering pumps. Each Actiflo® basin has a separate feed point.

Sodium hypochlorite is provided for free chlorine disinfection following filtration and for residual disinfection in the distribution system. It can also be added for intermittent chlorination at other locations in the plant to keep various basins clean. Sodium hypochlorite is delivered in bulk as a 12.5-percent liquid solution. The storage tanks are piped to the metering pumps, which transfer the solution to the dosing location. The primary point of application is at the filter effluent, while additional "booster" chlorine can be added to the finished water.

Sodium hydroxide is used for pH adjustment. It is stored in a 25-percent liquid solution, and metering pumps deliver it to the application location. The pH of the water can be adjusted at three locations in the plant: raw water (chemical vault), filter influent, and filter effluent. The typical chemical feed point is at the filter effluent. Seasonally, sodium hydroxide is added to the raw water to optimize coagulation.

Although not currently used at the plant, nonionic polymer can be used as a filter aid. The primary point of chemical addition is at the Ozone Contact Basin effluent channel. The polymer can also be added to the backwash water based on a flow signal from the backwash water flowmeter.

Calcium thiosulfate is used to quench any ozone residual in the ozonation system effluent prior to filtration. Liquid calcium thiosulfate is stored in 220-gallon totes. The active tote is connected to metering pumps, which deliver the chemical to the ozone effluent channel. An ozone residual monitor located in the filter gallery detects any ozone residual in the filter inlet channel.

Space in the Chemical Storage Room is allotted for storage and metering of polyphosphate, a corrosion inhibitor. Space, chemical storage, and feed facilities were provided for aqueous ammonia. Aqueous ammonia reacts with sodium hypochlorite to form chloramines for residual disinfection of treated water. The chemical can be added downstream of the Filter Control Weir or at the High Service Pump Station. This system was added in case additional DBP control is needed to meet more stringent future regulations, or if the plant water were to be blended with another chloraminated water supply in the region, such as the Portland Water Bureau (PWB). However, this chemical has not ever been used at the WRWTP

Anionic polymer is used for sludge processing. It can be added to the thickener influent or the centrifuge inlet. It is stored as a liquid (emulsion) in 55-gallon drums housed in the Chemical Building. Polymer is pumped to the point of addition with PolyBlend® units, which combine polymer mixing with utility water and chemical delivery to the points of application.

A truck fill station is located at the southeast corner of the Chemical Storage Room for bulk delivery of chemicals stored in tanks. At the fill station, the operator must select the chemical tank to fill on a local control panel. The panel will then display the level in the tank to verify that it requires filling. When the operator selects start, the inlet valve will open and the delivery driver can connect the hose to the proper fill station and open the manual isolation valve. An alarm will sound at the station's tank HIGH level to warn that the tank has been filled.

3.3.8 Washwater Equalization Basin

The washwater equalization basin provides equalization for recycling the filter backwash water, filter-to-waste water, sludge thickener decant water, and the dewatering facility centrate water. The basin is sized to store approximately two backwash volumes, including filter-to-waste. Flow collected in the basin is pumped back to the raw water pipeline just downstream of the chemical injection vault.

The recycle pump station contains three variable-speed vertical turbine pumps, each rated at 500 gpm, which are controlled according to the desired recycle rate. The basin contains an overflow weir box and pipe to divert overflows back to the raw water pump station caisson.

3.3.9 Gravity Thickener

Sludge, containing suspended solids and chemical floc, is physically removed from the treatment plant in the settling basins of the Actiflo® process. The solids are separated from the microsand at the hydrocyclones and conveyed by gravity to the gravity thickener. Sludge flow to the thickener is continuous while the Actiflo® process is in operation. Sludge is thickened from approximately 0.05 percent to 0.5 percent solids (in the Actiflo® waste stream) to 2.5 percent average solids concentration in the thickener.

Thickened sludge gravity-flows from the thickener to the sludge equalization and mixing tank where sludge quality and quantity are equalized prior to pumping to the centrifuges. The pipeline between the thickener and mixing tank contains a motorized valve that controls sludge transfer based on an operator-set timer. The mixing tank contents are mixed with a constant-speed solids mixing pump.

A PVC standpipe is located adjacent to the mixing tank. In an emergency, the standpipe can be used to divert sludge from the mixing tank to the Irrigation Waste Pump Station. The pump station discharges to the sewer system. While this system has not been needed to date, it can be used for short-term removal of solids from the treatment plant.

Thickened sludge transfer pumps convey contents of the sludge mixing tank to the centrifuges for dewatering. These pumps work in combination with the centrifuges. The thickened sludge flow rate is monitored by a magnetic flowmeter. Polymer is added to the thickened sludge before the centrifuges to help in dewatering.

The centrifuges are located in the two-story Solids Handling Building. The upper floor contains the mechanical equipment and the lower floor is a pass-through for the sludge-hauling trucks. A diverter gate is located on the solids discharge chute of the centrifuges. Once the solids have reached a specified percent solid concentration, or an operator set time has elapsed, the diverter gate opens and dewatered sludge drops down into a screw conveyor trough on the underside of the upper story floor slab. The conveyor must be operating when the centrifuge is in operation to collect sludge and divert it to the conveyor chutes and into sludge collection bins (or a hauling truck in the future). Liquid centrate recovered from the centrifuge operation is conveyed by gravity to the washwater equalization basin.

3.4 Historical Plant Performance

Historical operating and plant performance data was obtained from the plant staff in March 2015. Figure 3.4 summarizes key operational and water quality performance parameters. The data is embedded into a process flow diagram of the overall plant. Raw water quality data is presented for the 11-year period since the 2006 WRWTP Master Plan was completed.

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RAW WATER QUALITY (MONTHLY AVERAGE)

	TURBIDITY (NTU)	TOC (mg/L)
JAN	23.82	1.52
FEB	14.99	1.39
MAR	15.56	1.43
APR	8.67	1.25
MAY	5.43	1.13
JUN	5.22	1.09
JUL	4.13	1.17
AUG	3.37	1.15
SEP	3.03	1.12
OCT	4.69	1.37
NOV	10.48	1.66
DEC	16.41	1.76

SETTLED WATER QUALITY (PERCENT RANK)

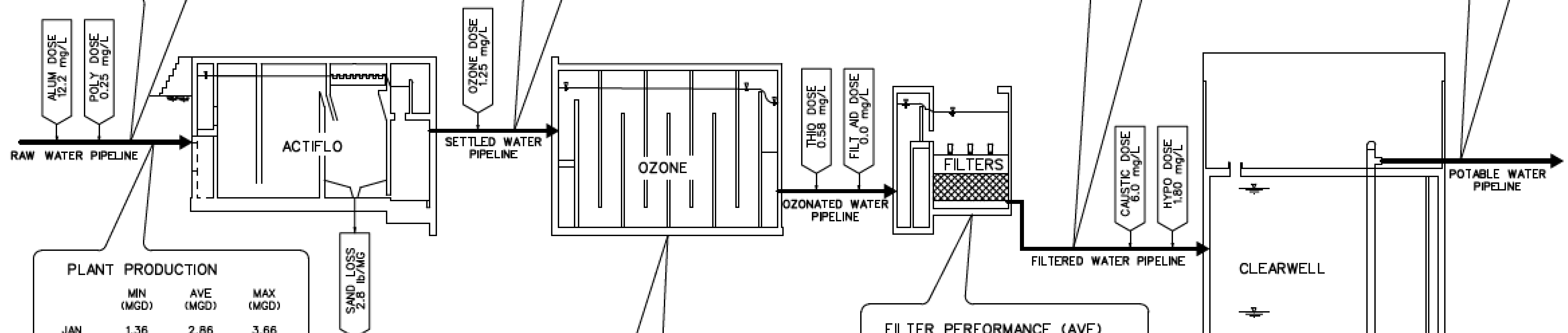
	5% (NTU)	50% (NTU)	95% (NTU)
ACTIFLO #1	0.15	0.37	0.94
ACTIFLO #2	0.13	0.36	0.92

FILTERED WATER QUALITY (PERCENT RANK)

	5% (NTU)	50% (NTU)	95% (NTU)
FILTER #1	0.03	0.04	0.07
FILTER #2	0.03	0.04	0.07
FILTER #3	0.03	0.04	0.07
FILTER #4	0.03	0.05	0.07
COMBINED	0.03	0.04	0.07

FINISHED WATER QUALITY (PERCENT RANK)

PARAMETER	5%	50%	95%
pH	7.70	7.80	7.90
CHLORINE RES (mg/L)	0.75	0.82	0.89
Turbidity (NTU)	0.03	0.04	0.07
TOC (mg/L)	0.43	0.54	0.66



PLANT PRODUCTION

	MIN (MGD)	AVE (MGD)	MAX (MGD)
JAN	1.36	2.86	3.66
FEB	1.34	2.92	4.02
MAR	1.87	3.26	4.10
APR	1.66	3.41	5.11
MAY	2.57	4.71	7.33
JUN	3.94	6.05	8.78
JUL	4.95	7.81	10.23
AUG	5.93	8.43	9.83
SEP	2.78	6.55	10.15
OCT	2.18	4.07	6.31
NOV	2.21	3.37	5.02
DEC	1.15	3.26	4.42

ELECTRICAL USAGE

	(kWh/MG)
JAN	3,368
FEB	2,799
MAR	2,031
APR	3,969
MAY	2,639
JUN	2,537
JUL	2,456
AUG	2,394
SEP	2,558
OCT	2,918
NOV	3,109
DEC	3,130

OZONE DISINFECTION PERFORMANCE (AVERAGE LOG-INACTIVATION)

	GIARDIA (ESTIMATED)	CRYPTOSPORIDIUM	VIRUS (ESTIMATED)
JAN	25.5	1.12	53.0
FEB	25.8	1.17	52.7
MAR	25.9	1.27	51.1
APR	27.2	1.39	53.1
MAY	29.9	1.61	61.0
JUN	26.3	1.53	53.2
JUL	27.6	1.82	54.6
AUG	26.4	1.73	51.7
SEP	26.6	1.58	53.4
OCT	25.1	1.34	50.5
NOV	25.5	1.27	50.1
DEC	25.6	1.18	52.0

FILTER PERFORMANCE (AVE)

	RUN TIME (HRS)	EFFICIENCY (%)	LOADING (GPM/SF)
JAN	56.3	98.9	4.43
FEB	58.1	98.6	4.14
MAR	57.7	99.0	4.46
APR	56.8	99.0	4.68
MAY	57.7	98.9	4.27
JUN	55.2	98.6	4.47
JUL	56.9	98.7	4.59
AUG	53.1	98.7	4.43
SEP	58.4	98.6	4.15
OCT	59.2	98.7	4.00
NOV	58.8	98.7	3.74
DEC	56.4	98.6	3.57

CLEARWELL DISINFECTION PERFORMANCE (LOG-INACTIVATION GIARDIA)

	AVE
JAN	1.15
FEB	1.28
MAR	1.40
APR	1.45
MAY	1.17
JUN	1.10
JUL	1.31
AUG	1.34
SEP	1.33
OCT	1.35
NOV	1.45
DEC	1.32

GENERAL SHEET NOTES

1. RAW WATER QUALITY (MONTHLY AVERAGE) CALCULATED USING DATA FROM 2006-2014. ALL OTHER DATA PRESENTED IS FROM 2012-2014.

Figure 3.4 WRWTP Process Performance Summary

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Plant performance data is limited to a three-year period (2012 to 2014) due to the significant increase in plant production and change from batch to continuous operation once WRWTP began serving the City of Sherwood. Parameters summarized in the graphic include monthly finished water production, electrical usage, chemical usage, sand loss, settled water, filtered water and finished water turbidity, ozone disinfection performance, filter production efficiency, and clearwell disinfection performance.

Before Sherwood took water in early 2012, the plant was operated on a daily on/off cycle for 8 to 16 hours per day to meet Wilsonville's water demands. The average annual production ranged from 2.8 to 3.2 mgd, with a peak day demand of 6.6 mgd. Since early 2012, the plant has operated continuously to meet water demand for both Wilsonville and Sherwood. During 2012 to 2014, the annual average plant production ranged from 4.5 to 4.9 mgd, with a peak day demand of 10.2 mgd. Table 3.2 shows the WRWTP production data from 2006 to 2014. Figure 3.5 shows raw water turbidity levels, which have ranged from approximately 1 to 147 Nephelometric Turbidity Units (NTU).

The Actiflo® process has performed well, consistently producing clarified water with less than 0.95 NTU. Sand loss through the Actiflo® system has been relatively low (2.8 pounds per million gallons [lbs/mg]) during the evaluation period period, well below the typical of 12 -to 16 lbs/mg at other Actiflo® plants on the West Coast.

The ozonation process has achieved a minimum of 1.0-log *Cryptosporidium* inactivation and greater than 3.0-log inactivation of *Giardia*, meeting the stringent requirements of the operations contract, though OHA does not grant any disinfection credit for ozonation. A minimum of 0.5-log *Giardia* inactivation is also achieved post-filtration in the clearwell using free chlorine. Using the ozone system CT values and the EPA ozone disinfection tables, the plant consistently achieves greater than 8.0-log of *Giardia* removal or inactivation; OHA only requires 3.0-log of *Giardia* removal or inactivation.

Table 3.2 WRWTP Production (mgd)

Year	Annual Average	Peak Season Average(1)	Low Season Average(2)	Minimum Monthly Average		Maximum Monthly Average		Maximum Weekly Average		Maximum Daily	
				Month	Value	Month	Value	Dates	Value	Date	Value
2006	3.1	4.7	2	Feb	1.9	Jul	5.4	07/20 - 07/26	6	07/22	6.3
2007	3.2	4.8	2.2	Dec	2.1	Jul	5.3	07/10 - 07/16	5.9	07/12	6.3
2008	3.1	4.7	2.1	Jan	2.1	Jul	5.5	08/11 - 08/17	6.2	08/15	6.5
2009	3.1	4.7	2.1	Feb	2.1	Jul	5.3	07/27 - 08/02	6	08/01	6.9
2010	2.8	4.1	2.1	Jan	2	Aug	5.2	07/22 - 07/28	5.6	07/25	6.2
2011	2.8	4.2	2	Jan	2	Aug	4.9	09/02 - 09/08	5.7	08/29	6.0
2012	4.5	6.9	2.5	Jan	2.1	Aug	8.4	08/15 - 08/21	8.7	08/17	9
2013	4.8	6.9	3.3	Jan	3.2	Jul	8	08/06 - 08/12	8.4	08/06	8.8
2014	4.9	7.8	3.2	Dec	3.2	Aug	8.9	08/04 - 08/10	9.2	07/11	10.2
										07/31	12.5
										08/24	11.4

Notes:
(1) Peak season is defined as June through September.
(2) b. Low season is defined as December through February.

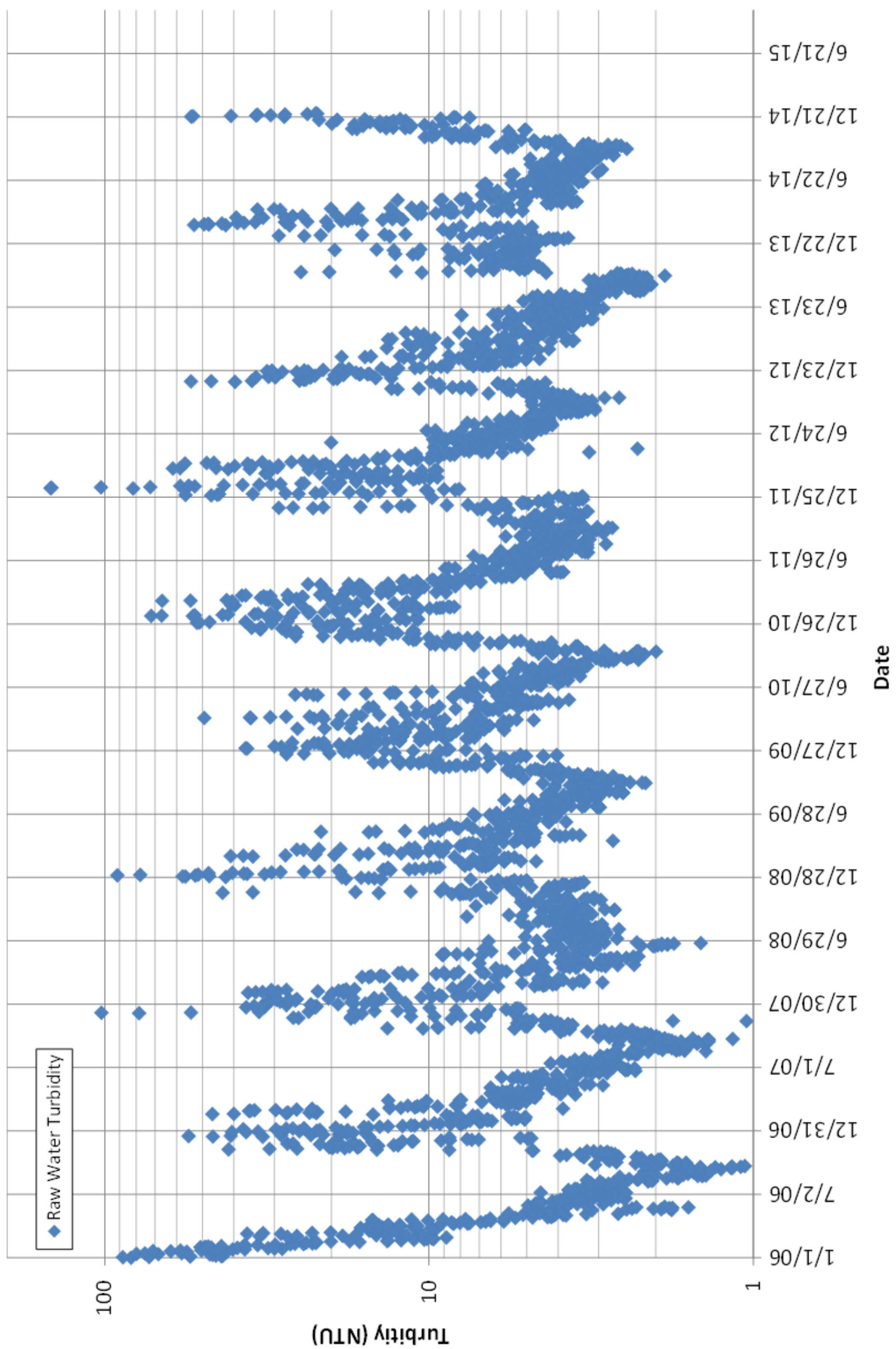

Figure 3.5 WRWTP Raw Water Turbidity

Average monthly raw water total organic carbon (TOC) levels ranged from 1.1 milligrams per liter (mg/L) to 1.8 mg/L. As shown in Figure 3.6, TOC removal is excellent, resulting in a low chlorine demand in the finished water and in the distribution systems, and low disinfection by-product (DPB) formation (based on evaluation of total trihalomethanes [TTHMs] and haloacetic acid 5 [HAA5, the sum of 5 HAA compound concentrations]). Average TOC percent removal between raw and finished water has ranged seasonally between 46 percent and 77 percent, with an average of 60 percent.

Various filter performance indicators were reviewed and analyzed including filtered water turbidity and filter run times. Filtered water turbidities have always been less than 0.10 NTU, well below both regulatory standards and the stringent performance requirements in the operations contract. Since the plant started operating continuously in early 2012, the filtration production efficiency has been very high (>98 percent) resulting in low backwash water usage.

During 2012 to 2014, the plant has used between 225 and 637 megawatt hours (mWh) per month. More power is used during the peak plant production months of June through September due to the increased pumping capacity at the raw water and finished water pump stations. The average unit power usage has been 2.7 mWh per MG produced. Figure 3.7 summarizes electrical power usage as a function of monthly finished water production.

During 2012 to 2014, the plant has produced between 14 and 69 wet tons per month of dewatered alum solids (sludge). More solids are generally produced during the fall and winter months when the raw water turbidity is elevated. A single centrifuge operates 10 to 20 hours per week, typically producing dewatered solids at a concentration of greater than 25 percent. The dewatered solids are hauled to a landfill (currently Coffin Butte Landfill located north of Corvallis) via a waste management contract. The average unit solids production has been 0.2 wet tons per MG produced, or approximately 0.05 dry tons/MG assuming 25-percent solids concentration. Figure 3.8 summarizes solids production as a function of monthly finished water production.

3.5 Conclusions

The data demonstrate exceptional operational plant performance for turbidity removal, disinfection levels, TOC removal, and low DBP formation potential. The extremely narrow range between the 5 and 95 percentile value for key water quality parameters such as turbidity, pH, and chlorine residual is a testament to the plant's robust design and the operator's attention to continuous optimal performance.

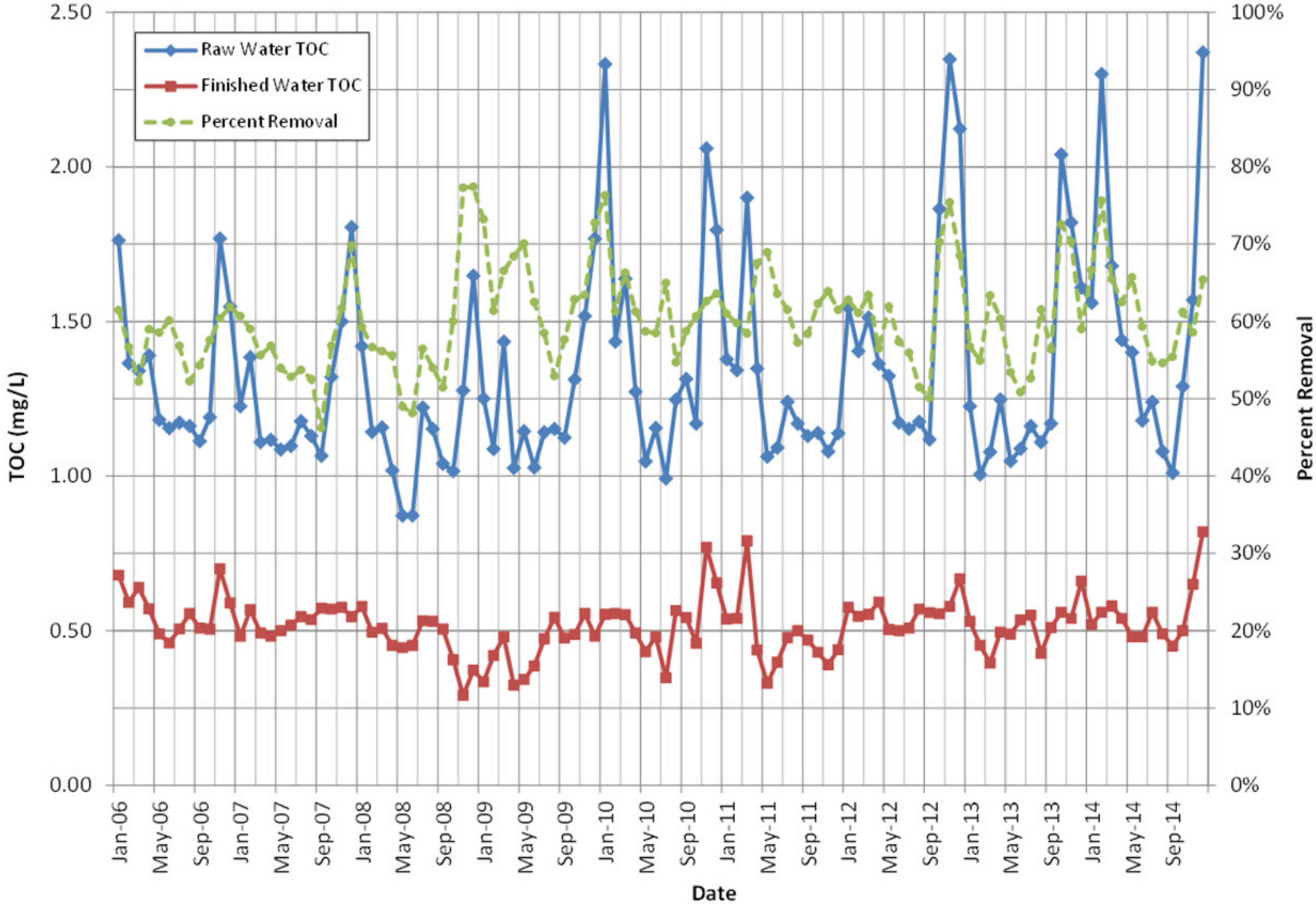

Figure 3.6 WRWTP Raw Water and Finished Water

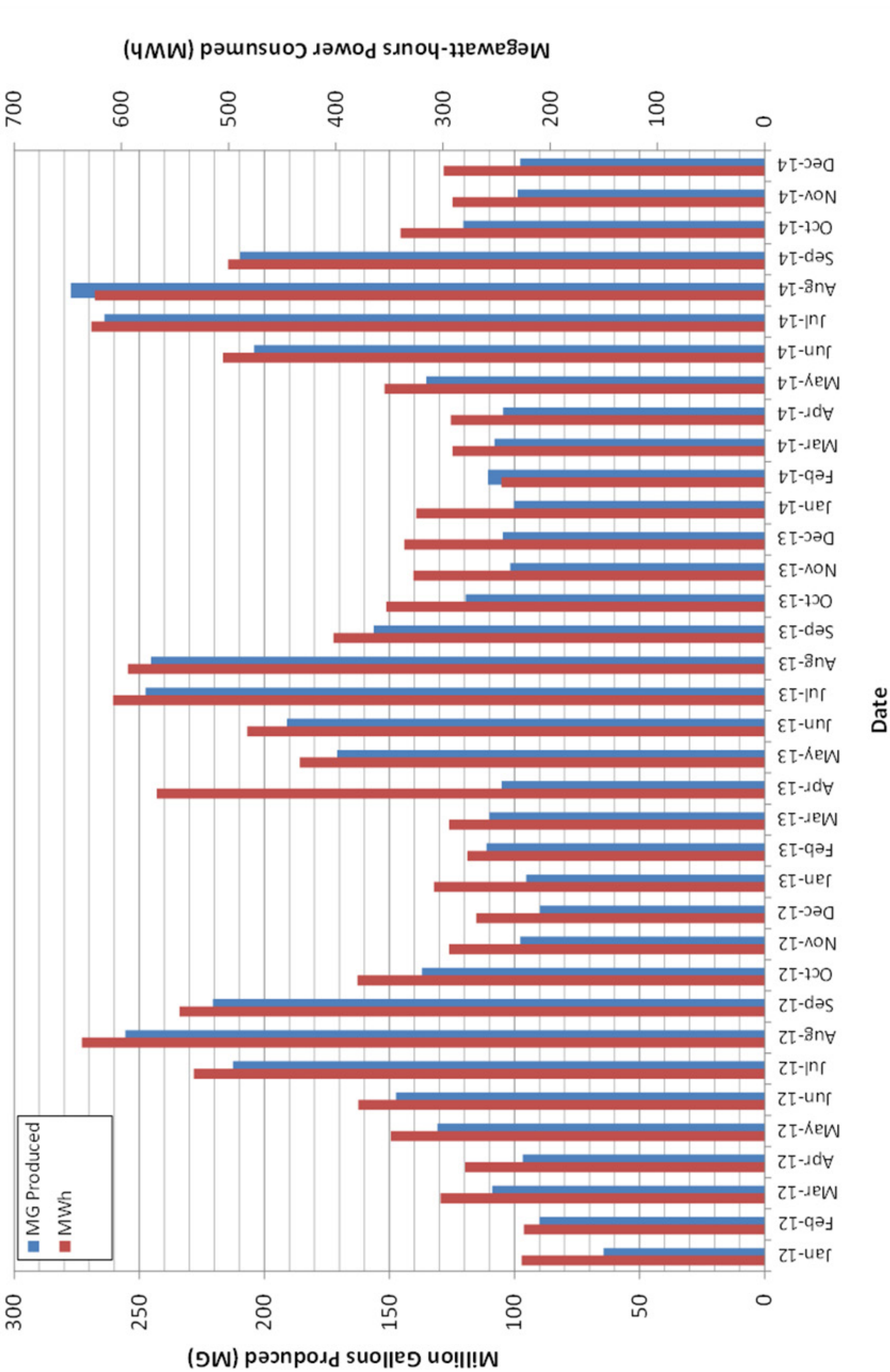

Figure 3.7 WRWTP Monthly Finished Water Production and Power Consumption

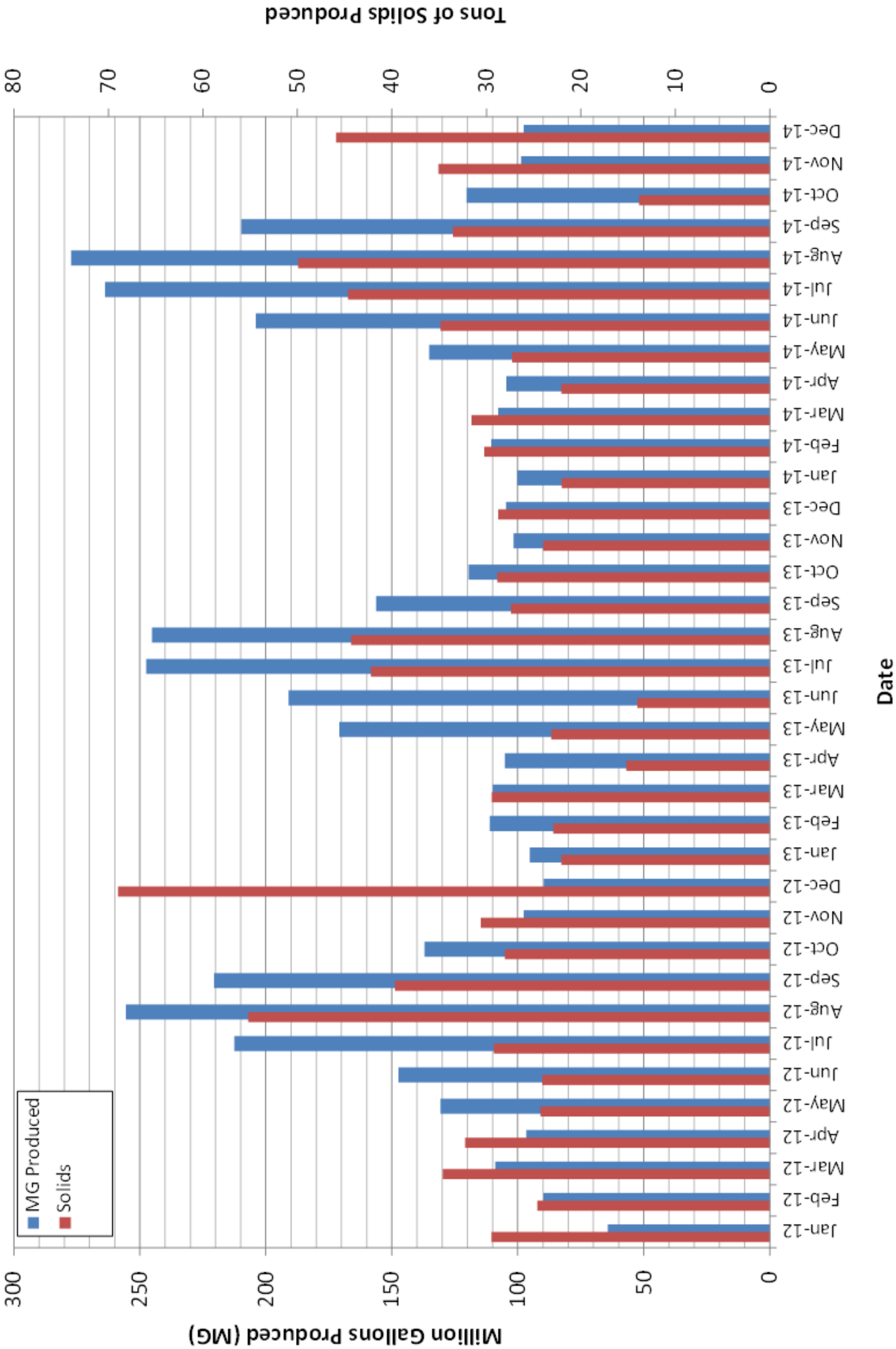

Figure 3.8 WRWTP Monthly Finished Water Production and Solids Production

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Chapter 4

HISTORICAL WATER QUALITY AND REGULATORY COMPLIANCE

4.1 Introduction

This Chapter summarizes the raw water quality in the Willamette River, the finished water quality from the WRWTP, and the current and anticipated future water quality regulations, including Contaminants of Emerging Concern (CECs).

Raw and finished water quality data presented are from May of 2006 through December 2014; no additional water quality analysis was performed as part of this ***2017 MPU***. May 2006 was a starting point for the data since the previous ***2006 Master Plan*** presented data from April 2002 through April 2006.

Through an agreement with the City, Veolia operates the WRWTP, which was commissioned in 2002. The water quality and operational contractual requirements are more stringent than regulatory requirements for select parameters. This Chapter also compares and contrasts the contractual and regulatory requirements.

4.2 Historical Water Quality

The Oregon Drinking Water Quality Act (the Act) was enacted in 1981, which includes the Oregon Revised Statutes (ORS), with periodic amendments. Per the OHA, the Act:

- Ensures that all Oregonians have safe drinking water.
- Provides a simple and effective regulatory program for drinking water systems.
- Provides a means to improve inadequate drinking water systems.

ORS 448.131 authorizes the OHA to adopt administrative rules to ensure safe drinking water. Oregon Administrative Rule (OAR) Chapter 333 Division 061 is reserved for regulations regarding public water systems. Table 4.1 presents the sampling frequency of finished and raw water quality parameters per the OAR requirements and the current operating contract with Veolia.

Table 4.1 WRWTP Comparison of Regulatory and Contract Sampling Frequencies

Contaminant	OAR Requirement	Contract Requirement
Physical Chemical Inorganic Parameters		
Conductivity	-	Weekly
Temperature	-	Continuous
Total Alkalinity	-	Weekly (Daily in the winter)
Total Hardness	-	Weekly
Calcium Hardness	-	Weekly
TON	-	Weekly
Iron	-	Monthly
Turbidity	Continuous	Continuous
Particles		Continuous
Color	-	Weekly
Physical Chemical Inorganic Parameters		Continuous
Chlorine Residual	Continuous	Continuous
Total Dissolved Solids	-	Weekly
Microbiological and Organic Parameters		
Total Coliform	40/month in Dist. Sys.	n/a
E. coli	If TC Positive	n/a
Viruses	-	Quarterly
Giardia	-	Monthly
Cryptosporidium	-	Monthly
Total Trihalomethanes	Quarterly	Monthly
Haloacetic Acids	Quarterly	Monthly
Bromate	Quarterly	Monthly
Regulated VOCs/SOCs (+dioxin)	Varies (Annually/ 3 Years)	Quarterly
Regulated IOCs	Varies (Annually/3 Years/ 9 Years)	Quarterly
Unregulated IOCs (+Al, B, Cr-6, Mn, Ag, V, Zn)	-	Quarterly
TOC	Monthly	Weekly
Geosmin	-	Monthly

Table 4.1 presents the contractual requirements for finished and raw water sampling. During the project's planning stages, the City established treated water quality goals for the WRWTP. They have been slightly modified since the plant was commissioned in 2002.

Table 4.2 compares the contractual treated water quality goals with the existing regulations from the OAR. The contractual finished water quality goal meets or is more stringent than the regulatory requirement for all water quality parameters.

Table 4.2 Comparison of Regulatory and Contract Finished Water Parameters

Water Quality Parameter	Unit	Existing Regulations	Contract Requirement
Total/fecal coliform	#/100 mL	<5% positive in system	0% positive leaving plant
Turbidity	NTU	≤0.3 95% of time; Always <1.0	<0.1 each filter 95% of filter run time(1); Always <0.3
Particles (>2 µm)	Count/mL	None	<50 95% of filter run time(1)
Pathogen Removal/Inactivation			
Viruses		4-log inactivation	Provide multi-barrier 2-log removal and 2-log inactivation
Giardia		2.5-log removal and 0.5-log inactivation (post filtration)	Provide multi-barrier 3-log removal and 1-log inactivation
Cryptosporidium		2-log removal	Provide multi-barrier 3-log removal and 1-log inactivation
Disinfection By-Products(2)			
TTHMs	µg/L	80	<40
HAA5	µg/L	60	<30
Bromate	µg/L	10	<5
Synthetic Organic Chemicals (including dioxins(3))	µg/L	Varies	<detection limit
Volatile Organic Chemicals	µg/L	Varies	<detection limit
Inorganic Chemical unreg (Al, B, Cr-6, Mn, Ag, V Zn)(3)	µg/L	Varies	<50% MCL
Alkalinity	mg/L as $CaCO_3$	None	>=20
pH		None	>=7.5 95% of time(1): Always ≥7.0
Arsenic	µg/L	2 to 10	≤2
Sulfate	mg/L	250	<MCL
TOC	mg/L	35% reduction in TOC if raw water in TOC is from 2-4 mg/L. 45% reduction if raw water TOC is from 4-8 mg/L	Same as OAR
T&O Compounds			
Geosmin	ng/L	None	<7
Odors	TON	3	<3

Notes:
(1) Within a 24-hour period from midnight to midnight.
(2) Data presented is from the finished water at the WTP effluent and not in the distribution system.
(3) Added analyses per Owner's request.

Raw and finished water quality were obtained with the assistance of Veolia staff and the City and Sherwood. Along with regularly calibrated field instruments, the operations staff continuously monitors the raw and finished water quality. Table 4.3 presents the raw and finished water quality data. The multi-barrier treatment approach at the WRWTP continues to produce finished water quality that meets or surpasses the state and federal regulatory requirements. Data in the tables include the finished water quality maximum contaminant level (MCL) along with the number of samples, value range, average, and medium data.

The 2006 – 2015 raw water quality data was compared to the data collected and presented in the 2006 Master Plan 2006. The few raw water contaminants detected in the raw water at trace levels have not been measured in the finished water and were therefore removed though the treatment process. Table 4.4 summarizes the finished water quality data from the WRWTP.

Table 4.3 WRWTP Summary of Raw Water Quality and Corresponding Finished Water MCL (May 2006 through 2014)

Contaminant	Unit	Finished Water MCL	No. of Samples	Value Range	Average	Median
General						
Turbidity	NTU	TT[2]: ≤0.3 95% of time; Always <1.0	3,167	1-147	9	5.2
TOC	mg/L	35% reduction in TOC if raw water in TOC is from 2-4 mg/L. 45% reduction if raw water TOC is from 4-8 mg/L	104	0.9 - 2.4	1.3	1.2
Alkalinity	mg/L as $CaCO_3$	None	1,000	0 - 31.3	22.9	22.9
Secondary Contaminants						
Color	-	15 color units	457	0 - 75	12.6	10
Corrosivity[1]	-	Non-corrosive				
Foaming Agents[1]	mg/L	0.5	n/a	n/a	n/a	n/a
pH	-	6.5-8.5	3,152	6.47-7.75	7.24	7.25
Hardness	mg/L as $CaCO_3$	-	463	0 - 38.1	23.5	23.2
Odor	-	3 TON	457	0 - 12	4.1	4.7
Total Dissolved Solids[1]	mg/L	500	n/a	n/a	n/a	n/a
Aluminum	mg/L	0.05-2	35	0 - 3.76	0.46	0.24
Chloride[1]	mg/L	250	n/a	n/a	n/a	n/a
Copper	mg/L	1 (MCL TT[2])	35	0.0052 - 0.0435	0.02	0.02
Fluoride	mg/L	2 (MCL 4.0)	35	0 - 0	0	0
Iron	mg/L	0.3	106	0 - 49.6	1.0	0.3
Manganese	mg/L	0.05	35	0.0035 - 0.169	0.02	0.01
Silver	mg/L	0.10	35	0 - 0	0	0
Sulfate	mg/L	250	35	2.5 - 9.46	4.3	3.9
Zinc	mg/L	5	35	0 - 0.0136	0.001	0
Contaminant	**Unit**	**Finished Water MCL**	**No. of Samples**	**No. of Detects**	**Value Range**	**Median**
Inorganic Contaminants (IOCs)						
Antimony	mg/L	0.006	35	1	0 - 0.00128	-
Arsenic	mg/L	0.010	35	1	0 - 0.0008	-
Barium	mg/L	2	35	35	0.00371 - 0.0268	0.0057
Beryllium	mg/L	0.004	35	1	0 - 0.00008	-
Boron	mg/L	Non-regulated	35	1	0 - 0.0543	-
Cadmium	mg/L	0.005	35	0	ND	ND
Chromium (total)	mg/L	0.1	35	6	0 - 0.00309	-
Cyanide (as free cyanide)	mg/L	0.2	35	1	0 - 0.0446	-
Lead	mg/L	TT[2]	35	2	0 - 0.00103	0
Mercury	mg/L	0.002	35	0	ND	ND
Nickel	mg/L	Non-Regulated	35	0	ND	ND
Nitrate-N	mg/L	10	35	35	0.17 - 0.74	0.37
Nitrite-N	mg/L	1	35	0	ND	ND
Selenium	mg/L	0.05	35	0	ND	ND
Sodium	mg/L	Non-regulated	35	35	3.16 - 8	4.6
Thallium	mg/L	0.002	35	0	ND	ND
Vanadium	mg/L	Non-regulated	35	23	0 - 0.0103	0.0023
Synthetic Organic Contaminants						
2,4-D	mg/L	0.07	35	0	ND	ND
2,4,5-TP Silvex	mg/L	0.05	35	1	0 - 0.00029	-
Bis (2ethylhexyl)adipate	mg/L	0.4	35	0	ND	ND
Alachlor	mg/L	0.002	35	0	ND	ND
Atrazine	mg/L	0.003	35	0	ND	ND
Benzo(a)pyrene	mg/L	0.0002	35	0	ND	ND
Lindane[1]	mg/L	0.0002	n/a	n/a	n/a	n/a
Carbofuran	mg/L	0.04	35	0	ND	ND
Chlordane	mg/L	0.002	35	0	ND	ND
Dalapon	mg/L	0.2	35	0	ND	ND
Dibromochloropropane (DB CP)	mg/L	0.0002	35	0	ND	ND

Table 4.3 WRWTP Summary of Raw Water Quality and Corresponding Finished Water MCL (May 2006 through 2014) – (Continued)

Contaminant	Unit	Finished Water MCL	No. of Samples	No. of Detects	Value Range	Median
Dinoseb	mg/L	0.007	35	0	ND	ND
Dioxin (2,3,7,8-TCDD)	mg/L	0.00000003	35	0	ND	ND
Diquat	mg/L	0.02	35	0	ND	ND
Endothall	mg/L	0.1	35	0	ND	ND
Endrin	mg/L	0.002	35	0	ND	ND
Ethylene Dibromide	mg/L	0.00005	35	0	ND	ND
Heptachlor	mg/L	0.0004	35	0	ND	ND
Heptachor epoxide	mg/L	0.0002	35	0	ND	ND
Hexachlorobenzene	mg/L	0.001	35	0	ND	ND
Hexachlorocyclopentadiene	mg/L	0.05	35	0	ND	ND
Methoxychlor	mg/L	0.04	35	0	ND	ND
Pentachlorophenol	mg/L	0.001	35	0	ND	ND
Bis(2-ethylhexyl)phthalate	mg/L	0.006	35	1	0 - 0.0013	-
Picloram	mg/L	0.5	35	0	ND	ND
Polychlorinated Biphenyls	mg/L	0.0005	35	0	ND	ND
Simazine	mg/L	0.004	35	0	ND	ND
Toxaphene	mg/L	0.003	35	0	ND	ND
Oxamyl(Vydate)	mg/L	0.2	35	0	ND	ND
Volatile Organic Contaminants (VOCs)						
Benzene	mg/L	0.005	35	0	ND	ND
Bromobenzene	mg/L	Non-regulated	35	0	ND	ND
Bromochlormethane	mg/L	Non-regulated	35	0	ND	ND
Bromodichlormethane	mg/L	Non-regulated	35	0	ND	ND
Bromoform	ug/L	10	35	0	ND	ND
Bromomethane	mg/L	Non-regulated	35	0	ND	ND
n-Butylbenzene	mg/L	Non-regulated	35	0	ND	ND
sec-Butylbenzene	mg/L	Non-regulated	35	0	ND	ND
tert-Butylbenzene	mg/L	Non-regulated	35	0	ND	ND
Chlorobenzene	mg/L	0.1	35	0	ND	ND
Carbon Tetrachloride	mg/L	0.005	35	0	ND	ND
Chloroethane	mg/L	Non-regulated	35	0	ND	ND
Chloroform	mg/L	Non-regulated	35	3	0 - 0.00138	-
Chloromethane	ug/L	10	35	0	ND	ND
2-Chlorotoluene	mg/L	Non-regulated	35	0	ND	ND
1,2-Dibromo- 3Chloropropane	mg/L	Non-regulated	35	0	ND	ND
Dibromochloromethane	ug/L	10	35	0	ND	ND
1,2-Dibromoethane	mg/L	Non-regulated	35	0	ND	ND
Dibromomethane	mg/L	Non-regulated	35	0	ND	ND
1,2-Dichlorobenzene	mg/L	0.6	35	0	ND	ND
1,3-Dichlorobenzene	mg/L	Non-regulated	35	0	ND	ND
1,4-Dichlorobenzene	mg/L	0.075	35	0	ND	ND
Dichlorodiflouromethane	mg/L	Non-regulated	35	0	ND	ND
1,1-Dichloroethane	mg/L	Non-regulated	35	0	ND	ND
1,2-Dichloroethane	mg/L	0.005	35	0	ND	ND
1,1-Dichloroethylene	mg/L	0.007	35	0	ND	ND
cis-1,2-Dichloroethylene	mg/L	0.07	35	0	ND	ND
trans-1,2-Dichloroethylene	mg/L	0.1	35	0	ND	ND
1,2-Dichloropropane	mg/L	0.005	35	0	ND	ND
1,3-Dichloropropane	mg/L	Non-regulated	35	0	ND	ND
2,2-Dichloropropane	mg/L	Non-regulated	35	0	ND	ND
1,1-Dichloropropene	mg/L	Non-regulated	35	0	ND	ND
cis-1,3-Dichloropropane	mg/L	Non-regulated	35	0	ND	ND
trans-1,3-Dichloropropene	mg/L	Non-regulated	35	0	ND	ND
Ethylbenzene	mg/L	0.7	35	0	ND	ND
Hexachlorobutsadiens	mg/L	Non-regulated	35	0	ND	ND
Isopropylbenzene	mg/L	Non-regulated	35	0	ND	ND
p-Isopropylbenzene	mg/L	Non-regulated	35	0	ND	ND

Table 4.3 WRWTP Summary of Raw Water Quality and Corresponding Finished Water MCL (May 2006 through 2014) – (Continued)

Contaminant	Unit	Finished Water MCL	No. of Samples	No. of Detects	Value Range	Median
Methylene Chloride	mg/L	Non-regulated	35	0	ND	ND
Napthalene	mg/L	Non-regulated	35	0	ND	ND
n-Propylbenzene	mg/L	Non-regulated	35	0	ND	ND
Styrene	mg/L	0.1	35	0	ND	ND
1,1,1,2-Tetrachloroethane	mg/L	Non-regulated	35	0	ND	ND
1,1,2,2-Tetrachloroethane	mg/L	Non-regulated	35	0	ND	ND
Tetrachloroethylene	mg/L	0.005	35	0	ND	ND
Toluene	mg/L	1	35	0	ND	ND
1,2,3-Trichlorobenzene	mg/L	Non-regulated	35	0	ND	ND
1,2,4-Trichlorobenzene	mg/L	0.07	35	0	ND	ND
1,1,1-Trichloroethane	mg/L	0.2	35	0	ND	ND
1,1,2-Trichloroethane	mg/L	0.005	35	0	ND	ND
Trichloroethylene	mg/L	0.005	35	0	ND	ND
Trichloroflouromethane	mg/L	Non-regulated	35	0	ND	ND
1,2,3-Trichlorpropane	mg/L	Non-regulated	35	0	ND	ND
1,2,4-Trimethylbenzene	mg/L	Non-regulated	35	0	ND	ND
1,3,5-Trimethylbenzene	mg/L	Non-regulated	35	0	ND	ND
Vinyl Chloride	mg/L	0.002	35	0	ND	ND
Xylenes (total)	mg/L	10	35	0	ND	ND
Dichloromethane	mg/L	0.0005	35	0	ND	ND
Contaminant	**Unit**	**Finished Water MCL**	**No. of Samples**	**% Detected**	**Value Range**	**Median**
Microbial Contaminants						
Total Coliform	ct/100 mL	<5% positive in system	1,000	100%	1 - 11200	301
E. Coli	ct/100 mL		1,000	98%	0 - 866	6
Viruses	MPN/100 L	4-log	35	63%	0 - 78.8	3.36
Giardia	ct/100 L	3-log	105	13%	0 - 93.2	0
Cryptosporidium	ct/100 L	2-log removal	105	2%	0 - 10	0

Notes:
(1) Parameter not actively sampled.
(2) TT: Treatment Technique.

Table 4.4 WRWTP Summary of Finished Water Quality (May 2006 through 2014)

Contaminant	Unit	MCL	No. of Samples	Value Range	Average	Median
General						
Turbidity	NTU	TT[2]: ≤0.3 95% of time; Always <1.0	3,167	0.02-0.06	0.04	0.04
TOC	mg/L	Non-regulated	104	0.29 - 0.82	0.51	0.54
Alkalinity	mg/L as $CaCO_3$	None	942	19 - 33.	25	25
Taste and Odor						
Geosmin	ng/L	None	104	0 - 0	0.00	0
Secondary Contaminants						
Color	-	15 color units	450	0 - 5	0.01	0
pH	-	6.5-8.5	3,167	7.50-8.10	7.8	7.8
Hardness	mg/L as $CaCO_3$	250	453	16.7 - 36.2	24.0	23.5
Odor	-	3 TON	448	0 - 3.3	1.1	1.2
Total Dissolved Solids	mg/L	500	453	26.2 - 91.5	63.4	63.9
Aluminum	mg/L	0.05-2	34	0 - 0.016	0.0005	0
Chloride[1]	mg/L	250	n/a	n/a	n/a	n/a
Copper	mg/L	1 (MCL TT[2])	34	0.0078 - 0.036	0.015	0.0132
Fluoride	mg/L	2 (MCL 4.0)	33	0 - 0	0	0
Iron	mg/L	0.3	104	0 - 0	0	0
Manganese	mg/L	0.05	34	0 - 0.007	0.002	0.002
Silver	mg/L	0.1	34	0 - 0	0	0
Sulfate	mg/L	250	34	7.4 - 18	10.19	9.83
Zinc	mg/L	5	34	0 - 0.0196	0.001	0
Contaminant	**Unit**	**MCL**	**No. of Samples**	**No. of Detects**	**Value Range**	**Median**
Inorganic Contaminants (IOCs)						
Antimony	mg/L	0.006	34	0	ND	ND
Arsenic	mg/L	0.010	34	0	ND	ND
Barium	mg/L	2	34	34	0.0029 - 0.0064	0.0047
Beryllium	mg/L	0.004	34	0	ND	ND
Boron	mg/L	Non-regulated	0	0	ND	ND
Cadmium	mg/L	0.005	0	0	ND	ND
Cyanide (as free cyanide)	mg/L	0.2	34	0	ND	ND
Lead	mg/L	TT[2]	34	7	0 - 0.00171	0
Mercury	mg/L	0.002	0	0	ND	ND
Nickel	mg/L	Non-regulated	34	1	0 - 0.05	0
Nitrate-N	mg/L	10	34	34	0.16 - 0.8	0.4
Nitrite-N	mg/L	1	0	0	ND	ND
Selenium	mg/L	0.05	0	0	ND	ND
Sodium	mg/L	Non-regulated	34	34	7.6 - 15	9.4
Thallium	mg/L	0.002	0	0	ND	ND
Synthetic Organic Contaminants						
2,4-D	mg/L	0.07	0	0	ND	ND
2,4,5-TP Silvex	mg/L	0.05	0	0	ND	ND
Bis (2ethylhexyl)adipate	mg/L	0.4	32	0	ND	ND
Alachlor	mg/L	0.002	0	0	ND	ND
Atrazine	mg/L	0.003	0	0	ND	ND
Benzo(a)pyrene	mg/L	0.0002	33	1	0 - 0.00003	0
Lindane[1]	mg/L	0.0002	n/a	n/a	n/a	n/a
Carbofuran	mg/L	0.04	0	0	ND	ND
Chlordane	mg/L	0.002	0	0	ND	ND
Dalapon	mg/L	0.2	0	0	ND	ND
Dibromochloropropane(DB CP)	mg/L	0.0002	0	0	ND	ND
Dinoseb	mg/L	0.007	0	0	ND	ND
Dioxin (2,3,7,8-TCDD)	mg/L	0.00000003	0	0	ND	ND
Diquat	mg/L	0.02	0	0	ND	ND
Endothall	mg/L	0.1	0	0	ND	ND
Endrin	mg/L	0.002	0	0	ND	ND

Table 4.4 WRWTP Summary of Finished Water Quality (May 2006 through 2014) – (Continued)

Contaminant	Unit	MCL	No. of Samples	No. of Detects	Value Range	Median
Ethylene Dibromide	mg/L	0.00005	0	0	ND	ND
Glyphosate	mg/L	0.7	0	0	ND	ND
Heptachlor	mg/L	0.0004	0	0	ND	ND
Heptachor epoxide	mg/L	0.0002	0	0	ND	ND
Hexachlorobenzene	mg/L	0.001	33	0	ND	ND
Hexachlorocyclopentadiene	mg/L	0.05	0	0	ND	ND
Methoxychlor	mg/L	0.04	0	0	ND	ND
Pentachlorophenol	mg/L	0.001	0	0	ND	ND
Bis(2-ethylhexyl)phthalate	mg/L	0.006	31	0	ND	ND
Picloram	mg/L	0.5	0	0	ND	ND
Polychlorinated Biphenyls	mg/L	0.0005	0	0	ND	ND
Simazine	mg/L	0.004	0	0	ND	ND
Toxaphene	mg/L	0.003	0	0	ND	ND
Oxamyl(Vydate)	mg/L	0.2	0	0	ND	ND
Volatile Organic Contaminants (VOCs)						
Benzene	mg/L	0.005	0	0	ND	ND
Bromobenzene		Non-regulated	35	0	ND	ND
Bromochlormethane		Non-regulated	35	0	ND	ND
n-Butylbenzene		Non-regulated	34	0	ND	ND
sec-Butylbenzene		Non-regulated	34	0	ND	ND
tert-Butylbenzene		Non-regulated	33	0	ND	ND
Carbon Tetrachloride	mg/L	0.005	34	0	ND	ND
Chlorobenzene	mg/L	0.1	34	0	ND	ND
Chloroethane		Non-regulated	34	0	ND	ND
2-Chlorotoluene		Non-regulated	34	0	ND	ND
4-Chlorotoluene		Non-regulated	35	0	ND	ND
1,2-Dibromo- 3Chloropropane		Non-regulated	33	0	ND	ND
1,2-Dibromoethane		Non-regulated	35	0	ND	ND
Dibromomethane		Non-regulated	34	0	ND	ND
1,2-Dichlorobenzene	mg/L	0.6	34	0	ND	ND
1,3-Dichlorobenzene		Non-regulated	34	0	ND	ND
1,4-Dichlorobenzene	mg/L	0.075	34	0	ND	ND
Dichlorodiflouromethane		Non-regulated	33	0	ND	ND
1,2-Dichloroethane	mg/L	0.005	34	0	ND	ND
1,1-Dichloroethylene	mg/L	0.007	34	0	ND	ND
cis-1,2-Dichloroethylene	mg/L	0.07	34	0	ND	ND
trans-1,2-Dichloroethylene	mg/L	0.1	34	0	ND	ND
1,2-Dichloropropane	mg/L	0.005	34	0	ND	ND
1,3-Dichloropropane		Non-regulated	34	0	ND	ND
2,2-Dichloropropane		Non-regulated	34	0	ND	ND
1,1-Dichloropropene		Non-regulated	34	0	ND	ND
cis-1,3-Dichloropropane		Non-regulated	34	0	ND	ND
trans-1,3-Dichloropropene		Non-regulated	33	0	ND	ND
Ethylbenzene	mg/L	0.7	34	0	ND	ND
Hexachlorobutsadiens		Non-regulated	33	0	ND	ND
Isopropylbenzene		Non-regulated	34	0	ND	ND
p-Isopropylbenzene		Non-regulated	34	0	ND	ND
Methylene Chloride		Non-regulated	35	0	ND	ND
Napthalene		Non-regulated	35	0	ND	ND
n-Propylbenzene		Non-regulated	33	0	ND	ND
Styrene	mg/L	0.1	34	0	ND	ND
1,1,1,2-Tetrachloroethane		Non-regulated	33	0	ND	ND
1,1,2,2-Tetrachloroethane		Non-regulated	34	0	ND	ND
Tetrachloroethylene	mg/L	0.005	34	0	ND	ND
Toluene	mg/L	1	34	0	ND	ND
1,2,3-Trichlorobenzene		Non-regulated	33	0	ND	ND
1,2,4-Trichlorobenzene	mg/L	0.07	34	0	ND	ND

Table 4.4 WRWTP Summary of Finished Water Quality (May 2006 through 2014) – (Continued)

Contaminant	Unit	MCL	No. of Samples	No. of Detects	Value Range	Median
1,1,1-Trichloroethane	mg/L	0.2	34	0	ND	ND
1,1,2-Trichloroethane	mg/L	0.005	34	0	ND	ND
Trichloroethylene	mg/L	0.005	33	0	ND	ND
Trichloroflouromethane		Non-regulated	33	0	ND	ND
1,2,4-Trimethylbenzene		Non-regulated	35	0	ND	ND
1,3,5-Trimethylbenzene		Non-regulated	33	0	ND	ND
Vinyl Chloride	mg/L	0.002	34	0	ND	ND
Xylenes (total)	mg/L	10	34	0	ND	ND
Disinfectant Residuals and DBPs						
Bromate	mg/L	0.01	104	22	0 - 0.0044	0
Bromoform	ug/L	10	35	0	ND	ND
Chloroform		Non-regulated	34	33	0 - 0.014	0.0049
Dibromochloromethane	ug/L	10	34	19	0 - 0.00134	0.00056
Dichloromethane	mg/L	0.00050	34	19	0 - 0.00134	0.00056
Bromodichlormethane		Non-regulated	35	34	0 - 0.00401	0.00176
Chlorine	mg/L	4.0	941	941	0.64 - 0.95	0.81
TTHM	mg/L	0.08	104	104	0.00261 - 0.0171	0.007095
HAA5	mg/L	0.06	104	95	0 - 0.0123	0.00473
Contaminant	**Unit**	**Finished Water MCL**	**No. of Samples**	**% Detected**	**Value Range**	**Median**
Microbial Contaminants						
Total Coliform	ct/100 mL	<5% positive	940	0%	ND	ND
E. Coli	ct/100 mL		941	0%	ND	ND
Viruses	MPN/100 L	2-log removal/2-log inactivation	36	0%	ND	ND
Giardia	ct/100 L	2.5-log removal/ 0.5-log inactivation	14	0%	ND	ND
Cryptosporidium	ct/100 L	2-log removal	14	0%	ND	ND

Notes:
(1) Parameter not actively sampled.
(2) TT: Treatment Technique.

All contaminants detected in the finished water were well below the MCL. The WRWTP finished water quality continues to meet or surpass regulatory requirements. Section 4.3.3 summarizes additional finished water quality data, collected in compliance with the Unregulated Contaminant Monitoring Rule (UCMR).

The data presented in Tables 4.1 through 4.4 were collected at the WRWTP. Table 4.5 presents the distribution system water quality, as reported in the City of Wilsonville *2014 Annual Water Quality Report.*

Table 4.5 Summary of Wilsonville Distribution System Water Quality Data

Contaminant	Sample Frequency	Minimum	Average	Maximum
VOCs				
TTHM	Quarterly	1.3	13.7	25.8
HAA5	Quarterly	2.1	8.3	18
Bromate	Monthly	ND		3.6
TOC	Quarterly	0.416	0.552	0.608
Chlorine	Monthly	0.35		0.98

All of the contaminants in Table 4.5 are below the MCL and maximum contaminant level goal (MCLG), as applicable. This further illustrates the reliable finished water quality from the WRWTP and within the distribution system.

4.3 Regulatory Compliance

4.3.1 Existing Regulations

Current state and federal drinking water regulations the WRWTP must comply with are as follows:

- National Primary Drinking Water Regulations (1975).
- Secondary Drinking Water Regulations (1979, 1991).
- Phase I, II, and V Regulations for IOCs, SOCs, and VOCs (1987, 1991, 1992; respectively).
- Surface Water Treatment Rule (1989).
- Total Coliform Rule (1989).
- Lead and Copper Rule (1991).
- Consumer Confidence Reports Rule (1998).
- Stage 2 Disinfection By-Product Rule (State 2 D/DBPR) (2006).
- Long-Term Stage 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) (2006).

4.3.2 Unregulated Contaminant Monitoring

The EPA uses the Unregulated Contaminant Monitoring (UCM) program to collect data for contaminants that are suspected in drinking water, but lack health-based standards set for the Safe Drinking Water Act (SDWA). Every five years, the EPA reviews the list of contaminants, largely based on the Contaminant Candidate List. The SDWA Amendments of 1996 provide for:

- Monitoring no more than 30 contaminants every five years.
- Monitoring only a representative sample of public water systems serving less than 10,000 people.

- Storing analytical results in a National Contaminant Occurrence Database (NCOD).

The UCM program progressed in several stages. Currently, the EPA manages the program directly as specified in the UCMR. The history of the UCM program includes:

- UCM – State Rounds 1&2 (1988-1997) - State drinking water programs managed the original program and required public water systems (PWSs) serving more than 500 people to monitor contaminants.
- UCMR 1 (2001-2005) - The SDWA Amendments of 1996 redesigned the UCM program to incorporate a tiered monitoring approach and required monitoring for 25 contaminants (24 chemicals and one bacterial genus) during 2001-2003.
- UCMR 2 (2007-2011) - UCMR 2 monitoring was managed by EPA and established a new set of 25 chemical contaminants sampled during 2008-2010.
- UCMR 3 (2012-2016) Current regulation monitoring for 30 contaminants (28 chemicals and 2 viruses) from 2012-2015. These contaminants are separated into three different lists. All public water systems serving populations >10,000 were required to sample for List 1 (21 contaminants), and public water systems serving populations >100,000 were required to sample for List 1 and List 2 (7 hormones). Unchlorinated public water systems with populations <1,000 were required to sample for two viruses as part of List 3.
- The UCMR 4 is scheduled to be in effect in 2018. The EPA administrator signed the UCMR 4 on December 8, 2016 and then the EPA submitted it for publication in the Federal Register. UCMR 4 monitors 30 chemical contaminants between 2018 and 2022, including the following:
  - Ten cyanotoxin chemical contaminants.
  - Two metals.
  - Eight pesticides and one pesticide manufacturing by-product.
  - Three brominated haloacetic acid (HAA) groups.
  - Three alcohols.
  - Three semi-volatile chemicals.

Table 4.6 summarizes the UCMR 3 data collected for the City of Wilsonville's distribution system (entry point downstream of WRWTP and maximum residence time point) and compares it to the other water utilities in Oregon and Washington.

Table 4.6 Summary of UCMR 3 Finished and Distribution Water Quality

Contaminant	Range of Detects OR/WA (ug/L)	Range of Detects Wilsonville (ug/L)
List 1		
1,1-dichloroethane	0.036	-
1,2,3-trichloropropane	-	-
1,3-butadiene	-	-
1,4-dioxane	0.07-0.28	-
bromomethane	-	-
chlorate	20-3000	43-130
chloromethane	0.2-2.2	-

Table4.6 Summary of UCMR 3 Finished and Distribution Water Quality (Continued)

Contaminant	Range of Detects OR/WA (ug/L)	Range of Detects Wilsonville (ug/L)
chromium	0.2-55	0.2
chromium-6	0.03-4.0	0.038-0.072
cobalt	1.8-1.9	-
Halon 1011	0.087-1.0	-
HCFC-22	0.088-0.67	-
manganese	1-820	
molybdenum	1-13	-
PFBS	-	-
PFHpA	0.013-0.026	-
PFHxS	0.20-0.24	-
PFNA	0.027-0.028	-
PFOA	0.02-0.03	-
PFOS	0.51-0.60	-
strontium	0.9-531	36-41
vanadium	0.2-41.9	1.0-2.5
List 2 (*not required for Wilsonville*)		
17-alpha-ethynylestradiol	-	N/A
17-beta-estradiol	-	N/A
4-androstene-3,17-dione	0.0004	N/A
equilin	-	N/A
estriol	-	N/A
estrone	-	N/A
testosterone	0.0005	N/A

Of the UCMR 3 contaminants sampled for in the City of Wilsonville's distribution system, there were only detects for select metals and chlorate. The contaminants were detected at similar levels to that seen regionally and nationally. For additional information, see the discussion on *Emerging Contaminants* below. The concentration of detected contaminants is well below current published health reference levels and/or public heath goals.

4.3.3 CT Compliance

The WRWTP has always met the regulatory requirement of a minimum of 0.5-log *Giardia* inactivation downstream of filtration. As a contract requirement, the WRWTP has also met a minimum of 1.0-log *Cryptosporidium* inactivation using intermediate ozone.

Although the OHA does not recognize the use of intermediate ozone for *Giardia* or virus inactivation, the CT required to achieve *Cryptosporidium* inactivation also causes an excess of 10-fold inactivation of *Giardia* and viruses. The Ozone Coalition, supported by Oregon Water Utility Council (OWUC), has petitioned the OHA to change its rules by developing and implementing a strategy for recognizing the disinfection benefits of pre- or intermediate ozone disinfection in Oregon. This petition coincides with this ***2017 MPU*** and is on-going; submission of a formal waiver application is expected in spring 2018. If the collaboration changes the regulations, the CT compliance point for the WRWTP should be re-evaluated.

4.3.4 Future Regulations

Several federal regulations are under development, which are listed below:

- **Lead and Copper Rule.** EPA is considering Long-Term Revisions to the Lead and Copper Rule to improve public health protection by making substantive changes and to streamline the rule requirements. EPA's primary goals in considering LCR Long-Term Revisions are to:
  - Improve the effectiveness of the corrosion control treatment in reducing exposure to lead and copper, and
  - Trigger additional actions that equitably reduce the public's exposure to lead and copper when corrosion control treatment alone is not effective.
- **Perchlorate**. Perchlorate is a naturally occurring and manufactured chemical anion that consists of one chlorine atom bonded to four oxygen atoms (ClO_4-). Perchlorate is commonly used as an oxidizer in rocket propellants, fireworks, airbag initiators for vehicles, matches and signal flares. In 2011, the EPA determined that perchlorate meets the Safe Drinking Water Act criteria for regulation as a contaminant. Since that time, EPA has been reviewing the best available scientific data on a range of issues related to perchlorate in drinking water including its occurrence, treatment technologies, analytical methods and the costs and benefits of potential standards.

These regulatory actions are not expected to affect the treatment process recommendations.

4.4 Emerging Contaminants

Numerous papers and presentations have documented a multitude of CECs in water supplies throughout the United States and elsewhere. Although the impacts of CECs are not fully understood, it is clear that the drinking water regulations will change in the future as more data is gathered via the UCM efforts, including the current UCMR 3 and the future UCMR 4. This section focuses on the UCMR program, which likely encompasses future regulations. There are also compounds of interest, which are site specific and discussed in this Chapter.

Manufactured nanomaterials are another set of CECs that have gained national attention. The broad family of nanomaterials are typically characterized as particles with a dimension measuring less than 100 nanometers (nm). Some nanomaterials are naturally occurring and comprise what is known as turbidity in surface water supplies (clay and silica).

Manufactured nanomaterials are used in a variety of applications and can be found in electronics, personal care products, medical supplies, clothing, and other household items. They can help impart disinfectant/antimicrobial properties (nanosilver), be used in UV protection (nanoscale zinc oxide/titanium dioxide), and help provide unique optical/electrical properties.

While increased use of manufactured nanomaterials may introduce them into surface water supplies (via stormwater runoff, industrial and/or wastewater treatment plant discharges), research on the long-term impacts on public health and the environment is currently limited.

Because the topic is fairly nascent and the EPA has yet to take further action, this section does not consider nanomaterials or discuss them further.

The potential for CECs in the Willamette River also needs to be better understood. CECs can potentially influence the expanded WRWTP treatment process and procedure selection, capital and operations/maintenance costs, and water quality monitoring requirements. To better account for these impacts, CECs were evaluated from national, regional, and local perspectives. This evaluation, summarized below, includes a review of recent literature, including articles in national trade journals, a summary of data obtained from the national EPA UCMR 3 database, consultation with national water quality experts, and a summary of interviews with various local and regional water suppliers.

4.4.1 National Perspective and Literature Review

A literature review, coupled with a review of data from the National EPA database summarizing UCMR 3 sampling results, was conducted to quantify the occurrence of CECs throughout the United States. Table 4.7 summarizes the results of this review.

The most-prevalent contaminants detected include chlorate, vanadium, strontium, molybdenum, trichloropropane, and dioxane. The prevalence of low levels of chlorate in drinking water is likely tied to the widespread use of sodium hypochlorite, since it has replaced chlorine gas as the preferred chlorine chemical over the past decade.

Low levels of some metals occur in various parts of the country, including the three most-prevalent. Vanadium, strontium, and molybdenum are believed to occur naturally in some water supplies. Out of the 14 compounds being tested in UCMR 3, two organic compounds (trichloropropane, a VOC, and dioxane, an SOC) were found in drinking water supplies across the nation, albeit at very low levels.

Although not part of the UCMR 3 testing, harmful algal blooms (HABs) and algal toxins have captured national attention recently after the large event in the City of Toledo, Ohio, in 2015. Algal toxin monitoring will most likely become a requirement for the upcoming UCMR 4, since the proposed list includes ten cyanotoxin chemical contaminants.

Table 4.7 Summary of Preliminary UCMR 3 Results[1]

Contaminant	MRL[2] (ug/L)	Reference Concentration (ug/L)[3]	Total Number of Results	Results >MRL %	Results >HRL[2] %	Total # of PWSs with Results	PWSs with Results >MRL %	PWSs with Results >HRL %
Oxyhalide Anion								
Chlorate	20	210	25,533	56.2	14.4	2,648	67.3	32.4
Metals								
Vanadium	0.2	21	25,683	60.8	2.9	2,640	69.8	3.3
Strontium	0.3	4,000	25,635	99.5	0.4	2,640	100	0.9
Molybdenum	1	40	25,685	42.6	0.5	2,640	50.7	0.6
SOCs								
1,2,3-trichloropropane	0.03	0.0004/0.042	15,145	0.8	0.7-0.8	2,626	1.5	1.2-1.5
VOCs								
1,4-dioxane	0.07	0.35/352	15,084	11.4	0-3.3	2,623	19.7	0-6.6

Notes:
(1) Russell, C. "Status of Unregulated Contaminant Monitoring Rule 3 (UCMR 3)." Journal AWWA March 2015: 43-44. Print.
(2) HRL - health reference level; MRL - minimum reporting level.
(3) For reference concentrations with two values, first value is associated with 10-6 cancer risk and second is associated with a 10-4 cancer risk. Single values refer to contaminants with non-cancer reference values.

4.4.2 Regional Perspective

For a regional perspective on CEC-related issues, four regional utilities were interviewed to collect and compile regional results from UCMR 3 testing and discuss issues of water quality like public concerns. Several of these utilities are currently or are considering using the Willamette River as a supply source. For all agencies, the primary question was, "In what way will CEC-related issues influence their agency's decisions regarding water treatment in the future?"

Appendix A of the ***2015 MPU*** includes a copy of the questionnaire used for the interviews, and Table 4.8 summarizes the results. The regional UCMR 3 testing results are consistent with national findings for chlorate, strontium, and vanadium. However, they differ from the national results in that Pacific Northwest (PNW) utilities have detected total and hexavalent chromium but have not detected molybdenum, VOCs, or SOCs. Furthermore, most utilities have expressed concerns about algae and algal toxins, and some are concerned about the potential for regulating perchlorate/chlorate and chromium/hexavalent chromium.

Table 4.8 Summary of CECs Interview Responses by Regional Surface Water Suppliers

Water Supplier	Source of Supply	UCMR 3 Detects	Comments/Concerns - Re: CECs
Oak Lodge Water District	Clackamas River	Chlorate Total chromium Hexavalent chromium Strontium Vanadium	Concern about algal toxins, non-point source pollution.
City of Corvallis	Willamette River and Rock Creek Reservoir	Chlorate Total chromium Hexavalent chromium Strontium Vanadium	Algal toxins. Dioxins were of concern historically (no recent detects).
Tacoma Water	Green River	Total chromium Hexavalent chromium Strontium Vanadium No hormones detected	Will begin algal toxin monitoring and additional surveillance for algae in reservoir/source water.
Seattle Public Utilities	Cedar River and Tolt Reservoir	Total chromium Hexavalent chromium Strontium Vanadium No hormones detected	Algae in source water/reservoirs. Have performed PPCP testing (hormones) with no detects. Observation that chlorate levels are related to disinfectant usage; chlorine gas vs. sodium hypochlorite.
Eugene Water and Electric Board	McKenzie River	Chlorate Total chromium Hexavalent chromium Strontium Vanadium	Algal toxins.

Note that Seattle, Tacoma, and Eugene Water and Electric Board (EWEB) are large enough to have to test both List 1 and List 2 contaminants for the UCMR 3. No hormones were detected in any of the three supplies.

Furthermore, other PNW utilities are concerned about algae and algal toxins. These utilities include Tacoma and Bellingham, Washington, and one along the South Umpqua River in Oregon. A review of these studies is not included in this summary, but it should be considered for future design efforts.

4.4.3 2015 MPU Participant Interviews

Representatives from each Participant in the 2015 MPU (potentially receiving water from the WWSS WTP) were interviewed; discussions focused on the concerns its agency might have when using the Willamette River as a supply, as shown in Table 4.9. UCMR 3 data was also discussed for the current source(s) of supply.

Table 4.9 Summary of CECs Interview Responses by 2015 MPU Participant Water Suppliers

Water Supplier	Source of Supply	UCMR 3 Detects	Comments/Concerns - Re: CECs
City of Beaverton	JWC WTP, ASR	n/a	n/a
City of Hillsboro	JWC WTP	Total chromium Hexavalent chromium Strontium Vanadium	No chlorate detects, presumably due to use of chlorine gas at JWC WTP. Source water monitoring program to address algae or other changes in water quality.
City of Sherwood	WRWTP, PWB	Chlorate Total chromium Hexavalent chromium Strontium Vanadium	Limited complaints since switching to using Willamette River WTP as primary supply.
City of Tigard	PWB, LOTWTP, ASR	Chlorate Total chromium Hexavalent chromium Strontium Vanadium	Noticed that chlorate was tied to ASR well sites that use sodium hypochlorite for disinfection.
TVWD	PWB, JWC WTP, ASR	Total chromium Hexavalent chromium Strontium Vanadium Chlorate	Concern about algal toxins. Public perception about source switch and impacts to distribution system. No hormones were detected.
City of Wilsonville	Willamette River	Chlorate Total chromium Hexavalent chromium Strontium Vanadium	Some concern about potential strontium regulations. Levels of UCMR 3 detects well below published health reference goals.

Of all the participants, only TVWD was large enough to require testing for both List 1 and List 2 from the UCMR 3. No hormones were detected.

From all interviews and data collected for UCMR 3, the highest-profile CECs, which should be given serious consideration for the WRWTP, appear to be:

- Algal toxins.
- Chromium/hexavalent chromium.
- Vanadium and/or strontium.
- Chlorate.
- Low concentrations of site-specific trace organic compounds.

4.5 Conclusion

Historical water quality data confirms that the plant consistently meets or surpasses existing finished water regulatory requirements. The high-quality source water, coupled with the robust treatment process, create a reliable treatment process that produces excellent finished water in the region. The current process train, with the built-in capability of adding UV or advanced oxidation (via hydrogen peroxide addition in conjunction with either ozone or UV treatment), or the implementation of biological filtration is expected to continue to meet anticipated future regulatory requirements with minor modifications to the treatment process procedures. See Chapter 6 for additional discussion on this topic.

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Chapter 5

EXISTING INFRASTRUCTURE

5.1 Introduction

This Chapter summarizes the existing WRWTP infrastructure and helps lay the groundwork for evaluating future expansion alternatives. Topics include:

- Site mapping
- Electrical Evaluation
- Seismic Evaluation and Mitigation Alternatives
- Life Safety Analysis
- Transient Surge Analysis

Additional existing plant analysis, including river durveying, major plant component evaluation, computational fluid dynamic evaluation of the Raw Water Pump Station, and a Geotechnical investigation are all included in Chapter 5 of the ***2015 MPU***.

5.2 Site Mapping

In June 2015, Compass Land Surveyors surveyed and identified utility locations for the existing WRWTP. The work was coordinated with record drawings and input from Veolia staff. The North American Vertical Datum (NAVD) 1988 was used for the survey. Pertinent site features for the existing site are shown on Figure 5.1.

Included in the site mapping was a multi-beam bathymetric survey of the Willamette River from approximately one mile downstream to approximately 1/4-mile upstream from the existing raw water intake. This information helped to support the river hydrology analysis and HEC-RAS modeling.

Concurrent to the site mapping, a hydrological model was developed for the mid-Willamette River to determine the expected flows and elevations at the WRWTP raw water intake. Since the available existing river stage (elevation) data from the United States Geological Survey (USGS) stations used was in the National Geodetic Vertical Datum of 1929 (NGVD 29), it was converted to NAVD 88 to match the new site and bathymetric survey. The conversion factor that was used is consistent with what the Federal Emergency Management Agency used when updating their flood plain mapping elevations for Wilsonville in 2008, and results in an offset of +3.5 feet when going from NGVD 29 to NAVD 88 (NGVD29+3.5=NAVD88).

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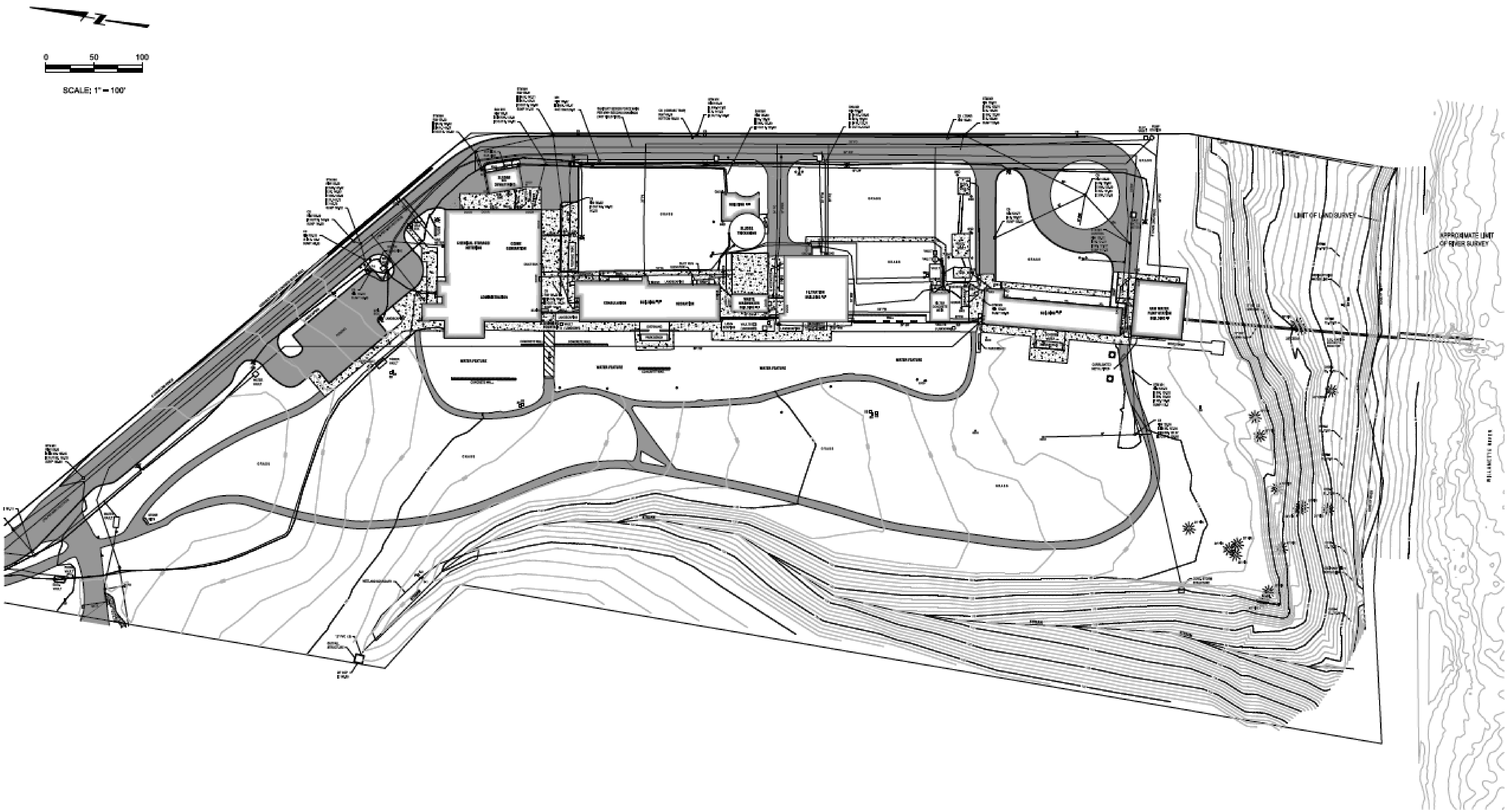

Figure 5.1 Lower Site Survey

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The original plan for the Raw Water Intake Pump Station Caisson (Caisson) was to construct it with a finished floor elevation of approximately 24.0 (NGVD29). However, during construction, groundwater was hit before reaching the desired elevation, so the finished floor of the Caisson was built at elevation of 34.0. This also required that the intake pipeline to the river have two, 45-degree fittings to reach the bottom of the river. To confirm the elevation of the Caisson, the depth was measured from the top deck to the Caisson floor. It was determined that the depth was 81 feet, which coincides with a Caisson floor at elevation 34.0 (NGVD29).

Comparisons of the 500-year flood, 100-year flood, and low water elevations and WRWTP construction record drawings to the most recent FEMA maps and to the hydrologic model, confirmed that NGVD 29 was used for vertical control.

While low flow conditions would typically correlate with low water elevations, the Willamette River elevation by the WRWTP intake is artificially raised during the summer months (July through August). This is done as part of Portland General Electric (PGE) operations at the Willamette Falls Dam by inserting 18-inch flashboards that result in the upstream water surface being elevated nominally 1.5 feet. The reliable increase in river elevation during the summer was observed from 2008 to 2015, and coincides with PGE's Federal Energy Regulatory Commission (FERC) 2005 license conditions and the publication of the Willamette River Biological Opinion in 2008.

This elevation information was used to assist in development of the computational fluid dynamic (CFD) model for the Caisson and pumps to evaluate its hydraulic capacity. Intake piping and screen head losses at different flows were calculated and provided by screen manufacturers. The elevation and resultant static water column depth in the caisson is summarized in Table 5.1. Head loss information at varied flows and corresponding dynamic water column depths are evaluated as part of the WWSP RWF project (B&V, 2017).

Table 5.1 WRWTP Caisson and Willamette River Elevations

	Unit	NGVD 29	NAVD 88	Static Water Column
Raw Water Intake Caisson (finished floor)	feet	34.0	37.5	-
Willamette River Minimum Level (September-June)	feet	52.5	56.0	18.5
Willamette River Minimum Level (July-August 95% flow exceedance)	feet	54.0	57.5	20.0

5.3 Electrical Evaluation

The power distribution system is a single-ended, simple radial system with a main 15-kV outdoor main switchgear (MS) receiving power from Portland General Electric (PGE) and distributing it to downstream switchboards.

Two existing outdoor liquid-filled unit substation type transformers step-down utility 12.47-kV voltage at the MS to lower distribution voltages of 4.16-kV and 480-V at the two downstream distribution equipment locations.

- T-1 provides power to the medium-voltage (5kV) switchgear 17-MVMCC-A, which feeds the three 500-hp high service pumps. It is an outdoor liquid-filled primary unit substation type transformer with neutral resistance grounding, 65° Celsius (C) temperature rise, rated OA (1,500 kVA)/FFA (1,725 kVA). The OA rating is a transformer's normal liquid (oil) cooled rating and FFA is the Future Forced Air cooled rating, which means the rating of T-1 would increase from 1,500 kVA to 1,750 kVA if a fan cooling option is provided in the future. Therefore, the existing maximum continuous rating of T-1 is 1,500 kVA, or 208 amps at 4,160 V.

- T-2 provides power to the low voltage (480 V) switchboard 17-SWBD-A, which feeds two 200-hp raw water pumps and several distribution motor control centers (MCCs). It is an outdoor liquid-filled secondary unit substation type transformer with a 65˚C temperature rise, rated OA (2,000 kVA)/FFA (2,300 kVA). The existing maximum continuous rating of T-2 is 2,000 kVA, or 2,405 amps at 480 volts (V).

Table 5.2 shows the rated capacity of all major electrical distribution equipment and transformers in the existing plant. Based on standard engineering design guidelines, electrical distribution equipment and transformers should be loaded to 80 percent of their capacity and reserve 20 percent for future loads or unpredicted overload conditions. Hence, a column indicating the 80 percent capacity rating of electrical distribution equipment and transformers is also included in the table for comparison. The available capacity values shown are based on comparison with 80 percent rating values. The current electrical system is depicted in Figure 5.1.

Table 5.2 WRWTP Electrical Load Summary

Equipment	Voltage	100% Capacity (Amps)	80% Capacity (Amps)	80% Capacity (KVA)	Existing Demand (Amps)	Existing Demand (KVA)	Available Capacity (Amps)(4)	Available Capacity (KVA)(4)
Main Switchgear "MS"	12.47 kV	600	480	10,368	277	5,983	203	4,385
XFMR T1	4.16 kV	208	166	1,200	144	1,038	22	162
17-MVMCC-A	4.16 kV	208(1)	166	1,200	144	1,038	22	162
XFMR T2	480 V	2,405	1,924	1,600	2,860(3)	2,378	(936)	(336)
17-SWBD-A	480 V	2,405(2)	1,924	1,600	2,860(3)	2,378	(936)	(336)
15-MCC-A	480 V	1,200	960	798	553	460	407	339
13-DP-A	480 V	800	640	532	322	268	318	265
8-MCC-A	480 V	600	480	400	89	74	391	325
6-MCC-A	480 V	600	480	400	182	151	298	262
4-MCC-A	480 V	600	480	400	118	98	362	301
2-MCC-A	480 V	600	480	400	25	21	455	378
Standby Equipment								
GEN1	480 V	1,500	1,200	998	1,155	960	240	38
15-SWBD-B	480 V	2,000	1,600	1,330	1,155	960	640	370
13-DP-B	480 V	800	640	532	265	220	375	312
4-MCC-B	480 V	600	480	400	130	108	350	291

Notes:
(1) 3,000-amp capacity. Limited by transformer T1 to 208 amps.
(2) 3,000-amp capacity. Limited by transformer T2 to 2,405 amps.
(3) Values retrieved from as-built one line drawings, which indicate the transformer and switchboard are overloaded.
(4) Based on 80-percent capacity.

The existing demand values were obtained from the existing as-built drawings. Numbers shown in red indicate negative capacity or under-rated equipment. In particular, existing demand values for switchboard 17-SWBD-A appear too high, resulting in negative available capacity values, indicating that the equipment is overloaded or under-rated.

Calculation results indicate the existing standby generator can provide power to all existing standby demand loads connected to switchboard 15-SWBD-B. The values in this evaluation should be field verified during design when the WRWTP is expanded.

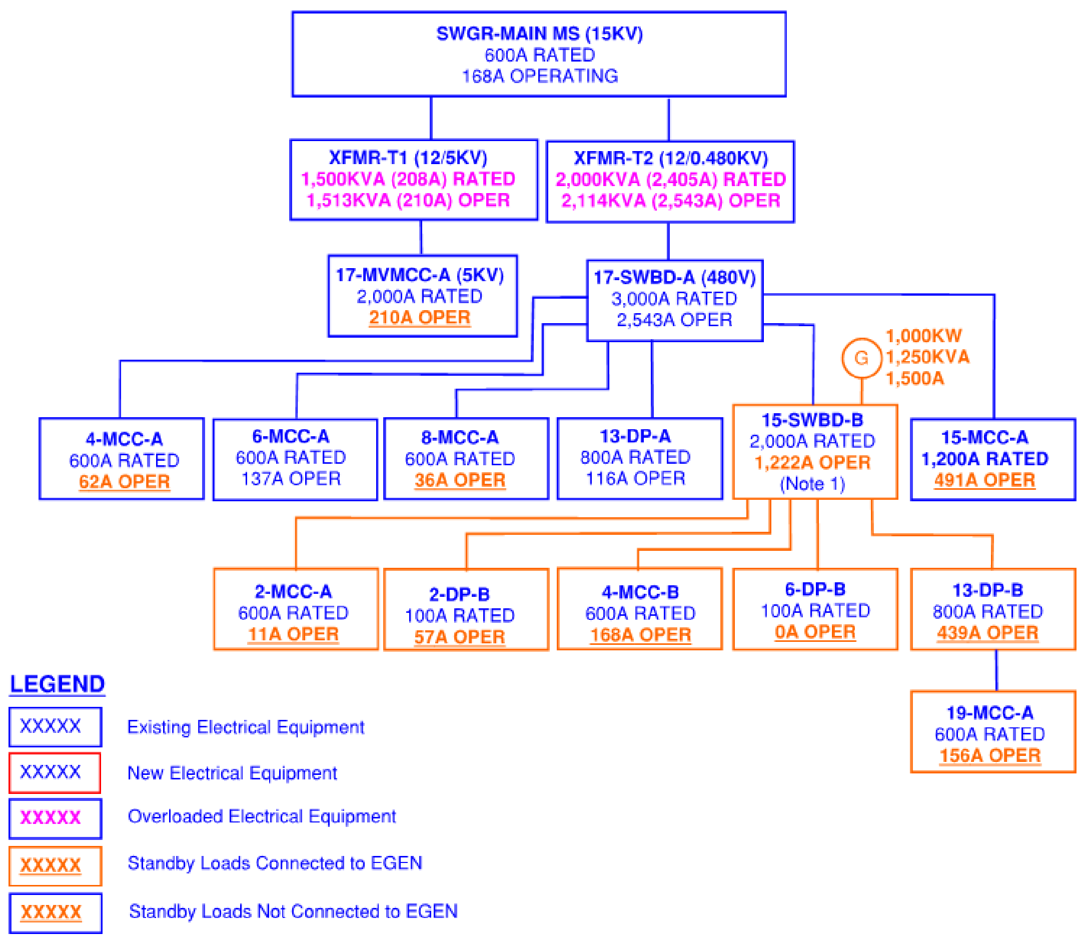

Figure 5.2 Current Electrical Load Diagram

5.4 Seismic Evaluation and Mitigation Alternatives

5.4.1 Oregon Seismic Requirements

Seismic design and construction of Oregon structures has been governed by a series of statewide building codes dating back to the first code adopted in 1974 which incorporated the 1973 Uniform Building Code (UBC) and became referred to as the State of Oregon Structural Specialty and Fire and Life Safety Code (OSSC). All of Oregon was deemed to be in Seismic Risk Zone 2, which equated to the structure being subjected to moderate damage seismic event equivalent to intensity VII on the Modified Mercalli Scale (M.M.) and carried a 0.5 multiplier in the formation. An intensity of VII was defined as *"Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Richter Scale Magnitude (RM) = 6.1."*

In 1976, a second statewide building code was adopted, using the 1976 UBC. The Seismic Risk Zone for Oregon did not change, but now carried a multiplier factor of 0.375. The statewide building codes were modified in 1979 and 1985, however the modifications had little or no effect to the seismic design criteria. A significant shift occurred in the 1988 UBC (1990 OSSC) when the Seismic Risk Zone in Oregon shifted to a 2B designation. With the adoption of the 1991 UBC (1993 OSSC), additional significant changes occurred in the treatment of seismic loading and analysis. The counties west of the Cascade Range of mountains were designated as Seismic Zone 3 while the eastern counties were designated as Seismic Zone 2.

When the 1994 UBC (1996 OSSC) was adopted, the seismic design criterion remained the same as the previous code, but the tables delineating Occupancy Categories and the Seismic Importance Factors were enhanced to provide more intense design values for the higher risk and important or essential facilities. The overall seismic design values for loading did not increase under this code adoption, however factors were provided that took into account proximity to known seismic faults and soils conditions at the site. This code cycle revised the seismic zone mapping along the southern Oregon coast, which was upgraded to Seismic Zone 4, the rest of the state remained at their previous zones. The 1998 OSSC remained in force with a variety of amendments for roughly a six-year period; very few seismic related revisions were made in this period.

In 2004, the State of Oregon made the move from the Uniform Building Code to the International Building Code (IBC) and adopted the 2003 International Building Code as amended to be the 2004 Oregon Structural Specialty Code. The IBC upgraded its design parameters by requiring the design to a 2,500-year return period earthquake versus a 500-year return period of an earthquake in the previous edition of the UBC codes. This change incorporated a substantial shift in earthquake regulations and how the seismic base shear was determined. The new formulation took into account very specific site characteristics insofar that the specific latitude and longitude in conjunction with the United States Geological Survey (USGS) soils/ground response information could be utilized. This technology allowed the use of spectral response acceleration for short and one-second periods along with soil definitions that took into account shear waves, penetration resistance, and shear strength of the soils. In addition, the Seismic Use Group was established that was a modification of the previous Seismic Importance Factor. The types of structural systems were expanded considerably and, when used with the revised base-shear formulation, gave very site-specific seismic loading. The net result of the new technology, and more precise method of loading determination, predicated an overall lowering of the seismic base-shear forces.

In 2007, the 2006 International Building Code was adopted with modifications as the 2007 and again, the 2009 IBC was adopted as the 2010 Oregon Structural Specialty Code and carried forward from the previous code cycle with very little change as it relates to earthquake design.

Over the years, the design of structures to prevent loss of life and limit structural damage has improved dramatically in an effort to help safeguard the citizens of Oregon. The net effect of the building code evolution through the years is that the state of Oregon has substantially safer buildings being constructed now than before the initial adoption of the State Building Code. The most recent codes that have been adopted provide minimum standards for use in building design to maintain public safety in the extreme ground shaking likely to occur during an earthquake. Requirements are primarily geared towards the safeguard against major failures and loss of life, not limit damage, maintain function, or provide for easy repair. Buildings housing essential facilities will be afforded a greater level of protection due to expending the additional money required to bring the facilities to a higher level of structural stability. The overall ability of a structure to resist an earthquake ground-motion event will depend on many factors, the location to the epicenter of the earthquake, the type and location of the fault, the type of soil structure the building is sited on, along with the type and quality of construction for the building.

In relationship to the original Willamette River Water Treatment Plant, the enforceable building code at the time was the 1998 Oregon Structural Specialty Code (OSSC). The 1998 OSSC required seismic design of the structure to meet a Seismic Zone 3 with a seismic event equivalent to intensity VII corresponding to a Richter Scale Magnitude (RM) of 6.1. Since that time, considerable more understanding and knowledge has been gained regarding the Cascadia Subduction Zone seismic event, which heavily influenced the subsequent building codes. The Oregon Resilience Plan further assessed and determined that Water Systems built in a period after the year 2000 as having "stringent lateral force requirements" and after a large Cascadia Subduction Zone earthquake "likely to remain intact."

5.4.2 Geotechnical Investigation Summary

A Geotechnical Report for the WRWTP Lower Site and Upper Site was prepared by Shannon & Wilson (S&W, 2015) and is presented in Appendix H of the ***2015 MPU***. It summarizes the conceptual geotechnical engineering evaluations and recommendations from the report and provides a seismic and structural evaluation of the major existing process structures that may be used in future expansions and to develop potential mitigation alternatives. Supplemental recommendations for the raw water pump station caisson mitigation were developed and are included in the abovementioned appendix.

5.4.3 Seismic Evaluation of Existing Facilities

A seismic and structural evaluation was performed for existing facilities at the WRWTP. The existing plant was designed in accordance with the enforceable building code at the time which was the 1998 Oregon Structural Specialty Code (OSSC). The 1998 OSSC required seismic design of the structure to meet a Seismic Zone 3 with a seismic event equivalent to intensity VII corresponding to a Richter Scale Magnitude (RM) of 6.1.

5.4.3.1 Evaluation Approach

The structural evaluation of the existing facilities was performed using a combination of ASCE 41-13 for buildings and ASCE 7-10, ACI 350.3-06, and ACI 350-06 for the caisson and tanks. The seismic forces (hydrodynamic forces) were calculated using ASCE 7-10, Chapter 15. The seismic response spectral accelerations for tankage, S_{DS} and S_{D1}, were based on data provided by Shannon & Wilson (S&W, 2015). The seismic response spectral accelerations for buildings, S_{XS} and S_{X1}, were based on 2008 seismic hazard data published by the United States Geological Survey (USGS).

5.4.3.2 Evaluation Results

A summary of the structural retrofit requirements is included in Table 5.3. Appendix A presents the TM detailing the evaluation parameters and calculations.

Table 5.3 Summary of Seismic Vulnerabilities

ID	Location	Description	Reference	Recommendation	Priority[1]
S1	Waste Washwater Equalization	The horizontal reinforcing steel in the north and south basin walls at the east corners (#8 @ 12" oc) have a DCR of 1.53 for soil seismic loads. Refer to Figure 2.2.	ACI 350.3-06	Install three (3) concrete braces across the width of the basin with intermediate column support as required to brace the north and south walls. Braces should be located at the mid-height of the wall. Refer to Figure 2.3.	L[2]
S2	Waste Washwater Equalization	The out-of-plane wall shear at the north and south walls where the existing concrete beam below the east wall of the building intersects the walls has a DCR of 1.67 for soil seismic loads. Refer to Figure 2.4.	ACI 350.3-06	Install three (3) concrete braces across the width of the basin with intermediate column support as required to brace the north and south walls. Braces should be located at the mid-height of the wall. Refer to Figure 2.2.	L[2]
S3	High Service Pump Station	The roof joist wall anchorage along the east and west walls of the pump station have a DCR of 1.55. Refer to Figure 2.5.	ASCE 41-13, Tier 1	Add new wall anchorage along the east and west walls mid-way between the existing roof joists. Refer to Figure 2.6.	H
S4	High Service Pump Station	The roof diaphragm shear capacity is exceeded at approximately 50% of the roof deck area with DCR's that vary from 1.82 to 2.25. Refer to Figure 2.7.	ASCE 41-13, Tier 1	Replace existing deficient deck sections with 16 GA corrugated steel decking.	H
S5	High Service Pump Station	The tension capacity of the diaphragm chord at the pump room has a DCR of 1.20 at the connections at the east windows. Refer to Figure 2.8	ASCE 41-13, Tier 1	Strengthen the existing chord connections as required. Refer to Figure 2.9.	M
S6	High Service Pump Station	Roof deck shear transfer to the interior wall ledger bolts have DCR's of 3.20 to 3.90. Refer to Figure 2.10.	ASCE 41-13, Tier 1	Add a new top plate over the interior shear walls and install epoxied anchors as required. Refer to Figure 2.11.	H[3]
S7	Solids Dewatering Building	The building has no lateral load resisting system in the transverse direction at the first floor level. The existing concrete joint at the elevated slab to the east and west walls does not have any seismic detailing to establish any concrete moment frame.	ASCE 41-13, Tier 1	Provide steel braced frames at the exterior of the building at the east side that braces the building at the second floor level. This system is anticipated to include three braces, each with their own concrete grade beam. It is assumed that the existing stair will need to be relocated to the west side of the building. Refer to Figure 2.12.	H

Table 5.3 Summary of Seismic Vulnerabilities (Continued)

ID	Location	Description	Reference	Recommendation	Priority[1]
S8	Solids Dewatering Building	The roof joist wall anchorage along the east and west walls of the building have a DCR of 1.17.	ASCE 41-13, Tier 1	Add new wall anchorage along the east and west walls mid-way between the existing roof joists. Refer to Figure 2.6.	M
S9	Solids Dewatering Building	The foundation elements do not have adequate ties across the building, as the floor slab is not connected to the walls or the footing.	ASCE 41-13, Tier 1	Tie the existing floor slab to the walls, which are already doweled to the existing footings. The retrofit is anticipated to include stainless steel angles and epoxy anchors. Refer to Figure 2.13.	M
S10	Various (estimated at 8 locations)	The space heaters at all facilities are laterally braced above their center of gravity, which allows the heaters to sway during an earthquake. The space heaters at the Switchgear Room at the High Service Pump Station are not braced at all.	ASCE 41-13, Tier 1	Provide seismic bracing.	H
S11	Ozonation	The ozone destruct piping located on the top deck of the Ozonation tank is not seismically braced.	ASCE 41-13, Tier 1	Provide seismic bracing of the pipe down to the concrete deck.	M
S12	High Service Pump Station	The cable trays lack longitudinal seismic bracing.	ASCE 41-13, Tier 1	Provide longitudinal seismic bracing of the cable tray.	M
S13	Chemical Storage / Ozone Generation Room	The chemical pipes that run through the center of the Chemical Storage Room are not seismically braced. The balance of the chemical pipes in the Chemical Storage Room and Ozone Generation Room lack longitudinal seismic bracing.	ASCE 41-13, Tier 1	Provide seismic bracing of the pipes as required.	M
S14	Ozone Generation Room	The ozone and LOX piping is not seismically braced.	ASCE 41-13, Tier 1	Provide seismic bracing of the pipes as required.	M

Notes:
1. H = High, M = Medium, L = Low.
2. The same mitigation recommended for vulnerability S1 will address S2.
3. Assumes that vulnerability S4 is addressed simultaneously, otherwise the cost will need to include removal/replacement of the roofing.

5.5 Life Safety Evaluation

In conjunction with the seismic assessment, the life safety deficiencies at the WRWTP were also assessed. These life safety findings are summarized in Table 5.4 and include those seismic vulnerabilities that are also a potential life safety hazard. Where building code provisions and standards are applicable, the relevant sections have been noted. Photographs are provided in Appendix A to assist with the description of the issues that were identified.

5.6 Transient Surge Analysis

A transient analysis was performed as part of this master plan update to confirm the findings of *Hydraulic Transient Analysis – City of Wilsonville* (MWH, 2011). The 2011 modeling efforts evaluated numerous scenarios with WRWTP flow rates up to 15 million gallons per day (mgd). Modeling results indicated that a minimum 750 cubic foot (ft^3) (5,600 gallon) surge tank located at the WRWTP is recommended to prevent negative pressure formation within the distribution system due to power loss at the WRWTP when the City of Wilsonville demand exceeds 10 mgd (Sherwood excluded) and/or 12.5 mgd with Sherwood.

5.6.1 Evaluation Methodology

The City of Wilsonville's 2017 Innovyze Infowater hydraulic model was provided for this hydraulic transient analysis. Based upon discussions with the City of Wilsonville, the *2011_MDDW48, Existing Demand with Priority 1 Improvements* Model Scenario was used to model the demand scenarios presented in Table 5.5 for the analyses. In addition, the model was used to determine if a surge tank is required assuming no Sherwood demand. A summary of the demand scenarios is included in Table 5.5.

Table 5.4 Summary of Life Safety Findings

ID	Location	Description	Code Reference	Recommendation	Priority[1]
LS1	Various	Tread plate hatches do not typically have any provisions for installing temporary fall protection barriers when in use.	OSHA 1910.23	Install sleeves or other hardware for temporary fall protection systems around hatches.	H
LS2	Various	Color coded chemical safety warning signs at exterior locations are faded so that colors are not clear any longer.	2014 OFC (NFPA 704)	Replace safety signs throughout the plant as required.	H
LS3	Actiflo™ / Ozonation / Filters	Exterior stair guardrail height is less than 42 inches above the stair tread and has no dedicated handrail. Installation met 1997 UBC provisions, but not current code.	2014 OSSC, Chpt 10	Replace guardrail with current code-compliant installation.	M
LS4	Actiflo™ / Higher Service PS / Chemical Storage	Doors exiting rooms that have rated electrical service that is 1,200 amps or greater do not have panic hardware. This occurs for	2014 OSSC, Chpt 10	Provide panic door hardware on 4 affected doors.	H
LS5	Ozone Generation / Chemical Storage	Doors serving occupancy Group H are lacking panic hardware. Also, the door that connects the Ozone Generation Room to the Administration Building swings into the Ozone Generation Room, which is a Group H occupancy.	2014 OSSC, Chpt 10	Provide panic door hardware on 3 doors and replace the door between the Ozone Generation Room and the Administration Building to reverse the door swing direction.	H
LS6	Ozone Generation / Chemical Storage	Chemical piping passes directly over exit egress routes at the southwest door of the Ozone Generation Room, the east door of the Chemical Room, and the west door of the Chemical Room.		Add secondary containment pans below the chemical piping over exit routes.	M
LS7	Various	Doors were found propped open during the site visit, which may suggest that the ventilation in the rooms may not be operating effectively and/or efficiently.		Verify that the ventilation system is operating as intended.	L
LS8	Actiflo™ / Filters	The west guardrail on the top deck of the Actiflo™ Basin and the top side of the ladder pit at the filters lack kick plates.		Install new kickplates at these locations.	L
LS9	Actiflo™ / Ozonation / Filters	The below-grade galleries have active weeping leaks that are coming from cracks in the tank walls and through expansion joints leaving the floor wet and potentially slippery.		Pressure inject a hydrophobic sealant into active leaks to seal them. Apply an exterior (negative side) waterstop on the surface of the joint.	M

Table 5.4 Summary of Life Safety Findings (Continued)

ID	Location	Description	Code Reference	Recommendation	Priority[1]
LS10	Actiflo™ / Ozonation / Filters	The below-grade galleries typically have wet floors due to leaking walls and leaking pipes/equipment. The electrical receptacles do not appear to have any GFCI protection.		Remove and replace the electrical receptacles with ones that are GFCI protected.	M
LS11	Ozonation	The south stairwell does not have a dedicated ventilation system that serves it directly.		Investigate if ventilation is sufficient and provide as required.	M
LS12	Filters	The maximum distance of travel to exit the north door is approximately 85 feet. The maximum distance to a single exit per the building code is 75 feet. The doors at the east end of the Filter Gallery exit to a ladder pit, which is not considered to be an exit for egress determination.	2014 OSSC, Chpt 10	Add a fire-rated door at the bottom of the stairs and add signage to the existing ladder pit door to clarify that it is not an exit. This may also require revision to the ventilation of the existing stair.	M
LS13	Waste Washwater	The ladder into the basin does not have any permanent tie-off points for a fall restraint system.		Verify how fall restraint is provided when using the ladder and provide additional hardware as required.	M
LS14	Sludge Dewatering	The building roof does not appear to have any overflow scuppers.	2014 OSSC, Chpt 15	Saw-cut out a notch in the parapet wall and install a scupper and downspout.	L
LS15	Ozone Generation Room	The emergency shut-off switch for the ozone generation equipment is located between the sensor and the generation equipment.		Install emergency shut-off switch at two other exits from the building.	M
LS16 (S4)	High Service Pump Station	The roof diaphragm shear capacity is exceeded at approximately 50% of the roof deck area with DCR's that vary from 1.82 to 2.25. Refer to Figure 2.7.	ASCE 41-13, Tier 1	Replace existing deficient deck sections with 16 GA corrugated steel decking.	H
LS17 (S6)	High Service Pump Station	Roof deck shear transfer to the interior wall ledger bolts have DCR's of 3.20 to 3.90. Refer to Figure 2.10.	ASCE 41-13, Tier 1	Add a new top plate over the interior shear walls and install epoxied anchors as required. Refer to Figure 2.11.	H[2]

Table 5.4 Summary of Life Safety Findings (Continued)

ID	Location	Description	Code Reference	Recommendation	Priority[1]
LS18 (S7)	Solids Dewatering Building	The building has no lateral load resisting system in the transverse direction at the first floor level. The existing concrete joint at the elevated slab to the east and west walls does not have any seismic detailing to establish any concrete moment frame.	ASCE 41-13, Tier 1	Provide steel braced frames at the exterior of the building at the east side that braces the building at the second floor level. This system is anticipated to include three braces, each with their own concrete grade beam. It is assumed that the existing stair will need to be relocated to the west side of the building. Refer to Figure 2.12.	H
LS19 (S10)	Various (estimated at 8 locations)	The space heaters at all facilities are laterally braced above their center of gravity, which allows the heaters to sway during an earthquake. The space heaters at the Switchgear Room at the High Service Pump Station are not braced at all.	ASCE 41-13, Tier 1	Provide seismic bracing.	H
LS20 (S13)	Chemical Storage / Ozone Generation Room	The chemical pipes that run through the center of the Chemical Storage Room are not seismically braced. The balance of the chemical pipes in the Chemical Storage Room and Ozone Generation Room lack longitudinal seismic bracing.	ASCE 41-13, Tier 1	Provide seismic bracing of the pipes as required.	M
LS21 (S14)	Ozone Generation Room	The ozone and LOX piping is not seismically braced.	ASCE 41-13, Tier 1	Provide seismic bracing of the pipes as required.	M

Notes:
1. H = High, M = Medium, L = Low.
2. Assumes that vulnerability S4 is addressed simultaneously, otherwise the cost will need to include removal/replacement of the roofing.

Table 5.5 Hydraulic Transient Analysis Demand Scenarios

Scenario	WRWTP Flow Rate (MGD)	Wilsonville Demand (MGD)	Sherwood Demand (MGD)
1	12.5	12.5	0
2	15	15	0
3	15	10	5
4	20	15	5
5	25	17.5	7.5
6	30	22.5	7.5

5.6.2 Evaluation Results

A hydropneumatic tank was recommended to mitigate the downsurge resulting from power failure at the WRWTP for demands of 12.5 mgd or greater. Therefore, the model was used to determine the size of hydropneumatic tank required for each scenario identified in Table 5.6. For each scenario, model runs were evaluated varying the tank volume, air volume, and size of the connecting pipe until an optimized solution was achieved. Hydropneumatic tank sizing was evaluated assuming a 24-inch diameter pipe connected to the upstream end of the discharge header and air volume assumed to be 50 percent of the total volume. Table 5.6 summarizes the findings of the analysis. A technical memorandum detailing the transient analysis findings is included as Appendix C.

Table 5.6 Hydropneumatic Tank Sizing Recommendations

Scenario	WRWTP Flow Rate (mgd)	Wilsonville Demand (mgd)	Sherwood Demand (mgd)	Minimum Tank Size (ft^3)
1	12.5	12.5	0	N/A [1]
2	12.5	12.5	0	N/A [1]
3	15	10	5	750
4	20	15	5	1,000
5	25	17.5	7.5	1,250
6	30	22.5	7.5	1,500

Notes:
(1) Scenario was evaluated to determine maximum demand before surge mitigation is recommended.

5.6.3 Recommendations

Modeling results have determined that a hydropneumatic tank located at the WRWTP is recommended when the City of Wilsonville's demand approaches 12.5 mgd, confirming the results from previous studies. Results indicate that a 750 ft^3 hydropneumatic tank is recommended for a WRWTP flow of 15 mgd; recommended tank sizing increases by 250 ft^3 with each 5 mgd increase in flow at the WRWTP to 1500 ft^3 at 30 mgd. Due to similarities in cost, a 1,500 ft^3 surge tank is recommended for the current installation. This will provide enhanced near-term surge protection and eliminate the need for additional construction in the future as demands increase.

Chapter 6

WRWTP EXPANSION CIP

6.1 Introduction

This Chapter describes the methodology used to determine the approach for WRWTP service expansion to 20 MGD and 30 MGD as well as on-going repair and replacement CIP planning. NOTE: Consideration for alternative capacities for the upcoming incremental (i.e. 20 mgd) expansion were provided in Chapters 2 and 6 of the ***2015 MPU***. The recommended approach considers all existing (and future) treatment processes at the WRWTP, which include:

1. Raw water pumping
2. Rapid Mixing
3. Ballasted flocculation/clarification (Actiflo®)
4. Ozonation
5. Filtration with a deep bed of granular activated carbon (GAC) over sand
6. Clearwell/chlorine disinfection
7. Finished water pumping
8. Waste washwater recovery
9. Mechanical solids dewatering
10. Chemical storage and metering facilities

6.2 Treatment Technologies

The evaluation of treatment processes considered the water quality and redundancy/resiliency level of service goals (LOS) summarized in Chapter 2, including the treatment implications like the plant's ability to meet current and potential future regulatory MCLs, reduce DBP formation, meet *Cryptosporidium* removal/inactivation requirements, and remove potential contaminants of emerging concern (CECs), pharmaceutical and personal care products (PPCPs), and algal toxins. LOS goals were the basis for the overall treatment process redundancy and dictated the procedures that a treatment process operates under.

6.3 Confirmation of Treatment Recommendation

In spring 2016, a Blue Ribbon Panel (BRP) of treatment experts convened to evaluate and confirm the recommended treatment steps in the ***2015 MPU***. Appendix J of this plan documents the results of this effort in the *Blue Ribbon Panel Report*.

In summary, the BRP confirmed that the WRWTP's current treatment technologies are the most-appropriate for continued treatment of the Willamette River at the expanded WRWTP, with provisions for minor process enhancements including:

- Advanced oxidation using hydrogen peroxide with ozone.
- Enhanced biological filtration.
- UV with or without hydrogen peroxide.

Leaving room for these enhancements creates future flexibility at the expanded WRWTP to accommodate and treat any constituents of emerging concern (CECs) if/when detected in the raw water.

6.4 20 MGD Expansion

As outlined in Chapters 2 and 6 of the ***2015 MPU***, the 20 MGD WRWTP expansion will rely on up-rating of existing treatment processes rather than installation of additional concrete basins and equipment. This section describes the approach used to up-rate the treatment systems and, where necessary, any steps required to demonstrate uprated treatment efficacy. Additionally, this section describes any steps necessary to increase equipment redundancy or reliability. A summary of this interim, 20 mgd capacity expansion flow projections, equipment quantities, and equipment sizing is presented in Table 6.1. The site layout and hydraulic profile of the 20 mgd capacity expansion is shown in Figure 6.1 and Figure 6.2, respectively.

Note that Table 6.1 presents two potential expansion options that can be implemented based on manager and operator preference or equipment performance. Though both options are viable, only Option 1 was included in the expansion cost estimate and CIP.

6.4.1 Flow Projections

Future anticipated peak day flow projections were provided by the Cities of Wilsonville and Sherwood. Projections for minimum and average day flow rates were calculated using the plant's current peak:minimum and peak:average ratios. These calculated minimum and average day projections were used to evaluate equipment performance and loadings as well as turn-down requirements for raw and finished water pumps, chemical feed facilities, and ozone generation units. Flow projections are listed in Table 6.1.

6.4.2 Raw Water Pumping

Current raw water pumping capacities were evaluated to determine if they are capable of meeting 20 mgd firm capacity, defined as the total pump capacity when largest pump is out of service. Based on the current pump configuration, the raw water pumps can only maintain 19 mgd firm capacity. Therefore, a recommendation for the 20 mgd expansion is the replacement of the 4 mgd, VFD-controlled pump with a larger unit to meet the firm capacity. For the purpose of this capacity analysis and related cost estimate, it is assumed that the pump is replaced with a 7.5 mgd, VFD-controlled unit; since this is a similar size with other installed pumps, it will utilize the same spare parts and have similar maintenance and operational requirements. NOTE: if installation of a smaller pump is desired to meet the low-demand requirements, a pump as small as 5 mgd would meet the firm capacity requirements. Regardless, improvements to the standby power system will be required, as the existing generator is not capable of meeting the plant's LOS goals.

When the WWSP RWF goes online in 2026, the number of pumps dedicated to the WRWTP will reduce from four to three – the WWSP and the WRWTP will share a 'spare' pump. At this time, it is recommended that all installed pumps are at least 7.5 mgd. It is assumed that the shared pump sizing will be sufficient to ensure the WRWTP can maintain 20 mgd firm capacity.

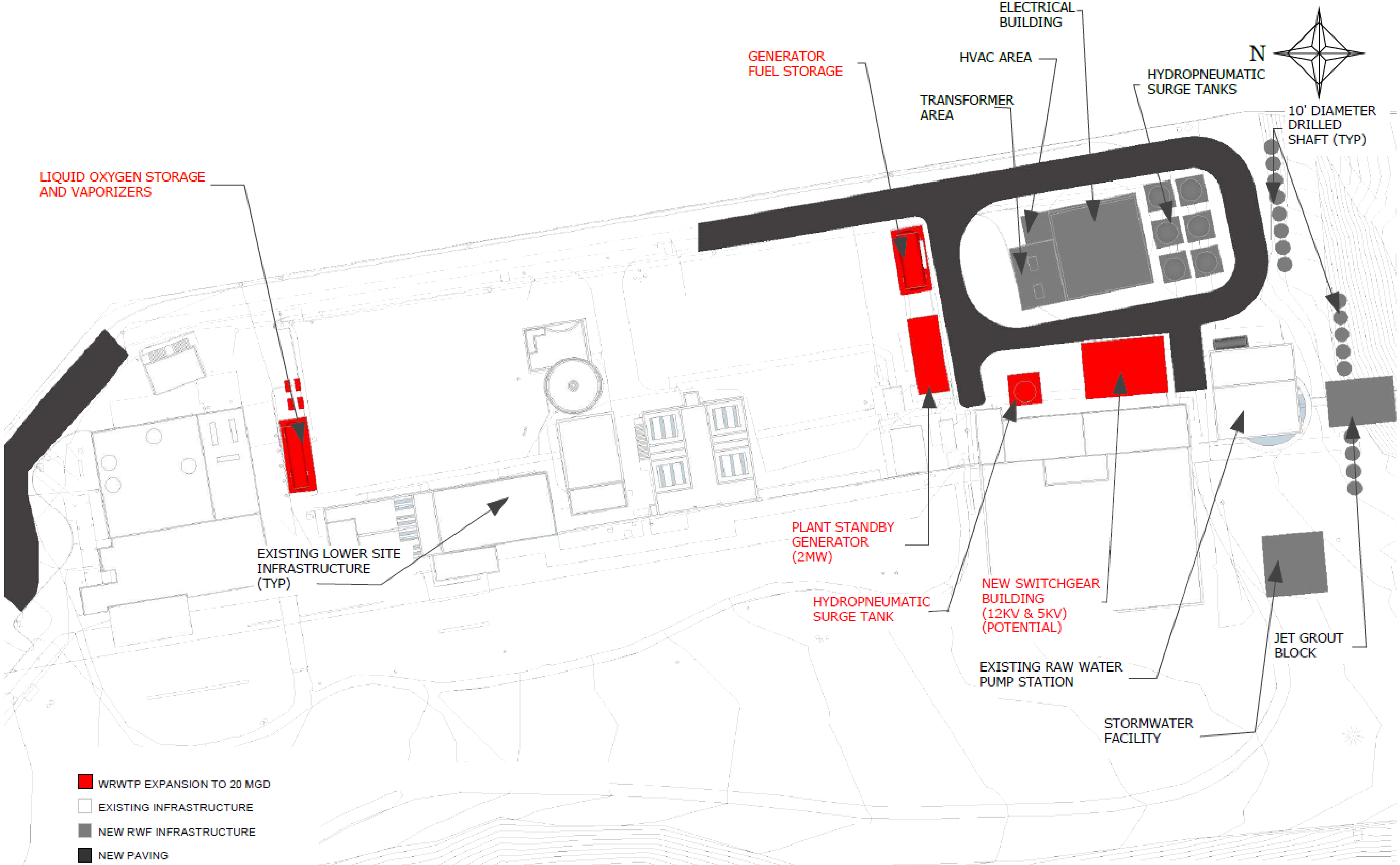

Figure 6.1 WRWTP Site Layout – 20 mgd Capacity

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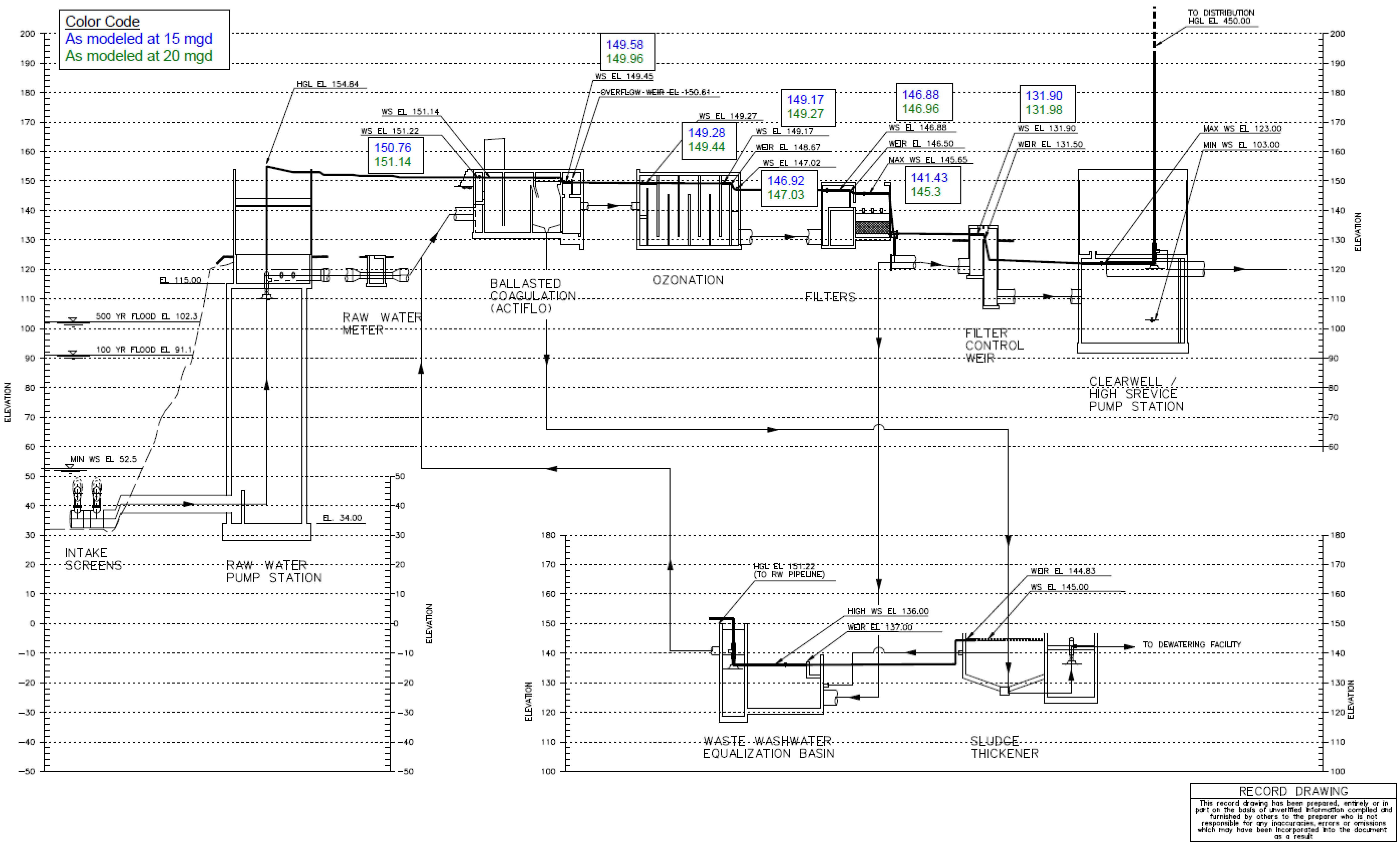

Figure 6.2 WRWTP Hydraulic Profile – 20 mgd Design Capacity

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6.4.3 Flash Mix

The current flash mix system consists of one installed and one shelf-spare pump, operating at approximately 10% of total plant flow. At the 20 mgd capacity expansion, this system will be operating at approximately 7% of total plant flow. Since recommended flash mix rate is 2 to 5% of total plant flow, this system is still sufficiently sized. If installed redundancy is preferred, permanent installation of the shelf-spare pump is recommended. However, this is not entirely necessary since there is the potential for chemical addition at the Actiflo® coagulation basin.

6.4.4 Ballasted Flocculation (Actiflo®)

6.4.4.1 System Up-rating

The feasibility of uprating the Actiflo® was evaluated in the ***2015 MPU***. Though the system is rated at 7.5 mgd per basin based on the current design criteria, it can operate up to 10 mgd per basin without any changes to the equipment sizing or configuration, including the sand recycle pumps. Therefore, the Actiflo® system will be uprated to 10 mgd per basin to facilitate the capacity expansion.

6.4.4.2 Equipment Redundancy

WRWTP operations staff were interviewed as part of this MPU evaluation to identify equipment that may require additional redundancy to ensure ideal system performance. For the Actiflo® system, plant operators recommended purchase of an additional 'shelf-spare' sand recirculation pump, as these pumps can often be difficult to service and/or parts have a long lead time.

6.4.5 Ozonation and Ozone Generation

6.4.5.1 System Up-rating

The feasibility of up-rating the ozone system was evaluated in the ***2015 MPU***. The ozonation system operates with both basins in service for a total treatment capacity of 15 mgd, or 7.5 mgd per basin. As mentioned in Chapter 3, the minimum ozone contact time at 15 mgd is 15 minutes with both basins operating or 7.5 minutes with one basin down for maintenance. Up-rating the ozone contact basins to 20 mgd will allow for 11 minutes of contact time with both basins operating or 5.5 minutes with one basin down for maintenance. This is still sufficient contact time to meet the 1-log *Cryptosporidium* inactivation goal, provided higher doses of ozone are maintained. This dose will also achieve the required 0.5-log inactivation of *giardia*, and will serve as the primary disinfection system for the plant. Therefore, up-rating the basins from 15 mgd to 20 mgd will not impact finished water quality.

To accommodate the increased ozone dosages, the 20 mgd expansion should include the following:

- Upgrade ozone diffusers in Ozonation basins.
- Replace the existing, leased 6,000-gallon LOX storage tank with a new 12,000 to 15,000-gallon tank to ensure sufficient onsite storage – this additional capacity will suffice for the 30 mgd expansion as well.
- Install one additional 300 ppd ozone generator (for a total of three) **OR** replace two existing units with two 400 ppd ozone generators.

6.4.5.2 Equipment Redundancy

No equipment redundancy upgrades are necessary for the ozonation or ozone generation system.

6.4.6 Filtration

6.4.6.1 System Up-rating

The feasibility of up-rating the filtration system was evaluated in the ***2015 MPU***. At the current 15 mgd plant capacity, the filters are rated at 7.5 gpm/sf with one filter out of service for backwashing and a nominal filtration rate of 5.7 gpm/sf when all four filters are in service. At the current 15 mgd capacity, EBCT through the GAC media is 5.9 minutes with one filter offline and 7.9 minutes with all filters operating. Uprating the filters to 20 mgd will result in a maximum filtration rate 10 gpm/sf with one filter out of service for backwashing and a nominal filtration rate of 7.5 gpm/sf with all four filters operating. Additionally, EBCT through the GAC media will be 4.5 minutes with one filter offline and 5.9 minutes with all filters operating.

OHA requires a full year of pilot data to support filter operations in excess of 6 gpm/sf. As documented in Chapter 6 of the ***2015 MPU***, filtration rates of 10 to 12 gpm/sf has already gained OHA approval at two other plants with similar raw water quality, the Lake Oswego-Tigard WTP and the proposed new Grants Pass WTP, respectively. Despite this precedent, pilot testing will likely still be required prior to filter uprating to demonstrate to OHA that the increased filtration rate will not adversely affect finished water quality. In the interest of time and expense, we recommend the Cities of Wilsonville and Sherwood negotiate an alternative approach to OHA's pilot filter requirements. Instead of pilot testing, the existing plant should gradually increase its filtration rate (e.g., 0.5 gpm/sf increments for an OHA-specified duration), collecting treated water data for comparison to WRWTP finished water requirements. After successful operation at the first increment of increased rate, the filtration rate can be increased again and the process repeated, until the desired rate is achieved/approved.

6.4.6.2 Equipment Redundancy

No equipment redundancy upgrades are necessary for the filtration system.

6.4.7 Clearwell/Chlorine Disinfection

6.4.7.1 System Up-rating

Primary disinfection, governed by the inactivation of 0.5-log giardia, is currently achieved in the Clearwell via chlorine disinfection. However, the existing Clearwell is incapable of meeting this disinfection requirement at flows in excess of 15 mgd in the summer, and 10 mgd in the winter; this has been well documented, most recently in the ***Willamette River WTP Disinfection (CT) Analysis*** (MWH, February 2010). The Cities have two alternatives for meeting these disinfection requirements moving forward, including:

- Installation of UV disinfection, downstream of the existing filters.
- Work with OHA to obtain giardia disinfection credit from the intermediate ozonation system.

The Cities have already begun the process of petitioning the State. Wilsonville is a founding member of the Oregon Water Utility Council's (OWUC) Ozone Coalition, and is currently working on drafting their petition to OHA. Final submission and review/approval are anticipated in

Summer 2018, well before plant production rates exceed the existing Clearwell's disinfection capabilities. Following OHA approval, the Clearwell will simply serve as a wet-well for the Finished Water Pump Station.

6.4.7.2 Equipment Redundancy

No equipment redundancy upgrades are necessary for the Clearwell.

6.4.8 Finished Water Pumping

Current finished water pumping capacities were evaluated to determine if they were capable of meeting 20 mgd firm capacity. Based on the current pump configuration, the finished water pumps can only maintain 19 mgd firm capacity. Therefore, our preliminary recommendation for the 20 mgd expansion is the replacement of the 4 mgd, VFD-controlled pump with a 7.5 mgd, VFD-controlled unit. Since this is a similar size with other installed pumps, it will utilize the same spare parts and have similar maintenance and operational requirements. If the Cities/operations staff wants to maintain a smaller pump to meet the low-demand requirements, two options exist:

- Replace the existing 4 mgd pump with a 5 mgd, VFD-controlled pump, or
- Simply add an additional pump, with capacity > 1 mgd, to meet the firm capacity requirements.

6.4.8.1 Equipment Redundancy

Once firm capacity requirements are met, no additional upgrades are necessary in the Finished Water Pump Station.

6.4.9 Waste Washwater Recovery

No modifications are necessary for the waste washwater recovery system for the 20 mgd capacity expansion

6.4.10 Mechanical Solids Dewatering

No modifications are necessary for the mechanical solids dewatering system for the 20 mgd capacity expansion

6.4.11 Chemical Storage and Metering

The following modifications are recommended for the 20 mgd capacity expansion:

- **Chemical Piping Replacement**: WRWTP operators indicate that the existing chemical lines and spares have become inoperable during their 15-year operating period. Therefore, it is recommended that the 20 mgd Capacity Expansion include the replacement of all in-place chemical lines.
- **Utilidor Extension**: To facilitate the current and future chemical line replacements, it is recommended that the existing utilidor be extended to the southern half of the WRWTP. To traverse the waste washwater equalization basin, the chemical pipelines will need to be installed along the interior western wall to route them to the utilidor.
- **Addition of a Second Dry Polymer System**: WRWTP operators indicate that the existing dry polymer batching system has become somewhat unreliable. Since this system is key to successful operation of the Actiflo® system, installation of a redundant dry polymer batching system is recommended.

- **Increased LOX Storage**: As previously mentioned, the existing leased 6,000-gallon LOX storage tank and associated evaporators should be replaced with a larger leased system to ensure sufficient onsite storage at the increased plant capacity.
- **Sodium Hypochlorite Tank Replacement**: One of the two hypochlorite tanks installed during plant construction failed during plant operation and was replaced with a smaller tank. To prevent unexpected failure of the second tank, the WRWTP should plan to replace the remaining 4,400-gallon original tank with a new 3,900 gallon tank as part of the 20 mgd Capacity Expansion.
- **Strainers on Pump Suction**: WRWTP operators reported difficulty with pump maintenance due to clogging in the suction line. To avoid this in the future, wye or basket strainers should be installed on chemical pump suction lines.
- **Hypochlorite Vent Return**: WRWTP operators reported concerns with the off-gassing of hypochlorite pump vents. To ensure a safe work environment is maintained, pump and line vents will be plumbed to return to the hypochlorite storage tanks.

Table 6.1 WRWTP 20 MGD Expansion Processes and Procedures

Flow Rate	Units	Option 1	Option 2
Minimum	MGD	3.3	3.3
Annual Average	MGD	6.4	6.4
Maximum (Plant Design)	MGD	20	20
	GPM	13,889	13,889
Willamette River			
Minimum River Level	FT	52.5	--
100 Year Flood Elevation	FT	91.1	--
500 Year Flood Elevation	FT	102.3	--
Intake Screens[1]			
Type: Horizontal cylindrical			
Number	#	2	--
Capacity, total	MGD	70	--
Diameter	IN	66	--
Screen Opening Size	mm	1.75	--
Maximum Face Velocity	FPS	0.4	--
Top of Screen Elevation	FT	42.75	--
Screen Cleaning			
Cleaning method: air burst			
Number of Compressors	#	2	--
Compressor Capacity	CFM	200	--
Air receiver volume	CF	2,200	--
Motor Size per compressor	HP	50	--

Table 6.1 WRWTP 20 MGD Expansion Processes and Procedures (Continued)

Flow Rate	Units	Option 1	Option 2
Raw Water Pumps			
Type: Vertical Turbine, Single-stage			
Number	#	4 (3+1)	--
Total capacity w/ stand-by	MGD	30	--
Firm capacity	MGD	22.5	--
Capacity (each)			
1 VFD Driven pump	MGD	7.5	--
1 VFD Driven Pump	MGD	7.5	--
1 VFD Driven Pump	MGD	7.5	--
1 Constant speed pump (Swing Pump?)	MGD	≥ 7.5	--
Total dynamic head (20 MGD)	FT	111	--
Total motor horsepower	HP	4@200	--
Initial Flash Mix			
Type: Pumped			
Number (Installed)	#	1	2 (1+1)
Mixing energy (ea)	sec^{-1}	1,000	1,000
Pump capacity (ea)	gpm	1,000	1,000
Pump flow as a percentage of plant flow rate (PFR)	%	7%	7%
Total dynamic head	FT	16	16
Total motor horsepower (ea)	HP	7.5	7.5
Flocculation/Sedimentation Process			
Type: Ballasted Flocculation (Actiflo®)			
Number of Basins	#	2	--
Design flow (per basin)	MGD	10	--
Max process hydraulic flow (per basin)	MGD	15	--
Mixing/Flocculation (per basin)			
Coagulation chamber volume	CF	2,000	--
Coagulation chamber HRT	MIN	2.2	--
Injection chamber volume	CF	2,165	--
Injection chamber HRT	MIN	2.3	--
Maturation chamber volume	CF	6,330	--
Maturation chamber HRT	MIN	6.82	--
Clarification			
Settling chamber volume	CF	7,570	--
Settling chamber HRT	MIN	8.2	--

Table 6.1 WRWTP 20 MGD Expansion Processes and Procedures (Continued)

Flow Rate	Units	Option 1	Option 2
Lamella tube settlers, surface area (ea)	SQ. FT.	260	--
Maximum design surface loading rate w/ all basins	GPM/SF	--	--
Design Surface Loading Rate w/ All Basins	GPM/SF	27	--
Maximum surface loading rate (1 basin OOS)	GPM/SF	**53**	**--**
Sand slurry recirculation system			
Number of sludge recirculation pumps per Basin	#	2 (2+0)	--
Pumps in operation	#	2	
Sludge recirculation rate	%	4.8	--
Capacity per pump	GPM	165	--
Total design head	FT	75	--
Pump horsepower	HP	10	--
Number of sand hydrocyclones (per basin)	#	2	--
Average Sand Loss Rate	LB/MG	23	--
Approx. Daily Sand Loss	PPD	460	--
Ozone Contact Basins			
Type: 8-stage counter-co-counter w/ fine-bubble diffusers			
Number of basins	#	2	--
Detention time w/ all in service @ Design Flow	MIN	11.20	--
Detention time w/ one out of service @ Design Flow	MIN	5.60	--
Average water depth	FT	21	--
Inside dimensions (each basin)	FT x FT	6 x 10	--
Volume (total)	CF	20,800	--
Ozone Destruct Units	#	2	--
Ozone Generators			
Number	#	3 (2+1)	2 (1+1)
Feed Gas	-	LOX	LOX
Capacity (ea)	ppd	300	400
% Ozone by Weight (max)	%	8	8
Design Ozone Dose	mg/L	2.4	2.4
Max Ozone Dose @ Design Flow	mg/L	5.40	4.80
Dose with one unit out of service @ Design Flow	mg/L	3.60	2.40
Liquid Oxygen (100% LOX)			
Number of tanks	#	1	-
Storage capacity, total	GAL	12,000	-
Storage (avg dose x max flow)	DAYS	26	-

Table 6.1 WRWTP 20 MGD Expansion Processes and Procedures (Continued)

Flow Rate	Units	Option 1	Option 2
Average Oxygen Dosage	mg/L	26	-
Storage Density	#/gal	9.5	-
Filters			
Type: Deep bed, dual granular media			
w/ influent flow splitting			
Number of filters	#	4	--
Number of bays/filter	#	1	--
Filter bay dimensions	FT x FT	20 x 23	--
Filter area (each filter)	SF	460	--
Total filter area	SF	1,840	--
Maximum filtration rate (Q/A)			
All filters on-line @ Design Flow	GPM/SF	7.5	--
One filter off-line @ Design Flow	GPM/SF	10.1	--
Hydraulic maximum	GPM/SF	12	--
Flow Rate Each Filter			
All filters on-line @ Design Flow	MGD	5.0	--
One filter off-line @ Design Flow	MGD	6.7	--
Filter media			
GAC			
Depth	IN	72	--
Effective size	MM	1.4	--
Uniformity coefficient		<1.4	--
Depth: Diameter (L:D)		1,306	--
Minimum Empty bed contact time (EBCT)			
All filters on-line @ Design Flow	MIN	5.9	--
One filter off-line @ Design Flow	MIN	4.5	--
Sand			
Depth	IN	12	--
Effective size	MM	0.45	--
Uniformity coefficient		<1.4	--
Depth: Diameter (L:D)	MM:MM	677	--
Total media			
Depth (maximum)	IN	84	--
Depth: Diameter (L:D)	MM:MM	1,984	--
Filter wash system			
Air scour blowers			

Table 6.1 WRWTP 20 MGD Expansion Processes and Procedures (Continued)

Flow Rate	Units	Option 1	Option 2
Number	#	2	--
Air scour rate	CFM/SF	3.2	--
Blower capacity (each)	ACFM	1,500	--
Blower horsepower (each)	HP	100	--
Backwash pumps			
Number	#	2	--
Maximum backwash rate	GPM/SF	20	--
Pump capacity (each)	GPM	9,200	--
Pump horsepower (each) – constant speed	HP	150	--
Maximum Backwash Volume	MGD	2.8	
Clearwell			
Type: Buried, reinforced concrete			
Active volume	MG	2.9	--
Max Operating Side Water Depth	FT	21.5	--
Dimensions	FT x FT	135 x 135	--
Detention Time (HRT) at Design Flow when full	HOURS	3.48	--
Hydraulic Efficiency up to 15 MGD	T10:HRT	0.11	--
Hydraulic Efficiency >15 MGD	T10:HRT	n/a	--
Finished Water Pumps			
Type: Vertical turbine, Two-stage			
Number	#	4 (3+1)	5 (4+1)
Total capacity w/ stand-by	MGD	30	30.5
Firm capacity	MGD	22.5	23
Capacity each			
1 VFD Driven pump	MGD	7.5	4
1 VFD driven pump	MGD	7.5	7.5
1 VFD driven pump	MGD	7.5	7.5
1 Constant speed pump	MGD	7.5	7.5
1 VFD driven pump		--	4
Total dynamic head	FT	--	--
Motor Size	HP	4@500	2@300 3@500
Waste Washwater Equalization & Pump Station			
Equalization basins			
Type: Concrete			
Number of basins	#	1	--

Table 6.1 WRWTP 20 MGD Expansion Processes and Procedures (Continued)

Flow Rate	Units	Option 1	Option 2
Volume	GAL	244,000	--
Maximum Backwash Volume	MGD	2.8	--
Hydrocyclone Overflow @ Design Rate	MGD	0.8	
Basin Hydraulic Retention Time	HOURS	1.6	--
Washwater recycle pumps			
Type: Vertical turbine			
Number	#	3 (2+1)	--
Firm capacity	GPM	1,500	--
Capacity each			
1 VFD driven pump	GPM	500	--
1 VFD driven pump	GPM	500	
1 constant speed pump	GPM	500	--
Time to empty basin (all pumps on-line)	HRS	2.7	--
Time to empty basin (one pump off-line)	HRS	4.1	--
Total dynamic head	FT	25	--
Motor horsepower	HP	3 @ 5	--
Solids Treatment			
Type: Gravity thickener and centrifuges			
Estimated Max Solids Production (dry) @ Design Flow	LBS/DAY	2,667	--
Estimated Max Hydraulic Flow Rate @ Design Flow	GPM	321	--
Gravity thickener (circular)			
Number of units (total, existing + new)	#	1	--
Diameter	FT	35	--
Side Water Depth	FT	12	
Max solids loading rate	PPD/SF	8	--
Max hydraulic loading rate	GPM/SF	1	--
Operating solids loading rate	PPD/SF	2.8	--
Operating hydraulic loading rate	GPM/SF	0.33	--
Storage Capacity @ Design Rate (7-day ops)	HOURS	4.5	
Storage Capacity @ Design Rate (5-day ops)	HOURS	3.2	
Solids Storage & Mixing			
Storage Volume	GAL	33,000	--
Estimated solids flow @ 2.5%	GAL/MG	765	--
	GPD	15,300	--
Mixing Tank HRT (7-day ops)	HOURS	51	--

Table 6.1 WRWTP 20 MGD Expansion Processes and Procedures (Continued)

Flow Rate	Units	Option 1	Option 2
Mixing Tank HRT (5-day ops)	HOURS	36	
Mixing Pumps	#	1	--
Pumping capacity	GPM	600	--
Pump horsepower	HP	5	--
Solids pump station			
Progressive Cavity Transfer Pumps	#	2	--
Pumping capacity (ea)	GPM	60	--
Motor Size (ea)	HP	10	--
Total dynamic head	FT	60	--
Centrifuges			
Type		Horz. Scroll	--
Number of units	#	2	--
Capacity, each	GPM	60	--
Max solids loading, each	LB/HR	750	--
Maximum 8-hr Processing Capacity (ea)	PPD	6,000	--
Maximum 8-hr Processing Capacity (ea)	GPD	28,800	
Motor horsepower-scroll, each	HP	40	--
Motor horsepower-back drive, each	HP	15	--
Centrifuge operation period (1 standby, 7-day ops)	HR/DAY	3.6	--
Centrifuge operation period (1 standby, 5-day ops)	HR/DAY	5.0	
Chemical Storage			
Primary coagulant (49% alum sol'n)			
Number of tanks	#	2	--
Storage capacity, total	GAL	13,000	--
Required Days Storage	DAYS	14	--
Storage (avg dose x max flow)	DAYS	28	--
Average Dosage	mg/L	15	--
Minimum volume for 21-day Storage	GAL	9,750	
Solution Strength (alum)	#/gal	5.4	--
Cationic polymer (dry polymer)			
Type	-	Dry Feeder	--
Feed Capacity	#/hr	17.6	--
Required Days Storage	DAYS	14	--
% solution	%	1	--

Table 6.1 WRWTP 20 MGD Expansion Processes and Procedures (Continued)

Flow Rate	Units	Option 1	Option 2
Storage (avg dose x max flow)	DAYS	--	--
Mixing Time	min	30	--
Sodium hypochlorite (12.5% NaOCl sol'n)			
Number of tanks	#	2	--
Storage capacity, total	GAL	7,800	--
Required Days Storage	DAYS	14	--
Storage (avg dose x max flow)	DAYS	24	--
Average Dosage	mg/L	2	--
Minimum volume for 21-day Storage	GAL	6,825	
Solution Strength	#/gal	1.05	--
Caustic soda (25% NaOH sol'n)			
Number of tanks	#	2	--
Storage capacity, total	GAL	13,000	--
Required Days Storage	DAYS	14	--
Storage (avg dose x max flow)	DAYS	31	--
Average Dosage	mg/L	6.5	--
Minimum volume for 21-day Storage	GAL	8,806	
Solution Strength	#/gal	2.65	--
Aqueous ammonia (19% NH_4OH sol'n)			
Number of tanks	#	1	--
Storage capacity, total	GAL	1,400	--
Anionic polymer			
Number of tanks	#	1	--
Storage capacity, total	GAL	55	--
Required Days Storage	DAYS	14	--
Storage (avg dose x max flow)	DAYS	> 1 year	--
Average Dosage	mg/L	0.4	--
Non-ionic polymer			
Number of tanks	#	1	--
Storage capacity, total	GAL	55	--
Required Days Storage	DAYS	14	--
Storage (avg dose x max flow)	DAYS	> 1 year	--
Average Dosage	mg/L	0.4	--
Calcium Thiosulfate			
Number of tanks	#	2	--
Storage capacity, total	GAL	440	--

Table 6.1 WRWTP 20 MGD Expansion Processes and Procedures (Continued)

Flow Rate	Units	Option 1	Option 2
Required Days Storage	DAYS	14	--
Storage (avg dose x max flow)	DAYS	47	--
Minimum volume for 21-day Storage	GAL	197	
Average Dosage	mg/L	0.2	--
Solution Strength	#/gal	3.6	--

Notes:
(1) Intake screen replacement will be completed as part of the WWSP RWF construction project and therefore is not included in this expansion.

6.5 30 MGD Expansion

The 30 mgd capacity expansion will be designed based on the updated process design criteria established for the 20 mgd capacity expansion. This will allow the plant to maximize the available space at the WRWTP with the intention of achieving a total capacity of 60 mgd within the existing site boundary. Additionally, utilizing the uprated criteria will allow the WRWTP to deliver high-quality finished water to the Cities of Wilsonville, Sherwood, and any potential distribution partners while minimizing rate increases.

6.5.1 Expansion Alternatives

During the preparation of the WRWTP 2017 MPU, alternatives were evaluated for each of the major treatment processes at the WRWTP (i.e. ballasted flocculation, ozonation, and filtration):

Alternative 1. Expansion at uprated design criteria
Alternative 2. Expansion at updated design criteria with post seismic basin redundancy (i.e. installation of a completely redundant basin)

The number of basins installed and assumed active following a seismic event are shown in Figures 6.3 and 6.4, and listed in Table 6.2. As shown in the table, Alternative 1 would allow the WRWTP to meet its LOS goal following a regional seismic event, but would not provide basin redundancy if/when a basin needs to be taken off-line for maintenance following a seismic event.

Alternative 2 provides sufficient redundancy following a regional seismic event, but is significantly more expensive.

Table 6.2 WRWTP 30 MGD Expansion Alternatives

	Number of Basins On-line: Total (Duty + Standby)			
Treatment Process	Alternative 1	Alternative 2	Alternative 1 PRSE	Alternative 2 PRSE
Actiflo®	3 (3+0)	4 (3+1)	1 (1+0)	2 (1+1)
Ozonation	3 (3+0)	4 (3+1)	1 (1+0)	2 (1+1)
Filtration	6 (5+1)	8 (7+1)	2 (2+0)	4 (3+1)

Notes:
(1) PRSE = post regional seismic event.

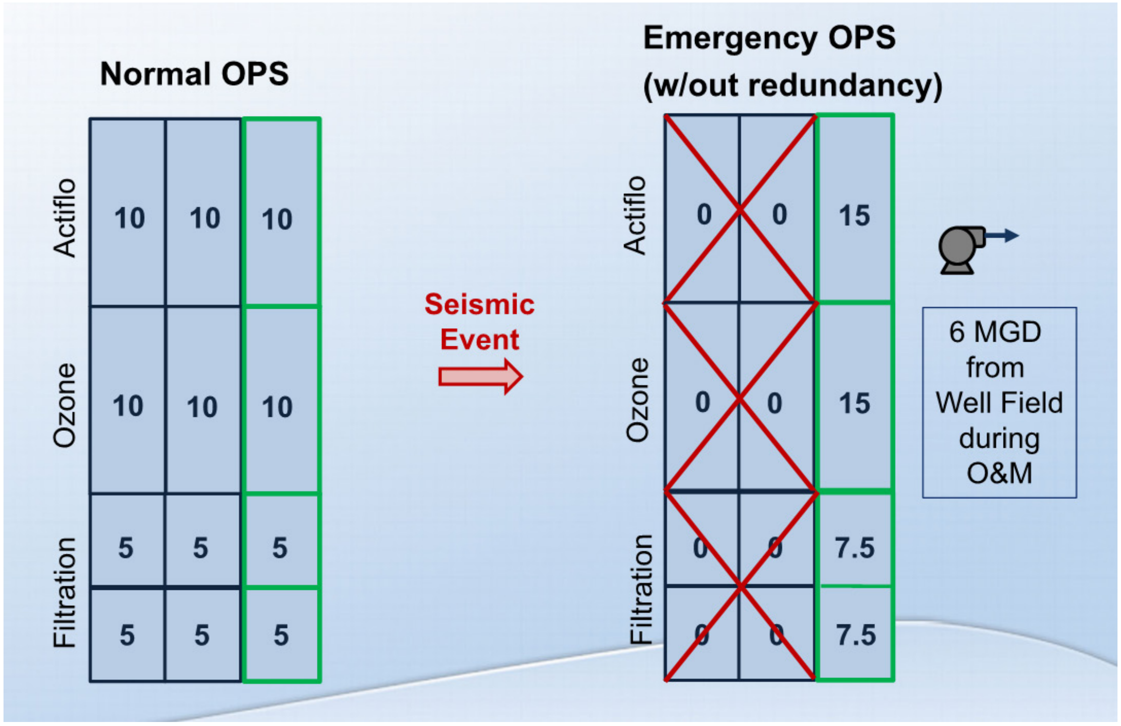

Figure 6.3 WRWTP 30 MGD Expansion – LOS

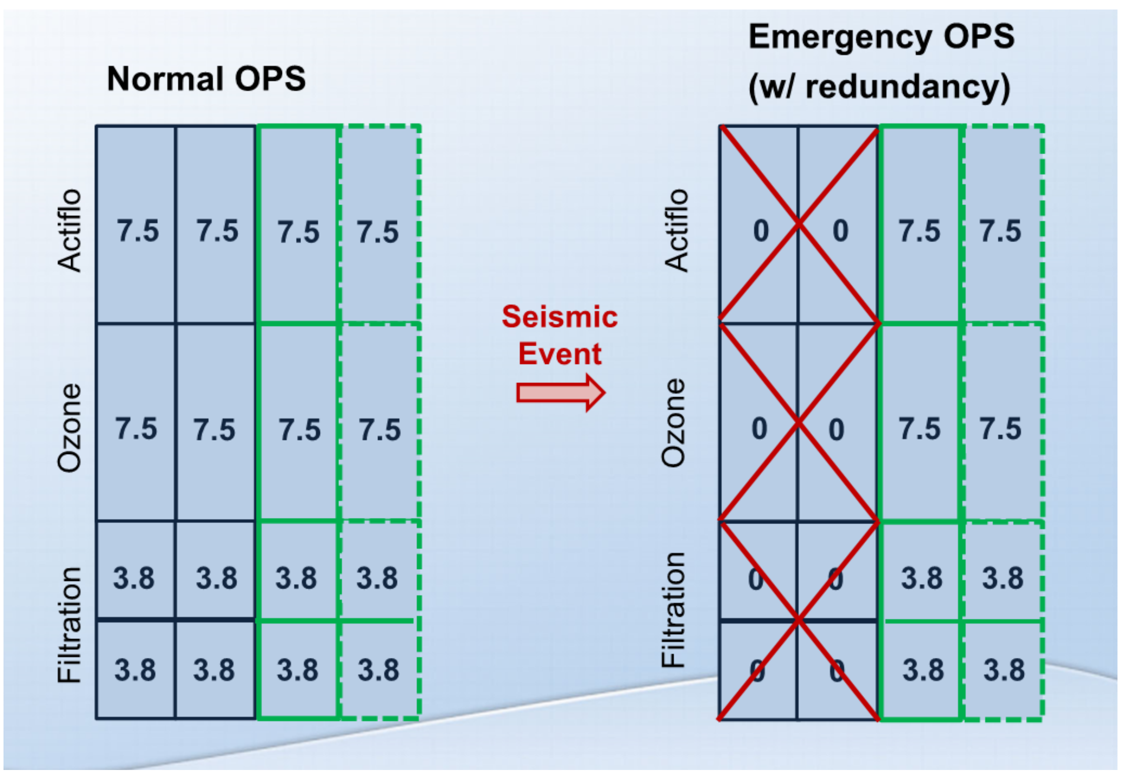

Figure 6.4 WRWTP 30 MGD Expansion – LOS + Post Regional Seismic Event Resiliency

6.5.1.1 Alternatives Evaluation

Per the WRWTP LOS goal established in Chapter 2, following a regional seismic event the WRWTP would be required to produce half (50%) of its nameplate capacity of 30 mgd (or 15 mgd) at the minimum potable water standard within 48 hours after a catastrophic event. For the purpose of this evaluation, it was assumed that the treatment basins installed during initial plant construction would not be initially functional, thereby limiting treatment to the basin(s) installed during the 30 mgd expansion.

The primary treatment process operating criteria for this alternatives evaluation are included in Table 6.3. For Alternative 1, the impacts to treatment following a regional seismic event include the following:

- **Actiflo®:** The remaining Actiflo® basin would be treating 15 mgd. Based on discussions with the vendor (Kruger), the basins installed at WRWTP are capable of treating this flow rate. However, they will need to have both sand pumps operating in parallel to ensure the basins are able to maintain a minimum 3% solids recycle rate with the existing 165 gpm sand pumps.
- **Ozonation:** The remaining ozone basin would be treating 15 mgd. This would limit detention time in the ozonation basin to 7.5 minutes. While this is sufficient to achieve 0.5-log *giardia* inactivation, the ozonation system would not be operable if the basin required maintenance. Though 1-log inactivation of *Cryptosporidium* isn't necessary (water quality LOS goals are limited to regulatory requirements only), the ozone basin will still be providing primary disinfection for the plant. Therefore, a lack of ozone redundancy is not desirable. However, the Clearwell is capable of providing giardia disinfection with free chlorine, at flows up to 15 mgd in the summer and 10 mgd in the winter, and could be used on an interim basis to facilitate maintenance of the ozone facilities.
- **Filtration:** The filtration system would be treating 15 mgd through two filters. This would result in a nominal filtration rate of 11.3 gpm/sf and a maximum filtration rate; plant flows will need to be limited when one filter is down for backwashing. Assuming the maximum permitted filtration rate is 12 gpm/sf, the WRWTP could only produce 8 mgd instantaneously during backwash cycles.

For Alternative 2, there are no treatment impacts following a regional seismic event because the remaining basins and maximum production rate would be identical to the expanded plant under normal operations (with one basin out of service). However, adopting this option would approximately double the cost of the 30 mgd capacity expansion. Additionally, it would increase operations and maintenance costs due to additional equipment and would create stranded capacity for the majority of the operational life, particularly since they would only be useful during maximum demand conditions. Therefore, it is recommended that Alternative 1 be considered for 30 mgd capacity expansion planning; all other resiliency options will be designed to minimize the risks associated with Alternative 1.

6.5.1.2 Alternative Water Supplies

Since the capital and operating costs of additional basins make Alternative 2 unfeasible, additional resiliency options were evaluated. These options included alternative supplies that may be necessary during times when plant demand is 15 mgd, but production is reduced, such as during filter backwash or equipment maintenance. Alternative water supplies identified during this evaluation include:

- Wilsonville and Sherwood Well Fields: Both cities maintain well fields that are plumbed to the potable water distribution system. These well fields are capable of producing approximately 3 mgd each.
- WWSP Supply: There is potential to request temporary supply from the WWSP. This would require addition of a tie point and meter between the two systems, likely located near the site of the future WWSS WTP in Sherwood, as well as an Intergovernmental Agreement (IGA) dictating the costs and maximum allowable diversion that would not impact WWSP customers. Additional studies are required to demonstrate what additional infrastructure (e.g. temporary booster pump stations) may be required to back-feed Wilsonville's distribution system from the Sherwood.
- Alternative Supply from Sherwood: This alternative would require both an additional source of supply to Sherwood (City of Portland, or equal), as well as the previously mentioned additional infrastructure required to convey the water to Wilsonville's distribution system.

Based on this evaluation, there are sufficient water supplies alternatives within the region (or even within the partner cities) to supplement the WRWTP if desired.

6.5.1.3 Alternative Recommendation

Based on the discussion above, the recommendation for the 30 mgd capacity expansion is Alternative 1 (no redundant basins following a catastrophic seismic event) and identification of an alternate water supply source (like the existing groundwater infrastructure) to supplement WRWTP production during maintenance activities. Alternative 1 is considered sufficiently conservative on its own since it is unlikely that the original basins will be completely inoperable as a result of a regional seismic event. However, identification of an additional water supply will provide significant regional resiliency.

Table 6.3 WRWTP 30 MGD Expansion Alternatives – Design and Operating Criteria following a Catastrophic Seismic Event

Flow Rate	Units	ALT 1	ALT2
Minimum	MGD	2.5	2.5
Average	MGD	4.8	4.8
Max (Plant Design)	MGD	15	15
	GPM	10,417	10,417
Clarification Process			
Type: Ballasted Flocculation (Actiflo®)			
Number of Basins	#	1	2
PRSE Flow Rate (per basin)	MGD	15	7.5
Max process hydraulic flow (per basin)	MGD	15	15
Mixing/Flocculation (per basin)			
Coagulation chamber volume	CF	2,000	2,000
Coagulation chamber HRT	MIN	1.4	2.9

Table 6.3 WRWTP 30 MGD Expansion Alternatives – Design and Operating Criteria following a Catastrophic Seismic Event (Continued)

Flow Rate	Units	ALT 1	ALT2
Injection chamber volume	CF	2,165	2,165
Injection chamber HRT	MIN	1.6	3.1
Maturation chamber volume	CF	6,330	6,330
Maturation chamber HRT	MIN	4.55	9.09
Clarification			
Settling chamber volume	CF	7,570	7,570
Settling chamber HRT	MIN	5.4	10.9
Lamella tube settlers, surface area (ea)	SQ. FT.	260	520
Design Surface Loading Rate w/ All Basins	GPM/SF	40	20
Maximum surface loading rate	GPM/SF	40	40
Sand slurry recirculation system			
Number of sludge recirculation pumps/basin	#	2	2
Pumps in operation	#	2	1
Sludge recirculation rate	%	3.2	3.1
Capacity per pump	GPM	165	165
Total design head	FT	75	75
Pump horsepower	HP	10	10
Number of sand hydrocyclones (per basin)	#	2	2
Average Sand Loss Rate	LB/MG	23	23
Approx. Daily Sand Loss	PPD	345	345
Ozone Contact Basins			
Number of basins	#	1	2
Detention time w/ all in service @Design Flow	MIN	7.47	14.94
Detention time w/ one out of service @Design Flow	MIN	N/A	7.47
Average water depth	FT	21	21
Inside dimensions (each basin)	FT x FT	6 x 10	6 x 10
Volume (total)	CF	10,400	20,800
Filters			
Number of filters	#	2	4
Number of bays/filter	#	1	1
Filter bay dimensions	FT x FT	20 x 23	20 x 23
Filter area (each filter)	SF	460	460
Total filter area	SF	920	1,840
Maximum filtration rate (Q/A)			
All filters on-line @ Design Flow	GPM/SF	11.3	5.7

Table 6.3 WRWTP 30 MGD Expansion Alternatives – Design and Operating Criteria following a Catastrophic Seismic Event (Continued)

Flow Rate	Units	ALT 1	ALT2
One filter off-line @ Design Flow	GPM/SF	22.6	7.5
Hydraulic maximum	GPM/SF	12	12
Flow Rate Each Filter			
All filters on-line @ Design Flow	MGD	7.5	3.8
One filter off-line @ Design Flow	MGD	15.0	5.0
Minimum Empty bed contact time (EBCT)			
All filters on-line @ Design Flow	MIN	4.0	7.9
One filter off-line @ Design Flow	MIN	2.0	5.9

6.5.2 Flow Projections

Future anticipated peak day flow projections were provided by the Cities of Wilsonville and Sherwood. Projections for minimum and average day flow rates were calculated using the plant's current peak:minimum and peak:average ratios, These calculated minimum and average day projections were used to evaluate equipment performance and loadings as well as turn-down requirements for raw and finished water pumps, chemical feed facilities and ozone generation units. Flow projections are listed in Table 6.4. The site layout for the 30 mgd capacity expansion is shown in Figure 6.5.

Note that Table 6.4 presents two potential expansion options that can be implemented based on manager and operator preference or equipment performance. Though both options are viable, only Option 1 was included in the expansion cost estimate and CIP.

6.5.3 Raw Water Pumping

At the 30 mgd expansion, the WRWTP will have three dedicated pumps and one pump shared with the WWSP RWF. Assuming there are three 7.5 mgd pumps installed at the time of the 30 mgd expansion and that the pump shared with the WWSP RWF is at least 7.5 mgd, the WRWTP firm capacity will be 22.5 mgd. Therefore, pump replacement will be necessary to support the 30 mgd expansion. A recommendation for the 30 mgd expansion is to replace two of the 7.5 mgd pumps with 15 mgd pumps. Assuming the shared spare is 7.5 mgd, this would provide a firm capacity of 30 mgd. It is also recommended that all dedicated pumps are VFD-controlled to ensure WRWTP can meet its capacity requirements without relying on the pump shared with the WWSP.

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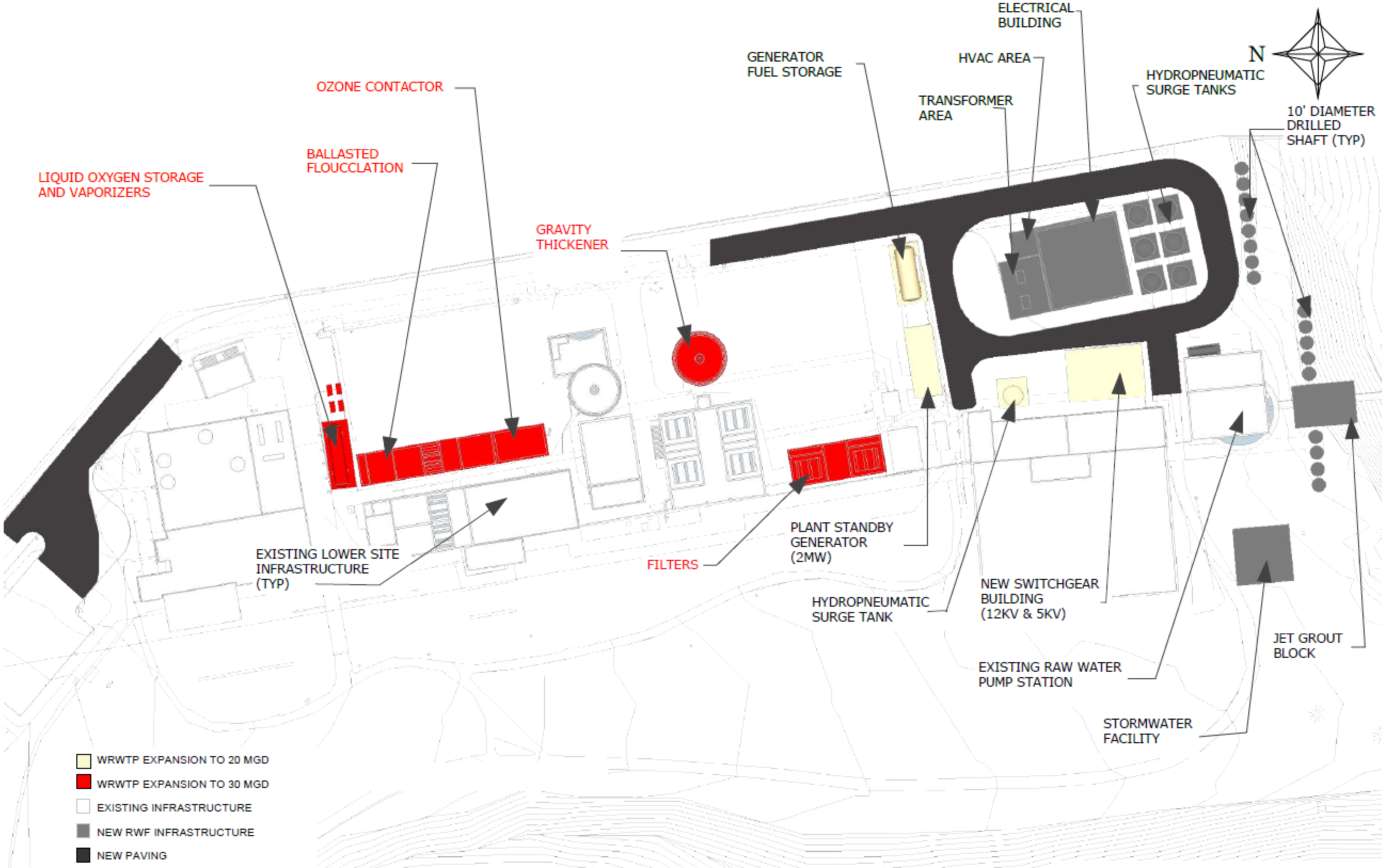

Figure 6.5 WRWTP Site Layout – 30 mgd Design Capacity

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6.5.4 Flash Mix

At the 30 mgd capacity expansion, the flash mix system will be operating at approximately 5% of total plant flow. Since recommended flash mix rate is 2 to 5% of total plant flow, this system is still sufficiently sized. If installed redundancy is preferred, permanent installation of the shelf-spare pump is recommended.

6.5.5 Ballasted Flocculation (Actiflo®)

At the 30 mgd capacity expansion, installation of one additional Actiflo® basin is recommended. This will maintain the uprated capacity of 10 mgd per basin as described in the 20 mgd capacity expansion.

6.5.6 Ozonation

At the 30 mgd capacity expansion, installation of one ozone basin is recommended. This will maintain the uprated capacity of 10 mgd per basin as described in the 20 mgd capacity expansion. The basin construction will include the shared ozone gallery, common with the fourth ozone basin when it is constructed during the next (i.e. 40 mgd) capacity expansion in the future. This expanded ozone contact facility will be capable of providing both the OHA required 0.5-log inactivation of *giardia*, as well as the non-regulated 1-log inactivation of *Cryptosporidium*, defined in the plant's LOS goals.

6.5.7 Filtration

At the 30 mgd capacity expansion, installation of two additional filters is recommended. This will maintain the uprated maximum filtration rate of 10 gpm/sf when one basin is off-line for backwashing, as described in the 20 mgd capacity expansion.

6.5.8 Clearwell/Chlorine Disinfection

As previously discussed, following OHA approval of the plant's petition to recognize the disinfection benefits of ozone, the Clearwell will continue to simply serve as a wet-well for the Finished Water Pump Station, and is capable of serving in this capacity to flows in excess of 60 mgd, or the plant's build-out capacity. That said, the disinfection capability at the Clearwell should be maintained, as free chlorine disinfection (at reduced rates) can serve as a temporary backup to ozone disinfection during a catastrophic event.

6.5.9 Finished Water Pumping

The finished water pumping capacity following the 20 mgd capacity expansion will depend on which option is selected. If four pumps are installed, the firm capacity will be up 22.5 mgd. If a fifth pump is installed, the firm capacity will be up to 23 mgd. Therefore, pump replacement or additional pump installation will be necessary in order to meet 30 mgd firm capacity. Installation options include the following:

- Assuming four total pumps: Replace three 7.5 mgd pumps with 12 mgd pumps gives a firm capacity of 31.5 mgd (included as Option 1 in Table 6.4).
- Assuming five total pumps: Replace three 7.5 mgd pumps with 12 mgd pumps for a firm capacity of up to 39 mgd (included as Option 2 in Table 6.4).

Note that the recommended finished water pump size is not consistent with the size recommended for the raw water pump size (12 mgd vs. 15 mgd). Due to space restrictions in the

Finished Water Pump Station and greater TDH of the finished water pumps, it is unlikely that 15 mgd VFD-controlled pumps could fit in the allotted space. It is recommended that final pump sizing and required space are reviewed prior to initiating design for the 30 mgd capacity expansion to determine if consistent pump sizes can be used in the finished and raw water facilities. Otherwise the plant control systems will need to be upgraded to compensate for these variations in pump rate.

6.5.10 Waste Washwater Recovery

Waste washwater pumps will need to be replaced by the 30 mgd expansion due to expired service life. To accommodate additional filters and the resulting increase in waste washwater flow rate, the 30 mgd capacity expansion should include upgrading from 500 gpm to 1,000 gpm pumps or installation of a fourth 500 gpm pump. This will ensure that the washwater recycle rate is high enough to empty the washwater equalization within one to two hours, as indicated in Table 6.4. The basin itself, which serves as a wet-well for the pump station, is adequately sized for flows in excess of 60 mgd, or the plant build-out flow rate.

6.5.11 Mechanical Solids Dewatering

6.5.11.1 Gravity Thickener

At 30 mgd, the hydraulic loading rate of the single gravity thickener will be up to 0.50 gpm/sf, which could negatively impact performance. Solids loading rates are still within reasonable range. Therefore, it is recommended that a second 35-foot diameter gravity thickener be installed at the 30 mgd capacity expansion.

6.5.11.2 Solids Mixing

The solids mixing system is sufficiently sized for 30 mgd design capacity; however, the current configuration includes one installed pump and a shelf-spare pump rather than installed redundancy. Due to the increased complexity of two gravity thickeners and the increased solids generation rate, the 30 mgd Expansion should include the installation of the shelf-spare mixing pump.

6.5.11.3 Solids Transfer and Thickening

The current 60 gpm solids transfer pumps and centrifuges will have exceeded their service life at the 30 mgd capacity expansion. Therefore, the two existing transfer pumps and centrifuges will need to be replaced as part of this expansion. In addition, the installation of a third transfer pump and centrifuge are recommended if five-day solids processing operations are preferable. With two centrifuges, the five and seven-day solids processing time will be 7.5 and 5.3 hours, respectively, assuming one unit is on standby. With the installation of a third centrifuge, the five and seven-day solids processing times are 3.7 and 2.7 hours assuming one unit is on standby, which is consistent with the current design criteria. This is recommended in lieu of increasing the transfer pump and centrifuge processing rate to ensure the WRWTP has sufficient redundancy. Based on discussions with plant operators, the centrifuges regularly require maintenance, so three centrifuges would provide additional redundancy.

6.5.12 Chemical Storage and Metering

The following projects are recommended during the 30 mgd expansion:

- **Chemical Storage Room Modifications**: The current Chemical Storage Room configuration limits potential storage expansion. The entryway is too restrictive to bring in new chemical storage tanks, chemical containments are too small to add additional tanks, and several chemical systems (such as aqueous ammonia) have been installed but never used. The ***2015 MPU*** recommended expanding the Chemical Storage Room, but the suggested layouts would either hinder road traffic or block access around the Solids Handing Building. Therefore it is recommended that the interior of the Chemical Storage Room be modified. These modifications will include replacing and expanding the existing roll-up door, expanding the alum, caustic, hypochlorite and polymer containment areas, removal of the aqueous ammonia system, and consolidation of the chemical storage with the appropriate chemical containment.

- **Dry Hypochlorite Batching System**: In order to provide sufficient resiliency during a regional seismic event, upgrading the hypochlorite system from a liquid to an on-site generation system is recommended. The existing hypochlorite storage is limited to approximately 14 days; in the event of a regional seismic event, it is possible that chemical delivery will be hindered, making it difficult to maintain plant chemical storage. Since hypochlorite is the most important water treatment chemical, installation of an on-site generation system will help ensure that (at a minimum) the primary chemical (salt) will have multiple suppliers and chemical disinfection is not interrupted following a regional seismic event.
- **Purchase LOX Tank and Evaporators**: The WRWTP currently leases the LOX tank and evaporators from one of several chemical supply companies in the region. Though this is cost-effective for the plant, it prevents the plant from working with other chemical vendors. To increase the available chemical supplier and pricing options for the WRWTP as their LOX consumption increases, it is recommended that the tank and evaporators are purchased as part of the 30 mgd expansion.

Table 6.4 WRWTP 30 MGD Expansion Processes and Procedures

Flow Rate	Units	Option 1	Option 2
Minimum	MGD	5.0	5.0
Average	MGD	9.6	9.6
Max (Plant Design)	MGD	30	30
	GPM	20,833	20,833
Willamette River			
Minimum River Level	FT	52.5	--
100 Year Flood Elevation	FT	91.1	--
500 Year Flood Elevation	FT	102.3	--
Intake Screens			
Type: Horizontal cylindrical			
Number	#	2	--
Capacity, total	MGD	150	--
Diameter	IN	66	--
Screen Opening Size	mm	1.75	--

Table 6.4 WRWTP 30 MGD Expansion Processes and Procedures (Continued)

Flow Rate	Units	Option 1	Option 2
Maximum Face Velocity	FPS	0.4	--
Top of Screen Elevation	FT	42.75	--
Screen Cleaning			
Cleaning method: air burst			
Number of Compressors	#	2	--
Compressor Capacity	CFM	200	--
Air receiver volume	CF	2,200	--
Motor Size per compressor	HP	50	--
Raw Water Pumps			
Type: Vertical Turbine, Single-stage			
Number	#	4 (3+1)	--
Total capacity w/ stand-by	MGD	45	--
Firm capacity	MGD	30	--
Capacity (each)			
1 VFD Driven pump	MGD	7.5	--
1 VFD Driven Pump	MGD	15	--
1 VFD Driven Pump	MGD	15	--
1 Constant speed pump (Swing Pump?)	MGD	≥ 7.5	--
Total dynamic head (15 MGD)	FT	115	--
Total motor horsepower	HP	2@200 2@400	--
Initial Flash Mix			
Type: Pumped			
Number (Installed)	#	1	2 (1+1)
Mixing energy (ea)	sec^{-1}	1,000	1,000
Pump capacity (ea)	gpm	1,000	1,000
Pump flow as a percentage of plant flow rate (PFR)	%	5%	5%
Total dynamic head	FT	16	16
Total motor horsepower (ea)	HP	7.5	7.5
Clarification Process			
Type: Ballasted Flocculation (Actiflo®)			
Number of Basins	#	3	--
Design flow (per basin)	MGD	10	--
Max process hydraulic flow (per basin)	MGD	15	--
Mixing/Flocculation (per basin)			
Coagulation chamber volume	CF	2,000	--

Table 6.4 WRWTP 30 MGD Expansion Processes and Procedures (Continued)

Flow Rate	Units	Option 1	Option 2
Coagulation chamber HRT	MIN	2.2	--
Injection chamber volume	CF	2,165	--
Injection chamber HRT	MIN	2.3	--
Maturation chamber volume	CF	6,330	--
Maturation chamber HRT	MIN	6.82	--
Clarification			
Settling chamber volume	CF	7,570	--
Settling chamber HRT	MIN	8.2	--
Lamella tube settlers, surface area (ea)	SQ. FT.	260	--
Maximum design surface loading rate w/ all basins	GPM/SF	--	--
Design Surface Loading Rate w/ All Basins	GPM/SF	27	--
Maximum surface loading rate	GPM/SF	40	--
Sand slurry recirculation system			
Number of sludge recirculation pumps per Basin	#	2 (2+0)	--
Pumps in operation	#	2	--
Sludge recirculation rate	%	4.8	--
Capacity per pump	GPM	165	--
Total design head	FT	75	--
Pump horsepower	HP	10	--
Number of sand hydrocyclones (per basin)	#	2	--
Average Sand Loss Rate	LB/MG	23	--
Approx. Daily Sand Loss	PPD	690	--
Ozone Contact Basins			
Type: 8-stage counter-co-counter w/ fine-bubble diffusers			
Number of basins	#	3	--
Detention time w/ all in service @ Design Flow	MIN	11.20	--
Detention time w/ one out of service @ Design Flow	MIN	7.47	--
Average water depth	FT	21	--
Inside dimensions (each basin)	FT x FT	6 x 10	--
Volume (total)	CF	31,200	--
Ozone Destruct Units	#	3	--

Table 6.4 WRWTP 30 MGD Expansion Processes and Procedures (Continued)

Flow Rate	Units	Option 1	Option 2
Ozone Generators			
Number	#	3 (2+1)	3 (2+1)
Feed Gas	-	LOX	LOX
Capacity (ea)	ppd	300	400
% Ozone by Weight (max)	%	8	8
Design Ozone Dose	mg/L	2.4	2.4
Max Ozone Dose @ Design Flow	mg/L	3.60	4.80
Dose with one unit out of service @ Design Flow	mg/L	2.40	6.39
Liquid Oxygen (100% LOX)			
Number of tanks	#	1	--
Storage capacity, total	GAL	12,000	--
Storage (avg dose x max flow)	DAYS	17	--
Average Oxygen Dosage	mg/L	26	--
Storage Density	#/gal	9.5	--
Filters			
Type: Deep bed, dual granular media			
w/ influent flow splitting			
Number of filters	#	6	--
Number of bays/filter	#	1	--
Filter bay dimensions	FT x FT	20 x 23	--
Filter area (each filter)	SF	460	--
Total filter area	SF	2,760	--
Maximum filtration rate (Q/A)			
All filters on-line @ Design Flow	GPM/SF	7.5	--
One filter off-line @ Design Flow	GPM/SF	9.1	--
Hydraulic maximum	GPM/SF	12	--
Flow Rate Each Filter			
All filters on-line @ Design Flow	MGD	5.0	--
One filter off-line @ Design Flow	MGD	6.0	--
Filter media			
GAC			
Depth	IN	72	--
Effective size	MM	1.4	--
Uniformity coefficient		<1.4	--
Depth: Diameter (L:D)		1,306	--

Table 6.4 WRWTP 30 MGD Expansion Processes and Procedures (Continued)

Flow Rate	Units	Option 1	Option 2
Minimum Empty bed contact time (EBCT)			
All filters on-line @ Design Flow	MIN	5.9	--
One filter off-line @ Design Flow	MIN	5.0	--
Sand			
Depth	IN	12	--
Effective size	MM	0.45	--
Uniformity coefficient		<1.4	--
Depth: Diameter (L:D)	MM:MM	677	--
Total media			
Depth (maximum)	IN	84	--
Depth: Diameter (L:D)	MM:MM	1,984	--
Filter wash system			
Air scour blowers			
Number	#	2	--
Air scour rate	CFM/SF	3.2	--
Blower capacity (each)	ACFM	1,500	--
Blower horsepower (each)	HP	100	--
Backwash pumps			
Number	#	2	--
Maximum backwash rate	GPM/SF	20	--
Pump capacity (each)	GPM	9,200	--
Pump horsepower (each) – constant speed	HP	150	--
Maximum Backwash Volume	MGD	6.3	--
Clearwell			
Type: Buried, reinforced concrete			
Active volume	MG	2.9	--
Max Operating Side Water Depth	FT	21.5	--
Dimensions	FT x FT	135 x 135	--
Detention Time (HRT) at Design Flow when full	HOURS	2.32	--
Hydraulic Efficiency up to 9.6 MGD	T10:HRT	--	--
Hydraulic Efficiency >9.6 MGD	T10:HRT	--	--
Finished Water Pumps			
Type: Vertical turbine, Two-stage			
Number	#	4 (3+1)	5 (4+1)
Total capacity w/ stand-by	MGD	43.5	51
Firm capacity	MGD	31.5	39

Table 6.4 WRWTP 30 MGD Expansion Processes and Procedures (Continued)

Flow Rate	Units	Option 1	Option 2
Capacity each			
1 VFD Driven pump	MGD	7.5	7.5
1 VFD driven pump	MGD	12	12
1 VFD driven pump	MGD	12	12
1 Constant speed pump	MGD	12	12
1 VFD driven pump		--	7.5
Total dynamic head	FT	--	--
Motor Size	HP	1@500 3@700	2@500 3@700
Waste Washwater Equalization & Pump Station			
Equalization basins			
Type: Concrete			
Number of basins	#	1	1
Volume	GAL	244,000	244,000
Maximum Backwash Volume	MGD	6.3	11.2
Hydrocyclone Overflow @ Design Rate	MGD	1.1	0.8
Basin Hydraulic Retention Time	HOURS	0.8	0.5
Washwater recycle pumps			
Type: Vertical turbine			
Number	#	4 (3+1)	3 (2+1)
Total capacity w/ stand-by	GPM	2,000	3,000
Capacity each			
1 VFD driven pump	GPM	500	1,000
1 VFD driven pump	GPM	500	1,000
1 VFD driven pump	GPM	500	--
1 constant speed pump	GPM	500	1,000
Time to empty basin w/ stand-by	HRS	2	1
Time to empty basin w/o stand-by	HRS	2.7	2.0
Total dynamic head	FT	25	25
Motor horsepower	HP	4 @ 10	3 @ 15
Solids Treatment			
Type: Gravity thickener and centrifuges			
Estimated Max Solids Production (dry) @ Design Flow	LBS/DAY	4,000	4,000
Estimated Max Hydraulic Flow Rate @ Design Flow	GPM	481	481
Gravity thickener (circular)			

Table 6.4 WRWTP 30 MGD Expansion Processes and Procedures (Continued)

Flow Rate	Units	Option 1	Option 2
Number of units (total, existing + new)	#	1	2
Diameter	FT	35	35
Side Water Depth	FT	12	12
Max solids loading rate	PPD/SF	8	8
Max hydraulic loading rate	GPM/SF	1	1
Operating solids loading rate	PPD/SF	4.2	2.1
Operating hydraulic loading rate	GPM/SF	**0.50**	0.25
Storage Capacity @ Design Rate (7-day ops)	HOURS	3.0	6.0
Storage Capacity @ Design Rate (5-day ops)	HOURS	2.1	4.3
Solids Storage & Mixing			
Storage Volume	GAL	33,000	--
Estimated solids flow @ 2.5%	GAL/MG	765	--
	GPD	22,950	--
Mixing Tank HRT (7-day ops)	HOURS	34	--
Mixing Tank HRT (5-day ops)	HOURS	24	--
Mixing Pumps	#	1	--
Pumping capacity	GPM	600	--
Pump horsepower	HP	5	--
Solids pump station			
Progressive Cavity Transfer Pumps	#	2	3
Pumping capacity (ea)	GPM	60	60
Motor Size (ea)	HP	10	10
Total dynamic head	FT	60	60
Centrifuges			
Type		Horz. Scroll	Horz. Scroll
Number of units	#	2	3
Capacity, each	GPM	60	60
Max solids loading, each	LB/HR	750	750
Maximum 8-hr Processing Capacity (ea)	PPD	6,000	6,000
Maximum 8-hr Processing Capacity (ea)	GPD	28,800	28,800
Motor horsepower-scroll, each	HP	40	40
Motor horsepower-back drive, each	HP	15	15
Centrifuge operation period (1 standby, 7-day ops)	HR/DAY	5.3	2.7
Centrifuge operation period (1 standby, 5-day ops)	HR/DAY	7.5	3.7

Table 6.4 WRWTP 30 MGD Expansion Processes and Procedures (Continued)

Flow Rate	Units	Option 1	Option 2
Chemical Storage			
Primary coagulant (49% alum sol'n)			
Number of tanks	#	2	--
Storage capacity, total	GAL	13,000	--
Required Days Storage	DAYS	14	--
Storage (avg dose x max flow)	DAYS	18	--
Average Dosage	mg/L	15	--
Minimum volume for 21-day Storage	GAL	15,167	
Solution Strength (alum)	#/gal	5.4	--
Cationic polymer (dry polymer)			
Type	-	Dry Feeder	--
Feed Capacity	#/hr	17.6	--
Required Days Storage	DAYS	14	--
% solution	%	1	--
Storage (avg dose x max flow)	DAYS	--	--
Mixing Time	min	30	--
Sodium hypochlorite (12.5% NaOCl sol'n)			
Number of tanks	#	2	--
Storage capacity, total	GAL	7,800	--
Required Days Storage	DAYS	14	--
Storage (avg dose x max flow)	DAYS	16	--
Average Dosage	mg/L	2	--
Minimum volume for 21-day Storage	GAL	10,238	
Solution Strength	#/gal	1.05	--
Caustic soda (25% NaOH sol'n)			
Number of tanks	#	2	--
Storage capacity, total	GAL	13,000	--
Required Days Storage	DAYS	14	--
Storage (avg dose x max flow)	DAYS	21	--
Average Dosage	mg/L	6.5	--
Minimum volume for 21-day Storage	GAL	13,000	
Solution Strength	#/gal	2.65	--
Aqueous ammonia (19% NH_4OH sol'n)			
Number of tanks	#	1	--
Storage capacity, total	GAL	1,400	--

Table 6.4 WRWTP 30 MGD Expansion Processes and Procedures (Continued)

Flow Rate	Units	Option 1	Option 2
Anionic polymer			
Number of tanks	#	1	--
Storage capacity, total	GAL	55	--
Required Days Storage	DAYS	14	--
Storage (avg dose x max flow)	DAYS	> 1 year	--
Average Dosage	mg/L	0.4	--
Non-ionic polymer			
Number of tanks	#	1	--
Storage capacity, total	GAL	55	--
Required Days Storage	DAYS	14	--
Storage (avg dose x max flow)	DAYS	> 1 year	--
Average Dosage	mg/L	0.4	--
Calcium Thiosulfate			
Number of tanks	#	2	--
Storage capacity, total	GAL	440	--
Required Days Storage	DAYS	14	--
Storage (avg dose x max flow)	DAYS	31	--
Minimum volume for 21-day Storage	GAL	298	
Average Dosage	mg/L	0.2	--
Solution Strength	#/gal	3.6	--

6.6 Electrical Upgrades

This section summarizes the recommended electrical upgrades for the WRWTP capacity expansions. For more information regarding the electrical evaluation, refer to Appendix C.

As mentioned in Chapter 5, the current electrical system is loaded above 80% of listed capacity, and is considered overloaded. Additionally, the existing emergency generator is not connected to all WRWTP equipment (for example, it is only wired to Actiflo® Basin 2) and only has sufficient capacity to power the 4 mgd raw and finished water pumps. The existing electrical configuration (at 15 mgd) is included in Chapter 5. Figure 6.6 depicts the electrical configuration and overloaded equipment following the 20 mgd WRWTP expansion if nothing is done to improve the 'backbone' of the plant's electrical infrastructure.

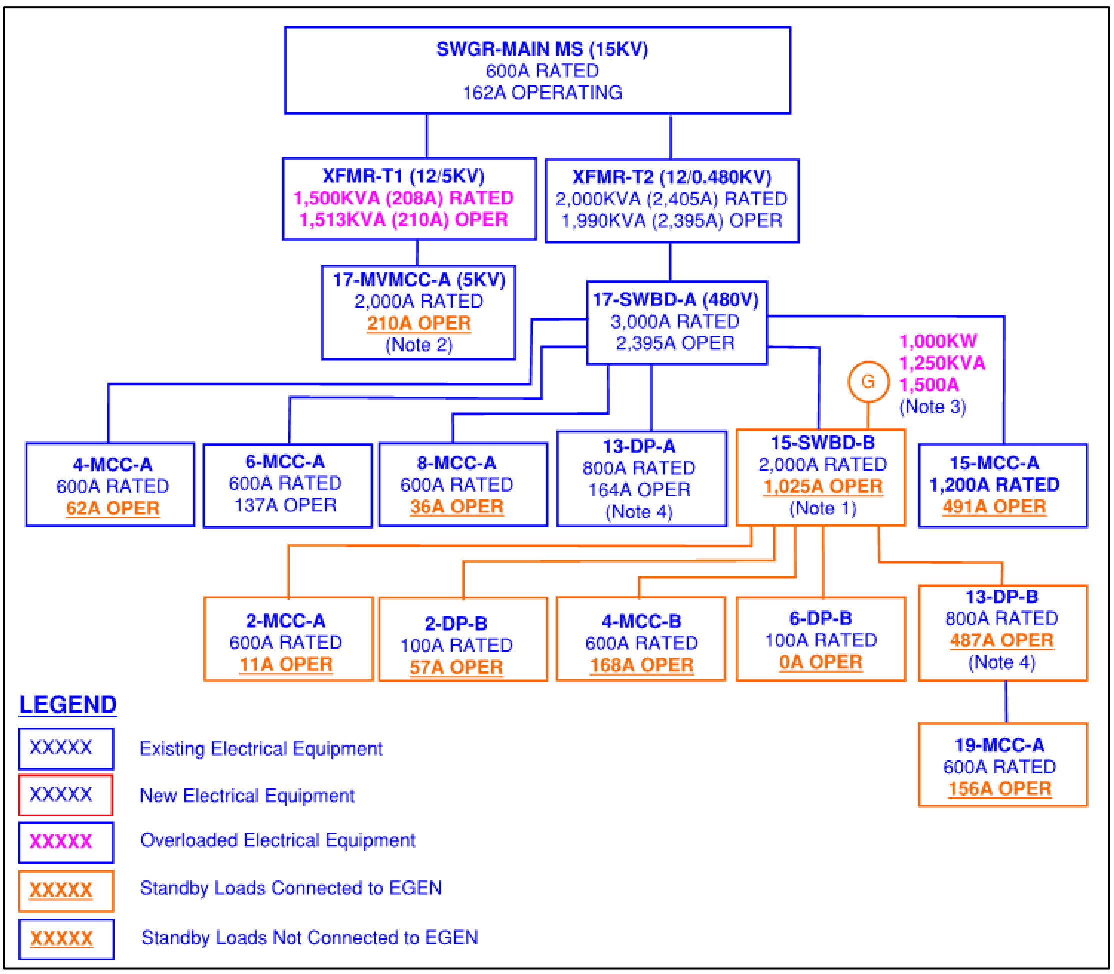
Based on these evaluations, it is recommended that the plant upgrade its existing electrical equipment as part of the 20 mgd expansion to ensure service is not interrupted due to electrical fault. The following upgrades are recommended:

- **Switchgear Replacement**: Recommend replacement with a 15 KV metering switchgear and 5 KV transformer, which should be sufficient to power the WRWTP through 60 MGD.

- **Emergency Generator Replacement**: Recommend replacement with a 2 MW generator wired directly to the 15 KV metering switchgear. This replacement will allow all plant equipment to be run on the emergency generator.
- **Plant Rewiring**: Recommend connection of all finished water pumps to the 5 KV transformer/switchgear, which will leave sufficient capacity on the remaining transformers to provide power to the rest of the plant.

Figure 6.7 depicts the electrical system following the above-listed, recommended improvements for the 20 mgd capacity expansion. These improvements lay the foundation for simple, low-risk expansion moving forward.

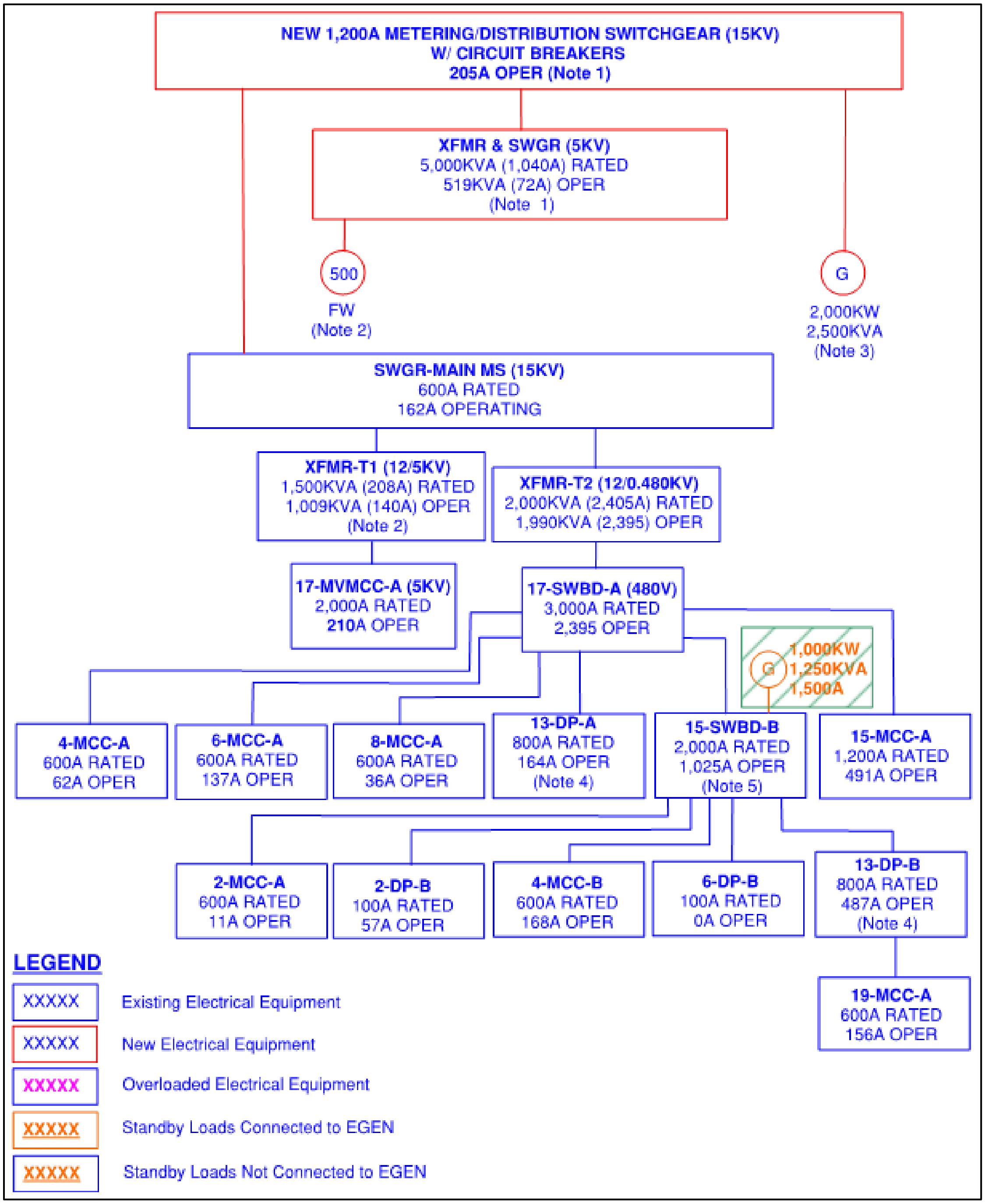
Figure 6.8 depicts the recommended system improvements to accommodate the 30 mgd. NOTE: recommended improvements are limited to the connection of additional finished and raw water pumps to the 5 KV transformer.



Notes:

(1) Exceedance due to replacing 4 mgd raw water pump with 7.5 mgd pump
(2) FW pumps do not have access to the emergency generator in this configuration
(3) Estimated load for emergency generator at 20 MGD is 1,900 KVA (1,520 KW), so existing generator is not sufficient
(4) Change in HP due to third 300 ppd ozone generator

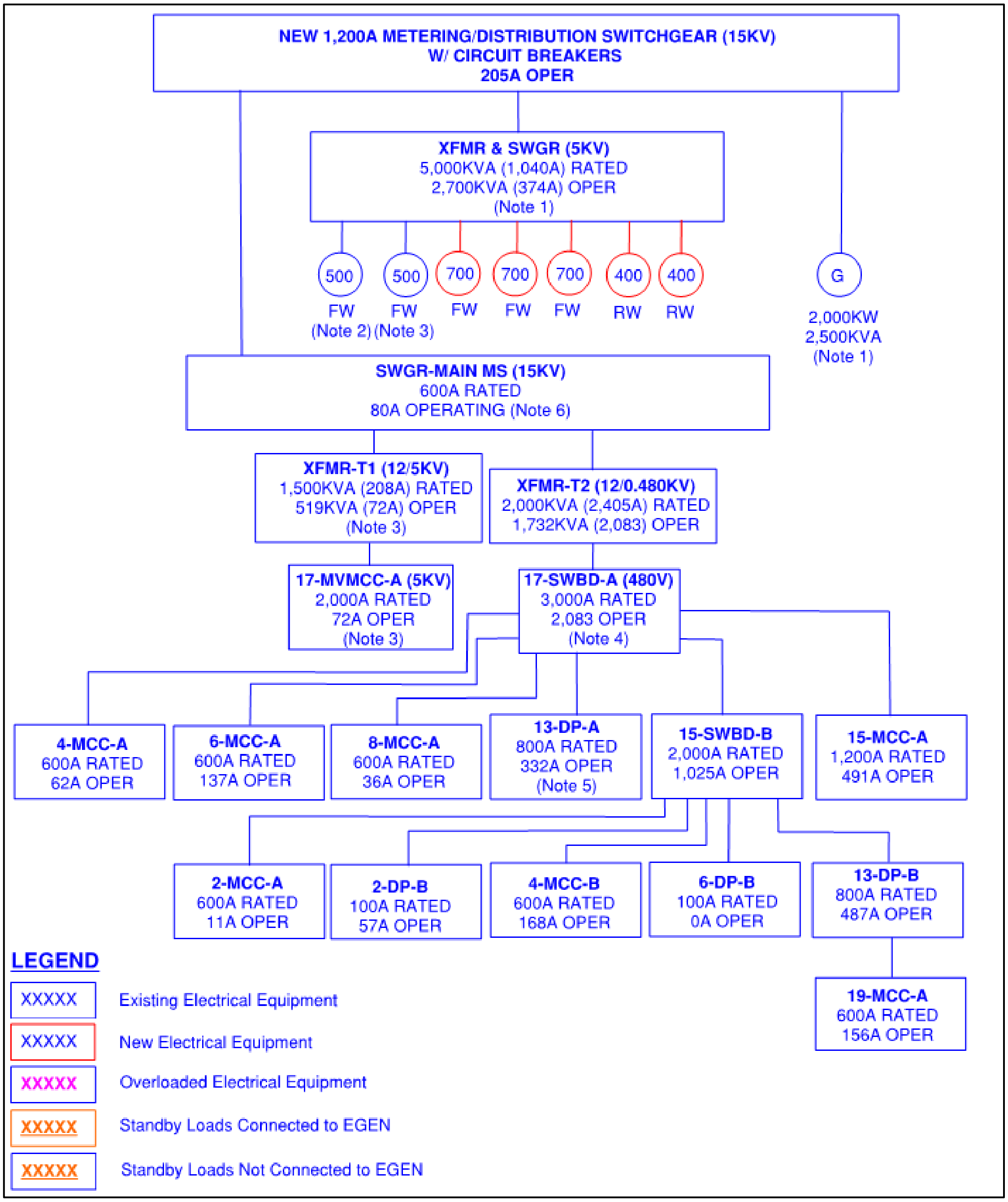
Figure 6.6 Existing Electrical System – 20 MGD Capacity



Notes:

(1) Replace existing switchgear with metering switchgear and transformer
(2) Connect new 500 HP finished water pump to new transformer
(3) Install new emergency generator to provide adequate standby power through the 30 MGD capacity expansion
(4) Increase due to addition of new ozone generator
(5) Increase due to upgraded raw water pump

Figure 6.7 Upgraded Electrical System – 20 MGD Capacity



Notes:

(1) Installation of additional finished and raw water pumps on main transformer
(2) Recommend removing any pumps connected to this transformer so it can be demolished to make room for 30 MGD expansion
(3) Recommend removing any pumps connected to this transformer so it can be demolished to make room for 30 MGD expansion
(4) Two raw water pumps removed from this switchboard
(5) Reflects additional ozone generator
(6) Equipment can be demolished to make room for 30 MGD expansion

Figure 6.8 Upgraded Electrical System – 30 MGD Capacity

6.7 Repair and Replace

In addition to the seismic and life-safety CIP recommended in Chapter 5, and the capacity expansion CIP recommendations presented in Chapter 6, the plant requires on-going maintenance/repair and replacement (R&R) of its existing infrastructure to ensure normal operations level of service goals. Table 6.5 includes a summary of recommended R&R for the WRWTP, across the 20-year planning horizon. The details and timing of these projects will be articulated in Chapter 7 – Implementation Plan.

Table 6.5 WRWTP Repair and Replace Projects

Repair and Replace Project	Approx. Service Year
Replace obsolete Robocon VFDs on three Finished Water Pumps	2019
Replace osbsolete Robocon VFDs on three Raw Water Pumps	2019
Replace obsolete ABB magnetic flow meters installed throughout the WRWTP and at Wilsonville Road	2019
Replace three existing rooftop HVAC units in the Administration Building: Conference Room, Control Room, and Laboratory (T-18HVAC01 through 3)	2019
Replace the four hydrocyclones installed in the two existing Actiflo® Basins	2020
Replace existing streaming current analyzer on Actiflo® inlet	2020
Replace the existing safety and warning signs throughout the site	2020
Replace the existing site fire alarm	2020
Replace the existing site sprinkler system	2020
Upgrade site security monitoring system	2020
Replace existing raw water sump pump	2020
Replace two existing sludge mixing pumps (one installed, one shelf spare)	2020
Replace three existing filter waste washwater recycle pumps	2020
Replace lamella settling tubes in the two existing Actiflo® basins, which are damaged due to UV exposure.	2022
Upgrade vendor PLC components in the two existing Actiflo® basins	2022
Replace the two flash mix pumps (installed and standby)	2022
Replace the six mixers installed in the two existing Actiflo® Basins	2022
Replace the two sample pumps installed in the two existing Actiflo® Basins	2022
Existing chemical lines are inaccessible south of the utilidoor and cannot be inspected or replaced. Based on WRWTP plant staff observation that many existing chemical lines are no longer functioning, recommend abandon lines in-place, extend utilidoor to the southern end of the plant, and reroute all necessary chemical lines through the extended utilidoor.	2022
Upgrade vendor PLC components in the existing dry polymer blending unit	2022

Table 6.5 WRWTP Repair and Replace Projects (Continued)

Repair and Replace Project	Approx. Service Year
Replate two existing 300 PPF ozone generators with 400 PPD units	2022
Inspect existing alum tank and repair as needed	2022
Inspect existing caustic soda tank and repair as needed	2022
Replace existing air scour blowers and motors on existing media filtration system	2022
Replace sitewide fire extinguishers	2022
Replace the two existing irrigation waste pumps (T-30P01/2)	2022
Replace the existing dewatered sludge screw conveyor in the Solids Handling Building	2022
Modifications necessary to support chemical pipelines along western WWEQ Basin wall	2022
Replace original dry polymer batching system (T-13ME01)	2027
PLC upgrade for Actiflo® Local Control Panels	2027
Replace existing soft-start controller on High Service Pump 3	2027
Replace the two existing water feature pumps (T-30P01/2)	2027
Replace two existing Air Burst Compressors	2027
Replace existing air burst control panel PLC and local control panel	2027
Replace two existing 60 GPM centrifuges	2027
Replace existing PLC and local control panel for two dewatering centrifuges	2027
Replace two existing backwash supply pumps in the Wastewater Equalization Basin	2032
Replace the two existing sludge mixing pumps	2032
Replace three existing filter waste washwater recycle pumps	2032
Replace existing streaming current analyzer on Actiflo® inlet	2036
Replace the five solids pumps (installed and standby) on the existing Actiflo® basins	2036
Replace the two installed flash mix pumps	2036
Replace the six mixers installed in the two existing Actiflo® Basins	2036
Replace the four hydrocyclones installed in the two existing Actiflo® Basins	2036
Replace the LOX evaporator equipment	2036
Replace aging MCC in existing filter gallery	2036
Replace air scour blowers and motors on existing media filtration system	2036
Replace the existing constant-speed 7.5 MGD pump with a VFD-controlled pump (Only if WRWTP still has access to four pump cans)	2036
Replace two existing 60 GPM solids transfer pumps	2036
Replace the existing gravity thickener drive	2036

Planning Commission Briefing
December 13, 2017

2017 Water Treatment Plant Master Plan Update

Eric Mende, PE
Capital Projects Engineering Manager

Jude Grounds, PE,
Carollo Engineers

Purpose of 2017 Master Plan Update

- Incorporate Level of Service Goals from 2015 MP
- Address 20 and 30 MGD Capacity Expansions
- Identify Lower Site Repairs/Replacements/Upgrades
- Implementation Plan (CIP, schedule)
  - Coordinate with WWSP Raw Water Facility Upgrades


Sludge Thickener
SB-5
High Service Pump Station (Finish Water)
Raw Water Pump Station
A'
B-4
SB-7
Filtration
Waste Washwater Equalization
SB-4
A
Administrative Building and Chemical Storage
Ozonation
Ballasted Coagulation
SB-2
Clearwell (Buried)
SB-1
225' from Top of Slope to Limit of Block Failure at Base of Clearwell
Willamette River
LEGEND
0
50
100
200

A Brief History

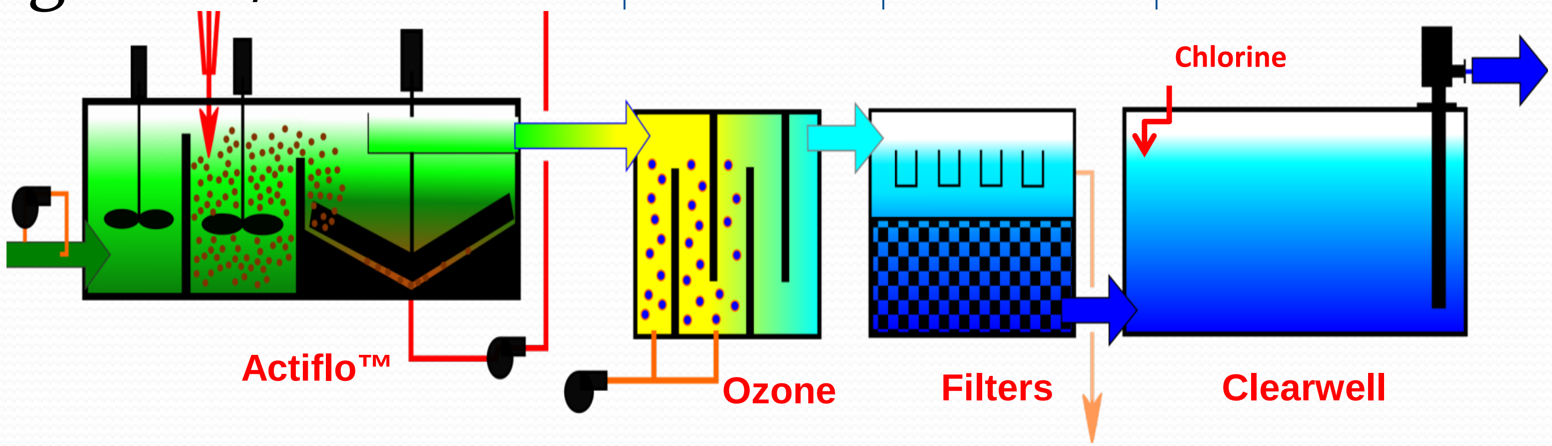
- Built / Operational in 2002 ($47M)
- Joint Ownership with TVWD
- 70 MGD Design*
- Conservative LOS goals/operations
- Current Capacity: 15 MGD (10 – WV, 5 - Sherwood)

Still state-of-the-art

Technical Summary:

Multi-barrier approach guides design and operational philosophy

Turbidity / Particles	●		●	
Pathogens		●		●
Tastes and Odors		●	●	
Trace Organics / CEC's		●	●	



Purpose of 2017 Master Plan Update

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Level of Service Goals (Water Quality)

	Water Quality Goals	Design / Operating Criteria
A	Keep current, very conservative water quality goals. Keep very conservative operational criteria (SF = 2)	Actiflo: 7.5 mgd (rated at 14 MGD) Filters: 5 mgd (rated at 10 MGD) Ozone/Chlorine: 1-log Crypto inactivation
B	Keep current, very conservative water quality goals. Modified operational criteria (SF= 1.5)	Actiflo: 10 mgd Filters: 6.7 mgd Ozone/Chlorine: 1-log Crypto inactivation
C	Lower WQ goals using aggressive operational criteria (SF = 1.0)	Actiflo: 14 mgd Filters: 7.9 mgd Ozone/Chlorine: 1-log Crypto inactivation

Level of Service Goals (Seismic)

LOS Goal	Regional Event (Seismic)	Local Event (Non-Seismic)
"Following a W catastrophic event …	2,475 year	Per occurrence
…within X days/weeks of the event…	48 hours	14 days
…deliver Y % of average day demand…	50% of nameplate	100% of nameplate
…with Z water quality."	Potable (at minimum regulatory requirement)	Potable (at plant treatment processes and procedures)

Purpose of 2017 Master Plan Update

- Incorporate Level of Service Goals from 2015 MP
- Address 20 and 30 MGD Capacity Expansions
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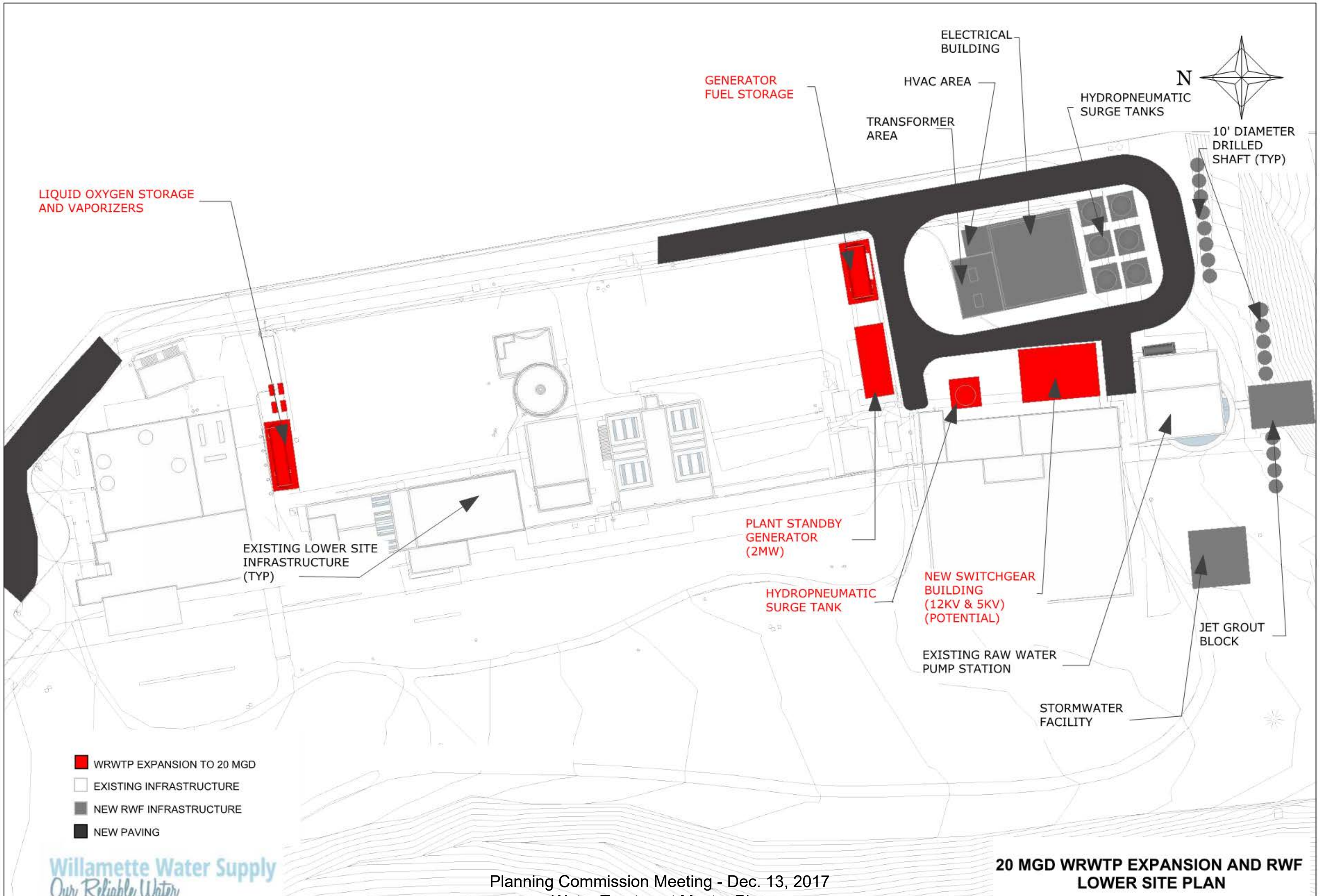
20 MGD Capacity Expansion

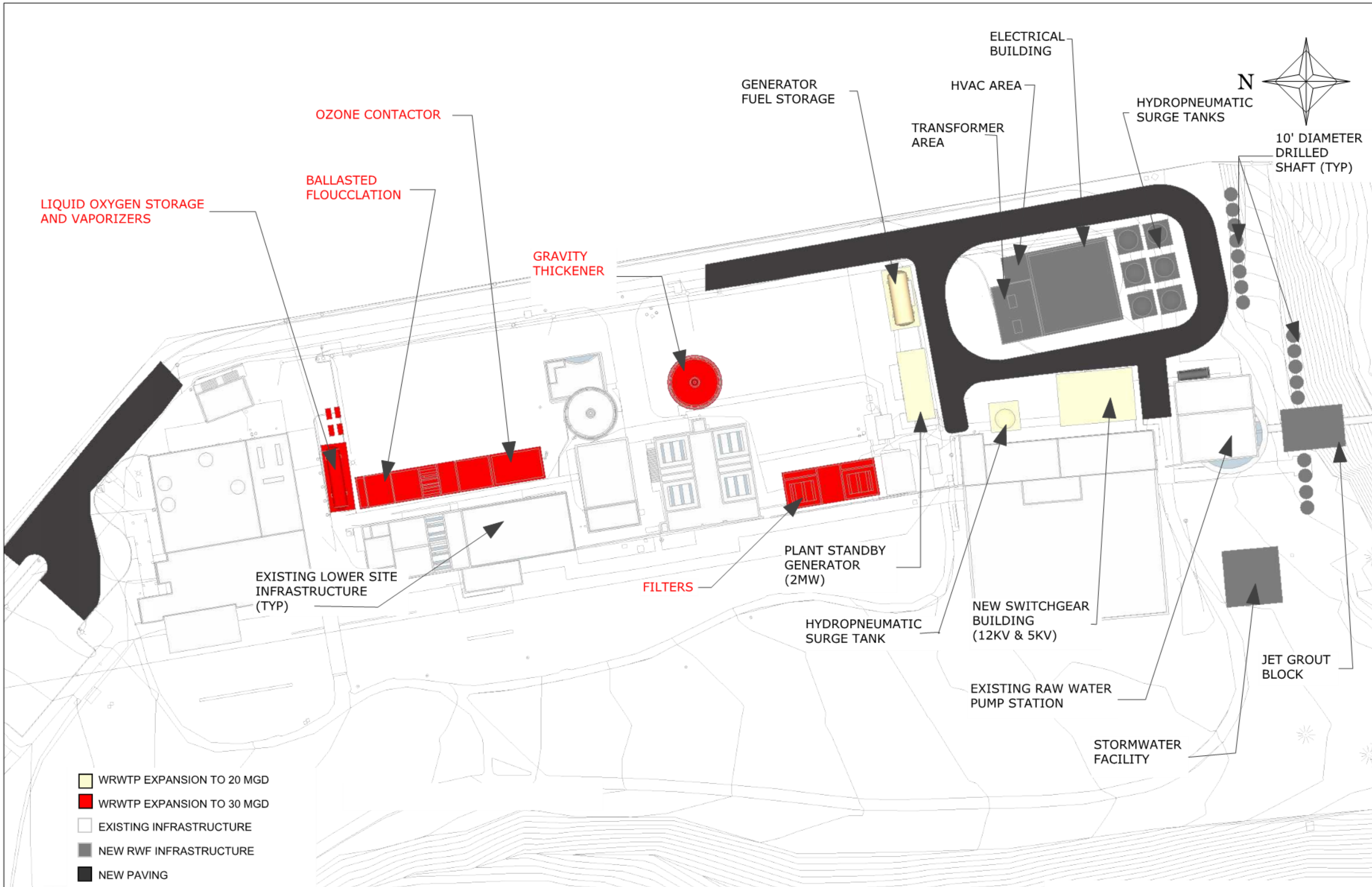
- Uprating existing equipment
- Minor equipment upgrades to support uprating
- Seismic / Life Safety Improvements
- Filtration pilot study or demonstration
- Recommend electrical upgrade



ELECTRICAL BUILDING
GENERATOR FUEL STORAGE
HVAC AREA
N
HYDROPNEUMATIC SURGE TANKS
TRANSFORMER AREA
10' DIAMETER DRILLED SHAFT (TYP)
LIQUID OXYGEN STORAGE AND VAPORIZERS
PLANT STANDBY GENERATOR (2MW)
EXISTING LOWER SITE INFRASTRUCTURE (TYP)
NEW SWITCHGEAR BUILDING (12KV & 5KV) (POTENTIAL)
HYDROPNEUMATIC SURGE TANK
JET GROUT BLOCK
EXISTING RAW WATER PUMP STATION
STORMWATER FACILITY
WRWTP EXPANSION TO 20 MGD
EXISTING INFRASTRUCTURE
NEW RWF INFRASTRUCTURE
NEW PAVING
Willamette Water Supply
Our Reliable Water
20 MGD WRWTP EXPANSION AND RWF LOWER SITE PLAN

30 MGD Capacity Expansion

- Expand at uprated design criteria
- Designed to new seismic code
- Reduces construction cost
- Conserve space for 60 MGD buildout at Lower Site



Willamette Water Supply
Our Reliable Water

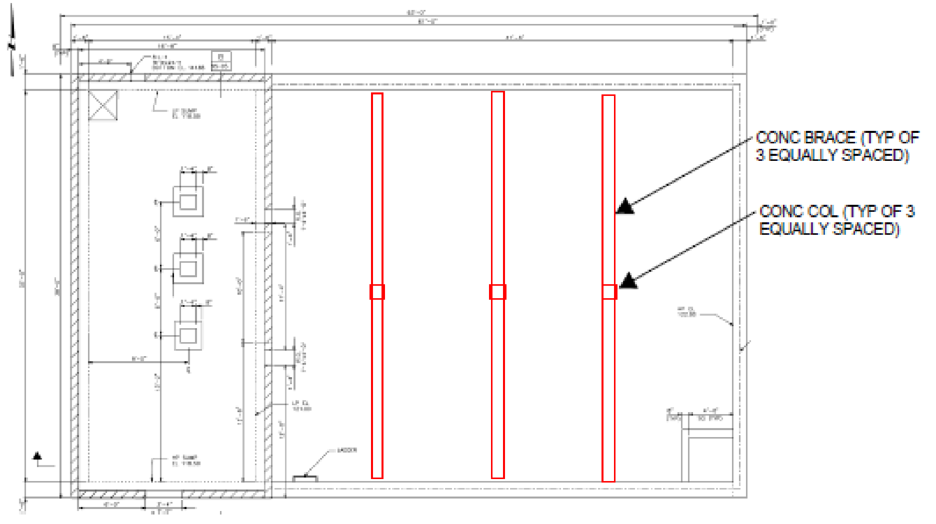
30 MGD WRWTP EXPANSION AND RWF LOWER SITE PLAN

Lower Site Repair and Replace

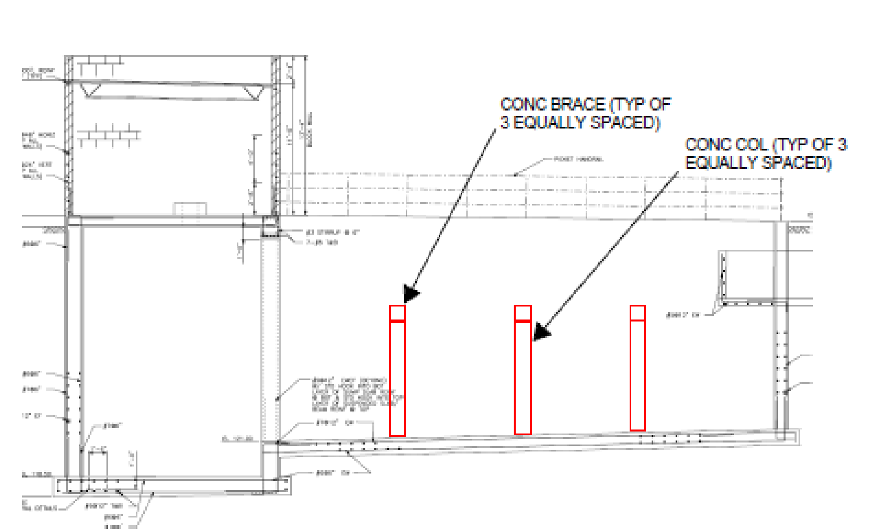
- Ongoing equipment repair and replacement schedule
  - Annual basis – Veolia

Seismic Retrofits

- Repairs to existing facilities to bring them to current seismic code
- Example: Addition of concrete braces to WWEQ Basin



PLAN VIEW OF THE WASTE WASHWATER EQUALIZATION BASIN.



SECTION VIEW OF THE WASTE WASHWATER EQUALIZATION BASIN.

Life Safety Repairs

- Tasks pertaining to building and hazard codes
- Projects include fall protection, hand railing, GFCIs, etc.

Equipment Repair & Replace

- Addresses equipment replacement due to service life
- Whenever possible ties in with capacity expansion

Purpose of 2017 Master Plan Update

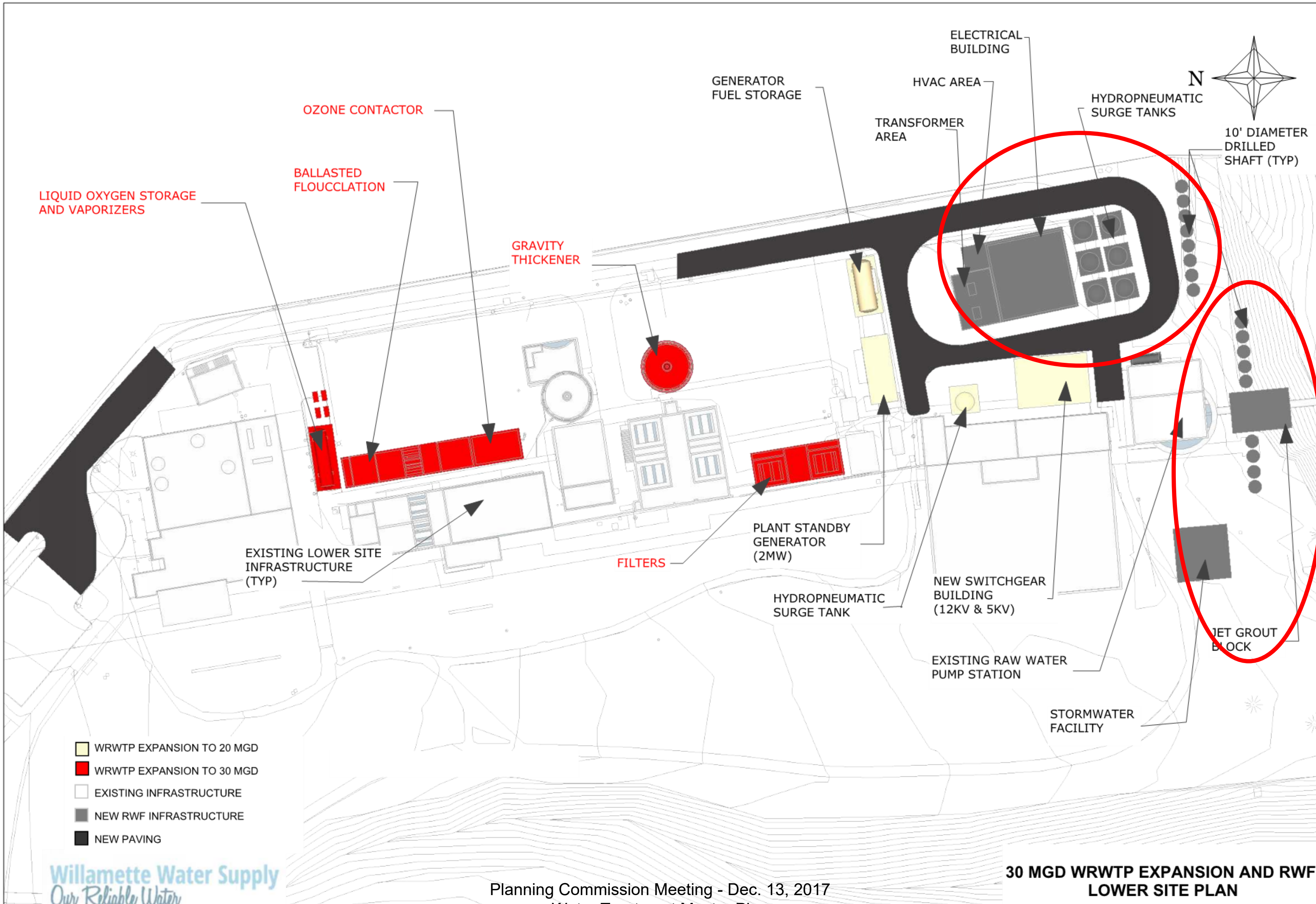
- Incorporate Level of Service Goals from 2015 MP
- Address 20 and 30 MGD Capacity Expansions
- Identify Lower Site Repairs/Replacements/Upgrades
- Implementation Plan (CIP, schedule)
  - Coordinate with WWSP Raw Water Facility Upgrades

Coordinated Facility Upgrades

Coordination with Willamette Water Supply

- Raw Water Pump Station Upgrade (24/25)
- Seismic Upgrade (Secant Pile Wall) (21/22)
- Generator Upgrade (18/19)**
- Electrical (Substation) Upgrades (18/19/20)
- Surge Tanks (18/19)**

** - WV Project



30 MGD WRWTP EXPANSION AND RWF LOWER SITE PLAN

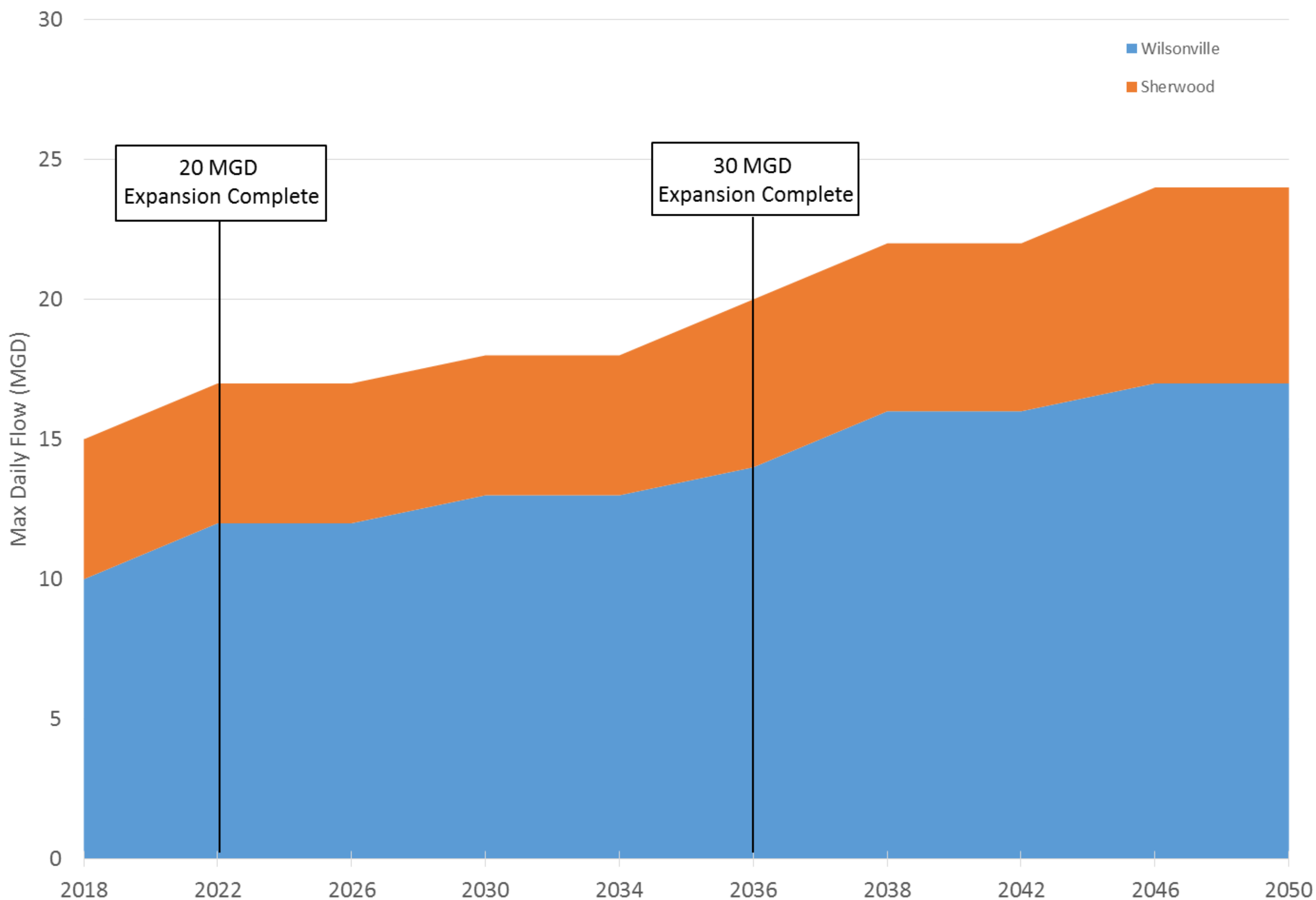
CIP Schedule

Project	Approx Service Year	Duration (Months)		Start Date
		Design	Construction	
20 MGD Capacity Expansion	2022	12	18	2019
Life Safety Repairs	2022	6	6	2021
Seismic Retrofits	2022	4	6	2021
Electrical Upgrades	2022	6	8	2020
30 MGD Capacity Expansion	2036	10	24	2033
Operations – Repair and Replace	Ongoing Annual Projects			

CIP Project Estimate

Project	Cost	% Water Operations	% SDCs
20 mgd Expansion	$3,893,165	--	100%
30 mgd Expansion	$32,518,600	--	100%
Life Safety Repairs	$616,153	100%	--
Seismic Retrofits	$1,151,866	100%	--
Electrical Upgrades	$11,082,506	100%	--
Operations - Repair and Replace	$19,045,704	100%	--

Implementation Plan/CIP



Master Plan - Next Steps

- MP Adoption Process
  - Planning Commission Work Session (12/13/17)
  - Planning Commission Hearing (2/14/18)
  - City Council Work Session (3/5/18)
  - City Council 1st Reading (3/5/18)
  - City Council 2nd Reading (3/19/18)
  - Effective Date 4/19/18

Questions?

PLANNING COMMISSION

WEDNESDAY, DECEMBER 13, 2017

II. WORK SESSION

B. Industrial Form-based Code (Rybold/Vance) (45 minutes)

PLANNING COMMISSION
WORK SESSION STAFF REPORT

Meeting Date: December 13, 2017	**Subject**: Coffee Creek Industrial Form-based Code and Pattern Book **Staff Members**: Jordan Vance, Economic Development Manager; Kimberly Rybold, Associate Planner **Department:** Community Development
Action Required	**Advisory Board/Commission Recommendation**
☐ Motion ☐ Public Hearing Date: ☐ Ordinance 1st Reading Date: ☐ Ordinance 2nd Reading Date: ☐ Resolution ☐ Information or Direction ☒ Information Only ☐ Council Direction ☐ Consent Agenda	☐ Approval ☐ Denial ☐ None Forwarded ☒ Not Applicable **Comments**: N/A

Staff Recommendation: Staff will brief the Planning Commission on modifications made to the Coffee Creek Industrial Form-based Code since the July work session in preparation for a public hearing in January.

Recommended Language for Motion: N/A

Project / Issue Relates To:

☒Council Goals/Priorities Complete form-based code work currently underway	☒Adopted Master Plan(s) Coffee Creek Industrial Area Master Plan	☐Not Applicable

ISSUE BEFORE COMMISSION:
Staff will provide an update on the Coffee Creek Industrial Area Form-based Code project, highlighting modifications that have been made to the review process as outlined in the Form-based Code to reflect feedback from the Development Review Board and City Council work sessions.

EXECUTIVE SUMMARY:

The Coffee Creek Industrial Form-based Code and Pattern Book together establish regulations and guidelines for street design and connectivity, site design and circulation, building form and massing, and building design and architecture. The Form-based Code, as drafted, uses clear and objective standards that are specific, discrete requirements and numerical standards, which substantially minimize judgment about compliance. Additional flexibility is built into the Form-based Code with adjustment criteria for a limited set of standards that provide additional flexibility to applicants. For applications that require waivers to standards of the Form-based Code, a Pattern Book with design guidelines that correlate with the Code's clear and objective standards would be utilized to encourage high-quality site and building design.

The project represents an opportunity to create clear and objective development standards that will simplify and provide more certainty with respect to the approval process for new projects in the Coffee Creek industrial and employment area. The project outcome will support economic development and job creation through regulations that provide the appropriate balance of certainty with a range of flexibility resulting in high-quality design from the public realm to site design and landscaping to the buildings.

The final phase of the Coffee Creek Industrial Area Form-based Code project has addressed process questions, most notably, whether or not it is feasible to utilize an administrative review process to evaluate applications using the Form-based Code. Throughout summer 2017, staff conducted work sessions with the Planning Commission, Development Review Board (DRB) panels, and City Council to gather feedback on this issue and related questions, including the evaluation of tree removal plans and traffic study analysis for individual development sites.

The Planning Commission generally supported an administrative development review process for applications not requiring City Council approval, while the DRB panels expressed concern about not providing citizens with a public hearing setting to submit testimony on applications. A hybrid approach was presented at the City Council work session in August 2017. As an alternative to the administrative approach, the clear and objective standards of the draft Code could be applied while continuing to utilize the DRB as the decision-making body on applications not requiring City Council approval (i.e. applications except for annexation, Comprehensive Plan map amendments and zone map amendments). Those applications listed above requiring City Council approval could proceed forward on a parallel track without first going before the DRB. While utilizing the DRB as opposed to staff-administered development review will add some time to the application process, it has the advantage of giving citizens a forum in which to be heard without sacrificing much in the way of expediency.

City Council directed staff to pursue this option, and to develop pilot parameters to determine if the Form-based Code could be later amended to administrative review as experience under the Form-based Code develops and as the area becomes more fully industrial. Staff proposes a pilot period of three completed development applications or five years, whichever comes first. During the pilot period, staff would track metrics including, but not limited to, number of requested waivers, time to approval, and quantity of testimony at public hearings or via other means. Staff would also survey applicants upon conclusion of the review processes to gain feedback from a customer experience standpoint.

To guide review of tree removal, staff developed a generalized diagram of tree cover in the Coffee Creek Industrial Area, providing clarity with respect to where a more detailed arborist report may be needed as a part of a development application. Staff proposes that applicants continue to utilize the City's Type C Tree Removal Plan process as a part of the development review process.

An area-wide transportation analysis, as presented during the summer 2017 work session, continues to be planned for the Coffee Creek Industrial Area. With a recently adopted

Transportation Systems Plan (2016) and the substantial work completed on the Basalt Creek Transportation Refinement Plan, the analysis largely exists, just needing to be tailored to the specifics of the area. More details will be forthcoming on this topic.

The final draft version of the Form-based Code and Pattern Book will incorporate these changes, setting the stage for adoption into the City's Development Code.

EXPECTED RESULTS:
The intent of the project is to create:

1. An attractive and functional industrial and employment district featuring cohesive and high-quality site, landscape and building design through an emphasis on the design of the public realm; and
2. A complete network of existing and new streets, paths, and trails that will support a sense of place and identity; and
3. A multi-modal transportation network that accommodates pedestrians, bicyclists, transit riders, motorists, and freight in the context of a modern light industrial and employment district.

TIMELINE:
The final Form-based Code and Pattern Book will be brought back to the Planning Commission in January for a public hearing and recommendation to City Council.

CURRENT YEAR BUDGET IMPACTS:
Development of the Form-based Code and Pattern Book was funded by a grant from ODOT's Transportation and Growth Management (TGM) Code Assistance Program. Funding to finalize the draft documents, incorporate feedback on Code implementation, and achieve adoption of the Code and Pattern Book was included in the FY 2016-17 budget. Unspent funds from FY 2016-17 were carried over to FY 2017-18 through the supplemental budget process.

FINANCIAL REVIEW / COMMENTS:
Reviewed by: Date:

LEGAL REVIEW / COMMENT:
Reviewed by: Date:

COMMUNITY INVOLVEMENT PROCESS:
The development of the draft documents was led by an internal Project Management Team (PMT), as well as a Technical Advisory Committee (TAC) made up of a Planning Commissioner, DRB member, Chamber of Commerce representative, industrial developer, broker, and architect. To date, two public open houses were conducted, in addition to a number of work sessions with the Development Review Board, Planning Commission and City Council.

POTENTIAL IMPACTS or BENEFIT TO THE COMMUNITY (businesses, neighborhoods, protected and other groups): The project has the benefit of creating clear and objective standards for the industrial development community and property owners in the Coffee Creek Area.

ALTERNATIVES:

There have been numerous alternatives considered throughout the creation of the new Code. The final draft Code and Pattern book take into account feedback received on process alternative during work sessions with the Planning Commission, Development Review Board, and City Council.

CITY MANAGER COMMENT:

N/A

ATTACHMENTS:

DRAFT July 2015 Coffee Creek Form-based Code available online:
http://www.ci.wilsonville.or.us/DocumentCenter/View/12011
DRAFT June 2015 Pattern Book available online:
http://www.ci.wilsonville.or.us/DocumentCenter/View/12010

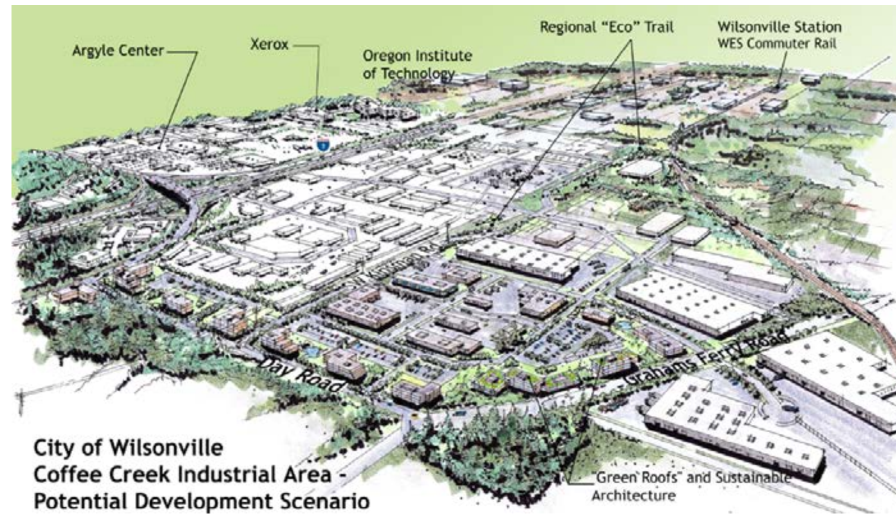
Coffee Creek Industrial Form-based Code

Planning Commission Work Session

December 13, 2017

WILSONVILLE OREGON

Project Background



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PC Work Session

July 2017

- Staff and consultant presented process options to determine if administrative review is feasible
- Planning Commission expressed support for the administrative review approach
  - Parallel review of annexations, Comprehensive Plan Map amendments, zone map amendments
  - Area-wide traffic study
  - Master tree plan

WILSONVILLE
OREGON

DRB and Council Work Sessions

July and August 2017

- Development Review Board expressed concern about lack of public hearing setting
- Staff and consultant presented hybrid approach to City Council
  - DRB administers FBC standards
  - Keep parallel review
- City Council supported hybrid approach as pilot

FBC Modifications

- Administer the FBC standards using the DRB as the reviewing entity
- Clarify the waiver process
- Edit Development Code to allow for parallel review of applications requiring City Council approval
- Continue using Type C Tree Permit with tree master plan
- Develop an area-wide traffic study

Table CC - 2: District-Wide Planning and Landscaping			
	Addressing Streets	Supporting Streets	Through Connections
General	The following provisions apply: • Section 4.176 for landscaping standards • Section 4.610.10 for tree removal, relocation or replacement. • Section 4.610.10(.01)(C.) for consideration of development alternatives to preserve wooded areas & trees.		

Table CC-3: Site Design			
	Addressing Streets	Supporting Streets	Through Connections
1. Parcel Access			
General	Unless noted otherwise below, the following provisions apply: • Section 4.177(.02) for street design; • Section 4.177(.03) to (.10) for sidewalks, bike facilities, pathways, transit improvements, access drives & intersection spacing. The following Development Standards are adjustable: • Parcel Driveway Spacing: 20% • Parcel Driveway Width: 10%		
Parcel Driveway Access	Not applicable	Limited by connection spacing standards Parcel Driveway Access may be employed to meet required connectivity, if it complies with Supporting Street Standards for Connection Spacing and Connection Type, see Figure CC-6. Subject to approval by City Engineer	Limited by connection standards for motorized vehicle access. Parcel Driveway Access may be employed to meet required connectivity, if it complies with Through Connection Standards for Connection Spacing and Connection Type, see Figure CC-6. Subject to approval by City Engineer
Parcel Driveway Spacing	Not applicable	150-feet, minimum See Figure CC-6	150-feet, minimum See Figure CC-6
Parcel Driveway Width	Not applicable	24-foot, maximum or complies with Supporting Street Standards	24-foot, maximum or complies with Through Connection Standards

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Pilot Parameters

Question

- Can we ultimately use administrative review for projects meeting the clear and objective standards of the FBC?

Time Period

- Three completed applications or a period of five years from adoption

Possible Metrics to Track

- Number of requested waivers
- Time to approval
- Quantity of testimony at public hearings or via other means

WILSONVILLE OREGON

Questions?

Next steps:

- Planning Commission public hearing
  - January 10, 2018
- City Council public hearing
  - February 5, 2018

WILSONVILLE
OREGON

PLANNING COMMISSION

WEDNESDAY, DECEMBER 13, 2017

III. LEGISLATIVE HEARING

A. Year 2000 URA – Boeckman Creek Bridge (Vance) (45 minutes)

PLANNING COMMISSION
RESOLUTION NO. LP17-0005
A RESOLUTION MAKING CERTAIN DETERMINATIONS AND FINDINGS RELATING TO THE YEAR 2000 URBAN RENEWAL PLAN ELEVENTH AMENDMENT

WHEREAS, the Urban Renewal Agency of the City of Wilsonville ("Agency"), as the duly authorized and acting urban renewal agency of the City of Wilsonville, Oregon, is proposing to undertake certain urban renewal activities in a designated area within the City pursuant to ORS Chapter 457; and

WHEREAS, the Agency, pursuant to the requirements of ORS Chapter 457, has caused the preparation of the Year 2000 Urban Renewal Plan Amendment attached hereto as Exhibit A (the "Amendment") and incorporated herein. The Plan authorizes certain urban renewal activities within the Year 2000 Urban Renewal Area (the "Area"); and

WHEREAS, the Agency has caused the preparation of a certain Urban Renewal Report attached hereto as Exhibit B (the "Report") and incorporated herein to accompany the Amendment as required under ORS 457.085(3); and

WHEREAS, the Agency forwarded the Amendment and Report to the Wilsonville Planning Commission (the "Commission") for review and recommendation; and

WHEREAS, the Tenth Amendment adopted findings related to the Transportation Goal in the Wilsonville Comprehensive Plan which were added to the Year 2000 Plan; and

WHEREAS, the Eleventh Amendment adds a transportation project that conforms to this goal; and

WHERAS, the Commission considered the Amendment and Report on December 13, 2017 and adopted a finding that the Amendment conformed with the Wilsonville Comprehensive Plan.

NOW THEREFORE, THE PLANNING COMMISSION OF THE CITY OF WILSONVILLE HEREBY FINDS:

Section 1.

1. The Amendment conforms to the Wilsonville Comprehensive Plan as described in the staff report on the Amendment.

Adopted by the Planning Commission of the City of Wilsonville this 13th day of December, 2017.

____
Jerry Greenfield, Planning Commission Chairman

ATTEST:

____
Tami Bergeron, Administrative Assistant III - Planning

SUMMARY OF VOTES:

Chair Jerry Greenfield	________
Commissioner Eric Postma	________
Commissioner Peter Hurley	________
Commissioner Al Levit	________
Commissioner Kamran Mesbah	________
Commissioner Phyllis Millan	________
Commissioner Simon Springall	________

Attachments: Exhibit A – Year 2000 Urban Renewal Plan Amendment
Exhibit B – Report on the Year 2000 Urban Renewal Plan Amendment
Exhibit C – Staff Report

EXHIBIT A

Year 2000 Urban Renewal Plan 11th Amendment

Substantial Amendment

The following changes are made to the Year 2000 Urban renewal Plan. Deletions are shown in ~~crossout~~ and additions are shown in *unbolded italics*.

SECTION 404 – Consistency of City's Comprehensive Plan

Transportation:
The Eleventh Amendment is in conformance with the Transportation section of the Comprehensive Plan as the project to be added to the Plan is a transportation project to allow for a more safe and efficient transportation system.

SECTION 405 – Consistency with Economic Development Policy

The Eleventh Amendment is in conformance with the Economic Development Policy as the project to be added to the Plan is a transportation project to allow for a safer and more efficient transportation system, allowing for continued growth on employment land and improved transportation access for the residential sector to support employment by providing housing opportunities.

SECTION 600 – URBAN RENEWAL ACTIVITIES

601 *Urban Renewal Projects and Improvement Activities*

A) Roads, Including Utility Work Indicated:

(14)) Boeckman Dip Bridge: The City of Wilsonville (City) recently completed master planning the 175-acre Frog Pond West area that will include improvements to a section of Boeckman Road over Boeckman Creek; the Boeckman Creek canyon is designated SROZ. Currently, this is a decades-old rural road constructed on an embankment with vertical grades that fail to comply with AASHTO (American Association of State Highway and Transportation Officials) design criteria. The road is substandard for urban use and presents safety concerns for all travel modes. The embankment blocks both salmonid and wildlife passage. The roadway lacks bike lanes and a north-side sidewalk, and the "dip" forces emergency services to slow in this area. The City's Transportation System Plan (TSP) designates the road as a Minor Arterial; the currently planned project will address all of the shortcomings mentioned above and provide an important connection for vehicles, pedestrians and bicyclists to all residential and employment areas east and west of Boeckman Creek and the new Meridian Creek Middle School. Sewer, water, and stormwater utilities will be upgraded or relocated as needed.

602 *Acquisition of Real Property*

E) Property Which May Be Acquired by Plan Amendment: The Agency has identified the following properties for acquisition pursuant to Section 602 of the Plan:

3) *Portions of the following tax lots may be acquired for additional right-of-way or easements concerning the Boeckman Dip Project (see attached* PART TWO EXHIBITS – YEAR 2000 PLAN *Exhibit 8).*

- *31W12D 03200*
- *31W12D 03300*
- *31W12D 02700*
- *31W12D 02600*
- *31W13AB15505*
- *31W13B 00100*
- *31W13B 00200*
- *31W13B 00301*
- *31W13B 02402*

SECTION 700 – FINANCING OF URBAN RENEWAL INDEBTEDNESS

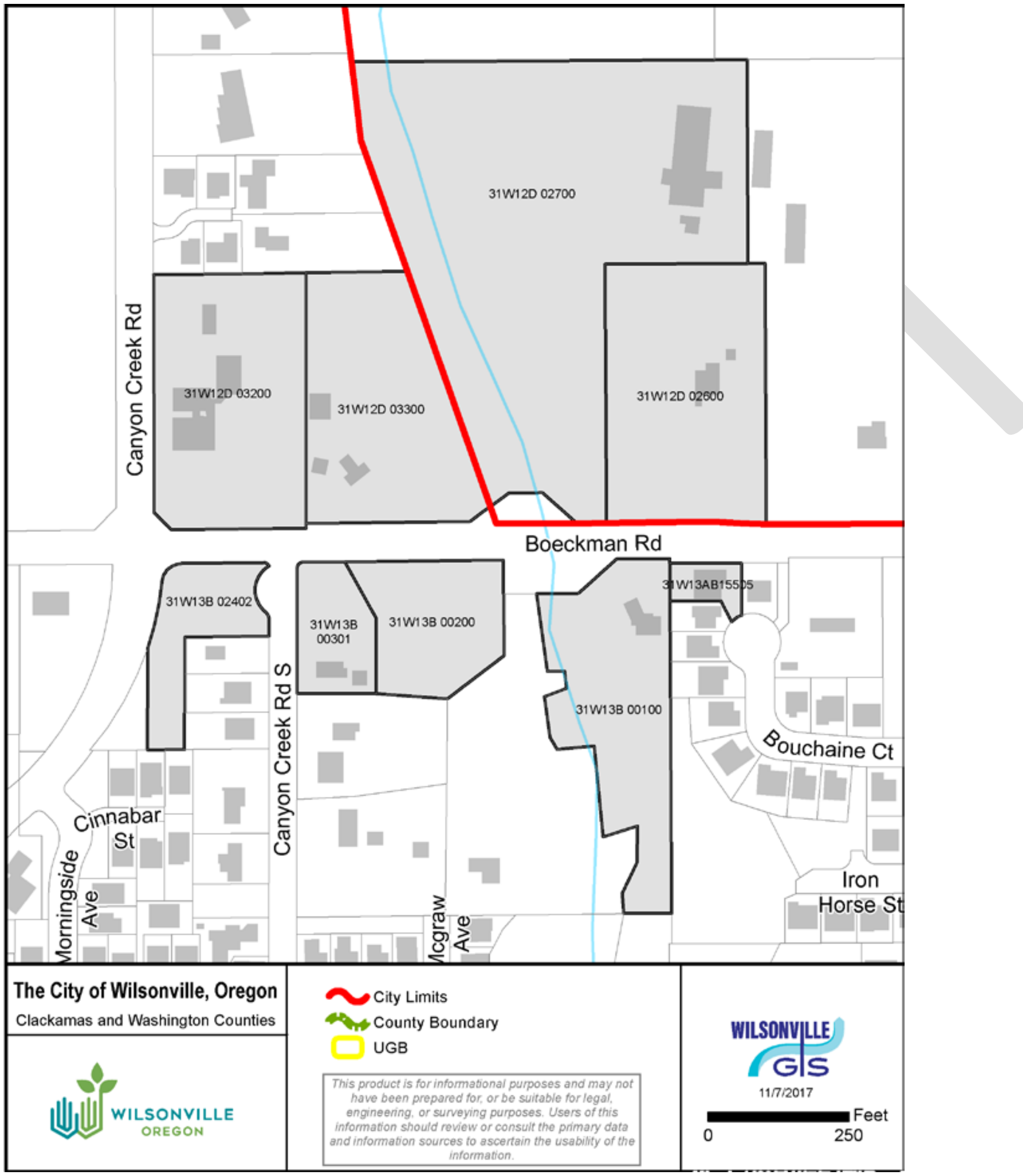
705 ***Maximum Amount of Indebtedness*** – The maximum amount of indebtedness that may be issued or incurred under the Plan is increased from $~~53,851,923.00~~ *$92,687,423.00* by $~~38,835,500.00~~ *$14,509,101* to a new total of $~~92,687,423~~ *$107,196,524*. This is based upon good faith estimates of the scope and costs of projects in the Plan and the schedule for their completion as completion dates were anticipated as of ~~March 1, 2007~~ *October 1, 2017*. The estimates included, but were not limited to, increases in costs due to reasonably anticipated inflation. This amount is the principal of such indebtedness and does not included interest or indebtedness incurred to refund or refinance existing indebtedness. (*Amended by Ordinance No. 498 – June 15, 1998 and Amended by Ordinance No. 639 – August 20, 2007 and Amended by Ordinance No. _____ on ___________.*)

PART TWO

EXHIBITS – YEAR 2000 PLAN

8. Potential Parcels to be Acquired for Boeckman Dip Project (portions of these parcels)

EXHIBIT 8



Summary of Text Changes
Year 2000 Urban Renewal Plan 11th Amendment – Substantial Amendment
Page 3

EXHIBIT B

Report Accompanying the Year 2000 Urban Renewal Plan 11th Amendment

DRAFT REPORT DATE – OCTOBER 30, 2017

Adopted by the City of Wilsonville

DATE

Ordinance No. ___

The Year 2000 Urban Renewal Area

Consultant Team

Elaine Howard Consulting, LLC

Elaine Howard
Scott Vanden Bos

Tiberius Solutions LLC

Nick Popenuk
Ali Danko
Rob Wyman

TABLE OF CONTENTS

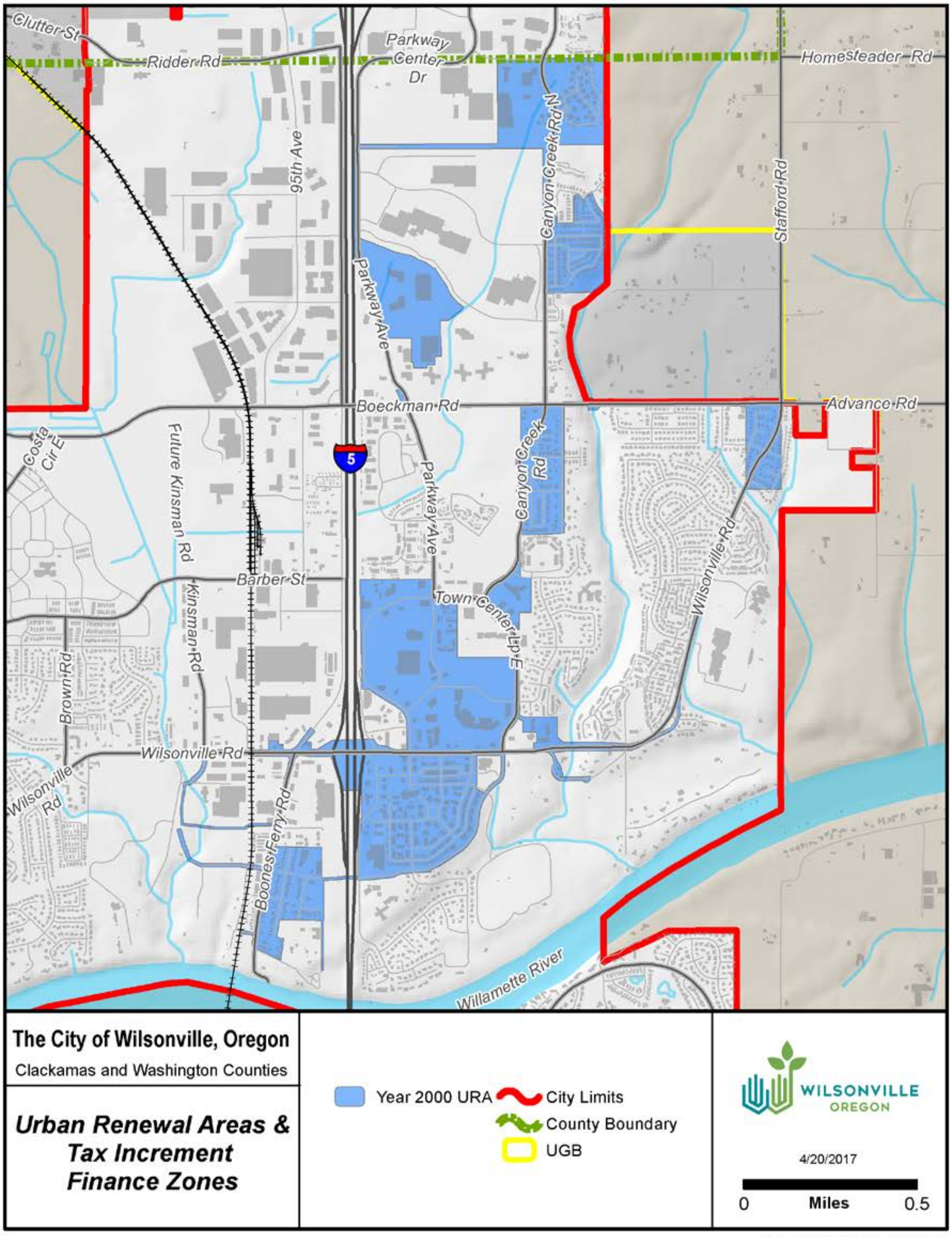
I. INTRODUCTION

The Report on the Year 2000 Urban Renewal Plan Amendment (Report) contains background information and project details that pertain to the Year 2000 Urban Renewal Plan Amendment (Plan). The Report is not a legal part of the Plan, but is intended to provide public information and support the findings made by the City Council as part of the approval of the Plan.

The Report provides the analysis required to meet the standards of ORS 457.085(3), including financial feasibility. The format of the Report is based on this statute. The Report documents the existing conditions in the Year 2000 Urban Renewal Area (Area) as they relate to the proposed projects in the Plan.

The Report provides guidance on how the urban renewal plan might be implemented. As the Wilsonville Urban Renewal Agency (Agency) reviews revenues and potential projects each year, it has the authority to make adjustments to the implementation assumptions in this Report. The Agency may allocate budgets differently, adjust the timing of the projects, decide to incur debt at different timeframes than projected in this Report, and make other changes as allowed in the amendments section of the Plan.

Figure 1 – The Year 2000 Urban Renewal Plan Area Boundary



Source: City of Wilsonville GIS

II. EXISTING PHYSICAL, SOCIAL, AND ECONOMIC CONDITIONS AND IMPACTS ON MUNICIPAL SERVICES

This section of the Report describes existing conditions within The Year 2000 Urban Renewal Area and documents the occurrence of "blighted areas," as defined by ORS 457.010(1).

A. Physical Conditions

1. Land Use

The Area measures 454.0 total acres in size, encompassing 325.89 acres included in 657 individual parcels, and an additional 128.11 acres in public rights-of-way. An analysis of FYE 2016-2017 property classification data from the Clackamas County Department of Assessment and Taxation database was used to determine the land use designation of parcels in the Area. By acreage, "Commercial land, improved" accounts for the largest land use within the area (34.22%). This is followed by "Multi-family improved" (21.9%), and "Residential improved" (20.22%). The total land uses in the Area, by acreage and number of parcels, are shown in Table 1.

Table 1 – Existing Land Use in Area

Land Use	Parcels	Acreage	% of Acreage
Commercial land, improved	58	111.52	34.22%
Multi-Family, improved	10	71.38	21.90%
Residential land, improved	436	65.88	20.22%
Industrial land, improved	3	25.03	7.68%
Industrial State appraised	2	18.68	5.73%
Commercial land, vacant	12	14.27	4.38%
Residential land, vacant	57	8.73	2.68%
Residential, condominium	73	4.41	1.35%
Tract land, vacant	1	3.60	1.10%
Industrial land, vacant	3	1.82	0.56%
Tract land, improved	1	0.53	0.16%
Multi-Family, vacant	1	0.05	0.02%
Total	657	325.89	100.00%

Source: Compiled by Tiberius Solutions LLC with data from the Clackamas County Department of Assessment and Taxation (FYE 2017)

2. Zoning Designations

As illustrated in Table 2, the most prevalent zoning designation (27.82%) of the Area by acreage is "Planned Development Commercial Town Center". The second most prevalent zoning designation is "Planned Development Residential-6", representing 20.82% of the Area.

Table 2 – Existing Zoning Designations

Zoning	Parcels	Acreage	% of Acreage
Planned Development Commercial Town Center	33	90.65	27.82%
Planned Development Residential-6	40	67.84	20.82%
Planned Development Industrial	57	60.34	18.52%
Planned Development Residential-5	213	28.36	8.70%
Planned Development Residential-3	175	25.96	7.97%
Planned Development Commercial	32	25.83	7.93%
Residential Agriculture Holding - Residential	83	19.50	5.98%
Residential	13	3.92	1.20%
Planned Development Residential-4	6	2.56	0.79%
Residential Agriculture Holding - Public	2	0.55	0.17%
Residential Agriculture-Holding	3	0.38	0.12%
Total	657	325.89	100.00%

Source: Compiled by Tiberius Solutions LLC with data from the Clackamas County Department of Assessment and Taxation (FYE 2017) and then cross-referenced with City of Wilsonville data.

3. Comprehensive Plan Designations

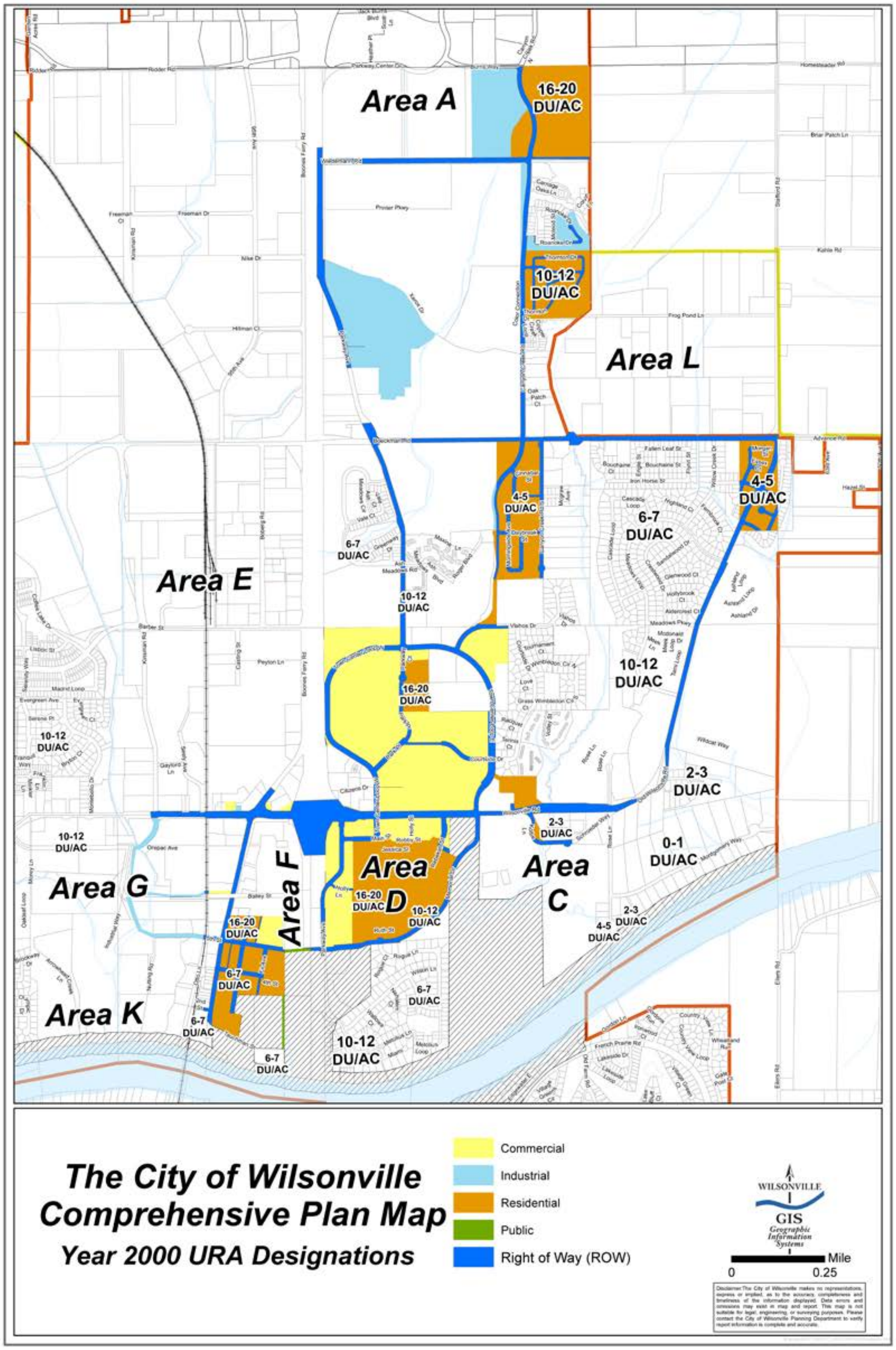
As illustrated in Table 3, the most prevalent comprehensive plan designation (45.58%) of the Area by acreage is "Residential". The second most prevalent comprehensive plan designation is "Commercial", representing 35.74% of the Area.

Table 3 – Existing Comprehensive Plan Designations

Comprehensive Plan Designation	Parcels	Acreage	% of Acreage
Residential	533	148.53	45.58%
Commercial	65	116.47	35.74%
Industrial	57	60.34	18.52%
Public	2	0.55	0.17%
Total	657	325.89	100.00%

Source: Compiled by Tiberius Solutions LLC data from the Clackamas County Department of Assessment and Taxation (FYE 2017) and then cross-referenced with City of Wilsonville data.

Figure 2 – Area Comprehensive Plan Designations



Source: City of Wilsonville There are two public designated parcels in the Area, however, they are so small they do not show up on the map.

B. Infrastructure

This section identifies the existing conditions in the Area to assist in establishing blight. There are projects listed in several City of Wilsonville infrastructure master plans that relate to these existing conditions. **This does not mean that all of these projects are included in the Plan.** The specific projects that are included in the Plan are listed in Sections IV and V of this Report.

1. Transportation

The following are capital projects in the Area from the City of Wilsonville Transportation Systems Plan:

Project ID	Project Name	Project Description	Cost
SI-04	Wilsonville Road/Town Center Loop West Intersection Improvements	Widen the north leg of the intersection and install a second southbound right-turn lane (dual lanes).	$500,000
BW-08	Town Center Loop Pedestrian, Bicycle, and Transit Improvements	Create more direct connections between destinations within Town Center area, improve accessibility to civic uses and transit stops, retrofit sidewalks with curb rampes, highlight crosswalks with colored pavement, and construct similar treatments that support pedestrian, bicycle, and transit access and circulations; also construct shared-use path along Town Center Loop West from Wilsonville Road to Parkway Avenue and restripe Town Center Loop East from Wilsonville Road to Parkway Avenue to a three-lane cross-section with bike facilities	$500,000
BW-09	Town Center Loop Bike/Pedestrian Bridge	Construct bike/pedestrian bridge over I-5 approximately aligned with Barber Street to improve connectivity of Town Center area with businesses and neighborhoods on west side of I-5; include aesthetic design treatments	$4,000,000
UU-01	Boeckman Road Dip Improvments	Upgrade at vertical curve east of Canyon Creek Road to meet applicable cross-section standards (i.e., 3 lanes with bike lanes, sidewalks, and transit stop improvements); options should also be considered to make connections to the regional trail system and to remove the culvert and install a bridge	$12,220,000
LT-P4	Canyon Creek Trail	Shared Use Path from Canyon Creek Park to Boeckman Creek Trail providing connectivity to the neighborhoods to the south	$200,000

2. Water

The following are capital projects in the Area from the City of Wilsonville's Water Master Plan:

Project ID	Description	Total Estimated Cost
168	10-inch Loop (Appts E. of Canyon Creek/Burns)	$41,000
169	8-inch Loop between Vlahos and Canyon Creek	$42,000
260	10-inch Extension on 4th Street (E. of Fir)	$69,000
261	8-inch Loop - Magnolia to Tauchman	$59,000
271	8-inch Loop near Parkway Center/Burns	$66,000
273	12-inch Loop crossing Boeckman	$16,000
274	8-inch Loop at Holly/Parkway	$56,000
285	8-inch Upgrade on Boones Ferry Road (south of 2nd Street)	$44,000
*	Pipeline and Valve Replacement (Annual Budget for 20-year planning period)	$173,000
*	Meter Replacement (Annual Budget for 20-year Planning Period)	$50,000

3. Stormwater

The following are projects in the Area from the City of Wilsonville's Stormwater Master Plan (please note that CMP is corrugated metal pipe):

Project ID	Project Name	Project Location	Existing Conditions	Proposed Solution	Cost Estimate
BC-8	Canyon Creek Estates Pipe Removal	Colvin Lane in Canyon Creek Estates	Erosion is occuring upstream and downstream of an existing culvert in the channel. Side slopes of the channel are steep, which enhances natural erosion.	Removal of the culvert and rehabilitation of the creek channel are proposed to fix existing and future channel erosion. Planting of vegetation following removal of the culvert will need to include techniques that strengthen the creeek banks through bio-engineering, such as live stakes made from live cuttings of plants that enhance bank stability or other reinforcing techniques.	$129,504
BC-5	Boeckman Creek Outfall Realignment	Boeckman Creek, north of SW Wilsonville Road	An 18-inch CMP outfall to Boeckman Creek that drains approximately 11 acres, about 300 feet north of Wilsonville Road, is installed perpindicular to the creek and discharges to a bubber structure about 3 feet high. Water builds up in the pipe until it flows out of the top of the structure. Some erosion is occurring around the bubbler structure resulting from water dropping out of the top of the structure under pressure.	Realign the last few segments of the pipe and remove the bubbler structure. The pipe would be realigned to allow water to discharge downstream in the direction of the creek flow, reducing the erosion occurring at the outfall. Along with the riprap for energy dissipation and vegetation for stability of the riparian area, this project would assist in stabilizing the outfall.	$38,441
ST-7	Boeckman Creek at Boeckman Road Stormwater Study	Boeckman Creek at Boeckman Road	Boeckman Creek at Boeckman Road is currently being used as a water control structure for upstream developments.	Boeckman Road may be replaced with a bridge structure, which would affect the detention facility. This study would evaluate options and identify alternatives for regional detention for upstream drainage.	$57,000

4. *Sanitary Sewer*

The following are projects in the Area from the City of Wilsonville's Wastewater Master Plan (please note that LF is linear feet):

Project ID	Name	Description	Project Limits	Estimated Cost
CIP-09	Parkway Interceptor	Gravity - Pipe Upsizing. 4,540 LF 12"pipe; 150 LF 15"pipe	From Elligsen Road to Beockman Road	$4,360,000
CIP-05	Boeckman Interceptor Phase 1	Gravity - Pipe Upsizing. 2,320 LF 18" pipe; 920 LF 21" pipe; 970 LF 24" pipe	From High School Interceptor to Memorial Park Pump Station	$4,270,000
CIP-06	Boeckman Interceptor Phase 2	Gravity - Pipe Upsizing. 3,760 LF 18" pipe	From Boeckman Road to High School Interceptor	$3,240,000
CIP-12	Memorial Drive Flow Splitter Structure	Flow Splitter Structure - Replacement. Replace Diversion Structure	I-5 Downstream of Memorial Park Pump Station	$150,000
CIP-16*	Pipe Replacement (0 To 5 Years	Gravity - Pipe Replacement. Approximately 930 LF Annually; Varied pipe diameters	Various, Approximately $360,000 Annually	$1,750,000
CIP-17	Town Center Loop Pump Station	Pump Station - Replacement. Replace Pump Station	Existing pump station	$440,000
CIP-19	Boones Ferry Park Grinder Pump	Pump Station - Restroom Grinder Pump. New grinder pump for park restrooms	Boones Ferry Park	$30,000
CIP-22*	Pipe Replacement (6 To 10 Years)	Gravity - Pipe Replacement. Approximately 930 LF Annually; Varied pipe diameters	Various, Approximately $360,000 Annually	$1,750,000
CIP-25*	Pipe Replacement (11 To 20 Years)	Gravity - Pipe Replacement. Approximately 930 LF Annually; Varied pipe diameters	Various, Approximately $360,000 Annually	$1,750,000
CIP-33	Frog Pond/Advance RD Urban Reserve Area - SW Boeckman Road	Gravity - New Pipe. 2,800 LF 18" pipe	From Stafford Road to Boeckman Creek	$4,170,000

5. *Parks and Open Space*

The following was reported by Jordan Vance, Economic Development Manager:

"The City's Bicycle & Pedestrian Master Plan, Dec. 2006, recommends adding the Boeckman Creek Trail and describes it as 'a critical piece of the potential regional trail loop around Wilsonville, linking to Memorial Park to the South, the Tonquin Trail to the West, and the Stafford Spur Trail to the East. Establishing the Boeckman Creek Trail as a regional trail would increase its usage, provide a much-needed north-south bikeway/walkway corridor and offer an amazing community amenity. This would entail adding a hard surface to facilitate non-motorized travel by wheeled vehicles such as wheelchairs, bicycles, inline skates, and skateboards.'

The City's Frog Pond West Master Plan (July 2017) and Financing Plan includes further discussion regarding the need for the Boeckman Bridge, upgrades to the Boeckman Interceptor and extending the Boeckman Creek Trail into Frog Pond, 'The Boeckman Creek Regional Trail will be both a neighborhood amenity and a key pedestrian connection to adjacent areas. South of Boeckman Road, the trail will run within the creek canyon along the sewer line easement. After passing under the future Boeckman Road bridge (which will span the "dip"), the trail will climb to the top of the bank and run along the edge of the vegetated corridor/SROZ and the western edge of the Frog Pond West neighborhood.'"

C. Social Conditions

Data from the US Census Bureau are used to identify social conditions in the Area. The geographies used by the Census Bureau to summarize data do not strictly conform to the Plan Area. As such, the Census Bureau geographies that most closely align to the Plan Area are used, which, in this case, is Block Group 1, Census Tract 227.10 and Block Group 1, Census Tract 244. Within the Area, there are 554 tax lots shown as residential use. According to the US Census Bureau, American Community Survey (ACS) 2010-14, the block groups have 1,819 residents, 80% of whom are white.

Table 4 – Race in the Area

Race	Number	Percent
White alone	1,447	80%
Black or African American alone	30	2%
American Indian and Alaska Native alone	154	8%
Asian alone	5	0%
Native Hawaiian and Other Pacific Islander alone	12	1%
Some other race alone	84	5%
Two or more races	87	5%
Total	1,819	100%

Source: American Community Survey 2011-2015 Five-Year Estimates

The largest percentage of residents in the block groups are between 18-24 years of age (17%).

Table 5 – Age in the Area

Age	Number	Percent
Under 5 years	176	10%
5 to 9 years	69	4%
10 to 14 years	115	6%
15 to 17 years	104	6%
18 to 24 years	315	17%
25 to 34 years	258	14%
35 to 44 years	194	11%
45 to 54 years	190	10%
55 to 64 years	247	14%
65 to 74 years	107	6%
75 to 84 years	44	2%
85 years and over	-	0%
Total	1,819	100%

Source: American Community Survey 2011-2015 Five-Year Estimates

In the block group, 9% of adult residents have earned a bachelor's degree or higher. Another 45% have some college education without a degree, and another 26% have graduated from high school with no college experience.

Table 6 – Educational Attainment in the Area

Education	Number	Percent
Less than high school	155	15%
High school graduate (includes equivalency)	272	26%
Some college	461	45%
Associate's degree	50	5%
Bachelor's degree	80	8%
Master's degree	14	1%
Professional school degree	-	0%
Doctorate degree	-	0%
Total	1,032	100%

Source: American Community Survey 2011-2015 Five-Year Estimates

In the block group, 46% of commuters drove less than 10 minutes to work, and another 41% of commuters drove 10 to 19 minutes to work.

Table 7 – Travel Time to Work in the Area

Travel time to work	Number	Percent
Less than 10 minutes	276	46%
10 to 19 minutes	247	41%
20 to 29 minutes	12	2%
30 to 39 minutes	35	6%
40 to 59 minutes	9	2%
60 to 89 minutes	17	3%
90 or more minutes	-	0%
Total	596	100%

Source: American Community Survey 2011-2015 Five-Year Estimates

Of the means of transportation used to travel to work, the majority, 70%, drove alone with another 15% carpooling.

Table 8 – Means of Transportation to Work in the Area

Means of Transportation to Work	Number	Percent
Drove alone	434	70%
Carpooled	95	15%
Public transportation (includes taxicab)	-	0%
Motorcycle	-	0%
Bicycle	-	0%
Walked	67	11%
Other means	-	0%
Worked at home	23	4%
Total	619	100%

Source: American Community Survey 2011-2015 Five-Year Estimates

D. Economic Conditions

1. Taxable Value of Property within the Area

The estimated total assessed value of the Area calculated with data from the Clackamas County Department of Assessment and Taxation for FYE 2017, including all real, personal, manufactured, and utility properties, is estimated to be $438,251,352 of which $44,087,806 is frozen base and $394,163,546 is excess value above the frozen base.

2. Building to Land Value Ratio

An analysis of property values can be used to evaluate the economic condition of real estate investments in a given area. The relationship of a property's improvement value (the value of buildings and other improvements to the property) to its land value is generally an accurate indicator of the condition of real estate investments. This relationship is referred to as the "Improvement to Land Value Ratio," or "I:L." The values used are real market values. In urban renewal areas, the I:L is often used to measure the intensity of development or the extent to which an area has achieved its short- and long-term development objectives.

Table 10 below shows the improvement to land ratios for properties within the Area. One hundred and forty-six parcels in the area (17.79% of the acreage) have I:L ratios of 1.0 or less. In other words, the improvements on these properties are worth less than the land they sit on. A reasonable I:L ratio for properties in the Area is greater than or equal to 2.0. Only 269 of the 657 parcels in the Area, totaling 57.68% of the acreage have I:L ratios of greater than or equal to 2.0 in FYE 2017. In summary, the Area is underdeveloped and not contributing significantly to the tax base in Wilsonville.

Table 10 – I:L Ratio of Parcels in the Area

Improvement/Land Ratio	Parcels	Acres	% Total Acres
No Improvement Value	90	32.98	10.12%
0.01-0.50	17	9.34	2.87%
0.51-1.00	39	15.64	4.80%
1.01-1.50	63	30.63	9.40%
1.51-2.00	179	49.34	15.14%
2.01-2.50	143	58.00	17.80%
2.51-3.00	33	21.19	6.50%
3.01-4.00	9	14.91	4.58%
> 4.00	84	93.86	28.80%
Total	657	325.89	100.00%

Source: Calculated by Tiberius Solutions LLC with data from Clackamas County Department of Assessment and Taxation (FYE 2017)

E. Impact on Municipal Services

The fiscal impact of tax increment financing on taxing districts that levy taxes within the Area (affected taxing districts) is described in Section IX of this Report. This subsection discusses the fiscal impacts resulting from potential increases in demand for municipal services.

The project being considered for future use of urban renewal funding is a transportation project. The use of urban renewal funding for this project provides an alternative funding source besides the City of Wilsonville's General Fund, the Road Operating Fund (gas tax), or system development charges (SDCs).

The financial impacts from tax increment collections will be countered by providing improved infrastructure to serve an area of the city scheduled for future residential development to augment the city's existing housing stock.

III. REASONS FOR SELECTION OF EACH URBAN RENEWAL AREA IN THE PLAN

The reason for selecting the Area has not changed since inception of the urban renewal plan: to cure blight within the Area.

IV. THE RELATIONSHIP BETWEEN URBAN RENEWAL PROJECTS AND THE EXISTING CONDITIONS IN THE URBAN RENEWAL AREA

The project identified for the amendment to the Year 2000 Urban Renewal Area is described below, including how it relates to the existing conditions in the Area.

A. Transportation Improvements

1. **Boeckman Road Dip $14,000,000 –** The City of Wilsonville (City) recently completed master planning the 175-acre Frog Pond West area that will include improvements to a section of Boeckman Road over Boeckman Creek; the Boeckman Creek canyon is designated SROZ. The City's Transportation System Plan (TSP) designates the road as a Minor Arterial; the currently planned project will address all of the shortcomings mentioned in the existing conditions below and provide an important connection for vehicles, pedestrians and bicyclists to all residential and employment areas east and west of Boeckman Creek and to the new Meridian Creek Middle School. The TSP project cost estimate was updated for this report.

   Existing conditions: Currently, this is a decades-old rural road constructed on an embankment with vertical grades that fail to comply with AASHTO design criteria. The road is substandard for urban use and presents safety concerns for all travel modes. The embankment blocks both salmonid and wildlife passage. The roadway lacks bike lanes and a north-side sidewalk, and the "dip" forces emergency service vehicles to slow in this area.

V. THE ANTICIPATED COMPLETION DATE FOR EACH PROJECT

The schedule for construction of projects will be based on the availability of funding. The projects will be ongoing and will be completed as directed by the Agency. Annual expenditures for project administration and finance fees are also shown below.

The Area is anticipated to complete all projects and have sufficient tax increment finance revenue to terminate the district in FYE 2023. The projections indicate spending on the Boeckman Dip Bridge project will be completed in FYE 2022. The projections in the financial model assume 3.1% annual growth in the assessed value of real property and a 1.0% change in personal and manufactured property, with no change in utility property.

Estimated annual expenditures by project category are shown in Table 11. All costs shown in Table 11 are in year-of-expenditure dollars, which are adjusted by 3% annually to account for inflation. The Agency may change the completion dates in its annual budgeting process or as project decisions are made in administering the Plan.

Table 11 – Projects and Costs in Year of Expenditure Dollars

URA PROJECTS FUND	Total	FYE 2018	FYE 2019	FYE 2020	FYE 2021	FYE 2022
Resources						
Beginning Balance		$ 1,808,885	$ 3,011,528	$ 1,823,664	$ 254,688	$ 275,988
Interest Earnings	$ 71,748	$ 18,089	$ 30,115	$ 18,237	$ 2,547	$ 2,760
Inter-Agency Loan	$ 22,810,686	$ 3,000,000	$ 5,300,000	$ 9,700,000	$ 3,589,434	$ 1,221,252
Bond/Loan Proceeds	$ 2,900,000	$ -	$ -	$ -	$ 2,900,000	$ -
Other	$ -					
Total Resources	$ 25,782,434	$ 4,826,974	$ 8,341,643	$ 11,541,901	$ 6,746,669	$ 1,500,000
Expenditures (YOE $)						
(Old Town Esc) East West connector	$ (7,000,000)	$ (1,100,000)	$ (3,200,000)	$ (2,700,000)		
Old Town Street Improvements	$ (1,868,300)	$ -	$ (1,245,533)	$ (622,767)		
Town Center Planning	$ (118,000)	$ (88,000)	$ (20,000)	$ (5,000)	$ (5,000)	
Livability Projects	$ (2,288,700)	$ -		$ (1,769,000)	$ (519,700)	
Park Improvements	$ (25,000)		$ (25,000)			
Boeckman Dip Bridge	$ (14,000,000)		$ (1,400,000)	$ (5,600,000)	$ (5,600,000)	$ (1,400,000)
Canyon Creek	$ -					
Financing Fees	$ (25,000)				$ (25,000)	
Project Management and Admin	$ (2,266,319)	$ (627,446)	$ (627,446)	$ (590,446)	$ (320,981)	$ (100,000)
Total Expenditures	$ (27,591,319)	$ (1,815,446)	$ (6,517,979)	$ (11,287,213)	$ (6,470,681)	$ (1,500,000)
Ending Balance		$ 3,011,528	$ 1,823,664	$ 254,688	$ 275,988	$ -

Source: Tiberius Solutions LLC

VI. THE ESTIMATED AMOUNT OF TAX INCREMENT REVENUES REQUIRED AND THE ANTICIPATED YEAR IN WHICH INDEBTEDNESS WILL BE RETIRED

Table 12 shows the allocation of tax increment revenues to debt service and loans to the project fund.

It is anticipated that all debt will be retired by FYE 2023 (any outstanding debt will be repaid). The total maximum indebtedness is $107,196,524, increased from $92,687,423 by $14,509,101.

The increase in maximum indebtedness requires concurrence according to ORS 457.220 which limits the increase in maximum indebtedness to 20% of the initial maximum indebtedness as increased annually by inflation. The initial maximum indebtedness of the Year 2000 Plan was $53,851,923. To adjust the initial maximum indebtedness, the City’s consultant used a 3.0% inflation factor as used in other plans. The inflated maximum indebtedness number used for the 20% calculation was $94,429,673, and 20% of that was $18,885,935. That $18,885,935 added to the original maximum indebtedness yields a potential new maximum indebtedness of $72,737,858 that would not require concurrence. However, the maximum indebtedness of the Year 2000 Plan is already $92,687,432, greater than $72,737,858. This means any change to maximum indebtedness will require concurrence, as the Area’s current maximum indebtedness exceeds the 20% threshold.

Table 12 – Potential Maximum Indebtedness Increases and Concurrence

Present MI	$92,687,432	Potential New MI	$72,737,858
Initial MI	$53,851,923		
Inflation factor	3%		
		Potential MI Increase	Potential MI Plus Initial MI
1-Jul-99	$55,467,481		
2000	$57,131,505		
2001	$58,845,450		
2002	$60,610,814		
2003	$62,429,138		
2004	$64,302,012		
2005	$66,231,073		
2006	$68,218,005		
2007	$70,264,545		
2008	$72,372,481		
2009	$74,543,656		
2010	$76,779,965		
2011	$79,083,364		
2012	$81,455,865		
2013	$83,899,541		
2014	$86,416,528		
2015	$89,009,023		
2016	$91,679,294		
2017	$94,429,673	$18,885,935	$72,737,858

Source: Elaine Howard Consulting LLC

Of the $107,196,524 maximum indebtedness, it is estimated that $81,385,000 has been used through the end of FYE 2017. The estimated total amount of tax increment revenues required to service the remaining maximum indebtedness of $25,811,524 is $23,327,472 and is made up of tax increment revenues from permanent rate levies. The reason the amount of tax increment revenues needed to service the remaining maximum indebtedness is less than the remaining maximum indebtedness is because the Tax Increment Finance (TIF) Fund has a beginning balance of $5,478,203 which has not been converted to debt, and does not yet count against the maximum indebtedness.

The finance plans shown in Table 11 and 13 assume Inter-Agency loans from the City, as well as a new bank loan in FYE 2021 to finance a portion of the cost of the Boeckman Dip Bridge project, as well as to refinance outstanding debt. The interest rate for the new bank loan is estimated at 3.25% with a five-year term. Under this assumption, the existing 2010 Bank of America loan is estimated to be paid off in 2021. The assumed financing plan maintains a debt service coverage ratio of at least 1.5 x total annual debt service payments. Although the assumption is the new loan would have a five-year term, it is anticipated there would be sufficient tax increment finance revenues to pay off the loan early, in FYE 2023, and cease collecting tax increment revenues in that year. It may be noted that the debt service coverage ratio in 2023 is not above 1.5, but that is only because the loan is being paid off early, and the payment being made is substantially larger than the payment required.

The time frame of urban renewal is not absolute; it may vary depending on the actual ability to meet the maximum indebtedness. If the economy is slower, it may take longer; if the economy is more robust than the projections, it may take a shorter time period. The Agency may decide to issue bonds or take on loans on a different schedule, and that will alter the financing assumptions. These assumptions show one scenario for financing and that this scenario is financially feasible.

Table 13 – Tax Increment Revenues and Allocations to Debt Service

TAX INCREMENT FUND	Total	FYE 2018	FYE 2019	FYE 2020	FYE 2021	FYE 2022	FYE 2023
Resources							
Beginning Balance		$ 8,996,568.00	$ 9,326,632.00	$ 7,595,411.00	$ 1,452,178.00	$ 250,000.00	$ 1,403,982.00
Interest Earnings	$ 290,248	$ 89,966.00	$ 93,266.00	$ 75,954.00	$ 14,522.00	$ 2,500.00	$ 14,040.00
TIF: Current Year	$ 22,877,472	$ 3,759,148.00	$ 3,994,901.00	$ 3,994,901.00	$ 3,987,785.00	$ 3,987,785.00	$ 3,152,952.00
TIF: Prior Years	$ 450,000	$ 75,000.00	$ 75,000.00	$ 75,000.00	$ 75,000.00	$ 75,000.00	$ 75,000.00
Bond and Loan Proceeds					$ 4,785,000.00		
Total Resources	$ 23,617,720	$ 12,920,682.00	$ 13,489,799.00	$ 11,741,266.00	$ 10,314,485.00	$ 4,315,285.00	$ 4,645,974.00
Expenditures							
Debt Service							
Series 2010 - B of A	$ (6,562,526)	$ (594,050.00)	$ (594,388.00)	$ (589,088.00)	$ (4,785,000.00)	$ -	$ -
New Loan and Refinancing	$ (8,026,076)	$ -	$ -	$ -	$ (1,690,051.00)	$ (1,690,051.00)	$ (4,645,974.00)
Total Debt Service	$ (14,588,602)	$ (594,050.00)	$ (594,388.00)	$ (589,088.00)	$ (6,475,051.00)	$ (1,690,051.00)	$ (4,645,974.00)
Debt Service Coverage Ratio		6.33	6.72	6.78	2.36	2.36	0.68
Inter-Agency Loan	$ (22,810,686)	$ (3,000,000.00)	$ (5,300,000.00)	$ (9,700,000.00)	$ (3,589,434.00)	$ (1,221,252.00)	$ -
Total Expenditures	$ (37,399,288)	$ (3,594,050.00)	$ (5,894,388.00)	$ (10,289,088.00)	$ (10,064,485.00)	$ (2,911,303.00)	$ (4,645,974.00)
Ending Balance		$ 9,326,632.00	$ 7,595,411.00	$ 1,452,178.00	$ 250,000.00	$ 1,403,982.00	$ -

Source: Tiberius Solutions LLC

VII. FINANCIAL ANALYSIS OF THE PLAN

The estimated tax increment revenues through FYE 2023, as shown above, are based on projections of the assessed value of development within the Area and the consolidated tax rate that will apply in the Area. The assumptions include assumed growth in assessed value of 3.1% for real property and 1.0% for personal and manufactured property, derived from a combination of appreciation of existing property values and new construction. No change in value for utility property is assumed.

Additionally, our analysis assumes $8,975,000 of exception value would be added to the tax roll in FYE 2021, based on a current development proposal in the Area that the City believes is likely to occur.

Table 14 shows the projected incremental assessed value, tax rates and tax increment revenues each year, adjusted for discounts, delinquencies, and compression losses. These projections of increment are the basis for the projections in Tables 11 and 13. Gross TIF is calculated by multiplying the tax rate times the excess value. The tax rate is per thousand dollars of value, so the calculation is "tax rate times excess value divided by one thousand." The consolidated tax rate includes permanent tax rates and includes one general obligation bond issued by Clackamas Community College. This bond will be impacted through FYE 2020, which is when the bond is scheduled to be repaid in full.

In June 2007, the Agency adopted a resolution to limit future tax increment collections to $4,000,000 annually (URA Resolution 156) in the Year 2000 Urban Renewal Area. This was originally achieved by reducing the acreage of the URA each year, but the City of Wilsonville instead began under-levying by reducing increment assessed value used when state legislation passed in 2009 to allow it.

Now, each year, the City of Wilsonville uses the UR-50 form to notify the Clackamas County Assessor how much increment value to use. Since FYE 2014, the City of Wilsonville has chosen to use $303 million in increment each year, which results in TIF revenue of around $4 million. However, because the consolidated tax rate is decreasing due to expiring bond rates, using $303 million in increment will not generate $4 million in TIF revenue in upcoming years. Therefore, our analysis assumes using $322 million for FYE 2019 and 2020, $325 million for FYE 2021 and beyond.

Using this increment value should provide TIF revenue very close to $4 million per year, but the exact amount will depend on adjustments, including discounts for early payment, delinquent taxes, and truncation loss due to rounding. That number is shown in the "Increment Used" column in Table 14. To show the amount of the underlevy each year, Table 14 also includes a "Total Gross TIF" column, which is the amount of tax increment revenues that could have been collected from the "Total Increment" column. The "Total Gross TIF" column less the "Underlevy" column nets the "Gross TIF for URA" column. That gross number is then adjusted for delinquencies to arrive at a "Net TIF for URA". It is this number, "Net TIF for URA", that is intended to be no more than $4,000,000 per year, per direction from the Agency.

Table 14 – Projected Incremental Assessed Value, Tax Rates, and Tax Increment Revenues

						Tax Increment Finance				
FYE	Assessed Value Total	Frozen Base	Total Increment	Increment Used	Tax Rate	Total Gross TIF	Underlevy	Gross TIF for URA	Adjustments	Net TIF for URA
2018	$451,880,969	$44,087,806	$407,793,163	$303,000,000	13.0594	$5,325,534	($1,368,536)	$3,956,998	($197,850)	$3,759,148
2019	$465,934,467	$44,087,806	$421,846,661	$322,000,000	13.0595	$5,509,106	($1,303,947)	$4,205,159	($210,258)	$3,994,901
2020	$480,425,029	$44,087,806	$436,337,223	$322,000,000	13.0595	$5,698,346	($1,493,187)	$4,205,159	($210,258)	$3,994,901
2021	$504,342,110	$44,087,806	$460,254,304	$325,000,000	12.9159	$5,944,599	($1,746,931)	$4,197,668	($209,883)	$3,987,785
2022	$520,017,276	$44,087,806	$475,929,470	$325,000,000	12.9159	$6,147,057	($1,949,389)	$4,197,668	($209,883)	$3,987,785
2023	$536,179,643	$44,087,806	$492,091,837	$256,962,100	12.9159	$6,355,809	($3,036,912)	$3,318,897	($165,945)	$3,152,952

Source: Tiberius Solutions LLC
Notes: TIF is tax increment revenues. Tax rates are expressed in terms of dollars per $1,000 of assessed value.

VIII. IMPACT OF THE TAX INCREMENT FINANCING

This section describes the impact of tax increment financing of the maximum indebtedness, both until and after the indebtedness is repaid, upon all entities levying taxes upon property in the Area.

The impact of tax increment financing on overlapping taxing districts consists primarily of the property tax revenues foregone on permanent rate levies as applied to the growth in assessed value in the Area. These projections are for impacts due to the Amendment and are estimated through FYE 2023, and are shown in Tables 15a and 15b. Tables 16s and 16b indicate projections of impacts to the taxing districts if there were no Amendment. These impacts through 2019 would have been the same with or without the Amendment, but in 2020 and beyond, there are additional impacts to taxing districts because the Amendment increases the maximum indebtedness, and increases the length of time required to pay off the debt.

The West Linn Wilsonville School District and the Clackamas Education Service District revenues from permanent tax levies are not *directly* affected by the tax increment financing, but the amounts of their taxes divided for the urban renewal plan are shown in the following tables. Under current school funding law, property tax revenues from permanent rate levies are combined with State School Fund revenues to achieve per-student funding targets. Under this system, property taxes foregone due to the use of tax increment financing, are replaced with State School Fund revenues, as determined by a funding formula at the State level.

Tables 15a and 15b show the projected impacts to permanent rate levies of taxing districts as a result of this Plan Amendment. Table 15a shows the general government levies, and Table 15b shows the education levies. Please note that impacts on these tables start in FYE 2020, when the new Maximum Indebtedness begins to be used. Tables 16a and 16b show the projected impacts to permanent rate levies of taxing districts if there were no Amendment. Table 16a shows the general government levies, and Table 16b shows the education levies.

Typically, in an urban renewal plan amendment, the increase in maximum indebtedness is equal to or less than the total impacts to taxing jurisdictions due to the amendment. However, in this Amendment that is not the case. There are two factors impacting taxing districts in a plan amendment that increases maximum indebtedness: 1) the dollars that are paying for projects (included in the maximum indebtedness number); and 2) the dollars paying the interest for the debt incurred to pay for the projects (not included in the maximum indebtedness number). Usually when a plan is amended to increase the maximum indebtedness, more debt is incurred, and as such, the amount of interest paid over the life of the Plan increases. That is not projected to be the case in this Plan. In fact, due to the refinancing of a loan, the amount of interest paid over the life of this Plan is projected to decrease, and decrease enough that it causes the overall impact to the taxing districts due to the Amendment to be less than the increase in maximum indebtedness due to the Amendment.

General obligation bonds and local option levies are impacted by urban renewal if they were originally approved by voters in an election prior to October 6, 2001, and if there are tax compression impacts under Measure 5. There are no local option levies approved prior to October 6, 2001 that will still be in effect in the Area at the time that tax increment revenues begin to be collected. There is one bond that will be impacted. The impact of the URA on the bond rate is estimated to be less than $0.01 per $1,000 of assessed value. This will result in a very minor increase in property taxes for property owners. Table 17 shows the impacts through the scheduled termination of the bond in FYE 2020. Over the three-year period, for a property with an assessed value of $100,000, the total cumulative impact would be $0.39 in increased taxes imposed, as shown in Table 17.

Measure 5 limits property taxes from permanent rates and local option levies to $10 per $1,000 real market value for general government and $5 per $1,000 real market value for education. For each individual property where the property tax rate exceeds these limits, the property's tax bill is reduced, or compressed, first by decreasing local option levies, and then by decreasing permanent tax rates. Although the presence of urban renewal does not increase the overall tax rate in a jurisdiction, urban renewal is considered its own line item as a general government rate when evaluating the Measure 5 limits. Therefore, all other tax rates, in both general government and education, are slightly reduced to account for this. These reduced rates are called urban-renewal adjusted rates.

When an urban renewal area expires, all the adjusted rates will return to their slightly higher unadjusted rates. The education permanent tax rates and local option levies will increase. The aggregate education tax rate in this area already exceeds the $5 per $1,000 of assessed value, and in recent years, many properties experienced compression losses due to the Measure 5 limits. The increase in education tax rates due to the eventual termination of the URA may further increase compression losses for education. Since local option levies are compressed first in any situation where the Measure 5 limit is exceeded, they are at the greatest risk of a reduction in revenue. Therefore, in this urban renewal area, the West-Linn Wilsonville School District local option levy has the highest risk of increased compression when the urban area expires.

The potential concern over compression loss is being monitored by the City of Wilsonville and the School District. Increases in real market values of properties in recent years has alleviated much of the compression losses the School District experienced in years past. If the closure of the URA appears as if it will have significant impact on School District compression losses, the URA is prepared to phase out the collection of TIF revenue more slowly, resulting in a more gradual financial impact on the School District.

Table 18 indicates the projected tax revenue to taxing districts in FYE 2024, once urban renewal is terminated. Table 18 breaks the excess value created by the urban renewal area into two categories, "Used" and "Not Used." The "Used" category refers to the excess value that the Agency used to generate their tax increment revenues. The "Not Used" category refers to the excess value that was created in the urban renewal area, but not used for calculations determining tax increment revenues due to the Agency's decision to under-levy on an annual basis.

Table 15a – Projected Impact of Amendment on Taxing District Permanent Rate Levies - General Government -

FYE	Clackamas County Permanent	City of Wilsonville Permanent	County Extension & 4-H Permanent	County Library Permanent	County Soil Conservation Permanent	FD64 TVF&R Permanent	Port of Portland Permanent	Srv 2 Metro Permanent	Vector Control Permanent	Subtotal Gen. Govt.
2018	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2019	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ (495,222)	$ (519,198)	$ (10,299)	$ (81,857)	$ (10,299)	$ (314,164)	$ (14,439)	$ (19,898)	$ (1,339)	$ (1,466,715)
2021	$ (756,258)	$ (792,872)	$ (15,728)	$ (125,005)	$ (15,728)	$ (479,762)	$ (22,050)	$ (30,386)	$ (2,045)	$ (2,239,834)
2022	$ (756,258)	$ (792,872)	$ (15,728)	$ (125,005)	$ (15,728)	$ (479,762)	$ (22,050)	$ (30,386)	$ (2,045)	$ (2,239,834)
2023	$ (600,860)	$ (629,950)	$ (12,496)	$ (99,319)	$ (12,496)	$ (381,179)	$ (17,519)	$ (24,142)	$ (1,624)	$ (1,779,585)
Total	$ (2,608,598)	$ (2,734,892)	$ (54,251)	$ (431,186)	$ (54,251)	$ (1,654,867)	$ (76,058)	$ (104,812)	$ (7,053)	$ (7,725,968)

Source: Tiberius Solutions LLC – note there are no impacts due to the Amendment until FYE 2020 when new MI is used.

Table 15b – Projected Impact of Amendment on Taxing District Permanent Rate Levies – Education

FYE	West Linn-Wilsonville School District Permanent	Clackamas Community College Permanent	Clackamas ESD Permanent	Subtotal Education	Total All
2018	$ -	$ -	$ -	$ -	$ -
2019	$ -	$ -	$ -	$ -	$ -
2020	$(1,002,802)	$ (114,979)	$ (75,946)	$ (1,193,727)	$ (2,660,442)
2021	$(1,531,389)	$ (175,586)	$ (115,977)	$ (1,822,952)	$ (4,062,786)
2022	$(1,531,389)	$ (175,586)	$ (115,977)	$ (1,822,952)	$ (4,062,786)
2023	$(1,216,714)	$ (139,506)	$ (92,146)	$ (1,448,366)	$ (3,227,951)
Total	$(5,282,294)	$ (605,657)	$ (400,046)	$ (6,287,997)	$ (14,013,965)

Source: Tiberius Solutions LLC note there are no impacts due to the Amendment until FYE 2020 when new MI is used.

Please refer to the explanation of the schools funding in the preceding section

Table 16a – Projected Impact Plan on Taxing District Permanent Rate Levies - General Government – Without Amendment

FYE	Clackamas County Permanent	City of Wilsonville Permanent	County Extension & 4-H Permanent	County Library Permanent	County Soil Conservation Permanent	FD64 TVF&R Permanent	Port of Portland Permanent	Srv 2 Metro Permanent	Vector Control Permanent	Subtotal Gen. Govt.
2018	$ (705,856)	$ (740,030)	$ (14,680)	$ (116,674)	$ (14,680)	$ (447,788)	$ (20,581)	$ (28,361)	$ (1,908)	$ (2,090,558)
2019	$ (749,252)	$ (785,527)	$ (15,582)	$ (123,847)	$ (15,582)	$ (475,318)	$ (21,846)	$ (30,105)	$ (2,026)	$ (2,219,085)
2020	$ (254,030)	$ (266,329)	$ (5,283)	$ (41,990)	$ (5,283)	$ (161,154)	$ (7,407)	$ (10,207)	$ (687)	$ (752,370)
Total	$ (1,709,138)	$ (1,791,886)	$ (35,545)	$ (282,511)	$ (35,545)	$ (1,084,260)	$ (49,834)	$ (68,673)	$ (4,621)	$ (5,062,013)

Source: Tiberius Solutions LLC – note this expires when the MI is reached.

Table 16b – Projected Impact on Taxing District Permanent Rate Levies – Education – Without Amendment

FYE	West Linn-Wilsonville School District Permanent	Clackamas Community College Permanent	Clackamas ESD Permanent	Subtotal Education	Total All
2018	$ (1,429,328)	$ (163,884)	$ (108,248)	$ (1,701,460)	$ (3,792,018)
2019	$ (1,517,202)	$ (173,959)	$ (114,903)	$ (1,806,064)	$ (4,025,149)
2020	$ (514,400)	$ (58,980)	$ (38,957)	$ (612,337)	$ (1,364,707)
Total	$ (3,460,930)	$ (396,823)	$ (262,108)	$ (4,119,861)	$ (9,181,874)

Source: Tiberius Solutions LLC – note this expires when the MI is reached.

Table 17 - Projected Impact of GO Bonds

	GO Bond Tax Rate (per $1,000 AV)			Property Tax Paid per $100,000 AV		
FYE	**Without UR**	**With UR**	**Impact of UR**	**Without UR**	**With UR**	**Impact of UR**
2018	0.1422	0.1435	0.0013	$ 14.22	$ 14.35	$ 0.13
2019	0.1423	0.1436	0.0013	$ 14.23	$ 14.36	$ 0.13
2020	0.1423	0.1436	0.0013	$ 14.23	$ 14.36	$ 0.13
Total				**$ 42.68**	**$ 43.07**	**$ 0.39**

Source: Tiberius Solutions LLC

Table 18 – Additional Revenues Obtained after Termination of Tax Increment Financing

			Tax Revenue in FYE 2024 (year after termination)			
Taxing District	**Type**	**Tax Rate**	**From Frozen Base**	**From Excess Value (Used)**	**From Excess Value (Not Used)**	**Total**
General Government						
Clackamas County	Permanent	2.4042	$ 105,996	$ 617,788	$ 605,364	$ 1,329,148
City of Wilsonville	Permanent	2.5206	$ 111,128	$ 647,699	$ 634,673	$ 1,393,500
County Extension & 4-H	Permanent	0.0500	$ 2,204	$ 12,848	$ 12,590	$ 27,642
County Library	Permanent	0.3974	$ 17,520	$ 102,117	$ 100,063	$ 219,700
County Soil Conservation	Permanent	0.0500	$ 2,204	$ 12,848	$ 12,590	$ 27,642
FD64 TVF&R	Permanent	1.5252	$ 67,243	$ 391,919	$ 384,037	$ 843,199
Port of Portland	Permanent	0.0701	$ 3,091	$ 18,013	$ 17,651	$ 38,755
Srv 2 Metro	Permanent	0.0966	$ 4,259	$ 24,823	$ 24,323	$ 53,405
Vector Control	Permanent	0.0065	$ 287	$ 1,670	$ 1,637	$ 3,594
Subtotal		*7.1141*	*$ 313,645*	*$ 1,828,055*	*$ 1,791,291*	*$ 3,932,991*
Education						$ -
West Linn-Wilsonville School District	Permanent	4.8684	$ 214,637	$ 1,250,994	$ 1,225,836	$ 2,691,467
Clackamas Community College	Permanent	0.5582	$ 24,610	$ 143,436	$ 140,552	$ 308,598
Clackamas ESD	Permanent	0.3687	$ 16,255	$ 94,742	$ 92,837	$ 203,834
Subtotal		*5.7953*	*$ 255,502*	*$ 1,489,172*	*$ 1,459,225*	*$ 3,203,899*
Total		**12.9094**	**$ 569,147**	**$ 3,317,227**	**$ 3,250,516**	**$ 7,136,890**

Source: Tiberius Solutions LLC

IX. COMPLIANCE WITH STATUTORY LIMITS ON ASSESSED VALUE AND SIZE OF URBAN RENEWAL AREA

State law limits the percentage of both a municipality's total assessed value and the total land area that can be contained in an urban renewal area at the time of its establishment to 25% for municipalities under 50,000 in population. As noted below, the frozen base (assumed to be FYE 2017 values), including all real, personal, personal, manufactured, and utility properties in the Area, is $44,499,418. The total assessed value of the City of Wilsonville less urban renewal excess is $2,661,811,027. The percentage of assessed value in the Urban Renewal Area is 7.43%, below the 25% threshold.

The Area contains 454 acres, including public rights-of-way, and the City of Wilsonville contains 4,835 acres. This puts 24.57% of the City's acreage in an Urban Renewal Area when including the City's other urban renewal areas, which is below the 25% threshold.

Table 19 – Urban Renewal Area Conformance with Assessed Value and Acreage Limits

Urban Renewal Area	Frozen Base/AV	Acres
West Side URA	$16,109,831	415
Year 2000 URA	$44,499,418	454
Coffee Creek	$99,003,704	258.35
TIF Zones		
27255 SW 95th Ave	$17,938,434	26.07
26440 SW Parkway	$12,582,201	24.98
26755 SW 95th Ave	$7,675,439	9.76
Total in URAs	$197,809,027	1188.16
City of Wilsonville	$3,403,012,022	4,835
UR Excess	$741,200,995	
City less UR Excess	$2,661,811,027	
Percent of Total	7.43%	24.57%

Source: Compiled by Elaine Howard Consulting, LLC with data from City of Wilsonville and Washington and Clackamas County Department of Assessment and Taxation (FYE 2017)

X. RELOCATION REPORT

There is no relocation report required for the Plan. No specific acquisitions that would result in relocation benefits have been currently identified.

EXHIBIT C

PLANNING COMMISSION MEETING
STAFF REPORT

<table>
<tr><td>Meeting Date:
Dec 13, 2017</td><td>Subject: Year 2000 Urban Renewal Plan 11th Amendment – Comprehensive Plan Conformance
Staff Member: Jordan Vance, Economic Development Manager
Nancy Kraushaar, PE, Community Development Director
Department: Community Development</td></tr>
<tr><td>Action Required</td><td>Advisory Board/Commission Recommendation</td></tr>
<tr><td>☐ Motion
☒ Public Hearing Date: Dec 13, 2017
☐ Ordinance 1st Reading Date:
☐ Ordinance 2nd Reading Date:
☐ Resolution
☐ Information or Direction
☐ Information Only
☐ Council Direction
☐ Consent Agenda</td><td>☒ Approval
☐ Denial

☐ None Forwarded
☐ Not Applicable
<hr>Comments:</td></tr>
<tr><td colspan="2">Staff Recommendation: Determine conformance of Year 2000 URA Amendment to the Wilsonville Comprehensive Plan.</td></tr>
<tr><td colspan="2">Recommended Language for Motion: N/A</td></tr>
<tr><td colspan="2">Project / Issue Relates To: [Identify which goal(s), master plans(s) your issue relates to.]</td></tr>
<tr><td colspan="2">☒Council Goals/Priorities   ☒Adopted Master Plan(s)   ☐Not Applicable</td></tr>
</table>

ISSUE BEFORE COMMISSION:
Determine conformance of Year 2000 URA Amendment to the Wilsonville Comprehensive Plan.

EXECUTIVE SUMMARY:
In response to City Council direction, staff has worked with consultants to draft the proposed 11th Amendment (Amendment) to the Year 2000 Urban Renewal Plan (Year 2000 Plan). The

proposed Amendment requires specific edits to the Year 2000 Plan text and is included with this report as **Attachment 1**. The Report Accompanying the Year 2000 Urban Renewal Plan – 11th Amendment (Report) is included with this report as **Attachment 2**.

The City of Wilsonville Urban Renewal Agency voted on a motion at their December 4, 2017 meeting to move ahead with the public review process for the proposed Year 2000 Urban Renewal Plan 11th Amendment. The public review process includes the Planning Commission's review of the Amendment to determine conformance with the City's Comprehensive Plan.

BACKGROUND:

At their March 20, 2017 meeting, staff briefed the Wilsonville City Council on the Boeckman Dip Bridge project and the potential to use urban renewal tax increment to fund the project. The project is important to upgrade this section of Boeckman Road to urban design standards and to serve all travel modes. Today, the steep vertical curves and narrow width present safety concerns due to site distance limitations and incomplete bike and pedestrian facilities. The bridge will become more and more important as an important community connection as the Frog Pond area develops.

A primary purpose for urban renewal is to provide a financing mechanism to fund improvements including transportation and utility improvements to allow for development in an Area. The Boeckman Dip Bridge project is approximately a $14 million project. The Boeckman Road right-of-way is located within the Year 2000 Urban Renewal boundary, shown in Figure 1, and area consisting of 454.0 acres of land including rights-of-way.

The staff memo for the March briefing indicated the need for a substantial amendment process in order to have sufficient funding for the project. Staff suggested that the Wilsonville Urban Renewal Task Force be convened to consider the issue and Council agreed and directed staff to move forward. Staff then briefed the task force on a potential amendment to the Y2000 Plan for the Boeckman Dip Bridge at its April 24, 2017 meeting. Upon polling, the task force unanimously agreed on its support for amending the Y2000 Plan to include the project.

With the draft Amendment and Report complete, the next step in pursuing the Amendment will be for the Urban Renewal Agency to move through the public review process, including presentations to the:

- Planning Commission for them to approve conformance with the Wilsonville Comprehensive Plan;
- Clackamas County Board of Commissioners for approval and concurrence;
- West Linn-Wilsonville School District for concurrence;
- Tualatin Valley Fire and Rescue;
- Wilsonville City Council for concurrence and adoption.

In addition, "Consult and Confer" letters will be sent to all taxing districts in the urban renewal area to inform them of the Amendment and seek their input.

The following are the key elements of the Amendment:

- The Boeckman Dip Bridge project will be added to the Year 2000 Plan.
- This is a substantial amendment to the Year 2000 Plan.

- As a part of the Year 2000 Plan Amendment the maximum indebtedness will be increased by $14,509,101. As this amount exceeds authority in ORS 457 for the Wilsonville City Council to approve on their own, concurrence will be required to increase the maximum indebtedness to this amount. Concurrence is approval by taxing districts that represent 75% of the permanent rate levy.
- The proposed amendment would result in the Year 2000 Plan becoming subject to "revenue sharing" provisions of Oregon Revised Statutes (ORS). The amount of revenue sharing required by ORS is dependent upon the ratio of annual tax increment revenues to the value of the original frozen base. No revenue sharing is required until annual tax increment revenues exceed 10% of the original maximum indebtedness. For the Year 2000 Plan, the original maximum indebtedness was $53,851,923. This means that mandatory revenue sharing would begin when tax increment revenues exceed $5,385,192. However, the City of Wilsonville already "under-levies" annual tax increment revenue for the Year 2000 Plan, through a self-imposed cap of $4 million in annual tax increment. Under this system, the URA would never achieve the level of annual tax increment revenue that would trigger the revenue sharing provisions of ORS. Thus, the district is effectively engaging in a method of revenue sharing that is more generous to affected taxing districts than the system required by ORS. However, as the City's approach is different from the sharing requirements of ORS, the taxing districts will need to concur with the existing voluntary sharing program.
- The new proposed maximum indebtedness, the limit on the amount of funds that may be borrowed for administration, projects and programs in the Area is $107,196,524.
- The Plan, as amended, projects 6 years of collecting tax increment revenue, ending in FYE 2023.

There are no explicit review criteria for a Planning Commission for the review of an urban renewal amendment. The Oregon Revised Statute (ORS) ORS 457.085(4) states that “An urban renewal plan and accompanying report shall be forwarded to the planning commission of the municipality for recommendations, prior to presenting the plan to the governing body of the municipality for approval under ORS 457.095”. The generally accepted practice is for the Planning Commission to provide input on the relationship of the Plan to the Local Goals and Objectives and particularly to its conformance to the City of Wilsonville Comprehensive Plan, both of which are elements of the Year 2000 Plan.

AMENDMENT 11 – COMPRHENSIVE PLAN CONFORMANCE

I. RELATIONSHIP TO LOCAL OBJECTIVES

The Amendment relates to local planning and development objectives contained within the Wilsonville Comprehensive Plan, the Wilsonville Planning and Land Development Ordinance (Chapter 4 Sections 4.100 -4.141 Zoning). The following section describes the purpose and intent of these plans, the particular goals and policies within each planning document to which the proposed Amendment relates, and an explanation of how the Amendment relates to these goals and policies. The numbering of the goals, policies, and implementation strategies will reflect the numbering that occurs in the original document. Italicized text is text that *has* been taken directly from an original planning document.

The goals of the City of Wilsonville Comprehensive Plan document which relate to this plan amendment are shown below.

A. City of Wilsonville Comprehensive Plan

Citizen Involvement:
Goal 1.1: To encourage and provide means for interested parties to be involved in land use planning processes, on individual cases and City-wide programs and policies.

Policy 1.1.1 The City of Wilsonville shall provide opportunities for a wide range of public involvement in City planning programs and processes.

Response: The Planning Commission public hearing on the proposed substantial amendment to the Year 2000 Urban Renewal Plan will provide the citizens of the community and interested individuals with the opportunity to comment on and participate in the review process supporting the citizen involvement section of the Comprehensive Plan.

Implementation Measure 1.1.1.b. Support the Planning Commission as the City's official Citizens Involvement Organization with regular, open, public meetings in which planning issues and projects of special concern to the City are discussed and resultant recommendations and resolutions are recorded and regularly reported to the City Council, City staff, and local newspapers. The Planning Commission may schedule special public meetings as the Commission deems necessary and appropriate to carry out its responsibilities as the Committee for Citizen Involvement.

Response: The Plan relates to this implementation measure, as there will be an open public meeting in front of the Planning Commission to inform and discuss the Plan.

Implementation Measure 1.1.1.d Support the Planning Commission as a public Citizens Involvement Organization which assists elected and appointed City Officials in communicating information to the public regarding land use and other community issues. Examples of ways in which the Commission may accomplish this include conducting workshops or special meetings.

Response: The Planning Commission public hearing on the proposed substantial amendment to the Year 2000 Urban Renewal Plan will provide the citizens of the community and interested individuals with the opportunity to comment on and participate in the review process supporting the citizen involvement section of the Comprehensive Plan.

Implementation Measure 1.1.1.e. Encourage the participation of individuals who meet any of the following criteria:

1. *They reside within the City of Wilsonville.*
2. *They are employers or employees within the City of Wilsonville.*
3. *They own real property within the City of Wilsonville.*

4. They reside or own property within the City's planning area or Urban Growth Boundary adjacent to Wilsonville.

Implementation Measure 1.1.1.f. Establish and maintain procedures that will allow any interested parties to supply information.

Implementation Measure 1.1.1.g The Planning Commission will continue to conduct three different kinds of meetings, all of which are open to the public. Whenever feasible and practical, and time allows, the Commission and staff will conduct additional informal meetings to gather public suggestions prior to drafting formal documents for public hearings. The different kinds of meetings conducted by the Commission will include:

1. *Public hearings;*

2. *Work sessions and other meetings during which citizen input is limited in order to assure that the Commission has ample time to complete the work that is pending; and*

3. *Informal work sessions and other meetings during which the general public is invited to sit with the Commission and play an interactive part in discussions. These sessions are intended to provide an open and informal exchange of ideas among the members of the general public and the Commissioners. Such meetings will happen at least two or three times each year.*

Response: The Planning Commission public hearing on the proposed substantial amendment to the Year 2000 Urban Renewal Plan will provide the citizens of the community and interested individuals with the opportunity to comment on and participate in the review process supporting the citizen involvement section of the Comprehensive Plan. Notice of this public hearing and the City Council public hearing has been sent to all property owners within 250 feet of the Year 2000 Urban Renewal Area.

Goal 1.2: For Wilsonville to have an interested, informed, and involved citizenry.

Policy 1.3: The city of Wilsonville shall coordinate with other agencies and organizations involved with Wilsonville's planning programs and policies.

Implementation Measure 1.3.1.b Where appropriate, the City shall continue to coordinate its planning activities with affected public agencies and private utilities. Draft documents will be distributed to such agencies and utilities and their comments shall be considered and kept on file by the City.

Response: The Plan relates to this goal and policy as all overlapping taxing jurisdictions were informed of the Plan, were provided copies of the documents, and were given opportunities for input. **Part of the public review process will include presentations to other public entities,**

including the Clackamas County Board of Commissioners, West Linn-Wilsonville School District, and Tualatin Valley Fire and Rescue.

Transportation:
GOAL 3.2: To encourage and support the availability of a variety of transportation choices for moving people that balance vehicular use with other transportation modes, including walking, bicycling and transit in order to avoid principal reliance upon any one mode of transportation.

Policy 3.2.1: To provide for safe and efficient vehicular, transit, pedestrian and bicycle access and circulation.

Implementation Measure 3.3.1.a. Encourage a balance among housing, employment, and commercial activities within the City so more people are able to live and work within Wilsonville, thereby reducing cross-jurisdictional commuting.

Implementation Measure 3.3.2.a. Provide pedestrian and bicycle connections between residential neighborhoods and major commercial, industrial, and recreational activity centers throughout the city, as shown in the Bicycle and Pedestrian Master Plan. Coordinate the system of pathways planned by adjacent jurisdictions to allow for regional travel.

Implementation Measure 3.3.2.b. Concrete sidewalks will be provided on both sides of all streets unless waived when alternative provisions are found to adequately address pedestrian needs.

Implementation Measure 3.3.2.c. Transportation facilities shall be ADA-compliant.

Implementation Measure 3.3.2.d. Fill gaps in the existing sidewalk and off-street pathway systems to create a continuous network of safe and accessible bicycle and pedestrian facilities.

Response: The Eleventh Amendment is in conformance with the Transportation section of the Comprehensive Plan as the project to be added to the Plan is a transportation project identified in the TSP that would allow for a more efficient and safe transportation system.

B. Transportation Systems Plan

Higher Priority Projects
UU-01 Boeckman Road Dip Improvements - Upgrade at vertical curve east of Canyon Creek Road to meet applicable cross-section standards (i.e., 3 lanes with bike lanes, sidewalks, and transit stop improvements); options should also be considered to make connections to the regional trail system and to remove the culvert and install a bridge.

Response: The proposed amendment would provide a funding mechanism for this roadway improvement, allowing for a more efficient and safe transportation system.

C. Frog Plan West Master Plan

Principles

Create a complete streets and trails network - Streets are designed for safe and enjoyable travel by bike, on foot, or by car. A great network of trails is provided. Safe crossings and connections are provided throughout the street and trail network.

Frog Pond is an extension of Wilsonville - Frog Pond is truly connected—it is an easy and safe walk, drive, bike trip, or bus ride to other parts of Wilsonville, and Frog Pond feels like a well-planned extension of the city.

Response: The addition of the Boeckman Dip project to the Year 2000 Urban Renewal Plan will allow for key components of the Frog Pond West Master Plan vision to be realized, providing a safe transportation connection between the Frog Pond neighborhood and other parts of Wilsonville.

In conclusion, the substantial amendment to add the Boeckman Road bridge to the Y2000 Urban Renewal Plan is consistent with and supportive of the applicable provisions of the Comprehensive Plan regarding statewide planning goal 1 citizen involvement as well as goal 12 transportation as is evidenced by the accompanying findings and the fact that the project is identified in the City's Transportation System Plan (Urban Upgrade – 01 Boeckman Road Dip Improvements) as well as the Frog Pond West Master Plan which was adopted as a sub-element of the Comprehensive Plan.

PLANNING COMMISSION RECOMMENDATION AND VOTE

Staff recommends that the Planning Commission:

1. Review and discuss the proposed Year 2000 Urban Renewal Plan Amendment
2. Find that the Plan conforms to the Wilsonville Comprehensive Plan, and recommend the Plan's adoption to the Wilsonville City Council

Recommendation/Suggested Motion(s):
"I move that the Wilsonville Planning Commission finds, based upon the information provided in the staff report, that the Year 2000 Urban Renewal Plan Amendment conforms with the Wilsonville Comprehensive Plan and further recommend that the Wilsonville City Council adopt the proposed Year 2000 Urban Renewal Plan Amendment."

EXPECTED RESULTS:

Staff and consultants will brief the Planning Commission on the proposed Amendment and their role in a future adoption process.

POTENTIAL IMPACTS or BENEFIT TO THE COMMUNITY (businesses, neighborhoods, protected and other groups)**:**
The Boeckman Dip Bridge will provide a much safer and more accessible connection for all travel modes.

Wilsonville Urban Renewal

ELAINE HOWARD CONSULTING, LLC

TIBERIUS SOLUTIONS

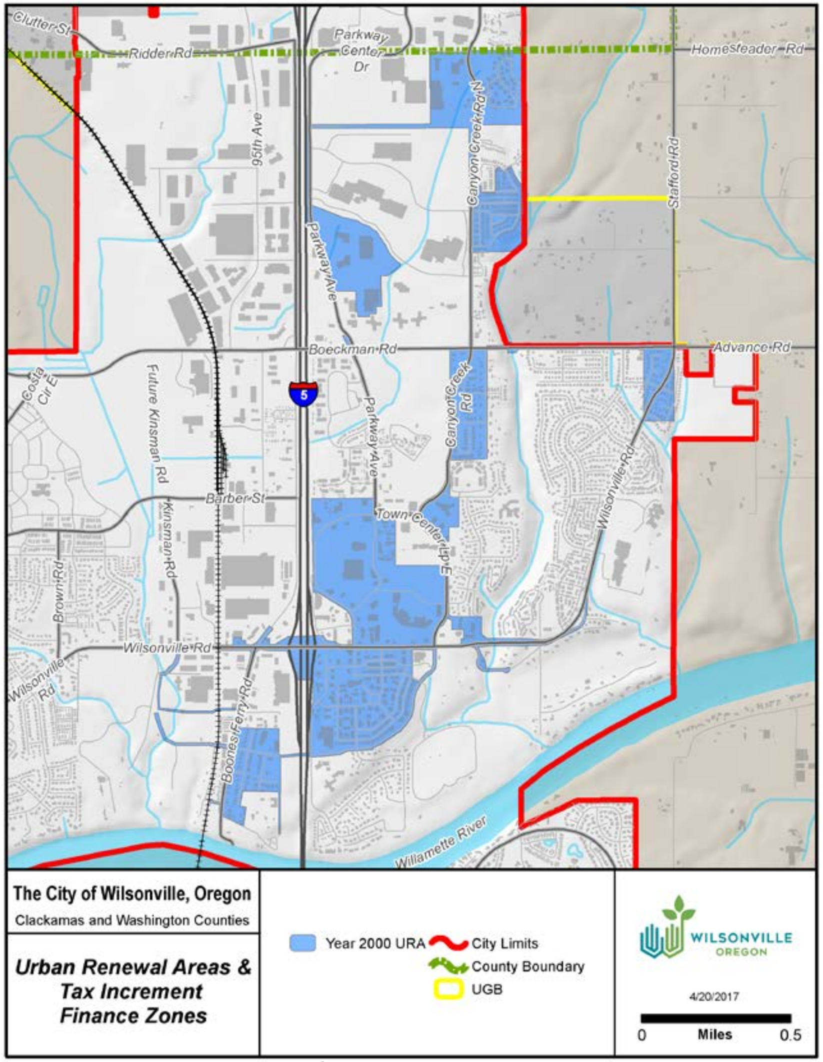
Purpose

- Determine whether the Year 2000 Plan Amendment is in conformance with the Wilsonville Comprehensive Plan.

Background: Project Discussions

- URA Agency meeting to adopt URA Resolution No. 278 on Dec 4, 2017
- Planning Commission briefed on November 8, 2017
- City Council briefed on Boeckman Dip Project March 20, 2017
- $14 Million
- Substantial amendment
- Wilsonville Urban Renewal Task Force unanimously supported Plan Amendment at April 27, 2017 meeting

Boundary Map



Project

- Boeckman Road currently has a major “dip” that is unsafe for all travel modes
- Proposed project is a bridge to address the “dip” and bring road up to current urban design and safety standards
- Project has become more important to connect the community as Frog Pond residential area develops

Financial Implications

- Increasing Maximum Indebtedness (MI) by $14,509,101
- Collection of additional MI extends duration through 2023
- Closure for unamended was targeted for FYE 2020

Approval Process

- Concurrence of other taxing districts (approval of 75% of the permanent rate levy)
- Clackamas County approval and concurrence

Increase in Maximum Indebtedness (MI)

- MI is being increased by more than 20% of original MI indexed for inflation
- Increases above 20% require Concurrence
- Original MI of Y2000 Plan: $53.8 million
- Current MI of $92.7 million already exceeds the 20% threshold, so any increase requires concurrence

Alternative Revenue Sharing Program

- Current under-levying caps Year 2000 TIF collections to $4 Million
- Because it is not the statutory revenue sharing program, concurrence is suggested

Clackamas County Approval

- Year 2000 Plan area contains unincorporated properties in Clackamas County
- Because there are Clackamas County properties in the boundary, Clackamas County approval of the Plan Amendment in its entirety is required. (not just approval of concurrence issues)

Planning Commission Action Requested

- Determine conformance of Year 2000 URA Amendment to the Wilsonville Comprehensive Plan
- Comp Plan Findings included in Staff Report

Questions?

Supplemental Slides: Impacts to Taxing Districts

- Process of 1) Increasing MI and 2) Proposing alternative revenue sharing program complicates the presentation of impacts
- Individualized taxing district letters (Consult and Confer Letters)
- Include the following tables:
  - Alternative revenue sharing program impacts vs statutory
  - Impact of amendment
  - Impact without amendment

Supplemental Slides:
Sample Tables: City of Wilsonville

FYE	City of Wilsonville Without 4M Cap	City of Wilsonville With 4M Cap	Difference Between 4M Cap and Uncapped
2017	$ (743,131)	$ (743,131)	$ -
2018	$ (740,030)	$ (740,030)	$ -
2019	$ (1,024,617)	$ (785,527)	$ (239,090)
2020	$ (1,059,316)	$ (785,527)	$ (273,789)
2021	$ (1,078,374)	$ (792,872)	$ (285,502)
2022	$ (618,740)	$ (792,872)	$ 174,132
2023	$ -	$ (629,950)	$ 629,950
Total	$ (4,521,077)	$ (4,526,778)	$ 5,701

FYE	City of Wilsonville Permanent
2018	$ -
2019	$ -
2020	$ (519,198)
2021	$ (792,872)
2022	$ (792,872)
2023	$ (629,950)
Total	$ (2,734,892)

FYE	City of Wilsonville Permanent
2018	$ (740,030)
2019	$ (785,527)
2020	$ (266,329)
Total	$ (1,791,886)

PLANNING COMMISSION

WEDNESDAY, DECEMBER 13, 2017

IV. INFORMATIONAL

A. City Council Action Minutes (11/6/2017 AND 11/20/2017)

City Council Meeting Action Minutes
November 6, 2017

COUNCILORS	STAFF	STAFF
Mayor Knapp	Bryan Cosgrove	Mark Ottenad
Council President Starr - Excused	Barbara Jacobson	Angela Handran
Councilor Akervall	Jeanna Troha	Dwight Brashear
Councilor Stevens	Kimberly Veliz	Chris Neamtzu
Councilor Lehan	Susan Cole	Andy Stone
	Nancy Kraushaar	Daniel Pauly
	Beth Wolf	Kerry Rappold
		Scott Simonton

AGENDA ITEM	ACTIONS
WORK SESSION	
A. CRM and GORequest	Council received an overview of the citizens' relationship management (CRM) software and the GORequest app the City utilizes to respond to citizen concerns.
B. Website Redesign	Staff updated Council on the plans to redesign the City's websites. Staff shared that Aha! Consulting was chosen to work with the City on the website redesign.
C. Transportation Forum	Council and staff discussed the planning of the future Transportation Forum to take place at City Hall.
D. Cutaway Bus Purchase	Staff provided Council with information on the Grant funded Cutaway bus purchase that Council would later be voting on that night at the Council meeting under the consent agenda as Resolution No. 2656.
E. Year 2000 Plan Urban Renewal District Amendment	Council was briefly updated on the upcoming Year 2000 Plan Urban Renewal District Amendment that staff is currently working on to bring to Council.
REGULAR MEETING	
Communications A. Prepare Out Loud	Everett Lapp presented on the American Red Cross sponsored event Prepare Out Loud. The event is intended to empower residents to be ready for disasters by taking practical steps to start preparing,

	being vocal about preparedness and encouraging others to start preparing.
Mayor's Business A. Upcoming Meetings	Upcoming meetings were announced by the Mayor as well as the regional meetings he attended on behalf of the City.
Consent Agenda A. **Resolution No. 2656** A Resolution Of The City Of Wilsonville Authorizing South Metro Area Regional Transit (Smart) To Purchase One Seventeen Passenger Bus From Creative Bus Sales. B. Minutes of the October 16, 2017 Council Meeting.	The Consent Agenda was adopted 4-0.
Public Hearing A. **Ordinance No. 810** – 1st reading An Ordinance Of The City Of Wilsonville Adopting The Old Town Single-Family Design Standards And Related Development Code Changes To WC Code Section 4.138 - Old Town Overlay Zone. (Pauly)	After a public hearing was conducted, Ordinance No. 810 was adopted on first reading with updates to be made to the ordinance attachment Exhibit A – Revised Code Section 4.138 Wilsonville Code, Old Town Overlay Zone.
New Business A. Community Enhancement Committee Bylaws/Appointments	Council moved that Kate Johnson (Position #1) and Brad Hughbanks (Position #2) be retroactively appointed to serve from February 1, 2016, through June 30, 2017, and Larry Beck (Position #3) and Jimmy Lee (Position #4) be retroactively appointed to serve from February 1, 2016, through June 30, 2018, to be in agreement with the bylaws approved by the committee on April 26, 2016. Motion carried 4-0.
City Manager's Business	City Manager Cosgrove announced that Councilor Lehan and/or Councilor Akervall are unable to serve on the Willamette Falls Locks Commission. Therefore, there is an opening if Councilor Stevens and/or Councilor Starr (excused) are interested in serving on the commission. The City Manager reported the Korean War Veterans Association (KWVA) is asking for a representative of the City to speak at the Veterans celebration this weekend Saturday, November 11, 2017 at 11:00 a.m., Councilor Stevens volunteered to attend and say a few words.
Legal Business	The City Attorney informed Council that the City received a response from Kinder Morgan and the company's vice president of public affairs has agreed to meet with staff.
ADJOURN	9:21 p.m.

City Council Meeting Action Minutes
November 20, 2017

City Council members present included:
Mayor Knapp
Councilor Starr
Councilor Stevens - Excused
Councilor Lehan
Councilor Akervall

Staff present included:
Bryan Cosgrove, City Manager
Jeanna Troha, Assistant City Manager
Barbara Jacobson, City Attorney
Kimberly Veliz, City Recorder
Delora Kerber, Public Works Director
Mike Ward, Civil Engineer
Susan Cole, Finance Director
Mark Ottenad, Public/Government Affairs Director
Angela Handran, Assistant to the City Manager
Pat Duke, Library Director
Miranda Bateschell, Planning Manager

AGENDA ITEM	ACTIONS
WORK SESSION	
A. Library Improvements (CIP 8098) (Duke)	Staff presented on various components of the planned Library Improvements Project. Council requested staff provide more information on the costs of including the installation of a HVAC system during the remodel.
B. Raw Water Facility Update (Kerber)	Staff showed Council a PowerPoint that included detailed drawings of the various elements of the updates to the Willamette River raw-water intake facility.
C. WWSP WGG IGA (Kerber)	Staff updated Council on the proposed Willamette Water Supply Program (WWSP) Willamette Governance Group (WGG) Intergovernmental Agreement (IGA).
D. Metro Urban Growth Boundary (UGB) Expansion Request for Frog Pond East and South (Bateschell)	Staff presented on Metro's new process for making the regional urban growth management decision. The first step of the proposal process being to submit a letter of interest to Metro in order to inform the Metro Council of an interest in proposing an expansion. Council requested that staff submit a letter of interest in the Advance Road Urban Reserve that the City has conducted initial concept planning for called Frog Pond East and South.

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E. Memorial Park Pump Station PSA Award (Ward)	Staff presented on a pending contract award. The award is scheduled to be on the consent agenda for the December 4, 2017 Council meeting.
REGULAR MEETING	
Mayor's Business A. Upcoming Meetings	Upcoming meetings were announced by the Mayor as well as the regional meetings he attended on behalf of the City.
Continuing Business A. Ordinance No. 810	Ordinance No. 810 was adopted, with changes provided by staff, on second reading by a vote of 3-1.
City Manager's Business	No report.
Legal Business	No report.
ADJOURN	8:17 p.m.

PLANNING COMMISSION

WEDNESDAY, DECEMBER 13, 2017

IV. INFORMATIONAL

B. 2018 Planning Commission Work Program

2018 WORK PROGRAM

Planning Commission

updated: 12/6/2017

DATE	AGENDA ITEMS		
	Informational	Work Sessions	Public Hearings
Jan. 10, 2018			Coffee Creek Industrial Form-based Code
Feb. 14, 2018	I-5 Exit 283-282 Interchange Facility Plan		Water Treatment Plant Master Plan
Mar. 14, 2018	Annual Housing Report Town Center Plan French Prairie Bridge I-5 Exit 283-282 Interchange Facility Plan	Parks and Recreation Master Plan	
April 11, 2018	Citywide signage and wayfinding project Basalt Creek Concept Plan French Prairie Bridge		Parks and Recreation Master Plan I-5 Exit 283-282 Interchange Facility Plan
May 9, 2018	UGB Expansion Request	Town Center Plan	
June 13, 2018	Town Center Plan	Density Inconsistency Revisions Basalt Creek Concept Plan	
July 11, 2018	French Prairie Bridge		Basalt Creek Concept Plan
Aug. 8, 2018		Density Inconsistency Revisions	
Sept. 12, 2018			Density Inconsistency Revisions
Oct. 10, 2018		Town Center Plan	
Nov. 14, 2018			
Dec. 12, 2018			
Jan. 9, 2019			

2018

1 Basalt Creek Concept Plan
2 Town Center Plan
3 Arrowhead Creek Planning Area
4 French Prairie Bike/Ped Bridge
5 Water Treatment Plant Master Plan
6 Solid Waste Code Amendments
7 Wayfinding
8 I-5 Exit 283-282 Interchange Facilities Plan Report
9 Density Inconsistency Revisions
10 Parks and Recreation Master Plan