



# CITY OF TROUTDALE

"Gateway to the Columbia River Gorge"

## AGENDA

### CITY COUNCIL – REGULAR MEETING

Troutdale City Hall - Council Chambers  
219 E. Historic Columbia River Hwy. (Lower Level, Rear Entrance)  
Troutdale, OR 97060-2078

**Tuesday, April 12, 2016 – 7:00PM**

1. **PLEDGE OF ALLEGIANCE, ROLL CALL, AGENDA UPDATE.**
2. **OATH OF OFFICE:** Judge Raymond Young will administer the Oath of Office to appoint Corey Brooks to fill City Council Position #2.
3. **PROCLAMATION:** Proclaiming April 23, 2016 as Arbor Day in the City of Troutdale.
4. **CONSENT AGENDA:**  
**4.1 MINUTES:** January 12, 2016 Regular Meeting.
5. **PUBLIC COMMENT:** Public comment is limited to comments on non-agenda items. *Remarks shall be limited to 5 minutes for each speaker unless a different time is allowed by the Mayor. The Mayor and Council should avoid immediate and protracted response to citizen comments.*
6. **PRESENTATION:** Multnomah County Sheriff's Office Command Staff introduction.  
*Sheriff Staton*
7. **REPORT:** A report from the Citizens Advisory Committee outlining their March meeting recommendations to the City Council.  
*Zach Hudson, Citizens Advisory Committee Chair*
8. **PRESENTATION:** East Metro Mediation services that are provide to Troutdale Residents.  
*Tera Cleland, East Metro Mediation*
9. **REPORT:** Comprehensive well assessment and action plan.  
*Travis Hultin, Chief Engineer*

**10. STAFF COMMUNICATIONS**

**11. COUNCIL COMMUNICATIONS**

**12. ADJOURNMENT**



**Doug Daoust, Mayor**

**Dated:** 4/6/16

City Council Regular Meetings will be replayed on Comcast Cable Channel 30 and Frontier Communications Channel 38 on the weekend following the meeting - Saturday at 2:30pm and Sunday at 9:00pm.

Further information and copies of agenda packets are available at: Troutdale City Hall, 219 E. Historic Columbia River Hwy. Monday through Friday, 8:00 a.m. - 5:00 p.m.; on our Web Page [www.troutdaleoregon.gov](http://www.troutdaleoregon.gov) or call Debbie Stickney, City Recorder at 503-674-7237.

The meeting location is wheelchair accessible. A request for an interpreter for the hearing impaired or for other accommodations for persons with disabilities should be made at least 48 hours before the meeting to: Debbie Stickney, City Recorder 503-674-7237.



# CITY OF TROUTDALE

"Gateway to the Columbia River Gorge"

## OATH OF OFFICE CITY OF TROUTDALE

STATE OF OREGON                     )  
  COUNTY OF MULTNOMAH        ) ss.  
  CITY OF TROUTDALE             )

*I, Corey Brooks, being first duly sworn, do solemnly say and swear that having been duly appointed as **City Councilor** for the City of Troutdale, that I will perform the duties of this office to the best of my ability; that I will support the Constitution and the laws of the United States of America and the Constitution and the laws of the State of Oregon and the Charter and Ordinances of the City of Troutdale to the best of my ability, so help me God.*

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**Corey Brooks**

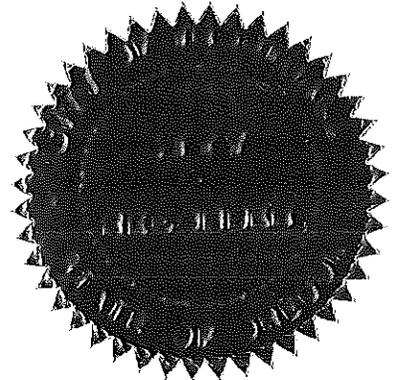
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**Raymond Young, Municipal Judge**

**ATTEST:**

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**Sarah Skroch, City Recorder**  
**Dated: April 12, 2016**



**ARBOR DAY  
PROCLAMATION**

Whereas, In 1872 J. Sterling Morton proposed to the Nebraska Board of Agriculture that a special day be set aside for the planting of trees, and

Whereas, This holiday, called Arbor Day, was first observed with the planting of more than a million trees in Nebraska, and

Whereas, Arbor Day is now observed throughout the nation and the world, and

Whereas, Trees can reduce the erosion of our precious topsoil by wind and water, lower our heating and cooling costs, moderate the temperature, clean the air, produce oxygen, and provide habitat for wildlife, and

Whereas, Trees are a renewable resource giving us paper, wood for our homes, fuel for our fires, and countless other wood products, and

Whereas, Trees in our city increase property values, enhance the economic vitality of business areas, and beautify our community, and

Whereas, Trees, wherever they are planted, are a source of joy and spiritual renewal.

Now, Therefore, I, Doug Daoust, Mayor of the City of Troutdale, do hereby proclaim April 23, 2016, as Arbor Day in the City of Troutdale, and I urge all citizens to celebrate Arbor Day and to support efforts to protect our trees and woodlands, and

Further, I urge all citizens to plant and care for trees to gladden the heart and promote the well-being of this and future generations.

Dated this 12<sup>th</sup> day of April, 2016.

Mayor Signature \_\_\_\_\_

**DRAFT**

**Agenda Item #4.1**  
4/12/16 Council Meeting

**MINUTES**

**Troutdale City Council – Regular Meeting**  
**Troutdale City Hall – Council Chambers**  
**219 E. Historic Columbia River Hwy.**  
**Troutdale, OR 97060**

**Tuesday, January 12, 2016 – 7:00PM**

**1. PLEDGE OF ALLEGIANCE, ROLL CALL, AGENDA UPDATE.**

Mayor Daoust called the meeting to order at 7:00pm.

**PRESENT:** Mayor Daoust, Councilor Ripma, Councilor Anderson, Councilor White, Councilor Allen, and Councilor Wilson.

**ABSENT:** Councilor Morgan - Excused

**STAFF:** Craig Ward, City Manager; Ed Trompke, City Attorney; Steve Gaschler, Public Works Director; Sarah Skroch, City Recorder; Steve Winstead, Planning Director; and Kenda Schlaht, Deputy City Recorder.

**GUESTS:** See Attached List.

Mayor Daoust asked are there any agenda updates?

Craig Ward replied there are no amendments to the published agenda.

Mayor Daoust stated I have 1 change to the agenda. I'd like to move Agenda Item #2 to the January 26, 2016 meeting because Councilor Morgan is not here and I'd like everyone to be here for that conversation.

**2. MOTION:** Election of 2016 Council President.

This item was moved to January 26, 2016.

**3. CONSENT AGENDA:**

**3.1 MINUTES:** October 20, 2015 Work Session and October 27, 2015 Regular Meeting.

**MOTION:** Councilor Ripma moved to approve the Consent Agenda. Seconded by Councilor Anderson. The motion passed unanimously.

**MOTION:** Councilor Allen moved to pull the vote on the consent agenda from our last regular meeting in order to update my council comments according to what was stated in the video. The meeting minutes (October 13, 2015 Regular Meeting) are missing a paragraph. Seconded by Councilor White.

Councilor Allen stated for the record, it is at 1 hour 52 minutes and 30 seconds into the video. It's my council comments. It was important enough that on the November 24<sup>th</sup> meeting it was brought up therefore I believe these minutes should reflect accurately for what was stated. Seconded by Councilor White.

Mayor Daoust states this has been moved and seconded to revote on the last consent agenda at the last regular meeting.

Councilor Ripma asks are you talking about the October 27<sup>th</sup> 2015 minutes?

Councilor Allen responds, on the last regular meeting we had a consent agenda item that was Tuesday, October 13<sup>th</sup> 2015 meeting minutes and about 1 hour, 52 minutes and 30 seconds into that were my council comments and there's a paragraph missing from the meeting minutes. On November 24<sup>th</sup> we had an agenda item specifically referring to my comments during that time, therefore, I would like the record to reflect accurately what was said.

Mayor Daoust stated that will be corrected and we will most likely deal with that under the consent agenda at our next meeting.

The motion passed unanimously.

**4. PUBLIC COMMENT:** Public comment is limited to comments on non-agenda items.

None.

**5. MOTION:** A motion accepting the Mayor's nominations for appointments to the Parks Advisory Committee, Citizens Advisory Committee, Budget Committee, Planning Commission, Public Safety Advisory Committee, and the Historic Landmarks Commission.

Mayor Daoust states each year the City conducts a recruitment process to fill vacancies on City's Committees. Ads are placed in the Gresham Outlook, the Troutdale Champion and on the City's web page soliciting citizens to apply for a position on one of our voluntary committees. This year we received 22 applications. The City Selection Committee comprised of the Mayor, City Councilors and the chair of the respected committee interviewed applicants for all committees. The Selection Committee came to a consensus at the end of the interviews and forwarded their recommendations to Mayor Daoust for his consideration.

Mayor Daoust states I am nominating the following applicants for appointment. For the **Parks Advisory Committee:** Position #1 - Charlie Foss, Position #2 - Gary Jones, Position #3 - Carol Allen, and the alternate - Paul Wilcox. For the **Citizen's Advisory Committee:** Position #1 - Carol Hasler, Position #6 - Paul Wilcox, Position #9 - Diane Castillo, Position #10 - Danny Stoddard, Position #11 - Sam Barnett, and the alternate - John Brown. For the **Budget Committee:** Position # 2 - Robert Canfield, Position #3 - Carol Hasler, Position #7 - Brian Sheets, and the alternate - Bruce Wasson. For the

**Planning Commission:** Position #6 - Tanney Staffenson, and Position # 7 - Sandy Glantz. For the **Public Safety Advisory Committee:** Position #1 - Will Knight, Position #2 - Charles Foss, Position #3 - Jerry Stitzel, Position #4 - Jorgan Shaw, and the alternate - Gary Jones. For the **Historic Landmarks Commission:** Position #1 - Audrey Lowell, Position #2 - Erin Janssens, and Position #3 - Sharon Nesbit.

**MOTION:** Councilor Wilson moved to approve Mayor Daoust's nominations.  
Seconded by Councilor Anderson.

Councilor Allen states I noticed the people chosen were changed since the Committee met. I see in the Charter where it says that Mayor nominates and Council approves the appointment. It seems to me that we shouldn't actually be telling people what positions they received and having them serve on committees prior to the Council approving those appointments. We should go through the process and do it officially and then let people know. Rather than let people know and having them serve prior to the Council actually doing the approval. We're short circuiting a required step according to our Charter.

Mayor Daoust states it's a timing thing because we just had the Budget Committee prior to this meeting, if that's what you're referring to.

Councilor Allen responds no in general. It's just process.

Councilor White states I'm not going to be able to vote in favor of this because there was changes made after the Committee made their selection. I can't really comment on those changes but I think it's only fair if the committee comes up with the selection. If it's down to 1 or 2 people we've lost our democracy and a fair process. I think it's a dangerous precedent. We've changed what we're calling it. It used to be the nominating committee's recommendations and now it's the Mayor's nominations for appointments. I'll be voting no.

Councilor Wilson states there is a conflict I want to address between our Code and our Charter and the Charter presides over the Code. The Charter, Section 18C, states the Mayor nominates and the Council approves appointments to the members for the commission for its committees established by the ordinance or resolution. The Mayor appoints Councilors and others to represent the City for and on community and intergovernmental organizations. In Section 18C as it sits today, the Mayor does have the authority to nominate the citizens. Whether or not the Committee selected those, according to the Charter, he can override those selections. I'm not in agreeance with it but it's the way the Charter is written right now and it's something I want to address with our Charter Review Committee to try to make this Charter, 18c, match with our Code 2.20.010 through .020. I do have one question. We had 2 Councilors that were not able to interview for 2 of the Committees because they had spouses in them but under section 2.20.020C it says no selection committee members shall vote on recommendation if the applicant is a relative of the member ie: spouse, child, brother, sister, parent of the member or as a director, officer or owner of business which employs that member. My concern

is we cut 2 people out of the process out of the entire committee specifically it states they cannot recommend or review their spouse. That would be the only thing I would like to get clear. It doesn't say anything about them not being able to interview any of the Committee members.

Mayor Daoust asks Ed Trompke to comment on this.

Ed Trompke replies it is very difficult for a Councilor to refuse him or herself from interviewing one person to then interview the other people and make any comment because it has to be a comparison of balancing of once there are 3 people on 3 positions. Whenever you have to weigh and balance the ability and relative worth of having a person on the group. I can't say that it's inappropriate because it's the Government Ethics Commission who ultimately has all the say on this. They're the judges, not me, and they make real clear that lawyers aren't supposed to try to give final word to Councilors on anything like that. But it's very prudent not to. That's the best I can say and it would be up to Government Ethics Commission to give you the final word. But it would prudent not to participate in any of them because you do have to weigh and balance.

Councilor Ripma states that sounds like you're suggesting that both Councilor White and Councilor Allen probably shouldn't vote.

Councilor Wilson responds no, my issue is that they were removed from the process for the committee that their spouse was applying for and weren't able to talk to any of the applicants. I feel that the two of them could be subjective in interviewing other people.

Councilor Anderson states I agree with all of this. I agree with Councilor Allen's point about appointing people before the start of the year. I believe everything that Councilor Wilson says about the incongruences of the Charter and the Council Rules. I understand Councilor White's point as well. My opinion is let's come up with a solution. I don't think we can vote on these tonight with all of these things hanging over us. We have to shore up our process and make sure we're doing it right. I have no issue with who is selected. I'd vote them in right now but I want it to stick. I'm not sure, especially with Councilor Allen's concern. That bothers me. I think we do need to appoint prior to any meetings being held.

Mayor Daoust asks if we could, let's make changes next time. I think we can vote on these tonight and put these people in place and they can start going to meetings.

Councilor Ripma agreed.

Mayor Daoust states the process was done with the whole selection committee with the exception that there was a couple of Committees that these two gentlemen had to sit out on because their wives applied for the Committee. There was one change, I was approached by Tanney Staffenson and Zach Hudson to place

somebody on the CAC that was an alternate on another committee. And that is the only change that was made outside of the selection committee process. All of these names came from the selection committee. I don't see why we can't vote tonight and make the changes that have been brought up next time we do it.

Councilor Wilson states I'm with you on that. I just wanted to bring up those points.

Councilor White states the reason for voting no was this would set a new precedent. Our best practice, regardless of what our Charter says, is how we follow it. It turns the whole interview process into a dog and pony show. Why even have it?

Councilor Allen responds I just wanted to point out that my wife had said she wanted to serve on a Committee but couldn't because I am a Councilor. I said you have your own mind, own opinions, and you certainly could do that. I don't know if I consider it a wise idea for her to do that but she does make up her own mind and I'm not going to be the one to try and stop her. I'm comfortable just staying out of the vote on anything that she's going to apply for because I don't want to influence it one way or the other. However, I do want to see us follow process and I think it's fine that the Mayor nominate whoever he wants. I object to it being implemented prior to the Council approving it, such as a Supreme Court justice when they're nominated they don't actually serve on the bench prior to confirmation.

Councilor Wilson asks Councilor Allen would you be willing to vote by Committee so you don't have to vote on the Committee your wife's on?

Councilor Allen states I would like that, yes.

Councilor Wilson asks Councilor White would that work for you?

Councilor White responds my point isn't who got selected. My point was we have a process that has been in place for a long time. We were even tipped off and warranted it was going to be changed during that process. And sure enough it got changed. That's a big red flag for me.

Councilor Allen states we would have felt better if we reconvened as a Selection Committee and gone over the changes prior to coming here, although it's not required.

Councilor Ripma states I believe you followed the process except for one substitution and I can't say whether that's happened before. Mayor Daoust and previous Mayors agreed to this process and the nominations are made by the Mayor after the Selection Committee picks. In this case, Mayor Daoust sent out an email saying he had met with Tanney, he had met with Zach, and he was making this change. I don't have any problem with approving these appointments.

**MOTION WITHDRAWN:** Councilor Wilson withdrew his motion to approve the nominees as they were presented.

**MOTION:** Councilor Wilson moved to approve each Committee with a separate vote. Seconded by Councilor Anderson.

**VOTE ON PARKS ADVISORY COMMITTEE APPOINTS:** Councilor Ripma – Yes; Councilor Anderson – Yes; Mayor Daoust - Yes; Councilor White – Yes; and Councilor Wilson – Yes.

**Motion Passed 5 – 0.**

*(Councilor Allen did not vote because his wife was being appointed to this committee)*

**VOTE ON CITIZENS ADVISORY COMMITTEE APPOINTS:** Councilor Ripma – Yes; Councilor Anderson – Yes; Mayor Daoust - Yes; Councilor White – Abstained; Councilor Allen – No; and Councilor Wilson – Yes.

**Motion Passed 4 – 1.**

*(Councilor White abstained from voting because his wife was being appointed to this committee)*

**VOTE ON BUDGET COMMITTEE APPOINTS:** Councilor Ripma – Yes; Councilor Anderson – Yes; Mayor Daoust - Yes; Councilor White – Yes; Councilor Allen – Yes; and Councilor Wilson – Yes.

**Motion Passed 6 – 0.**

**VOTE ON PLANNING COMMISSION APPOINTS:** Councilor Ripma – Yes; Councilor Anderson – Yes; Mayor Daoust - Yes; Councilor White – Yes; Councilor Allen – Yes; and Councilor Wilson – Yes.

**Motion Passed 6 – 0.**

**VOTE ON PUBLIC SAFETY ADVISORY COMMITTEE APPOINTS:** Councilor Ripma – Yes; Councilor Anderson – Yes; Mayor Daoust - Yes; Councilor White – Yes; Councilor Allen – Yes; and Councilor Wilson – Yes.

**Motion Passed 6 – 0.**

**VOTE ON HISTORIC LANDMARKS COMMISSION APPOINTS:** Councilor Ripma – Yes; Councilor Anderson – Yes; Mayor Daoust - Yes; Councilor White – Yes; Councilor Allen – Yes; and Councilor Wilson – Yes.

**Motion Passed 6 – 0.**

**6. PUBLIC HEARING / ORDINANCE (Introduction):** An ordinance amending the Comprehensive Land Use Plan Map and Zoning District Map for a 6.88 acre parcel, currently designated MDR Medium Density Residential and zoned R-5 Single Family

Residential, and proposed to be designated High Density Residential and zoned A-2 Apartment Residential.

Steve Winstead, Planning Director, states we are here to present to you a series of two hearings. This is a type 4 review which is basically going before both the Planning Commissions and City Council for an ordinance for a comprehensive land map amendment. This is presented by Sheldon Development. Their staff is here tonight. This went before the Planning Commission and as you've read in the packet, there was no decision made at that point. The vote was 3 - 3 and a recommendation was not approved. There was no motion or recommendation for denial. What we have today is basically a restating of the staff report that was provided to the Planning Commission. The subject site is at the corner of Cherry Park and 242<sup>nd</sup>.

Steve Winstead presented a PowerPoint Presentation on the 15-057 Sheldon Development and it is attached to the minutes as Exhibit A.

Steve Winstead states you will see an ordinance attached and you will make a decision on this January 26<sup>th</sup> at the second hearing. In the ordinance it talks about the criteria which we have discussed and our final order as well. Also included are letters from citizens, concerns and handouts. In terms of Reynolds School District we had asked for comments and received none. In terms of traffic impact we'll be going back to Multnomah County and we will be looking at that. At this time are there any questions for staff?

Councilor Wilson states that one of the concerns written was the utility impacts and the traffic levels in that area. Can you tell me what the utility impacts are going to be for that area or to the City? How do you feel you're going to be able to move all that new traffic through the complex?

Steve Winstead responds the applicant is here and will address that for you. What we see as a City is how we deal with sewer and storm service. We're looking at the size of a line, is it going to be adequate, are we going to be able to make that work. These are design issues that Public Works would like to work with the developer on to ensure that they have addressed these issues. The traffic side is definitely an issue. The developer has a traffic engineer and they have submitted information to Multnomah County for their review. This is in concert with a lot of other traffic issues that are happening. Multnomah County has become the center focus for all the traffic issues at the intersection, receiving info from Gresham, and receiving info from us. They're taking all of the information from all of the development that's going on there. It's Multnomah County's road and they have complete latitude on what they want to do on that. They will be commenting to the developer as well as us as to what their recommendation is during this site design on traffic accidents and where they will be located and adjacencies across the street from access to Safeway. There is a lot of particulars that go into this. Their traffic engineers will work with Public Works. I'm not a transportation expert but I do know that it is being addressed.

Councilor Wilson asks are we not putting the cart before the horse, by not having the answers to whether or not the area can handle the impact of higher traffic and utility issues?

Steve Winstead responds let's say we didn't have a design in front of us and all we were doing was changing the comp plan and zone. For example if we found that the traffic was so intense that we wanted to reduce the number of parking units to keep the traffic levels down. We would still be here talking about a plan and talking about an A-2. The intensity might be different based on traffic but we would still be here regardless of what the design looked like. It's just a developer that's indicated a number and he is going to have to substantiate that number working with our staff and Multnomah County.

Councilor Wilson asks with the Planning Commission was there anything that the no side commented on that needed to be fixed in order for them to say yes?

Steve Winstead states I can't really say what the Planning Commission would or would not have done. There was some questions asked from them to us and one of them was how much A-2 available land we have and that's why we did the staff report.

Councilor Wilson asks is there someone from the Planning Commission we could ask?

Mayor Daoust states they can come up during public comment and make a statement if they want. When we get into these comp plan and zone change decisions that we're up against right now all we're supposed to look at 2 weeks from now when we do make a decision is whether the criteria are met. It's hard for the public and us not to dabble into some of the site and design questions that we have because our upfront decision on site planning and zoning changes will have a lot to do with what eventually will end up there. It's kind of hard to separate the two but it is our job to make a decision in 2 weeks on the comp plan and the zoning change period.

Councilor Ripma states I understand the staff says the application met the requirements for this change. Are you saying we couldn't turn this down?

Steve Winstead replies absolutely not. That's our recommendation based on what information that we got and our own analysis on it.

Councilor Ripma asks our plan, as you said, designates where apartments should go, A-2 and so on. Our plan designated this area R-5 so I assumed it met all the criteria for R-5 when that was adopted.

Steve responds that is correct.

Councilor Ripma continues R-5 fits the plan. There is no requirement that this be A-2 it's just saying it meets the criteria for A-2 but also meets the criteria for R-5.

Steve Winstead responds yes it does.

Councilor Ripma says you had a slide that showed the density of various apartments in Troutdale at 24.4 units per acre. That looked like the highest one in Troutdale. Is this going to be the highest density proposed development in Troutdale?

Steve Winstead states based on the applicant's information to us today, the answer to that would be yes.

Councilor Ripma asks about access to this site, is it only through Woodale? Or is there going to be street access to 242<sup>nd</sup> and to Cherry Park?

Steve Winstead responds right now they want to have access from 242<sup>nd</sup> and Cherry Park. But there will be no vehicular access from Larsson. There will only be 2 points of access.

Councilor Ripma states you said there were conditions but those conditions were site and design review of the eventual proposal, a street plan, those are just requirements, anybody has to do that, those aren't owner conditions of any kind. They have to meet the requirements to develop.

Steve Winstead responds I agree. They can be a problem if, for example, they can't meet the traffic requirement. They may have to mitigate where they place those accesses. they may have to mitigate where they place their building, they may have to reduce the number of units, they may have to do all kinds of things in order to satisfy trip counts and access to 242<sup>nd</sup> and Cherry Park. That's going to occur during the site design review process. Tonight we're trying to look at it on the basic decision, does it meet the comp plan? Is a zone change an appropriate measure?

Councilor Ripma asks if we were to approve a zone change, there is no guarantee that they are going to build the development that they're showing us pictures of at all?

Steve Winstead replies that is absolutely correct.

Councilor Anderson asks do we have any other A-2 zoning in the City of Troutdale right now that is currently available? Or are we here because we don't so we want a zone change to suit?

Steve Winstead answers right now we have another A-2 across from Troutdale Market. That's the only open available land right now for A-2.

Councilor Ripma asks apartments can be built downtown, can't they?

Steve Winstead responds yes they can be built downtown through conditional use. But on availability we do not have a lot of A-2 available at this time. We're built out 85%.

Councilor Anderson asks so the answer to my question is no? We're maxed out on A-2 and we're here because we need more and this is available?

Steve Winstead responds this gets us to a point of providing more A-2.

Councilor Ripma states to Councilor Anderson I think that mischaracterizes it. We know, for instance, that Frank Windust's property could be built with apartments. And we know that's for sale. It's false to say that we have to provide A-2. We do not have to do this.

Craig Ward responds that is correct. If I could expand on that briefly. The question originally was, do we need more A-2? We have one undeveloped A-2 parcel. The question was not is there any place else in the city that you could build apartments. Apartments are permitted uses and conditional uses in other zones as well. I think that is the disconnect between what you two were asking.

Mayor Daoust states in reading through Multnomah County's input on roads I found it interesting that even though they said they didn't object, more detail was needed was at the beginning of every paragraph. They also said further review of impacts from other projects may require off site mitigation. What did they mean by that?

Steve Winstead responds when it talks about off site mitigation one of the things is where the access points are going to be. Where the driveways are going to be. Are they going to end up being a right in right out? That's how you would reduce traffic. Again, I'm not a traffic engineer. The applicant has brought his traffic engineer here tonight. Basically I'm saying that I am concurring with Multnomah County's decision that if there's a way to make it happen they can work with the applicant to make it happen. And that's what our charge is. If Multnomah County comes back to us and says during the design review process we've done everything we can but we do not agree with their plan or we do not agree with where they have their access points they can recommend denial to us on the site design review. Not denial of the project but denial of the specific design being presented at that time. There is always going to be room to deny the specific design and have the design redone or looked at in order to mitigate these issues.

Mayor Daoust asks who all is going to present to us? Is the Sheldon Developer going to present?

Steve Winstead responds yes and I believe that Sheldon has his planner and his traffic engineer here tonight. We have a number of audience members who would like to speak on this.

Carey Sheldon, Sheldon Development, states I am the development applicant for the project. We've built several of these. We build, own, and manage our own properties. It's not low income it's going to be market rate rents. I feel it's a higher end product that we are trying to build on this corner. It's a gateway to your City so we want it to stand out and be proud and look good. I'm going to introduce Rick as our land use planner and we also have another Rick that does our traffic engineering to answer questions for you and then I'll be happy to answer questions on the rebuttal if you have any for me.

Rick Givens, Planning Consultant, states I am working with Mr. Sheldon on this application. You have a very good overview of the building proposal through Steve's presentation so I'm going to be try to be relatively brief. Rick Nys of Green Light Engineering is here. He's a traffic consultant on the project so if you have any questions

relating specifically to traffic issues he can address your concerns. When we first came to look at this property we looked at it from a standpoint of does it really fit with the City's criteria for designation for A-2 development. We don't want to enter into a project that we don't think is reasonable. In looking at this property it was clear to us that things have changed in the City of Troutdale in terms of development in this particular area that warrant consideration of increasing density at this intersection. As you know across the street in Gresham is the home for the Subaru development and several industrial/commercial type projects in that general area. That argues in favor of additional opportunities for multi-family housing. People need places close to work that they can live and as you know with the pricing of housing these days a lot of people have to start out in rental housing and a lot of people choose to downsize to rental housing. This is a logical spot, it's quick access to all the services across the street in terms of commercial, quick access to the freeway and it's a just a really good location in terms of the general parameters of what we've looked at as multi-family sites. In looking at surrounding land uses, that's the other thing you consider when you look for properties like this, it was pretty clear the southern border is an issue. There's a single family development alongside the border, there's a street stub to the property. The question is can we design something here that would work from a standpoint of A-2 level of development and yet provides for preservation of privacy of the neighborhood, preservation of traffic flow and those kinds of things. We're cognitive of those things when we look at properties and we feel the answer to that is yes. Steve is correct that this is not a design review application but it is fair game to look at in general of the things you can do from the site design standpoint that make it feasible that this project could fit into the surrounding neighborhood. Really your zone change approval criteria asks you to look and consider those things and it talks about not impacting adjacent properties to the extent that it damages them and makes them not usable for uses that they're zoned for. The property owners to the east, we talked with them and they do not object to the proposal for multi-family use. The only concerns we've heard expressed have been those neighbors along the south boundary of the property. Traffic is obviously a concern as it might impact that neighborhood. This will probably be a concern for them whether it was developed as an existing R-5 zoning or rezoned to A-2. Any way you look at it there's a potential for additional traffic through the neighborhood. In this case, we believe it's a lesser impact because we're proposing that Larsson be gated with an emergency vehicle gate and there be no vehicular traffic through that intersection at all. We will provide for pedestrian traffic so people in the neighborhood could walk to the commercial center and bicycle traffic but not for cars. R-5 would call for a connection of that street through and there would be cross traffic and additional traffic through the neighborhood. This proposal there would probably not be any cross traffic at all other than bicycle and foot traffic. The other thing we considered was can we design it in a way that 3 story units don't create problems with overview of backyards, can we design it in a way where there's not immediate impacts on people in terms of noise and those kind of things. What we're proposing is setting the units back, having a row of garages along that border, having a 20 foot buffer between the garage and the property lines. We'll do some extensive landscaping and buffering in there. We believe those things in combination can make this project work well. Bear in mind that the alternative is not an open berry field. The alternative is R-5 lots, 5,000 square foot lots fairly dense with homes presumably within 10 feet of their backyard. We would be set back further than that in our proposed design. With those things in

consideration we think that the land use issues can be resolved. We understand that means going to design review to the Planning Commission. We'll have to present thorough plans for the buffering and landscape design and architectural things. Conceptually we believe this can be designed in a way that offsets the impact of having an apartment project next door. It's important to note that Mr. Sheldon is talking about a quality type product. It's not going to be low end apartments, they're designed with air conditioning and a number of things that are not normally in lower end apartments. Regarding impacts on schools, apartments in general generate lesser school traffic per household than single family simply because you get a lot of empty nesters, a lot of first time home buyers, a lot of people who are sharing apartments as they start out their work career. There aren't as many school age kids generated. The school district does not object it. The issue of sewer is one that we're aware of that needs to be studied in detail. Mr. Sheldon's engineers are looking at that. Traffic is an issue. We're proposing an exit point that would line up with the street access to the shopping center across the street. We're also proposing a right turn in/right turn out onto 242<sup>nd</sup>. Rick Nys is here and can address that. We believe those designs can be worked out. The availability of apartments including this side of the City, is pretty limited.

Rick Nys with Green Light Engineering, states I'm a traffic engineer, professional engineer, and professional traffic operations engineer. We're not really looking at the full buildout of apartments. We're really looking at the difference between the trips of the existing zone versus the proposed zone. We're not looking at the impact of 168 apartment units we're looking at the difference between the existing zone and proposed zone. We know there's going to be an issue at the Cherry Park and 242<sup>nd</sup> intersection in the future. My analysis shows that intersection will operate service F in 2040 which means quite a bit of congestion. As part of this application, that's the year we're looking at. We're not looking at the rate the intersection operates at today. As part of this application, what we're looking at is we're responsible for mitigating our incremental impact. We're not responsible for mitigating an entire project or getting a whole new section back to operating the way it should in 2040. In 2040 my analysis showed that with this project or without this project the intersection at Cherry Park and 242<sup>nd</sup> will operate level service F. It doesn't get much worse than that. Our responsibility comes with incremental criteria is to mitigate that situation without the zone change. As far as this project, we propose signal timing modifications at the intersection. Multnomah County has agreed to those signal timing modifications. That mitigates our impact. It will still operate at level service F in 2040 and we don't need to mitigate back to level service D or any other standard. Part of the reason why Multnomah County suggests that more detail is needed in the future as part of the site plan review is that more details will be provided at that intersection. We're still responsible for meeting the Multnomah County standard at that intersection as part of the site plan review.

Mayor Daoust asks when Multnomah County says that that intersection right there is at risk at dropping below acceptable levels of service in 2016 what do they mean by that? You're talking about a level F. What is Multnomah County talking about?

Rick Nys responds if you're service level D drops to service level E, it's possible in 2016 and beyond. That's something that would be evaluated as part of the site plan review.

Rick Givens states one thing I think should be noted is that when Rick talks about our obligation to mitigate doesn't mean that the County isn't going to do things as well as part of other project to improve the situation. They know they have an issue there and may address it. It's going to be an issue whether it's zoned R-5 or A-2.

Councilor White asks is there any data that shows that there's fewer vehicles/trips in apartments?

Rick Nys responds I did a trip generation comparison of the existing zone versus the proposed zone, kind of a worst case scenario. With the existing zone the trip generation would be 43 vehicles in the AM/peak hour, 55 vehicles in the PM/peak hour. With the zone change in place the AM/peak hour would be 86 vehicles and then 110 PM/peak hour.

Councilor Wilson asks how many trips are currently going up and down that street right? I wanted to see how many trips go through there per day. I often enter 242<sup>nd</sup> from that neighborhood, almost every day and there is a ton of traffic at 6 o'clock at night going through there. That's an awful lot of traffic coming up and down that street to begin with. It would just seem to me that whatever development goes in, they're going to have a hard time coming in and out of that area. I would think that even with a right turn in or a right turn out it's going to be difficult for any of that traffic to get out onto 242<sup>nd</sup> during peak loads.

Rick Nys responds the right turn in and the right turn out should be fairly easy. It's the getting out on Cherry Park Rd that's more difficult. That intersection will still be City and County standards for level service.

Councilor Allen states I can't help but notice differences, about a year ago we were talking about improvements to that intersection and improvements to 238<sup>th</sup>. We had Multnomah County and their engineers and Metro telling us that we had plenty of capacity going into the future. It might be interesting to compare what they said last year to what we're being told this year.

Rick Nys responds my 2040 analysis is based on Metro's travel plan for testing models. There's a lot of unknowns about what's going to happen.

Councilor Allen states they did say that they would make improvements to that intersection. I can't help but notice the disparity. Maybe those improvements are needed sooner than later.

Rick Nys replies what Multnomah County is suggesting is that we deal with those issues at the site plan review because we propose mitigation that meets requirements at this stage.

Mayor Daoust asks did you take into account what our own staff said that given this location that it could be argued that vehicular trips can be reduced because future

residents are walking to work, school, commercial and community services? Did you take that into account?

Rick Nys responds generally you don't assume that in a traffic impact study. It's kind of hard to differentiate between the vehicular trips and the pedestrian trips and the bicycling trips and not really having accepted methodology that everyone accepts that says how many trips are generated by pedestrians and bicycles. I took the standard trip generation and then applied that to your system. There's no transit very close by so walking and biking may reduce trips especially across to Safeway.

Mayor Daoust states for your information Tri-Met has a service enhancement plan for all of East Multnomah County and one of the things they're planning on doing is for line 25, which goes down Glisan and Cherry Park Rd, which is going to add bus service beyond 181<sup>st</sup> all the way to 257<sup>th</sup> and make it more frequent. It will be more buses going down Glisan and Cherry Park Rd in the future, when they can afford more buses.

Councilor Ripma states Mr. Sheldon mentioned that you own and operate more rental complexes like you're proposing here and I'm wondering if there are any nearby that you can identify? Or is there a website I can go to look up to see where they are? You mentioned that Larsson would be gated and emergency access only. You can't guarantee that is going to happen. You can't condition the zone change on guaranteeing that Larsson won't have full access, not just emergency only.

Carey Sheldon responds if I can get an email address I can send the information tomorrow regarding other complexes.

Rick Givens responds with we expect from our conversations with Multnomah County that we'll be allowed to get an access of some sort onto 242<sup>nd</sup>. I can't guarantee it obviously until we go through the design review process but I can guarantee that if we don't demonstrate we've got adequate services we aren't likely to get design review approval. The people who make the decision on the Planning Commission level on the design will have full knowledge at that point of what the specific proposal is, what Multnomah County's comments on it are, what City staff's comments are and they're only going to approve it if they believe that we are carrying out the requirements of protecting the values of the neighborhood next door. We think that's a perfectly reasonable assumption that gating that off to prevent parking lot traffic from going out through our local street there's no reason for it to go that direction. It would certainly be a way of allowing for foot traffic, bike traffic but just keeping the cars from not going that way.

Councilor Ripma states you also mentioned the idea of garages on the south property line. I think garages are shown on your drawing but not where the apartments are.

Rick Givens responds that one stretch there we don't have the garages shown there, at least at this time. The idea was that there's a fairly extensive amount of trees along that stretch. The apartments are set back about 50 feet.

**Mayor Daoust calls for a 10 minute break at 8:38pm and reconvenes the meeting at 8:49pm.**

Mayor Daoust states before we get to the public hearing I have a few quasi-judicial land use hearing questions for the Council related to declarations or challenges. Do any members of the Council wish to report any ex parte contact or information gain outside the hearing including any site visits?

Councilor Anderson states I believe I might know the property owner, Frank Amatto, but I can't confirm that. I just know a gentleman named Frank Amatto who I know owns property in the area. I don't know if it's him but it's better safe than sorry to put it out there.

Mayor Daoust states this is duly noted.

Councilor White states I had contact with an HOA person, Sally Savidge, at a birthday and they talked a little about the proposal.

Councilor Allen states I do have friends that live in that neighborhood and I also was at a Citizens Advisory Committee meeting where this came up and I excused myself from the room to separate myself while they talked about it.

Councilor Ripma states I have visited the site many times because there's a fruit stand right there.

Councilor Wilson states I live on the other side of that neighborhood.

Mayor Daoust asks have you all familiarized yourselves with the application in front of you?

The Council responds yes.

**Mayor Daoust opened the public hearing opens at 8:52pm.**

Mayor Daoust states before we get started I know it's standard practice for us to reach out 250 feet to adjacent property owners. In this particular case it really didn't cover very many houses or people. We followed normal procedure but I think a lot of folks that live in single family homes didn't hear about this.

Sally Savidge, Troutdale, Oregon, states that was one of my complaints in my email to you. In Cherry Ridge we have 203 homes, this affects us tremendously as far as traffic and livability in the area. I'm concerned about traffic with that many apartments going in. I would be happier with smaller single homes. The reason for it is we have a lot of traffic on Cherry Park. We lost a student at Reynolds High School last year. That's when they put that crosswalk in, even though it had been complained about for years because of the speed. The sizes of the buildings, they have some similar down on 207<sup>th</sup> and Glisan. I think it was on your presentation. That all shows beautifully when there's landscaping around it. Up there, there's no room if you're going to put that much building/apartments

in there. They don't have the lake there, they wouldn't have some of the amenities that make anything they build there look presentable to the neighborhood in my opinion. I think you need to do better about reaching out to homes other than what you're required to. I heard from a home owner about the meeting that the Planning Commission had on December 16<sup>th</sup>. They had mentioned they would be high end apartments, no section 8. They can't, in my mind, do that. To me that's discriminatory the way he presented that. High end doesn't mean just because it's granite countertops, that just kind of rubbed me wrong. I think in a matter of time the State of Oregon is going to step in and change that qualification. I could be wrong. Until we get a better idea of what your traffic studies are because this is just really a hit and miss and not clear at all. As far as the studies that they have done and the impact on the community, I would hate to see these homes built then we all have to deal with it later. That's all I can see to as what is going to happen. That's all from me at this point.

Wendy Tucker, Troutdale, Oregon, I live on Stella. I just heard about this from Sally on Thursday. Cerise is the exit point you're talking about for getting over? There's 2 points, one on 242<sup>nd</sup> and one on Cerise by the Safeway. If you put an apartment complex in there how are they going to get in and out?

Mr. Sheldon responds yes one on 242<sup>nd</sup> a right and right out and on Cherry Park a full intersection lining up with Safeway. The only driveway that goes into Safeway is directly across from 18<sup>th</sup>.

Wendy Tucker continues the driveway that is directly across from the gas station if you have right in right out you're still going to have traffic concerns. Just people going in and out of the fruit stand now in the summertime and Christmas trees at Christmas time is hazardous to say the least. A lot of times you can be turning left onto Cherry Park from 242<sup>nd</sup> and immediately you're stopped in the middle of that intersection because there's people pulling in or out of the 2 driveways that are there for the fruit stand. I went to the intersection yesterday because I've lived there for about 12 years and I know if you want to get out onto Cherry Park in the 3:00 to 3:30 hour you better use the signal light at Cerise because otherwise you're not going to get out because there's 35 school buses passing. School buses that back up past the Cerise signal light which is the next signal light east on Cherry Park. Traffic on 242<sup>nd</sup> at that time of day is very bad in the 5-6 o'clock hour. Even the R-5 homes that the HOA would prefer is still going to add traffic to that area. 160 apartments or even 150 apartments is more traffic than I think that neighborhood can handle. I'm also concerned about the impact on the sewers. They said that Multnomah County and Public Works did a study. I don't know what that means but can our sewers and our water handle that additional impact? Reynolds High School, I live on Stella, I am on the road that goes between the park and McDonalds and I can tell you our HOA has had the Reynolds principal to our meetings because of the students passing through there. We've had a few break-ins, graffiti and mostly trash. I think that the impact to Reynolds High School and to my particular street just from the trash would be difficult. I can see a decrease to our property values if we have a 3 story apartment building there. I see an increase to property taxes as well.

Paul Charpentier, Troutdale, Oregon, states this property was originally zoned R-5 and there was a reason for that. I don't see why we would change it. There are houses on 3 sides of it. You have high density apartments right across the street from a high density shopping center and another one on the other corner. The traffic, I was making a left hand turn last week and I was nineteenth to turn left into Gresham. You have to wait two lights constantly. If this apartment complex is 168 versus 42 cars you're going to have 500 cars parked in the complex there. My granddaughter and her mom live in an apartment complex on Highway 26 and their parking lot is constantly full. You can't find a parking spot in there. People park out on Highway 26 that live in the apartments because they're full. There is nowhere else for them to park around here unless they start parking their cars in the neighborhood. Subaru is going to have 2 or 3 semis an hour going in and out and they're only going to have 30 employees. We just voted for school improvements and expansion to the high school. There could be 200 more kids going to those schools. The property right next door to them west is vacant. Are they going to put apartments in there too eventually? We don't know. What are we going to do if it doesn't make Troutdale a better place to live? And last, if it was in your neighborhood how would you feel if this volume of apartments went in?

Ryan Richter, Troutdale, Oregon, states I live in the house right on the corner of Larsson and 22<sup>nd</sup> Street. I would argue that there is probably nobody that this is going to impact more than me and my neighbors. One of the things I would propose is better notification to the other surrounding residents. 250 feet is not enough. It's going to impact far greater than that. There's a lot of people I talked to in the neighborhood who have concerns but didn't realize this was going on, didn't get the letter, maybe missed it over the holiday season. If there's a way we could possibly post something at the field notifying residents where to go for more information that would be appropriate. I bought the home in 2013. It was a short sale. I bought it because one, I could put some sweat equity in there and build up the value of the house and live in a neighborhood. Just down the street there are kids that ride their bikes and play on their skateboards and play basketball. I've seen in the past with a lot of apartment communities they build them and there's a lot of units in there but there's not a lot of parking. If there's 168 units they're all going to have cars because they're going to have to go a ways before they get to a bus or Max lines. If they all have cars, they have friends visiting, this overflow parking is going to spill right into my backyard. It's going to be all through the neighborhood there. So these kids that are out riding their bikes and playing basketball and it's going to be a safety issue for all these other residents that are in the neighborhood that have existing homes and kids playing on the street and now you have all these other cars zooming around, making shortcuts, trying to cut through to get out and avoid the light. In addition to that, we're making estimates on the traffic based on what we're forecasting for the Subaru plant that's going in there. We don't know for sure the true impact yet. Gresham is planning some development for the Springwater Corridor with industrial use and once that takes place a lot of that's going to be flowing right down 257<sup>th</sup> and 242<sup>nd</sup>. I think that's going to make that area even more congested. I urge you to pump the brakes a little bit and do a further study, put the sign out on the property and let more residents know. Thank you.

Gary Cohen, Troutdale, Oregon, states I live a few houses down from Ryan Richter. I've lived there for 22 years. When I first moved in, single family and berry fields surrounding

the whole area. I've seen a lot of changes. By the City's own criteria on your comprehensive plan, it states there are 4 criteria that need to be met in order for this land to be re-zoned. One, you need to have retail shopping. That is the only criteria that has been met for this proposal. Employment status, Subaru center is only going to employ 30 some people. The businesses in the Safeway shopping center already have employees. I highly doubt that there's going to be much more opportunities of employment from there. Transit as of right now, there is no bus. The closest bus is 6/10 a mile to the south on Stark or a mile to the west or a mile to the north. And lastly it requires a minor arterial. 242<sup>nd</sup> is not a minor arterial. These are criteria by your own standards you have said must be met before it can be re-zoned. These are criteria that you have already made that are required for this proposal to go forward and be changed. As far as traffic, 242<sup>nd</sup> is already an extremely busy thoroughfare. For years the City of Gresham and the City of Troutdale have grappled with this problem of what do we do to create a bypass. The traffic, especially in the winter, is incredible. There have been times where I've been waiting to get through the light and traffic is backed up halfway to Stark Street. I live in the Woodale subdivision. When I try to turn right onto to 242<sup>nd</sup> there have been times when I've had to wait 2 minutes just to get out. And if you want to get onto Glisan Street that's impossible now. You have to go down to the light at Cherry Park, turn right, turn into the Safeway shopping center, do a U-turn, come back out and turn right onto Glisan just to go west on Glisan. That's how bad the traffic is now. We're talking about adding 168 unit housing development right in right out. What do they propose for the people coming from the north going back to this apartment complex? They're going to be making a left hand turn at that light. Already there have been times when I've come up the hill from Halsey and there is traffic backed up because so many people are wanting to turn left. Now you're adding however many more driving trips and more people wanting to turn left. The only entrance to this property is going to be across from the gas station entrance. So you're going to have this long line of traffic turning left and then immediately they're going to be turning right. The traffic signal at 242<sup>nd</sup> and Cherry Park can barely handle the traffic at present. When I was here at the Planning Commission, the Metro traffic representative stated that yes we can mitigate that by changing the timing signal. Give me a break. Changing the timing signal on the traffic light? That's all you're going to do? For years we tried to come up with alternatives such as to widen the road because that's really our only viable alternative to this traffic problem. But that's never going to happen given the constraints. We couldn't do it 15 years ago, we're not going to do it now. When I look at everything together here, the traffic, the reduced property values, possibly compromised safety for both children and homeowners there is nothing to warrant a change in re-zoning here. If you look at the map from Cherry Park south to Stark Street, 242<sup>nd</sup> east to 257<sup>th</sup> there is no high density apartments there. It's all single residential houses. Why are we going to stick this high density apartment complex in this very poor location? Just because we can? This is the wrong intersection to do this in. I would say that we reject this proposal for re-zoning and leave it as single family. At the Planning Commission there was one letter that was read that was in favor of this and indeed the letter that was read, not by the people that wrote it but, they stated they were in favor of the planning change in hopes that they're land would also be re-zoned because they own a very sizable property and I'm sure they would be happy to have it re-zoned so they could sell their property at a handsome profit.

Sam Barnett, Troutdale, Oregon, I wasn't planning on speaking tonight. I did not know this was going on. I don't live within 275 feet of the area but this would affect me. First off I'm sad to see another field go away. I'm wondering what's going to differentiate us from Portland and Gresham in the future when all these fields go away and we're just covered in concrete, parking lots, apartment complexes, duplexes, beauty salons, and Papa Johns. This is a horrible idea. Are you kidding me? This is just not an apartment complex. This is the highest density housing in Troutdale that we're proposing to do going from the R-5 into the A-2. 242<sup>nd</sup> has one lane moving north down that winding road where you have the 4 foot curb. It's one lane going to down that hill. But it will all be fixed by 2040. 2040? There's going to be a 20 foot buffer from the garages and neighboring homes. The homes, if it's R-5 is going to be much different. It's going to be 20 feet from a backyard to the fence. There's no difference. We're looking at 137 apartments, we're looking at the zone change. You mentioned easy access to the freeway. Where is that easy access? Down 242<sup>nd</sup> to I-84? It's not easy now. And it wasn't easy before the pothole. There is no easy access from 242<sup>nd</sup> to the freeway, it's one lane, it backs up all the time. I do everything I can to avoid 242<sup>nd</sup> to go down to I-84. What's the option, 257<sup>th</sup>, Cherry Park? We all love our fields and we're sad to see them go away. We love our open spaces and it seems like we should be very grateful for Metro because without Metro we're not going to have any fields left here in Troutdale. Please consider keeping it R-5. I don't think we have room for this complex, much less the highest density housing in Troutdale at that intersection.

**Mayor Daoust closed the public hearing at 9:19pm.**

Mayor Daoust states now staff and developers can address. One of the questions was could there be any Section 8 housing so you might want to address that. And the overflow parking issue with the neighborhoods.

Rick Givens responds Mr. Sheldon doesn't plan on putting in any Section 8 housing in this development. Rents will probably be too high for that type of housing. It's not a discriminatory thing. I'm not aware of any state or local ordinances or statutes that would require him to do so. The issue of off street parking and parking in other neighborhoods, Troutdale has a very high requirement for the amount of parking. A lot of jurisdictions allow maximum parking spaces so you could end up with one and a half spaces per unit. Troutdale is still requiring not only 2 spaces per unit but 2 and a third. I would say we have more parking on this site than any other comparable sized project that I've ever done. I think there's going to be ample parking. I would say your standards will ensure there is ample on-site parking.

Councilor Wilson asks on average each one of these buildings is going to have 24 apartments in it. Can you tell me how many total parking spaces are planned there?

Rick Givens responds there are a total of 230 standard spaces, 133 compact spaces and 30 garage spaces equals 393 total spaces for 168 units. Gary Cohen talked a little bit about the criteria for placement of A-2 zoning and said it wasn't met. Actually it more than meets the criteria. I wanted to clarify that. The plan list for areas may be designated for SDR obviously the first one does not apply. The second one says the areas adjacent or

in close proximity existing or planned shopping centers, as you know there is one across the street, employment centers, there is quite a bit of employment in this area in close proximity. We have to meet 2 of 3 criteria. Transit routes, we're not only adjacent to an arterial, it's a major rather than a minor. 242<sup>nd</sup> is a major arterial. I don't think Mr. Barnett understood the comment about 2040. That's simply that when you're doing the zone change plan amendment, traffic planning rules require that you look out at least that far. You have to look at the impact. Not just what's happening now but what it will be in 2040 in this case.

Steve Winstead states Mayor, I think you said it very well when you started out as saying it's difficult to separate the design from the actual planning. You do have a tough decision to make and we're going to do this again in 2 weeks. One of the things I take away from this is the fact that maybe just the 250 feet is not enough. That's our minimum standard. That's what we have done. In the future you'll have the opportunity to look at our development code and to suggest some things that would help us with better notification.

Councilor Allen asks how much time did we give people? How many days of notice did we give people?

Steve Winstead responds I believe we gave people 10 days.

Councilor Wilson states it was a 3-3 vote. Of the people that voted no is there anything that they would've desired that would've changed their mind?

Taney Staffenson responds it came through 3-3. We were missing a member so there wasn't a 7<sup>th</sup> there. I didn't believe there was going to be any decision made that evening that was going to change anyone's vote. I will say this is a really difficult application. We did our best to be thorough and go through it. I will say it was also difficult for us to not look at site and design and how many apartments and anything like that because that wasn't our responsibility with looking at comp plan. Additionally we did look at the traffic study and that also isn't a direct factor in our decision because that comes under consideration when the application is forwarded. When the application comes forward that's when the County chimes in and Public Works as far as street access where it's going to be, how many cars are allowed that type of thing. More than the zoning is what it can handle.

Brian Sheets states just to inform the council I was one of the people not in favor of this. You asked what would change my mind, it would be if it was in a different location to have something increase the intensity to A-2. I just didn't think the location was an appropriate place to increase the intensity above R-5. I was able to separate out the site and design review portion of it. We had a great presentation about proposed site but you can break that out and look at this as an exercise where you ask for something small then you ask for something more and ask for something more. If you come to understand that part of the process it was easy to not even have a site plan to understand it didn't matter what was probably going to be put there. It's probably not going to help the livability of the community. That's how I rationalized it. There were 3 other people who didn't agree with

me and probably 2 other people that may have had different ways of going about it. But that's how I came about it personally.

Taney Staffenson states we received a lot of testimony as have you regarding a number of factors.

Councilor White states I had the privilege to attend that meeting and I just want to compliment you guys on your thoroughness and professionalism. Excellent meeting.

Councilor Allen asks Mayor Daoust I wonder if you're willing to work with staff and see if it would make sense to increase the area in which we give notification for this. I understand we did what was required but should we do more? I would like you to take a look at that if you would. The second thing is a reminder from our attorney may be in order to the Council as far as what our obligations are just to keep us out of trouble. What can we do what can't we do.

Ed responds let me do it very briefly right now and I may send you an email. Generally speaking you're in the middle of deliberations in a quasi-judicial hearing. If anyone approaches you to talk about it you will have to disclose the ex-parte contact at the next meeting and the subject of the contact. It would be better not to. Keep an open mind in the meantime. It would be best not to deliberate with anybody else but if you do need information do it through the email system and have staff get it to you so there is public record of it. It could be included in the record of the hearing in case there should be an appeal that keeps there everything above board and everybody knows what's going on. The best practices would be to not talk about it with folks in any way that you're not prepared to come in and bury your soul to the public at the next meeting.

Councilor Anderson states I have one request, it would be helpful to have the minutes of the Planning Commission for those of us that weren't there. Not the exhibits or anything just the testimony and the feedback from the Commissioners.

Craig Ward states there is an underlying question which is have the minutes from that meeting been prepared. I can't give you a straight answer to that. If they have been prepared and hopefully approved by the Planning Commission, because until that happens they are just draft minutes. We will certainly forward them to the Council per your request and we will forward them to you when they have been approved by the Planning Commission. I don't know when that might occur.

Taney Staffenson replies we will do our best to do that next Wednesday.

Councilor Ripma states I remember someone saying the audio is available. If we want we could do that. I also wanted to say you mentioned there are 2 more opportunities for the public to speak on this. There's really only one and it's 2 weeks from today when we're going to be deciding the issue of the zone change. There'll be future meetings after the zone change as followed out by an application for approval and a plan there will be other opportunities but there's really only one more opportunity for the public to weigh in on this zone change and if there's neighbors you want to contact and spread the word.

Councilor Wilson asks can we get a mailing out spreading it out farther about the next meeting on the 26<sup>th</sup>?

Craig Ward asks how far out would you like us to draft that? We have to pull a mailing list from the County's property owner's database. That's how we create the mailing list and we use GIS to identify the properties that fall within a 250 foot radius or essentially at the edge of this property. If we're going to use a different number and send out mailings we can certainly do that but you need to know what that number is.

Councilor White states I understand the circumstances here the way the site is drawn out but I don't want to create a precedent where if we do it for this project then they will expect it for other projects. I'm okay with notifying more people on this situation but I'm just worried we're going to make a precedent and we're going to have to do it for every project.

Mayor Daoust states you would almost have to go out a 1,000 feet if not more to get to single family homes that are in the Cherry Ridge neighborhood. An adjacent block or so beyond. Forget going beyond Safeway that's even more than a 1,000 feet. I'm talking the neighborhoods to the NE the South and the East. Just so you capture a couple blocks going each way. I think that's more than 1,000. A 2 block additional radius.

**7. MOTION:** A motion authorizing execution of an Agreement with Grey Line for Dedicated Parking.

Craig Ward states this is an odd situation, one that I'm not aware, the City has ever faced. A representative from Grey Line is here tonight and came to me 3 months ago and introduced a notion that they would like to provide a service to essentially tourists in The Gorge for hop on and hop off bus service. Therefore people would not face the challenge that we all know that they have of finding parking in the Gorge if they want to see it. If they've flown in from someplace else they can get a bus in Portland or they could drive a car to Edgefield or they could drive a car to Downtown Troutdale and they could park their vehicles with the confidence that a 35 passenger coach will be able to take them and enjoy their day in the Gorge and return to their parking location. So their proposal to me is noted in Exhibit A of the Item 7 staff report. Concentrating on the parking lot that's across the street due west of the old City Hall. They were looking at and have proposed and requested that they be allowed to use 10 parking spaces. They also requested that their coaches be provided dedicated space on the Historic Highway in the location shown that's currently designated as motorcycle parking. During the 2 ½ months every summer that they want to operate this service they would be dedicated to their exclusive use. That means the coach has a place to pull in and their customers have to have a confidence that that's where they will be meeting the bus. We don't currently have any arrangement with any of our downtown businesses or any other vendor for reserving public parking spaces for their exclusive use. The costs of the number of parking spaces is not excessive in my opinion. We do set a bit of a precedent for saying you pay us a dollar a day and you can reserve a parking space in our downtown. Granted these are not in high demand parking spaces. It's also proposed to be a 2 year pilot project essentially with a clause that if it wasn't working in the first year, which would be this summer, they could terminate

the contract and walk away from it. At the end of 2 years we too get to determine whether it's working for us. We then engaged in some discussion with input from staff about what the reasonable rate would be for these parking spaces. They're proposing a dollar a day. The only models that I could come up with were essentially parking meters in Portland. That I don't think is a fair comparison with the demand for parking that we have here. There is no methodology to come up with a rate. They're proposing a dollar a day for the 10 parking spaces and my sense is that if the parking is going to be in the old City Hall parking lot then that's the place that the coach could pull in rather than take up parking spaces which I believe are most valuable along this Historic Highway particularly in the summer. How many spaces they would need for the coach to be able to park hasn't been determined. I estimated 2 here as a viable option. There are currently 20 parking spaces in that parking lot. I have not, since we stopped using City Hall on a regular basis, ever seen more than 5 or 6 cars in there except on days like Summerfest or other days where we really have quite a bit of business. There was some discussion with staff about well they can use it anytime but during Summerfest but that isn't going to work for them. They have to print a brochure and advertise it to their customers and they have to be confident that they have dedicated parking spaces. The total amount of money here we're talking about is going to be less \$1,000. It's not really about the money. It's about the precedent of dedicating public parking spaces and essentially leasing them to a vendor for a period of 2 summers. I didn't prepare an agreement, I've already detailed the rough terms. I wanted to bring it first to you. We can sign a simple letter contract with the terms I've mentioned here and execute it. I don't want to do that if the Council is uncomfortable with the precedent. Any of those items, the number of spaces, the rate per day, whether or not they use a dedicated spaces on the Historic Highway, or take my recommendation which is we just rent them a couple more spaces in the old parking lot. All of those are questions that you can direct me to proceed with. If Grey Line is going to do this they need us to make a commitment so they can get on with advertising this service. Grey Line has spoken to the Chamber of Commerce. Mr. Cruz isn't here today but I understand that the Chamber is supportive. This will bring in additional customers every day to our downtown who will I'm sure take advantage of shopping and eating opportunities in our downtown. The pilot project I doubt will have any conflict with our ambitions for City Hall once we determine those and move on with whatever the subsequent plan will be so I don't see that as a being a particular problem. I see this as an opportunity, minimal cost, minimal impact on businesses but it does set a precedent that concerns me and that's why we're here before you today. The representative from Grey Line is here if you have questions.

Mayor Daoust asks if you wrote up an agreement today it would be dedicating 10 out of 20 parking spots in that parking lot?

Craig Ward responds for their parking and probably a couple of additional spaces for the coach to be able to pull in and park, so 12 altogether.

Councilor Allen asks what are the hours of operation?

David Duncan, with Grey Line, in answer to your question I brought a picture of the vehicles that we're proposing to use. They are 35 foot coaches that were built in 2008 and are replicas of what are called national park buses that were built in the 1930s. What

we envision is that there would be 4 departures a day from Troutdale. The first coach would come out in the morning loading in downtown Portland from where we operate from Pioneer Courthouse Square, come directly to Troutdale with a stop at Edgefield Manor and then hopefully downtown Troutdale. The vehicles would proceed east on this Historic Highway to milepost 35 and coming back on Interstate 84 and repeating the cycle 4 time each day to allow for a hop on hop off service to alleviate traffic in the Gorge. As most of you are aware it's the 100<sup>th</sup> anniversary of the highway coming up and we're working with ODOT on this program as well. The vehicle itself being 35 feet with it in a sense would need the same as 2 standard parking spaces that you would have for an automobile.

Councilor Ripma asks have you seen this lot? I don't see how that bus can go into that lot.

David Duncan responds the bus would be curbside. The lot would be the 10 spaces for parking. The parking spaces we're requesting are in the City parking lot. The coach would be an accident waiting to happening pulling in and out of that. We need to identify a place where we could have a designated loading area. It would only be there a matter of 5 or 6 minutes to unload and reload to proceed again.

Councilor Wilson asks you're stopping at McMenamini's? Are they charging you for the spaces that the people are going to use at McMenamini's?

David Duncan replies no they are not. Actually they're quite enthused about the concept because they want to create packages with this where people will hopefully have breakfast there before they leave or lunch or dinner. Or overnight lodging etc. so they see this as a benefit of another service that they can sell as part of their property.

Councilor White states I know one of our goals is tourism but another is to find parking for our downtown. We're really stretched thin for parking. I think there are better locations that don't involve tying up public parking spaces. I love the idea of having the bus come into town and bring new people to our town but I can think of a hand full of better sites that would be private property. I don't think they're going to be too interested in a dollar per spot. That seems like a really low rate. Dean Hurford's lot for example kitty corner from Plaid Pantry that's a huge area. You could pull a whole bus in there. You could probably get 30 spaces.

David Duncan responds in answer to your question, we've identified numerous places where there's literally hundreds of spaces. What we wanted to do is look at Troutdale being the Gateway to the Gorge and the historic nature of downtown and the historic nature of the vehicles does seem to be a natural fit where people could come into Troutdale in the morning, come back in, go through the shops. So the idea is it would complement the downtown Troutdale area. It would be mutually beneficial. That was the whole purpose.

Councilor White states we had a similar conversation trying to get tour buses to pull into our museums like our Barn Museum. Staff was working on that. I don't know if that would be a viable option or not. It would be new parking instead of taking away existing parking.

We have a lot of activity in that area. We have a winery going in, the Discovery Block is being developed that's only going to get tighter. Especially with the highway's 100 year anniversary.

David Duncan responds we've already looked at that and talked to them about making that another stop or attraction. We've been operating Columbia River Highway tours for 5 years. We operate 7 days a week during the summer operating season with 47 passenger motor coaches. We've been selling those out the last 2 years. We've really learned what the market is where the potential is for expansion and we're very enthused about the prospects for this. Our hope is that we can make downtown Troutdale that natural gateway to it.

Councilor Allen states I didn't really catch the hours of operation.

David Duncan responds we're looking at the first departure from Troutdale at 9am, second one at 10:30am, third one at 12:30pm and the last one at 2pm. The last return to Troutdale is 3:30pm and head back to Portland.

Councilor Allen asks is there a layover in Troutdale at all? Or is it a spot to load, reload and depart again. Kind of like the park and ride.

David Duncan replies in this case we start with a single coach doing a 2 hour loop, so it only allows a 5 minute layover in Troutdale.

Councilor Allen asks is there any chance that the Councilors here would be willing to look at our parking within our downtown area as a whole? Can we do that? Does it need to be in an executive session or open meeting? We should be looking at this.

Mayor Daoust asks you're not talking this year? You're talking in general.

Councilor Allen responds we have a number of things going on that take up spaces and it's been a problem for us.

Councilor Wilson states this is probably one of our most under used lots in the City. If you didn't have this for them they would be parking on the street and be there all day. In my opinion if it's a pilot program then it's a pilot program and in a few years if it's not working for them or it's not working for us it would end.

David Duncan states we've already published 2016 hop on hop off trolley brochures. We have 2 more in the works including this one. We're participating with Travel Oregon at the ITB conference in Berlin which is the world's largest travel show. We're getting a lot of international travelers so we want our Gorge shuttle program with the brochure for that and that show starts March 9<sup>th</sup>. I'm already working on 2017. To answer your question we need to know exactly what our infrastructure is probably within the next 7 to 10 days.

Councilor White asks has our business community been reached out to with this idea?

Craig Ward responds only speaking to Claude representing the Chamber. I don't know what outreach they may have done. I will state that when David first came to me he was talking about using the parking lot adjacent to Mayor's Square. That lot is actively used by our local businesses. I think the other alternative that I considered is the parking lot north of the highway at Depot Park. That would be highly visible but when you take up 10 parking spaces we only own the parking spaces on this south side of that lot. There really aren't sufficient parking spaces there. The notion that they could park on the street they could potentially do that but we still need a location for where the coaches park and where they're all going to get together. It seems to me that the parking lot at old City Hall is the least used parking lot in our City. He wanted this agreement back in November but because of our schedule it kept sliding. I regret the pressure is on you to make a decision.

Councilor Ripma asks are the 10 spaces going to be marked somehow?

Craig Ward responds yes we would have to mark them. I would require them to pay for the cost of doing so.

Councilor Ripma states this seems like a wonderful program. I love the buses. Yes there is some risk that it would cause congestion in the parking lot. For a 2 year pilot I would go for it.

Mayor Daoust states this is the most underutilized lot in all of downtown so it makes a lot of common sense. We've been thinking of ways to get people off the freeway and into downtown Troutdale and you guys are doing it for us.

Councilor Anderson states I like the idea for all those reasons. I hope that if we do this that the Chamber, and I trust they will, will leverage it with our downtown businesses in a form of a coupon book to encourage people to stay. I'm not really comfortable with jumping in for 2 years. I would like a 1 year with a 1 year review. I know that they haven't opted out if our operating plan changes significantly they cancel. We might not want to cancel but we may want to modify. I think this would possibly be a big benefit for our business community. I think we should go forward with it with a 1 year review.

Councilor Allen states I like the idea of considering a year because I like this idea but I wish we would as a Council address parking in general in our downtown area. It's a problem now and it's about to be a worse problem. Quite frankly, 2 years out from now I don't know how bad it will be. Maybe a year as a compromise is a risk. I would really like us to take a serious look at downtown parking.

Councilor Wilson asks don't we have a map, an overlay of downtown with a parking study being done or proposed?

Tanney Staffenson responds it's in the CIP list.

Councilor White states I think it would be a mistake to do this without input from the business group, the businesses that are on that street. I would really like to hear from

them. If that's your business and you're relying on those spaces. They're extremely important. Maybe we could hear from some of them right now.

Laura Burleson, owner of The Troutdale House, states I have the wedding venue. I bring 300 to 600 people every weekend from May to almost all through October. That's a lot of people who need parking and I know they use that lot. With the winery going in, they're going to use that lot. When I first opened The Troutdale House all the businesses yelled at me saying to me where are all my customers going to park? But it's my lot. I see a huge issue.

David Duncan states the schedule for the Grey Line proposal is Thursday through Sunday.

Laura Burleson states there are going to be more businesses coming in, townhouses are going in. Parking is pretty thick already. I love Troutdale and I love the idea of tourism. We need a garage or something.

Rip Caswell, owner of Caswell Galleries, states I want to say I'm really conflicted. On one hand I'm really excited about what he's doing. I love the idea of the old park cars and bringing in tourism. I'm 100% in favor of it. I wish there was a way that we could add some new parking for this to happen. I think it's something we should invest in and try to make a partnership happen there. I know that the Calcagno Winery's counting on that parking lot as they are going to be investing a lot of money in renovations of that building. They're going to be attracting a lot of people to their winery. I know that was a consideration for their picking that location. We are so limited in parking right now. If the last riders end at 3pm, can that lot be used after that?

David Duncan responds in theory it would start arriving at 8:30 or 8:45am. The last ones that would come in they would get off the last bus, go to their car and be gone by 3:45pm. In a realistic matter yes unless some go to the antique shop or other businesses. My guess is that most of those cars would soon after the last bus came in. You may have some stragglers that are going to go have dinner or something like that.

Rip Caswell asks could the signage say from 9 to 3 and then after that and before that it would be available to the public. That would make a big difference. There's a lot of people that come into town for wedding events, for the wine tasting events are usually in the evenings. First Friday Art Walk I've seen that lot packed full clear up to 3<sup>rd</sup> or 4<sup>th</sup> Street now. If it was available after 3:30pm or something that would make a big difference.

David Duncan responds the last coach is due back in at 3:30pm so in theory by 3:45 or 4 o'clock is when they would realistically be available.

Laura Burleson states I think that would work.

Frank Windust, Troutdale, Oregon, states I think that's the biggest mistake I've heard made in this City for a long time. There was a traffic study done about 10 years ago and it was about how there is a problem of parking in the City and Troutdale was going to

have to put a stop light in by Buxton Road where the road comes down. Things are booming and things are crowded now. I built 13 townhouses at the end of 2<sup>nd</sup> Street. Just right in front of me there's an apartment complex right up above City Hall. There's 10 units there and a duplex and an old house there. And they have no legal parking other than parking along the street. In my townhouses everybody has 2 cars. I even have a tenant who has 3 cars. You can't even drive down 2<sup>nd</sup> Street to the cul-de-sac to turn around. Townhouses are being built on 2<sup>nd</sup> Street now and everyone is assuming that they're going to park underneath in the garages and they also have the parking lot in front of them. But what you don't know is these people don't park in their garages. They use those for storage. All the cars are parked along the road. When everybody's home from work you can't even drive down the street. Then they have a wedding going on down below and they're parked 3 to 4 blocks up the street. It's a mess down there right now. I see in front of the old City Hall someday someone might do something with that. Just a block west of mine there's another 12 units. It's the same way. They don't park in their garages. They park on the street. The roads are not adequate for 2 cars. You're going to have a mess there and once you get it so far along then you can't do a thing about it. I think this is the stupidest thing I've ever heard of. People have trouble parking now. The streets are plugged with people. You get a good summer day, you have Summerfest, it's going to be a total mess. I went down to Public Works to see if I could get a copy of that parking study that was done that the City paid for. It should be something to be looked into by the City. It's a mess and I don't know why the Council can't seem to see that. It's only going to get worse.

Councilor Allen asks can we use some of the parking behind old City Hall? If not for the public maybe for City vehicles? It's kind of secluded so you would probably want cameras on it.

Craig Ward responds if we invest money to create a parking lot behind old City Hall yes we can. Right now it is a dirt lot which is not capable of handling much like the lot Councilor White is referring to down the hill. That too would cost a considerable investment in order to turn that into a parking lot. Any parking lot we have needs to be an impervious surface, needs to have appropriate drainage, and have storm water. They all cost money.

Councilor White states there are exceptions for seasonal uses like Edgefield for example. With their concerts they're parking on dirt. I think that's the kind of attitude we're going to need to solve this problem. Seasonal parking anywhere we can get. I would be in favor of looking at any unused city owned property or bare lot. Gravel it up and let's allow people to utilize it during our busy season. Especially with this 100 year anniversary coming up.

Mayor Daoust states we're coming up with a lot of long term parking ideas and that is separate from the issue but related for the longer term. In my mind there are months that are restricted for the use of this bus and bringing tourism into town. It's not year round. It's the most underutilized parking lot in downtown Troutdale. The few businesses that spoke seem to think it is okay, it can work. If we have a 1 year pilot and then reanalyze it I think we should go ahead and bring the old buses and the additional people into downtown Troutdale. That would be my preference. I think it's a great idea. I know we have a long term parking problem. Everybody know that. Every City does.

Councilor Wilson states I think having a 2 year program with a 1 year opt out would better service us.

Councilor Allen asks would you entertain us meeting as a Council within the next 4 months to have a serious discussion about parking? I like the 1 year pilot idea.

Mayor Daoust asks are you okay with 2 year with a 1 year opt out?

Councilor Anderson responds I want to review that through the year.

Mayor Daoust states Councilor Wilson is recommending a 2 year with a review after 1 year where we could opt out.

**MOTION: Councilor Wilson moves to make an agreement with Grey Line for a 2 year program on our underutilized parking lot for 10 spaces and a spot for the bus with a 1 year review and 1 year opt out by either party with limited hours of operation. Seconded by Mayor Daoust. The motion passed unanimously.**

**8. DISCUSSION:** A discussion regarding at large vs. by position elections for City Council.

Paul Wilcox gives Council handouts which can be found in the meeting packet.

Paul Wilcox states a few weeks ago I proposed this idea to the Citizen's Advisory Committee. They forwarded the idea to the Organization Review Subcommittee. On December 8<sup>th</sup> the Subcommittee talked about it and the Citizen's Advisory Committee also discussed it briefly. The Subcommittee was going to take it up again this evening but the meeting was canceled. In the aspect in timing, it's a good possibility that this will require a Charter amendment. To be in effect in November's election this needs to be on this May's primary ballot. This is probably less commonly called plurality at large but that could be a little confusing so I'm going to clarify the language. At large generally refers to where voter's vote for every open seat or open office. Plurality means whoever gets the most voter wins. I'll read a definition first so you know what I'm talking about. Plurality at large is essentially an alternative term for block vote. From here on out I'm going to call it block vote. Block vote is a voting system used in multi member constituencies where voters can elect more than one representative in each constituency. Voters can cast as many votes as there are available seats. In my chart the 2 columns list the Tri-County Cities that use either one of the two methods. I also have listed Cascade Locks and Hood River's trending. As you can see from the 2 columns they are actually pretty evenly divided between the 2 methods. A couple footnotes I should have added to Position column is that Hillsboro actually has Wards. Also if you look at the Position side of the chart I review a couple different elections years, 2014 and 2012. What the 2 sides of the chart indicate is the Position side first column for each election year is the number of positions open. So if you have a 6 member council that elects 3 every 2 years I'm showing 3 available positions and likewise on the At Large side. The second number after the

comma in each column is how many candidates ran in that election. If you look down at Troutdale in 2014 you had 3 positions open and you had 6 candidates. So under the Position method that's probably your ideal. You have 2 candidates in each of the 3 positions. My other footnote applies to Sandy in 2012. You've also got 3 openings and 6 candidates. You have a distribution problem with candidates there. That particular election distribution was actually 3 candidates for 1 position, 2 candidates for another position and 1 candidate for the third position. So you had an elected incumbent and I'll give you one guess on which position that was. It was the one that ran out of votes. My point is that incumbent had been unopposed in a previous election and someone came along and opposed them. They were probably an easier target.

Councilor Allen asks do you know why they were unopposed. Were they doing a good job?

Paul responds in a previous election when they ran in 2008 they were elected unopposed and they were challenged. At the At Large side I'm using a different standard of what constitutes a fully challenged slate essentially. North Plains, 2014, you have 3 openings and 6 challenges. Under the Block Voting system its irrelevant how many challengers there are versus openings because you're balancing vote for the top 3 however many challengers there are, you're not aligned one on one within the position because there are no positions. So in that scenario, most cities in Oregon have a 6 member council. For every position to be essentially at risk, all that's required is 4 candidates to run. Obviously 2 of those are going to beat their seats considering there are 3 incumbents. Obviously only 1 of them can be replaced if there are 4 running. The 3 incumbents don't know who is going to lose. I'm looking at 2014 Troutdale election. It's kind of your ideal under the Position system. At 2008 through 2012 you had 3 elections over a 6 year period where you had 9 positions of re-election. Out of those 9 positions the voters had a voting in choosing 3 of those. 3 out of 9. The other 6 elections were unopposed positions. The 2008 is interesting because one of the candidates had been defeated 2 years earlier. You have to wonder if that candidate was really the people's choice. Since there's a lack of challengers there isn't much say in the matter. As far as the Block system applying to that particular election we had 3 opposed candidates. I would say to become a fourth candidate under the Block system you would actually technically force those other 3 candidates to actually campaign and convince the people they were to be elected.

Mayor Daoust asks is it your idea that going to the Block system would attract more people to run for office. If they didn't have to run against an individual that all they had to do was get the most votes. Is that part of what you're thinking? Would it attract more people if we got away from running each other but went to the Block system the way you describing it? Is that part of your thoughts?

Paul Wilcox responds yes you could put it that way.

Councilor Allen states at this point I have a correction on 2010. I know something about this. You have Allen vs Hudson, Fox, Canfield and Pilcher, to be accurate and prove your point it was actually none vs. it was an open seat. There was no incumbent on that

election. The only person who had previously served on the council at that time was Canfield.

Paul Wilcox states that could be a little confusing. I see your point. The reason that your name is at the top is as the winner is on the top line.

Councilor Wilson states if you look at 2014 none of that would have changed in a Block system.

Paul Wilcox responds possibly not. I have a reference for that also. In 2010 when you have an open seat versus an incumbent held seat your challengers seem to flock to the open seat. That's rather apparent here. You have 5 candidates running for an open seat and the only person that took on an incumbent was Lora Lawrence in Position 1. Lora Lawrence got a free ride that time around. Something interesting about that particular race is that Lora Lawrence got as many votes losing than Councilor Ripma and almost as many as Councilor Allen and Pilcher combined. So when you have a 5 way race for a single position you only need 20% plus 1 to win. Where Lora Lawrence needed 50% plus another win. It's quite a challenge.

Councilor Wilson states under the Block system Lora Lawrence would have been on the City Council.

Paul Wilcox responds that is correct. That was one of the things I meant to say before I started into the election analysis. You guys got in fair and square into the system as it stood. In 2012 you had essentially 2 incumbents running unopposed. You had Councilor Wilson with 2 opponents and went to a recount with a 4 vote difference. I'm thinking that if that had been a 5 way race that could have easily gone a different direction with a race that close. On 2014, this could apply to any of the elections actually, I recall Councilor Ripma made a comment during the campaign that he thought his opponent would make a good councilor but he wished that he wasn't running against Councilor Ripma. Under the Position system you had to choose between those two. But under the Block system, theoretically, Moriarty would have been in the running. That covers the charts. The Block vote minimizes unopposed candidates and it expands voter choice. You can choose from however many people for candidates. It's not just one side or the other side of each individual position. Those are my 2 main arguments for it. Now I want to get into if this requires a charter amendment or if there's another alternative to implement this. I want to compare some examples of how other city charters address the language of electing councilors. One I thought was most specific on the Positions side was Gresham's. Under Gresham we have at each final November election councilors should be elected from 3 positions. Councilors from positions 1, 3 and 5 shall be elected at the November Presidential election. Councilors from position 2, 4 and 6 shall be elected at the November Gubernatorial election. That is very specific. Gladstone is also the Positions system and theirs is similar. The most detailed one on the Block Vote side which is Lake Oswego. Each general election 3 councilors shall be elected for a term of 4 years. The 3 candidates that receive the 3 greatest number of votes are elected to the council. The subcommittee one of the things they're adjusting is what happens when there's a vacancy out of sequence in the council or if somebody leaves the council for whatever reason. Here's a

built in method that would address that issue. If one or more vacancies on the council other than Mayor are being filled at the general election vacant office shall be filled by the person or persons receiving the next greatest number of votes. If you had a mid-term vacancy up here the fourth highest vote getter would get that seat for the 2 year term. My favorite as far as simplicity is the city of Bandon. Council consists of 6 councilors nominated in the election. 3 candidates receiving the highest number of votes are elected councilors for the term. With Rogue River the city council shall be composed of 6 city council members. Candidates receiving the greatest number of votes shall be elected to the council seats. Candidates are eligible for any seat to be filled at the election. The reason I point that one out is that I was able to obtain from the City of Rogue River the ordinance that led to the passage of that in 1998. You have a copy of that. Just yesterday I got an email from Jackson County elections office and they were able to provide me with the actual ballot measure. When we're looking at language I thought it was interesting that Happy Valley's, which is Block voting, they're charter reads that each general election after adoption of this charter 2 councilors will be elected for 4 year terms by position. If you take that at face value that's some seriously ambiguous language. They do in fact use Block voting. I talked to the City Recorder and it's basically to keep track of which seat we're talking about. Troutdale's charter councilor consists of a Mayor and 6 councilors nominated and elected from the city At Large. Councilors consist of fewer members when there are vacancies in office. The term of office for a councilor is 4 years. Each general election after adoption of this charter 3 councilors shall be elected each to a 4 year term. That's some vague generic language in my opinion. Other cities do it. And you have Gresham and Lake Oswego which is very specific. From this there is no mention of position. I searched through all the ordinances I could find. I asked staff what the origin and basis is to the idea of funding my position in Troutdale. I didn't get an answer back. My question is would an option be to go to the County Elections Office to say we're not going to do positions anymore. The language is so vague and generic. The other alternative is obviously a charter amendment. I admit from the top that I'm asking you as a council if it requires a charter amendment that you can do this and put it on the ballot, let the people decide. From a candidate or an incumbent perspective there are down sides. They're not going to be able to run unopposed very easily. You're going to have to campaign more.

Councilor Ripma states I have a short statement because Paul and I did talk about this and I tried to persuade him out of this several times. I wanted to say I respect Paul and his seriousness and thoughtfulness on all issues and I think he's trying to solve a problem that isn't a problem. Namely it's avoiding uncontested elections. Paul has a thing about that. He doesn't want any uncontested elections. Most of them on his chart are contested. The biggest drawback for what I'm calling multiple seat voting, I read that in the literature you directed us to, or block voting where everyone runs for the open seats and the top 3 vote getters get elected it detracts from the ultimate accountability of the councilors. Under the current system each councilor is responsible for the decisions that we make, the votes we take and cast in council. Someone not doing a good job or voting contrary to the best interest of the city is subject to challenge and withdraw an opponent at the next election. The public is best served, because that councilor must account for his or her position in votes taken. With multiple seat voting or block voting a councilor can vote and will not be challenged. Paul is right, the candidates running will not go negative

because they can't. If a citizen thinks that councilor is not doing a good job or favors positions or interests the citizen disagrees with the councilor must defend those positions. And citizens wishing to challenge a councilor or a candidate and run against the person to make him or her account for those positions. In other words, a citizen or group of citizens can try to take out a councilor. Now this is good for the citizens of Troutdale and makes councilors accountable. They must defend what they do against a challenger with multiple seat voting or block voting all a citizen can do is run and hope that the candidate the citizen wants to challenge ends up with too few votes. The fact that Troutdale's current system offers greater accountability is supported by one of your resources you provided. The fair voice on page 10 the citywide designated seats system, which is Troutdale's, their statement is because under a citywide designated seats system challengers can target individual incumbents. It is easier to hold councilors accountable. We would be giving the accountability up to go with a block voting system and that's exactly why we should keep the system we have. We're far better served by councilors being directly accountable to the voters subject to challenge at the next election. Ask people who have lived under both systems or worked for cities under both systems they'll tell you. Councilors are less accountable, they're less easy to challenge. There's all these weird candidates and some can get in just by riding the wave. What is the problem, Paul, you decry uncontested elections because sometimes candidates don't have opponents. Is it worth weakening our elected official's accountability to the voters just to eliminate uncontested seats? I mean under block voting we could just have 3 people file. It's still uncontested. If an elected official happens to be doing a good job, and that's my biggest argument, or is popular or is otherwise not opposed, is that not a vote of confidence? Anyone can file. If the citizens of Troutdale want to re-elect Paul Thalsofer multiple times or Eric Anderson or Glenn White the last election and no one chooses to run against them I don't think there's anything wrong with that. That isn't a problem. In this case, your fix is worse than the problem because if we adopt it you detract from the councilors accountability, force candidates who do not draw opponents to run a fully contested race even if normally they wouldn't have been opposed. Why do it? I wouldn't support such a charter amendment. If the council wants to consider this further, which I don't really favor, it needs to go to a Citizen Charter Review Committee like we did the last charter change back 10 years ago. We've always done it that way. You referenced a proposal to the Citizen's Advisory Committee that you made in a meeting but the council never referred this matter to the CAC. If they took it up themselves without telling us, I wasn't aware of it because I would've been there. If they considered this at a CAC meeting they only heard one side. That's not the way to do it. I know you mean well Paul but I ask you to reconsider this idea.

Councilor Allen states I see things differently because I think differently. It's like a job interview, if there is a councilor that I'm not happy with I'm going to probably run against them. If I'm not happy with the work they're doing. But if there's a councilor I am happy with I don't want to accidentally win and displace them. If somebody challenges me in the future and I have confidence they're going to do a good job I'll probably concede because it would be nice to get back to handling my investments and doing my hobbies. I do this job out of a sense of social responsibility and I would be glad for somebody to take up the reins. As long as I have confidence the city is in good hands.

Councilor Wilson states I took the responsibility of contacting Maywood Park, Wilsonville and Happy Valley because they run at true At Large elections. The response from most of them because they don't do it by district so they go with their serving all of the community and not just a certain section of that community or certain group of that community. They're serving everybody and that's why the At Large elections they feel are better. I'm really not in favor of At Large elections just so you know. I'm just trying to explain why the other cities maintain and feel that they're the best because that way you don't have a special interest group coming in and challenging one of us. The feeling from the At Large cities that I contacted around us is that they feel that they're serving a whole community and not different sections or a different group and that is why they will maintain having the At Large vote.

Paul Wilcox states I was trying to theorize what the basis of why we do Position and not the geographic position. All I can think of was that it creates a similar situation where people more familiar with the 2 sides. We have opposing viewpoints. I'm thinking maybe that's where the idea of Position came from because it created almost a partisan divide of a nonpartisan election. Troutdale doesn't specify the partisan nonpartisan.

Councilor Allen states my concern here is that if I were to have a money making opportunity in front of the City, if I had business in front of the City, the weakness in this kind of plan is all you have to do is run more candidates for open positions which would be a bargain. It's like buying lottery tickets, it gives me a better chance of being in more seats and having the council that will vote money my way. It just makes election corruption so much more likely. That's what I think is a huge problem with this country and I don't want to make that easier.

Mayor Daoust states that was a good discussion. I don't think these 19 cities listed are At Large but saying their city councilors are any less adept than our city councilors. There are pros and cons for both ways. These cities have good city councilors also. Thank you for all your overview Paul, very thorough as usual.

**9. UPDATE:** An update from the City Organization Review Subcommittee introducing their recommendations for amendments to the City Charter.

Councilor Anderson states they're going to come back next week with 4 more writings for everybody to vote on. I'm putting the word out there now 2 weeks before any reporting needs to be discussed. It's a courtesy thing. We could have waited 2 weeks and just put it all out there in a packet. I'm going to let you know what's going to come and what's going to be coming in 2 weeks. You can vote it down. I have chicken scratches to hand out. The committee talked about the at large versus block and we could see the advantages and the disadvantages so we didn't come forward with a recommendation. Your argument certainly resonated with me.

Councilor Allen states I think it's confusing for people because we are at large but what we're really talking about is specifying position or block.

Councilor Anderson states Councilor Ripma's argument really hit a lot of hot buttons and made a lot of sense. I'm going to go through these real quick. We're going to present you with 3 proposed council rule changes and 4 proposed charter provisions. Again, you'll be able to vote on them. For the charter one of the things we're going to propose to you is language of appeals and the issue of council being able to talk openly with manager about staff. We the Committee felt that that was an overreaction to a certain individual and as Craig has aptly put it to us, we can't even tell him the staff is doing a good job because our charter doesn't allow it. The language will read that Craig won't have to go to city management and won't have to take our recommendations or act on it. But he will be free to comment on things that we weren't free to comment on. Another thing we're going to discuss and bring to you on the charter is an Executive Session confidentiality. This is something the Councilor Morgan was very passionate about and he would like to include a discipline for disclosing Executive Session confidential material and a fine in the amount of not more than \$500.00 payable to the general fund of the City, exclusion from all Executive Sessions of which the same or similar subject is to be discussed and/or public reprimand or censor from any open session and/or publication. Again that's going to be formal language with the crux of it is if you violate regular sessions privilege there will be a \$500.00 fine. That's the reason it has to be chartered because there's monetary penalty. The third thing we're bringing for your consideration is a language that if there is a change in the delivery of Public Safety within the City of Troutdale that they go to a public vote. I think we all know where that came from and why. There is some decisions I think are too big for us. This is something that I got from the March meetings. I think we've bit off a lot and Councilor White couldn't sleep for days and afterwards and that's not right. The fourth thing is we desire to put in place and present to you a provision where if you're going to seek higher office within the City that you're going to have to resign your seat. The reason is that if you're going to run for mayor and you have 2 years left on your term you get a free shot. The concern of the Committee is that with the elections being what they are and passions being what they are is that it bogs down the council pre-election and especially post-election. That is something that we're bringing you for consideration. Again it has to do with carrying on the business of the City. That's my motivation to bring it and I've seen what elections have done. You get done with one and you just kind of slow down. The council rules that we're going to bring to you for consideration, these are all Councilor Morgan. The first one is whenever a city committee or subcommittee recommends that council consider whether to adopt or reject a resolution, ordinances or other action. The members of such committee or subcommittee including any council members shall be named in their support, rejection or extension should be noted in the record presented to council for its action. Simply put, Councilor Morgan wants you to know that he is the one that brought this forth. The second change, following a council vote to approve or disapprove a resolution or ordinance, the council shall not reconsider or revisit the substance of the decision except under the procedure for a motion to reconsider. Again, Councilor Morgan. That will be in writing for you in a couple weeks. And the third thing the charter revise the Mayor is the political head of the City as such the Mayor may represent the City or appoint a delegate to represent the City and may enter in non-binding discussions with leaders of other governments. The Mayor shall from time to time report to council about such discussions. I'm not going to speak for Councilor Morgan but what it stems from is there's been some ambiguity about what Mayor Daoust can do, can't do, should do and shouldn't do. We wanted to crystalize it. We wanted to put in English

so everybody's on the same page as to what he can do and can't do and what we should expect of it.

Councilor Anderson states the Committee will continue because there other rules that we want to look at. I unfortunately will not be a part of that Committee once it does continue because due to work getting in the way I've had to scale back and so I submit my resignation to this committee. So that will be a point that somebody else to go forward and address the rules. This will be put in formal writing by Ed Trompke to the council on the 26<sup>th</sup>. It will be in the packet the week before.

Mayor Daoust states I think we'll have a great discussion in 2 weeks. I'd rather not do it tonight given the time of the evening.

#### **10. STAFF COMMUNICATIONS:**

Craig Ward states just two quick items for you tonight. A reminder that next Monday is the Martin Luther King, Jr holiday and non-emergency city facilities will be closed. I had informed the council a few weeks ago that we were once a member of the Columbia Corridor Association which represents property owners and businesses along the Columbia River. The cost for us to join is \$475.00 and like with most associations you get real benefits out of your membership. We need to attend. It's a bit of a sacrifice in terms of probably both council time and staff time. As your development manager I would expect to attend. I wanted to bring it the council's attention and see whether or not you support spending the 475.00 and investing the staff time to make our investment paid off.

Mayor Daoust states I've been to a couple Columbia Corridor meetings and they are really good meetings. There is a lot of people in that group. In my mind we should be part of that because we're part of the Columbia Gorge.

Councilor White asks what property do we have that's on the Columbia, TRIP? It's not really on the Columbia because there's such a large greenbelt blocking us from the Columbia.

Craig Ward states I see your point. Although the property is essentially protected by the levy of the Columbia River are fair game. It's really about our mutual interest with other communities and businesses for development along the area that butts the Columbia River. As I understand it we dropped our membership on as a cost saving measure back in 2008 or 2009. We were looking to strip out all of our discretionary expenses. I have attended occasional meetings as well. You get a small discount, it's not significant if you're a member but it's a bit uncomfortable when other cities like Wood Village and Fairview are finding ways to become members and participate in these. Unless there is council opposition I will go ahead and cut the check and become members.

#### **11. COUNCIL COMMUNICATIONS:**

Councilor White asks is there an agenda update on the selection council president of the first meeting in January?

Mayor Daoust responds I already said that we put it off until next meeting.

Councilor White states we're violating our own rules by doing that.

Ed Trompke states it is in the charter that the council is supposed to do it at the first meeting. It's allowed though to as long as Councilor Allen is continuing to put it over. The stated reason was that all 7 council members should be present. I think that's a valid reason to postpone it. It would be best to do it today but the Mayor has to have all 7 present. I think there's some discretion to send it over pass it around to all those willing and it sounded like it was to continue serving as President until the election.

Councilor Allen states whether I serve or not serve is not that important to me. The thing is our councilor rules can be overridden by the majority of council. But city charter being overruled does Councilor White have a point here?

Ed Trompke responds he has a point but it's also possible that you could end up with an even number of people and you could end up with a tie vote. Which point are you going to stay here forever until it happens and never adjourn? I think the Mayor was taking some discretion and practicality into account.

Councilor White states I would like to get an update on our parks recreation program. Is there a committee now working on it? Or is still just in your hands Craig? I think we originally directed that you would meet with the other City Administrators.

Craig Ward responds I have done so. We're still developing proposal. A councilor from Fairview who's an advocate has identified some approaches that he vote very important to study. We're still working away at it. Initially he was hopeful that we would make some changes. Essentially his proposal which is the only proposal on the table at the moment, is to create sports leagues. Something we don't do. Our recreation program provides classes, it provides camp, some of those camps have a sports emphasis to them but they're not leagues where teams organize, coaches volunteer. They're assigned different fields which are reserved for events. There's quite a complexity to that. It's much more complicated than it may appear. We haven't yet priced out what that may be. In particular should we do that for next summer which we were hopeful? We would have to suspend a compilation of our summer rec program newsletter that we send out. We don't know enough details about how we would pull this thing together or how to pay for it to offer it in the summertime. We're continuing to work. We'll just have to see how it emerges. I understood that Mayor Thalhoffer was also working on a business plan which Councilor Cooper has yet to see. There just seems to be early concepts and designs that haven't been shared with me or the 2 Fairview electives.

Councilor Allen states conditions have changed this year. We have a community room that we're not using much. The police aren't using anymore. I question whether or not we should actually move the council to the community room and then possibly use this space for planning or other staff. We have more planning and building going on now that we did before. I think currently there are crowded into our Parks and Recreation facility which we actually built for Parks. It might make sense to think about that.

Councilor Wilson states we should hold it over for a work session topic. Steve Gaschler, I just wanted you to tell your guys thanks for helping that 93 year old lady during the floods and sand bagging her garage and around her yard. They went above what their duties are to take care of a local citizen. And also all the work you guys did during the deep freeze. The last thing I have is when the Centennial coming up on the Columbia River Highway I think that the City should form a small committee to work with the Chamber and also work with Rip Caswell to put on a big unveiling of the statue on the 100 year anniversary. We should invest, the Chamber should invest and if we could get the County to help invest in putting on a big celebration for that day would be great.

**12. ADJOURNMENT:**

Councilor White moves to adjourn. Councilor Wilson seconds. Meeting adjourned 11:32pm.

**DRAFT**

\_\_\_\_\_  
**Doug Daoust, Mayor**

**Dated:** \_\_\_\_\_

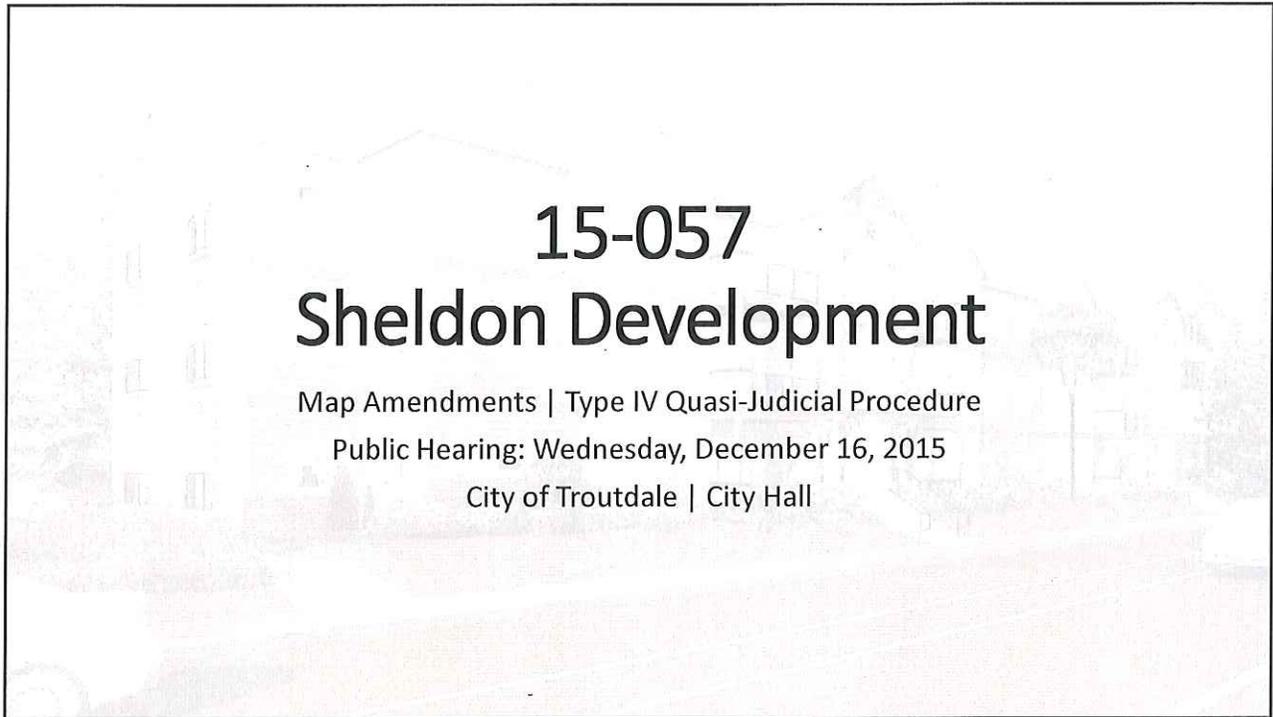
**ATTEST:**

\_\_\_\_\_  
**Kenda Schlaht, Deputy City Recorder**

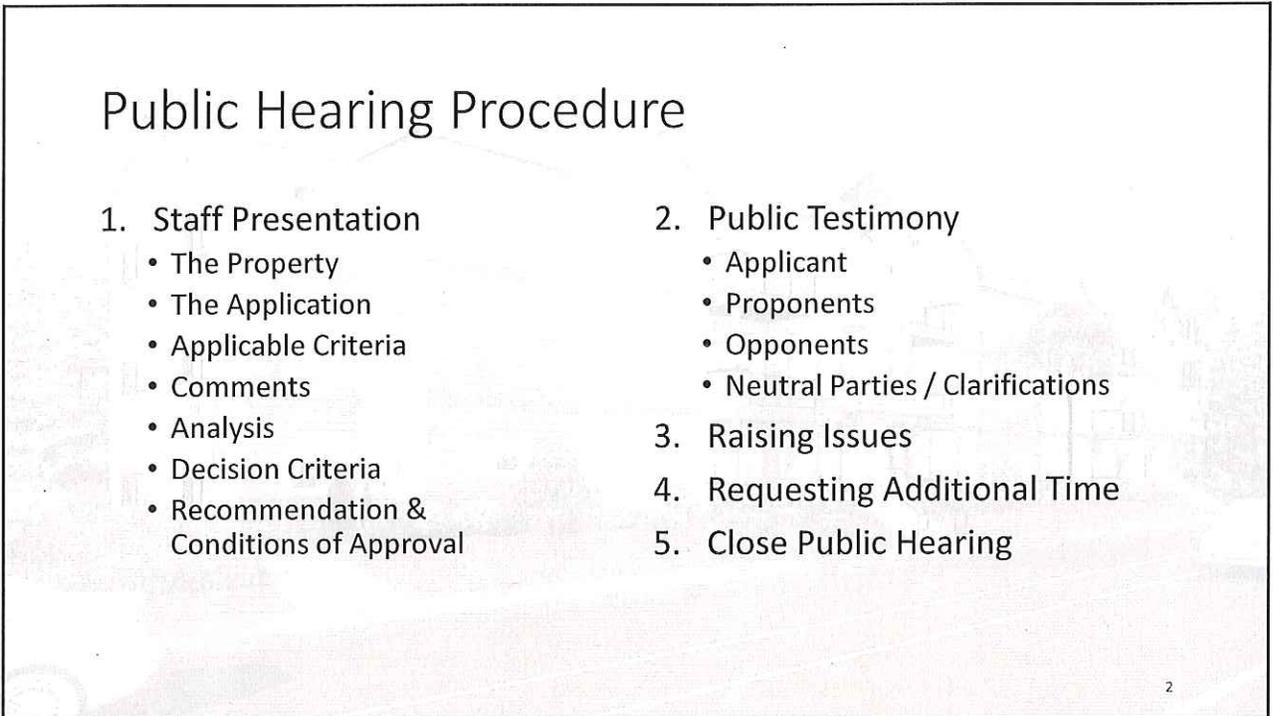
**CITY OF TROUTDALE**  
**CITY COUNCIL – Regular Meeting**  
**Tuesday, January 12, 2016**

**PLEASE SIGN IN**

Name – Please Print	Address	Phone #
Sally Savidge	1970 SW Montmore	503 666 1105
PAUL CHARPENTIER	2120 SW STURGES LN T1	503 253 5946
Dale Loucks	Troutdale	—
Frank S. Windrud, Jr	Corbett	—
Brian Shurts	Troutdale, OR	503-830-1448
Diane Castillo-White	Troutdale OR	—
Rick Givens	18680 Sunblaze Dr. O.C.A.	503-479-0097
Tarey Sheldon	23765 SE Hwy 212 Camas	503 805 8711
Kul (amb)	Troutdale	—
Claude Emz	WCECC	563 799 207
PAUL MILCOX	TROUTDALE	—
BRUCE WASSON	TROUTDALE	503-661-1047
Lana Des	—	—
Sam Barnett	Troutdale	—
Ryn Richter	TROUTDALE	503 807 8011
GARY COHEN	Troutdale	503-789-5676
Wendi Tucker	2101 SW Stella Way	503-312-2750
ALEXANDER BILKA	↓	503-310 4926
Martin Burlos	Troutdale	503-
TANNY STAFFORSON	Troutdale	503-819-7737



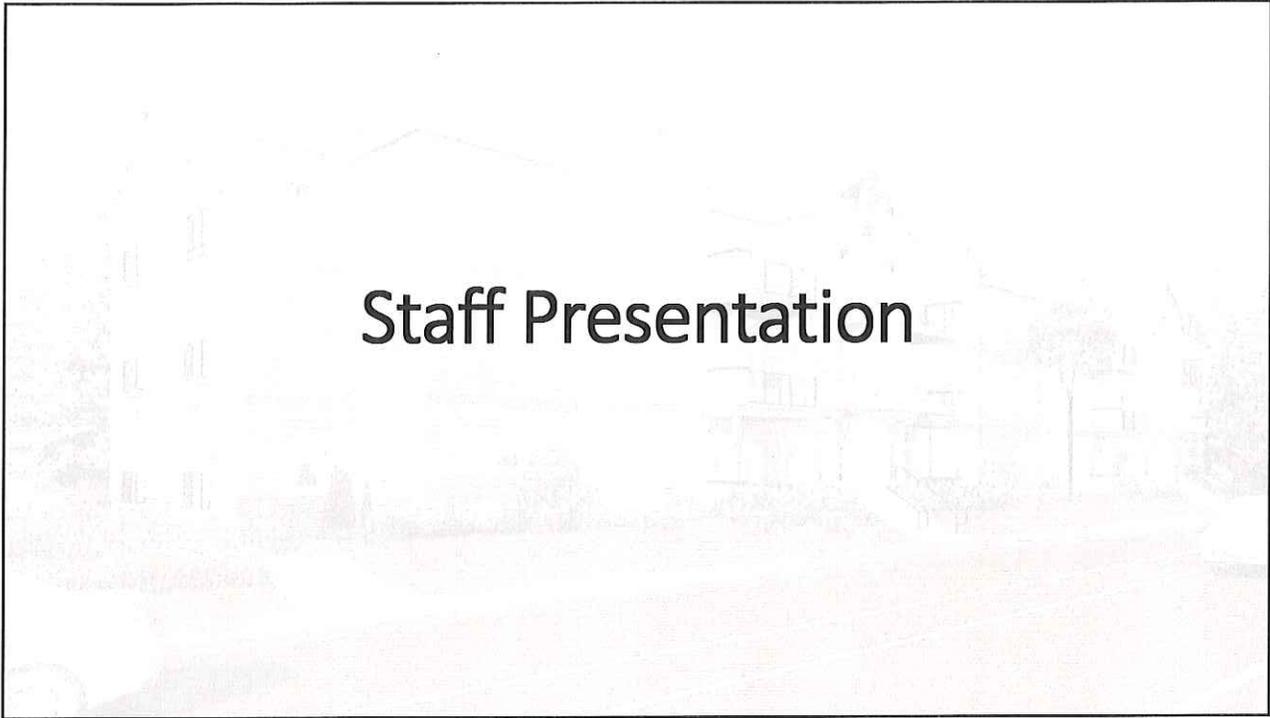
**15-057**  
**Sheldon Development**  
Map Amendments | Type IV Quasi-Judicial Procedure  
Public Hearing: Wednesday, December 16, 2015  
City of Troutdale | City Hall



**Public Hearing Procedure**

1. Staff Presentation
  - The Property
  - The Application
  - Applicable Criteria
  - Comments
  - Analysis
  - Decision Criteria
  - Recommendation & Conditions of Approval
2. Public Testimony
  - Applicant
  - Proponents
  - Opponents
  - Neutral Parties / Clarifications
3. Raising Issues
4. Requesting Additional Time
5. Close Public Hearing

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# Staff Presentation

## The Property

- southeast corner of SE 242<sup>nd</sup> Avenue and SW Cherry Park Road (both are County maintained)
- Undeveloped
  - seasonal agricultural stand / Christmas trees
- 6.88 acres, generally level terrain
- Current Land Use Designation: **MDR** Medium Density Residential
- Current Zoning District: **R-5** Single Family Residential

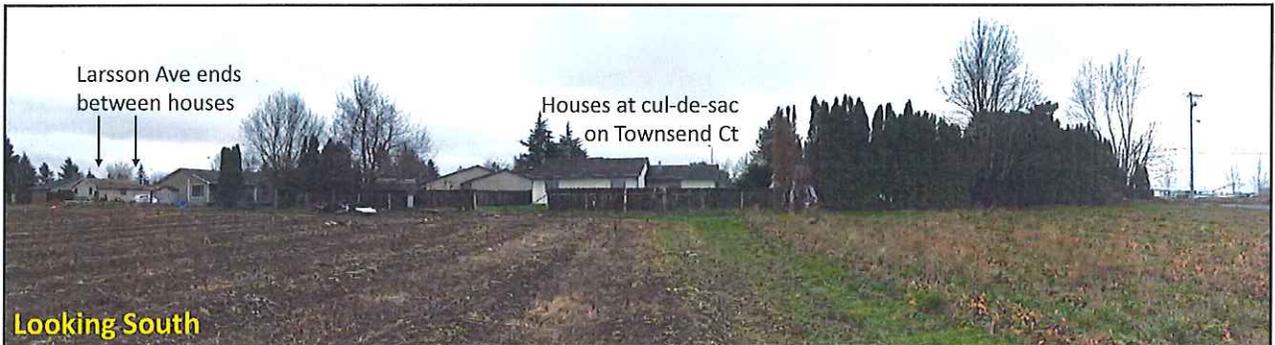
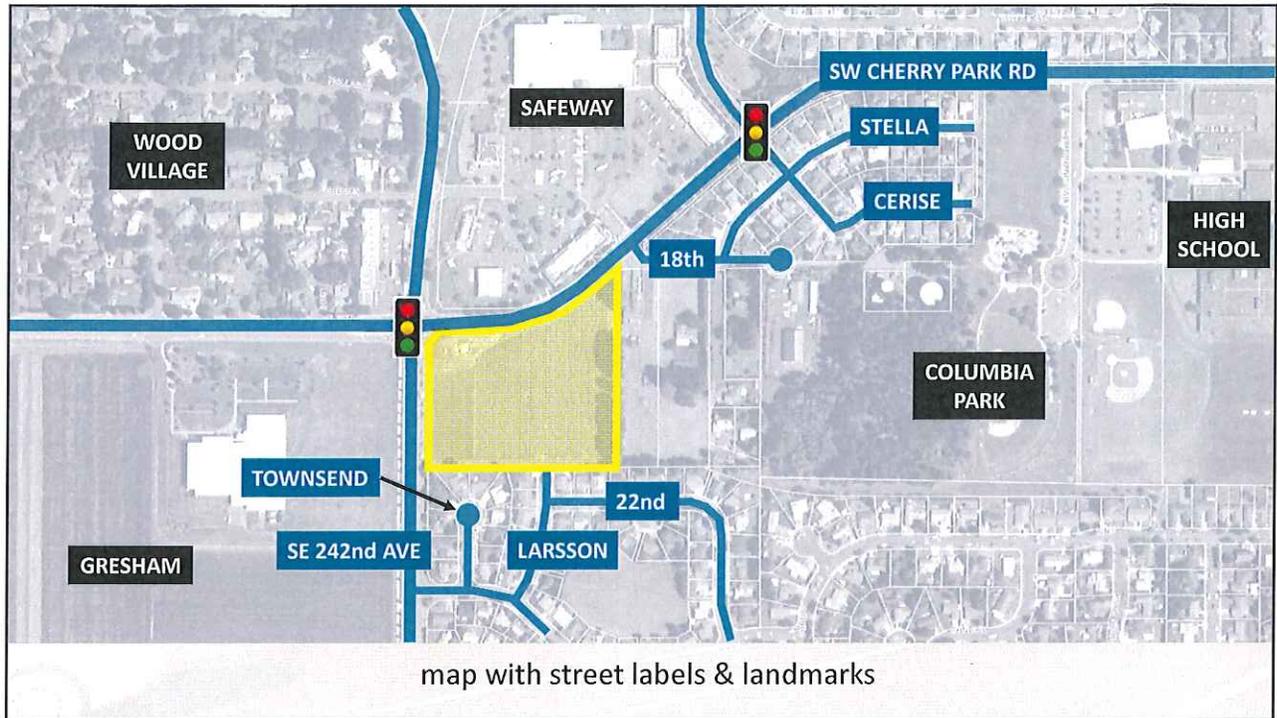
East SE South SW



bird's eye view looking south



aerial map





Looking south onto Larsson Ave



Looking north from Larsson Ave



Posted Notice



Posted Notice

## The Application

### Comprehensive Land Use Plan "Comp Plan" Map Amendment

- Current: Medium Density Residential
- Proposed: High Density Residential

### Zoning District Map Amendment

- Current: R-5 Single Family Residential
- Proposed: A-2 Apartment Residential

*Site Plan Review is not included*

### **High Density Residential** land use

should be "areas adjacent, or in close proximity to existing/planned shopping centers, employment centers, transit routes, or minor arterials"

[Comp Plan p. 11]

### **A-2 Apartment Residential** zoning

"intended primarily for multiple-family (apartments) and attached dwellings in a high-density residential environment"

[TDC 3.061]

## The Application

- Concurrent review for both amendments
- Applicant has indicated intent to develop the property
- Traffic Impact Analysis included in submittal
- **Not Part of this Application**
  - Approval request for a specific development proposal or site plan
  - Site & Design Review – separate application

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## Applicable Criteria

### **City Standards**

- Comprehensive Land Use Plan
- Transportation System Plan (TSP)
- Construction Standards for Public Works Facilities
- Trousdale Development Code (TDC)
  - Ch. 1 (Introductory Provisions)
  - Ch. 2 (Procedures for Decision Making)
  - Sec. 3.060 (A-2 Apartment Residential)
  - Ch. 15 (Amendments)
  - Ch. 16 (Public Deliberations & Hearings)

### **Multnomah County Standards**

- Transportation Road Rules

### **Metro Standards**

- Urban Growth Mgmt. Functional Plan

### **State Standards**

- Statewide Planning Goals (Comp Plan), post-acknowledgement review

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# The Application

## Type IV Quasi-Judicial Procedure

- Public Hearing (*at Planning Commission*)
  - Planning Commission recommendation
  - City Council is decision-making entity
- If there is an appeal...*
- State Land Use Board of Appeals

## Timeline

- mid July: Pre-Application conference
- early Nov: Application acknowledgment
- early Nov: Notice & Request for Comment sent
- early Dec: Staff Report with Comments
- 12/16/15: **Initial Public Hearing**
- TBD: City Council

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# Comments

## Agency Comments

- City of Troutdale *Planning, Building & Public Works*
- Multnomah County Transportation Planning
- Department of Land Conservation & Development
- Metro
- TriMet

### *No Written Response from:*

- Gresham Fire & Emergency Services
- Reynolds School District
- City of Gresham (*west of Property*)
- City of Wood Village (*northwest of Property*)

## Public Comments

- Citizens Advisory Committee
  - Planning Commission requested input on 11/18/15
  - Meeting scheduled for 12/02/15 was cancelled - lack of quorum
- Neighboring Property Owners
  - Gregory Ashton – 2147 SW Larsson Ave
- Public Testimony (after Staff Presentation)

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## Comments Summary

- Agencies had no objections to the map amendments
  - Traffic impacts and connectivity (*Mult Co & PW*)
  - Coordination with other projects
  - Capacity of sanitary sewer infrastructure (*PW*)
- Most concerns to be addressed at site & design review for specific development proposals
- Neighbor comment concerns:
  - Traffic increases
  - School crowding
  - Resident safety
  - Property values
  - Asked that the map amendments be turned down due to these concerns

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## Analysis

- Know the definitions
  - High Density Residential
  - A-2 Apartment Residential
- Analyze trends in housing needs
- Look to local examples
- Consider site benefits and drawbacks
- Review application for compliance
- Develop a recommendation from the decision criteria

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# Analysis

- Housing trends

- High demand for market rate apartments
- Increase in rentals due to high property values

- Local examples

- HDR suggests *average* density of 21 units/acre (u/ac) [Comp Plan p. 11]
- Applicant indicates desire for up to 168 units on site = **24.4 units/acre**
- Densities of local apartment complexes:
  - Halsey Heights (Halsey): 20.3 u/ac
  - Troutdale Terrace (257<sup>th</sup>): 17.7 u/ac
  - The Lodges at Lake Salish (Fairview): 26.8 u/ac
  - Vista at 23 (Gresham/MHCC): 24.34 u/ac



Halsey Heights | 69 units | 20.3 units/acre



The Lodges at Lake Salish | 203 units | 26.8 u/ac



## Analysis

### Site Benefits

- Adjacent to commercial services and job centers
- Along existing arterial roads
- Near school, park, and library
- “5 minute walk radius”

### Site Drawbacks

- Concerns from the neighbors
- Traffic levels
- Utility impacts

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## Decision Criteria – Comp Plan Map [TDC 15.050.B]

1. Compliance with applicable Statewide Land Use Planning Goals and related Oregon Administrative Rules.
2. Consistency with the applicable goals and policies of the Comprehensive Land Use Plan.
3. The Plan does not provide adequate areas in appropriate locations for uses allowed in the proposed land use designation, and the addition of this property to the inventory of lands so designated is consistent with projected needs for such lands.
4. The Plan provides more than the projected need for lands in the existing land use designation.
5. Uses allowed in the proposed designation will not significantly adversely affect existing or planned uses on adjacent lands.
6. Public facilities and services necessary to support uses allowed in the proposed designation are available, or are likely to be available in the near future. The applicant shall demonstrate compliance with the Transportation Planning Rule (...)

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## Decision Criteria – Zoning District Map [TDC 15.050.C]

1. The proposed zone is appropriate for the Comprehensive Land Use Plan land use designation on the property, and is consistent with the description and policies for the applicable Comprehensive Plan land use classification.
2. The uses permitted in the proposed zone can be accommodated on the proposed site without exceeding its physical capacity.
3. Adequate public facilities, services, and transportation networks are in place, or are planned to be provided concurrently with the development of the property. The applicant shall demonstrate compliance with the Transportation Planning Rule (...)
4. The amendment will not interfere with the livability, development, or value of other land in the vicinity of site-specific proposals when weighed against the public interest in granting the proposed amendment.
5. The amendment will not be detrimental to the general interest of the community.

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## Recommendation

- Decision criteria have been met
- Issues including traffic and infrastructure capacity to be fully reviewed at next stage by City & other agencies
- Staff recommends approval of map amendments, with conditions (next slide)

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## Proposed Conditions of Approval

### Planning

- Fulfilling requirements of conditions responsibility of the applicant
- Future development on the site shall undergo Site & Design Review
- The Planning Director reserves the right to refer an application for Site & Design Review to the Planning Commission

### Public Works

- Applicant to prepare a preliminary plan on road/path connectivity with existing streets
- Applicant to model impact of sewer collections system with intended number of units. Results from that study will determine public improvements and conditions of approval for any vertical construction

### Transportation (*Multnomah County*)

- On-site and/or off-site improvements, right-of-way dedication, and/or permits for access or construction may be required.

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## Public Testimony

## Public Testimony

### **Order of Testimony**

1. Applicant
2. Proponents
3. Opponents
4. Neutral Parties / Clarifications
5. Requests for Additional Time

### **Reminder:**

- All issues raised by a participant must be sufficiently clear and specific to allow PC and other parties to respond.
- Failure to raise an issue during this public hearing may invalidate a future appeal based on that issue.

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## Requesting Additional Time

- Opportunities for additional evidence or testimony
  - Continuing the public hearing to a future date
  - Leaving the record open for at least seven days
  - If record is left open, any participant may file a written request for an opportunity to respond. PC shall reopen the record to allow any person to raise new issues which relate to the new evidence

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**THE RESUME OF:**

**MONTE G. REISER**

## Monte G. Reiser

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### Introduction

Acting Commander Monte G. Reiser is currently assigned to the Operations Section of the Multnomah County Sheriff's Office, Troutdale Police Community Center. He was promoted to Acting Commander on December 1, 2015. Additional assignments have included Captain of Operations, Captain of Investigations, Inspector of the Professional Standards Unit (Internal Affairs) and Law Enforcement Administrative Captain. Acting Commander Reiser served as a Lieutenant for the River Patrol Unit. He has served on the Multnomah County Inter-agency Committee on Abuse Prevention, Domestic Violence Fatality Committee, Senate Bill 111 Use of Deadly Physical Force Planning Committee, Local Public Safety Coordinating Council, Law Enforcement Division Steering Committee and was assigned as Director for the Regional Organized Crime Narcotics Task Force. Acting Commander Reiser previously supervised as a sergeant in the patrol and river patrol units. Acting Commander Reiser's tenure with the Multnomah County Sheriff's Office includes serving a two-year assignment with the Detective Unit/East Multnomah County Major Crimes Team, and two years with the DUII Enforcement Team and East Multnomah County Fatal Accident Team. Acting Commander Reiser managed the MCSO Field Training Program and Motors Unit while supervising in the patrol unit. He began his career serving as a police officer, corporal and sergeant for the Seaside Police Department in Seaside, Oregon.

Acting Commander Reiser holds a Bachelor's Degree in Law Enforcement from Western Oregon State College. He holds Executive, Management, Supervisor and Advanced Police Officer Certificates from the Oregon Department of Police Safety Standards and Training and has completed the Management Certification Program at the "Executive Leadership Institute" at Portland State University and "Command College" with the Oregon State Sheriff's Association. He has served as Chair, Vice-Chair and Secretary of the Oregon State Sheriff's Enforcement Command Council. He is an active member of the Oregon Fallen Badge Foundation where he serves on their response team for officer line of duty deaths.

Acting Commander Reiser has been involved with various community oriented policing project teams which involved the creation of the following programs: Elder Abuse Detective, Intercept (Multi-agency online child

## **Monte G. Reiser**

---

predator investigations), MCSO Warrant Strike Team, MCSO Homeless Outreach Team and the Green Hornet Trail Rescue and Wilderness Law Enforcement Team and Community Resource Deputies. He is currently a member of the Columbia River Historic Highway Collaborative.

Acting Commander Reiser enjoys the outdoors to include running, hiking fishing and photography. He enjoys coaching and refereeing youth basketball. He is married to his wife, Jennifer and has two daughters, Hannah and Emma.

### **Law Enforcement Experience:**

12/1/15 to Current	Acting Commander of MCSO Operations Section (TPCC Office)
07/01/15 to 11/30/15	Captain of MCSO Operations Section (TPCC Office)
06/01/11 to 06/30/15	Captain of MCSO Law Enforcement Operations Division
11/01/10 to 05/31/11	Inspector – Professional Standards Division Multnomah County Sheriff's Office
01/26/10 to 03/31/10	Interim Business Director (Chief Deputy) Multnomah County Sheriff's Office
11/05/09 to 01/25/10	Law Enforcement Administrative Captain Multnomah County Sheriff's Office
10/23/06 to 11/04/09	Captain, Investigations Division Multnomah County Sheriff's Office

**Monte G. Reiser**

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07/01/06 to 09/21/06 Acting LE Chief Deputy, Multnomah  
County Sheriff's Office

06/01/03 to 06/30/06 Lieutenant, Special Operations Division  
Multnomah County Sheriff's Office

01/15/03 to 05/31/03 Sergeant, Patrol Division  
Multnomah County Sheriff's Office

01/15/02 to 01/14/03 Sergeant, Marine Division  
Willamette River Patrol Office  
Multnomah County Sheriff's Office

03/01/99 to 01/14/02 Sergeant, Patrol Division  
Hansen Building Precinct  
Multnomah County Sheriff's Office

07/01/98 to 03/01/99 Patrol Deputy  
Hanson Building Precinct  
Multnomah County Sheriff's Office

07/01/96 to 07/01/98 Detective, Detective Unit  
Multnomah County Sheriff's Office

07/01/94 to 06/30/96 Deputy, DUII Enforcement Team  
Drug Recognition Evaluator/Fatal Crash  
Team  
Multnomah County Sheriff's Office

11/01/93 to 06/30/94 Patrol Deputy  
Hansen Building Precinct  
Multnomah County Sheriff's Office

07/01/93 to 10/25/93 Sergeant  
Seaside Police Department  
Seaside, Oregon

## Monte G. Reiser

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07/01/92 to 06/30/93	Corporal Seaside Police Department Seaside, Oregon
04/01/90 to 06/30/92	Police Officer, Patrol Division Seaside Police Department Basic Patrol
05/25/88 to 03/30/90	Reserve Police Officer Seaside Police Department Basic Patrol

**Education and Training: Refer to attached DPSST training records.**

### **Achievements and Awards:**

June 2015	2015 Multnomah County Employee Innovation Award
December 2014	Oregon State Sheriff's President's Special Recognition Award
June 2010	MCSO Distinguished Service Award
May 2009	MCSO Sheriff's Award (Major Crimes Team)
April 2006	MCSO Sheriff's Award (River Patrol Unit)
October 2003	Marine Law Enforcement Program Manager of the Year, Oregon State Marine Board
October 2001	MCSO Citation

## Monte G. Reiser

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October 2001	MCSO Commendation
May 1992	Police Officer of the Year Seaside Police Department
May 1991	Life Saving Award Seaside Police Department

**Agenda Item #7**  
**RECEIVED** 4/12/16 Council Meeting

APR 04 2016 *58*

CITY RECORDER'S OFFICE  
CITY OF TROUTDALE

April 3, 2016

From: The Troutdale Citizens Advisory Committee

To: The Troutdale City Council

Re: Agenda Item for April 12, 2016 Meeting

Dear Mayor Daoust,

The Troutdale Citizens Advisory Committee passed three resolutions during its March meeting, all of which make recommendations to the City Council. Please add an item on the April 12, 2016 City Council agenda so that I can bring these to the attention of the City Council and answer any questions.

The CAC has made three suggestions:

- 1) Put the public comment period at council meetings before the consent agenda, so that if a member of the public wishes to comment on the consent agenda before it is passed, he or she can.
- 2) Reword the text on council meeting agendas to clarify the fact that public comment on agenda items is welcome, but should be reserved until that time during the meeting.
- 3) Clarify the phrase "when appropriate" as it applies to the Council's making decisions during work sessions.

Sincerely,

Zach Hudson

Chair, Troutdale Citizens Advisory Committee



# CITY OF TROUTDALE



## STAFF REPORT

**SUBJECT / ISSUE:** Comprehensive well assessment and action plan

**MEETING TYPE:**  
City Council Regular Mtg.

**MEETING DATE:** April 12, 2016

**STAFF MEMBER:** Travis Hultin, Chief Engineer

**DEPARTMENT:** Public Works

**ACTION REQUIRED**  
Information/Discussion

**ADVISORY COMMITTEE/COMMISSION RECOMMENDATION:**  
Not Applicable

**PUBLIC HEARING**  
No

**Comments:**

**STAFF RECOMMENDATION:** Not Applicable

**EXHIBITS:**

- A. *Comprehensive Well Assessment and Action Plan, November 2015*
- B. Presentation slides

**Subject / Issue Relates To:**

- Council Goals
  Legislative
  Other (describe)  
 Water Supply

**Issue / Council Decision & Discussion Points:**

- ◆ All of Troutdale water comes from wells
- ◆ Well performance and water quality naturally declines over time, so periodic assessment is necessary in order to anticipate and plan for well repairs and replacement, if needed
- ◆ This assessment and plan is a recommendation of the 2012 Water Master Plan.
- ◆ Short and long range strategies and action plans for each of the City's water supply wells and for the well field as a whole is proposed
- ◆ Customer satisfaction was evaluated through a survey and interviews. Overall, customer satisfaction is currently good.

Reviewed and Approved by City Manager:

- ◆ The City's wells are aging. Some are still performing satisfactorily, while others exhibit chronic problems and will require significant effort and investment to recover or replace.
- ◆ Improved and/or expanded preventive maintenance and operation programs developed in this study can reduce rates of decline, maximize return on investment, and improve the quality of water delivered to customers

**BACKGROUND:**

The City of Troutdale obtains all of its domestic water supply from its own well field, consisting of 7 production wells, and one monitoring-only well. The 2012 Water Master Plan included a top-level review of the state of the City's well field. As a result of that review, well performance declines are evident, so the Master Plan recommended a comprehensive well assessment study to provide a more thorough evaluation of well performance, water quality, and water rights, and to develop short and long range recommendations specific to each of the City's wells.

In 2015, the City engaged GSI Water Solutions, a local firm with tremendous knowledge of east county hydrogeology and the City's well field, to perform this well assessment, with support from Keller Engineering, a civil engineering firm. Chris Augustine, Registered Geologist, was the primary technical lead for the study. Mr. Augustine will provide an overview of the results of the in depth review, and the recommended strategies and actions, and answer questions related to this *Comprehensive Well Assessment and Action Plan*.

This study quantifies declines in well performance and evaluates probable causes. It identifies proactive strategies and specific actions for each of the City's wells that can be implemented in order to preserve current well field assets and recover well field capacity to the extent feasible; or to plan for retirement and replacement where preservation and recovery are likely infeasible. Utilized as a whole, this study provides information that will enable the City to make the most of its strategic investments in its well field.

This study additionally refined the Water Master Plan's analysis of the City's current water permit and water right portfolio and provides recommendations for the management of those permits and rights.

Further, this study includes an evaluation of the quality of the City's drinking water supply, which starts with the quality of the water source. The water quality evaluation was both quantitative (water sampling and testing) and qualitative (customer satisfaction surveys and interviews). Overall, customer satisfaction with the City's water quality and water service is quite good, with a few exceptions. As a result of that evaluation, this study also provides recommendations to further improve the quality of the water the City delivers to its customers.

**PROS & CONS:** N/A

**Current Year Budget Impacts**  Yes (*describe*)  N/A

The City intends to commence with one well rehabilitation in the current fiscal year

**Future Fiscal Impacts:**  Yes (*describe*)  N/A

This plan recommends short and long range actions that will be funded from the Water Fund

**City Attorney Approved** N/A  Yes

**Community Involvement Process:**  Yes (*describe*)  No

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*Final Report*

# Comprehensive Well Assessment and Action Plan

## City of Troutdale, Oregon 2015

Prepared for  
**City of Troutdale**

November 2015



EXPIRES 4-30-2016

Prepared by





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# Glossary of Acronyms

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ATP - adenosine triphosphate

bgs - below ground surface

C-date - completion date

Cells/ml - cells per milliliter

cfs - cubic feet per second

COBU - Claim of beneficial use

DSFC - Downhole suction control flow

EPA - Environmental Protection Agency

ft/gpm - feet per gallon per minute

ft/sec - feet per second

ft<sup>2</sup>/day - feet squared per day

gpm - gallons per minute

gpm/ft of dd - gallons per minute per foot of drawdown

GSI - GSI Groundwater Solutions Inc.

Hz - hertz

IRB - iron related bacteria

LSI - Langalier saturation index

MCL - maximum contaminant limit

MDD- maximum daily demand

MG - million gallons

MGD -million gallons per day

mg/L - milligrams per liter

µg/L - micrograms per liter

MULT - Multnomah

mV - millivolts

OAR- Oregon Administrative Rule

OHA - Oregon Health Authority

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OWRD - Oregon Water Resources Department  
ORP - oxidation reduction potential or "redox"  
pH - measure of acidity or alkalinity  
PMOP - preventative maintenance and operations plan  
ppb- parts per billion  
ppm - parts per million  
SDWA - Safe Drinking Water Act  
SGA - Sand and Gravel Aquifer  
SLYM - slime forming bacteria  
SMCL - Secondary Maximum Concentration Limit  
SRB - Sulfate reducing bacteria  
STPP- sodium triphosphate  
SS - stainless steel  
SU - standard units  
TDH - total dynamic head  
TDS - total dissolved solids  
TOC - total organic carbon  
TON - Threshold Odor Number  
TSA - Troutdale Sandstone Aquifer  
WSE - Water System Engineering  
WMP - Water Master Plan

# Executive Summary

---

GSI Water Solutions, Inc. (GSI) provided an evaluation and summary of the City's municipal water supply wells, municipal source water rights, and water quality as part of its Water Master Plan (WMP) update to assess current and future demands (Black and Veatch, 2012). Observations during that WMP update identified several actions to assist the City with protecting and fully utilizing their groundwater assets and recommended the City evaluate options for improving well yield and water quality. The long-term goal of the City is to develop and maintain sufficient source capacity of good quality water to reliably meet current and future anticipated demands. The City selected the project team of GSI Water Solutions, Inc. and Keller Associates to perform the 2015 comprehensive assessment and develop an action plan identifying short term and long term actions for the City to fully develop, manage and protect its groundwater assets.

The 2015 comprehensive well assessment included evaluation of the City's seven groundwater supply wells using current and historic well performance evaluation, bacterial and water quality assessments and evaluating pump and motor performance. The City has six wells (Well 3, Well 4, Well 5, Well 6 and Well 7) completed in the Sand and Gravel Aquifer (SGA) of the lower Troutdale Formation. Well 2 is completed in the shallower Troutdale Sandstone Aquifer (TSA). Water treatment options were evaluated to address water quality issues observed in the City's wells which includes:

- Presence of manganese in Wells 3, 4, 6, 7 and 8 at concentrations that approach or exceed the Secondary Maximum Contaminant Level (SMCL) of 0.05 milligrams per liter (mg/L).
- Elevated concentrations of total dissolved solids (TDS) are present in Well 4.
  - TDS concentrations are greater than 300 mg/L, which is not typical of the SGA
  - Carbonate minerals/scale observed on distribution system and plumbing fixtures in areas serviced by Well 4.
- Arsenic has historically been present at concentrations below but near the maximum contaminant level (MCL) of 0.010 mg/L at Well 7.
- Hydrogen sulfide is present in all SGA wells except Well 5.

To better understand the impacts of water quality on City customers, the project team assisted the City with customer outreach surveys to provide feedback on water quality within the City's service areas.

The status of the City's water rights was also evaluated as part of the comprehensive assessment. The City has a vested interest in fully developing unused capacity on existing water rights permits to retain those water rights into the future, while also utilizing the well field in a sustainable manner to ensure long-term viability of the groundwater supply.

## Well Assessment

The comprehensive assessment of the City's wells expanded upon the preliminary findings from the WMP update that identified wells with significant well yield and performance declines. The City has attempted to redevelop and rehabilitate several of its wells with either limited or short lived improvements in well performance. Well declines can be the result of several processes including:

1. Normal pump and motor wear which leads to performance deterioration overtime.
2. Changes in distribution system operation and head as the system is developed and modified.
3. Changes in aquifer conditions, such as water levels, water quality, or nearby pumping by other groundwater wells (i.e., well interference).
4. Physical plugging of the well screen and filter pack resulting from poor well construction and/or improper well design, inadequate well development, bridging of aquifer material in pore spaces, or structural damage to the well screen or casing.
5. Chemical precipitation or encrustation of the well screen, filter pack, and/or near well aquifer matrix because of water quality conditions.
6. Biological fouling of the well screen, filter pack, and/or near well aquifer matrix.

In order to better understand the potential cause(s) of the well declines GSI performed the following assessment actions at individual wells:

- Historical review of well performance and water quality
- Current well performance assessment using step rate pumping tests.
- Bacterial and water quality assessment.
- Pump and motor performance evaluation.

This approach resulted in the following key observations:

- Well 2 does not appear to have any outstanding issues; however, access to measure water levels during operation should be improved and the well should be monitored as part of a preventative maintenance program.
- Well 3 appears to have a shallow groundwater influence based on lower pH values and the presence of nitrate. Additionally, the well appears to produce sand at higher pumping rates which is indicative of a well construction or design issue. Iron oxidizing bacteria are present at levels of concern, which would suggest biofouling is also a clogging mechanism resulting in the observed well performance declines. Specific capacity was observed to be 2.02 gallons per minute per foot of drawdown (gpm/ft of dd) at the operational pumping rate of 202 gpm. The aggressive water chemistry observed might suggest a well integrity issue (similar to Well 4 which was reconstructed in 2008) related to its relatively shallow surface seal. Alternatively, the observed sand production in the well may have resulted in caving of formation material, which could allow downward vertical flow along the well casing from shallower zones.

- Well 4 water quality has improved slightly with the 2015 TDS values much less than historical values of 550 mg/L; however, the potential to form scale and mineral deposits within the distribution system is still a concern. Slime forming bacteria were present in the casing sample at levels that are of concern and anaerobic and sulfate-reducing bacteria were also observed. The bacterial population does not appear to have affected well performance which has been relatively consistent at approximately 12 gpm/ft of dd since 2006.
- Well 5 well performance and yield do not appear to have changed substantially. Water quality is good overall with slightly elevated manganese concentrations observed in 2014. The well is limited to an instantaneous production rate of 1394 gpm based on the City's water rights associated with Well 5. The observed specific capacity during 2015 step rate testing was 65.02 gpm/ft of dd at a maximum rate of 1736 gpm. The well specific capacity does not appear to have decreased substantially since installation in 2007.
- Well 6 specific capacity in 2015 is 8.3 gpm/ft at the operational yield of 475 gpm, an improvement from the 2011 specific capacity (Black & Veatch, 2011). Water quality and bacterial assessment suggests that a shallow groundwater source may be affecting Well 6. Well 6 had iron related bacteria populations identified in 2006; however, the 2015 results indicate lower levels of bacterial activity at Well 6 since last tested in 2006. Well 6 performance is likely affected by interference from City Well 8 and potentially other SGA groundwater users.
- Well 7 currently has a specific capacity of 12.0 gpm/ft of dd at the operational target rate of 488 gpm. Sand production at higher pumping rates has been a problem that has persisted since the well was originally constructed. Modifications were made to the well in 1993 to try to arrest filter pack settlement due to the sanding condition and improve access to the screened intervals. Aesthetic water quality was poor at the start of pumping but improved after continued pumping during 2015 testing. Chlorine was observed in the untreated groundwater during testing conducted during two separate events on April 14, 2015 and August 14, 2015. The concentration of chlorine diminished over time but was still present even with continued pumping during both events. The observation of chlorine in the discharge in the initial samples and after continued pumping is enigmatic, has no obvious source and would not be anticipated to be naturally present or persist given the chlorine demand in the aquifer based on the observed organic carbon concentrations. Arsenic was observed at concentrations well below the observed historical values and the current MCL. The presence of nitrate and a lower pH observed at Well 7 suggests a shallow groundwater source potentially related to the multiple screen intervals in the SGA or well integrity issues due to its relatively shallow surface seal and a corrosive groundwater condition in the well. Lastly, anecdotal evidence suggests that downward vertical flow has been observed in Well 7 since it was constructed, which may contribute to the extreme bacterial populations observed in 2015. Given the differences in water quality and well design between Well 7 and Well 8, the mixing of aerobic and anaerobic groundwaters between the shallow and deeper screened intervals within Well 7 is likely promoting biofouling in the well and appears to influence water quality at Well 8 when Well 8 is in operation.

- Well 8 has a specific capacity of 6.7 gpm/ft of dd at the operational target rate of 509 gpm. With the exception of elevated manganese, water quality was overall good. Bacterial populations consisting primarily of slime forming bacteria were present at concentrations of concern in Well 8, in both the casing and the aquifer sample. On this basis the well performance loss is likely due to biofouling; however, physical clogging of particulates accumulating within the filter pack cannot be eliminated. Performance of Well 8 is likely affected by well interference from City Well 6, Well 7 (when operated) and potentially other SGA groundwater users.

One recommendation from the 2015 review is the implementation of a Preventative Maintenance and Operations Plan (PMOP) for all City wells to monitor well performance, water quality, bacterial populations and pump and motor performance on a periodic basis. Implementation will allow identification of changes that may affect well performance and/or water quality.

## Water Treatment Options Analysis

Iron, manganese, TDS, hydrogen sulfide, and arsenic were all reviewed specifically to quantify the concerns expressed by the City. Based on that review for wells 2, 3, 4, 5, 6, 7, and 8, we recommend that a distribution system operations management approach will be the best solution to address water quality concerns rather than more costly treatment methods. Specific system operational changes include the following:

- Enhanced pump-to-waste protocols to prevent introduction of poor quality water, accumulated hydrogen sulfide, biofilm, and sediment into the distribution system.
- Structured unidirectional flushing program performed periodically to remove any accumulated biofilm and sediment in the distribution system.
- Blending of high TDS water from Well 4 with lower TDS water in the distribution system.

Implementation of these system changes will improve water quality delivered to City customers by eliminating introduction and accumulation of hydrogen sulfide, biofilm, metals and sediment within the distribution system.

## Action Plan

On the basis of observations from the 2015 testing program, water rights transactions and both short term and long term action plans were developed for the City to protect and develop its groundwater assets.

## Water Rights Transactions

1. The City should submit a Water Management Conservation Plan (WMCP) to the OWRD to meet the requirements outlined in the final orders of the Extension of Time applications for Permit G-6881, Permit G-9866 and Permit G-9867.
2. Develop a COBU to document the City's historic use of water under T-3119 so that the water right may be certificated. The water use data needed to support the COBU must be from before the completion dates (C-date) of October 1, 1993.
3. Develop additional groundwater supply at Well 2 through a new TSA water right application.
4. The C-dates for Permits G-6881, G-8655, G-9867, G-9866, and G-13565 are all October 1, 2017. Prepare extension of time applications for each permit (5 total) requesting additional time to develop the water use authorized under the permits. The driving need for the time extension is to refurbish and/or replace wells.
5. Prepare a transfer application for the certificate resulting from the certification of T-3119 to add one or more existing or planned wells to replace the single well listed on this water right (Drinker Well).
6. Prepare permit amendment application for Permits G-6881, G-8655, G-9867, G-9866, and G-13565 to change and/or add well(s) to the permits sufficient to allow the City to appropriate the full rate authorized under the permits based on observed operational rates and allow flexible allocation for a future well(s).

## Short Term Actions (2015 to 2017)

1. Adjust pump-to-waste operations to diminish sediment, hydrogen sulfide and biofilm introduction into the distribution system when bringing wells online. The extended pump-to-waste period will be long enough to remove 2 to 5 borehole volumes. The pump-to-waste cycle duration will vary from well to well based on construction, well yield and observation of water quality improvements.
2. Consider reducing operational pumping rates of wells and implementing longer run cycles for filling reservoirs or rotation of well operation, if possible. The reduced operational pumping rates will be adjusted to maintain a sufficient water column above the pump intake to minimize introduction of oxygen into the standing water column in the well. The modification to the rate and pumping duration will vary from well to well, system demand and distribution system operation to fill reservoirs.
3. Periodically perform a structured unidirectional flushing program to remove accumulated biofilm, sediment and mineral precipitates from the distribution system.
4. Modify Well 2 to allow access for monitoring well performance and evaluate if additional capacity exists.

5. Perform well video surveys at Wells 3, 6, 7 and 8. Recommendations for future redevelopment, reconstruction or maintenance activities will depend on observations of the condition of the wells. For planning purposes we recommend the City plan for at least 2 well redevelopment efforts at Well 6 and either Well 3 or Well 8.
6. Implement the Preventative Maintenance and Operations Plan (PMOP) annual maintenance monitoring program at all City Wells to identify well maintenance, water quality and well redevelopment.

## **Long Term Action Plans (2015 to 2020)**

1. Develop additional groundwater supply at the proposed Well 9 location for redundancy and long term projected demand.
2. Evaluate other potential well locations within the City's service areas should other Well 3 or Well 7 need to be replaced. Based on the available information of current conditions at Well 3 and Well 7, we do not recommend further well redevelopment or investment in maintaining these wells as groundwater assets for long-term use. Unless well video surveys (or other downhole evaluations) provide supplemental information suggesting that the wells can be modified and/or redeveloped, we recommend the City consider abandoning these wells in the future and transferring the authorized water right permitted rate(s) to a new or replacement well.
3. Replace Well 3 and Well 7 with a new water supply well to meet the City's projected future demands. This will require additional water right transactions to maximize the City's water rights associated with Well 3 and Well 7. Proposed Well 9 may be capable of replacing one or both of these well locations depending on encountered aquifer conditions; however, additional new well(s) may be required.
4. Revise and continue to implement the PMOP based on observations of well redevelopment effectiveness, identify well maintenance and water quality improvement needs.

## Section 1

# Introduction

GSI Water Solutions, Inc. (GSI) provided an evaluation and summary of the City's municipal water supply wells and municipal source water rights during the facility inventory in 2011 as part of its Water Master Plan (WMP) update (Black and Veatch, 2012) to assess current and future demands on the groundwater supply. Based on observations during the 2011 facility assessments, the City's wells are limited in production capacity by both water rights and long term well performance declines and need to be addressed to meet future demands. On this basis, the City pursued a comprehensive well assessment to identify the cause(s) for the diminished well performance and yield exhibited by the City's water supply wells.

## Groundwater Supply

The City has seven groundwater supply wells (2, 3, 4, 5, 6, 7 and 8) that can be used to meet current customer water demands (Figure 1). Most of the City's original water supply wells (2, 3, 4, and 6) were installed between 1978 and 1981; Well 7 was installed in 1991; Well 8 and Well 5 were subsequently added to the system in 1993 and 2007, respectively. The City currently only operates wells 2, 3, 4, 5, 6 and 8 regularly. Well 7 is tested periodically to ensure the pump and well are operational when needed. The City's updated WMP suggests the wells have a combined yield of approximately 5.15 million gallons per day (MGD), with a theoretical maximum of 7.4 MGD.

All but one of the City groundwater wells (Well 2) are interpreted to be completed in the Sand and Gravel Aquifer (SGA) unit (Hartford and McFarland, 1989) of the lower Troutdale Formation in the Portland Basin. The SGA is the major aquifer used by other nearby municipalities in the Portland Basin, including the City of Portland. The SGA consists of varying proportions of loose to moderately cemented sand and gravel, interfingering with finer-grained sediments which represent alluvial deposits from the ancestral Columbia River and rivers draining the Cascade Range in Oregon. City Well 2 is completed in the Troutdale Sandstone Aquifer (TSA) which is encountered at shallower depths and separated from the SGA by low permeability clay and silt sediments of the Confining Unit 2 (Hartford and McFarland, 1989). Water well reports and well construction information for the City's wells are included in Appendix A.

## Water Rights

The long-term goal of the City is to develop and maintain sufficient source capacity of good quality water to reliably meet current and future anticipated demands. In doing so, the City also has a vested interest in fully developing unused capacity on existing water rights permits to retain the water rights into the future, while utilizing the well field in a sustainable manner to ensure long-term viability of the groundwater supply.

The City currently holds seven water rights for municipal use with a cumulative total water right capacity of 5,606 gallons per minute (gpm) [12.49 cubic feet per second (cfs) or 8.07 MGD]. Of the City's seven existing water rights, one is a water right certificate, five are water use permits, and one is a water right transfer. Four of the City's water rights are associated with a single City water supply well, with the remaining three water rights being associated with two or more other water supply wells. A matrix of the City's water rights and water supply wells is provided in Table 1 to provide a means of illustrating the allocation of the City's well production capacity (based on the City reported 2015 pumping rate for its water supply wells) among its current water rights.

Key observations from Table 1 include the following:

- The City's current water rights authorize a total cumulative rate of 5,606 gpm (12.49 cfs) for municipal use by the City.
- 3,714 gpm (8.27 cfs) of the City's current well production capacity is being utilized under the City's water rights.
- The City has 1,892 gpm (4.22 cfs) of water right capacity that is not being currently used by an existing City water supply well.
- The City has 1,232 gpm (2.75 cfs) of well production capacity without allocated water rights: 41 gpm at Well 2, 676 gpm at Well 5, and 515 gpm at Well 7.

The City has the opportunity to complete the development of its water rights through water right transfers, the improvement of well performance of its existing wells, and through well replacement and/or addition of new wells. This comprehensive well assessment will evaluate these different options to assess which are the most cost beneficial to fully utilize their existing water rights.

In June 2015 the Oregon Water Resources Department (OWRD) notified the City that it is requiring the submittal of an updated Water Management and Conservation Plan (WMCP) to minimize potential problems related to certification of its water use Permits and to allow the City to gain authorization to appropriate groundwater at a greater rate than the "Development Limitations" specified in the conditions for the applications for Extension of Time that were approved for Permits G-6881, Permit G-9866 and G- 9867 in 2008. Previously, the City was required to submit the WMCP update by October 1, 2015; however, during the Permit Extension of Time process the OWRD conditioned the approval with a submittal date of May 23, 2011 and "Development Limitations" based on Oregon Administrative Rule (OAR) 690-09 and OAR 690-33 (Table 1).

Prior to pursuing any additional water right transactions, the City must submit an updated WMCP to the OWRD as required under Oregon Administrative Rule (OAR) 690 -86. The updated WMCP is intended to be a long term planning tool to identify needs, management and conservation tools and to help secure OWRD authorization for increased diversion under the extended Permits.

## Well Performance and Well Yield Declines

During the 2011 facility inventory, City wells 3, 4, 6, 7 and 8 were observed to have substantial declines in well yield and well performance since they were originally constructed (Table 2). Several of the City's wells have been rehabilitated one or more times. Comparison of current operational well performance to initial well performance results indicated specific capacity declines of 40 to 60 percent. The performance declines are reflected by well yield declines of up to 450 gpm for individual wells.

Typically, the loss of well performance and yield can result from one or more of several major causes related to well construction, water quality, aquifer properties or operational conditions including:

1. Pump and motor wear and deterioration overtime.
2. Changes in distribution system operation and total dynamic head (TDH) as the system is developed and modified.
3. Changes in aquifer conditions, such as water levels, water quality, or nearby pumping by other groundwater wells (i.e., well interference).
4. Physical plugging of the well screen and filter pack resulting from poor well construction and/or improper well design, inadequate well development, bridging of aquifer material in pore spaces, or structural damage to the well screen or casing.
5. Chemical precipitation or encrustation of the well screen, filter pack, and/or near well aquifer matrix because of water quality conditions.
6. Biological fouling of the well screen, filter pack, and/or near well aquifer matrix by iron related bacteria (IRB), slime-forming (SLYM), or sulfate-reducing bacteria (SRB).

The influence of one or more of these conditions can significantly affect the well performance and in some instances, if not diagnosed early, can affect the longevity of a water supply wells operating life cycle. In the absence of changes in the pumping system or distribution system and well interference, the loss of well performance and yield is primarily a result of clogging of the well screen and/or filter pack. Conditions 4, 5 and 6 listed above will result in clogging and limit flow into the well during pumping. Preliminary review of the available information during the facility inventory indicated that several of the City wells may be experiencing declines in well performance due to one or more of these conditions.

## Water Quality

In addition to decreasing well performance and yields, the City has experienced aesthetically-objectionable water quality in several of the SGA wells. Well 7 has historically had arsenic concentrations that approaches the primary drinking water Maximum Contaminant Limits (MCL) established by the Environmental Protection Agency (EPA) Safe Drinking Water Act (SDWA) and adopted by the Oregon Health Authority (OHA). Several wells approach or exceed the Secondary Maximum Contaminant Limits (SMCL) for

drinking water criteria for manganese, sodium and total dissolved solids (TDS). Additionally, hydrogen sulfide is present in groundwater resulting in taste and odor (i.e. rotten egg odor) issues with aesthetic water quality.

Specific water quality issues observed in the City's wells include:

- Manganese is present in wells 3, 4, 6, 7 and 8 at concentrations that approach or exceed the SMCL of 0.05 milligrams per liter (mg/L).
- Elevated concentrations of total dissolved solids (TDS) are present in Well 4.
  - TDS concentrations are greater than 300 mg/L, not typical of the SGA
  - Carbonate minerals/scale observed on distribution system and plumbing fixtures in areas serviced by Well 4.
- Arsenic has historically been present at concentrations near the MCL of 0.010 mg/L at Well 7.
- Hydrogen sulfide is present in all SGA wells except Well 5.

The generally poorer SGA water quality in Troutdale water supply wells relative to wells operated by municipalities west of the City may be attributable to local and regional geologic structures present in the area in the vicinity east of Troutdale. The geologic faults and structures may serve as potential conduits for deeper, more mineralized waters to intrude into the overlying Troutdale Formation. Additionally, because the SGA is relatively thin on the east side of Troutdale, pumping induced upward vertical gradients may enhance upwelling of more mineralized higher TDS waters from the underlying basalt aquifers (Black and Veatch, 2012).

## Goals and Objectives for 2015 Study

The 2012 Water Master Plan Update recommended that the City perform a comprehensive well assessment to investigate each of the City's wells performance histories, local aquifer conditions and water quality to define specific actions for the City to further develop its groundwater source and mitigate any further well performance declines and water quality issues. The specific goals and objectives of this study include:

- Review of the 2012 Water Master Plan for the City, Water Quality Reports and any available supporting documentation regarding well construction, water quality, water rights and local and regional hydrogeology.
- Conduct a comprehensive sampling and testing program at each of the City's wells.
- Identify mechanisms that contribute to well performance decline and water quality issues at individual wells.
- Provide prioritized actions to arrest or recover well yields and water quality.
- Provide specific scoping and planning level costs where possible with the available information collected as part of the comprehensive assessment.
- Provide planning level scoping and cost estimates for other actions that may require further evaluation outside of the scope of the comprehensive well assessment.

## Report Organization

The Comprehensive Well Assessment and Action Plan is organized as follows:

- Section 1 - Introduction
- Section 2 - Assessment Approach
- Section 3 - Water Supply Well Assessments
- Section 4 - Customer Survey Results
- Section 5 - Water Quality Treatment Options
- Section 6 - Action Plan Alternatives Analysis
- Section 7 - Action Plan

Tables and Figures are included at the end of the report. Electronic copies of Appendices A-G are included on a data CD attached to the end of the report.

## Section 2

## Assessment Approach

This section summarizes the methodology and approach for the evaluation of the individual well performance, the bacterial assessment and water quality, pump and motor performance and observations and the general condition of each of the City's wells.

### Assessment Approach and Methodology

Each water supply well was evaluated to determine the condition of well including:

- Well performance.
- Bacterial assessment and water quality profile.
- Pump and motor performance.

Evaluating a water supply well using these diagnostic tools in concert can help to identify the cause of well performance decrease and whether to redevelop, rehabilitate, reconstruct or replace a well. Additionally, the comprehensive evaluation also provides baseline information for any future well performance or water quality related issues at the City's well; however, other diagnostic tools requiring removal of the pump and motor such as well video surveys, flow profiling or geophysical surveys may also be required to determine the causes of well performance decline. Brief descriptions of each of the diagnostic approaches utilized for the 2015 assessment are described below.

### Well Performance

The City has maintained documentation of the well yields and long term well performance of its wells since they were constructed. Well performance can be estimated from the specific capacity of the well. The specific capacity of a well is estimated by dividing the well yield (in gpm) by the total drawdown in the well (in feet of drawdown) at the observed pumping rate. Several factors affect the observed specific capacity of a well including:

- Aquifer properties
- Pumping rate and duration of pumping
- Well screen and filter pack design
- Well drilling method and well development
- Aquifer or hydrologic boundaries, if present
- Other groundwater wells (i.e. well interference)

Using both long term specific capacity trends and step rate pumping test analysis can provide clues to the individual contributions of these factors to the total drawdown at a pumping well. The City typically operates their wells at a "sustainable" pumping rate determined by the current well performance for a period of hours or the long term specific capacity. The long term specific capacity of the wells were evaluated during the 2011

facility inventory and have not changed substantially based on a comparison of City operational pumping rates reported in 2015.

Evaluating specific capacity at multiple (typically increasing) pumping rates (commonly referred to as a step rate pumping test) is useful in tracking trends in well performance. The value of a step rate pumping test is that it allows evaluation of the contributions of various frictional losses that contribute to the total drawdown in a well over a range of pumping rates. The total drawdown within the well casing during pumping is generally greater than the drawdown immediately outside the well in the aquifer due to both laminar and turbulent frictional losses within the aquifer and as water enters the well (Figure 2).

Aquifer losses are largely dependent on the formation and the aquifer properties (i.e. transmissivity and storage coefficient), but are also dependent on the duration of pumping and well construction. The turbulent well loss contribution to the total drawdown is a combination of turbulent losses near the well bore, screen and within the well as water enters the well. On that basis, the turbulent well losses would be most affected by the reduced permeability in the screen, filter pack and formation near the well by well clogging. The turbulent well losses and aquifer losses are related to the total drawdown by the following empirical equation:

$$s_w = BQ + CQ^P \quad (\text{i.e. the Hantush- Biershenk equation})$$

Where:

$s_w$  = total well drawdown [feet]

$Q$  = flow rate at the observed drawdown [gpm]

$B$  = the aquifer loss due to laminar flow to the well [feet/gpm]

$C$  = the turbulent flow loss in the well, also referred to as the "well loss" [ft/gpm]

$P$  = constant turbulent flow exponent with a general value of 2, but ranging from 1 to 3 (Kawecki, 1995)

A Hantush- Biershenk analysis was performed to evaluate the contribution of turbulent well losses and aquifer losses to the total observed drawdown of the well (Krusemann and de Ridder, 1991; Kawecki, 1995). Assuming a constant of 2 for the turbulent flow exponent ( $P$ ), the above equation can be simplified so that aquifer losses and the turbulent well losses can be estimated on a linear plot of step rate pumping test data where we plot specific drawdown ( $s/Q$ ) versus the flow rate ( $Q$ ) for each well (see Appendix B). The determination of  $B$  and  $C$  also using the Hantush-Biershenck plot allows the following:

- Prediction of drawdown at an extrapolated target pumping rates.
- Estimation of the percent of total head loss due to laminar flow (Driscoll, 1986)

These estimates are particularly useful when evaluating operational changes due to well performance decline.

The values of  $B$  and  $C$  can also be estimated using a residual statistical solution of the step rate pumping test observations with the Dougherty and Babu (1984) solution of the Theis (1935) equation in the aquifer test analysis software AQTESOLV PRO. Estimated values for  $B$  and  $C$  using the Hantush-Biershenk method or the residual statistical solution should be

in general agreement; however, one of the underlying assumptions to the Hantush-Biershenk analysis is that each pumping step reaches steady-state conditions and this isn't always achievable in the field. An advantage of the residual statistical solution is that it accounts for transient conditions and also allows estimation of the additional parameters of transmissivity and the well bore skin value ( $S_w$ ).

The well bore skin value typically ranges from -5 to 20 (Kawecki, 1995). A negative  $S_w$  estimate suggests that the permeability near the well is enhanced relative to the aquifer formation, and the well is properly designed and properly developed. In the case of a positive skin factor the drawdown within the well is greater than outside the well. A positive  $S_w$  is a result of the drawdown within the well is greater than outside the well due to a lower permeability in a damaged skin zone. This typically is the result of many factors including mud infiltration into the aquifer formation during drilling, bridging of screen openings by coarse particles; mineral precipitation, improper screen and filterpack design causing the well to experience clogging or poor well development.

The interpretation of the step rate testing analyses using the Hantush-Biershenk method and Theis method combined with the review of the long term specific capacity trends in the City Wells will allow evaluation of contributions to total drawdown due to linear well and aquifer losses and turbulent well losses; however, pumping by other SGA users and the City's SGA wells is reflected in the variability in the specific capacity in the City's historic operational data for several wells (Well 6, Well 7 and Well 8 in particular).

## Bacterial Assessment and Water Quality Profile

Bacteria are present in soil, surface water, groundwater and the biosphere. In the most general sense, bacteria of concern in water supplies can be divided into those that are pathogenic (or capable of making a person ill) and those that are non-pathogenic. The pathogenic bacteria of concern in drinking water are Coliform bacteria because they are indicative of sanitary conditions and their presence may suggest that other pathogens may be present including disease-causing bacteria, viruses, or protozoa and many multicellular parasites. Sodium hypochlorite introduced into the distribution system at a sufficient concentration and allowed the required duration of contact time will effectively eliminate pathogens and maintain sanitary conditions in source water. The City regularly tests for the presence of coliform bacteria and also maintains sufficient chlorine residual within the distribution system to meet sanitary standards.

Non-pathogenic bacteria are problematic due to their ability to grow and mature within the environment of a water supply well and/or distribution system. Under the right conditions, non-pathogenic bacteria populations can proliferate and result in biological fouling of the well screen, filter pack, and/or near well aquifer matrix and microbial induced corrosion in the well. These bacteria are typically iron related bacteria (IRB), slime-forming (SLYM), or sulfate-reducing bacteria (SRB). These bacteria can accumulate biological depositions of iron and manganese, produce excessive slime (or biofilm) and release hydrogen sulfide as a by-product of anaerobic respiration of sulfate. While not a threat to human health, their presence generally results in color, taste, staining and odor issues with source water quality, clogging and/or corrosion of an affected well and scale, slime buildup and corrosion within the distribution system. The presence of nutrients such as iron, manganese, sulfate,

phosphate or nitrate can support bacterial populations under aerobic or anaerobic conditions, which results in bacterial plugging of the well screen, filter pack and formation. Identification of the bacteria population and nutrient sources can help identify the causes of well performance losses and poor water quality.

In addition to bacterial populations, water quality variability can also cause clogging of the well screen and/or the well bore in a water supply well. Groundwater with chemistry prone to chemical precipitation typically has higher concentrations of TDS, carbonate, iron and manganese. As groundwater enters the oxidizing environment in a pumping well precipitation of in precipitation of carbonate scale, ferrihydroxide and oxide minerals on the well, screen, filterpack and within the distribution system. Additionally, mixing of waters within the well from different water bearing zones that have subtle differences in water quality or an oversaturated condition with respect to carbonate can also cause the precipitation of minerals to occur.

Water quality sampling results can be used to evaluate groundwater quality at each well to determine whether favorable conditions were present for chemical precipitation and biological populations of the wells. At each well a "casing" sample and an "aquifer" sample were collected in unpreserved 1 liter sterile polyethylene bottles to evaluate bacterial populations and water quality in the vicinity of the wellbore, and further away from the well, within the aquifer. During sample collection water quality parameters of temperature, specific conductance, oxidation-reduction potential (ORP), pH, and dissolved oxygen were observed and recorded using a YSI 556 multi-parameter water quality meter. Trends in water quality parameters can be diagnostic of well construction issues or bacterial populations

The dominant bacterial species and identifiable bacterial population were evaluated using both microscopic analysis and quantitative methods (i.e. adenosine triphosphate (ATP) fluorescence) to estimate the total relative bacterial populations. The water quality samples were characterized for selected nutrients, metals and typical ions (i.e. carbonate, sulfate, chloride, etc.) to evaluate the potential for precipitation of minerals and corrosiveness of the groundwater. Additionally, to evaluate the historical occurrence of arsenic at Well 7, time-series sampling of the arsenic species arsenite (+3) and arsenate (+5) were collected to evaluate potential sources of historically elevated concentrations of arsenic relative to other SGA wells.

The bacterial assessment and water quality samples were submitted to Water Systems Engineering (WSE) in Ottawa, Kansas to evaluate the potential for bacteriological and/or chemical precipitation as causes of clogging. The arsenic speciation samples were submitted to ALS analytical labs in Kelso, Washington. The field parameter observations, WSE reports for bacterial assessments, WSE water quality and ALS water quality results are included as Appendix D at the end of this report.

## Pump and Motor Performance

Deterioration of pump and motor performance can result in the loss of well yields. Periodic evaluation of the pump and motor condition can be performed by observing the discharge rate and total dynamic head (TDH) within the design curve of the pump. Deviations from the design curve for the installed pump and motor can provide indications of potential

mechanical (i.e. bowl, shaft or bearing wear) or electrical wear in the pumping system. The pump and motor evaluation was performed during the step rate pumping tests to evaluate system performance over the range of the design curve for the pump.

The following data were collected: Voltage, amperage, pumping water level, pump discharge rate, and system pressure/back pressure; however, because a suitable wattmeter or power factor meter was not available the power factor was assumed to be 90 percent, which is a typical for a 100 horsepower motor at full load. Additionally, wells with variable frequency drives installed were manually overridden to operate a frequency of 60 Hertz (Hz) to remove ambiguity and limit the additional calculations required to account for the affinity laws if the pump frequency was varied during system testing. Pump and motor field forms, system as-builts and design curves are compiled in Appendix D.

The observed data were used to calculate the water horsepower, input kilowatts, and pump efficiency. Overall efficiency or "wire-to-water" efficiency of the pumping system was evaluated. The typical efficiency of a new pump is 75 to 85 percent at its design point (i.e. TDH and flow) and a full load efficiency electric motor is typically 85 to 96 percent efficient. For a 100 Hp pump the following overall efficiency ranges are:

- Excellent - greater than 66 percent
- Good - 66 to 63 percent
- Fair - 63 to 57 percent
- Low - below 57 percent

Due to well performance issues the City is operating several of its pumps well below the design flow rate (i.e. at higher TDH and lower pumping rates) resulting in low overall estimated efficiencies.

## SECTION 3

## Water Supply Well Assessments

This section presents individual well assessment results for the City's water supply wells. The comprehensive assessments are presented for individual wells as follows:

- Well Construction
- Well Performance
- Bacterial Assessment
- Water Quality
- Well Video Survey Observations (where available)

A comparison of historic and current well performance is provided in Table 4. Summaries of the bacterial assessment results and water quality results are shown in Table 5 and 6, respectively. A summary of the step rate pumping test observations and estimated parameters for each well is presented in Table 7.

### Well 2 Assessment

The City's oldest water supply well still in use is Well 2 (MULT 1430), which is located adjacent to Reservoir 2. Well 2 was originally installed in 1976, with a reported yield of 550 gpm. Well 2 is completed in the TSA, the shallow portion of the Troutdale Aquifer.

#### Well Construction

In addition to being the only well not completed in the deeper SGA aquifer, Well 2 is also the only City well that was constructed with a natural formation pack screen design (i.e. no engineered filter or gravel pack). The well was constructed using telescoping steel casing with 12-inch casing driven to 280 feet below ground surface (bgs) and 10-inch casing driven within the 12-inch casing to a depth of 448 feet bgs. The well has a 2-inch annular seal (i.e. 16-inch borehole) to 45 feet bgs and the 10-inch casing was driven into a clay layer. No grout seal was installed between the 10-inch and 12-inch casing and the well does not meet current OWRD standards for well construction.

The well is screened from 450 to 480 feet bgs in a sand and gravel unit. The screen interval consists of 6 feet of 0.020 slot 10-inch telescopic stainless steel (SS) screen and 24 feet of 10-inch telescopic SS screen. The screen design capacity is 860 gpm at recommended design threshold of entrance velocity of 0.1 feet per second (ft/sec) (Driscoll, 1986).

#### Well Performance

Well 2 is currently capable of producing approximately 494 gpm. The original specific capacity of the well was reported to be 7 gpm/ft of dd. The current specific capacity could not be evaluated as the access port to measure water levels is currently blocked by a water level sounder; however, the well yield has remained consistent since it was last evaluated during the facility inventory in 2011.

## Water Quality

City staff report that the well has not had any problems since installation, and has excellent water quality in comparison to other wells operated by the City. The well has low total dissolved solids (TDS), a low alkalinity and low dissolved and total metals concentrations relative to other City wells (Table 5). Well 2 pH is greater than 8.0 SU, which is more similar to SGA wells and nitrate historically has been non-detect, suggesting anaerobic conditions are present in the TSA near the well. The low concentrations of dissolved oxygen (< 1 mg/L) observed during the step rate testing support this conclusion (Figure C-1).

## Bacterial Assessment

The bacterial assessment results for Well 2 indicated the lowest bacterial population and biological indicators observed at the City wells tested in 2015 (Table 6). At this time the well does not appear to be prone to or affected by biofouling or well clogging.

## Historic Well Video Survey

Downhole video surveys at Well 2 were not reviewed as part of this study.

## Well 3 Assessment

Well 3 (MULT 1429) is an SGA well located to the east of Reynolds High School, on the east side of SW 257<sup>th</sup> Avenue, in a below ground vault. After installation in 1978, Well 3 had a reported yield of 500 gpm with a specific capacity of 5 gpm/ft of dd. This specific capacity was observed to increase during subsequent testing in 1991 and 1993 (E & E Services, 1993), but has since decreased significantly. Filter pack and/or formation material has been observed in the distribution system during routine flushing near the well.

Well 3 was rehabilitated and redeveloped in 2008, by the City with minor improvement in well yield and/or performance. Redevelopment included using mechanical surging and swabbing in combination with use of the dispersing agent sodium triphosphate (STPP). The dispersing agent was recommended to mobilize fine silts which were suspected to be the cause of the decrease in well performance. The well was superchlorinated using 200 parts per million sodium hypochlorite solution (Steve Schnieder, pers comm., 2011). Since bringing Well 5 online, the City has reduced the operation of Well 3 due to its diminished performance and water quality issues.

## Well Construction

Well 3 has a 2-inch surface annular seal to a depth of 60 feet bgs. Below 60 feet the well has 12-inch casing to 508 feet bgs. The 12-inch casing was driven to a total depth of 615 before the shoe being cut off and the casing pulled back to 508 feet. The annular seal for Well 3 does not meet current well construction standards that require a grout seal be installed in wells completed in unconsolidated aquifers with significant clay beds (OAR 690-210-140). The construction standards require a 2-inch grout seal be installed a minimum of 5 feet into a clay bed that separates the shallower aquifer from a deeper aquifer (i.e. the TSA is separated from the SGA).

The well has 30 feet of 8-inch pipe size 60 slot SS screen installed from 510 to 545 feet bgs with a 5 foot blank from 530 to 535 feet bgs. The resulting design capacity of the well is approximately 1200 gpm at 0.1 ft/s

### Well Performance

The 2011 specific capacity was approximately 2 gpm/ft of dd and the estimated maximum potential yield of the well was reported to be 285 gpm (Table 2). The reported yield of 285 gpm for Well 3 was observed to be at the limits of performance of the well, and pumping levels are close to the net positive suction head of the pump.

During testing in 2015, Well 3 was tested at a maximum rate of 222 gpm with 97 feet of drawdown which results in a specific capacity of 0.69 gpm/ft of dd, approximately 14% of the original specific capacity of 5 gpm/ft of dd. The aquifer losses and turbulent well losses were observed to be relatively high (Table 4); however, because the well appears to be developing during pumping, the estimated linear, turbulent well loss coefficients and well loss due to laminar flow are likely inaccurate (Figure B-1). The aquifer transmissivity estimated from the step rate pumping test is the lowest of all of the City's SGA wells (Figure B-2).

### Water Quality

Well 3 has historically had elevated concentrations of manganese and dissolved hydrogen sulfide gas. During 2014 and 2015, Well 3 was observed to have relatively low TDS and alkalinity and was undersaturated based on its Langalier saturation index, suggesting a low potential for forming scale but a slightly corrosive groundwater (Table 5). The following other observations were made for the water quality at Well 3:

- Well 3 was observed to have relatively low pH (less than 7 SU)
- Nitrate (as Nitrogen) present at concentrations above 2.5 mg/L.
- Total organic carbon (TOC) in the casing sample was 2 mg/L while it was not detected in the aquifer sample.
- Both the casing and aquifer sample had re-suspended iron (organically derived iron) present.
- Manganese was 0.0012 mg/L, well below the SMCL of 0.05 mg/L
- Sodium was also well below the SMCL of 20 mg/L, ranging from 5.12 to 4.84 mg/L.
- Langalier saturation index (LSI) results ranged from -0.94 to -1.1 suggesting it's under-saturated with respect to calcium carbonate and is corrosive.

Consistent with the presence of nitrate, the water quality parameter trends observed during step rate pumping at Well 3 indicated dissolved oxygen greater than 6 mg/L, a pH of less than 7 SU, and an oxidizing ORP (Figure C-2). These conditions are not typical of the deeper SGA and suggest the potential influence of shallow groundwater at Well 3. Combined with the differences in sodium, nitrate and manganese it would appear that Well 3 may be receiving shallower groundwater due to a well construction or well integrity issue.

## Bacterial Assessment

Bacteria assessment of Well 3 suggests a moderate bacterial population comprised predominately of iron/manganese oxidizing bacteria *Gallionella* and *Leptothrix* were present in the casing sample. The ATP counts were above 100,000 cells per milliliter (cells/ml) in the casing sample, but less than 30,000 cells/ml in the aquifer sample (Table 6).

## Historic Well Video Survey

Downhole video surveys at Well 3 were not reviewed as part of this study.

## Well 4 Assessment

Installed in 1980, Well 4 (MULT 1340/93369) is located behind the City Public Works building. The well reportedly had an original yield of 900 gpm and a specific capacity of 11 gpm/ft of dd. GSI completed flow profiling and depth discrete water quality profiling of Well 4 in December 2006 to evaluate whether the quality of water produced from the well could be improved by modifying the screened intervals of the well (GSI, 2008a). Subsequent to that study Well 4 was reconstructed.

## Well Construction

Well 4 was originally constructed with a 12-inch diameter casing to 494 feet bgs, with the screened interval consisting of 6-inch pipe size 30 slot continuous wire-wrapped SS screen from 493 to 563 feet bgs. The 2-inch cement grout annular surface seal was installed to a depth of 38 feet bgs. Based on the screen design the well has a maximum capacity of approximately 970 gpm at a screen entrance velocity of 0.1 ft/sec.

In 2006 a video survey of Well 4 revealed extensive corrosion of the 12-inch production casing below the static water level, including a hole at an approximate depth of 150 feet. The presence of the hole in the casing and lack of a seal below an approximate depth of 64 feet required repair or abandonment of the well to comply with Oregon Water Resources Department (OWRD) well construction standards.

The well was repaired by perforating the 12-inch casing, installing a 10-inch diameter mild steel casing (0.25-inch wall thickness) liner between +1 foot and 438 feet bgs, and installing a grout seal between the 10-inch and 12-inch casings to bring the well up to the OWRD standards.

## Well Performance

The yield of Well 4 has decreased by approximately 300 gpm from when the well was first operated, primarily due to the reduction in the diameter of the well after the repair, requiring installation of a lower capacity pump. The specific capacity of the well was reported to gradually increase to 17 gpm/ft of dd by 1992 and has been consistently close to 12 gpm/ft of dd since 2006.

During 2015 testing the specific capacity was observed to be between 12.16 and 12.9 gpm/ft of dd. The linear and turbulent well losses were estimated to be relatively low and the total head loss appears to be predominately due to laminar flow (Figure B-3). The aquifer

transmissivity estimated from the step rate pumping test was 7,500 ft<sup>2</sup>/day and suggests that the SGA aquifer is highly transmissive in this area.

## Water Quality

Historically, water quality at Well 4 meets all primary drinking water standards; however, manganese and TDS are above the secondary drinking water standards (Table 5). The TDS concentration in Well 4 has historically exceeded 550 mg/L, resulting in mineral precipitation on plumbing fixtures in the area of the City it serves. The concentration of chloride also has been historically elevated in Well 4, but does not exceed secondary standards. Additionally, hydrogen sulfide gas is present at Well 4.

Water quality sampling results performed in 2014 and 2015 indicate the following:

- Well 4 TDS concentrations were observed to be in the range of 219 to 312 mg/L nearly half of historic concentrations observed at the well.
- Sodium values have also decreased from 150 mg/L in 2005 to 50 mg/L or less in 2014/2015 sampling.
- Chloride is well below the MCL of 250 mg/L with concentrations ranging from 17.8 to 37.2 mg/L.
- A positive LSI was observed (0.56 to 0.14) indicating the potential for deposition of carbonate and/or metal oxide scale.

Water quality trends at Well 4 during the step rate pumping test suggest generally anaerobic (dissolved oxygen < 1 mg/L) and reducing (ORP < 0 millivolts [mV]) while the pH that was slightly alkaline (greater than 8 SU) (Figure C-3). It appears that water quality has improved slightly at Well 4 since it has been reconstructed; however, it still has relatively higher TDS and the potential for forming scale or mineral deposits within the distribution system is greater relative to other City wells.

## Bacterial Assessment

Well 4 bacterial assessment sampling observed relatively moderate bacterial activity based on the visual microscopic evaluation and ATP counts (Table 6). The casing bacterial populations were 219,000 cells/ml and the aquifer sample was 59,000 cells/ml. The bacteria identified to be present were *Pseudoxanthomas* and *Acidovorax*. Anaerobic growth was 10% of the total microbial population in each sample, which is likely the source of the odor observed at startup of the well.

## Historical Well Video Review

The most recent well video surveys available for Well 4 were reviewed as part of the 2006 well reconstruction project (GSI, 2008). Given that the video surveys were run prior to reconstruction and after reconstruction was completed, they do not provide useful diagnostics or insight into the well's current performance.

## Well 5 Assessment

Well 5 (MULT 90881), installed in 2007, is the City's highest yielding well and is capable of producing 2,000 gpm, but currently is operated at a maximum rate of 1,324 gpm because of water rights limitations. The well had a 48-hour specific capacity of approximately 50.1 gpm/ft of dd (48.78 gpm/ft of dd was estimated from the water well report of drawdown at a pumping rate of 2,000 gpm when first installed).

### Well Construction

Well 5 is the City's deepest well and is completed in the SGA (Table 1). The well has 16-inch steel casing installed to a depth of 525 feet bgs with a 2-inch cement annular seal installed to the same depth. Well 5 is screened in the SGA across multiple zones consisting of medium to fine black sands. The well has completed with 89 feet of 12-inch pipe size 40 slot continuous wire-wrapped SS screen with an estimated transmitting capacity of 3600 gpm at an entrance velocity of 0.1 ft/sec.

### Well Performance

The observed specific capacity of Well 5 ranges from 79.69 to 65.02 gpm/ft of drawdown at pumping rates of up to 1,736 gpm based on step rate testing in 2015. A specific capacity of approximately 90 gpm/ft of drawdown was observed at the current operational target rate of 1,400 gpm during the step-rate pumping test of Well 5 after completion of the well (GSI, 2008b). The transmissivity of the SGA estimated for Well 5 is the highest amongst the City's wells (Table 4).

### Water Quality

Well 5 water quality during the 2014 and 2015 sampling event was generally acceptable and does not appear to have any issues not previously identified during the facility inventory. The following observations were made.

- The LSI was observed to be slightly positive oversaturated.
- Nitrate was not-detected.
- Odor was also not-detected in 2014 or 2015.
- pH was slightly alkaline at 8.01 to 8.02 SU.
- Manganese was present at a concentration of 0.0568 mg/L, which is slightly above the SMCL of 0.05 milligrams per liter (mg/L).
- Sodium was observed at 23.2 mg/L, also slightly exceeding the SMCL of 20 mg/L.

No substantial trends in water quality were noted during testing and overall water quality was consistent with those anticipated in the SGA (Table 5). During the 2015 step rate pumping test at Well 5 water quality conditions were observed to be generally anaerobic (dissolved oxygen < 2 mg/L), slightly oxidizing (ORP ~ 100 mV) with a slightly alkaline pH near 8 SU (Figure C-4). The presence of hydrogen sulfide noted during drilling of the well has not observed during subsequent operation of Well 5 or during 2015 testing.

## Bacterial Assessment

The biological activity in Well 5 was the lowest observed in the City's SGA wells (Table 6). Very little biological activity was observed during the microscopic and quantitative analysis. ATP counts were well below the level of concern of 100,000 cells/ml.

## Historic Well Video Review

The most recent video for Well 5 was performed in 2012 when pump maintenance was performed. The well screen and filter pack were relatively clear of any debris or biofilm. Minor debris that was dislodged during the pump removal and/or by the camera assembly was visible in the water column. The visual observations during the video survey in 2012 support the WSE sample analysis of a low level of biological activity at Well 5.

## Well 6

Well 6 (MULT 67091) is located in Sweetbriar Park and was installed in 1981. Well 6 had an original reported yield of 900 gpm with a specific capacity of 14 gpm/ft of drawdown. During re-testing of the well in 1992 the specific capacity was observed to have decreased to 8 gpm/ft of drawdown. Performance of the well had been observed to continue to diminish and the specific capacity was estimated to be 6.6 gpm/ft of drawdown at 476 gpm in 2011 (Black & Veatch, 2011).

## Well Construction

Well 6 has a telescopic seal, with a 2-inch annular seal from ground surface to 100 feet and a 1-inch annular seal from 100 to 195 feet bgs (Table 1). The well appears to be sealed into a cemented gravel of the TSA rather than a well-defined confining sediment layer (i.e. clay or silt). Below the annular seal, driven 12-inch steel casing is present to 420 feet. Well 6 does not meet current OWRD construction standards due to the lack of an annular seal installed 10 feet below the top of a confining unit that hydraulically separates the shallower TSA from the deeper SGA.

The screen section consists of 75 feet of 6-inch pipe size 30 slot continuous wire-wrapped SS screen (Table 1). The estimated transmitting capacity of the screen at an entrance velocity of 0.1 ft/sec is approximately 1600 gpm.

## Well Performance

The specific capacity and yield of Well 6 were reported to have declined as early as 1988. After chemical rehabilitation in 1988, the pumping rate was reduced to 600 gpm to maintain lower screen entrance velocities and uphole velocities during pumping. Specific capacity quickly diminished after the rehabilitation and well redevelopment using mechanical techniques and jetting was recommended in the 1993 water master plan document (E & E Services, 1993). The well was last documented to be redeveloped in 2008 using mechanical surging and swabbing in combination with sodium triphosphate (STPP), a dispersing agent. The dispersing agent was recommended to mobilize fine silts which were suspected to be the cause of the decrease in well performance. The well was then superchlorinated using a 200 parts per million (ppm) sodium hypochlorite solution (Steve Schnieder, per comm. 2011).

Testing of the well in 2015 suggests that well performance is better than previously estimated (Table 3). The well was observed to have an estimated specific capacity ranging from 8.79 gpm/ft of drawdown at 123 gpm to 8.32 gpm/ft of drawdown at 499 gpm. Performance of Well 6 was observed to be 6.6 gpm/ft of drawdown at 476 gpm during the facility inventory in 2011. Review of historic specific capacity data collected by the City suggests year to year fluctuation of both increases and decreases in specific capacity, particularly after the installation of Wells 7 and 8 (Appendix B). This is consistent with observations during the Well 8 pumping test results that observed approximately 3.5 feet of drawdown at Well 6. Well interference from the City's wells (and other SGA users) may be responsible for the observed year to year variation in specific capacity at Well 6.

## Water Quality

Water quality at Well 6 is observed to have an elevated manganese concentration and hydrogen sulfide odor, which is generally consistent with the City's other SGA wells. Water quality results from 2014 and 2015 sampling are tabulated in Table 6 and summarized below:

- pH was slightly alkaline at 7.9 to 8.08 SU based on the lab results.
- Manganese was 0.0491 mg/L, slightly less than the secondary standard.
- The threshold odor number (TON) was 6.73 SU above the SMCL of 3.0 SU, likely due to hydrogen sulfide.
- LSI ranged from -0.12 to -0.3.
- Nitrate was detected (0.3 mg/L) in the 2015 casing sample, but not detected in the aquifer sample or the 2014 sample.
- Sodium ranged from 25.5 to 27.4 mg/L.
- Dissolved oxygen was less than 1 mg/L and strongly reducing conditions (less than -100 mV) were observed during step rate testing (Appendix C).

The groundwater at Well 6 appears to be slightly corrosive and is undersaturated with respect to carbonate, which likely would limit scale formation within the well and distribution system. On the basis of customer complaints and the TON of 6.73 SU in 2014, hydrogen sulfide odor is persistent at Well 6. The field parameter monitoring suggests anaerobic (dissolved oxygen < 1 mg/L) and reducing (ORP < -150 mV) conditions with an alkaline pH (pH > 8 SU) groundwater at Well 6 (Figure C-5). The operation of the submersible pump and motor resulted in minor shifts in the temperature of the discharge during the step rate pumping test.

## Bacterial Assessment

Prior to the current bacterial assessment testing in 2015, GSI collected and submitted a water quality sample to Water System Engineering of Ottawa, Kansas in 2006 for bacterial assessment. Microscopic evaluation of the 2006 samples showed a moderate population of the iron and manganese oxidizing bacteria *Crenothrix*. This bacterium is often of concern due to its active digestion of available iron and manganese in a well. In addition to corrosive tendencies, this bacterium secretes an iron or manganese rich, gelatinous stalk. The stalk

that is produced can actively bridge and clog screen openings as well as pump intakes. Furthermore, the bacteria can migrate beyond the well setting, affecting distribution lines and water treatment procedures.

In 2015, Well 6 was observed to have relatively low bacterial activity overall; however, several bacteria and protozoa were identified in the casing sample, which had an ATP count of 217,000 cells/ml (Table 7). Anaerobic growth represented 10 percent of the total microbial growth, which likely attributes to the odor observed at Well 6. The presence of the protozoa in the sample would suggest surface water influences; however, some protozoa do occur in biofouled wells. On the basis of the 2015 results it would appear that the 2008 chemical treatment and superchlorination have effectively controlled the bacteria population at Well 6.

### **Historic Well Video Review**

GSI reviewed three historical videos for Well 6 performed between 1988 and 2004. Review of the historic videos suggests that Well 6 has experienced biofouling since installed. Well video surveys suggest that the well has experienced plugging due to iron-oxide deposition on the well screen. Iron oxide deposition was significant enough to limit visibility of the filter pack sections of the well screen.

## **Well 7**

The City installed Well 7 (MULT 1444) in 1981 in the Sandee Palisades residential area. The original reported well yield and specific capacity were 1,000 gpm and 18.6 gpm/ft of drawdown respectively. The well was not put into service until 1990, but once in service quickly began to experience well performance issues and required redevelopment. The well is currently capable of producing 518 gpm with a specific capacity of 9.8 gpm/ft of drawdown; however, the City does not operate Well 7 regularly and only exercises the well to ensure that it is operational in case it is needed as a back-up supply.

### **Well Construction**

Well 7 was poorly designed and constructed based on a review of the original water well report and observations during subsequent in-well work. The annular seal at Well 7 is reported to consist of cement grout from ground surface to 20 feet bgs; which meets the minimum requirements for an annular surface seal for OWRD, but does not meet current requirements for sealing off aquifers with significant clay beds because the seal does not extend down into a confining clay bed below the TSA and above the SGA.

Based on the OWRD water well report, Well 7 is constructed with 30 feet of 100 slot stainless steel screen with a gravel pack consisting of ¼-inch to ¾-inch pea gravel and screened over two intervals from 360 to 385 feet (cemented gravel) and 465 to 475 feet (clay and gravels); however, during subsequent in well work the actual screen intervals was noted to begin at 358 to 384 feet and the lower interval(s) was from 465 to 475 feet bgs, 480 to 490 feet bgs and from 495 to 525 feet bgs. This is consistent with the as-built information reported by Robinson and Noble (1981). The well screen has an estimated transmitting capacity of 1200 gpm at 0.1 ft/sec.

During initial step rate testing after construction, Well 7 was observed to produce substantial amounts of green sand at the start of pumping with sand production increasing as the well was pumped at higher rates; most likely due to the aggressive screen slot size and filter pack design. The sanding condition has persisted and the City currently pumps to waste at the start of pumping to prevent introduction of sand particulate, sediment and turbid water into the distribution system.

## Well Performance

The current specific capacity of the well was observed to range from 10.69 to 18.88 over pumping rates ranging from 151 to 588 gpm (Figure B-9). During initial testing in 1980, Well 7 was originally observed to have specific capacity ranging from 15.4 to 30.7 at pumping rates ranging from 470 to 1000 gpm. After rehabilitation in 1993, the well had a specific capacity of 17 gpm/ft of dd at 700 gpm (Robinson and Nobles, 1993) The current well performance is generally consistent with the long duration specific capacity estimate of 9.8 gpm/ft of dd at 550 gpm observed during the 2011 facilities inventory (Black and Veatch, 2011), but has decreased substantially since originally constructed.

During 2006, the City performed dynamic flow profiling of Well 7 to evaluate if well reconstruction could address the arsenic occurrence. The dynamic flow profiling was performed at a target pumping rate of 600 gpm and over the interval from 360 feet bgs to 525 feet bgs. Approximately 21 percent of the total production was observed in the upper screen interval while 66 percent was observed in the interval from 465 to 490 feet bgs. The remaining 13 percent was from 500 to 509 feet bgs.

## Water Quality

Water quality at Well 7 differs from other SGA wells (including nearby Well 8) based on the historical presence of elevated concentrations of arsenic which approach the EPA MCL, the presence of nitrate and a lower more neutral pH (less than 7.5 SU). Water quality results observed during 2015 at Well 7 are presented in Table 5. Results from 2014 and 2015 can be summarized as follows:

- pH ranged from 7.13 to 7.24 SU.
- Well 7 groundwater is slightly undersaturated (LSI of -0.7 to -1) and mildly corrosive.
- Chlorine was observed to be present at 4.85 mg/L and at 0.11 mg/L in 2015 samples.
- Chlorine was re-tested and observed at concentrations of 5.93 mg/L to 0.10 mg/L
- Nitrate (as nitrogen) was present at concentrations 0.5 mg/L to 2.5 mg/L in 2015.
- Manganese was 0.4 mg/L in the 2015 casing sample and 0.0187 mg/L during 2014 City water quality sampling.
- Odor was not detected in 2014 sampling.
- Arsenic (total) was 0.7 to 0.8 µg/L, well below the MCL of 10 µg/L.
- Sodium is present at concentration below the MCL, ranging from 13.1 to 14.0 mg/L.

Visual observations during sampling suggest aesthetically poor water quality at system startup that improved during pumping. Water quality trends during step rate pumping

were observed to be slightly aerobic (dissolved oxygen > 2 mg/L), oxidizing (+200 mV) and a pH of 7.2 SU (Figure C-6). ORP appears to decrease with each change in pumping rate. Similar to other wells, minor shifts in temperature are observed during the step rate pumping test related to the operation of the submersible motor. The 2014 and 2015 general water quality would support that the water quality is generally good at Well 7; however, the low pH and elevated dissolved oxygen trends suggest a shallower aquifer source rather than the SGA. Additionally, the sodium concentrations in Well 7 are relatively low for an SGA well and are comparable to Well 2 (a TSA well) and Well 3.

Due to its reactivity in nature, chlorine does not occur naturally in groundwater at the concentrations observed at Well 7. The City performed confirmation sampling of the WSE results on August 14, 2015. The confirmation sampling included 4 samples taken at approximately 1 hour intervals. Similar to the previous results, the residual chlorine concentration was highest in the casing sample and decreased with continued pumping (Table 5). Subsequent conversations with the WSE laboratory and City staff have not identified a likely source for the presence of chlorine such as sampling artifacts/error, laboratory error, a faulty check valve or a leaking pump lubrication line; however, colorimetric methods that use N,N Diethyl-1,4 Phenylendiamine Sulfate (DPD) indicator (such as standard method 4500 Cl-G) are prone to interference from oxidized manganese, copper and turbidity. Oxidized manganese is the most common and its interference results in a "false positive" or elevated chlorine results due to its reactivity with chlorine.

Natural sources for chlorine could include certain bacteria that produce organochlorines during decomposition of plant matter or volcanic gasses which contain hydrogen chloride. Alternative anthropogenic sources could include leaking chlorinated swimming pool(s) or an open-loop heat pump system; however, in both instances the chlorine demand within the shallow subsurface would rapidly consume the highly reactive chlorine by converting it to chloride salts or other organochlorines. Available information does not provide a clear source for the observed elevated chlorine concentrations present in Well 7. Given the biological and chemical reactivity of chlorine in aqueous solutions and the high manganese concentrations observed at Well 7, we suspect that the residual chlorine results are "false positives" due to interference in the colorimetric analysis.

### **Arsenic Occurrence Evaluation**

Two potential sources for the arsenic in Well 7 had been proposed previously: (1) the presence of sediments derived from hydrothermally altered volcanic rocks of the western Cascades and geochemical conditions conducive to dissolution and mobilization of arsenic; or (2) bioaccumulation by iron-related bacteria observed to be present at Well 7. However, based on the other water quality observations in 2015 a third potential source for arsenic may be possible. The presence of nitrate, elevated dissolved oxygen and a lower pH value suggest that a shallower water bearing zone may be contributing to the water quality observed at Well 7 and this might be the source of arsenic.

To evaluate the first two working hypotheses, GSI performed time series sampling at Well 7. Sampling was performed to collect arsenic samples at system start up and after pumping 5, 10, 15 and 45 times the standing borehole volume. If groundwater is the arsenic source a more constant result would be anticipated, whereas if arsenic mobilization were more

related to biofilm then decreasing trends with continued pumping would be anticipated. The total arsenic concentrations were observed to be between 0.83 µg/L to 0.584 µg/L and consisted primarily of arsenic (V), or arsenate the oxidized form of arsenic. Arsenic speciation results are summarized in Table 7.

The time series sampling approach was designed to evaluate arsenic mobility as redox and/or pH conditions changed with extended pumping (see Figure C-6). Arsenic (+V) is strongly adsorbed by ferrihydrite and oxyhydroxides like those that are deposited by iron-related bacteria. The tendency for strong adsorption makes arsenic (+V) easier to treat than arsenite, the redox state that has a greater acute toxicity. Fluctuations in pH and Eh can mobilize metals and adsorbed arsenic resulting in its sporadic occurrence in water supply wells.

Given the high levels of bacteria observed in the casing sample, arsenic would have been expected to be higher in the earlier time series samples and less in subsequent samples if it were the source, but arsenic concentrations did not vary substantially in the 10, 15 and 45 borehole volumes during testing, which might suggest an aquifer source. However, arsenic is not typically present at concentrations of concern in the SGA in Troutdale and surrounding areas and therefore hypothesis No. 1 still seems unlikely. Given the presence of nitrate observed at Well 7, the presence of arsenic may be associated with agricultural land use practices with arsenic based pesticides and herbicides that have infiltrated shallow groundwater hydraulically upgradient from Well 7.

Arsenic concentrations in Well 7 have been steadily decreasing since 2006; however, based on the available data it is uncertain if the decrease in arsenic concentrations is due to decreased operation of Well 7 since 2006 or a change in groundwater conditions near Well 7.

## Bacterial Assessment

The loss of well capacity may be related to iron bacteria *Crenothrix* populations that were observed in the water supply system near Well 7 (E & E Services, 1993). Subsequent video surveys observed a depleted gravel pack and scale encrustation on the lower screen interval below 464 feet. The well was recommended to be cleaned, disinfected and the gravel pack replenished. Available information indicates that the well was superchlorinated in an attempt to control the bacterial population (E & E services, 1993).

The 2015 bacterial assessment strongly suggests that biofouling is the primary well clogging mechanism (Table 6). Microscopic and quantitative analysis indicate moderate to extremely high bacteria populations at Well 7, particularly in the casing sample. The ATP result for the casing sample was extremely high at 14.7 million cells/ml and the aquifer sample was above the threshold value of concern of 100,000 cells/ml. Both the casing and aquifer sample were observed to have iron and manganese oxidizing bacteria present. *Crenothrix* and *Leptothrix* were the primary iron related bacteria and are typically found together in heavily biofouled wells. Aerobic bacteria *Bacilli specie* and nitrate bacteria *Cupriavidus nectar* were also identified.

As noted previously, both the aquifer and casing samples had detectable concentrations of chlorine, which if present did not affect the mature and well established bacterial population within Well 7. Given the biological and chemical reactivity of chlorine in

aqueous solutions, we suspect that the chlorine is a false positive due to interference in the colorimetric analysis.

### **Historic Well Video Review**

The City provided two well videos of Well 7. The well videos were of generally poor quality; however, during video surveying of Well 6, the narrative by the operator from Well Scan (or Robinson and Noble) had commentary about observed “down hole” flow at Well 7. This narrative would be consistent with observations that only the lower interval was encrusted during the initial well redevelopment in 1993.

Based on the encountered geology, the two water bearing zones appear to be separated by significant clay to sandy clay layer(s) within the SGA. Downhole flow under static conditions has been observed in other wells completed in the SGA (GSI, 2014). The downhole flow may be promoting well clogging and/or biofouling by introducing water that has slightly different geochemistry, higher dissolved oxygen concentrations and/or nutrients into the lower portion of Well 7; however, given the differences in water quality of Well 7 and Well 8 (see next section) there may be another cause such as a well integrity issue (similar to those observed at Well 1B and Well 4 where the casing had corroded) allowing the introduction of shallower groundwater into the well.

## **Well 8 Assessment**

Well 8 (MULT 4372) was installed in 1994 and is co-located with Well 7 at Sandee Palisades Park. Well 8 was originally tested at a yield of 1,200 gpm and a specific capacity of 17.6 gpm/ft of drawdown. Well 8 has experienced diminished well performance since installation and has undergone multiple rehabilitations with the most recent occurring in 2008. Similar to Well 3 and Well 6, the last redevelopment performed consisted of mechanical redevelopment assisted by a STPP dispersing agent followed by superchlorination of the well. Well 8 does not share the same high arsenic occurrence with neighboring Well 7, located several hundred feet away.

### **Well Construction**

Well 8 has a bentonite annular seal from ground surface to 94 feet bgs, below 94 feet the well was reportedly sealed with slough and/or “squeeze” from the formations. Like wells 3 and 6 it does not meet current OWRD requirements due to the lack of an annular seal below the TSA. The well is screened over six intervals from 410 feet bgs to 533 feet bgs with 10-inch pipe size 40 slot stainless steel wire wrapped screen with an 8 x 12 gradation sand filter pack (Table 1). The screen has a design capacity of 2650 gpm at an entrance velocity of 0.1 ft/sec.

It should be noted that Well 8 does not share the shallower screen interval at Well 7 and has a much more conservative well screen and filter pack design over the lower interval of the well.

### **Well Performance**

When originally tested in 1994, Well 8 had a 24 hour specific capacity of 17.9 gpm/ft of dd. The specific capacity ranged from 6.39 ft/dd to 6.98 ft/dd during the 2015 short duration step rate pumping test (Table 3). During the facility inventory in 2011, the operational

specific capacity of Well 8 was observed to vary between 4.9 to 6.5 gpm/ft of drawdown at 471 gpm, which is approximately 30 to 40 percent of the original well performance. The minor variability in well performance observed during longer operational cycles is likely due to the influence of other groundwater wells including the City's Wells 6 and Well 7

## Water Quality

Similar to as the City's other wells, Well 8 has had hydrogen sulfide and manganese affect its aesthetic water quality; however, Well 8 does not share the low pH, presence of arsenic or nitrate concentrations observed at nearby Well 7, located approximately 100 feet away. Key observations of Well 8 water quality from 2014 and 2015 sampling include the following:

- pH is slightly alkaline, ranging from 7.90 to 8.02 SU.
- LSI ranged from -0.4 to +.04 and was observed to change subtly with continued pumping.
- Manganese was 0.0443 mg/L, slightly less than the secondary standard of 0.05 mg/L.
- TON was 1.41 SU in 2014, well below the SMCL of 3.0 SU.

Water quality results for Well 8 are summarized in Table 5. Water quality trends suggest anaerobic (less than 2 mg/L) conditions, slightly reducing conditions (less than 0 mV) and an alkaline pH of 8.0 SU (Figure C-7). Due to the submersible pump motor, temperature increased slightly with increases in pumping rate. Additionally, ORP was observed to decrease with increases in pumping rate during 2015; however, during the final step it was observed to decrease while pH shifted slightly lower and dissolved oxygen increased slightly. These trends may reflect the influence on Well 8 water quality of Well 7 located only 100 feet away.

## Bacterial Assessment

Well 8 was observed to have relatively low visible bacterial activity, but moderately high ATP counts in both the casing (693,000 cell/ml) and aquifer (206,000 cells/ml) sample. Iron or manganese oxidizing bacteria were not observed; however anaerobic growth was 10 percent. The major bacterial populations identified during microscopic analysis consisted of *Acidovorx temperans* and *Acinetobacter lwoffii*.

Relative to nearby Well 7, Well 8 well performance is not as affected by biofouling from a well performance perspective, but the moderate bacterial population may contribute to the observed hydrogen sulfide odor (TON 1.41 in 2014).

## Historic Well Video Review

Well videos performed in 2001 (2) and 2004 were reviewed to evaluate the condition of Well 8. The well videos were performed prior to well redevelopment/cleaning in 2001. The well videos did not indicate any damage to the well screen or liner. In general, the condition of the screens was good with some plugging concentrated in the upper screens on "pre-cleaning" video. Tuberculation and/or pitting were noticeable in the upper portion of the casing, likely the result of bacterial and/or the hydrogen sulfide present in the well.

## Well Assessment Summary

A summary of the individual well assessments is provided in Table 8. A brief summary of the conclusions derived from our assessment of the status of the City's groundwater supply wells are as follows:

- Well 2 does not appear to have any outstanding issues; however, access to measure water levels during operation should be improved and the well should be monitored as part of a preventative maintenance program.
- Well 3 appears to have a shallow groundwater influence based on its lower pH values and the presence of nitrate. Additionally, the well appears to produce sand at higher pumping rates which may indicate a well construction issue. Bacterial populations were at levels of concern and iron oxidizing bacteria were identified which would suggest biofouling as the primary clogging mechanism for well performance declines. Specific capacity was observed to be 2.02 gpm/ft of dd at the operational pumping rate of 202 gpm/ft of dd. The aggressive (or corrosive) water chemistry observed might suggest a well integrity issue related to its relatively shallow surface seal and corrosion or damage to the casing (similar to Well 4). Alternatively, the observed sand production in the well may have resulted in caving of native formation material along the casing allowing downward vertical flow from shallower zones. Options for well redevelopment or replacement of Well 3 may be limited due to the small property size and the location of the vault.
- Well 4 water quality has improved slightly over time with observed TDS values much less than historical reported values of up to 550 mg/L; however, the potential to form scale and mineral deposits within the distribution system is still a concern. Slime forming bacteria were present in the casing sample at levels of concern and anaerobic bacteria were observed. The bacterial population does not appear to have affected well performance which has been relatively consistent at approximately 12 gpm/ft of dd since 2006.
- Well 5 performance and yield do not appear to have changed substantially. Specific capacity does not appear to have changed substantially since installation in 2007. Overall water quality is good with slightly elevated manganese concentrations observed in 2014. The well is limited to a production rate of 1324 gpm based on the City's water rights assigned to Well 5.
- Well 6 specific capacity is 8.3 gpm/ft in 2015 at the operational yield of 475 gpm, an improvement from 2011 specific capacity reported in B & V (2011). Water quality and bacterial assessment suggests that a shallow groundwater source may be affecting Well 6. Well 6 previously had iron related bacteria populations; however, the 2015 results indicate lower levels of bacterial activity at Well 6. Well 6 is likely affected by well interference from the operation of City Well 8 and potentially other SGA groundwater users.
- Well 7 was observed to have a specific capacity of 12.0 gpm/ft of dd at the operational target rate of 488 gpm. Sand production at higher pumping rates has been a problem that has persisted since the well was originally constructed. Modifications were made to

the well in 1993 to try to arrest filter pack settlement due to the sanding issue and improve access to the screen area. Aesthetic water quality was poor at the start of pumping but improved after continued pumping. The observation of chlorine in the aquifer even with continued pumping is enigmatic, has no obvious source and would not be anticipated to persist given the chlorine demand based on organic carbon concentrations observed in the well and/or aquifer. Arsenic was observed at concentrations well below the historical values and the MCL. The presence of nitrate and the lower pH observed at Well 7 suggest a shallow groundwater source potentially related to the multiple screen intervals in the SGA or well integrity issues due to its relatively shallow surface seal and a corrosive groundwater condition in the well. Lastly, anecdotal evidence suggests that downward vertical flow has been observed in Well 7 since it was constructed, which may contribute to the extreme bacterial populations observed in 2015. Given the differences in water quality and well design between Well 7 and Well 8, the mixing of aerobic and anaerobic groundwaters between the shallow and deeper screened intervals within the Well 7 is likely promoting biofouling in the well.

- Well 8 has a specific capacity of 6.7 gpm/ft of dd at the operational target rate of 509 gpm during 2015 testing. With the exception of elevated manganese water quality was overall good. Bacterial populations consisting primarily of slime forming bacteria were present at concentrations of concern in Well 8 in both the casing and the aquifer sample. On this basis the well performance loss is likely due to biofouling; however, physical clogging of particulate accumulating within the filter pack cannot be eliminated based on observations of the well specific capacity improving during pumping (i.e. development).

## SECTION 4

## Customer Survey Results

As part of the comprehensive well assessment the City requested assistance with completing a customer survey program. The survey program incorporated a web based approach using the City's website portal and social media accounts (i.e. Facebook) to reach out to the larger customer base and also included phone interview of selected customers representing different water uses such as industrial, food service and commercial. Brief descriptions of the web based and customer outreach survey results are provided below for each program. The full results are included in Appendix E.

### Web Survey Results

The City developed a web based questionnaire that was designed to illicit feedback regarding several aspects of the customers experience with City drinking water but focused primarily on water quality. The questionnaire was advertised on the City's monthly water bills sent to its water customers. The questionnaire hosted on the Survey Monkey website and made available to customers in early May through the City's web portal.

The respondents to the web survey were residential customers. Of those respondents seventy five percent (75%) rated their water quality as better than average and eighty three (83%) rated their service as better than average. The most typical complaints were related to odor (rotten eggs or earthy/musty smell), hard water (i.e. staining and scale) and color or cloudiness related to iron and manganese content.

### Commercial Customer Outreach Survey Results

City staff provided a preliminary list of commercial customers to contact to interview regarding the quality of the City's water and it's suitability for industrial, commercial, manufacturing and food service uses. The initial list of commercial customers included the following:

- Toyo Tanso.
- Diebold Lumber.
- Tube Specialties.
- Ristorante Di Pompello, a restaurant.
- Travel Centers of America (several commercial water uses).
- Albertson's (with Starbucks Coffee).
- Skyland Pub.
- Cherry Park Market Center Dental office.
- McMenemy's Edgefield Lodge (several commercial water uses).
- One of the adult care facilities on 257<sup>th</sup> and Cherry Park Road.
- A motel in the Northern part of the City.
- A school within the City (Reynolds High School).

- A fast food customer in the southern part of the City.

The targeted outreach interview included an extended list of the questions included in the web-based survey. Of the customers and/or categories listed above, the City received responses from 12 customers. Diebold Lumber and McMenamins declined to participate in the survey. The responses are summarized in Table 9.

## Customer Survey Summary

In general, the residential and commercial customers found water quality to be acceptable (Figure 4); however, taste, staining and odor issues were noted and in some cases treated using a point of use filter or water softener. Specifically, most of the odor complaints appear to be related to the Well 6, 7 and 8 service area (Figure 5) and are predominately hydrogen sulfide (i.e. "rotten egg" smell) and earthy/musty odors (Figure 6).

## SECTION 5

## Water Quality Treatment Options

This section describes the treatment options for water constituents that can cause aesthetic issues and/or are regulated as risks to human health based on chronic exposure under the Safe Drinking Water Act (SDWA).

### Treatment

Based on the 2014 and 2015 water quality results, customer survey results, and interviews conducted with the City's Water Department Staff, it was anticipated that treatment of the City's source water might be needed to address water quality concerns at several of the individual wells. The water quality concerns faced by the City of Troutdale have included both primary (arsenic) and secondary contaminants (iron, manganese, odor and TDS), as identified in the drinking water standards established by the USEPA under the SDWA.

The primary standards are legally enforceable standards that apply to public water systems, and are intended to protect public health by setting guidelines for chronic exposure of water users to contaminants in drinking water. The secondary drinking water standards are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water quality. A summary of the national primary and secondary drinking water regulations (current as of 2015) is provided in Appendix F of this report for reference.

The secondary contaminants identified through interviews with City staff are iron, manganese, and TDS. Arsenic, a primary contaminant, and hydrogen sulfide, an unregulated contaminant, were also identified as water quality concerns. These contaminants have been problematic to the City for a number of years and as described previously, one of this study's goals was to address these concerns.

The process used by our team to evaluate the identified water quality concerns and evaluate the treatment options was as follows:

- Conduct project meetings with City staff to discuss the concerns
- Review available historical water quality data for all wells (2, 3, 4, 5, 6, 7, & 8)
- Conduct water quality sampling at each well to identify changes in water quality with continued pumping (Table 5)
- Review the typical operation and maintenance of the City wells and distribution system

A discussion of recommendations for the treatment or mitigation and management of these contaminants within Troutdale's water supply is described by contaminant below.

### Iron and Manganese

Iron and manganese are naturally occurring and are present in minerals within the SGA and can affect drinking water systems. Secondary standards have been established for iron and

manganese for aesthetic reasons and due to their staining potential. The SMCL for iron is 0.3 mg/L; the SMCL for manganese has been set at 0.05 mg/L. Iron and manganese are discussed together because of their similar behavior and the treatment methods.

Iron in a drinking water system can come from natural deposits in the ground, from the steel casings of a drinking water well, or from cast iron, ductile iron, or steel distribution system piping. Iron concentrations in the source water and distributions can also be related to the presence of iron-related bacteria populations in the well or distributions system. Iron causes red or brown staining on plumbing fixtures that accumulates over time.

Manganese in a drinking water system comes only from dissolution of naturally occurring manganese minerals within the source aquifer, for the City wells this is the SGA. Manganese causes black (sometimes described as dark brown) staining on plumbing fixtures that accumulates over time. Although not commonplace in SGA wells in the Portland area, elevated concentrations of manganese have been encountered in some areas, particularly in the vicinity of Troutdale, Fairview, Wood Village and Blue Lake Park; however, occurrences of manganese in the SGA are not well understood.

The alternatives available for the treatment of iron and manganese involve either chemical precipitation or adsorption of the contaminants. For the City of Troutdale, it would be desirable to accomplish this through a pressurized system since the water supply consists of wells that are pumped. Options include greensand filtration with a pressure filter, use of a proprietary adsorption media, or membrane filtration. All of these options have significant costs associated with them for capital construction and operation and maintenance.

Treatment utilizing any of the three methods discussed has a cost range of \$1 to \$2 million per well location where the treatment is required. The capital cost and the range would vary based on the type of treatment selected, the well production rate, the level of contamination being removed, space available to construct and house the treatment facility, and the methods available for disposing of the resulting waste material. In addition to the capital cost, the operation and maintenance cost for any of these systems is significant; they require increased licensure of the City's operation staff, expanded laboratory sampling requirements, higher power consumption, and chemical purchase and usage.

### **Total Dissolved Solids (TDS)**

TDS includes any minerals, salts, metals, cations, or anions dissolved in water. TDS are comprised of inorganic salts (principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides, and sulfates) plus small amounts of organic matter that are dissolved in the water. It is common for ground water to contain measurable TDS which can sometimes be significant. TDS causes the build-up of what may be commonly referred to as hard water deposits or scaling on plumbing fixtures and within a municipality's water system. Because of the aesthetic concerns with high levels of TDS, the established secondary drinking water criteria is 500 mg/L.

The treatment for TDS varies based on the specific chemical composition of a water source's TDS (i.e. hardness vs. salts). If the TDS is predominantly hardness-based (primarily calcium and magnesium), softening techniques are used to reduce the concentrations. Softening techniques may include lime softening, if the treatment is accomplished on a large scale at a single source, or adsorption. The use of adsorption-type water softeners is typically not used on a large scale at a single source due to the high sodium concentrations resulting from the

process. (As with household water softeners, salt (sodium chloride) is used to regenerate the media. After regeneration, the media then releases sodium into the water which can cause concerns for people with high blood pressure.) Potassium chloride is an alternative, but it is significantly more expensive, and is not employed on large scale due to its cost.

If softening is required to remove hardness types of TDS, it is typically accomplished by homeowners with individual water softeners. The capital expense and operation and maintenance of the system is borne by the homeowner.

## Hydrogen Sulfide

Hydrogen sulfide is an unregulated aesthetic concern that can cause the perception of a "rotten egg" or mineral odor in drinking water. Hydrogen sulfide can be detected by the nose at levels less than 1 mg/L; there is not an established drinking water criteria for hydrogen sulfide because it does not pose a health threat at the concentrations that are typically found in drinking water. Hydrogen sulfide is naturally occurring in some ground water sources, and is highly volatile and easily removed. It is typically associated with thermal or warm water sources, and is the byproduct of sulfate-reducing bacteria that can live within thermal aquifers.

The treatment for hydrogen sulfide on a large scale is accomplished via air stripping, which uses either forced airflow or a tower to remove the hydrogen sulfide. The simplest and most common form of removal is through an air stripping tower. The water is pumped to the top of a tower (typically 10 to 20 feet high) and cascades through a media source while air is forced upward through the media. The interaction of the air with the cascading water strips the hydrogen sulfide out of the water and releases it to the atmosphere. The water from the tower drains into a small tank, from which it is typically chlorinated and then pumped into the distribution system. The costs for these systems are in the general range of \$600,000 to \$1.0 million, depending on water flow rate and the contaminant concentration.

## Arsenic

Arsenic is a primary drinking water contaminant with an MCL of 10 micrograms per liter ( $\mu\text{g}/\text{L}$ ) or parts per billion (ppb). The most common source of arsenic in a drinking water system is the erosion/dissolution of natural occurring arsenic minerals. Arsenic can also come from surface contaminant sources, such as pesticides applied to agricultural areas that are washed through the soil into the deeper ground water aquifers. It has been observed only at City Well 7 at concentrations of concern.

Treatment of water that contains elevated arsenic concentrations include adsorption to media (either a proprietary media or activated alumina), or filtration through membranes. If the arsenic is in the dissolved form, oxidation may be required to convert it to a form that can be removed by adsorption or filtration. Some small water systems have used point-of-use treatment systems that are installed at each connection within the distribution system. This method would not be manageable or feasible for the City due to the number of connections.

Arsenic treatment at a well head requires the addition of a treatment unit that is sized to remove sufficient arsenic to produce water with arsenic levels below the MCL. The treatment technique is similar to that for iron and manganese, and the costs for construction (\$1.0 to \$2.0 million) and operation and maintenance are also similar to those for iron and

manganese treatment. Arsenic does have the added complexity of disposing of the regeneration or backwash stream produced by the treatment process. Because the backwash contains concentrations of arsenic, it cannot be discharged to the environment without additional treatment. Many communities dispose of this waste stream through their wastewater system, which requires consideration of how the bio-solids at the wastewater treatment plant are handled. Since this may involve additional cost, a detailed preliminary study should be completed for arsenic treatment.

## Blending Options

Blending of water sources to reduce the concentration of contaminants may also be a consideration. Blending requires dedicated piping to combine several water sources before delivery to the public. In addition, operational interlocks are required to prevent the contaminated water source from operating without the blending water source. This option can become costly if the City's water sources are not close together. The costs for this alternative are predominately capital costs that address the construction of blending pipelines and the necessary telemetry to inter-tie the operation of the two sources. Some additional operation and maintenance costs may be associated with this alternative but they are typically not significantly more than normal operations. Depending on the pipeline lengths, this alternative can range from the tens of thousands of dollars to well into the millions.

## System Management

GSI and Keller Associates reviewed the City of Troutdale's water quality variability with continued pumping (Table 5). Based on the results observed in the 2015 sampling and sampling conducted by the City in 2014, system management may be a viable alternative to treatment for the City. This alternative would establish operational protocols for each of the seven wells, as well as the distribution system.

The operational protocols would include an extended pump-to-waste operation before a well is pumped into the system. The pump-to-waste period would be determined for an individual well based on the standing water volume of the well and observation of water quality parameters such as turbidity, pH and ORP. Extending the pump-to-waste interval will be especially important when a well has been off-line for a period of time. Another protocol would involve periodic operation of each well to avoid leaving a well dormant for significant periods of time, since leaving a well dormant allows the standing water column in the well to stagnate which may promote or worsen the water quality within a well.

A structured unidirectional system flushing program performed on an annual basis could also reduce the incidences of dirty or cloudy water as well as taste and odor complaints. In our review of the 2015 water sampling results, we identified that City wells have significant differences in their chemistry (as demonstrated by the Langelier Saturation Index and hardness). Each water distribution system (and/or service zone) develops its own natural biofilms based on the source water it receives and are sensitive to changes in water chemistry.

The City operates seven wells (using Well 7 sparingly), turning various wells on and off based on seasonal demand fluctuations and the water needs of the community. Since the wells have differing water chemistry, this process can cause subtle changes in the water

chemistry within the distribution system. These subtle changes in water chemistry and system operation has been observed to cause biofilm sloughing which may be reported by customers as dirty, cloudy, or rusty water. These incidents can be managed by a structured unidirectional system flushing program and extended pump-to waste cycles as dormant sources are brought on line to meet seasonal demand.

## SECTION 6

## Action Plan Alternatives Analysis

This section presents a summary of the comprehensive well assessment and the action plan alternatives for enhancing existing well capacity, developing new well capacity, improving system water quality and protecting the City's groundwater assets.

### Enhance Operational Capacity of Existing Wells

The operational capacity of existing wells can be increased in several ways. First, the City can complete several water rights transactions to allow pumping of wells 2 and 5 to their full physical capacity and, if feasible bring Well 7 back on line as an operational well. Second, Wells 2, 5, 7 and 8 may allow for higher pumping rates based on the available drawdown remaining at current operational pumping rates, particularly in Well 8. Lastly, the performance and capacities of Wells 3, 6, 7 and 8 have declined significantly over time, and capacity may be regained by implementing a structured rehabilitation program or in the case of Well 3 and Well 7 replacement of the well. Brief descriptions of each of these alternatives are provided below.

#### Water Rights Transactions:

The City has 1,892 gpm of unutilized water right capacity available to meet future needs (Table 2). The City should complete water rights transactions to align unutilized water right capacity with well production capacity, including that of both current and planned production wells. The specific details for water rights transactions were provided in the 2011 facilities inventory (Black and Veatch, 2012) and are summarized as follows:

- Make modifications to Well 2 to enable an assessment of well performance.
- Develop a Certificate of Beneficial Use (COBU) to document the City's historic use of water under T-3119 so that the water right may be certificated.
- Once a certificate is obtained for T-3119, submit a transfer application adding one or more of the City's current water supply wells as additional points of appropriation. At a minimum, we recommend that Well 5 be added as an additional point of appropriation as Well 5 has additional well production capacity beyond the water right capacity currently allocated to it and because Well 5 is the well associated with the sister permit, Permit G-6881 (i.e., in combination, T-3119 and Permit G-6881 would provide a year-round rate of 700 gpm for Well 5).
- Submit a permit amendment application for Permit G-9867 to reallocate the authorized rate of the permit among the wells currently associated with the permit (Wells 5, 6, 7, and 8). This reallocation of the permit rate would allow the City to maximize the production capacity of Well 5 and Well 7 (or a replacement well).

- Submit a permit amendment application for Permits G-8655 and G-11761 to add planned Well 9 as an additional point of appropriation to utilize the additional water right capacity under these water rights that is not being currently utilized by the City.

Additionally, the City's water use permits have a completion date of October 2017. The City will need to file for an extension of time to demonstrate completeness of the construction and full beneficial use of the water. Depending on the City's preferred strategy for replacing Well 7 on Permit G-9867 and for the addition of Well 9 to Permit G-8655 and G-11761, the City will need to apply for the extension of time prior to performing the related water right transfers.

### **Additional Well Capacity**

Well 2, Well 5, Well 7 and Well 8 appear to have additional capacity based on 2015 testing. Well 2 yield and performance suggests that it has additional capacity that could be developed. Modifications to Well 2 will need to be made to ascertain the additional capacity available. Well 8 has been observed to have 40 feet of additional available drawdown at the operational rate of 696 gpm during testing in 2015. The water right appropriation authorized rate for Well 8 is 1001 gpm. Based on the current specific capacity of Well 8 the City could pump the well up to 950 gpm (assuming 20 feet of water column above the intake). Well 5 has a current water authorized rate of 1324 gpm, but could be pumped at rates up to 2000 gpm.

Well 7 appears to have additional pumping capacity up to 800 gpm based on its observed specific capacity and available drawdown; however, it has been observed to produce sand at higher pumping rates. Limiting sand production could be accomplished with a downhole suction flow control (DSFC) screen installed below the pump. The DSFC screen limits mobilization of sand by utilizing a smaller diameter screen with a finer slot size (i.e. a well within a well) that better distributes flow through the well's screen interval and/or limits flow from certain sections of the well screen interval; however, additional frictional losses associated with more screen intervals installed in the well will occur and the additional production capacity a DSFC screen would provide is not certain. Lastly, the DSFC screen would likely be subject to the biofouling that persists at Well 7 and plugging of the DSFC screen would likely offset any improvements in well yield.

Increased pumping rates are not recommended at this time for Well 3, 4, and 6.

### **Alternatives for Well Performance Improvement**

City Wells 3, 6, 7 and 8 all have experienced declines in well performance; however, GSI would only recommend that 6 and 8 be considered for further evaluation and redevelopment. Redevelopment at Well 6 and 8 would consist of a mechanical redevelopment and chemical treatment, if required. The costs associated with well redevelopment are well specific and may depend on observations during well video surveys, but based on similar projects in the SGA the estimated cost would be from \$30,000 to \$50,000 dollars for mechanical redevelopment and \$80,000 to \$120,000 dollars with chemical treatment. It is not recommended to perform chemical treatment without

attempting mechanical redevelopment first. An outline of the recommended scope of work for mechanical redevelopment and chemical treatment are included in the updated Preventative Maintenance and Operations Plan (Appendix F).

Based on the potential additional production capacity, there is not a substantial difference in the cost per gallon for well rehabilitation of Well 3, 6, 7 and 8; however, if well reconstruction or other alternatives are required at Well 3 and 7 they will have substantially higher costs per gallon than Well 6 and Well 8. Further evaluation for Well 3 and Well 7 is described below.

### **Further Evaluation of Well 3**

Prior to making a recommendation for well rehabilitation, further evaluation is required at well 3 to determine whether the observed water quality is related to a well integrity issue and whether sand production can be arrested or mitigated. Additional evaluation includes performing a well video survey to assess the condition of the well casing and screen in each of these wells. If an obvious condition cannot be identified the City may want to consider performing a static flow profile of the well using a dye tracing method or similarly sensitive method. Removal of the pump and motor during the video survey will allow the City to modify access tubes to the well in the event that flow profiling (or other tools) is required to perform further evaluation of borehole conditions.

### **Further Evaluation of Well 7**

Well 7 could continue to be utilized with adjustments to the pump-to-waste program and if water right transactions allowing usage with Well 5 are completed. A similar approach to evaluate Well 7 could also be performed; however, there are several conditions that will limit the ability to redevelop/rehabilitate the Well 7 including:

- Overly aggressive filter pack and screen design, resulting in sand production limiting redevelopment methods
- Potential downward flow from shallower water bearing zones to deeper water bearing zones will persist without reconstruction.
- Potential well integrity issues related to the annular seal will persist without reconstruction.
- Extreme biological fouling relative to other wells as a result of water quality.
- Presence of arsenic historically.
- Apparent influence of Well 7 on Well 8 water quality during 2015 pumping.

As noted above a DSFC screen could reduce sand production in Well 7. If the evaluation determines a well integrity issue that could be resolved by the installation of a liner (similar to Well 4), reconstruction of Well 7 would likely be problematic. Due to the original construction, any installed liner insert will reduce the size of the pump that could be installed, further reducing production well capacity. On this basis, reconstruction and /or modification of Well 7 is not cost beneficial and would not likely substantially increase overall system capacity. If the City wishes to increase system capacity, GSI would recommend the City consider replacement of Well 7 and/or decommissioning of the existing well once well integrity problems are confirmed.

## Groundwater System Expansion

The City has 1,892 gpm of unutilized water right capacity available to meet future needs (Table 2). A strategy needs to be implemented to protect and fully utilize this water right capacity. Adding a well would serve to help develop this unutilized water right capacity and increase the total supply capacity. The City has previously identified a future well location (Well 9) at the Strebin Road Reservoir site as part of future expansion of the water supply system. The City should consider a review of the location and OWRD records to make sure that conditions have not changed or identify additional information that may have become available (i.e. new nearby wells) since the original exploratory study in 2009.

Completion of a new production well at this (or another location) would accomplish a number of beneficial objectives, including:

- Capture unutilized water right capacity, as recommended above.
- Increase the City's firm source capacity to be able to meet the year 2030 MDD.
- Replace capacity that cannot be restored in deteriorating wells.
- Replace capacity from wells that produce lower quality water, such as wells 4 and 7.

We recommend that the City plan to construct a new well and replace one (or more) wells. Implementing the recommendations for enhancing the capacity of the existing wells should provide ample time for the City to develop the necessary funds for the new well (Well 9) and a replacement well. Estimates for installation and testing of a new SGA well range from approximately \$450,000 to \$600,000 based on 2015 cost estimates. Additional costs for the installation of the well house, pump, motor, controls and distribution housing are conservatively estimated to be \$900,000 to \$1,100,000, not including design cost.

While the potential exists for the City to fully utilize its water rights with the addition of a new Well 9, it may also want to consider replacing Well 3 and/or Well 7. The current Well 3 location has limited opportunity to site a new well due to site size limitations and interpreted poor hydrogeologic conditions. An alternative location within the service area may need to be identified; however, the Well 7 facility has sufficient options to site a replacement well near the existing well facility, which would allow the City to utilize the existing pumphouse, distribution system and controls already in place and minimize development costs.

This could be done using a pitless adaptor (or offset) well installation from the existing pumphouse. Besides potential cost savings, the Well 7 location has the advantage of an understanding of the hydrogeology, whereas the Well 9 would be an exploratory location and its production capacity is unknown (GSI, 2008). A properly drilled, designed and constructed well to replace Well 7 would likely be able to perform similar or better than the original well, limit sand production and also limit the influence of shallow groundwater. This would improve water quality particularly with respect to the arsenic, which is typically not present in the deeper SGA water supply wells in the Portland Basin. Water rights transactions would be required to increase the flexibility in using the replacement well for Well 7 in conjunction with Well 5.

## Water Quality Management Alternatives

After evaluating the water quality results for the City of Troutdale (which included both 2014 and 2015 sampling reports for wells 2, 3, 4, 5, 6, 7, and 8), we believe that a distribution system management approach will be the best solution to address water quality concerns. Per the original scope for this study, our team reviewed treatment options presented in Section 5 of this report.

However, based on the review of recent water quality data, we conclude that treatment would likely be a costly and unwarranted approach for the City. This conclusion is supported by the responses to the customer surveys that were conducted. While some of the responses may appear to be clustered when you consider the system with the City's operation of their wells in each service zone, the reports of poor water quality seem to be more global in nature. The water quality concerns are more related to SGA groundwater quality and distribution system maintenance than to a single source or well specific concern. This agrees with the well sampling results.

Iron, manganese, TDS, hydrogen sulfide, and arsenic were all reviewed specifically to quantify the concerns expressed by the City. In our review of the water quality results, we did find elevated levels for some of these constituents; however, we also found evidence that these levels can likely be managed through system operations rather than treatment. Though the iron levels reported in Wells 4, 6, and 7 are all above the SMCL for the casing (first draw) samples, the total iron level in the aquifer samples is below the SMCL in all but one well. Iron (resuspended) levels above the SMCL in the aquifer sample for Well 4 and Well 7 are likely due to the release of trapped particulate iron that has been deposited by iron-fixing bacteria during long periods of well inactivity. This suggests that consistent pumping of the wells and the use of a pump-to-waste protocol will likely mitigate iron concerns without the installation of treatment.

A pump-to-waste cycle should be established for Wells 4, 6, and 7. These should include a seasonal first start-up protocol, which will likely be manually initiated by the operations staff and monitored to ensure the iron level has reduced before the well is placed in an automatic mode. The second protocol that should be considered is the amount of time the well should pump-to-waste automatically when it is called for in the normal operation of the system. Pumping to waste should continue until the water quality parameters of turbidity, specific conductance, ORP and pH stabilize and are indicative of low concentrations of biofilm, accumulated solids and sediment, and improved water quality. Stabilization times of these parameters will be well specific and additional monitoring of iron and manganese concentrations should be performed at some of the City wells.

The manganese levels reported in Wells 6 and 7 are also above the SMCL for the casing samples. However, the aquifer samples are zero and non-detect respectively. As with the recommendation for iron, the best solution for the mitigation of the elevated manganese concentrations is likely a consistent seasonal (manual) and normal operation (automatic) pump-to-waste protocol. This protocol should also be established as described above for iron. Testing should be completed to determine the optimum pump-to-waste timing, to ensure that excess amounts of accumulated iron and manganese are not pumped into the

system. A field test kit that utilizes a colorimetric method to measure the manganese concentration in the water should be used. The water should be tested on 5 minute increments to determine the optimum pump to waste time for normal operation. Less frequent monitoring intervals could be used for wells that are seasonally operated or remain idle for long periods of time.

Treatment of the elevated TDS in Well 4 (312 mg/L reported in 2014) is an option the City should consider. The reported level is well below the SMCL of 500 mg/L for TDS. As described in Section 5, TDS is typically addressed through the installation of private residential water softeners. An alternative to water softening could be blending. This approach would require the construction of transmission piping and the operational inter-tying of two wells. Reviewing the TDS in the remaining wells, it appears that a blending strategy would be successful in reducing the TDS of the water being delivered to customers from Well 4 to a level in the mid-200's. The costs of constructing a blending pipeline and increasing the operational complexity of the well should be considered. A blending pipeline will be specific to the route selected and the length and diameter of the pipeline. Costs for this alternative can range from \$50 to \$120 per foot depending on pipeline diameter, length, and the surface repairs necessary after installation of the pipe.

For hydrogen sulfide, we recommend further study to verify that the reported hydrogen sulfide odor is coming from a ground water source, rather than as the result of poor water quality within the distribution system. This would require evaluation of water quality within the distribution system to determine if sulfate reducing bacteria (or other biofilm consortiums) are present within the distribution system and measurement of hydrogen sulfide at each well head and within other areas of the distribution system. Treatment options for hydrogen sulfide are dependent on the concentrations that the hydrogen sulfide is present in the groundwater well(s) or within the distribution system. At lower concentrations aeration/air stripping (less than 2 mg/L), filtration (up to 10 mg/L) and chlorination ( up to 75 mg/L). Air stripping systems can be expensive because it requires re-pumping after aeration and filtration systems require continuous operation, maintenance and replacement/regeneration of filter media. The most cost effective treatment for hydrogen sulfide at low levels typically is chlorination, which is the current disinfection method the City utilizes at its individual water supply wells.

If the City determines the hydrogen sulfide persistence can be attributed to higher hydrogen sulfide concentrations in a single well (such as Well 6), testing should be conducted to determine if dosing or an adjustment in dose of chlorine solution has an effect on the hydrogen sulfide. This can be conducted on a bench scale with sodium hypochlorite before a decision is made to treat. It is also recommended that distribution system maintenance be performed in the areas that are reporting the hydrogen sulfide odor. The testing results at Wells 3, 6 and 7 did identify low levels of sulfate, which can be a source of hydrogen sulfide if sulfate-reducing bacteria are present within the distribution system. A pump-to-waste protocol could also be beneficial to remove any hydrogen sulfide that may have accumulated in a well source while idle.

Arsenic was the final contaminant of concern included in this evaluation. The 2014 and 2015 water quality sampling results indicated that the City has two wells that contain low levels

of arsenic: Well 3 at 0.3 ppb and Well 7 at 0.497 ppb to 0.83 ppb. The observed concentrations are well below the 10 ppb MCL for arsenic. From the sample information that has been reviewed for this report to establish current conditions, we do not believe any treatment is necessary for arsenic in the City of Troutdale's wells. The City should continue to monitor arsenic concentrations as required by OHA as part of their routine drinking water quality sampling.

The conclusion of the treatment options analysis that was completed for the City of Troutdale's drinking water wells indicates that implementing some management approaches will likely have a significant impact on water quality. Three approaches are outlined below:

1. A more robust pump-to-waste program should be established for each of the City's seven wells. This program should develop pump-to-waste times for each well for two scenarios.
  - The first scenario is the seasonal start-up protocol when the well is being added to the system after a period of inactivity. This should be a manual process. The pump-to-waste period should be significant enough to ensure that the concentrations of iron, manganese, and hydrogen sulfide as applicable to each individual well, are acceptable before the water is introduced to the distribution system. This will be unique for each well and is determined through field trials.
  - The second scenario is pump start-up to meet system demands after the well has been placed into service. For this situation, the pump-to-waste scenario should be automated, and will be significantly shorter than the seasonal start-up protocol. The well should be pumped to waste long enough to remove any minor contaminant build-up that may have occurred since its last start.
2. A second recommended water quality management approach is a bi-annual unidirectional distribution system flushing program. A unidirectional flushing program can have a significant impact on the City's current water quality concerns, and will help control dirty or cloudy water complaints due to re-suspended iron and bio-film buildup.
  - The flushing program should start at the well head and work its way outward to the interface of the next well within the service zone or distribution system tie-in.
  - The length of time the system should be flushed at each point should be calculated to ensure the flushing is accomplishing its intended purpose. Hydrant exercise typically does not constitute a long enough period of time for a beneficial flush to occur. Flushing times at each location may reach 10, 20, or 30 minutes, depending on the length and diameter of the pipeline being flushed.
  - As the flushing is occurring, the pipeline should be isolated so the water is forced from the source through the flushing point. If water comes from side branches, the water velocity will be too slow to accomplish an effective flush.

- A preliminary flushing program can be confirmed by a hydraulic model, if one exists, before it is implemented in the distribution system.
- Once the system has been thoroughly flushed, maintenance flushing can be accomplished at shorter durations to maintain the distribution system.

We recommend that the City flush starting from the wells to remove iron and manganese sediments that are precipitated within the distribution system due to oxidation reactions after disinfection with the chlorination solution. We recommend that wells be used a minimum of 3 weeks every three months. This is a good starting point and should be adjusted based on long term observations to optimize the water quality.

3. The final recommendation is operating the wells at lower flow rates more frequently to meet water demands, rather than allowing them to be inactive for long periods during low demand. The benefits of longer pumping at lower flow rates includes consistent water movement through each well, reduced stress on the aquifer, and limiting the introduction of oxygen. This approach will help prevent the buildup of contaminants such as iron and manganese, and may help to reduce the hydrogen sulfide concerns.

It should be noted that reductions in flow rates can lead to deposition of sediments and particulate within the distribution system. However, a high velocity flushing protocol as described above, which the operations staff has indicated they currently employ, would remove any deposition within the distribution system.

Any flowrate reductions would be to allow supply to more closely meet demand during low demand times. Lowered or reduced pumping rates would likely require the coordination of the well control system, and would be the most beneficial if wells are operated on VFDs like Wells 3, 5 and 6. If VFDs are not installed, another way to accomplish this would be to rotate the wells on an established schedule, with each well being used as a lead well at least once per month. The changes in supply well operations will have to be reviewed with the City operations staff to determine the challenges that exist in accomplishing this change in source water supply operational schedule.

The water quality of the City's wells is good overall and does not warrant additional cost that would be required by treatment. Adjustments to operating the wells and distribution system should provide cost-effective improvements to City drinking water quality, but may require additional City resources to implement (i.e. the unidirectional flushing program).

## SECTION 7

## Action Plan

The action plan for the City includes both short term actions and longer term planning level actions to protect the City's groundwater assets, improve system water quality and provide additional capacity. Water right transaction and associated planning level costs estimates for preparation and submission to OWRD are provided below. The recommended short term and long term actions are also presented below; estimated costs and required resources for each well maintenance action and well replacement action are included in Table 10. Appendix G has specific and general scope of work documents for well maintenance actions identified in Table 10.

### Water Rights Transactions and Planning Level Costs

1. The City should submit the updated WMCP to the OWRD to meet the requirements of the outlined in the final orders of the Extension of Time applications for Permit G-6881, Permit G-9866 and Permit G-9867. Costs to update the WMCP are dependent on changes to the WMCP approved by OWRD in 2005 and on availability of records to support the required information to complete the update but generally are \$10,000 to \$25,000 dollars; OWRD fee \$ 1,800 dollars.
2. Develop a COBU to document the City's historic use of water under T-3119 so that the water right may be certificated. The water use data needed to support the COBU must be from before the completion dates (C-date) of October 1, 1993. Planning level cost estimate: COBU preparation \$3,000; OWRD fee \$0; optional (but recommended) expedited review by OWRD \$1,000 dollars.
3. Develop additional groundwater supply at Well 2 through a new TSA water right application. Application preparation: \$1500 dollars; OWRD fees \$1650.
4. The C-dates for Permits G-6881, G-8655, G-9867, G-9866, and G-13565 are all October 1, 2017. Prepare extension of time applications for each permit (5 total) requesting additional time to develop the water use authorized under the permits. The driving need for the time extension is to refurbish and/or replace wells. Planning level cost estimate: Application preparation \$10,000; OWRD fees \$2,875 dollars.
5. Prepare a transfer application for the certificate resulting from the certification of T-3119 to add one or more existing or planned wells to replace the single well listed on this water right (Drinker Well). Planning level cost estimate: Application preparation \$3,000 dollars; OWRD fee \$1,350 dollars.
6. Prepare permit amendment application for Permits G-6881, G-8655, G-9867, G-9866, and G-13565 to change and/or add well(s) to the permits sufficient to allow the City to appropriate the full rate authorized under the permits based on observed

operational rates and allow flexible allocation for a future well(s). Planning level cost estimate: Application preparation \$10,000 dollars; OWRD fee \$6,500 dollars.

## Short Term Actions (2015 to 2018)

1. Adjust pump-to-waste operations to diminish sediment, hydrogen sulfide and biofilm introduction into the distribution system when bringing wells online. The costs to perform this include City staff time and water quality parameter monitoring equipment and/or analytical lab costs.
2. Consider reducing operational pumping rates of wells and implementing longer run cycles for filling reservoirs, if possible. This may require some trial and error adjustment by City staff, but no other associated costs are anticipated.
3. Periodically perform a structured unidirectional flushing program to remove accumulated biofilm, sediment and mineral precipitates from the distribution system. Costs to perform this consist of City staff time and analytical laboratory fees (optional testing for bacterial populations and/or scale analysis).
4. Modify Well 2 to allow access and evaluate if additional capacity exists (see Table 10 for planning level costs).
5. Perform well video surveys at Wells 3, 6, 7 and 8. Recommendations for future redevelopment, reconstruction or maintenance activities will depend on observations of the condition of the wells. For planning purposes we recommend the City plan for at least 2 well redevelopment efforts at Well 6 and either Well 3 or Well 8 (see Table 10 for planning level costs).
6. If the City elects to perform Well 8 redevelopment it should also consider decommissioning Well 7 (depending on well integrity evaluation results) at the same time since 2015 observations suggest that nutrient and dissolved oxygen migration from Well 7 influences Well 8 during pumping and may promote biofouling at Well 8 (see Table 10 for planning level costs).
7. Implement the Preventative Maintenance and Operations Plan (PMOP) annual maintenance monitoring program at all City Wells to identify well maintenance, water quality and well redevelopment (Appendix F).

## Long Term Action Plans (2015 to 2020)

1. Develop additional groundwater supply at the proposed Well 9 location for redundancy and long term projected demand (see Table 10 for planning level costs). As part of this action the City should revisit the Well 9 siting study to evaluate whether groundwater conditions have changed and/or additional groundwater wells that might provide additional information on local hydrogeology have been installed since the original study. Costs to review and/or update of the siting study are approximately \$7500 dollars.

2. Evaluate other potential well locations within the City's service areas should other Well 3 or Well 7 need to be replaced. This could be done in conjunction with the re-evaluation of the preferred location for Well 9 recommended above.
3. Periodically revise and continue to implement the PMOP based on observations of well redevelopment effectiveness, identified well maintenance and water quality improvement needs at City water supply wells or within the distribution system (Appendix F). Costs to revise the PMOP will be dependent on identified needs, well and pumping system modifications and future expansion of the City's water supply; however, planning level costs for annual review of well performance testing, pump and motor performance and water quality testing performed by City staff are approximately \$5,000 dollars.

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**Tables**

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**Table 1. Well Construction and Pump Installation Summary**  
City of Trumbull Comprehensive Well Assessment and Action Plan, 2015

Well Construction Information, Historical Yield and Specific Capacity 2015																
Well Name (OMB Well ID)	Year Constructed	Aquifer	Depth Drilled (ft BGL)	Seal Depth (ft BGL)	Well Casing Diameter (Inches/Type)	Screen Interval (ft) (See Notes)	Filter pack (inverts) (ft BGL)	Screen Diameter (Inches/Type)	Static Water Level during installation (feet BGL)	Original Yield (gpm/MGD) <sup>1</sup>	Original Specific Capacity (gpm/ft of dd)	Reported Specific Capacity 1998 <sup>2</sup> (gpm/ft of dd)	Reported Yield 1998 <sup>3</sup> (gpm/ft of dd)	Operational Yield 2010-2015 (gpm) <sup>4</sup>	Reported Specific Capacity near Operational Rate (gpm/ft of dd)	% of Original Specific Capacity
Well 2 (MULT 1430)	1976	TSA	485	65	10 PS	510 to 530 (60 inch) 535 to 545 (60 inch) 550 to 560 (20 inch)	None	10 T	280	550/0.79	7	690	690	NA	NA	—
Well 3 (MULT 1429)	1979	SGA	515	68	12 PS	515 to 530 (60 inch) 535 to 545 (60 inch) 550 to 560 (20 inch)	No. 6 Monterey Sand and gravel 480 to 571	8 PS	288	800/0.805	5	390	390	150	2.4	48.0%
Well 4 (MULT 1340/9336)	1980/2008	SGA	573	438 (connect)	12 PS	470 to 572 (10 inch) 575 to 581 (40 inch) 585 to 591 (40 inch) 595 to 601 (40 inch)	CSK 10 X 20	6 PS	118	900/1.297	11.2	700	700	650	12.3	100.0%
Well 5 (MULT 90882)	2007	SGA	697	535	16 PS	467 to 477 (80 inch) 482 to 492 (80 inch) 497 to 507 (80 inch) 512 to 522 (80 inch) 527 to 531 (80 inch)	401 to 679	12 PS	304.5	2000/2.88	NA	NA	890	890	81.4	90.4%
Well 6 (MULT 67051)	1981	SGA	545	155	12 PS	350 to 385 (100 inch) 465 to 475 (100 inch)	Sand Aquic No. 8 381 to 544 3/4 to 3/8 inch 320 to 538	6 PS	205.4	900/2.297	14	500	490	490	8.3	59.3%
Well 7 (MULT 1448)	1980	SGA	575	20	12 PS	410 to 415 (40 inch) 435 to 450 (40 inch) 464 to 474 (40 inch) 480 to 490 (40 inch) 505 to 515 (40 inch)	8 X 12 378 to 548	6 T	174	1000/1.44	18.6	550	515	515	10.7	57.5%
Well 8 (MULT 4372)	1994	SGA	548		12 PS			10 PS	185	1300/1.73	17.6	790	570	570	6.6	37.5%

Pump Installation Information and 2010-2011 Testing Summary																
Well Name	Pump Type	Pump Model/Stage	Motor Horsepower	Pump Design Flow Rate	Pump Target TDH	Pump Intake Set Depth (feet BGL)	Date Tested	Transducer-Set Depth	Water Above Transducer (feet)	Static Water Level (ft BGL)	Transducer Reading (feet of water above transducer)	Tested Pumping Rate 2011 (gpm)	Drawdown (feet)	Specific Capacity	Maximum Capacity in 2011 <sup>5</sup>	Water Right Permitted Rate (gpm)
Well 2	VLS	Perkins 31A 17	100	500	561	452.03	NA <sup>6</sup>	NA <sup>6</sup>	NA <sup>6</sup>	NA <sup>6</sup>	NA <sup>6</sup>	285	NA <sup>6</sup>	7	500	449
Well 3	SUB	Goulds SWAC 4	100	500	580	451	7/10/2010	440	150.0	250.01	10	285	140	2.0	285	285
Well 4	SUB	Goulds BRHC 4 stage	75	600	363	322	4/5/2010	320	88	232	67	567	21	27.0	600	600
Well 5	VLS/VFD	Fairbanks Morse 2333-9 stage	300	2000	570	438	6/13/2011	430	143.6	286.43	107	1403	36.6	38.4	2000	1370
Well 6	SUB	Goulds SWAC 4	100	400	579	360	6/10/2011	352	144	208	72	476	72	6.6	400	400
Well 7	SUB	Flowy 1000RH 12 stage	125	720	470	290.58	7/28/2010	270	75	195	22	518	53	9.8	538	538
Well 8	SUB	Goulds 12CHC 8 stage	200	1000	515	338	6/10/2011	321	142.12	174.88	64	471	76.1	6.0	735	735

**Notes:**  
 ft bgl = feet below ground surface  
 gpm = gallons per minute  
 MGD = million gallons per day  
 VLS = vertical lift shaft  
 VFD = variable frequency drive  
 TSA = Trumbull Sandstone Aquifer  
 SGA = Trumbull Sand and Gravel Aquifer  
 CSK = Coronal Silica Sand  
 1 Well Yield from CURD Well logs used E & E (1993)  
 2 1998 Yield and specific capacity estimates from E & E (1993)  
 3 Well capacity based on 4-hour pumping tests conducted in 2011.  
 4 The maximum capacity of a well had greater than 20 feet of available drawdown during the testing, the well capacity from the 2010/2011 testing was adjusted using the well's specific capacity to either the maximum flow rate coincident with 20 feet of pump submergence or the design flow rate of the well.  
 5 Estimated Well 5 specific capacity based on short duration step rate pumping test at 1400 gpm

**Table 2. Allocation of Water Right Capacity on Existing Water Rights**  
 City of Trousdale Comprehensive Well Assessment and Action Plan, 2015

Well Name	Water Right ▶	T-3119 Get-34708 Per. G-2320 App. G-2512 0.81 0.81 364	T-9484 Per. G-6881 App. G-6627 0.75   1.56 0.33 337   700 <sup>2</sup>	50525 Per. G-7035 App. G-7589 1 1 449	Per. G-8655 App. G-9291 1.1 1.1 494	T-10208 T-7453 Per. G-9867 App. G-9714 4.4 0.834 1,975	T-10341 Per. G-9866 App. G-9583 2.2 2.23 0.492 987	Per. G-11761 App. G-13565 2.23 2.23 1,001	Total Water Right Rate 12.49 cfs 7.22 cfs 5,606 gpm	Well Capacity Allocated (gpm) <sup>4</sup>	Well Capacity Remaining (gpm)
Drinker Well	SGA	0	0						0	0	
Well 2	TSA			449					449	41	
Well 3	SGA				150				150	0	
Well 4	SGA								650	0	
Well 5	SGA <sup>(4)</sup>		337						890	676	
Well 6	SGA					553			490	0	
Well 7 <sup>(5)</sup>	SGA					490			0	515	
Well 8 <sup>(6)</sup>	SGA					515			570	0	
Well 9	not drilled					0			0	0	
Water Right Appropriation Rate Allocated (gpm)		0	337	449	150	1558	650	570			
Water Right Appropriation Rate Remaining (gpm)		364	0	0	344	417	337	431			

**Notes:**

- <sup>1</sup> Water right "Development Limitation" were imparted as part of the conditional approval of the Extension of Time for Permit G-69867, G-9866 and G-6881. Authorized rates less than water right appropriation shown in bold italics.
- <sup>2</sup> Rate of use reduced during irrigation season: 337 gpm during irrigation season, 700 gpm during non-irrigation season
- <sup>3</sup> Well capacity based on operational rates provided by City in March 2015.
- <sup>4</sup> Well 5 can be operated at a much higher instantaneous rate than current operation; however Well 5 is limited to 987 gpm cfs on T-10208 (shared with Well 7) and 337 gpm under T-9484 [1324 gpm total]
- <sup>5</sup> Well 7 is not currently operated. Allocation of well capacity based on 2015 reported pumping rate. See note #2 above.
- <sup>6</sup> Well 8 is allocated up to 987 gpm (2.2 cfs) and can utilize any remaining water right allocation not used by Well 5, 6 and 7 under permit amendment T-10208.

Table 3. Well Construction and Pump Installation Summary  
 City of Trowbridge Comprehensive Well Assessment and Action Plan, 2015

Well Construction Information, Historical Yield and Specific Capacity												
Well Name (OWRD Well ID)	Year Constructed	Static Water Level during Installation (feet bgs)	Original Yield gpm/AGD <sup>H</sup>	Original Specific Capacity <sup>I</sup> (gpm/ft of dd)	Transducer Set Depth (ft bsp)	Yield 2010-2011 (gpm)	Reported Specific Capacity 2010-2011 (gpm/ft of dd)	% of Original Specific Capacity	Reported Specific Capacity 2015 (gpm/ft of dd) or performance	2015 Operational Pumping Rate (gpm)	Maximum Pumping Rate during Step Rate Testing 2015(S)	Water Right Permitted Rate (gpm)
Well 2 (MULT 1430)	1976	280	550/0.79	7	NA <sup>J</sup>	NA	NA	—	No apparent decline in yield or performance	490	500	449
Well 3 (MULT 1425)	1979	288	600/0.865	5	440	285	2	40.0%	2015: 2.02 gpm/ft @ 202 gpm Original: 5 gpm/ft @ 600 gpm	150	222	494
Well 4 (MULT 1340/93369)	1980/2008	118	900/1.297	11.2	320	567	27	241.1%	2015: 11.6 gpm/ft @ 611 gpm 1998: 15.5 gpm/ft @ 200 gpm	650	647	987
Well 5 (MULT 90881)	2007	304.5	2000/2.89	90 <sup>K</sup>	430	1403	53.9	59.9%	2015: 69 gpm/ft @ 1485 gpm 2007: 72 gpm/ft @ 1400 gpm	890	1736	1,975/337
Well 6 (MULT 67091)	1981	205.4	900/1.297	14	352	476	6.6	47.21%	2015: 8.2 gpm/ft @ 493 gpm Original: 14 gpm/ft @ 900 gpm Well interference	490	499	1975
Well 7 (MULT 1444)	1980	174	1000/1.44	18.6	270	518	9.8	52.7%	2015: 10 gpm/ft @ 551 gpm Original: 18.6 gpm/ft @ 1000 gpm Well interference	515	588	1975
Well 8 (MULT 4372)	1994	185	1200/1.73	17.6	321	471	6.5	36.9%	2015: 6.8 gpm/ft @ 51.8 gpm Original: 17.6 gpm/ft @ 1200 Apparent decrease since 2011: 3 gpm/ft (9.8 @ 51.8)	570	696	1,001/1,975

NOTES:

ft bgs = feet below ground surface gpm/ft of dd = gallons per minute per foot of drawdown

gpm = gallons per minute

MGD = million gallons per day

<sup>I</sup> Well Yield from OWRD Well logs and E & E (1993)

<sup>J</sup> 1993 Yield and specific capacity estimates from E & E (1993)

<sup>K</sup> Well capacity based on maximum tested rate during step rate pumping tests conducted in 2015.

Well 7: 450gpm  
 Well 3: 150gpm @ current speed setting, will require significant throttling at full speed  
 Well 4: 650gpm  
 Well 5: 890gpm @ current speed setting  
 Well 6: 450gpm @ Hz  
 Well 7: 515gpm and throttled to unknown pump head  
 Well 8: 570gpm but is throttled to 140gpm pump head

Table 4. Aquifer and Turbulent Well Loss Estimates  
City of Troutdale Comprehensive Well Assessment and Action Plan, 2015

Well	Slope on Hantush-Beirshenk Plot <sup>1</sup>	Hantush-Beirshenk Solution			Their Solution			General Guidance for Well Loss Coefficient <sup>2</sup>				Well Loss due to Laminar Flow ( $L_v$ ) as % of Total Head Loss	Notes <sup>4</sup>
		B day/ft <sup>2</sup>	C day/ft <sup>2</sup>	B day/ft <sup>2</sup>	C day/ft <sup>2</sup>	Skin Factor $S_w$	new Well $C < 6.7E-10$	Mild Deterioration $6.7E-10 < C < 1.3E-9$	Well Beyond Rehabilitation $C > 1.3E-9$	Original Transmissivity Estimate <sup>3</sup> (ft <sup>2</sup> /day)	2015 Transmissivity Estimate (ft <sup>2</sup> /day)		
Well 3	Negative	2.65E-03	-1.12E-09	7.19E-04	4.17E-10	10.0	X		1,340	1,200	102.0%	Well appears to be developing	
Well 4	Positive	3.69E-04	4.51 E-10	3.53E-04	2.53E-10	10.9	X		3,041	7,500	86.8%		
Well 5	Positive	4.51E-05	1.01E-10	2.95E-05	2.92E-11	-4.5	X		15,410	11,000	56.2%		
Well 5 - 2007	Positive	1.39E-05	3.89E-10	1.59E-05	7.10E-11	-5.0	X		15,410	9,700	—		
Well 6	Positive	5.79E-04	5.53E-10	3.45E-04	6.20E-10	0.4	X	X?	3,832	2,400	52.2%		
Well 7	Positive	2.14E-04	2.49E-9	1.63E-04	2.37E-09	-0.9	X	X	4,154	4,900	43.3%		
Well 8	Negative	7.86E-04	-4.53E-11	4.72E-04	4.82E-12	10.0	X		5,895	4,000	100.8%	Well appears to be developing	

Notes:

<sup>1</sup> A negative slope on the Hantush-Beirshenk plot indicates that the well is developing.

<sup>2</sup> General guidance numbers from Walton (1970). These numbers are for general guidance and well specific information should be used, particularly in the case of Well 3 and Well 8 where the C value may not be representative.

<sup>3</sup> Original transmissivity estimated using the wells original specific capacity using the method of Driscoll (1986) for Wells 3, 4, 6, and 7. Well 5 and Well 8 were calculated values were from the original well construction reports

<sup>4</sup> Development of a well is the improvement of well performance by removal of fine grained particles, sediment or biofilm in the well screen, filterpack or aquifer sediments that may be limiting groundwater flow to the well. In older wells, this typically results from higher intake velocities at higher pumping rates. Typically well performance decreases as the pumping rate and duration increases.

Table 5. Summary of City of Troutdale Inorganic Well Assessment  
City of Troutdale Comprehensive Well Assessment and Action Plan, 2015

Analyte	Well 2		Well 3		Well 4		Well 5		Well 6		Well 7 <sup>1</sup>		Well 8	
	Casing	Aquifer	Casing	Aquifer	Casing	Aquifer	Casing	Aquifer	Casing	Aquifer	Casing	Aquifer	Casing	Aquifer
<b>2015 Water System Engineering Results</b>														
pH Value	8.05	8.22	6.59	8.17	8.17	8.01	8.01	7.2	7.5	7.85	7.9	7.45	7.13	7.9
Phenolphthalein Alkalinity	mg/L	4	ND	ND	ND	ND	ND	0	0	0	ND	ND	ND	ND
Total Alkalinity	mg/L	112	88	92	160	160	112	112	108	124	128	124	104	136
Hydroxide Alkalinity	mg/L	ND	ND	ND	ND	ND	ND	0	0	0	ND	ND	ND	ND
Carbonate Alkalinity	mg/L	8	ND	ND	ND	ND	ND	0	0	0	ND	ND	ND	ND
Bicarbonate Alkalinity	mg/L	104	104	88	160	160	112	112	108	124	128	124	104	136
Total Dissolved Solids	mg/L	158	158	150	221	219	170	171	165	143	208	158	104	186
Conductivity	µm or µS/cm	220	191	209	307	304	236	238	229	199	209	220	161	258
Oxidative Reduction Potential	mV	197.6	191.7	212.9	208.5	202.9	205	195.7	147	112	181.1	166	206	201.1
Langlier Saturation Index	SU	0.014	0.18	-0.84	-1.1	0.56	0.14	0.03	-1.57	-1.28	-0.12	-0.7	-0.8	-0.09
Total Hardness	mg/L	72	80	88	104	80	72	72	32	28	56	56	88	40
Carbonate Hardness	mg/L	72	80	88	104	80	72	72	32	28	56	56	88	40
Non Carbonate Hardness	mg/L	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium	mg/L	48	44	56	44	56	44	20	20	36	28	48	48	32
Magnesium	mg/L	24	36	24	44	36	28	40	28	12	20	28	40	32
Sodium (as Na)	mg/L	18.6	17.1	5.12	4.84	35	36.2	23.2	28.5	45.8	44.1	25.5	27.4	14
Potassium (as K)	mg/L	2.1	2.2	2	3.5	3.5	3.1	3.5	2.7	2.3	2.8	1.4	1.8	2.8
Phosphate (as P <sub>2</sub> O <sub>4</sub> )	mg/L	0.28	0.23	0.6	0.4	0.32	0.48	0.69	0.7	0.75	0.77	0.76	0.46	0.7
Chlorides (as Cl)	mg/L	8	8.4	9.6	12	37.2	25.6	18	26	10.4	11.6	11.2	12.8	11.2
Nitrate (Nitrogen)	mg/L	ND	ND	2.6	3.1	ND	ND	ND	0.8	ND	0.8	ND	0.5	2.5
Chlorine (as Cl)	mg/L	ND	ND	ND	ND	ND	ND	ND	0	0	ND	4.85	0.11	ND
Dissolved Iron (as Fe <sup>2+</sup> )	mg/L	ND	ND	ND	ND	ND	ND	ND	0	0	ND	ND	ND	ND
Suspended Iron (as Fe <sup>3+</sup> )	mg/L	ND	0.09	ND	0.88	0.15	0.06	ND	0.1	0.1	0.3	ND	0.69	ND
Iron Total (as Fe)	mg/L	ND	0.09	0.09	0.88	0.15	0.06	ND	0.1	0.1	0.3	ND	0.69	ND
Iron (Resuspended)	mg/L	ND	0.7	0.04	0.78	0.38	0.16	ND	0.2	0.2	0.07	0.3	19.7	0.03
Copper (as Cu)	mg/L	ND	ND	ND	ND	ND	ND	ND	0	0	ND	ND	ND	ND
Manganese (as Mn)	mg/L	ND	ND	ND	ND	ND	ND	ND	0.1	0	ND	ND	0.4	ND
Sulfate (as SO <sub>4</sub> )	mg/L	ND	ND	4	4	ND	ND	ND	0.5	0.7	ND	ND	3	ND
Silica (as SiO <sub>2</sub> )	mg/L	18	20.1	46	42.3	31.8	36.5	37.6	32.6	36.5	32.2	38.9	41.8	34.6
Tannin/Lignin	mg/L	ND	ND	ND	ND	0.1	0.1	ND	0.1	0.1	ND	ND	0.3	0.1
Total Organic Carbon (C)	mg/L	0.9	1.3	2	0	1.4	3.2	0.2	1.3	1.1	0.4	1.9	1.5	1.1
<b>2014 Water Quality Results (July and October 2014)</b>														
pH	SU	7/14	10/15	7/14	10/15	7/14	10/15	7/14	10/15	7/14	10/15	7/14	10/15	7/14
Total Dissolved Solids	mg/L	--	8.42	--	7.87	--	7.97	--	8.02	--	8.08	--	7.24	--
Langlier Saturation Index	SU	--	104	--	136	--	312	--	188	--	148	--	164	--
Sodium (as Na)	mg/L	17.8	--	0.2	--	0	--	-0.1	--	--	-0.3	--	-1	--
Nitrate (Nitrogen)	mg/L	ND	--	0.131	--	ND	--	26.3	--	27.9	--	16.7	--	38.7
Arsenic (total)	mg/L	ND	--	0.036	--	ND	--	ND	--	ND	--	0.00788	--	ND
Manganese (total)	mg/L	--	0.0343	--	0.0012	--	0.0568	--	0.0568	--	0.0451	--	0.0187	--
Odor	(TON)	--	1.19	--	1.41	--	1.19	--	ND	--	6.73	--	ND	--

NOTES:  
 1. Well 7 was resampled for Chlorine on August 14, 2015 to evaluate its presence using time series sampling  
 Initial Result = 5.93 mg/L  
 10 minutes = 0.511 mg/L  
 34 minutes = 0.144 mg/L  
 77 minutes = 0.100 mg/L  
 77 minutes = 0.089 mg/L (Duplicate)  
 These results are consistent with those observed during original testing. Full analytical lab report is in Appendix C.

Italicized results are not typical results in the SGA aquifer water quality  
 Bold Values exceed SML for Manganese  
 mg/L = milligrams per liter  
 SU = Standard Units  
 mV = millivolts  
 µS/cm = microSiemens per centimeter  
 TON = Threshold Odor Number  
 ND = Not Detected  
 NA = Not Analyzed  
 Casing = Sample collected after standing water in pump column evacuated  
 Aquifer = Sample collected prior to competing aquifer pumping test, typically 3 to 4 hours

Table 6. Summary of Bacterial Results for ASR Well No. 1  
 City of Troutdale Comprehensive Well Assessment and Action Plan, 2015

Biological Analysis	Well 2 3/17/2015		Well 3 3/25/2015		Well 4 3/17/2015		Well 5 3/17/2015	
	Casing	Aquifer	Casing	Aquifer	Casing	Aquifer	Casing	Aquifer
Plate Count (colonies/ml)	2	0	42	2	12	42	22	1
Anaerobic Growth	<10%	<10%	10%	10%	10%	10%	10%	10%
Sulfate Reducing Bacteria	Negative	Negative	Negative	Negative	Negative	Positive	Negative	Negative
Fe/Mn Oxidizing Bacteria	Negative	Negative	Positive	Negative	Negative	Negative	Negative	Negative
ATP (cells per ml) Initial	56,000	12,000	138,000	27,000	217,000	59,000	32,000	6,000
ATP (cells per ml) 24 Hour	13,000	6,000	152,000	21,000	710,000	577,000	42,000	32,000
Bacterial Identification	<i>Acidovorax delafieldii</i> ;	No ID Possible	<i>Acidovorax delafieldii</i> ; <i>Gallionella</i> ; <i>Leptothrix</i>	<i>Acidovorax delafieldii</i>	<i>Pseudoxanthomonas mexicana</i>	<i>Acidovorax delafieldii</i> ; <i>Staphylococcus epidermidis</i>	<i>Acidovorax delafieldii</i> ;	No ID Possible
<b>Microscopic Analysis</b>								
Biological Activity	Very Low	None	Low	Very Low	Low	Moderate	Very Low	Very Low
Iron Oxide	--	--	Minor	Very Low	Low	Heavy	Low	Trace
Crystalline Debris	--	--	Minor	Trace	Trace	Trace	Moderate	--
Iron Oxide Biomass	--	--	Trace	--	No Sheathed or Starlike Bacteria	Low	Trace	--
Bacterial Identification	No Sheathed or Starlike Bacteria	--	<i>Gallionella</i> ; <i>Leptothrix</i>	--	--	--	--	--

Notes:  
 M = million  
 F = filtered

Biological Analysis	Well 6 11/20/2006		Well 6 3/25/2015		Well 7 3/17/2015		Well 8 3/25/2015	
	Casing	Aquifer	Casing	Aquifer	Casing	Aquifer	Casing	Aquifer
Plate Count (colonies/ml)	1	No Growth	46	1	>1,500	1	6	0
Anaerobic Growth	<10%	<10%	10%	<10%	10%	10%	10%	10%
Sulfate Reducing Bacteria	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Fe/Mn Oxidizing Bacteria	Negative	Negative	Negative	Negative	Positive	Positive	Negative	Negative
ATP (cells per ml) Initial	5.0 M	<1000	271,000	11,000	14.9 M	127,000	693,000	206,000
ATP (cells per ml) 24 Hour	Not Reported	Not Reported	1.7 M	86,000	14.5 M	102,000	493,000	375,000
Bacterial Identification	<i>Crenothrix</i>	No ID	<i>Acidovorax delafieldii</i> ; <i>Microbacterium maritipicum</i> ; <i>Gordonia namibiensis</i>	<i>Pseudomonas fuscovagrineae</i>	<i>Acidovorax delafieldii</i> ; <i>Cupriavidus necator</i> ; <i>Leptothrix</i>	<i>Bacillus specie</i> ; <i>Leptothrix</i> ; <i>Crenothrix</i>	<i>Acidovorax temperans</i> ; <i>Acinetobacter lwoffi</i>	No ID Possible
<b>Microscopic Analysis</b>								
Biological Activity	Trace	None	Very Low	Very Low	Moderate	Low	Very Low	Very Low
Iron Oxide	Minor	None	Trace	--	Moderate	Moderate	Trace	--
Crystalline Debris	Large	None	Trace	--	Heavy	Low	--	--
Iron Oxide Biomass	--	--	Trace	--	<i>Leptothrix and Protozoa</i>	<i>Leptothrix</i> <i>Crenothrix</i>	--	--
Bacterial Identification	<i>Crenothrix</i>	--	--	--	--	--	--	--



**Table 7. Well 7 Arsenic Speciation**

*City of Troutdale Comprehensive Well Assessment and Action Plan, 2015*

Sample No.	Approximate Number of Borehole Volumes	Volume Pumped (gals)	Total Inorganic Arsenic (µg/L)	Arsenic (III) (µg/L)	Arsenic (V) (µg/L)	Comments
Well 7-1	--	800	0.83	ND	0.83	Sample very turbid
Well 7-2	5	7100	0.537	0.04	0.497	--
Well 7-3	15	19700	0.582	0.054	0.528	--
Well 7-4	45	58300	0.584	0.013	0.584	--
<b>Notes:</b>						
Arsenic (III) = arsenite						
Arsenic (V) = arsenate						
µg/L = micrograms per liter = parts per billion						

**Table 8. Summary of Comprehensive Well Assessment Finding and Potential Actions**  
 City of Troutdale Comprehensive Well Assessment and Action Plan, 2015

Well	Well Performance <sup>1</sup>	Allocated Water Right (gpm)	Additional Water Right Rate <sup>2,3,4,5</sup> (gpm)	Water Quality	Bacterial Assessment	Well Construction	Clogging Mechanism	Other	Recommended Well Maintenance Action
2	No apparent decline in yield or performance; tested at 495 gpm	449	-50	Good	Normal	TSA Well	None	-	Pull pump and motor to remove transducer and/or replace sounding tube
3	2015: 2.1 gpm/ft @ 222 gpm Original: 5 gpm/ft @ 600 gpm	494	344	pH, Nitrate suggest shallower aquifer	Moderate Population Iron Related Bacteria	Well Seal Integrity Questionable/Sanding Issue	Physical plugging/Minor Biofouling	Did not respond to redevelopment	Perform well video; depending on observations consider mechanical redevelopment and chemical treatment. May also consider decommissioning/replacing well in future.
4	2015: 11.6 gpm/ft @ 511 gpm 1993: 15.5 gpm/ft @ 500 gpm	987	337	Elevated TDS, manganese, silica, hydrogen sulfide	Slight Bacterial Population	Reconstructed 2006	None/Minor Physical Plugging	-	None; consider water quality blending to address elevated TDS/manganese
5	2015: 69 gpm/ft @ 1485 gpm 2007: 72 gpm/ft @ 1400 gpm	1324	0	Elevated manganese	Normal	No issues	None/Minor Physical Plugging	Boundary Condition?	Perform well video when pump/motor serviced; depending on observations consider mechanical redevelopment and chemical treatment.
6	2015: 8.2 gpm/ft @ 493 gpm Original: 14 gpm/ft @ 900 gpm Well Interference	987	497	Elevated manganese, hydrogen sulfide/odor	Moderate Population Iron Related Bacteria; protozoa detected	Well Seal Integrity Questionable	Physical plugging/Minor Biofouling	Well Interference with 7 and 8 (other SGA Wells); Responded to redevelopment	Perform well video; depending on observations consider mechanical redevelopment and chemical treatment.
7	2015: 10 gpm/ft @ 551 gpm Original: 18.6 gpm/ft @ 1000 gpm Well Interference	538	--	Elevated manganese and arsenic (not observed in 2015), nitrate, low pH, sodium, dissolved oxygen suggest shallower groundwater source. Chlorine Present?	Mature Well Established Population of Iron Related Bacteria	Well Seal Integrity Questionable/Sanding Issue	Biofouling/Physical plugging	Well Interference with 6 and 8 (other SGA Wells); Did not respond to redevelopment	Perform well video; depending on observations consider mechanical redevelopment and chemical treatment. May also consider decommissioning/replacing well in future.
8	2015: 6.8 gpm/ft @ 518 gpm Original: 17.6 gpm/ft @ 1200 Apparent decrease since 2011: 3 gpm/ft (9.8 @ 518) Well Interference	1001	483	Elevated manganese and hydrogen sulfide/odor dissolved oxygen	Moderate Population Iron Related Bacteria; protozoa detected	No issues	Physical plugging/Minor Biofouling	Well Interference with 6 and 7 (and other SGA Wells?)	Perform well video; perform mechanical redevelopment and depending on observations consider chemical treatment.

**Notes:**

<sup>1</sup> Well performance based on historical reported values and 2015 observations during step rate testing.

<sup>2</sup> Well capacity based on operational rates provided by City in March 2015.

<sup>3</sup> Well 5 can be operated at a much higher instantaneous rate than current operation; however Well 5 is limited to 987 gpm cfs on T-10208 (shared with Well 7) and 337 gpm under T-9484 (1324 gpm total)

<sup>4</sup> Well 7 is not currently operated. Allocation of well capacity based on 2015 reported pumping rate. See note #2 above.

<sup>5</sup> Well 8 is allocated up to 987 gpm (2.2 cfs) and can utilize any remaining water right allocation not used by Well 5, 6 and 7 under permit amendment T-10208.

Table 9. Summary of Customer Outreach Survey  
 City of Troutdale Comprehensive Well Assessment and Action Plan, 2015

Drinking Water Source: Do you drink from tap?	Skyland Pub 3175 S Troutdale Rd City of Troutdale Yes, no filter	Comfort Inn 1000 NW Graham City of Troutdale Bottled water	Cherry Park Dental 2513 SW Cherry Park Rd City of Troutdale Bottled water	Tube Specialties 1459 NW Sundial Rd City of Troutdale Yes	Starbucks- Albertsons 25591 Southeast Stark City of Troutdale With filter for drinks	Cherry Park Plaza 1323 SW Cherry Park Rd City of Troutdale With filter	Burger King 25135 SE Stark City of Troutdale With filter	Travel Centers of America 790 NW Frontage Rd City of Troutdale Yes	Albertsons 25591 Southeast Stark City of Troutdale With filter	Toyo Tanso 2575 NW Graham Cir City of Troutdale With filter	Reynolds School District For all schools in district City of Troutdale With filter	Ristorante Di Pompello 177 E. Historic Columbia River Hwy City of Troutdale With filter
Water use (business, outdoor, food service, manufacturing)	Indoor business and food service	Indoor, outdoor and food service	Indoor business	Indoor business, Outdoor irrigation, Industrial processes	Indoor business, food service	Indoor business, outdoor, food service and manufacturing	Indoor business, outdoor and food service	Indoor business, outdoor and food service	Indoor business and food service	Manufacturing/ industrial processes	Indoor business	Indoor business, outdoor, food service
Rate Quality of drinking water - 1 (poor) to 5 (excellent)	4	2	3	5	5	1	4	4	4	3	3	5
Rate water service you receive from City - 1 (poor) to 5 (excellent)	4	4	3	5	5	5	5	5	5	4	3	5
Any characteristics with City water (cloudiness, odor, taste, sediment, hard water, soft water, stains, etc) Explain	None	Bad taste- avoided City water for years. Hard water. Stains on fixtures, dishware and laundry	Odor-earthy, musty, happens several times a month	None	None	Bad taste-Mineral and metallic taste every day. Hard water and leaves stains on fixtures	Cloudiness- brown when it rains	Hard water, Stains on fixtures	None	Bad taste, mineral randomly	Cloudiness- red/orange/brown, rarely. Bad taste- mineral taste, daily. Sediment. Hard water. Scale left on fixtures	None
Does water quality vary	Consistent	Consistent-bad	Varies randomly	Consistent	Consistent	Consistently bad	Varies randomly	Consistent	Consistent	Varies randomly	Varies randomly	Varies randomly
Equipment to improve water quality	None	No	no	no	Yes, triple purifier	Filter	Filter	Water softening system	Filter	Filter	yes, filter	Yes, filter
Water Pressure	Good	Good	Good	Good	Good	Good	Good	Good	Water pressure varies throughout the day	Good	Good	Good
Notes	-	Lifespan of linens is significantly shortened by hard water yellowing.	-	-	-	Please fix the bad taste	-	-	-	-	-	-



**Table 10. Summary of Potential Well Maintenance Actions and Planning Level Cost Estimates**  
 City of Troutdale Comprehensive Well Assessment and Action Plan, 2015

Well	Asset Management Priority	Associated Water Right(s)	2015 Operational Rate (gpm)	Allocated Water Right(s) Rate (gpm)	Additional Water Right Rate Available (gpm)	Well Performance	Recommended Well Maintenance Action	Estimated Cost to Perform Well Maintenance Actions	Additional Comments
2	Mod	Cer. 50525	490	449	-41	No apparent decline in yield or performance; tested at 499 gpm	Pull pump and motor to remove transducer and/or replace sounding tube	\$15,000 - pull pump and motor, video and install sounding tube	--
3	High	Per G-8655	150	494	344	2015: 2.3 gpm/ft @ 222 gpm Original: 5 gpm/ft @ 600 gpm	Perform well video; depending on observations consider mechanical redevelopment and chemical treatment (optional).	\$50,000 (mechanical only) \$80,000 to \$100,000 (redevelopment with chemical treatment) \$50,000 (well decommissioning)	Reportedly produces sand; May need reconstruction or alternatives to mitigate sand production; Well seal concern
4	Low	T-10341 (Per G-9866)	650	987	337	2015: 11.6 gpm/ft @ 611 gpm 1993: 15.5 gpm/ft @ 900 gpm	None; consider water quality blending to address elevated TDS/manganese	--	Water quality shows slight improvement in 2014/2015
5	Low	T-9484/Per G-6881 T-10208 (Per G-9867)	890	1374	434	2015: 69 gpm/ft @ 1485 gpm 2007: 72 gpm/ft @ 1400 gpm	Perform well video when pump/motor serviced; depending on observations consider mechanical redevelopment in the future.	\$15,000 - pull pump and motor/video \$50,000 (mechanical redevelopment only)	Well capacity is water right limited; Evaluate impacts of higher pumping rates (i.e. well interference)
6	High	T-9484 T-10208 (Per G-9867)	490	987	497	2015: 8.2 gpm/ft @ 493 gpm Original: 14 gpm/ft @ 900 gpm Well Interference	Perform well video; depending on observations consider mechanical redevelopment and chemical treatment (optional).	\$50,000 (mechanical redevelopment only) \$80,000 to \$100,000 (redevelopment with chemical treatment)	Bacterial population reduced after last well rehabilitation; Well performance improved
7	Low/Mod	T-9484 T-10208 (Per G-9867)	515	987	472	2015: 10 gpm/ft @ 551 gpm Original: 18.6 gpm/ft @ 1000 gpm Well Interference	Perform well video; depending on observations consider mechanical redevelopment and chemical treatment.	\$50,000 (mechanical redevelopment only) \$80,000 to \$100,000 (redevelopment with chemical treatment)	Well produces sand; Water quality suggests shallow groundwater source; anomalous chlorine concentrations; Influences water quality at Well 8
8	High	T-9484 T-10208 (Per G-11761)	570	1001	431	2015: 6.8 gpm/ft @ 518 gpm Original: 17.6 gpm/ft @ 1200 gpm Apparent decrease since 2011: 3 gpm/ft @ 518 gpm	Perform well video; perform mechanical redevelopment and depending on observations consider chemical treatment (optional).	\$50,000 (mechanical redevelopment only) \$80,000 to \$100,000 (redevelopment with chemical treatment)	Well 7 appears to influence nutrient and dissolved oxygen
New Well 9	Mod	T-10341 (Per G-9866)	NA	NA	NA	TBD	Drill, Construct and Test New Well (similar to Well 5). Design, Build and Construct Wellhouse.	\$500,000 (Well Only) \$1,600,000 (Well and Wellhouse)	--
Replacement Well for Well 3 or 7	Mod	See Above	NA	NA	NA	TBD	Drill, Construct and Test New Well (similar to Well 5). Design, Build and Construct Wellhouse.	\$500,000 (Well Only) \$1,600,000 (Well and Wellhouse)	If well video survey, identify concern then replacement may be recommended

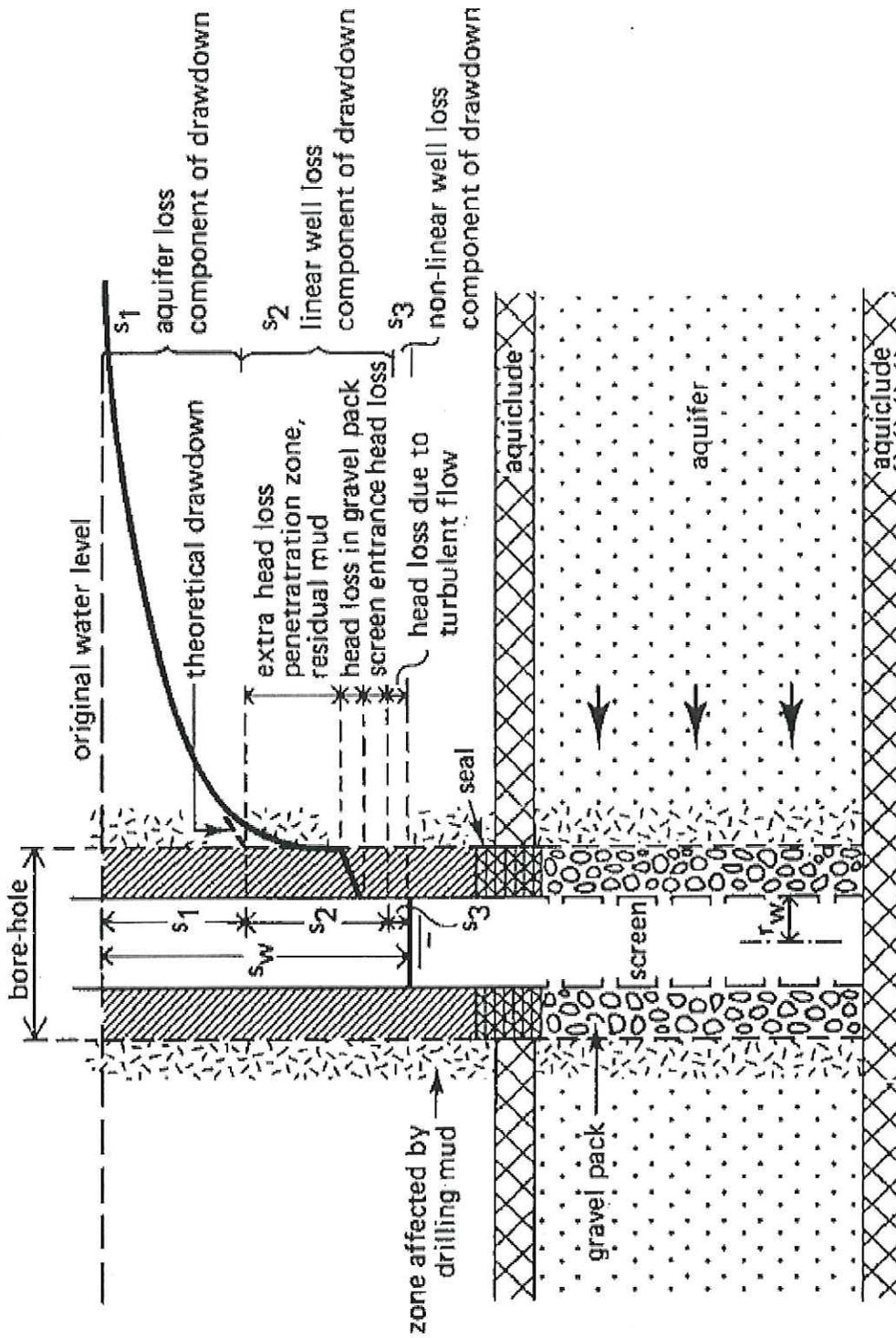
**Notes:**  
 See Table 2 for complete water rights allocations.  
 Wells 5, 6, 7 and 8 share 1,975 gpm (4.4 cfs). Well 5 and 7 share 987 gpm (2.2 cfs). Well 6 has 2.2 cfs. Well 8 has the remainder of the water right rate of 4.4 cfs not used by 6 and 7 and not to exceed the existing water right.  
 Well 5 also is a point of appropriation on T-9484 (337 gpm/700 gpm) and T-3119 (364 gpm). T-3119 needs to be certificated to allow use.  
 Costs for chemical rehabilitation will be dependent on well construction, degree of biofouling and amount of chemical treatment needed. Refined costs can be developed after well video surveys.  
 Costs for well maintenance based on recent projects of similar scope in 2015.



**Figures**

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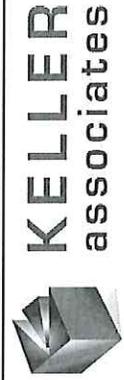




Notes:

1.  $S_1$  and  $S_2$  are components of the Term B and relate linearly to pumping rate
2.  $S_3$  is the turbulent losses term "C" and varies to the square of the pumping rate. This relationship is the same as that for pipe flow.
3.  $S_w$  represents the total drawdown in the well.

Figure 2. Components of Total Drawdown in a Well



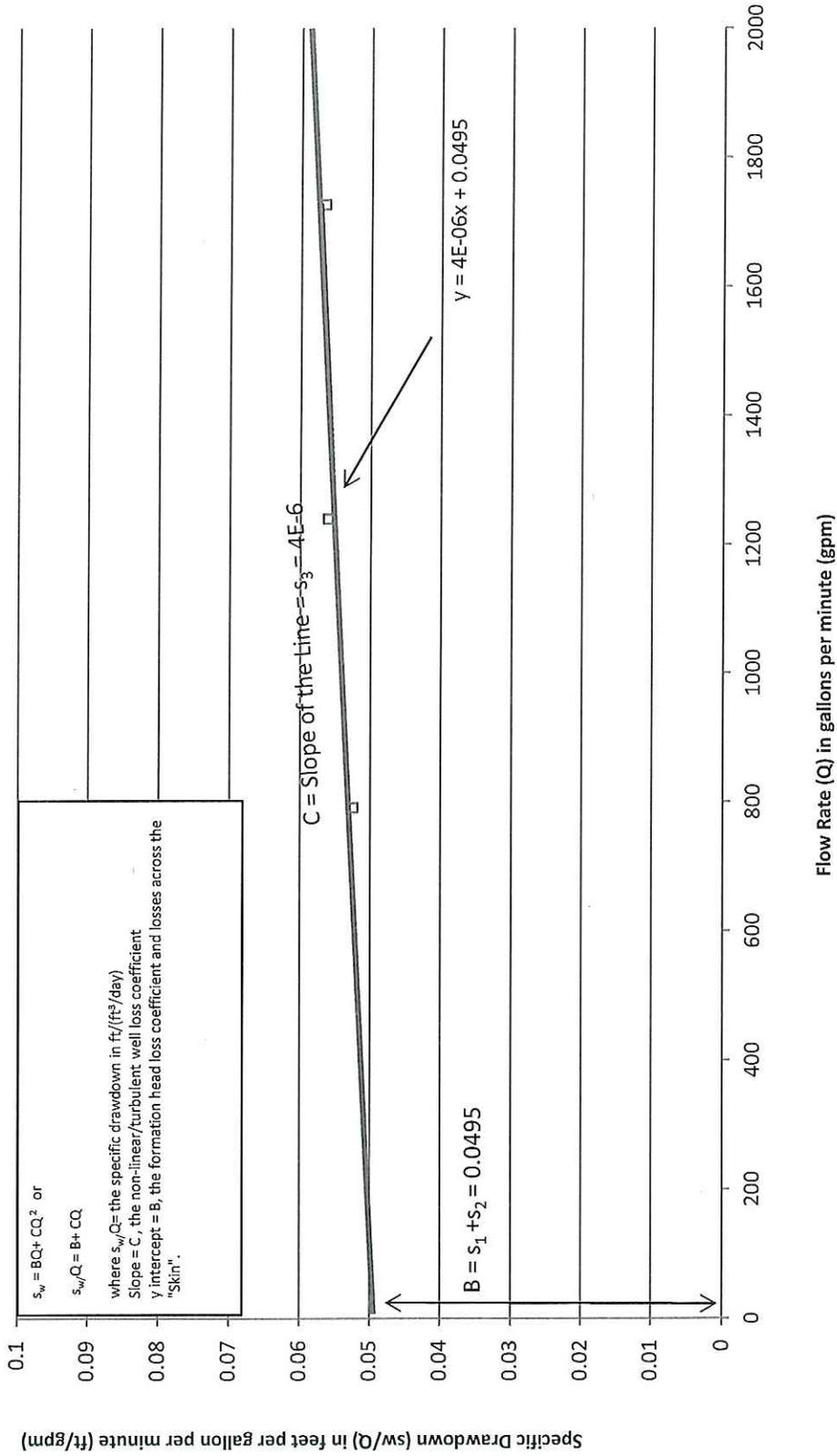
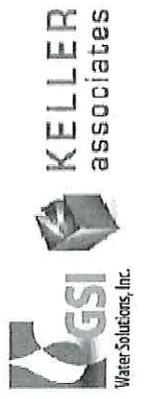
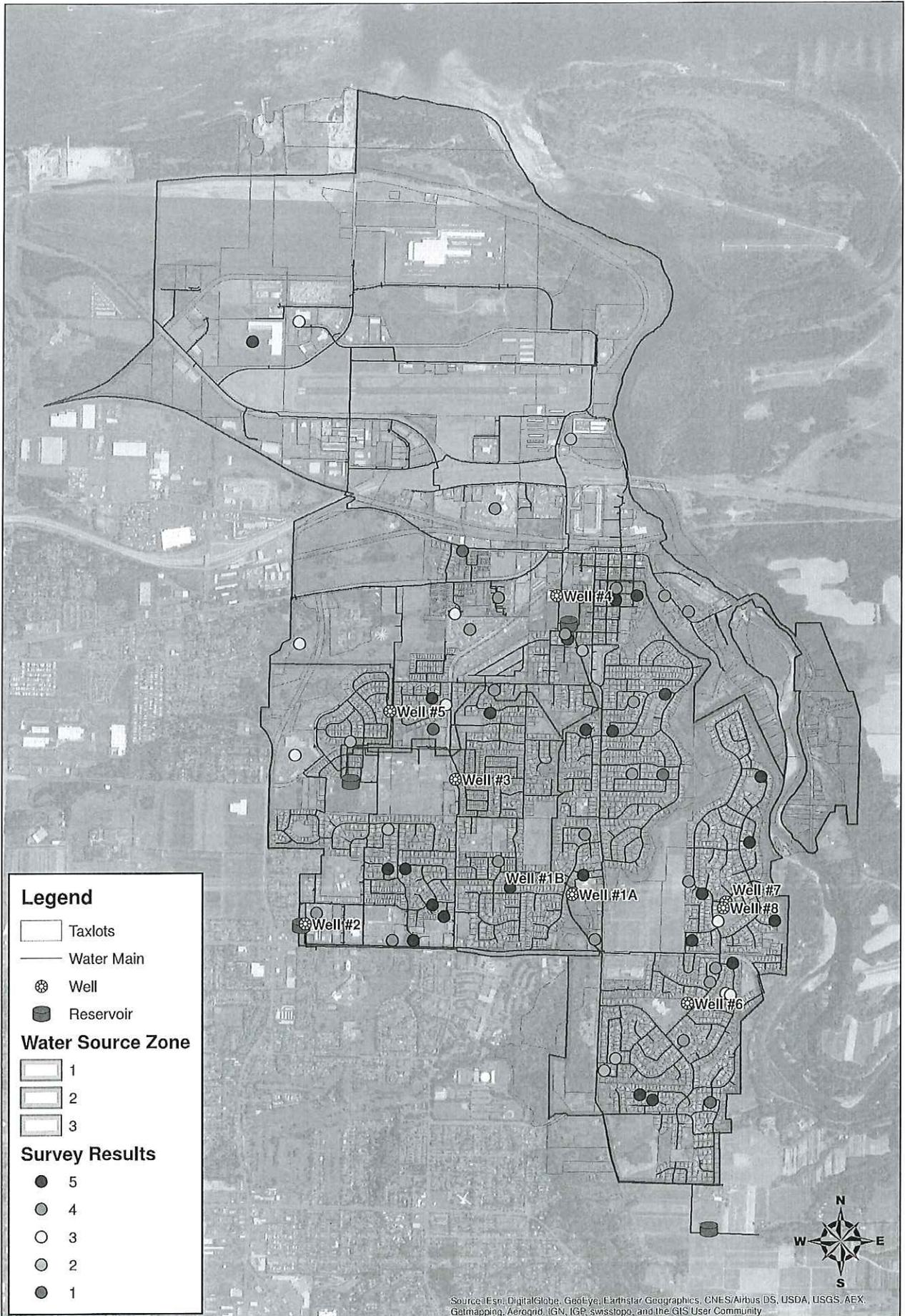
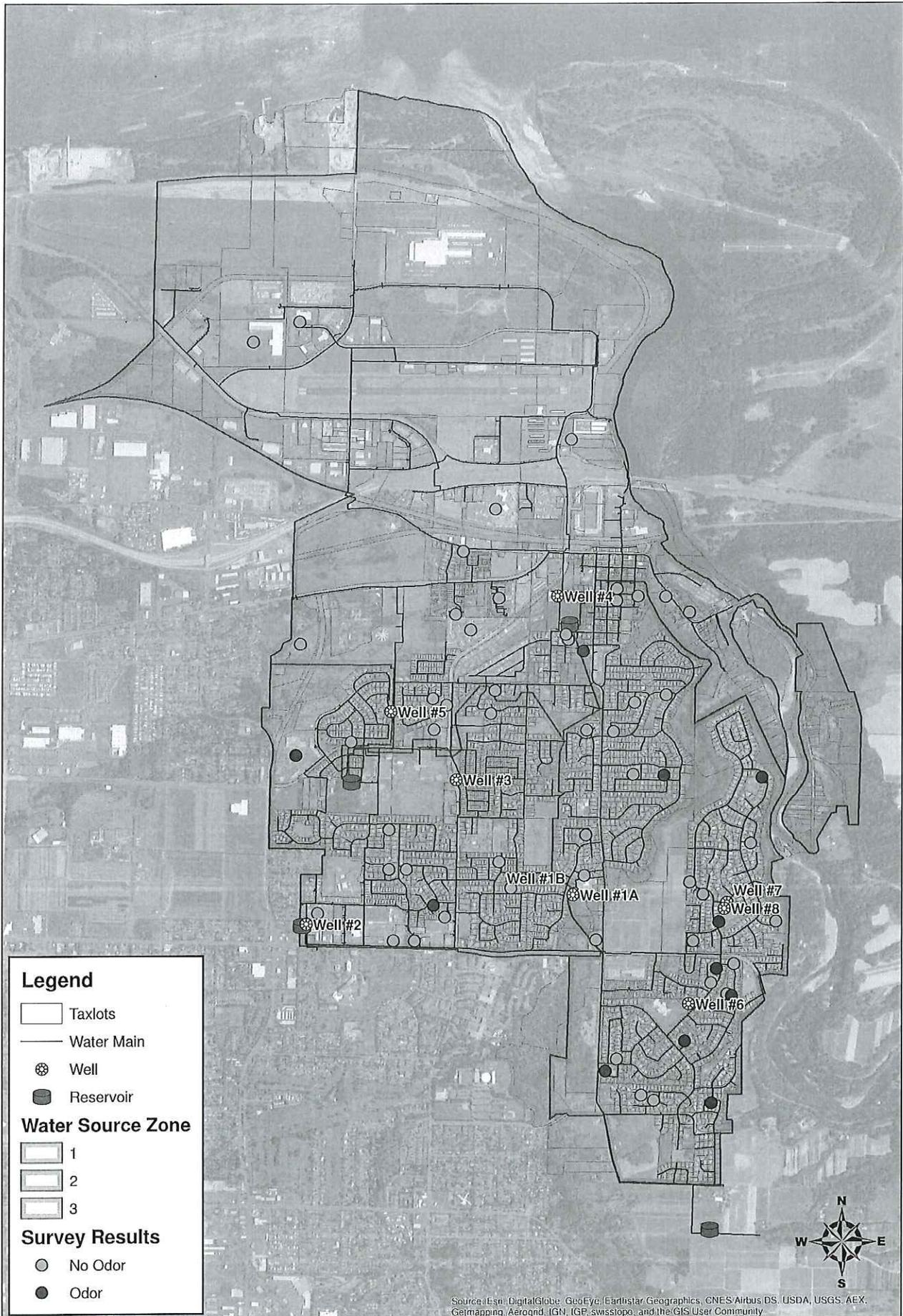


Figure 3. Example of Hantush Biershenk Plot  
 City of Troutdale Comprehensive Well Assessment and Action Plan, 2015

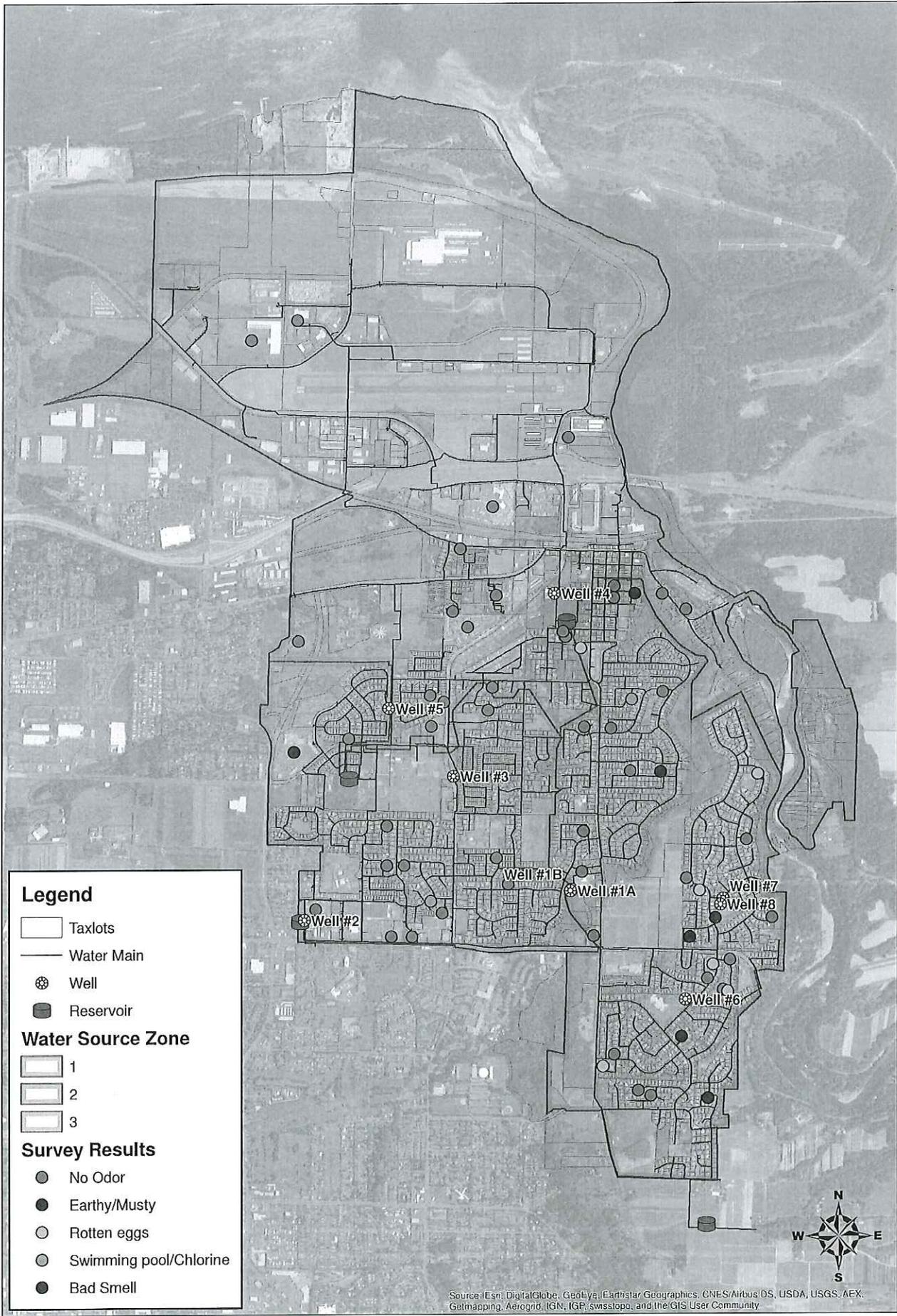




<p>Figure:</p> <p>4</p>	<p>Title:</p> <p>Water User Survey Results: Water Quality Rating</p>	<p>Project:</p> <p>Well Assessment</p>	<p>Prepared for:</p> <p>City of Troutdale, OR</p>		
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<p>Figure: 5</p>	<p>Title: Water User Survey Results: Odor</p>	<p>Project: Well Assessment</p>	<p>Prepared for: City of Troutdale, OR</p>		
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**Legend**

- Taxlots
- Water Main
- Well
- Reservoir

**Water Source Zone**

- 1
- 2
- 3

**Survey Results**

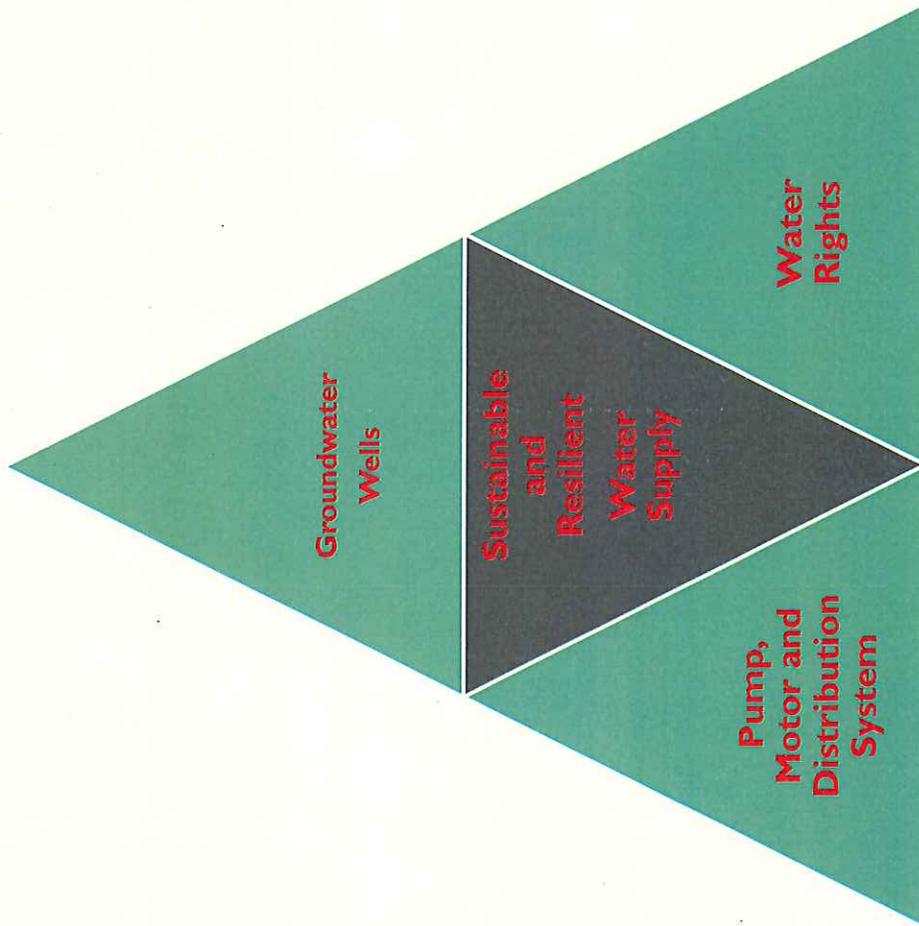
- No Odor
- Earthy/Musty
- Rotten eggs
- Swimming pool/Chlorine
- Bad Smell

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus/DS, USDA, USGS, AEX, Gelpmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

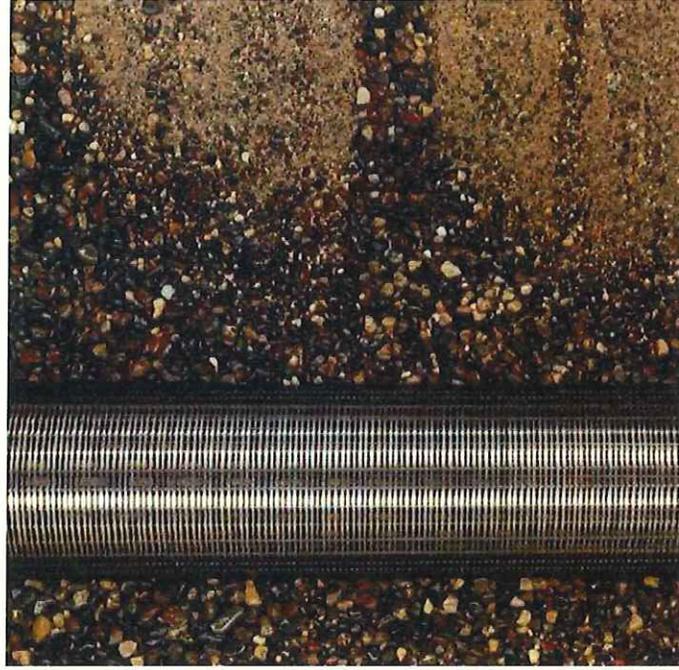
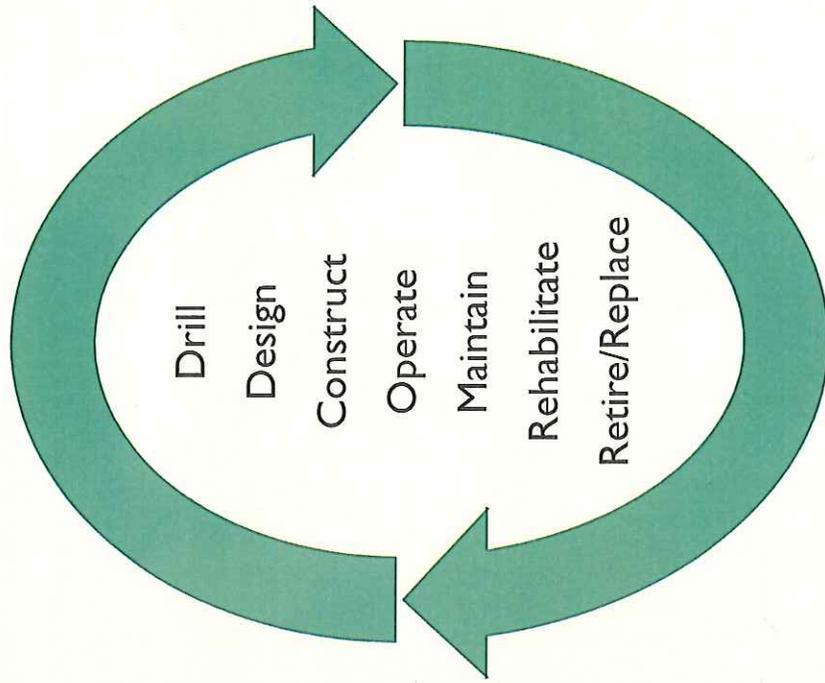
<p>Figure: 6</p>	<p>Title: Water User Survey Results: Odor Description</p>	<p>Project: Well Assessment</p>	<p>Prepared for: City of Troutdale, OR</p>		
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**Appendices A-G Included on Enclosed Data CD**

# GROUNDWATER SUPPLY ASSETS



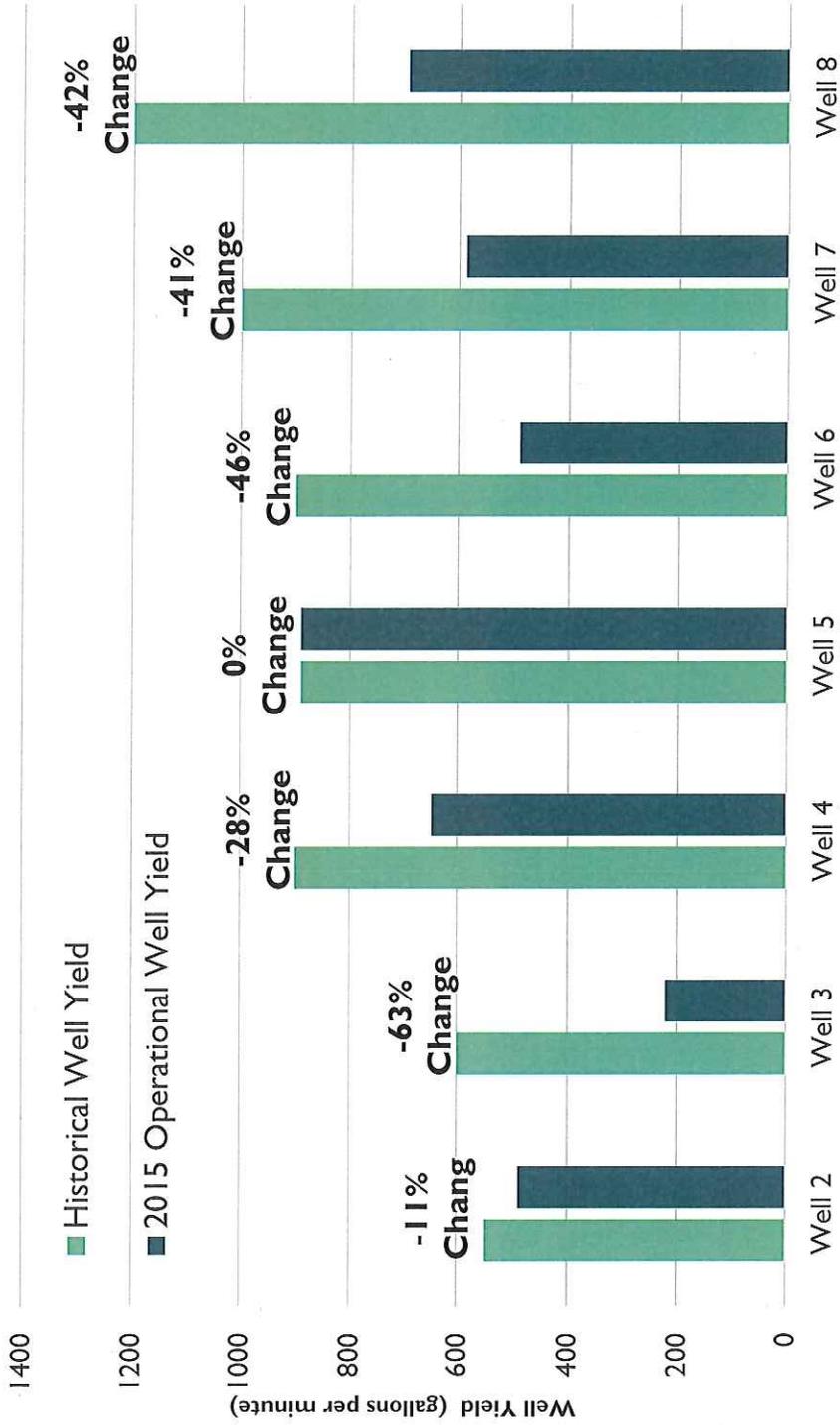
# THE CIRCLE OF LIFE FOR A WATER WELL



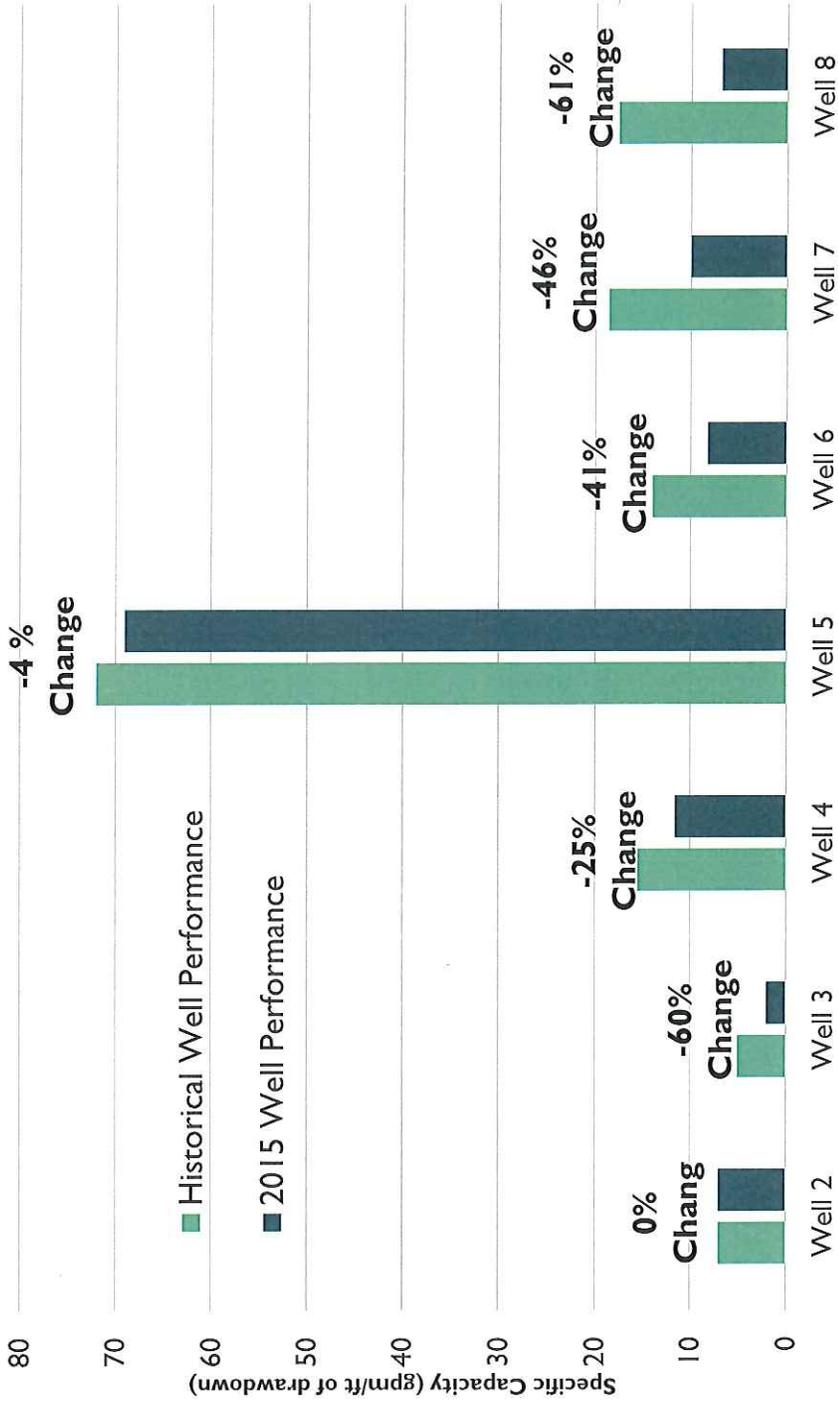
# CITY OF TROUTDALE GROUNDWATER SUPPLY

- 7 Water Supply Wells (9 to 40 years in age; majority 20+ years)
  - Six wells completed in the deep alluvial aquifer
  - Well 2 in the shallow alluvial aquifer
- The City has performed periodic maintenance on the wells
  - Well redevelopment at 3, 6, 7 and 8 due to declines
  - Well 4 reconstructed due to casing and seal integrity issue
  - Well 2 and 5 have not experienced declines
- Providers Fairview, Portland, Wood Village, Rockwood deep aquifer wells have similar well performance issues and water quality (iron and manganese)

## Comparison of Current and Historical Well Yield



# Comparison of Current and Historical Well Performance



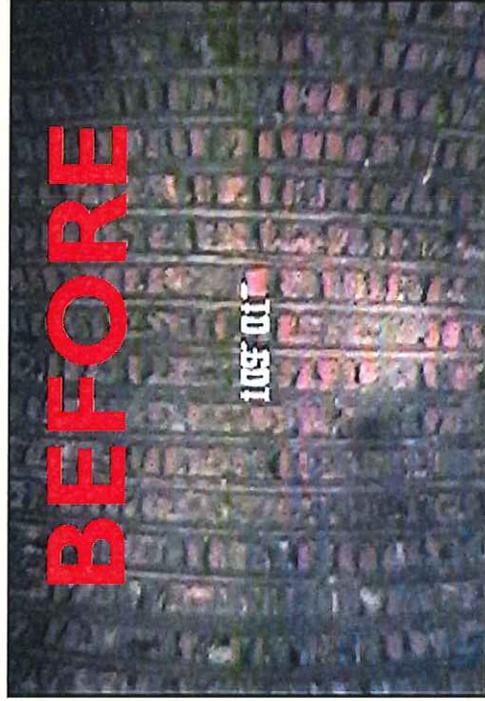
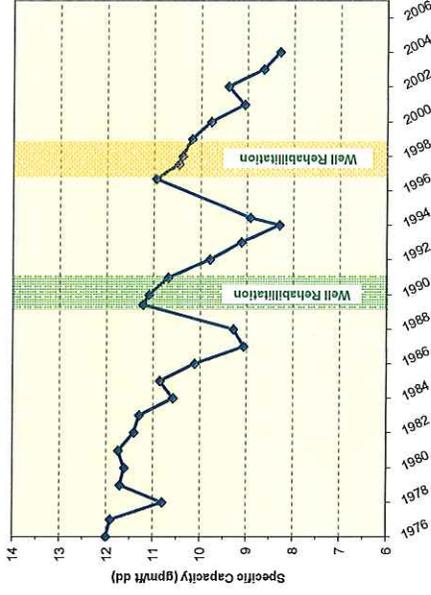
# COMPREHENSIVE WELL ASSESSMENT GOALS

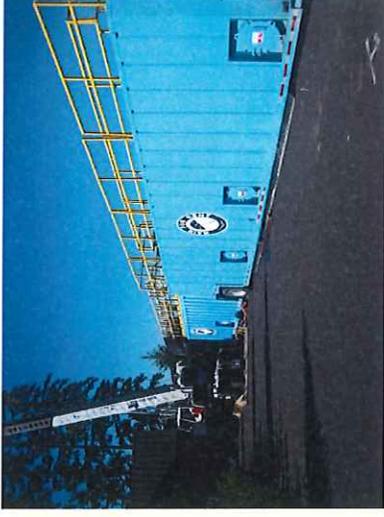
- Proactive Plan for Maintaining a High Quality, Sustainable and Resilient Groundwater Supply
- Identify & Prioritize Maintenance Goals on a Well by Well Basis
- Tailor City's Existing Maintenance and Operations Plan for Groundwater Wells
  - Specify Monitoring Goals to Protect Assets
  - Develop Action Levels for Maintenance
- Evaluate and Protect Existing Water Rights
  - Demonstrate Beneficial Use
  - Water Rights Transactions to Maximize Flexibility



# WELL REDEVELOPMENT/REHABILITATION

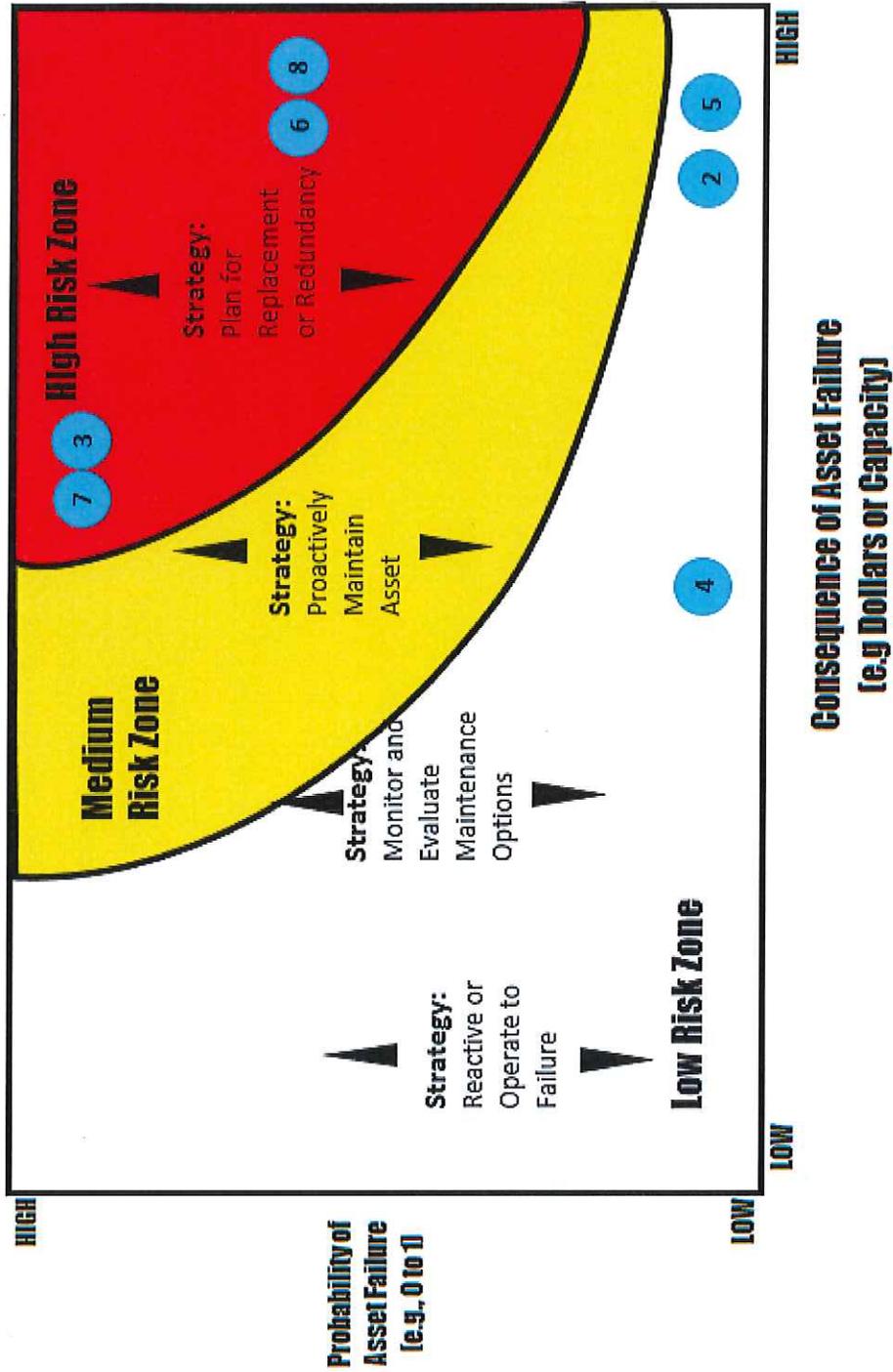
- Diagnose the Problem
  - Well Performance
  - Water Quality
  - Bacterial Assessment
- Develop a Structured Approach to Improve Performance
  - Physical Redevelopment
  - Chemical Treatment/Rehabilitation
- Tailor the City's Preventative Maintenance Program





Water Well Rehabilitation YouTube Video - Nebraska Heath Dept/Nebraska Water Well Association/University of Nebraska/Design Water Technologies

# ASSET MANAGEMENT STRATEGY



# ACTION PLAN

## SHORT TERM ACTIONS

(2016 TO 2018)

- Water Rights Transactions by October 2017
- Implement the Preventative Maintenance and Operations Plan
- Adjust Well Operations to Optimize Water Quality
- Adjust Flushing Program as Needed
- Modify Well 2 Access
- Well Video Surveys at Wells 3, 6, 7 and 8
- Plan for 2 Redevelopments at Well 6 and either Well 3 or Well 8 Depending on Video Results
- Prior to Well 8 Redevelopment Abandon/Decommission Well 7

## LONG TERM ACTIONS

(2016 TO 2020)

- Develop Additional Groundwater Supply at Proposed Well 9 Location or Alternative
- Evaluate Potential Locations Within Service Areas for Replacement of Well 3 and/or Well 7
- Periodically Revise the Preventative Maintenance and Operations Plan to Meet City Asset Management Goals as New Wells are Constructed
- Collaborate with Other Deep Aquifer Well Users and Oregon Water Resources to Manage the Resource