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Deschutes County Board of Commissioners  
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(541) 388-6570 - Fax (541) 385-3202 - [www.deschutes.org](http://www.deschutes.org)

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## **MINUTES OF PUBLIC HEARING**

### **DESCHUTES COUNTY BOARD OF COMMISSIONERS**

**WEDNESDAY, JANUARY 6, 2016**

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La Pine High School, La Pine, Oregon

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*Present were Commissioners Alan Unger, Tammy Baney and Anthony DeBone. Also present were Tom Anderson, County Administrator; Nick Lelack and Peter Russell, Community Development; and fifteen other citizens. No representatives of the media were in attendance.*

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*Chair Alan Unger called the meeting to order at 6:17 p.m. (There was a late start due to the fire alarm going off.)*

Chair Unger explained that the hearing is a continuation from previous hearings in 2015, regarding Ordinance No. 2016-007. The purpose of the hearing was to take additional public testimony on a Goal 11 exception proposal for south County.

Commissioner DeBone said this is the second of two Board of Commissioner hearings recently held in south County on this topic. Approval of an exception to Goal 11 would allow multiple properties to connect to a common system, whether two or a whole subdivision. There are some communities that already have sewer systems and those might be able to provide some guidance. The exception would incorporate into the comprehensive plan so that discussions could happen and neighborhoods could decide whether and when they want to pursue developing a system.

Chair Unger stated that the State has to include some language that some residents are not happy about. Without this language, the need for the exception would not be clear. The County Is not interested in telling people what needs to happen in their neighborhoods; it would allow citizens to come together and find solutions that fit their needs, if and when those needs arise. There are places where there are more problems than in others. This could also allow people to get away from the ATT systems, if a sewer system is viable and desired.

Commissioner Baney added that it is a tool in the toolbox, for the community to decide what to do. Each community should be able to have options. Those options are very limited right now. It is up to the citizens to decide if they want increased options now or at some time in the future.

Commissioner DeBone said someone asked about looking into potential health issues. There have been letters from the agencies and they talk about potential health hazards, and those letters are in the record.

Chair Unger wants staff to be able to answer questions at this time as well. Peter Russell explained how the process works, with the DEQ enforcing State rules and the County being an agent of the State and having to follow State direction. Normally, per Goal 11, you cannot have sewer systems on properties located outside an incorporated area. An exception can be obtained by explaining why you would benefit from the exception. The County works with the DEQ and LCDC to do this, based on certain characteristics of the area. If approved, the property owners have the option to look at a variety of sewer systems.

Chair Unger said that it is the State's call as to whether an ATT system is required. The County has to follow their direction, as an agent of the State.

Citizen Kathy DeBone asked if this issue affects other parts of the County. Mr. Russell explained, while referring to an oversized map, the area that is being considered. It would be in southern Deschutes County, south of Sunriver, because of the unique hydrology of the area. They don't have the same issues with high groundwater levels in other parts of the County. Northern Klamath County may also seek this exception as well, since they share the same geologic and hydrologic features.

Commissioner Baney brought up a question that has come to her: if approved, could the State or County mandate sewer systems. Mr. Russell replied that the County cannot, but the State has the authority to do so. There would have to be a severe public health hazard.

Tom Anderson noted that the State has that authority anyway, regardless of the Goal 11 status. They could take action at any time if a serious public health hazard existed. State law governs DEQ and then the County, and there are certain strict criteria for them to take that kind of step.

Mr. Russell said that LCDC, DEQ and the County are applicants, and hope to avoid getting to that point. He added that this happened in two other counties because there was open sewage going down the side of the roads. It has to be pretty bad for this to happen.

Commissioner DeBone added that they would adopt the recommendations of the steering committee, after two years of work, to help set direction for the future. Mr. Russell said they adopt the map, and the Newberry Country Plan would add this to avoid a radical change in the land use pattern. The current zoning would remain the same. The steering committee had recommendations that were adopted into the Plan.

Cary Mathews said he has installed thousands of septic systems here. Orenco systems have excellent engineers and systems. This is the only system that can be installed at this time. He asked if all systems would have to be approved by Orenco through the State. His company can retrofit but Orenco won't do so. The cost is an issue. He is concerned whether Orenco is going to run things down here and require the use of their systems. He is the only one who can provide sand filter systems in the area at this time. He is concerned whether Orenco will have a monopoly. He said that Bob Baggett of the DEQ knows this.

He has been involved in Oregon Water Wonderland, La Pine and Sunriver sewer and septic systems. He supports the idea of a cluster system but wants to know if there is a monopoly through Orenco. Commissioner Baney said that the State determines who is on the list of contractors, and it is frustrating for the County if there are others who want on this list but can't get there. You want competition in the private sector. It is her understanding that this is up to the State but was also discussed by the steering committee.

Mr. Mathews said that the engineers would submit to the County and the DEQ what they wanted to see. Somehow this has to be addressed, having just one company locked in to do this work. Commissioner DeBone said it is good to have this information on the record. He knows some of the DEQ staff and management, who are the policy makers.

Tom Bradler lives off Day Road, asked about up-zoning. He thought there was the potential for State law to change or be circumvented in this regard. Mr. Russell said that if someone wants to up-zone, they have to have findings to support it. At the local level, there are policies in place not to do so. The County has control of local land use policies, but the property owner has the right to appeal to the State if the County denies it.

Commissioner DeBone said that the land use system in place means that, for instance, if you live in residential area, your neighbor can't just go out and get commercial zoning.

John Huddle, Citizen Action Committee President, stated that the advisory committee includes Orenco members. So they have approved their own systems. This is a concern. They may not have intended to make it this way. The demonstration project provided them with a foothold.

He said that a cluster system may not be cheaper. The cost and benefits have not been discussed and only one company is doing the work. Some of this is outside the County's control, making it more expensive.

Commissioner Baney asked for a specific recommendation. She asked if a company should not be included. Mr. Huddle stated that there should be a way to examine these relationships to make sure they are appropriate. Those whose systems are being examined should not be on the committee to approve their own systems. This is a conflict of interest and does not benefit the consumer.

Mr. Mathews said he did a lot of research on this issue. He supports them being on the committee. This is not new to Orenco. There are others who might be interested in doing this work, but they need to know what the technology requirements are. There should be others who are just as qualified from outside the area.

Judy Forsythe asked Mr. Mathews if the Orenco systems are specifically designed for this type of area. Mr. Carey said that they have the best technology for here. But they should not be the only option. They say theirs is the only system that will work here and DEQ seems to support this.

Martha Bauman stated that her concern is regarding the Goal 11 exception, and who might tell them that it has to be done a certain way and they would have no say about it. They should be the ones in control, not the County or the legislature. She has a shotgun so they better not step onto her property and tell her what to do. She does not want a mandatory sanitary authority telling them what to do.



Mr. Anderson said the County does not have this authority. However, the State does have the authority whether there is an exception or not. They would have to be with certain conditions existing and no alternatives to protecting health and safety. This happened in in Jackson County and Hood River County, where a full-blown sewer system was required due to severe problems. No one at the County envisions this happening.

Commissioner DeBone said that they support monitoring the groundwater. The only way State action would come about is if there is detectable nitrate pollution and there are resulting health problems. By then there would be a long history of monitoring before this could ever happen. If there are a lot more people with a lot more groundwater loading, it could become an issue. Commissioner Baney said this is what they want to head off.

Sharon Reeder asked how the testing is done and if EFU land uses are part of this, such as manure and other things associated with farmland. Commissioner DeBone said this is part of the future monitoring. Every five years there would be an update and a twenty-year look. This use needs to be determined. Chair Unger stated that manure does produce nitrates and people often need to be educated on this.

Mr. Anderson stated that another recommendation of the committee was additional extensive groundwater monitoring, and DEQ has basically accepted the recommendations of the committee.

Commissioner Baney said that there are fertilizers used on golf courses as well, and all of this is being considered.

Glen Clark off Day Road stated that the problem is that some homeowners have horses with manure stacked up around wells. He wants to know why the County does not do anything about this. This will show high nitrates. After 27 feet down, supposedly there are no nitrates. Most of the ground here has a foot-thick clay layer and nitrates do not penetrate it. People need more separation between the wells and systems.

Commissioner DeBone said that his wife put manure around the well house so she could plant flowers in it, and he said this was not a good idea.

Glen Clark said that some of the water will clean itself naturally. Commissioner Baney hopes this can be brought to life. Mr. Clark stated that a lot has to do with where the wells are placed so they are separated from septic systems.

Commissioner DeBone stated that if there are wells that are testing badly, they should investigate why a particular well might be testing that way. They need to look at the scenario. It may not be a basin wide problem. Mr. Clark said that there might be natural conditions at play or it might be very localized.

Commissioner DeBone said they have test wells that are regularly tested, and this data gets more valuable over time. This just finds an area for the exception. If there is a problem with a particular well or area, they can decide whether a system is justified. Commissioner Baney said that this won't occur unless the citizens form a sewer district. The neighbors determine what and where. She hopes the neighbors will come together to mitigate any problems, which may not mean having any kind of community system but doing something differently. The exception allows the community to come together if there is an issue and deal with it.

Mr. Bradler stated that he and others have little faith in the DEQ and would like well monitoring done by a third party, such as OSU. He thinks DEQ tends to cherry-pick wells to create a situation. Their credibility has been questioned.

Dan Varcoe lives in La Pine and supports the option of the exception. It is good to have options. He would also like to see whether they can put in a standard system if appropriate. He still objects to language that accepts the idea that they have contaminated water. They have to be honest about what they do. If there are some wells that test badly but there are reasons for that specifically, that is not a health hazard for the entire region. If they continue to use this language that they may have or will have problems, it will perpetuate the problems that they have had to deal with. He does not know of anyone with a dangerous drinking water well. Some probably do. But no one really knows for sure. Using that language to leverage this is not worth getting the exception.

Commissioner DeBone stated that the County is taking testimony and will deliberate soon. The soil in the area is highly porous and they have a high water table. They have great water but need to protect it. The confluence of the three rivers is a place where there is more density, and this will affect the Deschutes. The river is a nitrogen-limited river system and any sideways action that affects this is not good. There are times of severe algae bloom. It is not a gross health hazard but the overall loading could be.

Mr. Varcoe would like language that does not conclude that they have bad water. You can Google search La Pine water and a lot says that they may have or might or will in the future, have bad water. Then people decide they want to stay away from La Pine.

Mr. Clark stated that the river has a clay bottom. The willows suck up nitrates more than grasses do. Pumice is a good filter for a lot of things. He feels that algae bloom happens because of the hotter weather. It can occur naturally. Commissioner DeBone stressed that he wants to protect the good water they have right now.

Mr. Clark said some properties need a sand filter system due to not having enough ground to filter.

Chair Unger said the exception would allow for more options. He asked what else the Board needs to know to proceed on this issue.

William Reeder asked how much will it cost and who pays for it, if someone wants a sewer system. Chair Unger that the community needs to evaluate the systems and decide which works best. Mr. Russell said that the DEQ feels they can go after grants to help with the cost. Commissioner DeBone said that only one neighborhood, Oregon Water Wonderland I, is talking about this. There are no neighborhoods that have this problem now, but if there is more density, this discussion might occur sooner. Commissioner Baney stated that a lot of people are worried about additional costs. There are costs related to either, and every property owner has this responsibility. A lot of folks do not maintain their systems so put other people at risk. The hope is if a community wants to form a district, that they can do it in a way to secure grants and financial help. It might be a small cluster system or tying into another system.

Nick Lelack said that over a year ago, a good idea from one of the committee members came up. If the Goal 11 exception is approved, to establish a pilot program with some property owners, get financial partners together to find out what resources are available, whether the County can be a partner, and learn from that. They could find out what it costs to create a district, install the system and maintain it. A pilot program could answer a lot of this. They want to see if the exception is authorized first.

Chair Unger said the New Neighborhood is a good place for that. Mr. Lelack stated that the County owns over 400 acres there and can transfer development rights, or sell property to fund a program for this purpose; or potentially use these resources to offset the cost of a district or system. There will be time in the next couple of years to put together a financial committee to investigate how to offset the costs.

John Huddle stated that he is concerned about the process. The Commissioners should be in the role of just objectively listening, but he is hearing that they are trying to sell the idea. That is not a good role for the County. They should listen carefully. One idea is putting this to referendum instead. They are not even close to getting buy-in from the public. It is not publicized well and they are not meeting Goal 1. It should go into a voters' pamphlet. Most people are not aware of this no matter what the Commissioners say. The devil is in the details. The language sets it up. The Oregon Health Authority can drive this management. The DEQ does not drive this. There is a process to petition through the courts to order hearings. This is outside of everyone's control.

Commissioner Baney asked for details. Mr. Huddle said they can use the language from the committee. The language is sufficient to accept at face value. They don't have a problem.

Another part of the problem is that this sets precedence. They don't know who down the road will do what. If undeveloped lots are pushed to sewer, this can end up with up-selling. Most people do not want this, in his opinion. It might be needed to support the cost of the system. Strategic planning is not there. He asked where are the problems or are there any. They have worked with OSU for 18 months and some of them want to do research. The DEQ has put roadblocks to this. They don't look at water wells, just sampling wells. Well depths differ, and there is no consistency.

They need to look at stand-alone subdivisions and study them. They need to do feasibility studies. Then decide what to do next. And can they afford it. Once this is in place, it all goes back to the start. It might be wise to back off on this for a while. Those who want it go forward don't know the cost of even of cluster system. They are dealing with unknowns. Allowing this exception would open up a can of worms.

Ken Mullenex stated that it is commendable that the Commissioners are bringing this idea forward to allow public comment and bring it out, to determine first steps. The other part is down the road and can't even be looked at until the exception is in place. It is a tool of the people who live there to use if they want to. It would help them keep their water as good as it is. This is a very logical process to move forward, to have a tool to help determine or allow residents to determine future alternatives or options to address issues. They have to get past this before looking at all the rest. It is the way the State designed the land use laws and a process needs to be followed.

Commissioner Baney said that every time they do this – and it was much larger audience when they had committee recommendations – with the committee doing it. It was them telling the County what they need, and what options might help. There was a good turnout and the message keeps getting refined. They may not always agree on the outcome, but she appreciates the questions. They are all conversation points at some point.

When they were at the SHARC, it was pointed out that the State would have never allowed this amount of development today. Knowing the fact that there is this large area that was left to fend for itself, it is a wonder that the water is as pristine as it is today. The people need to get what they need to keep it pristine. She does not care if anyone develops another lot, but people who own them should have the ability to develop their property, too. They need to work together to make sure this area stays pristine. She appreciates Mr. Huddle's comments. Everyone wants the same outcome, but the question is how they get there.

Commissioner DeBone said there has been good information sharing for a long time. The La Pine Economic Group supports this as well, as does the Sunriver Chamber. A lot of people know about this subject.

John Huddle said there are 27,000 people in this area. The Commissioners want people to buy into something but they need to know about it. The only way is through the ballot box. Even a nonbinding referendum would raise the bar of knowledge. He predicts that they would reject it the first time but eventually people might warm to the idea.

Commissioner Baney asked if the steering committee made this recommendation. Mr. Huddle said this is his statement. People need to wake up to the need. He fears the language is derogatory and should be changed. The language should be removed. People won't buy into it otherwise. There is no education going on down here. A delay won't hurt anything. This is being rushed. They need to get more people engaged.

Mr. Bradler asked how this was publicized. There are not that many people here. He has been to all of the meetings. It was overkill to use this facility, as they could have had the use of the senior center at no cost.

In response, one person said they say it on the internet, and one saw on KTVZ. It was announced at the Band of Brothers meeting. It was in the Chamber Buzz that goes to many people.

Mr. Russell said they did a public service announcement and also continued this several times. The large number of hearings was not required, but they wanted to reach more people that way. He got e-mails from others.

Kathy DeBone remembers the last meeting when this room was full. There was a lot to be concerned about at that time. Maybe through all of the discussions, the committee and hearings, people are now not as concerned about the exception. She looks at this as an opportunity. Maybe people are waiting to see what happens later.

Mr. Mathews supports this idea. There is support among the contractors. They are aware of this. There are places that cannot be built upon because of the limitations. He supports it and he is La Pine rumor central at his office. His friends also support it.

Mr. Huddle said that Robert Ray isn't here and the two chairs of the committee are not here. They were here before. It was not in the Wise Buy or the Eagle. That's what people read here. He has a radio show on Fridays and did not get the PSA.

Commissioner DeBone said that as a community and society, it is hard to get the word out. There are many ways to do this but no one knows exactly where to get the news they want. It is not like there is one newspaper or outlet. He has attended the steering committee meetings and most are supportive. Most are not here because they did not feel it was necessary.

Chair Unger said there has been a lot of education and testimony, and many hearings to help educate. At this point, they need to look at moving forward.

Judy Forsythe stated that she thought about this long and hard. It is amazing how much testimony has come out. She contends that an exception is premature, overreaching, unwise and irresponsible. In the absence of credible data, negative media attention has impacted south County. The voters do not share the media's perception. Credible data should be straightforward, clear-cut and uncomplicated, and this does not meet those needs. Everyone has agreed that there is time. Let's use part of that time to have thorough testing performed by a third party such as OSU. This will either confirm or verify and prove or verify, or it will refute, dispute and challenge the allegations.

What are we waiting for? It is not up to the populace to convince the County. The County has to convince the people. If an independent third party can answer the question about trending in certain neighborhoods, especially those that are independent, then there can be an effort to complete the process. If there is a reliable and convincing argument, they can come back to this table and look at developing public policy. *(A copy of her statement is attached for reference.)*

Mr. Russell said at this point, the Board can keep the record open, set a date certain for another hearing, close the oral and accept written, or close both and set a date certain for deliberation.

Commissioner Baney asked to close the oral portion of the hearing but leave the written record open to take further information. She feels two weeks would be appropriate. Commissioner DeBone supports this. Chair Unger said that they have done a great job with outreach and they have now reached a point where they need to deliberate.

Written testimony will be accepted until 5 p.m. on January 20; and deliberations will take place at the 10 a.m. business meeting on January 27.

*Chair Unger adjourned the meeting at 7:55 p.m.*

**DATED this \_\_\_\_\_ Day of \_\_\_\_\_ 2016 for the  
Deschutes County Board of Commissioners.**

\_\_\_\_\_  
Alan Unger, Chair

\_\_\_\_\_  
Tammy Baney, Vice Chair

ATTEST:

\_\_\_\_\_  
Anthony DeBone, Commissioner

\_\_\_\_\_  
Recording Secretary



## BOARD OF COMMISSIONERS' MEETING

### REQUEST TO SPEAK

Subject: Proposed Goal 11 Exception for South County Date: Jan. 6, 2016

Name Tom Bradler

Address Day Road

Phone #s \_\_\_\_\_

E-mail address \_\_\_\_\_

☐ In Favor      ☐ Neutral/Undecided      ☐ Opposed

Submitting written documents as part of testimony? ☐ Yes ☐ No

If so, please give a copy to the Recording Secretary for the record.





## BOARD OF COMMISSIONERS' MEETING

### REQUEST TO SPEAK

Subject: Proposed Goal 11 Exception for South County Date: Jan. 6, 2016

Name Martha Sauman

Address 67050 Deer Run Lane

Lapine OR 97739

Phone #s 541-536-7670

E-mail address lapinemoa@msn.com

☐ In Favor ☐ Neutral/Undecided ☒ Opposed

Submitting written documents as part of testimony? ☐ Yes ☐ No  
If so, please give a copy to the Recording Secretary for the record.



## BOARD OF COMMISSIONERS' MEETING

### REQUEST TO SPEAK

Subject: Proposed Goal 11 Exception for South County Date: Jan. 6, 2016

Name Terri Mathews

Address Carie Cary

Phone #s \_\_\_\_\_

E-mail address \_\_\_\_\_

☐ In Favor ☐ Neutral/Undecided ☐ Opposed

Submitting written documents as part of testimony? ☐ Yes ☐ No  
If so, please give a copy to the Recording Secretary for the record.



## BOARD OF COMMISSIONERS' MEETING

### REQUEST TO SPEAK

Subject: Proposed Goal 11 Exception for South County Date: Jan. 6, 2016

Name Ken Mulenex

Address MAYOR

Phone #s \_\_\_\_\_

E-mail address \_\_\_\_\_

☐ In Favor ☐ Neutral/Undecided ☐ Opposed

Submitting written documents as part of testimony? ☐ Yes ☐ No

If so, please give a copy to the Recording Secretary for the record.



## BOARD OF COMMISSIONERS' MEETING

### REQUEST TO SPEAK

Subject: Proposed Goal 11 Exception for South County Date: Jan. 6, 2016

Name Glen Clark

Address 16055 Strauss Rd

La Pine OR. 97739

Phone #s 541 771 6608

E-mail address GdClark0707@gmail.com

☐ In Favor ☐ Neutral/Undecided ☒ Opposed

Submitting written documents as part of testimony? ☐ Yes ☐ No

If so, please give a copy to the Recording Secretary for the record.



## BOARD OF COMMISSIONERS' MEETING

### REQUEST TO SPEAK

Subject: Proposed Goal 11 Exception for South County Date: Jan. 6, 2016

Name Sharon Reeder & William Reeder

Address 50694 Hwy 31  
La Pine

Phone #s 541-536-6049

E-mail address reedkrl@hotmail.com

☐ In Favor ☒ Neutral/Undecided ☐ Opposed

Submitting written documents as part of testimony? ☐ Yes ☒ No  
If so, please give a copy to the Recording Secretary for the record.



## BOARD OF COMMISSIONERS' MEETING

### REQUEST TO SPEAK

Subject: Proposed Goal 11 Exception for South County Date: Jan. 6, 2016

Name Dan Varcoe

Address PO Box 2461 - 15990 Pierson Rd.  
La Pine, OR 97239

Phone #s 541-221-9177

E-mail address d.k.varcoe@gmail.com

☒ In Favor ☐ Neutral/Undecided ☐ Opposed

Submitting written documents as part of testimony? ☐ Yes ☒ No  
If so, please give a copy to the Recording Secretary for the record.



## BOARD OF COMMISSIONERS' MEETING

### REQUEST TO SPEAK

Subject: Proposed Goal 11 Exception for South County Date: Jan. 6, 2016

Name Judy Forsythe

Address 52343 Ammon

La Pine, OR 97739

Phone #s 541 536-7669

E-mail address Judy.Ken1999@gmail.com

☐ In Favor ☐ Neutral/Undecided ☒ Opposed

Submitting written documents as part of testimony? ☒ Yes ☐ No  
If so, please give a copy to the Recording Secretary for the record.



## BOARD OF COMMISSIONERS' MEETING

### REQUEST TO SPEAK

Subject: Proposed Goal 11 Exception for South County Date: Jan. 6, 2016

Name John Huddell

Address PO Box 1295, La Pine, OR 97739

Phone #s 541-728-8105

E-mail address president@lpg.us

☐ In Favor ☐ Neutral/Undecided ☒ Opposed

Submitting written documents as part of testimony? ☒ Yes ☐ No  
If so, please give a copy to the Recording Secretary for the record.

January 06, 2016

My name is Judy Forsythe. For the record, I contend that a blanket Goal 11 Exception is not only premature and over-reaching, but also unwise and irresponsible.

Commissioners, I'll tell you what I want to see.

In the absence of credible data, reckless, negative media attention has created the appearance of a problem regarding the need for sewers in South Des. Ct.

We are, however, keenly aware that the voters, after 9 long years, do not share the media's perception of a problem.

Credible data must be straightforward, open, direct and reliable. The data and findings in this case do not meet the basic, clear-cut, uncomplicated criteria required to convince the populace.

Everyone agrees: WE HAVE TIME. Let's use a small portion of that TIME to have rigorous, accurate and thorough testing performed by an independent, third-party, such as Oregon State University.

Rigorous testing will do one of two things: Either it will

1. CONFIRM, VERIFY, PROVE AND SETTLE THE ASSERTIONS LAYED BEFORE US, ONCE AND FOR ALL.

Or, it will:

2. REFUTE, DISPROVE and CHALLENGE the allegations which have shrouded South Deschutes County all these years.

What are we waiting for?

It is not up to the populace to convince you.

It is up to YOU to convince us that sewers are necessary. That will not happen without an independent research project.

If an independent, reputable third party research project can answer the questions about possible trending of elevated contaminants, like nitrates, in respective neighborhoods like Wild River, PineCrest or Newberry Estates, then let's put the county's manpower and effort towards helping complete such a research project.

If a pattern can be shown that is reliable, reproducible and convincing to the local populace, then, and only then, let us come back to the table to address the appropriateness of developing public policy to address CURRENT, defensible findings. We request a plan that provides both predictability and stability for the needs of South Deschutes County.

Thank you for your time this evening.

## DESCHUTES COUNTY CITIZEN'S ACTION GROUP

POST OFFICE BOX 493, LA PINE OREGON 97739

12/15/2015

Board of County Commissioners  
Deschutes County  
1300 Wall Street  
Bend, Oregon 97701

Subject: Goal 11 Exception – Alternative Proposal

Dear Commissioners:

We appreciate the effort Deschutes County put into the planning and due process toward a blanket goal 11 exception for South Deschutes County. The Deschutes County Citizen's Action Group (CAG) feels strongly that potential problems far outweigh the advantages for a goal 11 exception of this magnitude. Despite assurances to the contrary, we are also apprehensive regarding potential unbridled development and up-zoning. We want to take this opportunity to propose an alternative, we believe that the "cart is before the horse."

Before we begin, however, we wish to point out that we are troubled by Deschutes County's attempt to meet the state's goal 1 for land use issues. ***"The governing body charged with preparing and adopting a comprehensive plan shall adopt and publicize a program for citizen involvement that clearly defines the procedures by which the general public will be involved in the on-going land-use planning process."*** OAR660-015-0000(1) Perfunctory listing of this meeting on the county's website or the distribution of a public notice in the Bend media fails to address the spirit of the OAR and adequately publicize the process. In addition, a meeting held the first week after the Holiday Season is likely to be overlooked. We remind the Commission that this is a pattern with Deschutes County regarding the goal 11 exception issue. We hold that poor attendance at these meetings is not an indication of the public's acceptance of the proposed ordinance, but rather a failure on the part of the county to publicize.

We agree that doing nothing is not an option. Even in the absence of credible data, negative media attention has created the appearance of a problem. Unfortunately, we are also keenly aware that the voters do not share the media's perception of a problem. In part, this is due to a valid perception that the data and findings are not credible, straightforward and reliable. For instance:

- ❖ *Rigor is important, especially when the analysis of the data leads to public policy affecting the lives of residents. In 2000, USGS, DEQ and Deschutes County sampled 192 wells, using that data as one comparison against the USGS Nitrate-Fate Transport Model (Morgan, et al, 2007). What the USGS reports failed to disclose were monitoring wells drilled in or near septic drain fields. One such well, number 1227, was drilled just nine feet from a drain field and had the highest nitrate value of any well in the sampling (25.9 mg/L). The USGS also used descriptive statistics from the Oregon DHS Real Estate well sampling as another comparison to the Model. In total, there were three significant areas where a lack of rigor affected the USGS Model:*



1. *Comparison of measures of central tendency and ranking of the data should exclude outliers (see definition below). Robust procedures for other analysis are not sensitive to outliers, but comparison of descriptive statistics, such as the mean or the 90<sup>th</sup> percentile are easily distorted by their presence. The authors should have adjusted for outliers and then used a statistical test to determine if the distributions were the same with and without the outliers (Walfish, 2006). They did not.*

- a. *The 2000 well sampling had outliers that widely differed from the rest of the sampling. For a comparison of values, such as the mean before and after removal of outliers, see Appendix ii.*
- b. *The real estate well sampling undoubtedly had outliers. (That table of real estate well values was not provided by Morgan (et al, 2007) but analysis of the interquartile range and the provided box plot strongly suggested their presence). For a comparison of measures between the real estate well test data available to this author (see limitations of the data) before and after removal of outliers, see Appendix ii.*

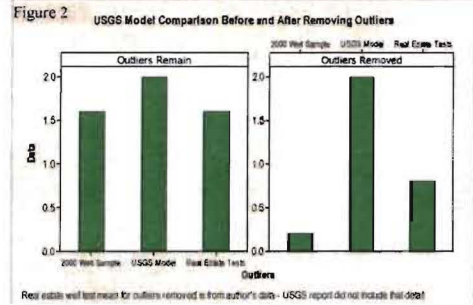
2. *The Model based the mean annual nitrate loading per household on a non-representative sample of just 69 households for the Basin. Morgan (et al, 2007) was silent on the existing literature about nitrate loading that suggested mean loading rates 20 to 30 percent less than that used in the Model.*
3. *USGS failed to consult the most reliable occupancy data, the U.S. Census and Midstate Electric Cooperative. Instead, the Model used the La Pine Chamber of Commerce and the U.S. Post Office, potentially overstating occupancy rates for the Basin.<sup>1</sup>*

❖ The burden of proof document makes strong reference to the septic issue in the core business areas of the City of La Pine as if that area is identical to the newer subdivisions outside the city. We remind the Commissioners that the septic issue in the core business area resulted from small lot size and bottomless cesspools, often dug to the aquifer, at local businesses, while the area outside the city is comprised of large lots and permitted septic systems. Such a comparison is like comparing apples to oranges.

❖ The burden of proof document makes reference to “recent sampling of monitoring wells in the area [that] demonstrated a small but statistically significant increase in nitrate concentration between 1995 and 2011. In fact, there were huge issues with the monitoring in 2011:

- 1 The government affairs representative for Orenco Systems, Inc. selected the wells for the comparison. Besides a glaring conflict of interest that DEQ should have prevented, there were a number of issues:

- a DEQ did not obtain samples from the same wells in 1995 as in 2011. Wells 219, 254, 260, 285 and 1002 did not collect samples from the same well as the well from 1995 because the well was abandoned or an inability to locate the original well. Well substitution introduced unacceptable error.



<sup>1</sup> Ground-water Protection and the La Pine Basin, Huddle, J., a report published for the Deschutes County Citizen's Action Group, 2012, [www.cagg.us/library](http://www.cagg.us/library). Note: Dr. Huddle holds a doctorate from Vanderbilt University with a minor in research design and methodology. Dr. Huddle also taught research design and methods at the graduate level.



- b *Well number 146 had a different physical address and geocoding. In addition, in 1995, no such well existed. While it was likely that the 1995 well number 145 was the same, there were sufficient discrepancies to require exclusion.* Final well count of legitimate wells for analysis was  $n = 37$ , covering an area of roughly 200 to 300 square miles. Our analysis did not find an upward trend of elevated nitrates. As we pointed out in our report, the data had many flaws.<sup>2</sup>
- 2 The same Orenco Systems, Inc. employee also selected a community college instructor from out-of-state to analyze the data, again a glaring conflict-of-interest that DEQ failed to prevent. DEQ authored a report on the behalf for the South Deschutes and North Klamath Groundwater Protection Committee, a DEQ advisory committee, stating the analysis, but without credit or supporting information, such as the degree of significance or reference for the reader.<sup>3</sup>

We propose that the first step, prior to considering a blanket goal 11 exception, is to conduct credible research by a reputable third-party source, like Oregon State University, and then consider those areas that deserve such attention for appropriate remedial action, that might, but not necessarily include, a goal 11 exception. You will never convince the voters that there is a problem without credible research. A glaring deficiency in all studies to date is a lack of representative subdivisions that would demonstrate the presence of a problem or the likelihood that one exists in the foreseeable future. In addition, no one has studied the private water wells that showed elevated concentrations of nitrates to discover why they became contaminated. Without such evidence, the public has not and will not accept blanket conclusions that septic systems are the problem. In like manner, the public has not been shown, beyond a shadow of a doubt that a problem exists to such a degree, or, on such a wide scale that would justify the reasonableness for a blanket goal 11 exception to allow sewers.

- ❖ First, design a credible study that asks these questions, “Is there a trend of elevated contaminates, like nitrates, in representative neighborhoods?” Given the lack of credibility with DEQ and Deschutes County, there must be a credible third source to design a study that answers this question is there a trend, a pattern, is the study reliable, replicable and convincing to the local populace. Once those questions are answered, then it is appropriate to develop policy to address the findings. It is inappropriate to base expensive and potentially harmful policy on supposition.

If credible research indicates the presence of a problem, we believe that several steps are necessary to the formulation of responsible public policy. Public policy must address affordability, cost-benefit-analysis, due diligence, strategic planning, transparency and public consensus. Policy that addresses these elements will serve the public well. None of these elements are present in the burden of proof document.

Public policy that fails to address affordability is like driving a \$2.4 million Bugatti to carpool the kids to school and sports, it's not the most affordable or practical solution. Unfortunately, there are homeowners in the La Pine Basin that can talk about affordability because they lost their life savings or homes due to the current county policy requiring ATT<sup>4</sup> upgrades. The burden of proof document is silent on affordability. In the 2011 legislative session, we

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<sup>2</sup> Ground-water Protection and the La Pine Basin, a report published for the Deschutes County Citizen's Action Group, 2012, Huddle, J. [www.cagg.us/library](http://www.cagg.us/library)

<sup>3</sup> South Deschutes/North Klamath Groundwater Protection: Report and Recommendations, 2013, Nigg, E. and Baggett, R.

<sup>4</sup> Alternative Treatment Technology



36.9% of all households are below the poverty rate

successfully inserted a budget note requiring that DEQ determine what other states were doing to address affordability. With the help of Rep. McLane and other legislators, we were able to enforce that budget note. Failing to address affordability ignores the public question, “How much will this all cost,” a requirement under OAR 660-004-0020(2)(c). We anticipate that a policy built on a preconceived supposition that sewers are the answer could cost upward to a third or a half a billion dollars, given the rural nature of the lots in question. The impact of the current ATT policy or the expense of converting to sewers after a blanket goal 11 exception has draconian implications for the disadvantaged (the overall poverty rate is 17.6%, but 36.9% of all households are below the poverty rate), the senior citizen (14.1% are in poverty), low-income families (18.4 % of families with children are in poverty), the disabled (51.5% are on SNAP) and veterans (14.4% are veterans, with 11% in poverty).<sup>5</sup> In addition, the implications for the environment and the impact on local small businesses is considerable.

Public policy without cost benefit analysis is like entrusting the credit card to a six-year-old, you might not get the desired benefit for the cost! We have repeatedly asked for cost versus benefit analysis. We point out that a goal 11 exception presupposes the need for sewers. Without credible research and a cost-benefit-analysis, we don’t know that sewers of any size are the appropriate answer. We continue to call attention to the lack of competition in Oregon from ATT septic manufacturers. In 2011, we also unsuccessfully petitioned the Environmental Quality Commission to change the administrative rules to address a lack of scientific criteria in the administrative rule that allows an agent to require an ATT system. We continue to hold that “in the opinion of the agent” is not good policy and it defies cost-benefit-analysis (OAR 340-071-0130(1)). We hold that there should not be a goal 11 exception without cost benefit analysis.

This process has hardly been transparent. Hearings were poorly promoted and mostly held in locations that seemed calculated to draw the least possible attendance. Information was deliberately shared at the last legally permissible moment. Written testimony from the earlier hearing is buried within the property listing section (DIAL) on the county website. In addition, the upcoming hearing is held when snow birds are gone for the winter, a substantial minority of South County residents. Transparency is vital for public confidence, the goal 11 exception has become murky process that is obscure and difficult to understand.


*Due diligence in a broad sense refers to the level of judgement, care, prudence, determination, and activity that a person would reasonably be expected to do under particular circumstances.*<sup>6</sup> As we reminded the Commissioners in individual meetings prior to the implementation of the hearing process, a public works project of the potential magnitude that a blanket goal 11 exception would create, poses the temptation for inappropriate acts by those who want favorable treatment or an inside advantage. As we continue to point out, there is the perception of cozy relationships. As we also noted, the language in the burden of proof document might inappropriately be used to try to meet the burden of proof for a probable health hazard under the Oregon Health Authority (ORS 431.705(4)), that an agency or an individual can use in a petition to address such a hazard. We hold that such language is irresponsible and does not meet a standard for due diligence. Any public policy must stand the scrutiny of due diligence to ensure that it cannot be hijacked for private gain and harm to the very people the policy was intended to protect.

<sup>5</sup> La Pine, 97739, zip code. U.S. Census, 2010-2014 American Community Survey 5-Year Estimates.  
[http://factfinder.census.gov/bkmk/table/1.0/en/ACS/14\\_5YR/S1701/8600000US97739](http://factfinder.census.gov/bkmk/table/1.0/en/ACS/14_5YR/S1701/8600000US97739)



<sup>6</sup> USLegal.com <http://definitions.uslegal.com/d/due-diligence>

Without consensus, there will not be willing compliance with required septic upgrades or hooking to sewers, as the Commissioners should already be aware. If credible research should demonstrate a problem, public consensus is vital to the development of public policy. We remind the Commissioners that historically there has never been South County consensus with the Board of Commissioner's legislation concerning this issue.<sup>7</sup> Again, we strongly urge the Commissioners to put this matter to a vote of the electorate. Without public consensus, there is no buy in. Consider these questions: "Why should someone who just paid \$20,000 for an ATT system agree that he should pay an additional \$20,000 to \$30,000 for a sewer?" "Why would anyone agree to spend that kind of money on a sewer based on supposition?" Again, we point out that the "scientific" evidence in the burden of proof document is inconsequential and often suspect. Furthermore, the public is well aware of that fact.

Respectfully submitted,

  
Martha Lyman  
Judy Forsyth  
Kenneth J. Forsythe  
The Deschutes County Citizen's Action Group

Leadership Team

  
Thomas H. Braden  
  
Paul E. Brown  
Anne Gregersen  
Patrick Murphy

Enclosures: Ground-water Protection and the La Pine Basin

2010-2014 American Community Survey 5-Year Estimates

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<sup>7</sup> Voters overturned by a county-wide referendum (Measure 9-70) a Deschutes County ordinance (local rule - Ordinance 2008-012) a one-sized-fits-all requirement for alternative treatment technology (ATT) septic systems for all non-sewered south Deschutes County homes.





S1701

POVERTY STATUS IN THE PAST 12 MONTHS

2010-2014 American Community Survey 5-Year Estimates

Supporting documentation on code lists, subject definitions, data accuracy, and statistical testing can be found on the American Community Survey website in the Data and Documentation section.

Sample size and data quality measures (including coverage rates, allocation rates, and response rates) can be found on the American Community Survey website in the Methodology section.

Although the American Community Survey (ACS) produces population, demographic and housing unit estimates, it is the Census Bureau's Population Estimates Program that produces and disseminates the official estimates of the population for the nation, states, counties, cities and towns and estimates of housing units for states and counties.

Subject	ZCTA5 97739				
	Total		Below poverty level		Percent below poverty level
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate
Population for whom poverty status is determined	10,779	+/-908	1,897	+/-489	17.6%
<b>AGE</b>					
Under 18 years	1,375	+/-358	290	+/-173	21.1%
Related children under 18 years	1,375	+/-358	290	+/-173	21.1%
18 to 64 years	6,229	+/-738	1,159	+/-322	18.6%
65 years and over	3,175	+/-343	448	+/-209	14.1%
<b>SEX</b>					
Male	5,479	+/-547	948	+/-295	17.3%
Female	5,300	+/-462	949	+/-258	17.9%
<b>RACE AND HISPANIC OR LATINO ORIGIN</b>					
One race	10,589	+/-907	1,785	+/-478	16.9%
White	10,186	+/-862	1,625	+/-434	16.0%
Black or African American	24	+/-28	24	+/-28	100.0%
American Indian and Alaska Native	125	+/-120	43	+/-44	34.4%
Asian	53	+/-51	0	+/-19	0.0%
Native Hawaiian and Other Pacific Islander	17	+/-26	0	+/-19	0.0%
Some other race	184	+/-177	93	+/-141	50.5%
Two or more races	190	+/-96	112	+/-83	58.9%
Hispanic or Latino origin (of any race)	355	+/-201	126	+/-147	35.5%
White alone, not Hispanic or Latino	10,042	+/-863	1,596	+/-428	15.9%
<b>EDUCATIONAL ATTAINMENT</b>					
Population 25 years and over	8,809	+/-684	1,494	+/-400	17.0%
Less than high school graduate	1,352	+/-363	276	+/-120	20.4%
High school graduate (includes equivalency)	3,680	+/-455	571	+/-198	15.5%
Some college, associate's degree	3,072	+/-390	574	+/-212	18.7%
Bachelor's degree or higher	705	+/-231	73	+/-75	10.4%
<b>EMPLOYMENT STATUS</b>					
Civilian labor force 16 years and over	4,159	+/-599	446	+/-184	10.7%
Employed	3,538	+/-533	319	+/-146	9.0%
Male	1,725	+/-305	127	+/-77	7.4%

Subject	ZCTA5 97739				
	Total		Below poverty level		Percent below poverty level
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate
Female	1,813	+/-332	192	+/-116	10.6%
Unemployed	621	+/-152	127	+/-69	20.5%
Male	379	+/-114	80	+/-51	21.1%
Female	242	+/-121	47	+/-36	19.4%
WORK EXPERIENCE					
Population 16 years and over	9,570	+/-771	1,611	+/-406	16.8%
Worked full-time, year-round in the past 12 months	2,063	+/-314	83	+/-61	4.0%
Worked part-time or part-year in the past 12 months	2,147	+/-409	339	+/-149	15.8%
Did not work	5,360	+/-601	1,189	+/-348	22.2%
All Individuals below:					
50 percent of poverty level	524	+/-223	(X)	(X)	(X)
125 percent of poverty level	2,752	+/-603	(X)	(X)	(X)
150 percent of poverty level	3,538	+/-731	(X)	(X)	(X)
185 percent of poverty level	4,637	+/-774	(X)	(X)	(X)
200 percent of poverty level	4,861	+/-805	(X)	(X)	(X)
Unrelated individuals for whom poverty status is determined	2,026	+/-458	793	+/-278	39.1%
Male	1,018	+/-281	386	+/-186	37.9%
Female	1,008	+/-253	407	+/-159	40.4%
Mean income deficit for unrelated individuals (dollars)	5,748	+/-1,353	(X)	(X)	(X)
Worked full-time, year-round in the past 12 months	284	+/-117	43	+/-41	15.1%
Worked less than full-time, year-round in the past 12 months	507	+/-255	196	+/-126	38.7%
Did not work	1,235	+/-327	554	+/-232	44.9%
PERCENT IMPUTED					
Poverty status for individuals	27.6%	(X)	(X)	(X)	(X)

Subject	ZCTA5 97739 Percent below poverty level Margin of Error
Population for whom poverty status is determined	+/-4.4
<b>AGE</b>	
Under 18 years	+/-10.2
<b>Related children under 18 years</b>	+/-10.2
18 to 64 years	+/-4.9
<b>65 years and over</b>	+/-6.5
<b>SEX</b>	
Male	+/-5.0
<b>Female</b>	+/-4.7
<b>RACE AND HISPANIC OR LATINO ORIGIN</b>	
One race	+/-4.4
<b>White</b>	+/-4.2
Black or African American	+/-60.5
<b>American Indian and Alaska Native</b>	+/-37.1
Asian	+/-40.7
<b>Native Hawaiian and Other Pacific Islander</b>	+/-71.9
Some other race	+/-50.4
<b>Two or more races</b>	+/-26.8
<b>Hispanic or Latino origin (of any race)</b>	+/-29.4
White alone, not Hispanic or Latino	+/-4.2
<b>EDUCATIONAL ATTAINMENT</b>	
<b>Population 25 years and over</b>	+/-4.4
Less than high school graduate	+/-8.7
<b>High school graduate (includes equivalency)</b>	+/-4.9
Some college, associate's degree	+/-6.8
<b>Bachelor's degree or higher</b>	+/-9.7
<b>EMPLOYMENT STATUS</b>	
Civilian labor force 16 years and over	+/-4.3
<b>Employed</b>	+/-4.0
Male	+/-4.3
<b>Female</b>	+/-6.0
Unemployed	+/-10.9
<b>Male</b>	+/-12.4
<b>Female</b>	+/-15.4
<b>WORK EXPERIENCE</b>	
<b>Population 16 years and over</b>	+/-4.2
Worked full-time, year-round in the past 12 months	+/-2.9
<b>Worked part-time or part-year in the past 12 months</b>	+/-6.5
Did not work	+/-6.6
All Individuals below:	
<b>50 percent of poverty level</b>	(X)
125 percent of poverty level	(X)
<b>150 percent of poverty level</b>	(X)
185 percent of poverty level	(X)
<b>200 percent of poverty level</b>	(X)
<b>Unrelated individuals for whom poverty status is determined</b>	+/-9.2
Male	+/-12.9
<b>Female</b>	+/-13.1

Subject	ZCTA5 97739 Percent below poverty level Margin of Error
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Mean income deficit for unrelated individuals (dollars)	(X)
Worked full-time, year-round in the past 12 months	+/-14.2
Worked less than full-time, year-round in the past 12 months	+/-22.4
Did not work	+/-12.1

#### PERCENT IMPUTED

Poverty status for individuals	(X)
--------------------------------	-----

Data are based on a sample and are subject to sampling variability. The degree of uncertainty for an estimate arising from sampling variability is represented through the use of a margin of error. The value shown here is the 90 percent margin of error. The margin of error can be interpreted roughly as providing a 90 percent probability that the interval defined by the estimate minus the margin of error and the estimate plus the margin of error (the lower and upper confidence bounds) contains the true value. In addition to sampling variability, the ACS estimates are subject to nonsampling error (for a discussion of nonsampling variability, see Accuracy of the Data). The effect of nonsampling error is not represented in these tables.

While the 2010-2014 American Community Survey (ACS) data generally reflect the February 2013 Office of Management and Budget (OMB) definitions of metropolitan and micropolitan statistical areas; in certain instances the names, codes, and boundaries of the principal cities shown in ACS tables may differ from the OMB definitions due to differences in the effective dates of the geographic entities.

Estimates of urban and rural population, housing units, and characteristics reflect boundaries of urban areas defined based on Census 2010 data. As a result, data for urban and rural areas from the ACS do not necessarily reflect the results of ongoing urbanization.

Source: U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates

#### Explanation of Symbols:

1. An '\*\*\*' entry in the margin of error column indicates that either no sample observations or too few sample observations were available to compute a standard error and thus the margin of error. A statistical test is not appropriate.
2. An 'L' entry in the estimate column indicates that either no sample observations or too few sample observations were available to compute an estimate, or a ratio of medians cannot be calculated because one or both of the median estimates falls in the lowest interval or upper interval of an open-ended distribution.
3. An 'L' following a median estimate means the median falls in the lowest interval of an open-ended distribution.
4. An '+' following a median estimate means the median falls in the upper interval of an open-ended distribution.
5. An '\*\*\*' entry in the margin of error column indicates that the median falls in the lowest interval or upper interval of an open-ended distribution. A statistical test is not appropriate.
6. An '\*\*\*\*\*' entry in the margin of error column indicates that the estimate is controlled. A statistical test for sampling variability is not appropriate.
7. An 'N' entry in the estimate and margin of error columns indicates that data for this geographic area cannot be displayed because the number of sample cases is too small.
8. An '(X)' means that the estimate is not applicable or not available.



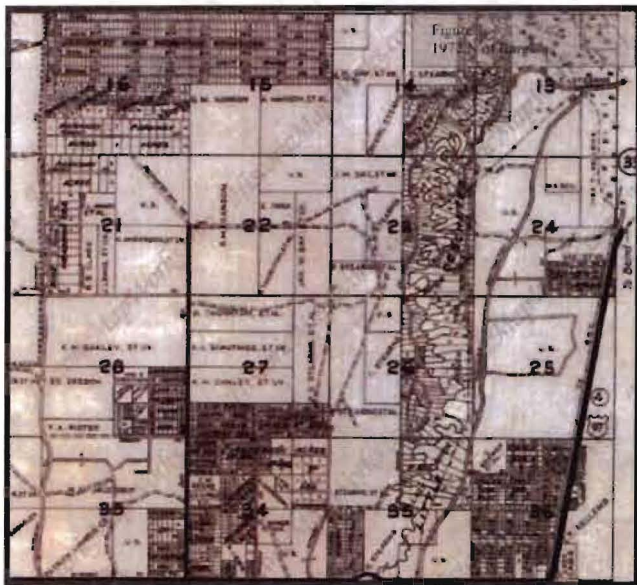
Ground-water Protection and the La Pine Basin  
John Huddle, Ed.D.  
March 5, 2012

*If we could first know where we are, and whither we are tending, we could then better judge what to do, and how to do it (Abraham Lincoln).*

There are suggestions that public agencies spent upwards of \$30 million taxpayer dollars on the ground water protection issue for the Basin, yet public policy remains mired in an agenda driven morass. This is the hypothesis that this analysis seeks to prove: *The Basin is loading with nitrates in the water wells.*

### History and Background

The actions of our ancestors influence us today. Central Oregon exploration began around 1825. Settlers platted the town of La Pine in 1910 (Metcalf). A review of historic maps of the area showed roads, railroad stations, and small lot subdivisions, many long abandoned (see Appendix iii). A repeal of all zoning laws in 1966 resulted in increased development (Metcalf). Fortunately, many of those subdivisions were never platted and developed. Like many small towns across the west, until the advent of electric power, the main means of waste disposal was the outhouse. The main way of handling a filled outhouse pit was to simply dig a new one a few feet away and move the outhouse. By the 1950's, with the advent of Midstate Electric Cooperative, conversation with those who have history of the area, indicated that bottomless cesspools came into existence. A bottomless cesspool was a pit, often dug to the aquifer and filled with drain rock interspersed with drainpipe. In 1974, Deschutes County first began to require septic system permits, although, septic systems were installed before that date.



In 1969, the Legislature formed the Oregon Department of Environmental Quality (DEQ). In 1978, DEQ sampled private water wells in the La Pine town area for water quality. A subsequent engineering study in 1982 led to the sewerage of the unincorporated village of La Pine. DEQ expanded well testing in 1993 and 1995 covering large parts of the La Pine Basin. Almost immediately, beginning with the 1978-79 samplings, rumors began to surface about well selection. One resident commented to this author that he was told in 1979 that his well didn't have the right level of nitrates and they could not use it in the "study." This author reviewed the data from 1978 through 2000 and was unable to detect rigorous scientific well selection.

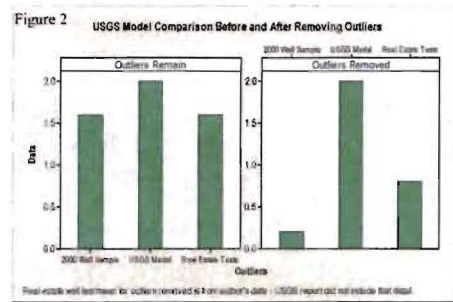
Public distrust continued to build. By 2008, a political revolt occurred when Deschutes County passed a blanket ordinance requiring expensive alternative treatment technology septic systems (ATT). That ordinance was overturned and an earlier ordinance requiring ATT's for many home construction projects or major repairs to standard septic systems repealed. Although, ATT determination is currently by a case-by-case basis, uncertainty and distrust of government continues. One of the reasons given for the 2011 well re-test was a lack of trust by the in the available data, including the USGS Nitrate-Fate Transport Model developed by Morgan (et al, 2007).

Rigor is important, especially when the analysis of the data leads to public policy affecting the lives of residents. In 2000, USGS, DEQ and Deschutes County sampled 192 wells, using that data as one comparison against the USGS Nitrate-Fate Transport Model (Morgan, et al, 2007). What the USGS reports failed to disclose were monitoring wells drilled in or near septic drain fields. One such well, number 1227, was drilled just nine feet from a drain field and had the highest nitrate value of any well in the sampling (25.9 mg/L). The USGS also used descriptive



statistics from the Oregon DHS Real Estate well sampling as another comparison to the Model. In total, there were three significant areas where a lack of rigor affected the USGS Model:

1. Comparison of measures of central tendency and ranking of the data should exclude outliers (see definition below). Robust procedures for other analysis are not sensitive to outliers, but comparison of descriptive statistics, such as the mean or the 90<sup>th</sup> percentile are easily distorted by their presence. The authors should have adjusted for outliers and then used a statistical test to determine if the distributions were the same with and without the outliers (Walfish, 2006). They did not.
  - a) The 2000 well sampling had outliers that widely differed from the rest of the sampling. For a comparison of values, such as the mean before and after removal of outliers, see Appendix ii.
  - b) The real estate well sampling undoubtedly had outliers. (That table of real estate well values was not provided by Morgan (et al, 2007) but analysis of the interquartile range and the provided box plot strongly suggested their presence). For a comparison of measures between the real estate well test data available to this author (see limitations of the data) before and after removal of outliers, see Appendix ii.
2. The Model based the mean annual nitrate loading per household on a non-representative sample of just 69 households for the Basin. Morgan (et al, 2007) was silent on the existing literature about nitrate loading that suggested mean loading rates 20 to 30 percent less than that used in the Model.
3. USGS failed to consult the most reliable occupancy data, the U.S. Census and Midstate Electric Cooperative. Instead, the Model used the La Pine Chamber of Commerce and the U.S. Post Office, potentially overstating occupancy rates for the Basin.



### Ad Hoc Analysis

Ad hoc as used here means, *Research designed for a specific purpose and specific client, and conducted as a one-off study or program of studies (as opposed to being conducted on a regular or continuous basis, AQR, 2012)*. As in previous well samplings, the 2011 well re-test samples also lacked scientific rigor for sample selection. To this author's knowledge, no agency or investigator stated a hypothesis for testing. With the release of the re-test data, DEQ claimed that the nitrate loading was upward for a sizeable minority of the wells sampled. As the previous discussion revealed, visual comparison of descriptive statistics can be misleading. Without rigorous research design that included a plan of analysis, this analysis must depend on ad hoc analysis with emergent hypotheses, driven by statistical methods sensitive to the data. The primary question, however, is this: *Do the well samples support the USGS Model that the Basin is loading with nitrates?*

#### Data:

The re-test data provided by DEQ did little to answer questions about the research question. Hypothetically, many variables might affect nitrate loading in private water wells. This analysis included as many variables as time and finances allowed. The following are the data for analysis:

1. 1978-79 La Pine Core Area well sampling. This sample was included in the La Pine Core Area analysis intact since all the wells, as best as could be determined, appeared to be within the La Pine Core Area. It was not used for other analysis. Data provided by DEQ, n = 49.
2. 1993 La Pine Core Area well sampling (n = 53). This sample was desegregated a core area (see analysis discussion) within La Pine and combined with other well sampling for that area. It was not used for other analysis.
3. 1995 La Pine Basin well sampling (n = 113). This sample was desegregated by the La Pine Core area and by the re-test wells and used extensively in the analysis. Data for the re-test wells was downloaded from the DEQ LASAR database.
4. 1999 La Pine Basin well sampling (n = 64). Data for the re-test wells was downloaded from the DEQ LASAR database. Analysis was the same as the 1995 well sample.
5. 2000 La Pine Basin well sampling. Full sample obtained from Hinkle (et al, 2007, n = 192). Re-test data downloaded from the DEQ LASAR database (n = 56). Sample desegregation included the La Pine Core Area and the re-test wells. Analysis excluded the full sample because it mixed well types (drinking and monitoring).

6. 2001 La Pine Basin well sampling (n = 29). Data obtained from the DEQ LASAR database. This sample was used for analysis with the re-test and La Pine Core area only.
7. 2011 La Pine well re-test (n = 37). Data obtained from the DEQ LASAR database and compared to DEQ provided sample. The analysis included the re-test wells and the La Pine Core Area.
8. Well test data after the 2011 re-test data when provided by the property owner (included only in well-specific analysis, n = 2).
9. Real estate sale well test data, 1989 through 2009, cleaned. Used only in trend analysis for the Basin and desegregated by Deschutes Recreational Homesites. Data obtained from DEQ (n=1567).
10. NOAA (2012) precipitation data January 1, 1978 through February 22, 2012 for the Wickiup Dam weather station. Precipitation data collection provided for a three-month quarter sample ending the last day of the month of the well sample (n = 37).
11. Well drill log data for Townships 20, 21, 22 in Deschutes County and 23 in Klamath County. Data obtained from the Oregon Water Resources Department (2012, n=7998).
12. Well drill logs for applicable wells re-tested in the La Pine well re-test (n = 35). Data obtained from the Oregon Water Resources Department (2012). Well log data collected included well depth, static water level at the time of drilling, and screen depth from surface. Data collection also included soil layers for the first three layers, coded using an author developed taxonomy for soil type derived from C.W. Fetter (1994) and depth to impermeable layer (taxonomy code three or greater). Rock layers received a code three because the porosity could not be determined from well logs. Soil layer was dependent on the driller's description, experience and accuracy.

Table 1: Impermeable Layer Material	Permeability	Rating
Gravel	$10^{-2}$ to 1	1
Sands & glacial outwash	$10^{-3}$ to $10^{-1}$	2
Silty to fine sands, porous rock	$10^{-5}$ to $10^{-3}$	3
Silt, sandy silts, clay & sand, glacial till	$10^{-6}$ to $10^{-4}$	4
Clay	$10^{-9}$ to $10^{-6}$	5

13. Septic system permits for the applicable wells re-tested in the La Pine well re-test. Data obtained from Deschutes County CDMaP (2012, n = 35). Klamath County data not included. Data included year of completion and repairs. Repairs were coded on a scale of 0 to 5.
14. Real Estate well test data (n = 172) around re-test wells having elevated (5 mg/L or greater) nitrates. Data obtained from the Oregon Department of Human Services/DEQ Pacific Northwest Water Quality Exchange database (2012). Analysis limited to trend analysis.

Table 2: Septic Repair Type	Code
No Repairs	0
Replace tank & other minor repair	1
Drain Field Repair	2
Move the system	3
Change type of system	4
No history of a permitted system	5

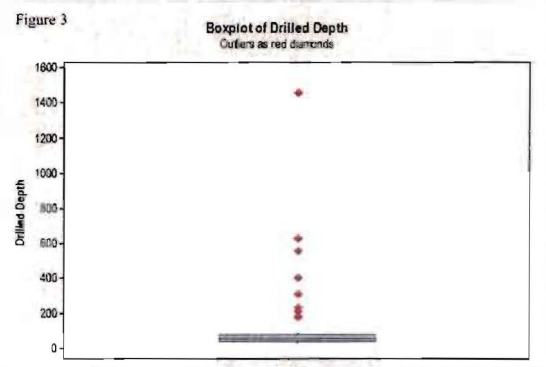
15. DEQ monitoring well data around the elevated wells ( $> 5.0$  mg/L  $\text{NO}_3^-$ ). Data obtained from the Oregon Department of Human Services/DEQ Pacific Northwest Water Quality Exchange database<sup>1</sup> (2012).
16. Maps consulted included Legacy Maps from the Deschutes County Road Department (2012), ArcGIS (2012) and Metsker's Deschutes County Map, circa 1935 and 1972 (Historic Map Works, 1935 & 1972). Analysis was used for comparison and historical reference.

#### Limitations of the Data:

1. DEQ provided 1995 La Pine Basin well sampling data showed non-detectable amounts of nitrates ( $\text{NO}_3^-$ ) as at the lowest detectable limit. A new download of the well samples for the wells in the La Pine well re-test followed acceptable procedure, setting the non-detects equal to  $\frac{1}{2}$  the lowest detectable limit or 0.0025, but only for analysis procedures for those wells in the re-test sample.

<sup>1</sup> This database is actually a DEQ database, but DHS uses it for the real estate well test data. Input of that data is not by DEQ.

2. The 2000 well tests as reported in the USGS Report No. 20075239 (Hinkle, et al. 2007) included DEQ monitoring wells that were not water wells, including one that was drilled at the end of a drain field. Robust trend analysis adjusted for outliers.
3. The 2011 La Pine well re-test included 14 wells not used in the analysis:
  - a) DEQ did not obtain samples from the same wells in 1995 as in 2011. Wells 219, 254, 260, 285 and 1002 did not collect samples from the same well as the well from 1995 because the well was abandoned or an inability to locate the original well. Well substitution introduced unacceptable error.
  - b) Well number 146 had a different physical address and geocoding. In addition, in 1995, no such well existed. While it was likely that the 1995 well number 145 was the same, there were sufficient discrepancies to require exclusion. Final well analysis was  $n = 37$ .
  - c) A review of the literature indicated that deep wells were unlikely to be of the same sample as shallow wells (Hinkle, et al, 2007). Rather than use an arbitrary cutoff for well depth, analysis for outliers served as the determining factor. Removal of outliers resulted in an analysis standard of less than 180 feet in depth with the next shallowest well, 85 feet deep, excluding eight wells.
4. Well driller's logs could not be located for two wells. The number was small and did not affect the findings.
5. Well drill data for all wells in the La Pine Basin reflected only those wells in the Oregon Department of Water Resources (2012) that had a value for depth of completed well.
6. Septic system permit data was only available for Deschutes County (2012). Klamath County systems ( $n = 2$ ) were excluded by the statistical program for comparisons to variables pertaining to the septic systems. The small number of excluded properties did not affect the analysis.
7. Real Estate data surrounding the elevated wells ( $n > 5.0\text{mg/L}$ ,  $n = 172$ ) lacked sampling consistency. Some wells had numerous real estate well tests nearby, others had few, requiring sampling a slightly larger area for those wells. All sampling was rectangular due to the database search restrictions.
8. DEQ monitoring well distance to the elevated ( $>5.0 \text{ mg/L NO}_3$ ) was not consistent due to database search restrictions. Effort was made to keep the search rectangle to under half a mile from the well.



#### Definitions:

1. **Heteroskedastic:** Subpopulations with differing variances.
2. **Interquartile range:** The interquartile range is the difference between the bottom ranked 25 percent and the upper 75<sup>th</sup> percentile rank ( $Q_3 - Q_1$ ).
3. **Measures of Central Tendency:**
  4. **Mean:** The arithmetic average.
  5. **Median:** The median is the middle value in a sample.
  6. **Mode:** The mode is the most frequent value in a sample.
7. **NO<sub>3</sub>:** Nitrate Ion used here as the abbreviation for Nitrite-plus-nitrate value in the DEQ/USGS data.
8. **Outliers:** Outliers are atypical, infrequent observations. The statistical package used identifies outliers on boxplots by labeling observations that are at least 1.5 times the interquartile range ( $Q_3 - Q_1$ ) from the edge of the box (Minitab, 2010, Walfish, 2006).
9. **Skewed:** The distribution is distributed to the left or right of the normal curve distribution. Most of the data for this analysis was left skewed.

#### Data Analysis Procedures:

1. Analysis used descriptive statistics, such as measures of central tendency (mean, median, mode), quartiles, percentile ranks and the range (Minitab, 2010). Minitab provides the Anderson-Darling Test for Normality as part of the graphical display. The better the distribution fits the data, the smaller this statistic. None of the data were normally distributed, although some began to approximate a normal distribution. Analysis used the assumption that the data were not normally distributed.
2. When appropriate, analysis used the boxplot procedure (Minitab, 2010, Walfish, 2006) to identify outliers. Outliers are red diamonds above or below the gray box representing the interquartile range ( $Q_3 - Q_1$ ).



3. Analysis of trends used the USGS Kendall-Theil Robust Line Sen Slope Estimator (2006). The Sen Slope Estimator uses the median slope to compute a robust linear regression. The Sen Slope is insensitive to outliers and is particularly suited for skewed and heteroskedastic data.
4. Analysis of relationships used the Spearman's rho ( $R$  or  $\rho$ , Minitab, 2010), designed to analyze variables that are not normally distributed. The Spearman's rho calculates based on ranks rather than raw data and is insensitive to outliers (Statsoft, 2012).

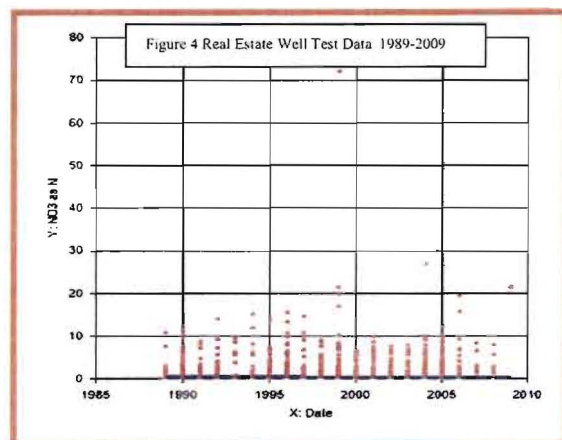
#### Analysis of the Data:

The attached charts (see Appendix i) provide the basic descriptive statistics on each sample for NO<sub>3</sub> and for select variables. As noted, none of the data for any of the variables was normally distributed.

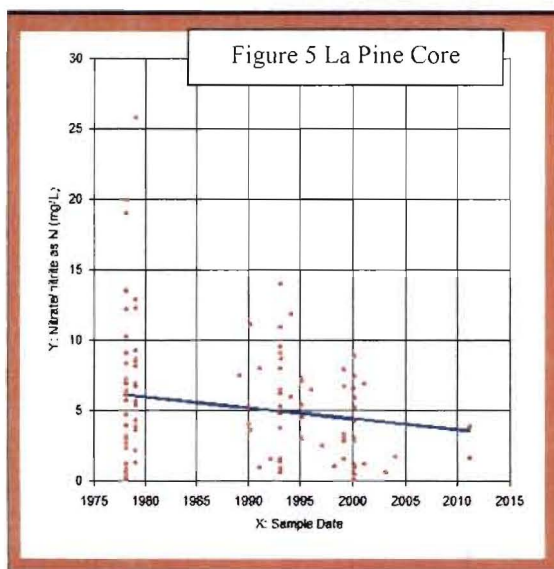
Before discussion of trends and relationships, it is helpful to analyze some of the characteristics of the La Pine Basin. Most water wells in the Basin are relatively shallow. The median depth of water wells in the Basin was 45 feet with the most frequent well depth (mode) at 40 feet. The depth to water is also shallow. The median depth to first water was 27 feet and the static water depth below the surface was 19 feet. The date of construction varied greatly, perhaps following the date of the subdivision platting, ranging from 1929 to 2012. Surprisingly, the wells in the re-test were of recent construction. Of the wells re-tested in 2011, included in this analysis, the median year built was 1990. The median depth was 50 feet and the static water level was 24 feet. The median depth to an impermeable layer of soil for those wells was 7.5 feet. The Basin continues to live up to its name as the "high desert." The median precipitation for those monthly quarters relating to the sample dates was 1.74 inches. Finally, in spite of the relatively shallow well depth in the basin (range was 6 to 1,460 feet), the median NO<sub>3</sub> value for the real estate well test data was 0.3500. The median NO<sub>3</sub> value for the Deschutes Recreational Homesites, one of the most densely platted subdivisions with many lots less than one acre, was only 0.0600.

#### Trends:

Large scale trends covering many years are difficult because well sampling was not consistent. No analysis of a trend between 1995 and 2000 was conducted because the 2000 study included wells that were not water wells. However, other well data allowed a picture of the quality of water for NO<sub>3</sub> in the Basin.



The real estate well test data has many flaws as the discussion under "limitations" explored. However, it is a large database of well test data and useful for the reason that it is sufficiently large to help minimize the data flaws. Trend analysis revealed a Sen Slope statistic of -0.007692, with a beginning NO<sub>3</sub> median of slope of 0.019 and an ending median of 0.09, indicating that there is no trend of increasing nitrate in the Basin according to this data.



The La Pine Core Area has the dubious honor of starting the succession of well tests for the Basin. A review of that data indicated that the well tests for the 1978-79 well tests in the Core Area were elevated. The median was 5.67 mg/L and the maximum detected value was 25.8 mg/L. A Sen Slope Estimate was obtained using the 1978-79, 1993, 1995, 2000, 2001, 2011 and the real estate well data for a corridor paralleling Highway 97, roughly from Reed Road to the south end of the Shop Smart grocery store, about three blocks to each side of the highway. This was judged to be an area where most if not all of the properties were on the sewer constructed after the 1978-79 well sample. The Sen Slope Trend (-0.077033) was a downward trend from the 1978-79 median of slope 6.38 and ending median of 3.85.

Although still elevated, the slope showed a decreasing trend of nitrate elevation in the La Pine Core Area. It is important to note, however, that the trend began at a much higher median of slope than the Real Estate data.

The Basin is a large area. Trend analysis should look considerably different for areas desegregated by lot size. One such area is the Deschutes Recreational Homesites subdivisions and related plats west of the Deschutes River, Spring River Road to the North, the National Forest to the West and South Century Drive to the South. The Sen Slope Estimator trend (-0.005455) was a slight downward trend with the initial median of slope at 0.15 and the ending slope at 0.01. The trend did not substantiate a trend of elevated nitrates for this desegregated region.

The region sampled by the 2011 re-test covered a large portion of the Basin (n = 265 data points). While it is not nearly as indicative of the Basin as the real estate data, it does represent a number of wells. Analysis excluded the deep wells as described earlier. The Sen Slope statistic was 0.002575. The initial trend from 1995 to 2000 was an upward slope with a median of slope of 0.19 and a median of slope of 1.05 in 2000. The slope trended downward from 2000 to 2011 with an ending median of slope of 0.0086. Something happened to reverse this trend between 2000 and 2011.

#### Analysis of Relationships:

The following relationships are not demonstrations of cause and affect, but only a possibility that one variable might have an affect on another.

There was a moderate negative relationship between nitrate level and the following variables (n=223):

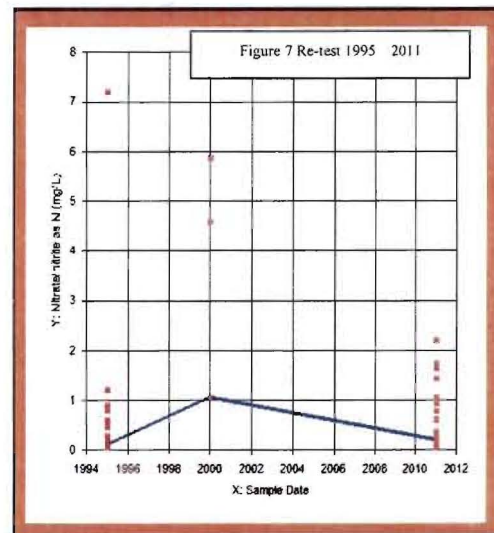
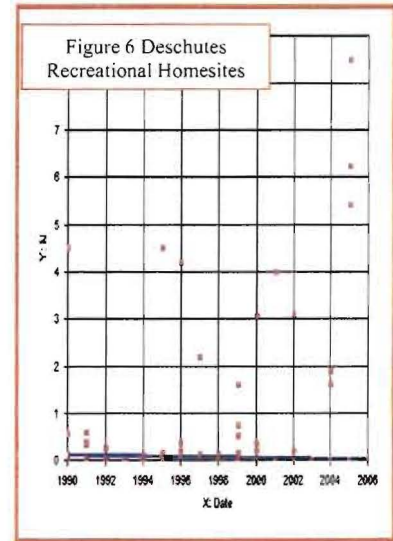
1. As the depth of the well increased the level of nitrates diminished (Spearman  $p = -0.329$ ).
2. As the screen top deepened from the ground surface, the level of nitrates diminished (Spearman  $p = -0.306$ ).
3. Depth to the first impermeable layer of soil increased, the level of nitrates in the well diminished (Spearman  $p = -0.384$ ).

These relationships suggest that (a) the deeper the well, for those wells under 180 feet in depth<sup>2</sup>, (b) the ability to draw deeper water into the well and (c) a deeper layer of impermeable soil all have some relationship to fewer nitrates in the well water.

Some septic systems had repairs ranging from a tank replacement to completely moving the system. For those septic systems with repair history, there was a moderate relationship between the date of the initial septic system completion and elevated nitrates in the well water (Spearman  $p = 0.319$ , n = 90).

At what level of nitrates should the property owner become concerned? The EPA says 10mg/L for public water systems (2012). DEQ states that values below 2 or 3 mg/L are generally considered background values (2011). Vermont states 5mg/L are a threshold of concern (2012). A rank ordering by cumulative percentile indicated that the 90<sup>th</sup> percentile rank for the data (n=224) was 5.0900 mg/L. The following relationship analysis subsets the data for all samples  $\geq 5.0900$  mg/L as the analysis standard<sup>3</sup>:

1. The shorter the distance between ground surface and the top of the screen (not all wells used a screen or perforations), the higher the level of nitrates in the well water (moderate relationship, Spearman  $p = 0.433$ ).



<sup>2</sup> Essentially, those wells 85 feet and shallower.

<sup>3</sup> Wells 104, 105, 110, 111, 136, 148, 151, 267, 505. Only samples for those wells, irrespective of sample date, that  $\geq 5.0900$  mg/L were included.

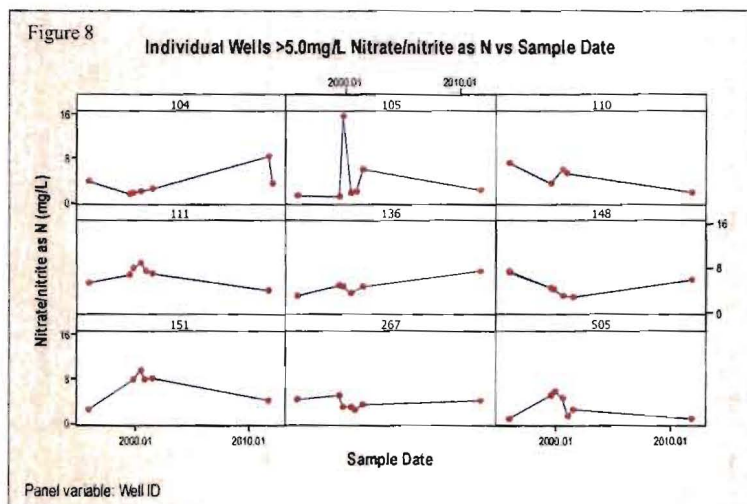


2. The shallower the depth to the first level of impermeable layer of soil demonstrated a strong relationship to elevated nitrate levels in the well water (Spearman  $\rho = 0.544$ ).
3. The greater the precipitation in the quarter ending the month of the well sample the greater the relationship to elevated nitrates in the well water (moderate relationship, Spearman  $\rho = 0.425$ ).
4. There was a moderate relationship between those properties with a septic system repair and elevated nitrates in the well water (Spearman  $\rho = 0.416$ ). Analysis of the data suggested that the relationship potentially centered on moving the septic systems.

For those wells with elevated nitrates, depth to screen, precipitation and depth to the impermeable layer had some affect.

#### Analysis of Individual Wells >5.0 mg/L

Is there anything pertaining to analysis of the individual elevated or “hotspot” wells that suggesting a relationship?



Although, these findings need interpretation with caution due to the small number of data points, the findings suggest possible areas for further investigation. Elevations above 5 mg/L  $\text{NO}_3$  are from one of the samples but not necessarily the latest. Analysis of relationships (correlation) was limited to precipitation level since

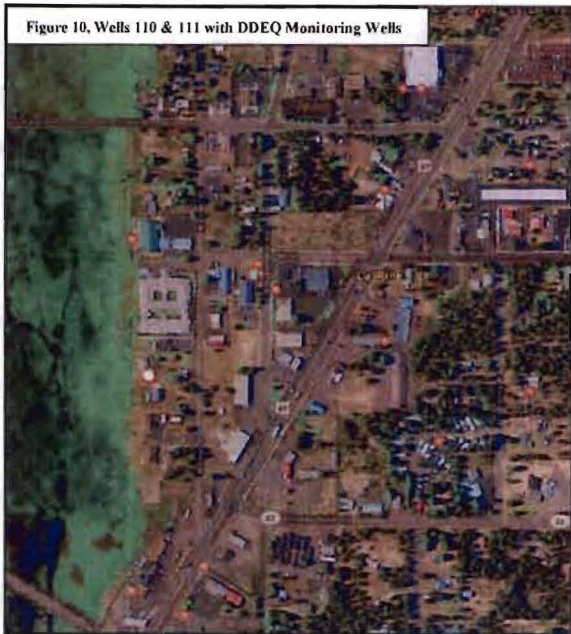


all other variables stay constant for individual wells. As the scatterplot of the wells shows, the  $\text{NO}_3$  level varied widely for each well per sample.

1. Well 104 is a 43-foot deep well drilled in 1979 with a static water level at 8 feet and a screen depth of 35 feet. The wellhead is below ground level. The property is zoned conditional use as a nursery and the well sits at the south end of a row of greenhouses, down slope. The depth to impermeable layer of soil in the subdivision, of properties sampled ( $n=6$ ), ranged from 3 feet to 45 feet and on to no impermeable layer. Note the wide fluctuation in nitrate values from October 2011 to February 2012. A recent re-test of the well by the property owner revealed significantly lower nitrate values for the irrigation well (well 104, 3.37 mg/L) and a nitrate value for the separate drinking water well of 1.08 mg/L. A search failed to locate DEQ monitoring wells nearby other than well number 105. **Analysis of the real estate data around 104 and 105 revealed a flat trend with a statistic of 0.00,  $n=51$ .**
2. Well 105<sup>4</sup>, located at the edge of a flood plain and just up slope from a private reservoir, showed a very strong relationship between precipitation level and elevated nitrates in the well (Spearman  $\rho = 0.904$ ). Well 105 has spiked from below 2 mg/L to greater than 15 mg/L in just one year. Precipitation level for the quarter ending the month of the date of sampling (15.6 mg/L) was 4.90 inches. The drilled depth is 42 feet with a static depth of 19 feet and a screen depth of 22 feet. Wellhead is below ground level. Well location (beige dot) is approximate. Note the reservoir to the left. The reservoir has many resident geese, the owner runs 200-300 head of cattle about three to four months out of each year and fertilizes with cow manure. A search failed to locate DEQ monitoring wells nearby other than well number 104.

<sup>4</sup> On the map, well 104 has a dark blue dot and well 105 is a light blue dot. Dots represent the approximate location according to the data provided and the accuracy of the mapping program.





feet and a screen depth of 30 feet. It and the adjoining property were all constructed at the same time with current standard septic systems (concrete tanks). A 1935 map of Deschutes County shows a road going east to west just south of Del Pino Rd. Evidence left behind across the road suggests the presence of a sawmill. Note that nitrate elevations began within two years of well construction, suggesting something other than the property septic systems. A search failed to locate any DEQ monitoring wells nearby. **Trend analysis for the surrounding area was flat at .073823, n=150.**

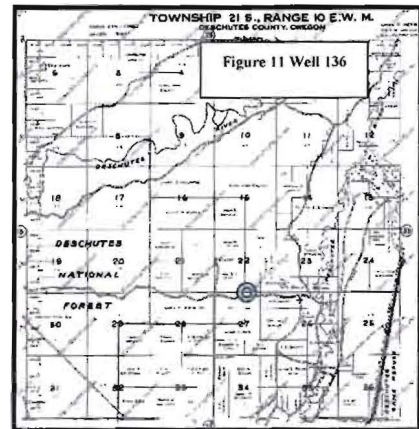
6. Well 148, located at or adjacent to an RV Park and near the Little Deschutes River, showed a strong negative relationship between precipitation level and nitrate level in the well water (Spearman  $p = -0.608$ ). As the precipitation level decreased the nitrate level in the well increased. There was a septic system replacement on the property. The well was constructed in 1978 to a depth of 38 feet with static water at 24 feet, the screen depth at 28 feet and the depth to the first impermeable layer was five feet. A search failed to



3. Well 110 is located in the downtown area of La Pine. It was drilled in 1977 to a depth of 40 feet with a static layer at 19 feet and the screen top at 23 feet. The well sits on .32 acre. There is no record of a septic system permit.

4. Well 111, located adjacent to the U.S. Bank building, is in an area with many parking lots and buildings. There was a moderate relationship between precipitation level and the level of nitrates in the water (Spearman  $p = 0.435$ ). Well 111 is in a sewered area, but adjacent to a former bottomless cesspool for a Laundromat (now a vacant lot). **The real estate well test trend statistic for wells 110 and 111 was  $-0.164371$ ,  $n=32$ . The DEQ monitoring well statistic was  $-0.399201$  (see figure 14<sup>5</sup>).**

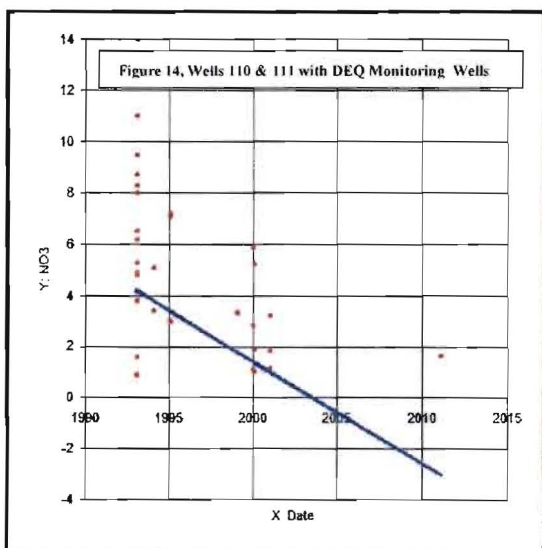
5. Well 136 is located north of Burgess Rd and east of Day Road. It was drilled in 1993 to a depth of 45 feet with a static water level of 28



locate DEQ monitoring wells nearby.

7. Well 151 also sits adjacent to the east side of the Little Deschutes River. There was a strong positive relationship between precipitation level and the level of nitrates in the well water (Spearman  $p = 0.852$ ). The well was constructed in 1989, the depth is 47

<sup>5</sup> Note, the trend line is misleading. It isn't possible to have a negative NO3 value.



feet deep. The driller's log did not indicate an impermeable layer. Diagonally across the road from this property is what appears to be a wastewater lagoon and spray field. No DEQ monitoring wells were located nearby. There was a strong negative relationship between precipitation level and nitrate level in the well water (Spearman  $\rho = -0.867$ ). As the precipitation level dropped, nitrates increased in the well water. **The trend for well 267 was flat with a statistic of 0.0, n=29.**

9. Well 505 is off Masten Road. The well was constructed in 1983 at a depth of 44 feet. Static water level was at 15 feet with the screen depth at 29 feet. A DEQ Monitoring well located to the about one property did not show NO3 above 1 mg/L (n = 7, 1995 to 2001). Septic system information was not available. **Trend analysis for the surrounding wells showed a trend statistic of  $-0.008132$ , n=38.**

## Conclusions and Summary

### Conclusions

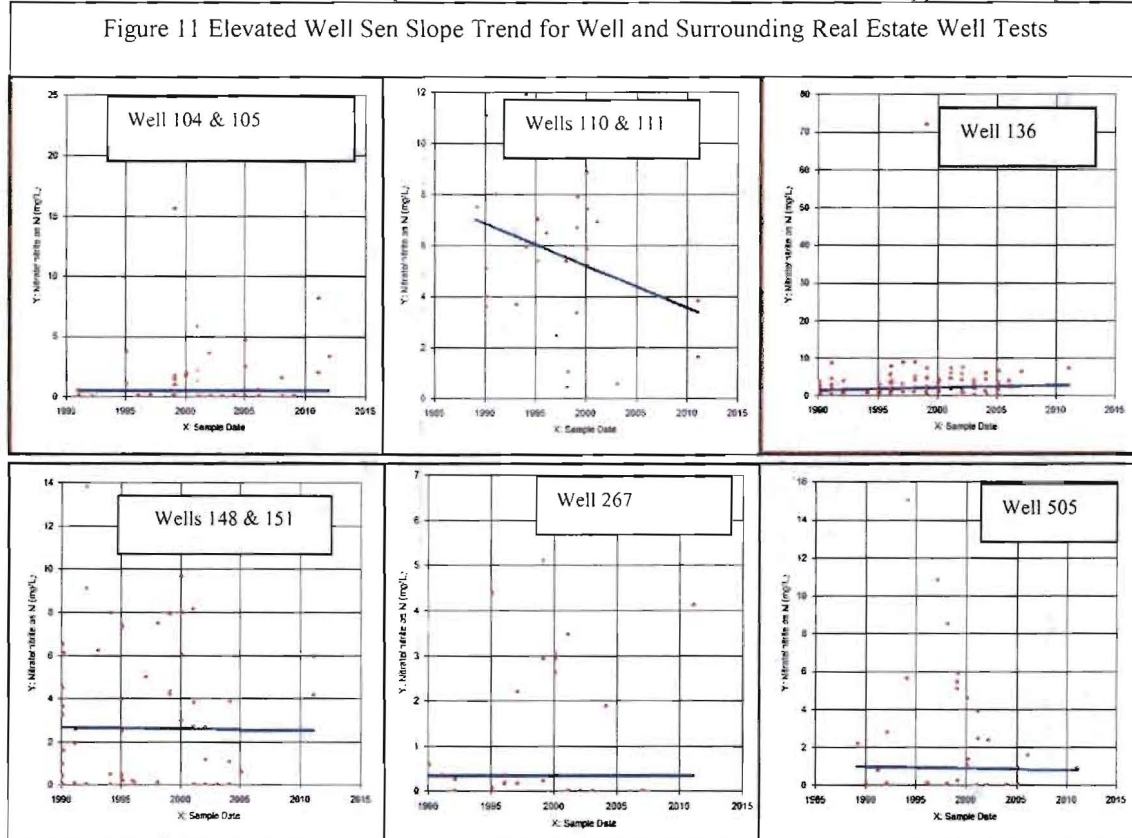
The analysis failed to prove the hypothesis: *The Basin is loading with nitrates in the water wells.* The null hypothesis is true. *Water wells in the Basin are not loading with nitrates at any level of significance.* Nitrates in the elevated wells are random and likely attributable to other causes. Analysis included more than 10,000 data points. The majority of the wells in the Basin are shallow wells with a mode of 40 feet. In spite of the shallow well depth, analysis of the data failed to disclose an upward trend of nitrate loading in the well water. The data, however, suggested possible relationships between select variables and nitrate levels in the wells. Data on well depth, static water level and screen depth suggested that the deeper the well, the water level in the well or the screen depth below the surface, the less likely of elevated nitrates in the well. Wells with elevated nitrates above 5 mg/L showed a possible relationship between increased precipitation level and increased nitrate level. There was a relationship between septic system repairs and elevated nitrates. Analysis of the individual wells with elevated nitrates (>5 mg/L) suggested alternate explanations other than nitrate-loading in the soil from intact septic systems. Suggestions of alternate explanations included agriculture runoff, wellheads below the ground surface, failed and substandard septic systems and historical land use.

### Implications

Every analysis should provide greater information to guide future study and/or policy. There were lessons from the analysis of the data.



1. ATT policy: As previous testimony and testimony before the DEQ Steering Committee has indicated, there has not been much of a cost benefit analysis for previous and current policy regarding ATT septic systems in the Basin. Instead, the argument presented was that policy is there to protect public health, apparently without much regard to cost. As the analysis showed, there is not a trend towards nitrate loading in the water wells. The data suggested, however, septic system repairs can possibly influence water quality. When policy requires or implies that the only solution to a standard system repair is replacement with a costly ATT system, a barrier to public health exists. Many homeowners cannot afford or oppose such expensive solutions. Nothing in this analysis would suggest that ATT systems are necessary to reduce nitrate loading in the water wells on properties with approved standard systems. Placing restrictive solutions on homeowners is a barrier to proper maintenance of their existing systems and a barrier to protecting public health.
2. Future Study: We can tell from the data that nitrate loading in the water wells is not a prevalent issue. It was surprising to find that there were so few DEQ monitoring wells around the wells with a history of elevated NO<sub>3</sub>. What we do not know with accuracy is what causes the elevated wells to become elevated, especially since most show wide fluctuations from sample to sample. A proper scientific study would select wells for sampling by geographic location and by the age of the subdivision. Once "hotspot" wells are located, a sampling plan is needed to determine how widespread the problem. Down slope samples of existing wells, drilled monitoring wells and core samples would allow a more accurate determination.
3. Well Construction: Well construction is important to safe drinking water. Educating the public as to safe well construction and maintenance is important. Conversation with staff at the Oregon Water Resources Department revealed that there are rules about the placement of the well. However, there does not appear to be a permitting



- process to ensure that the well is placed appropriately in relationship to septic systems.
4. There are at least four agencies involved in the well and septic arena for private land owners: Oregon Department of Human Services, Oregon Water Resources Department, Oregon Department of Environmental Quality and the respective counties. In addition, there are at least four databases/search engines for the data pertaining to wells and septic systems. There did not appear to be much effort to cross-reference that data, especially the well driller's logs. While it might be important to maintain the individual databases, there needs

to be a mechanism where the homeowner or prospective buyer can access all information about the well and the septic system together.

5. Selection of Regions of Interest: The data analysis indicated impermeable layers of soil under many of the properties sampled. However, that sampling was only for 37 wells and is far from representative. Any identification of regions or areas needing a plan for nitrate reduction should take into account the underlying soil type. Without a thorough catalogue of impermeable soil for all well logs for the Basin, that task is virtually impossible. For instance, one property can have a clay layer three feet down and the next property has none.
6. Flexibility: The public reacted strongly to one-size-fits-all public policy regarding ATT systems. Anecdotal information suggests that there is a history of barriers to subdivisions or smaller groups of homeowners self-selecting waste treatment or water solutions. Within the bounds of statute and administrative rule to protect the public interests, citizen groups with a common interest need maximum flexibility to solve their problems without the driving force of an external and insensitive agency's agenda. Fees for such solutions need to reflect actual cost and balance against the public good rather than supporting the agency's budget.

### **Summary**

The available data comprised a collection of well samples and variables with the potential to influence nitrate levels in the wells. The USGS Model appeared flawed, leaving no reliable benchmark to measure nitrate loading. Instead, the analysis used trend analysis and relationship between variables combined with a review of features of individual wells to arrive at conclusions. The analysis of the data failed to demonstrate nitrate loading in private water wells for the Basin. The law of averages with the preponderance of shallow wells in the Basin should have shown a trend or pattern of elevated nitrates if the USGS Model were accurate. No such pattern emerged. Suggestions were made for policy and future investigation.

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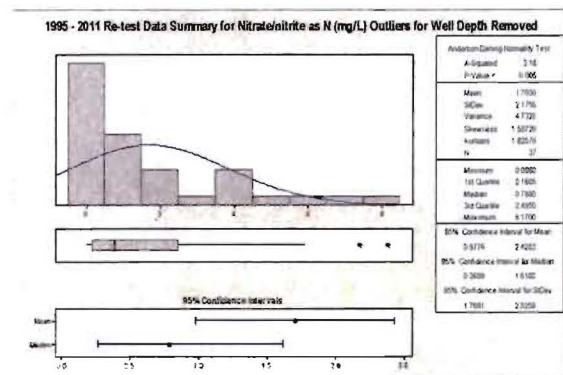
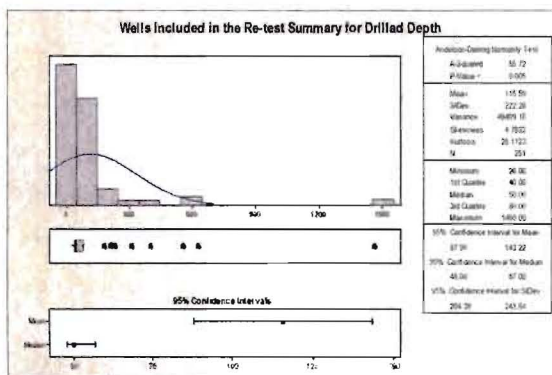
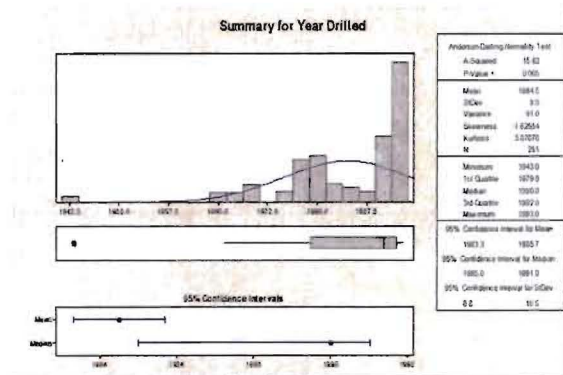
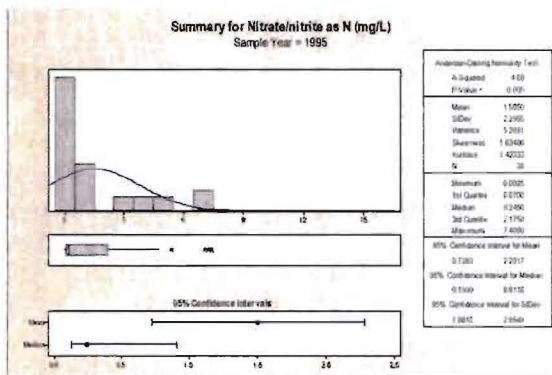
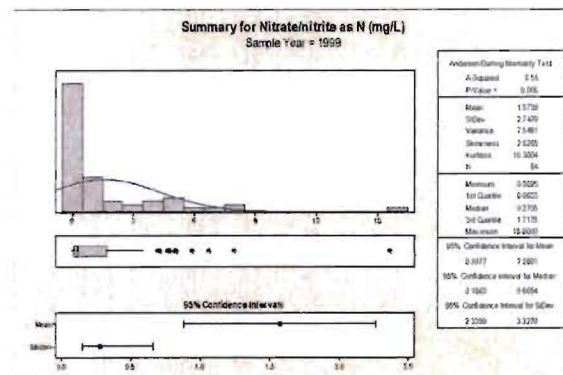
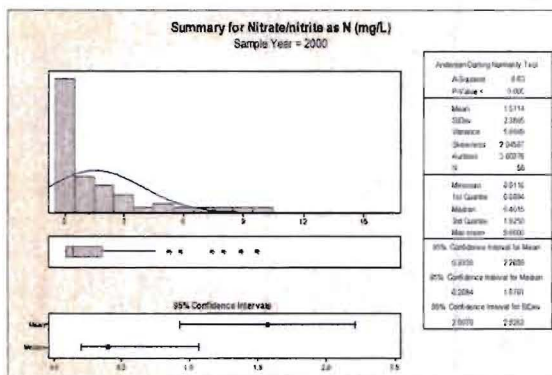
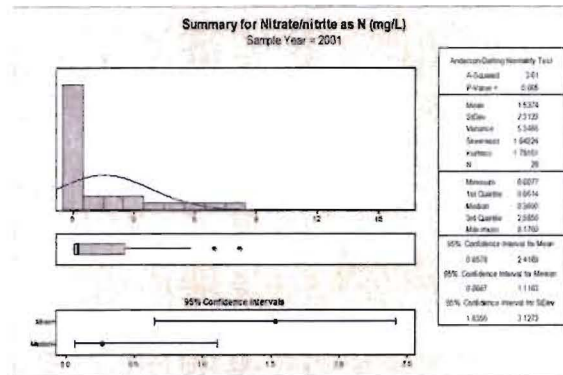
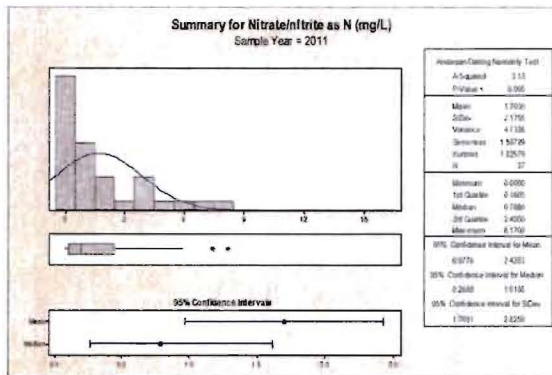
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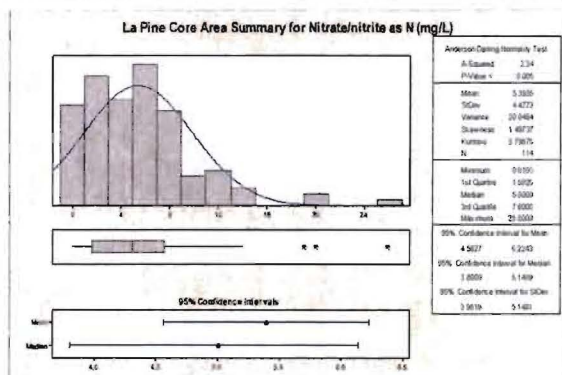
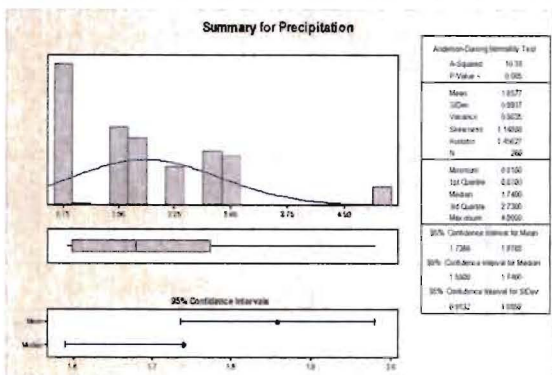
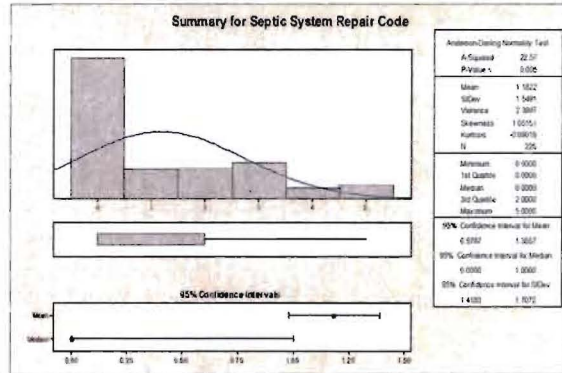
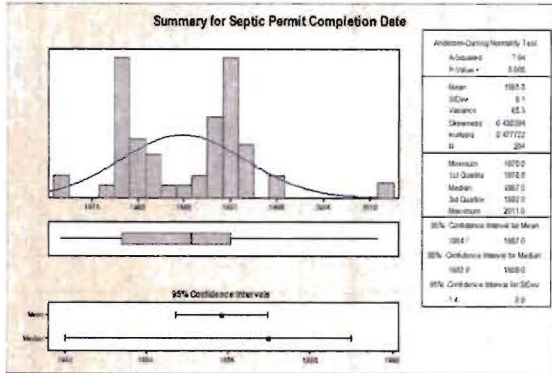
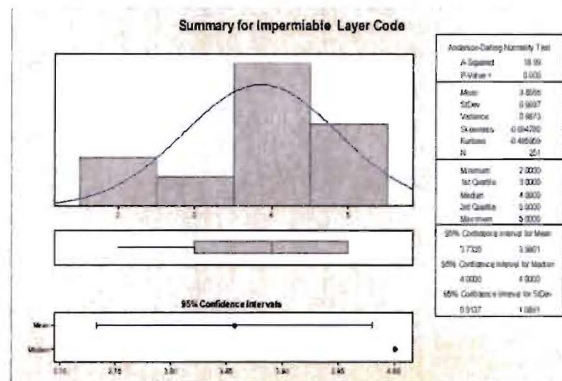
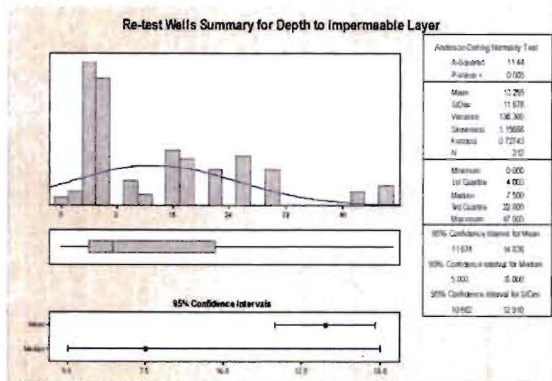
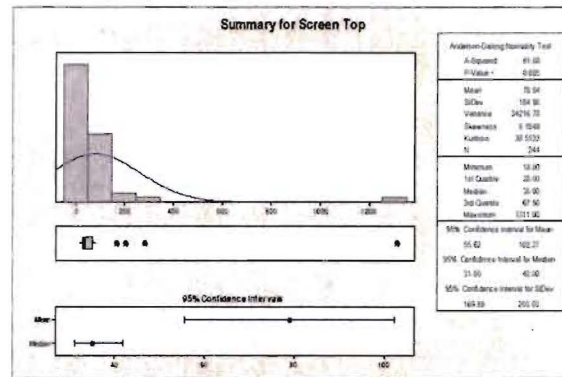
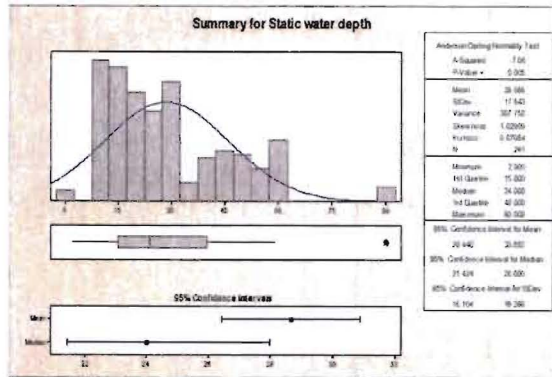
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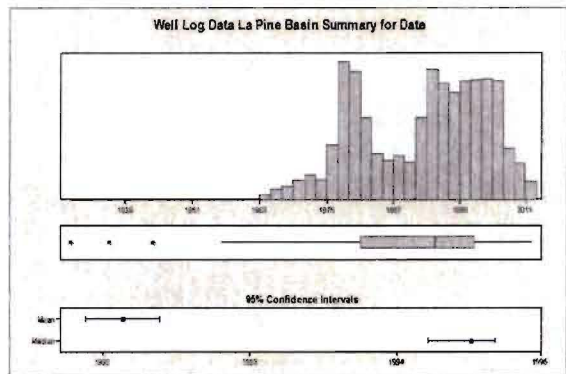
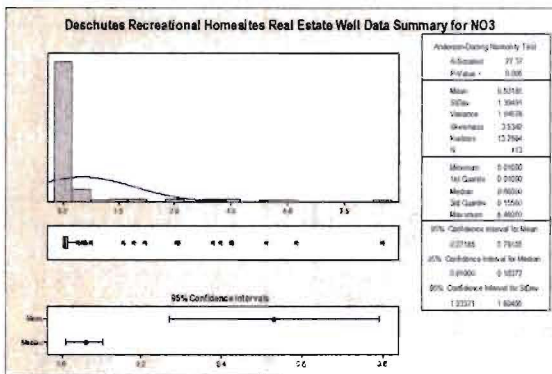
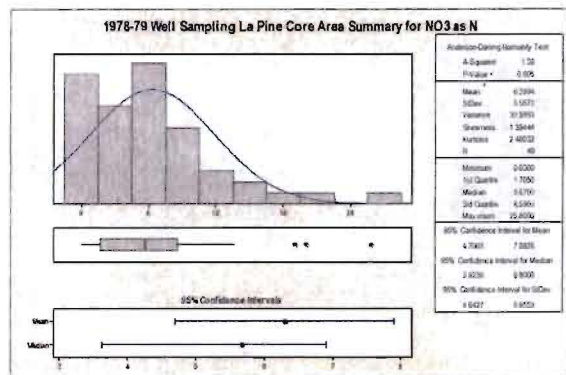
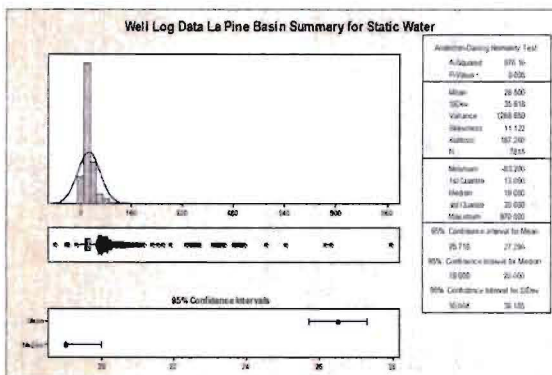
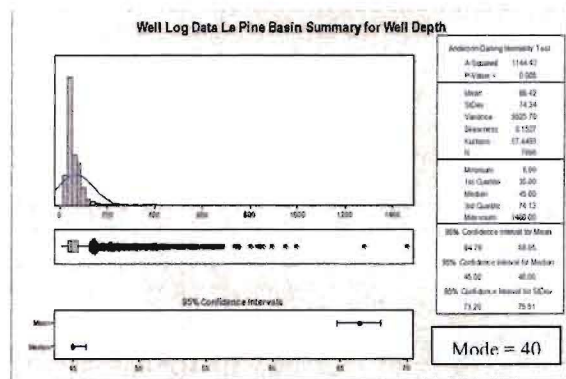
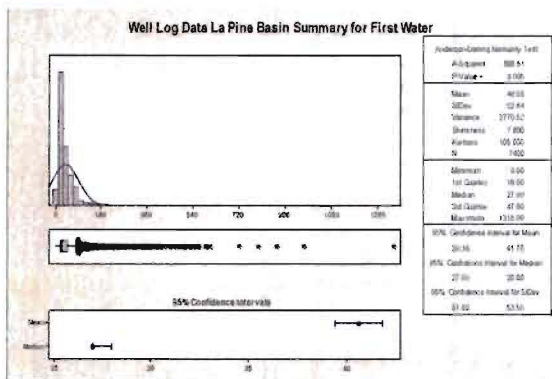
# Appendix i Sample and Variable Distributions<sup>6</sup>



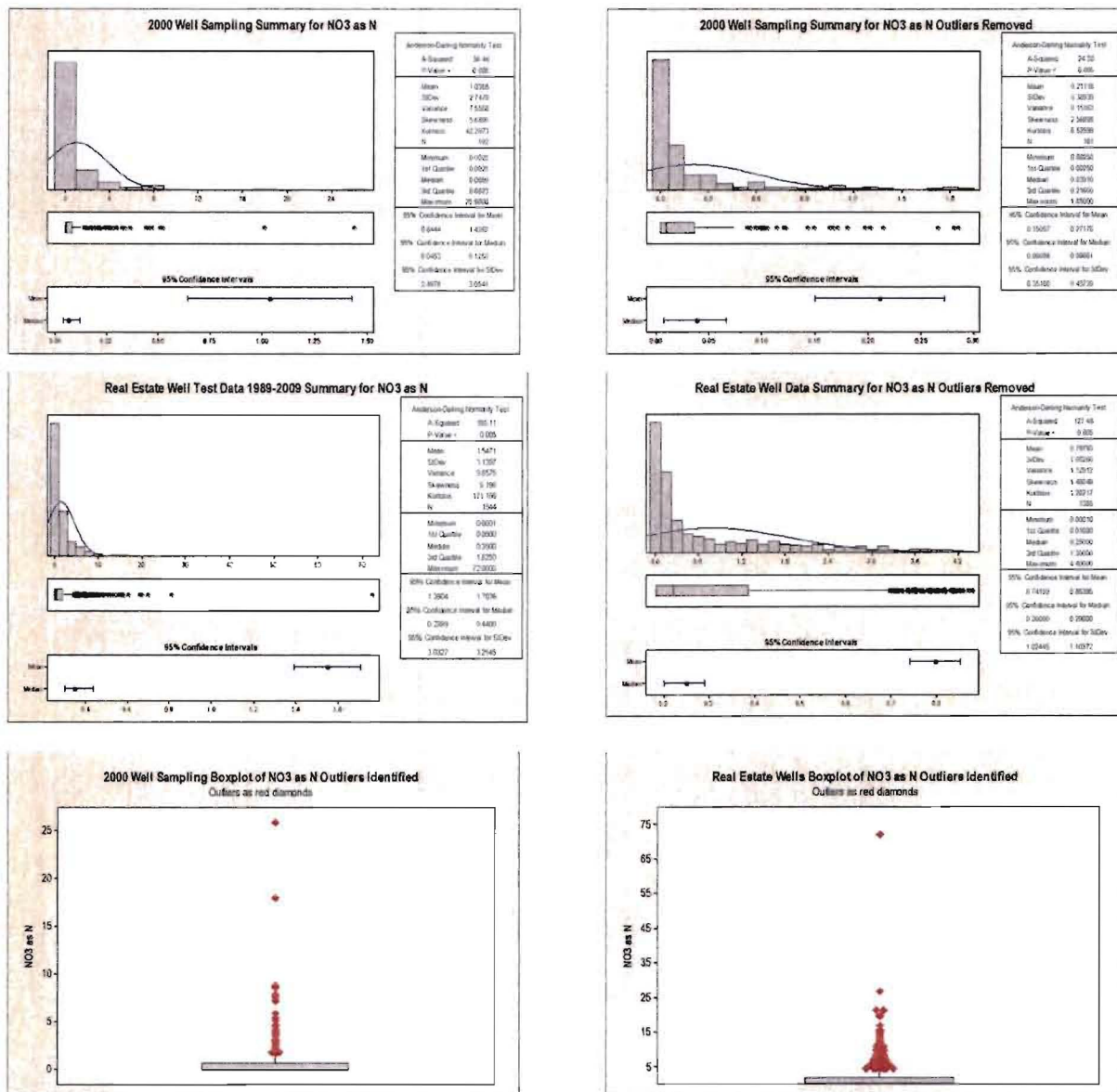




<sup>6</sup>Some samples include data at different points in the year, such as June and October.



## Appendix ii USGS Model Comparison



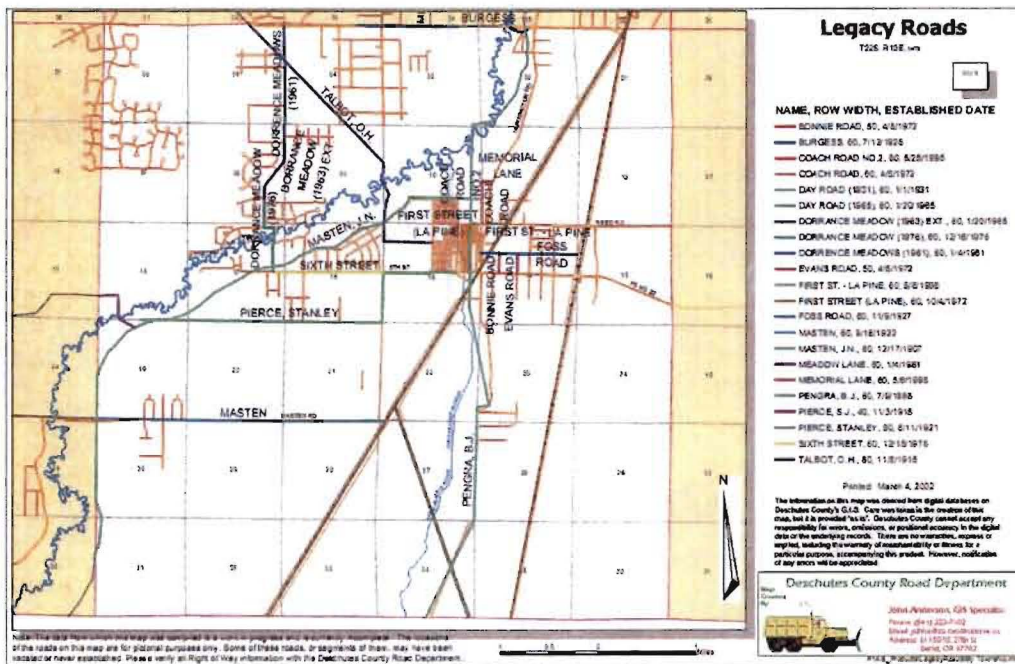
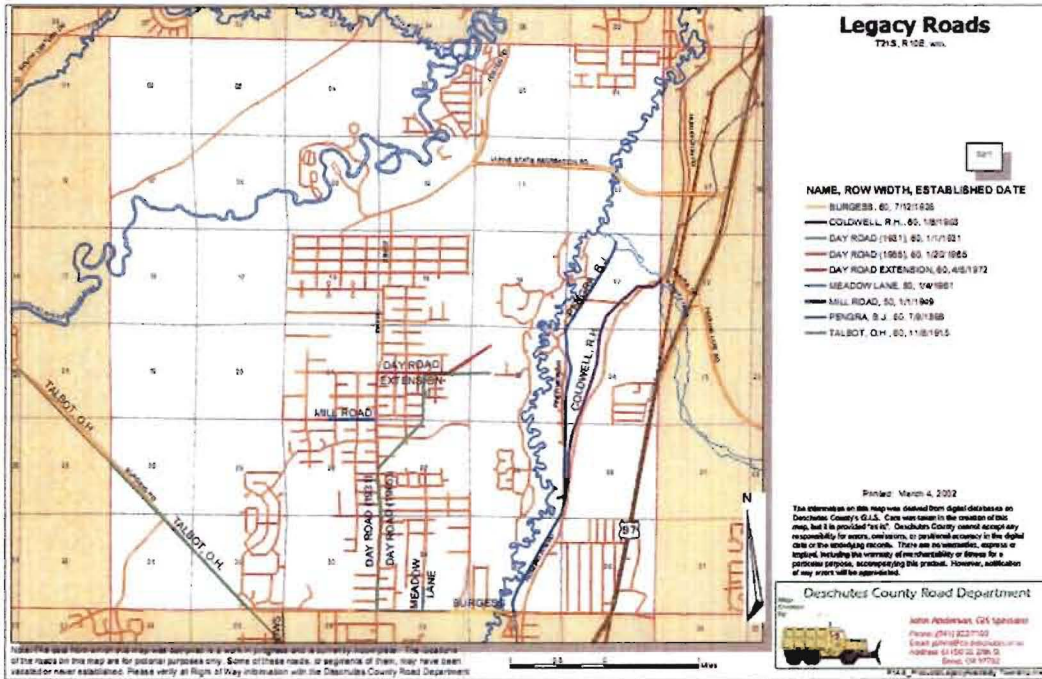
USGS MODEL COMPARISON BEFORE AND AFTER OUTLIER REMOVAL			
	2000 SAMPLE MEAN	USGS MODEL MEAN	REAL ESTATE WELL MEAN
USGS Model	1.6 mg/L	2.0 mg/l	1.6 mg/L
Outliers Removed	0.2 mg/L	N/A	0.8 mg/L <sup>7</sup>
Sample Size	109	1398	1572 (USGS) 1567 (1989-2009 <sup>8</sup> )

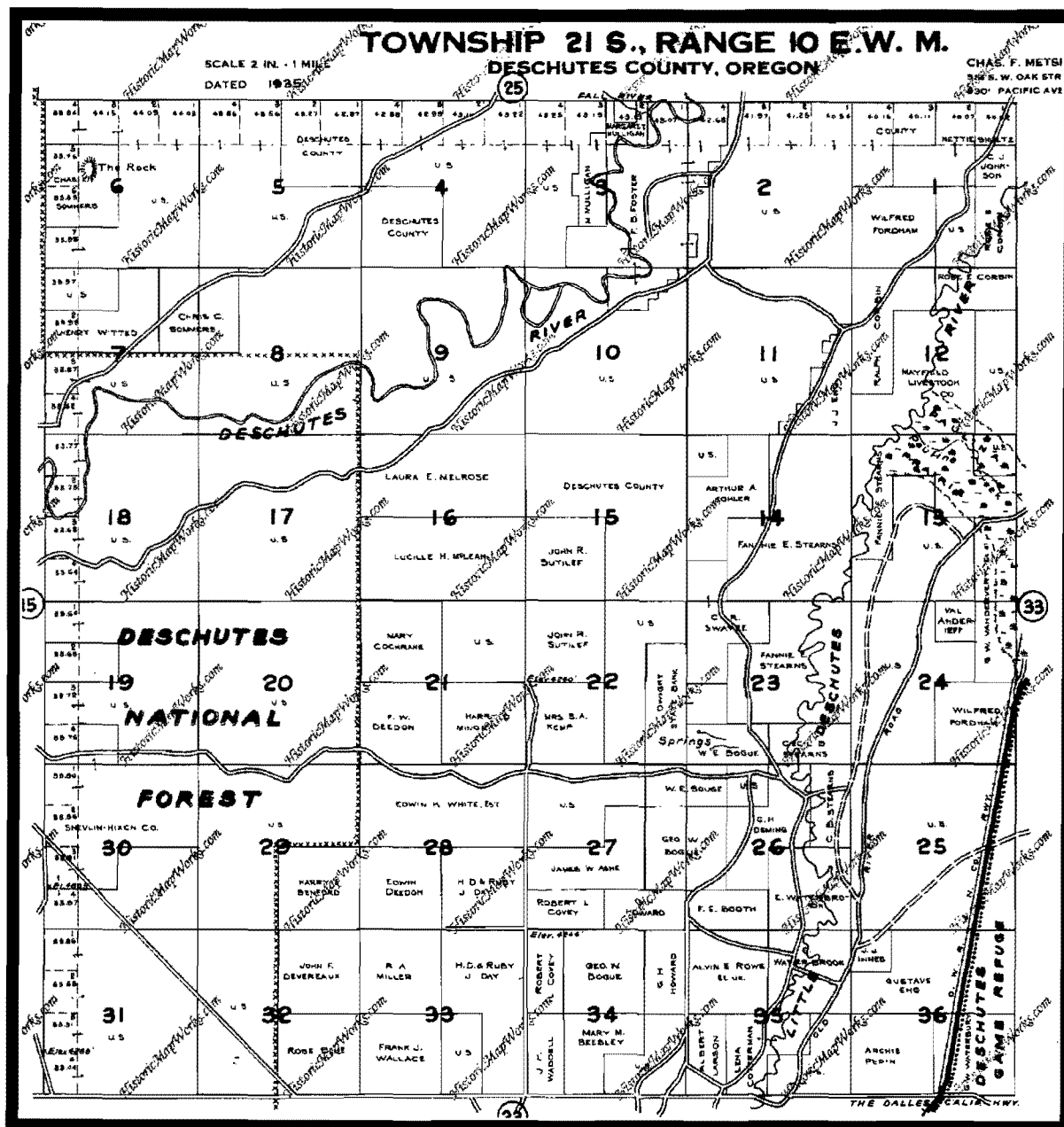
<sup>7</sup> This mean is for data presented in this analysis, however, analysis of the range and interquartile range suggest this value is probably close.

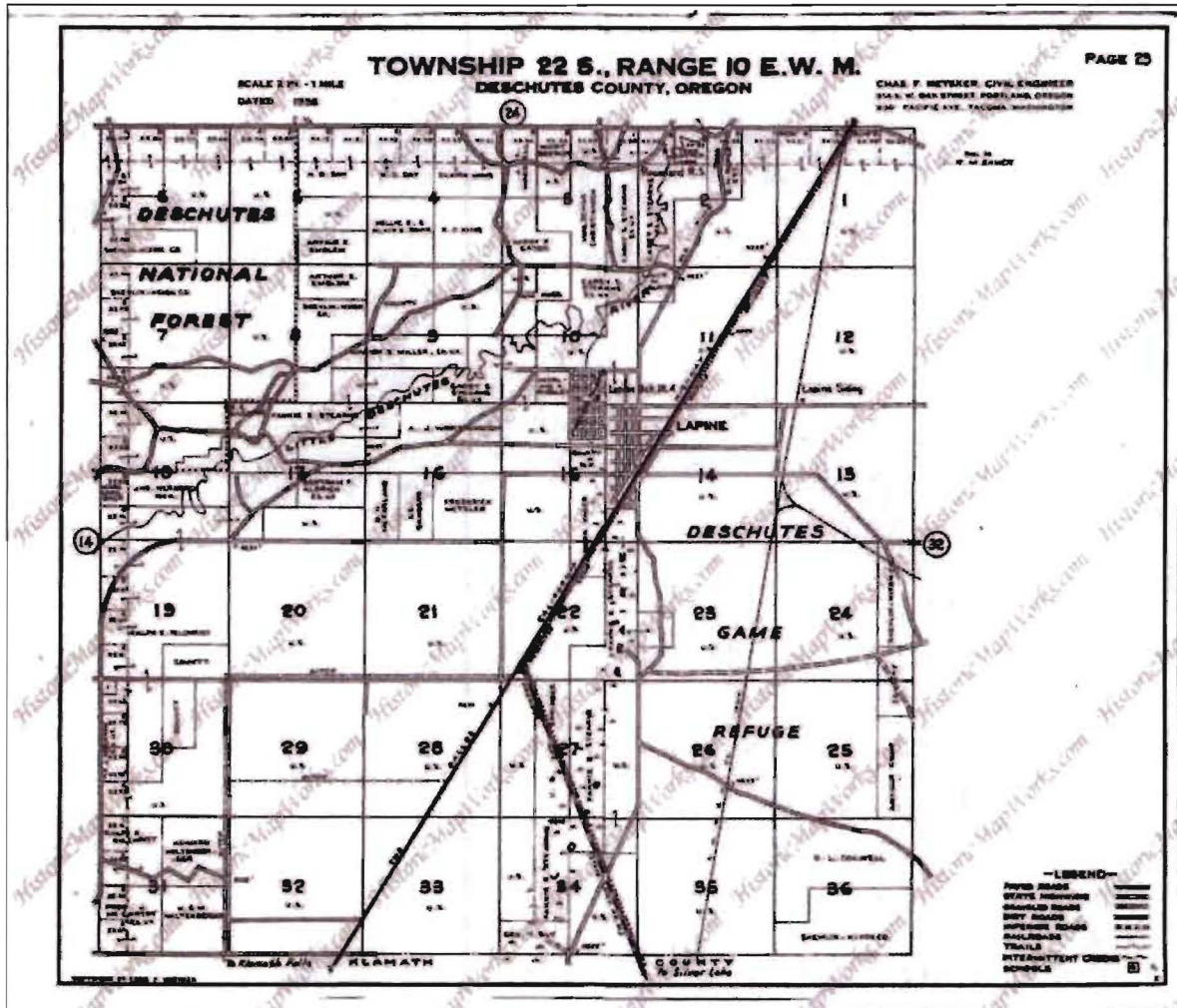
<sup>8</sup> The real estate data used in the USGS Model comparison could not have been cleaned. The data used in this analysis reflects about ten more years' data, yet is slightly less than the sample size reported by the USGS.



# Appendix iii Maps







PAGE 043 - TOWNSHIP 22 S., RANGE 10 E.W. M., Deschutes County 1936...



