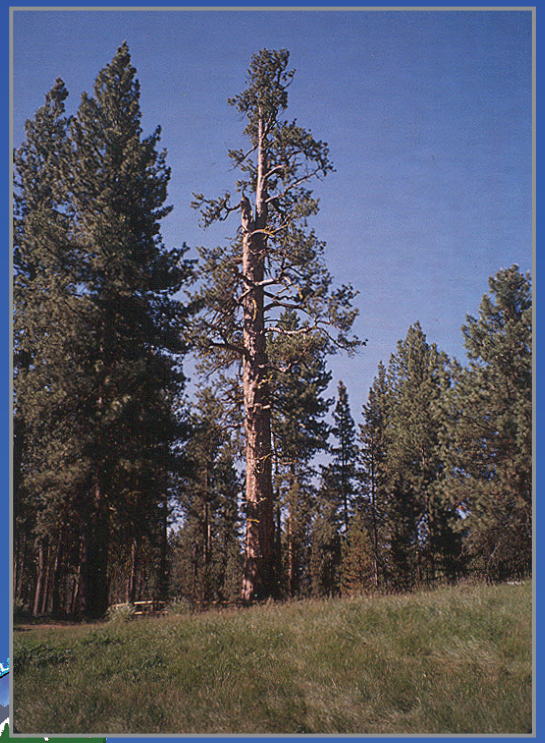
Wells and the Well-being of Oregon, Salem *December 11, 2008*

Groundwater Quality in Southern Deschutes County

Scientific investigations and planning for resource protection

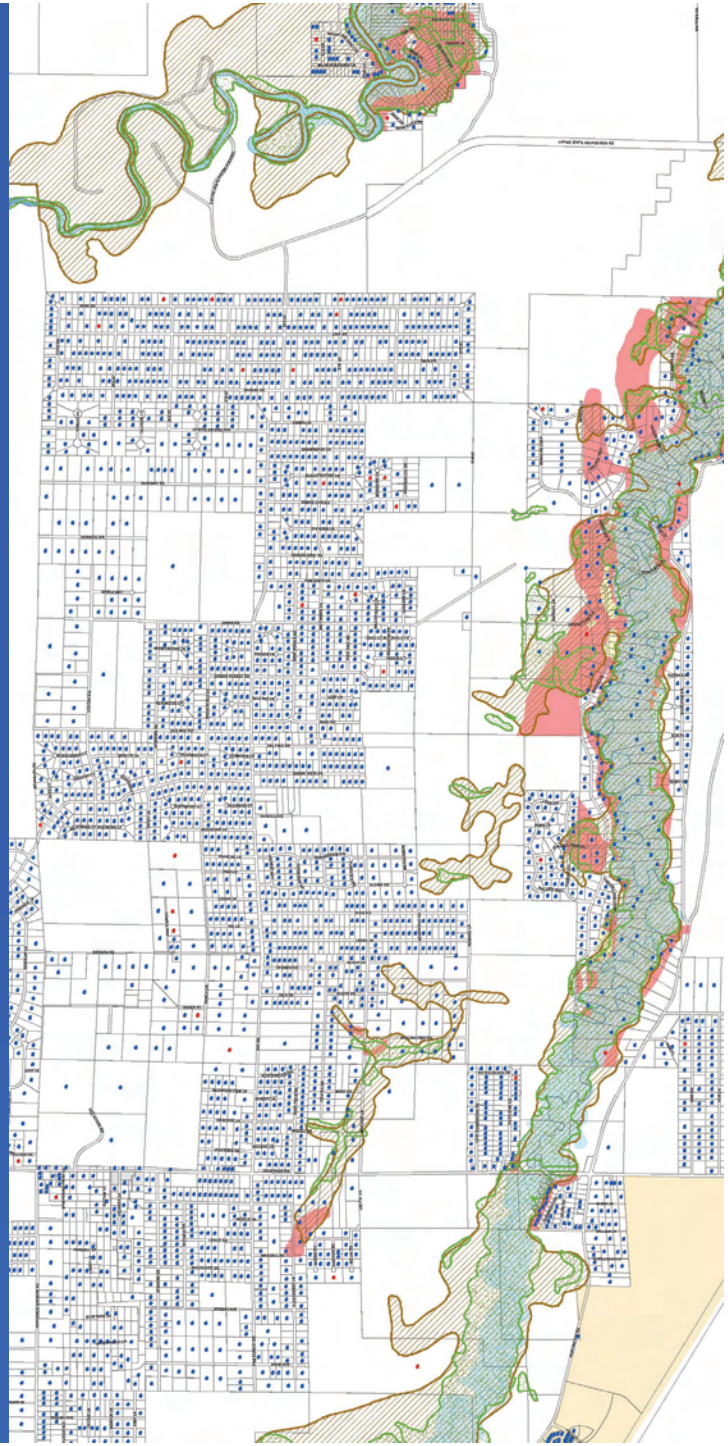


USGS
science for a changing world

DESCHUTES COUNTY

DEQ
State of Oregon
Department of
Environmental
Quality

Problem



- Thin, volcanic soils; shallow water table
- Most homes on septic & individual wells
- Upper 100 ft contains most productive sediments
- Area growing rapidly
- Nitrate first detected in 1980s

U.S. Geological Survey Mission

"To provide reliable, impartial, timely information that is needed to understand the Nation's water resources."

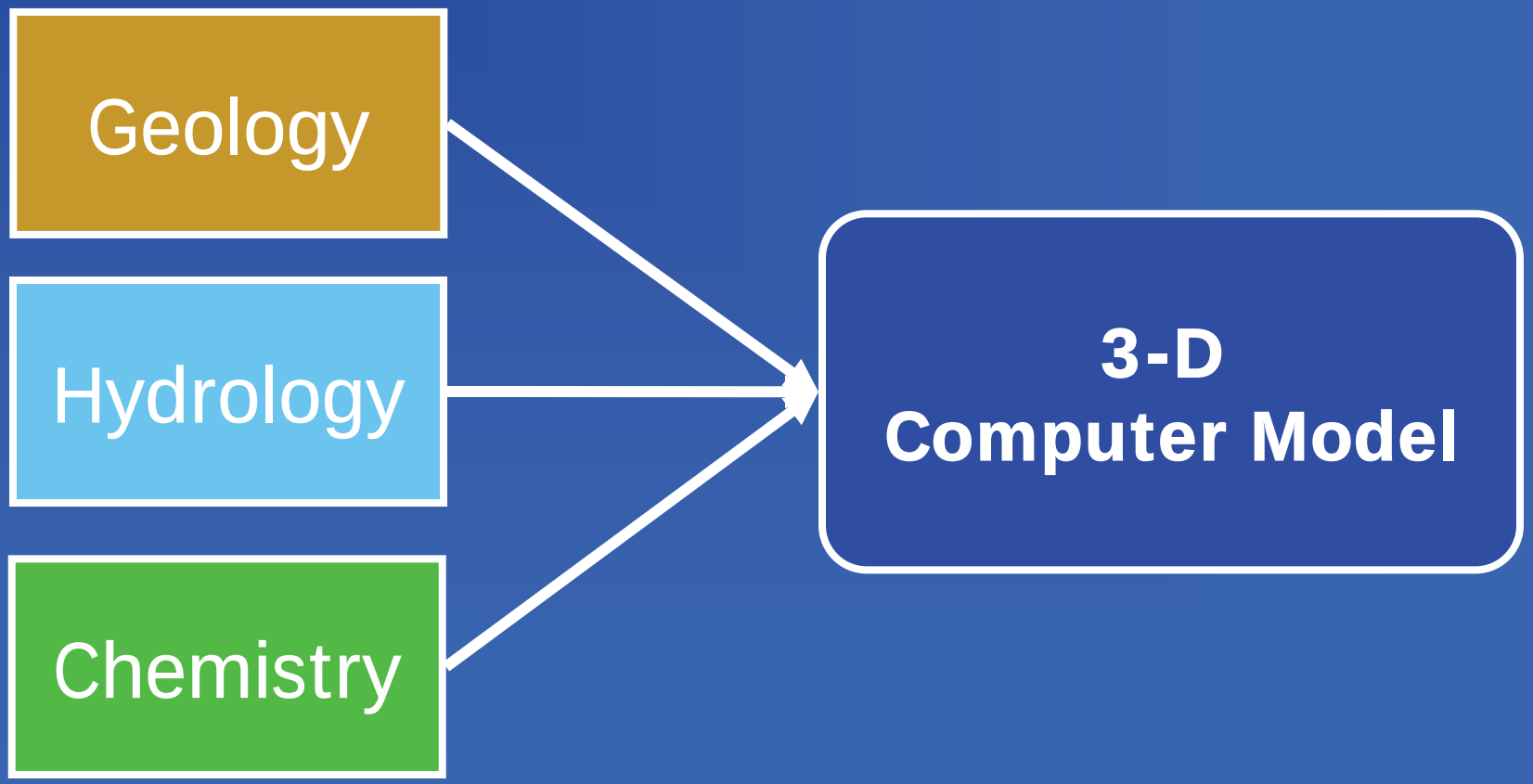
This information is made available to decision makers so they may use it to:

Protect and enhance water resources for human health, aquatic health, and environmental quality.

Public opinion – 1998

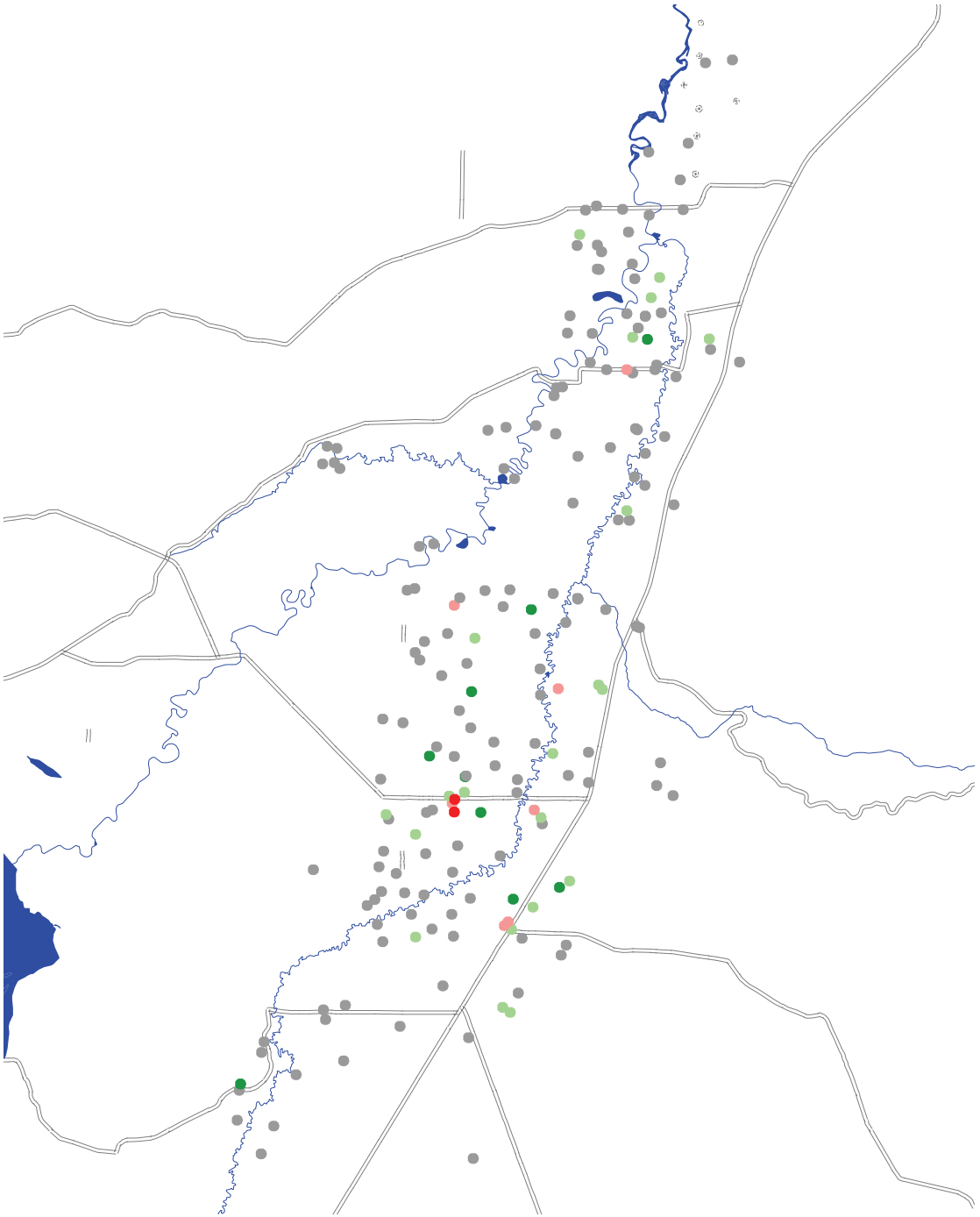
- No new sewers (too expensive)
- Use onsite systems to solve the problem (retain the rural character of the region)
- Doing nothing is not an option (we need to protect our groundwater)

Components of the study

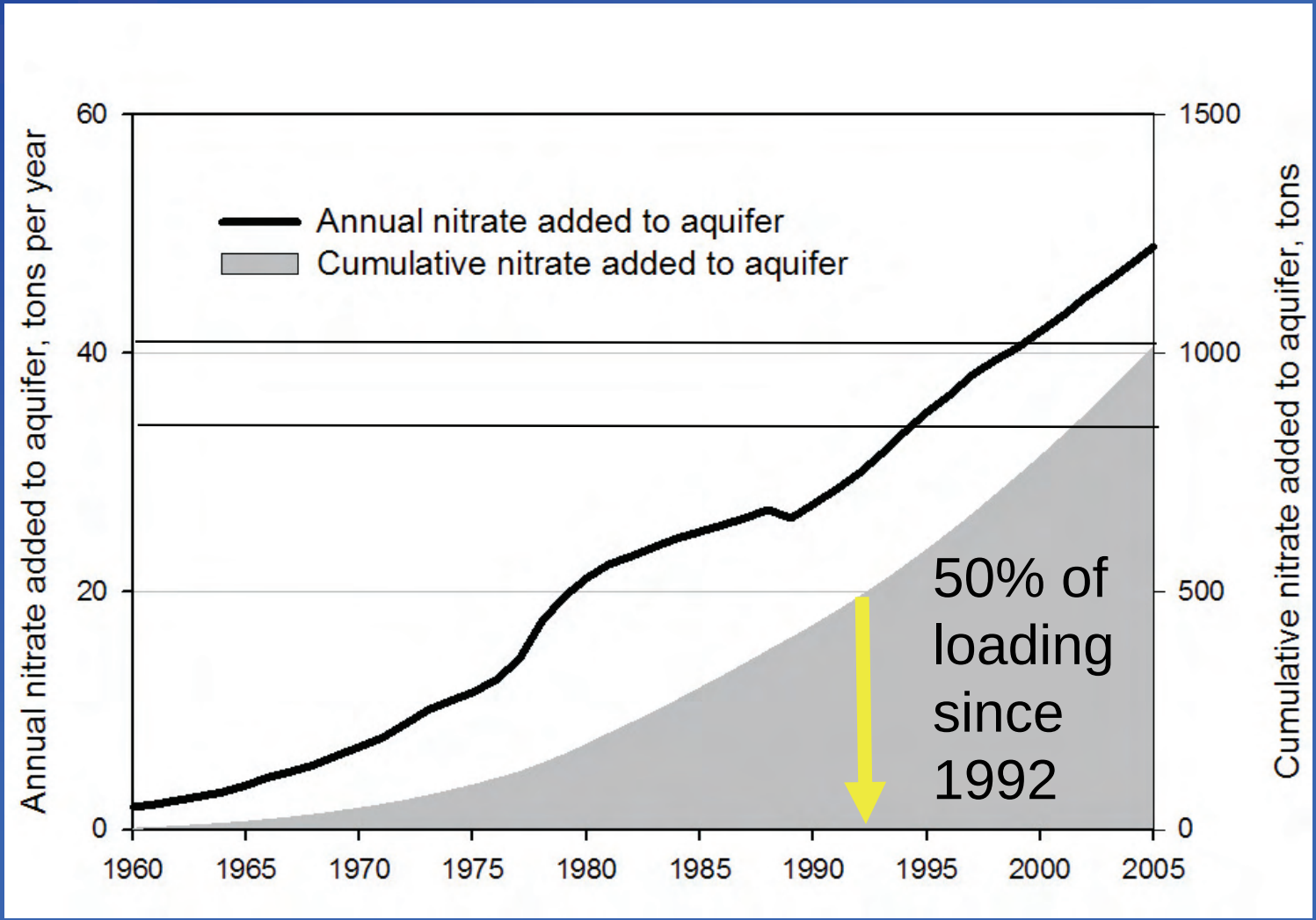


Aquifer scale sampling

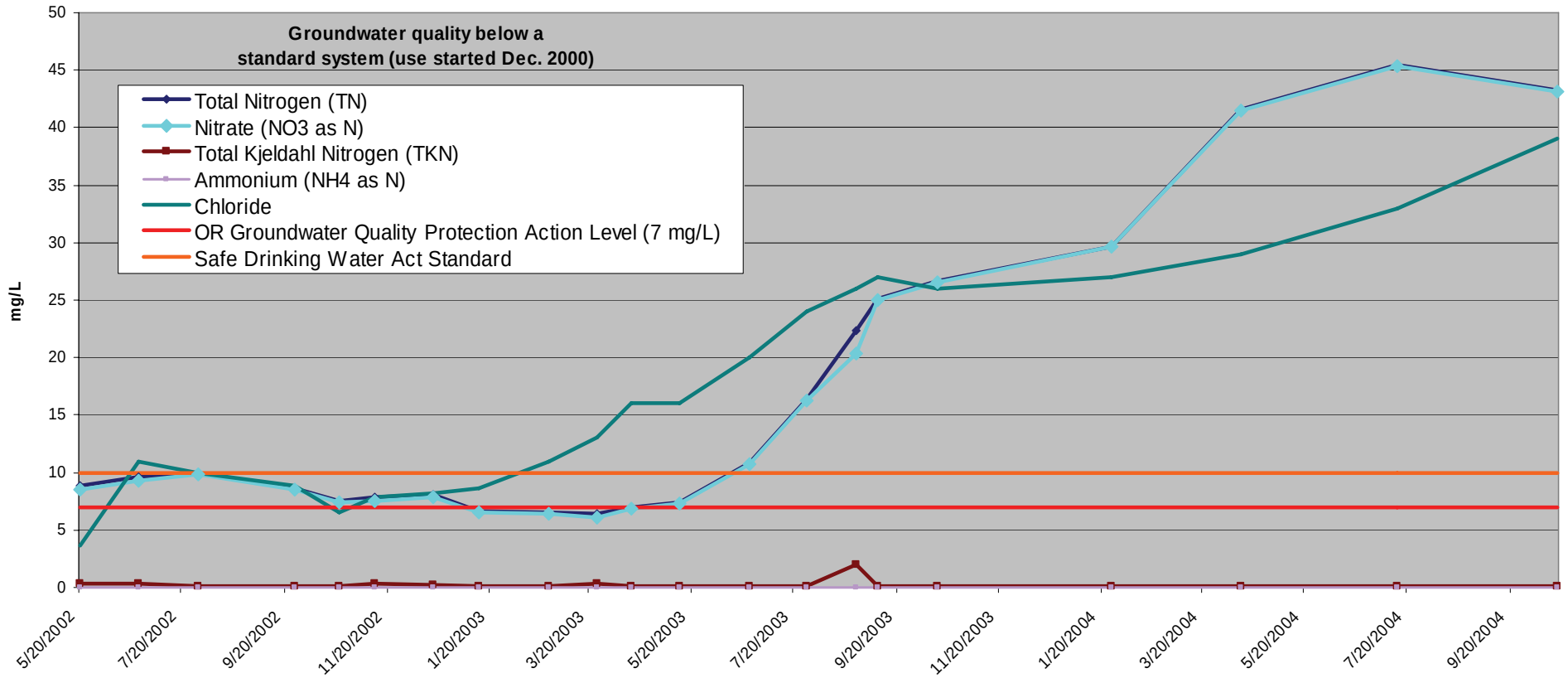
- <1 mg N/L
- 1-3 mg N/L
- 3-5 mg N/L
- 5-10 mg N/L
- >10 mg N/L



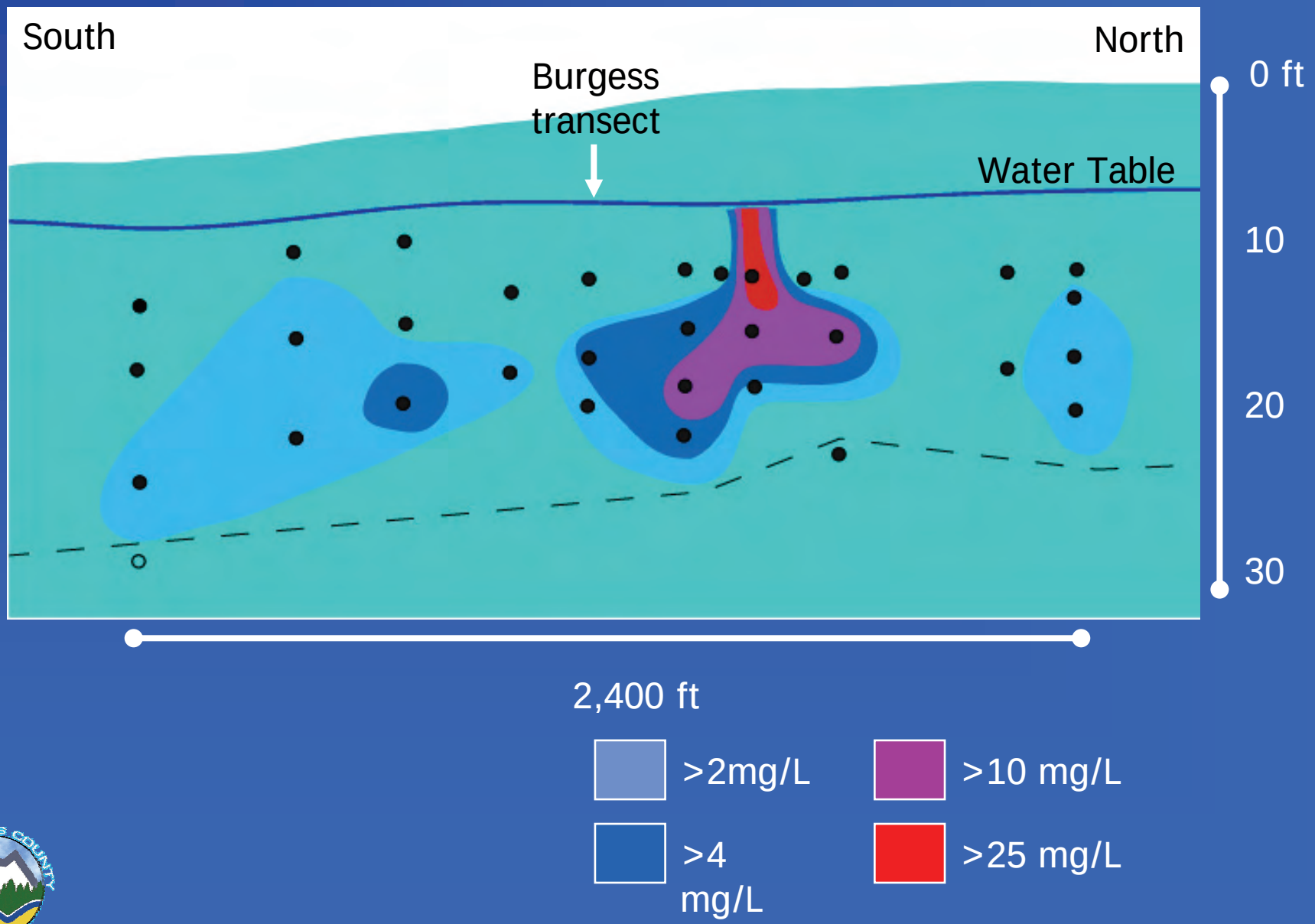
Existing Onsite Systems Nitrate Loading 1960-2005



Site specific sampling



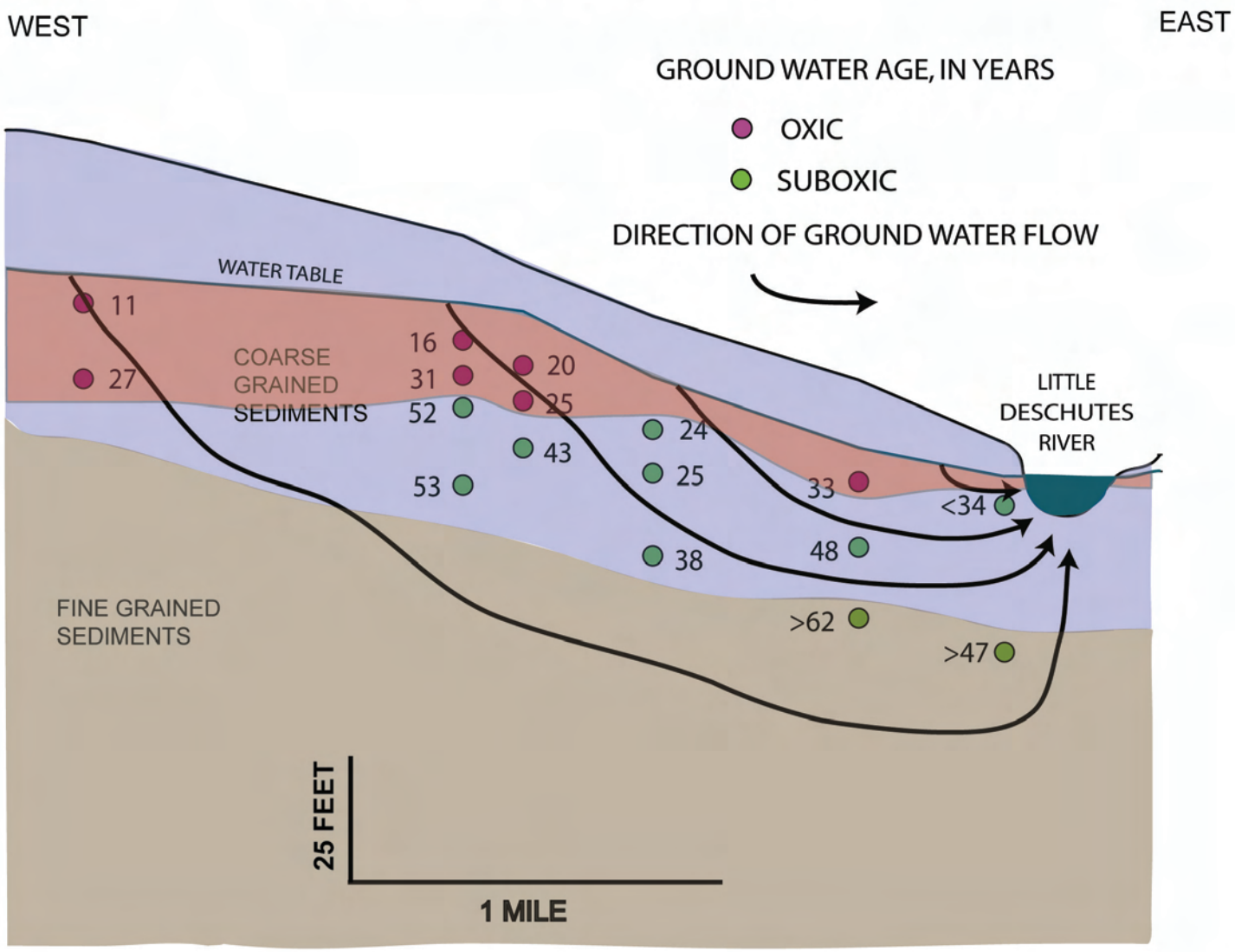
Septic Tank Effluent Creates Nitrate Plumes



Main Points: Chemistry

- Nitrate in La Pine ground water is from septic tank effluent
- Ground water in the La Pine basin moves slowly
- Historically loaded nitrate has not moved far – yet.
- Denitrification will remove some nitrate

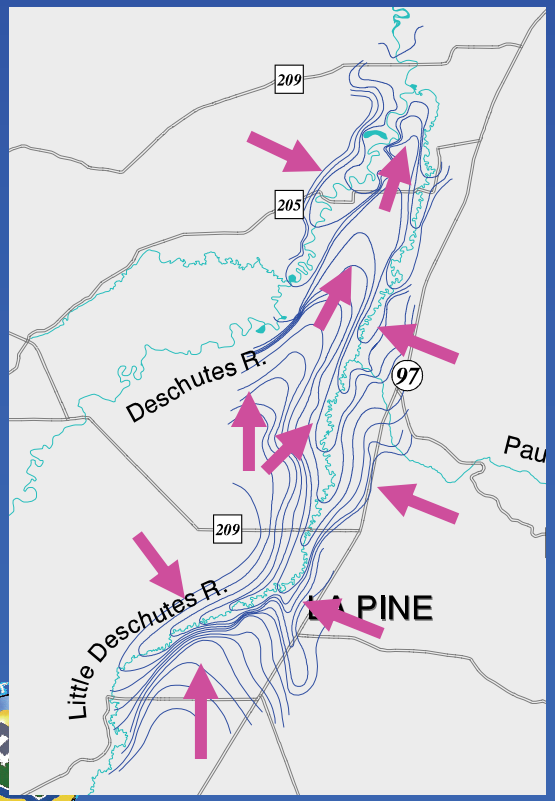
BURGESS TRANSECT



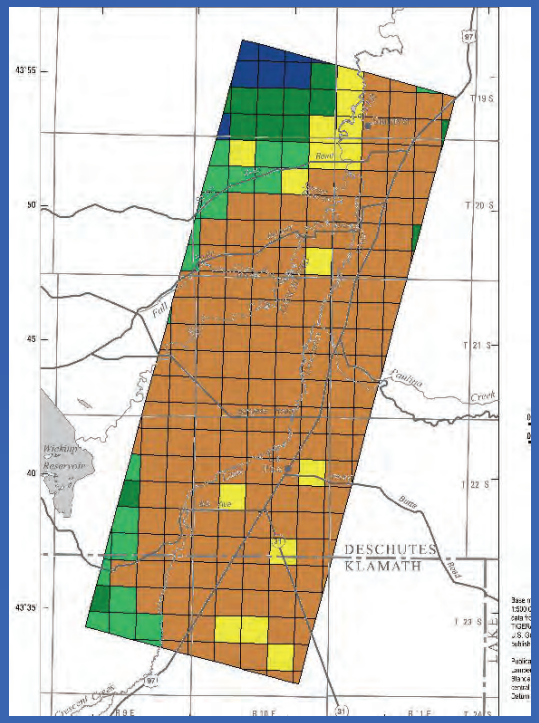
Hydrology

Measuring groundwater level below stream

Measuring groundwater level in well

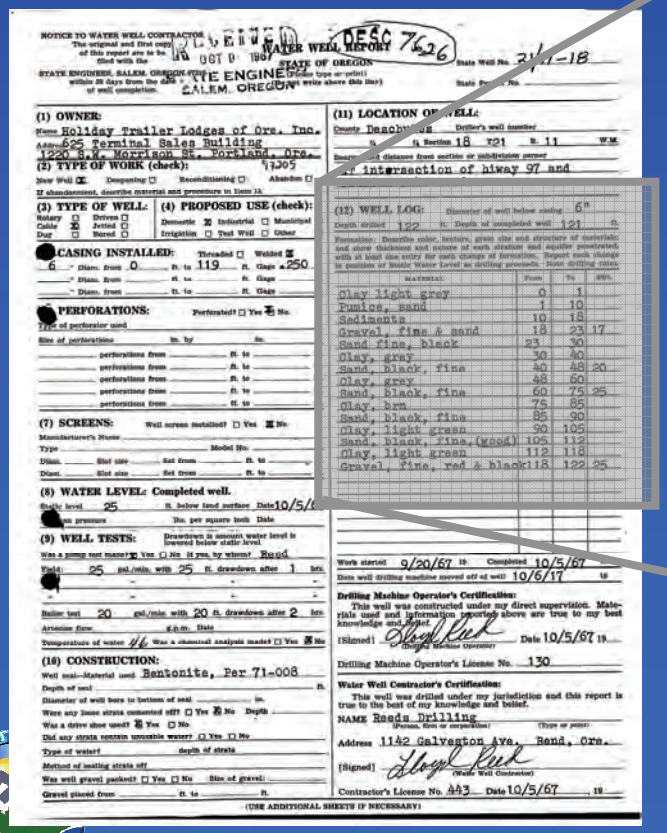


Map of groundwater flow directions



Map of groundwater recharge

Geologic data from 450 private wells



NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM, OREGON within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON

State Well No. 21/7-18

(1) OWNER:
Name Holiday Trailer Lodges of Ore. Inc.
Address 625 Terminal Sales Building
1220 S.W. Morrison St. Portland, Ore.

(2) TYPE OF WORK (check): New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL: Rotary ☐ Driven ☐ Cable ☒ Jetted ☐ Dug ☐ Bored ☐

(4) PROPOSED USE (check): Domestic ☒ Industrial ☐ Municipal Irrigation ☐ Test Well ☐ Other

CASING INSTALLED: Threaded ☐ Welded ☒
6 Diam. from 0 ft. to 119 ft. Gage .250

PERFORATIONS: Perforated? ☐ Yes ☒ No.

(7) SCREENS: Well screen installed? ☐ Yes ☒ No.

(8) WATER LEVEL: Completed well.
Static level 25 ft. below land surface Date 10/5/

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? Reed
Yield: 25 gal./min. with 25 ft. drawdown after 1 hrs.
Bailer test 20 gal./min. with 20 ft. drawdown after 2 hrs.
Artesian flow g.p.m. Date
Temperature of water 46 Was a chemical analysis made? ☐ Yes ☒ No

(10) CONSTRUCTION:
Well seal—Material used Bentonite, Per 71-008
Depth of seal ft.
Diameter of well bore to bottom of seal in.
Were any loose strata cemented off? ☐ Yes ☒ No Depth
Was a drive shoe used? ☒ Yes ☐ No
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☐ No Size of gravel:
Gravel placed from ft. to ft.

(11) LOCATION OF WELL:
County Deschutes Driller's well number
¼ ¼ Section 18 T21 R. 11 W.M.
Bearing and distance from section or subdivision corner
At intersection of hiway 97 and

(12) WELL LOG: Diameter of well below casing 6"
Depth drilled 122 ft. Depth of completed well 121 ft.
Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level as drilling proceeds. Note drilling rates.

MATERIAL	From	To	SWL
Clay light grey	0	1	
Pumice, sand	1	10	
Sediments	10	18	
Gravel, fime & sand	18	23	17
Sand fine, black	23	30	
Clay, grey	30	40	
Sand, black, fine	40	48	20
Clay, grey	48	60	
Sand, black, fine	60	75	25
Clay, brn	75	85	
Sand, black, fine	85	90	
Clay, light green	90	105	
Sand, black, fine,(wood)	105	112	
Clay, light green	112	118	
Gravel, fine, red & black	118	122	25

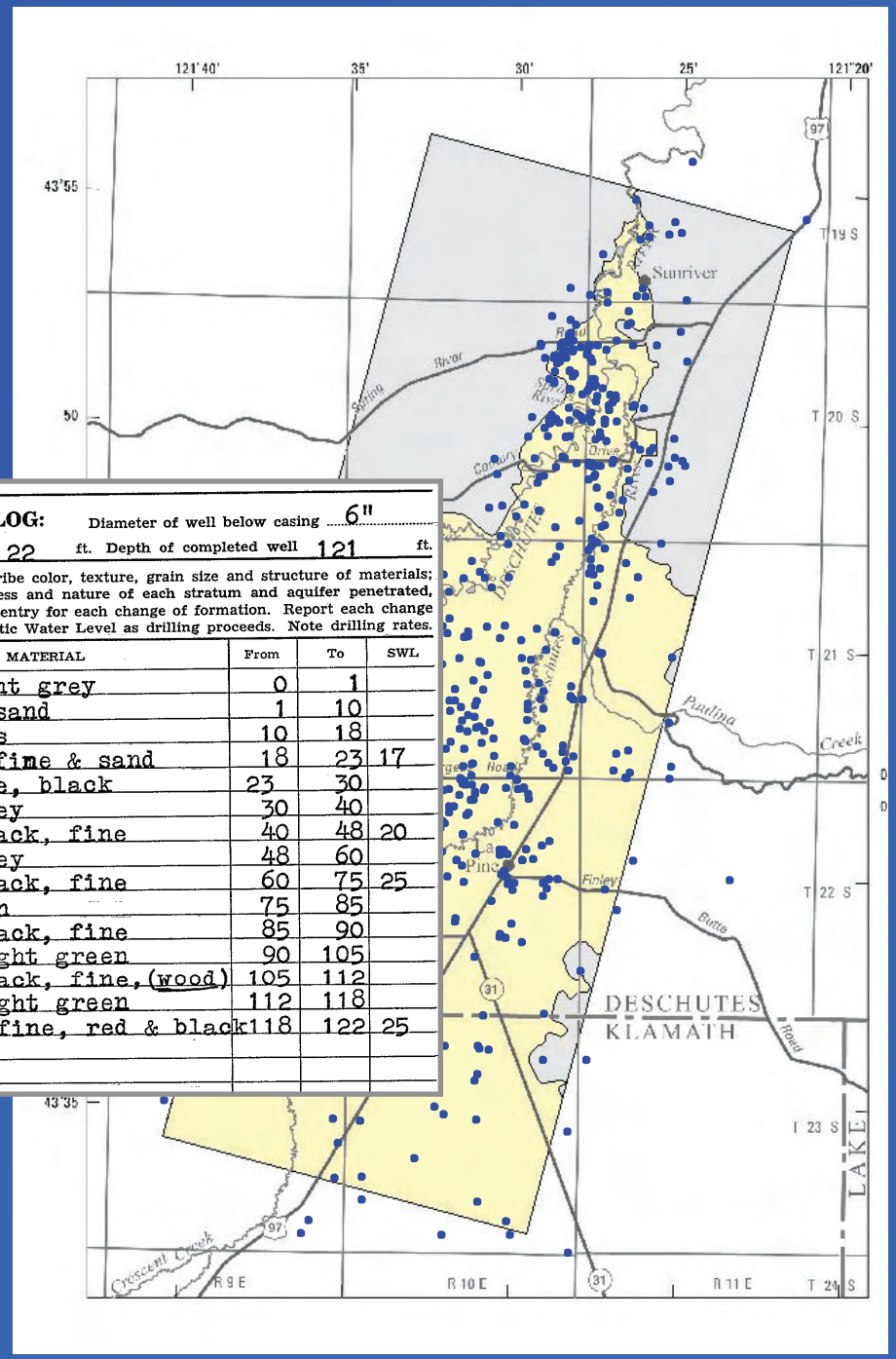
Work started 9/20/67 19 Completed 10/5/67
Date well drilling machine moved off of well 10/6/17 19

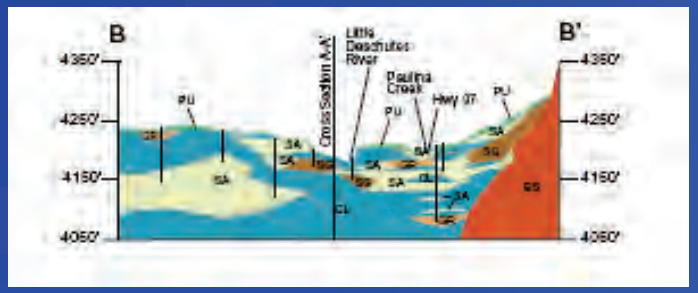
Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Lloyd Reed (Drilling Machine Operator) Date 10/5/67 19

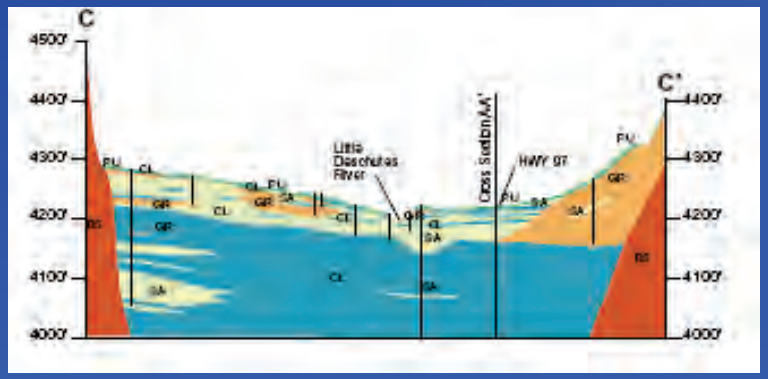
Drilling Machine Operator's License No. 130

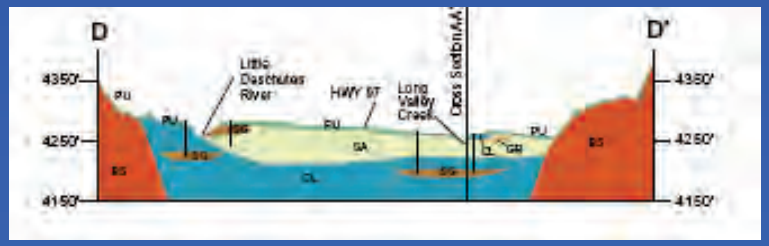
Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
NAME Reeds Drilling (Person, firm or corporation) (Type or print)
Address 1142 Galveston Ave. Bend, Ore.
[Signed] Lloyd Reed (Water Well Contractor)
Contractor's License No. 443 Date 10/5/67 19

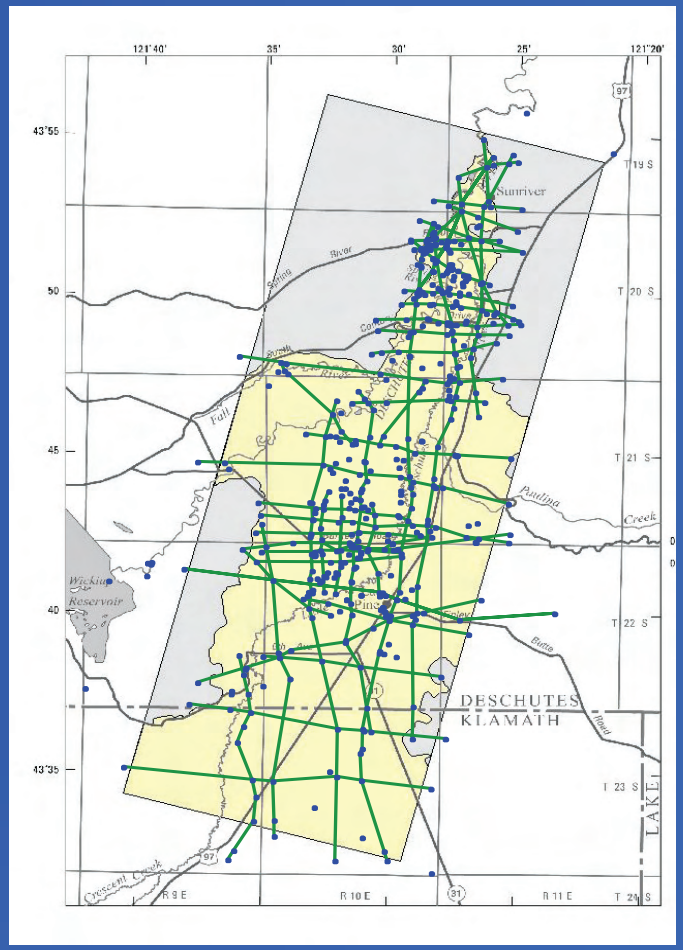
(USE ADDITIONAL SHEETS IF NECESSARY)

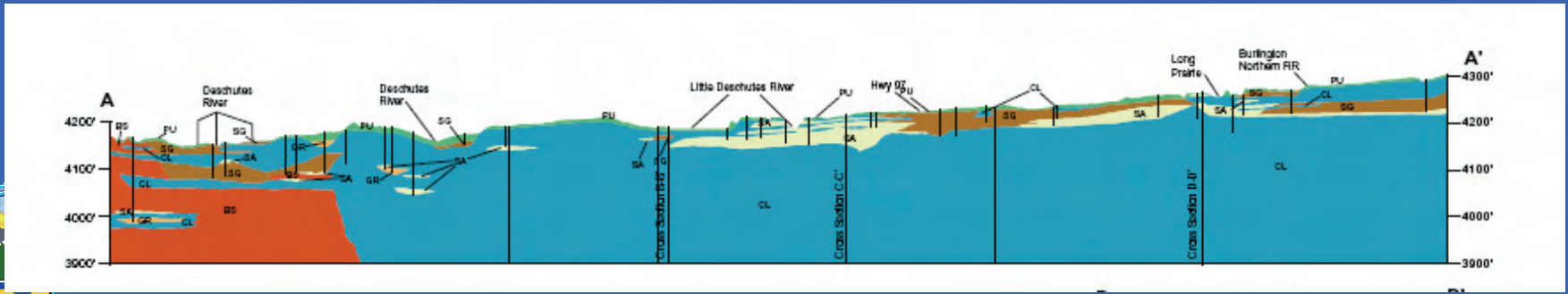



B
B'
Little Deschutes River
Paulina Creek
Hwy 97
Cross Section A-A'
4350'
4250'
4150'
4050'
PU
SA
SG
CL
GR
BS

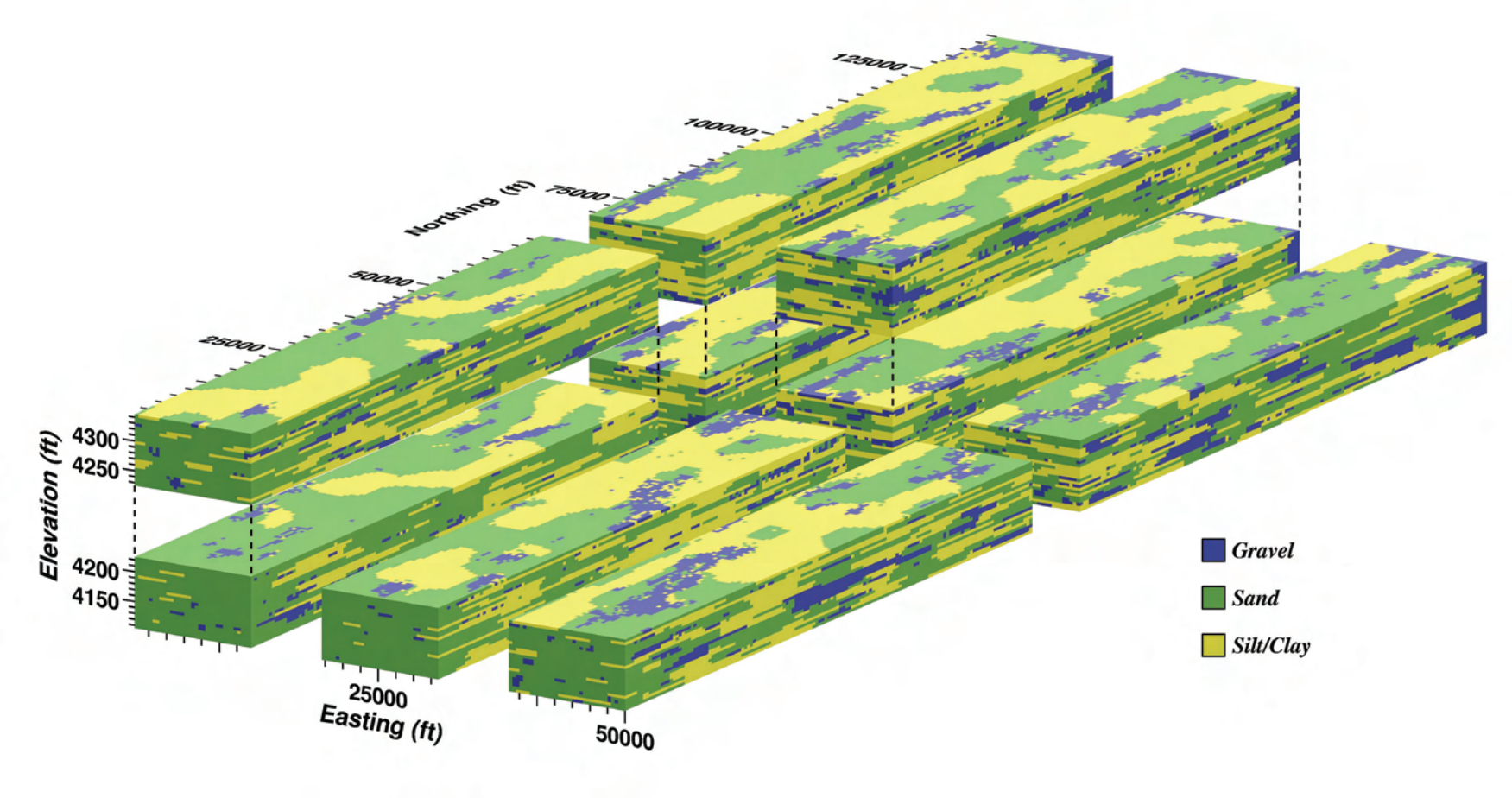

C
C'
Little Deschutes River
Cross Section A-A'
HWY 97
4500'
4400'
4300'
4200'
4100'
4000'
PU
CL
GR
SA
BS


D
D'
Little Deschutes River
HWY 97
Long Valley Creek
Cross Section A-A'
4350'
4250'
4150'
PU
SG
SA
CL
GR
BS

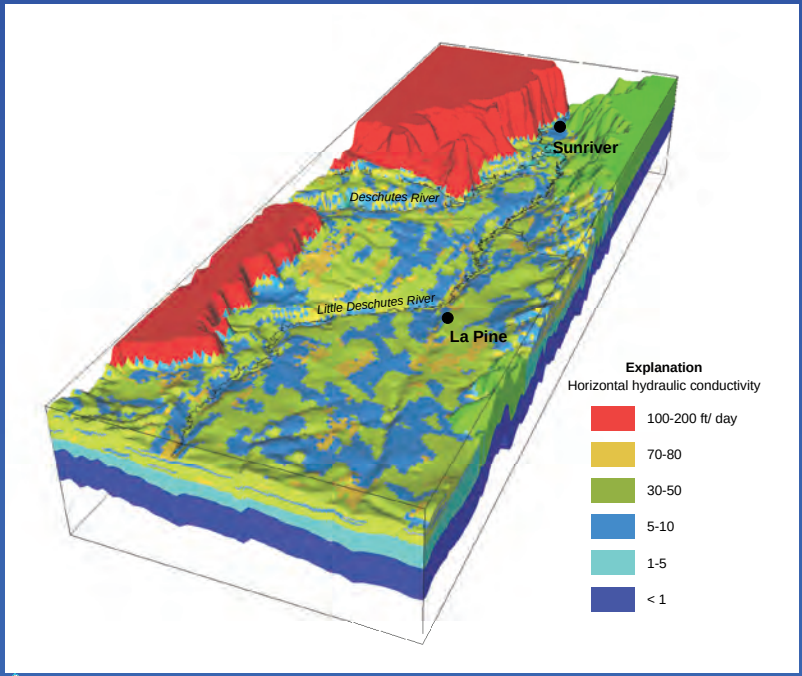

121°40'
35'
30'
25'
121°20'
43°55'
50
45
40
43°35'
Sunriver
Spring River
Fall
Paulina Creek
Wickiup Reservoir
Pine
DESCHUTES
KLAMATH
LAKE
Crescent Creek
T 19 S
T 20 S
T 21 S
T 22 S
T 23 S
T 24 S
R 9 E
R 10 E
R 11 E
97
31


A
A'
Deschutes River
Deschutes River
Little Deschutes River
Hwy 97
Long Prairie
Burlington Northern RR
4200'
4100'
4000'
3900'
4300'
PU
SG
SA
CL
GR
BS
Cross Section B-B'
Cross Section C-C'
Cross Section D-D'

Final Product: 3-D Geology



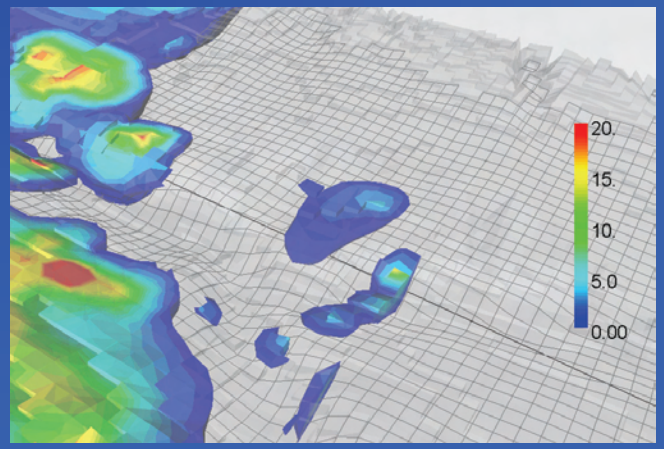
Ground-Water Model



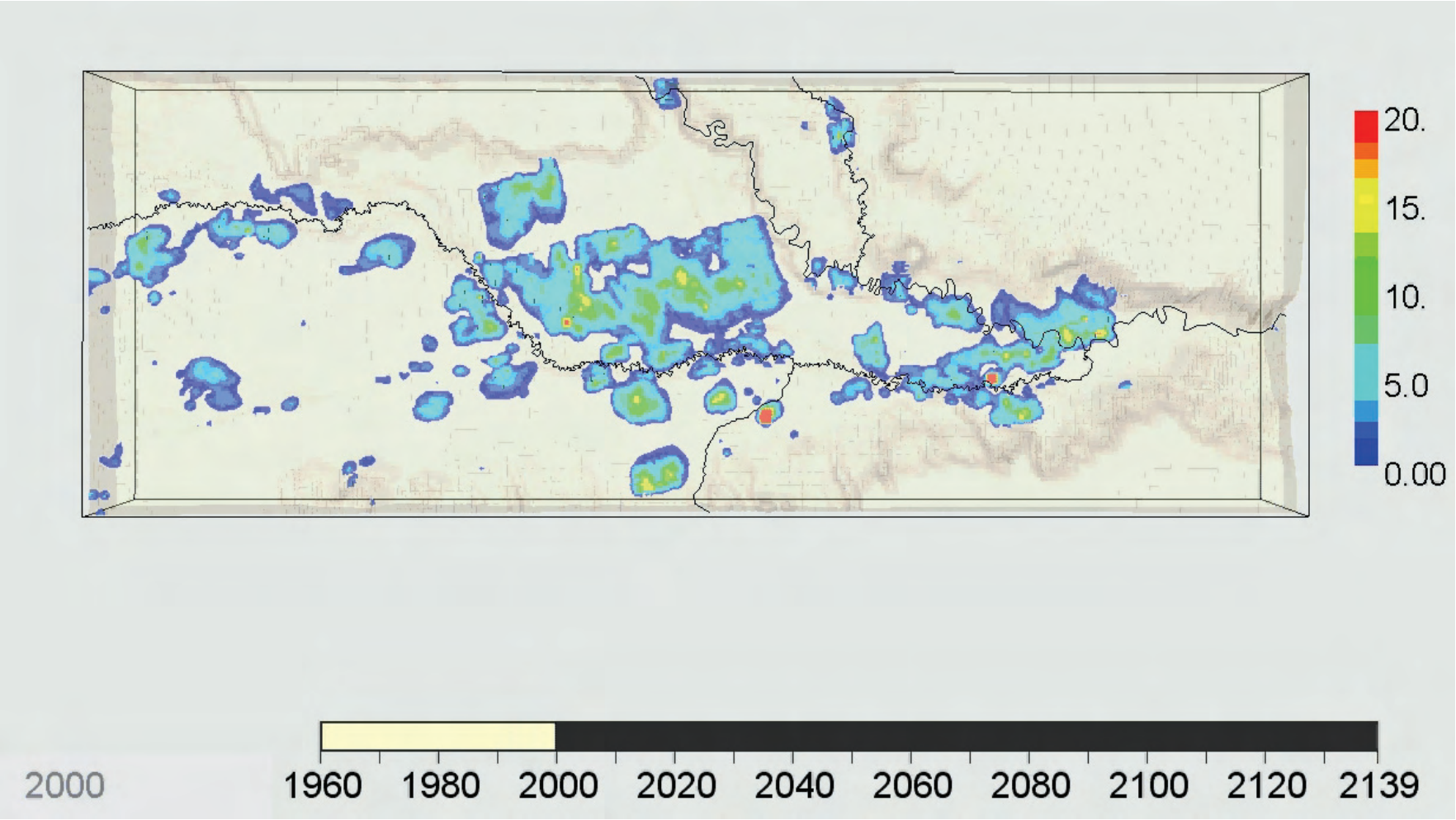
What if we do nothing?

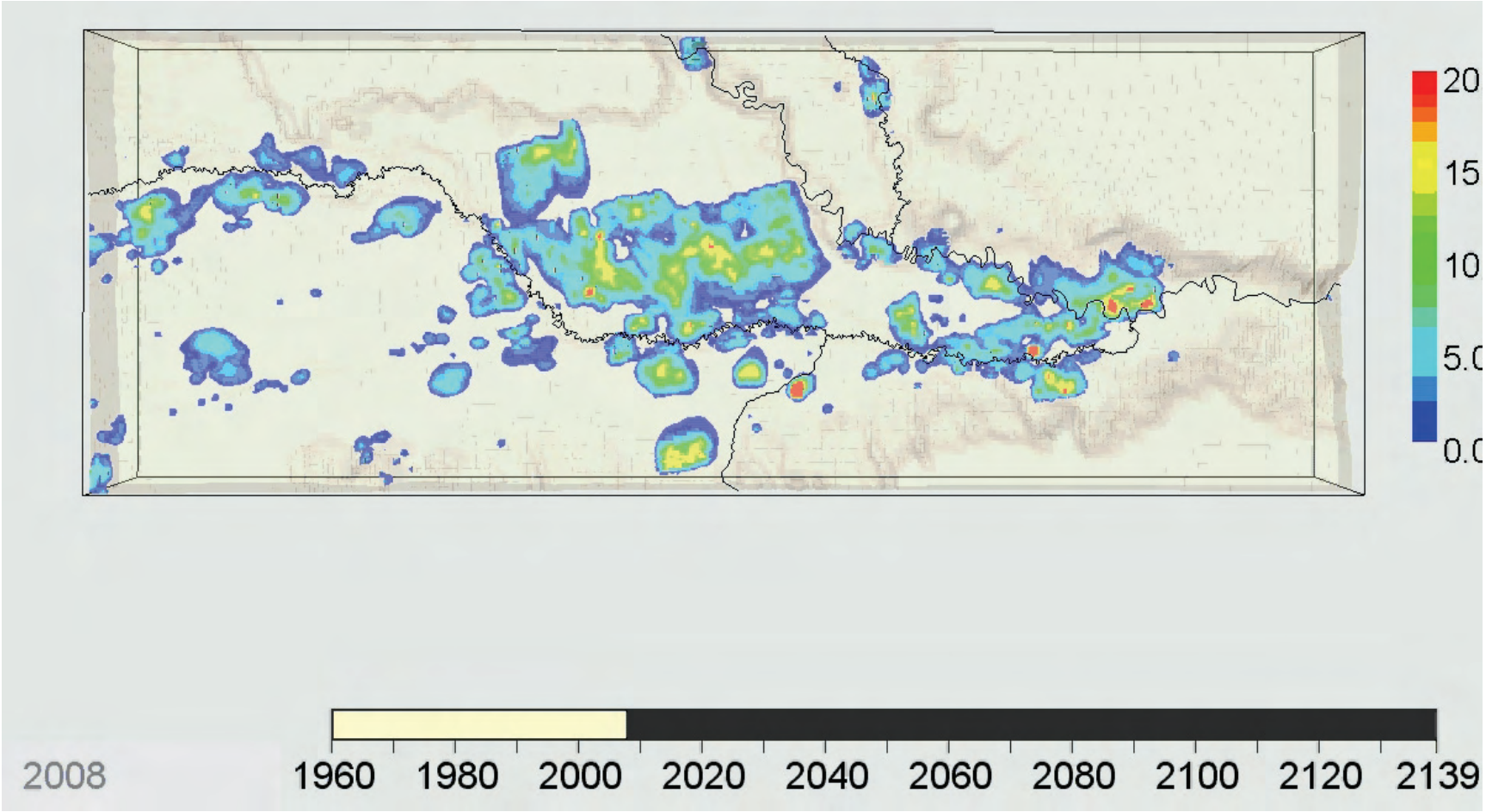
What is the sustainable nitrate loading capacity?

La Pine Ground-Water Model

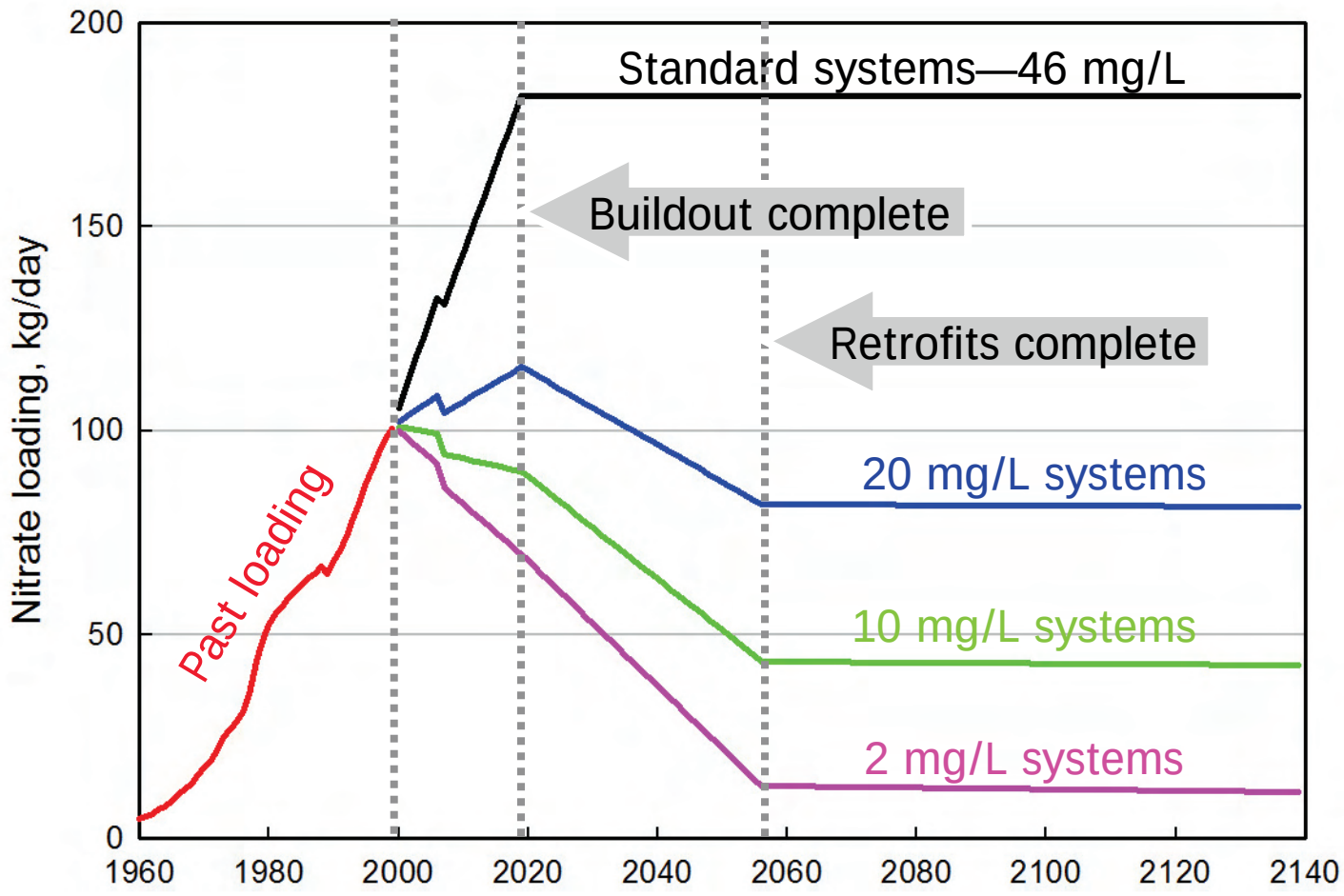


The Movie


20.
15.
10.
5.0
0.00
2000
1960
1980
2000
2020
2040
2060
2080
2100
2120
2139


20
15
10
5.0
0.0
2008
1960
1980
2000
2020
2040
2060
2080
2100
2120
2139

Nitrate Loading for Defined Scenarios



Main Points: Model

- If nothing is done, model results show groundwater nitrate concentrations will increase for over 100 years, and
- Average shallow nitrate concentrations will exceed 10 mg/L over large areas.
- Sustainable nitrate loading capacity of the aquifer has been used by Deschutes County to develop performance standards for onsite systems in the region.

South County Groundwater Milestones

1960's and 1970's

125-square mile area of La Pine subdivided into between 12,000 and 15,000 lots

1982

La Pine Aquifer Study finds high nitrate levels in groundwater underlying the core area of La Pine.

1986

La Pine core area sewered.

1994

Oregon DEQ finds increasing nitrate levels outside of the La Pine area.

1996

County receives a $157,250 Regional Problem Solving grant from DLCD to identify regional problems and evaluate solutions.

1998

Public feedback states no new sewers, find onsite systems that will protect groundwater

Continued…

1999

DEQ awarded $5.5 million for the La Pine National Demonstration Project and initiates groundwater investigations with USGS, field test of advanced onsite wastewater treatment systems, and development of 3-D groundwater model

2005

Nitrate Loading Management Model (optimization) added to 3-D model

2005

DEQ amends onsite rule to allow the use of advance onsite wastewater treatment systems

2005

Deschutes County begins work on Pollution Reduction Credit program and a county code to require groundwater protection

2008

Board of County Commissioners adopts county code requiring groundwater protection action

Where are we now?

2008

Members of the public have petitioned to have the county code placed on the ballot so that county residents can vote on whether to make the code effective or repeal it.

Why?

One claim is that the science is unsound.

Stay tuned...

Ground water eventually flows to rivers.

Little Deschutes River just above mouth, October 2000

USGS Project Website: http://oregon.usgs.gov/projs_dir/or186

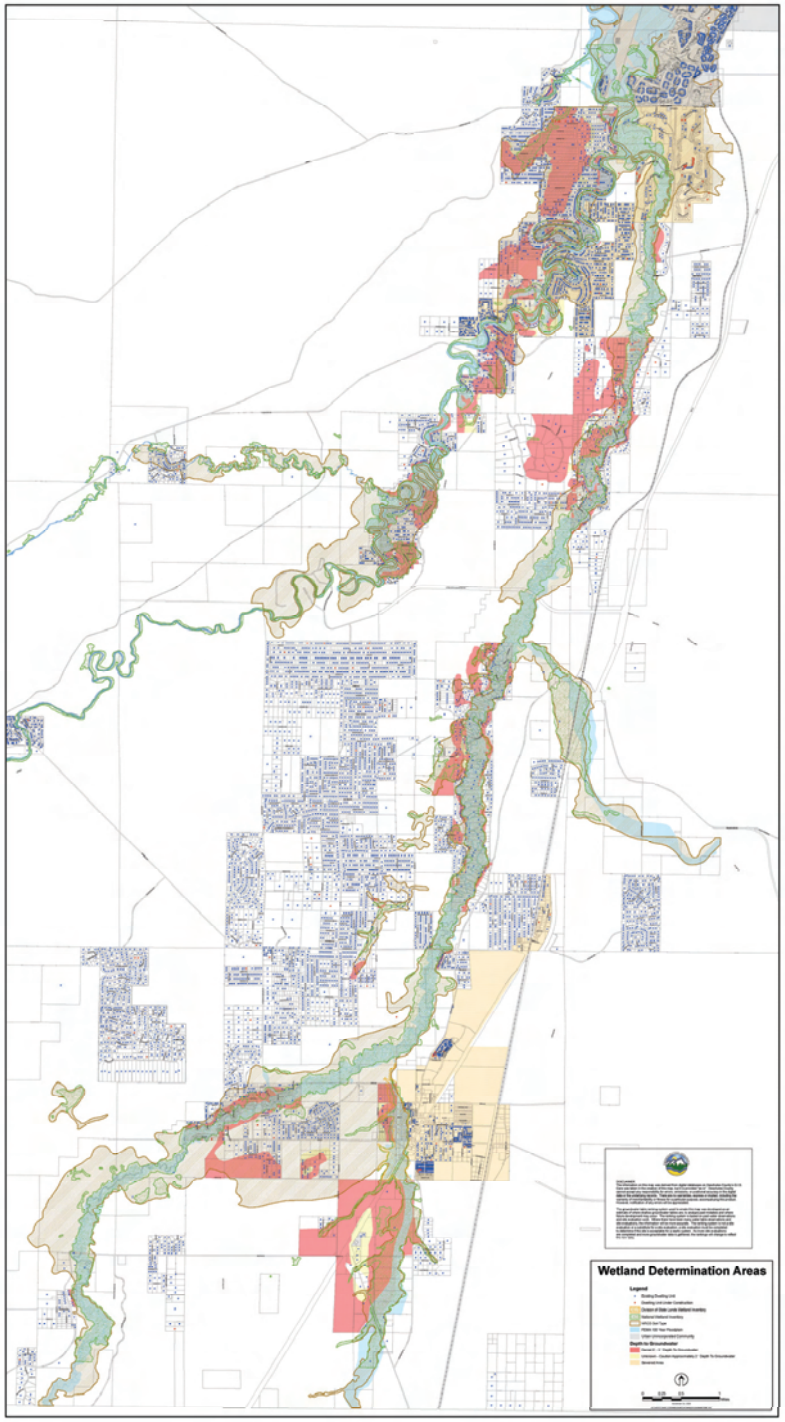
Deschutes County Project Website:
www.deschutes.org/cdd/gpp/

Summary of public involvement

1. May 13, 2003, Presentation of results from the 3-D model, groundwater study and nitrogen reducing system field test to the Board of County Commissioners in La Pine.
2. May 2006, Deschutes County Home Show
3. May 6, 2006, Open house at County offices in La Pine
4. May 11, 2006, Planning Commission meeting (part of TDC Amendment Hearing)
5. November 9, 2006 (requested by the La Pine Senior Center)
6. November 30, 2006 (hosted by the Deschutes County Planning Commission)
7. December 20, 2006 (Science Session requested at 11/30/2006 Planning Commission meeting)
8. Office Hours:
    - January 4, 2007, 5:00 - 7:00, Deschutes County office, La Pine
    - January 9, 2007, 1:00-5:00, Village Properties office, Sunriver
    - January 18, 2007, 1:00-5:00, Village Properties, Sunriver
    - January 23, 2007 3:00 - 5:00, Deschutes County office, La Pine
9. Hearing before the Board of County Commissioners, March 13, 20, 27th , 6:00 – 9:00 PM, La Pine High School
    - Written record for proposed Local Rule open from February 2007 through July 2008
10. Board of County Commissioners work session with Oregon Department of Environmental Quality and Department of Land Conservation and Development, April 18, 2007
11. Board of County Commissioners work session with Oregon Department of Environmental Quality and Department of Land Conservation and Development, January 30, 2008
12. Hearing before the Board of County Commissioners, March 19, 2008, La Pine High School
13. Public work sessions of the Board of County Commissioners, April through June 2008
14. Hearing before the Board of County Commissioners, July 7, 2008, Board Hearing Room
15. Deliberation and Decision of the Board of County Commissioners, July 9, 2008
16. Adoption of Deschutes County Code Chapter 13.14, unanimous vote of the Board of County Commissioners, July 23, 2008, effective October 23, 2008

Other public involvement

- On-going one on one contacts with EH staff either in person or by phone/e-mail
- Presentations available upon request
- Numerous news articles

Problem

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