

# **Groundwater in the East King County Groundwater Management Area (EKC GWMA)**

**Presented by Sevin Bilir**

WLRD, Groundwater Protection Program

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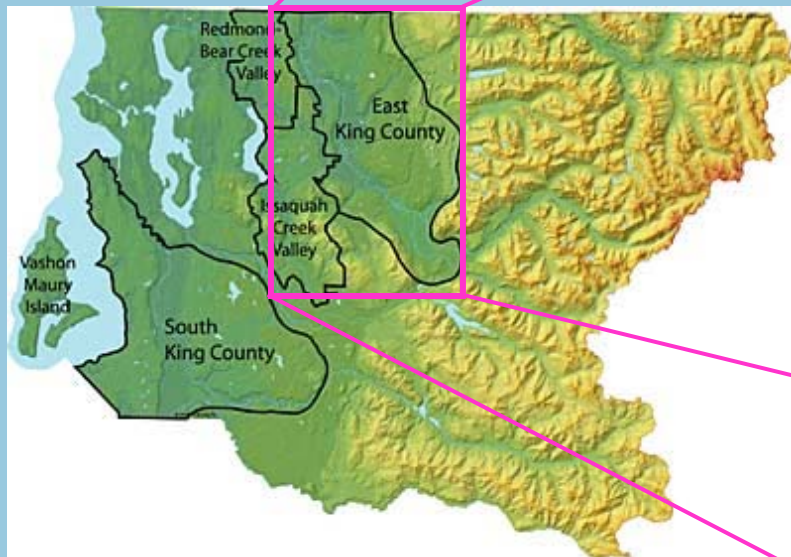
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Tom Ventur**

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**Funded by KC EKC Rural Drainage Program**

# East King County Groundwater Management Area (EKC GWMA)

- Rural setting
- Municipalities
- Topography



## Scope and Summary

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Water resources evaluation planned for the EKC GWMA during 2005-2007.

Conduct a groundwater level survey of a subset of wells previously used by the United States Geological Survey (USGS) in a study of the region in 1990 (Turney, 1995).

- unincorporated areas of the EKC GWMA.
- screened in the uppermost hydrologic units
- water level elevations only

Water levels were measured in 45 wells in early November 2005.

Water levels in most groundwater wells were either about the same or on average up to five feet lower than in 1990.

The differences in water levels are possibly due to lower precipitation in recent years.



## Activities

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Based on a review of critical areas, shallow hydrologic units, decisions from the former EKC GWMA committee, and management plan, wells chosen for the study were screened in the uppermost aquifers;

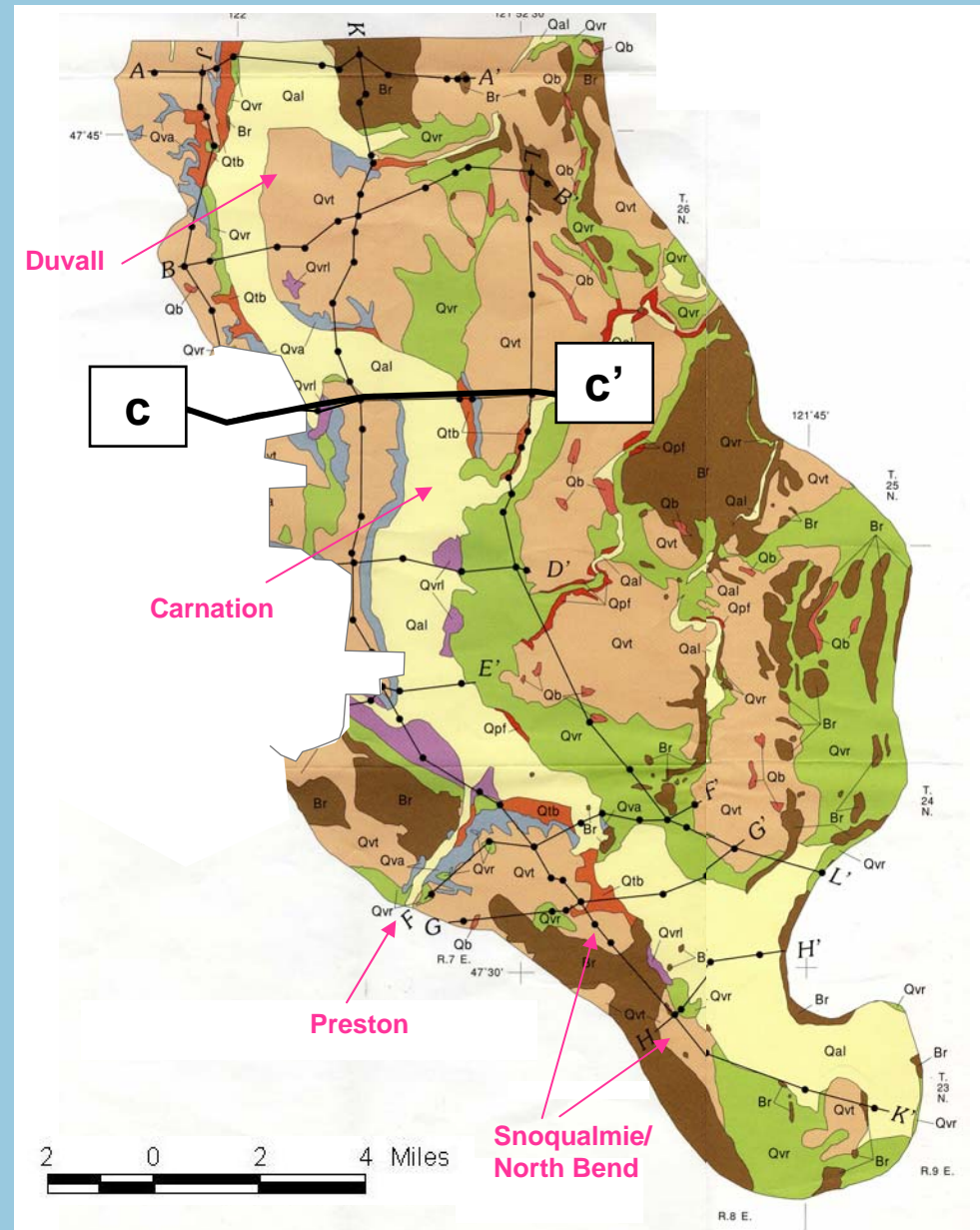
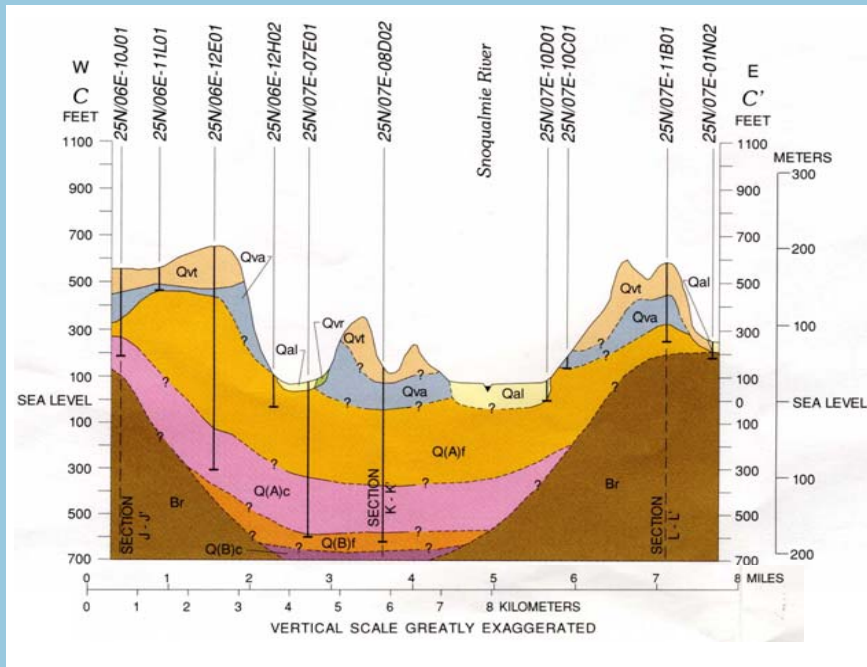
- 💧 Alluvium (Qal)
- 💧 Vashon Recessional Outwash (Qvr)
- 💧 Vashon Advance Outwash (Qva)

### TASKS

- Choose well locations for survey
- Identify well owners and obtain permission
- Prepare materials & coordinate field logistics
- Field reconnaissance
- Conduct water level survey
- Update EQulS database
- Prepare water level contour maps
- Prepare technical memo
- Send results to participants
- Post report on KC web page

# Geologic Setting

Qal	Alluvium
Qvr	Vashon recessional outwash
Qva	Vashon advance outwash



## Well Access

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Total used in USGS study	231
Declined, inconvenienced	-18
Declined, unhappy with KC	-13
No response	-45
Change in well, could not use	-19
Backups for study wells	-91
Total for this study	45

### TASKS

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# Public Feedback

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## Reasons for lack of participation

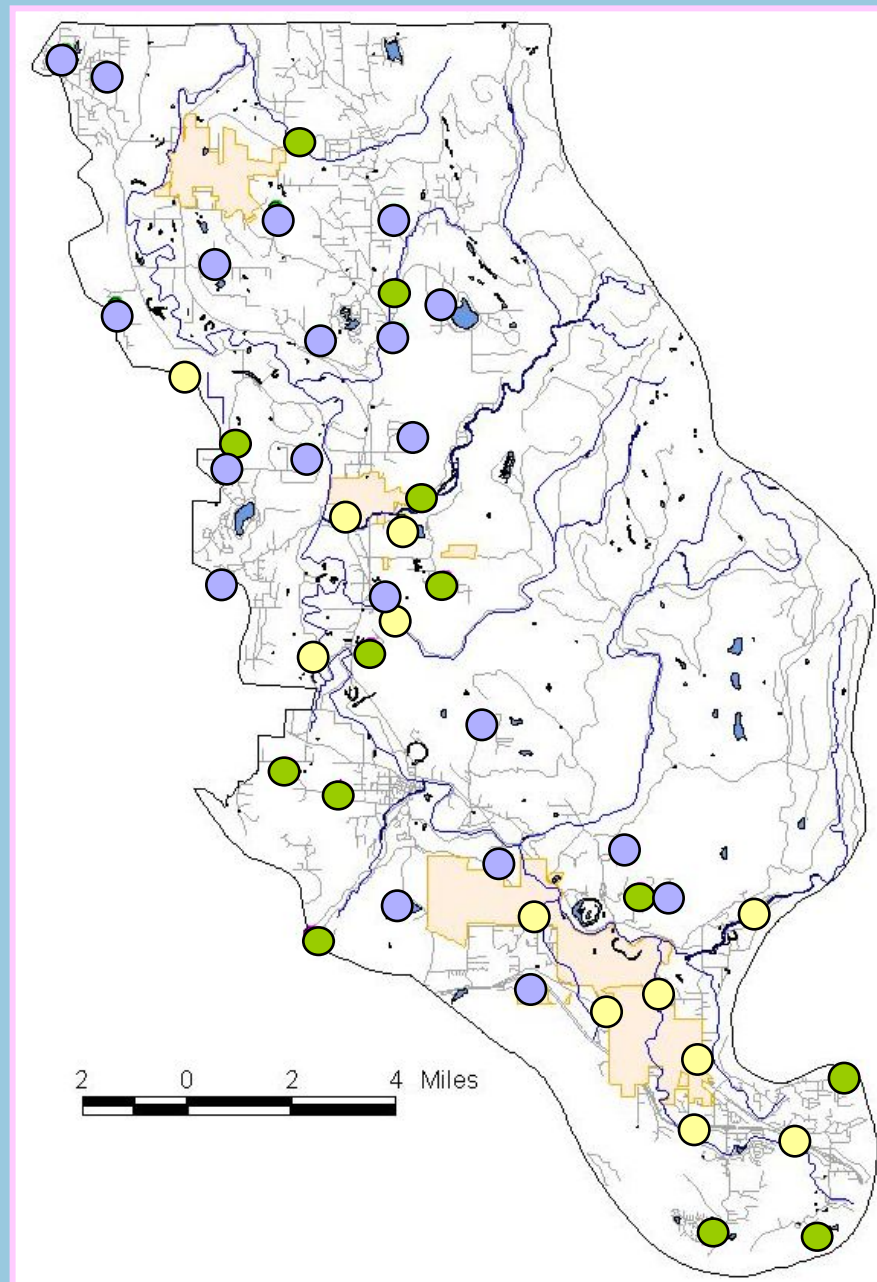
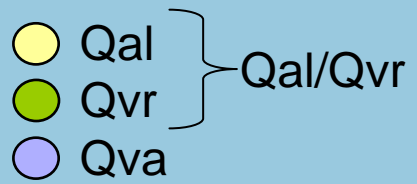
- Rumors about plans to reduce private landowner rights to water
- Misinformation about a planned groundwater fee on private well use
- Security
- KC may use data to support an agenda that does not benefit EKC residents
- Lack of response by KC
- Misunderstanding of hydrogeologic processes
- Misunderstanding of pumping affects on drinking water quality

## Common concerns

- 💧 Water quantity reductions in streams, lakes, and near water supply wells
- 💧 Contamination from nearby landfills, sewage waste, and iron concentrations

# Well Locations

Wells screened in:



# Field Work

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- Field reconnaissance
- GPS measurements
- Field Activities Plan
- Water level measurements

## TASKS

- Choose well locations for survey
- Identify well owners and obtain permission
- Prepare materials & coordinate field logistics
- Field reconnaissance
- Conduct water level survey
- Update EQuIS database
- Prepare water level contour maps
- Prepare technical memo
- Send results to participants
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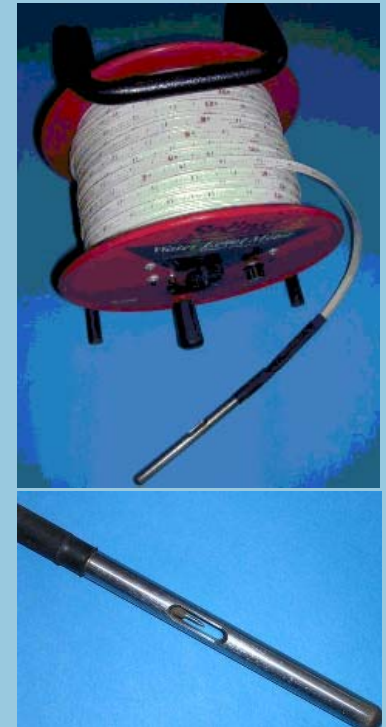
# Wellhead Housing



# Wellhead Access & Water Level Measurements



Sounder



# Post- Fieldwork Data Processing

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## **Data Check / Analysis**

Compared to previous results

## **Mapping**

Many sites located with GPS/Trimble equipment

## **EQuIS Database**

Water level data entered into the EQuIS database tables

Corrections

Updates made to addresses and owner names

## **Reporting**

Results letter report to owners

Internal report

Letter report to web site

### **TASKS**

- Choose well locations for survey
- Identify well owners and obtain permission
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# Water Level Elevation Differences; 1990 to 2005

## Alluvium (Qal) & Vashon Recessional Outwash (Qvr) Aquifer

Local Well ID Number	USGS 1990 STUDY	EKC 2005 STUDY		Difference (feet)*
	Groundwater Elevation (feet, MSL)	Pump Status	Groundwater Elevation (feet, MSL)	
23N/08E-04H01	410.86	Recovering	410.92	0.06
23N/08E-05K02	425.04	Recovering	425.20	0.16
23N/08E-10F03	444.79	Recovering	440.61	-4.18
23N/08E-13N01	519.99	Static	517.61	-2.38
23N/08E-15P01	464.52	Recovering	463.89	-0.63
23N/08E-25R01	731.75	Static	743.34	11.59
23N/08E-27R01	908.69	Static	915.72	7.03
23N/09E-07P01	772.27	Static	762.37	-9.90
24N/07E-16F01	115.35	Recovering	113.21	-2.14
24N/07E-17B01	191.43	Static	187.80	-3.63
24N/07E-33D01	487.56	Recovering	486.00	-1.56
24N/08E-26K01	437.19	Static	430.81	-6.38
24N/08E-28E02	700.70	Static	696.36	-4.34
24N/08E-30N01	441.45	Static	440.50	-0.95
25N/06E-01F01	64.28	Static	64.32	0.04
25N/07E-07P01	102.60	Static	100.60	-2.00
25N/07E-15R02	160.65	Static	144.7**	-15.95
25N/07E-21C01	59.73	Static	62.30	2.57
25N/07E-22G01	80.14	Static	83.49	3.35
25N/07E-26F01	312.08	Static	312.00	-0.08
25N/07E-33N01	43.08	Static	45.38	2.30
25N/07E-34C01	92.47	Static	91.00	-1.47
25N/07E-34N01	85.09	Static	77.30	-7.79
26N/07E-17B01	nm	Static	24.50	na
26N/07E-27P01	305.74	Static	305.60	-0.14

# Hydrogeologic Results

## Alluvium (Qal) & Vashon Recessional Outwash (Qvr) Aquifer

### Decreases in water level

Water levels decreased in 16 of the 25 wells.

4 of those wells showed significant decreases:

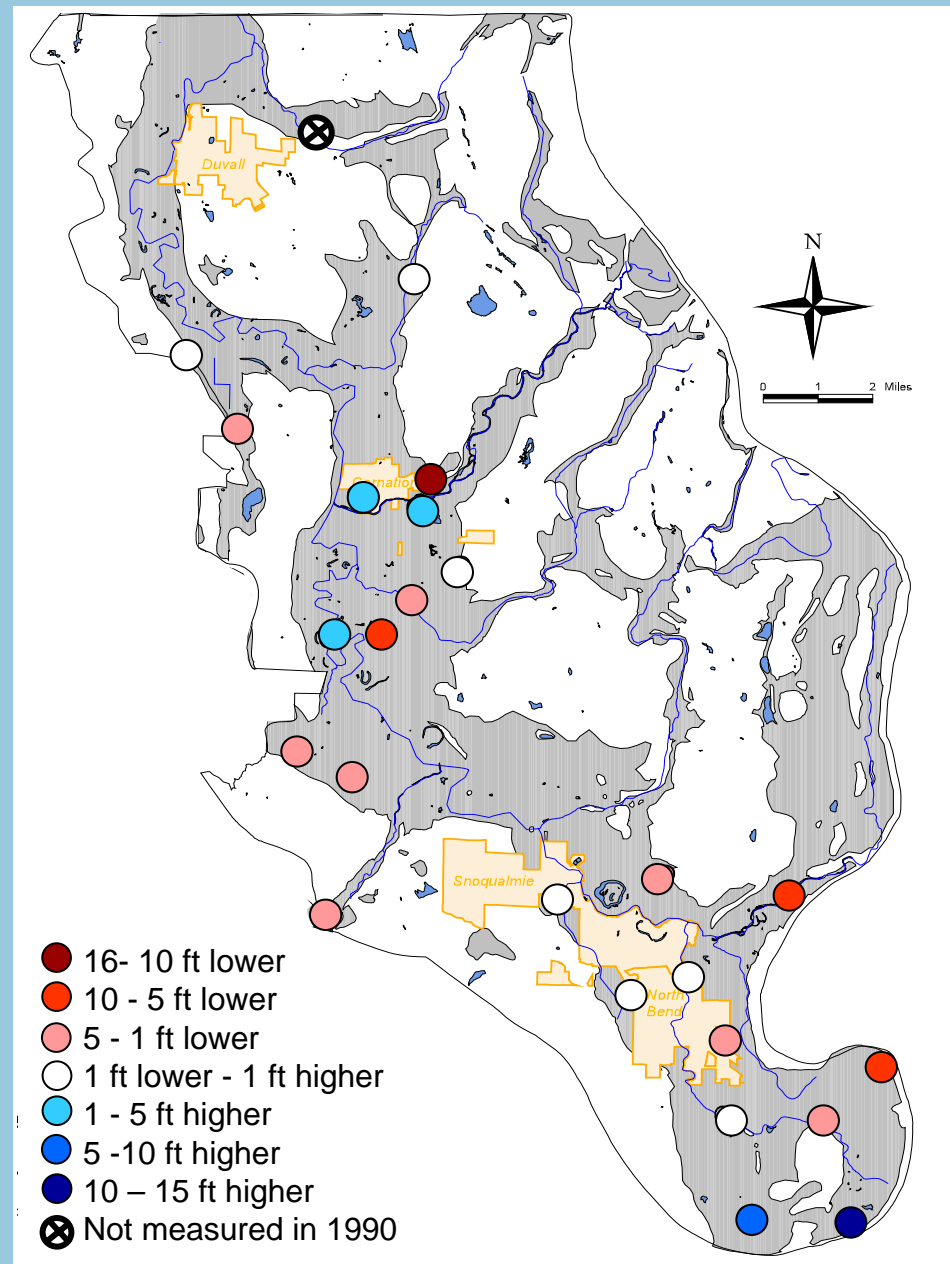
- ◆ Two wells near the SE boundary; 9.9 and 6.38 ft lower levels.
- ◆ Griffin Creek well, near Carnation; 7.79 ft drop in water level.
- ◆ Hilltop well near Carnation; 15.95 ft drop in water level.

### Increases in water level

Water levels increased in 8 of the 25 wells.

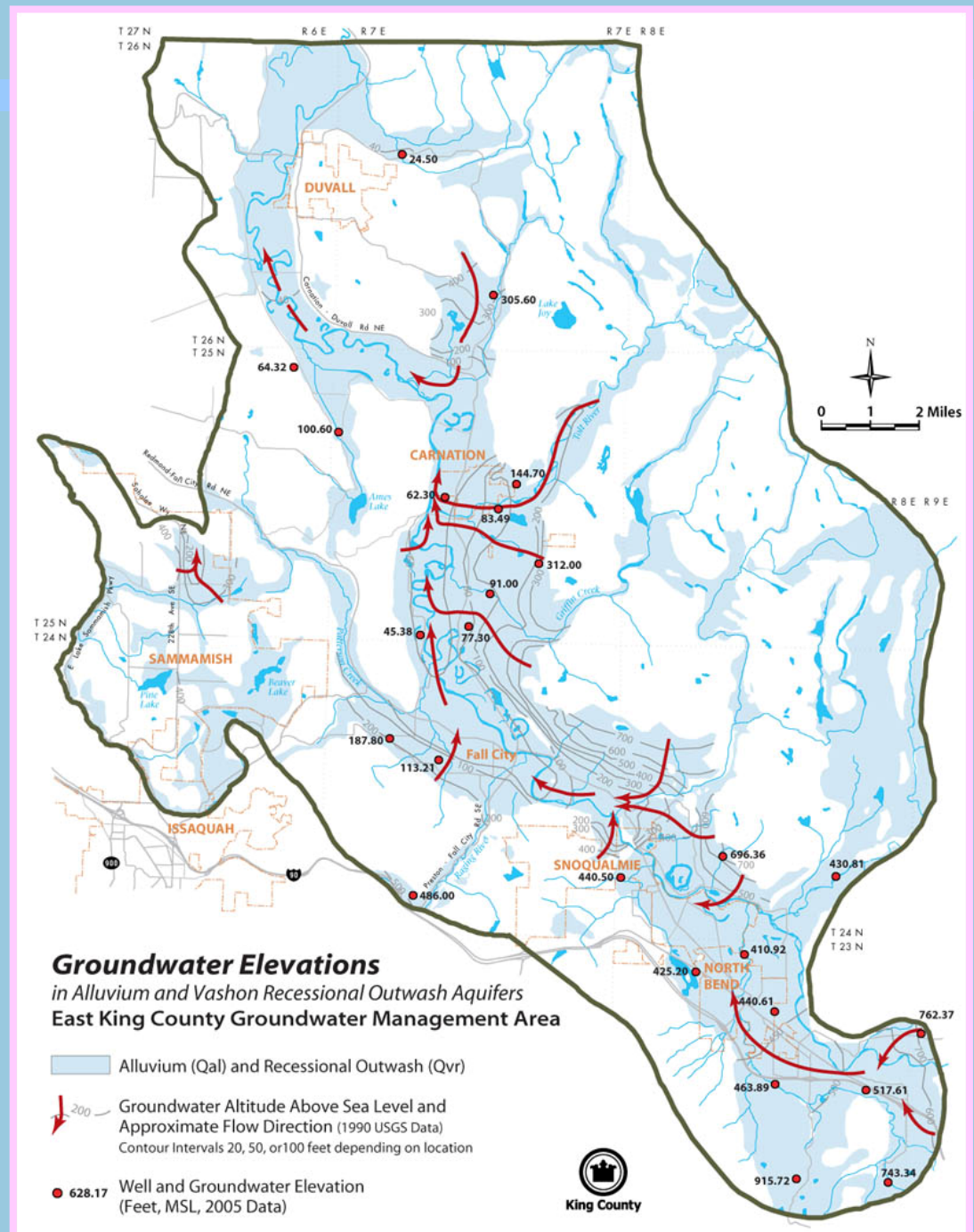
2 of those wells showed significant increases:

- ◆ Grounding well in the Wilderness Rim Development; 7.03 ft higher water level.
- ◆ Residential well near Chester Morse Lake; 11.59 ft higher water level.



# Geohydrologic Map; 1990 & 2005

Alluvium (Qal) &  
Vashon Recessional  
Outwash (Qvr ) Aquifer



# Water Level Elevation Differences; 1990 to 2005

## Vashon Advance Outwash (Qva) Aquifer

	USGS 1990 STUDY	EKC 2005 STUDY		
Local Well ID Number	Groundwater Elevation (feet, MSL)	Pump Status	Groundwater Elevation (feet, MSL)	Difference (feet)*
23N/08E-06F01	964.32	Static	961.13	-3.20
24N/07E-12E01	718.04	Static	713.25	-4.79
24N/07E-24Q01	288.33	Static	284.70	-3.63
24N/07E-27J01	631.69	Recovering	628.17	-3.52
24N/08E-20J01	562.98	Static	562.61	-0.37
24N/08E-28H01	801.07	Recovering	797.00	-4.07
25N/07E-10J01	350.80	Static	349.35	-1.45
25N/07E-17A01	210.78	Static	210.30	-0.48
25N/07E-18C01	167.20	Static	166.74	-0.46
25N/07E-27M01	125.46	Static	124.24	-1.22
25N/07E-30M01	109.87	Recovering	110.12	0.25
26N/06E-04J01	434.79	Static	439.93	5.14
26N/06E-10A01	372.77	Static	371.15	-1.62
26N/06E-25H01	218.75	Static	216.28	-2.47
26N/06E-35E01	nm	Nearby pumping well	410.76	na
26N/07E-20E01	253.39	Static	251.50	-1.89
26N/07E-22D01	473.32	Static	473.81	0.49
26N/07E-32J01	356.40	Recovering	347.50	-8.90
26N/07E-34L01	340.05	Recovering	339.25	-0.80
26N/07E-35D01	492.25	Static	489.26	-2.99

# Hydrogeologic Results; 1990 to 2005

## Vashon Advance Outwash (Qva) Aquifer

### Decreases in water level

Water levels decreased in 17 of the 20 wells.

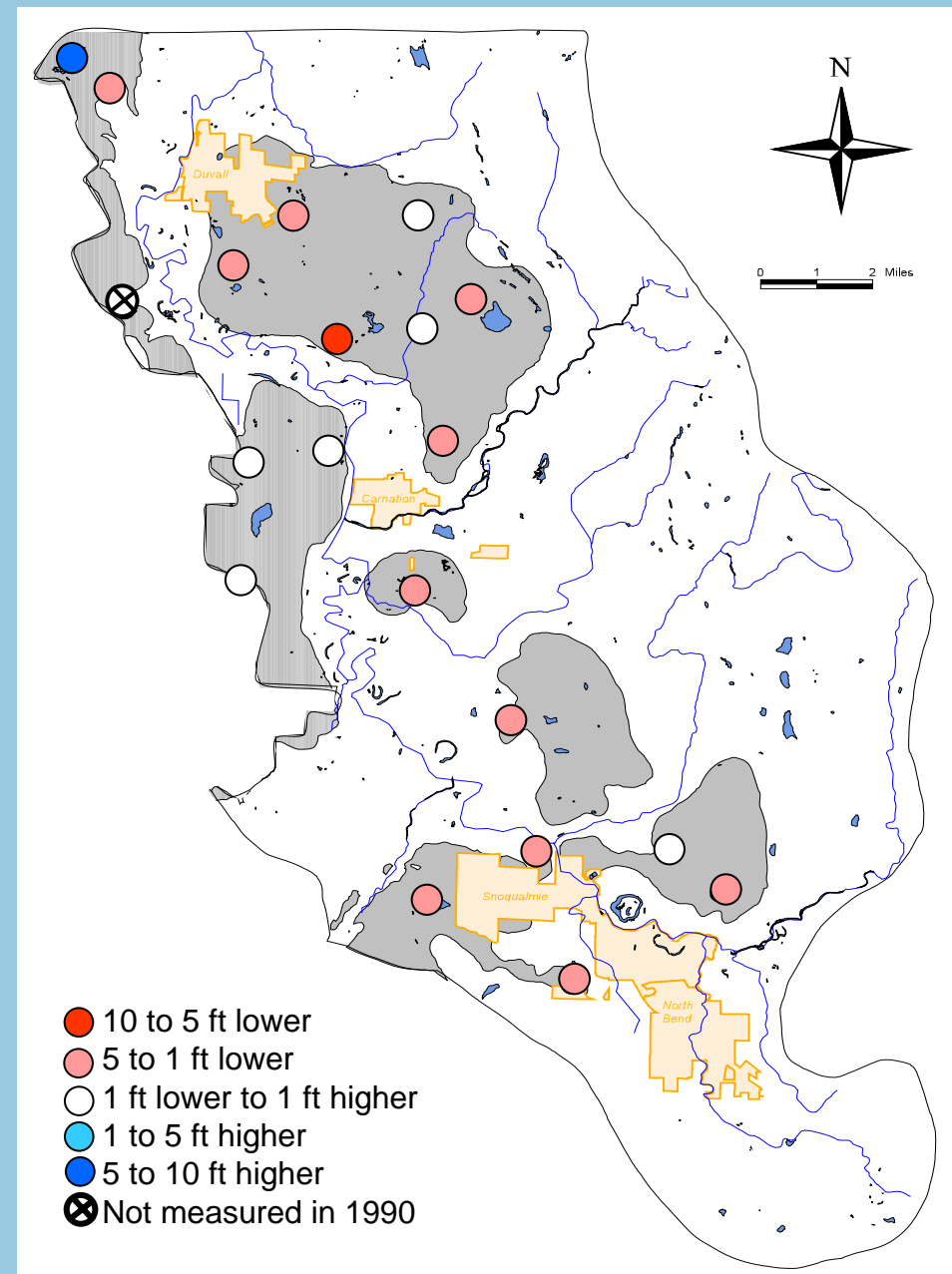
- Recovering well between Carnation and Duvall; 8.9 ft lower water level.
- Snoqualmie park adjacent to I-90; 3.2 ft lower water level.

### Increases in water level

Water levels increased in 3 of the 20 wells.

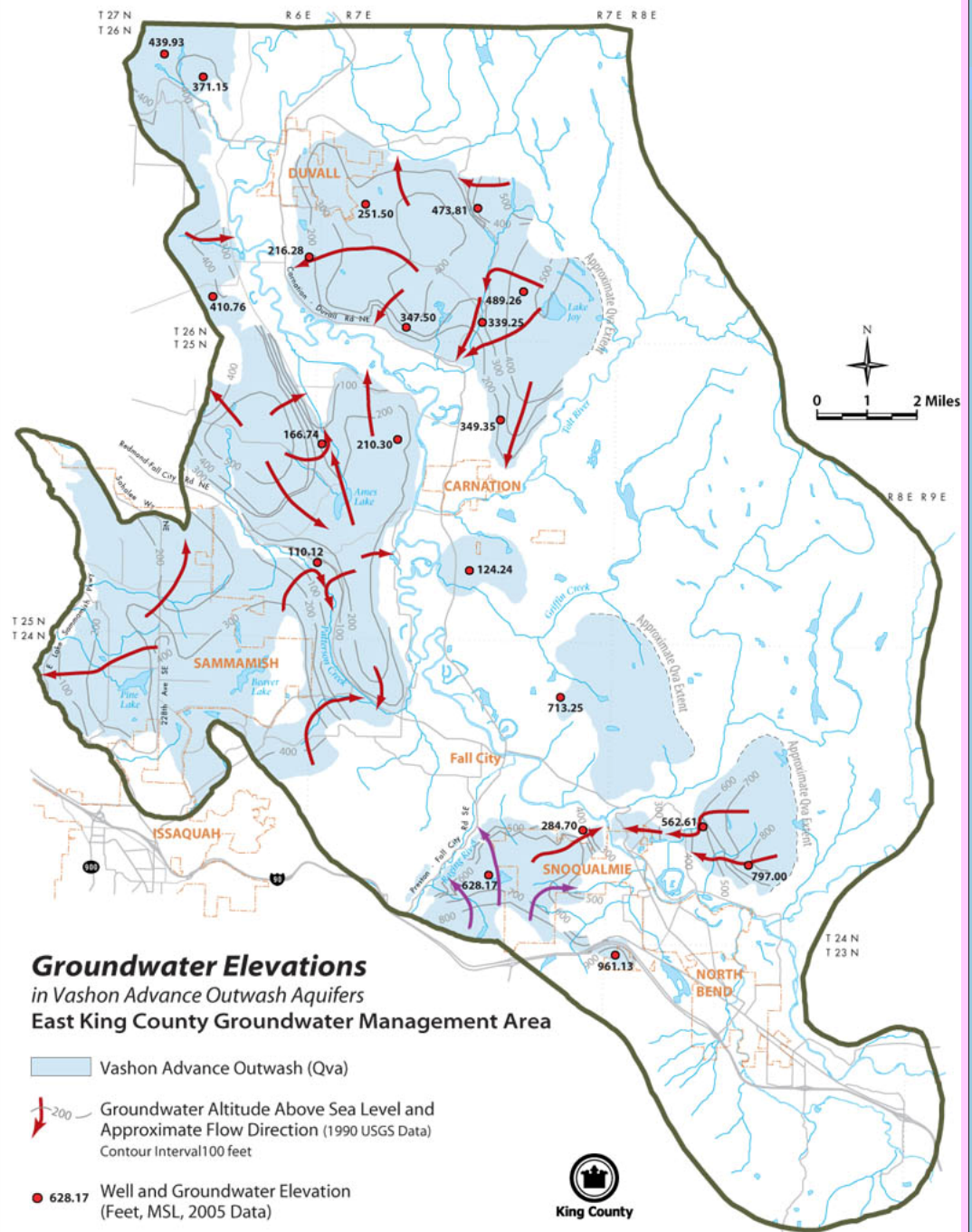
Only 1 of those wells showed significant increase.

- A well in the Woodinville area had a 5.14 ft higher water level.



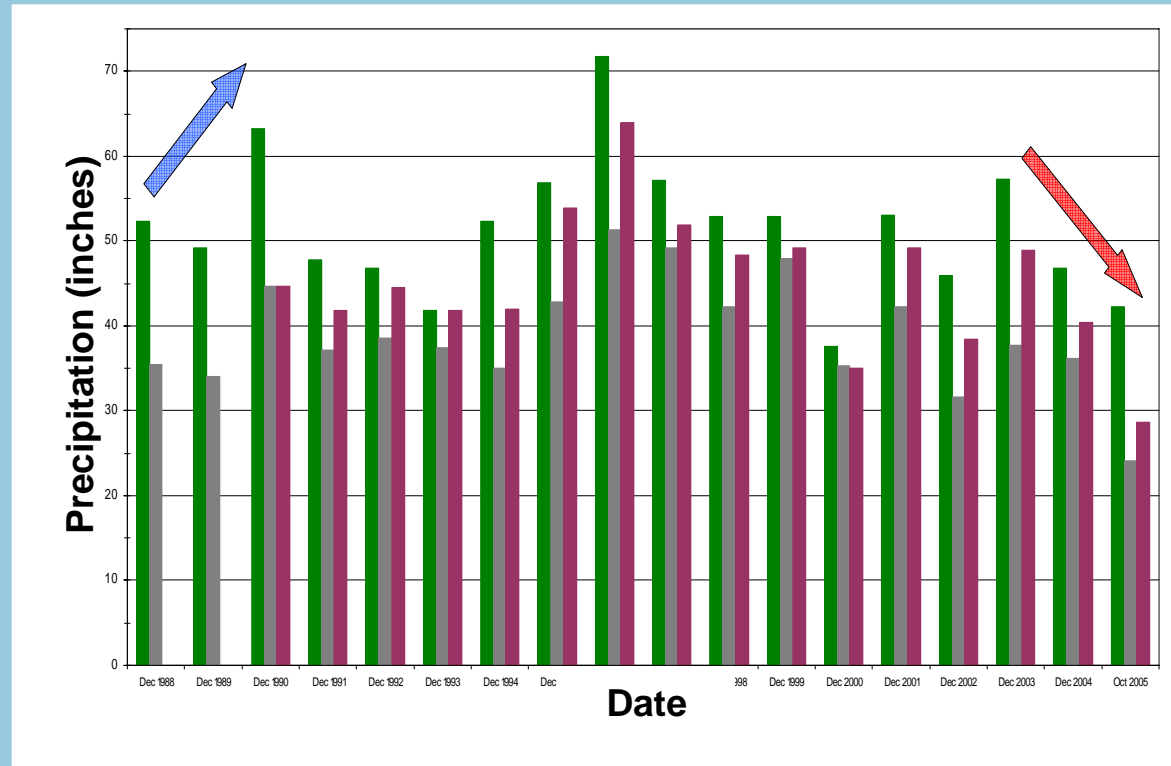
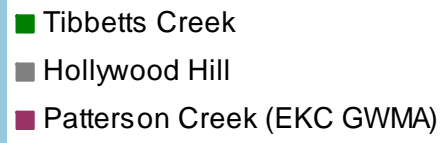
# Geohydrologic Map; 1990 & 2005

## Vashon Advance Outwash Aquifer (Qva)



## Reasons for Observed Differences

- ◆ During the three year time period prior to 1990, annual precipitation increased. Annual precipitation has been decreasing since 1996.



- ◆ Measurements in 2005 were all taken within a 3 day period. The USGS measurements were taken between May and December 1990.
- ◆ Increased development in the EKC GWMA.

## Summary

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- Water levels measured in 45 wells in early November 2005.
- Water levels were either about the same or on average up to five feet lower than in 1990.
- The differences in water levels between 1990 and 2005 are possibly due to lower precipitation in recent years.
- Increased activity in the past 15 years. Landowners reported adding wells, replacing wells, moving to water districts, or deepening wells.



## Comments

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- Benchmark of the present day health of the aquifer
- Water resources evaluation
- Improve education of the public regarding KC policies and groundwater concepts
- Build a more trusting relationship between the KC council and the EKC public

