
East King County Groundwater Level Survey Fall 2005

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King County

Department of Natural Resources and Parks
Water and Land Resources Division

Science Section

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Department of Natural Resources and Parks

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EXECUTIVE SUMMARY

A water resources evaluation was conducted for the East King County Groundwater Management Area (EKC GWMA). The scope of the evaluation was to 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 et al, 1995). Wells screened in the uppermost hydrologic units, Alluvium (Qal), Vashon Advance Outwash (Qva), and Vashon Recessional Outwash (Qvr) aquifers, were the focus of this study. Water levels were measured in 45 wells in early November 2005. The data set collected was compared with the results reported in the USGS report. Water levels in most groundwater wells were either about the same or on average up to five feet lower. The differences in water levels are possibly due to lower precipitation in recent years.

ACTIVITIES

Based on a review of critical areas, shallow hydrologic units, decisions from the former EKC GWMA committee, and management plan, wells were chosen for the study that are screened in the uppermost aquifers; Alluvium (Qva), Vashon Advance Outwash (Qva) and Recessional Outwash (Qvr) aquifers. An extensive search to contact landowners through letters and phone calls was conducted. Figure 1 shows the locations of the wells used in this study.

Permission to enter property and measure water levels was obtained from landowners. A field reconnaissance was conducted in order to meet landowners, evaluate wellhead access requirements, and plan logistics for the final field event. During the final field event, water levels were measured in 45 wells over a period of three days.

HYDROGEOLOGIC RESULTS

Due to the hydrologic connection between Qal and Qvr, these units are considered as one aquifer for this study. Figures 2 and 3 show the geohydrologic maps for each aquifer from the USGS report. These figures show the groundwater flow directions and areal distribution of the aquifer. Elevations of water levels measured in 2005 are posted at each well location. Water levels in most groundwater wells were either about the same or lower by about one to five feet. Table 1 lists the wells in each aquifer, the measured water levels in 1990 and 2005, and differences in water levels at each well over that time period.

Vashon Advance Outwash (Qva) Aquifer

Out of the 20 wells screened in the Qva only one well (26N/06E-04J01) showed a noticeably higher water level. This well was located in the Woodinville area and had a 5.14 ft higher water level (Table 1). The well is located near and east of the Aspenwood Development where homes are supplied with water from the Tolt Reservoir, via the Woodinville Water District. Water is discharged to the local aquifer through private septic systems. This may be a contributing factor to higher water levels since the development was built in the mid-1990s.

Of the remaining 19 wells, the differences were mostly one to five feet lower, with one well (26N/07E-32J01) showing an 8.9 ft lower water level (Table 1). One well (23N/08E-06F01) located in a city park adjacent to Interstate 90 had a 3.2 ft lower water level (Table 1). This well is no longer used and the former vineyard and winery has since been turned into a park. It is likely that the differences seen here are not due to local effects such as pumping of nearby wells.

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

Out of the 25 wells screened in the Qal and Qvr only two indicated a significantly higher water level. These wells (23N/08E-25R01 and 23N/08E-27R01) are located southeast of North Bend, in an area affected by seepage from the City of Seattle watershed (Chester Morse Lake). Well 23N/08E-27R01, having a 7.03 ft higher water level, is a grounding well surrounded by homes that are serviced by a local water supplier (Table 1). The other well (23N/08E-25R01) is a residential well and had an 11.59 ft higher water level (Table 1). There were three more wells with water levels between two and four feet higher. These were located near Carnation (25N/07E-21C01 and 25N/07E-22G01) and southwest of Carnation, near the Snoqualmie River (25N/07E-33N01).

Of the remaining wells, there were four having significantly lower water levels than in 1990. Wells 23N/09E-07P01 and 24N/08E-26K01 are located near the southeastern boundary of the EKC GWMA and showed 9.9 and 6.38 ft lower water levels, respectively (Table 1). Wells 25N/07E-34N01 and 25N/07E-15R02 showed 7.79 and 15.95 ft lower water levels, respectively (Table 1). Well 25N/07E-34N01 is located near Griffin Creek, south of Carnation. Well 25N/07E-15R02 is located on a hilltop, east of Carnation, and had been deepened 50 ft between 1990 and 2005. Since there is a marked difference in water levels (15.95 ft lower) in this well, it is possible that this well represents groundwater in the upper fine grained unit (Q(A)f); the hydrologic unit beneath Qvr. When compared to the geohydrologic maps for Q(A)f, Qal and Qvr in the USGS report, this water level is within the expected range for that time period for all aquifers.

DISCUSSION

One of the reasons for lower water levels may be due to annual precipitation. During the three year time period prior to 1990, annual precipitation in the area within and near EKC GWMA increased. Conversely, annual precipitation has been decreasing since 1996. It is likely that this has contributed to the lower water levels measured during this study.

Another possible reason for this general decline in water levels may include increased development in the EKC GWMA. As evidenced by ongoing construction and recently built housing, it was apparent that the EKC GWMA has seen residential and commercial development in the last 15 years. Many land parcels had been subdivided. Landowners reported adding wells, replacing wells, moving to water districts, or deepening wells.

Because of the funding limitations, KC will have minimal involvement in coordinating and investigating groundwater in the EKC GWMA during at least the next few years. This evaluation provides a benchmark to allow some consideration of the present day health of the

aquifer, until the Groundwater Protection Program can again study the resource more comprehensively.

REFERENCES

Turney, G. L., Kahle, S. C., and N. P. Nixon, 1995, Geohydrology and Ground-Water Quality of East King County, Washington: U. S. Geological Survey Water-Resources Investigations Report 94-4082, 123 p.

TABLE 1

GROUNDWATER LEVELS

Local Well Identification Number	USGS 1990 STUDY	KING COUNTY FALL 2005 STUDY			Groundwater Elevation (feet, MSL)	Difference (feet)*
	Groundwater Elevation (feet, MSL)	Date	Time	Pump Status		
VASHON ADVANCE OUTWASH (Qva) AQUIFER						
23N/08E-06F01	964.32	11/08/05	12:20	Static	961.13	-3.20
24N/07E-12E01	718.04	11/08/05	15:30	Static	713.25	-4.79
24N/07E-24Q01	288.33	11/08/05	12:50	Static	284.70	-3.63
24N/07E-27J01	631.69	11/10/05	10:30	Recovering	628.17	-3.52
24N/08E-20J01	562.98	11/08/05	09:35	Static	562.61	-0.37
24N/08E-28H01	801.07	11/08/05	09:00	Recovering	797.00	-4.07
25N/07E-10J01	350.80	11/09/05	11:50	Static	349.35	-1.45
25N/07E-17A01	210.78	11/09/05	15:21	Static	210.30	-0.48
25N/07E-18C01	167.20	11/08/05	11:55	Static	166.74	-0.46
25N/07E-27M01	125.46	11/09/05	09:40	Static	124.24	-1.22
25N/07E-30M01	109.87	11/08/05	12:30	Recovering	110.12	0.25
26N/06E-04J01	434.79	11/09/05	08:00	Static	439.93	5.14
26N/06E-10A01	372.77	11/09/05	08:25	Static	371.15	-1.62
26N/06E-25H01	218.75	11/09/05	09:15	Static	216.28	-2.47
26N/06E-35E01	nm	11/09/05	14:10	Nearby pumping well	410.76	na
26N/07E-20E01	253.39	11/09/05	09:49	Static	251.50	-1.89
26N/07E-22D01	473.32	11/09/05	10:05	Static	473.81	0.49
26N/07E-32J01	356.40	11/09/05	17:05	Recovering	347.50	-8.90
26N/07E-34L01	340.05	11/10/05	11:10	Recovering	339.25	-0.80
26N/07E-35D01	492.25	11/09/05	10:40	Static	489.26	-2.99
ALLUVIUM (Qal) AND VASHON RECESSAL OUTWASH (Qvr) AQUIFERS						
23N/08E-04H01	410.86	11/08/05	10:11	Recovering	410.92	0.06
23N/08E-05K02	425.04	11/08/05	09:31	Recovering	425.20	0.16
23N/08E-10F03	444.79	11/08/05	10:00	Recovering	440.61	-4.18
23N/08E-13N01	519.99	11/08/05	12:00	Static	517.61	-2.38
23N/08E-15P01	464.52	11/08/05	08:05	Recovering	463.89	-0.63
23N/08E-25R01	731.75	11/08/05	07:50	Static	743.34	11.59
23N/08E-27R01	908.69	11/08/05	09:30	Static	915.72	7.03
23N/09E-07P01	772.27	11/08/05	09:55	Static	762.37	-9.90
24N/07E-16F01	115.35	11/10/05	13:18	Recovering	113.21	-2.14
24N/07E-17B01	191.43	11/09/05	12:30	Static	187.80	-3.63
24N/07E-33D01	487.56	11/09/05	12:45	Recovering	486.00	-1.56
24N/08E-26K01	437.19	11/08/05	09:57	Static	430.81	-6.38
24N/08E-28E02	700.70	11/08/05	08:45	Static	696.36	-4.34
24N/08E-30N01	441.45	11/09/05	11:45	Static	440.50	-0.95
25N/06E-01F01	64.28	11/09/05	09:01	Static	64.32	0.04
25N/07E-07P01	102.60	11/08/05	12:05	Static	100.60	-2.00
25N/07E-15R02	160.65	11/09/05	15:30	Static	144.7**	-15.95
25N/07E-21C01	59.73	11/08/05	11:00	Static	62.30	2.57
25N/07E-22G01	80.14	11/09/05	10:10	Static	83.49	3.35
25N/07E-26F01	312.08	11/08/05	16:35	Static	312.00	-0.08
25N/07E-33N01	43.08	11/10/05	08:13	Static	45.38	2.30
25N/07E-34C01	92.47	11/08/05	10:45	Static	91.00	-1.47
25N/07E-34N01	85.09	11/08/05	12:50	Static	77.30	-7.79
26N/07E-17B01	nm	11/09/05	08:50	Static	24.50	na
26N/07E-27P01	305.74	11/09/05	10:15	Static	305.60	-0.14

Notes

nm not measured
na not applicable

MSL mean sea level
USGS United States Geological Survey

* A negative number indicates a decrease in water level elevation. For example, 23N/09E-07P01 (a well screened in Qal/Qvr) has a -9.9 foot difference. This means that the water levels are 9.9 feet lower then when measured in 1990.

** This well was deepened 50 ft between 1990 and 2005.

Indicates groundwater elevation differences greater than 5 feet less than in 1990.

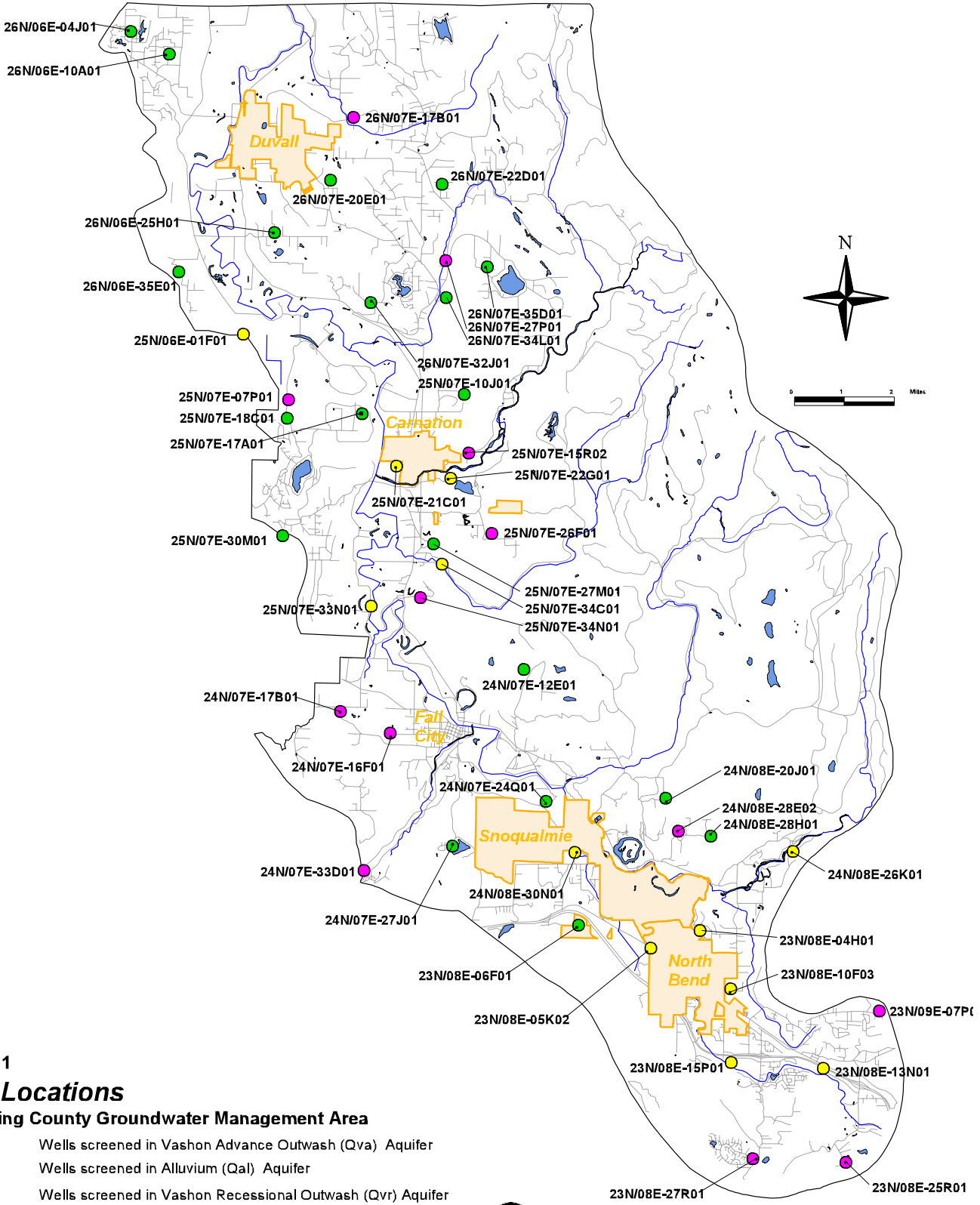


Figure 1
Well Locations

East King County Groundwater Management Area

- Wells screened in Vashon Advance Outwash (Qva) Aquifer
- Wells screened in Alluvium (Qal) Aquifer
- Wells screened in Vashon Recessional Outwash (Qvr) Aquifer
- Lakes
- Rivers
- Roads

Note: Wells screened in the Qal and the Qvr Aquifers are mapped as one hydrologic unit.



T 27 N R 6 E R 7 E R 7 E R 8 E
 T 26 N

Sources:
 "Maps Showing the Quantity and Areal Distribution of Recharge, Altitudes of Water Levels, and Directions of Ground-water Flow in Major Aquifers, East King County, WA, Plate 3(c). From "Geohydrology and Ground-water quality of East King County, WA, by GL Turney, SC Kahle, and NP Dion, 1995, USGS Water Resources Investigations Report 94-4082 (Prepared by US Geological Society in cooperation with the Seattle-King County Department of Public Health); King County Street Network; King County Hydrography

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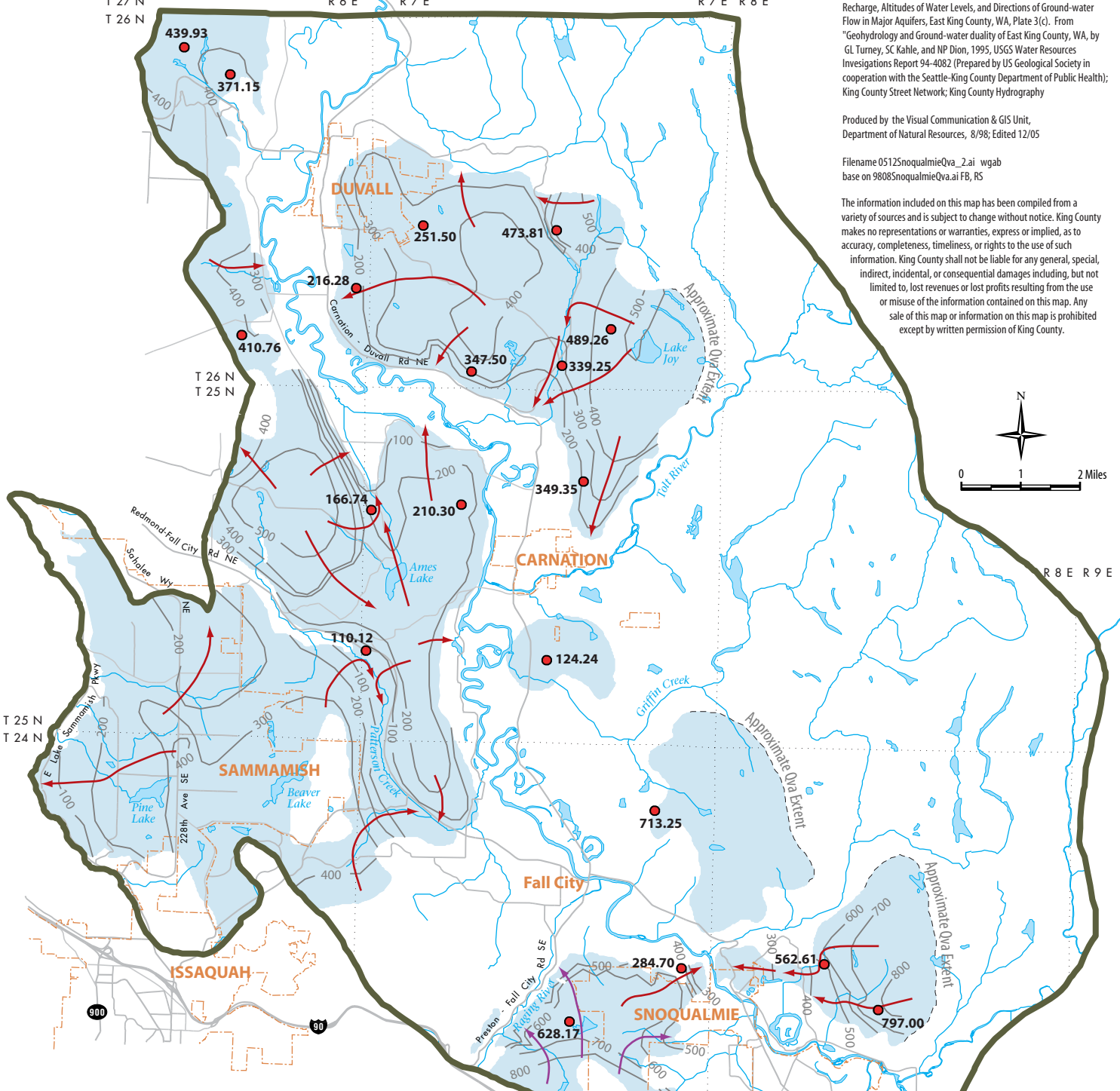


Figure 2
Groundwater Elevations
in Vashon Advance Outwash Aquifers
East King County Groundwater Management Area

- Vashon Advance Outwash (Qva)
- Groundwater Altitude Above Sea Level and Approximate Flow Direction (1990 USGS Data) Contour Interval 100 feet
- 628.17 Well and Groundwater Elevation (Feet, MSL, 2005 Data)



T 27 N R 6 E R 7 E R 7 E R 8 E
 T 26 N

Sources:
 "Maps Showing the Quantity and Areal Distribution of Recharge, Altitudes of Water Levels, and Directions of Ground-water Flow in Major Aquifers, East King County, WA by GL Turney, SC Kahle, and NP Dion, 1995 (Prepared by US Geological Society in cooperation with the Seattle-King County Department of Public Health); King County Street Network; King County Hydrography

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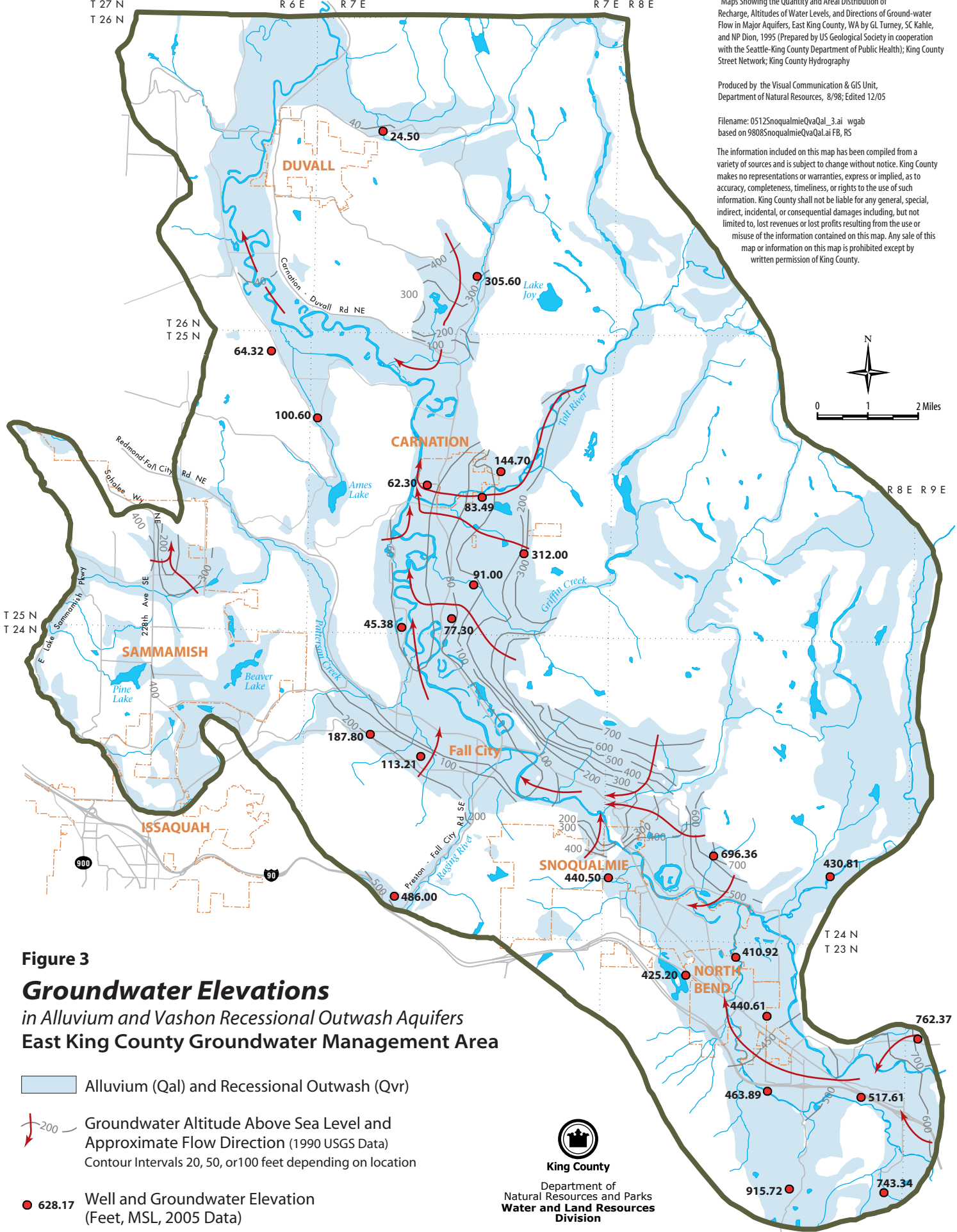


Figure 3
Groundwater Elevations
in Alluvium and Vashon Recessional Outwash Aquifers
East King County Groundwater Management Area

- Alluvium (Qal) and Recessional Outwash (Qvr)
- Groundwater Altitude Above Sea Level and Approximate Flow Direction (1990 USGS Data)
 Contour Intervals 20, 50, or 100 feet depending on location
- 628.17 Well and Groundwater Elevation (Feet, MSL, 2005 Data)

