

# Water Resource Monitoring on Vashon-Maury Island

SCIENCE SEMINAR  
OCTOBER 31, 2007

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October 31, 2007



# Presentation Outline

- WRE Project Review
- Water Resources Monitoring
  - Precipitation
  - Surface water
  - Groundwater
- Modeling
- Web Pages

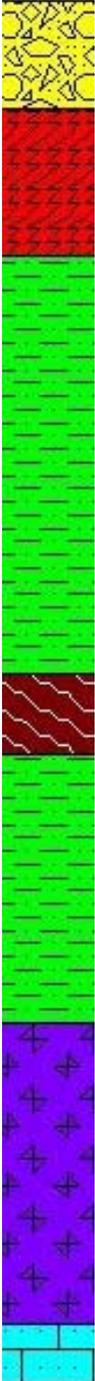
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# Water Resources Evaluation Project Review

- Ongoing project (2004-2010)
- Island-wide water resources characterization
- VMI Sole Source
  - All water used on island comes from ppt.

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# WRE Project Review con't

- Monitoring water resources
- Develop modeling tool to assess possible future scenarios
- Multiple phases
- Cooperation/coordination between county, state, island residents
- Funded by VMI Rural Drainage Program (RDP) fees

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# Water Resource Monitoring

## ■ Precipitation

- 2 historic sites
- 5 ppt sites
  - Map next slide
- 1 site upgrade to a "full" meteorological station
  - precipitation, air temperature, wind speed, wind direction, solar radiation, and % cloud cover

## ■ Important for GW recharge estimates

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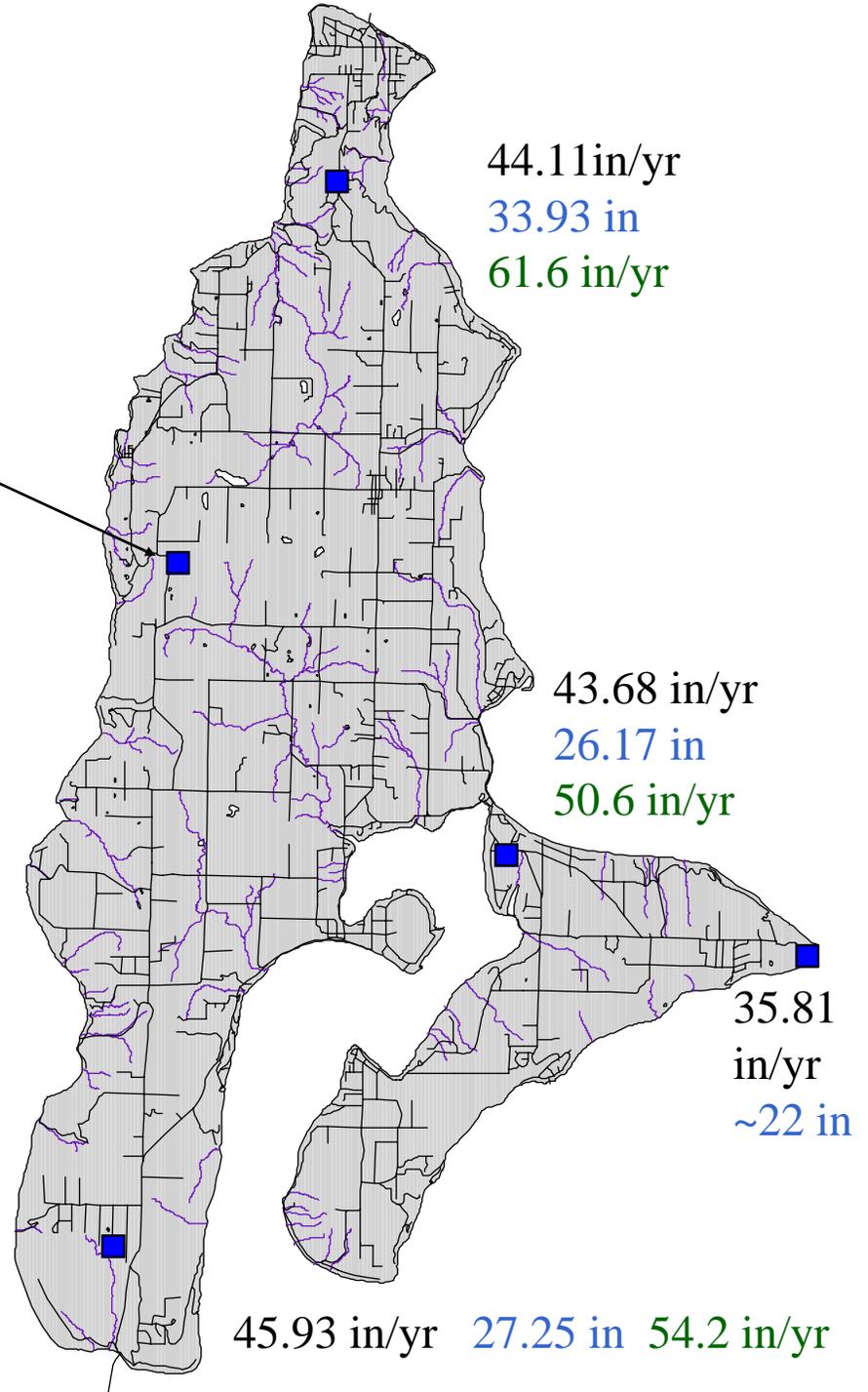
# VMI WRE Precipitation Stations

## 5 – Precipitation (blue)

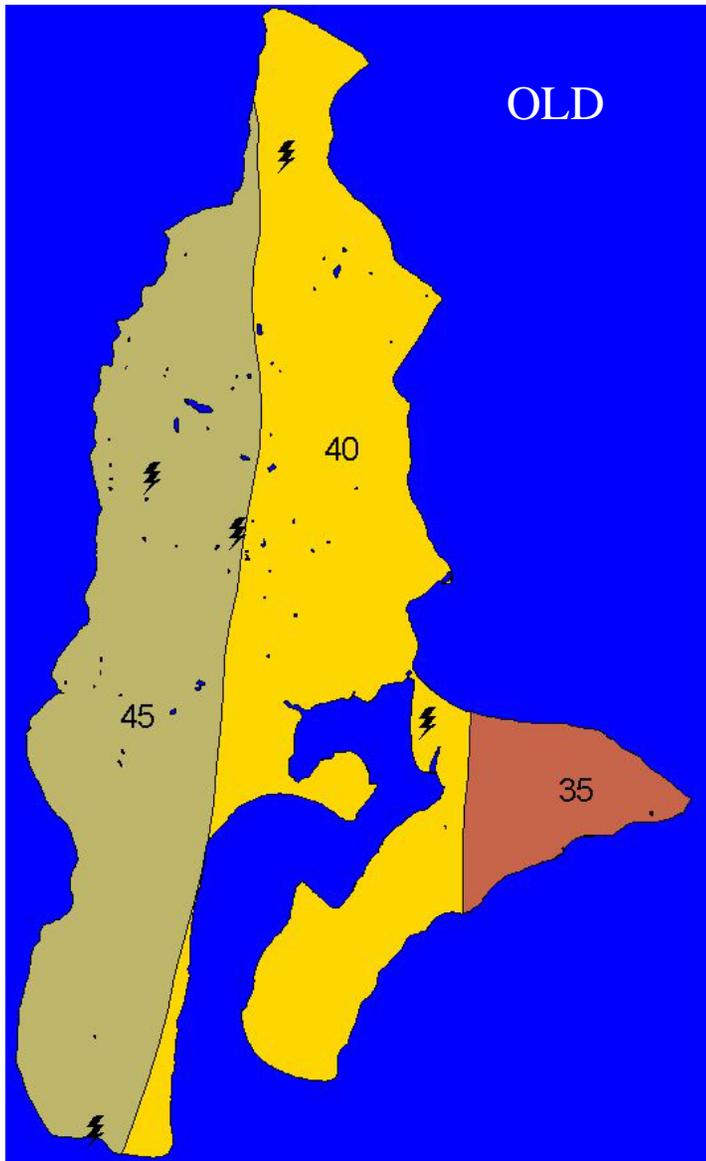
precipitation totals for each site  
2006 Water year (Oct-Sep)  
2007 WY (Oct-Dec)  
2007 WY totals

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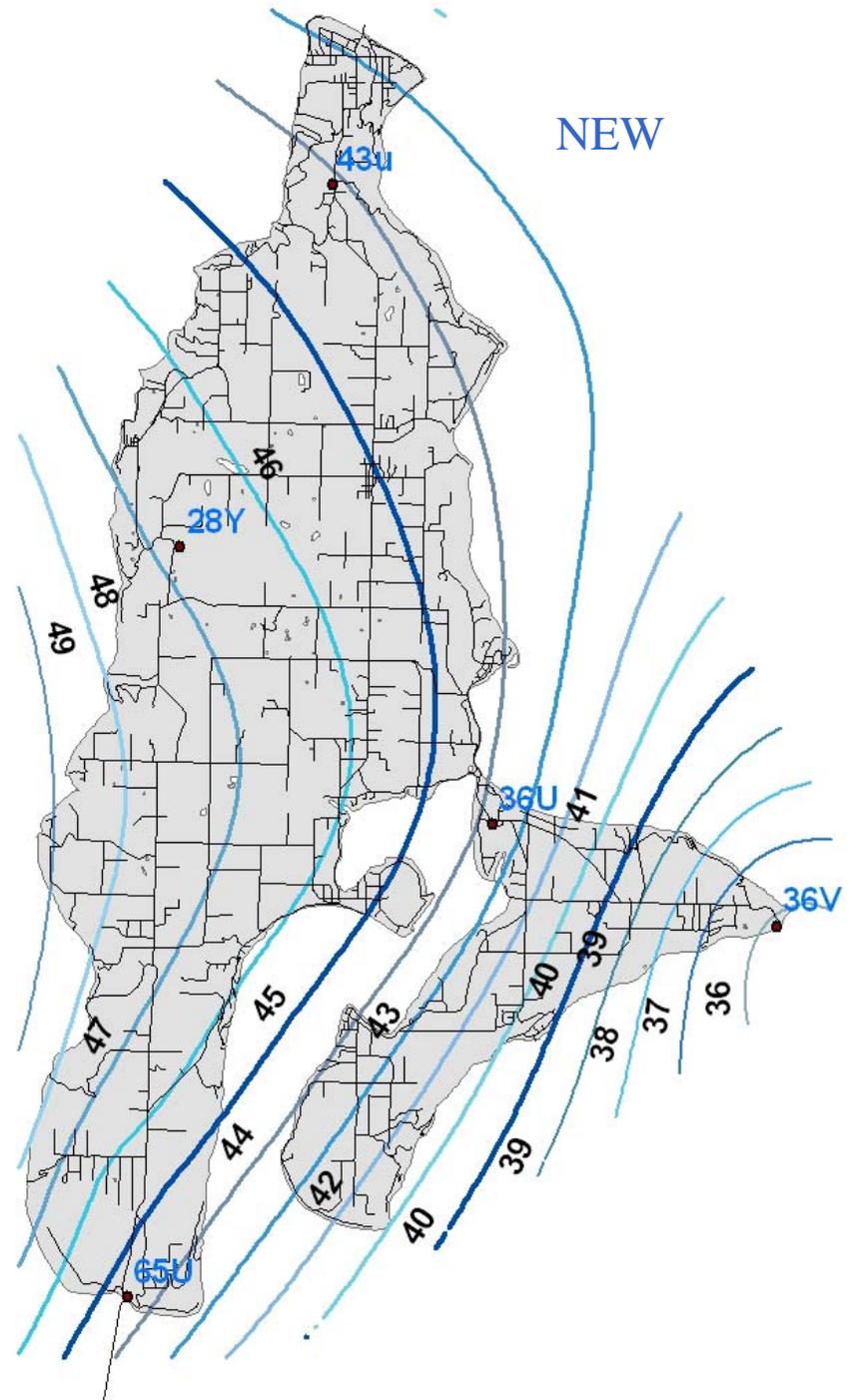
46.78 in/yr  
28.80 in  
54.0 in/yr  
Weather station

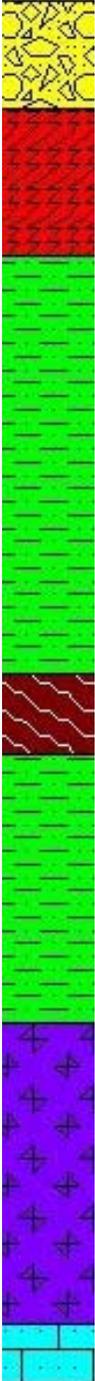


# VMI Rainfall Contours



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# Surface Water Monitoring

## ■ Stream Gaging

- 2 historic sites
- 5 continuous gage sites
  - Map next slide
- 20 + sites Island-wide
  - Measured 2 to 3 annually
  - Baseflow

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# Stream Gauging

Blue = Stream Gage sites

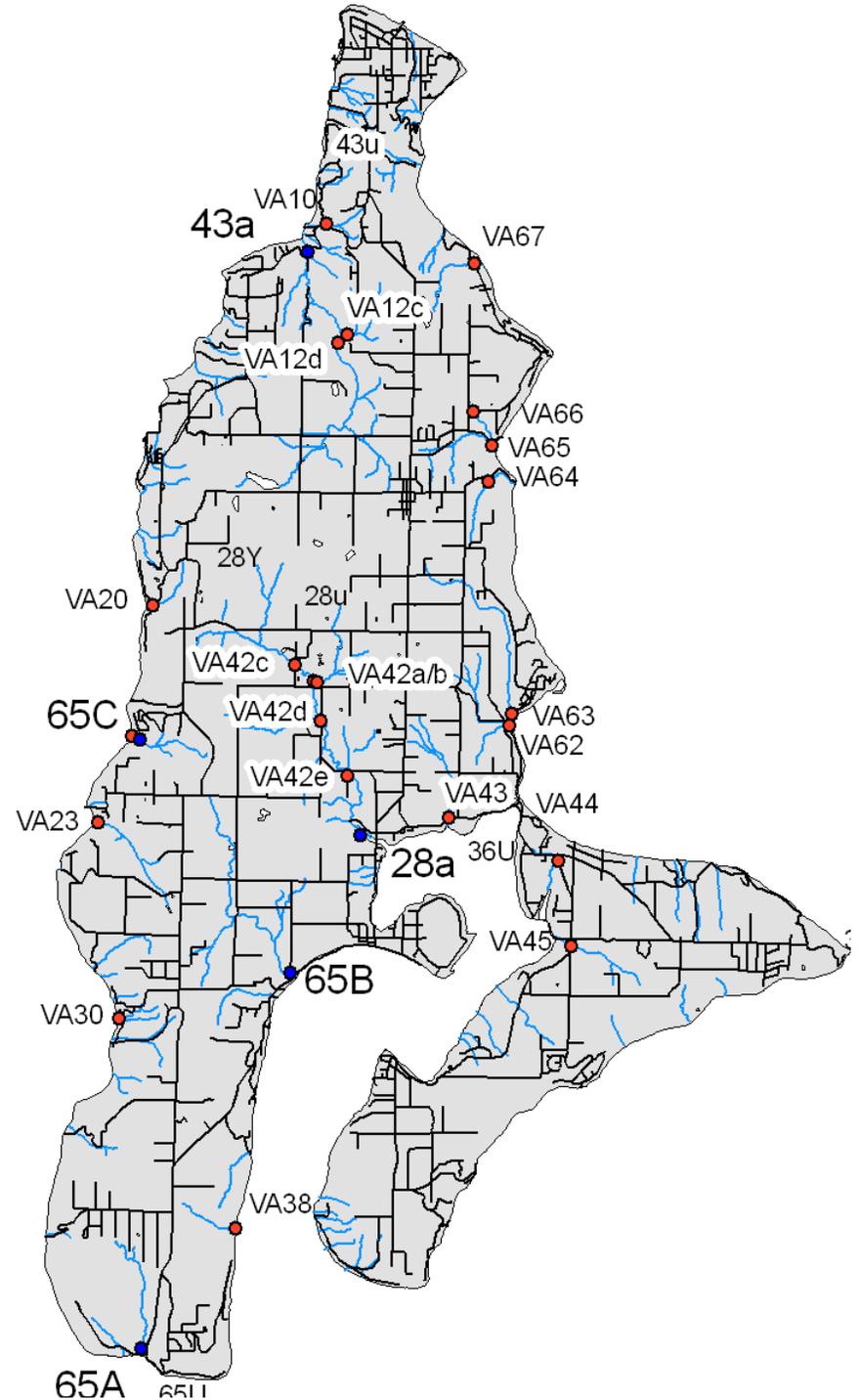
(5)

Shinglemill,  
Green Valley,  
Tahlequah,  
Fisher,  
Judd

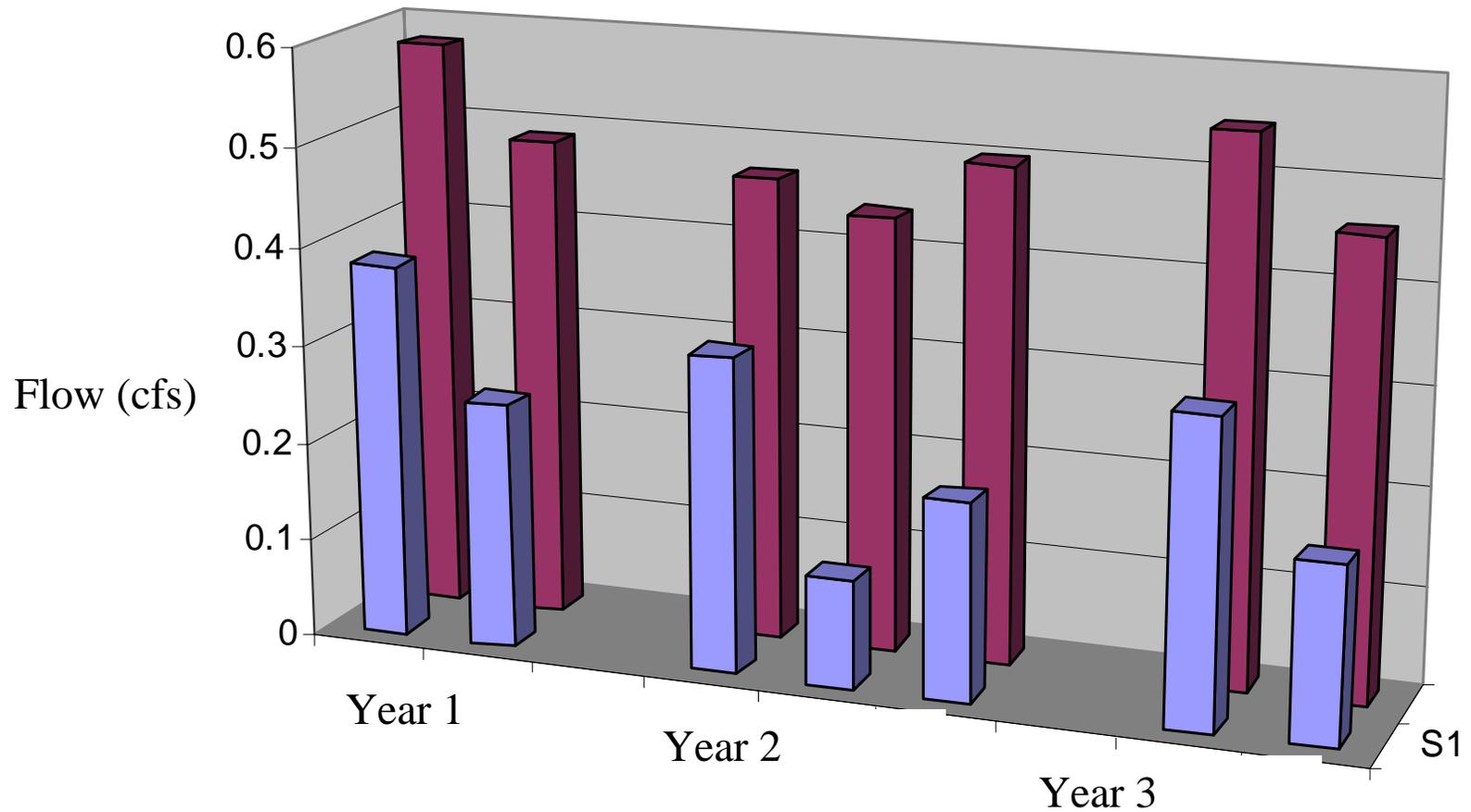
Red = Baseflow measurements

(22)

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# Stream Gaging – 2 baseflow sites



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# Surface Water Monitoring

## ■ Stream Water Quality

- Short term assessment (2007)
- Data gap in the Water Resources of VMI
- 7 sites
  - Monthly sampling
  - 12 sites
- Parameters
  - N+N, NH<sub>3</sub><sup>+</sup>, Total N, Alk, Ortho/Total P, EC, FC, TSS and field parameters (pH, DO, Cond)

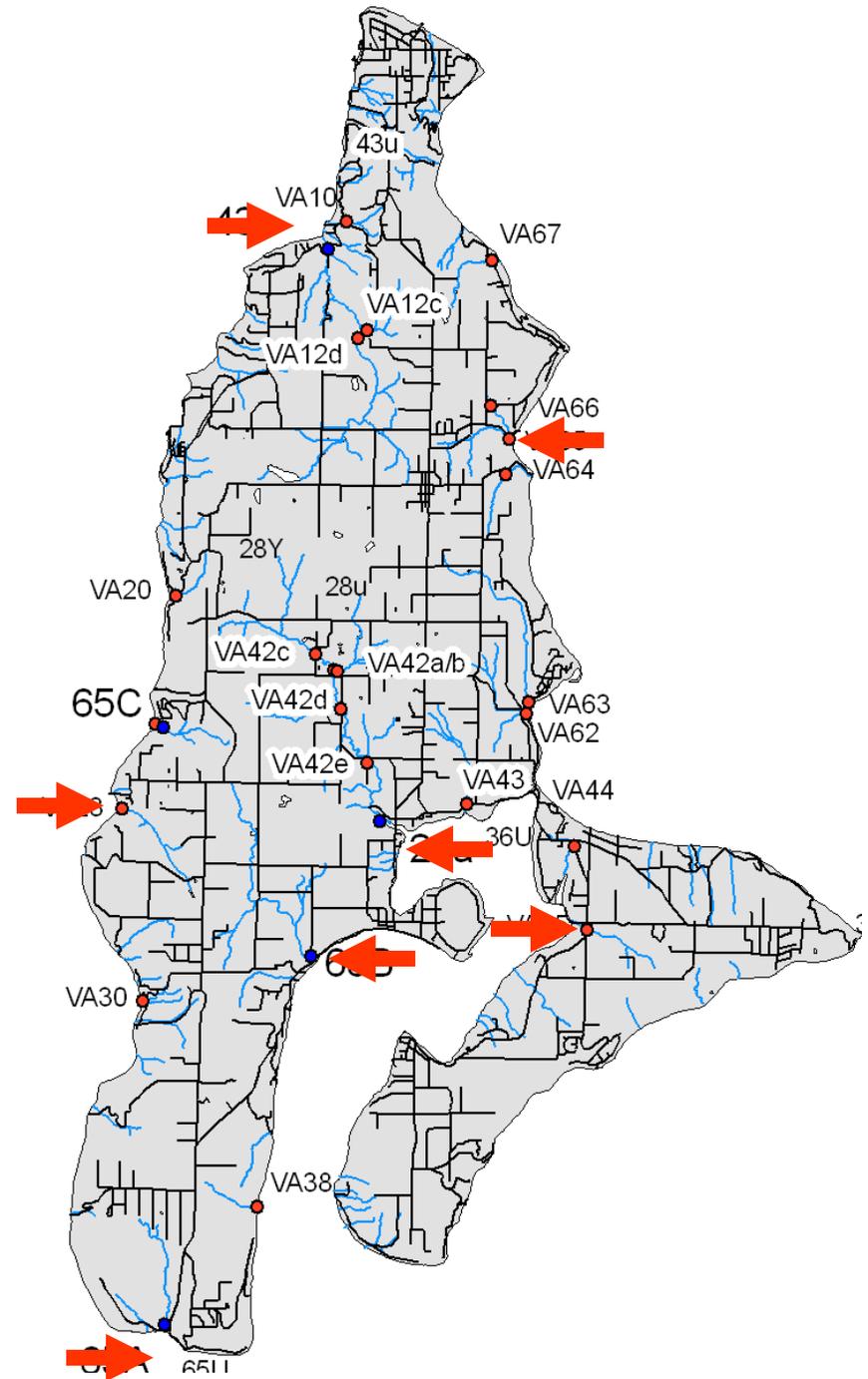
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# VMI WRE Stream WQ Stations

7 – Stream WQ (red)

Shinglemill,  
Christensen,  
Tahlequah,  
Fisher,  
Judd,  
Mileta,  
Gorsuch

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# GW Monitoring – Water Quality

- Annual monitoring for Environmental Indicators
  - 20 sites (long term sites)
  - Nitrate, chloride, arsenic
- Organic chemicals (2005)
  - Cl-pest, OP-pest, Cl-herbs, EDC
  - No detected organics except bis(2-ethylhexyl)adipate [lab contamination]
- Arsenic Speciation (2006/07)
  - 18 sites
- Dedicated Sampling set-ups in MW
  - Alk, TDS, Cl, F, Si, P, Nitrate, SO<sub>4</sub>, metals

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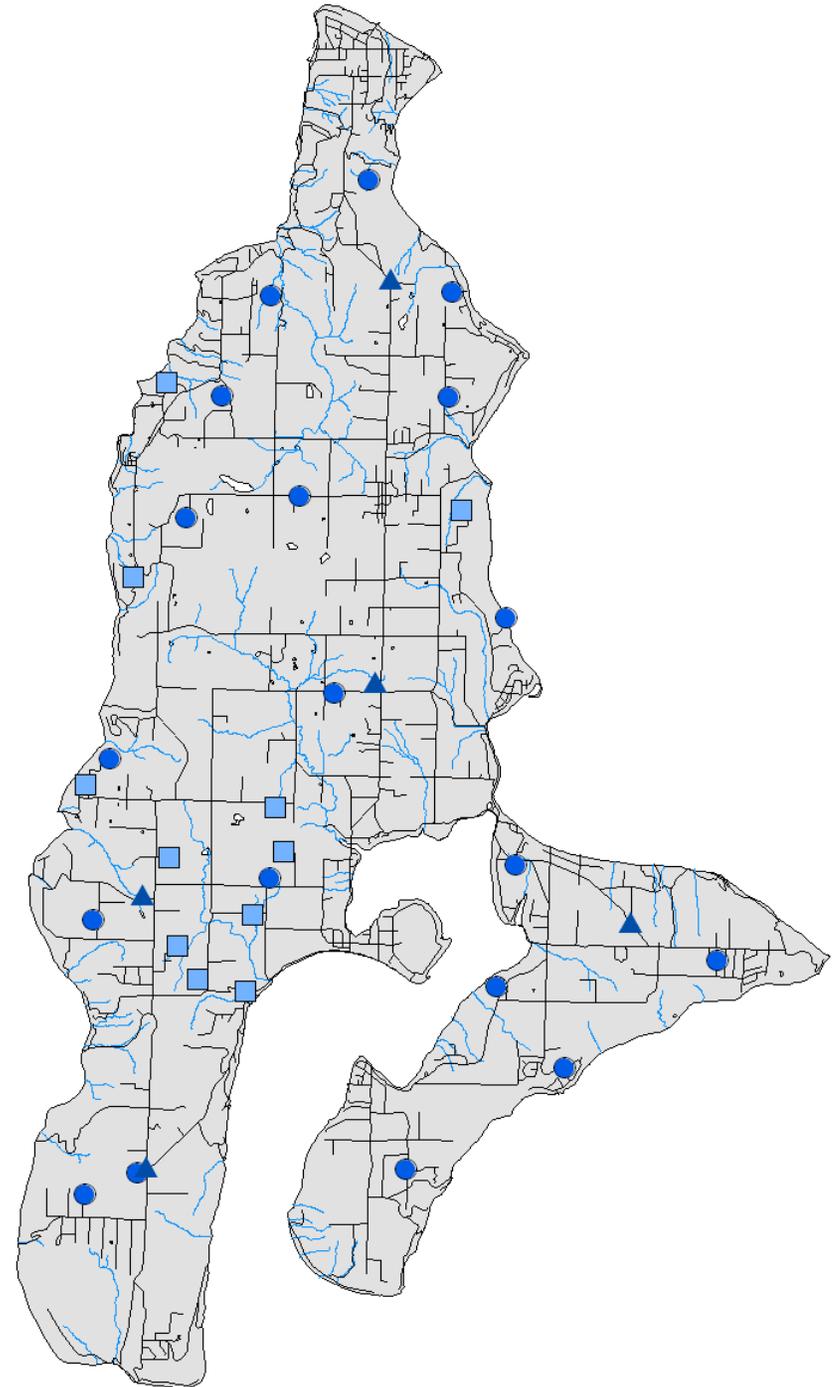
# GW Water Quality Sites

20 long term sites  
(circles)

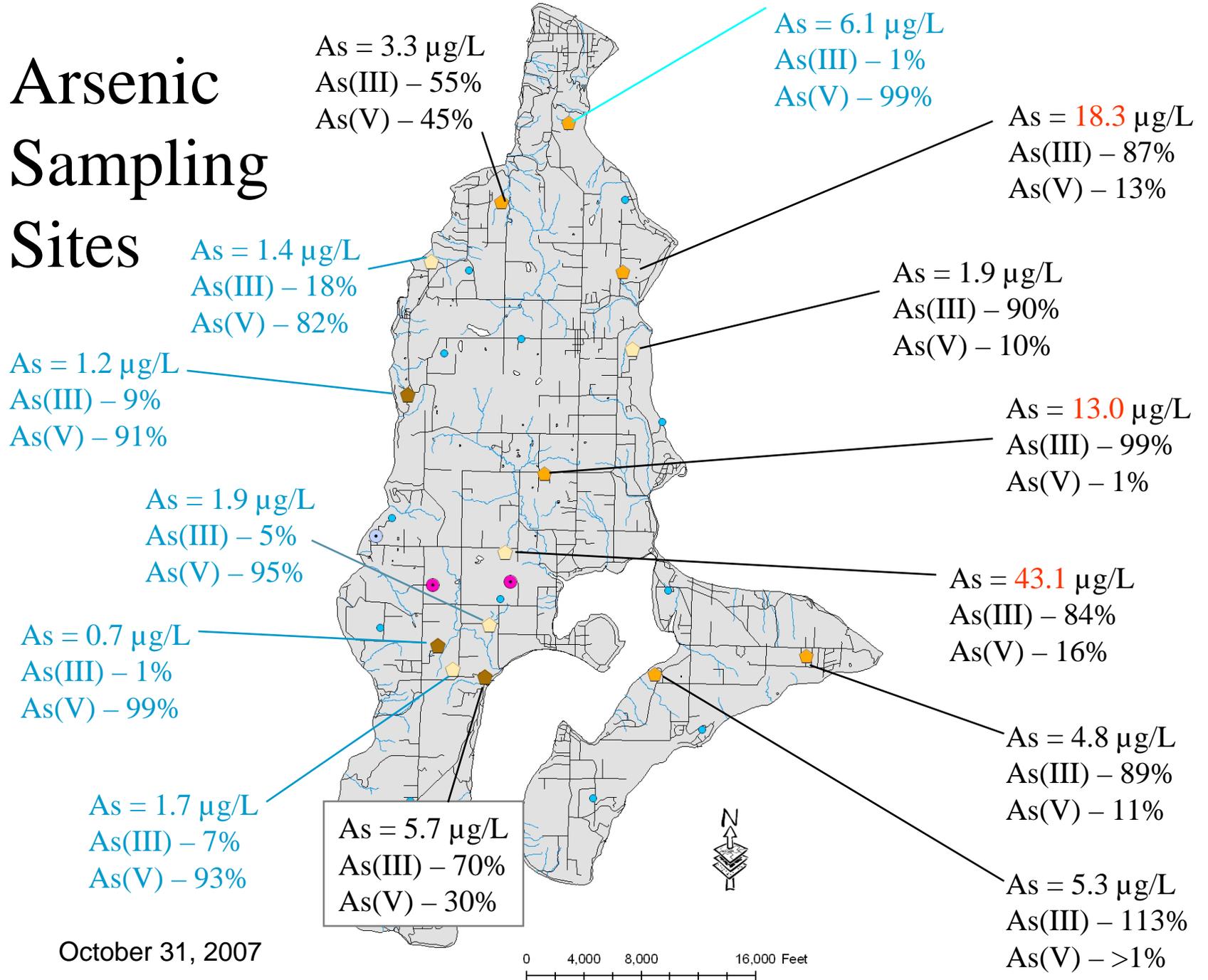
6 Monitoring Wells  
(triangles)

10 Special WQ sites  
(squares)

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# Arsenic Sampling Sites





# GW Monitoring - Water Quantity

- Island-wide water level survey
  - 24 sites
  - Twice annually
- Continuous water levels
  - 6 Monitoring wells sites
  - Leveloggers
- Volunteer water level sites
  - 8 locations (5 since 2001)

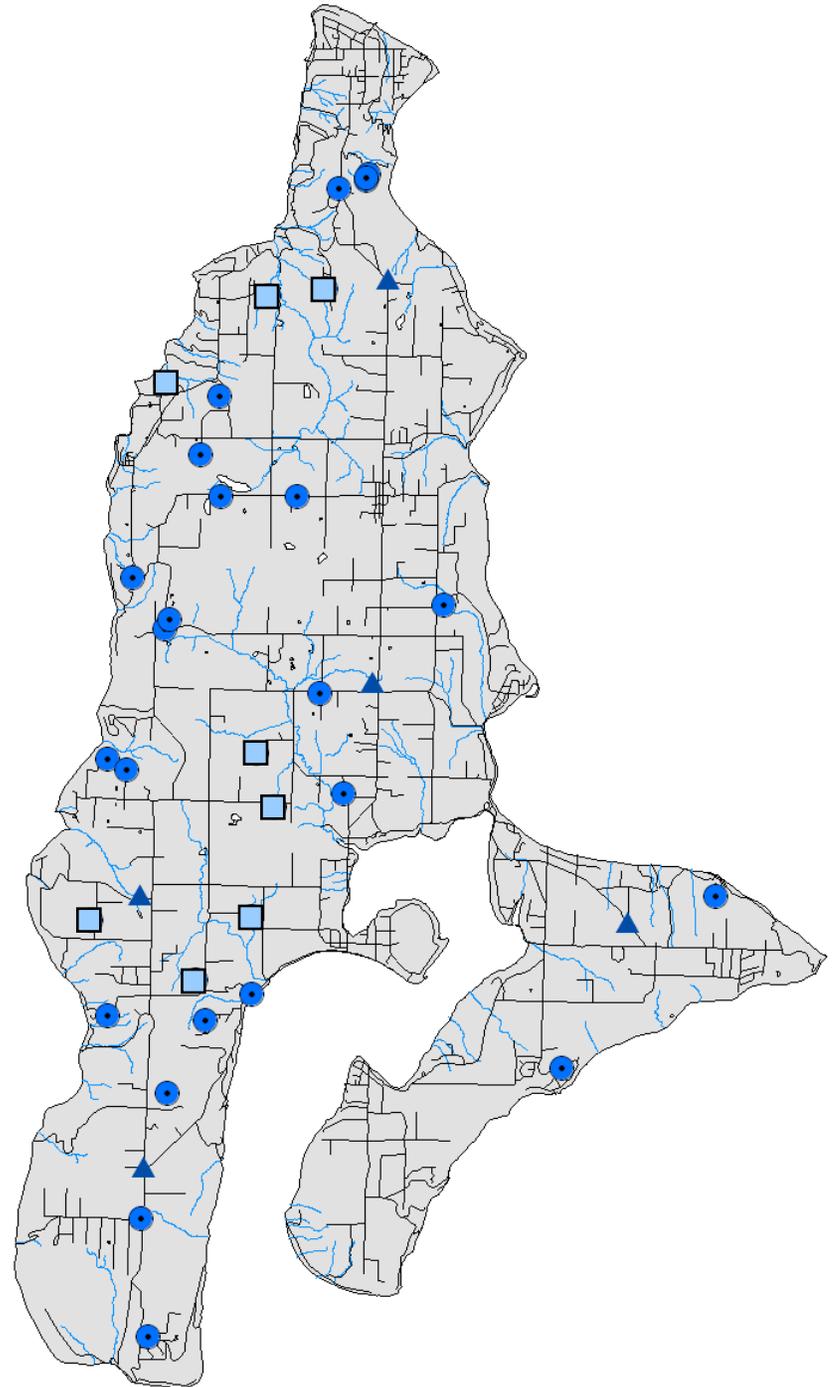
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# GW WL Sites

24 survey sites  
(circles)

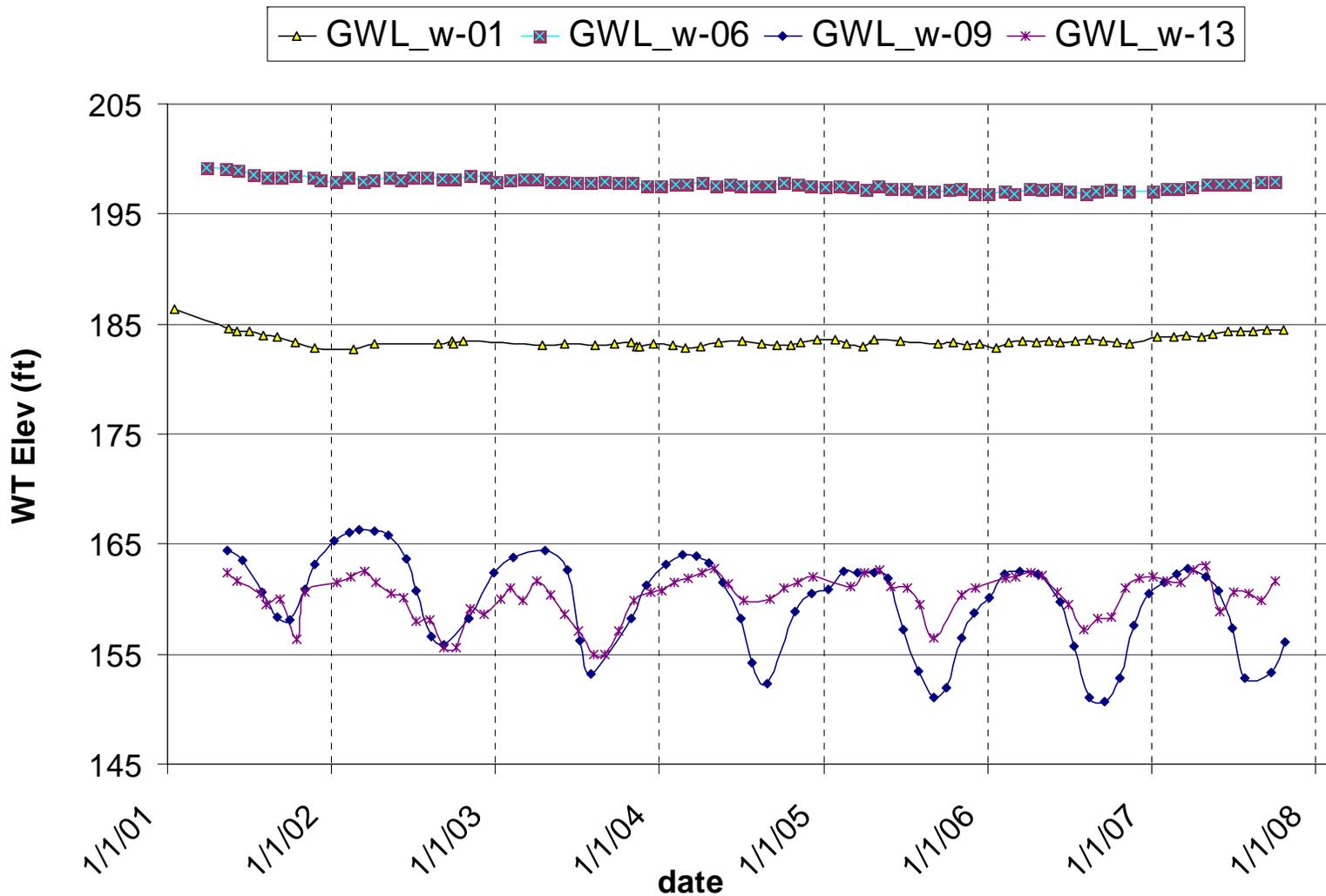
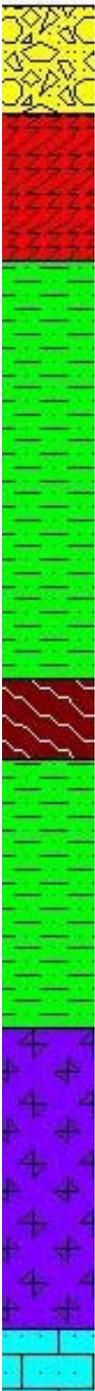
6 Monitoring Wells  
(triangles)

8 Volunteers WL  
sites  
(squares)



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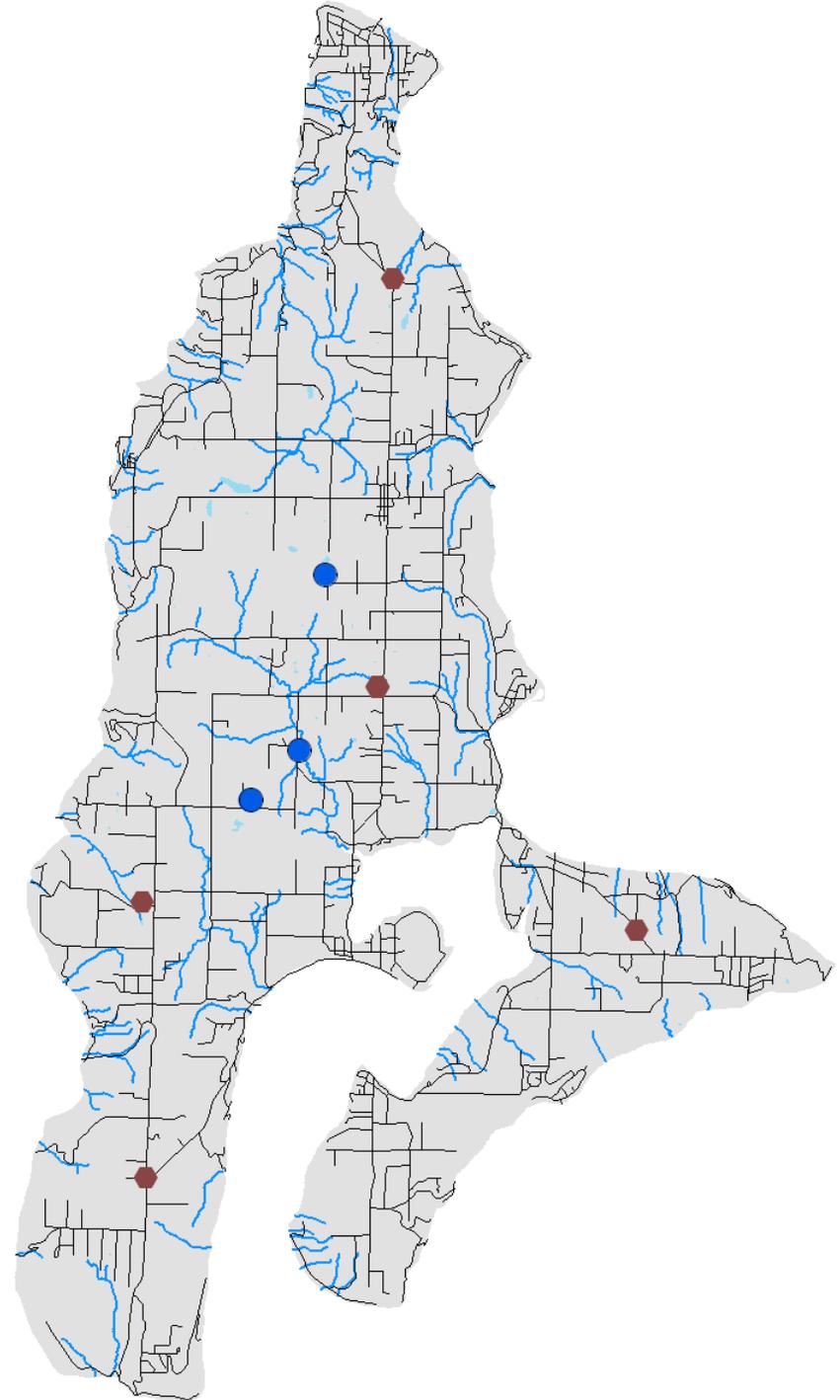
# Volunteer water level sites



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# Monitoring Well Sites

- 5 areas
- 6 wells (brown)
  - 5 - 2" wells
  - 1 - 6" well
- Depths between 155' to 242'.
- 4 new wells (blue)
  - Nov/Dec



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# Wells on VMI

Group A Sources = Red Squares

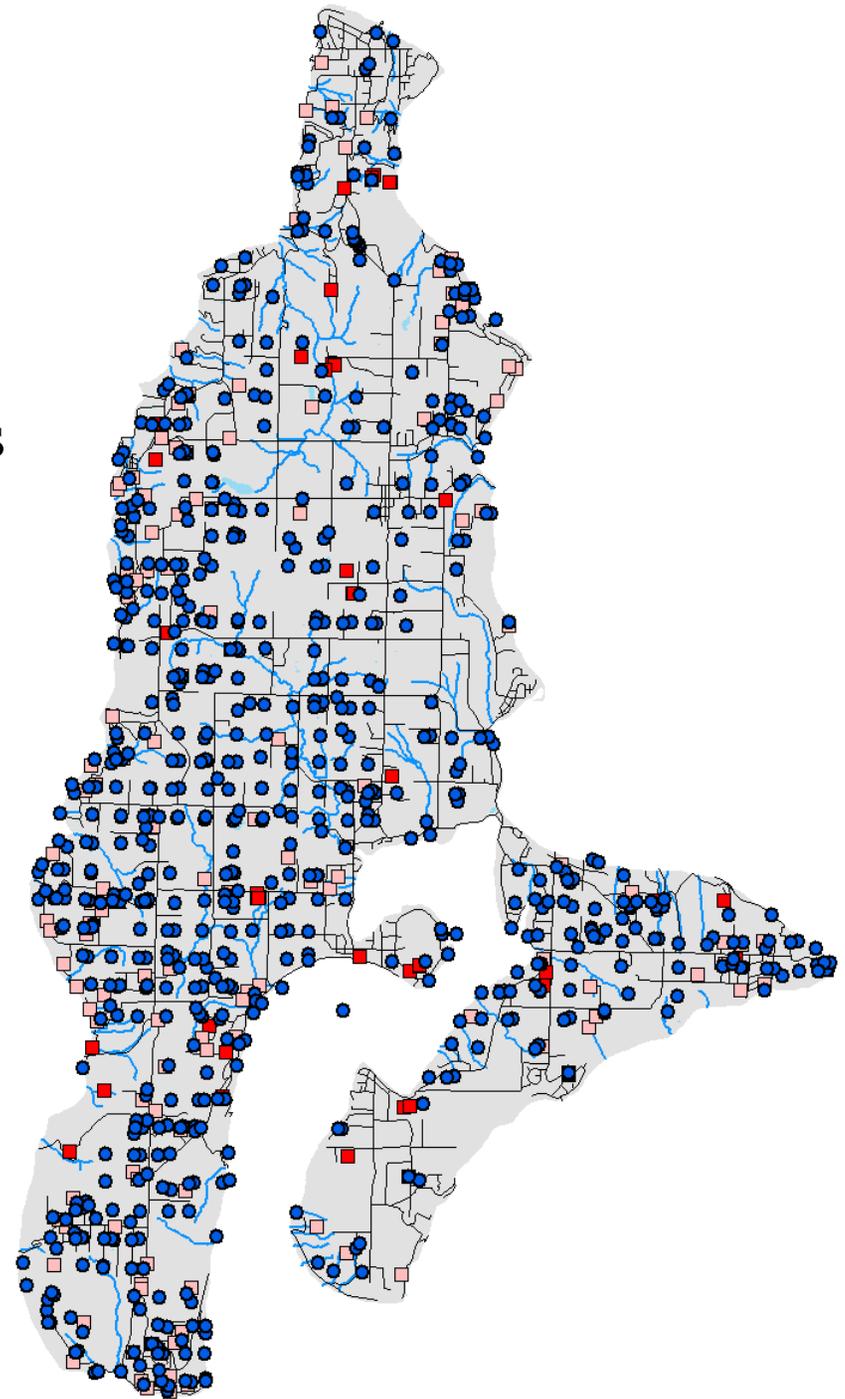
(53)

Group B PWS = Pink Squares

(137)

Exempt wells = Blue Circles

(884)



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# Exempt Well Metering - July 2007

Range of GPD (gallons per day) for  
18.2 to 632.3 (avg. 337.8)

| July   |       |           |       |
|--------|-------|-----------|-------|
| date   | meter | # of days | GPD   |
| 29-Jun | 30910 | 29        | 435.9 |
| 2-Jul  | 17894 | 30        | 117.8 |
| 12-Jul | 10240 | 113       | 90.6  |
| 17-Jul | 2850  | 28        | 18.2  |
| 1-Jul  | 24450 | 30        | 632.3 |
| 5-Jun  | 6680  | 47        | 142.1 |
| 12-Jul | 46007 | 84        | 547.7 |
| 16-Jul | 32980 | 21        | 522.4 |

~Weekly readings of 1 site

| date   | meter | # days | GPD   |
|--------|-------|--------|-------|
| 10-May | 2410  | 10     | 234.0 |
| 23-May | 5900  | 13     | 268.5 |
| 28-May | 7380  | 5      | 296.0 |
| 12-Jun | 14340 | 15     | 464.0 |
| 18-Jun | 17250 | 6      | 485.0 |
| 25-Jun | 22010 | 7      | 680.0 |
| 9-Jul  | 26810 | 14     | 342.9 |
| 16-Jul | 32980 | 7      | 881.4 |

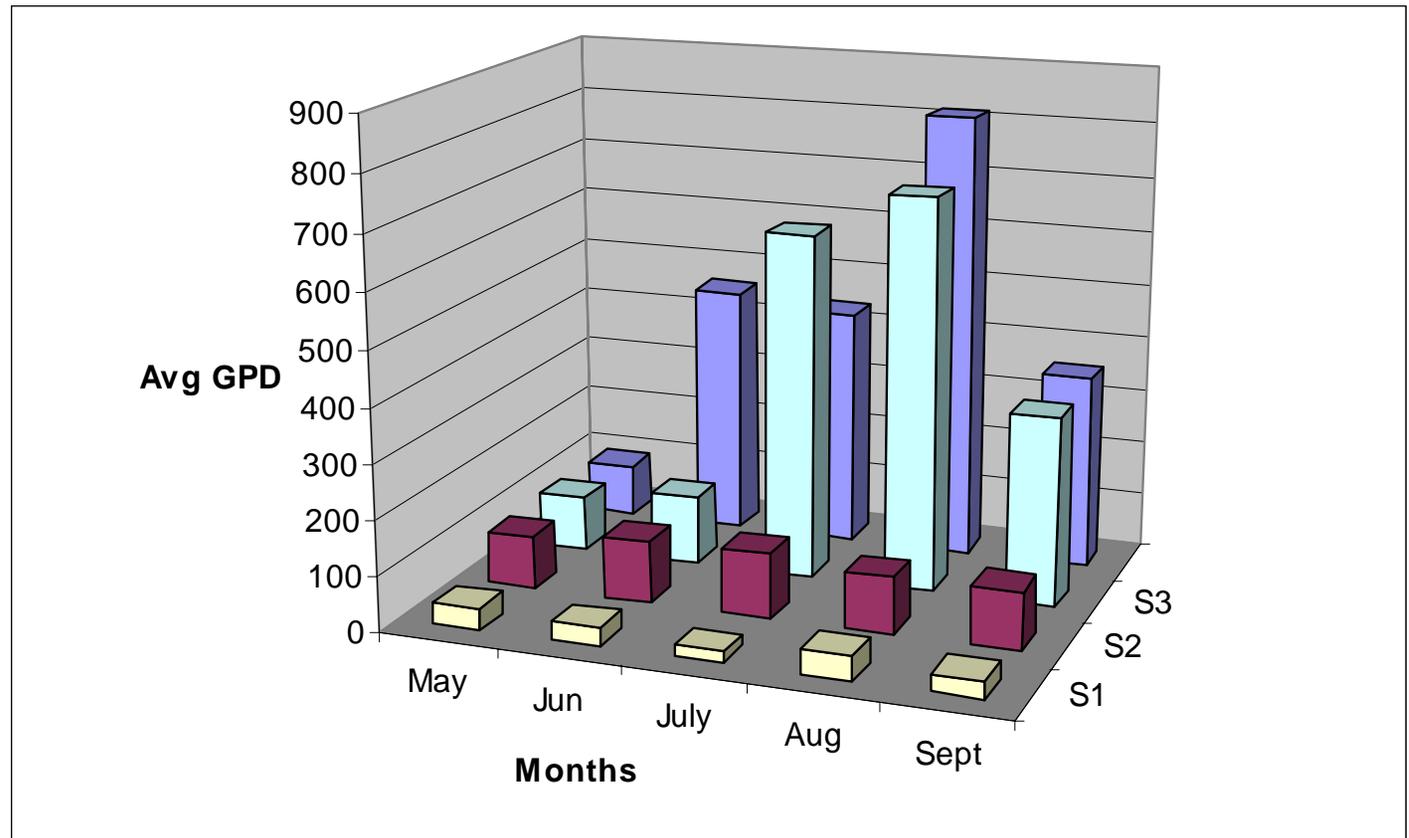
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# Exempt Well Metering con't

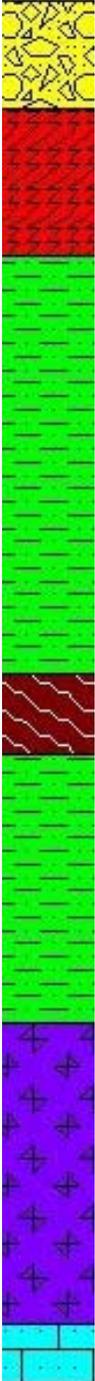
Range of averaged daily usage from April – September  
18.2 to 815.9 GPD (gallons per day)

Monthly  
Averages:

May: 122.8  
June: 232.1  
July: 337.8  
Aug: 326.3  
Sept: 231.6



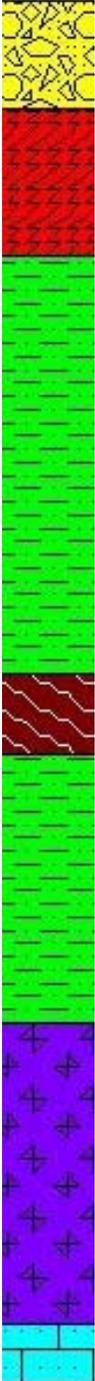
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# Modeling

- Phase I Groundwater
  - Island-wide Steady-state
  - DONE
- Phase II Surface water - Groundwater
  - Mike-SHE
  - Kyle's talk
- Phase III Refined Integrated SW-GW
  - Areas of concern focus
  - Contaminant transport

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# Water Balance - comparison

|                 | <b>WRE</b> | <b>Mike-She</b> | <b>Carr</b> | <b>GWMP</b> |
|-----------------|------------|-----------------|-------------|-------------|
| recharge (gpm)  | 16455      |                 | 6107        | 20960       |
| <b>outflows</b> |            |                 |             |             |
| Puget sound     | 80%        | 63%             | 20%         | 38%         |
| Streams         | 12%        | 27%             | 80%         | 62%         |
| Wells           | 5%         | 5%              | --          | --          |
| Springs         | 3%         | 5%              | --          | --          |

Adapted from VMI WRE Phase I GW Model Report Table 4-2

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## King County Groundwater

<http://dnr.metrokc.gov/groundwater>



King County seeks to protect the health and well-being of its residents who rely on groundwater for drinking, and to ensure enough groundwater replenishes streams, lakes and wetlands to support fish and wildlife in the future. This site is provided by the *King County Groundwater Protection Program*. For information about program goals, responsibilities, funding and staff, please read [About King County Groundwater Protection Program](#).

**[The Groundwater Story Animation](#)** - see groundhogs sing and dance as they teach about groundwater!

### **[Groundwater data](#)**

Look up well depths, water quality data, water level measurements and other groundwater data by looking up place names or attributes, or by navigating an interactive map.

### **[Groundwater Maps and Reports](#)**

Read original reports and maps describing groundwater characteristics and conditions in King County.

### **[Groundwater Management Areas](#)**

Learn about groundwater related issues, policies and activities in one of five areas in King County including East King County, Issaquah Valley, Redmond-Bear Creek, South King County, and Vashon-Maury Island groundwater management areas.

### **[Groundwater Committees](#)**

Find out more about the citizen committees that advise King County on policies and plans related to groundwater.

### **[Drinking Water - Public Health, Seattle and King County](#)**

Find King County Public Health services, resources and regulations related to wells and other small drinking water systems that rely on groundwater.

### **[Groundwater Education](#)**

Find descriptions of groundwater and the water cycle, links to educational, conservation, and stewardship sites and ways that you can take action to protect King County's groundwater.

### **[Related Groundwater Resources](#)**

Browse a list of links to valuable information sources related to groundwater in our region.

This page is produced and maintained by the **King County Groundwater Protection Program**. To learn more about this group and its responsibilities, please read [about the Groundwater Protection Program](#).



### **[King County wins "Best of Web" award](#)**

Citation is one of five for online excellence, including an education award for our Groundwater Story animation.

### **Why is groundwater important?**

An estimated **30 percent** of King County's population relies on groundwater wells for drinking water. That's over **half a million people!**

Groundwater also feeds surface streams in the summer months, and provides water for salmon and other fish when there is little rain.

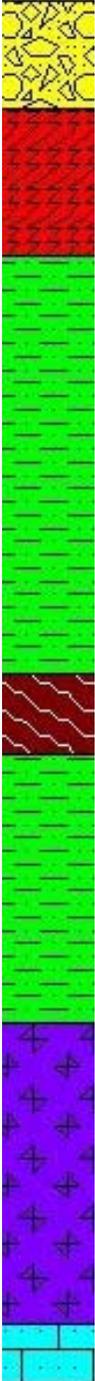
### **Care to join us?**

Groundwater Protection Committee meetings are open to the public:

[East King County](#)  
[Issaquah Creek Valley](#)  
[Redmond-Bear Creek](#)  
[Vashon-Maury Island](#)

[Learn more](#)

# Interactive web page/database



 **King County** [Home](#) [News](#) [Services](#) [Comments](#) [Search](#)

 [Natural Resources and Parks »](#)  
[Water and Land Resources Division »](#)

## Groundwater Data

*King County, Washington*

**King County Groundwater**

Data  
[Database lookup](#)  
[Interactive Map](#)

[Maps and Reports](#)

[Management Areas](#)

[Committees](#)

[Other Organizations and Resources](#)

The King County Groundwater Protection Program maintains geographic and tabular databases of groundwater quality and water level data. King County provides two methods to find and display information in its databases:



The **iMap Search** option opens an interactive groundwater map (iMap) which enables visitors to select and query groundwater information through web-based maps and geographically-based software.

[About iMap](#)



The **Text Search** option provides a search form enabling visitors to look up groundwater information filtered by geographic label such as city, watershed, Groundwater Management Area, or by attribute such as well log availability.

This page is produced by the **King County Groundwater Protection Program**. To learn more about this group and its responsibilities, please read [about the Groundwater Protection Program](#).



# Vashon-Maury Island Water Resources Evaluation

The Vashon-Maury Island Water Resources Evaluation (WRE) is a project designed to describe and assess the water resources of the island. This project will provide a better understanding of how different activities can adversely affect the island's water quality and quantity and lead to an updated, more accurate water supply budget for the island.

» Learn [more details](#) about the project or to read the project [workplan](#).

## Project Data

The WRE project is collected a variety of data to help assess the water resources on Vashon-Maury Island (VMI). The [Project Documents](#) page has a variety of reports relating to on-going monitoring and modeling.

Groundwater data is available [on-line](#). Water quality and water level data can be searched via a map or by a text filter. Here's a [map](#) of groundwater sampling sites in 2006.

Stream and precipitation data are also [available](#). Selecting 'WRIA 15' and check 'active only' will yield eleven (11) gage sites. Here's a [map](#) of those sites.

» [Project News](#) is an e-mail list about project information.

## Vashon Groundwater Education

This project works closely with the [VMI Groundwater Protection Committee](#) to broaden the understanding of the water resources of the island.

Here are several examples of VMI specific education material available to islanders:

- » [Balancing Water](#) (439K pdf)
- » [Garden Green Drink Clean](#)
- » [Waterfacts](#)



<http://dnr.metrokc.gov/wlr/WQ/vashon-island/index.htm>



## Care to join us?

[Groundwater Protection Committee](#) meetings are open to the public and held quarterly on the 4th Wednesday of the month (Jan/Apr/Jul/Oct).