

ENV H 440/ENV H 545

Seattle Water and Wastewater Facilities

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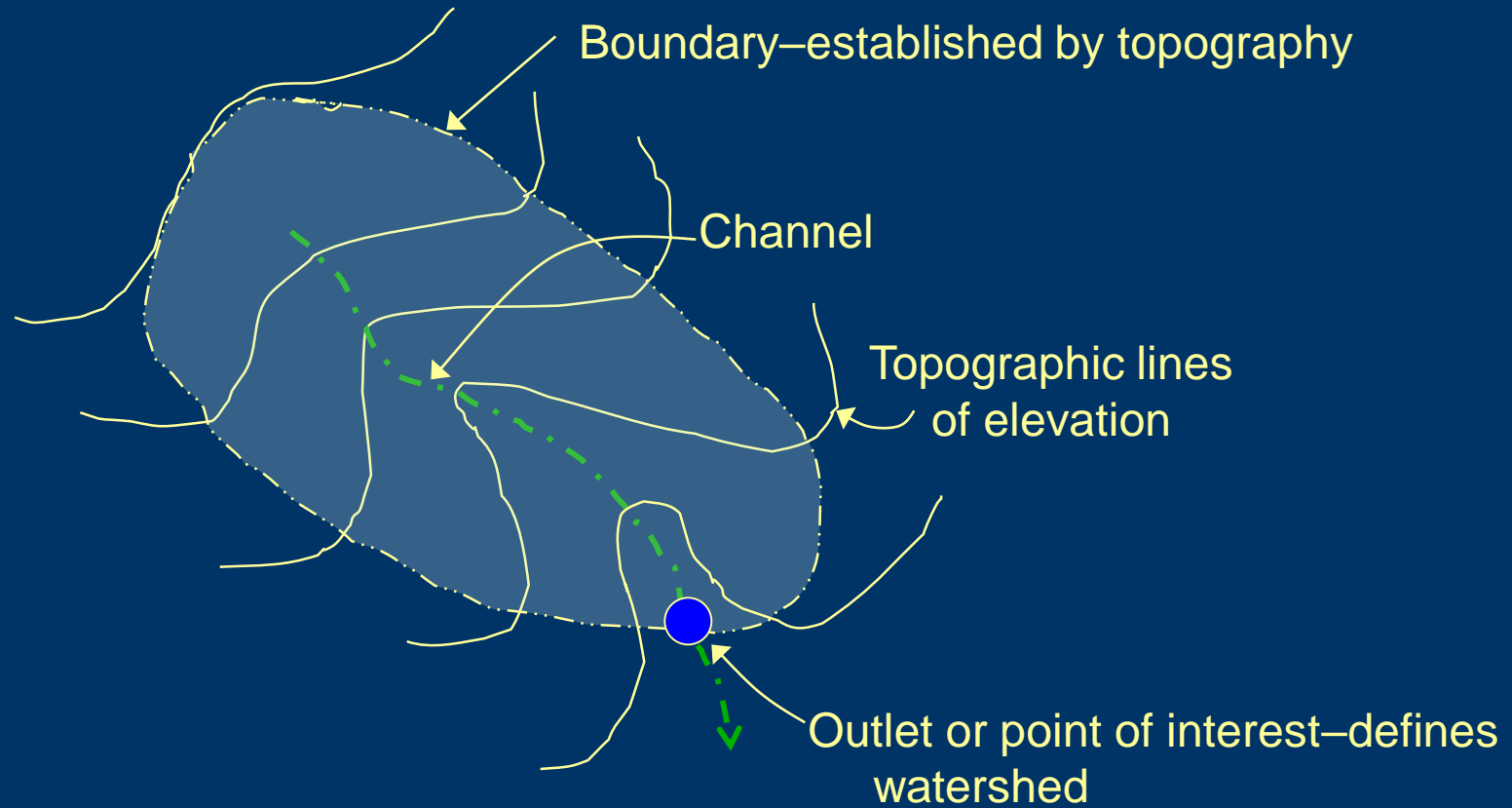
Course Link

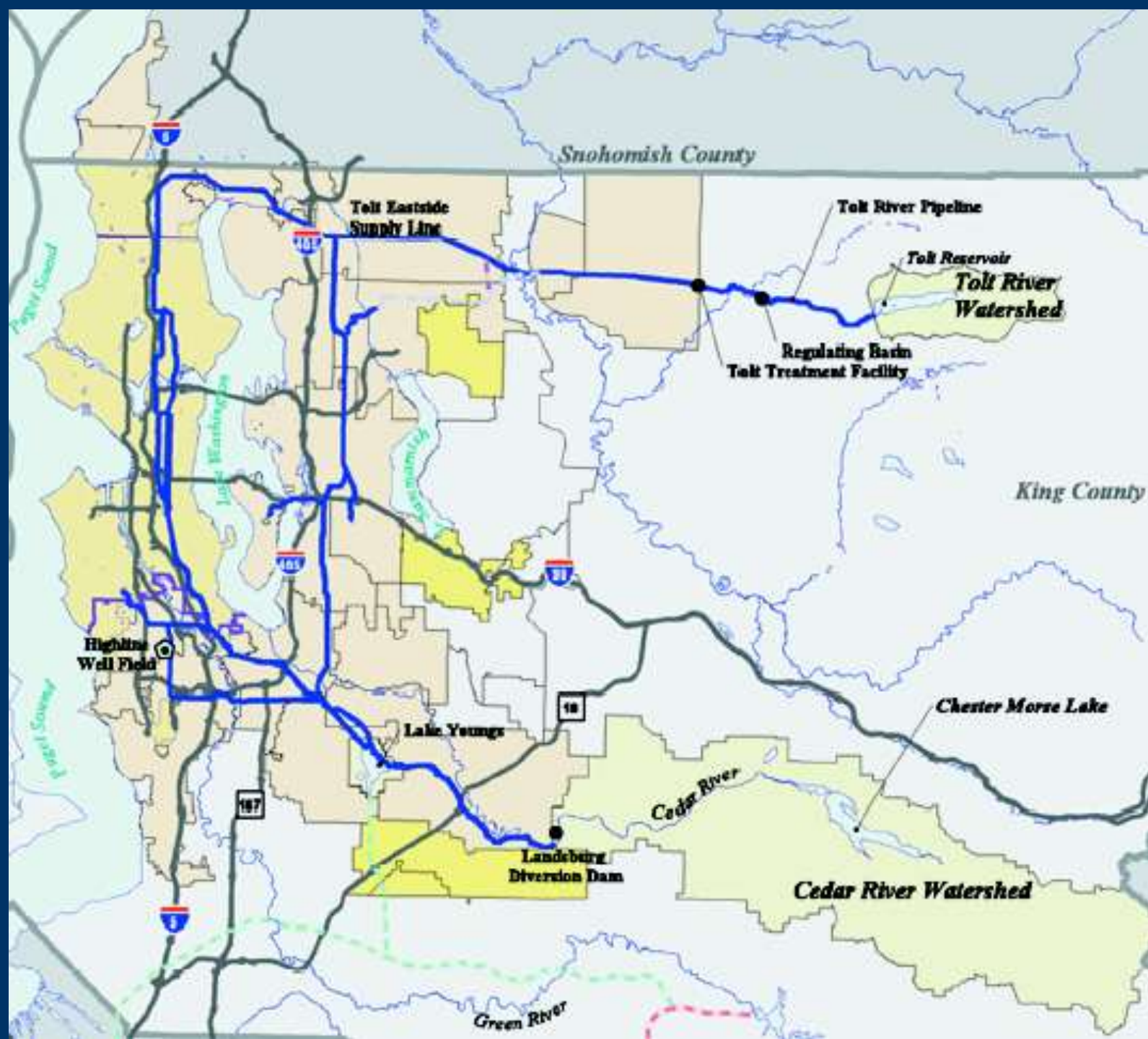
<http://courses.washington.edu/h2owaste/>

NW City Water Supplies

- Seattle's Protected Drinking Water
 - Cedar River Watershed
 - 66% of water supply; up to 180 MGD
 - 90,546 acres (141 square miles)
 - only 22% of water used for drinking water
 - Tolt River Watershed
 - 30% of water supply; up to 120 MGD
 - 12,500 acres
 - Remainder of Water from Groundwater
- Other NW Cities Water
 - Everett- Sultan River Watershed
 - Tacoma- Green River Watershed
 - Portland, OR- Bull Run Watershed

Watershed







Cedar River Watershed

Source: Seattle Public Utilities



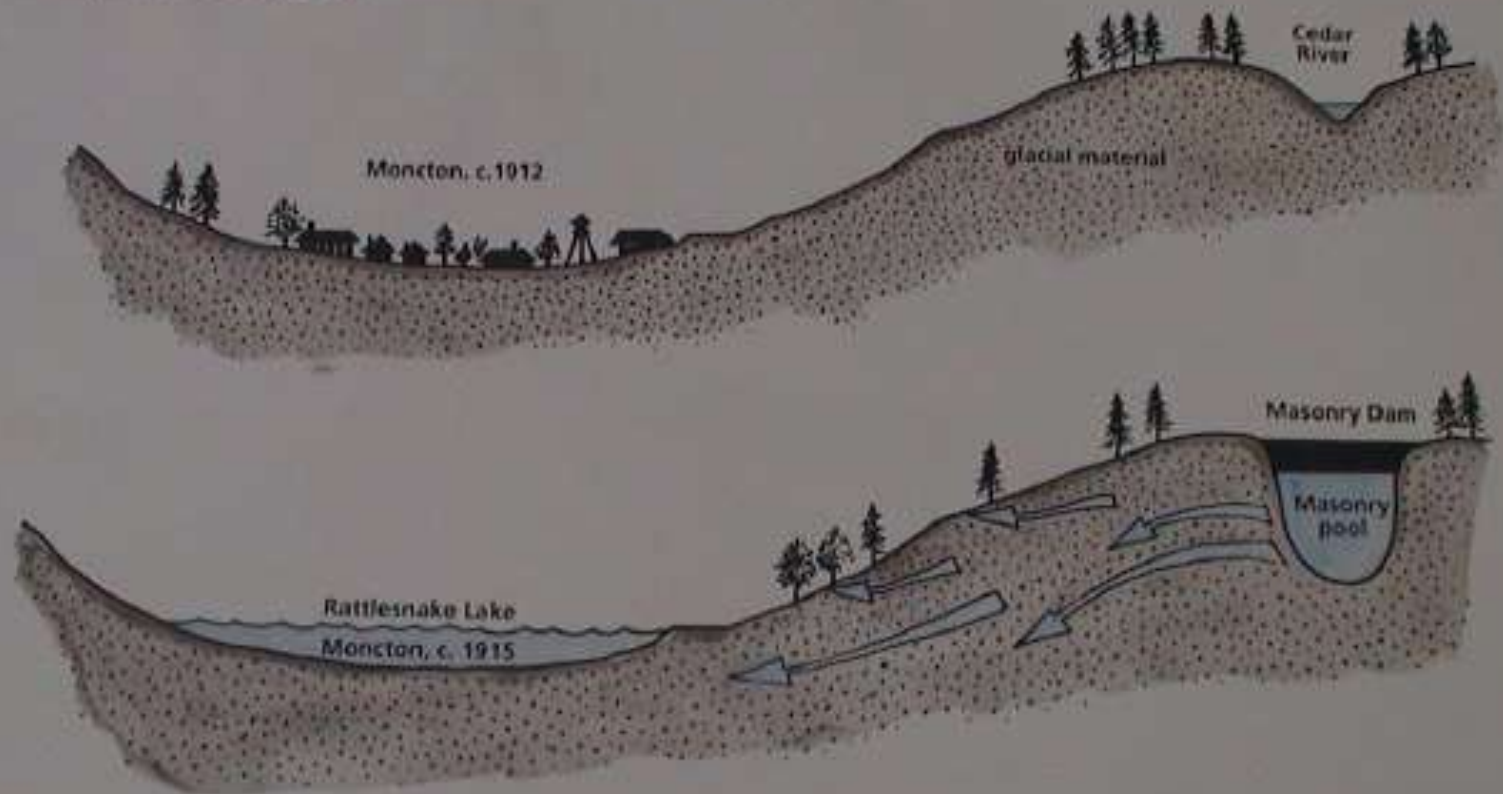
Tolt Reservoir and Dam
City of Seattle Public Utilities

Source: Seattle Public Utilities

Seattle Water History

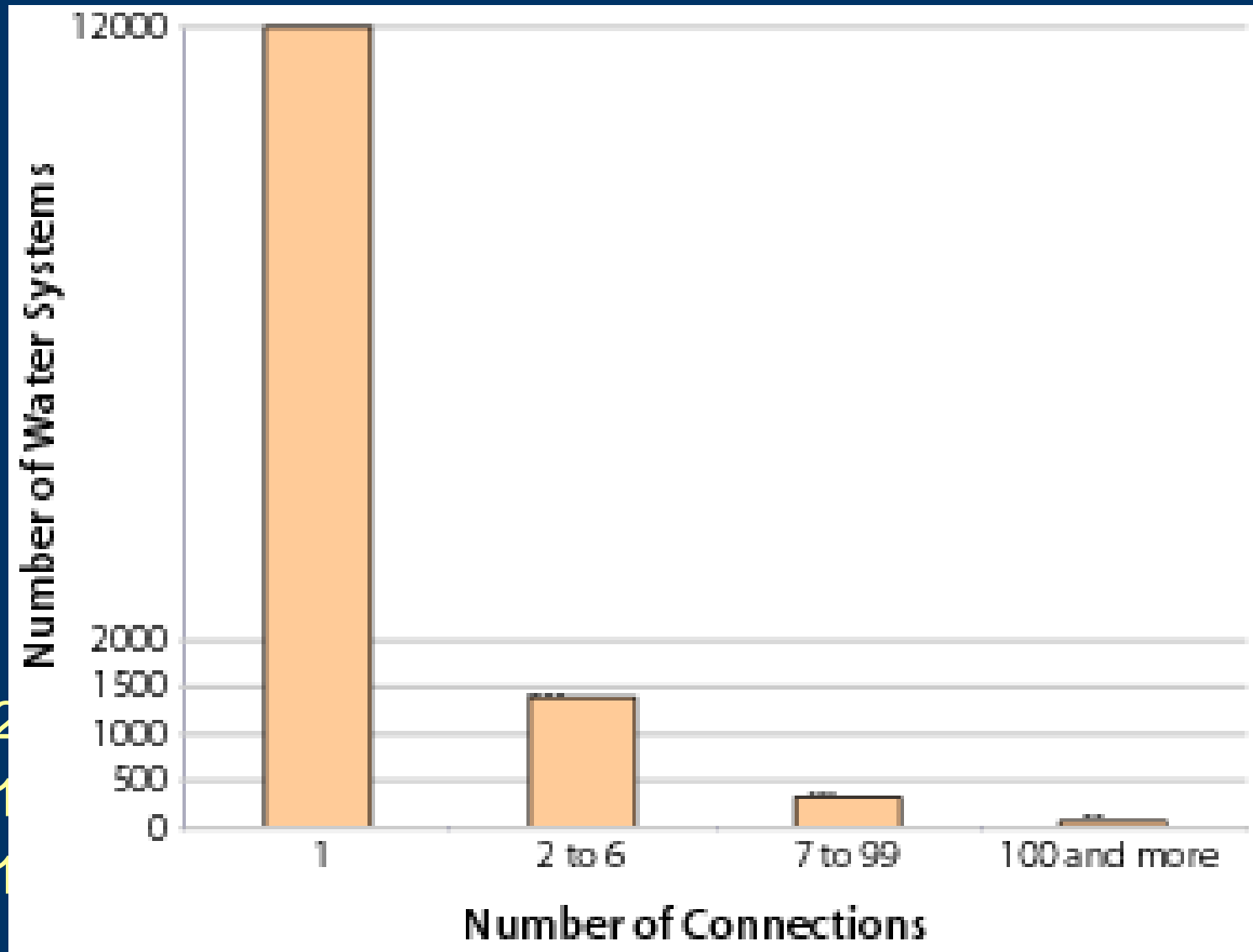
- 1854-1890 Water provided by wells, springs, and private companies
- 1889 City held election to decide if city should own its own water system
- Prior to election the Great fire of Seattle
 - Burned 64 acre business district due to lack of water
- 1890 Seattle bought two private companies
 - Spring Hill Water Company and Union Water Company
- 1895 Seattle voted to construct Cedar River water system
 - Water first flowed into Seattle January 10th 1901
 - Water diverted by dam at Landsburg
 - Channeled into pipeline (28.57 miles) to Volunteer Park and Lincoln reservoirs
 - 23.5 MGD
- Second pipeline in 1909
 - 45 MGD additional
- 1915 Masonry Dam constructed and Floods Mocton
- 1964 South Fork of Tolt brought online to serve North Seattle and Eastside
- 1987 Highline Well Field began Operation
- 2001 New Tolt River Facility completed
- 2004 New Cedar River Facility completed

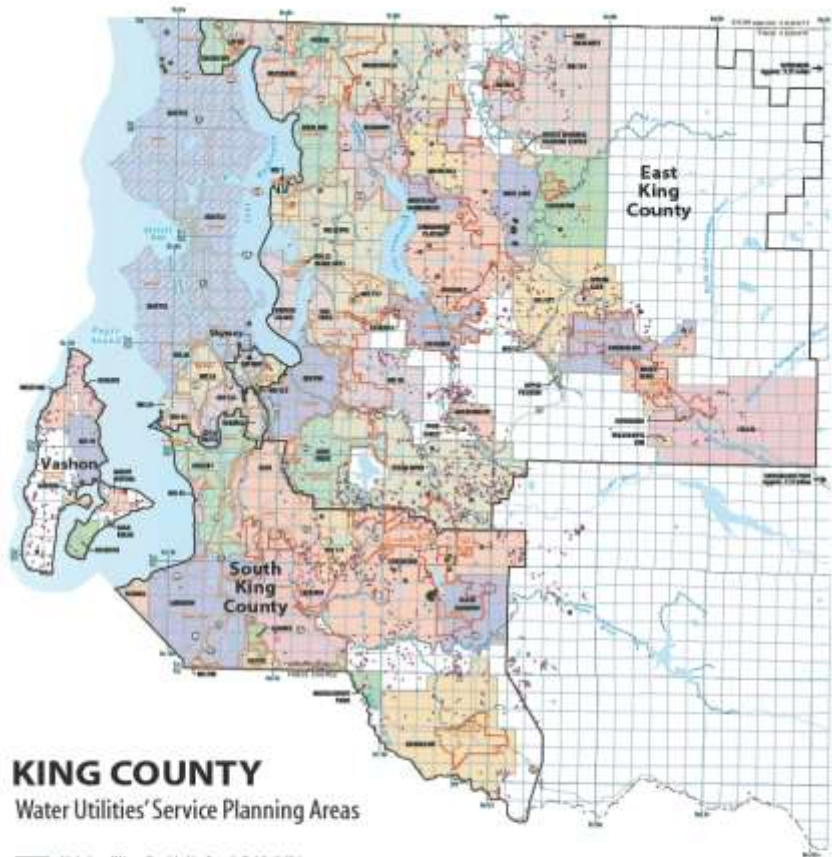
at Cedar (Morse) Lake in 1912.
the water level behind the
m was watertight, the
continental glacier 13,000
months, the town of



- http://www.seattle.gov/util/About_SPU/Water_System/Water_Sources_&Treatment/Cedar_River_Watershed/Tours_&Programs/COS_002326.asp

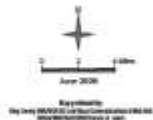
King County Drinking Water





KING COUNTY
Water Utilities' Service Planning Areas

- Majority of Water Provided by Seattle Public Utilities
- Water Utility Name
- City Name
- Group B Water Systems
- Group A Water Systems with Fewer than 100 Connections
- Irrigation Wells, 2001-2005
- Salmon-bearing Rivers/Streams
- Coordinated Water Supply Planning Area
- Urban Growth Area Boundary
- City Boundary
- Section - Township - Range Grid

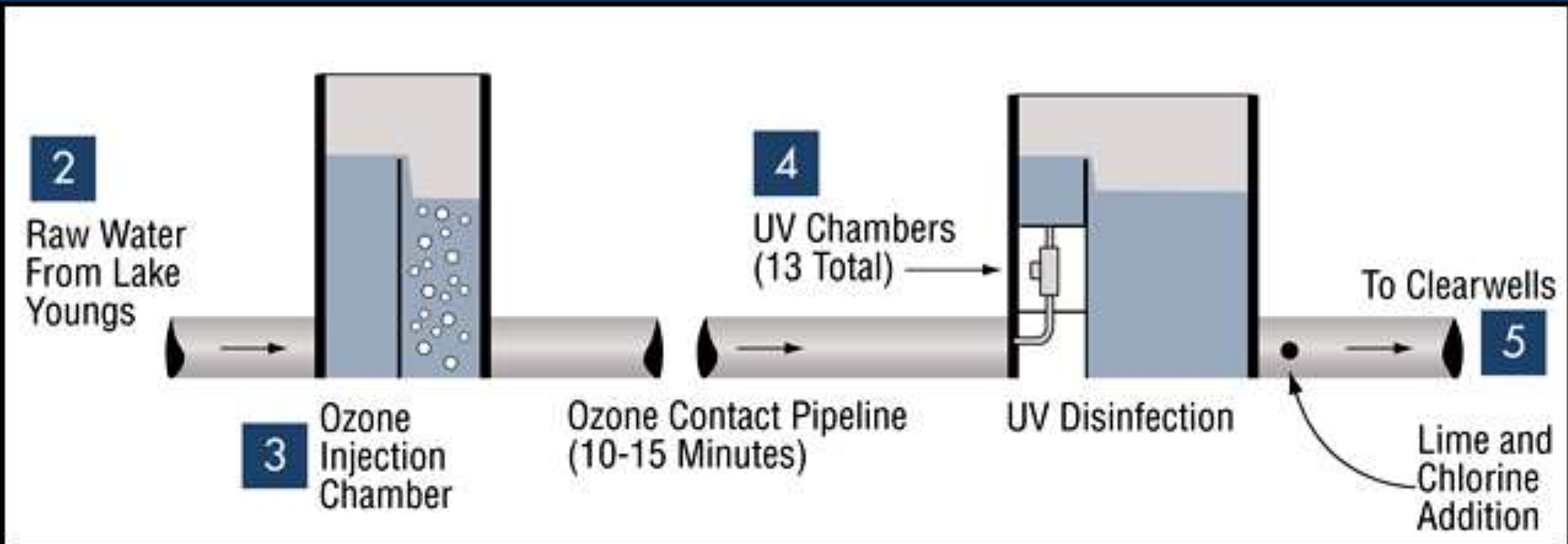


- 39 Water and Sewer Districts

SPU water

- The Cedar River watershed, a 90,546-acre protected watershed that provides almost 70 percent of the area's drinking water.
- 177, 928 metered service lines and 18,000 fire hydrants.
- 2,500 fire protection service lines.
- 1,670 miles of distribution water mains.
- 176 miles of water transmission pipelines (average pipe size is 66 inches diameter; largest pipe size is 90 inches diameter).
- 29 supply and distribution pumping stations with 96 individual pumping units.
- 16 reservoirs, totaling 489 million gallons of storage.
- 16 elevated tanks and standpipes, totaling 16 million gallons of storage.
- 4 dams, including 2 headwork facilities.

Cedar River Treatment Chain



Tolt River Treatment Chain

- Ozonation, Filtration, Fluoridation, pH and Alkalinity Control (Lime), Chlorination

Seattle Waste Treatment

- 1922 Seattle- 30 raw sewage outfalls into Lake Washington
- 1963 Seattle- Diversion of sewage from Lake Washington to Puget Sound began
- Seattle's Waste Treatment Facilities
 - 420 square mile service area; serving 1.4 million people in King, South Snohomish, and Northern Pierce Counties
 - Westpoint Treatment Plant (1966)
 - 119.3 MGD average
 - South Treatment Plant (1965)
 - 81.3 MGD average
 - Vashon Treatment Plant
 - 0.124 MGD average
 - Brightwater Project (North Facility) (2010)
 - Carnation Facility (2007)



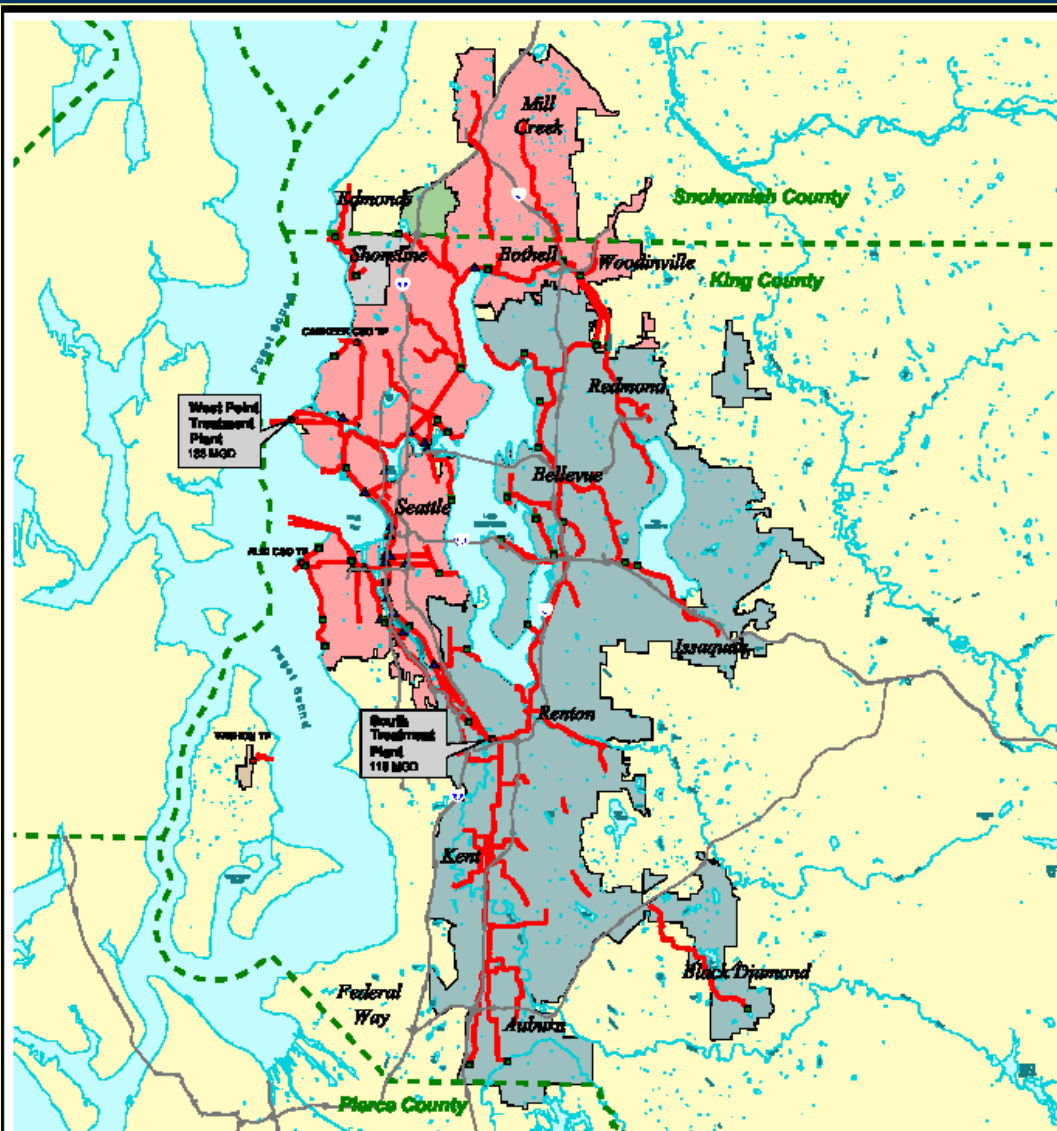
Westpoint

South



No site identified at this time for roads treatment plant, conveyance, or outfall








King County Wastewater Treatment Service Area and Facilities

- King County Owned Treatment Plants
- Pump Stations
- ▲ Regulator Stations
- ▲ King County Conveyance Lines
- ▲ County Lines
- Water Features
- KC WTD Service Area
- West Service Area
- East Service Area
- Vashon Service Area
- Edmonds Service Area - Treated by KC
- KC Service Area - Treated by Edmonds

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 August 2, 2008

SPU drainage and wastewater

- 90,000 inlets.
- 51,000 maintenance holes.
- 45,396 catch basins.
- 1,491 miles of combined sewer and sanitary pipelines (average sewer pipe size is 8 inches diameter; largest pipe size is 210 inches diameter).
- 150 miles of ditches and culverts.
- 68 pump stations.
- 450 miles of storm sewer pipelines (average storm sewer pipe size is between 12 inches and 24 inches diameter; largest pipe is 180 inches diameter).
- 38 combined sewer overflow systems.

Remaining Problems with Seattle Water/Wastewater

- Combined Sewer Overflows
- Uncovered Storage Reservoirs
- Capacity
- Distribution System



WARNING

**Possible Sewage Overflows
During and Following Heavy Rain**

9/26/2008 7:00:00 AM



King County and City of Seattle Combined Sewer Overflow (CSO) Locations: NORTH

- KING COUNTY CSO**
- CSO discharging
- CSO discharged in last 48 hours
- CSO not discharging
- Real time data not available
- City of Seattle CSO
- CSO Treatment Plant/Facility
- Wastewater Treatment Plant
- Park

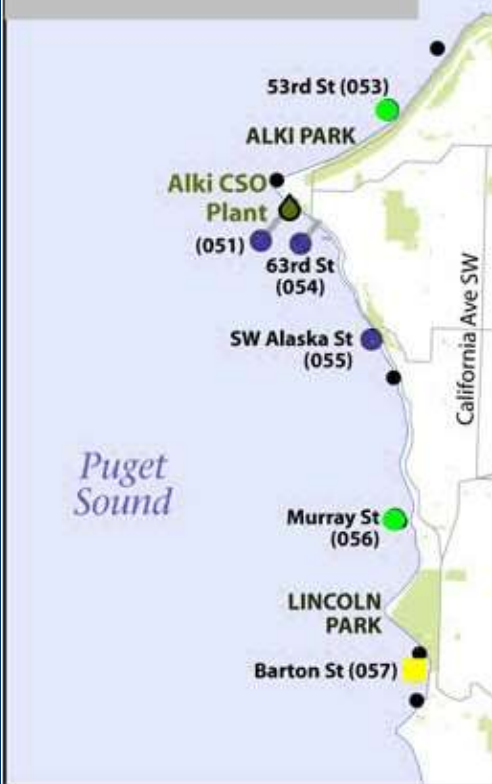


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King County and City of Seattle Combined Sewer Overflow (CSO) Locations: SOUTHWEST

KING COUNTY CSO

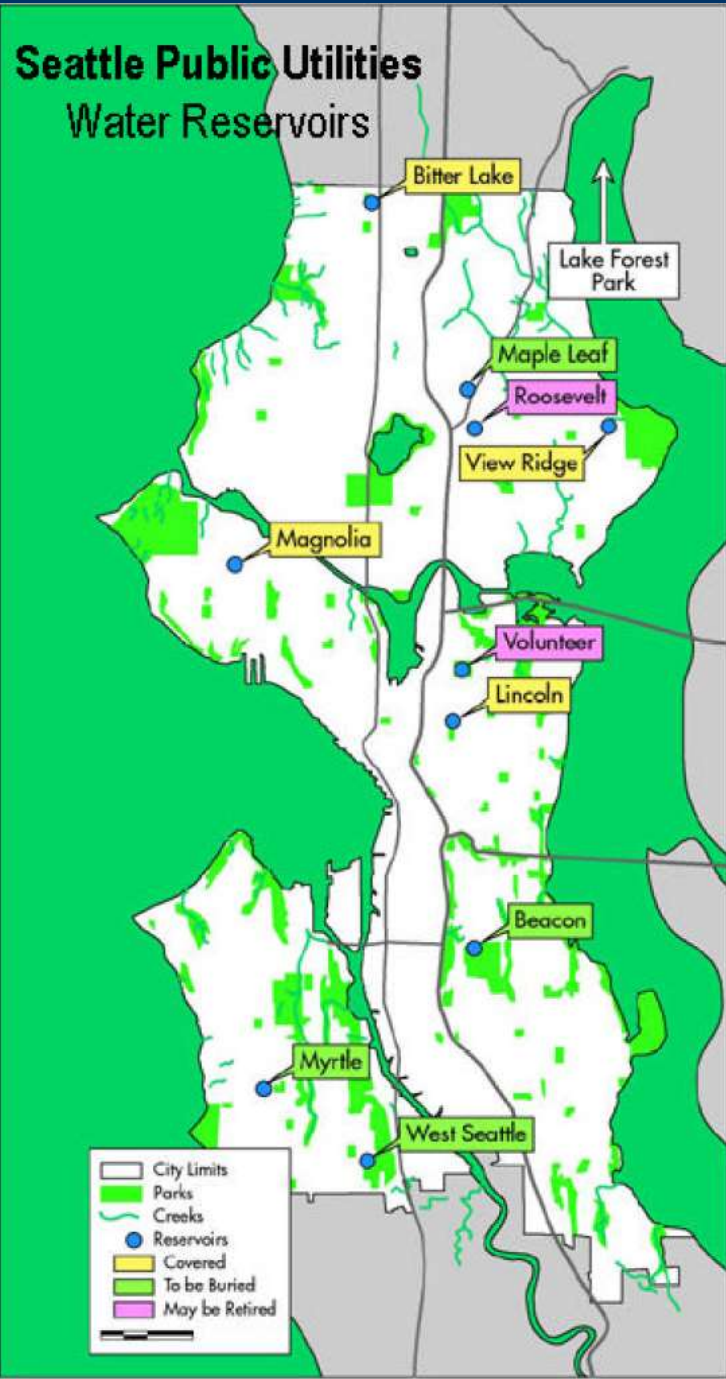
-  CSO discharging
-  CSO discharged in last 48 hours
-  CSO not discharging
-  Real time data not available
-  City of Seattle CSO
-  CSO Treatment Plant/Facility
-  Wastewater Treatment Plant
-  Park



King County

Department of
Natural Resources and Parks
**Wastewater Treatment
Division**

Seattle Public Utilities Water Reservoirs



Research Skills

Research Skills

- **Conducting a Search for Information**
 - Primary
 - Secondary
- **Where to Search?**
 - Databases
 - Internet
 - Library
- **Evaluation of Information**
 - Bias
 - Prevailing View
 - Scientifically Sound
- **Information Management**
 - Endnote

Databases

- Pubmed/Medline
- Web of Science
- Water Resources Abstracts
- Engineering Village 2
- Current Contents
- Community of Science

Other Databases

- [Agricola](#)
- [ASFA](#)
- [Biosis](#)
- [GeoRef](#)
- [GeoRef preview](#)
- [GeoBase](#)
- [BioOne](#)
- [Biomed Central](#)
- [ASCE CE database](#)
- [Digital Dissertation Abstracts](#)
- [CRIS](#)
- [DOE Reports](#)
- [Engineering Electronic Journals](#)
- [Engineering Handbooks](#)
- [Expanded Academic Index](#)
- [History of Science and Technology](#)
- [Index of Scientific and Technology Proceedings](#)
- [Agris](#)
- [Lexis/Nexis](#)
- [MD Consult](#)
- [NTRS-NASA](#)
- [NEPIS](#)
- [National Newspapers](#)
- [NLM Gateway](#)
- [NTIS](#)
- [Proquest/UMI](#)
- [Publishers Catalogs](#)
- [Scifinder Scholar](#)
- [Soil Survey Index](#)
- [NLM-SIS \(Toxline\)](#)
- [OLS](#)
- [NGMDB.USGS.gov](#)
- [EPA Test Methods](#)

Websites

- USGS
- EPA
- CDC
- ASTDR
- Washington Department of Health
- Washington Department of Ecology
- NRCS
- WHO

Websites

- [ProMED](#)
- [The Water Page](#)
- [US Water News](#)
- [The World's Water](#)
- [National Groundwater Organization](#)
- [Water Tech Online](#)
- [UNESCO Water](#)
- [Water Quality Information Center](#)

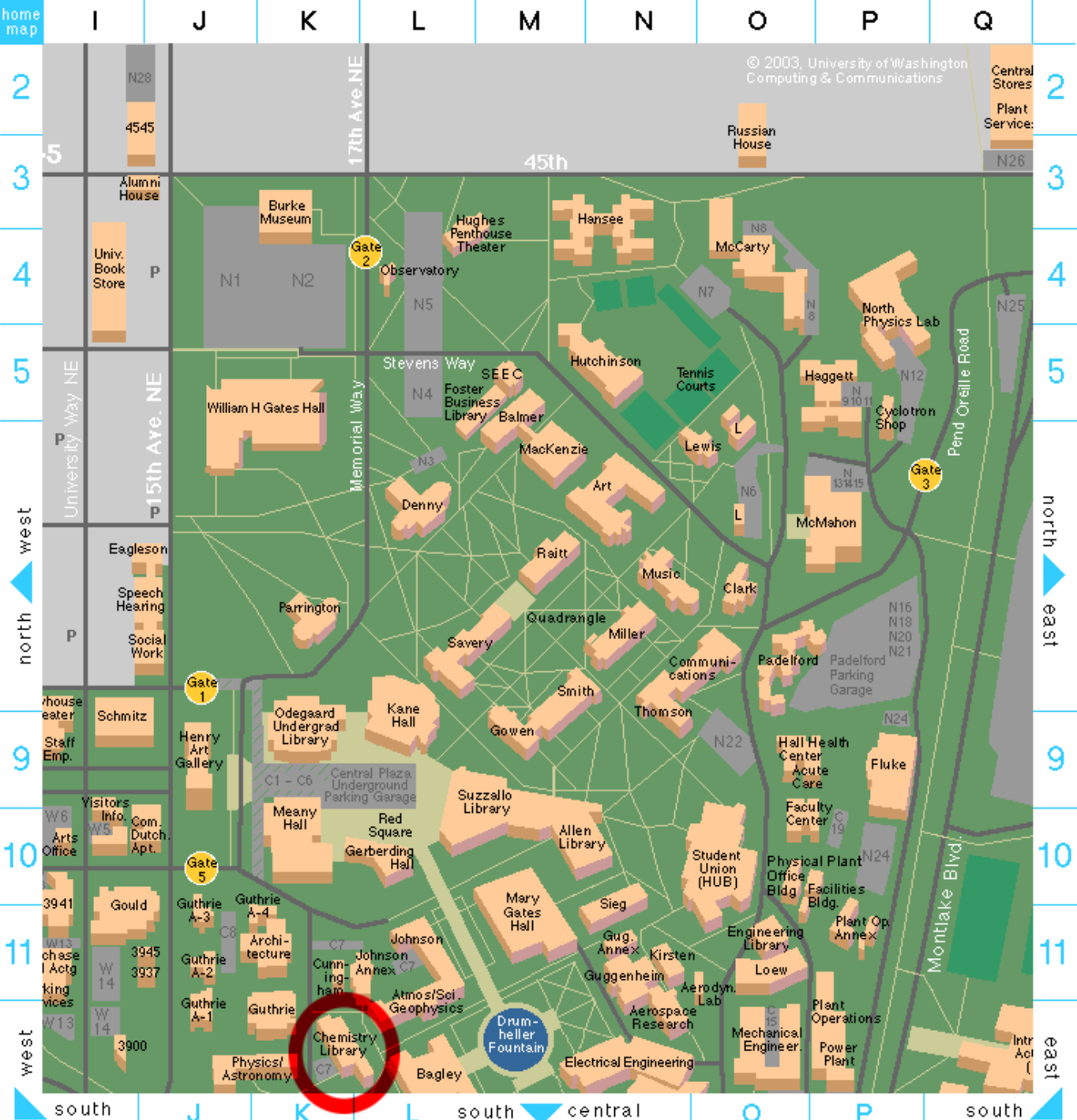
Libraries

- Health Sciences Library
- Engineering Library
- Chemistry Library
- Urban Planning/Architecture
- Fisheries Library
- Suzallo/Natural Sciences



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Central Stores
Plant Service:
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Chemistry Library

Drumheller Fountain

Russian House

Central Stores
Plant Service

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Alumni House
Univ. Book Store

University Way NE
15th Ave. NE

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Speech Hearing
Social Work

House eater
Staff Emp.

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W5 Info.
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William H Gates Hall

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Gate 1
Gate 5
Henry Art Gallery
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Central Plaza
Undergrad
Parking Garage
Meany Hall
Red Square
Gerberding Hall

Johnson
Johnson Annex
Cunningham
C7
C7
Atmos/Sol.
Geophysics
Physics/Astronomy
Bagley

Observatory
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SEEC
Foster Business Library
Balmer
MacKenzie
Denny
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Savery
Kane Hall
Odegaard Undergrad Library
Gowen
Suzzallo Library
Allen Library
Mary Gates Hall
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Kirsten
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Electrical Engineering

Hughes Penthouse Theater
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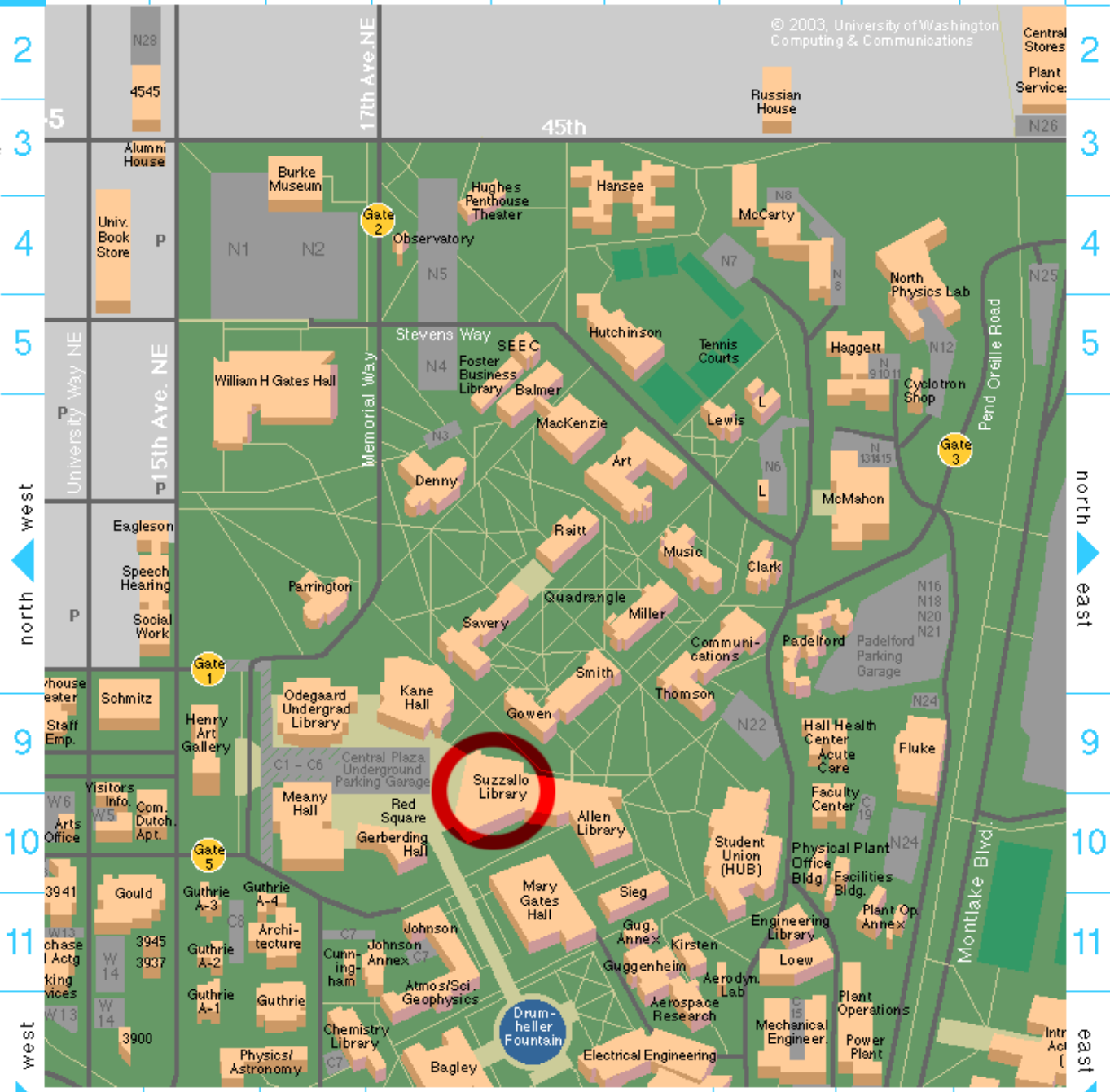
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Suzzallo Library

Drumheller Fountain

Evaluating Information

- Bias
- Prevailing view
- Scientifically Sound

Endnote

- Bibliographic software
- Keeps track of all references
- Allows searching of several databases
- Formats list of references/in text citations