Mapping TV Inspection Observations using Linear Referencing

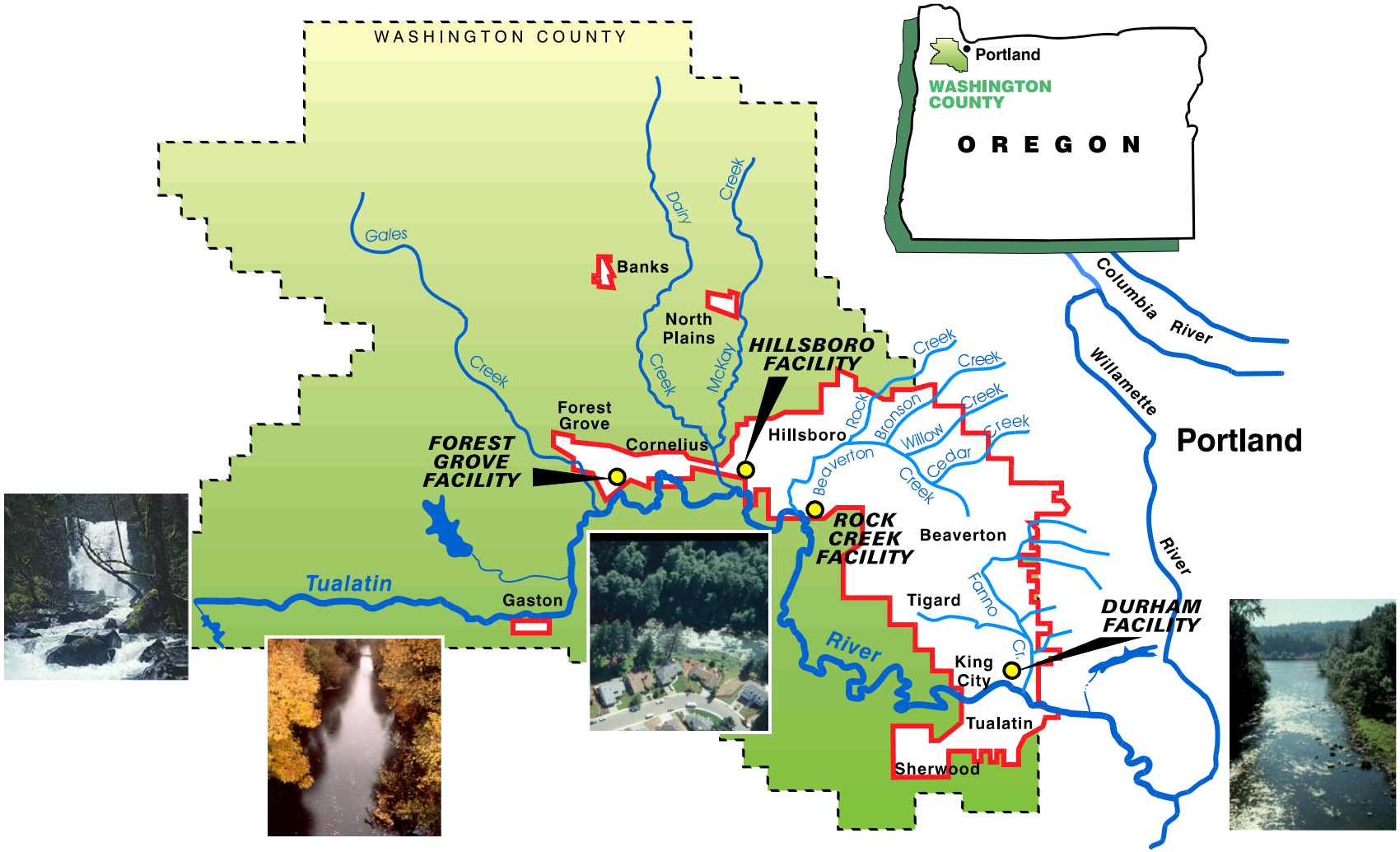
Jeff Van Note, IT Manager

ESRI International User Conference

July 22, 2015

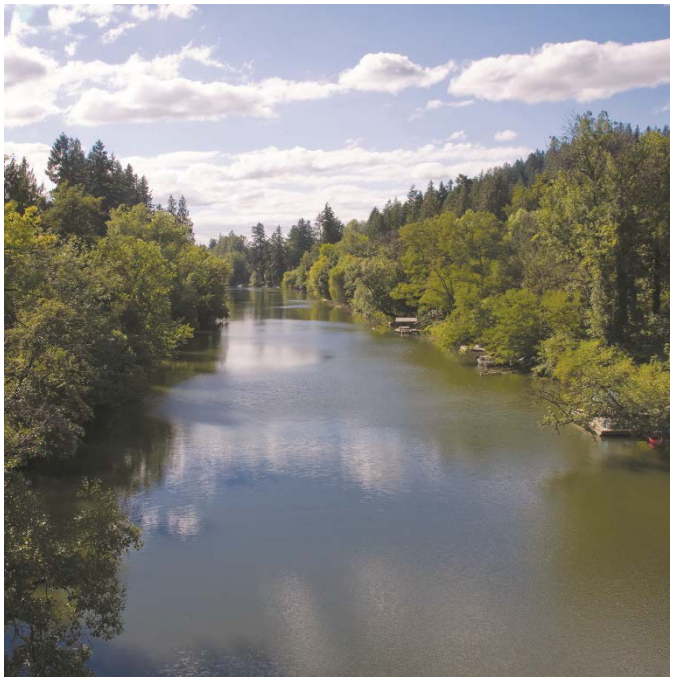
Clean Water Services

Tualatin River Watershed



Tualatin River Facts

- Among the first watersheds in the nation with a TMDL—1988, revised in 2001
- 712-square mile basin, 80-mile river
- Only source is rainfall
- Cleaned wastewater & release of stored water is nearly 70% of summer flow
- Water quality is better than it's been in decades



Clean Water Services

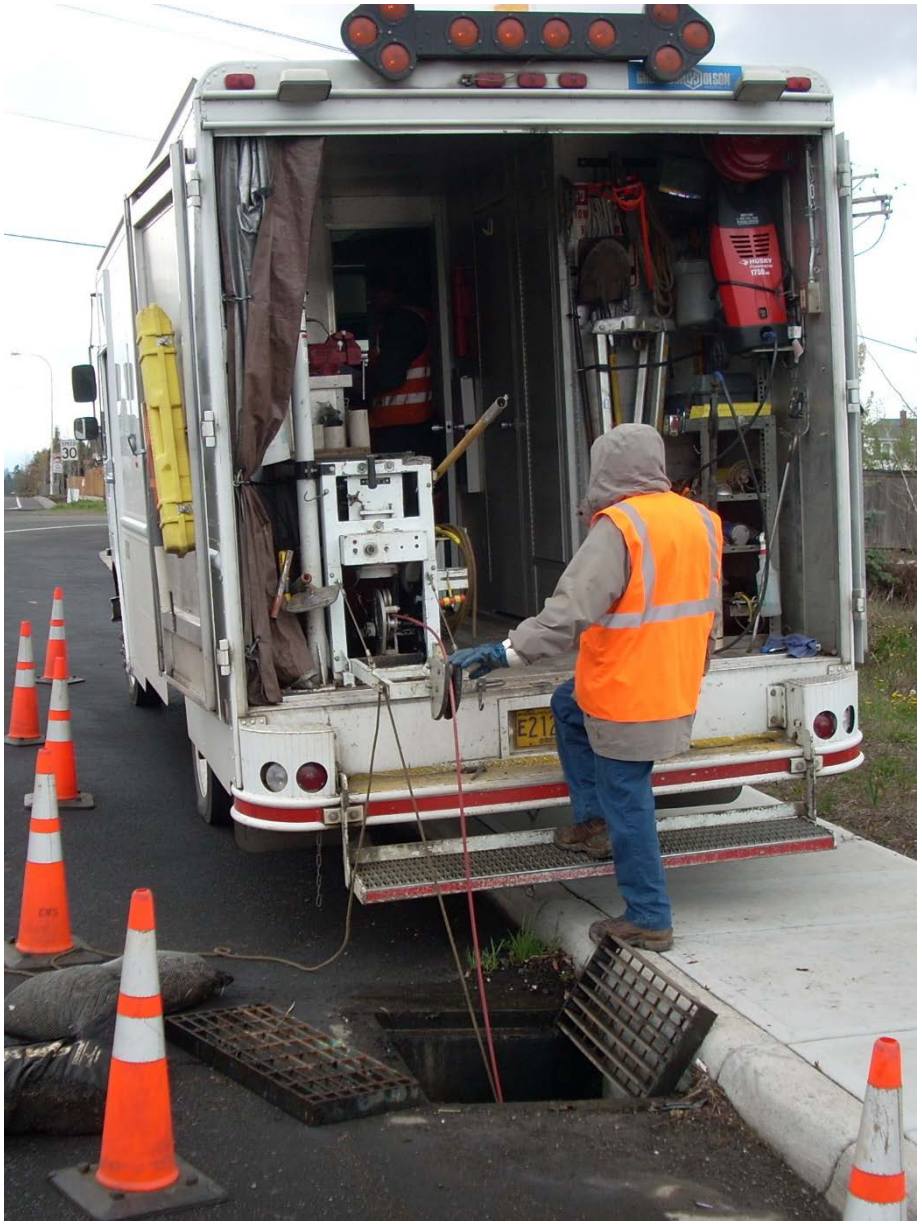
- County service district established in 1970 as the Unified Sewerage Agency (USA)
- Water resources management utility serving more than 560,000 residents inside the urban growth boundary of Washington County
- 12 Partner Cities
- Budget: $59.3M Operating/$57.3M Capital
- Close working relationship with Washington County, but a separately managed and financed public utility

Core Business Areas

- **Wastewater Collection and Treatment**
- **Surface Water Management**
- **River Flow Management**
- **Regional Water Supply Planning**

TV Inspections

- Done to assess condition of sanitary and SWM pipes
- Defects, laterals, and other observations noted by:
  - Observation code
  - Footage
  - Clock reference
  - Severity, if applicable
- Imported to maintenance management system (MMIS)



Clean Water Services

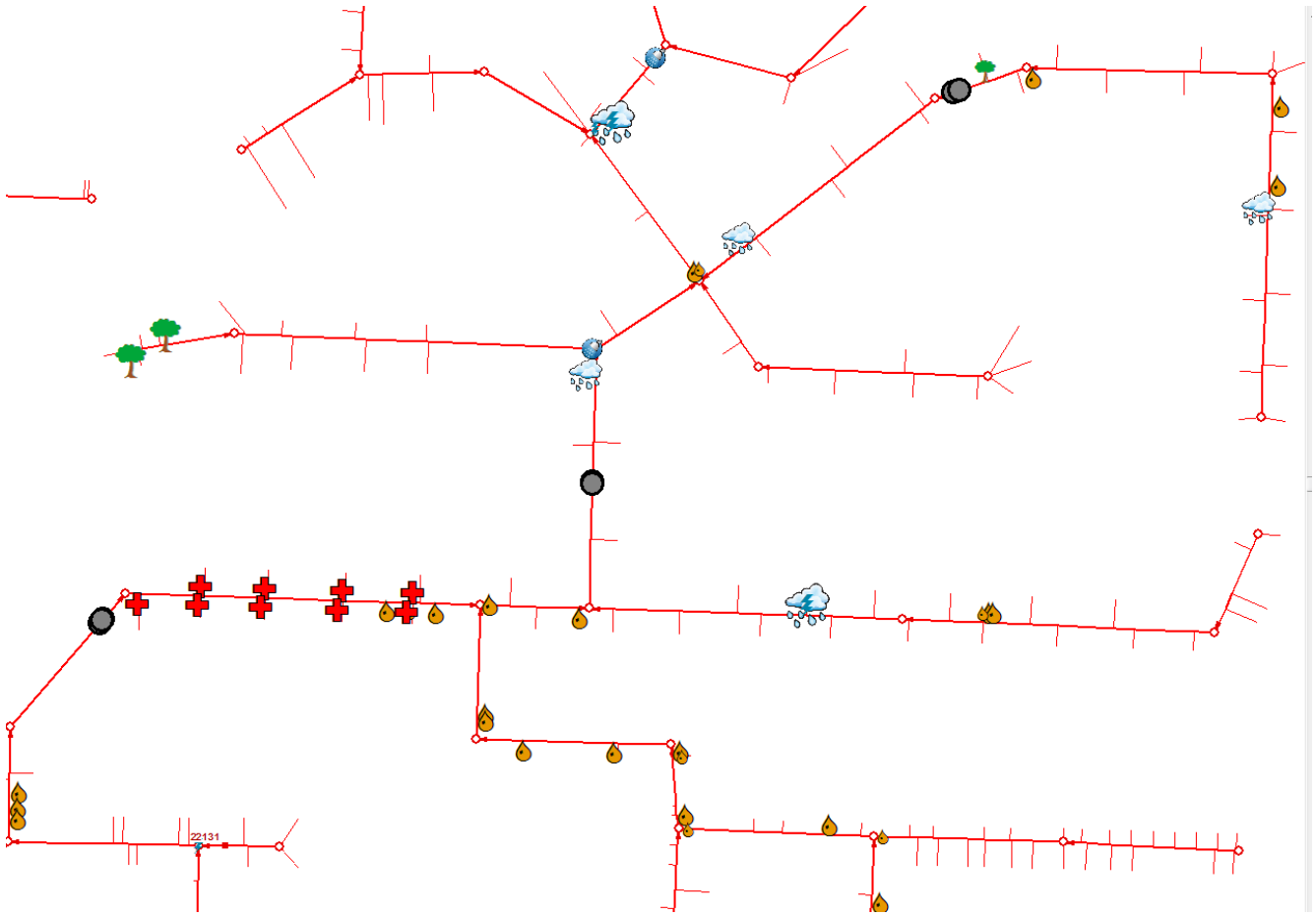
Observations Feature Class

- Point geometry
- Observations from last TV inspection
- Defects categorized by District and department standards
  - Structural, inflow, grease, roots, laterals
- Larger symbol size indicates higher severity

Observations

Clean Water Services

Observations



Clean Water Services

Clean Water Services

Why GIS?

- TV inspection reports are available in both the MMIS and from GIS for specific lines
- GIS allows users to:
  - See the condition of lines in an area at a glance
  - Easily query & display only layers of interest
- Advantages of an observations feature class:
  - Novice GIS users do not have to use linear referencing & joins
  - Allows observations to be categorized by business need

Inspection Report

Inspection Details

Sanitary Line: 9608 (US) - 9607 (DS)

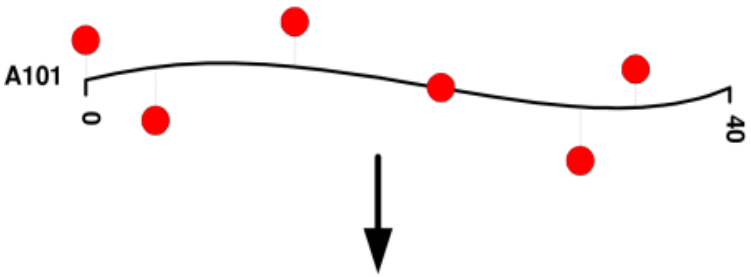
Inspection Date: 3/29/2013

TV Direction: Downstream to Upstream

Footage	Reference	Notation	Severity	Start Clock	End Clock	Co
111.60		General Observation	0			
111.60		Manhole	0			
108.10	2 O'Clock	Roots Medium Joint	3	8	4	
102.70		Tap Factory Active	0	9		
99.50		Tap Factory Capped	0	3		
79.90		Tap Saddle Active	0	3		
70.10		Roots Fine Barrel	2	2	5	
0.00		Manhole	0			
0.00		Water Level	0			

Linear Referencing

- **For TV inspection purposes:**
  - **Location expressed as distance along a line**
- **Examples include:**
  - **Flow gauges on a river**
  - **Mileposts on a highway *and…***
  - **Footage on a sewer line**



Point_ID	Route_ID	Measure
1	A101	0
2	A101	4.9
3	A101	14.7
4	A101	23.9
5	A101	33.2
6	A101	38.1

Required Inputs

- Event table
  - TV observations from MMIS
- Route class
  - Derived from Sanitary Gravity Mains

Observations Event Table

- Get most recent inspection from MMIS
- Get observations and footage using upstream to downstream direction (with flow)
- Calculate the footage and reverse clock direction for inspections done against flow
- Clock references between 1-5 & 7-11 will have an offset to help with visuals
- Map to custom defect categories and populate table in geodatabase

Route Feature Class

- A route feature class is required
- Python script creates route class from Sanitary Gravity Mains feature class periodically
  - Sanitary line unique ID is route identifier
  - From/To fields are shape length

Route Event Class

- Python script calls Make Route Event Layer tool
  - Use route feature class created from Sanitary Gravity Mains
  - Use table of observations as event table
  - TV inspection events are points as opposed to lines
- Empty & append to observations feature class in geodatabase
- Automated process

Business Applications

- **Field Operations supervisors:**
  - **Root control program**
  - **Evaluating possible point repairs**
- **Engineers:**
  - **Part of rehab project prioritization**
  - **Identifying inflow & infiltration priorities**

Clean Water Services

In Conclusion

Questions?

VannoteJ@CleanWaterServices.org