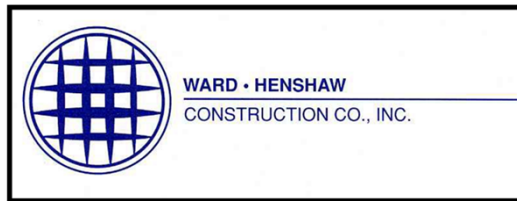


City of Grants Pass Reservoir No. 3 Replacement



Presented by: Michael L. McKillip, P.E., Ph.D.
Murray, Smith & Associates, Inc.

May 7, 2014



Presentation Overview

2

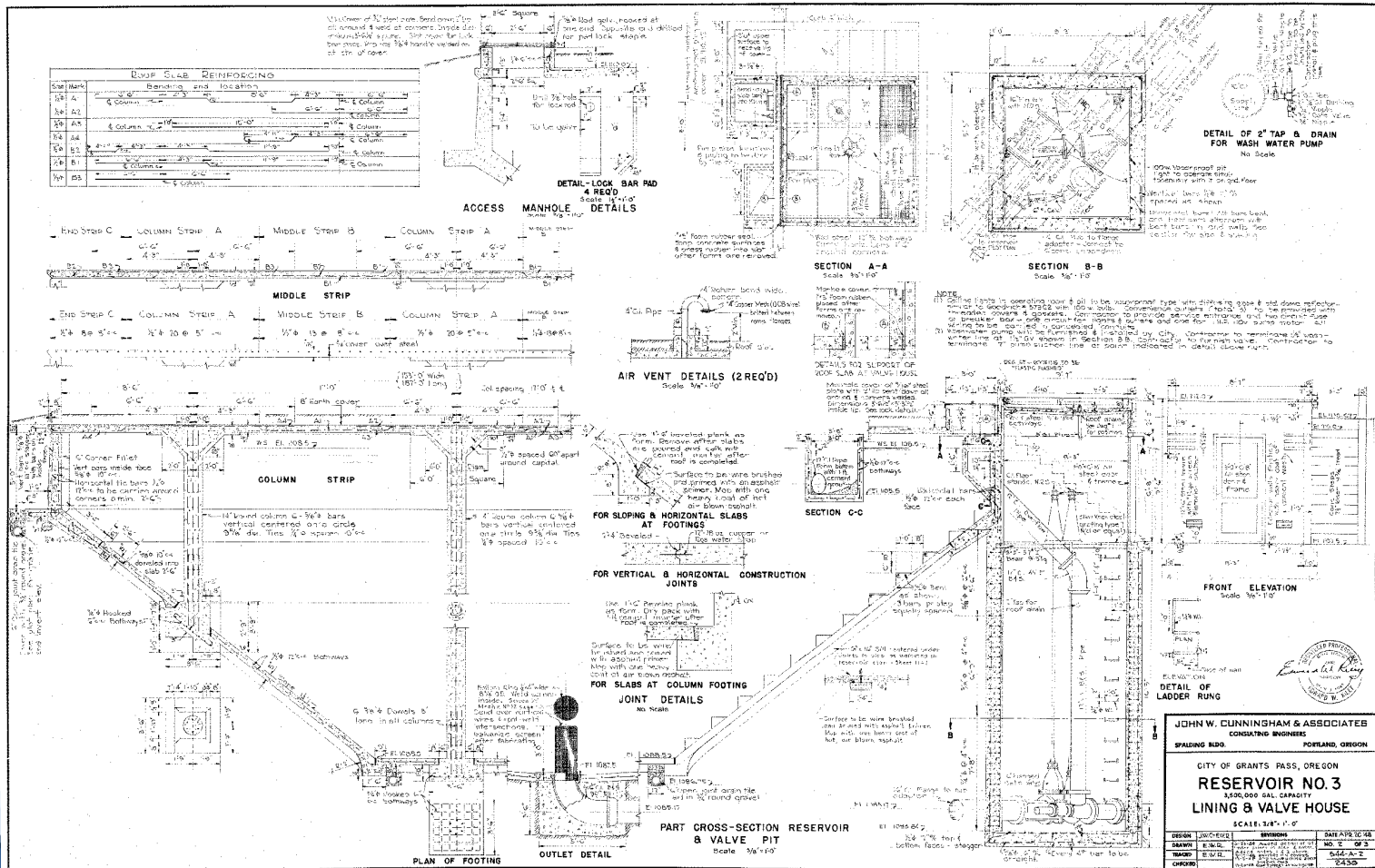
- **Project History**
 - Existing reservoir
 - Assessment
- **Reservoir Design & System Controls**
 - Style selection, sizing, mixing
 - Seismic and control features
- **Reservoir Construction**
- **Promoting Successful Construction Projects**



Existing Concrete Reservoir

3

- Hopper-Bottom
- 1948
- 3.5 MG
- 5.5" Roof
- 17' Spans
- 8" soil cover



2008 Maintenance - Hatches

4



51x72 Looking East

2008 Maintenance – Vault & Instruments

5



Surprise

6



Reservoir Assessment

7

- Leaking, cracking
- Exposed rebar & spalling



- Structural assessment

Public Safety

8



Failing Roof Mitigation

9

Roof Structural Assessment:

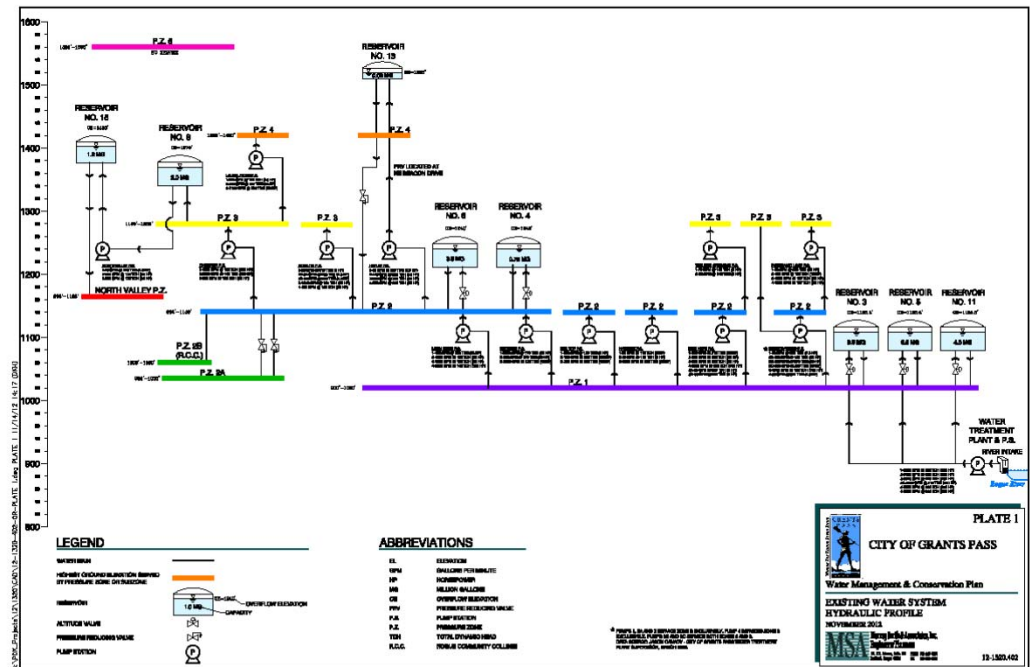
- Repair vs. Replace Roof
- Roof vs. Reservoir



New Reservoir Sizing

11

- Review existing data
 - CIP
 - Planning
 - Site constraints
- Pressure Zone Demands



Upsizing Benefits

12

- Provides for future storage needs in PZ 1
- Economy of scale (volume, number of projects)
- Reduces future land acquisition
- Low current construction costs (2011 design; 2013 construction)
- Low current bond rates
- Greater operational flexibility (turbidity, maintenance)
- Greater emergency storage (WTP out of service)

Reservoir Design - Style

13

- Material
- Style/shape
- Loading (buried)



AWWA D110

Standard for wire and strand-wound circular prestressed concrete water tanks

ACI 318

Building Code Requirement for Reinforced Concrete



ACI 350

Seismic Design of Liquid-Containing Concrete Structures



D110 Seismic Features – Seismic Cables

14

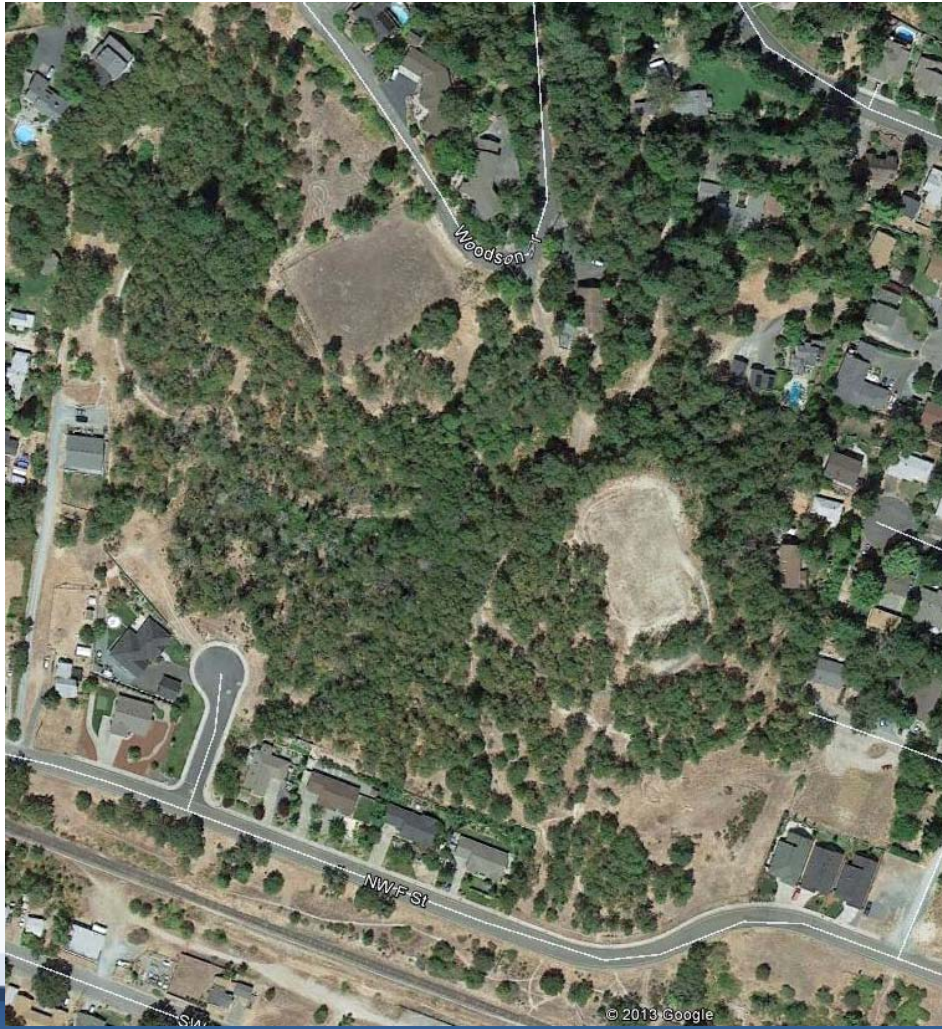


D110 Seismic Features – Vertical Tendons



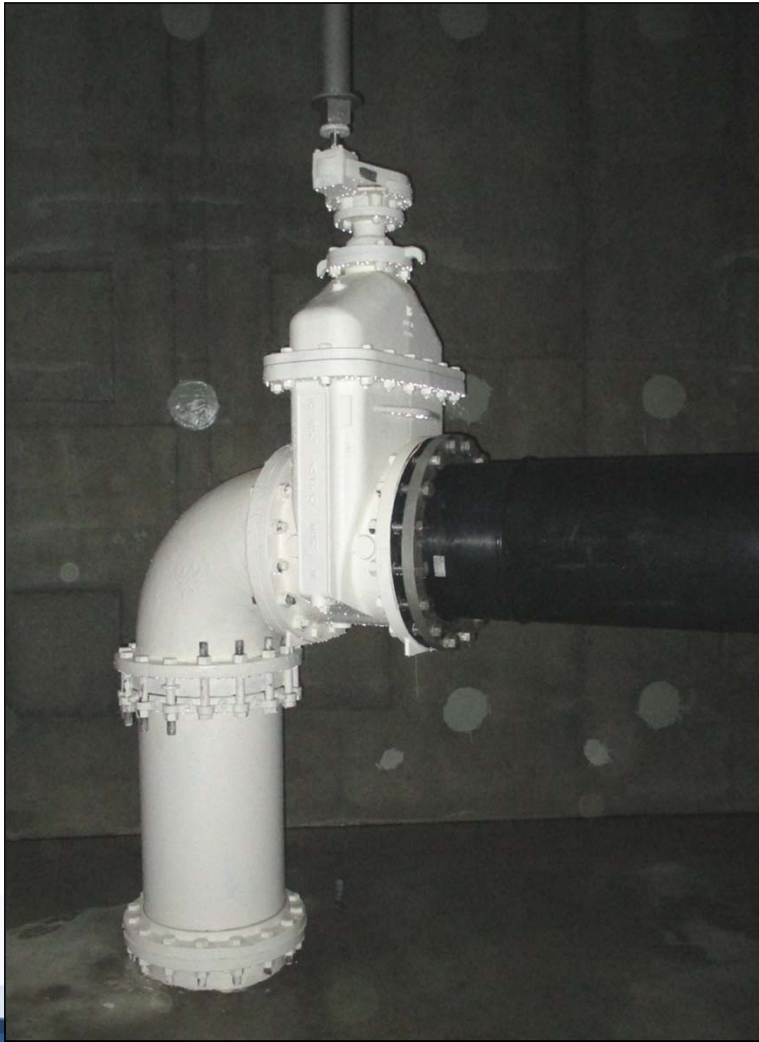
Reservoir Design – Isolation Valving

16



Installed Valves

17



Flexible Piping Connections

18



Reservoir Design - Mixing & Water Quality

19

- **Hydraulic Analysis**
 - Typical day
 - Future peak day
- **System Configuration**
- **Water Quality**
 - Can be an issue due to water age and low reservoir turnover
 - Reservoirs sized for future growth
 - Sized for peak events
 - Improve water quality operationally or with mixing improvements



Courtesy of
Matt Hickey

Mixing & Water Quality

20

- **Inlet Mixing System**

- Reservoir geometry
- Fill/drain rates



- **Tideflex (passive mixing)**

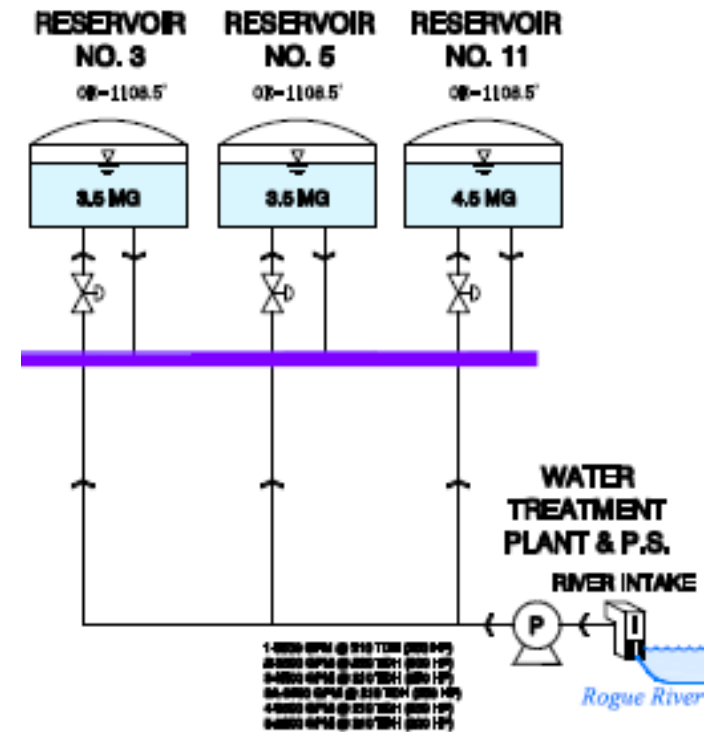
- Header piping
- “Duck Bill” valves



Reservoir Controls

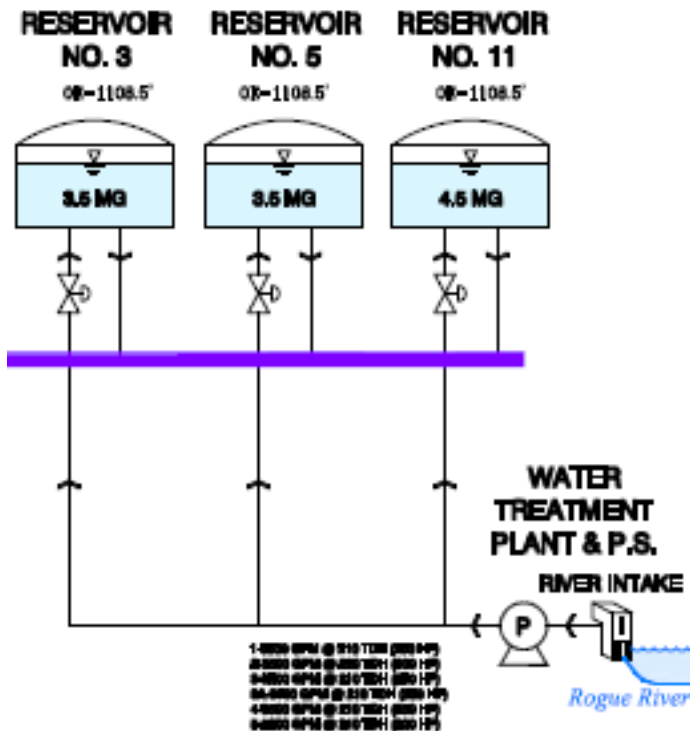
21

- Altitude Valve
- Floats
- Pressure transducer



Construction Schedule – Reservoir Offline ~1 year

22



Historic Landmark by the Grants Pass Historic Building and Sites Commission and the American Water Works Association's (AWWA) National Historic Water Landmarks.

Construction - Before

23



Construction – Mass Excavation

24



Construction – Underdrain, Foundation

25



Construction – Pipe Blocks

26



Construction – Floor Slab & Joint



Construction – Floor Slab



Photo by Ward-Henshaw Construction

Construction - Walls



Photo by City of Grants Pass

Construction - Walls



Construction - Roof

31



Circumferential Pre-stressing

32

City of
Tigard:

550-ft
Reservoir
(2008-9)



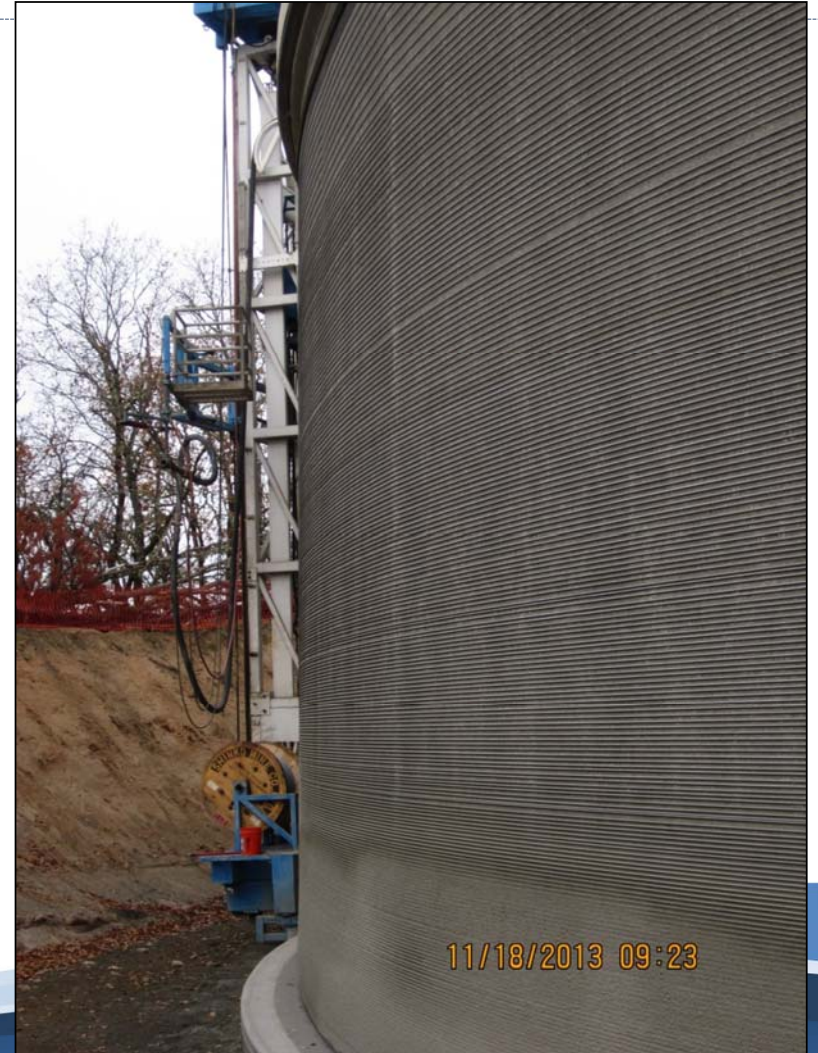
Pre-wrap Blasting



City of Rogue River,
1.2 MG Reservoir

Strand Wrapping

34



Topcoat Shotcrete

35



Shotcrete Curing

36



Exterior Coating

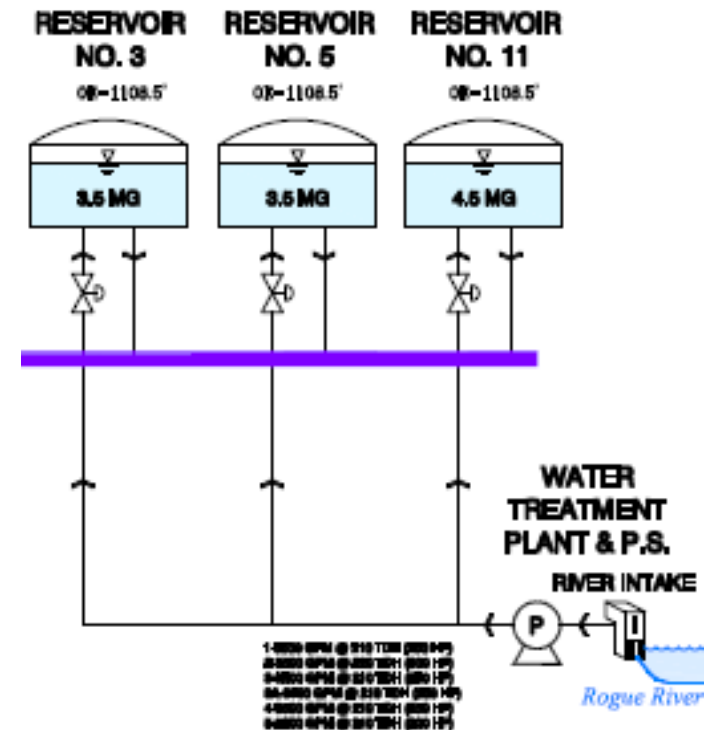
37



Reservoir Filling and Testing

38

- Reservoir filling
- Hydrostatic testing
- Bacteria testing
- Wetwell chlorine residual
 - 1.0 to 0.6 ppm in 2 hours



Instrumentation

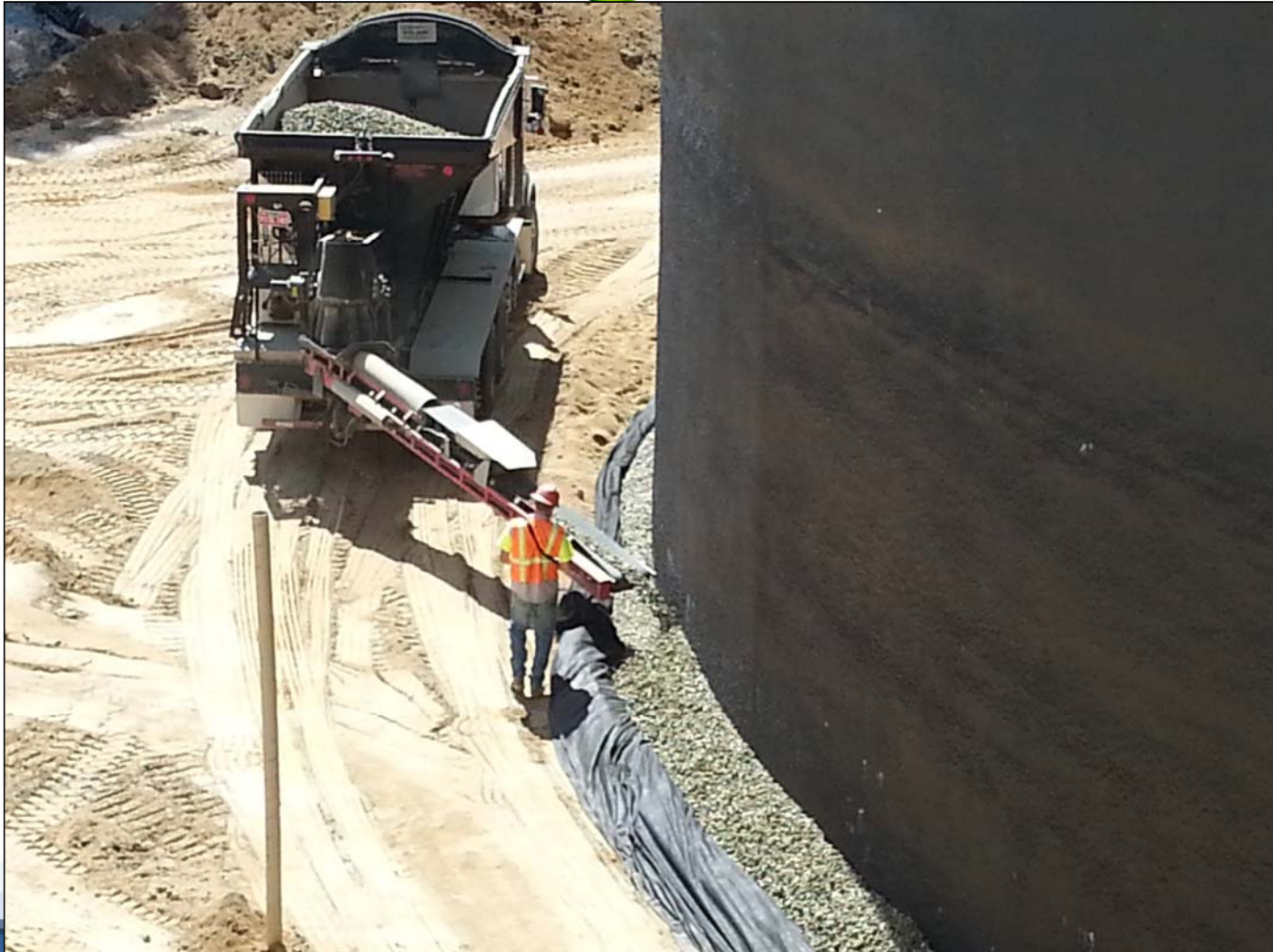
39

OAR 333-061-0050(1)(e): “Only materials designed for potable water service and meeting NSF Standard 61 [...], or equivalent shall be used in those elements of the water system which are in contact with potable water.”



Wall Drain Rock Placement

40



Another method...

41



April 30, 2014

42



Proposed Equipment

43



From Caterpillar website

Almost There...

44

- On schedule – completed by June
- 0.2% in change orders
- At original contract value overall

Construction Contractor Pre-qualifications

45

- **Promoting Success**
 - Demonstrated Experience
 - Efficiency
 - Appropriate Low Bid
- **Retain Competition**



Another Example

46

- City of Tigard
- Excavation & Shoring
Prequalification



Field Observation

47

- Qualified Staffing
- Design Intent
- Contractor Relationship
- Common Issues
- Keeping the contractor in the black



'Concrete' Example: Pre-pour Meetings

48

- **Success through anticipated problems**
 - **Delivery:** Routes, hours, events
 - **Access, staging, traffic control**
 - **Hot/cold weather**
 - **Curing**
 - **Equipment failure/backups**
 - **Special Inspections**
 - **Out of specifications process**



There's always one...

49





50



Thank You!

51

