TUALATIN VALLEY
WATER DISTRICT

IMPLEMENTING HDPE FOR TVWD ENGINEERS & OPERATORS

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TOPICS

1. About TVWD
2. About TVWD’s main replacement program
3. Planning the pilot program
4. Design
5. Purchasing Equipment
6. Training
7. Construction
8. Lessons Learned

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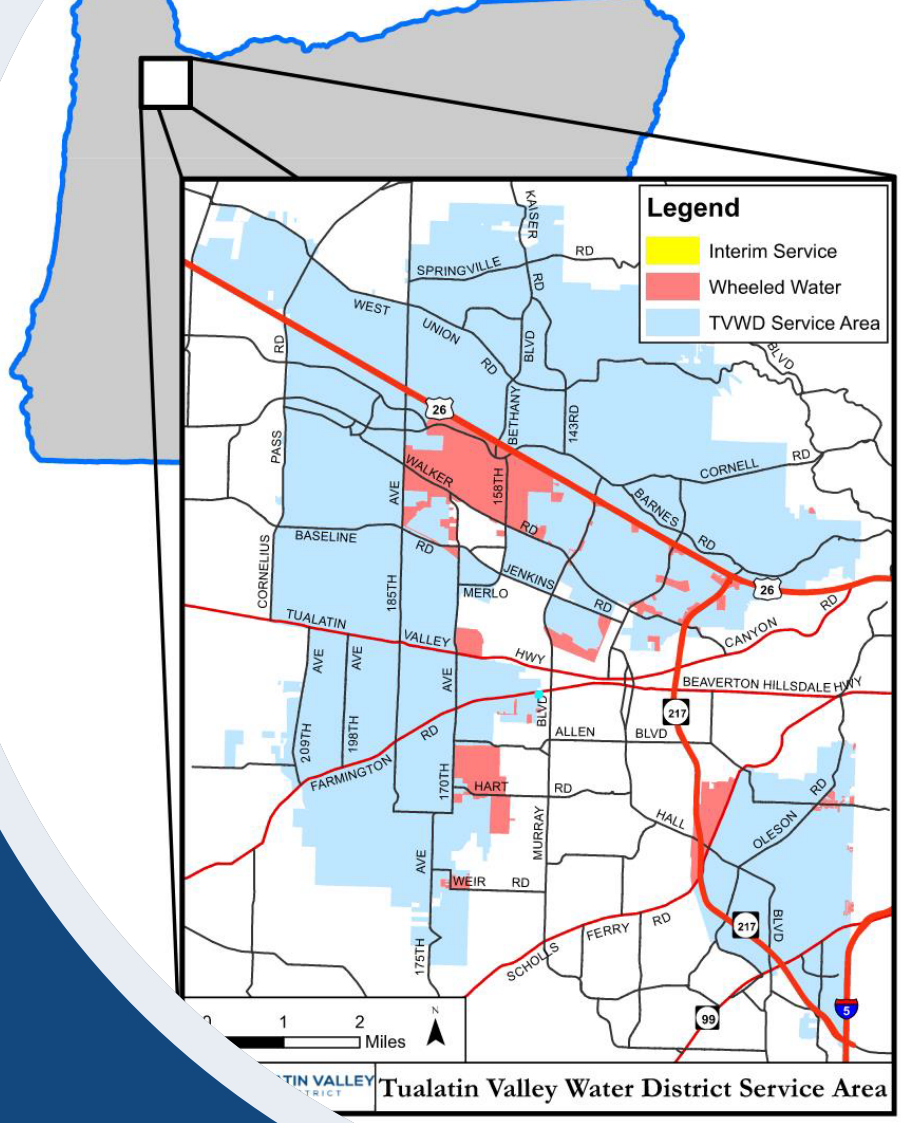
About TVWD

District Info



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ABOUT TVWD

General

- TVWD is a special district that serves over 217,000 customers in Washington County, OR
- Service area is more than 41 square miles
- Over 758 miles of pipe (distribution and transmission)

Main Breaks

- From July 2020 – June 2021, TVWD operations repaired more than 40 shear or corrosion-related leaks

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About TVWD

Main Replacement Program

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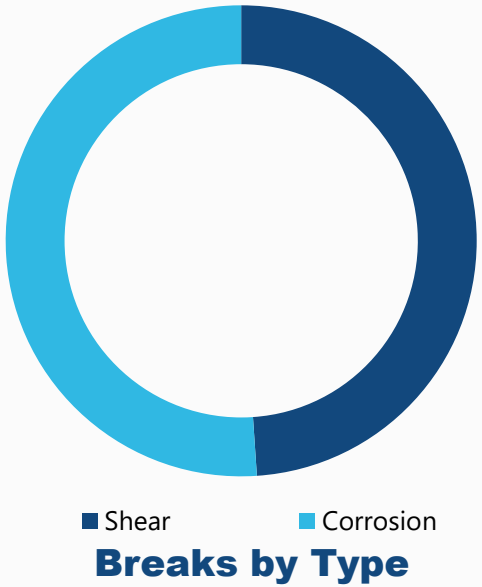
MAIN REPLACEMENT PROGRAM

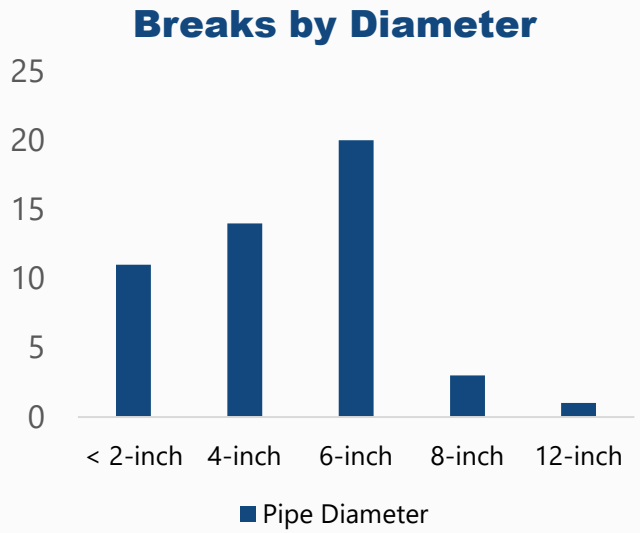
Why even consider HDPE?

NO END IN SIGHT…

- TVWD has a goal of 1% replacement per year (7.5 miles)
  - Currently replacing much less than 1%
- Program is reactionary to leaks
- Over 120 projects identified
- Most projects are 6-inches or less
- HDPE is a cost-effective option for 4-inches or less



Breaks by Type



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Planning the Program

HDPE Replacement Options

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PLANNING THE PROGRAM

TVWD's Approach

1. **Start with the idea**
   - TVWD Engineering and Operations staff attended the "HDPE Roadshow" and learned about HDPE for waterlines
2. **Get initial buy-in and develop the pilot program**
   - Determined the cost per linear foot of HDPE projects vs. traditional DIP projects
   - Presented idea for pilot program to management for approval
3. **Compile list of representative projects**
4. **Initiate design**
   - TVWD acquired the help of Ferguson waterworks contacts to design our first HDPE project
5. **Train operators**
   - Again, TVWD used the help of Ferguson waterworks to get the necessary training and certification
6. **Purchase equipment and supplies**
   - Based on the design and list of projects, TVWD was able to purchase the right equipment
7. **Construct project**
   - For the first project, we had Ferguson to help us inspect and test the new pipe
8. **Get feedback and improve!**

POLL QUESTION #1

Does your organization currently use or plan to use HDPE?

Options:

1. Yes
2. No
3. Unsure

Design Process

HDPE Replacement Options

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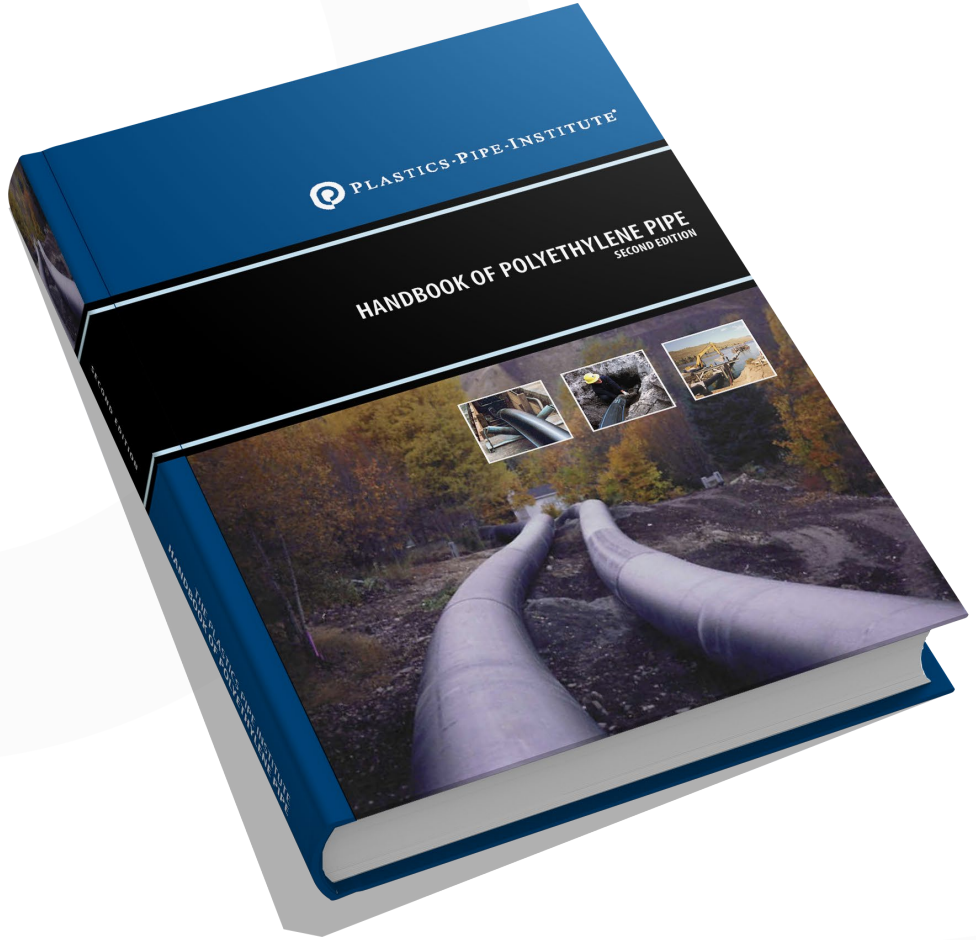
DESIGN PROCESS

Answering some major questions!

1. **What type of pipe should we use?**
   - DR 7? DR 9? DR 11?
2. **How do we install the service lines?**
   - Butt fusion? Electrofusion?
   - What type of EF fittings work best?
3. **How do we install appurtenances like CARVs or blowoffs?**
   - What type of EF fittings?
   - What about thrust restraint?
4. **What about cathodic protection?**
   - Are anodes required for service lines and meters?

PPI Field Manual – Absolutely Essential (link)



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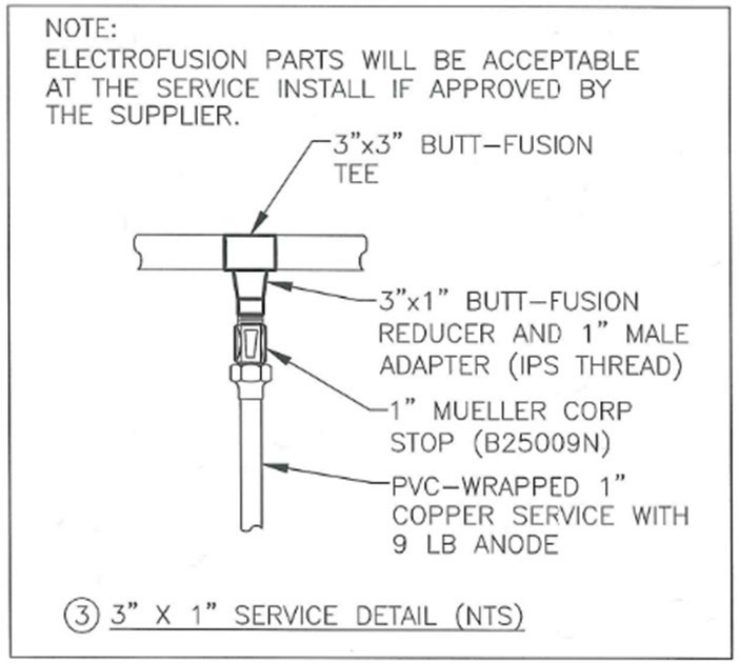
DESIGN PROCESS

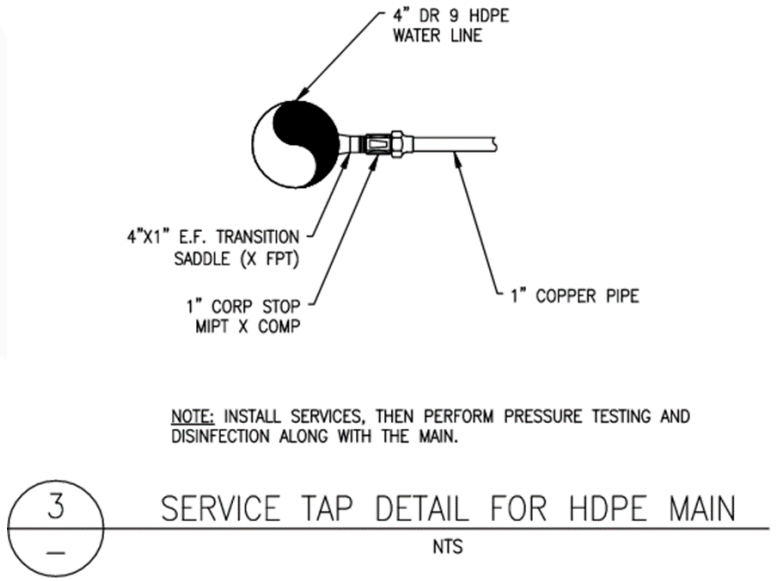
Answering some major questions!

1. **What type of pipe should we use?**
   - TVWD selected DR-9 PE4710 (IPS).
   - This type of pipe could be used in most applications in our service area so parts can be maintained on hand for repair.
   - IPS has the same O.D. as ductile iron pipe so our fittings would also work.
2. **How do we install the service lines?**
   - We tried both! We will discuss more in detail on the next slide.
3. **How do we install appurtenances like CARVs or blowoffs?**
   - Again, we tried both! Our design progression will follow.
4. **What about cathodic protection?**
   - Ok, this was an easy question. Based on our experiences, we knew we would need to have sacrificial anodes on the copper service lines.

SERVICE SADDLES

Design Progression – Based on Operations Feedback





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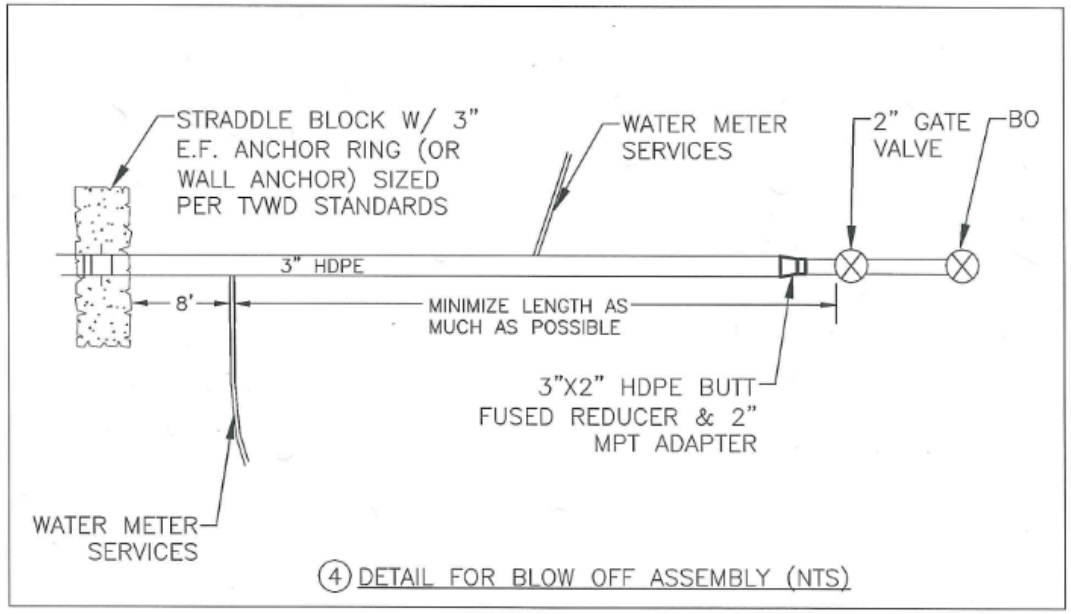
BLOWOFF DESIGN

Design Progression – Based on Operations Feedback



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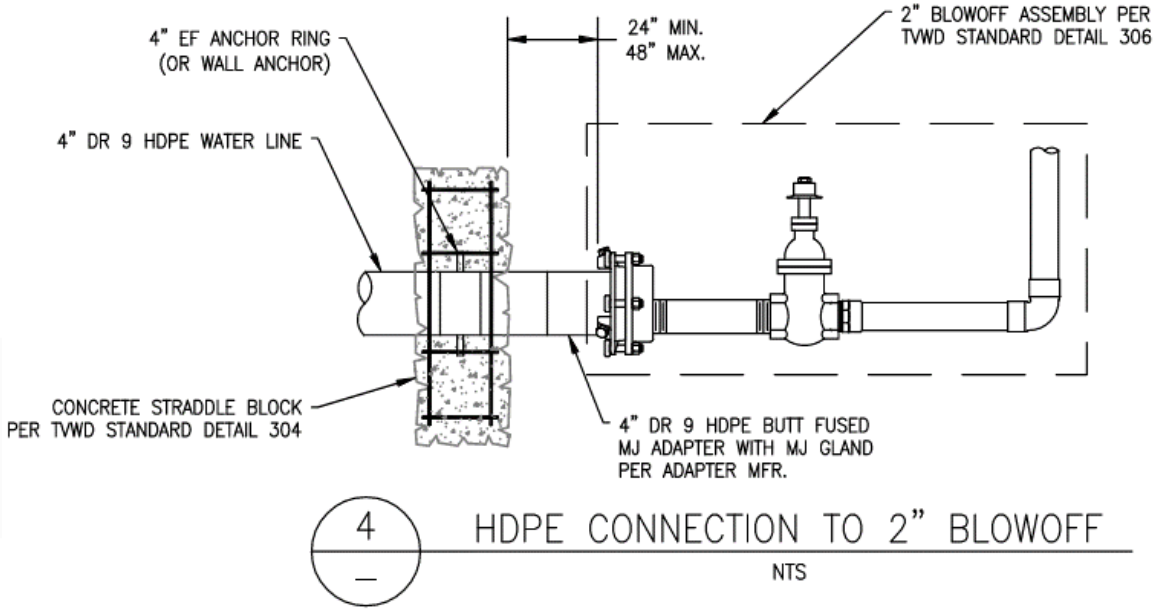

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Purchasing Equipment

HDPE Equipment Options

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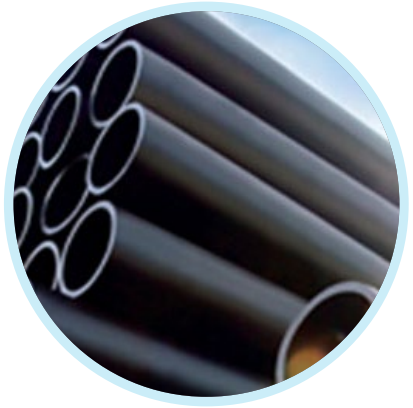
PURCHASING EQUIPMENT



Determine what work will be done

Determine what equipment you need

Justify the purchase

TVWD'S EQUIPMENT

1-4" Pitbull (Butt Welding Machine)

Raptor Electrofusion Machine & Scanner

TVWD purchased equipment for just under $10k in 2018. This has been worth the investment.

- Weekly rental rates would have been about $1,000.
- We have used the equipment on more than 6 projects. Each project has been 1-2 weeks.

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Training

HDPE Installation

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TRAINING TVWD OPERATORS

Learning a new skill takes practice.

1. **Training TVWD Operators was essential to the success of the HDPE program.**
2. **Training was offered locally by Ferguson**
   - TVWD operators took the certification training course a couple of months before commencing their first project.
3. **Variety of training is available, TVWD chose training for up to 6” pipe**
   - We already knew our equipment would only go up to 4” and that we were not planning to use HDPE in-house for anything larger than 4”.
4. **Training meets ASTM standard for HFE (Heat Fusion Equipment) Operator**
   - The certification lasts for one year.
   - Operations staff are responsible for maintaining their certificate.
5. **Ongoing HDPE projects are the most effective training. HDPE fusion is a technical skill that must be practiced**
   - Engineering staff will continue to look for HDPE projects in order to maintain this skill set.

Construction

Project Example

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DAMASCUS WATERLINE

3” HDPE Directional Drill

HDPE laid out

Drill rig and exit pit

Bore Pit and tracer wire

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Lessons Learned

Project Examples

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PRESSURE TESTING

Not quite the same as ductile iron pipe.

Ductile Iron Pipe

- Test occurs once pipe is buried
- Pipe does not expand or contract based on temperature
- Test pressure is the higher of 150 psi or 1.5 times the system pressure
- Pressure is held for one hour before determining leakage
- Leakage is determined by the following formula:

$$L = \frac{S \cdot D \cdot P^{0.5}}{148{,}000}$$

where:

L = Allowable leakage (gal/hour)
D = Nominal pipe diameter (inches)
S = Length of pipe tested (feet)
P = Average test pressure (psi)

HDPE (Reference: PPI Technical Note 802)

- Pre-test and visually inspect the pipe for leaks before burying or boring in
- Pipe does expand and contract based on temperature.
  - This results in a significantly longer test so the pipe temperature stabilizes from the water temperature.
- Test pressure is the lower of 1.5 times system pressure or pressure rating of the lowest pressure rated component in the test section.
- Initial expansion phase:
  - Pressurize the system and add water as necessary to maintain test pressure for 4 hours.
- Test phase:
  - Reduce pressure by 10 psi and stop adding water. Monitor pressure for 1 hour. If pressure holds, leakage is not indicated.

POLL QUESTION #2

How long is the initial expansion phase during an HDPE pressure test?

Options:

1. 1 hour
2. 2 hours
3. 4 hours
4. None, there is no initial expansion phase.

WELDING IN WEATHER

One last tip – invest in a canopy so you can weld in any weather (especially in the PNW)

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THANK YOU

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