

The Future of Pipe Replacement

Presented by

Zack Worley, PE – District Engineer
(David Evans and Associates, Inc.)

Craig Christensen, PE – District Engineer
(David Evans and Associates, Inc.) (not present)

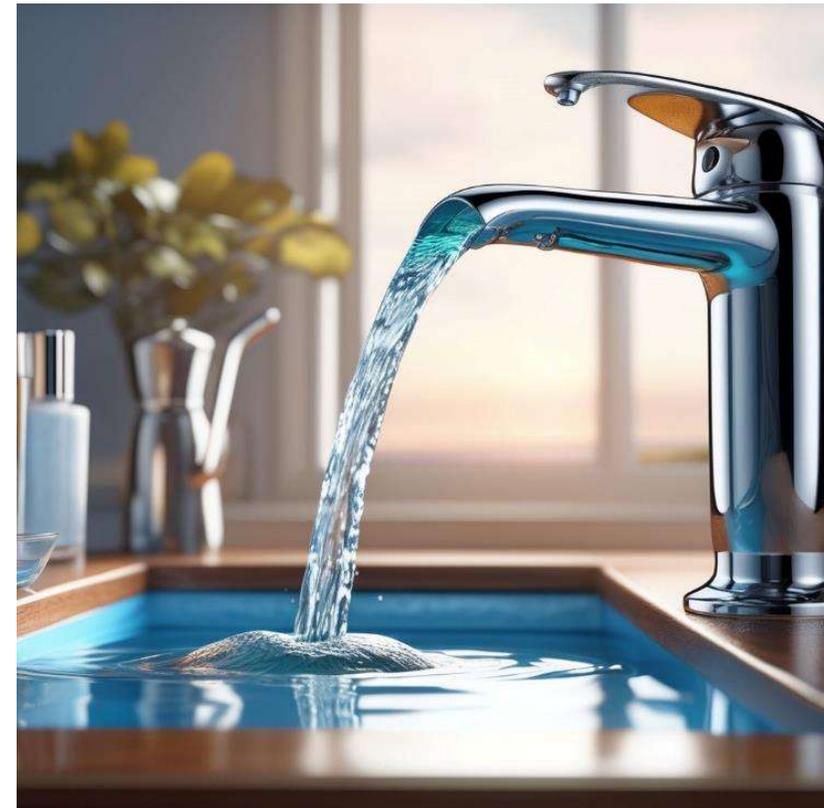
Joshua Drummond – Operations Manager
(King County Water District No. 90)

Gus Flather – Field Foreman/Inspector
(King County Water District No. 90)



Presentation Goal

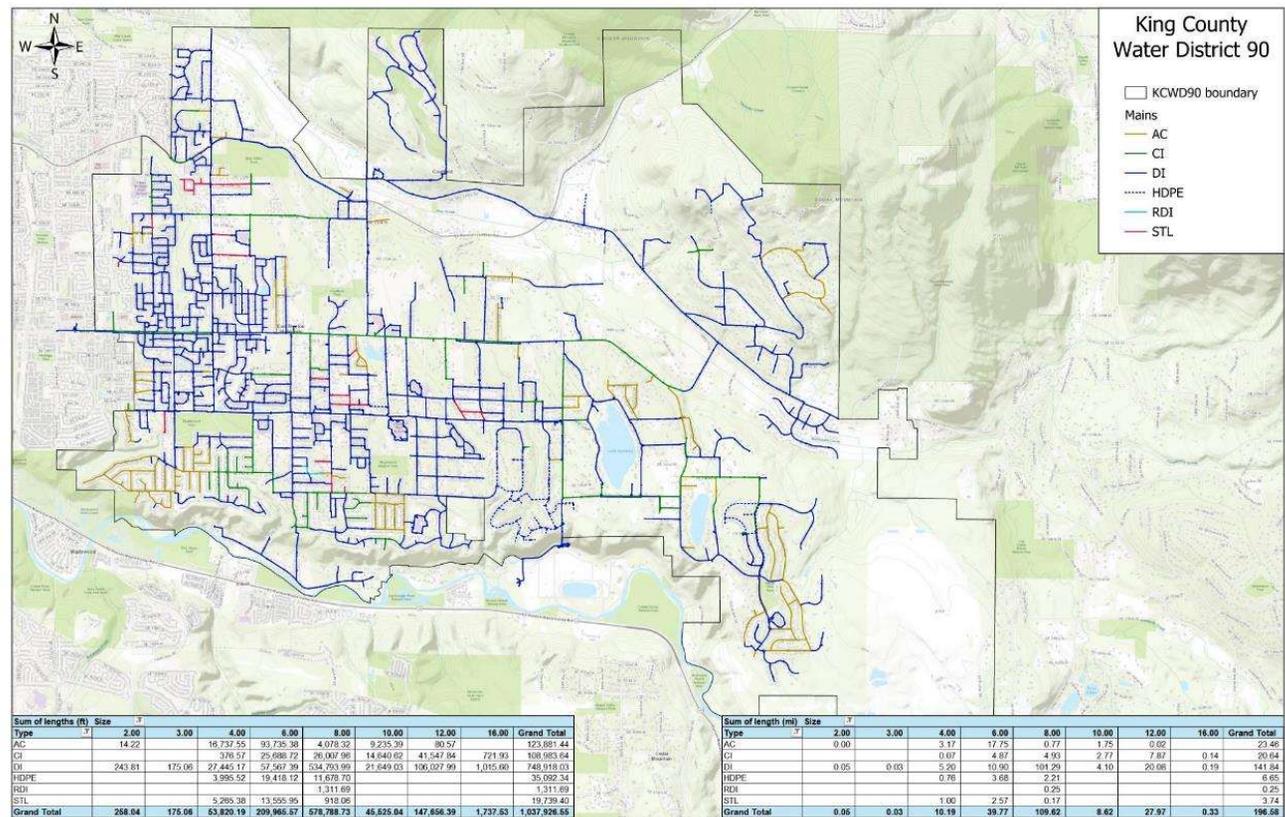
To educate utility providers on ways they can save their ratepayers money by utilizing alternative materials and alternative construction methods on their aging infrastructure in an ever-changing world



Overview of the District



- Located in King County
- Located in Renton, WA
- ~8,200 connections
- Supply via wells (~5%) and SPU (~95%)
- 20,000 LF of Steel
- 124,000 LF of AC
- 109,000 LF of CI
- 750,000 LF of DI
- Currently only 35,000 LF of HDPE... future 200,000 LF of HDPE!



Overview: Why are we here?



INCREASED
EFFICIENCY

AGING
INFRASTRUCTURE

ASSET LONGEVITY
& SEISMIC
RESILIENCY

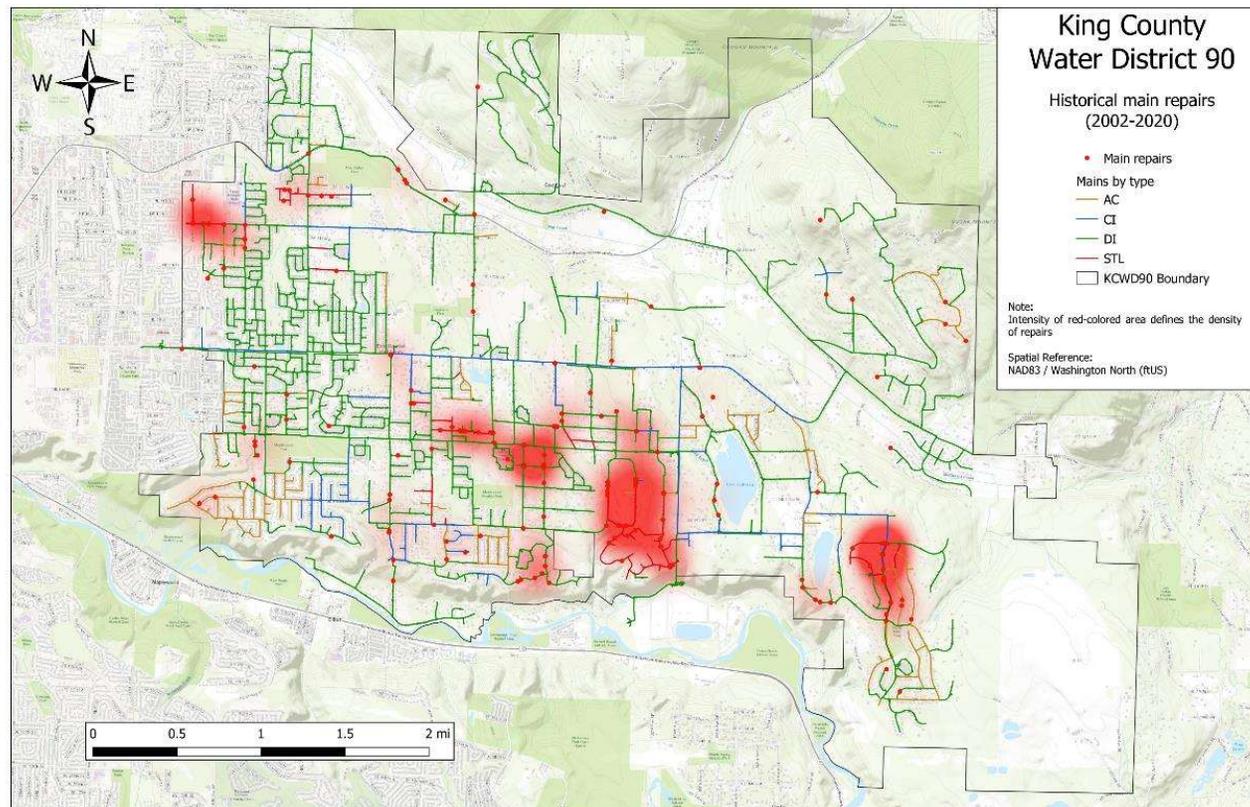
FUNDING
UNCERTAINTY



Overview: Why are we here?



Overview: Why are we here?



Overview: Why are we here?



Problems that got us here

Stuck using traditional materials / methods

Cost of ductile iron (mains) and copper (services)

Open-cut replacement requiring full road overlays

Inflation and supply chain issues caused by COVID

Solutions to the problems

Work collaboratively to find alternative materials / methods

HDPE w/tracer wire

Pipebursting w/minimal pavement restoration

District pre-purchasing materials

Project Costs



Discussion Starts
on District Philosophy
Changes



District Philosophy
Implemented and
District Engineer
Changes



Year	Project	Footage	Overall Cost*	Cost per Foot
2018	Lake McDonald	4600 feet	\$1.65 million (\$2.06 million**)	\$359 (\$448**)
2019	West Lake Kathleen	7800 feet	\$2.79 million (\$3.38 million**)	\$360 (\$436**)
2022	HDPE Pilot	1300 feet	\$318k (\$334k**)	\$245 (\$257**)
2023	Renton Suburban Tracts	13550 feet	\$2.79 million	\$271
2024	804 Zone	5300 feet	\$1.22 million +/-	\$230 +/-

* Overall Cost includes District, material, engineering, and construction costs

** ENR construction cost index update to present day

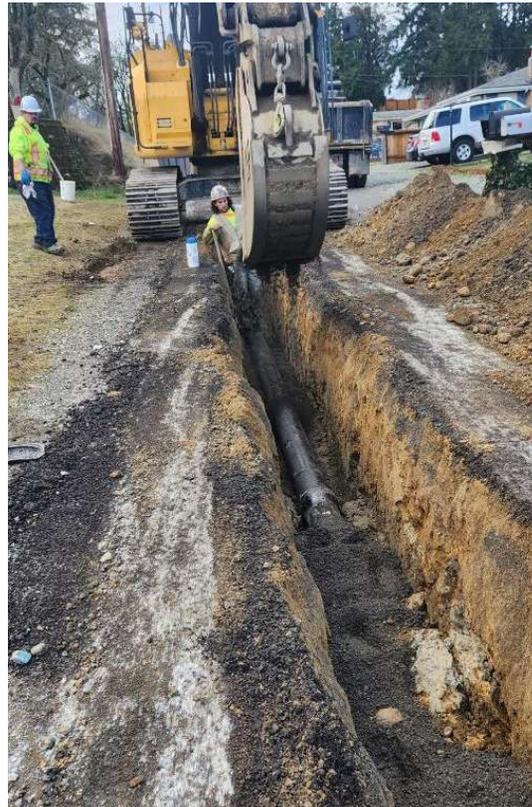
Recent and Current Projects



Year	Project	Footage	District Cost	Material Cost	Engineering Cost	Contractor Cost	Total Cost (per foot)	Pavement Restoration Savings
2022	HDPE Pilot	1,300 feet	\$95k (30%)	N/A	\$50k (16%)	\$173k (54%)	\$318k (\$245/LF)	\$163k (33%) (\$125/LF)
2023	Renton Suburban Tracts	13,550 feet (10,299 feet)	\$185k (6%)	\$582k (20%)	\$302k (11%)	\$1,744k (63%)	\$2.79 million (\$271/LF)	\$1.293 million (32%) (\$125/LF)
2024	804 Zone	5,300 feet	\$61k (5%)	\$159k (13%)	\$118k (10%)	\$876k (72%)	\$1.22 million (\$230/LF)	\$665k (55%) (\$125/LF)
2025	NE 8 th & Apollo*	2,030 feet	\$140k (47%)	\$40k (13%)	\$20k (7%)	\$100k (33%)	\$300k (\$148/LF)	\$262k (87%) (\$129/LF)

*In-house project

Stuck using traditional materials and methods



Worked collaboratively to find alternative materials and methods



Ductile iron and copper... Same old, same old...



Why HDPE?



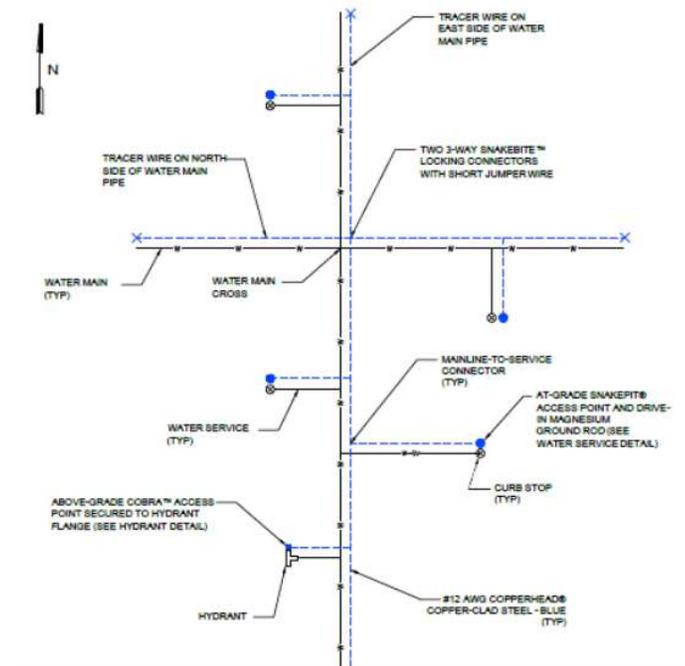
Local Evaluation of Seismic Performance Characteristics of Various Pipes and Connectors

Criteria	CIP	PVC With Restraint	PVCO	PVCO Deep Bell With Restraint	DIP	DIP With Restraint	DIP With Restraint, Expansion Sleeve	DIP Seismic	HDPE
Ruggedness	1	2	3	3	3	3	3	3	3
Bending	1	2	3	3	3	3	3	3	3
Joint flexibility	1	2	2	2	3	3	3	3	3
Joint restraint	1	1	1	3	1	3	3	3	3
Strain relief	1	2	1	3/1	1	1	3	3	3
Corrosion resistance	1	3	3	2	1	1	1	1	3
Familiarity with use	3	3	2	2	3	3	3	2	1
Availability	1	3	1	1	3	3	3	1	3

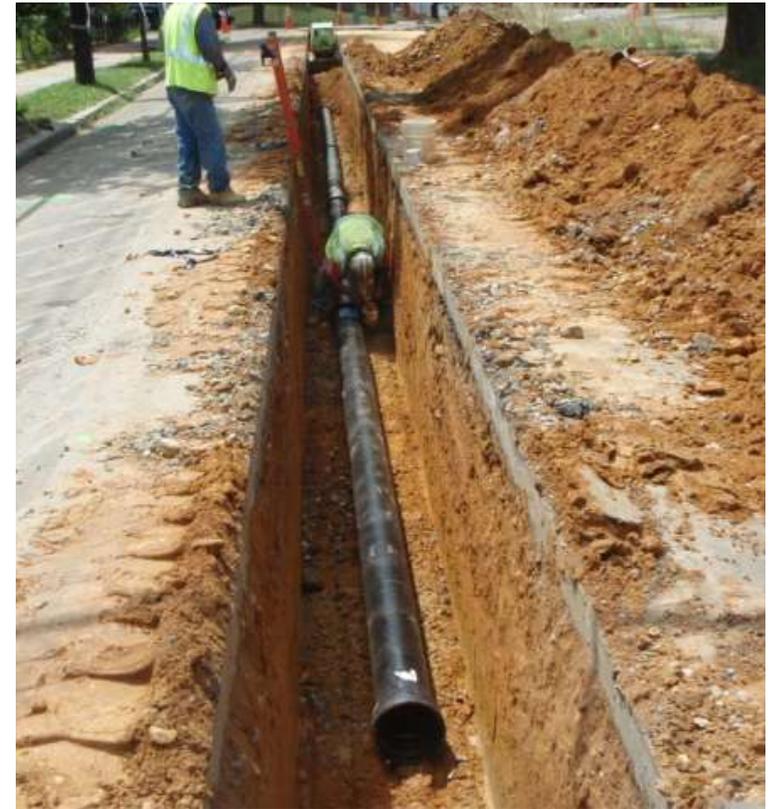
Table courtesy of Donald Ballantyne. Used with permission.

CIP—cast iron pipe, DIP—ductile iron pipe, HDPE—high-density polyethylene, PVC—polyvinyl chloride, PVCO—polyvinyl chloride (molecularly oriented)

For comparison purposes. 1: Low/Poor, 2: Medium/Average, 3: High/Excellent



Open cut replacement requiring full road overlays



Why *not* Pipebursting?



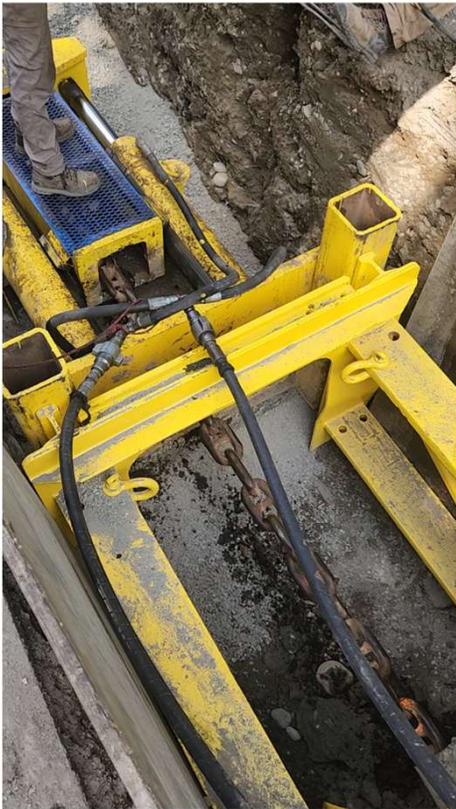
Why *not* Pipebursting?



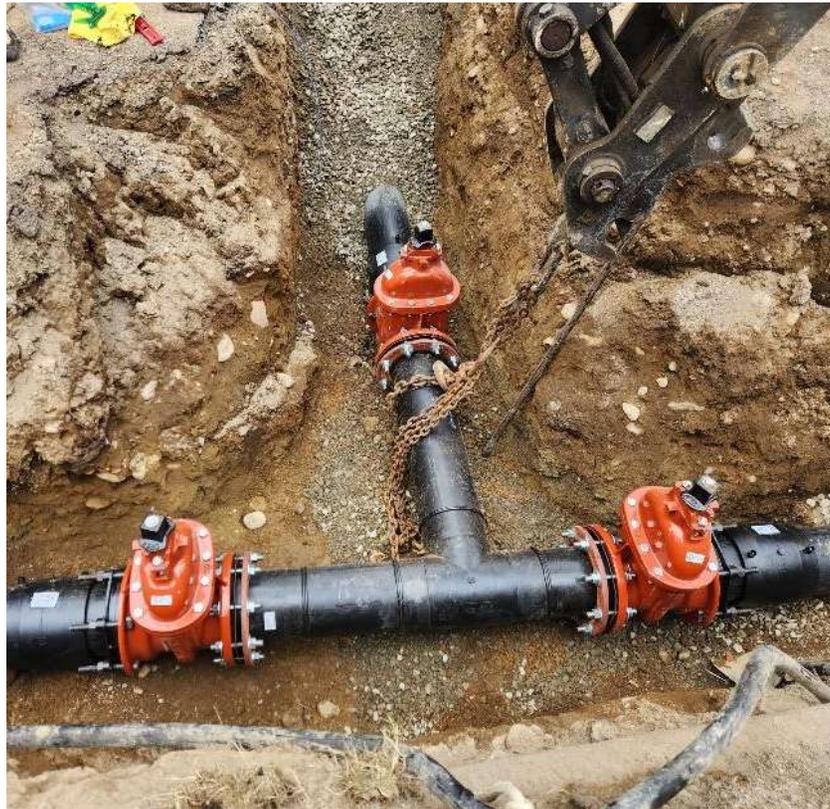
Why *not* Pipebursting?



Why *not* Pipebursting?



Why *not* Pipebursting?



Inflation and supply chain issues caused by COVID



Pre-purchasing materials



DAVID EVANS
AND ASSOCIATES INC.

BID TABULATION

Called by: King County Water District #90
For: 2022 CIP Materials Procurement

Vendor 1

Vendor 2

ITEM NO.	QUANTITY	DESCRIPTION OF ITEM	UNIT	UNIT PRICE	TOTAL COST	LEAD TIME	UNIT PRICE	TOTAL COST	LEAD TIME
				USD \$	USD \$	(WEEKS)	USD \$	USD \$	(WEEKS)
1		HDPE PIPING, IPS. BUTT FUSED	-	-	-	-	-	-	-
1A	8,000	1" DR7	LF	\$ 0.70	\$ 5,600.00	6	\$ 0.72	\$ 5,760.00	5
1B	12,000	8" DR11	LF	\$ 12.50	\$ 150,000.00	10	\$ 12.61	\$ 151,320.00	5
1C	7,000	10" DR11	LF	\$ 19.25	\$ 134,750.00	10	\$ 19.34	\$ 135,380.00	5
1D	2,000	12" DR11	LF	\$ 28.00	\$ 56,000.00	10	\$ 27.36	\$ 54,720.00	5
4		HDPE FITTINGS, DR11	-	-	-	-	-	-	-
4A		SADDLES, EF	-	-	-	-	-	-	-
4A(1)	120	8"	EA	\$ 65.50	\$ 7,860.00	3	\$ 78.75	\$ 9,450.00	6
4A(2)	50	10"	EA	\$ 68.50	\$ 3,425.00	3	\$ 78.75	\$ 3,937.50	6

Notes:

- 1 Both vendors supplied Lead Time (weeks) in a range, the upper limit (higher) value was used.
- 2 Investigate cost difference.
- 3 Lead Time required puts material on Critical Path
- 4 Price advantage offset by lead time, investigate.

Required District Training and Equipment



Future

- Pipebursting AC
- In-House Work

