



THE Event For The Utility Infrastructure Industry

Underground Construction Technology
International Conference & Exhibition

Vermeer®



**EQUIPPED TO
DO MORE.®**

Maximize Productivity with your Utility Installation

Cory Mass

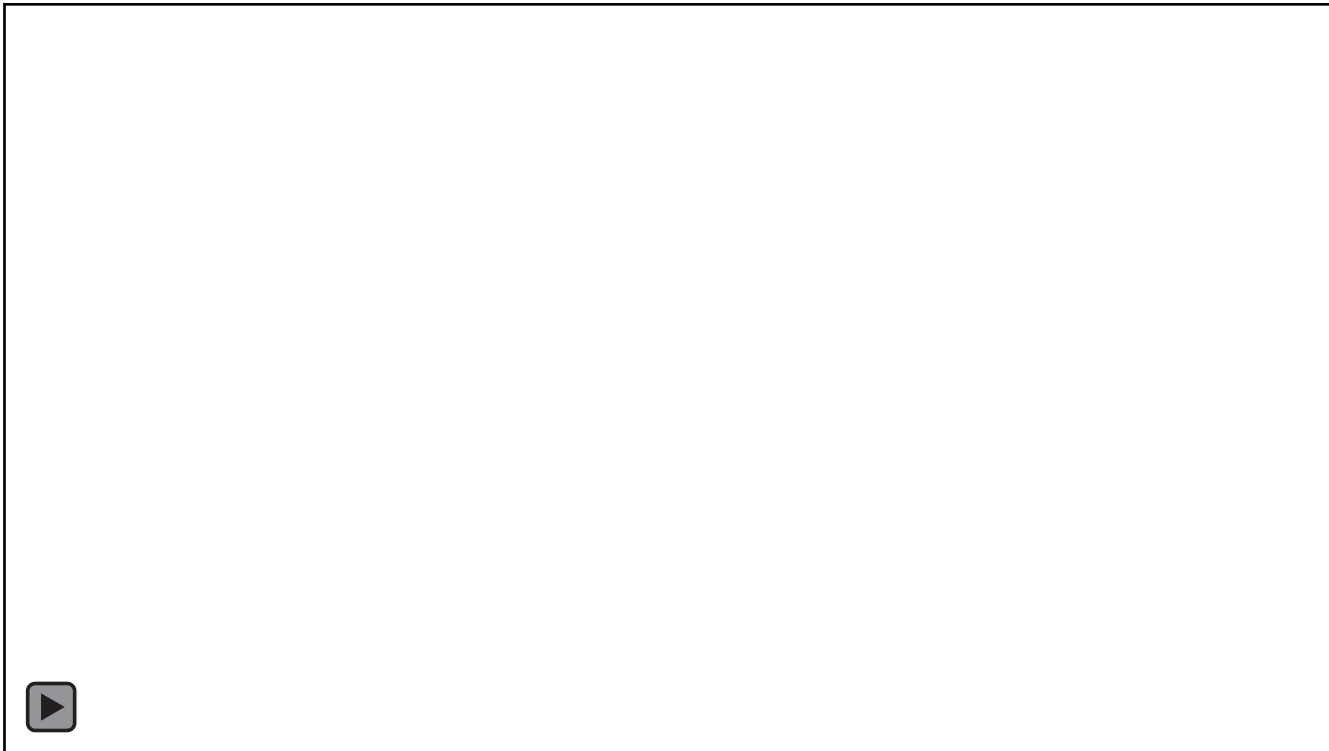


Content

- What is HDD?
- Productivity inhibitors
- Market situation
- Productivity tools in HDD
- Contractor story
- Demo



HDD: horizontal directional drilling



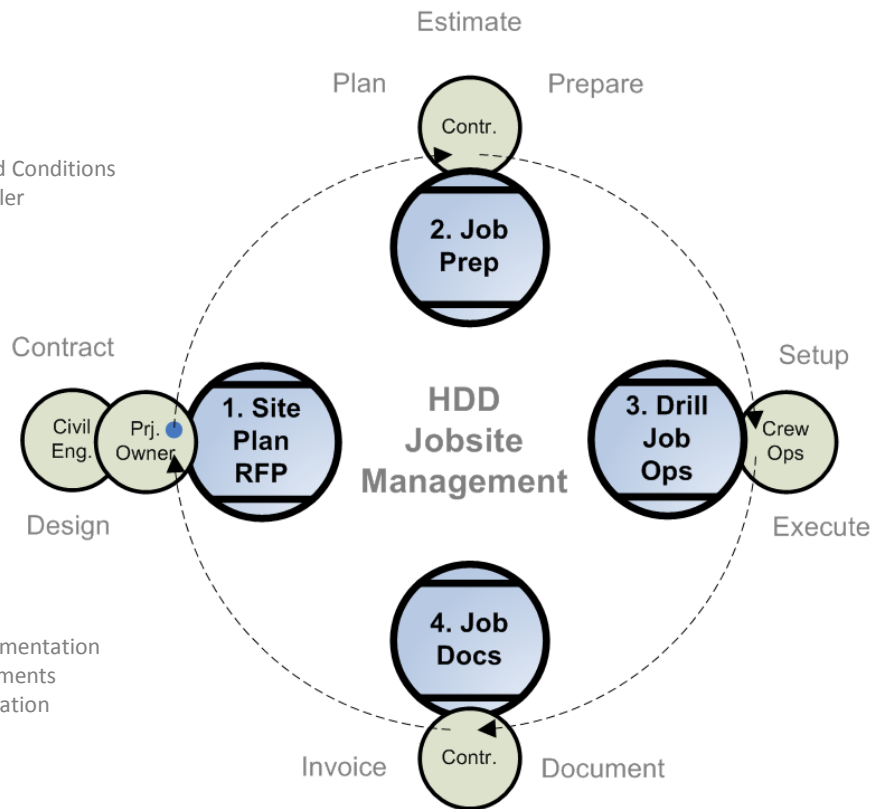
Typical HDD productivity inhibitors

Communication

- Varying, Difficult Ground Conditions
- Engineering Plan vs. Driller Experience
- Varying Documentation Requirements

Consolidation

- Design vs. As-Built Documentation
- Time to Complete Documents
- Required Project Information



Job Readiness

- What People
- What Equipment
- What Ground Conditions
- Where To Go

Production

- Product Installed Correctly
- Installation Risks, "Cross Bores", "Inadvertent Return"

Utility hit stats

- Study conducted by PHMSA* looking into issue of one-call exemptions revealed that between 1993 and 2012
 - 1630 pipeline incidents caused by third party excavation damage, resulted in
 - 141 deaths and 440 injuries, costing
 - \$336,736,529 in property damage
- October 2016 in Constructionequipment.com:
 - “APWA estimates an underground utility line is hit every 60 seconds”
 - “Estimated potential to unlock \$21 in value for every \$1 invested in underground asset management by reducing accidents, damages, and delays”



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*US DOT's Pipeline and Hazardous Materials Safety Administration, regulatory authority for gas and hazardous liquid pipeline safety materials;

"Study on the Impact of Excavation Damage on Pipeline Safety" commissioned by Sec of Transportation

**The total number of pipeline incidents caused by third-party excavation damage in any given year is just a small fraction of the number of excavation damage incidents to all underground facilities

The collage features several key documents and forms:

- DAILY SAFETY MESSAGE**: A form at the top left with sections for 'DAILY SAFETY MESSAGE' and 'DAILY SAFETY MESSAGE'.
- GAS SERVICE RECORD**: A form at the top right with fields for 'GAS SERVICE RECORD', 'DATE INSTALLED', 'SYSTEM NAME', and 'WELL NO.'.
- Bore Machine**: A central form with fields for 'Bore Machine #', 'Additives', 'Fuel (gal)', 'Machine Hours', 'Pipe Size', 'Pipe Type', 'Footage', 'Depth Range (ft)', 'Add Additive', 'Remove Additive', 'Foreman', 'Supervisor', 'Discard Changes', and 'Save'.
- Daily Safety Message**: A form at the bottom left with a table for 'Daily Safety Message' and a 'Page 1' label.
- Calculation/Work Sheet**: A form at the bottom right with a title 'Calculation/Work Sheet', 'Calc. No.', 'Rev.', 'Sheet', and 'Date'.
- Hand-drawn Diagrams**: Several diagrams showing site layouts, borehole locations, and equipment positions, including a 'Borehole Location' diagram and a 'Borehole Location' diagram.

ROI example

- Increasing revenue vs. productivity*

Case Study: Utility Contractor X: more revenue

	Base Case		Option 1 (10% more revenue)		
Revenue	\$	50,000	\$	55,000	10% <i>10% increase in revenue!</i>
Cost of goods sold:					
Labor	20,500	41.0%	22,550	41.0%	
Material	10,250	20.5%	11,275	20.5%	
Equipment	8,200	16.4%	9,020	16.4%	
Subcontractors	2,050	4.1%	2,255	4.1%	
Total	41,000	82.0%	45,100	82.0%	
Gross profit	9,000	18.0%	9,900	18.0%	
Operating expenses	6,000	12.0%	6,600	12.0%	
Operating income	3,000	6.0%	3,300	6.0%	
Interest expense	750	1.5%	750	1.4%	
Pre-tax income	\$	2,250 4.5%	\$	2,550 4.6%	\$300K <i>\$300K to bottom line</i>

Case Study: Utility Contractor X: greater productivity

	Base Case		Option 2 (5% more productive)		
Revenue	\$	50,000	\$	50,000	
Cost of goods sold:					
Labor	20,500	41.0%	19,475	39.0%	5% <i>5% labor & equipment productivity gain....</i>
Material	10,250	20.5%	10,250	20.5%	
Equipment	8,200	16.4%	7,790	15.6%	
Subcontractors	2,050	4.1%	2,050	4.1%	
Total	41,000	82.0%	39,565	79.1%	
Gross profit	9,000	18.0%	10,435	20.9%	
Operating expenses	6,000	12.0%	6,000	12.0%	
Operating income	3,000	6.0%	4,435	8.9%	
Interest expense	750	1.5%	750	1.5%	
Pre-tax income	\$	2,250 4.5%	\$	3,685 7.4%	\$1,435K <i>\$1,435K to bottom line!</i>

Why new technologies in HDD?

- **Risk Mitigation**
 - Field studies on utility line hits, jobsite incidents
- **Efficiency Improvement**
 - Efficiencies below general construction industry
- **Governmental and Institutional Initiatives**
 - The PIPES Act of 2016
 - ASCE-xxx: Standard Guideline for Data Collection and Exchange of Exposed Utility Infrastructure

Remote monitoring systems

- A telematics technology using cellular, Wi-Fi or satellite communications to transmit data remotely
 - Equipment and jobsite monitoring
 - Fleet management, standard solutions
 - Advanced Fleet solutions to include CAN bus data
 - Wide range of system providers: i.e., Trimble *VisionLink Unified Fleet* or other OEM-specific systems

Standard productivity data

- **GPS location** for tracking equipment and planning work routes
- **Engine rpm** to monitor things like work vs. idle times
- **Fuel utilization** to better optimize operation costs
- **Engine hours** to drive machine lifecycle decisions
- **Geofencing** to monitor machine positioning outside of the expected limits



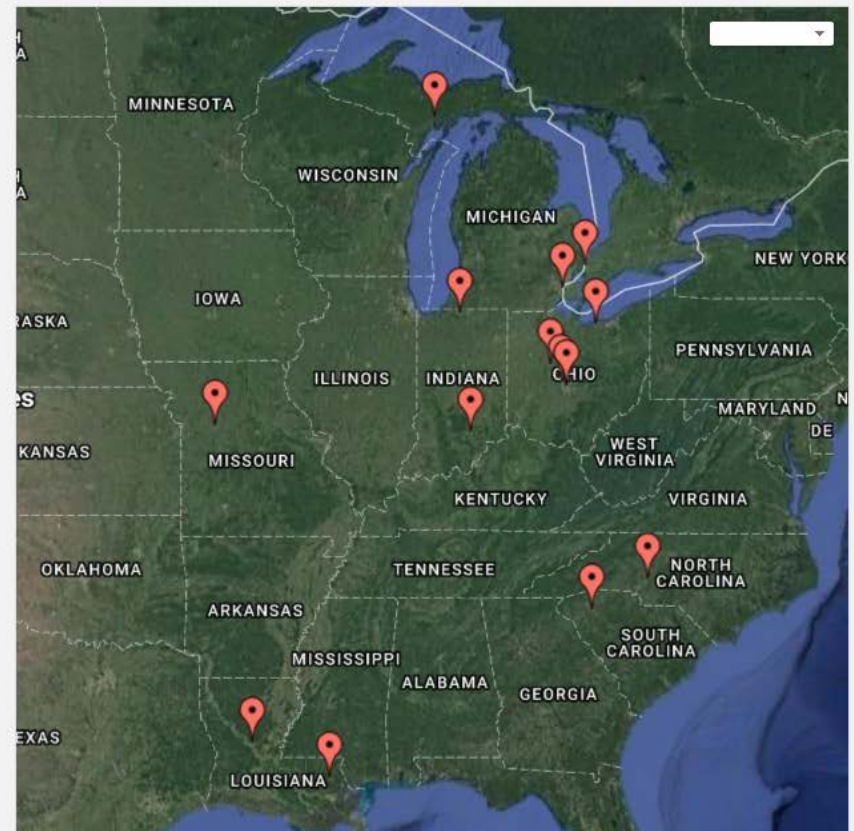
Summary	Positions	Engine	Unit Data	Alerts	Maintenance Plans	Faults
Engine Summary						
	Engine	Work	Idle	Fuel Used		
Current	236 hr	196 hr	40 hr	920 gal		
Today	2 hr	0 hr	2 hr	8 gal		
Yesterday	4 hr	3 hr	0 hr	14 gal		
This Week	6 hr	3 hr	2 hr	22 gal		
This Month	12 hr	7 hr	4 hr	45 gal		
This Year	236 hr	196 hr	40 hr	920 gal		



Equipment monitoring

Model: D24x40 S3 Status: Owned, Sold					
Name	Engine Hrs (hr)	Idle Hrs (hr)	% Idle (%)	Fuel (gal)	
F 200407	912.40	472.04	51.74	2,260.65	
F 200408	314.05	181.25	57.71	629.39	
F 200412	168.90	96.41	57.08	392.96	
F 200413	459.25	230.44	50.18	1,033.71	
F 200414	372.90	190.29	51.03	1,016.27	
F 200415	602.90	331.45	54.98	1,465.10	
F 200417	285.55	131.58	46.08	733.08	
F 200419	470.55	310.61	66.01	949.43	
F 200420	415.90	294.66	70.85	746.81	
F 200421	404.30	233.85	57.84	1,007.16	
F 200423	193.15	111.55	57.75	429.54	
F 200424	117.00	65.16	55.69	308.16	
F 200426	50.85	27.05	53.19	119.67	
F 200427	22.75	10.89	47.85	51.78	

Showing items 1 to 14 of 14





Maintenance planning

- Planned vs. unplanned maintenance
- Jobsite interruptions
- Maintenance records

Log Unscheduled Maintenance

Current	History	Defined			
Type	Name	Data Point	Due	Reminder	
Milestone	100 Service Hours	Engine Hours	at 100 Hours (hr)	at 50 Hours (hr)	Details
Milestone	1000 Service Hours	Engine Hours	at 1,000 Hours (hr)	at 950 Hours (hr)	Details
Milestone	1500 Service Hours	Engine Hours	at 1,500 Hours (hr)	at 1,450 Hours (hr)	Details
Milestone	2000 Service Hours	Engine Hours	at 2,000 Hours (hr)	at 1,950 Hours (hr)	Details
Milestone	250 Service Hours	Engine Hours	at 250 Hours (hr)	at 200 Hours (hr)	Details
Milestone	4500 Service Hours	Engine Hours	at 4,500 Hours (hr)	at 4,450 Hours (hr)	Details
Milestone	50 Service Hours or Weekly	Engine Hours	at 50 Hours (hr)	at 20 Hours (hr)	Details
Milestone	500 Service Hours	Engine Hours	at 500 Hours (hr)	at 450 Hours (hr)	Details

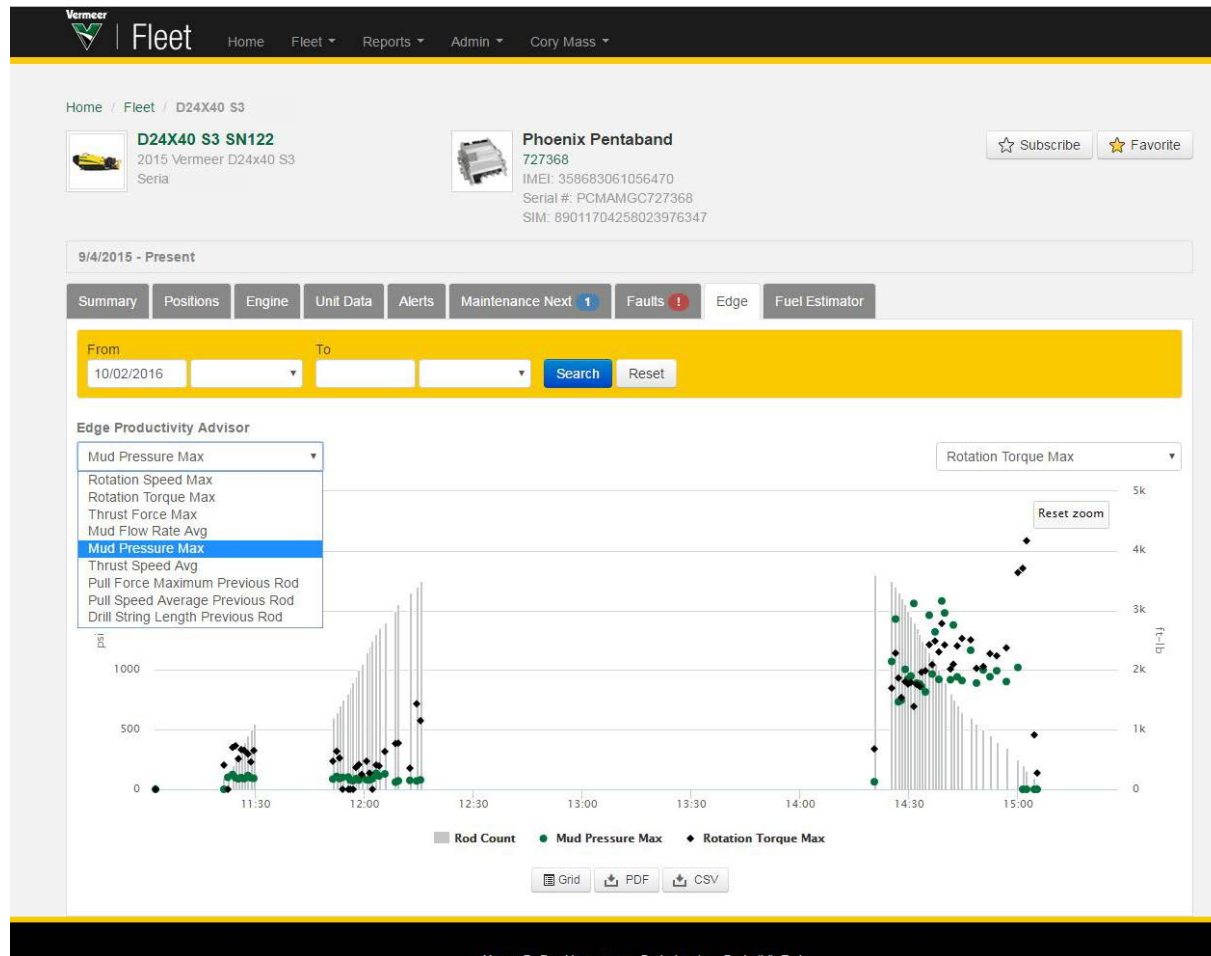
Showing items 1 to 8 of 8



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Enhanced productivity data



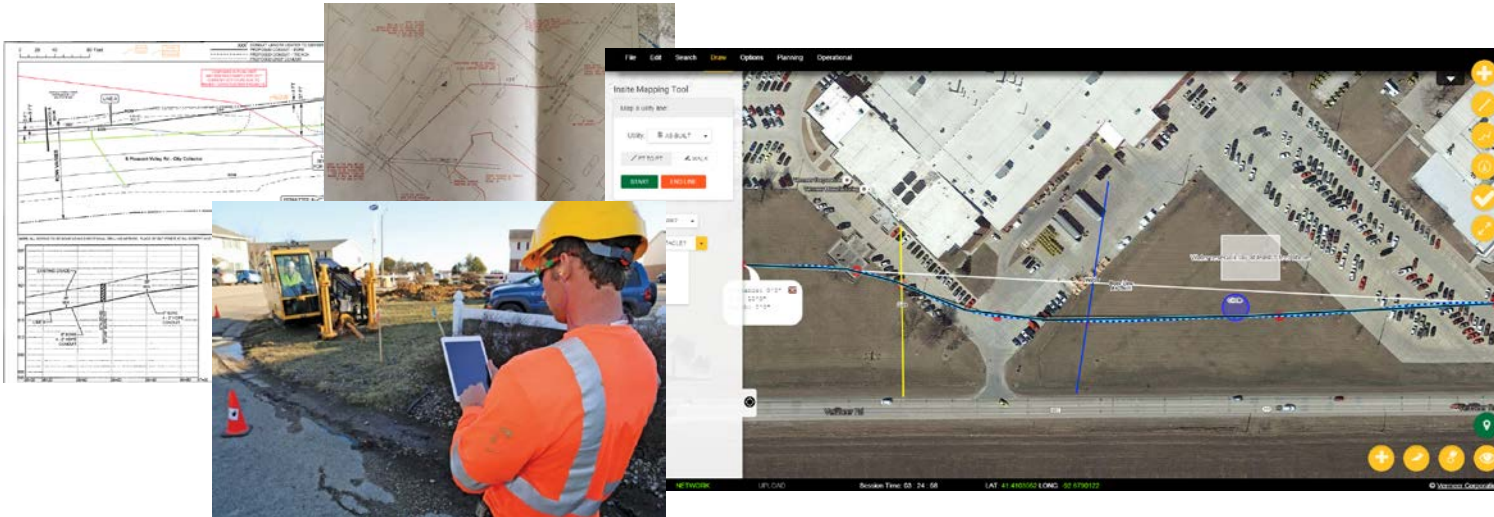
Preplan with easy-to-use tools



Plan a job in the office, add or change a bore plan, share “digital job jacket” with remote field team instantly

- **Customer value:** Swift jobsite preparation in the office using intuitive planning tools may reduce travel time

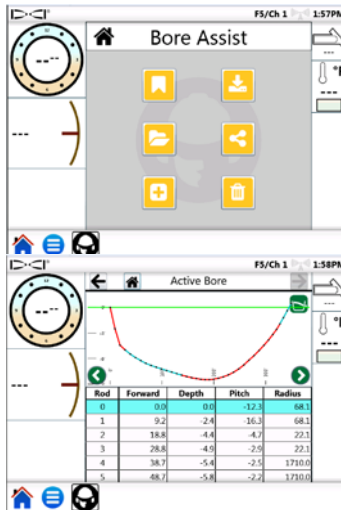
Simple jobsite mapping



Map Utilities, as-built, potholes, etc., for fiber job accurately into electronic “job jacket”

- **Customer value:** Help save time and costs with simple GPS mapping, providing data in line with job specifications, including latitude/longitude

Bore plan on rig

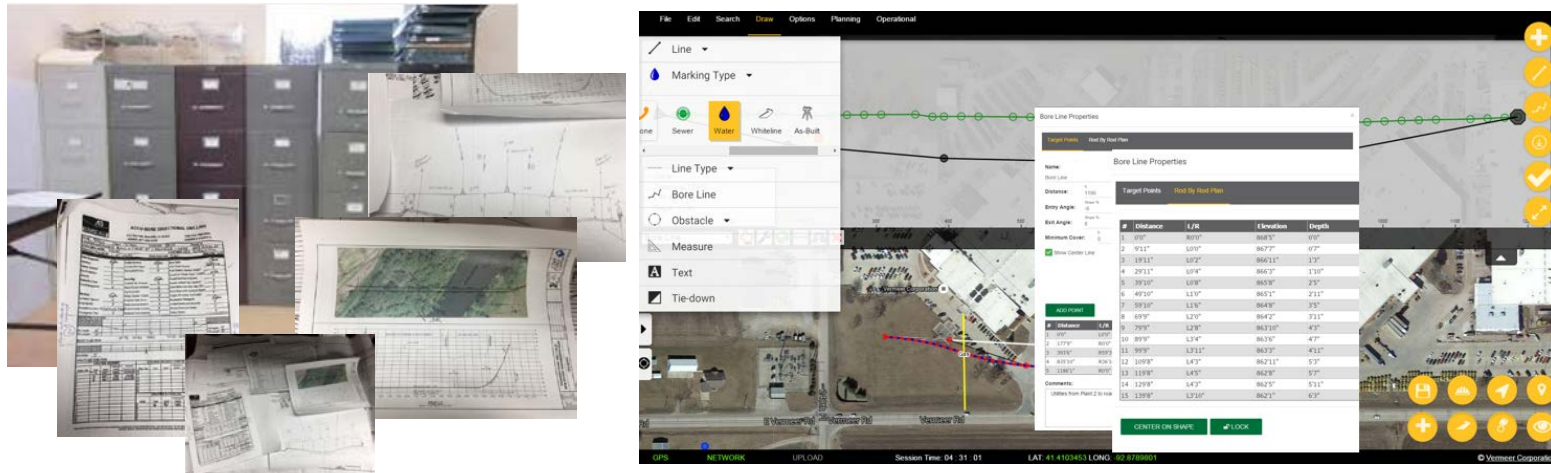


Load plan information to machine or plan/change it on the machine

- **Customer value:** Save time, avoid rework, Increase the chance for “first time right” drilling with simple tools, protect the assets



Complete job documents digitally



File job documentation online: invoicing materials readily available soon after installation

- **Customer value:** Help shorten billing cycle time, decrease time to generate professional reports



Job story – Erik Carlson

President/Owner, Pinnacle Construction

- Operating since 2001 in Charleston, South Carolina with a military and customer service background
- Specialized in underground utility construction, operating a fleet of Vermeer and competitive horizontal directional drills, from 9,000 to 40,000 lb (4082.3 to 18,143.7 kg) capacity, and employs more than 40 people
- Each crew is fully outfitted with electronic utility locating equipment, hydraulic reel trailers, mud spoils vacuum units and various sized mini-excavators or backhoes
- Pinnacle is a full-service underground utility construction contractor specializing in horizontal directional boring and public utility – electric work

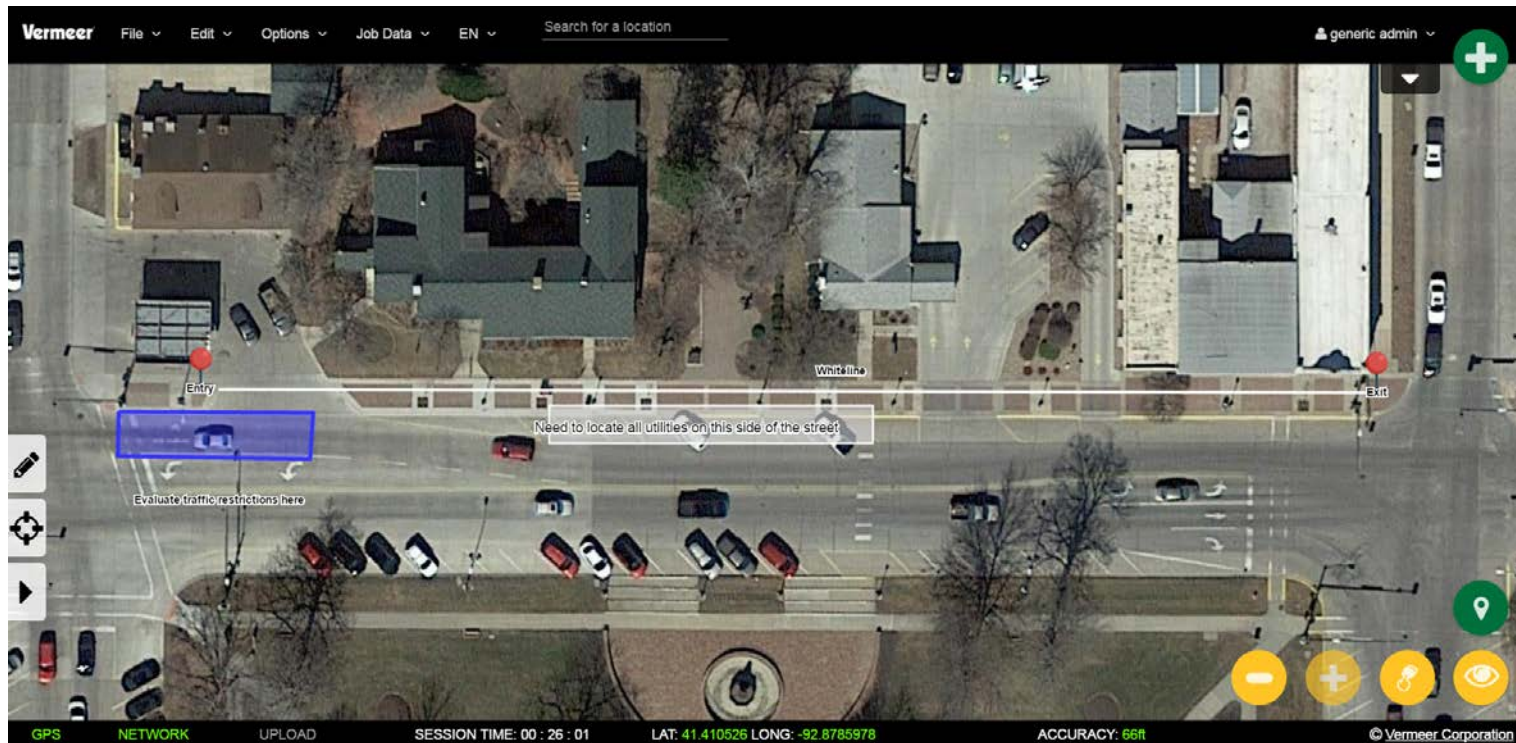


“We take responsibility for our actions. Foremen are being held responsible for the decision-making that occurs in the field. If there is not a safe “window” to operate within, then we either hand dig the area to locate the obstruction or we adjust to create a larger margin of separation. The customer’s needs will always be a priority – so long as it is safe to do so.”

- Erik Carlson
Pinnacle Construction



Starting a basic plan





Planning potholing - daylighting

Vermeer File Edit Options Job Data EN Search for a location generic admin

Pothole Properties

Label: Pothole 2 Depth: 6
Diameter: 24 ☒ Auto Replace Intersection
Lat: 41.4081782 Long: -92.9171951

ADD INTERSECTION

Utility	Depth	Diameter	Clearance	Lat	Long
Gas	5'	0"		41.4081753	-92.9172018

Comments:
Gas Pothole 2

LOCK OK CANCEL

GPS NETWORK UPLOAD SESSION TIME: 00 : 31 : 35 LAT: 41.410526 LONG: -92.8785978 ACCURACY: 66ft © Vermeer Corporation



Review and update as-you-go

Vermeer File Edit Options Job Data Search for a location generic admin +

Map a utility line
Map a bore

POTHOLE
PIN POINT
ADD OBSTACLE?

Pothole Properties

Label: Pothole 3 Depth: 0
Diameter: 1 ☐ Auto Replace Intersection
Lat: 41.4105359 Long: -92.87859

ADD INTERSECTION

Utility	Depth	Diameter	Clearance	Lat	Long	
Electric	2'	2"	12"	41.4105359	-92.87859	
Phone	4'	1"	9"	41.4105359	-92.87859	
Sewer	6'	2"	12"	41.4105359	-92.87859	
	0'	0"		41.4105359	-92.87859	✓✗

Comments:

UNLOCK **OK** **CANCEL**

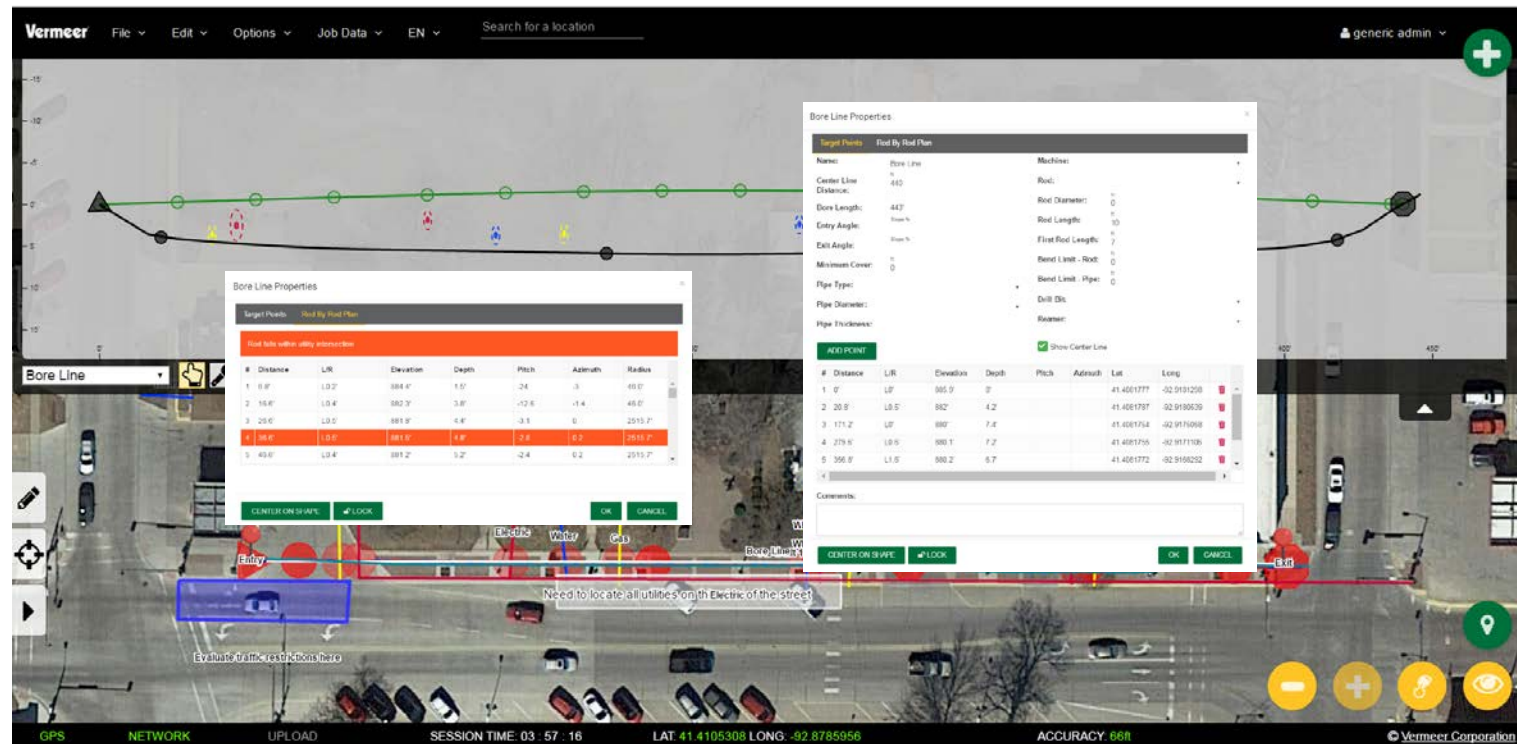
GPS NETWORK UPLOAD SESSION TIME 00:23:00 LAT 41.4105359 LONG -92.8785888 ACCURACY 66ft © Vermeer Corporation

Create proposed bore path



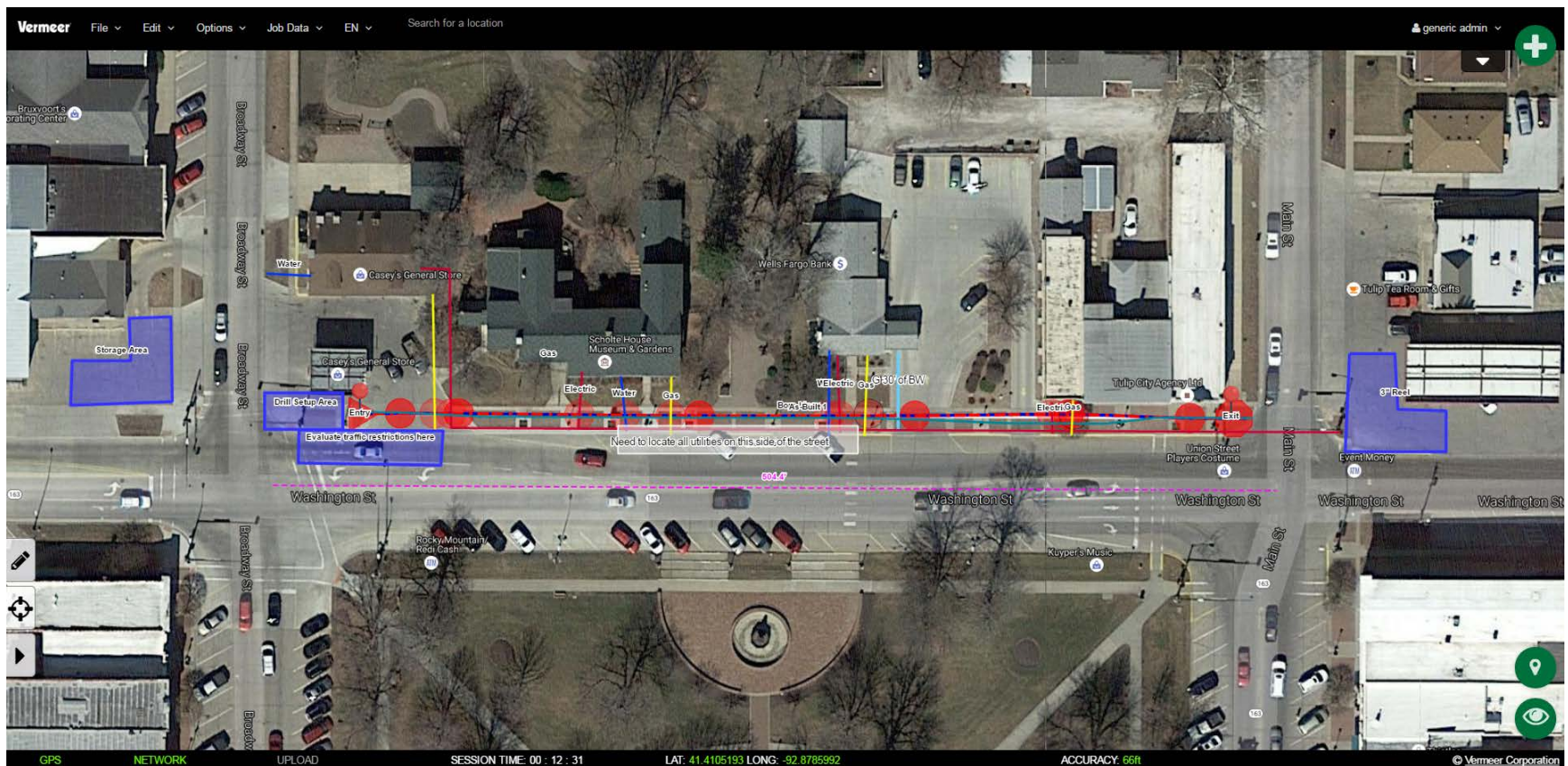


Bore path view and per-rod conflict warning



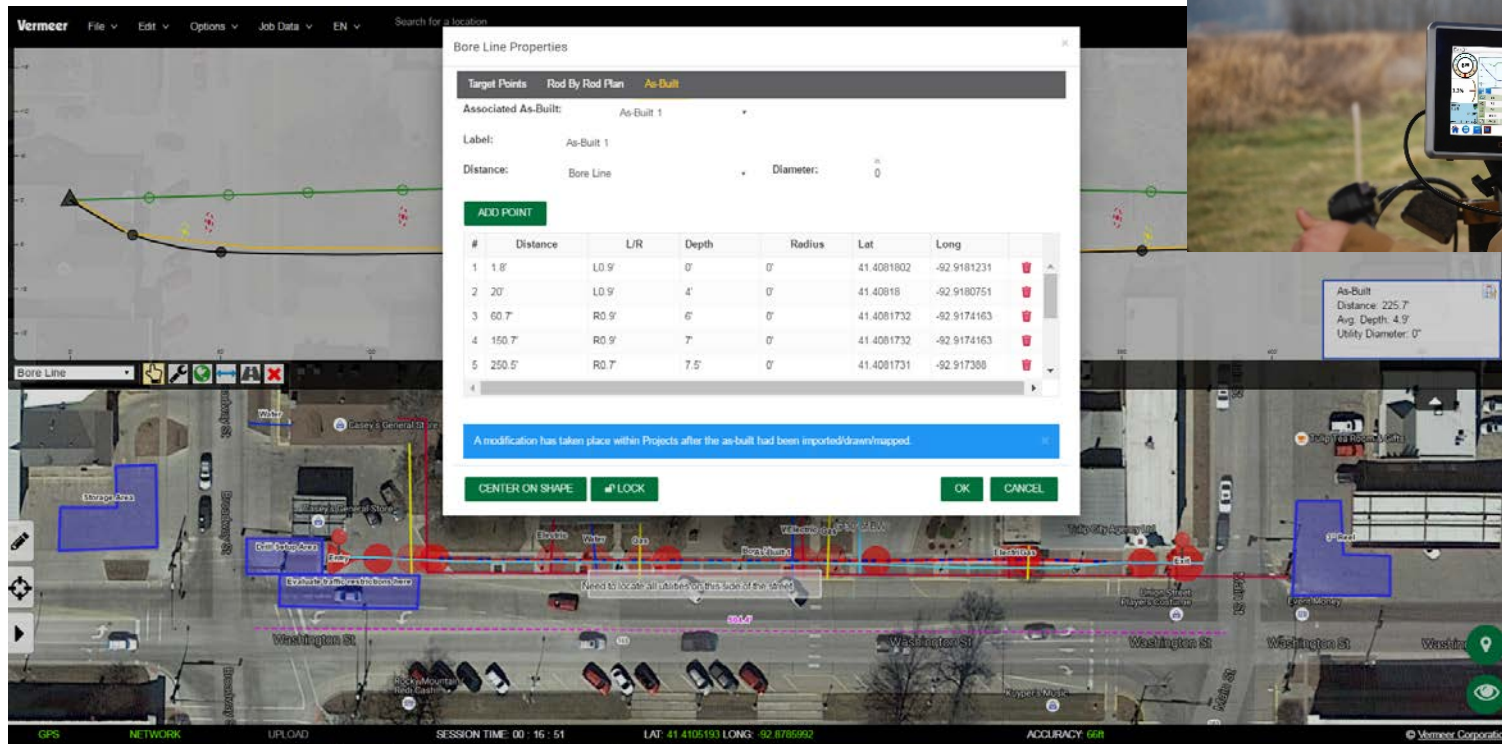


Add jobsite information





Actual vs. plan



As-Built
Distance: 225.7'
Avg. Depth: 4.9'
Utility Diameter: 0"



Finalize job record



Select Reports

Bore Lines SELECT ALL

☒ Bore Line

Sections SELECT ALL

☒ Project Summary ☒ Aerial Overview

☒ Rod-by-Rod ☒ Bore Aerial/Side

☒ Potholes

Bore lines selected intersect utility clearance

Export

Type ☒ KML ☐ BoreAssist File

File Name A51107-KML-2016-10-06-03-1448

OK CANCEL

CLM2.2.6

Report Generated: 12/05/2016 Project Ref #: 999999

Project Description: Facets tunnel installation

Projected Start Date: 06/07/2016 Projected End Date: 10/14/2016

Actual Start Date: 10/11/2016 Actual End Date: 10/14/2016

Customer: Site:

Cable:

Conc:

Conc:

Conc:

© Vermeer Projects

Rod by Rod Report

For Bore: Bore Line

Machine/Rod Information

Diameter: 2" Length: 10' Bore Level: 0'

Rod fails within utility intersection

Rod #	Distance	UTS	Location	Depth	Depth	Actual	Radius
1	0.0'						
2	10.0'						
3	20.0'						
4	30.0'	1.0'	880.0'	7.2'	0.00%	-1.00%	1400.0'
5	40.0'	1.0'	880.0'	7.2'	0.17%	-1.00%	1400.0'
6	50.0'	1.0'	880.0'	7.2'	-0.17%	-1.00%	1400.0'
7	60.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
8	70.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
9	80.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
10	90.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
11	100.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
12	110.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
13	120.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
14	130.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
15	140.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
16	150.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
17	160.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
18	170.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
19	180.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
20	190.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
21	200.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
22	210.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
23	220.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
24	230.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
25	240.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
26	250.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
27	260.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
28	270.0'	1.0'	880.0'	7.2'	-0.33%	-2.00%	1200.0'

© Vermeer Projects

Bore Aerial and Profile View

Profile View

© Vermeer Projects

Utility Locates

Locate Personnel: _____

Date: 10/05/2016 Company: SC 160

Required Date: _____ Address: _____

Due Date: _____ City/State: _____ State: _____ Zip: _____

Project ref #: 999999

Utility	Depth	Location	Depth	Depth	Actual	Radius
A1: 400' (Bore) at 1700'	1700'	880.0'	7.2'	0.00%	-1.00%	1400.0'
A2: 400' (Bore) at 1700'	1700'	880.0'	7.2'	0.17%	-1.00%	1400.0'
A3: 400' (Bore) at 1700'	1700'	880.0'	7.2'	-0.17%	-1.00%	1400.0'
A4: 400' (Bore) at 1700'	1700'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
A5: 400' (Bore) at 1700'	1700'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
A6: 400' (Bore) at 1700'	1700'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
A7: 400' (Bore) at 1700'	1700'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
A8: 400' (Bore) at 1700'	1700'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
A9: 400' (Bore) at 1700'	1700'	880.0'	7.2'	-0.33%	-2.00%	1200.0'
A10: 400' (Bore) at 1700'	1700'	880.0'	7.2'	-0.33%	-2.00%	1200.0'

Comments:

© Vermeer Projects

A51107-KML-2016-10-06-03-1448.kml



Key benefits observed, Pinnacle Study*

Main Steps	Legacy Methods	New Methods	Benefits & *Time Saving per Job
Preplan for bid/permit	Multiple trips to site, random pictures at site, unmanaged data collection, if any	Virtual visit, “Job e-file,” add pictures and information to e-file	Faster, more accurate RFP response: DAYS to HOURS
Preplan for production	Separate files: checklists, permits, safety, plan, etc. Paper folder, in-person pick up	E-file update, add files in cloud; share complete e-file with crews	Optimize time of jobsite managers: HOURS
Production, jobsite documentation	Penmanship , losing docs, as-built in notebook, job spec change, multiple trips to office	Cloud access to e-file, shared files for updates, changes and approvals	Real- time file share with stakeholders: DAYS to HOURS
Post doc for invoice and record keeping	Consolidate 30-80 pieces of paper, copies, duplicates, filing etc.	Consolidated cloud-based and searchable e-file	“Where, when, what, who” at your fingertips DAYS to HOURS to MINUTES

* Time study ongoing, time savings depends on the scope of a construction job



Product demo

- Bore path, utilities and add pictures
- Plan, map and collaborate in near real-time
- <https://projects.vermeer.com>

Summary

Productivity tools (software, hardware) on and off machines are increasingly necessary for achieving jobsite **productivity** gains and help **managing potential risks** of drilling operations

- Help achieve consistency in jobsite development
- Claims mitigations
- Future work coordination, know what to expect
- Reduce non-value-added time on jobsite



Questions?

Vermeer Productivity Tools assist users with planning and management functions. Information provided is reliant upon the accuracy and quality of user-provided data. Vermeer Corporation reserves the right to make changes in product engineering, design and specifications; add improvements; or discontinue manufacturing or distribution at any time without notice or obligation. Products shown are for illustrative purposes only and may display optional features. Please contact your local Vermeer dealer for more information on product specifications.

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