

Using side stream
monitoring and pipeline flow
modeling to better
understand internal
corrosion threats.

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Pipeline Monitors



Side Stream Monitor



Monitoring Devices

Typical Equipment

- Coupons
 - Vertically Across System
 - Multiples at Bottom
 - “Floating” at Solids/Liquid Interface
- Electrical Resistance
- Linear Polarization Resistance
- Galvanic Probe
- Sessile Bacteria Monitor

Optional Equipment

- BS&W Monitor
- Electrochemical Noise
- MAS Pit Detection
- Densitometer
- pH
- High Sensitivity ER
- Hydrogen
- Others

Koch Pipeline Monitoring System Equipment



Multiple Coupon Ladder
Type Holder



“Floater”



Electrical
Resistance Probe



Sessile Bacteria Monitor

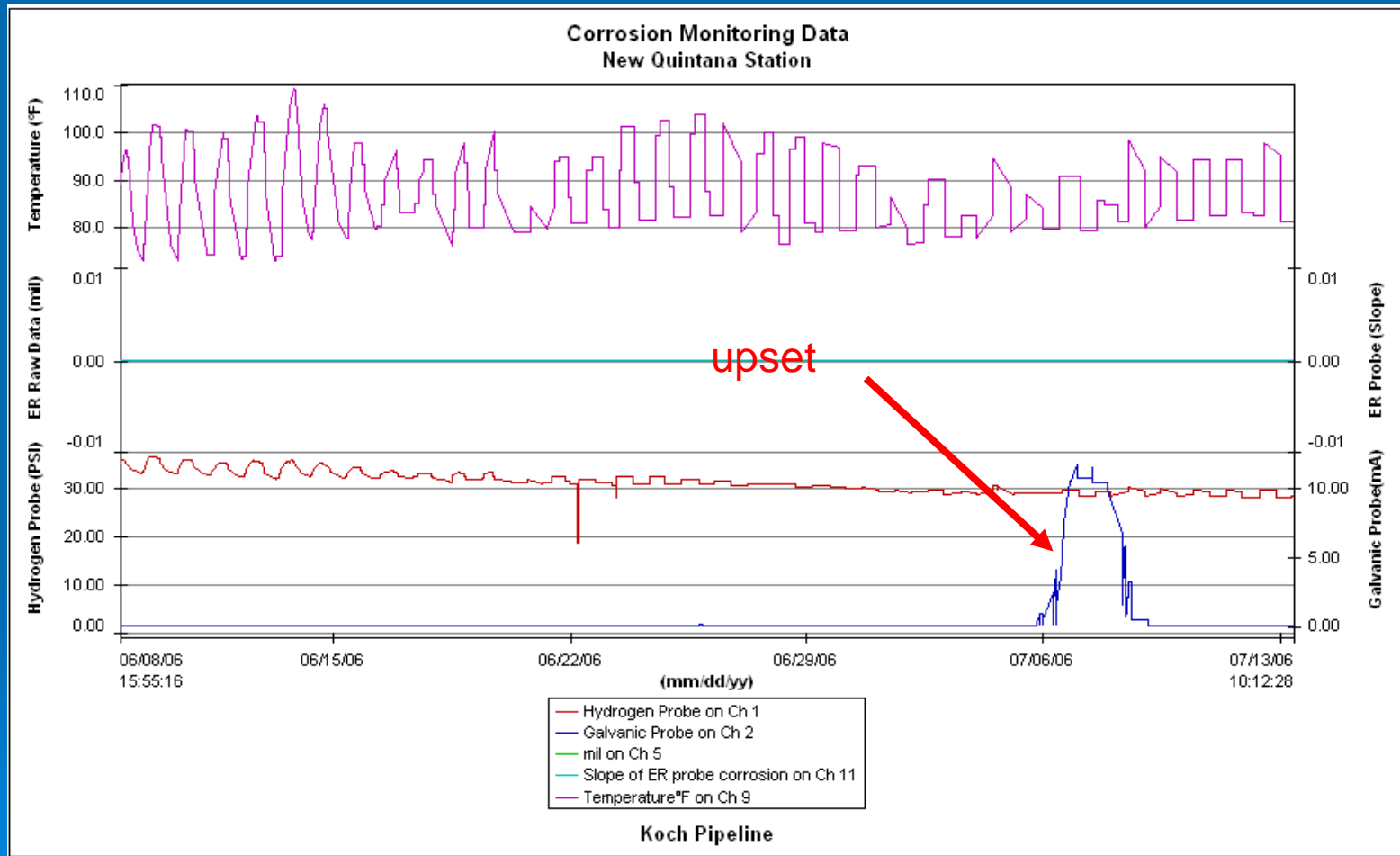


Galvanic Probe

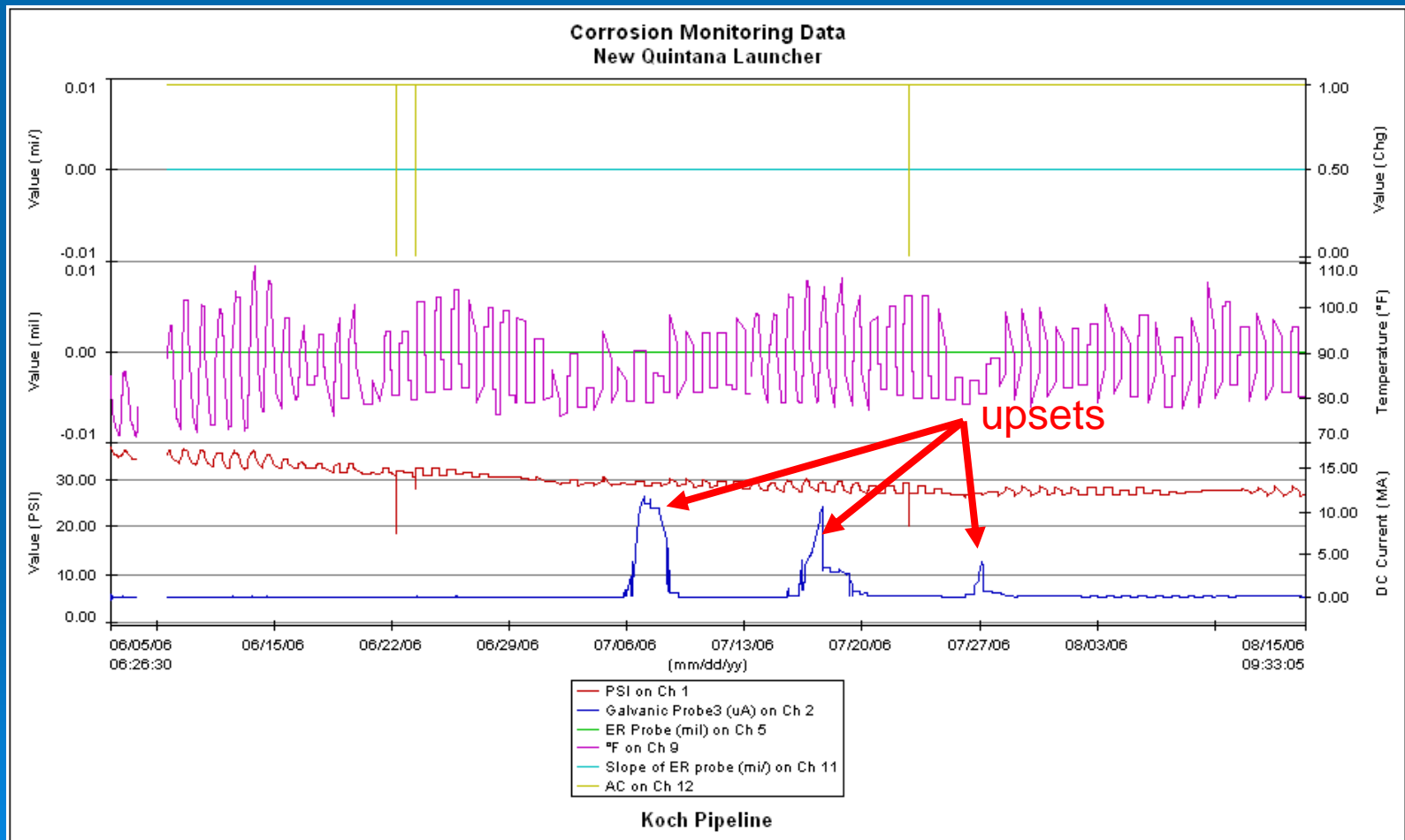
Connection Location



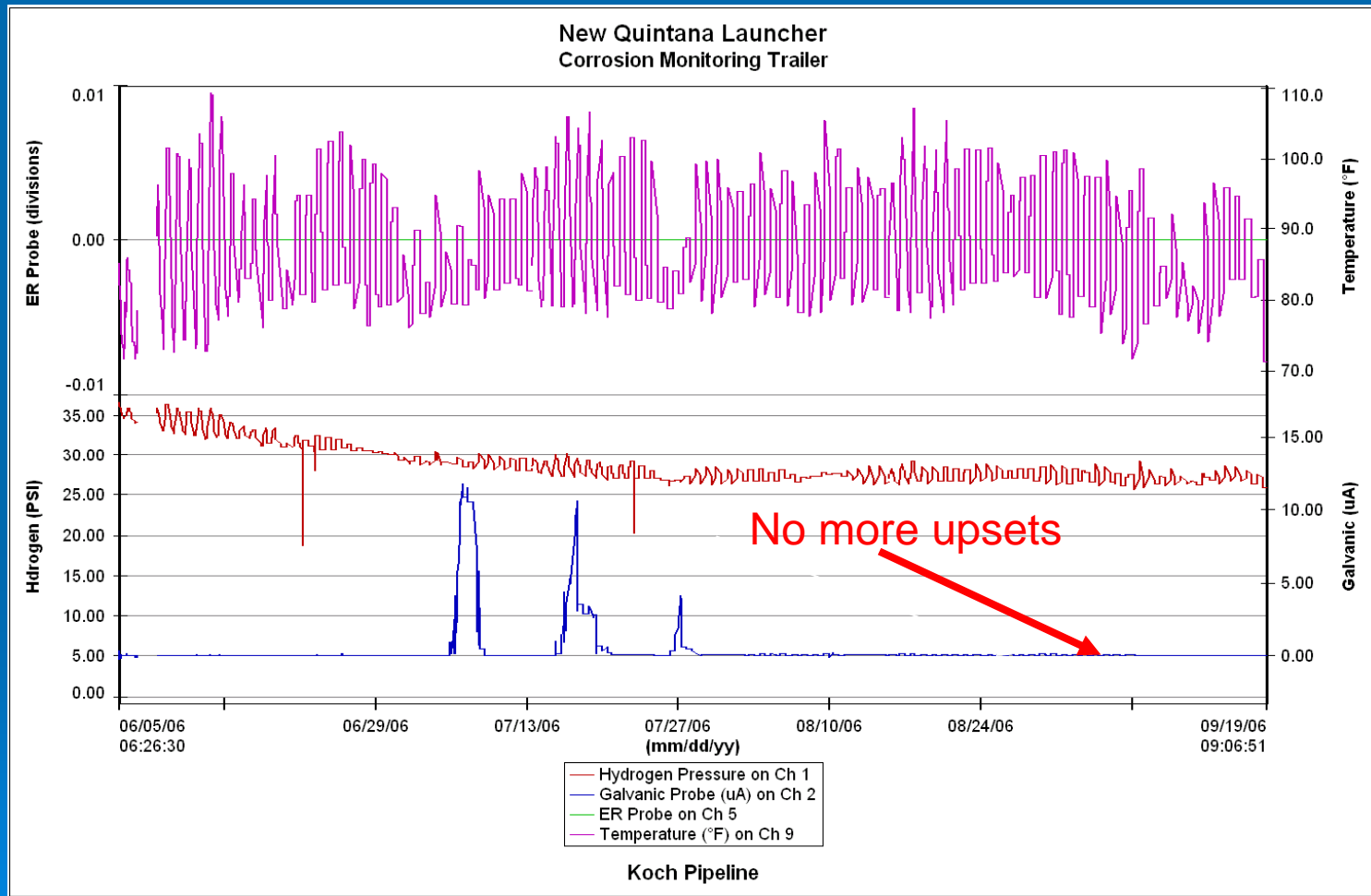
Data Results 6/8-7/13



Data Results 7/13-8/13



Data Results 6/8-9/6

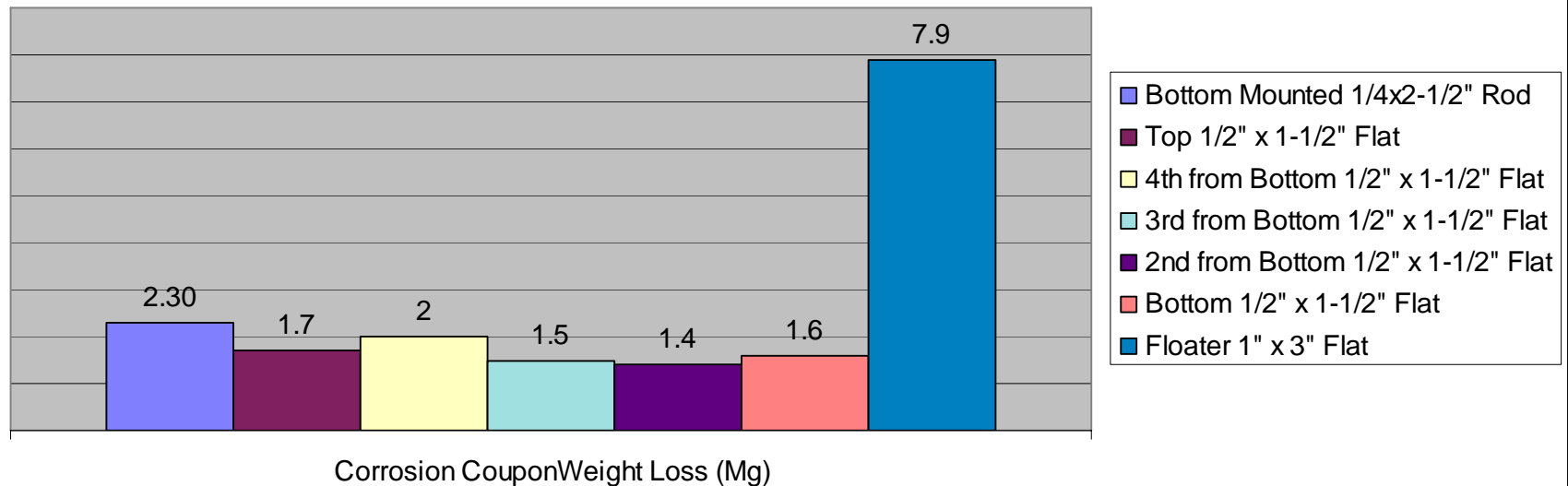


“Floater” Coupon 30 Days



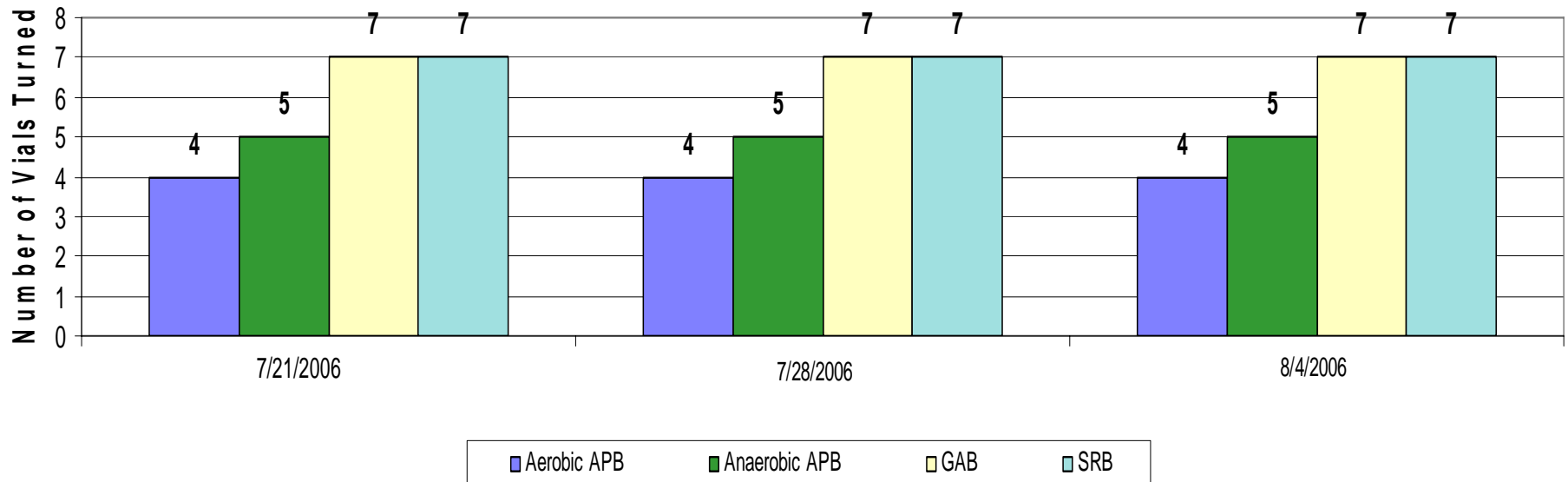
Corrosion Rates

Koch Monitor, New Quintana Launcher



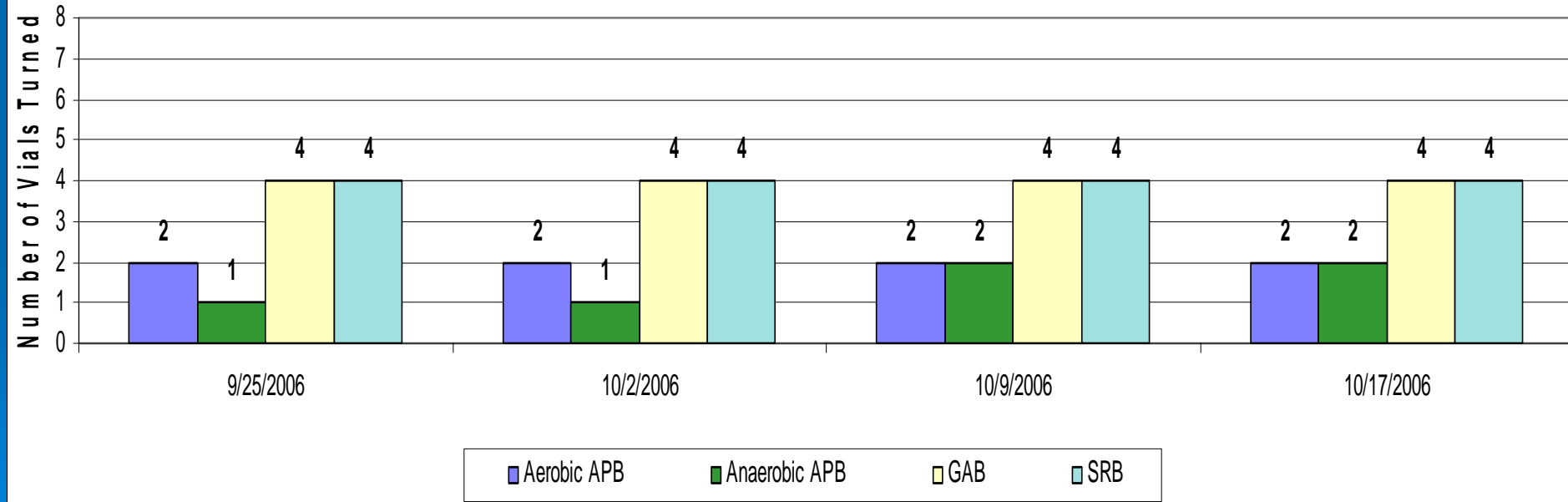
Bacteria Results 7/13-8/6

New Quintana Launcher (Sessile)



Bacteria Results 10/17

New Quintana Launcher (Sessile)



Sludge from Monitor

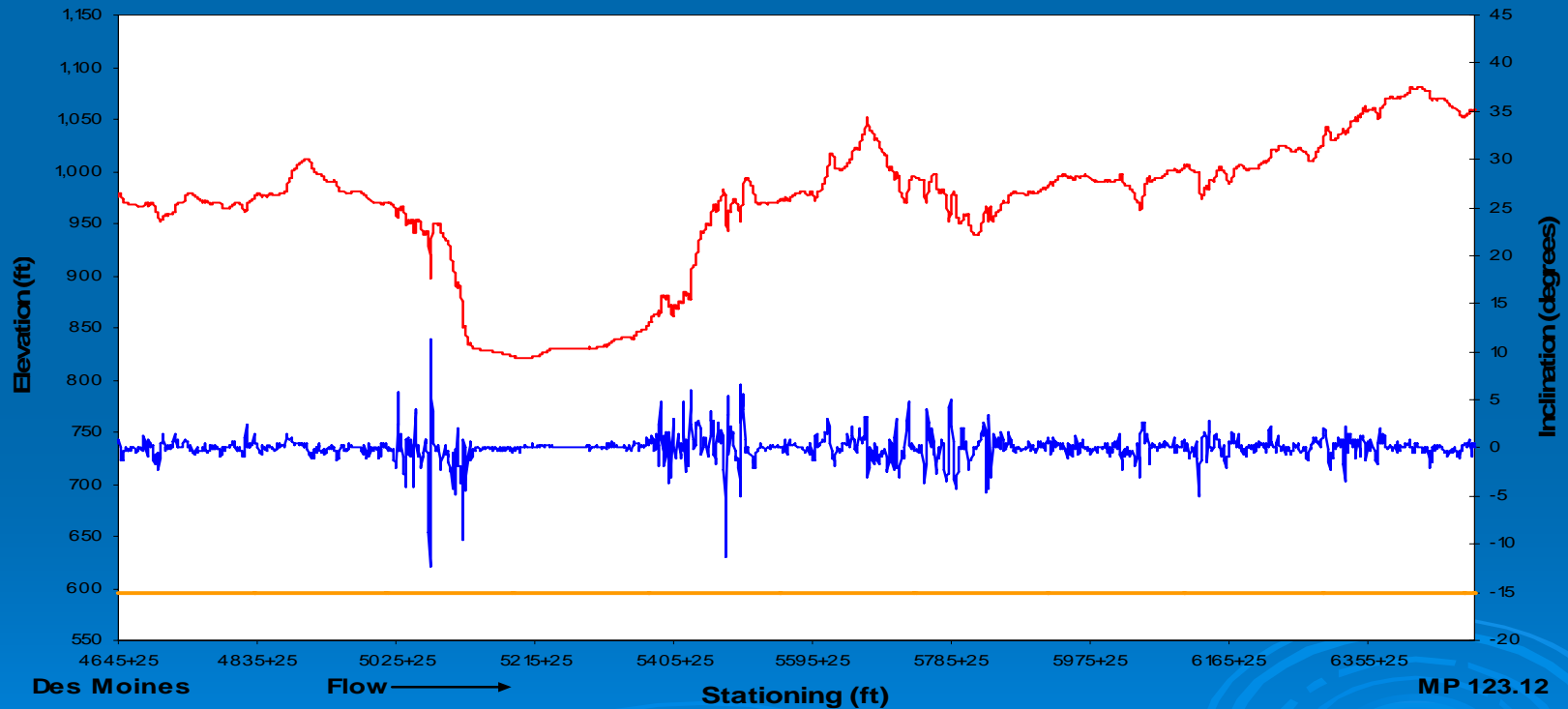


Benefits of Flow Modeling

- Using elevations, pipeline specs, and crude types, models can illustrate necessary flow rates to keep water entrained.
- Additionally, if flow rates can't be met the model illustrates areas of possible water accumulation.
- Helps in the development of mitigation activities.

Example #1

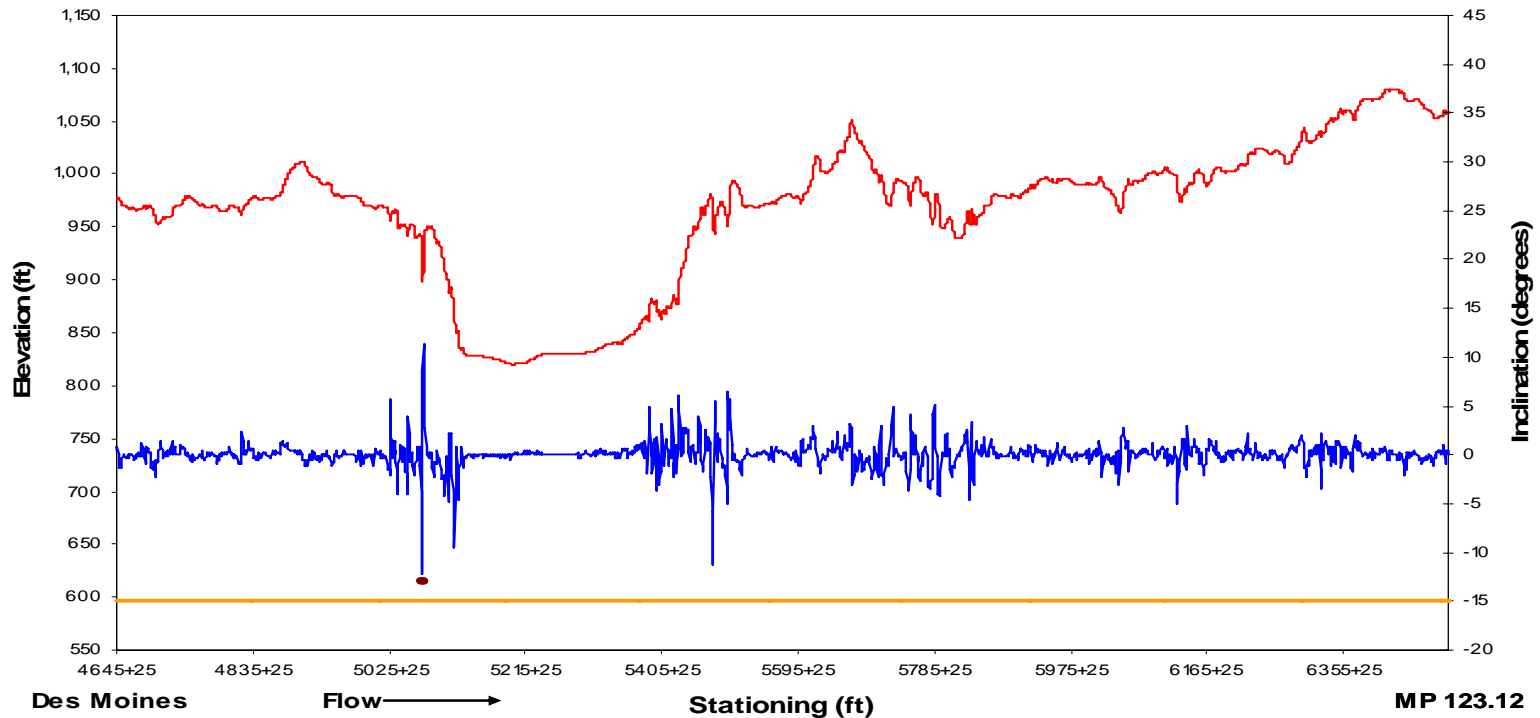
Des Moines to Mason City
Line 5051 - 86400 BPD Wyoming Asphaltic - 1% H₂O



— Elevation — Inclination — Entrainment — Stratified without Accumulation — Stratified with Accumulation

Example #2

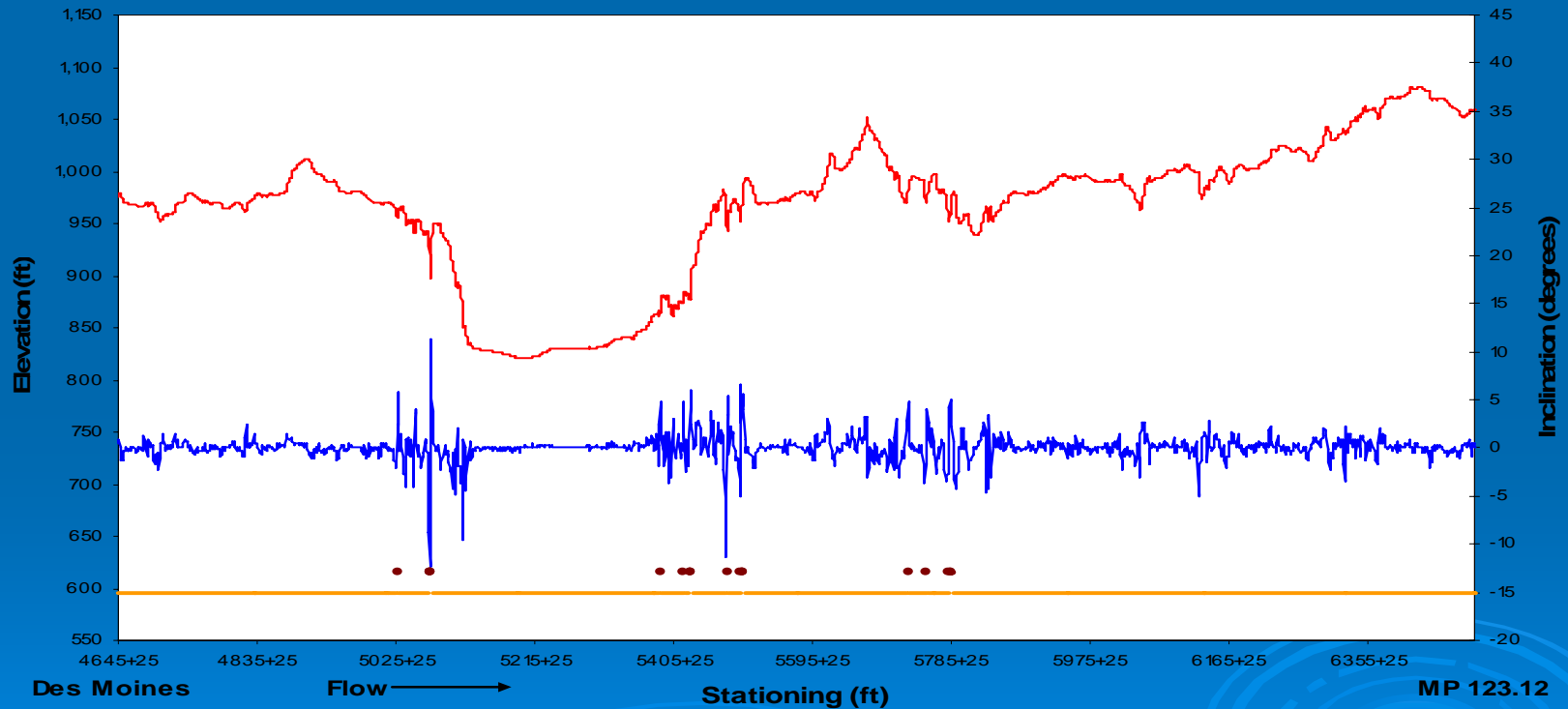
Des Moines to Mason City Line 5051 - 86400 BPD Wyoming Sour - 1% H₂O



— Elevation — Inclination — Entrainment — Stratified without Accumulation — Stratified with Accumulation

Example #3

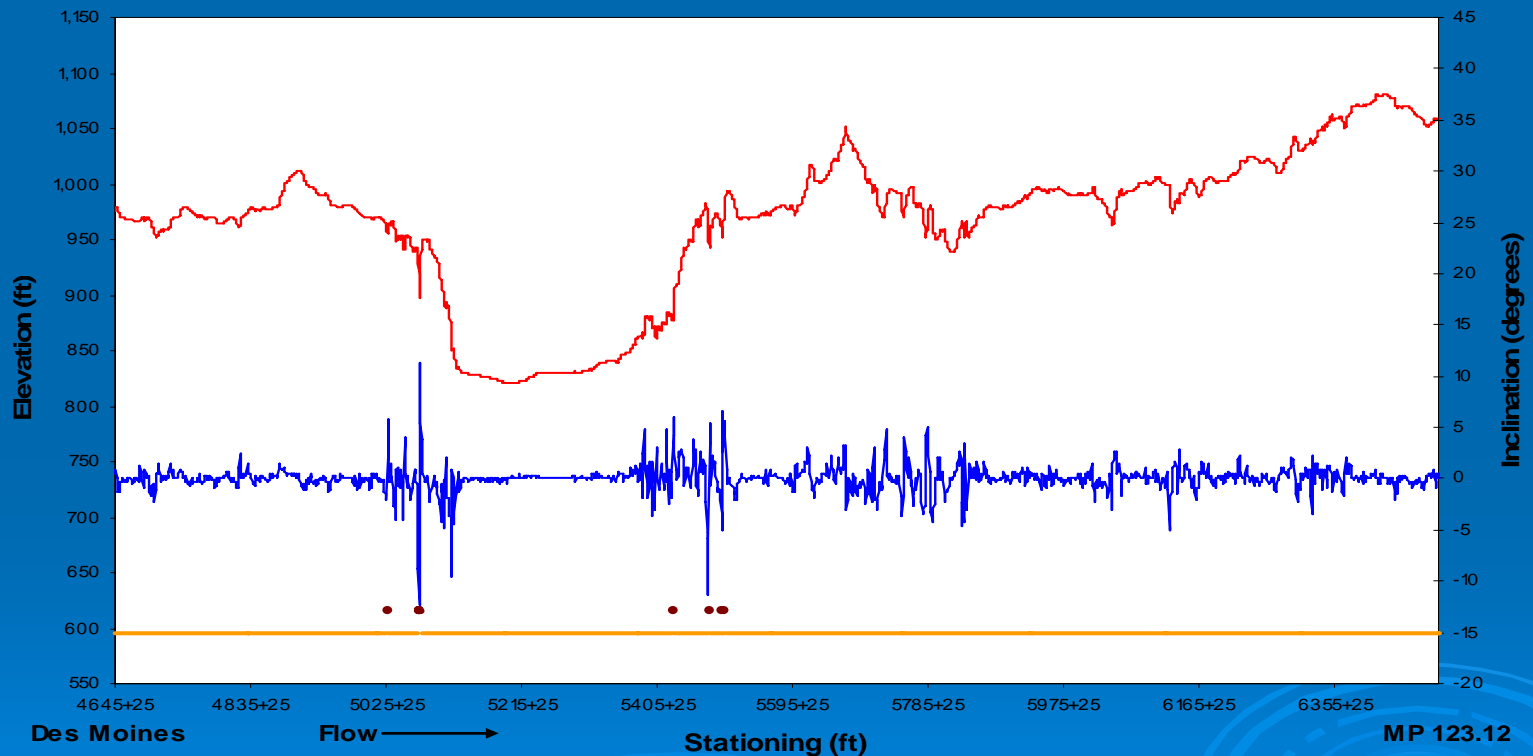
Des Moines to Mason City
Line 5051 - 86400 BPD Wyoming Sweet - 1% H₂O



— Elevation — Inclination — Entrainment — Stratified without Accumulation — Stratified with Accumulation

Example #3A

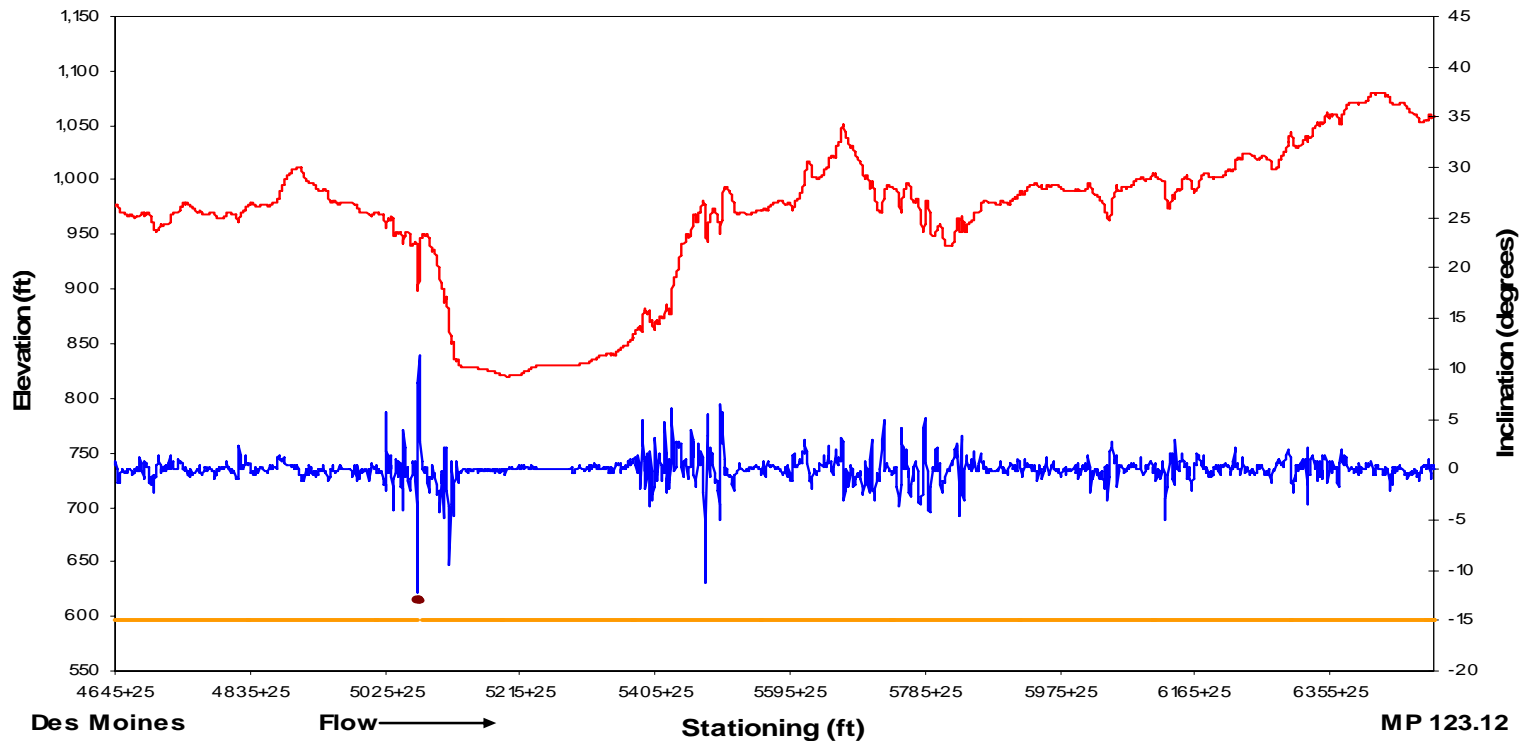
Des Moines to Mason City
Line 5051 - 86400 BPD Wyoming Sweet - 0.5% H₂O



— Elevation — Inclination — Entrainment — Stratified without Accumulation — Stratified with Accumulation

Example #3B

Des Moines to Mason City
Line 5051 - 86400 BPD Wyoming Sweet - 0.3% H₂O



Questions?

