

# Case Study: Lake Sakakawea, Missouri River, ND 15,426' HDD Intersect

Jim Cloud, President – Brownline, USA, Inc.

Rollin Boyd, Vice President – Brownline USA, Inc.



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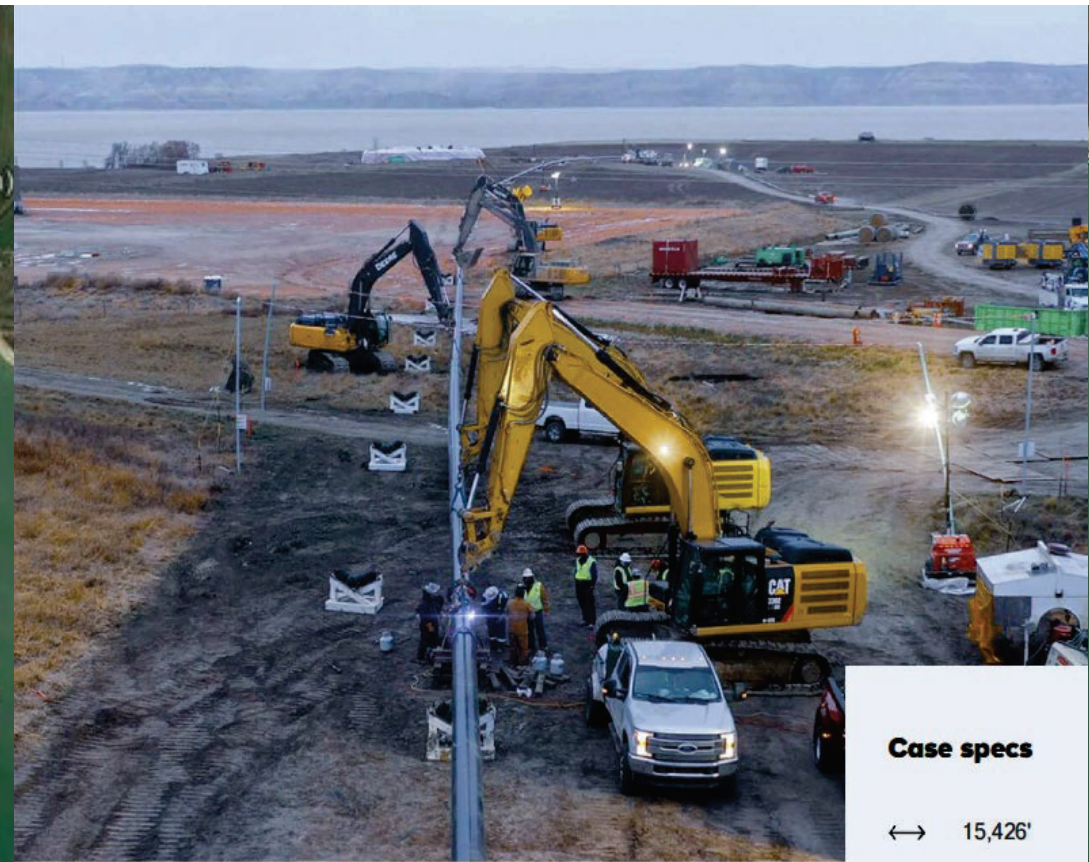
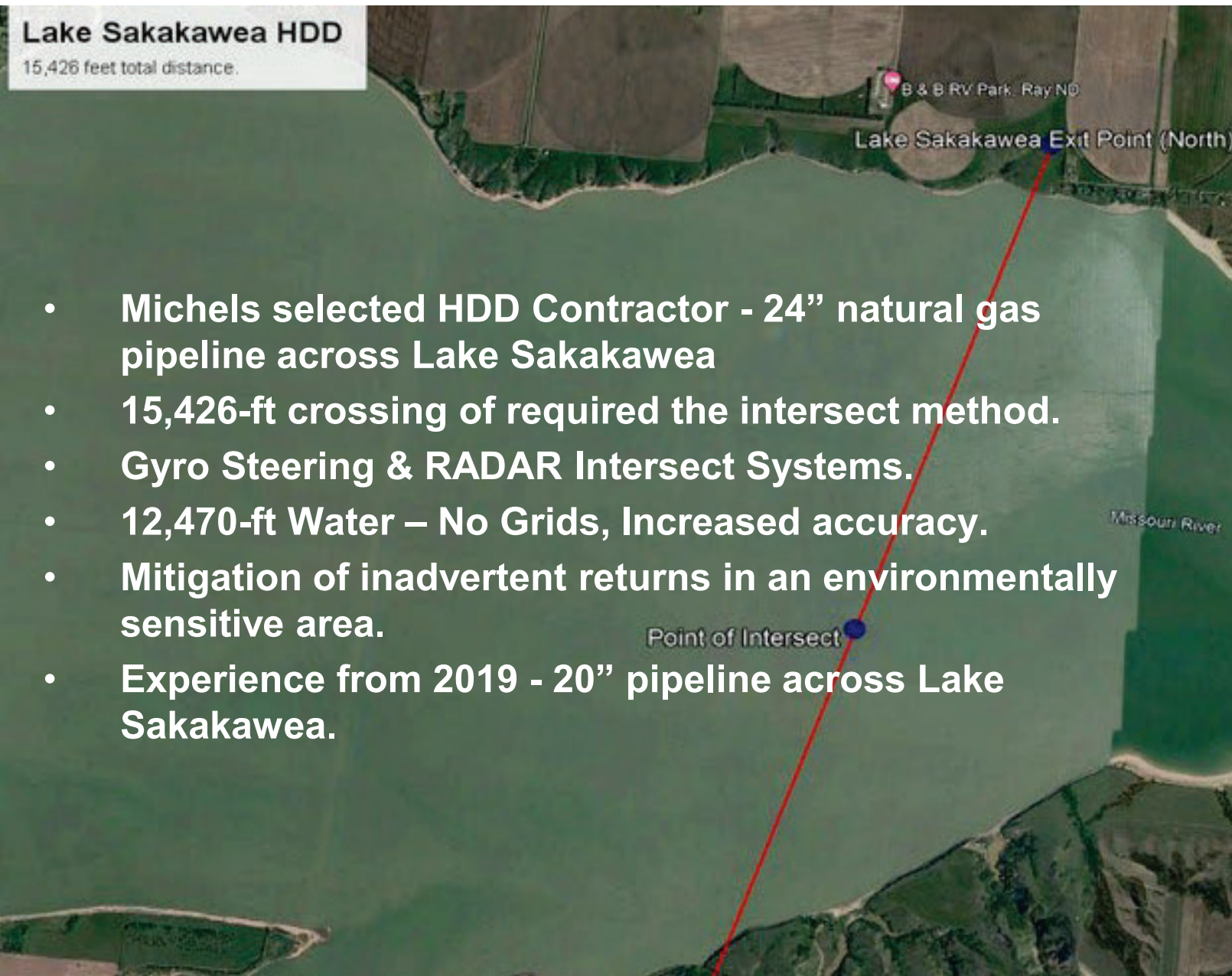




## Lake Sakakawea HDD

15,426 feet total distance.

- Michels selected HDD Contractor - 24" natural gas pipeline across Lake Sakakawea
- 15,426-ft crossing of required the intersect method.
- Gyro Steering & RADAR Intersect Systems.
- 12,470-ft Water – No Grids, Increased accuracy.
- Mitigation of inadvertent returns in an environmentally sensitive area.
- Experience from 2019 - 20" pipeline across Lake Sakakawea.



Case specs

↔ 15,426'



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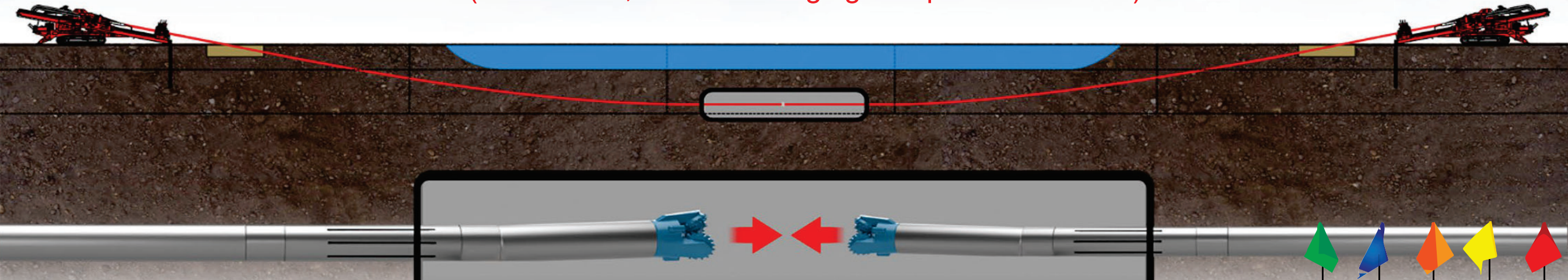




# Tooling - HDD Intersect

- Drillguide GST & RADAR Intersect tool.
- Monitoring Pressure-While-Drilling; No Inadvertent Returns.
- Active Ranging of the RADAR; Real Time Communication between BHAs.

(MGS Tools; Passive Ranging interpretive location.)

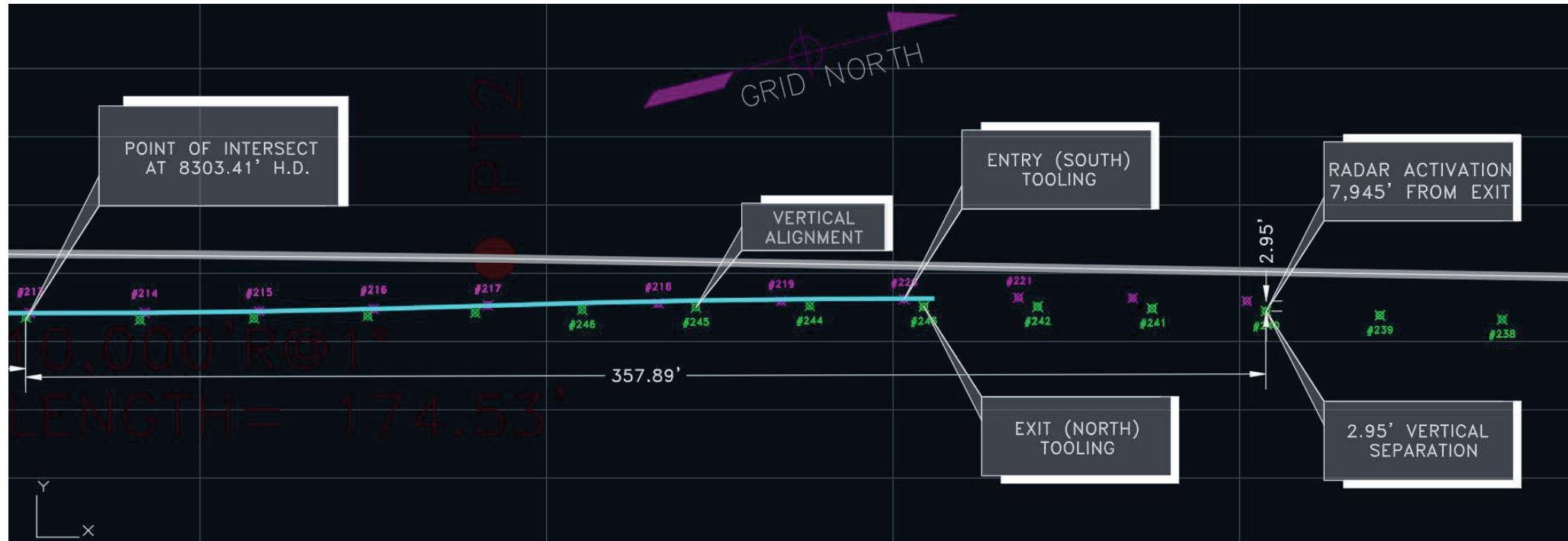








# Vertical Alignment



**South BHA in magenta, north BHA in green**

- South operation drilled to 7475.85'
- North operation drilled to 7977.42'
- 2.95' of vertical separation at the point of radar activation



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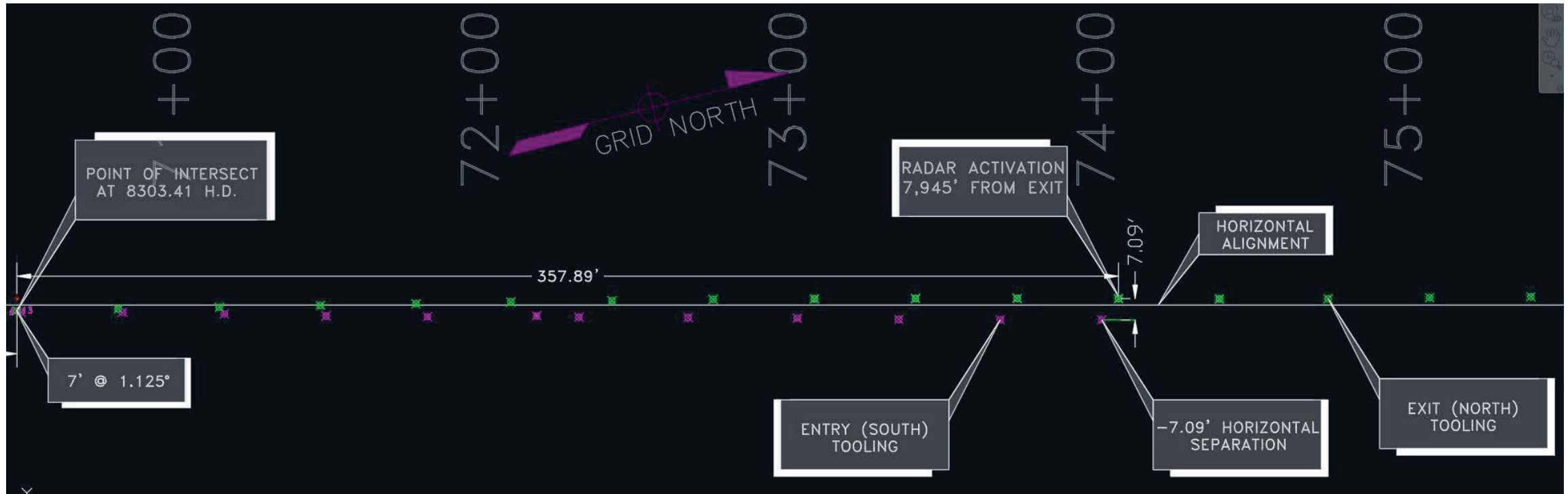
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# Horizontal Alignment



South BHA in magenta, north BHA in green

- Radar activated at station 74+07.77
- Radar results showed a horizontal separation of 7.09'





# Vertical Adjustment

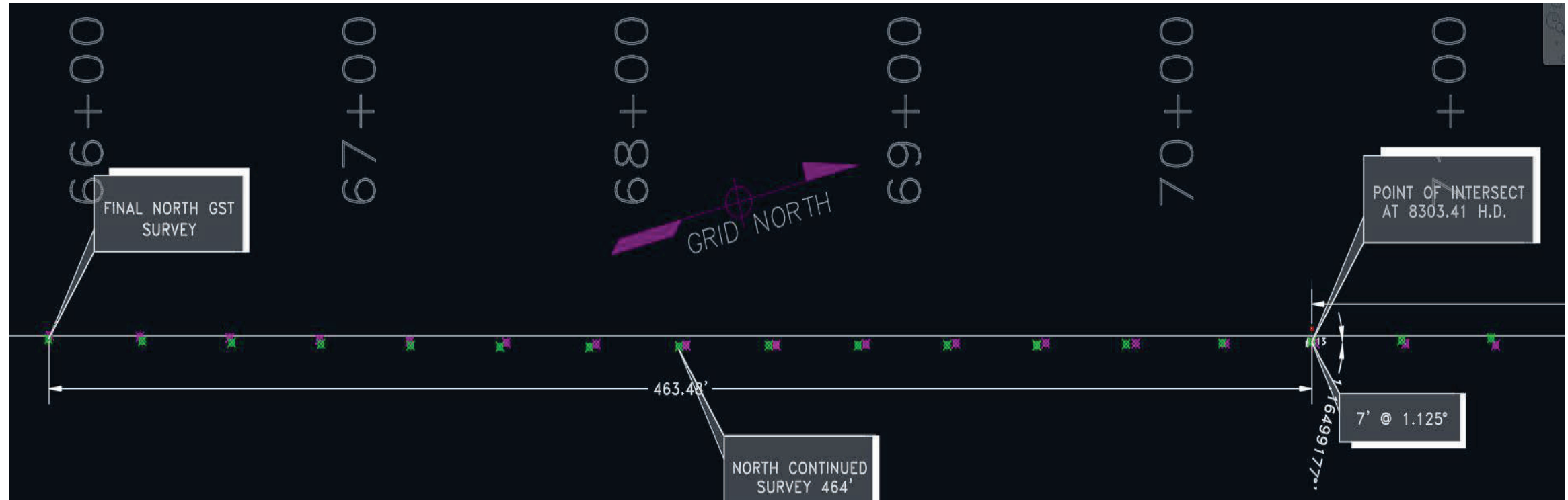


- North BHA INC is at  $1.4^{\circ}$  or  $91.4^{\circ}$
- Calculated a  $.94^{\circ}$  decrease in angle to make the intersection in 358'





# Horizontal Adjustment

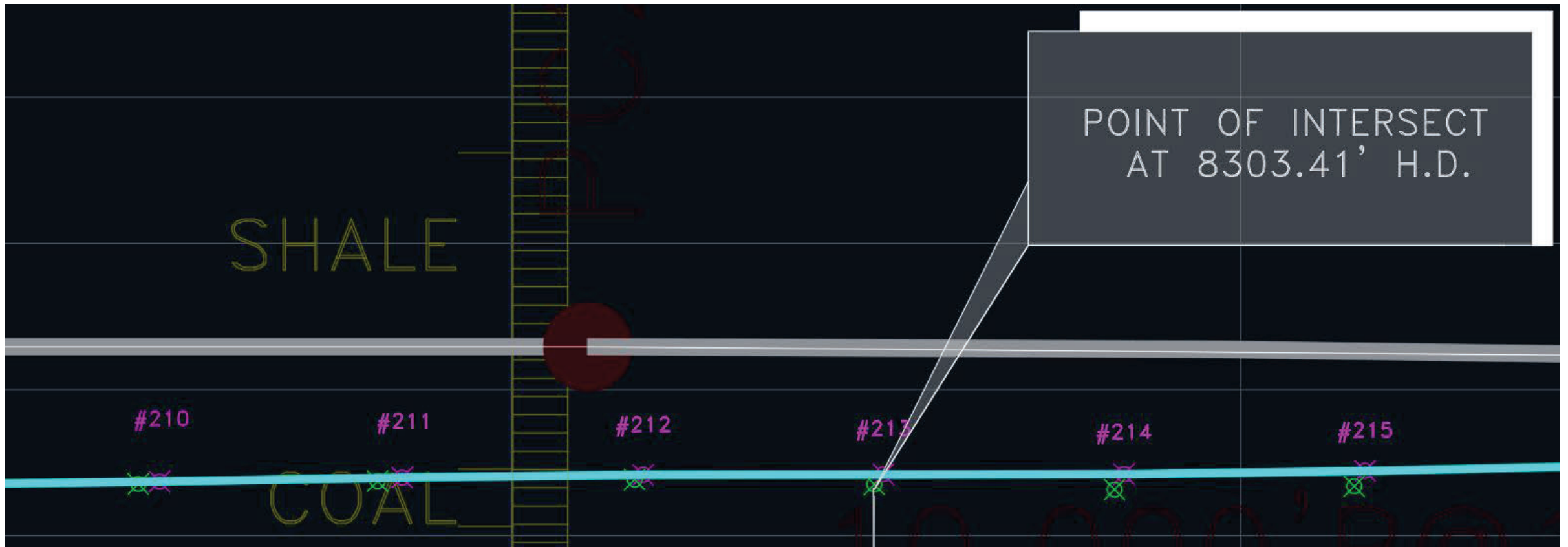


- The north operation continued southward while the south began retrieval
- The AZI was adjusted 1.12° to the east for the north operation
- This calculation will shift the north BHA 7' eastward in 358' with a 10,000' RAD





# Vertical Results



- The north operation made the vertical adjustment and intersected at planned station



# Horizontal Results



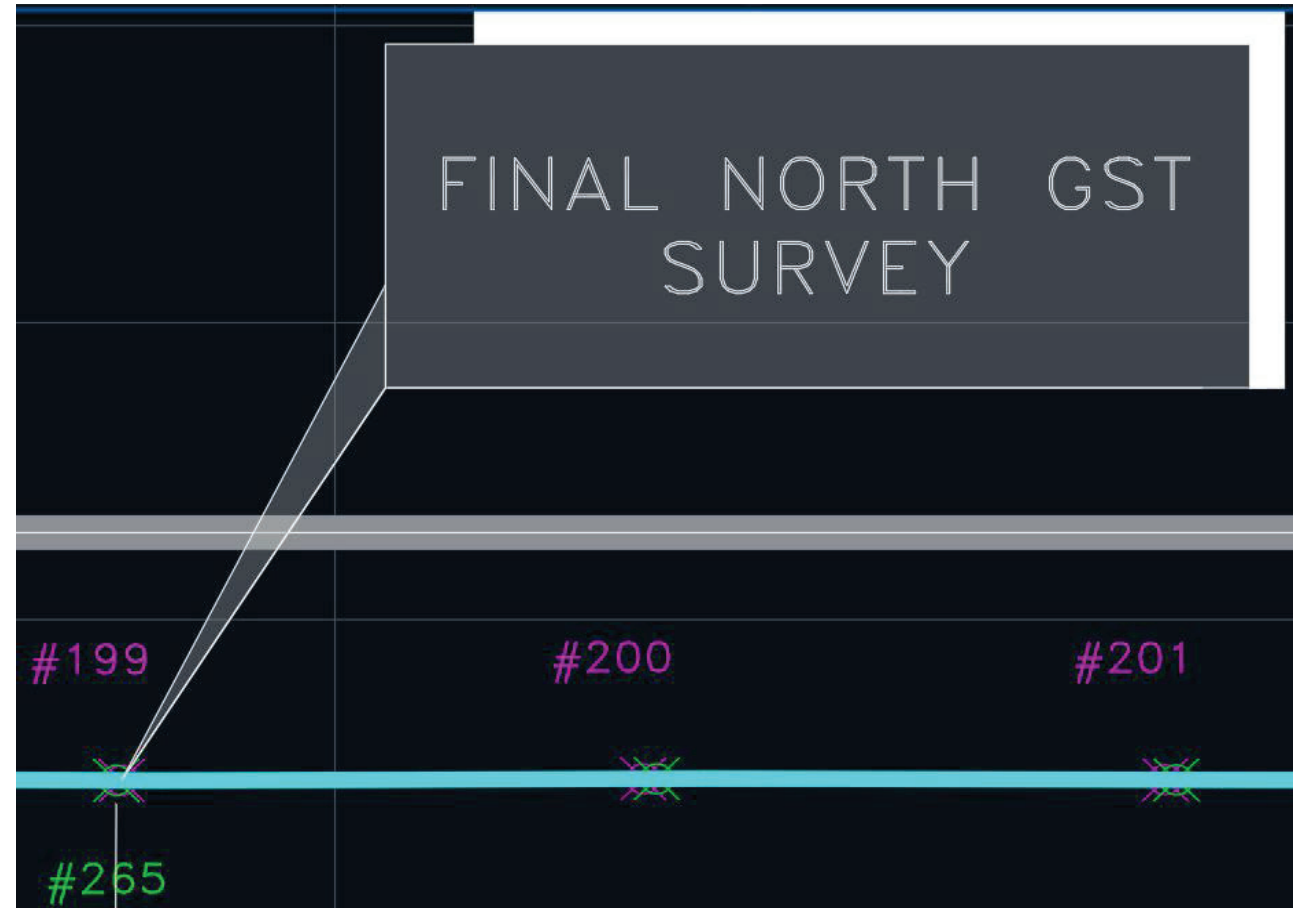
- The north operation successfully made the AZI adjustment and intersected the south bore hole at the planned station.
- The HZ angle as the BHA intersected south borehole was  $.29^\circ$  with a 6,263' RAD





# Final Results

- North operation completed final survey with both the vertical and Horizontal data in alignment with the South data
- The North operation advanced forward through the existing bore path with no survey to the south side insertion point
- South operation continued retrieval of the tooling to the surface



# Summary

**Contractor; attention to detail, engineering, planning, execution and experience.**

**Brownline's Drillguide Gyro and Radar Steering Technology - accurate and smooth intersect.**

**Pressure-While-Drilling (PWD) monitoring - mitigate and inadvertent returns.**





Congratulations **MICHEL'S** on 2022  
New Installation Project of the Year!



Brownline is proud to have provided the Drillguide Gyro Steering and Radar Intersect Systems for the project!

# Brownline

**Innovation, precision and reliability.**

**That is what we provide.**

**That is who we are.**

**The worlds most advanced Gyro Steering System.**

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# ? Questions ?

Jim Cloud, President – Brownline, USA, Inc. – [j.cloud@drillguide.com](mailto:j.cloud@drillguide.com)

Rollin Boyd, Vice President – Brownline USA, Inc. – [r.boyd@drillguide.com](mailto:r.boyd@drillguide.com)



## *Exhibit Hall – Booth 613*

