

Advanced Energy



Standpipe Rupture

17/11/2016

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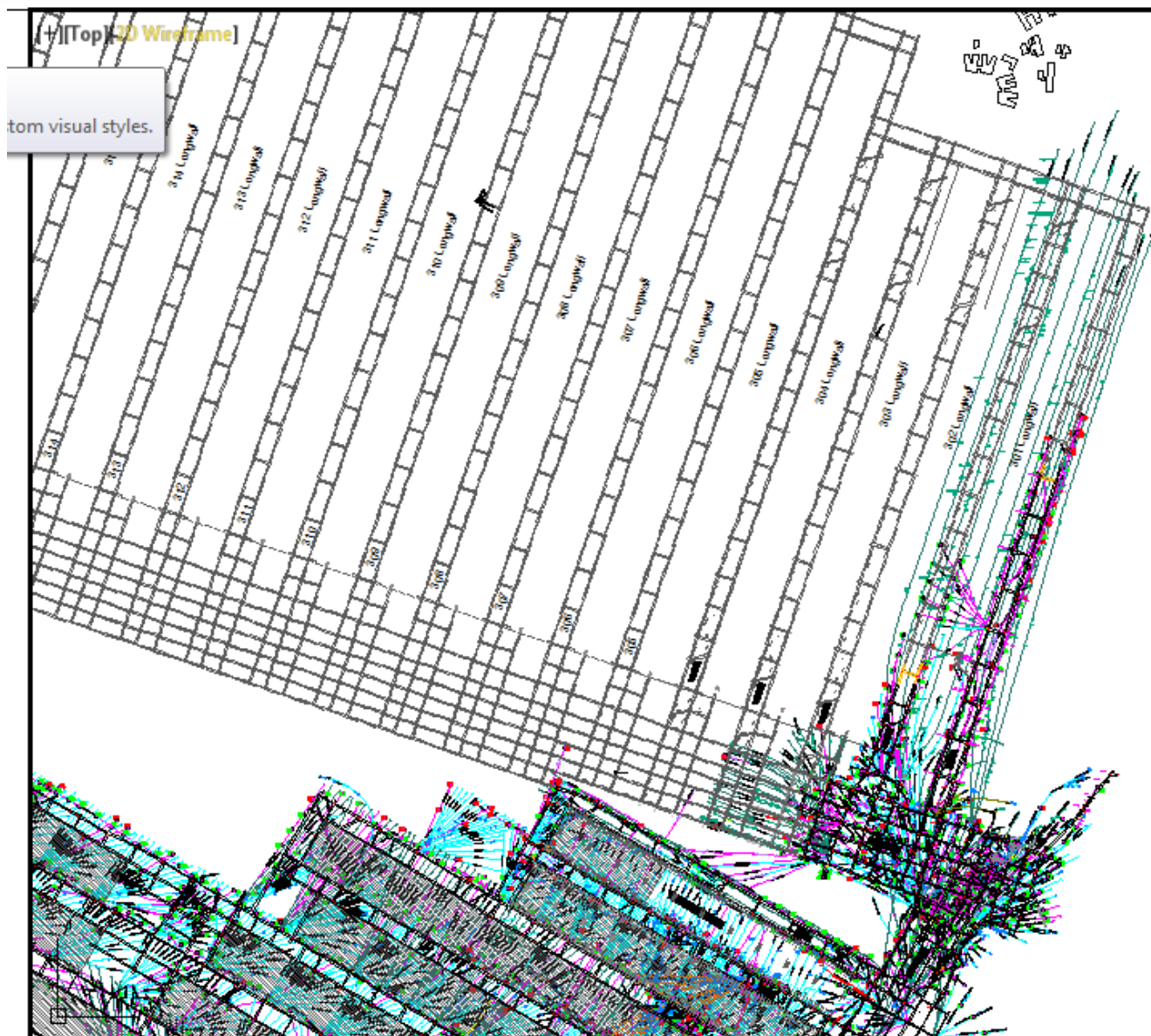
Metropolitan Overview

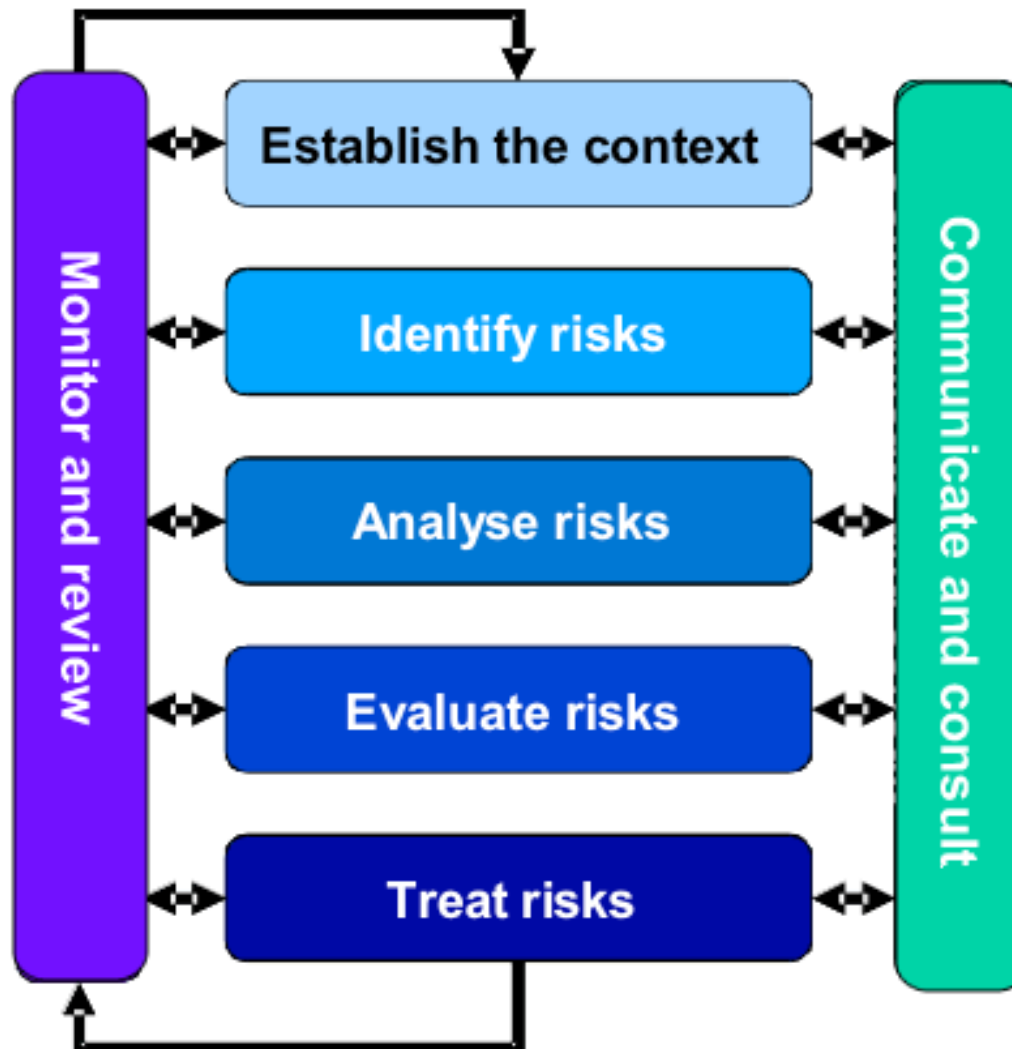
Location	<ul style="list-style-type: none">• Helensburgh, New South Wales
Product	<ul style="list-style-type: none">• Coking coal (~ 70% LV HCC & ~ 30% Other Metallurgical coal)
Volume	<ul style="list-style-type: none">• 1.8Mt (2015)
Overview	<ul style="list-style-type: none">• One of the oldest continually operating coal mining operations in Australia• Underground mine utilizing longwall mining techniques• Residential Workforce of ~360 residing in the greater Illawarra region of NSW
Transportation	<ul style="list-style-type: none">• Railed to Port Kembla Coal Terminal
Employment	<ul style="list-style-type: none">• 260, plus contractors



- SIS drilling not possible due to surface constraints
- Contract project to drill:
 - 11 x 2000m; and
 - UIS bores in new mining area
- Bulli Seam – predominant seam gas CO₂ at average 15m³/tonne virgin content
- Seam height in area ranges from 2.8 - 3.2m.
- VLI successful contractor
 - Modular drill rig selected, with bolt down feed frame due to site access constraints

Location Plot finished bores





- Workplace Risk Assessment & Control (WRAC) risk assessment model
- Combination of mine management, check inspectors, industry experts and site and contract drill operators used in RA
- Key risks identified
 - Standpipe design and loading
 - Removing survey tool and DHM in high gas environments
 - Gas emission from rib line
 - Standpipe blockages
 - Excessive bore hole back pressure.
 - Gas Range capacity

Risk controls were implemented:

- 150mm Kevlar composite standpipes
 - Reduced wear on standpipe wall due to less contact
- 12 metre long standpipes
- Dual 100mm off-takes from each standpipe
- Closed circuit drill set up to allow tools to be removed without gas leakage
- Drill rig bolted to floor using 6 x AX grade bolts
- 300mm gas range to each drill site and daily monitoring of gas range for blockages

Standpipe set up

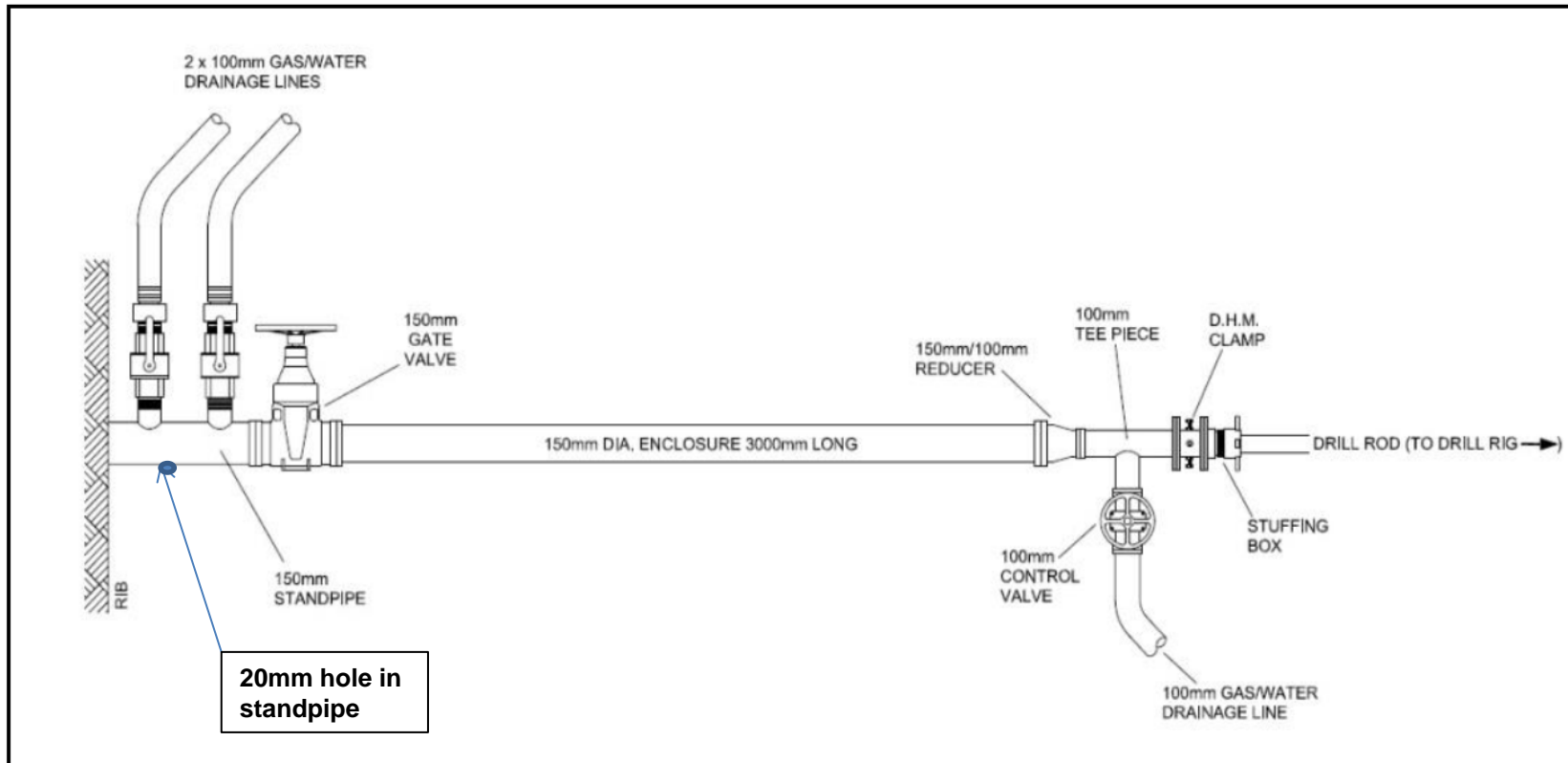
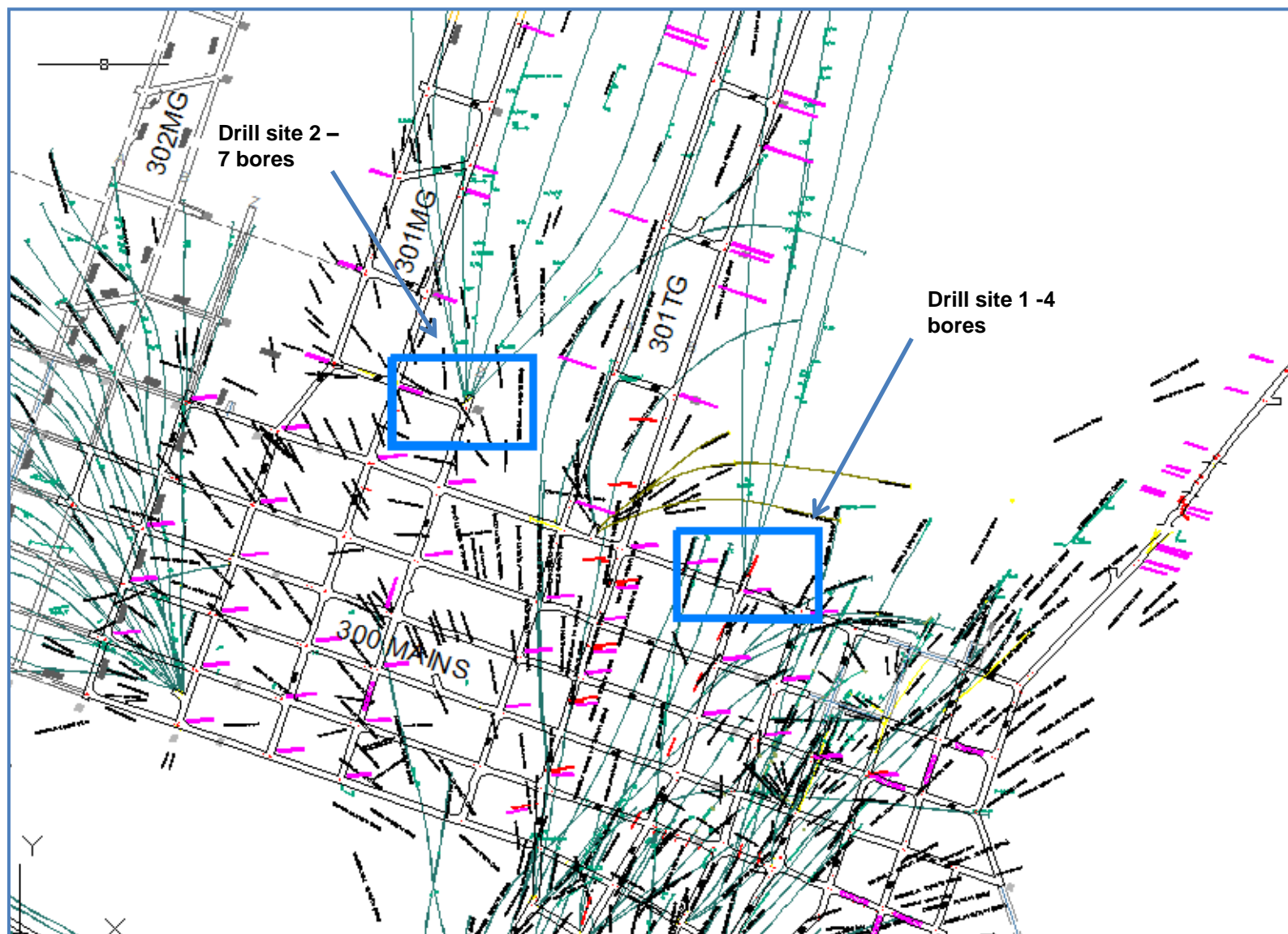
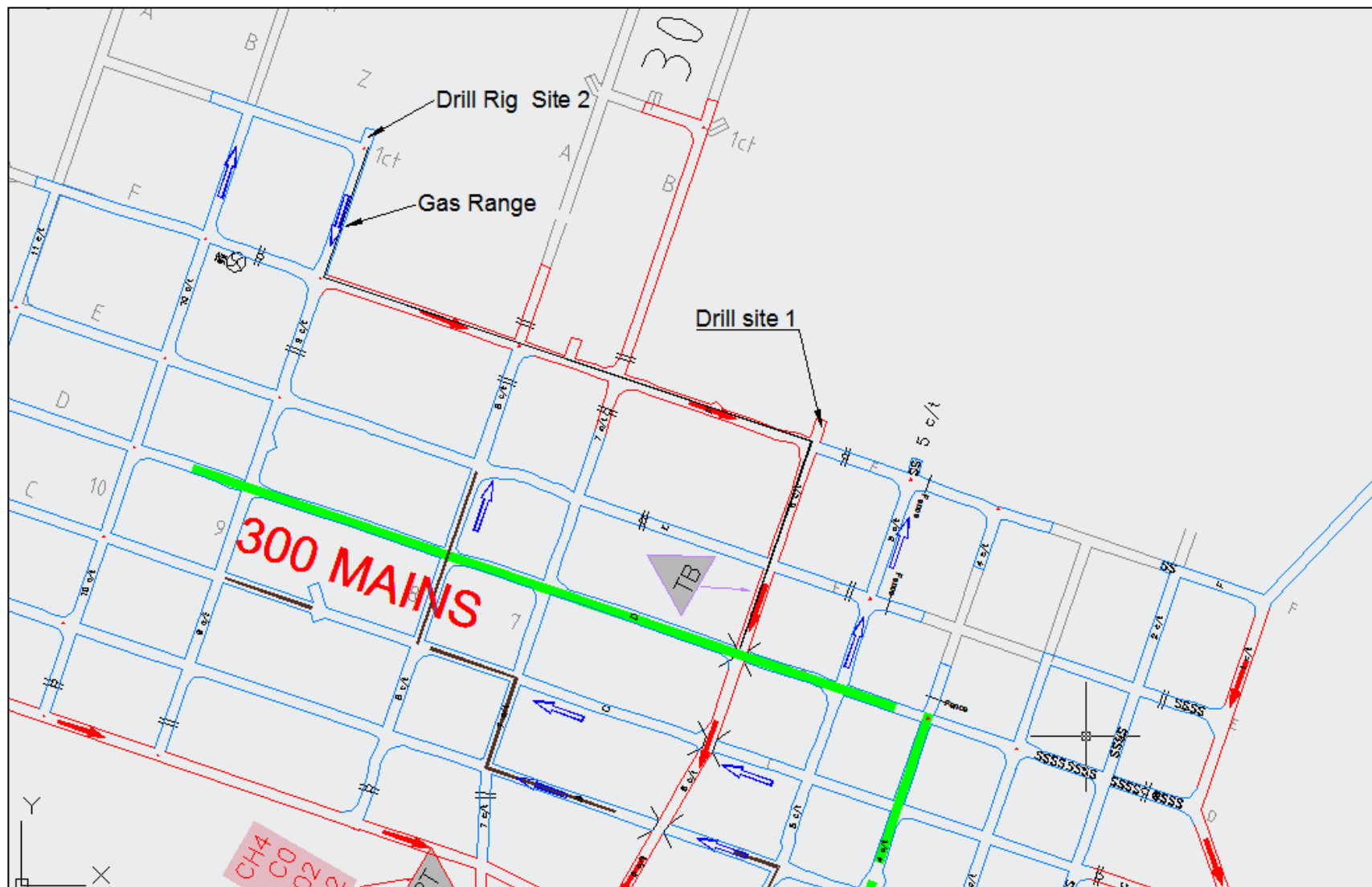


Figure 2: Standpipe configuration with 3 m enclosure

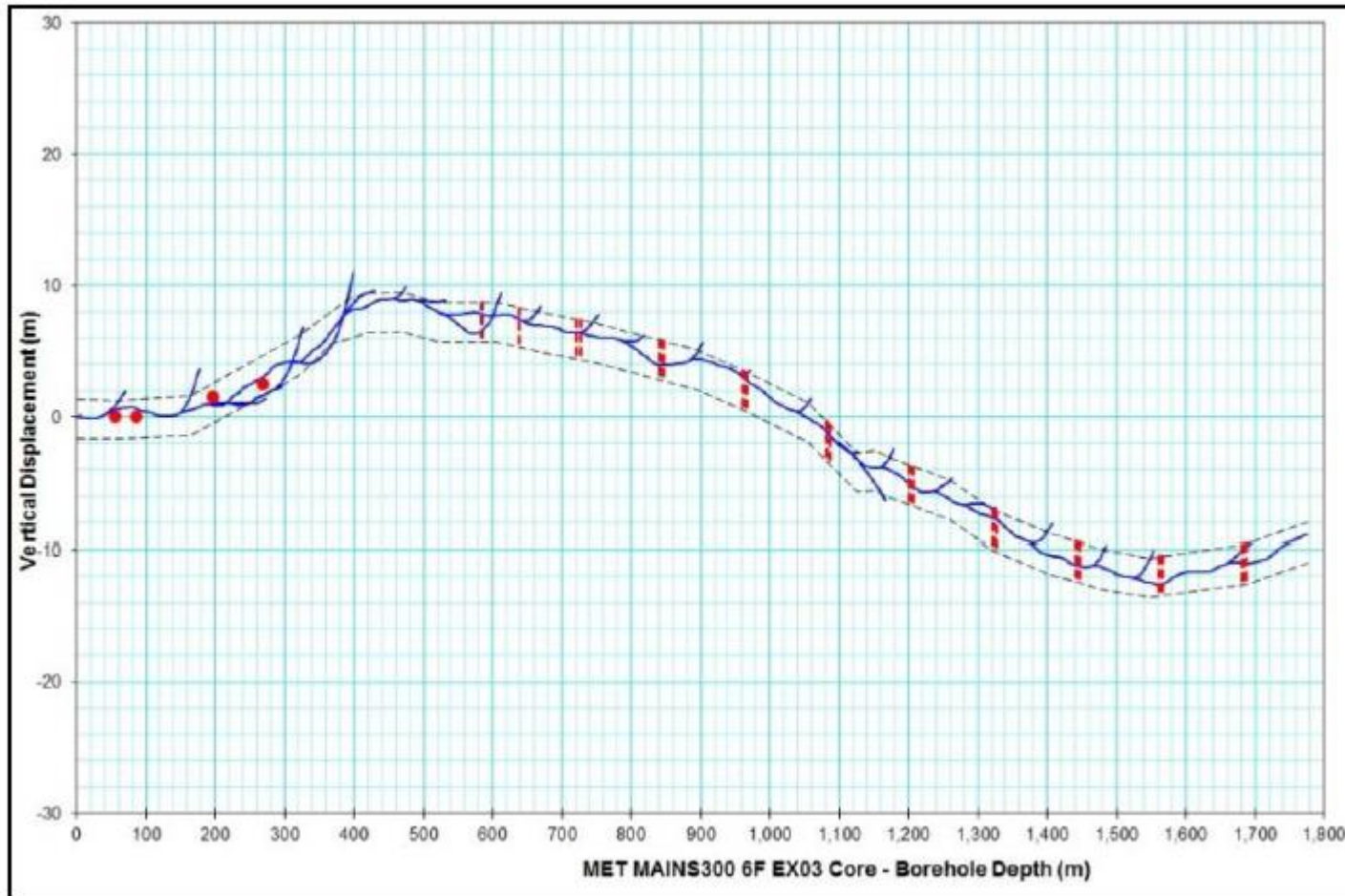
Location of Drill Sites



Ventilation Arrangement Drill Site 2



Seam Profile (Bore EX03)

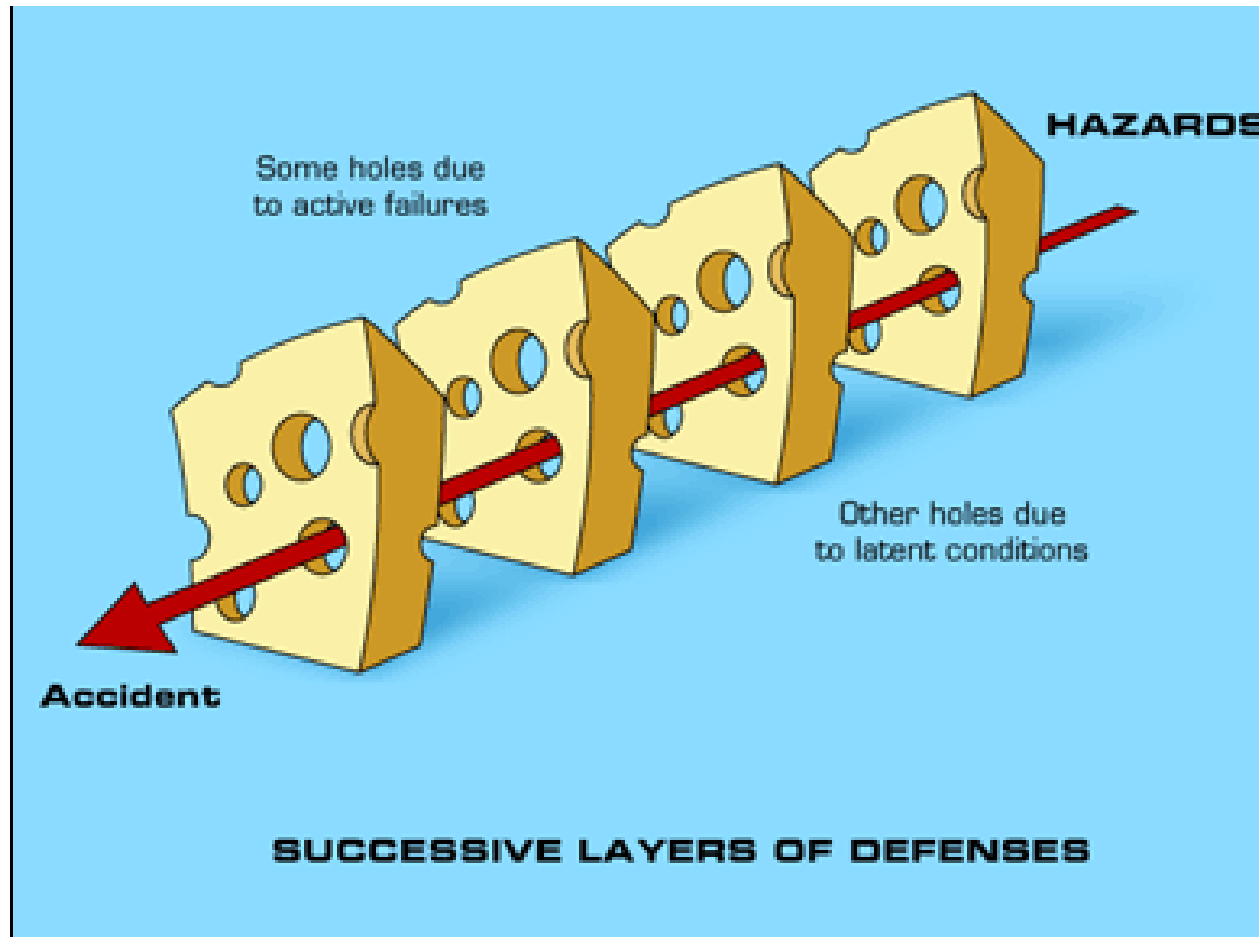


- Incident occurred day-shift 24 November 2015
 - Release of gas from standpipe # 9
- 7 boreholes had been completed successfully at up to 2150m in length.
 - 4 bores at first drill site
- Previous shifts had started to experience issues with maintaining a water seal in the gas water separator due to back pressure in the range
- Boreholes were turned off to allow repositioning of equipment
- Separator had been installed at non-optimum height due to gas range location and equipment position

- One of the drill crews had previously identified a small leak in the bottom of the standpipe and had sealed the leak with grout.
- Standpipe turned off at 11.30 am and grout patch fails under pressure
- Subsequent examination showed a hole 30mm diameter worn in bottom of standpipe -

- Back pressure caused grout repair to fail, releasing seam gas under pressure
- Ventilation increased to stub – remaining bores turned back on.
- Incident reported to regulator – Clause 179 – uncontrolled escape of gas
- Site sterilized by regulator – drilling suspended until original standpipe integrity able to be re-established
- Review of procedures and processes carried out.

So what went wrong?



- Boreholes were turned off to rectify gas water separator problem
- Rib line was under-cut where standpipe was installed – increasing length of exposed standpipe
- Standpipes had only single layer of Kevlar wear protection – no prior knowledge of wear associated with this length bore
- Gas range and drill rig location compromised separator set up
- Back pressure in gas range from first drill site bore holes

- Bolt down feed frame holes were of greater diameter than bolts – rig was able to move slightly under load
- Increasing curvature on boreholes with greater deflection on drill string
- Closed circuit set up
 - Placed rig six metres from standpipe allowed for further deflection
- Leakage from standpipe not identified as issue by drillers

- Consultation with standpipe OEM
 - OEM supplied composite adhesive – additional layers glued on and covered with steel pipe bandage.
- A test standpipe was set up to test and pressure tested to OEM specification before repairs to damaged standpipe carried out
- All standpipes were examined for damage
- External sleeves bonded to all standpipes
- Procedure to inspect drill rig hold down bolts each shift and chain blocks used to lock rig alignment

- Gas separator – separate gas line - run into return – not into gas range
- Training of crews in procedure to bond sleeves to standpipes
- Retraining of crews in procedures to set up each standpipe and monitoring requirements of rig position each shift

Key learnings from incident

- Risk assessment process focused on engineering controls
- Success of first four bores led to some complacency with second set of boreholes
- Audit and assessment of each standpipe and set-up following incident
- Highlights James Reason's model –
 - Series of small un-related events coincide and led to an incident
 - 1. Compromised water separator set-up
 - 2. Gas range back pressure
 - 3. Undercut rib and known hole in standpipe
 - 4. Drill rig –feed bed movement
 - 5. Greater than predicted wear on standpipes.

Thank You