Relief Well Ranging Strategy

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Relief Well History

Santa Barbara oil spill occurred in January 1969 in the Santa Barbara Channel in Southern California

According to Dr. Preston Moore the first relief well ever was for this problem and the objective was to penetrate and produce the reservoir to blowdown the pressure and thus “stop” the flow, e.g., RELIEF WELL “relieved” the pressure in the reservoir.

Why do we drill relief wells?

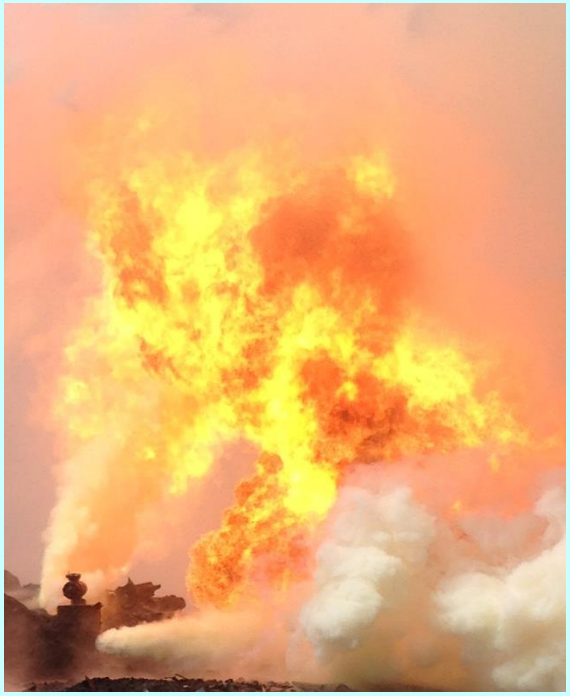
Answer: Because we have to!

If there is another solution, it is taken because time is the driving factor in any well control event.

SOLUTION MUST BE SOONER RATHER THAN LATER IN ALL CASES.

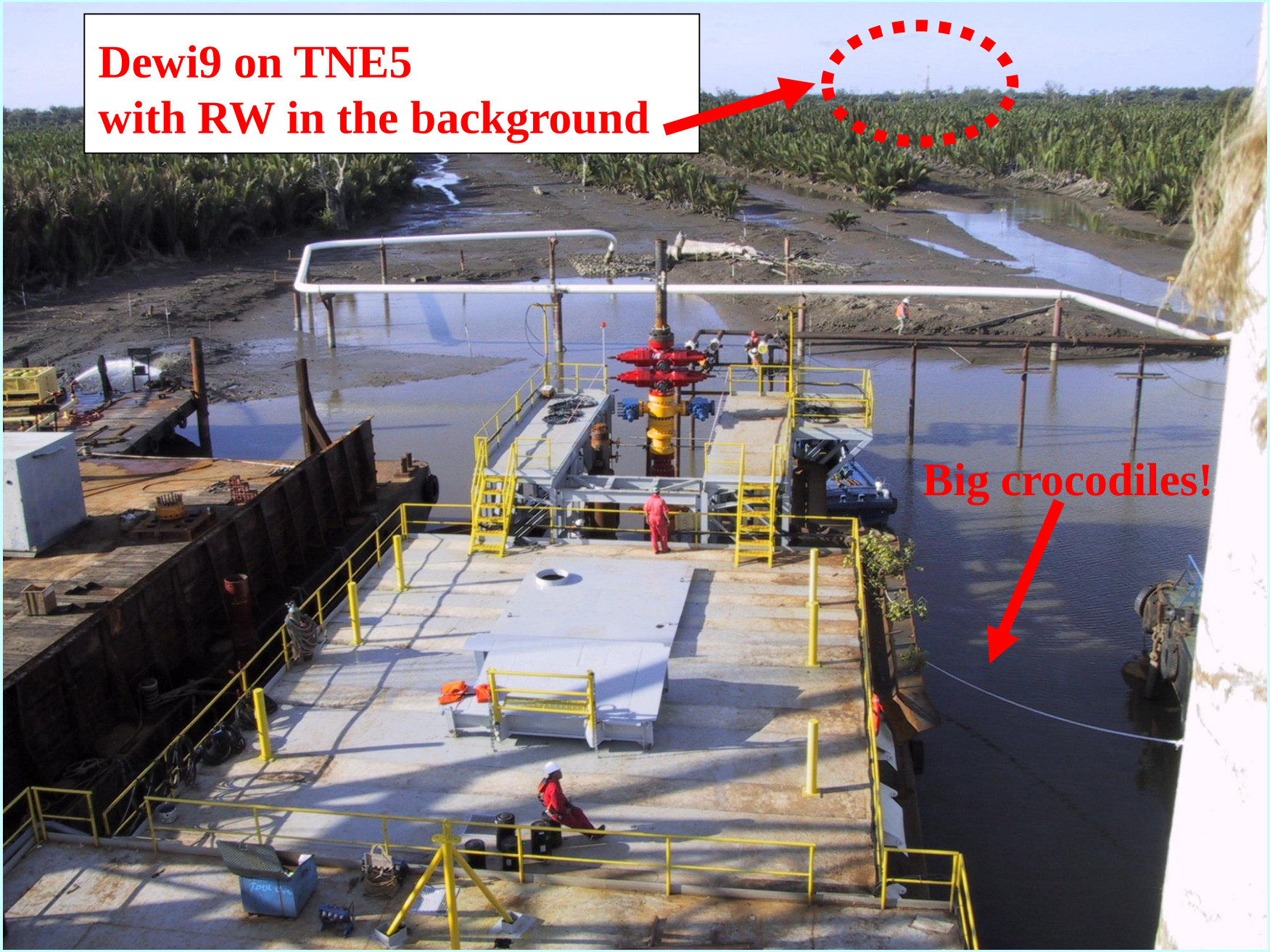
GOM Event 2007
Off-bottom Kill Objective

N. America HTHP Land

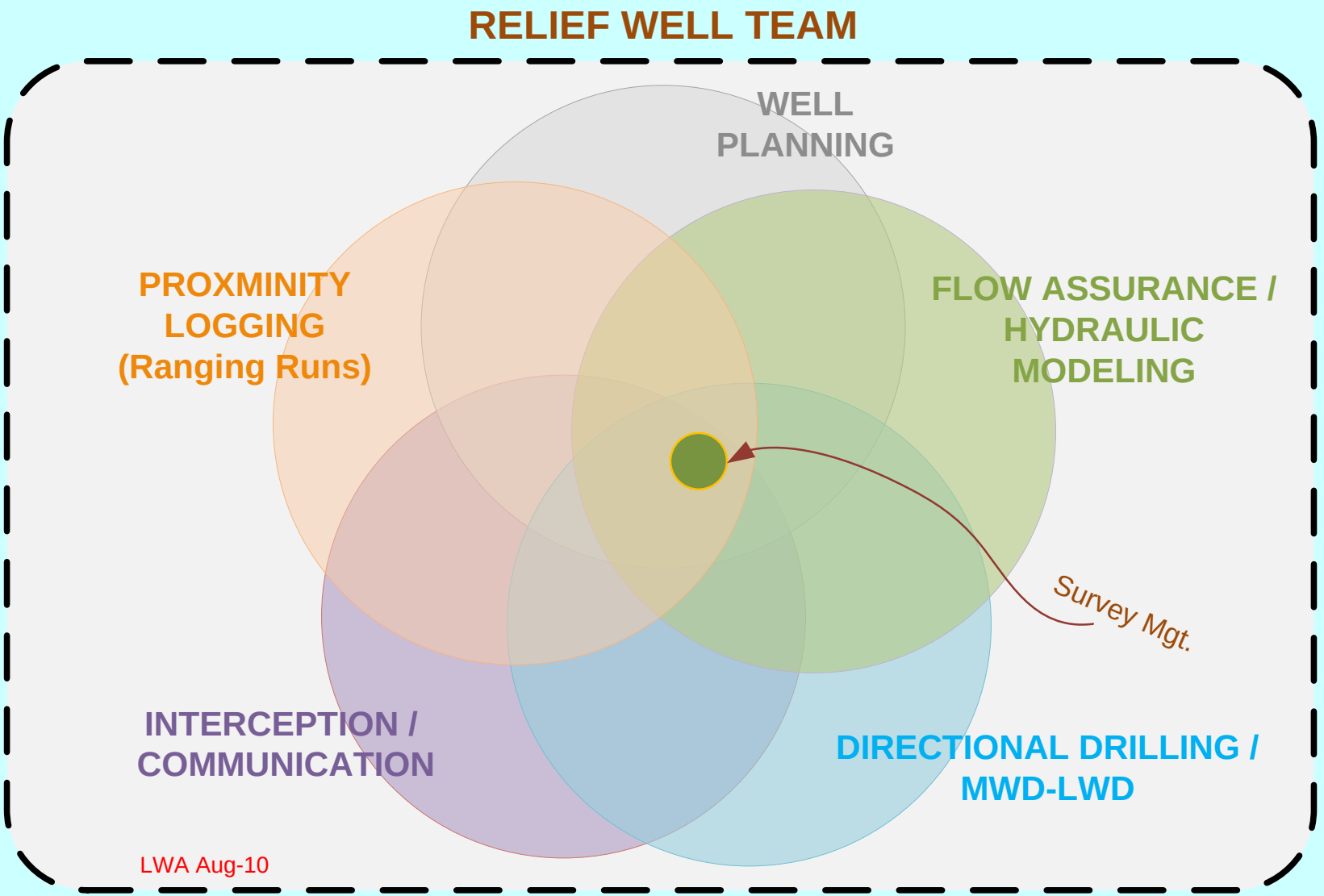


Lake Maracaibo crater circa 1988

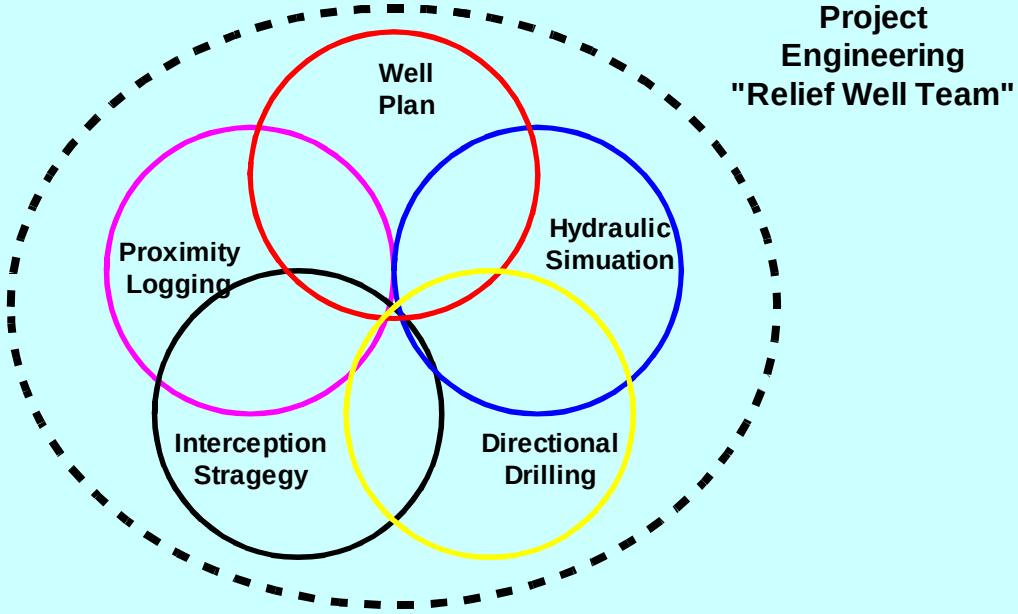
Swamp Barge Rig Marea after a few hours of exposure to fire


Dewi9 on TNE5
with RW in the background
Big crocodiles!

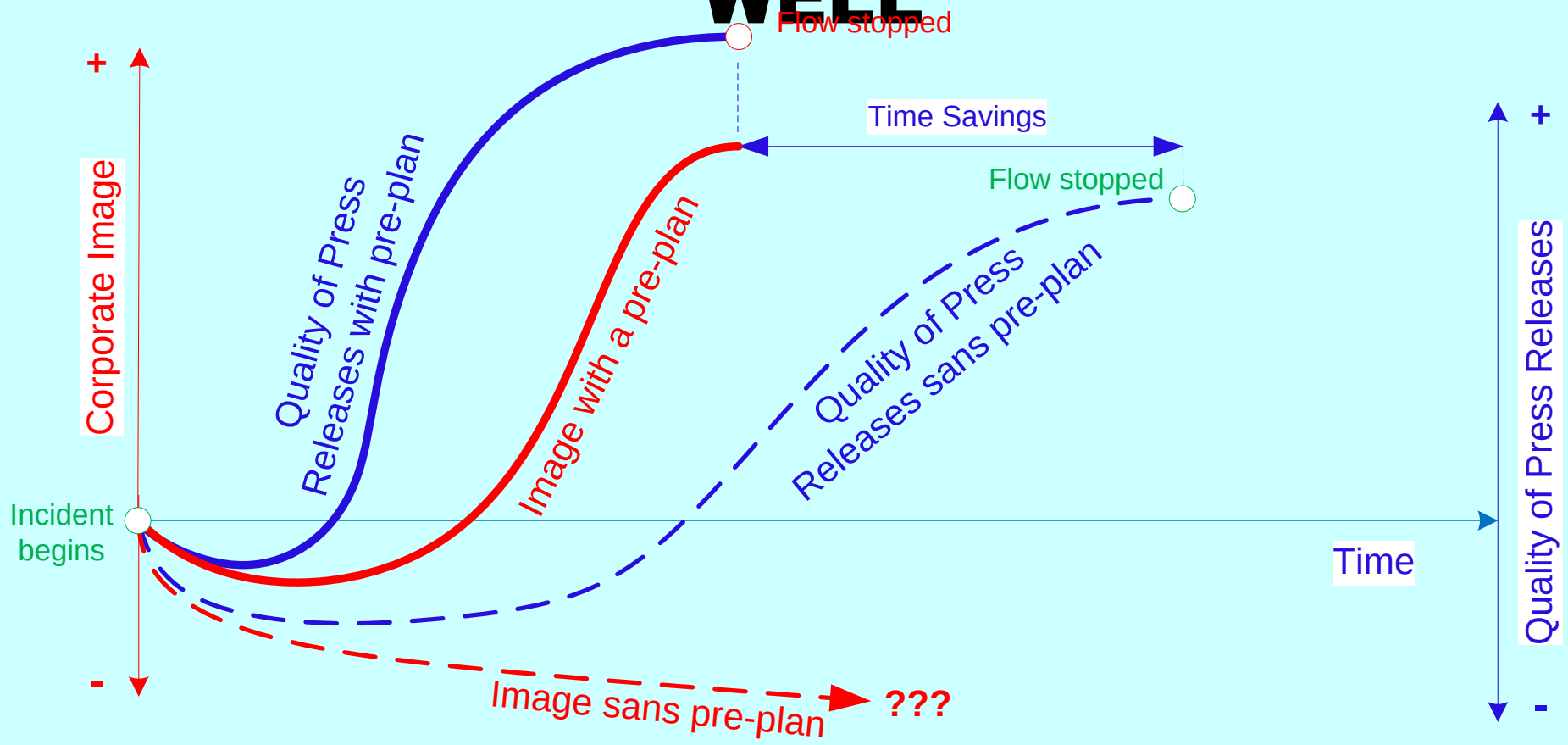
How Does Ranging Fit Into the Project



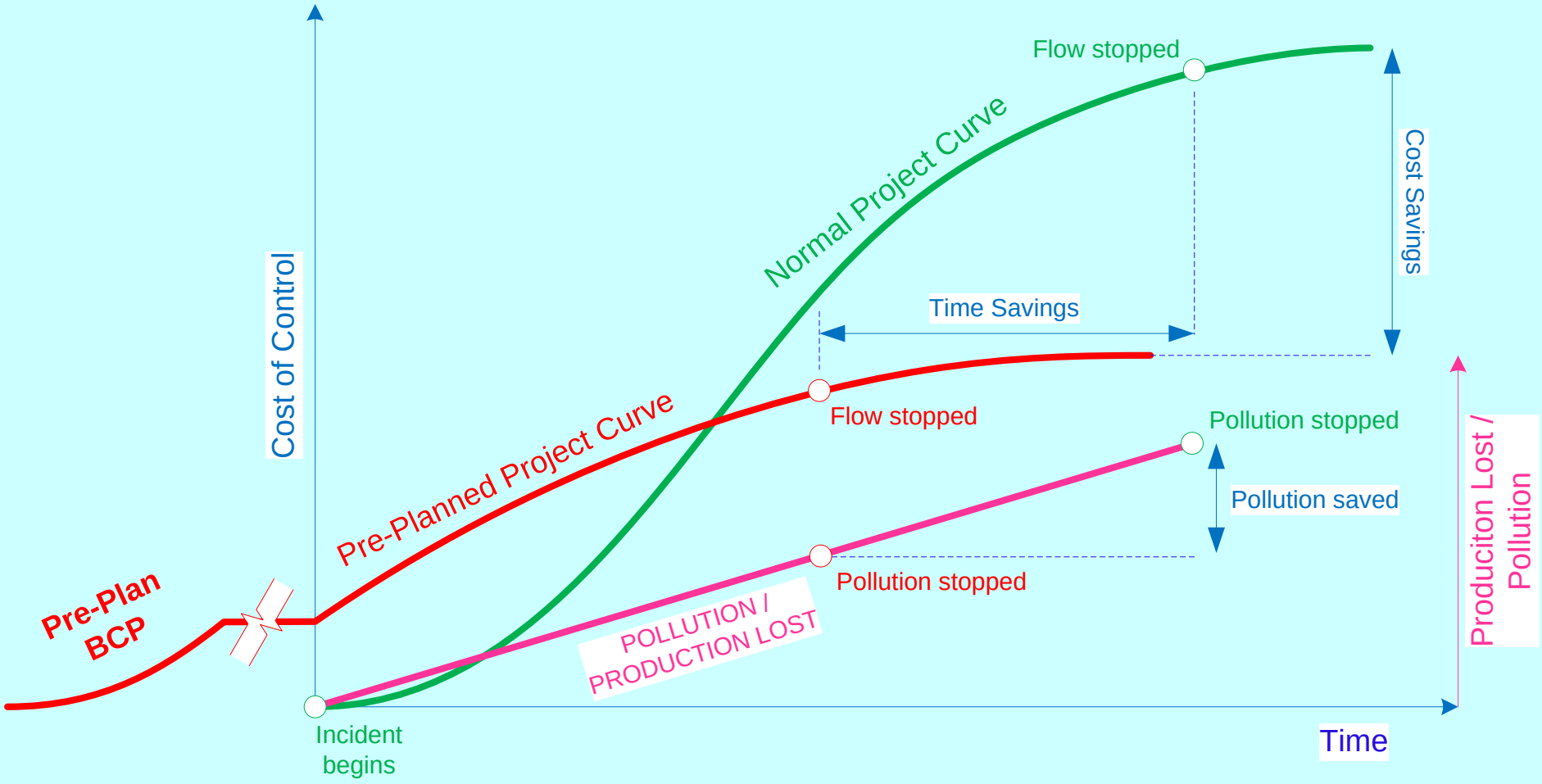
Overlapping responsibilities



OVER ALL OBJECTIVE – STOP THE FLOW – STABILIZE THE WELL



IMPACT OF TIME



OBJECTIVES

- Allow communication for a pump to kill operation
- Least risk per ALARP
  (as low as reasonably possible)
- Least time possible
  (time = exposure in blowout)

The “real” Objective

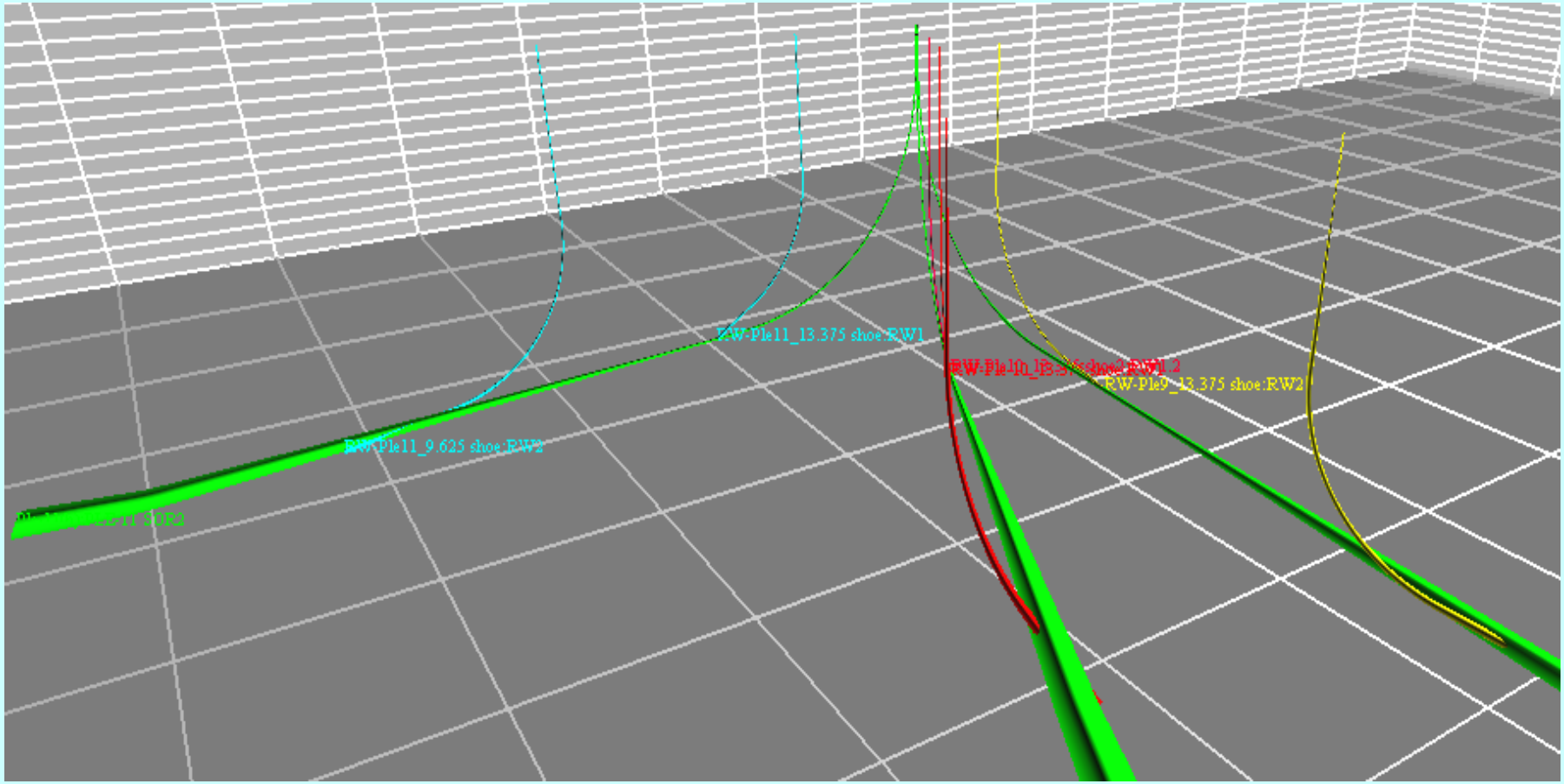
- Hit a VERY small target and make a communication:

Proximity Choices: WL (active) or MWD (passive)

- Why choose one over the other?
- Both have strength and weaknesses
- Active has greater range (in most cases)
- Passive uses tools that are already in the hole (MWD) – no trip out to obtain data
  (provided you are within the detection range)

LOGICAL ANSWER: Use both

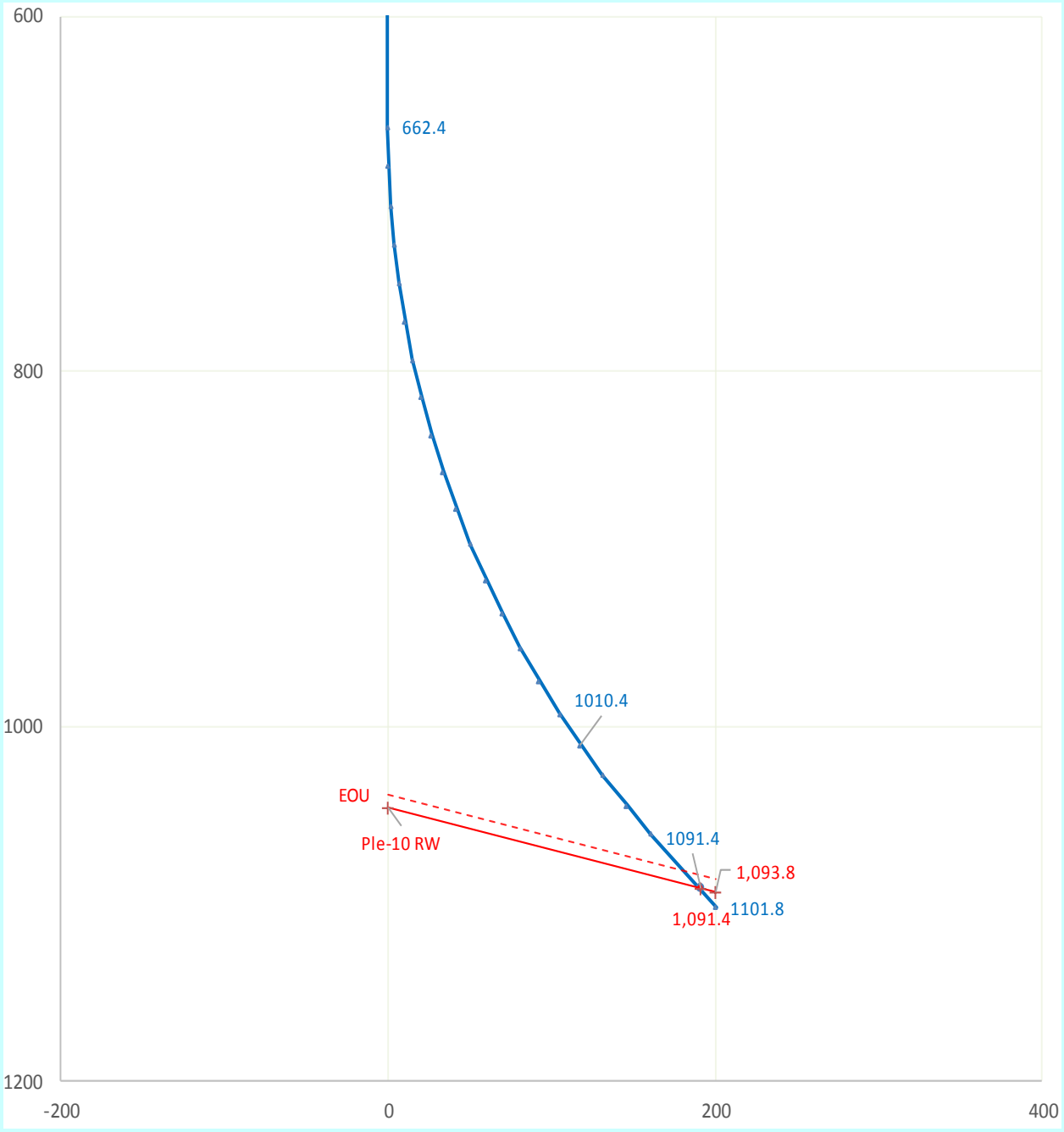
Relief Well Plans are now part of the Emergency Response Plan ERP for high risk (pollution)



Angle Impact (Incident and EOUs size)

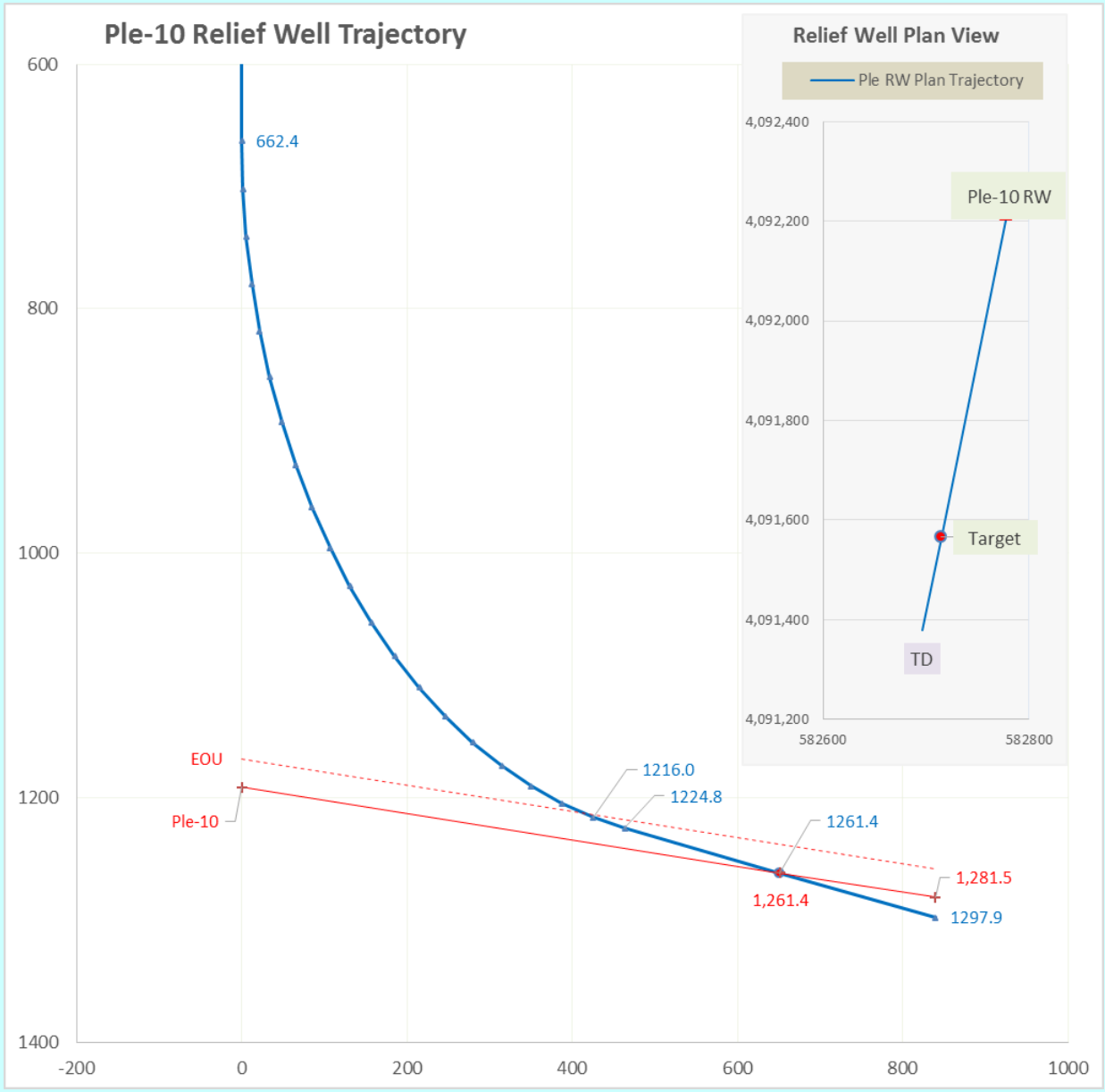
Large Incident Angel

Small EOUs

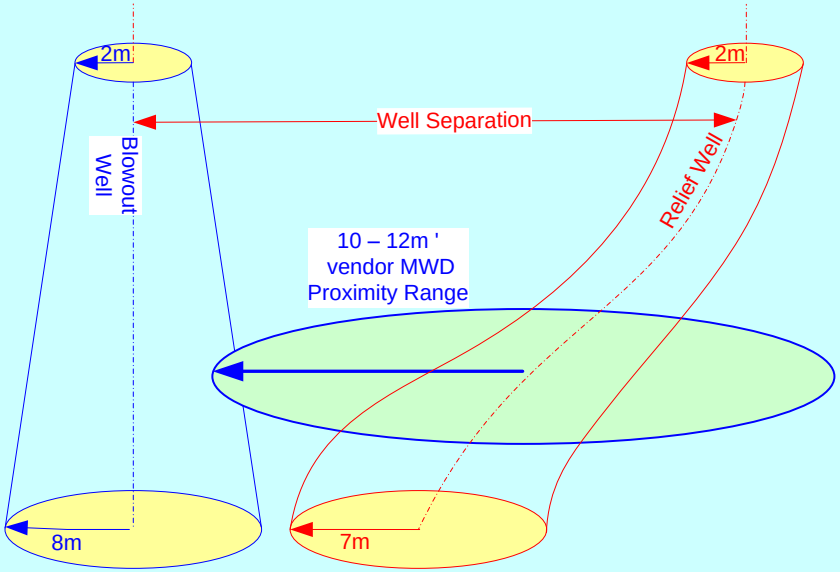


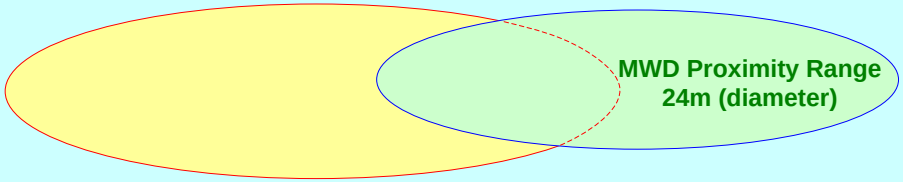
Low Incident Angle

Large EOUs

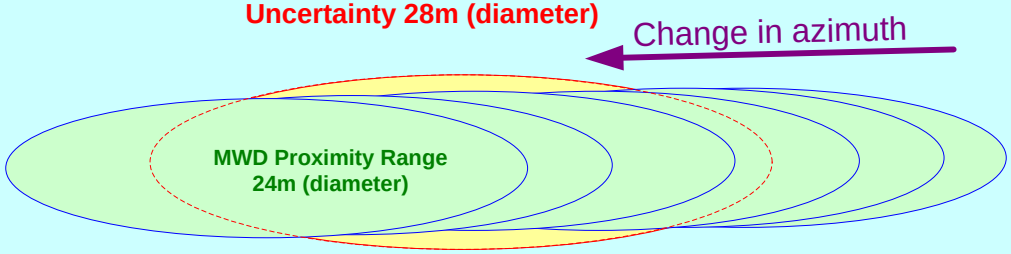


Ranging in small EOU



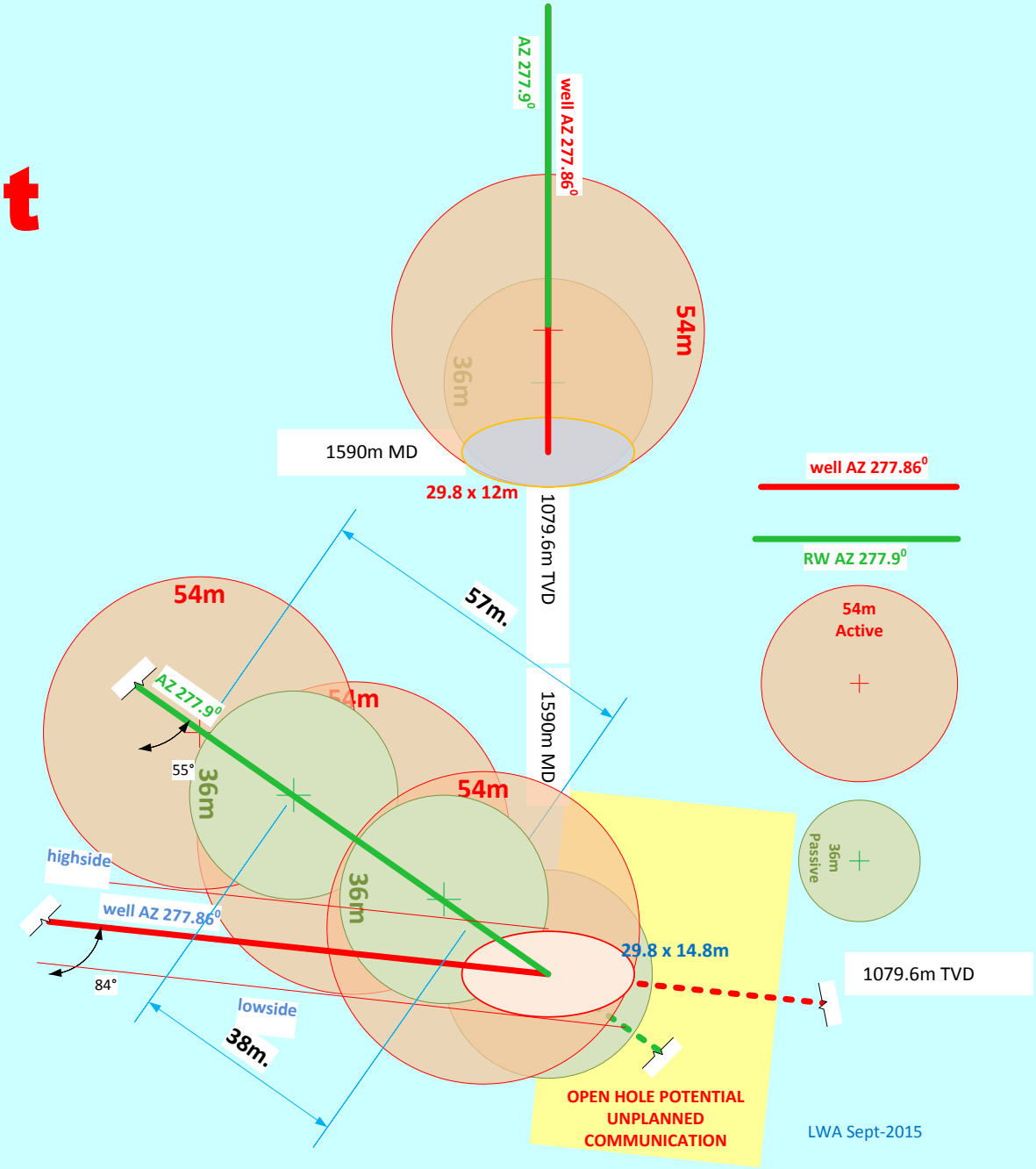


Sum of Surface + RW + Blowout Well Uncertainty 28m (diameter)

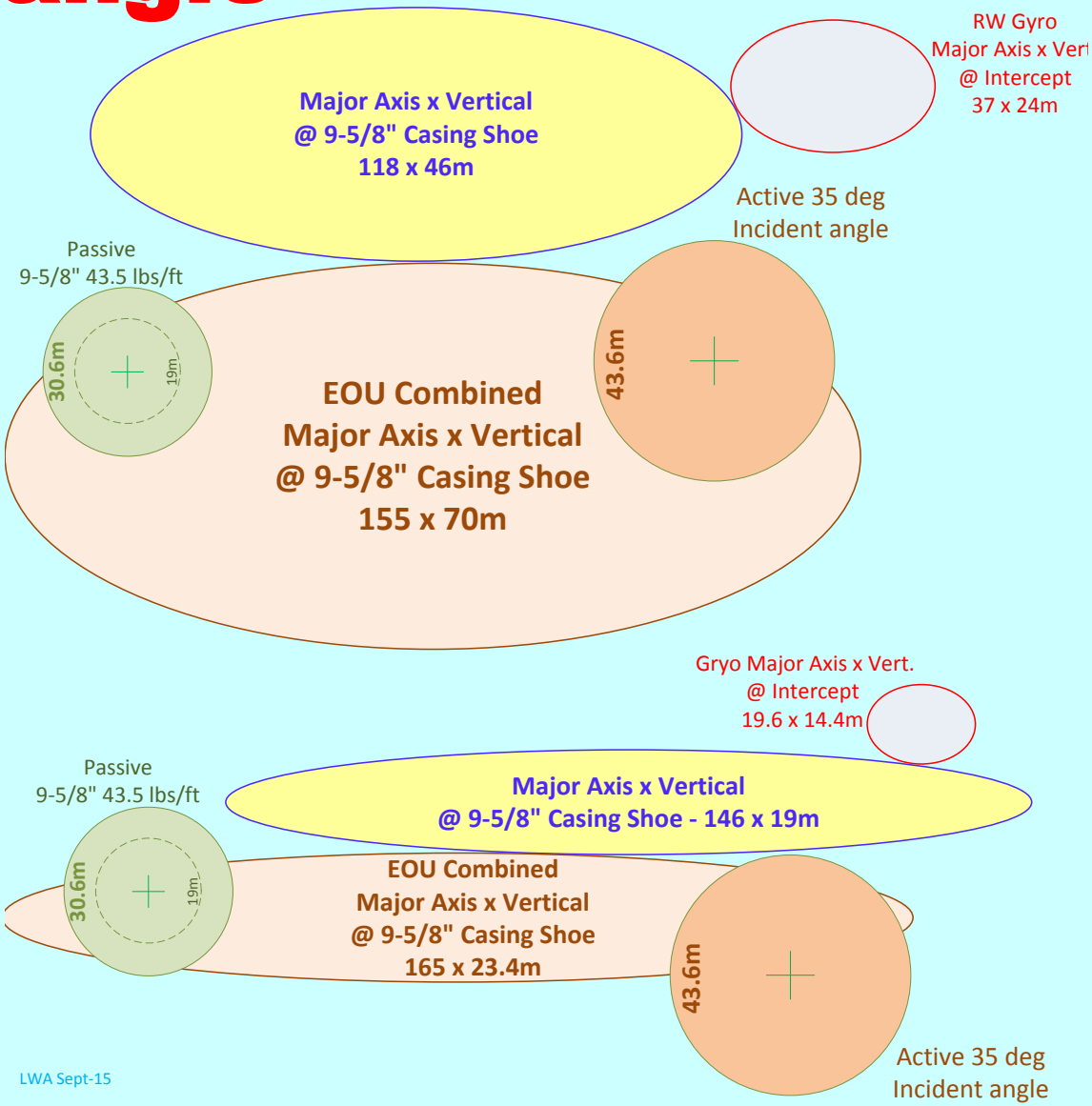


Sweeping thru the ellipse to locate Blowout Well Casing

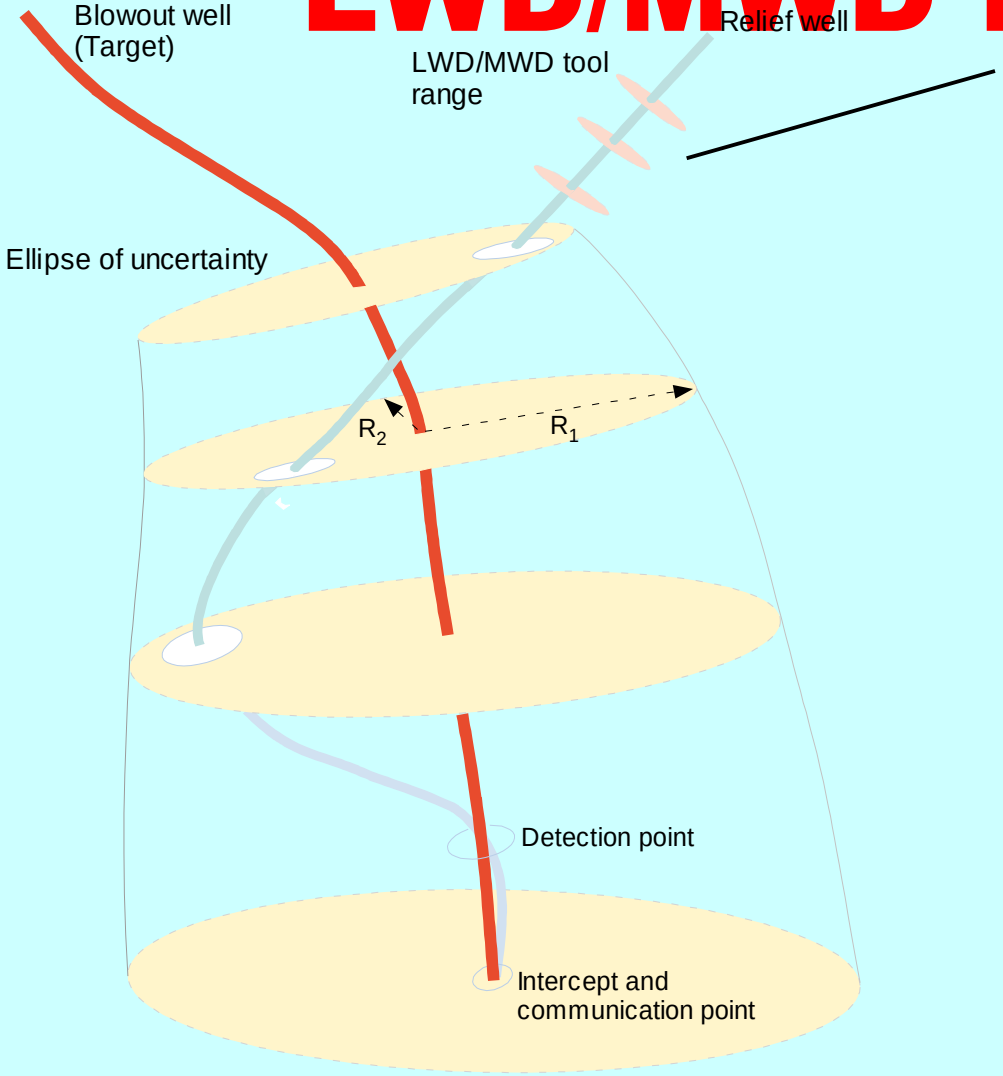
Large Incident small EOUs

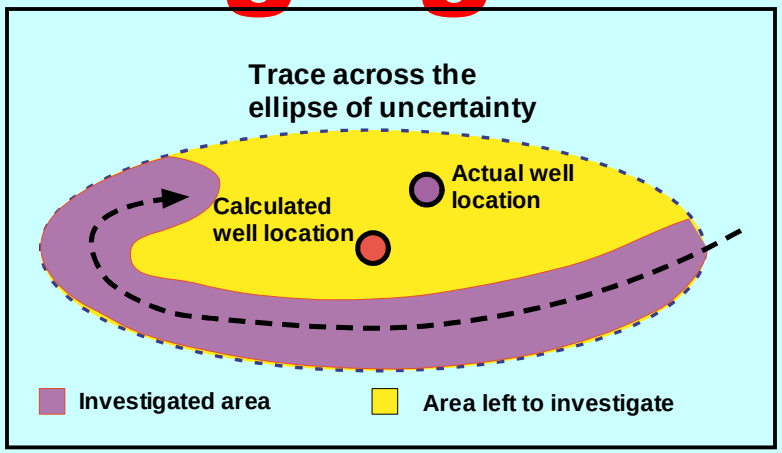


Small EOU but high Incident angle



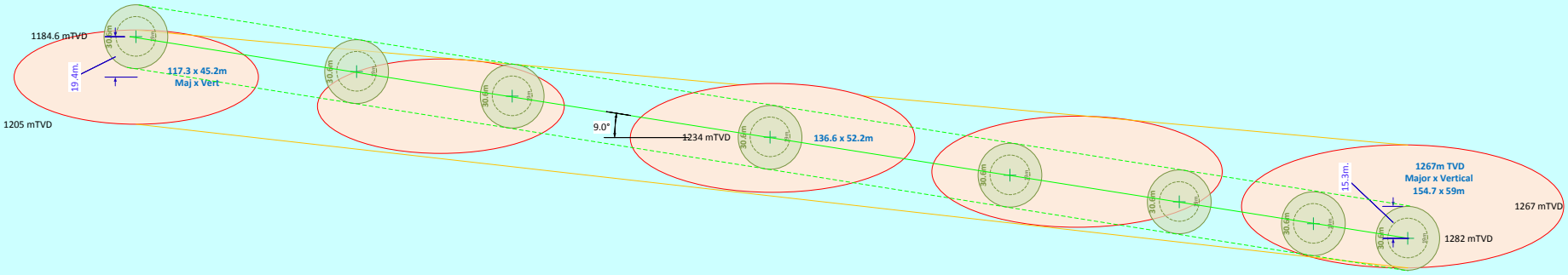
LWD/MWD Ranging



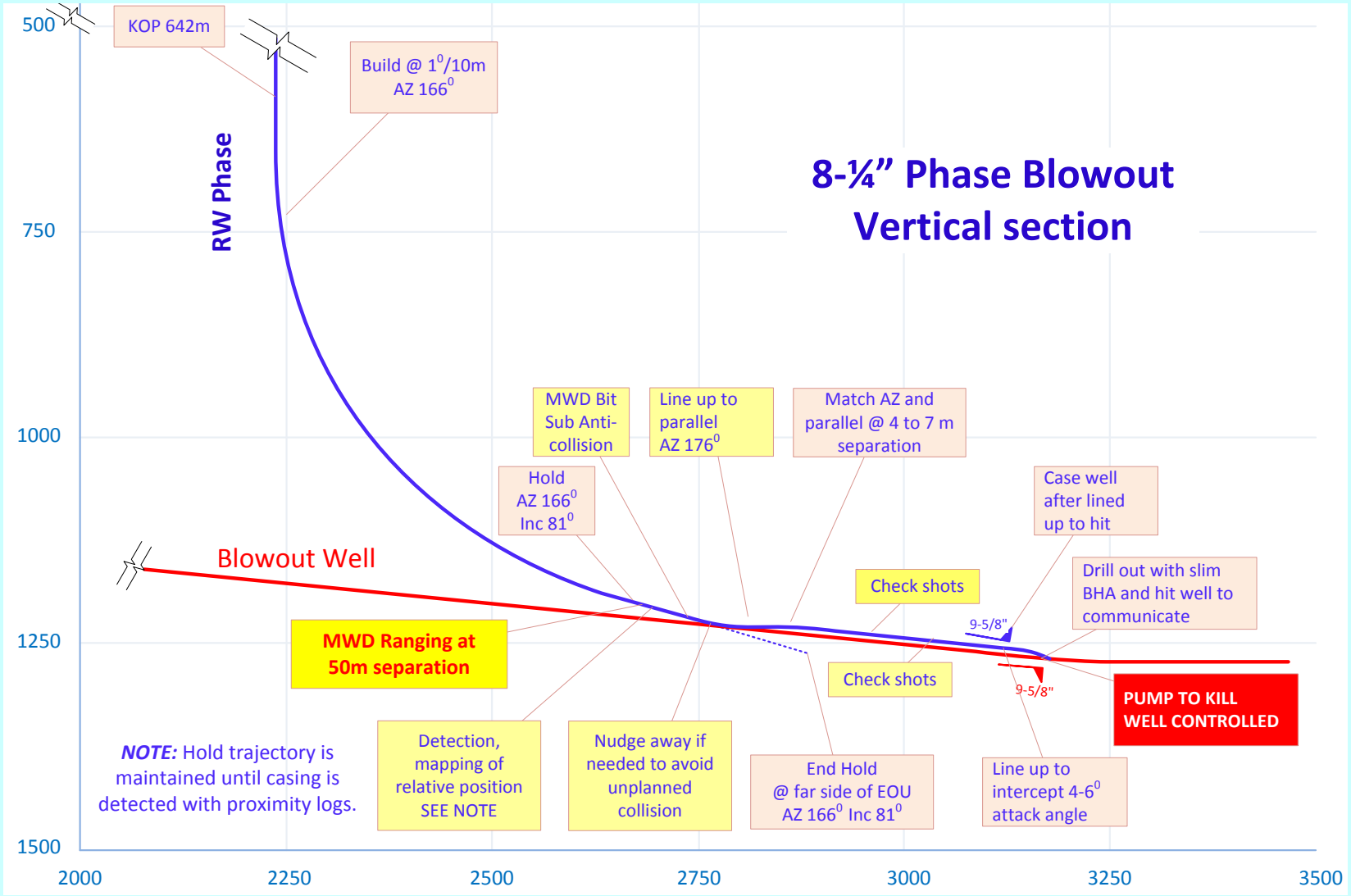


Well Planning Extends Range-of-Detection

Sweep thru the EOU holding angle



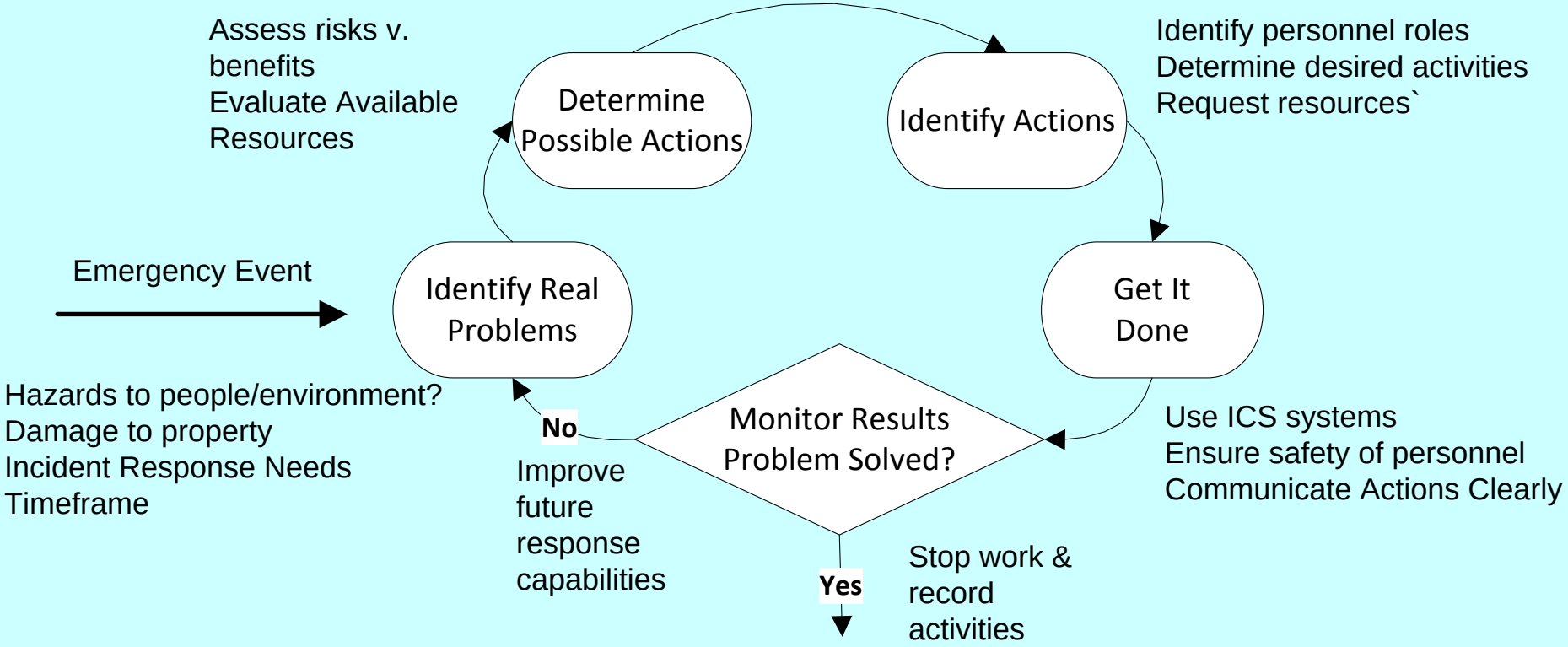
Example Strategy for Ranging



ABEL Generalized Ranging Strategy

- Aim at a point where the EOU is manageable (not all that big if possible)
- Use near-bit inc. and MWD as anti-collision and ranging
- Drill to that point where calcs say detection should have happened
- If no go Log the hole with WL and or EMS run or continuous MWD to increase detection range

USE DEMMING MODEL



END OF PRESENTAION