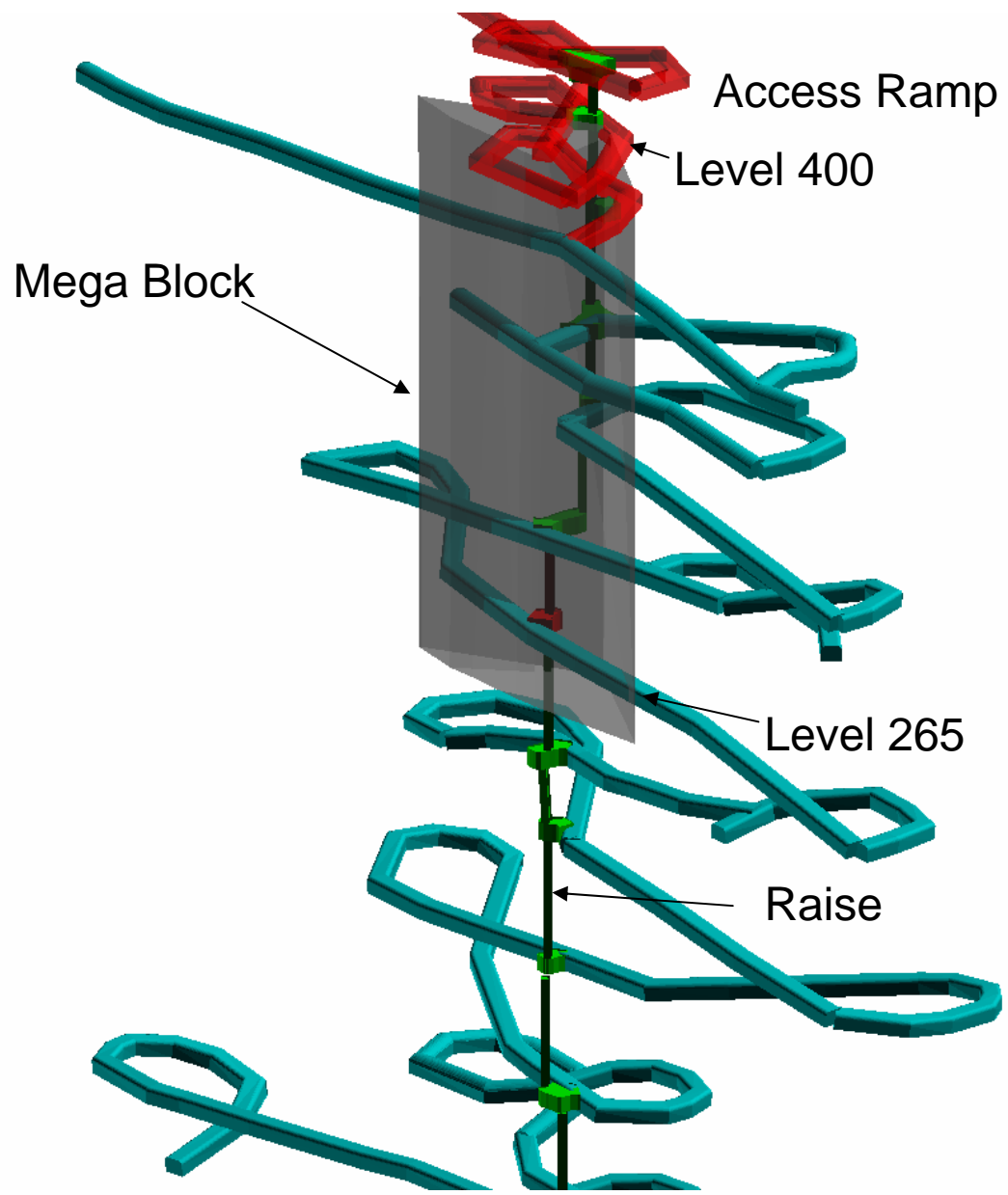


San José Mine Rescue Operation





Action Plan

- Alternatives considered:
 - ❑ Rescue operation through the mine's interior (discarded because of blocked ore chimneys and high risk for rescuers)
 - ❑ Construction of a new tunnel (discarded given the lengthy delivery deadline).
 - ❑ New raise for rescue operation (chosen option)
- Technologies require destination point to be accurately known.
- There are risks inherent to the rescue process:
 - ❑ Technical failures, geology, landslides in shafts
 - ❑ Deviations in drilling
 - ❑ Effects of water on shaft stability
- Alternatives were selected considering availability and quickness.
- It is advisable to work straight towards the target to facilitate a rescue operation with cage/ torpedo (there have been previous successful experiences under this modality)

Chosen Alternatives

- Three alternatives are being implemented to carry out the rescue operation
- These three equipments work with different technologies

Raise Borer



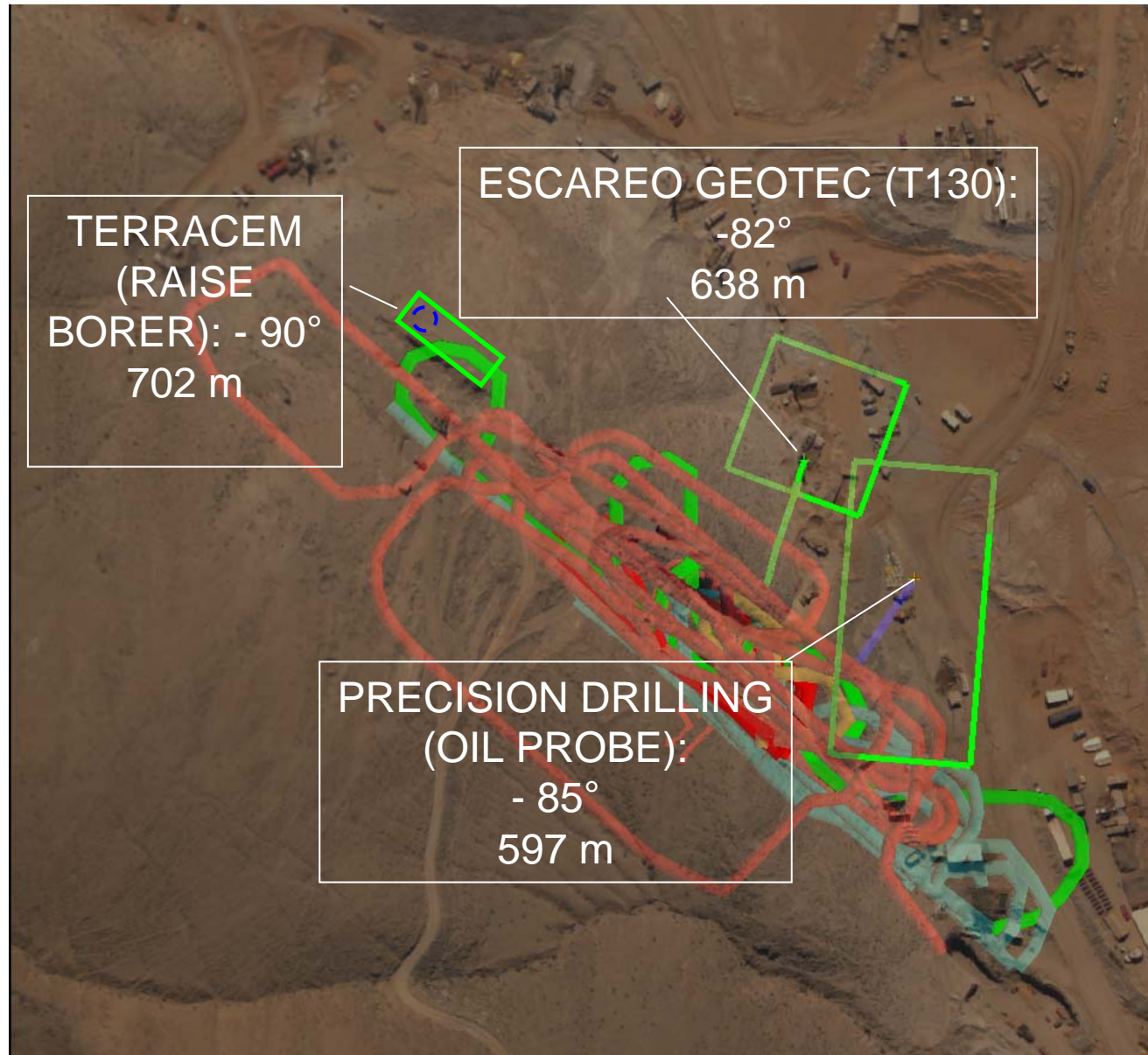
T130



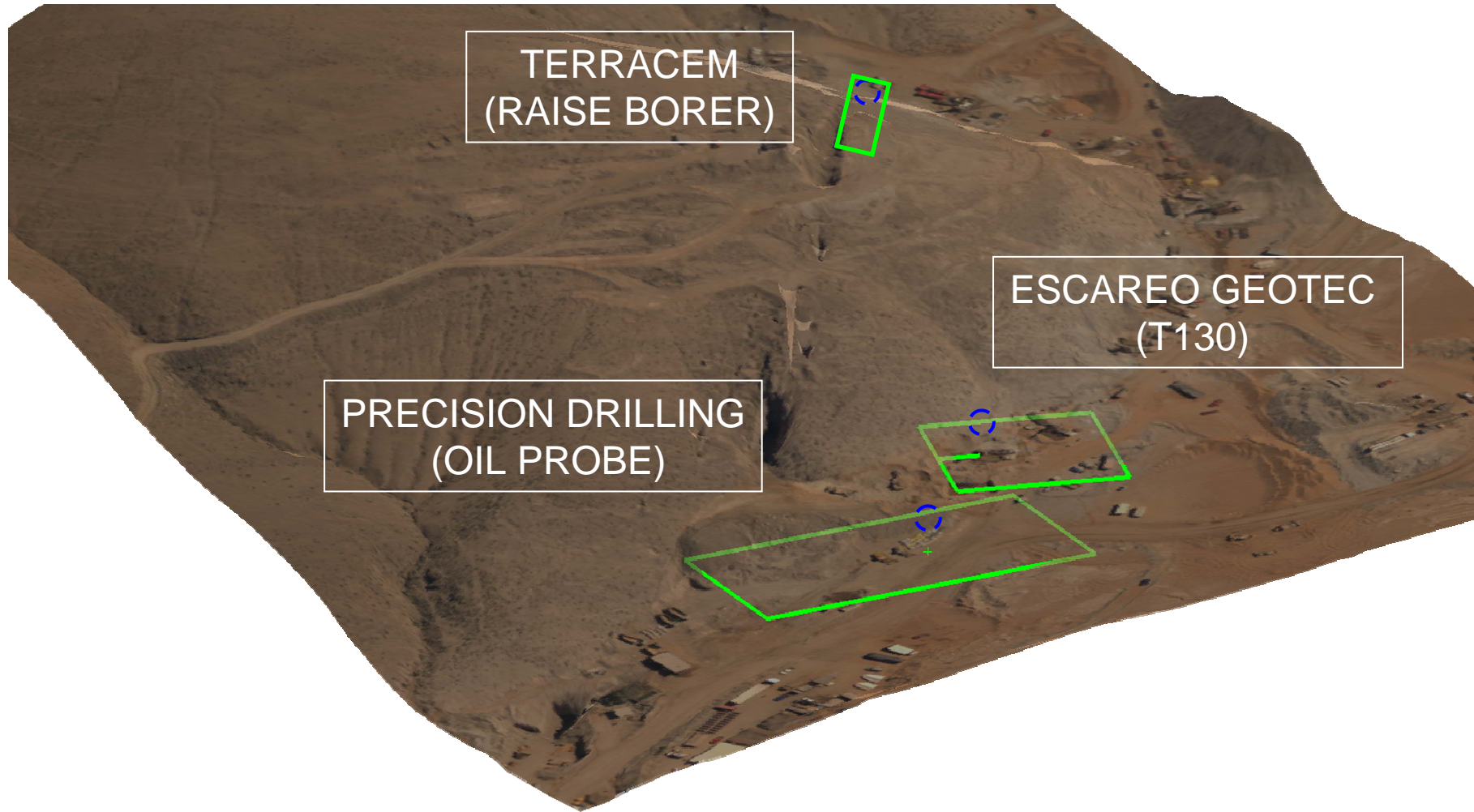
Oil Probe



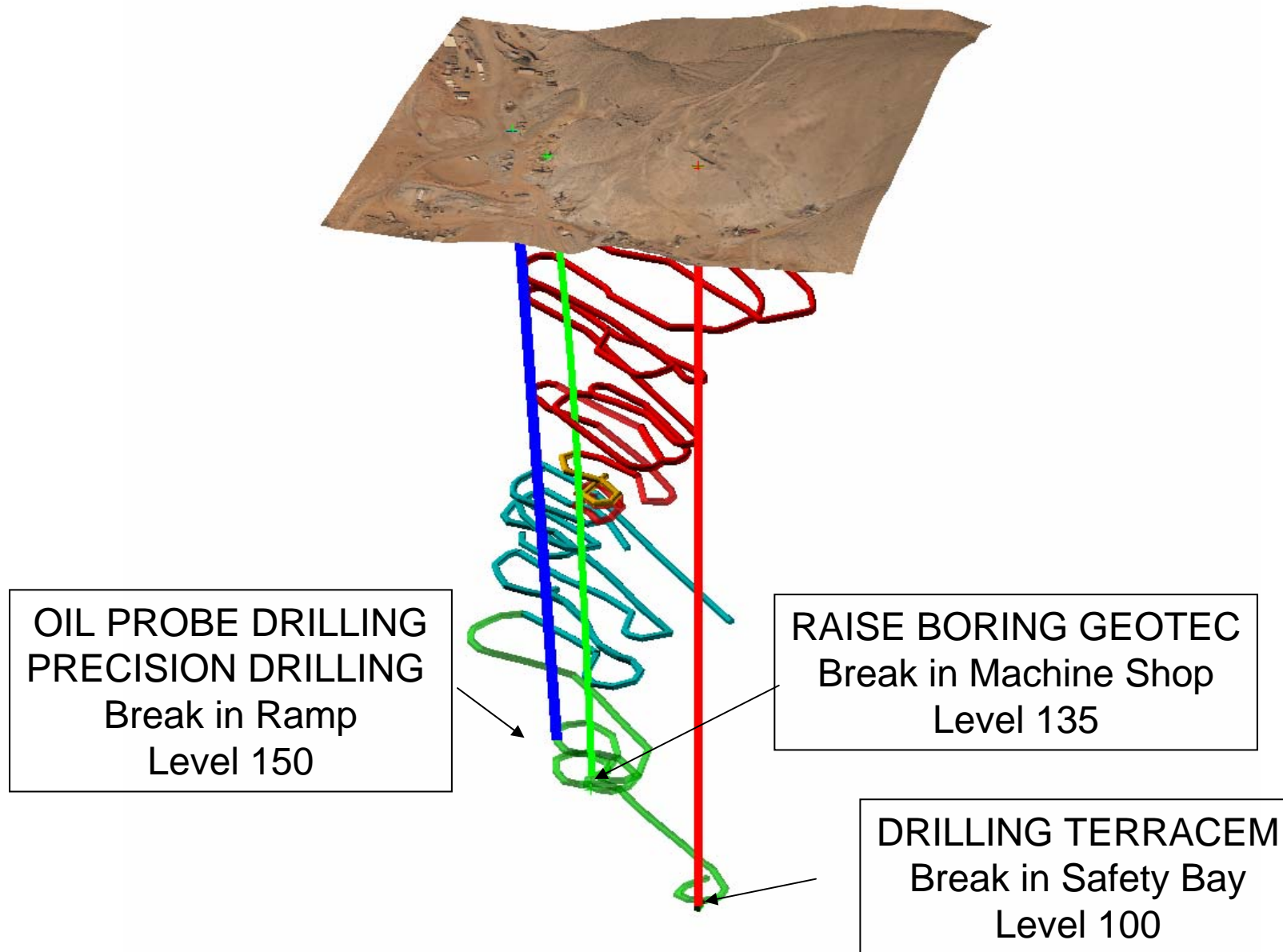
Three Different Contact Points



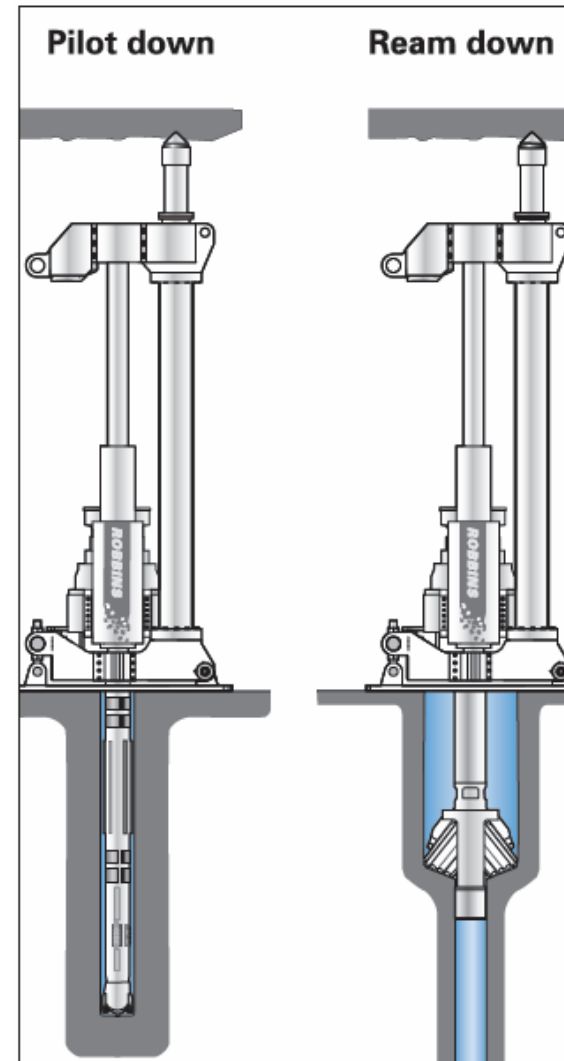
Three Different Contact Points



Three Different Contact Points



Raise Borer (Alternative A)



RAISEBORING

Raise Borer: Description

- The Raise Borer Strata 950 is stationary equipment, which is anchored to the floor.
- It is used to develop shafts or raises that can reach up to 8 m in diameter
- The operation involves drilling a pilot shaft downwards with a tool called boring bit and about 30 to 40 cm in diameter, with a drilling speed ranging from 15 to 25 m per day depending on the kind of rock.
- Subsequently, the shaft is slashed with a tool known as reamer. Its penetration speed will depend both on the type of rock and the final diameter of raiseboring, and normally an average of 10 to 15 m of upward progress is obtained per day.
- Traditional raises of upward progress have achieved over 800 meters in length.
- In top-down shafts the experience does not exceed 400 m.

Raise Borer

Type of Equipment	Raise Boring
Model	Strata 950
Description	Drilling of Pilot and subsequent raiseboring
Company	Terracem
Original Location of Equipment	División Andina Codelco
Length	700 meters
Pilot Diameter	38 centimeters
Reamed Diameter	66-72 centimeters
Deviation	0,15% with directional system (rvds)
Inclination	vertical
Total Time	Approximately 3 to 4 months
Ease for rescue operation	Sufficient diameter for rescue operation
Advantages	Known technique and proven in hard rock
Disadvantages / Risks	Uncased shaft, greater risk of landslides
Special Requirements	Drill steels are needed from other contractors

SCHRAMM T-130 XD (Alternative B)



T-130

- The Scrhramm T-130 is mounted on a truck and tires. It is commonly used in deep exploration drilling of water wells. It uses reverse or conventional circulation of air and it can reach 1,000 m in depth.
- From time to time, it is used over an existing hole, which is used as a guide, to successively enlarge the diameter of the drilling.
- In the particular case of San Jose mine, a very special “Down the Hole” (DTH) hammer is used, which has 5 hammers in 1 (Low Profile) and has never been used in Chile before.
- In the first stage, a hammer will widen the diameter to 30 cm and on a second round a second hammer will reach a 70 cm diameter.
- The average drilling speed ranges from 1 to 3 m per effective hour of drilling, depending on the type of rock.

Low Profile Drill



T-130

Type of Equipment	Hole Opener
Model	Schramm T130XD
Description	DTH Drill on truck
Company	CRI
Original Location of Equipment	Collahuasi
Length	630 meters
Pilot Diameter	0,13 meters
Reamed Diameter	0,66 meters
Inclination	Follows existing drilling shaft
Area of Installation	Minimum
Total Time	Approximately 3 months
Disadvantages /Risks	Non-proven technology, shaft is left uncased

Oil Probe (Alternative C)



Oil Probe

- The RIG 422 is mounted on large-scale crawler treads. Its tower is 45 meters high and it is mainly used in oil drilling. It requires a large area for its installation (Approx. 100 by 80 m.)
- This is an equipment that has a capacity for deep penetration; it can drill over 2,000 meters deep.
- It uses drill bits that drill into the soil in decreasing diameters starting from 90 cm to end up with 15 cm.
- Two diameters will be used In the case of San Jose mine: the first 50 meters will have a diameter of 90 cm, to then decrease to 70 centimeters until reaching the planned depth.
- The drilling speed (as in the previous alternatives) depends on the type of rock, and in the first 1,000 meters it can vary between 20 and 40 meters per day.

Sonda Petrolera

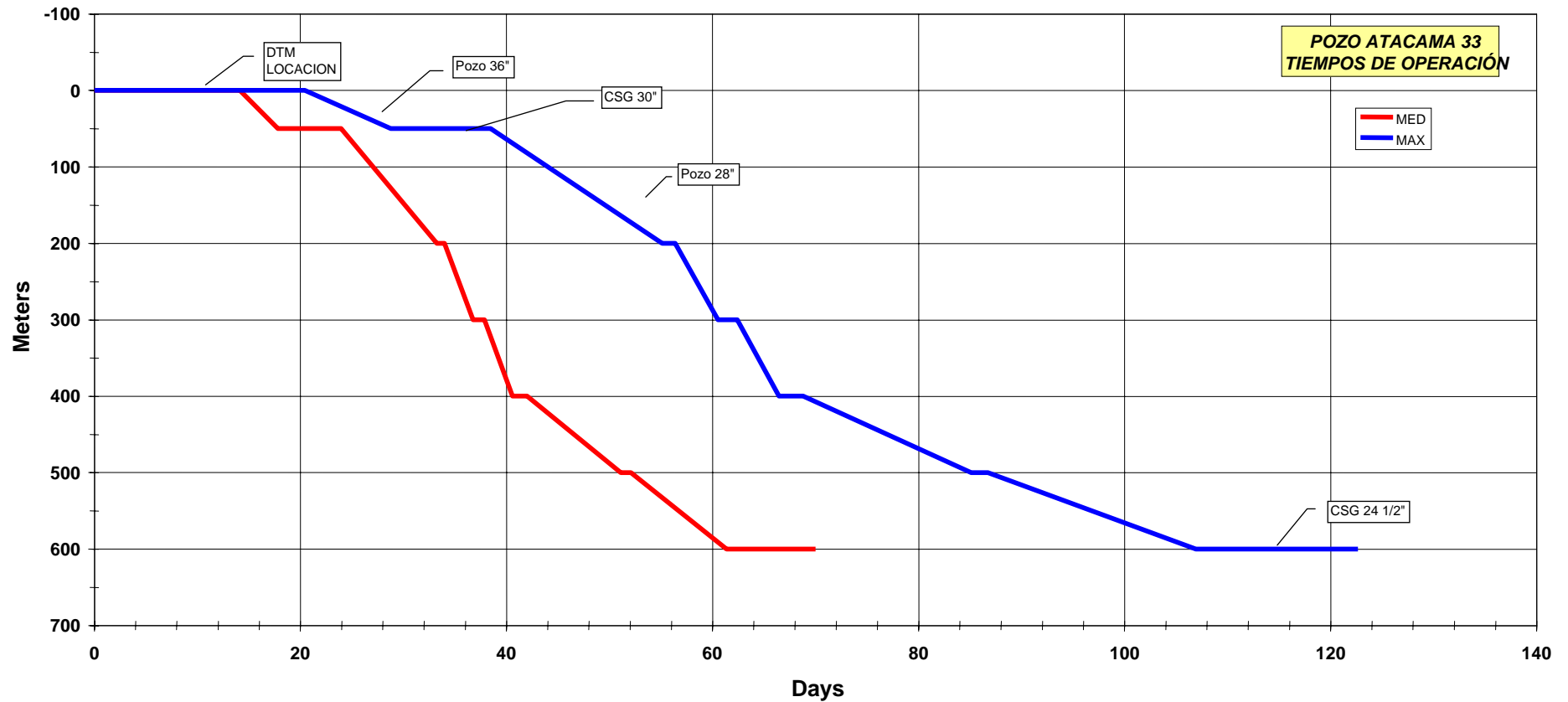
Type of Equipment	Oil Probe
Model	National 610-E
Description	Rotating Rig
Company	Precision Drilling
Original Location of Equipment	Iquique (crated)
Length	700 meters
Pilot Diameter	It does not make pilot
Reamed Diameter	0.6 meters (including steel casing)
Deviation	1 degree
Inclination	Vertical up to 85°
Installation Area	60 x 80 meters
Total Time	Approximately 2 to 3 months
Ease for Rescue Operation	Time of Execution, cased shaft facilitates rescue operation
Advantages	Cased shaft improves stability condition
Disadvantages / Risks	Requires a work platform, with existing limitation of space in the area
Special Requirements	Low-bed and regular trucks

Specifications for the Transport and Installation of Oil Probe

- Contractor Company: Precision Drilling (Canadian).
- It requires 42 trucks for its transportation from Iquique: 15 low bed trucks and 27 regular trucks
- It requires 42 trucks for its transportation from Iquique: 15 low bed trucks and 27 regular trucks
- It is currently in Iquique, and craned due to end of operations. The probe was used in a geothermal energy project and it was going to be returned to its owner.
- The installation normally occupies 1 hectare, in the case of the San Jose mine it will be adapted to occupy a surface of approximately 0.5 hectares (60 x 80 m).
- It will drill a total of 600 m, and in the process it will require three changes of tricone bits



Schedule for Oil Probe: Possible Scenarios



Casing

- Two alternatives are being considered: a steel pipe and one in PVC.
- It has not been decided what alternative will be used, and the choice will depend on technical details (mainly installation time).
- PVC is faster to install, lighter and cheaper, with the disadvantage of possible deformations and the effects of friction on it.



Rescue Cages



Diameter: 0,55 m

Rescue Cages

- The cage will be 2 to 2.5 meters long, the diameter will be adapted that of the cased shaft (it should be around 55 and 60 cm in diameter).
- There are two options of hoisting: one with the winder of the drillers (4m per second under normal conditions; in this case it should be a little slower, since probably there will be banging against the casing), and the second is through the bar system of the driller (this is slower, and it could take almost two hours per person).
- The hoisting with the winder will probably take between 20 and 30 minutes per person.
- The cage should be equipped with oxygen, water, some food, artificial light and communication between the cage and hoisting system.
- The main risks are from banging against the casing.
- Another concern is in relation to the brake system of the winder, to avoid eventual problems given the lack of guides and emergency brake system in the cage itself.

Conclusions

- There has been an in-depth analysis of the available options.
 - ▣ Codelco leads the professional rescue team, with the participation of drilling companies and Enap.
- Three different options give us assurance of success.
- Total time until rescue will depend on field conditions, possible technical setbacks, and casing needs and availability.
 - ▣ Projections estimate rescue of miners in early November in an optimistic scenario, and early December if technical setbacks were to appear in the process.