



Drilling on Ice

November 16, 2022

# TEAM DRILLING – Drilling on Ice.

- ▶ **First things First:**
- ▶ Prior to moving on to the frozen lake, proper access to the area must be taken into account.
- ▶ All trail access to the lake must be dog legged and any standing trees must be hand cut 30 mts from the lake shore to avoid erosion of the soil into the lake.
- ▶ Proceed to check Ice to establish ice cover is adequate for drilling and ancillary equipment.



# Drilling on Ice

- ▶ Once Ice thickness is safe, drill and ancillary equipment are moved to the drill collar.
- ▶ Equipment is spaced and set up on rig mats or timbers can be used.
- ▶ Drills, pump shacks and other mobile equipment are all outfitted with secondary containment.
- ▶ Rig mats add an additional buffer from the drill to the ice surface in the event any leaks should occur.





# TEAM DRILLING

- ▶ Drills, pump shacks are all outfitted with spill kits in the event of an accidental spill
- ▶ Diesel double walled fuel tanks are stored on land and only moved to the ice surface while re-fueling, the fuel tanks are then removed to land.



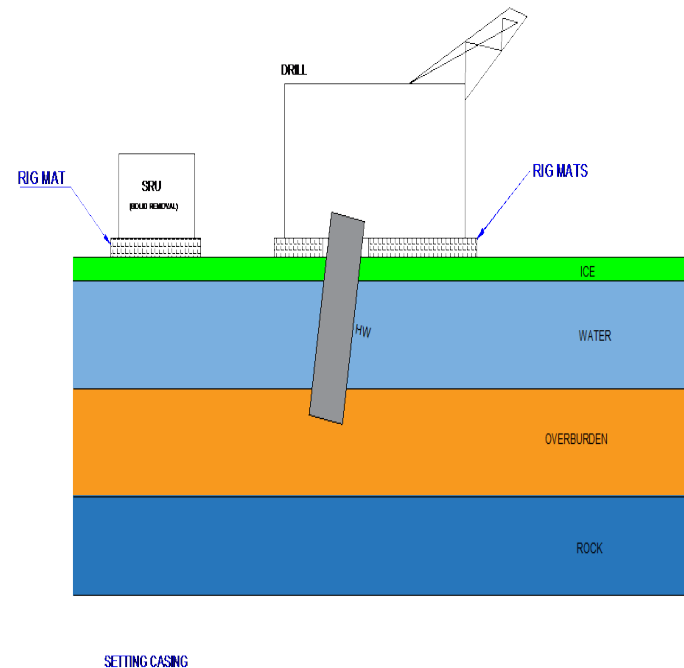
# Drilling on Ice

- ▶ Water supply suction hose intakes must be outfitted with a screen to prevent fish from becoming entrapped while pumping water.



# TEAM DRILLING

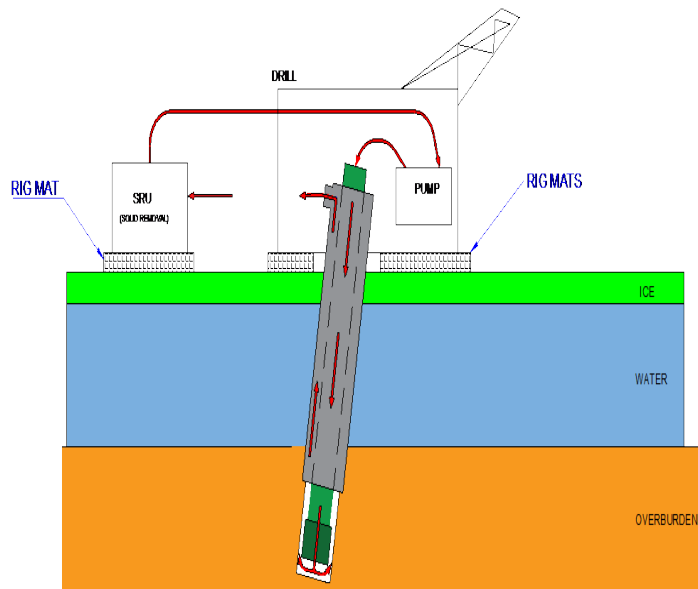
- ▶ Equipment is set up, drill rig inspection is conducted. Ready to start drilling.
- ▶ Depending on water depth and angle of hole casing slings will be required.
- ▶ Single hole or several holes drilled to install casing slings.
- ▶ Install casing slings
- ▶ Trip in outer casing (HWT) to stabilize when drilling the casing and drill rods.
- ▶ Outer casing can be either suspended above or pushed into the silt / overburden.



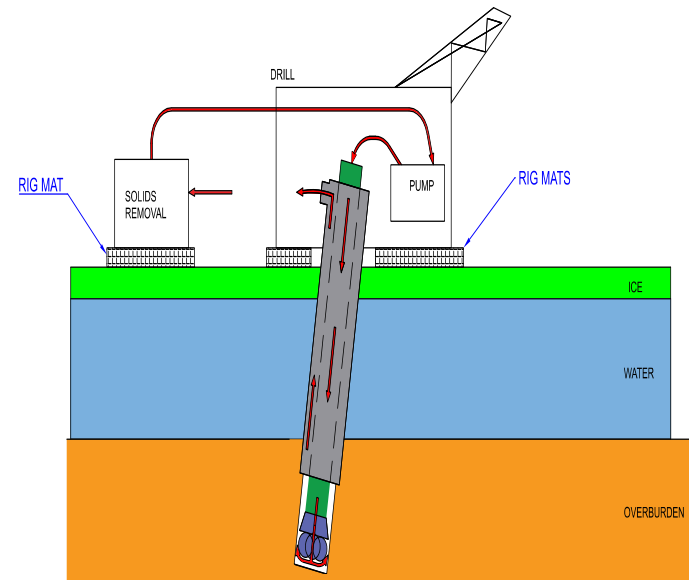
# Drilling on Ice

- ▶ Outer casing is secured.
- ▶ Trip in casing to commence drilling overburden.
- ▶ Drill pipe is outfitted with a divertor or cuttings collection pan to collect return cuttings and divert them to the SRU.
- ▶ Couple of methods used , drill with a coring bit or tricone bit both achieve the same result drilling through the overburden into bedrock.
- ▶ Once bedrock is established casing is reamed into the bedrock to form a good seal between the overburden and bedrock.

# Drilling on Ice



RE-CIRCULATION DURING DRILLING

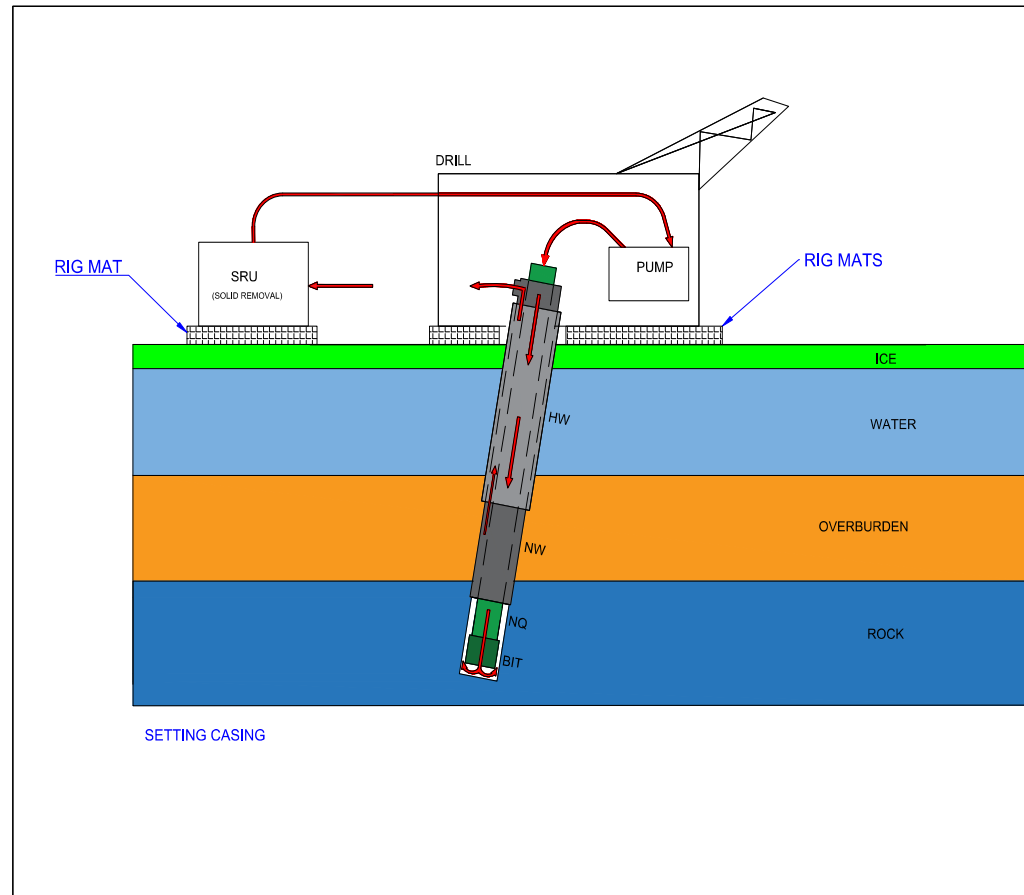


RE-CIRCULATION DURING TRI-CONING



# Drilling on Ice

- ▶ Core drilling commences, drill fluid pumped down the inside of the drill rods, return fluid, drill cuttings are returned to the surface.
- ▶ The return fluid is diverted to the SRU which captures the material and separates the cuttings from the fluid.
- ▶ Drill cuttings are bagged and taken to a approved disposal site.
- ▶ Return water is reused to drill with.
- ▶ Due to fractures in the bedrock return fluids can be lost into the formations before reaching the surface.



# Drilling on Ice – Drilling additives

## SAND Xpress

A pre-mixed drilling  
additive for  
sand and gravel  
conditions

This revolutionary new product is pre-mixed for easy use – no complicated recipes to follow. **Simply add to the mixer to create a high viscosity fluid mix** that improves removal of drill cuttings, conditions bore hole walls and provides optimized core recovery.

SAND Xpress prevents rust and polymer build-up, enhances tool life and penetration rates, and reduces torque. What's more, it is transportable by air and is environmentally safe.

- ✓ Can be used in either fresh or brackish water.
- ✓ Concentrated so transportation costs are reduced.
- ✓ Effective in drilling conditions where temperatures exceed 150°F.



# Drilling on Ice

- ▶ SRU – Solids removal unit.
- ▶ Centrifuge System, Filter pack system.
- ▶ Centrifuge removes cuttings from return water. Able to reuse water.
- ▶ Cuttings bagged and taken to a specified disposal area.



# Drilling on Ice

- ▶ Drill hole completed, to prevent any contamination of the lake water into any aquifer or prevent any impure water from entering the lake a safety plug is pumped down to seal these sections off.
- ▶ Cement is then pumped down to ensure a watertight seal.





# Drilling on Ice

- ▶ Once Cementing is completed the drill rods are removed.
- ▶ Drill is moved off the site, the drill site is marked and any debris cleaned up.
- ▶ Completion inspection conducted with client and signed off.
- ▶ Lake area is left in the same condition as it was found.





# Drilling on Ice



# Team Drilling

## Thank you

### Questions?

