

Comparison of Jupiter Construction Work: 2020 v. 2021

Equipment/Activity	2020	2021
Mobilization & Demobilization Dates	20.FEB.2020 (Mob); 12.MAY.2020 (Demob)	04.JAN.2021 (Mob); 30.APR.2021 (Demob)
Pre-Construction Activities (hanging noise curtains, mobilizing equipment, site prep)	25.FEB.2020 – 10.MAR.2020	04.JAN.2021 – 22.JAN.2021
HDD Noise abatement measures	Noise curtains installed at East, North and South boundaries of the worksite.	Noise curtains installed at East, North and South boundaries of the worksite in addition to noise barriers around the HDD Rig and Mud Pump
Water Source	Via dedicated water trucks.	Via dedicated water trucks
Core Sample near pilot hole	N/A	Core sample survey (2-3 days of work) will inform HDD operations. Additional noise abatement measures will be implemented for this work, including temporary sound control panels around the equipment.
Pilot Hole	As shown on 2020 site plan	As shown on 2020 site plan
Punch Out Hole	3,150 feet	2,800 feet
HDD Rig	American Augers DD-440T	American Augers DD-440T
Mud Pump	Ellis Williams E-447.	Ellis Williams E-447
Mud Recycling Unit	Tulsa Rig Iron MCS-750	Tulsa Rig Iron MCS-750
Downhole Mud Motor	Not in use on last day of drilling	Yes, InRock 6 ¾" Mud Motor
Temporary Casing	Yes, used approximately 240 feet of 16" welded-together casing. Removed upon completion of HDD.	Yes, using approximately 300 feet of 18" screwed-together casing and 900 feet of 16" screwed-together casing, 300 feet of which will be within the 18" casing. To be removed upon completion of HDD.
Temporary Casing Installation & Removal Methods	Installation and removal by means of the HDD rig attached on the casing via adaptor.	Installation and removal by means of the HDD rig attached on the casing via adaptor. Additional contingency removal tools will be available on site to be used if needed (<i>i.e.</i> pneumatic hammer and casing fishing tool).

Increase in Temporary Casing Length

Casing helps to:

- ✓ Stabilize the bore hole through the soft ground conditions, minimizing the likelihood of an inadvertent release (IR)
- ✓ Support the Bottom Hole Assembly (BHA), including the non-magnetic collar, mud motor, steering tooling and drill bit in order to make steering easier
- ✓ Increase thrust transmission at the drill bit during piloting through the harder material
- ✓ Avoid risk of snaking/buckling of the drill string along the entry curve of the bore profile
- ✓ Improve drilling fluid return flow during drilling operations

240 feet of 16” casing was temporarily installed in 2020 (all removed); November 2020 survey results and 2020 drilling experience indicate that additional casing should be used in 2021

Installation of Temporary Casing

The HDD rig installs the casing using a casing turner (e.g., adapter that connects the casing threads of the HDD rig's drive pinion).

18" Screwed-Together Casing

- Drill pilot bore using the HDD rig (5.5" diameter drill pipe for 300' length).
- Install 18" casing, pushing it down over the drill string with the HDD rig. Leading edge of casing has "teeth" for rotational drilling.



16" Screwed-Together Casing

- Once 18" casing is installed, continue to drill pilot bore using the HDD rig (5.5" diameter drill pipe for 600' length) for total length of 900' from the entry position.
- Install 16" casing by pushing it down over the drill string with the HDD rig and through the previously installed 18" casing. Leading edge of casing has "teeth" for rotational drilling.



Why use 16" casing inside of 18" casing?

- **Eliminates “rotary constraints” on the 16” casing for the first 300’ of the bore.**
 - Minimizes rotational torque applied on the 16” casing during installation
 - Minimizes area under friction during 16” casing removal.
- **Improves drilling fluid returns, thus minimizing the likelihood of an IR occurrence.**

Removing Temporary Casing

When is the casing removed?

- The casing is removed once the punch-out hole is reached and HDD drilling is complete.

How is the casing removed under normal conditions?

- The casing is removed by **reversing** the installation methodology (using the HDD rig and the casing rotation adaptor to pull the casings out of the bore).

How is the casing removed if the HDD Rig's pull-back force is not enough?

- Instead of the HDD rig, a pneumatic hammer is occasionally used only if additional force is needed to remove the casing. Use of the pneumatic hammer is not expected to exceed one operational day if needed.

How is the casing removed if there is an incident?

- A customized hook (i.e., fishhook – see right) may be attached at the extremity of the drill string. It is used to catch the end of the broken piece of casing and drag the broken piece to the entry pit (using the HDD rig, not pneumatic hammer).



Removing Temporary Casing (cont'd)

- Once the temporary casing is removed, the 6 5/8” diameter drill pipe will be the only remaining material.
- The drill pipe will be used as the conduit to house the undersea cable. The undersea cable is pulled ashore from the cable laying vessel through the conduit. The undersea cable is then connected to the terrestrial fiber network.
- Use of casing was part of permitted 2020 construction plan, and the 2021 work will use the same methodologies. There are no potential impacts that were not previously considered.
- Upon removal, the bore hole is naturally backfilled by the residual non-toxic drilling mud mixed with native sediment from the adjacent area.