



P R O J E C T M E E T I N G N O T E S

MSET Discussion — Functional Requirements, COTS, Custom & Semi-Custom Options

Multi-Set Retrievable Bridge Plug for Tundra Swabbing Operations

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Meeting Overview

Date: April 16, 2026 Attendees: Jeff Kennedy, Lev (Operations), Shane (Engineering)

This meeting covered the technical and operational requirements for a multi-set retrievable bridge plug (MSET) to be integrated with Kobold's frac BHA. The objective is to enable Kobold to perform swabbing operations for Tundra without requiring a handoff to Eclipse/Steelhaus, thereby saving rig time and cost.

Current Swabbing Workflow — Kobold for Tundra

The standard Kobold swabbing workflow for Tundra proceeds as follows:

1. Run in hole with the frac BHA, clean up the wellbore, and recover sand/debris.
2. Close all CT-shiftable sleeves on the way out.
3. Confirm sleeve integrity via full-well pressure test.
4. Selectively open target sleeves for the first swabbing interval (e.g., sleeves 3, 4, 5).
5. Set the G5X flow-through tool approximately 5–10 m above the uppermost open sleeve.
6. Swab the interval for approximately one day; OSR submits a swab report to the client (Perkins or equivalent).
7. Overnight, the client reviews data and issues the next swabbing program.
8. Close the evaluated sleeves, pressure test again, open the next interval, reposition the G5X, and repeat.

The purpose of swabbing is to determine oil-to-water ratios per zone, helping Tundra decide which sleeves to leave open for production. This approach works only if every sleeve seals. If all sleeves hold pressure, Kobold can complete the full swab program with a single packer set above the zone of interest.

The Leaking Sleeve Problem

Sleeve seal degradation on Tundra wells is a well-known and expected issue. Root causes include:

- Dragging seals across debris and port edges during shifting, which shaves O-rings. The last O-ring crossing the 1-inch port gets sheared on each shift cycle — a 1-inch piece with a perfect dovetail imprint has been recovered on the BHA.
- With 4 O-rings on the upper section of a sleeve, there are effectively only 3 reliable open/close cycles before integrity is lost.
- Corrosion of the seal bore and seal degradation after 5–6 months on production compounds the problem.

Once a leaking sleeve is identified (even a minor leak — e.g., 5 MPa dropping to 3 MPa over 5 minutes), Tundra will not proceed with Kobold swabbing. The job is cancelled and Eclipse/Steelhaus is called in. This occurs on roughly 90% of Tundra swabbing programs.

Eclipse / Steelhaus Method

When Kobold cannot swab due to a leaking sleeve, Steelhaus (formerly Eclipse) takes over. Before Steelhaus arrives, Kobold runs back in and opens all sleeves so that Steelhaus can access any zone.

Steelhaus procedure:

1. Run in hole with a bridge plug and set it below the zone of interest (e.g., between sleeves 2 and 3).
2. Disconnect from the bridge plug.
3. Pull up above the zone of interest and set a tension-set packer (J-mechanism, always held in tension).
4. Pressure test between the two packers (bridge plug below, tension packer above) at approximately 725–1000 PSI (5–7 MPa). Tundra is very conservative with pressure to avoid damaging casing.
5. Move the top packer above the zone of interest and begin swabbing.
6. To change intervals: unset the top packer, flush debris (fishnet flush), latch onto the bridge plug, retrieve it, reposition to the next interval, and repeat.

Advantages of the Steelhaus method: - Tension-set packer keeps tubing straight and in tension, resulting in less wear on swab cups and the ability to swab deeper. - The straddle setup isolates the zone regardless of leaking sleeves.

Disadvantages: - Steelhaus cannot open or close Kobold's CT-shiftable sleeves. If Tundra wants to change which sleeves are open, Steelhaus must POOH, Kobold runs back in to manipulate sleeves, then Steelhaus runs back in. This results in multiple trips, significant time, and cost.

MSET Value Proposition

If Kobold integrates a retrievable, multi-set bridge plug onto the bottom of the frac BHA, the following single-run workflow becomes possible:

1. Run in hole with the frac BHA (including MSET bridge plug), clean up the wellbore, and close/open sleeves as needed.
2. Set the bridge plug below the zone of interest.
3. Disconnect from the bridge plug via overshot.
4. Move uphole, set the G5X compression packer above the zone.
5. Pressure test between the bridge plug and G5X.
6. Swab the interval.
7. To change intervals: unset the G5X, latch back onto the bridge plug, retrieve it, reposition, and repeat — while also opening/closing sleeves as directed by the client.

This eliminates the need for Steelhaus on most jobs, keeps Kobold's sleeve manipulation capability in play throughout the swabbing program, and saves the client significant rig time and mobilization costs.

Key Technical Discussion Points

[Enter key technical discussion points here.]

Compression vs. Tension Set Packer

Tundra's preference is tension (tubing stays straight, less wear on swab cups, ability to swab deeper), but compression is acceptable and has never been a deal-breaker. The Kobold G5X is compression-set because the BHA must be able to shift sleeves — a tension-set upper packer would preclude this. Cole (engineering) raised the point that a compression-set packer limits the number of intervals that can be swabbed at once (fixed pipe length below the packer), and if the client changes the program mid-job, a trip

to surface may be needed to adjust. The group concluded that this trade-off is acceptable given the value of retaining sleeve manipulation capability.

Equalizing / Indexing Valve Requirement

Ryan (sales) raised the concept of an equalizing indexing valve integrated into the bridge plug gudgeon, similar to what Silver Fox offers. The purpose is to equalize differential pressure across the bridge plug before unsetting, preventing damage to the packer element and ensuring clean retrieval.

The group discussed whether this is necessary for the Tundra application: - Differential pressure across the bridge plug in a lateral is expected to be low (formation pressure, not wellhead pressure). - The bridge plug must hold pressure from both directions (it is a proper, solid bridge plug). - It may be possible to simply latch on with the overshot, rotate right, and stroke apart without needing an EQ valve.

Action: Revisit this requirement with a supporting sketch showing expected pressures and loading across the bridge plug in a typical Tundra lateral.

Multi-Set Requirement

Single-shot bridge plugs (hydraulic set with shear release) will not work for this application. The bridge plug must be set, retrieved, and reset at multiple locations within the same run — potentially 5–10 or more times per job. The AS1-X style mechanical set packer (quarter-turn J-slot mechanism) is the leading candidate because it is inherently multi-set and field-proven.

Overshot / Slip Joint Mechanism

The group discussed the overshot stinger that connects the BHA to the bridge plug. Key considerations: - Must be able to reliably latch and unlatch in a debris-laden wellbore. - Lev noted that these tools are very debris-sensitive and can be difficult to unset. - The J-slot mechanism requires rotation (quarter-turn right to set, left to release for the overshot). Concern was raised about transmitting rotation through the full work string — Lev confirmed that the quarter-turn forces itself through the string (only a few hundred pounds needed). - Shear pins protect against accidental release during RIH, but once sheared, the overshot relies on the J-slot profile to retain the plug. The group needs to confirm that accidental tagging/jarring will not release the plug prematurely.

Tundra Well Conditions

Lev provided context on Tundra's drilling practices: - Tundra drills very undulating well paths (bouncing off the top and bottom of a ~2 m pay zone based on geological samples rather than MWD data). - Wells are shallow but extremely tortuous, requiring maximum BHA flexibility. - Casing landings are difficult — Trinidad rigs were modified with hydraulic winches tied to the top drive to force casing to bottom. - Ian Fisher (recently hired, former Tundra driller with ~200 wells of experience) is a valuable source of operational intelligence on Tundra well profiles.

Existing COTS Options Reviewed

The group reviewed several commercial off-the-shelf (COTS) bridge plug and packer options from Silver Fox, including:

- AS1-X Mechanical Set Packer: Double-grip, quarter-turn J-slot, compression or tension set, holds pressure from above and below, 10K or 7K ratings, large internal bypass, field-proven. Leading candidate for the MSET bridge plug. - Overshot Stinger (T2): Guides onto the gudgeon fish-neck, seals, and latches via J-mechanism. Integral to the retrieval system. - Equalizing Check Valve: Standing valve that allows flow from below while blocking from above. May or may not be required (see discussion above).

Blaine Best (Tundra consultant, former Kobold employee) reportedly has two full straddle strings in his garage that may be available for inspection or purchase. These would provide a physical reference for the exact setup Eclipse/Steelhaus currently uses.

Action Items

1. Lev — Reach out to Blaine Best to request access to one of his straddle strings for inspection/purchase, and gather his operational insights on the existing Eclipse/Steelhaus setup.
2. Jeff — Set up a call with Chris Perkins (Tundra) to discuss the MSET development, get Tundra's input on design requirements, and identify anything sub-optimal with the retrievable packers currently being used in Tundra operations that can be addressed in the MSET. Include Shane D'Arcy and Lev Zakharov on the call.
3. Group — Review COTS AS1-X mechanical set packer options from Alberta-based vendors (see Appendix A for vendor list) and evaluate compatibility with the G5X BHA.
4. Group — Research hydraulic-set retrievable packer options as an alternative to the mechanical J-slot set mechanism. Evaluate whether hydraulic set could offer advantages in debris tolerance or ease of operation.
5. Group — Revisit the equalizing valve requirement with a supporting sketch showing expected pressures and loading across the bridge plug in a typical Tundra lateral. Determine whether equalization is needed or if the low differential pressures make it unnecessary.
6. Group — Evaluate the overshot/slip joint mechanism in detail. Confirm that accidental tagging or jarring during RIH will not release the bridge plug prematurely. Consider sourcing a sample unit for bench testing.

Appendix A — Mechanical Set Packer & Bridge Plug Vendors (Canada)

The following Canadian vendors supply AS1-X style mechanical set retrievable packers and related bridge plug products, listed alphabetically.

1. Canam Pipe & Supply Location: 2441 29 Ave SW, Calgary, AB T2T 1P1 Phone: +1 (403) 543-0350 Email: canam@canamservices.com Website: <https://canamservices.com> Product: AS1-X Retrievable

Packer — Mechanical set, retrievable. Also carries HD Retrievable Packer and HS/HS-1 Hydraulic Set Packers.

2. Evolution Oil Tools Location: #3, 1820 – 30th Avenue NE, Calgary, AB T2E 7M5 Phone: (403) 243-1442 | Toll Free: 1-800-265-8665 Website: <https://eotools.com> Product: AS1-X Arrowset Packer — Mechanical set, retrievable, full-opening ID for unrestricted flow and passage of wireline tools. Product Page: <https://eotools.com/index.php/component/virtuemart/26/22/completion-tools/packers/as1-x-arrowset-packer-detail.html> Additional Locations: Edmonton AB, Lloydminster AB

3. Giant Oil Tools Location: 8 Technology Way SE, Calgary, AB T3S 0B2 Phone: (403) 279-2015 | Toll Free: 1-833-781-5157 Email: slink@giantoiltools.com (Sales — Steven Link) Website: <https://giantoiltools.com> Product: Mechanical set packers and bridge plugs. Leading Canadian manufacturer of conventional completion tools. Technical data sheets available at: <https://giantoiltools.com/technical-information/>

4. Maverick Downhole Technologies Location: Edmonton, Alberta Website: <https://www.maverickdownhole.com> Product: Maverick Bridge Plug — Available in 10K (Maverick-10) and 6K (Maverick-6) ratings. Drillable materials for rapid drill-out. Note: These are drillable plugs, not retrievable. Included for reference as a potential alternative if drillable is acceptable.

5. Pinnacle Oil Tools Location: 100-335 Energy Way, Red Deer County, AB T4E 0A6 Phone: (403) 348-8323 Email: info@pinnacleoiltools.ca Website: <https://pinnacleoiltools.ca> Product: PX-10 Mechanical Set Double Grip Packer — 10K (69 MPa) rated, mechanical set, retrievable, double-grip. Also manufactures the CWR Retrievable Bridge Plug and HM-1/HM-1B Bridge Plugs. Western Canada's largest privately owned downhole tool company. Additional Locations: Drayton Valley AB, Grande Prairie AB, Calgary AB

6. Renown Down Hole Solutions Location: 5201-60 St, Lloydminster, AB T9V 2S9 Phone: (780) 874-1103 Website: <https://www.renownds.com> Product: AS1-X Double-Grip Packer — Multi-set retrievable, compression or tension set, holds pressure from above or below. Product Page: <https://www.renownds.com/product/as1-x-double-grip-packer/> Hours: Mon–Fri 8:00 AM – 5:00 PM, 24hr on-call service

7. Silver Fox Completion Services Location: 229 Clearview Dr, Red Deer County, AB T4E 0A1 Phone: 1-833-575-8665 | Local: (403) 342-1640 Email: info@silver-fox.net Website: <https://silver-fox.net> Product: AS1-X Mech — Double-grip, mechanical set, retrievable, compression or tension set. 10K (69 MPa) or 7K (48 MPa). Large internal bypass. Field-proven in Canadian operations. Product Page: <https://silver-fox.net/downhole-tools/retrievable-packers/as1-x-mech/>

8. TechWest Tools Location: Bay D, 5516-40 St SE, Calgary, AB T2C 2A1 Email: sales@techwesttools.com Website: <https://www.techwesttools.com> Product: Complete line of completion, production and service tools. Mechanical and hydraulic set packers manufactured in-house. Engineering team co-located with manufacturing in Calgary. Note: TechWest may offer single-direction variants. Confirm bidirectional pressure holding capability.

NOTE: Product data sheets could not be downloaded directly due to network restrictions. Recommend visiting vendor websites to download current spec sheets for the 4-1/2 inch, 11.6 lb/ft casing size relevant to Tundra operations.

