



**NWT Facility
SUNCOR et al TWEED LAKE M-47
Abandonment Program**

Bottom Hole Location: 300N18602011800

Click here to enter text.

**Project Name:
IO #:
AFE Amount: \$**

Rev #0

Corporate Head Office
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I. OBJECTIVE

The objective is to abandon the well. A bond log will be run to find the cement top on the production casing. From that information the production casing will be cut and pulled. Another bond log will be run on the surface casing to find the free pipe. Casing will be perforated to cover off the water zones. A cement plug or wells will be placed to squeeze of the water zones. The well will be turned over to logistics to be cut and capped.

II. WELL DATA

Well Name: SUNCOR et al TWEED LAKE M-47

Permit Number:	N84A089	U.W.I:	300M4767000125450
AFE Number:		Working Interest %	100%
AFE Amount:	\$		
Spud Date:	Jan 11/85	Rig Release:	Feb 24/85
Elevations:	KB: 435.22 m	GL: 429.1 m	CF: N/A
Depths:	TD: 1420.00 mKB	PBTD: 1179.8 mKB	BGWP: m
Directional:	TVD: Vertical	Angle: n/a	KOP: n/a
Latitude:	66° 56' 47.11" N	Longitude:	125° 54' 9.42" W

III. TUBULAR & WELLHEAD DATA

Conductor: 2 jts – 508 mm, 139.89 kg/m, K-55, BT&C csg set @ 24.0 mKB
Cemented w/: 10.8 tonne of Arctic Set cement, good cement returns of 3.0 m³

Conductor: 5 jts – 339.7 mm, 101.2 kg/m, K-55, BT&C csg set @ 64.0 mKB
Cemented w/: 18 tonne (12.5 m³) of Arctic Set @ 1870 kg/m³ cement, Floats held,
2.0 m³ good cement returns to surface

Surface Casing: 36 jts – 244.5 mm, 59.53 kg/m, L-80, LT&C set @ **760.0** mKB
23jts – 244.5 mm, 64.74 kg/m, S0095, LT&C set @ 308.54 mKB
2 jts – 244.5 mm, 59.53 kg/m, L-80, LT&C set @ 22.72 mKB

ECP set at 48.0 mKB and DV tools at 45.0 mKB

Cemented w/: 1 stage 64 tonne "G" neat estimate cement top of 350 mKB.

2 stage 4 tonne of "G" + 2.0 CaCl₂. Held okay, Good cement returns 1.5 m³.

From the Bond log Run on Feb 2/85 the cement top is at 365.0 mKB, marked on log 410 mKB

Production Casing: 2 jts – 177.8 mm, 43.16 kg/m, N-80, LT&C csg set @ **1418.0 mKB**

105 jts – 177.8 mm, 43.16 kg/m, S0095, LT&C csg set @ 1408 mKB

2 jts – 177.8 mm, 43.16 kg/m, N-80, LT&C csg set @ 22.04 mKB

Cemented w/: 3.0 m³ scavenger, lead 46.0 tonne of "G" neat @ 1890 kg/m, followed by tail of 7 tonne "G" + CaCl₂, plug did not bump. Beld off. Held okay.

2.0 m3 of cement returns to surface

Wellhead: 279.4 mm x 245 mm Casing Bowl, 21 MPa, McEvoy
279.4 mm x 179.4 mm Tubing Head, 21 MPa McEvoy
179.4 mm x 65 mm, Tubing Head Adapter Flange, 21 MPa
65 mm, 35 MPa, Master Valve, Cameron
65 mm, 35 MPa, Secondary Valve, Cameron
65 mm x 52.4 mm 21 MPa Studded Flow Tee
52.4 mm, 21 MPa, Wing Valve

IV. ATTACHMENTS

- Wellbore diagram

Well History

Jan 1985 DRILLING HISTORY

This well was spud on January 11, 1985 and drilled as follows

Conductor 1

- Drilled 311 mm pilot hole to 24 m
- Pick up 610 mm hole opener
- Drill 610 mm open hole to 23 mKB with Visgel/XC Polymer mud
- Ran 2 joints 508 mm 140 kg/m K-55 BT&C conductor pipe
- Landed at 23 mKB
- Cemented in place with 10.8 tonnes Arctic Set

Conductor 2

- Drilled 445 mm conductor hole to 64 mKB with Visgel/XC Polymer mud
- Ran 5 joints 340 mm 101 kg/m K-55 BT&C casing
- Landed at 64 mKB.
- Cemented in place with 18 tonnes Arctic Set

Intermediate Hole

- Tripped for bit at 145 m, jars spearated, had to fish collars out of hole.
- Lost circulation when tripping for bit at 273 mKB.
- Rig up air drilling equipment and blow hole dry
- Drill ahead with foam from 273 mKB to 760 mKB
- Logged (DIL-GR, LDT-GR-CAL, BHSC LSS-GR) open hole to 760 mKB; casing shoe at 64 mKB
- Ran 245 mm 60&65 kg/m L-80&SOO95 LT&C casing (see casing record attached)
- Cemented with 64 tonnes class G cement (stage 1); annulus bridged off with 9.9 m3 displaced. Pressure increased to 30 MPa with no results.
- Cemented with 4 tonnes class G + 2% CaCl₂ (stage 2); stage tool at 45 mKB
- 1.5 m3 good cement returns to surface

- Weld on casing bowl (10 3000# x 9 5/8); pressure tested weld to 21 MPa.
- RIH with 216 mm bit and tagged DV closing plug at 44.4 m.
- Drilled out DV tool plug then continued to drill out cement from 204 m to 224 m with 216 mm bit.
- Continued to drill out cement to 760 m
- POOH and prepare to bond log
- **Performed bond log and located cement top at 370 m. Good cement bond to 414 m. Logging tool unable to read bonding of cement to 45 m above DV tool.**
- Ran Gyro; indicated hole deviating slightly

Surface hole

- Day 7 Drilled out conductor to 79 m with water based mud.
- Day 8 Drilled to 145 m with with mud weight of 1120 kg/m³. Twisted off a the jars and left part of the BHA in the hole.
- Day 9 Drilled to 215 m with with mud weight of 1120 kg/m³. Fished and recovered BHA. No loss while circulating.
- Day 10 Drilled to 265 m with with mud weight of 1055 kg/m³.
- Day 11 Drilled to 321 m with with mud weight of 1120 kg/m³. Lost circulation at 273 m. Switched over to air drilling at 273 m. Very little mud in the returns approximately 0.5 m³.
- Day 12 Drilled to 428 m with air. Making approximately 0.4 m³/min or 24 m³/hr of water.
- Day 13 Drilled to 494 m with air.
- Day 14 Drilled to 544 m with air. Making approximately 0.5 m³/min or 30 m³/hr of water.
- Day 15 Drilled to 620 m with air. Making approximately 1.3 m³/min or 78 m³/hr of water.
- Day 16 Drilled to 671 m with air. Making approximately 2 m³/min or 120 m³/hr of water.
- Day 17 Drilled to 758 m with air. TD section.

Main Hole

- Displaced hole to mud (Visgel/XC Polymer mud).
- Drilled 216 mm hole from 763-795 mKB. Chlorides climbing; drilling through salt zone with salt top at 764 mKB.

- Continued to drill from 795-997 mKB; saturated mud system with 912 sks salt (350 kg/m³ mud)
- Drilled ahead with saturated salt mud system.
- Through zone of interest, salt concentration in mud ~155,000 ppm. Mud additives included salt, XC, FLR100, caustic, barite, Q broxin, D foamer, and soda ash.
- Cored 1217-1224, 1400-1409, and 34 sidewall cores
- Logged (DLL-MSFL, BHCS, CNL-LDT, NGT-AMS, SHDT, CST, WST)
- Performed 5 DSTs over Mt Clark and Mt Cap formations
- Ran 2 joints 178 mm 43 kg/m N-80 LT&C casing
- Ran 106 joints 178 mm 43 kg/m SOO95 LT&C casing
- Casing landed at 1418 mKB
- Cemented with 46 tonnes class G neat cement
- tailed in with 7 tonnes class G with 2.5% CaCl₂
- Displaced cement with drilling mud; DID NOT BUMP PLUG

The subject well was spud on January 11, 1985. The 245 mm surface casing was landed at 760 mKB and cemented in place. The 216 mm production hole was drilled to a total depth of 1418 mKB. The 178 mm production casing was run to 1418 mKB and cemented in place.

Cement bond logging indicated cement top above 365 mKB.

Feb 2004 A service rig was moved in from Norman Wells. The wellbore was cleaned out to PBD at 1322 mKB and the well circulated over to Rimbey Platinum frac oil. The Mount Clark was perforated underbalanced from 1222.5 to 1233.5 mKB using 114 mm guns. A 178 mm retrievable packer with plug in place was wireline set at 1196 mKB. The 73 mm EUE production tubing string, complete with a clamped on 9.53 mm injection line for methanol injection was run.

A 9.5 tonne fracture stimulation was performed on the Mount Clark formation. The well was flowed back on clean-up and a 4 point flow test conducted. The final gas rate was 263 e3m³/d at 9.6 MPa. The well was suspended by setting a 'PX' plug in the on-off connector above the packer at 1195.6 mKB. The tubing pressure was bled down from 11.1 MPa to 6.2 MPa for a negative test on the plug. A 73 mm 'G' packoff was set a 40 mKB and the tubing bled to zero.

Wellsite inspections in 2010 and 2013 have recorded a tubing pressure of 10.7 MPa at surface indicating both downhole plugs are leaking.

Jun 2010 Did a lease inspection. Flew to location. Did a bubble test on vent no issues. Shut in casing pressure 0 KPa. Shut in tubing pressure 10.8 MPa. Serviced the wellhead. Pressure tested the casing to 1.4 MPa for 10 minutes, good. Rigged out.

Sept 2013 Did a lease inspection. Flew to location. Did a bubble test on vent no issues. Serviced the wellhead. Pressure tested the casing to 1.4 MPa for 10 minutes, good. Rigged out.

- Feb 2015 Move in rig up service that was brought in from Norman Wells. Rig up service rig. Rig in wireline unit. When pulling the G pack off pulled out of the rope socket. Fish all equipment out of the hole. Retrieve G pack off. Pull out of the hole with the XN plug from the nipple at 1185 mCF. Filled tubing with 25% methanol, water, and 8% Halliburton MX794 inhibitor pumped into zone. Well is dead. Set a tubing BP on top of the XN. Set tool but did not disconnect. Had to jar to get off. Set a second BP on top of the first. Set without issue. Pressure tested the tubing to 7 MPa for 10 minutes. Good PT. Pressure tested the casing to 7 MPa for 10 minutes. Good PT. Run in the hole with a tubing punch and perforated the tubing at 1186 mCF. Circulated the well with the same inhibited solution, recovered all the frac oil on the side. Pull out of the hole with the tubing and injection line that was strapped to it with Cannon clamps. Run in the hole with a casing scraper and tagged the packer at 1196 mKB. Worked over setting area and Pull out of the hole. Run in the hole with a BP on wireline and set at 1187.8 mKB. Pressure tested to 7 MPa for 10 minutes. Good PT. Dump bail 8 m of cement on plug. Top up the casing with 120 l of diesel. Rigged out moved off.
- Aug 2019 A OROGO inspection report was done by Barlon Engineering. Did a bubble test which was negative and did a gas migration test which was negative. Serviced the wellhead.

V. TUBULAR PROPERTIES

O.D. (mm)	Weight (kg/m)	Grade	Thread	I.D. (MIN) (Pin) (mm)	Drift Diameter (MIN) (mm)	Coupling O.D. (S&B) (mm)	Capacity (MAX) (m ³ /m)	Collapse (MPa)	Burst Body Connection (MPa)	Tensile (1000daN)
508.0	139.89	K-55	BT&C	485.7	481.0	533.4	0.18535	3.59	14.55	366.5
339.7	101.2	K-55	BT&C	315.3	311.4	365.1	0.07726	13.44	23.79	319.4
244.5	59.53	L-80	LT&C	224.4	218.4	269.9	0.039559	21.3	39.64	327.8
244.5	64.74	S0095	LT&C	222.4	218.4	269.9	0.038846	35.03	56.19	462.6
177.8	43.16	L-80	LT&C	157.1	153.9	194.5	0.019569	48.4	56.26	265.6
177.8	43.16	S0095	LT&C	157.1	153.9	194.5	0.019569	54.92	66.81	303.8

VI. LANDING DEPTHS

Description	Landing Depth, mKB
Conductor	24.0
Conductor	64.0
Surface Casing	760.0
Production Casing	1418.0

VII. FORMATION TOPS

Formation Top	mSS	mKB	mTVD
Saline River Salt	-327.8	763.0	
Mountain Cap	-562.8	998.0	
Top High G.R. Shale Marker	-693.3	1128.5	
Base High G.R. Shale Marker	-745.8	1181.0	
Mountain Clark	-775.8	1211.0	
Proterozoic	-798.8	1234.0	

RESERVOIR PROPERTIES

Formation: Mount Clark
Fluid Type: Gas
Interval (mKB): 1222.5 – 1233.5
Length (m): 11.0
TVD (m): 1222.5 – 1233.5
Pressure (kPa): 12.1 MPa
Temperature (°C): 11.5
Max H₂S / CO₂ (%): 0/0

VIII. SUNCOR REQUIREMENTS

General:

This well is part of a project which is proprietary to Suncor Energy Inc., Information is to be held strictly confidential, document not to be copied.

Well site Supervisors must ensure that the applicable Suncor Safe Work Practices are observed, including the following:

- Safety Orientation - All Onsite personnel must be oriented to site hazards and signed in on the sign-in log.
- All personnel performing work must have a valid Completions Work Permit prior to commencing work.
- Ground Disturbance deeper than 30 cm (including rig anchors) is not to be carried out without the direction of a Logistics representative.
- Hydrocarbon Exposure LEL monitors will be used by all personnel on any job where hydrocarbon vapors may be present.
- H2S Safe Work Practice will be observed by providing H2S detection equipment, trained personnel, and specified safety equipment when required.
- Ensure a Field Level Hazard Assessments (FLHA) to identify and document site specific hazards are completed prior to commencing work, before all critical tasks and at any change in scope during the task as per the Suncor Completions SWP.
- Directive 33 Well Servicing and Completions Operations—Requirement Regarding the Potential for Explosive Mixtures and Ignition in Wells – have documented practices available at the well site for the safe management of the potential for explosive mixtures and ignition in wells and associated surface equipment. A Fire and Explosion Hazard Management Plan is to be posted at the work site.

Ensure current MSDS sheets are onsite for all controlled products including produced fluids. Ensure that workers are made aware of the Hazards and safeguards.

All unplanned events that occur that cause or could have caused loss are to be reported to the Completions Superintendent immediately. Incidents with or without loss must reports must be utilized as directed by the Completions Superintendent.

All wastes must be manifested and tracked when leaving the facility, to a non-Suncor owned disposal site, as per AER Directive 58. A fully completed AER Alberta Environment Waste Manifest is to be submitted with the final report for all Dangerous Oilfield Wastes (DOWs).

Conduct all operations in accordance with applicable IRP's, provincial acts and regulations pertaining to the AER.

Ensure a copy of the Suncor Corporate ERP is available on site. Complete and post the Suncor Completions Site Specific ERP.

An Assignment of Supervisor form must be completed and posted at location.

An injured worker transportation form must be posted on location. If the work site is greater than 40 minutes from an approved medical facility an alternate form of injured worker transportation with qualified emergency medical personnel must be present on location. Note: Suncor medic clinics qualify as an approved medical facility.

All employees and contractors certification of First Aid, H₂S, WHMIS and TDG etc. must be verified before they are allowed access to work on site.

All contractors' competency must be verified before they are allowed access to work onsite. Frequent, task-specific, on-going competency assessments must also be conducted for the duration of a contractor's term in a specific position.

A site walk inspection must be conducted every day in conjunction with a morning operational / safety meeting outlining all safety hazards and planned procedures for the day. This must be recorded on the daily tour report.

Road use and pipeline crossing agreements and Temporary Diversion Licenses, when required, must be in place prior to commencing any operations.

Any operation outlined in this program or otherwise implied by the nature of the work to be conducted that requires clarification shall be discussed with Operations.

Calgary office, Completions Analyst, Completions@Suncor.com will submit required AER DDS notifications.

IX. CONTACTS**SUNCOR PRIMARY CONTACTS**

Name	Title/Location	Office	Cellular
Matt Crockett	Completions Engineer	403-296-5439	587-284-1549
Jonathan Koteles	Completions Supt.	403-296-8916	403-510-7217

REGULATORY, HEALTH, & SAFETY AGENCIES

Name	Emergency #	Emergency #	
SEC Calgary	403-296-3000		
Air Ambulance Service	1-800-661-3822		
RCMP – Fort McMurray	780-799-8888 (24hr)		
Regional Hospital			
W.C.B.	1-866-922-9221		
FOREST FIRE NWT	1-877-698-3473 (1-877-NWTFIRE)		
GNWT (Office of the Regulator of Oil and Gas Operations)	1-867-920-8130 (24hr) (Spill Response) 1-867-445-8551 (Incident Response) 1-867-767-9067	310-3473 Emergency Reporting Line	
Sathu Land and Water Board (SLWB)	1-867-598-2413		
Mackenzie Valley Land and Water Board (MVLWB)	1-867-669-0506		
NWT – Environment and Natural Resources Sahtu Regional Office	1-867-587-2422 (General) 1-867-587-2422 (Wildfire)	403-297-8311 (24hr) Calgary Office	
NWT – Environment and Natural Resources Decho Regional Office	1-867-695-7450 (General) 1-867-695-7433 (Wildfire)		

SERVICE COMPANY CONTACTS

Service Type	Company	Contact Name	Office Number	Cellular

X. PROCEDURE

This program is to be used as a guide only. Field conditions and engineering decisions may change throughout the course of the job. However, do not change or deviate from this procedure without approval from the responsible Completions Superintendent.

1. Review the previous WellView report for this well. Flag any potential issues and discuss with the Calgary Superintendent.
2. Inspect the wellhead valves for sign of damage and discuss with the Permit Issuer before signing off on the permit. Obtain work permits (e.g. Hot Work Permit) and approvals to begin well work.
3. Hold a safety orientation with a procedural meeting and conduct a pre-job hazard assessment with all onsite personnel and document in the Daily Report. Scout the location for construction requirements and confirm wellhead specifications.
4. If applicable ensure the Well Abandonment/Flaring notifications have been submitted at least 24 hours prior to the respective operations to the Calgary office, c/o Completions Analyst – completions@suncor.com
5. Monitor LEL and H₂S with personal monitors throughout the program.
6. Perform a 10-minute Surface Casing Vent Flow bubble test as per the outlined procedures in Well Suspension and Abandonment Guidelines and Interpretation Notes Section 4B. Notify the Operations Supervisor of the results and document the results in the Day #1 daily report. In the event of a positive gas flow, see Section 4B “Testing For SCVF” of OROGO Well Suspension and Abandonment Guidelines and Interpretations Notes.
7. Measure and record casing pressure. Notify Calgary operations if pressure exists.
8. Rig in the Precision service rig and equipment to OROGO, O.H. & S., and Suncor specifications. Stump test the annular BOP, double gate pipe rams, manifold, and lines to 1400 kPa low and 7 MPa high for 10 minutes each.
9. Check pressures on wellhead. Kill the well with fresh water if required.
10. Remove the wellhead top section. Install and function test BOP's. Pressure test the ring groove connection. Perform all pressure and function tests to OROGO and Suncor specifications.

11. Run in with landing joint with a pressure tested safety valve (7 MPa) and screw into tubing hanger. Disengage the lag screws and pull out of the hole with the pup joint and tubing hanger. Laydown the hanger and pup joint.
12. Pick up, pin drift, and run in the hole with the following tubing configuration:
 - 1 – 152.0 mm EG3G retip tricone bit from J&L
 - 1 - 153.9 mm casing scraper
 - 1 - 88.9 mm REG to 88.9 mm EUE crossover
 - X – 88.9 mm, 13.84 kg/m, J-55, EUE tubing to surface
13. Run in the hole and tag plug back at ~1179.8 mKB. Work the scraper over the plug setting interval from 400 mKB to 350 mKB. Pull out of the hole with the tubing and lay down 600 mKB.
14. Move in rig up Reliance wireline unit. Run in the hole with a 153.9 mm gauge ring. Run in the hole with a RBL/GR/CCL and log from PB to surface. Correlate to the **Weatherford Photo Density Dual Spaced Neutron** log. Send the results to Greg gheffel@suncor.com and Jonathan Koteles jkoteles@suncor.com. A 7 MPa pressure pass may be required depending on cement quality. Send log to Becky Harish (bharish@suncor.com) to fill out DDS submission.
 - Pressure test lubricator and wellhead connections to 1.4 MPa (low) and 7.0 MPa (high) using water/methanol prior to every run or nitrogen.
15. Pressure test the casing to 7 MPa if a 7 MPa pressure pass was not performed during the bond log.
16. Make up and run in the hole with a Weatherford 177.8 mm permanent bridge plug and running tools. Correlate to the CCL log just run. Log the bridge plug onto depth and land the top of the plug at 395.0 mKB or approximately 10 meters below the cement top. Come off the plug and pull out of the hole.
17. Pressure test the bridge plug to 7 MPa for 15 minutes. Rig out wireline and pressure truck.
18. Move in rig up Weatherford. Make up and run in the hole to cut the casing. (Need to add in all the tools and running depth.) Assume the cut will be at 380.0 mKB.
19. Pull cutting tools out of the hole.
20. Rig in return lines from to production annuls valve to the rig tank. Pump fluid down the casing through the casing cut to circulate out the drilling mud.

21. Pull the casing. (Need to add in all the tools.)
22. Move in rig up Reliance wireline unit. Run in the hole with a 218.4 mm gauge ring. Run in the hole with a RBL/GR/CCL and log from PB to surface. Correlate to the **Weatherford Photo Density Dual Spaced Neutron** log. Send the results to Greg gheffel@suncor.com and Jonathan Koteles jkoteles@suncor.com. A 7 MPa pressure pass may be required depending on cement quality. Send log to Becky Harish (bharish@suncor.com) to fill out DDS submission.
 - Pressure test lubricator and wellhead connections to 1.4 MPa (low) and 7.0 MPa (high) using water/methanol prior to every run or nitrogen.

Interval 289 to 320 mKB

23. Move in rig up Lee Energy. Make up and run in the hole with the following assembly. Use the gator tool to cut each free joint of casing. The bottom most cut will be determine from the bond logging results. Top perf will be made at mKB.
 24. Run in the hole with 88.9 mm, 13.84 kg/m, J-55 EUE tubing open end and land tubing 5 m above the bridge plug at ~395.0 mKB.
 25. Rig up Sanjel cement pumper Suncor, AER, and OH&S regulations. Prepare to cement the well with ?? tonne (m³) of "G" + 0.5% CFR-2 + 0.3% CFL-3 + 0.5% CaCl₂ + 0.15% CDF-6P as per the attached program PRG2003855 Rev 0. Assume job from 420 to 200 mKB
 26. Confirm that there is zero pressure on the casing and record in Wellview.
 27. Connect the cementing unit treating line to the tubing and pressure test the treating line and the tubing valve to 14 MPa for 10 minutes with fresh water and methanol.
 28. With the tubing landed at 2.0 m from plug depth, circulate 2.0m³ ±20°C fresh water.
 29. Continuously mix and displace the cement plug.
- NOTE:** The approximate volume required is 14.3 m³. Open hole volume is 6.81 m³ with 30% excess.
- NOTE:** At 200 L/min it will take approximately 71 minutes to circulate the cement in. Well may go on vacuum. Allow the cement plug to find its balance.

NOTE: Have Sanjel provide 2 cement samples at surface to monitor on location. Ensure they are kept in the heated environment and monitor that the samples gel and set up in a reasonable time.

30. Once the plug has been placed for the full length of the plug weight, which should bring the plug top to 200 mKB. Pull the tubing up to 180 mKB and wash out the tubing with 1.5x tubing volume $\pm 20^{\circ}\text{C}$ fresh water. If unable to gain circulation during cementing operations do not attempt to back wash, continue with pulling and standing tubing.

31. Next day Run in the hole and tag for the cement top. Report results to Calgary.

Interval 70 to 215

32. Perforate the next intervals.

33. Rig up Sanjel cement pumper Suncor, AER, and OH&S regulations. Prepare to cement the well with ?? tonne (m^3) of "G" + 0.5% CFR-2 + 0.3% CFL-3 + 0.5% CaCl_2 + 0.15% CDF-6P as per the attached program PRG2003855 Rev 0. Assume job from 200 to 30 mKB

34. Confirm that there is zero pressure on the casing and record in Wellview.

35. Connect the cementing unit treating line to the tubing and pressure test the treating line and the coil to 14 MPa for 10 minutes with fresh water and methanol.

36. With the tubing landed at 2.0 m from plug depth, circulate $2.0\text{m}^3 \pm 20^{\circ}\text{C}$ fresh water.

37. Continuously mix and displace the cement plug.

NOTE: The approximate volume required is 13.2 m^3 . Open hole volume is 6.43 m^3 with 30% excess.

NOTE: At 200 L/min it will take approximately 66 minutes to circulate the cement in. Well may go on vacuum. Allow the cement plug to find its balance.

NOTE: Have Sanjel provide 2 cement samples at surface to monitor on location. Ensure they are kept in the heated environment and monitor that the samples gel and set up in a reasonable time.

38. Once the plug has been placed for the full length of the plug weight, which should bring the plug top to 30 mKB. Pull the tubing up to 25 mKB and wash out the tubing with 1.5x tubing volume $\pm 20^{\circ}\text{C}$ fresh water. If unable to gain circulation during cementing operations do not attempt to back wash, continue with pulling and standing tubing.

39. Next day Run in the hole and tag for the cement top. **If the cement is above the top perforation by 10 m then we will pressure to 7 MPa for 15 minutes.** Report results to Calgary.

NOTE: Plan B

If the casing was not successfully pulled due to some issue that was not anticipated the perforation will be made through both the production and surface casing in a similar depth as planned previously.

Interval 289 to 320

Interval 70 to 215

Perforation placement need to be determined within each of the interval but will be the same as for the removal of the casing string. Cementing operations will be similar, but chemical loading might need to be adjusted.

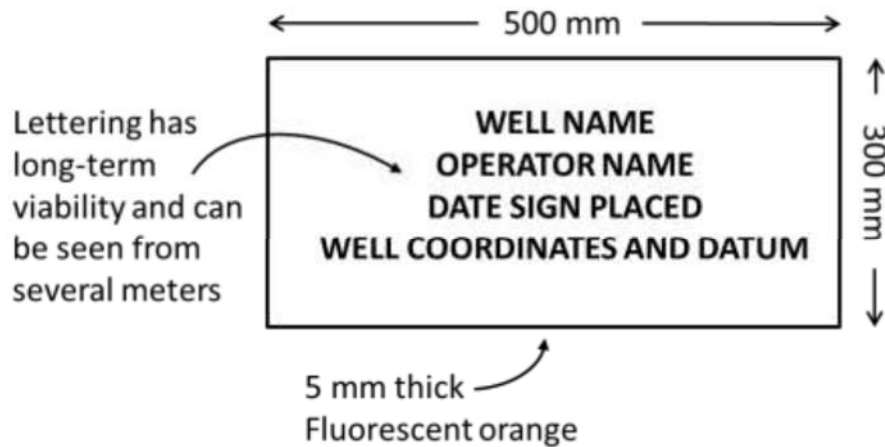
40. Fill out the attached “Surface Abandonment Handover Form” and turn the well over to logistics for cut and cap. Note the date of the gas migration test in the document. Send form to Greg gheffel@suncor.com & Jonathan jkoteles@suncor.com.
41. Winterize the well and wellhead to ensure no freezing issues will occur. Leave wellhead in D13 compliance. Rig out and release all services Move all equipment off location.

Surface Abandonment Requirements

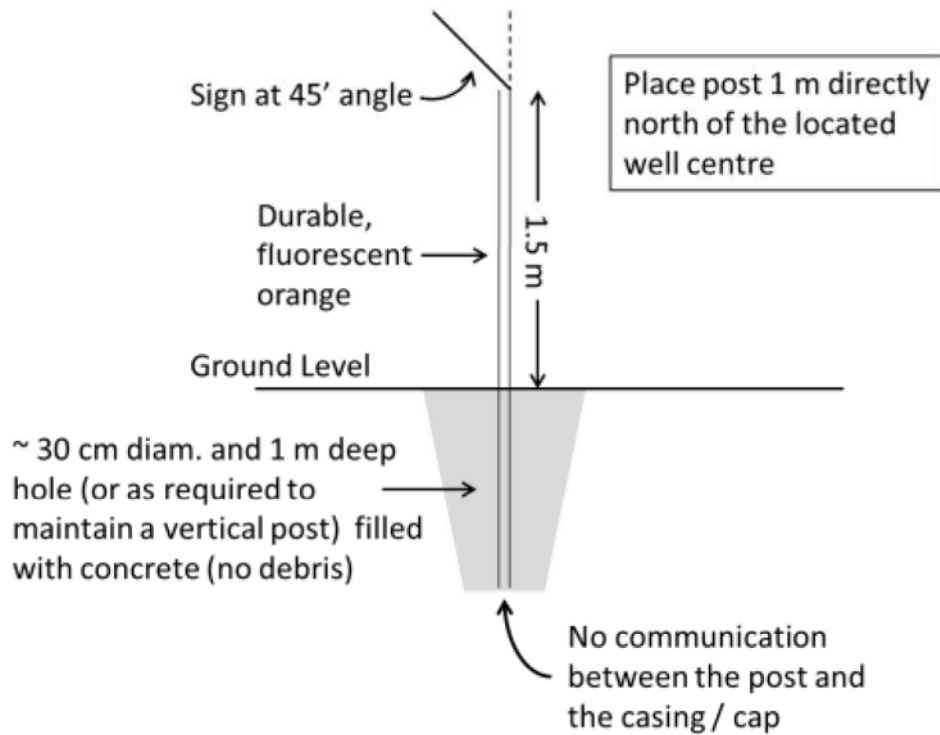
42. To comply with OROGO Abandonment Section 6E Surface Abandonment Guidelines. Immediately upon Completion of the downhole abandonment work, Suncor Logistics team will receive the “Surface Abandonment Handover Form”.
43. Suncor Logistics will move onto location and perform the below procedure:
- Remove the Wellhead
 - Cut off casing strings minimum 1 meter below natural ground level
 - Surface, intermediate and production casing strings must be capped at surface with a vented capping system: a steel plate that is fastened and installed in a manner as to prevent any potential for pressure to build up within the casings from the shallowest zonal abandonment to the surface, while restricting access to the casing strings at surface.
 - Field verified coordinates for the well center must be provide to OROGO as part of the Well Operations report. Geodetic datum must be specified NAD83 recommended. Coordinates must be to 4 decimal places or in degrees, minutes and seconds to 2 decimal places.

- A field sketch of the area must also be submitted as part of the Well Operations Report.
- After surface abandonment is completed, the well must be marked with a durable post and sign as shown below.

Sign Requirements



Post Requirements



- Ensure all debris associated with entire well operation is removed.
- Take pictures of lease and cut and capped well with signage.

- Submit all information and pictures to mcrockett@suncor.com and applicable Logistics team lead.

44. Finalize Documentation

- Ensure tubing tallies are entered and correct in Wellview.
- Ensure WellView schematic is accurate, as built, drawing.
- Take a picture of final wellhead and add as WellView attachment.
- Attach electronic copies of well related information to WellView file, if applicable.
- Well Site Supervisor emails Project Engineer of the end date of the operation in Wellview and files end of well (EOW) documentation in the Completion Microsoft Teams EOW WSS Entry
 - Completion Teams Folder>General> EOW> End of Well WSS Entry
 - License # _ Well Name_ EOW
- Issue Work Orders to vendors - following completion of the requested work, field operations will confirm that the field ticket is complete and accurate in writing, by signing the field ticket and providing a separate work order.

END OF PROGRAM

XI. PROGRAM SIGN OFF

PREPARED BY:

Matt Crockett
Sr. Engineer, Completions

Date

APPROVED BY:

Tier 1:

Jonathan Koteles
Superintendent, Completions

Date

APPROVED BY:

Tier 1:

Bill Plaxton
Specialist Completions Engineering

Date

Elevations			
KB Elevation:	435.22 m	KB-THF 5.52 m	TD 1418.0 mKB
GL Elevation:	429.10 m	KB-CF: 6.12 m	PBTD 1179.8 mKB
		KB-GL: 6.12 m	

Wellhead:	Size and Rating									
Manufacturer	mm	x	mm	MPa	x	mm	MPa	x	mm	MPa
McEvoy / Crown	245	x	279	21	x	179	21	x	65	35

Casing	Hole	Joints	OD	Wt.	Grade	Thread	Top	Bottom
	mm	#	mm	kg/m				
Conductor:	610	2	508	140	K-55	BT&C	surface	23.0 mKB
Conductor:	445	5	340	101	K-55	BT&C	surface	64.0 mKB
Surface:	311	61	245	60/65	L-80 / SOO95	LT&C	surface	760.0 mKB
Production:	216	109	178	43	N-80 / SOO95	LT&C	surface	1418.0 mKB

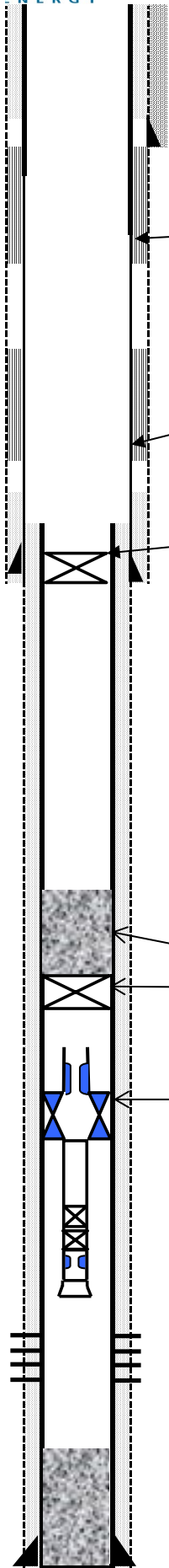
Wellbore Fluid: 25/75 methanol-water w/ 0.8% Halliburton MX794 inhibitor

Perforations / Open Hole		Top	Bottom	BHP	BHT	H ₂ S	CO ₂
Date	Formation	(mKB)	(mKB)	(kPa)	(°C)	(%)	(%)
Mar 3/04	Mount Clark (suspended w/ BP & cement)	1222.5	1233.5	12,500	11.5	0.00	0.00
Perforated with 114 mm ERHSC guns loaded with 38.6 gm Powerjet charges @ 17 spm & 60° phasing							

Bottomhole Equipment Description (from top down) depth in mKB				
Item	Jts	Description	Length	Top
1		179 mm x 73 mm EUE Crown 'CTC-1A-EN' tubing hanger with 9.53 mm control line (plugged) and 63.5 mm BPV prep		
2		8 lineal meter cement cap	8.0	1179.8
3		178 mm 69 MPa permanent bridge plug		1187.8
4		Halliburton 'HD' on/off connector mandrel w/ 58.75 mm 'X' profile		
5		178 mm x 73 mm EUE Halliburton 'Versaset' retrievable packer with 'HNBR' elements	1.90	1196.00
6		3.0 m x 73 mm 9.7 kg/m L-80 EUE pup joint c/w two Owen 69 MPa premium permanent bridge plugs	3.09	
7		73 mm EUE x 58.75 mm Halliburton 'XN' nipple w/ 56.01 mm no-go with 58 mm no-go dart for setting bridge plug	0.39	1200.99
8		98.55 mm OD x 73 mm EUE wireline re-entry guide	0.15	
		Bottom of re-entry guide landed at		1201.53

Remarks Wellbore topped with 120 litres diesel for freeze protection.

Well Status Suspended gas well. **Prepared by** Bob Barvir





Surface Abandonment of Cased Well - Handover Document

**** For Corehole Abandonment (OSE): see Surface Abandonment OSE Corehole Form**

(Completions) Downhole Abandonment Date: _____
(Logistics) Surface Abandonment Date: _____

Wellsite (Name + UWI): _____

MSL # _____

Completions Supervisor: _____

Logistics Supervisor: _____

		Y	N	N/A
1	Pressure test passed? Read & record shut-in casing pressure _____ kPa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Cement depth consistent with D20?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Other D20 consideration explain:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Well head removed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Solar Panels and other hardware removed / deactivated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Safe Work Permit from Operations received by Logistics?	<input type="checkbox"/>		<input type="checkbox"/>
7	On-site safety meeting held?	<input type="checkbox"/>		
8	Ground Disturbance Authorization received?	<input type="checkbox"/>		<input type="checkbox"/>
9	Hot work permits received?	<input type="checkbox"/>		<input type="checkbox"/>
10	Personal 4-head gas monitoring in place?	<input type="checkbox"/>		<input type="checkbox"/>
11	LEL tested at wellhead? <i>Note: If reading exceeds 0%, stop work & contact Calgary.</i>	<input type="checkbox"/>		<input type="checkbox"/>
12	Surface casing vent flow test was performed. <i>Note: If flow detected, stop work & contact Calgary.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Other Hazardous material used during down hole abandonment <i>Explain</i> _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Mitigative measures taken to deal with Hazardous material: <i>Explain</i> _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Depth to cement: _____ (Required: Depth or Unknown) If Unknown - why? (Frozen, etc.) _____ <i>Note: If >8m Stop and review with Calgary office</i> Fill to 3 meters below ground level with Cement if greater than 8m	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	Depth to water: _____ (Required: Depth or Unknown)			
17	Nu Wave Technology used?	<input type="checkbox"/>	<input type="checkbox"/>	
18	Intermediate/production casing(s) capped with steel plate?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Surface casing capped with steel plate?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	Welding & venting procedures documented?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	Casings cut off and capped greater than 1m* below final contour elevation? <i>*Note: 2m below final contour elevation if located on peat lands or if within 15km of urban development (50 houses or see survey plan)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22	Job documented with pictures? See 2nd tab	<input type="checkbox"/>		

23 Additional Comments Completions :
Type of Fluid left above Plug: _____

24 Additional Comments Logistics :

25 Completions Supervisor: Fill in Red Highlighted and forward to Completions Superintendent and Logistics Field Representative.
26 Logistics Supervisor: Save Document as PDF including **UWI in the document name** and within 48 hours of work being completed.
Forward to: LOGISTIC@suncor.com, Logistics Superintendent, gbis@telus.net, sun.jodymccconnell@ddmail.ca
NOTE: cc Tanya Richens (trichens@suncor.com if within Firebag or Mackay River EPEA Boundary)

2 Photos Required: 1. Close up of the capped casing.

2. Cap in relation to excavated hole, needs to show that cap is under final ground level