N.E.B. COPY

K-45A

Well History - Pointed Mountain A-2A

94/06/01 Moved in rig and associated equipment over seven days at cost of $305,000.

94/06/08 Unable to set 93.67 mm FSG plug in F ripple at 152 m because 98 mm gauge ring fell through nipple. Set 114.3 m retrievable bridge plug at 143 mKB. Speared into tubing and pulled dognut free with 3000 daN over string weight. Pulled 289.5 joints, 114.3 mm, L-80, CS Hydril. Tubing was parted at 2880 mKB.
Severe scale build up and holes in bottom joints of tubing. The tubing condition was progressively worse as depth increased from 2632 to 2880 mKB. The tubing string was junked.

94/06/14 Ran Vertilog from 2880 mKB to surface. Few spots with wall loss of 25%. Generally very good casing. Set bridge plug at 2878.2 mKB. Ran Segmented Bond Tool with 7 MPa on casing. Cement top at 2732 mKB, but bond O.K. over proposed whipstock depth. Perforated 2874.5-2875.4 mKB, hoping to achieve injection through questionable cement bond. Pressured to 11 MPa with no bleed off. Dump bailed 8 m of Thermal 40F cement on top of bridge plug. Set another bridge plug at 2856 mKB. Set Homco bottom-trip whipstock tool on top of B.P. Mill S-95 casing with starting mill at .8 m in 80 minutes. Ran Window mill and 2 watermelon mills. Milled 1.3 m. Mill cored out in centre. Replaced Window mill and ran same watermelon mills. Milled 2.4 m. Pressure tested open hole to 11 MPa.

94/06/22 Run bit #1, 156 mm (ATJ-M33D) with medium speed high performance motor with 1.75° adjustable bent housing, Monel Drill collars and sperry sun MWD. Drill with HEC polymer for 60 m in 16.25 hours. Bit condition 7-8-1 RIH with bit #2 but MWD tools failed. POOH and replaced MWD. Ran bit #2 (ATJ-M33D) with 1.5° bent housing and MWD. Slide and rotate from 2914 to 2978. Pulled bit. Condition was 5-8-2. Ran bit #3 (155.6 mm TD 268 PDC) with 1.5° bent housing motor and MWD. Tight hole @ 2926. Reamed and washed to 2978 m. Motor would stall out while sliding with 4500 to 5000 daN on bit. Drilled 35 m in 15.5 hours. PDC bit condition 7-I. Ran bit #4 (F57D) with 1.5° adjustable bent housing and MWD. Drilled to 3057 mKB (44 m in 18.5 hrs). Bit condition 7-4-2. Stop every 15 stands to circulate and cool MWD temperature. Circulating BHT=105°C. Surface mud temp. = 35°C. Ran Bit #5 (F57D) without motor and MWD. Drilled into Nahanni top at 3082 m and drilled total of 104 m in 35 hrs. Bit condition was 8-2-0.

94/07/02 Wait on rotary table repairs. Ran in with bit #6 (F57D) and drilled from 3161 to 3216 m in 13.5 hours. No restrictions or fill on trip in. Drilled with 6-8000 daN and 60-65 rpm. No mud losses to formation throughout drilling operation. Ran Scientific Drilling gyroscope directional survey to TD @ 3216 mKB. Final bottom hole co-ordinates are 106.25 m North and 389.77 m East from surface co-ordinates.

94/07/05 Ran Atlas Compensated Densilog - CNL-GR-Caliper. Ran 24 joints of 114.3 mm 18.75 kg/m, 13CR-80, FL4S, Range 3 liner with Davis float shoe, stage collar, McAllister ECP, Brown Oil Tools hanger and 127 mm tie back extension. ECP set at 3080 mKB, casing shoe set at 3082.25 mKB. Liner hanger set. Cemented with 6.6 tonnes Thermal 40F.

94/07/08 Drilled cement out from 2693 to liner top at 2794 with 156 mm bit. Drilled out liner top with 97 mm mill and then drilled out stage tool and float shoe. Ran in hole to 3216 m and circulated to fresh water. No mud or water loss to formation.

94/07/09 Set retrievable bridge plug at 2400 mKB and dump bailed sand and cement on top.

94/07/10 Perforated 2325.5 to 2326.5 mKB @ 4 spm with 101.6 mm HSC and 32 gm charges with hole full of water. Pressure to surface at 11,400 kPa. Set cement retainer, ran drill pipe and flowed sweet gas. Flowed $155x10^3$ m^3/d at 17,500 kPa 12.7 mm choke. Flow decreased in 4 hours to $80x10^3$ m^3/d at 12,025 kPa on a 12.7 mm choke. Shut well in and built up to 17,000 kPa in 2 hours.

24 hour build up pressures on surface casing = 6200 kPa; intermediate casing = 4900 kPa

94/07/12 Cement squeezed perfs with 6.6 t Thermal 40F cement. Pumped $5m^3$ in 6 stages in 2 hours. Maximum squeeze pressure of 21 MPa. Stung out and backwashed 0.3 m^3 slurry. Perforated 947-948 mKB with 101.6 mm EHSC, 32 gram charges, 4 shots. Circulated water down 178 mm casing and up intermediate casing at 0.5 m^3/minute at 3 MPa. Opened surface casing and closed intermediate but unable to circulate up surface casing at 6 MPa. Cement squeezed through retainer at 934 mKB with 8.3 m^3 slurry with full returns.. Total of 7.8 m^3 cement behind casing. Final pump pressure of 5 MPa. WOC. 24 hours. Drilled out hard cement on top of retainer. Drilled out retainer and pressure tested to 10,200 kPa for 10 minutes. Intermediate casing pressure - 0 - no blow. Surface casing built to 9,000 kPa after 44 hour shut-in. Surface vent opened and bled to zero in 1 minute. Left open to pit with lazy 1 m. flame.

94/07/15 Drilled out cement retainer and hard cement to 2343 mKB. Gas in returns. Well started to flow. Set cement retainer at 2315 mKB. Established feed rate w/ water @ 30 l/m @ 26 MPa. Batch mixed 4 m^3 of Nowsco Thermal 40 to 1876 kg/m^3 and squeeze in 6 stages at up to 0.11 m^3/min @ 22 MPa. Max. squeeze pressure of 25 MPa. 1.41 m^3 slurry in formation.

94/07/20 Drilled out hard cement and retainer. Pressure tested to 10 MPa for 10 minutes. Ran 30 minute flow check. No sign of gas. Retrieved bridge plug from 2400 mKB.

94/07/21 Ran 131.1 mm polish mill and casing scraper. Reciprocate scraper over intervals 935-955 and 2310-2350 mKB. Ran to top of setting collar. Rotate @ 50-60 rpm with 1-2 daN weight. Reciprocate 1.5 m up and down 10 times at 70-80 rpm. Circulate bottom up and POH.

94/07/22 Ran 114.3 mm, L-80, 18.99 kg/m, NK3SB tubing to top of liner. Tally, drift, redope, use wrap-around tongs, computer torque. Pickled casing and tubing with 7 m^3 15% HCl and flush with water plus O_2 scavenger at 0.5 m^3/minute. Acid caused some peeling off of 'varnish' from new tubing.

94/07/24 Ran 1.82 m tie back extension, 13CR-80, with 3 sets of molyglass seals, plus Baker 13CR 'R' nipple, 1 joint 13CR-85 tubing, McMurry (Copeco) type FO side pocket mandrel with 25.4 mm Monel chemical injection valve and BK-2 latch, 1 joint 13CR-85 tubing, Baker Hydra-Pak retrievable packer without rubber seal, Baker HEL on-off connector with 69.85 mm 'F' profile, 1 joint 13CR-85 tubing, Daniels (Import too) side pocket injection mandrel with McMurry 25.4 mm Monel chemical injection valve and BK-2 latch, crossover, 114.3 mm, L-80, NK3SB, 18.99 kg/m tubing to surface. Dropped on L-shaped elevator pin 3/8" diameter x 8: long into hole with 80 joints in the hole. Pin will not go below the upper gauge ring on the packer. Driller forgot to install a running stripper rubber. All tubing inspected, computer torqued and hydrotested to 21 MPa. Circulated to T8067 corrosion inhibitor filtered to 3 microns. Set RZG plug in R nipple and set packer at 2769.98 mKB with tubing in 18,000 daN compression. Installed wellhead.

94/07/26 Pull RZG plug. No sign of any flow. Move out service rig to A-1. RIH with coiled tubing and jetting tool. Jet wash open hole with 15 m^3 15% HCl plus N_2 at .05 to .1 m^3/min and holding 10 MPa back pressure on the C.T. annulus. Washed from the top down because C.T. was unable to pull slow enough while pulling from the bottom up. Blow dry with N_2. No burnable gas recovered. Recovered 36.1 m^3 liquid. Shut well in for 45 minutes to rig off C.T. Open well - dead in 4 minutes.

94/07/30 Tagged fluid level at 1160 mKB. Recovered a fluid sample. Inhibitor and acid in water. pH=6, TDS=16% (129,000 ppm).

94/08/04 Shut in surface casing pressure 10,950 kPa. Shut-in intermediate casing pressure was zero. Repaired hydraulics on C.T. injector. Blew well dry to 3200 mKB. Recovered 23.2 m3, mostly inhibitor. Formation gas flowed @ 14 x 103 m3/d decreasing to 2.3 x 103 m3/d @ 300 kPa in 3 hours. Next day blew well dry with N2 and recovered 8 m3 mostly inhibitor. Leave well open for 7.5 hours, then performed N2 squeeze with C.T. @ 2850 m. Pressured up to 25 MPa with total of 8800 scm N2. Feeds @ ~ 50 scm/min N2. Well bleeds to 21 MPa in 30 minutes. Casing pressure built to 8900 kPa due to leaking tie-back stem seals. Bled off with very little formation gas to surface. Ran in hole with C.T. for third blowdown. Recovered 1.6 m3 fluid then straight N2. Pulled 2000 daN over string weight 3 times between 3050-3000 mKB. Gas production @ 4.6 x 103 m3/d @ 25 kPa. Bled casing pressure off from 8400 kPa to 100 kPa in 1 hour -- 90 % N2, 10% formation gas. Final flow rate from tubing was 4.7 x 103 m3 /d @ 25 kPa. SI well. Built up to 3750 kPa in 5 hours.

94/08/08 RIH with gauge ring could not 'feel' a fluid level to 2785 mKB. Set ball check tubing plug in Baker 69.85 x 68.5 mm 'R' nipple and pressure test tubing to 21 MPa. Attempt to P-test casing -- unsuccessful. Bled to tbg side. Pulled chemical injection valves. Valves were tight in mandrel with some black grit and scale on them. Set inconel dummy valves. Pressure test casing -- leaking. Pressure tested tubing - indicated small leak. Pulled plug from R nipple and recovered some Molyglass packing from the top of the plug (from tie-back stem). Pressured up down tubing and fed into Nahanni at 0.4 m3/min at 33 MPa. Decided to pull tubing and switch to a more conventional permanent packer with tailpipe and locator seal assembly type of

completion. Surface casing was open to flare throughout operations. The intermediate casing was TSTM (shut-in).

94/09/05 Moved Drive #41 back to location from A-1A. Pulled 53,000 daN (17,000 daN over string weight - shear set @ 17,800 daN) to shear Baker Hydra-Pak packer (without seal rubber) and pulled tubing. Molyglass seals and AFLAZ 'O' rings 90% gone with deep scratches in near-gauge portion of mandrel between seal ring areas. Also gouges just below no go at top of stem. No go area that sits on bevel top of seal box extensions had marks every centimetre around ring as it made by a bit. Concluded that when cleaning out cmt. to top of liner (after cant. liner). Must have been too aggressive w/ bit and chewed up liner top and perhaps turned a lip inside. NOTE: The McMurry 25.4 mm Monel chemical injection valves retrieved from the well were shop tested at Copeco and found to have failed (75 % were missing from around reverse ball seat.). ~~O rings??~~ making the spring loaded valves ineffective --> allowing pressure on both annulus and tubing to equalise. 'O' rings were not made of kalrez as ordered and specified by Copeco.
Set Guiberson Magnum permanent packer at 2778.61 mKB (COR) with seal bore extension, tailpipe (Incolloy 825 & 925) with Otis PXN plug in place with re-entry guide landed 0.9 m inside the tie-back extension. Hydro-tested to 49 MPa, thread wash and computer torqued 114.3 mm tubing into the hole. Pressure tested annulus to 10 MPa and the tubing to 35 MPa. 9.8 m locator seal assembly landed in 4500 daN compression.

94/09/11 Blow tubing dry with N2. Leave 9 MPa on wellhead and pulled Otis PXN plug with 7/32" braided wireline. Bled well to zero in one hour. No sign of formation gas. Filtered 86 m3 water for acid frac to 1 micron.

94/09/13 Acid frac Nahanni. Filled hole with 10m3 gelled water plus 4 m3 28 % HCl acid. Pumped additional 16 m3 acid + 15 m3 gelled water + 20 m3 acid + 20 m3 gelled water + 20 m3 acid + 25 m3 gelled water + 24 m3 acid and flushed with 13 m3 water plus 1710 scm N2. Pumped at 47.5 to 51.6 MPa with rate increase from 1.5 to 2.5 m3/min. ISIP 47 MPa. 15 min SIP=34 MPa. Pressure at 22 MPa in 85 minutes. Opened well and flowed back 38 m3 in 6 hours with a final pressure of 30 kPa. Shut in and built up to 2600 kPa in 2-5 hrs. Bled to zero in 10 minutes and recovered 1.17 m3. Shut-in waiting on coiled tubing to blow well dry with N2.

94/09/17 RIH with C.T. Found fluid at 2000 m. Could not get past 3122 mKB with C.T. Blow well dry and recover 57 m3 water.

94/09/19 Unload well with C.T. and N2. Recovered 4 m3 water. Gas rate at 3.5 x 10^3 m^3/d. Shut well in.

94/09/20 Shut-in tubing pressure of 11,420 kPa. Opened well and flowed 5.3 x 10^3 m^3/d at 25 kPa. Recovered 9.5 m3 water. Continue to stop cock well as follows:

Date	Final rate	fluid recovery	comments
94/09/21	14.3 x 103m3/d	29.2 m3	140,000 ppm salt, pH=7
94/09/22		0 7.9 m3	Blow dry w/ C.T. & N2

94/09/23 Pumped 2 m3 FO200/xylene mix. Flowed back and recovered same clean fluid. Ran 44.5 mm Black Max mud motor on C.T. First motor would not run. Ran second motor and drilled from 3116 to 3119. Could not make any more hole. POH.

94/09/24 Work coiled tubing with straight joint on bottom to 3206 mKB and wash total of 6 m3 of Xylene/F0200 mix across open hole interval. Blow out with N2. Recovered the Xylene/F0200 at surface. Mixture appeared clean. No indication of asphaltene or tar.

94/09/25 Flow well for 3 days. Gas rates declined slightly from 19.3 x 10^3 m^3/d to 18.3 x 10^3 m^3/d. Water rates dropped from 9.9 m3/d to 8.7 m3/day at flowing tubing pressure of 140 kPa. Water salinity 110,000 ppm, pH=7.

94/09/29 Unable to get below 3180.3 m. with GR-CCL. Perforated open hole with 54 mm, through tubing mechanically decentralised, expendable bar carrier at 20 spm, 0 deg. phasing, 16 gram Silver Jet charges from 3156.0 - 3160.0, 3136.0 - 3140.0, 3109.0 - 3113.0, 3096.0 - 3104.0 mkB. Had to flow well to dislodge guns stuck in liner.

94/09/30 Shut in pressure 11,660 kPa. Opened well to flow. Pressure dropped to 1070 kPa in 3 hours. Well slugging. Stop - cocked well.

94/10/02 Flowing 18.2 x 10^3 m^3/d at 95 kPa plus 9.9 m3/d water with pH=7, salinity= 86,000 ppm. Rates decreased in 61 hours to 17.9 x 10^3 m^3/d @ 300 kPa plus 9.5 m3/d water (pH = 6, salinity = 8800 ppm). Shut well in and rigged out testers. Production operations will tie in well to separator and flare to clean up well.
Total load fluid recovered to date = 288.5 m3.
Load fluid left to recover = 470.9 m3. (includes 28.5 m3 annular fluid, kill fluid, drilling mud and acid)
salinity indicates virtually all acid is recovered.

Total Field costs: $3,634,152.