**GEOLOGICAL SURVEY OF CANADA
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Synthetic seismograms
from borehole seismic data and well logs,
Beaufort-Mackenzie Basin

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CONTENTS

ABSTRACT

Borehole seismic survey data are compiled for 202 wells in the Beaufort-Mackenzie Basin, including vertical seismic profile, check-shot and crystal cable surveys. On the basis of the well seismic data, well logs and deviation survey data (for deviated wells), synthetic seismograms are generated for the 202 wells using LogM (LMKR GeoGraphix®). The resulting synthetics are illustrated with a time/depth window, well logs, well seismic data, calculated velocity, as well as stratigraphic information and casing shoe depths. The presentation of results provides key time-depth relationships important to seismic interpretation, but it also shows log responses in the time domain to rationalize reflection events by effectively tying well tops and other levels to surface-seismic reflection profiles. The information is also useful for the identification of permafrost (Hu et al., 2013) and gas hydrate zones as well as for other types of sedimentary basin studies.

INTRODUCTION

A fundamental part of petroleum geoscience is to analyze and geologically interpret reflection seismic data (2-D and 3-D profiles/volumes) in order to identify petroleum prospects. This requires geologic information in wellbores (e.g. formation tops) to be related, or tied, to reflection seismic data (normally two-way travel time) at or near those wellbores. The first objective of a well seismic survey (WSS) is to facilitate such well-to- seismic ties which are used to constrain seismic interpretations and thus reduce petroleum exploration risk. A WSS acquires seismic time and depth (T-D) relationships by recording the times of seismic waves arriving at downhole receiver(s) at measured depths. The WSS T-D information is used to adjust the integrated sonic times which are the sum of all the short continuous sonic transit time readings obtained from borehole sonic logs. Sonic information requires adjustment due to the fundamentally different nature of sonic velocity from seismic velocity. This generally comes from the fact that sonic velocity is measured over short distances (i.e. sonic tool length) with a high frequency wave (e.g. 20,000 Hz) whereas seismic velocity is measured outside the borehole with a lower frequency (e.g. 50 Hz) acoustic wave source (Schlumberger,

1989). In addition, sonic log readings are affected by velocity dispersion and poor borehole conditions. Adjusting the sonic readings to WSS T-D data provides a final T-D relationship (T-D control curve) that has the velocity detail of the sonic log, and the accurate seismic travel time reference of the WSS. This allows any logs or derivative information such as synthetic seismograms to be displayed with an axis of seismic two-way travel time for direct comparison to 2-D and 3-D seismic data in the vicinity of the well.

Frontier exploration wells normally include some type of WSS and this holds true for Beaufort-Mackenzie Basin wells. For this study, we used WSS data for 202 wells drilled between 1965 and 2007 (Table 1). Table 1 indicates the type of WSS and the source of the data for each well. Data were donated by Shell Canada Ltd. and were also obtained from the National Energy Board (NEB) well history files. Three general types of well seismic surveys (WSS) have been used; 1) check-shot; 2) crystal cable and 3) vertical seismic profile (VSP). The first two survey types are technologies that predate VSPs (circa 1980). All the above survey types provide time-depth (T-D) relationships that allow calculation of compressional wave velocity between downhole tool (geophone) depth levels. VSP technology provides information beyond a basic T-D relation and allows a short 2D reflection seismic image to be processed from seismic waveform data recordings (Mari and Coppens, 2008). This study does not compile such VSP images but rather uses VSP surveys for their basic T-D information.

The main objective of this study is to provide detailed documentation of the well velocity data compilation, and show synthetic seismograms and T-D relationships for Beaufort-Mackenzie wells, using available well seismic survey and log data. A multi-curve illustration is presented for each studied well. In addition, a multi-parameter comparison is provided to contrast basic sonic correction methods. Also illustrated and discussed are synthetic seismogram effects arising from using logs that are probably compromised in part by poor borehole conditions as indicated by caliper logs. This study does not provide actual surface seismic data near wells for comparison to the synthetic data.

BOREHOLE SEISMIC SURVEYS

Check-shot survey

A "check-shot" survey is a generic name for a type of WSS that pre-dates VSP technology. "Check-shot surveys" are also called "velocity surveys" and were commonly referred to as "Seismic Reference Service" (SRS) geophysical logs by "Century Geophysical Corporation of Canada", a company contracted for many such surveys during early petroleum exploration of Canada's northern frontiers, including the Beaufort-Mackenzie Basin. Such surveys define a unique relationship between time and depth, at survey-defined levels downhole. The survey acquisition uses a seismic source of similar frequency to that used in typical surface recorded seismic and measures seismic travel time from sea level or ground surface to a downhole receiver at a measured depth. This T-D information is used primarily to adjust the integrated sonic log travel time which is measured over much shorter distances in a borehole with a higher frequency source.

Basically, a tool containing receivers (typically three geophones of different gains) is lowered down the borehole by means of a conducting cable. A preamplifier is usually included to increase the amplitude of the signal detected before it passes along the cable to the recording equipment on the surface. At each measurement point (depth), the tool is held against the side of the hole by means of a clamp controlled from the surface. The vertical travel time between the seismic source and the borehole geophone is measured. The seismic source is typically an air gun (for offshore wells) or dynamite/vibrator (for onshore wells). The downhole geophone(s) record the arriving energy. Several shots can be made if data are noisy. Average interval velocities between check-shot levels can be calculated and the travel times corrected to a reference datum.

The check-shot survey data are compiled for 193 onshore and offshore Beaufort-Mackenzie wells (Table 1), and consist of measured depth, true vertical depth (TVD), travel time, converted vertical, average and interval velocities, and various corrections. Figure 1 shows measured parameters required to convert the observed travel time along the slant path from the shot location to the well geophone (T) to the vertical travel time (T_{gd}) with respect to the seismic reference datum (SRD). Correction to the SRD is

necessary if the shot source lies above or below this datum. If the hole is deviated or there is a significant source offset, the observed travel times must be converted to TVD travel times. The average vertical velocity is calculated and corrected to the SRD using the appropriate vertical distance between geophone and SRD (D_{gd}) and the corresponding T_{gd} value (Fig. 1). Interval velocities are calculated between each geophone depth. Figure 2 illustrates the Beaufort-Mackenzie Basin well locations that have check-shot surveys.

Vertical seismic profile (VSP)

Vertical seismic profiling is a borehole seismic method of concurrently recording both the up-going and down-going acoustic energy. It represents a significant advantage over the conventional surface reflection seismic method, which records only the up-going waves. An analysis of the up-going and down-going parts allows a near-borehole seismic image to emerge. VSP's can be considered as an acoustic log in the range of seismic frequencies (Mari and Coppens, 2008). In this study VSP information is used only for first break picks that have been converted to vertical travel time as T-D pairs to adjust sonic logs prior to synthetic seismic generation.

Crystal cable survey

The crystal cable velocity survey is designed for determination of the shallow (<1000 m) seismic velocity distribution and it has a higher resolution than conventional check-shot surveys due to a closer spacing of downhole geophones. Prior to VSP technology, it was generally the best seismic method for permafrost investigations in the near wellbore (Hatlelid and MacDonald, 1982) because it provides a consistent and cost-effective method of obtaining detailed near surface velocity information (Walker and Stuart, 1976).

The crystal cable velocity survey is normally carried out prior to running the first intermediate casing string and commonly a conventional check-shot survey is run at the same time for correlation purposes. The crystal cable consists of 12 pressure sensitive crystal detectors attached to a flexible steel-cored cable at a standard interval spacing of 15.24 m (50 ft) (closer spacing may be required depending on local conditions). The detectors have a nominal depth rating of 1524 m (5000 ft) but external factors may limit

the maximum survey depth to considerably less than 762 m (2500 ft). As in the case of check-shot surveys, both dynamite and airguns have been used as an energy source.

For the Beaufort-Mackenzie Basin, borehole sloughing does not appear to be a major problem in the Tuk Peninsula area but it can be a concern in the North Delta/Richards Island area. It is difficult to obtain a good acoustic bond between the well casing and formation in a badly caved borehole. As a result, crystal cable records shot in cased holes may be affected by casing kicks. In some wells in the Richards Island area, this problem is so severe as to mask all true direct arrival energy on the records over the entire permafrost interval (Walker and Stuart, 1976).

VSP and crystal cable survey data are available for 107 Beaufort-Mackenzie wells (Figure 3 and Table 1). Most of these wells have original field data for interpretation but a small number of wells also have complete interpreted records. In addition, there are a few wells that lack original data but have T-D plots included in the NEB well history reports. For some wells, records indicate that crystal cable surveys were run but the data are not available from the NEB. Vertical depth (D_{gd}) and vertical shot time (T_{gd}) from SRD are calculated using the original crystal cable data and equations (1) and (2) in Figure 1.

SYNTHETIC SEISMOGRAMS

True vertical depth conversion

A TVD survey is required when the wellbore deviates away from the vertical significantly enough so that measured depths along the hole do not match the actual vertical depths from the surface. When this happens, measured log depths appear deeper than they actually are. A TVD survey contains depth pairs that relate the measured depth along the borehole to the actual vertical depth from the surface. Using a TVD survey and LogM program (LMKR GeoGraphix®), log values can be restored to their actual vertical depths by applying a TVD correction which requires that the log curve values are resampled during the conversion. This is necessary since the log curves are being restored from an inclined trajectory to a vertical one, with a longer interval on the original curve

being compressed somewhat to fit into the equivalent interval along the new vertical trajectory. The curve sample interval used for the TVD corrected log curves does not change. However, the final total depth of the log curves will now be less than the measured depth of the original logs.

Time to depth conversion and velocity profile

The recorded travel times from well seismic surveys (check-shot, VSP, and crystal cable) were used to adjust the travel times of the integrated sonic log, which then becomes the basic seismic reference.

Four methods can be used for sonic log correction (using LogM program, LMKR GeoGraphix®); polynomial, cubic spline, block shift and differential shift. The polynomial method provides the best fit using least-squares regression. The correction applied to each sonic log value is the derivative (slope) of the polynomial curve at that depth. The polynomial curve applied will "average" a smooth fit between the borehole seismic data points to create the smoothed sonic transit time (DT) drift curve (fit curve). As a non-linear method, cubic spline generates a smoothed fit curve which passes exactly through each borehole seismic control point (depth - time pairs). However, the smoothed curve can introduce a high slope on the fit curve resulting in an unrealistic drift correction. The block shift method is a form of linear regression. It is an effective method to use if care is taken to ensure that borehole seismic data points are placed at geological boundaries (wherever possible) to reduce the effect of artificial impedance contrasts, even though the fit curve is not smoothed. With this method, the correction is applied to the part of the log where the drift originates. The change in drift over each borehole seismic interval is divided equally over all sonic log samples in the interval. Similar to the block shift, the differential shift method also applies a linear correction, but the drift values are applied proportionately over the interval. This can work better for the intervals with lower transit times.

The calibrated sonic and density logs (if available) are used to construct a synthetic seismogram. The corrected sonic log is selected as the control time curve that is used to convert well logs from depth to time, both for display and for the generation of

synthetics. It is also used to convert trace data including wavelets, synthetic traces and seismic traces from time to depth for the display, which allows identification of reflecting horizons by reference to the seismic response at the wellbore. A velocity curve is also obtained from the corrected sonic log using LogM (LMKR GeoGraphix®).

In addition to providing data for sonic calibration, check-shot and/or VSP and/or crystal cable surveys allow a T-D conversion to be made when no sonic log has been recorded. The simple method is to derive the sonic curve shape from resistivity or density log data. These pseudo-sonic logs can then be edited and adjusted to WSS data.

Creating synthetic trace

The seismic waveforms propagating through the earth are affected by each lithologic bed boundary. Specifically, at the interface of two formations of contrasting acoustic impedances, part of the energy will be transmitted across the interface and some will be reflected. The amount of seismic energy transmitted and reflected depends on the acoustic impedance contrast between the two formation beds. The acoustic impedance of a formation (AC) values are determined from the following relation:

AC = Velocity X Density (1)

After the acoustic impedance values are calculated at each time sample, the reflection coefficients (RC) are then calculated for each sample (or layer) in the sonic log using the following relation:

RC = (AC2 - AC1) / (AC2 + AC1) (2)

where RC is the reflection coefficient between the upper layer 1 and the lower layer 2. AC1 and AC2 are the acoustic impedances of layers 1 and 2.

The subsurface can be approximated for seismic purposes by a series of layers having specific acoustic impedances, which can be used to produce a series of reflection coefficients at the boundaries. In general, sonic and density are selected for RC calculation. Single sonic or density can be used also to compute RC if only one of these logs is available. In the last step the selected wavelet is convolved with the reflection

coefficient series to create the synthetic traces which are displayed using a number of duplicate traces for clarity (5 traces are used in this study).

The time sample interval can range from 0.1 ms to 5.0 ms in 0.1 ms increments but it is set at 1 ms for this study. The value of a log curve at any time sample is an average, using triangular weighting, of the depth samples that lie between the time samples that immediately precede and follow the time sample that is being calculated. The time sample interval will generally only affect the appearance of log curves displayed in time mode. The larger the time sample interval, the greater the smoothing of log character as a result of this averaging. It can also have an effect on the appearance of synthetic traces (either in time or depth).

SYNTHETIC AND LOGS PRESENTATION

Borehole seismic survey information provides absolute corrections to the T-D curve so that synthetic traces created from the calibrated sonic log (TVD corrected) will match more closely with surface seismic data. Based on compiled check-shot, VSP, and crystal cable data, and well logs, synthetic seismogram profiles were produced using LogM for 202 wells in the Beaufort-Mackenzie Basin.

The generated synthetic seismogram profile contains a T-D window and seven other tracks as shown in Figure 4. The T-D window shows two-way travel time with a linear scale and depth with a non-linear scale and this provides fundamental data for equating seismic travel time to depth for basin studies. The first track consists of caliper curves such as the density caliper (CALD), sonic caliper (CALS), neutron caliper (CALN), general caliper (CAL) and resistivity caliper (CALR) which are used to show the borehole condition. Dual caliper logs are available for some wells (CALX; caliper 1-3; and CALY; caliper 2-4). The second track includes two lithology logs, gamma ray (GR) and spontaneous potential (SP), distinguishing permeable and non-permeable zones. The third track shows resistivity logs such as deep (ILD - deep induction, LLD - deep laterolog, RD - high resolution deep induction; AHF90; RLA5; A40H - the high resolution laterolog); medium (ILM - medium induction, RM - high resolution medium induction, PLA3; P40H - high resolution medium laterolog); and shallow resistivity

curves (LL8 - laterolog 8, LLS - shallow laterolog, RS - high resolution shallow induction, MSFL - micro spherically focussed log, SFL - shallow focussed log, MFR - micro focussed resistivity, RLA1; P16H - high resolution shallow laterolog). Older unfocussed resistivity logs are available for several wells (LAT - lateral resistivity measurement of a spherical shell with a radius of 5.7 m, LN - long normal 1.6 m resistivity measurement, SN - short normal 0.4 m). The fourth track displays the bulk density log (RHOB) and the neutron porosity (PHIN - with sandstone calibration; PHINls - with limestone calibration, if available) or the neutron log (NEUT) when the neutron porosity log is not available. This track is not presented for some wells that lack density and neutron porosity logs. The fifth track illustrates the well seismic survey data (WSS – VSP, and/or crystal cable, and/or check-shot), and the velocity curve. The sixth track shows the synthetic trace (Reverse). The seventh track shows the DT drift curve. Formation/sequence tops, casing shoe, and basic well information and synthetic plotting parameters are also presented in the profile. The detailed stratigraphic correlation chart and formation/stratigraphic units for the Beaufort-Mackenzie area are listed in Figure 5.

Usually the corrected sonic and density logs (if available) are used to generate synthetic seismograms for this study. However, poor borehole conditions have a severe effect on density log readings, resulting in anomalously low values in overgauged and/or rugose borehole intervals. In this case, a single corrected sonic log is suggested to be used for the generation of synthetic seismograms rather than the sonic and density combination. As shown in Figure 6, in the major poor borehole intervals (A, B and C) identified by density caliper log, there are large differences between Reverse1 (synthetic trace from single corrected DT) and Reverse2 (synthetic trace from corrected DT and density) synthetics. The stronger reflections for Reverse2 are an artefact of poor density log readings for the enlarged and rugose borehole intervals. In the absence of caliper information, the erroneous Reverse2 results could be misinterpreted as resulting from geological factors such as lithology changes, formation boundaries, or hydrocarbon occurrences. For a few wells with poor borehole intervals included, both synthetic trace Reverse1 and Reverse2 are displayed in the synthetic profile to provide a better understanding and interpretation of the seismograms.

Among the four methods for sonic log correction described above, the polynomial method is used for most of the wells because it provides the best fit between the calculated velocity and borehole seismic data using least-squares regression. However, the polynomial method does not work well for short, high-contrast intervals with too few borehole seismic data points to provide sufficient resolution (e.g., less than 4) such as in shallow permafrost zones. As an example, Figure 7 shows a comparison of synthetic profiles when different correction methods are used for sonic log calibration for the Pikiolik M-26 well. Figure 7a shows that large, short wavelength impedance changes in the permafrost zone can result in significant velocity errors when the polynomial method is used for DT correction; there is a large difference between calculated velocity (from corrected DT) and borehole seismic velocity for the Ronning Group interval (the yellow coloured interval at the bottom of the well). Figure 7b is obtained when the linear block shift correction is used, illustrating that the calculated velocity has a good fit to the borehole seismic velocity in the Ronning Group interval, even though strong reflections occur in the shallow permafrost zone (the blue coloured interval in the shallow interval of Fig. 7b). Figure 7 also illustrates that poor borehole conditions have degraded density log readings with consequent impacts on the synthetic trace (Reverse2 in Fig. 7a and b).

Detailed composite plots are illustrated in alphabetic order by well name in Appendix A (Aagnerk E-56 to Ivik N-17 wells; Figs. 8 to 68), Appendix B (Kadluk O-07 to Minuk I-53 wells; Figs. 69 to 111), Appendix C (Napartok M-01 to Spring River YT N-58 wells 68; Figs. 112 to 162), and Appendix D (Taglu C-42 to Ya Ya P-53 wells; Figs. 163 to 209). Each plot consists of a T-D window and six other tracks displaying detailed well logs, borehole seismic surveys and synthetic results, providing very important T-D conversion information for seismic data interpretation and basin analysis.

DISCUSSION

The polynomial "smoothed" method is designed such that the correction for drift should be applied over a depth interval that is larger than the interval from which the drift originated. For most of the wells, this criterion was met and the polynomial method for sonic log correction yielded the best fit of calculated velocity to borehole seismic

velocity. However, this method does not work well for short depth intervals with high acoustic impedance contrasts and sparse borehole seismic data points (Fig.7a). In contrast, when the linear block shift correction is applied to any interval (large or short), changes in drift are compensated for by modifying the sonic log values strictly within the borehole seismic intervals so that the T-D curve exactly matches the times at borehole seismic depths, reflecting the real abrupt lithology change and other geological boundaries (Fig.7b), although introducing artificial impedance contrasts at borehole seismic depths. The polynomial correction is recommended when there are abundant borehole seismic points and no abrupt short wavelength lithology and geological boundary variations whereas the block shift linear method is preferred for the wells with strong variations in lithology or other physical properties.

Synthetic seismogram results depend on numerous factors such as the quality of log curve digitizing, borehole conditions (such as washouts, rugosity, and mud invasion as shown in Fig. 6), tool problems that can contribute to generally poor log data quality, and missing logs. In this report, basic log editing included corrections for the wrong scale, erroneous log values, depth shifting and stretching, and mismatch between multi logs, and redigitizing of logs for poor quality/missing data intervals. However, some hidden errors or minor mistakes may still exist in well logs even though obvious errors were eliminated. Usually poor borehole intervals can be recognized by use of caliper curves; for such cases, two synthetic traces were produced in the synthetic seismogram profiles for assisting in the understanding and interpretation of synthetic results. If the borehole condition is very poor (e.g., the permafrost zone), then the quality of the synthetic will be reduced substantially whether or not the synthetic trace is obtained from a single corrected sonic log or from corrected sonic and density logs because it is not possible to recover true log values under these circumstances.

Even after the identification and correction of quality issues for basic logs and well seismic surveys as described above, rock velocity values determined from sonic logs and well seismic surveys are inherently different. Some reasons for this are stated in Schlumberger 1989, "The formation velocities obtained by sonic logs may differ from those obtained by surface surveys for the following reasons: (1) velocity dispersion with frequency, seismic velocities (measured at roughly 50 Hz) may be as much as 6% lower

than sonic velocities (measured at 20000 Hz), (2) borehole effects, such as those caused by formation alteration, may decrease the apparent sonic log velocities, and (3) the sonic transit time measurement is fundamentally different from the surface seismic measurement. The sonic log velocity is measured in a continuous manner alongside the borehole, while the seismic waves reaching the geophone(s) take the most direct acoustic (shortest) path" (Schlumberger, 1989).

ACKNOWLEDGEMENTS

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LIST OF TABLES

LIST OF FIGURES

Table 1. Borehole seismic surveys are available in 202 wells drilled between 1965 and 2007 in the Beaufort-Mackenzie Basin

UWI	Company	Well Name	Check shots		VSP/ Crystal Cable	Comments on*
			Shell		NEB	
300E566950136450	Gulf et al.	Aagnerk E-56		Y		
300C156930135450	Imp.	Adgo C-15	Y		Y	
300F286930135450	Imp.	Adgo F-28	Y		Y	
300G246930135450	Esso et al.	Adgo G-24		Y	Y	
300H296930135450	Esso et al.	Adgo H-29		Y		
300J276930135450	Esso	Adgo J-27	Y			
300P256930135450	Imp.	Adgo P-25	Y		Y	
300P096940137450	Dome et al.	Adlartok P-09	Y	Y*		has additional point
302I457030133300	Dome et al.	Aiverk 2I-45	Y	Y*		discrepancy from Shell
300F146930132150	Imp. et al.	Akku F-14		Y	Y	
300A376820135000	Shell	Aklavik A-37	Y		Y	
300F386810135000	Union	Aklavik F-38	Y			
302P357020134000	Gulf et al.	Akpak 2P-35	Y			
300P237000132450	Esso et al.	Alerk P-23	Y		Y	
300H166940131000	Elf et al.	Amaguk H-16		Y		
300N447000130450	Imp. et al.	Amarok N-44		Y	Y	
300I657010133300	Gulf et al.	Amauligak I-65	Y	Y*		suspect Shell data wrong
300J447010133300	Gulf et al.	Amauligak J-44		Y		
300O867010133300	Gulf et al.	Amauligak O-86	Y	Y*		has additional point
300O097000133300	Esso et al.	Amerk O-09		Y	Y	
300E907020135000	Dome et al.	Arluk E-90	Y			
300K066950133450	Esso et al.	Arnak K-06		Y	Y	
300L306950133450	Imp.	Arnak L-30	Y		Y	
300E416940132300	Imp.	Atertak E-41	Y		Y	
300K316940132300	Esso et al.	Atertak L-31 (K-31)		Y	Y	
300G046900133450	Gulf et al.	Atigi G-04 (E. Reindeer G-04)	Y			
300O486900133450	Gulf et al.	Atigi O-48	Y			
300A556950131450	Imp. et al.	Atkinson A-55		Y	Y	
300H256950131450	I.O.E.	Atkinson H-25	Y			
300M336950131450	I.O.E.	Atkinson M-33		Y	Y*	assumed crystal cable data
300H136830135300	Shell	Beaverhouse Creek H-13	Y			
300E476850137150	I.O.E.	Blow River Yt. E-47	Y			
300K606830129150	C.P.O.G.	Crossley Lake S. K-60	Y			
300N447000136000	Gulf et al.	East Tarsiut N-44	Y		Y	
300M566950140000	Dome et al.	Edlok M-56 (N-56)	Y	Y*		suspect Shell data wrong
300I486910135450	Chevron et al.	Ellice I-48			Y	
300O146910135450	I.O.E.	Ellice O-14	Y		Y	
300J076920132300	I.O.E.	Eskimo J-07	Y			
300B606840136000	Chevron et al.	Fish River B-60	Y		Y	
300G076930135300	Sun et al.	Garry G-07	Y		Y	
300P046930135300	Sun et al.	Garry P-04	Y		Y	
300G076940134000	Esso et al.	Hansen G-07		Y		
300B417030132000	Dome et al.	Havik B-41		Y		
300J176920136150	Imp. et al.	Ikattok J-17	Y		Y	
300A016850134000	Gulf et al.	Ikhil A-01 (E. Reindeer A-01)	Y			
300I376850134000	Gulf et al.	Ikhil I-37	Y		Y	
300K356850134000	Gulf et al.	Ikhil K-35		Y	Y	
300B486940135000	Imp.	Immerk B-48	Y		Y	
300A066950137000	Gulf et al.	Immiugak A-06	Y	Y*		suspect Shell data wrong
300J296910133000	Dome et al.	Imnak J-29	Y		Y	
300D546830133300	Amoco et al.	Inuvik D-54		Y		
300B357040134000	Dome et al.	Irkaluk B-35			Y	
300E277000134150	Imp.	Isserk E-27	Y		Y	
300I157000134150	Esso et al.	Isserk I-15		Y		
300F296830134300	DEVON ET AL	Itiginkpak F-29			Y	
300I277000134000	Esso et al.	Itiyok I-27		Y	Y	
300B526940131450	Esso et al.	Itkrilek B-52		Y		
300C526940134150	Imp.	Ivik C-52	Y		Y	
300J266940134150	Imp.	Ivik J-26	Y		Y	
300K546940134150	Imp.	Ivik K-54	Y		Y	
300N176940134150	Imp.	Ivik N-17	Y			
300O076950136000	Esso et al.	Kadluk O-07	Y		Y	
300D586900133150	Gulf et al.	Kamik D-58	Y			
300L606900133150	Gulf et al.	Kamik L-60	Y			
300F427000131000	Imp. et al.	Kanguk F-42		Y	Y	
300I247000131000	I.O.E.	Kanguk I-24	Y		Y	

UWI	Company	Well Name	Check shots Shell	NEB	VSP/ Crystal Cable	Comments on*
300G427010131000	Imp.	Kannerk G-42		Y	Y	
300J397000130000	Imp. et al.	Kapik J-39		Y	Y	
300I437000135150	Esso et al.	Kaubvik I-43	Y		Y	
300J947050133300	Dome	Kenalooak J-94	Y		Y	
300A437000135450	Gulf et al.	Kiggavik A-43	Y		Y	
300N466910134450	Gulf et al.	Kikoralok N-46	Y			
300F486930134000	Gulf et al.	Kilagmiotak F-48	Y			
300M166930134000	Gulf et al.	Kilagmiotak M-16	Y			
300I296930131150	Elf et al.	Kiligvak I-29	Y			
300D296940132150	Imp.	Kimik D-29		Y	Y	
300O206850134450	Shell	Kipnik O-20	Y			
300O227030134000	Dome et al.	Koakoak O-22	Y		Y	
300N677010133000	Gulf et al.	Kogyuk N-67	Y		Y	
302I447030135000	Dome et al.	Kopanoar 2I-44	Y	Y*	Y	suspect Shell data wrong
300L347030135000	Dome et al.	Kopanoar L-34			Y	
300M137030135000	Hunt et al.	Kopanoar M-13	Y		Y	
300N026840131300	C.P.O.G.	Kugaluk N-02	Y			
300H596940133150	Imp.	Kugmallit H-59	Y			
300L246900135150	Shell	Kugpik L-24	Y			
300L466900135150	PC Devon	Kugpik L-46			Y	
300O136900135150	Shell	Kugpik O-13	Y			
300C586920135000	Shell	Kumak C-58	Y			
300E586920135000	Shell	Kumak E-58	Y		Y	
300J066920135000	Shell	Kumak J-06	Y			
300K166920135000	Shell	Kumak K-16	Y			
300M156910135151	PC Anderson	Kurk M-15			Y	
300M396910135150	Imp. et al.	Kurk M-39	Y		Y	
300E296920135300	Imp.	Langley E-29	Y			
300K457000131150	Imp. et al.	Louth K-45		Y	Y	
300A326940132000	I.O.E.	Magak A-32	Y		Y	
300A066930134300	Imp.	Mallik A-06	Y		Y	
300J376930134300	Imp.	Mallik J-37	Y		Y	
300L386930134300	Imp.	Mallik L-38	Y		Y	
300P596930134300	Imp.	Mallik P-59		Y		
300G126930132450	Esso et al.	Mayogiak G-12		Y		
300J176930132450	I.O.E.	Mayogiak J-17		Y	Y	
300L396930132450	Imp.	Mayogiak L-39	Y		Y	
300I536950136150	Esso et al.	Minuk I-53	Y	Y*	Y	has additional points
300M016840134300	Esso et al.	Napartok M-01	Y		Y	
300F316830134450	Shell	Napoiak F-31	Y		Y	
300H506950131300	I.O.E.	Natagnak H-50	Y			
300K236950131300	I.O.E.	Natagnak K-23	Y			
300K536950131300	Imp. et al.	Natagnak K-53		Y	Y	
300O447010137000	Dome et al.	Natiak O-44	Y	Y*		suspect Shell data wrong
300E566950139300	Dome	Natsek E-56	Y		Y	
300K597030136000	Dome et al.	Nektoralik K-59	Y		Y	
300J677030133000	Dome et al.	Nerlerk J-67		Y		
300M987030133000	Dome	Nerlerk M-98	Y		Y	
300B446940135450	Imp.	Netserk B-44	Y		Y	
300F406940135450	Imp.	Netserk F-40	Y		Y	
300B196920135150	Shell	Niglintgak B-19	Y			
300H306920135150	Shell	Niglintgak H-30	Y			
300M196920135150	Shell	Niglintgak M-19	Y		Y	
300L196950135150	Esso et al.	Nipterk L-19		Y	Y	
300L867010134000	Gulf et al.	North Issungnak L-86	Y		Y	
300C226950134450	Imp.	Nuktak C-22	Y		Y	
300A106910133150	Esso et al.	Nuna A-10		Y	Y	
300A326910133150	Imp.	Nuna A-32		Y	Y	
300E406910133150	Esso et al.	Nuna E-40		Y		
300O097000130300	I.O.E.	Nuvorak O-09	Y			
300J066850133450	Gulf Mobil	Ogeoqeoq J-06	Y			
300M316900134150	Gulf et al.	Ogruknang M-31	Y			
300H016920136000	Chevron et al.	Olivier H-01			Y	
300C386850133300	Gulf	Onigat C-38 (E. Reindeer C-38)	Y			
300D526850133300	Gulf et al.	Onigat D-52		Y	Y	
300K496850133300	Gulf et al.	Onigat K-49		Y	Y	
300C606940136150	Devon	Paktoa C-60			Y	
300A446900133300	Gulf et al.	Parsons A-44	Y			

UWI	Company	Well Name	Check shots		VSP/Crystal Cable	Comments on*
			Shell		NEB	
300F096900133300	Gulf et al.	Parsons F-09	Y		Y	
300N106900133300	Gulf et al.	Parsons N-10	Y			
300O276900133300	Gulf et al.	Parsons O-27	Y			
300P536900133300	Gulf et al.	Parsons P-53	Y			
300B356940135150	Sun et al.	Pelly B-35	Y			
300E546930132300	I.O.E.	Pikiolik E-54		Y	Y	
300M266930132300	I.O.E.	Pikiolik M-26		Y	Y	
300A057000136450	Gulf et al.	Pitsiulak A-05		Y	Y	
300E176950134150	Imp.	Pullen E-17		Y	Y	
300A416910134300	Gulf et al.	Reindeer A-41	Y			
300D276910134300	B.A. et al.	Reindeer D-27	Y			
300F366910134300	Gulf et al.	Reindeer F-36	Y			
300L416930138450	Pacific et al.	Roland BayYt.L-41	Y		Y	
300H237010130000	Imp. et al.	Russell H-23		Y	Y	
300B356930136150	Imp.	Sarpik B-35	Y		Y	
300D506840133450	Gulf et al.	Shakgatlatachig D-50		Y	Y	
300P606840133300	Gulf	Sholokpaoqak P-60 (E.Reindeer P-60)	Y	Y*		has two additional points
300A126910133300	Gulf et al.	Siku A-12		Y		
300C556910133300	Gulf et al.	Siku C-55	Y			
300I057030134300	Dome et al.	Siulik I-05	Y	Y*		suspect Shell data wrong
300N586910138300	I.O.E.	Spring River Yt. N-58	Y		Y	
300C426930134450	I.O.E.	Taglu C-42	Y		Y	
300D436930134450	I.O.E.	Taglu D-43 (F-43)	Y		Y	
300D556930134450	I.O.E.	Taglu D-55	Y		Y	
300G336930134450	I.O.E.	Taglu G-33	Y		Y	
300H546930134450	Imp.	Taglu H-54	Y		Y	
300H066930135000	Esso et al.	Taglu West H-06	Y			
300P036930135000	Imp.	Taglu West P-03	Y			
300A257000136150	Dome et al.	Tarsiut A-25	Y		Y	
300K266910135000	Gulf et al.	Titalik K-26	Y			
300O156910135000	Shell et al.	Titalik O-15	Y			
300H246920134450	Gulf et al.	Toapolok H-24	Y			
300O546920134450	Gulf et al.	Toapolok O-54	Y			
300B406920133000	Esso et al.	Tuk B-40		Y		
300F186920133000	I.O.E.	Tuk F-18	Y			
300G396920133000	Esso et al.	Tuk G-39		Y		
300G486920133000	Esso et al.	Tuk G-48		Y		
300L096920133000	Esso et al.	Tuk L-09 (M-09)		Y	Y	
300O196920132450	I.O.E.	Tuktu O-19	Y		Y	
300A126930133000	Esso et al.	Tuktuk A-12		Y		
300D116930133000	Esso et al.	Tuktuk D-11		Y		
300H226930133000	Esso et al.	Tuktuk H-22		Y		
300K316900135000	Shell	Tullugak K-31	Y			
300F306900134300	Gulf et al.	Tununuk F-30	Y			
300K106900134450	I.O.E.	Tununuk K-10	Y			
302C507010132300	Dome et al.	Ukalerk 2C-50	Y		Y	
300C507010132300	Dome et al.	Ukalerk C-50	Y		Y	
300A356850135450	Shell	Ulu A-35	Y			
300J376930134150	Imp.	Umiak J-37	Y		Y	
300N056930134150	Encana et al.	Umiak N-05			Y	
300B116850135150	Shell	Unak B-11	Y		Y	
300L286850135150	Shell et al.	Unak L-28	Y			
300B126920135150	Shell	Unipkat B-12	Y			
300I226920135150	Shell	Unipkat I-22	Y			
300N126920135150	Shell et al.	Unipkat N-12	Y			
300C216930135150	Chevron et al.	Upluk C-21	Y		Y	
300L426930135150	Chevron et al.	Upluk L-42	Y		Y	
300M386930135150	Chevron et al.	Upluk M-38	Y	Y*	Y	Recalculation of vertical time
300P667020132000	Dome et al.	Uviluk P-66	Y	Y*	Y	suspect Shell data wrong
300C236920133150	Imp. et al.	Wagnark C-23		Y	Y	
300G126920133150	Imp.	Wagnark G-12	Y	Y*	Y	has additional deep data
300L366920133150	Esso et al.	Wagnark L-36		Y		
300L176950132000	Esso et al.	West Atkinson L-17	Y			
300P457000136150	Gulf et al.	West Tarsiut P-45		Y	Y	
300A286920134300	Gulf et al.	YaYa A-28	Y			
300I176920134300	Gulf et al.	YaYa I-17	Y			
300M336920134300	Gulf et al.	YaYa M-33	Y			
300P536920134300	Gulf et al.	YaYa P-53	Y			

Vertical depth (D_{gd}) and vertical travel time (T_{gd}) from seismic reference datum (SRD) to geophone are calculated as follows:

$$D_{gd} = D_{gm} - (E_W - E_{SRD}) \tag{1}$$

$$T_{gd} = T\cos\alpha - D_{sd}/V_E \qquad \text{where} \quad \cos\alpha = D_{gs}/[(H^2 + D_{gs}^2)^{1/2}] \tag{2}$$

D_{gm} - geophone depth below well elevation
D_{wd} - difference between well elevation and elevation datum = $E_w - E_{SRD}$
D_{gd} - geophone depth below elevation datum (SRD) = $D_{gm} - D_{wd}$
D_{gs} - geophone depth below shot elevation = $D_{gd} + D_{sd}$
d_s - depth of shot
D_{sd} - difference between shothole elevation and SRD = $E_{SH} - d_s - E_{SRD}$
D_{sd}/V_E - time correction from shot to SRD
E_{SRD} - elevation of seismic reference datum (SRD)
E_s - elevation of shot
H - horizontal distance from well to shothole
E_W - elevation of well with respect to kelly bushing
T - observed travel time from shot to well geophone
T_{gs} - vertical travel time for D_{gs} distance = $T * \cos\alpha$
T_{gd} - vertical travel time for D_{gd} distance = $T_{gs} - D_{sd}/V_E$
V_E - elevation correction velocity

Figure 1. Definition of terms for borehole seismic survey
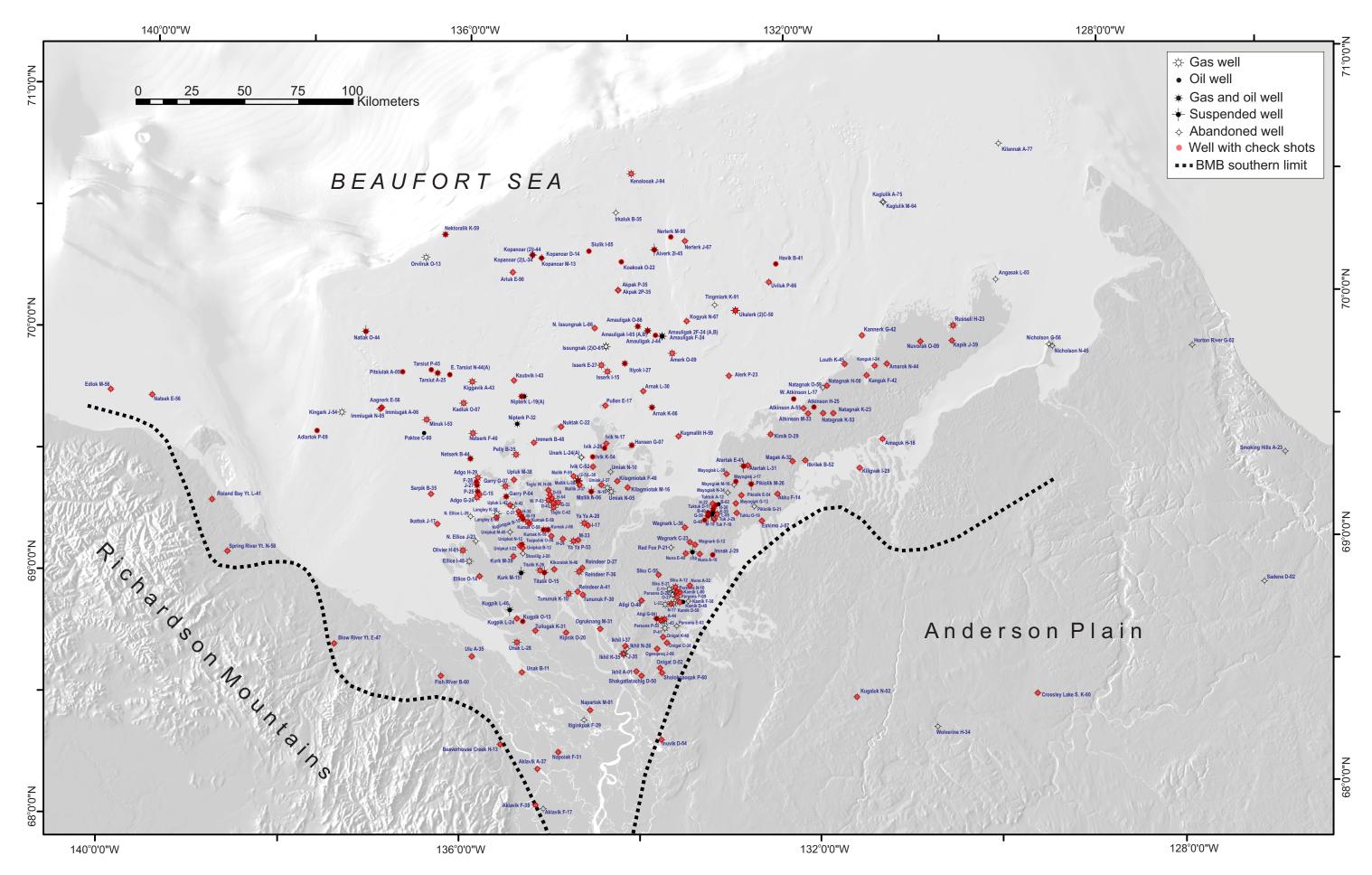
Figure 2. The location of the wells with check-shot surveys, Beaufort-Mackenzie Basin.
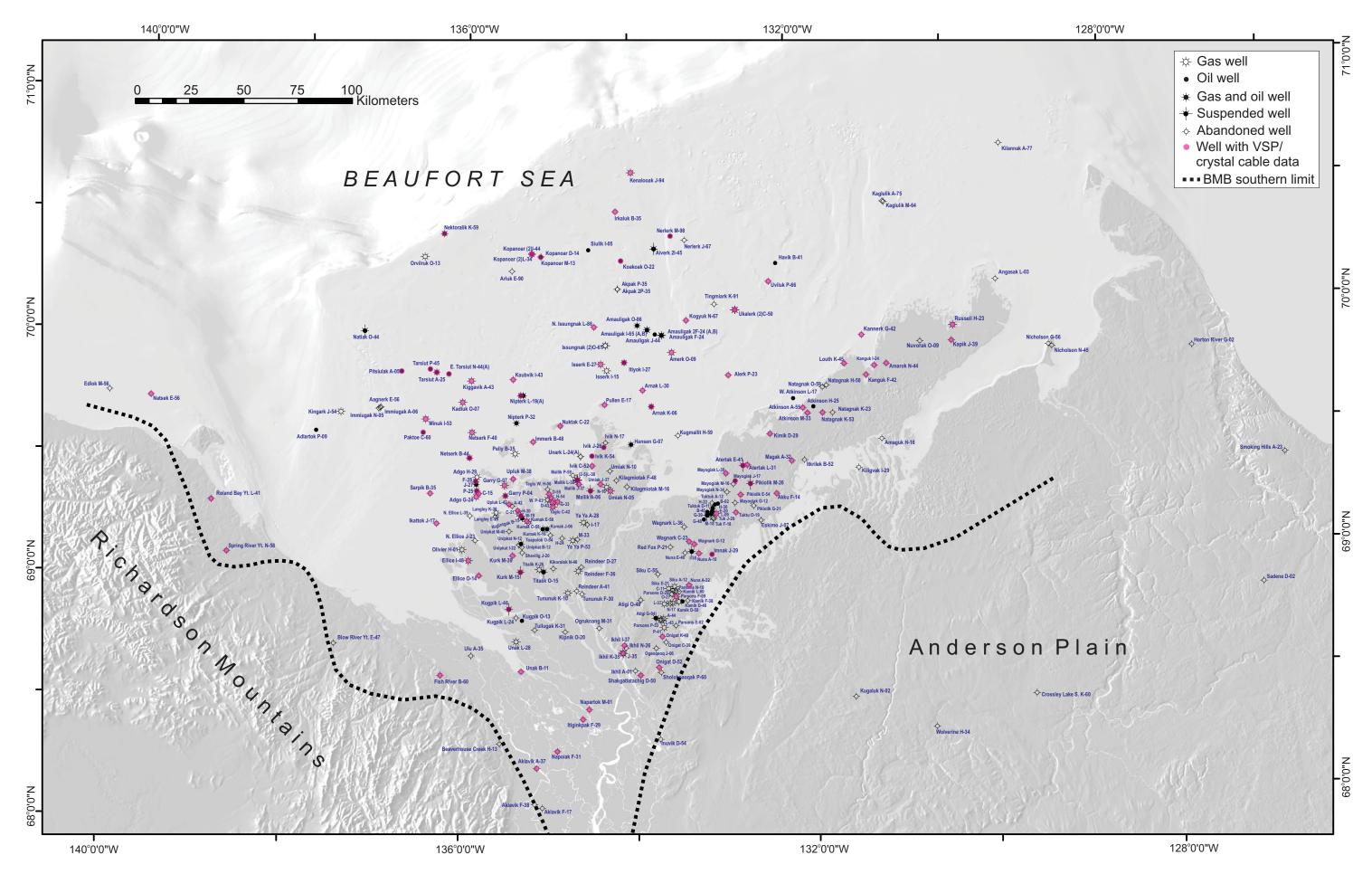
Figure 3. The location of the wells with VSP/crystal cable data, Beaufort-Mackenzie Basin.
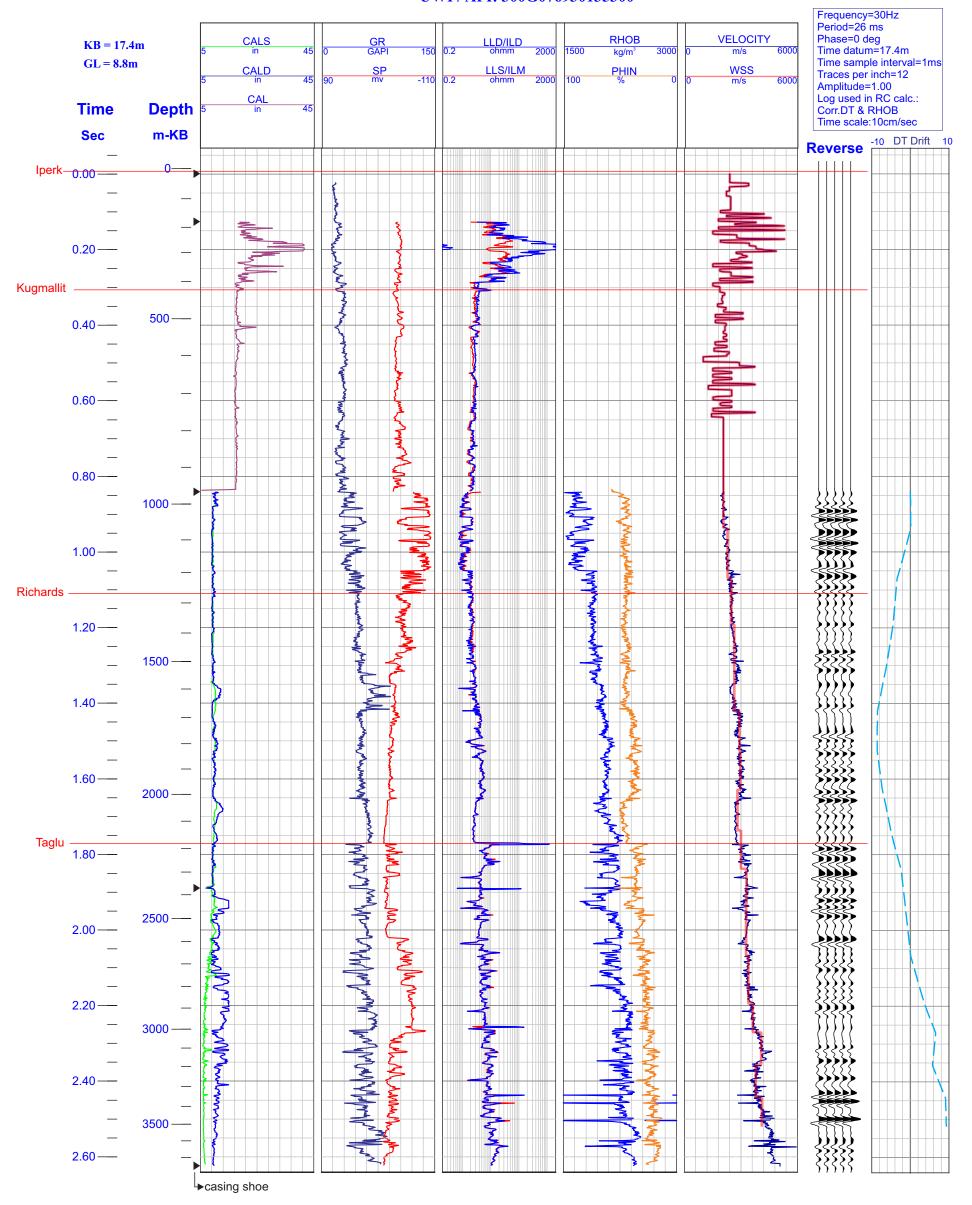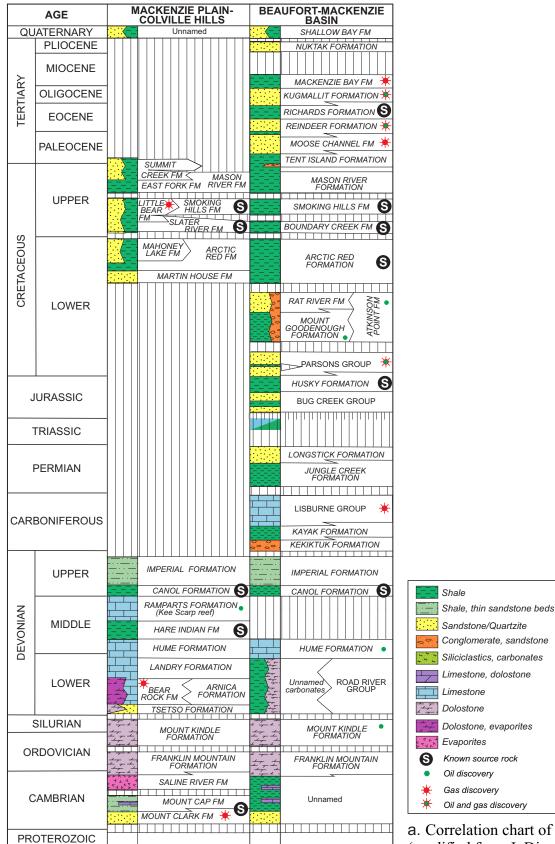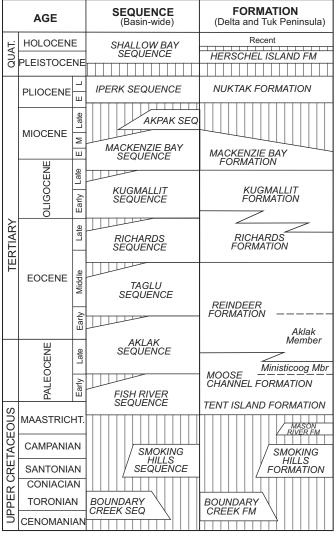
Figure 4. An example presenting well logs and synthetic, containing a time/depth window and seven tracks for Garry G-07 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and general caliper (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD) and medium (LLS/ILM) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse). The seventh track illustrates the DT drift curve.

Figure 5. Stratigraphic correlation chart and formation/stratigraphic units for the Beaufort-Mackenzie Basin.

a. Correlation chart of Phanerozoic strata (modified from J. Dixon et al., 2007; Fig. 2)

AGE		MACKENZIE PLAIN-COLVILLE HILLS	BEAUFORT-MACKENZIE BASIN
QUATERNARY		Unnamed	SHALLOW BAY FM
TERTIARY	PLIOCENE		NUKTAK FORMATION
	MIOCENE		MACKENZIE BAY FM
	OLIGOCENE		KUGMALLIT FORMATION
	EOCENE		RICHARDS FORMATION
			REINDEER FORMATION
	PALEOCENE		MOOSE CHANNEL FM
			TENT ISLAND FORMATION
CRETACEOUS	UPPER	SUMMIT CREEK FM / EAST FORK FM / MASON RIVER FM	MASON RIVER FORMATION
		LITTLE BEAR FM / SMOKING HILLS FM / SLATER RIVER FM	SMOKING HILLS FM
			BOUNDARY CREEK FM
	LOWER	MAHONEY LAKE FM / ARCTIC RED FM	ARCTIC RED FORMATION
		MARTIN HOUSE FM	
			RAT RIVER FM
			MOUNT GOODENOUGH FORMATION / ATKINSON POINT FM
JURASSIC			PARSONS GROUP
			HUSKY FORMATION
			BUG CREEK GROUP
TRIASSIC			
PERMIAN			LONGSTICK FORMATION
			JUNGLE CREEK FORMATION
CARBONIFEROUS			LISBURNE GROUP
			KAYAK FORMATION
			KEKIKTUK FORMATION
DEVONIAN	UPPER	IMPERIAL FORMATION	IMPERIAL FORMATION
		CANOL FORMATION	CANOL FORMATION
	MIDDLE	RAMPARTS FORMATION (Kee Scarp reef)	
		HARE INDIAN FM	
		HUME FORMATION	HUME FORMATION
	LOWER	LANDRY FORMATION	
		BEAR ROCK FM / ARNICA FORMATION	Unnamed carbonates / ROAD RIVER GROUP
		TSETSO FORMATION	
SILURIAN		MOUNT KINDLE FORMATION	MOUNT KINDLE FORMATION
ORDOVICIAN		FRANKLIN MOUNTAIN FORMATION	FRANKLIN MOUNTAIN FORMATION
CAMBRIAN		SALINE RIVER FM	
		MOUNT CAP FM	Unnamed
		MOUNT CLARK FM	
PROTEROZOIC			

Legend:
- Shale
- Shale, thin sandstone beds
- Sandstone/Quartzite
- Conglomerate, sandstone
- Siliciclastics, carbonates
- Limestone, dolostone
- Limestone
- Dolostone
- Dolostone, evaporites
- Evaporites
- (S) Known source rock
- Oil discovery
- Gas discovery
- Oil and gas discovery

b. Comparison of lithostratigraphic and sequence stratigraphic nomenclature (modified from J. Dixon et al., 2007; Fig. 4.)

AGE			SEQUENCE (Basin-wide)	FORMATION (Delta and Tuk Peninsula)
QUAT.	HOLOCENE		SHALLOW BAY SEQUENCE	Recent
	PLEISTOCENE			HERSCHEL ISLAND FM
TERTIARY	PLIOCENE	L / E	IPERK SEQUENCE	NUKTAK FORMATION
	MIOCENE	Late	AKPAK SEQ	
		M / E	MACKENZIE BAY SEQUENCE	MACKENZIE BAY FORMATION
	OLIGOCENE	Late	KUGMALLIT SEQUENCE	KUGMALLIT FORMATION
		Early	RICHARDS SEQUENCE	RICHARDS FORMATION
	EOCENE	Late / Middle	TAGLU SEQUENCE	REINDEER FORMATION
		Early	AKLAK SEQUENCE	Aklak Member
	PALEOCENE	Late		Ministicoog Mbr
			MOOSE CHANNEL FORMATION	
		Early	FISH RIVER SEQUENCE	TENT ISLAND FORMATION
UPPER CRETACEOUS	MAASTRICHT.			MASON RIVER FM
	CAMPANIAN		SMOKING HILLS SEQUENCE	SMOKING HILLS FORMATION
	SANTONIAN			
	CONIACIAN			
	TORONIAN		BOUNDARY CREEK SEQ	BOUNDARY CREEK FM
	CENOMANIAN			

Formation/Stratigraphic units list

Aklavik – Aklavik Formation
Akpak – Akpak Sequence
Albian Flysch Formation
Almstrom Crk. – Almstrom Creek Formation
Arctic Red - Arctic Red Formation
Arnica - Arnica Formation
Atkinson Pt. - Atkinson Point Formation
Bluefish - Bluefish Member
Boundary Crk. - Boundary Creek Sequence/Formation
Bug Crk. - Bug Creek Group
Cambrian
Cambrian-Precambrian
Canol - Canol Formation
Carboniferous
Cretaceous
Cuesta Crk. - Cuesta Creek Member
Devonian
Eocene
Fault
Fish River - Fish River Sequence
Franklin Mtn. - Franklin Mountain Formation
Gossage - Gossage Formation
Hare Indian - Hare Indian Formation
Horton River - Horton River Formation
Hume - Hume Formation
Husky - Husky Formation
Imperial - Imperial Formation
Iperk - Iperk Sequence
Jungle Crk. - Jungle Creek Formation
Kamik - Kamik Formation
Kayak - Kayak Formation
Kugmallit / Kugmallit Seq. - Kugmallit Sequence
Kugmallit SF- Kugmallit Sub-Fan
Landry - Landry Formation
Langton Bay - Langton Bay Formation
Lisburne Grp. – Lisburne Group
L.Cambrian - Lower Cambrian
L.Cretaceous - Lower Cretaceous
L. Husky – Lower Husky Member
L. Paleozoic - Lower Paleozoic

L. Tertiary - Lower Tertiary
Mackenzie Bay - Mackenzie Bay Sequence
Manuel Crk. - Manuel Creek Formation
Martin Crk. - Martin Creek Formation
Mason River - Mason River Formation
McGuire -McGuire Formation
M. Ordovician - Middle Ordovician
Ministicoog - Ministicoog Member
Moose Channel - Moose Channel Formation
Mount Cap - Mount Cap Formation
Mount Clark - Mount Clark Formation
Mt. Goodenough / Mt. Goodenough Fm. – Mount Goodenough Formation
Mt. Goodenough Ss - Mount Goodenough sandstone
Mt. Kindle - Mount Kindle Formation
Murray Ridge - Murray Ridge Formation
Paleozoic
Parsons Grp. - Parsons Group
Peel - Peel Formation
Permian
Precambrian
Proterozoic
Quaternary
Rapid Crk. - Rapid Creek Formation
Rat River - Rat River Formation
Recent
Reindeer / Reindeer Seq./Fm.– Reindeer Sequence / Formation
Reindeer Superseq.- Reindeer Super sequence
Richards Fm.- Richards Formation
Richards / Richards Seq. - Richards Sequence
Richardson Mtn. - Richardson Mountains Formation
Ronning Grp. – Ronning Group
Saline River - Saline River Formation
Shallow Bay Formation
Siku - Siku Member
Smoking Hills – Smoking Hills Sequence/Formation
Taglu – Taglu Sequence
Tatsieta - Tatsieta Member
Tent Island - Tent Island Formation
Undefined
U. Cretaceous - Upper Cretaceous
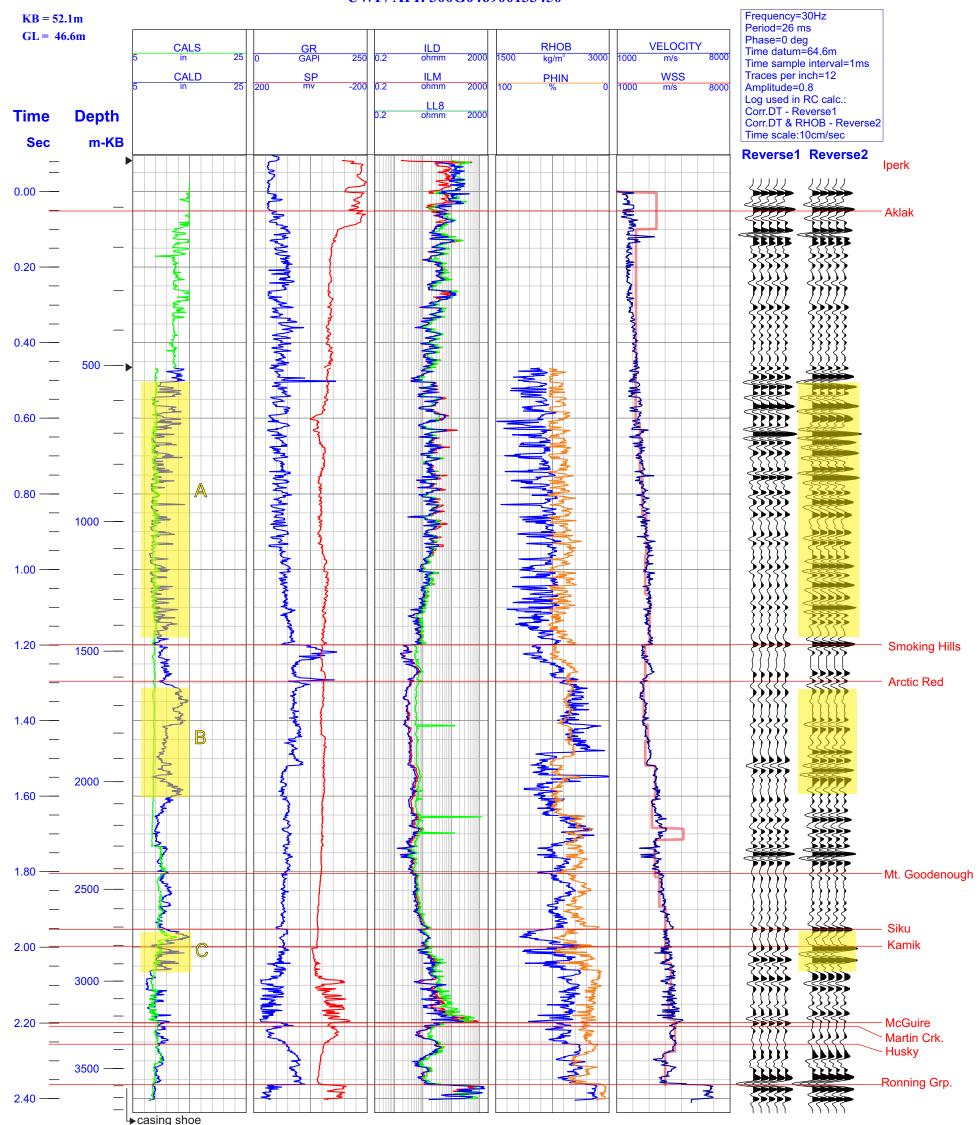
Figure 6. Comparison of synthetic profiles when single corrected DT, and both logs of corrected DT and density are used for generation of synthetic seismograms (Reverse1 and Reverse2). Major poor borehole intervals (A, B and C with yellow colour) are indicated by density caliper log, where a big difference occurs between Reverse1 and Reverse2 (with yellow colour), indicating that the stronger reflections (Reverse2) are caused by poor density readings that are badly affected by an enlarged and rugose borehole. Without caliper information, this could have been misinterpreted as a lithology change, or formation boundary, or hydrocarbon occurrence, or some other geological factor.

PIKIOLIK M-26

UWI / API: 300M266930132300

a. Synthetic profile when polynomial method is applied in sonic log correction.

b. Synthetic profile when block shift linear method is applied to sonic log correction.
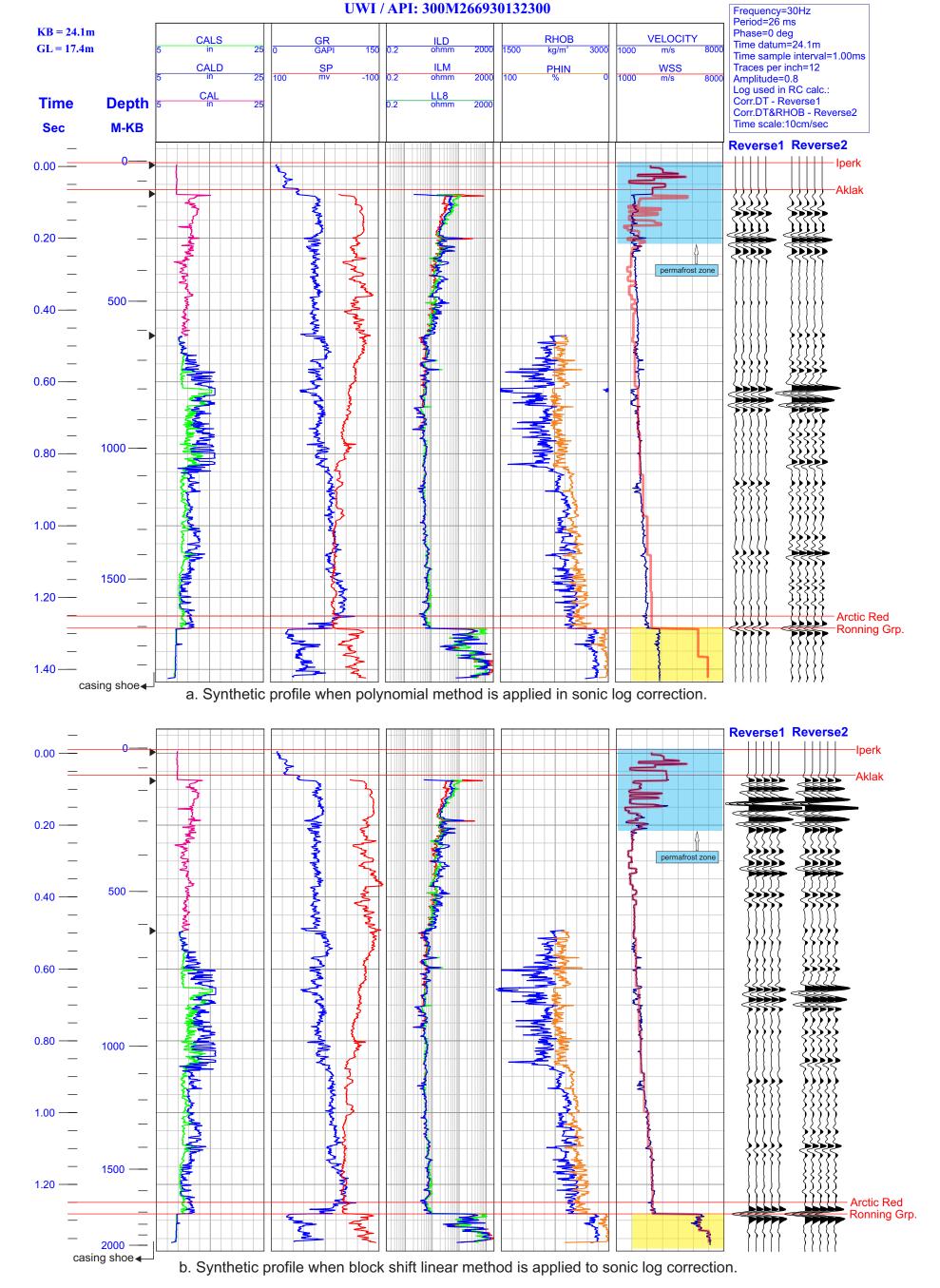
Figure 7. Comparison of synthetic profiles when different correction methods are used for sonic log correction for the Pikiolik M-26 well. Big differences are observed in two intervals, the shallow permafrost zone (the blue coloured) and the Ronning Group interval (the yellow coloured). The calculated velocity from the corrected sonic log is too low for the Ronning group when the polynomial method is applied (a). The block shift correction gives a good match between the calculated velocity and the borehole seismic velocity (b), even though strong reflection occurs in the shallow permafrost zone. Synthetic seismograms are affected by poor borehole conditions for some intervals (Reverse1 and Reverse2).
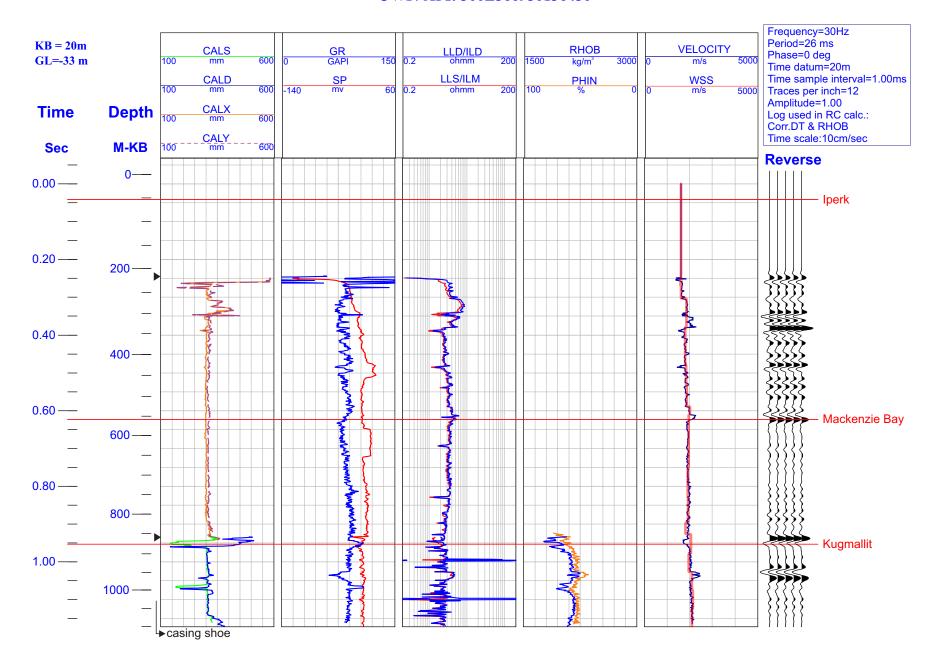
Figure 8. Well logs and synthetic for the Aagnerk E-56 well, time-depth window is displayed. The first track consists of caliper curves, including sonic caliper log (CALS), density caliper (CALD), caliper 1-3 (CALX) and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) logs; the third track shows deep (LLD/ILD), and medium (LLS/ILM) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
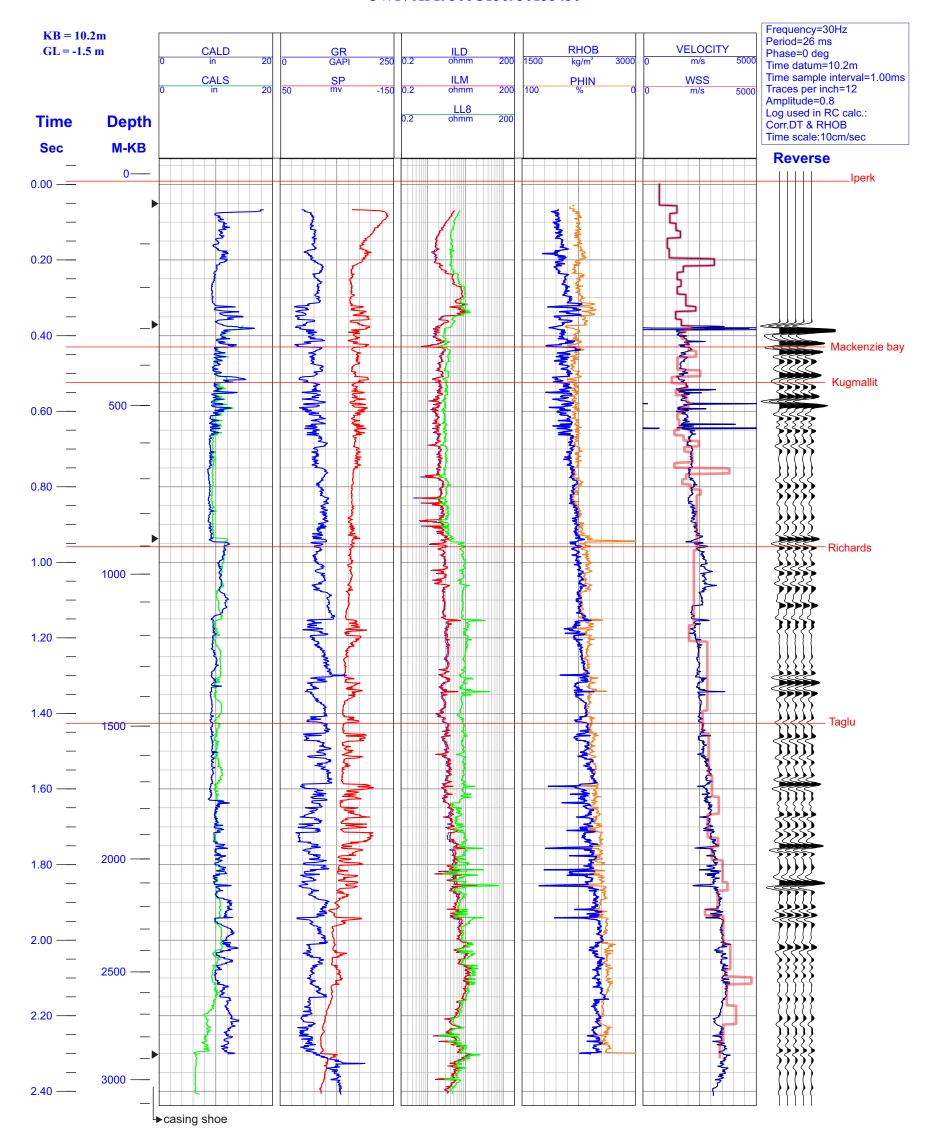
Figure 9. Log suite and synthetic for the Adgo C-15 well, time-depth window is displayed. The first track consists of sonic caliper log (CALS) and density caliper (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) logs; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

ADGO F-28

UWI / API: 300F286930135450
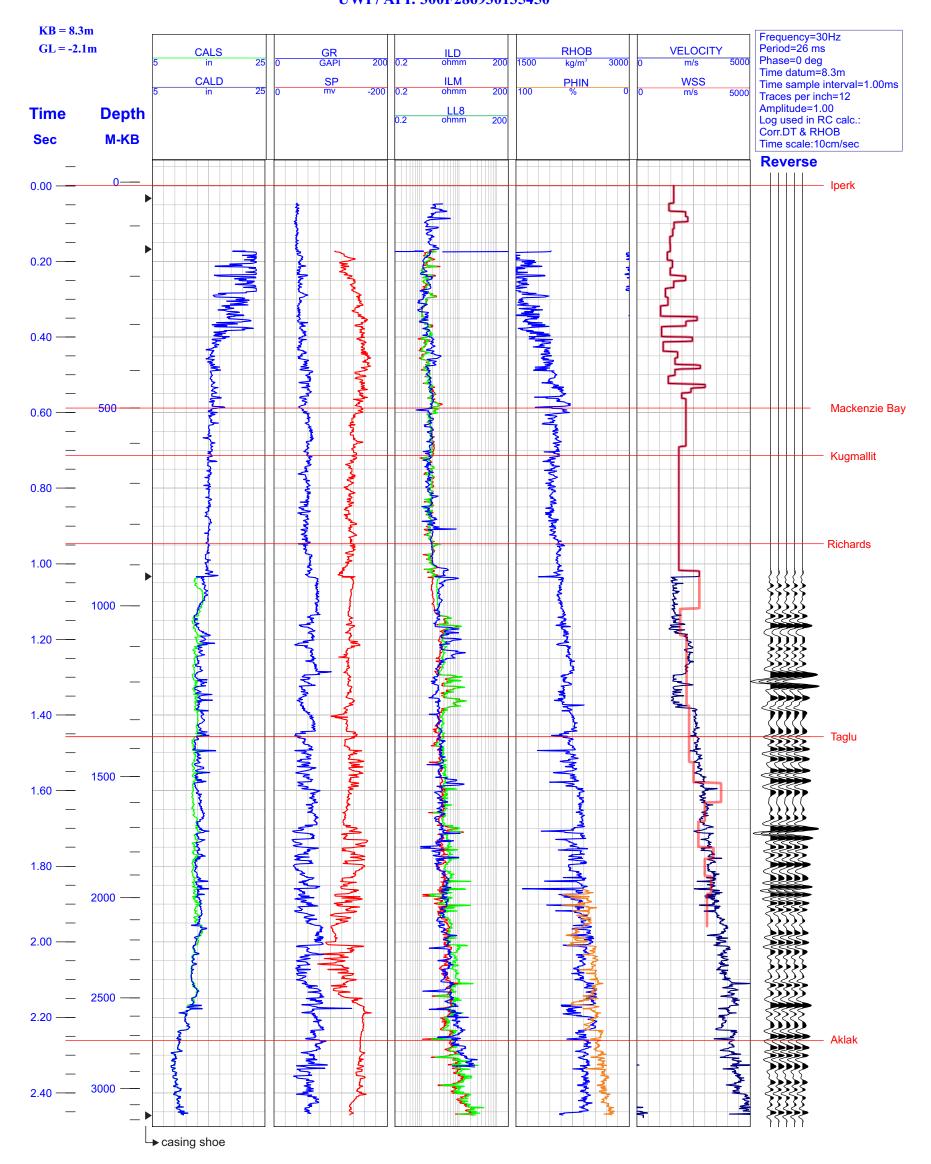
Figure 10. Log suite and synthetic for the Adgo F-28 well, time-depth window is displayed. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS- check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
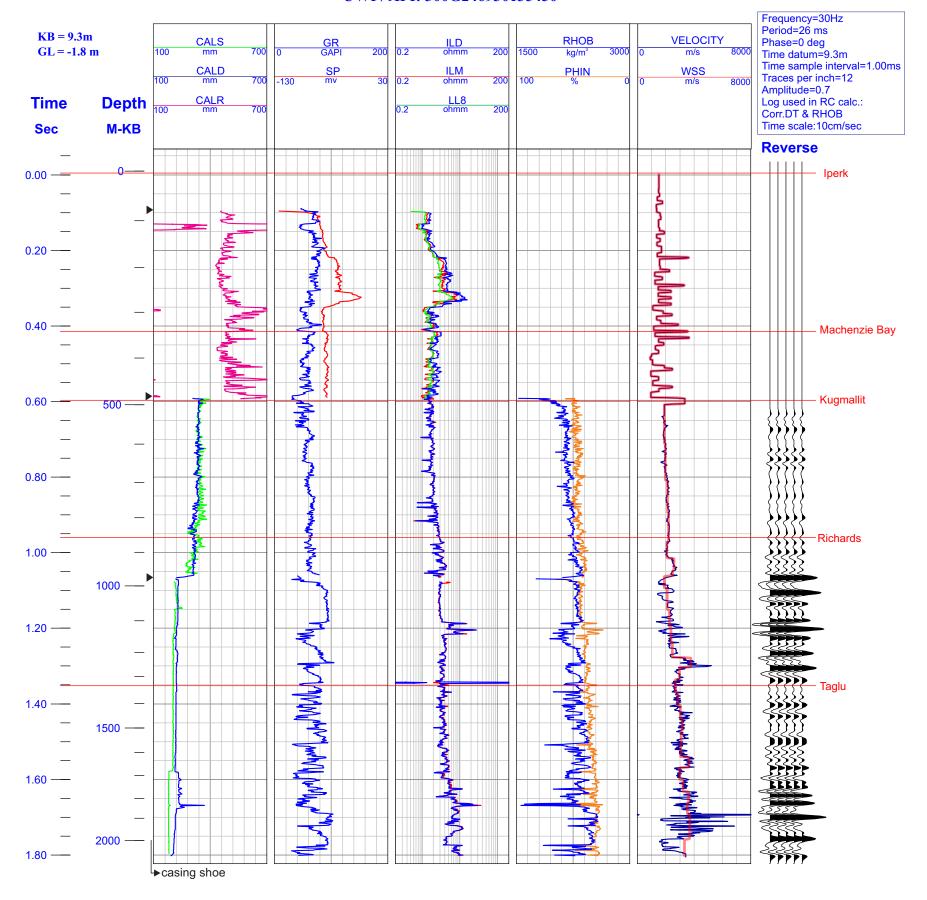
Figure 11. Well logs and synthetic for the Adgo G-24 well, time-depth window is shown. The first track consists of caliper curves, including sonic caliper log (CALS), density caliper (CALD), and resistivity caliper log (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) logs; the third track shows deep (ILD), and medium (ILM), and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
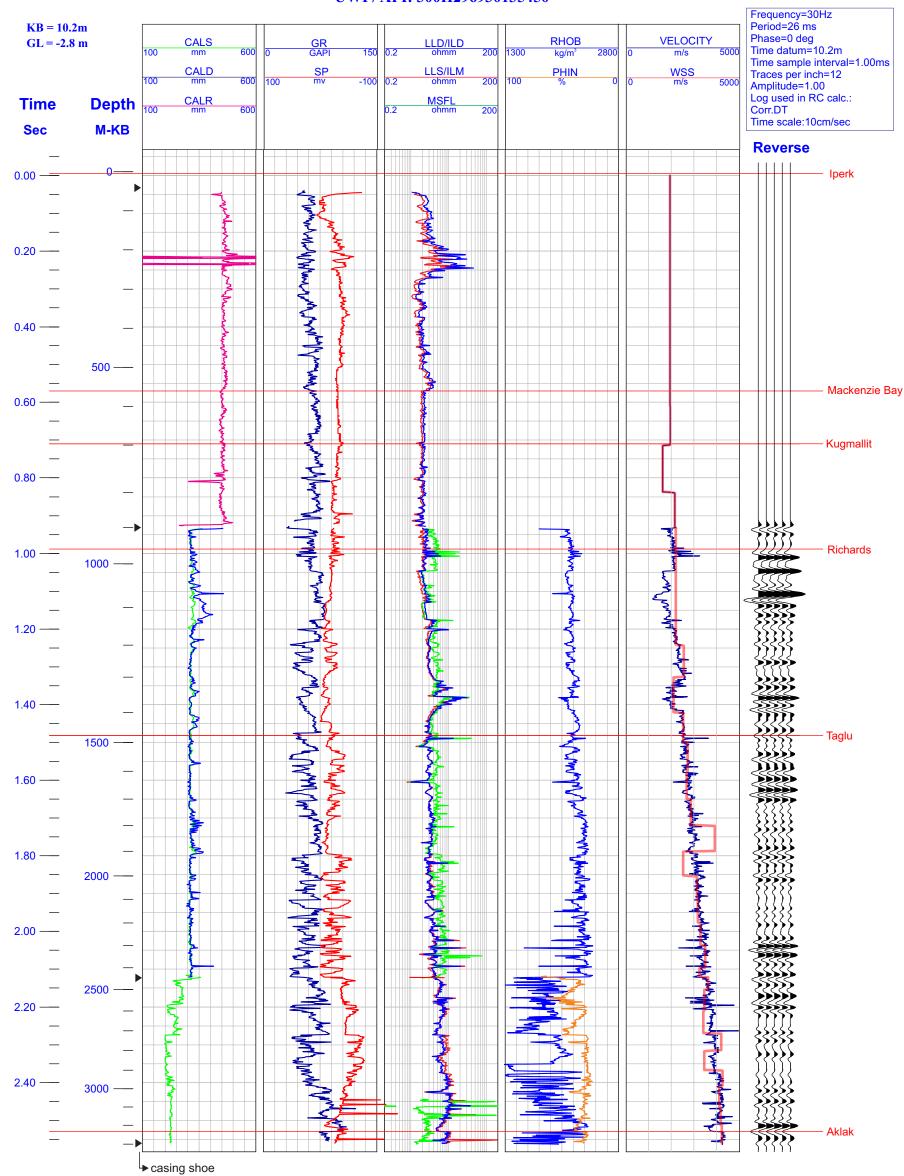
Figure 12. Well logs and synthetic for the Adgo H-29 well, time-depth window is illustrated. The first track consists of caliper curves, including sonic caliper log (CALS), density caliper (CALD), and resistivity caliper log (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) logs; the third track shows deep (LLD/ILD), medium (LLS/ILM) resistivity logs, and shallow (MSFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse), which is from single corrected DT due to poor density log data.
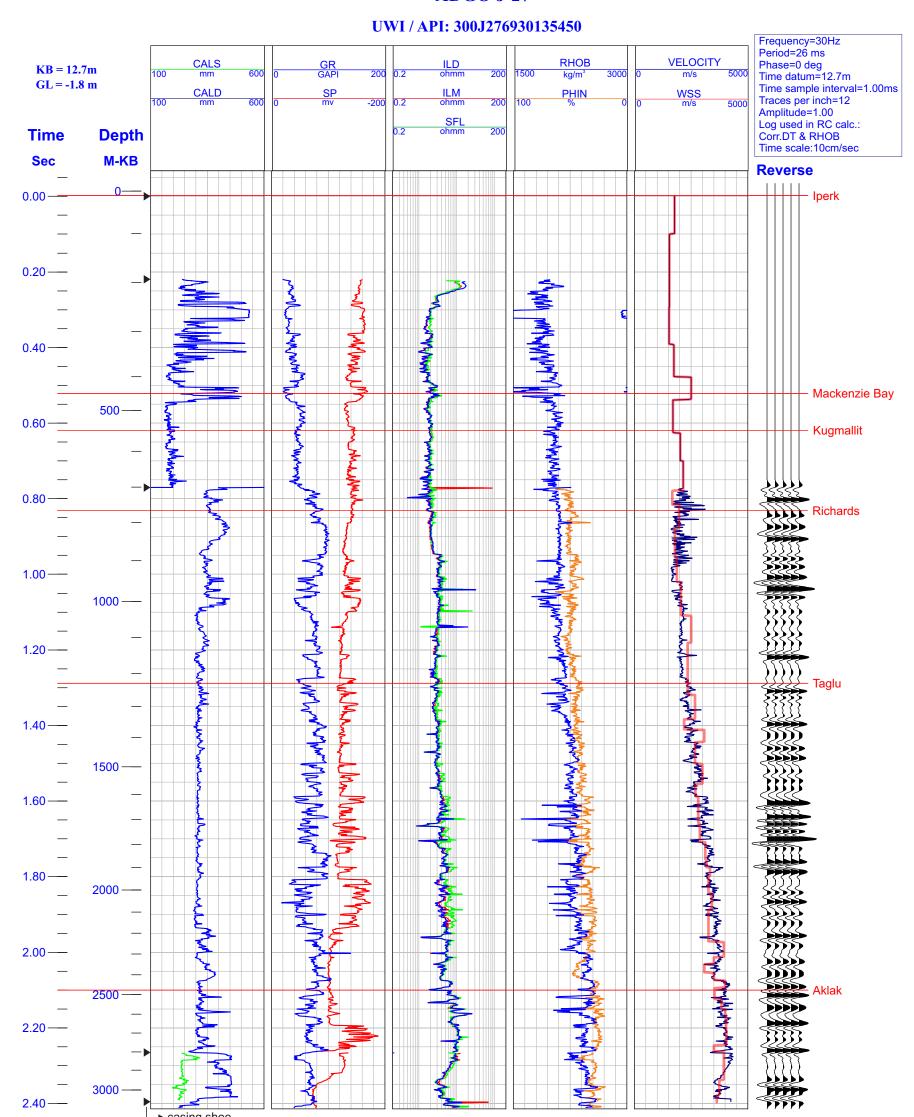
Figure 13. Well logs and synthetic of the Adgo J-27 well, time-depth window is shown. The first track consists of caliper curves, including sonic caliper log (CALS), and density caliper (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) logs; the third track shows deep (ILD), and medium (ILM), and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
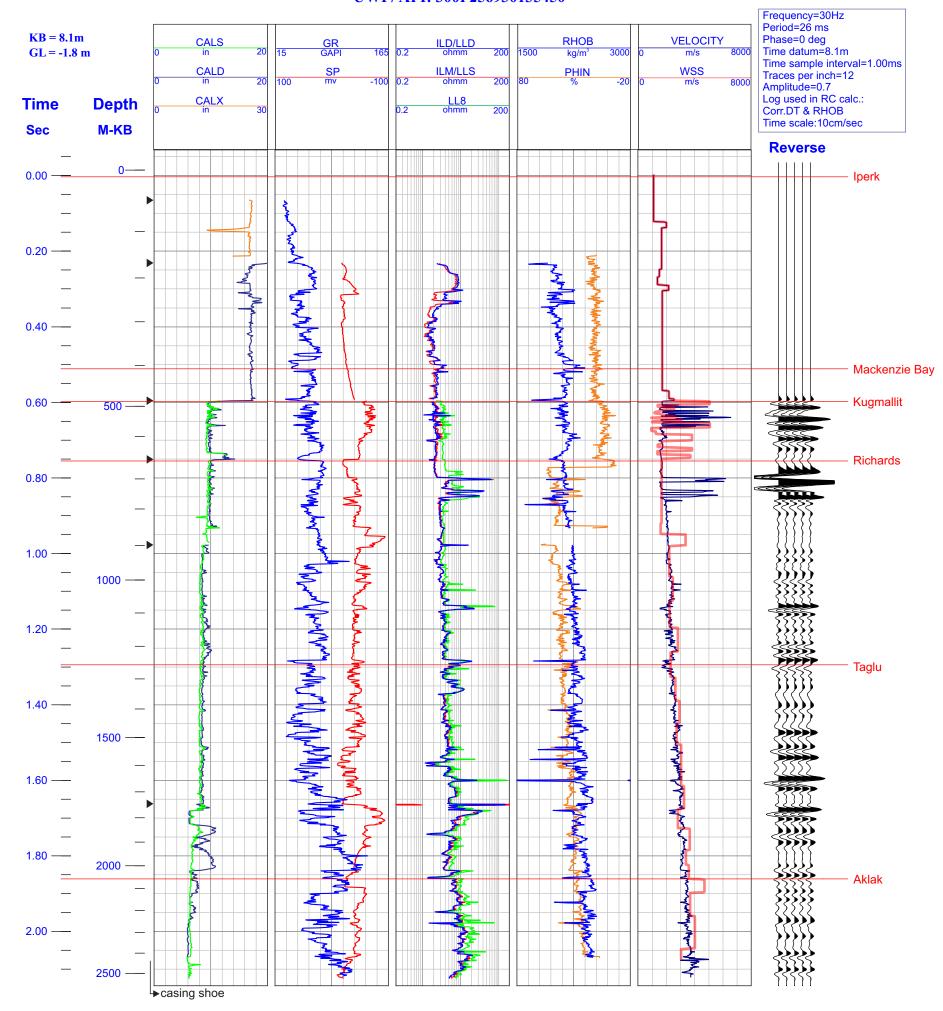
Figure 14. Well logs and synthetic of the Adgo P-25 well, time-depth window is illustrated. The first track consists of caliper curves, including sonic caliper log (CALS), density caliper (CALD) and caliper 1-3 (CALX); the second track contains gamma ray (GR) and spontaneous potential (SP) logs; the third track shows deep (LLD/ILD), and medium (LLS/ILM), and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
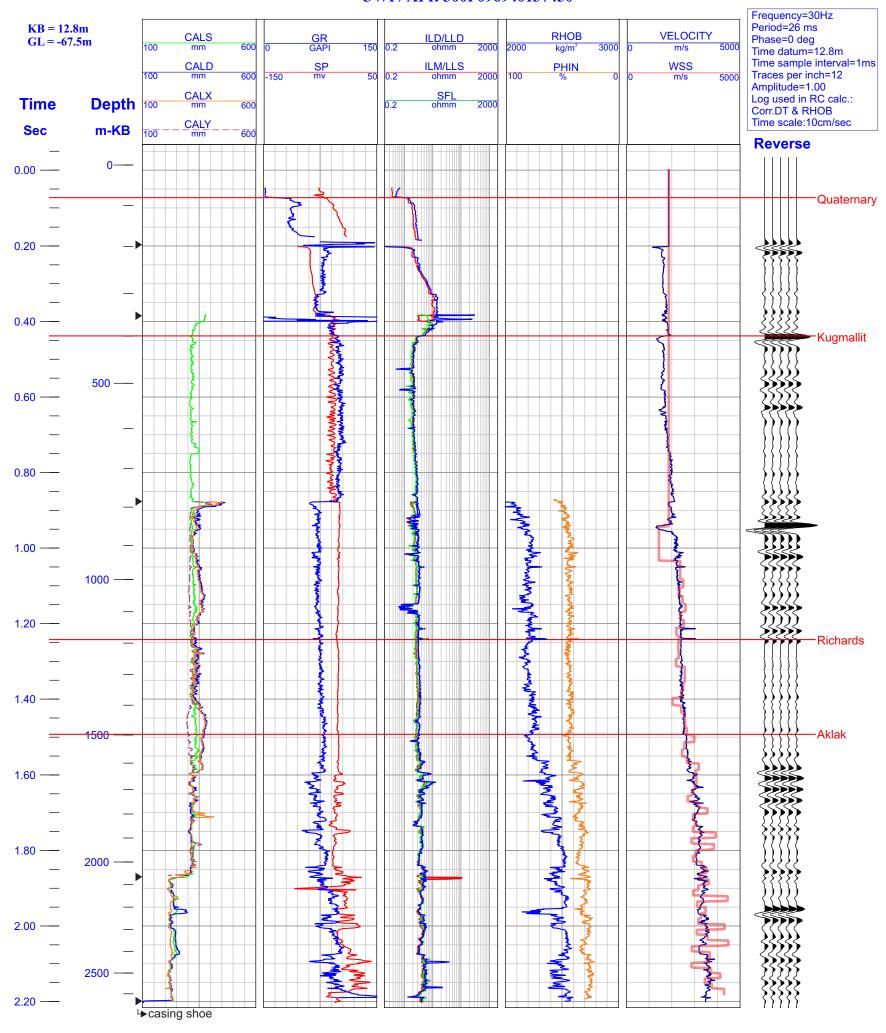
Figure 15. Well logs and synthetic of the Adlartok P-09 well, time-depth window is illustrated. The first track consists of caliper curves, including sonic caliper log (CALS), density caliper (CALD), caliper 1-3 (CALX) and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) logs; the third track shows deep (LLD/ILD), and medium (LLS/ILM), and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
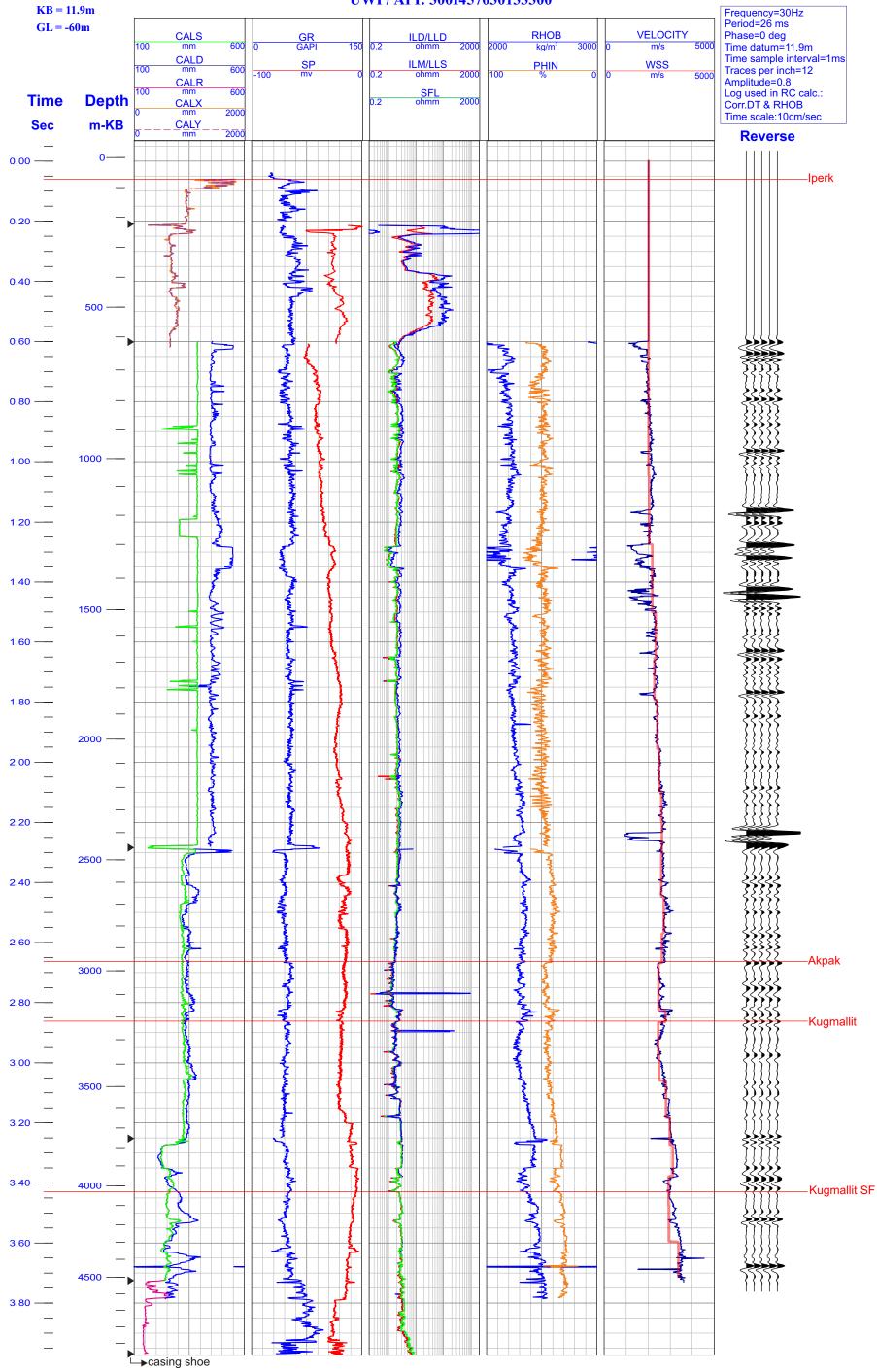
Figure 16. Well logs and synthetic of the Aiverk 2I-45 well, time-depth window is illustrated. The first track consists of caliper curves, including sonic caliper log (CALS), density caliper (CALD), caliper 1-3 (CALX) and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) logs; the third track shows deep (LLD/ILD), and medium (LLS/ILM), and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

AKKU F-14

UWI / API: 300F146930132150
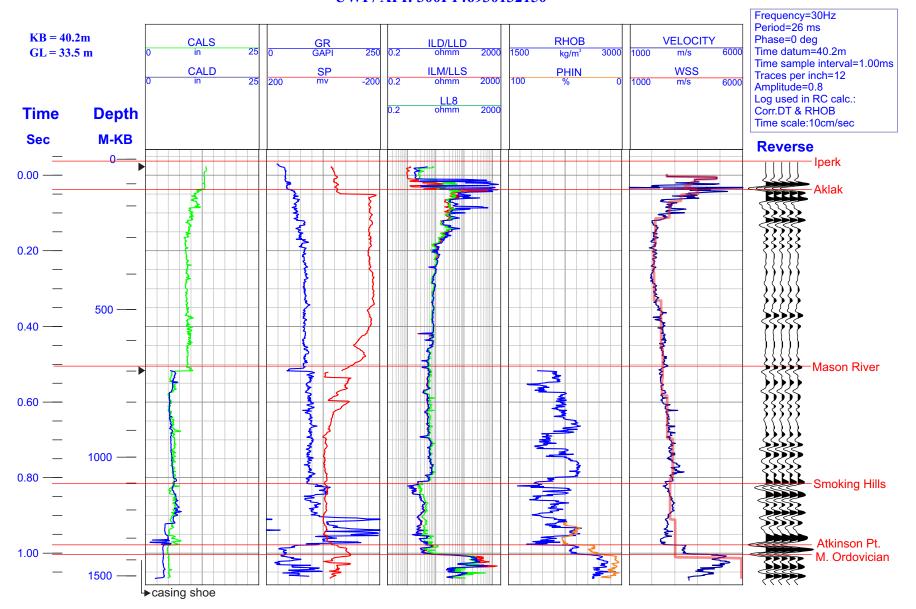
Figure 17. Well logs and synthetic of the Akku F-14 well, time-depth window is illustrated. The first track consists of caliper curves, including sonic caliper log (CALS), and density caliper (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) logs; the third track shows deep (LLD/ILD), medium (LLS/ILM) resistivity logs, and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
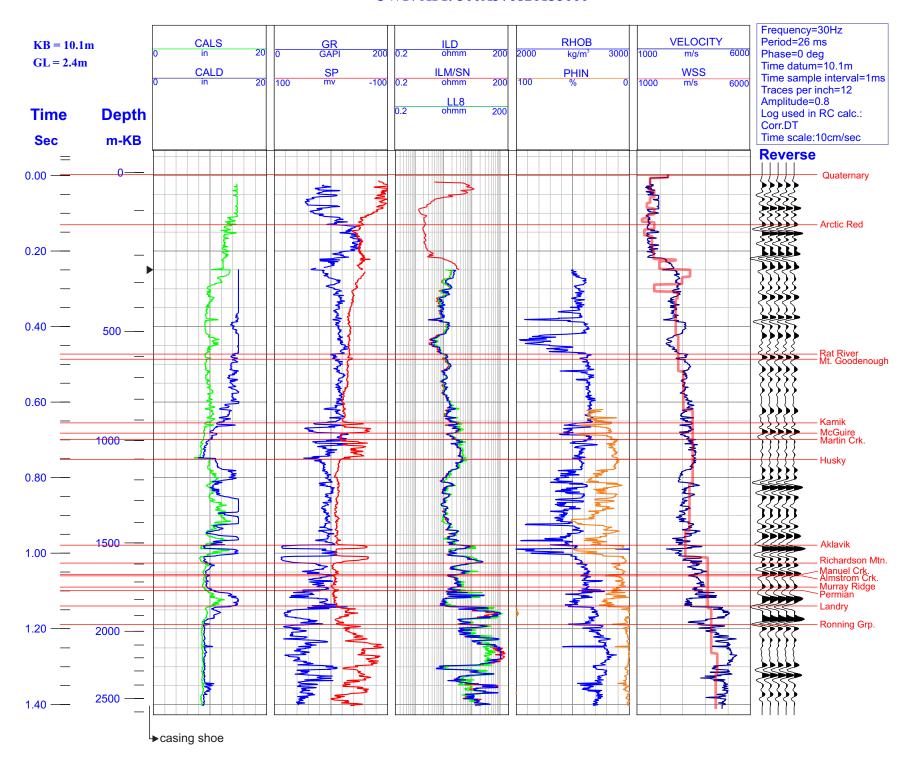
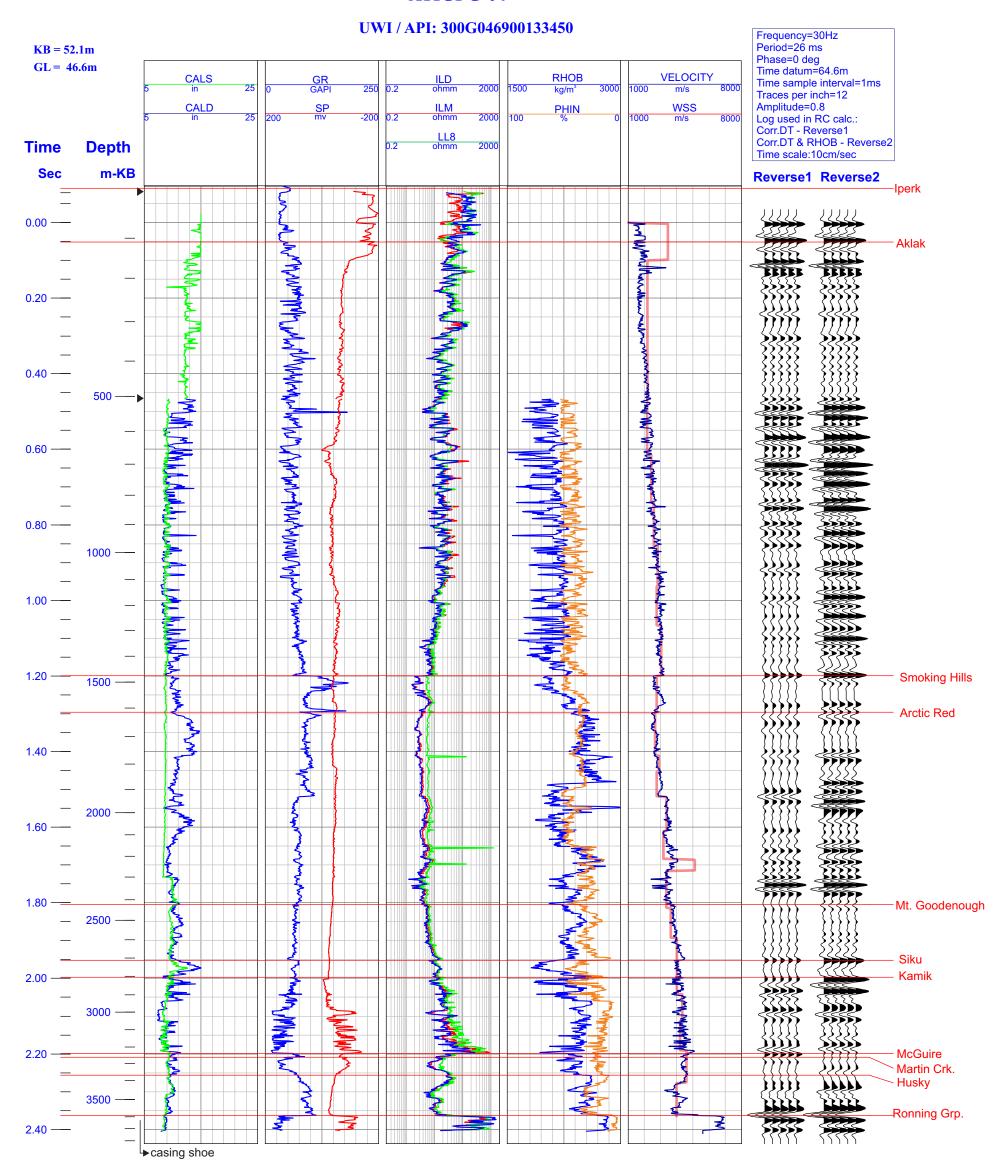Figure 18. Well logs and synthetic of the Aklavik A-37 well, time-depth window is illustrated. The first track consists of caliper curves, including sonic caliper log (CALS), and density caliper (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) logs; the third track shows deep (LLD/ILD), medium (LLS/ILM) resistivity logs, and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS - check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
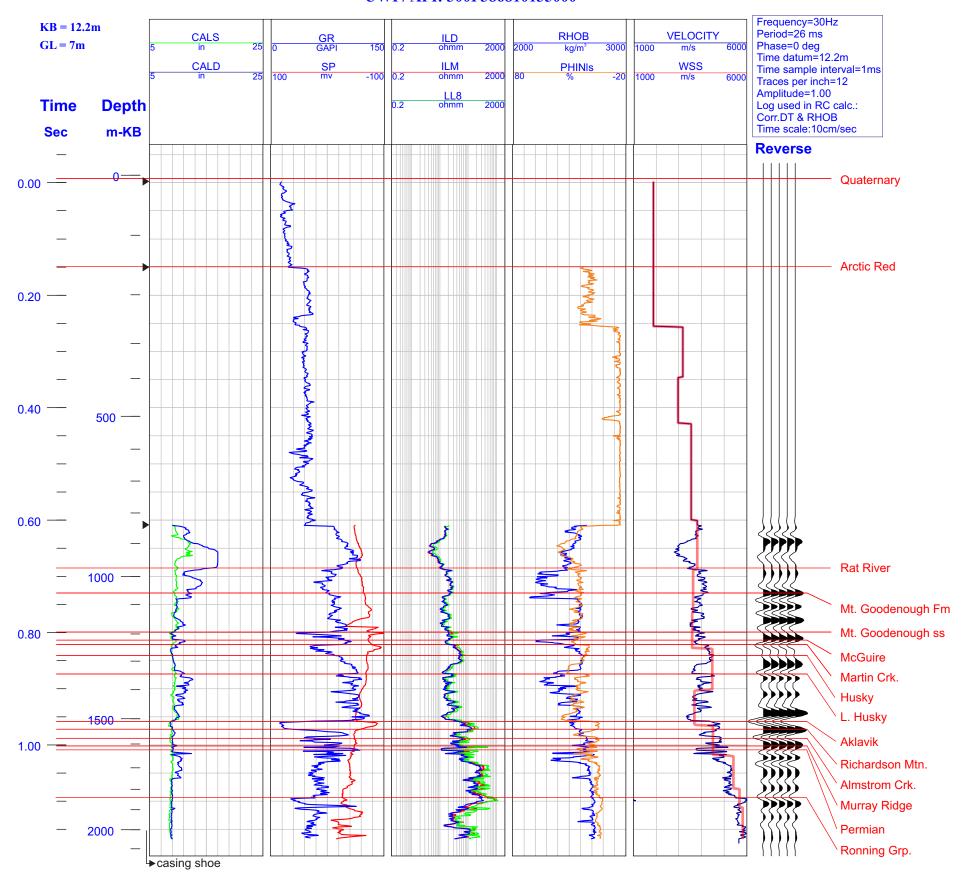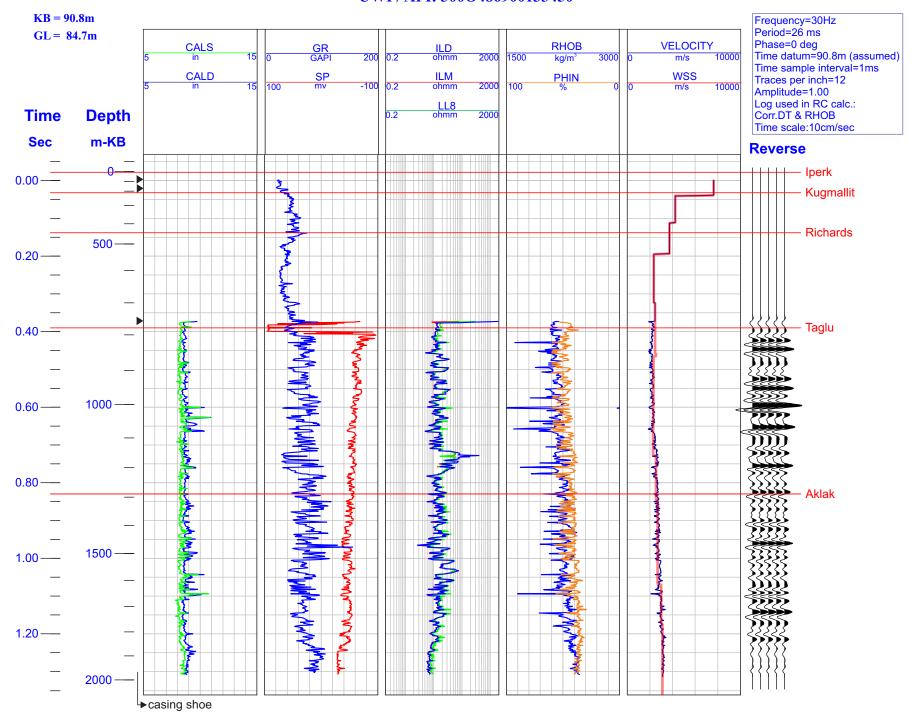
Figure 19. Well logs and synthetic of the Aklavik F-38 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; Track 3 shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHINls with limestone calibration) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
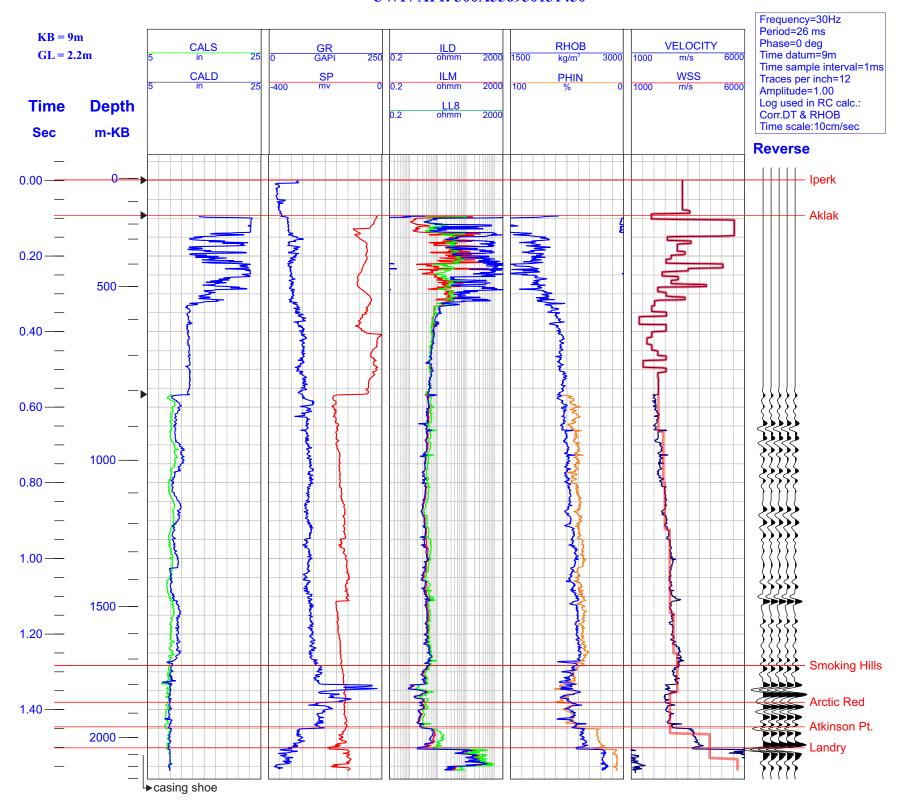
Figure 20. Well logs and synthetic of the Akpak 2P-35 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
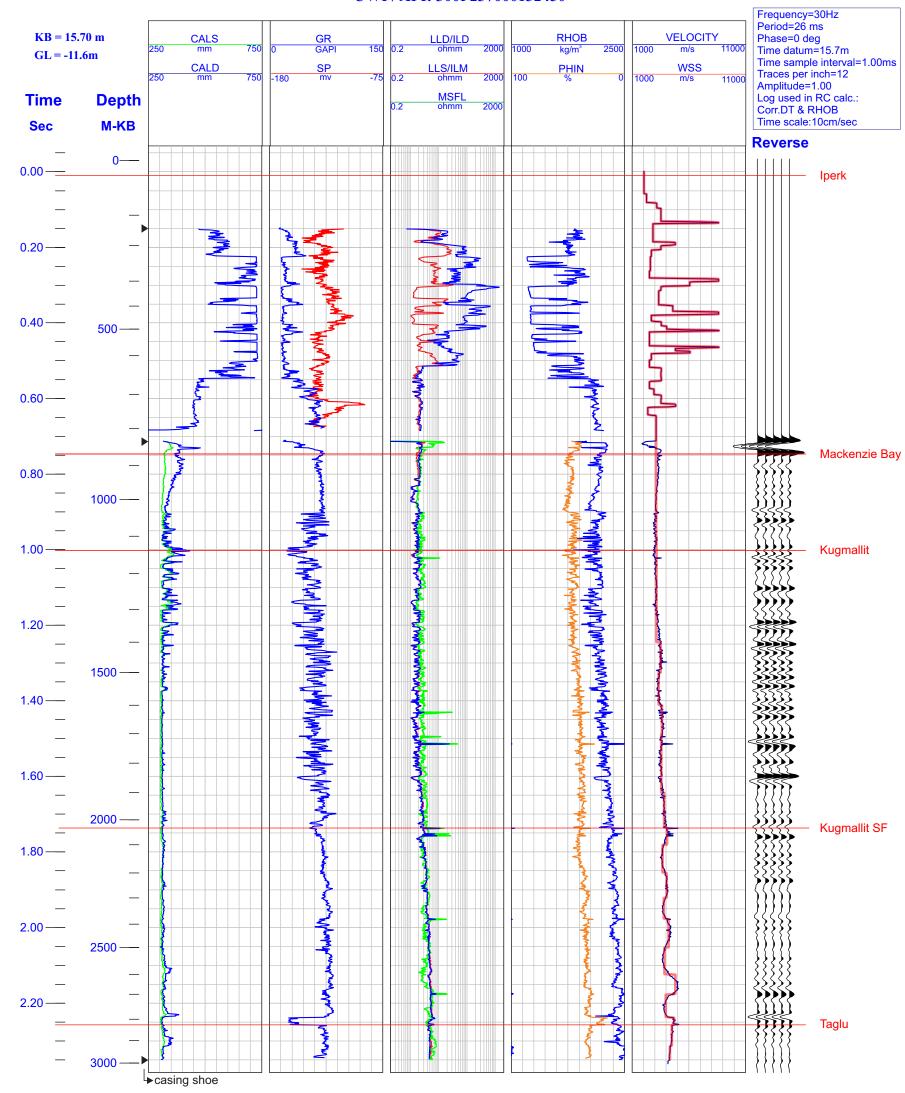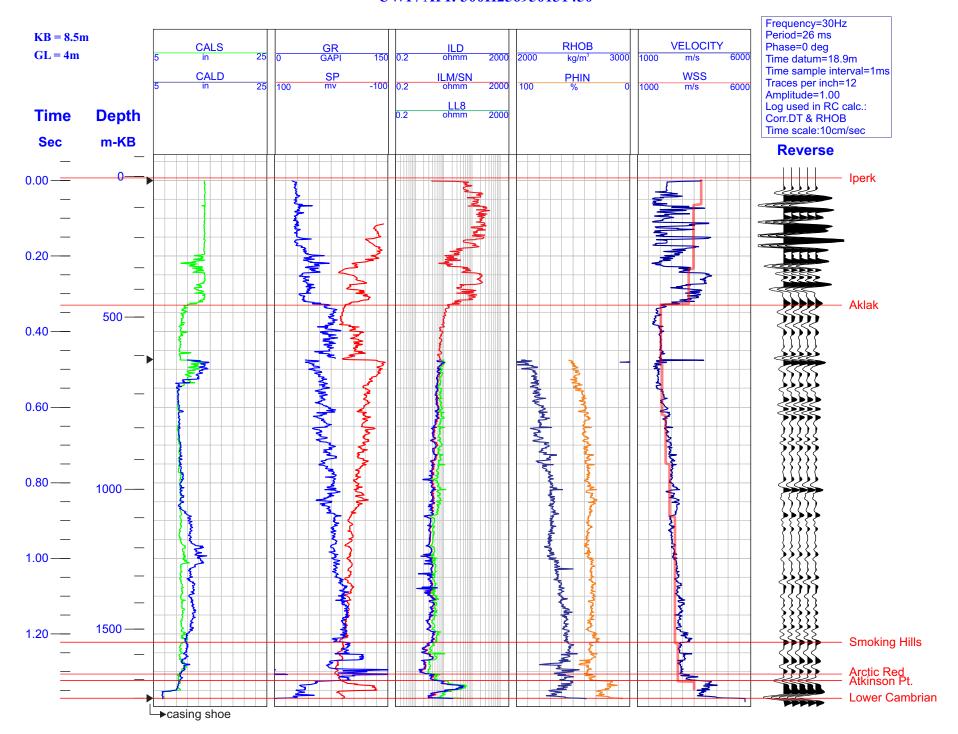
Figure 21. Well logs and synthetic of the Alerk P-23 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (MSFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
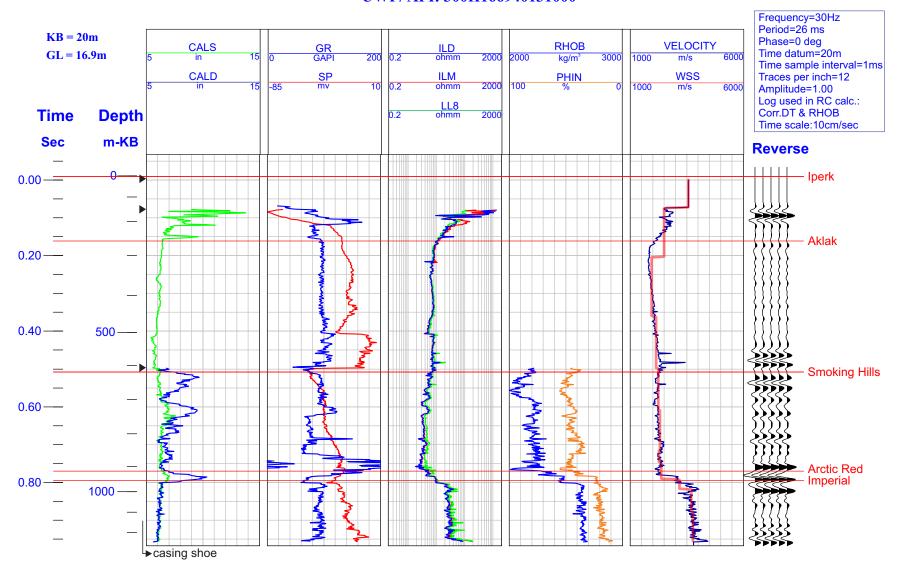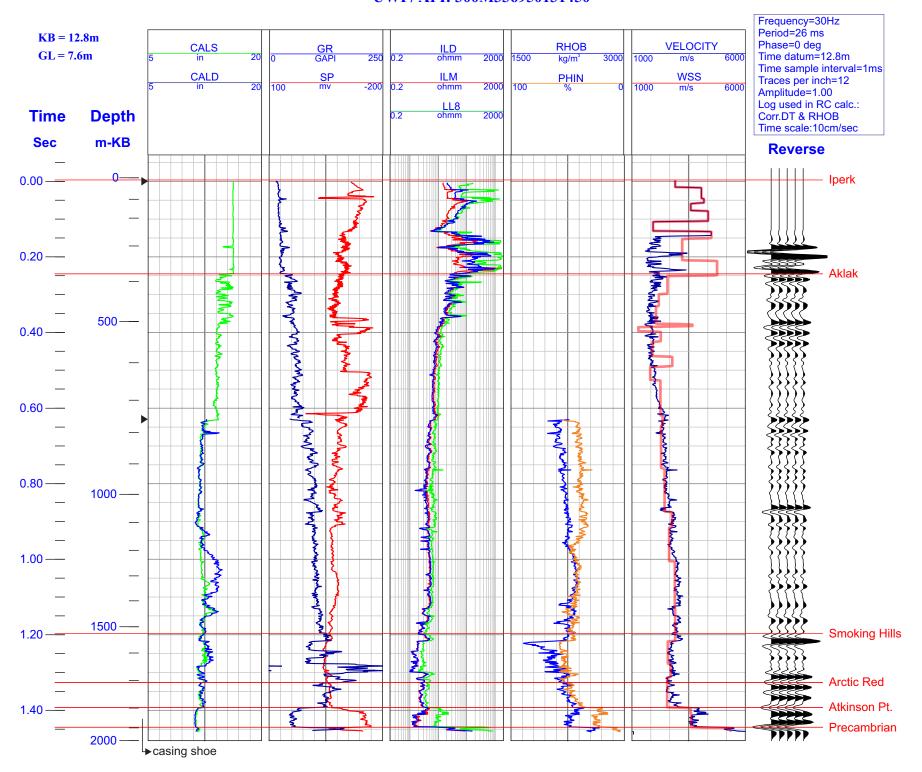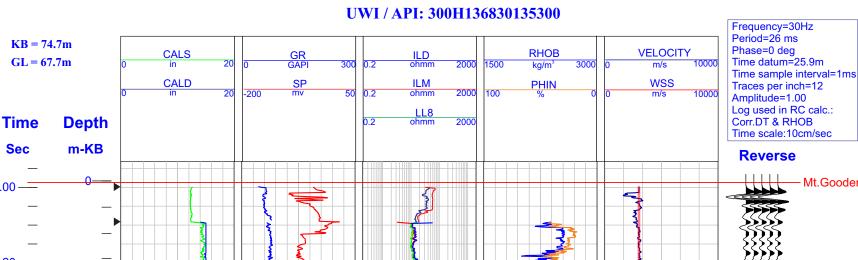
Figure 22. Well logs and synthetic of the Amaguk H-16 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
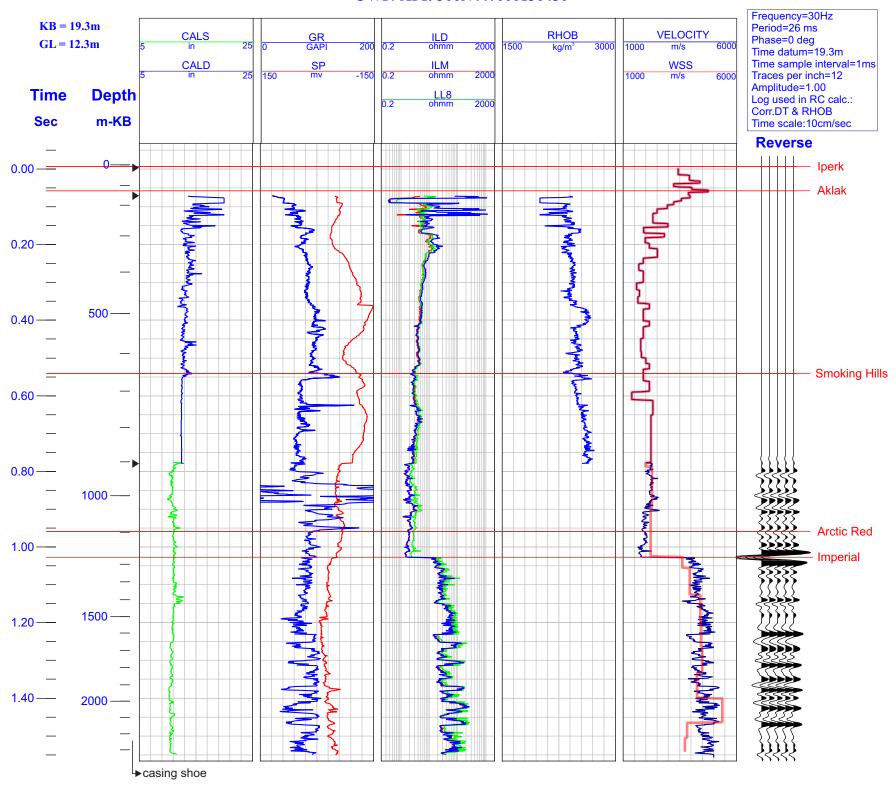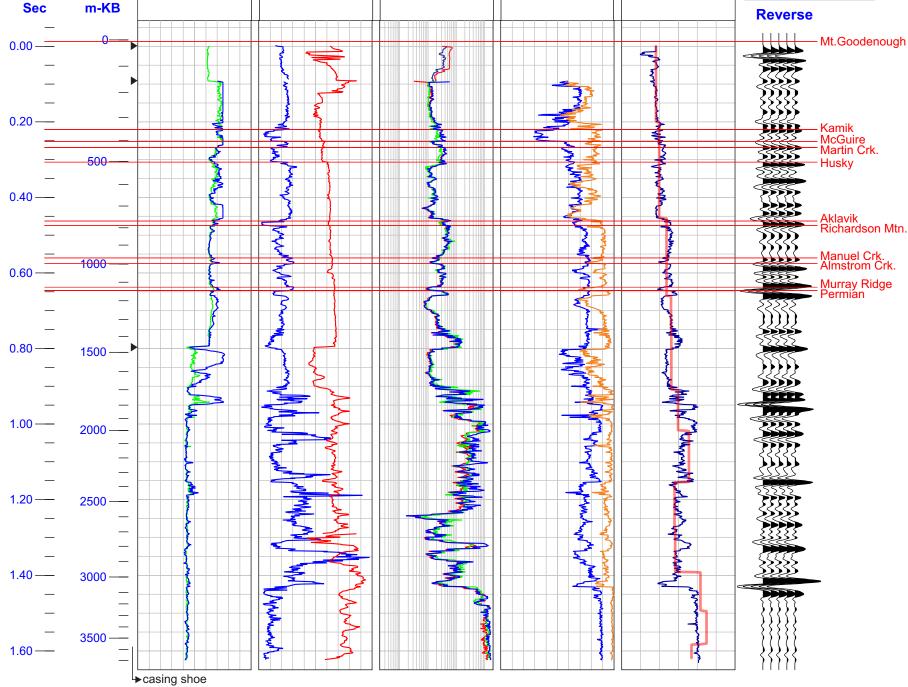
Figure 23. Well logs and synthetic of the Amarok N-44 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB); the fifth track illustrates well seismic survey (WSS-check shots, VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
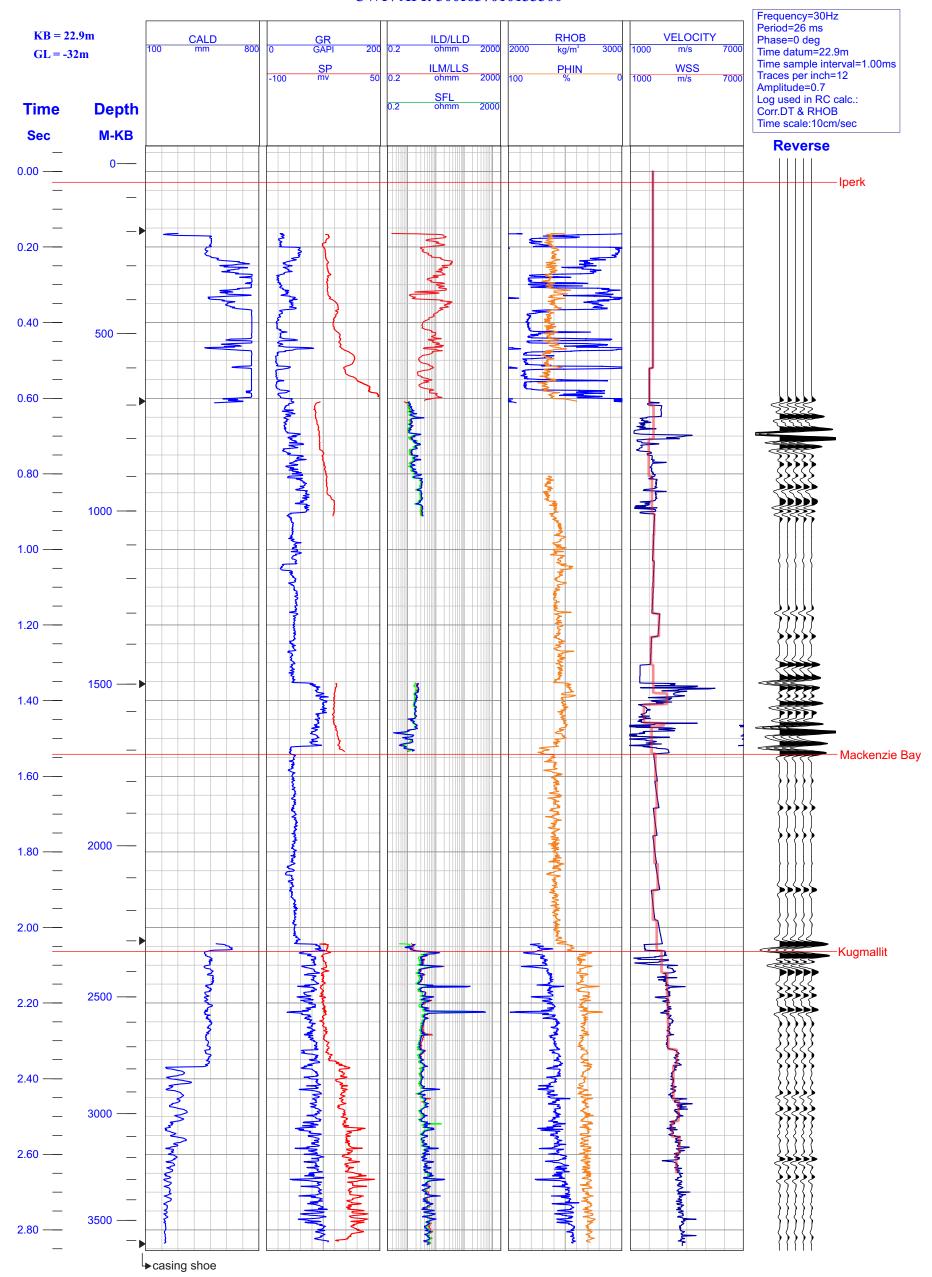
Figure 24. Well logs and synthetic of the Amauligak I-65 well. The first track includes density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
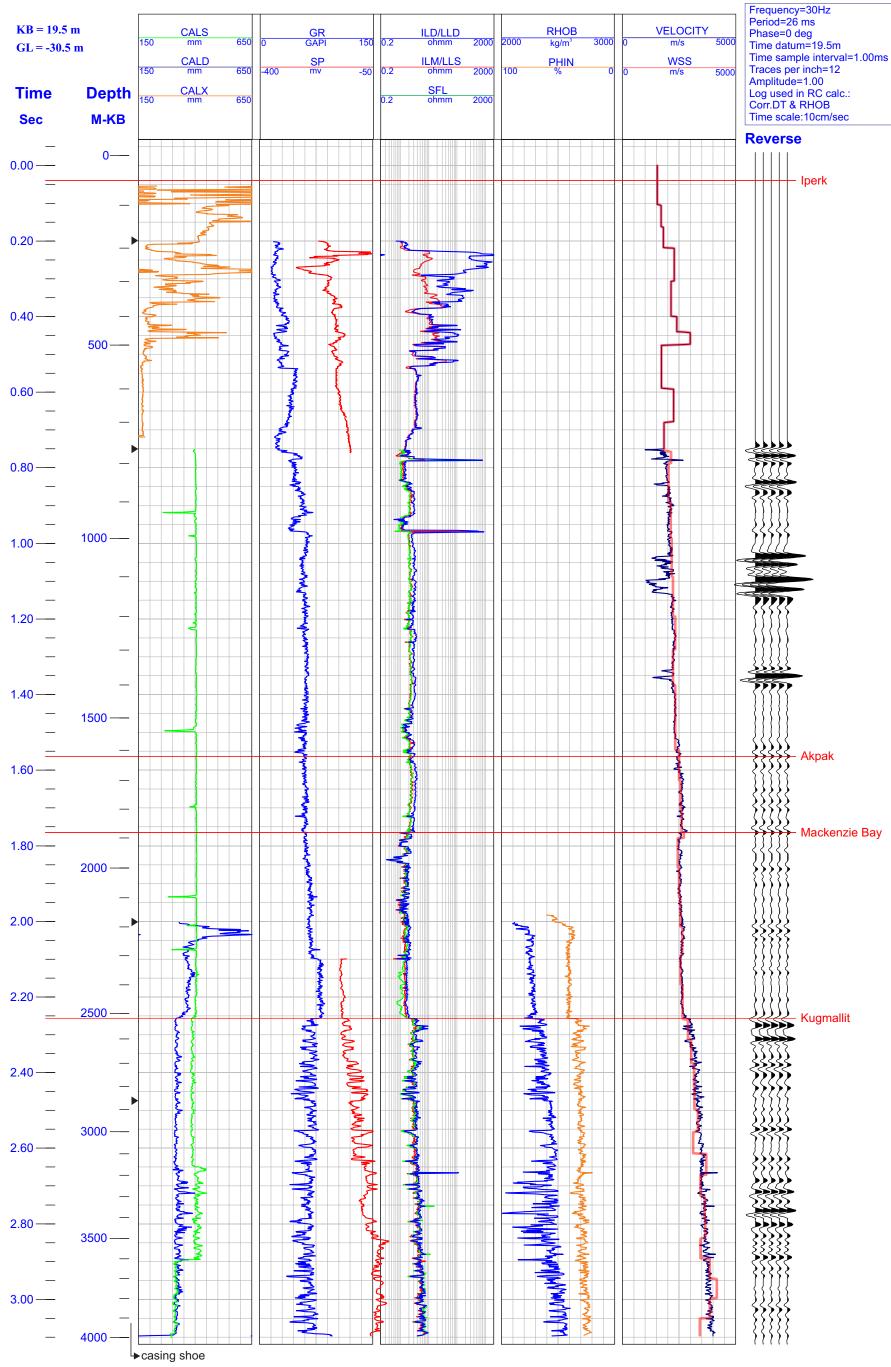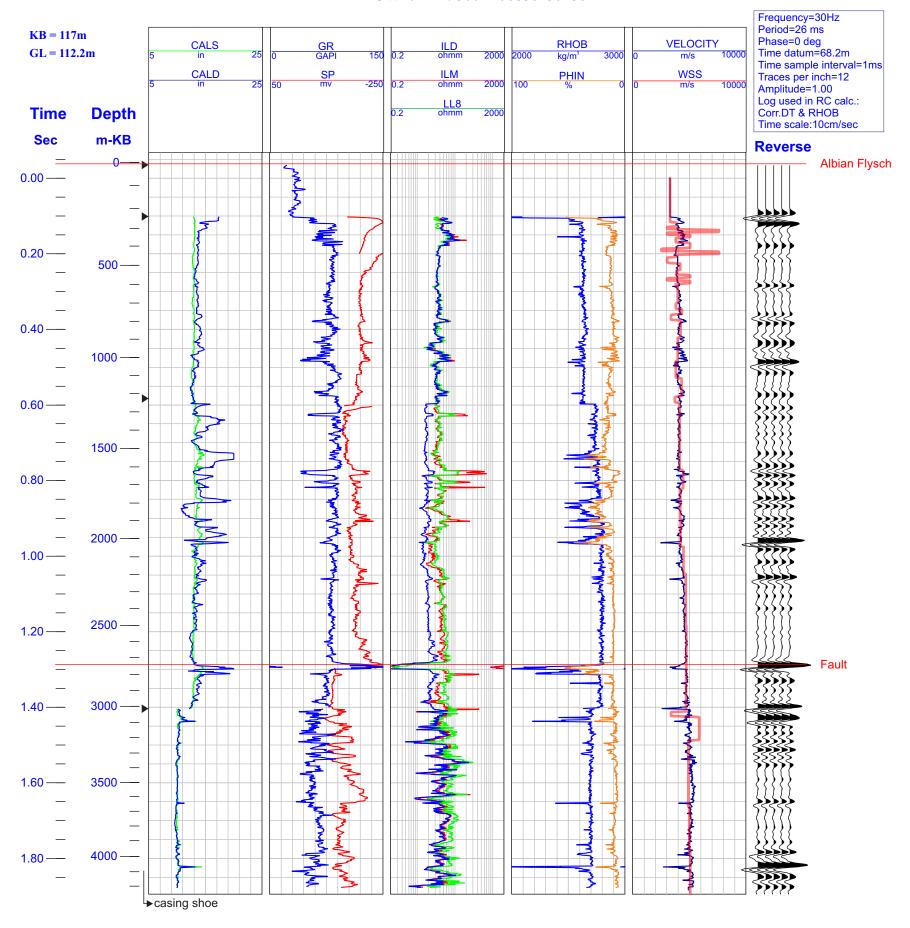
Figure 25. Well logs and synthetic of the Amauligak J-44 well. The first track includes sonic caliper log (CALS),density caliper log (CALD) and caliper 1-3 (CALX); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
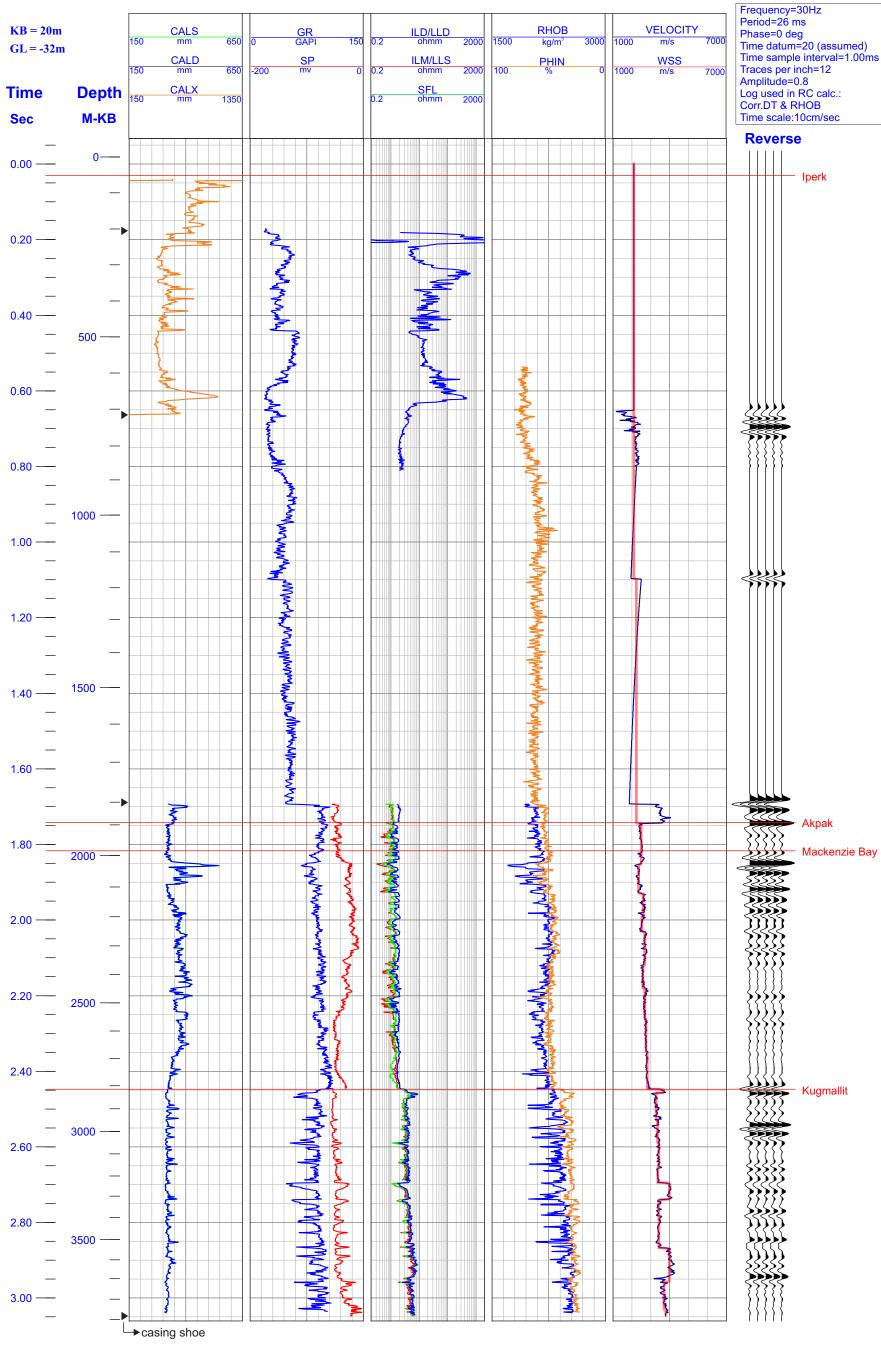
Figure 26. Well logs and synthetic of the Amauligak O-86 well. The first track includes sonic caliper log (CALS),density caliper log (CALD) and caliper 1-3 (CALX); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
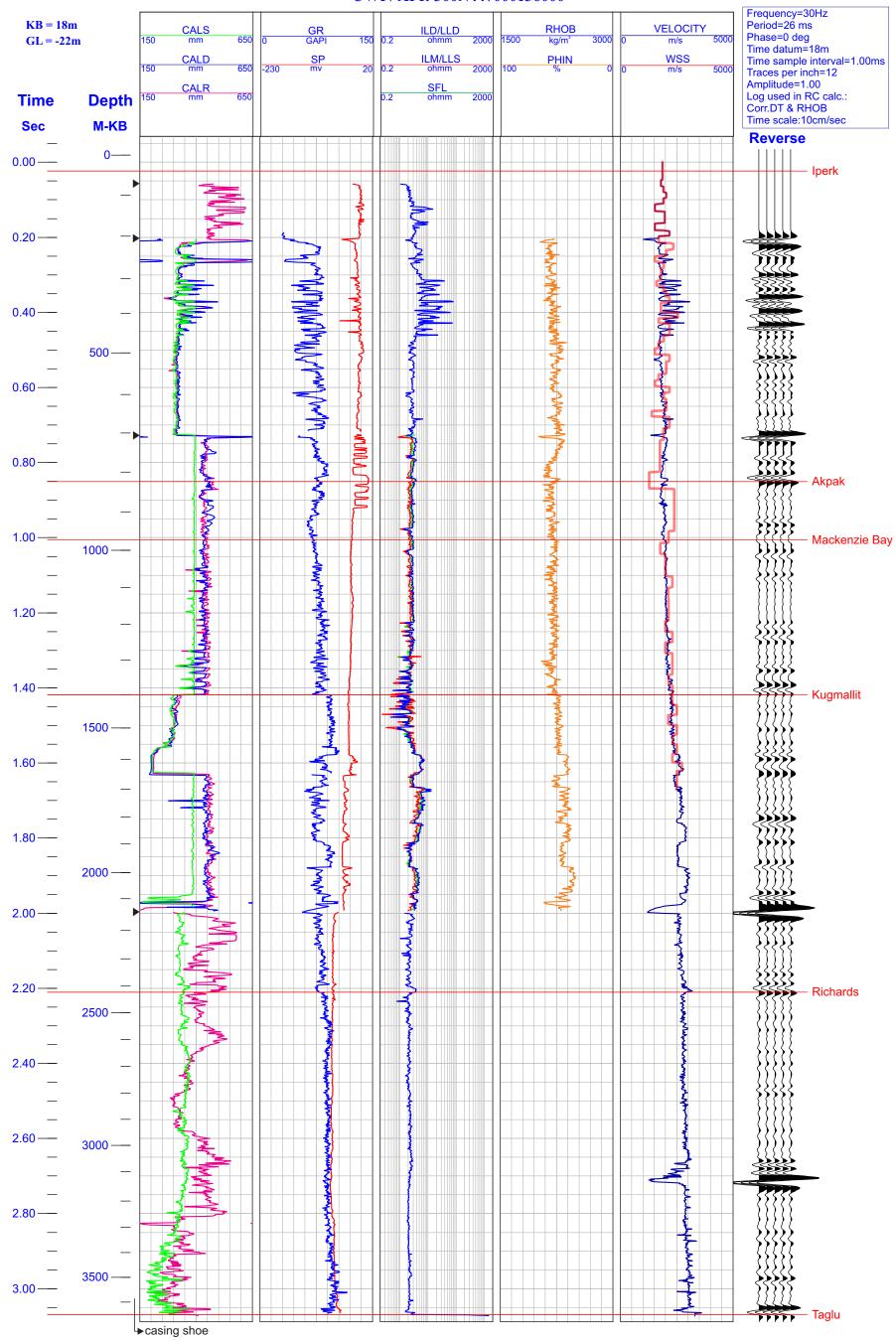
AMERK O-09

UWI / API: 300O097000133300
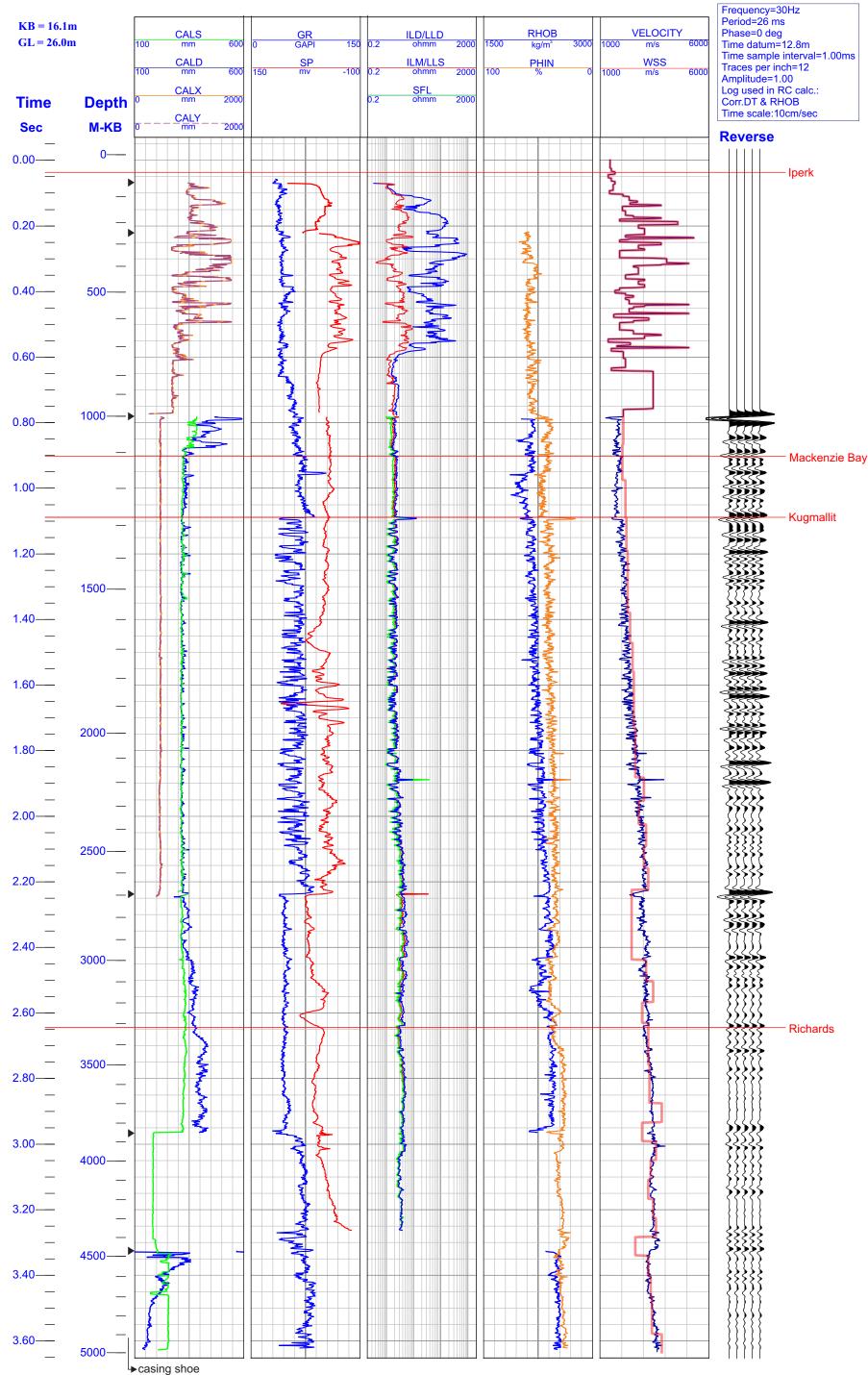
Figure 27. Well logs and synthetic of the Amerk O-09 well. The first track includes sonic caliper log (CALS),density caliper log (CALD), caliper 1-3 (CALX) and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
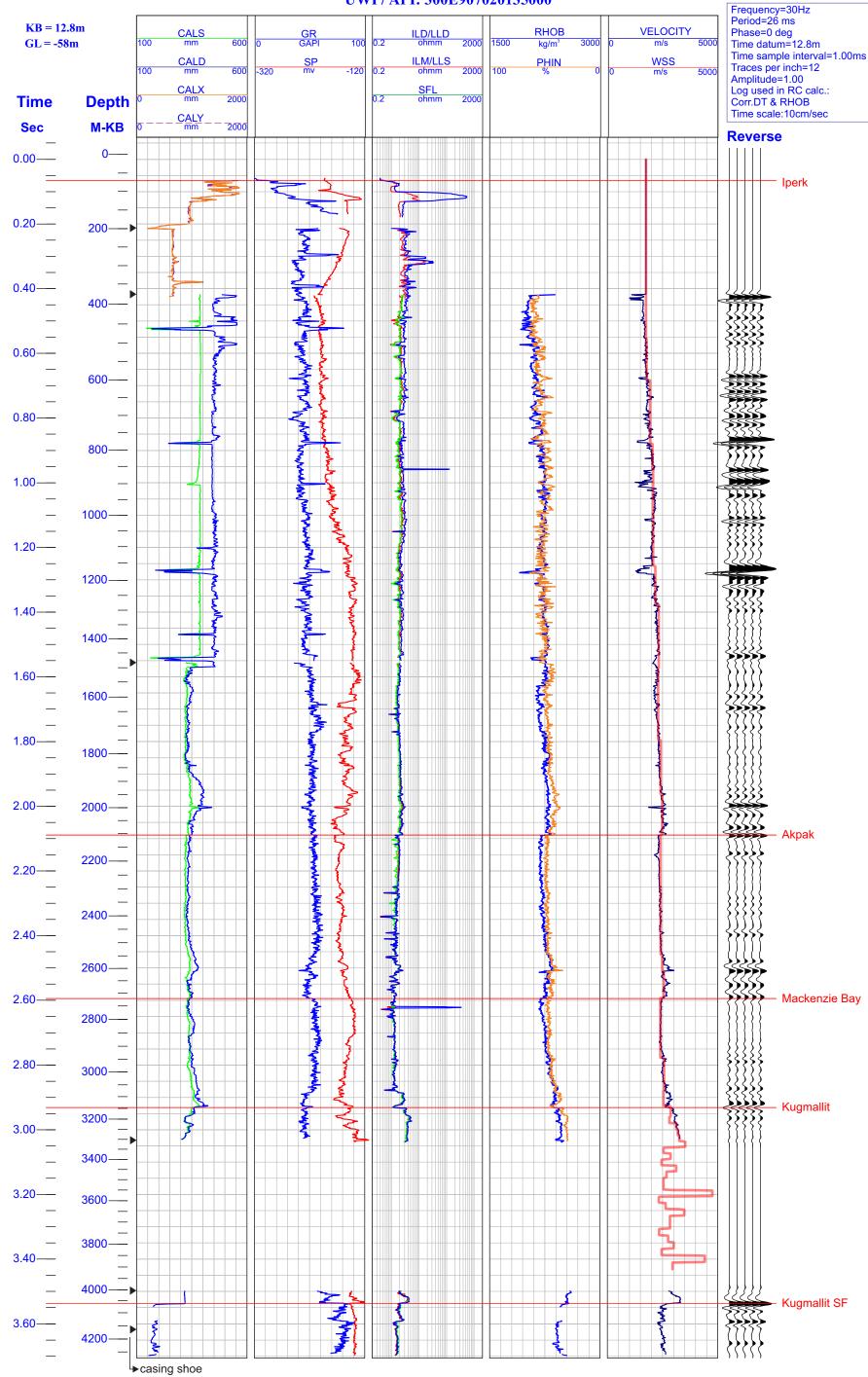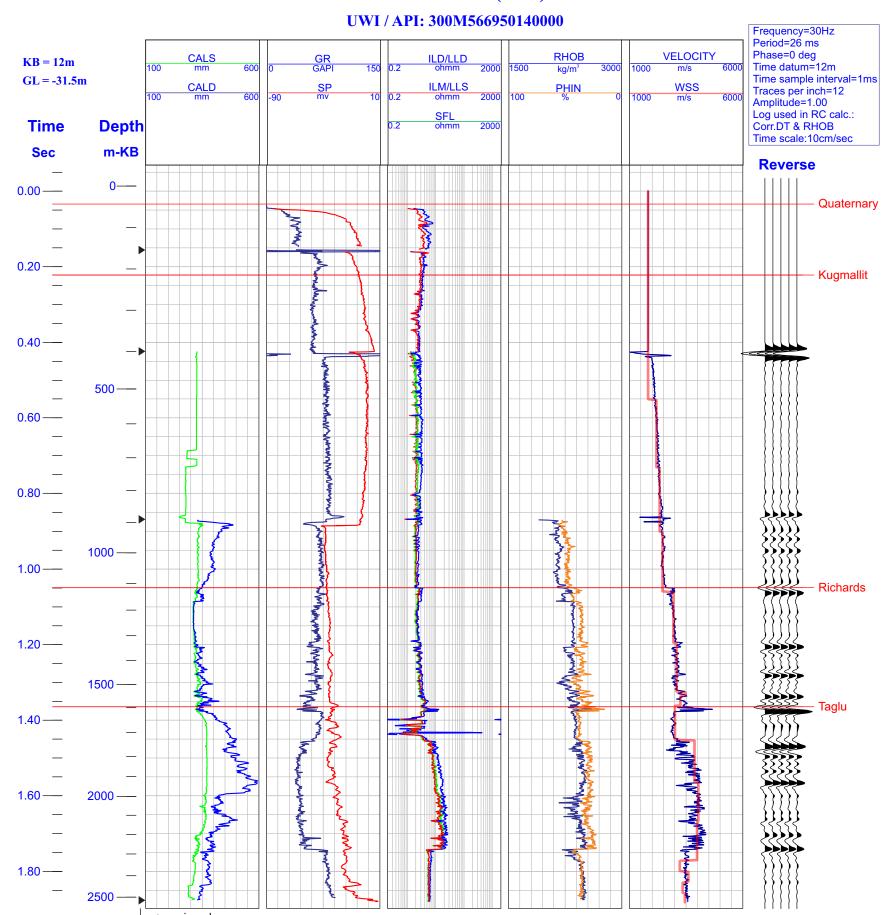
Figure 28. Well logs and synthetic of the Arluk E-90 well. The first track includes sonic caliper log (CALS), density caliper log (CALD), caliper 1-3 (CALX) and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
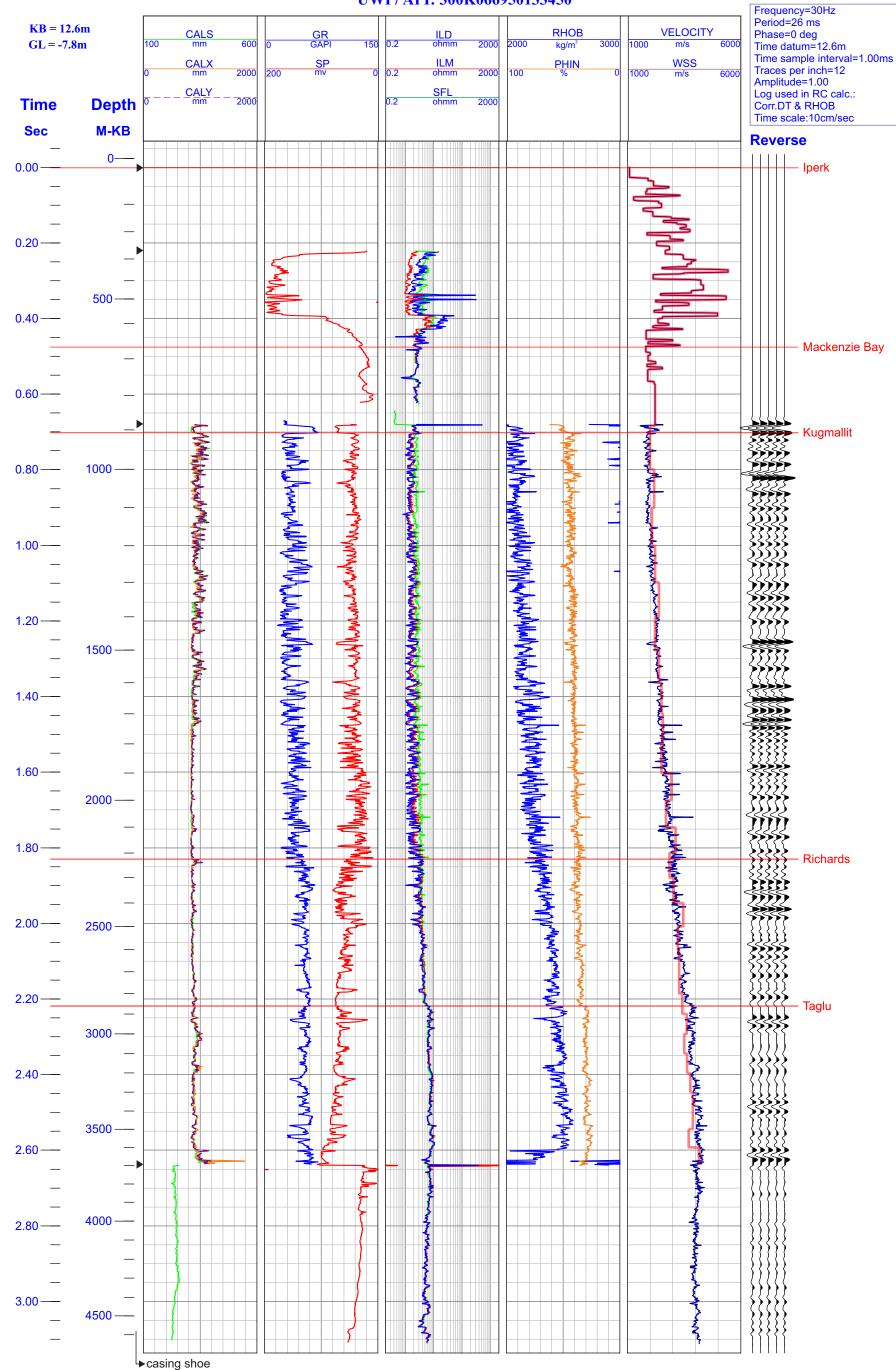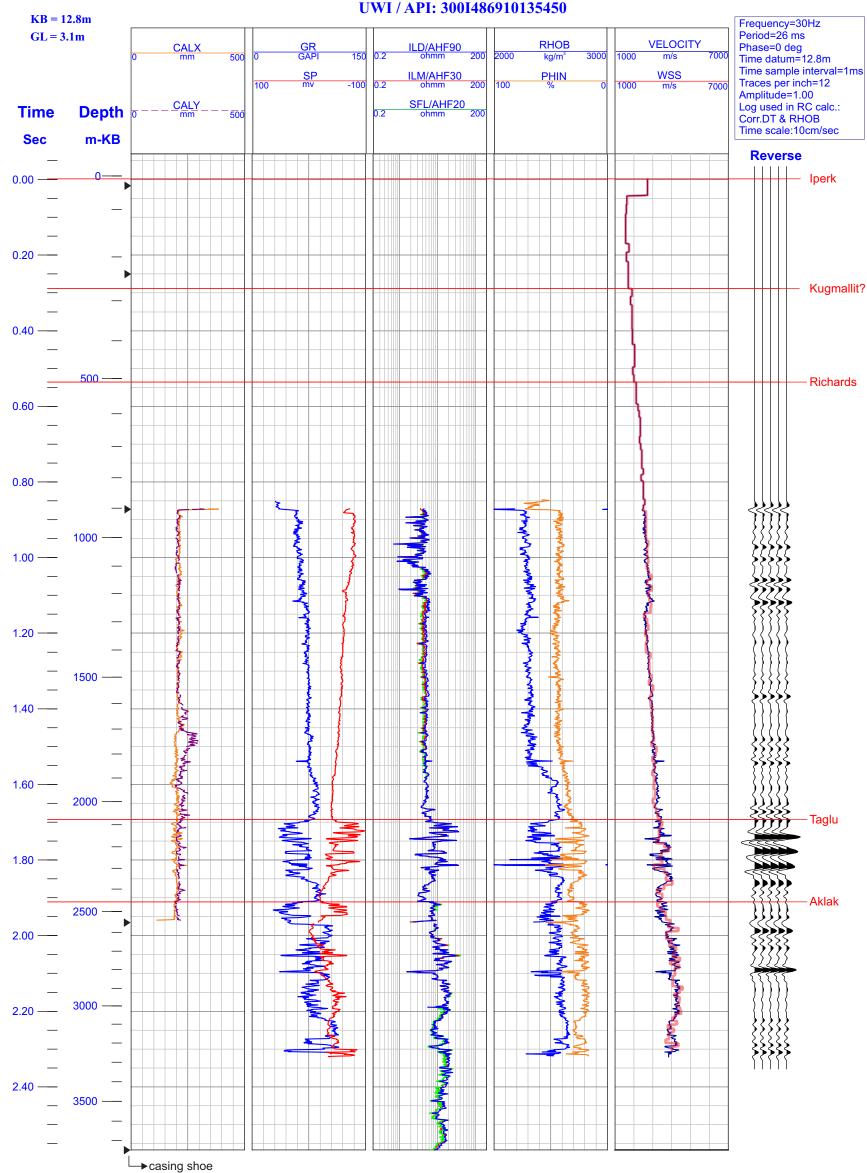
Figure 29. Well logs and synthetic of the Arnak K-06 well. The first track includes sonic caliper log (CALS), caliper 1-3 (CALX) and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
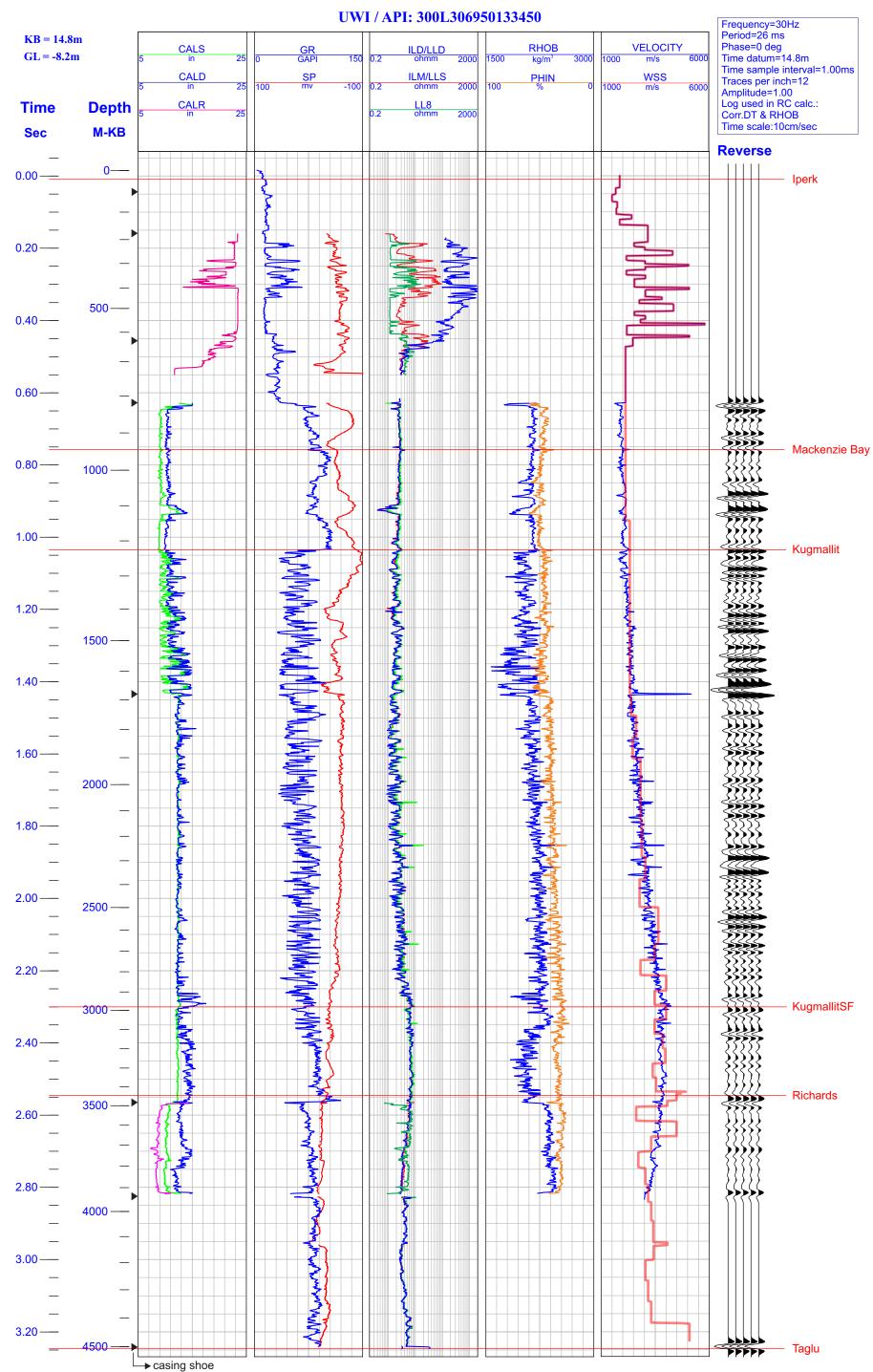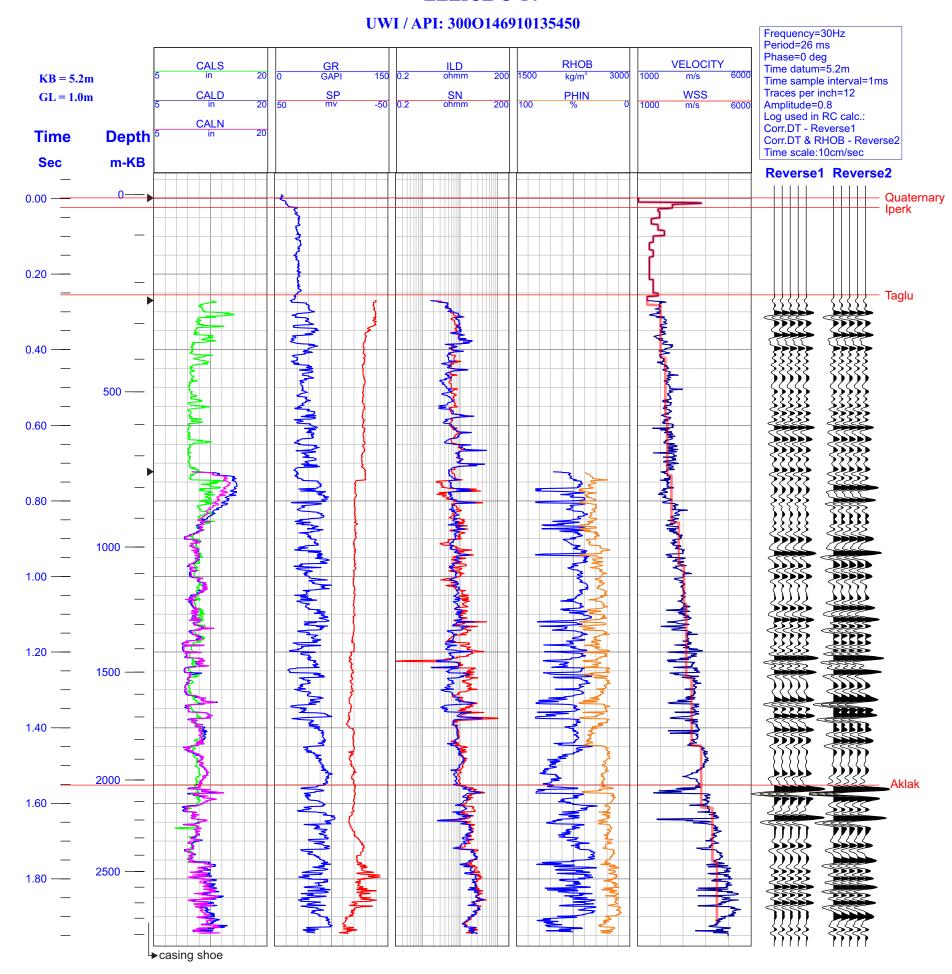
Figure 30. Well logs and synthetic of the Arnak L-30 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and resistivity caliper (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

ATERTAK E-41

UWI / API: 300E416940132300

KB = 19.8m

GL = 12.3m
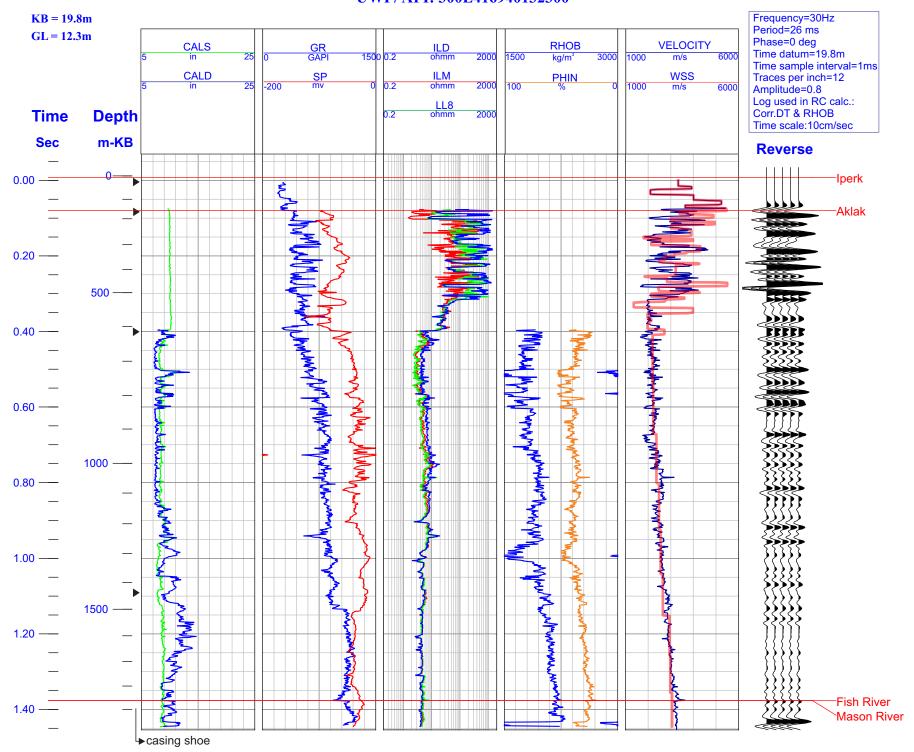
Figure 31. Well logs and synthetic of the Atertak E-41 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
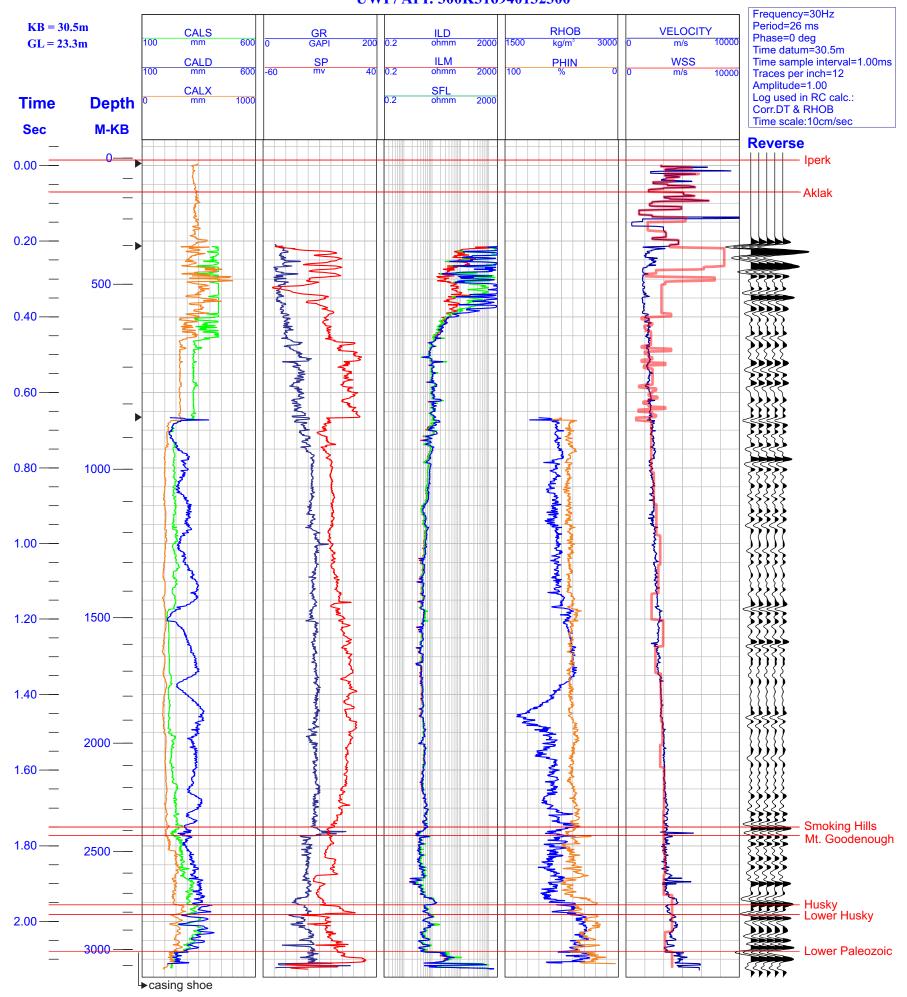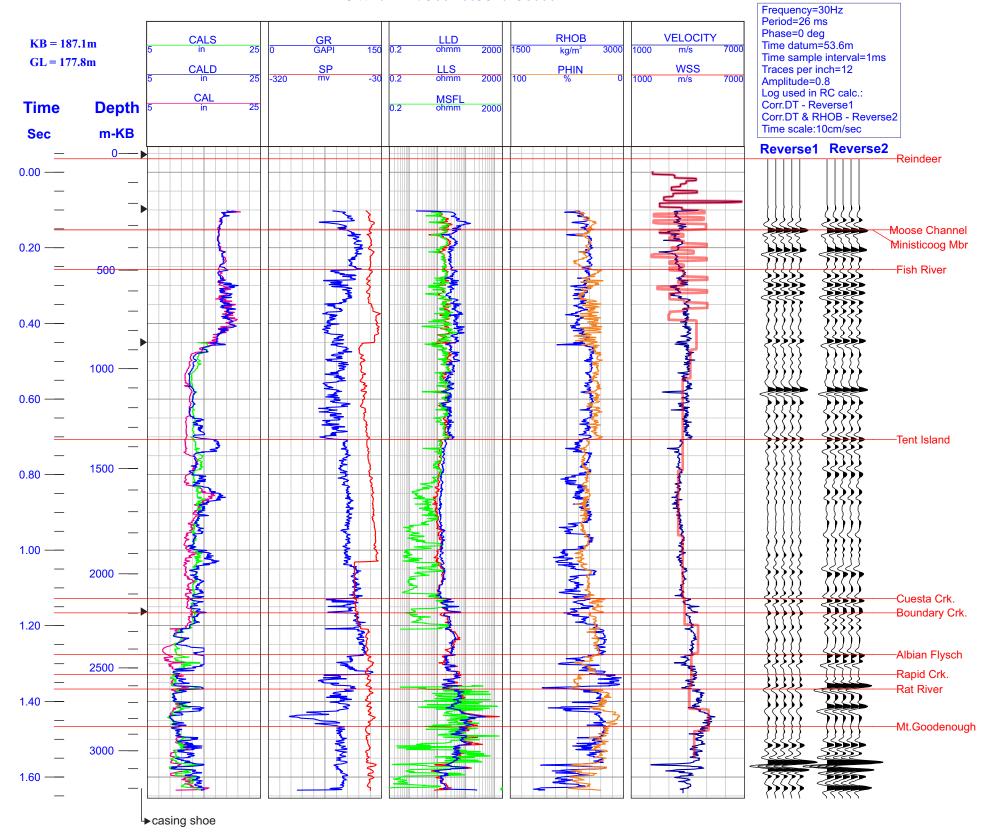
Figure 32. Well logs and synthetic of the Atertak L-31 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and caliper 1-3 (CALX); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

ATIGI G-04

UWI / API: 300G046900133450

KB = 52.1m

GL = 46.6m

Frequency=30Hz
Period=26 ms
Phase=0 deg
Time datum=64.6m
Time sample interval=1ms
Traces per inch=12
Amplitude=0.8
Log used in RC calc.:
Corr.DT - Reverse1
Corr.DT & RHOB - Reverse2
Time scale:10cm/sec

Track	Curves
CALS	5 in 25
CALD	5 in 25
GR	0 GAPI 250
SP	200 mv -200
ILD	0.2 ohmm 2000
ILM	0.2 ohmm 2000
LL8	0.2 ohmm 2000
RHOB	1500 kg/m³ 3000
PHIN	100 % 0
VELOCITY	1000 m/s 8000
WSS	1000 m/s 8000

Time (Sec) / Depth (m-KB)

Reverse1 Reverse2

Markers: Iperk, Aklak, Smoking Hills, Arctic Red, Mt. Goodenough, Siku, Kamik, McGuire, Martin Crk., Husky, Ronning Grp.

casing shoe

Figure 33. Well logs and synthetic of the Atigi G-04 (E. Reindeer G-04) well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1-from single DT, and Reverse2-from DT & RHOB). A big difference occurs between Reverse1 and Reverse2 and indicates the stronger reflections (Reverse2) are caused by poor density readings that are badly affected by an enlarged and rugose borehole (see the caliper curves in the first track).
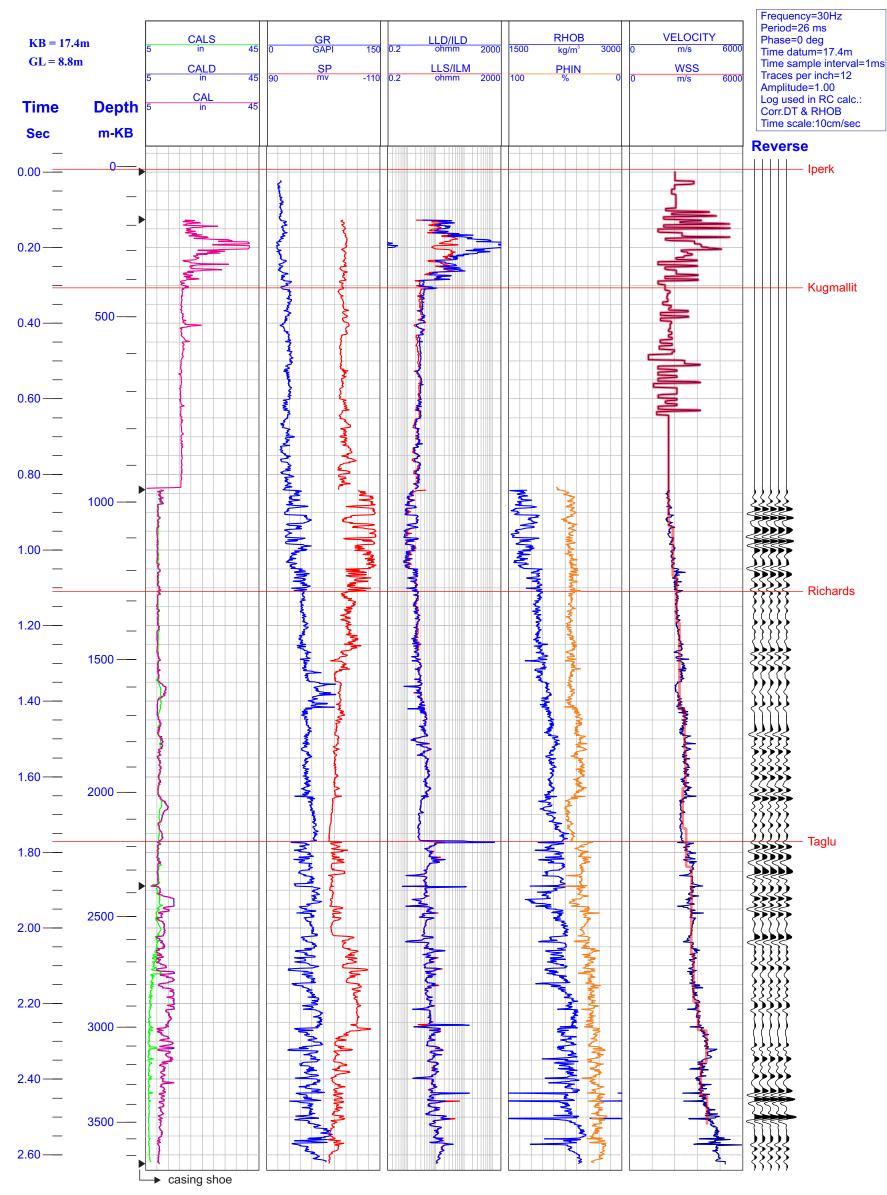
Figure 34. Well logs and synthetic of the Atigi O-48 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
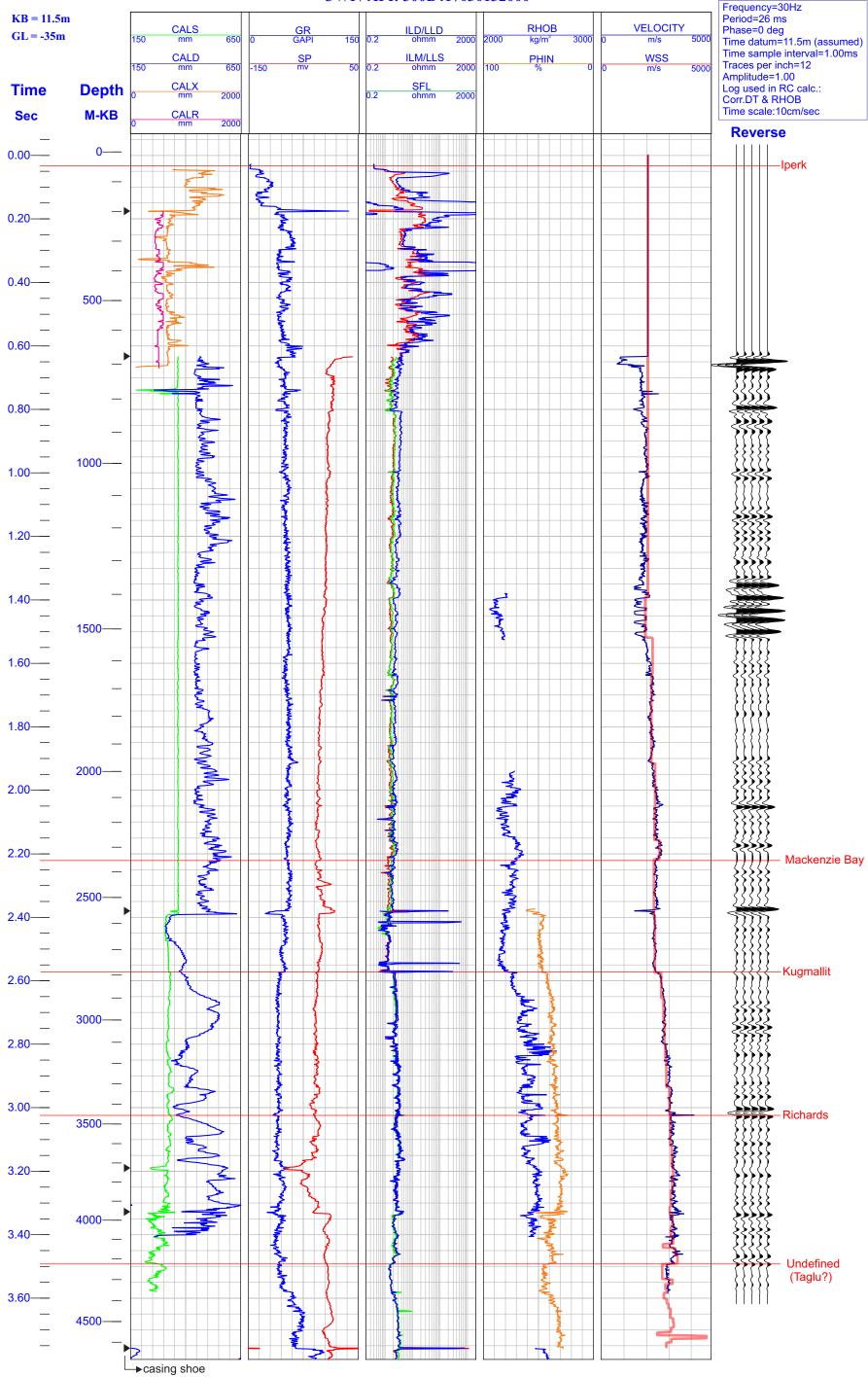
Figure 35. Well logs and synthetic of the Atkinson A-55 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 36. Well logs and synthetic of the Atkinson H-25 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM/SN) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

ATKINSON M-33

UWI / API: 300M336950131450

Figure 37. Well logs and synthetic of the Atkinson M-33 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
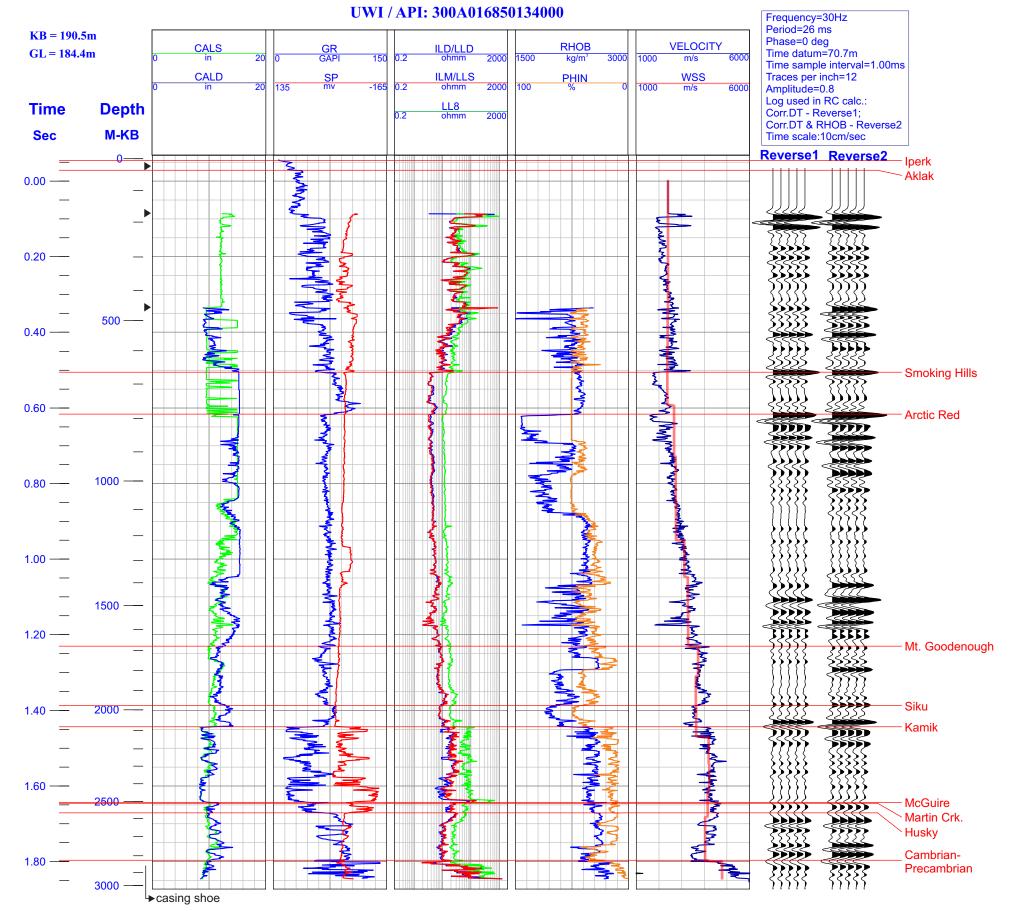
Figure 38. Well logs and synthetic of the Beaverhouse Creek H-13 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
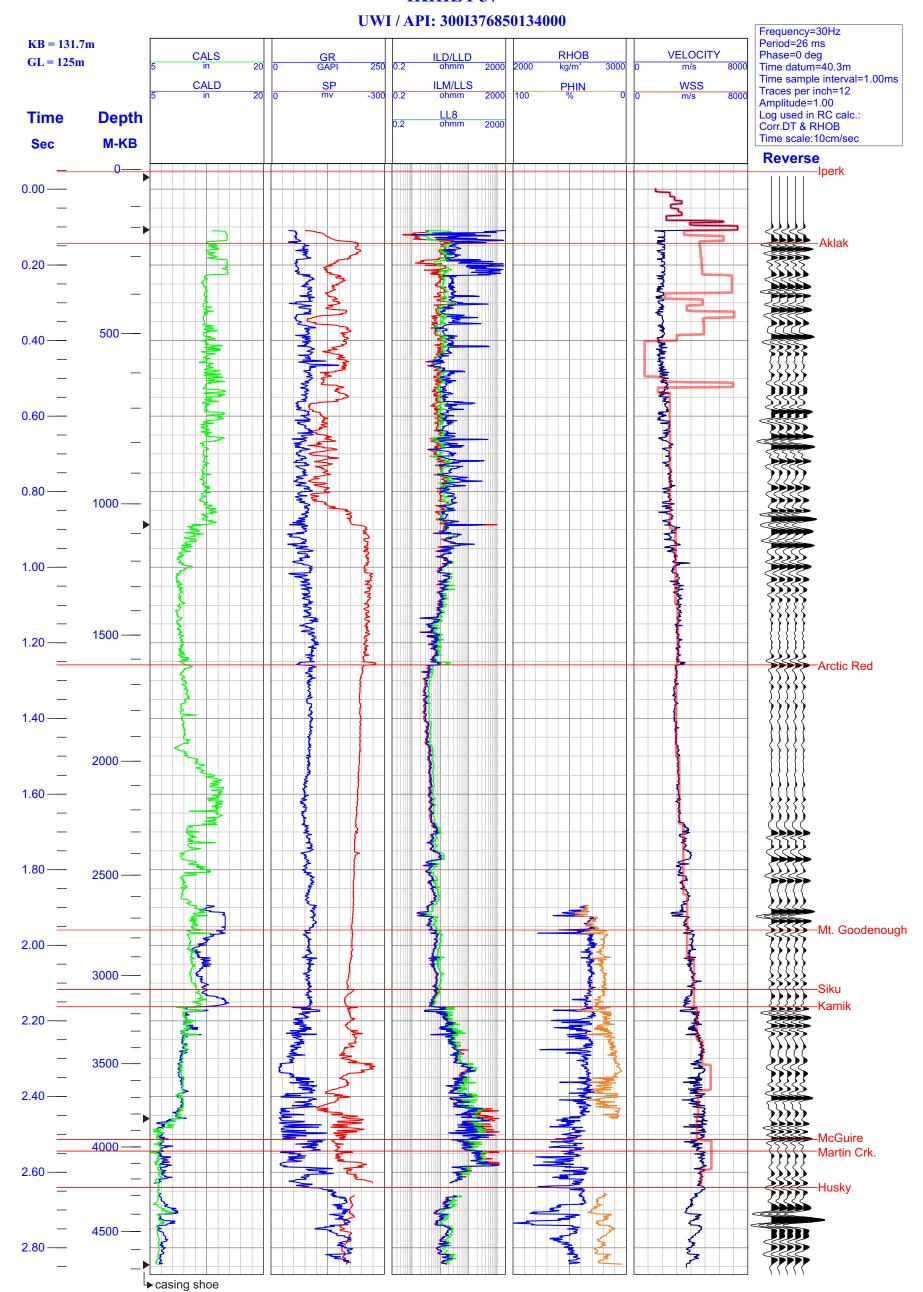
Figure 39. Well logs and synthetic of the Blow River YT E-47 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

CROSSLEY LAKE S. K-60

UWI / API: 300K606830129150
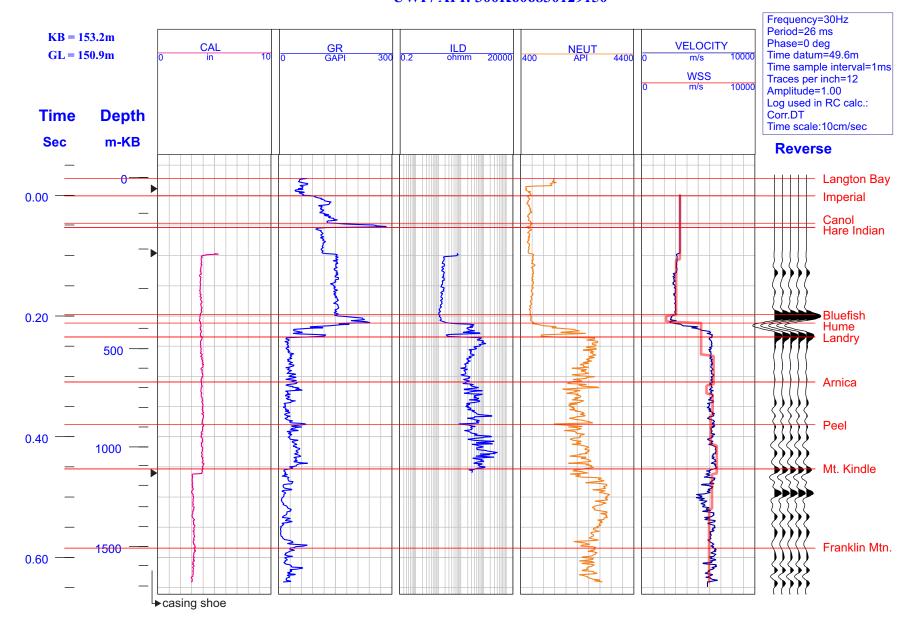
Figure 40. Well logs and synthetic of the Crossley Lake S. K-60 well. The first track includes general caliper log (CAL); the second track contains gamma ray (GR) log; the third track shows deep (ILD) induction log; the fourth track illustrates neutron log (NEUT), the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 41. Well logs and synthetic of the East Tarsiut N-44 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and resistivity caliper (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and velocity . The sixth track displays synthetic traces (Reverse).
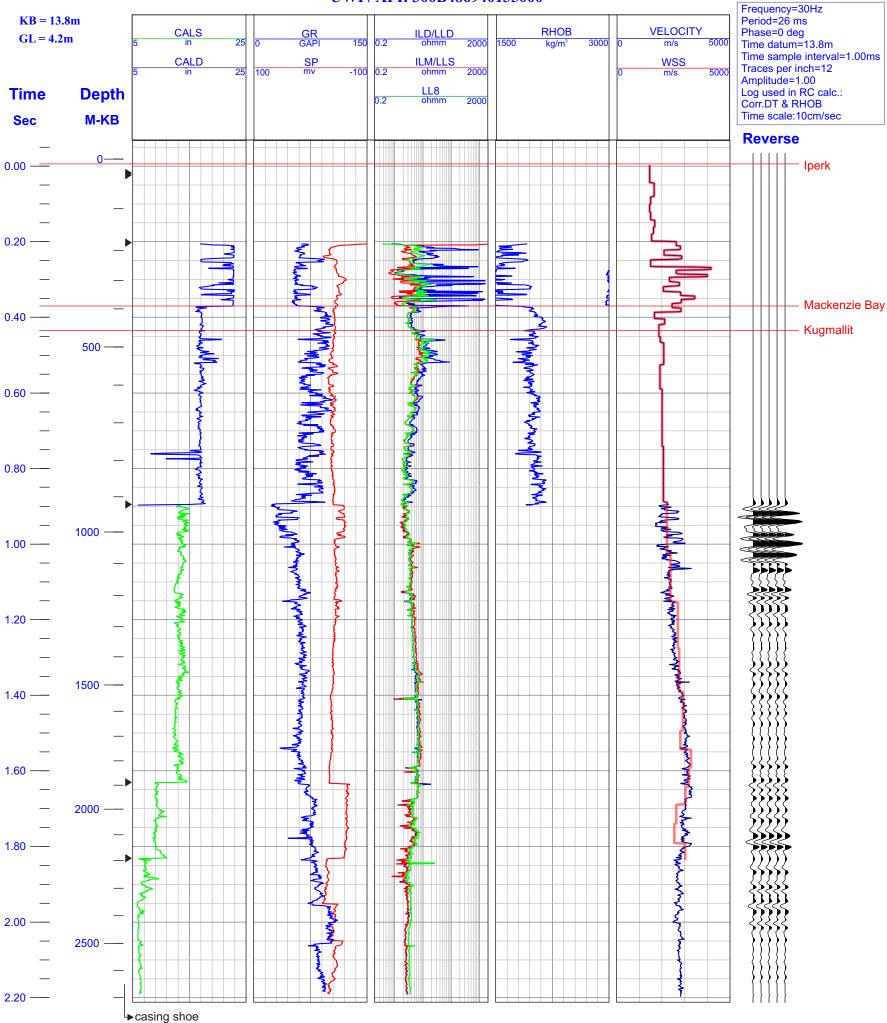
Figure 42. Well logs and synthetic of the Edlok M-56 (N-56) well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 43. Well logs and synthetic of the Ellice I-48 well, showing the time-depth conversion. The first track consists of caliper curves, caliper 1-3 (CALX) and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) logs; the third track shows deep (ILD/AHF90), and medium (ILM/AHF30) and shallow (SFL/AHF20) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates borehole seismic survey (WSS-VSP) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

ELLICE O-14

UWI / API: 300O146910135450

Figure 44. Well logs and synthetic of the Ellice O-14 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and neutron caliper (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD) and medium (SN) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1-from single DT, and Reverse2-from DT & RHOB). A big difference occurs between Reverse1 and Reverse2 and indicates the stronger reflections (Reverse2) are caused by poor density readings that are badly affected by an enlarged and rugose borehole (see the caliper curves in the first track).

Figure 45. Well logs and synthetic of the Eskimo J-07 well. The first track includes sonic caliper log (CALS); the second track contains gamma ray (GR) log and spontaneous potential log (SP); the third track shows deep (ILD) induction log and medium resistivity log (SN); the fourth track illustrates neutron log (NEUT), the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
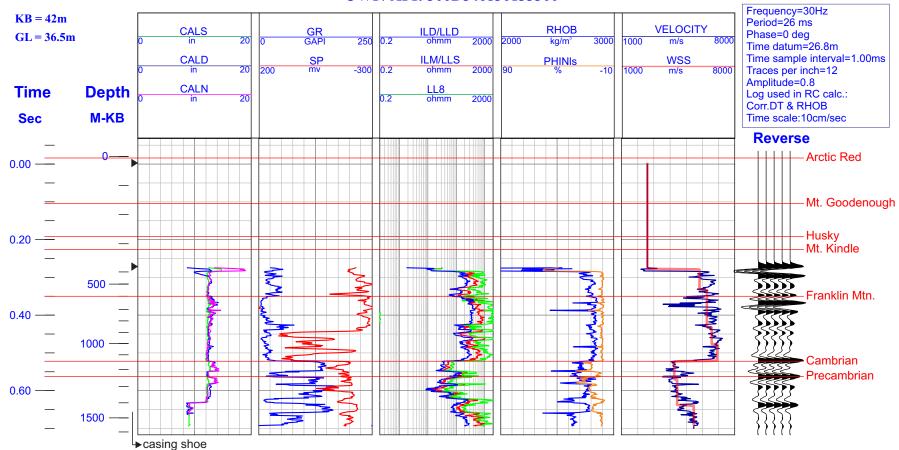
Figure 46. Well logs and synthetic of the Fish River B-60 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and general caliper (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD) and medium (LLS/ILM) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1-from single DT, and Reverse2-from DT & RHOB). Difference occurs between Reverse1 and Reverse2 and indicates the stronger reflections (Reverse2) are caused by poor density readings that are affected by an enlarged and rugose borehole (see the caliper curves in the first track).

Figure 47. Well logs and synthetic of the Garry G-07 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and general caliper (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD) and medium (LLS/ILM) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

GARRY P-04

UWI / API: 300P046930135300
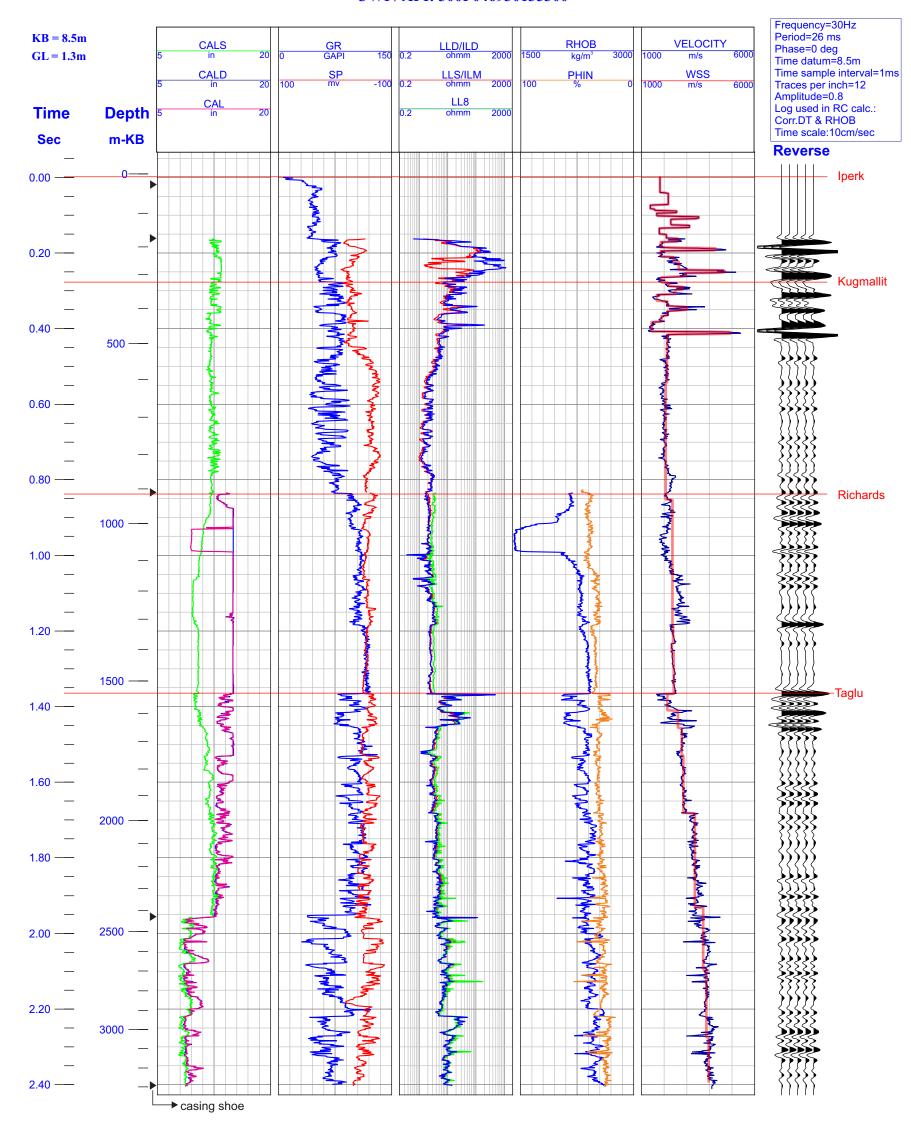
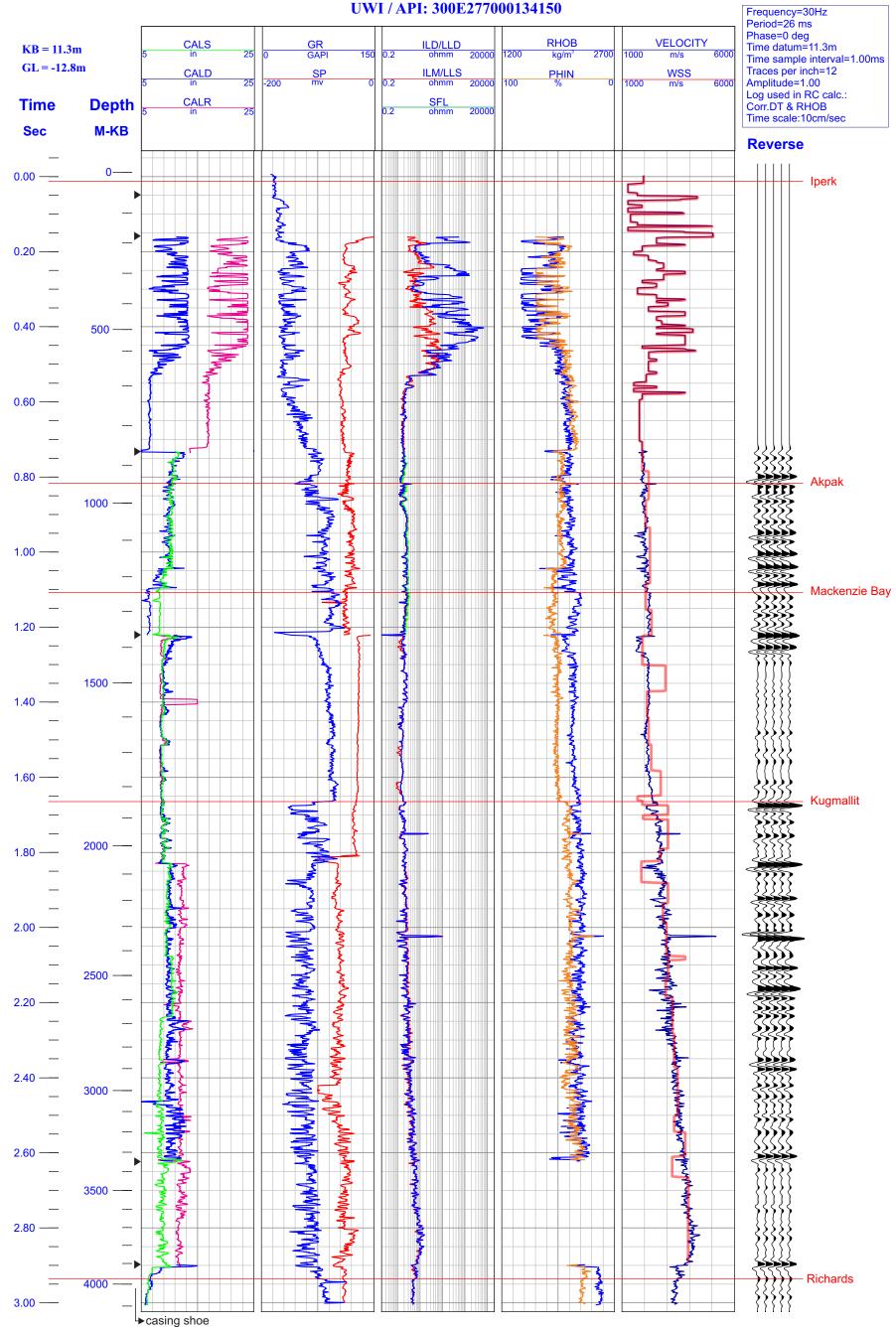Figure 48. Well logs and synthetic of the Garry P-04 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and general caliper (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
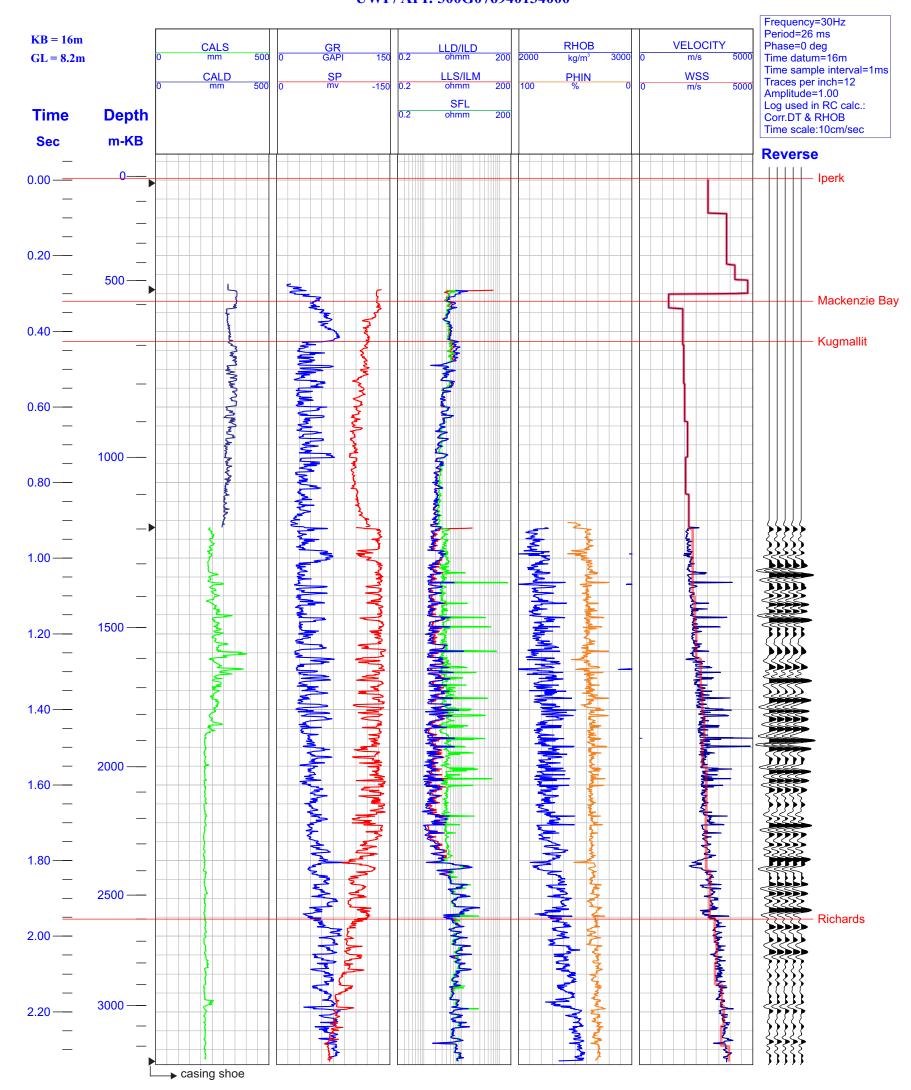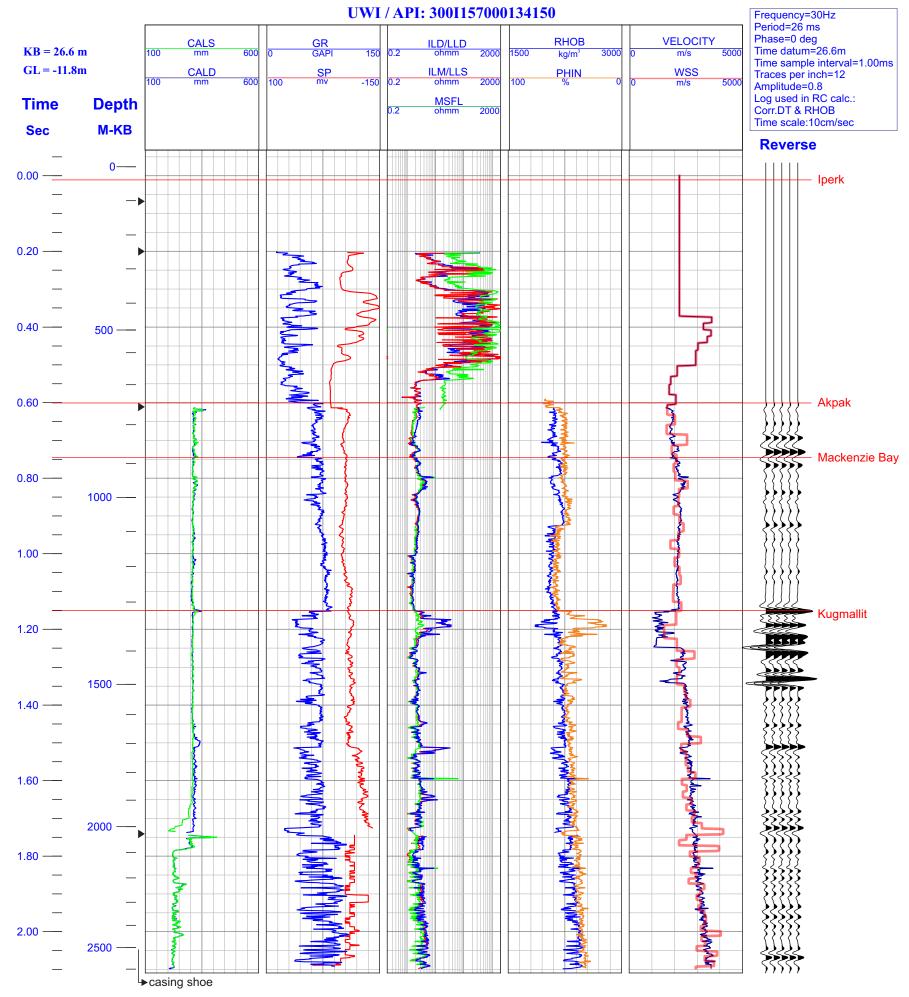
Figure 49. Well logs and synthetic of the Hansen G-07 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

HAVIK B-41

## UWI / API: 300B417030132000

Figure 50. Well logs and synthetic of the Havik B-41 well. The first track includes sonic caliper log (CALS), density caliper log (CALD), caliper 1-3 (CALX) and resistivity caliper (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 51. Well logs and synthetic of the Ikattok J-17 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 52. Well logs and synthetic of the Ikhil A-01 (E. Reendeer A-01) well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1-from single DT, and Reverse2-from DT & RHOB). Difference occurs between Reverse1 and Reverse2 and indicates the stronger reflections (Reverse2) are caused by poor density readings that are badly affected by an enlarged and rugose borehole (see the caliper curves in the first track).

Figure 53. Well logs and synthetic of the Ikhil I-37 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
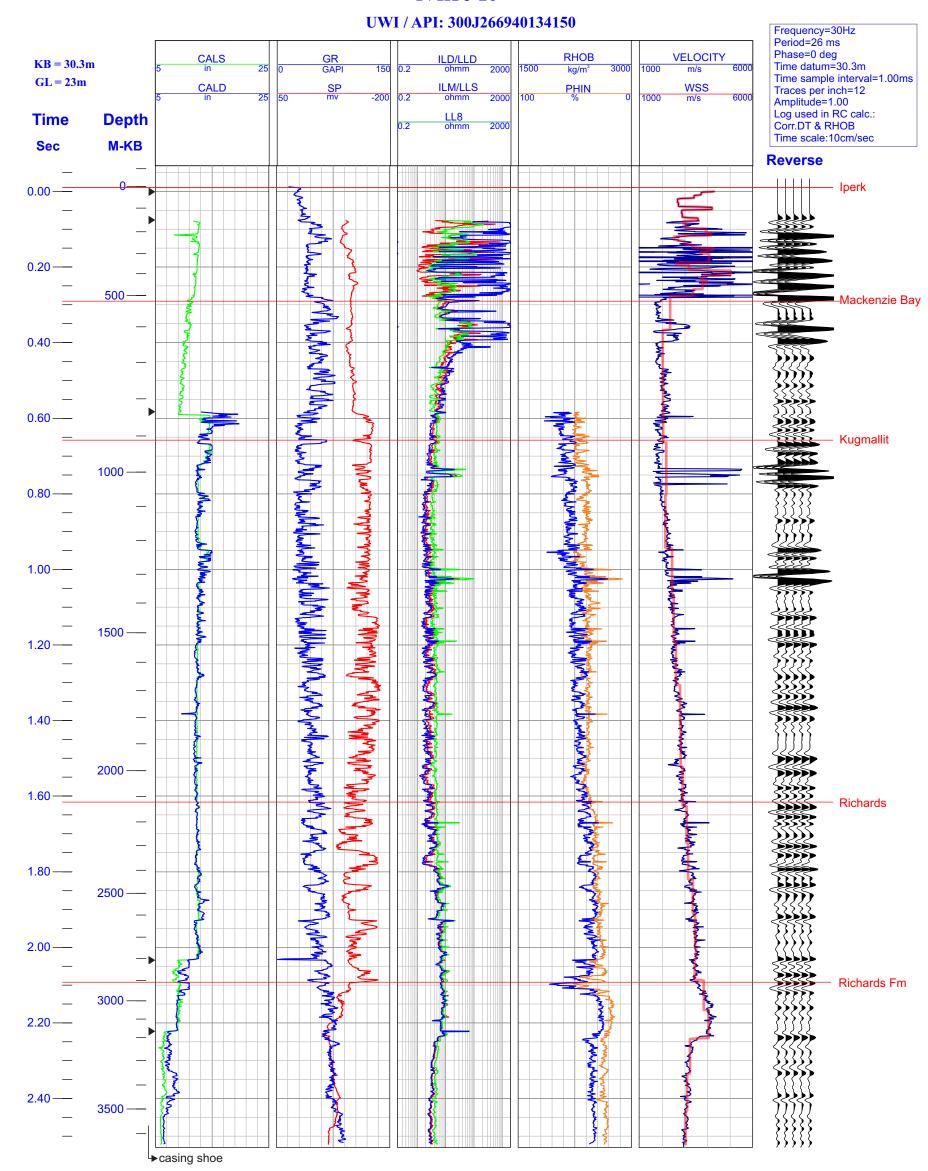
Figure 54. Well logs and synthetic of the Ikhil K-35 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
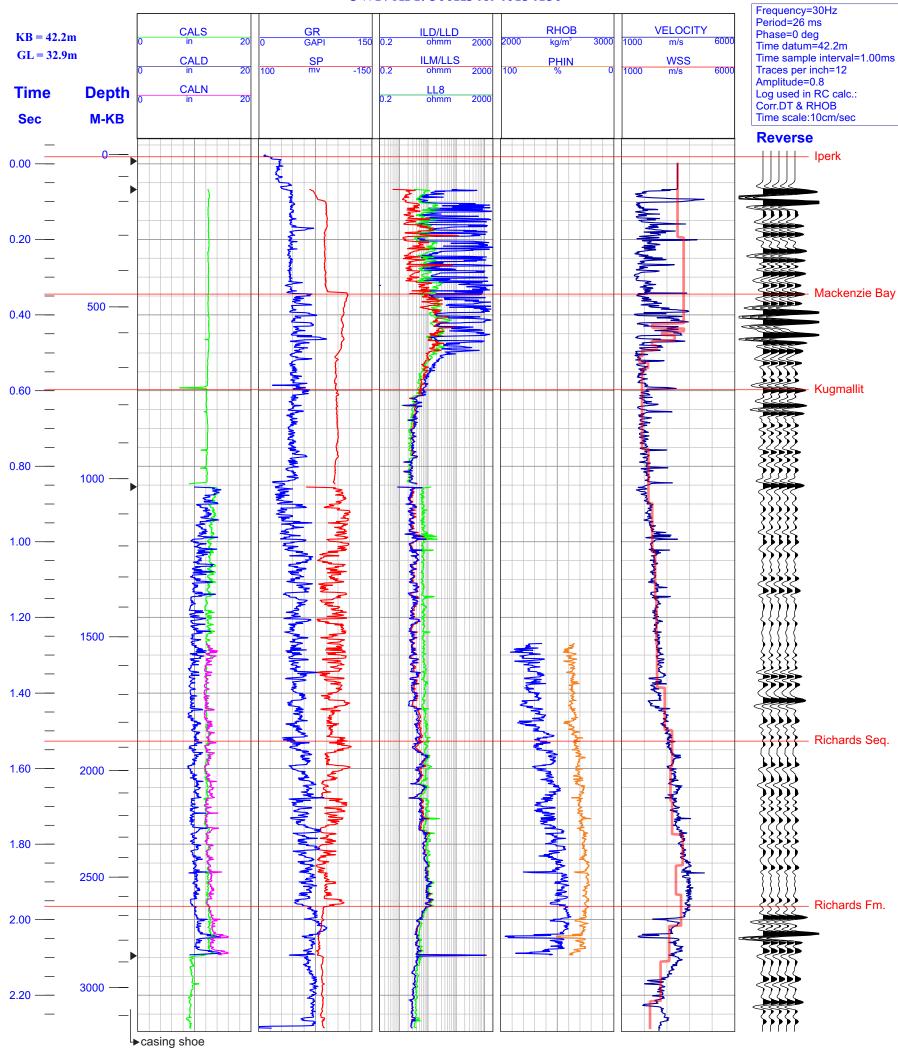
Figure 55. Well logs and synthetic of the Immerk B-48 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
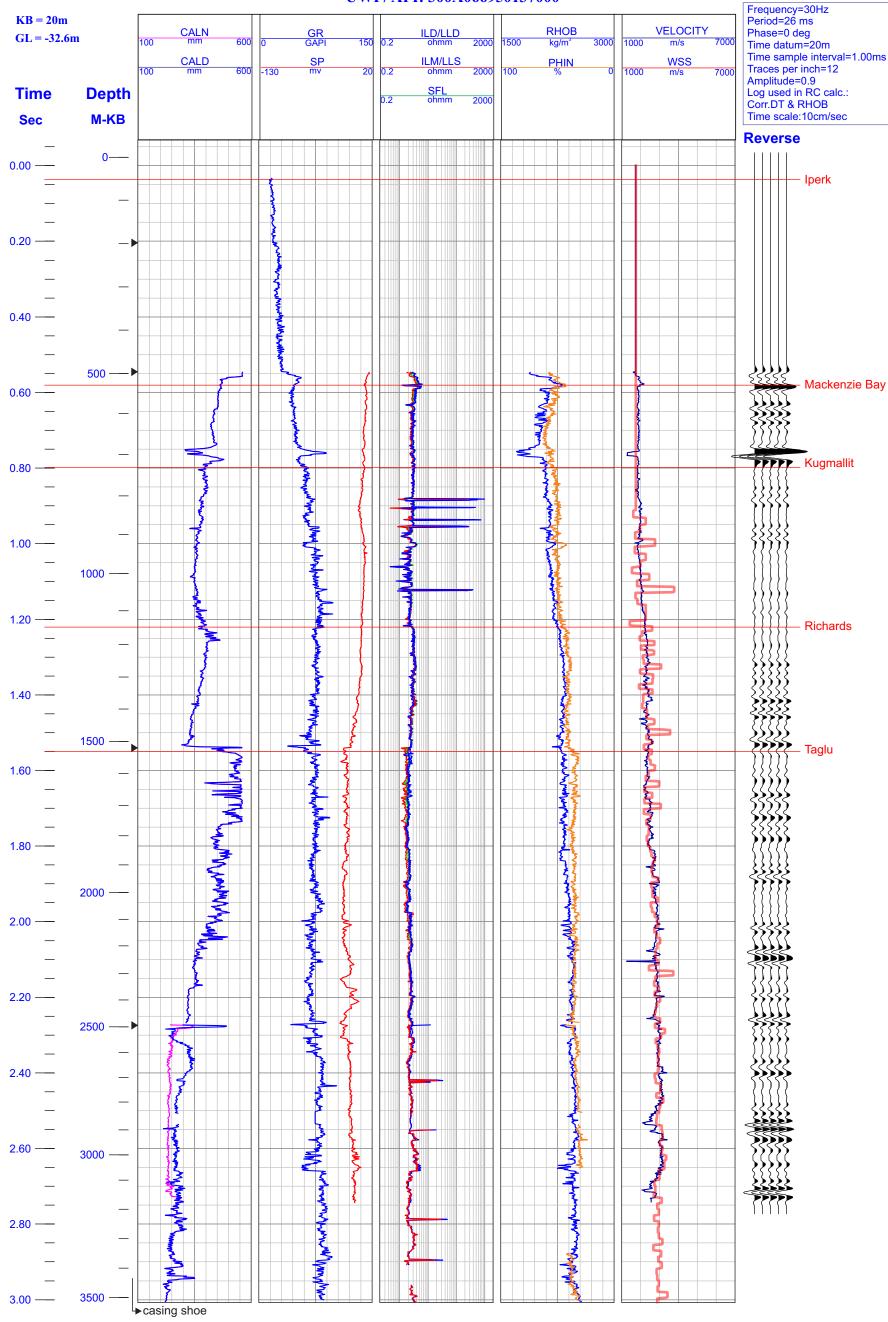
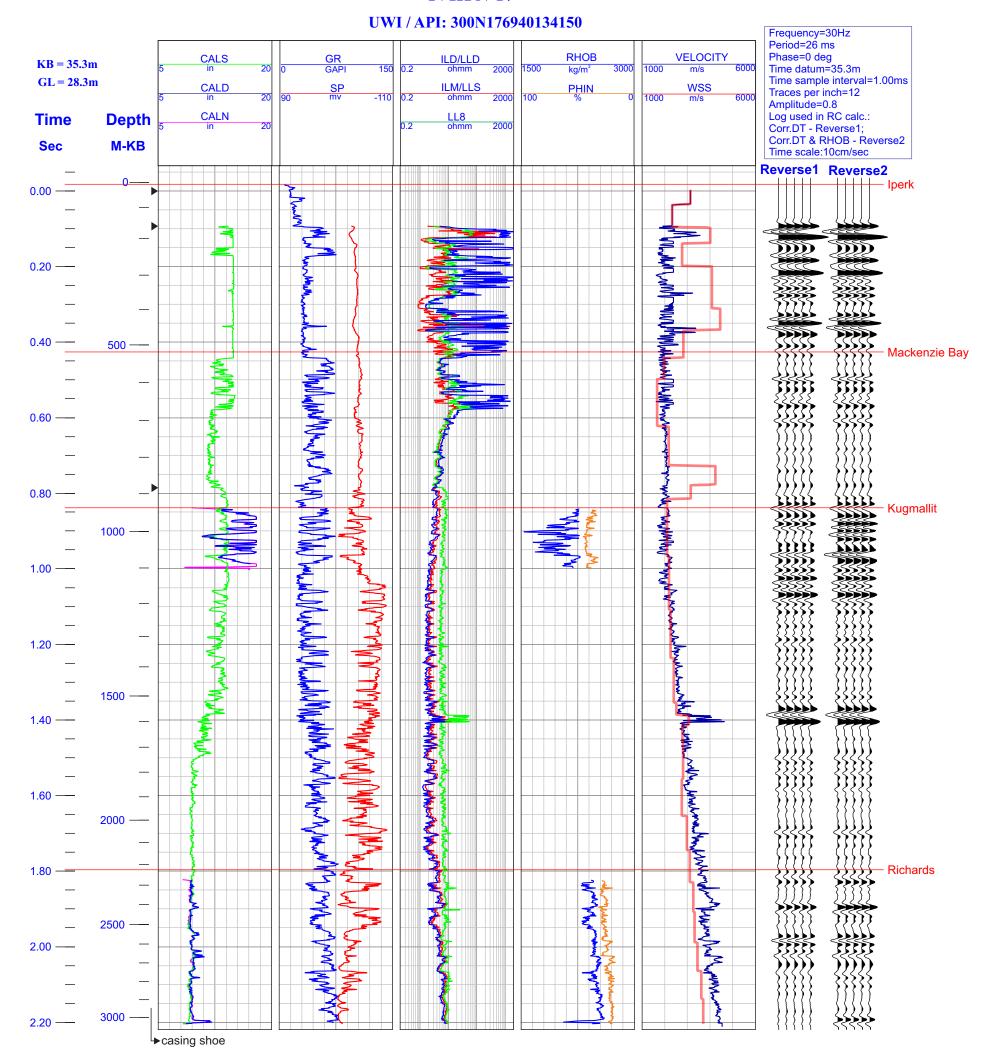Figure 56. Well logs and synthetic of the Immiugak A-06 well. The first track includes sonic caliper log (CALS) and neutron caliper log (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots), calculated velocity curve. The sixth track displays synthetic traces (Reverse).
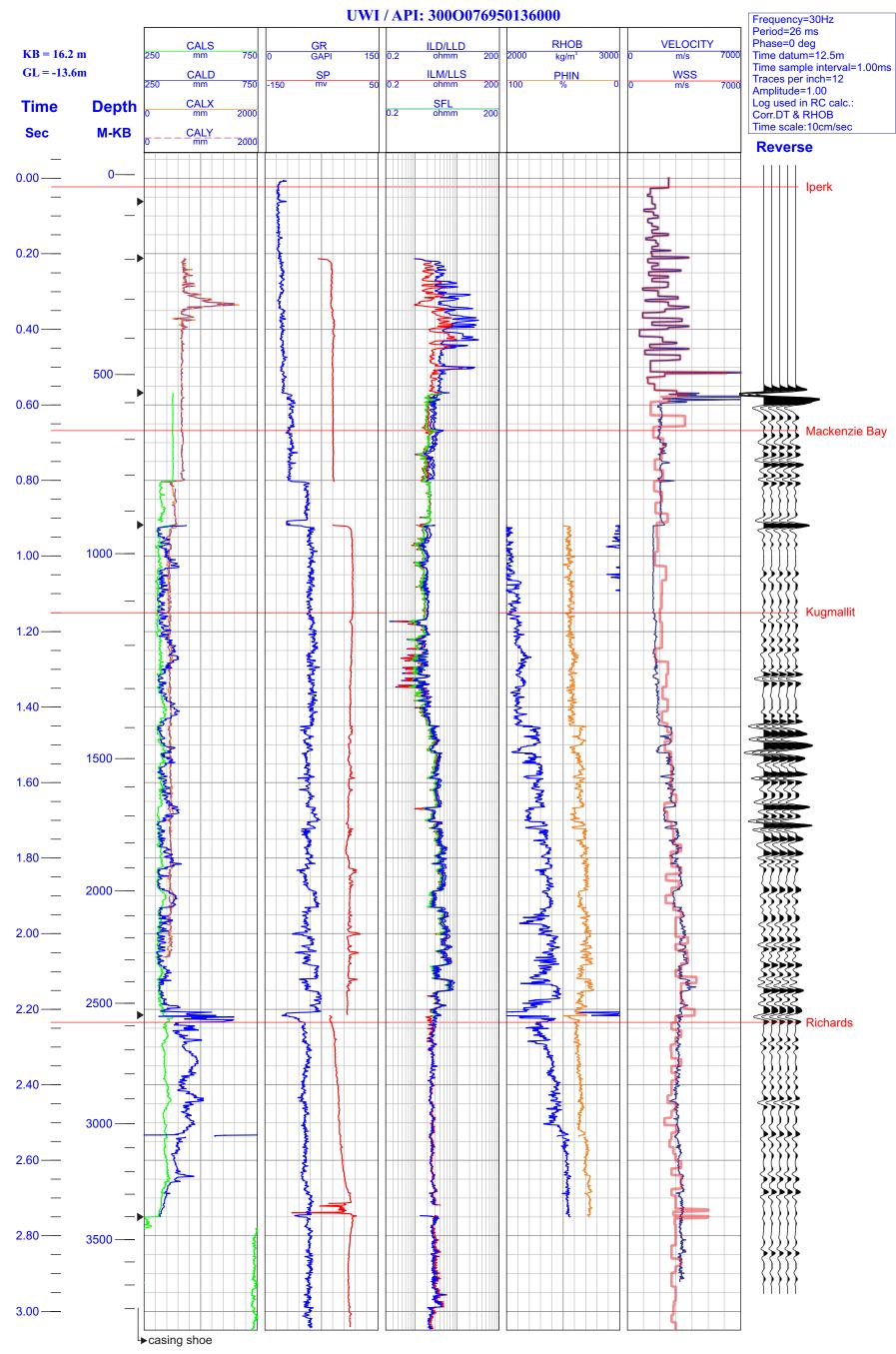
Figure 57. Well logs and synthetic of the Imnak J-29 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
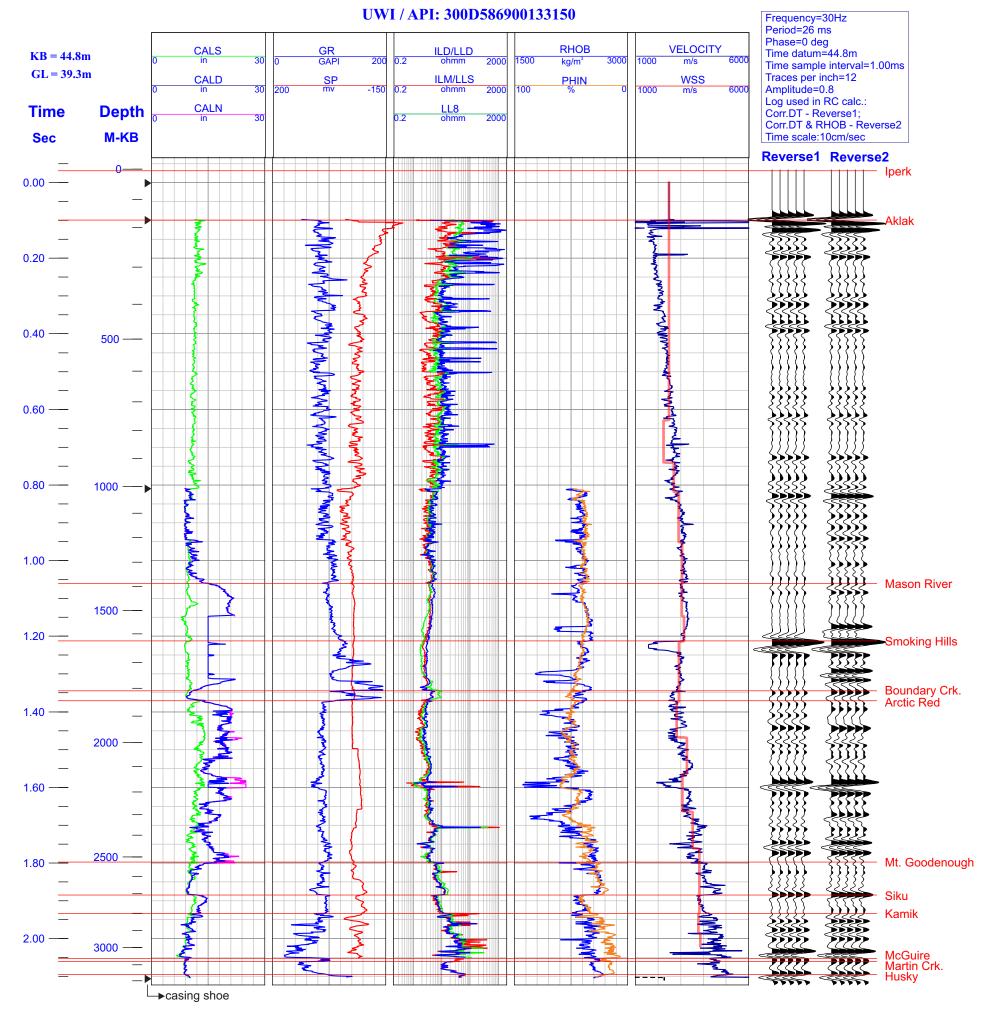
Figure 58. Well logs and synthetic of the Inuvik D-54 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and neutron caliper log (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
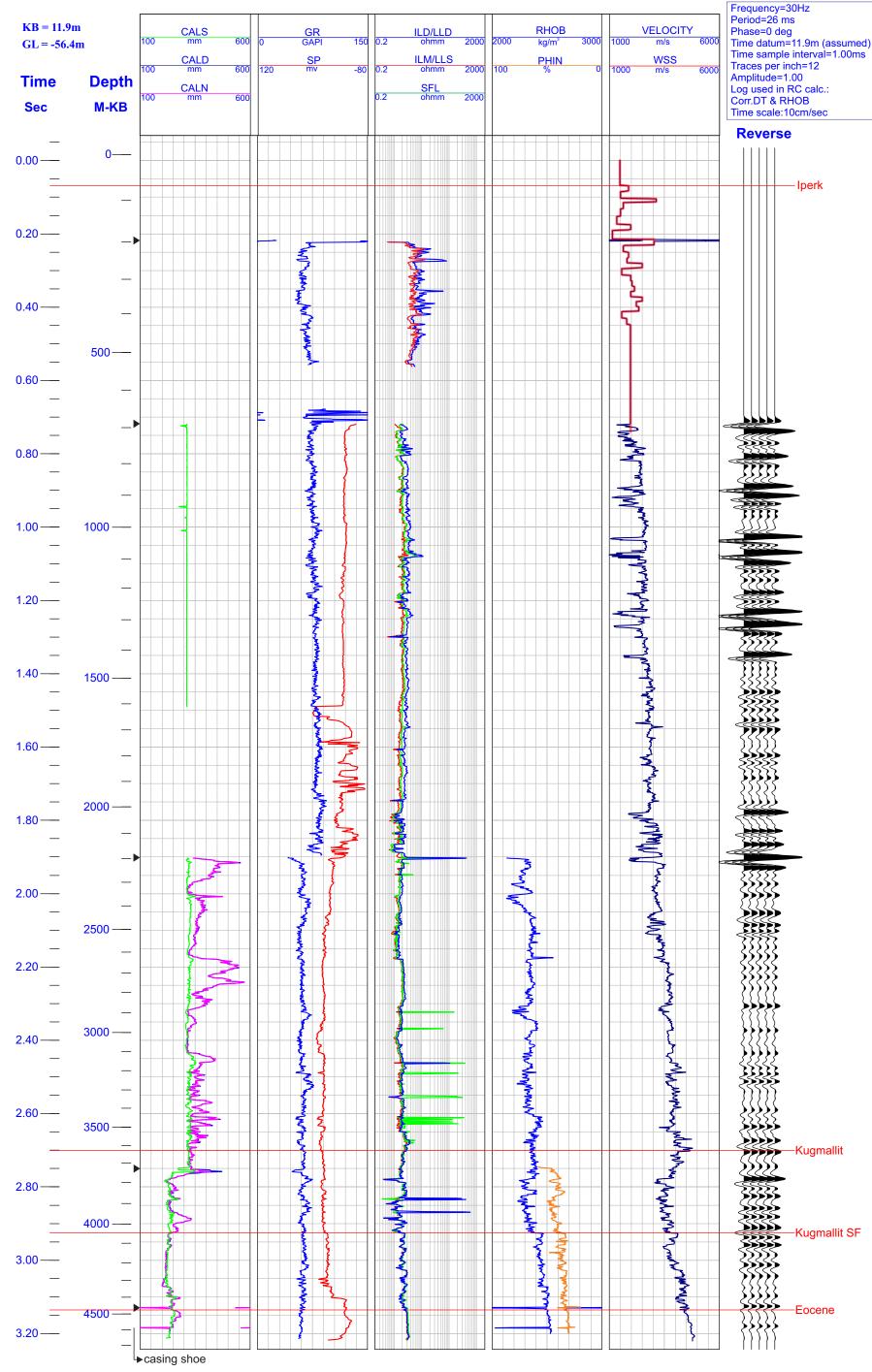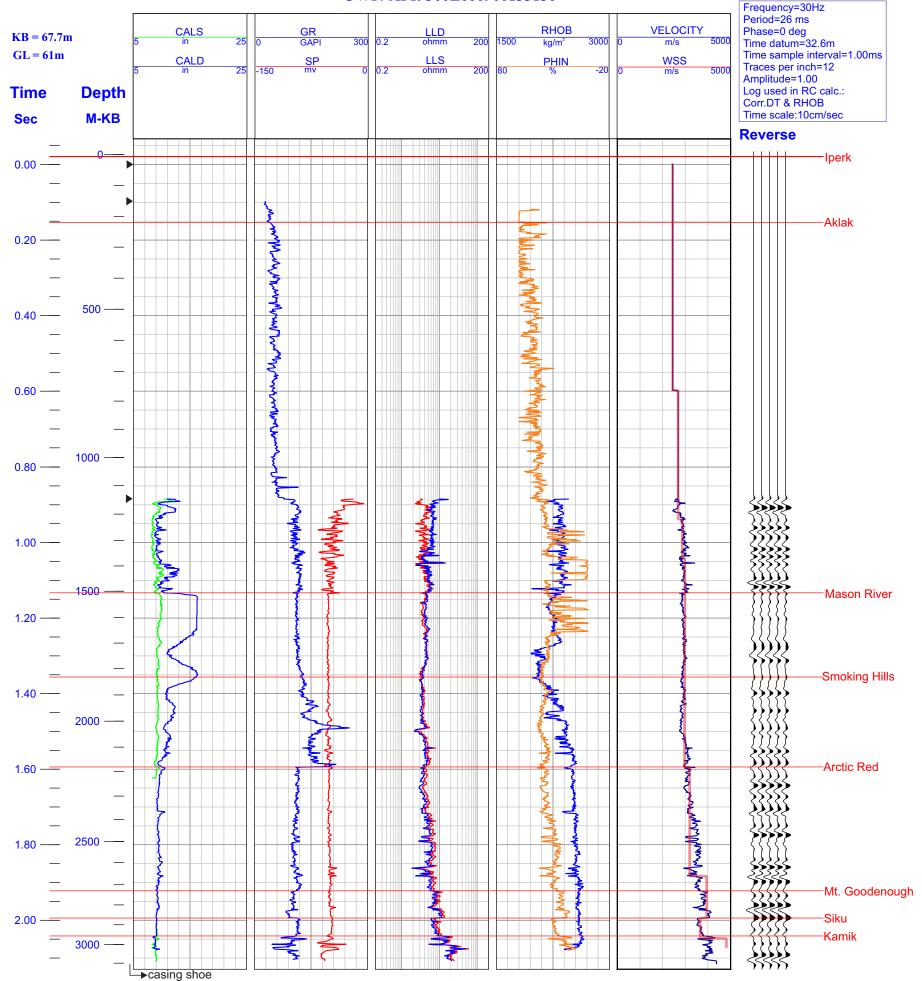
Figure 59. Well logs and synthetic of the Irkaluk B-35 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and neutron caliper log (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 60. Well logs and synthetic of the Isserk E-27 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and resistivity caliper log (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 61. Well logs and synthetic of the Isserk I-15 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (MSFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
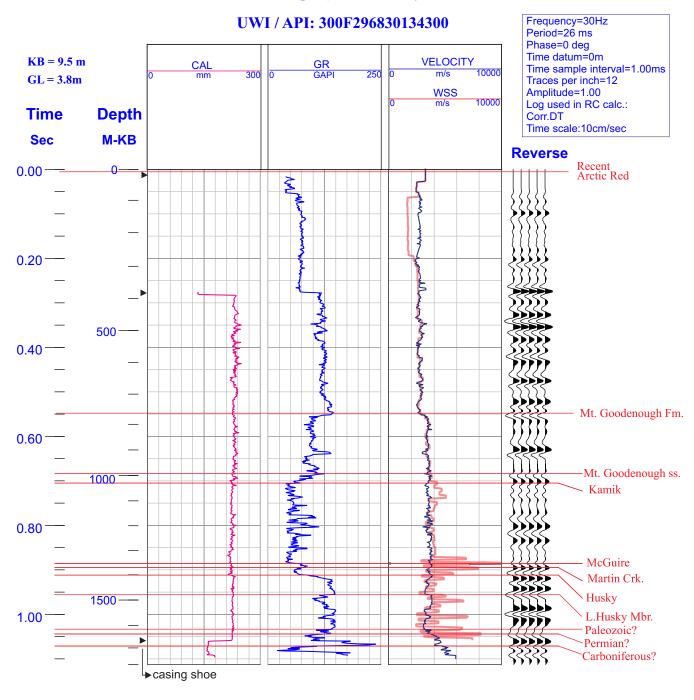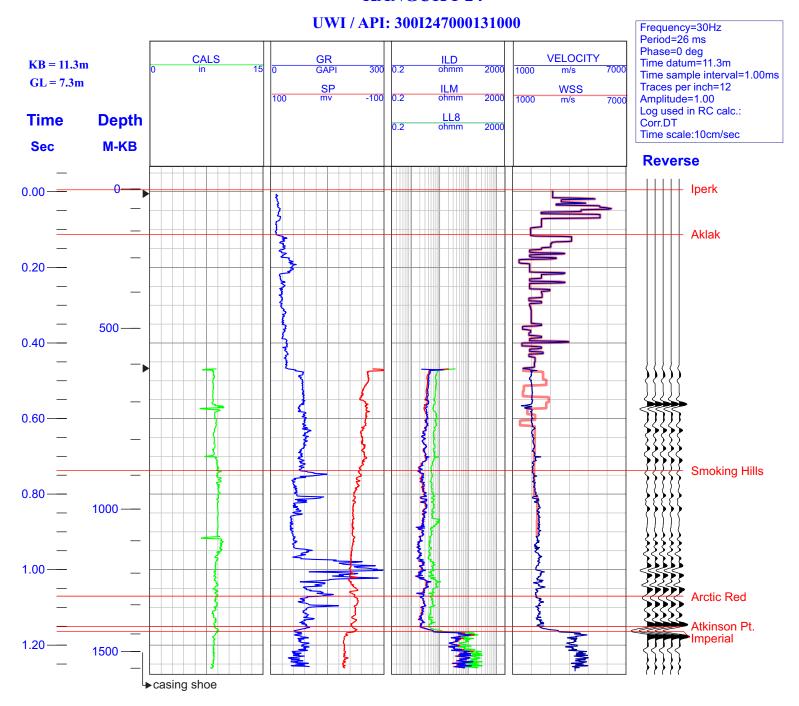
Figure 62. Well logs and synthetic of the Itiginkpak F-29 well. The first track includes caliper log (CAL); the second track contains gamma ray (GR) log; the third track illustrates well seismic survey (VSP) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
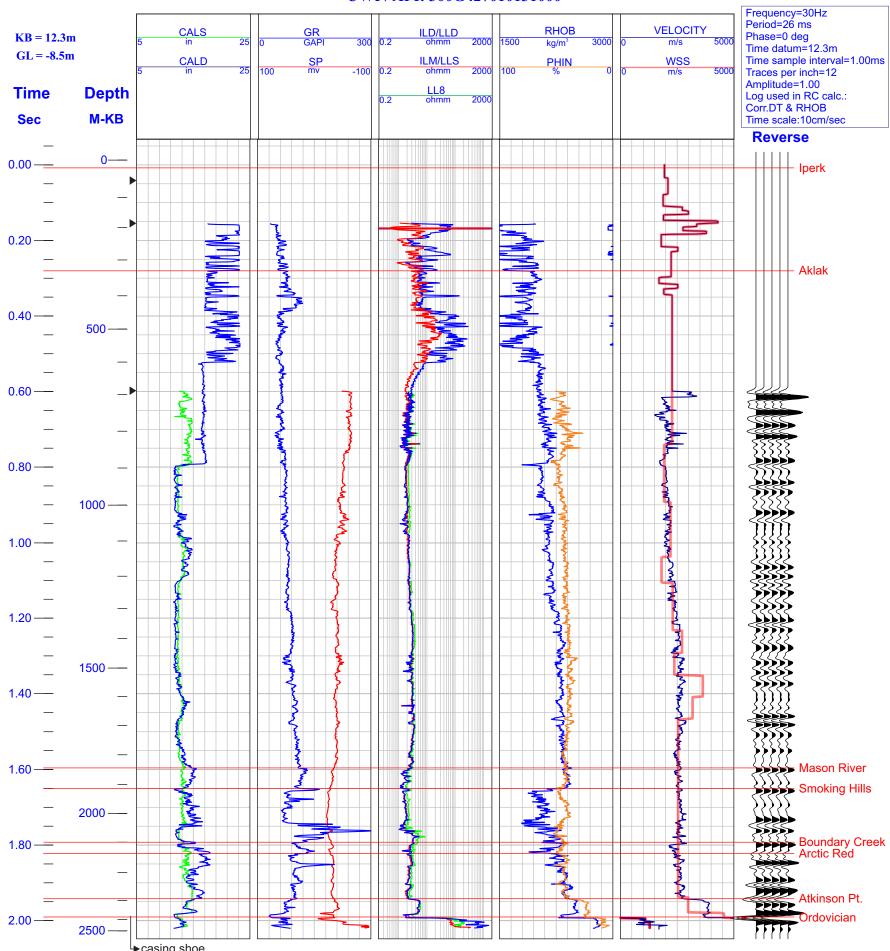
Figure 63. Well logs and synthetic of the Itiyok I-27 well. The first track includes sonic caliper log (CALS), density caliper log (CALD), caliper 1-3 (CALX) and caliper 2-4 (CALY) logs; the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1-from single DT, Reverse2-from DT and RHOB).
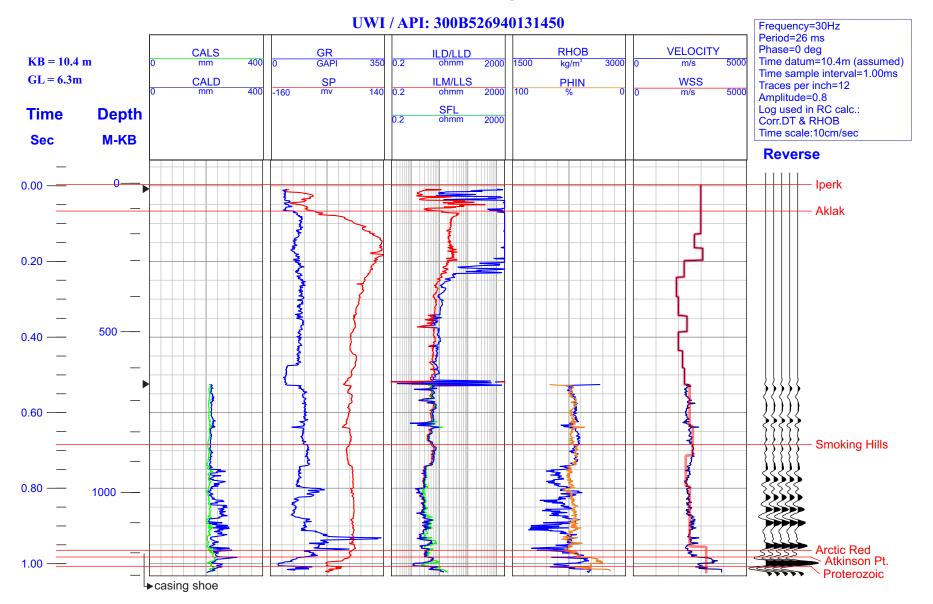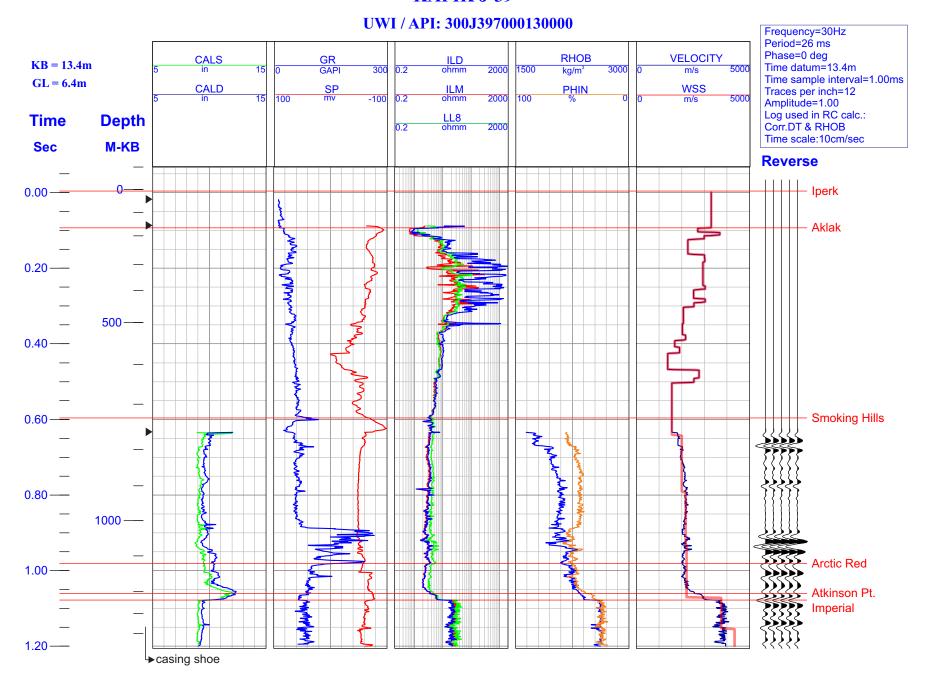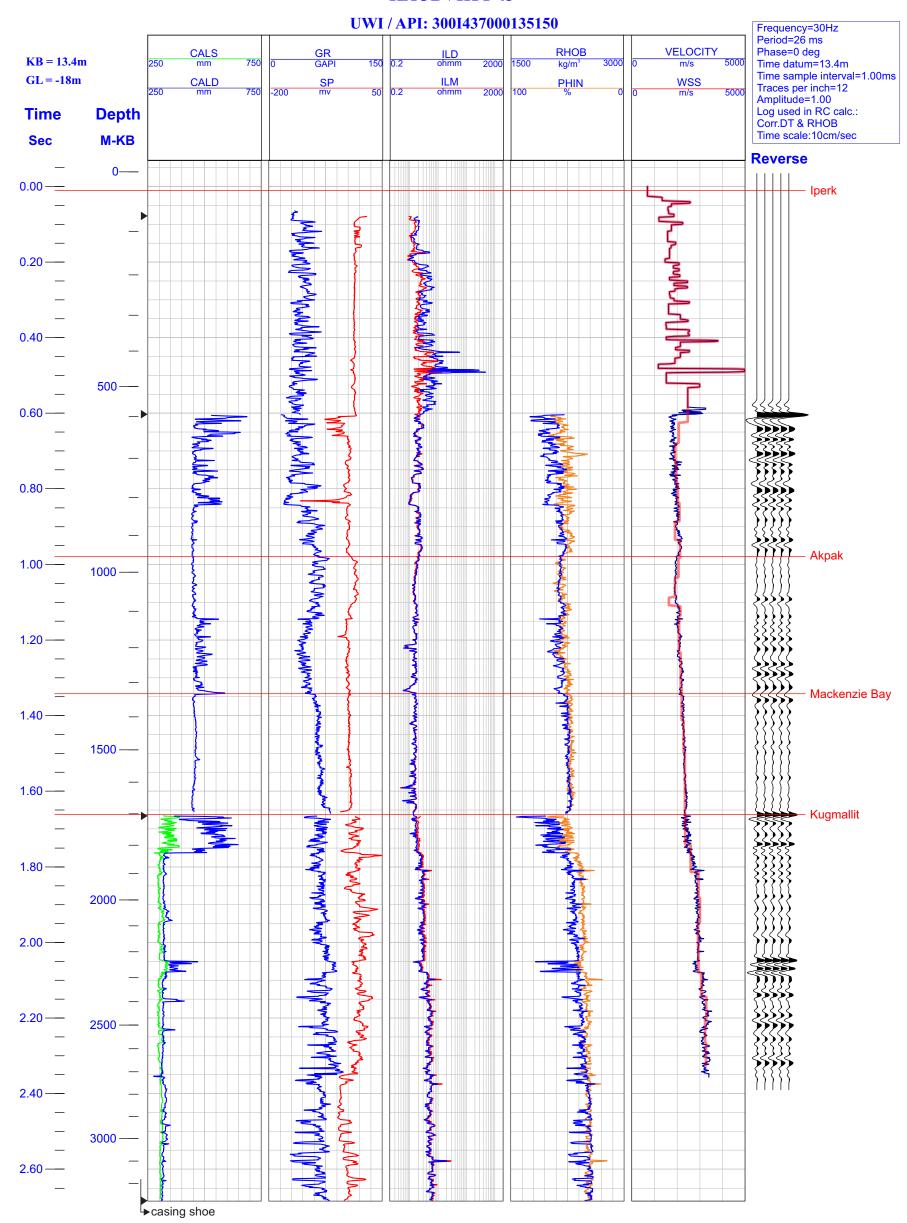
Figure 64. Well logs and synthetic of the Itkrilek B-52 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD) and medium (LLS/ILM) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

IVIK C-52

UWI / API: 300C526940134150
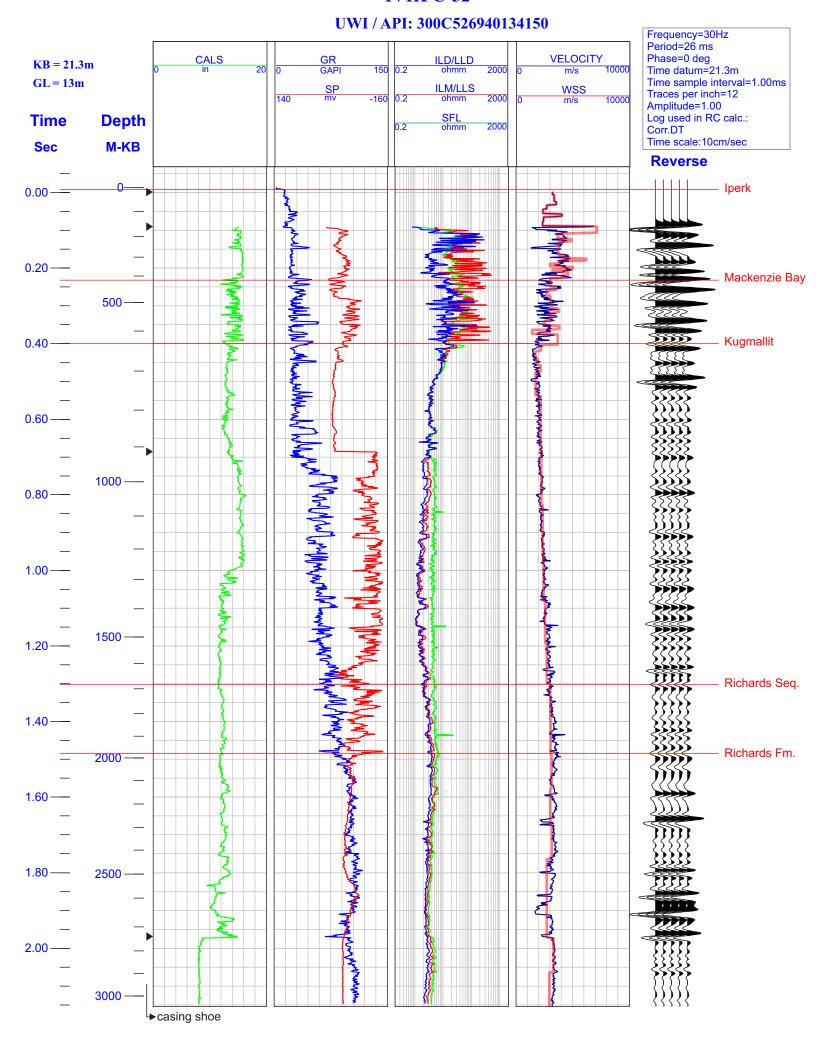
Figure 65. Well logs and synthetic of the Ivik C-52 well. The first track includes sonic caliper log (CALS); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (MSFL) resistivity logs; the fourth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The fifth track displays synthetic traces (Reverse).

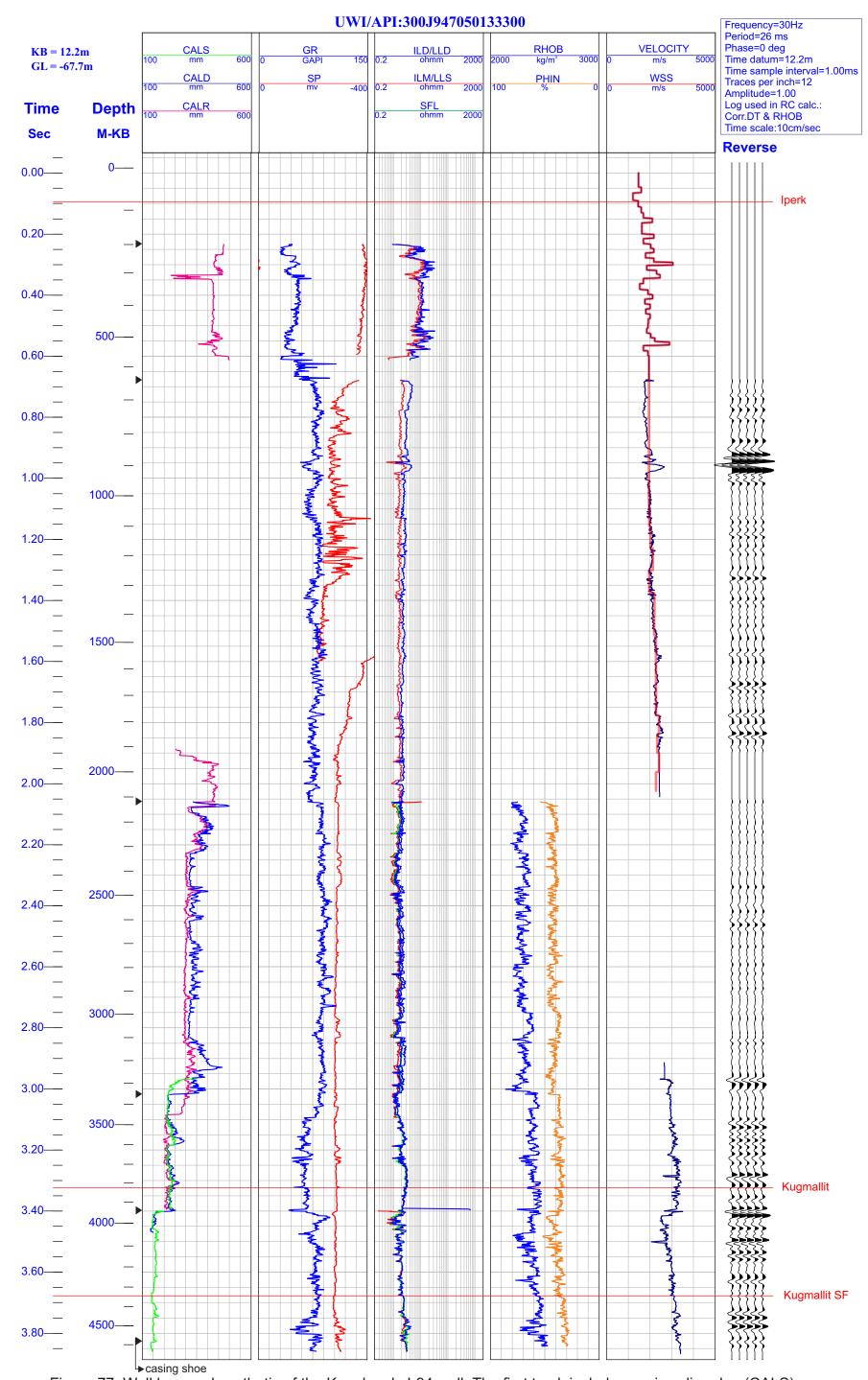Figure 66. Well logs and synthetic of the Ivik J-26 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
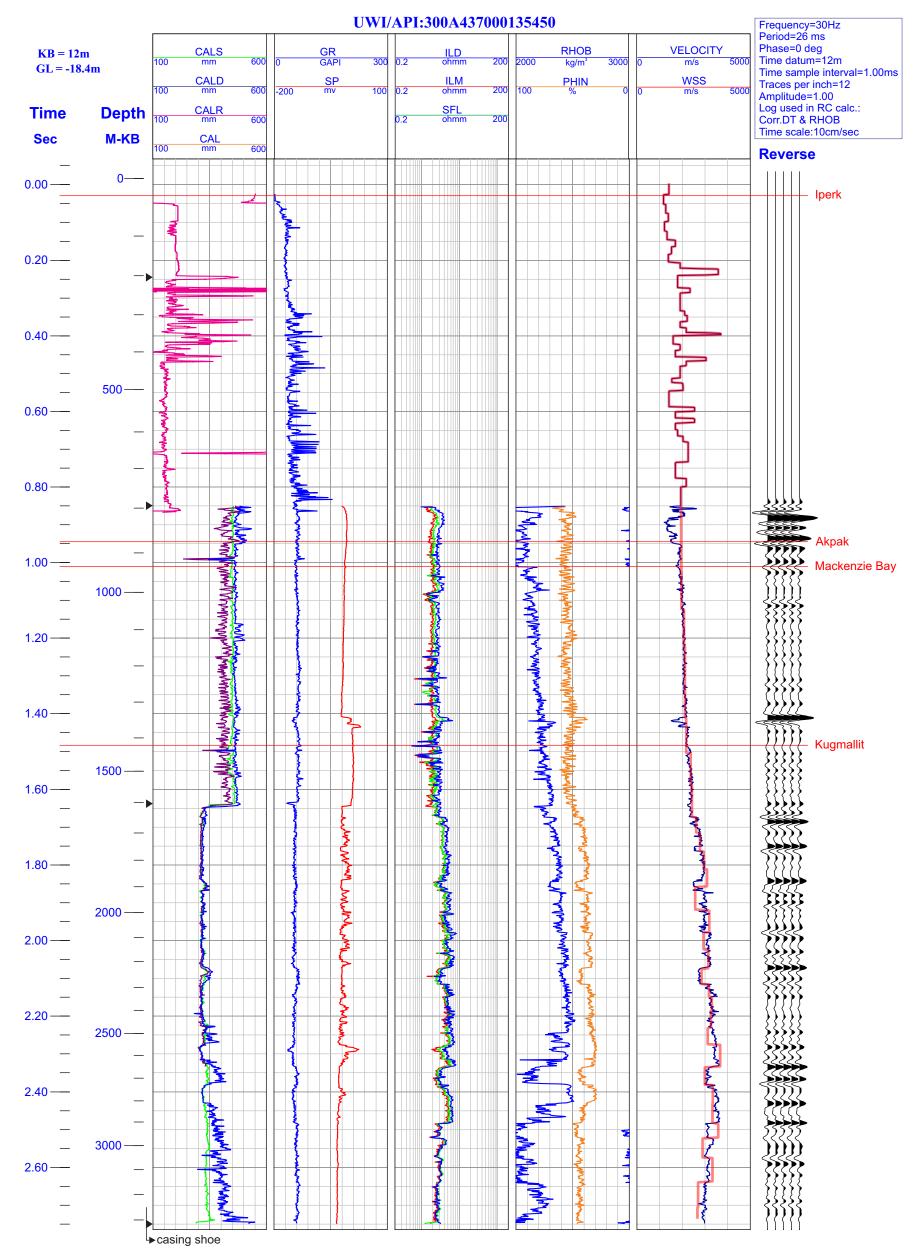
Figure 67. Well logs and synthetic of the Ivik K-54 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and neutron caliper (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

IVIK N-17
UWI / API: 300N176940134150
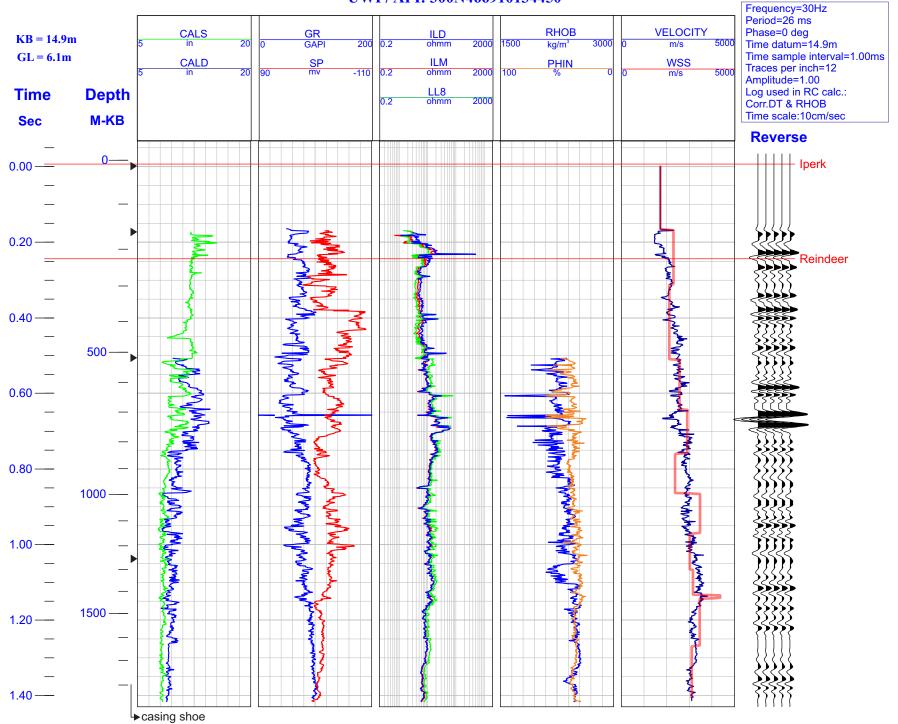
Figure 68. Well logs and synthetic of the Ivik N-17 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and neutron caliper (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1-from single DT, Reverse2-from DT and RHOB).

KADLUK O-07

UWI / API: 300O076950136000

Figure 69. Well logs and synthetic of the Kadluk O-07 well. The first track includes sonic caliper log (CALS), density caliper log (CALD), caliper 1-3 (CALX) and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
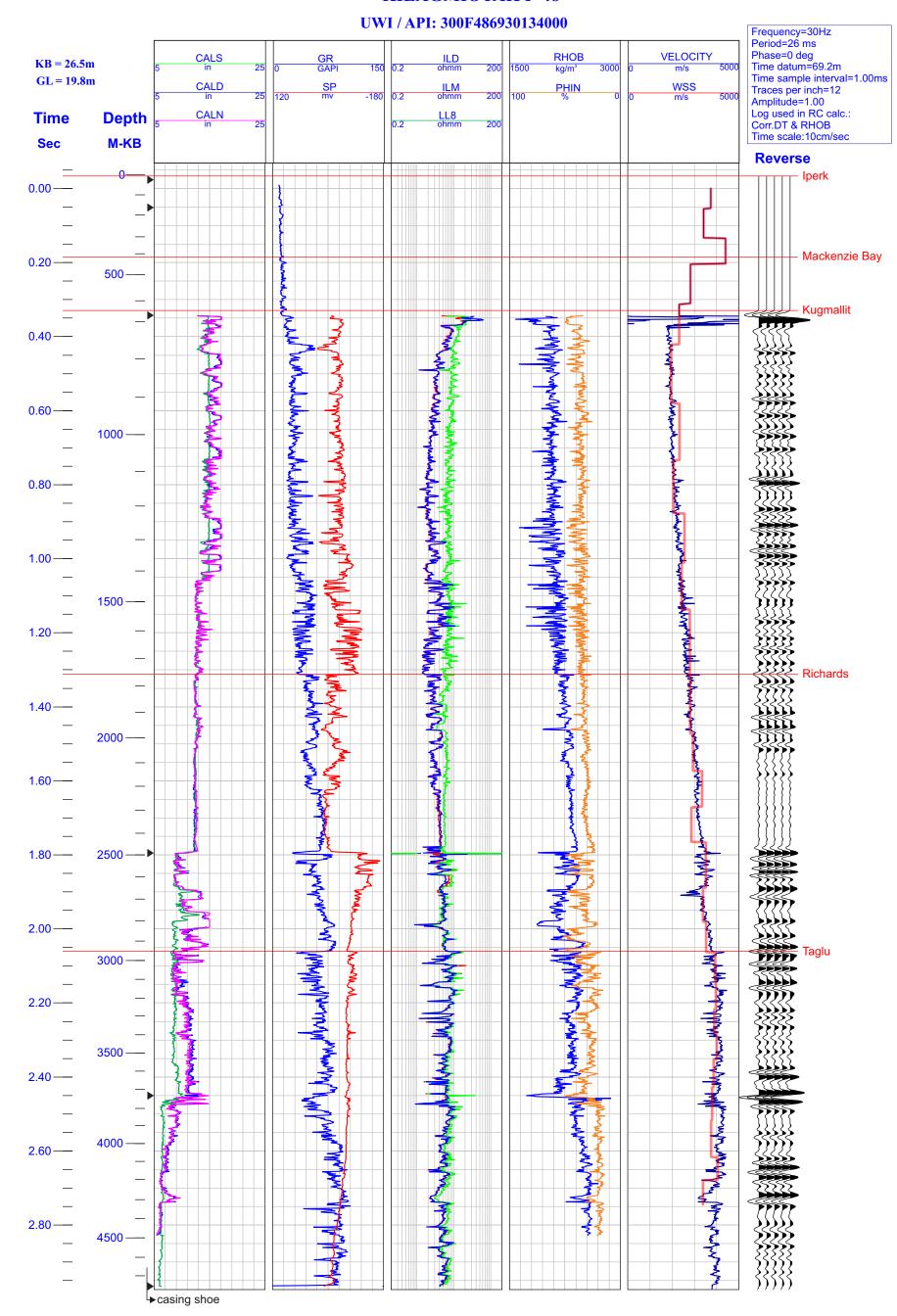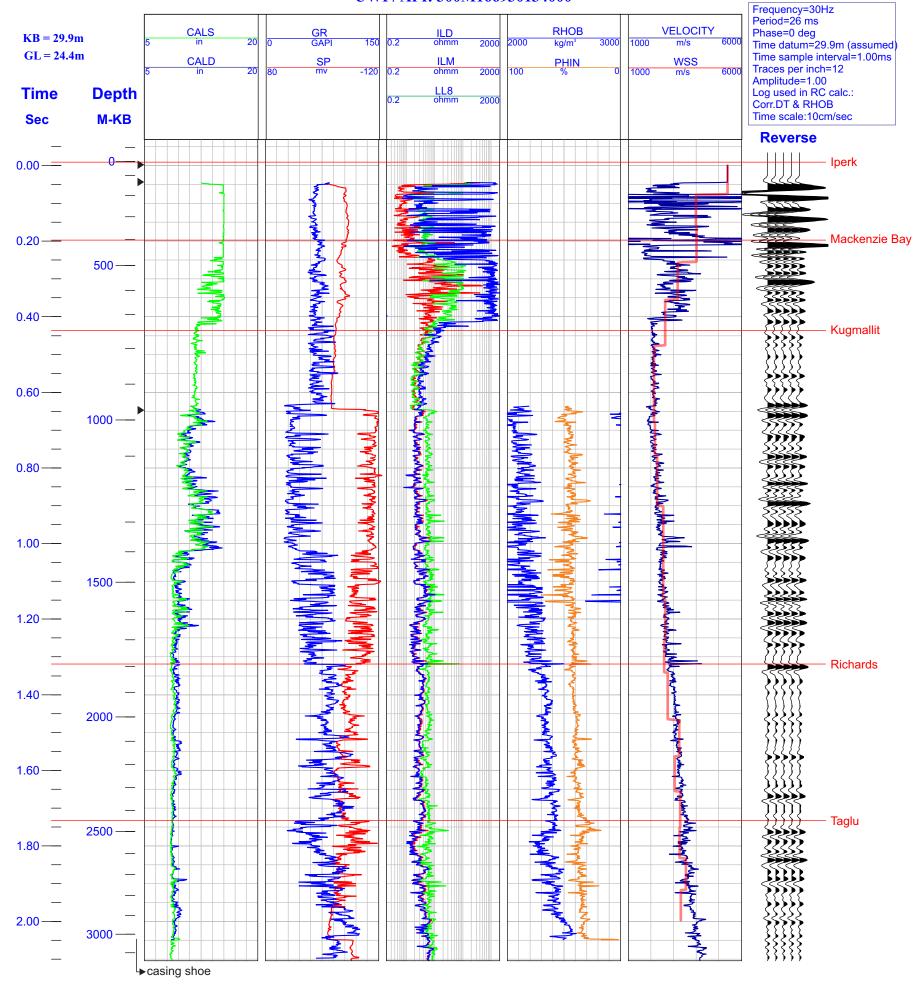
Figure 70. Well logs and synthetic of the Kamik D-58 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and neutron caliper (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1- from DT, and Reverse2- from DT and RHOB).
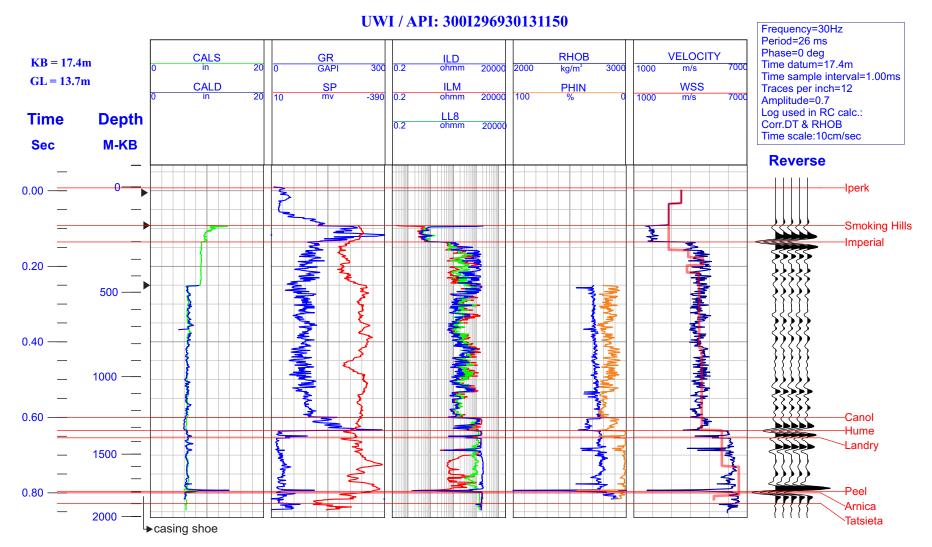
Figure 71. Well logs and synthetic of the Kamik L-60 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep laterolog (LLD) and shallow laterolog (LLS); the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
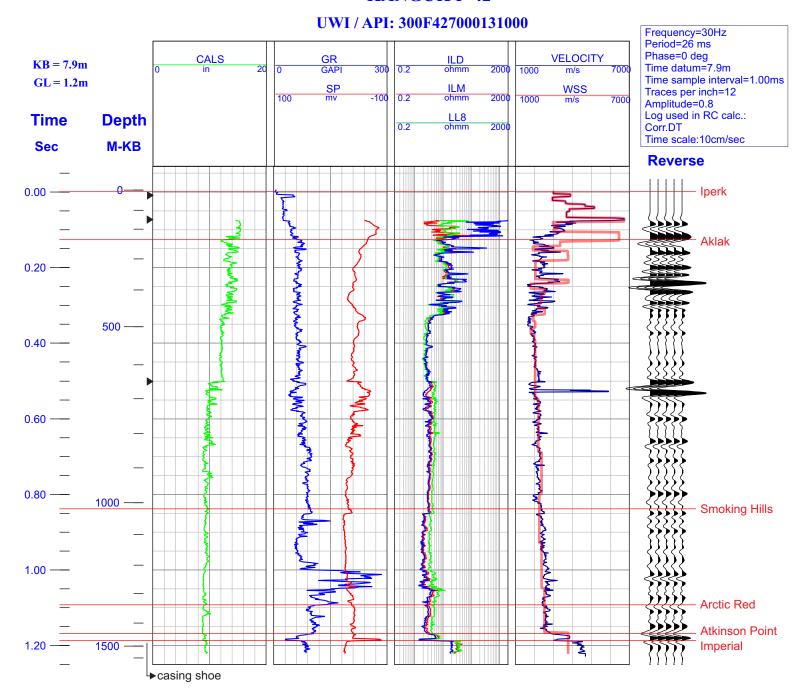
Figure 72. Well logs and synthetic of the Kanguk F-42 well. The first track includes sonic caliper log (CALS); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The fifth track displays synthetic traces (Reverse).

Figure 73. Well logs and synthetic of the Kanguk I-24 well. The first track includes sonic caliper log (CALS); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The fifth track displays synthetic traces (Reverse).
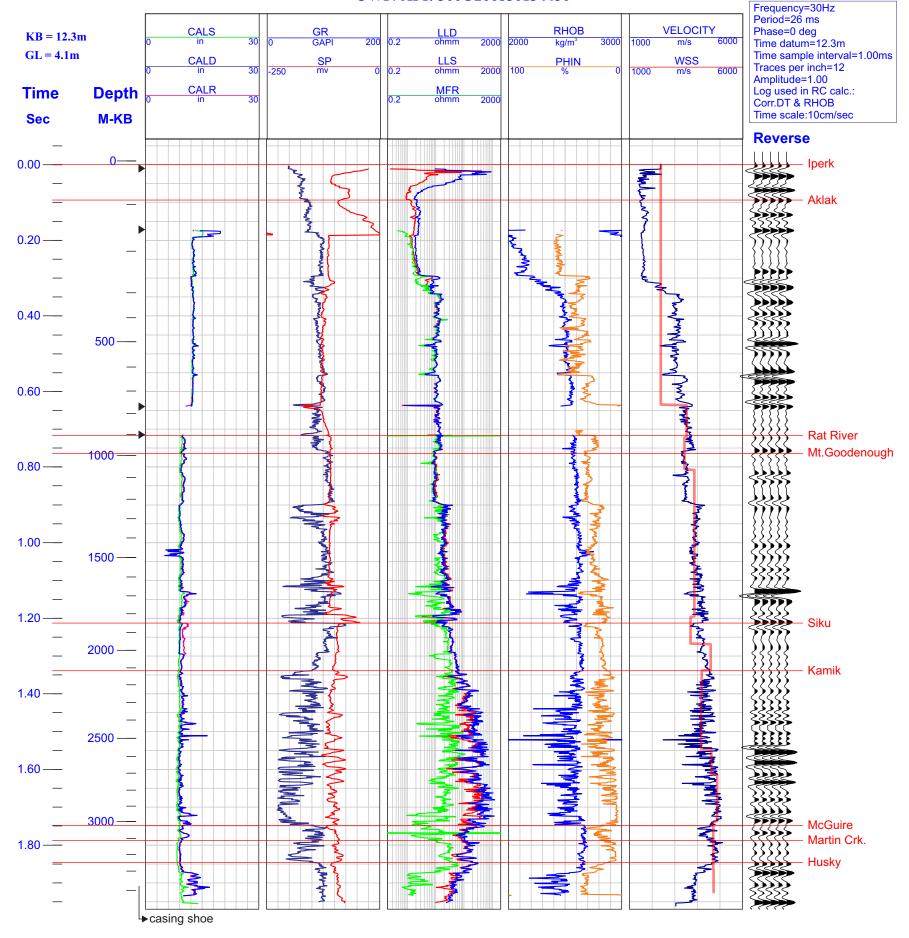
KANNERK G-42

UWI / API: 300G427010131000

Figure 74. Well logs and synthetic of the Kannerk G-42 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
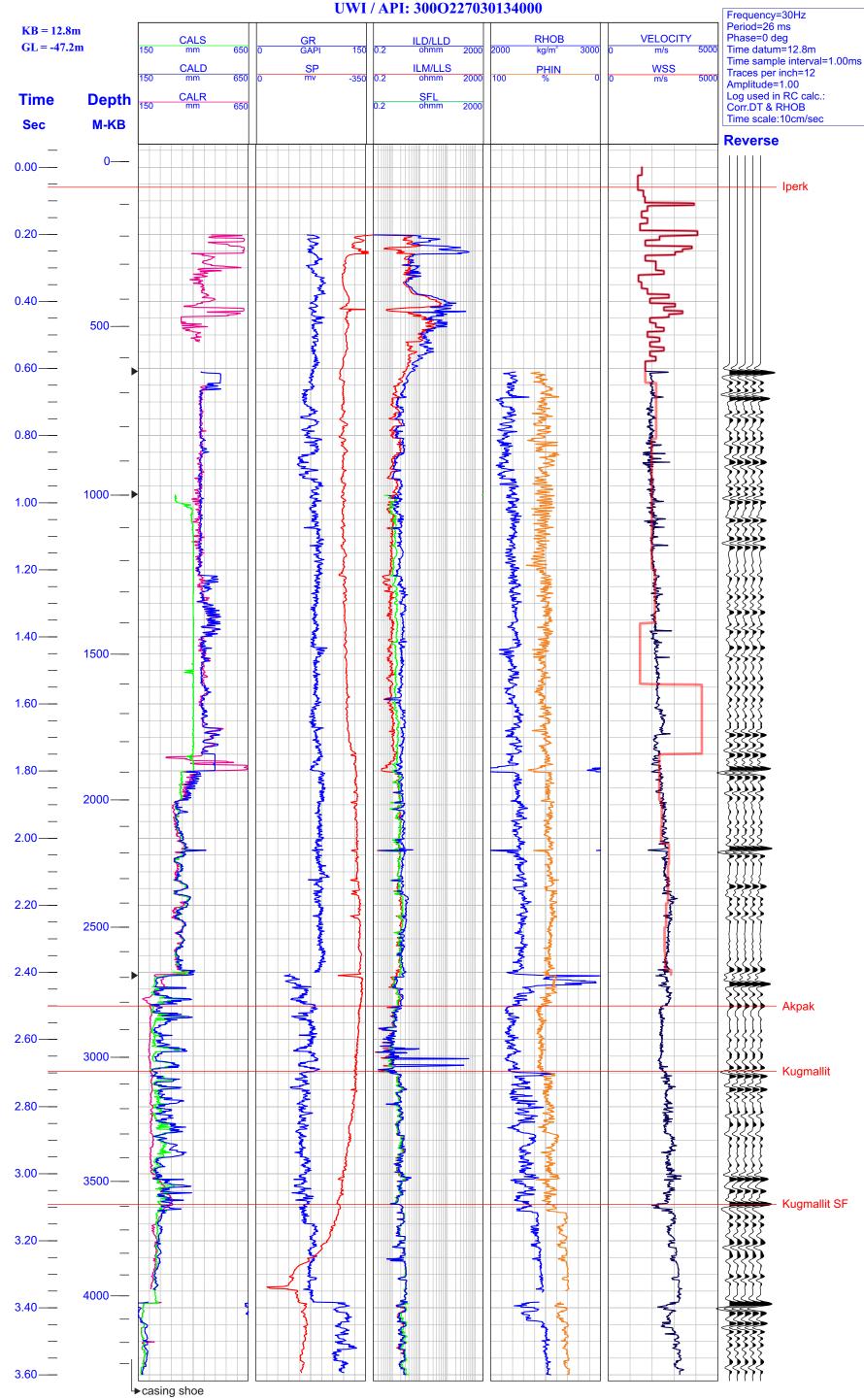
Figure 75. Well logs and synthetic of the Kapik J-39 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep induction (ILD), medium induction (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

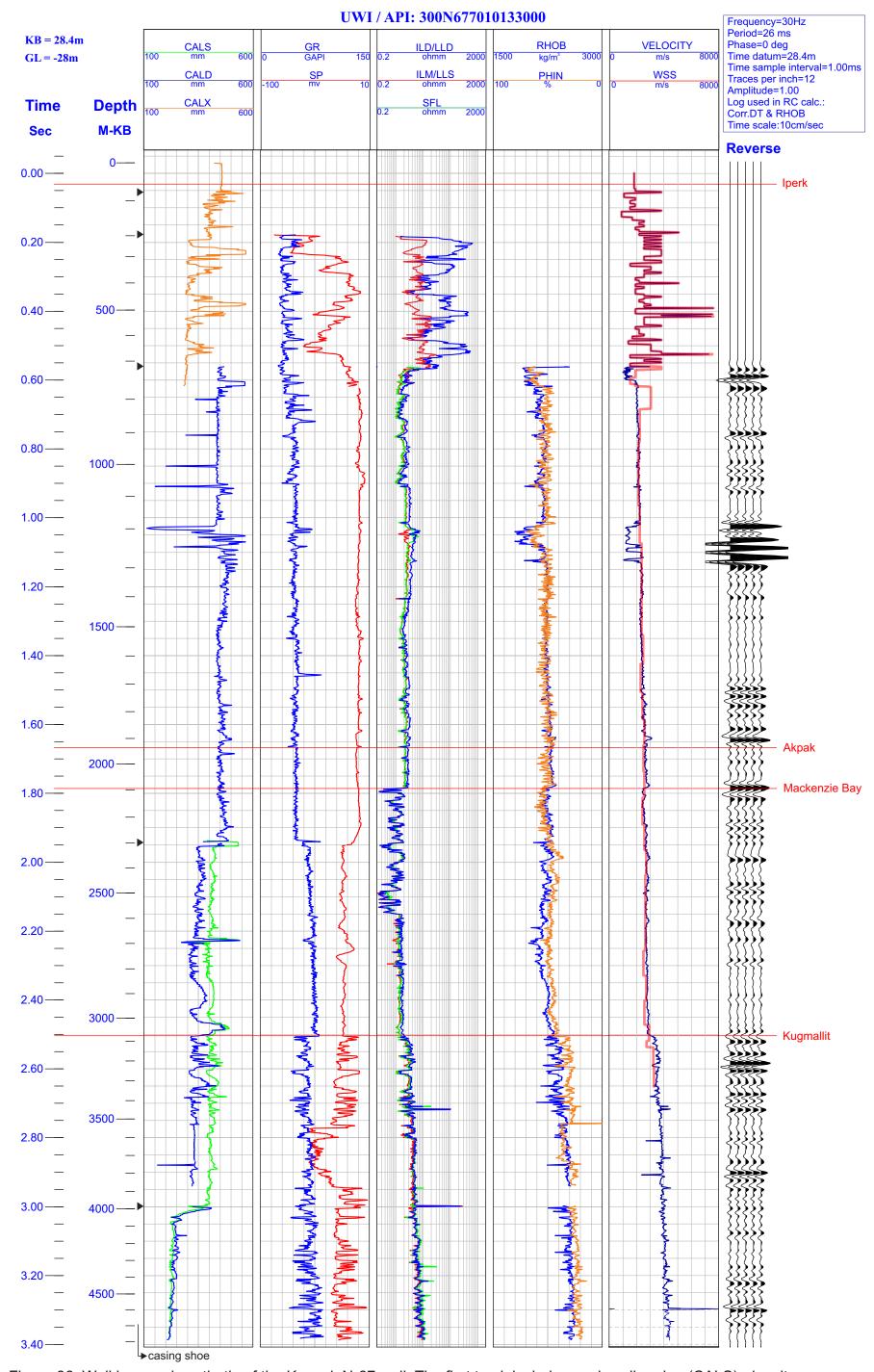Figure 76. Well logs and synthetic of the Kaubvik I-43 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep induction (ILD) and medium induction (ILM) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
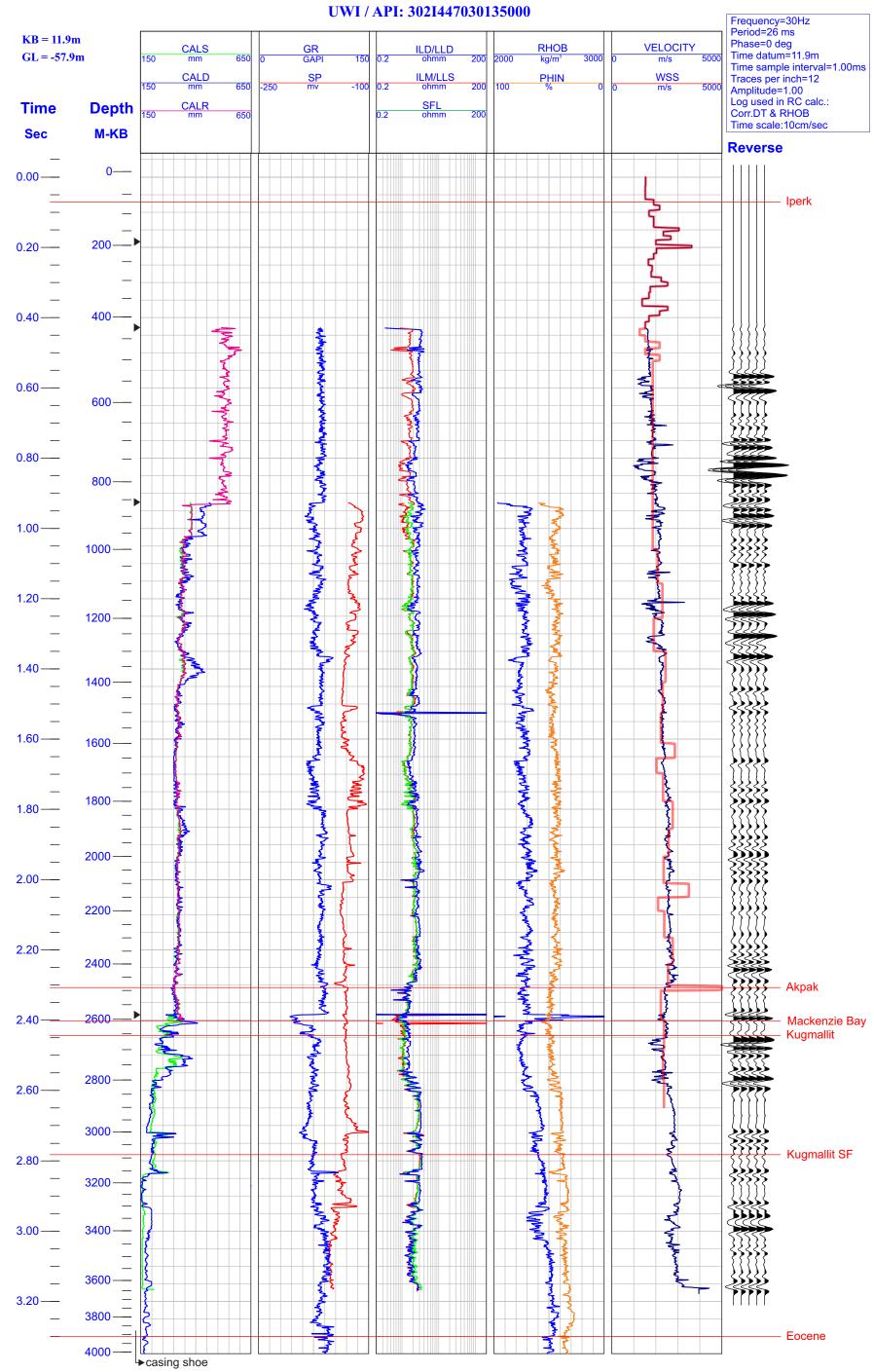
Figure 77. Well logs and synthetic of the Kenalooak J-94 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and resistivity caliper log (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
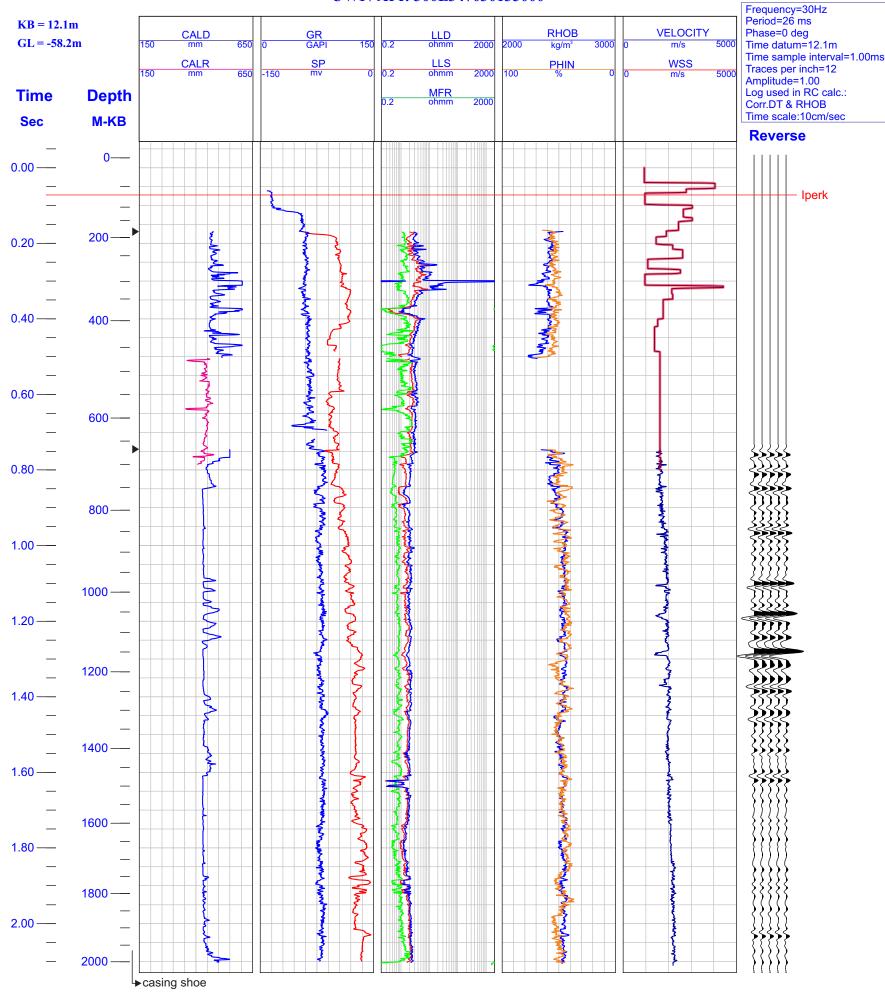
Figure 78. Well logs and synthetic of the Kiggavik A-43 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD), general caliper log (CAL) and resistivity caliper log (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
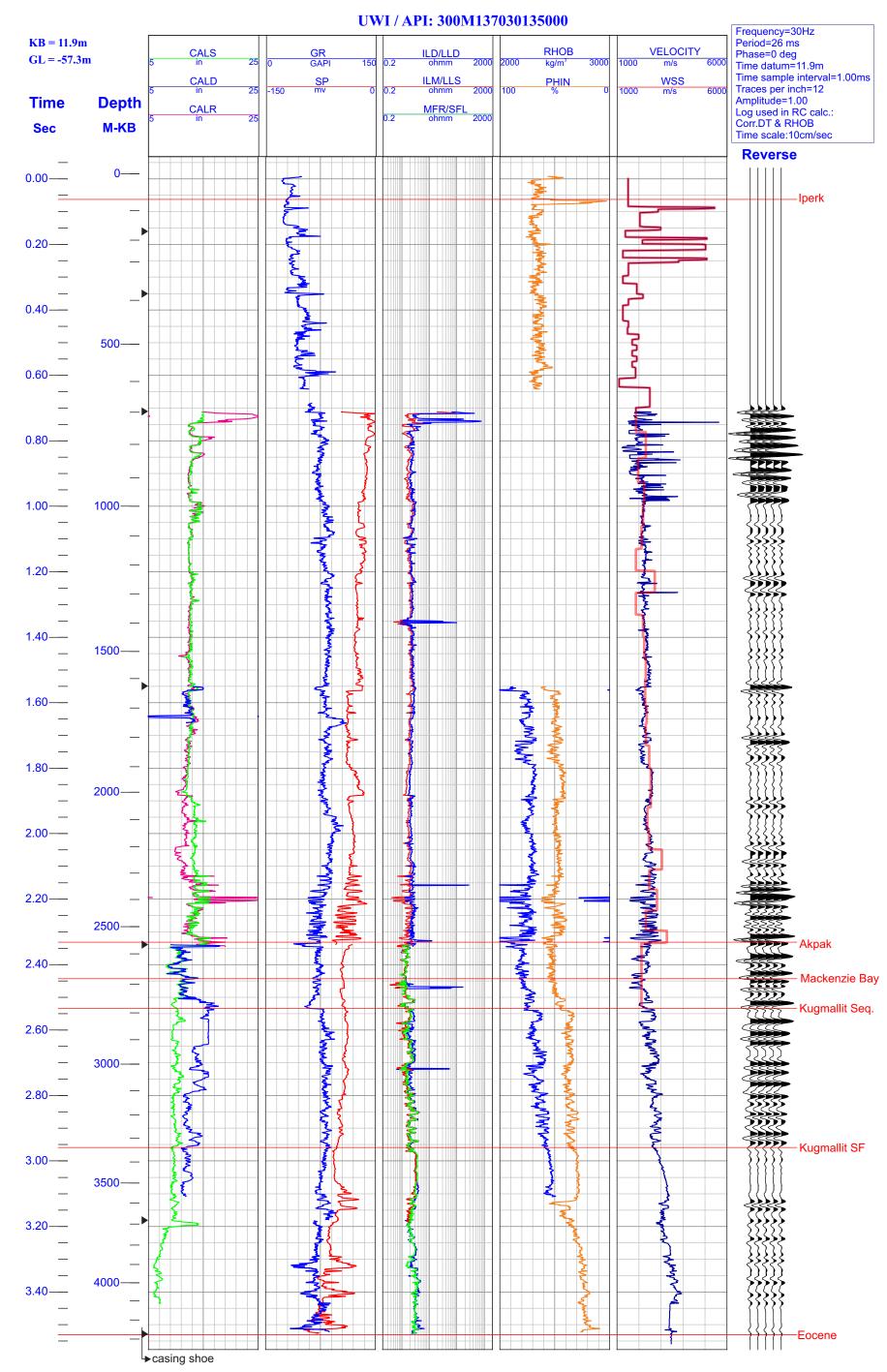
Figure 79. Well logs and synthetic of the Kikoralok N-46 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 80. Well logs and synthetic of the Kilagmiotak F-48 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and neutron caliper log (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 81. Well logs and synthetic of the Kilagmiotak M-16 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
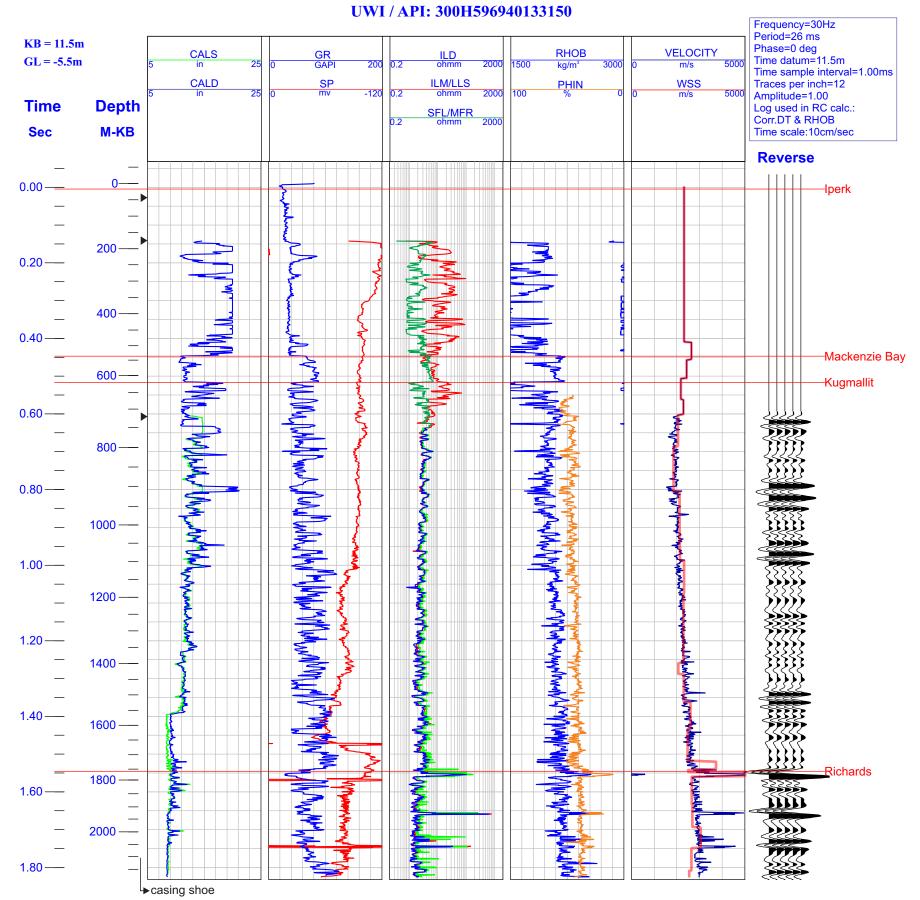
Figure 82. Well logs and synthetic of the Kiligvak I-29 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
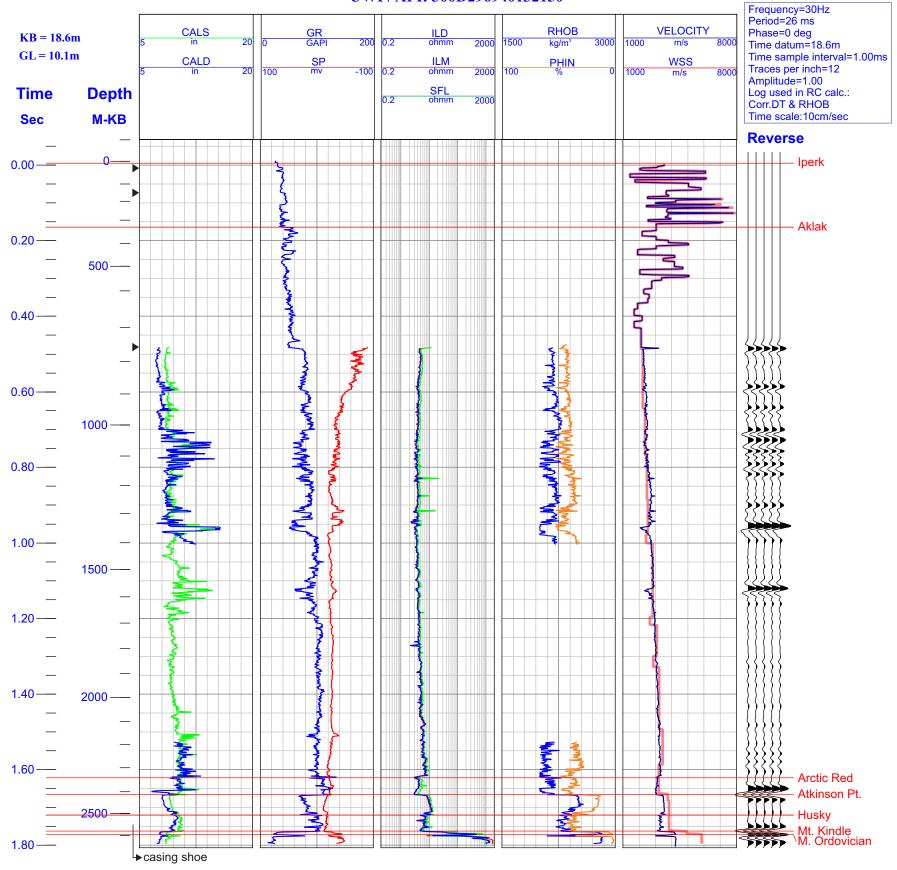
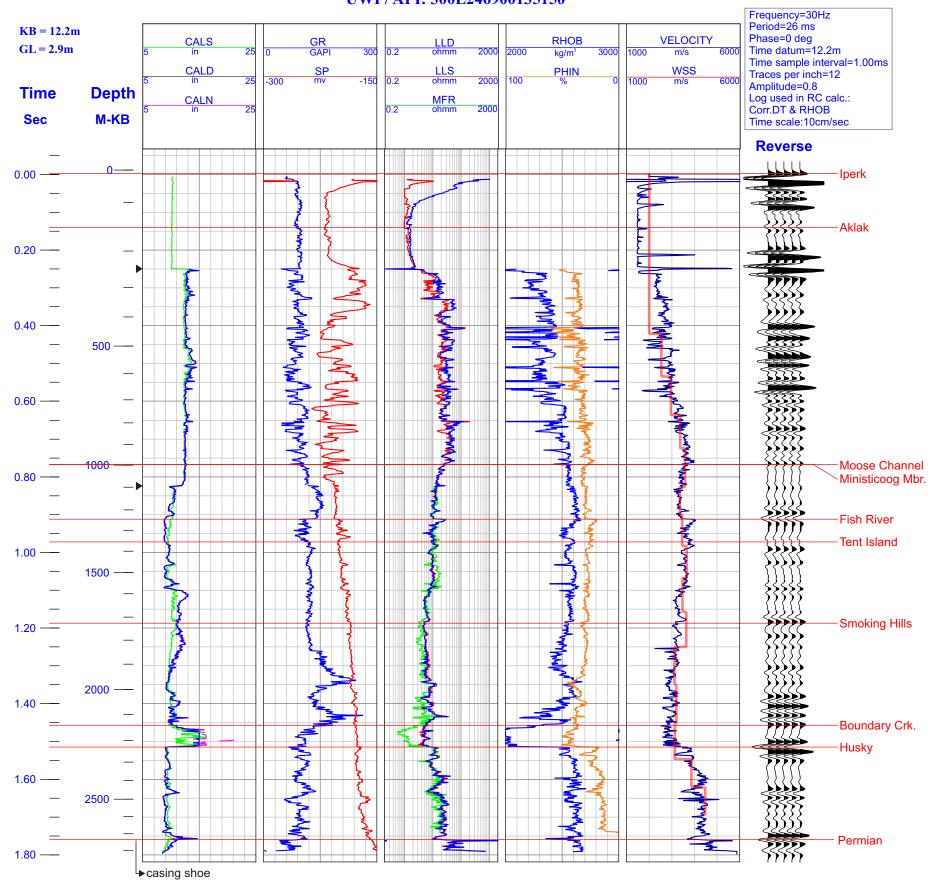Figure 83. Well logs and synthetic of the Kimik D-29 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 84. Well logs and synthetic of the Kipnik O-20 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and resistivity caliper log (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD), medium (LLS) and shallow (MFR) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
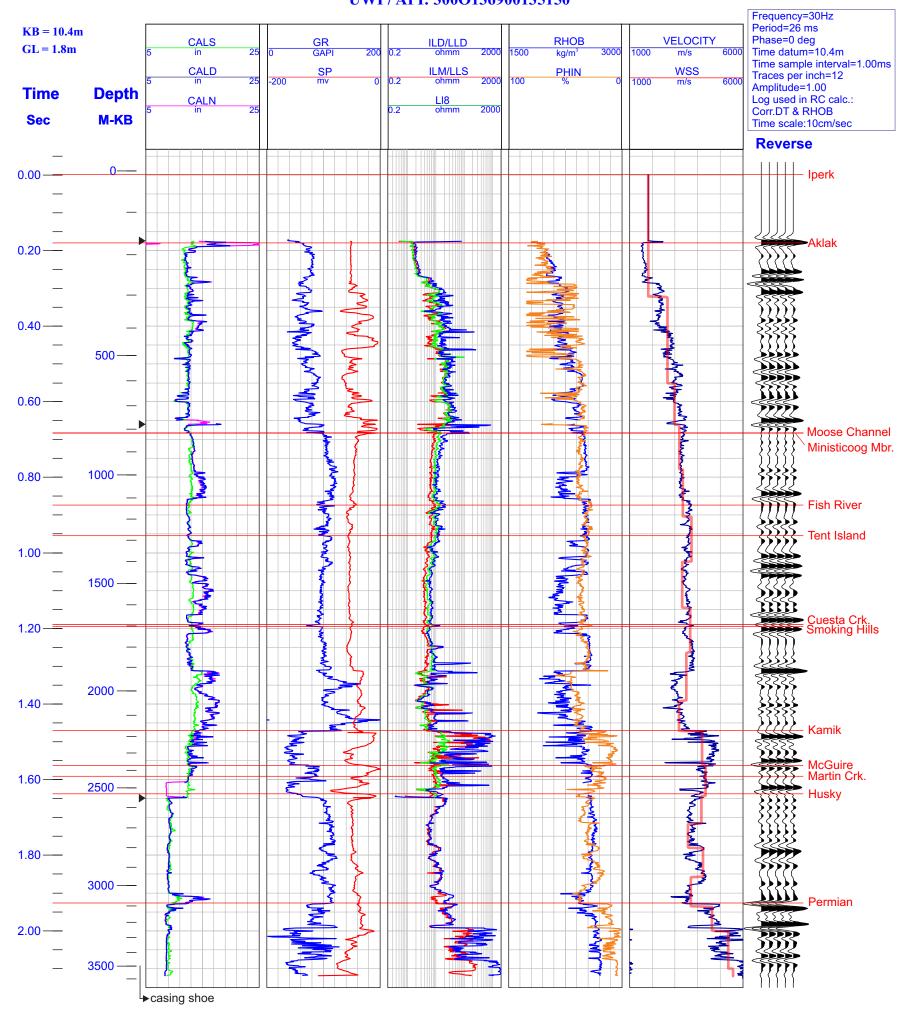
KOAKOAK O-22

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Figure 85. Well logs and synthetic of the Koakoak O-22 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and resistivity caliper log (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
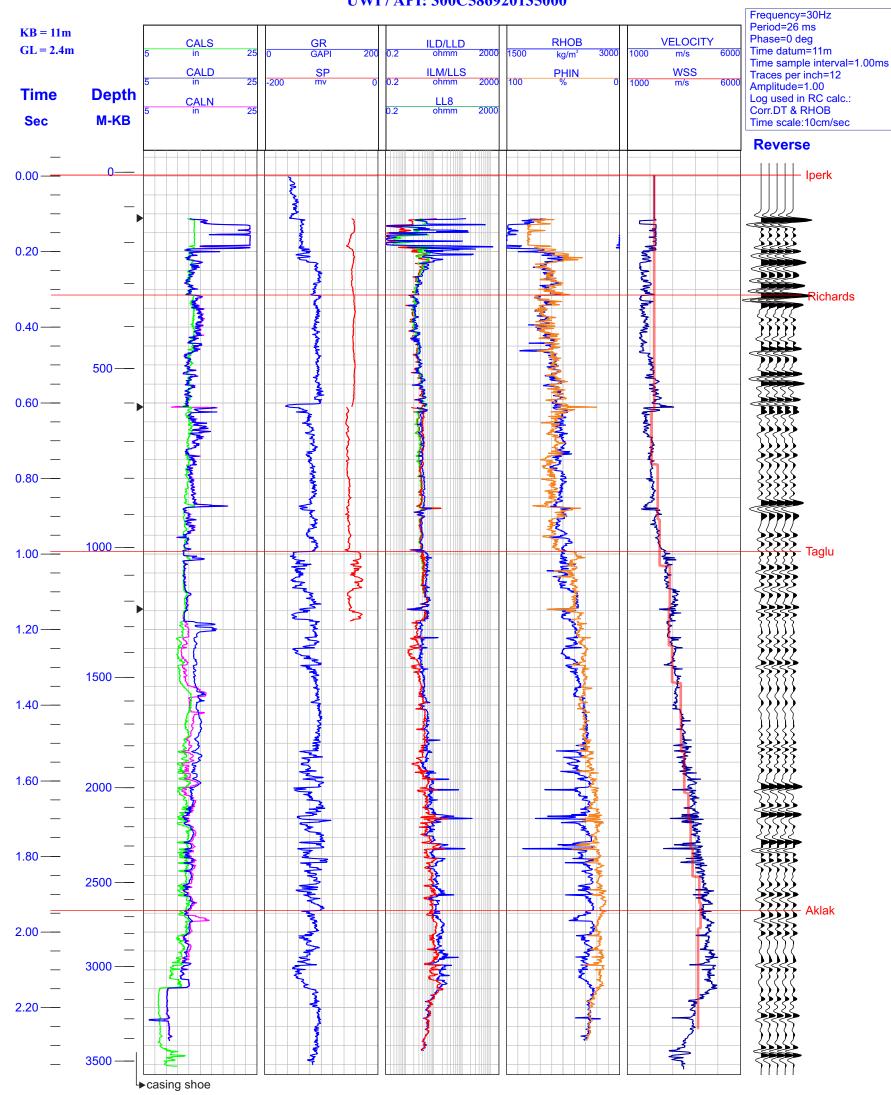
Figure 86. Well logs and synthetic of the Kogyuk N-67 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and caliper 1-3 (CALX); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 87. Well logs and synthetic of the Kopanoar 2I-44 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and resistivity caliper log (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 88. Well logs and synthetic of the Kopanoar L-34 well. The first track includes density caliper log (CALD) and resistivity caliper log (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD), medium (LLS) and shallow (MFR) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
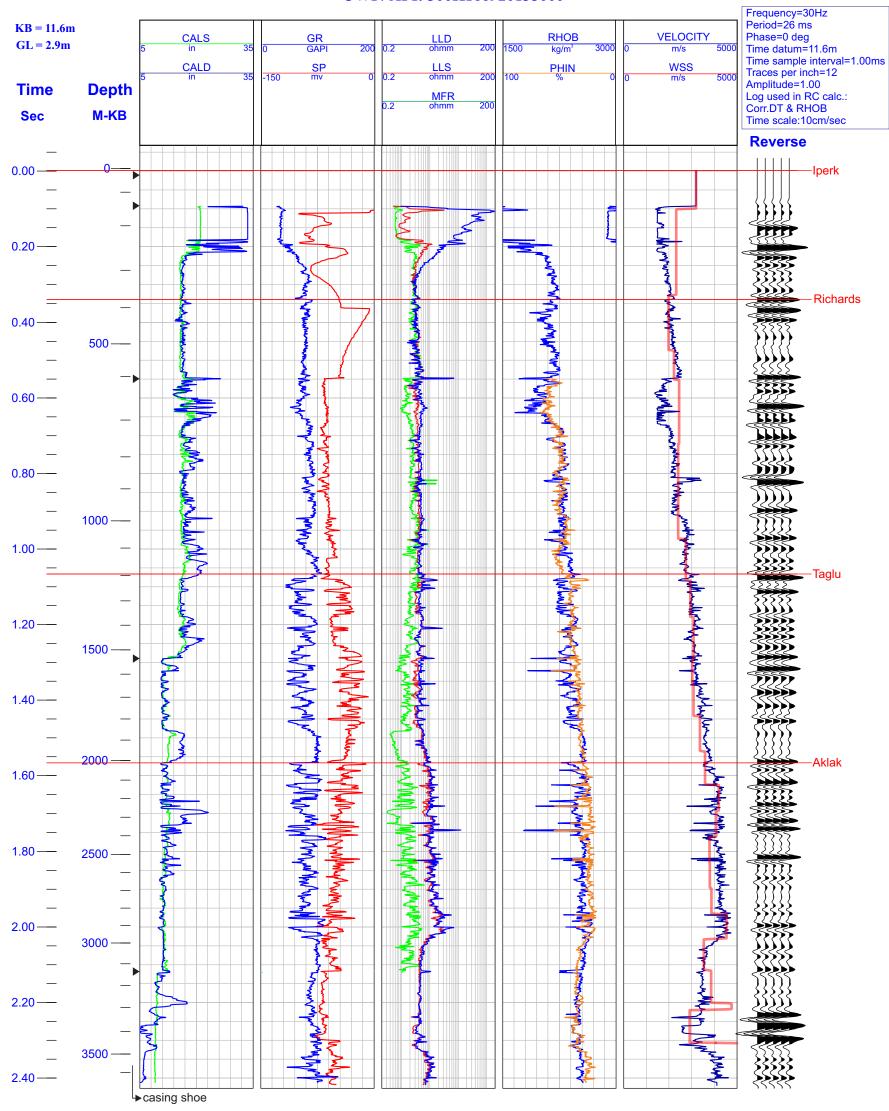
Figure 89. Well logs and synthetic of the Kopanoar M-13 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and resistivity caliper log (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD/ILD), medium (LLS/ILM) and shallow (MRF/SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
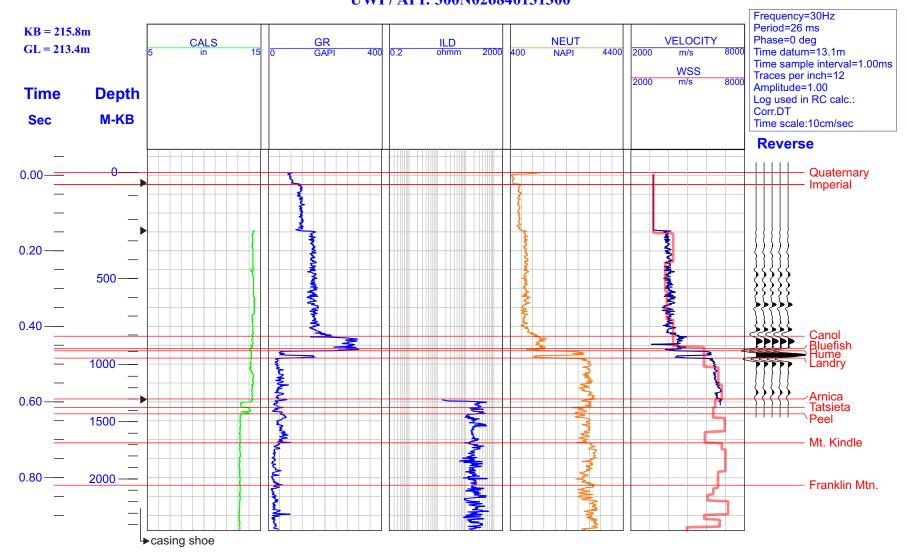
Figure 90. Well logs and synthetic of the Kugaluk N-02 well. The first track includes sonic caliper log (CALS); the second track contains gamma ray (GR) log; the third track shows deep induction log (ILD); the fourth track illustrates neutron log (NEUT) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
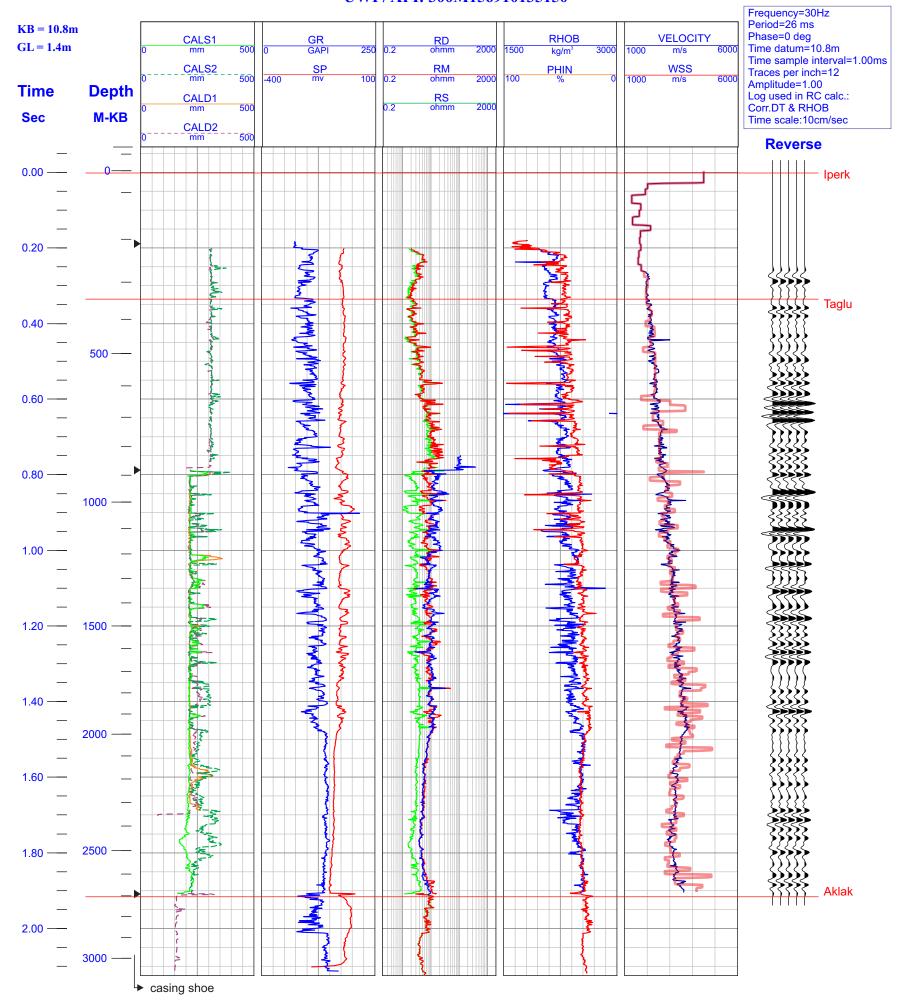
Figure 91. Well logs and synthetic of the Kugmallit H-59 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and resistivity caliper log (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (LLS/ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
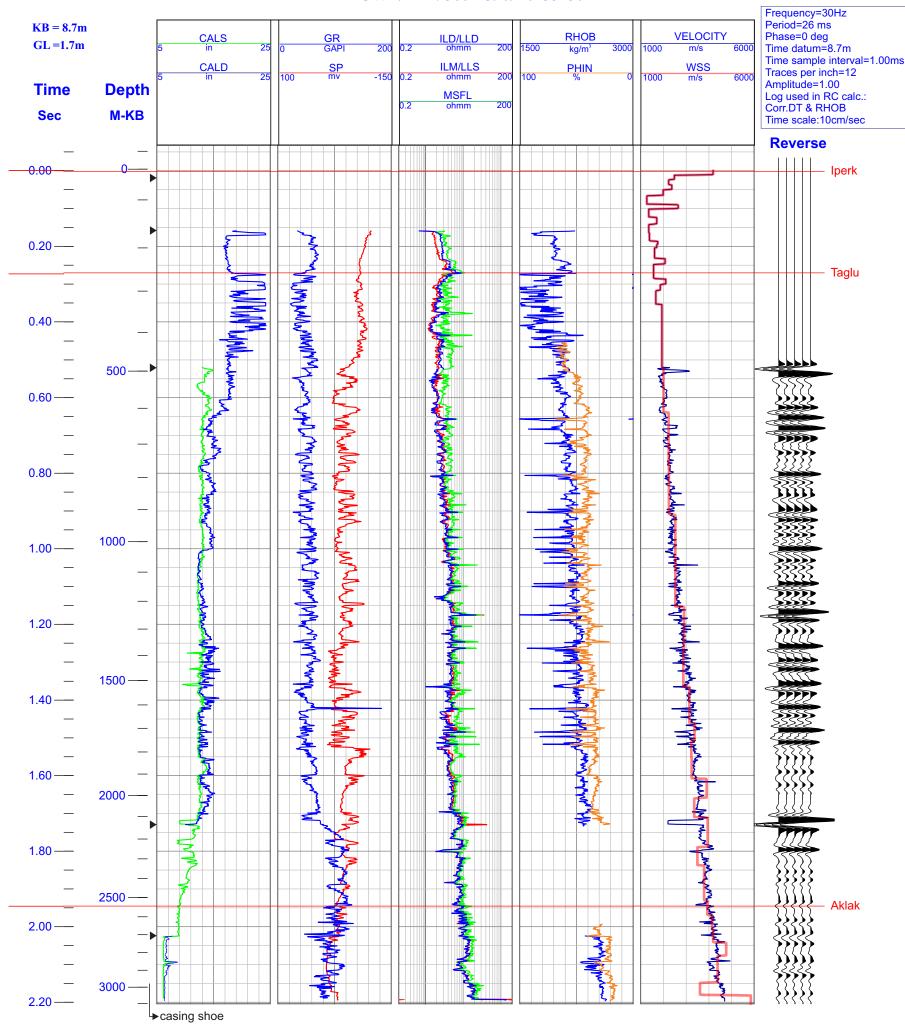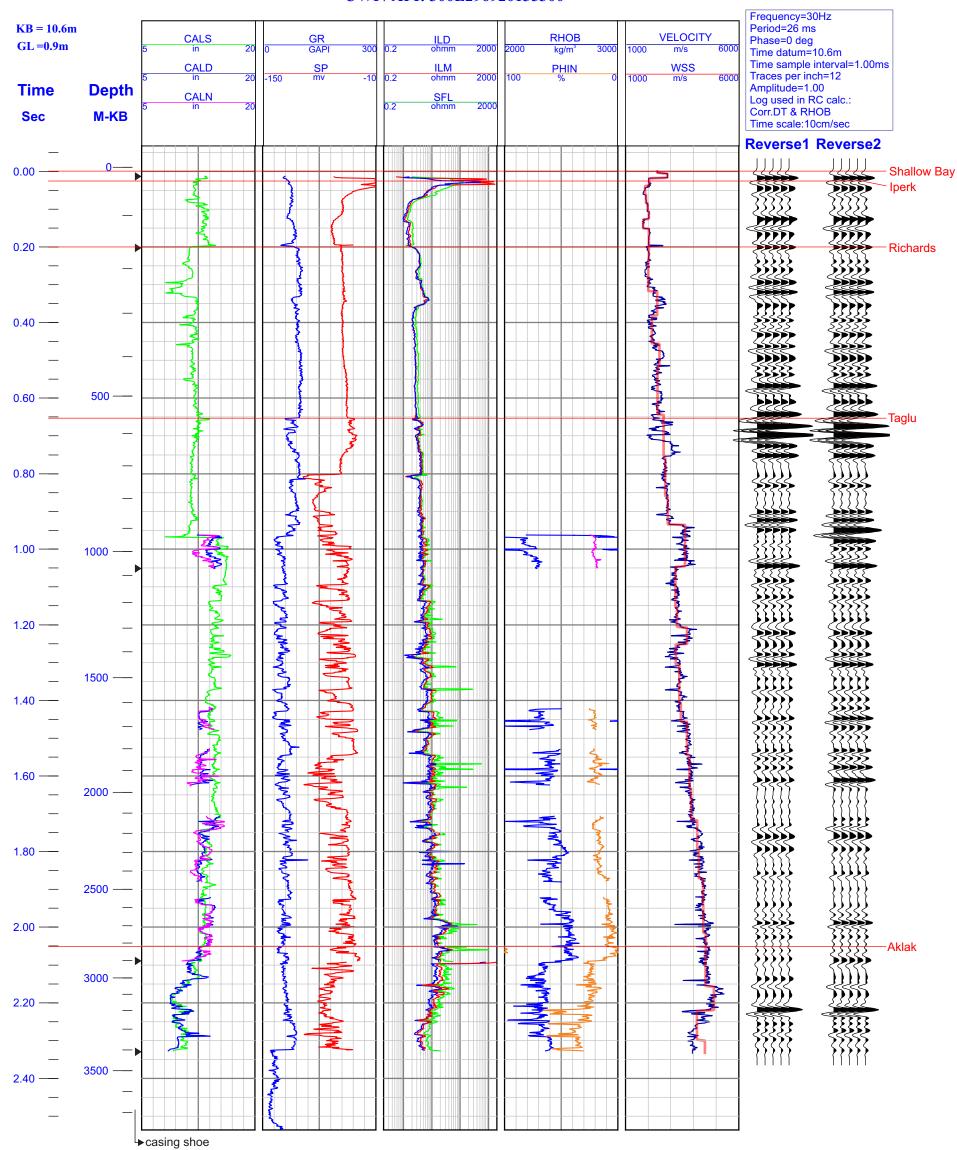
Figure 92. Well logs and synthetic of the Kugpik L-24 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and neutron caliper log (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD), medium (LLS) and shallow (MFR) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
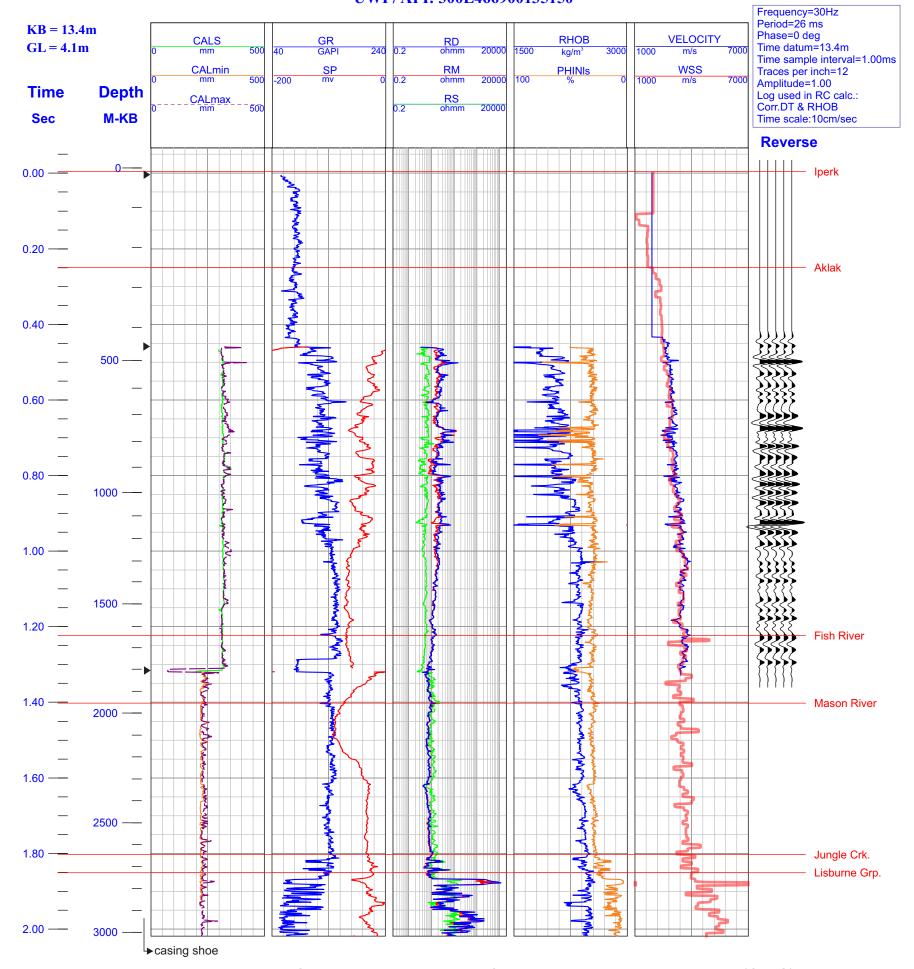
Figure 93. Well logs and synthetic of the Kugpik L-46 well. The first track includes sonic caliper log (CALS), minimum caliper (CALmin) and maximum caliper (CALmax); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (RD), medium (RM) and shallow (RS) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity with limestone calibration (PHINls) log data; the fifth track shows well seismic survey (WSS-VSP) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
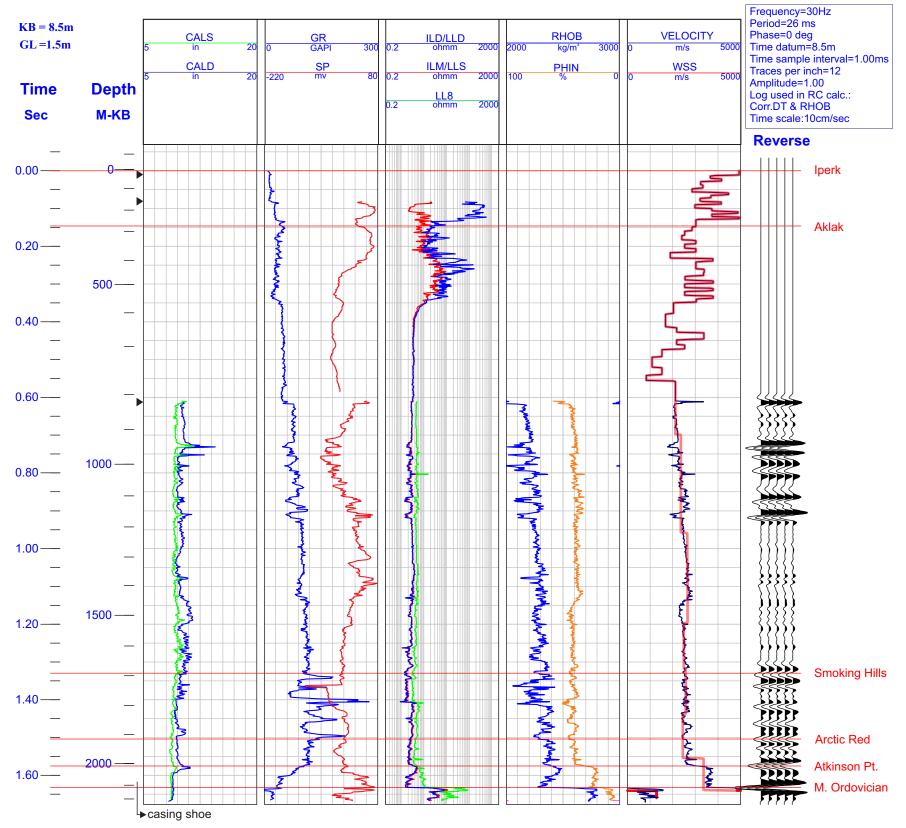
Figure 94. Well logs and synthetic of the Kugpik O-13 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and neutron caliper log (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
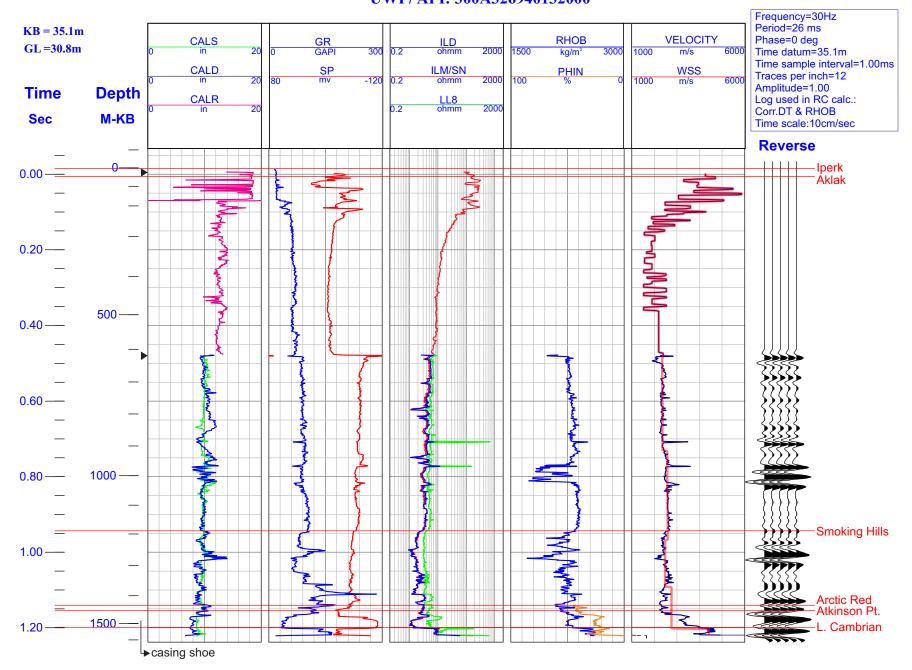
Figure 95. Well logs and synthetic of the Kumak C-58 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and neutron caliper log (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
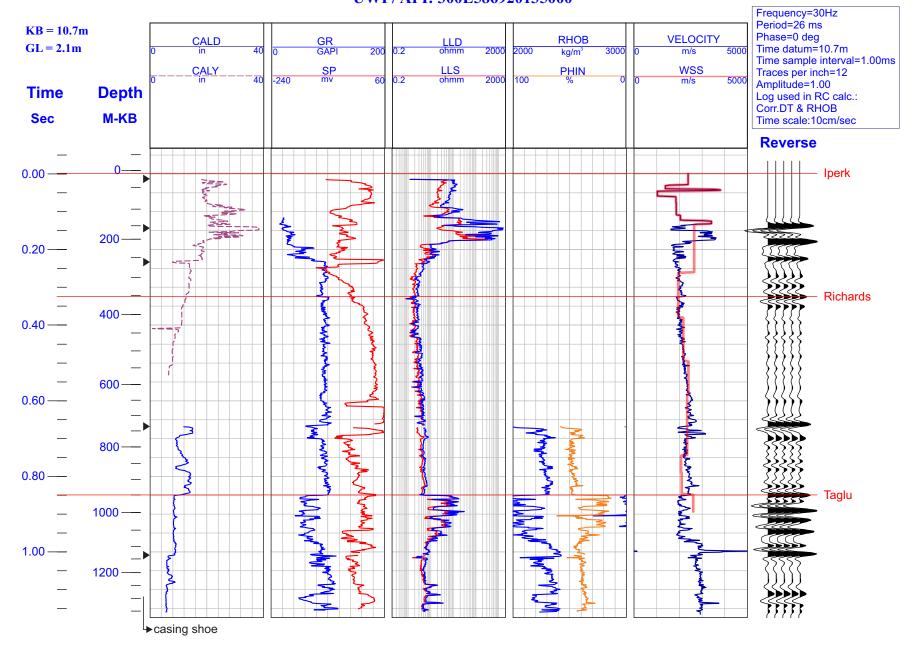
Figure 96. Well logs and synthetic of the Kumak E-58 well. The first track includes density caliper log (CALD) and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD) and medium (LLS) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

KUMAK J-06

UWI / API: 300J066920135000
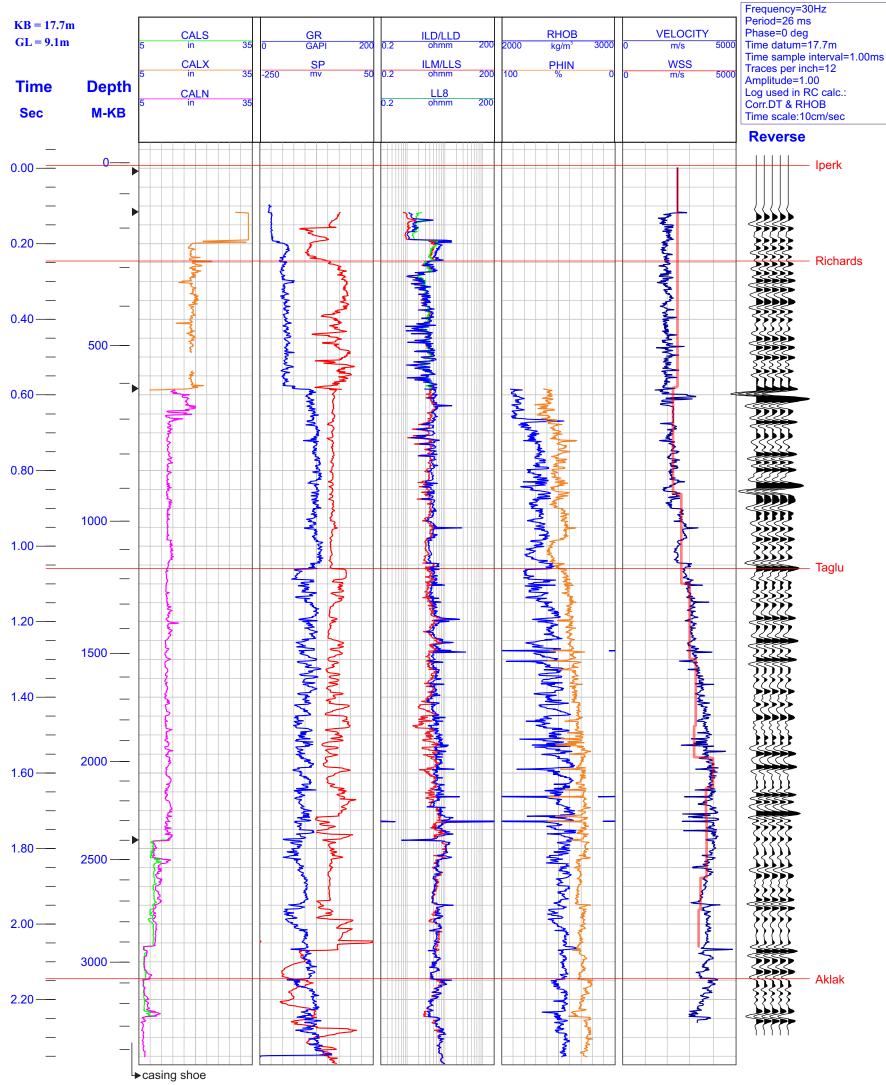
Figure 97. Well logs and synthetic of the Kumak J-06 well. The first track includes sonic caliper log (CALS), caliper 1-3 (CALX) and neutron caliper log (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
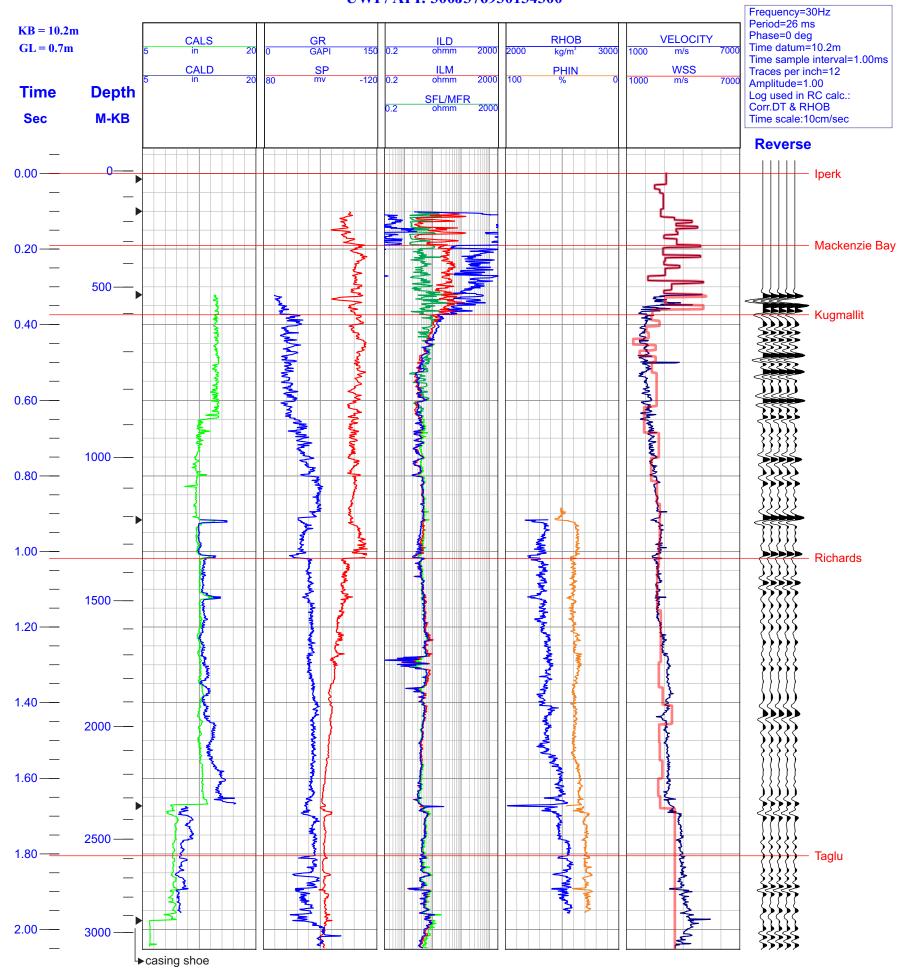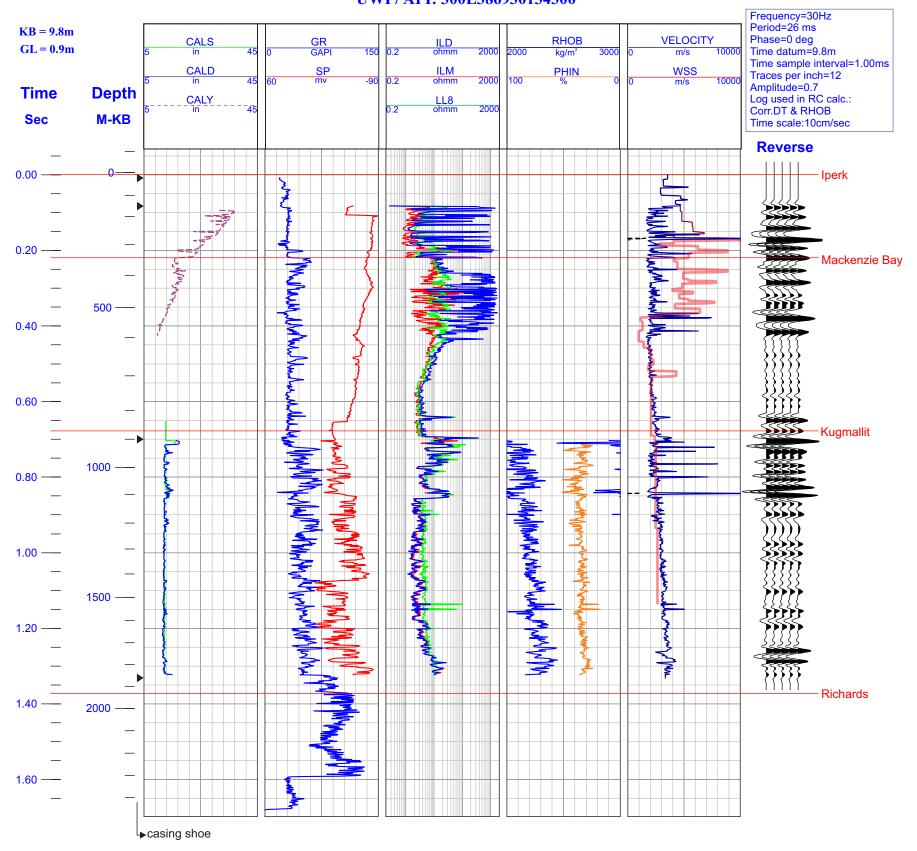
Figure 98. Well logs and synthetic of the Kumak K-16 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD), medium (LLS) and shallow (MFR) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

KURK M-15

UWI / API: 300M156910135150

Figure 99. Well logs and synthetic of the Kurk M-15 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (RD), medium (RM) and shallow (RS) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-VSP) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
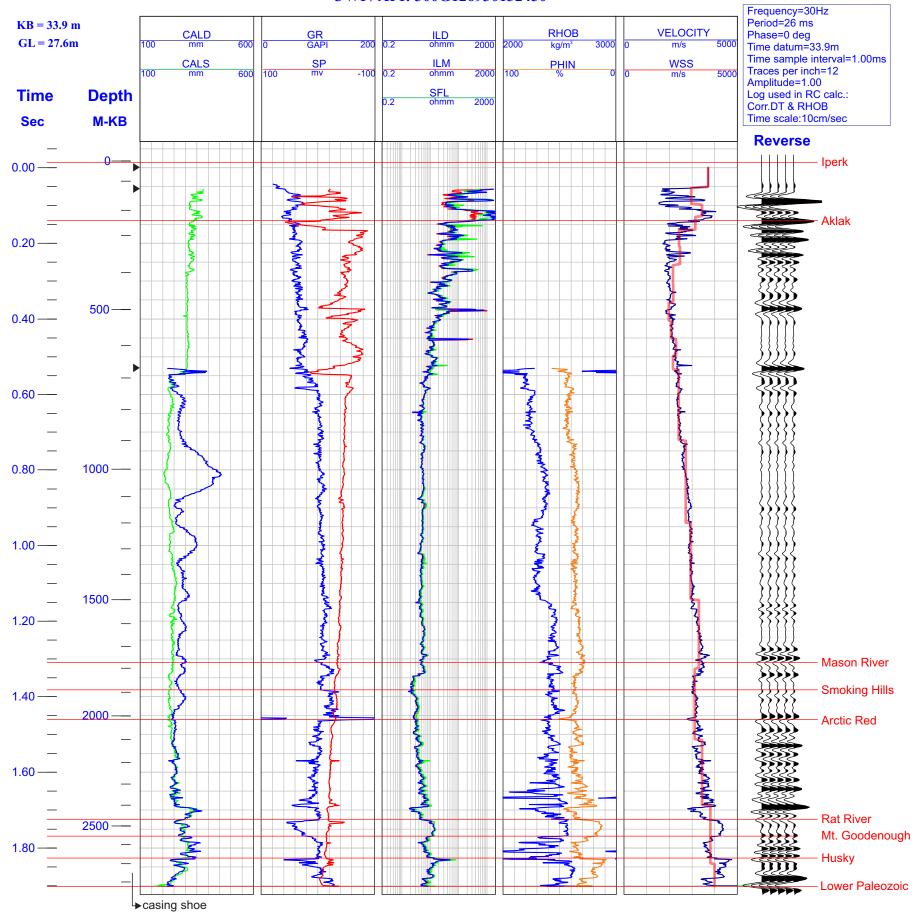
Figure 100. Well logs and synthetic of the Kurk M-39 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (MSFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 101. Well logs and synthetic of the Langley E-29 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and neutron caliper log (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1-from single DT, Reverse2-from DT&RHOB). The block shift correction is applied to the well.
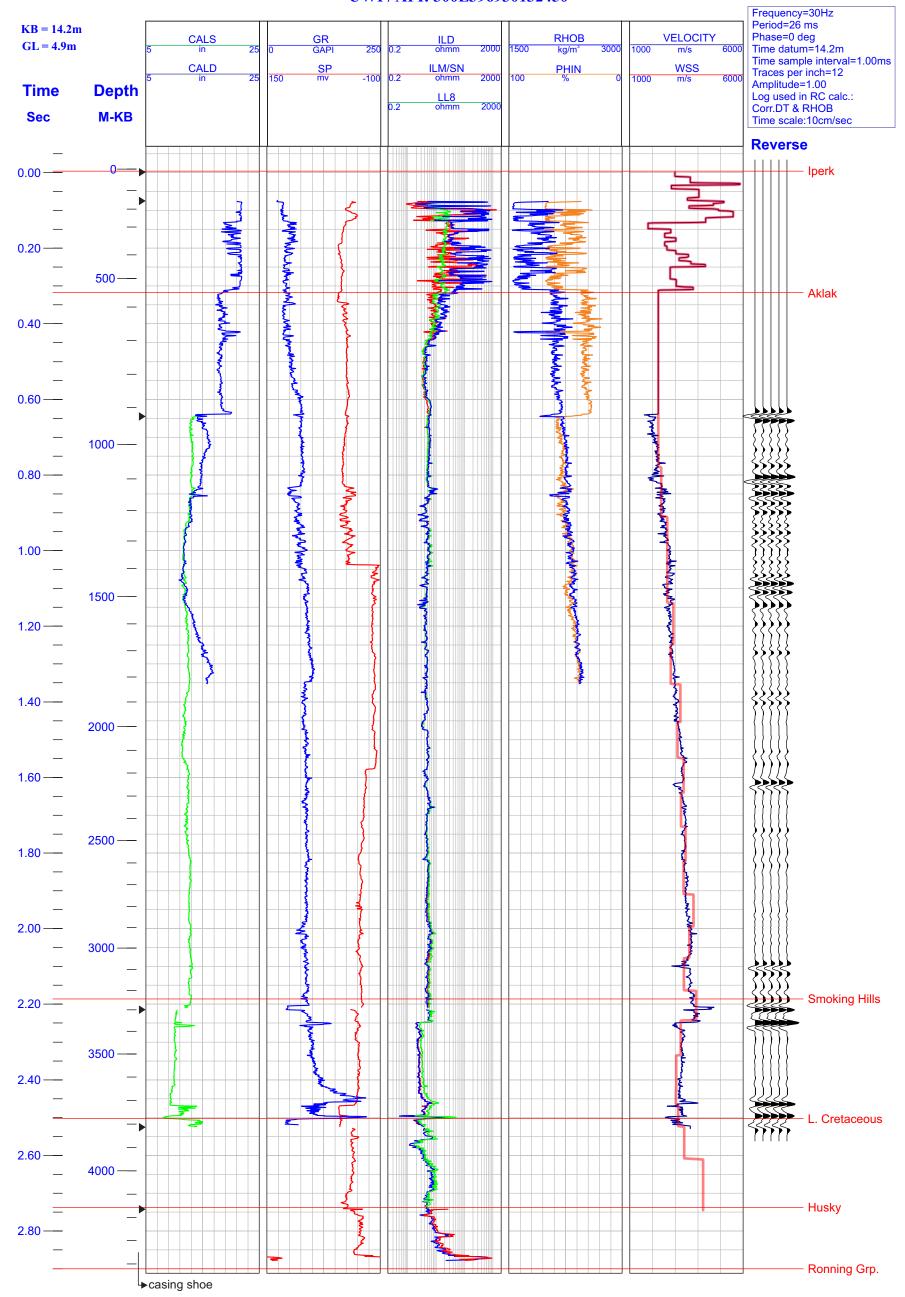
Figure 102. Well logs and synthetic of the Louth K-45 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 103. Well logs and synthetic of the Magak A-32 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and resistivity caliper log (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM/SN) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
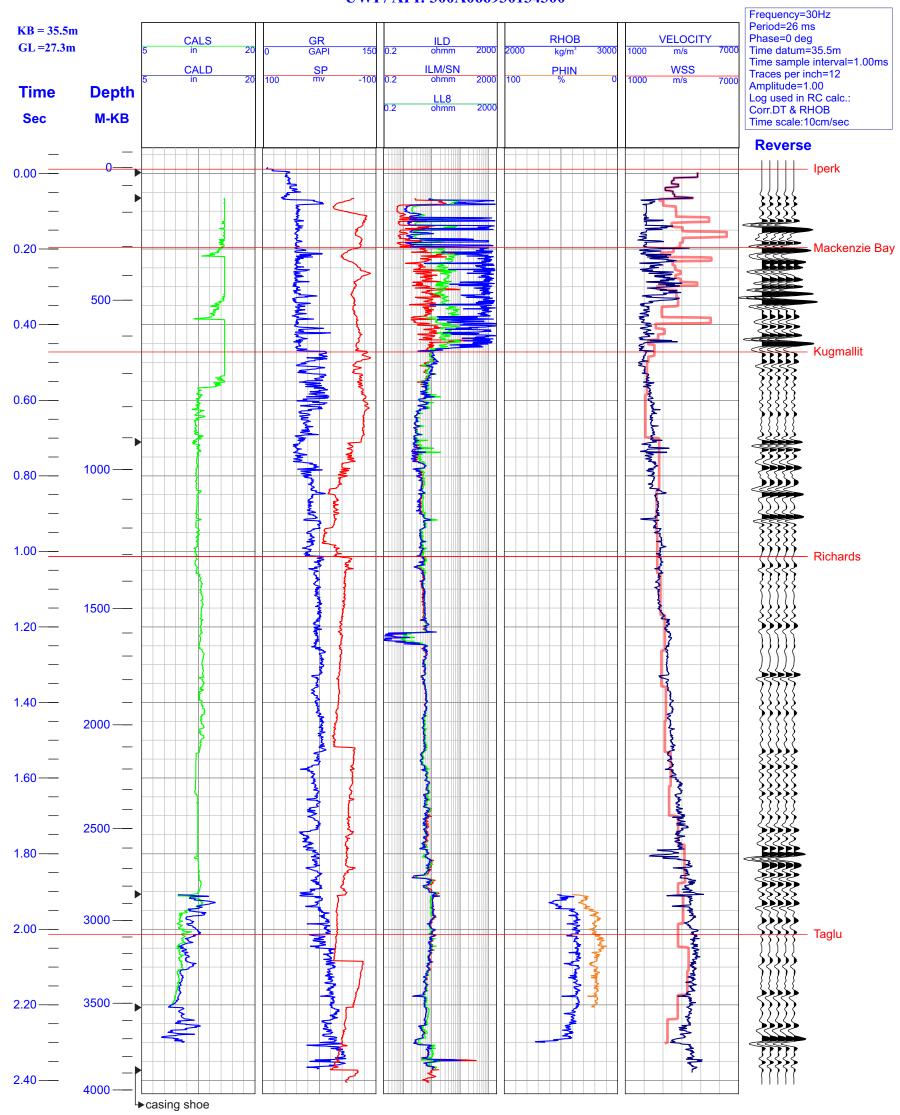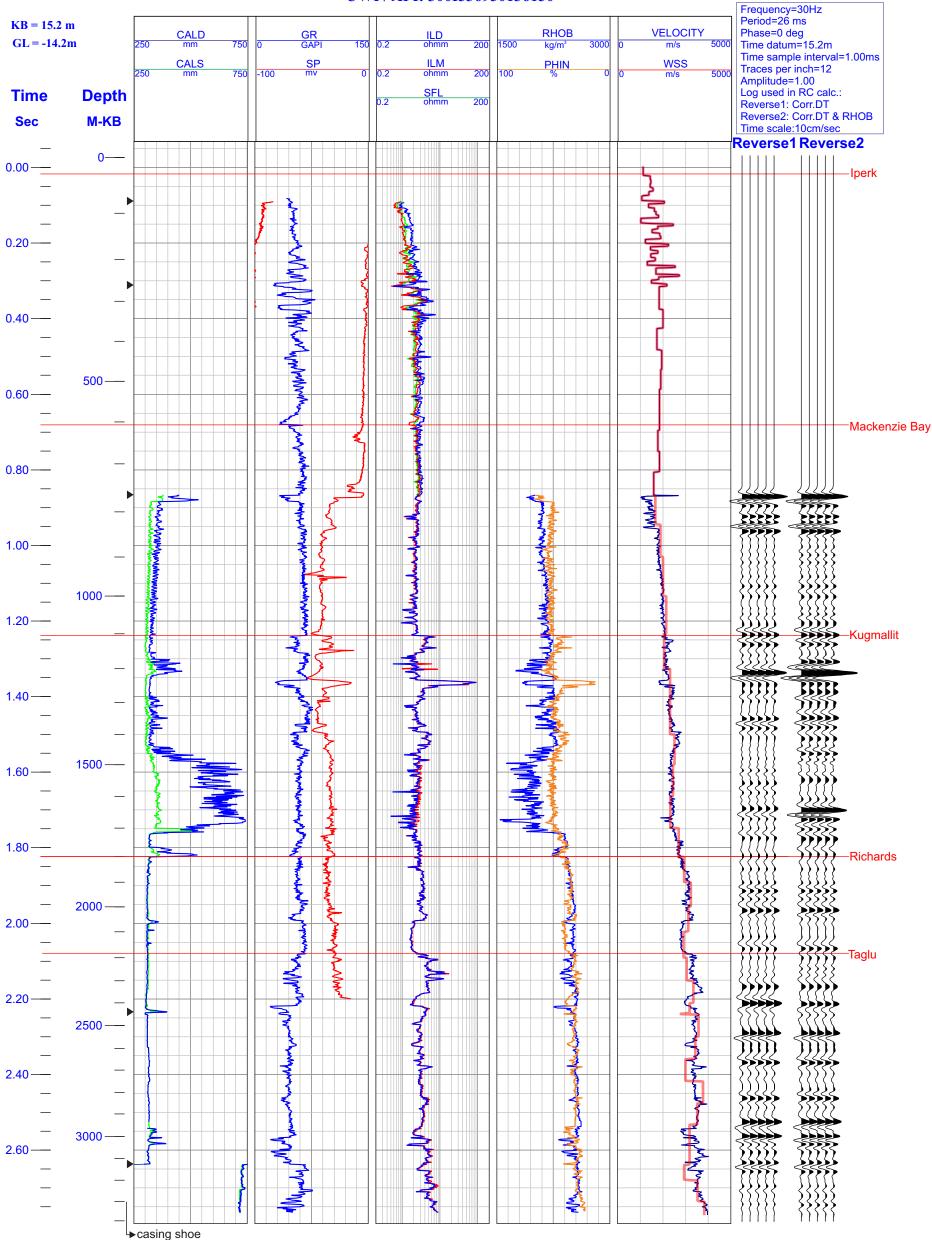
Figure 104. Well logs and synthetic of the Mallik A-06 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM/SN) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
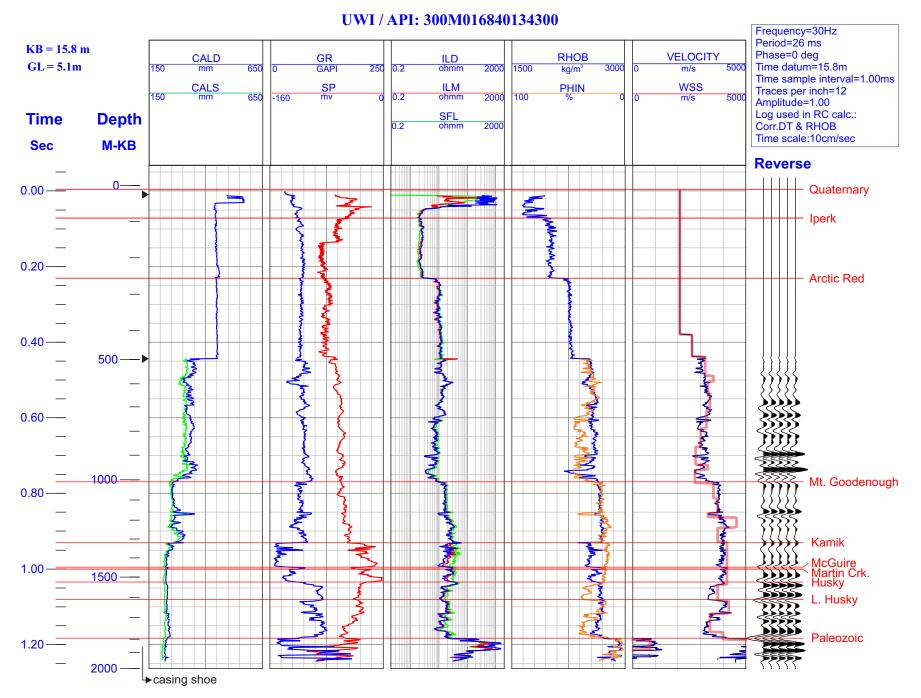
Figure 105. Well logs and synthetic of the Mallik J-37 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (MSFL/SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

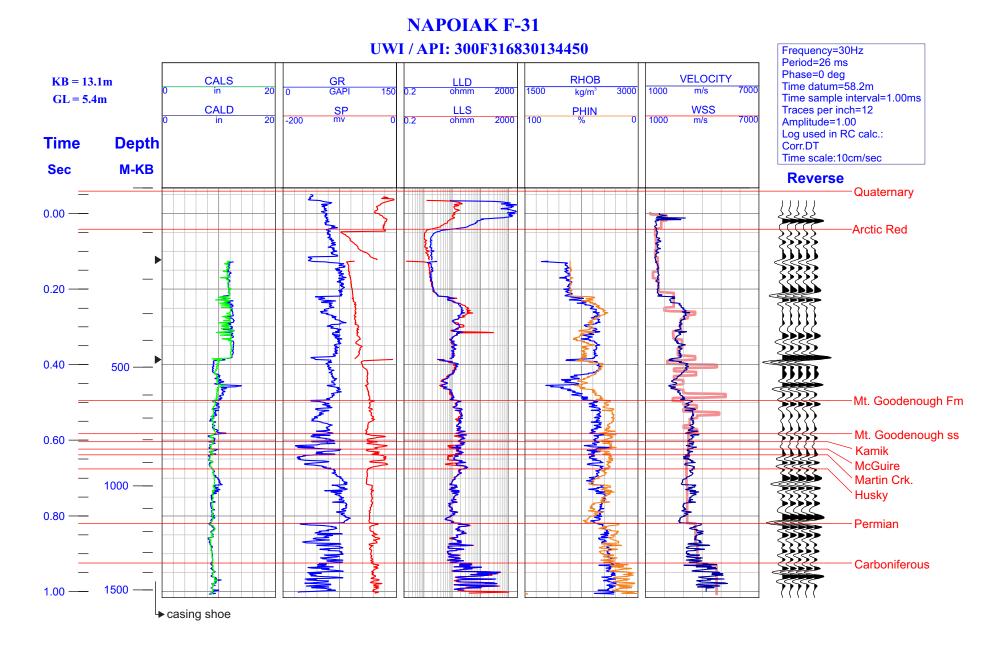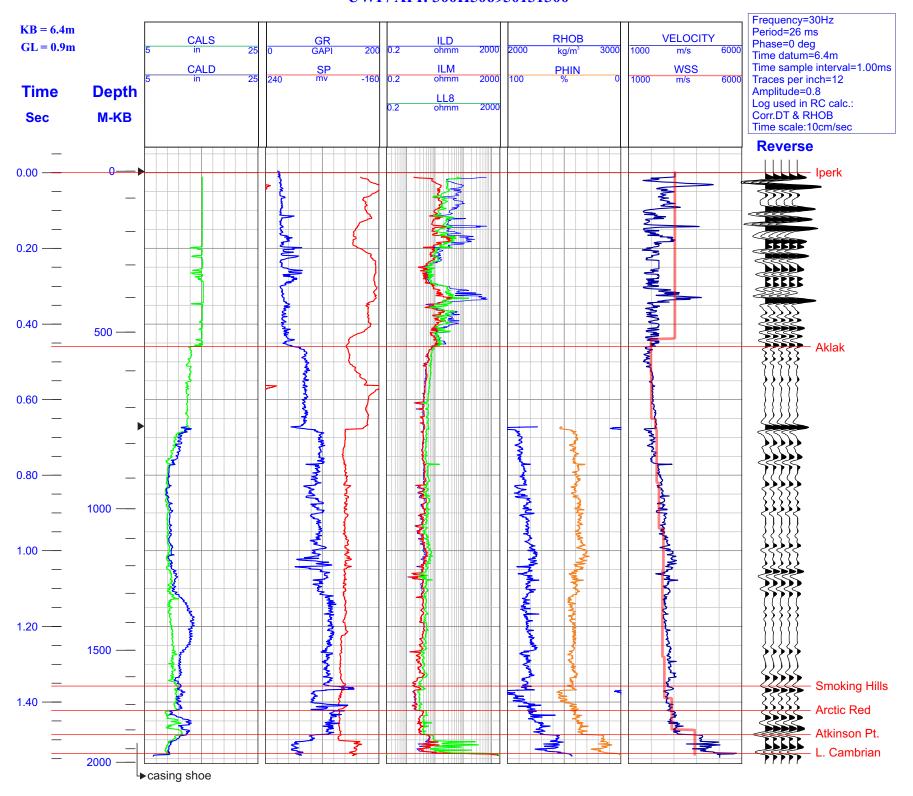Figure 106. Well logs and synthetic of the Mallik L-38 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
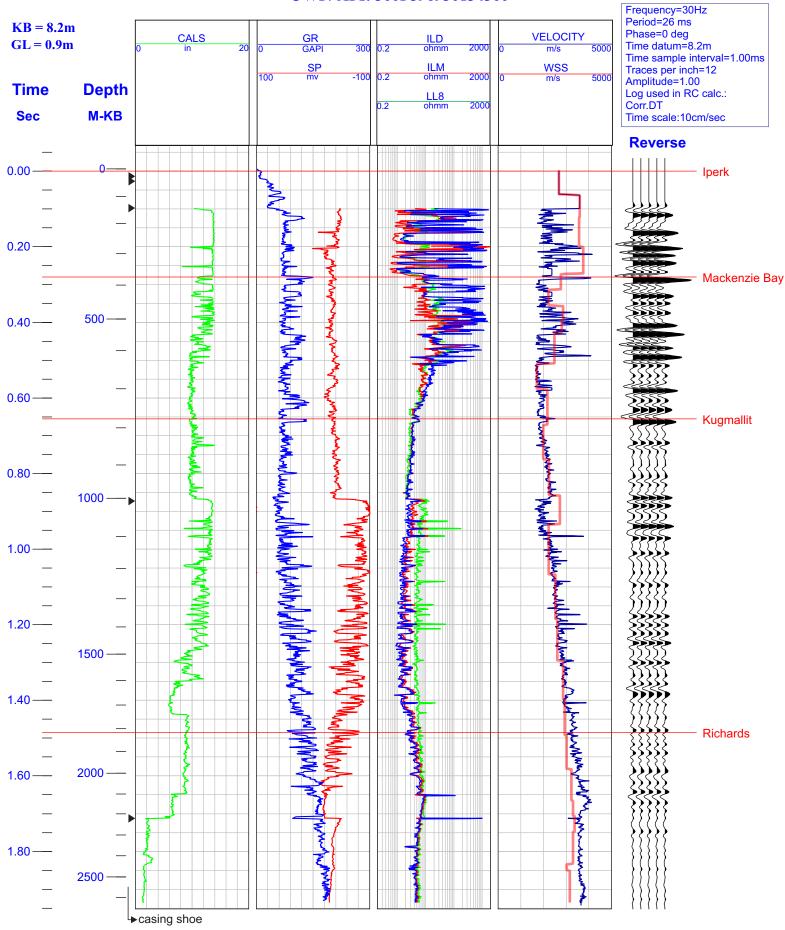
Figure 107. Well logs and synthetic of the Mallik P-59 well. The first track includes sonic caliper log (CALS); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The fifth track displays synthetic traces (Reverse).
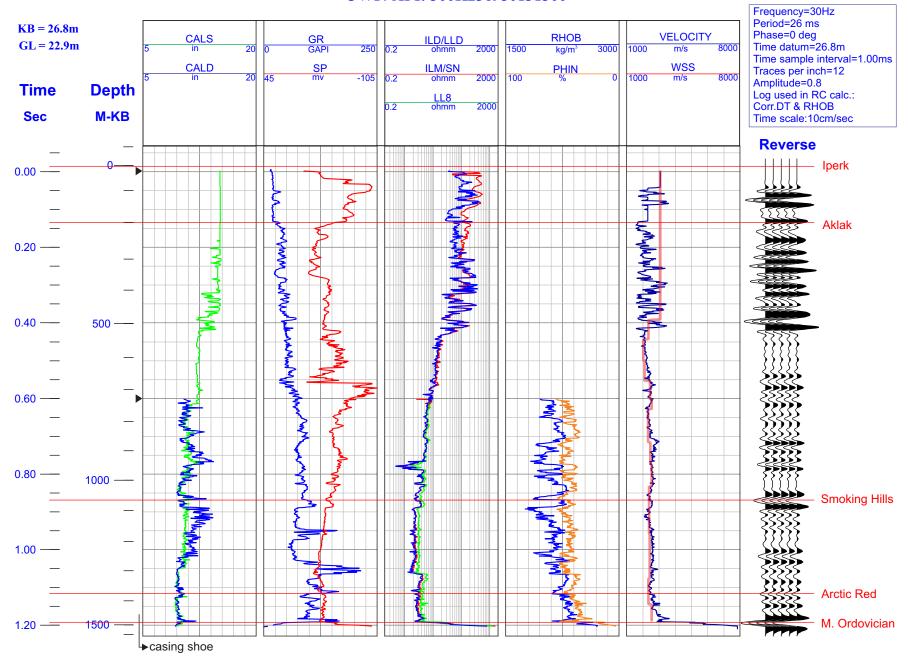
Figure 108. Well logs and synthetic of the Mayogiak G-12 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
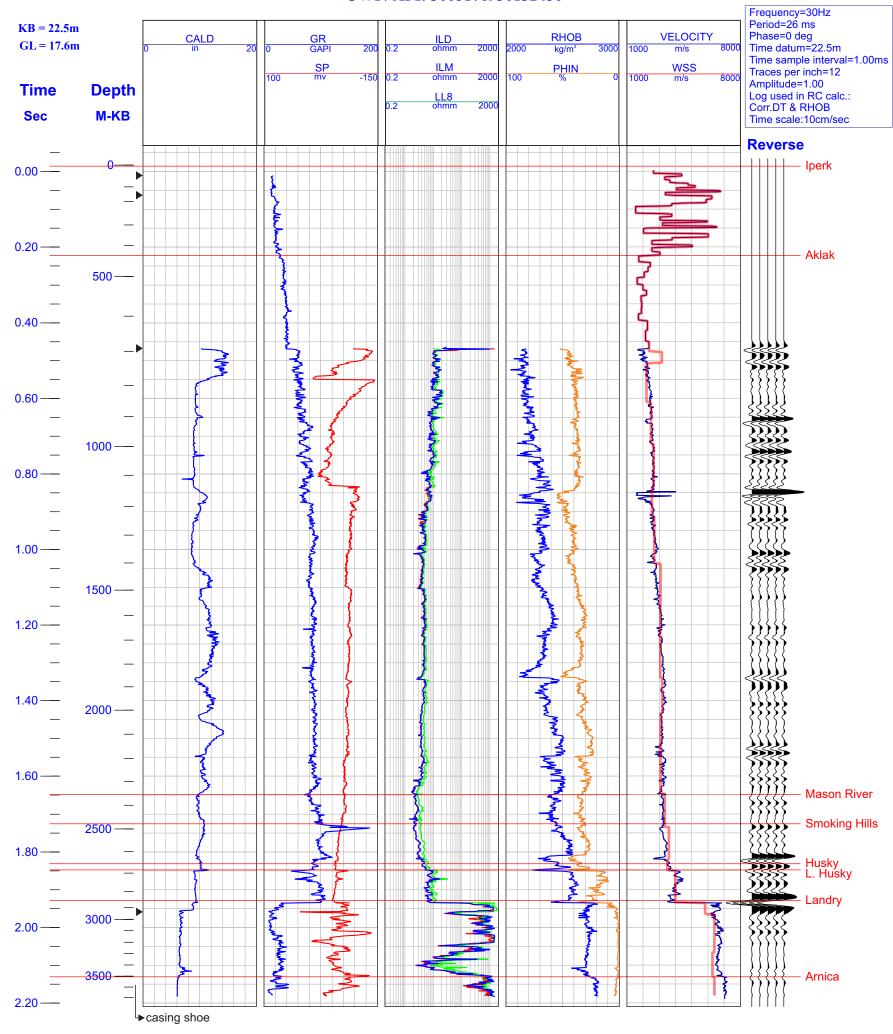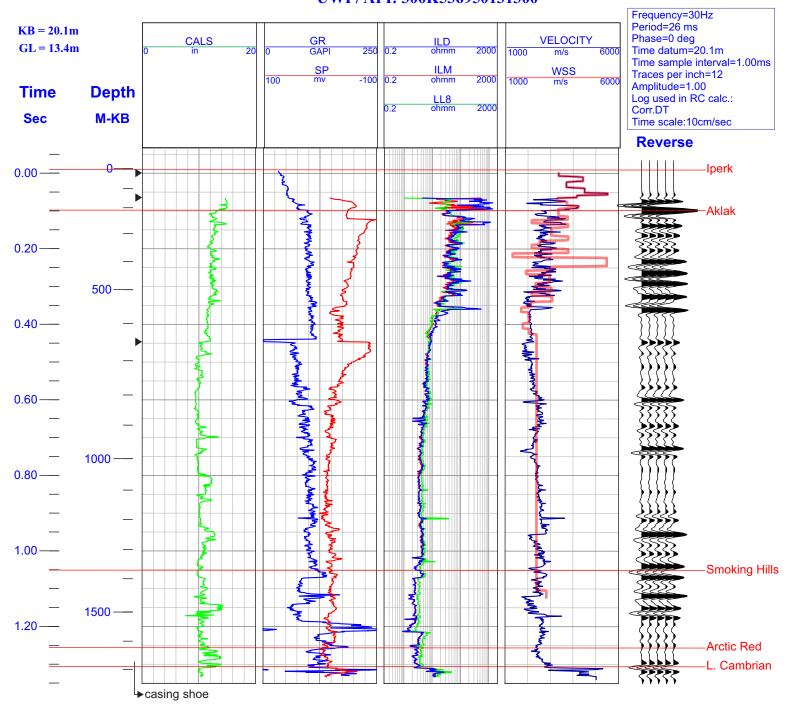
Figure 109. Well logs and synthetic of the Mayogiak J-17 well. The first track includes density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (Ll8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
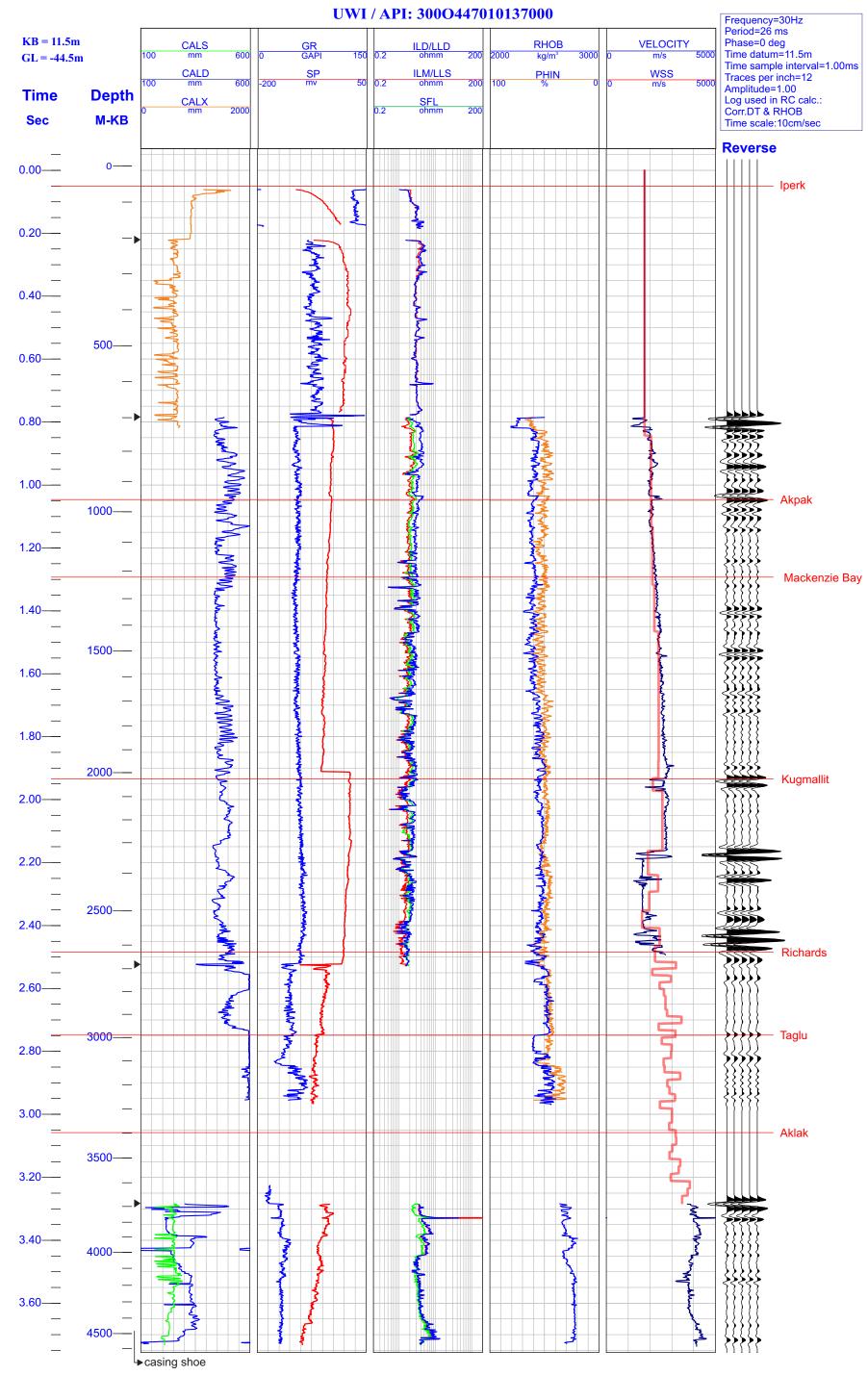
Figure 110. Well logs and synthetic of the Mayogiak L-39 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM/SN) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

MINUK I-53

UWI / API: 300I536950136150
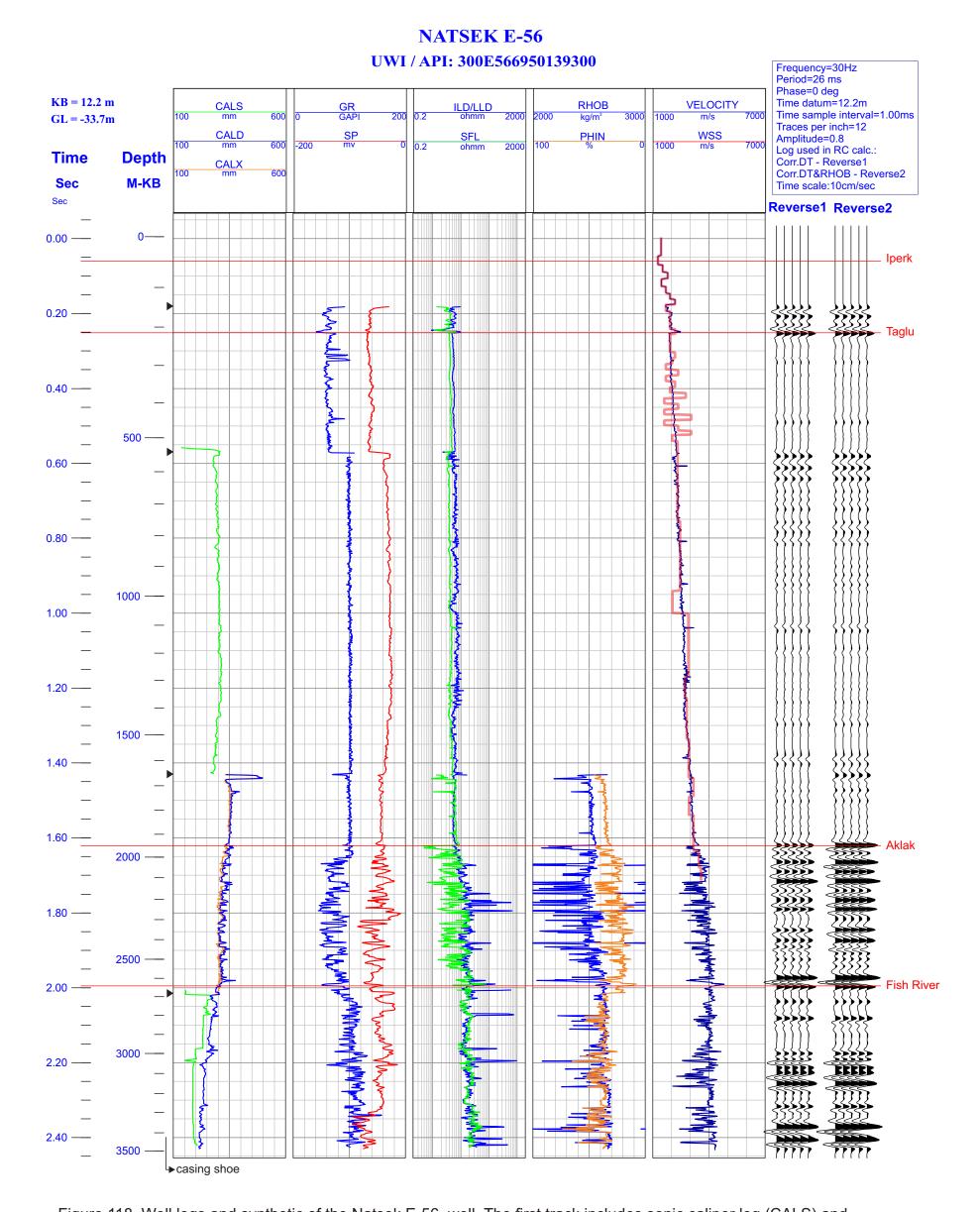

Figure 111. Well logs and synthetic of the Minuk I-53 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1 - from single DT, Reverse2 - from DT and RHOB logs).
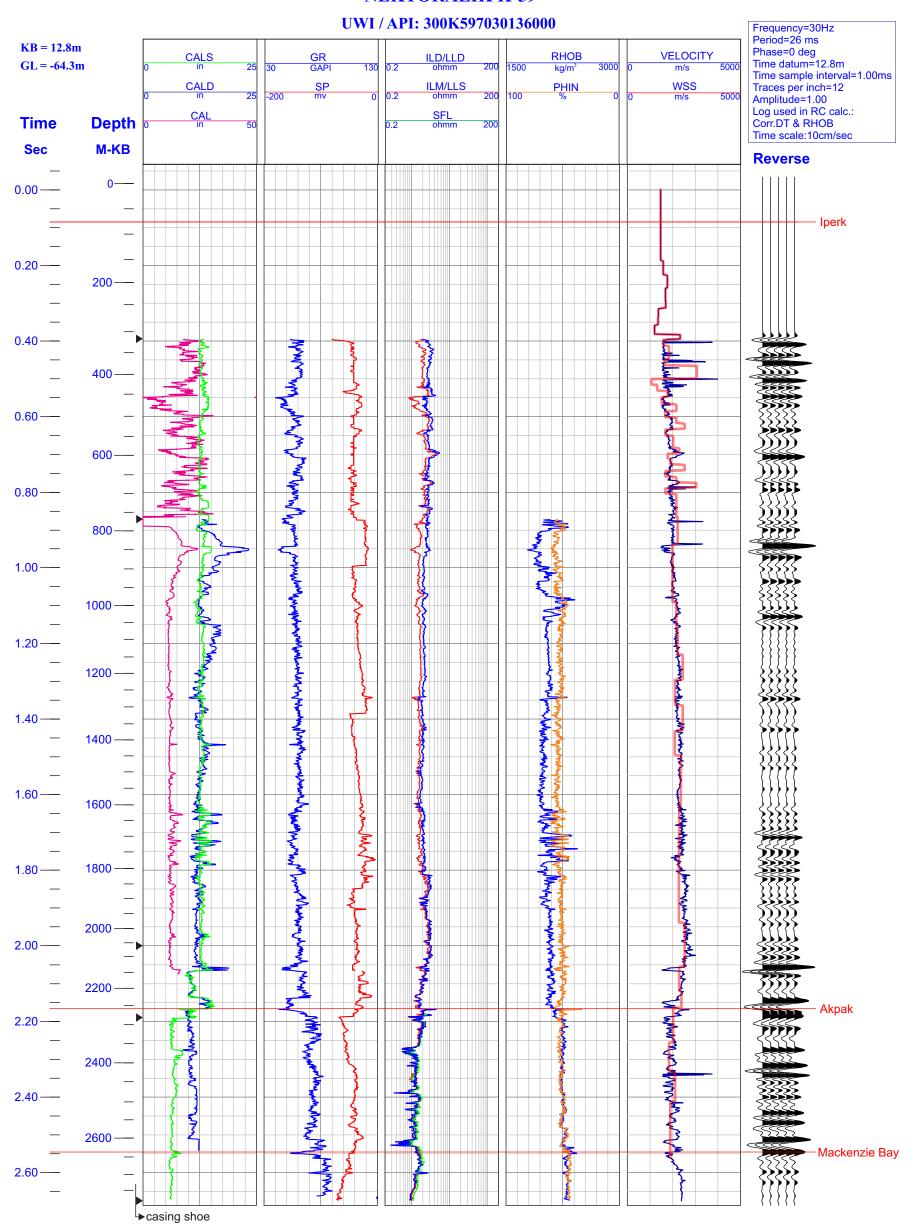
Figure 112. Well logs and synthetic of the Napartok M-01 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and neutron caliper log (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 113. Well logs and synthetic of the Napoiak F-31 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD) and medium (LLS) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

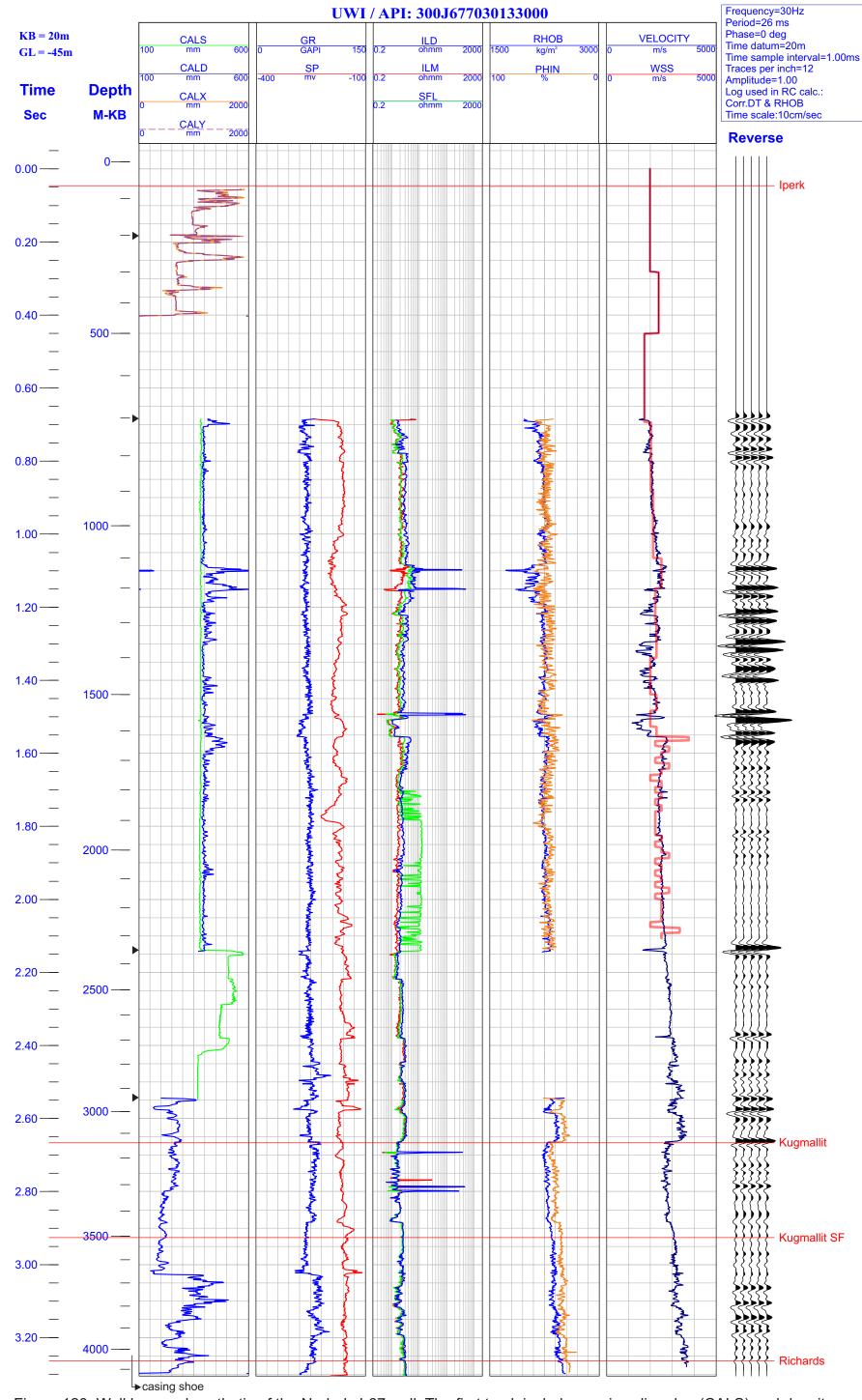Figure 114. Well logs and synthetic of the Natagnak H-50 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
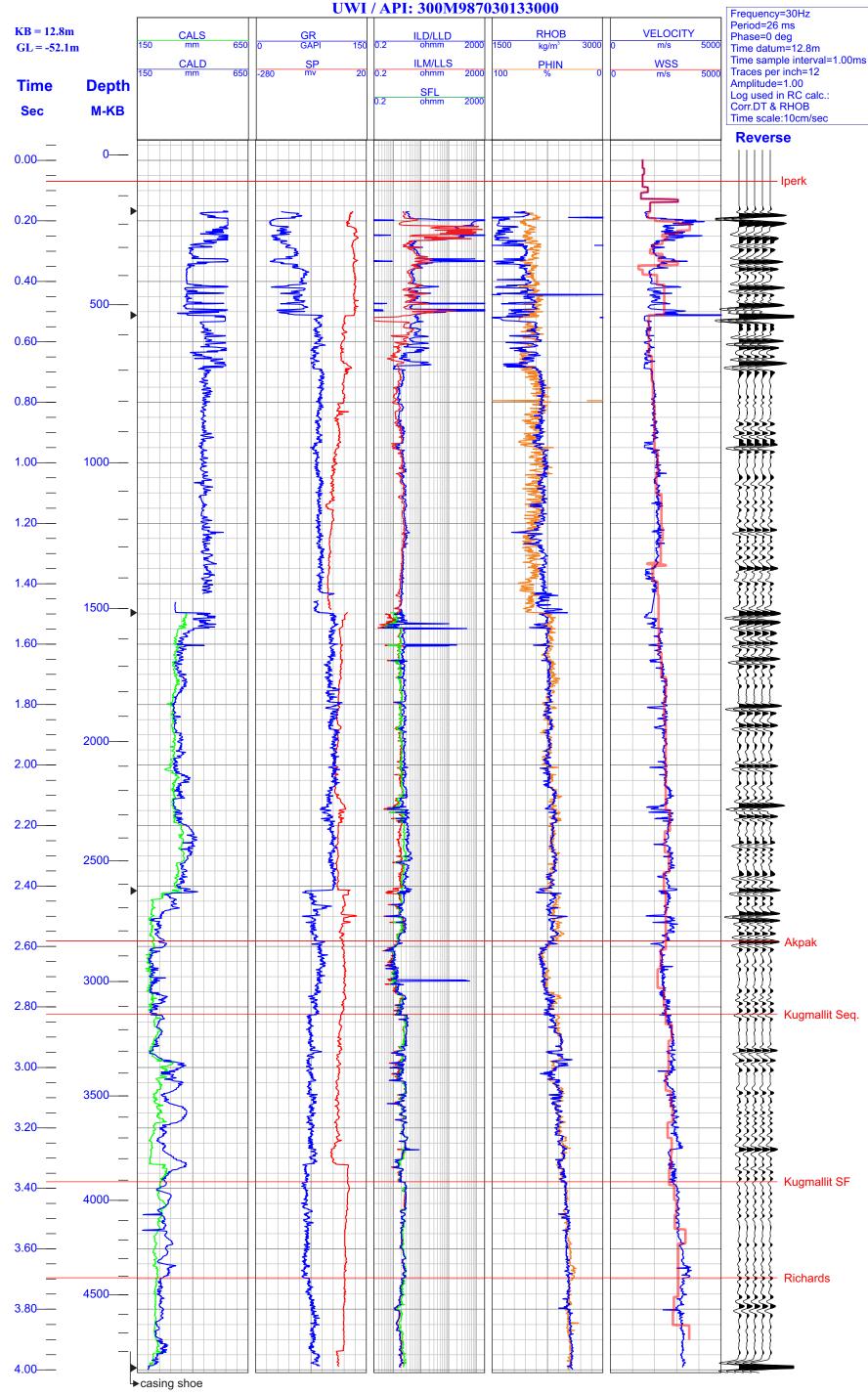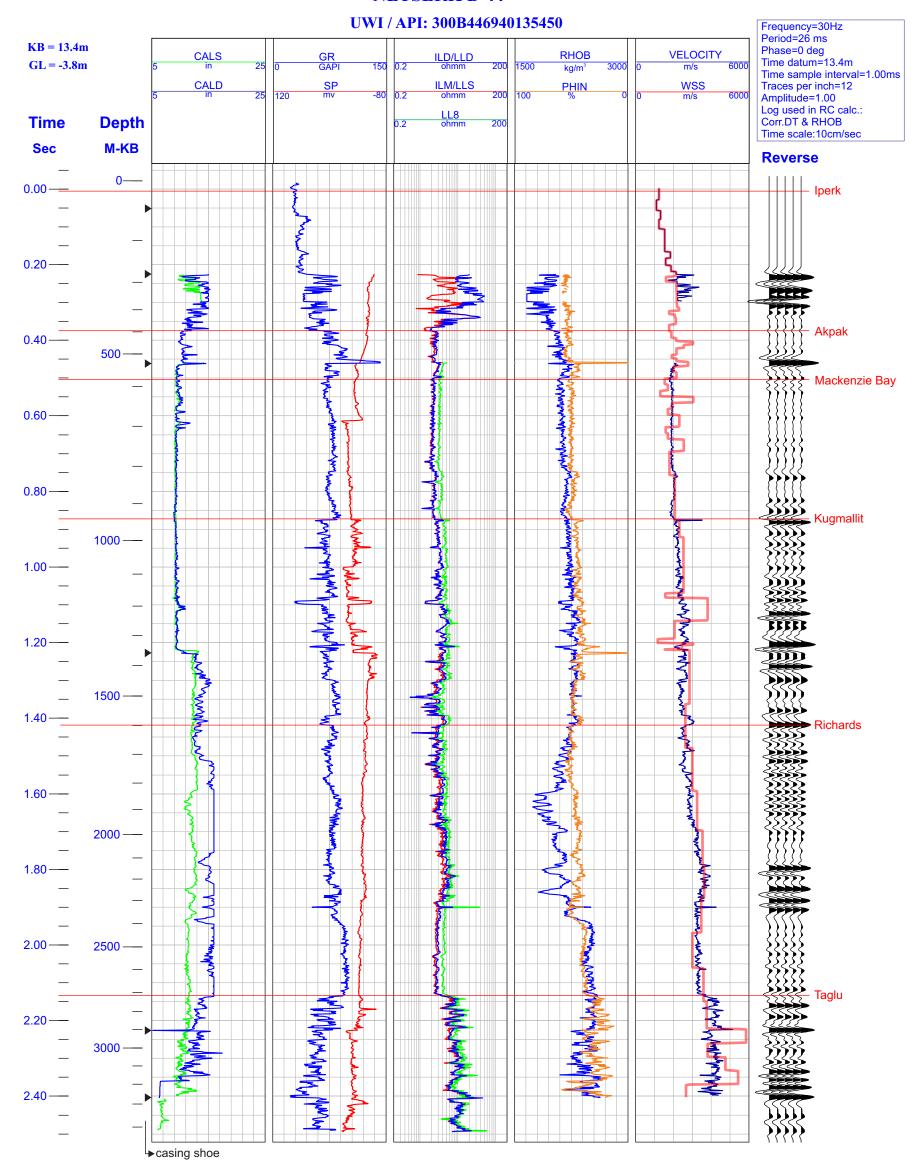
Figure 115. Well logs and synthetic of the Natagnak K-23 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 116. Well logs and synthetic of the Natagnak K-53 well. The first track includes sonic caliper log (CALS); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The fifth track displays synthetic traces (Reverse).
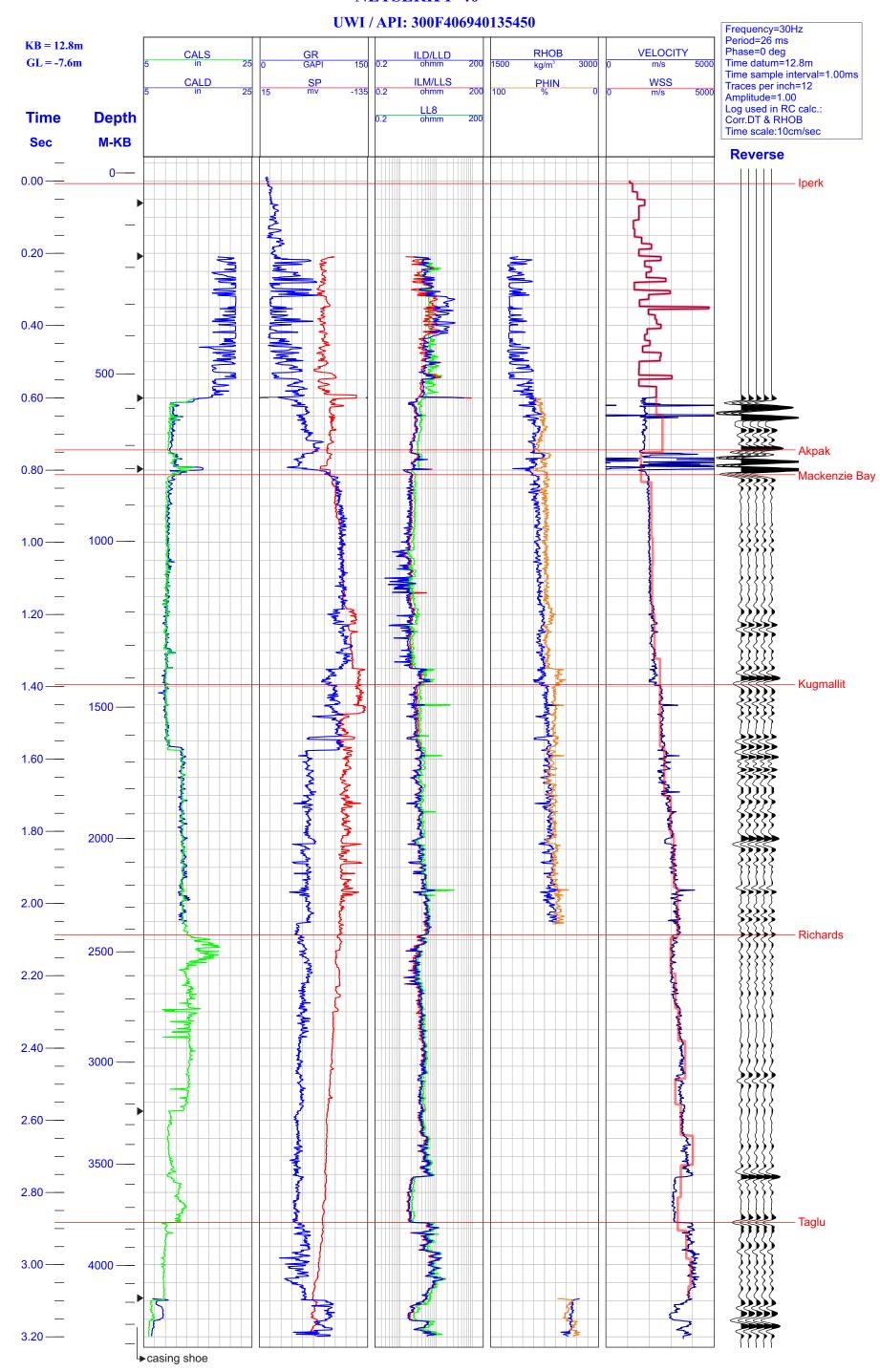
Figure 117. Well logs and synthetic of the Natiak O-44 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and caliper 1-3 (CALX); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
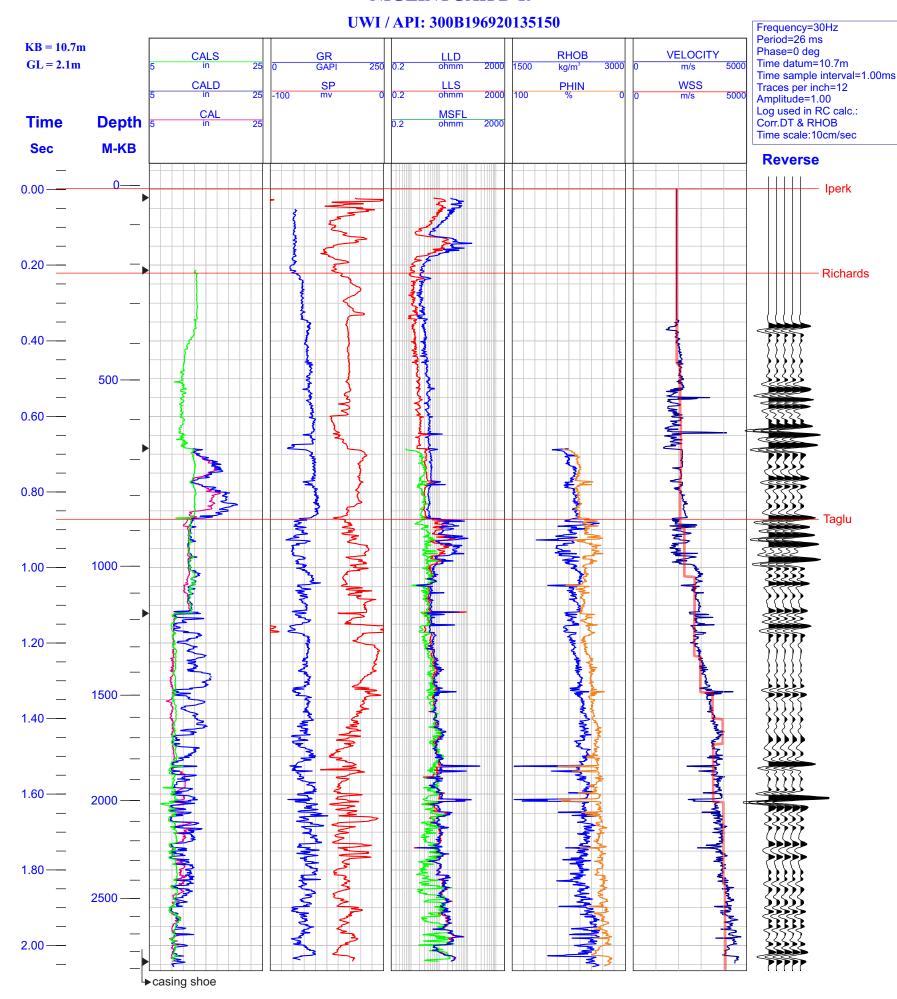
Figure 118. Well logs and synthetic of the Natsek E-56 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and caliper 1-3 (CALX); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1-from single DT, Reverse2-from DT & RHOB).
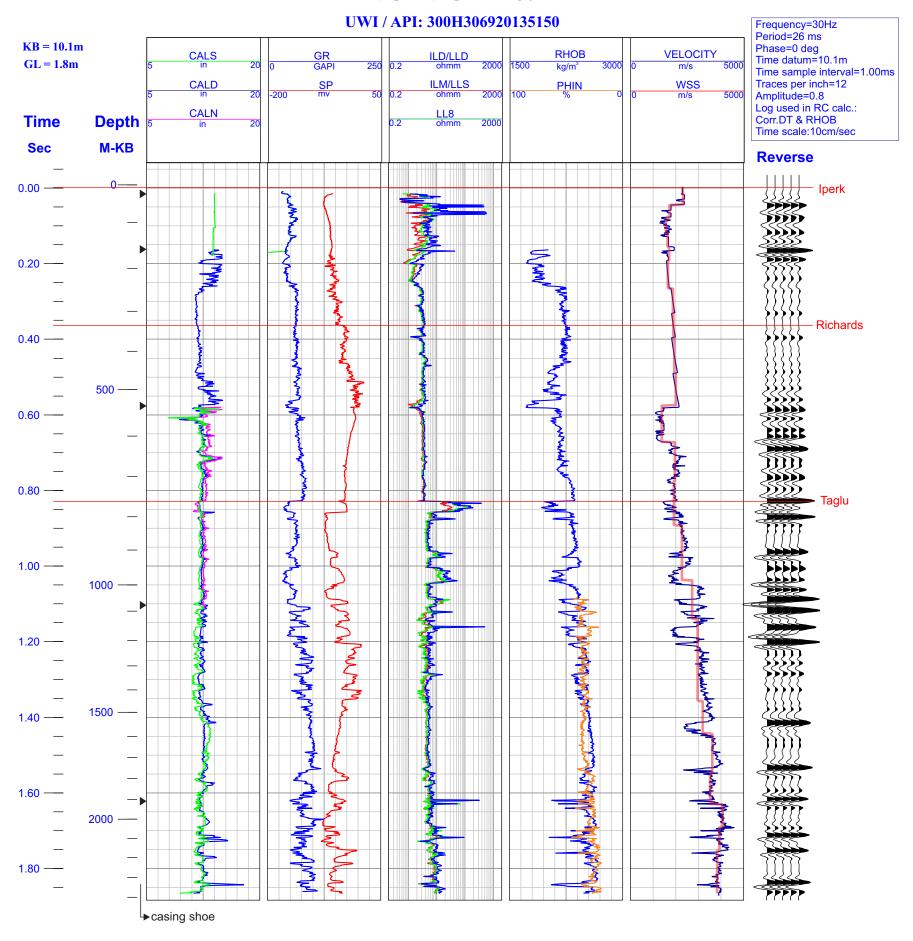
Figure 119. Well logs and synthetic of the Nektoralik K-59 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and general caliper log (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 120. Well logs and synthetic of the Nerlerk J-67 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD), caliper 1-3 (CALX) and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

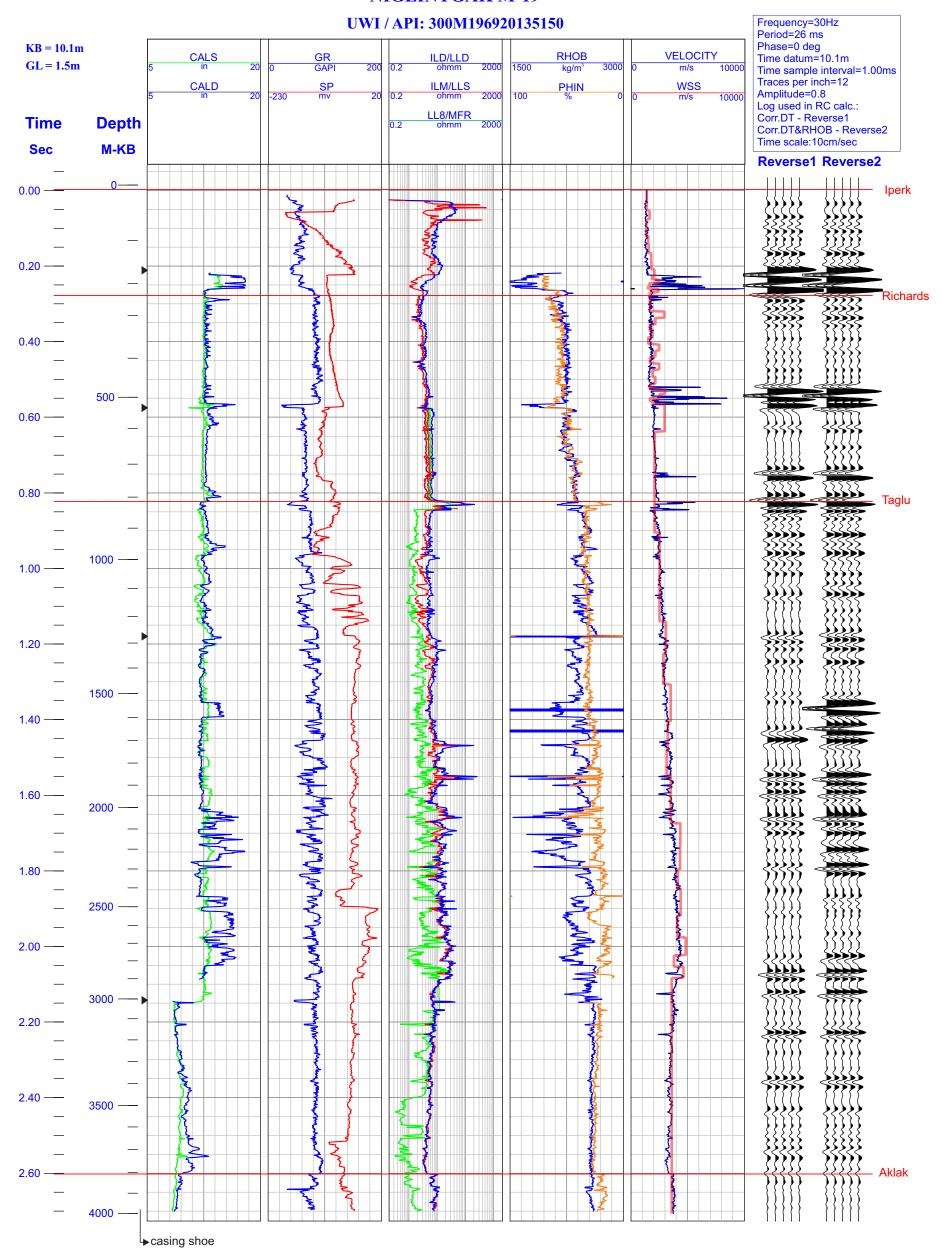Figure 121. Well logs and synthetic of the Nerlerk M-98 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
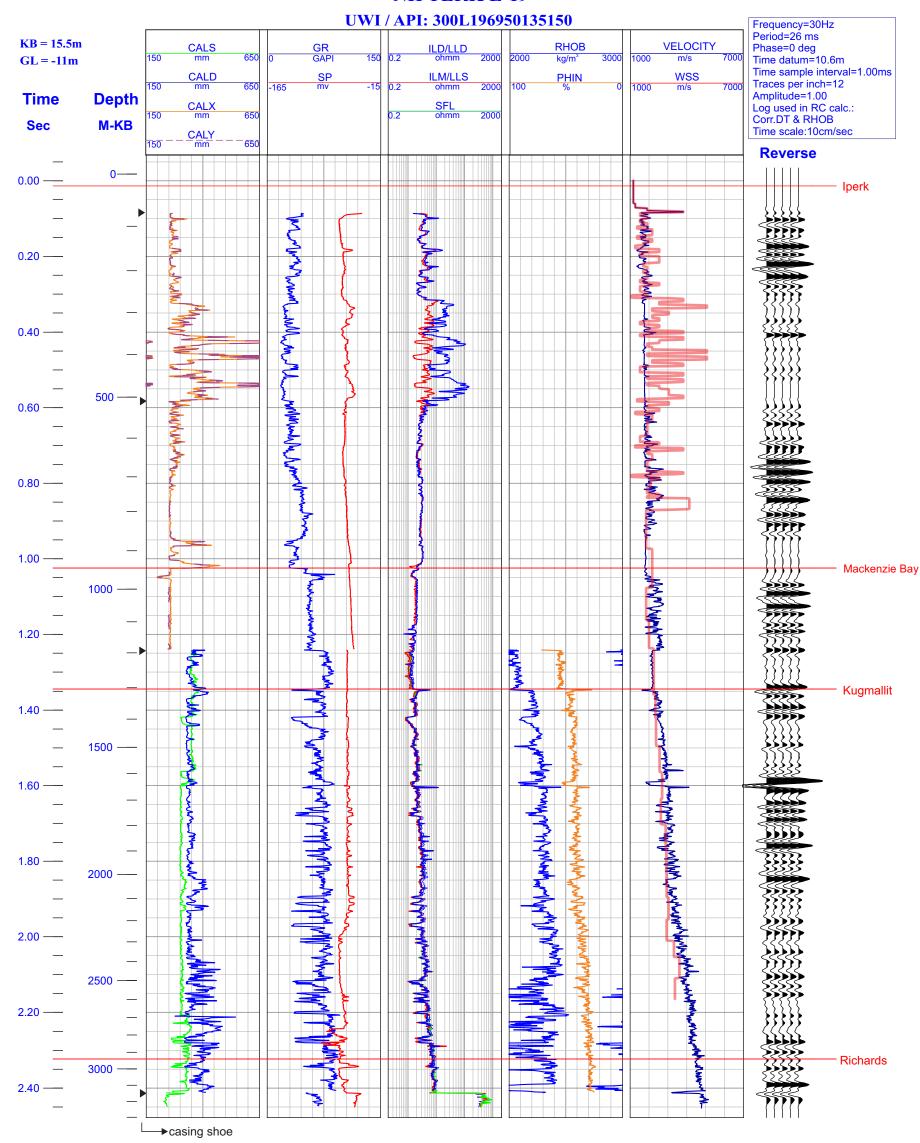
Figure 122. Well logs and synthetic of the Netserk B-44 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

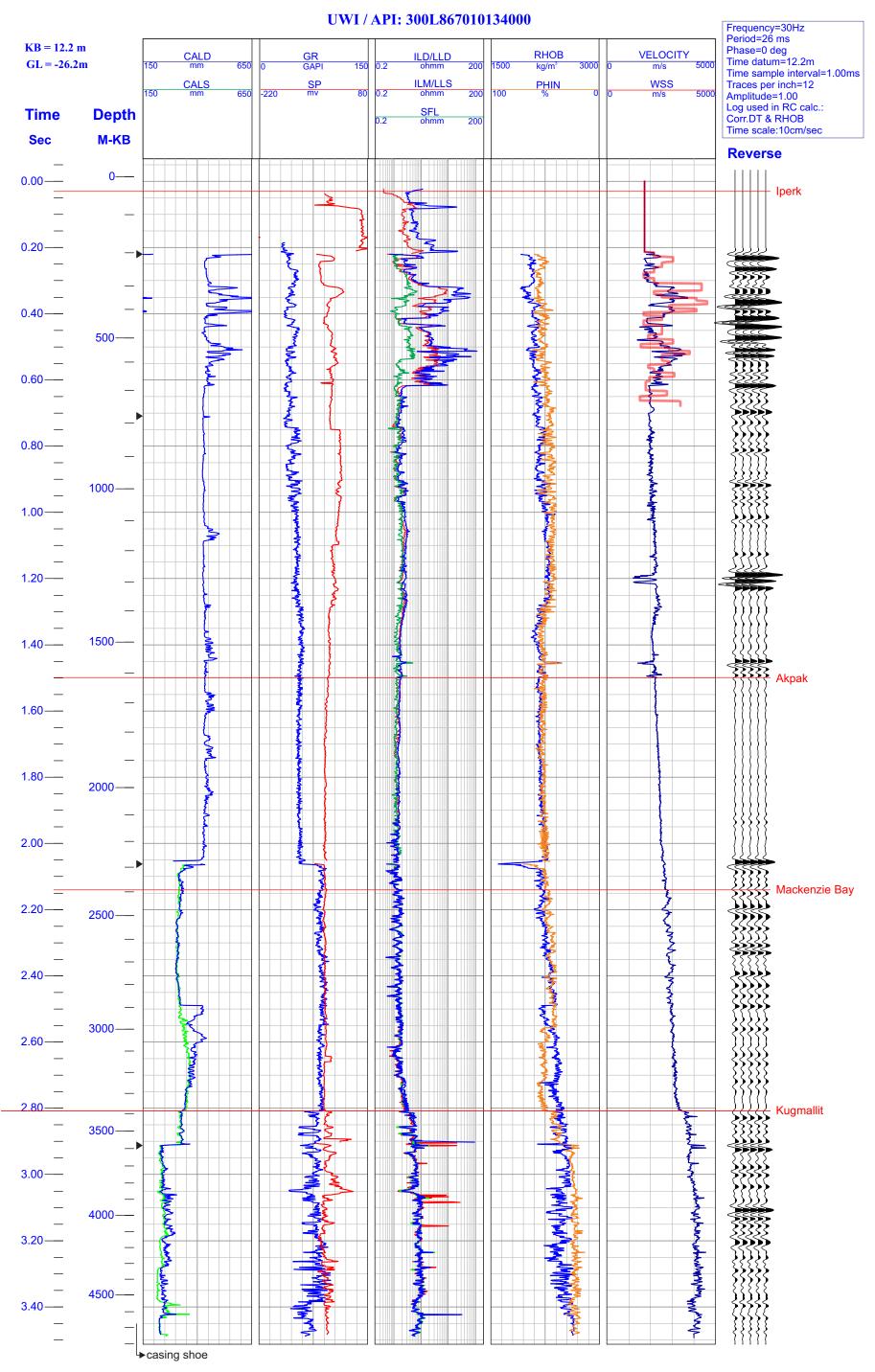Figure 123. Well logs and synthetic of the Netserk F-40 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

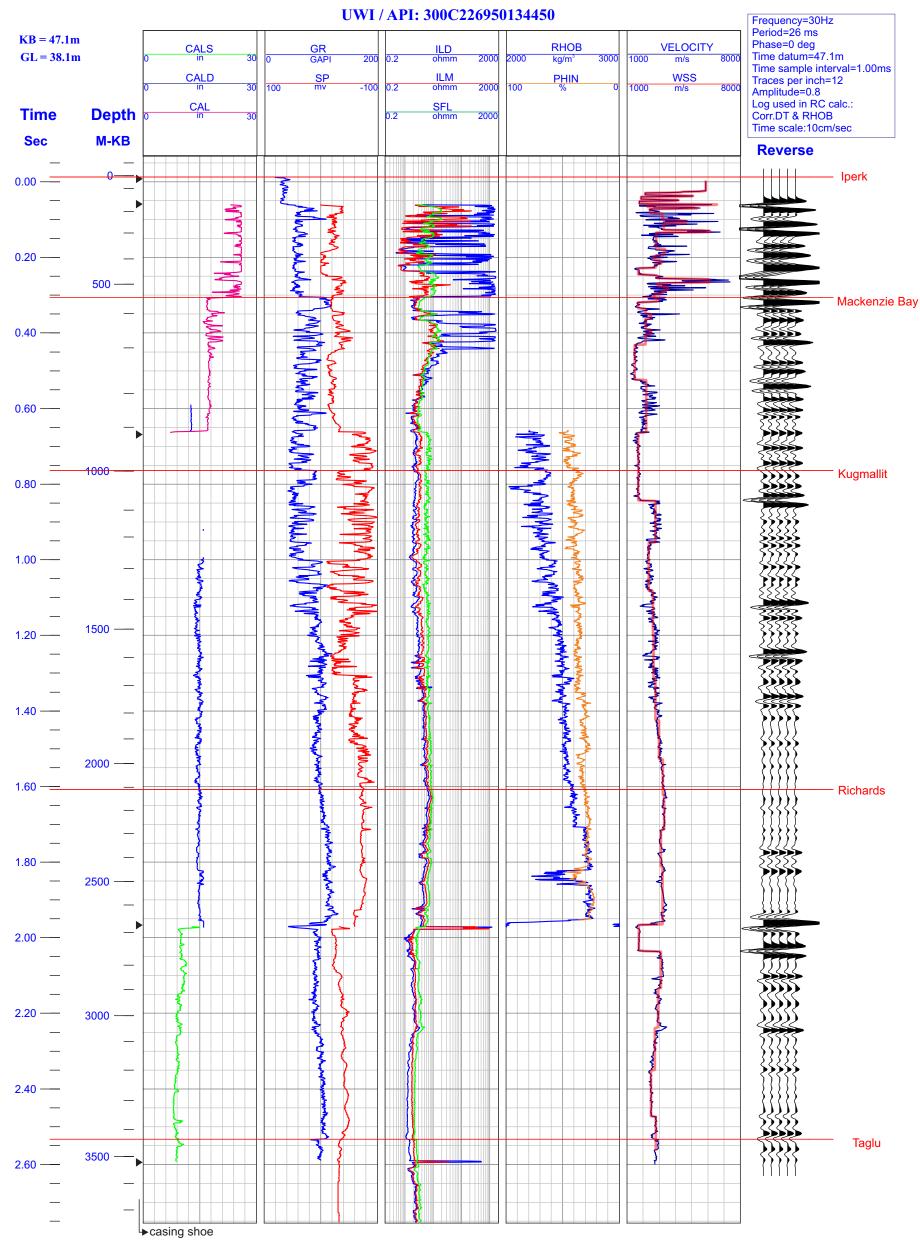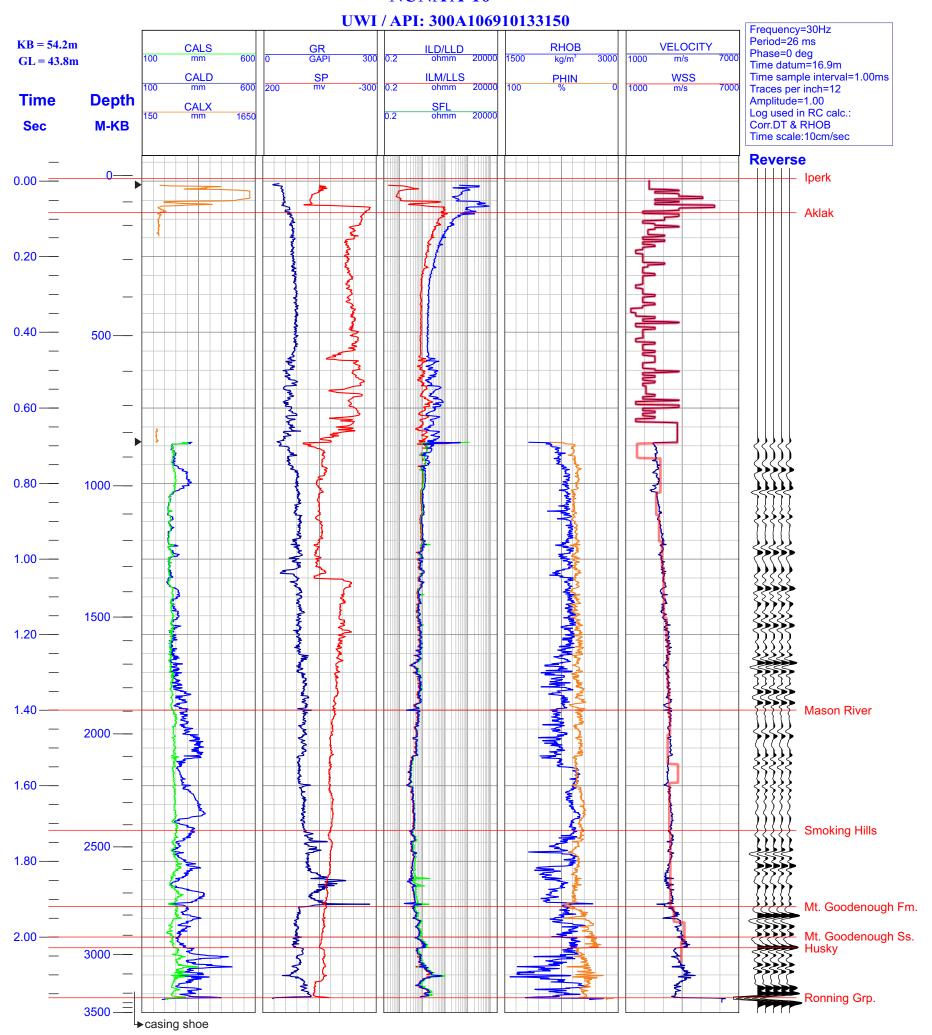Figure 124. Well logs and synthetic of the Niglintgak B-19 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and general caliper log (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD), medium (LLS) and shallow (MSFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 125. Well logs and synthetic of the Niglintgak H-30 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and neutron caliper (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

NIGLINTGAK M-19

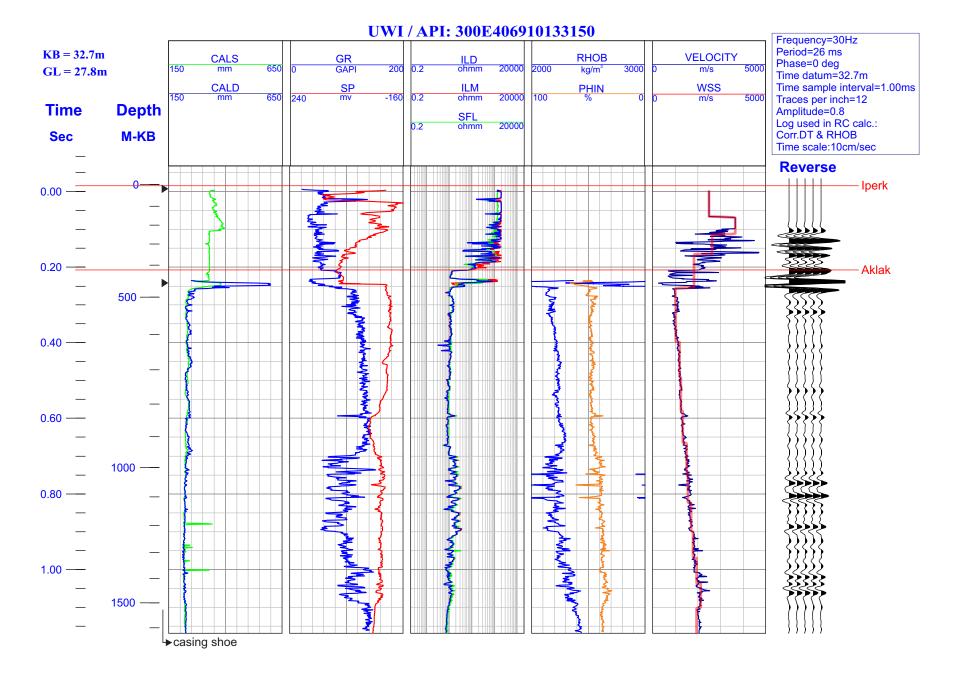**UWI / API: 300M196920135150**

Figure 126. Well logs and synthetic of the Niglintgak M-19 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (LL8/MFR) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1- from single DT, Reverse2 - from DT & RHOB).

Figure 127. Well logs and synthetic of the Nipterk L-19 well. The first track includes sonic caliper log (CALS), density caliper log (CALD), caliper 1-3 (CALX) and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 128. Well logs and synthetic of the North Issungnak L-86 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
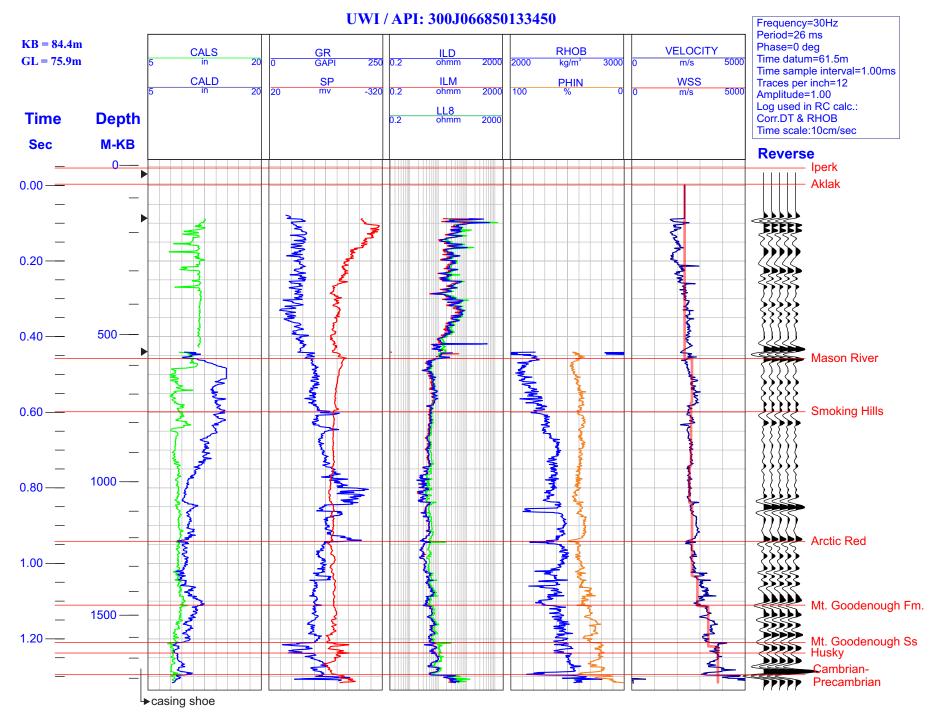
Figure 129. Well logs and synthetic of the Nuktak C-22 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and general caliper (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
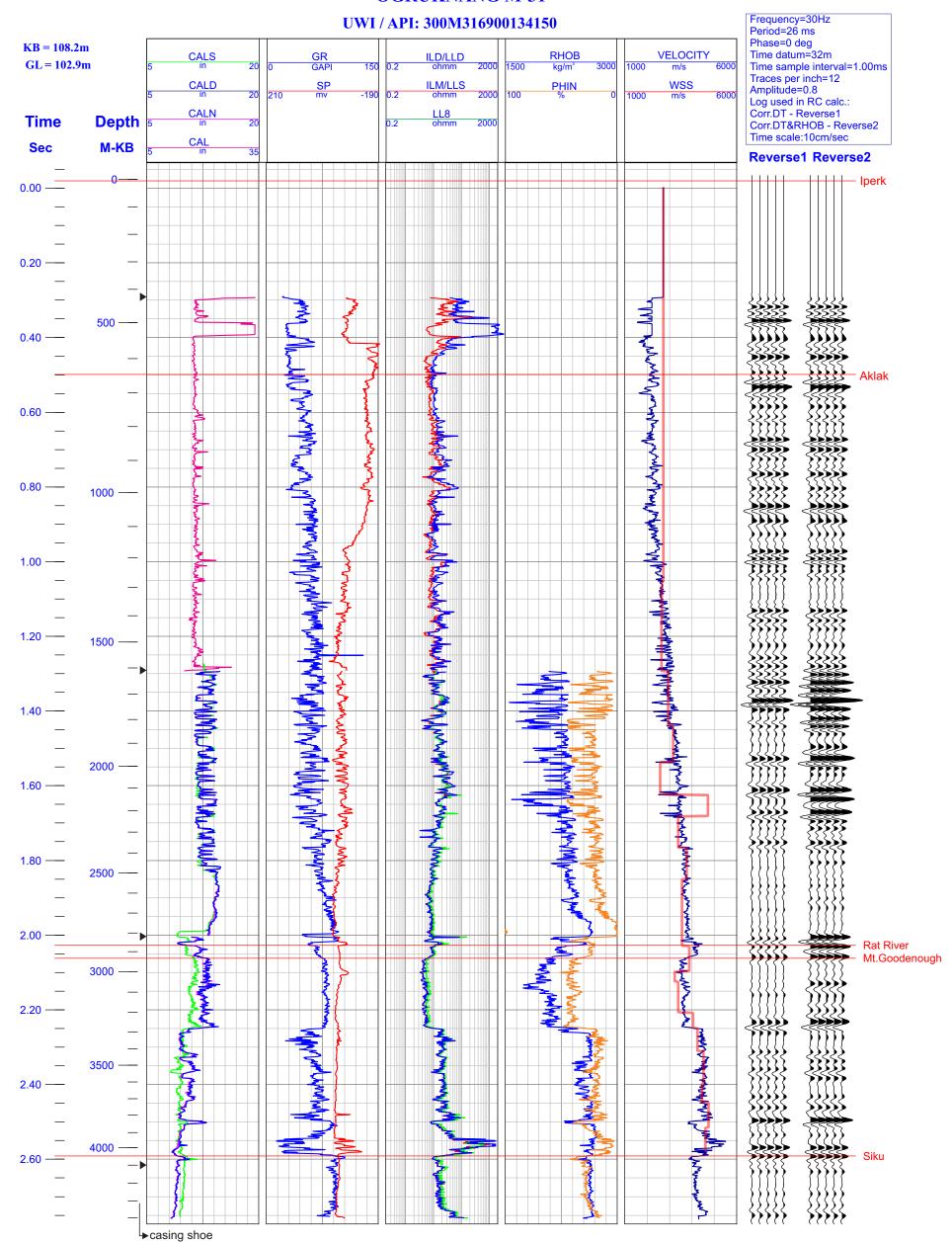
Figure 130. Well logs and synthetic of the Nuna A-10 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and caliper 1-3 (CALX); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
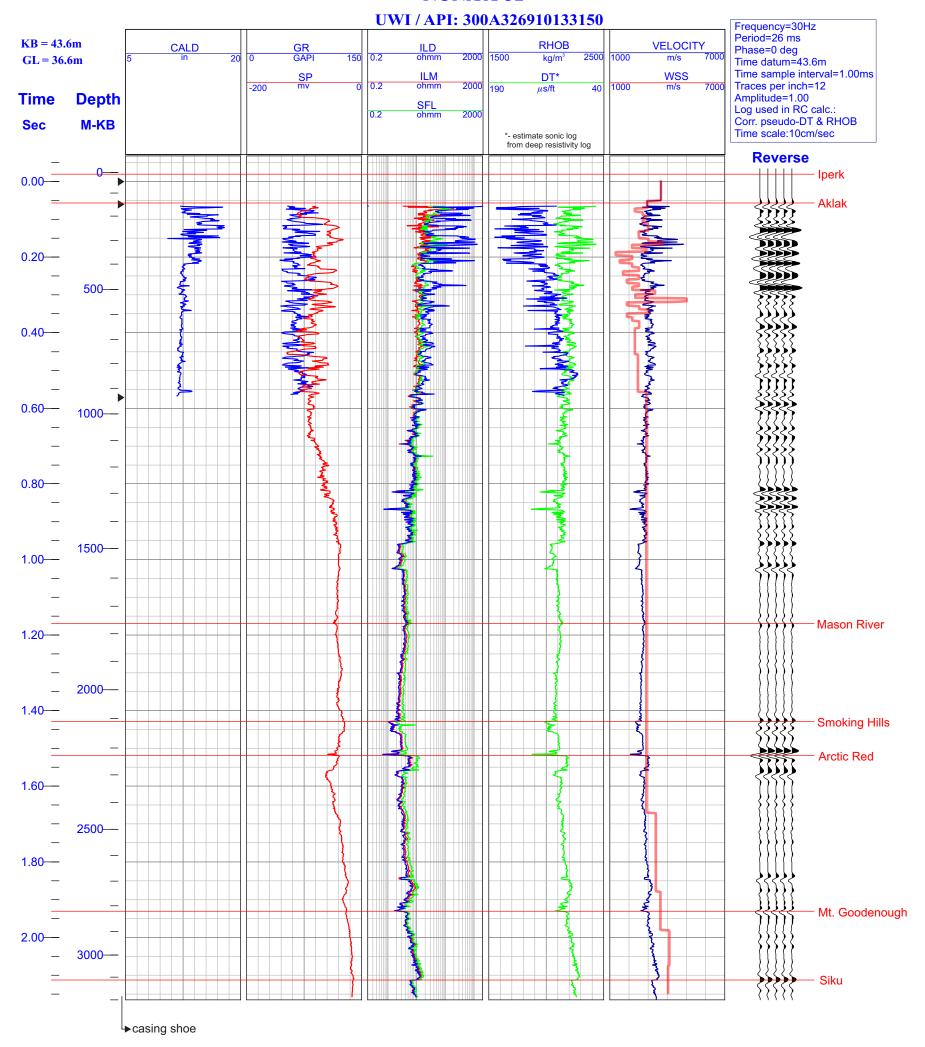
Figure 131. Well logs and synthetic of the Nuna A-32 well. The first track includes density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB); the the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and velocity; the sixth track displays synthetic traces (Reverse). Sonic curve was calculated from deep resistivity due to the lack of a sonic log. Synthetic traces are based on the pseudo-sonic log only below 920 m where there is no density log.

Figure 132. Well logs and synthetic of the Nuna E-40 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
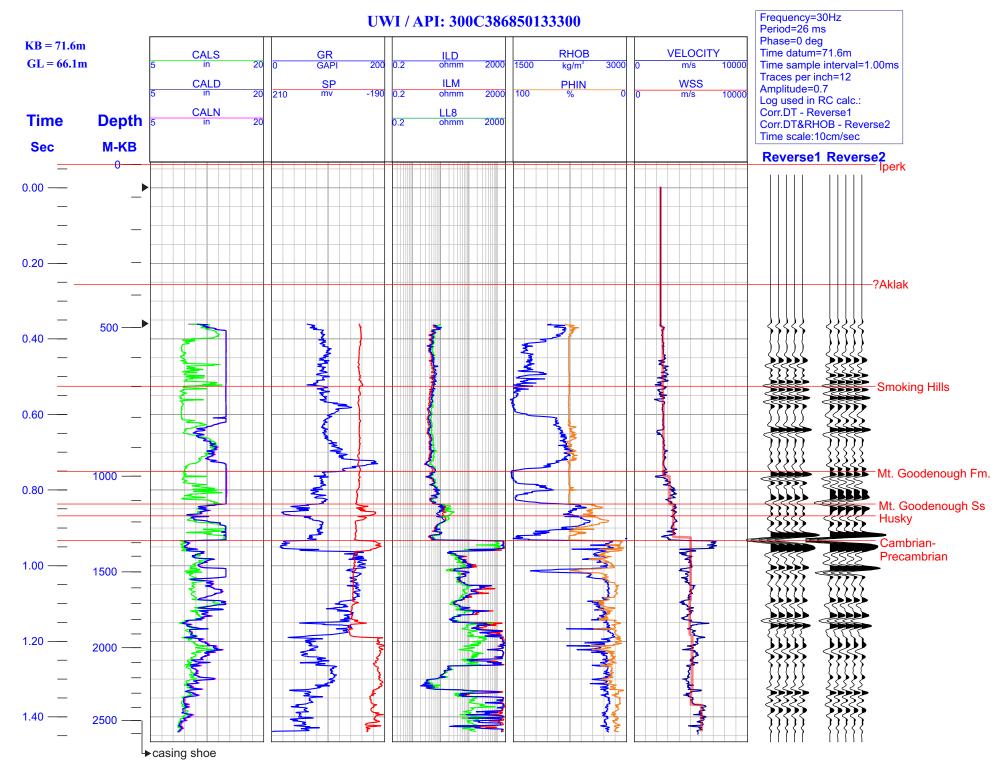
Figure 133. Well logs and synthetic of the Nuvorak O-09 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM/SN) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
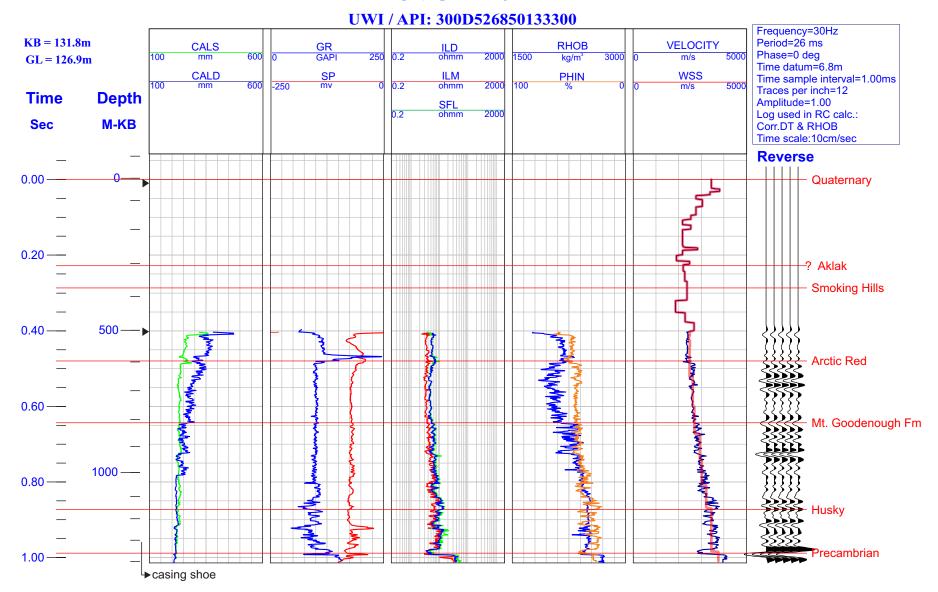
Figure 134. Well logs and synthetic of the Ogeoqeoq J-06 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
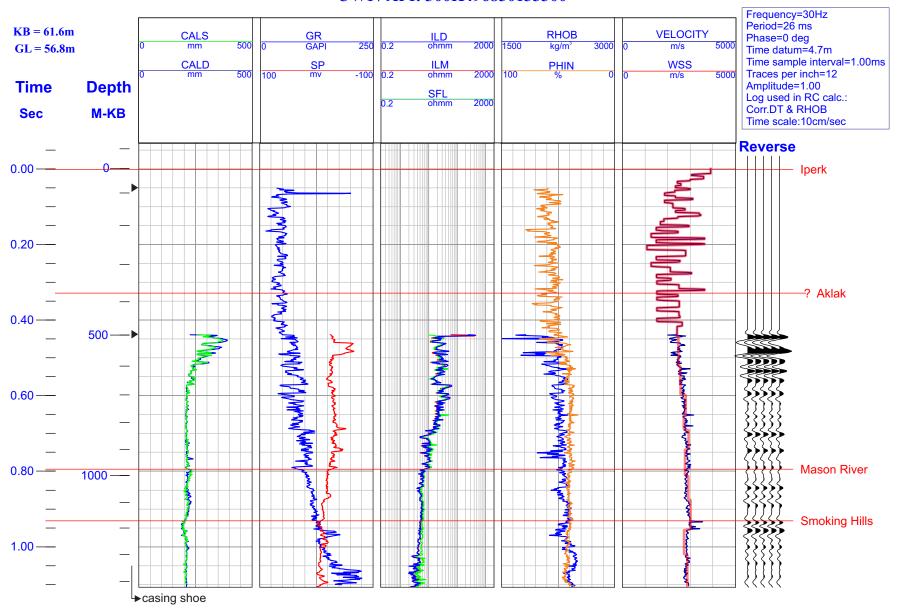
Figure 135. Well logs and synthetic of the Ogruknang M-31 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD), general caliper (CAL) and neutron caliper (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1-from single DT, Reverse2-from DT & RHOB).
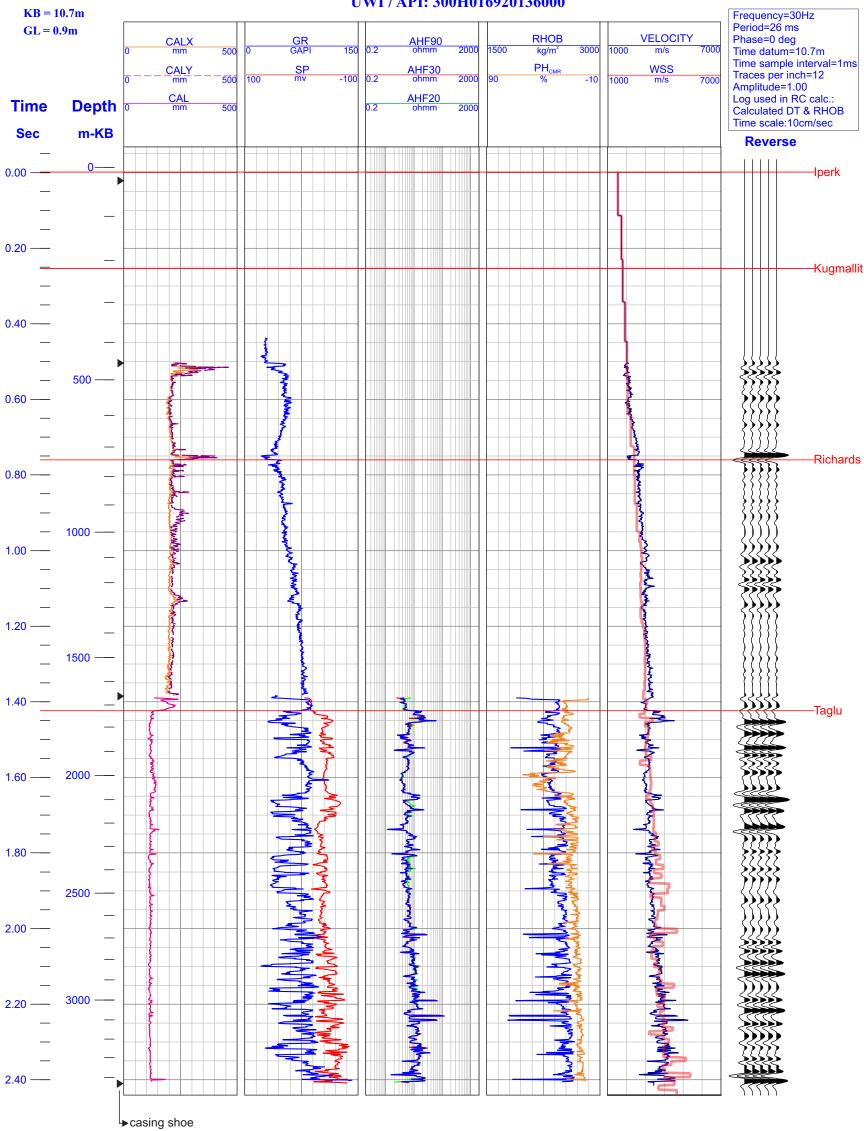
Figure 136. Well logs and synthetic of the Olivier H-01 well, showing the time-depth conversion. Synthetic is generated from estimated sonic log from deep resistivity log for the lower interval of the well due to lack of sonic log. The first track consists of caliper curves, general caliper (CAL), caliper 1-3 (CALX) and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) logs; the third track shows deep (ILD/AHF90), and medium (ILM/AHF30) and shallow (SFL/AHF20) resistivity logs; the fourth track illustrates density (RHOB) and nuclear magnetic porosity (PH_{CMR}) log data; the fifth track illustrates borehole seismic survey (VSP) and velocity curve. The sixth track displays synthetic traces (Reverse).
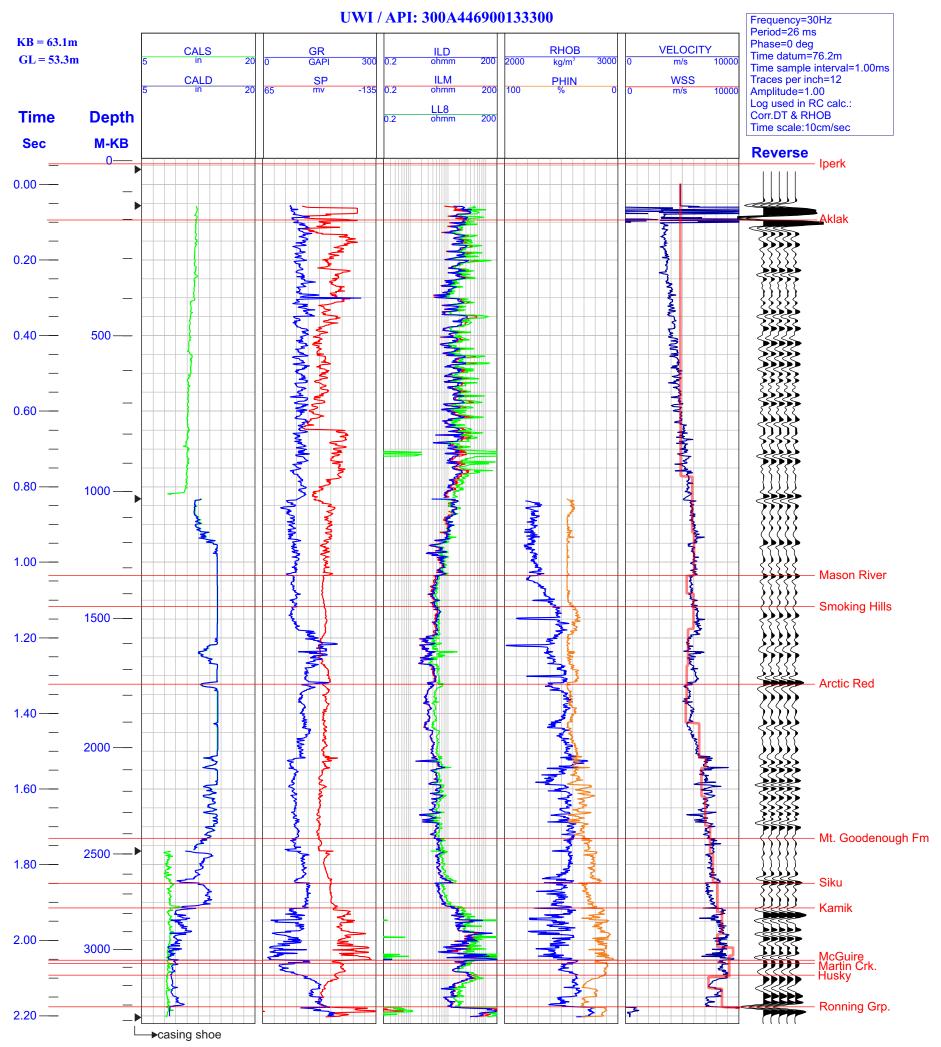
Figure 137. Well logs and synthetic of the Onigat C-38 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and neutron caliper (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1 - from single DT, Reverse2 - from DT & RHOB).

ONIGAT D-52

UWI / API: 300D526850133300

KB = 131.8m
GL = 126.9m

Time **Depth**

Sec **M-KB**

Figure 138. Well logs and synthetic of the Onigat D-52 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
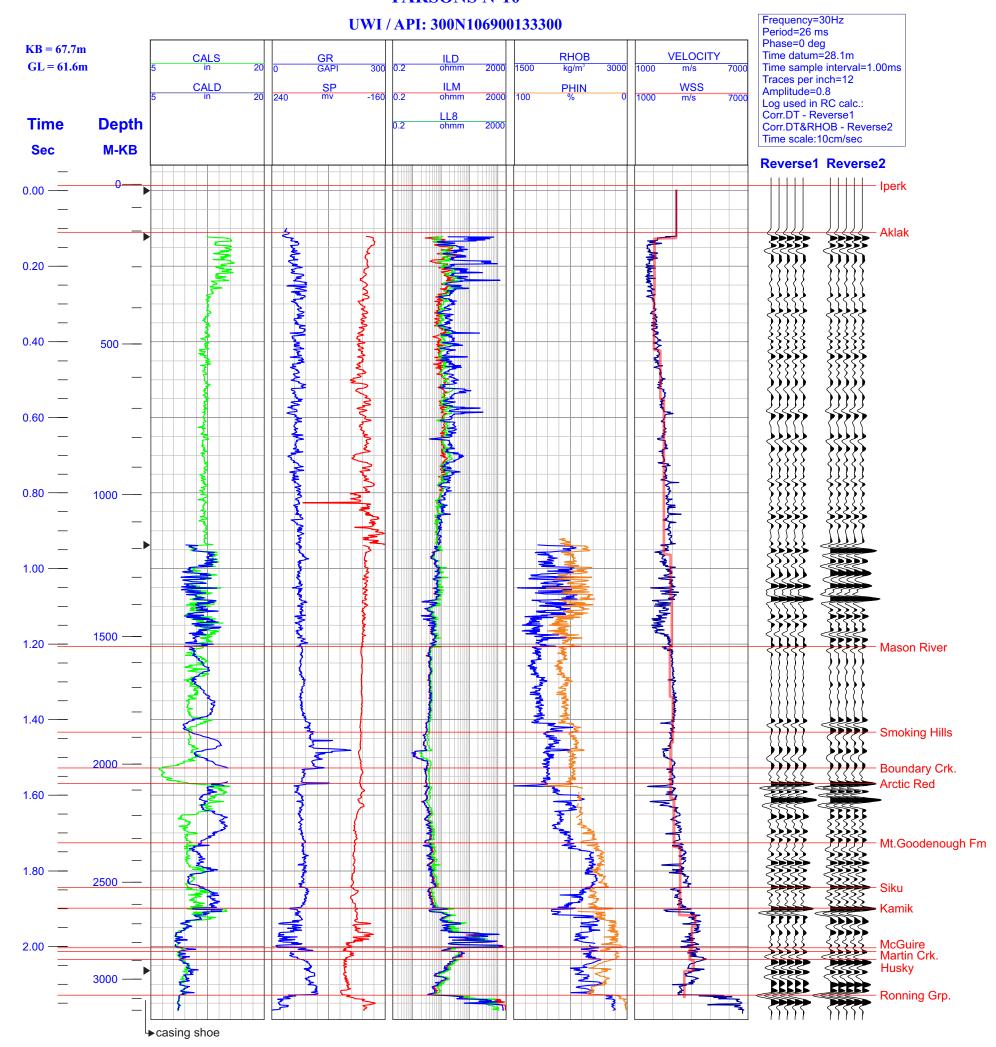
Figure 139. Well logs and synthetic of the Onigat K-49 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
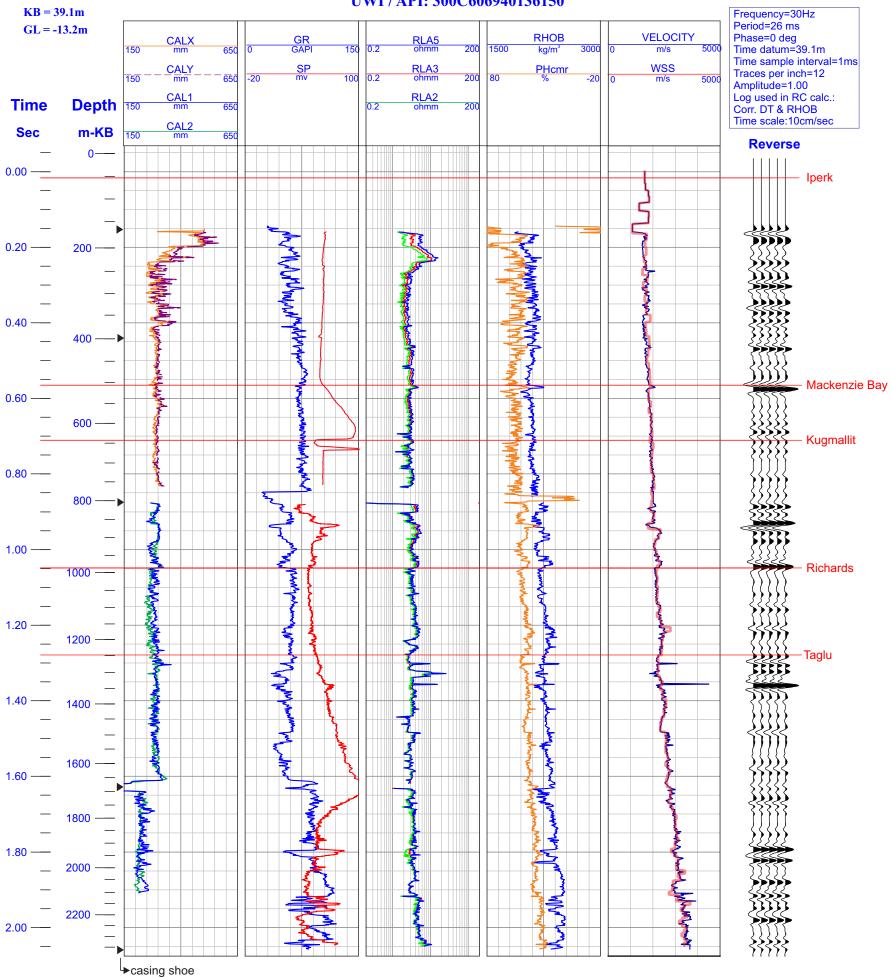
Figure 140. Well logs and synthetic of the Paktoa C-60 well, showing the time-depth conversion. The first track consists of caliper curves, caliper 1 (CAL1), caliper 2 (CAL2), caliper 1-3 (CALX), and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) logs; the third track shows deep (RLA5), and medium (RLA3), and shallow (RLA2) resistivity logs; the fourth track illustrates density (RHOB) and total nuclear magnetic porosity (PH$_{CMR}$) log data; the fifth track illustrates well seismic survey (VSP) and velocity curve. The sixth track displays synthetic traces (Reverse).

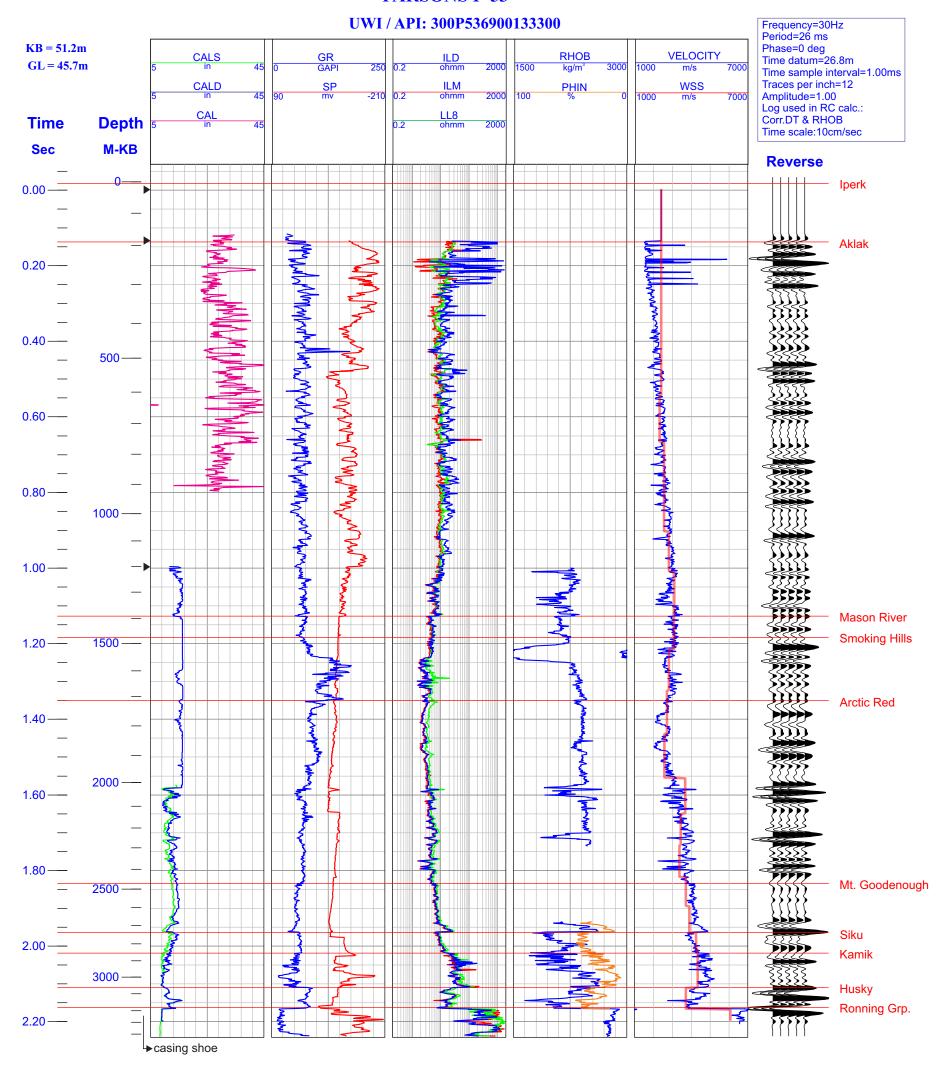Figure 141. Well logs and synthetic of the Parsons A-44 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
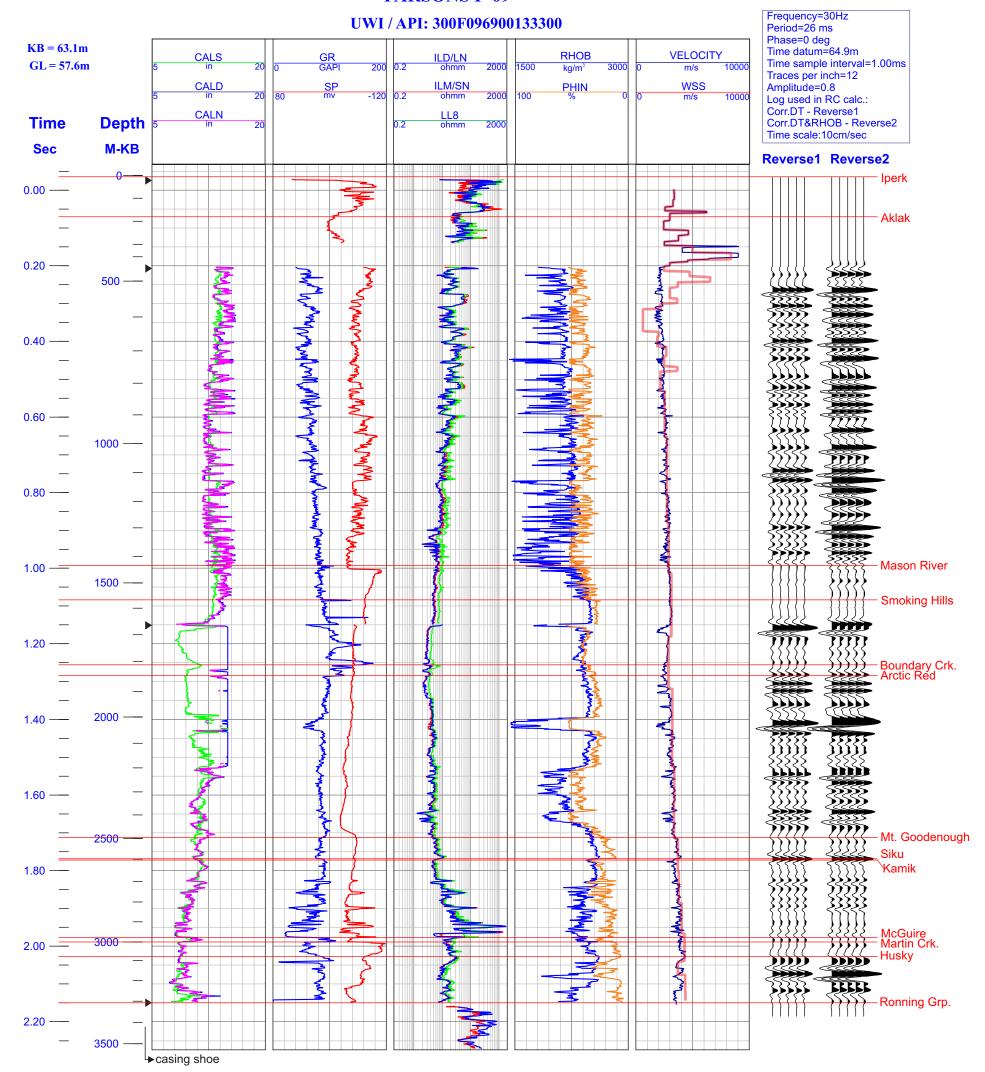
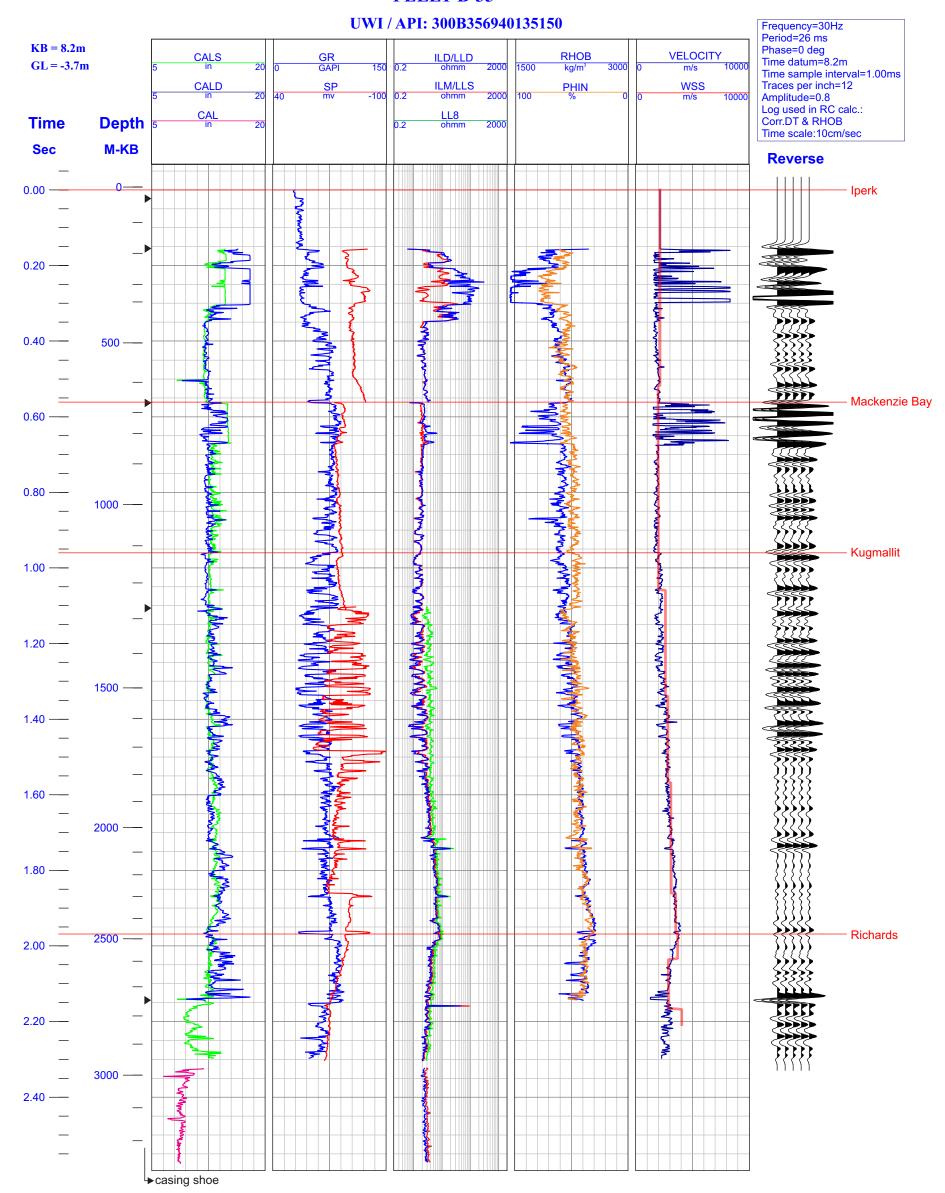Figure 142. Well logs and synthetic of the Parsons F-09 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and neutron caliper (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LN), medium (ILM/SN) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1- from single DT, Reverse2 - from DT & RHOB).

Figure 143. Well logs and synthetic of the Parsons N-10 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1 - from single DT, Reverse2 - from DT & RHOB).
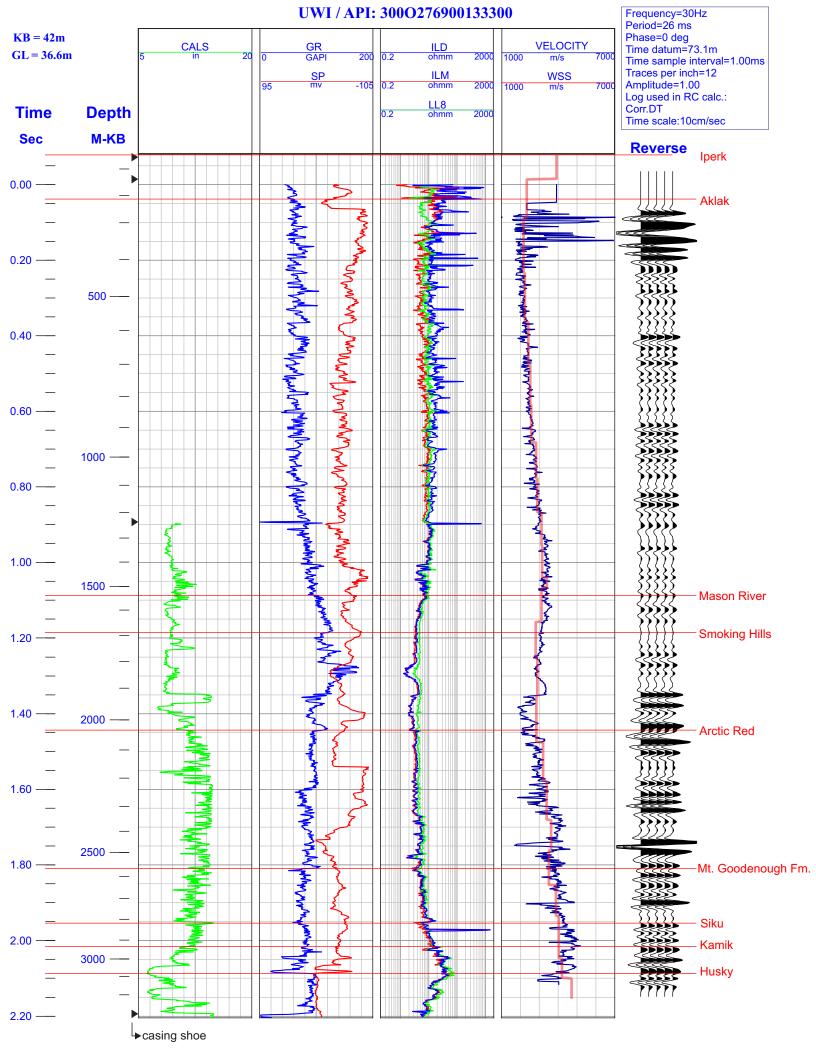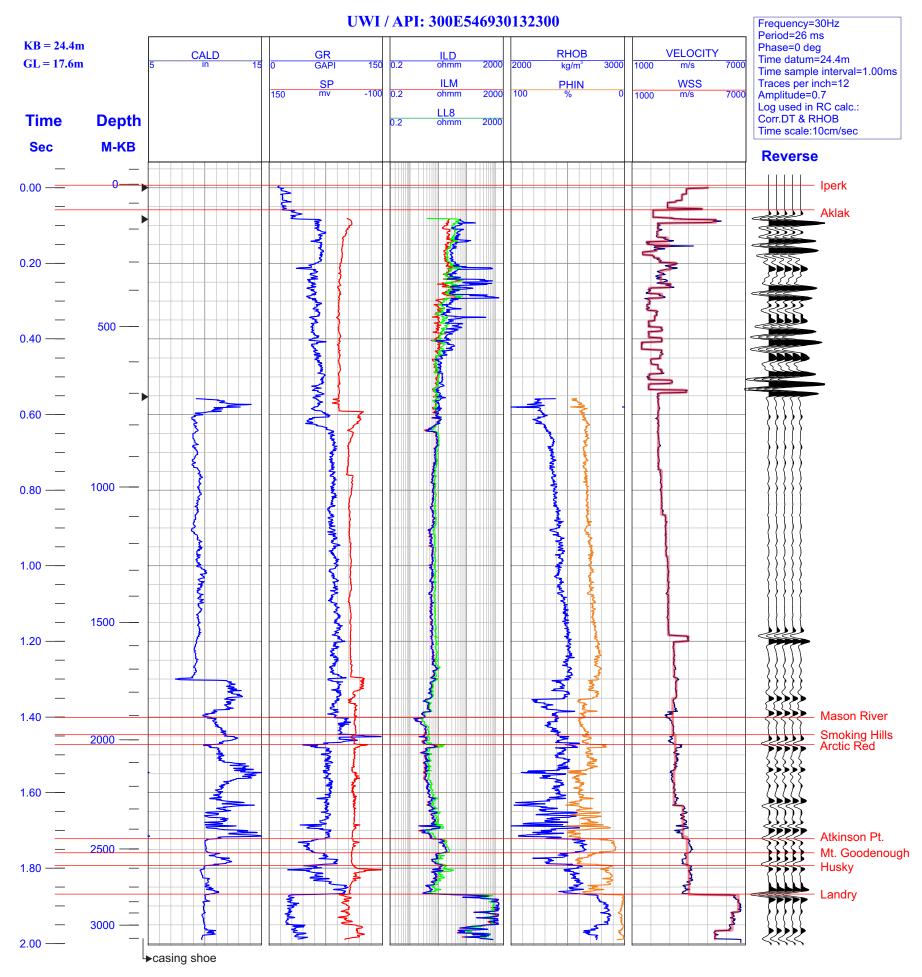
Figure 144. Well logs and synthetic of the Parsons O-27 well. The first track includes sonic caliper log (CALS); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The fifth track displays synthetic traces (Reverse).
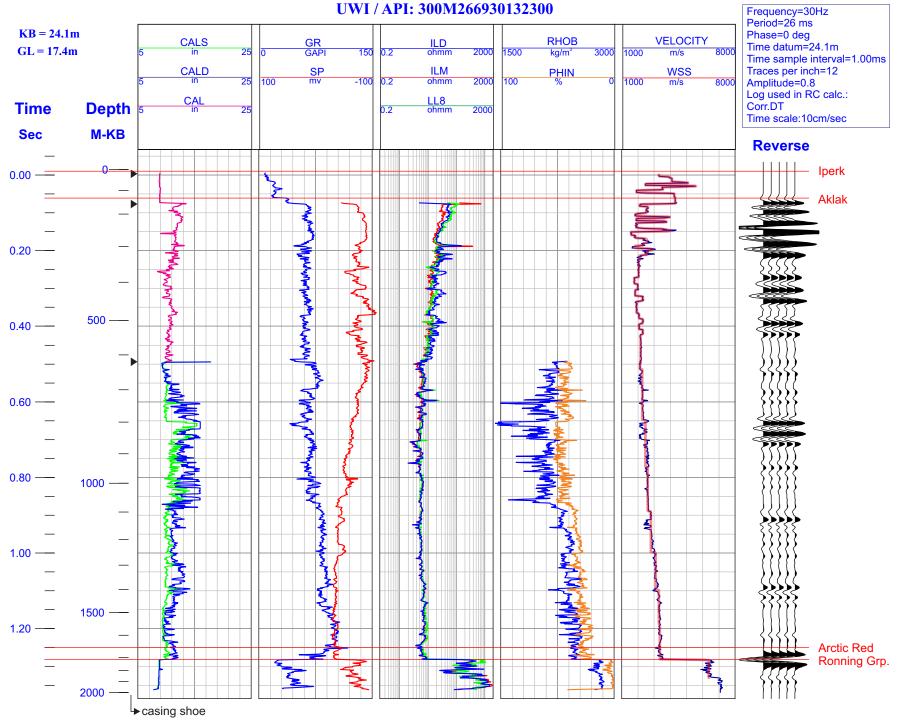
Figure 145. Well logs and synthetic of the Parsons P-53 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and general caliper (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
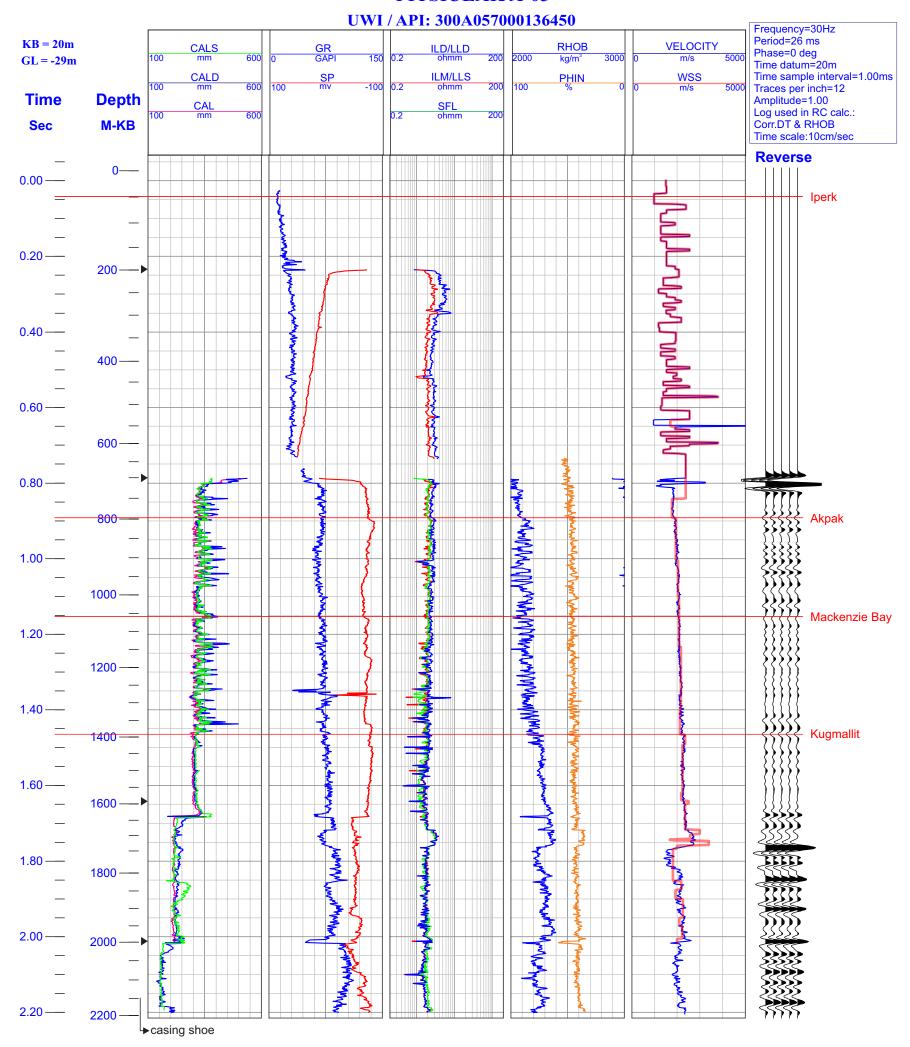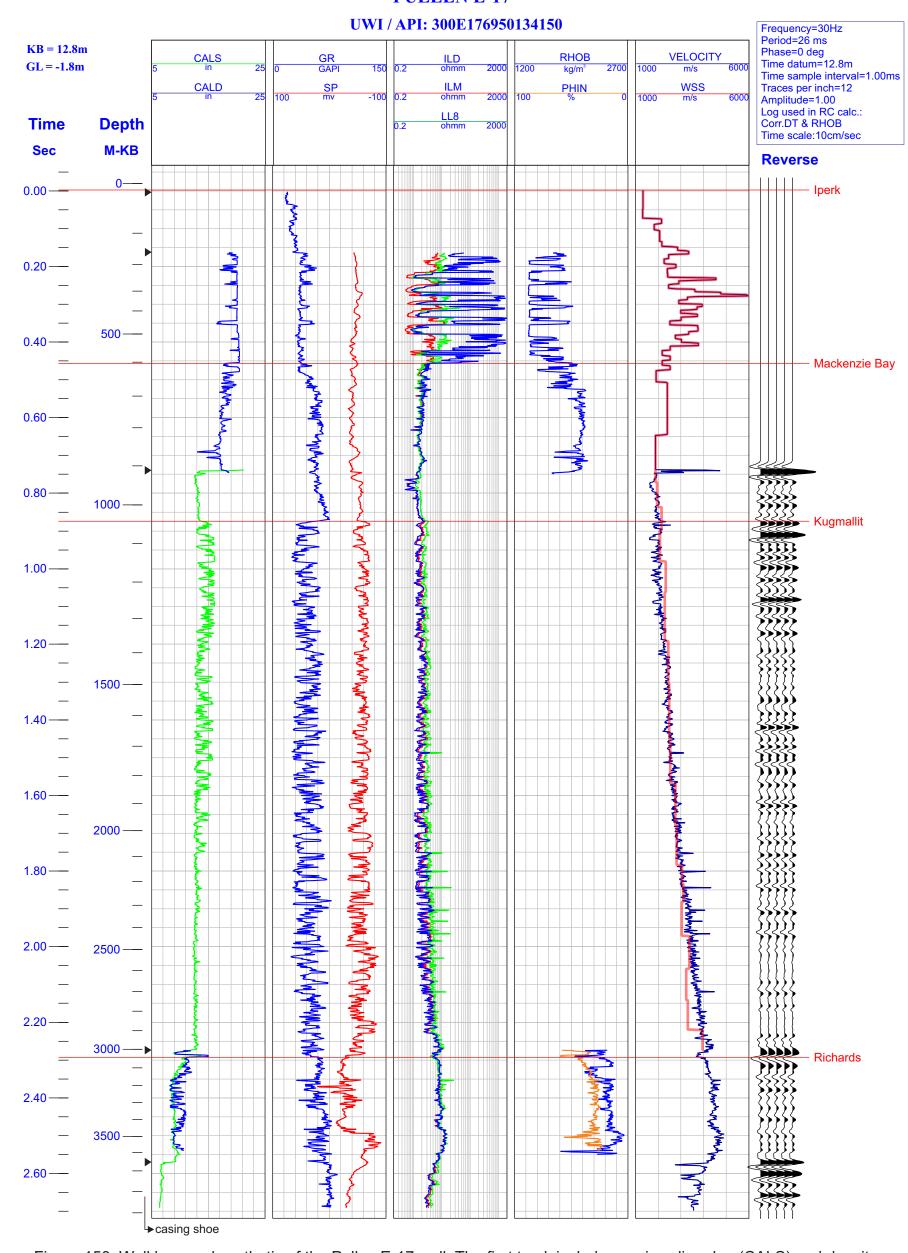
Figure 146. Well logs and synthetic of the Pelly B-35 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and general caliper (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 147. Well logs and synthetic of the Pikiolik E-54 well. The first track includes density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
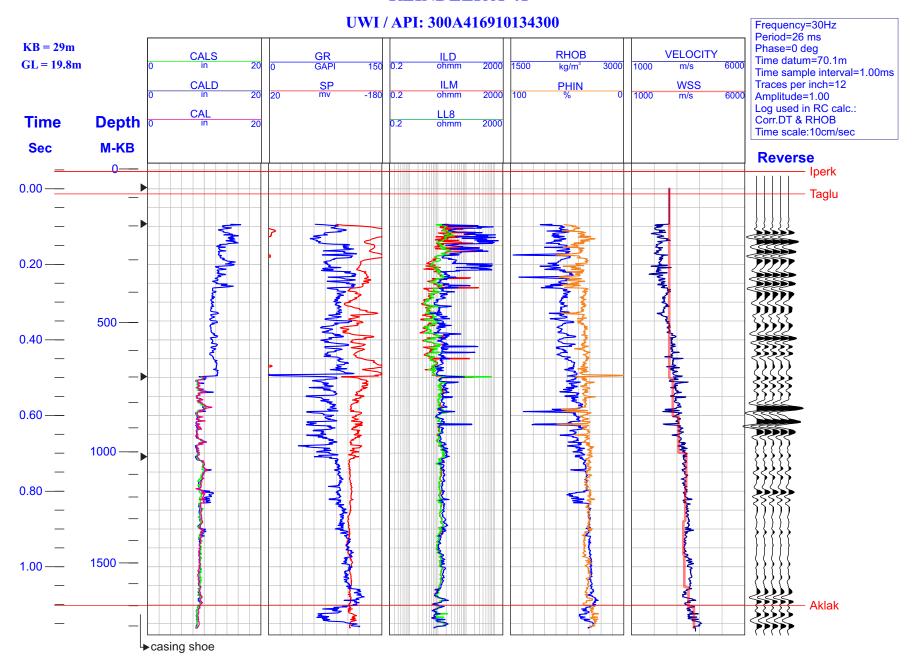
Figure 148. Well logs and synthetic of the Pikiolik M-26 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and general caliper (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse). The block shift correction is applied to the well.
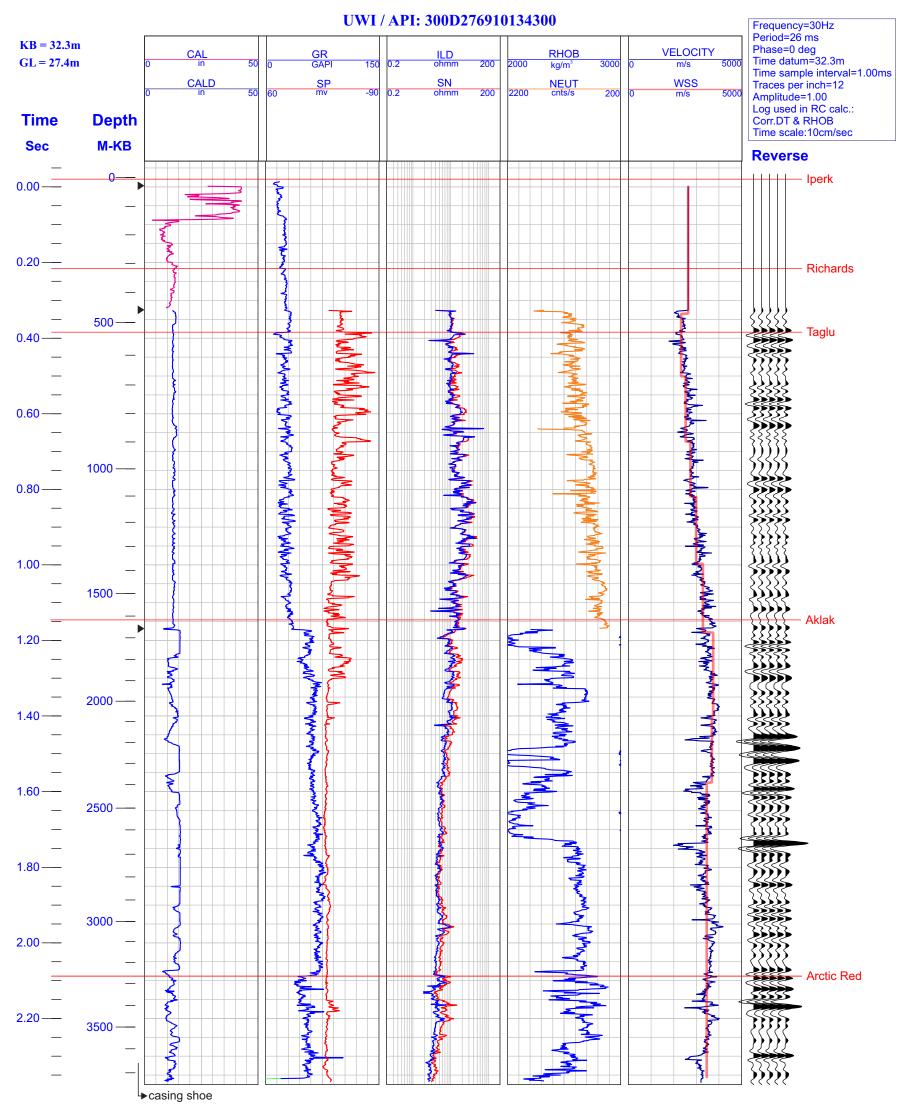
Figure 149. Well logs and synthetic of the Pitsiulak A-05 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and resistivity caliper (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
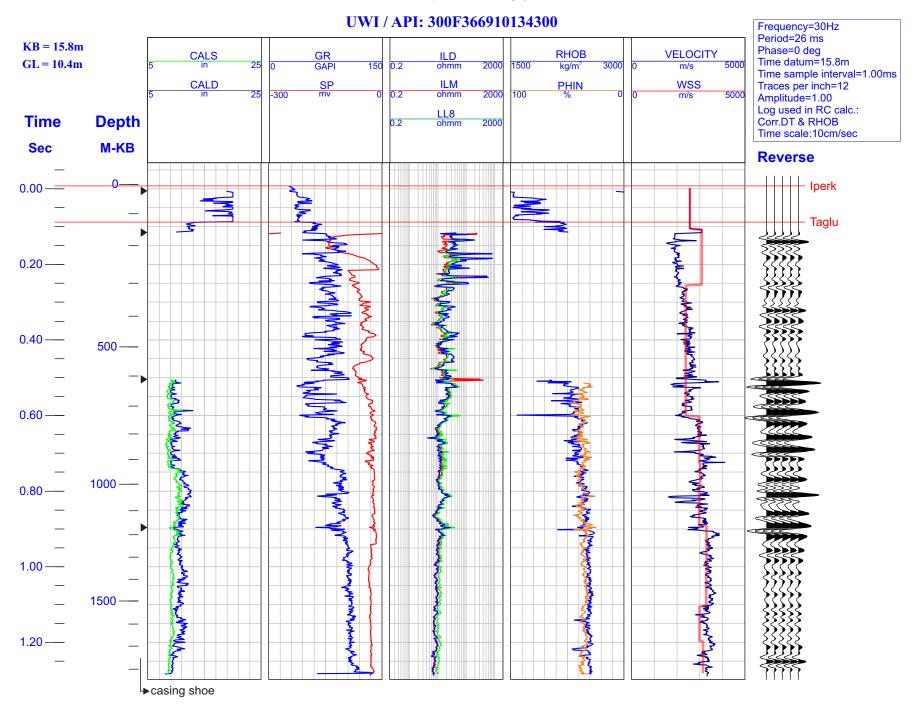
Figure 150. Well logs and synthetic of the Pullen E-17 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
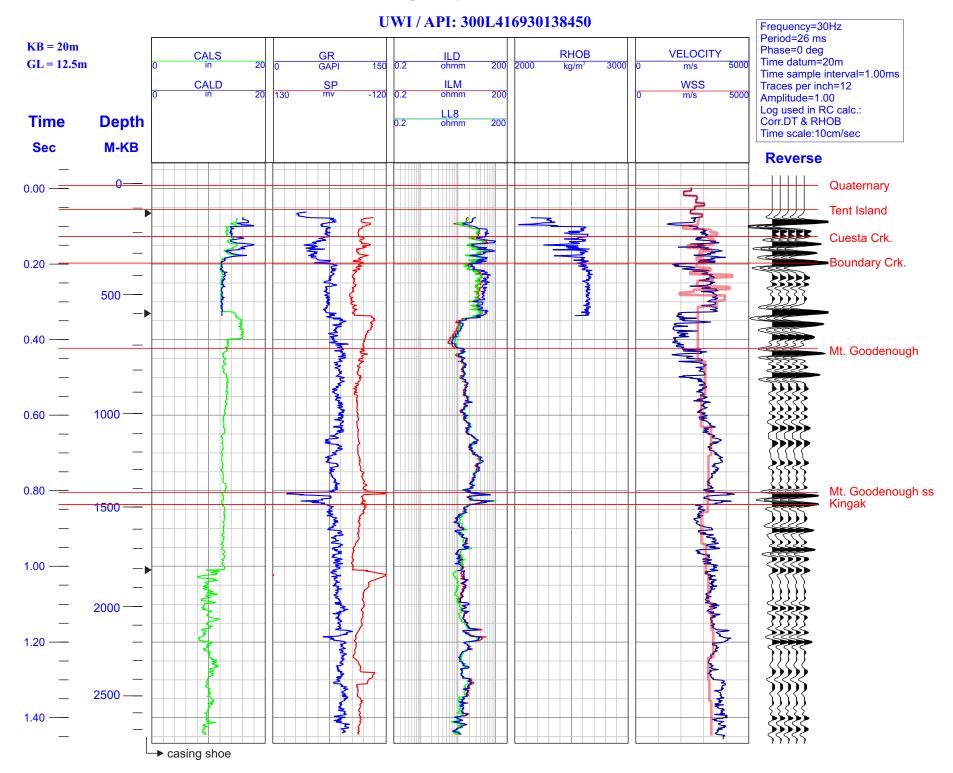
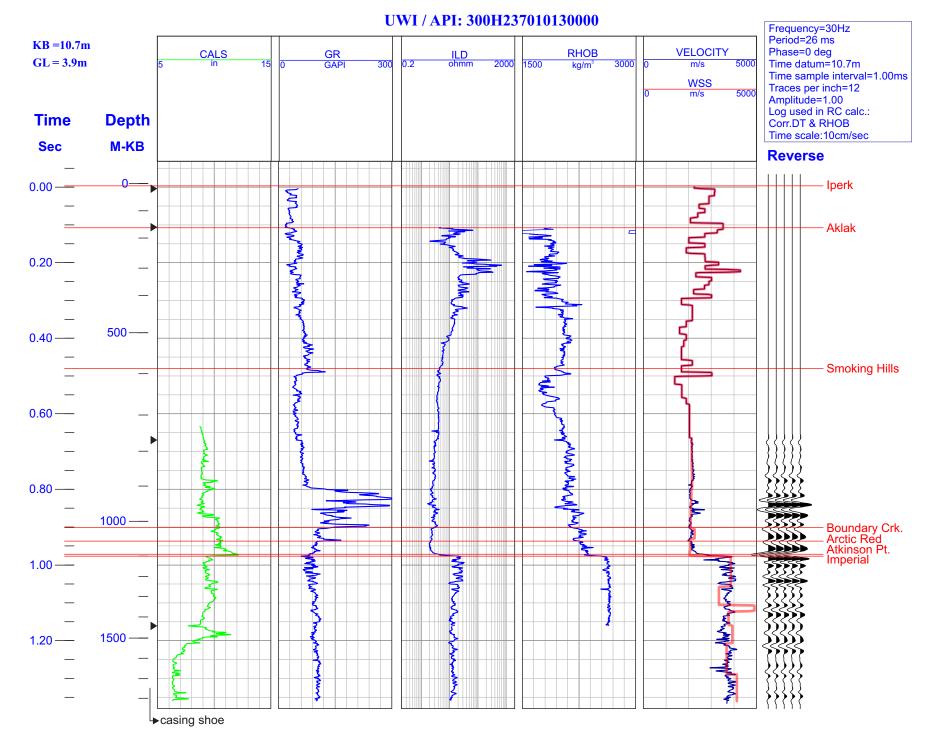Figure 151. Well logs and synthetic of the Reindeer A-41 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and general caliper (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 152. Well logs and synthetic of the Reindeer D-27 well. The first track includes general caliper log (CAL) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD) and medium (SN) resistivity logs; the fourth track illustrates density (RHOB) and neutron log (NEUT); the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
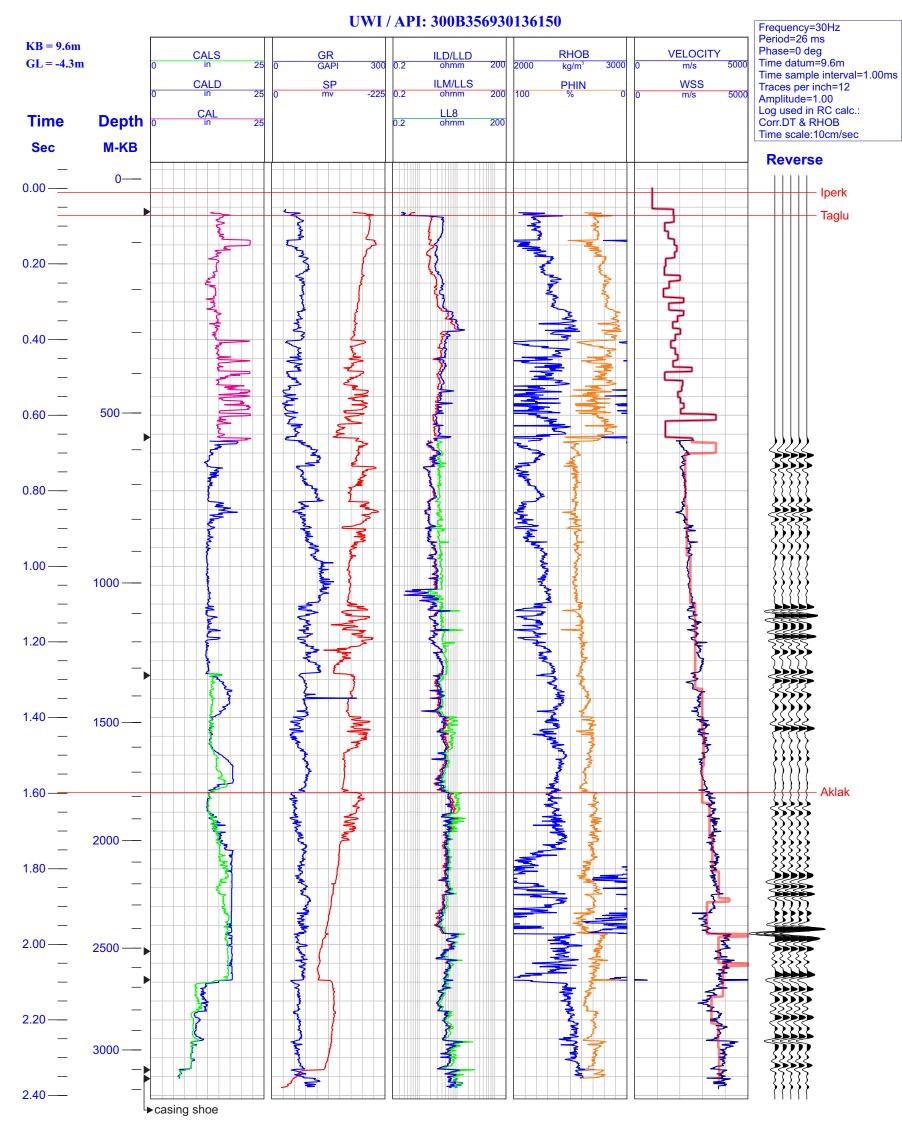
Figure 153. Well logs and synthetic of the Reindeer F-36 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
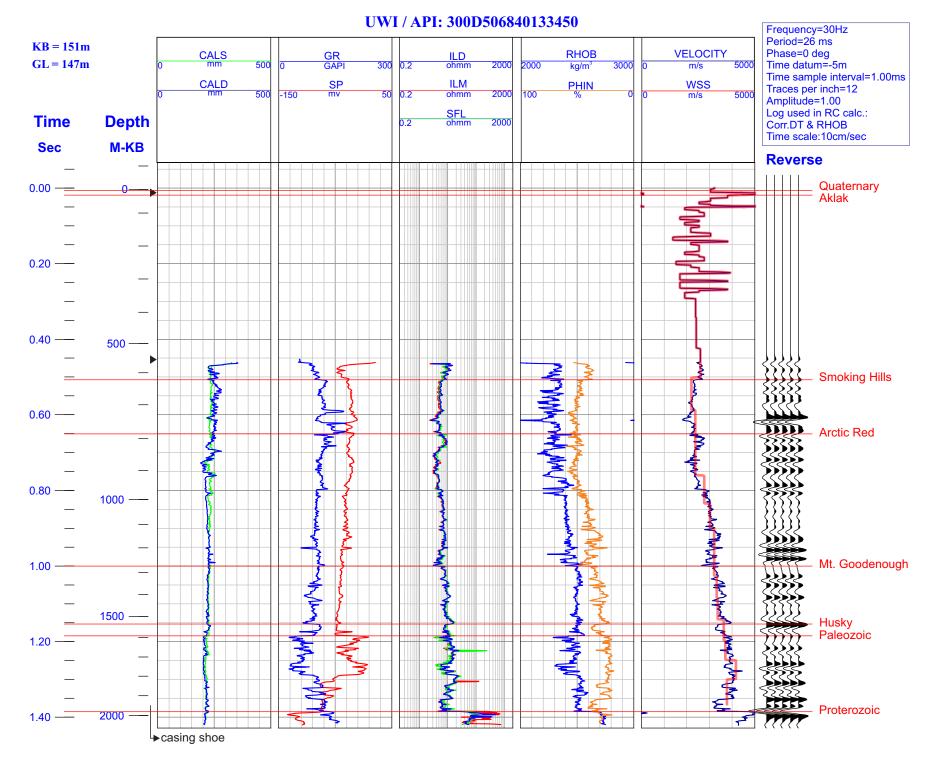
Figure 154. Well logs and synthetic of the Roland Bay YT L-41 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) log; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 155. Well logs and synthetic of the Russell H-23 well. The first track includes sonic caliper log (CALS); the second track contains gamma ray (GR) log; the third track shows deep (ILD) resistivity log; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
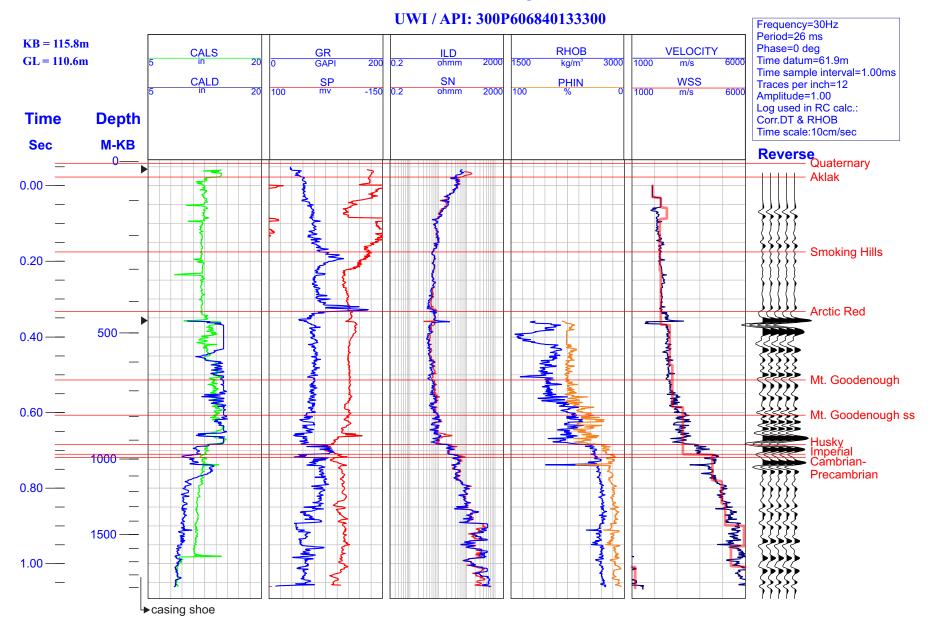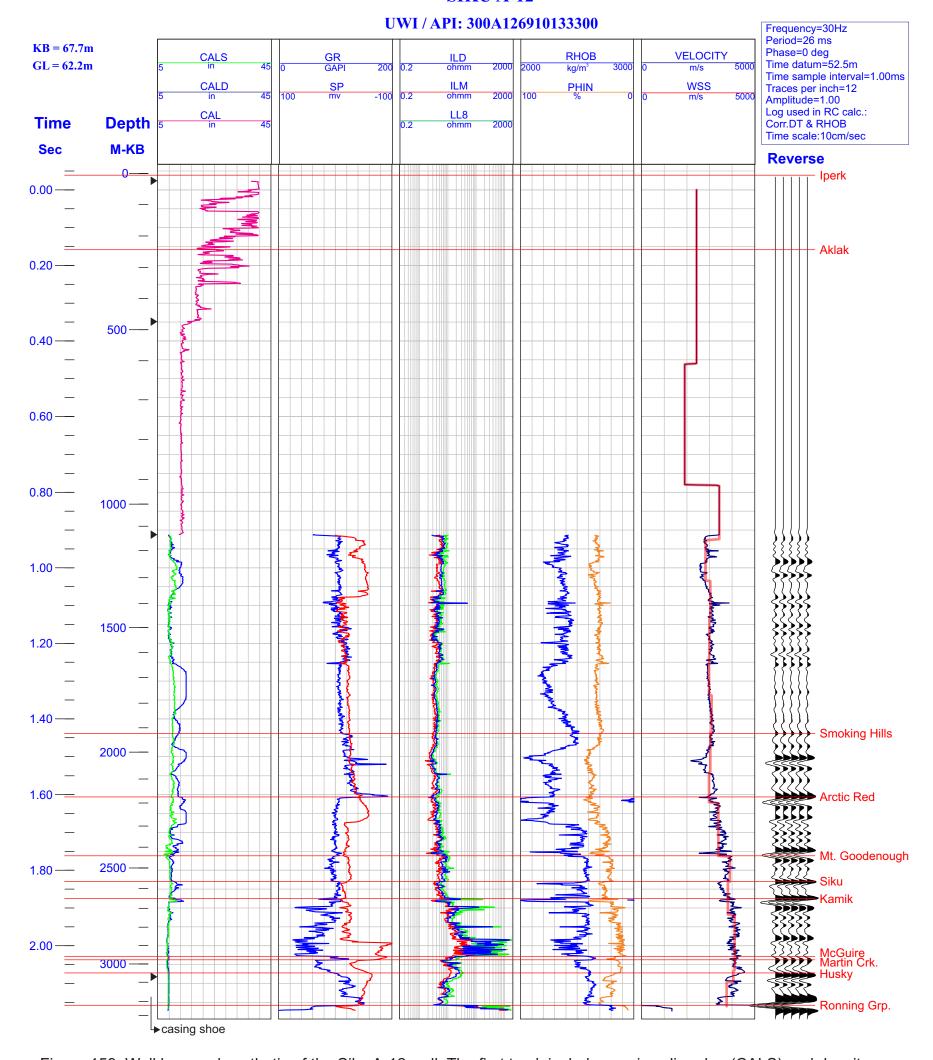
Figure 156. Well logs and synthetic of the Sarpik B-35 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and resistivity caliper (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and velocity. The sixth track displays synthetic traces (Reverse).

Figure 157. Well logs and synthetic of the Shakgatlatachig D-50 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
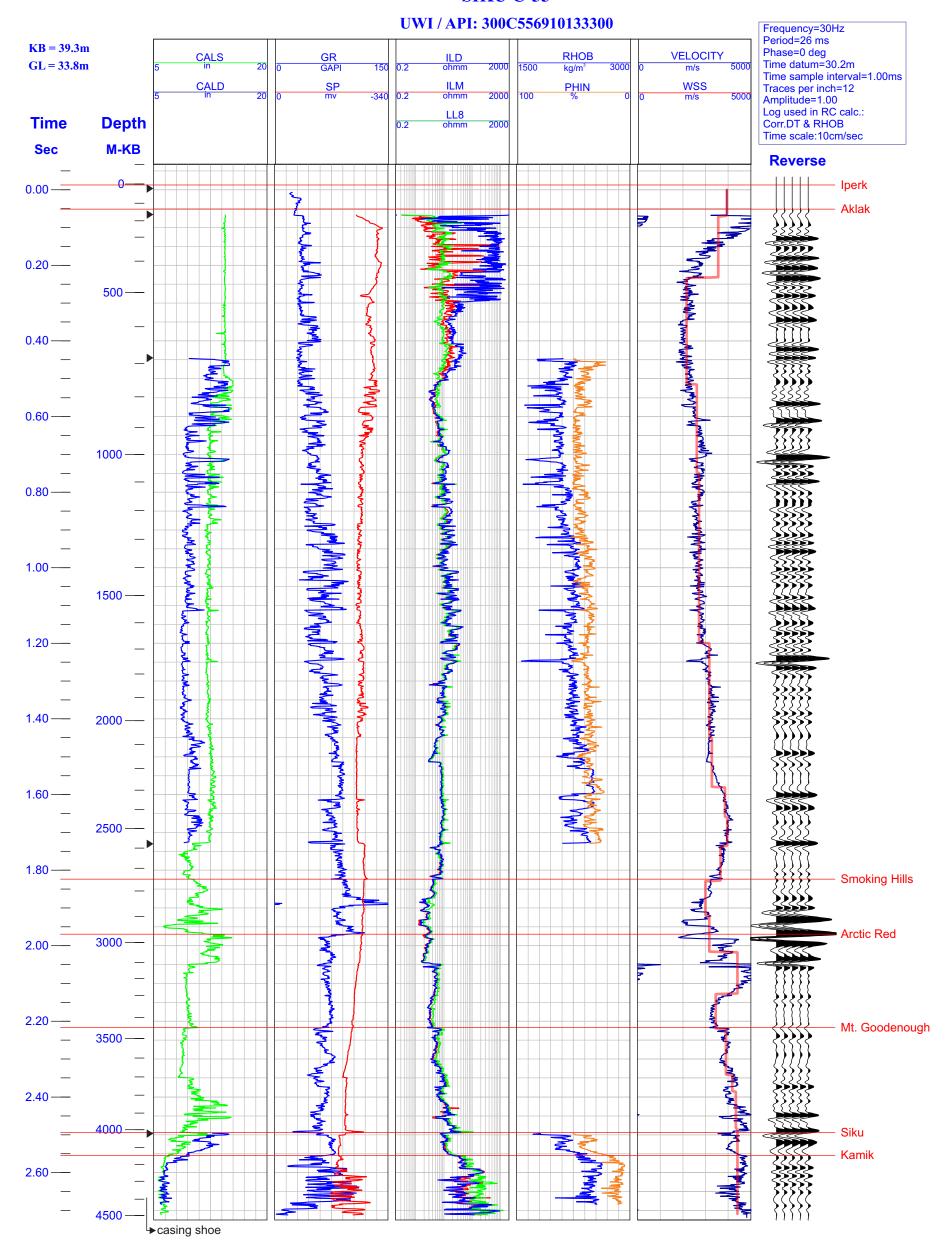
Figure 158. Well logs and synthetic of the Sholokpaoqak P-60 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD) and medium (SN) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
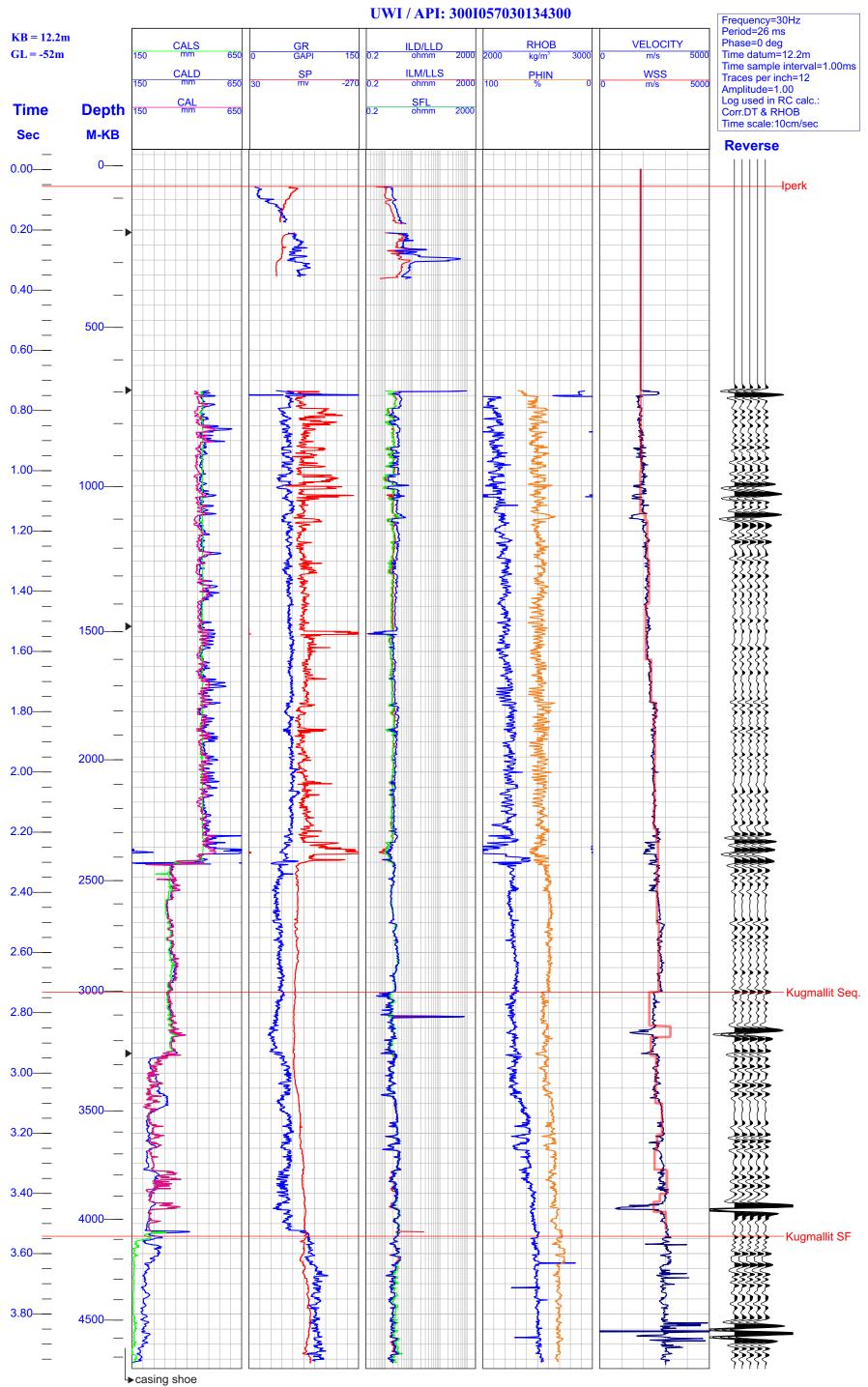
Figure 159. Well logs and synthetic of the Siku A-12 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and general caliper log (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
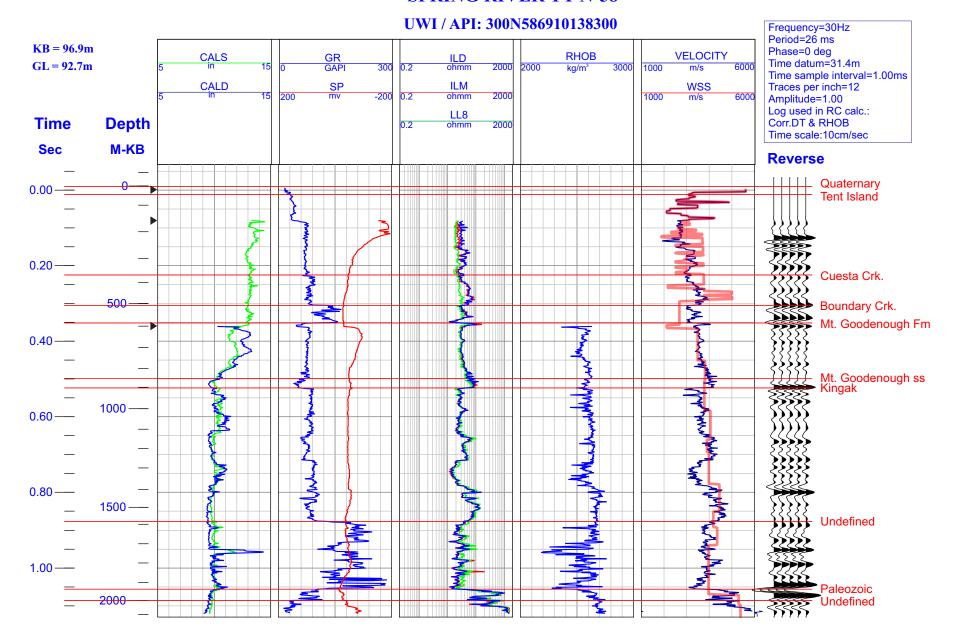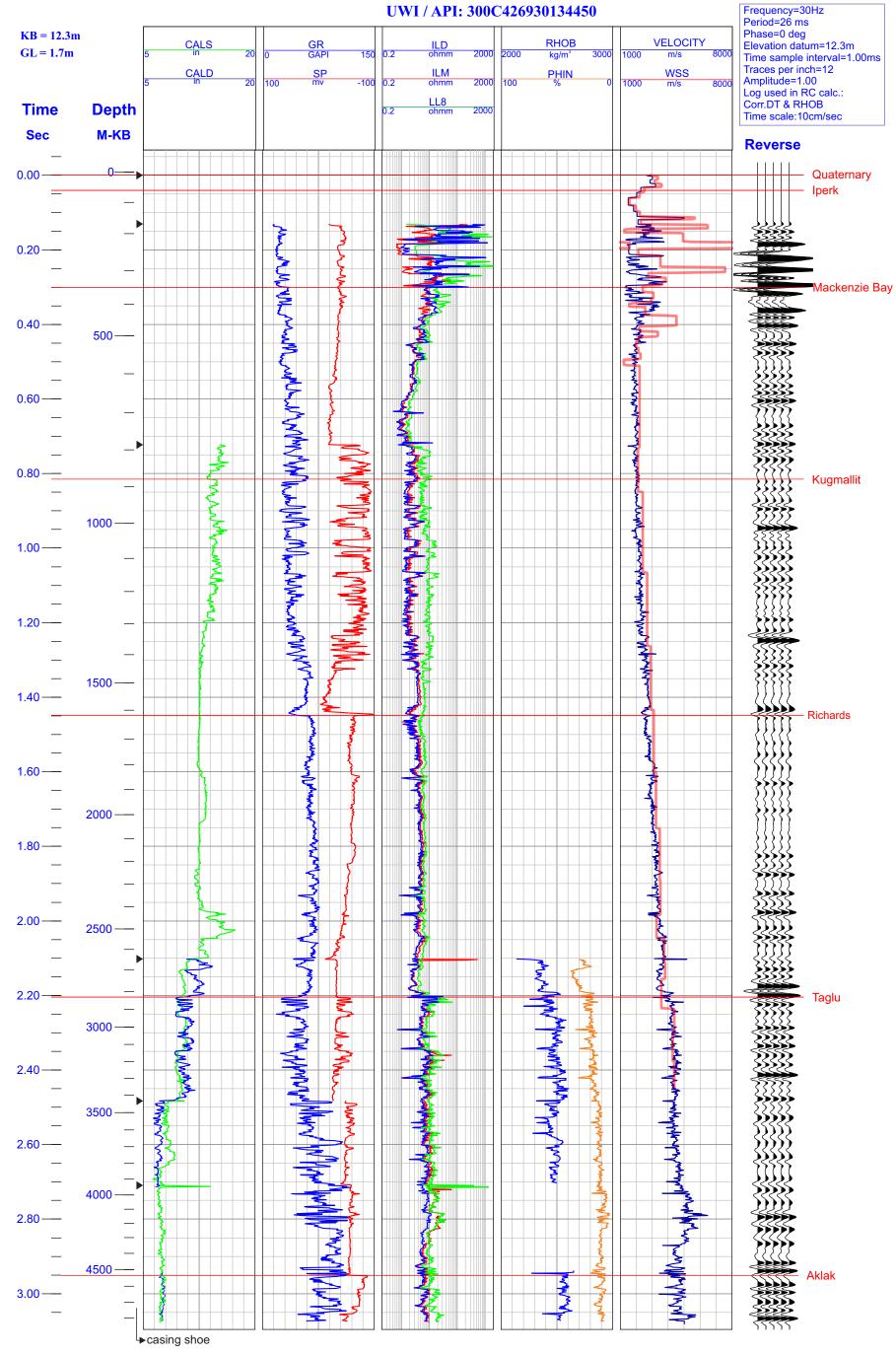
Figure 160. Well logs and synthetic of the Siku C-55 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 161. Well logs and synthetic of the Siulik I-05 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and resistivity caliper log (CALR); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 162. Well logs and synthetic of the Spring River YT N-58 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density log (RHOB); the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
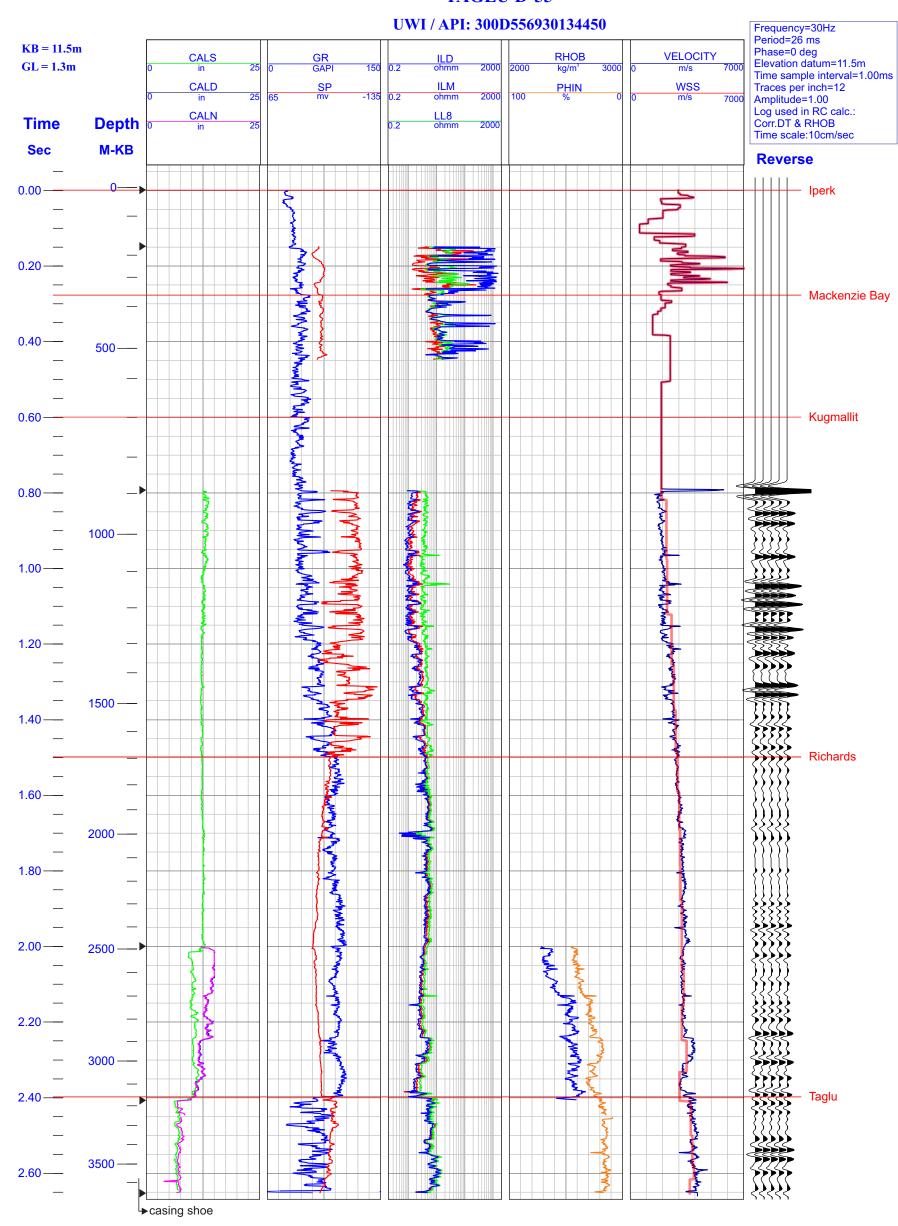
Figure 163. Well logs and synthetic of the Taglu C-42 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

TAGLU D-43

**UWI / API: 300D436930134450**

Frequency=30Hz
Period=26 ms
Phase=0 deg
Elevation datum=11.8m
Time sample interval=1.00ms
Traces per inch=12
Amplitude=1.00
Log used in RC calc.:
Corr.DT
Time scale:10cm/sec

KB = 11.8m
GL = 1.5m

CALS	GR	ILD	VELOCITY
0 in 40	0 GAPI 150	0.2 ohmm 2000	0 m/s 10000
CAL	SP	ILM	WSS
0 in 40	100 mv -100	0.2 ohmm 2000	0 m/s 10000
		LL8	
		0.2 ohmm 2000	

Time   **Depth**

Sec   **M-KB**

Reverse

Iperk — 0.00

Mackenzie Bay — 0.20

Kugmallit — 0.40

Richards

Taglu

Aklak — 2.80

casing shoe

Figure 164. Well logs and synthetic of the Taglu D-43 well. The first track includes sonic caliper log (CALS) and general caliper log (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The fifth track displays synthetic traces (Reverse).
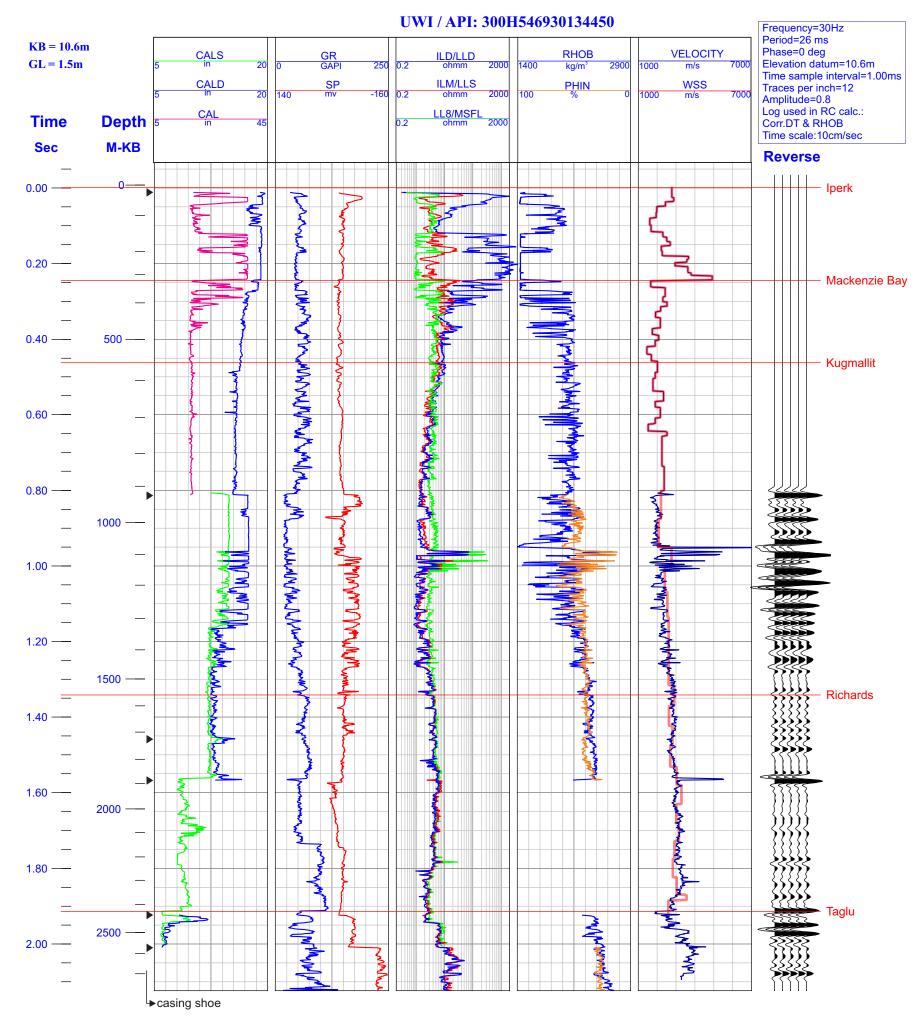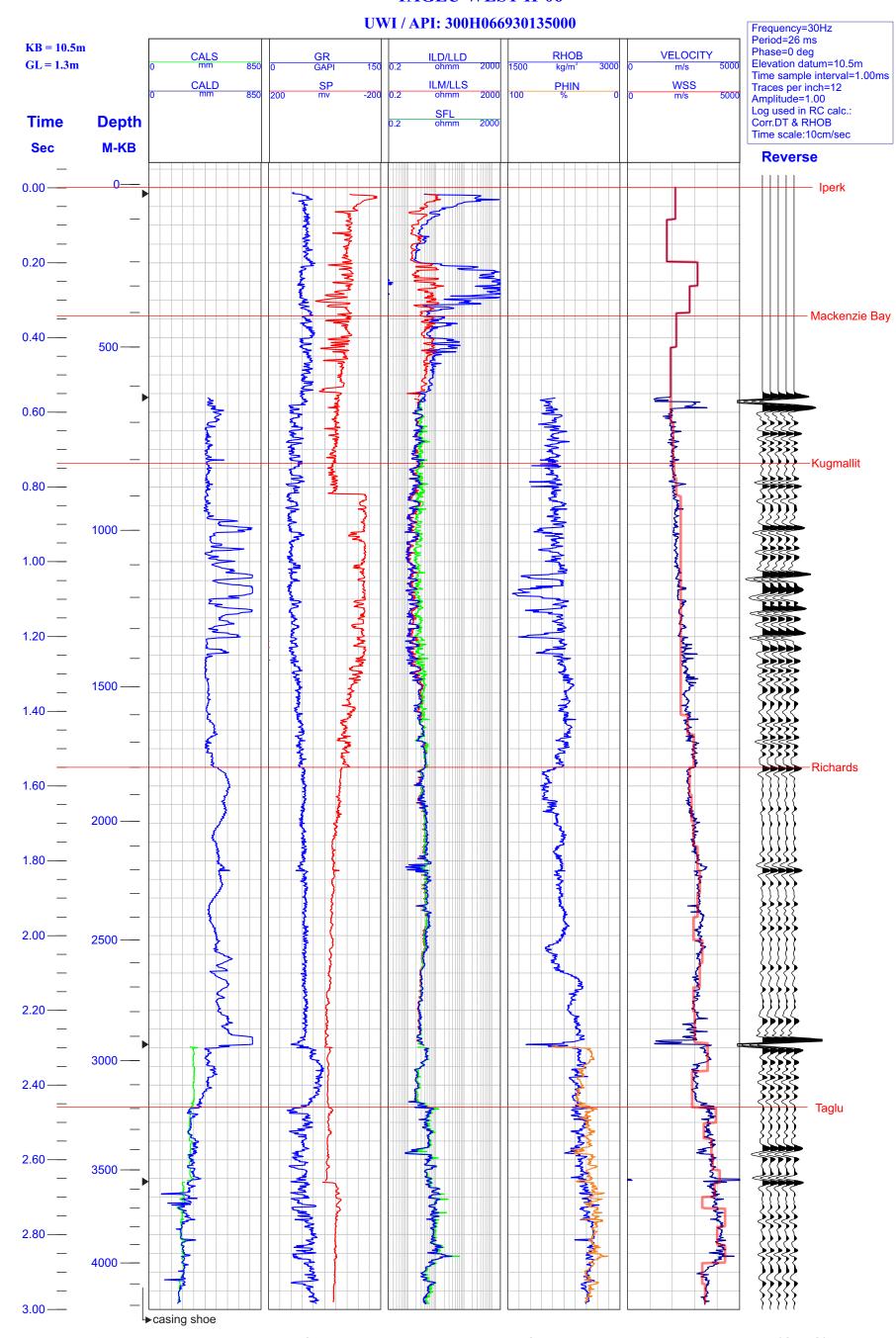
Figure 165. Well logs and synthetic of the Taglu D-55 well. The first track includes sonic caliper log (CALS), density caliper log (CALD) and neutron caliper (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
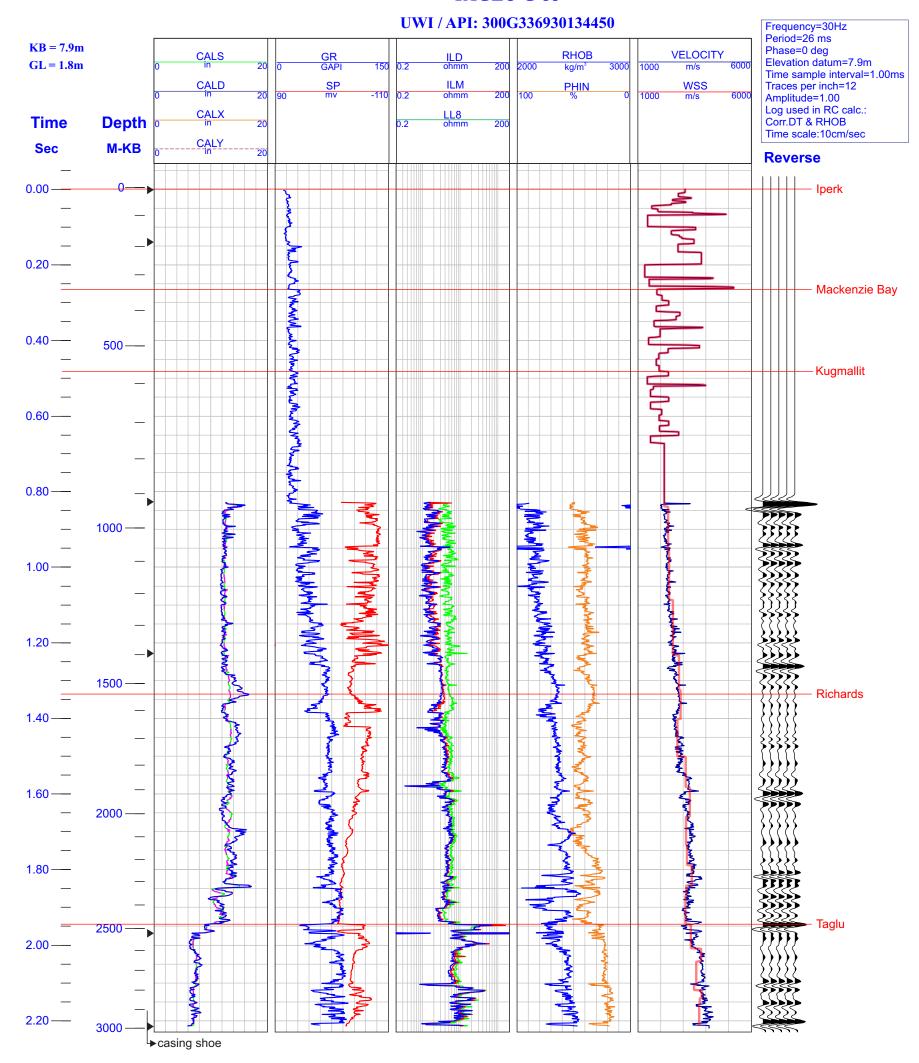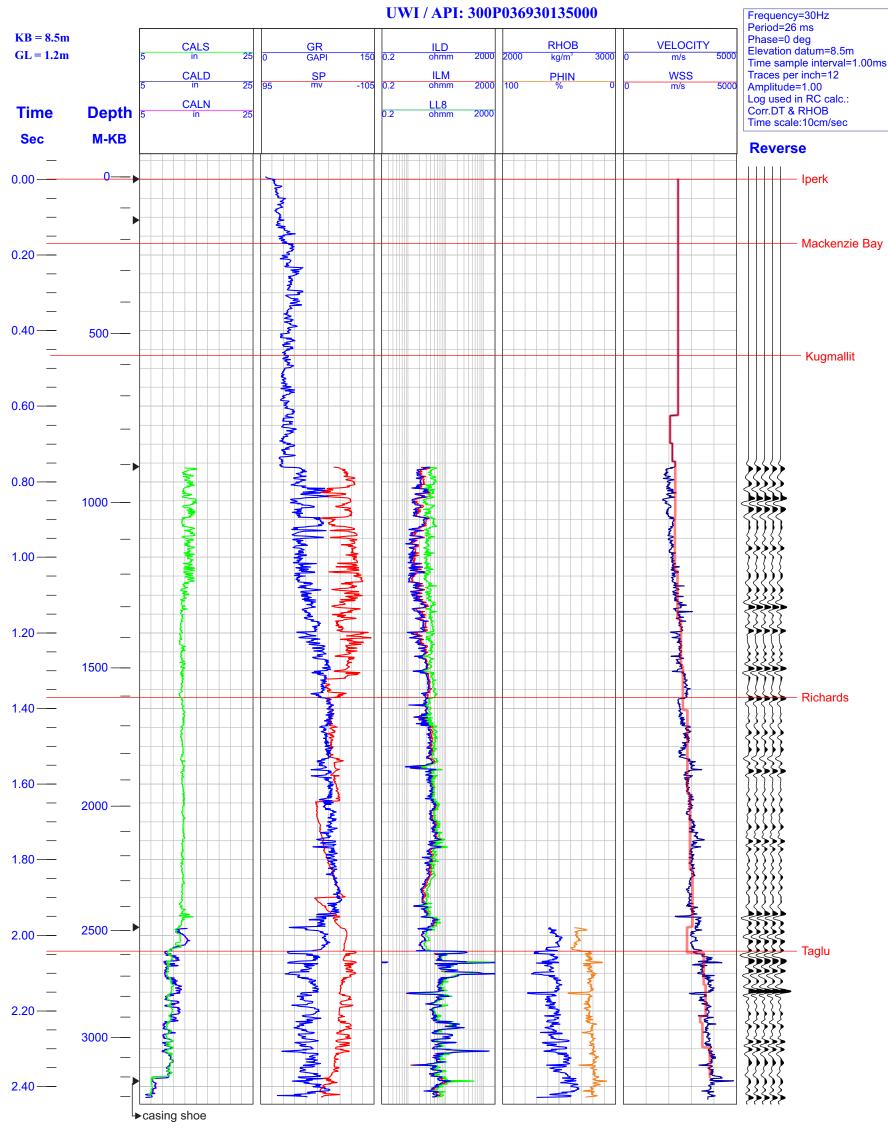
Figure 166. Well logs and synthetic of the Taglu G-33 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD), caliper 1-3 (CALX) and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
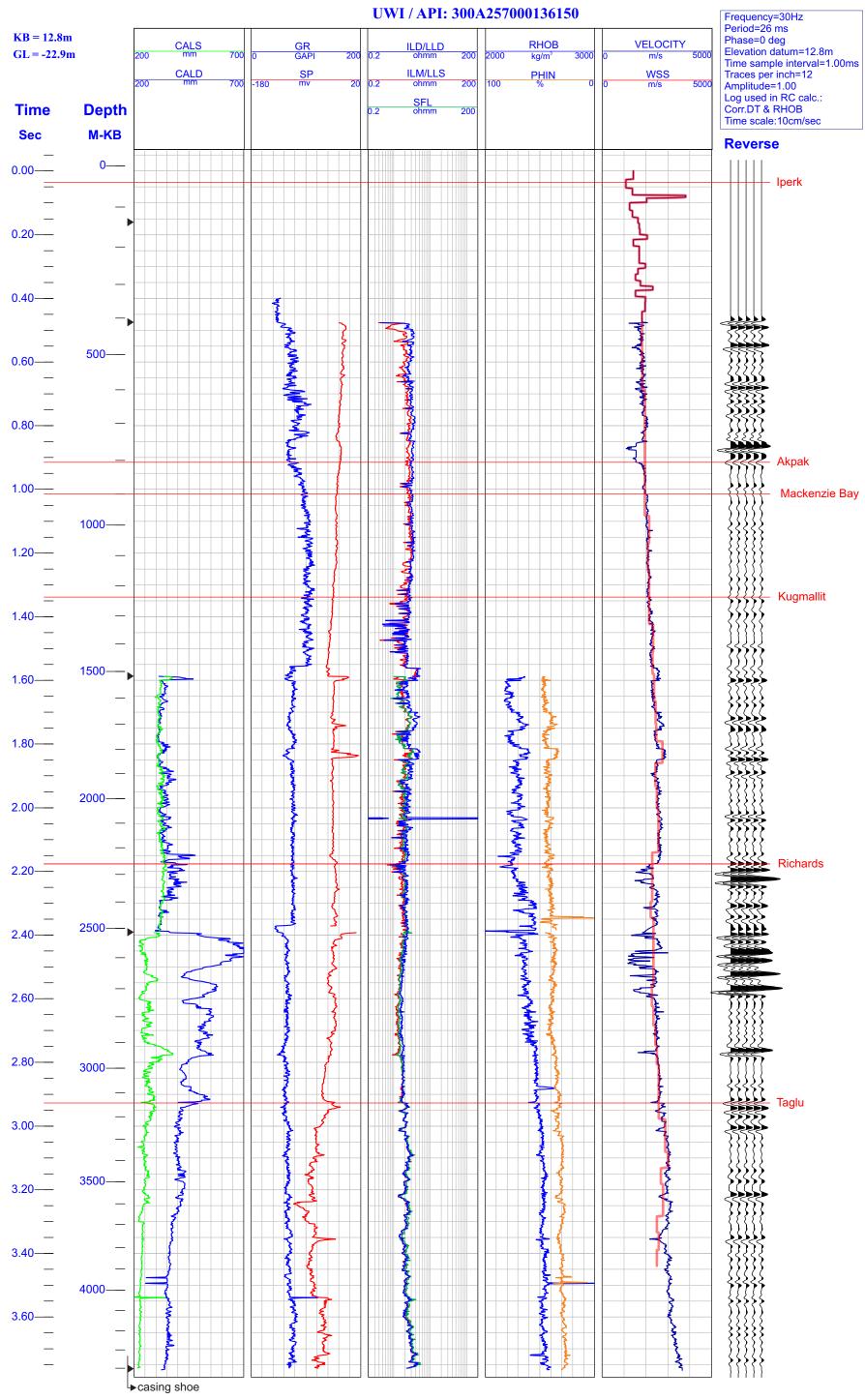
Figure 167. Well logs and synthetic of the Taglu H-54 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and general caliper (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (LL8/MSFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

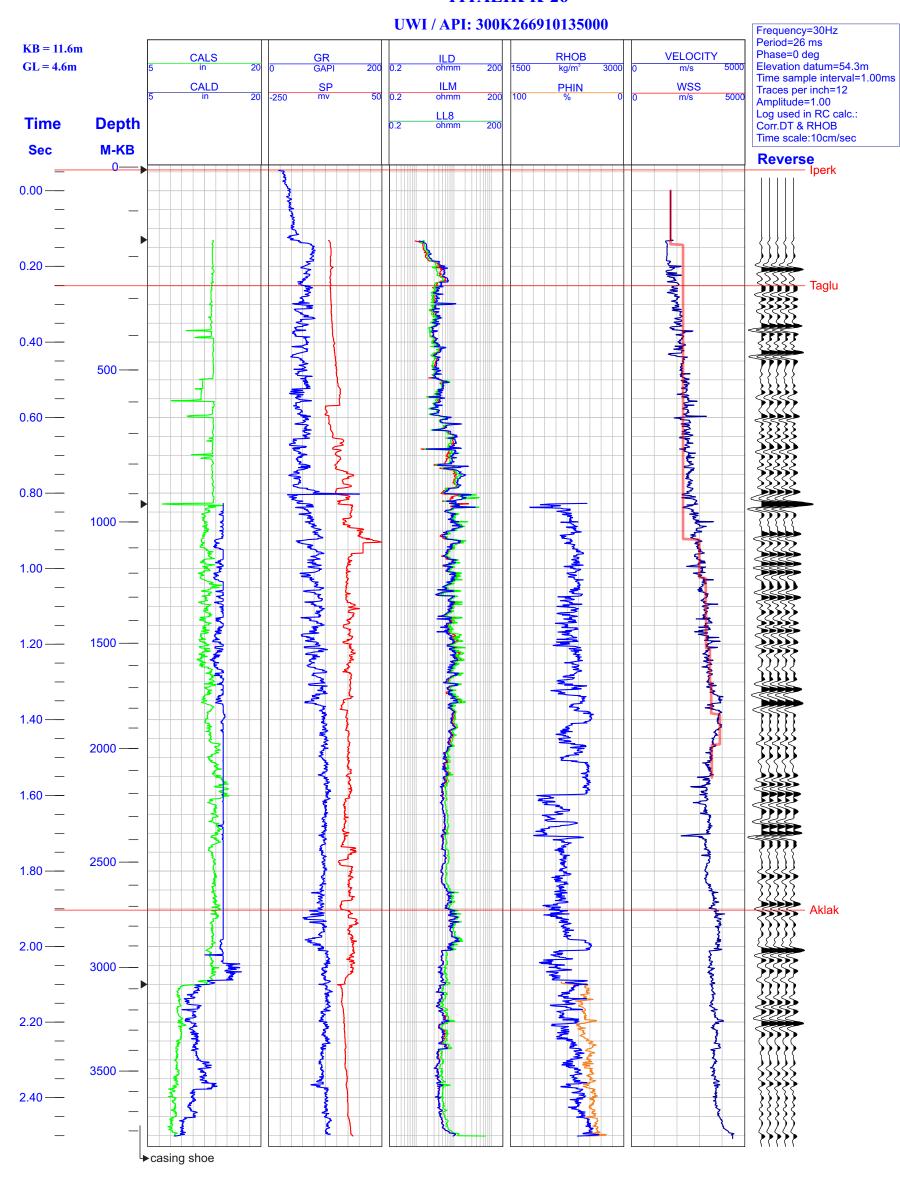Figure 168. Well logs and synthetic of the Taglu West H-06 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 169. Well logs and synthetic of the Taglu West P-03 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and neutron caliper (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
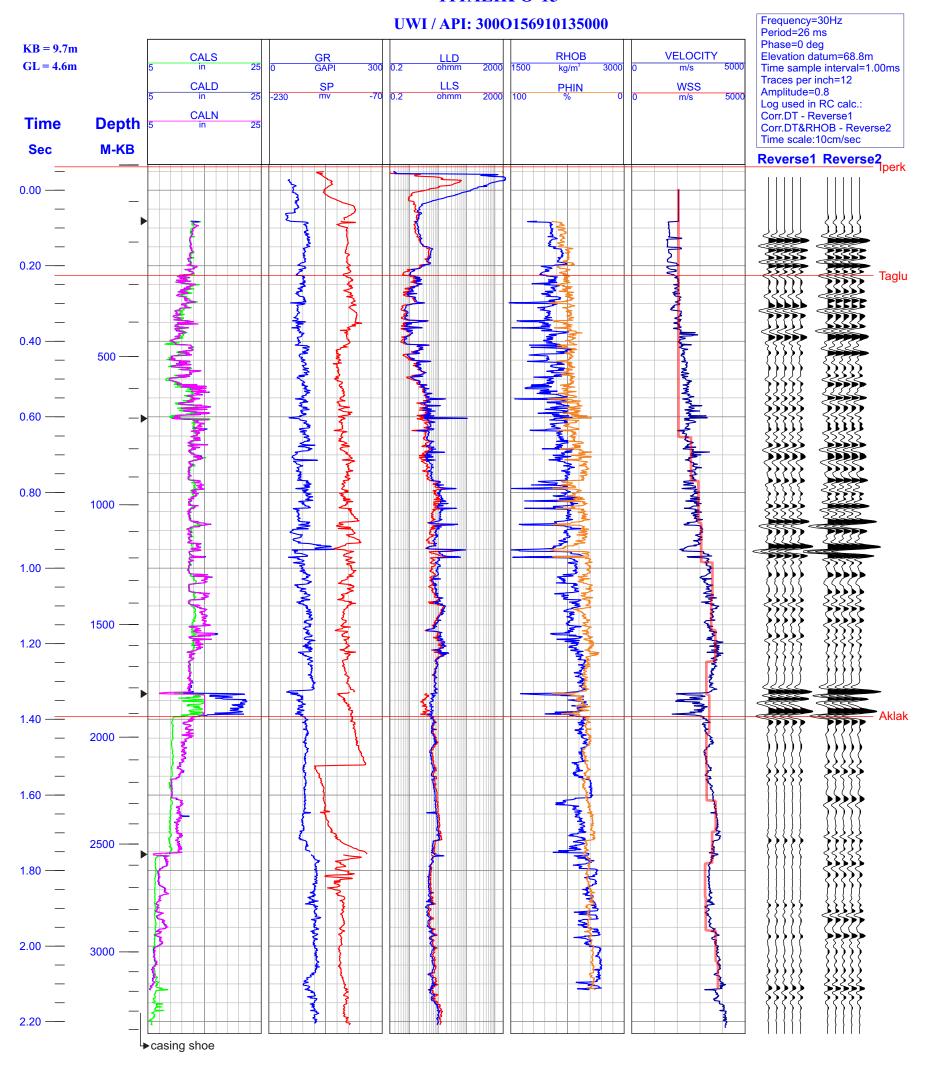
Figure 170. Well logs and synthetic of the Tarsiut A-25 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
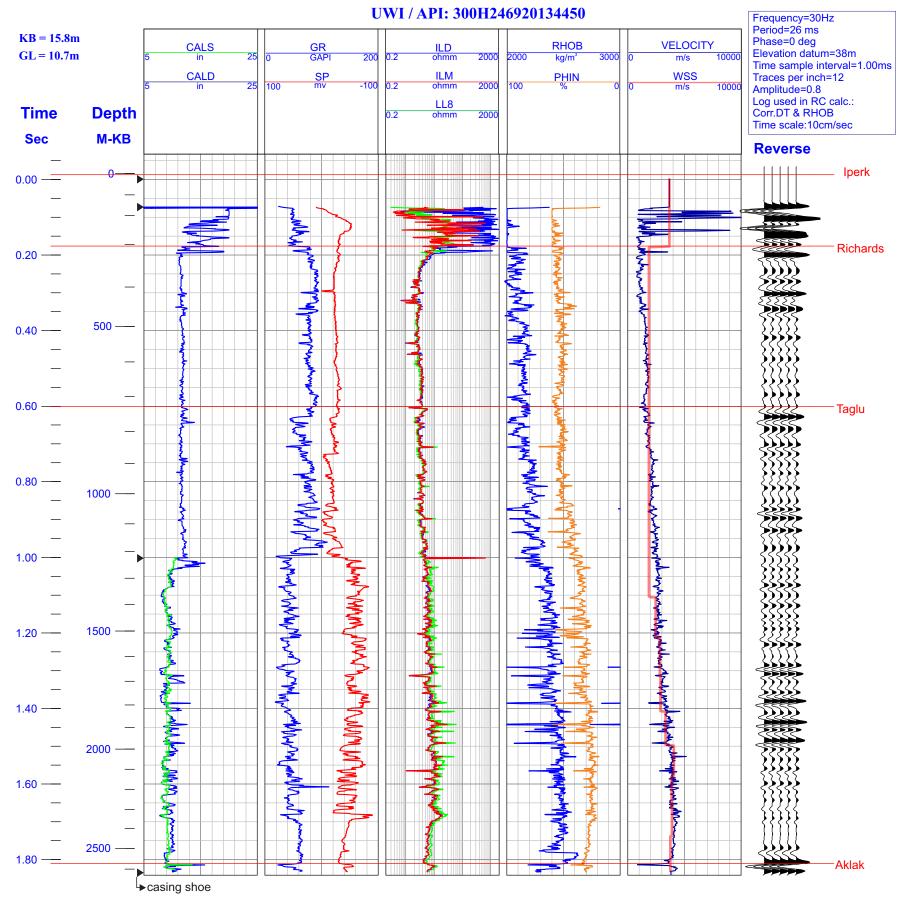
Figure 171. Well logs and synthetic of the Titalik K-26 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

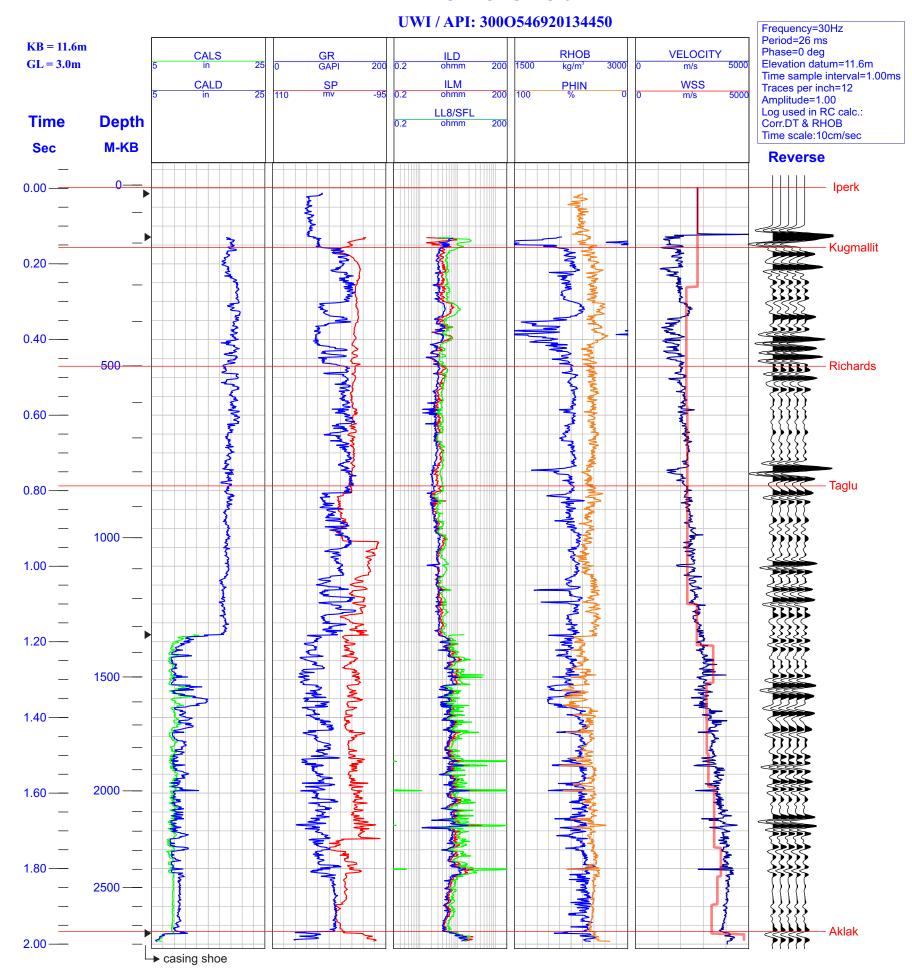Figure 172. Well logs and synthetic of the Titalik O-15 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and neutron caliper log (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD) and medium (LLS) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1 - from single DT, Reverse2 - from DT & RHOB).
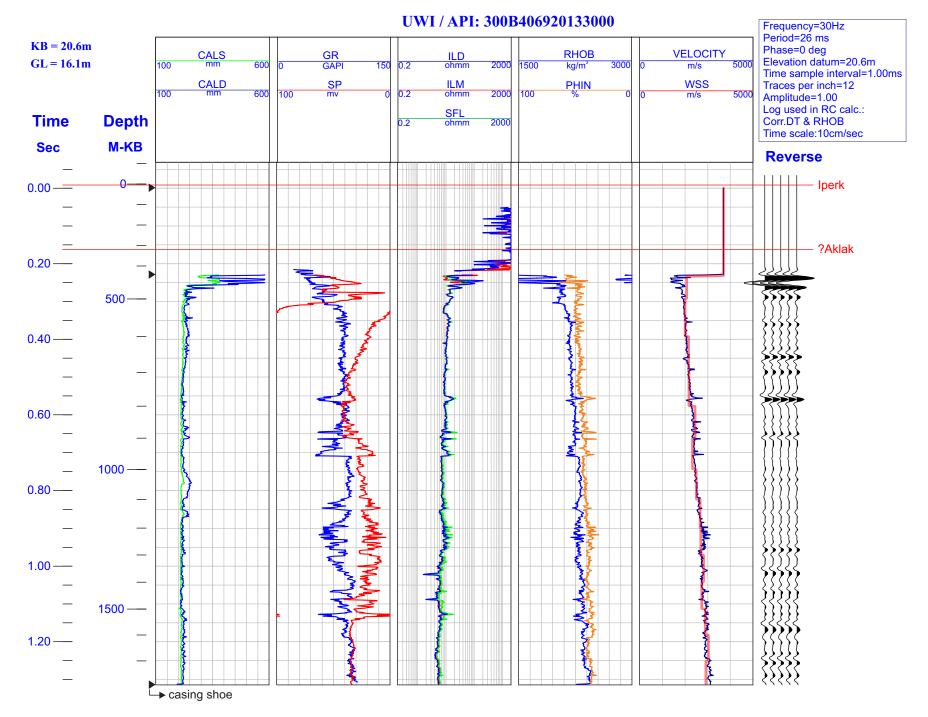
Figure 173. Well logs and synthetic of the Toapolok H-24 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
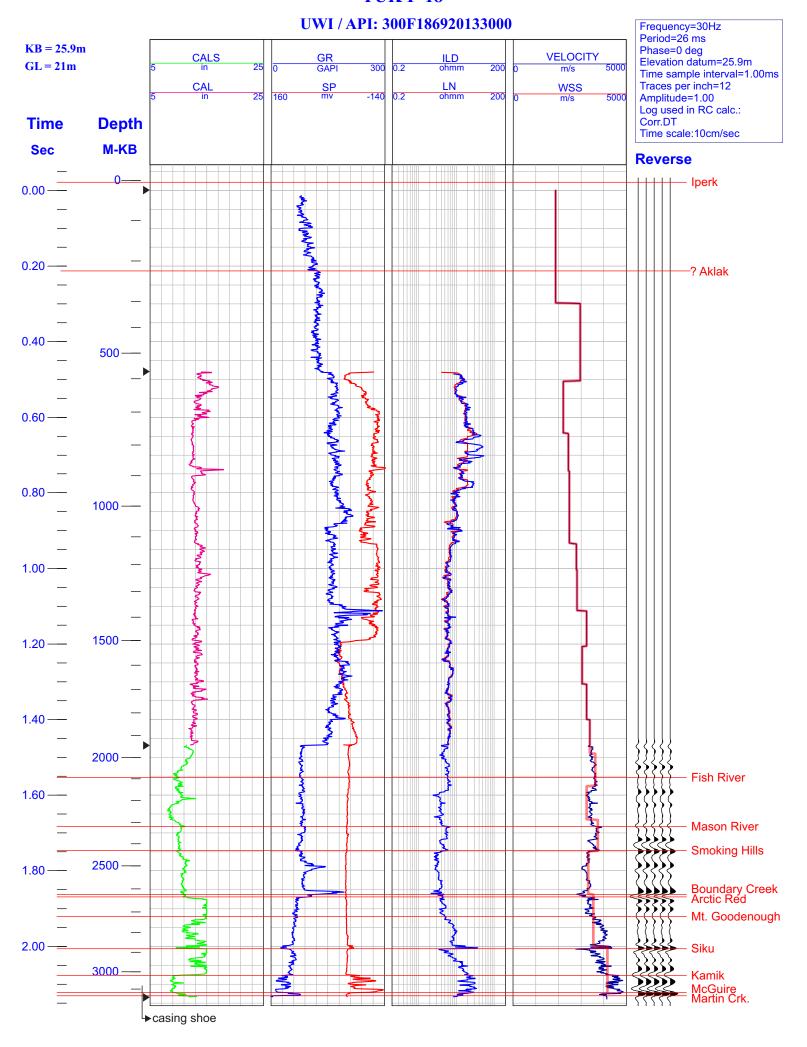
Figure 174. Well logs and synthetic of the Toapolok O-54 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8/SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
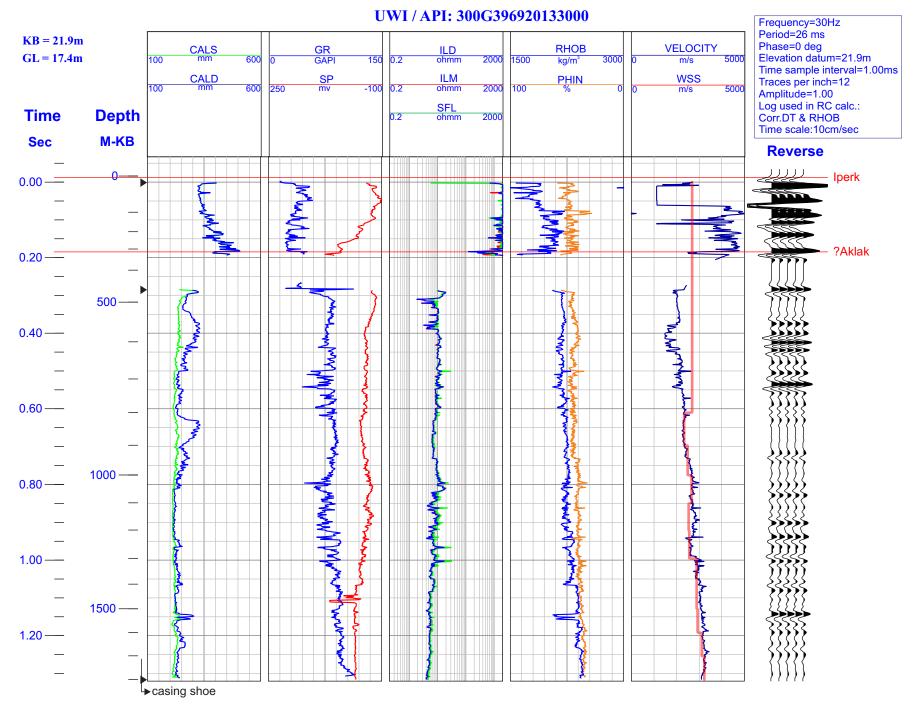
Figure 175. Well logs and synthetic of the Tuk B-40 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
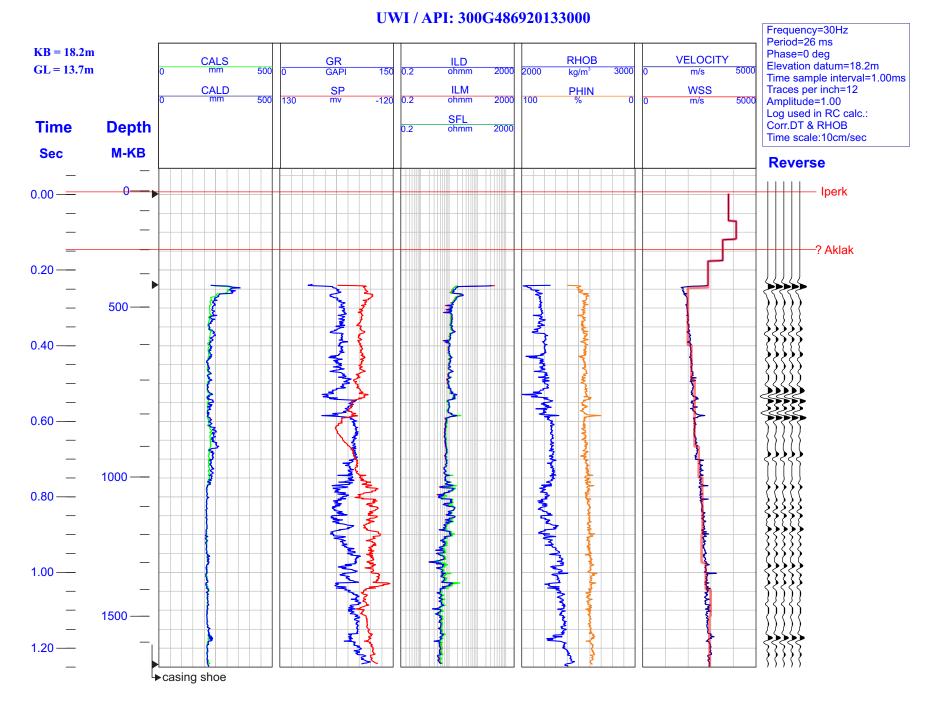
Figure 176. Well logs and synthetic of the Tuk F-18 well. The first track includes sonic caliper log (CALS) and general caliper log (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep induction log (ILD) and long normal resistivity log (LN); the fourth track illustrates well seismic survey (WSS-check shots) and calculated velocity curve. The fifth track displays synthetic traces (Reverse).
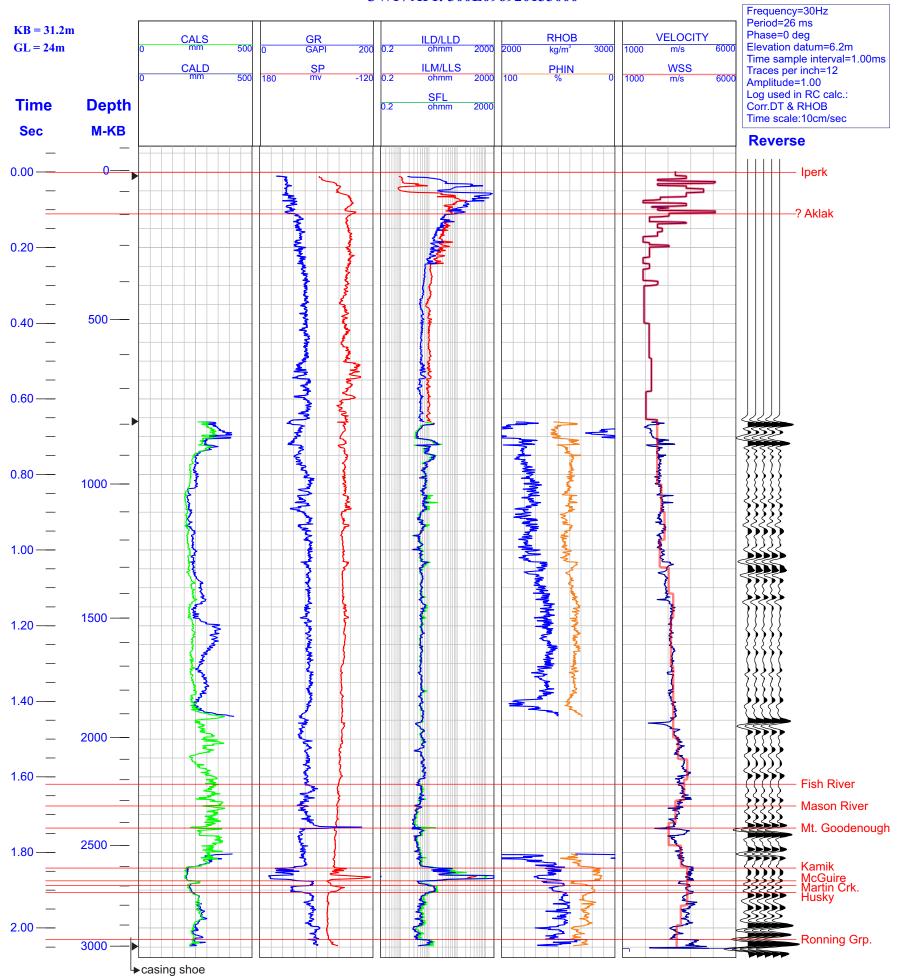
Figure 177. Well logs and synthetic of the Tuk G-39 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
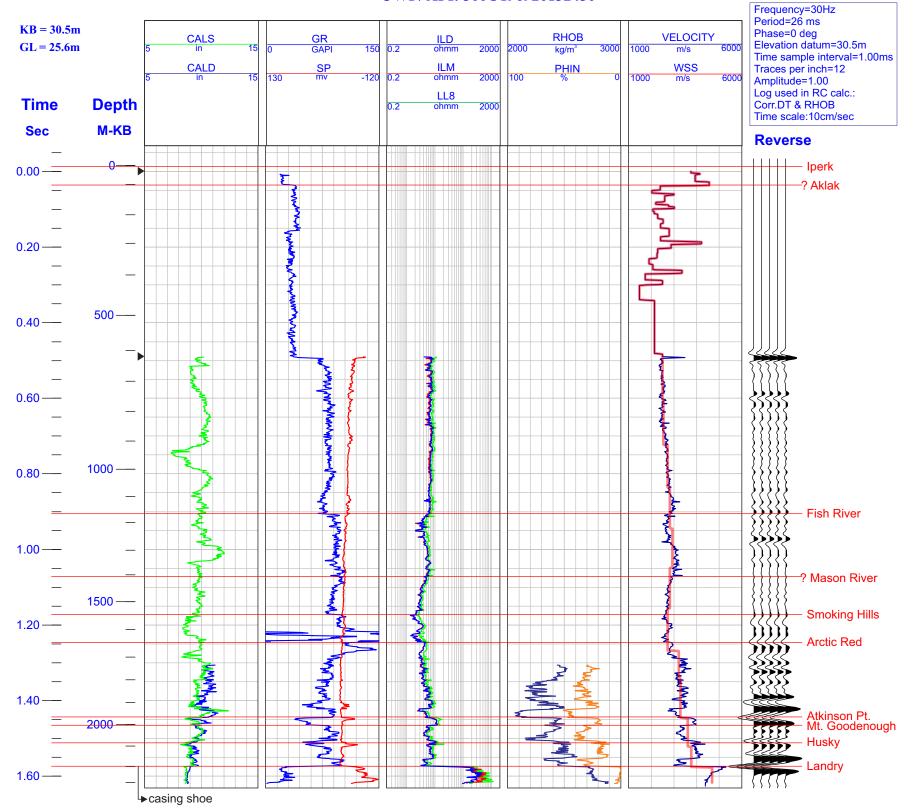
Figure 178. Well logs and synthetic of the Tuk G-48 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
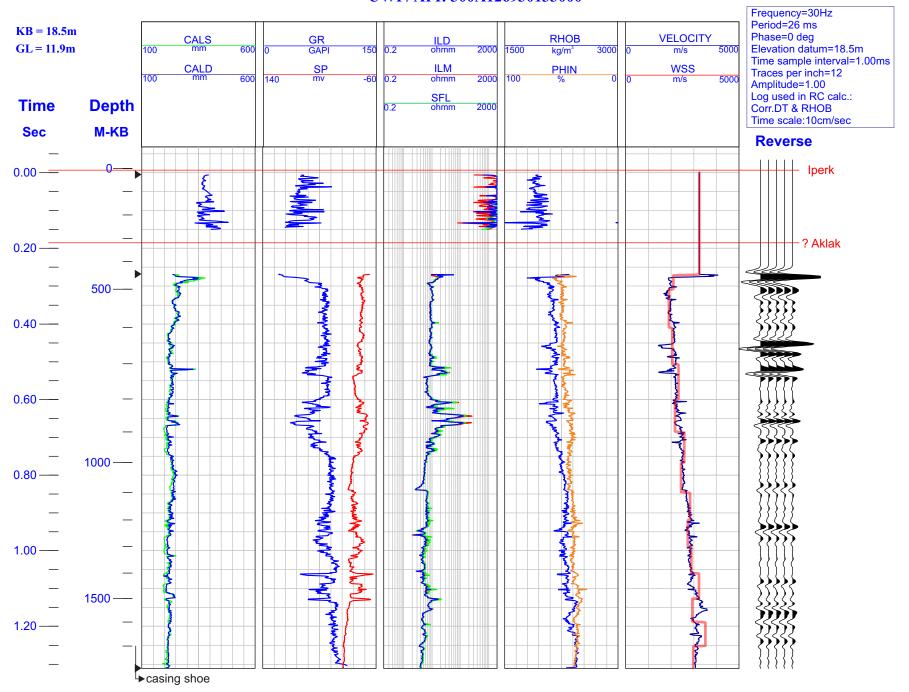
Figure 179. Well logs and synthetic of the Tuk L-09 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 180. Well logs and synthetic of the Tuktu O-19 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
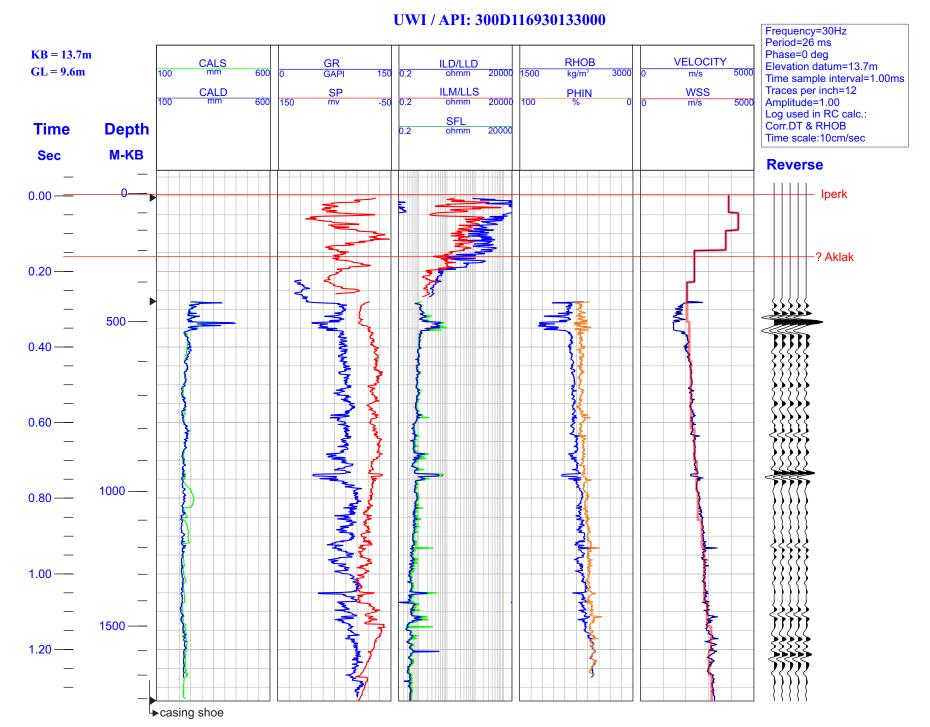
Figure 181. Well logs and synthetic of the Tuktuk A-12 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
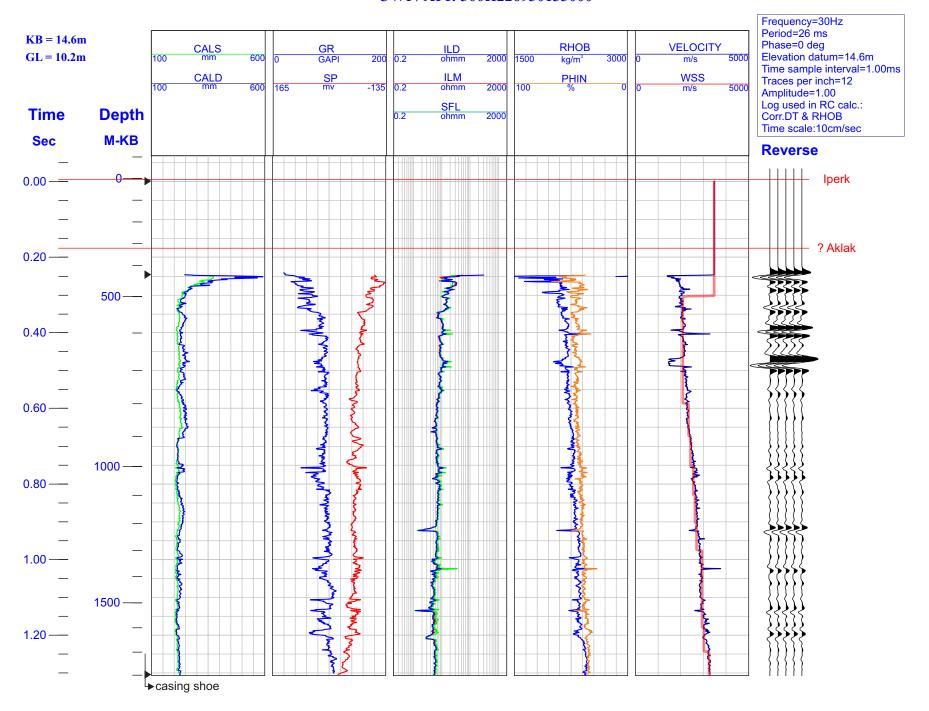
Figure 182. Well logs and synthetic of the Tuktuk D-11 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
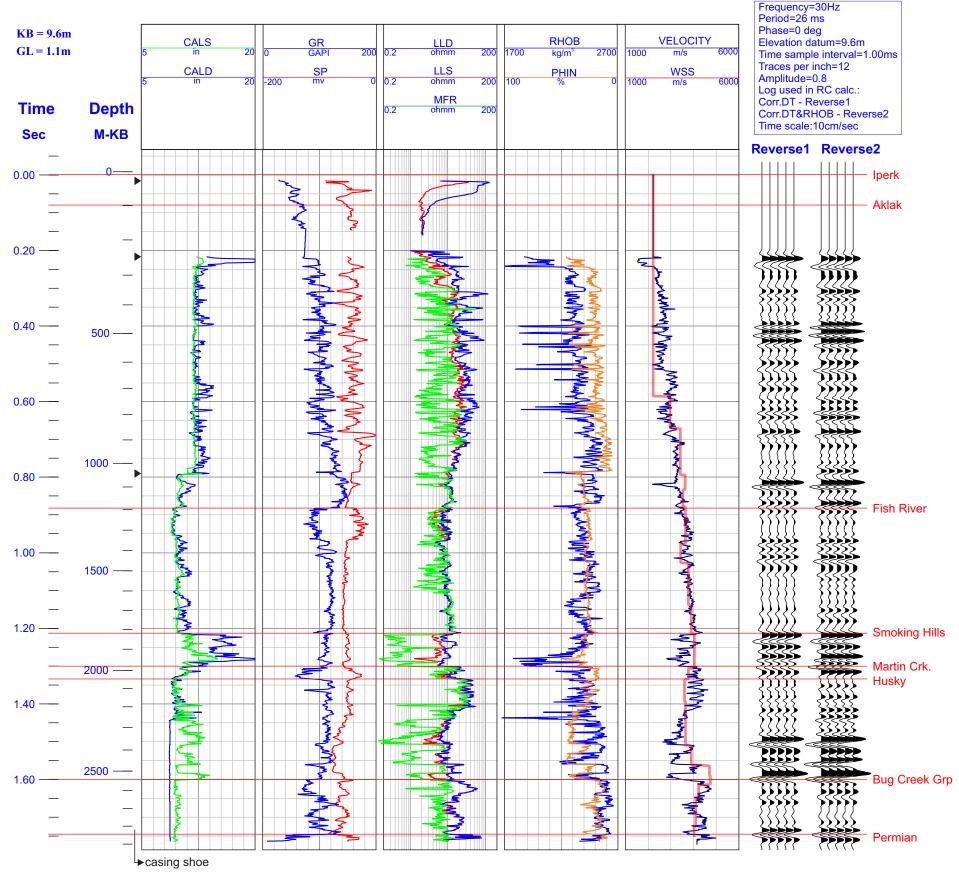
Figure 183. Well logs and synthetic of the Tuktuk H-22 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
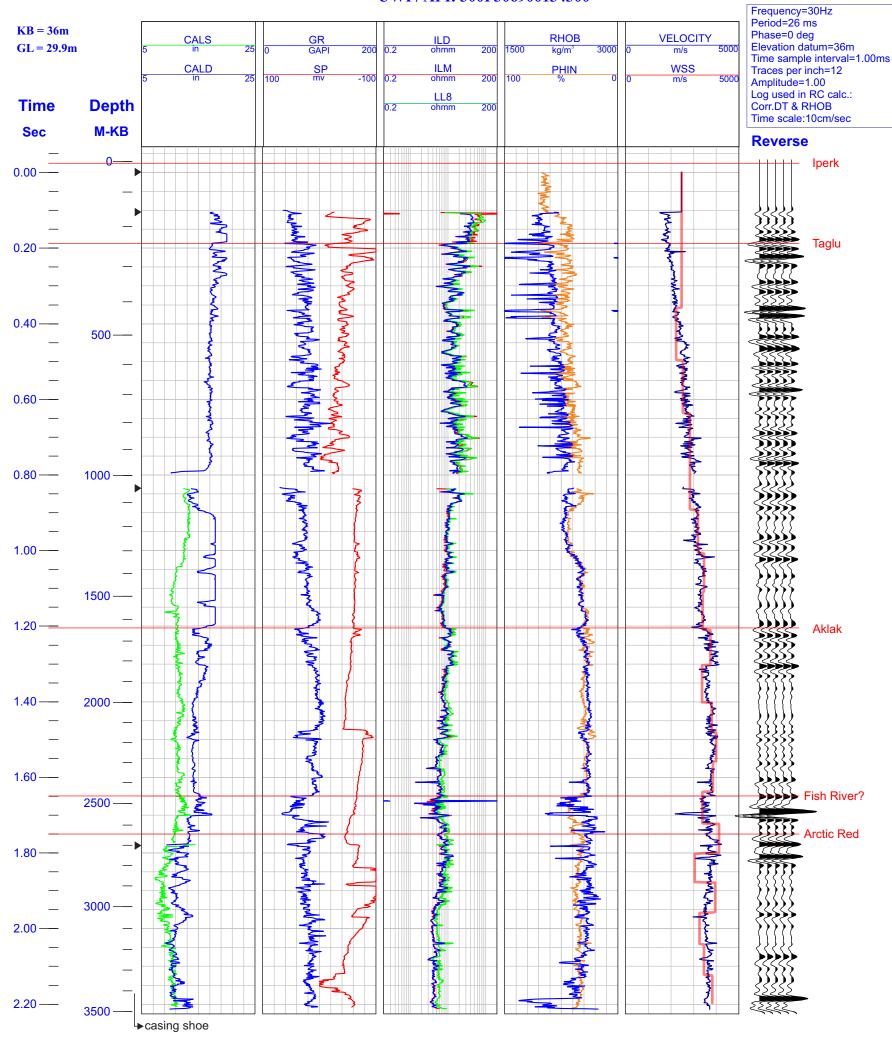
Figure 184. Well logs and synthetic of the Tullugak K-31 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD), medium (LLS) and shallow (MFR) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1 - from single DT, Reverse2 - from DT & RHOB).
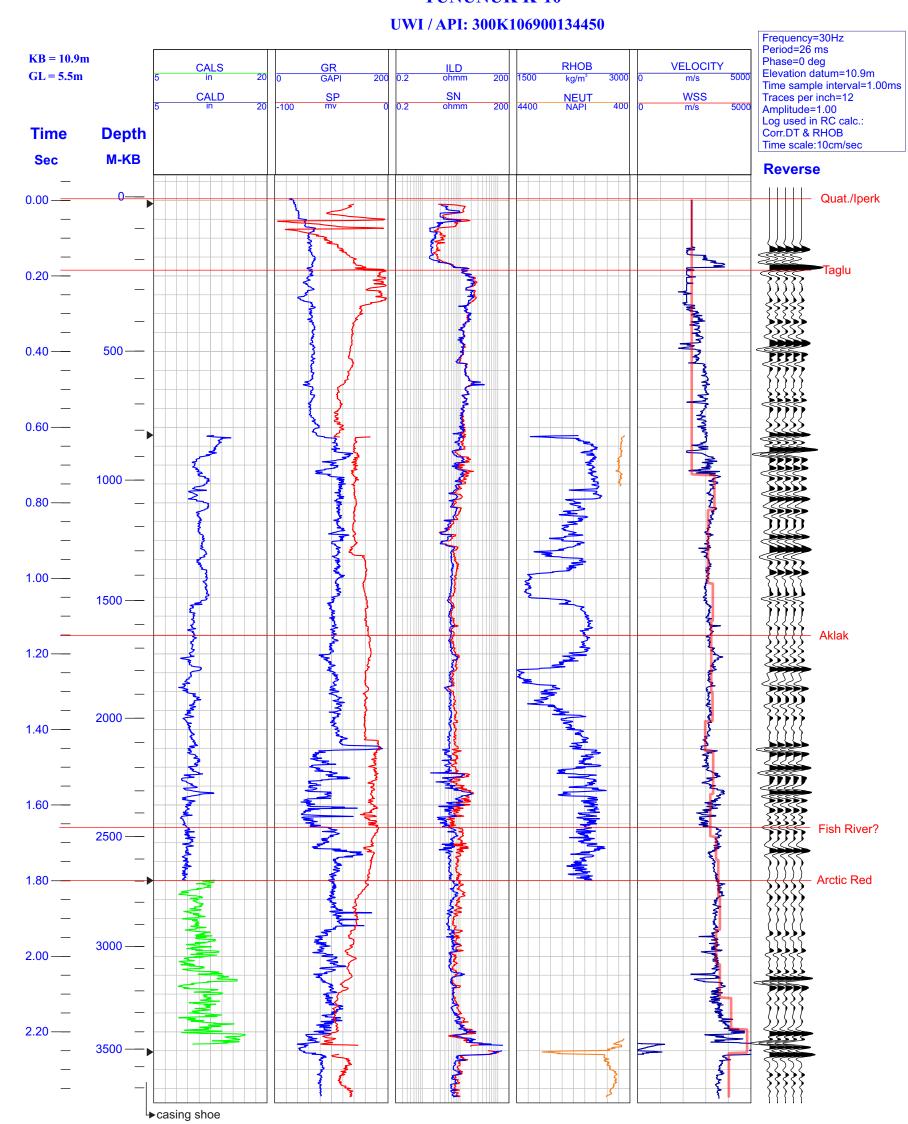
Figure 185. Well logs and synthetic of the Tununuk F-30 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 186. Well logs and synthetic of the Tununuk K-10 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep induction log (ILD) and short normal resistivity log (SN); the fourth track illustrates density (RHOB) and neutron log (NEUT); the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
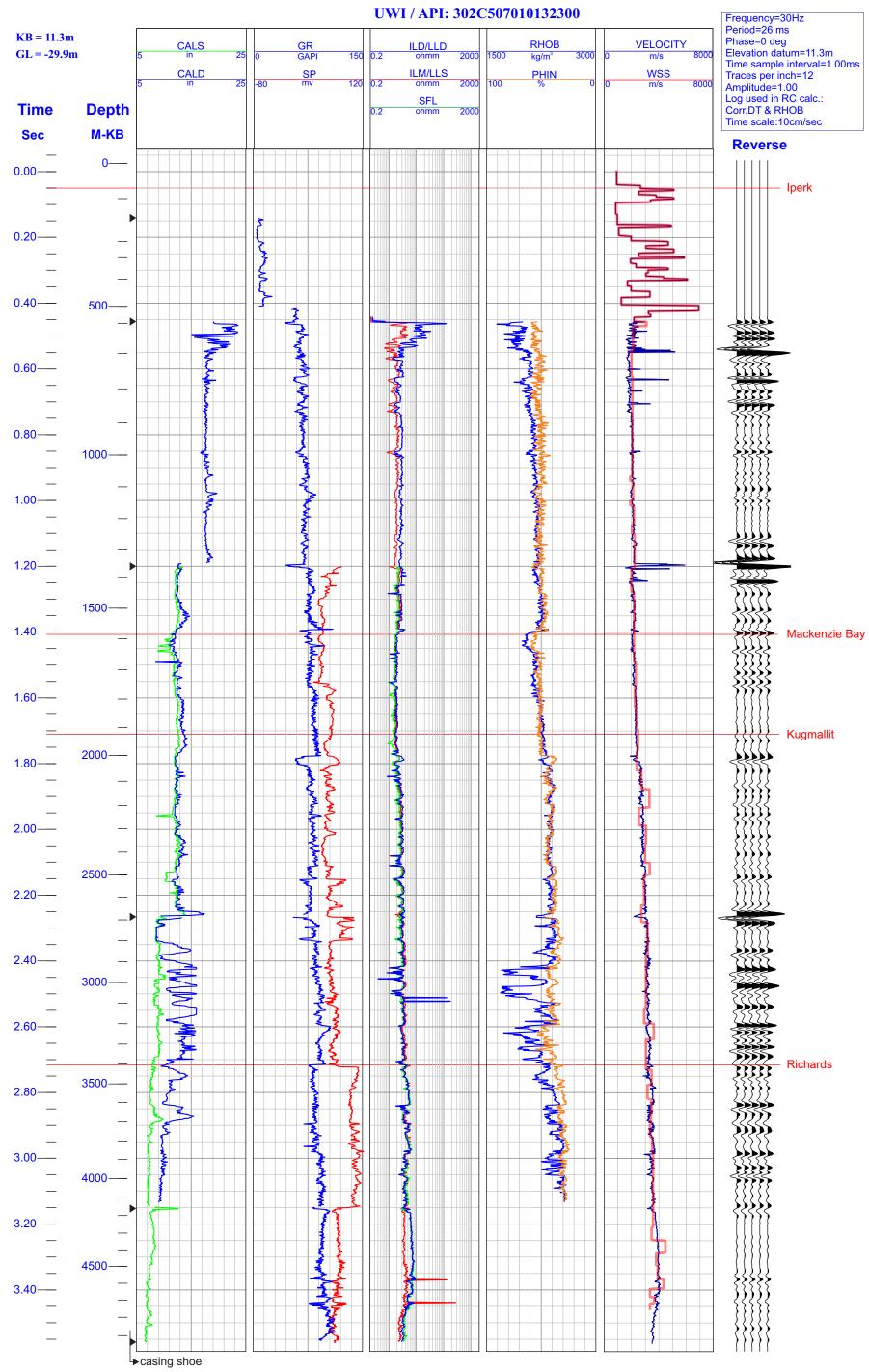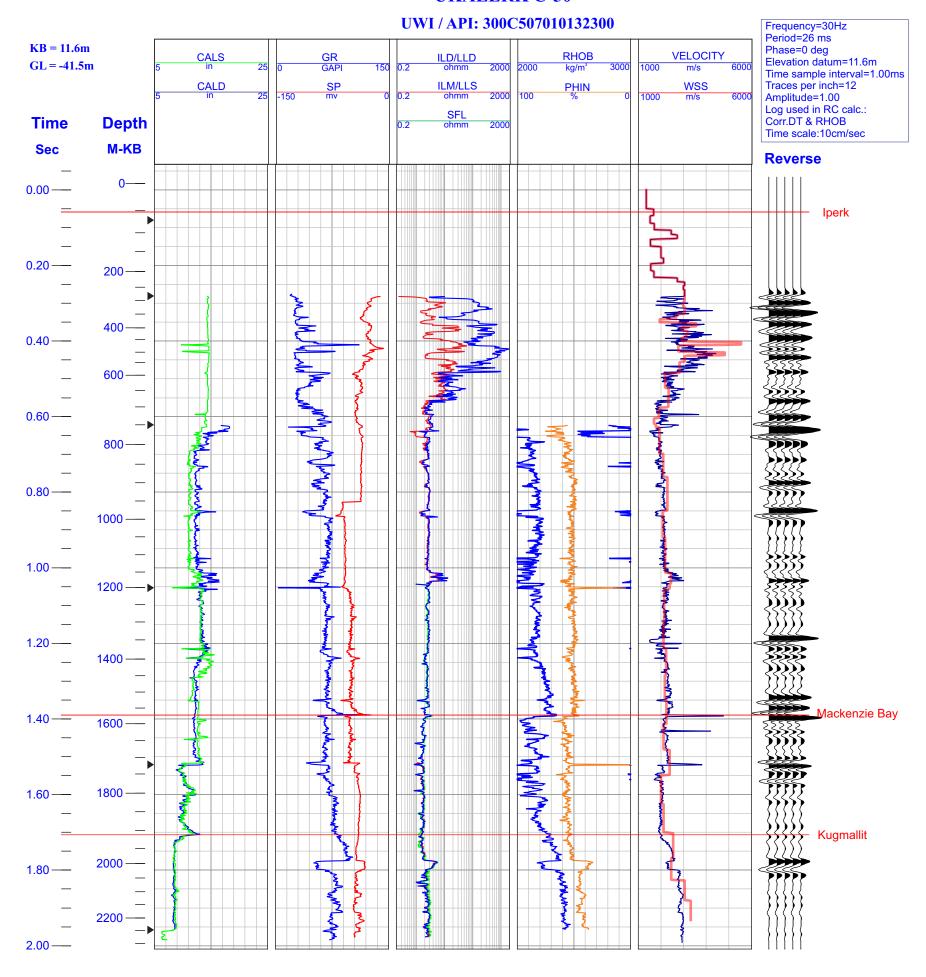
Figure 187. Well logs and synthetic of the Ukalerk 2C-50 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

UKALERK C-50

UWI / API: 300C507010132300

KB = 11.6m
GL = -41.5m

| Frequency=30Hz |
| Period=26 ms |
| Phase=0 deg |
| Elevation datum=11.6m |
| Time sample interval=1.00ms |
| Traces per inch=12 |
| Amplitude=1.00 |
| Log used in RC calc.: |
| Corr.DT & RHOB |
| Time scale:10cm/sec |

Reverse

Track headers:

CALS	GR	ILD/LLD	RHOB	VELOCITY
5 in 25	0 GAPI 150	0.2 ohmm 2000	2000 kg/m³ 3000	1000 m/s 6000
CALD	SP	ILM/LLS	PHIN	WSS
5 in 25	-150 mv 0	0.2 ohmm 2000	100 % 0	1000 m/s 6000
		SFL		
		0.2 ohmm 2000		

Time / **Sec** — **Depth** / **M-KB**

Markers (horizontal): Iperk, Mackenzie Bay, Kugmallit

Figure 188. Well logs and synthetic of the Ukalerk C-50 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
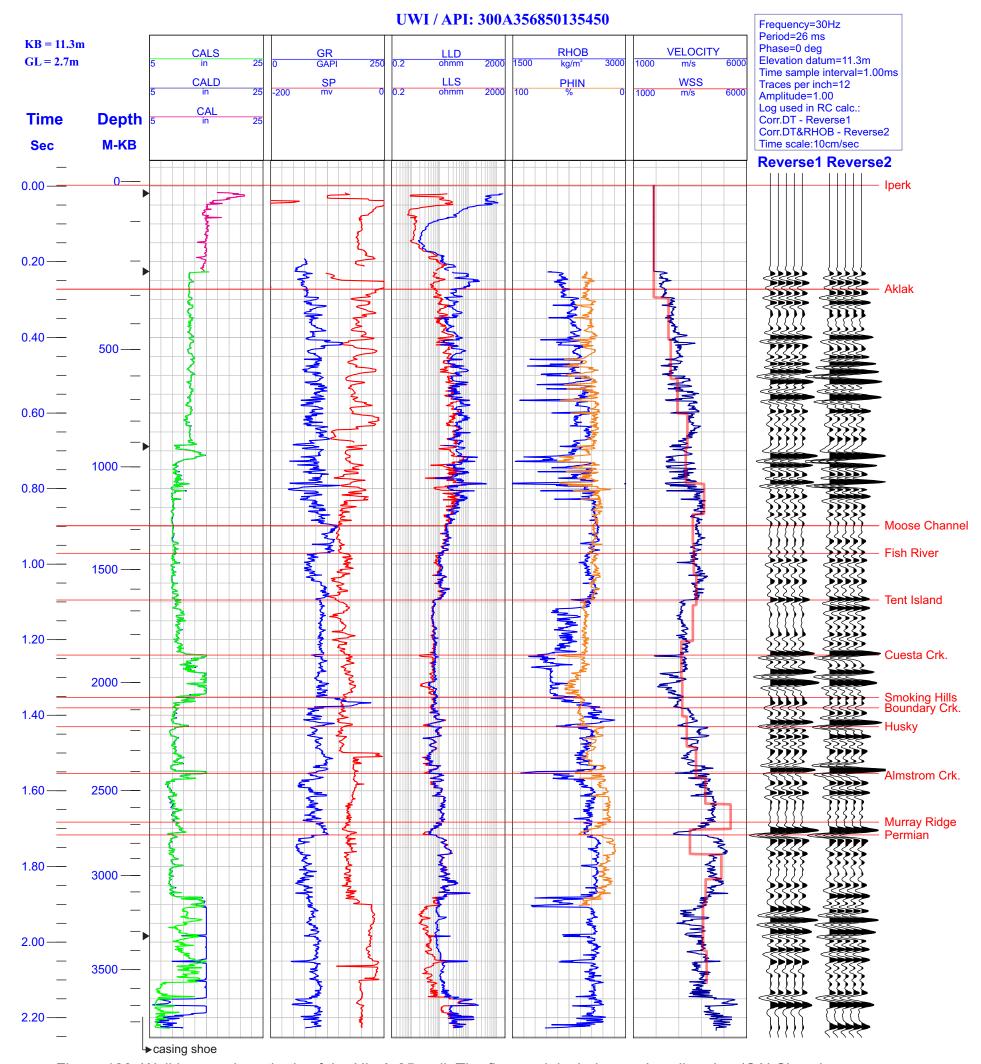
Figure 189. Well logs and synthetic of the Ulu A-35 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and general caliper (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep laterolog (LLD) and medium laterolog (LLS); the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1- from single DT, Reverse2 - from DT & RHOB).
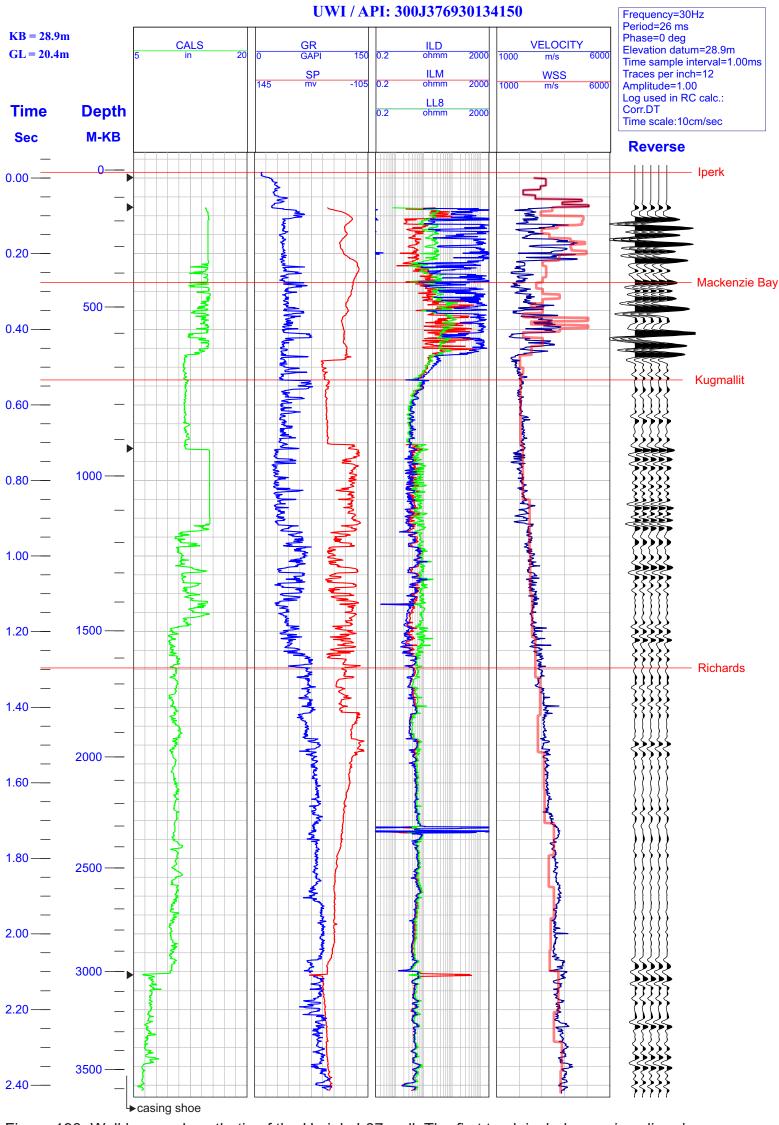
Figure 190. Well logs and synthetic of the Umiak J-37 well. The first track includes sonic caliper log (CALS); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The fifth track displays synthetic traces (Reverse).
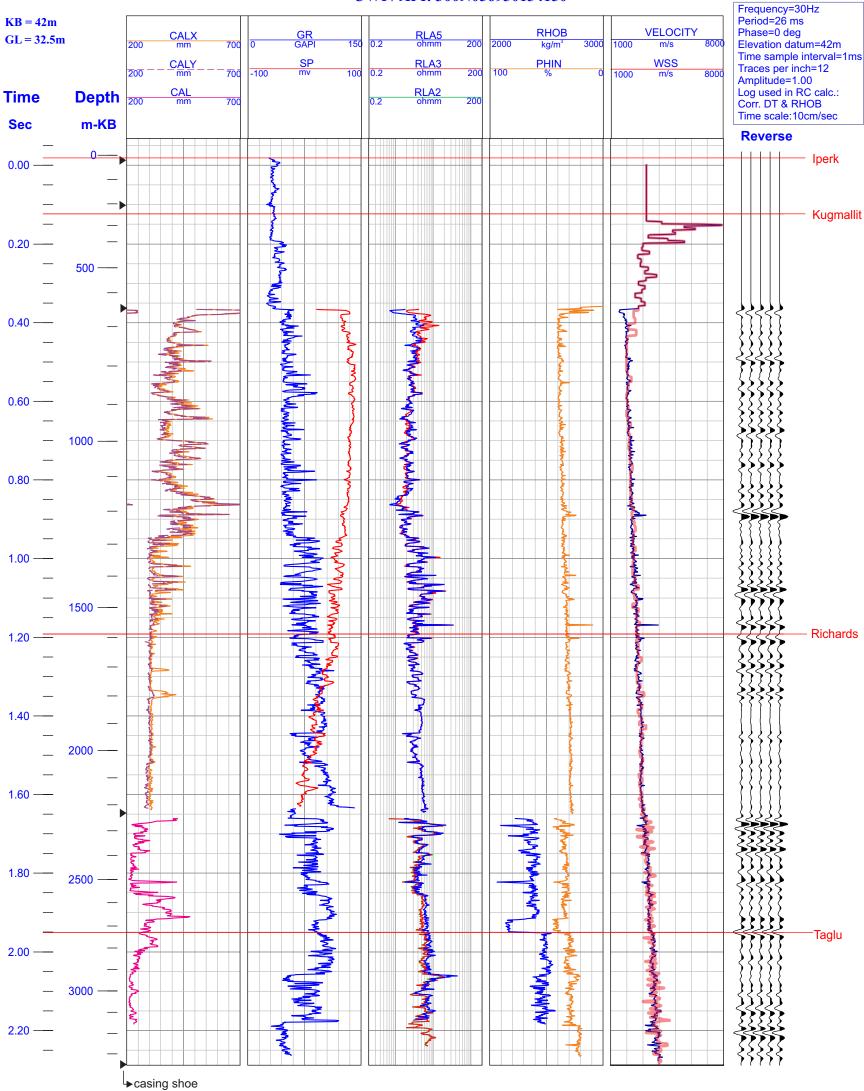
Figure 191. Well logs and synthetic of the Umiak N-05 well, showing the time-depth conversion. The first track consists of caliper curves, general caliper (CAL), caliper 1-3 (CALX), and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) logs; the third track shows deep (RLA5), and medium (RLA3), and shallow (RLA2) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track illustrates well seismic survey (VSP) and velocity curve. The sixth track displays synthetic traces (Reverse).
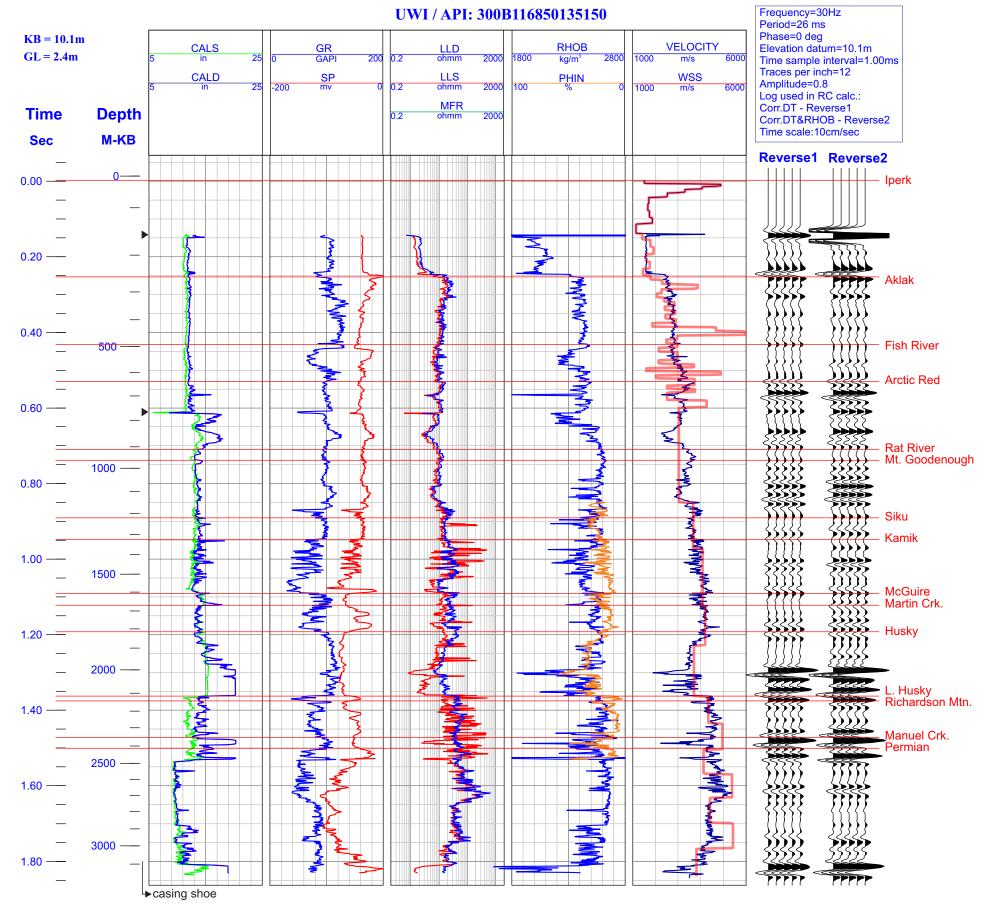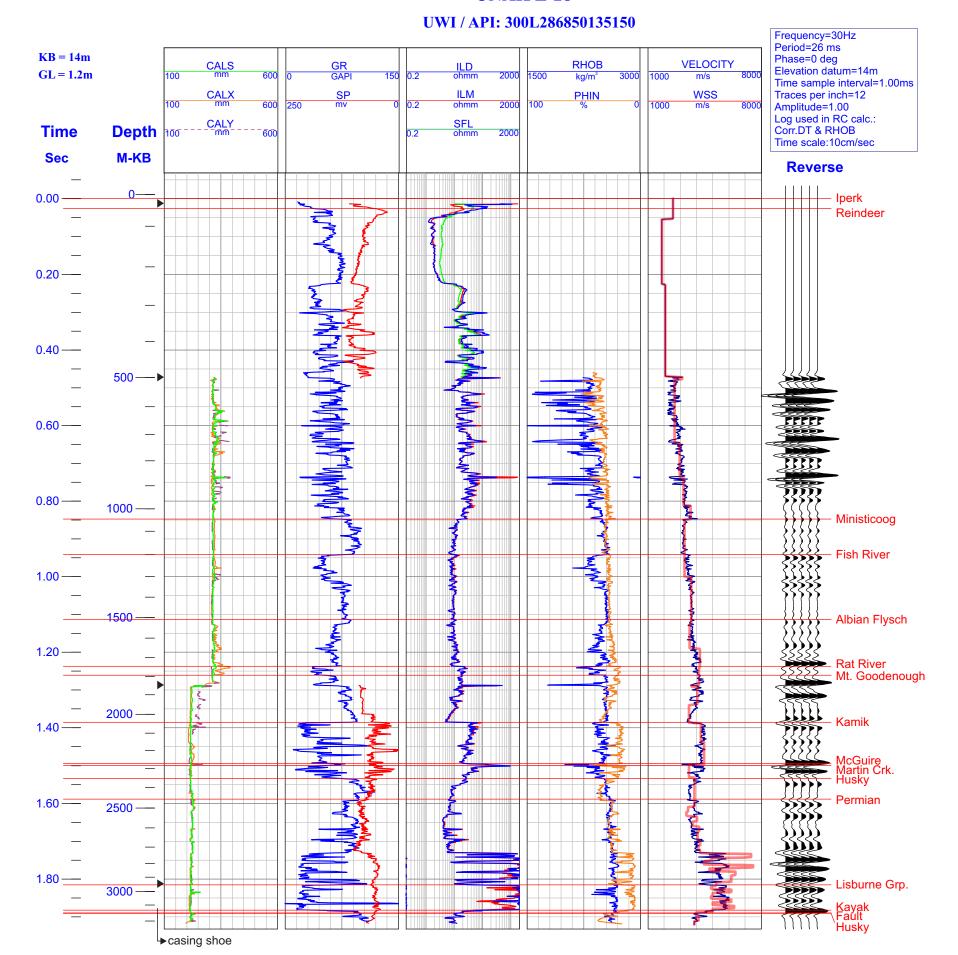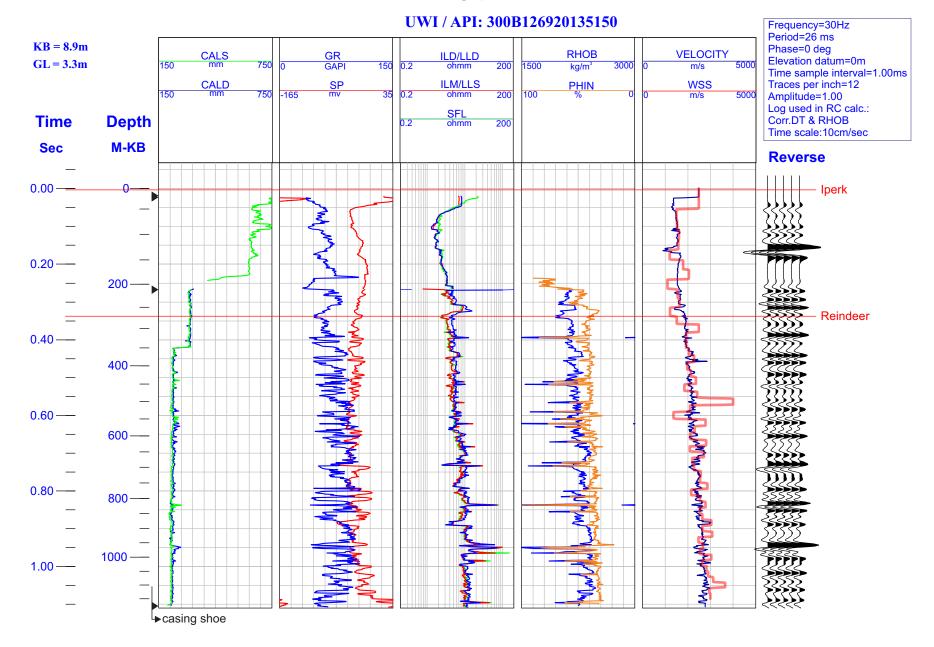
Figure 192. Well logs and synthetic of the Unak B-11 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD), medium (LLS) and shallow (MFR) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1-from single DT, Reverse2 - from DT & RHOB).

Figure 193. Well logs and synthetic of the Unak L-28 well. The first track includes sonic caliper log (CALS), caliper 1-3 (CALX) and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
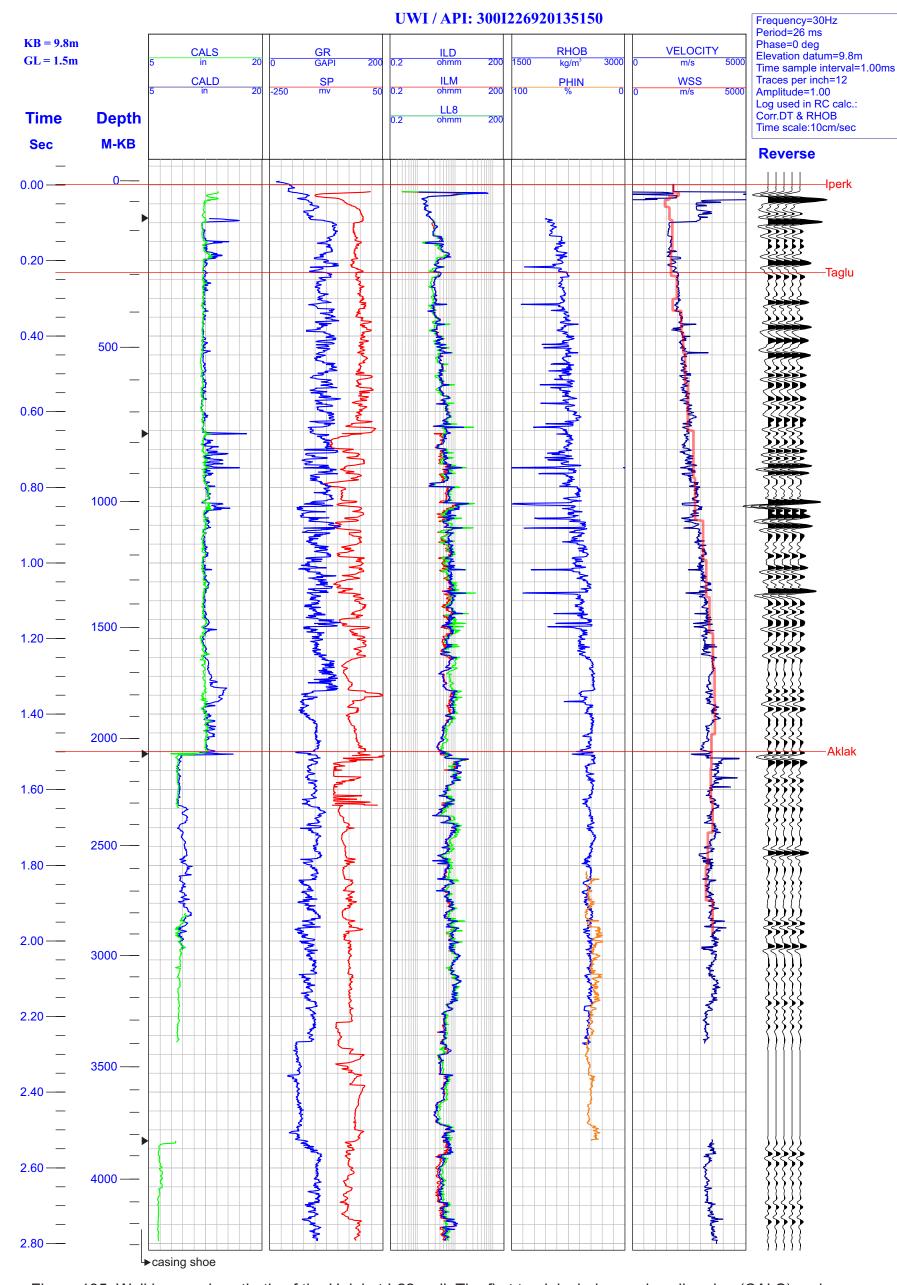
Figure 194. Well logs and synthetic of the Unipkat B-12 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
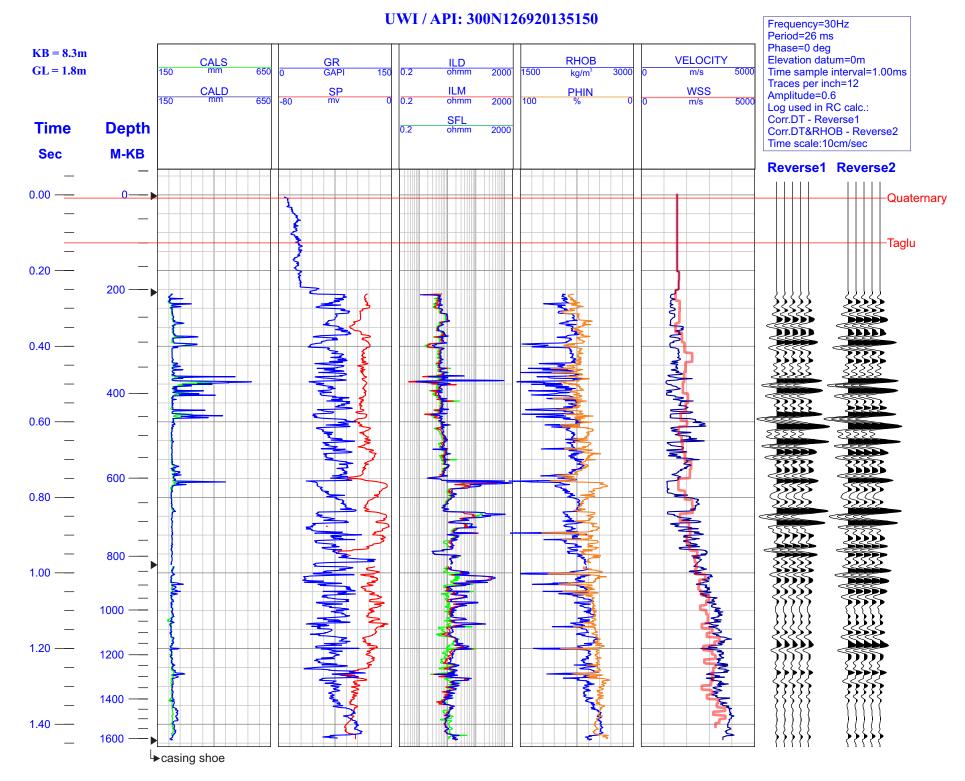
Figure 195. Well logs and synthetic of the Unipkat I-22 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
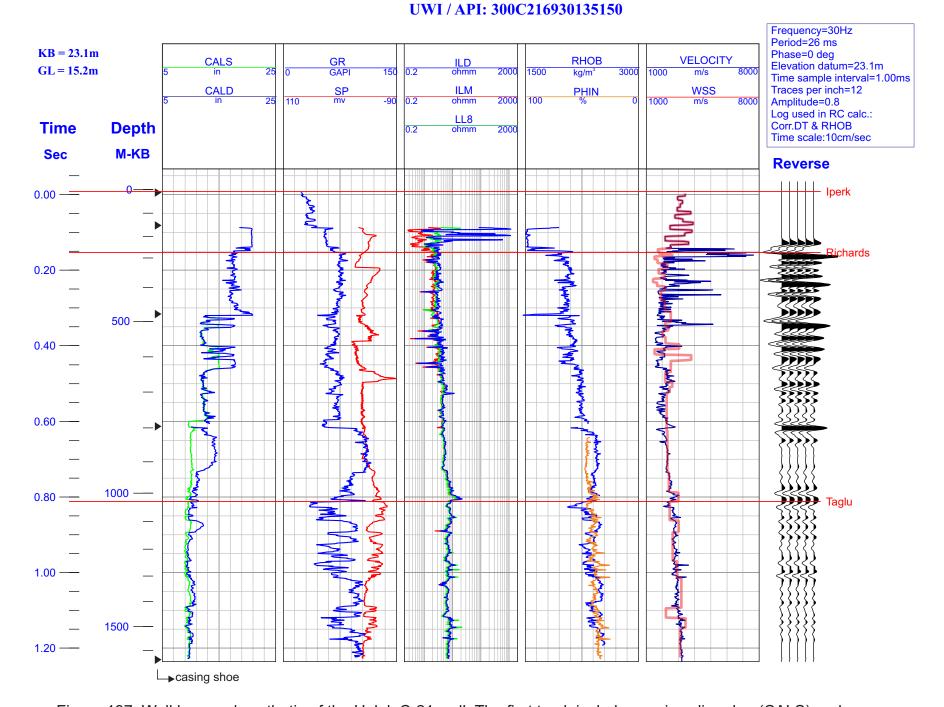
Figure 196. Well logs and synthetic of the Unipkat N-12 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse1 - from single DT, Reverse2 - from DT & RHOB).
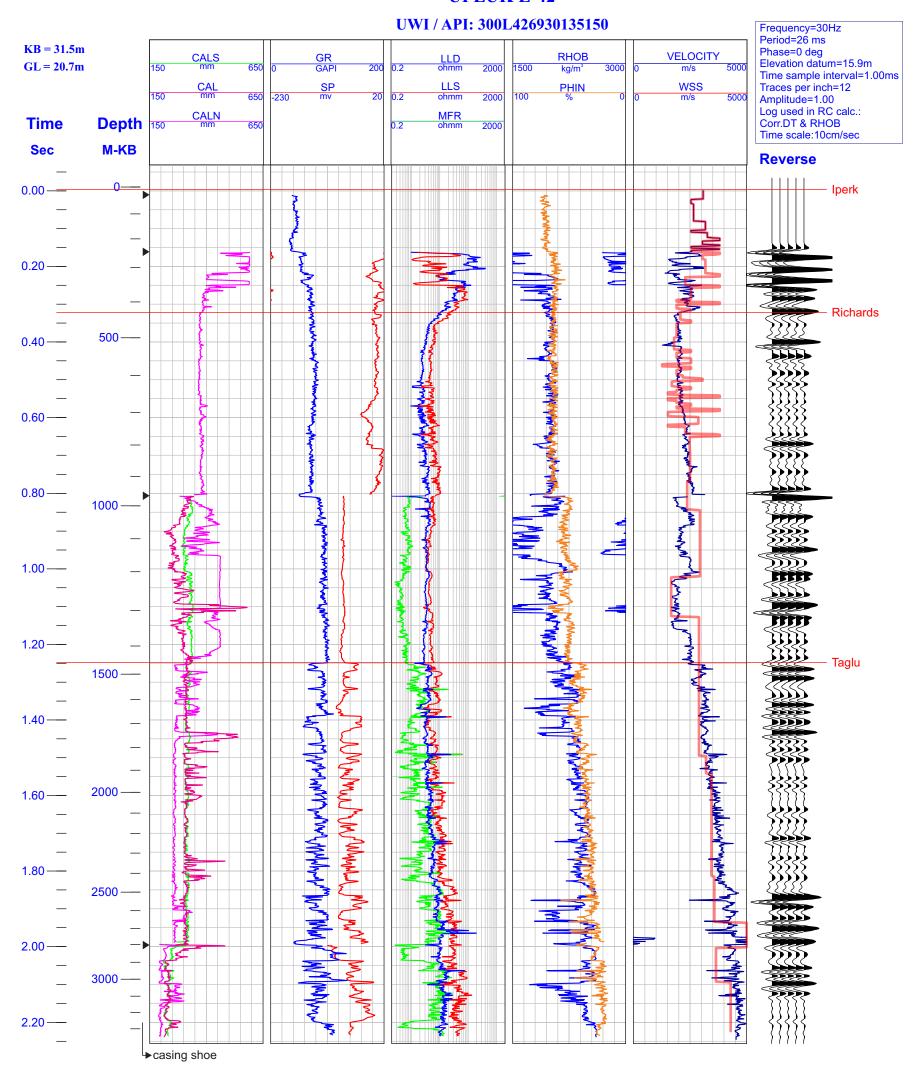
UPLUK C-21

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Figure 197. Well logs and synthetic of the Upluk C-21 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 198. Well logs and synthetic of the Upluk L-42 well. The first track includes sonic caliper log (CALS), general caliper log (CAL) and neutron caliper log (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD), medium (LLS) and shallow (MFR) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
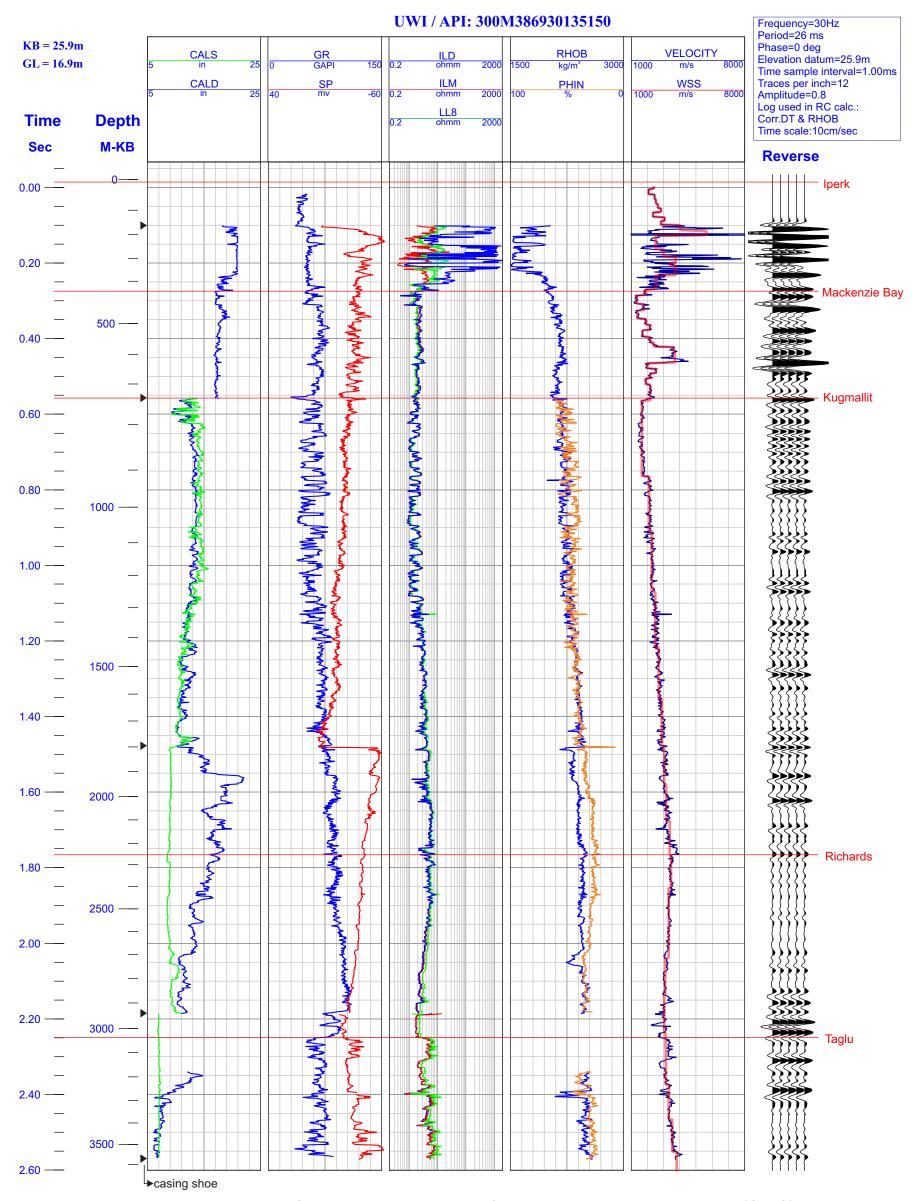
Figure 199. Well logs and synthetic of the Upluk M-38 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
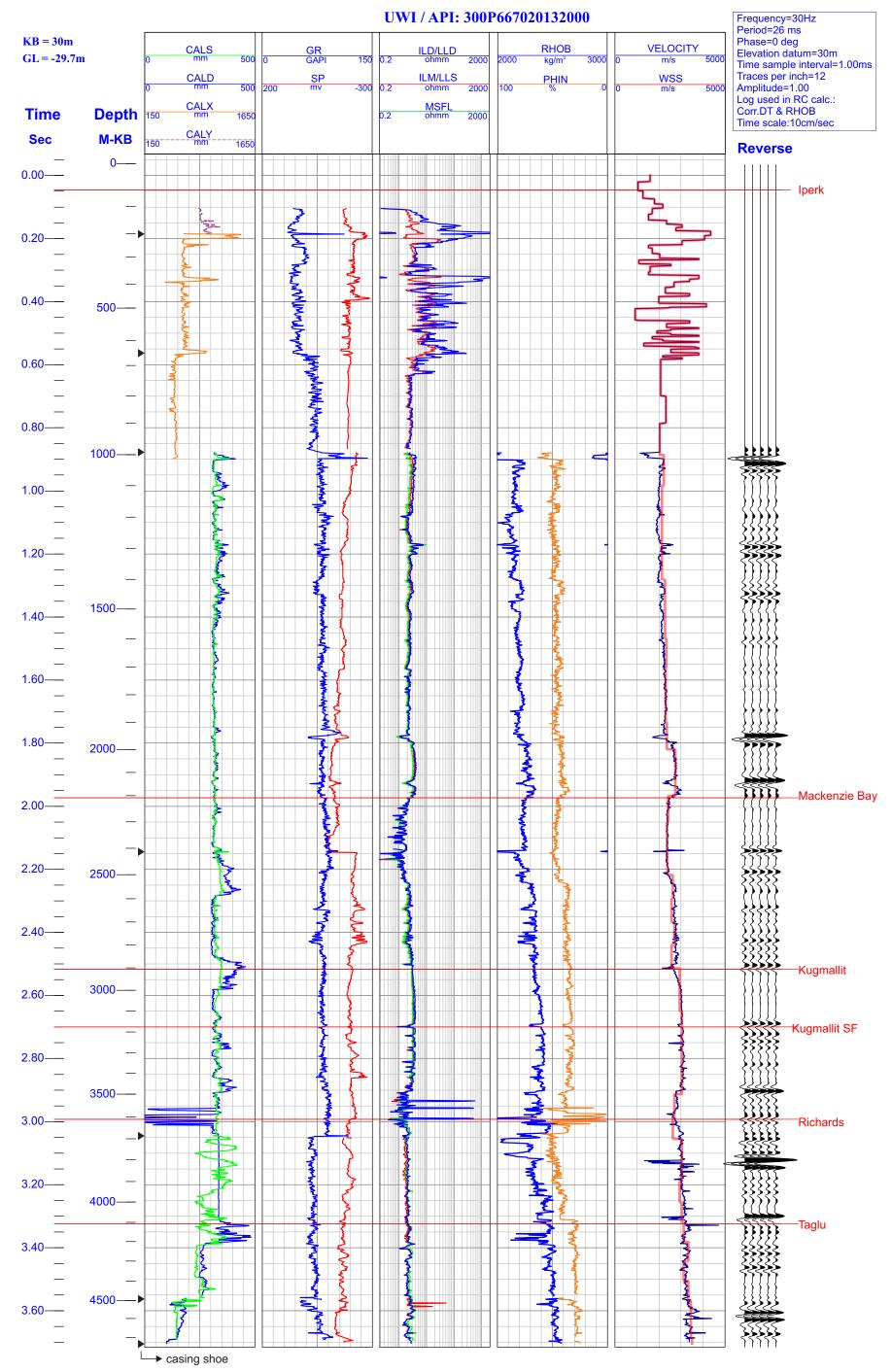
Figure 200. Well logs and synthetic of the Uviluk P-66 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD), caliper 1-3 (CALX) and caliper 2-4 (CALY); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (MSFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
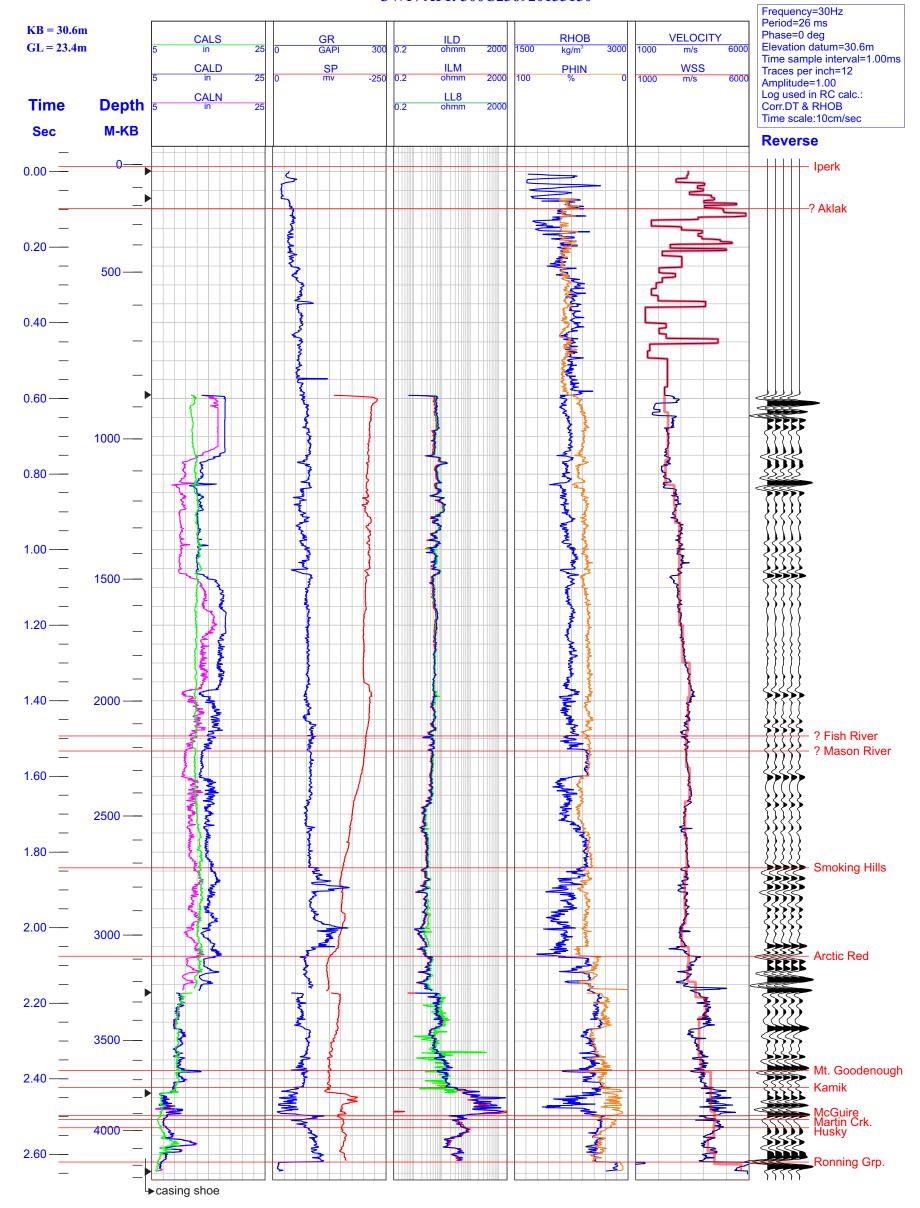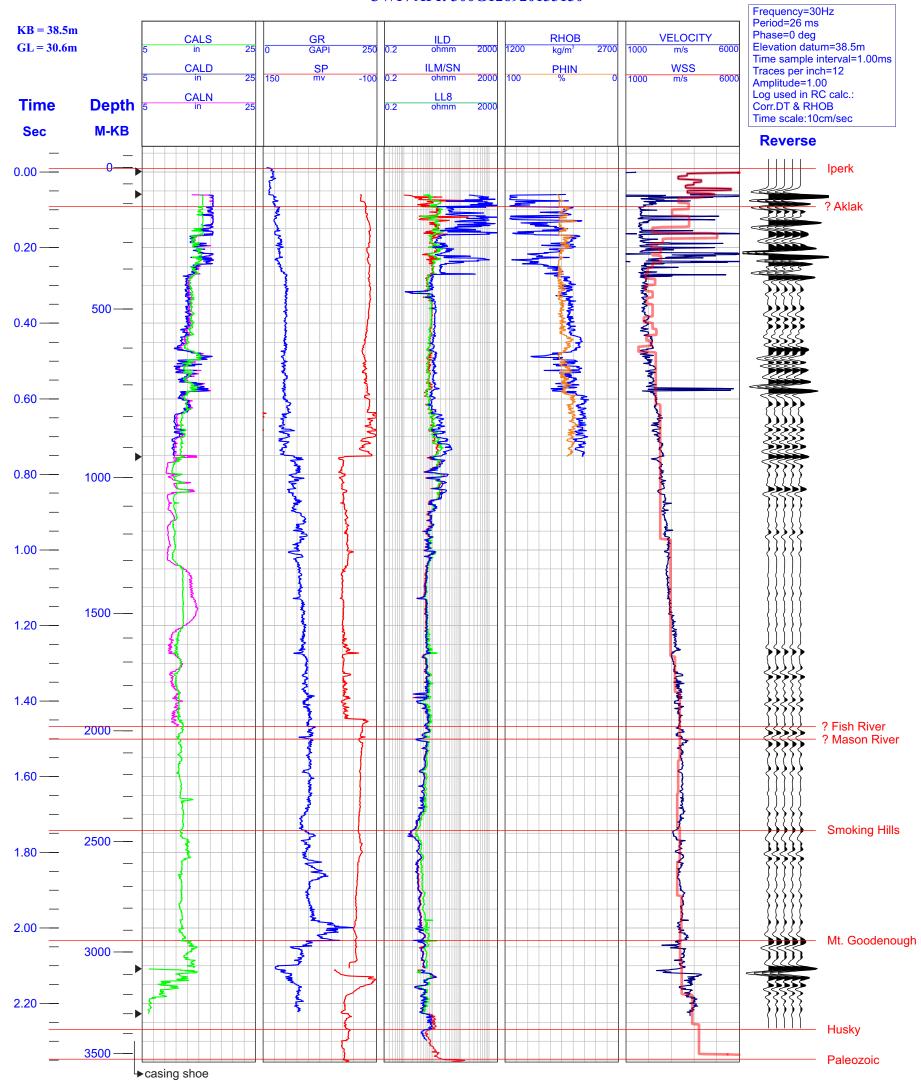
Figure 201. Well logs and synthetic of the Wagnark C-23 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and neutron caliper log (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

Figure 202. Well logs and synthetic of the Wagnark G-12 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and neutron caliper log (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM/SN) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
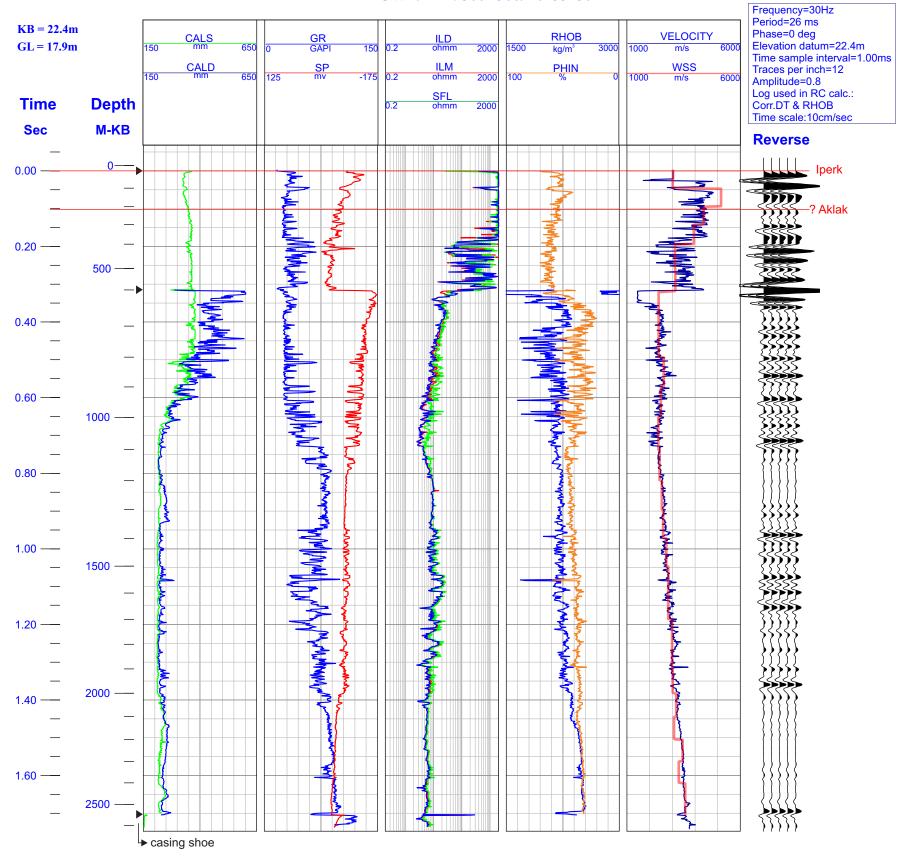
WAGNARK L-36

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Figure 203. Well logs and synthetic of the Wagnark L-36 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
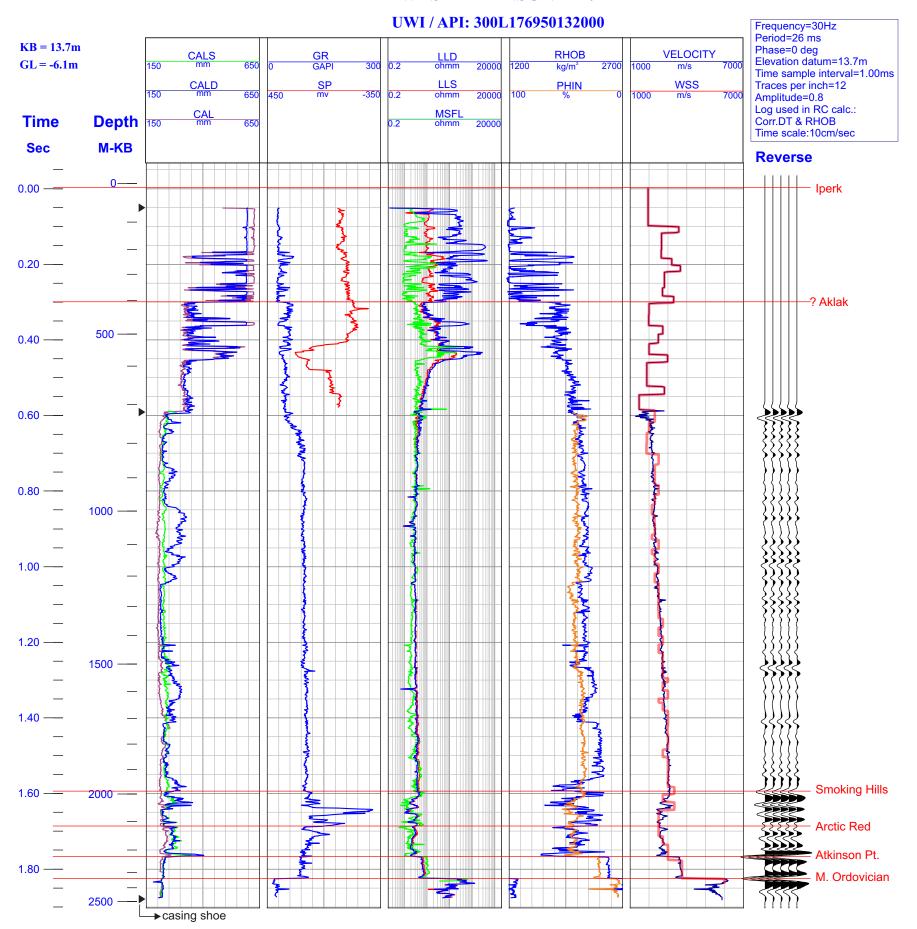
Figure 204. Well logs and synthetic of the West Atkinson L-17 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and general caliper log (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (LLD), medium (LLS) and shallow (MSFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
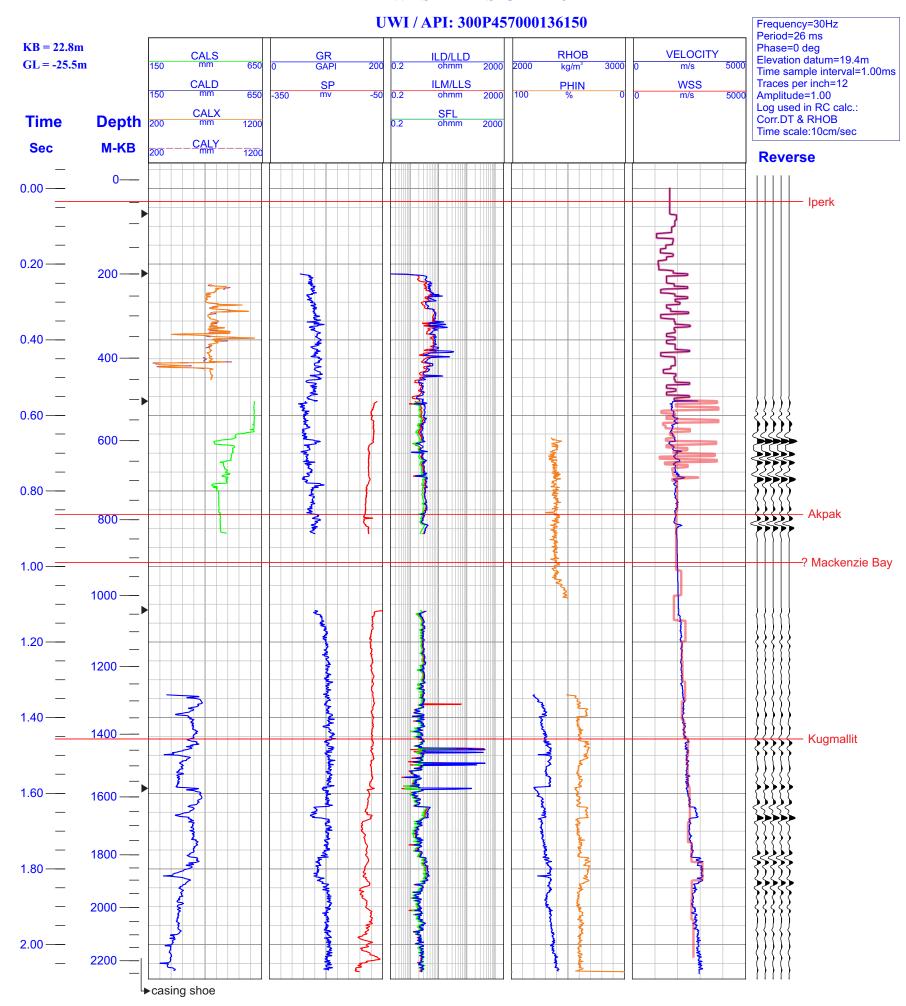
Figure 205. Well logs and synthetic of the West Tarsiut P-45 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and general caliper log (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD/LLD), medium (ILM/LLS) and shallow (SFL) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots and VSP/crystal cable survey) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
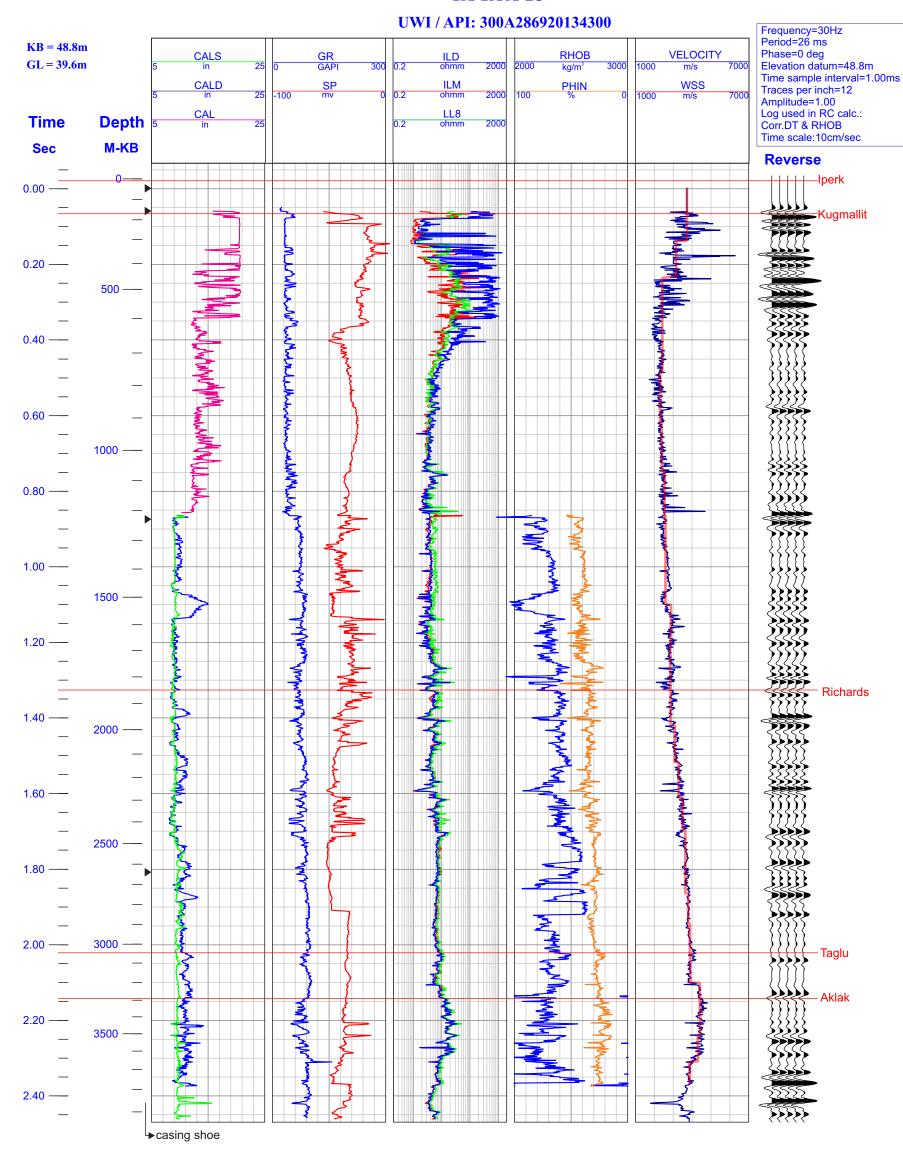
Figure 206. Well logs and synthetic of the Ya Ya A-28 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and general caliper log (CAL); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
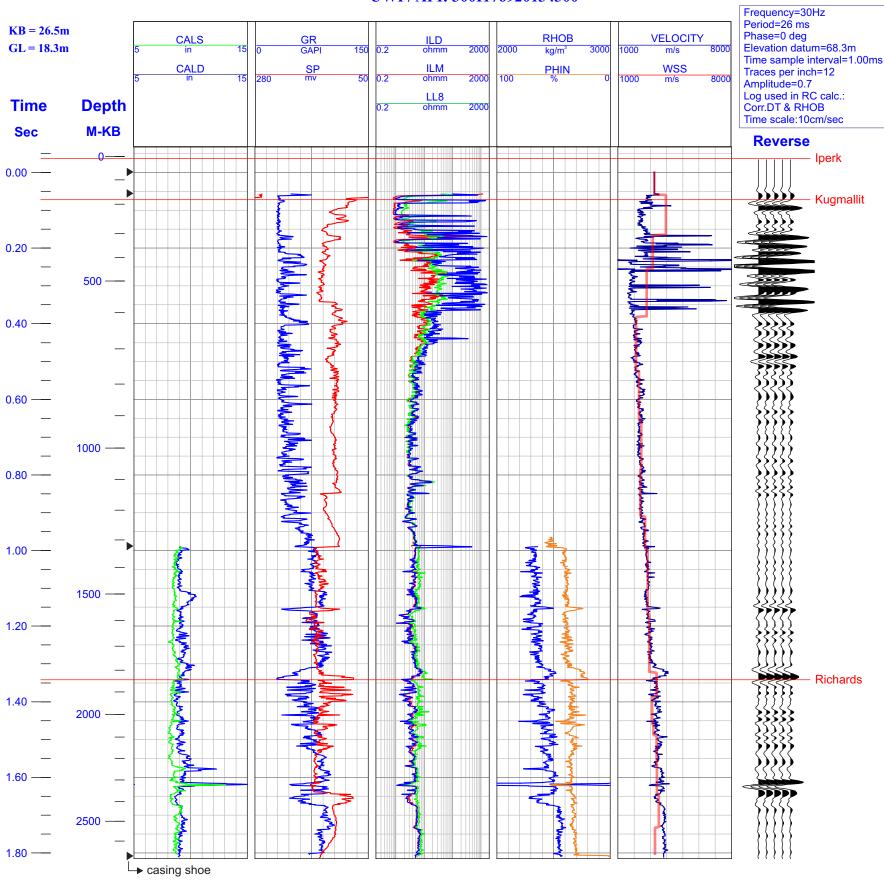
Figure 207. Well logs and synthetic of the Ya Ya I-17 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).

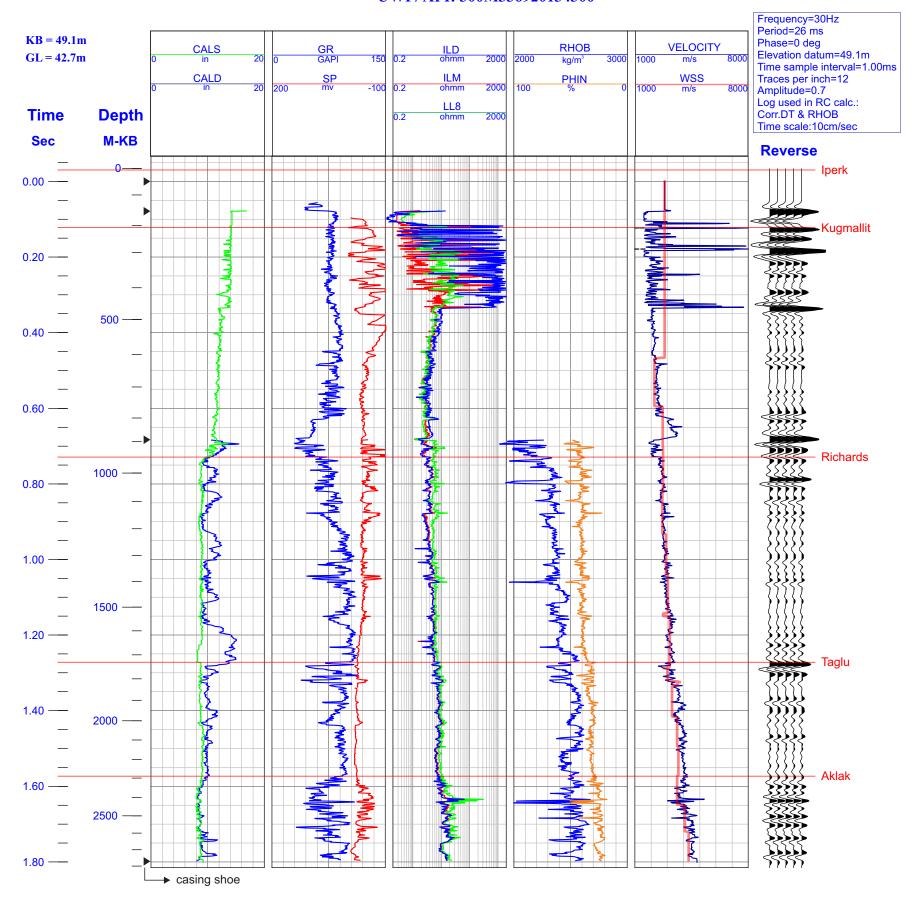# YA YA M-33

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Figure 208. Well logs and synthetic of the Ya Ya M-33 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).
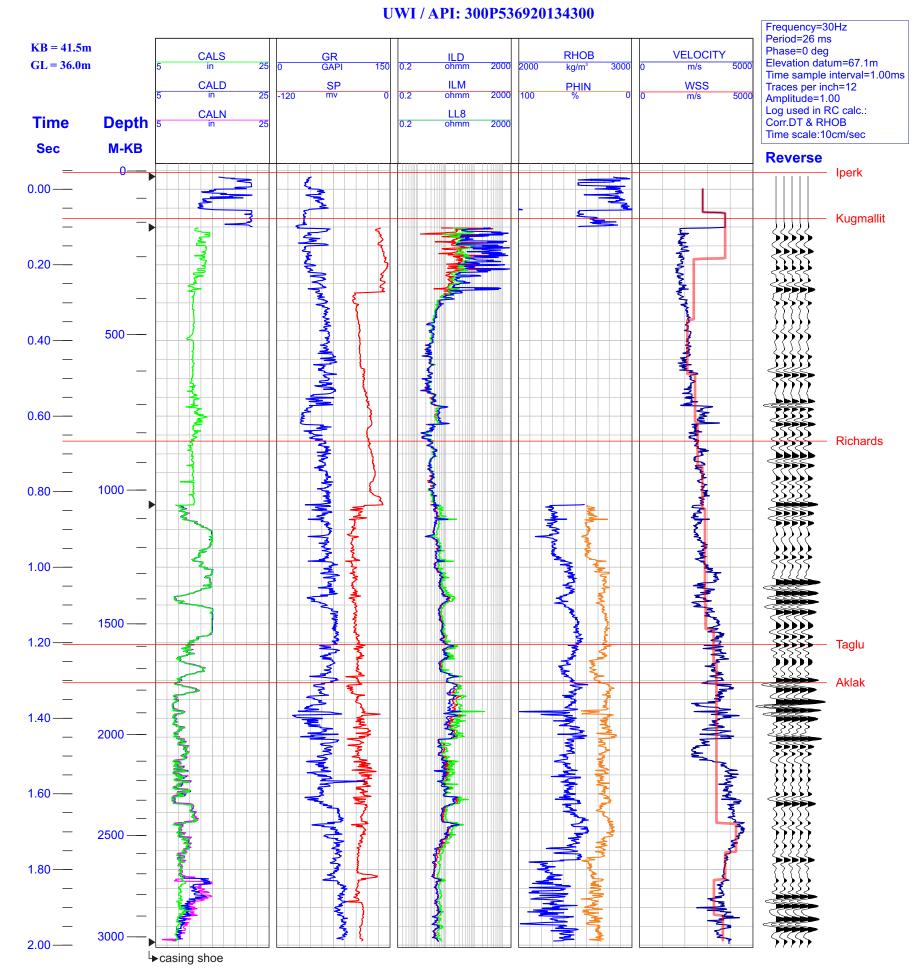
Figure 209. Well logs and synthetic of the Ya Ya P-53 well. The first track includes sonic caliper log (CALS) and density caliper log (CALD) and neutron caliper log (CALN); the second track contains gamma ray (GR) and spontaneous potential (SP) log; the third track shows deep (ILD), medium (ILM) and shallow (LL8) resistivity logs; the fourth track illustrates density (RHOB) and neutron porosity (PHIN) log data; the fifth track shows well seismic survey (WSS-check shots) and calculated velocity curve. The sixth track displays synthetic traces (Reverse).