Appendix C – Glossary

This glossary contains explanations of technical terms and acronyms commonly used to describe seismic processing and interpretation. More comprehensive explanations can be found in standard seismic texts and reference books (e.g. Sheriff, R.E. (1991) Encyclopaedic Dictionary of Exploration Geophysics, Society of Exploration Geophysicists, Oklahoma).

2D	two-dimensional
3D	three-dimensional
AGC	automatic gain control; data-dependent scaling designed to normalise trace amplitude within a running time window
anisotropy	variation of seismic velocity depending on the direction in which it is measured; a sequence of sedimentary bedding produces polar anisotropy (where seismic velocities are symmetric about the bedding); non-horizontal fracturing and microcracks produces azimuthal anisotropy (where seismic velocities are symmetric about the axis perpendicular to the fracturing)
bandpass filtering	attenuation of seismic energy outside of a user-defined frequency bandwidth
CMP stacking	the summation of all traces within a CMP gather
common midpoint (CMP) gather	the set of seismic traces that share the same midpoint between their sources and receivers
common receiver gather (CRG)	a collection of seismic traces recorded at the same geophone (receiver) location
deconvolution	a process designed to restore a waveshape to the form it had before undergoing a filtering action; applied to seismic reflection data to remove the filtering effect of the earth and so improve the resolution of reflected energy
dominant frequency	the predominant frequency of a seismic dataset determined by measuring the time between successive peaks or troughs of the recorded seismic pulse, and taking the reciprocal
fold	the multiplicity of data within a CMP gather; that is, the number of traces within a CMP gather that will contribute to the summed trace at that CMP location
dominant wavelength	the seismic wavelength associated with the dominant frequency; for P waves, equivalent to Vp divided by the dominant frequency
frequency	the repetition rate of a periodic waveform, measured in ‘cycles per second’ or Hertz (Hz)
frequency bandwidth	range of frequencies over which the recorded seismic signal has significant power
f-xy deconvolution	a random-noise attenuation method typically applied to seismic data following CMP stacking; improves the signal-to-noise ratio of the final stack
geometric spreading	see spherical divergence

geophone	the recording device or receiver used to transform seismic energy into an electrical voltage for input into the seismic recording system; a single vertically-oriented geophone is used for conventional seismic acquisition
geophone array	a group of geophones arranged in a linear or areal pattern connected to a single recording channel (i.e. the ground motion recorded by each of the geophones within the array is summed to produce just one seismic recording at the particular receiver station); used to discriminate against waves with certain dominant wavelengths and boost the signal-to-noise ratio
geophone array length	the distance over which a geophone (receiver) array is planted about a receiver station; typically of the order of 20-30m for petroleum-scale recording and 2-5m for coal-scale seismic recording
groundroll	a type of seismic wave that travels along or near the surface of the ground; characterised by relatively low velocity, low frequency and high amplitude; recorded as a steeply dipping, linear event on a seismic shot record; often interferes with desired reflection events
instantaneous frequency attribute	the temporal rate of change of the instantaneous phase; generally has a high degree of variation that can often be related to stratigraphy
instantaneous phase attribute	a measure of the lateral continuity of events on a seismic section
magnitude spectrum	amplitude of seismic recording as a function of frequency
migration	a seismic inversion operation involving rearrangement of seismic data samples so that reflections are plotted at their true locations; required where laterally varying seismic velocities and dipping reflectors cause seismic energy to be recorded at relative positions different to their real physical location
mute	elimination of unwanted energy from seismic traces; typically used over certain time intervals to remove groundroll or noise bursts out of the final stack
normal moveout (NMO)	the variation of the arrival time of reflection energy with offset; NMO corrections compensate for this variation in traveltime so that reflection energy from each geological boundary is properly aligned prior to stacking; for horizontal reflectors, P-wave NMO can be described as hyperbolic
offset	the distance from the source point to the receiver location
P waves	longitudinal or compressional seismic waves; characterised by particle motion in the direction of travel; acquired using conventional (single-component) seismic acquisition surveys
predictive deconvolution	a method of deconvolution that takes advantage of the predictability of surface multiples; provided necessary statistical assumptions are met, predictive deconvolution will remove surface multiple energy at the same time as removing the filtering effect of the earth to produce high resolution seismic reflection events
receiver array	see geophone array

reflection amplitude attribute	a measure of the amplitude of seismic energy reflected from a specific geological interface; instantaneous amplitude is the amplitude recorded at the interpreted arrival time of the seismic event; RMS amplitude is the root-mean-square amplitude determined over a window of a specified length centred about the interpreted arrival time of the seismic event
reflection gradient attribute	a measure of the rate of variation in arrival time of a seismic event; anomalously high gradients are generally indicative of structures or rapidly varying depths of the reflector being analysed
residual static corrections	remnant statics associated with incomplete weathering static corrections
resolution	the ability to separate two features which are very close together
resolution limit	for discrete seismic reflectors, the minimum vertical separation so that one can ascertain that more than one interface is involved; the commonly used Rayleigh resolution limit is defined as one quarter the dominant wavelength; the Widess limit is defined as one eighth the dominant wavelength
S waves	transverse or shear seismic waves; characterised by particle motion perpendicular to the direction of travel; acquired using multi-component (3-C) seismic acquisition
seismic attribute	typically refers to some measurement extracted from seismic data beyond conventional reflection two-way time (TWT); typically presented as an auxiliary 2D surface or image; commonly used attributes include reflection amplitude, instantaneous frequency or reflection gradient (dip) (see independent entries for a description of these attributes)
seismic waves	sound waves that propagate through the earth
seismic modelling	generation of a synthetic seismic record given an earth model
seismic reflection	a geophysical method to image the sub-surface using artificially-generated sound waves; typically the arrival times of various seismic waves are used to map sub-surface structure
seismic source	an artificial device that releases energy or seismic waves into the ground; typical coal-seismic sources include small dynamite explosions, MiniSOSIE and Vibroseis
seismic velocity	the propagation speed of a seismic wave through a particular material
shot record	a collection of seismic traces recorded at a number of receivers from the release of seismic energy at a single source location
signal-to-noise ratio (S/N)	the ratio of desired signal to all other recorded energy (noise) in a seismic recording; may be difficult to determine in practice
spectral whitening	a signal processing procedure whereby all frequency components within a signal bandwidth of a seismic recording are equalised
spherical divergence	the decrease in seismic wave strength with distance; caused by seismic waves continually spreading out as they travel through a medium so that energy density decreases

spherical divergence correction	a scaling correction to compensate for decrease in wave strength with distance as a result of geometric spreading
stacking	process by which a set of seismic traces are summed
static corrections	corrective time shifts applied to seismic data to compensate for the effects of variations in elevation, weathering thickness, weathering velocity or reference to datum; the objective is to determine the arrival times which would have been observed if all measurements had been made on a flat plane with no weathering or low-velocity material present
structural interpretation	involves the mapping of geological interfaces and discontinuities (such as faults) via picking of the TWT of seismic reflection energy from target reflectors
trim statics	corrective time shifts applied to NMO-corrected CMP gathers prior to stacking; designed to optimally align flattened reflection events
TWT	two-way traveltime; refers to the time it takes for seismic energy to travel from the seismic source, down to a reflector, and back to the surface receiver
velocity analysis	calculation of a velocity that will accurately compensate for the effects of NMO; typically involves flattening reflection events in a CMP
wavelength	the distance (in metres) between two successive similar points on two adjacent cycles of a seismic wave, measured perpendicular to the wave front; often represented by the symbol λ