Quadrant II – Transcript and Related Materials

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Name of the Presenter: Aliston D'Souza

NOTES:

SEISMIC WAVES

The science dealing with the study of EARTHQUAKES in all their aspects is called seismology. Seismic Waves. During each earthquake, elastic waves are generated at the focus: These (waves) are called seismic waves and they travel in all directions with their characteristic velocities. It is now a well-established fact that seismic waves are of three main types abbreviated as the P-waves, the S-waves and the L-waves.
(a). The P-waves. These are also called the primary waves, push and pull waves, longitudinal waves and compressional waves. These are the fastest of the seismic waves and are longitudinal in character, i.e. the particles vibrate in the direction of propagation.
(b).The S-waves. These are also called the secondary waves, the shear waves, the transverse waves or the distortional waves. These waves are transverse in character, like the light waves, i.e. particles. vibrate at right angles to the direction of propagation.

The P and S-waves are sometimes collectively referred as body waves because they travel deep into the body of the Earth before re-emerging on the surface. They are recorded at far off distances from the focus in major earthquakes after refractions and reflections from deeper zones of the Earth It is a well-established fact that their velocities increase considerably with depth. The sudden change in their behavior at depth of 2900 km (2898 km to be precise) is of great significance in the understanding of the internal structure of the Earth.

(c) The L-waves. These are also called long waves, or surface waves because their journey is confined mainly to the surface layers of the Earth. These waves are comparatively sluggish and in any seismic records they are observed only after the arrival of the P and the S-waves. In character, the surface waves are of two main types :
The Rayleigh Waves in which the displacement of the particle is of a complex nature, partly being in the direction of propagation and partly at right angles to it.

The Love Waves in which the displacement of the particle is practically horizontal, that is, in the direction of propagation.
In terms of their effects on solid material of crust of the earth, the Rayleigh waves tend to distort the horizontal surface into a wavy, zig-zag shape. The love waves, however, tend to create shearing (breaking) ruptures.
The velocity of surface waves is controlled by the frequency of waves and the structure (layered or otherwise) of the ground. In the homogeneous non-layered structures, Rayleigh waves travel fast and form the prominent L-waves. Their velocity may reach as much as 0.92 Vs, where Vs is the velocity of shear or transverse waves in the same medium.