Three different techniques have been applied to construct a seismic velocity imaging along a single profile at King Abdulaziz City for Science and Technology (KACST), Riyadh, KSA. Conventional refraction analysis or layer refraction, diving-wave tomography, also known as refraction tomography or turning-ray tomography and diving-wave penetration correction approaches have been applied for velocity imaging. This study aims at the estimation of the near-surface geology for civil engineering purposes. A comparison between the velocity imaging constructed from these three techniques was also done to find out the degree of matching between them. Exploratory borings for determination of the soil profile layer thicknesses and lithological description were used supporting seismic data analysis. The results of the exploratory borings (Soil & Foundation Co. Ltd., 2007) along the interpreted profile were used to support the seismic data analysis. The estimated layer thicknesses and lithological description in the study area are the following: (1) a first layer composed of brown, dense, dry silty sand with gravel with a thickness range of 1.5-4.8 m, (2) a second layer composed mainly of completely weathered limestone with an average thickness of 6.5 m, and (3) the third layer is formed of moderately weathered limestone.