Exercise 15

- Reversed refraction time-distance curves are given in the attached sheet.
- Compute the velocities v_1 and v_2, the depths to bedrock h_d and h_u and construct the section. Comment on the composition of the subsurface rock materials.

Solution

- The time-distance curves provided the following values:
- t_{id}=
- t_{iu}=
- v_d=
- v_u=
- v_1=

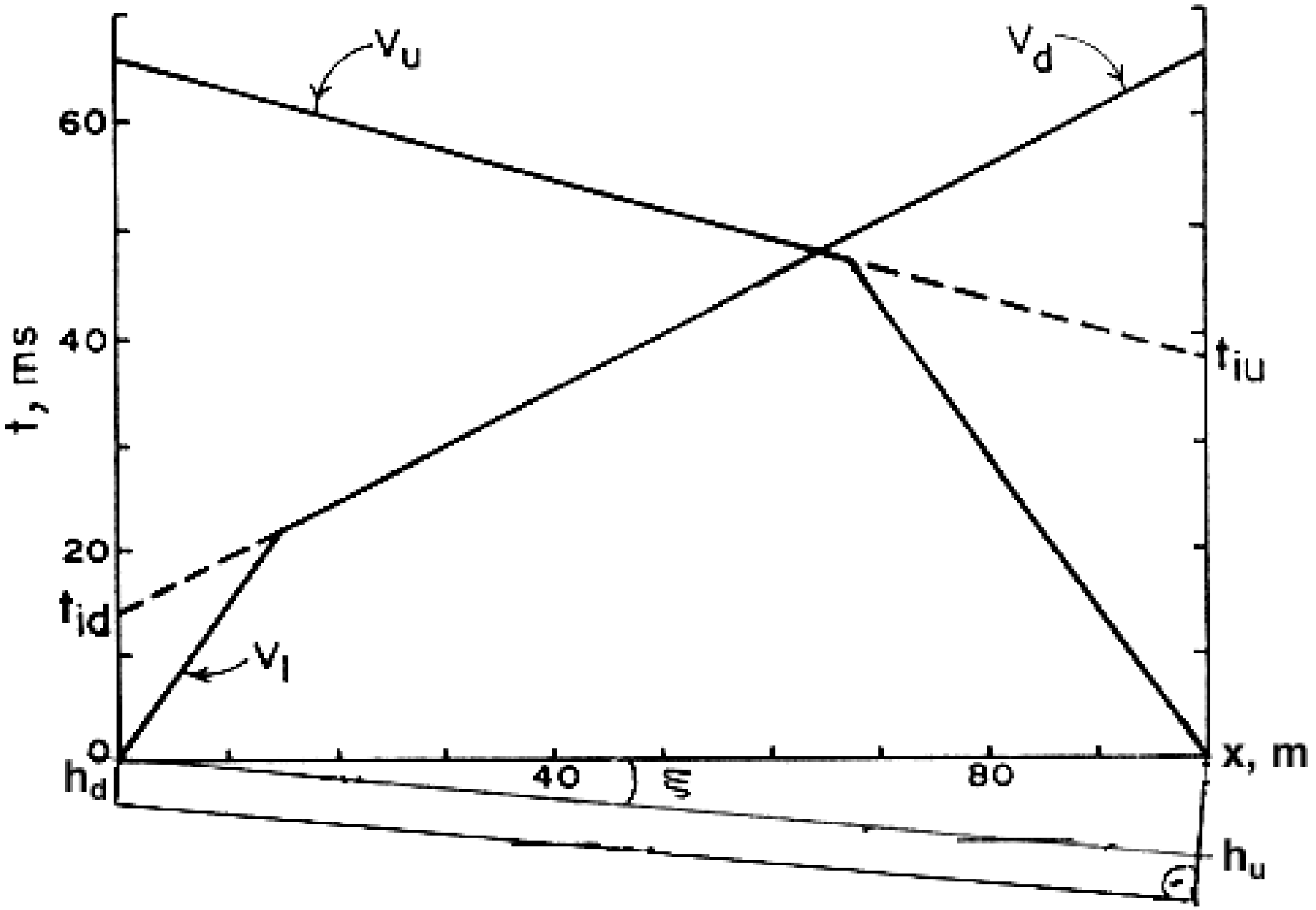

Fig. Locating a refractor from traveltime curves.

- The critical angle has been determined as $\theta_c=1/2(\sin^{-1}(v_1/v_d)+\sin^{-1}(v_1/v_u))$.
- The velocity v_2 has been determined from the relationship $\sin\theta_c = v_1/v_2$.
- The angle of dip has been estimated as $\xi=1/2(\sin^{-1}(v_1/v_d)-\sin^{-1}(v_1/v_u))$.
- The depth h_d has been obtained as $v_1 t_{id}/2\cos\theta_c$.
- The depth h_u has been obtained as $v_1 t_{iu}/2\cos\theta_c$.

- The small velocity values found above indicate that the study area consists of sedimentary rocks. Because of the overlap of velocity values for different rock types, it is difficult to identify lithology from velocity alone. In the present case, the overburden with velocity ……..appears to be some unconsolidated material (e.g., sand and soil) or weathered material, while the substratum with velocity ……. may consist of some consolidated material (e.g., hard shale or hard sandstone).

- (Hints: v_1=600-900 m/s; v_2=2200-2600 m/s; h_d=4-7 m; h_u=12-14 m)