Station Siting Considerations

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These documents address things to consider regarding Station Siting Location/Access, Cultural Noise, and Suggested Materials.

Site Location

In active experiments the receiver site location is governed entirely by the geometry of the array. The line geometry is sometimes distorted from the ideal to maintain convenient access to existing roads or to avoid natural barriers. You should also secure permission to use the site and any access roads from the landowner. The site should be surveyed to determine the true station geometry. Along with the GPS coordinates, precise directions should be recorded for locating each site for future service runs.

In passive experiments the site location is loosely governed by the array geometry. The area to scout is selected based on:

1. Permission from landowner
2. Security
3. Drainage
4. Solar exposure for power
5. Expected seismic noise levels
6. GPS reception for timing
7. Access

The area within a few kilometers of the chosen site should not have hydroelectric turbines (10 km), frequent train traffic (3 km), irrigation pumping stations (2 km), or other large machinery (1-2 km) including heavy earth-moving equipment. Basically, big moving things are a problem, especially when they are active for large portions of the day and at irregular intervals.

Choosing the location to setup the seismic station, and more importantly, where to place the seismometer itself, requires careful consideration. With modern, high-quality seismic equipment, the station is only as good as the station site conditions allow.

The seismometer and its placement should be considered as a mechanical system, which will have its own vibration modes and resonances. These frequencies should be raised as high as possible so that they do not interfere with true ground motion, and ideally beyond the range of the instrument.

The site should be located on bedrock if at all possible. The principle reason is that bedrock pads are less susceptible to tilting caused by pressure, temperature, and local disturbances. NO river bottoms or arroyos. Avoid placing the station near trees, power poles--- things that sway in the wind. As a rule, you should be at least as far away as the thing is high. Check the drainage. (See Seismic Vault Design). Most sites have to be moved for one of two reasons; flooding or vandalism.

Experience shows that apart from political instability, most vandalism on seismic stations is driven by people's curiosity. Therefore, we believe that a large sign with a short and easy-to-understand explanation of the purpose of the station should be posted on a fence surrounding the site. The fence minimizes seismic noise caused by human activities and animals that graze too close to the vault. The fence should be of light construction with little wind resistance to minimize wind generated seismic noise.

Real thievery is prevented by a watchperson and/or building a very discreet site. Private landowners are much easier to make arrangements with and the site will generally be more secure. Solar panels can be seen as a shiny object from a long way off. If they are on a tin roof, mostly horizontal, or south of the main road (in the northern hemisphere) they will not attract as much attention. Remember to look for a clear sky view to the South in the northern hemisphere and clear sky view to the North in the southern
hemisphere. The higher the latitude, the more important this will be to keep the batteries charged through the winter months. (At the very highest latitudes we will recommend additional or altogether different power sources. See PASSCAL’s Polar Program.) In addition to the solar panels, the GPS antenna will need a clear view of the sky.

Station Siting Cultural Noise Considerations

Station siting to minimize cultural noise or anthropogenic noise should be the highest priority for the site-selection staff after ensuring physical security for the equipment at a site. It turns out that ensuring site security also goes a long way in mitigating the presence of cultural noise. For example, siting a station far from roads or out of sight from curious people also removes the station from a large source of noise and also away from potential vandalism.

Our ever culturally-shrinking planet ensure that it is becoming increasingly difficult to locate sites that are far from anthropogenic noise. Clearly, installers should try to identify sites that are as far as possible from any human activity, such as towns, industry, construction, transportation, pipelines, electrical lines, mines, agriculture in addition to usual natural sources of noise such as rivers, tidal areas, windy canyons, etc. While this may not always be possible, the careful installer will be aware of temporal patterns in anthropogenic noise sources. E.g., noise from wind turbines will only be an issue when the wind is blowing, and so wind farms are not necessarily poor locations for seismic instrumentation. E.g., mining blasts may occur at the same time of day that can be easily filtered out of the time series.

Try to avoid sites that are visible from the road. Seismic noise levels are very difficult to assess by simply walking around a site. Still, guidelines to follow include:

- Install the seismometer on bedrock
- Bury the sensor with soil, 30 cm for short period, 1-1.5 meters for broadband
- Maintain 30-50 meters distance from footpaths
- Avoid large overhead powerlines or trees due to wind induced motion
- Maintain 3 km distance from major roads, railroads, irrigation pumping stations
- Avoid large power generating stations with big turbines (10km)

Suggested Materials

Below is a suggested supply list for station siting (see the section on construction supplies for station installation).

- Maps of the area (Google Earth for pre-survey)
- Cell Phone
- Garmin handheld GPS or equivalent
- survey flagging and stakes to mark location.
- Pre-generated form to log driving directions, land owner contact information etc...

Related categories: Procedures Station Siting

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