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Geophysics Division,
Geological Survey of Canada, Ottawa.

Figures to Accompany Comments on The Canadian Superconducting Gravimeter Installation

D. R. Bower

September 27, 1989

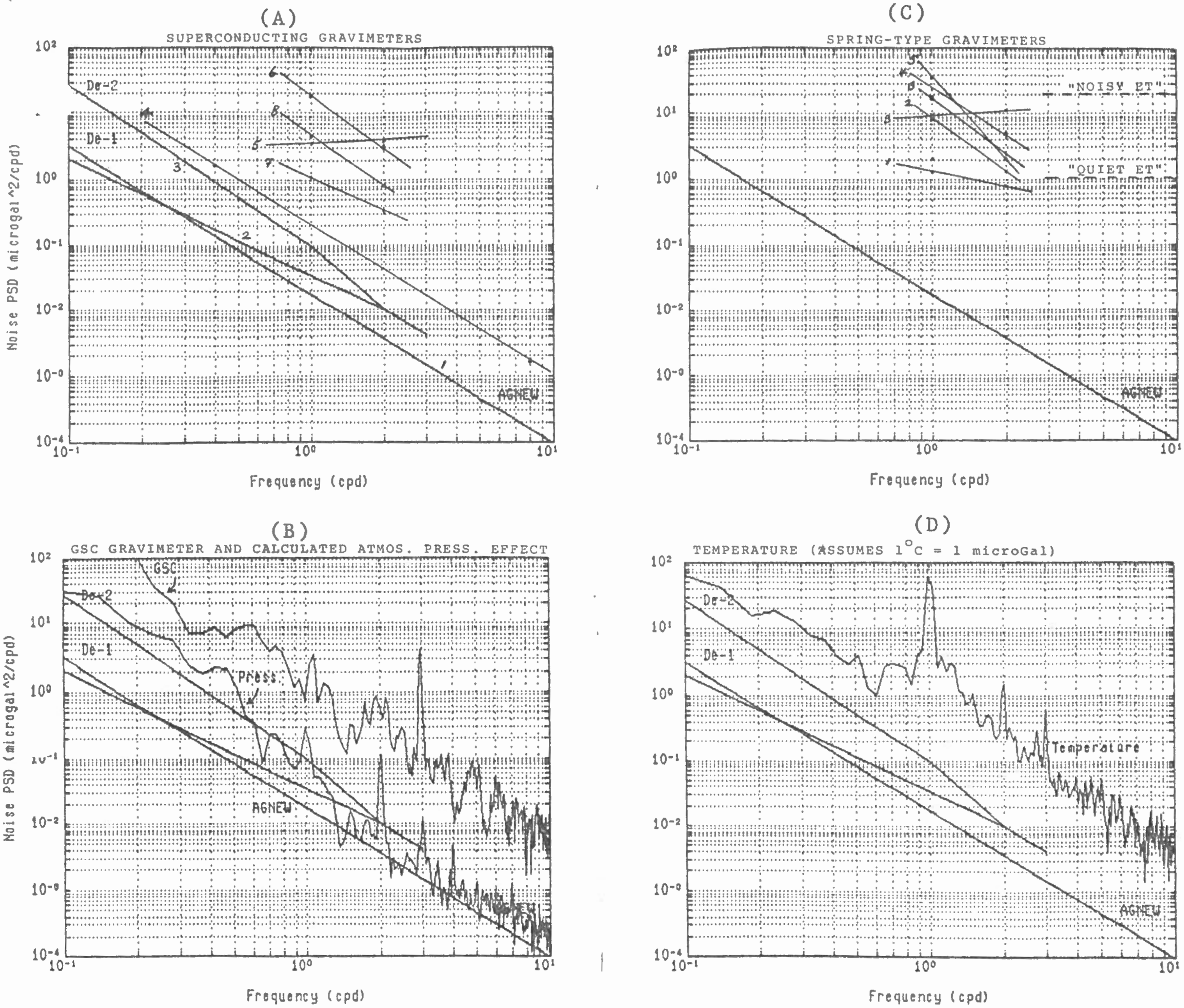


FIGURE 1

POWER SPECTRAL DENSITY (uGal^2/cpd) OF RESIDUAL GRAVITY DATA AND PREDICTED GRAVITY EFFECT OF ATMOSPHERIC PRESSURE. ALSO SHOWN IS PSD OF TEMPERATURE.

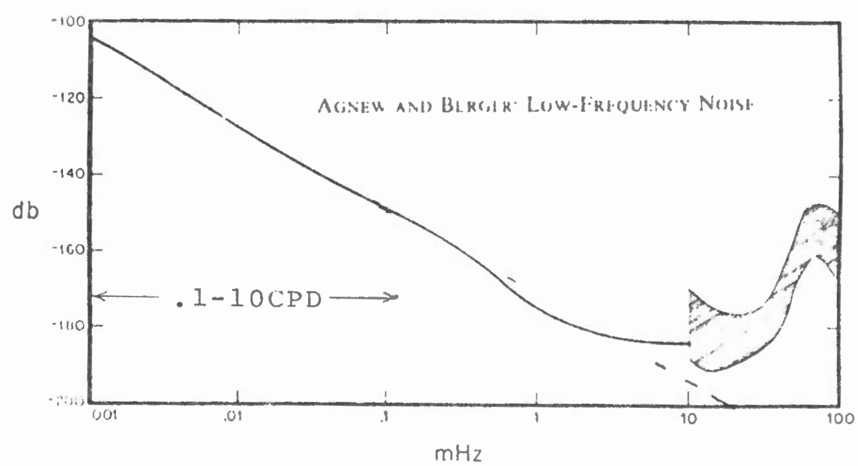
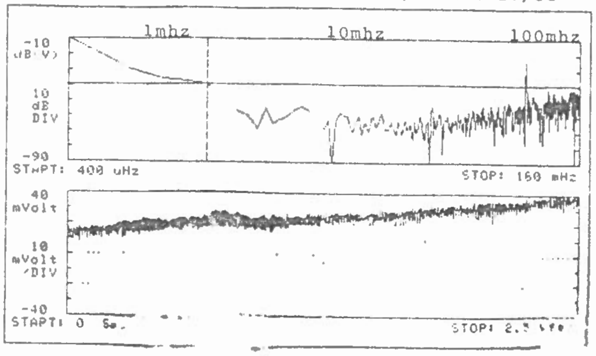
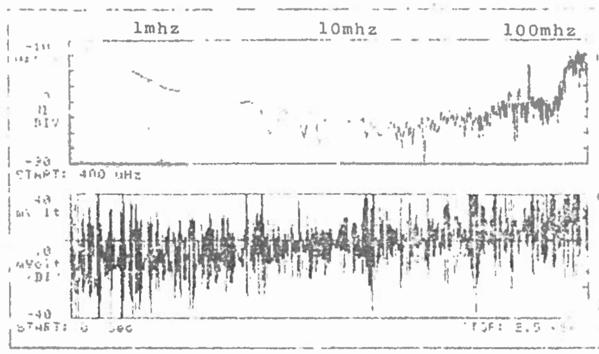


Fig 2. Vertical ground noise as a function of frequency. The vertical axis is power spectral density in decibels relative to 1 m^2 s^{-4}. The shaded area to the right of 10 mHz shows the range of noise found at HGLP stations [*Murphy and Savino*, 1975]. The line to the right shows the ground noise at Piñon Flat, the quietest of the Project IDA stations, based on data from the superconducting and Project IDA gravimeters.

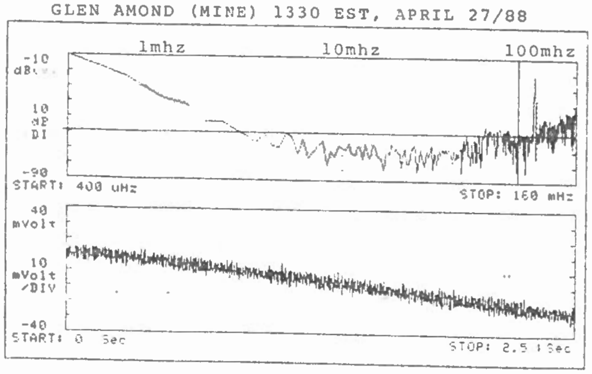
OTTAWA (CLEAN ROOM) 1905 EST, APRIL 27/88



OTTAWA (CLEAN ROOM) 1002 EST, APRIL 21, 1988



GLEN AMOND (MINE) 1330 EST, APRIL 27/88



ALGONQUIN RADIO OBSERVATORY 1054 EST. APRIL 20/88

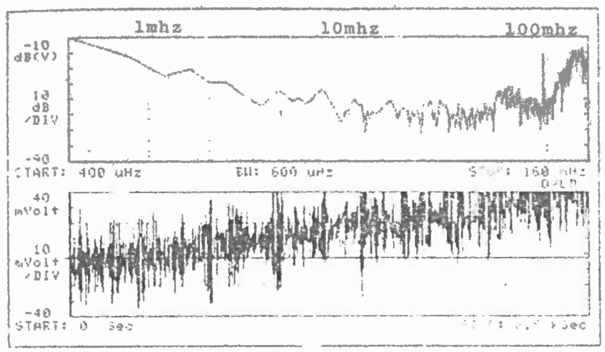


FIGURE 3 - NOISE TESTS AT OTTAWA, GLEN ALMOND AND ALGONQUIN USING MODEL G GRAVIMETER AND HP SPECTRUM ANALYSER

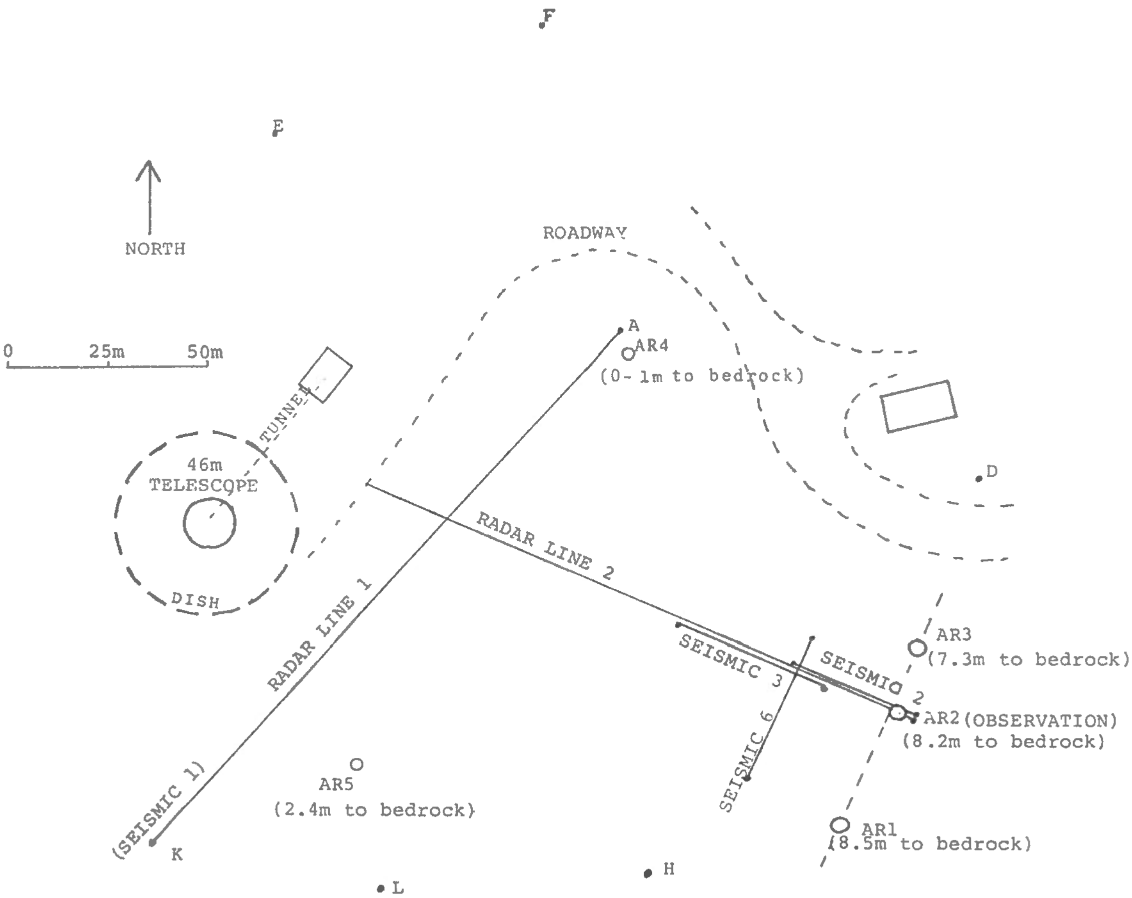
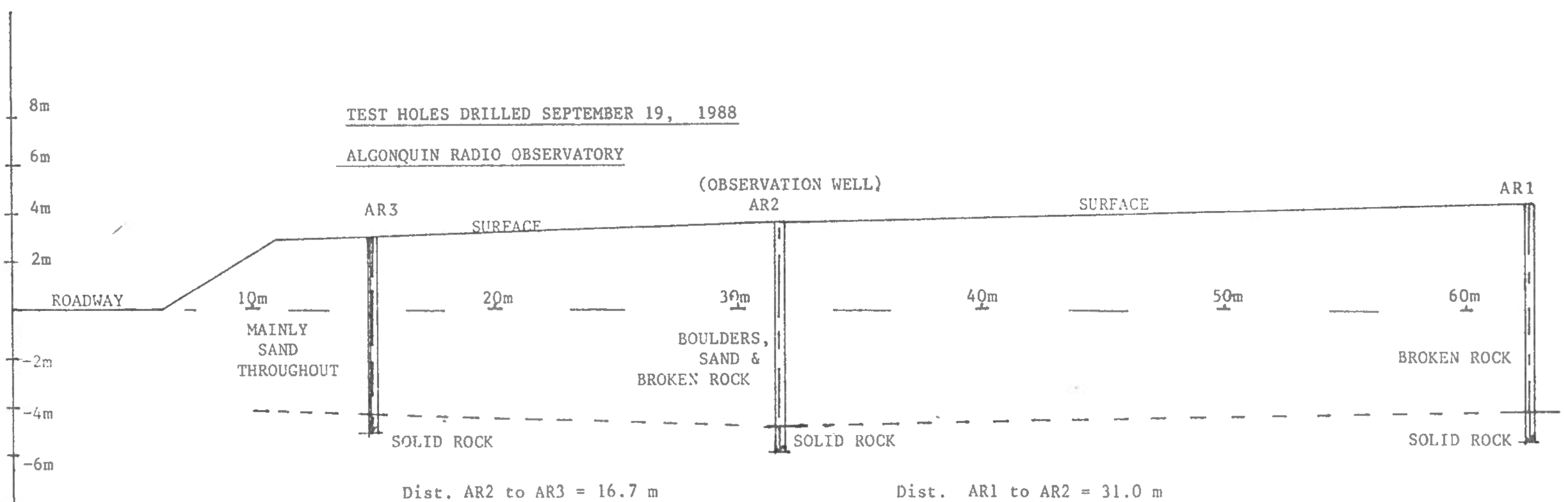


FIGURE 4 ALGONQUIN RADIO OBSERVATORY SITE. SHOWING LOCATION OF PRINCIPAL FEATURES. (Sept. 19, 1988 - Not a survey)



AR3
0 - 24' Sand
24' Solid rock
27' Rock continues.
27' Stop drilling.
Clay layer just above solid rock.

AR2
Drilling with 8" bit.
20' - "boulders"
27' - solid rock.
31' - finished, still solid.
Installed casing, 5' into solid rock. Slot cut in casing 1' long, 1/8" wide, beginning 5' from end. (2 slots cut).
Casing projects 36" above surface.
Casing redrilled to remove debris.
Sounded bottom of hole later as 29' from ground surface. Water level 15 hours after drilling is 50" from bottom.

AR1
Solid rock encountered at 28'. Continued to drill to 32' (est.).
2' - broken rock encountered.
7' - hard rock (boulder)
8' - 13' loose, broken rock.
20' - broken up, "like gravel".
27' - becomes hard.

FIGURE 5 SECTION THROUGH BOREHOLES AR1, AR2 AND AR3

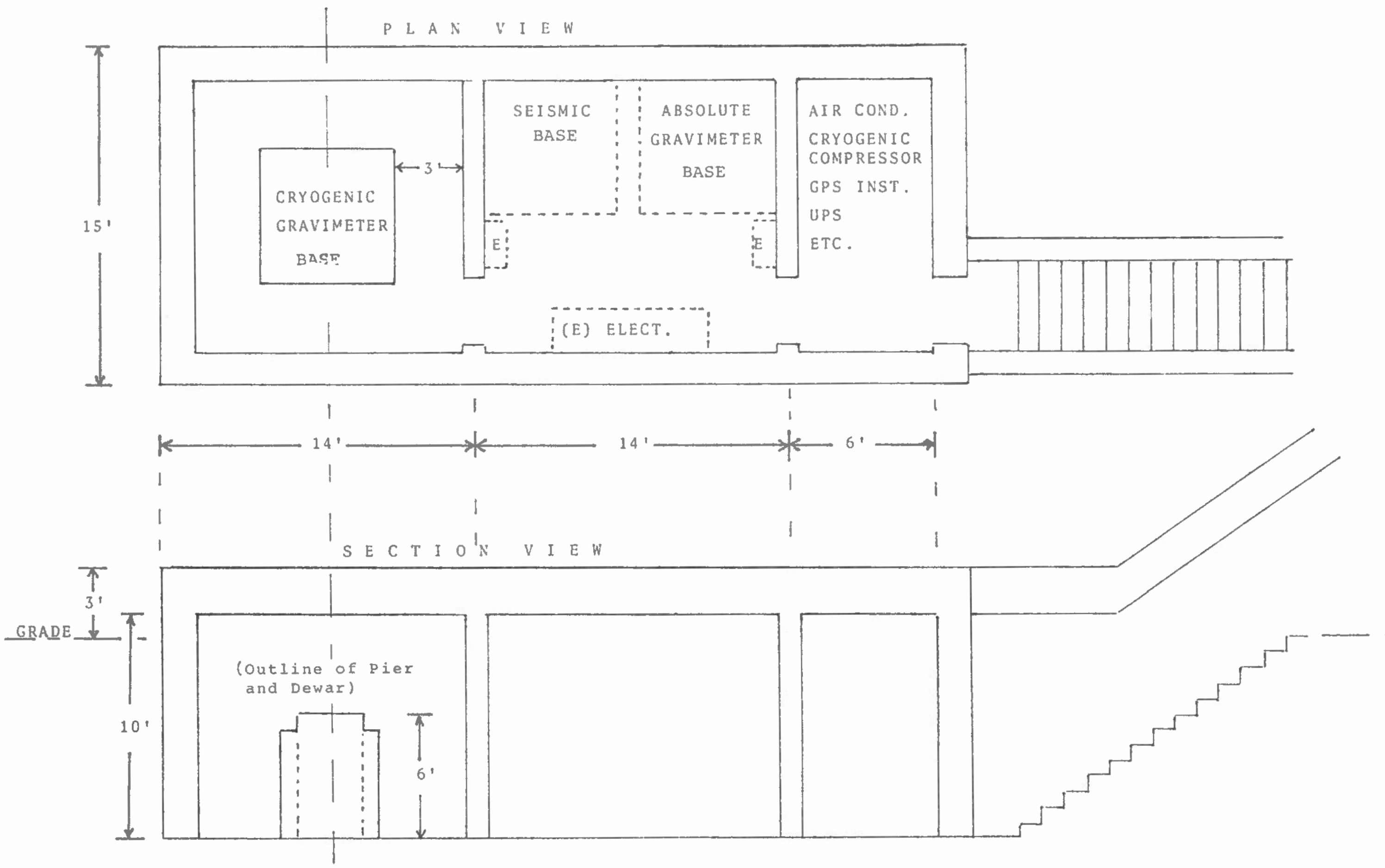


FIGURE 6 - SUPERCONDUCTING GRAVIMETER INSTALLATION - NOMINAL CONFIGURATION FOR A PARTIALLY BURIED SITE.

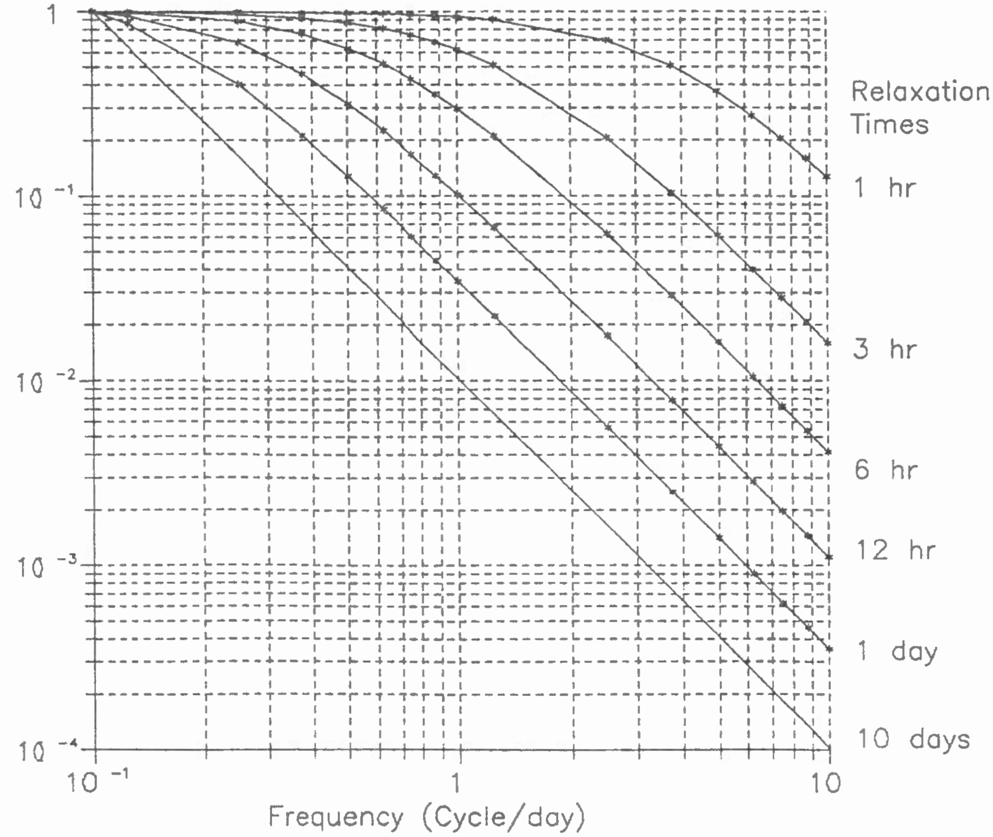


Figure 7 - Velocity P.S.D. of a particle system due to Brownian motion.

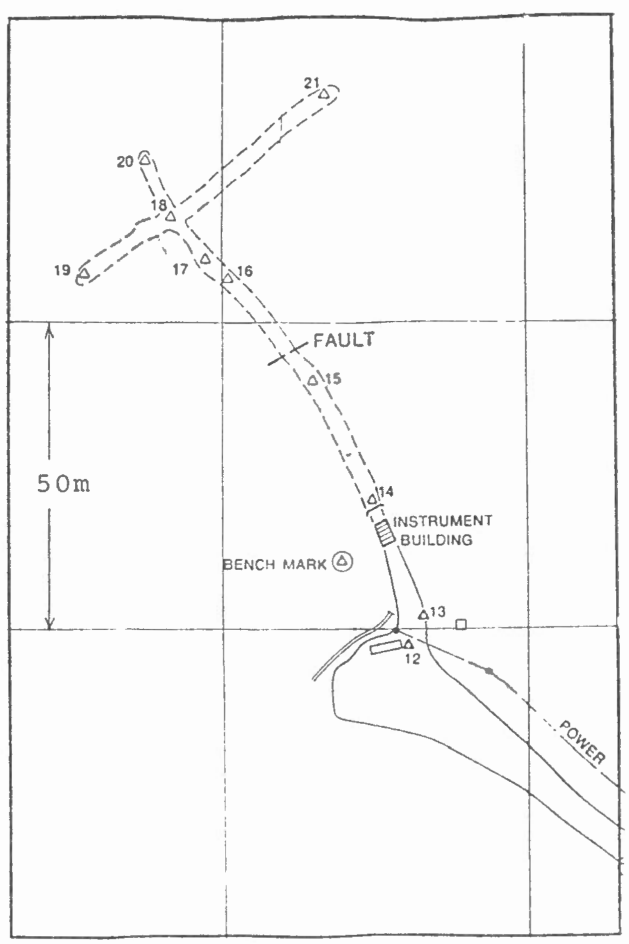


Figure 8

Mine at Glen Almond, Que.

INSTALLATION FEATURES

1. Hoist to be located over the main pier.
2. Plan assumes that bases are the bedrock surface. The ceiling height should be increased if the bases need to be built up from the bedrock surface.
3. Essential specifications re temperature, humidity and ventilation to come later.
4. External drainage to a pumped sump to be provided.
5. Building to be backfilled to a minimum depth of coverage to be specified later.
6. Consider the need for a slot to decouple nearby loading of the 'floor' from the instrument base. (Required slot depth ≈ distance to load ?)
7. Doors and stairway to be 36" wide for passage of instrument dewars.
8. Tilt 'noise' at periods less than 5 mins must be less than 3 μradians. (ANAC tiltmeters along tunnel ok for this).
   Longer periods should be handled ok by thermal levellers.
9. It would be useful if the building was sufficiently airtight to permit testing the effect of external pressure on the He lines etc.
10. Initially it may be desirable to monitor the tilt of the instrument base by independent means. (Note Brussels' experience with noisy levellers).
11. There is evidence that mechanical shock may cause a change in current distribution in the ball and thus a change in the magnetic field. The environment should be examined closely to ensure that no shocks can be anticipated. (Local blasting etc.)
12. Brussels attributes the gravity noise they experience at the time of passage of a nearby train over a trestle bridge to tilt noise in the 10-20 hz range. (Will need a seismometer to test for this)
13. Would there be advantages and would it be feasible to set up a monitoring position in the control room?