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UCRL-52674

THE PERMEABILITY OF GRANULAR BEDS EMPLACED IN VERTICAL DRILL HOLES

Stewart K. Griffiths
Frank A. Morrison, Jr.

February 23, 1979

Work performed under the auspices of the U.S. Department of Energy by the UCLLL under contract number W-7405-ENG-48.

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ABSTRACT

To determine the permeabilities of granular materials emplaced in vertical drill holes used for underground nuclear tests, we conducted an experiment at the USDOE Nevada Test Site (NTS). As the hole is being filled, falling material increases pressure above and within the granular beds beneath. When the filling operation starts or stops, a transient pressure response occurs within the beds; we measured this response in beds of various compositions. The permeabilities after emplacement were found by matching analytical predictions of the response to these data. This information is useful in assuring the containment of nuclear tests conducted in such drill holes.

INTRODUCTION

Underground nuclear tests are usually conducted in deep vertical drill holes. After emplacement of the nuclear device and before detonation, the hole is stemmed (filled). Most of the fill is granular material meant to prevent radioactive gas from reaching the surface; the ability to impede fluid flow is thus a criterion for selection of stemming materials.

Stemming materials used by Lawrence Livermore Laboratory (LLL) include pea gravel, Overton sand, and a heterogeneous mixture called LLL mix. The LLL mix provides most of the resistance to fluid transport. It is composed of pea gravel and fines from the NTS, combined with fly ash. The pea gravel and fines are blended and emplaced by a monitored conveyor as fly ash is added from a hopper; the material is LLL mix as it enters the hole. When it arrives at the bottom, however, it may have different proportions and, consequently, different properties because of the varied sedimentation velocities of the constituents.

For several years, LLL containment design has used LLL mix almost everywhere above the predicted nuclear cavity. Recently, a layered design has been adopted; layers of pea gravel are used so that the amount of LLL mix emplaced is about 20% of that formerly needed. These shorter layers of LLL mix may have properties significantly different from those of longer layers and those of laboratory mixtures.

To evaluate the efficacy of this layered design for the containment of nuclear tests, we must know the permeabilities of the materials after emplacement. We can then make calculations of the multiphase, multicomponent flow through these porous media.^{1,2} To determine the permeabilities, we conducted a stemming experiment.

Transient downhole pressures produced during the stemming operation were used to determine permeabilities—no auxiliary source of pressure was needed. The drag on falling particles creates a pressure rise that, at any depth, is proportional to the mass of material suspended above that depth. This pressure increase occurs throughout the depositing layer and penetrates underlying layers.

When stemming of a layer begins or ends, the pressure at the upper bed surface changes. This causes a transient response in that layer and all layers beneath. We measured this response with pressure transducers located in different layers; these measurements and models of gas flow were used to determine the permeabilities of the materials.

EXPERIMENT

The stemming experiment was conducted in drill hole U8e at the NTS, shown in Fig. 1. The hole was filled from its total depth of 1947 ft to a depth of 1434 ft with layers of pea gravel, LLL mix, and Overton sand. It was lined between 1846 and 1611 ft; tuff, the surrounding lithologic unit, served as a barrier to radial flow above the liner because it is considerably less permeable than the stemming materials being investigated. Water was standing in the hole, so pea gravel was emplaced until a dry tag was obtained at a depth of 1809 ft. The saturated gravel bed also acted as an impermeable barrier. The materials investigated were emplaced above this level.

Four semiconductor pressure transducers (denoted as PX) were suspended downhole on a wire rope. They provided high-level output (about 200 mV at full scale, from 0 to 25 psia) and moderate linearity over the temperature range encountered during the experiment. A three-wire system, insensitive to wire length, transmitted the transducer signals to the analog input panel of a Mod Comp II data acquisition and analysis computer. There the signals were low-pass filtered, converted to digital floating-point format, and buffered before storage. The system operator controlled sampling rates; 10 samples/minute were taken from each input channel near the beginning and ending of stemming, and 1 sample/minute was taken during other times.

The data analysis and output routines of this system are extensive. The operator may introduce scaling factors to correct for effects such as offset in the original transducer signal and temperature-induced drift. Excessive noise was eliminated from the data, in some cases, using filtering functions and wild-point editing. Edited data are readily printed as single- or multi-channel plots of pressure vs time.

GOVERNING EQUATIONS

The relations describing gas flow through porous media are well known.³ Low Reynolds-number isothermal flow of an ideal gas is governed by a nonlinear diffusion equation. In one dimension, it is

$$\frac{\partial}{\partial x} \left(\frac{k}{\mu} p \frac{\partial p}{\partial x} \right) = \epsilon \frac{\partial p}{\partial t} \quad (1)$$

where

- x = spatial coordinate
- t = temporal coordinate
- k = permeability of the medium
- ϵ = porosity: void volume fraction of the bed
- μ = gas viscosity (constant in an isothermal flow)
- p = pressure of the gas.

We are interested here in small deviations from the larger ambient pressure. This restriction permits us to linearize Eq. (1) using

$$p = p_0 + p_d \quad (2)$$

where

- p_0 = ambient pressure
- p_d = deviation from the ambient pressure.

FIG. 1. Stemming materials employed in drill hole U8e and locations of pressure transducers.

For sufficiently small p_d , with constant permeability and viscosity, we obtain the linearized diffusion equation

$$\frac{\partial^2 p_d}{\partial x^2} = \frac{1}{\alpha} \frac{\partial p_d}{\partial t} \quad (3)$$

where the effective diffusivity is

$$\alpha = p_0 k / \epsilon \mu . \quad (4)$$

An appropriate value for α , and thus k , is chosen to match the response predicted by the solution of Eq. (3) to the measured response.

Two cases of flow are pertinent to this study. One, involving what we shall call the higher-permeability bed, is the response in a bed lying above a bed of markedly lower permeability. This applies to the Overton sand layer and all pea gravel layers in U8e. In a higher-permeability bed, the response time within the bed may be comparable to the time over which the pressure changes at its upper boundary when stemming begins or ends. In such an instance the boundary condition should describe the actual pressure variation.

The second case occurs in a lower-permeability bed—material emplaced over one or more layers of material with higher permeability. All of the LLL mix layers in U8e are instances of lower-permeability beds. The longer response time in such beds allows us to treat the the boundary pressure changes as step changes.

GAS-FLOW MODELS

HIGHER-PERMEABILITY BED

Consider a short layer such as that shown in Fig. 2. This bed has been emplaced by constant stemming above a comparatively impermeable bed. Gas pressure is uniform through the layer and is higher than ambient by an amount p_1 . This initial condition is

$$p_d = p_1 \text{ when } t = 0, \quad 0 \leq x \leq L . \quad (5)$$

When stemming ceases, the downhole pressure drops linearly while a monodisperse material falls. For fall time t^* , the condition imposed at the upper boundary is

$$p_d = \begin{cases} p_1 [1 - (t/t^*)] & \text{when } t < t^* \\ 0 & \text{when } t \geq t^* \end{cases} \quad \text{at } x = 0 . \quad (6)$$

Darcy's law, which was used in the derivation of Eq. (1), relates the apparent fluid velocity u to the local pressure gradient. This law, valid for low Reynolds-number flow, is

$$u = - \frac{k}{\mu} \frac{\partial p}{\partial x} . \quad (7)$$

FIG. 2. Schema of the model for a higher-permeability bed. p_d = deviation from ambient pressure at time t and position x ; L = length of the layer.

Because no flow crosses the impermeable lower boundary, that boundary condition is simply

$$\frac{\partial p_d}{\partial x} = 0 \text{ at } x = L \quad (8)$$

where L = length of the layer

The ramp-type upper boundary condition given by Eq. (6) is most easily satisfied by applying Duhamel's theorem to the Fourier-series solution of the associated fundamental problem. The fundamental (unit step) problem is given by

$$\frac{\partial^2 f}{\partial x^2} = \frac{1}{\alpha} \frac{\partial f}{\partial t}, \quad (9)$$

with the conditions

$$\frac{\partial f}{\partial x} = 0 \text{ at } x = L; \quad (10)$$

$$f = 1 \text{ at } x = 0, t > 0; \quad (11)$$

$$f = 0 \text{ when } t = 0, 0 \leq x \leq L. \quad (12)$$

The solution of this problem is the series

$$f(x,t) = 1 - \frac{4}{\pi} \sum_{n=1}^{\infty} g_n(x) e^{-\alpha(\lambda_n)^2 t} \quad (13)$$

where

$$\lambda_n = \frac{(2n-1)\pi}{2L} \quad (14)$$

and

$$g_n(x) = \frac{(-1)^{n-1}}{2n-1} \cos [\lambda_n(L-x)] \quad (15)$$

According to Duhamel's theorem, the final solution is given by

$$p_d = p_1 + \int_0^t f(x, t-\tau) F'(\tau) d\tau \quad (16)$$

where $F'(\tau)$ is obtained by differentiating Eq. (6) with respect to time. This yields

$$F'(\tau) = \begin{cases} -\frac{p_1}{t^*} & \text{when } \tau < t^* \\ 0 & \text{when } \tau \geq t^* \end{cases} \quad (17)$$

Two conditions must be kept in mind when performing the integration in Eq. (16). The first condition is the case when $t < t^*$, the second when $t > t^*$. These two cases may be treated simultaneously by changing the upper limit of integration in the equation to a new variable, t' , defined as

$$t' = \begin{cases} t & \text{when } t < t^* \\ t^* & \text{when } t \geq t^* \end{cases} \quad (18)$$

The final solution satisfying Eqs. (3), (5), (6), and (8) may then be written

$$p_d = p_1 \left\{ 1 - \frac{1}{t^*} \left[t' - \frac{4}{\pi} \sum_{n=1}^{\infty} g_n(x) \frac{e^{-\alpha(\lambda_n)^2 t'}}{\alpha(\lambda_n)^2} \left(e^{\alpha(\lambda_n)^2 t'} - 1 \right) \right] \right\} \quad (19)$$

Responses calculated with this relation will be compared with experimental results to determine permeabilities.

Measurements of the pressure response induced by subsequent stemming can be used to confirm these permeabilities. In this case, the initial condition for pressure distribution is

$$p_d = 0 \text{ when } t = 0$$

in place of Eq. (5). The upper boundary condition given by Eq. (6) now becomes

$$p_d = \begin{cases} p_1(t/t^*) & \text{when } t < t^* \\ p_1 & \text{when } t \geq t^* \end{cases} \quad \text{at } x = 0 \quad (20)$$

The rise time t^* is the time for the material being stemmed to fall from the top. The pressure distribution in this case is

$$p_d = \frac{p_i}{t^*} \left[t' - \frac{4}{\pi} \sum_{n=1}^{\infty} g_n(x) \frac{e^{-\alpha(\lambda_n)^2 t'}}{\alpha(\lambda_n)^2} - \left(e^{\alpha(\lambda_n)^2 t'} - 1 \right) \right] \quad (21)$$

LOWER-PERMEABILITY BED

Consider the transient pressure response in a layer overlying material of relatively higher permeability, as shown in Fig. 3. The layers underneath constitute a finite fluid source, or "bottle," with known volume and pressure. The material in the bottle must be highly permeable, for these calculations, so that spatial pressure gradients are small and the pressure derivative with respect to time is uniform.

When the overlying layer is being stemmed, pressure in the bottle increases as air enters. At the time stemming ceases, this pressure may be either less than or equal to the maximum downhole pressure rise.

The governing equations for pressure in the bottle and layer of interest are coupled in their boundary conditions at the common interface. We will decouple these and write a single equation for the layer, with a

FIG. 3. Schema of the model for a lower-permeability bed. p_d and L are the same as in Fig. 2; p_b = instantaneous pressure in the underlying bed (bottle) at time t .

mixed boundary condition at the interface. The initial pressure distribution within the layer is assumed to be uniform except at the lower boundary:

$$p_d = \begin{cases} p_1 & \text{for } 0 \leq x < L \\ p_2 & \text{at } x = L \end{cases} \quad \text{when } t = 0 \quad (22)$$

where p_2 = initial pressure in the bottle.

As stated earlier, the pressure at the upper bed surface drops when stemming stops and the mass of suspended material decreases. The time span of this pressure drop is typically very small compared to the response time in a lower-permeability bed. Therefore, we can adequately describe the pressure at the upper boundary by a step function:

$$p_d = \begin{cases} p_1 & \text{when } t = 0 \\ 0 & \text{when } t > 0 \end{cases} \quad \text{at } x = 0 \quad (23)$$

At the interface between the layer and the bottle, continuity for gas in the bottle and Darcy's law give the mixed boundary condition:

$$\frac{\partial p_d}{\partial t} = -\frac{\alpha\beta}{L} \frac{\partial p_d}{\partial x} \quad \text{at } x = L \quad (24)$$

where β = ratio of void volume in the layer to that in the bottle.

The real-time Fourier analysis of this problem, via separation of variables, leads to non-orthogonal eigenfunctions; this causes difficulty when classical techniques are used. The most expedient means of solution is through Laplace transforms. The governing equation thus becomes

$$\frac{\partial^2 \phi}{\partial x^2} = \frac{1}{\alpha} (s\phi - p_1) \quad (25)$$

where

ϕ = transform of p_d

s = Laplace parameter.

The appropriate boundary conditions are now

$$\phi = 0 \quad \text{at } x = 0 \quad (26)$$

and

$$s\phi - p_2 = -\frac{\alpha\beta}{L} \frac{\partial \phi}{\partial x} \quad \text{at } x = L \quad (27)$$

The solution of the transformed equation satisfying the boundary conditions is

$$\phi = \frac{p_1}{s} - h(s) \quad (28)$$

where

$$h(s) = \frac{p_1 \left\{ \frac{\alpha \beta}{L} \sqrt{\frac{s}{\alpha}} \cosh \left[\sqrt{\frac{s}{\alpha}} (x - L) \right] - s \sinh \left[\sqrt{\frac{s}{\alpha}} (x - L) \right] + ms \sinh \left(\sqrt{\frac{s}{\alpha}} x \right) \right\}}{s \left[\frac{\alpha \beta}{L} \sqrt{\frac{s}{\alpha}} \cosh \left(\sqrt{\frac{s}{\alpha}} L \right) + s \sinh \left(\sqrt{\frac{s}{\alpha}} L \right) \right]} \quad (29)$$

where

$$m = 1 - \frac{p_2}{p_1} . \quad (30)$$

By replacing the first term of Eq. (28) with its real-time counterpart, we may write the inversion of ϕ in terms of the fundamental operation. That is,

$$p_d = p_1 - \frac{1}{2\pi i} \int_{\sigma_0 - i\infty}^{\sigma_0 + i\infty} h(s) e^{st} ds \quad (31)$$

where

$$i = \sqrt{-1} . \quad (32)$$

If $h(s)$ is analytic within and on a closed curve C , except at a finite number of poles— $s_0, s_1, \dots, s_n$, all inside C —then by the residue theorem:

$$\frac{1}{2\pi i} \int_C h(s) e^{st} ds = \sum_{j=0}^n R_j(x) e^{s_j t} \quad (33)$$

where $R_j(x)$ = the residue at the j th pole of $h(s)$.

Examining Eq. (29), we find these poles located at

$$s = 0 \text{ (simple pole)} \quad (34)$$

and

$$\sqrt{\frac{s}{\alpha}} = i\lambda_j \text{ (simple pole)} , \quad (35)$$

where $j = 1, 2, \dots, n$,

such that

$$\lambda_j L \tan \lambda_j L = \beta . \quad (36)$$

We limit our attention to the first n roots of the transcendental equation, Eq. (36). The 0th residue, at $s = 0$, is p_1 . When $h(s)$ is written in the rational form

$$h(s) = \frac{q(s)}{z(s)} , \quad (37)$$

the remaining residues at the simple poles $s_1, s_2, \dots, s_n$ become

$$R_j(x) = \frac{q(s_j)}{z'(s_j)} \quad (38)$$

This, with Eqs. (35) and (36) and after some simplification, yields

$$R_j(x) = \frac{-2p_1 \left[\beta^2 + (\lambda_j L)^2 - \frac{m (\lambda_j L)^2}{\cos \lambda_j L} \right]}{\lambda_j L \left[(\lambda_j L)^2 + \beta^2 + \beta \right]} \sin \lambda_j x \quad (39)$$

Because the 0th term in the inversion of $h(s)$ cancels the first term in the right-hand-side of Eq. (31), the final solution may be written

$$p_d = - \sum_{j=1}^{\infty} R_j(x) e^{-\alpha(\lambda_j)^2 t} \quad (40)$$

In the preceding analysis we assumed that the initial pressure in the layer was uniform. Unless the initial pressure in the bottle equals that in the layer (i.e., the bottle is full), this assumption is probably erroneous. This problem does not, however, preclude finding a solution. For times greater than the relaxation time for transients within the layer, a quasi-steady-state condition exists. The pressure in the layer decays slowly as air empties from the bottle. At this point the rate of decay depends only on the instantaneous pressure in the bottle and the permeability of the overlying layer. Quasi-steady-state behavior is independent of initial conditions.

By taking the time derivative of Eq. (40) we obtain an expression for the rate of pressure decay within the layer:

$$\frac{\partial p_d}{\partial t} = \alpha \sum_{j=1}^{\infty} (\lambda_j)^2 R_j(x) e^{-\alpha(\lambda_j)^2 t} \quad (41)$$

At the lower interface, Eq. (41) describes the decay in the bottle:

$$\frac{dp_b}{dt} = \frac{\partial p_d}{\partial t}, \text{ evaluated at } x = L, \quad (42)$$

where p_b = instantaneous pressure in the bottle.

By matching this analytical prediction of the response to the measured response, we can determine an effective permeability for the overlying layer.

A somewhat simpler expression for explicitly determining the effective permeability of material in a layer/bottle configuration can be derived. The nonlinear governing equation for the local pressure is Eq. (1). We now approximate the quasi-steady-state value of $\partial p / \partial t$; the first-order relation

$$\frac{\partial p}{\partial t} = \frac{dp_b}{dt} \frac{x}{L} \quad (43)$$

is satisfactory. The boundary conditions are

$$p = p_0 \text{ at } x = 0 \quad (44)$$

and

$$p = p_b \text{ at } x = L. \quad (45)$$

By substituting Eq. (43) into Eq. (1) and assuming constant permeability and viscosity, we obtain an ordinary differential equation. After integration and application of the boundary conditions this yields

$$p^2 = \frac{\epsilon \mu}{3k} \frac{dp_b}{dt} \frac{x^3}{L} + \left(p_b^2 - p_0^2 - \frac{\epsilon \mu}{3k} \frac{dp_b}{dt} L^2 \right) \frac{x}{L} + p_0^2. \quad (46)$$

Using continuity of mass for the bottle and Darcy's law in the layer, we obtain

$$\frac{dp_b}{dt} = - \frac{\beta k}{2\epsilon \mu L} \frac{\partial p^2}{\partial x}, \text{ evaluated at } x = L. \quad (47)$$

After finding the gradient of p^2 from Eq. (46), substituting it into Eq. (47), and rearranging, we find the permeability of the material in the layer:

$$k = - \frac{2(1 + \beta/3)\epsilon \mu L^2 \frac{dp_b}{dt}}{\beta(p_b^2 - p_0^2)}. \quad (48)$$

RESULTS

OVERTON SAND

A 57-ft layer of Overton sand was emplaced in U8e, as shown in Fig. 1. Because Overton sand is known to be a relatively high-permeability material, and no other layers were under it (the saturated bed beneath acted as an impermeable barrier), we apply the analysis for a higher-permeability bed.

When stemming ceased, the boundary condition above the bed was determined from pressure transducer 2PX; this pressure variation and the linear ramp fit to it, described by Eq. (6), are shown in Fig. 4. The value of t^* is 138 s. The response within the bed was measured with transducer 1PX. This response is plotted in Fig. 5, with the response predicted by Eq. (19) using a permeability of 36 darcys (D). The agreement between the two is quite satisfactory.

After decay of pressure in the Overton sand layer, stemming of the next layer of NTS pea gravel began. The resulting pressure rise at the upper boundary of the emplaced layer of Overton sand and the pressure response within the layer were again measured with 2PX and 1PX. The value of t^* in Eq. (21) is associated, in this case, with the terminal velocity of the pea gravel. A permeability of 36 D provides equally good agreement between these predicted and measured responses in the Overton sand layer.

This value of 36 D is considerably higher than that indicated by a previous laboratory investigation,⁴ which found the permeability of rodded Overton sand to be near 25 D. On the other hand, estimation of permeability on the basis of particle size gives a still higher value. Sieve analyses⁴ show Overton sand to be nearly

monodisperse, with a narrow diameter range centered about 0.010 in. Use of this diameter, d , in the empirical expression⁵

$$k = (6.54 \times 10^{-4}) d^2 \quad (49)$$

yields 45 D. Naturally, the presence of smaller particles would tend to reduce permeability. The permeability of emplaced Overton sand, as determined here, is in reasonable agreement with these previous estimates.

PEA GRAVEL

When stemming of the pea gravel layer stopped, pressure measurements made with 2PX and 3PX provided an opportunity to estimate pea gravel permeability. The responses within and above the layer were so nearly identical, however, that an accurate estimate was not possible. Sample calculations, using the model for a higher-permeability bed, convinced us that we easily could have distinguished differences in responses if the permeability were less than 2500 D. It must exceed 2500 D, perhaps considerably. The diameter of the pea gravel ranges from about 0.15 to 0.36 in. A rough calculation, using uniform 0.28-in. spheres in Eq. (49), gives a permeability of about 30,000 D.

Containment calculations^{1,2} are insensitive to large values for pea gravel permeability. Because flow is controlled by the other, lower permeability, layers, any high permeability of pea gravel gives essentially equivalent results.

LLL MIX

The U8e experiment offers two layers of emplaced LLL mix that are suitable for analysis. These are shown in Fig. 1. Whereas the model for higher-permeability beds sufficed for treatment of the preceding two, progressively more permeable layers, the model for lower-permeability beds is appropriate for analysis of the LLL mix layers.

The lower 43-ft layer was emplaced in the lined portion of the hole above the pea gravel and Overton sand. The saturated bed beneath the sand layer acted as an impermeable lower boundary for the bottle. Both the sand and pea gravel contribute to the bottle's total volume.

Pressure in the bottle, measured with 1PX and 2PX, had reached the maximum possible, as measured with 3PX, before stemming ceased. Hence the initial pressure distribution is known: it is uniform in the layer and bottle. Moreover, as we had assumed, pressure in the bottle was nearly uniform in space throughout the decay.

Measurements with 4PX, just above the emplaced LLL mix layer, provide a description of the boundary condition at the upper interface. The observed decay time, t^* , of 144 s was very small compared with the total response time. Therefore, we considered this boundary condition to be a step change from p_1 to zero, as expressed in Eq. (23).

The response measured with 1PX and 2PX is plotted with the response predicted by Eq. (40) in Fig. 6. In this instance the permeability determined is the effective permeability of the layer, i.e., the permeability of an equivalent amount of homogeneous material. Using a value of 8.1 D provides good agreement between the analytical prediction and the measured response.

At 4000 s the rate of decay measured with 1PX or 2PX is -1.07×10^{-4} psi/s, as indicated in Fig. 7. At that time the instantaneous pressure in the bottle and the local ambient pressure are also known. Using these values in Eq. (48), with

FIG. 6. Pressure response in the underlying bed (bottle) for the 43-ft LLL mix layer, measured with transducers 1PX and 2PX, and the response predicted by Eq. (40 using permeability = 8.1 D.

FIG. 7. Rate of decay of pressure (dp_b/dt) in the underlying bed (bottle) for the 43-ft LLL mix layer, determined from measurements with transducers 1PX and 2PX.

$$\begin{aligned}L &= 43 \text{ ft} \\ \beta &= 0.30 \\ \epsilon &= 0.319 \\ \mu &= 1.25 \times 10^{-5} \text{ lbm/ft}\cdot\text{s},\end{aligned}$$

gives an effective permeability of 7.6 D, which agrees well with the results from Eq. (40).

Nonuniformity of material in this layer of LLL mix is illustrated by the pressure response measured with 3PX, shown in Fig. 8. At all times, the measured pressure is higher than that predicted for the same location using Eq. (40) and an effective permeability of 8.1 D. The response measured with 3PX is nearly identical to that predicted 10 ft closer to the lower interface when homogeneity within the layer is assumed. This indicates that the permeability of the material between the transducer and the lower interface is much higher than the effective value for the layer. Such behavior is consistent with the expected stratification of constituents in emplaced LLL mix.

When stemming of LLL mix begins, coarse material with a high terminal velocity arrives downhole before the finer constituents. This forms a section of high-permeability material at the lower boundary of an emplaced layer. Similarly, when stemming stops, fine low-permeability material builds up at the upper boundary. In the interim, equilibrium may be established if the stemming interval is sufficiently long.

The available means of analyzing the 85-ft layer of LLL mix are more limited than those for the 43-ft layer—air pressure in the bottle was not uniform at the time stemming ended, so the initial conditions are not known. Also, stemming of a subsequent layer of pea gravel started soon after this layer was emplaced, so only a short time existed during which quasi-steady-state behavior was displayed. These constraints restrict our analysis to the explicit relation given by Eq. (48).

Pressure in the bottle was measured with all four transducers. Although the pressure was not uniform in this region, the rate of pressure decay was. Figure 9 shows the measured rate. Using the measured values for p_b and p_0 in Eq. (48), with

$$\begin{aligned}L &= 85 \text{ ft} \\ \beta &= 0.45 \\ \epsilon &= 0.319 \\ \mu &= 1.25 \times 10^{-5} \text{ lbm/ft}\cdot\text{s},\end{aligned}$$

yields an effective permeability of 6.8 D for this layer.

An important aspect of this result is that the emplaced 85-ft layer does not lie in a cased portion of the hole. The medium surrounding the layer is tuff, a porous volcanic rock; therefore we might have expected to find a much higher effective permeability because of flow through the wall of the hole. Such flow apparently was not significant. In this instance, tuff behaves as if it were impermeable. Measurements in other drill holes, however, have shown the opposite behavior—rapid pressure decay as the result of radial flow into the surrounding rock.

The observed effective permeabilities of ~8 and ~7 D for the LLL mix layers are, as we found for the Overton sand layer, somewhat higher than determined by laboratory tests. These tests⁴ found the permeability of the roddeed material to be 1.21-1.71 D. The differences probably arise from the pronounced nonuniformity in these short layers.

The quasi-steady-state analysis presented here was also applied to data obtained in a 224-ft layer of LLL mix, which was emplaced above a depth of 1922 ft in a hole designated U2ar. The effective permeability of 1.3 D determined for this longer layer was, as expected, closer to the laboratory value for roddeed LLL mix and considerably lower than those found for the 43- and 85-ft layers. This probably results from the diminished effect of nonuniformity in the longer layer, which would reduce its effective permeability.

FIG. 8. Nonuniformity in the 43-ft LLL mix layer: the pressure measured with transducer 3PX within the layer is higher than that predicted by Eq. (40) using the effective permeability of 8.1 D.

FIG. 9. Rate of decay of pressure (dp_b/dt) in the underlying bed (bottle) for the 85-ft LLL mix layer, determined from measurements with transducers 1PX, 2PX, 3PX, and 4PX.

CONCLUSIONS

To describe the fluid flow through a granular layer following the cessation of stemming, we developed two gas-flow models. One deals with the flow through a higher-permeability bed—one lying above a layer of relatively low-permeability material. The other applies to flow through a lower-permeability bed lying above a layer of relatively high-permeability material. To determine the permeabilities of LLL stemming materials, we made pressure measurements in layers of Overton sand, NTS pea gravel, and LLL mix; by matching an analytical prediction of the pressure response to the data, we determined the effective permeability of the emplaced materials.

The permeability of emplaced Overton sand was found to be near 36 D. This value is higher than that determined in laboratory tests on rodded sand, but lower than the permeability estimated on the basis of uniform particle size.

The analysis of pressure response in a layer of NTS pea gravel indicated its permeability to be at least 2500 D. This value is only a lower bound; we expect that the actual permeability is much higher. An estimated permeability of 30,000 D based on a typical particle size for NTS pea gravel supports this expectation.

Three layers of LLL mix were analyzed. The effective permeabilities range from about 8 D for a short layer to 1.3 D for a longer layer. These values are consistent with the expected deviations from laboratory results. In each case, the permeability of emplaced LLL mix is greater than or approximately equal to the value found in laboratory tests on rodded LLL mix.

The differences in emplaced LLL mix permeabilities reflect the nonuniformities in these layers. The constituents of LLL mix fall at different speeds, the larger falling faster. The result is nonuniformity at the top and bottom of each layer; pressure responses within the layers verified this. The effects of LLL mix nonuniformity on fluid flow are expected to be greatest in deep, short layers.

ACKNOWLEDGMENT

We wish to thank Tom Phillips and Larry Starrh for their constant assistance and Hugh Watling for his continuing support of this project. We are also grateful for the invaluable help of many CREMINO management team members and of the EG&G special measurements personnel.

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SAND79-0264

Unlimited Release

**Seismic Reflection Data Report
Waste Isolation Pilot Plant (WIPP)
Site, Southeastern New Mexico**

Volume II

December 1978

John L. Hern, G. J. Long & Associates, Inc.
Dennis W. Powers, Lawrence J. Barrows, Sandia Laboratories

Sandia Laboratories

SAND79-0264
Unlimited Release
Printed May, 1979

SEISMIC REFLECTION DATA REPORT

Waste Isolation Pilot Plant (WIPP) Site,
Southeastern New Mexico

VOLUME II

John L. Hern
G. J. Long & Associates, Inc.
Houston, Texas

Dennis W. Powers
and
Lawrence J. Barrows
Division 4511
Sandia Laboratories
Albuquerque, New Mexico

DECEMBER, 1978

7.0 INDEX TO ENCLOSURES IN POCKETS*

Combined Vibroseis Program within WIPP Site Area Map

1976 Seismic Program Map

Seismic Line 1

Seismic Line 2

Seismic Line 3

1977 Seismic Program Maps (2)

Seismic Line X-1

Seismic Line X-2

Seismic Line X-3

Seismic Line X-3A

Seismic Line X-4

Seismic Line X-5

Seismic Line X-6

Seismic Line X-7

Seismic Line X-8

Seismic Line X-9

Seismic Line X-10

Seismic Line X-11

Seismic Line X-12

Seismic Line X-13

1978 Seismic Program Map

Seismic Line Y-1

Seismic Line Y-2

Seismic Line Y-3

Seismic Line Y-4

Seismic Line Y-5

*Please note that all of the above data were corrected and processed with a 3200 foot elevation datum.

103°54' W
32°27' N

28

27

33

34

26'

4

3

SAN-I

261
260

25'

9

10

2

26

25

30

29

35

36

31

32

X-4

235
230

225

200

175

2

1

.6

CM-1

C-1

J-A

J-E

X-3

1.5

X-1

25

7

8

12°

1

3

28

27

26

X-2

X-1

33

34

35

X-8

ERDA
TD 2711

4

3

2

ERDA II

ERDA 8,
TD 4910

9

10

11

4

10 3 9 4
3 0 2 2

1750
1700

25

30

29

X-8

ERDA 7
TD 3908

31

32

36

6

5

12

7

8

25'

9

10

24'

SAN-3

135 16

120

15

100

R

23'

S

21

22

22

T

22'

28

27

5

12

7

8

13

18

17

E

32

JEN-I

R

S

24

19

22

20

8

BAS-I

T

25

30

29

22'

28

27

21'

33

34

20'

4

3

9

180

9

200

200

10

19'

25

30

29

FED-1

36

31

32

COUNTY

COUNTY

EDDY

LEA

6

5

12

FED-5

12

7

8

32

E

19'

9

SAN-2

2000

2000

10

R

18'

16

5

15
23

1

21

22

32°17' N
103°54' W

53'

52'

13

E

1130

12

7

8

14

13

18

17

23

24

19

0

51'

50'

49'

14

9

10 E

11

400

31

R

16)

15

200

PP-6

14

23

1

10

21

22

15

23

SAN-1

12

7

8

32

E

R

13

18

5

17

23

1

24

19

20

16

3, 17' N
1, 404' W

32°17' N
103°54' W

53'

52'

17

_____ 1976 SEISMIC PROGRAM
 _____ 1977 SEISMIC PROGRAM
 _____ 1978 SEISMIC PROGRAM

ZONE	AREA
I	100 Acres
II	1,818 Acres
III	6,221 Acres
IV	10,821 Acres
TOTAL	18,960 Acres

19

4.3

4.2

36°16'N
104°41'W

20

SANDIA LABORATORIES**SEISMIC SURVEY****LOS MEDANOS SITE AREA
EDDY COUNTY, NEW MEXICO****COMBINED VIBROSEIS PROGRAM
WITHIN WIPP SITE AREA**

INTERPRETATION BY

G J LONG & ASSOCIATES, INC

SEISMOLOGIST

APPROVED

SCALE	DATE	C. I.	
1" = 2,000'			

103°54' W
32°27' N

28

27

33

34

26'

4

3

SAN-1

26'
260

25'

9

10

28

27

26

33

34

35

ERDA 6
⊕ TD 2711

4

3

2

⊕ ERDA 11

9

10

⊕ ERDA 8
TD 4910

11

3

103°41'W
32°27'N

25

30

29

36

ERDA 7
⊕ TD 3908'

31

32

1

6

5

12

7

8

4

9

10

11

24

SAN-3

135

96

o

o

120

o

o

15

o

100

o

o

o

14

o

30

o

80

R

S

22

22

T

21

23

22

28

27

26

5

9

10

11

SAN-2

15

SAN-3 16

14

TD 15,225'

20
H

S

21 40

22

22

23

I

WRT-1

28

27

26

120 II

7

E

12

7

8

36

31

32

140

120

100

JR-1

B-1

1

JR-3

JR 7
TD 14,590'

6

CB-1

5

36

EDDY

COUNTY

12

1

LEA

COUNTY

31

FED-1

6

7

FED-5

32

5

8

32

R

E

13

32°17' N
103°54' W

14

13

18

17

24

19

20

50

49

48

15

31

R

16 §

 2^3

15

14

PP 6

21

22

23

SAN-1

16

32°17'N
103°41'W

17

19

20

ZONE	AREA
I	100 Acres
II	1,818 Acres
III	6,221 Acres
IV	10,821 Acres
TOTAL	18,960 Acres

21

SANDIA LABORATORIES

SEISMIC SURVEY

LOS MEDANOS SITE AREA
EDDY COUNTY, NEW MEXICO

1976 SEISMIC PROGRAM MAP

INTERPRETATION BY:

G. J. LONG & ASSOCIATES, INC.

SEISMOLOGIST

APPROVED:

SCALE

DATE

C. I.

1" = 2,000'

JAMES #1-A

2

225

220

215

210

205

200

195

3

LINE 8 79

190

185

180

175

170

165

160

SANDIA CORE HOLE

4

155 150 145 140 135 130 125

LINE 11 81

90 95 100 105 110 115 120

6

50

45

40

35

30

25

20

7

MARATHON #1

8

SE

Dresser Olympic

SEISMIC SURVEY
FOR

SANDIA LABS

PROJECT LOS MEDANOS LINE 1

LOCATION EDDY COUNTY, TEXAS

DATE RECORDED 4 - 28 - 76 TO 5 - 3 - 76

DATE PROCESSED 5 - 17 - 76

DATA PROCESSING

- 1 DEMULTIPLEX
- 2 GAIN RECOVERY
- 3 COMMON DEPTH POINT GATHER
- 4 APPLY DATUM STATICS
- 5 DECONVOLUTION

9

Pred. Length AUTO ms. Oper. Length 240 ms.
Start Gate For Tr 200 ms. Near Tr 300 ms.

10

4 APPLY DATUM STATICS

5 DECONVOLUTION

Pred. Length AUTO ms. Oper. Length 240 ms.
Start Gate For Tr. 800 ms. Near Tr. 300 ms.
Gate Length 3000 ms.

6 DIGITAL FREQUENCY FILTER 8-38 Hz 0 to 4000 ms.

7 VELOCITY ANALYSIS

8 APPLY NORMAL MOVEOUT

9 MUTE

11 STACK 24 FOLD

DECONVOLUTION

Pred. Length _____ ms. Oper. Length _____ ms.
Start Gate _____ ms.
Gate Length _____ ms.

12 DIGITAL FREQUENCY FILTER

12 - 38 Hz 0 to 600 ms.
8 - 30 Hz 600 to 4000 ms.
_____ Hz _____ to _____ ms.
_____ Hz _____ to _____ ms.

10 AUTOMATIC RESIDUAL STATICS

MIGRATION

DIGITAL AGC

DATE : 5 - 18 - 76

ANALOG PLAYBACK

FILTER OUT - OUT MIX NONE

HORIZONTAL SCALE 8 TR/IN VERTICAL SCALE 7.5"/SEC

COMPUTING

DATUM VRH VELOCITY 8000'/SEC

RECORDING

RECORDED BY DRESSER OLYMPIC

INSTRUMENT TYPE DFS III RECORD FILTER 8-18-62Hz

NOTCH FILTER IN SAMPLE RATE 4 ms RECORD LENGTH 4 sec

ENERGY SOURCE : VIBROSEIS SWEEP FREQUENCY 8 - 39 Hz

NO./SWEEPS PER LOCATION 16 LOCATION INTERVAL 220'

19

RECORDED BY DRESSER OLYMPIC
INSTRUMENT TYPE DFS 111 RECORD FILTER 8-18-62 Hz
NOTCH FILTER IN SAMPLE RATE 4 ms RECORD LENGTH 4 sec
ENERGY SOURCE : VIBROSEIS SWEEP FREQUENCY 8-39 Hz
NO./SWEEPS PER LOCATION 16 LOCATION INTERVAL 220'
MODEL & TYPE GEOPHONES WHS FREQ. 8 Hz NO./GROUP 48
TYPE COVERAGE 2400 % SPREAD LENGTH 11880'
NO. TRACES 48 OFFSET 880' GROUP INTERVAL 220'

SPREAD DIAGRAM

2.6

2.7

2.8

2.9

3.0

3.1

3.2

3.3

3.4

3.5

3.6

3.7

3.8

3.9

30

39

WILLS #1

203 200 195 190 185 180 175 170

2

165

160

155°

150

145

140

135

SHELL # 1

3

130

125

120

115

110

105

100

4

95

90

85

80

75

70

65

SANDIA CORE HOLE

LINE 1 197

60

55

50

45

40

35

30

5

WILLIAMS #1

6

NE

Dresser Olympic

SEISMIC SURVEY
FOR

SANDIA LABS

PROJECT LOS MEDANOS LINE 2
LOCATION EDDY COUNTY, TEXAS
DATE RECORDED 5 - 4 - 76 TO 5 - 11 - 76
DATE PROCESSED 5 - 17 - 76

DATA PROCESSING

- 1 DEMULTIPLEX
- 2 GAIN RECOVERY
- 3 COMMON DEPTH POINT GATHER
- 4 APPLY DATUM STATICS
- 5 DECONVOLUTION

Pred. Length AUTO ms. Oper. Length 240 ms.
Start Gate Far Tr. 800 ms. Near Tr. 300 ms.

7

10

2 GAIN RECOVERY

3 COMMON DEPTH POINT GATHER

4 APPLY DATUM STATICS

5 DECONVOLUTION

Pred. Length AUTO ms. Oper. Length 240 ms.
Start Gate For Tr. 800 ms. Near Tr. 300 ms.
Gate Length 3000 ms.

6 DIGITAL FREQUENCY FILTER 8-38 Hz 0 to 4000 ms.

7 VELOCITY ANALYSIS

8 APPLY NORMAL MOVEOUT

9 MUTE

11 STACK 24 FOLD

DECONVOLUTION

Pred. Length _____ ms. Oper. Length _____ ms.
Start Gate _____ ms.
Gate Length _____ ms.

12 DIGITAL FREQUENCY FILTER

12-38 Hz 0 to 600 ms.
8-30 Hz 600 to 4000 ms.
_____ Hz _____ to _____ ms.
_____ Hz _____ to _____ ms.

10 AUTOMATIC RESIDUAL STATICS

MIGRATION

DIGITAL AGC

DATE : 5 - 18 - 76

ANALOG PLAYBACK

FILTER OUT - OUT MIX NONE

HORIZONTAL SCALE 8 TR/IN VERTICAL SCALE 7.5" / SEC

COMPUTING

DATUM VRH VELOCITY 8000' / SEC

RECORDING

RECORDED BY DRESSER OLYMPIC

INSTRUMENT TYPE DFS III RECORD FILTER 8-18-62Hz

NOTCH FILTER IN SAMPLE RATE 4 ms RECORD LENGTH 4 sec

ENERGY SOURCE : VIBROSEIS SWEEP FREQUENCY 8-38 Hz

NO./SWEEPS PER LOCATION 16 LOCATION INTERVAL 220'

15

ANALOG PLAYBACK

FILTER OUT - OUT

MIX NONE

HORIZONTAL SCALE 8 TR/IN VERTICAL SCALE 7.5" / SEC

COMPUTING

DATUM VRH

VELOCITY 8000' / SEC

RECORDING

RECORDED BY DRESSER OLYMPIC

INSTRUMENT TYPE DFS III RECORD FILTER 8 - 18 - 62Hz

NOTCH FILTER IN SAMPLE RATE 4 ms RECORD LENGTH 4 sec

ENERGY SOURCE : VIBROSEIS SWEEP FREQUENCY 8 - 38 Hz

NO./SWEEPS PER LOCATION 16 LOCATION INTERVAL 220'

MODEL & TYPE GEOPHONES WHS FREQ. 8 Hz NO./GROUP 48

TYPE COVERAGE 2400 % SPREAD LENGTH 11880'

NO. TRACES 48' OFFSET 880' GROUP INTERVAL 220'

SPREAD DIAGRAM

24

TYPE COVERAGE 2400 % SPREAD LENGTH 11880'
NO. TRACES 48 OFFSET 880' GROUP INTERVAL 220'

SPREAD DIAGRAM

33

34

35

36

37

38

39

135 130 125 120 115 110 105

100

95

90

85

80

75

70

2

65

60

55

50

45

40

35

LINE 1 109

3

4

Dresser Olympic

SEISMIC SURVEY
FOR

SANDIA LABS

PROJECT LOS MEDANOS LINE 3
LOCATION EDDY COUNTY, TEXAS
DATE RECORDED 5 - 11 - 76 TO 5 - 14 - 76
DATE PROCESSED 5 - 17 - 76

DATA PROCESSING

- 1 DEMULTIPLEX
- 2 GAIN RECOVERY
- 3 COMMON DEPTH POINT GATHER
- 4 APPLY DATUM STATICS
- 5 DECONVOLUTION

Pred. Length AUTO ms. Oper. Length 240 ms.
Start Gate For Tr. 800 ms. Near Tr. 300 ms.

5

0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
1.3
1.4
1.5

3 COMMON DEPTH POINT GATHER

4 APPLY DATUM STATICS

5 DECONVOLUTION

Pred. Length AUTO ms. Oper. Length 240 ms.
Start Gate Far Tr. 800 ms. Near Tr. 300 ms.
Gate Length 3000 ms.

6 DIGITAL FREQUENCY FILTER 8-38 Hz 0 to 4000 ms.

7 VELOCITY ANALYSIS

8 APPLY NORMAL MOVEOUT

9 MUTE

11 STACK 24 FOLD

DECONVOLUTION

Pred. Length _____ ms. Oper. Length _____ ms.
Start Gate _____ ms.
Gate Length _____ ms.

12 DIGITAL FREQUENCY FILTER

12-38 Hz 0 to 600 ms.
8-30 Hz 600 to 4000 ms.
_____ Hz _____ to _____ ms.
_____ Hz _____ to _____ ms.

10 AUTOMATIC RESIDUAL STATICS

MIGRATION

DIGITAL AGC

DATE : 5 - 18 - 76

ANALOG PLAYBACK

FILTER OUT - OUT MIX NONE

HORIZONTAL SCALE 8 TR/IN VERTICAL SCALE 7.5 "/SEC

COMPUTING

DATUM VRH VELOCITY 8000'/SEC

RECORDING

RECORDED BY DRESSER OLYMPIC

INSTRUMENT TYPE DFS III RECORD FILTER 8-18-62Hz

NOTCH FILTER IN SAMPLE RATE 4 ms RECORD LENGTH 4 sec

ENERGY SOURCE : VIBROSEIS SWEEP FREQUENCY 8-38 Hz

NO. / SWEEPS PER LOCATION 16 LOCATION INTERVAL 220'

RECORDING

RECORDED BY DRESSER OLYMPIC

INSTRUMENT TYPE DFS III RECORD FILTER 8-18-62Hz

NOTCH FILTER IN SAMPLE RATE 4 ms RECORD LENGTH 4 sec

ENERGY SOURCE : VIBROSEIS SWEEP FREQUENCY 8-38 Hz

NO./SWEEPS PER LOCATION 16 LOCATION INTERVAL 220'

MODEL & TYPE GEOPHONES WHS FREQ. 8 Hz NO./GROUP 48

TYPE COVERAGE 2400% SPREAD LENGTH 11880'

NO. TRACES 48 OFFSET 180' GROUP INTERVAL 220'

SPREAD DIAGRAM

17

2.7

2.8

2.9

3.0

3.1

3.2

3.3

3.4

3.5

3.6

3.7

3.8

3.9

104°03'W
32°38'N

104°00'

29

28

27

R 30 E

32

33

S

19

1

34

5

4

3

8

9

10

2

26

25

30

35

36

31

2

1

6

11

12

7

3

29	28	E ₂₇ 31 R	26
32	33 S 19 T	34	35
5	4	3	2
8	9	10	11

4

103°50'W
32°38'N

28

E₂₇

26

31

R

S₃₃

34

35

4

3

2

9

10

11

5

35'

11

12

7

TD 1650'

34'

14

13

18

29

R

S

23

20

24

19

33'

26

25

30

6

8

9

10

17

16

30₁₅

E

R

20

S

20²¹

22

T

29

28

TD 12,695'

27

7

11

12

7

14

13

18

23

24

19

26

25

30

8

8

9

10

11

17

16

31

15

14

R

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20

20

21

22

23

T

29

28

27

26

9

26

25

30

32'

35

36

31

31'

1

6

5

30'

12

7

8

10

29

28

27

32

33

34

X-12

4

3

2

9

10

11

26

25

30

35

36

31

X-13

1

6

5

12

7

X-10

12

29

28

27

26

32

33

34

35

4

3

2

1

TD 4415'

9

10

11

12

13

E

30'

12

7

8

29'

13

18

17

28'

24

19

20

25

30

29

14

9

10

11

E

16

15

29

14

R

S

21

21

22

23

T

28

27

26

15

X-10

12

7

8

13

18

17

24

19

20

25

30

29

16

9

10

11

12

E

16

R

30

15

14

13

S

21

21

22

23

24

28

27

26

25

17

18

	28	27	26
104' 00'	59'	58'	57'

25

30

29

57'

56'

55'

54'

20

28

27

26

25

53'

52'

51'

21

SANDIA LABORATORY

SEISMIC SURVEY

ADJACENT AREA TO LOS MEDANOS
EDDY AND LEA COUNTIES, NEW MEXICO

1977 SEISMIC PROGRAM

INTERPRETATION BY
G. J. LONG & ASSOCIATES, INC.

SEISMOLOGIST

APPROVED

SCALE

DATE

C 1

1" = 2,000'

27

26

25

52'

51'

32°27'N
103°50'W

SANDIA LABORATORIES

SEISMIC SURVEY

ADJACENT AREA TO LOS MEDANOS SITE
EDDY AND LEA COUNTIES, NEW MEXICO

1977 SEISMIC PROGRAM MAP

INTERPRETATION BY
G. J. LONG & ASSOCIATES, INC

SEISMOLOGIST

APPROVED

SCALE	DATE	C I	
1" = 2,000'			

22

103°54'W
32°27'N

	28	27	
26'	33	34	☼
	4	3	
25'	9	10

26

25

30

29

35

36

X-4

31

32

236
235

225

200

175

2

J-A
☼

C-1
☼

CM-1
☼

6

X-9

5

2

X-5

J-E
☼

X-1

7

8

12°

9

28

27

26

X-2

2

33

34

35

X-8

205

200

175

150

100

125

125

ER

TD

25

50

75

ERDA II

100

70

75

9

125

145

10

ERDA B,
TD 4910

25

11

3

103°41'W
32°27'N

5

30

29

6

31

ERDA 7
TD 3908'

32

X-8

1

6

5

2

7

8

5

9

10

24'

16

15

R

23'

21

22

22

S

T

22'

28

27

6

12

7

8

13

18

17

32

JEN-I

R

24

19

22

20

BAS-I

WRT-I

T

25

30

29

FED-I

9

7

8

18

17

E

32

JEN-I

R

S

19

20

22

BAS-I

T

30

29

FED-I

10

21'

33

34

20'

4

3

19'

9

10

R

18'

16

15
23

S

T

35

36

31

1250

32

JR-1
☼

B-1
☼

JR-3
☼

JR-7
☼

6

TD 14,590'

CB-
☼

5

2

E

12

7

8

1130

14

13

18

17

12

36

X-5

01
3900
3950

COUNTY

31

32

COUNTY

EDDY

LEA

6

5

X-6

FED-5

12

7

8

32

R

13

18

17

23

1

14

32°17' N
103°54' W

53'

52'

23

24

19

0

51'

50'

49'

t
r

16

1

21

22

23

46

45

17

ZONE	
I	
II	
III	
IV	
TOTAL	1

AREA	
100	Acres
1,818	Acres
6,221	Acres
10,821	Acres
18,960	Acres

18

SANDIA LABORATORY

SEISMIC SURVEY

LOS MEDANOS SITE AREA
EDDY COUNTY, NEW MEXICO

1977 SEISMIC PROGRAM MAP

INTERPRETATION BY:
G. J. LONG & ASSOCIATES, INC.

SEISMOLOGIST:

APPROVED:

SCALE	DATE	C. I.
1" = 2,000'		

1
19

20

43'

42'

32°17'N
10°04'W**SANDIA LABORATORIES**

SEISMIC SURVEY

LOS MEDANOS SITE AREA
EDDY COUNTY, NEW MEXICO

1977 SEISMIC PROGRAM MAP

INTERPRETATION BY
G. J. LONG & ASSOCIATES, INC.

SEISMOLOGIST:

APPROVED:

SCALE	DATE	C. I.	
1" = 2,000'			

19

sec

7

VEL. ANAL.

EAST

15 20 25 30 35 40 45

sec 8

VEL. ANAL.

2

VEL. ANAL.

LINE X-2

LINE X-9

sec 9

VEL. ANAL.

3

sec 10

VEL. ANAL.

EAST →

4

ELEVATIONS

STATICS

FOLD %

c 10

EAST →

LINE DIRECTION

5

VELOCITY FUNCTION
DIRECTION
LINE INTERSECTION

STATIONS

Dynacoustic

LOS MEDANOS

LINE X-1
STATIONS 15-143
SOUTHEAST NEW MEXICO

RECORDED BY:
 DATE:
 INSTRUMENTS:
 NOTCH FILTER:
 RECORD LENGTH:
 SWEEP / RECD:
 STN INV:
 DEG PER STN:
 ARRAY TYPE:

STATICS CORP
 ORIGIN:

- 1) DEFAULT
- 2) GINPAT
- 3) VIBRO
- 4) CORRECTION
- 5) DECONVOLVE
OPERATE
PREDICT
- 6) TIME-IN
0.0-3.0
- 7) APPLY
- 8) VELOCITY
- 9) APPLY
- 10) FIRST
- 11) STACK
- 12) TIME-IN
0.0-3.0
- 13) DIGITAL
- 14) DISPLAY
9 TR/IN
10 IN/IN

1
 12

INPUT REEL HEADER INFORMATION

REEL NUMBER
DATE CREATED 10/13/77
NUMBER SAMPLES/TRACE 1500
SAMPLE RATE IN MILLS 2
PROCESSOR
LINE NUMBER X-1
JOB NUMBER
SECTION NUMBER
PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER OLYMPIC PARTY: ME. 62
DATE: SEPTEMBER 14, 1977 FILTER: 18/36-124 HZ
INSTRUMENTS: CFS 1 - CFS IV SAMPLE RATE: 2MS
WATCH FILTER: 10 SOURCE: VIBROSEIS
RECORD LENGTH: 16 SEC. SHEEP LENGTH: 12 SEC.
SHEEP FREQUENCY: 20-100 HZ NO/GROUPS 24
STN INV: 110 FT. VIB. INV: 110 FT.
GEO PER STN: 6 GEO TYPE: GSC-200
ARRAY TYPE: INLINE TYPE COVER: 1200 PCHT

PROCESSING SEQUENCE

PROCESSED BY DRESSER OLYMPIC

STATISTICS COMPUTATION

DATUM: 3200 FT.
VSN: 6000 FT/SEC.

- 1) DEMULTIPLEX
- 2) BINARY GAIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON 2ND ZERO CROSSING
- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 20-80 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 20-80 HZ
- 13) DIGITAL AGC
- 14) DISPLAY
8 TR/IN
10 IN/SEC.

SPREAD DIAGRAM

10

1
.....
121

14

15

sec 5

VEL. ANAL.

WAVE

P - B

348 345 340 335 330 325 320

0.1

0.2

sec 32

VEL. ANAL.

VEL. ANAL.

2

LINE 13
154

315 310 305 300 295 290 285

VEL. ANAL.

3

280 275 270 265 260 255 250

sec 28 & 29

VEL. ANAL.

4

E RDA 9

245

240

235

230

225

220

215

sec 20 & 21

VEL. ANAL.

VEL. ANAL.

5

LINE X6

215

210

205

200

195

190

185

180

VEL. ANAL.

6

sec 17 8 16

P-5

LINE X-5
165

175

170

165

160

155

150

145

VEL. ANAL.

VEL. ANAL.

7

sec 8 a 9

VEL. ANAL.

8

LINE X-1
73

LINE X-2
40F-1

sec 32

VEL. ANAL.

FC - 68

10

40

35

30

25

20

15

10

ELEVATIONS

STATICS

FOLD %

LINE DIRECTION

VELOCITY FUNCTION
DIRECTION
LINE INTERSECTION

STATIONS

NORTH

L0S MEDAN0S

LINE X-2
STATIONS 3-348
SOUTHEAST NEW MEXICO

L0S MEDAN0S

LINE X-2
STATIONS 3-348
SOUTHEAST NEW MEXICO

INPUT REEL HEADER INFORMATION

REEL NUMBER
DATE CREATED 10/13/77
NUMBER SAMPLES/TRACE 1500
SAMPLE RATE IN HILLS 2
PROCESSOR
LINE NUMBER X-2
JOB NUMBER
SECTION NUMBER
PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER OLYMPIC	PARTY: M0. 62
DATE: SEPTEMBER 22, 1977	FILTER: 10/36-124 HZ
INSTRUMENTS: CFS 1 - CFS IV	SAMPLE RATE: 2MS
NOTCH FILTER: IN	SOURCE: VIBROSEIS
RECORD LENGTH: 16 SEC.	SWEEP LENGTH: 12 SEC.
SWEEP FREQ: 25-100 HZ	N0/GROUPS: 24
STN INV: 110 FT.	VIB. INV: 110 FT.
000 PER STN: 6	000 TYPE: OSC-200
ARRAY TYPE: INLINE	TYPE COVER: 1200 PRCNT

PROCESSING SEQUENCE

PROCESSED BY DRESSER OLYMPIC

STATISTICS COMPUTATION

DATUM: 3200 FT.
VSN: 6000 FT/SEC.

- 1) DEMULTIPLY
- 2) BINARY GAIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON 2ND ZERO CROSSING
- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION (NOTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 13) DIGITAL AGC

22

25

14: DISPLAY
8 TR/IN
10 IN/SEC.

***** FILMING PARAMETERS *****

PERCENT GAIN 200
HORIZONTAL SCALE 8. TR/IN
VERTICAL SCALE 10. IN/SEC
FILMING DIRECTION R/L
PERCENT DWA 0
POLARITY BLACK+VE

DATA PROCESSED BY
CHASSIS R.T.W.I.C

33

44

50

53

55

sec 24

sec 25

VEL ANAL

SOUTHEAST

LINE X4

31

5

10

15

20

25

30

35

sec 30

VEL. ANAL.

VEL. ANAL.

2

40

45

50

55

60

65

70

sec 32

4

VEL. ANAL.

VEL. ANAL.

110

115

120

125

130

135

140

sec 33

VEL ANAL

5

LINE X-2
250

145

150

155

160

165

170

17

6

sec - 4

VEL. ANAL.

1650
1605
1540
1515
1470
1425
1380
1335
1290
1245
1200
-65

ELEVATION

15
0
200
400
600
800
1000
1200

STATICS

15
0
200
400
600
800
1000
1200

FOLD %

sec 3

LINE DIR

SOUTHEAST

VELOCITY
DIRECTION
LINE INT

210 215 220 225 230 235

0.1
0.2

STATIONS

7

ELEVATIONS

STATICS

FOLD %

sec 3

LINE DIRECTION

8

SOUTHEAST

VELOCITY FUNCTION
DIRECTION
LINE INTERSECTION

STATIONS

Dynamic

LOS MEDANOS

LINE X-3
STATIONS 3-235
SOUTHEAST NEW MEXICO

INPUT REEL HEADER INFORMATION

REEL NUMBER
DATE CREATED 11/16/77
NUMBER SAMPLES/TRACE 1500
SAMPLE RATE IN MILLS 2
PROCESSOR
LINE NUMBER
JOB NUMBER
SECTION NUMBER
PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER OLYMPIC	PARTY: MO. 62
DATE: OCTOBER 27, 1977	FILTER: 18/36-124 HZ
INSTRUMENTS: CFS 1 - CFS 1V	SAMPLE RATE: 2MS
NOTCH FILTER: IN	SOURCE: VIBROSEIS
RECORD LENGTH: 16 SEC	SWEPT LENGTH: 12 SEC.
SWEPT FREQUENCY: 25-100 HZ	NO GROUPS: 24
STN INV: 110 FT.	VIB. INV: 110 FT.
GEOS PER STN: 6	GEOS TYPE: OSC-200
ARRAY TYPE: IN LINE	TYPE COVER: 1200 PCHT

PROCESSING SEQUENCE

PROCESSED BY DRESSER OLYMPIC

STATISTICS COMPUTATION

DATUM: 3200 FT.
YSH: 6000 FT/SEC.

- 1) DEMULTIPLEX
- 2) BINARY GAIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON 2ND ZERO CROSSING
- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NPH
- 10) FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 13) DIGITAL AGC
- 14) DISPLAY
8 TR/IN
10 IN/SEC.

16

SPREAD DIAGRAM
1 12 VP 13 24
.....
1210 440 440 1210

***** FILMING PARAMETERS *****

PERCENT GAIN 200
HORIZONTAL SCALE 8. TR/IN

1.3
1.4
1.5
1.6
1.7
1.8
1.9
2.0
2.1
2.2

23

***** FILMING PARAMETERS *****

PERCENT GRAIN 200
VERTICAL SCALE 10: IN/SEC
FILMING DIRECTION L/R
PERCENT GRAIN 0
POLARITY BLACK+VE

DATA PROVIDED BY

24

31

sec
25

sec 30

VEL. ANAL.

VEL. ANAL.

EAST

VEL. ANAL.

LINE 4

6.5

1

5

10

15

20

25

30

35

0.1

0.2

ELEVATIONS

STATICS

FOLD %

VEL. ANAL.

LINE X-3
#25

EAST

LINE DIRECTION

VELOCITY FUNCTION
DIRECTION
LINE INTERSECTION

STATIONS

2

Dynacoustic

LOS MEDANOS

LINE X-3A

3

STATIONS 3-46 SOUTHEAST NEW MEXICO

INPUT REEL HEADER INFORMATION

REEL NUMBER
DATE CREATED 12/09/77
NUMBER SAMPLE/TRACE 1500
SAMPLE RATE IN KILLS 2
PROCESSOR
LINE NUMBER X-3A
JOB NUMBER
SECTION NUMBER
PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER OLYMPIC	PARTY: NO. 62
DATE: NOVEMBER 22, 1977	FILTER: 18/36-124 HZ
INSTRUMENTS: CFS 1 - CFS 1V	SAMPLE RATE: 2
NOTCH FILTER: IN	SOURCE: VIBROSEIS
RECORD LENGTH: 16 SEC.	SWEPT LEN: 12 SEC.
SWEPT FREQ: 25-100 HZ	NO/GROUPS 24
STN INV: 110 FT.	VIB. INV: 110 FT.
GEO PER STN: 6	GEO TYPE: OSC-200
ARRAY TYPE: INLINE	TYPE COVER: 1200 PERCENT

PROCESSING SEQUENCE

PROCESSED BY DRESSER OLYMPIC

STATISTICS COMPUTATION

DATUM: 3200 FT.
VSM: 6000 FT/SEC.

- 1) DEMULTIPLEX
- 2) BINARY GAIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON 2ND ZERO CROSSING
- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 13) DIGITAL AGC
- 14) DISPLAY
0 TR/IN
10 IN/SEC.

SPREAD DIAGRAM

1 12 VP 13 24
..... 1210 440 440 1210

4

***** FILMING PARAMETERS *****

PERCENT GRAIN 200
HORIZONTAL SCALE 8. TR/IN
VERTICAL SCALE 10. IN/SEC
FILMING DIRECTION L/R
PERCENT BGR 0
POLARITY BLACK+VE

DATA PROVIDED BY
DANSON ELECTRIC

6

8

sec 25

VEL. ANAL.

2

sec 24

VEL. ANAL.

VEL. ANAL.

24

VEL. ANAL.

P 12

3

70

75

80

85

90

95

100

sec 13

VEL. ANAL.

4

VEL. ANAL.

P 13

sec 12

VEL. ANAL.

LINE X-5
58

5

140 145 150 155 160 165 170 175

ELEVATIONS

STATICS

FOLD %

LINE DIRECTION

VELOCITY FUNCTION
DIRECTION
LINE INTERSECTION

STATIONS

NOISE

7

L0S

ELEVATIONS

STATICS

FOLD %

LINE DIRECTION

8

VELOCITY FUNCTION
DIRECTION
LINE INTERSECTION

STATIONS

Dynacoustic

L0S MEDANOS

LINE X-4

0.3

0.4

0.5

0.6

0.7

0.8

0.9

1.0

1.1

9

RECORDED BY: 0
 DATE: 0
 INSTRUMENTS: 1
 NOTCH FILT: 1
 RECORD LEN: 1
 SWEPT FREQ: 2
 STN INV: 1
 GEO PER STN: 6
 ARRAY TYPE: 1

STATICS COMPU
 DATUM:
 VSM:

- 1) DEMULTIP
- 2) BINARY
- 3) VIBROSEI
- 4) COMMON D
- 5) DECONVUL
OPERATOR
PREDICTI
- 6) TIME-INV
0.0-3.0
- 7) APPLY D
- 8) VELOCITY
- 9) APPLY N
- 10) FIRST
- 11) STACK 1
- 12) TIME-INV
0.0-3.0
- 13) DIGITAL
- 14) DISPLAY
8 TR/IN
10 IN/IN

15

STATIONS 3-233 SOUTHEAST NEW MEXICO

INPUT REEL HEADER INFORMATION

REEL NUMBER
DATE CREATED 11/16/77
NUMBER SAMPLE/TRACE 1500
SAMPLE RATE IN HILLS 2
PROCESSOR
LINE NUMBER X-4
JOB NUMBER
SECTION NUMBER
PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER OLYMPIC	PARTY: WQ. 62
DATE: OCTOBER 27, 1977	FILTER: 18/36-124 HZ
INSTRUMENTS: CFS I - DFS IV	SAMPLE RATE: 2MS
NOTCH FILTER: 1N	SOURCE: VIBROSEIS
RECORD LEN: 16 SEC.	SWEEP LEN: 12 SEC.
SWEEP FREQ: 25-100 HZ	NO/GROUPS 24
STN INV: 110 FT.	VIB. INV: 110 FT.
GEO PER STN: 6	GEO TYPE: GSC-200
ARRAY TYPE: INLINE	TYPE COVER: 1200 PRCNT

PROCESSING SEQUENCE

PROCESSED BY DRESSER OLYMPIC

STATICS COMPUTATION
DATUM: 3200 FT.
VSM: 6000 FT/SEC.

- 1) DEMULTIPLEX
- 2) BINARY GAIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON 2ND ZERO CROSSING
- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 13) DIGITAL AGC
- 14) DISPLAY
0 TR/IN
10 IN/SEC.

16

SPREAD DIAGRAM
VP
1 12 13 24
.....
1210 440 440 1210

1.2

1.3

1.4

1.5

1.6

1.7

1.8

1.9

2.0

17

23

***** FILMING PARAMETERS *****

PERCENT BAIN 200
HORIZONTAL SCALE 8. TA/IN
VERTICAL SCALE 10. IN/SEC
FILMING DIRECTION L/R
PERCENT BAIN 0
POLARITY BLACK+VE

DATA PROCESSED BY
OBERON OLYMPIC

24

sec 12

VEL. ANAL.

VEL. ANAL.

SOUTHEAST

2

VEL. ANAL.

LINE X 4

195

35

40

45

50

55

60

65

sec 7

VEL. ANAL.

3

sec 18

VEL. ANAL.

70 75 80 85 90 95 100

8

ANAL

VEL ANAL

4

sec 16

VEL. ANAL.

6

sec 21

VEL. ANAL.

175

180

185

190

195

200

205

VEL. ANAL.

7

210

215

220

225

230

235

240

sec 22

VEL ANAL

8

VEL ANAL

sec

45

250

255

260

265

270

275

VEL. ANAL.

9

280

285

290

295

300

305

310

26

VEL. ANAL.

10

VEL. ANAL.

sec 25

sec 36

VEL. ANAL.

350

355

360

365

370

375

380

ELEVATIONS

STATICS

LINE DIRECTION

VELOCITY FUNCTION
DIRECTION
LINE INTERSECTION

STATIONS

12

Dynacoustic
SOUTH AFRICA

LOS MEDANOS
LINE X-5
STATIONS 3-391
SOUTHEAST NEW MEXICO

INPUT REEL HEADER INFORMATION

REEL NUMBER
DATE CREATED 11/04/77
NUMBER SAMPLES/TRACE 1600
SAMPLE RATE IN MILLS 2
PROCESSOR
LINE NUMBER X-5

RECORDED BY:
DATE:
INSTRUMENTS:
NOTCH FILTER:
RECORD LENGTH:
SWEEP FREQUENCY:
STATION INVERTED:
GEOLOGICAL PERIOD:
ARRAY TYPE:

STATISTICS ON
DATA
VOLUME:

- 1) DEMUL
- 2) BINNING
- 3) VIBRATION
- 4) CORRECTION
- 5) DECONVOLUTION
OPEN
FREQUENCY
- 6) TIME
0.0-0.0
- 7) APPLY
- 8) VELOCITY
- 9) APPLY
- 10) FIRST
- 11) STACK
- 12) TIME
0.0-0.0
- 13) DIGIT
- 14) DISPLAY
8 TR
10 I

1
.....

25

SECTION NUMBER
PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER OLYMPIC	PARTY: W0. 62
DATE: OCTOBER 3, 1977	FILTER: 18/36-124 HZ
INSTRUMENTS: CFS 1 - DFS IV	SAMPLE RATE: 2MS
NOTCH FILTER: 1N	SOURCE: VIBROSEIS
RECORD LENGTH: 16 SEC.	SWEPT LENGTH: 12 SEC.
SWEPT FREQUENCY: 25-100 HZ	N0/GR0UPS: 24
STN INV: 110 FT.	VIB. INV: 110 FT.
GEO PER STN: 6	GEO TYPE: GSP-200
ARRAY TYPE: INLINE	TYPE COVER: 1200 PRCNT

PROCESSING SEQUENCE

PROCESSED BY DRESSER OLYMPIC

STATISTICS COMPUTATION

DATUM: 3200 FT.
VSH: 6000 FT/SEC.

- 1) DEMULTIPLEX
- 2) BINARY GAIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON 2ND ZERO CROSSING
- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 13) DIGITAL AGC
- 14) DISPLAY
8 TR/IN
10 IN/SEC.

***** FILMING PARAMETERS *****

PERCENT GAIN 200
HORIZONTAL SCALE 8. TR/IN
VERTICAL SCALE 10. IN/SEC
FILMING DIRECTION L/R
PERCENT B/R 0
POLARITY BLACK+VE

DATA PROCESSED BY
DRESSER OLYMPIC

26

1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2.0
2.1

1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2.0

1210

440

440

1210

***** FILMING PARAMETERS *****

PERCENT GRIN 8. 200
HORIZONTAL SCALE 10. TR/IN
VERTICAL SCALE 10. IN/SEC
FILMING DIRECTION L/R
PERCENT BAR 0
POLARITY BLACK+VE

DATA PROVIDED BY
CHENIERE ALYPIC

41

2.0

2.1

2.2

2.3

2.4

2.5

2.6

2.7

2.8

2.9

42

VEL ANAL

SOUTHEAST

sec 12

VEL ANAL

5

10

15

20

25

30

35

VEL. ANAL.

LINE X 4

193

2

sec 7

VEL. ANAL.

3

sec 18

VEL. ANAL.

3

ANAL

VEL ANAL

4

105

110

115

120

125

130

135

sec 17

VEL. ANAL.

5

se

LINE X-2
143

sec 16

VEL. ANAL.

6

sec 21

VEL. ANAL.

175

180

185

190

195

200

205

VEL ANAL

7

210 215 220 225 230 235 240

sec 22

VEL. ANRI

8

sec 21

VEL. ANRI

26

VEL. ANAL.

VEL. ANAL.

se

25

sec 36

VEL. ANAL.

ELEVATIONS

STATICS

LINE DIRECTION

VELOCITY FUNCTION
DIRECTION
LINE INTERSECTION

STATIONS

12

Dynamic

LOS MEDANOS

LINE X-5
STATIONS 3-391
SOUTHEAST NEW MEXICO

INPUT REEL HEADER INFORMATION

REEL NUMBER
DATE CREATED 11/04/77
NUMBER SAMPLES/TRACE 1500
SAMPLE RATE IN MLLS 2
PROCESSOR
LINE NUMBER X-5

13

L0S MEDANOS

LINE X-5
STATIONS 3-391
SOUTHEAST NEW MEXICO

INPUT REEL HEADER INFORMATION

REEL NUMBER
DATE CREATED 11/04/77
NUMBER SAMPLES/TRACE 1500
SAMPLE RATE IN HILLS 2
PROCESSOR
LINE NUMBER X-5
NO NUMBER
SECTION NUMBER
PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER OLYMPIC	PARTY: MO. 62
DATE: OCTOBER 3, 1977	FILTER: 10/36-124 HZ
INSTRUMENTS: CFS I - CFS IV	SAMPLE RATE: 2MS
NOTCH FILTER: IN	SOURCE: VIBROSEIS
RECORD LEN: 16 SEC.	SWEEP LEN: 12 SEC.
SWEEP FREQ: 25-100 HZ	NO/GROUPS 24
STN INV: 110 FT.	VIB. INV: 110 FT.
DEB PEN STN: 6	GES TYPE: GSC-200
ARRAY TYPE: INLINE	TYPE COVER: 1200 PRCNT

PROCESSING SEQUENCE

PROCESSED BY DRESSER OLYMPIC

STATISTICS COMPUTATION

DATUM: 3200 FT.
VSM: 6000 FT/SEC.

- 1) DEMULTIPLEX
- 2) BINARY GAIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON 2ND ZERO CROSSING
- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-2.0 SEC. 25-80 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 13) DIGITAL AGC
- 14) DISPLAY
8 TR/IN
10 IN/SEC.

26

SPREAD DIAGRAM

40

SPREAD DIAGRAM

1 12 VP 13 24

..... 1210 440 440 1210

***** FILMING PARAMETERS *****

PERCENT GAIN 200
HORIZONTAL SCALE 8. IN/IN
VERTICAL SCALE 10. IN/SEC
FILMING DIRECTION L/R
PERCENT BPA 0
POLARITY BLACK+VE

DATA PROVIDED BY

42

47

sec 20

VEL. ANAL.

SOUTHERST

VEL. ANAL.

LINE X-2
212

2

sec 28

VEL. ANAL.

VEL. ANAL.

3

180

175

170

165

160

155

150

sec 27

VEL. ANAL.

4

145

140

135

130

125

120

115

rec 35

VEL ANAL

6

S

75 70 65 60 55 50 45

sec 2

VEL ANAL

AA - 2

40

35

30

25

20

15

10

7

sec 1

VEL ANAL

2

ELEVATIONS

STATICS

FOLD %

LINE DIRECTION

VELOCITY FUNCTION
DIRECTION
LINE INTERSECTION

STATIONS

SOUTHEAST

10

5

Dynacoustic

LOS MEDANOS

LINE X-6

8

0.2

0.3

0.4

0.5

0.6

0.7

0.8

0.9

1.0

10

LOS MEDANOS

LINE X-6
STATIONS 3-251
SOUTHEAST NEW MEXICO

INPUT REEL HEADER INFORMATION

REEL NUMBER
DATE CREATED 11/02/77
NUMBER SAMPLES/TRACE 1800
SAMPLE RATE IN MILLS 2
PROCESSOR
LINE NUMBER X-6
SECTION NUMBER
PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER OLYMPIC	PARTY: WB. 62
DATE: OCTOBER 11, 1977	FILTER: 18/36-124 HZ
INSTRUMENTS: CFS 1 - DFS IV	SAMPLE RATE: 2MS
NOTCH FILTER: 1N	SOURCE: VIBROSEIS
RECORD LENGTH: 16 SEC.	SWEEP LENGTH: 12 SEC.
SWEEP FREQ: 25-100 HZ	NB/DROPS: 24
STN INV: 110 FT.	VIB. INV: 110 FT.
DEB PER STN: 6	DEB TYPE: GSC-200
ARRAY TYPE: INLINE	TYPE COVER: 1200 PCHT

PROCESSING SEQUENCE

PROCESSED BY DRESSER OLYMPIC

STATICS COMPUTATION
DATUM: 3200 FT.
VSM: 6000 FT/SEC.

- 1) DEMULTIPLEX
- 2) BINARY ORIGIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATION LENGTH=140 MILLS
PREDICTION TIME BASED ON 2ND ZERO CROSSING
- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 13) DIGITAL AGC
- 14) DISPLAY
8 TR/IN
10 IN/SEC.

15

SPREAD DIAGRAM
1 12 VP 19 24
..... 1210 440 440 1210

13) DIGITAL AGC

14: DISPLAY
8 TR/IN
10 IN/SEC.

***** FILMING PARAMETERS *****

PERCENT GAIN 200
HORIZONTAL SCALE 8. TR/IN
VERTICAL SCALE 10. IN/SEC
FILMING DIRECTION R/L
PERCENT 0
POLARITY BLACK+VE

DATA PROVIDED BY

VEL ANAL

VEL ANAL

ERDA 0

sec 2

VEL ANAL

3

75

80

85

90

95

100

105

VEL. ANAL.

E RDA- 6

sec 35

VEL. ANAL.

4

LINE X-B

122

110

115

120

125

130

135

140

ELEVATIONS

STATICS

FOLD %

sec 25

LINE DIRECTION

VELOCITY FUNCTION
DIRECTION
LINE INTERSECTION

STATIONS

6

Orange County

LOS MEDANOS

L0S MEDAN0S

**LINE X-7
STATIONS 3-170
SOUTHEAST NEW MEXICO**

INPUT REEL HEADER INFORMATION

REEL NUMBER
DATE CREATED 11/17/77
NUMBER SAMPLE/TRACE 1500
SAMPLE RATE IN MILLS 2
PROCESSOR
LINE NUMBER X-7
JOB NUMBER
SECTION NUMBER
PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER BLYMPIC	PARTY: HO. 62
DATE: NOVEMBER 5, 1977	FILTER: 10/36-124 HZ
INSTRUMENTS: CFS 1 - DPS IV	SAMPLE RATE: 2MS
NOTCH FILTER: 1K	SOURCE: VIBROSEIS
RECORD LENGTH: 16 SEC.	SWEEP LENGTH: 12 SEC.
SHEEP FREQ: 25-100 HZ	NO/GROUPS 24
STH INV: 110 FT.	VIB. INV: 110 FT.
GEOPER STN: 6	GEOP TYPE: GSC-200
ARRAY TYPE: INLINE	TYPE COVER: 1200 PERCENT

PROCESSING SEQUENCE

PROCESSED BY DRESSER BLYMPIC

STATISTICS COMPUTATION
DATUM: 3200 FT.
VSM: 6000 FT/SEC.

- 1) DEMULTIPLEX
- 2) BINARY GAIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON 2ND ZERO CROSSING
- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 13) DIGITAL AGC
- 14) DISPLAY
0 TR/IN
10 IN/SEC.

12

- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 13) DIGITAL AGC
- 14) DISPLAY
8 TR/IN
10 IN/SEC.

SPREAD DIAGRAM

1 12 13 24

1210 440 440 1210

VP

***** FILMING PARAMETERS *****

PERCENT GRAIN 200
HORIZONTAL SCALE 8. TR/IN
VERTICAL SCALE 10. IN/SEC
FILMING DIRECTION L/R
PERCENT BAR 0
POLARITY BLACK+VE

DATA PREPARED BY

2.0

2.1

2.2

2.3

2.4

2.5

2.6

2.7

2.8

2.9

24

sec 34

VEL. ANAL.

VEL. ANAL.

EAST

200 195 190 185 180 175

VEL. BNRL

2

sec 35

sec 36

VEL. ANAL.

4

ELEVATION

6

STATICS

FOLD %

sec 32

LINE DI

CHNL

EAST

VELOCITY
DIRECTION
LINE IN

STATION

ELEVATIONS

STATICS

FOLD %

sec 32

EAST →

LINE DIRECTION →

VELOCITY FUNCTION
DIRECTION
LINE INTERSECTION

7

STATIONS

8

10

LOS MEDA

LINE X-
STATIONS 3-
SOUTHEAST NEW-

14

INPUT REEL HEADER INFORMATION

REEL NUMBER
DATE CREATED 12/0
NUMBER SAMPLE/TRACE
SAMPLE RATE IN MILLS
PROCESSOR
LINE NUMBER
JOB NUMBER
SECTION NUMBER
PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER OLYMPIC	PARTY:
DATE: NOVEMBER 13, 1977	FILTER:
INSTRUMENTS: CFS I - DFS IV	SAMPLE
NOTCH FILTER: IN	SOURCE:
RECORD LENGTH: 16 SEC.	SHEEP L
SHEEP FREQ: 25-100 HZ	NO/GRAB
STN INV: 110 FT.	VIB. IN
GEO PER STN: 6	GEO TYPE
ARRAY TYPE: INLINE	TYPE CO

PROCESSING SUMMARY

PROCESSED BY DRESSER

STATISTICS COMPUTATION

DATUM: 3200 FT.
VSW: 6000 FT/SEC.

- 1) DEMULTIPLEX
- 2) BINARY GAIN RECOVERY
- 3) MICROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON 2ND ZERO
0.0-3.0 SEC. 25-60 HZ
- 6) TIME-INVARIANT DIGITAL FREQUENCY
0.0-3.0 SEC. 25-60 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY
0.0-3.0 SEC. 25-60 HZ
- 13) DIGITAL AGC
- 14) DISPLAY
0 TR/IN
10 IN/SEC.

L0S MEDAN0S

LINE X-8
STATIONS 3-203
SOUTHEAST NEW-MEXICO

INPUT REEL HEADER INFORMATION

REEL NUMBER
DATE CREATED 12/08/77
NUMBER SAMPLE/TRACE 1500
SAMPLE RATE IN MILLS 2
PROCESSOR
LINE NUMBER X-8
JOB NUMBER
SECTION NUMBER
PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER OLYMPIC	PARTY: MO. 62
DATE: NOVEMBER 13, 1977	FILTER: 18/36-124 HZ
INSTRUMENTS: CFS 1 - DFS IV	SAMPLE RATE: 2MS
NOTCH FILTER: 1N	SOURCE: VIBROSEIS
RECORD LEN: 16 SEC.	SWEEP LEN: 12 SEC.
SWEEP FREQ: 25-100 HZ	NO/GROUPS 24
STN INV: 110 FT.	VIB. INV: 110 FT.
GEO PER STN: 6	GEO TYPE: GSC-20D
ARRAY TYPE: INLINE	TYPE COVER: 1200 PRCNT

PROCESSING SEQUENCE

PROCESSED BY DRESSER OLYMPIC

STATICS COMPUTATION

DATUM: 3200 FT.
VSM: 6000 FT/SEC.

- 1) DEMULTIPLEX
- 2) BINARY GAIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON 2ND ZERO CROSSING
- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 13) DIGITAL AGC
- 14) DISPLAY
0 TR/IN
10 IN/SEC.

15

- 12) TIME-INVM
0.0-3.0 S
13) DIGITAL M
14) DISPLAY
8 TR/IN
10 IN/SEC.

1210

12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-8.0 SEC. 20-80 HZ

13) DIGITAL AGC

14) DISPLAY
8 TR/IN
10 IN/SEC.

***** FILMING PARAMETERS *****

PERCENT GAIN 200
HORIZONTAL SCALE 8. TR/IN
VERTICAL SCALE 10. IN/SEC
FILMING DIRECTION L/R
PERCENT BAR 0
POLARITY BLACK+VE

DATA PROVIDED BY
ORIGIN & TYPE

sec 5

VEL. ANAL.

SOUTHEAST

VEL. ANAL.

sec 8

sec 9

VEL. ANAL.

2

SOUTHEAST

ELEVATIONS

STATICS

FOLD %

ec 9

VEL. ANAL.

SOUTHEAST

LINE DIRECTION

VELOCITY FUNCTION
DIRECTION
LINE INTERSECTION

3

STATIONS

Dresser Olympic

L0S MEDANOS

LINE X-9
STATIONS 3-66.5

LINE INTERSECTION

STATIONS

L05 MEDAN05

LINE X-9
STATIONS 3-66.5
SOUTHEAST NEW MEXICO

INPUT REEL HEADER INFORMATION

REEL NUMBER
DATE CREATED 10/13/77
NUMBER SAMPLE/TRACE 1500
SAMPLE RATE IN M1: S 2
PROCESSOR
LINE NUMBER X-9
JOB NUMBER
SECTION NUMBER
PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER OLYMPIC	PARTY: WB. 62
DATE: SEPTEMBER 24, 1977	FILTER: 18/36-124 HZ
INSTRUMENTS: CFS I - DFS IV	SAMPLE RATE: 2MS
NOTCH FILT: IN	SOURCE: VIBROSEIS
RECORD LEN: 16 SEC.	SWEEP LEN: 12 SEC.
SWEEP FREQ: 25-100 HZ	N0/GR0UPS 24
STN INV: 110 FT.	VIB. INV: 110 FT.
GE0 PER STN: 6	GE0 TYPE: GSC-200
ARRAY TYPE: INLINE	TYPE C0VER: 1200 PRcnt

PROCESSING SEQUENCE

PROCESSED BY DRESSER OLYMPIC

STATICS COMPUTATION

DATUM: 3200 FT.
VSW: 6000 FT/SEC.

- 1) DEMULIPLX
- 2) BINARY GAIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT ORTHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON 2ND ZERO CROSSING
- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ

6

INPUT REEL HEADER INFORMATION

REEL NUMBER
 DATE CREATED 10/13/77
 NUMBER SAMPLES/TRACE 1500
 SAMPLE RATE IN MILLS 2
 PROCESSOR
 LINE NUMBER X-9
 JOB NUMBER
 SECTION NUMBER
 PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER OLYMPIC PARTY: W0. 62
 DATE: SEPTEMBER 24, 1977 FILTER: 18/36-124 HZ
 INSTRUMENTS: CFS 1 - DFS IV SAMPLE RATE: 2MS
 NOTCH FILTER: IN SOURCE: VIBROSEIS
 RECORD LENGTH: 16 SEC. SWEEP LENGTH: 12 SEC.
 SWEEP FREQUENCY: 25-100 HZ NO/GROUPS 24
 STATION INVERT: 110 FT. VIB. INVERT: 110 FT.
 GEO PER STATION: 6 GEO TYPE: GSC-200
 ARRAY TYPE: INLINE TYPE COVER: 1200 PERCENT

PROCESSING SEQUENCE

PROCESSED BY DRESSER OLYMPIC

STATISTICS COMPUTATION

DATUM: 3200 FT.
 VSM: 6000 FT/SEC.

- 1) DEMULTIPLEX
- 2) BINARY GAIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON 2ND ZERO CROSSING
- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25 80 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25 80 HZ
- 13) DIGITAL AGC
- 14) DISPLAY
8 TR/IN
10 IN/SEC.

- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10: FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 13) DIGITAL AGC
- 14: DISPLAY
8 TR/IN
10 IN/SEC.

SPREAD DIAGRAM

1	12	13	24
.....			
1210	440 440	1210	

***** FILMING PARAMETERS *****

PERCENT GAIN 200
HORIZONTAL SCALE 8. TR/IN
VERTICAL SCALE 10. IN/SEC
FILMING DIRECTION L/R
PERCENT BAR 0
POLARITY BLACK+VE

DATA PROCESSED BY
DICKER OLYMPIC

12

1.8

1.9

2.0

2.1

2.2

2.3

2.4

2.5

2.6

2.7

13

ELEVATIONS

STATICS

FOLD %

sec 5

LINE DIRECTION

VELOCITY FUNCTION
DIRECTION

STATIONS

LOS

STAT

ELEVATIONS

STATICS

FOLD %

2

sec 5

LINE DIRECTION

VELOCITY FUNCTION
DIRECTION

STATIONS

Dresser Dynamic

L0S MEDANOS

LINE X-10
STATIONS 5-25

3

RECORDED BY: DR
DATE: NM
INSTRUMENTS: CP
NOTCH FILT: IN
RECORD LEN: 10
SWEEP FREQ: 20
STN INV: 10
GEO PER STN: 6
ARRAY TYPE: IN

STATICS COMPUT
DATUM:
VSW:

- 1) DEMULTIPL
- 2) BINARY GA
- 3) VIBROSEIS
- 4) COMMON DE
- 5) DECONVOLL
OPERATION
PREDICTIO
- 6) TIME-INVA
0.0-3.0 S
- 7) APPLY DAT
- 8) VELOCITY
- 9) APPLY NME
- 10) FIRST P

LOS MEDANOS

LINE X-10
STATIONS 5-25
SOUTHEAST NEW MEXICO

INPUT REEL HEADLINE INFORMATION

REEL NUMBER
DATE CREATED 12/9/77
NUMBER SAMPLE/TRACK 1500
SAMPLE RATE IN MILLS 2
PROCESSOR
LINE NUMBER * 10
JOB NUMBER
SECTION NUMBER
PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER OLYMPIC	PARTY: W0. 62
DATE: NOVEMBER 21, 1977	FILTER: 18/36-124 HZ
INSTRUMENTS: CFS I - DFS IV	SAMPLE RATE: 2MS
NOTCH FILTER: 1N	SOURCE: VIBROSEIS
RECORD LEN: 16 SEC.	SWEEP LEN: 12 SEC.
SWEEP FREQ: 25-100 HZ	NO/GROUPS: 24
STW INV: 110 FT.	VIB. INV: 110 FT.
GEO PER STN: 6	GEO TYPE: GSC-200
ARRAY TYPE: INLINE	TYPE COVER: 1200 PRCNT

PROCESSING SEQUENCE

PROCESSED BY DRESSER OLYMPIC

STATISTICS COMPUTATION

DATUM: 3200 FT.
VSM: 6000 FT/SEC.

- 1) DEMULTIPLEX
- 2) BINARY GAIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON 2ND ZERO CROSSING
- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION (MUTE)

4

PREDICTIO

- 6) TIME-INVA
0.0-3.0
- 7) APPLY DAT
- 8) VELOCITY
- 9) APPLY NH
- 10: FIRST BR
- 11) STACK 12
- 12) TIME-INVA
0.0-3.0
- 13) DIGITAL
- 14: DISPLAY
8 TR/IN
10 IN/SEC

1
1210

5

PREDICTION TIME BASED ON 2ND ZERO CROSSING

- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 13) DIGITAL AGC
- 14) DISPLAY
9 TR/IN
10 IN/SEC.

SPREAD DIAGRAM
1 12 VP 13 24
* * * * *
1210 440 440 1210

***** FILMING PARAMETERS *****

PERCENT GAIN 200
HORIZONTAL SCALE 8. TR/IN
VERTICAL SCALE 10. IN/SEC
FILMING DIRECTION L/R
PERCENT BAR 0
POLARITY BLACK+VE

DATA PROCESSED BY
UNION PACIFIC

6

7

sec II

sec

VEL. ANAL.

VEL. ANAL.

NORTHEAST

85

80

75

70

65

60

12

VEL. ANAL.

2

ELEVATIONS

STATICS

FOLD %

3

sec 1

LINE DIRECTION

VELOCITY FUNCTION
DIRECTION

STATIONS

L0S MEDANO

LINE X-11
STATIONS 2-27

ELEVATIONS

STATICS

FOLD %

LINE DIRECTION

VELOCITY FUNCTION
DIRECTION

STATIONS

4

Deane Oblique

L0S MEDANOS

LINE X-11
STATIONS 2-27

STATIONS 3-8 SOUTHEAST NEW MEX

INPUT REEL HEADER INFORMATION

REEL NUMBER
DATE CREATED 12/12/77
NUMBER SAMPLE/TRACE 1500
SAMPLE RATE IN HILLS 2
PROCESSOR
LINE NUMBER X-11
JOB NUMBER
SECTION NUMBER
PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER OLYMPIC PARTY: W
DATE: NOVEMBER 20, 1977 FILTER: S
INSTRUMENTS: CFS I - DFS IV SAMPLE RATE: S
NOTCH FILTER: IN SOURCE: V
RECORD LEN: 16 SEC. SHEEP LEN: S
SHEEP FREQ: 25-100 HZ NO/GROUPS 2
STN INV: 110 FT. VIB. INV: S
GEO PER STN: 6 GEO TYPE: G
ARRAY TYPE: INLINE TYPE COVER: S

PROCESSING SEQUENCE

PROCESSED BY DRESSER OLYMPIC

STATICS COMPUTATION
DATUM: 3200 FT.
VSW: 6000 FT/SEC.

- 1) DEMULTIPLY
- 2) BINARY GAIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON 2ND ZERO CROSSING
- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL F
0.0-3.0 SEC. 25-80 HZ
- 13) DIGITAL AGC
- 14) DISPLAY
8 TR/IN
10 IN/SEC.

SPREAD DIAGRAM
VP

1 12 13
1210 440 440

7

STATIONS 3 87 SOUTHEAST NEW MEXICO

INPUT REEL HEADER INFORMATION

REEL NUMBER
DATE CREATED 12/12/77
NUMBER SAMPLE/TRACE 1500
SAMPLE RATE IN MILLS 2
PROCESSOR
LINE NUMBER X-11
JOB NUMBER
SECTION NUMBER
PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER OLYMPIC	PARTY: W8. 62
DATE: NOVEMBER 20, 1977	FILTER: 10/36-124 HZ
INSTRUMENTS: CFS I - DFS IV	SAMPLE RATE: 2MS
NOTCH FILTER: IN	SOURCE: VIBROSEIS
RECORD LENGTH: 16 SEC.	SWEEP LENGTH: 12 SEC.
SWEEP FREQUENCY: 25-100 HZ	NO GROUPS: 24
STATION INVERT: 110 FT.	VIB. INVERT: 110 FT.
GEO PER STATION: 6	GEO TYPE: 05C-200
ARRAY TYPE: INLINE	TYPE COVER: 1200 PCANT

PROCESSING SEQUENCE

PROCESSED BY DRESSER OLYMPIC

STATISTICS COMPUTATION

DATUM: 3200 FT.
VSM: 6000 FT/SEC.

- 1) DEMULTIPLEX
- 2) BINARY GAIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON 2ND ZERO CROSSING
- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 13) DIGITAL AGC
- 14) DISPLAY
8 TR/IN
10 IN/SEC.

SPREAD DIAGRAM

8

9

10

1210

440

440

***** FILMING PARAMETERS **

PERCENT GAIN	200
HORIZONTAL SCALE	8. TR/IN
VERTICAL SCALE	10. IN/SE
FILMING DIRECTION	R/L
PERCENT GRR	0
POLARITY	BLACK+VE

DATA PROCESSED BY
DRESSER ELECTRIC

1210

440

440

1210

***** FILMING PARAMETERS *****

PERCENT GAIN 200
HORIZONTAL SCALE 8. TR/IN
VERTICAL SCALE 10. IN/SEC
FILMING DIRECTION R/L
PERCENT BAR 0
POLARITY BLACK+VE

DATA RECEIVED BY
DRESDEN OLYMPIC

12

2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3.0

13

15

sec 2

VEL. ANAL.

VEL. ANAL.

EAST →

5

10

15

20

25

30

ELEVATIONS

STATICS

FOLD %

sec /

VEL ANAL

LINE DIRECTION

VELOCITY FUNCTION
DIRECTION

STATIONS

LOS MEDANOS

LINE X-12
STATIONS 3-46
SOUTHEAST NEW MEXICO

2

3

L05 MEDAN05

LINE X-12
STATIONS 3-46
SOUTHEAST NEW MEXICO

INPUT REEL HEADER INFORMATION

REEL NUMBER
DATE CREATED 12/12/77
NUMBER SAMPLE/TRACE 1500
SAMPLE RATE IN HILLS 2
PROCESSOR
LINE NUMBER X-12
JOB NUMBER
SECTION NUMBER
PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER OLYMPIC	PARTY: W0. 62
DATE: NOVEMBER 16, 1977	FILTER: 10/36-124 HZ
INSTRUMENTS: CFS I - CFS IV	SAMPLE RATE: 2MS
NOTCH FILT: IN	SOURCE: VIBROSEIS
RECORD LEN: 16 SEC.	SWEEP LEN: 12 SEC.
SWEEP FREQ: 25-100 HZ	N0/GROUPS 24
STN INV: 110 FT.	VIB. INV: 110 FT.
GE0 PER STN: 6	GE0 TYPE: GSC-20D
ARRAY TYPE: INLINE	TYPE COVER: 1200 PCMT

PROCESSING SEQUENCE

PROCESSED BY DRESSER OLYMPIC

STATICS COMPUTATION

DATUM: 3200 FT.
VSW: 6000 FT/SEC.

- 1) DEMULTIPLEX
- 2) BINARY GAIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON 2ND ZERO CROSSING
- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ

4

5

- 9) APPLY NM0
- 10: FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 KHZ
- 13) DIGITAL REC
- 14: DISPLAY
8 TR/IN
10 IN/SEC.

***** FILMING PARAMETERS *****

PERCENT GAIN 8. 200
HORIZONTAL SCALE 10. TR/IN
VERTICAL SCALE 10. IN/SEC
FILMING DIRECTION L/R
PERCENT BAR 0
POLARITY BLACK+VE

DATA PROVIDED BY
QUICKER OLYMPIC

10

sec 34

sec 35

VEL. ANAL.

EAST

50

45

40

35

30

25

20

ELEVATIONS

STATICS

FOLD %

2

VEL. ANAL.

EAST

LINE DIRECTION

VELOCITY FUNCTION
DIRECTION

STATIONS

LOS MEDAN

LINE X-13
STATIONS 3-5

ELEVATIONS

STATICS

FOLD %

3

LINE DIRECTION _____

VEL. ANAL.

EAST

VELOCITY FUNCTION
DIRECTION

STATIONS

L0S MEDAN0S

LINE X-13
STATIONS 3-53

SOUTHEAST

INPUT REEL WEP

REEL NUMBER
 DATE CREATED
 NUMBER SAMPLE/IN
 SAMPLE RATE IN
 PROCESSOR
 LINE NUMBER
 JOB NUMBER
 SECTION NUMBER
 PROCESSING STEP

FIELD IN

RECORDED BY: DRESSER OLYMPIC

DATE: NOVEMBER 15, 1977

INSTRUMENTS: CFS 1 - OPS IV

NOTCH FILTER: IN

RECORD LENGTH: 16 SEC.

SWEEP FREQUENCY: 25-100 HZ

STN INV: 110 FT.

GEO PER STN: 6

ARRAY TYPE: "LINE

PROCESSING

PROCESSED BY D

STATICS COMPUTATION
 DRTUM: 3200 FT.
 VSM: 6000 FT/SEC.

- 1) DEMULTIPLEX
- 2) BINARY GAIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON
- 6) TIME-INVARIANT DIGITAL F
0.0-3.0 SEC. 25-80 HZ
- 7) APPLY OPTUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL F
0.0-3.0 SEC. 25-80 HZ
- 13) DIGITAL AGC
- 14) DISPLAY
8 TR/IN
10 IN/SEC.

SPRE

12

1210

440

5

SOUTHEAST NEW MEXICO

INPUT REE

FORMATION

REEL NAME
DATE CRE. 12/12/77
NUMBER SAM- 1500
SAMPLE RATE .E
PROCESSOR LLS 2
LINE NUMBER X-13
JOB NUMBER
SECTION NUMBER
PROCESSING STEP

FIELD INFORMATION

RECORDED BY: DRESSER OLYMPIC PARTY: W0. 62
DATE: NOVEMBER 15, 1977 FILTER: 10/36-124 HZ
INSTRUMENTS: CFS 1 - DFS IV SAMPLE RATE: 2MS
NOTCH FILTER: IN SOURCE: VIBROSEIS
RECORD LEN: 16 SEC. SWEEP LEN: 12 SEC.
SWEEP FREQ: 25-110 HZ NO/GROUPS 24
STN INV: 110 FT. VIB. INV: 110 FT.
GEO PER STN: 6 GEO TYPE: GSC-200
ARRAY TYPE: INLINE TYPE COVER: 1200 PRCNT

PROCESSING SEQUENCE

PROCESSED BY DRESSER OLYMPIC

STATICS COMPUTATION

OPTUM: 3200 FT.
VSW: 6000 FT/SEC.

- 1) DEMULTIPLY
- 2) BINARY GAIN RECOVERY
- 3) VIBROSEIS CORRELATION
- 4) COMMON DEPTH POINT GATHERS
- 5) DECONVOLUTION
OPERATOR LENGTH=140 MILS
PREDICTION TIME BASED ON 2ND ZERO CROSSING
- 6) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 7) APPLY DATUM STATICS
- 8) VELOCITY ANALYSIS
- 9) APPLY NMO
- 10) FIRST BREAK SUPPRESSION (MUTE)
- 11) STACK 12 FOLD
- 12) TIME-INVARIANT DIGITAL FREQUENCY FILTER
0.0-3.0 SEC. 25-80 HZ
- 13) DIGITAL AGC
- 14) DISPLAY
0 TR/IN
10 IN/SEC.

SPREAD DIAGRAM

6

***** FILMING PARAMETER

PERCENT GRAIN 200
 HORIZONTAL SCALE 8. T
 VERTICAL SCALE 10. I
 FILMING DIRECTION R
 PERCENT BAR 0
 POLARITY BLACK+VE

 DATA PROCESSED BY
 DISNEY 6LTV

8

***** FILMING PARAMETERS *****

PERCENT GRAIN 200
HORIZONTAL SCALE 8. 1X/IN
VERTICAL SCALE 10. 1X/SEC
FILMING DIRECTION R/L
PERCENT BAR 0
POLARITY BLACK+VE

DATA PRODUCED BY
ONCEON SYSTEMS

9

103°54' W
32°27' N

28

27

33

34

26

4

3

25

9

10

26

25

30

29

35

36

31

32

2

1

6

5

11

12

7

8

2

28

27

26

33

34

35

ERDA
⊕ TD 27

4

3

2

3

⊕ ERDA II

ERDA B
⊕ TD 4910

9

10

11

103°
32'2"

25

30

29

ERDA 7
⊕ TD 3908'

36

31

32

A 6
2711'

1

6

5

12

7

8

4

103° 41' W
32° 27' N

30

29

ERDA 7
⊕ TD 3908'

31

32

6

5

7

8

5

24

16

15

R

23

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21

22

22

T

22

28

27

6

E

1430

13

18

Y-1

172

Y-4

172

149

23

24

19

131

125

Y-3

172

113

101

26

25

30

29

7

14

13

18

17

JEN-1

R

23

24

19

20

S

22

BAS-1

WRT-1

T

26

25

30

29

FED-1

TY

Y

9

21

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34

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2

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⊗

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JR-3
⊗

JR
TD 14.590
⊗

6

CB
⊗

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14

13

18

17

12

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III

34

◇ G-1

35

AA-2

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CB-1

IV

4

3

2

9

10 E

11

31

R

16 S

15

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FP 6

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36

COUNT

COUNT

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COUNT

31

32

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LEA

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FED-5

7

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32

E

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5

18

23

17

1

15

32°17' N
103°54' W

21

53'

22

52'

16

23

24

19

20

49

48

17

20

21

22

23

48

47

46

45

ZONE

I

II

III

IV

TOTAL

18

24

19

20

44

43

42

19

ONE	AREA
I	100 Acres
II	1,818 Acres
III	6,221 Acres
IV	10,821 Acres
TOTAL	18,960 Acres

SANDIA LABORATORY

SEISMIC SURVEY

LOS MEDANOS SITE A
EDDY COUNTY, NEW MEXICO

1978 SEISMIC PROGRAM

INTERPRETATION BY

G. J. LONG & ASSOCIATES, INC.

SEISMOLOGIST

APPROVED

SCALE	DATE	C. I.
1" = 2,000'		

19

20

43

42'

32°17' N
.03°41' W

20

SANDIA LABORATORIES

SEISMIC SURVEY

LOS MEDANOS SITE AREA
EDDY COUNTY, NEW MEXICO

1978 SEISMIC PROGRAM MAP

INTERPRETATION BY

G J LONG & ASSOCIATES, INC

SEISMOLOGIST

APPROVED

SCALE

DATE

C I.

1" = 2,000'

3385

3385

3386

3397

3399

DATUM

3200

SANDIA Y-3

SANDIA Y--1

101

105

110

115

120

125

00

01

02

03

3396 3406 3407 3412 3415 3417 3418 3

2

SAN

VA

125 130 135 140 145 150 155

SANDIA Y-4

VA

AREA
LINE
STATE
COUNTY
DATE SH

3

RECORDED
INSTRUMENT
ENERGY
SWEEP
SWEEP
LISTEN
SAMPLE

**SEISMIC AND DIGITAL
CONCEPTS, INC.**

SANDIA LAB.

NORTH

AREA	SANDIA
LINE	Y-1
STATE	NEW MEXICO
COUNTY	LEA
DATE SHOT	JULY 2-12 1978

FIELD PARAMETERS

RECORDED BY

CXC, INC.

4

**RECORDED
INSTRUMENTS
ENERGY
SWEEP LENGTH
SWEEP FREQ
LISTEN TIME
SAMPLE RATE**

**DIGITAL
HDR-4000
VIBRATOR
12.0 SEC
25-100 HZ
4.0 SEC
2 MS**

0.4

0.5

0.6

0.7

0.8

0.9

1.0

1.1

1.2

1.3

5

04

05

06

07

08

09

10

11

12

13

CABLE

1430-11

GROUP INT

VIBR. INT

COVERAGE

PROCESS

PROCESSED

1 SPIKE DE

0030-070

0600-100

OPERATOR

3, 10 TV FI

000-005

007-101

103-200

4 STATICS

DATUM

DATUM

VA-VELOC

5, 8 AGC

6 AUTO RES

7 12 FOLD

9 NOISE RE

DISPL

HORZ SCALE

VERT SCALE

ELEV SCALE

POLARITY

JOB NAME

COMPL

7

CABLE	24 TR SPLIT
1430-110-VP-110-1430	FT
GROUP INT	110 FT
VIBR. INT	110 FT
COVERAGE	12 COP

PROCESSING PARAMETERS

PROCESSED 2.0 SEC 2 MS
1 SPIKE DECON-TIME VARYING
0.030-0.700 - GATE 1
0.600-1.80 - GATE 2
OPERATOR 100 MS BOTH GATES
3, 10 TV FILTER
0.0-0.5 40-90 HZ
0.7-1.1 30-75 HZ
1.3-2.0 20-65 HZ
4 STATICS, NMO, STEP-MUTE
DATUM 3200 FT ASL
DATUM VEL 6000 FT/SEC
VA-VELOCITY ANALYSIS
5, 8 AGC
6 AUTO RESID STATICS
7 12 FOLD STACK
9 NOISE REJECTION FILTER

DISPLAY PARAMETERS

HORZ SCALE	8 TR/IN
VERT SCALE	10 IN/SEC
ELEV SCALE	100 FT/IN
POLARITY CODE	LEFT+ RIGHT-

JOB NUMBER	6200
COMPLETED	AUG 1978

REF

8

1.2

1.3

1.4

1.5

1.6

1.7

1.8

1.9

2.0

VERT SCALE
ELEY SCALE
POLARITY C

JOB NUMBER
COMPLETED

VERT SCALE	10 IN/SEC
ELEY SCALE	100 FT/IN
POLARITY CODE	LEFT+ RIGHT-

JOB NUMBER	6200
COMPLETED	AUG 1978

REF

12

3433

3434

3436

3438

DATUM

3200

SANDIA Y-3

SANDIA Y-2

101

105

110

115

120

00

01

02

03

3446 3447 3450 3446 3448 3455 3464 34

SAN

VP

2

3476

3480

3473

SANDIA Y-4

VA

160

165

170

SEC

AREA
LINE
STATE
COUNTY
DATE SHOT

FIELD

RE

3

RECORDED
INSTRUMENT
ENERGY
SWEEP LENGTH
SWEEP FREQUENCY
LISTEN TO
SAMPLE RATE

**SEISMIC AND DIGITAL
CONCEPTS, INC.**

SANDIA LAB.

NORTH

AREA	SANDIA
LINE	Y-2
STATE	NEW MEXICO
COUNTY	LEA
DATE SHOT	JULY 2-12 1978

FIELD PARAMETERS

RECORDED BY

CXC, INC.

**RECORDED
INSTRUMENTS
ENERGY
SWEEP LENGTH
SWEEP FREQ
LISTEN TIME
SAMPLE RATE**

**DIGITAL
HDDR-4000
VIBRATOR
12.0 SEC
25-100 HZ
4.0 SEC
2 MS**

4

CABLE

1430-11

GROUP INT

VIBR. INT

COVERAGE

PROCESS

PROCESSED

1 SPIKE DE

030-070

500-1000

OPERATOR

3, 10 TV FI

0.0-0.5

0.7-1.0

1.3-2.0

4 STATICS

DATUM 3

DATUM 4

VA-VELOC

5, 8 AGC

6 AUTO RES

7 12 FOLD

9 NOISE RE

DISPL

HORZ SCALE

VERT SCALE

ELEV SCALE

POLARITY

JOB NO

COMPLE

7

CABLE	24 TR SPLIT
1430-110-VP-110-1430	FT
GROUP INT	110 FT
VIBR. INT	110 FT
COVERAGE	12 CDP

PROCESSING PARAMETERS

PROCESSED 2.0 SEC 2 MS
1 SPIKE DECON-TIME VARYING
0.030-0.700 - GATE 1
0.600-1.80 - GATE 2
OPERATOR 100 MS BOTH GATES
3,10 TV FILTER
0.0-0.5 40-90 HZ
0.7-1.1 30-75 HZ
1.3-2.0 20-65 HZ
+ STATICS, NMO, STEP-MUTE
DATUM 3200 FT ASL
DATUM VEL 6000 FT/SEC
VA-VELOCITY ANALYSIS
5,8 AGC
6 AUTO RESID STATICS
7 12 FOLD STACK
9 NOISE REJECTION FILTER

DISPLAY PARAMETERS

HORZ SCALE	8 TR/IN
VERT SCALE	10 IN/SEC
ELEV SCALE	100 FT/IN
POLARITY CODE	LEFT+ RIGHT-

JOB NUMBER	6205
COMPLETED	AUG 1978

REF

8

1.2

1.3

1.4

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1.8

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2.0

9

10

1.2

1.3

1.4

1.5

1.6

1.7

1.8

1.9

2.0

POLARITY C

JOB NUMBER
COMPLETED

POLARITY CODE

LEFT+

RIGHT-

JOB NUMBER

6205

COMPLETED

AUG 1978

REF

12

3384

3381

3388

3392

3398

DATUM

3200

SANDIA Y-1

SANDIA Y-3

VA

172170

165

160

155

150

0.0

0.1

0.2

0.3

3401

3406

3407

3411

3415

3421

3430

SANDIA Y-5

VA

2

SANDIA

145

140

135

130

125

120

115

0 3437 3444

IA Y-2

VA

5 110 105

SEI

S

AREA
LINE
STATE
COUNTY
DATE SHOT

FIELD

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3

RECORDED
INSTRUMENT
ENERGY
SWEEP LEN
SWEEP FRE
LISTEN TI
SAMPLE RA

**SEISMIC AND DIGITAL
CONCEPTS, INC.**

SANDIA LAB.

EAST

AREA	SANDIA
LINE	Y-3
STATE	NEW MEXICO
COUNTY	LEA
DATE SHOT	JULY 2-12 1978

FIELD PARAMETERS

RECORDED BY

CXC, INC.

**RECORDED
INSTRUMENTS
ENERGY
SWEEP LENGTH
SWEEP FREQ
LISTEN TIME
SAMPLE RATE**

**DIGITAL
HDR-4000
VIBRATOR
12.0 SEC
25-100 HZ
4.0 SEC
2 MS**

4

CABLE
1430-11
GROUP INT
VIBR. INT
COVERAGE

PROCESS

PROCESSED
1 SPIKE DE
0.030-0.70
0.600-1.00
OPERATOR
3, 10 TV FI
0.0-0.5
0.7-1.0
1.3-2.0
4 STATICS
DATUM
DATUM
VA-VELOC
5, 8 AGC
6 AUTO RES
7 12 FOLD
9 NOISE RE

DISPL

HORZ SCALE
VERT SCALE
ELEV SCALE
POLARITY

JOB N
COMPL

7

CABLE	24 TR SPLIT
1430-110-VP-110-1430	FT
GROUP INT	110 FT
VIBR. INT	110 FT
COVERAGE	12 COP

PROCESSING PARAMETERS

PROCESSED 2.0 SEC 2 MS
1 SPIKE DECON-TIME VARYING
0.030-0.700 - GATE 1
0.600-1.80 - GATE 2
OPERATOR 100 MS BOTH GATES
3,10 TV FILTER
0.0-0.5 40-90 HZ
0.7-1.1 30-75 HZ
1.3-2.0 20-65 HZ
4 STATICS, NMO, STEP-MUTE
DATUM 3200 FT ASL
DATUM VEL 6000 FT/SEC
VA-VELOCITY ANALYSIS
5,8 AGC
6 AUTO RESID STATICS
7 12 FOLD STACK
9 NOISE REJECTION FILTER

DISPLAY PARAMETERS

HORZ SCALE	8 TR/IN
VERT SCALE	10 IN/SEC
ELEY SCALE	100 FT/IN
POLARITY CODE	LEFT+ RIGHT-

JOB NUMBER	6199
COMPLETED	AUG 1978

REF

8

HORZ SCAL
VERT SCAL
ELEV SCAL
POLARITY

JOB NUMBER
COMPLETED

HORZ SCALE	8 TR/IN
VERT SCALE	10 IN/SEC
ELEV SCALE	100 FT/IN
POLARITY CODE	LEFT+ RIGHT-

JOB NUMBER	6199
COMPLETED	AUG 1978
REF	

12

DATUM
3200

SANDIA Y-4

SANDIA Y-1

3462

3469

3479

3473

3471

3476

3477

SANDIA Y-5

SANDIA

2

45

40

35

30

25

20

15

77 3464 3475

IDIA Y-2

AREA
LINE
STATE
COUNTY
DATE SHOT

FILE

3

RECORDED
INSTRUMENT
ENERGY
SWEEP LENGTH
SWEEP FREQUENCY
LISTEN TO
SAMPLE RECORD

**SEISMIC AND DIGITAL
CONCEPTS, INC.**

SANDIA LAB.

EAST

AREA	SANDIA
LINE	Y-4
STATE	NEW MEXICO
COUNTY	LEA
DATE SHOT	JULY 2-12 1978

FIELD PARAMETERS

RECORDED BY

CXC, INC.

**RECORDED
INSTRUMENTS
ENERGY
SWEEP LENGTH
SWEEP FREQ
LISTEN TIME
SAMPLE RATE**

**DIGITAL
KODR-4000
VIBRATOR
12.0 SEC
25-100 HZ
4.0 SEC
2 MS**

4

CABLE

1430-1

GROUP INT

VIBR. INT

COVERAGE

PROCESS

PROCESSED

1 SPIKE ON

0.030-0.1

0.600-1.0

OPERATOR

3, 10 TV F

0.0-0.0

0.1-1.0

1.0-2.0

4 STATICS

DATUM

DATUM

VA-VELO

5, 8 AGC

6 AUTO RE

7 12 FOLD

9 NOISE R

DISP

HORZ SCAL

VERT SCAL

ELEY SCAL

POLARITY

JOE N

COMPU

7

CABLE	24 TR SPLIT
1430-110-VF-110-1430 FT	
GROUP INT	110 FT
VIER. INT	110 FT
COVERAGE	12 CDP

PROCESSING PARAMETERS

PROCESSED 2.0 SEC 2 MS
1 SPIKE DECON-TIME VARYING
0.030-0.700 - GATE 1
0.600-1.80 - GATE 2
OPERATOR 100 MS BOTH GATES
3, 10 TV FILTER
0.0-0.5 40-90 HZ
0.7-1.1 30-75 HZ
1.3-2.0 20-65 HZ
4 STATICS, NMO, STEP-MUTE
DATUM 3200 FT ASL
DATUM VEL 6000 FT/SEC
VA-VELOCITY ANALYSIS
5, 8 AGC
6 AUTO RESID STATICS
7 12 FOLD STACK
9 NOISE REJECTION FILTER

DISPLAY PARAMETERS

HORZ SCALE	8 TR/IN
VERT SCALE	10 IN/SEC
ELEV SCALE	100 FT/IN
POLARITY CODE	LEFT+ RIGHT-

JOB NUMBER	6206
COMPLETED	AUG 1978

REF

8

ELEY SCALE
POLARITY

JOB NUMBER
COMPLETED

ELEV SCALE
POLARITY CODE

100 FT/IN
LEFT+ RIGHT-

JOB NUMBER
COMPLETED

6206
AUG 1978

REF

12

DATUM
5200

SANDIA Y-5

SANDIA Y-3

1421 3426 3430 3439 3447 3457 3466 34

VA

2

SAN

25 30 35 40 45 50 55

INDIA Y-4

VA

SE

AREA
LINE
STATE
COUNTY
DATE SHOT

FIE

RI

3

RECORDED
INSTRUMENT
ENERGY
SWEEP LENG
SWEEP FREQ
LISTEN TIM
SAMPLE RAT

SEISMIC AND DIGITAL
CONCEPTS INC.

SANDIA LAB.

NORTH

SANDIA

Y-5

NEW MEXICO

LEA

JULY 2-12 1978

FIELD PARAMETERS

RECORDED BY

CXC INC.

DIGITAL
HDB-4000
VIBRATOR
1200 SEC
25-100 HZ
400 SEC
2 MS

RECORDED
INSTRUMENTS
ENERGY
SWEEP LENGTH
SWEEP FREQ
LISTEN TIME
SAMPLE RATE

0.4

0.5

0.6

0.7

0.8

0.9

1.0

1.1

1.2

1.3

CABLE

1430-11

GROUP INT

VIBR. INT

COVERAGE

PROCESS

PROCESSED

1 SPIKE DE

0.030-0.70

0.600-1.00

OPERATOR

3, 10 TV FI

0.0-0.5

0.7-1.0

1.3-2.0

4 STATICS

DATUM

DATUM

VA-VELOC

5, 8 AGC

6 AUTO RES

7 12 FOLD

9 NOISE RE

DISPL

HORIZ SCALE

VERT SCALE

ELEV SCALE

POLARITY

JOB NO

COMPL

7

CABLE 24 TR SPLIT
1430-110-VP-110-1430 FT
GROUP INT 110 FT
VIBR. INT 110 FT
COVERAGE 12 COP

PROCESSING PARAMETERS

PROCESSED 2.0 SEC 2 MS
1 SPIKE DECON-TIME VARYING
0.030-0.700 - GATE 1
0.600-1.80 - GATE 2
OPERATOR 100 MS BOTH GATES
3, 10 TV FILTER
0.0-0.5 40-90 HZ
0.7-1.1 30-75 HZ
1.3-2.0 20-65 HZ
4 STATICS, NMO, STEP-MUTE
DATUM 3200 FT ASL
DATUM VEL 6000 FT/SEC
VA-VELOCITY ANALYSIS
5, 8 AGC
6 AUTO RESID STATICS
7 12 FOLD STACK
9 NOISE REJECTION FILTER

8

DISPLAY PARAMETERS

HORZ SCALE 8 TR/IN
VERT SCALE 10 IN/SEC
ELEY SCALE 100 FT/IN
POLARITY CODE LEFT+ RIGHT-

JOB NUMBER 6207
COMPLETED AUG 1978

REF

10

VERT SCAL
ELEY SCAL
POLARITY

JOB NUMBER
COMPLETED

VERT SCALE
ELEY SCALE
POLARITY CODE

10 IN/SEC
100 FT/IN
LEFT+ RIGHT-

JOB NUMBER
COMPLETED

6207
AUG 1978

REF

12