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EVALUATION of FWD DATA for NDOT OVERLAY DESIGN PROCEDURE

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16. Abstract

This studies goal was to develop a mechanistic overlay design procedure for Nevada highways. The results from data analysis on this study produced the following recommendations. The frequency of FWD testing should be held at or around 10 FWD tests/lane-mile to maximize the benefit of FWD testing and minimize the error in the FWD data. The effect of nonlinearity was very minimal when compared with the site variability. Eleven sites were selected from twenty-seven sites for the in-depth analysis for site variability, nonlinearity, and back calculation procedures.

Future work was recommended for completion of the overlay design procedure, determine seasonal variation of materials properties, finalize the overlay design algorithm, and a user friendly computer program for assisting engineers with overlay design procedure. MODULUS model should be used in the overlay design procedures, as well. A final report should be developed and training provided.

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TABLE OF CONTENT

1. INTRODUCTION

A large number of Nevada's highways are approaching the end of their service life. As a consequence, an urgent need is present to upgrade and maintain these existing highways. Overlaying the deteriorated highway pavement with a new layer of asphalt concrete is by far the most efficient and economical way of upgrading its performnace. By applying a well-designed overlay to a deteriorated pavement section, its functional and structural perfromances can be greatly improved. The new layer of asphalt concrete would provide a smoother traveled surface and increase the strength of the existing structure to carry traffic loads throughout its design life.

The Nevada Department of Transportation (NDOT) has recognized those needs and has sponsored a research project for the developement of a customized overlay design procedure which takes into account the localized conditions throughout the state. The primary goal of this overlay design procedure is to recommend a pavement structure which can withstand the applied traffic loads throughout the design life without excessive reduction in its functional and structural performances. The reduction in the functional performance of pavement will result in excessive loss of serviceability and/or increase in roughness, while the reduction in the structural performance will result in excessive cracking and/or rutting.

The overlay design procedure being developed in this research

is a mechanistically-based design method. The structural capacity of the existing pavement layers represents an important part of the overlay design process. The structural evaluation is usually performed by either one of the two techniques: a) destructive testing, or b) non-destructive testing (NDT).

Destructive testing has not been widely accepted since the pavement is disturbed during testing. Laboratory tests such as the resilient modulus, indirect tension, R-value, and the California Bearing Ratio (CBR) are some of the tests performed on cores obtained from the field. Non-destructive testing represents an alternative technique by which the load carying capacity of the pavement is evaluated without disturbing or destroying its components. The measurement can be repeated at a given point if needed. The non-destructive evaluation of pavements generally follows one of two main techniques: surface deflection or wave propagation. Only the surface deflection measurement technique will be discussed since it is the one selected for the overlay design procedure.

Deflection measurement consists of measuring the deflection response of the pavement caused by specific types of loading. A surface loading is generated by an NDT device, such as the Benkelman Beam (static loading), Dynaflect, Road Rater (steady state vibratory loading) and the Falling Weight Deflectometer (FWD) (impulse loading). Table 1 lists most of these devices along with their configuration and loading properties. Currently, highways and airfield agencies are moving towards using the FWD since it applies impulse loading which better simulates the actual traffic

TABLE 1 Characteristics of commercially available nondestructive testing (NDT) devices.

Device Name	Principal of Operation	Min. Load (lb)	Max. Load (lb)	Type of Load Transmission
Benkelman Beam AASHO	Deflection Beam	N/A	N/A	Truck Wheels
Deflection Beam (British)	Deflection Beam	N/A	N/A	Truck Wheels
La Croix Deflectograph	Mechanized Deflection Beam	Empty Truck Weight	Loaded Truck Weight	Truck Wheels
Dynaflect	Steady State Vibratory	1000	1000	Two 16"diam. Steel Wheels
Model 400 B Road Rater	Steady State Vibratory	500	2800	Two 4"by 7" Pads with 5.5" Center Gap
Model 2000 Road Rater		1000	5500	Circular Plate 18" diam.
Model 2008 Road Rater		1000	8000	
KUAB 150 Falling Weight Deflectometer	Impulse	1500	35000	Sectionalized Circular Plate 11.8" diam.
Dynatest Model 8000 Falling Weight Defectometer	Impulse	1500	24000	Circular Plate 11.8"diam.

loading. The FWD is currently used as the NDT device for the NDOT overlay design procedure. Its physical properties and testing procedure will be described in a latter part of this report.

Objectives

As mentioned earlier, the overall objective of this research is to develop a mechanistic overlay design procedure applicable for the Nevada highways system. A total of eight tasks must be completed, three of these tasks have been completed and reported on in earlier reports. This report documents the findings and recommendations of the fourth task which deals with the analysis of the FWD data. Task 4 includes the following subtasks:

1. Investigation of the variability of the FWD data across the test site.
2. Investigation of the nonlinearity of the FWD data.
3. Selection of backcalculation algorithm to estimate layers moduli.

2. NON-DESTRUCTIVE TESTING

Test Sites

A total of twenty seven sites were selected for pavement evaluation and material characterization of the existing pavement structures. The criteria used in the selection of the test sites included:

1. Climate
2. Traffic
3. Age of Pavement
4. Type of Construction
5. Condition of Pavement

In order to accomplish the objectives of Task 4, eleven sites were selected from the entire twenty seven sites for an in-depth analysis of site variability, nonlinearity, and backcalculation procedures. The above five site selection criteria were also applied in the selection of the eleven sites.

Description of Site Configuration

The individual test site consisted of 1000 foot section on the outside traffic lane of the pavement section. The structural sections of the eleven selected sites are shown in Table 2. Each test site was subdivided into twenty one stations (every 50 feet within the 1000 foot section) for FWD deflection testing. Figure 1 shows the stations layout for a typical test site.

Table 2 Structural Properties of Selected Test Sites

Site	AC Layer (in.)	Base Course (in.)
11	4.00	11.0
12	7.25*	16.0
16	7.75*	11.0
17	5.75	4.0
24	7.75	9.0
26	7.50	9.0
28	3.00	6.0
31	14.75	13.0
35	6.25*	9.0
36	4.75**	8.0 (CTB) 28.0
310	6.50	8.0 (CTB) 8.5

* Does not include leveling course.

** Overlayed by concrete 1990.

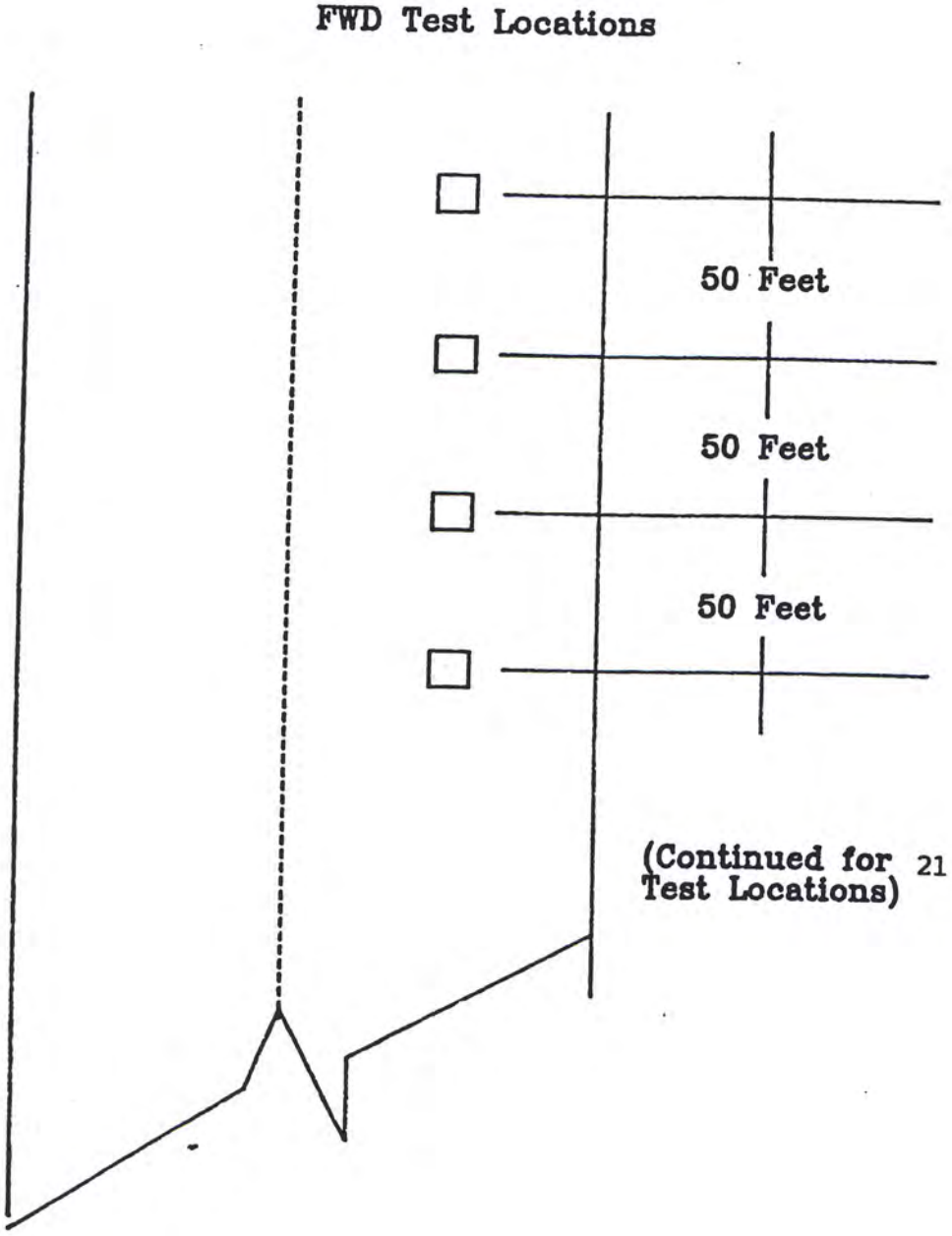

Figure 1 Spacing of Test Locations within Each Test Site (Total of 21 Test Locations/Site)

FWD Test

The FWD device was originally developed in Europe. It delivers a transient force to the pavement surface. The device uses a weight which is lifted to a given height on a guided system and is then dropped. The falling weight strikes a plate underlain by a rubber cushion which transmits the force to the pavement. By varying the mass of the falling weight and/or the drop height, the impulse force can be varied. The FWD has a relatively small preload compared to the actual loading and typically varies between 3 and 14% of the maximum load. The weight drops onto the plate-rubber system to provide a load pulse in approximately a half-sine wave form (impulse loading). The load is transmitted to the pavement through a 12 inch diameter plate in most cases. The pulse duration is usually 30-40 msec.

The deflection is measured using up to seven velocity transducers mounted on a bar which is lowered automatically with the loading plate. The velocity transducers can be placed at several radial distances away from the center of the loading plate. The normal sequence of operation is to move the device to the test point and hydraulically lower the loading plate and the transducers to the pavement.

The Nevada Department of Transportation owns the Dynatest FWD model 8000 which is the most widely used FWD in the United States at present. The load range is between 1500 to 24000 lb. applied by varying the drop heights and drop weights. The FWD testing sequence for the project consisted of testing every station (21

stations/site) within the twenty seven test sites at least once during each of the four seasons in order to identify seasonal changes in material properties. Each FWD test consisted of applying four load levels and measuring the corresponding deflection basins (deflections at the various sensors locations).

3. DATA ANALYSIS

The overall objective of task 4 is to complete the analysis of the entire FWD data base. The task has been divided into the following subtasks:

1. Investigate the variability of FWD data across the site
2. Investigate the nonlinearity of FWD data
3. Select a backcalculation model

All of the above subtasks have been completed and the findings are documented in this report.

Variability of FWD Data

It is well known that the subgrade, crushed aggregate base, and asphalt concrete courses are all made of nonhomogeneous materials. As a general rule in pavement design, we try to limit the variability of the asphalt concrete material, and somewhat control the variability of the crushed aggregate bases. However, the quality of the subgrade, which is made of the natural soil, is almost uncontrollable. Therefore, a certain degree of variability would always exist among the various stations and mileposts of any highway section. In addition, as the pavement deteriorates and approaches the end its design life, the degree of variability is expected to increase dramatically.

The overlay design process is usually implemented on old pavements which have experienced a reduction in their performance and may have large variability. Therefore, the investigation of

Table: 3 Effect of Site Variability on FWD Data

Site No:11			Date:8/88			Station:0 to 20
Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	8736	5.420	1.030	5.584	0.360	0.371
1	8552	5.220	1.052	5.493	0.240	0.253
2	8408	5.570	1.070	5.962	0.320	0.343
3	8672	4.820	1.038	5.002	0.280	0.291
4	8448	4.310	1.065	4.592	0.320	0.341
5	8720	4.360	1.032	4.500	0.320	0.330
6	8304	5.100	1.084	5.527	0.320	0.347
7	8472	5.850	1.062	6.215	0.490	0.521
8	8288	4.900	1.086	5.321	0.320	0.347
9	8288	5.490	1.086	5.962	0.330	0.358
10	8448	4.980	1.065	5.305	0.240	0.256
11	8328	6.640	1.081	7.176	0.400	0.432
12	8392	5.930	1.072	6.360	0.320	0.343
13	8472	5.810	1.062	6.172	0.440	0.467
14	8320	6.130	1.082	6.631	0.400	0.433
15	8208	5.810	1.096	6.371	0.360	0.395
16	8224	6.090	1.094	6.665	0.360	0.394
17	8424	5.530	1.068	5.908	0.360	0.385
18	8448	5.930	1.065	6.317	0.400	0.426
19	8360	5.260	1.077	5.663	0.320	0.344
20	8464	4.980	1.063	5.295	0.240	0.255
Mean	8427	5.435	1.068	5.811	0.340	0.363
STD*	143.76	0.578	0.018	0.668	0.062	0.067
C.O.V**	1.706	10.644	1.687	11.489	18.311	18.574

* STD-Standard Deviation **C.O.V-(Std.Dev/Mean)*100

Table: 4 Effect of Site Variability on FWD Data

Site No:26			Date:3/88		Station:0 to 20	
Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	9280	7.270	0.970	7.051	1.740	1.688
1	8960	11.620	1.004	11.672	3.030	3.044
2	9160	5.890	0.983	5.787	1.580	1.552
3	9016	7.150	0.998	7.137	1.700	1.697
4	8928	12.130	1.008	12.228	1.980	1.996
5	8856	8.380	1.016	8.516	1.780	1.809
6	8992	7.470	1.001	7.477	1.900	1.902
7	8840	7.630	1.018	7.768	1.700	1.731
8	8800	8.020	1.023	8.202	1.620	1.657
9	8840	7.710	1.018	7.850	1.500	1.527
10	9088	6.920	0.990	6.853	1.460	1.446
11	8720	7.790	1.032	8.040	1.540	1.589
12	8736	6.680	1.030	6.882	1.580	1.628
13	8672	8.180	1.038	8.489	1.780	1.847
14	8848	8.660	1.017	8.809	1.980	2.014
15	8704	7.830	1.034	8.096	1.620	1.675
16	8400	7.950	1.071	8.518	1.420	1.521
17	8576	8.620	1.049	9.046	1.940	2.036
18	8632	7.350	1.043	7.663	1.740	1.814
19	8552	8.500	1.052	8.945	1.940	2.042
20	8576	7.790	1.049	8.175	1.620	1.700
Mean	8818	8.073	1.021	8.248	1.769	1.805
STD*	213.42	1.397	0.025	1.433	0.327	0.327
C.O.V**	2.420	17.298	2.411	17.377	18.488	18.105

* STD-Standard Deviation **C.O.V-(Std.Dev/Mean)*100

Table: 5 Effect of Site Variability on FWD Data

Site No:36			Date:2/89			Station:0 to 20
Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	9408	2.690	0.957	2.573	0.730	0.698
1	9800	2.960	0.918	2.718	0.730	0.670
2	9576	1.860	0.940	1.748	0.770	0.724
3	9528	2.210	0.945	2.088	0.770	0.727
4	9416	2.370	0.956	2.265	0.650	0.621
5	9432	1.230	0.954	1.174	0.690	0.658
6	9496	1.780	0.948	1.687	0.570	0.540
7	9504	1.340	0.947	1.269	0.650	0.616
8	9400	2.020	0.957	1.934	0.570	0.546
9	9448	1.540	0.953	1.467	0.570	0.543
10	9448	1.580	0.953	1.505	0.530	0.505
11	9392	1.580	0.958	1.514	0.610	0.585
12	9296	2.020	0.968	1.956	0.610	0.591
13	9288	1.540	0.969	1.492	0.490	0.475
14	9472	1.540	0.950	1.463	0.650	0.618
15	9376	1.460	0.960	1.401	0.610	0.586
16	9368	1.780	0.961	1.710	0.690	0.663
17	9320	3.200	0.966	3.090	0.530	0.512
18	9320	2.530	0.966	2.443	0.610	0.589
19	9368	1.940	0.961	1.864	0.570	0.548
20	9352	2.170	0.962	2.088	0.440	0.423
Mean	9429	1.969	0.955	1.879	0.621	0.592
STD*	111.71	0.523	0.011	0.496	0.087	0.079
C.O.V**	1.185	26.549	1.163	26.394	13.950	13.290

* STD-Standard Deviation **C.O.V-(Std.Dev/Mean)*100

the site variability is essential in order to make some recommendations concerning the required frequency of FWD testing and the effect of nonlinear behavior of the pavement materials.

The FWD data collected from the eleven sites on two different dates were analyzed to investigate the variability of the FWD data. The analysis consisted of determining the mean, standard deviation, and coefficient of variation of the deflections at sensors 1 and 6 which are 0.0 and 55.1 inches away from the center of load, respectively. The deflections corresponding to the load level nearest to 9000 lb were all normalized to equivalent 9000 lb deflections using linear interpolation. The deviations of the actual load levels from the 9000 lb level were very small.

Tables 3, 4, and 5 show typical site varability data obtained from each of the three NDOT districts. The rest of the site variability data are shown in Appendix A. The mean, standard deviation and coefficient of variation (C.O.V.) (the ratio of standard deviation to the mean times 100) of the normalized deflections were evaluated for all twenty one stations of each of the selected eleven sites.

In most statictical data, the value of the standard deviation tends to increase as the mean of the measured value increases. Therefore, in order to study the true variability of the data, we should look at the C.O.V. values. It is generally accepted that C.O.V. values below 10 percent indicates low variability, and values above 10 percent indicate that significant variability exists. Table 6 summarizes the mean, standard deviation, and C.O.V. values for all the sites. The data in Table 6 show that the

Table 6 Summary of Means, Standard Deviations, and Coefficient of Variations

Test Site	Date of Test	D1 Mean	D1 Std	D1 C.O.V.	D6 Mean	D6 Std	D6 C.O.V.
11	8-88	5.81	0.67	11.49	0.36	0.07	18.57
	2-89	9.99	1.80	18.05	0.85	0.35	40.85
12	8-88	4.79	0.97	20.22	0.55	0.15	26.48
	2-89	4.33	1.42	32.73	0.65	0.21	32.88
16	8-88	6.65	0.99	14.89	0.85	0.11	13.04
	2-89	4.14	0.50	11.97	1.09	0.16	14.25
17	8-88	16.83	2.72	16.18	1.77	0.28	16.11
	2-89	15.90	3.94	24.79	2.32	0.57	24.56
24	6-88	13.74	1.25	9.06	1.76	0.37	21.12
	12-88	9.25	0.89	9.66	1.88	0.36	18.8
26	3-88	8.25	1.43	17.38	1.81	0.33	18.11
	6-88	10.82	1.58	14.62	1.62	0.18	10.97
28	3-88	52.31	6.61	12.64	3.67	0.51	13.97
	6-88	49.93	5.76	11.53	3.43	0.50	14.68
31	7-88	6.15	0.59	9.63	0.94	0.29	30.54
	1-89	1.15	0.24	20.86	0.58	0.20	35.15
35	7-88	11.22	3.60	32.10	1.49	0.24	16.17
	2-89	1.74	0.90	51.79	0.64	0.09	13.38
36	7-88	14.82	4.43	29.86	1.28	0.25	19.51
	2-89	1.88	0.50	26.39	0.59	0.08	13.29
310	7-88	27.75	5.37	19.34	2.14	0.37	17.42
	1-89	1.65	0.11	6.80	0.77	0.08	10.62

majority of the C.O.V. values fall between 15 and 30 percent. The relatively high C.O.V. values indicate that the sites have significant varabilities within the 1000 feet sections which must be taken into consideration in the final overlay design procedure.

Determination of FWD Tests/mile: The site variability study showed that each test site has a certain level of variability. The degree of variability was different among the various sites. The effect of pavement variability on the overlay design process is generally handled in two steps: a) divide the pavement section into uniform analysis units and, b) recommend the required FWD tests/mile. The analysis regarding the length of the analysis units within the pavement section will be discussed as a separate step in the overlay design procedure. The recommendations of the required FWD tests/mile are based on the site variability data and is discussed in this section.

In order to evaluate the structural perfomance of a highway segment, FWD tests have to be performed at certain intervals. As the number of tests increases, the estimated structural values more closely approximate the true values. In other words, the larger the sample size, the more we are able to represent the population. On the other hand, the larger the sample size, the more expensive the process will be. The principle of statistical confidence level is very useful in determining how many observations will be necessary to ensure that the estimated mean is within a certain limit of the actual mean. The statistical formula used for this

purpose is as follows which is recommended by the 1986 AASHTO guide.

$$R = K_{\alpha} \left(\frac{\sigma}{n} \right) \qquad (1)$$

where

n = number of observations (FWD tests)

K_{α} = the standardized normal deviate, which is a function of the desired confidence level

$1-\alpha$ = confidence level

σ = true standard deviation of the random variable (parameter) being considered

R = allowable error in the random variable being considered

The value of K_{α} can be obtained from normal distribution tables. The following table shows the values of K_{α} for common values of confidence levels.

Confidence Level	K_{α}
80 %	1.282
90 %	1.645
95 %	1.960
99 %	2.576

NDOT has been conducting FWD tests at a frequency of 106 tests/mile for this project. This testing frequency is quite high

and the associated cost would prohibit continuing at this level in the future. However, the true standard deviation of FWD data of specific test site can be determined from this data. The allowable error, R, can be estimated based on a combination of engineering analysis and practice.

For this part of the study, eleven one thousand feet sections were selected at random from the twenty seven total test sites. FWD tests were performed at these sites at every 50 feet interval which gives a rate of 106 tests/mile. During the analysis process, it was made sure that each test site is "homogeneous", i.e. has the same construction history, layer thickness, material properties and traffic volume. It was decided to select the peak FWD deflection (D-1) as the random variable to be used in the analysis. The first FWD sensor was selected since it reflects the variability of the subgrade as well as various pavement layers as opposed to the sixth sensor which is a function of the subgrade stiffness only.

For each test section, the average and standard deviation of the readings of the first FWD sensor were computed from all 21 tests (one FWD test every 50 feet of the 1000 foot section). It was then assumed that the true standard deviation of the first sensor readings of each test site is equal to the standard deviation obtained from the 21 FWD readings. In other words, it was assumed that 106 FWD tests/mile fully represent the FWD variability of the one mile section without error. It was also assumed that a 90% confidence level is practically acceptable (K_α= 1.645). Using equation 1, the percent error in the reading of the first FWD sensor (absolute error x 100/average value) was computed

for several levels of tests/mile as shown in Table 7.

The decision of selecting an optimum number of FWD tests/lane-mile is not simple. Any number of FWD tests will be associated with a certain degree of accuracy. The larger the number of FWD tests/lane-mile, the larger the accuracy in representing the test highway section. On the other hand, the larger the number of FWD tests/lane-mile, the more expensive the FWD testing process will be. Considering the data shown in Table 7, the average error for the test site ranges from 5 to 18 percent, as the number of FWD tests/lane-mile decreases from 50 to 3 tests/lane-mile. The relationship in Figure 2 can be divided into high and low benefit regions. In the high benefit region, the error in the D-1 is decreased by 45 percent as the result of adding an extra 7 tests/lane-mile (from 3 to 10 tests/lane-mile), while in the low benefit region, the error is decreased by 50 percent as the result of adding an extra 40 tests/lane-mile (from 10 to 50 tests/lane-mile). In order to maximize the benefit of FWD testing and minimize the percent error in the measured deflections, the 10 tests/lane-mile is recommended.

Nonlinearity of FWD Data

Since the pavement is subjected to a large number of repeated loads from traffic, the stiffness characteristics of the pavement materials should be specified based on the resilient behavior of the material. A commonly used measure of resilient response is the resilient modulus. It is customary to use a constant linear

Table 7 Percent Error in FWD Sensor Number 1 Reading for Various Numbers for FWD Tests/Mile

Test Site	Date of Test	No. of FWD Tests/Mile 50	20	10	7	5	3
11	8-88	3	4	6	7	9	11
	2-89	4	7	9	11	13	17
12	8-88	5	7	11	13	15	19
	2-89	8	12	17	20	24	31
16	8-88	3	5	8	9	11	14
	2-89	3	4	6	7	9	11
17	8-88	4	6	8	10	12	15
	2-89	6	9	13	15	18	24
24	6-88	2	3	5	6	7	9
	12-88	2	4	5	6	7	9
26	3-88	4	6	9	11	13	17
	6-88	3	5	8	9	11	14
28	3-88	3	5	7	8	9	12
	6-88	3	4	6	7	8	11
31	7-88	2	4	5	6	7	9
	1-89	5	8	11	13	15	20
35	7-88	7	12	17	20	24	30
	2-89	12	19	27	32	38	49
36	7-88	7	11	16	19	22	28
	2-89	6	10	14	16	19	25
310	7-88	4	7	10	12	14	18
	1-89	2	3	4	4	5	6
Average		5	7	10	13	14	18

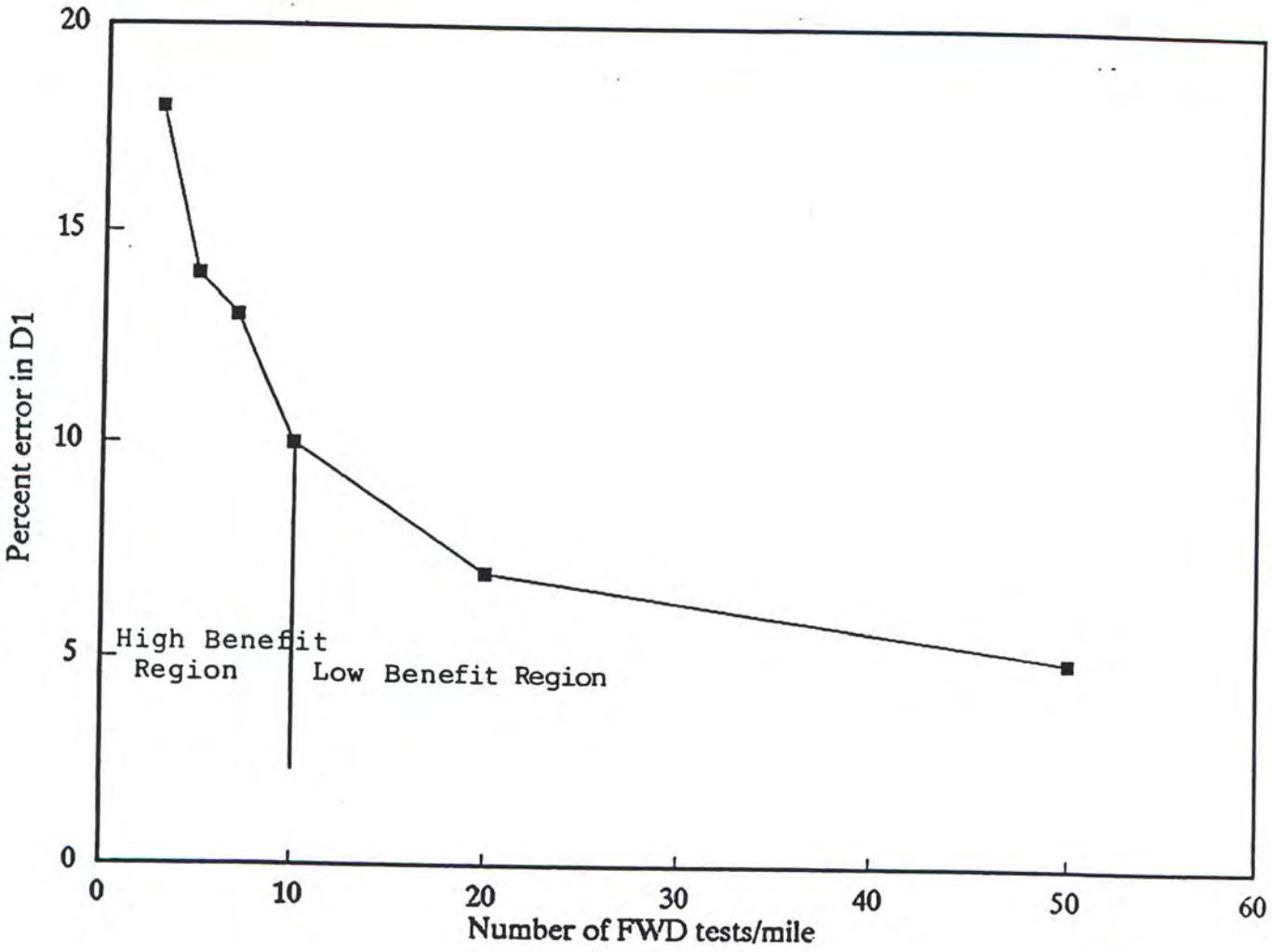

Figure 2. Effect of Number of FWD test/mile on the percent error in deflection Data.

resilient modulus for the asphalt concrete (AC) layer. However, consideration should be given to account for the temperature sensitivity of the AC layer. Repeated unconfined compression or confined triaxial testing procedures are often used to evaluate the resilient moduli of fine-grained soils and granular materials. Soils resilient moduli are stress-dependent. The fine-grained soils exhibit a resilient modulus that decreases with an increase in the deviatoric stress, while granular base materials stiffen with an increasing deviatoric stress level (1,2,3).

Based on repeated load triaxial testing to characterize the resilient behavior of granular and coarse-grained soils, researchers have proposed the following:

$$E_b = K_b \ (\theta)^n$$

In which E_b equals the resilient modulus, θ equals the first stress invariant or sum of all principal stresses, and K_b and n are the experimental constants. In the computation of θ, geostatic stresses as well as the stresses caused by the surface load should be considered. Thompson has summarized the available data for a broad range of granular materials (3). He pointed out that K_b typically varies from 1620 to 7210, while the mean value of n varies from 0.45 to 0.62 for soil types varying from silty sands to crushed stone.

For fine-grained soils, the most significant influence is due to deviatoric stress (σ_d). The available stress-dependent behavior models for fine-grained soils can be categorized as arithmetic and

semi-log models. In the arithmetic model the relationship between the resilient modulus, E_s and σ_d is assumed to be represented by a number of straight lines; while in the semi-log model, the relationship between $\log(E_s)$ and σ_d is assumed to be linear (4,5,6).

Apart from exhibiting nonlinear stress-dependant behavior, the unbound pavement materials, can undergo failure close to the load. The failure zone which includes area under tension has been computed when analyzing wheel loads on pavements. When unbound materials are under failure, the effective stiffness of this region will be substantially lower.

Study of Nonlinearity Using FWD Data: The main purpose for estimating the pavement layer stiffness using backcalculation is to use them in stress and strain computations in the pavement under design wheel load applications. These stresses and strains are then used as input for pavement distress (performance) models such as rutting and fatigue. It has been pointed out earlier that FWD loading closely simulates moving truck loading. Therefore, if FWD data indicates nonlinearity to be important for the load levels of interest then it is going to be important for the stress/strain computations under the wheel loads. To this end an investigation of the extent of nonlinearity in FWD data was carried out using the available FWD data. The procedure adopted is presented below.

At each site the FWD data were obtained at load levels varying from about 6000 lbs to as much as 22000 lbs. Deflection data obtained from the selected eleven test sites for two seasons

(Summer 88 and Winter-Early 89) and at stations 6, 8, 12, 17, and 20 were considered in the study. It was decided that it is unnecessary to include data from all stations for this investigation. Furthermore, similar to the site variability study, deflections at sensors 1 and 6 were used. While the defection at D-1 reflects the influence of all pavement layers, the deflection at D-6 typically reflects the influence of subgrade.

All the deflection data selected as outlined above were "normalized" using linearity to give deflections for a load of 9000 lbs. The normalized deflections for a typical site (Site 11) are shown in Table 8 and 9. Similar tables for all other sites are presented in Appendix B. The tables also give the standard deviation for each station.

If the FWD measurements are indeed free of error (loads and deflection) and if the pavement layers are linear elastic then the normalized deflection data will be just one point. The range of variation of deflection indicates the extent of nonlinearity. The range of variations are presented in terms of coefficient of variation in Table 10. The results for Site 28 have been removed from the table since the FWD data for this site showed inconsistent surface deflections with the increase in FWD load. The coefficient of variation typically varied from 0.0 to 18.3%. Generally higher values were computed for D6 where the measured deflections are quite small. The majority of coefficient of variations fall within 3 - 5%.

The deflection variability across a site (i.e. site variability) has been reported earlier. It is important that the

Table: 8 Effect of Non-Linearity on FWD Data

Site:11 Date:8-88 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	8304.00	5.10	5.53	0.30	0.32	0.35	0.04
6.00	12255.00	7.04	5.17		0.40	0.29	
6.00	17448.00	9.49	4.90		0.49	0.25	
6.00	22264.00	11.70	4.73		0.57	0.23	
8.00	8288.00	4.90	5.32	0.30	0.32	0.35	0.04
8.00	12244.00	6.76	4.97		0.40	0.29	
8.00	17608.00	9.09	4.65		0.53	0.27	
8.00	22216.00	11.30	4.58		0.61	0.25	
12.00	8392.00	5.93	6.36	0.45	0.32	0.34	0.04
12.00	12392.00	8.22	5.97		0.36	0.26	
12.00	17744.00	10.75	5.45		0.57	0.29	
12.00	22384.00	12.93	5.20		0.57	0.23	
17.00	8424.00	5.53	5.91	0.37	0.36	0.38	0.03
17.00	12328.00	7.79	5.69		0.49	0.36	
17.00	17504.00	10.08	5.18		0.61	0.31	
17.00	22392.00	12.41	4.99		0.77	0.31	
20.00	8464.00	4.98	5.30	0.42	0.24	0.26	0.06
20.00	12464.00	6.68	4.82		0.40	0.29	
20.00	17560.00	8.58	4.40		0.73	0.37	
20.00	22584.00	10.55	4.20		0.98	0.39	
MEAN:	14440.90	8.09	4.92	0.31	0.48	0.29	0.04

*STD-Standard Deviation

Table: 9 Effect of Non-Linearity on FWD Data

Site:11 Date:2-89 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	9896.00	10.08	9.17	0.85	0.85	0.77	0.06
6.00	14440.00	13.28	8.28		1.13	0.70	
6.00	19352.00	15.81	7.35		1.37	0.64	
6.00	23608.00	18.34	6.99		1.62	0.62	
8.00	9848.00	7.47	6.83	0.32	0.57	0.52	0.01
8.00	14320.00	9.88	6.21		0.85	0.53	
8.00	19192.00	13.04	6.12		1.09	0.51	
8.00	23472.00	15.69	6.02		1.29	0.49	
12.00	9536.00	14.35	13.54	1.49	1.82	1.72	0.21
12.00	13888.00	17.83	11.55		2.22	1.44	
12.00	18744.00	21.78	10.46		2.67	1.28	
12.00	22944.00	24.35	9.55		2.91	1.14	
17.00	9544.00	11.19	10.55	0.83	0.73	0.69	0.03
17.00	13912.00	14.15	9.15		1.01	0.65	
17.00	18720.00	17.75	8.53		1.29	0.62	
17.00	22952.00	21.70	8.51		1.54	0.60	
20.00	9456.00	9.21	8.77	0.60	0.57	0.54	0.03
20.00	13816.00	11.98	7.80		0.81	0.53	
20.00	18664.00	14.94	7.20		1.05	0.51	
20.00	22960.00	18.93	7.42		1.21	0.47	
MEAN:	15679.24	14.37	8.10	0.68	1.27	0.71	0.06

*STD-Standard Deviation

Table: 10 Summary of the Coefficient of Variations from the Nonlinearity Study

		Coeffecient variation %									
		Displacement D - 1					Displacement D - 6				
Site No	Date	St. No.6	St. No.8	St. No.12	St. No.17	St. No.20	St. No.6	St. No.8	St. No.12	St. No.17	St. No.20
11	8/88	5.90	6.20	7.80	6.80	9.00	14.30	13.80	14.30	8.80	18.30
	2/89	10.70	5.10	13.20	9.00	7.70	8.80	2.00	15.10	4.70	5.90
12	8/88	8.53	4.91	9.65	7.24	6.86	14.82	3.85	11.30	2.20	1.66
	2/89	6.02	1.43	4.91	4.01	2.37	7.92	3.25	6.32	0.00	2.64
16	8/88	1.59	0.80	1.95	0.81	0.83	2.98	2.11	3.87	2.36	3.07
	2/89	1.40	2.08	1.99	2.43	1.03	1.55	0.80	1.79	4.59	2.35
17	8/88	4.16	3.79	2.42	2.99	8.84	4.96	4.29	5.11	1.17	1.18
	2/89	6.66	5.13	5.31	5.74	13.14	1.92	3.27	2.93	3.69	1.57
24	6/88	1.26	0.31	0.84	2.82	0.68	3.62	2.29	2.15	3.87	5.85
	12/88	2.05	1.55	2.20	2.68	1.25	3.98	3.15	4.22	3.86	2.59
26	3/88	1.89	3.31	3.17	3.71	3.99	4.48	1.23	4.61	0.99	4.20
	6/88	5.98	8.52	3.76	7.87	7.66	1.90	7.06	8.05	1.08	2.09
31	7/88	0.00	2.06	2.09	2.25	1.55	0.00	3.42	4.04	3.82	0.66
	1/89	0.65	4.72	3.66	2.56	1.61	2.02	2.05	2.99	2.56	2.59
35	7/88	9.83	9.58	6.89	3.73	2.12	2.22	3.21	0.59	2.81	1.31
	2/89	5.20	4.69	3.11	0.00	1.25	1.56	4.45	1.22	1.32	1.55
36	7/88	8.01	12.30	8.78	5.78	10.20	0.90	1.00	2.54	3.45	2.48
	2/89	2.32	3.98	2.93	6.01	3.67	1.79	6.03	3.24	3.70	6.25
310	7/88	6.69	3.04	2.18	2.77	3.09	3.48	2.53	0.81	2.58	2.40
	1/89	5.38	3.16	2.07	3.95	3.49	10.45	2.40	7.72	4.24	4.58

variability in deflection due to nonlinearity (importance of nonlinearity) should be assessed along with the variability in deflection due to site variability. This is achieved in the next section.

Comparison of Site Variability and Nonlinearity

As was discussed under the site variability and nonlinearity studies, the range in deflection data from 6000 to 22000 lb FWD tests were normalized to 9000 lb. For the site variability study, the mean, standard deviation, and coefficient of variation of the deflection closest to 9000 lb were computed for all 21 stations. The data was used to examine the degree of variability within each test site. In the case of the nonlinearity study, the mean, standard deviation , and coefficient of variation of the FWD deflections at all load levels for each of the randomnly selected five stations were evaluated. The purpose of comparing the variablity study with the nonlineraity study is to decide whether nonlinearity is a major factor and should be considered in the overlay design procedure.

As can be shown from Tables 6 and 10, the majority of the C.O.V. values from the site variability study range from 15 to 30 percent, while the majority of the C.O.V. values from the nonlinearity study range from 3 to 5 percent. Thus the "error" expected from assuming that the pavement system behaves as linear rather than nonlinear material is much less than the "error" resulting from the spacial variability in material properties.

Figure 3 and 4 show typical comparison of site variability and nonlinearity data, for sites 11 and 31 which represent the worst and best nonlinearity conditions, respectively.

Backcalculation of Layers Moduli

The ultimate goal of the backcalculation process is to estimate the pavement material properties from NDT data. The basis of the procedure is to find the set of parameters which corresponds to the best fit of the measured deflection bowls. The best fit is achieved by minimizing the error between measured and calculated deflection bowls.

A growing body of knowledge already exists in this area with regard to the backcalculation of layer moduli under nondestructive test loading (NDT), such as the FWD. The aim is to match measured deflections with those calculated using assumed layers moduli. For more than two decades, the matching process has been trial and error, with few rules to guide the analyst. In recent years several automatic search routines have been developed which minimize error between measured and calculated deflection bowls. Two such routines are the EVERCALC and MODULUS models (7,8). The details of these procedures are given below.

MODULUS Model: The MODULUS model is a generalized modulus backcalculation procedure, developed by the researchers at the Texas Transportation Institute (TTI) as a part of a NCHRP research project. As for all backcalculation procedures, the model is

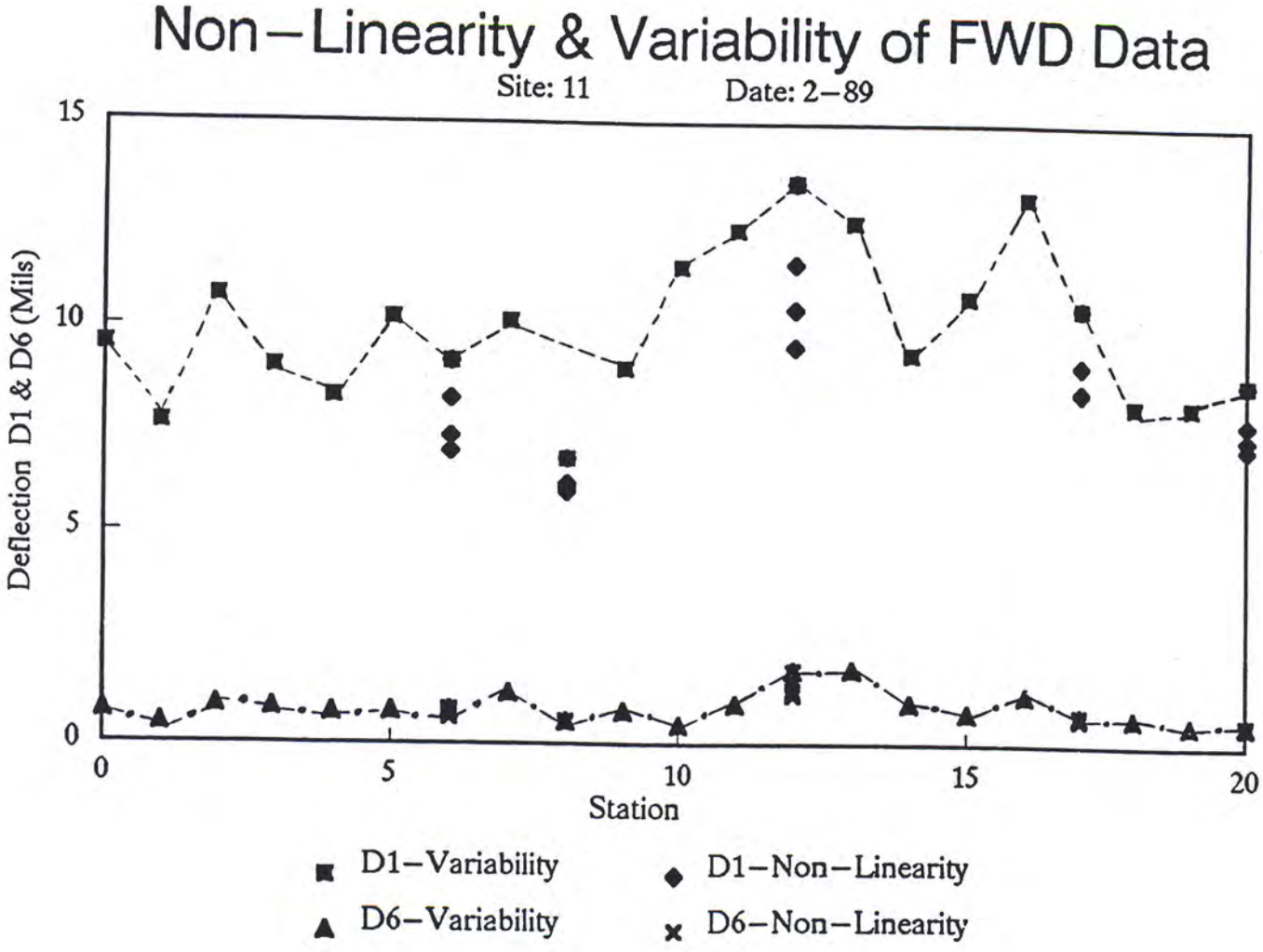

Figure 3: Comparison of Nonlinearity Effects on FWD Data, Site 11

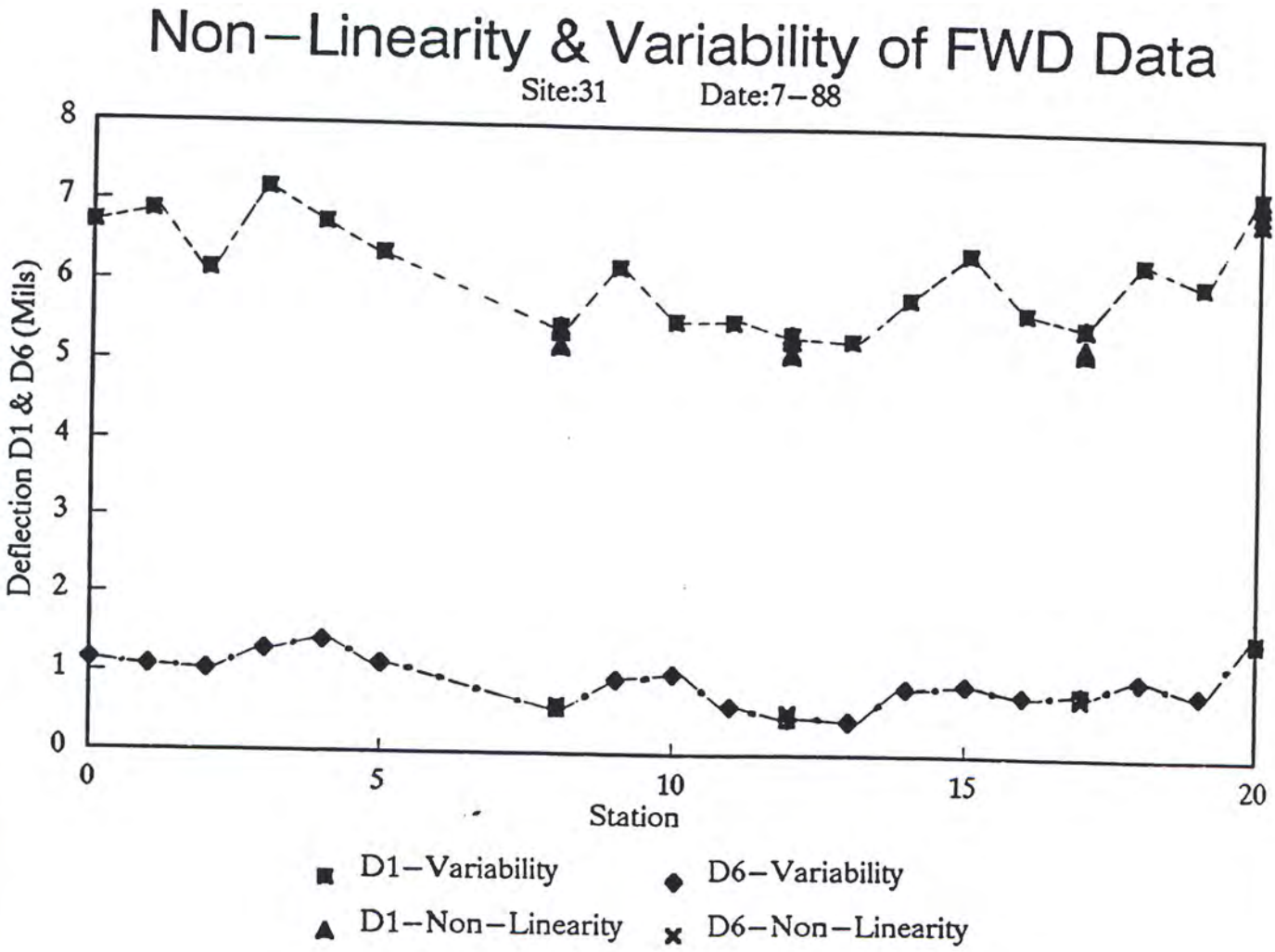

Figure 4: Comparison of Nonlinearity and Site Variability Effects on FWD Data, Site 31.

designed to find the set of pavement moduli that correspond to the best fit of the measured deflection bowls.

Any backcalculation procedure such as EVERCALC, BISDEF, etc... requires a deflection computation routine such as CHEVRON, BISAR, IILIPAVE, etc... The number of calls for the deflection routine depends on the minimization algorithm used. For example, the EVERCALC model calls the deflection computation routine (NLAYER+1)*ITER+1 times for each deflection bowl to be analyzed, where NLAYER is the total number of layers for which moduli are to be determined, and ITER is the number of iterations. Generally, the pattern search technique requires numerous calls of the deflection computation routine for each measured bowl. This procedure can be inefficient in the case where a larger number of bowls are to be analyzed. This drawback is overcome in the MODULUS model by generating ahead of time a data base containing deflection bowls for the expected range of moduli and using a 3-point Lagrange interpolation technique to compute the deflection bowl for any set of unknown values within the expected range. It is worth mentioning that after the generation of the data base, the deflection computation routine is no longer required.

EVERCALC Model: The back calculation program EVERCALC is based on linear elastic layer theory and uses CHEVRON n-layer program to calculate defections in pavements given the pavement resilient modulus values (8,9). This program was developed at the University

of Washington and requires Poisson's ratios and layer thicknesses for the pavement layers as input. For convergence in deflection, optimization inverse solution algorithm routine that is used with BISDEF is incorporated in EVERCALC.

The optimization inverse solution technique minimizes the summation of error squared. Here the error is the difference between the measured and calculated deflections. When the summation of error squared is equal or smaller than a specified tolerance, a match for deflection basin or convergence between the calculated and field deflection is found. The original program EVERCALC had some FORTRAN line errors in the convergence routine and therefore in some cases the program gets "locked in" within a DO loop. These lines were identified and were corrected at the University of Nevada, Reno (UNR). It is a user friendly menu driven program and has the capability of either accepting seed and range of moduli for pavement layers as input or assuming values assigned in the program.

One of the basic limitations of the program is that it assumes the subgrade extends to infinity (half space). In a number of cases this assumption is unrealistic.

Selection of Backcalculation Model

The EVERCALC and MODULUS backcalculation models were used to evaluate the pavement layers moduli for all 21 station of the eleven selected sites. The primary goal of this analysis is to select an appropriate backcalculation model to be used in the final

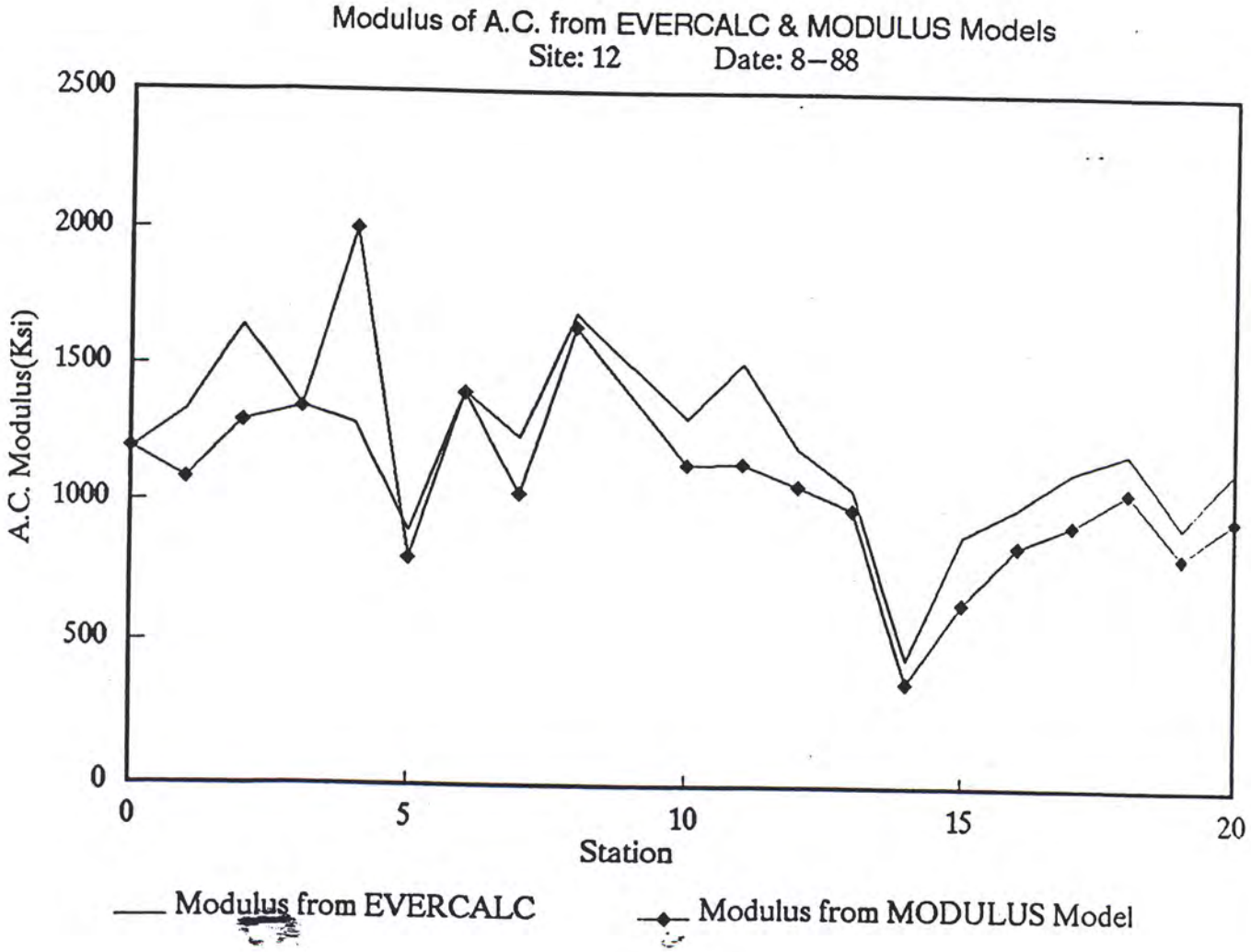

Figure 5. Comparison of Asphalt Concrete moduli from Evercalc and Modulus Models

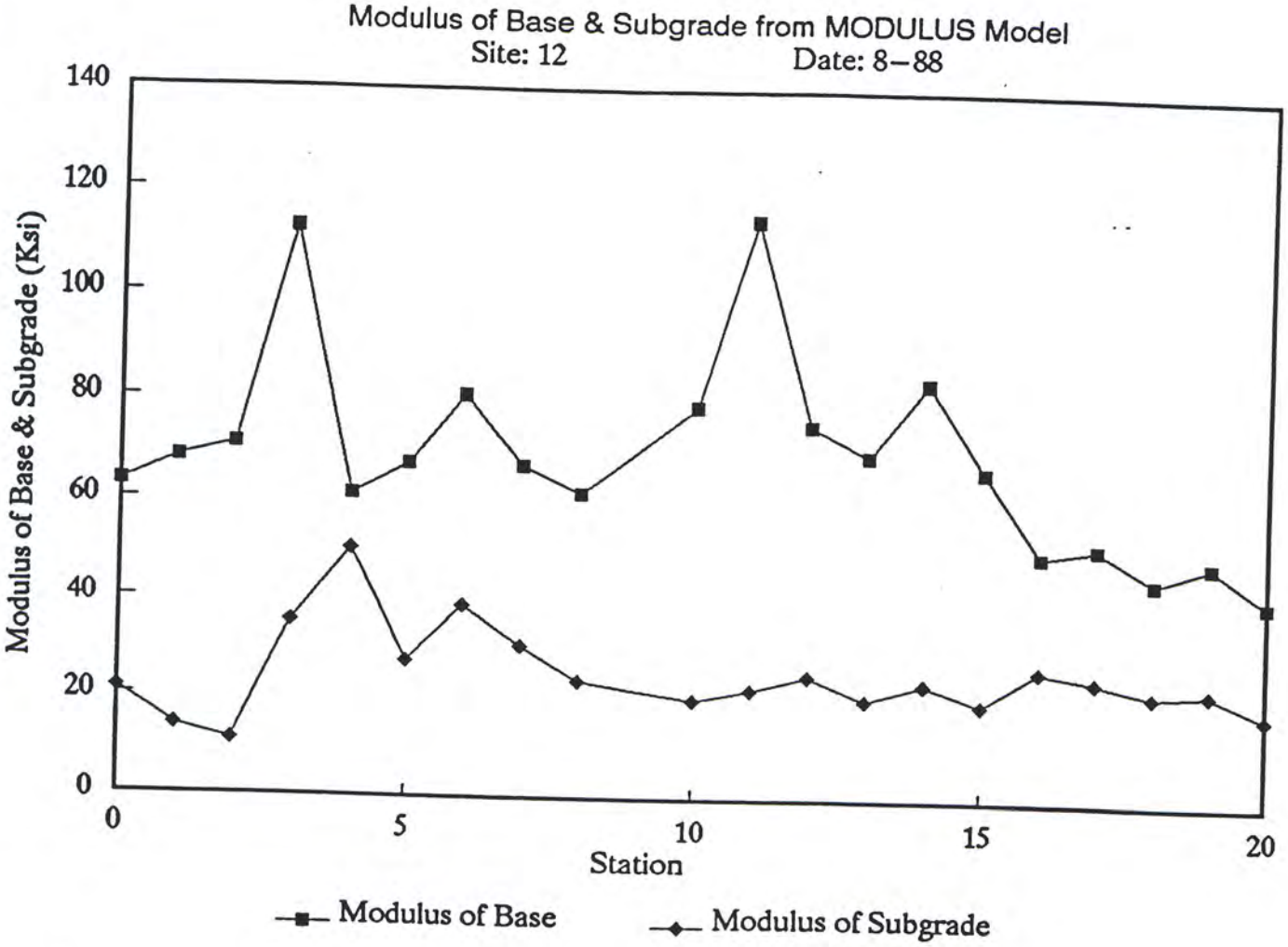

Figure 6. Backcalculated Moduli of Subgrade and Base Course from MODULUS Model.

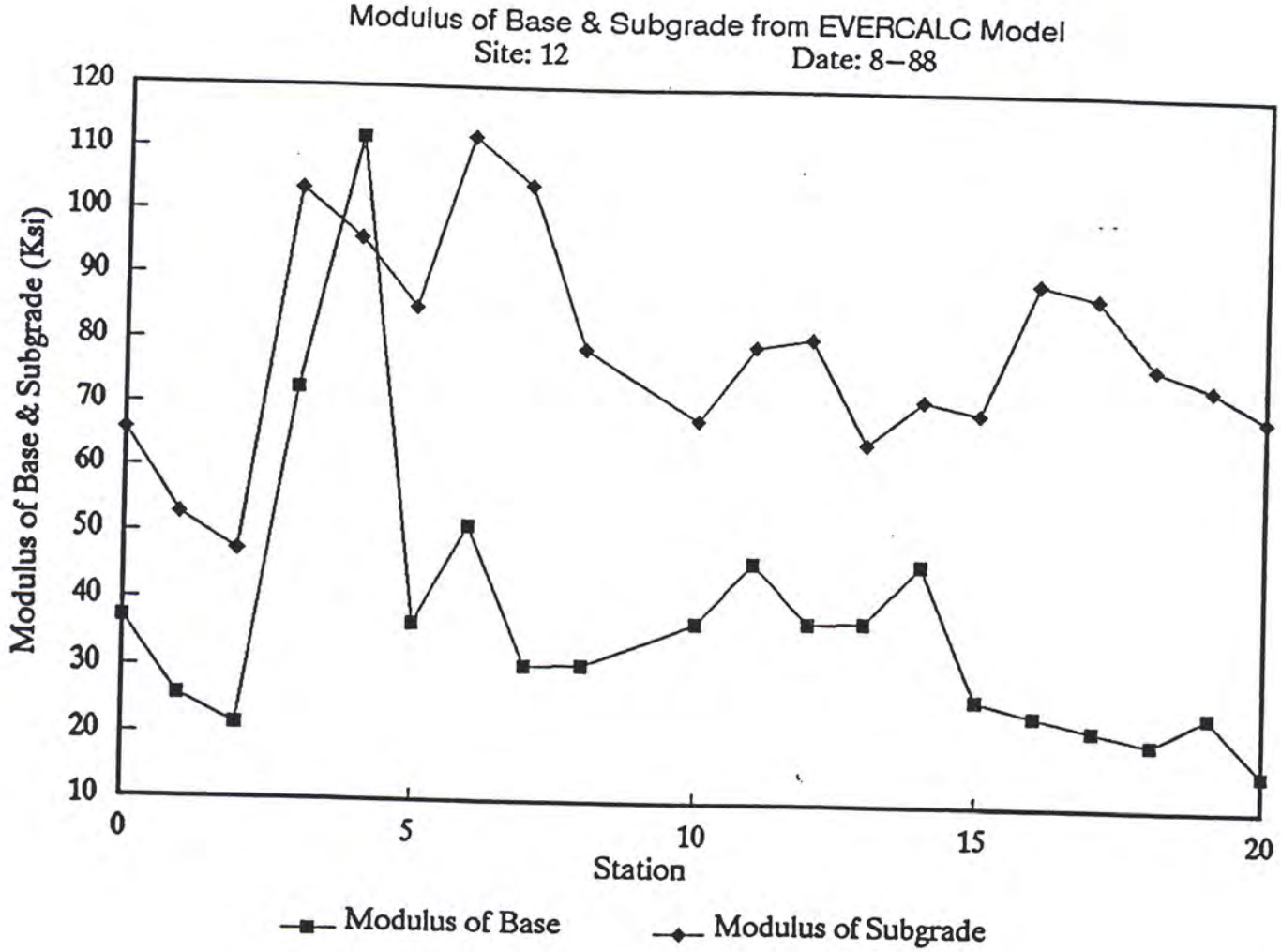

Figure 7. Backcalculated Moduli of Subgrade and Base Course from EVERCALC Model.

performance of both models in the above criteria, it is recommended that the MODULUS model should be used in the overlay design procedure.

4. RECOMMENDATIONS AND FUTURE WORK

Based on the data analysis conducted in Task 4, the following recommendations can be made:

- The test sites exhibit large variability which should be considered in the final overlay design procedure.
- The frequency of FWD testing should be held at or around 10 FWD tests/lane-mile in order to maximize the benefit of FWD testing and minimize the error in the FWD data.
- The effect of nonlinearity is very minimal and when compared with the site variability. Therefore, an FWD load closest to 10,000 lb should be used in the FWD testing with at least three replicate tests.
- Since the nonlinearity effect is minimal, only the FWD tests closest to 10,000 lb load need to be used in the overall backcalculation analysis.
- The MODULUS model performed superior to EVERCALC in all criteria, therefore, MODULUS should be used to conduct all backcalculation analyses for the overlay design procedure.

In order to complete the overlay design procedure, the following tasks must be completed:

- Complete the backcalculation of all twenty seven sites for all seasons.

- Determine the seasonal variation of materials properties.

- Finalize the overlay design algorithm.
- Develop a user friendly computer program to assist engineers with overlay design procedure.
- Develop the final report and provide training.

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APPENDIX A

SITE VARIABILITY OF THE FWD DATA

Table: A1 Effect of Site Variability on FWD Data

Site No:11			Date:8/88			Station:0 to 20
Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	8736	5.420	1.030	5.584	0.360	0.371
1	8552	5.220	1.052	5.493	0.240	0.253
2	8408	5.570	1.070	5.962	0.320	0.343
3	8672	4.820	1.038	5.002	0.280	0.291
4	8448	4.310	1.065	4.592	0.320	0.341
5	8720	4.360	1.032	4.500	0.320	0.330
6	8304	5.100	1.084	5.527	0.320	0.347
7	8472	5.850	1.062	6.215	0.490	0.521
8	8288	4.900	1.086	5.321	0.320	0.347
9	8288	5.490	1.086	5.962	0.330	0.358
10	8448	4.980	1.065	5.305	0.240	0.256
11	8328	6.640	1.081	7.176	0.400	0.432
12	8392	5.930	1.072	6.360	0.320	0.343
13	8472	5.810	1.062	6.172	0.440	0.467
14	8320	6.130	1.082	6.631	0.400	0.433
15	8208	5.810	1.096	6.371	0.360	0.395
16	8224	6.090	1.094	6.665	0.360	0.394
17	8424	5.530	1.068	5.908	0.360	0.385
18	8448	5.930	1.065	6.317	0.400	0.426
19	8360	5.260	1.077	5.663	0.320	0.344
20	8464	4.980	1.063	5.295	0.240	0.255
Mean	8427	5.435	1.068	5.811	0.340	0.363
STD*	143.76	0.578	0.018	0.668	0.062	0.067
C.O.V**	1.706	10.644	1.687	11.489	18.311	18.574

* STD-Standard Deviation

**C.O.V-(Std.Dev/Mean)*100

Table: A2 Effect of Site Variability on FWD Data

Site No:11 Date:2/89 Station:0 to 20

Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	10448	11.070	0.861	9.536	0.890	0.767
1	10040	8.580	0.896	7.691	0.530	0.475
2	9984	11.900	0.901	10.727	1.010	0.910
3	10000	10.040	0.900	9.036	0.930	0.837
4	9848	9.130	0.914	8.344	0.810	0.740
5	9936	11.300	0.906	10.236	0.850	0.770
6	9896	10.080	0.909	9.167	0.850	0.773
7	9864	11.110	0.912	10.137	1.290	1.177
8	9848	7.470	0.914	6.827	0.570	0.521
9	9656	9.680	0.932	9.022	0.810	0.755
10	9704	12.370	0.927	11.473	0.490	0.454
11	9552	13.160	0.942	12.399	0.970	0.914
12	9536	14.350	0.944	13.543	1.820	1.718
13	9592	13.400	0.938	12.573	1.860	1.745
14	9648	10.040	0.933	9.366	1.010	0.942
15	9504	11.380	0.947	10.777	0.770	0.729
16	9352	13.720	0.962	13.204	1.210	1.164
17	9544	11.190	0.943	10.552	0.730	0.688
18	9464	8.620	0.951	8.197	0.690	0.656
19	9432	8.580	0.954	8.187	0.530	0.506
20	9456	9.210	0.952	8.766	0.570	0.543
Mean	9729	10.780	0.926	9.989	0.914	0.847
STD*	260.88	1.851	0.024	1.803	0.366	0.346
C.O.V**	2.682	17.174	2.629	18.051	40.052	40.849

* STD-Standard Deviation **C.O.V-(Std.Dev/Mean)*100

Table: A3 Effect of Site Variability on FWD Data

Site No:12			Date:8/88			Station:0 to 20
Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	9336	4.940	0.964	4.762	0.650	0.627
1	8968	5.530	1.004	5.550	0.850	0.853
2	8912	5.530	1.010	5.585	0.970	0.980
3	8480	3.040	1.061	3.226	0.360	0.382
4	8520	2.850	1.056	3.011	0.440	0.465
5	8408	4.620	1.070	4.945	0.440	0.471
6	8424	3.200	1.068	3.419	0.320	0.342
7	8416	4.110	1.069	4.395	0.360	0.385
8	8640	3.950	1.042	4.115	0.530	0.552
9	8648	3.240	1.041	3.372	0.440	0.458
10	8792	4.510	1.024	4.617	0.610	0.624
11	8840	3.870	1.018	3.940	0.530	0.540
12	8760	4.350	1.027	4.469	0.490	0.503
13	8720	4.860	1.032	5.016	0.610	0.630
14	8528	5.970	1.055	6.300	0.530	0.559
15	8568	5.650	1.050	5.935	0.570	0.599
16	8392	4.980	1.072	5.341	0.400	0.429
17	8568	5.020	1.050	5.273	0.440	0.462
18	8488	5.140	1.060	5.450	0.530	0.562
19	8352	5.340	1.078	5.754	0.490	0.528
20	8376	5.770	1.074	6.200	0.570	0.612
Mean	8626	4.594	1.044	4.794	0.530	0.551
STD*	238.68	0.926	0.028	0.969	0.151	0.146
C.O.V**	2.767	20.150	2.680	20.222	28.549	26.482

* STD-Standard Deviation **C.O.V-(Std.Dev/Mean)*100

Table: A4 Effect of Site Variability on FWD Data

Site No:12			Date:2/89		Station:0 to 20	
Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	10248	5.060	0.878	4.444	0.930	0.817
1	9856	5.770	0.913	5.269	1.250	1.141
2	9848	5.490	0.914	5.017	1.170	1.069
3	9864	3.160	0.912	2.883	0.490	0.447
4	9880	3.080	0.911	2.806	0.490	0.446
5	9816	3.790	0.917	3.475	0.530	0.486
6	9776	2.770	0.921	2.550	0.280	0.258
7	9784	3.520	0.920	3.238	0.400	0.368
8	9744	3.870	0.924	3.575	0.650	0.600
9	9792	3.240	0.919	2.978	0.570	0.524
10	9680	4.150	0.930	3.858	0.770	0.716
11	9688	3.520	0.929	3.270	0.650	0.604
12	9696	3.760	0.928	3.490	0.570	0.529
13	9640	4.190	0.934	3.912	0.650	0.607
14	9520	7.790	0.945	7.364	0.930	0.879
15	9488	8.740	0.949	8.290	0.930	0.882
16	9528	5.220	0.945	4.931	0.610	0.576
17	9464	5.020	0.951	4.774	0.610	0.580
18	9408	5.140	0.957	4.917	0.730	0.698
19	9400	4.900	0.957	4.691	0.690	0.661
20	9432	5.450	0.954	5.200	0.770	0.735
Mean	9693	4.649	0.929	4.330	0.699	0.649
STD*	202	1.472	0.019	1.417	0.232	0.213
C.O.	2.082	31.656	2.061	32.731	33.263	32.883

*STD-Standard Deviation **C.O.V-(Std.Dev/Mean)*100

Table: A5 Effect of Site Variability on FWD Data

Site No:16			Date:8/88			Station:0 to 20
Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	8808	8.340	1.022	8.522	0.890	0.909
1	8704	5.650	1.034	5.842	0.690	0.713
2	8744	7.590	1.029	7.812	0.770	0.793
3	8576	5.890	1.049	6.181	0.890	0.934
4	8664	4.740	1.039	4.924	0.650	0.675
5	8640	6.050	1.042	6.302	0.810	0.844
6	8640	6.680	1.042	6.958	0.930	0.969
7	8680	7.040	1.037	7.300	1.010	1.047
8	8584	7.040	1.048	7.381	0.890	0.933
9	8504	6.600	1.058	6.985	0.970	1.027
10	8456	5.140	1.064	5.471	0.890	0.947
11	8480	6.440	1.061	6.835	0.850	0.902
12	8520	6.920	1.056	7.310	0.730	0.771
13	8592	4.150	1.047	4.347	0.610	0.639
14	8488	7.190	1.060	7.624	0.810	0.859
15	8392	6.920	1.072	7.421	0.810	0.869
16	8504	5.180	1.058	5.482	0.730	0.773
17	8416	5.770	1.069	6.170	0.770	0.823
18	8448	6.440	1.065	6.861	0.650	0.692
19	8480	6.360	1.061	6.750	0.810	0.860
20	8368	6.640	1.076	7.141	0.890	0.957
Mean	8557	6.322	1.052	6.649	0.812	0.854
STD*	117.67	0.962	0.014	0.990	0.106	0.111
C.O.V**	1.375	15.224	1.369	14.893	13.033	13.035

* STD-Standard Deviation **C.O.V-(Std.Dev/Mean)*100

Table: A6 Effect of Site Variability on FWD Data

Site No:16			Date:2/89			Station:0 to 20
Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	9784	4.780	0.920	4.397	1.330	1.223
1	9584	4.270	0.939	4.010	1.050	0.986
2	9408	5.060	0.957	4.841	1.170	1.119
3	9368	4.070	0.961	3.910	0.860	0.826
4	9464	3.830	0.951	3.642	0.890	0.846
5	9496	4.510	0.948	4.274	1.210	1.147
6	9520	4.470	0.945	4.226	1.330	1.257
7	9336	5.180	0.964	4.994	1.370	1.321
8	9392	4.860	0.958	4.657	1.290	1.236
9	9400	4.430	0.957	4.241	1.250	1.197
10	9472	3.830	0.950	3.639	1.130	1.074
11	9168	4.230	0.982	4.152	1.250	1.227
12	9208	4.510	0.977	4.408	1.130	1.104
13	9400	3.000	0.957	2.872	0.850	0.814
14	9368	4.190	0.961	4.025	1.170	1.124
15	9336	4.550	0.964	4.386	1.170	1.128
16	9432	3.640	0.954	3.473	1.050	1.002
17	9280	3.680	0.970	3.569	1.050	1.018
18	9232	4.310	0.975	4.202	0.820	0.799
19	9160	4.310	0.983	4.235	1.130	1.110
20	9144	4.900	0.984	4.823	1.290	1.270
Mean	9379	4.315	0.960	4.142	1.133	1.087
STD*	150.00	0.510	0.015	0.496	0.162	0.155
C.O.V**	1.599	11.829	1.587	11.967	14.322	14.245

* STD-Standard Deviation **C.O.V-(Std.Dev/Mean)*100

Table: A7 Effect of Site Variability on FWD Data

Site No:17 Date:8/88 Station:0 to 20

Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	8240	23.520	1.092	25.689	2.100	2.294
1	8480	16.600	1.061	17.618	1.860	1.974
2	8480	15.260	1.061	16.196	1.780	1.889
3	8352	14.940	1.078	16.099	1.580	1.703
4	8456	14.630	1.064	15.571	1.660	1.767
5	8368	13.990	1.076	15.047	1.330	1.430
6	8144	14.070	1.105	15.549	1.420	1.569
7	8064	14.630	1.116	16.328	1.460	1.629
8	8120	12.970	1.108	14.376	1.170	1.297
9	8080	15.890	1.114	17.699	1.330	1.481
10	8328	14.310	1.081	15.465	1.660	1.794
11	8240	18.780	1.092	20.512	2.180	2.381
12	8368	15.850	1.076	17.047	1.620	1.742
13	8464	16.250	1.063	17.279	2.060	2.190
14	8160	16.680	1.103	18.397	1.980	2.184
15	8392	11.660	1.072	12.505	1.370	1.469
16	8536	13.040	1.054	13.749	1.580	1.666
17	8350	14.630	1.078	15.769	1.580	1.703
18	8056	14.700	1.117	16.423	1.460	1.631
19	8016	13.910	1.123	15.618	1.420	1.594
20	7912	17.990	1.138	20.464	1.500	1.706
Mean	8267	15.443	1.089	16.828	1.624	1.766
STD*	176.05	2.424	0.023	2.724	0.271	0.284
C.O.V**	2.130	15.697	2.144	16.184	16.660	16.106

* STD-Standard Deviation

**C.O.V-(Std.Dev/Mean)*100

Table: A8 Effect of Site Variability on FWD Data

Site No:17 Date:2/89 Station:0 to 20

Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	9272	20.830	0.971	20.219	3.960	3.844
1	10056	16.560	0.895	14.821	2.750	2.461
2	9056	15.260	0.994	15.166	2.350	2.335
3	9008	16.130	0.999	16.116	2.550	2.548
4	9136	13.190	0.985	12.994	2.550	2.512
5	9040	14.590	0.996	14.525	1.460	1.454
6	9024	14.030	0.997	13.993	2.140	2.134
7	9016	16.170	0.998	16.141	1.620	1.617
8	8976	11.980	1.003	12.012	1.900	1.905
9	9056	18.500	0.994	18.386	1.780	1.769
10	8928	12.810	1.008	12.913	2.100	2.117
11	8800	19.650	1.023	20.097	3.070	3.140
12	8848	15.340	1.017	15.604	2.430	2.472
13	8752	15.060	1.028	15.487	2.830	2.910
14	8664	18.580	1.039	19.301	3.070	3.189
15	8784	10.080	1.025	10.328	1.580	1.619
16	8768	11.150	1.026	11.445	2.220	2.279
17	8760	11.380	1.027	11.692	2.140	2.199
18	8664	17.040	1.039	17.701	2.100	2.181
19	8752	16.050	1.028	16.505	1.940	1.995
20	8584	27.230	1.048	28.550	1.860	1.950
Mean	8950	15.791	1.007	15.904	2.305	2.316
STD*	301.747	3.768	0.032	3.942	0.583	0.569
C.O.V**	3.372	23.859	3.155	24.785	25.311	24.564

* STD-Standard Deviation

**C.O.V-(Std.Dev/Mean)*100

Table: A9 Effect of Site Variability on FWD Data

Site No:24 Date:6/88 Station:0 to 20

Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	8792	15.140	1.024	15.498	2.220	2.273
1	8744	13.440	1.029	13.833	1.820	1.873
2	8736	12.570	1.030	12.950	1.820	1.875
3	8672	12.730	1.038	13.211	1.780	1.847
4	8712	11.860	1.033	12.252	1.700	1.756
5	8752	11.030	1.028	11.343	1.330	1.368
6	8712	13.200	1.033	13.636	1.860	1.921
7	8744	12.020	1.029	12.372	1.330	1.369
8	8760	12.450	1.027	12.791	1.250	1.284
9	8728	11.460	1.031	11.817	1.420	1.464
10	8704	12.530	1.034	12.956	1.250	1.293
11	8664	13.720	1.039	14.252	1.370	1.423
12	8720	12.690	1.032	13.097	1.330	1.373
13	8600	13.910	1.047	14.557	1.700	1.779
14	8576	14.070	1.049	14.766	2.220	2.330
15	8560	14.230	1.051	14.961	1.270	1.335
16	8560	15.420	1.051	16.213	2.140	2.250
17	8552	14.430	1.052	15.186	2.390	2.515
18	8544	13.360	1.053	14.073	1.900	2.001
19	8536	13.120	1.054	13.833	1.900	2.003
20	8568	14.150	1.050	14.863	1.500	1.576
Mean	8664	13.216	1.039	13.736	1.690	1.758
STD*	84.75	1.125	0.010	1.245	0.350	0.371
C.O.V**	0.978	8.516	0.981	9.061	20.724	21.115

* STD-Standard Deviation

**C.O.V-(Std.Dev/Mean)*100

Table: A10 Effect of Site Variability on FWD Data

Site No:24 Date:12/88 Station:0 to 20

Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	9120	10.990	0.987	10.845	2.510	2.477
1	9056	9.570	0.994	9.511	1.980	1.968
2	9008	9.090	0.999	9.082	2.060	2.058
3	8992	8.930	1.001	8.938	1.860	1.862
4	9056	8.930	0.994	8.875	1.820	1.809
5	9016	7.080	0.998	7.067	1.370	1.368
6	8944	9.130	1.006	9.187	1.940	1.952
7	9088	8.180	0.990	8.101	1.420	1.406
8	8936	8.890	1.007	8.954	1.580	1.591
9	8920	7.670	1.009	7.739	1.500	1.513
10	8880	8.780	1.014	8.899	1.460	1.480
11	8792	9.330	1.024	9.551	1.500	1.535
12	8912	8.420	1.010	8.503	1.370	1.384
13	8792	9.290	1.024	9.510	1.740	1.781
14	8776	9.450	1.026	9.691	2.220	2.277
15	8856	9.610	1.016	9.766	2.060	2.093
16	8808	10.400	1.022	10.627	2.390	2.442
17	8792	10.040	1.024	10.278	2.470	2.528
18	8744	9.010	1.029	9.274	1.980	2.038
19	8712	9.210	1.033	9.514	1.980	2.045
20	8712	9.960	1.033	10.289	1.860	1.921
Mean	8901	9.141	1.011	9.248	1.860	1.882
STD*	124.59	0.851	0.014	0.893	0.347	0.355
C.O.V**	1.400	9.308	1.398	9.655	18.627	18.835

* STD-Standard Deviation

**C.O.V-(Std.Dev/Mean)*100

Table: A11 Effect of Site Variability on FWD Data

Site No:26 Date:3/88 Station:0 to 20

Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	9280	7.270	0.970	7.051	1.740	1.688
1	8960	11.620	1.004	11.672	3.030	3.044
2	9160	5.890	0.983	5.787	1.580	1.552
3	9016	7.150	0.998	7.137	1.700	1.697
4	8928	12.130	1.008	12.228	1.980	1.996
5	8856	8.380	1.016	8.516	1.780	1.809
6	8992	7.470	1.001	7.477	1.900	1.902
7	8840	7.630	1.018	7.768	1.700	1.731
8	8800	8.020	1.023	8.202	1.620	1.657
9	8840	7.710	1.018	7.850	1.500	1.527
10	9088	6.920	0.990	6.853	1.460	1.446
11	8720	7.790	1.032	8.040	1.540	1.589
12	8736	6.680	1.030	6.882	1.580	1.628
13	8672	8.180	1.038	8.489	1.780	1.847
14	8848	8.660	1.017	8.809	1.980	2.014
15	8704	7.830	1.034	8.096	1.620	1.675
16	8400	7.950	1.071	8.518	1.420	1.521
17	8576	8.620	1.049	9.046	1.940	2.036
18	8632	7.350	1.043	7.663	1.740	1.814
19	8552	8.500	1.052	8.945	1.940	2.042
20	8576	7.790	1.049	8.175	1.620	1.700
Mean	8818	8.073	1.021	8.248	1.769	1.805
STD*	213.42	1.397	0.025	1.433	0.327	0.327
C.O.V**	2.420	17.298	2.411	17.377	18.488	18.105

* STD-Standard Deviation

**C.O.V-(Std.Dev/Mean)*100

Table: A12 Effect of Site Variability on FWD Data

Site No:26 Date:6/88 Station:0 to 20

Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	8584	9.090	1.048	9.531	1.540	1.615
1	8280	9.920	1.087	10.783	1.860	2.022
2	8272	7.150	1.088	7.779	1.500	1.632
3	8328	8.620	1.081	9.316	1.500	1.621
4	8296	14.310	1.085	15.524	1.620	1.757
5	8224	10.200	1.094	11.162	1.620	1.773
6	8232	9.090	1.093	9.938	1.460	1.596
7	8192	9.720	1.099	10.679	1.460	1.604
8	8296	10.550	1.085	11.445	1.460	1.584
9	8296	9.330	1.085	10.122	1.500	1.627
10	8080	9.450	1.114	10.526	1.250	1.392
11	8816	9.090	1.021	9.280	1.330	1.358
12	8320	7.830	1.082	8.470	1.700	1.839
13	8192	10.360	1.099	11.382	1.420	1.560
14	8264	11.070	1.089	12.056	1.210	1.318
15	8168	10.470	1.102	11.536	1.290	1.421
16	8192	10.990	1.099	12.074	1.290	1.417
17	8144	10.750	1.105	11.880	1.700	1.879
18	8120	9.530	1.108	10.563	1.500	1.663
19	8088	11.110	1.113	12.363	1.580	1.758
20	8128	9.800	1.107	10.851	1.330	1.473
Mean	8262	9.925	1.090	10.822	1.482	1.615
STD*	163.81	1.404	0.021	1.582	0.161	0.177
C.O.V**	1.983	14.145	1.910	14.622	10.854	10.971

* STD-Standard Deviation **C.O.V-(Std.Dev/Mean)*100

Table: A13 Effect of Site Variability on FWD Data

Site No:28 Date:3/88 Station:0 to 20

Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	9688	50.400	0.929	46.821	4.210	3.911
1	9440	48.740	0.953	46.468	3.920	3.737
2	9160	51.820	0.983	50.915	4.330	4.254
3	8992	55.380	1.001	55.429	4.490	4.494
4	9184	53.560	0.980	52.487	3.880	3.802
5	9160	50.670	0.983	49.785	3.120	3.066
6	8912	54.980	1.010	55.523	3.880	3.918
7	8960	55.260	1.004	55.507	4.000	4.018
8	8840	56.720	1.018	57.747	4.410	4.490
9	8976	47.240	1.003	47.366	3.600	3.610
10	8744	56.560	1.029	58.216	3.680	3.788
11	8696	59.730	1.035	61.818	4.000	4.140
12	8688	58.900	1.036	61.015	3.480	3.605
13	8920	50.560	1.009	51.013	4.160	4.197
14	8880	49.650	1.014	50.321	3.800	3.851
15	8960	42.690	1.004	42.881	3.230	3.244
16	9000	44.550	1.000	44.550	2.750	2.750
17	9032	42.450	0.996	42.300	2.910	2.900
18	8936	68.740	1.007	69.232	2.870	2.891
19	8704	49.170	1.034	50.842	3.070	3.174
20	8712	46.760	1.033	48.306	3.150	3.254
Mean	8980	52.120	1.003	52.312	3.664	3.671
STD*	242.28	6.086	0.026	6.610	0.526	0.513
C.O.V**	2.698	11.677	2.617	12.635	14.348	13.967

* STD-Standard Deviation

**C.O.V-(Std.Dev/Mean)*100

Table: A14 Effect of Site Variability on FWD Data

Site No:28 Date:6/88 Station:0 to 20

Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	8520	45.460	1.056	48.021	3.360	3.549
1	8608	41.900	1.046	43.808	3.320	3.471
2	8216	47.550	1.095	52.087	3.480	3.812
3	8360	53.760	1.077	57.876	3.720	4.005
4	8312	46.560	1.083	50.414	2.910	3.151
5	8216	46.920	1.095	51.397	2.830	3.100
6	8176	53.090	1.101	58.441	3.680	4.051
7	8176	51.500	1.101	56.690	3.560	3.919
8	8024	52.770	1.122	59.189	3.640	4.083
9	8808	41.700	1.022	42.609	2.950	3.014
10	8144	39.000	1.105	43.099	3.360	3.713
11	8000	43.110	1.125	48.499	3.680	4.140
12	8072	53.720	1.115	59.896	3.150	3.512
13	8216	45.610	1.095	49.962	3.600	3.944
14	8112	47.470	1.109	52.666	3.400	3.772
15	8048	40.440	1.118	45.224	2.830	3.165
16	8424	40.870	1.068	43.665	2.470	2.639
17	8240	41.150	1.092	44.945	2.510	2.742
18	8248	37.310	1.091	40.712	2.510	2.739
19	8184	45.020	1.100	49.509	2.550	2.804
20	8128	44.940	1.107	49.761	2.510	2.779
Mean	8249	45.707	1.092	49.927	3.144	3.434
STD*	196.24	4.887	0.025	5.756	0.444	0.504
C.O.V**	2.379	10.692	2.313	11.528	14.121	14.682

* STD-Standard Deviation

**C.O.V-(Std.Dev/Mean)*100

Table: A15 Effect of Site Variability on FWD Data

Site No:31			Date:7/88		Station:0 to 20	
Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	8824	6.600	1.020	6.732	1.130	1.153
1	8432	6.440	1.067	6.874	1.010	1.078
2	8448	5.770	1.065	6.147	0.970	1.033
3	8368	6.680	1.076	7.185	1.210	1.301
4	8480	6.360	1.061	6.750	1.330	1.412
5	8424	5.970	1.068	6.378	1.050	1.122
8	8232	5.020	1.093	5.488	0.530	0.579
9	8512	5.890	1.057	6.228	0.890	0.941
10	8512	5.260	1.057	5.562	0.970	1.026
11	8320	5.140	1.082	5.560	0.570	0.617
12	8424	5.060	1.068	5.406	0.440	0.470
13	8344	4.940	1.079	5.328	0.400	0.431
14	8496	5.530	1.059	5.858	0.810	0.858
15	8448	6.050	1.065	6.445	0.850	0.906
16	8464	5.380	1.063	5.721	0.730	0.776
17	8472	5.220	1.062	5.545	0.770	0.818
18	8448	5.970	1.065	6.360	0.930	0.991
19	8388	5.690	1.073	6.105	0.770	0.826
20	8504	6.840	1.058	7.239	1.420	1.503
Mean	8449	5.779	1.065	6.153	0.883	0.939
STD*	112.88	0.588	0.014	0.592	0.274	0.287
C.O.V**	1.336	10.168	1.312	9.626	31.009	30.538

* STD-Standard Deviation

**C.O.V-(Std.Dev/Mean)*100

Table: A16 Effect of Site Variability on FWD Data

Site No:31 Date:1/89 Station:0 to 20

Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	9264	1.580	0.972	1.535	0.850	0.826
1	9272	1.660	0.971	1.611	0.930	0.903
2	9176	1.340	0.981	1.314	0.730	0.716
3	9240	1.340	0.974	1.305	0.730	0.711
4	9224	1.580	0.976	1.542	0.850	0.829
5	9144	1.300	0.984	1.280	0.690	0.679
6	9288	1.580	0.969	1.531	1.010	0.979
7	9248	1.070	0.973	1.041	0.530	0.516
8	9344	1.030	0.963	0.992	0.490	0.472
9	9296	1.230	0.968	1.191	0.650	0.629
10	9248	0.990	0.973	0.963	0.440	0.428
11	9304	0.950	0.967	0.919	0.320	0.310
12	9320	1.070	0.966	1.033	0.360	0.348
13	9264	0.790	0.972	0.767	0.240	0.233
14	9208	0.830	0.977	0.811	0.360	0.352
15	9248	1.110	0.973	1.080	0.570	0.555
16	9232	0.990	0.975	0.965	0.530	0.517
17	9168	1.150	0.982	1.129	0.400	0.393
18	9248	1.030	0.973	1.002	0.490	0.477
19	9264	1.030	0.972	1.001	0.530	0.515
20	9160	1.230	0.983	1.209	0.810	0.796
Mean	9246	1.185	0.973	1.153	0.596	0.580
STD*	51.32	0.247	0.005	0.241	0.209	0.204
C.O.V**	0.555	20.820	0.556	20.858	35.111	35.151

* STD-Standard Deviation

**C.O.V-(Std.Dev/Mean)*100

Table: A17 Effect of Site Variability on FWD Data

Site No:35			Date:7/88			Station:0 to 20
Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	8920	10.750	1.009	10.846	1.580	1.594
1	8816	11.340	1.021	11.577	2.260	2.307
2	8560	10.160	1.051	10.682	1.420	1.493
3	8736	11.460	1.030	11.806	1.370	1.411
4	8376	13.870	1.074	14.903	1.210	1.300
5	8240	17.630	1.092	19.256	1.330	1.453
6	8592	13.600	1.047	14.246	1.330	1.393
7	8600	12.450	1.047	13.029	1.330	1.392
8	8488	14.470	1.060	15.343	1.540	1.633
9	8712	2.720	1.033	2.810	1.050	1.085
10	8640	10.830	1.042	11.281	1.370	1.427
11	8552	13.280	1.052	13.976	1.500	1.579
12	8512	15.140	1.057	16.008	1.620	1.713
13	8720	9.010	1.032	9.299	1.170	1.208
14	8624	8.460	1.044	8.829	1.210	1.263
15	8784	8.100	1.025	8.299	1.370	1.404
16	8776	7.790	1.026	7.989	1.250	1.282
17	8704	7.350	1.034	7.600	1.420	1.468
18	8648	7.430	1.041	7.732	1.500	1.561
19	8312	10.830	1.083	11.726	1.540	1.667
20	8632	7.950	1.043	8.289	1.500	1.564
Mean	8616	10.696	1.045	11.216	1.422	1.486
STD*	162.86	3.293	0.020	3.600	0.236	0.240
C.O.V**	1.890	30.786	1.912	32.101	16.576	16.169

* STD-Standard Deviation **C.O.V-(Std.Dev/Mean)*100

Table: A18 Effect of Site Variability on FWD Data

Site No:35			Date:2/89		Station:0 to 20	
Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	9224	0.440	0.976	0.429	0.440	0.429
1	9208	1.110	0.977	1.085	0.610	0.596
2	9008	1.340	0.999	1.339	0.570	0.569
3	9160	1.420	0.983	1.395	0.610	0.599
4	9128	1.340	0.986	1.321	0.530	0.523
5	9176	2.290	0.981	2.246	0.650	0.638
6	9208	1.460	0.977	1.427	0.650	0.635
7	9064	2.020	0.993	2.006	0.570	0.566
8	8984	1.380	1.002	1.382	0.650	0.651
9	9256	3.560	0.972	3.462	0.770	0.749
10	9104	4.940	0.989	4.884	0.650	0.643
11	9016	1.540	0.998	1.537	0.770	0.769
12	9080	1.860	0.991	1.844	0.810	0.803
13	9216	1.380	0.977	1.348	0.650	0.635
14	9304	1.190	0.967	1.151	0.610	0.590
15	9144	1.420	0.984	1.398	0.730	0.719
16	9040	1.540	0.996	1.533	0.610	0.607
17	9064	2.170	0.993	2.155	0.770	0.765
18	9160	1.500	0.983	1.474	0.690	0.678
19	9104	1.540	0.989	1.522	0.650	0.643
20	9256	1.620	0.972	1.575	0.690	0.671
Mean	9138	1.765	0.985	1.739	0.651	0.642
STD*	88.09	0.915	0.009	0.901	0.086	0.086
C.O.V**	0.964	51.822	0.964	51.794	13.233	13.381

* STD-Standard Deviation **C.O.V-(Std.Dev/Mean)*100

Table: A19 Effect of Site Variability on FWD Data

Site No:36			Date:7/88			Station:0 to 20
Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	8504	21.740	1.058	23.008	1.210	1.281
1	8544	15.060	1.053	15.864	1.370	1.443
2	8504	16.680	1.058	17.653	1.660	1.757
3	8496	15.060	1.059	15.953	1.460	1.547
4	8512	15.420	1.057	16.304	1.460	1.544
5	8648	8.260	1.041	8.596	1.250	1.301
6	8424	11.860	1.068	12.671	1.050	1.122
7	8376	6.800	1.074	7.307	1.090	1.171
8	8384	14.150	1.073	15.190	0.850	0.912
9	8656	8.300	1.040	8.630	1.130	1.175
10	8272	13.240	1.088	14.405	0.850	0.925
11	8264	18.580	1.089	20.235	1.420	1.546
12	8240	19.720	1.092	21.539	1.500	1.638
13	8272	14.470	1.088	15.743	0.730	0.794
14	8320	9.720	1.082	10.514	1.130	1.222
15	8280	11.620	1.087	12.630	1.010	1.098
16	8184	20.910	1.100	22.995	1.420	1.562
17	8368	11.110	1.076	11.949	1.050	1.129
18	8368	11.380	1.076	12.239	1.170	1.258
19	8296	10.630	1.085	11.532	1.050	1.139
20	8280	14.900	1.087	16.196	1.130	1.228
Mean	8390	13.791	1.073	14.817	1.190	1.276
STD*	131.31	4.059	0.017	4.425	0.235	0.249
C.O.V**	1.565	29.430	1.553	29.863	19.752	19.507

* STD-Standard Deviation **C.O.V-(Std.Dev/Mean)*100

Table: A20 Effect of Site Variability on FWD Data

Site No:36			Date:2/89		Station:0 to 20	
Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	9408	2.690	0.957	2.573	0.730	0.698
1	9800	2.960	0.918	2.718	0.730	0.670
2	9576	1.860	0.940	1.748	0.770	0.724
3	9528	2.210	0.945	2.088	0.770	0.727
4	9416	2.370	0.956	2.265	0.650	0.621
5	9432	1.230	0.954	1.174	0.690	0.658
6	9496	1.780	0.948	1.687	0.570	0.540
7	9504	1.340	0.947	1.269	0.650	0.616
8	9400	2.020	0.957	1.934	0.570	0.546
9	9448	1.540	0.953	1.467	0.570	0.543
10	9448	1.580	0.953	1.505	0.530	0.505
11	9392	1.580	0.958	1.514	0.610	0.585
12	9296	2.020	0.968	1.956	0.610	0.591
13	9288	1.540	0.969	1.492	0.490	0.475
14	9472	1.540	0.950	1.463	0.650	0.618
15	9376	1.460	0.960	1.401	0.610	0.586
16	9368	1.780	0.961	1.710	0.690	0.663
17	9320	3.200	0.966	3.090	0.530	0.512
18	9320	2.530	0.966	2.443	0.610	0.589
19	9368	1.940	0.961	1.864	0.570	0.548
20	9352	2.170	0.962	2.088	0.440	0.423
Mean	9429	1.969	0.955	1.879	0.621	0.592
STD*	111.71	0.523	0.011	0.496	0.087	0.079
C.O.V**	1.185	26.549	1.163	26.394	13.950	13.290

* STD-Standard Deviation **C.O.V-(Std.Dev/Mean)*100

Table: A21 Effect of Site Variability on FWD Data

Site No:310 Date:7/88 Station:0 to 20

Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	8528	35.420	1.055	37.380	1.900	2.005
1	8192	23.280	1.099	25.576	1.460	1.604
2	9272	27.190	0.971	26.392	1.660	1.611
3	9144	23.600	0.984	23.228	2.100	2.067
4	8152	24.510	1.104	27.060	1.860	2.053
5	8120	23.870	1.108	26.457	1.820	2.017
6	8040	27.270	1.119	30.526	1.820	2.037
7	8168	31.780	1.102	35.017	1.940	2.138
8	8168	22.210	1.102	24.472	1.820	2.005
9	8248	17.670	1.091	19.281	1.500	1.637
10	8248	19.920	1.091	21.736	1.660	1.811
11	8200	20.120	1.098	22.083	1.330	1.460
12	8328	21.740	1.081	23.494	2.260	2.442
13	8000	22.490	1.125	25.301	2.260	2.543
14	8184	24.350	1.100	26.778	2.140	2.353
15	9320	23.600	0.966	22.790	2.350	2.269
16	9072	26.680	0.992	26.468	2.260	2.242
17	8024	31.660	1.122	35.511	2.390	2.681
18	7808	33.480	1.153	38.591	2.510	2.893
19	8088	28.420	1.113	31.625	2.300	2.559
20	8088	29.690	1.113	33.038	2.180	2.426
Mean	8352	25.664	1.080	27.753	1.977	2.136
STD*	435.61	4.603	0.053	5.368	0.326	0.372
C.O.V**	5.216	17.934	4.902	19.344	16.484	17.423

* STD-Standard Deviation **C.O.V-(Std.Dev/Mean)*100

Table: A22 Effect of Site Variability on FWD Data

Site :310			Date:1/89			Station:0 to 20
Stn	Load	D-1	Coeft.	D1*Coeft	D-6	D6*Coeft
0	10152	1.780	0.887	1.578	0.890	0.789
1	9976	1.740	0.902	1.570	0.730	0.659
2	9744	1.700	0.924	1.570	0.810	0.748
3	9704	1.780	0.927	1.651	0.810	0.751
4	9680	1.940	0.930	1.804	0.810	0.753
5	9560	1.940	0.941	1.826	0.850	0.800
6	9512	1.660	0.946	1.571	0.810	0.766
7	9552	1.660	0.942	1.564	0.810	0.763
8	9576	1.740	0.940	1.635	0.930	0.874
9	9504	1.940	0.947	1.837	0.930	0.881
10	9528	1.660	0.945	1.568	0.890	0.841
11	9472	1.780	0.950	1.691	0.890	0.846
12	9536	1.580	0.944	1.491	0.770	0.727
13	9448	1.780	0.953	1.696	0.890	0.848
14	9456	1.740	0.952	1.656	0.930	0.885
15	9448	1.820	0.953	1.734	0.890	0.848
16	9472	1.820	0.950	1.729	0.850	0.808
17	9440	1.620	0.953	1.544	0.770	0.734
18	9432	1.780	0.954	1.698	0.730	0.697
19	9496	1.460	0.948	1.384	0.570	0.540
20	9424	1.820	0.955	1.738	0.730	0.697
Mean	9577	1.750	0.940	1.645	0.823	0.774
STD*	182.41	0.116	0.017	0.112	0.086	0.082
C.O.V**	1.905	6.653	1.839	6.795	10.423	10.615

* STD-Standard Deviation **C.O.V-(Std.Dev/Mean)*100

APPENDIX B

NONLINEARITY OF FWD DATA

Table: B1 Effect of Non-Linearity on FWD Data

Site:11 Date:8-88 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	8304.00	5.10	5.53	0.30	0.32	0.35	0.04
6.00	12255.00	7.04	5.17		0.40	0.29	
6.00	17448.00	9.49	4.90		0.49	0.25	
6.00	22264.00	11.70	4.73		0.57	0.23	
8.00	8288.00	4.90	5.32	0.30	0.32	0.35	0.04
8.00	12244.00	6.76	4.97		0.40	0.29	
8.00	17608.00	9.09	4.65		0.53	0.27	
8.00	22216.00	11.30	4.58		0.61	0.25	
12.00	8392.00	5.93	6.36	0.45	0.32	0.34	0.04
12.00	12392.00	8.22	5.97		0.36	0.26	
12.00	17744.00	10.75	5.45		0.57	0.29	
12.00	22384.00	12.93	5.20		0.57	0.23	
17.00	8424.00	5.53	5.91	0.37	0.36	0.38	0.03
17.00	12328.00	7.79	5.69		0.49	0.36	
17.00	17504.00	10.08	5.18		0.61	0.31	
17.00	22392.00	12.41	4.99		0.77	0.31	
20.00	8464.00	4.98	5.30	0.42	0.24	0.26	0.06
20.00	12464.00	6.68	4.82		0.40	0.29	
20.00	17560.00	8.58	4.40		0.73	0.37	
20.00	22584.00	10.55	4.20		0.98	0.39	
MEAN:	14440.90	8.09	4.92	0.31	0.48	0.29	0.04

*STD-Standard Deviation

Table: B2 Effect of Non-Linearity on FWD Data

Site:11 Date:2-89 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	9896.00	10.08	9.17	0.85	0.85	0.77	0.06
6.00	14440.00	13.28	8.28		1.13	0.70	
6.00	19352.00	15.81	7.35		1.37	0.64	
6.00	23608.00	18.34	6.99		1.62	0.62	
8.00	9848.00	7.47	6.83	0.32	0.57	0.52	0.01
8.00	14320.00	9.88	6.21		0.85	0.53	
8.00	19192.00	13.04	6.12		1.09	0.51	
8.00	23472.00	15.69	6.02		1.29	0.49	
12.00	9536.00	14.35	13.54	1.49	1.82	1.72	0.21
12.00	13888.00	17.83	11.55		2.22	1.44	
12.00	18744.00	21.78	10.46		2.67	1.28	
12.00	22944.00	24.35	9.55		2.91	1.14	
17.00	9544.00	11.19	10.55	0.83	0.73	0.69	0.03
17.00	13912.00	14.15	9.15		1.01	0.65	
17.00	18720.00	17.75	8.53		1.29	0.62	
17.00	22952.00	21.70	8.51		1.54	0.60	
20.00	9456.00	9.21	8.77	0.60	0.57	0.54	0.03
20.00	13816.00	11.98	7.80		0.81	0.53	
20.00	18664.00	14.94	7.20		1.05	0.51	
20.00	22960.00	18.93	7.42		1.21	0.47	
MEAN:	15679.24	14.37	8.10	0.68	1.27	0.71	0.06

*STD-Standard Deviation

Table: B3 Effect of Non-Linearity on FWD Data

Site:12 Date:8-88 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	8424.00	3.20	3.42	0.26	0.32	0.34	0.04
6.00	12528.00	4.39	3.15		0.36	0.26	
6.00	17768.00	5.69	2.88		0.49	0.25	
6.00	22352.00	6.80	2.74		0.57	0.23	
8.00	8640.00	3.95	4.11	0.19	0.53	0.55	0.02
8.00	12616.00	5.57	3.97		0.73	0.52	
8.00	17792.00	7.39	3.74		1.01	0.51	
8.00	22328.00	9.05	3.65		1.25	0.50	
12.00	8760.00	4.35	4.47	0.38	0.49	0.50	0.05
12.00	12568.00	5.73	4.10		0.69	0.49	
12.00	17744.00	7.31	3.71		0.77	0.39	
12.00	22360.00	8.62	3.47		0.97	0.39	
17.00	8568.00	5.02	5.27	0.35	0.44	0.46	0.01
17.00	12608.00	7.08	5.05		0.65	0.46	
17.00	17744.00	9.09	4.61		0.89	0.45	
17.00	22400.00	10.95	4.40		1.13	0.45	
20.00	8376.00	5.77	6.20	0.39	0.57	0.61	0.01
20.00	12480.00	8.18	5.90		0.85	0.61	
20.00	17616.00	10.67	5.45		1.17	0.60	
20.00	22208.00	12.81	5.19		1.46	0.59	
MEAN:	14565.71	6.74	4.07	0.26	0.73	0.44	0.02

*STD-Standard Deviation

Table: B4 Effect of Non-Linearity on FWD Data

Site:12 Date:2-89 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	9776.00	2.77	2.55	0.14	0.28	0.26	0.02
6.00	14352.00	3.72	2.33		0.44	0.28	
6.00	19136.00	4.78	2.25		0.53	0.25	
6.00	23472.00	5.65	2.17		0.57	0.22	
8.00	9744.00	3.87	3.57	0.05	0.65	0.60	0.02
8.00	14248.00	5.49	3.47		0.93	0.59	
8.00	19080.00	7.35	3.47		1.33	0.63	
8.00	23320.00	8.97	3.46		1.66	0.64	
12.00	9696.00	3.76	3.49	0.16	0.57	0.53	0.03
12.00	14208.00	5.22	3.31		0.73	0.46	
12.00	18968.00	6.64	3.15		0.97	0.46	
12.00	23224.00	7.95	3.08		1.17	0.45	
17.00	9464.00	5.02	4.77	0.18	0.61	0.58	0.00
17.00	14016.00	7.04	4.52		0.89	0.57	
17.00	18776.00	9.13	4.38		1.21	0.58	
17.00	23016.00	10.99	4.30		1.46	0.57	
20.00	9432.00	5.45	5.20	0.12	0.77	0.73	0.02
20.00	13896.00	7.83	5.07		1.13	0.73	
20.00	18064.00	10.24	5.10		1.58	0.79	
20.00	22920.00	12.41	4.87		1.98	0.78	
MEAN:	15657.52	6.39	3.55	0.11	0.93	0.51	0.02

*STD-Standard Deviation

Table: B5 Effect of Non-Linearity on FWD Data

Site:16 Date:8-88 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	8640.00	6.68	6.96	0.11	0.93	0.97	0.03
6.00	12776.00	10.00	7.04		1.42	1.00	
6.00	17824.00	13.60	6.87		2.02	1.02	
6.00	22312.00	16.72	6.74		2.59	1.04	
8.00	8584.00	7.04	7.38	0.06	0.89	0.93	0.02
8.00	12664.00	10.59	7.53		1.29	0.92	
8.00	17688.00	14.78	7.52		1.90	0.97	
8.00	22232.00	18.38	7.44		2.39	0.97	
12.00	8520.00	6.92	7.31	0.14	0.73	0.77	0.03
12.00	12608.00	10.24	7.31		1.05	0.75	
12.00	17736.00	14.03	7.12		1.50	0.76	
12.00	22256.00	17.27	6.98		2.02	0.82	
17.00	8416.00	5.77	6.17	0.05	0.77	0.82	0.02
17.00	12524.00	8.66	6.22		1.17	0.84	
17.00	17680.00	11.94	6.08		1.66	0.85	
17.00	21896.00	15.02	6.17		2.14	0.88	
20.00	8368.00	6.64	7.14	0.06	0.89	0.96	0.03
20.00	12432.00	10.08	7.30		1.33	0.96	
20.00	17592.00	13.99	7.16		1.90	0.97	
20.00	21784.00	17.43	7.20		2.47	1.02	
MEAN:	14501.52	11.23	6.65	0.07	1.48	0.87	0.02

*STD-Standard Deviation

Table: B6 Effect of Non-Linearity on FWD Data

Site:16 Date:2-89 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	9520.00	4.47	4.23	0.06	1.33	1.26	0.02
6.00	13912.00	6.60	4.27		1.98	1.28	
6.00	18712.00	9.05	4.35		2.71	1.30	
6.00	22952.00	11.11	4.36		3.36	1.32	
8.00	9392.00	4.86	4.66	0.10	1.29	1.24	0.01
8.00	13824.00	7.31	4.76		1.90	1.24	
8.00	18544.00	10.08	4.89		2.59	1.26	
8.00	22824.00	12.45	4.91		3.19	1.26	
12.00	9208.00	4.51	4.41	0.09	1.13	1.10	0.02
12.00	13552.00	6.80	4.52		1.66	1.10	
12.00	18368.00	9.33	4.57		2.30	1.13	
12.00	22520.00	11.62	4.64		2.87	1.15	
17.00	9280.00	3.68	3.57	0.09	1.05	1.02	0.05
17.00	13736.00	5.61	3.68		1.70	1.11	
17.00	18536.00	7.75	3.76		2.22	1.08	
17.00	22808.00	9.64	3.80		2.91	1.15	
20.00	9144.00	4.90	4.82	0.05	1.29	1.27	0.03
20.00	13584.00	7.31	4.84		1.86	1.23	
20.00	18312.00	10.00	4.91		2.67	1.31	
20.00	22432.00	12.33	4.95		3.23	1.30	
MEAN:	15293.33	7.59	4.23	0.06	2.06	1.15	0.02

*STD-Standard Deviation

Table: B7 Effect of Non-Linearity on FWD Data

Site:17 Date:8-88 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	5704.00	9.76	15.40	0.62	0.97	1.53	0.08
6.00	8144.00	14.07	15.55		1.42	1.57	
6.00	11072.00	17.99	14.62		1.98	1.61	
6.00	13408.00	20.87	14.01		2.59	1.74	
8.00	5680.00	8.81	13.96	0.52	0.89	1.41	0.06
8.00	8120.00	12.97	14.38		1.17	1.30	
8.00	11086.00	16.76	13.61		1.78	1.45	
8.00	13544.00	19.49	12.95		2.15	1.43	
12.00	6016.00	10.99	16.44	0.40	1.09	1.63	0.09
12.00	8368.00	15.85	17.05		1.62	1.74	
12.00	10928.00	20.16	16.60		2.22	1.83	
12.00	13176.00	23.32	15.93		2.71	1.85	
17.00	5728.00	10.04	15.78	0.46	1.09	1.71	0.02
17.00	8350.00	14.63	15.77		1.58	1.70	
17.00	11008.00	18.70	15.29		2.14	1.75	
17.00	13256.00	21.58	14.65		2.51	1.70	
20.00	5120.00	12.69	22.31	1.75	0.97	1.71	0.02
20.00	7912.00	17.99	20.46		1.50	1.71	
20.00	10920.00	22.77	18.77		2.06	1.70	
20.00	13384.00	26.29	17.68		2.47	1.66	
MEAN:	9091.62	15.99	15.29	0.63	1.66	1.56	0.04

*STD-Standard Deviation

Table: B8 Effect of Non-Linearity on FWD Data

Site:17 Date:2-89 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	6296.00	9.84	14.07	0.88	1.46	2.09	0.04
6.00	9024.00	14.03	13.99		2.14	2.13	
6.00	12472.00	17.87	12.90		2.87	2.07	
6.00	15776.00	20.91	11.93		3.56	2.03	
8.00	6328.00	8.18	11.63	0.58	1.25	1.78	0.06
8.00	8976.00	11.98	12.01		1.90	1.91	
8.00	12576.00	15.57	11.14		2.51	1.80	
8.00	15832.00	18.38	10.45		3.07	1.75	
12.00	6192.00	10.59	15.39	0.78	1.62	2.35	0.07
12.00	8848.00	15.34	15.60		2.43	2.47	
12.00	12232.00	19.92	14.66		3.32	2.44	
12.00	15480.00	23.40	13.60		3.96	2.30	
17.00	6080.00	8.97	13.28	0.73	1.54	2.28	0.08
17.00	8760.00	13.12	13.48		2.14	2.20	
17.00	12232.00	17.00	12.51		2.91	2.14	
17.00	15456.00	19.96	11.62		3.52	2.05	
20.00	5736.00	20.63	32.37	3.58	1.21	1.90	0.03
20.00	8584.00	27.23	28.55		1.86	1.95	
20.00	11936.00	33.36	25.15		2.55	1.92	
20.00	15032.00	38.22	22.88		3.11	1.86	
MEAN:	10183.24	17.36	15.11	1.09	2.33	1.97	0.05

*STD-Standard Deviation

Table: B9 Effect of Non-Linearity on FWD Data

Site:24 Date:6-88 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	5936.00	8.74	13.25	0.17	1.21	1.83	0.07
6.00	8712.00	13.20	13.64		1.86	1.92	
6.00	11712.00	17.75	13.64		2.55	1.96	
6.00	14048.00	21.27	13.63		3.15	2.02	
8.00	5968.00	8.42	12.70	0.04	0.85	1.28	0.03
8.00	8760.00	12.45	12.79		1.25	1.28	
8.00	11680.00	16.60	12.79		1.74	1.34	
8.00	14082.00	19.88	12.71		2.10	1.34	
12.00	5904.00	8.46	12.90	0.11	0.89	1.36	0.03
12.00	8720.00	12.69	13.10		1.33	1.37	
12.00	11680.00	17.08	13.16		1.82	1.40	
12.00	14056.00	20.59	13.18		2.26	1.45	
17.00	5792.00	9.37	14.56	0.43	1.58	2.46	0.10
17.00	8552.00	14.43	15.19		2.39	2.52	
17.00	11544.00	19.84	15.47		3.36	2.62	
17.00	13880.00	24.23	15.71		4.21	2.73	
20.00	5800.00	9.41	14.60	0.10	1.17	1.82	0.10
20.00	8568.00	14.15	14.86		1.50	1.58	
20.00	11552.00	19.01	14.81		2.10	1.64	
20.00	13936.00	22.85	14.76		2.79	1.80	
MEAN:	9565.81	14.78	13.21	0.14	1.91	1.70	0.06

*STD-Standard Deviation

Table: B10 Effect of Non-Linearity on FWD Data

Site:24 Dte:12-88 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	6032.00	6.05	9.03	0.19	1.29	1.92	0.08
6.00	8944.00	9.13	9.19		1.94	1.95	
6.00	12000.00	12.57	9.43		2.75	2.06	
6.00	14592.00	15.42	9.51		3.44	2.12	
8.00	6016.00	5.93	8.87	0.14	1.01	1.51	0.05
8.00	8936.00	8.89	8.95		1.58	1.59	
8.00	11992.00	12.21	9.16		2.14	1.61	
8.00	14592.00	14.90	9.19		2.67	1.65	
12.00	5968.00	5.57	8.40	0.19	0.89	1.34	0.06
12.00	8912.00	8.42	8.50		1.37	1.38	
12.00	11992.00	11.62	8.72		1.94	1.46	
12.00	14488.00	14.31	8.89		2.43	1.51	
17.00	5904.00	6.60	10.06	0.28	1.62	2.47	0.10
17.00	8792.00	10.04	10.28		2.47	2.53	
17.00	11824.00	13.95	10.62		3.48	2.65	
17.00	14344.00	17.19	10.79		4.33	2.72	
20.00	5864.00	6.64	10.19	0.13	1.21	1.86	0.05
20.00	8712.00	9.96	10.29		1.86	1.92	
20.00	11800.00	13.76	10.49		2.55	1.94	
20.00	14384.00	16.76	10.49		3.19	2.00	
MEAN:	9813.71	10.47	9.10	0.16	2.10	1.82	0.06

*STD-Standard Deviation

Table: B11 Effect of Non-Linearity on FWD Data

Site:26 Date:3-88 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	8992.00	7.47	7.48	0.14	1.90	1.90	0.08
6.00	13032.00	10.71	7.40		2.47	1.71	
6.00	17688.00	14.23	7.24		3.60	1.83	
6.00	21648.00	17.08	7.10		4.12	1.71	
8.00	8800.00	8.02	8.20	0.26	1.62	1.66	0.02
8.00	13016.00	11.54	7.98		2.35	1.62	
8.00	17808.00	15.26	7.71		3.23	1.63	
8.00	21808.00	18.18	7.50		3.88	1.60	
12.00	8736.00	6.68	6.88	0.21	1.58	1.63	0.07
12.00	12904.00	9.72	6.78		2.18	1.52	
12.00	17704.00	12.73	6.47		2.87	1.46	
12.00	21744.00	15.38	6.37		3.56	1.47	
17.00	8576.00	8.62	9.05	0.32	1.94	2.04	0.02
17.00	12712.00	12.41	8.79		2.87	2.03	
17.00	17472.00	16.48	8.49		3.88	2.00	
17.00	21528.00	19.57	8.18		4.81	2.01	
20.00	8576.00	7.78	8.16	0.31	1.62	1.70	0.07
20.00	12856.00	11.34	7.94		2.51	1.76	
20.00	17496.00	14.78	7.60		3.15	1.62	
20.00	21648.00	17.71	7.36		3.80	1.58	
MEAN:	14511.62	12.18	7.27	0.21	2.76	1.64	0.04

*STD-Standard Deviation

Table: B12 Effect of Non-Linearity on FWD Data

Site:26 Date:6-88 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 b (9000Lbs)	STD*
6.00	8232.00	9.09	9.94	0.55	1.46	1.60	0.03
6.00	12440.00	13.08	9.46		2.22	1.61	
6.00	17400.00	17.15	8.87		2.99	1.55	
6.00	21720.00	20.55	8.52		3.76	1.56	
8.00	8296.00	10.55	11.45	0.87	1.46	1.58	0.10
8.00	12488.00	14.63	10.54		1.98	1.43	
8.00	17472.00	18.89	9.73		2.59	1.33	
8.00	21896.00	22.21	9.13		3.23	1.33	
12.00	8320.00	7.83	8.47	0.30	1.70	1.84	0.13
12.00	12872.00	11.23	7.85		2.22	1.55	
12.00	16896.00	14.90	7.94		2.95	1.57	
12.00	20856.00	17.75	7.66		3.48	1.50	
17.00	8144.00	10.75	11.88	0.84	1.70	1.88	0.02
17.00	12384.00	15.14	11.00		2.55	1.85	
17.00	17312.00	19.57	10.17		3.52	1.83	
17.00	21656.00	23.24	9.66		4.41	1.83	
20.00	8128.00	9.80	10.85	0.75	1.33	1.47	0.03
20.00	12472.00	13.99	10.10		1.98	1.43	
20.00	17384.00	18.14	9.39		2.79	1.44	
20.00	21832.00	21.46	8.85		3.36	1.39	
MEAN:	14200.00	14.76	9.12	0.55	2.46	1.50	0.05

*STD-Standard Deviation

Table: B13 Effect of Non-Linearity on FWD Data

Site:28 Date:3-88 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	5888.00	42.06	64.29	6.67	2.63	4.02	0.05
6.00	8912.00	54.98	55.52		3.88	3.92	
6.00	12288.00	68.19	49.94		5.42	3.97	
6.00	15152.00	78.62	46.70		6.83	4.06	
8.00	5888.00	44.03	67.30	9.01	2.83	4.33	0.09
8.00	8840.00	56.72	57.75		4.41	4.49	
8.00	12104.00	66.05	49.11		5.98	4.45	
8.00	15072.00	72.81	43.48		7.16	4.28	
12.00	5768.00	45.83	71.51	14.90	2.51	3.92	0.19
12.00	8688.00	58.90	61.02		3.48	3.60	
12.00	11984.00	52.89	39.72		4.73	3.55	
12.00	14944.00	58.76	35.39		5.66	3.41	
17.00	5936.00	32.77	49.68	6.31	1.98	3.00	0.08
17.00	9032.00	42.45	42.30		2.91	2.90	
17.00	12384.00	50.87	36.97		4.04	2.94	
17.00	14664.00	53.44	32.80		5.05	3.10	
20.00	5808.00	36.56	56.65	6.47	2.14	3.32	0.04
20.00	8712.00	46.76	48.31		3.15	3.25	
20.00	11816.00	56.37	42.94		4.25	3.24	
20.00	14752.00	64.75	39.50		5.26	3.21	
MEAN:	9934.86	51.61	47.18	7.23	4.01	3.47	

*STD-Standard Deviation

Table: B14 Effect of Non-Linearity on FWD Data

Site:28 Date:6-88 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	5512.00	41.39	67.58	6.87	2.47	4.03	0.23
6.00	8176.00	53.09	58.44		3.68	4.05	
6.00	10840.00	63.28	52.54		5.34	4.43	
6.00	12960.00	71.39	49.58		6.55	4.55	
8.00	5512.00	41.07	67.06	6.56	2.47	4.03	0.11
8.00	8024.00	52.77	59.19		3.64	4.08	
8.00	10480.00	63.48	54.52		5.01	4.30	
8.00	13032.00	71.23	49.19		6.11	4.22	
12.00	5392.00	42.33	70.65	8.14	2.10	3.51	0.05
12.00	8072.00	53.72	59.90		3.15	3.51	
12.00	10712.00	63.60	53.44		4.29	3.60	
12.00	12960.00	70.56	49.00		5.18	3.60	
17.00	5568.00	31.94	51.63	4.97	1.54	2.49	0.13
17.00	8240.00	41.15	44.95		2.51	2.74	
17.00	10896.00	49.73	41.08		3.40	2.81	
17.00	12984.00	55.42	38.41		4.04	2.80	
20.00	5560.00	35.57	57.58	10.75	1.98	3.21	0.20
20.00	8128.00	44.94	49.76		2.51	2.78	
20.00	10680.00	33.72	28.42		3.64	3.07	
20.00	12760.00	59.88	42.24		4.69	3.31	
MEAN:	8880.38	49.54	49.77	6.22	3.54	3.39	0.12

*STD-Standard Deviation

Table: B15 Effect of Non-Linearity on FWD Data

Site:31 Date:7-88 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00			0.00	0.00		0.00	
6.00						0.00	
6.00						0.00	
6.00						0.00	
8.00	8232.00	5.02	5.49	0.11	0.53	0.58	0.02
8.00	12136.00	7.31	5.42		0.77	0.57	
8.00	17104.00	10.00	5.26		1.17	0.62	
8.00	21784.00	12.65	5.23		1.37	0.57	
12.00	8424.00	5.06	5.41	0.11	0.44	0.47	0.02
12.00	12344.00	7.31	5.33		0.73	0.53	
12.00	17376.00	10.00	5.18		0.97	0.50	
12.00	21960.00	12.57	5.15		1.17	0.48	
17.00	8472.00	5.22	5.55	0.12	0.77	0.82	0.03
17.00	12344.00	7.27	5.30		1.09	0.79	
17.00	17344.00	10.16	5.27		1.50	0.78	
17.00	21912.00	12.73	5.23		1.82	0.75	
20.00	8504.00	6.84	7.24	0.11	1.42	1.50	0.01
20.00	12376.00	9.84	7.16		2.06	1.50	
20.00	17416.00	13.64	7.05		2.91	1.50	
20.00	21800.00	16.80	6.94		3.72	1.54	
MEAN:	11406.10	7.26	4.39	0.08	1.07	0.64	

*STD-Standard Deviation

Table: B16 Effect of Non-Linearity on FWD Data

Site:31 Date:1-89 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	9288.00	1.58	1.53	0.01	1.01	0.98	0.02
6.00	13608.00	2.33	1.54		1.54	1.02	
6.00	18400.00	3.16	1.55		2.02	0.99	
6.00	22768.00	3.87	1.53		2.47	0.98	
8.00	9344.00	1.03	0.99	0.05	0.49	0.47	0.01
8.00	13728.00	1.58	1.04		0.73	0.48	
8.00	18520.00	2.25	1.09		1.01	0.49	
8.00	22920.00	2.85	1.12		1.29	0.51	
12.00	9320.00	1.07	1.03	0.04	0.36	0.35	0.01
12.00	13552.00	1.66	1.10		0.49	0.33	
12.00	18392.00	2.25	1.10		0.65	0.32	
12.00	22728.00	2.89	1.14		0.85	0.34	
17.00	9168.00	1.15	1.13	0.03	0.40	0.39	0.01
17.00	13568.00	1.74	1.15		0.57	0.38	
17.00	18328.00	2.45	1.20		0.81	0.40	
17.00	22624.00	3.04	1.21		0.97	0.39	
20.00	9160.00	1.23	1.21	0.02	0.81	0.80	0.02
20.00	13528.00	1.86	1.24		1.13	0.75	
20.00	18288.00	2.53	1.25		1.58	0.78	
20.00	22616.00	3.20	1.27		1.90	0.76	
MEAN:	15230.86	2.08	1.16	0.03	1.00	0.57	0.01

*STD-Standard Deviation

Table: B17 Effect of Non-Linearity on FWD Data

Site:35 Date:7-88 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	8592.00	13.60	14.25	1.22	1.33	1.39	0.03
6.00	12752.00	18.02	12.72		1.94	1.37	
6.00	17568.00	22.77	11.66		2.59	1.33	
6.00	21920.00	26.88	11.04		3.19	1.31	
8.00	8488.00	14.47	15.34	1.28	1.54	1.63	0.05
8.00	12752.00	19.33	13.64		2.22	1.57	
8.00	17696.00	24.31	12.36		3.03	1.54	
8.00	21952.00	29.57	12.12		3.64	1.49	
12.00	8512.00	15.14	16.01	1.00	1.62	1.71	0.01
12.00	12600.00	20.71	14.79		2.35	1.68	
12.00	17440.00	26.96	13.91		3.28	1.69	
12.00	21808.00	32.37	13.36		4.08	1.68	
17.00	8704.00	7.35	7.60	0.27	1.42	1.47	0.04
17.00	12784.00	10.51	7.40		1.94	1.37	
17.00	17816.00	13.95	7.05		2.87	1.45	
17.00	22176.00	17.08	6.93		3.44	1.40	
20.00	8632.00	7.95	8.29	0.17	1.50	1.56	0.02
20.00	12728.00	11.38	8.05		2.18	1.54	
20.00	17632.00	15.49	7.91		2.95	1.51	
20.00	22000.00	19.21	7.86		3.72	1.52	
MEAN:	14502.48	17.48	10.59	0.65	2.42	1.44	

*STD-Standard Deviation

Table: B18 Effect of Non-Linearity on FWD Data

Site:35 Date:2-89 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	9208.00	1.46	1.43	0.08	0.65	0.64	0.01
6.00	13712.00	2.33	1.53		1.01	0.66	
6.00	18472.00	3.24	1.58		1.33	0.65	
6.00	22768.00	4.15	1.64		1.58	0.62	
8.00	8984.00	1.38	1.38	0.07	0.65	0.65	0.03
8.00	13616.00	2.29	1.51		1.09	0.72	
8.00	18504.00	3.12	1.52		1.37	0.67	
8.00	22776.00	3.95	1.56		1.70	0.67	
12.00	9080.00	1.86	1.84	0.06	0.81	0.80	0.01
12.00	13528.00	2.85	1.90		1.25	0.83	
12.00	18344.00	3.99	1.96		1.70	0.83	
12.00	22688.00	5.06	2.01		2.10	0.83	
17.00	9064.00	2.17	2.15	0.00	0.77	0.76	0.01
17.00	13536.00	3.24	2.15		1.17	0.78	
17.00	18384.00	4.39	2.15		1.54	0.75	
17.00	22672.00	5.42	2.15		1.90	0.75	
20.00	9256.00	1.62	1.58	0.02	0.69	0.67	0.01
20.00	13568.00	2.37	1.57		0.97	0.64	
20.00	18392.00	3.28	1.61		1.29	0.63	
20.00	22776.00	4.11	1.62		1.62	0.64	
MEAN:	15206.10	2.97	1.66	0.04	1.20	0.68	0.01

*STD-Standard Deviation

Table: B19 Effect of Non-Linearity on FWD Data

Site:36 Date:7-88 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	8424.00	11.86	12.67	0.91	1.05	1.12	0.01
6.00	12616.00	16.44	11.73		1.54	1.10	
6.00	17624.00	21.03	10.74		2.22	1.13	
6.00	21936.00	25.18	10.33		2.71	1.11	
8.00	8384.00	14.15	15.19	1.58	0.85	0.91	0.05
8.00	12368.00	18.30	13.32		1.37	1.00	
8.00	17424.00	22.93	11.84		1.66	0.86	
8.00	21912.00	26.88	11.04		2.18	0.90	
12.00	8240.00	19.72	21.54	1.68	1.50	1.64	0.04
12.00	12064.00	26.52	19.78		2.10	1.57	
12.00	17112.00	34.35	18.07		2.91	1.53	
12.00	21616.00	41.15	17.13		3.72	1.55	
17.00	8368.00	11.11	11.95	0.64	1.05	1.13	0.04
17.00	12384.00	15.65	11.37		1.70	1.24	
17.00	17456.00	20.67	10.66		2.22	1.14	
17.00	21904.00	25.06	10.30		2.75	1.13	
20.00	8280.00	14.90	16.20	1.44	1.13	1.23	0.03
20.00	12312.00	20.04	14.65		1.58	1.15	
20.00	17376.00	25.50	13.21		2.39	1.24	
20.00	21992.00	30.36	12.42		2.95	1.21	
MEAN:	14275.81	21.04	13.05	1.04	1.88	1.14	0.03

*STD-Standard Deviation

Table: B20 Effect of Non-Linearity on FWD Data

Site:36 Date:2-89 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	9496.00	1.78	1.69	0.04	0.57	0.54	0.01
6.00	13896.00	2.61	1.69		0.89	0.58	
6.00	18704.00	3.60	1.73		1.17	0.56	
6.00	23120.00	4.62	1.80		1.42	0.55	
8.00	9400.00	2.02	1.93	0.08	0.57	0.55	0.03
8.00	13776.00	2.96	1.93		0.73	0.48	
8.00	18624.00	4.27	2.06		1.01	0.49	
8.00	22968.00	5.42	2.12		1.21	0.47	
12.00	9286.00	2.02	1.96	0.06	0.61	0.59	0.02
12.00	13632.00	3.08	2.03		0.97	0.64	
12.00	18440.00	4.27	2.08		1.29	0.63	
12.00	22704.00	5.38	2.13		1.54	0.61	
17.00	9320.00	3.20	3.09	0.17	0.53	0.51	0.02
17.00	13752.00	4.35	2.85		0.85	0.56	
17.00	18544.00	5.61	2.72		1.13	0.55	
17.00	22840.00	6.72	2.65		1.37	0.54	
20.00	9352.00	2.17	2.09	0.08	0.44	0.42	0.03
20.00	13608.00	3.20	2.12		0.73	0.48	
20.00	18488.00	4.55	2.21		1.05	0.51	
20.00	22976.00	5.85	2.29		1.29	0.51	
MEAN:	15377.43	3.70	2.06	0.07	0.92	0.51	0.02

*STD-Standard Deviation

Table: Effect of Non-Linearity on FWD Data

Table: B21 Effect of Non-Linearity on FWD Data

Site310 Date:7-88 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	5616.00	19.45	31.17	1.99	1.29	2.07	0.08
6.00	8040.00	27.27	30.53		1.82	2.04	
6.00	10224.00	35.14	30.93		2.51	2.21	
6.00	14104.00	41.23	26.31		3.15	2.01	
8.00	5592.00	15.38	24.75	0.73	1.17	1.88	0.05
8.00	8168.00	22.21	24.47		1.82	2.01	
8.00	11032.00	29.37	23.96		2.47	2.02	
8.00	13880.00	35.22	22.84		3.07	1.99	
12.00	5504.00	14.82	24.23	0.51	1.50	2.45	0.02
12.00	8328.00	21.74	23.49		2.26	2.44	
12.00	11256.00	28.89	23.10		3.11	2.49	
12.00	13616.00	34.63	22.89		3.76	2.49	
17.00	5432.00	21.86	36.22	0.97	1.58	2.62	0.07
17.00	8024.00	31.66	35.51		2.39	2.68	
17.00	10792.00	41.46	34.58		3.32	2.77	
17.00	13320.00	49.80	33.65		4.12	2.78	
20.00	5328.00	19.88	33.58	1.00	1.54	2.60	0.06
20.00	8088.00	29.69	33.04		2.18	2.43	
20.00	11112.00	39.41	31.92		3.07	2.49	
20.00	13544.00	46.64	30.99		3.76	2.50	
MEAN:	9095.24	28.85	27.53	0.87	2.38	2.24	0.05

*STD-Standard Deviation

Table: B22 Effect of Non-Linearity on FWD Data

Site310 Date:1-89 Stn:6,8,12,17,20

Station	Load (Lbs)	D-1	D-1 (9000Lbs)	STD*	D-6	D-6 (9000Lbs)	STD*
6.00	6832.00	1.03	1.36	0.08	0.44	0.58	0.07
6.00	9512.00	1.66	1.57		0.81	0.77	
6.00	13296.00	2.21	1.50		1.01	0.68	
6.00	16672.00	2.81	1.52		1.21	0.65	
8.00	6616.00	1.11	1.51	0.05	0.61	0.83	0.02
8.00	9576.00	1.74	1.64		0.93	0.87	
8.00	13312.00	2.37	1.60		1.21	0.82	
8.00	16552.00	2.93	1.59		1.50	0.82	
12.00	6624.00	1.03	1.40	0.03	0.65	0.88	0.06
12.00	9536.00	1.58	1.49		0.77	0.73	
12.00	13048.00	2.09	1.44		1.05	0.72	
12.00	16288.00	2.65	1.46		1.42	0.78	
17.00	6480.00	1.03	1.43	0.06	0.49	0.68	0.03
17.00	9440.00	1.62	1.54		0.77	0.73	
17.00	12784.00	2.25	1.58		1.05	0.74	
17.00	16072.00	2.73	1.53		1.21	0.68	
20.00	6424.00	1.15	1.61	0.06	0.44	0.62	0.03
20.00	9424.00	1.82	1.74		0.73	0.70	
20.00	12728.00	2.49	1.76		0.93	0.66	
20.00	15968.00	3.12	1.76		1.13	0.64	
MEAN:	10818.29	1.88	1.48	0.05	0.87	0.69	0.04

*STD-Standard Deviation

Table: C1 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:11 Date:8-88

Stn	EVER-CALC RESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Depth to Bed Rock
0	1293339	55441	105414	1218017	73336	62071	70.37
1	1490347	44021	138162	1034009	78308	68797	63.35
3	1202853	76338	110374	940175	114435	62120	59.06
4	1476673	82165	112524	1010846	139961	59901	111.52
5	2946384	49891	116301	1336079	144495	52408	203.71
6	1478904	49857	110469	1281247	73157	61724	300.00
7	1546536	41600	87586	1842161	43163	55818	71.43
8	1893992	50695	102108	1141323	107615	50362	66.05
9	1536756	39828	107175	1322950	60784	58155	142.63
10	1912804	43172	129786	863735	112129	57468	72.42
11	3278514	13688	86311	1807757	52179	32796	105.09
12	2236888	25815	101169	1493955	59621	46250	111.63
13	1613762	48709	77682	1117312	91744	40151	91.60
14	1688251	36922	83239	892895	90424	38904	290.55
15	1788642	33105	92928	1476595	55391	48848	124.39
16	1596861	32279	93499	1272880	55286	48417	86.67
17	1724781	41319	94630	1439157	67218	50778	82.28
18	1161332	45252	100019	1193027	54572	61183	101.79
19	1151846	54964	114544	968248	79604	64462	57.65
20	1450154	45421	150459	1233503	66123	81193	71.19
Mean	1723481	45524	105719	1244294	80977	55090	114.17
S.D.*	533409	14888	17910	265695	28453	10879	69.13
COV**	30.95	32.70	16.94	21.35	35.14	19.75	60.55

*S.D=Standard Deviation **COV=Coefficient of variation

APPENDIX C

BACKCALCULATION OF LAYERS MODULI

Table: C2 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:11 Date:2-89

Stn	EVER-CALC RESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Depth to Bed Rock
0	1674691	20438	50062	1108296	48507	26869	98.46
1	1161538	23791	92332	1323450	21955	73168	47.07
2	1816305	14255	40688	1461901	32801	21454	88.80
3	2432146	16603	47618	1206477	65251	22692	157.33
4	1161099	52149	46640	333502	144571	24704	151.87
5	2221576	10135	48294	1999995	14384	29405	71.53
6	3207967	8755	64369	1165008	59599	23590	113.90
7	2341602	17707	33579	1577195	55131	17089	183.67
8	4999998	6374	69040	1999995	90116	18881	57.62
9	2737476	16131	47105	764446	94168	21025	118.12
10	1749678	11416	63824	260926	75796	23688	85.29
11	2069096	7833	40555	1293582	30755	17484	113.45
12	2882405	5400	25715	1999995	19137	12352	148.38
13	3725419	5062	26396	1999995	42530	10683	148.29
14	4290254	7237	49348	1235594	82163	17389	124.19
15	1993691	10194	49667	1343842	31403	22666	120.89
16	2227770	6893	34342	1222148	35561	14306	120.28
17	1343112	14469	54934	1091593	27801	29150	57.80
18	1571348	28930	57148	945664	67788	30696	182.05
19	1319751	29291	66427	749298	69289	34386	107.67
20	1869515	19405	61307	882910	63410	29430	160.10
Mean	2323640	15832	50923	1236467	55815	24815	116.99
S.D.*	998038	10787	15234	488025	30466	12414	38.83
COV**	42.95	68.13	29.92	39.47	54.58	50.03	33.19

*S.D=Standard Deviation **COV=Coefficient of variation

Table: C3 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:12 Date:8-88

Stn	EVER-CALC RESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Depth to Bed Rock
0	1183973	37243	65585	1194958	63271	21228	81.58
1	1326623	25765	52777	1079720	68345	13971	87.36
2	1642119	21506	47316	1290520	71085	11174	89.96
3	1344706	72459	103458	1340701	112643	35382	73.63
4	1281173	111819	95702	1999995	61501	50337	107.90
5	895084	36595	85192	799067	67547	27455	70.48
6	1403388	51202	112046	1399326	80887	38795	61.97
7	1237179	30584	104402	1029540	67412	30622	62.99
8	1694353	30785	79078	1641057	61950	23549	76.43
10	1307586	37241	68047	1139291	79350	19998	65.59
11	1511619	46266	79890	1142660	114764	22109	84.57
12	1203810	37337	81263	1064817	75800	24949	83.58
13	1052418	37566	64781	977737	69910	20331	76.27
14	448018	46318	71837	363885	84327	23591	79.29
15	888553	26250	69696	647988	67005	19473	77.99
16	993672	24076	90150	853541	50250	26754	71.32
17	1123554	22085	88122	928737	51939	24681	63.93
18	1194799	20312	77467	1049854	45284	22262	64.44
19	925134	24453	74406	821039	49013	22830	71.41
20	1136463	15718	69485	952860	41152	18205	68.55
Mean	1189711	37779	79035	1085865	69172	24885	75.96
S.D.*	277332	21282	16297	342440	18790	8532	10.97
COV**	23.31	56.33	20.62	31.54	27.16	34.29	14.44

*S.D=Standard Deviation **COV=Coefficient of variation

Table: C4 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:12 Date:2-89

Stn	EVER-CALC RESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Depth to Bed Rock
0	1594293	43696	55346	1521329	81317	18672	110.67
1	1674182	33293	40960	1129040	123395	9850	100.92
2	1693263	37252	43172	1137486	132704	10491	106.42
3	1827166	80756	97405	1411199	199999	28472	98.41
4	1984904	77275	100784	1999995	68129	51364	81.82
5	1884961	42594	89887	1295465	142955	24418	75.97
6	2923498	35208	176657	1793968	154452	41955	58.63
7	1977769	43285	111479	1187657	158339	30005	63.06
8	2369466	33165	76155	1745885	126449	19340	78.67
9	3075168	41160	86266	1999995	177491	21209	75.15
10	1684189	59111	61923	1188050	172572	16365	100.40
11	2387427	50220	76168	1647095	176969	19431	95.58
12	1924636	44346	85690	1999995	31622	53688	79.88
13	1643988	45486	72817	1065449	153392	19365	82.76
14	651498	24643	48914	437664	69409	14360	82.41
15	436415	32797	47384	258602	92585	13705	78.11
16	1433883	22347	77865	869931	93069	19600	67.83
17	1531676	23301	77900	885245	102813	19313	68.22
18	1664895	21098	66947	1033318	96768	16253	73.82
19	1416612	32422	65376	946197	111564	17591	77.29
20	1581194	19923	62733	1008091	89206	15343	73.53
Mean	1779099	40161	77230	1264841	121676	22895	82.36
S.D.*	591312	16064	29027	471629	42570	11834	14.04
COV**	33.24	40.00	37.59	37.29	34.99	51.69	17.04

*S.D=Standard Deviation **COV=Coefficient of variation

Table: C5 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:16 Date:8-88

Stn	EVER-CALC RESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Depth to Bed Rock
0	401072	18739	42796	303310	60541	19307	77.74
1	581646	30718	57153	483753	82233	27051	88.75
2	541901	10825	54682	429276	37974	22422	74.46
3	857365	15428	47933	635104	73533	19317	90.20
4	636384	45844	65705	514778	117906	31468	91.28
5	739350	17041	51164	538311	74905	21133	82.64
6	642763	17788	44501	490624	67797	19115	93.04
7	548888	22499	39460	502152	54341	18754	100.94
8	497128	20125	46089	429112	51698	21951	105.70
9	420673	42954	41704	376468	85744	21012	135.13
10	644501	44700	49075	662805	70751	25851	155.45
11	369755	45556	46580	294102	126704	21055	116.37
12	353181	29878	53433	277890	83156	24568	108.29
13	464839	109206	71256	545750	199999	31920	165.75
14	276677	48311	46714	200506	170028	19402	125.62
15	392983	25994	48602	274859	113435	19467	121.12
16	475103	59584	55975	381099	199999	22846	150.75
17	418839	53762	51000	315881	199999	20196	112.40
18	432353	27562	53475	294579	122389	21425	75.30
19	414821	37794	48989	282400	167390	19343	125.83
20	547249	21124	44130	342567	129049	16248	100.98
Mean	507499	35497	50496	408349	109027	22088	109.42
S.D.*	136788	21415	7466	125537	50775	3955	25.86
COV**	26.95	60.33	14.79	30.74	46.57	17.91	23.64

*S.D=Standard Deviation **COV=Coefficient of variation

Table: C6 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:16 Date:2-89

Stn	EVER-CALC RESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Depth to Bed Rock
0	1998159	13511	37345	1645911	106571	15856	134.79
1	682012	250000	44483	1999995	113648	24288	132.97
2	1520077	19590	42934	1999995	9722	29967	119.36
3	2027269	17248	41772	1409321	156623	17826	115.76
4	1793151	46118	52491	1473955	168961	25911	96.41
5	2014757	19294	44155	1591379	132851	19496	111.46
6	2410601	15595	41063	1999995	127967	17231	126.48
7	1643995	20370	36550	1419261	101744	16970	147.93
8	1888423	15589	40772	1618559	97180	18115	125.69
9	1859917	38427	39911	1407676	189184	18307	134.60
10	2579583	29841	44554	1999537	184655	19995	145.98
11	1551428	74673	38765	1691457	199999	17369	177.66
12	1405041	43745	43178	1089798	199999	19555	115.69
13	1570153	185790	57833	1999995	107977	34766	172.12
14	2112082	25912	44022	1598180	199999	18430	121.58
15	1850551	22067	42491	1298497	186641	17890	139.49
16	2427787	40191	47633	1999995	58434	28332	150.17
17	2571993	27123	47550	1999995	92611	23496	131.51
18	1606468	39769	44239	1266389	199999	19731	131.02
19	1538811	56535	40815	1416558	199999	18446	182.05
20	1699286	21556	38478	1091561	193957	16128	125.92
Mean	1845312	48712	43383	1619905	144225	20862	135.17
S.D.*	431775	57760	4853	308510	53648	4946	21.20
COV**	23.40	118.58	11.19	19.04	37.20	23.71	15.68

*S.D=Standard Deviation **COV=Coefficient of variation

Table: C7 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:17 Date:8-88

Stn	EVER-CALC RESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Depth to Bed Rock
0	330905	2500	14118	252740	75293	5673	67.41
1	604250	2500	20576	379294	92495	8556	83.30
2	625658	3758	21510	249966	199999	9406	88.47
3	670952	2500	23302	427935	92480	9496	78.06
4	580835	4296	22702	330957	123838	10358	88.34
5	650525	2500	29102	366155	92667	11429	75.52
6	658740	2633	25463	352234	113473	10360	77.68
7	514101	3590	24273	313447	90525	10797	86.06
8	719509	2676	29612	298975	165854	11504	68.95
9	297098	6408	26236	128975	128975	12897	78.11
10	563750	4528	23056	345675	110310	10674	86.04
11	466759	2841	16991	326199	68563	7643	87.00
12	569734	2827	23328	253938	136059	9780	83.98
13	625571	3296	18721	355522	130757	8189	89.71
14	598429	2500	18585	729249	9212	8441	86.95
15	684303	6592	27408	386962	168072	12898	98.16
16	810646	3349	24750	647547	82092	10610	99.11
17	516537	5205	22873	296877	125096	10722	91.71
18	549161	3250	24267	283603	114911	10491	85.25
19	580846	3894	24401	239901	181555	10700	84.25
20	327413	5919	22631	118934	184260	10859	85.51
Mean	568844	3693	23043	337385	118404	10071	84.27
S.D.*	126087	1298	3693	136764	44089	1654	7.78
COV**	22.17	35.13	16.03	40.54	37.24	16.42	9.24

*S.D=Standard Deviation **COV=Coefficient of variation

Table: C8 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:17 Date:2-89

Stn	EVER-CALC RESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Depth to Bed Rock
0	863961	2500	11636	738020	139496	4650	103.43
1	921840	4278	17498	686256	199999	7493	102.52
2	835912	4454	17915	556250	199999	7953	83.60
3	703525	7734	16258	547473	199999	7399	103.98
4	1164135	2500	20825	877340	199999	7875	76.98
5	295484	3606	39094	303571	6606	22021	21.74
6	975688	3304	20607	672673	199999	8508	21.15
7	129931	12255	39090	238396	20447	23839	
8	1087357	4872	23141	909161	199999	9872	99.16
9	1583924	2500	23343	1999995	5000	10027	
10	961181	2500	26773	1086121	32583	10861	61.58
11	487544	7103	13510	310498	189194	6307	112.24
12	910156	3373	17948	628440	199999	7411	98.58
13	1051957	5412	14819	920941	190052	6336	126.80
14	606407	5772	13348	430680	180468	6015	113.63
15	1128370	9045	26023	1147841	199999	11721	95.92
16	1512619	5377	19742	1547426	199999	8128	108.84
17	969432	5391	19245	1562608	25976	8615	96.54
18	550642	4767	18499	275464	199999	8479	90.36
19	572821	5241	20381	290621	199999	9451	89.14
20	50000	37374	18732	100572	100572	10057	102.94
Mean	826804	6636	20877	753826	147161	9668	81.39
S.D.*	386430	7261	7016	483936	76061	4617	37.01
COV**	46.74	109.42	33.61	64.20	51.69	47.76	45.47

*S.D=Standard Deviation **COV=Coefficient of variation

Table: C9 Backcalculated Moduli from EVERCALC and TEXAS Models

Site 24 Date: 6-88

Stn	EVER-C-CALC RESESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Dep to Bed Rock
0	481320	3797	19427	535640	9350	7239	98.84
1	543067	3778	23897	546235	15307	8000	85.24
2	655167	3344	25215	726344	8241	8457	83.72
3	669840	2559	28249	695782	7884	8388	84.49
4	692492	3331	28533	733092	9110	9347	90.40
5	750867	2666	40313	702276	12741	10272	75.92
6	648806	2500	26973	690819	8095	7803	83.19
7	612631	3161	34493	532516	19926	9569	73.02
8	608893	2524	38344	562227	12166	9752	67.25
9	648334	3501	32970	625614	14104	10213	81.08
10	585890	2664	36613	567794	9768	10101	67.05
11	499702	2821	32111	442729	14858	9075	72.00
12	595404	2500	35999	601143	8586	9658	68.83
13	548070	2621	26761	570091	7489	8423	78.87
14	573210	3121	20607	636463	7467	7171	100.69
15	553503	2672	23848	568773	9020	7486	88.20
16	507460	2616	20800	550801	6627	6997	86.48
17	585329	2956	19728	557321	18002	6057	104.39
18	582908	3027	24067	629439	7588	8155	90.43
19	477732	2500	22658	547994	5000	7584	
20	721924	8306	16436	544792	7595	8403	40.78
Mean	597264	3189	27526	598471	10425	8483	77.18
S.D.*	74356	1215	6714	74005	3877	1156	21.97
COV**	0.12	0.38	0.24	0.12	0.37	0.14	0.28

*S.D=Standard Deviation **COV=Coefficient of Variation

Table: C10 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:24 Date:12-88

Stn	EVER-CALC RESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Depth to Bed Rock
0	1012476	4717	20121	791455	65344	6994	143.97
1	1099638	5058	25376	792467	76155	8712	117.87
2	1254322	4912	24628	970107	77767	8262	121.57
3	1380595	2815	31867	1251995	38084	9069	98.59
4	1300395	3446	30624	1090490	50584	9353	101.03
5	1604311	4066	41720	1475473	45415	12496	92.25
6	1390315	2531	31888	1227364	40375	8638	100.99
7	1268769	3904	38948	1052737	46340	11937	89.33
8	1271595	2608	39494	1106868	31245	10463	87.22
9	1464756	3796	36759	1410539	34571	11379	95.07
10	1205229	2910	39732	1246477	12721	11970	83.04
11	1040702	3209	35775	879570	33160	10821	86.13
12	1294996	2676	45349	1296995	12678	12558	78.22
13	1143379	3275	30702	1051410	32417	9579	96.04
14	1199385	5035	21840	1019315	64885	7546	128.42
15	1223342	3163	26927	931703	61483	8072	110.93
16	1135043	3585	21291	958345	53358	6965	124.13
17	1242117	3594	21180	945603	72570	6684	136.16
18	1194426	4808	24667	1011078	60499	8461	119.05
19	1126376	4957	24558	847991	74640	8368	120.30
20	1109628	2598	29877	1031688	26368	8781	91.05
Mean	1236276	3698	30634	1066175	48127	9386	105.78
S.D.*	138130	877	7406	186160	19520	1810	18.29
COV**	11.17	23.71	24.18	17.46	40.56	19.28	17.29

*S.D=Standard Deviation **COV=Coefficient of variation

Table: C11 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:26 Date:3-88

Stn	EVER-CALC RESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Depth to Bed Rock
0	1910041	5000	33162	1672606	83802	10401	97.63
1	1828679	5000	25173	1999995	20286	9565	112.45
2	2722994	5726	34906	1999995	142615	11004	123.00
3	1821555	5000	32095	1999995	20858	11746	88.48
4	584745	5964	25933	399717	47402	10606	48.50
5	1452675	5000	27464	1274757	63067	9472	102.53
6	1846458	5000	29820	1377937	108181	9400	100.98
7	1662375	5000	30441	1245293	88235	10092	112.02
8	1413587	5852	29583	1010091	86325	10506	104.28
9	1350717	7749	30051	1044560	82580	11425	101.92
10	1514844	11895	31135	1227903	102726	12377	116.85
11	1488074	5144	30308	1527397	33728	11109	100.35
12	1856269	6759	31692	1354231	114331	10989	132.95
13	1392195	5753	27036	1065117	81228	9635	126.70
14	1435149	5000	25268	1248681	68305	8667	116.43
15	1531346	5000	30189	1201904	75326	10258	101.77
16	1271715	5000	31404	1232515	36197	11439	19.77
17	1142758	6129	24152	402126	169586	8369	117.58
18	1712327	5000	29589	1737588	59974	9619	98.94
19	1349882	5000	25414	1240136	64725	8560	96.37
20	1433869	5000	29550	1713925	27066	10283	93.78
Mean	1558203	5761	29255	1332213	75073	10263	100.63
S.D.*	391338	1544	2816	428782	37874	1049	24.68
COV**	25.11	26.81	9.63	32.19	50.45	10.22	24.53

*S.D=Standard Deviation **COV=Coefficient of variation

Table: C12 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:26 Date:6-88

Stn	EVER-CALC RESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Depth to Bed Rock
0	1088291	4835	29014	1215044	16204	9989	89.59
1	1111621	2979	27454	728081	73084	6753	100.69
2	1422774	7234	30013	923406	130044	8630	114.57
3	1246617	3670	31326	987853	60125	8178	84.29
4	543360	2899	27619	227027	61242	7185	79.93
5	833859	4518	26601	574314	64839	7792	102.49
6	1149681	2998	35673	688050	77286	8225	81.99
7	670704	8927	26503	385057	100409	8681	243.76
8	583127	10529	24812	325057	98307	8576	84.17
9	717396	10369	26660	396135	121742	8614	199.40
10	617776	10368	28595	333872	102776	9771	83.49
11	875656	7343	31192	604725	81023	10042	88.87
12	461904	53860	29024	561652	199999	8968	180.20
13	718745	5104	27199	365507	112261	7332	85.39
14	721777	3635	31190	325511	95023	7685	64.46
15	772900	3892	30685	339910	108821	7649	73.62
16	611607	4824	29688	282911	97576	8057	84.12
17	867101	3173	26709	460998	96433	6286	90.45
18	1024431	3642	28705	502074	122427	6799	81.02
19	818372	2877	30032	348545	101690	6740	83.50
20	908622	3330	32749	467908	98168	7557	75.28
Mean	846015	7667	29116	525887	96166	8072	103.39
S.D.*	244182	10651	2457	251251	34371	1043	44.96
COV**	28.86	138.92	8.44	47.78	35.74	12.92	43.48

*S.D=Standard Deviation **COV=Coefficient of variation

Table: C13 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:28 Date:3-88

Stn	EVER-CALC RESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Depth to Bed Rock
0	479493	5121	9880	369879	13676	6299	115.80
1	500000	4531	10373	422882	11187	6580	94.17
2	320265	6643	9355	213981	16256	6137	115.53
3	385643	4481	8428	250209	14170	5262	172.76
4	431372	3820	9783	234124	15313	5814	108.74
5	436185	2640	11560	407186	5000	7327	57.09
6	484050	2994	9104	253620	14195	5263	129.62
7	473300	2732	9221	409012	6892	5648	98.60
8	472033	2500	8793	444080	5335	5452	91.79
9	444789	4637	10566	287722	14991	6503	124.30
10	500000	2500	8915	414701	5917	5396	98.77
11	500000	2500	7854	366320	8751	4541	129.83
12	500000	2500	7923	330207	5000	5306	70.21
13	500000	3518	8962	577710	5755	5777	119.27
14	500000	3265	9897	473576	6630	6320	100.69
15	500000	4364	11772	569515	6323	7864	91.46
16	449763	3891	13322	349889	9884	8105	70.04
17	500000	4519	12336	485640	9174	7813	82.71
18	500000	5870	12890	471026	12466	8243	83.01
19	500000	2658	11374	350383	9228	6453	86.37
20	500000	3575	10882	290116	14964	6305	106.59
Mean	470328	3774	10152	379608	10053	6305	102.25
S.D.*	45470	1160	1544	101122	3883	1017	24.98
COV**	9.67	30.73	15.21	26.64	38.63	16.12	24.43

*S.D=Standard Deviation **COV=Coefficient of variation

Table: C14 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:28 Date:6-88

Stn	EVER-CALC RESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Depth to Bed Rock
0	500000	50000	7332	394518	13195	5731	139.51
1	500000	25000	8350	734638	5000	6840	90.10
2	500000	25000	7255	298247	12004	5767	98.26
3	500000	25000	6583	273825	11516	4992	120.28
4	500000	25000	7446	464601	9104	5601	113.75
5	500000	25000	8181	413664	5000	7019	55.44
6	500000	25000	6646	198367	14778	4973	117.87
7	500000	25000	6825	316725	10418	5125	101.03
8	500000	25000	6486	415934	5736	5167	87.35
9	500000	25000	8967	596604	11379	6267	74.15
10	500000	25000	6800	353689	7673	5189	83.39
11	500000	25000	5648	526875	5000	4375	120.24
12	500000	25000	6918	373552	5000	5558	70.17
13	500000	25000	6832	658640	5000	5480	120.91
14	500000	25000	6893	479755	6726	5618	85.82
15	500000	25000	8854	482554	7819	7102	75.61
16	500000	25000	9593	549884	5221	8197	66.47
17	500000	25000	9060	430117	9515	7070	77.70
18	500000	25000	9995	534025	8190	8040	74.98
19	500000	25000	8373	364721	9795	6322	81.31
20	500000	25000	11614	113558	11355	11355	67.61
Mean	500000	26190	7841	427357	8544	6276	91.52
S.D.*	0	5324	1409	144266	3008	1513	22.19
COV**	0.00	20.33	17.97	33.76	35.21	24.11	24.25

*S.D=Standard Deviation **COV=Coefficient of variation

Table: C15 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:31 Date:7-88

Stn	EVER-CALC RESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Depth to Bed Rock
0	334291	13183	45082	281969	79201	10791	96.51
1	264865	27957	42699	232844	113600	11584	122.82
2	326842	24359	44776	289657	101769	12016	124.97
3	241388	46864	33804	219463	150312	8830	153.92
4	274084	53062	31859	248334	170917	7644	170.56
5	295115	34840	41363	252987	154357	10270	111.53
8	309534	23623	79980	262403	104208	21875	80.92
9	332390	17499	54887	256141	133198	12480	78.74
10	397834	21387	50084	314157	147848	11190	84.63
11	249394	54103	70067	221043	199999	19493	89.17
12	348714	14961	98553	296114	68420	24717	61.14
13	282659	31842	93586	282464	84739	28246	65.74
14	287028	48016	49787	248973	199999	12849	85.89
15	246502	41005	49919	213436	185742	12835	90.93
16	326081	26850	59777	263590	156023	14918	77.49
17	346591	26109	56052	297049	123596	14882	90.15
18	338257	14495	51376	280379	89643	12397	91.56
19	336891	14120	62371	278263	86115	15156	85.64
20	226300	71244	29843	218316	199999	6728	232.28
Mean	303408	31869	55046	260925	134194	14153	104.98
S.D.*	44203	15957	18586	29338	42862	5534	40.53
COV**	14.57	50.07	33.76	11.24	31.94	39.10	38.61

*S.D=Standard Deviation **COV=Coefficient of variation

Table: C16 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:31 Date:1-89

Stn	EVER-CALC RESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Depth to Bed Rock
0	5149887	45167	58745	1999995	54817	38046	125.64
1	4382941	500000	45336	1999995	125892	26323	138.46
2	5924279	498894	54748	1999995	73284	49438	97.07
3	5755256	500000	56089	1999995	74233	50078	110.02
4	5436503	69761	54022	1999995	46146	38638	125.88
5	5451183	114029	53388	1999995	73421	47598	126.38
6	10000000	54395	43151	1999995	58626	30972	125.95
7	6552870	500000	79317	1999995	125892	78705	97.00
8	4800414	500000	94344	1999995	199526	53143	106.73
9	5518352	312779	69600	1999995	199999	41952	106.87
10	4542788	500000	109201	1999995	199999	92096	107.13
11	2989331	500000	147541	1999995	125892	140597	96.76
12	2221507	494729	143296	1999995	79432	131562	117.80
13	3529923	233244	217621	1999995	125892	140595	66.65
14	5136634	500000	134275	1999995	199999	110116	83.51
15	5377741	500000	80403	1999995	125892	71929	107.13
16	7532156	500000	81208	1999995	40689	135631	107.30
17	2113558	500000	140066	1999995	79432	129367	107.13
18	5969252	500000	90693	1999995	199526	53843	96.90
19	6785340	500000	84019	1999995	199526	52127	96.96
20	10000000	500000	50394	1999995	76643	55040	100.88
Mean	5484282	396333	89879	1999995	118322	74657	107.05
S.D.*	1990231	171835	43530	0	57597	39001	15.85
COV**	36.29	43.36	48.43	0.00	48.68	52.24	14.81

*S.D=Standard Deviation **COV=Coefficient of variation

Table: C17 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:35

Date 7-88

Stn	EVER-CAC RESULT E1	E2	E3	E4	TEXAS MODEL RESULT E1	E2	E3	E4	Depth to Bed Rock
0	707077	14811	10000	26561	508567	18109	378878	6157	82.59
1	307780	50115	10000	26933	325184	20939	611068	6111	97.66
2	336554	51963	10000	30529	341892	22463	680463	6805	85.92
3	217950	25805	10000	29725	297790	23877	312784	7143	82.30
4	243085	20669	10000	29373	227283	11590	679609	7577	75.74
5	168360	12609	10000	26502	160461	7886	727095	7272	88.95
6	73051	250000	10000	21493	242212	21718	89399	8072	75.28
7	168321	61685	10000	28932	184946	31413	238174	7495	82.74
8	402158	7777	10000	25087	319915	8318	615806	6158	75.54
9	298822	49259	15788	36060	319444	21604	914219	9143	80.17
10	224101	69842	10000	30247	260622	25816	601097	6964	92.90
11	113454	250000	10000	16383	299898	18395	147193	6645	78.41
12	295692	14265	10000	23678	205317	22116	73859	6845	81.74
13	281861	57216	10000	34563	359383	46748	164062	8917	75.01
14	423966	75616	10000	34207	475710	27508	659953	7647	91.73
15	389516	103799	11749	32729	454946	36742	683260	6834	106.29
16	687738	57010	10000	35301	660107	24923	753019	7604	97.85
17	470439	136474	10000	31449	582814	49287	379454	6628	116.08
18	345223	155323	10000	34594	422044	54509	636614	6367	220.38
19	554824	6256	18654	17186	326071	16162	691945	6920	149.70
20	422195	116652	10000	29834	506680	41220	479385	6053	109.37
Mean	339627	75578	10771	28636	356252	26254	500826	7112	97.45
S.D.	164216	69869	2171	5418	130645	12582	241362	830	32.51
COV*	48.35	92.45	20.15	18.92	36.67	47.92	48.19	11.67	33.36

Table: C18 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:35 Date 2-89

Stn	EVER-CAC RESULT E1	E2	E3	E4	TEXAS MODEL RESULT E1	E2	E3	E4	Depth to Bed Rock
0	4999998	250000	127250	116847	1999995	199526	630957	139498	4.90
1	4999998	250000	2000001	92985	1999995	199526	630957	133155	86.70
2	4999998	250000	2000001	86509	1999995	199999	999997	65126	86.07
3	4999998	250000	2000001	108587	1999995	199999	999997	68952	74.19
4	4999998	250000	2000001	95027	1999995	199999	999997	97349	87.06
5	500000	250000	2000001	89938	1999995	199999	633353	33801	97.01
6	4999998	250000	2000001	99657	1999995	199999	999997	70396	83.56
7	1457929	250000	2000001	79319	1999995	199999	999997	39033	97.20
8	4999998	250000	2000001	70066	1999995	199999	999997	59580	107.49
9	500000	227212	2000001	87860	445797	199999	999997	34385	108.02
10	500000	82778	2000001	64678	576276	79432	251188	57627	109.72
11	4999998	250000	2000001	55504	1999995	199999	999997	22738	107.41
12	4999998	250000	2000001	90717	1999995	199999	398107	46340	121.66
13	4999998	250000	2000001	100773	1999995	147128	735640	113116	96.35
14	4999998	250000	2000001	74790	1999995	199999	999997	93694	86.31
15	4999998	250000	2000001	75151	1999995	199999	633353	39751	114.40
16	4999998	250000	2000001	56033	1999995	199999	633353	39842	56.91
17	2943496	250000	934371	79325	1999995	199999	633353	17762	119.82
18	4999998	250000	2000001	78829	1999995	199999	999997	54770	106.77
19	4999998	250000	2000001	76152	1999995	199999	633353	40762	86.81
20	4999998	250000	2000001	29834	1999995	199999	633353	39989	106.81
Mean	4090543	240952	1860078	81361	1858189	191695	783187	62270	92.63
S.D.	1692506	35699	448894	19221	437538	27502	227270	33729	24.94
COV*	41.38	14.82	24.13	23.62	23.55	14.35	29.02	54.17	26.92

*S.D=Standard Deviati **COV=Coefficient of variation

Table: C19 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:36 Date 7-88

Stn	EVER-CAC RESULT E1	E2	E3	E4	TEXAS MODEL RESULT E1	E2	E3	E4	Depth to Bed Rock
0	120018	20894	18341	32346	177871	17787	53361	17787	56.91
1	129007	40808	10261	30458	134857	40253	38366	12869	142.59
2	174400	28621	55407	23220	184778	27894	442075	7411	146.67
3	235361	25397	1000000	25418	233001	26488	594442	10165	71.72
4	117428	37276	56862	28935	123163	36949	123163	12316	145.81
5	394531	73630	10914	35772	406926	75973	19276	16474	180.37
6	160884	48152	30419	38838	170358	46752	145379	15147	140.71
7	307736	107548	10000	39726	332625	104417	112758	12360	226.20
8	141315	35563	28652	45910	139009	41702	158514	13897	76.26
9	261498	85271	10000	38774	250860	93456	39676	14288	150.78
10	111932	45538	13928	46586	134374	40312	403124	13437	162.48
11	138015	25564	12312	27967	158063	22930	481673	7765	113.78
12	195567	20007	10000	27045	214762	18455	247991	8269	96.56
13	139299	33420	29071	49032	136917	41075	135938	13688	54.22
14	211921	60725	35422	36095	233358	57877	464551	10513	156.17
15	189461	47212	12191	40498	216457	43205	249523	12331	222.94
16	100000	26271	1000000	28111	100000	28075	911191	9112	278.55
17	185975	52888	10000	40904	213053	48804	173369	12866	126.93
18	192474	48477	24077	35494	219371	45040	469556	10333	213.33
19	409103	34381	110578	36049	394105	35599	999997	10199	105.42
20	100000	38906	135151	34298	123855	37156	371566	12385	225.87
Mean	191235	44598	124933	35308	204655	44295	315976	12077	147.35
S.D.	86268	21519	285766	6981	83027	21989	267615	2689	59.62
COV*	45.11	48.25	228.74	19.77	40.57	49.64	84.69	22.27	40.46

*S.D=Standard Deviati **COV=Coefficient of variation

Table: C20 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:310 Date:7-88

Stn	EVER-CALC RESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Depth to Bed Rock
0	236699	3494	18682	257847	5936	6168	37.19
1	311257	6260	24692	369451	9032	8934	38.50
2	385705	3622	20451	435876	5000	7243	39.95
3	369761	7525	21356	543268	5000	10945	39.07
4	433979	5195	18095	387178	16327	5125	68.86
5	374858	6228	18864	395055	13439	6009	55.40
6	281009	5009	19444	376682	5023	8125	38.37
7	173167	5132	19853	223396	5949	8107	36.21
8	344560	8350	20038	372464	16271	6744	50.98
9	458452	10806	24524	416453	27515	7641	60.34
10	387193	9826	22183	351881	24484	6987	60.00
11	367532	7828	26484	380718	15593	8803	42.79
12	356647	10721	18091	493248	12917	6837	54.91
13	251822	13079	17521	254829	23802	6143	54.97
14	295594	8240	17940	332928	14707	6229	52.87
15	198378	19886	18976	167677	37965	6600	284.48
16	410038	4933	18587	532407	5000	7497	44.59
17	297436	4134	14444	309204	9319	4480	54.86
18	200803	5114	14038	224767	8874	4922	42.99
19	237102	6787	16422	271518	11326	5867	42.94
20	227953	6056	16627	254898	10400	5875	41.80
Mean	314283	7535	19396	350083	13518	6918	59.15
S.D.*	81152	3717	3073	99655	8507	1474	51.17
COV**	25.82	49.34	15.84	28.47	62.93	21.30	86.52

*S.D=Standard Deviation **COV=Coefficient of variation

Table: C21 Backcalculated Moduli from EVERCALC and TEXAS Models

Site No:310 Date:1-89

Stn	EVER-CALC RESULT E1	E2	E3	TEXAS MODEL RESULT E1	E2	E3	Depth to Bed Rock
0	4999998	250000	126272	1999995	199999	164931	109.66
1	4999998	250000	134054	1999995	199999	172471	110.06
2	4999998	250000	133017	1999995	199999	171194	104.29
3	4999998	250000	120829	1999995	199999	159871	117.81
4	4999998	250000	111527	1999995	199999	148820	117.47
5	4999998	250000	108567	1999995	199999	143791	111.57
6	4999998	250000	130873	1999995	199999	169661	105.01
7	4999998	250000	131779	1999995	199999	169948	105.10
8	4999998	250000	115684	1999995	199999	154938	111.81
9	4999998	250000	102904	1999995	199999	90593	111.60
10	4999998	250000	124899	1999995	199999	163471	94.60
11	4999998	250000	114281	1999995	199999	153883	111.99
12	4999998	250000	139091	1999995	199999	175210	94.79
13	4999998	250000	116671	1999995	199999	156158	102.78
14	4999998	250000	117549	1999995	199999	156714	105.63
15	4999998	250000	112864	1999995	199999	152616	112.12
16	4999998	250000	112993	1999995	199999	152831	118.46
17	4999998	250000	137950	1999995	199999	174426	105.46
18	4999998	250000	120210	1999995	199999	160229	94.38
19	4999998	250000	167268	1999995	199999	198669	105.50
20	4999998	250000	125197	1999995	199999	165428	111.85
Mean	4999998	250000	124023	1999995	199999	159803	107.71
S.D.*	0	0	13731	0	0	19362	6.92
COV**	0.00	0.00	11.07	0.00	0.00	12.12	6.42

*S.D=Standard Deviation **COV=Coefficient of variation

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