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TONNAGE & COMPOSITION OF LIMESTONE...

Tolman, C. F.

REPORT ON TONNAGE AND COMPOSITION OF
LIMESTONE AVAILABLE IN PROPOSED QUARRIES A AND B,
PERMANENTE CORPORATION, AND SUPERFICIAL RESIDUARY CLAY
ON THE PROPERTY OF THE PERMANENTE CORPORATION
SANTA CLARA COUNTY, CALIFORNIA

PART I. (TEXT)

C. F. Tolman

J. Kennan

Stanford University

June 18, 1939

C. F. TOLMAN
STANFORD UNIVERSITY
CALIFORNIA

June 18, 1939

The Permanente Corporation
1522 Latham Square Building
Oakland, California

Gentlemen:

At your request I submit the results of our sampling of a portion of the Permanente limestone, situated on the southern slope of Bald Peak and on the northern slope of Permanente canyon. The area sampled lies above the 1500 foot level, and also above the mass of Franciscan sandstone and volcanics which separates the great limestone body into two portions. The area sampled covers the Southeast Quarter of Section 18, Township 7 South, Range 2 West and does not include large and easily available bodies of high grade limestone north and east of this area nor the large mass of limestone below the 1500 level on the northern slope of Permanente canyon, nor the mass of limestone south of Permanente Creek. These three additional areas contain large tonnages of high grade "dark" limestone.

The area sampled and the areal extent of the entire body of Permanente limestone is shown on the Location Map accompanying this report.

The present preliminary report is accompanied by the following photographs, maps and tabulations:

I. Panorama (In Envelope).

Panorama of the south slope of Bald Peak showing the limestone body from Permanente Creek to the top of Bald Peak and the included beds of Franciscan sandstone and volcanics (andesite), trenches dug for sampling, the old lower and upper quarries, and the location of proposed quarries A and B.

II. Maps and Geologic Sections.

(1) Location map showing extent of Permanente limestone and clay areas sampled. (In roll).

(2) Geologic map of the area above the 1500 foot contour embracing proposed new quarries A and B. (In roll).

(3) Sample map of the area of proposed new quarries A and B. (In roll).

(4) Geologic cross sections showing geology and chemical composition of areas embraced in proposed quarries A and B. The estimates of tonnage and calculations of average value are based on these cross sections. (In envelope).

(5) Map of Clay Area A. (In roll).

(6) Map of Clay Area B. (In roll).

(7) Map of Clay Area C. (In roll).

(8) Map of Clay Area D. (In roll).

III. Tabulations.

(1) Tabulations of chemical analyses of limestone to

date.

(A) Jack hammer samples.

(B) Diamond drill samples.

(C) Hand samples.

(2) Tabulations of analyses of surface clay to date.

(3) Tabulations of analyses of andesite and associated sandstone formation.

(A) Upper andesite.

(B) Franciscan sandstone and shale along west limestone contact.

(C) Interbedded Franciscan sandstone and shale.

(4)A)Analyses of bay clays north of the Bayshore Highway (Poland Hand Samples of Clays).

(B) Logs of wells in area east of Bayshore Highway.

(5) Tabulations showing tonnage and composition of the Permanente limestone available within the proposed quarry sites A and B. (Text, pp. 17 and 18).

(6) Tabulations showing tonnage of clay available on the properties of the Permanente Corporation. (Text, p. 20).

Respectfully submitted,

June 26, 1939

Mr. H. P. Davis
Henry J. Kaiser Company
1522 Latham Square Building
Oakland, California

Dear Mr. Davis:

In accordance with the plans outline to you by Mr. Tolman, we have checked over the preliminary report that was given to you on the 19th of June. A few discrepancies were noted, and the corrections to be made are as follows:

(1) Geologic Map -

Along the 1600 foot contour line, near the southern edge of the map, there is an area colored in pink; this area should be colored light blue to denote it as upper light limestone.

(2) Sample Map -

Lying along the 1600 foot contour line, near the southern edge of the map, there is an area colored pink; this area should be colored light blue to indicate an average calcium carbonate content of 72.04%.

(3) Text of Report -

(A) On page 2, line 21 should read as follows: "3,697,100 tons gross and 2,137,550 tons, etc."

(B) On page 20, the clay tonnage tabulation should read as follows:

	Gross Tonnage	% Coarse Waste	Net Tonnage
Area A =	1,050,000	48.5	542,150
Area B =	1,755,000	39.5	1,061,000
Area C =	757,400	39.6	457,400
Area D =	134,700	43.5	76,300
TOTAL =	3,697,100		2,137,550

(C) There was no mention made regarding the fact that in diamond drill holes 6 to 9 inclusive, the sludge samples were the only analyses available. When the core analyses have been run, the average grade of the deposit, in the area around these holes, may be changed a slight amount.

Respectfully submitted,

JVN:hp

J. V. Newman, Jr.

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Part I, (Text)

SUMMARY OF REPORT

The Permanente limestone available above the lowest level of the two proposed quarries consists of three limestone formations: (1) lower "white" cherty limestone, (2) "dark" high grade limestone, (3) upper "white" cherty limestone.

The average composition and tonnage available of these three types of limestone above the 1500 foot level (in the proposed quarries) are as follows:

	Tons	Composition
Upper light limestone	= 1,341,600	72.04% $CaCO_3$
Dark limestone	= 15,320,000	86.21% $CaCO_3$
Lower light limestone	= 13,430,000	69.07% $CaCO_3$

Interstratified between the lower "white" limestone and the high grade "dark" limestone is a bed of clayey Franciscan sandstone about 30 feet thick. The tonnage of this material is 2,444,000 tons. The chemical composition is given in Tabulation No. 3 C. This material can either be wasted or utilized to mix with the clay-bearing portion of the cement mix.

The limestone formations mentioned above rest on a thick block of Franciscan sandstone and volcanics (andesite). This formation limits the base of the upper quarry and by its thickness greatly reduces the available tonnage of limestone underlying the sandstone and extending down to the bottom of the canyon of Permanente Creek.

Most of the available limestone above the 1500 foot level can be extracted from the two proposed quarries. If it is desired to utilize all of the limestone above the Franciscan base a subsidiary quarry can be run in from the 1400 foot level to extract the material below the 1500 foot level.

The geologic cross sections have been used to calculate tonnage and average composition of the three limestone formations. They should also be used in laying out the proposed quarries.

Finally, only a portion of the available tonnage of high grade "dark" limestone on the Permanente property will be extracted from the proposed quarries. The extent of the entire Permanente limestone body is shown on the Location Map attached to this report.

Clay.

3,697,100 tons gross and 2,137,650 ~~2,835,500~~ tons after coarse is deducted of residuary clay capping most of the property of the Permanente Corporation has been sampled and analyzed, and the analyses are attached herewith.

Unlimited deposits of bay clays are available in the swamp lands of the San Francisco Bay eight miles from the property of the Corporation and clays of similar character occur under a thin layer of overburden between the bay and Bayshore Highway.

PERMANENTE FORAMINIFERAL LIMESTONE

The limestone body herein described is the largest known deposit of foraminiferal limestone of Franciscan Age. Exposures of this type of limestone were mapped by A. C. Lawson in the San Mateo and Tamalpais quadrangles[1], by J. C. Branner in the Santa Cruz quadrangle (including the Permanente deposit)[2], and the continuation of this zone was mapped by John van Steen Tolman south of Guadalupe Creek and on Calero Creek south of Calero damsite in the New Almaden quadrangle.[3] Limestone occurs as lenticular masses in this zone nearly one hundred miles long.

By far the largest and most important of these deposits is the Permanente limestone mass. Detailed drilling and sampling has shown that the Permanente limestone is divided into three distinct units: (1) the lower "white" limestone, also designated in the field as cherty white limestone, averaging 200 feet in thickness as shown in the geologic cross sections; (2) the central formation of "dark" limestone, averaging 200 feet in thickness, also called blue limestone on account of the color of weathered surfaces, colored by hydrocarbon residues; it contains

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1) U.S. Geol. Surv. Geologic Atlas. San Francisco Folio, No. 193, p. 22, 1914.
2) U.S. Geol. Surv. Geologic Atlas. Santa Cruz Folio, No. 163, 1909.
3) Geological Report on the Calero, Almaden, and Guadalupe Damsites, Plate VIII, 1934.

only a small amount of chert; (3) the upper horizon of "white" limestone with much interbedded chert, similar in character and composition to the lower horizon of "white" limestone.

The base of this series is a wedge-shaped mass of Franciscan volcanics and sandstone, the uppermost contact of which lies in the vicinity of the 1500 foot level and will form the bottom of the proposed quarry B. Below the Franciscan inclusion the limestone series is repeated by thrust faulting, and a large additional tonnage of available limestone not included in this report occurs below the 1500 foot contour down to Permanente Creek and also on the mountain slopes south of the creek. The investigation of the details of this faulting and of the structure of the entire mass of limestone has not as yet been completed and will be discussed in the final report and depicted in the final cross sections. The accompanying cross sections show the structure in so far as it affects the proposed quarries A and B.

An interesting feature discovered by detailed sampling is the uniformly high grade of the "dark" limestone and the uniformly lower grade of the two "white" limestone members carrying interbedded chert. This relation is constant and geologic structure was determined by lithology (color of formation), chemical composition, and by the attitude of the beds shown by dips and strikes. It seems probable that conditions which developed the small amount of hydrocarbons in the enclosed basin in which the "dark" foraminiferal limestone was laid down were unfavorable for the deposition of abundant chert, while in the absence of hydrocarbons the micro-organisms secreting silica and the foraminifera secreting calcium carbonate were both active.

The separation of the deposit into one high grade (in calcium carbonate) and two lower grade members is of economic importance. As shown on the geologic cross sections the "dark" limestone and the "white" limestone can be quarried separately, and any mixture desirable can be sent to the cement mill.

If the "white" limestone is used in large amounts the chert must be separated from the limestone. This can be accomplished in part by rejecting the larger chert beds in quarrying and nearly complete elimination of chert can be accomplished by flotation. Mixing of high grade "dark" limestone with the lower grade "white" limestone might make it possible to manufacture cement for many years without recourse to flotation, and, in any case, probably only the "white" limestone, and possibly only a portion of the "white" limestone, will be treated by flotation.

As the important geologic features are depicted on the maps and cross sections, these are described briefly in the following paragraphs with emphasis laid on the features of practical importance in regard to quarrying and mixing for cement. Further technical geologic description will be reserved for the final report.

DESCRIPTION OF PANORAMA OF SOUTHERN SLOPE OF BALD PEAK TO PERMANENTE CREEK (TAKEN JUNE 13, 1939).

This panorama shows Trenches No. II, III, IV, and V and diamond drills at Holes No. 9 at right, 8 at center, and 6 at left. The wedge of Franciscan sandstone and volcanics is shown in the center ground and widens greatly to the right, that is, towards the east, cutting out both the upper and lower limestone bodies east of the two old quarries. Hence, the continuation of the limestone beyond the proposed quarries lies to the northeast of the present Upper Quarry. This relation is shown on the Location Map.

The photograph was taken on the high ridge south of Permanente Creek, and hence the limestone south of the creek is not shown on the photograph.

DESCRIPTION OF GEOLOGIC MAP.

The geologic map of the proposed quarries A and B of the Permanente Corporation shows the areal extent of the geologic formations enumerated in the introductory paragraph. On it are plotted the numerous strikes and dips registering the attitude of the beds that were measured during this examination. As much of the area is covered with brush and soil, trenching was necessary to expose the limestone formations.

The outcrop areas of the "dark" limestone with high calcium carbonate content and low in chert are shown in blue. There are two areas of this formation shown on the map, a minor strip parallel to the main fault zone (also described as the "boundary fault") which cuts and terminates the Permanente limestone on the northwest, and the main outcrop, approximately one half the area mapped, bounded on the northwest by the "breccia fault".

This body of high grade limestone makes the deposit commercially valuable, and without it the two "white" cherty members would probably not be of commercial value.

The "dark" limestone surrounds the outcrop area of upper "white" cherty limestone, and this in turn encloses the upper Franciscan andesite. This pattern of older beds surrounding younger members is a graphic representation of the main structure of the limestone body above the 1500 foot level; namely, a syncline or trough plunging towards the east (see cross sections).

The "upper andesite", colored in green at the right center of the area mapped, widens rapidly towards the east of the quarry area and joins the main body of Franciscan andesite and sandstone shown on the map. This thickening of the volcanic members shown at the bottom of the map cuts out the limestone to the east of the area mapped.

The lower cherty limestone, colored in pink, lies south of the "dark" limestone and above the main included mass of Franciscan andesite and sandstone. It is brought up again northwest of the main body of "dark" limestone by the "breccia fault". The narrow band of "dark" limestone mentioned previously borders the lower cherty limestone on the northwest and is completely cut off by a great "boundary" fault zone, the hanging wall of which is shown on the map.

STRUCTURAL CROSS SECTIONS.

The geologic structure is shown on vertical cross sections which are usually constructed from formational boundaries and strike and dip observations plotted on the geologic maps. In addition to these data we have used the following information:

(1) Core samples obtained from ten diamond drill holes which show the character of rock and attitude of beds in each hole.

(2) The logs of nine diamond drill holes put down by the Santa Clara Holding Company and chemical analyses of this material.

(3) The logs of three churn drill holes bored by the California Portland Cement Company and chemical analyses of sludge samples.

(4) Jack hammer samples. These holes were from 12 to 20 feet deep and were spaced at 50 foot intervals. The dry cuttings were collected, and character of each sample shows type of limestone. These samples were analyzed.

In plotting all the above data it was discovered that the sedimentary sequence - namely, (1) the lower "white" cherty limestone, (2) the intermediate "dark" non-cherty limestone, and (3) the upper "white" cherty limestone - was well established. Color, chemical analysis and occurrence all gave an identical sequence of formations. The maps and cross sections showing chemical composition are identical with the maps and cross sections on which geologic formations are plotted.

This result was both surprising and satisfactory as it was feared, before the detailed studies were carried on, that the chert might be distributed erratically throughout the limestone sequence and that large bodies of homogenous high grade material might not exist.

The definite formational boundaries between these three types of limestone also assisted in determining the structure of the deposit, and, therefore, the accompanying geologic cross sections are far more accurate than could have been made from geologic observations at ground surface alone, no matter how detailed such observations might be.

Structural Cross Section through Trench No. II.

This section shows the geologic conditions near the eastern margin of the proposed quarries and also the position of the upper andesite exposed where the trench intersects the road to the Permanente Clubhouse. Diamond Drill Hole No. 7 was put down in the center of this volcanic material. The analyses of this "upper andesite" are tabulated. It appears that it can be incorporated in the clay of the cement mix if the clay is low in magnesia and silica.

The bulk of the material shown in this section is high grade "dark" limestone which averages a little over 200 feet in thickness. A band of Franciscan sandstone which contains a little andesite in Drill Hole No. 1 averages about 40 feet thick in the section, thinning towards the north. The analyses of this interbedded layer of sandstone is shown in Tabulation No. 3.

If this material can be used as a portion of the clay constituent of the cement mix, it will not be necessary to waste it in quarrying.

Only a small thickness of the upper "white" limestone is shown in this section.

The lower "white" limestone has been penetrated to a depth of 230 feet in Hole No. 5 and 223 feet in Drill Hole No. 6 which did not reach to the underlying Franciscan sandstone. The position of the main block of andesite and sandstone will be indicated more accurately after Drill Holes No. 8, 9 and 10 reach this material. It is hoped, therefore, that these holes will be continued until the underlying Franciscan material is encountered.

The upper andesite shown in Drill Hole No. 7 lies in the faulted syncline. This syncline is the main structural feature of the limestone body and was mentioned in the description of the geologic map. At the south end of the section the limestone is folded, and the anticline is dragged into the overturned position by the thrust fault at the contact with the main Franciscan block.

Cross Section through Trench No. III.

This cross section shows the lower cherty member 150 to 200 feet thick, the interbedded Franciscan layer 15 to 50 feet thick, and the maximum thickness of the "dark" non-cherty member varying from 220 feet to nearly 300 feet in this cross section.

The bulk of the material south of Drill Hole No. 2 encountered in this portion of the quarry will be the high grade "dark" limestone.

The main syncline shown in the cross section has flattened into a gentle structure. The overturn along the thrust fault is pronounced. The main fault which cuts off the limestone body lies just north of the section, and the parallel "breccia fault" is shown on the north end of the section.

Cross Section through Trench No. IV.

In cross section No. 4 the main boundary fault is shown at the north and the parallel "breccia fault" some 300 feet to the south. The high grade "dark" limestone is from 180 to 200 feet in this section and is separated from the underlying "white" limestone by the bed of Franciscan sandstone (shown in all the cross sections) 15 to

30 feet thick. The average thickness of the lower limestone as determined from the log of Drill Hole No. 5 is about 200 feet.

In this section the high grade limestone forms a belt of nearly 200 feet in thickness, approximately parallel to the ground surface, extending from the cliffs just above the main Franciscan contact to a point 290 feet south of the property line.

The main synclinal structure has flattened out into two gentle undulations approximately parallel with the ground surface.

This section is extended across Permanente canyon to the base of the limestone south of Permanente Creek. The structure of the limestone members is indicated by plotting the contacts between the lower "white" limestone, the "dark" limestone, and the upper "white" limestone. The structure of the lower body will be portrayed in detail in the final report.

<u>Cross Section through Trench No. V.</u>

This interesting cross section shows the "boundary fault" at the north end of the section and the "breccia fault", also shown in the cross section through Trench No. IV. It also shows a local compression of the main syncline and the universal overturning of strata at the Franciscan sandstone contact at the base of the proposed quarry. The interstratified layer of Franciscan sandstone shown in all the cross sections feathers out at the south end of the section. The "dark" high grade limestone in this section of the quarry will not average over 50 feet in thickness and will comprise the near-surface material.

To quarry the large body of lower "white" limestone it will be necessary either to utilize or to waste the interbedded Franciscan sandstone layer.

The limestone is entirely cut off about 100 feet south of the property line by the "boundary fault", and from this point for a distance of 190 feet southerly the "dark" limestone constitutes a thin surface cap. Under this cap and extending to the "breccia fault" 360 feet south of the "boundary fault", a thickness of about 200 feet of the underlying "white" cherty limestone only is available for quarrying.

Cross Section through Drill Holes W-1 and DD 2, 5 and 6.

This cross section is approximately at right angles to the cross sections previously described and may be considered a longitudinal cross section roughly parallel to the northerly quarry faces.

This cross section brings out the continuity of the included stratum of Franciscan sandstone which separates the "dark" limestone from the underlying "white" cherty limestone. It shows the cutting out of the "dark" limestone at the west end of the section by the "breccia fault".

The Practical Value of the Cross Sections.

The north-south cross sections are used to determine tonnage and average value of the quarry above the 1500 foot level. All the material above that level can be worked out by two quarries, one at about the 1500 foot level, and the second at the 1700 foot level.

These cross sections can serve as a guide if it is desired to mine exclusively the high grade "dark" limestone for a number of years and for the laying out of the quarry to get any desired percentage mixture of the "dark" and the "white" limestone.

The interbedded layer of Franciscan sandstone will either be wasted or used in the clay mix. This tonnage, therefore, can be added to the available clay supply. In any case, it must be deducted from the limestone tonnage.

Due to request for prompt transmission of this report, these sections were not reduced to the same scale as the geologic map.

SAMPLING

Three sampling methods were used in the exploration of the limestone body at Permanente; namely, diamond drilling, jack hammer drilling and moiled hand channels across exposed outcrops. It was first thought that the hand channel sampling would be important. However, two main obstacles were encountered in hand sampling: (1) the scarcity of exposures that could be fairly sampled and (2) differential weathering of limestone which caused the chert to protrude on the rock surfaces. The latter caused silica to be added to the sample unless extreme care was maintained.

The jackhammer sampling was developed to supplement the hand channel samples. Holes were drilled at fifty foot intervals along each of the five trenches that were cut down to bedrock. The holes varied in depth according to the type of rock drilled. Twenty foot holes were drilled where the rock was homogenous and did not cave badly, and the average hole was between twelve and sixteen feet deep.

Each hole was divided into four foot sample intervals, and during drilling all cuttings were blown from the hole by means of a blowpipe, and drillings for each four feet constituted a sample. The cuttings were collected by means of a powder box fitted with the necessary holes and gaskets so that the drillings would be blown into the box container. All drilling was done without water, and the cuttings were easily lifted by the blowpipe from these comparatively shallow depths.

The diamond drill sampling is primarily dependent upon continuous sludge return. The broken and laminated character of the rock rarely allows more than 25% core recovery. Continuous sludge return was obtained by cementing the hole whenever the water was lost during drilling, and further, by cementing at the end of each shift. All of the cuttings during the drilling of each five foot run were collected and washed in a large tub, dried, quartered and preserved as a sample.

All of the core that was recovered was placed in individual core boxes and after examination was split into two equal parts. One part was crushed, pulverized and analyzed, while the other was permanently filed in a core box.

Where appreciable core was recovered, the core and sludge analyses were combined according to the percent of core recovered.

TONNAGE ESTIMATES

Method of Calculation.

The tonnage of the limestone was calculated as follows:

Planimeter measurements were made of each formation. Each cross sectional area was multiplied by one half the distance between adjacent trenches for section 3 and 4. The tonnage represented by Trench II was determined by multiplying the areas by a width of 386 feet. The tonnage represented by Trench V was determined by multiplying the planimeter area by 236 feet, and the triangular shaped additional area to the west was determined by multiplying one half the planimeter area of Trench V by 300 feet.

Tonnage of Formations.

1700 - 1900 Quarry:

Upper light limestone	=	577,000 tons
Dark limestone	=	8,433,000 tons
Lower light limestone	=	6,665,000 tons
Total limestone	=	15,675,000 tons
Upper Andesite	=	131,000 tons
Franciscan sandstone & andesite	=	873,000 tons

1500 - 1700 Quarry:

Upper light limestone	=	764,600 tons
Dark limestone	=	6,887,000 tons
Lower light limestone	=	6,765,000 tons
Total limestone	=	14,416,600 tons
Franciscan sandstone & andesite	=	1,571,000 tons

Total Both Quarries:

Upper light limestone	=	1,341,600 tons
Dark limestone	=	15,320,000 tons
Lower light limestone	=	13,430,000 tons
Total limestone	=	30,091,600 tons
Upper andesite	=	131,000 tons
Franciscan sandstone & andesite	=	2,444,000 tons

CALCULATION OF CHEMICAL ANALYSES

The average grade of the limestone was derived by weighting the analyses according to the thickness of the beds penetrated by diamond drill holes and intersected by jack hammer samples.

The analyses of diamond drill holes were averaged for 25 foot intervals except where marked variations were noted. These results were plotted on the cross sections.

The following composition was derived for all limestone above the 1500 foot level:

Upper light limestone	=	72.04%	$CaCO_3$
Dark limestone	=	86.21%	$CaCO_3$
Lower light limestone	=	69.07%	$CaCO_3$

CLAY DEPOSITS

As stated in various communications addressed to this Corporation, various types of clay are available, and the available tonnage of two types is practically unlimited.

These available clay deposits are as follows:

(1) The residuary clay mantle that overlies the bedrock capping most of the property of the Permanente Corporation. Five areas, namely, Areas A, B, C, D and E, have been bored, sampled, and tonnage estimates made. A portion of this large tonnage is of special value for initial operations on account of more favorable chemical composition as shown on the tabulated analyses and because certain of the stripped areas will not be conspicuousely visible when viewed from the valley.

A part of Area B is superficially altered Santa Clara formation, the bedrock of which is clay cemented wash conglomerate. If samples of this area are satisfactory, it is probable that deep cuts can be made in the Santa Clara formation and large additional tonnage can be provided in the immediate vicinity of the plant.

An unlimited tonnage of clay of constant value can be obtained by dredging cheap marshland of the San Francisco Bay or by mining in pits a similar clay which is covered by a shallow overburden and extends approximately up to the Bayshore Highway.

The data available in regard to these deposits is limited to a preliminary report made to the Permanente Corporation by Mr. J. F. Poland. He states:

"Area 1. The marshlands and sloughs on the southwest side of San Francisco Bay will furnish an inexhaustible supply of blue clay. Eight samples of this clay have been collected and turned in to your Permanente laboratory for analysis. This area has the advantages of cheap land and no overburden. It is eight miles from your property, however.

"Area 2. The Bayshore Highway area will supply clay of essentially the same quality as that obtainable from the the marshlands. ....Land values will be higher than in Area 1, but the source of supply will be six to seven miles from your plant. Test boring of any property is recommended before purchase. A power or hand auger outfit will furnish the cleanest samples.

"Development operations in this area would probably require the removal of 6 to 10 feet of superficial soil. This region is not planted to fruit trees and should be lower priced than the land in Area 3, particularly east of the Bayshore Highway. The Sunnyvale Air Base occupies much of the central part of this area, but there is an extensive region available east of the Air Base property."

A copy of the logs of wells situated within Area 2 between the Bayshore Highway and the bay appears in Tabulation 4 B, and the analyses of the samples of the slough material taken by Mr. Poland appears in Tabulation 4 A.

A study of the tonnage estimates and chemical analyses indicates that there are large and sufficient deposits of various types of clay available, and the engineers in charge of the plant can select the type of deposit most satisfactory under the particular conditions that exist at Permanente.

CLAY TONNAGES

The clay tonnage was determined by multiplying the average depth of the clay samples times the horizontal area in square feet.

	Gross Tonnage	% Coarse Waste	Net Tonnage	
Area A =	1,050,000	48.3	553,350	(542,850)
Area B =	1,755,000	39.5	1,061,000	
Area C =	757,400	39.6	457,400	
Area D =	134,700	43.3	~~763,750~~ (76,300)	
TOTAL =	3,697,100		~~2,835,500~~ (2,148,050)	(2,137,550)

I.A

JACKHAMMER SAMPLES

ASSAY LOG
JACKHAMMER SAMPLES
NO. HOLE
LOCATION
DESCRIPTION

WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
1A	92.6	2.2	1.2										
1B	95.6	1.4	0.9										
2A	98.0	0.9	0.3										
2B	89.0	10.6	0.6										
2C	91.8	5.7	0.7										
3A	96.3	1.8	0.2										
3B	97.0	1.2	1.1										
3C	86.9	11.6	1.0	0.4									
4A	95.2	4.0	0.3										
4B	94.2	2.8	1.0										
4C	95.6	2.2	0.8										
5A	92.9	2.6	2.0										
6A	88.6	9.8	1.1										
6B	76.9	21.0	1.5										
6C	77.3	21.1	1.0	0.6									
7A	80.8	18.3	0.7										
7B	86.5	12.7	0.8	0.9									
7C	78.5	19.2	1.0										
8A	20.0	52.8	35.3	4.5									
8B													
8C	NOT RUN												
8D													
9A	90.9	6.4	1.7										
9B	93.5	3.4	1.3										
9C	95.7	3.6	---										
10A	84.0	13.6	4.2										
10B	91.7	8.4	1.0										
10C	96.2	2.2	0.7										
11A	95.2	3.0	1.7										
11B	87.4	10.2	0.6										
11C	96.5	1.6	0.6										

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

Sample Number	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
II	22A	86.7	11.9	0.8										
	23B	96.7	2.9	----										
	23C	86.6	11 .2	1.0										
	24A	87.0	10.6	1.4										
	24B	81.2	16.1	1.9										
	24C	74.9	22.5	1.6										
	25A	77.1	20.0	1.2										
	25B	77.1	20.6	0.2										
	25C	52.9	31.0	10.7										
	26A	80.0	18.2	1.4										
	26B	83.7	14.0	2.6										
	26C	91.0	2.6	----										
		CaO			MgO									
	27A	1.9	55.0	25.0	0.5									
	27B)													
	27C (													
	27D)	Not Run												
	27E)													
	28A	65.5	31.9	2.4										
	28B	64.3	25.7	2.1										
	28C	86.2	12.0	1.6										
		CaO			MgO									
	29A	2.7	85.3	12.6	0.9									
	29B	55.4	42.0	2.1	----									
	29C	74.1	24.0	1.0										
	30A	84.5	14.3	1.1										
	30B	93.4	5.0	0.9										
	30C	91.0	6.4	1.1	1.1									
	31A	92.5	6.3	1.1										
	31B	95.6	1.7	0.5	0.6									
	31C	96.4	2.9	0.6	0.4									
	32A	93.3	4.1	----	0.9									
	32B	95.6	2.4	----										
	32C	97.5	1.1	----										

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

E R	WEIGHT OF CORE	ASSAY OF CORE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	WEIGHT OF SLUDGE	ASSAY OF SLUDGE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	CALCULATED ASSAY $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$
	33A	89.6	10.2	0.8										
	33B	92.2	6.6	0.6										
	33C	86.2	13.3	1.1										
	34A	91.1	5.0	1.6										
	34B	94.6	4.2	0.7										
	34C	95.6	4.6	0.8										
	35A	99.2	0.4	0.4										
	35B	95.1	1.7	0.3										
	35C	80.7	16.9	0.5										
	36A	70.9	26.0	1.6										
	36B	83.5	14.6	2.1										
	36C	97.4	2.3	0.3										
	37A	89.2	7.3	1.4										
	37B	81.7	15.2	0.7										
	37C	96.2	2.7	0.5										
	37D	95.0	3.2	0.7										
	38A	81.1	14.0	0.8										
	38B	81.3	16.5	1.1										
	38C	92.7	4.6	0.6										
	39A	91.8	6.0	1.1										
	39B	96.7	1.1	0.6										
	39C	99.6	1.9	---										
	40A	88.5	9.0	1.1										
	40B	86.2	12.7	0.7										
	40C	79.0	19.2	1.4										
	40D	95.0	3.5	0.9										
	40E	90.1	6.0	1.0										

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	WEIGHT OF SLUDGE	$CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	$CaCO_3$	SiO_2	R_2O_3	$MgCO_3$
JH	41A	78.7	17.7	1.8										
	41B	86.6	12.1	1.0										
	41C	94.9	2.7	0.8										
	42A	80.0	9.2	2.4										
	42B	89.0	7.2	1.7										
	42C	80.5	18.2	1.5										
	43A	93.7	6.5	0.6										
	43B	83.2	16.2	0.6										
	43C	91.9	6.7	0.6										
	43D	72.7	26.0	0.6										
	43E	89.5	10.8	0.8										
	44A	Soil Not Cut												
	44B	75.3	24.7	0.1	0.7									
	44C	79.9	18.4	1.0										
	45A	85.5	13.4	0.7										
	45B	86.3	28.3	0.3										
	45C	85.8	11.8	0.4										
	46A	63.6	35.0	0.9										
	46B	61.5	37.6	0.6										
	46C	54.0	45.1	1.0										
	46D	85.0	15.8	2.0										
	46E	91.1	7.6	0.8										
	47A	94.8	3.4	1.1										
	47B	94.8	3.6	1.1										
	47C	83.9	14.7	0.9										
	47D	82.4	16.4	1.3										
	47E	91.6	6.9	1.1										
	48A	27.8	61.9	4.8										
		CaO			MgO									
	48B	0.1	85.4	12.5	0.8									
	48C	Tr.	89.0	9.5	MgO 0.0									
	48D	CaO 0.2	79.9	18.6	MgO 1.5									
	48E	CaO 0.5	83.9	14.1	MgO 0.6									

ASSAY OF LOG
JACKHAMMER SAMPLES

NO. 5015
LOCATION
DESCRIPTION

LE ER	WEIGHT OF CORE	ASSAY OF CORE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	WEIGHT OF SLUDGE	ASSAY OF SLUDGE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	CALCULATED ASSAY $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$
	57A	90.8	3.2	0.7										
	57B	91.8	6.4	0.8										
	57C	92.0	7.1	0.9										
	58A	93.0	3.2	1.1										
	58B	86.5	11.7	1.1										
	58C	95.2	4.3	0.7										
	59A	74.3	18.6	5.2										
		CaO			MgO									
	59B	85.5	8.2	6.0	1.7									
	59C	92.8	5.4	0.6										
	59D	75.0	21.6	1.8										
	59E	84.5	14.7	0.8										
		CaO			MgO									
	60A	53.8	36.8	7.7	1.3									
	60B	68.2	29.0	1.4										
	60C	76.1	22.4-	1.2										
	61A	24.6	68.2	5.1										
	61B	51.3	46.2	2.5										
	61C	83.0	16.3	0.5										
	61D	82.6	16.1	1.3										
	61E	86.8	9.6	1.5										
	62A	57.0	40.2	2.1										
	62B	83.8	14.7	1.2										
	63A	75.3	23.1	2.0										
		CaO			MgO									
	63B	32.2	48.3	11.7	5.9									
	63C	34.3	57.5	4.7										
	63D	51.9	45.7											
	63E	49.2	49.3	1.7										
		CaO			MgO									
	63-64A	14.0	52.8	26.5	6.7									
	63-64B	47.7	45.2	5.4										
	63-64C	49.3	41.4	5.7										
		CaO			MgO									
	63-64D	15.3	62.1	7.1	1.1									
	63-64E	34.0	56.8	5.0										

ASSAY OF LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
JH	64A	CaO 1.9	94.1	3.2	MgO ---									
	64B	CaO 0.7	77.3	19.1	MgO 3.5									
	64C	CaO 3.9	60.2	29.7	MgO 6.3	(Andesite)								
	64D	CaO 2.9	68.6	22.0	MgO 6.5	"								
	64E	CaO 1.2	94.3	3.0	MgO 1.5									
	65A	CaO 5.3	58.8	25.0	11.0	"								
	65B	CaO 7.2	51.2	28.4	MgO 12.2	"								
	65C	CaO 10.6	46.0	24.9	MgO 11.6	"								
	65D	CaO 17.0	46.6	26.1	MgO 9.6	"								
	65E	CaO 23.9	42.5	24.5	MgO 8.8	"								
	66A	87.9	10.1	0.8										
	66B	75.3	23.0	1.2										
	66C	70.2	28.3	1.1										
	66D	68.1	29.6	1.6										
	66E	51.5	45.5	2.2										
	67A	CaO 25.0	56.4	15.8	MgO 1.0									
	67B	82.4	14.6	1.3	0.7									
	67C	65.1	29.7	1.4										
	68A	36.0	60.4	3.8										
	68B	45.5	51.2	2.4										
	68C	56.7	40.8	2.3										
	69A	Soil Not Cut												
	69B	84.3	13.3	1.2	1.6									
	69C	86.8	12.0	1.0										
	69D	90.0	8.5	1.0										
	69E	91.5	6.6	0.8										
	70A	94.5	5.1	0.9										
	70B	96.1	2.8	0.6										
	70C	98.6	1.2	0.5										

ASSAY OF LOG
JACKHAMMER SAMPLES

NO. HOLES
LOCATION
DESCRIPTION

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	WEIGHT OF SLUDGE	ASSAY OF SLUDGE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	CALCULATED ASSAY $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$
JH	71A	93.5	6.0	0.7										
	71B	94.6	1.0	---	2.9									
	71C	94.5	1.5	---	1.2									
	71D	91.8	6.3	1.1										
	71E	89.7	9.0	0.7										
	72A	61.0	36.2	2.0										
	72B	90.9	8.1	1.0										
	72C	76.0	21.0	1.6										
	72D	78.1	20.2	1.1										
	73A	85.0	13.6	1.4										
	73B	84.1	14.6	1.2										
	73C	86.0	11.1	1.2										
	73D	95.5	2.3	0.8										
	73E	86.2	11.3	1.4										
	74A	68.0	23.0	2.4	0.7									
	74B	75.0	22.0	1.6										
	74C	71.0	26.2	1.8										
	74D	89.2	10.2	1.2										
	74E	87.6	10.7	1.1										
	75A	78.5	17.7	1.7										
	75B	75.0	23.1	1.0										
	75C	67.5	30.7	1.1										
	75D	61.0	35.6	1.6	0.6									
	76A	73.0	25.2	1.0										
	76B	78.3	18.9	1.3										
	76C	73.8	23.6	1.5										
	77A	83.4	15.0	0.6	0.6									
	77B	77.0	20.3	1.1										
	77C	74.3	23.4	1.1										
		CaO			MgO									
	77D	38.8	51.5	3.4	0.9									

ASSAY OF LOG
JACKHAMMER SAMPLES

NO. HOLES
LOCATION
DESCRIPTION

PLE BER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
E	78A	36.9	59.2	5.0										
	78B	84.0	14.6	1.3										
	78C	79.5	16.8	1.2										
	78D	71.1	27.4	1.4	1.0									
	78E	68.7	28.4	1.4										
	79A	94.9	3.4	1.2	1.4									
	79B	76.3	21.4	1.4	1.2									
	79C	78.6	20.0	1.1	1.0									
	79D	48.2	38.2	9.0	2.6									
	80A	95.1	4.0	0.4	1.0									
	80B	86.1	12.1	1.1	0.9									
	80D	86.6	9.5	0.8	0.8									
		CaO			MgO									
	81A	16.7	48.1	29.7	6.7									
	81B	47.3	35.8	9.5	2.2									
	81C	84.5	12.6	1.0	1.2									
	82A	81.0	16.2	1.4	1.6									
	82B	Caved - No Sample												
	83A	97.7	1.5	0.6	0.6									
	83B	78.1	20.4	0.9										
	83C	95.0	3.4	0.6										
	83D	90.7	4.3	0.8										
	83E	89.6	8.2	1.5										
	84A	76.1	19.6	1.8										
	84B	92.5	6.6	0.8										
	84C	94.8	2.6	0.7										
	85A	91.0	6.6	1.2										
	85B	96.0	2.9	0.6										
	85C	90.1	8.4	0.6										

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

LE / ER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
	12A	95.6	2.8	0.9										
	12B	97.0	1.5	0.1										
	12C	88.0	9.9	1.4										
	13A	OVERBURDEN												
	13B	58.2	40.5	1.4										
	13C	39.7	57.5	2.8										
	14A	74.8	25.4	—										
	14B	72.2	26.1	1.0										
	14C	54.2	44.4	0.8										
	15B	86.5	5.6	1.8										
	15C	82.8	15.5	0.6										
	16A	65.9	32.1	1.6										
	16B	93.4	5.1	—										
	16C	91.0	8.9	0.5										
	17B	91.9	5.9	—										
	17C	90.5	7.2	1.4										
	18A	79.4	15.4	2.0										
	18B	95.0	4.1	—										
	18C	96.5	3.2	—										
	19A	65.2	32.5	2.8	0.4									
	19B	88.0	10.5	0.6	0.8									
	19C	84.6	15.7	0.8										
	20A	86.7	13.6	1.0										
	20 B	86.5	11.8	1.5										
	20C	83.8	16.1	0.9										
	21A	90.5	7.8	1.0										
	21B	71.8	25.8	1.6										
	21C	87.9	11.1	0.8										
	22A	86.5	11.7	0.6										
	22B	97.9	0.6	0.6										
	22C	78.0	21.2	1.1										

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

Sample Number	Weight of Core	Assay of Core CaCO3	SiO2	R2O3	MgCO3	Weight of Sludge	Assay of Sludge CaCO3	SiO2	R2O3	MgCO3	Calculated Assay CaCO3	SiO2	R2O3	MgCO3
JR	23A	86.7	11.9	0.8										
	23B	96.7	2.9	—										
	23C	86.6	11.3	1.6										
	24A	87.0	10.6	1.4										
	24B	81.2	16.1	1.9										
	24C	74.9	22.5	1.6										
	25A	77.1	20.0	1.2										
	25B	77.1	20.6	0.2										
	25C	52.9	31.0	10.7										
	26A	80.0	18.4	1.4										
	26B	83.7	14.6	2.6										
	26C	91.0	2.6	—										
		CaO			MgO									
	27A	1.9	65.0	26.8	0.5									
	27B													
	27C													
	27D	Not Run												
	27E													
	28A	65.5	31.8	2.4										
	28B	64.3	25.7	2.1										
	28C	86.2	12.0	1.6										
		CaO			MgO									
	29A	2.7	85.3	12.0	0.6									
	29B	55.4	42.0	2.1	—									
	29C	74.1	24.0	1.8										
	30A	84.5	14.5	1.1										
	30B	93.4	5.0	0.9										
	30C	91.0	6.4	1.1	1.1									
	31A	92.5	5.5	1.1										
	31B	95.8	1.7	0.5	0.6									
	31C	96.4	2.9	0.6	0.4									
	32A	93.5	4.1	—	0.9									
	32B	96.6	2.4	—										
	32C	97.6	1.1	—										

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	WEIGHT OF SLUDGE	ASSAY OF SLUDGE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	CALCULATED ASSAY $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$
J1	33A	89.3	10.2	0.8										
	33B	92.2	6.6	0.6										
	33C	86.2	13.5	1.1										
	34A	91.1	5.0	1.8										
	34B	94.6	4.2	0.7										
	34C	95.6	4.5	0.6										
	35A	99.2	0.4	0.4										
	35B	95.1	1.7	0.3										
	35C	80.7	16.9	0.5										
	36A	70.9	26.0	1.6										
	36B	83.6	14.6	2.1										
	36C	97.4	2.3	0.9										
	37A	89.2	7.8	1.4										
	37B	81.7	16.2	0.7										
	37C	96.2	2.7	0.6										
	37D	95.0	3.2	0.7										
	38A	81.1	14.0	0.6										
	38B	81.5	16.5	1.1										
	38C	92.7	4.6	0.6										
	39A	91.8	6.0	1.1										
	39B	96.7	1.1	0.6										
	39C	99.5	1.9	---										
	40A	88.5	9.0	1.1										
	40B	80.2	12.7	0.7										
	40C	79.0	18.2	1.4										
	40D	95.0	3.5	0.9										
	40E	90.1	6.0	1.0										

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

MPLE MBER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	CaCO3	SiO2	R2O3	MgCO3	CaCO3	SiO2	R2O3	MgCO3
JH	41A	78.7	17.7	1.8										
	41B	86.6	12.1	1.0										
	41C	94.9	2.7	0.8										
	42A	80.0	9.2	2.4										
	42B	89.0	7.2	1.7										
	42C	80.5	18.2	1.3										
	43A	93.7	6.5	0.6										
	43B	83.2	15.2	0.6										
	43C	91.9	6.7	0.6										
	43D	72.7	26.0	0.6										
	43E	89.5	10.6	0.9										
	44A	Soil Not Cut												
	44B	75.3	24.7	0.1	0.7									
	44C	79.9	16.4	1.0										
	45A	85.5	13.4	0.7										
	45B	68.3	28.5	0.3										
	45C	83.8	11.8	0.4										
	46A	65.8	35.0	0.9										
	46B	61.3	37.6	0.6										
	46C	54.0	45.1	1.0										
	46D	83.0	15.8	2.0										
	46E	91.1	7.6	0.8										
	47A	94.8	3.4	1.1										
	47B	94.8	3.6	1.1										
	47C	83.9	14.7	0.9										
	47D	82.4	16.4	1.3										
	47E	91.6	6.9	1.1										
	48A	27.5	61.9	4.8										
	48B	CaO 0.1	85.4	12.5	MgO 0.8									
	48C	tr.	89.0	9.5	MgO 0.8									
	48D	CaO 0.2	79.9	18.6	MgO 1.3									
	48E	CaO 0.5	83.9	14.1	MgO 0.8									

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

PLE BER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
					MgO									
05	49A	Tr.	89.8	8.7	0.8									
		CaO			MgO									
	49B	2.8	85.8	10.7	0.6									
		CaO			MgO									
	49C	2.0	73.8	22.8	1.4									
		CaO			MgO									
	50A	0.8	88.2	9.4	0.7									
	50B	Tr.	85.5	14.8	MgO 1.0									
	50C	77.8	20.3	2.5	0.7									
		CaO			MgO									
	51A	1.2	82.6	14.7	0.9									
		CaO			MgO									
	51B	0.8	86.9	9.6	0.8									
	51C	CaO			MgO									
		3.0	80.5	15.6	0.9									
		CaO			MgO									
	51D	45.8	44.5	5.4	---									
	51E	58.3	39.1	2.1										
		CaO			MgO									
	52A	3.5	75.4	19.3	1.1									
	52B	92.5	4.2	0.8										
	52C	91.0	7.5	1.2										
	52D	79.8	17.2	1.0										
	52E	80.3	18.2	1.3										
	53A	92.6	5.6	2.2										
	53B	92.5	3.7	1.0										
	53C	90.0	6.8	---										
	54A	89.9	7.9	1.0										
	54B	96.8	2.5	---	0.6									
	54C	87.5	9.0	1.9										
	54D	94.8	4.4	1.0										
	54E	88.7	10.5	0.8										
	55A	91.0	6.8	3.3										
	55B	96.7	1.6	0.6										
	55C	90.9	7.4	1.2	0.7									
	56A	94.8	2.7	1.0										
	56B	95.8	1.2	1.4										
	56C	95.2	1.4	1.2										
	56D	95.4	2.7	0.6	0.9									
	56E	95.5	2.5	1.0										

ASSAY OF LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	WEIGHT OF SLUDGE	ASSAY OF SLUDGE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	CALCULATED ASSAY $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$
JK	57A	90.8	3.2	0.7										
	57B	91.0	6.4	0.8										
	57C	92.0	7.1	0.9										
	58A	93.9	3.2	1.1										
	58B	86.9	11.7	1.1										
	58C	93.2	4.3	0.7										
	59A	74.9	18.6	5.2										
		CaO			MgO									
	59B	85.5	8.2	6.0	1.7									
	59C	92.6	5.4	0.6										
	59D	75.0	21.8	1.3										
	59E	84.5	14.7	0.8										
		CaO			MgO									
	60A	53.6	36.8	7.7	1.3									
	60B	68.2	29.0	1.4										
	60C	76.1	22.4=	1.2										
	61A	24.6	68.2	5.1										
	61B	51.3	46.2	2.5										
	61C	83.0	16.3	0.5										
	61D	82.6	15.1	1.3										
	61E	86.8	9.8	1.5										
	62A	57.0	40.2	2.1										
	62B	83.8	14.7	1.2										
	63A	75.3	23.1	2.0										
		CaO			MgO									
	63B	32.2	49.8	11.7	3.9									
	63C	34.3	57.5	4.7										
	63D	51.9	48.7											
	63E	49.2	49.3	1.7										
		CaO			MgO									
	63-64A	14.0	52.8	26.3	6.7									
	63-64B	47.7	43.2	6.4										
	63-64C	49.2	41.4	5.7										
		CaO			MgO									
	63-64D	15.3	62.1	7.1	1.1									
	63-64E	34.0	56.8	5.9										

ASSAY OF LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
JH	64A	CaO 1.6	94.1	3.4	MgO —									
	64B	CaO 0.7	77.5	18.1	MgO 3.5									
	64C	CaO 3.9	60.2	29.7	MgO 6.3	(Andesite)								
	64D	CaO 2.3	66.6	22.0	MgO 6.5	"								
	64E	CaO 1.2	94.3	3.0	MgO 1.2									
	65A	CaO 3.9	58.8	25.8	MgO 11.9	"								
	65B	CaO 7.2	51.3	25.4	MgO 12.2	"								
	65C	CaO 10.6	48.0	24.9	MgO 11.6	"								
	65D	CaO 17.0	46.6	25.1	MgO 9.6	"								
	65E	CaO 28.3	42.6	24.5	MgO 6.6	"								
	66A	87.9	10.1	0.8										
	66B	75.3	23.6	1.2										
	66C	70.2	28.3	1.1										
	66D	68.1	29.8	1.6										
	66E	51.5	45.5	2.2										
	67A	CaO 25.8	58.4	13.5	MgO 1.0									
	67B	82.4	14.6	1.3	0.7									
	67C	68.1	29.7	1.4										
	68A	36.6	58.4	5.8										
	68B	45.5	51.2	2.4										
	68C	56.7	40.5	2.2										
	69A	Soil Not Cut												
	69B	84.3	13.3	1.2	1.6									
	69C	86.3	12.0	1.0										
	69D	90.0	8.8	1.0										
	69E	91.5	6.8	0.8										
	70A	94.5	3.1	0.9										
	70B	96.1	2.2	0.8										
	70C	98.6	1.2	0.5										

ASSAY OF LOG
JACKHAMMER SAMPLES

NO. HOLES
LOCATION
DESCRIPTION

E F	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
	71A	95.6	3.0	0.7										
	71B	94.6	1.0	---	2.9									
	71C	94.5	1.3	---	1.2									
	71D	93.8	5.0	1.1										
	71E	89.7	9.0	0.7										
	72A	61.0	36.4	2.0										
	72B	90.9	8.1	1.0										
	72C	76.0	21.0	1.6										
	72D	78.1	20.2	1.1										
	73A	85.0	13.6	1.4										
	73B	84.1	14.6	1.2										
	73C	86.6	11.1	1.2										
	73D	95.3	2.8	0.8										
	73E	86.8	11.2	1.4										
	74A	68.0	28.0	2.4	0.7									
	74B	75.0	22.9	1.8										
	74C	71.0	26.2	1.5										
	74D	89.2	10.2	1.2										
	74E	87.6	10.7	1.1										
	75A	78.5	17.7	1.7										
	75B	73.0	23.1	1.0										
	75C	67.5	30.7	1.1										
	75D	61.9	35.6	1.6	0.6									
	76A	72.8	25.4	1.0										
	76B	78.8	18.9	1.3										
	76C	73.8	23.6	1.5										
	77A	84.4	15.0	0.8	0.8									
	77B	77.8	20.3	1.1										
	77C	74.3	23.4	1.1										
		CaO			MgO									
	77D	38.8	51.5	8.4	0.9									

ASSAY OF LOG
JACKHAMMER SAMPLES

NO. HOLES
LOCATION
DESCRIPTION

[illegible]	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
JH	78A	36.9	59.2	3.6										
	78B	84.0	14.6	1.5										
	78C	79.5	19.6	1.2										
	78D	71.1	27.4	1.4	1.0									
	78E	68.7	28.4	1.3										
	79A	94.0	3.4	1.2	1.4									
	79B	76.3	21.4	1.4	1.2									
	79C	78.6	20.6	1.1	1.0									
	79D	48.2	38.2	9.0	2.6									
	80A	95.1	4.0	0.4	1.0									
	80B	86.1	12.1	1.1	0.8									
	80C	88.5	9.6	0.5	0.9									
		CaO			MgO									
	81A	15.7	48.1	23.7	6.7									
	81B	47.5	35.8	9.5	2.2									
	81C	84.5	12.6	1.6	1.2									
	82A	81.0	16.2	1.4	1.8									
	82B	Caved - No Sample												
	83A	97.7	1.5	0.6	0.9									
	83B	78.1	20.4	0.9										
	83C	95.0	3.4	0.6										
	83D	89.7	8.5	0.8										
	83E	89.6	8.2	1.5										
	84A	76.1	19.6	1.8										
	84B	92.3	5.6	0.5										
	84C	94.6	2.6	0.7										
	85A	91.0	8.6	1.3										
	85B	94.0	2.9	0.5										
	85C	90.1	8.4	0.8										

ASSAY OF LOG
JACKHAMMER SAMPLES

NO HOLES
LOCATION
DESCRIPTION

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
JH	86A	95.6	3.1	1.3										
	86B	95.4	2.9	0.8										
	86C	95.2	2.0	0.8	1.1									
	86D	96.3	2.3	0.3										
	86E	95.1	2.2	1.4	1.4									
	87A	63.2	34.7	1.6										
	87B	83.1	15.7	1.4										
	87C	94.6	4.4	0.5										
	88A	93.0	4.4	1.4										
	88B	87.5	11.8	0.8										
	88C	92.4	5.4	0.8										
	89A	95.0	3.2	0.7										
	89B	87.2	11.2	1.0										
	89C	90.4	8.4	0.9										
	89D	84.5	15.9	0.8										
	89E													
	90A	94.5	2.1	0.7										
	90B	88.1	10.1	0.7	1.0									
	90C	93.5	5.3	0.8										
	91A	81.2	17.2	0.9										
	91B	97.0	1.7	0.4										
	91C	96.0	2.1	0.4										
	92A	96.0	2.5	0.5										
	92B	97.6	1.7	0.5	1.1									
	92C	96.0	3.9	0.7	1.0									
	92D	84.3	15.0	0.9										
	92E	68.8	29.4	1.9	1.2									
		CaO			MgO									
	93A	3.6	92.1	2.3	1.0									
	93B	24.5	72.0	2.3										
	93C	64.6	33.8	1.0										

ASSAY OF LOG
JACKHAMMER SAMPLES

NO. HOLES
LOCATION
DESCRIPTION

MPLE MBER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	S102	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	S102	R2O3	MgCO3	CALCULATED ASSAY CaCO3	S102	R2O3	MgCO3
JH	94A	64.5	33.1	1.8										
	94B	62.0	36.2	1.5										
	94C	62.9	35.5	1.2										
	95A	85.6	13.4	1.0	1.0									
	95B	79.2	18.4	1.1	1.0									
	95C	65.6	32.4	1.6	1.0									
	95D	62.5	36.0	1.5	1.0									
	95E	64.5	33.7	1.5										
	96A	71.2	28.2	0.9										
	96B	81.1	17.5	0.8										
	96C	85.9	11.6	0.8	1.2									
	97A	26.7	1.8	0.5										
	97B	58.7	38.4	1.2	1.0									
	97C	47.0	50.4	1.3	1.0									
	98A	42.5	54.4	2.1										
	98B	69.5	26.5	2.2										
	98C	67.6	29.9	1.5	0.8									
	98D	78.7	19.5	1.1										
	98E	87.7	10.7	1.0	1.0									
	99A	95.1	2.9	0.6										
	99B	96.2	1.8	0.5										
	99C	96.8	2.0	0.7										
	99D	96.3	3.6	0.5	1.0									
	99E	94.4	3.5	0.5										
	100A	94.7	2.9	0.5	-1.0									
	100B	94.7	3.7	0.5	-1.0									
	100C	95.6	3.0	0.5	-1.0									
	100D	96.5	3.0	0.5	-1.0									
	100E	96.2	3.5	0.6	-1.0									

ASSAY OF LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
JH	101A	95.3	2.8	0.5										
	101B	93.1	4.8	1.2										
	101C	96.7	1.9	0.4										
	101D	96.6	2.0	0.4										
	101E	96.5	2.9	0.6										
	102A	92.1	4.3	0.6										
	102B	97.5	1.5	0.5										
	102C	96.8	2.0	0.4										
	102D	93.8	6.4	0.6										
	103A	92.5	4.6	1.2	-1.0									
	103B	95.4	3.0	0.7										
	103C	88.0	11.2	1.2										
	103D	62.8	34.3	1.6	-1.0									
	103E	84.0	15.9	0.7										
	104A	66.8	30.6	1.6										
	104B	74.0	22.8	1.1										
	104C	68.9	29.1	1.2										
	104D	67.9	28.7	1.9										
		CaO			MgO									
	105A	15.8	58.9	19.7	3.1									
		CaO			MgO									
	105B	6.8	51.4	29.8	7.5									
		CaO			MgO									
	105C	15.0	50.3	26.5	7.6									
		CaO			MgO									
	105D	11.0	56.2	23.6	8.0									
		CaO			MgO									
	105E	8.7	60/6	22.6	5.4									

ASSAY OF LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

PLE BER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SIO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SIO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SIO2	R2O3	MgCO3
E	106A	84.4	12.7	1.6										
	106B	84.0	13.0	1.3										
	106C	65.6	20.9	7.6										
	106D	CaO			MgO									
		16.1	44.3	35.2	4.4									
		CaO			MgO									
	106E	6.0	50.3	38.0	5.7									
	107A	63.4	35.6	1.2	1.0									
	107B	57.7	40.4	1.3	-1.0									
	107C	62.3	36.6	1.1										
	108A	87.3	40.9	1.2										
	108B	68.9	28.5	1.6	-1.0									
	108C	67.6	29.8	1.4	-1.0									
	109A	79.5	15.8	1.7										
	109B	81.0	16.5	1.0										
	109C	77.1	20.7	0.9										
	109D	93.2	4.7	0.9	-1.0									
	109E	68.0	29.8	1.3										
	110A	73.2	24.6	1.2	-1.0									
	110B	76.5	21.6	1.1	-1.0									
	110C	84.5	13.6	0.8										
	111A	71.5	24.5	1.4										
	111B	66.9	31.0	0.9										
	111C	72.0	25.6	1.0										
	112A	88.9	7.3	1.2										
	112B	89.3	7.0	1.2										
	112C	81.5	15.5	1.6										
	112D	73.5	30.9	1.0	1.1									
	112E	69.7	28.2	1.0										
	113A	90.1	8.2	0.8										
	113B	93.2	5.8	0.4										
	113C	75.7	21.4	1.0	0.5									

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
JH	114A	92.5	5.0	1.3										
	114B	94.0	4.0	0.8										
	114C	97.8	3.4	0.8										
	115A	93.2	3.5	1.4										
	115B	86.3	8.7	0.9	-1.0									
	115C	89.8	6.9	0.7										
	115D	87.0	8.6	0.9										
	115E	92.0	7.0	0.7										
	116A	82.8	15.8	0.9										
	116B	93.2	5.0	1.3										
	116C	96.7	1.2	0.4										
	117A	95.3	1.5	1.6										
	117B	95.8	3.5	0.6										
	117C	95.4	3.5	0.8										
	118A	91.3	8.4	0.7										
	118B	82.5	16.1	0.6										
	118C	88.4	9.0	0.9										
	118D	95.9	2.1	0.7										
	118E	89.6	17.5	0.8										
	119A	96.0	2.1	0.4										
	119B	97.2	1.1	0.5										
	119C	90.0	7.8	0.5										
	120A	84.3	14.3	0.8										
	120B	92.3	4.7	0.7										
	120C	90.9	6.3	0.6										
	121A	95.6	2.7	1.2										
	121B	96.5	1.4	0.4										
	121C	96.4	1.5	0.6										
	121D	97.2	1.2	0.6										
	121E	97.2	1.7	0.7										

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

MPLE MBER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	S102	R203	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	S102	R203	MgCO3	CALCULATED ASSAY CaCO3	S102	R203	MgCO3
JH	122A	89.7	7.0	0.8										
	122B	88.4	9.8	0.6										
	122C	93.2	5.9	0.9										
		CaO			MgO									
	123A	60.9	29.9	7.2	0.9									
	123B	84.8	8.8	1.6										
	123C	93.9	2.6	0.1										
	124A	87.1	11.6	1.0										
	124B	71.4	24.6	1.0										
	124C	77.5	22.3	0.6										
	124D	55.5	48.8	1.6										
	124E	47.1	49.7	1.2										
	125A	68.5	29.2	1.0										
	125B	64.5	33.9	0.8										
	125C	54.4	42.8	0.9										
	126A	85.2	19.0	0.9										
	126B	83.5	15.2	0.8										
	126C	86.4	12.6	0.6										
	126D	65.9	32.0	1.0										
	126E	64.2	33.4	1.3										
	127A	37.7	58.2	1.6										
	127B	59.1	39.0	3.6										
	127C	41.7	56.7	1.4										
	127D	55.8	43.2	1.6										
	127E	55.7	42.7	1.2										
	128A	82.5	14.3	1.4										
	128B	88.7	10.2	1.0										
	128C	92.2	6.9	0.9										
	128D	92.4	6.5	0.9										
	128E	97.0	2.9	0.6										

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

ELE- BER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
H	129A	90.4	5.6	1.5										
	129B	91.5	6.6	0.7										
	129C	89.5	11.0	0.8										
	129D	95.5	4.2	0.4										
	129E	91.8	7.4	0.7										
	130A	92.2	6.3	0.8										
	130B	74.0	21.6	1.4										
	130C	75.0	21.9	1.1										
	130D	85.5	13.5	0.6										
	130E	87.6	11.3	0.9										
	131A	78.5	20.6	---										

Drilled 16' - No cuttings returned after 5 feet.

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE	PAGE 18
LOCATION	
DESCRIPTION	Trench 5

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT of SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
		CaO			MgO									
JH	132A	5.8	54.1	28.0	6.7									
	132B	CaO			MgO									
		3.8	53.5	30.7	8.9									
	132C	CaO			MgO									
		2.8	52.0	31.2	8.3									
	133A	CaO			MgO									
		31.4	46.1	17.4	3.1									
		CaO			MgO									
	133B	16.2	46.2	15.3	2.6									
		CaO			MgO									
	133C	5.2	56.7	30.7	5.0									
		CaO			MgO									
	134A	13.2	44.7	27.9	4.7									
		CaO			MgO									
	134B	10.0	48.2	33.8	6.3									
		CaO			MgO									
	134C	12.3	47.3	32.2	4.9									
		CaO			MgO									
	134D	9.8	48.2	32.5	5.8									
		CaO			MgO									
	134E	4.5	51.8	33.4	6.6									
	135A	97.0	2.6	0.4										
	135B	97.0	1.6	0.6										
	135C	94.5	4.4	0.8										
	135D	88.7	10.9	0.6										
	135E	87.7	10.7	0.7										
	136A	81.7	16.4	1.2										
	136B	91.5	5.5	0.8										
	136C	91.5	7.5	0.5										
	136D	91.7	6.7	0.7										
	136E	94.8	3.0	0.5										
	137A	72.9	25.2	1.2										
	137B	48.8	49.0	1.0										
	137C	89.0	9.8	0.8										
	137D	92.2	4.8	0.6										
	137E	94.9	3.8	0.6										

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

PLE BER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
JR	138A	35.3	61.8	1.0										
	138B	59.4	38.5	0.9										
	138C	76.3	20.4	0.4										
	139A	67.7	31.4	--										
	139B	87.3	6.5	0.4										
	139C	74.3	24.3	0.3										
	140A	73.3	25.1	1.5										
	140B	55.7	43.1	0.3										
	140C	58.0	40.2	1.0										
	140D	77.1	22.0	0.4										
	140E	63.6	35.1	1.1										
	141A	74.2	22.3	0.5										
	141B	60.8	37.6	0.8										
	141C	76.0	22.7	0.6										
	141D	80.5	17.0	0.7										
	141E	81.4	15.4	0.8										
	142A	73.5	24.7	1.2										
	142B	88.8	6.6	0.5										
	142C	90.7	7.9	0.7										
	143A	92.4	7.1	0.3										
	143B	95.7	2.9	0.5										
	143C	79.8	10.9	1.1										
	143D	90.3	8.7	0.7										
	143E	91.5	5.2	0.3										
	144A	88.4	10.1	0.3										
	144B	87.7	9.1	2.2										
	144C	78.9	19.9	1.2										
	145A	92.2	5.3	0.2										
	145B	88.7	10.0	0.4										
	145C	95.5	3.1	0.4										

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

PTH BER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SIO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SIO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SIO2	R2O3	MgCO3
	146A	94.5	5.0	0.5										
	146B	98.0	1.2	0.6										
	146C	75.1	25.5	0.6										
	146D	95.5	4.8	0.6										
	146E	94.4	4.7	0.5										
	147A	82.1	14.2	0.4										
	147B	95.8	3.1	0.5										
	147C	97.1	1.7	0.6										
	148A	93.7	5.0	0.7										
	148B	95.2	2.7	0.6										
	148C	96.5	2.4	0.6										
	149A	88.4	8.1	1.4										
	149B	94.8	2.5	0.5										
	149C	84.2	15.0	0.4										
	149D	96.2	2.5	0.6										
	149E	94.0	2.3	1.0										
	150A	92.9	3.9	0.5										
	150B	95.2	2.9	0.8										
	150C	95.9	2.0	1.0										
	151A	96.1	2.2	0.5										
	151B	95.7	4.1	0.6										
	151C	86.7	11.6	—										
	152A	95.4	2.3	1.4										
	152B	96.0	2.8	0.6										
	152C	94.2	3.2	1.0										
	152D	96.0	1.8	0.6										
	152E	89.8	7.1	0.7										
	153A	95.2	3.8	1.1										
	153B	97.1	0.8	0.4										
	153C	97.4	0.4	0.6										
	153D	96.7	0.5	0.2										
	153E	96.3	0.9	0.2										

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

PLE BER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
E	154A	94.1	2.6	0.2										
	154B	90.2	7.6	0.3										
	154C	96.0	2.8	0.5										
	154D	96.4	2.2	0.2										
	154E	88.0	10.2	0.4										
	155A	63.8	34.2	1.3										
	155B	69.8	29.9	1.4										
	155C	92.9	6.2	0.4										
	155D	89.0	10.0	0.6										
	155E	96.1	3.8	0.4										
	156A	78.7	19.6	0.8										
	156B	76.4	21.4	1.0										
	156C	85.9	15.1	0.6										
	156D	84.2	14.7	0.8										
	156E	80.4	18.5	0.8										
	157A	71.6	27.0	0.6										
	157B	73.6	25.3	0.8										
	157C	76.5	22.7	0.8										
	157D	73.5	24.6	1.1										
	157E	74.0	26.1	0.8	4.6									
	158A	20.3	51.0	19.1										
	158B													
	158C	45.3	42.0	7.8	6.5									
	158D	31.2	52.5	8.1	6.6									
	158E	7.0	61.6	23.1	3.5									
	159A	87.2	9.6	0.8										
	159B	80.6	15.4	2.0										
	159C	72.5	24.1	0.7										
	159D	84.6	12.2	0.8										
	159E	78.5	19.9	0.9										

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
JII	160A	81.8	17.4	0.7										
	160B	86.3	12.9	0.4										
	160C	86.5	12.0	0.3										
	160D	82.3	15.4	0.2										
	160E	86.0	12.4	0.4										
	161A	CaO			MgO									
		2.6	88.8	6.7	0.7									
		CaO			MgO									
	161B	5.5	88.5	5.0	1.0									
	161C	38.7	58.5	1.3										
	161D	31.1	66.7	0.8										
	162A	1.1	92.6	5.1	0.8									
	162B	0.8	90.8	7.2	0.6									
	162C													
	162D	81.5	17.5	0.8	3.3									
	162E	93.0	7.0	0.6										
		CaO			MgO									
	163A	28.3	63.0	6.8	0.7									
		CaO			MgO									
	163B	57.5	36.7	2.9	0.7									
	163C	76.2	22.8	0.5										
	164A	84.1	13.8	1.1										
	164B	84.7	13.1	0.5										
	164C	74.6	24.8	0.8										
	164D	74.8	21.5	2.0										
	164E	57.7	40.2	1.5										
	165A	55.0	42.7	1.3										
	165B	34.5	63.4	1.1										
	165C	53.4	44.3	1.2										
	166A	53.1	45.8	1.3										
	166B	57.3	38.7	1.2										
	167A	61.3	36.8	1.4										
	167B	61.7	36.9	0.6										
	167C	70.4	28.0	0.8										
	167D	75.3	24.0	0.6										
	167E	76.5	20.8	1.4										

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	WEIGHT OF SLUDGE	ASSAY OF SLUDGE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	CALCULATED ASSAY $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$
JH	168A	65.2	32.7	1.2										
	168B	45.0	52.5	1.0	2.7									
	168C	42.8	55.3	1.6										
	169A	64.4	35.4	1.6										
	169B	57.7	41.5	1.1										
	169C	65.8	31.7	1.0										
	170A	67.6	29.9	1.2										
	170B	80.6	17.8	1.0										
	170C	77.3	20.2	1.1										
	170D	81.8	16.9	1.0										
	170E	85.1	13.6	1.0										
	171A	82.5	16.8	1.2										
	171B	95.0	6.5	0.6	2.8									
	171C	96.1	1.8	0.1										
	172A	94.8	2.0	0.4										
	172B	97.5	1.2	0.4										
	172C	96.5	1.9	0.7										
	173A	96.7	1.9	0.4	1.5									
	173B	96.2	2.9	0.6										
	173C	95.0	4.8	0.5										
	173D	95.8	3.1	0.4										
	173E	95.0	3.8	0.6										
	174A	94.5	2.3	0.8										
	174B	95.0	2.7	0.6										
	174C	97.0	2.3	0.7										
	175A	89.6	5.6	1.8										
	175B	98.4	1.2	0.4										
	175C	97.0	1.8	0.5										

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION
DESCRIPTION

...PLE ...ER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	S102	R203	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	S102	R203	MgCO3	CALCULATED ASSAY CaCO3	S102	R203	MgCO3
	176A	83.4	14.5	0.8										
	176B	80.5	19.4	0.8										
	176C	89.2	8.9	0.6										
	176D	85.5	13.5	0.6										
	176E	88.7	10.3	0.7										
	177A	84.4	14.5	0.9										
	177B	95.0	4.2	0.4										
	177C	96.5	2.5	0.4										
	178A	95.2	3.5	0.7	1.9									
	178B	92.9	6.6	1.0										
	178C	80.0	19.2	0.8										
	179A	82.2	14.7	1.4										
	179B	79.0	18.8	1.6	2.7									
	179C	75.6	21.2	1.0										
	179D	55.7	43.5	1.2										
	179E	60.1	33.0	5.5										
	180A	70.8	22.1	4.3										
	180B	58.3	28.0	10.4	1.9									
	180C	83.2	15.8	0.9										
	181A	81.8	16.3	1.0										
	181B	75.6	22.2	1.8										
	181C	52.6	45.2	0.7										
	182A	80.6	18.9	0.7										
	182B	82.2	15.5	0.6										
	182C	77.2	20.9	0.8										
	182D	89.5	8.8	0.7										
	182E	96.6	2.4	0.7										

ASSAY LOG
JACKHAMMER SAMPLES

NO. HOLE
LOCATION Page 25
DESCRIPTION

MPLE MBER	WEIGHT OF CORE	ASSAY OF CORE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	WEIGHT OF SLUDGE	ASSAY OF SLUDGE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	CALCULATED ASSAY $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$
JH	183A	76.8	21.7	1.1										
	183B	71.2	27.1	0.9										
	183C	54.6	43.6	1.4										
	184A	70.5	28.0	0.8										
	184B	86.0	11.8	1.2										
	184C	95.8	3.0	0.8										

1 B

DIAMOND DRILL SAMPLES

A S S A Y   L O G

NO. HOLE   Diamond Drill Hole #1

LOCATION

DESCRIPTION

Sample Number	Weight of Core	Assay of Core $CaCO_3$	Assay of Core SiO_2	Assay of Core R_2O_3	Assay of Core $MgCO_3$	Weight of Sludge	Assay of Sludge $CaCO_3$	Assay of Sludge SiO_2	Assay of Sludge R_2O_3	Assay of Sludge $MgCO_3$	Calculated Assay $CaCO_3$	Calculated Assay SiO_2	Calculated Assay R_2O_3	Calculated Assay $MgCO_3$
0-5		94.1	4.2	0.7							94.1	4.2	0.7	
5-10														
10-15		95.7	3.0	0.4							95.7	3.0	0.4	
		89.5	8.0	1.0										
15-20		72.7	24.8	2.4		A	74.7	17.6	0.9		81.1	16.4	1.7	
20-25		89.7	8.3	1.0		B	76.8	15.7	0.8		89.7	8.3	1.0	
25-30		88.0	10.2	1.0			Grab Samples--not considered in				88.0	10.2	1.0	
30-35		97.0	1.4	0.4	-1.0		corrected assay				97.0	1.4	0.4	
35-40		81.4	16.5	1.8	#1.0		93.6	4.4	1.5	0.5	92.6	4.6	1.5	
40-45		80.0	17.6	1.8	-1.0		86.3	12.0	0.9	0.4	86.0	12.0	0.9	
45-50		41.7	55.0	2.5			92.5	6.8	1.0	0.8	88.9	9.2	1.0	
50-55		87.8	10.5	1.6	-1.0		91.2	6.9	1.0		89.9	7.0	1.0	
55-60		33.3	63.0	3.6	-0.5		79.0	22.7	1.2		77.6	23.8	1.0	
60-65		67.8	30.8	3.2	#1.0		80.3	16.8	1.4		79.6	17.6	1.4	
65-67		28.7	67.2	4.4	#1.0		77.8	16.5	1.4		73.6	16.7	1.5	
67-74		44.0	52.5	3.6	-1.0		80.5	16.0	1.9		79.5	16.7	1.9	
[illegible]-81		61.0	35.6	1.5	-1.0		80.5	16.6	1.6		79.9	17.0	1.6	
81-84		80.2	16.8	2.5	-1.0		70.9	26.8	1.7		71.6	26.7	1.7	
84-89		39.4	57.9	1.8			70.8	26.0	2.0		68.2	28.56	2.0	
89-95		70.7	25.4	3.1	-0.5		79.5	17.2	2.0		78.4	19.5	2.1	
95-101		86.1	20.8	2.8	-0.5		71.0	25.8	2.4		70.1	24.8	2.48	
101-103		60.5	35.6	1.6			83.9	12.7	1.7		80.2	16.4	1.7	
103-108		72.5	23.0	3.6			No Sludge Return				74.5	23.0	3.6	
108-113		55.2	41.6	2.1			below this point				55.1	41.5	2.1	
113-116		61.5	34.0	2.9							61.5	34.0	2.9	
116-121		35.6	62.8	1.5							35.6	62.8	1.5	
121-126		32.8	62.6	4.0							32.8	62.6	4.0	
126-128		76.2	21.5	1.6							76.2	21.5	1.6	
128-129		56.3	41.5	2.1							56.8	41.5	2.1	
129-132		45.9	45.3	3.9							45.9	45.3	3.9	
132-137		45.0	35.7	12.9	7.1						45.0	35.7	12.9	7.
137-137½		68.1	28.6	2.1							68.1	28.6	2.1	
137½-142		87.0	10.5	1.2							87.0	10.5	1.2	

A S S A Y L O G

NO. HOLE Diamond Drill Hole #2

LOCATION

DESCRIPTION

Sample Number	Weight of Core	ASSAY OF CORE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	Weight of Sludge	ASSAY OF SLUDGE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	CALCULATED ASSAY $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$
0-5		93.6	5.2	0.5			87.8	10.6	1.2		90.9			
5-10		94.6	3.7	0.6			85.0	12.3	2.0		90.6			
10-15		91.8	6.4	0.8			95.8	3.5	1.0		95.0			
15-20		97.3	2.3	0.8			No Sludge				97.3			
20-25		96.8	2.4	0.6			No	"			96.8			
25-30		94.8	3.6	0.5			92.5	2.6	4.5	1.1	95.4			
30-35		97.0	1.4	0.4	-1%		96.2	1.5	1.4		96.3			
35-40		85.7	12.5	1.0			87.8	9.8	-		87.1			
40-45		92.7	6.4	0.7			91.0	5.5	1.0		91.1			
45-50		93.8	4.7	0.6			88.1	10.1	0.8		89.2			
50-55		96.8	1.6	0.4			89.8	7.4	1.9		90.0			
55-60		97.5	1.5	0.8			95.4	2.0	3.0		95.5			
60-65		91.7	5.9	0.7			95.6	2.9	1.4		95.2			
65-68		96.9	1.6	0.7			92.9	5.2	1.7		93.0			
68,73		94.7	3.0	0.6			No	Sludge			94.7			
73-74		95.6	2.4	0.6			No	"			95.6			
74-78		95.2	2.5	0.6			No	"			95.2			
[illegible]0		95.6	2.3	0.6			(93.5	2.6	6.0	1.1	94.1			
80-85		96.0	1.9	0.5			(							
85-90		No	Core				92.2	5.1	2.5		92.2			
90-94½		96.3	0.5	0.3			95.9	3.2	1.4		96.3			
94½		92.3	5.9	0.7			95.5	2.9	1.1	0.7	95.4			
100-107		94.4	0.8	1.7			87.5	10.4	2.9	0.8	87.6			
107-112		96.6	1.5	0.4			86.2	11.5	2.7		86.0			
112-117		96.7	1.5	0.2			85.4	11.9	3.6	0.9	85.8			
117-122		97.7	0.7	0.3			93.8	5.5	2.4		93.9			
122-127		96.7	1.3	0.8			92.3	7.0	1.9		92.4			
127-132		81.6	17.4	1.0			95.2	3.7	2.9	1.2	94.0			
132-137		92.6	6.9	0.6			91.4	3.6	6.5	2.1	91.4			
137-142		96.5	2.3	0.3			88.4	8.9	1.4		88.6			

A S S A Y   L O G

NO. HOLE   Diamond Drill Hole #2

LOCATION

DESCRIPTION

Sample Number	Weight of Core	Assay of Core CaCO$_3$	SiO$_2$	R$_2$O$_3$	MgCO$_3$	Weight of Sludge	Assay of Sludge CaCO$_3$	SiO$_2$	R$_2$O$_3$	MgCO$_3$	Calculated Assay CaCO$_3$	SiO$_2$	R2O3	MgCO$_3$
142-147		76.4	21.5	1.0			81.8	16.2	1.4		81.3			
147-152		76.6	21.5	1.1			91.2	5.5	0.6	1.4	90.6			
152-157		82.6	15.9	0.7			91.5	8.0	0.1		91.1			
157-162		97.1	1.6	0.4			87.8	9.6	1.4		89.1			
162-167		94.5	3.3	0.5			88.9	7.8	1.6		89.3			
167-172		30.0	66.5	2.5			82.8	12.2	2.8		80.6			
172-176		71.2	25.4	2.0			87.6	7.8	1.9		87.3			
176-182		65.5	27.8	2.0			68.0	28.4	3.2		68.0			
182-186		72.3	24.4	1.9			68.5	27.6	0.9		69.7			
186-191		61.3	36.2	2.0			80.0	14.7	1.1		78.0			
191-191½		26.9	70.0	1.9			No	Sludge			26.9			
191½-200		51.5	46.7	2.6			72.2	14.5	10.9	1.8	71.6			
200-206		46.6	50.8	2.0			80.5	14.7	4.3		78.2			
206-207½		32.0	65.2	2.0			No	Sludge			32.0			
207½-208		87.2	4.7	0.6							87.2			
208-208⁹		75.2	20.7	1.5							75.2			
208-211		94.1	2.4	0.9							94.1			
211-213		73.3	21.5	1.1							73.3			
213-218		67.8	29.4	1.5							67.8			
218-222		69.4	29.0	1.4			(95.0	4.1	2.6		86.7			
222-226							(							
226-228		59.2	37.7	1.6			79.4	14.5	4.9		70.9			
228-233		59.2	36.8	1.0			87.2	10.4	2.2		84.6			
233-238		37.4	59.6	1.8			80.0	17.1	2.0		76.1			
238-243		48.1	47.6	2.7			No	Sludge			48.1			
243-244		63.6	33.2	1.6			77.9	19.1	1.9	±1	72.1			
244-249		42.9	62.3	2.5			72.3	22.5	3.2	±1	68.2			
249-254		24.2	71.3	2.4			63.7	33.7	1.9	±1	62.1			
254-259		56.0	42.3	3.5			59.6	38.2	1.7	0.6	59.4			
259-264		55.2	44.3	1.6			67.2	27.5	5.4	2.0	66.6			
264-271		No	Core				69.1	28.2	1.8	±1	69.1			
271-276							55.5	37.0	5.9	2.4	55.5			

A S S A Y   L O G

NO. HOLE Diamond Drill Hole #3

LOCATION

DESCRIPTION

Sample Number	Weight of Core	ASSAY OF CORE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	Weight of Sludge	ASSAY OF SLUDGE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	CALCULATED ASSAY $CaCO_3$	S_1O_2	R_2O_3	$MgCO_3$
0-5		93.9	5.2	0.3							93.9			
5-10		98.8	0.8	0.3			87.7	10.0	2.5	0.4	88.6			
10-15		98.0	1.2	0.2			86.8	10.1	1.5		87.2			
15-20		88.5	9.8	0.6			94.3	3.7	0.6		94.2			
20-24		No	Core				95.4	3.4	0.8		95.4			
24-29		"	"				95.5	3.5	0.8		95.5			
29-34		91.1	8.0	0.5			90.8	4.8	3.7		90.9			
34-39		89.8	9.0	0.6			87.8	8.8	2.2		88.0			
39-44		97.3	1.4	0.2			85.8	5.8	8.9		86.2			
44-49		89.0	9.2	0.4			88.0	8.5	2.9		88.0			
49-50		91.1	5.8	1.6	3.2		88.0	7.5	4.6	3.2	88.9			
50-55		69.2	12.4	1.7	14.9		80.6	12.5	8.6		76.0			
55-58½		55.8	29.9	8.9			No	Sludge			55.8			
58-60^7		26.4	66.1	9.6	1.2		"	"			26.4			
60^7-63		28.3	55.2	9.8			"	"			28.3			
63-70		80.7	16.8	1.4			88.0	11.5	6.9		82.4			
70-75		97.5	1.8	0.6			66.0	22.6	15.0	2.4	71.6			
75-80		94.3	5.1	0.5			No	Sludge			94.3			
80-84		96.6	2.0	0.4			71.0	18.0	10.4	1.3	76.1			
84-89		75.6	22.9	0.8			90.4	9.4	1.8	1.7	87.4			
89-91		97.6	1.8	0.5			83.2	13.9	1.5	-0.5	87.1			
91-96		82.2	17.2	0.7			72.6	24.0	3.0	1.6	74.1			
96-99		95.0	4.4	0.4			89.2	7.2	2.5	1.8	92.3			
99-101½		84.7	14.8	0.8			80.1	16.6	1.2	1.9	80.8			
101½-103½		94.2	5.1	0.6			No	Sludge			94.2			
103½-107		61.9	35.7	3.1			"	"			61.9			
107-112		91.3	7.3	1.1			"	"			91.3			
112-116		74.0	25.0	1.0			67.3	30.9	1.8	0.5	68.6			
116-126		76.2	22.9	1.0			70.3	27.7	0.9	0.5	70.6			
126-130		No	Core				88.8	8.7	2.1		88.8			
130-134		40.1	58.4	1.0			75.4	22.9	1.2	-1.0	75.6			

A S S A Y   L O G

NO. HOLE Diamond Drill Hole #3

LOCATION

DESCRIPTION

Sample Number	Weight of Core	Assay of Core $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	Weight of Sludge	Assay of Sludge $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	Calculated Assay $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$
134-139		74.6	24.8	0.6			76.6	20.8	2.5	-1.0	76.0			
139-144		No	Core				No	Sludge			--			
144-149		86.0	12.2	0.5			74.2	24.5	2.8	1.6	77.6			
149-154		47.5	50.8	1.0			68.2	34.7	2.9	1.2	67.8			
154-157		55.6	43.0	0.6			62.0	30.5	5.5	2.0	61.6			
157-162		52.4	45.8	1.5			27.0	68.1	2.6	-1.5	28.0			
162-168		55.9	42.3	1.8			26.9	70.4	2.6	1.2	[illegible]			
168-174		73.7	25.6	0.6			No	Sludge			73.7			

A S S A Y L O G

NO. HOLE Diamond Drill Hole #4

LOCATION

DESCRIPTION

Sample Number	Weight of Core	$CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	Weight of Sludge	Assay of Sludge $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	Calculated Assay $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$
0-5		96.8	2.1	0.7			95.5	1.8	1.1	0.8	96.6			
5-10		94.8	3.9	0.4			88.4	8.9	1.2		88.6			
10-14		97.0	0.8	0.6			94.0	3.9	0.9		94.1			
14-18		96.3	1.5	0.9			95.2	1.6	1.5		95.4			
18-23		96.6	1.8	0.6			99.0	1.9	1.5		98.7			
23-26		98.2	2.0	0.8			89.9	2.7	1.5		99.9			
26-29		95.8	2.0	0.7			91.8	3.5	5.2	1.7	92.3			
29-34		92.7	6.6	0.8			93.2	4.0	4.2		92.9			
34-36		96.3	1.9	0.4			95.9	1.9	1.1		96.0			
36-40		95.6	2.3	0.8			96.5	1.4	2.0		96.4			
40-44		97.2	1.1	0.4			97.2	1.4	0.8		97.2			
44-49		97.3	1.4	0.5			97.3	1.0	0.9		97.3			
49-54		96.8	1.2	0.2			97.3	1.1	0.7		97.2			
54-59		98.0	1.4	0.4			No Sludge				98.8			
59-62		96.5	1.5	1.3			85.5	12.8	2.6		85.8			
62-67		96.5	2.5	0.4			95.2	3.3	0.7		95.3			
67-72		98.2	1.5	0.4			94.3	3.3	1.0		94.5			
[illegible]-76		97.3	1.8	0.4			No Sludge				95.2			
76-79		96.4	2.6	0.4			94.8	2.7	0.9		95.2			
79-84		95.7	2.8	0.5			95.2	2.3	1.9		95.2			
84-87		95.8	2.5	1.0			94.6	3.0	1.0		94.8			
87-92		96.5	2.4	0.7			95.3	2.2	1.6		95.4			
92-97		96.2	1.8	0.3			95.6	2.5	1.7		95.6			
97-102		96.3	1.6	0.4			96.3	2.0	1.3		96.5			
102 -104		97.8	1.1	0.2			94.2	2.3	1.7		94.6			
104-109		97.8	1.6	0.3			89.5	5.6	2.0	3.0	90.0			
109-114		96.3	3.6	0.4			90.6	5.7	2.4		90.7			
114-119		91.8	7.2	0.6			87.8	7.2	5.1	1.8	88.0			
119-125		84.4	14.4	0.8			89.3	7.1	2.0	2.5	89.2			
125-130		80.4	17.8	1.0			No Sludge				80.4			
130-134		90.5	9.0	0.6			90.0	7.1	2.1	1.5	90.0			

A S S A Y L O G

NO. HOLE Diamond Drill Hole #4

LOCATION

DESCRIPTION

Sample Number	Weight of Core	$CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	Weight of Sludge	Assay of Sludge $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	Calculated Assay $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$
134-139		91.1	7.8	0.5	-1%		89.8	6.9	2.1	1.5	89.9			
139-144		95.2	3.2	0.4	"		83.2	10.5	3.4	2.0	84.2			
144-149		97.2	1.2	0.3	"		85.3	10.3	3.2	2.0	86.9			
149-154		97.5	1.4	0.4	"		84.2	10.4	3.5	2.9	87.6			
-158		92.7	5.6	0.4	"		85.9	11.5	0.6		86.3			
158-162		98.0	1.0	0.3	"		86.7	10.2	0.6		87.5			
162-166		97.4	0.8	0.2	"		86.9	9.7	0.7		87.7			
166-171		No	Core				72.8	24.6	2.4		72.8			
171-176		"	"				78.6	18.4	0.5		78.5			
176-181		98.2	0.8	0.2	-1%		83.2	14.6	1.1		83.8			
181-183		No	Core				84.3	13.7	1.6		84.3			

A S S A Y   L O G

NO. HOLE   Diamond Drill Hole No. 5

LOCATION

DESCRIPTION

Sample Number	Weight of Core	$CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	Weight of Sludge	ASSAY OF SLUDGE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	CALCULATED ASSAY $CaCO_3$	SiO_2	R2O3	MgCO3
-7	)						93.2	3.9	0.9	1.1	93.8			
-15	)	97.5	1.0	0.3			93.5	4.0	0.5	1.4	93.5			
6-20	)						90.5	5.3	5.2	-1.0	90.5			
0-25		93.2	4.8	0.2			92.3	5.7	0.9	-1.0	92.5			
5-30		No	Core				91.3	3.6	5.2	-1.0	91.3			
0-32							91.9	7.1	1.5	-1.0	91.8			
2-37		89.0	9.2	0.4			90.6	6.4	1.3		90.5			
7-42		No	Core				89.2	8.8	1.0		89.2			
2-47		97.2	0.7	0.3			93.5	4.2	1.3		93.6			
7-52		97.3	0.4	0.1			91.7	5.9	1.5		91.8			
2-57		No	Core				93.5	2.5	0.3		93.5			
7-62		96.5	1.0	0.2			81.8	9.5	7.8	1.6	82.4			
2-67		90.6	6.2	0.4			82.3	14.6	2.5		82.7			
7-71		93.9	3.8	0.6			85.7	12.0	2.0		86.0			
1-77		[illegible]	6.5	0.4			92.7	5.1	1.8		92.4			
7-82		96.0	1.9	0.3			89.5	7.5	2.4		89.6			
[illegible]9		81.3	15.7	1.1			85.5	11.9	1.9		85.0			
9-94		74.3	22.2	1.3			66.6	31.4	1.6		67.6			
4-99		[illegible]	[illegible]	[illegible]			74.2	23.1	2.8		75.9			
0-104		89.8	7.3	0.8			79.3	18.7	1.7		80.1			
104-109		86.8	9.8	0.7			76.7	17.9	2.8		77.9			
109-114		[illegible]	[illegible]	[illegible]			85.5	11.6	2.4		84.7			
114-119		90.5	6.1	0.6			70.2	25.4	1.3		71.9			
119-124		72.9	25.6	1.0			76.1	21.5	0.9		75.3			
124-129		[illegible]	[illegible]	[illegible]			None				53.2			
129-134		84.7	12.7	1.1			72.3	22.7	1.4	0.7	73.0			
134-139		53.2	[illegible]	1.3			74.3	19.4	1.6	1.8	73.9			
139-144		[illegible]	[illegible]	1.5			69.7	25.5	1.1	0.9	73.7			
144-150		[illegible]	67.7	1.4			None				28.3			
150-155		66.8	30.1	1.0			64.3	30.7	4.3		64.3			

ASSAY LOG

NO. HOLE Diamond Drill Hole [illegible]

LOCATION

DESCRIPTION

Sample Number	Weight of Core	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	Weight of Sludge	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
155-157		No	Core				28.0	55.5	9.8	4.8	28.0			
157-161		"	"				26.8 CaO	54.1	11.4	5.2 MgO	26.8			
161-164		"	"				13.1	62.3	16.2	2.9	13.1			
164-169		"	"				62.6	28.5	3.0	4.0	62.3			
169-174		88.1	9.3	0.9			60.9	29.1	4.0	4.6	64.1			
174-178		[illegible]	[illegible]	[illegible]			78.0	16.1	3.7	1.0	78.3			
179-182		76.3	21.9	0.8			75.3	16.2	2.4	2.6	75.4			
182-188		89.9	8.1	0.9			96.7	2.1	0.6		96.4			
188-193		[illegible]	[illegible]	[illegible]			93.3	4.7	1.2		92.2			
193-198		97.0	5.3	0.5			91.3	6.8	0.9		92.4			
198-204		88.7	10.4	0.4			90.8	6.5	1.4		90.7			
204-209		[illegible]	4.3	0.1			84.0	14.0	0.7		84.3			
209-214		91.0	7.5	0.4			83.4	15.1	0.8		83.7			
214-219		73.2	25.5	0.3			77.4	20.8	0.9		76.6			
219-224		[illegible]	26.3	0.6			76.0	22.5	0.8		75.7			
224-229		75.5	22.0	0.7			66.1	27.3	5.9	2.0	65.2			
229-234		No	Core				77.8	18.9	2.1	1.7	77.3			
234-239		[illegible]	19.5	0.7			67.7	29.6	2.1		60.4			
239-244		35.2	62.8	0.8			71.9	25.1	2.4	2.0	70.5			
244-249		No	Core				65.7	28.3	2.1		65.7			
249-254		74.6	24.2	0.8			71.0	27.3	1.5	1.2	71.1			
254-259		No	Core				62.7	33.5	3.6		62.7			
259-262		"	"				60.3	34.9	2.5	1.1	60.3			
262-267			"				62.2	33.3	2.6	1.5	62.2			
267-272			"				62.2	34.1	1.7	1.4	62.2			
272-279		46.7	50.2	1.0			67.4	28.2	2.0	1.4	66.2			
279-288		44.4	52.0	0.7			50.5	54.0	3.4	-1.5	50.1			
288-294		55.2	40.7	0.3			61.7	34.0	2.9	-1.5	61.5			
294-299		43.4	54.3	0.8			48.6	44.0	4.1	1.5	49.1			
299-302		No	Core				51.9	45.8	2.6	1.4	51.9			

ASSAY LOG

NO. HOLE
LOCATION
DESCRIPTION

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	WEIGHT OF SLUDGE	ASSAY OF SLUDGE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	CALCULATED ASSAY $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$
302–309		71.5	26.3	0.8			59.5	35.0	4.0	2.4	59.5			
309–314		85.6	12.7	0.5			57.2	40.1	1.4		61.1			
314–318		70.4	21.0	0.6			57.2	39.2	1.8		60.8			
318–323		63.5	34.5	0.5			54.4	40.4	4.0		54.6			
323–329		62.3	36.5	0.7			55.8	41.0	2.2		54.0*			
329–333		61.8	37.1	0.6				None			61.8			
333–338		69.8	29.1	0.4			74.6	18.0	12.0		74.4			
338–345		No Core					73.8	18.1	13.5		73.8			
345–349		80.5	18.6	0.6			69.0	25.4	5.6		71.5*			
349–356		65.1	32.4	0.8			48.3	47.0	2.9	1.7	49.0			
356–357		29.2	68.2	0.8			47.7	45.4	4.4		46.6			
357–362		65.8	31.7	0.6			68.3	25.9	3.4		68.2			
362–368		None					47.6	38.3	8.4		47.6			
368–374		87.2	11.5	0.5			79.9	15.3	2.7	1.8	81.2*			
374–380		62.7	35.3	0.7			62.5	31.2	3.8	2.0	62.3			
380–385		51.5	46.0	1.0			55.6	40.3	5.8	2.0	53.4			
385–388		87.6	11.4	1.0			47.3	44.2	6.0	2.2	48.6			
388–392		None					34.3	59.2	4.2		34.3			
392–396		"					32.5	60.9	4.4	2.1	32.5			
396–400		69.6	29.5	0.7			57.6	39.0	1.6	1.2	59.7*			
400–404		46.6	53.0	0.7			57.6	39.1	1.5	1.1	57.1			
404–409	1/4	57.8	40.4	1.2			55.2	39.2	3.3	1.9	56.4			
409–414		None					56.6	38.8	4.2	1.8	56.6			

ASSAY LOG

NO. HOLE
LOCATION
DESCRIPTION

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE				WEIGHT OF SLUDGE	ASSAY OF SLUDGE				CALCULATED ASSAY			
		CaCO3	SiO2	R2O3	MgCO3		CaCO3	SiO2	R2O3	MgCO3	CaCO3	SiO2	R2O3	MgCO3
0- 5							94.2	5.4	0.3					
5-10							95.1	4.0	0.6					
10-15							94.2	1.8	1.2					
15-20							92.3	6.6	0.6					
20-26							92.6	5.8	0.6					
26-32							89.5	7.7	1.8					
32-37							89.4	7.4	3.0					
37-42							90.5	6.4	2.6					
42-47							89.3	7.0	3.0					

#6A

ASSAY LOG

NO. HOLE
LOCATION
DESCRIPTION

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgC
0- 5							91.5	6.2	1.6					
5-10							91.5	6.5	1.1					
10-15							93.0	4.8	1.0					
15-20							93.6	4.5	0.7					
20-22							92.2	5.6	1.3					
22-27							90.5	6.4	2.1	1.1 *				
27-29							90.0	7.6	1.4					
29-36							81.9	8.2	1.3	0.9				
36-40							82.8	7.8	1.6	0.8				
40-45							83.6	13.6	4.1	0.8 *				
45-48														
48-53							58.8	30.9	8.1	2.5				
53-58							64.5	27.0	8.5	2.0 *				
58-60							37.1	51.8	10.5	2.9				
60-65							23.4	49.5	15.0	11.6				
65-70							22.2	52.8	15.4	10.5				
							CaO			MgO				
4							12.4	60.1	20.6	8.8				
74-78-1/2							20.6	48.3						
78½-80½														
80½-83								48.3						
83-88							CaO	47.2						
88-93								—						
93-99								46.4						
99-104								49.0						
104-110							16.2	50.8	29.8	11.9				
110-116							19.8	49.8		*				
116-118														
118-123							64.8	32.5	1.8					
123-128								—						
128-133								—						
133-138								—						
138-143														

ASSAY LOG

NO. HOLE
LOCATION
DESCRIPTION

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgCO3
143-148							63.7	33.6	1.8					
148-153							66.2	31.6	1.2					
153-158							64.8	32.6	1.2					
158-163							65.2	32.8	1.0					
163-168							71.2	24.6	3.6 *					
168-173							63.6	30.5	5.0					
173-178							57.6	38.5	2.8					
178-183							41.2	56.9	1.4					
183-188							24.8	70.8	2.7					
188-193							36.6	62.0	2.6					
193-196							23.3	72.1	3.0					
196-201							39.8	51.8	4.5					
201-206							47.5	48.2	0.5					
206-212							52.8	44.4	1.6 *					
212-217							82.5	13.4	3.8					
217-222							65.9	32.0	1.8					
222-229							83.0	12.8	3.2					
[illegible]-234							74.9	20.0	3.9					
234-239							78.0	17.6	4.0 *	1.4				
239-241							No Sludge							
241-246							42.8	57.2	2.8	1.2				
246-251							22.0	71.8	5.9					
251-256							37.2	56.6	4.9	1.0				
256-259							29.6	63.8	4.7	1.0				
259-264							83.7	11.4	3.2					
264-269							44.8	50.8	2.5					
269-274							58.5	37.4	3.5	1.3				
274-278							45.9	39.5	3.5					
278-283							62.2	34.0	2.6					
283-288							61.8	35.2	2.6	1.2				
288-292							59.8	36.0	2.5					

A S S A Y L O G

NO. HOLE Diamond Drill Hole #6A

LOCATION

DESCRIPTION

Sample Number	Weight of Core	Assay of Core: CaCO3	SiO2	R2O3	MgCO3	Weight of Sludge	Assay of Sludge: CaCO3	SiO2	R2O3	MgCO3	Calculated Assay: CaCO3	SiO2	R2O3	MgCO3
292-297							46.3	43.1	6.8					
297-303							48.3	42.8	6.4					
303-308							44.5	49.3	5.9					
308-313							67.2	28.4	3.0					
313-317							67.5	27.5	3.5					
317-324							88.0	5.9	2.3					
324-329							65.2	30.0	4.9					
329-334							63.3	30.0	5.5					
334-340							63.5	30.1	5.0					

ASSAY LOG

NO. HOLE
LOCATION
DESCRIPTION

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	SiO2	R2O3	CALCULATED ASSAY MgCO3	CaCO3	SiO2	R2O3	MgCO3
0-5		No Core					57.9	60.2	1.8					
5-9		36.6	61.7	0.8			26.4	72.0	1.1					
9-12		No Core					20.4	77.8	1.2					
12-14		37.7	59.3	0.9			22.8	76.3	1.3					
14-17		15.5	82.8	1.0										
14-18		24.9	72.0	1.2			29.3	68.8	1.2					
[illegible]-20		40.3	57.5	0.9			49.7	47.6	1.2					
20-27		55.2	42.5	1.0			46.7	48.7	1.7					
27-30		56.2	41.3	0.6										
30-32		60.2	38.8	0.4			70.3	27.3	1.2					
32-35		46.0	50.3	0.5			67.6	36.9	3.0 *					
35-34		66.0	32.0	0.6			No Sludge							
34-37							80.9	16.5	2.4					
37-42		59.7	40.1	0.7			86.4	11.1	1.4					
42-47		No Core					85.9	13.9	1.0					
47-52		"					81.5	16.1	1.1					
52-55		"					75.7	21.9	1.1					
[illegible]		"					86.3	9.4	2.6					
60-73		"					No Sludge							
73-74		"					71.8	24.2	4.6 *	1.9				
74-77		22.4	75.6	0.6			No Sludge							
77-82		No Core					47.3	51.6	1.1					
82-86		"					34.6	64.4	1.0					
86-91		"					39.6	59.5	1.1					
91-96		"					37.6	60.9	1.2					
96-101		"					40.0	59.5	1.0 *					
101-106		"					91.5	6.9	1.1					
106-111		"					59.4	39.9	1.2					
111-116		86.5	13.6	0.5			68.7	28.4	1.9					
116-121		95.4	4.4	0.3			75.3	24.7	1.0					
121-126		91.0	6.5	0.[illegible]			63.3	39.0	1.3					
126-131		96.2	3.0	0.1			66.4	30.7	1.1 *					

A S S A Y L O G

NO. Hole Diamond Drill

LOCATION

DESCRIPTION 7A

Sample Number	Weight of Core	$CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	Weight of Sludge	ASSAY OF SLUDGE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	CALCULATED ASSAY $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$
131-136)	1	96.3	3.0	0.1			96.5	2.8	0.6					
136-141)	18						95.2	3.4	0.5					
141-146		97.2	1.7	0.2			95.4	3.6	0.4					
146-151		No Core					94.5	2.0	0.4					
151-156		—					95.3	4.2	0.5					
156-161		—					91.8	4.5	—					
161-166		—					92.9	4.4	1.9					
166-171		—					92.8	4.5	1.2					
171-176		—					90.0	7.8	0.9					
176-181		96.7	1.8	0.2			94.5	3.6	2.4					
181-186		No Core					92.8	4.2	2.3					
186-191		—					92.1	5.0	1.2					
191-196		—					No Sludge							
196-201		—					96.3	2.8	0.6					
201-206		—		[illegible]			92.8	6.8	0.8					
206-211		—					92.0	7.2	0.8					
211-216		—					90.4	8.3	0.8					
216-221		94.2	3.2	0.5			87.0	9.2	3.8					
221-226		No Core					81.0	14.8	3.5					
226-231		83.7	14.2	0.4			No Sludge							
231-236		95.1	3.8	0.6			86.2	9.8	3.4					
236-241		No Core					90.6	5.7	3.4					
241-244		No Core					88.6	7.4	2.6					
244-249		98.0	1.6	0.4										
249-254		No Core												
254-259														

A S S A Y L O G

NO. HOLE Diamond Drill Hole No.3

LOCATION

DESCRIPTION

Sample Number	Weight of Core	ASSAY OF CORE CaCO3	SiO2	R2O3	MgCO3	Weight of Sludge	ASSAY OF SLUDGE CACO3	SiO2	R2O3	MgCO3	CALCULATED ASSAY CaCO3	SiO2	R2O3	MgO3
0-7							No Sludge							
7-12							63.8	34.1	1.0					
12-17							75.9	22.1	0.6					
17-23							No Sludge							
23-25							No Sludge							
25-30							97.7	1.6	0.5					
30-36							91.5	6.2	3.1					
36-42							97.0	2.5	1.8					
42-47							No Sludge							
47-52							94.0	2.7	3.2					
52-58							96.3	2.6	1.0					
58-63							90.6	7.7	1.6					
63-68							93.6	4.8	0.5					
68-71							95.0	3.2	0.8					
71-76							88.3	9.5	1.2					
7[illegible] 81							83.8	14.4	1.0					
[illegible]86							83.9	13.5	1.2					
86-92							82.7	11.4	8.2					
92-98														
98-103							96.6	1.8	0.6					
103-105														
105-108														
108-113														

ASSAY LOG

NO. HOLE Diamond Drill Hole No. 9

LOCATION

DESCRIPTION

Sample Number	Weight of Core	ASSAY OF CORE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	Weight of Sludge	ASSAY OF SLUDGE $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$	CALCULATED ASSAY $CaCO_3$	SiO_2	R_2O_3	$MgCO_3$
0-5		97.0	1.2	0.4			59.7	26.1	8.5					
5-10		95.6	2.9	0.2			80.7	11.0	5.2					
10-15)		96.9	1.4	0.2			96.0	2.0	2.0					
15-19)							97.5	1.7	0.5					
19-23		97.0	1.4	0.1			97.5	1.6	1.1					
23-28		96.4	1.7	0.3			86.5	8.8	4.6					
28-32		98.2	1.3	0.3			95.2	2.0	3.0					
32-37							97.5	1.6	1.0					
37-42							96.5	2.2	2.6					
42-47							No Sludge							
47-53							87.0	10.1	2.2					
53-58							66.3	29.2	1.2					
50-63							92.5	5.8	2.9					
63-65							93.3	3.8	1.5					
65-70							95.5	1.9	1.9					
[illegible]-74							94.3	2.0	3.0					
74-79							96.7	2.1	0.7					
79-84							97.2	2.0	0.7					
84-89							92.8	4.5	0.9					
89-94							93.4	4.4	1.0					
94-100														
100-103														
103-108														
108-113														
113-119							85.0	13.2	1.2					
119-123														
123-128							85.6	12.8	1.4					
128-131														
131-139							84.0	03.5	2.6					

1 C

HAND SAMPLES

ASSAY LOG
H. S. SAMPLES (MOILED HAND SAMPLES)

NO. HOLE
LOCATION
DESCRIPTION

SAMPLE NUMBER	WEIGHT OF CORE	ASSAY OF CORE CaCO3	S102	R2O3	MgCO3	WEIGHT OF SLUDGE	ASSAY OF SLUDGE CaCO3	S102	R2O3	MgCO3	CALCULATED ASSAY CaCO3	S102	R2O3	MgCO3
HS	1	70.8	27.2	1.1		White	Limestone							
	2	41.4	55.4	2.0		"	"							
	3	70.4	27.6	0.9		"	"							
	4	78.2	19.6	1.9		"	"							
	5	90.8	7.6	0.9		Blue	"							
	6	96.3	2.5	1.4		"	"							
	7	93.2	6 .3	1.7		"	"							
	8	93.5	2.7	0.2		"	"							
	9	92.7	3.2	0.1		"	"							
	10	90.6	7.1	2.0		"	"							
	11	92.7	5.3	low		"	"							
	12	87.5	10.3	1.3		"	"							
	13	92.8	5.5	0.2		"	"							
	14	92.6	3.8	0.2		"	"							
	15	90.3	4.5	0.3		"	"							
	16	72.4	26.8	0.2		"	"							
	17	63.3	35.0	0.8		White	"							
	18	71.7	24.2	0.6		"	"							
	19	59.7	38.9	0.8		"	"							
	20	66.2	30.5	1.4		"	"							
	21	68.3	28.3	1.3		"	"							
	22	76.6	22.6	0.8		"	"							
	23	87.7	12.2	0.9		"	"							
	24	89.5	9.2	1.1		Blue	"							
	25	97.0	1.8	----		"	"							
	26	97.0	2.1	0.6		"	"							
	27	75.5	21.4	1.4		"	"							
	28	77.4	19.9	1.5		White	"							

2

TABULATIONS OF ANALYSES OF THE SURFACE CLAYS TO DATE

TRANSCRIPT OF ANALYSIS OF CLAY BORE HOLES
Permanente Project
Area A.

Sample No.		Basis	SiO	Al O	Fe O	CaO	MgO	Undet.	% Coarse Waste
BH 1	0-5'	Ignited	66.0	14.1	7.7	1.0	4.3	6.9	69.
1	5'-6'6"	"	62.6	19.5	5.7	0.9	4.0	7.5	59.
2	0-3'3"	"	50.5	17.2	15.7	3.4	4.6	6.6	74.
4	0-5'	"	60.9	18.3	8.2	1.4	9.0	2.2	49.
6	0-5'	"	70.3	19.0	3.9	1.2	2.2	3.4	45.
6	5'-8'6"	"	57.4	23.4	8.5	2.3	3.7	4.7	70.
7	0-5'	"	54.6	30.7	10.0	0.8	3.7	0.2	79.
7	5'-10'	"	57.5	19.4	9.1	0.6	4.3	9.1	65.
9	0-3'11"	"	60.0	21.7	8.0	0.9	4.8	4.6	67.
11	0-2'	"	69.6	14.4	11.4	0.7	1.9	2.0	91.
12	0-5'	"	56.9	25.5	8.6	0.8	3.9	4.0	52.
12	5'-7'2"	"	58.2	23.0	7.4	0.4	3.9	7.1	54.
19	0-5'	"	58.5	25.1	6.9	0.9	3.4	5.1	74.
19	5'-10'	"	57.2	25.2	8.6	0.8	3.4	4.8	68.
21	0-16"	"	61.8	23.4	6.9	1.9	2.8	3.2	44.
31	0-3'	"	68.5	20.1	4.7	0.7	2.2	3.8	47.
36	0-3'	"	69.0	19.5	4.3	1.0	2.3	3.9	42.
38	0-2'6"	"	69.2	19.7	4.6	0.9	2.1	4.5	61.
40	0-5'6"	"	69.7	18.2	4.7	0.9	2.2	4.3	50.
41	0-4'6"	"	68.0	19.2	4.7	1.0	2.3	4.8	58.
43	0-5'	"	68.8	19.5	4.1	0.8	1.9	4.9	38.
43	5'-10'	"	66.7	19.8	6.0	0.8	2.1	5.6	38.
43	10'-11'2"	"	66.2	20.1	5.4	0.9	2.3	5.1	41.
51	0-5'	"	59.0	24.8	7.4	0.7	3.4	4.7	65.
51	5'-6'9"	"	57.7	14.6	14.0	0.4	6.7	6.8	53.
61	0-4'	"	65.3	19.4	7.7	1.4	2.6	3.6	26.
62	0-4'6"	"	67.9	19.9	4.5	0.9	2.5	4.3	54.
70	0-2'8"	"	69.2	18.6	4.5	0.9	2.2	4.7	43.
77	0-5'	"	58.4	25.1	8.3	0.6	3.4	4.2	82.
81	0-4'	"	71.4	17.3	4.0	1.1	1.6	4.6	43.
83	0-5'7"	"	72.5	16.3	3.8	0.6	1.5	3.3	31.
85	5'-10'	"	72.5	17.9	3.7	0.6	1.7	3.8	23.
98	0-5'	"	68.2	18.7	4.2	1.9	2.0	5.0	33.
98	5'-6'4"	"	66.6	20.4	5.1	1.0	2.3	4.6	73.
105	0-5'5"	"	68.5	18.3	5.8	1.2	2.4	3.8	45.
111	0-5'2"	"	67.1	21.3	3.5	1.4	2.4	4.3	29.
114	0-5'5"	"	62.7	20.9	8.6	1.5	3.5	2.8	22.
116	0-4'	"	56.2	20.4	13.7	3.4	48.	1.5	47.
121	0-5'	"	69.2	18.3	5.3	1.6	2.3	3.3	44.
121	5'-10'	"	52.6	19.5	16.6	4.2	5.2	1.7	50.
121	10'-14'	"	52.4	19.1	16.1	5.1	5.4	1.9	42.
122	0-5'	"	59.4	19.7	11.2	2.4	5.0	2.3	19.
122	5'-6'8"	"	65.8	17.5	9.7	1.6	4.5	1.4	37.
124	0-5'	"	66.3	20.1	5.3	0.7	2.4	5.2	20.
126	0-5'	"	66.0	18.7	7.3	1.6	5.8	0.6	62.
137	0-5'	"	54.4	16.2	3.4	0.9	1.5	3.6	53.
137	5'-11'	"	66.0	19.9	6.5	1.0	2.8	3.8	34.
143	0-3'9"	"	69.9	18.6	4.6	0.8	1.9	3.9	56.
147	0-1'8"	"	66.4	21.4	4.6	0.7	2.4	4.5	49.
150	0-5'6"	"	68.7	10.2	5.3	1.3	2.3	3.2	38.
150	5'6"-6'9"	"	69.5	18.4	3.0	0.9	2.1	4.1	34.
152	0-3'6"	"	68.4	19.7	4.8	0.8	1.9	4.4	30.

Sample No.	Basis	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Undet.	%Coarse Waste
Bl 182 0-4'2"	Ignited	68.4	18.8	4.8	0.7	3.4	3.9	45.
189 0-4'	"	68.2	19.5	4.6	0.8	2.5	4.4	45.

ANALYSIS OF CLAY SAMPLES

AREA NO. B

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Undeter-mined	Percentage of Coarse Material (Rejected)
BH 173A	54.3	17.4	14.2	3.4	7.9	2.8	46
173B	53.8	17.2	14.8	2.9	7.3	4.0	41
174	57.4	17.9	10.6	3.1	7.7	3.3	38
175	62.3	16.3	10.6	1.3	4.1	5.4	42
176	58.1	16.5	13.4	2.2	6.5	3.3	36
177	57.3	15.8	9.9	3.0	10.7	3.3	44
178A	67.3	17.2	6.8	0.9	2.6	5.2	57
178B	62.6	20.4	8.2	0.9	3.1	4.8	53
179A	70.4	17.1	4.8	1.2	2.2	4.3	34
179B	72.9	14.9	4.7	1.1	1.3	5.1	36
179C	70.6	15.4	6.4	0.8	2.0	4.8	37
180	74.6	14.8	3.9	0.7	2.1	3.9	24
181	70.5	16.9	4.7	0.7	2.4	4.8	39
182	68.8	19.2	4.8	0.8	2.3	4.1	32
183A	68.7	17.6	5.0	1.8	3.2	3.7	39
183B	69.3	20.6	1.8	1.3	4.0	3.0	26

ANALYSIS OF CLAY SAMPLES

AREA NO. B

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Undetermined	Percentage of Coarse Material (Rejected)
BH 225	68.7	18.9	2.6	1.1	2.3	6.4	41
226	69.7	18.4	3.5	1.0	1.8	5.6	35
227	66.5	19.6	5.0	1.6	2.4	4.9	40
228	64.2	21.1	4.7	1.4	2.8	5.8	29
229	69.7	16.1	5.0	2.6	2.0	5.6	46
230	68.8	18.9	3.6	1.4	2.1	4.2	40
231	72.7	16.8	3.9	0.2	2.1	4.3	38
232	71.7	16.2	5.2	1.1	2.0	3.8	19
233	59.0	18.7	13.7	0.7	6.1	3.8	41
234	53.5	21.6	13.7	1.9	5.6	3.7	50
235	47.7	18.5	14.1	7.8	8.6	3.3	47
236	53.9	19.2	13.3	3.2	7.6	2.7	42
237	56.4	17.4	15.5	2.1	6.2	2.4	43
238	54.4	19.6	12.4	2.6	7.6	3.4	30
239	58.0	19.0	11.1	2.1	5.8	4.0	40
240	54.2	17.2	12.5	5.3	8.1	2.5	32
241	58.2	19.4	11.7	2.2	6.0	2.5	21
242	58.9	18.2	11.2	2.8	5.1	3.8	34
243	58.4	18.0	12.0	1.9	6.1	3.6	32
244	57.1	15.6	9.8	4.3	6.6	6.4	32
245	58.2	17.8	13.4	2.3	6.4	1.9	21
246	52.4	20.7	12.6	2.5	7.7	4.1	41

ANALYSIS OF CLAY SAMPLES
AREA NO. B

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Undeter-mined	Percentage of Coarse Material (Rejected)
BH 247	53.2	19.1	12.5	3.6	7.3	4.3	36
248	58.5	18.0	11.9	1.7	5.2	4.7	36
249	57.4	20.6	12.9	1.7	*	7.4	28
250	67.1	19.5	4.9	0.9	*	7.6	35
251	71.5	15.7	4.7	1.3	*	6.8	37
252		No clay - all rock					
253	69.6	17.1	6.1	0.4	2.5	4.3	31
254	69.6	15.7	5.6	1.1	*	7.8	33
255	73.2	13.2	4.6	1.0	*	8.0	
256							
257	68.2	19.5	4.1	0.8	2.0	5.4	30
258	70.3	17.4	3.6	1.4	2.3	5.0	54
259		No clay - all rock					
260	63.2	17.8	10.0	2.1	3.6	3.3	45
261	56.4	19.0	12.0	2.4	6.9	3.3	41
262	62.2	16.5	9.1	2.5	7.4	2.3	36
263	60.5	17.2	9.2	4.7	4.9	3.5	27
264	47.6	13.2	10.5	12.8	14.7	1.2	26
265	52.7	20.4	14.3	3.9	7.7	1.0	40
266	51.8	19.0	14.7	4.6	7.5	2.4	42
267	70.2	17.9	4.2	0.8	2.0	4.9	46
268	68.2	18.1	7.9	0.2	2.7	2.9	43
269 63.4	60.1	18.9	13.1	2.7	4.5	0.7	35

(*) Range 2 - 6%

ANALYSIS OF CLAY SAMPLES
AREA NO. B

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Undetermined	Percentage of Coarse Material (Rejected)
BH 270	54.8	17.7	15.2	4.5	7.6	0.2	48
271	51.8	19.3	14.1	3.9	8.9	2.0	38
272	68.5	18.0	5.4	1.3	2.7	3.1	31
273	54.1	18.9	12.7	4.2	6.3	3.8	43
274	49.6	18.1	15.2	4.9	9.4	2.8	60
275	52.4	18.9	16.7	4.0	1.9	6.1	35
276	69.7	17.6	3.4	1.7	2.1	5.5	31
277	69.7	17.9	4.6	0.8	2.2	4.8	35
278	70.3	15.4	4.1	1.4	2.2	6.6	45
279 73.6	72.4	16.3	5.3	0.9	1.9	3.2	24
280	51.1	17.5	12.7	4.3	10.0	4.4	53
281	53.0	17.1	15.5	4.8	8.2	1.4	57
282	56.2	18.1	12.6	4.6	7.2	0.3	25
283	45.7	15.2	14.7	8.8	15.7	-	36
284							
285	61.3	17.2	10.9	3.0	5.3	2.3	35
286	72.3	14.1	3.8	1.3	1.6	6.9	29
287							
288	71.9	16.3	3.5	1.4	1.8	5.1	40
288B	71.4	17.6	3.6	1.1	2.1	4.2	32
289							
290	55.2	16.6	14.0	4.7	7.5	2.0	59

ANALYSIS OF CLAY SAMPLES
AREA NO. E

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Undetermined	Percentage of Coarse Material (Rejected)
BH 291							
292	57.2	17.2	11.5	3.2	6.8	4.1	22
293	51.3	18.1	14.7	6.4	6.8	2.7	45
294	50.1	17.8	13.6	4.8	10.2	3.5	64
295	55.0	18.9	13.1	2.4	5.6	5.0	47
296A	74.1	14.7	4.0	0.7	1.5	5.0	29
296B	64.3	17.2	9.1	1.9	4.1	4.4	26
297	51.7	17.8	12.8	3.7	11.0	3.0	55
298	54.4	16.5	13.0	4.8	8.4	2.9	49
299	54.6	17.7	12.5	3.1	7.3	4.8	34

ANALYSIS OF CLAY SAMPLES
AREA NO. B
-5-

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Undetermined	Percentage of Coarse Material (Rejected)
BH 326	70.1	17.7	4.5	0.9	2.3	4.5	55
327	70.1	18.5	4.9	0.5	2.3	3.7	36
328	66.3	20.2	5.0	0.9	2.9	4.7	46
329	68.8	18.2	4.9	1.5	2.3	4.3	55
330	68.8	20.4	1.5	1.1	2.3	6.9	63
331	69.0	17.9	4.6	1.3	2.4	4.8	47
332	71.5	17.8	1.9	1.3	1.7	5.8	62
333	70.3	16.8	4.0	1.5	2.0	5.4	57
334							
335	69.5	17.1	3.0	1.3	2.2	6.9	49
336	71.2	17.1	3.3	1.1	1.8	5.5	51
337	72.6	16.7	3.5	1.7	1.5	4.0	31
338	73.2	16.8	3.4	0.3	1.5	4.8	26
339	73.5	15.0	4.8	1.1	1.5	4.1	28
340	73.4	17.0	3.2	1.1	1.6	3.7	50
341	69.2	17.7	4.3	1.0	2.4	5.4	37
342							
343							
344							
345							
346							
347							

ANALYSIS OF CLAY SAMPLES

AREA NO. C

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Undetermined	Percentage of Coarse Material (Rejected)
BH 193	53.2	19.0	14.0	3.2	8.8	1.8	45
194	60.6	20.3	9.6	1.9	5.0	2.6	37
195	47.7	19.9	15.0	9.9	3.3	4.2	42
196	54.7	18.1	14.1	2.6	9.1	1.4	40
197	56.8	19.0	13.2	4.1	6.2	0.7	38
198	58.1	15.1	15.2	1.4	9.3	0.9	45
199	53.7	17.1	15.8	4.1	8.2	1.1	38
200	62.3	16.7	11.0	1.5	5.3	3.2	39
201	63.6	17.1	9.8	1.0	5.4	3.1	48
202	64.5	19.0	11.4	1.2	2.8	1.1	32
203	61.7	15.0	14.6	1.8	3.9	4.0	38
204	69.5	14.2	10.6	1.6	2.2	1.9	35
205	69.3	18.6	8.6	0.8	1.5	1.2	46

ANALYSIS OF CLAY SAMPLES

AREA NO. C

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Undetermined	Percentage of Coarse Material (Rejected)
BH 300	61.0	19.8	9.3	1.3	4.7	4.9	40
301	71.0	17.1	5.1	0.4	2.1	4.3	38
302	69.9	16.2	6.1	2.4	1.8	3.6	33
303	63.5	19.1	7.5	1.2	1.9	6.8	45
304	70.5	17.8	5.6	0.5	2.2	2.4	24
305	52.4	19.8	16.6	4.7	3.7	2.8	61
306	55.3	20.5	12.8	1.7	6.8	2.9	20
307	65.4	17.8	10.7	1.7	2.6	2.8	22
308	70.9	14.1	10.0	0.3	1.9	2.8	48
309							
310	59.3	18.2	13.8	2.2	4.8	1.7	45
311	51.7	22.3	16.9	3.3	4.2	1.6	40
312	50.8	21.0	15.2	7.4	4.7	0.9	38
313	48.7	21.8	18.3	4.4	4.9	1.9	60
314	71.8	16.8	8.7	0.7	1.1	0.9	64
315	69.2	17.7	10.1	0.8	1.3	0.9	43
316	58.0	20.6	14.0	0.3	5.1	2.0	25
317	60.5	18.7	11.9	0.4	3.5	5.0	31

ANALYSIS OF CLAY SAMPLES
AREA NO. C

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Undetermined	Percentage of Coarse Material (Rejected)
BH 350	71.2	16.7	4.8	1.3	1.5	4.5	37
351	72.4	16.4	5.0	0.9	1.7	3.6	25
354							
355	71.2	16.2	4.7	1.4	2.2	4.3	46

ANALYSIS OF CLAY SAMPLES

AREA NO. D

Sample No.		SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Undetermined	Percentage of Coarse Material (Rejected)
BH	184	52.5	19.7	13.7	3.4	8.1	2.6	60
	185	52.1	16.5	17.5	2.7	10.2	1.0	44
	186	71.7	13.9	8.0	1.3	2.9	2.2	63
	187A	59.9	18.6	12.0	1.2	4.7	3.6	32
	187B	61.9	17.7	10.4	1.2	5.8	3.0	48
	187C	58.0	15.9	10.3	5.1	8.9	1.8	33
	188	60.1	19.6	9.4	0.4	6.3	4.2	54
	189A	70.0	15.5	9.1	0.9	2.3	2.2	39
	189B	68.4	16.9	9.2	0.2	2.3	3.0	31
	190	56.4	23.8	12.0	4.9	2.3	0.6	35
	191	59.4	22.1	10.9	3.9	2.8	0.9	30
	192	58.8	19.4	11.5	2.2	6.8	2.1	51

60.7 11.16

TABULATION 3.

Analyses of Andesite and Associated Sandstone Formation.

(A) Upper Andesite.

(B) Franciscan sandstone and Shale along West Limestone Contact.

(C) Interbedded Franciscan Sandstone and Shale.

TABULATION 3.

Analyses of Andesite and Associated Sandstone Formation.

(A) Upper Andesite.

(B) Franciscan sandstone and Shale along West Limestone Contact.

(C) Interbedded Franciscan Sandstone and Shale.

UPPER ANDESITE

(Jeeldimmer Samples)

	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO
JR 27	55.0	28.2		1.9	6.3
JR 65A	53.8	14.2	11.6	3.8	11.9
JR 65B	51.2	14.0	11.4	7.2	12.2
JR 65C	48.0	14.1	10.8	10.6	11.6
JR 65D	46.6	14.2	10.9	17.0	9.6
JR 65E	42.6	14.2	10.5	23.8	8.6

Franciscan Sandstone and Shales along West Limestone Contact

(Jackhammer Samples)

	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO
JH 152A	64.1	16.7	11.3	5.8	6.7
JH 152B	65.0	17.9	18.6	8.8	6.9
JH 152C	62.0	17.5	13.7	2.8	6.3
JH 153A	46.1	10.0	7.0	31.4	3.1
JH 153B	49.2	11.1	8.0	16.2	2.6
JH 153C	54.7	17.3	15.4	6.2	5.0
JH 154A	44.7	14.6	13.4	15.2	4.7
JH 154B	45.8	19.0	14.1	10.0	6.3
JH 154C	47.5	16.9	12.5	13.8	4.9
JH 154D	48.8	17.8	14.7	6.5	5.8
JH 154E	51.6	17.0	14.2	4.5	6.5

Interbedded Franciscan Sandstone and Andesite

Diamond Drill No. 6

	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO
60-65	46.3	15.8	10.8	16.8	7.6
70-74	50.1	16.7	9.8	12.4	5.8
74-78	48.5	15.2	9.6	15.3	8.5
80-83	48.5	15.3	9.8	12.4	8.5
83-93	47.2	19.6	12.6	8.8	10.6
93-98	46.4	17.7	10.9	6.9	9.2
98-104	49.0	18.7	11.7	6.9	10.3
110-116	49.6	18.8	11.6	6.7	11.9

Diamond Drill No. 5

161-164	62.5	12.2	6.0	13.1	2.8

Churn Drill Hole W-1

169-182	39.8	7.7	4.6	21.7	8.2
182-190	49.0	10.8	4.4	14.7	1.8

Churn Drill Hole W-3

262-272	35.8	3.0	2.8	30.5	0.8

Diamond Drill Hole No. 2

	SiO_2	R_2O_3	$CaCO_3$	$MgCO_3$
264-271	28.2	1.8	68.1	1.6
271-275	37.0	3.9	55.6	2.4

Diamond Drill Hole No. 3

50-55	12.4	1.7	69.2	14.9
56-60	56.1	9.6	26.4	1.8

4 A

ANALYSES OF BAY CLAYS —— POLAND HAND SAMPLES

TRANSCRIPT OF POLLAND HAND SAMPLES OF CLAYS
Permanente Project

	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Undet.	%Coarse Waste
P 1	61.0	20.4	7.7	2.2	4.6	4.1	
P 2	62.5	19.4	7.9	2.2	3.9	4.1	
P 3	62.3	18.8	8.3	1.4	4.5	4.9	
P 4	61.2	20.6	8.6	1.1	3.9	4.6	
P 5	62.5	19.4	8.4	1.3	3.9	4.5	
P 6	63.1	19.7	8.3	0.3	4.5	4.1	
P 7	56.4	15.5	6.6	8.3	8.5	4.7	
P 8	59.6	20.4	9.3	1.4	4.4	4.9	
P 10	58.8	17.5	12.5	4.6	4.9	1.7	
P 17	66.1	16.0	8.1	2.7	3.4	3.7	
P 18	58.7	16.2	14.9	3.3	4.7	2.2	

4 B

LOGS OF WELLS EAST OF THE BAYSHORE HIGHWAY

WELL NO.	Owner	Log	
1	Lowe & Lowe,	6 - 15	soil
	Monte Vista	15 - 305	yellow clay
2	Vidovich & Caviglia,	0 - 3	soil
	Collins Ave.,	3 - 35	clay
	Sunnyvale	35 - 55	gravel
		55 - 110	sand & gravel
3	A. G. Rose,	0 - 20	clay & gravel
	Grant Rd. and	20 - 85	soft clay
	Portland Ave.	85 - 90	red clay
		90 - 95	gravel
		95 - 140	soft red clay
4	Lewis Co.,	22 - 55	blue clay
	Ranch 8,	55 - 59	fine gravel
	Agnew Rd. near	59 - 100	blue clay
	Bayshore Highway		
5	Machado Well,	0 - 11	soil
	Mtn. View,	11 - 13	sand & gravel
	Alviso Rd.	13 - 177	blue clay
6	Tompkins,	0 - 9	adobe
	Bayshore Highway	9 - 13	yellow clay
	& Jagels Rd.	13 - 18	yellow sand
		18 - 49	blue clay
		49 - 55	fine gravel
		55 - 67	yellow clay
		67 - 172	blue clay
7	H. Mitarai,	0 - 5	soil
	Freitas Dairy	5 - 60	yellow clay
	Ranch	60 - 111	sandy blue clay
8	Y. Oku,	0 - 20	soil
	Mtn. View &	20 - 30	yellow clay & gravel
	Alviso Rd.	30 - 60	yellow clay
		60 - 115	yellow clay & gravel
9	U. S. Air Base -	0 - 8	top soil
	(old well)	8 - 24	blue clay
		24 - 29	gravel
		29 - 67	blue clay
		67 - 112	yellow clay
10	Poncini,	0 - 10	top soil
	Mtn. View - across	10 - 13	sand
	Bayshore Highway	13 - 65	yellow clay & gravel
	from Air Base	65 - 85	gravel & clay
		85 - 167	blue clay

DATE DUE			
1-15-99