12.5 Seepage Analyses for Upper and Lower Reservoirs



Eagle Mountain Pumped Storage Project – Seepage Analyses for Upper and Lower Reservoirs

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This memorandum summarizes preliminary estimates of seepage from the proposed Upper and Lower Reservoirs for the Eagle Mountain Pumped Storage Project. In addition, this TM provides opinions on the potential effectiveness of using the available fine mine tailings as a seepage control blanket to minimize seepage losses from the Upper and Lower Reservoirs. This treatment measure was proposed in the earlier project concepts developed in the 1990s. We also assessed the potential effectiveness of other seepage control measures at the two reservoirs.

Due to the current access constraints at the site, all geotechnical and geological information used for the seepage estimates was obtained from prior investigations and studies conducted by GeoSyntec Consultants, GSi/Water, and GeoPentech in support of studies for a proposed landfill. The results of those studies represent an initial step in characterizing potential seepage impacts associated with the Eagle Mountain Project. Seepage impacts are of particular concern to the Metropolitan Water District of Southern California (MWD), the State Water Quality Board, and others in the region.

Site Geology

Bedrock geologic units present at the site can be generally classified as either igneous or meta-sedimentary. The igneous units include several varieties of granitic rock including porphyritic quartz monzonite, diorite, monzonite porphyry, and granodiorite. The meta-sedimentary units include quartzites, meta-arkoses, and marbles formed by metamorphosis and/or hydrothermal-alteration or sandstones, conglomerates, arkoses, and carbonate rocks deposited in the Paleozoic or Precambrian age.

Surficial geology of the Eagle Mountain area generally consists of unconsolidated alluvial deposits. The alluvial deposits include sands, silts, gravels, and debris-flow deposits. The most significant alluvial deposits are found on the eastern edge of the site area, where they form a laterally extensive alluvial fan that extends and thickens to the east into the Chuckwalla Valley. Some of these deposits are exposed in the east wall of the east pit and underlie the eastern portion of the Lower Reservoir.

The alluvial deposits within the Chuckwalla Valley extend to significant depths below the ground surface and generally consist of sands, silty sands, sands and gravel, cobbles and boulders. Within the sandy alluvial deposits in the Chuckwalla Valley a predominately clay layer was logged in borings at depths varying from about 600 to 900 feet, and is generally about 100 to 300 feet in thickness.

The entire Central Pit (Upper Reservoir) is incised into bedrock. Alluvial deposits in the area of the Upper Reservoir are smaller in extent and are generally confined to laterally discontinuous, generally thin deposits along the bottoms of the canyons.

Rock containing little to no mineral value (waste rock and tailings) generated by the former Kaiser operations were deposited in numerous areas near the site. These mining by-products include several distinctly different materials, including both bedrock and alluvial overburden, and tailings produced as a result of the mining and separation of iron ore-bearing rock from host rock. The tailings include both fine and coarse varieties.

The hydraulically-placed fine tailings exist in settling ponds to the southeast of the proposed Upper Reservoir. Total volume of these materials is estimated to potentially be over 19 million cubic yards. Laboratory testing indicated that the fine tailings vary in composition, ranging from silty sand and sandy silt to clayey silt to silty clay. In general, soils with higher sand content are located near the slurry discharge point while finer grained soils are present in the distal portions of each pond.

Coarse tailings were placed at several locations around the site, although the largest deposit lies in a stockpile located immediately south of the proposed Lower Reservoir. The total volume of coarse tailings in this stockpile is estimated to be about 50 million cubic yards. The majority of the coarse tailings were classified as clean gravels or sandy gravels containing significant percentages of cobbles and boulders and few fines.

The chemical composition of these materials will be fully investigated during Phase 1 Predesign investigations. Those studies are described in Section 12.1 of this document.

Upper Reservoir

The Upper Reservoir will occupy the former Central Pit of the Kaiser Mine. The reservoir is elongated generally east-west, with a maximum dimension of about 5,300 feet. North-south dimensions vary between 1,500 and 2,000 feet near the maximum planned reservoir surface (El. 2485). The existing low point in the Upper Reservoir is located in the eastern half of the pit and extends down to El. 2230. Due to topographic conditions, there will be two dams required to create the upper reservoir. The current concept is to construct these dams using roller-compacted concrete (RCC) with aggregate materials being derived from the abundant coarse mine tailings at the site or from other on-site aggregate sources with suitable characteristics for RCC.

Available geologic mapping shows the north side of the pit to be underlain by granitic rock units, while the central and southern portions of the pit are underlain by metasedimentary units and iron ore. Areas of the proposed Upper Reservoir are also covered with coarse tailings. Two borings completed in the bottom of the Upper Reservoir site (MW-10 and CH-10) provide insights on the hydrogeologic character of the rock materials. Rock core was obtained from boring CH-10. The boring was drilled to a total depth of 1,389 feet. Water was first observed at a depth of 1,309 feet. Rock lithology in the upper 350 feet of the boring was found to be moderately fractured, interbedded igneous and metasedimentary rock. Monitoring well MW-10, a 13.5-inch diameter borehole, was drilled to a total depth of 1,480 feet below ground surface. Water was first encountered at a depth of 506 feet; however, the static water level subsequently dropped and later stabilized at a depth of 1,040 feet. Borehole locations and logs are provided in the Appendix of this report.

Lower Reservoir

The Lower Reservoir will be located in the former East Pit of the Kaiser Mine. No dams are required to provide the needed storage at the Lower Reservoir. The pit has a maximum dimension of about 5,400 feet in an east-west direction, and a maximum dimension of about 2,000 feet in a north-south direction when measured at the normal maximum reservoir water surface at El. 1092. The pit narrows to the west to a minimum width of about 300 feet. The pit includes two low points or bowls, one in the east, and one in the western half of the pit. These low points are separated by a bedrock saddle, which is mantled with tailings deposits on the west side. The low point within the east bowl is at El. 776, while the lowest point within the west bowl is at El. 715. The intervening saddle is at about El. 880.

The proposed Lower Reservoir can be divided into two zones on the basis of geology. The eastern one-quarter of the site is excavated in Quaternary alluvial sediments, including fan deposits and debris flow deposits. In the eastern wall of the pit, a vertical section of about 300 feet of alluvial deposits is exposed. The western three-quarters of the site are underlain by granitic rocks and undifferentiated metasedimentary rocks and rocks of the upper quartzite unit. The granitic rocks are located along the northern face of the pit, while the metasedimentary rocks are found along the south pit face and the lower portions of the north face. Quartzite is located in the central portion of the pit and underlies the unconsolidated deposits.

A total of eight borings were used to characterize the geology in the area that would be occupied by the Lower Reservoir and surrounding areas; these include: MW-13, CH-5A, P-1, MW-1, MW-2, P-11, P-12, and C-10. Borings MW-13, CH-5A were completed along the western and northwestern corner of the Lower Reservoir site. These two borings show slightly fractured, interbedded igneous and metasedimentary rock extending to depths below EI. 500. The static water level was subsequently measured in boring MW-13 at about 285 feet below the ground surface. The boring for P-1 is located on the bedrock saddle which divides the East Pit into two sections. This boring was drilled to a depth of 270 feet, and also shows interbedded igneous and metasedimentary rock for the entire depth. A static water level was subsequently measured at 177 feet below the ground surface in P-1.

Boreholes MW-1, MW-2, P-11, P-12, and C-10 were located east of the pit, and were projected onto the geologic section prepared for our analysis. The logs of these boreholes were reviewed to estimate the extent of alluvial deposits found on the eastern edge of the site. Generally, the alluvial deposits form a laterally extensive alluvial fan that extends and thickens to the east into the Chuckwalla Valley. These five borings encountered predominately fine to coarse sand, with gravel and cobbles in several locations. The borings also indicate a relatively thin, predominately clay layer interbedded within the primarily sandy alluvial deposits. The clay layer ranges in elevations from about 600 to 900 feet, and is generally about 100 to 300 feet thick. The groundwater in the bedrock and alluvium generally drops from west to east and from north to south. The groundwater was estimated to be approximately 240 feet below the ground surface at the point where boring P-12 is projected onto the geologic section. Borehole locations and logs are provided in the Appendix.

Seepage Analyses

The expected quantity of seepage through the Upper and Lower Reservoirs was evaluated by performing seepage analyses. The seepage analyses were performed using the twodimensional, finite element program GeoStudio 2007, specifically the SEEP/W module. The majority of the seepage from the proposed reservoirs is anticipated to travel from west to east towards the Chuckwalla Valley, similar to the existing ground water conditions at the site. Based on these ground water levels and the geologic conditions, the hydraulic gradient produced by the proposed reservoirs will be greater in the west-east direction than the hydraulic gradient in the north-south direction; therefore, all seepage flow rates and annual seepage volumes were estimated using west-east profiles. However, there is potential for seepage from the proposed reservoirs to travel from north to south. For this reason, north-south seepage profiles were also developed for both reservoirs only for estimating the ground water levels at specific down-gradient facilities of concern. We performed the analyses for the reservoirs using cross sections prepared for the locations shown in plan view on Figure 1. The representative cross sections used for the Upper Reservoir and Lower Reservoir seepage analyses are shown on Figures 2 through 5.

Hydraulic Conductivity

The estimates of hydraulic conductivity for the various geologic materials present at the site were developed based on the available results of field permeability tests, laboratory permeability tests, correlations with published values based on material descriptions and gradations, and empirical correlations between grain size and permeability. The hydraulic conductivity values used in the seepage analyses are presented in Table 1.

Material	Hydraulic Conductivity (centimeters/sec)	Hydraulic Conductivity (feet/sec)	Conductivity Ratio
Rock – Upper Reservoir (moderately fractured)	1.00E-04	3.28E-06	1.00
Rock – Lower Reservoir (slightly fractured)	1.00E-05	3.28E-07	1.00
Sand	5.00E-03	1.64E-04	0.25
Clay (sandy)	1.00E-05	3.28E-07	1.00
Liner - (fine tailings)	2.16E-06	7.09E-08	1.00

Table 1. Summary of Material Hydraulic Conductivities

The value for hydraulic conductivity of the rock in the Lower Reservoir was based on packer pressure testing conducted in 5 boreholes (borings 2, 3, 5A, 11 and 12). None of these boreholes were located within the Lower Reservoir, but are considered to be representative of the rock unit surrounding and within the reservoir. The calculated hydraulic conductivities ranged from 1 x 10-6 cm/s (centimeters/second) to 1 x 10-4 cm/s, with a geometric mean of 1 x 10-5 cm/s. The geometric mean was selected to represent the rock at the Lower Reservoir. Based on boreholes CH-10 (located in Upper Reservoir) and CH-5A (located on rim of Lower Reservoir), the rock at higher elevations is considered to be more fractured, which typically increases the hydraulic conductivity. Because the rock at the Upper Reservoir is considered to be more fractured than the rock in the Lower Reservoir, the hydraulic conductivity was increased by an order of magnitude to account for increased fracturing.

The alluvial deposits will have the highest conductivity and are represented by the sand category in Table 1. The hydraulic conductivity used for the sand category was based on the average of 17 empirical correlations between grain size and permeability. The range of hydraulic conductivities for the sand category was between 1 X 10-2 cm/s to 1 X 10-5 cm/sec, with an average of 5.0 X 10-3 cm/s.

The hydraulic conductivity used for the clay layer was based on an average of two laboratory permeability tests, which gave a value of 1.0 X 10-5 cm/s. Estimates of hydraulic conductivities for the fine tailings liner were based on an average of field and laboratory permeability tests. The results of field permeability tests on the fine tailings ranged from 9.2 X 10-9 to 4.3 X 10-7 cm/s; laboratory permeability test yielded results between 5.8 X 10-9 to 8.2 X 10-6 cm/s. The average hydraulic conductivity from these field and laboratory tests was 2.16 X 10-6 cm/s. This averaged hydraulic conductivity value was adjusted proportionally to evaluate varying thicknesses of the liner. Calculations for the hydraulic conductivity used for the various materials are presented in the Appendix.

West-East Profile Analysis Results

Seepage flow rates and gradients were estimated for both the Upper and Lower Reservoirs of the Eagle Mountain Pumped Storage Project at both the minimum and maximum water surface elevations. Seepage flow rates were also estimated using liner thicknesses of 3, 5, and 8 feet for both reservoirs, at minimum and maximum water storage elevations. The seepage blankets would only be placed on the reservoir floors and on zones of the reservoir basin slopes where ground slopes are flat enough to support stable fill placement under rapid draw-down reservoir conditions. For the initial analyses, only seepage blankets were considered. Other treatment measures to reduce reservoir seepage are described later in this memorandum.

The seepage flow rates were determined based on a unit width of the geologic section. To estimate the total seepage rate for the entire reservoir, the unit width seepage rate was multiplied by the average top width for that water surface elevation. The minimum and maximum average top widths for the two reservoirs are shown in Table 2.

Reservoir	Minimum Water Surface Elevation Average Top Width (feet)	Maximum Water Surface Elevation Average Top Width (feet)	Average Top Width Used for Average Annual Seepage Calculations (feet)
Central Pit Upper Reservoir	595	1485	1040
East Pit Lower Reservoir	680	1100	890

 Table 2. Reservoir Water Surface Elevation Average Top Widths

The estimated unit width seepage quantities and average annual seepage volumes for the Upper Reservoir are presented in Table 3. Seepage quantities and volumes for the Upper Reservoir with various liner options are also shown in Table 3. The resultant groundwater levels from seepage of the Upper Reservoir at maximum water surface elevation are shown on Figure 6.

Table 3. Upper Reservoir Seepage Analysis Results – Seepage Blanket Only

	Parameter	Max.	Min.	Average
0 ER	Unit Width Seepage Rate (cfs)	0.00195	0.00124	0.00160
Ž Z L	Annual Seepage (ac-ft/yr)	2097	535	1202

ERK CK	Unit Width Seepage Rate (cfs)	0.00178	0.00106	0.00142
Annual Seepage (ac-ft/yr)		1913	456	1068
cK ER	Unit Width Seepage Rate (cfs)	0.00174	0.00091	0.00133
5 THI LIN	Annual Seepage (ac-ft/yr)	1874	394	1000
cK ER	Unit Width Seepage Rate (cfs)	0.00170	0.00070	0.00120
8 THI LIN	Annual Seepage (ac-ft/yr)	1823	303	903

cfs – cubic feet per second ac-ft/yr – acre-feet per year

Max. – Maximum Min. – Minimum

The estimated unit width seepage quantities and average annual seepage volumes for the Lower Reservoir are presented in Table 4. Seepage quantities and volumes for the Lower Reservoir with various liner options are also shown in Table 4. The resultant groundwater levels from seepage of the Lower Reservoir at maximum water surface elevation are shown on Figure 7. The remaining computer outputs of the analyses are included in the Appendix.

	Parameter	Max.	Min.	Average
0 ER	Unit Width Seepage Rate (cfs)	0.00356	0.00181	0.00269
L Z	Annual Seepage (ac-ft/yr)	2836	891	1731
ПС. КК	Unit Width Seepage Rate (cfs)	0.00348	0.00177	0.00262
	Annual Seepage (ac-ft/yr)	2768	871	1690
E C .	Unit Width Seepage Rate (cfs)	0.00347	0.00175	0.00261
LIN	Annual Seepage (ac-ft/yr)	2765	863	1683
E C .	Unit Width Seepage Rate (cfs)	0.00347	0.00175	0.00261
	Annual Seepage (ac-ft/yr)	2764	860	1681

Table 4. Lower Reservoir Seepage Analysis Results – Seepage Blanket Only

cfs – cubic feet per second ac-ft/yr – acre-feet per year Max. – Maximum Min. – Minimum

Based on the seepage analyses of the Eagle Mountain Pumped Storage Project and assuming no reservoir seepage treatments, the estimated annual average seepage volume from the Upper Reservoir is approximately 1,200 acre-feet, and the estimated annual average seepage volume from the Lower Reservoir is approximately 1,700 acre-feet. The estimated annual seepage volume for the Lower Reservoir is about 500 acre-feet more than the Upper Reservoir because the eastern wall of the Lower Reservoir primarily consists of alluvial sediments and debris flow deposits, which have significantly higher hydraulic conductivities.

Based on the seepage analysis, the fine tailings blanket liner options for the Upper Reservoir reduce the average annual seepage volume. The estimated reduction in average annual seepage volume for the Upper Reservoir ranged from about 11 to 25 percent, depending on the liner thickness. The maximum reduction for the Upper Reservoir was approximately 300 acre-feet annually, with an eight-foot thick liner in place.

The fine tailings blanket liner in the Lower Reservoir was estimated to be relatively ineffective. This is because the upper half of the walls in the pit, which consist of the alluvium deposit, are

too steep to support the fine tailings liner. And, since the majority of seepage from the Lower Reservoir will be through this alluvium deposit, the analyses indicated little change due to the various liner options. The estimated reduction in average annual seepage volume for the Lower Reservoir was about 2.5 percent, regardless of the liner thickness. The maximum reduction for the Lower Reservoir was approximately 50 acre-feet annually, with an eight-foot thick liner constructed where possible. Based on this analysis, additional seepage reduction measures beyond a fine tailings blanket liner will be required for the Lower Reservoir.

North-South Profile Analysis Results

Seepage and ground water elevations along a north-south profile toward the CRA were estimated for both the Upper and Lower Reservoirs of the Eagle Mountain Pumped Storage Project at both the minimum and maximum water surface elevations. The seepage analysis from the proposed Upper Reservoir at maximum water surface elevation is shown on Figure 8. Generally, the maximum water surface elevation in the Upper Reservoir is projected to cause the ground water levels near the location of the CRA to rise approximately 45 feet above the estimated existing ground water levels. Results of the seepage analysis from the proposed Lower Reservoir at maximum water surface elevation are shown on Figure 9. Generally, the maximum water surface elevation in the Lower Reservoir is projected to cause the ground water levels near the location of the CRA to rise approximately 150 feet above the estimated existing ground water surface elevation in the Lower Reservoir is projected to cause the ground water levels near the location of the CRA to rise approximately 150 feet above the estimated existing ground water levels. The remaining computer outputs of the analyses are included in the Appendix.

Potential Impacts from Reservoir Seepage

Concerns have been raised about the potential impacts of seepage from the reservoirs on the concrete lining of the Colorado River Aqueduct (CRA), which is owned and operated by MWD. The potential impacts to the CRA from reservoir seepage were analyzed using both west-east and north-south profiles for each of the project reservoirs. The impacts of seepage were expected to be the most noticeable in the west-east profiles due to the close proximity of the Lower Reservoir to the CRA; however, the impacts along the north-south profiles were also investigated to fully assess the seepage concerns.

Based on the west-east seepage analysis for the Lower Reservoir, assuming no seepage treatments and continuous seepage at the maximum reservoir water surface elevation, the estimated groundwater elevation near the location of the CRA is estimated to stabilize at approximately El. 915, as shown on Figure 7. The current static groundwater elevation at this location is about at El. 675, which is about 240 feet lower than the modeled ground water surface elevation with fully-developed reservoir seepage. The ground surface elevation near the CRA is approximately EI. 1000, which is about 85 feet higher than the groundwater elevation predicted under worse-case conditions for seepage from the Lower Reservoir. Because the estimated ground water elevation is predicted to be well below the ground surface, no uplift forces are predicted on the concrete lining of the CRA. Based on the north-south seepage analysis of seepage from the Upper and Lower Reservoirs, the Lower Reservoir produced the greatest increases from the estimated ground water elevations; therefore, the Lower Reservoir seepage results were used to analyze the impacts to the CRA facilities. The CRA facilities that could potentially be impacted by reservoir seepage along the north-south profiles include the CRA Pump Station and CRA channel near the pump station, as shown on Figure 1. Based on the north-south seepage analysis from the Lower Reservoir, and assuming no seepage treatments and continuous seepage at the maximum reservoir water surface elevation, the estimated ground water elevation near the location of the CRA is estimated to reach approximately El. 745 feet, as

shown on Figure 9. The current static ground water elevation at this location is assumed to be about at El. 580 feet. However, this elevation may be conservatively high, because ground water wells and elevation data are not available at this location, but data was extrapolated to develop a conservative estimate. Therefore, the existing ground water elevation is estimated to be about 165 feet lower than the modeled ground water surface elevation with fully developed reservoir seepage. The ground surface elevation near the CRA is approximately El. 985 feet, which is estimated to be about 240 feet higher than the ground water elevation predicted under worse-case conditions for seepage from the Lower Reservoir. Because the estimated ground water elevation is predicted to be well below the ground surface, no uplift forces are predicted on the concrete lining of the CRA or at the pump station.

In addition, we estimate that the steady-state groundwater profile for the Lower Reservoir shown on Figure 7 will take at least 15 years to fully develop from the estimated seepage volume, assuming a two year filling period and the reservoir remains at the maximum water surface elevation after filling. We also estimate that the steady-state groundwater profiles for the Upper Reservoir shown on Figures 6 and 8 will take at least 50 years to fully develop, assuming a two year filling period and the reservoir remains at the maximum water surface elevation after filling. Furthermore, it is estimated to take at least 30 years for groundwater levels near the Upper Reservoir to reach and daylight at the nearest surface drainage channel. If the groundwater levels do daylight in the adjacent surface drainage channels, any seepage will be collected and conveyed to the Lower Reservoir. However, the reservoirs can never be completely full at the same time, and reservoir levels will cycle up and down in response to energy demands and hydroelectric operations. Realistically, we expect that the estimated steady-state groundwater levels from seepage from the Eagle Mountain Project may not fully develop during the estimated project service life of 50 years.

Hydrocompaction has also been identified as a potential impact that could be associated with seepage from reservoirs of the Eagle Mountain Project. The potential for hydrocompaction in soils is related to the grain size of the sediments and how they were deposited. Fan deposits, such as those present near the project site, when deposited by flash-flood type of events, are highly susceptible to compaction when wetted either from above or below. Under worse-case conditions, our analyses indicate that groundwater levels will be about 80 feet below ground surface and will not reach the near-surface zones where hydrocompaction would be the most problematic.

Studies conducted for MWD in the Chuckwalla Aquifer (Upper Chuckwalla Groundwater Basin StorageGeoPentech 2003) addressed hydrocompaction. The studies suggested that to depths of 100 feet, hydrocompaction could range from 0.56 to 1.8 percent, depending on soil composition. As such, surface subsidence may total from 0.5 to 1.8 feet. Therefore, additional reduction of seepage is needed and seepage recovery wells are needed to reduce hydrocompaction to negligible levels.

Other Seepage Treatment and Monitoring Measures

The Project plans to limit seepage from the project reservoirs to the maximum extent possible. This includes the Upper Reservoir, Lower Reservoir, and the brine disposal ponds¹ that will be part of the water quality management system for the project, which is described in the draft License Application. A more-detailed hydrogeologic analysis will be prepared during final design of the project. We will also undertake detailed geologic mapping of the reservoirs during project design. Upon completion of the hydrogeologic analysis and detailed geologic

mapping, engineering design solutions will be provided to reduce seepage from the project reservoirs in order to reduce the potential for hydrocompaction and impacts to groundwater levels and water quality.

Seepage control from the project reservoirs will be accomplished using systematic procedures and steps that have been applied successfully at similar projects. These procedures will include the following:

- After access to the site is obtained, a team of geologists and geotechnical engineers will conduct a detailed reconnaissance of the reservoir basins and pond areas to identify zones where leakage and seepage would be expected to occur. These areas will include faults, fissures and cracks in the bedrock, and zones that have direct connection to the alluvial deposits of the Chuckwalla Valley. During the reconnaissance, the team will evaluate the effectiveness of various methods for seepage and leakage control to mitigate the effects of these particular features.
- Seepage and leakage control methods will be further investigated utilizing data from the geologic reconnaissance and hydrogeologic modeling studies.
 Potential methods for seepage and leakage control will include curtain grouting of the foundation beneath the dam footprint and around the reservoir rim, as needed; backfill concrete placement and/or slush grouting of the faults, fissures and cracks recognized in the field reconnaissance; placement of low permeability materials, as technically feasible, over zones too large to be grouted and over areas of alluvium within the Lower Reservoir; seepage and leakage collection systems positioned based on the results of the hydrogeologic analyses; and clay or membrane lining of the brine ponds associated with the project's water quality management system. The collection systems would recycle water into the project reservoirs or the RO (reverse osmosis) system.
- Design and construction of the seepage and leakage control measures, which will be aided by the results of the groundwater modeling.
- Design and construction of a comprehensive monitoring program, consisting of observation wells and piezometers that will be used to assess the effectiveness of the seepage and leakage control measures.
- Based on monitoring results, additional actions may be taken to further control leakage and seepage from the reservoirs and ponds. Such measures may include curtain grouting and the expansion of seepage and leakage collection systems.

We modified the seepage model described above to reflect implementation of the above noted measures, in addition to the use of seepage blankets on the bottom and flatter-sloped areas of the two reservoirs. We assumed that the following measures would provide the indicated levels of seepage reduction:

> Grouting measures in fractured bedrock zones are expected to reduce the effective seepage area by 30% in the Upper Reservoir and 20% in the Lower Reservoir. Grouting in the Lower Reservoir was not assumed to be possible or effective in the exposed alluvium on the eastern end of the reservoir. The

percentage reduction due to grouting of fractured bedrock zones was estimated based on rock quality index (RQI) test results from the earlier subsurface exploration programs. The RQI for the top 100 feet of the boreholes was averaged for each reservoir. The percentage reduction was estimated assuming 100-RQI_{avg} divided by two.

The exposed alluvium in the eastern portion of the Lower Reservoir extends over a total perimeter distance of approximately 5,000 feet with the maximum depth of approximately 315 feet below the normal water surface elevation. The average slope of the pit walls in this zone is about 3 to 1 (horizontal: vertical), although the upper half of the pit has steep slopes near 1.5 to 1 in inclination. A possible treatment option, which will be investigated during final design for feasibility and effectiveness, would be to blanket the entire zone with a stepped RCC or soil cement overlay. This would reduce the effective seepage area by at least 80%. However, this approach could be very expensive. Therefore, other treatment options will be explored during final design.

Results of these analyses are presented below:

 Table 5. Upper Reservoir Seepage Analysis Results – Grouting and Seepage

 Blanket

	Parameter	Max.	Min.	Average
ERK -	Unit Width Seepage Rate (cfs)	0.00126	0.00078	0.00102
THI 3	Annual Seepage (ac-ft/yr)	1351	338	768
ERK ERK	Unit Width Seepage Rate (cfs)	0.00124	0.00072	0.00098
THI 2	Annual Seepage (ac-ft/yr)	1332	310	738
CK ER	Unit Width Seepage Rate (cfs)	0.00122	0.00061	0.00092
	Annual Seepage (ac-ft/yr)	1308	265	689

cfs – cubic feet per second ac-ft/yr – acre-feet per year Max. – Maximum Min. – Minimum

Table 6.	Lower Reservoir	[,] Seepage Analysis	Results –	Grouting,	Seepage	Blanket
	and RCC or Soil	Cement Treatment	over the A	lluvium		

	Parameter	Max.	Min.	Average
cK ER	Unit Width Seepage Rate (cfs)	0.00206	0.00135	0.00171
3 THI LIN	Annual Seepage (ac-ft/yr)	1641	665	1099
cK ER	Unit Width Seepage Rate (cfs)	0.00170	0.00106	0.00138
5 THI LIN	Annual Seepage (ac-ft/yr)	1358	521	890
cK ER	Unit Width Seepage Rate (cfs)	0.00131	0.00090	0.00111
8 THI LIN	Annual Seepage (ac-ft/yr)	1045	443	713

cfs – cubic feet per second ac-ft/yr – acre-feet per year Max. – Maximum Min. – Minimum Based on the seepage analysis of the Upper Reservoir, the grouting of rock fractures could potentially reduce seepage from the reservoir an additional 200 to 300 acre-feet depending on the fine tailings blanket liner thickness. The estimated total reduction in average annual seepage volume from the Upper Reservoir, using both grouting and blanket liner, ranged from about 36 to 41 percent, depending on the liner thickness. The maximum reduction for the Upper Reservoir was approximately 500 acre-feet annually, with an eight-foot thick liner plus grouting in place. The estimated groundwater levels resulting from seepage from the Upper Reservoir utilizing the additional seepage control measures are a minimum of approximately 125 feet lower than the estimated ground surface and are shown on Figure 10 at the average reservoir water surface elevation.

Based on the seepage analysis of the Lower Reservoir, the grouting of rock fractures and RCC or soil cement treatment on the alluvium could potentially reduce seepage from the reservoir an additional 600 to1,000 acre-feet depending on the fine tailings blanket liner thickness. The estimated total reduction in average annual seepage volume from the Lower Reservoir using a blanket liner, grouting rock fractures and treatment of alluvium, ranged from about 37 to 59 percent, depending on the liner thickness. The maximum reduction for the Lower Reservoir was approximately 1,000 acre-feet annually. The estimated groundwater levels resulting from seepage from the Lower Reservoir utilizing the additional seepage control measures are a minimum of approximately 265 feet lower than the estimated ground surface and are shown on Figure 11 at the average reservoir water surface elevation.

We anticipate that any water that may escape the engineered seepage and leakage solutions will be captured by groundwater wells that will be operated to mitigate above-normal hydrostatic pressures on the CRA. The groundwater level control wells will be operated to maintain the groundwater levels within <u>+5</u> feet of the historic levels in areas where hydrocompaction could potentially occur and adversely impact the CRA or other infrastructure. The combined pumping from the wells will be about 100 gpm from each of the proposed extraction wells for a total of 900 gpm. These wells will return the intercepted water to the Lower Reservoir. The wells, if found to be needed, will be located based on the results of detailed hydrogeologic modeling studies. Groundwater level and quality monitoring will be performed at monitoring wells and the project's extraction and water supply wells. Groundwater level and water quality sampling will be performed at:

- One up-gradient and 3 to 5 down-gradient wells around each reservoir and the brine disposal pond to detect seepage.
- Nine monitoring wells in the valley sediments to assess changes related to seepage or from project pumping.
- Two residential/municipal wells nearest the project to ensure safe drinking water.
- Extraction wells
- Groundwater levels will initially be monitored on a monthly basis, which may later be extended to quarterly or annual monitoring. Water quality sampling and testing will be performed initially on a quarterly basis.

Based on implementation of the above-noted measures, we believe that our engineering design would mitigate any potential impacts to the CRA. The proposed measures to minimize and collect seepage will help insure that seepage emanating from the reservoirs is returned to the reservoirs prior to reaching the CRA.

Source: GeoPentech, 2003. Upper Chuckwalla Groundwater Basin Storage, Draft Report. Produced for Metropolitan Water District.























GEI Consultants, Inc.

EAGLE MOUNTAIN - CENTRAL PIT SEEPAGE RESULTS SEEPAGE BLANKET ONLY

Reservoir Paramters

Max WSE	2485 ft
Min WSE	2343 ft
Max Reservoir WSE Area	48 acres
Min Reservoir WSE Area	191 acres
Max WSE Average Top Width	1485 ft
Min WSE Average Top Width	595 ft
Average Top Width	1040 ft

	Parameter	Max	Min	Average
INER	Unit Width Seepage Rate (cfs)	0.00195	0.00124	0.00160
NO L	Annual Seepage (ac-ft/yr)	2097	535	1202
HICK IER	Unit Width Seepage Rate (cfs)	0.00178	0.00106	0.00142
3' TH LIN	Annual Seepage (ac-ft/yr)	1913	456	1068
HICK IER	Unit Width Seepage Rate (cfs)	0.00174	0.00091	0.00133
5' TH	Annual Seepage (ac-ft/yr)	1874	394	1000
HICK IER	Unit Width Seepage Rate (cfs)	0.00170	0.00070	0.00120
8' TH	Annual Seepage (ac-ft/yr)	1823	303	903

EAGLE MOUNTAIN - CENTRAL PIT SEEPAGE RESULTS GROUTING AND SEEPAGE BLANKET

Reservoir ParamtersMax WSE2485 ftMin WSE2343 ftMax Reservoir WSE Area48 acresMin Reservoir WSE Area191 acresMax WSE Average Top Width1485 ftMin WSE Average Top Width595 ftAverage Top Width1040 ft

	Parameter	Max	Min	Average
INER	Unit Width Seepage Rate (cfs)	0.00195	0.00124	0.00160
NO L	Annual Seepage (ac-ft/yr)	2097	535	1202
HICK IER	Unit Width Seepage Rate (cfs)	0.00126	0.00078	0.00102
3' TH LIN	Annual Seepage (ac-ft/yr)	1351	338	768
HICK IER	Unit Width Seepage Rate (cfs)	0.00124	0.00072	0.00098
5' TH	Annual Seepage (ac-ft/yr)	1332	310	738
HICK IER	Unit Width Seepage Rate (cfs)	0.00122	0.00061	0.00092
8. TH	Annual Seepage (ac-ft/yr)	1308	265	689

EAGLE MOUNTAIN - EAST PIT SEEPAGE RESULTS SEEPAGE BLANKET ONLY

Reservoir Paramters

Max WSE	1095 ft
Min WSE	925 ft
Max Reservoir WSE Area	163 acres
Min Reservoir WSE Area	63 acres
Max WSE Average Top Width	1100 ft
Min WSE Average Top Width	680 ft
Average Top Width	890 ft

	Parameter	Max	Min	Average
NO LINER	Unit Width Seepage Rate (cfs)	0.00356	0.00181	0.00269
	Annual Seepage (ac-ft/yr)	2836	891	1731
3' THICK LINER	Unit Width Seepage Rate (cfs)	0.00348	0.00177	0.00262
	Annual Seepage (ac-ft/yr)	2768	871	1690
5' THICK LINER	Unit Width Seepage Rate (cfs)	0.00347	0.00175	0.00261
	Annual Seepage (ac-ft/yr)	2765	863	1683
8' THICK LINER	Unit Width Seepage Rate (cfs)	0.00347	0.00175	0.00261
	Annual Seepage (ac-ft/yr)	2764	860	1681

EAGLE MOUNTAIN - EAST PIT SEEPAGE RESULTS GROUTING, SEEPAGE BLANKET, AND RCC TREATMENT

Reservoir Paramters

Max WSE	1095 ft
Min WSE	925 ft
Max Reservoir WSE Area	163 acres
Min Reservoir WSE Area	63 acres
Max WSE Average Top Width	1100 ft
Min WSE Average Top Width	680 ft
Average Top Width	890 ft

	Parameter	Max	Min	Average
NO LINER	Unit Width Seepage Rate (cfs)	0.00356	0.00181	0.00269
	Annual Seepage (ac-ft/yr)	2836	891	1731
3' THICK LINER	Unit Width Seepage Rate (cfs)	0.00206	0.00135	0.00171
	Annual Seepage (ac-ft/yr)	1641	665	1099
5' THICK LINER	Unit Width Seepage Rate (cfs)	0.00170	0.00106	0.00138
	Annual Seepage (ac-ft/yr)	1358	521	890
8' THICK LINER	Unit Width Seepage Rate (cfs)	0.00131	0.00090	0.00111
	Annual Seepage (ac-ft/yr)	1045	443	713

Eagle Mountain Pumped Storage Project Upper Reservoir - SEEP/W Output

Model Mesh Properties - Upper Reservoir (East-West)





EXISTING CONDITIONS



.

NO LINER



NO LINER



3' LINER



5' LINER



8' LINER


















GEI Consultants, Inc. 080470 Eagle Mountain Pumped Storage Project Reservoir Seepage Analysis (SEEP/W) 1/4/2011 NDM

Model Mesh Properties - Upper Reservoir (North-South)









Eagle Mountain Pumped Storage Project Lower Reservoir - SEEP/W Output GEI Consultants, Inc. 080470 Eagle Mountain Pumped Storage Project Reservoir Seepage Analysis (SEEP/W) 1/4/2011 NDM

Model Mesh Properties - Lower Reservoir (East-West)





EXISTING CONDITIONS



NO LINER



NO LINER









3' LINER





8' LINER















GEI Consultants, Inc. 080470 Eagle Mountain Pumped Storage Project Reservoir Seepage Analysis (SEEP/W) 1/4/2011 NDM

Model Mesh Properties - Lower Reservoir (North-South)









SEEP/W Input Materials Properties Data

GEI Consultants, Inc. 080470 Eagle Mountain Pumped Storage Project Reservoir Seepage Analysis (SEEP/W) 7/24/2008 NDM

Material	Hydraulic Conductivity (cm/sec)	Hydraulic Conductivity (ft/sec)	Conductivity Ratio
Rock – Upper Reservoir			
(Moderately Fractured)	1.00E-04	3.28E-06	1
Rock – Lower Reservoir			
(Slightly Fractured)	1.00E-05	3.28E-07	1
Sand	5.00E-03	1.64E-04	0.25
Clay (sandy)	1.00E-05	3.28E-07	1.00
Liner - (fine tailings)	2.16E-06	7.09E-08	1.00
RCC Treatment	1.00E-08	3.28E-10	1.00

Summary of SEEP/W Material Properties
GEI Consultants, Inc. 080470 Eagle Mountain Pumped Storage Project Reservoir Seepage Analysis (SEEP/W) 1/4/2011 NDM

Material Properties - Hydrualic Conductivity Functions





Sand



1.0e-07 1.0e-0 1.0e-09 1.0e-1 1.0e-1 1.0e-1 1.0e-1 1.0e-1 1.0e 1 0e-1 1.0e 1.0e-1 Matric Suction (psf) Clay Ratio = 1.0 Glacial Till (Compacted), Ksat = 3.28e-07 ft/s 1.0e-06 1.0e-07 1.0e-0 1.0e-09 1.0e-10 1.0e 1.0e-1 1.0e-1 1.0e-1 1.0e-' 1.0e-1 1 0e-1 1.0e-1 1.0e-19 Matric Suction (psf) 5' Liner Ratio = 1.0

Glacial Till (Compacted), Ksat = 3.28e-06 ft/s

Ratio = 1.0

Rock - Upper Reservoir

1.0e-05

1.00-06

1.0e-0





5' Liner, Ksat = 4.254e-08 ft/s (2)

GEI Consultants, Inc. 080470 Eagle Mountain Pumped Storage Project Reservoir Seepage Analysis (SEEP/W) 1/4/2011 NDM

Material Properties - Hydrualic Conductivity Functions



GEI Consultants, Inc. 080470 Eagle Mountain Pumped Storage Project Reservoir Seepage Analysis (SEEP/W) 1/4/2011 NDM

Material Properties - Volumetric Water Content Functions











GEI Consultants, Inc. 080470 Eagle Mountain Pumped Storage Project Reservoir Seepage Analysis (SEEP/W) 7/24/2008 NDM

Chuckwalla Report, Hydraulic Conductivities Summary

				Hydraulic
				Conductivity
Boring	Description	USCS	Depth	(cm/sec)
Č-1	Sand	SP	201	1.00E-05
C-1	Clayey Sand	SC	201	2.10E-05
C-1	Silty Sand	SM	322	3.00E-06
C-5	Fat Clay	СН	142	9.20E-10
C-5	Clayey Sand	SC-SM	62	2.70E-07
C-5	Silty Sand	SM	62	3.00E-07
C-9	Silty sand	SM	145	3.50E-05
TP#2	Silty Sand	SM	14	1.20E-04
TP#3	Silty Sand	SM	5	3.90E-04
				Average
		SM		9.14E-05

SC

9.14E-05 1.06E-05

GEI Consultants, Inc. 080470 Eagle Mountain Pumped Storage Project Reservoir Seepage Analysis (SEEP/W) 7/24/2008 NDM

Emperical

5				DE	Hydraulic
Boring	Description	USCS	Depth	(mm)	(cm/sec)
C-1	Sand w/ Silt	SP-SM	17	0.08	7.00E-03
C-1	Sand w/ Silt	SP-SM	58	0.06	4.00E-03
C-1	Silty Sand	SM	101	0.0015	3.47E-05
C-1	Sand w/ Silt	SP-SM	110	0.0015	3.47E-05
C-1	Sand w/ Silt	SP-SM	123	0.008	1.61E-04
C-1	Sand w/ Silt	SP-SM	423	0.06	4.00E-03
C-5	Sand w/ Grave	SW	59	0.2	3.25E-02
C-5	Gravel w/ S&S	GP-GM	81	0.05	2.50E-03
C-5	Sand w/ Silt	SP-SM	101	0.1	1.00E-02
C-5	Gravel w/ S&S	GP-GM	121	0.065	4.75E-03
C-5	Sand w/ Silt	SP-SM	280	0.006	1.22E-04
C-9	Sand w/ Silt	SW-SM	17	0.05	2.50E-03
C-10	Sand w/ Silt	SP-SM	8	0.01	2.00E-04
C-10	Sand w/ Silt	SP-SM	16	0.06	4.00E-03
C-10	Sand	SP	78	0.08	7.00E-03
C-10	Sand w/ Silt	SP	130	0.05	2.50E-03
C-1	Sand	SP	201		1.00E-05
				Average	4.78E-03

Lookup Table

(0111000)	Increment
2.50E-05	0.019444444
2.00E-04	0.057500000
2.50E-03	0.15000000
1.00E-02	0.225000000
1.00E-01	1.800000000
1.00E+00	1.000000000
	(cm/sec) 2.50E-05 2.00E-04 2.50E-03 1.00E-02 1.00E-01 1.00E+00



GEI Consultants, Inc. 080470 Eagle Mountain Pumped Storage Project Reservoir Seepage Analysis (SEEP/W) 7/24/2008 NDM

Liner - Fine Tailings

Hydraulic Conductivities - cm/sec

				-
Test Type	Min	Max	Average]
Field	9.20E-09	4.30E-07	2.20E-07]
Lab	5.80E-09	8.20E-06	4.10E-06]
Average =	7.50E-09	4.32E-06	2.16E-06	cm/sec
	2.46E-10	1.42E-07	7.09E-08	ft/sec

				1917		1.17	6.2 N.C.														10	10 C C						
1	E			T	8			ar.	VERIM	e.			same.					1	1					1	1	1		1.2001
			1000033	1000000		DEPTH	CASING		SCREEN	ED .		DF	ILLING	HEIGHT	SPIR	ELEV.	5652	52052	6392	6/17/92	7/1/22	7/1592	7/29/92	87.352	828/72		1	
3.DAGROS	LOC	ADON	COUNT	DEPTH	BOTTON	10	BOITON	1000	NIER	/AL	HOLE	1	ATES	OF	.0151	OF 157	SWL	SWL	SWL	SML	SWL	SHL	SWL	SWL	SWL	BOREHOLE	RSHARKS	
NO.	NORTHING	EASTING	BEV.	DRILLED	ELEV	BEHOS	(DENIN	CLEV.	PHOM	10	SKA	BEGEN	END	CASNO	ALE	MATCH	ELEV.	ELV.	HEY.	ELEY.	BEEV.	ELEV.	EEV.	ELEV.	ELEV.	NO.		
200.00	STATION	OFFSET	្រក	F	FI FI	F1	-		1		N	1	1	IN	FC	FI	Fi	Pi I	181	1 14	1 71	I FT.	FT.	FT	FT.	1	· · · · · · · · · · · · · · · · · · ·	
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44-1	6:9959.37	224016R.01	104500	400	CASES	1 EVA	1 365	66010	30	- 30	1 10	421103	3/25/90	229	33824	706,79	1 705.15	1 705.37	1 435.64	1 156 50	1 445.00	706.60	708.44	705.15	705.15	A4/6-1	ALD ROTARY	SEE NOTE (1)
1444-2	615081A81	2210948.20	1082.01	455	620.01	1 100	1 000	625.01	334	100	1 10	Janu	10000	1 20.	1 3043	742.11	Tia Cu	1 003.04	754.01	727	1 255 72	00310	00425	661.54	663.90	HM19-2	ARHOTAR	(2)
CKN2	61897736	2232404.20	1048.84	300	200.04	H	1 140	630.04	1 20	200		12/20/00	11/200	12	1 20145	1 7/2 20	1 35424	1 20120	255 66	1 200.10	1 202.60	1200	120.34	130.01	ALM	Phone 2	hevense und namen	(3)
1644	618642251	2237376.45	1 16/	140	1 63373		240	1 636.73	80	1 100	10	130.01	15/00/0		1 12 11	700.07	1 1000	1 10020	1 Filling	226.33	1/4 71	10001	10001	702.61	1 73273	14074	HEVENSE CARLA PRAVINEN	(3;
W#5	618340.71	2238160.12	611.26	20	00010		240	327 50	180	100	10	132431	132100	- 53	7 724 63	7415	030.78	1 911 55	030.30	77. 97	2:45	009.34	CANA DI	1 bs/ be	666.73	pumps	HEYENSE GHL HAMMEN	(5)
444-6	616696151	22325(A.)7	1347.89	640	ME	-		142	1 350	660	10	1 54 121	160001	6/3	200.30	10121	1 11614	1 11222	1 116.00	T GIED	615.63	200.00	1439	1 766-56	7/120	PMM-6	HEVENSE CONC. HAMMEN	(3)
Mart-7	616416.00	2228597,46	1605.60	165	acuse	-	1	inter .		11.0	INAC	10000	2240		1 010	1111.00	1	1 10.45	914.40	1 1103	813.02	A)7/4	81373	VISAN	618.9	Mart 1	AIRMANMEN	[2]
WW&(CLD)	619350.60	2222019400	1 1758.54	964	804.54		1144	C'ALCO	INA	INA 2011	600	1 10.00	1 83031	IVA	1 10	636.34		1 103.03	0012	- MILL	10011		-			manarcatts	ARHAMMEN	(2) (4) (15)
Write herei	6:5059.68	222.018.00	1768.54	6/1	80154		1 040	1 8000	1 131.5	1 0415	1 123	33042	461086	4.4		Parts -	1	- BA33	00108	0.00	ADDA	NOTE	180022	1 kause	807.04	prens extreme	ARMAN	(5)
Adre-9	6:9812.021	2220256.54	2234.92	1.544	1 72.92		IIIMA	INA	INA	INA	0.0	100200	110310	INA		1.112.57		1	1		1			1	1	MAN-9	IARHAMMER .	(2) (4)
An-10	622825.281	2221019.45	21135	1213.7	100/155	-	1 11/3	11.34.35	1069	11/3	1 135	21042	1 30062	32	1 500	1800.05	1 1404.85	1 1440.44	1 14.00	1 142/21	14152/	12/1.06	1285.23	1285.32	1222.62	MM-10	MUDHOTARY	(5)
AM-11	617755.19/	222146753	1 1780.25	1130	6512	1 4	1 1115	0082	8021	9165		1 3/1/9/2	3234	034	1 10	83020		1007	1	1 Yes.17	-	BAL17	915.92	1 818.25	1 942.96	MM-13	MUD ROTARY AND AR HAMAER	(5) (12)
MH-12	62427456	2235034.53	1247	550	656.77	1 3	1 40	1 775.77	1 360	400	1 140	32052	132544	3.1	490	/16.27	1 663125	1 602.72	0.50.11	1 63/31	00044	654.56	652.62	845.44	1 646.4	MW-12	ARHAMMER	[2]
Mm-13	619009.21	7/22/6151	1051.40	420	631.4	<u> </u>	31 364,7	686.78	20	3643	11275	41352	40000	6.50	1 310.0	741.48	1 77523	7/4.11	1 757.74	1 1201	15:51	761.ES	750.64	760.54	1 758.4	PUHY-13	ARHAMMER	(5)
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C254	623163.42	2230015.46	192.9	5 600	\$75.96	3 3	21 800	5755	SINA.	N/A	1350	1 3/12/92	13/29/92	2 1.4	875	1 1000.98	1 1505.73	1501.73	1505.29	1 1496.05	1450.65	1491.65	1487.14	1487.9	1485.36	1014	CORED	(2)(1)(14)
15H4	619921.91	2234144.1	16572	900	257.2	1 1	31 900	757.2	Z INA	IN/A	12201	4652	142854	2 15	751	8562	1	1	1	1	1					ICHSA	00460	(5) (14)
Cr+10	622366.74	2221936.07	2307.36	1389	1 S18.7	5	71 1385	GIL7	5 NA	1 Sert	1 34	120322	13/5/92	0.2	1309	1998.76			C 0	1250.20	1	1315.51		1		121-10	100HED	(1) (14)
0411	617737.34	2721490.64	1781.5	1100	681.50	2 1	91 1100	681.5	A MIN	INA	1 34	47452	4299	2 INA	910	871.59		1	1	1		100		1	(CH-IT	CORED	(5) (14) (15
CH-12	624000.32	2200002	1207.5	a 545	662.0	2 3	71 52	682.5	AVA .	N/A	1 27	512/52	51764	ZINA	475	732.59		1		1 2	1			1	A	C34-12	CORED	(5)(14)
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P-1	615311,22	2220615.2	6 878.7	0 270	606.	1 1	51 25	619.	201	71 257	562	5 32352	1322/2	2 27	5 200	676.2	699.37	1 700.27	700,49	599.4S	698.24	696.79	696.41	67135	597.65	121	ARHAMMER	(5)
P-2	619050.91	2/2004/ 51	1744.1	5 900	714.10	5 2	91 964	789.1	5) 900	64	6.562	51 3/23/92	3/26/54	2 20	2 656	689,16	\$17.49	917.49	\$17.52	\$17.2	918.91	120,25	\$22.10	\$16.33	20001	122	AIR HANNER	(6)
. 3	613956.93	2234536.2	1241.7	7 673	51 500.7	7 18	11 66	576.7	7 61	663	1 1	6 322192	4/2/9	2 18	3 500	681.77	1 736.49	735.01	735.6	7.6.19	-735.27	734.97	73132	1 2000	ובנגל	20	AR HALMER & SMCASO	(6)
4	615377.15	2230790.6	13845	0 62	5 750.5	5 3	41 62	759.	51 57	6 62	1 5	4992	4/28%	2 10	81 354	8.05				1	\$13,25	91925	633.24	Siens	918.87	PA	ARHAMMER & SOUCCISE	(5)
12-3	614425.58	2230849.3	1367.0	0 62	SI 76	21 3	71 67	5 71	21 57.	5 62	5.	5 4115	4289	2 20	21 58	852	1	1	Second Second			918.08	841.75	915.75	917.75	64	ARHAMMER I SALCUSE	(6)
2.6	619199.92	7757275.8	10625	1 42	5 6275	1	40	643.5	1 30	405	1 5	5 4/2054	4000	2 28	31 285	767.51	791.36	790.68	786.02	782-38	1 77951	775.76	772.42	769.01	766.74	12-6	AIR HAMMER	(6)
2.7	619091.96	2703315	1050.9	6 42	5 625.9	61	01 42	3 627.	5 37	3 42	5	5 4245	4/26/9	2 24	2 275	17596	756.29	765.39	1 755.79	75275	75434	753.57	750.28	17530	751.84	12-7	ARTHANMER	(6)
P.s.	619050.92	1 27.0119	3 1050.6	0 40	08 6501	61	01 37	3 677.	5 32	31 37	1 5	5 4258	4265	2 22	3] 155	836.6	779.02	780.71	774.68	767.1	1 705.14	.784.35	763.53	752.14	762.5	P-8	AR HANNER	(6)
2.0	1	1	11000	50	51505'	1 2	01 52	51 51	0 47	0 52	552	5 4295	5562	0.2	5 475	350		1 600."	1599.58*	600.25	600,25	24.003	569.5	601.75	569.55	P-9	AIR HAMMER & SALCASE	(6)
P-10	1	i	11120*	67	51445'	1 10	01 67	5 44	51 62	51 673	1 5.62	SISTINZ	511/5	2 23	31 570	550*		591"	1591.21	1 591.41	581.15	591.58	55025	1 552.41	590.57	P-10	AIR HAMMER & SANCASE	(6)
12-11	1	1	1900*	48	51445'	1NVA	1 47	0 37	2 35	01 47	1 5	5 5125	2 5/18/8	2 32	51 425	505	1	576"	1577.31"	577.06	571.67	578.57	577.8	580.34	5/8	P-11	AIR HAMMER & SALCASE	(6)
19.65			1847	50	01342	IN/A	1 50	01 34	21 45	01 500	5.52	5 520%	2 6/3/92	24	81 420	472	1	-	1	502.25	522.75	503.56	502.00	503.81	500.61	P-12	ARHAMMER & SNICKSE	(5)
5.12		-	1328	72	5 615.	1	01 72	51 63	51 57	5 72	5 5	5 67.62	6202	20	1 650	678	1	1	1	800.25	800.71	601	800.06	802.41"	2 801.66	P-13	ARHAMER	(5)
1.13	Planet Dill	IN THE REAL PROPERTY.	NS. HOLY	IT SURV	EYED						(5/14	VING DH	LING		_		(LOELU	L GALMAN	achie	SALLIE	SCALLO	3						
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BOREHOLE NO.	NORTHING	EASTING	ELEY,	DRILED	ELEV	BECROCK	DEFTH	ELEY.	FROM	10	SEE	BEGIN	END	CLISING	TO IST WATER	WATER	EEV.	SWL ELSV.	EEV.	ELEY.	BEY.	SWL BLEY.	SWL BLEV.	SWL BLEV.	SWL EEV.	NO.	ROMANS	
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NOTES:	* APPROXIN = READING A	ATE ELEVATION	NS MITHIN ONE	EFOOT								6										•						
					- 19	Ę	÷.			-												_				-	UPDATED 827/92 UPDATED 827/92 Escie Mourtain Lendit, Rivenide County, Calibrit MINE RECLAMATION CORPORATION	a
L				-			-				8		-		1.00	_			- 0							<u></u>	0574	2107



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		-			_	_		ENGINEERS
PROJECT: EAC	LE HOUNTAS	N			HOLE /W	EL .	WW-1	
LOCATION :					DUMETO	a: 10*		Ling Bash, GA
JOB NUMBER :	0187073.03				TOTAL D	EPTH: 4	eoc '	1731 48 - 1844 745 (20) 47 - 548
GEOLOGIST / EN	GINEER: S.	GARBA	ссю/к.	USTER	DATE ST	ARTED :	APRIL 27, 1989	
CRILLER: POR	NEER				CATE CO	MPLETED	- MAY 18, 1989	
DRILL FIG : FA	UNG F8				SAMPLA	KG DEVICE	l: <u> </u>	
CRUING METHO	DO: MUD RC	TARY	10.02		PAGE :	1 0	F 7	
DEPTH SAMPLE	CONFLE	TION DE	7AL	SUPLE	aLOW COUNTS/ FOOT	LISCS SYNUBOL	DESCRIPTI	Сн
0-1-2-			10" DUMETER LOCKING MCMLMENT COVER				D'RECT AIR ROTARY U STEEL CASING	නඩා ග පෝ
3			8				LIGHT TAN SILTY FRE COARSE SAND WITH 2 BOULDERS > 1 FOOT BOREHOLE J GRAVE.	TO VERY S'N GRAVEL TO 2 OBSERVED N IS WOSTLY
7	SOULLE B PC		10" DAMETER STEEL				AND KINOR MAGNETT	TE-HEMATITE
9-					Î.		l -	
10								
						1		
"	*						MUD ROTARY	
13 -					1		MUD REMOVES FINES	
14-				1		ļ.		
15-			CONCRETE					
16			CHOUT					
17								
18-						1		
19-								
20-								

BORING LOG

CENUMBER: 018	MOUNTAN 7073.03	HC	GE :	9: MW-1 3 OF 7
DEPTH SAUPLE	COMPLETION DETAIL	SULPLE , COUNTS / FOOT	USCS SYMBOL	DESCRIPTION
20 CR				
-				SAME AS ABOVE
×				40% OLLARTZ 40% FELDSPAR, 20% DARK ODLORED GRAINS
- 1				
- [∞]				
-	₩ ₩.			
106-	CULETER			
-				CUTTINGS ARE COARSE SAND SIZED
110				50% OLIARTZ 40% FELDSPAR, 10% CAP
_				
115				
- 1				
120-	000			45% OLARTZ 40% FELDSPAR, 15% DAF
	GROUT			COLCRED GRAINS
×				
		1 1	8	
130				
		1 1		
136-				
140-				
			l	
145-				
				SON QUARTZ 35% FELDSPAR, 15% DARK COLORED GRAINS
150 -				
	N231 K34			

OB NUM	BER: 0187	073.00			PA	SE :	4 OF 7
DEPTH (FEET)	SAMPLE	COMPLETION	DETAL	SMPLE	COUNTS /	uscs Stwaal	DESCRIPTION
:56-	1						
-				1			45% OUARTZ 40% FELOSPAR 15%
160 -							DARK COLORED GRAMS
-			8				
166 -							
170			ST.				
			NO PYC			g - 2	
175							
_							
180-			8				
_	a la		×.				
:85							
-			8				
190-			CONCRETE				190 - 245" SLT - CLAY, VERY LITTLE
_			GROLT				SAND IN CUTTINGS, SCOTT DRICLING
196-							
-							
200-							
-			8				
206 -							
-							5.
210-							
-							
215							

BORING LOG



BORING LOG

EPTH FEET)	Sample	50	WPLETICH D	ETAL	SMPLE	BLOW COUNTS/ FOOT	uses Stubal	DESCRIPTION
چ ا				13 NONTEREY SAND UNCCES				284'-200' COBBLES - BOULDERS
» ~		S* CHAMETER	alesson a				3	
~		80410ULE 80 PAC		ACLE CAVES				COARSE SAND SZED CUTTINGS, 30%
								QUARTZ JOK FELDSPAR, 10% ERDCTE
»								
5-								318' COBBLES - BOULDERS
				SOL SOL				
-								2281 - 3301 COBBLES - BOULDERS
8		80°.						
-		SLOT PVC						
_								

DEPTH SAUPLE	COMPLETION DETA		SUPLE	BLOW COUNTS/ FOOT	uscs smuaca	DESCRIPTION		
100 100 </th <th>BRA REAL</th> <th>KLE KLEME SOL</th> <th></th> <th></th> <th></th> <th>WATER AT 350 ? NUD TANS OUT 374' - 377' SAT - CLAY VERY LITTI SAND IN CUTTINGS, SLOW DRILLI 380' COBBLES - BOULDERS OLARSE SAND SIZED CUTTINGS, OLARTIZ 30% FELDSPAR, 30% IF ORE EPIDOTE, MARC ROCK FRACMENTS 386' - 400' ANOULAR CHIPS OF II ORE TO 0.2" T D = 400'</th>	BRA REAL	KLE KLEME SOL				WATER AT 350 ? NUD TANS OUT 374' - 377' SAT - CLAY VERY LITTI SAND IN CUTTINGS, SLOW DRILLI 380' COBBLES - BOULDERS OLARSE SAND SIZED CUTTINGS, OLARTIZ 30% FELDSPAR, 30% IF ORE EPIDOTE, MARC ROCK FRACMENTS 386' - 400' ANOULAR CHIPS OF II ORE TO 0.2" T D = 400'		

UHING	LU	G					_	_	SCS
PROJECT: EAG	LEMOUN	TAIN				HOLEIN		H 4 / MW 2	2711 Long Boost Brok
LOCATION :						CUNET	R: 10*		Lang Brand, CA
CB NUMBER :	0187073	90				TOTALD	EFTH	455.	1213) 438 - Mara FALL(2131427 - 3868
GEOLOGIST / EN	GINEER	2.G	AREAC	c:o		CATE ST	ARTED .	MARCH 25, 1990	<u> </u>
CRILLER BEY	ж					DATE CO	MPLETE	D : APFUL 4, 1990	
CRILLAIG . POR	TACRILL					SAMPLIN	G DEVICE	CYCLONE	
DEVILING METHO	D. AR	RATOR	Y/MU	D ROTAR	Y	FAGE :	1	OF 9	
FEET I	cow	PLETK	XN DET	AZ	SAMPLE	BLOW COUNTS/ FOOT	USCS SYMBOL	DESCRIPT	
								START WITH AUGER T	TO SET
	·.			HONCHENT			SC . GC	0 - 15 - TAN - LIGHT E	ROWN CLAYEY
2-	DAMETER							BOULDERS (TO 6 * C	COBBLES AND DBSERVED);
3-	SLAFACE CASHO							SUBANGULAR TO SU GRANITE, QUARTZIT	BROUNDED; E, FRON ORE; DRY
4-									
5-						C	1 3		
6-								1	
		8		CONCRETE	4				
-				TO					
9-	0			SUIVERSE		l I		HAWMER	TH 8 DOWNHOLE
10-	5								
11-		8			1		1		
12-								CUTTINGS SEGREGA	TE IN CYCLONE
	CARSON								
13 -	CASING .							l	
14-	COUPL NOS								
15-							SP	SAND WITH GRAVEL	TO 1 OBSERVED,
16-								ALTERATION, CALC	SILICATE ROCK
								SMALLER FRACTION	IS MORE ANGULAS
							1	(PROGMENTS OF LA	HOER HOURS)
18-					1				
19-									
20-			1					20 - SUGHT CAVING	

BORING PROJECT : EAGLE MOUNTAIN HOLE / WELL #: BH 4/ MW 2 PAGE 2 OF 9 JOB NUMBER: 0187073.09 SAMPLE COUNTS : DEPTH USCS COMPLETION DETAIL SAMPLE DESCRIPTION (FEET) SYMBOL FOOT 30---40 - FINES ARE LOST FROM CYCLONE SP 40 -COARSE SAND AND GRAVEL TO 2" OBSERVED, ANGULAR TO SUBROUNDED, GRANITE, RON ORE, QUARTZITE; NO CEMENT OR CLAY OBSERVED 40" - 45" - BEGIN TO GET INTO CEMENTED ZONE, SEVERAL OF THE 0.1 - 0.2 " GRAVEL GRAINS HAVE TAN CLAY COATINGS 50 -CARRON STEEL CASING WITH WELDED COUPLING -_ SP . GW 60 . SWITCH TO S . TRICONE SIT 5C ----SAND AND GRAVEL TO 1 " OBSERVED. ANGULAR TO SUBROUNDED, WHOLE CLASTS AND PIECES OF LARGER -FOCKS. NO CLAY OR CEMENT: GRANITE, QUARTZITE, IRON ORE, PALE GREEN MARBLE, EPIDOTE; DRY -.0 --75 - TRACE CEMENT ON 0.1 - 0 2" GRAVEL 80 -80 - 85 - SMALL PIECES OF GRAVEL ARE PARTLY COATED WITH CLAY CEMENT, LARGE QUANTITY OF FINE BROWN CLAY IN DUST FROM CYCLONE. COHESIVE WHEN WET: DRY

BORING

PROJECT : EAGLE MOUNTAIN

1.0		_	
	WELL	:	1

BH 4/ MW 2 PAGE 3 OF 9

DEPTH SAMPLE	COMPLETION DETAIL	SWIPLE	SLOW COUNTS/ FOOT	USCS SYLIGOL	DESCRIPTION
20 1 100 1 110 120	SUMETOR SUMETO			SP SP	95' - GRAVEL HAS CLAY COATINGS, VERY LITTLE CLAY IN FINES 100' COARSE SAND WITH CLOS GAVEL FINES ARE NOT COHESINE WHEN WET: GRAVEL HAS SAND GRAINS CEMENTED TO IT, DRY 105' - 110' SAND WITH 10 - 20% GRAVEL TO 1', VERY LITTLE RINES; GRAVEL HAS CLAY CEMENT COATINGS, MOSTLY SUBROUNDED; GRANTE FINE GRAINED CALC SULCATE ROCK EPIDDTE, WITTE CULARTZITE, RED BROWN VESCULAR VOLCANIC OR DIKE ROCK
	0000000			SP	125 - SAME AS ABOVE
130				s	P 135'- VERY LITTLE FINES, GRAVEL IS MOSTLY ANGULAR QUARTIZITE FROM LARGER POCKS: SUBROUNDED GRANTE AND FINE GRAINED CALC SUCATE POCK INS CLAY - CEMENT COATINGS
				5	SC 145" - 150" - CLAY RCH ZONE WITH COARSE SAND AND GRAVEL TO 0.5" CLAY IS LIGHT TAN (REDORN BROWN WHEN WET), GRAVEL IS ANGULAR TO SUBROUNDED, GRANTE, QUARTZITE BLACK FINE GRAINED MARC DUAR TO IRON GRE, SOME PIECES HAVE CLAY COATINGS; DRY

BORING

DEPTH	SAMPLE		010711	acow	USCS	DECADIONAL
(FEET)		WHITLET		FOOT	SYMBOL	LESCHIPTICH
150		4 ODMETER STELL CLISHO			50	165'+ - CLAY RICH ZONE WITH SAND - 20% GRAVEL TO 0.5*(MDSTLY < 0.3*) OBSERVED, SUBANGULAR TO SUBROUNDED, CLAY COATHIGS ON SOME PIECES; META- ARKOSE, GRANITE, OUARTZITE, IRON ORE: DRY
180		WTH WELDED COUPLINGS			sc.ac	180' - 185' + - CLAY RICH ZONE WITH COARSE TO VERY COARSE SAND AND GRAVEL: GRAVEL IS ANGUAR TO SUBROUNDED, GRANITE, QUARTZITE, IRON ORE; DRY
190			0000000		cı	150 *- CLAY FRCH ZONE WITH < 20% SAND AND GRAVEL, CLAY IS UGHT TAN (MEDIUM PINK- BROWN WHEN WET), GRAVEL INCLUDES GRANITE, IRON GRE (MAGNETITE), DIGRITE, OUARTZ, EPIDOTE
200	8				SP · GW	196 - COARSE SAND AND GRAVEL TO 0.5 *, MOSTLY ANGULAR CHIPS OF GRANITE AND IRON ORE (MAGINETITE)
	1998 - F. S.				\$3	205 - CLAY WITH SAND AND GRAVEL TO 0.5 * OBSERVED, ANGULAR TO SUBROUNDED, GRANTE, IRON ORE, QUARTZITE, EPIDOTE; DRY

134	120		1 -
D	Un	IN	u

SAMPLE	COMPLETION DETAIL	SMARE	BLOW COLNTS/ FOOT	USCS SYMBOL	DESCRIPTION
	4' 	E71 62		5P 50-32	225 - COARSE TO VERY COARSE SAND WITH APPROXIMATELY 10% GRAVEL ROUNDED GRAINS: DRY 220 - CLAY WITH SAND AND GRAVEL GRANITE, MARIC DIKE ROCK, QUARTZITE GRAVITE, MARIC DIKE ROCK, QUARTZITE GRAVEL TO 0.7 'OBSERVED, GRAVEL IS ANCULAR TO SUBROUNDED, GRANITE, ENDOTE, QUARTZITE, IRON ORE, WITH CLAY- CEMENT COATINGS, DRY
250					

BORING

CB NUM	BER: C	187073 09			PA	G€: 6	QF 9
DEPTH (FEET)	SAMPLE	COMPLETION DE	TAIL	SAMPLE	BLOW COLNTS FOOT	USCS STUBOL	DESCRIPTION
280		4 Sumetile Sum	CONCRETE ORQUE TO SURFACE			S₽ • GW	2801-3001- CLAY WITH CCARSE - VER COARSE SAND AND GRAVEL TO 0.7 OGSERVED, MOSTLY ANSULAR CHU OF OLUARIZITE AND GRANITE; SUBROUNDED - ROUNDED IRON ORE META-ARIKOSE, GRANITE; DRY
310 +				-		SP	310° - CLAY WITH SAND AND «10% GRAVEL TO 0.5° OBSERVED, SUBROUNDED, DORTE, FINE GRANIED CALC SUCATE ROCK, QUARTIZITE, MARC DIRE ROCK; AGGREGATES OF CEMENTED SAND; DRY
320						SR-GW	225 *- CLAY WITH SAND AND 10 - 20% GRAVEL TO 0.5 * OBSERVED, MOST ANGULAR TO SUBANGULAR, GRANN CULARTZITE, FINE GRAINED CALC SUCATE ROCK; SOME GRAINS HAVE CLAY COATINGS; DRY

BORING

EPTH SAMPLE	COMPLETION DETAIL	SUMPLE	ELOW COUNTS/ FOOT	USCS STHEOL	DESCRIPTION
130	200000000			sc	200 - CLAY RICH ZONE SAND WITH GRAVEL TO 1 * OBSERVED. SUBANGULAR, GRANITE, DRY
				CL	340"- 545"- CLAY WITH AFPROXIMATELY 10% SAND, CLAY HAS A TRACE OF INDISTURE 346"- 347"- TRACE MOISTURE IN CLAY, GRAVEL HAS MOIST COATINGS
350	С				
360	20000000			sc	365 - CLAY WITH SAND
370	SENTONITE	0			אוי איני.
	584. 	IL IL IL			375 - DRY
380	25' 5'ADMLE33 5'TADMLE33 3'LANK 24LANK 24LANK	BCTRC NECTOR		G	COSSERVED, MOSTLY FIRE GRAINED CAL SUCATE ROCK CLAY IS VERY SUCATE Y MOST

BORING

DEPTH (FEET)	SAMPLE	COMP	LETION DE	TAL	SAMPLE	BLOW COUNTS / FOCT	USCS STUBOL	DESCRIPTION
3990					4-13-00 WaTER LEVEL ATTOR DEVELOP- WENT - 200'		SP	390 - 396 - COARSE SAND AND GRAVEL WITH AGGREGATES OF SAND CEMENTED TOGETHER
400 					S 20-00 Waiter LEVEL Ruses to 400' OVERWIGHT		SP	400 - LET HOLE STAND OPEN FOR 15 MINUTES - NO WATER 405 - COARSE SAND WITH MINOR GRAVEL GRANITE AND IRON ORE (MAGNETITE)
410	81 32 52 57 57 50 29	07 AUNA ESS TEL XEEN 4. 450		43 MONTERY SAND				ж. е
420								INJECT WATER
8	825	USH READED WPLINGS					SW	425 '- 430 '- FINE TO COARSE SAND (NOT TYPICAL) WITH 10% GRAVE TO 0.3 ' ORSERVED. ANGULAR, CLEAN - NO CEMENT, MOSTLY GRANITE WITH TRACE MANGNETIC IRON ORE
-								435 ' - 440 ' - DRILL THROUGH BOULDERS OF IRON ORE, CUTTINGS TURN RED
···-							SP	440 - CCARSE SAND GRANITE, GLASSY QUARTZ, MCONETITE - HEMATTE IRON ORE
-								TD = 440 ' WITH AIR ROTARY

Site / Location			1	Saut Ca		1.6	or ano	. Die	Count Elevano	Baratela No	1			1.1			1	1	E
CENTRAL PT					27692	1.		16	2311 35'	WW - 10	20 14 CV2-			×	~~		2	- 8	Material Classification
Coordinates / Stationing				Complete	on Cale 309/92		R. R	BY B. W	LCOXCN. 8 MARSH	Botom et Borencie (ogs)	Water Cata Drilling Cata Personnel C	langes	NO SI	1 HOI	Recover	Della Plat	100484	Depth (h	Physical Description
Dr.2 Make and Model			1	Dalling I	Artico	1	SAL P	uid .	Top of Bedrock (bgs)	Fint Encountered There D				a l	<u> </u>			- 13	
Dolling Castractor			-	Sell Can	00/10/0	ARY I	cfal C		Total Number of	State Water Leve	1992								
TONTO DRILLING SERVICES	1	×	1	15	1 15 1/2	110		N/A	Core Bares N/A	1			Air Hanner		2 hrs			370	2500 - 380 0" - RON OFF: Dark gray, brown, magnetra-noh; hard, extremely strong; minor groen / brown
REMARXS: Maser Data Drilling Data Personnel Changes	1 SIL	00U / 14	Partice /	# 1410	reton (II)	(ę) (yd	iwhi Loo		Matienal Cla and Physical Di	95073300 95073300					30 mm				calo-secures, activoria, tana yalow / brown quartera.
Foremant: Wayne Beaupre	18"	ê	\$¢.	102	ŝ	å	12	No samo	was takan belone 310°.									380 -	Light yalow to reddish brown, sne granad; hare, year stoog, mitrogreen cale-silimites (dooside / actorize);
Drill Crow A (Montong) Driller: Frank Hight Helpens: Jen Willer	cone																	-	
Criti Citer 8 (Attempon) Dider: Ledate Bronson		11									397 decto at 124	5 a.m.			397			390	*
Halpan: Rick Gostevich Wat McGruay			310	-		310	-	310.0 - 3	170 07 SAON CRE: prov. magnetite-non; compact nong mingr guarterie, caco-si	s, hard, extremely strong: calles	asided 20" mot. and m drailing at 12:52 a.m.	on 02/15/52			25			1	
Fra 310 bec			55 mm				-			nave i					15 min			-	2
added 27 nd, and resumed chang at 505 p.m. on 02/16/92							-			640								1	4000 - 420 0 - FON ORE
						320		1200.0	350 COUNTIZE Arown, she praned: very h Godes and Gassemanated inc	ard, very strong, minos sgnetræmematrægoettike								400 1	Dark pay to troom mapeete-ternate; hard, entremely strong minor green cale-socalas (dopade / actnoite).
							-					2107			4107			1	4 1
330' depth at 6:00 p.m., added 27' rod, and resumed			3337 227	-		330					410 ² (spoth at 2.02 added 20 ² rod, and ro kniang at 2.19 a.m. o	a.m., asumed in 02/19/92		ΙÌ	20° n			410-	
chilling 20 6:15 p.m. on 02/12/92			1 17				-	1							3 has 32 ma			1	
							1												4200 - 440 5 SKARN
	14° Air Harama	ĺ				340	-	150.0 - 3 Dank (180 C IRON ORE: pay, prown, magnetie-rich; prendrown calo-silicates, a	hard, soong, ucholas, stace								420 -	Dant gray mic-simulari(diosside / anthroum); hard, moderately strong; trans dant gray iron ore.
							T.T.	yeacon	ଟିଙ୍ଗଳ ହ୍ୟାଇଥି.										SC ABORT NUC
1940° - 64403							1				4307 depth at 5:51	£			430			430	
350 depth at 7:45 p.m., access 20 rod, and resumed chaing at \$20 p.m. on 627:8/92.			20 0	1		350	1				400ed 20' rod, and r criting at 6:01 a.m. o	asumed an 02/19/52			207 in 201 min			1	
							-												
						360												440	440.0 - 450.0 CUARTZ MCNZONITE Radidah brown, fine graned; vory raint, very strong, canno dias green calo-stantias (Sopside / actinoite).
3707 depan at 10:00 p.m.											450° dapon at 6.00 added 20° ppd, and i	2							
aring ATERIAN REX 1952			370			370	1				Stary # E421	0201292	104	1 1	450			450	ASDO - 4500 MAFIC DXE
ALTHO DEAN ASTA	10	A NO.	04/9 G12	2 5-19		÷.	Th	PRA	Group, Inc		PECUNG DEA	AFFE	30	* MQ.	G125-	19	-		Berka Group, Inc
15,1108 2484	*	NA XD.	EM1 J HA	9010/1 TALA				BOR	EHOLE LOG	+ URE +	Nº 11	08 200	Al or	UWH ICD	J HAT	ALA	EAG		
ENGINEERING OUT	0	****	DAF	FELDT	EAG	LE NO	AINE	RECLAN	ATION CORPORAT	TON	STET CERT	HED THE	1	-	D AFF	ELDT	-retat.	MINE	E RECLAMATION CORPORATION
WAL DEULUGIST /. /					-					1 00	GEOLO	SIST /		1					

REMARKS: Water Data Draing Data Personner Changes	bod Site	Blows / ROD %	Automote / Recorrey	(24) (240 (240 / 5 b)	Elevadon (fi)	(v) (JdeQ	Muwin Loy	Matanar Cau Micacon and Physical Description		REMURIUS; Water Data Diffing Cata Personnel Grünges	Tod Ste	(Borns / ROD %	Adracce / Recorery	Orte Flate (Min / 6 N)	Eleration (II)	Depar (h)	S Haueral Classification and Physical Description
	14" Air Hanznar		20" in 3 hr 5 mins			450		450.0 - 450.0" MAFIC DIKE: Gray green, propyrite alteration of feldscar, trace quants.	•		Ar Hamma		27 is 1 br 25 min			530	4700 - 1000 ISON DPE Dan gray magnetie-hemaina, with shree / bronze wiened mag throughout, hard, strong.
						460 -		460.0 - 470.0' SKARN- Dark green calo-sidcates (diopside /actinotite), with 50% magnetite-hemalite cre								540 -	
470 depth at 5.47 a.m., added 27 nd, and neurod Gnaing at 5:58 a.m. on 627552			20' in 2 hrs 17 min			470 -		470.0 - S40.0" IRON ORE Care pray magnetur-watare, with shire / bronze objected mice (sendre ?) hroughout hard, strong	2	557 depon at 1:20 e.n., added 27 md, and resumed defing at 236 e.n. on 02/2042			550 20 in 4 ha 43 min			550 -	
						480 -		450.0 - 490.0° Minor dark green cale-sificates								560 -	
400" depth at 12.15 p.m., added 20" rod, and meumed criting at 210 p.m. on 02/19/22		-	450' 20' in 5 hrs			490 -		450.0 - 500.07 Increase in dark grown mitrisficator. Decrease in light groon mitrisficator.	2	570 dopth at 6.12 a.m., added 20 not, and neumed drafing' at 6.20 a.m. on 62/22/82.			570 20 20 hs 20 hs 20 hs 20 hs			570 -	
Deviation Survey + 172°.			1			500 -		500.0 - 540.07 Miror dark green said-sciences								580 -	
510" depon at 7,10 p.m., added 27" rod, and maxmed drilling at 9:30 p.m. on 62/16/92,		_	510' 20' în 2 hra			510 -			New Sector	500" depth at 2.27" a.m., added 20" md, and resursed delling at 2.45 a.m. on 02/21/62.			557 207 in 5 hn 15 mn			590 -	500.0 - 600.0" SKARN: Dark green exis-siliarize (dopside sicinoide), Nerd, extremely strong: mean magnetite.
						520 -				Denation Survey = 1 *						600 -	SDD.0 - 520.0" CUARTIZITE: Yedges (borren, the graned; way hard, way strong; minor banding of calcivitizates.
500 6000 0 1100 p.n. added 20 rod, and neuroso define g. 1253 000. 27531592			530'			530			NOOL	SIU doct at 800 sm.	10	TE	6107		-	610	
P 1108	DAT JOS DWG CHE	HO. 3 HO. 1WK	04/92 G125- EM19 J HAT F. HAR D AFF	ALA RIS ELDT	EAG		NTAN INE R	PRA Group, Inc BOREHOLE LOG MW-10 LANDRIL MARENSPE COUNTY CALIFORNIA ECLAMATION CORPORATION	o posterles	Nº 1108 Nº 1108 Engineering	2012/21	E NO. Ma NO. LAWN LAWN LCO	G125 EM15 JHAT RHAF DAFF	-19 010/4 ALA IRIS ELDT	EAG	LE MOU	BOREHOLE LOG MW-10 INTAIN LANDRILL RIVERSIDE COUNTY CALIFORNIA INE RECLAMATION CORPORATION

REMARKS: Water Data Dräing Cata Personnel Changes	Tool Sire	Blown / FOO %	Advance / Recovery	(Men / 5 B)	Elevarium (h)	Depth (N	. MATHIN LOU	Masenal Classis Seaten and Physical Description		REWARKS: Waaw Data Disting Cata Personnel Charges	Tod Size	Blines / ROO %	Adrence / Recorrey	Lift: Flaw (Min / 5 b)	flooth (1)	Maintal Log	Malamai Classification and Physical Description
	14" Air Haconer					610		5000 - 520 0° CULATIZITE Taker / Down, See praces: very hart, very story: nuror banding of calo-science.	•		13 3/4" Tá Cone		20 in 45 hm		690		EDD - 700 C ANDESTE, Mechan-dats pay, file gamed; hart, wery storg, more how one and quart; mortanne, table spedera and shows spat.
						620		5700 - 650 0° ANDESITE, Dark gray, porsymmer, hard, very strong; moner quark, montantia.	142						700		
			637	.		630	Leveluevele	EGOD - SLOT OUNTIZ MONZONITE Light years is readed, brown, the graned; hard, very strarg; minor epidical, trade calora		710° deorth as 12:30 p.m., added 20° md, and resumed draling as 7.45 a.m. on 02/25/62	ti		710 27.e 25 25 cm		710		
						640	متعالميميما	CLO C - KSOT OUARTZITE Date grame / gray: She galant, van hald vary artner; minor epidola, sternicia, tala stronta.			13 1/2 Tri Cone				720		
EST depth at \$50 p.m., atood 27 nd, and realised draing at 11.01 p.m. on 62/52/52			850 20 in 12 tra 14 min			650		5500 - 5700 ANDESTE Cax gray, porphytrac: haid, very surong: numer quartz, monzonse.		737 doorn at 11:00 a.m., added 27 rod, and neumed delangtas 11:15 a.m. on 02/25/92			730 20 m 5 m 20 m 20 m		730		720 0 - 7505" IPON ORE Dark gray magnetishermatis; hard, strong; minor epidote.
Sneak in hydrauúc hose, rig stus down, Resumed chúng at 6:16 p.m. on 020252.						660				-	12 34 Tá Core				740		
577 dopth at 11:00 p.m., added 20 rot, and resumed draling at 11:15 p.m. on 02/22:52			27 27 15 hr			670		<u>8700 - 880 0° CUARTZITE</u> Light gray to care gray pream; very hard, wery strang; menor kinocrae.		750° Gepch at 4:35 p.m., accard 20° rock, and resumed chilling at 4:50 p.m. on 0272592.			750 27 28 29 25 25 25 25 25		750		750.0 - 750.0" ANDESITE: Medicam-dark gray, fine grazed: Aard, wey strong: manor into a kino sako quarta monzanina, table epidica and Emonta staat.
						680									760		TODO - TOO' CUARTITIE Tan gay to gay press, has graned; way hard, vary stong, moor knowns starting.
500 6000 x 300 p.m., 2000 20 nd 2010 p.m., 2000 20 nd 2010 p.m., 2010 p.m., 2010 p.m., 2010 p.m., 2010 p.m., 2010 p.m., 2			6907			690		600.0 - 730 0" ANDESITE:		The depth as 7.15 pm. added 22 rod, and returned draining as-250 pm. an-252 552		TE	770		770		7700 - 7805 ANDESITE
Nº 1108	195833	4 HD. NG HO. KANN KCD	G125 EM15 J HAT A HAT	ALA RAIS FELDT	EAG		UNTAB VINE	BOREHOLE LOG MW-10 HIANDEILL EVERSIDE COUNTY CALLEGENIA RECLANATION CORPORATION		Nº 1108	2 Constant	8 NO, 19 NO, 14 NO, 14 NN 14 D 14 D	G125 EM19 J HAT R HAR D AFF	19 010/6 ALA RIS ELDT	EAGLE NK		BOREHOLE LOG MW-10 AN LANDFILL RIVERSIDE COUNTY CALIFORNIA E RECLAMATION CORPORATION

REMARIOS: Water Data Drilling Data Personnel Changes	tod Sre	Blows / ROD %	Adrance / Recovery	Drift Fiate (Min / 5 k)	Elevador (II)	Depti (h)	Murekal Log	Meternel Cassification and Physical Description	REMARKS: Weiter Data Drifting Data Personnel Changes	Tod Sire	Rews / BOD %	Advance / Recovery	Driti Rana (Min / 6 b)	Elevation (II)	(a) Chop (a)	Mainted Log	Meseral Cassification and Physical Description
	12 Ster Tri Cone		27 a 28			770		7700 - 780 0° ANDESTE Macum Di Gart gray, She grashel; haro, way scoreg, minor quartum and landon stan, trade iron one and landon.	-	13 3 Tri Can	•	25 in 2 Ma 45 min	Í		850		8500 - 6600 OUANTOTE Logi prey pres, the praned; hard, very strong; minor eth one and anceste.
			×			780 -		7800 - 7000" OUARTZ MONZONITE: - Lega yakew to malash bitwin, ine graned; hard, wiji satorig, mikor tran ore, taua bisotra saah.							860		8000 - 800 (F_ANDESITE Light to deal green kne grundo; hard, reg scong, close knonne, ton ore, tade pyrta.
97 čeph z 10:30 p.m., d 27 rod, and resumed ng zt 12:01 a.m. on 02/75.92.			7507 20 6 to 10 20 min			790 -		790.0 - 810.0" CULATZITE: Light party priver, the grained; very htm. very strang: mixor from one.	\$70 depth at 730 p.m., added 27 rod, and resumed draing at 7.45 p.m. on 02/25/92.			670			870 ·		u.
encoon Sunney = 2°	13 1/2 Tri Cone					800 -									880	****	
ಗ್ ರೋದ್ ಖ ಕಿ.25 ೩.ಇ., ಡ 20 ಇರ, ಖರ ಗಾರ್ಟಾಜ ವು ಕ.35 ೩.೫, ರಾ 02.2652.			810 27 in 2 h3		-	810-			· •			230			890-		890.0 - 970.07 CUARTOTE Gray - graen, the granec, very hard, very strang; minor kodola
× ,						820 -							1		900		
30' 68-521 월 10:45 a.m., 15 180367 58-80 54-70 62 22' rock, and resumed 19 24 4:53 0.m. 00 62:25-92.	13 34 Tá Care		8307 227 n 2 hrs			830		BIDD - 650/C ANDESITE, Destry green to gray tab. She graned; hard, very storg, minor ton ce web dissertanted grays, gray finontia,	910° doph at 204 a.m., added 20° rod, and meurod dhimg at 219 a.m. on 02/27/92.	13 1 7/ Co	2	910 20 3 hrs 16 mit			910		
			57 man		and the second se	840									920		922.0 - 930.0" Trace menoike and syme.
ESO GEODI EL 430 2.M. ESO 25 TOD (ANTO SEL MOD STOL 25 COSID. 25 (MOD) TOD (SEC STOL 25 COSID. 25 (MOD) (SEC) SEC COSID (SEC)	-		650 04/92	2		850	The	ASCA - 680 F CHARTERE	estor depth at 5:35 a.m. added 27 md, and menned anism s. Artifician or 27:21,52		DATE -	- 04/9	2	15	930	The	PRA Group, Inc
ANNO 1108	C C C C C C C C C C C C C C C C C C C	NO NO.	G125 EM15 J HAT R HAT	ALA RRIS	EAC	SLE MOI	MIAN	BOREHOLE LOG MW-10 LUNDFIL EVERSIDE COUNTY CALFORNIA		- AM	200 M	RHJ	TALA TALA TALA TALA TALA TALA	EAC	GLE MO		BOREHOLE LOG MW-10 IN LANDELL BINERSIDE COUNTY CALLEDS RECLAMATION CORPORATION

							_			_	-		1 1		_	
REMARXS: Weber Data Drifting Data Personnel Changes	Tool Size	Blows / POD %	Adramos / Recovery	Drell Fraise (Men / 6 b)	Eleveton (h)	Depth. (S)	Material Log	Material Classification and Physical Description	REMARKS: Water Gata Draing Gata Personnel Charges	Tool Sire	(Bows / AOD %	Адчансе / Песичеу	Dell flate (MAN / 6 B)	Elovation (h)	Ompth (N)	B Hatanal Cassification and 3 Physical Cescroton 3
	13 1/2" Tri Com			1	1	930		800 0 - 570 C CUART2TE Gary - press, his granet, wey hard, wey struck infor dedicat,	5	3 3/4" Tri Cone				[1010	1910.0 - 1070.0" ANDESITE: Dati green to gray, fire graned; hard, wey strong; tace smorre.
4.0																1010.0 = 1070.0" Sighty perphymic tase magnetia.
				ŝ		940			Lost enclant.						1020 -	
								(m)								. *
	13 3/4"					950			1030' depin at 6:25 a.m., 0301/92						1030 -	
Ð	Cone														-	
						960									1040 -	
															-	
1						970		970.0 - 990.0" ANDESTE. Dark emer. (ne craned; hard, very stone;	* * <u>}</u>						1050 -	1050.0 - 1060.0" Epidora, accinocia
								minor quarters, race imova.							-	
	ł		1			980			200						1060 -	1060.0 - 1070.07 Trace case cuart.
e -																
					-			900 - 1010 CUAFIZTE							1070	1070.0 - 1080.07 IRON CRE
						990		Long prein to gray, and grauned; viewy hand, viewy strang.								Dark gray magnesse-henaster, hard, storing; abuncard pyrte, minor tremokle.
Destron Surger = 1.5*				ļ			1	1000 - 1010 01 Minor may be fatt grave anderlia.								
						1000									1000	1580.0 - 1090.0" Trace andaste.
1010' depth # 317 & m.						1010	1	10100 - 1070 M JURE TE	ESTERED GEOLOG			1097			1090	1090.0 - 1195.0" ANDESITE:
NG DEAN AFFE		478	1 1010 04/9	12 .	İE	11010	Th	e PRA Group, Inc	A Catho was are and	- 10	TE NO.	04/92 0125-	-19		E	The PRA Group, Inc
AP 1108 A H	A		EMI	19010/9	1			BOREHOLE LOG	Lain Ber Child	DR	G 80.	EM19 J HAT	010/10 ALA			BOREHOLE LOG
A ANSING MINT	11		R HA	ARIS	EA	GLE NO	VINE		ENGINZERINO GEOLOGIST	2	F0	R HAR	RIS ELDT	EAG	LE MOU	NTAIN LANDFILL RIVERSIDE COUNTY, CAUFORNIA INE RECLAMATION CORPORATION
RUL CEOLOGIST /	-	-	_		-				PAR OF SUIFORM							

	1	1 1		1			-			I.		T i					6.5	
REMARKS: Water Data Drifting Data Personnel Changes	Tool Stee	Binms / BOD %	Autonce / Recursey	(Min / 6 A)	Elevation (b)	(V) Uda	Historia Log	Material Classification and Physical Descrotion		REMARKS: Water Data Onling Data Prisonnel Changes	Tool Site	Blows / ROD %	Adrence / Recorery	CALL FLAND (MAn / 6 N)	Elevation (II)	Depth (6)	Muterial Log	Malenal Clause Frazion and Physical Description
	13 34' Tri Cone					1090		10900 - 11950 - ANDESTE Dark green to back, fee grained; haid, way storeg, nihor magnetie and prica, trace quirt, evolue, tennole, botta,	-		13 1/2" Tri Cone					1170		1000 - 11950 - ANDESTE Date green to black, Sne graned; hard, view store; minor magnetia and pyrme, stace counts, spoote, transitio, botte,
						1100					•					1180		
	13 1/2 Tri Cone					1110 -				<i>x.</i>						1190 -		•
						1120				1207 ఈ భా జెళ్ళి బా., on 030232						1200 -	كسكيد فيدفينه بطيف فيطبطه	11950 - 12250° CUARTZITE, Light green - grap, why low graned; wey hart, wey stong: meer charse, take boots.
тў;						1130 -										1210 -		12120 - 1235.0° Minor dark green to black andiece, trace lincovite state.
						1140 -		1140.0 - 1150.0" Madum gray-green; marot quartum and epicole.		1227 dech z 1201 a.m., on 626332	7				1	1220 -		1220.0 - 1225.0" Trace magnetite.
						1150		1152.0 - 1195.0" Dark gray - graen.							1	1230		
						1160 -		1163.0 - 1195.07 Trace magneta.		1247 dech z 5:27 a.m., on 0302392					1	240 -		12350 - 14300 - ANDESITE Dark green to black, fine graned, hand, very strong, mithor magneties and epidole, race knows stain
STERED GEOT	100	11	1090 04/92 G125	-19		1170	The	PRA Group, Inc		NG DEAN 455	DATI JOB	80.	04/92 G125-1	9	1	250	The	PRA Group, Inc
ENGINEERING	1003	10 HQ.	EM19 J HAT R HAF D AFF	ALA RIS ELDT	EAG	SLE MOL	NTAN	BOREHOLE LOG MW-10 LANDRIL RIVERSIDE COUNTY CALIFORNIA RECLAMATION CORPORATION	OCONTITUD.	H2 1108	CKC CKC	NQ. KN D	EM190 J HATA R HARR D AFFE		EAGLE	E MOUR Mil	NE RE	BOREHOLE LOG MW-10 ANDERL RIVERSIDE COUNTY CALIFORNIA CLAMATION CORPORATION

	-	1 0	_	1	1		1 1				2	2.3		2				
REMARICS: Witer Data Driling Data Personnel Changes	Tool Site	Umma / ROD %	Attence I Recret	Dem Flate (PAn / 6 h)	Elevation (b)	(1) 1000	Mulerial top	Muteral Cassification and Physical Description		REMURICS: Water Casa Defining Casa Personner Changes	Tool Site	Come / FAD %	Advance / Recovery	(Ma) Hale	. Elevation (1)	(w) subout	Maintal Log	Havenar Classikason and Physical Description
	13 1/2" Tri Cone					1250		1235.0 - 1400 C ANDERTE Dara grass to back fee pranet hard, wery strong, mor supplete and epidely. Hare knows. 1250.0 - 1250 Whot parties, imae systal sacra	- [13 1/2 Tri Cone					1330		12350 - 1460.07 ANDESITE Dark prese to black line graned; hurs, very strong; manor magnetie and sodora, trace Lincola sam
1257 doon a 820 2.m. on 03.0362				•.		1260		1250.0 - 1270.0" Abundarı pirk calata, nunor pux main quara.								1340 -		1340.0 - 1350.0 Trace pyrme, actinoida.
						1270		1270.0 - 1280.0" Abundam pale green quartate, minor arrynitole, calom.								1350 -		· ·
1257 Secti at 400 p.m., on 636392						1280								2		1360		
·•4;						1290 -		1250.0 - 1300.7 15% magnetie, trace pyrae.		e dji						1370 -		1370.0 + 1390.07 Abundant limentia, rece calora.
1307 depth at 554 a.m., on 0306492.	ſ					1300	ليتقمعا عيدهما									1380 -		
						1310										1390		1380.0 - 1400.0" Aburdani ampilibole.
					and a second second	1320										1400		1400.0 + 1410.0° Trace pyrta, rum cale-silcator.
22.020						1330				STERED GEOL						1410		
SEAN AFE	C.4.	ATE NO.	04/92 G125	2		4	The	PRA Group, Inc	10511-	1 05-16 - TO 10	1 1	TE	04/92	-10		1410	The	PRA Group, Inc
42 1108	0000	NG HC. NAWH NCO	EM11 JRA RHA	SOLOULS	3 EA	<u>gle mo</u> r N	UNTAIN AINE 1	BOREHOLE LOG MW-10 N LANDFILL RIVESSIDE COUNTY, CALIFORNIA RECLAMATION CORPORATION	U.S.S.ELINENIA	ENGINEERING	A LEISIS	KO NO.	EM19 J HAT R HAT D AFI	ALA ARIS ELDT	EAG	RE MOL	UNTAIN INE F	BOREHOLE LOG MW-10 LANDEIL RIVERSIDE COUNTY CAUFORNIA RECLAMATION CORPORATION

HEST END OF EAST PT				Sau	CLL CLL	1352		3014	13	3/4*	1351 48	50 ED4 MC
Coordinaum / Summery				Con	Dist.on	200	Í	5000	1 67	MININ	500.24	Bottom of Sonnow (Spt)
Critt Rio Make and Micriel		_		1 Drife	TO LLOC	1052		Orille	C FL	1	1100 07 546-004 (505)	First Encountered With Do
NGERSOLL SAND TA				1	AS +	ATUTH				2	30	3107
TONTO DRILLING SERVICES, I	NC			ISUN 16°C	Cia 00	1/210	1 19	Total Reco	Cons may 3	N/A	Core Books NVA	State Water Level (55)
REMARCS: Voise Dec Drifing Data Pecciniel Changes	kod Ste	P20 74	FIRCHING & BOX	Peceri Care Decorey	Box Nantee	Elevation #1	Crede PS		Uthologic Log		Katerial Ci ar Physicat (ຊອງແມ່ຊາແດງ ກຽ ປະຊາຊາງເທດ
Notr Shit Crox Dollar Mith Bonson Helefit Jason Vena Staten Barak Dollar Rox Gostovich Helefit Crox Helefit Crox File Dave Caso 19.0 Bottom of concurant casing.	19 C 19 C 13 JUC Hamowr						11 2 3 4 5			0 - 3.0 Gray 2.0 - 1 Gray Gray of c with Sam	ATTIFICAL FILL , General GY, LAGLAL M Mod mad justice maintain 42.0° CUARTATIE , Second Control of Lagran Standard , Sacara ,	eny 3/4 + 1/4" ens and verses , magnesie and the lease and the lease and y Smallen present wery stang.
Casing mark to TO. Resure daing an much ourses cases a case of the ourses cases of the cases	(A)	CATE IG	05	92	_		7		he	PRA	Group, Inc	0 s
Sorres	2		J S R	HATAL	A 15	EAGL	.E VK	OUN	TAIN	BOR	EHOLE LOG MW-13	NTY CALIFORNIA
ON GEOLOGIST	ATA S							mil	ic P	EUDA	ALION COAPON	<u> 117</u>

REWARKS When Cas Drilling Cas Preformet Changes	Tool Sta	152 000	FINCHINE / 100	Preset Core Recovery	Bot Darth	['eration (1)	(ii) yolog	Lihologic Log	Waterat Classification and Physical Description
	10 3'4' Ar Hatemer						70 80-		23 - 142.7 OUARIZITE. Gray, Lawgrand, solariet werd and united of carts. Standar, samendar, nadpretar and with dopade far Schamm, branchers with those Falls memori. Bandy weathered, way tand, very storig.
100 - 110° Curange to 314°.							50		85.0 - 100.0° Canuel gray.
							100-		Re .
<u>(</u> e							110		
1200 - 142 Cutarge to 34°.							120		
							130-		
1425 - 155 Ducings marry aund stass.			And the state of t				140		135.0 - 142.0 Lott gray. 142.0 - 155.0 HEWATITE AND OUARTZITE Red and gray, hee-graved with magnetize, temple and mag grays basily weathered, wey back, way song
TERED GEAN		-	06	sz.			150	The	PRA Group, Inc
NE LOS INE LOS INTEL LOS I		-C4 H3	GI A EN J I R	25-19 (19013) HATAL	2 A S	EAG	LE MOU	INTA:	

RENARKS Wee' Cara Offing Data Anarthe Churges	Tool Sus	150 006	Fractures / fool	Percent Core	Bet Merimi	tu) vassus	(ng that day	Wobgk Log	Waternal Gas miticanien and Popyical Gescription	REMARKS View Data Diffic Cau Philotta Changel	fool Site		(v) III	LINCINION / (OGI	Percent Core	Box Mandar Cleverbon (b)	Depdi (n)	Lihologic Log	Material Classification and Physical Description
155-715 যি-হোড়া হায় লহান) She and nation-graned card state.	13 34° Air Herretwi						150		1420 - 1550 - NERATTE QUARTER: Red and gay, hor-yound. 1550 - 2100 QUARTETE. Gay, for-yound, somethic samalayers and works of nagresa, kenars, ma, actorids, works, which guart, and Burby realizand, way hard, why score	20° Cutings preconversity fea and medium ratio setse.	13 3/ Ar Ham	e*					230		2100. 2750 0F WAGNETTE HEWATTE, OUATIZITE INTERMOLED; Dark pay, frequence, britte, 2020 - 2350 / Wooty magnetia, 2300 - 2500 Pyrta Integnetta in outlings.
							170-										250		250.0 - 250.0" Overease in percent magnetia and increase in percent hematia,
							180		163.0 - 150 C' Increased percent of magnetie in cultings.			A REAL POINT OF THE OWNER OF THE PARTY		**********			250		
2 (S							190		150.0 - 210.0" Approximately 40% of extings are magnetic; trais most and superture. Vereased persent of magnetic with dects.	- <u>1</u> 2							270	بالمستعدار ويتريدون	275.0 - 420.0" DUARTZITE:
	•						200								Statute of		250		Gray, the-pared, satured whiles of magnets, Some barrar Sing while (ppum, few thermatic peers with quark, hidsay and mus, Locally tanding and freaction in the quarkar, Sately weathend, very hard, very stong, chlorus, epodos, micro fo
210-225 Cutings are nowly fre and medium-graned aand solar.							210		210.0 - 2750.0" WAGNETTE, HEVATITE CULATIZITE INTERMUED: Date gray, See-parande, masile black magnesia, modish heratis and gray quartic, Mice vendes and tapanet Efregs of maky quartic, mice, accordia, and tapanetne. Barely westhand, moderatily hard, very storeg, barde, Scattared, moderatily hard, very storeg, barde, Scattared incl. staned factures.								300	والمعميطية ومروا وموروا	
The series and the se		DATE	06/8	2	-		230	The	PPA Group (pc	310.07 Centr & and of right shift on CA1552 Encounters and water & 310 Samour of the California Carried C. RT by Decourter 310 Carried C. RT by Decourter 310							310	معيميكينينية	
CENTRAL CONTRAL CONTRA		он на 246 на 04.44 04.44 снор 4.44 0	G12 EM1 J R P. H	5-19 9013/3 ATALA ARAIS	T	EAGL	E MOU M		BOREHOLE LOG MW-13 ENDFIL EVERSIDE COUNTY CAL'FORNIA ECLAMATION CORPORATION)	3 8 8 8 8	1 HQ 1 3 HQ 1 3 HQ 1 4 HQ 1 HQ 1 HQ 1 HQ 1 HQ 1 HQ 1 HQ 1 HQ 1	G125 G125 EM19 J HA R HJ	2 5-19 9013/4 TALA ARRIS	EAG			BRA Group, Inc BOREHOLE LOG MW-13 A LANDEIL EIVERSIDE COUNTY CALIFORNIA

REMARKS Were Data Defing Cata Peterne Changes	Tool Stre	FICO (X)	Frechiros / foot	PACANT COLO	Bod Planton	Elevedor (11)	لە1ھە ۋرا	Lahologic Log	Material Classification and Physical Cascingtion
310" Gegin at 7:30 a.n., on 04/1782 315" Begin mecting sone water, 320 - 337" Driter record way 391" (at when cary spaceton in Jose).	12 U4" Tá Cove						310		275.0 - 420.0" OUARTETE: Gar, the graned, satisfied vanishing of magnetic Some fination flog and spytum. Few theoretics process with quart, lettings and mean Locally barrong and insulation in the quartities. Barby wateward, why had, why stong, relocal, eacher Bit. 370.0 - 333.0" Some brecastor, more satismentine and magnetia.
337 ವಿಕಾಣ ಪ 10 ಮಿ ಎಗ್ಸ್ en 04/17/52							330-		330.0 - 340.0° Banding mena nexcube.
							340		340.0 - 355.0" Increase in porcant one leditor Seatamed exclared features, some Field with day, some banding and insaton.
350° Depth 21 10:50 2.개 60 64/71/52 350 - 360° Driller reports very 557.							350		350,0 - 355,0" Brezzakó (?), Naked, Min day and gouge (?).
				1			360-		355.0 - 375.0" ಡಿಂದರ್ಯ ಹಿರಲಾಗ ಮರ್ಕಿ ಮನಾಂತ ರೋ ರಾ ತಮಾತಾರ ಗತ್ರಮಾರವಾ ಇಂಗು, ನಿವರ್ಷಣದ ಗಂಡ, ತಮಾಂತಾ-ರಾಗದರೇತ ಇಳಿಗೊತ್ತು, ನಿರ್ಮಾತಾರ ಗಾಗ- ನಮಗಾಂತ ಗತ್ರಮಾರ್ಕ,
STOT End bay shat on 04:1752 and begin night shit on 04/1762							370-		3750 - 4200° Lott creation cray, brecosted with
TERED GEOL							360-		satared meior weives of herrätzemagnestelerosecres and veins of activolizatempolia in a calipsy gouge Seatared ron-fauned licences.
CONSTRAINTS		DATE	. 06/	92			393	The	PRA Group Inc
2 VENDING CEDICOIST		104 HG	GII EM J H R H	25-19 19013/ (ATALA (ARRIS	5	EAG	LE MOU	NTAIN	BOREHOLE LOG MW-13 LANDRIL RIVERSIDE COUNTY CALIFORNIA

REMARKS Weine Dea Dreffing Data Personnel Chingae	Took Size	140 (14)	frectures / bo	Percent Core Decorecy	Box Number	Emission (1)	Depth (N	Librologic Log	Material Classification and Physical Centrolices
	12 UAT Tri Cone						350		2750 - 4250 OUARTZITE: Gay, Sweganed, satarid venous of magnetic Some Sizaria Eling win gazan. Fen breaziec piones with quart, lectors and mice. Locally banding and feesion in the quarta. Barely weathered, winy hard, way stong. Chicks, epiclas, actor Ed. 375.0 - 420.7 Light grenish gray.
							410		ж ж
422 5° Completed drilling as right shirt on 0417/32					_		<u></u>	_	Batom of Bonahole Teat Dept 4220 lise:
ġ.							\$ 0		Elenazor: 537,48 (ee)
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							450		
FTFRED GEAL		1	060	2			470		
NGNIESNS	1000	DH D	G:2 EMT J HJ R H	5-19 9013/6 ATALA AFRIS FFELD	T	EAGL		TAIN TAIN	PRA Group, Inc Me used to the second

APPENDIX A

LITHOLOGIC DESCRIPTION

Eagle Mountain Piezometer No. 1

- 0 15ft ARTIFICIAL FILL
- 15 25ft QUARTZITE
- 25 45ft QUARTZITE AND QUARTZ MONZONITE
- 45 65ft QUARTZITE
- 65 80ft QUARTZ MONZONITE
- 80 196ft QUARTZITE
- 196 200ft QUARTZ MONZONITE WITH SOME QUARTZITE
- 200 205ft QUARTZITE WITH SOME QUARTZ MONZONITE
- 205 270ft QUARTZ MONZONITE

APPENDIX A

LITHOLOGIC DESCRIPTION

Eagle Mountain Piezometer No. 11

- 0-10ft <u>POORLY GRADED SAND</u> (SP): Trace coarse, angular to subrounded gravel; 10% fine, angular to subrounded gravei; 25% coarse, angular to subrounded sand; 60% medium, angular to subrounded sand; 5% fine, subangular to subrounded sand; brown, dry, maximum size = 25mm
- 10 20ft <u>POORLY GRADED SAND WITH GRAVEL</u> (SP): 20% coarse, angular to subangular gravel; 15% fine, angular to subangular gravel; 30% coarse, angular to subrounded sand; 35% medium, angular to subrounded sand; trace fine sand; brown, dry, maximum size = 30mm
- 20 75ft <u>POORLY GRADED SAND WITH GRAVEL</u> (SP) : 5% coarse, angular to subangular gravel; 10% fine, angular to subangular gravel; 40% coarse, angular to subangular sand; 45% medium, angular to subangular sand; trace fine, subangular to subrounded sand; brown, dry, maximum size = 35mm
- 75 135ft <u>POORLY GRADED GRAVEL WITH SAND</u> (GP): 25% coarse, angular to subrounded gravel; 35% fine, angular to subrounded gravel; 20% coarse, angular to subrounded sand; 20% medium, angular to subrounded sand; trace fine sand; brown, dry, maximum size = 43mm
- 135 205ft <u>POORLY GRADED SAND WITH GRAVEL</u> (SP): 10% coarse, angular to subrounded gravel; 15% fine, angular to subrounded gravel; 30% coarse, angular to subrounded sand; 40% medium, angular to subrounded sand; 5% fine, subangular to subrounded sand; brown, moist (due to injection of water during drilling), maximum size = 37mm
- 205 210ft <u>POORLY GRADED GRAVEL</u> (GP): 80% coarse, subangular to subrounded gravel; 20% fine, subangular to subrounded gravel; trace coarse, subangular to subrounded sand; trace medium, subangular to subrounded sand; trace fine, subangular to subrounded sand; trace fines; no dilatancy, medium toughness, medium plasticity, medium dry strength; brown, moist (due to injection of water during drilling), maximum size = 40mm
- 210- 255ft <u>POORLY GRADED SAND</u> (SP): Trace coarse, subangular to subrounded gravel; trace fine, subangular to subrounded gravel; 15% coarse, subangular to subrounded sand; 65% medium, subangular to subrounded sand; trace fine, subangular to subrounded sand; brown, dry, maximum size = 39mm

LITHOLOGIC DESCRIPTION - Piezometer No. 11 (cont.)

- 255- 270ft <u>SANDY LEAN CLAY</u> (CL): Trace fine, angular to subrounded gravel; trace coarse, angular to subrounded sand; 10% medium, angular to subrounded sand; 20% fine, subangular to subrounded sand; 70% fines; no dilatancy, medium toughness, medium plasticity, medium dry strength: brown, moist (due to injection of water during drilling)
- 270- 310ft <u>CLAYEY SAND</u> (SC): Trace fine, angular to subrounded gravel; 5% coarse, angular to subrounded sand; 30% medium, angular to subrounded sand; 35% fine, subangular to subrounded sand; 30% fines; no dilatancy, medium toughness, medium plasticity, medium dry strength; brown, moist (due to injection of water during drilling)
- 310- 345ft <u>SANDY LEAN CLAY</u> (CL): Trace fine, angular to subrounded gravel; trace coarse, angular to subrounded sand; 10% medium, subangular to subrounded sand; 30% fine, subangular to subrounded sand; 60% fines; no dilatancy, medium toughness, medium plasticity, medium dry strength; brown, moist (due to injection of water during drilling)
- 345- 365ft <u>CLAYEY SAND</u> (SC): Trace fine, angular to subangular gravel; 10% coarse, angular to subangular sand; 40% medium, angular to subrounded sand; 30% fine, subangular to subrounded sand; 20% fine: no dilatancy, medium toughness, medium plasticity, medium dry strength; brown, moist (due to injection of water during drilling)
- 365- 485ft <u>POORLY GRADED SAND</u> (SP): 5% fine, angular to subrounded gravei; 40% coarse, angular to subrounded sand; 55% medium, angular to subrounded sand; trace fine, subangular to subrounded sand; trace fines; brown, dry

APPENDIX A

LITHOLOGIC DESCRIPTION

Eagle Mountain Piezometer No. 12

- 0-10ft <u>POORLY GRADED SAND</u> (SP): 10% coarse, angular to subrounded gravel; 10% fine, angular to subrounded gravel; 45% coarse, angular to subrounded sand; 35% medium, angular to subrounded sand; trace fine sand; brown, dry, maximum size = 38mm
- 10 15ft <u>POORLY GRADED GRAVEL WITH SAND</u> (GP) : 25% coarse, angular to subrounded gravel; 35% fine, angular to subrounded gravel; 25% coarse, angular to subrounded sand; 15% medium, angular to subrounded sand; trace fine sand; brown, dry, maximum size = 40mm
- 15 30ft <u>POORLY GRADED SAND WITH GRAVEL</u> (SP) : 5% coarse, angular to subrounded gravel; 20% fine, angular to subrounded gravel; 40% coarse, angular to subrounded sand; 35% medium, angular to subrounded sand; trace fine sand; brown, dry, maximum size = 22mm
- 30 60ft <u>POORLY GRADED GRAVEL WITH SAND</u> (GP): 30% coarse, angular to subrounded gravel; 35% fine, angular to subrounded gravel; 25% coarse, subangular to subrounded sand; 10% medium, subangular to subrounded sand; trace fine sand; brown, dry, maximum size = 31mm
- 60 115ft <u>POORLY GRADED SAND WITH GRAVEL</u> (SP) : 10% coarse, angular to subangular gravel; 20% fine, angular to subrounded gravel; 40% coarse, angular to subrounded sand; 30% medium, subangular to subrounded sand; trace fine sand; brown, dry, maximum size = 30mm
- 115 130ft <u>ELASTIC SILT</u> (ML): 10% fine, subangular to subrounded sand; 90% fines; slow dilatancy, medium toughness, low plasticity, low dry strength; brown, dry
- 130- 155ft <u>POORLY GRADED SAND</u> (SP) : Trace coarse, subangular to subrounded gravel; 10% fine, angular to subrounded gravel; 35% coarse, angular to subrounded sand; 50% medium, subangular to subrounded sand; 5% fine, subangular to subrounded sand; brown, dry, maximum size = 32mm
- 155- 370ft <u>POORLY GRADED SAND</u> (SP): Trace fine, subangular to subrounded gravel; trace coarse, subangular to subrounded sand; 60% medium, subangular to subrounded sand; 40% fine, subangular to subrounded sand; brown, dry
- 370- 500ft <u>POORLY GRADED SAND</u> (SP): Trace fine, subangular to subrounded gravel; 20% coarse, subangular to subrounded sand; 70% medium, subangular to subrounded sand; 10% fine, subangular to rounded sand; trace to 5% fines; slow dilatancy, medium toughness, medium plasticity, low dry strength; brown, dry



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	-			1.00	28.0				28.0 - 65	O CUNTETE		
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sh at \$15 pn, 402/82	HG 185 HGLE	20	4	100 12	5 3.0 B		10		550 - 74 0 OUARTZ SEYENTE Phayers, catalegraves, Masty K-lekcas, with mitor maintain catal and primate. Fractures hakey, sight/ open, HerDz catang, Rock is massive, hart, sitting.		150 septi # 3:45 pm, 40492	HQ 3.85	40	5	100	- SOX		150		74.07 - 208.07 CULATIZITE Light to dark green, ins-grained, weat banding, Hard, strong, society to mo
pt 21 10:35 pt, 402:92	2405" CORE	22	3	100	6		BC		740-2030 OUATION Logis to Gat green, feedmed, weak boots banding. Mail store, septy to noderally taxuned Frances notify 45:50 and 10:50 begreet to bas, smoot, more camp to		167 depth at £15 pm, 40492	1013 2,406 COR	32	2	100	14	M	160	haant	smoot, merc calcar M 150.5 - 160.0 minor syenia dileieu
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ogist R. Reynoics ng sown for repar		45 60	1	100	mOx e		100 1		No INF HOMENA & STROM & 1 GOTTEST		150° Geoth at 12.55 am, 405.92		12	c1	1:00	117	5	180	-line -	
メタテカ 21 930 pm, 403.92		2	2	188	80		110				190' cappor as 9:25 am. 4/05/92		\$2	1	100	BOX 18		190		
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68579 at 1025 pm, 40392		52	2	100	BOX	1	120			2	200° cepth at 12:30° pm, 4/05/92 Deviation survey = <2 degrees Geolocist: R. Remolds		18	2	100	19		200	- Internet	197.0" - 208.0" hydronernal alterator
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70 0 dects # 10.02 L.m.			2	2	6						
EUSTERED GEOLOGI		CATE COB HG. DHO HG.	06/ G11 EM	92 25-19 19005 TOOA	/1		Ţ	hel		Group, Inc EHOLE LOG	
NA 1003	1 1	une .	D	AFFEL	DT	EAGLE MO	MIN	TAIN	ANDFI	L. RIVERSIDE COUNTY	CALIFORNIA

REMARKS Inter Data Drilling Cas. Pelacityse Charges	Tool Stee	(M) (D)	FINCTURE / KOOT	Parcert Core	Box Pamber	Elevation (11)	(1) (1)	Librologic Log	Materat Classification 206 Physical Description
	HQ 3.85"	10	~5	42	MOX		70		13.0 - 349.5 CUARTZ MONZONITE. Popphymic, pok gray, mecum to coarte granted.
	2,405" Core	82	4	100	6				K-ledicial phenocrysts is 3 cm, aburdari borra Mossty hard, strang: slipitly to highly traduned. tractures variable.
83.5 dech z 1135 z.h. n 040962		72	5	100	xCB		80		73.2 - 140.5 law incomes, 60 - 73 degrees to anis, weak chlories mating.
		\$2	c 1	60	1 150				
90,0" dects at 1.25 p.m.		23	cl	100	BOX		90		
		74		1	855				
		71	1	100	E O				
100.07 depth al 5.15 p.m., on 04/09/92	8	100	0	\$7	\$ 9		100-		
		72	1	100	BC				
110:0° dooth at 6:45 p.m., on 0409:92		.65	دا	100	10		110-		
					8		-		
120.0° doon at 6'40 p.m.		87	4	100	X		120-		
0105382		68	1	100	124.0				
		54	đ	100	×O				
130.0° begin at 1030 p.n., on 0406-92		87	cl	100	12		130-		
		85	<1	100	XOX		1		
140,07 decm at 1225 km., m 64/1092		57	2	100	141.0		140-		140.0" + 155.0" slightly tractured, 10, 60, and 60 degrees to azis, calone coapings,
150 man and De Charles		52	2	100	X 14				
an outcase clenter of of	21	1	7/92		1500	1	150		
The Elo	13	8 HQ (3125-	19		=	K-	Ine	ATHO DECKEDS OUP, Inc
A 108	0		EM190	205/2 DR	-				BOREHOLE LOG
× W RETTERS	100	KO I	R HA	RRIS		EAG	LE MOU	NTAI	N LANDFILL RIVERSIDE COUNTY CALIFORNIA
1 Manual Mido	714	*D	AF!	ELDT			м	NE	RECLAMATION CORPORATION

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	1		Ι								1	1	1	1	1	I	1	1	
REMARKS Noter Data Drifting Data Pressree Calinges	teol Sue	100 (01)	FIREWALL 1 1001	Percent Core	Bor Nartes	Eleverticon (FI)	Depth (1)	Litrologic Log	Meisra: Classification end Physical Description	REMARXS Wear Cea Drilling Dea Preamw Charges	of Site	(1) 00	when / bot	acters Core	or Martine	bradies (1)	uth Ci	April (c)	Waterat Classification and Physical Description
	HQ 3.45	\$5	1	100			150		120 - 349.5° CUARTZ MONZONITE. Porstymic, pok gray, macium to coarse grained.		HC	e	14		211	4	2	30 j	13.0 - 349 5 CUARTZ MONZONITE
	2,405 Core		1	1	a o x		-		Klakistar prenozysti to 3 m, zburčan botis. Mosty hani, temor, skoty to noty baturec, hamute varoba	12	3.55 Hole 2.406	-	1.	1	l ô X				Porphymic, pick gray, medvuts to coarse grained. K-feidspar phenocryste to 3 cm, abundant botte Nostly hard, strong: slightly to highly framined.
163.0" aven z 100 p.m. on 647092		Ľ	1-	1	15		150 -		180.0" - 170.0" http:// tectined. MnOtistaned sahdy facture Sand, factures 10 segmes to 205.	2400 dects at 1230 p.m.	~	10		1 100	23	2	2	1	Z4.5 - 243.0 tacune 10 - 43 degree to
		2	1	*5	154 5					on 6471.92		Ľ	1.	100	a		1		E 237. 24317 - 25017 Inchines 40 and 70-90 decrees
		17	<1	100	mOy							٥	10	60	× 24		i		to and, slightly opan, no SI
170.0 dects z 4.50 p.m. on 047052		2	Ϊ,	50	15		170 -		hammes 70 - 50 Gognes to sus, calcus 4.	250 5 depth at 1:50 p.m., on 64/11/92.		0	1 10	50	251.0	4	2	50	
		-	1.	1.	Б		-		e			30	2	100	BOX			-	
160,07 Secto at 2:30 p.m.		13	5	75	OX .		180 -			2015 6550 11 11/6 3.5		57	3	100	25		2		2500 - 3005" (mattring 10-30 and 70-90
an ouroas.		35	3	1:00	185.0					on 0471/92		0	2	100	8		-		cognes to and, impulat, day and minus &
		31	3	85	80							17	3	100	x x				
1900 certs 2 9.40 cm. on 04/1052		9	1 3	75	13		190 -			270.5 'depth 25 4 00 J.m. on 04/12/92		8	3	45			2	70-	
		47	2	1 50	195.5				164.5 - 234.5 taccures 1045, 60, and 50 degrees to auts, minor cauche, rare groups to			11	1,5	62	2743			1	
200.0" depth at 100 a.m.	1.	H	1	-	ox 2		200 -		*	500 (mp + 27) 10		0	1 2	80	XOX				
of of the last	1	28	1 5	92	2015					on 04/12/52		11	3	100	523	4	1		
	1	22	1.	\$5	×On							56	2	100	80%		1		1
210.07 Geoth 21 410 2.m. on 04/11/92		27	1	92	20		210			290,07 dopth 21 10:20 2.m., on 04/12:52		30	1 3	100	25		2	90-	
		0	1.	68	BOY		- 24	1					1		0	1	Ì.		
2000 dept z 650 am.	1	-	1.	1	21		220			300 J dwn z 135 p.n.		37	3	100	23			1	100 F . 100 F
		4	1.	100	223.0 B					on 641292		38	2	100	ŝ	2			degrees to acts, causta fd
TUT OF STERED GEOLO	1	20	5	100	×		230			115/1 APA 31 179 77		52	1,	100	× 30]	
1 Talla Mile	ET.	TATE NO	07/S	-19				The	PRA Group, Inc	S DEAN ACC	à L		07/9	2	1		1 3	10 }	e PRA Group, Inc
CERTIFIED		₩ ∞ EM190053 BOREHOLE LOG XMM N TOOR CH-5A						11.774	BOREHOLE LOG	2 (14 14 14 14 14 14 14 14 14 14 14 14 14			G12	+19 9005/4 207			_	term Co-	BOREHOLE LOG
Land only	1		DA	FFELD	T	EAG	102 100	AINE	RECLAMATION CORPORATION 3 2 12	+ HERRINES	10		RH	FELD	T	EAG	SLE N	MINS	CH-5A
OF CAUFOR										AT DEVLOUSSI	5								
										Con CAR									

REMARKS Instan Data Drifting Data Presonnes Onartyses	loot Stre	POD (%)	Frechures / box	Percent Core Recorery	Doc Harrism	Ekvito (1)	(14 that it)	(Ninisofic Log	Waterial Classification and Physical Description	RBAARKS Vedar Dea Driffing Data Pelacime Charges	Tool Stee	(K) (K)	Fractures / loot	Pacent Core Record	Dot Jamber	Eleveritor (1)	Depth (1)	Libringie Log	Material Class and Physical Oeso
3	HC LLS	4	2	100	B		310		13.5" - 349.5" CUARTZ HONZONTE Portymik, pink gay, makim to course guived		HQ S.85"	1	3	100	39		390	1	368.0 - 3950 OUARTZITE When to median gray, banks and di and entertaining and participants
20	405	20	2	100	X 31				Wasy hard, strong sighty to highly factured, orientation variable.	·	2.405	-			5			1	degrees to acis, calors 9. Yay he
0.7 dech z 550 c.n.		-	-	_	1195		320-		309.5 - 324.5 tracums 43 and 70 degrees to amis, semi-smooth to hacky, sighty open.	4000 Seph 2 1201 p.m.,		37	2	100	×		400	1	Gray to presen gray, fire granad, to and heldspar. Franzes variable of
		43	2	:00	NOX				324.5 - 368.0 Instrumen 10, 40, and 70 dagments			13	>10	06	404.5				smooth signal open, mear cause
		21	2	75	32				D ace, shooth to haddy, minor calche 12,			30	2	100	NOW				
10" dents at 9:50 p.m., n 292		8	5	75			330-			410.0 6005 # 1210 a.m. on 047552		8	5	100	41		410	-	
	ł		1	20	×0æ		The second second second second second second second second second second second second second second second se					33	1 4	100	B	1	22	1	
		21	4 1	23	33							12	2	56	X 42				
5405 dech a 1220 a.m., 247392	1	8	2	100	80		340-			4205 Geph 2 422 2.h., on 047552		50	3	92	421.0 B		420	1-1-1-1	
	İ		2		X H		1		47			-		76	X		3		
50.07 Gent # 400 2.m.	ł	-		1	3495		350-		M9.5 - 368.0" HORNFELS. Medum gray, the graned, ecugranular, Alemaing	605 (407 # 7.52 a.m.		_	2	13	431.0		430	1	
	l	2	4	100	XO				bands of biothe-ampinious-magneties and quartz- leidspar. Kard, strong.			0	5	100	BOX				434.0 - 632.5 GRANCEES / GRAN
		13	10	\$5	357.5							23	75	100	44				Appears to be a plante muttine of o neorymolicities metasadments, hard,
21392		0	-10	75	NO W		360-			443.5 depth at 1:10 p.m. on 0475/92	22	35	3	100	e Ox		440		434.0" - 470.0" fractures variable, sis semi-smooth, minor calora 55,
	ſ	0	10	80	35							0	>10	100	45			-	
170.0° depth at 3:30 a.m.	ſ	5	<1	100	88.0°		370-		365 C - 335.0" CUARTZITE What to medican gray, zones and sicts of K-lastsour and enformationers. Science 15-51	450.0 daon at 640 p.m.		37	>10	100	8		450	1	
41492	ļ	-	-	_	X				Cogress to any, calma 13. Very hard, stong.	on persag		50	11	100	X			1	
		\$5	el	:00	37 377 S							8	2	65	4575			-	
350.0" deste al 6:10 a.m.	Ì	S1	<1	100	×0a		380-			450.0 depth # 122 a.m., on 647692		<u> </u>	25	75	BOX		460	-	
	ł				35		-					37	3	90	47 465.0			1	
5300 dept 2 000 2.m.		*	4	0	SOX 39		390			on OUTSEEF OFTI THEAT		25	3	85	BOX		470		
LONG DELY AFFE	CAN AN	HQ G1	92	-	-		T	The	PRA Group, Inc	S AS HO DENI AFFE		ATE ON BE	07/92 G125-	19			1	The	PRA Group, Inc
(FR3 1108 -)	040	N N	11900 TCC/	55	-				BOREHOLE LOG	4ª 1108)]		EM19	OCS 6 OR					BOREHOLE LOG
NILEAUSOL . 101	NF NF	D R	AFFE	LDT	-	EAGL	E MOU	NE P	LANDFILL RIVERSIDE COUNTY, CALIFORNIA	A M DECKED	1	***	DAF	FELDT	-	EAG	LE MOI	UNTAI	N LANDFILL RIVERSICE COUNTY

REMARKS Veser, Des Dream Des Avearner Charges	hood Site	HOD (X)	FIREWARD / 6001	Peceri Con Peceri	But Number	Ekradon (1)	(13 yulag	Litrade log	Waterus Classification and Physical Description	REMARKS Marin Dica Dating Dica Personnel Changes	Tool Site	ROD (M)	Fractories / Kol	Percent Core	Box Jambe	Eleration (5)	(r) (r)	Labologic Log	Minergal Classification and Physical Description
7 Septi # 1250 p.m., 52	HQ J.45" Hole 2,406 Core	28	3 >10 <1	18 18	3CX 48 4755 8 0 X		470		<u>(4.0° - 5325° GRAVOTES / GRAVICUTE</u> Μαδιαυ σχην, ασταστη 10 συτάχη στρακο, εγογατιτάς Αρχοματ το δε ε ραστο ποι στο το στρατη ποτατογία από παρταμάτακό ποτασσόταταις - τολά, ποστου πότοια Γοπτασι αματι-θεάτομα (Guella to E'. 470° - 530° δετατηρε γαταλία στο παιατοπ, ματι-ματικά το Ιτάλαγ, Ιδρίαξη σους. πατά αματα ΙΔ.	5000° depan at 9.45 a.m., m 04019422	HO 3.85 Hole 2.405 Core	12 0 0	× × ×	1 10	a ox 57 57 80 X OB X OB		550		CALC - 5025 CRANNFELS / GRANNITE Mackum gray, mackum to course graned, expensional Acpeans to be a pasce manufer of party monitories a morpatized macasedments. Nat. mechinistrony, Common guardiaeticar characteristic filteristic SOLD - SSOLD Instante patient random, findante signify open, seme-smooth, with random carl, FeDL and carbs EL.
n suuch housing an g		22	3	13 12 13	484.5" 5 0 X		490		*		and a set of the set of the second second	26	2	10	58 0 565 5 4 0 4 X		170 I		÷
92 92		8	•	100	493.5" B O I					Sind deen a sub pro- on Sensing2		6	4	10	59 59 575.55				*
600π x 3.50 εm., 32		0	3	100	51 502.5' B O X		500 -			550.07 depen at 1:22 p.m., on 04/15/92. Ag down for circh repar		7	2	71	x 8 60 525.57		580		550 ರ್. 605 ರ್ 'ಸಾಮಾರ್ಣ :0, 40, ಎಗರ 70 ರೊಭ್ ಗಾಪ ಸಂತಿ ಮಾತ, ನಡೆರಡ ಟಿ ಸಂಗಿತ್
ዕርጥ 21 ዓ.ዳን ደም 32		35 18	2	100	52 511.0 8 0 X		510			5000 6000 2 445 2.m. on 04/22/92		0	× ×	6	5 61		590		
жећ 21 630 р.н. 2		39 57	1	100 100	519.5" 519.5" 50X		520-		.*	500.0" decth at 930 a.m., on 04/22/52. 505" chaing speceed to run packer texts on HQ how:	£	0 0	>10	0 10	8 8 8 0 X 8 62 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8		600-		525,5 - 535,5 Tactures 10-20 and 40-70 degrees
1000 p.m. 2		8	>10 >10	60 80	54 529 (7 BOX		530		500 T - 500,0" Hactore subten random fractures slightly open, semi-smooth, with monor cary, FeOrt, and caloria St.	nectoad to NO hole, neutred 547 am, 42592 610 ರ್ decth at 11:50 am, on 04/2592	NQ 2.56 Hole 1.775 Com	0 0 0	6	- 3 1 K 1	8 8 8	A DESCRIPTION OF A DESC	610		b ann, saonsancon b hairry, sighty open. Cay and calons 53.
۱۹۵۹ X 1255 ه		0	يد در	35 70	22 9 0 8 0 8 0 9		540			520,0° depth # 12.55 p.m., on 04/2592		1 8	6	9	00 X		620		
ETT RED GENI	A 14	0 0 17	4	42 90 180	56 549.0"		550	The	PRA Group Inc	500 0077 # 210 2.M. on 04/25/2		13 7	6	1	00 <u>525 5</u> BOX 00 ⁶⁶		630	The	PRA Group Inc
CO 1108	4 2 2 2 2	14 (14 (14 (14 (14 (14 (14 (14 (125-1 M190 1 TOC 1 HAR	RIS		EAG	ENOU	NTAIN	BOREHOLE LOG CH-SA ENDRUL RIVERSIDE COUNTY CALIFORNIA ECLAMATION CORPORATION	HIG DEAN AFRICA		A08 HQ	G12 EMI N TO R H	5-19 9005 OCR ARR:	R IS DT	EAG	LE MOUI	NTAIN	BOREHOLE LOG CH-5A I UNDFILL RIVERSICE COUNTY, CALIFORNI SECI AMAGINON CORPORATION

					_							1	1	1	1	-	1		2	1								
REMARKS Water Cata Dating Cata Preserve Charges	ol Sie	30 (x)	where I kol	MONT CON	oz Nártów	eration (II)	والم الم	linkadie Log	Materia: Classification and " Fitysical Description		REMARKS Vision Octo Drilling Octo Presonal Changes	Teel Stre	100 (00)	Frectories / byx	Pwcare Core Pwcare Core	Bos Nurtow	Ehvadon (ri)	ပါရာက ကိုး	Letotop: Lou	Material Classificance and Physical Distorction								
730.07 Gent & 210 p.m. on C472/52	HQ	0	5	54	BCX 81		790	1=	667.5 - 643.2 CUARTETE Nacum to dait giny, the to medium graned,		3705 000th 21 1255 p.m. on 042552	NQ 2.58" hole	42	2	100	- 4710 		\$70		870.57 - 900.57 QUARTZ MONZONITE. Internaty city-attend, Healthy to strongly bisacned, Abundani hombes senostra, Hostanziany hard,								
	Hole 1.775 Care	10	>12	100	80		2						Waary boolad, bominis caliz nongoria calesis. Hosey hart, stong, hoshy lacalad, Franciska varane onenason, sighty open, weak caly and calora calorg		80 J April 1 230 p.n	Care	32	6	100	50 550 02				Processing stong, here sectore to because Practures variable, day and calce S.				
800 0 depti z \$20 p.m. n 04/27/92,		7	>10	60	82		500	-			an wearsz		7	>10	100	aox		880.		המוזי יפטול שבו מוני לאיני לא גיאל לאין אין אין אין אין אין אין אין אין אין								
		0	>10	63	xox	80X 13 25	22 25 1		-			230.07 6econ at 405 p.m		54	4	100	81 688.5				esti - solit dat percut stad carse cener.							
510.0 dept & 1256 LT. 0 042352		14	्	90	83 812.5			3	25 ⁵	25	3	1	5	5	6:0	repro-	4		an 042892		22	>13	100	xoa		850 -		
				62	001								a 1	00007 2001 2002 11 5 50 0.0		0	>:0	:00	82 897 0 60X				895.07 - 900.07 taun breca, dav-ech matri					
320 5 0405 21 2:33 2.5 C4/28/52		0	2	50	× 84		820	1			on 04/28/52	İ				900.0		900-		TOTAL CEPTH 900'								
		0	5	96	824.S																							
8500 George 2 509 a.m.		43 10 100 X	X 55	X 55	830		E27.0 - 633.0" abundani chara monazin'a, sirangiy Efaned to day, with sicharistica 10 begines to zas					;																
		10	>10	100	B												9											
6430 conn 11 635 1.n n 0472552		13	1	100	X 56		640											-										
		28		100	8430 3 C		\$50-	\$50		643.7 - 664.97 QUARTZ UDNZCHTE. Stornyy day-used and bearred, abundant botte (>20%), Moderawy hard, moderately																		
850.07 George # \$25 2.7.		31	1	100	¥ 87				stong, hypey factured. Cury and calora interiora Sang.											8								
		45	5	100	BO				Leves																			
805 Sect # 1120 LD		7	>10	100	X 58		660																					
		13	>10	100	B				664 0 - 8700 HORNFELS					a a constit as														
on SATTATE RED DEAN		52	2	\$5	83		870		SCOR SO-47%, Makey Kusian, Franciss 1070 decrea to and, streptiar, weak day 58, weak FeOr stan	1	CISTENED OLOGO	0	п	07/92		1		-	The	PRA Group Inc								
Santo USAN AFFE	2 8 2	N 10	07/92 3125-1 EM190	19 CS/11				The	BOREHOLE LOG		A NE LIOR	× 10 2	DH DH DH DH DH DH DH DH DH DH DH DH DH D	G125 EM190 K HO	19 XC5/12 CHSTA	TTER	-	tert.	CONIU	BOREHOLE LOG								
+ AREALED	2 6 3		R HAP	HSTA RIS	TTER	EAG	LE MO		CH-5A		CLATINES	1	*2	D AF	ELDT		EAG	LE MOL	INTAIN INE I	LANDRIL RIVERSIDE COUNTY, CALIFORNIA RECLAMATION CORPORATION								
OTA GEOKOGIST	/								and and a second second second in the		WA POESLOGIST																	
ABMARUS Wear Data Drates Data		~	• / bot	Con	te.	10	6	c leg	Waterus Classification ad Physical Description		ABMARKS Maar Cica Dating Data Practice Carryon		8	n / bot	Con	-	[1] v	E	k 100	Materias Glassification and Physical Description								
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	Toxi Str	NOU ON	Function	Percert	Box Ma	Eleration	Dipti ((shotog				Tool SI	BOD C	Freche	Percent	Bet Pa	Email	5 710	1 Mickly									
550.0" decth at 210 p.m., on 047552	NQ 258 Hole 1.775	7	6	100	ow Bag		630		42.0° - 532.5° GRANOFELS / DRANULTE Wedem gray, median to state graned, equipandar Acquest to be a plates matter of quart descripts and menymatized metabelaneos, Kard, medium strong,	*1 55	n 04/2552	NG 256 Hole 1.775 Care	0	>1	100	0		-		Barto - SALZ COUNTIENE Nacion to dant prov. Les to canizan granes, weaky bastist, Connan quarz nonzones diviets, Wasty han, strong, highly lacated. Frances rances orientation, sichly costs, weak car y the cating accords								
540,07 Secth at 300 p.m., on 04/25/52		٥	6	100	X 65		640		602.5 - 644.0 HORNFELS Light to needum pry, the graned, ecosystector, Borne 275, weakly black, dasket of quarts- beddaw, Hard strong, hydry hansand Franzisc		720.07 doich at 5.05 p.m. an 04/25/92		0	1	\$5	74		720 -		718.0 - 719.0 שבת פסטקופ. לקרו קיצון כשון אלא הקרוארה כן קעוברים.								
		13	6	100	a Cx				(c), 40, kto (7 organise to acts, supply steen, manar calone. 644.07 - 6515 OUARTIZITE: Pinkins para, fine to mechani gray, weakly biolog.				13	>10	65 0 50	726.0		-										
550.07 depth at 4:57 p.m., on 04/25/92		33	4	100	67 651.0 B		650		Abundant Bedgag, munor bortik, Hard, strang, nagny brammet, Francise 40 and 70 degrees to suid, slightly open, weak city and munor caloria 82.		730.07 depth 2 10:30 p.m. on 64/2592		17	25	100	0X 75		730 -										
550 % Secon at 6,20 c.m.		٥	6	100	63				Private grat, the graned, bland, Strongy marmet with pick quart moreover. Kand, strong, togsty factured Franziers 20 and 50-70 degrees to ant, sighty open flactify, well, tidy and minime mating.		749,17 Soon 21 195 J.m.		0	5	83	725.5 8 0												
on 042592		15	2	100	a Ox		660 -				on 6427/52.		25	5	84	X 76 745.5		740 -										
6770		0 25	>10	80	69 659.5		670		557.07 - 643.27 QUARTZTE: Mecum 15 Cart pay, for 16 modum graned, meany bedded. Common quart mortamite custors. Many hard store, here's macund financies value		750.07 depth at \$000 a.m. on 04/27/92		0	6	85	*O®		750-										
		0	>10	82 100	0x 70				oneration, signify open, weak cay and course cours;				13	5	80	77				()								
660 0 depth at 1130 p.m., on 542592		0	5	100	5		680-				750.07 dayon at 5:40 a.m. on 64/27/92	2	8	5	90	Ta ta		760 -										
530 7 cech at 530 a.m.		0 40	-	10 57	X 71						777 J 6007 ± 730 ±7.		3	3	100	755.07 8 0 X				766 C - 773 C quarz montanna sú								
on 04/25/92	and services	0	-	100	692.0°		6977777				on 04/27/52		15	4	80	77		770-										
700.07 depth at 12:01 p.m. on 04/25/52		28	4	100	72 700 5		12				730.5" dech at 12.95 p.m. on 04/27/92		0	>10	0 100	BOX 2		780 -										
		25	2	100	mOx I								0	>10	100	1783.5 BCX 81												
7100 coph at 3:15 p.m. on 42552	1-1	12	5	100	73		710	The	PRA Group, Inc		on CUTZER CRED OFFIC		0 ATE	>10 07/92 G125	2	790 0		790	The	PRA Group, Inc								
Samo DEAN AFFE	2 2 3	-	EM190	05/9 HSTA RIS	TTER	EAGL		VTAIN	BOREHOLE LOG CH-5A LANDELL RIVERSICE COUNTY CALIFORNIA	¢	112 1108 A			EMI K HK	OCS/10	ATTER	EAG	LE MOL	INTAIN	BOREHOLE LOG CH-SA								
		0	AFF	ELDT			M:	NE P	ECLAMATION CORPORATION		CEOLOGIST OF CAUFORNIA	/ 1		5 4	FFELDI		(N	INE F									

Project Site / Grill Sce CE	TRAL PO	7		154	eve Da	" CC7352	1	185 DCHES	Ground Elevation 2307,76 FEET	Botahota Ne CH-10
Considenties / Stationung				0	omplect	04 Date	10	19210 Br	R. HARRIS, R. USREY	Bottom ef Botenete (253)
Cris Rig Mean and Model BOT	ES 56-5			12	ning k	WHINDE SE	1	Milling Fluid	Top of Sedinck (bgs)	Pint Enconteres Weter ID;
Draine Concerner TONTO DALLA	g servic	ES. 1	VC.	154	11 54	00/10/040	IN I T	Clas Core	Total Rumber of Core Boses	Static Water Level (bost
RBMARKS: Were Casa Deling Osta Personnel Darges	Test Sire	ROD (X)	Factoria per face	Parant Con	Dox Number	floredian Gil	Over his	Uibalogic Log	Wateriat Physica	Classification and i Description
FOREMANC WATNE SEAUPRE DRUL CREW & (Tan-Tam) Dollar: Sharen Kutal Heldan: Enc Chens John Cross	525 TRI CONE	1	1,	١,					0.0 - 7.0' SET CASING No sample taken	
<u>DRUL CREW B: Nom-Tami</u> Dråer, Joël Riky Holpan: Brik Kenze Brans Williams	HQ 3.850* HOLE	1	>10	43	BOX		10		7.9 - 15.4 QUARTZITE. Ugnt gray, fine-graned, au weathered	Lav
Geningest D. Volumo Gening set at 7.0 ket	2.406* CORE	1	>10	90	1				15.4 - 59.0 IRON ORE	c
on (22/13/52 Geologist: R Kurrs		1	1	١	80		20.		way hard. Winor mea.	
Stopped driking at 17 - problems recheving cone. Replaced casing is 17		50	1	98	2				23.5 One with imaginar in of light mixed instance (no	ದತ್ತಾಣ ಇತ್ತಿದ್ದಾ
23.5 depth at 11:40 pm, 273/52		80	1	:00	BOX		30.			
		47	1	74	BOS		1010			
		12	>10	80	4		40			
		35	1	65		i				
		0	51	10	DX					
Frider noted that hole made minor amount of water		19	>10	65	5		50			
		19	>10	75	8					
		13	4	54	X 6		60	-	SS 66.3 IPON CRE BRI Light Ast colored logmenta matra (70%). Fragmenta u Fragmenta Colored Logmenta u	(30%) in org
STERED GEOLOGICA		45	3	66	807		- Provention	4	663 - 67.8 DICRITE DICE Meduan green, meduan coa	na-granad, w.m
Kin Osen Cart	Allo	40 1	3 1	96	191		70	The PRA (Conset highly allond to at	2014 MR 190393632
ENDINEERING CE	14.2	0 ×0.	BM 1 R. HA	ACCE-	1	FAGIE	MO	BORE	HOLE LOG CH-10	PIGURE NO
PRE DE AVUEDENT		• 2	D. AF	961D	7	EXOLE	MOU	INE RECLAM	ATION CORPORATIO	DN 1 of 18

Water Cuta Onling Cata Personnel Changes	food Site	1×1 004	FINDERS PH 100	Paun Con Pacerer	Bos Nurter	Elevator (h)	(ii) kinged	l'shetegic Leg	Waterial Classification and Physical Geachston
	10	40	з	96	WOX1		70 1		69 5 . 73 5 CAE BAECOLA.
	2.405" (2.405"	47	2	64	80				Headhared churks of improve-staned cionta 76.0" to 76.5" highly radiuned, with day gouge
		85	cl	100	8. 8.		80		Gray, Inte-prained matrix. Hard, scong. Healed tractices
Gaologist D. Volume		82	2	100	BOX				leise zone with hexied fractices
		17	3	1			90		
		-		1	8				Green, sphanoc. Fine-praned papoctase phenocrysto 2 + 5%, altering to chlorite. Lincovie stan n
		50	*	100	X 10		100		30 - 50 degrees.
		2	5	100	102.0		100		
		50	з	100	X				
2.		47	4	:00	8		110		highly altered zone - dark preen epidcie and chicina
		13	6	100	X				bremailed, traces of calore in vers
125 6493 11 4:55 3.37, 2/1492		45		1	1257		120		1195 - 1297 ORE BRECCIA: Ten to kont grown angular tagments.
		69	3	100	X I		1		Fractures dip 20-60 degrades. Very haid, very strong. Aperturbe tight, some kitonia statung
130° depin at 555 pm, 2/1492		54	4	100	8		130		179.7 - 110 0 SOLAN ZONE
		25		100	14 17.0				101.7 - 138.6 CORITE PORPHYRY D.K.E. Gray, with leadspar phenocysi (67%). Fractures do steeps, Heading lactures with one flung
145 6000 NI 6:43 pm. 27492		27		1	BOX		140		108.5 - 140 7 SKARN ZONE Green starson, 401 to neocon hard 140.7 - 155.0" ORE BAECCIA
		-	1	1	15				Tan to fight pray anguar hagnens 40-50% fragments 1-6mm in black ore maint Magnetist hemaite mains, with several green attention
ESTERED GEOLOG		48	3	\$	0 X 16		150		Sighty hard, moderately stong
Ferrino our alle	0.		37	2519				The PR	A Group, Inc
. Nº 1108	2/0	-	. BN	19006-	2			В	OREHOLE LOG
forg Automatical	1 0		RI	HARRIS		-	ELICIA	MT40111	CH-10
X ENGINEERING LAT			2	LITER O	π	EAG	M	INE BEC	AMATION CORPORATION

Hear Dua Miling Dua Maannel Changus	Test Size	ROD (%)	finame per lost	Facart Con Record	Boy Huntur	(H) MILLING	[i] who	limitedic Log	Maserial Glassification and Physical Description	REMARKS Hear Das Diffing Das Processes Changes	od Size	00	ACIENT PHE BOOK	river Com	t Harber	(I) uster	[1] es	helepic Leg	Material Classi and Physical Cenci
depth at 10.00 pm; 2/14/92	HQ 3.850" HCLE	32	5	100	15 542		150		1407 - 155 0" PON CRE SRECCH. Tan to light green, anguar lagnens. 40-50 % tagters 1-6 cm in black one mark Forgmens for the lagnen	Geolopsz D. Yaturno 200 szecz z 8:00 szu, 2/1592	HQ HQ	0	5	100	22	5	230 1	=	229 - 237.0" CUARTERE
	2.405" CORE	15	8	100	BOX				15507 - 1570 BON ORE: Rush black, Highly harcuned, nearly vertical so	Proclama with could calva. Geologist: R Harra.	HOLE	16	2	100	MOx				Inst. Highly facture, factures degrees, lot, with heratelistical 2017 - 245 5, CHIETZ MONZON
		42	6	100	17	and many res	160		finonte stand SI, tot wei-head. <u>157 07 - 184 5° OUARTZITE</u> Light prem, very Sne-grained. Steeply dooring	247 depth at 8.00 pm 2/15/92	CORE	0	8	100	8		240		Light pre-brown, ine-graned. Ac moderately storg
				~	ň X O		- the		banong. Hyphy szeried. 1649 - 1730 SCHISTOSE META-ARKOSE Lyst green with bands of baar, pork, green			0	>10	55	807		1.1.1		245.5 - 275.5 IRON CRE
Norst J. Suitard F Sept al 11:30 prs. 2/14/92			1		18	1	170		eands co bu corports, Hammins moder (24) parallel banes, Moderatery hard, moderately surving	260 dama at 800 cm 2/1552		25	1	80	27		250		Machanie nch, nisy back, sighty Moderately hard, sighty wallers Scattered times and verse of ska
			1	20	BOX				173.0 - 175.0 IRCN ORE Rusty back, hervy tactured, Magnetie rich 175.0 - 178.0 ORE BRECCIA:			14	2	\$2	mox		200 1		(stam, calcisicate minerals) 258.0 - 275.8 Stam, dark cre
7 cepts 2: 1:00 am, 2/15/92		77	2	100	19		180 -		Fragments of meta-aniste in magnetics on 178 0 - 165 5 IPON CRE. Magnetisends. Lost to care green arientich			63		55	23		1.1.1		valow screen, some steeply do banding
		85	2	:00	xOa				1255 - 157,0" CUARTZITE.	257 depth at 9:30 pm, 2/15/92		28	2	100	*0®		250]		nearly vertical verts of calible
10 daçin at 207 am, 2/15/92		8	2 1	8	22		190		Griensin what, very strang, Very hard, very strang, 187 01 - 229 51 (RON ORE)	Geoopst J Suitard	1	22	1	82	29				256.0 - 267.0 magnesa ven. slighty vuggy
		96	et 1	00	BOX				Happenderun, numo with while salo-subarts or quarture to 1908;	10		-			BOX		270		
		85	1	100	21		-teat-		190.5 - 216.5" one with wards of whole caus-			-	-	-	30	1 COLOR			275.5 - 284 C QUARTZ MONZO
7 depth at 4:16 am, 275/92		82	,	100	XOX		200		success, and express the netroit. Magnetic vice price, serverine, more those. Kodentey hard, molenably stand, Very bactined, brecastes, numerous healed thatmas,			24	3	82	XOX		280		tactures slightly open, with know atal. Very hard, very subing, ber
	1	65		8	22							0 2	5	81	202				2520 increasing 219/2000, 184
10 certh at 5,18 am, 27592		9	1		xox		210					-	•	64 100	OX 2		290		
		-+	1	2	8							-	•		202.5				291.7 - 294.0 Gouça liçhi tə cumbiy 294.0 - 119.7 JACM CAF
25 depit at 6.27 km, 27.552		71	1	80	X		220					45	2	89	ox 1				Back, then, hard, wery stong. A treat pyrra, March tactures Har to 1/2" of themona and cause.
		83	cl 1	8	B					300 decth at 547 am, 2/16/52 Deviation survey = 0.75 depress Geologist: D. Voltumo		100	<1	:00	301.2		300]		
SUSSERED GEOLOGIA		57	5	80	X		230		2293 - 737 0 CUNRIZITE:	SEBED GEOL		\$2	el	100	OX 3				
Nº 1108 E	A	11	3/92 G125	-10		-		he PR	Group, Inc	State - CAN day BE		100	41	100	12.20.		310	he PR	A Group Inc
ENGINEERING WAY		4mm	RH	URALS ERIT		EAGU	E MOUN		REHOLE LOG CH-10 DRILLEMERSIDE COUNTY, CALIFORNIA	Nº 1108	5		G12 E4	19006	14 S		c c	B	OREHOLE LOG
OF CALFON	~	*0	D AF	FELD	7		MI	NE RECL	AMATION CORPORATION 3 et 12	ENGINEEDANG	-	-	0.1	TREAU	07	EAC	M		NDFILL RIVERSIDE COUNTY, C

rear Geo Drifte Geo. Antornel Clarges	Teel Str.	110 000	Fiaders per tool	Pacard Con Records	Out Notes	(lireson (b)	tul vadra	Vicheligie 103	Material Classification and Physical Description	REMARKS Wear Dea Drifty Das Pensone Charge	•18	[X]	in the bot	- m	etw.	les (2)	613	ogie Log	Material Classification 646 Physical Discontion
	HQ	100	d	100	B		310 1		254 07 - 319 77 FON CRE Black, mon, hart, very store, Abundani synie		Isal	ROD	- Lines	Furces	San M	Eleval	Depth	(Inhal	
	HOLE 2406" CORE	ß	<1	100	X 35				terrolina to > 1/2".		HQ 385 HQ	. 44		5 :00	XO8 B		390		387 - 325.0 CUARTZTE Rest years to no nemate statu moderately exaction moderately hard, moderately textures earlis- menation. Zones of proteste-covera-exclos a literator
		0	6	180	mox \$		320		319.7 - 341.0" QUARTZ MONZUNTE. Protectoren, the granad, hepty tracmind. Fractures variable 60, many 1980-9, more innone suan. Views and fractures miomzed. Very Auto, very strong	400° depth at 1:00 pm on 2/17/52 Develops survey = 3.75 decrees	2.400	6 47		1 100	45		400		285.0 - 422.5 SKLAN Fre praned, motion with K-ladspar-opdora-toone- quarti-pyrozene. Kard, stong
ic A. Kama		0	10	100	KO B		1					53	1	130	BOX				402.5 - 428.0" IRON ORS: Abundani Irish pyrtis Izones up to 2" Noderstally tracting: factories optic 600.49 up to 60 degrees. Nard, strong, strong, weathered
		67	3	:00	37		330 -			4107 depth at 1:00 cm on 2/17/92		60	1	100				1	emonte staned.
		33 0	2	100	100							60	1	100	xow		410		412.5 - 415.7 moderately weathind sono, anuncan femotes stan. Yugs of remains syma tooc with quarts
		23	3	100	38		340-		341.0" - 389.5" SCHISTOSE META-ARKOSE Banded perk-brave, dan prein, igiti prein, ye/iswig-te/n Moderzay framund vers balded instrutis end is totore	427 dants at 1/48 cm on 2/1762		3		100	47			1.1.1	
		0	•	130	MOX	and the second se			badarq: Sighily wallharwa, coornalsing with sestin.			80		100	43		420		423.7 - 425.0" signly lacared with bronse-tenas stan. Signly weathered
		n	5	100	39 51 cl		350-			430' depth at 2:41 pm on 2/17/52		87		1 120	8 CX	Ì	430.		178 0 - 436 Z OVARTZ WONZONITE Prik-brown, coarse-graned Abundani K-lessorar
		50	3	:00	E ×O							4	1	100	49				minor intonio stalo, shalow do.
		n	8	18	BOX		360					8	1 3	100	×OM				436.2" - 452.0" IRON ORE Asumatan pyrae, Very hard, very strong, brigh Numerous verhoal fractures with pyrae billing
		25	10	100	41 875				365.5 Increasing chicate-policies alteration, increasing tracture device, figurates open, 30-40 deprese to acc.	4407 Geodeth at 2:55 pm on 2/17/62 Geodester R. Harra		63	2	100	50		440		
at J. Suthard to penerator lakine. 903 pm, 2. Resumed scaling 11.40 pm, 2		18	4	130	CX 2		370					43		100	OX 51		450.		
		8	5	100	xOm					450" depth at 5:00 pm on 2/17/62		80	•	100	8 0				4520 - 457 5 ANDESITE DXE: Grawnan przy, ma-graneo. Hoderzisły alarec hard strong to 4564, becoming premianał sofie
אדעלא: D. איזעלא: סיידעלא: D. י		51 C	4	100	42		380-		382 - 385 highly bacures, highly alterne, Biterne slaut in tracures	4507 depth at 5.55 pm on 2/17/52		38	4	100	X 52 4505	Transaction of the	460		457 5 - 6100 CUARTZITE נקוד קוד, אישיקיבואל, אווין אבל, אוין אינטין אנוין היאפועל דומנועט אל ההסווש עם ט ז דות
wh +====================================		3	8	:00	ox 4		350		SARS - 295 C QUARTERE			32	4	1:00	BOX				logang 30 - 45 degrees, knigular wans to 10 ton
S DEAN AFRA	04	TE	5/612 G12	5-19				he PR	A Group, Inc	410 0000 2 R FT 12 M F 6000		10	0 10	1 100	14		470		
Nº 1108		NO NO NO NO NO	EM R. 1	19008 HARR	-5 5 -	EAG	ILE MOU	NTAIN LA	DREHOLE LOG CH-10 IDFILL RIVERSIDE COUNTY, CALIFORNIA LAMATION CORPORATION S er -	Nº 1108		DATE	10. NO. N	392 6125-1 EN 19	1 006-8 97.5			The PR	OREHOLE LOG

Rour Des - Delle Des - Delle Des - Pensone Carpas	Teel Site	R00 (M)	Findense per bot	Percent Con [leconer	Don Harter	Elecadon (b)	(i) triding	limhaisgic i eg	Maternal Classification and Physical Description	REWARKS West Deta Drilling Data Pendimat Changes	Teol Size	800 (x)	Fractures per locot	Pacent Con	Cos Hunter	Elivreton (ii)	Depth fill	Lithelagie Log	Motorial Classification and Physical Description
	19 1957 1904 2.00	ສ 13	1	100	NOX SE				457 5 - 610 CT CUARTIZITE. Lott ptr: Sne-craned. Very hard, very stong. Kany ne-keeke tauting, with innormal, up to 5 not, depend 0 - 10 degrees. Franzins with press. both up 20 - 45 demes. Innormal runart	Geologist D. Votumo	HQ 3AS HOU	67	1	100	BCX 53 54.0		550		457 5 - 610 5 CUARTIZITE Lipti gray, im-graned, Very hard, very strong Mary re-healed training with knorek sizin, up to 5 mm, dogung 0, 10 degrees. Tight training
87 depth z 4:13 am, 27652	CORE	75	2	8 8	SOX S		480		10 mm.	557 depth at 9:30 am, 2/19/52	2406	2 2	2	100	64 5620		\$60		with prints, do 20 - 45 degrees. Singular quart rens to 10 cm.
20 and tractumes per test averaged r box 56 (7 cone runs). 87 depon at 9:10 am, 2/18/92		(60)	(1)	8	BOX		490		Had facures.			\$	2	100	BCX 65				•
QD and tractures per foot averaged		(6.2)	(1)	100	ST ST BOX		100			577 dept at 1055 am. 2/19/92		50	2	100	E IS		570		5750 - 578.5 abundant ophi healed bactures
107 depth at 1:42 pm, 2/15/92 Devacion survey = 1.5 degrees		63	4	100	57 80 60 90		500		500.0° - 547.0° light grawn, with tanks of banking dooing about 60 degroot. Fractures nearly versal. Signity less hard and state.	550' seotr al 215 pm, 2/19/92		42	3	100	66 98255		580		578.7 are ven, and inch, 90 degrees to tare 223.
107 doorn at 440 pm, 271252		100 100 1 100 1		100 10	SE CES		510		bunding staapans with 60037	550 Geph 21 325 pm. 2/15/52		80 49	<1	100 58	0 X 542 50		\$90		5336 - 613,5 satisfied quara noncons Galas, 2-8 andres, 30 45 degrees to acc Galas advances of quarante
207 sept az 7:35 pm, 27:662		42 37 60	4 1	8 8 8	51 12 15 15 15 15 15 15 15 15 15 15 15 15 15		\$20			533° clepiti at 400 pm, 2/15/92 Demation survey = 0.75 clegities		8 8	3	100	57 1 MOY		e00		
37 ಈನ್ ೫ 1200 ಹಾ, 273-92		42	1	8	52 TE 80 X		\$30 •••			617 septi at 6.10 pm, 2/19/62		२	2	100	23 234.7 BOX		610		510 C - 555 C ANDESTTE DIKE Das ger yan socce-chore-grout-s-grou
47 depth 21 2.36 am, 27.952		53	0 <1	200	80 X		\$40			620° capts at 6.06 pm - 2715492		37	1	100	70 815.5 BOX		620		aranao, Ananco prunkinas kri keopa phenoonsa isik, Noosanay kasuna kuri storo, isotay walarna, franuns içit, wit çuaro, epidole, mico calone, sepencie, inova
20592		100	<1 <1	100	2 SHOX2		550		547.0" - 550.0" Gray, banding nearly attent Very hard, wery strong. Cark ghein attention atnes.	607 data pr 200 pr 200 200 200 200 200 200 200 200 200 20		56	2	100	SXO B B B B C X X		630		
Net 1108		10 NO.	3/62 G125- EM 11 R MU 0. HE D AFE	14000 14400 175 175 170	_	EAG		BC	A Group, Inc REHOLE LOG CH-10 DFILL RIVERSIDE COUNTY, CAUFORNIA AMATION CORPORATION T et 15	Nº 1108		ATE 05 40.	492 G12 EV 1 S H/ D A	S-19 19006-4 AARLS ERIT	1	EAG		HO PRA	AGroup, Inc REHOLE LOG CH-10 DFILL RIVERSIDE COUNTY, CALIFORNIA JAMATION CORPORATION

Valur Dela ' Driling Dela Personnel Chenges	feel Site	fractions and box	Percent Core Decent Core	Bos Harter	(1)	(s) (s)	Litislagic Lag	Waterial Classification and Physical Casenglian	REMARKS Wear Doa Diffe Dan Pearwan Changas	el fire	00 00	(x) any	Indent per look	be Hardan	(4) solitered	Noth ([]]	libisteric Leg	Walincial Classification and Physical Description
	HQ 3.5507 HOLE 2.405	50 1 50 2	18	dra nox		30		S10.07 - SSGT ANDERE INCE Logar park here chanked, why school and king new state fractional work finances itam, so to 5 cm, Sport 0, -10 Cognetes. Topin transmo work promo, coping 20 - 45 cognetes. Introduce cuartor web to 10 cm.	710 days at 210 an, 2/2012	1 HK 32 HO	0 2	25	4 100	a and a down		71		591 4' - 505 0' CUARTZITE Dark gray, may fire grained. Hard, strog, into the supply realized. Hodemany macmod appendes signly oper- forming marked 0. Videonce on the formation
epth at 10:45 pm, 2/15:52	-	67 2	100	73	6	40 -		534.0 - 645.0 mmor knone stan, calcte in mins. Sighty waardined.	727 depth at 3:45 pm, 2720/52	24	25	1		5	2	72	1	stan, mnor calcia.
sc F, Usray		23 / 2 57 / 2 67 / 2	8.8	B O X 74					Geologist J. Suitard		7	57	2 100 2 100	Sox				
979 at 209 an. 272392		74 1	100 2	BOX	6	150			7537 depth 21 4:45 pm, 2/20/92		6	1 19	2 10	179	7	73		
ph al 455 am, 222052		015	100	75 94.07 B	5	60		volume rocke ingen security, networks subpry took Lennas securit, certile, copy 0 - 30 copies 662.8 - 666.0° shaur zone with subru,	747 depth at 517 pm. 272792		7	n		- 54 734 B	4 2			
		2 4	100 2	X 76 97 - 1 30				serpentine, tab is in tracticities. 66517 - 521-67 - 524,014 Dark green aterization in audiesche (?), wich fron one and catolan wind. Moderately hard, moderately strong, moderately weathered			5	52	1 100	0 X 65	5			
		18 2 30 2	100	x n e o					757 tape z 650 pr. 27092		6	3 58	2 100	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	5	75	0	
ist at 7:15 at, 2/2052		8 4	130		6	1			767 depth al 825 pm, 22092	•	3	31	1 100		5	76		759.0" - 779.0" Saut tone: breasaid, mire beaching, mirer gouge, moderaidy altered
135 D. Yo'umo 1907 al 800 am. 20292		23 5	100	X 75	6	90		91.4. 505.7 (2/AST/775) Dark gay, very long-tames.	770 depin at 846 pm, 22092			• •		X		77	hanala	
eon al 9 23 an. 27252		o >:0	2	sox s				Rard, Strabo, Irish & Sabort, Weathevol, Moderazily Razinale, Jaconze Sighty Coon. Coping mostry 0 - 30 degrees, mizer smokras stan, mixer succes.	Gaologist R. Usay		1	25 ,	10 10	BOX				
on sunsy + 1 degree		0 4	100	sox					780 6030 at 11.25 pn, 2/2092		1	2	4 10	781 80 X	5	78		
CHOT 21	1 13	2 4	100	51	1,	:01			790 dept at 1215 an 22162		12	1 8	2 10	8		79		
NO DEAY 47 10 10 10 10 10 10 10 10 10 10 10 10 10	OATE OWO CALL	40. G: HO. DA	2 1906-3 1906-3 HURKS MERIT		EAGLE		BC	CH-10 FILL INVERSIDE COUNTY CALIFORNIA CH-10	Nº-JIOS	ALA.	0411 101 1 040 040	80. 80.	UR2 G125-11 EM 190 R. KUA D. NEP	08-10 PLS		GLEN	CUNTAIN	PRA Group, Inc BOREHOLE LOG CH-10 LANDFUL RUSERSIDE COUNTY CALIFORM

k

FENARCS Main Cas Dating Casa Personal Changes	6ite	E	the per text		tion (fil	Ξ	tajis tag	Hetsvel Glassification and Physical Discription	ABMAKS Wer Cca Differ Cca			w kool		(1)	(u)		(0)	Waterut Classification
	Tes	BoB	51	4		140	1		Penantel Chirgel	1 Bire	120	d uno	S Sand	Nurte	LANON	(I) VId	helegic	Porskal Description
	1857	28	2 1	8 0		790	2	Ent (200 M COLOTATE Dat gray, way be-grand. Next source for the schedule associated	870 Gern z 11:40 an. 2/21/92	1 2	SE	£	22	8	5	870 4	-	
	HOLE	83	d 1	90 91		-		Hodersmity sammed, spermes sughtly open, dipping mastly 0 - 30 degrees, minor smarthe		345	23	el	100	DX 100				נקיב קיזין, קפאפיגוין קובייליארטיבב נקיב קיזין, קפאפיגוין קוביבייהיה היווסר לכיכהוגיב מהפה, ו'ביל, גדטרק, הסכפהנוגין אבורפילל
depts at 4:01 am, 2/21/92	CORE	8	1 1	8 18	B	800	1	IDA AND DES.		2.405	57	2	100	1765		i		Hoderstally factured, with dark grown alteration along fractures. Apertures agric, views do 20.00 doctment.
tton sinny = 1 degree		ø	1 1	∞ 5	X				EBOT depth at 1:40 pm, 2/21/52 Gencent J. Schart	Cone	11	3	100	X		880		
			. 1.	1 10	12			205 0 - 632.0" META-ARKOSE			16		1	101		1		•
6400 at 5:14 am, 2/21/92		2	- ["	_	8	810		znes, Moderzay nin to hard, moderzały strang to strang, moderzały wszawać Moderzaw transfe wsh dawi trwe zakraton zień tozarze i bakrute			35	1	100	8		1		
		48	1 1	00 3	3		1	Sight, Marta 20 - 30 degrands.	590 seen 2 627 pm, 2/21.92	1	27	3	100	X I		890		
			1	101	50					1			1	1.0264				Light gray, course graned, K-lektour phenodysis Epicoa in lindures, diarstaal epidole 1-2 %
Georgi az 6.29 am. 2/21/92		60	1	8							68	1	100	BOX	1			897 - BST green andesse Gra
		18	2 1	00 S	4	020			900 dappn at 10:00 pm, 2/21/62		19	2	:30	103		900 -		
			1						Denation survey = 10 cagnes Gaeringat R. Ustray		100	4	1100	13				mut the still
deets at 7:38 at 271.52		2	2	80		830			-X			-	1	X		1		Dark green, fine grained, vertical flow tertura Pyrozene-noti, with epidote in vertic. Hart,
		50	2 1	8 13	2.3	0.00			\$10 depon at 3:10 am, 2/22/92		2	2	1:00	104 I \$10.01		910-		stong, sighty weathened. Moderalsly factured with bronze, hematic star, factures die 045 decrees.
igist D. Vaturno			-								70	1,	100	×Ou				
AND # \$28 38 37167		50	2	0 0	6			509.07 - 846.5" tracmand comes, highly alarted			-	1	1	:05		1.1		
		4	2 :	00 14	25	840]	קיבוים אונון, דורר ובורא אוור.	527 cents at 4:15 am, 2/22/92	•	57	2	100	8		920 -	2	STIT - STAT OUNFIT MONZONITE.
			+			1					0	1,	100	X				Green-gray, madum graned. Endoue-Seo vent 1-3 mm, pyramone-nch zones. Kard, strong.
(mt + 6/5 to 10/60		60	1	00 9 15	7		1			1			1	106				SPICY TREATE
0001 a 260 an, ochia		27	3 1	00 1		850	1		500 depth at 5:40 am, 272252		85	1	100	00		930 -		Light gray, the graned, shatland appearance, with dark grave absizion along shatler know Value of ourk-brown massive cuarts to 1 st.
			-		ž			1			-	1	1	107				Very hard, very scong, unweathered, slighty fractured, with minor calona fill.
		40	2	30 19	6 17						2	1	100	255				
COCT 22 10:36 MT. 221192	1	40	2 1	8	8	860	1		540 Sept at 7.50 am. 272252		130	<1	100	XOX		940-		\$37 - \$45° scalinged eng voies 10 2 cm.
			_					stolarsket, herzze szn	Geologet D. Vaturto		80	1:	100	108				
6007 21.11-12-27 221.02		27	>10 1	00 14	AS)	870					2	3	100	e e				
SISTENEN DEOLO	0	TE	472			- 1-	The PR	A Group, Inc	\$50" depth at 972 am, 272392			1		103		950		
ATTAC DEAL ARE DEAL	14		EM 19	06-11	ľ		B	OREHOLE LOG	SUSTERED GEOLOGI	•	31A 08 10	40	125-19		-	Υ.	The PR	A Group, Inc
- Nº 1108		100	0.40	en a	-	AGLE NO	UNTAIN LA	CH-10 NDFILL RIVERSIDE COUNTY CALLEORNIA	Canno and the first	m		0. 9. R	N 1900	12-12 15			В	OREHOLE LOG CH-10
ENGINEERING V7 -/	- 1-		2.47	elot	(AINE REC	LAMATION CORPORATION	in Bal Moh			0.	AFFE	T 107	EAG	SLE MO	AINE REC	NDFILL RIVERSIDE COUNTY, CALIFORNIA

			1	_	_		1.				695										
REMARKS Vecus Duce Delling Data Presonnel Charges	1001 5410	(x) 004	Fractures per look	FROMMY LOAD	Bot Nurther	Ehrstim (1)	Deeth Bil		teriopic top	Matona: Glassification and Physical Description	REMARKS Wear Day Drifting Day Personnel 4	Na gas	A Sue	0 (X)	ictures pair foot	corel Core conery	Murtee	(1) users	Ah (1)	to) steps	Material Classification and Physical Centrysian
	245	2	3 1	8	109		35			551.0" - 952.0" IRON ORE Black, magnetis-ron, abundani massire prina- temolog-sendra, meno kmorra stan. Calora		-	18	8	21	100	0 0 801	Be	1030	5	1027 5 - 1054 5 IRON ORE
	2405	60		8	×OH			1.1		abundant in Instants D I mm			185. HOLE	17	2	100	X 119				Black magnetisendt, Moderatery Faitured, aperturtes slightly open, dio staleo to warnost, with kinonica stalin Hard, strong, way slightly weathered.
67 depth at 10735 an. 272572	lune	56	2 1	8	110		96			Greensh, highly started. Cacta soundari in horsonal inscars. Noderasily to very tractified, hard, stong, slighty, weathend.	1045 6003 2	15 am. 2/23/92	2405	8	2	100	8				
		87	1	8	BOX		-			555.0 - 570.5 TRON CRE / SKARN USA prime & Suce, Active Stand, Aduncian					1		X 120		1040 1		
		-		_	111					Suphry Inaction with calors vers to 1 mm. Nostly hard to very hard, strong to very soong				57	1	100	OUS C				
70 60pm 21 1145 2m. 272252		"	1		300		971		* :	970 5 - 977 1' ANDESITE CXE	1050 cepth 2	25 27, 27292		3	1	100	NOX		1050 -		
21		2	1</td <td>20</td> <td>X </td> <td></td> <td></td> <td>÷</td> <td></td> <td>Dark grzy, sughty porpryring, aprantic groundmast Sáphty to moderately frammod, spicote and calore láing Apenteres alighty open, minor importe stain i fart, strang</td> <td></td> <td></td> <td></td> <td>23</td> <td>2</td> <td>100</td> <td>125</td> <td></td> <td></td> <td></td> <td>1045 9 - 1067 4 SXAEN</td>	20	X			÷		Dark grzy, sughty porpryring, aprantic groundmast Sáphty to moderately frammod, spicote and calore láing Apenteres alighty open, minor importe stain i fart, strang				23	2	100	125				1045 9 - 1067 4 SXAEN
80 dapts at 1.55 pm. 272.92		17	2 1	80	8		58			977 11 - 981 11 IRON CRE			ļ			_	BCX				Мазы видат, липанаедорогу кол сле золе Изсекцие у меданини.
eologist J Schart		01	511	00	×O		1	1		Red, brown, slady: nemasus, mitor magnetice Highly weathered, suit, crumbly, ruggy	1067 64921 21	00 am. 2/2352		27	3	100	122		1050		
		01	3 18	is r	113					<u>981 1' - 1027 5' SKARN'</u> Grien chioma, eodota, tempula, with ora rens (mananta a mytha) b 2 motor. Sectional submits topes	Geningst D. Vo	uno	1	23	2	100	SOY				
90° depth at 400 pm, 2/22.92		2	2 1	20	NOX		\$9	0		Moderately fractured, with calcus SE, Emorya state, Hard, strong, slightly weathered.	1070 6007 21	50 40 275/52		0	>10	100	123		1		1067 4" - 1081 3" ANDESITE DIKE Green-prey, hopby abared, abundant importe star Meany hopby frammed to saturated. Storay
		-		~	114									0	>10	100	B		10/0		hard, slighty strong, hipply weathered
		50	3 1	8	BCY			-			2			17	>10	100	X 124				
000° depth at 5:32 pm, 2/22/92 Demation survey + 1 degree		75 1	5 1 1	100	115		100	0			1080' depth at	.47 27, 22352		29	3	100	ICTES		1060 -		1021 3 - 1109 0" CUARTZITE
		42	2	8	KOB								frontant of	53	2	100	NOX				Prokish tan, preen, gray Pervasive chloride-social atteration. Calora in visios 1-5 mm, menor knowle sizm. Hard to very hard, very sizong, sightly to moderately
010° depth at \$135 pm, 2/22,52		73	1	200	116		101							67	1	:00	125				tacturad, aparturas signay open
		40	2	100	8			-			1090° 60070 at	37 27, 27392			, [100	SOX		1090 -		
			1		X 117			1									125				
1020° decen at 10.35 pm, 2/22.92 Geologist R. Librey		8	a	80	8		102	1			1100" 1997 11	50 pm, 272.92		52	2	100	80		1100		
		67	<1	100	X		-			1027.5 - 1054 5 IRON CRE.	Geologist J. Sc Deviation survey	sand ≥ 15 degraes		72	2	100	127				
100 407 9 5700 00 00 00		-	1	00	BOX		103			ספרת, לבי גוונים שירובה אלה להמיש גברי לביל בינים ביין אין ביין אין ביין אין ביין אין ביין אין ביין אין ביין אין ביין אין ביין אין ביין אין ביין אין ביין אין ביין אין ביין אין ביין גער אין גער גער אין גער אין גער אין גער אין גער אין גער גער אין גער גער גער גער גער אין גער אין גער אין גער אין גער אין גער אין גער אין גער גער גער גער גער גער גער גער גער גער				78	1	100	80				
NO DEAN AFE	C 41	E MQ.	4%2 G125	-10	_		- 'v	Ţ	he PR	A Group, Inc	1110 3400 2	1030 CEUIS	0	TE	452		123	-	1110		1090 - 1120 ANDESTE CKE
Nº 108 - 23 24	Hi on	0 40.	EN 11	1006-1 1775-5	3	-			В	OREHOLE LOG	1 SUITE	DEAN AFFE	10	NO NO.	G12	5-19 15005-	14	Ξ		OHEVETHO	BOREHOLE LOG
And the first	Cn.	-0	0. AS	FRUT	r	EA	GLE I	NUCH Mit	TAIN LA	INDFILE RIVERSIDE COUNTY, CALIFORNIA CLAMATION CORPORATION 10 ct 1	1 Anis	12,1108 A		****	2.4	LERT	5	EAG	GLE MOU	NTAIN U	CH-10 ANDFILL RIVERSIDE COUNTY, CALIFORNIA
STA GEOLOGIST ONIA											XX	TINEERING CIT	1		2.1	10	T	1	M	INE RE	CLAMATION CORPORATION

Norm And Make Desa Daling Data Personani Chergee	Teel Site	1400 (M)	forcess per tool	Present Con	Ba Hinter	CIRCORCO (II)	Depth [1]	linder in	Meterul Classification and Physica, Gesenduon
	HQ 3185*	π	<1	100	80X		1110]		1109 07 - 1112 07 ANDESTE DIKE Green, hohy stand, hohy relicined Modersey to sighty hard, modersely to sighty strong
	2.406"	0	5	65	BOX		1		1112 0" - 1116.5" FAULT GOUGE
35 depth at \$15 pm, 2/2352		12	3	100	125		1120		SICIANACIÓN. 1116.5 - 1164 8 CUARTZITE
		42	3	100	BOX				Greeversytat Signey wathared, moderatory fortune instants signey hazed, mostly 5-20 degrees from ass, with otherw-siz (a), shows stan
107 depth at 10:00 pm, 2/23:92					130		1130-		
		42	3	100	in O a				•
KARCEST R. USINY		47	2	:00	131				
40 George 1225 am. 22452		65	1	100	BO		1346-]		
		52	3	100	122				
57 depon al 225 am, 22452		72	2	100	mOx		1150		
iologist O. Voltumo		57	2	100	123				
657 degen al 4:55 am, 2/24/92					acx		11160		
		62	2	100	134		1		
		70	2	1:00	8		1		Gay to period green; ecusions of green stated
70 depch at 8:01 sm. 22492		67	1	100	X 125		1170-		enarmia. Kart is very hard, szong, sieptoy weathered. Moderate chonta-epicele-pynte altaration Galora verid, hardine is 1 cm.
		\$2	1	100	8				
		R	2	100	Nox X				1178 9 - 1195 5 OUAHIZITE
50 GREN E 940 10, 22092		53	2	100	a o y		1180		Median partopara, Kiphy facurato, heatad with dark prese chambedocur-prise, backine to 3 cm, 10-30 degrees iron and Very hard, very szong, sighty westwared
00 coch at 11:12 am, 2:2452		63	cl	1:00	127		1100		
STERED GEOL	- 04	78	492		11			he PR	A Group, Inc
NG DEAN ASS	1400		G12	519		-	-	DRIULTING	INCUITUS P/
and the second	1/1		RY	19008 (ARR)	5	-	1	EDITE	D BOREHOLE LOG
1 1:08 AVX/X	-		C. 1	AERIT		EA	GLE MOUN	TAIN LA	NOFILL RIVERSIDE COUNTY, CALIFORNIA
Tingen tova	4.	P-0	D. A	FFEL	DT	1	AU.	NE REC	AMATION COSPORATION

RELEARUS Harar Duca Drefor Duca Presonnal Changas	fool Site	(x) 00U	FIRMER PR 100	Perset Con Necest	Ern Nustee	Elevation (1)	Depth (11)	Lithelegic Leg	Wateral Cassingation and Physical Description
11907 Genori al 11:12 ani, 2/24/92	HQ 3.65" HOLE	60	1	130	mOx		1190		1173.9" - 1195.0" CULATIZITE Madum prikoray, highly katurad, mostly hauled with dark green chlorae-produce-prize, hourse in 3.0m 10.00 denome from size. View hard
	2.406" CORE	13	>10	100	138				VIRY ETONG, EGOLY HEALTHING. 1195.0 - 1198.5" SKARN:
200 dopth at 1200 pm, 2/2692 Deviation survey + <1.5 degrees		28	3	100	NOa		1200-		Very cart green to black, highly shared; ore vers with syme. Moderately hard, moderately strong, moderately weathered, highly fractured,
Denicesz J. Suthard		0	1 2	1:00	129		1		sperures moderately open. 1198.7 1203.5 ANDESITE
210 dean at 4:40 am 2/24/92		61	11	100	mOx				tactind, kinor epideu-calcue EL
		52	2	100	142		12:07		Heauth gray to great, fine to medium graned, Green Election (pyrosce-anghibola-Microsce-epidosa-
		0	1 3	100	80				vers of epidote-calcula, knonce stan ward, strong
1227 sepan al 6.30 pm, 2/24.92		50	15	100	141		1220-		
			1.	1	222				1220 F - 1236 C ANDESITE Dark city, sphanoc, slighty porphynoc Moderawy
* *			1	63	x				to highly fractured, spectures light to slightly coen with epidoxe-pyrne 18, fimoniae stain. Hard, strong, slightly weathered.
200 decth 11 9.55 pm, 2/2492		1:	1	\$2	142		1230-		
		52	2	100	×00				1236 0 + 1238 5" CULATIZ MONICONITE Prix to brown, medium grained, Francisco mosty hasted
Secondist: R. Usitely	1	35	12	100	140				tarine to 3 mm, 15-30 degrees from ars, with calcte SE imonte etam. Very hard, very strong, slighty weather
1245 depth at 3:40 am, 2725/92		42	2	100	8		1240-		1238 5 - 1252.0 CUARTZITE
Seologist O. Voltumo		8	10	100	X 144				Gray, tan, pink motied zones. Older hartures hasted, with black to green sharapon times, Younger (hartures hested, with abundant calore, apentures alignity to motientary open, doctly near-wertical. Name, story,
1257 Sector # 9:50 am, 225592		u	2	100	BOX		1250-		
		:4	>10	100	145 1755 C				
		13	2	100	NOK				
1257 Gepth at 1275 pm, 22552		53	5	100	146		1260-		1252.5 - 1275.5 CUARTZ WONZONTE
		47	:	:00	BCX				Moderately frammed with calors Et, signay open Seatened swifed masses of guarane
1270 6003-01-270-00 27552	1	67	1 2	1 100	147		1270		1
SSIENCE OLOLO	0.		352				T	he PR	A Group, Inc
ALLAG UDWI AFFE	1 00	- HO	EV	19006	-16	-		PHILING P	
Nº 1108 - 10/1	the.		R.)	WERE	s	1		6	CH-10
aris Data Alla	1/1-	* 0	C. 1	AERIT		EAG	GLE MOUN	TAIN LA	NDFILL RIVERSIDE COUNTY, CALIFORNIA

	I T I F	1 1								
REMARKS Vean Loca , Sting Coca Personal Charges	led Sue ROD (%) Finktmes per led Perend Cott Bennery Du thenton Ebration (t)	Daych Fi) Landdogi Log	Waternal Glassaticstop and Physical Description	REMARIUS View Data Drifting Data Privotras Charges	31.4	C [2]	art Con	Minitar Lation (N)	lul o	Katerius Glassification end Stytecal Sessification
1270 depin 21 200 pm, 27562	HO 47 2 100 271 T	1270 -	1252.07 - 1276.57 DUARTZ MCA2ONITE Gray-brown, majare-graned, Nard, simong Moderably heratind, with militie 50, apenutes signay open, Scalared sender masker of quarters	1357 depth # 1005 am, 27892	101 101	11 11	0 100	20X	1350 1	E 1300.0" - 1385.0" CUARTIZITE. Long green to medun durk gray, Snegraned to
1230° depch zi 4:06 pm, 2/25/92 Geologist J. Suttain	2 407 1 1 100 148 50 2 450 3 80 c1 100 X 40 2 100 X	1250	1275 5 - 1285 5 LIVESTOVE. Garyopen, with abuncan calour verse and harme frammes with baars (ora?) 51. Hart, strong, noderatory frammed, aberune signate open framework metacoanter with open. 1285 5 - 1283 0° CUARTZ MCHZCANTE	1360° depri az 1200 pm, 27252	1590" HOLE 2405" CORE	19 9 29 9 29 9	5 100 5 100 1 100	6 0 × 158	1360-	vennous, Vary harz, vory sering, unweizherd Moderauer tearren santen sante is schrift open. Calena-endem vers, hanne is 5 mm, 0-53 degrees form acts.
1250' depth at IT:57 pm, 27592 Geologal R. Uster	50 2 100 237.2 3 22 1 3 100 X 57 3 100 150 22 12 2 20 2	1290	Scen and gray, mask with mark generatives quartize, hand, story, sighty meanword moderately fractured, when explosive-scene is the neural scene tizes of - 1200 ST CHARTZITE. Dat gray, wan 35 min one was Nant story Nederately fractured sectors sighty cost with calcula- chart-scene 50	1370° depart si 2.17 pm, 22852		13	5 100	159 13720	1370-	
Geologist O. Voltumo 1300 Geon at 11:52 am, 2/25/52 Deviacon survey = 1.5 degrees	57 2 100 0 0 58 1 100 151 1 100 151 44 2 100 8 1 100 151 1	1300	1256.5" - 1330.0" SXLFN Gray, Stack, graw, ourge, with major times of quarties and one. Up to 25% one, with abuncant prime, Kard, strong, sightly weahward. Moderatay factured, apentures moderatay open, cancer or verds 1364 - 1377 minutoson of cancer verds	Geologist J. Sutrati 1987 Avon z Still pr., 223/52		79 81 <1 72 <1	1 100	100 13005	1380	
1310 depth at 2:10 pm, 2/25/92 Geologist J. Suthand	13 3 130 152 1722 25 3 100 8	1310				87 cl	100	151	1390	TOTAL DEPTH 1389 FEET
1225" depth at 5.15 pm, 222552 Broken done chain - ng calen unal 1247 am, 22262	63 ct 100 153 100 2 100 5 100 2 100 5 56 c1 100 X	1320	ŝ						1400	
Gaesager, R. Usnev 1307 decem at 127 a.m. 277/62	100 c1 100 r54 100 c1 100 r54 35 2 t00 0 x 0 >10 100 r55	1330	1337 - 1397 GUARTZTE Light green is medium dam gray, Ste-grained is rstrous. Viery hare, viery strong, urwaisznerod Koleszawi huszniki: thaurike auto su support open Caliche-epociasi were, harise al 5 mm, 0-00 degreen a tuta						1410	
1340 aeon 21 400 2m 20252	0 >10 120.75 0 >10 0 0 47 5 100 156	1340							1420	
Geologist D Vaturno 1350' decon	17 5 100 57	1350								
AP 1108	DATE 4/2 100 HD. G155:9 2008 HD. EM 1900517 2008	BO	A Group, Inc REHOLE LOG CH-10 SFILL RIVERSIDE COUNTY, CALIFORNIA AMATION CORPORATION 17 pt 15	SUCCEAN AFFEIL		ATR DB HO. NG HO. RAMM	442 G125-13 EM 1900 R. KAR	8-16	1430	The PRA Group, Inc
GEOLOGIST AND				GEOLOGIST	P-F	P*0	D. ATTE	101	N	INE RECLAMATION CORPORATION IS of





DRAFT

Samale Information I					Con Looviatory		Slevelle				Madonali
Rorino	Sample Ma	ibe-th	ta-situ	In-site Dry	Atterbere Limite		44 .1200 15 Sum			USCS	Cenderlivity
			Wrater Content M	Unit Walata auf			-	-2200	(Group	
		(0)	Concert, 35	weither bei	LL	21	(%)	(%)	(%)	Symbol	(c m/s)
C-1	3	17	1.7	112.4		-	91	¥.3	-	SP-SM	
	7	58	1,1	111.4			97.3	9,3	•	SP-SM	
	12	401	2.8	_ 111.6	NP	Ne	38,3	14.6	k	SM	
	13	110					99.8	11,7	-	SP-SM	
	14	120-125*		· ·	· · · · · · · · · · · · · · · · · · ·	·	81.6	8.7	3	(SP-SM)	
	15	141	· ·		·····		99.4	25.4	19	SM-SC	
	10	423	· · ·	·		ļ	92.5	16.5	10	SM-SC	
	11	100				•	00,4	77.0		(SMI)g	
<u>_</u>	10	201	53	100.0	31	-	06.1	18.8	11	50	
	21	210-220*	-		NP	NP			<u>.</u>		
	24	240-250*	-			•	97.9	23.3	13	SM-SC	
_	26	262	7.7	104.2	24	4	•	•		SC-SM	
	27	263-272*	•	•			95.7	19	8	SM	
	28	265-275*	-		-	-	71,9	14.9	1	(SM)e	
	29	240-295*		•	-	-	98,3	16,4	•	\$M	
	32	322	5,6	126,1	•	-	9t.7	25.1	13	SM	
	34-2	380		-	21	3	·	-	•	SM	
	27	400-420*			40	26			-	CL.	
	38	420-426*	-		-	- :	99.9	Ř,I			
	42-2	460	15.3	113,1	23	3	·	· · · ·	•	SC-SM	
C-4	443	460			44	- °	074			SC.UM	
		a/s				-	97,0	14.1	- 11	ac. 3M	-
	4.2	- 20	26	124.2			74.6	13.1	1	(\$200	
	1	1.		-			99.7	16	- 13	SM	
		59	•		•		58.6	2.#		(SW)e	
	10-3	62	2,9	112.4		•	91.9	22	16	SC-SM	2,700-07
		B/a		-			#3.6	14,5	4	(SM)s	
	12-3	31	2	113.7	-		15	9.8	· .	(CP-GM)	
	11	(0)					04 5	1.6		60.514	
				· · · ·			34.3		•	01-0.11	~
		121		-			52.7	6.7	•	(GP-GMB	
		142	- 255	93.2			100	91.2		141	9,20710
	71	305	163	106.4	- 16	10	100	75.4	- 11	(h(l))a	
	25	200				10		423	18	SM SM	
		276			-		100	13.4	-	SM	
	29	210		•			100	8.2	7.4	SP-SM	
	36	399			-		100	41.5	18	SM-SC	
	MC-I	J44**	31.6	92	100	58		98.7	-	CH	
C-9	3	17	0.4	102.4			50.4	9.2	-	SW-SM	
	6	35-45*	•	•	•		98,6	16,6	•	SM	
		59-77*	-	-	49	32	•	-	•	· CI,	
	10	12	2).6	90.5	4E	24	100	68,6	.10	s(CL)	
	15	87-94*	_ ·			-	471	12.7	6	SM	
	17	32-100-		107.0	· ·	- · - · ·	04.6	22	4	SP-SM	1 100-00
C-10	JM	0-15.5*		107,9		· ·	01.5	74		SP-SM	2,742,403
		14).9	115.6			93.2	7.4		SP-SM	
		17-30	•	-		-	97.5	10.4	2	86-SM	
		10-63*	•		· .		97.1	5.8	•	SP-SM	
	5	63-93*	· ·	-		•	91.2	3.7	3	SP	
		95		-	•	~	58.4	12.4	ŝ	SP-SM	
	14	100	2.1	115.8	_		91,3	9.5	-	SP-SM	
	12	101-121*	•		•	•	91	16.2	11	<u>зм</u>	
	ນ	122-(19*	•	-	•	•	78.4	1	5	(SP-SM)E	
	ж	175-191*		•			59. 6	5.4	7	SP-SM	
	17	191-191*		*			73.4	*	6	(SP-SMJS	
	11	198	2.1	100.5			66.9	3.6		(SP-SM)g	
	20	207-240*		···	·	· · ·	94.5	15,7	*	MG	
	- 21	240-200*	· ·	•		-	93,7	12,1	•	SE-2M	
	22	354		110.7		74'	77	61.6	-	(C) w	
		428,442*	V ,1	10.3	- 11	11	teo	63,11	50	CH	
	Per	447-4514			59	32	100	411		Cit	
	34										
	35	469-470*		-	59	37	99.6	86.7	70	CH	
	35	469-470*	•	-	59 51	37 29	99.6 98.2	86,7	70 59	(CH) (CH)3	

Principles of Geotechnical Engineering



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(6.27)



(b)

Figure 6.8 Results of permeability tests on which Eq. (6.27) is based: (a) results for $C_u = 1-3$; (b) results for $C_u > 3$ (after Kenney, Lau, and Ofoegbu, 1984)

where D_5 = diameter (mm) through which 5% of soil passes. Figures 6.8a and 6.8b show the results on which Eq. (6.27) is based.

On the basis of laboratory experiments, the U.S. Department of Navy (1971) provided an empirical correlation between k (ft/min) and D_{10} (mm) for granular soils with the uniformity coefficient varying between 2 and 12 and $D_{10}/D_5 < 1.4$. This correlation is shown in Figure 6.9.



Figure 6.9 Permeability of granular soils (after U.S. Department of Navy, 1971)

According to their experimental observations, Samarasinghe, Huang, and Drnevich (1982) suggested that the hydraulic conductivity of normally consolidated clays (see Chapter 10 for definition) can be given by

$$k = C_3 \left(\frac{e^n}{1+e}\right) \tag{6.28}$$

where C_3 and *n* are constants to be determined experimentally. This equation can be rewritten as

$$\log[k(1+e)] = \log C_3 + n \log e$$
(6.29)

Hence, for any given clayey soil, if the variation of k with the void ratio is known, a loglog graph can be plotted with k(1 + e) against e to determine the values of C_3 and n.

Some other empirical relationships for estimating the hydraulic conductivity in sand and clayey soils are given in Table 6.3. One should keep in mind, however, that any empirical relationship of this type is for estimation only, because the magnitude of k is a highly variable parameter and depends on several factors.

Tavenas et al. (1983) also gave a correlation between the void ratio and the hydraulic conductivity of clayey soil. This correlation is shown in Figure 6.10. An important point to note, however, is that in Figure 6.10, PI, the plasticity index, and CF, the clay-size fraction in the soil, are in *fraction* (decimal) form.

6.5 Empirical Relations for Hydraulic Conductivity 153

Type of Soil	Source	Relationship ^a	Comments
Sand	Amer and Awad (1974)	$k = C_2 D_{10}^{2.32} C_u^{0.6} \frac{e^3}{1+e}$	
	Shahabi, Das, Tarquin (1984)	$k = 1.2C_2^{0.735} D_{10}^{0.89} \frac{e^3}{1+e}$	Medium to fine sand
Clay	Mesri and Olson (1971)	$\log k = A' \log e + B'$	
	Taylor (1948)	$\log k = \log k_0 - \frac{e_0 - e}{C_k}$ $C_k \approx 0.5e_0$	For <i>e</i> < 2.5,

Table 6.3 Empirical Relationships for Estimating Hydraulic Conductivity

 $^{a}D_{10} = \text{effective size}$

 C_u = uniformity coefficient C_2 = a constant

 $k_0 = in situ$ hydraulic conductivity at void ratio e_0

k = hydraulic conductivity at void ratio e

 $C_k = permeability change index$



Figure 6.10 Variation of void ratio with hydraulic conductivity of clayey soils (based on Tavenas et al., 1983)