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Subject: Technical Review Comments
Environmental Impact Report
Eagle Crest Energy Company Eagle Mountain Pumped Storage Project

Dear Mr. Cook:

Geosyntec Consultants (Geosyntec) is pleased to provide our technical review comments to Kaiser Ventures, LLC (Kaiser) on certain portions of the Eagle Mountain Energy Company (ECEC) Eagle Mountain Pumped Storage Project Draft Environmental Impact Report (DEIR), hereinafter referred to as the Project.

Our technical review comments are divided into the following three categories:

- Review of the DEIR for Omissions in the Evaluation of Landfill Compatibility Issues;
- Evaluation of the Reverse Osmosis System; and
- Evaluation of Storm Water Management System and Upper and Lower Reservoir Overflow Impacts to the Landfill and Surrounding Area.

Geosyntec's technical review comments are provided below.

Review of the DEIR for Omissions in the Evaluation of Landfill Compatibility Issues

Seepage

The DEIR identifies potentially significant impacts subject to the mitigation program related to seepage from the proposed reservoirs and tunnels and its impact on the landfill. The DEIR also identifies some proposed mitigation measures for controlling seepage. The proposed mitigation measures have not been adequately conceived or explained with regard to their compatibility with the Eagle Mountain landfill project. Significant impacts may remain on the construction and operation of the landfill at the site related to changes in the hydrogeology due to seepage.

As required for any proposed mitigation measure the licensee should provide enough detail in their description to allow for a determination of whether the proposed measures are appropriate and feasible.

This should include at a minimum:

- a preliminary description of any steps necessary to implement measures and the preliminary schedules for implementing the measures referenced to the license issuance date;
- Approximate costs of these measures.
- A consultation record leading to the development of these measures
- Operations and maintenance place for the proposed systems.

While some information has been provided regarding the schedule for additional minimal investigation and a conceptual design for some seepage control measures, ECEC has failed to meet these minimum requirements to allow for a determination that the mitigation measure are appropriate and feasible. Indeed the DEIR and its technical appendices raise many good questions about seepage without providing details about how this relates to the landfill.

- ECEC identifies increases in the groundwater elevations under the landfill footprint from the operation of both the upper and lower reservoirs. The impact of this seepage or even the magnitude of the increases in groundwater elevation below the permitted landfill (the "uncontrolled" or "controlled" situations) is not explicitly addressed in the DEIR. The two technical appendices addressing the issue of seepage "Eagle Mountain Pumped Storage Project – Seepage Analyses for Upper and Lower Reservoirs" and "Eagle Mountain Pumped Storage Project – Seepage Recovery Assessment" make no limited reference to the landfill project and focus instead on the CRA project.

- The promised reductions of the seepage induced groundwater elevations to "below the bottom elevation of the landfill liner" are necessary but not sufficient. The impacts on global stability, liner stability, hydrogeologic monitoring requirements, vadose zone monitoring, and constructability of the landfill in the "seepage increased" condition even with groundwater below the liner have been ignored completely by ECEC.

- In "Eagle Mountain Pumped Storage Project – Seepage Recovery Assessment" no modeling or other justification is presented as evidence to support the assertion that "about seven seepage control wells be needed to control seepage losses" from the upper reservoir. ECEC admits that "Additional seepage recovery wells will be constructed along the axis of the Eagle Creek Canyon to provide secondary control to prevent groundwater levels from rising beneath this area of the proposed landfill" but does not provide details. No metrics are set for control of the groundwater elevations under the landfill. Modeling instead focuses on the lower reservoir and its impact on CRA. This is no discussion of the impact of the lower reservoir on the landfill.

- Control of seepage using a seepage blanket in the best case scenario proposed for the upper reservoir involves only a reduction of 25%. Any additional reduction of 30% due to grouting was established as an unsubstantiated estimate by ECEC. These seepage control measures don't appear to produce significant benefit under the adjacent landfill footprint based on the modeling seepage models prepared by ECEC. (See Figure 6 and Figure 10 of "Eagle Mountain Pumped Storage Project – Seepage Analyses for Upper and Lower Reservoirs")

- ECEC's estimates of hydraulic conductivity for the Upper reservoir used in "Eagle Mountain Pumped Storage Project – Seepage Analyses for Upper and Lower Reservoirs" are unsubstantiated and are based on qualitative comparisons with borehole hydraulic conductivity of the lower reservoir. Site specific estimates of the fractured bed rock hydraulic conductivity in the upper bedrock area should be made prior to acceptance of the currently submitted seepage modeling.

- The composition of the mine tailing (with a large percentage of sand sized materials) may not be suitable for a low permeability seepage control blanket. It appears that estimates of hydraulic conductivity of the proposed seepage blankets are based on Geosyntec's laboratory hydraulic conductivity testing of the fine tailing material in 1996. These estimates were made assuming the material would be use as a compacted low permeability barrier as part of the landfill liner. It is unclear that the sample and testing conditions (compaction, confining pressure, gradient) used the Geosyntec testing are consist with what would expected in the seepage blanket condition. Desiccation cracking and an increase in hydraulic conductivity of the proposed seepage barriers should also have been addressed in the DEIR. The economic feasibility of what would be a very expensive and time consuming seepage control program including blankets, grouting, monitoring and pumping well network are not discussed. How will the seepage control system be maintained and operated? Is there financial assurance that the seepage control will continue after ECEC is gone and groundwater levels are still elevated?

- Seepage from the proposed tunnel under the landfill is not systematically addressed in the DEIR. Is concrete proposed for the entirety of the tunnel lining? What are the estimated seepage losses from the tunnel with the proposed concrete lining? For unlined portions?

<u>Stability Comments</u>

Increased groundwater elevations, even if controlled below the liner elevation will increase the potential for slope instability in the landfill. Increases in groundwater elevation could potentially increase the driving forces on landslides resulting in reduced factors of safety. Existing designs will not meet their required factors of safety and will require redesign. This will increase time and budget for design and construction and potentially reduce airspace due to the need to flatten slopes and incorporate berms for stability. It is ERC's responsibility to show that seepage would not produce these significant negative impacts on the landfill

<u>Inadequate Proposed Phase I Geotechnical investigation Program</u>

The proposed investigation program will provide inadequate information regarding the design and constructability of the proposed system. This is especially true with regard to seepage. Boring spaced at intervals of 1000 feet in the tunnel and over 500 feet in the proposed dam abutments would appear to be insufficient to provide design for these features and may not be an appropriate mitigation measure. What is the basis for establishing this level of investigation?

Dam Break Analysis

While unlikely there is a chance that any dam will suffer a catastrophic failure during its lifetime. The southern saddle dam is adjacent to the western portion of phase 1 of the landfill. Land filling and Landfill related activities will likely be occurring in the dam break inundation areas. Flooding of these areas in addition to the potential for loss of life may damage landfill facilities, equipment, and access roads/railroads, interrupting the availability of the landfill as a resource to the community. Inundation maps should be prepared and the potential for the economic and environmental impacts of such a failure should be addressed and quantified.

Landfill Siting Criteria Near Reservoirs/Water Bodies

The Upper Reservoir and its South Saddle Dam are located adjacent to the northeastern corner of Phase 1 of the Eagle Mountain Landfill.

We are unaware of any large reservoir proposed adjacent to a permitted lined landfill in the state of California. An attempt to control seepage from a large unlined reservoir at such a grand scale with a sensitive neighboring project is not something that is "standard of practice" and deserves more than a passing mention of a few proposed seepage control methods. A permit should not be granted based on promise of additional investigation and analysis in the future. (How will the Regional Water Quality Control Board or Kaiser have input on the design process once this project has been permitted? FERC and DSOD who will be reviewing designs may not be sensitive to construction and operational constraints of the landfill as it relates to hydrogeology.)

The standard of practice is not to site a landfill near a water body or reservoir; consequently, there are no existing specific regulatory criteria or available technical publication that pertains to landfill siting near water bodies or reservoirs. Siting a landfill near a reservoir should not be considered for the Project unless a comprehensive analysis be performed and included in the DEIR.

Potential Impacts to the Liner

A November 24, 2009 GEI memorandum contained in DEIR Appendix C indicates on Page 2 that the water tunnel would be lined with concrete throughout to mitigate seepage. In the very next sentence, it indicates that "it may be feasible to only line the tunnels at certain locations where seepage potential is high." In the latter scenario, the seepage potential is not adequately addressed; consequently, the potential impacts to the liner system, such as potential liner uplift, have not been addressed in the DEIR.

While significant deformation of the landfill liner due to construction of the proposed tunnels is unlikely, criteria should be established to control or monitor this potential deformation.

Previous comments made in August 2008 on the Draft Application made to the Federal Regulatory Commission regarding seepage-related impacts to the liner on the Draft Application went unaddressed in the DEIR. Such comments included the following:

- The DA suggests using fine mine tailings for use as a seepage control blanket. We believe the composition of the mine tailings (i.e., large percentage of sand-sized materials) would not be suitable for a low-permeability seepage control blanket. The DA does not include a comprehensive static and seismic stability evaluation of tailings placed in the pits. Fine tailings will be subject to wetting and drying cycles due to the rising and falling water levels in the pits. The DA needs to address the potential for desiccation cracking and resultant increase of hydraulic conductivity of the fine tailings as a seepage barrier.

- The fines placed against the side walls of the Central and East Pits will be unconfined, will become saturated, and during draining of the pits, will be subjected to seepage forces. Free swell of the fines submerged below the low water level of the pits is likely to occur; long-term swelling under unconfined conditions will lead to an increased hydraulic conductivity of the seepage blanket material. These issues need to be addressed in a comprehensive slope stability analyses and geotechnical evaluation in order to adequately identify and address impacts of the pumped storage project.

- Page 1-6 of the DA indicates that "During the first four phases, no overlap occurs between the landfill disposal areas and lands required for the proposed pumped storage project." The proposed conveyance tunnels transect Phases II, III, and IV of the Landfill Project. A detailed study should be performed to address the impacts of the conveyance tunnels to the Landfill Project, including, but not limited to, the effect of seepage on landfill stability and on the integrity of the landfill liner system. The alignment, profile, and corresponding elevations of the proposed conveyance tunnels with respect to the liner system base grading plan and waste fill plans for each respective phase of landfill development should be thoroughly evaluated to identify and adequately address impacts to the Landfill Project.

- Development of a geotechnical sections is required as soil liquefaction may be an issue. Local increase in groundwater elevations may result in local increase in soil liquefaction potential.

- The DA indicates the applicant understands reservoir seepage is an important issue for the project. However, to date, the applicant has only identified the issue and has not undertaken detailed investigations/analyses to understand the magnitude of the problem. Furthermore, at this time, the applicant only provides conceptual information regarding future seepage investigations, development of a seepage flow model, and potential components of a seepage mitigation program.

Potential Impacts on Methane Generation

Based on the potential for seepage that has been inadequately addressed in the DEIR, and ensuing impacts to the liner system without further required analysis, there may be a potential for impacts to methane generation should the liner system be impacted by the Project.

In the event that seepage water contacts the waste mass, accelerated waste decomposition and corresponding increased methane generation can be expected. Waste mass stability is likely to be affected and should be addressed in the DEIR. Rapid waste decomposition will result in accelerated landfill settlement and could require additional operational effort to be required for landfill regrading, surface water management system improvements, and the need for additional landfill gas collection wells to maintain effective gas control at the site. Altogether, these additional activities would result in increased capital and operational costs for Kaiser.

Potential Impacts on the Environmental Monitoring and Collection Systems

The DEIR does not address the impact seepage may have on the environmental monitoring system.

For example, seepage resulting from the project, as presented in the above comments, will very likely affect the vadose zone monitoring system immediately beneath the liner system. The purpose of the vadose zone monitoring system is to evaluate liner system integrity by monitoring for the presence of liquids under the liner system. Seepage will likely cause "false positive" liquid detections in the vadose monitoring system.

The landfill operation would be required to conduct costly and time consuming technical field investigations and analysis each time a "false positive" reading was detected in order to demonstrate to the regulators that the liner system integrity has not been compromised. This will result in increased costs and unnecessary investigations, analyses, and reporting for the landfill project.

Seepage from the reservoirs and tunnel will likely impact the perimeter gas monitoring probes that are required for landfill development. The perimeter probes could become "watered in" from seepage from the adjacent reservoir and tunnel. If the perimeter probes become watered in, the regulators will require the operator of the landfill to install replacement probes, resulting in recurring financial impacts. The DEIR does not address this impact to the environmental monitoring system.

Airspace Losses

The proposed construction road to the surge tank bisects landfill Phases 1, 2, and 3. Temporary and possible long-term airspace losses to the landfill capacity will occur, depending on the duration of use of the construction access road. A worse-case scenario is presented as Figure 1, where landfill development is limited to areas south of the proposed construction road due to access impacts. Based on the alignment of the proposed construction access road, there are significant potential impacts on landfill development, especially in Phase 1, where the perimeter access road may not be built until sufficient landfill buildout is achieved. Development of the landfill south of the proposed construction road is estimated to result in approximately 15 million cubic yards (12.4 million tons) of airspace loss in Phase 1. The alignment of the proposed construction road will require redesign of the landfill development and phasing plan, reevaluation of the geotechnical and stability analyses already conducted for the site, and modification of interim stormwater control features. These impacts are not addressed in the DEIR.

Furthermore, approximately 31 million cubic yards (25.6 million tons) of airspace impacts in Phase 2, and approximately 9 million cubic yards (7.4 million tons) of airspace impacts in Phase 3, could occur; at the very minimum, airspace in Phases 1 through 3 will be temporarily unavailable due to the presence of the construction road; the total potential impacts to available airspace could be as much as approximately 45.4 million tons until landfill perimeter roads are extended throughout Phases 1 through 3.

Permanent airspace losses are likely due to the alignment of the overhead transmission lines running between Phase 5 and Phase 3 to the switch yard area. This impact from the Project was not addressed in the DEIR.

These airspace losses should be adequately addressed in the DEIR to determine impact of the proposed project on landfill site life, operations, and the need for comprehensive technical reevaluation, and redesign of the landfill.

Evaluation of Reverse Osmosis System

General

A review was conducted of the Technical Memoranda (TM) that were prepared in support of the DEIR for the proposed Eagle Mountain Pumped Water Storage Project (the Project). The Project plans to use an RO system to remove total dissolved solids (TDS) from make-up water that is needed to replace the water that will be lost due to seepage out of the reservoirs during the first year of operation and evaporation losses over the life of the project. The make-up water will be obtained by pumping local groundwater supply wells. Although the TM do not provide specific data regarding RO selection or operation, the following operating parameters were inferred based on the data provided in TM 12.2, 12.4, and 12.6:

- The RO will process approximately 1,260 gallons per minute (gpm) on average based on the addition of evaporation losses in the reservoir (1093 gpm) and the RO brine evaporation ponds (167 gpm);
- The RO will remove approximately 95% of the TDS mass from the process water based on the pumped groundwater supply TDS

concentration of 2,400 parts per million (ppm) and the target make-up TDS water concentration of 660 ppm; and

- Following the initial reservoir filling operation, the RO is only expected to treat enough process water to replace evaporation losses, as the Project assumes that its seepage recovery wells will recover the seepage out of the reservoirs.

TM 12.4 also states that the RO system will be capable of treating up to 2055 gpm, but it appears that this capacity is reflective of the initial reservoir filling operation and potential peak flow rates.

Analysis of Water Wastage by Evaporation of Reverse Osmosis Brine

The Project is expected to lose 1763 acre-feet of water per year due to evaporation from the reservoirs and another 270 acre-feet per year due to evaporation from the RO brine evaporation ponds (TM 12.1 and 12.2). This equates to an average of about 1.8 million gallons per day. For comparison purposes the United States Environmental Protection Agency estimates that the average household of four can use up to about 400 gallons per day of water (http://www.epa.gov/WaterSense/pubs/indoor.html). Thus, on average the Project will lose enough water via evaporation to supply about 4,500 households of four. This proposed plan for making up this water is to pump groundwater from the local groundwater aquifer despite the water shortages faced by California.

Evaluation of Potential Constituents that will Concentrate in the Reservoir Water

No specific groundwater characterization data are provided in the TM, with the exception that the groundwater supply is expected to contain 2,400 ppm of TDS. Calculations indicate that, despite the RO system's removal of TDS, the TDS concentration in the reservoir will increase over time (Figure 2). Similarly, if hazardous constituents (e.g., arsenic, selenium, mercury, etc.) should be present in the water then their concentrations will also increase over time.

Arsenic is a hazardous constituent that is often a concern in California groundwater supplies. The Project appears to be in a region of California that typically contains between 1 and 50 micrograms per liter (μg/L) of arsenic (Figure 3). For reference, the Maximum Contaminant Level (MCL) for arsenic in drinking water is 10 μg/L. As shown in Figure 2, the concentrations will increase over time and may exceed the MCL already, depending on the pumped groundwater quality.

Note that the Project does not seem to account for the fact that the seepage water will likely dissolve solids as it migrates through the native sediments.[1] Our calculations also did not consider this phenomenon, as no information is provided for the projected concentrations of TDS or hazardous constituents in the seepage water. The TDS in the reservoir will increase even faster than predicted if seepage water dissolves additional solids. Further, hazardous constituents could also accumulate in the reservoirs faster than predicted, particularly if the native sediments contain elevated concentrations of these constituents.

In summary, the TDS is expected to concentrate over time. Unless the RO system is designed to preferentially remove potential hazardous constituents, then the concentrations of these constituents would also be expected to increase over time. The TMs do not seem to fully consider whether accumulation of these constituents will occur, and if so if they pose a threat to the environment.

The data provided in the TM with respect to the selection and operation of the RO system are limited, and there was no information regarding the characterization of the groundwater that will be used to fill the reservoirs. Consequently, it is not clear if the Project fully considered the amount of water wastage, the potential for concentration of hazardous chemical constituents in the reservoir water, and the potential for hazardous constituents to trigger regulatory standards for the salt that will accumulate in the RO brine ponds for eventual disposal. However, the analysis presented herein raise concerns related to each of these issues.

Evaluation of Storm Water Management Plan and Upper and Lower Reservoir Overflow Impacts to the Landfill and Surrounding Area

After reviewing the documents above to determine whether analyses conducted in preparation of the DEIR are appropriate for determining impacts and potential issues related to landfill compatibility, the following findings were noted:

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[1] According to TM 12.6, the Project assumes that the seepage recovery wells will capture 100% of the seepage from the reservoirs, which may not be practical given the large size of the reservoirs and the presence of "joints, fractures, and faults" that would be expected to conduct seepage.

The analyses conducted do not necessarily reflect the complexity of the hydrologic and hydraulic relationships internal to the Project and of the Project in relation to landfill plans.

For example, the hydrologic and hydraulic analyses discussed in the Project Drainage Plan and Reservoir Spillway Design consisted of a unit hydrograph analysis of inflows to the reservoirs, HEC-RAS modeling to design reservoir spillways, and unit hydrograph routing to account for transient storage volumes for each reservoir throughout the Probable Maximum Flood (PMF). The analysis does not take into account the modified watershed conditions that will result due to landfill development and associated stormwater management measures nor does it evaluate the system performance under dynamic conditions, where sequential storm events occur within the time frame for system recovery from the design conditions.

Flooding analyses supporting DEIR's for large-scale projects with impacts typically include these types of analyses and should be performed for this Project

Management of the PMF flows captured by the closed-loop reservoir system is managed primarily through excess storage in the reservoirs. Because the Project is intended to be a closed-loop system, where flows from the upper reservoir are routed to the lower reservoir via gravity, and pumped back up into the upper reservoir during off-peak hours, the infrastructure critical to system performance under the PMF is dependent on the stage of each reservoir when the PMF occurs. The Project Drainage Plan and Reservoir Spillway Design memorandum describes one scenario, where the upper reservoir is full, and establishes a critical storage volume for the lower reservoir, greater than which the lower reservoir would be unable to accommodate the entire PMF without pumping.

Pumping capacity between the lower reservoir and the upper reservoir, in combination with the excess storage in the lower reservoir when full to normal capacity, appear to be sufficient to accommodate the PMF if it were to occur when the lower reservoir is full. This management approach, however, relies heavily on the integrity of the pumping infrastructure under such extreme circumstances, increasing the risks associated with infrastructure failure. These risks and their resulting impacts should be adequately analyzed as the impacts of being wrong are tremendous.

We understand that you may be providing this comment letter to the State Water Resources Control Board. Should you have any questions regarding these comments, please do not hesitate to contact us at (714) 969-0800.

Sincerely,

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Associate

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Associate

HL1224/GEOSYNTEC DEIR REVIEW COMMENTS.DOC

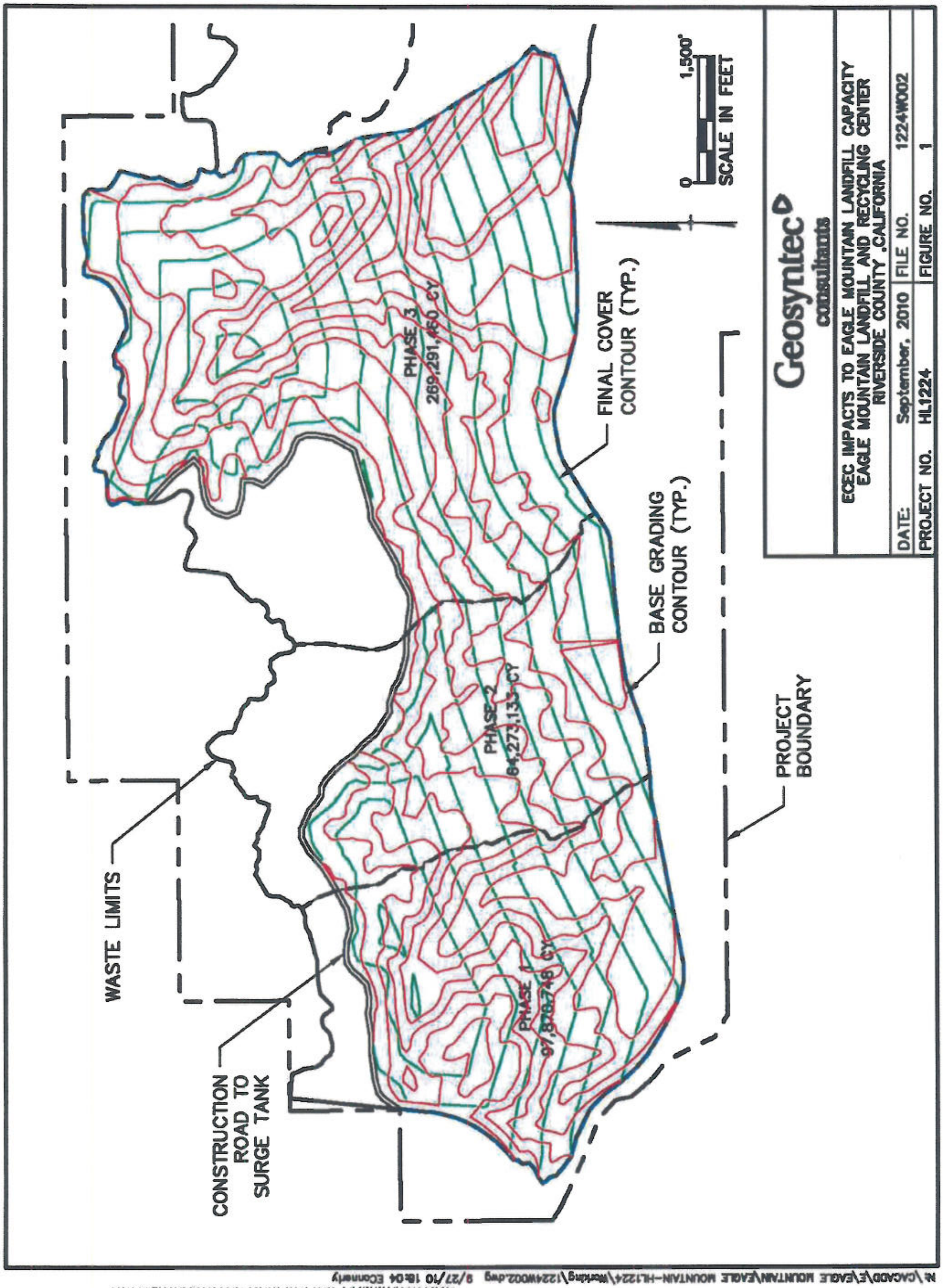
WASTE LIMITS
CONSTRUCTION ROAD TO SURGE TANK
PHASE 1
97,879,746 CY
PHASE 2
84,273,135 CY
PHASE 3
269,291,460 CY
FINAL COVER CONTOUR (TYP.)
BASE GRADING CONTOUR (TYP.)
PROJECT BOUNDARY
0
1,500'
SCALE IN FEET
Geosyntec
consultants
ECEC IMPACTS TO EAGLE MOUNTAIN LANDFILL CAPACITY
EAGLE MOUNTAIN LANDFILL AND RECYCLING CENTER
RIVERSIDE COUNTY, CALIFORNIA
DATE: September, 2010
FILE NO. 1224W002
PROJECT NO. HL1224
FIGURE NO. 1

FIGURE 2
ACCUMULATION OF TOTAL DISSOLVED SOLIDS AND ARSENIC
EAGLE MOUNTAIN PUMPED STORAGE PROJECT

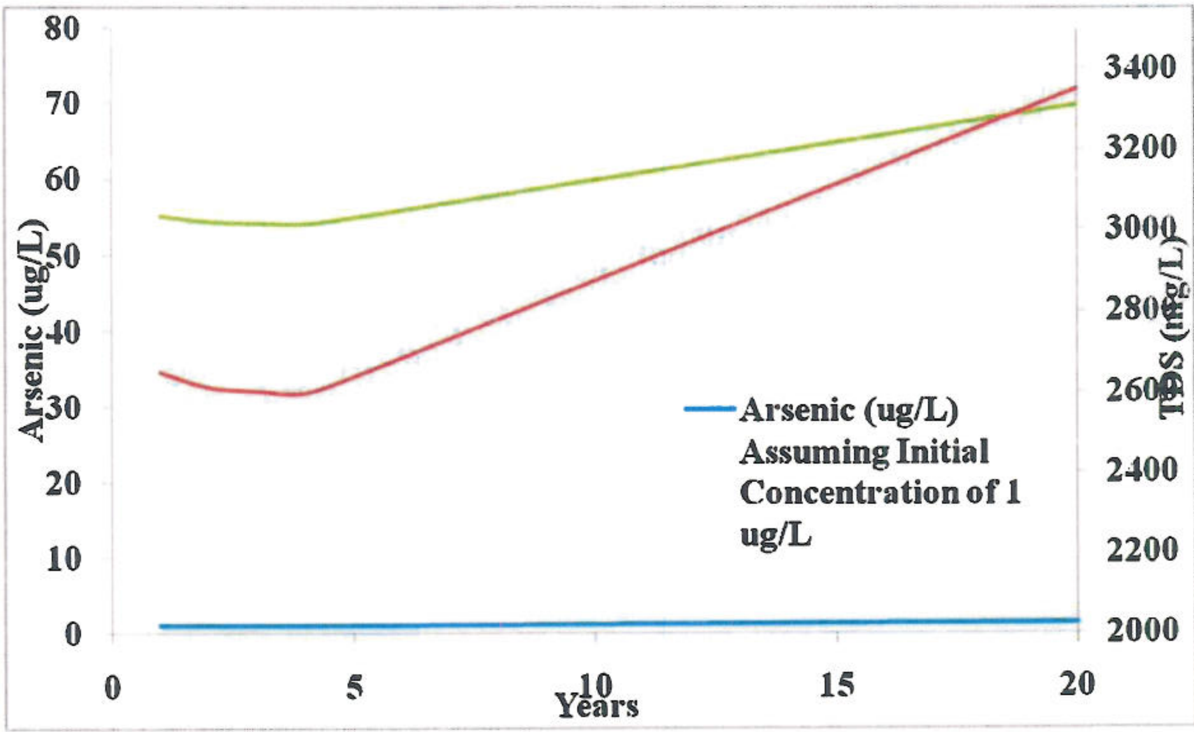

FIGURE 3
USGS MAP OF ARSENIC CONCENTRATIONS BY COUNTY
EAGLE MOUNTAIN PUMPED STORAGE PROJECT