May 29, 2009 063-7079-100

Nevada Division of Environmental Protection
901 South Stewart Street, Suite 4001
Carson City, NV 89701

Attention: Mr. Jon Taylor, P.E.

RE: RESPONSE TO TECHNICAL REVIEW COMMENTS
JUNGO DISPOSAL SITE, HUMBOLDT COUNTY, NEVADA

Dear Mr. Taylor:

Golder Associates Inc. (Golder) has prepared responses on behalf of Jungo Land and Investments Inc. to Nevada Division of Environmental Protection's (NDEP's) March 3, 2009 first technical review letter regarding the Jungo Disposal Site (JDS) Permit Documents. In responding to NDEP's comments, we have attached the following revised submittals:

- Attachment 1 - Volume II Design Plans (Revised May 2009);
- Attachment 2 - Report of Design Text and Tables (Revision 2);
- Attachment 3 - Wind Erosion Calculations (to be inserted in the Report of Design, Appendix H);
- Attachment 4 - Plan of Operations Text (Revision 2);
- Attachment 5 - Appendix C and Table 1, Plan of Operations;
- Attachment 6 - Surface Water Calculations (to be inserted in the Report of Design, Appendix J); and
- Attachment 7 – Supplemental HELP analyses for revised cover section (to be inserted in the Report of Design, Appendix G).

During our March 10, 2009 conversation, you indicated that the comments on the first page were general in nature and did not require immediate response. NDEP may follow-up with more specific comments at a later date. However, we are providing the following response to these general comments.

On page 1, NDEP states: *"The primary concerns the NDEP has are related to whether there is sufficient characterization of the subsurface soils and a reasonable understanding of the engineering properties necessary to address the regulatory requirements of NAC 444.6795 Location restrictions: Unstable areas. (NRS 444.560)." NDEP also indicates that "... in the NDEPs view, suspect soils (landfill bottom being almost directly adjacent) in combination with being located in a Seismic Impact Zone (NAC 444.6793) present a problematic site condition. Accordingly the NDEP will be reserving authority to require further investigation.*

To try to clarify, at the landfill boundary there will be some 100psi of effective stress either in or adjacent to the Sandy-Silt/Silty-Sand layers with little to no cohesion. Coupled with a seismic event at partial buildout may compromise the integrity of the liner."

Response A: Five borings were completed to depths of approximately 100 to 150 feet (see Figure 4, Report of Design). Each boring encountered a general soils sequence and depth to groundwater that were similar. On this basis, a conceptual geologic and geotechnical model was developed for permitting purposes. We recognize that additional information and possibly design refinements will be needed prior to the construction of each cell. However, we believe that this information should be sufficient to enable the evaluation of the general engineering performance relative to the NAC regulations, For example, the Report of Design calls for completion of additional subsurface borings at a minimum frequency of 6 borings per cell (or approximately one boring per 9 acres) prior to the construction of each cell. In the event the subsurface conditions and engineering properties varying substantially from that described in the Report of Design, the geologic and geotechnical models will need to be updated, and if necessary, the landfill design modified appropriately with NDEP review and approval (See Report of Design, Section 2.1.4.2.3).

A primary concern for the landfill is the magnitude of base settlement under loading by the refuse fill mass. In our experience, landfills with modern composite liners have been sited in areas prone to relatively large base settlement and subject to seismically-induced ground motions much larger than those expected for the Jungo Disposal Site. Base settlement and seismicity do not preclude the development of a landfill, but instead require proper engineering to mitigate these concerns.

For the Jungo Disposal Site, the potential for base settlement is a constraint on how high the refuse can be filled and how steep the side-slopes can be constructed. To address NDEP concerns, and to mitigate base settlement at the site, proposed refuse fill depths have been limited to 200 feet at the center of the landfill and side-slopes have been flattened to an overall slope of less than 4H:1V.

In regards to NDEP's stated concern with 100 psi effective stress at the landfill boundary in or adjacent to the Sandy Silt or Silty Sand layers with little or no cohesion, we offer the following for your consideration:

- The material located adjacent to the liner and immediately below to a depth of 29 to 45 feet is unsaturated and classified as dense to very dense. This material is expected to exhibit an effective internal friction angle greater than 30 degrees (Report of Design, p. 17). For slope stability analyses, the critical interface along the liner system is much lower (assumed to be 12 degrees). Therefore slope stability is controlled by liner interface shear strengths and not by the subsurface soils near the liner. Furthermore, liner interface shear strength testing will be completed as part of the final design of each cell and verified by the construction quality assurance program. These tests will be performed under representative normal stress conditions (i.e. up to 100 psi) and interface conditions (e.g. saturated as may be appropriate).

- Based on Golder's experience, most regional landfills have refuse fill depths greater than 200 feet. Therefore, an effective stress of 100 psi or greater at the base of the liner is common for landfills.

- Specifically, at the Jungo Disposal Site, this maximum effective stress would only occur near the center of the landfill and only at final development. This location is too far away from the landfill edge to pose a concern from a slope stability perspective. Due to the high effective stresses and the significant depth to saturated soils (29 to 60 feet below the base of the liner), it is Golder's engineering judgment that seismically-induced

liquefaction of the underlying soils that could lead to additional settlement is unlikely, even at buildout.

On page 1, NDEP states that "Additionally, it will be difficult to determine whether "settlement" has taken place in the waste mass or in the subsurface soils for the purpose of maintaining grade to sumps. In view of the critical slope necessary to promote drainage some 1600' and knowing only the last point taken prior to the next expansion does not provide assurance drainage is being maintained throughout the entire distance."

Response B: The Report of Design (p. 16) acknowledges that base settlement is a critical consideration in project design. Establishment of a settlement monitoring system during construction would be recommended to help calibrate the predictive settlement models to actual field performance and to verify performance during landfill development.

On page 1, NDEP states that "it will not assume no leakage through the liner, nor remove from consideration further protective measures for the groundwater as the site is restricted."

Response C: As discussed in the Report of Design (p. 13), the Jungo Disposal Site includes a composite liner system with protective measures in excess of that required by NAC in order to provide additional groundwater protection. These measures include:

- A high capacity leachate collection system to minimize leachate depth on the liner.
- Installation of landfill gas extraction pipes on top of the liner to minimize gas migration potential through the liner.

In addition, a gas collection system will be installed as soon as sufficient volumes of gas are generated to operate a landfill gas flare.

The following summarizes our response to the 16 numbered comments provided in NDEP's March 3, 2009 letter.

Comment 1: *All drawings must be 200'/"*

Response: During our March 10, 2009 discussion, NDEP clarified that the final cover grading plan drawings were the only additional drawings in the set that should be included at a scale of 1-inch = 200 feet. The base grading and final grading plans are currently shown at this scale. These revised drawings are included in ***Attachment 1***.

Comment 2: *Please revise the HELP Model, Foundation Settlement, Slope Stability Calculations to reflect a Unit Weight of ~45lbs/ft^3 for the waste mass.*

Response: The unit weight of 45 pounds per cubic foot (pcf) suggested by NDEP reflects a typical unit weight of refuse without soil cover following initial refuse placement with a moderate compaction effort[1]. This unit weight value is considerably lower than the unit weight of the entire in-place fill mass when taking into consideration daily and intermediate soil cover and subsequent settlement of the refuse. The total unit weight of the in-place fill mass is

[1] Bolton, Neal, 1995, The Handbook of Landfill Operations, p. 204, Blue Ridge Solid Waste Consulting, Bozeman, MT.

considerably higher as documented by Landva and Clark[2] and Kavazanjian.[3] The above studies show that the entire in-place fill unit weight is typically between 60 and 95 pcf. For the Jungo Disposal Site, Golder has assumed an in-place fill mass unit weight of 70 pcf, which reflects the extensive use of alternative daily cover proposed for the Jungo Disposal Site.

Use of NDEP's suggested lower unit weight would lead to an underestimate/highly "unconservative" settlement analyses (i.e. predict less foundation settlement) and present a slight underestimate/slightly unconservative slope stability analyses (i.e. calculate slightly lower factors of safety). We believe that a unit weight of 45 pcf is incorrect for the engineering analyses and could lead to unconservative conclusions. For that reason, we have not revised these calculations. We also note that the HELP analyses referenced by NDEP do not rely on an assumed unit weight in estimating leachate generation. However, it appears that NDEP may have been referring to the leachate pipe capacity calculations following the settlement of the landfill base, which rely on the HELP analyses for the leachate generation rates.

Comment 3: *Please include soil loss due to wind at the facility (NRCS Custom Soil Resource Report for Humboldt County).*

Response: As requested by NDEP, Golder prepared soil loss calculations due to wind erosion, which are discussed in the Report of Design (text included in ***Attachment 2***) and included in Appendix H of the Report of Design (***Attachment 3- Erosion Calculations).***

In completing calculations that are the most applicable to the Jungo Disposal Site, Golder consulted with Messrs. Fred Fox, Larry E. Wagner, and Michael Sporcic who are all wind erosions specialists working for the United States Department of Agriculture, Natural Resource Conservation Service (NRCS). Because of the complexity of wind erosion calculations, NRCS staff recommended the use of Single-Event Wind Erosion Evaluation Program (SWEEP, Version 1.0), which is a part of the Wind Erosion Prediction System (WEPS). WEPS is a process-based, continuous, daily time-step model that simulates weather, field conditions, and erosion.

Please note that the methodology for estimating soil loss due to wind erosion was primarily developed for agricultural applications where crops are harvested seasonally and the fields are barren of vegetation for portions of the year. Wind erosion primarily occurs when fields are barren of vegetation or have sparse vegetation cover. This seasonal situation is not reflective of the final cover for the Jungo Disposal Site, and therefore, these calculations have limited value in assessing total erosion rates. Furthermore, these calculations show that wind erosion is negligible if a moderately vegetated cover is established on the final cover.

Comment 4: *Please provide detailed sump design drawings, both in plan and in elevation with depths to groundwater included.*

Response: Detail A on Sheet 3A (***Attachment 1***) shows a typical sump grading plan. Section C-C' on Sheet 9 (***Attachment 1***) shows section of a typical sump relative to the subsurface geological conditions including groundwater. Groundwater elevations are shown on the remaining cross-sections on Sheets 9, 15 and 16. The subsurface geology cannot be clearly shown on these latter sections due to the due to the scale of the cross-sections.

[2] Landva, C. and J. Clark, 1990, "Geotechnics of Waste Fills," Waste Fills, Theory and Practice - ASTM STP 1070, pp. 86 – 103. Landva and Knowles, Eds.
[3] Kavazanjian, E., 2001, "Mechanical Properties of Municipal Solid Waste," Eighth International Waste Management and Landfill Symposium, Sardinia, pp.415-424.

Comment 5: *Please include (i.e. show) the Final Cover, with detailing, (Drawing 4) in conjunction with the LCRS and Gas Collection Piping detail.*

Response: Details 3 and 4A on Sheet 4 (***Attachment 1***) show the final cover penetration detail of the pipes extending along the base liner. Detail 15 on Sheet 8 and referenced from Sheet 6 (***Attachment 1***) show the penetration of the landfill gas pipes through the final cover.

Comment 6: *Previously the NDEP requested:*

> *NAC 444.680 Please provide the following: (d) Show any proposed soil borrow areas. [As a matter of note calculations show a deficit of ~132,000 yd^3 of soil, please identify where this will be taken from]*
>
> *The NDEP cannot find any soil borrow area(s) identified. It is understood that the landfill will progress in a modular fashion with excavation taking place ahead of disposal, please show these areas in conjunction with various phases of the site.*

Response: The soil borrow areas occur within the landfill disposal footprint. The progression of the soil borrow areas are delineated on Drawings 10 through 16 (***Attachment 1***), which illustrate the construction sequencing.

Comment 7: *Please provide a cross section (in elevation) showing the excavation in each of the phases with distance/depth to water and detailing (adjacent soil profiles would also be helpful).*

Response: The revised sections provide the requested information. In addition, Sections A-A' and B-B' (***Attachment 1***) were redrawn at a larger scale to show the module development and excavations relative to groundwater level. Section C-C' is an expanded section of the sump area at Section B-B' (Sheet 9) that also shows the subsurface soil profile. These sections are generally representative of the depth to groundwater and the general subsurface conditions.

Comment 8: *Please return the number of employees previously submitted and then removed. Please do not remove anything from the application not directly commented on or required to remove.*

Response: The number of employees was not removed from the Operations Plan. The number of employees (between 25 and 30 people) is on Page 7.

Comment 9: *Please remove references to "sheetflow" this site is predominantly subject to "Ponding" (NRCS Custom Soil Resource Report for Humboldt County).*

Response: The Report of Design (p. 4) was revised to state the ponding occurs during normal precipitation events and sheetflow occurs during intense storm events after the depressions fill.

Comment 10: *Are the PE Stamps and signature either scanned or computer generated?*

Response: The PE Stamps and signature were neither scanned nor computer generated. The documents transmitted with this letter include a wet stamp and signature.

Comment 11: *Please provide updated and current Groundwater Elevations for each of the borings.*

Response: Groundwater elevations representing the latest measurements are summarized in Table 3 for each of the borings.

Comment 12: *Please include in the Closure Plan a process for verification of Interim Closure for the site. This would include a request to the NDEP for a site visit and inspection to confirm Partial Closure and confirmation Financial Assurance is no longer required for this particular area.*

Response: The requested language is included on P. 28 of the Plan of Operations and on P. 2 of Appendix C to the Plan of Operations.

Comment 13: *It is not clear for each of the expansions (modules) how Run-on and Run-off will be managed. The NDEP cannot authorize a release onto adjacent properties; accordingly all waters must be managed onsite. Please provide details for each expansion.*

Response: Per our discussion with NDEP, the plans have been revised to retain surface water run-off on-site in a detention basin and within the perimeter channel. The Report of Design (p. 19) (***Attachment 2***), and the Site Development Drawings (Drawings 3, 3C, 3E, 7, and 10 through 14) (***Attachment 1***) illustrate the detention basin. Surface water calculations supporting the basin design are included in ***Attachment 6***.

Comment 14: *Are the blow counts corrected or uncorrected in the Well logs?*

Response: The blow counts are uncorrected in the well logs.

Comment 15: Please remove "Conceptual Design" and Replace with "Final Design", the NDEP will not review Conceptual Designs.

Response: The Drawings were revised to remove "Conceptual Design." However, as further clarification, these drawings are submitted as "final" for regulatory review and approval only. They are not submitted for final Construction.

Comment 16: Just to clarify, is NORCAL proposing a 5 foot soil Cap with membrane?

Response: Per our discussion with NDEP, the attached documents and plans now reflect a 3-foot thick cap (one-foot thick foundation layer and two-foot thick vegetative soil cover) with a geomembrane and a geocomposite drainage layer. We have also revised our HELP analyses for this cover section (***Attachment 7***)

Please call if you have any questions or require additional information.

Sincerely,

GOLDER ASSOCIATES INC.

Ken Haskell
Principal/Practice Leader

cc: E. Merrill, Jungo Land and Investments, Inc.

Attachments:

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