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Todd Stewart, Project Manager
BrightSource Energy
1999 Harrison Street, Suite 500
Oakland, CA 94612

Dear Mr. Stewart:

Enclosed are agency comments on your revised stormwater design plans posted to your internet site, March 23, 2009. These plans were reviewed at the meeting in Primm on March 25, 2009, where we provided initial feedback.

I want to stress that these written comments are preliminary and focus on the "big picture" elements of your design and design assumptions, and should not be taken as BLM's final review of the civil design for the project. The California Energy Commission (CEC) has also reviewed these comments and assisted in their preparation.

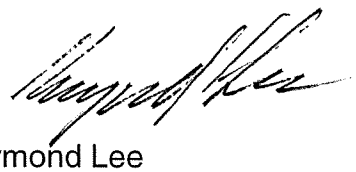
A large volume of written workplans, reports, and verbal information has been provided to BLM and CEC over the past two months related to stormwater management and project design. BrightSource has made a significant change from the previous concept of large scale active stormwater management to one of stormwater proofing of features along with a Low Impact Development proposal. We still find many inconsistencies in the written and verbal information that has been presented making it difficult to provide detailed comments on many items.

The attached comments begin with general comments relating to your Low Impact Development Scenario and the Methodology for pre- and post-development flow calculations. The last section is specific to the assumptions you used for post-development flow calculations. These comments supplant our previously provided written comments on your original scope of work documents and infiltration memo. We would find it very useful for you to prepare a response to comments document to demonstrate how each of the BLM comments are being addressed in your plans.

If you have questions, please contact Tom Hurshman and he can facilitate setting up discussions with the appropriate individuals from BLM. I suspect once you have had a

chance to review the comments, a conference call to go through each item will be beneficial.

Sincerely,



Raymond Lee
Field Manager

cc: John Kessler, CEC

Comments/Observations on Ivanpah SEGS
Stormwater Management Approach and Technical Memos
April 8, 2009

Introduction

A large volume of written workplans, reports, copies of existing literature, and verbal information has been provided to the Bureau of Land Management (BLM) in support of the current facility layout, construction, and stormwater management system design for the Ivanpah Solar Electric Generating Systems (Ivanpah SEGS) right-of-way (ROW) application. These items include:

- Workplans for Hydrogeology (Attachment A) and Hydraulics (Attachment B) analysis;
- the Infiltration Memo dated February 15, 2009;
- five Technical Memos (TM1-5) dated March 6 (one of these, TM3, was a revision of the Infiltration Memo based on BLM comments);
- three additional Technical Memos (TM6-8) dated March 23 (one of these, TM7, provided additional details on the Infiltration Memo);
- the Revised Project Description dated March 23;
- the current facility design drawings dated March 23; and
- verbal information provided during a meeting on March 25.

At this time, BLM has provided written comments only on the workplans and the initial February 15 Infiltration Memo. While revised documents have been submitted, BrightSource has not developed a Response-to-Comment document that clearly indicates what the action or resolution has been in response to each of BLM's comments. Therefore, it is difficult, at this time, to understand which comments have been accepted and resulted in changes, versus which comments have not yet been resolved. It is critical for both parties that we document resolution of written comments.

During the March 25 meeting, BrightSource requested that BLM forward any comments on the other documents as early as possible. Also at that meeting, BLM verbally presented several general comments on the entire process, and some of the assumptions that were being used. The comments presented below represent those "big-picture" comments. Detailed comments on each item will also be provided once BLM completes the technical review of the documents.

Proposed Low Impact Development Scenario

1) Information Needed to Assess Appropriateness of Low Impact Development Scenario

In general BLM agrees that a Low Impact Development design is preferable to an active stormwater management system, if it can be demonstrated that the proposed development is designed to withstand erosional forces which could impact the feasibility of site operations; result in transportation of damaged materials (heliostats and their components) outside of the site boundary; and/or result in modification of stormwater erosion and deposition characteristics outside of the site boundary.

Based on verbal information provided during the March 25 meeting, the current stormwater flow calculations have been used to modify the proposed depth of installation of heliostat supports from four feet to five feet. In order to be sufficient to avoid the impacts mentioned above, this depth must account for three factors:

- Depth sufficient to support the weight of the heliostat, including accounting for wind pressure;
- Depth sufficient to account for depth of scour associated with each support; and
- Depth sufficient to account for natural erosion associated with lateral migration of channels.

BLM has two primary comments associated with these factors. First, each is a function of the calculated stormwater flow depth and velocity, so agreement on these calculations is required before the sufficiency of the heliostat stability can be demonstrated. Specific comments on the velocity and depth calculations are provided in Comments 2 through 9 below.

The second concern is that the proposed depth of five feet appears to address the first two items, but not the third (lateral migration of channels). There are some channels present which are more than five feet deep, and there are many more that are one to two feet deep. It is not clear whether the proposed five foot depth would be sufficient should a natural erosion event result in lateral migration of a one to two-foot deep channel.

Before the Low Impact Development proposal can be accepted, these two items must be addressed. Agreement must be reached on the stormwater flow calculations, and the design of the heliostat supports to account for channel migration must be demonstrated.

General Methodology for Both Pre- and Post-Development Flow Calculations

2) Antecedent Moisture Condition used for both pre- and post-development calculations.

TM2 and TM6 present the 100-year design storm runoff calculations for the pre-development and post-development scenarios, respectively. The Curve Numbers used for both calculations are based on the Antecedent Moisture Condition (AMC) II. In the San Bernardino Manual (Section C.5), the Curve Number obtained from the soil maps is to be adjusted based on the precipitation scenario being evaluated. The text states that "For 100-year storm analysis, AMC III shall be used."

This would require an adjustment of the Curve Number obtained from the soil type maps using the Curve Number Relationships in Table C.1 of the San Bernardino Manual. Using this Table, the corresponding Curve Numbers to be used for soil type A would be adjusted from 63 to 82, and the Curve Numbers to be used for soil type B would be adjusted from 77 to 92. The Curve Numbers for the mountain sub-basins would increase from their current values of 81 to 88 to correspondingly higher values between 94 and 98.

While BLM has approved the use of portions of the Clark County Manual related to the randomness of channel switching on alluvial fans, the San Bernardino Manual is to be complied with in all other respects. Please modify the calculations accordingly.

3) Depth-Area Reduction Factor (DARF) used for both pre- and post-development calculations.

In TM2, a rainfall Depth Area Reduction Factor (DARF) of 0.89 was applied to all 15 watersheds, based on the total 21.7 square mile area of the combined watersheds. The TM cites that this "was determined using NOAA Technical Memorandum NWS Hydro 40 as required by Clark County." Actually, Clark County requires use of the 6-hour USACE, Los Angeles District (1988) depth-area reduction factors for all rainfall analysis in the Clark County area. The values to be used for this analysis should be those from Table 502 of the Clark County Manual.

Also, the manner of determining the DARF by using the combined areas of the separate watersheds is not an accurate method for determining the HEC-1 flow output at each sub-basin concentration point. Instead, the area of the each individual sub-basin should be used for each individual sub-basin calculation. For example, the DARF that should be applied to watershed M1 is about 0.97, not 0.89.

Specific Assumptions for Post-Development Flow Calculations

4) Proposed use of ad-hoc infiltration calculations to replace the San Bernardino County Manual method.

The purpose for these calculations, as stated in the original workplan, is for the results to be "incorporated into a model of soil-water flow to assess the significance of roadways, heliostats, and soil binders on the effective infiltration over the ISEGS site". In written comments on the initial Infiltration Memo provided by BLM on February 20, (Comment #2), BLM requested clarification of the intended use of the infiltration calculations. The additional information provided in TM3 and TM7 still do not specifically present how the infiltration calculation results would be used within the proposed stormwater management system design. However, the intention became clear during the March 25 meeting – the intention appears to be for these calculations to replace the procedures required by the San Bernardino County Manual to calculate the increase in runoff due to site development.

Again, the only deficiency in the San Bernardino County Manual that has been discussed with BLM is the lack of an alluvial fan methodology to account for random channel switching. There has been no discussion of deficiencies in its manner of addressing Curve Number adjustments for the post-development condition.

Based on these observations, BLM suggests the following resolution:

- BrightSource should perform the calculations of the pre- and post-development runoff condition using the procedures in the San Bernardino County Manual. BLM staff are available to jointly discuss and come to agreement on specific assumptions, including the proper Antecedent Moisture Condition (AMC) to use, appropriate Curve Numbers for the post-development condition, the precipitation

model to use, and the effect of the presence of mirrors on the precipitation model. For assumptions and parameters for which there is uncertainty, BLM will require that conservative assumptions be used to ensure any potential impacts are identifiable.

- If the methodology presented in the San Bernardino County Manual is technically inaccurate for the situation at Ivanpah SEGS, then BrightSource should present a memo that provides detailed information regarding the deficiency, and a recommended solution. This memo should also reference supporting information from the manual regarding the use of alternative methods, if such information exists.

- Because we expect the calculation to be performed using the San Bernardino County Manual method, we do not have detailed comments on the infiltration calculations at this time. Some observations are provided in Comment #5 below, but these should be considered preliminary and incomplete.

5) Difference in Pre- and Post-Development Infiltration Rates

If use of site-specific measurements is ultimately approved, then there are still questions regarding the applicability of the current infiltrometer sample results. Numerous issues exist regarding the current sample results:

- BLM requested data regarding these samples in Comment #5 of our comments dated February 20, and only some of the information was provided. BLM requested photographs, field descriptions of the locations and soil types, and raw field data that was used to calculate the steady rates presented on Page 3 of TM3. The information provided for the March 25 meeting included photographs, but no field descriptions or field data.

- The issue is not whether seven samples are enough, since these samples are trying to characterize two different conditions. There are only four samples to represent one condition (pre-development) and three to represent another condition (post-development).

- The pictures show that one of the post-development samples is in a disturbed area near a water pumping system – this site may have had excavation and backfill, instead of just traffic. This may reduce the number of usable post-development samples to two.

- One of the pre-development samples is not located within the site boundaries.

- Of the three locations where both a natural and a compacted measurement were made, two of them show an expected result – the infiltration rate in the natural location is higher than that of the compacted location. However, Site 1 results show that the infiltration rate at the compacted location (9.06 ft/day) is substantially higher than the corresponding natural location (1.62 ft/day).

- The range of results from the four pre-development samples shows substantial variation across the site. The results range from 1.62 to 24.61 ft/day. This is a very

wide variation that may not characterize the site through calculation of a mean based on four samples.

- The transcription of some numbers from the steady-state field results to their use in the infiltration model appears to be incorrect. From TM3, the steady-state infiltration rates for Location 1 (Natural), Location 3 (Natural), and Location 4 (Natural) are reported differently in the table on Page 6 versus their corresponding field results shown in Figures 2.4A, 2.4D, and 2.4F. Using Location 3 (Natural) as an example, the steady-state infiltration rate reported on Figure 2.4F is read off of the graph to be about 17.5 inches/hr. This translates to 35 ft/day. However, the value reported on the Table on Page 6 of TM3 is 24.61 ft/day. Overall, 4 of the steady-state infiltration rates reported in the table on Page 6 match the results reported in their corresponding figures, while results for 3 of the samples do not match. The use of the incorrect values in the table results in underestimating the difference in pre- and post-development infiltration rates, and thus underestimating the hydrologic impact of the development.

These observations indicate that the current limited sample results cannot be accepted as representative of the very large areas being characterized. As discussed in Comment #4, BLM expects this calculation to be performed in the manner of the San Bernardino County Manual. Should the need to use site-specific sample results to replace the Manual method be agreed upon by the agencies, then a revised sampling program will need to be implemented.

6) Infiltration rate determination on the access roads.

TM6 discusses the use of the 10% increase in Curve Number for the site access roads, based on the results of TM4. The 10% increase was an area-weighted average derived in TM4 based on a combination of two effects – the infiltrometer results that indicated an 80% reduction in conductivity on the service paths, and the percentage of the overall site which would be covered by service paths.

TM6 uses this 10% increase in Curve Number directly for the access roads, then applies the value for a 12-foot wide access road to an entire 200-by-200 foot cell, and then claims that this application is conservative. Since the 10% increase was an area-weighted value in the first place, applying it over a larger area does not, in itself, make its use conservative. In fact, we do not know whether it is a conservative calculation or not, since we do not know the compacted/non-compacted ratio in each individual cell. The calculation may be conservative in some cells, and not conservative in others. To be conservative in the manner implied in TM6, the calculation should use the 80% infiltration reduction over the entire 200-by-200 foot cell.

7) Infiltration rate on the intra-field heliostat areas

The current stormwater flow calculations assume that the only areas in which compaction would result in modified infiltration rates are the power block, administrative areas, access roads, and service pathways between heliostats rows. BLM is currently reviewing TM6, and expects to have comments on the specific assumptions regarding the Curve Number and configurations of these features.

This particular comment concerns the treatment of the other areas of the site – the areas between and amid the heliostats which are not included within the power block, administrative areas, access roads, and service pathways. Construction efforts in these areas will include: driving vehicles to deliver personnel and materials; use of equipment to cut vegetation and install heliostat supports; removal or rocks and undefined "light-grading" in some areas; and equipment and foot-traffic to install heliostat wiring conduits. The current calculations assume that these activities will have no long-term impact on drainages, vegetation, and infiltration rates in those areas. It also assumes that the current proposal to perform all of this construction without more aggressive grading and road maintenance is feasible.

The assumption that these activities will have no long-term effect on drainages, vegetation, and soil infiltration rates is not supported by information currently provided in the Supplemental Project Description. Some necessary information is not provided, such as the wheelbases of the vehicles and equipment, the pressure exerted by the tires, the locations of trips, and the numbers of trips. Other information is provided but is not believable – for instance, the proposal to cut vegetation to provide clearance for equipment, and then to shade the vegetation with heliostats, does not support an assumption that long-term vegetation effects on runoff will be negligible.

Currently, these calculations are entirely based on best-case assumptions that are not supported by any provided data. In addition, many of the assumptions, such as the assumption that construction vehicle traffic will not compact soils or affect drainages, are counter-intuitive. Should these assumptions prove incorrect, the entire Low Impact Development scenario may be unworkable. These calculations should be re-done using more conservative assumptions to determine whether the Low Impact Development scenario is still a feasible option.

8) Definition of the area of the "service paths"

The calculation of a 10% increase in Curve Number in TM4 is based on an assumption that the service paths are 8 feet wide. The Caterpillar 550 Wheel Harvester shown in the Supplemental Project Description appears to have a wheelbase much wider than 8 feet. The wheelbase of this item should be defined, and the service path width adjusted accordingly. Also, the TM4 calculation assumed service paths between every two heliostat rows, while verbal information during the March 25 meeting suggested it will occur on every 4th heliostat row. These two observations may cancel each other out, but the actual assumptions should be specified.

9) Effect of long-term vegetation changes on the roughness value

The most recent Supplemental Project Description (dated March 25) states that existing vegetation will be used, to the extent possible, to minimize water and wind erosion. The Flo-2D model presented in TM6 does not specifically state what assumptions were used for evaluating the effect of vegetation on roughness, but from the information in the Supplemental Project Description and verbal discussions, BLM infers that the calculations are performed based on an assumption that vegetation remains in place through the lifespan of the project.

BLM has provided verbal comments for some time regarding assumptions of the status of vegetation over the long-term operation of the facility. We have suggested that BrightSource's hydrogeologic and hydraulic calculations should not be based on the current state of vegetation, nor on the expected state of vegetation shortly after construction. Instead, we have stressed that the flow calculations need to be based on the expected worst-case vegetation conditions that will occur during the lifetime of the facility.

What that worst-case condition will be is difficult to define at present. During the March 25 meeting, BrightSource implied that they have implemented field studies to attempt to identify the impact of certain activities on the vegetation – specifically, the cutting of vegetation to create clearance for construction vehicles. BLM agrees that some mechanism of coming to an understanding of the long-term status of the vegetation needs to be identified. However, such a mechanism must consider all potential parameters that may influence vegetation. These may include, but not be limited to:

- Cutting/trimming to create clearance;
- Compaction of soil during construction;
- Shading by heliostats;
- Relocation of precipitation by presence of heliostats;
- Addition of water through heliostat washing;
- Modification of stormwater flow by presence of heliostat supports and maintenance roads;
- Use of dust suppressants; and
- Use of weed management practices.

Given the complexity of these parameters, and the lack of data on similar projects in this environment, BLM understands the difficulty in projecting what the overall effect will be. However, the current documentation appears to assume that the overall effect will be to maintain current conditions. This does not appear to be a supportable assumption. In general, most of the above factors can be assumed to negatively impact the native vegetation. The result may be replacement of the native vegetation with non-native species that are more adaptable to shade and other stressors, or it may result in denudation of certain areas.

It is recommended that worst-case scenario calculations be performed to determine the impact of large-scale vegetation denudation on stormwater flows, and resulting sedimentation, erosion, and heliostat stability calculations. We understand that BrightSource has implemented field studies on the vegetation impacts. BLM has no information on these studies, so cannot comment on their scope and purpose. If site-specific field studies are eventually approved to obtain data, they must incorporate all potential stress factors, not just cutting and trimming. Also, any vegetation studies must have their methodologies reviewed and approved by BLM prior to being implemented.

10) Precipitation Model

The current calculation is based on a 100-year, 24-hour precipitation model. The San Bernardino County Manual requires the use of a 24-hour model for the runoff calculation, but a multi-day storm for calculations associated with the design of detention basins. Because no detention basins are proposed at this time, no multi-day analysis is required.

However, should detention basins become a component of the design, the multi-day analysis will be required.