

**DOCKET**

**09-AFC-6**

DATE MAY 20 2010

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May 20, 2010

Alan Solomon  
Project Manager  
California Energy Commission  
1516 Ninth Street  
Sacramento, CA 95814

RE: **Blythe Solar Power Project, Docket No. 09-AFC-6**  
*Revised Health Risk Assessment for the Blythe Solar Power Project PDOC*  
Technical Area: Air Quality

Dear Mr. Solomon:

Attached please find the following Revised Health Risk Assessment for the Blythe Solar Power Project PDOC.

If you have any questions on this submittal, please feel free to contact me directly.

Sincerely,



Alice Harron  
Senior Director, Development

## Memorandum

|         |  |      |   |
|---------|--|------|---|
| To      | Roseana Navarro-Brasington, Mojave Desert AQMD   | Page | 1 |
| CC      | Patrick McKean (AECOM), Denise Hazelman (AECOM), Elizabeth Ingram (Solar Millennium), Carl Lindner (AECOM), Arrie Bachrach (AECOM) |      |   |
| Subject | Revised Health Risk Assessment for the Blythe Solar Power Project PDOC<br>Docket No. 09-AFC-6                                      |      |   |
| From    | Russ Kingsley  |      |   |
| Date    | May 17, 2010   |      |   |

This correspondence presents the methodology and results of a revised health risk assessment (HRA) performed to assess impacts and public exposure associated with emissions of toxic air contaminants (TACs) from the Blythe Solar Power Project (BSPP). The HRA is being submitted in response to the Mojave Desert Air Quality Management District (MDAQMD) request for a revised HRA due to changes to the project design. The specific changes to the project that are evaluated in this revision include the following:

- The Site layout of the power blocks has been revised with new equipment locations. The location of power block sources was revised;
- Elimination of the natural gas-fired heat transfer fluid (HTF) heater from the Project operations;
- Increase in the boiler use and hence emissions (as a consequence of the HTF heater removal);
- Increase in hours of operation of the cooling tower;
- Increase in the number of mirror wash events assumed in the air quality impacts analysis;
- Change to the maintenance vehicle travel within the solar field; and
- Elimination of the vehicle travel associated with use of reverse osmosis (RO) concentrate for dust suppression.

### 1.1 Health Risk Assessment Procedures

The methods used to assess potential human health risks are consistent with the *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* published by the California Office of Health Hazard Assessment (OEHHA 2003). The latest OEHHA cancer potency factors, and chronic and acute reference exposure levels (RELs) for each TAC were used. The California Air Resources Board (ARB) Hot Spots Analysis and Reporting Program (HARP, Version 1.4a) software was used to perform the risk analysis. The HARP software contains the latest OEHHA toxicity values, as well as the now outdated United States Environmental Protection Agency (USEPA) Industrial Source Complex (ISCST3) dispersion model.

For this HRA, the ISCST3 model which is built-in to HARP was not used. Instead, the USEPA current guideline model, AERMOD was used along with the ARB-provided HARP On-Ramp tool. The HARP On-Ramp provides a convenient mechanism to convert AERMOD dispersion results into a format that is compatible with HARP's risk module.

### Emissions Characterization

Facility stationary source emissions were calculated based on operational data for four auxiliary boilers, four diesel powered fire water pumps, four diesel-powered emergency generators, four Ullage Vent Stacks, and four two-cell cooling towers. **Table 1-1** summarizes the modeled TAC emission rates for the Auxiliary Boilers, **Table 1-2** summarizes the modeled TAC emission rates for the Diesel Powered Fire Water Pumps, **Table 1-3** summarizes the modeled TAC emission rates for the Diesel Powered Emergency Generators, **Table 1-4** summarizes the modeled emission rates for the Cooling Towers, and **Table 1-5** summarizes the modeled emission rates for the Ullage Vent Stacks.

**Table 1-1 Modeled Auxiliary Boilers TAC Emissions**<sup>1</sup>

| Pollutant                      | CAS Number Used in HARP | Maximum Hourly Emission Rate (lb/hr) | Annual Average Emission Rate (lb/yr) |
|--------------------------------|-------------------------|--------------------------------------|--------------------------------------|
| 7,12-Dimethylbenz(a)anthracene | 57976                   | 5.33E-07                             | 9.20E-04                             |
| Acenaphthene                   | 83329                   | 6.00E-08                             | 1.04E-04                             |
| Acenaphthylene                 | 208968                  | 6.00E-08                             | 1.04E-04                             |
| Anthracene                     | 120127                  | 8.00E-08                             | 1.38E-04                             |
| Benz(a)anthracene              | 56553                   | 6.00E-08                             | 1.04E-04                             |
| Benzene                        | 71432                   | 7.00E-05                             | 1.21E-01                             |
| Benzo(a)pyrene                 | 50328                   | 4.00E-08                             | 6.90E-05                             |
| Benzo(b)fluoranthene           | 205992                  | 6.00E-08                             | 1.04E-04                             |
| Benzo(g,h,i)perylene           | 191242                  | 4.00E-08                             | 6.90E-05                             |
| Benzo(k)fluoranthene           | 207089                  | 6.00E-08                             | 1.04E-04                             |
| Chrysene                       | 218019                  | 6.00E-08                             | 1.04E-04                             |
| Dibenz(a,h)anthracene          | 53703                   | 4.00E-08                             | 6.90E-05                             |
| p-Dichlorobenzene              | 106467                  | 4.00E-05                             | 6.90E-02                             |
| Fluoranthene                   | 206440                  | 1.00E-07                             | 1.73E-04                             |
| Formaldehyde                   | 50000                   | 2.50E-03                             | 4.31E+00                             |
| Hexane                         | 110543                  | 6.00E-02                             | 1.04E+02                             |
| Indeno(1,2,3-cd)pyrene         | 193395                  | 6.00E-08                             | 1.04E-04                             |
| Naphthalene                    | 91203                   | 2.03E-05                             | 3.51E-02                             |
| Phenanthrene                   | 85018                   | 5.67E-07                             | 9.78E-04                             |
| Pyrene                         | 129000                  | 1.67E-07                             | 2.88E-04                             |
| Toluene                        | 108883                  | 1.13E-04                             | 1.96E-01                             |

<sup>1</sup> Emissions for each auxiliary boiler

**Table 1-2 Modeled Diesel Powered Fire Water Pumps TAC Emissions <sup>1</sup>**

| Pollutant                 | CAS Number Used in HARP | Maximum Hourly Emission Rate (lb/hr) | Annual Average Emission Rate (lb/yr) |
|---------------------------|-------------------------|--------------------------------------|--------------------------------------|
| Diesel Particulate Matter | 9901                    | 9.91E-02                             | 4.96E+00                             |

<sup>1</sup> Emissions for each diesel powered fire water pump

**Table 1-3 Modeled Diesel Powered Emergency Generators TAC Emissions <sup>1</sup>**

| Pollutant                 | CAS Number Used in HARP | Maximum Hourly Emission Rate (lb/hr) | Annual Average Emission Rate (lb/yr) |
|---------------------------|-------------------------|--------------------------------------|--------------------------------------|
| Diesel Particulate Matter | 9901                    | 9.65E-01                             | 4.83E+01                             |

<sup>1</sup> Emissions for each diesel powered emergency generator

**Table 1-4 Modeled Cooling Tower TAC Emissions <sup>1</sup>**

| Pollutant             | CAS Number Used in HARP | Maximum Hourly Emission Rate (lb/hr) | Annual Average Emission Rate (lb/yr) |
|-----------------------|-------------------------|--------------------------------------|--------------------------------------|
| Chloroform            | 67663                   | 1.58E-02                             | 1.39E+02                             |
| Chromium (Hexavalent) | 18540299                | 1.34E-08                             | 1.17E-04                             |
| Copper                | 7440508                 | 1.33E-07                             | 1.16E-03                             |
| Vanadium              | 7440622                 | 7.17E-08                             | 6.28E-04                             |
| Zinc                  | 7440666                 | 3.27E-06                             | 2.87E-02                             |

<sup>1</sup> Emissions for each cooling tower (2 cells combined)

**Table 1-5 Modeled Ullage Vent Stack TAC Emissions <sup>1</sup>**

| Pollutant | CAS Number Used in HARP | Maximum Hourly Emission Rate (lb/hr) | Annual Average Emission Rate (lb/yr) |
|-----------|-------------------------|--------------------------------------|--------------------------------------|
| Benzene   | 71432                   | 7.50E-01                             | 3.00E+02                             |
| Biphenyl  | 92524                   | 7.50E-05                             | 3.00E-02                             |

<sup>1</sup> Emissions for each Ullage vent stack

**Risk Assessment Dispersion Modeling Methodology**

The AERMOD (version 09292) dispersion model was used in this assessment. The stationary source locations, building downwash, stack parameters, receptor grids, and meteorology were consistent with the criteria pollutant modeling submitted with the California Energy Commission Application for Certification (AFC). Meteorological data consisted of three years (January 2002-December 2004) of surface meteorological data collected at the Blythe Riverside County Airport and upper air soundings from the Desert Rock, Nevada station, as submitted with the AFC.

**Figure 1-1** (figures are located at the end of this memo) presents a composite wind rose for the Blythe Riverside County Airport meteorological dataset. **Figure 1-2** provides a digitized site plan with the source locations used in the HRA.

Modeled stack parameters are provided in **Table 1-6**. The coordinates are in Universe Transverse Mercator (UTM), Zone 11, referenced in U.S. Geological Survey (USGS) North American Datum 1983 (NAD83).

**Table 1-6 Modeled Stack Parameters**

| Source ID | UTM E (m)  | UTM N (m)   | Base Elev. (m) | Stack Height (m) | Stack Diameter (m) | Stack Temp. (K) | Stack Velocity (m/s) |
|-----------|------------|-------------|----------------|------------------|--------------------|-----------------|----------------------|
| AuxBoil1  | 709453.101 | 3729108.024 | 143.3          | 15.240           | 0.914              | 422.04          | 7.19                 |
| AuxBoil2  | 705756.585 | 3729034.134 | 175.3          | 15.240           | 0.914              | 422.04          | 7.19                 |
| AuxBoil3  | 706968.939 | 3727392.549 | 160.9          | 15.240           | 0.914              | 422.04          | 7.19                 |
| AuxBoil4  | 710303.730 | 3727458.573 | 135.6          | 15.240           | 0.914              | 422.04          | 7.19                 |
| FirPump1  | 709501.509 | 3729154.312 | 143.3          | 3.048            | 0.152              | 683.15          | 32.73                |
| FirPump2  | 705806.556 | 3729080.621 | 175.3          | 3.048            | 0.152              | 683.15          | 32.73                |
| FirPump3  | 707023.776 | 3727250.153 | 160.9          | 3.048            | 0.152              | 683.15          | 32.73                |
| FirPump4  | 710358.224 | 3727311.723 | 135.6          | 3.048            | 0.152              | 683.15          | 32.73                |
| EmerGen1  | 709479.470 | 3729160.276 | 143.3          | 7.010            | 0.229              | 683.15          | 141.70               |
| EmerGen2  | 705784.102 | 3729086.741 | 175.3          | 7.010            | 0.229              | 683.15          | 141.70               |
| EmerGen3  | 706998.489 | 3727341.104 | 160.9          | 7.010            | 0.229              | 683.15          | 141.70               |
| EmerGen4  | 710332.822 | 3727405.669 | 135.6          | 7.010            | 0.229              | 683.15          | 141.70               |
| Cool1_1   | 709511.356 | 3729098.372 | 143.3          | 6.837            | 3.658              | 305.59          | 8.23                 |
| Cool2_1   | 709520.792 | 3729098.669 | 143.3          | 6.837            | 3.658              | 305.59          | 8.23                 |
| Cool1_2   | 705815.705 | 3729024.375 | 175.3          | 6.837            | 3.658              | 305.59          | 8.23                 |
| Cool2_2   | 705826.008 | 3729024.474 | 175.3          | 6.837            | 3.658              | 305.59          | 8.23                 |
| Cool1_3   | 707039.404 | 3727405.114 | 160.9          | 6.837            | 3.658              | 305.59          | 8.23                 |
| Cool2_3   | 707029.100 | 3727404.870 | 160.9          | 6.837            | 3.658              | 305.59          | 8.23                 |
| Cool1_4   | 710363.065 | 3727469.290 | 135.6          | 6.837            | 3.658              | 305.59          | 8.23                 |
| Cool2_4   | 710373.298 | 3727469.271 | 135.6          | 6.837            | 3.658              | 305.59          | 8.23                 |
| Ullage_1  | 709418.630 | 3729152.150 | 143.3          | 6.096            | 0.406              | Ambient         | 14.33                |
| Ullage_2  | 705722.080 | 3729078.510 | 175.3          | 6.096            | 0.406              | Ambient         | 14.33                |
| Ullage_3  | 706934.230 | 3727347.380 | 160.9          | 6.096            | 0.406              | Ambient         | 14.33                |
| Ullage_4  | 710269.520 | 3727413.130 | 135.6          | 6.096            | 0.406              | Ambient         | 14.33                |

A summary of the modeled receptor grid is provided below:

- Property line receptors placed every 25-meters (m);
- Cartesian receptor grid at 100-m spacing out to 2 km;
- Cartesian receptor grid at 250-m spacing out to 5 km from the facility; and
- Cartesian receptor grid at 500-m spacing out to 10 km from the facility.

The receptor grids were generated in UTM Zone 11 NAD83 coordinates. Receptor elevations were determined using AERMAP (version 09040) and National Elevation Data available from the United States Geological Survey, as submitted with the AFC. **Figure 1-3** shows the modeled receptor grid.

The AERMOD dispersion results were loaded into HARP using the HARP On-Ramp to calculate the maximum individual cancer risk, and the chronic non-carcinogenic and acute hazard indices over the entire receptor grid, as described below.

**Risk Characterization**

Carcinogenic risks, chronic non-carcinogenic, and acute health effects were assessed using the dispersion modeling described above and numerical values of toxicity provided by OEHHA. The HARP software performs the necessary risk calculations following the OEHHA risk assessment guidelines and the ARB Interim Risk Management Policy for risk management decisions (ARB 2003). These guidelines recommend that the following risk analysis methods be employed:

- Residential Cancer Risk: Derived (Adjusted) Method;
- Residential Chronic Hazard Index: Derived (OEHHA) Method;
- Acute Hazard Index for All Exposures: Acute HI Simple (Concurrent Max.); and
- Off-Site Worker Standard Work Schedule for Cancer Risk and Chronic Hazard Index.

To estimate the maximum cancer risk for residential exposures, the modeled exposure pathways included inhalation, homegrown produce (using non-urban default ingestion fractions), dermal, soil, and mother’s milk absorption. The same pathways were assumed for off-site worker exposure.

**1.2 Health Risk Assessment Results**

**Table 1-7** presents the predicted risks. The maximum residential and off-site worker risks are below the MDAQMD Rule 1320 Moderate Risk threshold for cancer risk (1-per-million), and below the Significant Health Risk thresholds for cancer risk (10-per-million), and chronic and acute hazard indices (1.0).

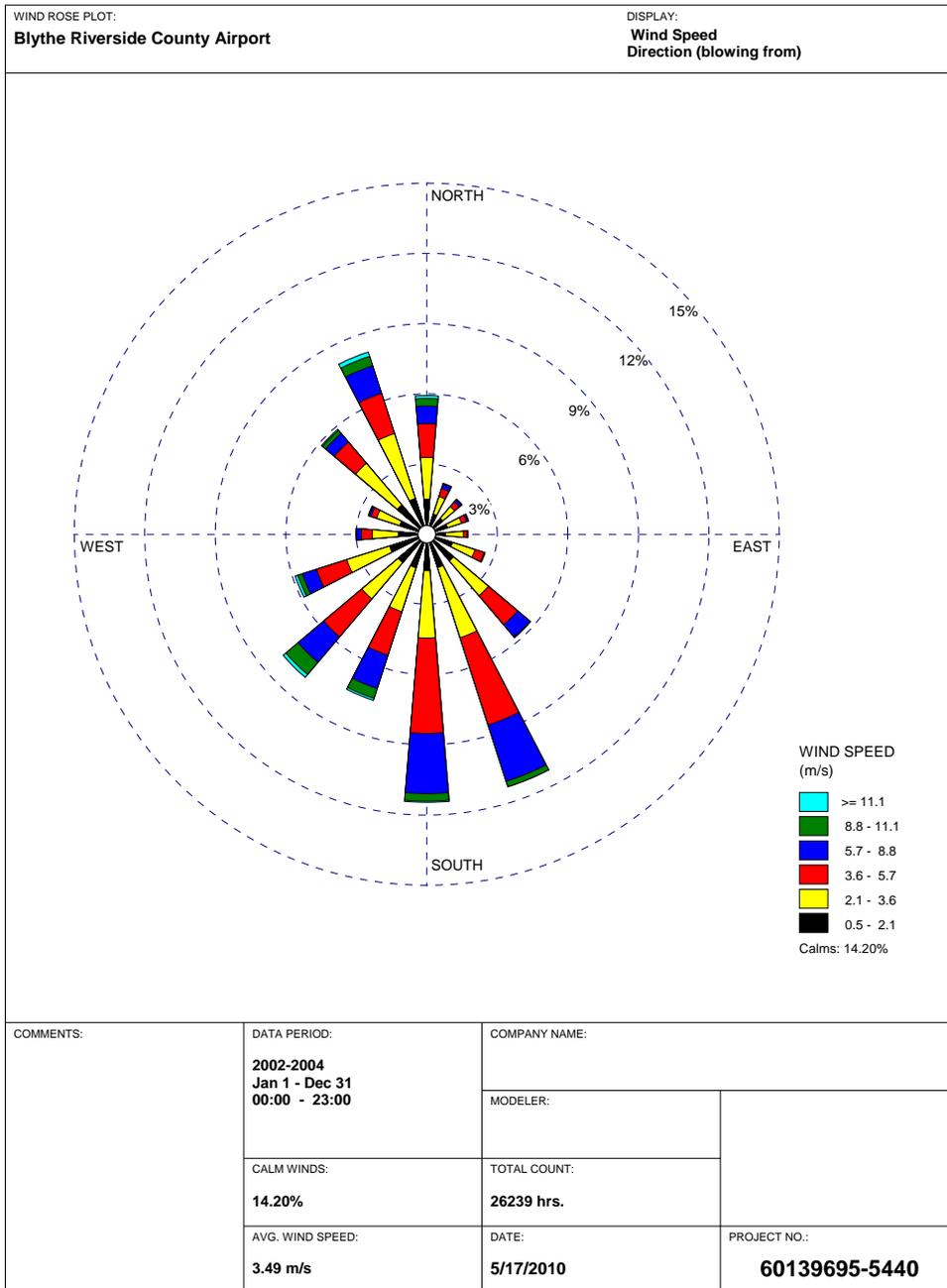
**Table 1-7 Maximum Predicted Risks**

| <b>Exposure Assumption</b>           | <b>Cancer Risk (Per Million)</b> | <b>Chronic Hazard Index</b> | <b>Acute Hazard Index</b> |
|--------------------------------------|----------------------------------|-----------------------------|---------------------------|
| Full-Time Resident                   | 0.96                             | 3.17E-04                    | 7.45E-04                  |
| Off-Site Worker                      | 0.19                             | 3.17E-04                    | 7.45E-04                  |
| <b>Moderate Risk Thresholds</b>      | <b>1</b>                         | <b>n/a</b>                  | <b>n/a</b>                |
| <b>Significant Health Thresholds</b> | <b>10</b>                        | <b>1</b>                    | <b>1</b>                  |

**References**

California Air Resources Board (ARB) 2003. Air Resources Board Recommended Interim Risk Management Policy for Inhalation-Based Residential Cancer Risk. October 2003.

California Office of Environmental Health Hazard Assessment (OEHHA) 2003. Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. August 2003.



WRPLOT View - Lakes Environmental Software

**Figure 1-1 Blythe Riverside County Airport Composite Wind Rose**

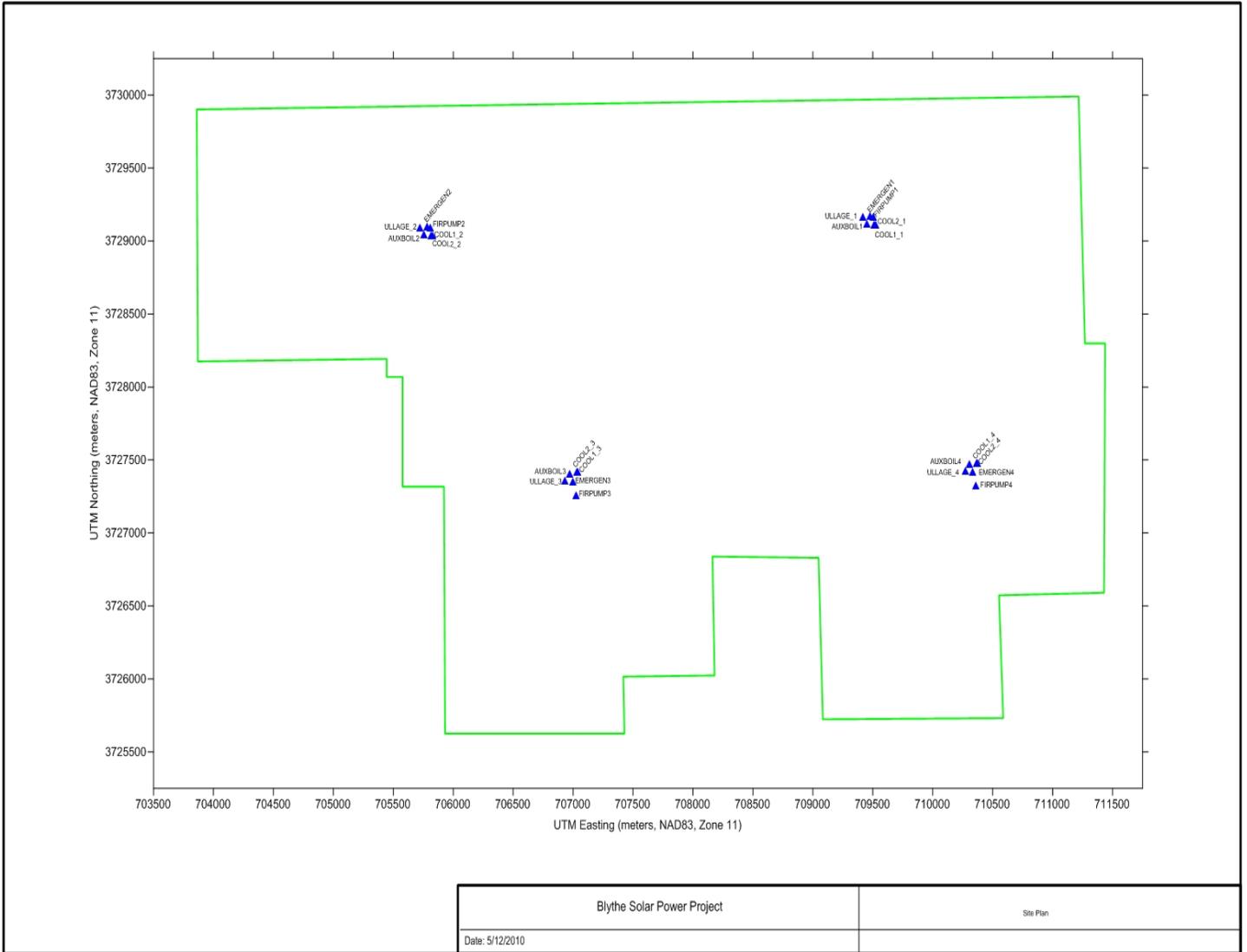


Figure 1-2 Digitized Site Plan

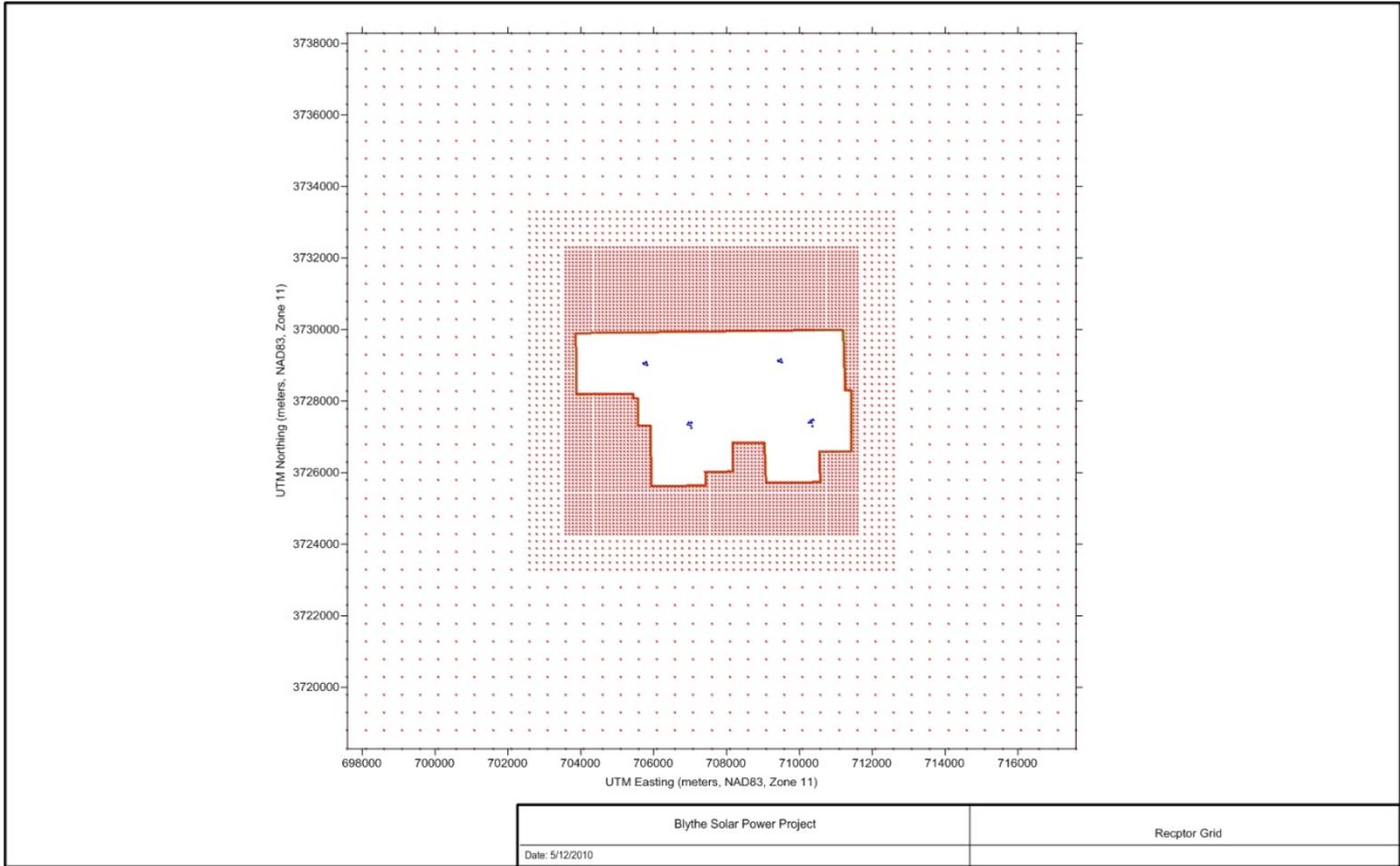


Figure 1-3 Modeled Receptor Grid

**STATE OF CALIFORNIA  
ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION**

***In the Matter of:***  
**APPLICATION FOR CERTIFICATION**  
**for the *BLYTHE SOLAR POWER PROJECT***

**Docket No. 09-AFC-6**  
**PROOF OF SERVICE**  
*(Revised 1/26/2010)*

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**DECLARATION OF SERVICE**

I, Carl Lindner, declare that on, May 20, 2010, I served and filed copies of the attached Blythe Solar Power Project Materials:

Revised Health Risk Assessment for the Blythe Solar Power Project PDOC

The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at:

[\[http://www.energy.ca.gov/sitingcases/solar\\_millennium\\_blythe\]](http://www.energy.ca.gov/sitingcases/solar_millennium_blythe).

The document has been sent to the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

**(Check all that Apply)**

**For service to all other parties:**

  X   sent electronically to all email addresses on the Proof of Service list;

       by personal delivery or by overnight delivery service or depositing in the United States mail at Camarillo, California with postage or fees thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses **NOT** marked "email preferred."

**AND**

**For filing with the Energy Commission:**

  X   sending an original paper copy and one electronic copy, mailed and emailed respectively, to the address below (preferred method);

**OR**

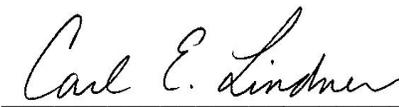
       depositing in the mail an original and 12 paper copies, along with 13 CDs, as follows:

**CALIFORNIA ENERGY COMMISSION**

Attn: Docket No. 09-AFC-6  
1516 Ninth Street, MS-4  
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I declare under penalty of perjury that the foregoing is true and correct.

  
\_\_\_\_\_