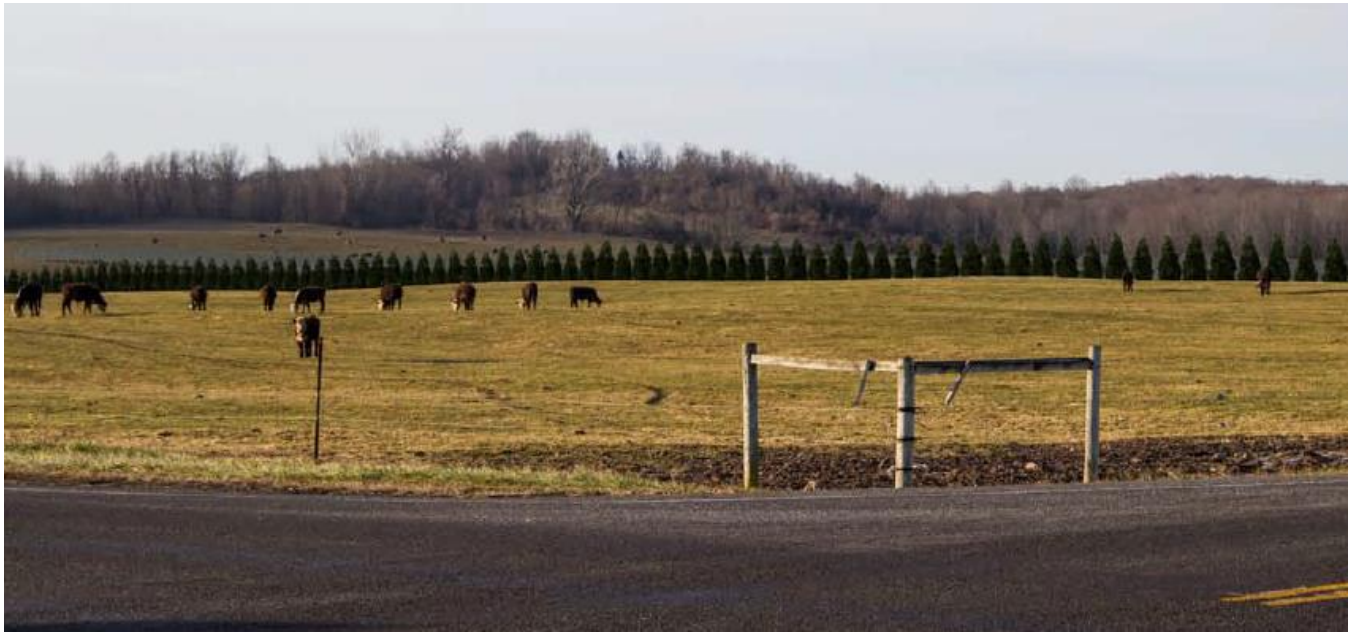
BERGMANN
ARCHITECTS ENGINEERS PLANNERS

Sampling and Analysis Plan

Delaware River Solar – Yellow Mills Road Project



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1.0 INTRODUCTION

Delaware River Solar, LLC ("DRS") is proposing development of an approximately seven (7) Megawatt alternating current Solar Farm (the "Project") on an approximately 45.105 acre portion of a 135.3 acre property owned by Roger and Carol Smith (the "Smiths") and located at 466 Yellow Mills Road in the Town of Farmington (the "Town"), Ontario County, New York (the "Site"). The Project will include the construction, on-going operations and maintenance, and decommissioning of three (3) large-scale ground mounted solar energy systems of 2.338 Megawatts alternating current each, to be located on three (3) subdivided parcels on the Site, designated as Lots #1, #2 and #3. See Figure 1. The Site is currently designated by the New York State Department of Agriculture and Markets ("NYSDAM") as Class 1-4 soils pastureland. Upon decommissioning the Project, the Site will be returned to agricultural use. As such, and as requested by the Town, Bergmann has prepared this Sampling and Analysis Plan (SAP) for the Project. This SAP describes the means and methods that will be implemented to characterize surface soil quality prior to construction of the Project, during the life of the Project, and upon decommissioning to return the Site to agricultural use.

1.1 BACKGROUND

A Phase I Environmental Site Assessment dated January 2019 was prepared for the Site by Leader Professional Services, Inc. (the "Phase I"). The Phase I did not identify any Recognized Environmental Conditions ("RECs"), Controlled RECs, or Historic RECs on the Site, therefore, no additional sampling or environmental investigations were conducted on the Site. A Toxicity Characteristic Leaching Procedure ("TCLP") analysis was previously conducted on the REC Twin Peak Solar Module panels, comparable solar panels to the ones proposed for the Project. The TCLP analysis concluded that the solar panels fell within all federal limits for toxic materials. See Appendix B for analytical results. The TCLP analysis was submitted to the Town Planning Board to show that the solar panels will not leach harmful chemicals into the soils. Once a specific panel manufacturer is selected for the Project, TCLP data from that manufacturer will be submitted to the Town Planning Board and Appendix B will be replace with that data.

As the Site contains prime soils, and because the Site is to be returned to agricultural use upon decommissioning the Project, the Town has requested a sampling plan to ensure that each solar farm is properly monitored to enable full restoration of each lot to its agricultural production potential at the same prime soils classifications and conditions presently existing.

1.2 OBJECTIVE

The objective of the scope of work outlined herein is to outline a procedure that will characterize and document the surface soil quality on the Site before construction, during operation and upon decommissioning of the solar panels as necessary to return the Site to agricultural use.

2.0 SCOPE OF WORK

The following section describes the scope of work that will be implemented to fulfill the objective of the study described in Section 1.2.

2.1 BASELINE SOIL SAMPLING

As part of the requirements detailed in the New York State Department of Agriculture and Markets, *Guidelines for Solar Energy Projects – Construction Mitigation for Agricultural Lands (Revision 10/18/2019)*, before any topsoil is disturbed, baseline representative surface soil samples will be collected from Project areas to be disturbed. The surface soil sampling detailed in this SAP will be consistent with Cornell University's soil testing guidelines.

Baseline composite surface soil samples will be collected in accordance with the procedures detailed in Section 3 below. Baseline composited surface soil sample locations will be established based on the current project engineering drawings and proposed solar array panel settings (the "Baseline Sample Locations"). A proposed Baseline Sample Locations plan is included in Figure 2.

Baseline Sample Locations will be field verified during the baseline surface soil sampling event with GPS instrumentation to create consistency for future sampling events. Baseline composite surface soil samples will be submitted to a laboratory to test the analytical parameters detailed in the table located in Section 2.3 below.

2.2 SOIL SAMPLING EVENTS

Following the baseline sampling event, composite surface soil samples will be collected in accordance with the schedule detailed in Section 2.4 and procedures detailed in Section 3 below, for the duration of the active solar array use (approximately seven (7)] sampling events over the course of the solar array's life cycle). The composite surface soil sample locations will be established based on the field verified Baseline Sample Locations once the solar array is constructed (the "Final Sample Locations"). The Final Sample Locations plan will be utilized for each sampling event and, once prepared, Figure 2 will be replaced with the final plan. In the event that a panel is broken and not replaced within four (4) months, a sampling event will be conducted at the location of the incident, and a report will be provided to the Town of Farmington in accordance with Section 3.3.

No additional sampling events, other than those listed in Section 2.4 below, are considered or required as part of this SAP.

2.3 DECOMMISSIONING SOIL SAMPLING

Upon completion of the Project and once the solar array has been decommissioned, one (1) final round of composite surface soil samples will be collected in accordance with the Final Sample Locations Plan and in accordance with the procedures detailed in Section 3 below. Sample results will be compared to the baseline sampling results, previous sampling results and the soil cleanup objectives listed in the Table in Section 3.2.

2.4 PROPOSED PROJECT SAMPLING SCHEDULE

The following table details the proposed sampling schedule to be implemented for the duration of the solar array project.

Sample Event	Sample	Year	Purpose
Baseline/Pre-Construction Sample	1	0	Baseline sample
Post-Construction Sample	2	5	Comparative to Baseline
Pre-Decommissioning Sample	3	29*	Comparative to Baseline
Pre-Restoration Sample	4	31	Comparative to Baseline

*Performed at Notice of Decommissioning.
Note: decommissioning may occur in a year later.

3.0 SAMPLING PROCEDURES

3.1 SOIL SAMPLING PROCEDURES

Surface soil samples will be collected in accordance with the Cornell Waste Management Institute, *Guide to Soil Testing and Interpreting Results* (see Appendix A). Provided below is a brief synopsis of the surface soil sample collection procedures that will be utilized in the field during each sampling event.

For each sampling event described in Section 2 above, one (1) composite surface soil sample will be collected per every three (3) acres from the lower drip edge of the solar panels located throughout the Site. Based on the entire property area to be developed consisting of 45.105-acres, the total samples to be collected is estimated at fifteen (15) composite samples per event. A proposed sample location plan is included in Figure 2. Once the solar array is constructed the Final Sample Location Plan will be prepared, utilizing the as-built survey or other similar plan for the Site, and Figure 2 will be replaced with the final plan. This Final Sample Location Plan will be utilized for each sampling event once construction is completed until the final decommissioning sample collection event.

Each of the fifteen (15) composite samples will consist of surface soils collected at three (3) discrete locations at a depth maximum of 2-inches below ground surface (bgs) per location, one (1) discrete sample from each acre. The three (3) discrete surface soil samples will be placed into a new, clean Ziploc®-type bag and composited within the bag before being placed into clean laboratory containers, generating one (1) composite sample. This procedure will be repeated throughout the 45.105-acre solar array property until a total of fifteen (15) composite samples have been collected.

The sample identification names for each of the composite samples collected will be determined during the baseline sampling event and will continue for the duration of the project with the date ending the sample nomenclature changing to reflect the sample collection date, consistent with NYSDEC EQuiS sample naming procedures.

The fifteen (15) composite samples will be stored in a pre-chilled cooler(s) during the sampling events and submitted to a NYSDOH Environmental Laboratory Approval Program (ELAP) under chain of custody procedures.

3.2 ANALYTICAL LABORATORY TESTING

Surface soil samples will be hand delivered, in a pre-chilled cooler under chain-of-custody control, to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certified analytical laboratory. The ELAP certified laboratory will perform the necessary laboratory preparations of the samples and subsequently perform the analytical laboratory program listed in the table below:

Analytical Parameter	Methodology	Comparison Soil Cleanup Objectives (SCOs)
TAL Metals	EPA 6010/6020/7470/7471	NYSDEC Part 375 Unrestricted Use
Volatile Organic Compounds (VOCs)[1]	EPA 8260B	NYSDEC Part 375 Unrestricted Use
Semi-Volatile Organic Compounds (SVOCs)[1]	EPA 8270C	NYSDEC Part 375 Unrestricted Use
Soil pH	EPA Method 9040B	Compared to baseline results

Analytical Parameter	Methodology	Comparison Soil Cleanup Objectives (SCOs)
Percent Organic Material	ASTM D2974	Compared to baseline results
Cation Exchange Capacity	ASTM D4548	Compared to baseline results
Phosphorus/Phosphate	SM 4500 PE	Compared to baseline results
Potassium/Potash	EPA 6010	Compared to baseline results
Nitrogen (TKN+NO_3+NO_2)	SM 4500 N-C, SM 4500 NO_3H	Compared to baseline results

Notes:
1 – VOC and SVOC samples will only be collected during the pre-construction/baseline and decommissioning sampling events.

Per the above table, the analytical parameters TAL Metals, Volatile Organic Compounds (VOCs), and Semi-Volatile Organic Compounds (SVOCs) are the "Environmental Parameters" and the analytical parameters Soil pH, Percent Organic Material, Cation Exchange Capacity, Phosphorus/Phosphate, Potassium/Potash and Nitrogen are the "Agricultural Parameters").

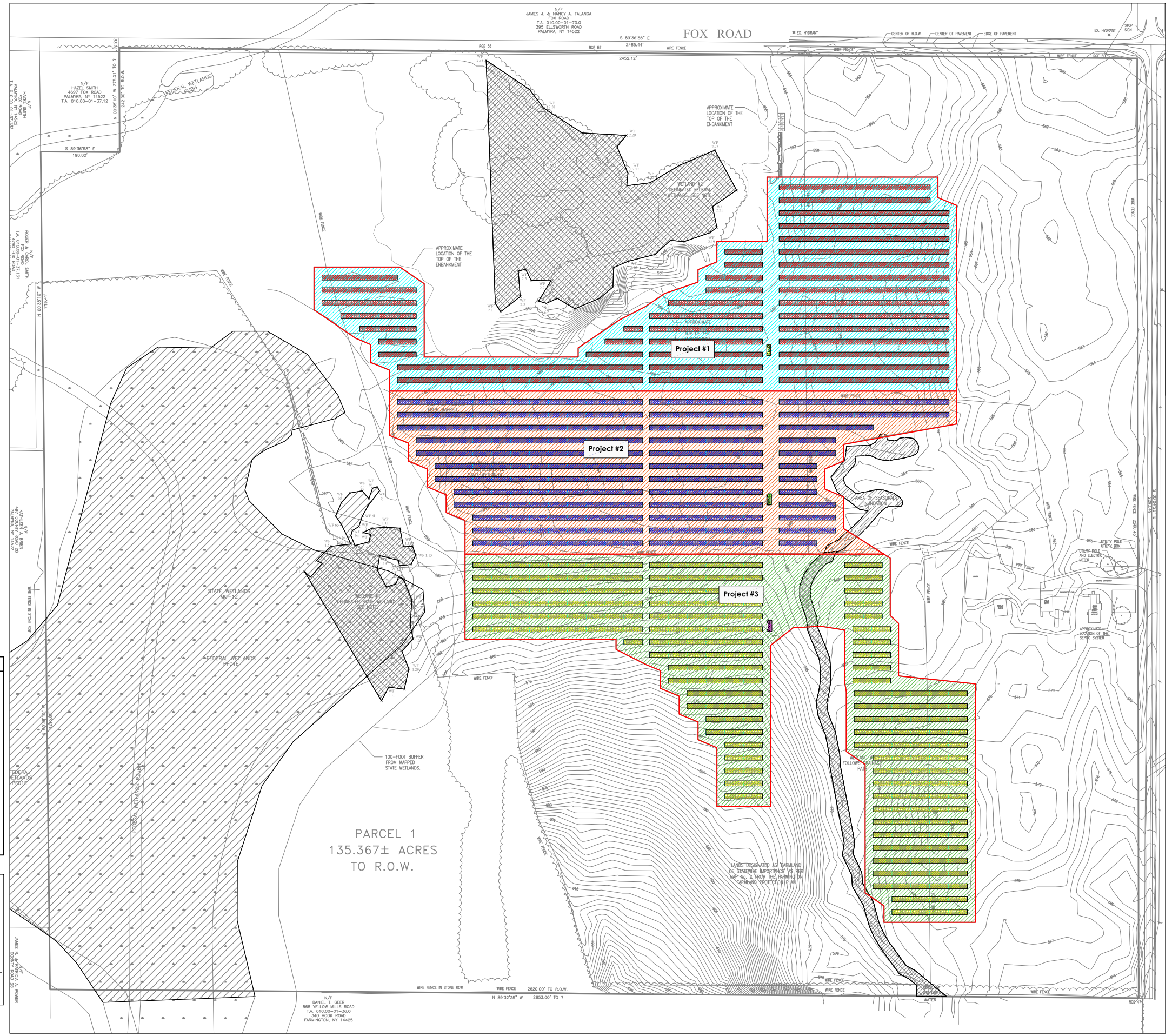
As detailed in the table above, Agricultural Parameters will be compared to the baseline sampling event. Environmental Parameters will be compared to 6 New York Code Rules and Regulations (6 NYCRR) Part 375-6.8 Soil Cleanup Objectives Table (a) Unrestricted Use Soil Cleanup Objectives.

Anticipated laboratory results are expected within approximately seven (7) business days of sample receipt (standard turnaround time).

3.3 REPORTING

After receipt of the laboratory results, the environmental consultant will prepare a tabulation of the analytical data and submit it to the Town. Analytical data results will be compared to the baseline sampling event and Soil Cleanup Objectives as detailed in the Table in Section 3.2 above. If a significant deviation has been realized from the analytical result comparison beyond the allowable limits of such materials monitored, DRS's environmental consultant will prepare a scientific summary explaining the reason for the significant deviations. Upon notice of decommissioning to the Town, a pre-decommissioning sample will be conducted and reported along with the Decommissioning Plan to be reviewed by the Planning Board for approval of Decommissioning work to be conducted. It is noted that deviations from the baseline sampling event do not necessarily indicate negative impacts from the solar panels, as the soils will regain nutrients from being fallow rather than being farmed or grazed annually. A final post-restoration sample and report will confirm whether soils have been restored to within allowable limits of materials monitored, or if additional restoration work is required.

FIGURES

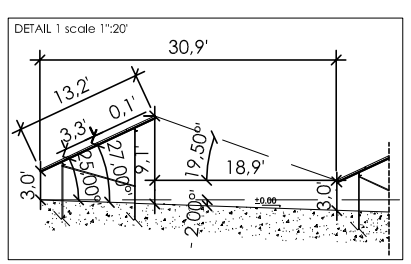


LEGEND

- AREA FOR SOLAR FARM #1: 9.88 Acres
- SURFACE MODULES AREA #1: 3.15 Acres
- INVERTER STATION AREA #1: 0.005 Acres
- AREA FOR SOLAR FARM #2: 10.74 Acres
- SURFACE MODULES AREA #2: 3.15 Acres
- INVERTER STATION AREA #2: 0.005 Acres
- AREA FOR SOLAR FARM #3: 10.65 Acres
- SURFACE MODULES AREA #3: 3.15 Acres
- INVERTER STATION AREA #3: 0.005 Acres

TOTAL AREA OF THE PLOT: 135.85 Acres

DETAIL 1 scale 1":20'



0' 50' 100' 200' 300' 400'

DRS DELAWARE RIVER SOLAR

33 Irving Place (Suite 1090), New York, NY 10003
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DRAWING ISSUE

- [ ] PRELIMINARY
- [ ] CONSTRUCTION
- [ ] CUSTOMER APPROVAL
- [ ] AS-BUILT
- [V] PERMITTING
- [ ] OTHER: _____

REVISIONS

REV	BY	APP	DESCRIPTION	DATE
0	AP	--	Initial Layout	07/09/18
1	CB	--	Reviewed and Modified	08/22/18

SYSTEM SUMMARY

MODULE

MANUFACTURER:	CSUN
MODEL:	CSUN - 72P
MODULE OUTPUT POWER:	345 Wp
STRING SIZE:	28
NUMBER OF STRINGS:	250 (per plant)
MODULE QUANTITY:	7,000 (per plant)
PV SYSTEM OUTPUT:	2,415 KWp DC (per plant)

INVERTER

MANUFACTURER:	INGETEAM
MODEL:	IS 1245TL U B480
QUANTITY / RATING:	2 /1,247 kVA (#1)
	2/ 1,247 kVA (#2)
	2/ 1,247 kVA (#3)
PV SYSTEM OUTPUT:	2,338 kW AC (#1)
	2,338 kW AC(#2)
	2,338 kW AC(#3)
DC SYSTEM VOLTAGE:	1,500 V

RACKING

MANUFACTURER:	TBD
CONFIGURATION :	4 Module Heigh - Landscape
TILT:	25°
AZIMUTH:	180°

BOS

CB QTY / FUSES (QTY / I):	TBD
TRANSFORMER QTY / RATING:	1 / 2,500 kVA (per plant)
INTERCON. VOLTAGE:	12.47 kV

Project Name: SOLAR PROJECT 7.014 MW AC
#1 #2 #3 (2.338 MW per plant)
466 Yellow Mills Rd FARM

Site Adress: Yellow Mills Rd
Farmington, NY 14522
43.017843, -77.259895

Sheet Name: FOOT PRINT LAYOUT

Scale: 1": 250' (ANSI B)

Project ID: #—

Plan No.: 21

APPENDICES

APPENDIX A

Cornell Waste Management Institute

Department of Crop & Soil Sciences
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by:
Hannah Shayler
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Ellen Harrison

Guide to Soil Testing and Interpreting Results

When is Soil Testing Helpful?

Certain chemical elements occur naturally in soils as components of minerals, yet may be toxic at some concentrations. Other potentially harmful substances may end up in soils through human activities. This could happen if former industrial or agricultural lands are later used for residential properties, and contaminants remain in the soil. Spills, runoff, or aerial deposition of chemicals used for agriculture or industry can also cause soil contamination in residential areas. At times, the amounts of some soil elements and other substances may exceed levels recommended for the health of humans, animals, or plants.

Soil contamination may be more likely if the site has or had any of the following: lead paint, high traffic, use of fertilizers or pesticides, industrial or commercial activity, treated lumber, petroleum spills, automobile or machine repair, junk vehicles, furniture refinishing, fires, landsfills, or garbage dumps. See the Cornell Waste Management Institute's document *Sources and Impacts of Contaminants in Soils* for more information.

Soil testing can help answer questions and address concerns about possible contamination. The sampling strategies outlined here can also guide efforts to test soils for other properties, such as pH, nutrient levels, or organic matter content. When deciding how soil tests can be helpful in a particular situation, consider the cost of analysis, as well as the property's location, size, history, current use, and overall soil quality.

CWMI Resources for Healthy Soils

http://cwmi.css.cornell.edu/soilquality.htm

- **Sources and Impacts of Contaminants in Soils**
- **Guide to Soil Testing and Interpreting Results**
- **Best Practices for Healthy Gardens**
- **More Information about Arsenic and Lead**

Strategies for Collecting Soil Samples

There is no one-size-fits-all strategy for collecting soil samples. Carefully consider what information soil tests can provide. Think about how people (especially children) might be exposed to soil contaminants at a particular site. People are generally exposed to soil contaminants through skin contact, breathing in dust, accidentally eating small amounts of soil, or eating fruits and vegetables with contaminants on or in them. Then, decide on a sampling strategy to best answer questions about that situation. For example,

To measure contaminant levels in particular areas, such as children's play areas, collect separate samples of the top one to two inches of soil. This could help identify a contamination source, such as a chemical spill.

To measure the average levels of contaminants in surface soil, collect several composite (combined) samples of the top one to two inches of soil from across the property. To find out if the concentrations are different in different areas, collect a separate sample from each area.

To measure contaminant levels in garden soil, collect deeper samples (the top six inches) from several locations and mix them together as a composite sample. To find out if some parts of the garden have higher concentrations than others, collect separate samples from the areas of interest.

Remember to:

♦ Collect the top six inches of soil from garden areas, or the top one to two inches from other areas.

♦ Take a composite sample by combining a number of samples from different locations (usually five to ten spots) and mixing them together.

♦ Collect at least three separate composite samples for each area of interest because the levels of a particular contaminant can vary throughout a site.

♦ Consider dividing larger areas (larger than 100 feet by 100 feet) into smaller parts for planning purposes.

Key Steps in Soil Testing Process

- ♦ Identify questions or concerns
- ♦ Consult with local county cooperative extension or other resources
- ♦ Select a laboratory
- ♦ Devise a sampling strategy
- ♦ Collect and submit samples
- ♦ If needed, use results to help make decisions to reduce exposure and improve garden health

General Procedure for Sample Collection

1. *Select the sites.* Based on the questions to be answered with test results, select the specific locations from which to collect samples.

NOTE: Carefully consider what information is needed, and the cost of analysis. Try to get the most information with available resources.

2. *Make a map or diagram.* Record where samples are collected and how they were collected (including the depth of soil collected), and label the samples accordingly. This information will be useful for interpreting the test results from the laboratory.

3. *Collect the samples.* At each sampling location, remove any surface vegetation and use a clean trowel, scoop or spoon to collect the sample to avoid contamination. For individual samples, use a different trowel, scoop or spoon for each sample or wash with soap and water between samples. It is fine to use the same sampling instrument to take the five to ten samples to mix for a composite sample.

4. *Package the samples.* For individual (not composite) samples, put each sample into a different container (double plastic bags, or containers provided or recommended by the laboratory). For composite samples, mix the individual samples in a clean container (such as a clean plastic bag placed inside a bucket) and then transfer the mixed sample to the container that will be sent to the laboratory. Follow the instructions provided by the laboratory regarding how to package and label the soil samples.

5. *Send the sample(s) to the laboratory as instructed.* If samples need to be analyzed within a specified time frame, select an appropriate shipping option.

What Laboratories Can Test Soils?

To find a laboratory that tests for the contaminant of concern, contact your local county cooperative extension office (*http://www.csrees.usda.gov/Extension/*), look in the yellow pages or search on the internet. Contact the laboratory before collecting a sample to find out if there are any specific forms or instructions. For samples collected in New York State, a list of laboratories certified by the NYS Department of Health Environmental Laboratory Approval Program (ELAP) is available at: *http://www.wadsworth.org/labcert/elap/comm.html*.

How Much Does it Cost to Test Soil Samples?

The cost of testing will depend on the number of samples tested (more samples will be more expensive), whether the samples will be analyzed for one contaminant or many (tests for multiple contaminants will be more expensive), and which contaminants are being tested for (analyses for some contaminants cost more than others). Costs will also vary from lab to lab due to the use of different analytical methods or pricing structures.

What Do Soil Test Results Mean?

Laboratory results report the amount of a particular substance measured in a soil sample, and can help people decide if changes in land use, gardening practices, or other behaviors might help reduce exposure to contaminants or improve soil health. Many common soil tests report the total amount of a particular contaminant. For metals, this usually means that the soils are digested in strong acid to bring all or most of the metal into solution for measurement. The resulting metal concentration is reported as "total metal" (for example,"total lead"). Other tests may measure some chemically extractable portion of the contaminant and use this value to estimate the total amount of contaminant in the sample.

Results are often given in soil concentration units as parts per million (ppm) of the contaminant being measured. A value of 1 ppm would mean that for every million "parts" of soil by dry weight, there would be 1 part of the contaminant. These values are the same as results reported in mg/kg (milligrams of contaminant per kilogram of soil) or µg/g (micrograms of contaminant per gram of soil).

There is no single standard that defines acceptable levels of contaminants in soils. Regulations issued by the NYS Department of Environmental Conservation (NYS DEC) and soil screening guidance provided by

the US Environmental Protection Agency (USEPA) may be a helpful place to start. The NYS DEC and USEPA values were developed for use in certain programs under certain conditions. However, these values can provide some guidance for interpreting test results since they are based on assessments of risks to human health or the environment posed by exposure to various soil contaminants through different site uses.

When comparing the different values to each other and to soil test results, it is important to understand the purpose of the numbers. Consider the differences in the intended uses of the values and why they were developed, and focus on the value that is most appropriate for a particular situation. The information below will help answer questions such as:

♦ Are the different values based on assessments of risks to human health, or other concerns such as protecting groundwater or ecological health?

♦ Did the risk assessments consider all of the likely exposure pathways for a particular contaminant that would result from a certain type of site use?

♦ How did the risk assessments account for background levels of contaminants that may be present in uncontaminated soils due to natural soil processes?

NYS DEC Soil Cleanup Objectives

With guidance from the NYS Department of Health, the NYS DEC has established Soil Cleanup Objectives (SCOs) under their Environmental Remediation Programs as part of regulations (6 NYCRR Part 375) intended to streamline the cleanup of contaminated Brownfield and Superfund sites. Remember, these regulations were developed specifically to determine if sites under these programs need further study. However, the science behind the SCOs can be used to help interpret the results of soil tests on properties that may not necessarily be Brownfield or Superfund sites.

The SCOs specify concentrations that soil contaminants should not exceed in order for a site to be used for a particular purpose. These values are based on risk assessments that make different assumptions in order to protect human health, groundwater, or ecological resources, and account for factors such as rural soil background levels. There are different SCOs for specific contaminants and for particular land uses, such as residential, commercial, or industrial use. This is because the values were calculated using different assumptions about exposure and how the intended use of the site will affect public health or the environment. A Technical Support Document with more information can be found at: *http://www.dec.ny.gov/chemical/34189.html*.

USEPA Soil Screening Levels

The USEPA has established Soil Screening Levels (SSLs) to streamline the evaluation and cleanup of Superfund sites intended for residential land use in the future. These guidance values aim to focus resources for site evaluation and cleanup where they are most needed. When SSLs are exceeded, it does not mean that cleanup is required, but rather that further study is necessary. If soil contaminant concentrations are less than the SSLs, no further action is required under the Superfund program. However, sites must still comply with any standards or screening levels under state or local programs.

Like the SCOs, the SSLs are risk-based values developed for specific land use scenarios using assumptions about how soil contaminants may affect people or the environment. The USEPA did not consider background levels of contaminants in soils when it developed the SSLs, so some of the values are below what is typically found in soils in some regions. More information, including a Quick Reference Fact Sheet and tables of all SSL values (see Appendix A), is available at: *http://www.epa.gov/superfund/health/conmedia/soil/index.htm*.

Why are the Numbers Different?

The values from NYS DEC and USEPA were derived at different times, by different agencies, for different purposes using different methods. For example, different assumptions may be made about factors such as:

♦ The amount of soil a person ingests;

♦ The amount of contaminant ingested from other sources, such as water and food;

♦ Whether children or adults are exposed;

♦ The length of exposure;

♦ The acceptable level of risk of disease;

♦ Uncertainty or missing information.

Background levels (naturally occuring concentrations of contaminants in soils) are also handled differently. For the NYS SCOs, if the risk-based value was lower than rural background values, the background value was used as the SCO. Otherwise, many sites might exceed the SCO based on existing background levels alone.

Other values, like the USEPA SSLs, do not account for background levels. Therefore, the concentrations of some contaminants may exceed the SSLs even in uncontaminated soils. However, knowing that background soil concentrations exceed guidance levels may still be useful information to help appropriately manage risks.

Guidance for Interpreting Test Results

Soil testing can provide information to help guide efforts to improve the quality of gardens and protect public health. There is no clear line of what is considered "safe". Generally speaking, if test results show that all or some areas of a property have contaminant levels higher than agency guidelines or levels recommended by other sources, it is wise to reduce the exposure of both children and adults. Children are especially vulnerable to harmful health effects, so it is particularly important to address any concerns about soil contaminants in areas where children play or where fruits or vegetables are grown for food.

The practices outlined in *Soil Contaminants and Best Practices for Healthy Gardens* will help improve soil quality and limit people's contact with soil contaminants. Given the many benefits of consuming fresh fruits and vegetables, it is important to use these practices whenever possible to create healthy gardens for growing healthy foods.

Some SCO and SSL values are described here and included in Table 1 to help with the interpretation of soil test results from yards, gardens, or other residential and community spaces.

♦ Like all of the SCO values adopted into regulation, the **NYS DEC Unrestricted Use SCOs** account for exposure to soil contaminants through soil ingestion, inhalation, and skin contact. These SCOs also account for exposure to soil contaminants through the consumption of home-grown vegetables and home-produced animal products, including meat, milk, and eggs, as well as the protection of groundwater and ecological resources.

Of the SCO values for different land uses, the Unrestricted Use SCOs are the lowest soil contaminant concentrations. These values were developed to be the most conservatively protective of human health, ecological resources, and groundwater for all land uses, and account for rural soil background concentrations. Similarly, if the calculated value was lower than the detection limit for a particular chemical (as specified by NYS DEC protocol), the detection limit was instead used as the final value for the Unrestricted Use SCO.

♦ The **NYS DEC Residential Land Use SCOs** were developed to help with the clean-up of sites to be used for residential purposes (usually single family housing), but not for raising livestock or producing animal products for human consumption. These values account for exposure to soil contaminants by ingesting soil, breathing in soil particles and vapors, skin contact, and eating home-grown vegetables, but NOT the consumption of animal products produced on site.

♦ The **NYS DEC Restricted Residential Land Use SCOs** are intended primarily for the cleanup of sites to be used for multi-family residential housing. This category DOES NOT account for exposures through the consumption of home-grown vegetable products or home-produced animal products. These activities are meant to be excluded from these sites. Under the SCO regulations, community vegetable gardens may be considered under this category with NYS DEC approval.

♦ The **USEPA SSLs for Residential Scenarios** are federal screening levels at which the USEPA recommends further study to determine whether cleanup is needed at a particular site. The exposure pathways addressed by the SSLs include direct ingestion of ground water and soil, inhalation of volatiles and dust; plant uptake, absorption through the skin, and exposure from volatiles in basements are addressed to a limited extent. SSLs are presented separately for different exposure pathways, rather than combined as in the SCOs. The generic SSL values shown here are intended to be conservative and protective for most site conditions in the United States for the purposes of the specific program for which they were developed. Note that many of the SSL values are considerably higher than the corresponding NYS DEC SCOs, as well as typical soil background concentrations. The assumptions used in the risk assessments may not be sufficiently protective for many situations.

Table 1. Values to guide the interpretation of soil test results for some common soil contaminants of concern to human, plant, and animal health.

A. New York State Soil Background Concentrations. Included here are average background concentrations (with minimum and maximum values in parentheses) measured in mineral soils of central and western New York (see Al-Wardy 2002). These values are intended to help with the interpretation of soil test results by providing some information about the levels of certain chemical elements typically found in uncontaminated soils.

B. New York State Department of Environmental Conservation Soil Cleanup Objectives (SCOs). Unrestricted Use SCOs and Restricted Use SCOs for the Protection Public Health for residential situations are included here for some contaminants of interest. See *http://www.dec.ny.gov/regs/15507.html* for all SCOs included in Subpart 375-6: Remedial Program Soil Cleanup Objectives, including values for other land uses and other contaminants. Additional human health-based SCOs are indicated in parentheses if different from the values included in the regulations. The final health-based SCOs were calculated considering chronic exposure, acute soil ingestion, and irritant contact dermatitis. More complete information about SCO development is available in the Technical Support Document at: *http://www.dec.ny.gov/chemical/34189.html*.

C. US Environmental Protection Agency Generic Soil Screening Levels (SSLs). Values for the ingestion-dermal exposure pathway of the residential use scenario are included here. Note that many of the SSL values are considerably higher than the corresponding NYS DEC SCOs and NYS soil background concentrations. Although the risk assessments used to develop the SSLs accounted for exposures through ingestion of homegrown produce to a limited extent, the assumptions used may not be sufficiently protective for many situations. More information about the development of the USEPA SSLs, as well as values for additional contaminants and commercial/industrial land use scenarios, can be found at *http://www.epa.gov/superfund/health/conmedia/soil/index.htm* (see Appendix A of the Supplemental Guidance).

Contaminant	A. NYS Soil Background[1] (ppm)	B. NYS DEC SCOs (ppm)			C. USEPA SSLs (ppm) *Residential Use, Ingestion-Dermal Exposure*
		Unrestricted Use	Restricted Use for the Protection of Public Health *Residential*	*Restricted-Residential*	
Arsenic	5.0 (1.8-13.3)	13 (0.11)	16 (0.21)	16 (1)	0.4
Cadmium	0.5 (0.3-1.1)	2.5 (0.43)	2.5 (0.86)	4.3	70
Chromium, hexavalent	13.5 (7.7-23.5)[2]	1 (11)	22	110	230
Chromium, trivalent		30 (18)	36	180	120,000
Copper	14.2 (5.7-35.3)	50 (270)	270	270	--
Lead	18.7 (9.8-35.6)	63 (200)	400	400	400[3]
Nickel	17.1 (7.9-36.9)	30 (72)	140	310	1600
Zinc	65.2 (36.3-117)	109 (1100)	2200	10,000 (11,000)	23,000

[1]Al-Wardy, M.M. 2002. Elemental distribution in the surface and subsurface soils of central and western New York. *Doctoral Dissertation*, Cornell University, Ithaca, NY.

[2]Values for total chromium. Hexavalent chromium, or "chromate," is highly toxic to humans. However, total chromium is usually almost entirely in the less toxic form of trivalent chromium.

[3]The USEPA generic SSLs do not include values for lead, dioxins, or PCBs, because separate USEPA documents specify risk-based guidance values for these contaminants in soils. Federal soil standards (Section 403 of the USEPA's Toxic Substances Control Act) defines soil as a hazard in play areas if bare soil contains 400 ppm or more of lead, or if average lead concentrations in bare soil exceed 1200 ppm in other areas of a yard.

Where Can I Get More Information?

Cornell Waste Management Institute Resources for Healthy Soils: ***http://cwmi.css.cornell.edu/soilquality.htm***

♦ Sources and Impacts of Contaminants in Soils ♦ Guide to Soil Testing and Interpreting Results

♦ Soil Contaminants and Best Practices for Healthy Gardens ♦ More Information about Arsenic and Lead

Other Resources

Agency for Toxic Substances and Disease Registry, Department of Health and Human Services, Atlanta. Provides information to prevent harmful exposures and diseases related to toxic substances. Accessible at: *http://www.atsdr.cdc.gov/*

California Office of Environmental Health Hazard Assessment. A database with toxicity information on many chemicals. Accessible at: *http://www.oehha.ca.gov/risk/ChemicalDB/index.asp*

Cleanup Levels for hazardous waste sites. Links to many federal, state and international websites that address soil clean up levels. Accessible at: *http://cleanuplevels.com/*

National Pesticide Information Center. Provides information about pesticides and related topics. Accessible at: *http://npic.orst.edu/*

New York State Department of Environmental Conservation. Brownfield and Superfund Regulation, 6 NYCRR Part 375 - Environmental Remediation Programs. Accessible at: *http://www.dec.ny.gov/chemical/34189.html*

Penn State University. Agronomy Fact Sheets: Environmental Soil Issues. Information about lead in residential soils, garden use of treated lumber, and other issues. Accessible at: *http://cropsoil.psu.edu/extension/esi.cfm*

US Environmental Protection Agency. Office of Solid Waste and Emergency Response. Soil Screening Guidance: Quick Reference Fact Sheet, EPA/540/F-95/041. Accessible at: *http://www.epa.gov/superfund/health/conmedia/soil/pdfs/fact_sht.pdf*

US Environmental Protection Agency. US Office of Solid Waste and Emergency Response. Superfund Soil Screening Guidance: Technical Background Document, EPA/540/R95/128. Accessible at: *http://www.epa.gov/oerrpage/superfund/health/conmedia/soil/introtbd.htm*

US Environmental Protection Agency. Integrated Risk Information System (IRIS). Searchable database with information on the toxicity of numerous chemicals. Accessible at: *http://cfpub.epa.gov/ncea/iris/index.cfm*

Washington State University Cooperative Extension. Gardening on Lead- and Arsenic-Contaminated Soils. Additional information about arsenic and lead in garden soils. Accessible at: *http://cru.cahe.wsu.edu/CEPublications/eb1884/eb1884.pdf*

Special Thanks to Contributors and Supporters

We greatly appreciate the ongoing insights and feedback provided by the New York State Department of Environmental Conservation and the New York State Department of Health, our colleagues at Cornell University and Cornell University Cooperative Extension-NYC, collaborators in the New York City urban soils group, and the many others whose questions, concerns, and experiences have led to the development of these documents.

APPENDIX B

ASTRONERGY

Declaration Letter

Date: Nov. 6th, 2017

To: M+W Energy, Inc.
Subject: Declaration letter for TCLP Report

We are pleased to inform you that our the solar module Toxicity Characteristic Leaching Procedure (TCLP) report is available for distribution. We confirm that the results fall within current EPA Standards.

Astronergy| Chint Solar
Anna Wang |Sales Director- the Americas
anna.wang@astronergy.com

Anna Wang

REC Americas LLC
1820 Gateway Drive, Suite 170
San Mateo, CA 94404
www.recgroup.com

SOLAR'S MOST TRUSTED

Toxicity Test Report
Prepared September 11, 2018
REC Twin Peak 2 PV Solar Panel

Mr. Manuel Folgado
Delaware River Solar
33 Irving Pl, 10th Floor
New York, NY 10003

Mr. Folgado,

Please see the attached TCLP test report for the REC Twin Peak solar module, which REC will be supplying for your forthcoming projects. The test was performed by TestAmerica Laboratories, Inc., of Irvine, CA. As noted in the results on pages 5 and 6, REC solar panels fall well within all federal limits for toxic materials.

REC modules are widely recognized as the standard for quality materials, workmanship, and longevity in the solar business. We look forward to working with you now and in the future.

Should you have any questions or wish to discuss this further, please do not hesitate to call me.

Sincerely,

George McClellan
Senior Technical Sales Manager
REC Americas LLC

Test Specification	Test Result:
Toxicity Characterization Leaching Procedure (TCLP)	PASS

RESULTS SUMMARY:

No analyte concentrations exceeded the maximums allowed. (see addendum report)

EPA Waste Number	Contaminant	Regulatory Level (mg/l)
D004	Arsenic	5.000
D005	Barium	100.000
D006	Cadmium	1.000
D007	Chromium	5.000
D008	Lead	5.000
D009	Mercury	.2000
D010	Selenium	1.000
D011	Silver	5.000

DETAILED TEST RESULTS: (see attached)

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614-5817
Tel: (949)261-1022

TestAmerica Job ID: 440-219289-1
Client Project/Site: REC Americas - Solar PV Panel- TCLP

For:
REC Americas LLC
111 Narlene Way
Pismo Beach, California 93449

Attn: George McClellan

Authorized for release by:
9/11/2018 12:15:10 PM

Rossina Tomova, Project Manager I
(949)261-1022
rossina.tomova@testamericainc.com

Table of Contents

Sample Summary

Client: REC Americas LLC
Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
440-219289-1	REC Twin Peak Solar Module	Solid	09/03/18 09:00	09/04/18 09:10

Job ID: 440-219289-1

Laboratory: TestAmerica Irvine

Narrative

Job Narrative
440-219289-1

Comments
No additional comments.

Receipt
The sample was received on 9/4/2018 9:10 AM; the sample arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.1º C.

GC/MS VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

GC/MS Semi VOA
Method(s) 8270C: Surrogate Phenol-d6 (Surr) recovery for the following sample was outside control limits: (440-219289-A-1-F MS). Evidence of matrix interference is present; however, low recovery due to less than optimal extraction conditions cannot be confirmed. Re-extraction and re-analysis was not performed because surrogate recoveries in the source sample are within acceptable limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Metals
Method(s) 6010B: The method blank for preparation batch 440-497277 and 440-497508 and analytical batch 440-498189 contained Lead above the method detection limit. This target analyte concentration was less than the reporting limit (RL); therefore, re-extraction and/or re-analysis of samples was not performed.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep
Method(s) 3520C: Insufficient sample volume was available to perform a matrix spike duplicate (MS/MSD) associated with preparation batch 440-497277 and 440-497626; 3520C_8270-TCLP. Only MS reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOA Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Client Sample ID: REC Twin Peak Solar Module

Date Collected: 09/03/18 09:00
Date Received: 09/04/18 09:10

Lab Sample ID: 440-219289-1
Matrix: Solid

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.020	0.0028	mg/L			09/06/18 12:13	1
Carbon tetrachloride	ND		0.050	0.0028	mg/L			09/06/18 12:13	1
Chloroform	ND		0.020	0.0033	mg/L			09/06/18 12:13	1
1,1-Dichloroethene	ND		0.050	0.0042	mg/L			09/06/18 12:13	1
1,2-Dichloroethane	ND		0.020	0.0028	mg/L			09/06/18 12:13	1
2-Butanone (MEK)	ND		0.10	0.047	mg/L			09/06/18 12:13	1
Tetrachloroethene	ND		0.020	0.0032	mg/L			09/06/18 12:13	1
Trichloroethene	ND		0.020	0.0026	mg/L			09/06/18 12:13	1
Vinyl chloride	ND		0.050	0.0040	mg/L			09/06/18 12:13	1
Chlorobenzene	ND		0.020	0.0036	mg/L			09/06/18 12:13	1
1,4-Dichlorobenzene	ND		0.020	0.0037	mg/L			09/06/18 12:13	1
Hexachlorobutadiene	ND		0.050	0.0038	mg/L			09/06/18 12:13	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*103*		*80 - 128*		*09/06/18 12:13*	*1*
4-Bromofluorobenzene (Surr)	*98*		*80 - 120*		*09/06/18 12:13*	*1*
Dibromofluoromethane (Surr)	*107*		*76 - 132*		*09/06/18 12:13*	*1*

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Methylphenol	ND		0.050	0.015	mg/L		09/06/18 12:16	09/10/18 15:24	1
1,4-Dichlorobenzene	ND		0.050	0.013	mg/L		09/06/18 12:16	09/10/18 15:24	1
2,4-Dinitrotoluene	ND		0.050	0.018	mg/L		09/06/18 12:16	09/10/18 15:24	1
Hexachlorobenzene	ND		0.050	0.015	mg/L		09/06/18 12:16	09/10/18 15:24	1
Hexachlorobutadiene	ND		0.050	0.020	mg/L		09/06/18 12:16	09/10/18 15:24	1
Hexachloroethane	ND		0.050	0.018	mg/L		09/06/18 12:16	09/10/18 15:24	1
Nitrobenzene	ND		0.20	0.015	mg/L		09/06/18 12:16	09/10/18 15:24	1
Pentachlorophenol	ND		0.20	0.018	mg/L		09/06/18 12:16	09/10/18 15:24	1
Pyridine	ND		0.050	0.013	mg/L		09/06/18 12:16	09/10/18 15:24	1
2,4,5-Trichlorophenol	ND		0.10	0.015	mg/L		09/06/18 12:16	09/10/18 15:24	1
2,4,6-Trichlorophenol	ND		0.10	0.023	mg/L		09/06/18 12:16	09/10/18 15:24	1
3-Methylphenol + 4-Methylphenol	ND		0.050	0.015	mg/L		09/06/18 12:16	09/10/18 15:24	1
Total Cresols	ND		0.025	0.013	mg/L		09/06/18 12:16	09/10/18 15:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl	*79*		*50 - 120*	*09/06/18 12:16*	*09/10/18 15:24*	*1*
2-Fluorophenol (Surr)	*70*		*30 - 120*	*09/06/18 12:16*	*09/10/18 15:24*	*1*
Nitrobenzene-d5 (Surr)	*77*		*45 - 120*	*09/06/18 12:16*	*09/10/18 15:24*	*1*
Terphenyl-d14 (Surr)	*81*		*10 - 150*	*09/06/18 12:16*	*09/10/18 15:24*	*1*
2,4,6-Tribromophenol (Surr)	*79*		*40 - 120*	*09/06/18 12:16*	*09/10/18 15:24*	*1*
Phenol-d6 (Surr)	*60*		*35 - 120*	*09/06/18 12:16*	*09/10/18 15:24*	*1*

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.20	0.070	mg/L		09/05/18 21:45	09/06/18 13:51	1
Barium	**0.61**		0.20	0.060	mg/L		09/05/18 21:45	09/06/18 13:51	1
Cadmium	ND		0.10	0.020	mg/L		09/05/18 21:45	09/06/18 13:51	1
Chromium	ND		0.10	0.020	mg/L		09/05/18 21:45	09/06/18 13:51	1
Lead	**1.1**	**B**	0.10	0.040	mg/L		09/05/18 21:45	09/06/18 13:51	1
Selenium	ND		0.10	0.080	mg/L		09/05/18 21:45	09/06/18 13:51	1

Client: REC Americas LLC
Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Client Sample ID: REC Twin Peak Solar Module
Date Collected: 09/03/18 09:00
Date Received: 09/04/18 09:10

Lab Sample ID: 440-219289-1
Matrix: Solid

Method: 6010B - Metals (ICP) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	ND		0.20	0.060	mg/L		09/05/18 21:45	09/06/18 13:51	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.0020	0.0010	mg/L		09/06/18 12:26	09/06/18 23:32	1

Method Summary

Client: REC Americas LLC
Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL IRV
8270C	Semivolatile Organic Compounds (GC/MS)	SW846	TAL IRV
6010B	Metals (ICP)	SW846	TAL IRV
7470A	Mercury (CVAA)	SW846	TAL IRV
1311	TCLP Extraction	SW846	TAL IRV
3010A	Preparation, Total Metals	SW846	TAL IRV
3520C	Liquid-Liquid Extraction (Continuous)	SW846	TAL IRV
5030B	Purge and Trap	SW846	TAL IRV
7470A	Preparation, Mercury	SW846	TAL IRV

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Lab Chronicle

Client: REC Americas LLC
Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Client Sample ID: REC Twin Peak Solar Module
Date Collected: 09/03/18 09:00
Date Received: 09/04/18 09:10

Lab Sample ID: 440-219289-1
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			25.07 g	500 mL	497278	09/04/18 23:38	CDH	TAL IRV
TCLP	Analysis	8260B		1	1 mL	10 mL	497545	09/06/18 12:13	AYL	TAL IRV
TCLP	Leach	1311			99.98 g	2000 mL	497277	09/04/18 23:34	CDH	TAL IRV
TCLP	Prep	3520C			200 mL	2.0 mL	497626	09/06/18 12:16	JAA	TAL IRV
TCLP	Analysis	8270C		1			498096	09/10/18 15:24	HN	TAL IRV
TCLP	Leach	1311			99.98 g	2000 mL	497277	09/04/18 23:34	CDH	TAL IRV
TCLP	Prep	3010A			5 mL	50 mL	497508	09/05/18 21:45	CDH	TAL IRV
TCLP	Analysis	6010B		1			498189	09/06/18 13:51	VS	TAL IRV
TCLP	Leach	1311			99.98 g	2000 mL	497277	09/04/18 23:34	CDH	TAL IRV
TCLP	Prep	7470A			2 mL	20 mL	497631	09/06/18 12:26	DB	TAL IRV
TCLP	Analysis	7470A		1			497854	09/06/18 23:32	DB	TAL IRV

Laboratory References:

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 440-497278/1-A
Matrix: Solid
Analysis Batch: 497545

Client Sample ID: Method Blank
Prep Type: TCLP

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.020	0.0028	mg/L			09/06/18 09:44	1
Carbon tetrachloride	ND		0.050	0.0028	mg/L			09/06/18 09:44	1
Chloroform	ND		0.020	0.0033	mg/L			09/06/18 09:44	1
1,1-Dichloroethene	ND		0.050	0.0042	mg/L			09/06/18 09:44	1
1,2-Dichloroethane	ND		0.020	0.0028	mg/L			09/06/18 09:44	1
2-Butanone (MEK)	ND		0.10	0.047	mg/L			09/06/18 09:44	1
Tetrachloroethene	ND		0.020	0.0032	mg/L			09/06/18 09:44	1
Trichloroethene	ND		0.020	0.0026	mg/L			09/06/18 09:44	1
Vinyl chloride	ND		0.050	0.0040	mg/L			09/06/18 09:44	1
Chlorobenzene	ND		0.020	0.0036	mg/L			09/06/18 09:44	1
1,4-Dichlorobenzene	ND		0.020	0.0037	mg/L			09/06/18 09:44	1
Hexachlorobutadiene	ND		0.050	0.0038	mg/L			09/06/18 09:44	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*103*		*80 - 128*		*09/06/18 09:44*	*1*
4-Bromofluorobenzene (Surr)	*98*		*80 - 120*		*09/06/18 09:44*	*1*
Dibromofluoromethane (Surr)	*111*		*76 - 132*		*09/06/18 09:44*	*1*

Lab Sample ID: LCS 440-497278/2-A
Matrix: Solid
Analysis Batch: 497545

Client Sample ID: Lab Control Sample
Prep Type: TCLP

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	0.250	0.244		mg/L		97	68 - 130
Carbon tetrachloride	0.250	0.247		mg/L		99	60 - 150
Chloroform	0.250	0.249		mg/L		100	70 - 130
1,1-Dichloroethene	0.250	0.234		mg/L		94	70 - 130
1,2-Dichloroethane	0.250	0.222		mg/L		89	57 - 138
2-Butanone (MEK)	0.250	0.227		mg/L		91	44 - 150
Tetrachloroethene	0.250	0.259		mg/L		104	70 - 130
Trichloroethene	0.250	0.268		mg/L		107	70 - 130
Vinyl chloride	0.250	0.202		mg/L		81	59 - 133
Chlorobenzene	0.250	0.253		mg/L		101	70 - 130
1,4-Dichlorobenzene	0.250	0.251		mg/L		100	70 - 130
Hexachlorobutadiene	0.250	0.262		mg/L		105	10 - 150

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Toluene-d8 (Surr)	*102*		*80 - 128*
4-Bromofluorobenzene (Surr)	*97*		*80 - 120*
Dibromofluoromethane (Surr)	*106*		*76 - 132*

Lab Sample ID: 440-219131-A-1-E MS
Matrix: Solid
Analysis Batch: 497545

Client Sample ID: Matrix Spike
Prep Type: TCLP

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	0.068		0.250	0.321		mg/L		101	66 - 130

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 440-219131-A-1-E MS
Matrix: Solid
Analysis Batch: 497545

Client Sample ID: Matrix Spike
Prep Type: TCLP

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Carbon tetrachloride	ND		0.250	0.254		mg/L		101	60 - 150
Chloroform	ND		0.250	0.250		mg/L		100	70 - 130
1,1-Dichloroethene	ND		0.250	0.230		mg/L		92	70 - 130
1,2-Dichloroethane	ND		0.250	0.229		mg/L		91	56 - 146
2-Butanone (MEK)	ND		0.250	0.233		mg/L		93	48 - 140
Tetrachloroethene	ND		0.250	0.253		mg/L		101	70 - 137
Trichloroethene	ND		0.250	0.276		mg/L		110	70 - 130
Vinyl chloride	ND		0.250	0.196		mg/L		78	50 - 137
Chlorobenzene	ND		0.250	0.255		mg/L		102	70 - 130
1,4-Dichlorobenzene	ND		0.250	0.260		mg/L		104	70 - 130
Hexachlorobutadiene	ND		0.250	0.279		mg/L		112	10 - 150

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Toluene-d8 (Surr)	*99*		*80 - 128*
4-Bromofluorobenzene (Surr)	*99*		*80 - 120*
Dibromofluoromethane (Surr)	*107*		*76 - 132*

Lab Sample ID: 440-219131-A-1-E MSD
Matrix: Solid
Analysis Batch: 497545

Client Sample ID: Matrix Spike Duplicate
Prep Type: TCLP

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Benzene	0.068		0.250	0.328		mg/L		104	66 - 130	2	20
Carbon tetrachloride	ND		0.250	0.248		mg/L		99	60 - 150	2	25
Chloroform	ND		0.250	0.251		mg/L		100	70 - 130	0	20
1,1-Dichloroethene	ND		0.250	0.232		mg/L		93	70 - 130	1	20
1,2-Dichloroethane	ND		0.250	0.221		mg/L		88	56 - 146	3	20
2-Butanone (MEK)	ND		0.250	0.225		mg/L		90	48 - 140	3	40
Tetrachloroethene	ND		0.250	0.243		mg/L		97	70 - 137	4	20
Trichloroethene	ND		0.250	0.267		mg/L		107	70 - 130	3	20
Vinyl chloride	ND		0.250	0.197		mg/L		79	50 - 137	0	30
Chlorobenzene	ND		0.250	0.244		mg/L		98	70 - 130	4	20
1,4-Dichlorobenzene	ND		0.250	0.257		mg/L		103	70 - 130	1	20
Hexachlorobutadiene	ND		0.250	0.269		mg/L		108	10 - 150	4	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Toluene-d8 (Surr)	*96*		*80 - 128*
4-Bromofluorobenzene (Surr)	*98*		*80 - 120*
Dibromofluoromethane (Surr)	*108*		*76 - 132*

Method: 8270C - Semivolatile Organic Compounds (GC/MS)

Lab Sample ID: MB 440-497277/1-C
Matrix: Solid
Analysis Batch: 498096

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 497626

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Methylphenol	ND		0.050	0.015	mg/L		09/06/18 12:16	09/10/18 14:32	1
1,4-Dichlorobenzene	ND		0.050	0.013	mg/L		09/06/18 12:16	09/10/18 14:32	1
2,4-Dinitrotoluene	ND		0.050	0.018	mg/L		09/06/18 12:16	09/10/18 14:32	1
Hexachlorobenzene	ND		0.050	0.015	mg/L		09/06/18 12:16	09/10/18 14:32	1
Hexachlorobutadiene	ND		0.050	0.020	mg/L		09/06/18 12:16	09/10/18 14:32	1
Hexachloroethane	ND		0.050	0.018	mg/L		09/06/18 12:16	09/10/18 14:32	1
Nitrobenzene	ND		0.20	0.015	mg/L		09/06/18 12:16	09/10/18 14:32	1
Pentachlorophenol	ND		0.20	0.018	mg/L		09/06/18 12:16	09/10/18 14:32	1
Pyridine	ND		0.050	0.013	mg/L		09/06/18 12:16	09/10/18 14:32	1
2,4,5-Trichlorophenol	ND		0.10	0.015	mg/L		09/06/18 12:16	09/10/18 14:32	1
2,4,6-Trichlorophenol	ND		0.10	0.023	mg/L		09/06/18 12:16	09/10/18 14:32	1
3-Methylphenol + 4-Methylphenol	ND		0.050	0.015	mg/L		09/06/18 12:16	09/10/18 14:32	1
Total Cresols	ND		0.025	0.013	mg/L		09/06/18 12:16	09/10/18 14:32	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl	*87*		*50 - 120*	*09/06/18 12:16*	*09/10/18 14:32*	*1*
2-Fluorophenol (Surr)	*76*		*30 - 120*	*09/06/18 12:16*	*09/10/18 14:32*	*1*
Nitrobenzene-d5 (Surr)	*87*		*45 - 120*	*09/06/18 12:16*	*09/10/18 14:32*	*1*
Terphenyl-d14 (Surr)	*89*		*10 - 150*	*09/06/18 12:16*	*09/10/18 14:32*	*1*
2,4,6-Tribromophenol (Surr)	*87*		*40 - 120*	*09/06/18 12:16*	*09/10/18 14:32*	*1*
Phenol-d6 (Surr)	*80*		*35 - 120*	*09/06/18 12:16*	*09/10/18 14:32*	*1*

Lab Sample ID: LCS 440-497277/2-C
Matrix: Solid
Analysis Batch: 498096

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 497626

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
2-Methylphenol	0.500	0.346		mg/L		69	47 - 106
1,4-Dichlorobenzene	0.500	0.323		mg/L		65	10 - 96
2,4-Dinitrotoluene	0.500	0.419		mg/L		84	44 - 128
Hexachlorobenzene	0.500	0.381		mg/L		76	48 - 120
Hexachlorobutadiene	0.500	0.318		mg/L		64	21 - 95
Hexachloroethane	0.500	0.297		mg/L		59	10 - 97
Nitrobenzene	0.500	0.390		mg/L		78	42 - 112
Pentachlorophenol	1.00	0.767		mg/L		77	50 - 120
Pyridine	1.00	0.536		mg/L		54	27 - 110
2,4,5-Trichlorophenol	0.500	0.393		mg/L		79	44 - 116
2,4,6-Trichlorophenol	0.500	0.399		mg/L		80	48 - 107
3-Methylphenol + 4-Methylphenol	0.500	0.358		mg/L		72	47 - 109

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-Fluorobiphenyl	*79*		*50 - 120*
2-Fluorophenol (Surr)	*65*		*30 - 120*
Nitrobenzene-d5 (Surr)	*78*		*45 - 120*
Terphenyl-d14 (Surr)	*82*		*10 - 150*
2,4,6-Tribromophenol (Surr)	*81*		*40 - 120*
Phenol-d6 (Surr)	*68*		*35 - 120*

Method: 8270C - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 440-219289-1 MS
Matrix: Solid
Analysis Batch: 498096

Client Sample ID: REC Twin Peak Solar Module
Prep Type: TCLP
Prep Batch: 497626

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
2-Methylphenol	ND		0.500	0.303		mg/L		61	50 - 120
1,4-Dichlorobenzene	ND		0.500	0.341		mg/L		68	35 - 120
2,4-Dinitrotoluene	ND		0.500	0.414		mg/L		83	65 - 120
Hexachlorobenzene	ND		0.500	0.394		mg/L		79	60 - 120
Hexachlorobutadiene	ND		0.500	0.328		mg/L		66	40 - 120
Hexachloroethane	ND		0.500	0.309		mg/L		62	35 - 120
Nitrobenzene	ND		0.500	0.393		mg/L		79	55 - 120
Pentachlorophenol	ND		1.00	0.817		mg/L		82	24 - 121
Pyridine	ND		1.00	0.445		mg/L		45	30 - 120
2,4,5-Trichlorophenol	ND		0.500	0.407		mg/L		81	55 - 120
2,4,6-Trichlorophenol	ND		0.500	0.393		mg/L		79	55 - 120
3-Methylphenol + 4-Methylphenol	ND		0.500	0.298		mg/L		60	45 - 120

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
2-Fluorobiphenyl	*81*		*50 - 120*
2-Fluorophenol (Surr)	*66*		*30 - 120*
Nitrobenzene-d5 (Surr)	*79*		*45 - 120*
Terphenyl-d14 (Surr)	*66*		*10 - 150*
2,4,6-Tribromophenol (Surr)	*83*		*40 - 120*
Phenol-d6 (Surr)	*19*	*X*	*35 - 120*

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 440-497277/1-B
Matrix: Solid
Analysis Batch: 498189

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 497508

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.20	0.070	mg/L		09/05/18 21:45	09/06/18 13:45	1
Barium	ND		0.20	0.060	mg/L		09/05/18 21:45	09/06/18 13:45	1
Cadmium	ND		0.10	0.020	mg/L		09/05/18 21:45	09/06/18 13:45	1
Chromium	ND		0.10	0.020	mg/L		09/05/18 21:45	09/06/18 13:45	1
Lead	0.0400	J	0.10	0.040	mg/L		09/05/18 21:45	09/06/18 13:45	1
Selenium	ND		0.10	0.080	mg/L		09/05/18 21:45	09/06/18 13:45	1
Silver	ND		0.20	0.060	mg/L		09/05/18 21:45	09/06/18 13:45	1

Lab Sample ID: LCS 440-497277/2-B
Matrix: Solid
Analysis Batch: 498189

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 497508

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	2.00	1.95		mg/L		98	80 - 120
Barium	2.00	1.99		mg/L		100	80 - 120
Cadmium	2.00	2.00		mg/L		100	80 - 120
Chromium	2.00	2.02		mg/L		101	80 - 120
Lead	2.00	1.98		mg/L		99	80 - 120
Selenium	2.00	1.75		mg/L		87	80 - 120
Silver	1.00	0.997		mg/L		100	80 - 120

Lab Sample ID: 440-219289-1 MS
Matrix: Solid
Analysis Batch: 498189

Client Sample ID: REC Twin Peak Solar Module
Prep Type: TCLP
Prep Batch: 497508

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	ND		2.00	1.93		mg/L		97	75 - 125
Barium	0.61		2.00	2.56		mg/L		98	75 - 125
Cadmium	ND		2.00	1.96		mg/L		98	75 - 125
Chromium	ND		2.00	1.98		mg/L		99	75 - 125
Lead	1.1	B	2.00	3.11		mg/L		100	75 - 125
Selenium	ND		2.00	1.78		mg/L		89	75 - 125
Silver	ND		1.00	0.983		mg/L		98	75 - 125

Lab Sample ID: 440-219289-1 MSD
Matrix: Solid
Analysis Batch: 498189

Client Sample ID: REC Twin Peak Solar Module
Prep Type: TCLP
Prep Batch: 497508

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	ND		2.00	1.96		mg/L		98	75 - 125	1	20
Barium	0.61		2.00	2.66		mg/L		103	75 - 125	4	20
Cadmium	ND		2.00	1.98		mg/L		99	75 - 125	1	20
Chromium	ND		2.00	2.00		mg/L		100	75 - 125	1	20
Lead	1.1	B	2.00	3.00		mg/L		94	75 - 125	4	20
Selenium	ND		2.00	1.79		mg/L		90	75 - 125	1	20
Silver	ND		1.00	0.987		mg/L		99	75 - 125	0	20

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 440-497277/1-D
Matrix: Solid
Analysis Batch: 497854

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 497631

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.0020	0.0010	mg/L		09/06/18 12:26	09/06/18 23:28	1

Lab Sample ID: LCS 440-497277/2-D
Matrix: Solid
Analysis Batch: 497854

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 497631

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.0800	0.0702		mg/L		88	80 - 120

Lab Sample ID: 440-219289-1 MS
Matrix: Solid
Analysis Batch: 497854

Client Sample ID: REC Twin Peak Solar Module
Prep Type: TCLP
Prep Batch: 497631

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	ND		0.0800	0.0694		mg/L		87	70 - 130

Lab Sample ID: 440-219289-1 MSD
Matrix: Solid
Analysis Batch: 497854

Client Sample ID: REC Twin Peak Solar Module
Prep Type: TCLP
Prep Batch: 497631

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		0.0800	0.0707		mg/L		88	70 - 130	2	20

Method: 7470A - Mercury (CVAA) (Continued)

Lab Sample ID: MRL 440-497275/4-C
Matrix: Solid
Analysis Batch: 497854

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 497633

Analyte			Spike Added	MRL Result	MRL Qualifier	Unit	D	%Rec	%Rec. Limits		
Mercury			10.0	9.03		ug/L		90			

GC/MS VOA

Leach Batch: 497278

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	1311	
MB 440-497278/1-A	Method Blank	TCLP	Solid	1311	
LCS 440-497278/2-A	Lab Control Sample	TCLP	Solid	1311	
440-219131-A-1-E MS	Matrix Spike	TCLP	Solid	1311	
440-219131-A-1-E MSD	Matrix Spike Duplicate	TCLP	Solid	1311	

Analysis Batch: 497545

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	8260B	497278
MB 440-497278/1-A	Method Blank	TCLP	Solid	8260B	497278
LCS 440-497278/2-A	Lab Control Sample	TCLP	Solid	8260B	497278
440-219131-A-1-E MS	Matrix Spike	TCLP	Solid	8260B	497278
440-219131-A-1-E MSD	Matrix Spike Duplicate	TCLP	Solid	8260B	497278

GC/MS Semi VOA

Leach Batch: 497277

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	1311	
MB 440-497277/1-C	Method Blank	TCLP	Solid	1311	
LCS 440-497277/2-C	Lab Control Sample	TCLP	Solid	1311	
440-219289-1 MS	REC Twin Peak Solar Module	TCLP	Solid	1311	

Prep Batch: 497626

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	3520C	497277
MB 440-497277/1-C	Method Blank	TCLP	Solid	3520C	497277
LCS 440-497277/2-C	Lab Control Sample	TCLP	Solid	3520C	497277
440-219289-1 MS	REC Twin Peak Solar Module	TCLP	Solid	3520C	497277

Analysis Batch: 498096

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	8270C	497626
MB 440-497277/1-C	Method Blank	TCLP	Solid	8270C	497626
LCS 440-497277/2-C	Lab Control Sample	TCLP	Solid	8270C	497626
440-219289-1 MS	REC Twin Peak Solar Module	TCLP	Solid	8270C	497626

Metals

Leach Batch: 497275

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MRL 440-497275/4-C	Lab Control Sample	TCLP	Solid	1311	

Leach Batch: 497277

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	1311	
MB 440-497277/1-B	Method Blank	TCLP	Solid	1311	
MB 440-497277/1-D	Method Blank	TCLP	Solid	1311	
LCS 440-497277/2-B	Lab Control Sample	TCLP	Solid	1311	
LCS 440-497277/2-D	Lab Control Sample	TCLP	Solid	1311	

Metals (Continued)

Leach Batch: 497277 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1 MS	REC Twin Peak Solar Module	TCLP	Solid	1311	
440-219289-1 MSD	REC Twin Peak Solar Module	TCLP	Solid	1311	

Prep Batch: 497508

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	3010A	497277
MB 440-497277/1-B	Method Blank	TCLP	Solid	3010A	497277
LCS 440-497277/2-B	Lab Control Sample	TCLP	Solid	3010A	497277
440-219289-1 MS	REC Twin Peak Solar Module	TCLP	Solid	3010A	497277
440-219289-1 MSD	REC Twin Peak Solar Module	TCLP	Solid	3010A	497277

Prep Batch: 497631

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	7470A	497277
MB 440-497277/1-D	Method Blank	TCLP	Solid	7470A	497277
LCS 440-497277/2-D	Lab Control Sample	TCLP	Solid	7470A	497277
440-219289-1 MS	REC Twin Peak Solar Module	TCLP	Solid	7470A	497277
440-219289-1 MSD	REC Twin Peak Solar Module	TCLP	Solid	7470A	497277

Prep Batch: 497633

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MRL 440-497275/4-C	Lab Control Sample	TCLP	Solid	7470A	497275

Analysis Batch: 497854

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	7470A	497631
MB 440-497277/1-D	Method Blank	TCLP	Solid	7470A	497631
LCS 440-497277/2-D	Lab Control Sample	TCLP	Solid	7470A	497631
MRL 440-497275/4-C	Lab Control Sample	TCLP	Solid	7470A	497633
440-219289-1 MS	REC Twin Peak Solar Module	TCLP	Solid	7470A	497631
440-219289-1 MSD	REC Twin Peak Solar Module	TCLP	Solid	7470A	497631

Analysis Batch: 498189

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-219289-1	REC Twin Peak Solar Module	TCLP	Solid	6010B	497508
MB 440-497277/1-B	Method Blank	TCLP	Solid	6010B	497508
LCS 440-497277/2-B	Lab Control Sample	TCLP	Solid	6010B	497508
440-219289-1 MS	REC Twin Peak Solar Module	TCLP	Solid	6010B	497508
440-219289-1 MSD	REC Twin Peak Solar Module	TCLP	Solid	6010B	497508

Definitions/Glossary

Client: REC Americas LLC
Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
X	Surrogate is outside control limits

Metals

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Accreditation/Certification Summary

Client: REC Americas LLC
Project/Site: REC Americas - Solar PV Panel- TCLP

TestAmerica Job ID: 440-219289-1

Laboratory: TestAmerica Irvine

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
California	State Program	9	CA ELAP 2706	06-30-19

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
8270C	3520C	Solid	3-Methylphenol + 4-Methylphenol
8270C	3520C	Solid	Total Cresols

Oregon	NELAP	10	4028	01-29-19

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
7470A	7470A	Solid	Mercury
8270C	3520C	Solid	Total Cresols

Irvine
17461 Derian Ave
Suite 100
Irvine, CA 92614
phone 949.261.1022 fax 949.260.3299

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Client Contact	**Project Manager: George McClellan**	**Site Contact:**	**Date:**	COC No:
Your Company Name REC Americas LLC	**Tel/Fax: 805 704 3226**	**Lab Contact:**	**Carrier:**	1 of 1 COCs
Address 1820 Gateway Dr, Ste 170	**Analysis Turnaround Time**			Job No.
City/State/Zip San Mateo, CA 94404	Calendar (C) or Work Days (W) 3			
805 704 3226	TAT if different from Below 3			
(xxx) xxx-xxxx FAX	☐ 2 weeks			SDG No.
Project Name: REC Americas - Solar PV Panel- TCLP	☐ 1 week			
Site: USA	☐ 2 days			
P O # 44020962 - 0	☐ 1 day			Sampler.

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Filtered Sample	8260 TCLP	6010 TCLP	7470 TCLP	8270	Sample Specific Notes:
REC Twin Peak Solar Module	3-Sep-18	9:00	coupon		1		X	X	X	X	

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other 1

Possible Hazard Identification
☒ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* *Poison B* ☐ *Unknown* ☐

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☒ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Special Instructions/QC Requirements & Comments:

2.0/2.1 1255

Relinquished by: George McClellan	Company. REC Americas	Date/Time: 4Sep18 09:10	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time.
Relinquished by:	Company:	Date/Time:	Received by:	Company: TAIN	Date/Time: 9/4/18 0910

Login Sample Receipt Checklist

Client: REC Americas LLC

Job Number: 440-219289-1

Login Number: 219289
List Number: 1
Creator: Skinner, Alma D

List Source: TestAmerica Irvine

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	Not present
Sample custody seals, if present, are intact.	N/A	Not Present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

SOLAR'S MOST TRUSTED

REC TWINPEAK 2S 72 SERIES

PREMIUM SOLAR PANELS WITH SUPERIOR PERFORMANCE

REC TwinPeak 2S 72 Series solar panels feature an innovative design with the higher panel efficiency of polycrystalline cells, enabling customers to get the most out of the space used for the installation.

Combined with industry-leading product quality and the reliability of a strong and established European brand, REC TwinPeak 2S 72 panels are ideal for commercial rooftops worldwide.

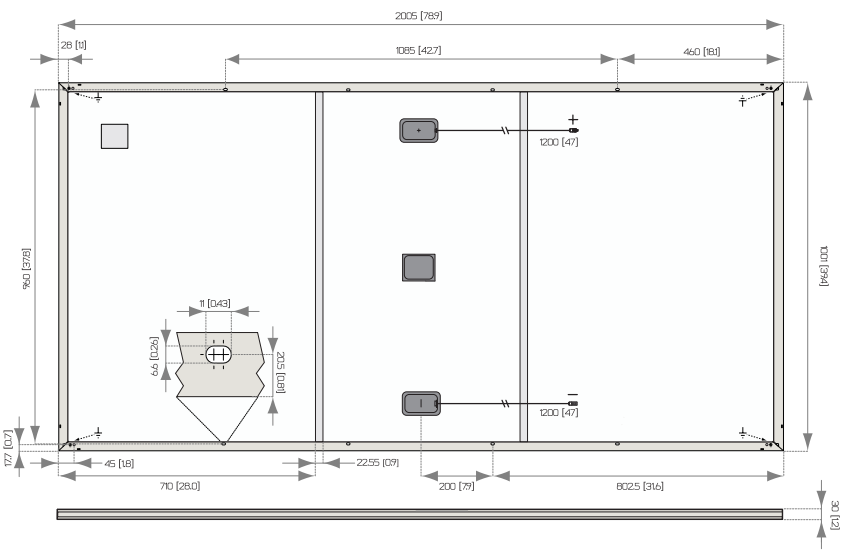
REDUCES BALANCE OF SYSTEM COSTS

IMPROVED PERFORMANCE IN SHADED CONDITIONS

INDUSTRY-LEADING LIGHTWEIGHT 72-CELL PANEL

100% PID FREE

REC TWINPEAK 2S 72 SERIES



Measurements in mm [in]

17.7% EFFICIENCY

10 YEAR PRODUCT WARRANTY

25 YEAR LINEAR POWER OUTPUT WARRANTY

GENERAL DATA

Cell type:	144 half-cut multicrystalline PERC cells 6 strings of 24 cells in series
Glass:	3.2 mm solar glass with anti-reflection surface treatment
Backsheet:	Highly resistant polymeric construction
Frame:	Anodized aluminum
Support bars:	Anodized aluminum
Junction box:	3-part, 3 bypass diodes, IP67 rated in accordance with IEC 62790
Cable:	4 mm² solar cable, 1.2 m + 1.2 m in accordance with EN 50618
Connectors:	Tonglin TL-Cable01S-F (4 mm²) (1500V) Tonglin TL-Cable01S-FR (4 mm²) (1000V) in accordance with IEC 62852, IP68 only when connected
Origin:	Made in Singapore

ELECTRICAL DATA @ STC

Product code*: RECxxxTP2S 72						
Nominal Power - P_{MPP} (Wp)	330	335	340	345	350	355
Watt Class Sorting - (W)	-0/+5	-0/+5	-0/+5	-0/+5	-0/+5	-0/+5
Nominal Power Voltage - V_{MPP} (V)	38.1	38.3	38.5	38.7	38.9	39.1
Nominal Power Current - I_{MPP} (A)	8.67	8.75	8.84	8.92	9.00	9.09
Open Circuit Voltage - V_{OC} (V)	46.0	46.2	46.3	46.5	46.7	46.8
Short Circuit Current - I_{SC} (A)	9.44	9.52	9.58	9.64	9.72	9.78
Panel Efficiency (%)	16.5	16.7	16.9	17.2	17.4	17.7

Values at standard test conditions (STC: air mass AM 1.5, irradiance 1000 W/m², temperature 25°C), based on a production spread with a tolerance of V_{OC} & I_{SC} ±3% within one watt class. At low irradiance of 200 W/m² at least 95% of the STC module efficiency will be achieved.
*Where xxx indicates the nominal power class (P_{MPP}) at STC indicated above, and can be followed by the suffix XV for 1500 V rated modules.

ELECTRICAL DATA @ NMOT

Product code*: RECxxxTP2S 72						
Nominal Power - P_{MPP} (Wp)	244	252	257	260	264	268
Nominal Power Voltage - V_{MPP} (V)	34.9	35.5	35.7	35.8	36.0	36.2
Nominal Power Current - I_{MPP} (A)	6.99	7.10	7.19	7.25	7.32	7.39
Open Circuit Voltage - V_{OC} (V)	42.3	42.8	42.9	43.1	43.2	43.3
Short Circuit Current - I_{SC} (A)	7.44	7.74	7.79	7.84	7.90	7.95

Nominal module operating temperature (NMOT: air mass AM 1.5, irradiance 800 W/m², temperature 20°C, windspeed 1 m/s).
*Where xxx indicates the nominal power class (P_{MPP}) at STC indicated above, and can be followed by the suffix XV for 1500 V rated modules.

MAXIMUM RATINGS

Operational temperature:	-40 ... +85°C
Maximum system voltage:	1000 V / 1500 V
Design load (+): snow Maximum test load (+):	367 kg/m² (3600 Pa)* 550 kg/m² (5400 Pa)
Design load (-): wind Maximum test load (-):	163 kg/m² (1600 Pa)* 244 kg/m² (2400 Pa)
Max series fuse rating:	25 A
Max reverse current:	25 A

*Safety factor 1.5

TEMPERATURE RATINGS*

Nominal Module Operating Temperature:	44.6°C (±2°C)
Temperature coefficient of P_{MPP}:	-0.36 %/°C
Temperature coefficient of V_{OC}:	-0.30 %/°C
Temperature coefficient of I_{SC}:	0.066 %/°C

*The temperature coefficients stated are linear values

CERTIFICATIONS

IEC 61215, IEC 61730 & UL 1703; MCS 005, IEC 62804 (PID)
IEC 62716 (Ammonia Resistance), IEC 60068-2-68 (Blowing Sand)
IEC 61701 (Salt Mist level 6), UNI 8457/9174 (Class A), ISO 11925-2
(Class E) ISO 9001: 2015, ISO 14001: 2004, OHSAS 18001: 2007

take-e-way take-e-way WEEE-compliant recycling scheme

WARRANTY

10 year product warranty
25 year linear power output warranty
(max. degression in performance of 0.7% p.a.)

See warranty conditions for further details.

MECHANICAL DATA

Dimensions:	2005 x 1001 x 30 mm
Area:	2.01 m²
Weight:	22 kg

Specifications subject to change without notice.

Ref: NE-05-07-13 Rev - C 07.17

Founded in Norway in 1996, REC is a leading vertically integrated solar energy company. Through integrated manufacturing from silicon to wafers, cells, high-quality panels and extending to solar solutions, REC provides the world with a reliable source of clean energy. REC's renowned product quality is supported by the lowest warranty claims rate in the industry. REC is a Bluestar Elkem company with headquarters in Norway and operational headquarters in Singapore. REC employs more than 2,000 people worldwide, producing 1.4 GW of solar panels annually.

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