STATE OF CALIFORNIA

GRANTS/CONTINGENT AWARD REQUEST

CEC-270 (Revised 02/10) CALIFORNIA ENERGY COMMISSION

To: Grants and Loans Office Date: 4/2/2012

Project Manager: Joe O`Hagan Phone Number: 916-327-1368

Office: Energy Generation Research Office Division: Energy Research and Development MS- 43

Project Title: Test of Avian Collision Risk of a Closed Bladed Wind Turbine

Type of Request: *(check one)*

☒ **New Agreement:** *(include items A-F from below)* Agreement Number: PIR-11-022

Program: PIER E / Environmental Area

Solicitation Name and/or Number: PON-11-502-05 (Solicitation to Address Environmental Issues Related to Clean Energy Systems)

Legal Name of Recipient: Shawn Smallwood

Recipient's Full Mailing Address: 3108 FINCH ST
DAVIS, CA 95616-0176

Recipient's Project Officer: Shawn Smallwood Phone Number: 530-756-4598

Agreement Start Date: 6/25/2012 Agreement End Date: 3/31/2015

☐ **Amendment :** *(Check all that apply)* Agreement Number:

- ☐ Term Extension – New End Date:
- ☐ Work Statement Revision *(include Item A from below)*
- ☐ Budget Revision *(include Item B from below)*
- ☐ Change of Scope *(include Items A – F as applicable from below)*
- ☐ Other:

ITEMS TO ATTACH WITH REQUEST:

A. Work Statement
B. Budget
C. Recipient Resolution, if applicable. (Resolution may be requested in Special Conditions if not currently available.)
D. Special Conditions, if applicable.
E. CEQA Compliance Form
F. Other Documents as applicable
- Copy of Score Sheets
- Copy of Pre-Award Correspondence
- Copy of All Other Relevant Documents

California Environmental Quality Act (CEQA)

☐ CEC finds, based on recipient's documentation in compliance with CEQA:
- ☐ Project exempt: NOE filed:
- ☐ Environmental Document prepared: NOD filed:
- ☐ Other:

☒ CEC has made CEQA finding described in CEC-280, attached

Funding Information:

*Source #1:	PIER-E	Amount:	$ 716,596.00	Statute:	11-	FY:	11-12	Budget List #:	501.027J
*Source #2:		Amount:	$	Statute:		FY:		Budget List #:	
*Source #3:		Amount:	$	Statute:		FY:		Budget List #:	

If federally funded, specify federal agreement number:

*** Source Examples include ERPA, PIER-E, PIER-NG, FED, GRDA, ARFVT, OTHER.**

Business Meeting Approval: *(refer to Business Meeting Schedule)*

Proposed Business Meeting Date: 5/9/2012 ☐ Consent ☒ Discussion

Business Meeting Participant: Joe O`Hagan Time Needed: 5 minutes

Agenda Notice Statement: *(state purpose in layperson terms)*

Possible approval of a ☒ Grant / ☐ Contingent Award to…

Possible approval of Agreement PIR-11-022 for a grant of $716,596.00 to Shawn Smallwood to evaluate the potential of an innovative turbine design to reduce avian collisions. (PIER electricity funding) Contact: Joe O'Hagan. (5 minutes)

Project Manager	Date	Office Manager	Date	Deputy Director	Date

Exhibit A
WORK STATEMENT

TECHNICAL TASK LIST

Task #	Task Name
1	Administration
2	Fatality Searches and Diurnal Behavior Surveys
3	Nocturnal Behavior Surveys
4	Analysis and Report Preparation

KEY NAME LIST

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
1	Shawn Smallwood		John Howe (FloDesign), Jim Hopper - demo site
2	Shawn Smallwood Lee Neher	Joanne Mount, Elizabeth Leyvas, Skye Standish, Douglas Bell	John Howe (FloDesign), Jim Hopper - demo site
3	Shawn Smallwood Lee Neher		John Howe (FloDesign) Jim Hopper - demo site
4	Shawn Smallwood Lee Neher		

GLOSSARY

Specific terms and acronyms used throughout this Work Statement are defined as follows:

Term/ Acronym	Definition
APWRA	Altamont Pass Wind Resource Area
ArcMap GIS 10.1	A recent version of GIS software developed by Environmental Sciences Research Institute, Inc.
BACI	Before-after, control-impact experimental design
CEQA	California Environmental Quality Act
Capacity factor	(MWh ÷ 8,760 h ÷ MW)×100%, where MWh = Megawatt-hours generated in a year, 8,760 h = hours in a year, and MW = total installed capacity available for energy generation during the year
CPR	Critical Project Review
CDFG	California Department of Fish and Game
DEM	Digital Elevation Model of the study landscape for use in GIS. Consists of a grid, the cells of which are attributed with spatial coordinates as well as elevation above mean sea level.
Energy Commission	California Energy Commission
KW	Kilowatts of rated capacity
m	meters
MW	Megawatts of rated capacity
MEWT	FloDesign's shrouded, mixer-ejector wind turbine

Exhibit A
WORK STATEMENT

PIER	Public Interest Energy Research
Repowering	Replacement of older wind turbines with modern wind turbines
SRC	Scientific Review Committee of Alameda County, http://www.altamontsrc.org/
Utilization	Measured use of a site by birds, First detections/hr, or preferably First detections/hr/km^3 of surveyed, visible airspace
WRA	Wind Resource Area

Problem Statement:
Avian fatalities pose a principal environmental barrier to the timely permitting of wind energy projects and fulfillment of the 33% Renewable Portfolio Standard under Assembly Bill (AB) 32. Citizens are increasingly using the California Environmental Quality Act (CEQA) to intervene in decisions to permit new wind projects in California. In addition, the US Fish and Wildlife Service has warned that it will not issue its new incidental take permit for golden eagles unless wind companies take measures to conserve eagles. Mitigation measures have failed to reduce raptor fatalities in the Altamont Pass Wind Resource Area (WRA) by 50% (ICF 2010, Smallwood 2010), so repowering is expected and is already underway over large portions of the Altamont Pass Wind Resource Area (APWRA). However, not all wind companies can repower with large, modern wind turbines, and the terrain of much of the APWRA as well as other WRAs is unsuitable for large wind turbines. Complicating matters are project impacts that repeatedly exceed impact predictions throughout California and North America, thus exposing shortfalls in pre-construction survey methods and in collision risk modeling.

A new wind turbine design is needed to: avoid avian collisions, address the issue of terrains that are unsuitable for large wind turbines, minimize grading for access roads and tower pads, and achieve higher capacity factors. FloDesign's shrouded, mixer-ejector wind turbine (MEWT) has yet to be tested for avian impacts. It should be tested against open-bladed turbines to compare differences in fatality rates and in avian reactions to the turbine. Methods are needed to: compare avian reactions to the turbines; estimate the avoidance rates required for collision risk models and informing map-based collision hazard maps; and replace conventional utilization surveys, which have not provided accurate predictions of fatality rates. Fatality rate estimates should require multiple years to account for inter-annual variation in abundance, and are rarely used to guide wind turbine siting.

Behavior surveys performed at ecologically meaningful times of the day require less time to arrive at more accurate models for predicting impacts and for guiding wind turbine siting. However, 2007 guidelines from the California Energy Commission and the California Department of Fish and Game recommend utilization surveys rather than behavior surveys. Behaviors have not been recorded at most wind projects, nor have they been recorded at night when many raptors are killed by wind turbines. Both repowering and new project development are in immediate need of another wind turbine

design option, as well as more timely and effective methods to predict and minimize project impacts.

Goals of the Agreement:
The goals of this Agreement are to:
(1) Test the avian safety of FloDesign's MEWT;
(2) Understand how birds react to this turbine compared to open-bladed wind turbines; and
(3) Provide data and methods for informing map-based collision hazard models to guide siting, and for providing avoidance rates to collision risk models for predicting project impacts.

Objectives of the Agreement:
The objectives of this Agreement are the following:
(1) Compare avian interactions with wind turbines between MEWTs and conventional turbines at known high-fatality sites during the day, night, and various wind and terrain conditions;
(2) Compare avian fatality rates between MEWTs and conventional turbines at known high-fatality sites, using a short search interval and a before-after, control-impact experimental design (BACI) design;
(3) Explain variation in fatality rates by turbine design, flight patterns, and avian interactions with wind turbines (i.e., avoidance behaviors); and
(4) Provide field-tested behavior survey methods and data that inform avoidance rates in collision risk models and map-based collision hazard models to guide wind turbine siting.

TASK 1 ADMINISTRATION

Task 1.1 Attend Kick-off Meeting

The goal of this task is to establish the lines of communication and procedures for implementing this Agreement.

The Recipient shall:

- Attend a "Kick-Off" meeting with the Commission Agreement Manager, the Grants Officer, and a representative of the Accounting Office. The Recipient shall bring its Project Manager, Agreement Administrator, Accounting Officer, and others designated by the Commission Agreement Manager to this meeting. The administrative and technical aspects of this Agreement will be discussed at the meeting. Prior to the kick-off meeting, the Commission Agreement Manager will provide an agenda to all potential meeting participants.

The administrative portion of the meeting shall include, but not be limited to, the following:

- Discussion of the terms and conditions of the Agreement
- Discussion of Critical Project Review (Task 1.2)
- Match fund documentation (Task 1.6) No work may be done until this documentation is in place.
- Permit documentation (Task 1.7)
- Discussion of subcontracts needed to carry out project (Task 1.8)

The technical portion of the meeting shall include, but not be limited to, the following:

- The Commission Agreement Manager's expectations for accomplishing tasks described in the Work Statement
- An updated Schedule of Products
- Discussion of Progress Reports (Task 1.4)
- Discussion of Technical Products (Product Guidelines located in Section 5 of the Terms and Conditions)
- Discussion of the Final Report (Task 1.5)

The Commission Agreement Manager shall designate the date and location of this meeting.

Recipient Products:

- Updated Schedule of Products
- Updated List of Match Funds
- Updated List of Permits

Commission Agreement Manager Product:

- Kick-Off Meeting Agenda

Task 1.2 Critical Project Review (CPR) Meetings

The goal of this task is to determine if the project should continue to receive Energy Commission funding to complete this Agreement and to identify any needed modifications to the tasks, products, schedule or budget.

CPRs provide the opportunity for frank discussions between the Energy Commission and the Recipient. The Commission Agreement Manager may schedule CPRs as necessary, and CPR costs will be borne by the Recipient.

Participants include the Commission Agreement Manager and the Recipient and may include the Commission Grants Officer, other Energy Commission staff and Management as well as other individuals selected by the Commission Agreement Manager to provide support to the Energy Commission.

Exhibit A
WORK STATEMENT

The Commission Agreement Manager shall:

- Determine the location, date, and time of each CPR meeting with the Recipient. These meetings generally take place at the Energy Commission, but they may take place at another location.
- Send the Recipient the agenda and a list of expected participants in advance of each CPR. If applicable, the agenda shall include a discussion on both match funding and permits.
- Conduct and make a record of each CPR meeting. One of the outcomes of this meeting will be a schedule for providing the written determination described below.
- Determine whether to continue the project, and if continuing, whether or not modifications are needed to the tasks, schedule, products, and/or budget for the remainder of the Agreement. Modifications to the Agreement may require a formal amendment (please see section 8 of the Terms and Conditions).
- Provide the Recipient with a written determination in accordance with the schedule. The written response may include a requirement for the Recipient to revise one or more product(s) that were included in the CPR.

The Recipient shall:

- Prepare a CPR Report for each CPR that discusses the progress of the Agreement toward achieving its goals and objectives. This report shall include recommendations and conclusions regarding continued work of the projects. This report shall be submitted along with any other products identified in this Work Statement. The Recipient shall submit these documents to the Commission Agreement Manager and any other designated reviewers at least 15 working days in advance of each CPR meeting.
- Present the required information at each CPR meeting and participate in a discussion about the Agreement.

Commission Agreement Manager Products:

- Agenda and a list of expected participants
- Schedule for written determination
- Written determination

Recipient Product:

- CPR Report(s)

Task 1.3 Final Meeting

The goal of this task is to closeout this Agreement.

The Recipient shall:

- Meet with Energy Commission staff to present the findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement.

  This meeting will be attended by, at a minimum, the Recipient, the Commission Grants Office Officer, and the Commission Agreement Manager. The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be two separate meetings at the discretion of the Commission Agreement Manager.

  The technical portion of the meeting shall present an assessment of the degree to which project and task goals and objectives were achieved, findings, conclusions, recommended next steps (if any) for the Agreement, and recommendations for improvements. The Commission Agreement Manager will determine the appropriate meeting participants.

  The administrative portion of the meeting shall be a discussion with the Commission Agreement Manager and the Grants Officer about the following Agreement closeout items:
  - What to do with any equipment purchased with Energy Commission funds (Options)
  - Energy Commission's request for specific "generated" data (not already provided in Agreement products)
  - Need to document Recipient's disclosure of "subject inventions" developed under the Agreement
  - "Surviving" Agreement provisions
  - Final invoicing and release of retention
- Prepare a schedule for completing the closeout activities for this Agreement.

Products:

- Written documentation of meeting agreements
- Schedule for completing closeout activities

Task 1.4 Monthyl Progress Reports

The goal of this task is to periodically verify that satisfactory and continued progress is made towards achieving the research objectives of this Agreement on time and within budget.

The objectives of this task are to summarize activities performed during the reporting period, to identify activities planned for the next reporting period, to identify issues that may affect performance and expenditures, and to form the basis for determining whether invoices are consistent with work performed.

The Recipient shall:

- Prepare a Monthly Progress Report to summarize all Agreement activities conducted by the Recipient for the reporting period, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. Each progress report is due to the Commission Agreement Manager within 10 days of the end of the reporting period. The recommended specifications for each progress report are contained in Section 6 of the Terms and Conditions of this Agreement.

Product:

- Monthly Progress Reports

Task 1.5 Final Report

The goal of the Final Report is to assess the project's success in achieving its goals and objectives, advancing science and technology, and providing energy-related and other benefits to California.

The objectives of the Final Report are to clearly and completely describe the project's purpose, approach, activities performed, results, and advancements in science and technology; to present a public assessment of the success of the project as measured by the degree to which goals and objectives were achieved; to make insightful observations based on results obtained; to draw conclusions; and to make recommendations for further projects and improvements to the Energy Commission's project management processes.

The Final Report shall be a public document. If the Recipient has obtained confidential status from the Energy Commission and will be preparing a confidential version of the Final Report as well, the Recipient shall perform the following activities for both the public and confidential versions of the Final Report.

The Recipient shall:

- Prepare an Outline of the Final Report.
- Prepare a Final Report following the approved outline and the latest version of the Final Report guidelines which will be provided by the Commission Agreement Manager. The Commission Agreement Manager shall provide written comments on the Draft Final Report within fifteen (15) working days of receipt. The Final Report must be completed at least 60 days before the end of the Agreement Term.
- Submit one bound copy of the Final Report with the final invoice.

Products:

- Draft Outline of the Final Report
- Final Outline of the Final Report

- Draft Final Report
- Final Report

Task 1.6 Identify and Obtain Matching Funds
The goal of this task is to ensure that the match funds planned for this Agreement are obtained for and applied to this Agreement during the term of this Agreement.

The costs to obtain and document match fund commitments are not reimbursable through this Agreement. Although the Energy Commission budget for this task will be zero dollars, the Recipient may utilize match funds for this task. Match funds shall be spent concurrently or in advance of Energy Commission funds for each task during the term of this Agreement. Match funds must be identified in writing and the associated commitments obtained before the Recipient can incur any costs for which the Recipient shall:

- Prepare a letter documenting the match funding committed to this Agreement and submit it to the Commission Agreement Manager at least 2 working days prior to the kick-off meeting. If no match funds were part of the proposal that led to the Energy Commission awarding this Agreement and none have been identified at the time this Agreement starts, then state such in the letter. If match funds were a part of the proposal that led to the Energy Commission awarding this Agreement, then provide in the letter a list of the match funds that identifies the:
    - Amount of each cash match fund, its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied.
    - Amount of each in-kind contribution, a description, documented market or book value, and its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient shall identify its owner and provide a contact name, address and telephone number, and the address where the property is located.
- Provide a copy of the letter of commitment from an authorized representative of each source of cash match funding or in-kind contributions that these funds or contributions have been secured. For match funds provided by a grant a copy of the executed grant shall be submitted in place of a letter of commitment.
- Discuss match funds and the implications to the Agreement if they are reduced or not obtained as committed, at the kick-off meeting. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide the appropriate information to the Commission Agreement Manager if during the course of the Agreement additional match funds are received.

- Notify the Commission Agreement Manager within 10 days if during the course of the Agreement existing match funds are reduced. Reduction in match funds must be approved through a formal amendment to the Agreement and may trigger an additional CPR.

Products:

- A letter regarding match funds or stating that no match funds are provided
- Copy(ies) of each match fund commitment letter(s) (if applicable)
- Letter(s) for new match funds (if applicable)
- Letter that match funds were reduced (if applicable)

Task 1.7 Identify and Obtain Required Permits

- The goal of this task is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track.

- Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement. Although the Energy Commission budget for this task will be zero dollars, the Recipient shall budget match funds for any expected expenditures associated with obtaining permits. Permits must be identified in writing and obtained before the Recipient can make any expenditure for which a permit is required.

The Recipient shall:

- Prepare a letter documenting the permits required to conduct this Agreement and submit it to the Commission Agreement Manager at least 2 working days prior to the kick-off meeting. If there are no permits required at the start of this Agreement, then state such in the letter. If it is known at the beginning of the Agreement that permits will be required during the course of the Agreement, provide in letter a list of the permits that identifies the:
  - Type of permit
  - Name, address and telephone number of the permitting jurisdictions or lead agencies
  - The schedule the Recipient will follow in applying for and obtaining these permits.
- Discuss the list of permits and the schedule for obtaining them at the kick-off meeting and develop a timetable for submitting the updated list, schedule and the copies of the permits. The implications to the Agreement if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in the Progress Reports and will be a topic at CPR meetings.
- If during the course of the Agreement additional permits become necessary, provide the appropriate information on each permit and an updated schedule to the Commission Agreement Manager.

- As permits are obtained, send a copy of each approved permit to the Commission Agreement Manager.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the Commission Agreement Manager within 5 working days. Either of these events may trigger an additional CPR.

Products:

- Letter documenting the permits or stating that no permits are required
- A copy of each approved permit (if applicable)
- Updated list of permits as they change during the term of the Agreement (if applicable)
- Updated schedule for acquiring permits as changes occur during the term of the Agreement (if applicable)

Task 1.8 Obtain and Execute Subcontracts

The goal of this task is for Recipients to identify any subcontracts required to carry out the tasks under this Agreement and to procure them consistent with the terms and conditions of this Agreement and the Recipient's own procurement policies and procedures. It will also provide the Energy Commission an opportunity to review the subcontracts to ensure that the tasks are consistent with this Agreement, that the budgeted expenditures are reasonable and consistent with applicable cost principles.

The Recipient shall:

- Prepare a letter documenting the subcontracts required to conduct this Agreement, and submit it to the Commission Agreement Manager at least 2 working days prior to the kick-off meeting. If there are no subcontracts required at the start of this Agreement, then state such in the letter. If it is known at the beginning of the Agreement that subcontracts will be required during the course of the Agreement, provide in the letter:
  - A list of the subcontracts that describes the anticipated maximum budget and general Work Statement for each,
  - A description of the procurement process to be used, and
  - The schedule the Recipient will follow in applying for and obtaining these subcontracts.
- Submit a draft of the subcontract that will include a budget with the information required in the budget details to the Commission Agreement Manager for review and approval, and incorporate any changes recommended by the Commission Agreement Manager.
- Submit a final copy of the executed subcontract.

Products:

- Letter describing the subcontracts needed, or stating that no subcontracts are required

- Draft subcontracts
- Final subcontracts

TECHNICAL TASKS

TASK 2 FATALITY SEARCHES AND DIURNAL BEHAVIOR SURVEYS

The first goal of this task is to provide suitable data for testing whether and to what degree the FloDesign MEWT is safer for birds in the APWRA. This will result in convincing test results by randomly allocating experimental treatments to existing wind turbine sites documented to have caused the highest fatality rates, and by using a BACI design. The second goal of this task is to thoroughly understand how birds will interact with MEWTs (including avoidance reactions) in order to inform map-based collision hazard models and collision risk models with resolute data on flight patterns and avoidance rates, thereby fostering careful wind turbine siting and accurate impact predictions for projects involving MEWTs and conventional open-bladed turbines.

The Recipient shall:

- Randomly allocate known, high-fatality sites into MEWT replacement and control treatment groups, ensuring that both treatments are replicated and interspersed, and that sufficient gaps between treatment groups are built into the design to minimize fatality contamination, which is caused by bird carcasses killed by one turbine and mistakenly attributed to another, neighboring turbine.
- Begin surveys at existing wind turbines one year prior to the replacement of about half of them by MEWTs. Continue surveys for another year at all wind turbines in both treatment groups, using a short search interval of two searches per week to minimize error in searcher detection and scavenger removal adjustments, and to detect many more fatalities than found during typical monthly searches (Smallwood 2009).
- Deploy seasonal detection trials designed to efficiently and more realistically quantify carcass detection rates, where detection rates account for the errors caused by searchers missing available carcasses and scavengers removing carcasses.
- Compare adjusted fatality rates between existing turbines in the control group and MEWTs in the replacement group.
- Perform 30-minute behavior surveys during mornings and evenings at observation stations that provide optimal views of wind turbines and landscape settings where birds tend to perform hazardous flights. Record the positions, behaviors, and flight heights of individual golden eagles, burrowing owls, red-tailed hawks, American kestrels, and other birds.
- Collect fatality and diurnal behavior data that represents metrics such as: Number of birds/session; Bird-minutes/session; Number of flights through the rotor zone during operating and non-operating periods; Flights within

20 m of rotors during operating and non-operating periods; Bird-minutes perched on wind turbine (including the location of the bird on the turbine); Proportion of approach vectors toward turbine, e.g., parallel to rotor axis and perpendicular to rotor axis, and from windward or leeward to rotor; Evasive behaviors exhibited by birds flying close to wind turbines; and Reactions of birds flying through the rotor's wake and in front of the rotors to detect any effects of turbulence at the leeward aspect and increased wind speed at the windward aspect.

- Prepare a Draft Fatality Rate Comparison Report that summarizes fatality comparisons and behavioral patterns and explains how the collected data and methods can be expanded for use elsewhere.
- Solicit review of the draft report from the Alameda County Scientific Review Committee (SRC). Modify the draft report based upon SRC comments.
- Submit the SRC's comments to the Commission Agreement Manager.
- Submit a Final Fatality Rate Comparison Report to the Commission Agreement Manager.

Products:

- Fatality and diurnal behavior data sets
- Draft Fatality Rate Comparison Report
- SRC comments on the draft report
- Final Fatality Rate Comparison Report

TASK 3 NOCTURNAL BEHAVIOR SURVEYS

The goal of this task is to understand how nocturnally active birds will interact with MEWTs, including avoidance reactions.

The Recipient shall:

- Collect nocturnal behavior data by using a thermal camera 13 nights per year at an estimated 27 stations to observe nocturnal bird reactions to open-bladed turbines and to MEWTs in the two treatment groups, with one hour per night spanning sunset and last twilight and one hour during total darkness.
- Prepare a Draft Nocturnal Behavioral Survey Report that identifies the nocturnal behavioral survey methodology and survey results.
- Submit the draft report to the SRC for review and comment. Modify the draft report based upon SRC comments.
- Submit the SRC's comments to the Commission Agreement Manager.

- Submit a Final Nocturnal Behavioral Survey Report to the Commission Agreement Manager.

Products:

- Nocturnal Behavior data sets
- Draft Nocturnal Behavioral Survey Report
- SRC comments on the draft report
- Final Nocturnal Behavioral Survey Report

TASK 4 ANALYSIS AND REPORTING PREPARATION

The first goal of this task is to analyze the data collected so that the effects of FloDesign's MEWT on avian collisions and behavioral reactions can be reported convincingly. The second goal of this task is to recommend effective behavior metrics to users of collision risk models and map-based collision hazard models, so that permits can be obtained more quickly and impact predictions can be improved.

The Recipient shall:

- Require daily transcription of fatality and behavior data to electronic spreadsheets to ensure that data are recorded properly and in a timely manner.
- Require monthly digitization of all mapped data to minimize errors and to ensure the timeliness of data processing.
- Require monthly quality control checks of all data by an analyst to ensure that data are being properly recorded and are ready for analysis.
- Utilize appropriate statistical tests to capitalize on the power of a BACI design in testing for differences in fatality rates and behavioral reactions of birds to the MEWTs as compared to open-bladed turbines.
- Prepare a report summarizing the results of tests of fatality rates and behavioral reactions to FloDesign's MEWT compared to open-bladed turbines and submit to the Commission Agreement Manger
- Make recommendations on methods and metrics for measuring behaviors that can be used to predict avian fatalities at projects throughout California and incorporate them into the Draft Final Report. The report must include recommendations on methods and metrics for measuring behaviors that can predict avian fatalities at projects throughout California.
- Submit the Draft Final Report and test results to the Alameda County SRC for review and comment.
- Revise the Draft Final Report based upon SRC comments.
- Submit the SRC's comments to the Commission Agreement Manager.
- Submit a paper summarizing project results to peer-reviewed scientific journals for publication.

Exhibit A
WORK STATEMENT

Products:

- Report summarizing the results of tests of fatality rates and behavioral reactions to FloDesign's MEWT compared to open-bladed turbines
- SRC comments on the draft Final Report
- Copies of articles relating to this research project submitted to peer-reviewed scientific journals