STATE OF CALIFORNIA
STANDARD AGREEMENT
STD 213 (Rev 06/03)

AGREEMENT NUMBER
15-C0081
REGISTRATION NUMBER

1. This Agreement is entered into between the State Agency and the Contractor named below:

STATE AGENCY'S NAME
Department of Pesticide Regulation, hereinafter referred to as "State"

CONTRACTOR'S NAME
The Regents of the University of California on behalf of its Riverside campus, hereinafter referred to as "University"

2. The term of this Agreement is: March 21, 2016 through June 30, 2018

3. The maximum amount of this Agreement is: $ 195,000.00

4. The parties agree to comply with the terms and conditions of the following Exhibits, which by this reference are made a part of the Agreement.

Exhibit A – A5: A–Scope of Work; A1–Deliverables; A2–Key Personnel; A3–Authorized Representatives; A4–Preexisting Data; A5–CV/Resumes	12 page(s)
Other Exhibits A (when applicable): A6–Current & Pending Support; A7–Third Party Confidential Information Requirement	1 page(s)
Exhibit B – B–Budget; B1–Budget Justification; B2–Subrecipient Budgets (if applicable); B3–Invoice Elements	4 page(s)
Exhibit C* – University Terms and Conditions	UTC-116

Check mark additional Exhibits below, and attach Exhibits or provide internet link:

☐ **Exhibit D** – Additional Requirements Associated with Funding Sources	page(s)
☐ **Exhibit E** – Special Conditions for Security of Confidential Information	page(s)
☐ **Exhibit F** – Access to State Facilities and Computing Resources	page(s)
☐ **Exhibit G** – If applicable	page(s)

Items shown with an Asterisk (*) are hereby incorporated by reference and made part of this agreement as if attached hereto.
These documents can be viewed at http://www.dgs.ca.gov/ols/Resources/StandardContractLanguage.aspx.

IN WITNESS WHEREOF, this Agreement has been executed by the parties hereto.

CONTRACTOR

CONTRACTOR'S NAME *(if other than an individual, state whether a corporation, partnership, etc.)*
The Regents of the University of California, on behalf of its Riverside campus

BY *(Authorized Signature)* ✍ FAlZgoul — DATE SIGNED *(Do not type)* 3/2/16

PRINTED NAME AND TITLE OF PERSON SIGNING
Frosina Al Zgoul, Principal Contract & Grant Officer

ADDRESS
Research and Economic Development, UC Riverside, CA 92521-0217

STATE OF CALIFORNIA

AGENCY NAME
Department of Pesticide Regulation

BY *(Authorized Signature)* ✍ — DATE SIGNED *(Do not type)* 3-14-16

PRINTED NAME AND TITLE OF PERSON SIGNING
Lu Saephanh, Fiscal Services and Business Operations Branch Chief

ADDRESS
1001 I Street, Sacramento, CA 95814

California Department of General Services Use Only

CJG

APPROVED
MAR 23 2016
OFFICE OF LEGAL SERVICES
DEPT. OF GENERAL SERVICES

☐ Exempt per:

Exhibit A

Project Summary & Scope of Work

Project Summary/Abstract

Briefly describe the long-term objectives for achieving the stated goals of the project.

If Third-Party Confidential Information is to be provided by the State:

☐ Performance of the Scope of Work is anticipated to involve use of third-party Confidential Information and is subject to the terms of this Agreement; ***OR***

☐ A separate CNDA between the University and third-party is required by the third-party and is incorporated in this Agreement as Exhibit A7.

Scope of Work

Describe the goals and specific objectives of the proposed project and summarize the expected outcomes. If applicable, describe the overall strategy, methodology, and analyses to be used. Include how the data will be collected, analyzed, and interpreted as well as any resource sharing plans as appropriate. Discuss potential problems, alternative strategies, and benchmarks for success anticipated to achieve the goals and objectives.

4. Background and Goals

Fipronil (5-amino-1-[2,6-dichloro-4-(trifluoromethyl) phenyl]-4-[(trifluoromethyl) sulfinyl]-1H-pyrazole-3-carbonitril) is a phenylpyrazole insecticide used in a variety of structural pest control products. Fipronil has become an increasingly popular pesticide among professional applicators for ant control because of its outstanding efficacy originated from its capability for vertical transfer in an ant colony. In California, fipronil is exclusively used by licensed applicators and its use is therefore primarily associated with residential areas in urban settings. A number of extensive surveys have established fipronil and its biologically active degradates as common contaminants in urban surface streams in California. For instance, a 26-month monitoring of 8 neighborhoods in Sacramento and Orange County by researchers from UC Riverside and UC Davis showed almost 100% occurrence of fipronil and its three degradates, i.e., fipronil sulfone, desulfinyl fipronil and fipronil sulfide, in urban runoff water draining neighborhoods, with the levels in Orange County almost 10-fold those in Sacramento (Gan et al., 2012). An extensive state-wide monitoring study by DPR's Environmental Monitoring Program during 2008-2014 also highlighted the ubiquitous occurrence of fipronil and its degradates in residential drainage runoff under both dry and wet conditions (Budd et al., 2015). These studies further affirmed fipronil sulfone and desulfinyl fipronil as the primary fipronil degradates in urban environments. Weston and Lydy (2014) reported that some macro-invertebrates are highly sensitive to fipronil compounds, with EC_{50} as low as 30 ppt for fipronil, and only 8 ppt for fipronil sulfone. Therefore, the levels of fipronil and its degradates (defined here as *fipronils*) in urban waterways, especially in southern California, are often several times these toxicity thresholds. Fipronil contamination may thus adversely affect the health and beneficial functions of surface aquatic ecosystems in regions such as California.

Exhibit A

To date research on fipronil has been largely confined to monitoring studies and laboratory toxicity assays. Our overall knowledge about the behavior of fipronil in urban environments is rather limited. A few significant knowledge gaps include the lack of understanding of the origin of fipronils in urban surface runoff, where and how fipronil is converted to its biologically active degradates, and how fipronils move from homes to urban streams. Below is a brief analysis of these information gaps and discussion on the need for improved understanding.

Compared to pyrethroids, fipronils have moderate hydrophobicity and relatively high water solubility, and hence a greater mobility. Unlike pyrethroids for which loose particles may dominate their offsite movement, fipronils in runoff may be attributed to both the dissolved form and that sorbed to solid particles. On impervious surfaces (e.g., concrete pavement), the distribution of fipronils between loose dust particles and the cement medium may determine the concentration profiles of fipronils during a precipitation-induced runoff event. It may also dictate the relationship between fipronil loads in relation to cumulative runoff volume through a series of precipitation events. It is likely that fipronils sorbed to loose particles on impervious surfaces are easily carried away by runoff water, resulting in high levels in the "first flush", as seen in Budd et al. (2015). However, a significant fraction of fipronils may reside in the porous concrete medium and may continue to leach out by runoff water, contributing to sustained concentration levels in runoff. Therefore, it is important to characterize the partition of fipronils between solid particles and concrete medium, between concrete medium and water, and between suspended particles and water. The partition coefficients among these components may be used to quantitatively describe the transport of fipronils in surface runoff and predict runoff loads.

Previous studies suggest that fipronil may be readily transformed to desulfinyl fipronil through photolysis and to fipronil sulfone through oxidation. It is likely that such transformations are greatly accelerated on impervious surfaces, especially under strong sunlight and high temperatures that are typical of the summer conditions in California. Most noticeably, the temperature on surfaces of concrete or asphalt pavement during summer daytime may be exceptionally high compared to soil or vegetated surfaces. It may be therefore hypothesized that the rate and pathways of fipronil transformations differ greatly between impervious and soil surfaces. While a surface soil likely has much greater microbial activity that may lead to microbial degradation, the surface of pavement may have abundant mineral oxides, higher pH and much higher temperature that may contribute to rapid abiotic transformations. As fipronil desulfinyl and fipronil sulfone have comparable or sometimes even greater biological activity than fipronil itself, it is important to understand the transformation kinetics of fipronil to these degradates and identify the conducive conditions in the microenvironment where pesticide applications are usually made, i.e., around the perimeter of a house. Likewise, fipronil degradates likely undergo further transformations, and the rates and pathways of such transformations may also differ between soil and pavement surfaces. Parameters such as formation rate constants of fipronil sulfone and desulfinyl fipronil, and dissipation rate constants (i.e., half-lives) of fipronil compounds, may be incorporated into fate and transport models to enable accurate description of concentrations of fipronils in runoff water and prediction of cumulative runoff loadings.

The following tasks are proposed to address the above knowledge gaps.

Exhibit A

5. Work to Be Performed

Task 1. Characterization of phase partition of fipronil compounds

- Batch sorption experiments: Carry out controlled experiments to measure partition of fipronil, fipronil desulfinyl, or fipronil sulfone, between urban dust particles and water, between surface soil and water, and between concrete or asphalt medium and water. For the measurement of phase distribution of fipronils between concrete (or asphalt) and water, small discs will be prepared according to typical compositions of these materials, and cured (i.e., washed and aged). These small discs will be equilibrated in pesticide solutions. At equilibrium, concentrations of fipronils in the solution and in the small disc will be measured after exhaustive solvent extraction. To determine phase partition between soil (or dust) and water, the solids and pesticide solution will be equilibrated, and the solid phase will be separated from water via centrifugation after equilibrium is reached. The separated phases will be analyzed for pesticide concentrations following solvent
extraction. Partition coefficients will be calculated from the pesticide distribution in different phases at equilibrium.

- Distribution around residential homes: Using actual homes in Riverside, measure distribution of fipronils between loose dust particles and concrete (or asphalt) medium. For example, following pesticide treatment around the perimeter of a house, dust of a given area on the driveway will be collected by vacuum, and the same surface will be washed with a gauze wipe containing a polar solvent (e.g., methanol). The measurements over time after the pesticide application will produce the relative distribution of fipronils between the loose particles (available for immediate runoff transport) and concrete medium (may be desorbed or leached into runoff water) over an extended period of time. Multiple homes, sampling sites (e.g., driveway, walkway, street) and sampling times (different summer and fall months) will be included as variables to derive representative distribution coefficients under environmental relevant conditions.

- Pesticide inventory surveys around residential homes: Using actual homes in Riverside and simulated pesticide applications, collect and analyze surface soil samples and dust samples on pavement around the house to construct an inventory of fipronil residues as a function of time after treatment. This information may be used to identify the "hot" spots or primary sources of fipronils contributing to runoff water contamination. This information, when combined with phase partition parameters, may be also used for predicting pesticide levels and loads in precipitation-induced runoff. Multiple homes, sampling locations (e.g., surface soil, mulches, dust on driveway and walkway) and sampling times (different summer and fall months) will be included as variables to derive pesticide inventory profiles under environmentally relevant conditions.

Task 2. Determination of transformation rates in different environmental compartments

- Batch incubation experiments: Carry out controlled experiments to determine the conversion of fipronil to fipronil desulfinyl or fipronil sulfone on concrete surfaces. Small concrete discs will be prepared and cured (i.e., washed and aged). A commercial formulation of fipronil (e.g.,

Exhibit A

Termidor) will be used to treat the concrete discs, and the treated discs will be exposed to outdoor summer conditions. The disappearance of fipronil parent, and formation and then dissipation of fipronil desulfinyl and fipronil sulfone, will be determined through chemical analysis at different time points after the treatment. Rate constants for the formation of degradates from fipronil and dissipation rate constants of fipronil and its degradates, will be derived by fitting the kinetics to appropriate models.

- Large concrete slab experiments: Using larger concrete slabs (40 by 60 cm, made in a previous project), treat loose solid particles with fipronil, and expose the treated dust on concrete slabs to outdoor summer conditions. The dust particles will be collected for chemical analysis at different times after the treatment. The data will be similarly analyzed to estimate the formation of fipronil degradates and dissipation rate constants of fipronil and fipronil degradation intermediates mediated through loose dust particles on pavement.
- Pesticide conversion and dissipation around homes: Using actual homes in Riverside and simulated pesticide applications, measure formation of fipronil degradates and dissipation of fipronil and degradates in surface soil and on pavement around the perimeter of a house by collecting and analyzing samples at different times after the treatment. The rate constants for the formation of fipronil degradates and dissipation of fipronils will be derived by fitting the data to appropriate models. Multiple homes, sampling locations (surface soil, mulches, dust on driveway and walkway) and sampling times (different summer and fall months) will be considered to derive formation rate constants of fipronil degradates and dissipation of fipronils under environmentally relevant conditions.

Task 3. Modeling of fipronil offsite transport

- Working with CDPR, modify existing surface runoff models to utilize phase partition coefficients of fipronils, and kinetic rate constants of formation of fipronil degradates and dissipation of fipronils in various media surrounding a residential home.
- Predict concentration levels and loads of fipronils in irrigation or irrigation-induced surface runoff from single homes.
- Predict concentration levels and loads of fipronils in urban surface streams at neighborhood or watershed scales representative of southern California conditions, and validate/calibrate model predictions against monitoring data.

Task 4. Dissemination of information and outreach/education

- Submit final report of the study results to DPR
- Give a presentation of final results to DPR

6. Deliverables

Task 1 Deliverables:

A report with data on partition coefficients of fipronil and its degradation intermediates and distribution in various compartments around residential homes following a perimeter application.

Exhibit A

Task 2 Deliverables:

A report with data on the formation rate constants of fipronil degradation intermediates from fipronil and dissipation rate constants of fipronil and its degradates in various media under environmental conditions typical of residential homes in southern California.

Task 3 Deliverables:

A modified model for predicting off-site transport of pesticides such as fipronil through surface runoff under urban environmental conditions.

Task 4 Deliverables:

Final report and presentation to DPR.

7. Project Timeline

	2016				2017				2018	
Activities	Jan-Mar	Apr-June	Jul-Sep	Oct-Dec	Jan-Mar	Apr-June	Jul-Sep	Oct-Dec	Jan-Mar	Apr-June
1. Task 1	X	X	X	X	X	X	X	X		
2. Task 2			X	X	X	X	X	X		
3. Task 3							X	X	X	X
4. Task 4					X	X	X	X	X	X

Exhibit A1

Schedule of Deliverables

List all items that will be delivered to the State under the proposed Scope of Work. Include all reports, including draft reports for State review, and any other deliverables, if requested by the State and agreed to by the Parties.

Deliverable*	Description	Due Date
Task 1 - Report	A report with data on partition coefficients of fipronil and its degradation intermediates and distribution in various compartments around residential homes following a perimeter application.	December 31, 2017
Task 2 – Report	A report with data on the formation rate constants of fipronil degradation intermediates from fipronil and dissipation rate constants of fipronil and its degradates in various media under environmental conditions typical of residential homes in southern California.	December 31, 2017
Task 3 – Modified Model	A modified model for predicting off-site transport of pesticides such as fipronil through surface runoff under urban environmental conditions.	June 30, 2018
Task 4 – Final Presentation	Final report and presentation to DPR.	June 30, 2018
The following Deliverables are subject to paragraph 18. Copyrights, Section B of Exhibit C		

* *If use of any Deliverable is restricted or is anticipated to contain Preexisting Data or copyrightable works with any restricted use, it will be clearly identified in Exhibit A4, Use of Preexisting Data, Copyrighted Works and Deliverables.*

Exhibit A2

Key Personnel

List Key Personnel as defined in the Agreement starting with the PI, by last name, first name followed by Co-PIs. Then list all other Key Personnel in alphabetical order by last name. For each individual listed include his/her name, institutional affiliation, and role on the proposed project. Use additional consecutively numbered pages as necessary.

Last Name, First Name	Institutional Affiliation	Role on Project
PI:		
Gan, Jay	*University of California, Riverside, Department of Environmental Sciences*	*Principal Investigator*
Co-PI(s) – if applicable:		
N/A		
Other Key Personnel (if applicable):		
Graduate Research Assistant	*University of California, Riverside*	*Investigator*

Exhibit A3

Authorized Representatives and Notices

The following individuals are the authorized representatives for the State and the University under this Agreement. Any official Notices issued under the terms of this Agreement shall be addressed to the Authorized Official identified below, unless otherwise identified in the Agreement.

Changes in the University Principal Investigator are subject to the Key Personnel section of this Agreement. Changes in other contact information may be made by notification, in writing, between the parties.

State Agency Contacts	**University Contacts**
Agency Name: Department of Pesticide Regulation	University Name: The Regents of the University of California, on behalf of its Riverside campus
Contract Project Manager (Technical)	***Principal Investigator***
Name: Yuzhou Luo Research Scientist III Address: Department of Pesticide Regulation Environmental Monitoring Branch 1001 I Street Sacramento, CA 95814 Telephone: (916) 445-2090 Fax: (916) 324-4088 Email: Yuzhou.Luo@cdpr.ca.gov	Name: Jay Gan, Professor Water Quality Specialist Address: Department of Environmental Sciences UC Riverside Riverside, CA 92521 Telephone: (951) 827-2712 Fax: (951) 827-3991 Email: jgan@ucr.edu
Authorized Official (contract officer)	***Authorized Official***
Name: Lu Saephanh Fiscal Services and Business Operations Branch Chief Address: Department of Pesticide Regulation Fiscal services and Business Operations Branch 1001 I Street Sacramento, CA 95814 ***Send notices to (if different):*** Name: Yuzhou Luo Research Scientist III Address: Department of Pesticide Regulation Environmental Monitoring Branch 1001 I Street Sacramento, CA 95814 Telephone: (916) 445-2090	Name: Frosina Al Zgoul Principal Contract & Grant Officer Address: Research and Economic Development 249 University Office Building Riverside, CA 92521-0217 Telephone: (951) 827-5535 Fax: (951) 827-4483 Email: awards@ucr.edu ***Send notices to (if different):*** Name: AOR listed above, cc: Jay Gan, PI listed above Address: Telephone:

Exhibit A3

Fax: (916) 324-4088 Email: Yuzhou.Luo@cdpr.ca.gov	Fax: Email:
Administrative Contact Name: Terry Harrison Contract Analyst Address: Department of Pesticide Regulation Business Services Office 1001 I Street, MS-4A Sacramento, CA 95814 Telephone: (916) 445-2511 Fax: (916) 445-6845 Email: Terry.Harrison@cdpr.ca.gov	***Administrative Contact*** Name: Frosina Al Zgoul, listed above Address: Telephone: Fax: Email:
Financial Contact/Accounting Name: Accounts Payable Address: Department of Pesticide Regulation 1001 I Street, MS-4A P.O Box 4015 Sacramento, CA 95812-4015	***Authorized Financial Contact/Invoicing*** Name: Fred Devera Fund Manager Address: Accounting UC PATH Riverside, CA 92521 Telephone: (951) 827-1948 Fax: Email: fred.devera@ucr.edu

Exhibit A4

Use of Preexisting Data, Copyrighted Works and Deliverables

If the either Party will be using any third-party or pre-existing data or copyrighted works that have restrictions on use, then list all such data or copyrighted works and the nature of the restriction below. If no third-party or pre-existing data or copyrighted works will be used, check "none" in this section.

A. State: Preexisting Data and/or copyrighted works to be provided to the University from the State or a third party for use in the performance in the Scope of Work.

☒ None or ☐ List:

Owner (State Agency or 3rd Party)	Type of Data or copyrighted work (Restricted or Unrestricted)	Description	If Restricted, nature of restriction:

B. University: Use of Preexisting Data or copyrighted works included in Deliverables identified in Exhibit A1.

☒ None or ☐ List:

Owner (University or 3rd Party)	Type of Data or copyrighted work (Restricted or Unrestricted)	Description	If Restricted, nature of restriction:

C. Anticipated restrictions on use of Project Data.
If the University PI anticipates that any of the Project Data generated during the performance of the Scope of Work will have a restriction on use (such as subject identifying information in a data set) then list all such anticipated restrictions below. If there are no restrictions anticipated in the Project Data, then check "none" in this section.

☒ None or ☐ List:

Owner (University or 3rd Party)	Description	Nature of Restriction:

Exhibit A5

Curriculum Vitaes (CV) / Résumés / Biosketch

Jay J. Gan
Professor of Environmental Chemistry
Department of Environmental Sciences, UC Riverside, CA 92521
Phone: (951) 827-2712; Fax: (951) 827-3993; email: jgan@ ucr.edu

I. Professional and Education Background

7.2004 - now	Professor of Environmental Chemistry, Dept. Environmental Sciences, Univ. California, Riverside
10.2007-7.2010	Department Chair, Dept. Environmental Sciences, Univ. California, Riverside
7.2001-6.2004	Assistant and Associate Professor, Dept. Environmental Sciences, Univ. California, Riverside
5.1995-7.2001	Assistant and Associate Researcher, The U.S. Salinity Laboratory, and Univ. California, Riverside
3.1993-5.1995	Postdoctoral Researcher, the US Salinity Laboratory and Univ. California, Riverside
8.1991-3.1993	Postdoctoral Researcher, Dept. Soil, Air and Climate, Univ. Minnesota, St. Paul, MN
2.1990-8.1991	Visiting Fellow, Agrochemicals Unit, Agricultural Research Laboratory, the International Atomic Energy Agency (UN), Seibersdorf, Austria
9.1982-7.1988	Ph.D., Environmental Chemistry, Zhejiang University, Hangzhou, China

II. Expertise and Interest

- Environmental fate, transport and risk assessment of pesticides and emerging contaminants
- Contaminant bioavailability in sediments and soils, biomimetic analysis, and ecotoxicology
- Biotic and abiotic transformations, phase partition, leaching, runoff, aquatic bioaccumulation, and plant uptake
- Analysis of trace organic residues in environmental matrices
- Wastewater reuse and fate/risks of PPCPs
- Mitigation strategies and risk-reduction practices (e.g., wetlands, vegetative buffers)

III. Professional Honors and Service

- **Fellow, AAAS (American Association for Advancement of Science), 2008**
- Fellow, Soil Science Society of America (SSSA), 2010
- Fellow, ASA (American Society of Agronomy), 2005
- Chair, Division S-11 "Soil and Environmental Quality", SSSA, 2011
- Associate Editor, *Environmental Pollution*, 01/2013 – now.
- Vice Chair Programming, IUPAC International Congress of Pesticide Chemistry, San Francisco, 2014
- Executive Committee, Agrochemical Division, American Chemical Society, 2012-2014
- International Committee Co-Chair, Agrochemical Division, American Chemical Society, 2013-2015
- In-coming Chair, Agrochemical Division, American Chemical Society, 2014-2016

IV. Teaching

- Introduction to Environmental Science (Lower Division, Undergraduate Level, 240-320 students)
- Environmental Organic Chemistry (Graduate Level)
- Fate and Transport of Chemicals in Environment (Graduate Level)

V. Publications

- Edited books: 4
- Peer-reviewed technical journal articles: 230

Total ISI citations: 5660; H-index 43 (as of November 2015)

Exhibit A6

Current & Pending Support

(Will be incorporated, if applicable.)

University will provide current & pending support information for Key Personnel identified in Exhibit A2 at time of proposal and upon request from State agency. The "Proposed Project" is this application that is submitted to the State. Add pages as needed.

PI: Jay Gan

Status (currently active or pending approval)	Award # (if available)	Source (name of the sponsor)	Project Title	Start Date	End Date
Proposed Project	15-C0081	Department of Pesticide Regulation	Understanding Sources and Transport of Fipronil in Urban environments	03/01/2016	06/30/2018
CURRENT		Department of Pesticide Regulation	Source Evaluation and Mitigation of Off-site Movement of Pesticides from residential Homes	04/16/2013	04/15/2016
CURRENT		Department of Pesticide Regulation	Development of Passive Sampling Techniques for Pesticides in Urban Streams	04/01/2014	06/30/2016
CURRENT		U.S. EPA	Reclaimed Water Irrigation: Plant Accumulation and Risks of Contaminants of Emerging Concern (CECs)	09/01/2015	08/31/2018
CURRENT		NIEHS	Exploring the Importance of Aging in Contaminant Bioavailability and Remediation	07/01/2014	06/30/2018
CURRENT		USDA-AFRI	Contaminant of Emerging Concern (CECs) in Reclaimed Water and Biosolids: Safe for Vegetable and Fruit Crops?	01/01/2016	12/31/2018
PENDING					
PENDING					

Zachary Cryder, Graduate Student

Status	Award #	Source	Project Title	Start Date	End Date
Proposed Project	15-C0081	Department of Pesticide Regulation	Understanding Sources and Transport of Fipronil in Urban environments	03/01/2016	06/30/2018
CURRENT					
CURRENT					
PENDING					

Exhibit B

Budget Estimate for Project Period

Table I. Expenditures by Budget Line Item

Budget Line Item	FY 15-16	FY 16-17	FY 17-18	TOTAL
1. Salaries & Wages	$10,687	$27,697	$28,250	$66,634
2. Direct Benefits	$393	$1,020	$1,040	$2,453
3. Travel (in state) ①	$800	$1,600	$1,600	$4,000
4. Supplies ②	$7,761	$20,956	$19,885	$48,602
5. PFR & HI ③	$10,449	$15,909	$16,531	$42,889
6. Overhead @25% ④	$4,910	$12,818	$12,694	$30,422
Total	$35,000	$80,000	$80,000	$195,000

① Travel – To and from various sites in southern California for sample collection; to attend annual project progress meetings.
② Supplies – The amount for supplies will be used to purchase mostly laboratory consumables, including chemical standards, solvents, specialty gases used on instruments, and other parts and supplies for sample preparation and instrumental analysis.
③ Graduate student partial fee remissions and health insurance.
④ Overhead – @25% MTDC.

Table II. Detail of Salaries and Wages

Classification	Monthly Salary	Number of Months	Percentage of Time ①	Total
Principle Investigator Jay Gan (FY 15-18) ~~(not paid by ODPR)~~				$ 0
Graduate Research Assistant (FY 15-16)	$3,635	4	73.5%	$10,687
Graduate Research Assistant (FY 16-17)	$3,738	12	61.75%	$27,697
Graduate Research Assistant (FY 17-18)	$3,812	12	61.75%	$28,250
Total Personnel				$66,634
Direct Benefits:				
Graduate Research Assistant @ 3.68%	**(FY15-16)**			$393
Graduate Research Assistant @ 3.68%	**(FY16-17)**			$1,020
Graduate Research Assistant @ 3.68%	**(FY17-18)**			$1,040
			Total Benefits	$2,453
			Total Personnel and Benefits	$69,087

Exhibit B3

Budget Justification

The Budget Justification will include the following items in this format.

Personnel

Name. *Starting with the Principal Investigator list the names of all known personnel who will be involved on the project for each year of the proposed project period. Include all collaborating investigators, individuals in training, technical and support staff or include as "to be determined" (TBD).*

Jay Gan, Professor of Environmental Chemistry
Zachary Cryder, Ph.D. student, Environmental Toxicology

Role on Project. *For all personnel by name, position, function, and a percentage level of effort (as appropriate), including "to-be-determined" positions.*

Dr. Jay Gan will serve as the Principal Investigator of this project and will oversee study design, data collection, data analysis, and preparation of reports and manuscripts. Dr. Gan will provide mentoring and supervision to the graduate student performing the specific experiments.

Mr. Zachary Cryder, who is a first year Ph.D. student in the Environmental Toxicology program, will be the graduate student primarily involved in this project. Zach will work under the supervision of Dr. Gan to carry out the specific experiments, sampling and sample analysis, data collection and analysis, and write-up of reports and manuscripts. It is anticipated that Zach will work on this project for its entire duration.

Fringe Benefits.

In accordance with University policy, explain the costs included in the budgeted fringe benefit percentages used, which could include tuition/fee remission for qualifying personnel to the extent that such costs are provided for by University policy, to estimate the fringe benefit expenses on Exhibit B.

Include direct benefits, partial fee remissions and health insurance for the graduate student and the amounts are calculated per UC Riverside policy.

Travel

Itemize all travel requests separately by trip and justify in Exhibit B1, in accordance with University travel guidelines. Provide the purpose, destination, travelers (name or position/role), and duration of each trip. Include detail on airfare, lodging and mileage expenses, if applicable. Should the application include a request for travel outside of the state of California, justify the need for those out-of-state trips separately and completely.

The amount will be used on trips to field sites for sample collection and for attending annual project meetings at UC Davis or Sacramento. The sampling trips include to sites in Orange County and Los Angeles County, and are estimated at $100 (vehicle rental, gas, tolls) per trip for 8 trips per year. The meeting trip is estimated at $400 per person for two persons per year.

Materials and Supplies

Itemize materials supplies in separate categories. Include a complete justification of the project's need for these items. Theft sensitive equipment (under $5,000) must be justified and tracked separately in accordance with State Contracting Manual Section 7.29.

The amount for supplies will be used to purchase mostly laboratory consumables, including chemical standards, solvents, specialty gases used on instruments, and other parts and supplies needed for sample collection, sample preparation and instrumental analysis.

Equipment

List each item of equipment (greater than or equal to $5,000 with a useful life of more than one year) with amount requested separately and justify each.

We will not purchase an equipment over $5000.

Consultant Costs

Consultants are individuals/organizations who provide expert advisory or other services for brief or limited periods and do not provide a percentage of effort to the project or program. Consultants are not involved in the scientific or technical direction of the project as a whole. Provide the names and organizational affiliations of all consultants. Describe the services to be performed, and include the number of days of anticipated consultation, the expected rate of compensation, travel, per diem, and other related costs.

None.

Subawardee (Consortium/Subrecipient) Costs

Each participating consortium organization must submit a separate detailed budget for every year in the project period in Exhibit B2 Subcontracts. Include a complete justification for the need for any subawardee listed in the application.

None.

Exhibit B3

Other Direct Costs

Itemize any other expenses by category and cost. Specifically justify costs that may typically be treated as indirect costs. For example, if insurance, telecommunication, or IT costs are charged as a direct expense, explain reason and methodology.

None.

Rent

If the scope of work will be performed in an off-campus facility rented from a third party for a specific project or projects, then rent may be charged as a direct expense to the award.

None.

Indirect (F&A) Costs

Indirect costs are calculated in accordance with the University budgeted indirect cost rate in Exhibit B.

25% MTDC

Exhibit B3

Invoice and Detailed Transaction Ledger Elements

In accordance with Section 14 – Payment and Invoicing, the invoice, summary report and/or transaction/payroll ledger shall be certified by the University's Financial Contact and the PI.

Summary Invoice – includes either on the invoice or in a separate summary document – by approved budget category (Exhibit B) – expenditures for the invoice period, approved budget, cumulative expenditures and budget balance available[1]

- Personnel
- Equipment
- Travel
- Subawardee – Consultants
- Subawardee – Subcontract/Subrecipients
- Materials & Supplies
- Other Direct Costs
    - TOTAL DIRECT COSTS (if available from system)
- Indirect Costs
    - TOTAL

Detailed transaction ledger and/or payroll ledger for the invoice period [2]

- Univ Fund OR Agency Award # (to connect to invoice summary)
- Invoice/Report Period (matching invoice summary)
- GL Account/Object Code
- Doc Type (or subledger reference)
- Transaction Reference#
- Transaction Description, Vendor and/or Employee Name [6]
- Transaction Posting Date [6]
- Time Worked [6]
- Transaction Amount [6]

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[1] If this information is not on the invoice or summary attachment, it may be included in a detailed transaction ledger.

[2] For salaries and wages, these elements are anticipated to be included in the detailed transaction ledger. If all elements are not contained in the transaction ledger, then a separate payroll ledger may be provided with the required elements.