Project Information Submittal Form

Project Submitter/Owner: Environmental Working Group of the Borrego Springs Watermaster

Project Name: Biological Restoration of Fallowed Lands

Contact Information

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Project Summary

Please provide a summary of the Project description. Use as much space as you need.

To maintain a viable water supply for current and future beneficial uses and users of groundwater in the Borrego Springs Subbasin (Basin), the Watermaster's Groundwater Management Plan (GMP) defines a sustainability goal of operating the Basin within its sustainable yield in a manner that does not exhibit undesirable results by 2040. Achieving this goal requires implementation of an aggressive pumping rampdown of approximately 75 percent over the next twenty years. The GMP lists several projects and management actions (PMAs) that are intended to support the reduction of groundwater pumping demands. The GMP recognizes that fallowing of agricultural lands will be a primary tool to reduce groundwater demands, but that there are several adverse impacts that could be associated with land fallowing, including airborne emissions through wind-blown dust, the introduction or spreading of invasive plant species, and changes to the landscape that could adversely affect visual quality.

The Watermaster's Environmental Working Group (EWG) contends that biological restoration of current and future fallowed lands could be a solution for addressing the potential adverse impacts associated with land fallowing, and could be helpful in protecting human health, the environment, and the socioeconomic wellbeing of the Borrego Springs community during GMP implementation. However, the land use changes that have occurred in the past have created various barriers to the establishment of native habitat on fallowed lands, and not all land parcels will have equal habitat value.

The Project proposed herein describes a three-year program to: characterize historical and current conditions; explore the feasibility of various biological restoration/rehabilitation techniques; and develop guidance for future biological restoration projects on current and future fallowed lands within the Subbasin. The goals of restoration/rehabilitation are: reduce water consumption; manage airborne dust emissions; increase natural biodiversity and habitat value; and maintain or enhance values pertinent to the Anza Borrego State Park and the residents of Borrego Springs.

Drawing upon the collective experiences of Land IQ managing dust issues for the Los Angeles Department of Water and Power on Owens Lake and the Imperial Irrigation District on the Salton Sea, and UCI research on ecological restoration and desert ecology, the Project scope-of-work will produce spatially explicit strategies for fallowing retired citrus orchards based upon the potential for rehabilitation given known environmental constraints. Land IQ and UCI have provided a separate scope-of-work that provided the basis for this Project description (attached).

The work will start with gathering and synthesizing existing information resources: utilizing geospatial datasets, the literature, and interviewing industry experts and people knowledgeable in land use management and history in the vicinity of Borrego Springs, including members of the EWG. The existing information will be supplemented with ground and drone measurements stratified across major ecological units based on plant community type and physical properties of the landscape. The potential for rehabilitation and the appropriate methodological approaches across these units will be further informed by measurements of life history stages and microsite characteristics critical to plant recruitment and establishment among a series of successional stages or land use states (e.g., recently fallowed, fallowed 5-10 years, existing natural reference sites, and existing citrus).

A unique challenge presented by the fallowing of citrus orchards is how to manage dust, make use or dispose of dead trees, and facilitate physical and biological processes important to the development of a natural desert landscape. The Project proposes a citrus tree removal strategy that is conducive to both dust management and increasing natural habitat value, while minimizing visual blight in the short term. A case study will be executed to inform the development of best practices and will involve sample "Brush Pile Wildlife Sand Fences" with cut citrus tree material placed strategically to manage wind/dust patterns. The Sand Fences will serve multiple functions including dust control by reducing soil particle velocity, safe sites for native plant recruitment through moisture retention and shading, and wildlife habitat by providing perches and cover. Furthermore, by not mulching the trees there will be a cost savings and avoidance of altered carbon cycles inconsistent with the native ecosystem and plant community succession.

The Project study area will be approximately 3,000 acres and encompass the extent of agriculture land uses in the Subbasin and any appropriate adjacent natural open space suitable for reference conditions for habitat restoration planning. For the farmlands that have the potential for permanent fallowing, a prioritization model will be prepared to assist in strategic planning to select sites for restoration.

The Project will be implemented in a phased approach over a three-year period under the guidance of the EWG and the approval of the Watermaster Board.

Describe the project location, current conditions, and the benefitting areas. Please attach, separately, a regional and Project map depicting the site(s) location, current conditions, and benefitting areas.

The Project location will be focused within the agricultural land uses in the northern portion of the Borrego Springs Subbasin. However, the results of the Project will assist with all lands that are currently fallowed in the Basin or may be fallowed during GMP implementation. A map is attached from the GMP that shows the current land uses within the Subbasin. Most of the agricultural and recreational land uses are located within the northern portion of the Subbasin. However, the entire Borrego Valley potentially benefits from the Project via the mitigation of airborne emissions of wind-

blown dust, combatting the spread of invasive plant species, improving the visual quality of the landscape, and restoring natural recharge processes.

What is the nexus of the Project to the Sustainability Goal of the Borrego Springs Subbasin Groundwater Management Plan (GMP)? Is the Project listed in the GMP? How does the Project help achieve the goals of the GMP?

The Project is not listed as a standalone project or management action (PMA) in the GMP. However, the project is referenced in some PMAs as a potential supporting activity and will thereby help achieve the Sustainability Goal of reducing groundwater pumping by 75 percent without causing undesirable results. Explanation is described below.

The PMAs listed in the GMP to achieve the Sustainability Goal were developed based the following considerations: (i) there are few opportunities for capture of excess precipitation; (ii) the Subbasin is remote to potential sources of imported water and totally dependent on groundwater for its water supply; (iii) water uses by volume within the Subbasin are primarily for agriculture and recreation; and (iv) the magnitude of the overdraft is estimated to be almost 400% above the Sustainable Yield. For these reasons, several of the PMAs listed in the GMP call for reducing groundwater demands that could involve fallowing of agricultural or recreational lands:

- PMA No. 1 - Water Trading Program. The Water Trading Program provides an economic incentive for conserving water by providing the potential to monetize voluntary water conservation or the elimination of water intensive uses. An example is a water trade from high-intensity agricultural water users to other lower-intensity water users, which may involve the fallowing of the agricultural lands.

- PMA No. 3 - Pumping Reduction Program. The Pumping Reduction Program is the central tool to implement the Physical Solution and achieve the sustainability goal for the Subbasin. The program involves the gradual Rampdown of groundwater production rights to the Sustainable Yield of the Subbasin by 2040. The Pumping Reduction Program may incentivize high-intensity agricultural or recreational water users to take advantage of the water trading (PMA No. 1) or land fallowing (PMA No. 4) management programs.

- PMA No. 4 - Voluntary Fallowing of Agricultural Land Program. The Voluntary Fallowing of Agricultural Land Program will constitute a mechanism to facilitate the conversion of high water use irrigated agriculture to low water use open space, public land, or other development on a voluntary basis.

While the GMP recognizes that fallowing of agricultural lands will be key to achieving the Sustainability Goal, it also recognizes the potential adverse environmental effects of fallowing, including airborne emissions through wind-blown dust, the introduction or spreading of invasive plant species, and changes to the landscape that could adversely affect visual quality.

Section IV.H of the Stipulated Judgment provides that:

> *An Environmental Working Group (EWG) will be established to advise the Watermaster on GDE and any other matters approved by the Watermaster.*

The role of the EWG is to advise and further the mission of the Watermaster to implement the Stipulated Judgment and comply with the SGMA by focusing on the protection of human health and

the environment. The activities of the EWG are always approved by the Watermaster Board and always include a nexus between environmental issues and the sustainable use of groundwater in the Borrego Springs Subbasin.

The EWG held its inaugural meetings in February and May 2021 to discuss and prioritize activities that the EWG could engage in pursuant to its purview and duties as defined by the Judgment. Some EWG members contend that biological restoration of current and future fallowed lands could be a solution for addressing potential adverse impacts associated with land fallowing, and is necessary to protect human health, the environment, and the socioeconomic wellbeing of the Borrego Springs community.

The Project proposed herein is intended to explore the feasibility of biological restoration techniques and develop guidance for future biological restoration projects on current and future fallowed lands within the Subbasin. Since land fallowing will be a central tool to reduce groundwater demands and achieve groundwater sustainability, the Project helps achieve the Sustainability Goal by addressing the potential adverse impacts associated with land fallowing.

What are the specific goals and needs for the Project, and how will the project achieve the goals and meet the needs?

The main goal of the Project is to develop data, information, and criteria to guide the use of biological restoration as a technique to mitigate the potential adverse impacts associated with the fallowing of lands that is expected to occur within the Subbasin. The Project will achieve these goals through analyses of existing data and information, field reconnaissance, and test cases of biological restoration techniques at existing fallowed lands within the Subbasin. A final technical report will describe and document the results, conclusions, and recommendations of the Project. The final report will describe and document the biological restoration strategies that are expected to be most effective within the Subbasin and a prioritization of land parcels for biological restoration.

The needs of the Project will be met by hiring technical subconsultants with demonstrated expertise in desert ecosystems and restoration ecology and obtaining guidance and review from the technical experts participating on the EWG.

What are the quantifiable benefits of the Project (e.g., protect or enhance water quality, water conservation, enhanced understanding of the groundwater basin, etc.)? How will those benefits be quantified and evaluated?

The main benefit of the Project will be the development of guidance criteria for the use of biological restoration as a technique to mitigate the potential adverse impacts associated with the fallowing of lands. Specifically, the Project develop the following beneficial information: an inventory of all current and prospective fallowed lands in the Subbasin; the types of restoration/rehabilitation strategies that are most effective and on which types of lands; and a prioritization of the fallowed lands that are most appropriate for biological restoration with the highest habitat value. These benefits will be quantified and described in the interim and final deliverables of the project.

Please describe the communities served by the Project. Will the Project benefit an Underrepresented Community, a Disadvantaged Community (DAC), and/or a Severely Disadvantaged Community (SDAC)? If so, please provide a map.

A map is attached from the GMP of the Basin and the area defined as a SDAC. While the Project activities will be focus within the northern portions of the Basin, the Project will serve the entire Basin, including the community of Borrego Springs and the area classified as a SDAC, because it is designed to mitigate the physical and biological impacts that may be associated with the progressive reductions in pumping.

- A primary driver of the economy in Borrego Springs is ecotourism associated with the Anza-Borrego State Park, dark and clear night skies, and the beautiful flora and fauna of the region. The Project will help maintain or enhance the physical and biological environment within the community, and thereby support economic activity within Borrego Springs.
- The Watermaster was officially formed in April 2021. Expenses to conduct Watermaster activities are relatively new costs that are ultimately funded by the residents and rate payers within the community. The grant funding will help offset the new costs and provide financial relief to the residents and rate payers.
- The community's water supply is solely dependent on the Basin. The Project is related to the larger project of implementation of the Judgment and GMP, which will ensure that the groundwater basin remains an affordable, high-quality source of water for the community in perpetuity.

Will the Project or Component positively impact issues associated with small water systems or private shallow domestic wells (e.g., groundwater contamination vulnerability, drawdown, etc.)? If so, please provide justification such as water system maps or domestic well census results.

Private shallow wells likely exist on current and/or potential future lands that will be fallowed. The Project may include recommendations for the continued use of domestic wells after fallowing to assist in biological restoration.

Does the Project address the needs of the State Water Board's SAFER Program, designed to ensure Californians who lack safe, adequate, and affordable drinking water receive it as quickly as possible, and that the water systems serving them establish sustainable solutions?

N/A

How does the Project address the Human Right to Water (AB 685 Section 106.3) which states that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes?

N/A

Please describe how the project contributes to addressing the risks in the region to water supply and water infrastructure arising from climate change. If possible, please provide the amount of greenhouse gas emissions reduced and carbon sequestered resulting from the project.

Biological restoration could act to sequester carbon through the process of biosequestration, which is the capture and storage of the atmospheric carbon dioxide by creation of natural vegetation and habitat and enhanced biological processes.

Work Plan

The Work Plan must contain descriptions of the anticipated tasks necessary to complete the project. Tasks should be organized by the five budget categories, as applicable: (a) Project Administration, (b) Planning/Design/Environmental, (c) Construction/Implementation, (d) Monitoring/Assessment, and (e) Interested Parties Outreach/Education. The Work Plan should also identify the anticipated deliverables for each task.

Add additional tasks and subtasks as needed to provide a detailed work plan. Some examples and suggested language have been provided.

Budget Category (a): Project Administration

Task 1 – Project Management. This task includes:

- Task 1a. Project Management. The objective of this task is to perform monthly project management activities for the program, including coordinating work, tracking task schedules and budget, managing sub-consultants and vendors, reporting progress to the Watermaster Board and EWG, and taking actions as necessary to address schedule or budget challenges.
- Task 13b. Grant Management and Reporting. The objective of this task is to coordinate with the Borrego Water District to the manage grant agreement including compliance with grant requirements, and preparation and submission of supporting grant documents and coordination with the Grantee, Borrego Water District. Prepare invoices including relevant supporting documentation for submittal to DWR via Borrego Water District. This task also includes administrative responsibilities associated with the project such as coordinating with partnering agencies and managing consultants/contractors.

  Deliverables: Invoices and necessary documentation.

Budget Category (b): Planning/Design/Environmental

n/a

Budget Category (c): Construction/Implementation

n/a

Task 2 – Review and Analysis of Existing Data

Task 2.1 – Kick-off Meeting. A kick-off meeting will be held with the EWG and the consultants at Land IQ and UCI to review the proposed scope-of-work and receive EWG input.

Task 2.2 – Literature Review. Literature review; data mining from existing reports; and written summary of relevant information for report.

Task 2.3 – Interviews with Key Stakeholders and Experts. The interviews will be conducted with local experts and subject-matter experts.

Task 2.4 – Project Geodatabase Creation. Creation of Project Geodatabase for relevant land use and environmental thematic layers, including, but not limited to topography, flow accumulation, soil characteristics, and wind patterns.

Task 2.5 – Farmland Water Consumption. Collect water consumption data from BWD; update parcel level Geographic Information System (GIS) data, as necessary; calculate water consumption by parcel, and digitize new data layers, as necessary.

Task 2.6 – Review of Historical Data. Review of historical maps, search of available historical records (e.g., herbarium records and historical accounts); georeference available historical maps and old place name references; synthesize information to describe site specific historical ecology; and include comparison of historical and current vegetation cover densities. Provide guidance on feasible restoration targets.

Deliverables:

1. Technical Memo Summarizing Existing Data
2. Initial Fallowed Farmland Rehabilitation Opportunities and Prioritization Map.

Task 3 – Existing Fallowed Farmland and Reference Natural Habitat Field Study

Task 3.1 – Field Observations of a Time Series of Existing Fallowed Farmland. Interviews with past and current BWD staff about experience with fallowed fields, field visits, and data collection of existing conditions.

Task 3.2 – Field Sampling of Reference Natural Habitat to Guide Farmland Restoration Potential. Use GIS layers to stratify landscape in the Valley, including the agricultural land into similar geomorphic features for sampling. Based on this stratification

and information from the time series of fallowed farmland, determine a sampling design to collect more detailed information on plant cover and "greenness" utilizing drones and multispectral imagery over hundreds of acres. Areas of interest will be visited on the ground to compare vegetation composition and plant physiological data that will further help to identify specific areas and species most promising for rehabilitation. Sample cover data, analyze and interpret reference conditions to identify a range of reasonable habitat restoration targets for fallowed farmland.

Deliverables:

1. Technical Report of Field Study Results

Task 4. Brush Pile Wildlife Sand Fence Case Study

Task 4.1 – Identify Manipulative Sites for Sand Fences. Working on land with BWD access agreements, identify one or multiple sites, based on feasibility, for construction of Sand Fences.

Task 4.2 – Design and Construct Sample Sand Fences. Working directly with crews in the field, identify the most economical method of construction, and build variations on the design, as appropriate. Sand Fences will be compared to control (no action) and mulched fields with chipped orchard tree material.

Task 4.3 – Baseline Observations of Sand Fence Function and Wildlife Value. Take baseline data for comparison to future datasets, and to characterize the habitat and dust control value of the Sand Fences. Utilizing information from Task 2 and initial results from Task 3, establish a pilot study with promising plant species to help understand plant response to Sand Fences.

Deliverables:

1. Constructed Sample Sand Fences
2. Technical Report

Task 5 – Farmland Fallowing Rehabilitation Strategies

Task 5.1 – Develop Conceptual Models for Key Rehabilitation Processes. Based on literature review, geodatabase indices and analysis, field study results, and expert interviews, develop conceptual models of key processes involved in dust, native recruitment, and habitat restoration of fallowed farmland.

Task 5.2 – Design Rehabilitation Strategies. Develop Rehabilitation Strategies for Fallowed Farmland based on conceptual models, the range of potential for rehabilitation based on site level measurements across the study area, and project goals.

Task 5.3 – Farmland Fallowing Best Practice Recommendations. Recommendations for Best Practice Language for Fallowing of Farmland to be incorporated into the GSP. Identify gaps in knowledge for future monitoring and study to improve best practice adaptively as land begins to be fallowed for water conservation.

Deliverables:

1. Draft Rehabilitation Strategies and Best Practice for Fallowing
2. Final Rehabilitation Strategies and Best Practice for Fallowing

Task 6 – Farmland Fallowing Prioritization

Task 6.1 – Prioritization Model for Fallowing Farmland Ranked by Benefits of Water Conservation and Rehabilitation Potential. Develop a model for prioritizing farmland for fallowing based on the reduction of water consumption, and likelihood of success of the rehabilitation strategies.

Deliverables:

1. Prioritization of Farmland Fallowing Report
2. Prioritization of Farmland Fallowing Map

Budget Category (e): Interested Parties Outreach/Education

Task 7 – Conduct EWG Meetings. At least two EWG meetings per year will be necessary for the EWG to: receive updates on project progress; receive input from the public and interested stakeholders; provide guidance and input to the Watermaster Technical Consultant and subcontractors; review draft and final project deliverables and make recommendations to the Watermaster Board.

Deliverables: Meeting agendas/packets; PowerPoint presentations; summary meeting notes; and memorandums with recommendations to the Watermaster Board. All EWG meeting deliverables will be posted to the Watermaster's website.

Budget

DWR required budget categories have been included below. Add tasks as applicable; additional rows must be added under the applicable categories to present the cost of each task described in the Work Plan.

Category		(a) Requested Grant Amount	(b) Local Cost Share: Non-State Fund Source*	(c) Total Cost	(d) % Local Cost Share (Col(b))/(Col(c))
(a)	**Project Administration**				
	Task 1. Project Management	$ 50,000		$ 50,000	0%
(b)	**Planning/Design/Environmental**				
	n/a				
(c)	**Construction/Implementation**				
	n/a				
(d)	**Monitoring/Assessment**				
	Task 2. Review and Analysis of Existing Data	$ 84,070		$ 84,070	0%
	Task 3. Existing Fallowed Farmland and Reference Natural Habitat Field Study	$ 218,750		$ 218,750	0%
	Task 4. Brush Pile Wildlife Sand Fence Case Study	$ 220,680		$ 220,680	0%
	Task 5. Farmland Fallowing Rehabilitation Strategies	$ 75,220		$ 75,220	0%
	Task 6. Farmland Fallowing Prioritization	$ 56,620		$ 56,620	0%

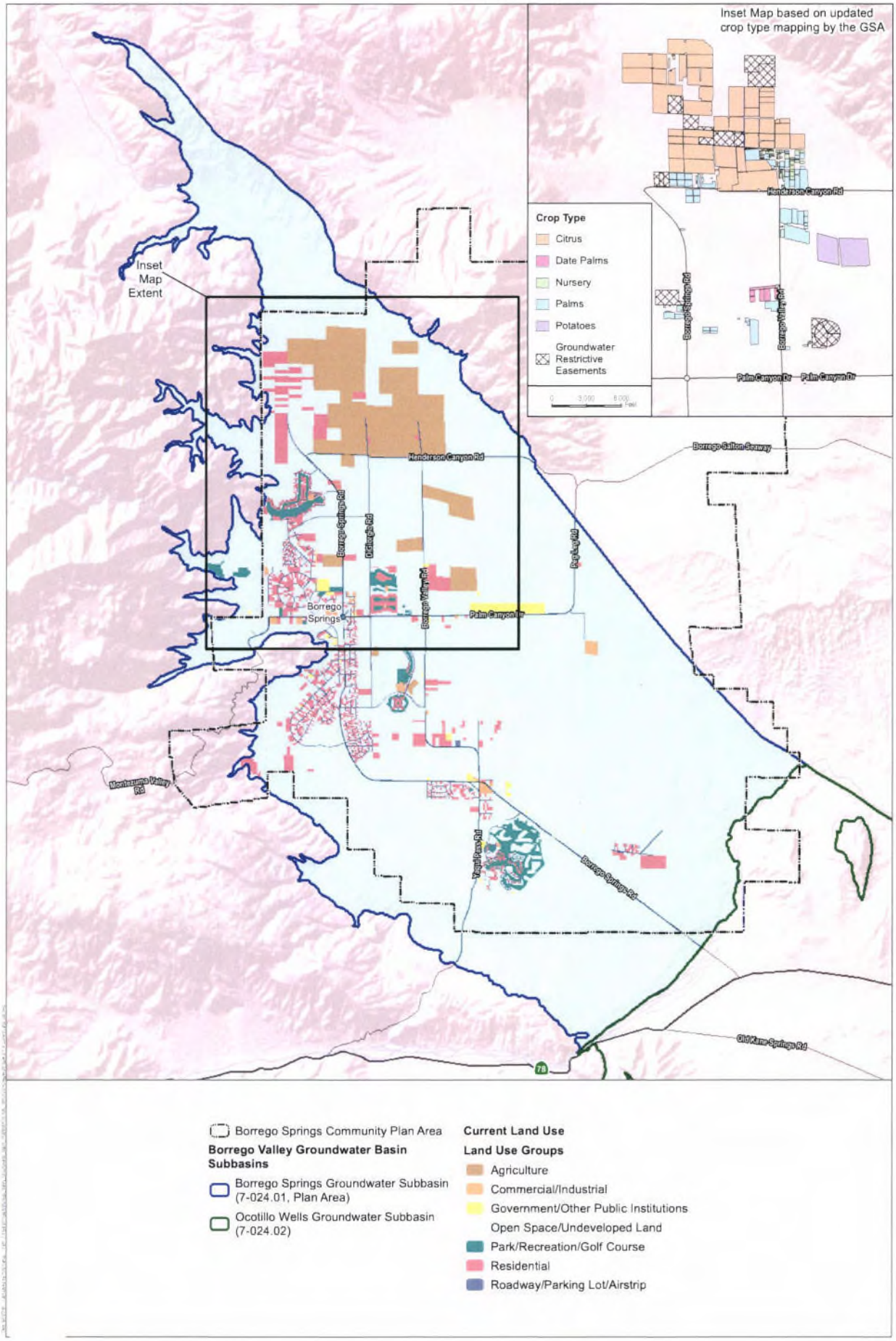
(e)	**Interested Parties Outreach/Public Education**				
	Task 7 – Conduct EWG Meetings	$ 50,000		$ 50,000	0%
(f)	**Grand Total (Sum rows (a) through (e) for each column)**	$ 755,340	0	$ 755,340	0%

* List sources of Local Cost Share funding:

Schedule

The Schedule must be organized in a manner that is consistent with the Work Plan and Budget that will be contained in the Grant Agreement. The Schedule Table presented below is a template that must be completed for each project in the proposal. The required budget categories have been included below. Add additional rows for each task as described in the Work Plan and Budget.

	Categories	Start Date (Earliest Start Date)	End Date (Latest End Date)
(a)	**Project Administration**	**7/1/2022**	**6/30/2025**
	Task 1. Project Management	7/1/2022	6/30/2025
(b)	**Planning/Design/Environmental**		
	n/a		
(c)	**Construction/Implementation**		
	n/a		
(d)	**Monitoring/Assessment**	**7/1/2022**	**6/30/2025**
	Task 2. Review and Analysis of Existing Data	7/1/22	11/30/22
	Task 3. Existing Fallowed Farmland and Reference Natural Habitat Field Study	1/1/23	12/31/24
	Task 4. Brush Pile Wildlife Sand Fence Case Study	1/1/23	12/31/24
	Task 5. Farmland Fallowing Rehabilitation Strategies	1/1/24	6/30/25
	Task 6. Farmland Fallowing Prioritization	1/1/24	6/30/25
(e)	**Interested Parties Outreach/Public Education**	**7/1/2022**	**6/30/2025**
	Task 7 – Conduct EWG Meetings	7/1/2022	6/30/2025

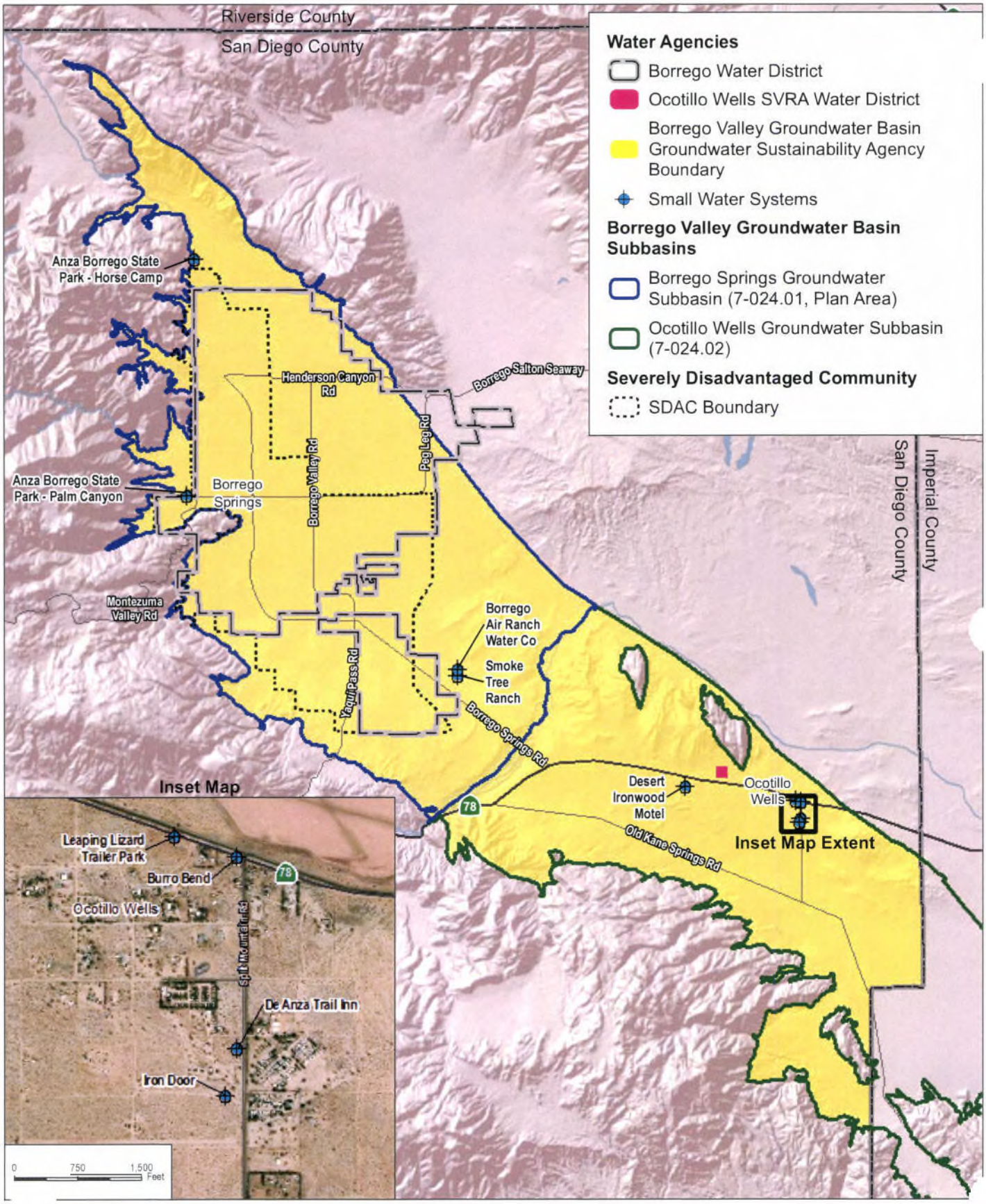


DATUM: NAD 1983. DATA SOURCE: SanGIS 2017; Inset Map Source GSA 2018

January 2020

DUDEK

Figure 2.1-4
Current Land Use
Groundwater Sustainability Plan for the Borrego Springs Groundwater Subbasin



DATUM: NAD 1983. DATA SOURCE: DWR 2015; San Diego County

January 2020

Figure 2.1-2

Water Purveyors within the Groundwater Sustainability Agency Boundary

Groundwater Sustainability Plan for the Borrego Springs Groundwater Subbasin

Technical & Cost Proposal

Concept Feasibility Plan for Rehabilitation of Fallowed Irrigated Agricultural Land in the Borrego Valley Groundwater Basin

Submitted to:

Environmental Working Group of the Borrego Springs Watermaster

c/o West Yost Associates
23692 Birtcher Drive • Lake Forest, CA 92630

January 14, 2020

Submitted by:

LAND IQ

THE UNIVERSITY OF CALIFORNIA · IRVINE

January 14, 2022

Environmental Working Group of the Borrego Springs Watermaster
c/o West Yost Associates
23692 Birtcher Drive
Lake Forest, CA 92630

RE: Letter of Transmittal for a Technical and Cost Proposal—Concept Feasibility Plan for Rehabilitation of Fallowed Irrigated Agricultural Land in the Borrego Valley Groundwater Basin

Dear Members of the Environmental Working Group,

The Land IQ/UCI Team is pleased to submit our proposal to develop a Concept Feasibility Plan (Plan) to improve fallowing practices for the Borrego Valley Groundwater Basin. The cost for the Project is a not-to-exceed price of $728,480.

The Land IQ/UC Irvine Team is uniquely qualified to provide the full range of necessary services to meet the goals of the Plan to reduce water consumption, manage dust, and increase natural habitat value in a sustainable manner. Our areas of expertise include agricultural and natural systems, remote sensing, native plant and land systems management, and ecological restoration. This expertise along with technical skills in plant ecology and physiology, research study design, and data analysis, enables our Team to determine optimal solutions to complex problems in our environment.

Our Team has demonstrated experience planning and successfully developing innovative solutions to challenging environmental problems throughout California. Notable experience for this project includes Land IQ's work developing dust mitigation measures on Owens Lake for the Los Angeles Department of Water and Power, and Statewide Crop Mapping product published to the State Department of Water Resources (DWR) Land Use Viewer, which is a resource for land use and water managers, including Groundwater Sustainability Agencies (GSAs). The new web map is viewable here: https://gis.water.ca.gov/app/CADWRLandUseViewer/.

UC Irvine (UCI) brings experience conducting research, working with land managers, and identifying optimal approaches to restoration and conservation challenges as part of the UCI Environmental Collaboratory. The UCI Environmental Collaboratory integrates three programs at UCI, allowing each program's strengths to work collaboratively to offer excellence in research, education, and land stewardship. These programs are UCI Nature, the Center for Environmental Biology, and the Master's program in Conservation and Restoration Science. Specifically, UCI Nature oversees UCI's natural reserves, including the Steele/Burnand Anza-Borrego Desert Research Center. Over the last few years one of the Environmental Collaboratory projects has included working with Anza Borrego State Park

staff, the Anza Borrego Foundation, and other scientists on the Proposition 1 Sentenac Cienega Ecosystem Restoration Project in Anza Borrego State Park. This project has strengthened working relationships among these organizations, in addition our relationships with the broader community in the area through events that have been offered to inform and involve the public and tribes in the restoration assessment and planning process.

Land IQ staff and UCI have worked together on successful habitat restoration projects, such as the restoration of cactus scrub habitat for the cactus wren on the UCI Nature Reserve. And we are actively integrating monitoring and habitat restoration planning efforts for the Orange County Central-Coastal Natural Community Conservation Plan & Habitat Conservation Plan (NCCP/HCP). We formulate our habitat restoration plans from careful consideration of landscape position, hydrology, and soils to determine the most appropriate habitat enhancement and restoration for each project site based on data analysis of existing information and comprehensive study design in highly complex environments. We generally bring fresh and efficient approaches to planning projects that can result in cost savings without sacrificing ecological function. For example, Land IQ pioneered direct seeding of saltgrass dominated meadows at Owens Lake that provide more efficient use of water to control dust on the lake while balancing open shorebird habitat.

Our Team has the experience to collectively address the scientific and practical challenges of rehabilitating farmland for the benefit of the community and the natural landscape and the professional capacity to carry such a project to completion. Our Team looks forward to working with the Environmental Working Group and its partners on this challenge.

Land IQ is a DGS Certified Small Business (Supplier No. 1748303).

Sincerely,

Mica Heilmann, CPSS
Land IQ
Owner | Soil & Agricultural Scientist

Travis Brooks
Land IQ
Restoration Ecologist

Megan Lulow, PhD
Executive Director
UCI Nature

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Scope of Work

Task 1 — 1 Project Management

Task 2 — Review & Analysis of Existing Data

- 2.1 Kick-off Meeting
- 2.2 Literature Review
- 2.3 Interviews with Key Stakeholders and Experts
- 2.4 Project Geodatabase Creation
- 2.5 Farmland Water Consumption
- 2.6 Review of Historical Data

Task 3 — Field Study

- 3.1 Field Observations of a Time Series of Existing Fallowed Farmland Physical and Biological Conditions
- 3.2 Field Sampling of Reference Natural Habitat to Guide Farmland Restoration Potential

Task 4 — Brush Pile Wildlife Sand Fence Case Study

- 4.1 Identify Manipulative Sites for Sand Fences
- 4.2 Design and Construct Sample Sand Fences
- 4.3 Baseline Observations of Sand Fence Function and Wildlife Value

Task 5 — Farmland Fallowing Rehabilitation Strategies

- 5.1 Develop Conceptual Models for Key Rehabilitation Processes
- 5.2 Design Rehabilitation Strategies
- 5.3 Farmland Fallowing Best Practice Recommendations

Task 6 — Farmland Fallowing Prioritization

- 6.1 Prioritization Model for Fallowing Farmland Ranked by Benefits of Water Conservation and Rehabilitation Potential

Task 7 — 7 Env. Working Group Meetings

Approach

Given the significant overdraft of the Borrego Valley Groundwater Basin (BVGB), the Borrego Water District (BWD) has instituted a 'Water Credit Policy' that encourages the voluntary reduction of water consumption. One of the most significant means of reducing water consumption will be permanently fallowing irrigated agricultural land in the BVGB. There are serious potential and realized risks to the natural desert landscape and the local community from standard fallowing practice, including dust, invasive plants, visual blight, and barriers to the establishment of native habitat.

To manage those risks and to take advantage of opportunities for rehabilitation of the land, we will develop strategies for fallowing farmland in the BVGB, with the following goals:

1) Reduce water consumption
2) Manage dust
3) Increase natural biodiversity and habitat value
4) Maintain or enhance values pertinent to the Anza Borrego State Park mission and Borrego Springs residents (e.g., invasive species control and reducing visual blight)

Rehabilitation or restoration strategies will be the basis for writing best practices for agricultural land fallowing for incorporation into the draft Groundwater Sustainability Plan that is currently in development.

Drawing upon the collective experiences of Land IQ managing dust issues for the Los Angeles Department of Water and Power on Owens Lake, and the Imperial Irrigation District on the Salton Sea, and UCI research on ecological restoration and desert ecology, we have developed a scope of work that will produce spatially explicit strategies for fallowing retired citrus orchard lands based upon the potential for rehabilitation given known environmental constraints.

We will initiate work with gathering and synthesizing existing information resources: utilizing geospatial datasets, the literature, and interviewing industry experts and people knowledgeable in land use management and history in the vicinity of Borrego Springs, including members of the Environmental Working Group. We will build upon this information with ground and drone measurements stratified across major ecological units based on plant community type and physical properties of the landscape. Potential for rehabilitation and methodological approach across these units will be further informed by measurements of life history stages and microsite characteristics critical to plant recruitment and establishment among a series of successional stages or land use states (recently fallowed, fallowed 5-10 years, existing natural reference sites, and existing citrus).

A unique challenge presented by the fallowing of citrus orchards in the BVGB is how to manage dust, make use or dispose of dead trees, and facilitate physical and biological processes important to the development of a natural desert landscape. For this Proposal we have developed a citrus tree removal strategy that is conducive to both dust management and increasing natural habitat value, while minimizing visual blight in the short term. We will conduct a case study to inform the development of best practices and create sample "Brush Pile Wildlife Sand Fences" with cut citrus tree material placed strategically to manage wind/dust patterns. The Sand Fences will serve multiple functions including dust control by reducing soil particle velocity, safe sites for native plant recruitment through moisture retention and shading, and wildlife habitat by providing perches and cover. Furthermore, by not mulching the trees there will be a cost savings and avoidance of altered carbon cycles inconsistent with the native ecosystem, which can impact plant community succession.

The study area will be approximately 3,000 acres and encompass the extent of agriculture in the BVGB and any appropriate adjacent natural open space suitable for reference conditions for habitat restoration

planning. For the farmland that has potential for permanent fallowing, we will develop a prioritization model to assist the BWD in strategic planning to reduce water consumption and rehabilitate the natural landscape.

Task 1. Project Management

1 Project Management. The staffing structure and internal project control procedures will ensure clear lines of communication between the EWG and the technical and scientific staff at Land IQ and UCI. The Project Manager, Travis Brooks, will be the point of contact for EWG communications.

Land IQ has a strong commitment to producing high-quality work products on time and within budget. We accomplish this goal through strong working relationships with our clients, depth of experience, following QA/QC procedures, phased and prioritized project schedules and budget control using up-to-date accounting tools and dedicated budget management staff.

Land IQ's technical document editors, cartographers and geospatial experts are well versed in biological resource management, monitoring and planning. In addition to technical editorial review, deliverables will be reviewed at multiple stages of development by senior staff, including Margot Griswold, Joel Kimmelshue and Megan Lulow, to help safeguard that work is consistent with our legacy of excellent biological resource management and technical analysis.

Task 2. Review and Analysis of Existing Data

2.1 Kick-off Meeting. Kick-off meeting with attendance of key staff.

2.2 Literature Review. Literature review; data mining from existing reports; and written summary of relevant information for report.

2.3 Interviews with Key Stakeholders and Experts. Interview local and subject matter experts.

2.4 Project Geodatabase Creation. Creation of Project Geodatabase for relevant land use and environmental thematic layers, including, but not limited to topography, flow accumulation, soil characteristics, and wind patterns.

2.5 Farmland Water Consumption. Collect water consumption data from BWD; update parcel level Geographic Information System (GIS) data, as necessary; calculate water consumption by parcel and, digitization of new data layers, as necessary.

2.6 Review of Historical Data. Review of historical maps, search of available historical records (e.g., herbarium records and historical accounts); georeference available historical maps and old place name references; synthesize information to describe site specific historical ecology; and include comparison of historical and current vegetation cover densities. Provide guidance on feasible restoration targets.

Task 3. Existing Fallowed Farmland and Reference Natural Habitat Field Study

3.1 Field Observations of a Time Series of Existing Fallowed Farmland. Interviews with past and current BWD staff about experience with fallowed fields, field visits, and data collection of existing conditions.

3.2 Field Sampling of Reference Natural Habitat to Guide Farmland Restoration Potential. Use GIS layers to stratify landscape in the Valley, including the agricultural land into similar geomorphic features for sampling. Based on this stratification and information from the time series of fallowed farmland, determine a sampling design to collect more detailed information on plant cover and "greenness" utilizing drones and multispectral imagery over hundreds of acres. Areas of interest will be visited on the ground to compare vegetation composition and plant physiological data that will further help to identify specific areas and

species most promising for rehabilitation. Sample cover data, analyze and interpret reference conditions to identify a range of reasonable habitat restoration targets for fallowed farmland.

Task 4. Brush Pile Wildlife Sand Fence Case Study

4.1 Identify Manipulative Sites for Sand Fences. Working on land with BWD access agreements, identify one or multiple sites, based on feasibility, for construction of Sand Fences.

4.2 Design and Construct Sample Sand Fences. Working directly with crews in the field, identify the most economical method of construction, and build variations on the design, as appropriate. Sand Fences will be compared to control (no action) and mulched fields with chipped orchard tree material.

4.3 Baseline Observations of Sand Fence Function and Wildlife Value. Take baseline data for comparison to future datasets, and to characterize the habitat and dust control value of the Sand Fences. Utilizing information from Task 2 and initial results from Task 3, establish a pilot study with promising plant species to help understand plant response to Sand Fences.

Task 5. Farmland Fallowing Rehabilitation Strategies

5.1 Develop Conceptual Models for Key Rehabilitation Processes. Based on literature review, geodatabase indices and analysis, field study results, and expert interviews, develop conceptual models of key processes involved in dust, native recruitment, and habitat restoration of fallowed farmland.

5.2 Design Rehabilitation Strategies. Develop Rehabilitation Strategies for Fallowed Farmland based on conceptual models, the range of potential for rehabilitation based on site level measurements across the study area, and project goals.

5.3 Farmland Fallowing Best Practice Recommendations. Recommendations for Best Practice Language for Fallowing of Farmland to be incorporated into the GSP. Identify gaps in knowledge for future monitoring and study to improve best practice adaptively as land begins to be fallowed for water conservation.

Task 6. Farmland Fallowing Prioritization

6.1 Prioritization Model for Fallowing Farmland Ranked by Benefits of Water Conservation and Rehabilitation Potential. Develop a model for prioritizing acquisition of farmland for fallowing based on the reduction of water consumption, and likelihood of success of the rehabilitation strategies.

Task 7. Environmental Working Group Meetings

7 Environmental Working Group Meetings. The Project Manager, Travis Brooks, and other key personnel relevant to the meeting agenda, will attend up to 2 meetings per year, for three years to present findings from each of the tasks in the work plan and seek feedback from EWG members.

Proposal Photo Credits:
https://commons.wikimedia.org/wiki/File:Blooming_desert.jpg
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https://commons.wikimedia.org/wiki/File:Black-throated_Sparrow_(Amphispiza_bilineata)_(8079397370).jpg
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https://commons.wikimedia.org/wiki/File:Large_lemon_orchard_prepared_for_irrigation_in_the_San_Fernando_Valley,_California,_ca.1900_(CHS-1773).jpg
https://commons.wikimedia.org/wiki/File:Abronia_villosa-3.jpg

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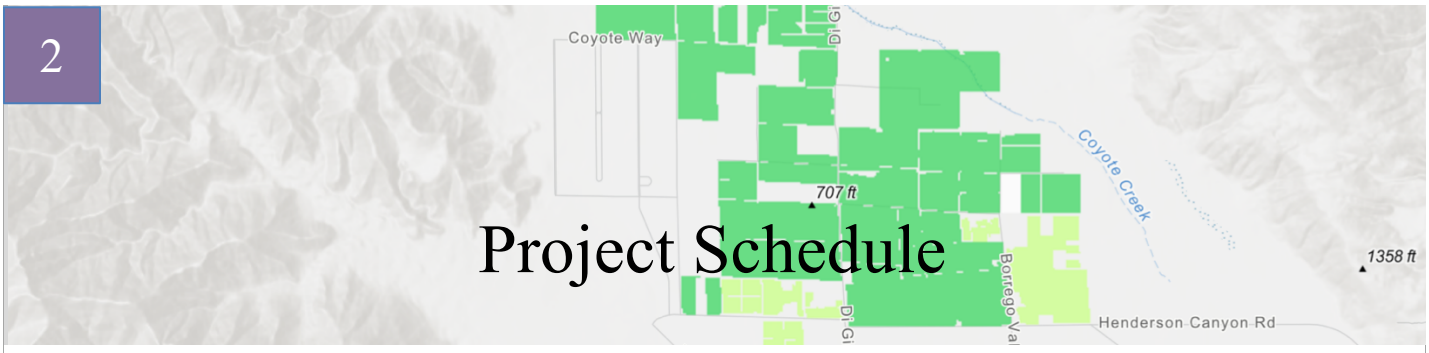

Project Schedule

Task	Approx. Time to Complete in Months	Anticipated End Date	Deliverables
Notice to Proceed (NTP)	---	July 1, 2022	
Task 1. Project Management	36	June 30, 2025	Quarterly Status Updates
Task 2. Review and Analysis of Existing Data	5	Nov. 30, 2022	Kick-Off Meeting Technical Memo Summarizing Existing Data Initial Fallowed Farmland Rehabilitation Opportunities and Prioritization Map
Task 3. Existing Fallowed Farmland and Reference Natural Habitat Field Study	24	Dec. 31, 2024	Technical Report of Field Studies
Task 4. Brush Pile Wildlife Sand Fence Case Study	24	Dec. 31, 2024	Constructed Sample Sand Fences Technical Report
Task 5. Farmland Fallowing Rehabilitation Strategies	18	June 30, 2025	Draft and Final Rehabilitation Strategies and Best Practice for Fallowing
Task 6. Farmland Fallowing Prioritization	18	June 30, 2025	Prioritization of Farmland Fallowing Report and Maps
Task 7. Env. Working Group Meetings	36	June 30, 2025	Participation in 6 Meetings

Project Team Organization

Environmental Working Group
Borrego Springs Watermaster

Travis Brooks | Project Manager
Restoration Ecologist, Land IQ

University of California, Irvine

Ecology & Geosystems

- **Megan Lulow** — UCI Project Manager, Senior Field Ecologist
  - **Sarah Kimball** — Senior Scientist Data Manager, Data Analysis
  - **Field Ecologist** — Anza-Borrego Desert Research Center
    - **Assistant Field Ecologist** — Field Studies and Data Management

Land IQ

Soil Science & Agriculture, Geospatial Analysis, Invasive Species Control Ecological Restoration

- **Margot Griswold** — Senior Restoration Ecologist
  - **Melissa Riedel-Lehrke** — Field Biologist, Invasive Species Control
- **Joel Kimmelshue** — Agricultural Systems and Land Reclamation
  - **Seth Mulder** — Soil Science & Agriculture
  - **Christopher Stall** — Soil Science & Agriculture
- **Zongwu Wang** — Geospatial Analysis & Remote Sensing
  - **Justin Sitton** — Associate Analyst, GIS

FIRM INFORMATION

Land IQ is a specialized land-based (agricultural and natural systems) science and remote sensing firm that pairs scientific knowledge of agronomic, native plant and land systems management with advanced remote sensing technologies, custom modeling, and analytical methods to develop powerful and cost-effective client solutions. The Land IQ team has been operating for over 15 years and some of our firm's select certifications and achievements include:

- California Small Business Enterprise (Micro) #1748303
- Women Business Enterprise #13010130
- Sacramento Area Sustainable Business
- 2017 Professional Services Contractor of the Year – Los Angeles Department of Water and Power – Owens Lake Dust Mitigation Science & Regulatory Team

TECHNICAL EXPERTISE

Land IQ maintains a staff of soil scientists, agronomists, ecologists, and remote sensing and GIS specialists. Our staff average over 14 years professional experience and hold professional certifications including Certified Professional Soil Scientists and Agronomists, Registered Professional Soil Scientists, Biologists, Ecologists, and Certified Professionals in Erosion and Sediment Control Specialists.

The Land IQ Habitat Restoration Group offers a wide range of specialized services in natural resource planning, analysis, restoration, and management. Our achievements in revegetating and reclaiming drastically disturbed landscapes, monitoring for mitigation, and assessing and monitoring exotic species highlight our success in restoration ecology. Land IQ has assessed over 15,000 acres of land for habitat restoration potential and developed specific protocols for resource management plans.

Land IQ has existing working project relationships with a variety of technical experts and universities that may be resources for selected project efforts. We value and welcome cooperative efforts and our relationships include researchers and experts from CSUMB/NASA-Ames, Cal Poly ITRC, UC Davis, Fresno State, UC Irvine, UCLA, USC, and UC Cooperative Extension.

PROJECT EXPERIENCE

- **Owens Lake Dust Mitigation Program –** Land IQ works with the Los Angeles Department of Water and Power to support the design of irrigation, grading and tillage plans, as well as the development of soil preparation and planting specifications specifically for the purpose of comprehensive dust control on the 100 square mile Owens Dry Lakebed. Land IQ specifically develops appropriate native seed mixes and manages the collection of local species to not only control dust but also enhance habitat value of the dust control areas.
- **Upper Chiquita Canyon Habitat Conservation Area Restoration & Management -** Land IQ is responsible for managing a 1,158-acre conservation easement in southern Orange County that supports important populations of California gnatcatchers and coastal cactus wrens. Land IQ staff has identified restoration opportunities on approximately 500 acres of land disturbed by historic dry-land farming and grazing, and developed efficient techniques for large-acreage restoration areas of cactus scrub, coastal sage scrub, native grassland, oak woodland habitats and rare plant species.
- **Stabilization of Exposed Salton Sea Floor** - Land IQ has consulted with the Imperial Irrigation District (IID) to identify strategies for stabilizing vast expanses of fragile, erodible exposed Sea floor by developing concepts for methods such as planting native cover, roughening surfaces to disrupt wind, or combinations of these approaches.

UCI University of California, Irvine

Statement of Qualifications

The Environmental Collaboratory

The UCI Environmental Collaboratory enables three programs at UCI who focus on advancing our understanding and stewardship of natural areas to leverage each other's strengths to provide excellent research and innovative solutions to environmental problems. The Environmental Collaboratory functions through working partnerships to develop knowledge networks, which are opportunities for the academic community, local land managers, policy makers, and conservation organizations to share information and utilize an active adaptive management framework to inform management activities. UCI-Nature facilitates research, education, and public service on the reserves it manages and in partnership with other neighboring land managers. The Center for Environmental Biology (CEB) offers year-long internships in which students are engaged in authentic environmental research and outreach experiences. The Masters in Restoration and Conservation Science Program prepares students to become leaders in the fields of environmental science, conservation, and restoration. Each cohort completes a group capstone project working with a partner sponsor to provide solutions to environmental challenges through an active adaptive management process.

Megan Lulow, Ph.D., Executive Director, UCI-NATURE

Megan oversees operations and programs for UCI-NATURE, which includes two desert reserves, a freshwater marsh, and an upland coastal reserve. She also teaches Restoration Techniques as part of the MCRS curriculum. She has seventeen years of professional experience in natural lands management as an ecologist and program director and has supervised several restoration projects. UCI Nature is part of the UC Natural Reserve System with reserves throughout California. It is central to the mission of these reserves to not only facilitate research and education on its reserves, but to foster connections between the University and the communities surrounding the reserves. Megan has published several studies in peer-reviewed journals with a focus on restoration ecology.

Sarah Kimball, Ph.D., Associate Adjunct Professor & Director, CEB

Sarah is an ecologist with broad interests, specializing in plants. She determines the research agenda for CEB, collaborating with local land managers to develop research projects that evaluate the effectiveness of conservation and restoration efforts. Sarah mentors students through the process of designing and carrying out ecological experiments. Sarah also teaches Restoration Ecology and Ecology, and serve as an academic advisor for the MCRS program. She has published over 35 studies in peer-reviewed journals, several of which focus on restoration ecology.

Selected Projects and Publications

1. Sentenac Cienega Ecosystem Restoration, Anza Borrego State Park, California Department of Parks and Recreation, CDFW Prop 1.
2. Water Management Improvements under Climate Change at the UC Irvine San Joaquin Marsh. Wildlife Conservation Board, Prop 68, Pacific Flyway Conservation.
3. Ecological Preserve Defensible Space Demonstration Project. Natural Communities Coalition, Natural Reserve of Orange County, Natural Communities Conservation Plan.
4. Drought Net Restoration Study: An Examination of the Effects of Seed Source on Restoration Success in a Changing Precipitation Regime
5. Kimball, S., M. Lulow, Q. Sorenson, K. Balazs, Y. Fang, S. Davis, M. O'Connell, and Travis E. Huxman. 2015. Cost-effective ecological restoration. *Restoration Ecology*. 23(6):800-810.
6. Wilson, K., M. Lulow, J. Burger, Y. Fang, C. Anderson, D. Olson, H. Possingham, M. O'Connell, and M.F. McBride. 2011. Optimal restoration: accounting for space, time, and uncertainty. *Journal of Applied Ecology.* 48(3):715-725.
7. Kimball, S., Long, J. J., Ludovise, S., Ta, P., Schmidt, K. T., Halsch, C. A., . . . Nguyen, L. (2019). Impacts of competition and herbivory on native plants in a community-engaged, adaptively managed restoration experiment. *Conservation Science and Practice, 1*(12). doi:10.1111/csp2.122

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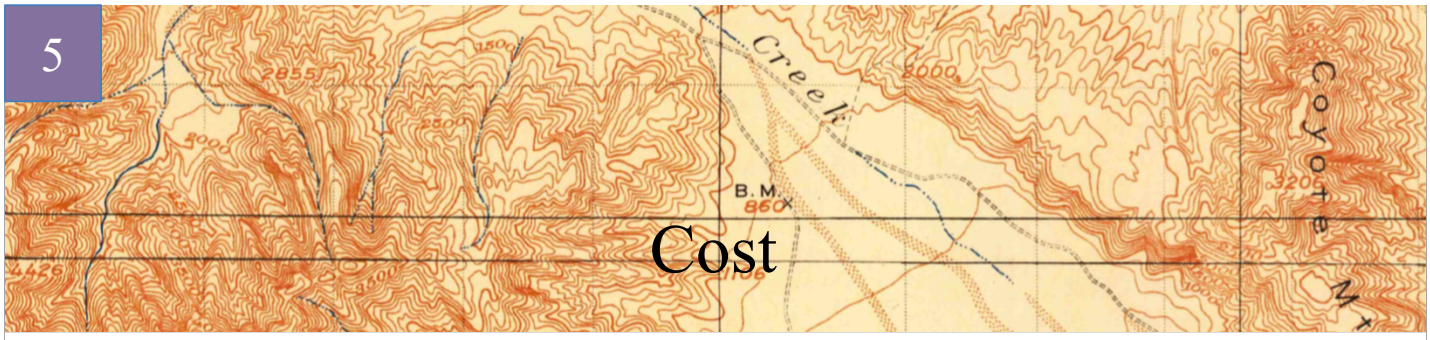

Cost

Land IQ and UCI strive to provide cost-effective professional services. Based upon the agreed upon Scope of Work, we will make efficient use of staff to carry out tasks under the contract.

The total price for Concept Feasibility Plan for Rehabilitation of Fallowed Irrigated Agricultural Land in the Borrego Valley Groundwater Basin Project is a not-to-exceed price of $728,480. Cost by Task is provided in the following table.

Task	Cost by Task
Task 1. Project Management	**$ 50,440**
Task 2. Review and Analysis of Existing Data	**$ 84,070**
Task 3. Existing Fallowed Farmland and Reference Natural Habitat Field Study	**$ 218,750**
Task 4. Brush Pile Wildlife Sand Fence Case Study	**$ 220,680**
Task 5. Farmland Fallowing Rehabilitation Strategies	**$ 75,220**
Task 6. Farmland Fallowing Prioritization	**$ 56,620**
Task 7. Environmental Working Group Meetings	**$ 22,700**
TOTAL	**$ 728,480**

Borrego Springs Youth and Seniors Center, Inc.

PO Box 1362

Borrego Springs, CA 92004

A 501(C)(3) Charitable Nonprofit Corporation

January 17, 2022

To: California Department of Water Resources (DWR)

We understand that the Borrego Springs Watermaster is submitting several Project proposals to include in a grant application “spending plan” for the DWR’s Sustainable Groundwater Management Grant Program under Proposition 68 and the 2021 Budget Act. We understand the Watermaster’s project proposals to be the following:

- **Watermaster Monitoring, Reporting, and Update to the Groundwater Management Plan**. This project covers a broad range of Watermaster tasks that include: conducting monitoring programs (e.g. groundwater-level and water quality); reporting on the monitoring programs; and updating the Groundwater Management Plan as required by the DWR. The activities included in this project will help the Watermaster comply with the Judgment and the Groundwater Management Plan, and will support the sustainable management of the Borrego Springs Groundwater Subbasin.

- **Biological Restoration of Fallowed Lands**. This project is recommended by the Watermaster’s Environmental Working Group. The project will develop information to guide the use of “biological restoration” as a technique to mitigate the potential adverse impacts associated with the fallowing of lands that is expected to occur within the Subbasin due to future reductions in groundwater pumping needed to achieve sustainable groundwater management. Reducing the potential for airborne dust emissions and enhancing habitat are the primary objectives of this project.

- **Groundwater Dependent Ecosystems (GDE) Monitoring Program**. This project is also recommended by the Watermaster’s Environmental Working Group. This project is designed to determine if the historical GDEs within the Subbasin (particularly the Mesquite Bosque in the Borrego Sink) are dependent on the regional aquifer of the Subbasin, or not. The results of this project could be used to update and improve the Groundwater Management Plan to protect the environmental uses of groundwater in the basin.

These projects will have multiple benefits to the severely disadvantaged and underrepresented community of Borrego Springs:

- The community’s water supply is solely dependent on the groundwater basin. These projects will help to ensure that the groundwater basin remains an affordable, high-quality source of water for the community.

- The Watermaster was officially formed in April 2021. Expenses to conduct Watermaster activities are relatively new costs that are ultimately funded by the residents and rate payers within the community. The grant funding will help offset the new costs and provide financial relief to our severely disadvantaged community.

- A primary driver of the economy in Borrego Springs is ecotourism associated with the Anza-Borrego State Park, dark and clear night skies, and the beautiful flora and fauna of the region. These projects will help maintain or enhance the physical and biological environment within the community, and thereby support economic activity within Borrego Springs.

We support the projects described in this letter, and the Watermaster’s efforts to achieve sustainable groundwater management in Borrego Springs.

Daniel Wright,

Board President