10-10-2011

Walking Box Ranch Planning and Design Quarterly Progress Report: Period ending October 10, 2011

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Executive Summary

- UNLV participated in two meetings with BLM regarding updating the current Task Order, obtaining a two-year no-cost extension for the two Assistance Agreements, and to develop the future WBR operating agreement between BLM and UNLV.
- Weather station progress included: 1) A study to review the recent developments in various building envelope components and their effects on the energy sustainability of a building has been completed and published, 2) Ground-source heat pump (GSHP) Vs Photovoltaic (PV) technology: A detailed comparison of ground source heat pumps and photo voltaic has been initiated, 3) A study to identify the most suitable and economically viable PV technology/technologies for applicability at the ranch buildings has begun, 4) Weather data for more than one complete year are now available and analysis indicates that the ranch may not be suitable for wind energy, but the area receives high insolation, thus the ranch constitutes a very good solar resource, and 5) The weather station is being modified to be grid-power independent, allowing it to be installed anywhere in the ranch as the construction of the new buildings start. All parts have been purchased and the unit will soon be installed.
- Progress continues in developing pamphlets describing plants and animals native to the area and also describing the local geology.
- Progress on the Multimedia Field Guides project that will develop and disseminate a modern geological and environmental field guide included testing of seven podcast-style modules by Clark County School District teachers. Based on feedback from the teachers some of the modules are being edited or revised and a physical map to accompany the podcasts is being developed.
- Blacksmith shop tools acquired by Rex Bell, Jr., have been donated to UNLV by Dorothy Bell. These items will be curated by a new UNLV history professor who specializes in museum curation, and a grad class currently under her direction.
• An application to CCSD to conduct a Professional Development workshop on Environmental Literacy at the ranch has been approved. The workshop will be held in March 2012. The workshop will offer one professional development credit and be directed at middle and high school teachers who teach earth science, life science, and environmental science.
• UNLV is nearing completion in work with a security consultant to identify best methods for securing the site when in operation.

Summary of Attachments

• Weather_Station_Progress_070511.doc
• Multimedia_Progress_100111.doc
• Low_Light_Photography_072611.doc

Planning and Design, and Construction Phase Items:

1. Provide BLM with consultation and advise to assist the BLM in defining the scope of work for the design of this project. The UNLV shall coordinate with the University departments and schools and act as the academic focal point for information relative to the design of the Science and Training Center for arid land studies.

   • UNLV has participated in the following meetings with BLM during the past quarter:
     o Met with BLM July 27 to discuss the future operating agreement
     o Met with BLM September 6 to discuss the future operating agreement
   • UNLV prepared agendas for all meetings and prepared and distributed meeting notes that included action items for all meetings.

2. Participate in all phases of scoping and planning meetings and meetings with the BLM’s planners, architects, and contractors for the design and development of the Walking Box Ranch as a Science, Research, and Training Center and Museum for the study of arid lands and development of the Headquarters as a Museum and interpretive center. The UNLV’s participation is to provide input to the BLM relevant to the specific educational and research goals of the project.

   • UNLV provided input to the architects on revised drawings for several buildings that were modified to meet the reduced construction budget.

3. Assist BLM in developing the environmental assessment by providing technical input and review of the draft environmental assessment.

   • UNLV was not involved in any environmental assessment activities this quarter. However, UNLV is aware that BLM is working on completing this
assessment so that geotechnical investigations at the ranch can begin on schedule. UNLV is available to help as needed.

4. Provide technical and academic advice to BLM in the development of the museum facilities, by conducting research into the historic records of the ranch and providing recommendations about the appropriate interpretive and environmental education programs that may be presented at the ranch.

- Additional research is now underway to prepare brochures describing birds and amphibians that are native to the ranch locality and also the local geology.
- Dorothy Bell, widow of Rex Bell, Jr., has donated all of the blacksmith equipment to UNLV for use in exhibits at the ranch. This equipment has been collected and is now being stored in the storage trailer at the ranch.
- Deirdre Clemente, a new faculty member in the history department at UNLV, who specializes in curating museum collections will have her graduate class work on curating these items.
- Weather Station: The final objective of the project is to assess the sustainable (renewable and/or energy efficient) energy potential of the Walking Box Ranch.

Accomplishments:

- Building envelope study: A study to review the recent developments in various building envelope components and their effects on the energy sustainability of a building is continued during this quarter. The results of the study are presented as a technical review paper for publication in the journal- Renewable and Sustainable Energy Reviews. The paper has been accepted and published. This article strives to make an exhaustive technical review of the building envelope components and respective improvements from an energy efficiency perspective.
  

- Ground-source heat pump (GSHP) Vs Photovoltaic (PV) technology: The intention of this task is to compare GSHP and PV for their potential as a cost effect renewable energy option for applications at WalkingBox Ranch buildings. In this quarter a complete, more detailed analysis is initiated. This analysis should be able to bring out the economic and environmental benefits of using either/both of these technologies. A few of the available federal and regional incentive programs for both the technologies will also be discussed in this study. A ground-coupled and PV mathematical modeling is carried out using MATLAB program. To authenticate the findings, a technical journal publication is planned.

- Solar PV performance and economic studies: Prospective net zero (electric) energy buildings at the Walking Box Ranch can be achieved by
applying solar PV systems. Thus, the focus of this task is to identify the most suitable and economically viable PV technology/technologies for applicability at the ranch buildings.

- **WBR weather station website monitoring, maintenance and continuous meteorological data collection:** The intent of this task is to ensure unhindered collection of meteorological data at the WBR location and analyze the data to infer important conclusions on the renewable energy potential at the WBR geographic location. The meteorological data collection was initiated in June, 2010 and had been continuous since then. Thus, a set of meteorological data which is collected for more than one complete year is available now. The following are some of the important conclusions that are easily inferred from the collected data. Average wind speeds of less than 5 miles/hour are available at the ranch. Areas with annual average wind speeds around 6.5 m/s or higher at a height of 80 meters are generally considered to have suitable wind resource for wind farms. Thus, this area might not be a good prospective location for wind power generation. However, there have been new generation wind turbines that can operate at lower wind speeds. A detailed analysis considering all different types of wind turbines is required to arrive at a concrete conclusion. Insolation is high in summer months compared to the winter months. Also, the total annual average global horizontal irradiation is 2163.62 kWh/m². This suggests that geographic location of WBR has a very good solar resource and can be harnessed by using appropriate solar technologies such as photovoltaics, evacuated glass tube solar water heaters, etc.

- **Power-autonomous weather station:** The target of this task is to develop a grid-power independent weather station, allowing it to be installed anywhere in the ranch as the construction of the new buildings start. The auxiliary power system components such as photovoltaic module, battery system, charge controller, sun-protection enclosure, wiring and the other necessary fittings have been sized and all the components have been procured for installation at the WBR. See Attachment Weather_Station_Progress_070511.doc for quarterly progress.

- **UNLV is funding an education project to develop and disseminate a modern geological and environmental field guide designed to engage and educate students and the public at the Walking Box Ranch field station in southern NV.** A series of geospatially-enhanced pod/vodcast-style field guides is being developed in which participants at the ranch observe the landscape while guided by audio tracks, remote sensing imagery, and digital animations. Aimed at the inexperienced user, the employment of hand-held devices will provide users the ability to tailor their experience and view information about remote sensing, geology, and geospatial technology. The Nevada State College Cooperative Teacher Improvement Program teacher education workshop field tested the modules and provided feedback. The modules worked for focused field-trip activities but were too complex for a public user and are thus being reconfigured. Some of the podcasts are being edited and re-
recorded and a hand-held physical map of the module will be developed. A finished product will be produced for public release by December 2011. See Attachment Multimedia_Progress_100111.doc for quarterly progress.

- UNLV is funding a project: “Documenting Walking Box Ranch using Night/low light techniques”. The project will use low light/night photography to isolate the location and artifacts from harsh daytime lighting. The goals are to provide documentary images of the location for education and research projects related to the ranch as well as to provide images suitable for outreach and fundraising for the site. Photography visits are schedule for Oct 21-22 for low light photography owing to the near new moon, and November -9 for full moon and full day shooting. See attachment: Low_Light_Photography_072611.doc.

5. Contribute technical and educational-based assistance to the BLM for the BLM’s consideration during construction development for the Science and Training Center and Museum as it relates to the future operations of these facilities as education centers.

- UNLV has continued to hold internal security meetings with a security consultant to finalize planned security details for the ranch. He is currently refining his security recommendations in consultation with UNLV IT and security personnel.
- PLI educators (Brody and Page) have been approved by the CCSD for a Professional Development workshop on Environmental Literacy. The workshop will be directed at middle and high school teachers who teach earth science, life science and environmental science. The workshop, which will be held at WBR in March 2012, will last about 2.5 days, will require 15 hours of contact time, and will offer one professional development credit.

6. Provide input and feedback to the BLM during the construction of the Field Research and Training Center and the Museum.

- The project is not under construction at this time.

Phase 1 Deliverables:

1. Provide a Facility and Future Needs Alignment Report that will identify the types of future research and training programs that will be conducted at Walking Box Ranch Field Research and Training Center and Museum. The report will also include a matrix that aligns predicted future activities with facility, construction, furnishing, and equipment needs.

- This report will be prepared after BLM has approved of the recently received business plan and after a conceptual plan for operation of the ranch after construction is identified by BLM and UNLV. UNLV and BLM are now meeting to define a workable future operations plan.
2. **Assist the BLM in developing a Preservation Plan for Existing Structures on the Headquarters Parcel of the Walking Box Ranch.**

   - UNLV continues to work with project architects by providing information and responses to questions about the facilities to determine how best to renovate the historic buildings for preservation.
   - UNLV has recently had conversations with BLM to express the serious nature of the continuing water damage to the ranch house. We agreed in September to hold a meeting at the ranch house in the near future to address this issue.

3. **Provide a Business Plan detailing anticipated future research, training, and other use goals and a financial plan for reaching those goals. The Business Plan should also describe income and operations and maintenance costs.**

   - Since the construction budget has been determined to be smaller than previously recognized, buildings are in the process of being scaled back and it is not yet certain what will and will not be constructed. As soon as BLM determines what buildings will be built, the business plan will be modified. January 2012 is the target date for a revised business plan.

**Phase 2 Deliverables:**

1. **Prepare a Project Development Plan that reflects UNLV’s Business Plan. The Project Development Plan should refine the anticipated research, residential training activities, and Museum use; identify recommended new facilities and renovations; outline construction; and plan center management (print and PDF).**

   - The project development plan, which is essentially the future operating plan, is now under discussion between UNLV and BLM. This quarter we met July 27 and September 6 to produce a conceptual operating plan that meets the needs of both BLM and UNLV. An agreement that details future operations will follow.

2. **Assist the BLM in creating a detailed Work Plans for each aspect of project development such as, but not limited to, existing building use, new construction, interpretive programs, and center management, based upon the Comprehensive Master Plan and Preservation Plan.**

   - The detailed work plans will be a component of the future operating plan, which is now being discussed in meetings between UNLV and BLM.

**Phase 3 Deliverables:**
1. Assist in the development of Facilities Design Drawings according to the recommendations of the Comprehensive Master Plan generated by the SAT project, in conformance with existing significant architectural features and historical attributes of the property, in a fashion responsive to LEED goals to the extent funding permits, and to meet all property easements.

   - UNLV continues to respond to questions by the architectural and engineering team as they work to complete their respective drawings.

2. Assist in the development of Facilities Design Drawings for the preservation of facilities according to the recommendations of the Comprehensive Master Plan and Preservation Plan in conformance with historical and architectural attributes of the buildings and property, and to meet all property easements.

   - UNLV continues to respond to questions by the architectural and engineering team as they work to complete their respective drawings.

Phase 4 Deliverables (During Construction):

1. Provide the BLM consultation and advice during construction to help the BLM ensure the construction meets the goals of the project.

   - The project is not under construction at this time.

2. Provide the BLM consultation and advice as needed during renovation of preserved facilities, to help the BLM ensure that the renovation meets goals of projects and is in accordance with historical restoration requirements and according to approved designs.

   - Project buildings are not being renovated at this time. However, UNLV is working with BLM to plan future renovations as needed.

Phase 5 Deliverables:

1. Assess and identify furnishings and equipment based upon facility needs; provide the BLM information related to furnishings and equipment for new and preserved facilities so that the BLM can procure these items, within project funding under this Cooperative Assistance Agreement. The UNLV may provide additional furnishings and equipment outside of this Agreement at the UNLV’s sole discretion.

   - UNLV is working with Dorothy Bell, widow of Rex Bell Jr., about possibly acquiring original ranch furnishings now in her possession that would be suitable to exhibit at the ranch.
   - Dorothy Bell has recently donated all of the blacksmith shop equipment to UNLV for use in the exhibits.
## SUMMARY OF PROJECT PLAN

*Walking Box Ranch – Planning and Design*

<table>
<thead>
<tr>
<th>Year One Deliverables</th>
<th>Percent Complete as October 10, 2011</th>
<th>Plan for Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Planning and Design:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Provide BLM with consultation and advice in defining the scope of the design of the Science and Training Center.</td>
<td>60%</td>
<td>Continue to consult and advise BLM in the scope of design of the training center</td>
</tr>
<tr>
<td>2. Participate in all phases of scoping and planning team meetings for the design and development of WBR as a Science, Research, and Training Center and Museum.</td>
<td>60%</td>
<td>Continue to participate in scoping and planning of the Museum and the training center.</td>
</tr>
<tr>
<td>3. Assist BLM in developing the environmental assessment process with technical input and review of drafts.</td>
<td>80%</td>
<td>Continue to work with EDAW and BLM on the Environmental Assessment process, scheduled to be complete later summer/early fall 2009, but now delayed until 2011.</td>
</tr>
<tr>
<td>4. Provide technical and academic advice to BLM in development of the museum facilities with recommendations of interpretive and environmental programs for presentation at the Ranch.</td>
<td>60%</td>
<td>Continue to provide technical and academic advice for interpretive and environmental programs.</td>
</tr>
<tr>
<td>5. Contribute technical and educational-based assistance to the BLM for the BLM’s consideration during construction development for the Science and Training Center and Museum as it relates to the future operations of these facilities as education centers.</td>
<td>60%</td>
<td>Continue to contribute technical and educational-based assistance to the BLM for the Science and Training Center and Museum.</td>
</tr>
<tr>
<td>6. Provide input and feedback to BLM during the construction of Field Research and Training Center and the Museum.</td>
<td>0%</td>
<td>Project is not under construction.</td>
</tr>
<tr>
<td><strong>Phase 1 Deliverables:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Provide a Facility and Future Needs Alignment Report that will identify the types of</td>
<td>20%</td>
<td>Work with faculty at UNLV to identify future research and training programs and incorporate</td>
</tr>
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</table>
future research and training programs that will be conducted at Walking Box.

<table>
<thead>
<tr>
<th>Phase 2 Deliverables:</th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>1. Prepare a Project Development Plan that reflects UNLV’s Business Plan. The Project Development Plan should refine the anticipated research, residential training activities, and Museum use.</td>
<td>0%</td>
<td>This will be done when the business plan is completed and in conjunction with preparation of the operating agreement.</td>
</tr>
<tr>
<td>2. Assist the BLM in creating a detailed Work Plans for each aspect of project development based upon the comprehensive master plan and preservation plan.</td>
<td>10%</td>
<td>This will begin as BLM needs to develop the work plans.</td>
</tr>
</tbody>
</table>

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<tr>
<th>Phase 3 Deliverables:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Assist in the development of Facilities Design Drawings according to recommendations of the comprehensive master plan generated by the SAT projects.</td>
<td>60%</td>
<td>We will continue to work with BLM, AECOM and AECOM subcontractors to assist with design of the facilities</td>
</tr>
<tr>
<td>2. Assist in the development of facilities design drawings for the preservation of facilities according to the recommendations of the Comprehensive Master Plan and Preservation Plan.</td>
<td>60%</td>
<td>We will continue to work with BLM, AECOM and AECOM subcontractors to assist with design of the facilities</td>
</tr>
</tbody>
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<tr>
<th>Phase 4 Deliverables (During Construction):</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Provide the BLM consultation and advice during construction to help the BLM ensure the construction meets the goals.</td>
<td>0%</td>
<td>The project is not yet in construction.</td>
</tr>
</tbody>
</table>
2. Provide the BLM consultation and advice as needed during renovation of preserved facilities, to meet goals of the project. | 0% | The project is not in construction.

<table>
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<th>Phase 5 Deliverables:</th>
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1. Assess and identify furnishings and equipment based upon facility needs; provide the BLM information related to furnishings and equipment for new and preserved facilities so that the BLM can procure these items, within project funding under this Cooperative Assistance Agreement. | 30% | We are in the process with Rex Bell Jr. of completing an inventory or items he will donate or sell to be exhibited in the planned museum at the ranch. Most equipment and furnishing planning will occur during the construction period.

Submitted by: 

Margaret N. Rees, 
Principal Investigator

10/11/11 
Date
ATTACHMENTS
Walking Box ranch project - quarterly progress report (July 2011 – September 2011)

Project Goal

The final objective of the project is to assess the sustainable (renewable and/or energy efficient) energy potential of the Walking Box Ranch. This led us to divide the project into various tasks. The following is a brief report on the progress of each task in this quarter.

Task 1: Building Envelope studies

Goal: The prospective Walking Box Ranch (WBR) buildings are expected to be highly energy efficient and the building envelope plays a very important role in improving the energy efficiency of any building. Thus, the objective of this task is to study the passive energy efficiency strategies through improvements in the building envelopes and document them for applicability at WBR buildings.

Progress: A study to review the recent developments in various building envelope components and their effects on the energy sustainability of a building is continued during this quarter. The results of the study are presented as a technical review paper for publication in the journal- Renewable and Sustainable Energy Reviews. The paper has been accepted and published. This article strives to make an exhaustive technical review of the building envelope components and respective improvements from an energy efficiency perspective. Different types of energy efficient walls such as Trombe walls, ventilated walls, and glazed walls are discussed. Performance of different fenestration technologies including aerogel, vacuum glazing and frames are presented. Advances in energy efficient roofs including the contemporary green roofs, photovoltaic roofs, radiant-transmittive barrier and evaporative roof cooling systems are discussed. Various types of thermal insulation materials are enumerated along with selection criteria of these materials. The effects of thermal mass and phase change material on building cooling/heating loads and peak loads are discussed. Application of thermal mass as an energy saving method is more effective in places where the outside ambient air temperature differences between the days and nights are high. Air tightness and infiltration of building envelopes are discussed as they play a crucial role in the energy consumption of a building. Energy efficiency approaches sometimes might not require additional capital investment. For example, a holistic energy efficient building design approach can reduce the size of mechanical systems compensating the additional cost of energy efficiency features. The journal publication of this technical article means an authentic endorsement from the technical community regarding our literature research findings.

Progress Index: completed, with successful journal publication. The details of the published journal article are as follows:

(http://www.sciencedirect.com/science/article/pii/S1364032111002504)
Task 2: Ground-source heat pump (GSHP) Vs Photovoltaic (PV) technology

Goal: The intention of this task is to compared GSHP and PV for their as a cost effect renewable energy option for applications at WalkingBox Ranch buildings.

Progress: In the previous quarter a preliminary analysis that compares the life cycle costs of both the technologies (the ground-source heat pump technology and the PV technology) was completed. This preliminary report concludes that through upgrading to GSHP technology from air-source heat pump technology, a monetary savings of $0.15 to $0.19 per unit kWh electrical energy saved is highly probable for a life-time operation of 25 years. Similarly, electrical energy can be generated at $0.158/kWh to $0.198/kWh by solar photovoltaic technology with a life time operation of 25 years.

In this quarter a complete, more detailed analysis is initiated. This analysis should be able to bring out the economic and environmental benefits of using either/both of these technologies. A few of the available federal and regional incentive programs for both the technologies will also be discussed in this study. A ground-coupled and PV mathematical modeling is carried out using MATLAB program. To authenticate the findings, a technical journal publication is aimed.

Progress Index: Satisfactory and preliminary report is complete, initiated a further thorough study.

Task 3: Solar PV performance and economic Studies

Goal: Prospective net zero (electric) energy buildings at the Walking Box Ranch can be achieved by applying solar PV systems. Thus, the focus of this task is to identify the most suitable and economically viable PV technology/technologies for applicability at the ranch buildings.

Progress: A technical paper on experimental comparison and economic analysis of various PV technologies (in the desert-type climatic conditions of south-western USA) was presented at the ASME 2011 Energy Sustainability Conference which was held during August 7-10, 2011. The daily performance results from the experimental test setup of various PV panels were used in this paper. In the same paper, an economic model is also developed in an effort to compare various market available PV technologies. The model performs a life cycle cost analysis of different PV technologies for a user-defined installed power and PV life expectancy (generally 25 years or more).

Progress Index: Completed, with a technical conference presentation and publication.

Task 4: WBR weather station website monitoring, maintenance and continuous meteorological data collection.

Goal: The intent of this task is to ensure unhindered collection of meteorological data at the WBR location and analyze the data to infer important conclusions on the renewable energy potential at the WBR geographic location.

Progress: The meteorological data collection was initiated in June, 2010 and had been continuous since then. Thus, a set of meteorological data which is collected for more than one complete year is available now. The following are some of the important conclusions that are easily inferred from the collected data.
Figure 2. Wind speed variation over more than a year period (6/2/2010 to 9/28/2011) at the WBR geographic location.

Figure 2 shows the wind speeds at the WBR. As shown, average wind speeds of less than 5 miles/hour are available at the ranch. Areas with annual average wind speeds around 6.5 m/s or higher at a height of 80 meters are generally considered to have suitable wind resource for wind farms. Thus, this area might not be a good prospective location for wind power generation. However, there have been new generation wind turbines that can operate at lower wind speeds. A detailed analysis considering all different types of wind turbines is required to arrive at a concrete conclusion.

Figure 3 shows the daily averaged solar insolation (in MJ/m²) on a horizontal surface. As shown, the insolation is high in summer months compared to the winter months. Also, the total annual average global horizontal irradiation is 2163.62 kWh/m². This suggests that geographic location of WBR has a very good solar resource and can be harnessed by using appropriate solar technologies such as photovoltaics, evacuated glass tube solar water heaters etc.
Figure 3. Solar insolation (MJ/m$^2$) received at WBR location over more than a year period (6/2/2010 to 9/28/2011)

The continuous collection of meteorological data is ensured with occasional troubleshooting. In this quarter, there were no technical errors that caused the interruption of automated data collection and scheduling. Timely update of the database by using Microsoft SQL Server Integration Services (SSIS) is monitored at regular intervals. The RTMC web server and the reporting web server that displays the ‘Live data’ and ‘Historic data’ respectively are being maintained.

**Progress Index:** Satisfactory and on-going with continuous meteorological data collection.

**Task 5: Power-autonomous weather station**

**Goal:** The target of this task is to develop a grid-power independent weather station, allowing it to be installed anywhere in the ranch as the construction of the new buildings start.

**Progress:** The auxiliary power system components such as photovoltaic module, battery system, charge controller, Sun-protection enclosure, wiring and the other necessary fittings have been sized and all the components have been procured for installation at the WBR. A schematic of the proposed system is shown in Figure 5.

**Progress Index:** Satisfactory and awaiting installation approval.
Figure 5. Schematic of the grid-independent solar power system
Progress Report for Walking Box Ranch Research and Education Grant 10/01/2011

Title: Multimedia Field Guides for Public Engagement at Walking Box Ranch, Mojave Desert

PI:
Dr. Scott Nowicki
Assistant Professor in Residence
UNLV Department of Geoscience
702-895-1239
scott.nowicki@unlv.edu

Project Dates:
July 1, 2011 - Sept 30, 2011

Results:
Since the Nevada State College Nevada Cooperative Teacher Improvement Program teacher education workshop field tested the first set of modules at Walking Box Ranch in late June, we have received feedback from the participants. Information obtained from the teachers from both observations and a survey indicate that these materials are appropriate for focused field-trip activities, but that they require too much guidance for a public user to walk up and use the module easily. Thus, we are in the process of reconfiguring the modules for future public use.

Since the beginning of July, the undergraduate effort has ended, and the PI and graphic artist have been discussing details in reconfiguring the modules, building more graphic content, and hosting the media in an easily-accessible web based format. Our plan is to edit and re-record some of the podcasts, and develop a hand-held physical map of the module in the fall, to provide a finished product for public release by December 2011.
Proposal for Walking Box Ranch Research and Education Grant

Title
Documenting Walking Box Ranch using Night/low light techniques

PI
J. Kilker, Ph.D.
Associate Professor, Emerging Technologies
UNLV Greenspun School of Journalism and Media Studies
E-mail: kilker@unlv.nevada.edu
Voice mail: 702/895-3729 (UNLV)
Web: http://faculty.unlv.edu/jkilker

Summary
This project documents the Walking Box Ranch (the ranch house, grounds, and artifacts) over the course of three visits. The project will use low light/night photography to isolate the location and artifacts from harsh daytime lighting. The goals for the project are to provide documentary images of the location for education and research projects related to Walking Box Ranch, as well to provide images suitable for outreach and fundraising for the site.

Requested budget
$4,118

Proposed dates
August 2011-April 2012
Introduction

Night and low light photography (Waterman, 2008) is increasingly being used to document and develop esthetically “atmospheric” imagery of historical locations (Paiva, 2003, 2008). Despite more than a century of what is now termed “night photography,” starting with sophisticated work by the Vargas Brothers from Peru (Keimig, 2010), recent advances the quality of portable digital cameras (Johnson, 2006) have led to a resurgence of the genre.

Night and low light photography are ideal for isolating and documenting infrastructure and exterior artifacts because its emphasis is managing lighting conditions. Most desert photography at locations such as the Walking Box Ranch is taken during “high noon” conditions, during which the overhead sun reduces shadows and creates a flat impression of the landscape. This time period is popular because most people avoid travelling in the desert at night or staying on location overnight, and because low light photography is technically challenging. Without preparation and appropriate equipment, photography in low light conditions often results in blurry or (with a flash) harsh replicas of daytime lighting conditions; in either case the results are not professional.

My research involves documenting technological systems and exploring digital imaging under extreme conditions (Kilker, 2009). The applied portion of this work involves documenting historic land use in the Mojave Desert, shown in this proposal’s example images in Appendices A and B.

Objectives

PI will document Walking Box Ranch under night/low light conditions for the following purposes:

- **The images will document the ranch house, grounds, and artifacts.**
  - The images will document points of view not available to casual visitors, including outside normal hours and from unusual perspectives.
- **The images will emphasize aspects of the location relevant to historical/interpretative themes (for example, remoteness, isolation, and environmental exposure).**
  - The images will be made available for multiple uses for supporting Ranch activities, including reports, proposals and new media applications, prints for sale at a Ranch gift shop for fund raising, and artwork for display at Ranch and facilities.
Methods

My field methods incorporate two different imaging techniques, depending on location and intent. The first is a neutral documentary style, with point of view perspectives during daylight conditions, often with high dynamic range (HDR) imaging to cope with the broad contrasts in desert lighting and close-ups to emphasize texture or evidence of accretion or erosion. (See images A1 and A2 in Appendix A for examples of HDR imaging under desert conditions.) The second technique, low-light and nighttime photography that uses moonlight and light painting, avoids the harsh daytime lighting in the desert and reduces visual clutter. (See images 3 and 4 below for an example of visually isolating a building in the desert at night.) In these cases, I document but do not modify the locations.

The specific process, used in the Mojave National Preserve and at the Desert Studies Center at Zzyzx for the example photographs, involves several steps. First I research the location to pre-visualize shots and perspectives, and to identify possible dangers that are likely to be increased in the darkness (barbed wire, dangerous structures, ant hills, holes in the ground, nails and broken glass, and so on). Then, if possible, I stay overnight on location at least once in order to capture the environmental light at dusk (when color temperature is higher/redder) and dawn (when it shifts lower/bluer, as seen in image A6), as well as moonlight and star trails. Staying on location also allows sufficient time for the long exposures needed for low light photography. Each exposure takes several minutes with an additional period needed to capture sensor noise data for later processing and to allow the sensor to cool down. I also use the extra time to repeat some photographs with different lighting to emphasize specific structural elements or flora, which allows me to later combine the lighting layers (see image A4 with its distinctive dashed star trail, indicating the merging of three images).

Additional steps involve returning to the location under different conditions. Visiting several times allows me to document how the location has changed using repeat photography—what has been repaired or damaged, what has been painted, or how the vegetation has changed. (I document how I take the photos and preserve image metadata to make it easier to duplicate the perspective in future shots.) For example, using repeat photography at the Halloran Summit location off of Interstate 15 (see image A7) demonstrates its social function, even though the building is abandoned, because of evidence about how sofas, evidence of bonfires, graffiti and reading materials change over time. In other words, there’s evidence of it being a surprisingly social location when viewed over the long term, but it does not appear to be shared by many people at any single point in time.

For each visit, I closely monitor weather conditions and rise/set times for the moon and sun. The ideal conditions are low wind speeds (this minimizes camera and subject movement and reduces airborne dust), low temperatures (reduces animal activity and sensor noise), and minimal cloud cover (to allow maximum moon and star light). Even in the desert I need to take humidity into account: Any recent rains make for interesting reflections and mist (see image A6 below), but the associated moisture can cause equipment problems if temperatures drop below the dew point.
The attached photographs show these methods used to document the following themes in the Mojave desert:

- Capturing the “feeling” of the open spaces (see images A4 and A8 for examples of isolated buildings).
- Capturing the boundaries of the buildings that we normally expect to be solid and secure (see images A5, A6, and A7).
- Capturing the textures and contrasts between the natural decay and human-influenced wear (see image A5).
- Capturing the notable presence of an artifact in an unexpected location, such as an isolated building, a sofa outdoors, a glassless window frame, a detached car door, or an underground vent popping out of the desert (see image A7).

**Plan for Walking Box Ranch**

Based on a preliminary visit to Walking Box Ranch to take photos, I propose visiting two or three additional times. During my first field visit, I identified several locations for further photography, as well as a few photography challenges (such as the orange cast of the bright security lights). Based on this first visit, I have planned several new lighting techniques to assist with the Walking Box Ranch project. Appendix B demonstrates several of the tests and lessons learned from them during the preliminary visit. Based on these results, I plan to document additional artifacts and perspectives. The sodium vapor security lighting and main house (both interior and exterior) proved most challenging, as shown in images B1 and B2. Images B3-B8 are examples of techniques that will work well for this location.

The results from the initial visit indicate I need full access to exterior and interior locations to set up shots and proper lighting, as well as the capability to control the security lighting. The sodium vapor security lighting created stark shadows with orange highlights on exterior shots, and made capturing buildings with the night sky as a background very challenging. Depending on the weather, I would plan visits during both a full and new moon periods for different conditions. The weather was not ideal during the test visit, as seen in image B1, in which the wind (see the flag blur on the lower right) and cloud cover result in visual distractions.

I welcome suggestions for additional artifacts and locations of special note that should be documented at the ranch.

**Deliverables**

I will deliver approximately 50-75 images in documentary style showing specific locations and artifacts. Locations will be selected by Julian Kilker with feedback and additions by Walking Box Ranch staff. Images B1-B2 are examples of this style.
Additionally, I will deliver approximately 25 aesthetically appealing images emphasizing themes covered in this proposal for fundraising use. Images B5-B8 are examples of this style.

High resolution images (approximately 5k by 3k pixels; specific dimensions depend on technique and cropping) will be provided in large TIFF and high quality JPEG formats for high quality publishing, along with low and medium high quality resolution JPEG formats suitable for web, e-mail, new media applications, and postcard printing. If desired, Black and White versions of selected images will also be provided (as shown in image B6, this involves “redeveloping” for black and white, not just removing color).

I can make recommendations for printing images at low cost, ranging from about $2 (for 8x12in) to $10 (for 20x30in) per image, and at about $0.40-$0.50 per postcard.

Dissemination of results

After funding this project and receiving the deliverables, the Walking Box Ranch Project could freely use the results of this documentary work for public display and reproduction, in print and electronic form, with appropriate source/author acknowledgement. I would retain the ability to use and present selected images from this project in exhibitions and reproductions of my collected work, as well as in online portfolios and in my research (such as in publications) and course materials (such as in the classroom, in workshops, and for my distance education classes). These presentations would, to the best of my ability, not to be used in connection with any person, entity, product, or service that could adversely affect the Ranch and its image or that would be inappropriate for a federal agency or public research university, which includes alcoholic beverages; cigarettes or other tobacco products; sexually oriented products or services; religious products; political parties or organizations; gaming or games of chance; or firearms.
Budget

In terms of support, I would welcome a grant to cover travel, PI expenses, and equipment costs. I estimate this to be $4,130 for this project.

*Estimated budget*

- **Travel expenses**
  - **$198. Car mileage expenses for 360 miles for three field work visits (includes the initial test visit).** 120 miles roundtrip x 3 trips x .55 cents/miles.
  - **$120. Overnight expenses for staying in the Walking Box bunkhouse for three visits (includes the initial test visit), including one night with an additional field assistant.** 4 person-nights at $30/person/night.
  - **$50. Food (dinner, breakfast and misc supplies such as hand warmers)**

- **Materials and supplies**
  - **$350 (inc. camera/lighting depreciation, batteries, and desert “harsh condition” lens and camera body cleaning)**

- **PI Time**
  - **$3400. Included actual 3 days shooting, research, planning and preparation before each trip, and post-processing of images, and arranging display and reproduction.**

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**Total = $4,118**
References


Appendix A: Examples of Julian Kilker’s photography at desert locations

*Image 1: Daytime high dynamic range imaging emphasizes land use (at China Ranch).*

*Image 2: Daytime high dynamic range imaging captures shaded rust and corrosion (at Kelso).*
Image 3: Night photograph emphasizing building (and the rare passing vehicle) in desert context.

Image 4: Night photography using moonlight and selective lighting (yellow and purple) to highlight both the building’s isolation and its open interior (at Cima).
Image 5: Internal and external lighting used to highlight building’s damage (at Zzyzx).

Image 6: Dawn lighting (steely blue, with an emerging pink of sunrise) and mist emphasize features of this abandoned spa structure (at Zzyzx).
Image 7: Repeat photography at this location documents its apparent social nature (at Halloran Summit).

Image 8: Exterior of same Halloran Summit location in moonlight shows proximity to Interstate 15.
Appendix B: Examples of Julian Kilker’s test shoots at initial Walking Box visit

Image B1: Night sky test reveals sodium vapor lighting and perspective challenges.

Image B2: Ranch house interior reveals fluorescent lighting and contrast challenges.
Image B3: Exterior, daylight, discarded tools.

Image B4: Interior, diffuse LED lighting, discarded tools in barn.
Image B5: Entrance gate, light painting test, reversed image for sign legibility.

Image B6: Entrance gate, sodium vapor lighting removal and BW test, reversed image.
Image B7: Wagon chassis and cholla, ground LED lighting test, evening.

Image B8: Wagon wheel details, artifact isolation test, evening. (Note security light in background.)