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Ms. Nora Flynn
Colorado Water Conservation Board
1313 Sherman Street, Room 718
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August 29th, 2022

Dear Nora,

Thank you for your continued support of the Bessemer Project, and specifically CWCB's funding of the Bessemer Project ATM Economic Impact Analysis. Since receiving our Notice to Proceed back in March 2020, Palmer has made excellent progress on the project. As you will see below, we have completed the project in its entirety, including: Task 1 – Scenario Development and Task 2 – Economic Impact Evaluation, and Task 3 – Digestion and Visualization.

I have detailed each Task below and have attached a final invoice for our work to date that corresponds with our submitted budget.

Please let me know if you have any questions about the completed work or the invoice. I am always happy to answer questions and discuss the project with you.

Many thanks to you and the CWCB for supporting such a cutting-edge water conservation project.

Regards,

Rebecca Jewett
President & CEO

PROGRESS REPORT: Bessemer Project ATM Economic Impact Analysis

CMS Number: 149211
Encumbrance Number: POGG1 2020-2927

The following is a summary of the specific work tasks that have allowed our team to complete the tasks as described in our original grant application. We are proud of the extensive work we have completed and are thrilled to have completed this complex undertaking.

TASK 1 – SCENARIO DEVELOPMENT - COMPLETE

- Acquired all original Bessemer Project data sets and other data sets relevant to the project
- Updated existing Bessemer Project analyses in preparation for developing scenarios and assessing economic impacts.
- Reviewed all data from a quality control standpoint and update the Water Quality Management Zones analysis.
- Built on existing analyses by examining crop data in order to: (a) assess cropping trends over time; (b) establish a representative baseline crop data set (as field crops change from year to year, a representative data set will be required to develop baseline and anticipated scenarios); and (c) examine crop data trends in light of updated Bessemer Project analyses, including (i) Farmland Protection Priority, (ii) Dry-Up Consideration Index, (iii) Conservation Priority Index, and (iv) Water Quality Management Zones.
- Examined cropping trends and patterns as they relate to CPAs and DCAs.
- Conducted a review of 1041 Permit regulations pertaining to "efficient utilization of water" requirements. This review:
    - assessed/compared code from the 16 Colorado counties with efficient utilization requirements;
    - catalogued issued permits and compare permit requirements for dry-up contexts;
    - determined ranges of permitting process costs for applicants and counties;
    - catalogued mitigation payment requirements;
    - assessed counties' opinions regarding whether or not payments were sufficient;
    - evaluated the intended vs. actual impact of both mitigation payments and supporting actions.
- The work referenced above was phased by: (1) collecting/reviewing code and issued permits; and (2) interviewing land use/planning staff regarding cost/process considerations.
- Reviewed dry-up mitigation practices and benchmarks from elsewhere.
- Acquired Colorado IMPLAN data and develop a methodology to account for: (a) specialty/high-value crops not represented by the data set; and (b) variation in production yields (affecting direct and indirect economic impacts) not implicit to the data set.
- Developed economic output models for baseline (existing) and anticipated (total Pueblo Water dry-up) scenarios utilizing cropping assessments from the updated analyses. This work was facilitated by the development of a tabular dataset that assesses crop values per acre based on anticipated yields for: (a) CPAs; (b) DCAs; and (c) neither CPAs nor DCAs (in other words: high, low, and average yields). This dataset was developed from a review of existing crop/sales data and interviews with farmers and other subject matter experts (SME). Both the data and methodology were presented to retained experts for feedback.

TASK 2 – ECONOMIC IMPACT EVALUATION - COMPLETE

- Met with Bessemer farmers and other knowledge experts who helped to define the parameters of an optimized production scenario on Bessemer lands. An optimized production scenario establishes what robust but realistic growth in the farm economy would look like--initially without a 30% reduction in production ground. The ultimate purpose of this exercise was to establish the opportunity cost of (i.e., the lost opportunity precipitated by) dry-up and to inform alternative dry-up scenarios.
- Identified optimization case studies applicable to the Bessemer Project--places in the United States where agricultural economies are growing due to strategic efforts and investments in the face of land conversion pressures. Interviewed additional subject matter experts in order to identify those case studies most applicable to Pueblo County.
- Developed an optimized production scenario, taking into account stakeholder and expert input and applicable case studies from elsewhere. Used this information to develop an optimized production scenario map.
- Developed an IMPLAN model that assesses economic outputs under the optimized production scenario, which determined the economic impacts (i.e., the opportunity cost) of dry up under the optimized scenario.
- Assembled a stakeholder and SME group (drawing from the list of stakeholders and SMEs engaged in optimization design) to review the baseline, anticipated, and optimized production scenarios and economic assessments run under each scenario. Solicited feedback on optimization scenario design, and then engaged stakeholders in the development of alternative dry-up scenarios. Alternative dry-up scenarios examined specific dry-up and production strategies that can mitigate the economic impacts of dry-up and improve future agricultural outputs. These alternatives included a combination of:(1) dry-up substitutions to preserve CPAs with higher production potential; (2) a shift to higher value crops; and (3) alternatives to permanent dry-up such as rotational fallowing or irrigation retention through efficiencies (e.g., drip/sprinkler). Some alternative land uses (e.g., compatible residential/commercial development) were considered. Alternative dry-up scenarios were driven by two primary considerations: (1) economics; and (2) land use.
- Established alternative dry-up scenarios, taking into account stakeholder input and expert feedback.
- Assessed economic outputs under the alternative dry-up scenarios using the IMPLAN model, then compared the economic impacts (i.e., the opportunity cost) of dry-up under the alternative scenarios to the baseline and anticipated scenarios.
- Re-assembled the stakeholder and subject matter expert group to review the alternative scenarios and economic assessments run under those scenarios. Solicited feedback in order to further refine and/or create variations on the scenarios.
- Finalized the optimized and alternative scenario maps, develop variations on alternative scenarios as indicated, and continued to advance the dashboard visual strategy and product development considerations.

TASK 3 – DIGESTION AND VISUALIZATION – COMPLETE

- Developed a report outline that incorporated research findings, scenarios, and economic impact assessments.
- Developed a series of visual product templates for report purposes. These products/templates established design criteria for maps, illustrations, and graphs, as well as the decision support

system dashboard that showcases projected economic impacts under different trajectories of change.

- Established a website design template. The website template showcases report findings by: (a) providing a video introduction to/overview of the project to include photos, video, and GIS story mapping animations; (b) presenting scenarios/findings in static and interactive formats; and (c) creating a DSS dashboard in concert with scenario presentations.
- Developed a functional website to house the DSS dashboard and supporting information.
- Developed a final report and created a comprehensive set of visual products for use in the report and/or in subsequent publications/presentations.

With the completion of the work products detailed above, I am eager to share with you the final deliverables: *The Economic Impacts of Dry-Up on Colorado's Bessemer Ditch, A scenario-based analysis with a review of 1041 requirements, best management practices, and mitigation policy recommendations* and a graphic illustration of the *Decision Support System (DSS)* (both attached). I would be happy to answer any questions and provide a walk-through on of the DSS website and its functionality at your request.