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Fairfax, VA 22031
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Nebraska Community Foundation, Inc.
PO Box 83107
Lincoln, NE 68501-3107
TIN# 47-0769903

PLATTE RIVER RECOVERY IMPLEMENTATION PROGRAM

Contract between Nebraska Community Foundation, Inc., Platte River Recovery Implementation Program, and Dewberry Consultants, LLC.

Platte River Basin Seasonal Streamflow Forecasting Using Hydroclimatic Indices, Phase III

1. Parties. This Contract is made and entered into by and between the Nebraska Community Foundation, Inc. (“**Foundation**”) of Lincoln, Nebraska, representing all signatories to the Platte River Recovery Implementation Program (“**Program**”) and Dewberry Consultants LLC (“**Consultant**”). The following persons are authorized to represent the parties through this Contract: Diane Wilson of the Foundation, Dr. Jerry Kenny of the **Program**; and Jerry Sparks (Administrative) and Stuart Geiger (Technical) of the **Consultant**.

2. Purpose of Contract. The purpose of this Contract is to allow the **Foundation**, acting as the fiscal agent for the Governance Committee (GC) of the **Program**, to retain the services of the **Consultant** to render certain technical or professional services hereinafter described in connection with an undertaking to be financed by the **Program**, and to delegate the Executive Director’s Office (“**ED Office**”) through its Executive Director or his designee the authority to administer this Contract.

TERMS AND CONDITIONS

3. Term of Contract and Required Approvals. This Contract is effective when all parties have executed it and all required approvals have been granted. The term of this Contract is from March 1, 2016 through January 31, 2017. The services to be performed under this Contract will commence upon receipt of authorization to proceed. All services shall be completed during this term.

If the **Consultant** has been delayed and as a result will be unable, in the opinion of the **Program**, to complete performance fully and satisfactorily within this Contract period, the **Consultant** may be granted an extension of time, upon submission of evidence of the causes of delay satisfactory to the **Program**.

4. Payment.

A. Reimbursement of Expenses. The **Program** agrees to pay the **Consultant** an amount based on the approved budget and hourly rate and reimbursable expenses price schedules depicted in Exhibit B, attached to this Contract and incorporated by reference as part of this Contract, for the services described in Exhibit A, attached to this Contract and incorporated by reference as part of this Contract. Total payment under this Contract for Task 1 shall not exceed fifty-one thousand, dollars (\$51,000.00).



B. Project Budget. The Project budget for each task included in Exhibit A is as follows:

<u>Task</u>	<u>Estimated Cost</u>
Task 1 - Explore Physical Mechanisms	\$18,537
Task 2 - Determine Feasibility of Earlier Forecasts	\$7,644
Task 3 - Develop South Platte Precipitation Forecast	\$16,358
Task 4 - Present HCI Forecast at WAC Meeting	\$7,017
Other Direct Costs	\$543
TOTAL Project Cost	\$50,099

The amounts for each task are estimates only, but are not to be exceeded unless authorized in writing by the **Program**. The Contract total amount is controlling. Payment shall be made directly to the **Consultant**. The **Consultant** shall maintain hourly records of time worked by its personnel to support any audits the **Program** may require. Billing reports shall be submitted no more often than monthly for activities and costs accrued since the last billing report. A brief project progress report summarizing project activities in the billing period must be submitted with each billing.

C. Billing Procedures. The **Consultant** shall send billing reports for services performed for the various tasks outlined in Exhibit A to the **ED Office** (address included below). The Program's Executive Director, upon receiving the billing report, will approve the bill and submit the bill for payment. The submittal for payment will then be reviewed by the Signatory Parties of the Program who will advise the **Foundation** of approval. The **Foundation** will make payment of these funds directly to the **Consultant** within 30 days of notice of approval by the Signatory Parties. Payments of bills are due within 60 days after the billing date of the Consultant.

Billing Point of Contact (Program):

Dr. Jerry F. Kenny, Executive Director
Platte River Recovery Implementation Program
Headwaters Corporation
4111 4th Avenue, Suite 6
Kearney, Nebraska 68845
Phone: (308) 237-5728
Fax: (308) 237-4651
Email: kennyj@headwaterscorp.com

D. Money Withheld. When the **Program** has reasonable grounds for believing that the **Consultant** will be unable to perform this Contract fully and satisfactorily within the time fixed for performance, then the **Program** may withhold payment of such portion of any amount otherwise due and payable to the **Consultant** reasonably deemed appropriate to protect the **Program** against such loss. These amounts may be withheld until the cause for the withholding is cured to the **Program's** satisfaction or this Contract is terminated pursuant to Section 8U. Any amount so withheld may be retained by the **Program** for such period as it may deem advisable to protect the **Program** against any loss. This provision is intended solely for the benefit of the **Program** and no person shall have any right against the **Program** by reason of the **Program's** failure or refusal to withhold monies. No interest shall be payable by the **Program** on any amounts withheld under this provision. This provision is not intended to limit or in any way prejudice any other right of the **Program**.



E. Withholding of Payment. If a work element has not been received by the **Program** by the dates established in Exhibit A, the **Program** may withhold all payments beginning with the month following that date until such deficiency has been corrected.

F. Final Completion and Payment. The final payment shall be made upon acceptance of the final report and receipt of the final billing.

5. Responsibilities of Consultant.

A. Scope of Services. The **Consultant** shall perform the specific services required under this Contract in a satisfactory and proper manner as outlined in Exhibit A. If there is any conflict between this Contract and the provisions of the specific requirements of Exhibit A, the specific requirements shall prevail.

B. Personnel. All of the services required hereunder will be performed by the **Consultant** or under its supervision, and all personnel engaged in the work shall be fully qualified and shall be authorized, licensed, or permitted under state law to perform such services, if state law requires such authorization, license, or permit.

C. Subcontracts.

(i) Approval Required for Subcontracts. Any subcontractors and outside associates or consultants required by the **Consultant** in connection with the services, work performed or rendered under this Contract will be limited to such individuals or firms as were specifically identified in the proposal and agreed to during negotiations or are specifically authorized by the **Program** during the performance of this Contract. The **Consultant** shall submit a list of the proposed subcontractors, associates or consultants; the scope and extent of each subcontract; and the dollar amount of each subcontract prior to Contract execution to the **Program** for approval. During the performance of the Contract, substitutions in or additions to such subcontracts, associates, or consultants will be subject to the prior approval of the **Program**. The **Program** approval of subcontractors will not relieve the **Consultant** from any responsibilities outlined in this Contract. The **Consultant** shall be responsible for the actions of the subcontractors, associates, and subconsultants.

(ii) Billings for Subcontractors. Billings for subcontractor, associates or subconsultants services will not include any mark up. The subcontract costs will be billed to the **Program** at the actual costs as billed to the **Consultant**. Subcontract costs will be documented by attaching subcontractor billings to the **Consultant's** billing submittals.

(iii) Copies of Subcontracts. The **Consultant** shall provide to the **Program** copies of each subcontractor contract immediately following execution with the subcontractor. All subcontracts between the **Consultant** and a subcontractor shall refer to and conform to the terms of this Contract. However, nothing in this Contract shall be construed as making the **Program** a party of any subcontract entered between the **Consultant** and a subcontractor.

D. Requests from the Program. The **Consultant** shall be responsible and responsive to the **Program** and the **ED Office** in their requests and requirements related to the scope of this Contract. If any of the request or requirements result in a change of scope schedule, and/or budget, the contract will be modified accordingly by mutual consent to reflect such changes.



E. Presentation of Data. The **Consultant** shall select and analyze all data in a systematic and meaningful manner so as to contribute directly in meeting the objectives of the Project, and shall present this information clearly and concisely, in a professional manner.

F. Draft of Final Report. The **Consultant** shall present the **Program** a draft of the final report covering all work elements of the Project including maps, charts, conclusions and recommendations prior to the publication of any final report and no later than the date specified in Exhibit A. Draft Reports will be provided to the Program in Microsoft Word format for distribution and review. The **Program** will respond with written comments to the **Consultant** as soon as possible. The **Consultant** will address the comments of the **Program** in the final report. Final Reports will be provided to the Program in Microsoft Word and PDF format.

G. Project Completion Report. A final project completion report in the form described in Exhibit A shall be submitted to the **Program** by the date specified in Exhibit A.

H. Reports, Maps, Plans, Models and Documents. One (1) copy of maps, plans, worksheets, logs, field notes and other reference or source documents prepared for or gathered under this Contract, and one (1) copy of each unpublished report prepared under this Contract shall be submitted to the **Program**. If the **Consultant** writes or uses a computer program or spreadsheet as a part of this project, the **Consultant** shall submit to the **Program** for approval all proposed program names and data formats prior to beginning work on that task. All data shall be submitted to **Program** in written and digital forms with the final report. Digital media shall be labeled by the **Consultant** to provide sufficient detail to access the information on the media. All user manuals shall be submitted by the **Consultant** to **Program** providing complete documentation of computer programs developed under this Contract. The user manual shall also specify the source code language and the type of computer equipment necessary to operate the program(s). Any programs or computer software generated as a part of this Contract shall be the sole property of the **Program**.

I. Inspection and Acceptance. All deliverables furnished by the Consultant shall be subject to rigorous review by the Program's **ED Office** prior to acceptance.

6. Responsibilities of the Program.

A. Designated Representative. The Executive Director of the **Program** shall act as the **Program's** administrative representative with respect to the **Consultant's** service to be performed under this Contract and shall have complete authority to transmit instructions, receive information, and interpret and define the **Program's** policies and decisions with respect to services covered by this Contract.

B. Data to be Furnished to the Consultant. All information, data, reports, and maps as are available to the **Program** and necessary for the carrying out of the Scope of Services set forth herein shall be furnished to the **Consultant** without charge and the **ED Office** shall cooperate with the Consultant in the carrying out of the project.

C. Review Reports. The **ED Office** shall examine all studies, reports, sketches, opinions of the construction costs, and other documents presented by the **Consultant** to the **Program** and shall promptly render in writing the **Program's** decisions pertaining thereto within the time periods specified in Exhibit A.

D. Provide Criteria. The **ED Office** shall provide all criteria and full information regarding its requirements for the project.



186 **7. Special Provisions.**

187 **A. No Finder's Fees.** No finder's fee, employment agency fee, or other such fee related to
188 the procurement of this Contract shall be paid by either party.

189 **B. Publication.** It is understood that the results of this work may be available to the
190 **Consultant** for publication and use in connection with related work. Use of this work for publication and
191 related work by the **Consultant** must be conducted with prior authorization from the **Program's** Technical
192 Point of Contact.

193 **C. Publicity.** Any publicity or media contact associated with the **Consultant's** services and
194 the result of those services provided under this Contract shall be the sole responsibility of the **Program**.
195 Media requests of the **Consultant** should be directed to the Director of Outreach and Operations in the **ED**
196 **Office**.

197 **D. Monitor Activities.** The **Program** shall have the right to monitor all Contract related
198 activities of the **Consultant** and all subcontractors. This shall include, but not be limited to, the right to
199 make site inspections at any time, to bring experts and consultants on site to examine or evaluate completed
200 work or work in progress, and to observe all **Consultant** personnel in every phase of performance of Contract
201 related work.

202 **E. Kickbacks.** The **Consultant** certifies and warrants that no gratuities, kickbacks or
203 contingency fees were paid in connection with this Contract, nor were any fees, commissions, gifts, or other
204 considerations made contingent upon the award of this Contract. If the **Consultant** breaches or violates this
205 warranty, the **Program** may, at its discretion, terminate this Contract without liability to the **Program**, or
206 deduct from the Contract price or consideration, or otherwise recover, the full amount of any commission,
207 percentage, brokerage, or contingency fee.

208 **F. Office Space, Equipment, and Supplies.** The **Consultant** will supply its own office space,
209 equipment, and supplies.

210 **8. General Provisions.**

211 **A. Amendments.** Any changes, modifications, revisions or amendments to this Contract
212 which are mutually agreed upon by the parties to this Contract shall be incorporated by written instrument,
213 executed and signed by all parties to this Contract.

214 **B. Applicable Law/Venue.** The construction, interpretation and enforcement of this Contract
215 shall be governed by the laws of the State of Nebraska. The Courts of the State of Nebraska shall have
216 jurisdiction over this Contract and the parties.

217 **C. Assignment/Contract Not Used as Collateral.** Neither party shall assign or otherwise
218 transfer any of the rights or delegate any of the duties set forth in this Contract without the prior written
219 consent of the other party. The **Consultant** shall not use this Contract, or any portion thereof, for collateral
220 for any financial obligation, without the prior written permission of the **Program**.

221 **D. Audit/Access to Records.** The **Program** and any of its representatives shall have access
222 to any books, documents, papers, and records of the **Consultant** which are pertinent to this Contract. The
223 **Consultant** shall, immediately upon receiving written instruction from the **Program**, provide to any
224 independent auditor, accountant, or accounting firm, access to all books, documents, papers and records of
225 the **Consultant** which are pertinent to this Contract. The **Consultant** shall cooperate fully with any such



independent auditor, accountant, or accounting firm, during the entire course of any audit authorized by the Program.

E. Availability of Funds. Each payment obligation of the Program is conditioned upon the availability of funds and continuation of the Platte River Recovery Implementation Program. If funds are not allocated and available for the continuance of the services performed by the Consultant, the contract may be terminated by the Program at the end of the period for which the funds are available. The Program shall notify the Consultant at the earliest possible time of the services which will or may be affected by a shortage of funds. No penalty shall accrue to the Program in the event this provision is exercised, and the Program shall not be obligated or liable for any future payments due or for any damages as a result of termination under this section. This provision shall not be construed to permit the Program to terminate this Contract to acquire similar services from another party.

F. Award of Related Contracts. The Program may undertake or award supplemental or successor contracts for work related to this Contract. The Consultant shall cooperate fully with other contractors and the Program in all such cases.

G. Certificate of Good Standing. Consultant shall provide Certificate of Good Standing verifying compliance with the unemployment insurance and workers' compensation programs prior to performing work under this Contract.

H. Compliance with Law. The Consultant shall keep informed of and comply with all applicable federal, state and local laws and regulations in the performance of this Contract.

I. Confidentiality of Information. All documents, data compilations, reports, computer programs, photographs, and any other work provided to or produced by the Consultant in the performance of this Contract shall be kept confidential by the Consultant unless written permission is granted by the Program for its release.

J. Conflicts of Interest

(i) Consultant shall not engage in providing consultation or representation of clients, agencies or firms which may constitute a conflict of interest which results in a disadvantage to the Program or a disclosure which would adversely affect the interests of the Program. Consultant shall notify the Program of any potential or actual conflicts of interest arising during the course of the Consultant's performance under this Contract. This Contract may be terminated in the event a conflict of interest arises. Termination of the Contract will be subject to a mutual settlement of accounts. In the event the contract is terminated under this provision, the Consultant shall take steps to insure that the file, evidence, evaluation and data are provided to the Program or its designee. This does not prohibit or affect the Consultant's ability to engage in consultations, evaluations or representation under agreement with other agencies, firms, facilities, or attorneys so long as no conflict exists.

(ii) A conflict of interest warranting termination of the Contract includes, but is not necessarily limited to, representing a client in an adversarial proceeding against the Platte River Recovery Implementation Program, its signatories, boards, commissions or initiating suits in equity including injunctions, declaratory judgments, writs of prohibition or *quo warranto*.

K. Entirety of Contract. This Contract, consisting of ten (10) pages, Exhibit A, consisting of five (5) pages, Exhibit B, consisting of one (1) page, represents the entire and integrated Contract between the parties and supersedes all prior negotiations, representations, and agreements, whether written or oral.



284
285 **L. Force Majeure.** Neither party shall be liable for failure to perform under this Contract if
286 such failure to perform arises out of causes beyond the control and without the fault or negligence of the
287 nonperforming party. Such causes may include, but are not limited to, acts of God or the public enemy,
288 fires, floods, epidemics, quarantine restrictions, freight embargoes, and unusually severe weather. This
289 provision shall become effective only if the party failing to perform immediately notifies the other party of
290 the extent and nature of the problem, limits delay in performance to that required by the event, and takes
291 all reasonable steps to minimize delays. This provision shall not be effective unless the failure to perform
292 is beyond the control and without the fault or negligence of the nonperforming party.

293
294 **M. Indemnification.** The **Consultant** shall indemnify and hold harmless the **Foundation**, the
295 **Program**, the **ED Office**, and their officers, agents, employees, successors and assignees from any and all
296 claims, lawsuits, losses and liability arising out of **Consultant's** failure to perform any of **Consultant's** duties
297 and obligations hereunder or in connection with the negligent performance of **Consultant's** duties or
298 obligations, including but not limited to any claims, lawsuits, losses or liability arising out of **Consultant's**
299 malpractice.

300
301 **N. Independent Contractor.** The **Consultant** shall function as an independent contractor for
302 the purposes of this Contract, and shall not be considered an employee of the **Program**, **Foundation** or **ED**
303 **Office** for any purpose. The **Consultant** shall assume sole responsibility for any debts or liabilities that may
304 be incurred by the **Consultant** in fulfilling the terms of this Contract, and shall be solely responsible for the
305 payment of all federal, state and local taxes which may accrue because of this **Contract**. Nothing in this
306 Contract shall be interpreted as authorizing the **Consultant** or its agents and/or employees to act as an agent
307 or representative for or on behalf of the **Foundation** or the **Program**, or to incur any obligation of any kind
308 on the behalf of the **Foundation** or the **Program**. The **Consultant** agrees that no health/hospitalization
309 benefits, workers' compensation and/or similar benefits available to **Foundation** or **Program** employees will
310 inure to the benefit of the **Consultant** or the **Consultant's** agents and/or employees as a result of this Contract.

311
312 **O. Notices.** All notices arising out of, or from, the provisions of this contract shall be in
313 writing and given to the parties at the address provided under this Contract, either by regular mail, facsimile,
314 e-mail, or delivery in person.

315
316 **P. Notice and Approval of Proposed Sale or Transfer of the Consultant.** The **Consultant**
317 shall provide the **Program** with the earliest possible advance notice of any proposed sale or transfer or any
318 proposed merger or consolidation of the assets of the **Consultant**. Such notice shall be provided in
319 accordance with the notice provision of this Contract.

320
321 **Q. Ownership of Documents/Work Product/Materials.** All documents, reports, records,
322 field notes, data, samples, specimens, and materials of any kind resulting from performance of this Contract
323 are at all times the property of the **Program**.

324
325 **R. Patent or Copyright Protection.** The **Consultant** recognizes that certain proprietary
326 matters or techniques may be subject to patent, trademark, copyright, license or other similar restrictions,
327 and warrants that no work performed by the **Consultant** or its subcontractors will violate any such
328 restriction.

329
330 **S. Proof of Insurance.** The **Consultant** shall not commence work under this Contract until
331 the **Consultant** has obtained the following insurance coverages and provided the corresponding certificates
332 of insurance:



(i) Commercial General Liability Insurance. **Consultant** shall provide coverage during the entire term of the Contract against claims arising out of bodily injury, death, damage to or destruction of the property of others, including loss of use thereof, and including products and completed operations in an amount not less than Five Hundred Thousand Dollars (\$500,000.00) per claimant and One Million Dollars (\$1,000,000.00) per occurrence.

(ii) Business Automobile Liability Insurance. **Consultant** shall maintain, during the entire term of the Contract, automobile liability insurance in an amount not less than Five Hundred Thousand Dollars (\$500,000.00) per occurrence. Coverage will include bodily injury and property damage covering all vehicles, including hired vehicles, owned and non-owned vehicles

(iii) Workers' Compensation or Employers' Liability Insurance. The **Consultant** shall provide proof of workers' compensation coverage. Consultant's insurance shall include "Stop Gap" coverage in an amount not less than Five Hundred Thousand Dollars (\$500,000.00) per employee for each accident and disease.

(iv) Professional Liability or Errors and Omissions Liability Insurance. The **Consultant** shall provide proof of professional liability insurance or errors and omissions liability insurance to protect the **Foundation**, **Program** and **ED Office** from any and all claims arising from the **Consultant's** alleged or real professional errors, omissions or mistakes in the performance of professional duties in an amount not less than One Million Dollars (\$1,000,000.00) per claim.

T. Taxes. The **Consultant** shall pay all taxes and other such amounts required by federal, state and local law, including but not limited to federal and social security taxes, workers' compensation, unemployment insurance and sales taxes.

U. Termination of Contract. This Contract may be terminated, without cause, by the **Program** upon fifteen (15) days written notice. This Contract may be terminated immediately for cause if the **Consultant** fails to perform in accordance with the terms of this Contract.

V. Third Party Beneficiary Rights. The parties do not intend to create in any other individual or entity the status of third party beneficiary, and this Contract shall not be construed so as to create such status. The rights, duties and obligations contained in this Contract shall operate only between the parties to this Contract, and shall inure solely to the benefit of the parties to this Contract. The provisions of this Contract are intended only to assist the parties in determining and performing their obligations under this Contract.

W. Time is of the Essence. Time is of the essence in all provisions of the Contract.

X. Titles Not Controlling. Titles of paragraphs are for reference only, and shall not be used to construe the language in this Contract.

Y. Waiver. The waiver of any breach of any term or condition in this Contract shall not be deemed a waiver of any prior or subsequent breach.



9. Contacts.

Administrative Point of Contact (Foundation):

Diane M. Wilson
Chief Financial and Operating Officer
Nebraska Community Foundation
PO Box 83107
Lincoln, Nebraska 68501-3107
Phone: (402) 323-7330
Fax: (402) 323-7349
Email: dwilson@nebcommfound.org

Technical Point of Contact (Program):

Dr. Jerry F. Kenny, Executive Director
Platte River Recovery Implementation Program
Headwaters Corporation
4111 4th Avenue, Suite 6
Kearney, Nebraska 68845
Phone: (308) 237-5728
Fax: (308) 237-4651
Email: kennyj@headwaterscorp.com

Administrative Point of Contact (Consultant):

Sam Crampton, PE, CFM. – Assoc. Vice President
Dewberry Consultants, LLC
2385 Brandywine Road
Suite 100
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Phone: (678) 537-8622
Email: scrampton@dewberry.com

Admin. Point of Contact (Program):

Dr. Jerry F. Kenny, Executive Director
Platte River Recovery Implementation Program
Headwaters Corporation
4111 4th Avenue, Suite 6
Kearney, Nebraska 68845
Phone: (308) 237-5728
Fax: (308) 237-4651
Email: kennyj@headwaterscorp.com

Media Point of Contact (Program):

Dr. Bridget Barron, Director of Outreach
Platte River Recovery Implementation Program
Headwaters Corporation
4111 4th Avenue, Suite 6
Kearney, Nebraska 68845
Phone: (308) 237-5728
Fax: (308) 237-4651
Email: barronb@headwaterscorp.com

Technical Point of Contact (Consultant):

Stuart Geiger, P.E.
Dewberry Consultants, LLC
990 S. Broadway, Suite 400
Denver, CO 80209
Phone: (303) 951-0620
Email: sgeiger@dewberry.com

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10. Signatures. By signing this Contract, the parties certify that they have read and understood it, that they agree to be bound by the terms of the Contract, that they have the authority to sign it.

NEBRASKA COMMUNITY FOUNDATION

Diane M. Wilson
Chief Financial and Administrative Officer

Date

Dewberry Consultants, LLC

Sam Crampton, PE, CFM

Date



EXHIBIT A

Platte River Basin Long-Range HCI-Based Water Supply Forecasting – Phase III for the Platte River Recovery Implementation Program

OVERVIEW

In 2015, Dewberry completed the Phase II effort to enhance seasonal streamflow and snowpack forecasts for the North Platte (hereafter, NP2) and South Platte Rivers (hereafter, SP2). This scope serves as the basis for Phase III efforts, and will explore five specific tasks – four to refine outcomes of the NP2 and SP2 work, and the last to present detailed information on the Hydro Climate Index (HCI) forecasting process and most up-to-date findings to the PRRIP Water Action Committee (WAC).

The main scientific and technical goals of the Phase III effort are:

1. **Investigate physical basis for predictions:** The result of NP2 and SP2 was a successful transition from a qualitative to a fully quantitative forecast system at key sites along both rivers. While an improvement in forecast accuracy from Phase I was very encouraging, questions remained regarding the causal mechanism. In fact, a fully satisfactory physical mechanism has remained elusive since the Phase I effort. Phase III will investigate plausible mechanisms, most notably the existence of “land-atmosphere” feedback, in a rigorous fashion.
2. **Test earlier lead times:** All efforts to date focused on preparing a May-July (MJJ) streamflow forecast that is operationally available by mid-January. However, decision makers could stand to benefit if a forecast with similar, but perhaps slightly lower, accuracy could be available with more lead time (e.g. a November forecast). Similarly, it is possible that forecast skill sharply increases with a slightly shorter lead time (e.g. a February forecast). Leveraging the Phase II results, Phase III aims to explore the forecast accuracy sensitivity to lead time.
3. **Forecast total South Platte Basin precipitation:** SP2 results showed that accurate forecasts of MJJ volumetric flow were possible at both Kersey and Julesburg. However, these forecasts could only be developed using data from ~1980 to the present, with a substantial reduction in accuracy when extending to the 1950s as in NP2. We speculated that water diversion activity (both agricultural and trans-mountain) could have resulted in a non-stationary association between climate and South Platte River. In order to bypass the numerous complications of diversions, Phase III will develop an MJJ precipitation forecast for the South Platte basin. Given a successful product, this forecast could be used to both inform the state of Colorado regarding the summer flood risk as well as provide insight into the amount of water supply leaving into Nebraska.

TASK 1 – EXPLORE PHYSICAL MECHANISMS

Goal:

HCI provide predictive skill for forecasting precipitation and streamflow through their effects on their atmospheric circulation. However, a substantial contribution to the high forecast accuracies developed in NP2 and SP2 comes from the Palmer Drought Severity Index (PDSI) and its tendency, or time rate of change. A search of peer-reviewed literature revealed that the physical mechanism of this relationship is



not well established. In Phase III, we investigate this mechanism by focusing on the land-atmosphere feedbacks that are known to operate in the western United States.

Therefore, the primary goal of this task is to determine if the forecast skill found in the Phase II effort is caused primarily by land-atmosphere feedback(s) that are likely to influence Platte River Basin weather during the winter, spring and early summer months.

Methodology:

1. Conduct a literature review on land-atmosphere feedbacks, particularly those operating in the western United States or similar climates.
2. Determine the optimal atmospheric variables to use for identifying land-atmosphere feedback. Possible candidates are low level humidity, temperature, soil moisture, geopotential height, storm heat and moisture fluxes (and their convergence), and storm density.
3. Establish an optimal prediction region or regions, which can focus either on the North or South Platte basins since a similar mechanism is expected. Given that broad regions of the western U.S. contributed to forecast skill in Phase II, determine how to create a single PDSI index from multiple regions.
4. Using the indices established in (3), conduct lead/lag correlations and composites between the index or indices and the key variables identified by 2.

Outcomes:

If we can identify a relationship between the atmospheric variables and the index predictors, then the findings of NP2 and SP2 will be reinforced. Notably, this will also open up the potential to expand the forecast system to other seasons, as there would be a documented relationship between the index and the weather in the Platte River basin. If no relationship can be quantified, then further research or modeling would need to be undertaken to identify the physical mechanisms responsible for the forecast skill developed by NP2/SP2.

TASK 2 – DETERMINE FEASIBILITY OF EARLIER FORECASTS

Goal:

Through Phase II, all efforts have been directed towards building a forecast system available by mid-January for a MJJ flow prediction. In Phase III, we will investigate how the previous NP2/SP2 forecast systems perform with shorter and longer lead times. This assumes that as forecast time increases, the forecast accuracy decreases. Understanding if this assumption is true or false, and the degree to which accuracy degrades with increased time, will provide further clarity on the use of HCI for long-range forecasting.

Methodology:

We will leverage the results of the NP2/SP2 reports to explore forecast accuracy sensitivity in the following ways:

1. Using the previously established predictors (independent of Task 1 in this proposal), we will vary lead time from 8 months (October forecast) to 2 months (March forecast) in increments of 1 month.



2. Using the results of (1), we will vary the predictors for the 8 and 2 month lead time (October and March) forecasts.

Ultimately, the goal of this exercise will be to create a chart of lead time vs. accuracy, shown schematically in Figure 1. Dependency on lead time could take many forms, and it is impossible to speculate in which direction the results might lead. However, it is safe to say that whatever the outcome, it will likely have value for the PRRIP's stakeholders. We bring attention to two possible scenarios (of many):

1. If forecast accuracy increases quickly with a late fall/early winter forecast (as a result of knowing the early season snowpack), then it could imply that it may be possible to extend the forecast back to November/December without much loss of accuracy.
2. If forecast accuracy only slowly increases through early winter but then rapidly increases around January as most of the wintertime circulation patterns are better known, then this would imply that the January forecast from Phase II could be the most optimal.

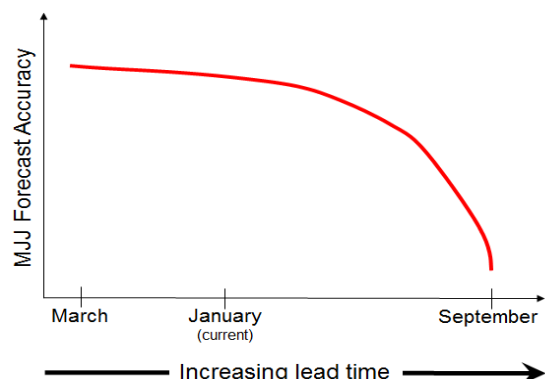


Figure 1: Schematic that shows the relationship between forecast lead time and accuracy.

Outcomes:

The primary outcome of this task will be a better understanding of the relative value of the Phase II work for stakeholders. While previous studies used January as a prediction month by mutual agreement with PRRIP, a quantification of a positive/negative relationship between lead time and accuracy will better explain the further potential for improving the forecast system.

TASK 3 – DEVELOP SOUTH PLATTE PRECIPITATION FORECAST

Goal:

Water diversion activity, both trans-mountain and agricultural/municipal, was identified as a possible factor in limiting SP2 forecast skill. Further difficulty in predicting streamflow stems from the lack of virgin flow data for the South Platte, and unexplained increases in diversions in the early 1980s. To bypass these issues, we will develop a forecast, using the HCI methodologies, for spring and summer precipitation. While precipitation alone will not explain streamflow, stakeholders will be able to understand the magnitude of potential flow based on the precipitation forecast.

**Methodology:**

1. Develop a South Platte Basin precipitation index. This would involve optimizing the following factors: spatial extent, timing and dataset (i.e. amount records). Several high-resolution, readily available datasets include the Climate Prediction Center's gage-based gridded dataset and the Livneh dataset. Both of these extend through at least 1950.
2. Since precipitation and evaporation factor heavily in the surface hydrology budget in Colorado, determine the extent to which precipitation alone is a useful metric for streamflow.
3. If (1) and (2) show convincing results, develop a spring and summer precipitation forecast for the South Platte basin.

Outcomes:

A precipitation forecast for the South Platte basin that bypasses the complications associated with variable diversion activity. As with SP2, a ~4-month lead time is sought.

TASK 4 – PRESENT HCI FORECAST STUDY AT PRRIP WAC MEETING

Dewberry will present a summary of the HCI-based forecast work to date in an approximately 1-hour long presentation at the PRRIP's May Water Advisory Committee meeting. This meeting is scheduled for May 3, in Ogallala, NE. Our presentation will focus on the evolution of the study from its early conceptual development to its current status as a qualitative and quantitative forecast tool. The presentation will discuss the utility of the forecasts, and also detail how future improvements (including those being undertaken with this scope of work) will be able to refine and extend forecast data.

As a part of this task, Dewberry's staff will prepare a PowerPoint presentation, which will be submitted as a final project deliverable. The task budget includes travel for Dewberry staff to and from Ogallala, NE by car, and one night's hotel accommodation.

DELIVERABLES

1. Unified Platte River basin report that simplifies concepts and discusses new analysis.
2. PowerPoint presentation to be presented at PRRIP WAC Meeting in May 2016.

SCHEDULE

The following dates assume a notice to proceed (NTP) of March 1, 2016

Report:

Draft Report – 4 Months after NTP

Final Report – 7 Months after NTP

PowerPoint:

Draft – 1 Week Prior to WAC Meeting

Final – 1 Week After WAC Meeting

**STAFF**

Staff	Proposed Role
Stuart Geiger, CFM <i>Project Manager</i>	Stuart will be responsible for the overall execution and delivery of the project. He will monitor resources and coordinate with the PRRIP project manager regarding the schedule and outcomes of the work.
Dmitry Smirnov, PhD <i>Project Meteorologist</i>	Dmitry will serve as the architect of the forecasting procedures and will perform all research, calculations, and programming.



EXHIBIT B

COST

We propose an hourly not to exceed price of \$50,098.84.

Labor		Project Manager		Project Meteorologist		Total	
		\$ 110.81		\$ 108.93			
	Task	Hrs	Cost	Hrs	Cost	Hrs	Cost
1	Explore Physical Mechanisms	10	\$ 1,108.10	160	\$ 17,428.80	170	\$ 18,536.90
2	Determine Feasibility of Earlier Forecasts	10	\$ 1,108.10	60	\$ 6,535.80	70	\$ 7,643.90
3	Develop South Platte Precip. Forecast	10	\$ 1,108.10	140	\$ 15,250.20	150	\$ 16,358.30
4	Present HCI Forecast at WAC Meeting	24	\$ 2,659.44	40	\$ 4,357.20	64	\$ 7,016.64
Labor Subtotal		54	\$ 5,983.74	400	\$ 43,572.00	454	\$ 49,555.74
Other Direct Costs		Qty	Unit Cost	Total Cost			
	Lodging (Keith County, NE - 2 staff x 1 night)	2	\$ 89.00	\$ 178.00			
	Per Diem (Keith County, NE - 2 staff x 1.5 day)	3	\$ 51.00	\$ 127.50			
	Mileage (Roundtrip from Denver, CO)	440	\$ 0.54	\$ 237.60			
ODC Subtotal			\$	543.10			
Hourly Not to Exceed Price \$ 50,098.84							
The information (data) contained in this proposal constitute a trade secret and/or information that is commercial or financial and is confidential or privileged. It is furnished in confidence with the understanding that it will not, without the permission of the offeror, be used or disclosed for other than evaluation purposes; PROVIDED, however, that in the event a contract is awarded based on this proposal or quotation, the offeree shall have the right to use and disclose this information (data) to the extent provided in the contract. This restriction does not limit the offeree's right to use or disclose this information (data) if obtained from another source without restriction.							

