AUGUST 11, 2021
WATER CONSERVATION AND DROUGHT MANAGEMENT ADVISORY BOARD
REGULAR MEETING 2:00 P.M.

Consistent with provisions of the Utah Open and Public Meetings Act, Utah Code Ann. § 54-2-207(4), the Water Conservation and Drought Management Advisory Board Chair has issued written determinations supporting the decision to convene electronic meetings of the Board without a physical anchor location. Due to the health and safety risks related to the ongoing COVID-19 pandemic and considering public health orders limiting in-person gatherings, the Water Conservation and Drought Management Advisory Board will continue to hold meetings by electronic means. The public is invited and encouraged to view the Board’s electronic meetings by viewing the City’s YouTube channel: https://www.youtube.com/MoabCityGovernment.

1. Call To Order
2. Written Determination To Conduct Electronic Meetings
3. Approval Of Minutes
   3.I. July 14, 2021, Regular Meeting
       Documents:
       WB-MIN-2021-07-14 DRAFT.PDF
4. Board And Staff Reports
5. Discussion Item: Water Board Purpose And Future
6. Potential Action Item: Bylaws Amendment - Quorum
   Documents:
   2 2018-04 INCLUDING REVISED TERMS FOR WATER BOARD MEMBERSHIP.PDF
7. Discussion Item: WaterSMART Grant For MIC System Upgrades
   Documents:
   3 2020_WEED_PROJECT_DESCRIPTIONS.PDF
   4 WATERSMART GRANT INSTRUCTIONS.PDF
8. Discussion Item: Concepts Of Yield
   Documents:
9. Adjournment

Special Accommodations:

In compliance with the Americans with Disabilities Act, individuals needing special accommodations during this meeting should notify the Recorder’s Office at 217 East Center Street, Moab, Utah 84532; or phone (435) 259-5121 at least three (3) working days prior to the meeting.

Check our website for updates at: www.moabcity.org
The Water Conservation and Drought Management Advisory Board held its regular meeting on the above date. Consistent with provisions of the Utah Open and Public Meetings Act, Utah Code Ann. §54-2-207(4), the Water Conservation and Drought Management Advisory Board Chair has issued written determinations supporting the decision to convene electronic meetings of the Board without a physical anchor location. Due to the health and safety risks related to the ongoing COVID-19 pandemic and considering public health orders limiting in-person gatherings, the Water Conservation and Drought Management Advisory Board will continue to hold meetings by electronic means. An anchor location was not provided. An audio recording of the meeting is archived at http://www.utah.gov/pmn/index.html. A video recording is archived at https://www.youtube.com/watch?v=NiIEXvvPrdU.

Regular Meeting—Call to Order and Attendance:
Water Board Chair Jeremy Lynch called the meeting to order at 2:01 PM. Participating remotely were Water Board Members Arne Hultquist, Kyle Bailey, Steve Getz, Mike Duncan, and Eve Tallman. Board Member Kara Dohrenwend was absent. City staff participating remotely were Deputy City Manager Carly Castle, City Engineer Chuck Williams, Public Works Director Levi Jones, Parks, Recreation, and Trails Director Annie McVay, Sustainability Director Mila Dunbar-Irwin, Recorder Sommar Johnson, and Deputy Recorder Kerri Kirk.

Written Determination to Conduct Electronic Meetings:
Board Chair Lynch read the written determination into the minutes.

Approval of Minutes: June 9, 2021
Motion: Board Member Tallman moved to approve the minutes without any changes. Board Vice Chair Hultquist seconded the motion.
Vote: The motion passed 6-0 with Board Members Hultquist, Lynch, Getz, Dohrenwend, Duncan, Tallman, and Bailey voting aye. Board Member Dohrenwend was not present for the vote.

Board and Staff Reports:
Pack Creek Fire Mitigation – Carly Castle, Deputy City Manager
Deputy City Manager Castle reported mapping of the fire to determine the impact on the watershed. She said the majority of the impact affected the Pack Creek watershed, and there was some impact on the Mill Creek watershed. She said there is concern about the potential for flooding, debris flow and sediment. She said there are two federal reports being completed to assess the damage and recommend whether some permanent infrastructure needs to be put in place to protect the community from flooding. She said Grand County and San Juan County will review the completed reports and determine a plan of action, if necessary. She said there are ongoing meetings with emergency management personnel to monitor the potential for flooding. She said the springs are also being monitored for potential contamination.

Board Vice Chair Hultquist added that the MAWP meeting next Wednesday will review the possible impacts to the drinking water sources and the NRCS (Natural Resources Conservation Service) will review a map of the severity of the burn.
City Parks Watering – Annie McVay, Parks, Recreation, and Trails Director

Parks, Recreation, and Trails Director McVay reviewed the watering days and times for the parks. There was a discussion about smart timers and moisture sensors. Sustainability Director Dunbar-Irwin inquired about Governor Cox’s suggestion for watering only three times a week. Parks, Recreation, and Trails Director McVay said there is a lot of feedback from the community about greener parks, and the amount of watering is a balance between the state and the community’s expectations.

City Engineer Williams discussed the water resources management plan for the valley that collaborates with GWSSA (Grand Water and Sewer Services Agency), San Juan Spanish Valley Special Service District, Moab Irrigation Company, and the City of Moab. There was a discussion about including MAWP in the stakeholder group. City Engineer Williams clarified that the state will be informed and involved with the plan as well. There was a discussion about utilizing the land use authorities to implement water conservation ordinances. There was a discussion about San Juan County and SITLA’s water usage.

Board Vice Chair Hultquist reported attending a meeting with Marc Stilson, Regional Engineer for the Utah Division of Water Rights. He said there was a discussion about more water monitoring in the valley.

Water Conservation Plan Update – Review Draft:
Sustainability Director Dunbar-Irwin requested input about the prioritization of the possible water conservation measures. Board Vice Chair Hultquist said the five-year plan for the water conservation goals seems very reasonable. Board Member Duncan liked the way the report was organized. Board Member Tallman inquired if the board members’ research was incorporated into the report. Sustainability Director Dunbar-Irwin said the documents that she received from the board were incorporated into the report; she said that, if anything was missed, to please resend it. Board Member Tallman suggested that the report include an executive summary. There was a discussion about not requiring a limit to growth in the conservation goal. There was a discussion about the population projection data. There was a discussion about the number of visitors and their water use. Sustainability Director Dunbar-Irwin said the technical data is still being obtained and will be added to the plan. She reviewed the timeline for submitting the draft to the state. There was a discussion about whether overflow is considered water loss.

Adjournment: Board Chair Lynch inquired about returning to in-person meetings. Sustainability Director Dunbar-Irwin said the bylaws would need to be edited to include electronic meetings if the board did not want to meet in person.

Board Chair Lynch inquired about future agenda items. Board Member Tallman suggested amending the bylaws regarding a quorum. Sustainability Director said there could be a discussion on various concepts of yield.

Board Chair Lynch adjourned the meeting at 3:37 PM.
CITY OF MOAB ORDINANCE NO. 2018-04

An ordinance amending and repealing certain provisions in Title 2 of the Moab Municipal Code pertaining to elected officers, appointment of officials, the Planning Commission, certain advisory boards, and records request fees.

The following describe the intent and purpose of this ordinance:

a. The City of Moab is a City of the Fifth Class, as defined by U.C.A. § 10-2-301, and operates under the six-member council form of government as defined by U.C.A. § 10-3-301 et seq.;

b. From time to time the City undertakes to revise its ordinances to remove archaic or outdated language, and to bring ordinances into compliance with current City needs and practices;

c. The City finds that several provisions in Title 2 of the Moab Municipal Code (“MMC”) are dated and in need of repeal or substantial amendment in light of current practices and because certain administrative or other bodies are no longer in existence or needed;

d. Utah Code Annotated §10-9a-301 requires that a municipality adopt planning commission rules of procedure and order to govern public meetings. The City of Moab has additionally enacted ordinances which create the Planning Commission and specify the matters that are within its jurisdiction;

e. That in the interest of efficient municipal administration a number of changes are needed to update the MMC, including:

1. Transfer appointment and removal power for certain department heads from the Mayor to the City Manager;
2. Remove outdated provisions regarding superintendents and at-will appointees;
3. Remove sections regarding advisory boards that no longer apply;
4. Update language related to records request fees to conform with the Utah Code Annotated and add specificity and detail, including in Exhibit “A” of the GRAMA fees section;
5. Update the section governing the Planning and Zoning Commission; and
6. Modify the composition of the Moab Water Conservation and Drought Management Advisory Board.

f. The changes enacted in this ordinance comply with applicable Utah laws pertaining to the alteration or consolidation of statutory functions, and specifically U.C.A. 10-3b-303(1)(b).
Now therefore, the Moab Municipal Code is amended as follows:
Chapter 2.04
CITY COUNCIL

2.04.010 Oath required.
Each member of the City Council, before assuming the duties of his office, shall take and subscribe the constitutional oath of office.

2.04.015 Role of the City Council.
The City operates under the form of government as identified under U.C.A. § 10-3b-301. The City Council shall review and approve all resolutions and ordinances; appropriate funds and adopt the annual budget and any amendments; set all mill levies or other taxes; review municipal administration as set out herein; and perform all other duties that may be required of it by law. With appointment from the Mayor and with the consent of the Council, the Council shall designate a person to serve as the Mayor Pro Tempore. The Mayor Pro Tempore shall carry out all duties and responsibilities of the Mayor when the Mayor is absent or unable to perform same. Any executive or administrative power held previously by the City Council is now delegated to the City Manager.

2.04.020 Meetings--Time and place.
A. The stated meetings of the City Council shall be held at a place designated by the City Council on the second and fourth Tuesday of each month, provided that when any meeting occurs on a general holiday, the meeting shall be held on the next succeeding day. The Council may hold other or special meetings at such times it determines to be convenient.
B. All meetings may be adjourned from time to time as business may require. The hour of regular meetings shall be seven p.m.
C. All regular City Council meetings may be preceded by a pre-meeting workshop for the purpose of allowing the council to receive staff reports and recommendations on regular meeting agenda items. The workshop shall commence one-half hour before the meeting, or such longer period of time as the council shall by notice designate.
D. All pre-meeting workshops shall be open to the public, but shall not be regarded as “public hearings” for the purposes of allowing testimony or comment from the public.
E. Pre-meeting workshops shall be conducted in an informal manner in the discretion of the governing body. Final action on any ordinance, resolution, or agenda item reviewed at a pre-meeting workshop shall be reserved for the regular meeting. (Ord. 98-04 § 1(part), 1998; Ord. 96-08, 1996: prior code § 2-10)

2.04.040 Meetings-Procedure generally.
The City Council shall sit with unlocked doors and shall keep minutes of its own proceedings. The votes for or against shall be taken upon the passage of all ordinances, all propositions to create any liability against the City, and in all other cases at the request of any member, which shall be entered upon the minutes of its proceedings. Unless otherwise provided for by law, the concurrence of a majority of the Council shall be necessary for the passage of any such ordinance or proposition. A majority of the Council is shall constitute a quorum to transact Council business. (Prior code § 2-10)
2.04.050 Meetings-Reconsideration of votes.
No vote of the City Council shall be reconsidered or rescinded at a special meeting, unless at such special meeting there are present as large a number of City Councilmembers as were present when such vote was taken. (Prior code § 2-11)

2.04.060 Meetings-Deferral of action on reports.
Upon request of any two members of the City Council, action on any report of a committee of the City Council shall be deferred to a future meeting of the City Council. (Prior code § 2-12)

2.04.070 Meetings-Special meetings.
The Mayor or any two members of the City Council may call a special meeting of the City Council by giving a notice thereof to each of the members of the City Council. Notice may be served personally, left at their domicile, or via email. Email is considered the preferred manner of providing notice. (Prior code § 2-13)

2.04.080 Vacancies.
If any vacancy shall occur in the office of City Councilmember by death, resignation, removal or otherwise, such vacancy shall be filled for the unexpired term by a vote of the City Council. Should the City Council fail for forty-five days to fill the vacancy in the City Council, the City Recorder shall sit as a member of the City Council for the purpose of choosing some person to fill such vacancy. (Prior code § 2-14)

2.04.090 Reinvestment Agency Authority.
Pursuant to Section 17C-1-102, et seq. of the Utah Code Annotated, as amended, the Community Reinvestment Agency Act, a community reinvestment agency of the City is hereby created, and the City Council is designated as the governing body. The Council shall have the power to transact business and exercise all of the powers of such agency as otherwise provided by law.
Chapter 2.08
MAYOR

2.08.010 Oath required.
The Mayor, before assuming the duties of the office, shall take and subscribe the constitutional oath of office. (Prior code § 2-16)

2.08.015 Role of the Mayor.
The powers and duties of the Mayor are as follows:
A. The Mayor is the chief ceremonial officer of the City and the presiding officer at all meetings of the City Council.
B. The Mayor is a non-voting member of the Council, but may vote where there is a tie vote of the other Council members, or as otherwise provided by law.
C. The Mayor, as a member of the Council, may participate in all deliberations of the Council in setting policy for the City.
D. The Mayor shall retain any legislative or quasi-judicial powers vested by law.
E. The Mayor shall appoint, with the advice and consent of the Council, persons to fill any vacancies on commissions, boards, or committees of the City.
F. The Mayor is the primary contact for the City Manager, and provides day to day oversight and supervision of the City Manager. The Mayor, in consultation with the other Council members, is responsible for facilitating the employee evaluation process for the City Manager.
G. Any other executive or administrative power held previously by the Mayor under prior law is delegated to the City Manager. (Ord. 93-9 § 6, 1993)

2.08.020 Office to be vacant upon removal from city.
If at any time during his/her term of office, the Mayor shall no longer make his/her primary residence within the City, the office shall thereby become vacant. (Prior code § 2-17)

2.08.030 Vacancy-Filling.
Whenever a vacancy shall occur in the office of Mayor, the City Council shall appoint a Mayor, who shall possess all the rights and powers of Mayor until the next municipal election, and until his/her successor is elected and qualified. (Prior code § 2-18)
Chapter 2.10
CITY MANAGER

2.10.010 Office created.
As authorized by U.C.A. § 10-3b-303 there is created the office of City Manager of Moab, Utah. (Ord. 93-9 § 1, 1993)

2.10.020 Appointment.
The appointment of a person to be known as City Manager shall be by the City Council, including the Mayor. Once approved by the City Council, the Mayor shall sign the contract entered into with the City Manager on behalf of the City. (Ord. 93-9 § 2, 1993)

2.10.030 Term.
The City Manager shall serve at the pleasure of the City Council, except that the Council shall employ the Manager for a term not to exceed three (3) years. The term of employment may be renewed at any time. Any person serving as City Manager may be removed with or without cause by a majority vote of the City Council. (Ord. 93-9 § 3, 1993)

2.10.040 Powers and duties.
The powers, duties, and obligations of the City Manager are as follows:
A. The administrative powers, authority, and duties are vested in the City Manager.
B. The City Manager shall be the chief administrative officer of the city and shall be responsible to the City Council for the administration of all city affairs placed in his or her charge. All City employees, contractors, or appointees (excluding persons appointed to City boards or commissions) shall be under the supervision and direction of the City Manager.
C. Subject to the terms of applicable contracts or personnel policies, the City Manager shall hire and, when he/she deems it necessary, suspend or remove all City employees and contractors. The City Manager has discretion to delegate personnel authority to any subordinate employee or department head with respect to employees under that person’s direct supervision.
D. The City Manager shall direct and supervise the administration of all departments, offices and agencies of the City, except as otherwise provided by law.
E. Except for the purpose of inquiry, the City Council and its members shall deal with the administrative service solely through the City Manager and neither the Council, nor any member thereof, or the Mayor shall give orders to any subordinates of the City Manager, either publicly or privately.
F. The City Manager shall attend meetings of the City Council with the right to take part in the discussion but not to vote. The City Manager may recommend to the City Council for adoption such measures as she/he may deem necessary or prudent.
G. The City manager is designated as the budget officer for the City and shall perform or cause to be performed all of the duties of such office as set forth in the Uniform Municipal Fiscal Procedures Act. As budget officer, the City Manager shall prepare and submit the annual budget to the City Council, along with any proposed amendments to the budget.
H. The City Manager shall promptly notify the Mayor and City Council of any emergency existing in any City department or body.
I. The City Manager shall perform such other duties as may be required by law, or by the City Council through ordinance, resolution, or informal direction.
J. In the manager’s temporary absence, the Assistant City Manager shall exercise the powers and perform the duties of the City Manager.

K. The City Manager shall carry out the policies and programs established by the Council.

L. The City manager may examine and inspect the books, records, and official papers of any office, department, agency, board, or commissions of the city and make investigations and require reports from all personnel. (Ord. 94-16, 1994; Ord. 93-9 § 4, 1993)

2.10.070 Salary.
The salary of the City Manager shall be set from time to time by resolution of the City Council. (Ord. 93-9 § 7, 1993)
Chapter 2.12
DUTIES OF CITY RECORDER

2.12.010 Oath required.
The City Recorder, before assuming the duties of the office, shall take and subscribe the constitutional oath.

2.12.020 Duties.
Pursuant to U.C.A. § 10-3-916 the Recorder is appointed by the Mayor, with the advice and consent of the City Council. The Recorder shall perform all duties as may by law devolve upon him/her as recorder of a city of the fifth class under the laws of the State of Utah. The Recorder shall keep records properly indexed of all City contracts, and the records shall be open to inspection by all interested persons. Unless otherwise provided by ordinance, the Recorder shall be ex-officio city collector. The Recorder shall perform such other and further duties as the City Council may by ordinance provide. Within the office of the Recorder a properly qualified employee may be appointed by the Recorder as the Deputy Recorder. The Deputy Recorder is authorized to perform, and shall perform, all duties of the Recorder during such times when the Recorder is unavailable or unable to perform same. Any official act of the Deputy Recorder taken in the absence of the Recorder shall be valid and binding to the same extent as if done by the Recorder. The Recorder, in addition to the powers and duties imposed by law and ordinance, shall perform the following duties:
A. The Recorder shall issue notices to the members of the City Council, when directed to do so by that body, and to members of the different committees and to all persons whose attendance is required before any committee, when directed or requested so to do by the chairman of such committee. The Recorder shall also issue notices of special meetings of the City Council.
B. The Recorder shall attest all licenses granted under this code or any other ordinance of the City, and shall keep a record of the issuance thereof.
C. The Recorder shall, without delay, deliver to the officers of the City, and all committees of the City Council, all resolutions and communications referred to such officers or committees by that body.
D. The Recorder shall, without delay, deliver to the Mayor all ordinances or resolutions which may be required to be approved or otherwise acted upon by the Mayor, together with all papers on which the same are founded.
E. The Recorder shall sign and attest all ordinances passed by the City Council that are signed by the Mayor or other officer.
F. The Recorder shall certify to the publication of all ordinances, resolutions, or other official documents.
G. The Recorder shall attest all papers signed by the Mayor officially, and keep and affix the corporate seal.
H. The Recorder shall keep correct records and minutes of all proceedings of the City Council, recording the same to the extent otherwise provided by law.
I. The Recorder shall countersign all contracts made on behalf of the City or to which the City is a party. Any City contract shall be void unless signed by the Recorder. The Recorder shall endorse a certificate upon every bond, warrant, or other evidence of debt issued pursuant to law, by the City stating that the same is within the lawful debt limit of the City, and is issued according to law.
J. The Recorder shall deliver to the successor in office the corporate seal, together with all books, papers, records and other property of the City.
K. The Recorder shall have the power to administer oaths in all matters in any way connected with the City government.
L. The Recorder shall attend to all official correspondence and report the same to the City Council as needed. (Prior code § 2-30)

2.12.030 Records of ordinances to be kept.
A. The Recorder shall keep records of all ordinances, together with affidavits of publication by the publisher. Before taking effect, all ordinances shall be deposited in the office of the Recorder.
B. The originals of all ordinances passed by the City Council shall be filed in the Recorder’s office. (Prior code § 2-31)

2.12.040 Papers, records, transcripts-Copies.
Upon request and upon the payment of such fees set by the City Council, the Recorder shall make, affix the corporate seal thereto and certify copies of all papers filed in the Recorder’s office and transcripts of all records of which the Recorder is the lawful custodian. (Prior code § 2-32)
Chapter 2.16
CITY TREASURER

2.16.010 Oath required.
The Treasurer, before entering upon the duties of office, shall take and subscribe the constitutional oath of office. (Prior code § 2-33)

2.16.020 Appointment of deputies and assistants.
Pursuant to U.C.A. § 10-3-916 the Treasurer is appointed by the Mayor, with the advice and consent of the City Council. The Treasurer shall have power to appoint from within the office of the Treasurer a properly qualified employee who shall be designated the Deputy Treasurer. The Deputy Treasurer is authorized to perform, and shall perform, all duties of the Treasurer during such times when the Treasurer is unavailable or unable to perform same. Any official act of the Deputy Treasurer taken in the absence of the Treasurer shall be valid and binding to the same extent as if done by the Treasurer. (Prior code § 2-34)

2.16.030 Powers and duties generally.
The Treasurer shall receive all money belonging to the City, including all taxes, license fees, utility billings, fines, and other funds owed to or held by the City, and shall keep an accurate and detailed account thereof, in such manner as may be provided by law, and shall collect all special taxes and assessments as provided by law. The Treasurer shall reconcile all accounts with the Recorder, as the City Council may direct at the end of every month, and turn over all warrants, interest coupons, bonds or other evidence of the indebtedness of the City which may have been redeemed during the month, taking the receipts of the Recorder therefor, and all such warrants, orders or other evidence of indebtedness shall be cancelled by the Treasurer and have written or stamped thereon the date of their payment or redemption. (Prior code § 2-35)

2.16.040 Collection of special taxes.
The Treasurer is ex-officio collector of special taxes. (Prior code § 2-36)

2.16.050 Receipts to be given.
The Treasurer shall give every person paying money to the City a receipt therefor, specifying the date of payment and upon what account paid; and he/she shall also file the duplicate of such receipt with the Recorder at the date of the monthly report. (Prior code § 2-37)

2.16.060 Payments.
The Treasurer shall not pay any funds owned or held by the City to any person unless the expenditure is duly appropriated and authorized upon action of the City Council, the Purchasing Agent, or the City Manager as otherwise provided by law. (Prior code § 2-38)

2.16.070 Investment decisions at authorized banking institutions.
A. The Treasurer is authorized to take any and all such actions in the name of and on behalf of the City in order to utilize investment opportunities available at banking institutions approved by the Utah Money Management Act. Such actions shall include but not be limited to setting up sweep accounts, zero balance accounts, automatic transfer of funds accounts and similar deposit
and investment arrangements, entering into transactions similar to the foregoing, and performing such actions as may be required in connection with any of the foregoing. From time to time the Treasurer shall present to the City Council for approval all necessary resolutions for designation of depository institutions and authorized signatories.

B. Agreements, instruments, or documents properly executed and delivered to any banking institution approved by the Utah Money Management Act by the city Treasurer shall be binding and enforceable obligations of the City, enforceable in accordance with their respective terms. (Res. 05-99, 1999)
Chapter 2.20
CITY COLLECTOR

Chapter 2.20 is hereby repealed.
Chapter 2.24
CITY ATTORNEY

2.24.010 Establishment-Appointment-Term.
There is established the office of City Attorney. The person(s) providing legal services to the City as City Attorney may be independent contractors designated by the City Manager or may be a full time city employee. Any applicable contracts for legal services are subject to approval by the City Council. Persons providing legal services to the City shall do so without a specified term, and services may be terminated as otherwise provided by contract. (Prior code § 2-43)

2.24.020 Oath required.
The City Attorney, before assuming the duties of his office, shall take and subscribe the constitutional oath of office. (Prior code § 2-44)

2.24.030 Delegation of Tasks.
Where appropriate, the City Attorney may delegate certain tasks to an associate or assistant attorney, provided that the City Attorney shall retain responsibility for all such tasks. (Prior code § 2-45)

2.24.040 Employment of special counsel.
The City Attorney shall have the power to employ, by and with the consent of the City Manager, special counsel on matters pertaining to the legal affairs of the City, if the same is deemed necessary and advisable. Such special counsel shall be compensated by the City as provided by contract. (Prior code § 2-46)

2.24.050 Succession-Delivery of records.
Upon the termination of legal services or upon request by the City, the City Attorney shall promptly deliver to any successor or such person(s) designated by the City copies of all books and papers, including but not limited to those in electronic form, pertaining to pending or concluded City legal matters. (Prior code § 2-47)

2.24.060 Powers and duties.
The City Attorney shall be responsible for prosecuting and conducting all cases for violations of this Code or any other ordinances of the City. The City Attorney shall appear on behalf of the City in all suits in which the City, City employees or officials are a party, and shall prosecute or defend them, as the case may be, in any courts until they are concluded. It shall be the duty of the City Attorney to advise all City employees, the City Manager, the Mayor, and City Council with respect to their official duties; to prepare the draft of all such ordinances as the City Council or City Manager from time to time shall instruct; and to perform such other duties as this Code and any other ordinances of the city and the general laws require, or as the City Council may specially direct. In addition to the powers and duties imposed by law or ordinance, the City Attorney shall have the following powers and duties:
A. He/she shall advise the City Council and its committees on such legal questions as may arise in relation to the business of the City, and attend the meetings of the City Council when required. He/she shall report periodically on any matter as necessary for the approval of the City Council or as necessary for oversight.
B. Whenever a criminal action for the violation of this Code or any other ordinance of the City is brought in any court, it shall be the duty of the City Attorney to appear and prosecute such action.
C. When requested, the City Attorney shall furnish written opinions or memoranda upon subjects submitted to him/her by the Mayor, the City Council, the City Manager, or the head of any department.
D. He/she shall draft any deeds, leases, contracts or other papers and forms required by the business of the City, when requested so to do by the Mayor, the City Council, the City Manager, or the head of any department.
E. He/she shall keep accurate records of all actions in which the City Attorney appears as counsel. Such books shall at all times be open to the inspection of the Mayor, the City Council, and/or the City Manager. (Prior code § 2-48)

2.24.070 Reporting
Periodically, or as requested by the Mayor or the City Council, the City Attorney shall provide oral reports or written memoranda detailing the status of pending legal matters or tasks which have been assigned. Day to day reporting on pending legal matters shall be provided to the City Manager. (Prior code § 2-49)
Chapter 2.32
UTILITIES SUPERINTENDENT

Chapter 2.32 is hereby repealed.
Chapter 2.36
SUPERINTENDENT OF STREETS

Chapter 2.36 is hereby repealed.
Chapter 2.40
OFFICERS GENERALLY

Chapter 2.40 is hereby repealed.
Chapter 2.52
PLANNING COMMISSION

2.52.010 Establishment--Composition.
The Planning Commission shall consist of seven (7) regular members. (Ord. 06-01 (part), 2006: prior code § 2-60)

2.52.020 Appointment of members--Qualifications--Compensation.
The members of the Planning Commission shall be appointed by the mayor with the consent of the city council from among the qualified electors of the city. Such members shall be selected without respect to political affiliations, and may serve with compensation to be determined by the City Council. (Ord. 06-01 (part), 2006: prior code § 2-61)

2.52.030 Terms--Minimum attendance--Standards removal--Filling vacancies.
The terms of office of each member of the planning commission shall be for three (3) years. Planning Commission members must attend a minimum of seventy-five percent of all Planning Commission meetings held during the course of a calendar year in order to remain a member of the Planning Commission. This ongoing determination of attendance shall be conducted by planning department staff and forwarded to the chairperson of the Planning Commission, the City Manager and Mayor and City Council. Vacancies and/or removals occurring otherwise than through the expiration of terms shall be filled by appointment by the Mayor with the consent of City Council. Members may be removed, with or without cause, by a majority vote of City Council. (Ord. 95-18, 1995: prior code § 2-62)

2.52.050 Organization--Meetings.
The Planning Commission shall elect from its membership a chair and vice chair and shall conduct meetings in accordance with the adopted bylaws and Rules of Procedure for Planning Commission meetings. The City Recorder shall keep a public record of Planning Commission proceedings. (Prior code § 2-64)

2.52.060 Powers and duties.
The Planning Commission shall have the following powers and duties:
A. After holding public hearings, the Planning Commission may recommend to the City Council a General Plan for the physical development of the City. The General Plan shall show the Planning Commission recommendations and may include, among other things, the general location, character and extent of streets, parks, parkways, and other public places; the general location and extent of public utilities; recommendations for future zoning designations and land uses; recommendations for future land use policy initiatives and long term goals; plans for the development of additional housing; a future land use plan; and other elements as may be required by law. Utah State Code. The Planning Commission may from time to time review the General Plan and forward recommendations to the City Council for amendments or revisions.
B. From time to time the Planning Commission may review the land-use ordinances of the City and consider amendments to same. It may recommend amendments or new ordinances to the City Council, either on its own initiative or upon referral by the City Council or staff.
C. The Planning Commission shall act as an advisory body, reviewing and making recommendations to the City Council with respect to those land-use applications or proceedings
as otherwise specified by ordinance. Additionally, the Planning Commission shall act as the land use authority on those matters specified by ordinance.

D. In its discretion, the Planning Commission may recommend that staff undertake studies or may recommend to the Mayor and City council programs or policies for the improvement of land development within the City.

E. The Planning Commission may exercise those additional powers as are reasonable or necessary to carry out and perform the enumerated powers and duties specified above.
Chapter 2.56
POLICE DEPARTMENT

2.56.010 Establishment-Composition.
There is established a regularly constituted police force to be known as the City Police Department which shall consist of a Chief of Police and such other police officers as shall be employed by the City from time to time. (Prior code § 20-1)

2.56.020 Powers and duties of police officers.
The Chief of Police and all police officers of the city shall have the following powers and duties:
A. To suppress riots, disturbances and breaches of the peace, and to apprehend all persons committing any offense against the laws of the state, this Code, or any other ordinances of the city;
B. To execute and serve all warrants, processes, commitments and all writs whatsoever, issued by any court;
C. To preserve the public peace, prevent crime, detect and arrest offenders, protect persons and property, remove nuisances existing in the public streets, roads and highways, enforce every law relating to the suppression of offenses, render such assistance in the collection of licenses as shall be required by the license collector and perform all duties enjoined upon them by law and ordinance (Prior code § 20-2); and
D. To arrest and take into custody any person who shall commit or threaten or attempt to commit in the presence of the officer, or within the view of the officer, any breach of the peace, or any offense directly prohibited by the laws of the State of Utah or this Code.

2.56.030 Chief-Appointment.
The City Manager shall appoint the Chief of Police. (Prior code § 20-3)

2.56.035 Appointment of deputies and assistants.
The Police Chief shall have power to appoint a properly qualified employee who shall be designated the Assistant Chief. The Assistant Chief is authorized to perform, and shall perform, all duties of the Chief during such times when the Chief is unavailable or unable to perform same. Any official act of the Assistant Chief taken in the absence of the Chief shall be valid and binding to the same extent as if done by the Chief.

2.56.040 Chief-Oath required.
The Chief of Police shall before assuming the duties of office take and subscribe the constitutional oath of office. (Prior code § 20-4)
Chapter 2.61
STATUTORY APPOINTEE SEVERANCE BENEFITS APPEALS

Chapter 2.61 is hereby repealed.
Section 2.64.060 is amended as follows:

2.64.060 Fees.
A. The City may charge reasonable fees to cover the City’s actual cost of compiling a record or duplicating a record. The fees shall be established by resolution of the City Council. The initial fees, until changed by resolution, are as set forth in “Exhibit A” attached to the ordinance codified in this Chapter and found on file in the office of the City Recorder.
B. When the City compiles a record in a form other than that normally maintained by the City, the actual costs under this section may include the following:
   1. the cost of staff time for compiling, formatting, manipulating, packaging, mailing, summarizing, copying, scanning, printing, or tailoring the record into certain formats or media to meet the person’s request;
   2. the cost of staff time to search for, locate, and retrieve the record, and other direct administrative costs for complying with a request;
   3. in the case of fees for a record that is the result of computer output other than word processing, the actual incremental cost of providing the electronic services and products together with a reasonable portion of the costs associated with formatting or interfacing the information for particular users, and the administrative costs as set forth in Subsections B.1. and B.2.; and
   4. fees for paper photocopies of records or digital copies of records, fees for packaging supplies, and postage fees for mailing records.
C. An hourly charge under Subsection B. may not exceed the fully loaded cost of employment of the lowest paid employee who, in the discretion of the custodian of records, has the necessary skill and training to perform the request.
D. The City may fulfill a record request without charge when it determines that:
   1. Releasing the record primarily benefits the public rather than a person;
   2. The individual requesting the record is the subject of the record;
   3. The requester’s legal rights are directly implicated by the information in the record, and the requester is impecunious; or
   4. The individual has requested in writing a waiver of the fees due to indigency, and the requester has been granted such waiver by the City Recorder.
E. The City may not charge a fee for:
   1. Reviewing a record to determine whether it is subject to disclosure, except as permitted by Subsection B.; or
   2. Inspecting a record; or
   3. Classification of a record.
F. A person who believes that there has been an unreasonable denial of a fee waiver under Subsection D. may appeal the denial to the City Manager as the Chief Administrative Officer of the City. The appeal must be made in writing and within 10 days of the denial of the fee waiver.
G. The adjudicative body hearing the appeal:
   1. shall review the fee waiver de novo, but shall review and consider the city’s denial of the fee waiver and any determination under Subsection D.; and
   2. has the same authority when a fee waiver or reduction is denied as it has when the
inspection of a public record is denied.

H. All fees received under this section by the city shall be retained by the city as a dedicated credit. Those funds shall be spent on the actual costs and expenses incurred by the city in providing the requested records.

I. The City may require payment of past fees and future estimated fees before beginning to process a request if:
   1. fees are expected to exceed $50; or
   2. the requester has not paid fees from previous requests.

Any prepaid amount in excess of fees due shall be returned to the requester.

J. This section does not alter, repeal, or reduce fees established by other sections of this municipal code.

Exhibit “A” to section 2.64.060 shall be amended to read as follows:

1. Record location, retrieval, research and compilation fee . . . .

Furthermore, Items 2., 3., 4., 5., 6., and 7., which now read: “Photocopying fee for . . . . .” shall all be amended to read: “Fee for photocopies for . . . . .”
Chapter 2.68
MOAB YOUTH CENTER BOARD

Chapter 2.68 is hereby repealed.
Chapter 2.72
HOLLYWOOD STUNT MEN’S HALL OF FAME BOARD

Chapter 2.72 is hereby repealed.
Chapter 2.84
MOAB ARTS AND RECREATION CENTER ADVISORY BOARD

Chapter 2.84 is hereby repealed.
Chapter 2.88
MOAB HILLSIDE REVIEW ADVISORY BOARD

Chapter 2.88 is hereby repealed.

Chapter 2.90
MOAB WATER CONSERVATION AND DROUGHT MANAGEMENT ADVISORY BOARD

Section 2.90.010 is amended as follows:

2.90.010 Composition of the Board.

The Moab Water Conservation and Drought Management Advisory Board (the Board) shall consist of seven members, six of whom shall be residents of the City of Moab. One member of the Board may be a resident of the Spanish Valley region.
The foregoing ordinance was passed and adopted upon the affirmative majority vote of the City Council of the City of Moab, and the affirmative vote of the Mayor, this 10th day of April, 2018.

This ordinance shall take effect immediately following passage.

By: ________________________    ________________________
Mayor Emily S. Niehaus    Date

Attest:

By: ________________________
Rachel Stenta, Recorder    Date


FY 2020 WaterSMART Grants: Water and Energy Efficiency Grants

California

Bard Water District, Construction of Five Gates Conveyance Improvements
Reclamation Funding: $300,000  Total Project Cost: $642,294

The Bard Water District, located in southern California near the Arizona border, along with the Quechan Indian Tribe, will construct conveyance improvements for the Five Gates structure, which is a series of gated culverts that act as a major chokepoint in the District’s delivery system. The District will replace the existing Five Gates with new more advanced metal gates and 560 feet of pipeline to increase water use efficiency and reliability through optimal flow rates, reduced leakage, and reduced operational losses. The project is a top priority for the District and the Tribe and is expected to result in annual water savings of 1,452 acre-feet, which will remain in the Lower Colorado River System.

Beaumont-Cherry Valley Water District, Beaumont-Cherry Valley Water District Advanced Metering Infrastructure Project
Reclamation Funding: $1,500,000  Total Project Cost: $5,704,270

The Beaumont-Cherry Valley Water District, located in Riverside County in southern California, will install new meters and upgrade previously installed meters so that all 19,154 primarily residential water meters in the District have advanced metering infrastructure (AMI) capable technology. The District will also install repeater equipment to improve the District’s leak detection program. The project is expected to result in annual water savings of 927 acre-feet by recovering losses currently caused by inaccurate metering and leaks. The area is vulnerable to drought conditions and is projected to have increasing demand due to population growth. The project will reduce the District’s dependence on imported water and will offset groundwater pumping from the adjudicated Beaumont Basin.

Firebaugh Canal Water District, 2nd Lift Canal Lining Project
Reclamation Funding: $1,000,000  Total Project Cost: $2,303,300

The Firebaugh Canal Water District located near Mendota, California, will line 2.5 miles of the unlined 2nd Lift Canal with concrete. The District will also replace existing turnout structures with pre-cast concrete structures that can accommodate high-efficiency irrigation system upgrades. The District is located within the Grassland Drainage Area, which is underlain with a shallow, saline aquifer. As subsurface drain water generated within the region is discharged to the San Joaquin River, minerals enter the river and degrade water quality. Water that is currently lost to seepage from the 2nd Lift Canal becomes unusable when mixed with the saline sink. The project is expected to
result in annual water savings of 320 acre-feet by reducing seepage, which supports the Westside Regional Drainage Plan, a collaborative effort by local water districts to curtail discharge to the river. During normal water years, conserved water will be marketed to adjacent water districts to supplement their water supply and to offset reliance on local groundwater, which is often poor quality and contributes to subsidence. During critical years when the District’s supply is curtailed, the water conserved will allow the District to make up for the reduced water allocation.

City of Needles, Needles Advanced Meter Infrastructure Project with Automated Meter Reading
Reclamation Funding: $213,826 Total Project Cost: $427,652
The City of Needles, located in San Bernardino County, California will install 1,944 meters with advanced metering infrastructure (AMI). The City currently relies on manual readings on a monthly basis, making it difficult to detect leaks. The project is expected to result in annual water savings of 160 acre-feet by reducing delays in leak identification and unusual consumption patterns. The water conserved will be used to meet increasing demand due to population growth, which will reduce the need for additional water rights or additional purchased water.

North Kern Water Storage District, Calloway Canal Lining and Water Delivery Improvements
Reclamation Funding: $1,500,000 Total Project Cost: $3,100,392
The North Kern Water Storage District, located in Bakersfield, California, will line 3,841 feet of an unlined portion of the Calloway Canal with 4-inch thick unreinforced concrete. The canal lining is expected to result in annual water savings of 1,349 acre-feet, which is currently seeping into the groundwater basin that has poor water quality. Additionally, the District will install flow meters, water level sensors, and telemetry at seven of the District’s production wells. These additional improvements will provide real-time data and allow the District to better control well operations, resulting in an expected annual water savings of 289 acre-feet from reduced pumping. The groundwater basin in the San Joaquin Valley portion of Kern County is critically stressed, especially when pumping increases during dry years. Overall, the project is expected to result in 1,638 acre-feet of water savings, which will offset groundwater pumping.

City of Oceanside, City of Oceanside Advanced Metering Infrastructure Project (Phase II)
Reclamation Funding: $1,500,000 Total Project Cost: $4,497,429
The City of Oceanside, located in southern California, will upgrade approximately 11,429 existing primarily residential water meters to advanced metering infrastructure (AMI) smart meters. The project is expected to result in annual water savings of 784 acre-feet by providing real-time information to customers about leaks, breaks, and other unusual consumption patterns. The water savings from this project will have broad benefits in an area that has historically experienced water shortages and drought, relies on purchased water, and is projecting population and water demand increases. Currently, the City purchases approximately 90% of its potable water supply from the San Diego County Water Authority. The water conserved through this AMI project will help the City to use existing supplies more efficiently to meet demands.
Rancho California Water District, Compound Meter Upgrade Project
Reclamation Funding: $454,784 Total Project Cost: $1,008,242

The Rancho California Water District, located in Riverside County, California, will replace 134 existing standard compound meters with upgraded compound meters that can connect to the District’s existing advance metering infrastructure system. The new meters will provide more accurate flow measurement and real-time water consumption data to customers. The project is expected to result in annual water savings of 271 acre-feet that is currently lost to leaks and customer overuse. The District and its water suppliers are susceptible to drought and face increased demand due to population growth. The water conserved will increase local water reliability and reduce imported water demand.

City of Santa Ana, Santa Ana Automated Metering Infrastructure Installation Project
Reclamation Funding: $1,200,000 Total Project Cost: $9,286,347

The City of Santa Ana, located in southern California, will replace 33,315 manual-read primarily residential water meters with updated advanced metering infrastructure (AMI) meters. AMI will provide real-time operational modeling information, establish a leak detection system, and provide water-consumption data to customers. The project is expected to result in annual water savings of 1,409 acre-feet that is currently lost to meter inaccuracies and leaks. The City is currently dependent on a combination of local groundwater and imported water for its supply. Water saved through the project will supplement the City’s finite groundwater supply and reduce the need to purchase additional water.

City of Santa Ana, SA-1 Hydropower and Water Conservation Project
Reclamation Funding: $300,000 Total Project Cost: $1,303,413

The City of Santa Ana will also install a 132-kilowatt hydro turbine and generator at the Garthe Pumping station, which is expected to generate up to 877 megawatt-hours of power annually to offset existing electrical use. The project also includes the installation of smart irrigation controllers and high-efficiency nozzles on City property to reduce irrigation water use.

City of Santa Barbara, Santa Barbara Advanced Metering Infrastructure Project (Phase 2)
Reclamation Funding: $1,500,000 Total Project Cost: $7,149,346

The City of Santa Barbara, located in southern California, will install advanced metering infrastructure (AMI) equipment and implement a data management system, along with a customer portal that will support 27,000 primarily residential water meters that were installed in a previous phase of this overall AMI project. By providing real-time water use data about leaks and abnormal use patterns, the project is expected to result in annual water savings of 631 acre-feet and will better prepare the City for extended drought conditions. The water conserved will offset groundwater pumping and reduce the City's dependence on water imported through the State Water Project.
Sutter Mutual Water Company, Bohannon Dam Automation Project
Reclamation Funding: $806,610  Total Project Cost: $1,613,220
The Sutter Mutual Water Company, located near Sacramento, will install Supervisory Control and Data Acquisition (SCADA) components that allow for remote monitoring of irrigation delivery system conditions and for remote operation of delivery system control gates at Bohannon Dam weir. The project includes six Rubicon SlipGates with SCADA capability using software that allows real-time monitoring and remote access to the site. The project is expected to result in annual water savings of 20,000 acre-feet currently lost to operational spills. The water conserved as a result of the project will allow the Company to reduce diversions from the Sacramento River, eliminate surplus deliveries, and to store more water in Bohannon Dam.

Western Municipal Water District, Riverside Service Area Meter Replacement and Customer Portal (Phase 2)
Reclamation Funding: $1,000,000  Total Project Cost: $3,690,717
The Western Municipal Water District, located in Riverside, California, will replace 7,008 manually read residential meters with advanced metering infrastructure. The project is supported by multiple planning efforts in the region and is expected to result in annual water savings of 505 acre-feet, which is currently lost to leaks and over consumption. By completing the project, the District expects to reduce its reliance on groundwater and imports from Metropolitan Water District of Southern California.

Colorado

City of Aspen, Aspen Intelligent Metering and Meter Replacement Project
Reclamation Funding: $500,000  Total Project Cost: $1,259,697
The City of Aspen will convert 4,000 residential and commercial accounts to advanced metering infrastructure (AMI). The project includes the installation and implementation of all associated network hardware and software to support the AMI technology, along with a customer portal. By improving leak detection and reducing customer overuse, the project is expected to result in annual water savings of 273 acre-feet, which represents 9% of the City’s current demands. The project will allow the City to reduce diversions and allow for the conserved water to remain in the Roaring Fork River for neighboring communities and the native ecosystem.

City of Grand Junction, City of Grand Junction Advanced Metering Infrastructure Project
Reclamation Funding: $300,000  Total Project Cost: $1,821,141
The City of Grand Junction, located in western Colorado, will upgrade 4,069 manual-read water meters with advanced metering infrastructure compatible meters. The City will also install a fixed network data collection system that will automatically collect and store hourly consumption data from its 9,867 customer meters. By providing customers with real-time data, the project is expected to result in annual water savings of 741 acre-feet, which is currently lost to customer overuse and leaks. As a result of the project, the City expects to reduce diversions from the Kannah Creek watershed, leaving water in the river system or otherwise making water available for other uses in the Upper Colorado River Basin.
City of Greeley, Greeley AMI Meter Installation Project
Reclamation Funding: $1,486,538 Total Project Cost: $6,059,617
The City of Greeley, located in northern Colorado, will convert 14,500 standard water meters to advanced metering infrastructure meters and integrate the smart meter software with Greeley Water’s Supervisory Control and Data Acquisition system. The updated meters will benefit residential, commercial, and wholesale water purchaser accounts. The City owns surface water rights in four major river basins and operates six storage reservoirs in an area that faces drought, population growth, and overallocation of rivers. The project is expected to result in annual water savings of 1,129 acre-feet currently lost to seepage, leaks, and customer overuse. The water conserved will remain available in storage, supporting the City through multi-year droughts. Surface flow rights can also be sent downstream to meet return flow obligations or be made available for other uses.

City of Longmont, Longmont Automated Meter Reading Project
Reclamation Funding: $800,000 Total Project Cost: $2,642,605
The City of Longmont, located north of Denver, will upgrade 7,629 residential and 711 large analog water meters to meters with automated meter reading (AMR) technology. Once completed, the project will provide a continuous flow of data that will notify staff of customer leaks, backflow events, meter tampering, and no flow events. The AMR meters will be connected to a fixed base collector system and customer portal, which will also provide customers with real-time data on their water usage. The project is expected to result in annual water savings of 361 acre-feet, currently lost to leaks and customer overuse. The water conserved will remain instream and better prepare the City for population growth and prolonged periods of drought.

City of Thornton, City-Wide Advanced Metering Infrastructure and Residential Meter Conversion Project
Reclamation Funding: $1,500,000 Total Project Cost: $4,000,000
The City of Thornton located near Denver, Colorado, will install a city-wide advanced metering infrastructure system and replace 19,919 low resolution residential meters with high resolution meters. The project is expected to result in annual water savings of 1,665 acre-feet currently lost to inefficient customer water use and leaks. The project will support statewide goals to address water supply gaps in the state and South Platte Basin and to integrate water quantity and quality issues. The water conserved will remain in Thornton’s storage reserves and reduce demands for treated water and diversions from the over-appropriated South Platte Basin.

Idaho

City of Ammon, City of Ammon Water Meter Installation Project
Reclamation Funding: $300,000 Total Project Cost: $2,593,371
The City of Ammon, located in southeastern Idaho, will install advanced metering infrastructure water meters in 916 residences that are currently unmetered. The City’s population has more than doubled between 2000 and 2010 and the growth is expected to continue. The project is expected to
result in annual water savings of 258 acre-feet by allowing the City to better monitor water usage and identify leaks, fluctuations, and other inconsistencies in the system. The water conserved will remain in the Eastern Snake River Plain Aquifer, which will strengthen the reliability of the City’s existing groundwater rights to adequately serve its growing population.

**Big Wood Canal Company, Jim Knight and Sagebrush Hydroelectric Projects**

Reclamation Funding: $1,500,000  
Total Project Cost: $4,204,482

The Big Wood Canal Company located near Twin Falls, Idaho, along with the American Falls Reservoir District #2, will upgrade the Jim Knight and Sagebrush hydroelectric projects located on the Milner-Gooding Canal, including improved intake structures, mechanical equipment, and powerhouse electrical controls at both projects. Both projects will include new powerhouse structures and vertical Kaplan turbines connected to a new generator. At Sagebrush, the current concrete penstock has leaks and will be upgraded with a 10-foot diameter, 370-foot long steel penstock. The power plant rebuilds will increase the combined generation capacity of the plants from 604 kilowatts to 1050 kilowatts. The project is expected to result in annual water savings of 180 acre-feet due to leaks and seepage at Sagebrush’s existing concrete penstock. The water conserved will remain in the American Falls Reservoir and Milner Lake and will allow for more efficient water deliveries to water users.

**Boise Project Board of Control, New York Canal Lining (Phase 7)**

Reclamation Funding: $226,832  
Total Project Cost: $453,664

The Boise Project Board of Control, located in Boise, Idaho, will replace 600 feet of existing concrete and asphalt lining along the New York Canal with a multi-layer geocomposite liner with a concrete cap. Water supply has not been sufficient to meet demands, and in recent years, users within the Board’s service area have had to purchase additional river water to help augment their irrigation water supply. The project is expected to result in an annual water savings of 367 acre-feet, which is currently lost to leaks and seepage. As a result of the project, the Board will be able to reduce reliance on purchased water from other sources and increase the amount of water available in Arrowrock, Anderson, and Lucky Peak Reservoirs to benefit fish and recreation.

**Dixie Bench Ditch Lateral Association, Maple Creek Watershed Irrigation Efficiencies Improvement Project**

Reclamation Funding: $142,357  
Total Project Cost: $285,000

The Dixie Bench Ditch Lateral Association, located in southeastern Idaho, will decommission 8,000 feet of earthen canal and install 7,040 feet of high-density polyethylene pipeline and pressurized polyvinyl chloride pipeline, bypassing the original canal. The area is vulnerable to drought, and the Association experiences ongoing conflict among its residential and agricultural users. The project is expected to result in annual water savings of 90 acre-feet, which is currently lost to seepage and operational spills. As a result of the project, the Association will reduce diversions from Maple Creek and reduce the need for imported water to meet late-season allocations, allowing water to remain instream. Once completed, the pipeline will complement a current Natural Resources Conservation Service’s Environmental Quality Incentives Program project to improve an existing irrigation system with pivots, wheel-line, pumping plants, and a Variable Frequency Drive.
Kansas

Kansas Bostwick Irrigation District, Converting Ridge 1.3 Right Open Open Lateral to a Buried Pipe System
Reclamation Funding: $163,000  Total Project Cost: $329,451

The Kansas Bostwick Irrigation District, located in northern Kansas, will convert 2.79 miles of open lateral canal into a buried pipeline system. The project is expected to conserve 623 acre-feet of water annually that is currently lost to evaporation, seepage, and operational spills. The area is dependent on the Republican River Basin which is over-drafted across multiple states. Groundwater depletions and overuse within the Republican River Basin have significantly impacted the District’s available water supplies in recent years. The project will allow the District to more efficiently manage its current water supplies and reduce diversions from the Republican River and Harlan County Lake, the District’s upstream supply reservoir. Reduced diversions from the Republican River will increase flows available for recreational activities and downstream tributaries, benefitting species including the endangered Topeka Shiner minnow.

Montana

Buffalo Rapids Irrigation Project—District 1, Lateral 1.7 Conversion Project
Reclamation Funding: $132,472  Total Project Cost: $291,869

The Buffalo Rapids Irrigation Project—District 1, located in eastern Montana, will convert 5,450 feet of open canal to a closed plastic irrigation pipeline. The District has experienced drought conditions over the last five years, and leakage and conveyance losses have contributed to water shortages and water scheduling issues. In response to system inefficiencies, the District has frequently had to divert and pump additional water from the Yellowstone River. By completing the project and increasing efficiency, the District will be able to reduce diversions. The project is expected to result in annual water savings of 248 acre-feet currently lost to seepage, which will remain in the Yellowstone River.

Buffalo Rapids Irrigation Project—District 2, Lateral 1.6 Conversion Project
Reclamation Funding: $300,000  Total Project Cost: $666,307

The Buffalo Rapids Irrigation Project—District 2, located in eastern Montana, will convert 8,660 feet of open canal to a closed plastic irrigation pipeline. The District has experienced drought conditions over the last five years, and leakage and conveyance losses have contributed to water shortages and water scheduling issues. In response to system inefficiencies, the District has frequently had to divert and pump additional water from the Yellowstone River. By completing the project and increasing efficiency, the District will be able to reduce diversions. The project is expected to result in annual water savings of 1,087 acre-feet currently lost to seepage, which will remain in the Yellowstone River.
Nebraska

Nebraska Bostwick Irrigation District, Enhancing Storage in Harlan Reservoir by Automating the Headgates of the Superior and Courtland Canals
Reclamation Funding: $75,000  
Total Project Cost: $152,434

The Nebraska Bostwick Irrigation District, located in south-central Nebraska, will install canal automation technology to provide closed-loop flow control to the Superior and Courtland Canals. Precise actuation, level measurement, and flow controllers will be installed onto existing radial gates. The District has faced water scarcity over the past decade. Farmers have adjusted by changing crops, growing crops under stress, and augmenting their delivered surface water with well water. By completing this project, the District will be able to use real-time data to more precisely match supply with demand, thereby improving management of the Harlan County Reservoir and a portion of the Republican River system. Once complete, the project is expected to result in annual water savings of 1,006 acre-feet currently lost to operational spills, which will remain in Harlan County Reservoir. The project will allow the District to more efficiently deliver water, reduce the need for groundwater pumping from the Republican River system, and provide increased instream flows later in the season for stream augmentation.

Oklahoma

City of Eufaula, Eufaula Water System Improvements (Part B & C)
Reclamation Funding: $1,500,000  
Total Project Cost: $4,032,571

The City of Eufaula, located in southeastern Oklahoma, will convert existing corrugated metal pipe, corrugated plastic pipe, cast iron pipe, and reinforced concrete pipe in its water delivery system to 38,242 feet of polyvinyl chloride pipe. The project also includes installation of new gate and pressure valves. The water system currently faces losses as high as 53 percent due to leaks and the lack of isolation valves. The project is expected to result in annual water savings of 198 acre-feet, which will remain in Lake Eufaula.

Oregon

Klamath Irrigation District, C-4-a Canal Lining/Piping Project
Reclamation Funding: $210,650  
Total Project Cost: $421,301

The Klamath Irrigation District, located in Klamath County, Oregon, will convert 1.5 miles of the currently open C-4-a Canal to 3,000 feet of Ethylene Propylene Diene Monomer lining and 5,000 feet of high-density polyethylene pipe. The project is expected to result in an annual water savings of 664 acre-feet which is currently lost to seepage, evaporation, and operational spills. Once the project has been completed, the District will reduce diversions from Upper Klamath Lake. The project is expected to improve lake levels to benefit fish species such as the endangered Shortnose Sucker, and to provide a potential late season supply for other water users in times of shortage. In addition, conserved water may be available for the fall waterfowl migration at the Lower Klamath National Wildlife Refuge.
Klamath Irrigation District, F-4 Canal Lining/Piping Project  
Reclamation Funding: $219,704  
Total Project Cost: $439,409

The Klamath Irrigation District will also convert 1.4 miles of the currently open F-4 Canal to 300 feet of Ethylene Propylene Diene Monomer lining and 7,392 feet of high-density polyethylene pipe. The project is expected to result in an annual water savings of 664 acre-feet.

Middle Fork Irrigation District, Coe Branch Pipeline and Irrigation Efficiency Project  
Reclamation Funding: $266,600  
Total Project Cost: $1,460,400

The Middle Fork Irrigation District, located in northwest Oregon, will install a high-density polyethylene pipe from its existing diversion on Coe Creek to an existing settling pond to provide clean irrigation water to its users. Coe Creek is a glacier-fed tributary of the Middle Fork Hood River, and its high sediment load restricts the District’s ability to fully utilize the water during the irrigation season. When sedimentation worsens in Coe Creek, the District must meet irrigation demand with water from Laurance Reservoir and its tributaries. The District will use the settling pond to remove glacial sediment from the water before it is delivered to irrigators, thereby avoiding diversions from Laurance Lake. By more efficiently and effectively removing sediment, the project will also allow water users to install high-efficiency micro-sprinklers.

Texas

Cameron County Irrigation District No.6, Bennett, Swan Nelson, 134, 139, and 196 Canals Piping Project  
Reclamation Funding: $300,000  
Total Project Cost: $857,143

The Cameron County Irrigation District No.6, located in southern Texas, will convert the earthen Bennett, Swan Nelson, 143, 139 and 196 Canals to 9,330 feet of polyvinyl chloride pipe. The project is expected to result in annual water savings of 1,040 acre-feet that is currently lost to seepage and evaporation. The Lower Rio Grande Reservoir System is over allocated and susceptible to long-term drought. The project will allow the District to reduce its diversions and allow for the conserved water to remain in the Lower Rio Grande Reservoir System.

El Paso County Water Improvement District No.1, Riverside Canal Concrete Lining Project (Phase III)  
Reclamation Funding: $1,000,000  
Total Project Cost: $2,039,504

The El Paso County Water Improvement District No.1 will line 6,600 feet of the currently earthen Riverside Canal with steel-panel reinforced concrete. The project is expected to result in annual water savings of 1,770 acre-feet that is currently lost to seepage. El Paso County has experienced prolonged and extreme drought conditions, and the population of El Paso County is projected to double to over 1.5 million people by 2070. The water conserved will allow for additional Rio Grande Project water to be stored in Elephant Butte and Caballo Reservoirs, which will provide critical water supplies to the area during drought years.
Harlingen Irrigation District Cameron County No.1, Piping of Wyrick Canal (Phase II)  
Reclamation Funding: $300,000  
Total Project Cost: $655,331  
The Harlingen Irrigation District Cameron County No.1, located in southern Texas, will convert 3,730 feet of the concrete Wyrick Canal to a 48-inch pressurized polyvinyl chloride pipe. The project will increase system reliability and reduce the amount of power needed to lift water into the distribution system. The Harlingen area is dependent on surface water from the Rio Grande and experiences water conflict as a result of drought, over-appropriation of water rights, and population growth. The project makes progress toward water management goals identified in several Rio Grande Basin planning activities, including canal piping as a recommended water management strategy, increasing delivery system efficiencies to address drought, and conserving water to relieve tension for all groups in the basin. The project is expected to result in a 92 acre-feet of water savings, which will remain in the Rio Grande River Basin to benefit domestic, municipal, industrial, agricultural, ecological, and recreational uses.

City of Wilmer, Smart Meter Conversion and SCADA System Implementation Project  
Reclamation Funding: $198,802  
Total Project Cost: $497,006  
The City of Wilmer located near Dallas, Texas, will retrofit 1,152 existing residential water meters to advanced metering infrastructure (AMI). The City will also install Supervisory Control and Data Acquisition equipment to allow for improved water management. The project will provide more accurate and detailed leakage and billing data and is expected to result in annual water savings of 53 acre-feet. The water conserved will remain in Dallas Water Utilities reservoirs.

Utah

American Fork City, American Fork City Pressurized Irrigation Metering Project  
Reclamation Funding: $1,500,000  
Total Project Cost: $3,035,400  
American Fork City, located near Salt Lake City, will install 2,324 water meters with advanced metering infrastructure compatible with businesses and homeowners on the City’s pressurized irrigation system. Through its pressurized irrigation system, the City delivers non-potable water for outdoor use. The City often has to pump water from its culinary wells to supplement the pressurized irrigation system during peak summer months. The project will enable the City to monitor real-time flows in the pressurized irrigation system and to accurately bill consumption. The project is expected to result in annual water savings of 597 acre-feet which is currently lost to customer overuse. The water conserved will offset the need for groundwater pumping and purchased water. Additional water would remain in the American Fork River system as instream flows or for aquifer recharge.

Bear River Canal Company, West Main Canal Liner Project  
Reclamation Funding: $1,500,000  
Total Project Cost: $3,031,600  
The Bear River Canal Company, located in northern Utah, will line 3,200 feet of the earthen and partially lined West Main Canal with geotextile fiber covered by concrete. The Company will also install a ramp flume with telemetry and a 2-kilowatt crossfloat turbine along the Hammond Canal. The West Main Canal is the primary canal that provides water to other large canals within the Company’s system, including the Hammond Canal. The project is expected to result in annual water savings of 4,903 acre-feet, which is currently lost to seepage. In dry years, the water conserved will
remain in the West Main Canal, allowing the Company to avoid reduced allocations. In wet years, conserved water will remain instream within the Bear River to benefit the Bear River Migratory Bird Refuge and the Great Salt Lake. Additionally, because seepage is eroding the hillside supporting the canal, the project addresses safety and reliability concerns.

**Benchland Water District, Secondary Water Project (Phase I)**
Reclamation Funding: $300,000  
Total Project Cost: $675,150

The Benchland Water District located near Salt Lake City, Utah, will install 450 secondary water meters as part of an overall secondary metering program. The State of Utah has experienced drought conditions in twelve of the last fifteen years. The project will allow the District to utilize advanced metering infrastructure to better detect leaks and customer overuse, which is expected to result in water savings of 175 acre-feet per year. The water conserved will remain in the District's upper reservoirs or within the Weber Basin Water Conservancy District's system or remain as instream flows to benefit the Bonneville Cutthroat Trout and Bluehead Sucker.

**Benchland Water District, Secondary Water Project (Phase II)**
Reclamation Funding: $300,000  
Total Project Cost: $675,150

The Benchland Water District will continue implementation of its secondary metering program with the installation of an additional 450 secondary water meters, which is expected to result in water savings of 175 acre-feet per year.

**Davis and Weber Counties Canal Company, Canal Piping, Lining and Hydro Project**
Reclamation Funding: $1,100,000  
Total Project Cost: $2,714,000

The Davis and Weber Counties Canal Company, located near Salt Lake City, will convert 1,685 feet of existing concrete liner and 1,875 feet of existing steel pipe with 2,060 feet of an 8-foot by 6-foot precast concrete box culvert and 1,500 feet of 66-inch reinforced concrete pipe. Severe drought from 2012 through 2018 has strained the water system and the Company has had to respond with shortened irrigation seasons. The project is expected to result in annual water savings of 794 acre-feet that is currently lost to seepage and evaporation. The project will allow for more water to be saved and held in the Echo and East Canyon Reservoirs, therefore remaining in the river system for longer periods and providing benefits to native fish species. Additionally, the project includes the installation of a meter station and replacement of a meter to better manage water distribution, and the installation of a 2-kilowatt hydro turbine to help offset project energy consumption.

**Nibbley Blacksmith Fork Irrigation Company, Quarter Circle Drive Piping Project**
Reclamation Funding: $300,000  
Total Project Cost: $760,000

The Nibley Blacksmith Fork Irrigation Company, located in Cache County, Utah, will convert 2,220 feet of an earthen canal known as the Quarter Circle Drive Section to irrigation pipe. The Company will also upgrade the existing headworks of the canal at the diversion point on the Blacksmith Fork River to provide more accurate flow measurement. The system of canals and pipes services approximately 3,100 acres of irrigated residential and agricultural land. The Company has had to divert additional water for delivery due to system inefficiencies and seepage losses. The project is expected to result in annual water savings of 814 acre-feet, which is currently lost to seepage,
evaporation, and heavy vegetation growth. The project will allow the Company to reduce diversions from the Blacksmith Fork River and more efficiently deliver water to its shareholders.

City of Orem, City of Orem Advanced Metering Infrastructure Program
Reclamation Funding: $1,500,000  Total Project Cost: $7,298,424
The City of Orem located near Provo, Utah, will install 18,691 advanced metering infrastructure (AMI) meters to replace existing manually read primarily residential water meters. An additional 1,451 existing meters will be retrofitted for AMI capability. The project is expected to result in annual water savings of 3,133 acre-feet through the availability of consumption data, improved leak detection, and more accurate meter reading and billing. The City is in an area that is highly susceptible to severe drought, projected population growth, and increased water demands. The water conserved will remain in the Provo River.

Riverton City, Riverton City Secondary Water Metering Project
Reclamation Funding: $1,500,000  Total Project Cost: $15,376,745
Riverton City, located in Salt Lake County, Utah, will install 9,872 meters on its secondary water distribution system. The secondary meters will be integrated with the City's advanced metering infrastructure system, which includes a data portal for customer interaction. The project will improve the reliability of the City's secondary system, preparing it for projected future growth. The project will support water conservation efforts and provide accurate, real-time data for individual users. The project is expected to result in annual water savings of 3,000 acre-feet by identifying customer overuse. The water conserved will be stored and made available for projected future demands in the area.

South Jordan City, South Jordan City Secondary Water Metering Project
Reclamation Funding: $300,000  Total Project Cost: $635,200
South Jordan City, located in Salt Lake County, Utah, will install 443 secondary water meters on existing residential connections. Secondary water meters equipped with endpoints that allow continuous data collection will provide usage information to better quantify secondary water use and promote conservation. The project will help to prevent the use of potable water for lawn and garden watering, especially during times of drought, and is expected to result in annual water savings of 172 acre-feet. The project directly supports the State of Utah’s goal to reduce residential water usage per capita per day by 25%. The water conserved will remain in the Jordan River, which drains into the Great Salt Lake.

Sunrise and Bench Creek Irrigation Company, Piping and Small Hydro Project
Reclamation Funding: $538,000  Total Project Cost: $1,196,500
The Sunrise and Bench Creek Irrigation Company, located in northern Utah, will replace 7,300 feet of existing corrugated metal pipe and 500 feet of open, unlined ditch with a 26-inch high-density polyethylene pipeline. The project also includes a new inlet structure, meter station, widening of a settling pond, and an underwater micro-hydro turbine to power the meter. The existing corrugated metal pipe experiences significant leaks, causing the Company to over-divert water from the Provo River to compensate for water losses. The project is expected to result in an annual water savings of 802 acre-feet, which will reduce diversions and enable Company shareholders to reduce their
reliance on the Central Utah Water Conservancy District. The water conserved will remain in the Provo River and eventually be stored in Jordanelle Reservoir.

Uintah Water Conservancy District, Steinaker Service Canal Enclosure Project (Reach III)
Reclamation Funding: $1,500,000  Total Project Cost: $15,500,000

The Uintah Water Conservancy District, located in northeastern Utah, will convert 13,100 feet of the unlined Steinaker Service Canal to 72-inch diameter fiberglass pipe with associated appurtenances, turnouts, and measurement devices. Drought is common in the project area, and the Steinaker Reservoir is an off-channel reservoir that does not get excess flows during large precipitation years. The project is expected to result in annual water savings of 900 acre-feet currently lost to seepage, which will be stored in Steinaker Reservoir. Conserved water will be used to address shortages during drought years, reduce the need for imported water, and maintain water levels necessary for recreation at Steinaker Reservoir. In addition, the project will provide a pressurized water supply, enabling the conversion from flood irrigation to sprinklers.

Ute Indian Tribe, Ute Indian Tribe Water Meter Replacement Project
Reclamation Funding: $837,900  Total Project Cost: $1,675,800

The Ute Indian Tribe, located in eastern Utah, will replace 1,021 existing meters with cellular LTE end point technology to detect water main breaks, service line breaks, and inaccurate metering. The project is expected to result in annual water savings of 381 acre-feet currently lost to metering inaccuracy. The water conserved will remain in the river system, improving water reliability for the tribe and multiple water districts and communities in the adjacent area.

Weber Basin Water Conservancy District, Upper Willard Canal Lining Construction Project (Phase 7)
Reclamation Funding: $1,200,000  Total Project Cost: $2,425,000

The Weber Basin Water Conservancy District, located in northern Utah, will line 2,000 feet of the currently unlined Willard Canal with 6-inch steel reinforced concrete. Canal lining has been identified as a priority in the District’s System Optimization Review and water conservation plan. The District administers water contracts totaling 226,170 acre-feet, serves a geographic area over 2,500 square miles, and has regional water supply responsibility for cities, districts, and companies located in five Utah counties. The area is vulnerable to drought and continues to experience rising demand from population growth. The project is expected to result in annual water savings of 3,000 acre-feet currently lost to seepage, which will be marketed to wholesale customers, mostly cities, in order to meet rapidly growing demand. Further, conserved water will remain in the Weber River for longer periods of time, benefitting species in the area, including the Bonneville Cutthroat Trout.

Weber Basin Water Conservancy District, Woods Cross Secondary Water Metering Project (Phase III)
Reclamation Funding: $300,000  Total Project Cost: $827,500

The Weber Basin Water Conservancy District will also install 650 secondary water meters with advanced metering infrastructure (AMI) to provide the District with real-time data to detect leaks and end use inefficiencies. The data will also help customers better understand how they can reduce
water usage. The area has experienced rapid population growth and drought, resulting in declining groundwater levels. The project is expected to result in annual water savings of 247 acre-feet which is currently lost to leaks and customer overuse. The water conserved will be stored to meet rising municipal demand from population growth and to regulate flows in the Davis Aqueduct, which has reached maximum capacity.

Wellsville City Irrigation Company, Wellsville Pressurized Irrigation Project
Reclamation Funding: $1,500,000 Total Project Cost: $5,895,000

The Wellsville City Irrigation Company, located in northern Utah, will convert its existing open earthen ditch system to a pressurized irrigation system throughout the City of Wellsville to provide irrigation water to city residents who are currently using potable water for indoor and outdoor use. The project also includes constructing a small storage pond with a Supervisory Control and Data Acquisition system, pumping station, and two booster pump stations. The project is expected to result in annual water savings of 1,960 acre-feet that is currently lost to seepage, evaporation, and operational spills. The project will allow for more water to remain in the Hyrum Reservoir until later in the irrigation season, which will provide increased flows in the Bear River, primarily to benefit the Bear River Migratory Bird Refuge.

Washington

Kittitas Reclamation District, South Branch Canal Efficiency Project
Reclamation Funding: $975,000 Total Project Cost: $1,950,000

The Kittitas Reclamation District located near Yakima, Washington, will install 4,637 feet of double barrel 60-inch, steel reinforced polyethylene pipe on the existing earthen South Branch Canal. The project is expected to result in annual water savings of 515 acre-feet currently lost to seepage and operational spills. The water conserved through the project will be delivered to Manastash Creek for instream flows to benefit threatened species, including Coho and Chinook salmon. The project is consistent with a memorandum of agreement between Reclamation, the Washington Department of Ecology, and the District to address water management issues in over-appropriated or flow-impaired tributaries to the upper Yakima River.

City of Leavenworth, City of Leavenworth Advanced Metering Infrastructure Project
Reclamation Funding: $300,000 Total Project Cost: $975,000

The City of Leavenworth, located in central Washington, will upgrade 1,400 existing manual-read primarily residential water meters with an advanced metering infrastructure (AMI) system. The system will include meters, data collection stations, radio transmitters, meter data analysis, and billing hardware and software. The AMI system will provide the City with real-time data to detect distribution system losses and unusual or continuous usage patterns. By improving metering accuracy, the project is expected to result in annual water savings of 22 acre-feet, which will remain in Icicle Creek.
**Quincy-Columbia Basin Irrigation District, West Canal Lining**  
**Reclamation Funding: $300,000**  
**Total Project Cost: $833,264**

The Quincy-Columbia Basin Irrigation District, located in central Washington, will line 2,500 feet of the earthen West Canal with a geotextile liner covered with concrete to address seepage losses. The project advances the goals of a Memorandum of Understanding (MOU) between the three Columbia Basin Project irrigation districts, the Washington State Department of Ecology, the Washington State Department of Fish and Wildlife, and the Bureau of Reclamation, where the parties have agreed to address regional water reliability concerns including drought, groundwater issues, and improved stream flows to assist salmon recovery. The project is expected to result in annual water savings of 850 acre-feet that is currently lost to seepage. The water conserved will be used to meet actions identified in the MOU, including offsetting groundwater pumping and enhancing flows in the Columbia River.

**Wyoming**

**Austin/Wall Irrigation District, Wall Reservoir Improvement Project**  
**Reclamation Funding: $300,000**  
**Total Project Cost: $900,000**

The Austin/Wall Irrigation District, located in southwestern Wyoming, will install a clay liner on a portion of the Wall Reservoir to reduce seepage losses. During times of shortage, when water deliveries under existing water rights from the Blacks Fork River are curtailed, the Wall Reservoir serves as a critical source of water for many growers. By addressing seepage, the District expects to be able to fill the reservoir more quickly, allowing for reduced diversions from the Blacks Fork River. Once complete, the project is expected to result in annual water savings of 1,048 acre-feet. Water conserved as a result of the project will help to avoid reduced allocations in times of shortage and will otherwise remain in the Blacks Fork River.

**Eden Valley Irrigation and Drainage District, Farson Lateral Phase III Piping and Hydro Project**  
**Reclamation Funding: $1,500,000**  
**Total Project Cost: $3,182,900**

The Eden Valley Irrigation and Drainage District, located in western Wyoming, will convert 6,200 feet of the unlined Farson Lateral to a 63-inch high-density polyethylene pipeline. Water is currently lost to seepage to the sandy subsurface, which raises the water table and brings salts to the surface. In addition, the project area has a low water holding capacity, resulting in an inefficient delivery system in a region prone to drought. As a result, the District diverts more water from the reservoirs than users require in order to account for seepage loss. The project is expected to result in annual water savings of 666 acre-feet by improving delivery efficiency. The conserved water will be used to avoid reduced water allocations during dry years and will otherwise remain in the Big Sandy and Eden Reservoirs and in the river system, providing recreation and wildlife benefits. This project also positions farmers in the District to implement on-farm improvements through the Natural Resources Conservation Service’s Environmental Quality Incentives Program by providing a pressurized system that can be used by farmers to convert to sprinkler irrigation. Lastly, the project includes the installation a 2-kilowatt hydro turbine to help offset project energy consumption.
Kirby Ditch Irrigation District, Kirby Ditch Lower Reach Piping Project
Reclamation Funding: $737,966  Total Project Cost: $2,236,260

The Kirby Ditch Irrigation District, located in central Wyoming, will convert 2.56 miles of the open Kirby Ditch to a buried polyvinyl chloride pipeline. The pipeline will service six landowners, totaling 704 acres, and enable improved water delivery. The project is expected to result in annual water savings of 1,008 acre-feet, which is currently lost to seepage. As a result of the project, the District will reduce its diversions from the Big Horn River and will also be able to avoid purchasing water from Boysen Reservoir. Once completed, the project will allow landowners to increase on-farm irrigation efficiency by converting to gated pipe and pivot irrigation.
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A. Program Description

A1. Authority
This NOFO is issued under the authority of Section 9504(a) of the Secure Water Act, Subtitle F of Title IX of the Omnibus Public Land Management Act of 2009, Public Law (P.L.) 111-11 (42 United States Code [U.S.C.] 10364).

Catalog of Federal Domestic Assistance (CFDA) Number
15.507

A2. Background, Purpose and Program Requirements
The objective of this NOFO is to invite eligible applicants (Section C.1) to leverage their money and resources by cost sharing with Reclamation on projects that seek to conserve and use water more efficiently; increase the production of renewable energy; mitigate conflict risk in areas at a high risk of future water conflict; enable farmers to make additional on-farm improvements in the future, including improvements that may be eligible for Natural Resources Conservation Service (NRCS) funding; and accomplish other benefits that contribute to sustainability in the western United States.

B. Federal Award Information

B1. Total Funding
Estimate contingent upon final Congressional appropriations

Estimated Total Funding
$ 15,000,000

B2. Expected Award Amount

Maximum Award
$ 2,000,000

Minimum Award
$ 0
B3. Anticipated Award Funding and Dates

Anticipated Award Date
September 30, 2022

Anticipated Project Completion Date
09/30/2025

B4. Number of Awards

Anticipated Number of Awards
50

B5. Type of Award

Funding Instrument Type
CA - Cooperative Agreement
G - Grant

Please see Attachment for additional funding instrument information and the Full Notice of Funding Opportunity Document under Section B.4

C. Eligibility Information

C1. Eligible Applicants

Eligible Applicants
25 – Others (see text field entitled “Additional Information on Eligibility” for clarification)

Additional Information on Eligibility

Category A applicants:
States, Indian tribes, irrigation districts, and water districts;
State, regional, or local authorities, the members of which include one or more organizations with water or power delivery authority; and
Other organizations with water or power delivery authority.

Category B applicants:
Nonprofit conservation organizations that are acting in partnership with, and with the agreement of, an entity described in Category A. Category B applicants must include with their application a letter from the Category A partner, stating that they are acting in partnership with the applicant and agree to the submittal and content of the proposal.

Applicants must also be located in the Western United States or Territories as identified in the Reclamation Act of June 17, 1902, as amended and supplemented; specifically: Alaska, Arizona,
California, Colorado, Hawaii, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, Wyoming, American Samoa, Guam, the Northern Mariana Islands, the Virgin Islands, and Puerto Rico.

**Those not eligible** include, but are not limited to, the following entities:

- Federal Governmental entities, Individuals, Institutes of higher education, 501(c)4 organizations, 501(c)6 organizations

### C2. Cost Sharing or Matching

**Cost Sharing / Matching Requirement**

Yes  
This program has a cost share requirement.

Applicants must be capable of cost sharing 50 percent or more of the total project costs. The total project cost is defined as the total allowable costs incurred under a Federal award and all required cost share and voluntary committed cost share contributions, including third-party contributions.

Cost share may be made through cash, costs contributed by the applicant, or third-party in-kind contributions. Third-party in-kind contributions include the value of non-cash contributions of property or services that benefit the federally assisted project and are contributed by non-Federal third parties, without charge. Cost share funding from sources outside the applicant’s organization (e.g., loans or state grants) should be secured and available to the applicant prior to award. Please see Section D.2.2.8 Official Resolution and Section D.2.2.5 Funding Plan and Letters of Commitment for more information regarding the documentation required to verify commitments to meet cost sharing requirements.

Other sources of Federal funding may not be counted towards the required cost share. The exception to this requirement is where the Federal statute authorizing a program specifically provides that Federal funds made available for such program can be applied to matching or cost sharing requirements of other Federal programs, such as awards to tribal organizations under P.L. 93-638, as amended. If it is determined that the Federal funding cannot be applied towards the non-Federal cost share, the work associated with the funding may be removed from the proposed project.

### C3. Other

**Please see Attachment for additional eligibility information and the Full Notice of Funding Opportunity Document under Section C.3**

**Excluded Parties:** Reclamation conducts a review of the SAM.gov Exclusions database for all applicant entities and their project personnel prior to award. Reclamation cannot award funds to entities or their key project personnel identified in the SAM.gov Exclusions database as ineligible, prohibited/restricted or otherwise excluded from receiving Federal contracts, certain
subcontracts, and certain Federal assistance and benefits, as their ineligibility condition applies to this Federal program.

C4. Eligible Project Types
Water Conservation Projects
Water conservation projects result in quantifiable and sustained water savings or improved water management. Please note that an agreement will not be awarded for an improvement to conserve irrigation water unless the applicant agrees to the terms of Section 9504(a)(3)(B) of Public Law 111-11. See Section F.2.4. Requirements for Agricultural Operations under Public Law 111-11, Section 9504(a)(3)(D) of this NOFO for further information. Eligible water conservation projects include:
• Canal Lining/Piping: Projects that line or pipe canals, resulting in conserved water.
• Supervisory Control and Data Acquisition and Automation (SCADA): Projects that install SCADA and/or automation components that provide water savings when irrigation delivery system operational efficiency is
• Landscape Irrigation Measures: Projects that provide water savings by reducing outdoor water usage. These measures include turf removal, Smart irrigation controllers (weather or soil-moisture based) and high-efficiency nozzles (sprinkler heads). These measures are typically promoted by water entities through rebates or direct-install programs, which are eligible for WaterSMART Grants funding.
• Commercial Cooling Systems: Projects to retrofit or replace large evaporative cooling units (cooling towers) to reduce consumptive water use and energy, such as conversion to air-cooled units or high-efficiency cooling towers. Given the average design life of commercial cooling towers is 15 to 20 years and the latest technology towers are much more water and energy efficient, there are potential savings to be had by replacing or retrofitting older existing systems.

Renewable Energy Projects
Projects that increase the use of renewable energy sources in managing and delivering water and/or projects that upgrade existing water management facilities resulting in quantifiable and sustained energy savings. Projects include, but are not limited to, those discussed in the following subsections.
• Implementing Renewable Energy Projects Related to Water Management and Delivery
• Renewable energy projects related to water management and delivery

Please see Attachment for additional eligibility information and the Full Notice of Funding Opportunity Document under Section C.3.1. and C.3.2.

D. Application and Submission Information

D1. Address to Request Application Package
If you are unable to access this information electronically, you can request paper copies of any of the documents referenced in this NOFO by emailing the Notice of Funding Opportunity staff at bor-sha-fafoa@usbr.gov.
D2. Content and Form of Application Submission

1. SF-424, Application for Federal Assistance

Applicants must submit the appropriate Standard Form (SF)-424, Application for Federal Assistance. The required application forms are available with this announcement on Grants.gov. The SF-424, Application for Federal Assistance must be complete, signed, and dated. Do not include any proprietary or personally identifiable information. Please note: Enter only the amount requested from this Federal program in the “Federal” funding box on the SF-424 Application form. Include any other Federal sources of funding in the “Other” box and provide details on those Federal source(s) and funding amount(s) in the required Budget Narrative (see the “Budget Narrative” section below).

Any applicant organization that has not completed the financial assistance certifications and representations within their SAM.gov registration must submit the appropriate signed and dated Assurances form. All of the required application forms are available with this announcement on Grants.gov.

Any applicant organization that has not completed the financial assistance certifications and representations within their SAM.gov registration must submit the appropriate signed and dated Assurances form. All required application forms are available with this announcement on Grants.gov.

Project Narrative

Please see Attachment for additional submission requirements information and the Full Notice of Funding Opportunity Document under Section D.2

Applicants must submit the appropriate SF-424 Budget Information form and Budget Narrative. For non-construction programs or projects, applicants must complete and submit the SF-424A, “Budget Information for Non-Construction Programs” form. All of the required application forms are available with this announcement on Grants.gov. Federal award recipients and subrecipients are subject to Federal award cost principles in 2 CFR 200.

Applicants must submit the appropriate SF-424 Budget Information form and Budget Narrative. For construction programs or projects, applicants must complete and submit the SF-424C, “Budget Information for Construction Programs”. All of the required application forms are available with this announcement on Grants.gov. Federal award recipients and subrecipients are subject to Federal award cost principles in 2 CFR 200.

Detailed Budget Narrative

Please see Attachment for additional budget information and the Full Notice of Funding Opportunity Document under Section D.2.2.5

Conflict of Interest Disclosure

Per the Financial Assistance Interior Regulation (FAIR), 2 CFR §1402.112, applicants must state in their application if any actual or potential conflict of interest exists at the time of submission.

(a) Applicability.

(1) This section intends to ensure that non-Federal entities and their employees take appropriate steps to avoid conflicts of interest in their responsibilities under or with respect to Federal financial assistance agreements.
(2) In the procurement of supplies, equipment, construction, and services by recipients and by subrecipients, the conflict of interest provisions in 2 CFR 200.318 apply.

(b) Notification.

(1) Non-Federal entities, including applicants for financial assistance awards, must disclose in writing any conflict of interest to the DOI awarding agency or pass-through entity in accordance with 2 CFR 200.112.

(2) Recipients must establish internal controls that include, at a minimum, procedures to identify, disclose, and mitigate or eliminate identified conflicts of interest. The recipient is responsible for notifying the Financial Assistance Officer in writing of any conflicts of interest that may arise during the life of the award, including those that have been reported by subrecipients.

(c) Restrictions on lobbying. Non-Federal entities are strictly prohibited from using funds under a grant or cooperative agreement for lobbying activities and must provide the required certifications and disclosures pursuant to 43 CFR part 18 and 31 U.S.C. 1352.

(d) Review procedures. The Financial Assistance Officer will examine each conflict of interest disclosure on the basis of its particular facts and the nature of the proposed grant or cooperative agreement, and will determine whether a significant potential conflict exists and, if it does, develop an appropriate means for resolving it.

(e) Enforcement. Failure to resolve conflicts of interest in a manner that satisfies the government may be cause for termination of the award. Failure to make required disclosures may result in any of the remedies described in 2 CFR 200.338, Remedies for noncompliance, including suspension or debarment (see also 2 CFR part 180).

Single Audit Reporting Statement
All U.S. states, local governments, federally recognized Indian tribal governments, and non-profit organizations expending $750,000 USD or more in Federal award funds in the applicant’s fiscal year must submit a Single Audit report for that year through the Federal Audit Clearinghouse’s Internet Data Entry System. U.S. state, local government, federally recognized Indian tribal government, and non-profit applicants must state if your organization was or was not required to submit a Single Audit report for the most recently closed fiscal year. If your organization was required to submit a Single Audit report for the most recently closed fiscal year, provide the EIN associated with that report and state if it is available through the Federal Audit Clearinghouse website.

Please see Attachment for additional disclosure information and the Full Notice of Funding Opportunity Document under Section D.3

Certification Regarding Lobbying
Applicants requesting more than $100,000 in Federal funding must certify to the statements in 43 CFR Part 18, Appendix A-Certification Regarding Lobbying. If this application requests more than $100,000 in Federal funds, the Authorized Official’s signature on the appropriate SF-424, Application for Federal Assistance form also represents the entity’s certification of the statements in 43 CFR Part 18, Appendix A.

Disclosure of Lobbying Activities
A fully completed and signed SF-LLL, Disclosure of Lobbying Activities is required is required if the applicant has made or agreed to make payment to any lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a covered Federal action. Note – this form cannot be submitted by a contractor or other entity on behalf of an applicant.

**Overlap or Duplication of Effort Statement**

Applicants must provide a statement that addresses if there is any overlap between the proposed project and any other active or anticipated proposals or projects in terms of activities, costs, or commitment of key personnel. If any overlap exists, applicants must provide a description of the overlap in their application for review.

Applicants must also state if the proposal submitted for consideration under this program is or is not in any way duplicative of any proposal or project that has been or will be submitted for funding consideration to any other potential funding source whether it be Federal or non-Federal. If such a circumstance exists, applicants must detail when the other duplicative proposal(s) were submitted, to whom (Agency name and Financial Assistance program), and when funding decisions are expected to be announced. If at any time a proposal is awarded funds that would be duplicative of the funding requested from the Bureau of Reclamation, applicants must notify the Notice of Funding Opportunity point of contact or the Program Coordinator immediately.

**D3. Unique Entity Identifier and System for Award Management (SAM)**

**Identifier and System for Award Management (SAM.gov) Registration:** This requirement does not apply to individuals applying for funds as individual (i.e., unrelated to any business or nonprofit organization you may own or operate) or any entity with an exception approved by the funding bureau or office in accordance with bureau or office policy. All other applicants are required to obtain a Data Universal Numbering System (DUNS) number from Dun & Bradstreet and then register in SAM.gov prior to submitting a Federal award application. Federal award recipients must continue to maintain an active SAM.gov registration with current information through the life of their Federal award(s). See the “Submission Requirements” section of this document below for more information on SAM.gov registration. We may not make a Federal award to an applicant that has not completed the SAM.gov registration. If an applicant selected for funding has not completed their SAM.gov registration by the time the program is ready to make an award, the program may determine that the applicant is not qualified to receive an award. The program can use that determination as a basis for making an award to another applicant. **There is no cost to register with Dun & Bradstreet or SAM.gov.** There are third-party vendors who will charge a fee in exchange for registering entities with Dun & Bradstreet and SAM.gov; please be aware you can register and request help for free.

**Obtain a DUNS Number**

Request a DUNS Number through the Dun & Bradstreet website. For technical difficulties, send an email to the D&B SAM Help Desk. Please ensure that you are able to receive emails from SAMHelp@dnb.com. The Grants.gov “Obtain a DUNS Number” webpage also provides detailed instructions. Once assigned a DUNS number, your organization must maintain up-to-
date information with Dun & Bradstreet. Applicants must enter their DUNS number in the “Organizational DUNS” field on the SF-424, Application for Federal Assistance form.

**Register with the System for Award Management (SAM)**

Register on the SAM.gov website. “Help” tab on the website contains User Guides and other information to assist you with registration. The Grants.gov Register with SAM page also provides detailed instructions. You can also contact the supporting Federal Service Desk for help registering in SAM. Once registered in SAM, entities must renew and revalidate their SAM registration at least once every 12 months from the date previously registered. Entities are strongly encouraged to revalidate their registration as often as needed to ensure their information is up to date and reflects changes that may have been to the entity’s DUNS or IRS information.

Please see Attachment for additional SAM.gov information and the Full Notice of Funding Opportunity Document under Section D.3

**D4. Submission Dates and Times**

**Due Date for Applications**
11/03/2021

**Application Due Date Explanation**
Electronically submitted applications must be submitted no later than 4:00 p.m., MT, on the listed application due date.

**D5. Intergovernmental Review**

Prior to application submission, U.S. state and local government applicants should visit the OMB Office of Federal Financial Management website and view the “State Point of Contact (SPOC) List” to determine whether their application is subject to the state intergovernmental review process under Executive Order (E.O.) 12372 “Intergovernmental Review of Federal Programs.” States not on the list do not participate in the intergovernmental review process, and therefore do not have a SPOC. If you are located within a State that does not have a SPOC, you may send application materials directly to a Federal awarding agency. If your state is on the list, contact the designated entity for more information on the state’s prior review requirements for Federal assistance applications.

**D6. Funding Restrictions**

**Indirect Costs: Individuals**

**Indirect Costs: Organizations**

Please see Attachment for additional budget information and the Full Notice of Funding Opportunity Document under Section D.2.2.5.
D7. Other Submission Requirements
Please see Attachment for additional submission information and the Full Notice of Funding Opportunity Document under Section D.4

E. Application Review Information

E1. Criteria

<table>
<thead>
<tr>
<th>A. Quantifiable Water Savings</th>
<th>Maximum Points: 28</th>
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<tbody>
<tr>
<td></td>
<td>Up to 28 points may be awarded for this criterion. This criterion prioritizes projects that will conserve water and improve water use efficiency, supporting the goals of E.O. 14008. Points will be allocated based on the quantifiable water savings expected as a result of the project. Points will be allocated to give greater consideration to projects that are expected to result in more significant water savings.</td>
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All applicants should be sure to address the following:

1. **Describe the amount of estimated water savings.** For projects that conserve water, please state the estimated amount of water expected to be conserved (in acre-feet per year) as a direct result of this project.

   Please include a specific quantifiable water savings estimate; do not include a range of potential water savings.

2. **Describe current losses:** Please explain where the water that will be conserved is currently going and how it is being used. Consider the following:

   a. Explain where current losses are going (e.g., back to the stream, spilled at the end of the ditch, seeping into the ground)?

   b. If known, please explain how current losses are being used. For example, are current losses returning to the system for use by others? Are current losses entering an impaired groundwater table becoming unsuitable for future use?

   c. Are there any known benefits associated with where the current losses are going? For example, is seepage water providing additional habitat for fish or animal species?
3. Describe the support/documentation of estimated water savings: Please provide sufficient detail supporting how the estimate was determined, including all supporting calculations. Note: projects that do not provide sufficient supporting detail/calculations may not receive credit under this section. Please be sure to consider the questions associated with your project type (listed below) when determining the estimated water savings, along with the necessary support needed for a full review of your proposal. 

In addition, please note that the use of visual observations alone to calculate water savings, without additional documentation/data, are not sufficient to receive credit under this section. Further, the water savings must be the result of reducing or eliminating a current, ongoing loss, not the result of an expected future loss.

4. Please address the following questions according to the type of infrastructure improvement you are proposing for funding. See Appendix A: Benefit Quantification and Performance Measure Guidance for additional guidance on quantifying water savings.

1. Canal Lining/Piping: Canal lining/piping projects can provide water savings when irrigation delivery systems experience significant losses due to canal seepage. Applicants proposing lining/piping projects should address the following:
   a. How has the estimated average annual water savings that will result from the project been determined? Please provide all relevant calculations, assumptions, and supporting data.
   b. How have average annual canal seepage losses been determined? Have ponding and/or inflow/outflow tests been conducted to determine seepage rates under varying conditions? If so, please provide detailed descriptions of testing methods and all results. If not, please provide an explanation of the method(s) used to calculate seepage losses. All estimates should be supported with multiple sets of data/measurements from representative sections of canals.
   c. What are the expected post-project seepage/leakage losses and how were these estimates determined (e.g., can data specific to the type of material being used in the project be provided)?
   d. What are the anticipated annual transit loss reductions in terms of acre-feet per mile for the overall project and for each section of canal included in the project?
   e. How will actual canal loss seepage reductions be verified?
   f. Include a detailed description of the materials being used.

2. Municipal Metering: Municipal metering projects can provide water savings when individual user meters are installed where none exist to allow for unit or tiered pricing, when existing individual user meters are replaced with advanced metering infrastructure (AMI) meters, and when new meters are installed within a distribution system to assist with leakage reduction. To receive credit for water savings for a municipal metering project, an applicant must provide a detailed description of the method used to estimate savings, including references to documented savings from similar previously
implemented projects. Applicants proposing municipal metering projects should address the following:

a. How has the estimated average annual water savings that will result from the project been determined? Please provide all relevant calculations, assumptions, and supporting data.

b. How have current distribution system losses and/or the potential for reductions in water use by individual users been determined?

c. For installing end-user water service meters, e.g., for a residential or commercial building unit., refer to studies in the region or in the applicant’s service area that are relevant to water use patterns and the potential for reducing such use. In the absence of such studies, please explain in detail how expected water use reductions have been estimated and the basis for the estimations.

d. Installation of distribution system meters will not receive points under this criterion. Accordingly, these projects must be paired with a complementary project component that will result in water savings in order for the proposal to receive credit for water savings, e.g., pipe installation using upgraded materials, or individual water service meters.

e. What types (manufacturer and model) of devices will be installed and what quantity of each?

f. How will actual water savings be verified upon completion of the project?

3. **Irrigation Flow Measurement**: Irrigation flow measurement improvements can provide water savings when improved measurement accuracy results in reduced spills and over-deliveries to irrigators. Applicants proposing municipal metering projects should address the following:

a. How have average annual water savings estimates been determined? Please provide all relevant calculations, assumptions, and supporting data.

b. Have current operational losses been determined? If water savings are based on a reduction of spills, please provide support for the amount of water currently being lost to spills.

c. Are flows currently measured at proposed sites and if so, what is the accuracy of existing devices? How has the existing measurement accuracy been established?

d. Provide detailed descriptions of all proposed flow measurement devices, including accuracy and the basis for the accuracy.

e. Will annual farm delivery volumes be reduced by more efficient and timely deliveries? If so, how has this reduction been estimated?

f. How will actual water savings be verified upon completion of the project?

4. **Turf Removal**: Applicants proposing turf removal projects should address the following:

a. How have average annual water savings estimates been determined? Please provide all relevant calculations, assumptions, and supporting data.

b. What is the total surface area of turf to be removed and what is the estimated average annual turf consumptive use rate per unit area?
c. Was historical water consumption data evaluated to estimate average annual turf consumptive use per unit area? If so, did the evaluation include a weather adjustment component?

d. Will site audits be performed before applicants are accepted into the program?

e. How will actual water savings be verified upon completion of the project?

5. **Smart Irrigation Controllers, Controllers with Rain Sensor Shutoff, Drip Irrigation, and High-Efficiency Nozzles:** Applicants proposing smart irrigation controllers, controllers with rain sensor shutoff, drip irrigation, or high-efficiency nozzle projects should address the following:

a. How have average annual water savings estimates been determined? Please provide all relevant calculations, assumptions, and supporting data.

b. Was historical water consumption data evaluated to estimate the percent reduction in water demand per unit area of irrigated landscape? If so, did the evaluation include a weather adjustment component?

c. What types (manufacturer and model) of devices will be installed and what quantity of each?

d. Will the devices be installed through a rebate or direct-install program?

e. Will site audits be performed before and after installation?

f. How will actual water savings be verified upon completion of the project?

6. **High-Efficiency Indoor Appliances and Fixtures:** Installing high-efficiency indoor appliances and fixtures can provide water savings for municipal water entities where there is significant potential for replacing existing non-efficient indoor appliances and fixtures. Applicants proposing high-efficiency indoor appliance and fixtures projects should address the following:

a. How have average annual water savings estimates been determined? Please provide all relevant calculations, assumptions, and supporting data.

b. What types (clothes washers, shower heads, etc.) of appliances and fixtures will be installed and what quantity of each?

c. Have studies been conducted to verify the existence of non-efficient appliances and fixtures? Provide published water savings rates for each of these devices and reference the source for each of the device savings rates.

d. Will the devices be installed through rebate or direct-install programs?

e. How will actual water savings be verified upon completion of the project?

7. **Commercial Cooling Systems:** Cooling towers are components of many refrigeration systems with many applications. They dissipate heat to the atmosphere through the evaporative process and are common in manufacturing processes where cooling is required. They are also used for cooling large commercial buildings. Cooling tower structures vary in size, design, and efficiency. Regardless, all cooling towers consume large volumes of water and energy.

Open-circuit or direct contact are the most common types of cooling towers. Water is supplied to the tower after gathering heat and then released in the upper tower levels and a fan near the base of the tower creates upward airflow. Closed-circuit towers are more efficient and closed-circuit towers with adiabatic cooling are more efficient yet.
Water and energy savings can be achieved by replacing or retrofitting older low efficiency cooling towers. Applicants proposing cooling system projects should address the following:

a. How have average annual water savings estimates been determined? Please provide all relevant calculations, assumptions, and supporting data.
b. Was historical water consumption data evaluated to estimate the percent reduction in water demand?
c. Specify type (manufacturer and model) of cooling tower system to be installed and/or provide a detailed description of existing system retrofit.

Note that an agreement will not be awarded for an improvement to conserve irrigation water unless the applicant agrees to the terms of Section 9504(a)(3)(B) of Public Law 111-11 (see p. 52 of the NOFO for additional information).

**B. Renewable Energy**

Maximum Points: 20

*Up to 20 points may be awarded based on the extent to which the project increases the use of renewable energy or otherwise results in increased energy efficiency and reduced greenhouse gas emissions.*

For projects that include construction or installation of renewable energy components, please respond to Subcriterion No. B.1: Implementing Renewable Energy Projects Related to Water Management and Delivery. If the project does not implement a renewable energy project but will increase energy efficiency, please respond to Subcriterion No. B.2. Increasing Energy Efficiency in Water Management. If the project has separate components that will result in both implementing a renewable energy project and increasing energy efficiency, an applicant may respond to both.

*Note: an applicant may receive points under both subcriterion No.B.1 and B.2 if the project consists of an energy efficiency component separate from the renewable energy component of the project. However, an applicant may receive no more than 20 points total under both subcriteria No. B.1 and B.2.*

Subcriterion No. B.1: Implementing Renewable Energy Projects Related to Water Management and Delivery*Up to 20 points may be awarded for projects that include construction or installation of renewable energy components (e.g., hydroelectric units, solar- electric facilities, wind energy systems, or facilities that otherwise enable the use of renewable energy). Projects such as small-scale solar resulting in minimal energy savings or production will be considered under Subcriterion No. B.2 below.*

**Describe the amount of energy capacity.** For projects that implement renewable energy systems, state the estimated amount of capacity (in kilowatts) of the system. Please provide sufficient detail supporting the stated estimate, including all calculations in support of the estimate.

**Describe the amount of energy generated.** For projects that implement renewable energy systems, state the estimated amount of energy that the system will generate (in kilowatt hours per year). Please provide sufficient detail supporting the stated estimate, including all
calculations in support of the estimate. Please explain how the power generated as a result of this project will be used, including any existing or planned agreements and infrastructure.

**Describe the status of a mothballed hydro plant.** For projects that are bringing mothballed hydro capacity back online, please describe the following:

- Clearly describe the work that will be accomplished through the WaterSMART Grant. Note: normal OM&R activities are not eligible for funding. The work being proposed must be an investment.

- Provide information about the capacity (in kilowatts) of the existing hydro system and the expected capacity once it is brought back on-line.

- Provide information about the duration that the hydro system has been offline and the reasons why it has been mothballed. Please include any FERC filings or other documentation regarding the system.

**Describe any other benefits of the renewable energy project.** Please describe and provide sufficient detail on any additional benefits expected to result from the renewable energy project, including:

- How the system will combat/offset the impacts of climate change, including an expected reduction in greenhouse gas emissions
- Expected environmental benefits of the renewable energy system
- Any expected reduction in the use of energy currently supplied through a Reclamation project.
- Anticipated benefits to other sectors/entities.
- Expected water needs, if any, of the system.

**AND/OR**

Subcriterion No. B.2: Increasing Energy Efficiency in Water Management *Up to 10 points may be awarded for projects that address energy demands and reduce greenhouse gas emissions by retrofitting equipment to increase energy efficiency and/or through water conservation improvements that result in reduced pumping or diversions.*

Describe any energy efficiencies that are expected to result from implementation of the water conservation or water efficiency project (e.g., reduced pumping).
• If quantifiable energy savings is expected to result from the project, please provide sufficient details and supporting calculations. If quantifying energy savings, please state the estimated amount in kilowatt hours per year.
• How will the energy efficiency improvement combat/offset the impacts of climate change, including an expected reduction in greenhouse gas emissions.
• If the project will result in reduced pumping, please describe the current pumping requirements and the types of pumps (e.g., size) currently being used. How would the proposed project impact the current pumping requirements and energy usage?
• Please indicate whether your energy savings estimate originates from the point of diversion, or whether the estimate is based upon an alternate site of origin.
• Does the calculation include any energy required to treat the water, if applicable?
• Will the project result in reduced vehicle miles driven, in turn reducing greenhouse gas emissions? Please provide supporting details and calculations.
• Describe any renewable energy components that will result in minimal energy savings/production (e.g., installing small-scale solar as part of a SCADA system).

C. Sustainability Benefits  Maximum Points: 20

Up to 20 points may be awarded under this criterion. This criterion prioritizes projects that address a specific water and/or energy sustainability concern(s), including enhancing drought resilience, addressing the current and future impacts of climate change, and resolving water related conflicts in the region. In addition, this criterion is focused on the benefits associated with the project, including benefits to tribes, ecosystem benefits, and other benefits to water and/or energy supply sustainability.

Addressing a specific water and/or energy sustainability concern(s). Will the project address a specific sustainability concern? Please address the following:

• Explain and provide detail of the specific issue(s) in the area that is impacting water sustainability, such as shortages due to drought and/or climate change, increased demand, or reduced deliveries.
• Explain and provide detail of the specific issue(s) in the area that is impacting energy sustainability, such as reliance on fossil fuels, pollution, or interruptions in service.
• Please describe how the project will directly address the concern(s) stated above. For example, if experiencing shortages due to drought or climate change, how will the project directly address and confront the shortages?
• Please address where any conserved water as a result of the project will go and how it will be used, including whether the conserved water will be used to offset groundwater pumping, used to reduce diversions, used to address shortages that impact diversions or reduce deliveries, made available for transfer, left in the river system, or used to meet another intended use.
• Provide a description of the mechanism that will be used, if necessary, to put the conserved water to the intended use.
• Indicate the quantity of conserved water that will be used for the intended purpose(s).
**Project benefits.** Please provide a detailed explanation of the project benefits and their significance. These benefits may include, but are not limited to, the following:

1. **Combating the Climate Crisis:** Presidential Executive Order 14008: Tackling the Climate Crisis at Home and Abroad, focuses on increasing resilience to climate change and supporting climate-resilient development. For additional information on the impacts of climate change throughout the western United States, see: [https://www.usbr.gov/climate/secure/docs/2021secure/2021SECUREReport.pdf](https://www.usbr.gov/climate/secure/docs/2021secure/2021SECUREReport.pdf). Please describe how the project will address climate change, including the following:

   a. Please provide specific details and examples on how the project will address the impacts of climate change and help combat the climate crisis.

   b. Does this proposed project strengthen water supply sustainability to increase resilience to climate change?

   c. Will the proposed project establish and utilize a renewable energy source?

   d. Will the project result in lower greenhouse gas emissions?

2. **Disadvantaged or Underserved Communities:** E.O. 14008 and E.O. 13985 support environmental and economic justice by investing in underserved and disadvantaged communities and addressing the climate-related impacts to these communities, including impacts to public health, safety, and economic opportunities. Please describe how the project supports these Executive Orders, including the following:

   a. Does the proposed project directly serve and/or benefit a disadvantaged or historically underserved community? Benefits can include, but are not limited to, public health and safety through water quality improvements, new water supplies, new renewable energy sources, or economic growth opportunities.

   b. If the proposed project is providing benefits to a disadvantage community, provide sufficient information to demonstrate that the community meets the disadvantaged community definition in Section 1015 of the Cooperative Watershed Act, which is defined as a community with an annual median household income that is less than 100 percent of the statewide annual median household income for the State, or the applicable state criteria for determining disadvantaged status.
c. If the proposed project is providing benefits to an underserved community, provide sufficient information to demonstrate that the community meets the underserved definition in E.O. 13985, which includes populations sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life.

3. **Tribal Benefits:** The Department of the Interior is committed to strengthening tribal sovereignty and the fulfillment of federal tribal trust responsibilities. The President’s memorandum “Tribal Consultation and Strengthening Nation-to-Nation Relationships” asserts the importance of honoring the federal government’s commitments to Tribal Nations. Please address the following, if applicable:

   a. Does the proposed project directly serve and/or benefit a tribe? Will the project increase water supply sustainability for an Indian tribe? Will the project provide renewable energy for an Indian tribe?

   b. Does the proposed project directly support tribal resilience to climate change and drought impacts or provide other tribal benefits such as improved public health and safety through water quality improvements, new water supplies, or economic growth opportunities?

4. **Enhancing Drought Resiliency:** Through this subcriterion and other sections above, this NOFO places a priority on projects that enhance drought resiliency. Please provide information regarding how the project will enhance drought resilience by benefitting the water supply and ecosystem, including the following:

   a. Does the project seek to improve ecological resiliency to climate change?

   b. Will water remain in the system for longer periods of time? If so, provide details on current/future durations and any expected resulting benefits (e.g., maintaining water temperatures or water levels).

   c. Will the project benefit species (e.g., federally threatened or endangered, a federally recognized candidate species, a state listed species, or a species of particular recreational, or economic importance)? Please describe the relationship of the species to the water supply, and whether the species is adversely affected
by a Reclamation project or is subject to a recovery plan or conservation plan under the ESA.

d. Please describe any other ecosystem benefits as a direct result of the project.

e. Will the project directly result in more efficient management of the water supply? For example, will the project provide greater flexibility to water managers, resulting in a more efficient use of water supplies?

Projects that are intended to improve streamflows or aquatic habit, and that are requesting $500,000 or more in Federal funding, must include information about plans to monitor the benefits of the project. Please describe the plan to monitor improved streamflows or aquatic habit benefits over a five-year period once the project has been completed. Provide detail on the steps to be taken to carry out the plan.

5. Other Benefits: Will the project address water and/or energy sustainability in other ways not described above? For example:

   a. Will the project assist States and water users in complying with interstate compacts?

   b. Will the project benefit multiple sectors and/or users (e.g., agriculture, municipal and industrial, environmental, recreation, or others)?

   c. Will the project benefit a larger initiative to address sustainability?

   d. Will the project help to prevent a water-related crisis or conflict? Is there frequently tension or litigation over water in the basin?

D. Complementing On-Farm Irrigation Improvements

Maximum Points: 10

Up to 10 points may be awarded for projects that describe in detail how they will complement on-farm irrigation improvements eligible for NRCS financial or technical assistance.

Note: Scoring under this criterion is based on an overall assessment of the extent to which the WaterSMART Grant project will complement ongoing or future on-farm improvements. Applicants should describe any proposal made to NRCS, or any plans to seek assistance from NRCS in the future, and how an NRCS-assisted activity would complement the WaterSMART Grant project. Financial assistance through EQIP is the most commonly used program by which NRCS helps producers implement improvements to irrigation systems, but NRCS does have
additional technical or financial assistance programs that may be available. Applicants may receive maximum points under this criterion by providing the information described in the bullet points below. Applicants are not required to have assurances of NRCS assistance by the application deadline to be awarded the maximum number of points under this sub-criterion. Reclamation may contact applicants during the review process to gather additional information about pending applications for NRCS assistance if necessary.

Please note: On-farm improvements themselves are not eligible activities for funding under this NOFO. This criterion is intended to focus on how the WaterSMART Grant project will complement ongoing or future on-farm improvements. NRCS will have a separate application process for the on-farm components of selected projects that may be undertaken in the future, separate of the WaterSMART Grant project. If the proposed project will complement an on-farm improvement eligible for NRCS assistance, please address the following:

- Describe any planned or ongoing projects by farmers/ranchers that receive water from the applicant to improve on-farm efficiencies.
  - Provide a detailed description of the on-farm efficiency improvements.
  - Have the farmers requested technical or financial assistance from NRCS for the on-farm efficiency projects, or do they plan to in the future?
  - If available, provide documentation that the on-farm projects are eligible for NRCS assistance, that such assistance has or will be requested, and the number or percentage of farms that plan to participate in available NRCS programs.
  - Applicants should provide letters of intent from farmers/ranchers in the affected project areas.

- Describe how the proposed WaterSMART project would complement any ongoing or planned on-farm improvement.
  - Will the proposed WaterSMART project directly facilitate the on-farm improvement? If so, how? For example, installation of a pressurized pipe through WaterSMART can help support efficient on-farm irrigation practices, such as drip-irrigation.

OR

  - Will the proposed WaterSMART project complement the on-farm project by maximizing efficiency in the area? If so, how?

- Describe the on-farm water conservation or water use efficiency benefits that are expected to result from any on-farm work.
  - Estimate the potential on-farm water savings that could result in acre-feet per year. Include support or backup documentation for any calculations or assumptions.

- Please provide a map of your water service area boundaries. If your project is selected for funding under this NOFO, this information will help NRCS identify the irrigated lands that may be approved for NRCS funding and technical assistance to complement funded WaterSMART projects.
Note: On-farm water conservation improvements that complement the water delivery improvement projects selected through this NOFO may be considered for NRCS funding and technical assistance to the extent that such assistance is available. For more information, including application deadlines and a description of available funding, please contact your local NRCS office. See the NRCS website for office contact information, www.nrcs.usda.gov/wps/portal/nrcs/main/national/contact/states/.

E. Planning and Implementation

Maximum Points: 8

E.1— Project Planning Points may be awarded for proposals with planning efforts that provide support for the proposed project.

Does the applicant have a Water Conservation Plan and/or System Optimization Review (SOR) in place? Does the project address an adaptation strategy identified in a completed WaterSMART Basin Study? Please self-certify or provide copies of these plans where appropriate to verify that such a plan is in place. Including a specific excerpt or a link to the planning document may also be considered where appropriate. Provide the following information regarding project planning:

1. Identify any district-wide, or system-wide, planning that provides support for the proposed project. This could include a Water Conservation Plan, SOR, Drought Contingency Plan or other planning efforts done to determine the priority of this project in relation to other potential projects.
2. Describe how the project conforms to and meets the goals of any applicable planning efforts and identify any aspect of the project that implements a feature of an existing water plan(s).
3. If applicable, provide a detailed description of how a project is addressing an adaptation strategy specifically identified in a completed WaterSMART Basin Study or Water Management Options Pilot (e.g., a strategy to mitigate the impacts of water shortages resulting from climate change, drought, increased demands, or other causes)

For more information on Basin Studies, including a list of completed basin studies and reports, please visit: www.usbr.gov/WaterSMART/bsp.

E.2— Readiness to Proceed Points may be awarded based upon the extent to which the proposed project is capable of proceeding upon entering into a financial assistance agreement. Please note, if your project is selected, responses provided in this section will be used to develop the scope of work that will be included in the financial assistance agreement.

Applications that include a detailed project implementation plan (e.g., estimated project schedule that shows the stages and duration of the proposed work, including major tasks, milestones, and dates) will receive the most points under this criterion.

- Identify and provide a summary description of the major tasks necessary to complete the project. Note: please do not repeat the more detailed technical project description
provided in Section D.2.2.4.; this section should be focused on a summary of the major tasks to be accomplished as part of the project.

- Describe any permits that will be required, along with the process for obtaining such permits.
- Identify and describe any engineering or design work performed specifically in support of the proposed project.
- Describe any new policies or administrative actions required to implement the project.
- Please also include an estimated project schedule that shows the stages and duration of the proposed work, including major tasks, milestones, and dates. Milestones may include, but are not limited to, the following: complete environmental and cultural compliance; mobilization; begin construction/installation; construction/installation (50% complete); and construction/installation (100% complete)

F. Collaboration

Maximum Points: 6

*Up to 6 points may be awarded for projects that promote and encourage collaboration among parties in a way that helps increase the sustainability of the water supply.*

Please describe how the project promotes and encourages collaboration. Consider the following:

- Is there widespread support for the project? Please provide specific details regarding any support and/or partners involved in the project. What is the extent of their involvement in the process?

- What is the significance of the collaboration/support?

- Will this project increase the possibility/likelihood of future water conservation improvements by other water users?

- Please attach any relevant supporting documents (e.g., letters of support or memorandum of understanding).

G. Additional Non-Federal Funding

Maximum Points: 4

*Up to 4 points may be awarded to proposals that provide non-Federal funding in excess of 50 percent of the project costs. State the percentage of non-Federal funding provided using the following calculation:*
Non-Federal Funding

Total Project Cost

H. Nexus to Reclamation

Maximum Points: 4

*Up to 4 points may be awarded if the proposed project is connected to a Reclamation project or Reclamation activity. No points will be awarded for proposals without connection to a Reclamation project or Reclamation activity.*

Describe the nexus between the proposed project and a Reclamation project or Reclamation activity. Please consider the following:

- Does the applicant have a water service, repayment, or O&M contract with Reclamation?
- If the applicant is not a Reclamation contractor, does the applicant receive Reclamation water through a Reclamation contractor or by any other contractual means?
- Will the proposed work benefit a Reclamation project area or activity?
- Is the applicant a Tribe?

E2. Review and Selection Process

Please see Attachment for additional review and selection information and the Full Notice of Funding Opportunity under Section E.2

E3. CFR – Regulatory Information

Please see Attachment for additional regulatory information and the Full Notice of Funding Opportunity under Section F.2

E4. Anticipated Announcement and Federal Award Dates

Reclamation expects to contact potential award recipients and unsuccessful applicants in spring 2022, subject to the timing and amount of final FY 2022 appropriations. Financial assistance agreements will be awarded to applicants that successfully pass all pre-award reviews and clearances. Award recipients will be contacted individually to discuss the time frame for the completion of their agreement.

F. Federal Award Administration Information
F1. Federal Award Notices
Please see Attachment for additional information and the Full Notice of Funding Opportunity

F2. Administrative and National Policy Requirements
See the “DOI Standard Terms and Conditions” for the administrative and national policy requirements applicable to DOI awards.

Data Availability
Per the Financial Assistance Interior Regulation (FAIR), 2 CFR §1402.315:

(a) All data, methodology, factual inputs, models, analyses, technical information, reports, conclusions, valuation products or other scientific assessments in any medium or form, including textual, numerical, graphic, cartographic, narrative, or audiovisual, resulting from a financial assistance agreement is available for use by the Department of the Interior, including being available in a manner that is sufficient for independent verification.

(b) The Federal Government has the right to:

(1) Obtain, reproduce, publish, or otherwise use the data, methodology, factual inputs, models, analyses, technical information, reports, conclusions, or other scientific assessments, produced under a Federal award; and

(2) Authorize others to receive, reproduce, publish, or otherwise use such data, methodology, factual inputs, models, analyses, technical information, reports, conclusions, or other scientific assessments, for Federal purposes, including to allow for meaningful third-party evaluation.

Please see Attachment for additional policy information and the Full Notice of Funding Opportunity under Section F.2

F3. Reporting

Financial Reports
All recipients must use the SF-425, Federal Financial Report form for financial reporting. At a minimum, all recipients must submit a final financial report. Final reports are due no later than 90 calendar days after the award period of performance end date or termination date. For awards with periods of performance longer than 12 months, recipients are required to submit interim financial reports on the frequency established in the Notice of Award.

Recipients will be required to submit a fully completed form SF-425 Federal Financial Report on at least a semi-annual basis and with the final performance report. The SF-425 must be signed by a person legally authorized to obligate the recipient.

Performance Reports
Performance reports must contain a comparison of actual accomplishments with the established goals and objectives of the award; a description of reasons why established goals were not met, if appropriate; and any other pertinent information relevant to the project results. Final reports are due no later than 90 calendar days after the award period of performance end date or termination.
date. For awards with periods of performance longer than 12 months, recipients are required to submit interim financial reports on the frequency established in the Notice of Award.

The specific terms and conditions pertaining to the reporting requirements will be included in the financial assistance agreement.

Interim performance reports submitted on at least a semi-annual basis, that include the following information:
• A comparison of actual accomplishments to the milestones established by the financial assistance agreement for the period
• The reasons why established milestones were not met, if applicable
• The status of milestones from the previous reporting period that were not met, if applicable
• Whether the project is on schedule and within the original cost estimate
• Any additional pertinent information or issues related to the status of the project

Real Property Reports
Recipients and subrecipients are required to submit status reports on the status of real property acquired under the award in which the Federal government retains an interest. The required frequency of these reports will depend on the anticipated length of the Federal interest period. Reclamation will include recipient-specific real property reporting requirements, including the required data elements, reporting frequency, and report due dates, in the Notice of Award when applicable.

Please see Attachment for additional reporting information and the Full Notice of Funding Opportunity Document under Section F.3

Conflict of Interest Disclosures
Recipients must notify the program immediately in writing of any conflict of interest that arise during the life of their Federal award, including those reported to them by any subrecipient under the award. Recipients must notify the program in writing if any employees, including subrecipient and contractor personnel, are related to, married to, or have a close personal relationship with any Federal employee in the Federal funding program or who otherwise may have been involved in the review and selection of the award. The term employee means any individual engaged in the performance of work pursuant to the Federal award. Recipients may not have a former Federal employee as a key project official, or in any other substantial role related to their award, whose participation put them out of compliance with the legal authorities addressing post-Government employment restrictions. See the U.S. Office of Government Ethics website for more information on these restrictions. Reclamation will examine each conflict of interest disclosure based on its particular facts and the nature of the project and will determine if a significant potential conflict exists. If it does, Reclamation will work with the recipient to determine an appropriate resolution. Failure to disclose and resolve conflicts of interest in a manner that satisfies Reclamation may result in any of the remedies described in 2 CFR 200.338 Remedies for Noncompliance, including termination of the award.

Other Mandatory Disclosures
The Non-Federal entity or applicant for a Federal award must disclose, in a timely manner, in writing to the Federal awarding agency or pass-through entity all violations of Federal criminal law involving fraud, bribery, or gratuity violations potentially affecting the Federal award. Non-Federal entities that receive a Federal award including the terms and conditions outlined in 2
CFR 200, Appendix XII—Award Term and Condition for Recipient Integrity and Performance Matters are required to report certain civil, criminal, or administrative proceedings to SAM. Failure to make required disclosures can result in any of the remedies described in 2 CFR 200.338 Remedies for Noncompliance, including suspension or debarment.

Please see Attachment for additional disclosure information and the Full Notice of Funding Opportunity Document under Section F.4

Reporting Matters Related to Recipient Integrity and Performance
If the total value of your currently active grants, cooperative agreements, and procurement contracts from all Federal awarding agencies exceeds $10,000,000 for any period of time during the period of performance of this Federal award, then you as the recipient during that period of time must maintain the currency of information reported to the System for Award Management (SAM) that is made available in the designated integrity and performance system (currently the Federal Awardee Performance and Integrity Information System (FAPIIS)) about civil, criminal, or administrative proceedings in accordance with Appendix XII to 2 CFR 200.

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G3. Application System Technical Support

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Support@grants.gov

H. Other Information

Please see Attachment for additional Environmental Review information and the Full Notice of Funding Opportunity Document under Section H
Aquifer–yield continuum as a guide and typology for science-based groundwater management

Article in Hydrogeology Journal - March 2013
DOI: 10.1007/s10040-012-0910-y

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Aquifer-yield continuum as a guide and typology for science-based groundwater management

Suzanne A. Pierce · John M. Sharp, Jr. · Joseph H. A. Guillaume · Robert E. Mace · David J. Eaton

Abstract Groundwater availability is at the core of hydrogeology as a discipline and, simultaneously, the concept is the source of ambiguity for management and policy. Aquifer yield has undergone multiple definitions resulting in a range of scientific methods to calculate and model availability reflecting the complexity of combined scientific, management, policy, and stakeholder processes. The concept of an aquifer-yield continuum provides an approach to classify groundwater yields along a spectrum, from non-use through permissive sustained, sustainable, maximum sustained, safe, permissive mining to maximum mining yields, that builds on existing literature. Additionally, the aquifer-yield continuum provides a systems view of groundwater availability to integrate physical and social aspects in assessing management options across aquifer settings. Operational yield describes the candidate solutions for operational or technical implementation of policy, often relating to a consensus yield that incorporates human dimensions through participatory or adaptive governance processes. The concepts of operational and consensus yield address both the social and the technical nature of science-based groundwater management and governance.

Keywords Groundwater management · Decision support · Integrated modelling · Socio-economic aspects · Sustainable yield

Introduction and a short history of aquifer yields

Over the last two centuries, the concepts by which groundwater resources are managed have gradually, but dramatically evolved. In 1856, Henry Darcy identified a method for finding a reliable, safe, and potable water source for the city of Dijon, France, and simultaneously created a founding principle of hydrogeology (Darcy 1856; Bobeck 2004), conservation of mass. Darcy’s observations led to quantitative techniques that helped him apply an innovative solution for describing the behavior of water flowing through porous media that explained groundwater flow and became the underpinning of management.

Advances in drilling and extraction in the early 1900s were accompanied by the concept of safe yield. Lee (1915) defined it as “. . . the limit to the quantity of water which can be withdrawn regularly and permanently without dangerous depletion of the storage reserve.” Safe yield was later refined as a rate of withdrawal for human use limited to economic feasibility (Meinzer 1920, 1923) by protecting rights to surface water (e.g. Conkling 1945), to preventing subsidence, and water-quality degradation. Theis (1940) recognized the impact of pumping on capturing natural discharge and altering recharge and groundwater storage. In the intervening years, groundwater science and management has transitioned to sustainable yield, reflecting decades of active disciplinary debate.
Six factors influence determination of sustainable yield including: (1) recharge rates and storage conditions, (2) water quality, (3) discharge rates and environmental flows, (4) legal constraints, (5) economic feasibility, and (6) issues of inter-generational equity. The first several factors are in the traditional realm of hydrogeology, as is economic feasibility when evaluating pumping design. Together these six factors of sustainable yield reflect the needs of modern society and recognize the multi-criteria nature of groundwater resource management. Based on consideration of these factors, Fig. 1 presents a conceptual typology that sheds light on the functional distinctions within the definition of sustainable yield as it relates to scientific knowledge of aquifers and governance structures. Sustainable yield is a concept that allows the leap from case-specific studies of groundwater availability to a more generalized form of science-based groundwater management that can explain decisions across aquifer settings and provide insights into phenomenon and behaviors across cases (Villa et al. 2009; Margerum 2008; Moore and Koontz 2003).

As groundwater systems are dynamic and heterogeneous in space, time, and social values, aquifer yields can be viewed through the lens of an adjustable continuum. By pairing the concept of a continuum with the six factors (summarized in Fig. 1), a framing device for describing the selection of an aquifer yield emerges. Aquifer performance factors reflect physical processes commonly assessed through field work and encoded in simulation models by subject matter experts, in this case hydrogeologists. Aquifer governance aspects may be used by groundwater managers, together with operational definitions, to implement management regimes (Ross and Martinez-Santos 2011; Ostrom 1990).

As society faces increasing water scarcity world wide, hydrogeology has no topic more timely than water availability and aquifer yield. Changes in the definition of yield presented from the perspective of social shifts occurring in the United States provide one example, out of many around the globe, for how the needs and context of society are related to and interact with scientific advances. Economic development and stabilizing economies in the era after World War II led to the use of optimization for groundwater management as hydrogeologists adapted numerical methods, classical and non-classical optimization for simulating groundwater behavior and optimizing management regimes (Zheng and Wang 2002, 1999; Ahlfeld and Mulligan 2000; Gorelick 1983; Bredehoef 2006; Focazio et al. 2002; Mandel and Shiftan 1981). The 1970s and 80s achieved lower water-use intensities through technological advances such as multi-stage pumps and drip irrigation producing a coincident plateau in consumption and use of groundwater by agriculture, industry, and energy (Wright et al. 2006). Since the 1990s, as data collection and monitoring technologies improved, public investment in programs that collect and record the raw information necessary to assess groundwater system behavior and response to management in the United States began to decrease (SWAQ 2004; USGS 2002), which is unfortunate given the recognized need for “good, trustworthy information” in resource management (Dietz et al. 2003). In the last two decades, advances in computational efficiency and methodologies that address parameterization and uncertainty enable new approaches to modeled experiments, multi-model analysis, and uncertainty (Matott et al. 2009; Banta et al. 2006; Doherty and Skahill 2006; Doherty 2004; Doherty 2003; Hamby 1994; Hill 1998; Poeter and Hill 1998). Recent public concern over groundwater use and availability has led to discussions about adaptive management and groundwater governance, linking the concepts of government, society, and science to improve water resources allocation, management, and policy development (Refsgaard et al. 2010; Mysiak et al. 2009; Pierce et al. 2006; Pereira et al. 2005).

Recent discourse has introduced the concepts of ecohydrology (Newman et al. 2006; Sophocleous 2007; Kalf and Wooley 2005 and consensus yield (Mace et al. 2001). Ecohydrology delves into considerations for establishing science-based environmental flows to prevent damage from human-induced demands. Consensus yield (Mace et al. 2001) recognizes explicitly the importance of engaging society with integrated groundwater resource planning and policy. Consensus yield is the acceptable range of extraction from an aquifer bounded by the

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**Fig. 1** Typology listing aquifer-yield factors for performance and governance

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**Table 1**

<table>
<thead>
<tr>
<th>Category</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity of Extractable Groundwater</td>
<td>Recharge Rates and Storage Conditions</td>
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<tr>
<td></td>
<td>Water Quality</td>
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<tr>
<td></td>
<td>Discharge Rates and Environmental Flows</td>
</tr>
<tr>
<td>Legal Constraints</td>
<td>Economic Feasibility</td>
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<tr>
<td></td>
<td>Inter-generational Equity</td>
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</tbody>
</table>

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preferences of affected stakeholders. Together the emergence of ecohydrology and consensus yield reflects scientific progress in our understanding of integrated systems behavior (Jakeman and Letcher 2003).

Consensus yield, in particular, reflects a shift in groundwater science because it acknowledges human-dimensions for determining aquifer yield or limits the magnitude of development and/or depletion of the resource that a community is willing to tolerate during a specified time period or planning horizon. The term operational yield represents the range of feasible management regimes that can be implemented for an aquifer, or what can be extracted (pumped) or discharged as spring-flow. The range of choice among stakeholders of their withdrawal preferences paired with a feasible operational regime leads to a concept of an aquifer-yield continuum.

### Defining an aquifer-yield continuum

The concept of an aquifer-yield continuum joins aquifer performance with groundwater governance (see Fig. 1) to delineate the range of all physically possible yields as influenced by human preferences, use and adaptive response. This continuum is measured as total volumes pumped over a period of time (a planning horizon), bounded by non-use of the resource vs. maximum mining, which completely depletes the resource. In between, available yield spans all feasible quantities of permitted extraction from an aquifer, based on scientific expertise, technical knowledge, and social preferences.

Figure 2 shows the aquifer-yield continuum and identifies the relationship between aquifer performance related yields as they exist in the current hydrogeologic literature. Using the simple formalization (Eq. 1) whereby, by conservation of mass, total volume \( V \) at the end of the time period is equal to the initial volume \( V_0 \) plus any recharge \( R \), minus the total discharge \( Q \). The volume may not stay constant in a given time period, avoiding the oversimplification of the water budget myth (Devlin and Sophocleous 2005).

\[
V = V_0 + R - Q
\] (1)

Total discharge from the system \( Q \) can be described (Eq. 2) as the combination of natural discharge \( D \) and human-induced discharge \( P \). Note that this formulation does not deal with just natural discharge but with developed recharge and discharge, modified due to pumping, by using the notation \( R_p \) and \( D_p \). The resulting Eq. 3 is used to derive the mathematical definitions of yield.

\[
Q = D + P
\] (2)

\[
V = V_0 + R_p - D_p - P
\] (3)

At one hypothetical extreme, non-use precludes human-induced extraction. In this case, pumping or human induced discharge is eliminated \( (P=0) \), such that the natural discharge will reflect the total discharge \( Q=D \) from a system.

The opposite extreme is extraction that results in exhaustion of an aquifer resource base or, maximum mining yield (Domenico 1972). Maximum mining yield is the volume of water that is technically feasible to extract from an aquifer, constrained only by the limit of the accessible volume or storage, such that \( V=0 \), and assuming that all discharge can be captured \( (D_p=0) \). Solving for \( P \) yields Eq. 4.

\[
P = V_0 + R_p
\] (4)

These volumetric extremes serve as bounds for the aquifer-yield continuum. Within Fig. 2, the aquifer-yield continuum is illustrated as real-valued, when in fact there can be spatial, temporal, and aquifer heterogeneity. Yields defined in terms of discharge \( Q \), can also be represented in terms of storage parameters (for example see Kalf and Wooley 2005; Pierce 2006). Additionally, the continuum concept does not imply that yields should change over time, though they may. The continuum presents yield delineations that are determined for a given planning horizon.

### Aquifer performance

Since Darcy’s work, the selection of an aquifer yield has been based on scientific knowledge and observed behavior of an aquifer. However, the contemporary hydrogeologist’s challenge of setting a yield value is complicated with more information than ever before. Determination of yield must reflect the time-varying nature of groundwater systems, climate conditions, ecosystem response, new
technological advances, and shifts in societal values. The multi-attribute nature of aquifer yield creates a situation where a single number is insufficient to guide management and policy for groundwater (see Fig. 2). Adaptive approaches adjust groundwater yields iteratively in accordance with a range of acceptable values, constrained by relevant social or ecosystem metrics.

While the precise terminology differs, common intermediary levels of groundwater availability are defined by a subset of yield types that include definitions for perennial extraction rates, such as (1) safe yield, (2) maximum sustained yield, (3) permissive sustained yield, (4) permissive mining yield, and (5) sustainable yield (Devlin and Sophocleous 2005; Domenico 1972). With the exception of sustainable yield, the various yield types are defined in terms of aquifer performance. Generally, these yields depend upon sound hydrogeologic interpretation using parameters that are evaluated with biophysical data and modeling approaches. The selection of a particular extraction limit for a specific groundwater basin and planning horizon does not necessarily prevent adverse impacts within that basin, due to spatial heterogeneity and temporal variation in flows.

According to a common operational definition, safe yield is attained when extraction is equal to average annual recharge \( (P=R_p) \). Under these conditions, recharge from both natural and human induced recharge is captured, such that natural discharge is eliminated and total storage will be depleted slowly (Eq. 5).

\[
V = V_0 - D_p
\]

This definition of safe yield is known to be problematic (Sophocleous 1997) and, in practice, the term is often used with the more complex meanings referred to earlier, or synonymously with maximum sustained yield as the maximum pumping rate. As shown in Fig. 2 the limits set by maximum and permissive sustained yields bound the general region that can be considered the sustainable yield region of aquifer performance. Maximum sustained yield is defined as the amount of water that can be continuously withdrawn from existing pumping centers without eventuallly dewatering the most productive water-yielding formation \( (V \geq V_0) \), though storage may vary within the planning horizon (Bredhehoft 2002; Devlin and Sophocleous 2005; Domenico 1972; Walton 1964, 1970). Applying the mass-balance equation to this constraint Eq. (6) shows that the extraction rate must be less than net annual developed recharge rates \( (R_p; \text{ Eq. 7); Devlin and Sophocleous 2005; Bredhehoft 2002; Sophocleous 1997}).

\[
V_0 + R_p - D_p - P \geq V_0
\]

\[
P \leq R_p - D_p
\]

This difference between permissive sustained yield, maximum sustained yield, and safe yield levels can be referred to as the ‘zone of contention’ (See Fig. 2). Between the first two yields, storage will not decrease, but reduction in discharge due to pumping may still cause unacceptable impacts. When maximum sustained yield is exceeded, impacts due to reduced storage will also occur. Both impacts are frequently the cause of conflict in groundwater management.

Permissive sustained yield allows consumptive use while not affecting levels of ecosystem, recreational, other non-consumptive flows or non-market uses (Domenico 1972). As an extension of maximum sustained yield, this requires that discharge rates (or permissive sustained yield discharge, \( D_{PSY} \)) are maintained at higher rates than would otherwise occur \( (D_{PSY} > D_p) \) while maintaining the condition that no dewatering is observed \( (V \geq V_0) \). Continuing from Eq. (7) yields Eq. (8), such that permissive sustained yield is lower than maximum sustained yield.

\[
P \leq R_p - D_{PSY} \leq R_p - D_p
\]

Analogously, permissive mining yield extends the concept of maximum mining yield by setting the extraction limit as the maximum volume of water in storage that can economically and legally be extracted and used for beneficial purposes without bringing about some unacceptable result (Domenico 1972). The extraction limit is determined by allowing dewatering to occur \( (V \geq V_{min}) \) assuming \( V_0 \geq V_{min} \text{ Eq. 9} \), and some discharge to be used \( (0 < D_{min} \leq D_p) \text{ Eq. 10} \), yielding Eq. (11). Note that while permissive mining yield is always greater than maximum sustained yield, it may be greater than or less than safe yield depending on the values of \( V_{min} \) and \( D_{min} \).

\[
V_0 + R_p - D_p - P \geq V_{min}
\]

\[
P \leq V_0 - V_{min} + R_p - D_p
\]

\[
\leq V_0 - V_{min} + R_p - D_{min} \leq V_0 + R_p
\]

\[
P \leq V_0 - V_{min} + R_p - D_{min}
\]

Permissive mining yield delineates a critical point along the aquifer-yield continuum, because it is constrained by both the minimum acceptable storage \( (V_{min}) \) and the minimum acceptable discharge \( (D_{min}) \). If exceeded, significant impacts would be expected by the end of the planning horizon, related to the aquifer performance factors presented in Fig. 1. Permissive sustained yield plays a similar role by constraining discharge \( (D_{PSY}) \) and its impacts, while accepting no long-term changes in storage (Devlin and Sophocleous 2005; Loáiciga 2006).
The terms of \( V_{\text{min}} \), \( D_{\text{min}} \), and the planning horizon incorporate preference and subjective aspects of yield. Within these terms the quantity for each yield type is dependent upon a decision about the ‘acceptable’ limits for storage, discharge, and the length of the planning horizon. These acceptability limits link the topic of available groundwater yield with the concepts and philosophies of sustainable yield, thus making explicit the confluence between biophysical and social systems within the framework of an aquifer-yield continuum. In conjunction with other water resources, sustainable yield is a quantity of water satisfying the requirements of Fig. 1 while falling between maximum sustained and permissive sustained yields.

In 1972 Domenico pointed out, ‘... the idea of safe yield encompasses a great deal more than the methods proposed to ascertain its value.’ Nearly 40 years later, the same may still be said for the methods used to determine aquifer yield. Within the realm of aquifer performance, scientific uncertainty and propagation of that uncertainty through integrated models to evaluate management options remains a pivotal challenge (Guillaume et al. 2012; Guillaume and Pierce 2011; Matott et al. 2009; Bredehoeft 2005) and requires the melding of scientific and social-process methodologies.

Hydrogeologic methods and assessment of groundwater characteristics strive to describe, measure, calculate, and model behavior and response, or ‘aquifer performance’. Managers, policymakers, and community stakeholders attempt to translate the implications of best available science to ascertain the relative vulnerability and resilience of aquifers under potential management regimes for ‘aquifer governance’. These continuum concepts are limited as they may vary in time, space, and with heterogeneous conditions, even in any one aquifer. In effect, groundwater yield values, particularly sustainable yields, are constrained by both aquifer performance and the willingness of a region or stakeholders to accept bounding conditions for a management regime. The precise limits of a management regime can vary with time, as consensus and operational yields represent two distinctives yield types that can be defined through science-based governance processes.

**Groundwater governance**

The contemporary complexity of defining a groundwater allocation problem is increased due to the variability among aquifer systems and between tangible elements (such as discharge rates, transmissivity, and water quality) and intangible community components (such as economic viability, quality of life, perceived water quality, and management options). In groundwater systems these elements may be expressed as stakeholder goals, which can be linked to a performance measure or objective function and subsequently could inform the creation of a policy or rule. For example (Pierce 2006), the desire to preserve a favored recreational site (e.g. intangible quality of life), may be expressed by maximizing springflow at that site within an aquifer system (e.g. tangible element) and, enacted by restricting extraction during periods with reduced springflow (implementation of governance).

Policies are designed and promulgated as a form of societal agreement. Governance is the implementation of actions that substantively identify social concerns and then execute the intent of policy. Managing groundwater through science-based approaches depends upon successful engagement with community stakeholders and integration of scientific information within the socio-political realities of a region (Gleeson et al. 2010; Galloway et al. 2003). In the case of aquifer systems, groundwater governance occurs in both formal and informal interactions. Multiparty interests for groundwater cases span hierarchal social systems, cross political boundaries, evoke conflicting interests, involve considerable uncertainty, and invoke consideration of potential impacts in both the short and long term. Governance processes use values, principles, objectives, and alternative actions for achieving desired outcomes through implementation of rules and policies (Ross and Martinez-Santos 2011).

Allocation decisions are the most common enactment of groundwater governance. Sustainable yield considerations often figure prominently in defining constraints on the quantity of extractable groundwater along with allocation limits determined by societal values (Sophocleous 2007). Scientific information about aquifer performance can inform stakeholders and clarify interpretations with regard to potential impacts or consequences. Allocating groundwater can be categorized as a combination of group decision problems and unresolved scientific uncertainty. When component parts of sustainable yield are considered in the context of governance, it is necessary to evaluate elements that are both quantitative and qualitative. For example, scientists may quantify recharge to a groundwater system, but qualitative stakeholder preferences determine the acceptability of land use policies which influence recharge pathways that a community will accept. Sustainable yield has both tangible aspects that can be calculated using traditional scientific methods as well as human-choice dimensions situated in relation to social process or decision analytic techniques.

Using the premise that sustainable yield falls within regions of groundwater behavior that is both physically feasible and acceptable to the communities affected by allocation decisions a set of possible management solutions can be defined. Therefore, methodologies to identify sustained yield must include both operational yield, based on physical science components, as well as consensus yield, derived from stakeholders’ subjective preference sets. Figure 3 shows the conceptual inter-relationship between sustainable, consensus, and operational yields. The combined elements of consensus and operational yield are pivotal to quantifying an actual value or preferably a range for sustainable yield conditions.
**Operational yield**

Operational yield prompted by the use of social objectives and constraints establishes the possible set of operational and management actions. Operational yield is the dynamic range of water volumes that can be extracted from an aquifer under a given set of operating conditions, or within a management regime, while meeting consensus- and sustained-yield metrics throughout a planning horizon. In an operations research context, the elements that make up an operational yield are the decision variables, objective functions, and constraints. Considerations may include pumping levels or policy triggers over a defined period of time to meet a set of needs within feasible ranges of aquifer performance. An operational yield need not be sustainable for a period of time, as some unsustainable but economically beneficial use of the resource may fit within the range of possible yields along with hypothetical aquifer response functions and stakeholder preference points. Therefore, the set of possible operational yields includes solutions that are outside the bounds of sustainable yield values for a given aquifer.

The set of operational guidelines that are used to manage the amount of groundwater available for use from an aquifer determines the operational yield at a given time. This quantity may be allowed to change in response to modifications in community or policy goals, climatic variations, or other influencing factors. Some of the more common variables that may be used to create a common set of operational rules include those associated with water budgets, or fluxes into and out of the system, and the spatial decision or timing components associated with the controllable elements of the system, such as well placement and pumping regime.

**Consensus yield**

The outcomes of a consensus yield process include a set of resource constraints or performance metrics that can be used to relate planning goals with operational practice through operational yield. Consensus yield (Mace et al. 2001) defines groundwater availability through stakeholder engagement—where representative community members co-learn about their aquifer iteratively and identify long-term management goals that will achieve acceptable conditions—in effect, withdrawal reflects a consensus choice. More recently, Richardson et al. (2011) described the approach used in the Murray Darling Basin, Australia, for groundwater planning that implemented consensus yield concepts using the term acceptable yield. Consensus (or acceptable) yield addresses the aspect of decision making for natural resources that has been referred to as the paradox of social choice (Luce and Raiffa 1985). The social choice paradox arises when the preferences of individuals must be aggregated in some fashion to define a set of feasible solutions for the management of a shared or common pool resource, like groundwater.

Consensus yield reflects the use of stakeholder inputs to identify a feasible range of value dimensions that delimit a negotiation space (Luce and Raiffa 1985) via critical points that represent stakeholder preferences relative to metrics of groundwater response such as water-table levels or target spring-flow rates. These critical points are referred to as desired future conditions, in the State of Texas (U.S.A.), (Mace et al. 2006) and as resource condition limits in various regions of Australia (Richardson et al. 2011). In both cases, stakeholder inputs guide science-based aquifer modeling efforts to delineate a negotiation space. The interpretation of this space should not be taken to represent the need for unanimous support for a particular management alternative. In fact, stakeholder defined “desired future conditions” of an aquifer may better serve the process if viewed as a decision aid to groundwater managers (Gregory et al. 2001). In other words, once desired future conditions and the extent of consensus yield conditions are defined for a community of stakeholders then decision makers can view the multi-attribute value set as guidance for potential operational regimes and management actions.

A sustainable yield can therefore be determined through the combination of a stakeholder process to identify management goals, as well as scientists and engineers calculating the operational amount of groundwater available through simulation and characterization methods capable of meeting management goals. Communities or groundwater management entities may choose non-sustainable yields by either consensus or through the implementation of operational regimes that fall outside the bounds of sustainable yield. However, sustainable yields are characterized by the selection of values that meet feasible aquifer performance and governance aspects. Figure 4 depicts the ranges and relationship of consensus and operational yield within the construct of an aquifer-yield continuum, which represents the perpetual challenge and balance for hydrogeology as a scientific discipline and as a managerial practice.

The range of consensus yield can span the same range of total available yield, from non-use to maximum mining in relation to the preferences of the affected stakeholder group. At the same time, the lower limit of operational yield has been set to the permissive sustained yield based on the interpretation that in the case of non-use, operational or management activities are unnecessary.
and a laissez-faire approach to the groundwater system can be selected. At the other extreme of the continuum, both consensus and operational yields may be equal to the maximum mining yield.

Methodologies and moving toward groundwater science for decision support

As the science of groundwater management evolves, methods for incorporating stakeholder concerns in the design of a yield policy are necessary to delineate useful approaches to determining yield and management policies. The concept of incorporating stakeholders in groundwater management problems is not new; texts on the topic of yield and allocation consistently mention the irrevocable need to engage communities (e.g. Richardson et al. 2011; Eaton et al. 2007; Mace et al. 2006; Custodio 2002). Yet these stop short of guiding groundwater scientists or management practitioners toward methodologies that span the critical gap between the context of community values and the scientific computation of groundwater allocation and management regimes. Practitioners in both the state of Texas and multiple basins in Australia are identifying terminology to meet the needs for describing aspects of yield to achieve real-world support for decisions about groundwater use and allocation. For example, Texas Legislature has explicitly recognized the importance of aquifer-yield continuum concepts by mandating a groundwater planning system that includes defining ‘desired future conditions’ for consensus yields paired with the use of science-vetted groundwater availability models to support implementation of operational yields (Mace et al. 2001).

A clear methodology for defining sustainable yields has yet to emerge. Yet despite the methodological haze, differing semantics, and diverse practices, the evaluation of aquifer yields as science-based quantities for management has flourished. The ongoing interest and deliberation among groundwater scientists surrounding sustainable yield demonstrates how core the term is to the discipline. Sustainable yield points out the very nature of groundwater science as a scholar-practitioner’s discipline. The aquifer-yield continuum approach creates distinctions within the terminology and concepts that are implicit in any attempt to implement science-based groundwater management.

Methods that are not traditionally included in hydrogeologic analyses can be employed to assess the factors for a consensus yield condition. To conduct consensus yield evaluations, models appropriate for use as scoping tools and stakeholder participants can define desired future conditions. Methodologies for systematically establishing the attributes that define consensus yield conditions with stakeholder groups can be drawn from a range of decision and social sciences (El Sawah 2010; Voinov and Bousquet 2010; Mysiak et al. 2009; Pahl-Wostl 2007; NRC 2008; Pierce 2006; Gregory et al. 2005). Tangible steps for determining consensus yield (Mace et al. 2001) address core elements of sustainable yield as defined in Fig. 1, particularly for socio-economic, environmental, long-term equity considerations of yield. Moreover, consensus yield considers both social process (engagement, education, facilitation) and incorporation of groundwater information and science (particularly through the use of numerical models). Additional guidance for devising consensus yield for specific cases can be gleaned from the design principles that are accepted for the management of common pool resources, of which groundwater is one example (Ross and Martinez-Santos 2011; Ostrom 1990, 2005).

Integrated and systems-level thinking for hydrogeology

Overall, the topics of aquifer yields call on hydrogeologists to reshape our role, quantify feasible yields using the best science, and address societal issues with an expanded set of skills. The discipline should expand both the technical capacity to model, forecast, and analyze hydrogeologic systems while strengthening skill sets for engaging in rigorous, transdisciplinary and empirical participatory process work for groundwater systems.

Conducting research on the topic of consensus yield across disciplinary boundaries and places hydrogeology within the broader context of integrated water resource management and societal decision making. The juncture
between society and hydrogeological sciences presents opportunities for scientists to evaluate scientific concepts at the meta-level and translate information into knowledge for communication and productive group learning.

Calculating operational yield calls on hydrogeologists to hone groundwater modeling capabilities, in both the context of stand-alone aquifer analyses and in the context of integrated systems for science-based participatory modeling. Research and practice related to aquifer yield requires continued strengthening of interfaces with numerical methods, statistics, ecosystem sciences, operational research, informatics, as well as with education, human organizational systems, along with understanding communities of practice in mediation, facilitation, dialog/deliberation, and public engagement. It is unlikely that a single individual can attain subject matter expertise in all these areas, which highlights the value of working in transdisciplinary teams and emphasizing the integrated nature of research on groundwater availability and management.

**Conclusions**

The aquifer-yield continuum represents the emerging relationship between research in groundwater science and implementation of groundwater management and policy. Contributions have come from both scholars and groundwater resource management practitioners. Hydrogeology is interdisciplinary by nature, and even Henry Darcy’s groundbreaking work benefited from cross-disciplinary communication. As water resources scarcity becomes more common, a resultant need for innovative water resource management practices will increase. The discipline of hydrogeology extends beyond the ability to describe, measure, and simulate groundwater behavior to the study of how to incorporate interdisciplinary approaches in solving the human choice issue of selecting the volume and quality of water to withdraw from an aquifer in a specific time and place.

Groundwater is a key element in the overall water budget for the globe. The myriad demands and beneficial uses (energy, industry, domestic use and consumption, agriculture) produce complex, ill-structured problems with expansive sets of multi-criteria tradeoffs and stakeholder preference sets. Implementation of available yields across the aquifer-yield continuum requires advances in science-based policy making and governance by building hydrogeologists’ ability to engage and communicate core concepts across disciplines. The discipline of hydrogeology extends beyond the ability to describe, measure, and simulate groundwater behavior to the study of how to incorporate interdisciplinary approaches in solving the human choice issue of selecting the volume and quality of water to withdraw from an aquifer in a specific time and place.

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