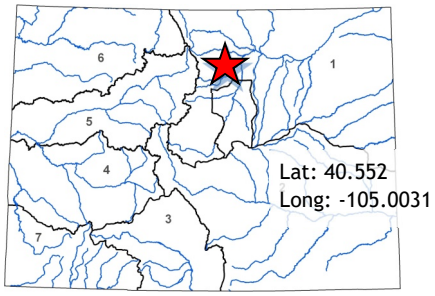
COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Water Plan Grant Application

Colorado State University
Irrigation Innovation Consortium
Headquarters Infrastructure

March 2021 Board Meeting



LOCATION	
County/Counties:	Larimer
Drainage Basin:	South Platte

DETAILS	
Total Project Cost:	$314,769
Water Plan Grant Request:	$157,384
Recommended Amount:	$157,384
Other CWCB Funding:	$0
Other Funding Amount:	$0
Applicant Match:	$157,384
Project Type(s): Construction and research	
Project Category(Categories): Agricultural	
Measurable Result: Agricultural efficiency, producer and stakeholder outreach	

The Irrigation Innovation Consortium (IIC) began in 2018 as a collaboration of five land grant universities, led by Colorado State University (CSU), and has since added multiple industry partners to become a center of excellence promoting water-energy efficiency in irrigation. The IIC mission fosters resiliency in our irrigated food and landscape systems by accelerating the development and adoption of water and energy-efficient irrigation technologies and practices through public-private partnerships. The IIC is midway through a five-year, $5 million grant from the Foundation for Food and Agriculture Research (FFAR) with another $5 million match in cash, services, and equipment from partner organizations, including Colorado Corn, Northern Water, and the Irrigation Association.

Colorado Water Plan Grant funding will support the development of hydraulic infrastructure at the IIC Headquarters (HQ) located in Fort Collins, CO. The IIC HQ serves as an irrigation technology center within CSU to foster private-public partnerships for furthering advancements in irrigation research, education, training and certification, and extension in CO, the U.S., and across the globe. In particular, the WPG funds will provide cost-share for partner commitments to install irrigation infrastructure at the IIC HQ, facilitating the development of cutting-edge demonstration/training facilities. The project will also enable hands-on evaluation of new irrigation technology before adoption and serve as a training facility for irrigators and others in the irrigation water industry. Collectively, these investments will help develop the capability of the IIC to carry out innovative and collaborative irrigation efficiency and conservation research, education training, and outreach activities.

This project furthers several Colorado Water Plan critical action goals relating to agriculture, including encouraging agriculture efficiency and resiliency while promoting agricultural productivity. The project also supports collaboration, bringing a diverse group of stakeholders to advance cutting-edge innovations in agriculture efficiency and conservation approaches. The project also offers an exciting opportunity for the Colorado Water Conservation Board to develop further relationships within the ICC network to help foster research and outreach opportunities to addressing multiple water resource challenges affecting the Colorado irrigation community.

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Water Plan Grant Application

Instructions

To receive funding for a Water Plan Grant, applicant must demonstrate how the project, activity, or process (collectively referred to as "project") funded by the CWCB will help meet the measurable objectives and critical actions in the Water Plan. Grant guidelines are available on the CWCB website.

If you have questions, please contact CWCB at (303) 866-3441 or email the following staff to assist you with applications in the following areas:

Water Storage Projects	Matthew.Stearns@state.co.us
Conservation, Land Use Planning	Kevin.Reidy@state.co.us
Engagement & Innovation Activities	Ben.Wade@state.co.us
Agricultural Projects	Alexander.Funk@state.co.us
Environmental & Recreation Projects	Chris.Sturm@state.co.us

FINAL SUBMISSION: Submit all application materials in one email to *waterplan.grants@state.co.us*
in the original file formats [Application (word); Statement of Work (word); Budget/Schedule (excel)]. Please do not combine documents. In the subject line, please include the funding category and name of the project.

Water Project Summary

Name of Applicant	Allan A. Andales
Name of Water Project	Improving irrigation efficiency through the development of the hydraulic infrastructure at Irrigation Innovation Consortium Headquarters

CWP Grant Request Amount	$157,384
Other Funding Sources _____	$
Other Funding Sources _____	$
Other Funding Sources _____	$
Applicant Funding Contribution	$157,384
Total Project Cost	$314,769

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Applicant & Grantee Information
Name of Grantee(s): Colorado State University
Mailing Address: Office of Sponsored Programs; 2002 Campus Delivery, Fort Collins, CO 80523-2002
FEIN: 846000545
Organization Contact: Catherine Douras
Position/Title: Senior Research Administrator
Email: Catherine.douras@colostate.edu
Phone: 970-491-2375
Grant Management Contact
Position/Title: Catherine Douras/Senior Research Administrator
Email: Catherine.douras@colostate.edu
Phone: 970-491-2375
Name of Applicant: Allan A. Andales (if different than grantee)
Mailing Address: 1170 Campus Delivery, Fort Collins, CO 80523-1170
Position/Title: Professor
Email: Allan.Andales@colostate.edu
Phone: 970-491-6516

Description of Grantee/Applicant
Provide a brief description of the grantee's organization (100 words or less).
Colorado State University is recognized as one of the premier research institutions and routinely ranks in the top of all-American Universities in research expenditures. The Office of the Vice President for Research has overall responsibility for facilitating the research enterprise at CSU. The Office works to encourage and support the development, marketing and application of CSU's intellectual property and our world-renowned researchers, students and facilities. The Office will lead the 21st Century Land-Grant mission of CSU by fostering and supporting the research enterprise, promoting scholarship and artistry, instilling a culture of integrity, and capitalizing on opportunities to address global challenges.

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Type of Eligible Entity (check one)	
✓	**Public (Government):** Municipalities, enterprises, counties, and State of Colorado agencies. Federal agencies are encouraged to work with local entities. Federal agencies are eligible, but only if they can make a compelling case for why a local partner cannot be the grant recipient.
	Public (Districts): Authorities, Title 32/special districts (conservancy, conservation, and irrigation districts), and water activity enterprises.
	Private Incorporated: Mutual ditch companies, homeowners associations, corporations.
	Private Individuals, Partnerships, and Sole Proprietors: Private parties may be eligible for funding.
	Non-governmental organizations (NGO): Organization that is not part of the government and is non-profit in nature.
	Covered Entity: As defined in Section 37-60-126 Colorado Revised Statutes.

Type of Water Project (check all that apply)	
	Study
✓	Construction
	Identified Projects and Processes (IPP)
✓	Other: Project demonstration and outreach

Category of Water Project (check the primary category that applies and include relevant tasks)		
	Water Storage - Projects that facilitate the development of additional storage, artificial aquifer recharge, and dredging existing reservoirs to restore the reservoirs' full decreed capacity and Multi-beneficial projects and those projects identified in basin implementation plans to address the water supply and demand gap.. *Applicable Exhibit A Task(s):*	
	Conservation and Land Use Planning - Activities and projects that implement long-term strategies for conservation, land use, and drought planning. *Applicable Exhibit A Task(s):*	
	Engagement & Innovation - Activities and projects that support water education, outreach, and innovation efforts. Please fill out the Supplemental Application on the website. *Applicable Exhibit A Task(s):*	
✓	Agricultural - Projects that provide technical assistance and improve agricultural efficiency. *Applicable Exhibit A Task(s): 1 to 7*	
	Environmental & Recreation - Projects that promote watershed health, environmental health, and recreation. *Applicable Exhibit A Task(s):*	
	Other	Explain:

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Location of Water Project	
Please provide the general county and coordinates of the proposed project below in **decimal degrees**. The Applicant shall also provide, in Exhibit C, a site map if applicable.	
County/Counties	Larimer
Latitude	40.5542
Longitude	-105.0031

Water Project Overview
Please provide a summary of the proposed water project (200 words or less). Include a description of the project and what the CWP Grant funding will be used for specifically (e.g., studies, permitting process, construction). Provide a description of the water supply source to be utilized or the water body affected by the project, where applicable. Include details such as acres under irrigation, types of crops irrigated, number of residential and commercial taps, length of ditch improvements, length of pipe installed, and area of habitat improvements, where applicable. If this project addresses multiple purposes or spans multiple basins, please explain. The Applicant shall also provide, in Exhibit A, a detailed Statement of Work, Budget, Other Funding Sources/Amounts and Schedule.
CWP Grant funding will support the development of hydraulic infrastructure at the Irrigation Innovation Consortium (IIC) Headquarters (HQ) located in Fort Collins, CO. The IIC HQ serves as an irrigation technology center within Colorado State University with the intention of fostering private-public partnerships for furthering advancements in irrigation research, education, training and certification, and extension in CO, the U.S., and across the globe. The IIC farm includes 35 acres of surface irrigation from multiple sources: i) a 450 gpm Coffin well, ii) Sand Dike Lateral Co. water shares, iii) Lake Canal Co. water shares, and iv) Colorado-Big Thompson (CBT) shares. The total irrigation water from these sources is approximately 120 acre-ft per year. The in-farm irrigation ditch length is 2900 feet. IIC HQ designs for cutting-edge and efficient irrigation systems and demonstration/training facilities are a result of a previous study funded by CWCB in 2016. In line with those designs, this proposed project will install the following: booster pump and irrigation mainline (~2,500 feet); sprinkler system for a grass reference evapotranspiration (ET_o) plot; mainline and concrete pad for a variable rate irrigation center pivot; automated head gate and turnout gate in the Sand Dike canal; and a mainline and manifold for a 7-acre drip irrigation system.

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Measurable Results		
To catalog measurable results achieved with the CWP Grant funds, please provide any of the following values as applicable:		
	New Storage Created (acre-feet)	
	New Annual Water Supplies Developed or Conserved (acre-feet), Consumptive or Nonconsumptive	
	Existing Storage Preserved or Enhanced (acre-feet)	
	Length of Stream Restored or Protected (linear feet)	
~40acre-ft	Efficiency Savings (indicate acre-feet/year OR dollars/year)	
	Area of Restored or Preserved Habitat (acres)	
	Quantity of Water Shared through Alternative Transfer Mechanisms	
	Number of Coloradans Impacted by Incorporating Water-Saving Actions into Land Use Planning	
	Number of Coloradans Impacted by Engagement Activity	
✓	Other	Explain: • Installation of mainline and concrete pad for variable rate irrigation center pivot • Design and installation of subsurface drip over the 7 designated acres • Installation of all water pipeline (details on size and length mentioned in budget) • Re-design and installation of electrical infrastructure to deliver power to all irrigation system components • Installation of donated Barrett booster pump and filtration system • Installation of Rubicon FlumeGate and PikoMeter® into the Sand Dike Lateral

Water Project Justification
Provide a description of how this water project supports the goals of Colorado's Water Plan, the most recent Statewide Water Supply Initiative, and the applicable Roundtable Basin Implementation Plan and Education Action Plan. The Applicant is required to reference specific needs, goals, themes, or Identified Projects and Processes (IPPs), including citations (e.g. document, chapters, sections, or page numbers). The proposed water project shall be evaluated based upon how well the proposal conforms to Colorado's Water Plan Framework for State of Colorado Support for a Water Project (CWP, Section 9.4, pp. 9-43 to 9-44;)

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This project supports the Colorado Water Plan and conforms to the CWP Framework as outlined in Section 9.4. Specifically, we are committed to collaboration, demonstrate sustainability, and establish fiscal and technical feasibility of the project.

The proposed project meets the needs of core Water Values described in the Colorado Water Plan (Sec 1, Page 1-6): *"Efficient and effective water infrastructure promoting smart land use"* and *"A strong environment that includes healthy watersheds, rivers and streams, and wildlife"*. Specifically, the hydraulic improvements made to the site will support research and demonstration that leads to field-level adaption, improving water and energy efficiency through technology development, testing and demonstration. Conversion of surface irrigation systems to more efficient sprinkler and drip irrigation will lead to reduced agricultural runoff to the stream adjacent to IIC HQ. Multiple participants in on-site activities will include irrigators, water districts, irrigation consultants and technicians, students and the public.

Furthermore, the project addresses at least two CWP goals in the area of Water Conservation and Reuse, namely "Promote water efficiency ethic throughout Colorado," and "Seek creative options for improving agricultural irrigation conservation and efficiency." (Sec. 6.3, Page 6-59). The project helps achieve these goals by pursuing research and demonstration in Municipal Water Conservation (Sec. 6.3.1, Page 6-61) through experimentation and research into the grass reference ET plots, and also in the area of Agricultural Conservation Efficiency, and Reuse (Sec. 6.3.4, Page 9-91) through the implementation of cutting-edge subsurface drip and a variable rate irrigation center pivot. The nature of these technologies, and the expertise of CSU irrigation faculty working at the site, provides opportunity to investigate the water-energy nexus in an agricultural setting (Sec. 6.3.5, Page 6-109).

Considering Colorado's long-term goals for Municipal, Industrial, and Agricultural Infrastructure Projects and Methods (Sec 6.5, Page 6-127), this proposed project will work towards at least one of these goals, by converting the on-site fields from flood to sprinkler and drip irrigation. The project will demonstrate to producers how to *"use water efficiently to reduce overall future water needs".* Automation and monitoring of canal flow will further allow for the quantification of improvements in farm water use efficiency.

IIC HQ lies within the South Platte River Basin. This project supports the South Platte/Metro Basin Roundtable's 2015 Basin Implementation Plan by meeting at least two of the Basin's goals (Page 1-25; https://www.colorado.gov/pacific/sites/default/files/SouthPlatteBasinImplementationPlan-04172015.pdf). First, in the area of Agriculture (Sec. 1.9.1), this project will "*Fully recognize the importance of agriculture to Colorado's future well-being, and support continued success and develop new voluntary measures to sustain irrigated agriculture"* by developing, testing, and promoting the most current technologies available for agricultural irrigation. Secondly, it will "*develop multipurpose storage, conveyance, system interconnections and other infrastructure projects to take advantage of limited remaining South Platte supplies and enhance water use efficiencies and supply reliability"* by increasing water application efficiency through the new drip and center pivot systems and thus alleviating the need for larger water diversions. Furthermore, the installation of automated head gate and canal flow controls will improve water diversion accuracy and allow for the monitoring of conveyance efficiency in the Sand Dike Lateral.

Improvements at IIC HQ are considered structural "Ditch and Diversion Improvements", as described in more detail in the statement of work section of this proposal. The greater purpose of the IIC HQ, which under this proposal will gain improvements to its irrigation infrastructure, is to serve as the Colorado-based site for irrigation research. As described above and other sections of this proposal, the IIC applications research will support non-structural goals of SWSI, the CWP and BIPs through improved irrigation efficiency and water conservation; information and data requirements for ATMs, water rights and planning; improved energy use in irrigation water management; irrigation water quality monitoring and management; groundwater management and conjunctive use; outreach and education; and many other goals and objectives of the State of Colorado.

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This proposed project strongly supports Colorado's aim for collaboration (Section 9.4, pp 9-43 to 9-44). The IIC is by definition a collaboration enterprise, a consortium, led by CSU, of five regional land-grant universities and other partners including industry, water districts, NGOs and others. The IIC is situated under CSU's Soil and Crop Sciences Department and includes direct participation from other departments such as Civil Engineering, with engagement of the School of Business, Office of Sponsored Research, CSU Foundation, CSU Research Foundation, the Water Center, and others. Outside of CSU, the IIC has committed sponsorships from local, regional and national partners who have provided donations in the form of cash, services and equipment. For example, Northern Water is a founding member of the IIC, contributing cash and supporting an on-going, key research project evaluating 12 landscape irrigation controllers. Rubicon Water, based in Fort Collins, is supporting IIC with canal and ditch upgrades that will substantially improve conveyance efficiency and control. Aqua Engineering, based in Fort Collins, is supporting the IIC with cash donations and with professional engineering designs for IIC irrigation infrastructure improvements.

The most immediate and direct impact of this project on CWP's goals will be by improving irrigation conservation and efficiency with industry-partnered applied research and adaption; for example, by extensive research on using remote sensing, soil moisture sensors, and other integrated technologies for reducing crop evapotranspiration and for improving efficiencies using the full range of irrigation technologies. Also, the IIC is implementing a broad outreach and education campaign that will ensure the water efficiency ethic is promoted throughout Colorado, and the U.S., with webinars, conferences, interviews with researchers and practitioners, educational materials and other communications.

Related Studies

Please provide a list of any related studies, including if the water project is complementary to or assists in the implementation of other CWCB programs.

2016-2017: Colorado Irrigation Center Design and Concept Development, PI: Jose L. Chavez, co-PIs Dr. Reagan Waskom and Dr. Stephen W. Smith, funded by CWCB, 2017.

2013-2015; Implementation of Deficit Irrigation Regimes: Demonstration and Outreach; PI Dr. José L. Chávez; Colorado Water Conservation Board, Alternative Agricultural Water Transfer Methods Competitive Grant Program.

2019-2020: Satellite and UAS Imagery Use to Implement Timely Irrigation Strategies, PI: Jose L. Chavez, Collaborators: Huihui Zhang (USDA), Daran Rudnick (UNL), Joel Schneekloth (CSU), Jonathan Aguilar (Kansas State), Juan Enciso (Texas A&M), and Florence Cassel (CA State), Sponsor: FFAR - Irrigation Innovation Consortium.

2018-2019: Assessing Temporal and Spatial Crop Water Consumptive Use with Unmanned Aerial Systems, PI: Jose L. Chavez, Collaborators: Huihui Zhang, Daran Rudnick; Sponsor: CWCB through CWI.

2015-2019: Monitoring alfalfa and grass water use under deficit irrigation using a spatially distributed temperature model. PI: J.L. Chavez, Co-PI: K. Venayagamoorthy and Perry Cabot, Sponsor: USDA NRCS (CO AES).

2014-2015: Developing an Unmanned Aerial Remote Sensing of ET System, PI: Sponsor: Colorado Water Conservation Board (CWCB) through CWI.

2012-2015: Reference evapotranspiration determination using the recursive method and surface aerodynamic temperature. USDA-CSREES and Colorado Agricultural Experiment Station. PI: Jose L. Chavez, coPI: Allan Andales.

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Previous CWCB Grants, Loans or Other Funding
List all previous or current CWCB grants (including WSRF) awarded to both the Applicant and Grantee. Include: 1) Applicant name; 2) Water activity name; 3) Approving RT(s); 4) CWCB board meeting date; 5) Contract number or purchase order; 6) Percentage of other CWCB funding for your overall project.
Jose L. Chavez, Reagan Waskom, and Stephen W. Smith. Colorado Irrigation Center Design and Concept Development, 2016.

Taxpayer Bill of Rights
The Taxpayer Bill of Rights (TABOR) may limit the amount of grant money an entity can receive. Please describe any relevant TABOR issues that may affect your application.
None

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Submittal Checklist	
✓	I acknowledge the Grantee will be able to contract with CWCB using the Standard Contract.
Exhibit A	
✓	Statement of Work(1)
✓	Budget & Schedule(1)
✓	Engineer's statement of probable cost (projects over $100,000) – See Exhibit C page 13
✓	Letters of Matching and/or Pending 3rd Party Commitments(1)
Exhibit C	
✓	Map (if applicable)(1)
✓	Photos/Drawings/Reports
✓	Letters of Support (Optional)
	Certificate of Insurance (General, Auto, & Workers' Comp.) (2)
	Certificate of Good Standing with Colorado Secretary of State(2)
	W-9(2)
	Independent Contractor Form(2) (If applicant is individual, not company/organization)
Engagement & Innovation Grant Applicants ONLY	
	Engagement & Innovation Supplemental Application(1)

(1) Required with application.
(2) Required for contracting. While optional at the time of this application, submission can expedite contracting upon CWCB Board approval.

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Colorado Water Conservation Board
Water Plan Grant - Exhibit A

Statement Of Work	
Date:	December 1, 2020
Name of Grantee:	Colorado State University
Name of Water Project:	Improving irrigation efficiency through the development of the hydraulic infrastructure at Irrigation Innovation Consortium (IIC) Headquarters
Funding Source:	IIC, Foundation for Food and Agriculture (FFAR), CO Water Plan Grant

Water Project Overview:

The Irrigation Innovation Consortium (IIC) began in 2018 as a collaboration of five land grant universities, led by CSU, and has since added multiple industry partners in becoming a center of excellence promoting water and energy efficiency in irrigation. The IIC mission fosters resiliency in our irrigated food and landscape systems by accelerating development and adoption of water and energy efficient irrigation technologies and practices through public-private partnerships. The IIC governance structure can be found online at https://irrigationinnovation.org/about/governance-structure/. The IIC is midway through a 5 year, $5M grant from the Foundation for Food and Agriculture Research (FFAR) with another $5M match in cash, services and equipment from partner organizations. The IIC is becoming self-sustaining via additional partnerships, research projects and other donations and collaborations. CSU's IIC site (termed "IIC HQ") is on CSU Research Foundation property with effective lease agreement valid until 2028 (renewable after lease end) at Prospect and I-25 in Fort Collins. IIC HQ serves as an irrigation technology center within Colorado State University with the intention of fostering private-public partnerships for furthering advancements in irrigation research, education, and extension in CO, the U.S., and across the globe. CWP Grant funding will support the development of IIC HQ.

The purpose of this grant application is to improve the irrigation infrastructure at IIC HQ for conducting applied irrigation research and IIC outreach activities. Some defined outcomes of the IIC include:

- Technology Development Focus: As an incubator of ideas for new and improved irrigation hardware, software, remote sensing applications and decision support systems where private companies work collaboratively with researchers in a precompetitive environment.
- Fill Research Gaps: Close university partnership with industry and government agencies has the greatest potential to propel irrigation science and technology forward into practical and fundamental applications.
- Pre-Competitive Space: The five founding university partners, along with USDA-ARS, provide a broad array of test and demonstration sites at their Experiment Station farms and university laboratories where applied irrigation research is currently underway.
- Demonstration and Training: The IIC provides irrigation practitioners with opportunities for hands-on evaluation of new technology before adoption. The IIC has a network of coordinated multi-state sites where irrigators can evaluate and be trained on new irrigation equipment and technology.
- Investment through Partnership: The IIC is bringing multiple partners together behind a common goal. Industry partners are key drivers of the Consortium and provide technology transfer for commercialization of new technologies.
- Public Benefit, Public Results: The Land Grant system and public universities develop knowledge for the benefit of all citizens and stakeholders. IIC's outreach emphasis will be represented in programs, as will our distance education offices.

The IIC's prioritized focus areas are: i) Water and Energy efficiency; ii) Remote Sensing and Big Data Applications for Improving Irrigation Water Management; iii) System Integration and Management; iv) Irrigation Technology Acceleration and Technology Transfer.

The IIC farm includes 35 acres of surface irrigation from multiple sources: i) a 450 gpm Coffin well, ii) Sand Dike Lateral Co. water shares, iii) Lake Canal Co. water shares, and iv) Colorado-Big Thompson (CBT) shares, totally ~120 acre-ft per year. The in-farm irrigation ditch length is 2900 feet.

IIC HQ plans for cutting-edge irrigation systems and demonstration/training sites are a result of a previous study funded by CWCB in 2016. These plans focus on creating a site capable of delivering effective research and education for both agriculture and landscape irrigators.

The current project proposal addresses the modernization of hydraulic structures and irrigation systems at IIC HQ to develop the capability of IIC HQ to carry on innovative and collaborative irrigation efficiency and conservation research, education, training and outreach activities.

Project Objectives:

1. Develop the hydraulic and electrical infrastructure for improved irrigation efficiency on 35 acres of the IIC Headquarters (Fort Collins, Colorado).
    a. Install electrical, booster pump, and pipeline infrastructure that will supply pressurized irrigation water to 35 acres of agricultural land at IIC HQ.
    b. Establish a reference crop (clipped grass) plot for on-site monitoring of reference crop evapotranspiration (ET_o).
    c. Install the main pipeline and concrete pad that will enable connection of a variable rate irrigation (VRI) center pivot sprinkler system (to be donated).
    d. Retrofit an existing check structure and install a Rubicon FlumeGate® (head gate) and PikoMeter ® (turnout gate) in the Sand Dike lateral.
    e. Install the main pipeline and manifold for a 7-acre drip irrigation system.
2. Use the improved irrigation infrastructure for demonstration and training on efficient irrigation technologies.

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Tasks
Task 1 – Electrical installation (Objective 1.a)
Description of Task:
CSU/IIC will work with an electrical contractor to design and install electrical lines to power the booster pump and its controller as well as lines to power the VRI center pivot and drip irrigation system.
Method/Procedure:
CSU/IIC will hire an electrical contractor to design and install the electrical lines from the on-site transformer to the booster pump, VRI center pivot, and drip irrigation system. Approximately 1,300 linear feet of wiring and electrical conduit will be installed, along with associated pull (junction) boxes.
Deliverable:
• Electrical design • Electrical power connections for the booster pump, VRI center pivot, and drip irrigation system

Tasks
Task 2 – Mainline and booster pump installation (Objective 1.a)
Description of Task:
CSU/IIC will work with Aqua Engineering Inc. to connect a booster pump (donated) to an existing well (CSURF Well #4) at IIC HQ. The booster pump will control irrigation water flow to the different irrigation systems (sprinkler system for grass reference ET_o plot, VRI center pivot, and drip irrigation). Mainline pipes will be installed to connect the booster pump to the various irrigation systems.
Method/Procedure:
An 8-inch pipe connection will be installed from Well #4 to the booster pump, which will be mounted on a concrete pad. The pump will be connected to electrical power (Task 1). The booster pump will be fitted with winterization, filtration, vacuum relief valve, and isolation gate valve assemblies. Approximately 2,500 linear feet of 6-inch mainline pipe will be installed to convey pressurized water from the booster pump to the various irrigation systems at IIC HQ.
Deliverable:
• Functional booster pump that will control irrigation water flow from an existing well (Well #4) to various irrigation systems at IIC HQ. • Mainline pipes to convey pressurized irrigation water to various irrigation systems at IIC HQ. • Pipe hydraulic operation test reports

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Tasks
Task 3 – Establishment of grass reference crop ET_o plot (Objective 1.b)
Description of Task:
IIC HQ needs on-site monitoring of grass reference crop ET (ET_o) for estimation of local crop consumptive water use (ET_c). The American Society of Civil Engineers (ASCE, 2005) recommends that an automatic weather station (AWS) used for calculating ET_o be located in the middle of a field with irrigated vegetation, such as clipped grass. Given that the intended ET_o plot at IIC HQ will be surrounded by other irrigated fields, it is estimated that around 0.5 acre of irrigated clipped grass will be adequate to surround an AWS that will be used for ET_o calculations. A solid set sprinkler system will be installed to establish and irrigate the 0.5-acre grass reference plot. ASCE-EWRI. (2005). The ASCE Standardized Reference Evapotranspiration Equation. Report 0-7844-0805-X, ASCE Task Committee on Standardization of Reference Evapotranspiration. Reston, Va.: American Soc. Civil Engineers.
Method/Procedure:
A solid set sprinkler irrigation system (donated by Toro Company; see Exhibit C pages 14-15) will be installed on 0.5 acres of land. A sprinkler irrigation contractor will be hired to install the system. Approximately 4,500 linear feet of 1-inch PVC pipes will be installed to convey pressurized water from the booster pump (Task 2) to the ET_o plot. Flow sensors and an irrigation controller will be installed for smart scheduling of irrigations. A sprinkler line blow out assembly will be installed for flushing and winterization. After the solid set sprinkler system is installed, grass seed will be planted on the field. An existing AWS will be transferred to the middle of the grass plot for automated monitoring of solar radiation, air temperature, relative humidity, and wind speed that are required for calculation of hourly (mm/h) and daily (mm/d) ASCE standardized ET_o.
Deliverable:
• Solid set sprinkler system for irrigating a 0.5-acre grass reference plot • Grass reference (ET_o) plot for monitoring weather variables required for calculating hourly and daily ET_o. • Report of irrigation system operation

Tasks
Task 4 – Installation of mainline and concrete pad for VRI center pivot (Objective 1.c)
Description of Task:
CSU/IIC will work with Aqua Engineering Inc. to install a mainline that conveys water from the booster pump to the VRI center pivot. A concrete pad will also be installed at the point of connection.
Method/Procedure:

Tasks
Installation of the buried mainline from the booster pump to the VRI center pivot will mostly be completed in Task 2. However, the mainline will be located on the east side of the Sand Dike lateral (ditch) while the VRI center pivot will be on the west side of the Sand Dike lateral. Therefore, approximately 100 linear feet of 4-inch pipes will be installed to convey water from the mainline, crossing over the Sand Dike lateral, and leading to the VRI center pivot point of connection (POC). A concrete pad will be installed at the center pivot POC to provide a stable foundation for the center pivot lateral and control panel.
Deliverable:
• Mainline pipe that conveys water from the booster pump to the VRI center pivot. • Concrete pad and pipe connector for the VRI center pivot and control panel (to be donated once mainline and electrical line are available).

Tasks
Task 5 – Installation of automated head gate and turnout gate in the Sand Dike lateral (Objective 1.d)
Description of Task:
CSU/IIC will work with Rubicon ™ and Aqua Engineering Inc. to retrofit an existing check structure that regulates the water level and flow through the Sand Dike lateral within the IIC HQ premises. The existing head gate is manually operated and does not have automated flow measurement. The existing head gate will be replaced with a state-of-the-art automated head gate along with a turnout gate, both with precise flow measurement capabilities.
Method/Procedure:
Permission from the Sand Dike Ditch Company will be obtained before retrofitting activities begin. Once approval has been obtained, the existing check structure will be removed. Rubicon will provide specifications for the necessary concrete work to fit a (donated; see Exhibit C page 16) Rubicon FlumeGate® that will provide accurate flow measurement and precise flow control. The FlumeGate will be installed after the concrete work has been completed. In addition, a Rubicon PikoMeter® (donated; see Exhibit C page 16) will also be installed in close proximity to the FlumeGate and will serve as a turnout gate capable of remotely delivering precisely measured quantities of water to surface-irrigated sections of the IIC HQ.
Deliverable:
• Automated head gate (Rubicon FlumeGate) that provides accurate flow measurement and precise flow control in the Sand Dike lateral within the IIC HQ premises. • Automated turnout gate (Rubicon PikoMeter) that delivers precise amounts of water to surface-irrigated sections of the IIC HQ.

Tasks
Task 6 – Installation of mainline and manifold for drip irrigation system (Objective 1.e)
Description of Task:
CSU/IIC will work with Aqua Engineering Inc. to extend the mainline pipe (from Task 2) to a 7-acre area that will be irrigated with low-pressure drip tape.
Method/Procedure:
The mainline installed in Task 2 will be extended to a 7-acre area directly south of the grass reference ET_o plot (Task 3). The extended mainline will terminate into a valve manifold that will have separate solenoid valves for regulating the flow of pressurized water to different drip irrigation zones. The manifold will be the point of connection to different zones of revolutionary drip tape (Turbo Tape®) that features built-in water filtration that could eliminate the need for dedicated filtration units. The Turbo Tape will be donated by Jain Irrigation, Inc (see Exhibit C page 17).
Deliverable:
• Mainline (from booster pump) extended to 7 acres of drip irrigated fields. • Manifold for control of irrigations to individual zones.

Tasks
Task 7 – Demonstration and outreach (Objective 2)
Description of Task:
As each of the improved irrigation systems and components become functional at IIC HQ, they will be used to demonstrate how irrigation technologies can increase irrigation application efficiency, reduce labor requirements, and conserve water. The IIC will invite irrigation stakeholders from across Colorado and other States to on-site field days, tours, and demonstrations. Outreach and educational materials will also be distributed through the Internet. Funding for these activities will be provided by the IIC (i.e CSU), as it is an integral part of the IIC's mission and will help the organization meet its aforementioned goals.
Method/Procedure:
The first two quarters of the project will be focused on design and installation of various components. It is anticipated that some components (e.g. booster pump, portions of mainline, sprinkler irrigation system for grass reference plot) will become functional by the third quarter. Irrigation stakeholders will be invited for a field day to demonstrate the operation of these components and best practices to increase irrigation efficiency using these components/systems. Instructors of relevant CSU courses (e.g. Irrigation Principles, Irrigation Systems Design, Irrigation of Field Crops, Water Engineering for International Development, etc.) will be invited to bring their classes to IIC HQ to learn about efficient irrigation technologies and conduct field demonstrations/exercises. Demonstrations and field days will also be scheduled in Year 2 of the project. The IIC communications specialist will be tasked with filming selected demonstrations of the improved irrigation components or systems. Short educational videos of these irrigation technologies will be posted on the IIC website (https://irrigationinnovation.org/). Electronic fact sheets will also be developed and posted.

Last Updated: June 2020

Tasks

After completion of the two-year CWCB project, the improved hydraulic and electrical infrastructure at the IIC HQ will continue to be used as research, demonstration, and education tools to advance and promote adoption of efficient irrigation technologies among agricultural irrigators and water managers in Colorado and beyond.

Deliverable:

- One field day each in Years 1 and 2 to demonstrate the improved irrigation infrastructure to water stakeholders.
- Relevant CSU classes visiting IIC HQ for experiential learning about irrigation technologies that can increase irrigation efficiency and conserve water.
- Educational videos and fact sheets distributed through the IIC website (https://irrigationinnovation.org/).

Budget and Schedule

This Statement of Work shall be accompanied by a combined Budget and Schedule that reflects the Tasks identified in the Statement of Work and shall be submitted to CWCB in excel format.

The Budget and Schedule are provided in Exhibit A.

Reporting Requirements

Progress Reports: The applicant shall provide the CWCB a progress report every 6 months, beginning from the date of issuance of a purchase order, or the execution of a contract. The progress report shall describe the status of the tasks identified in the statement of work, including a description of any major issues that have occurred and any corrective action taken to address these issues.

Final Report: At completion of the project, the applicant shall provide the CWCB a Final Report on the applicant's letterhead that:

- Summarizes the project and how the project was completed.
- Describes any obstacles encountered, and how these obstacles were overcome.
- Confirms that all matching commitments have been fulfilled.
- Includes photographs, summaries of meetings and engineering reports/designs.

The CWCB will pay out the last 10% of the budget when the Final Report is completed to the satisfaction of CWCB staff. Once the Final Report has been accepted, and final payment has been issued, the purchase order or grant will be closed without any further payment.

Last Updated: June 2020

Payment

Payment will be made based on actual expenditures and must include invoices for all work completed. The request for payment must include a description of the work accomplished by task, an estimate of the percent completion for individual tasks and the entire Project in relation to the percentage of budget spent, identification of any major issues, and proposed or implemented corrective actions.

Costs incurred prior to the effective date of this contract are not reimbursable. The last 10% of the entire grant will be paid out when the final deliverable has been received. All products, data and information developed as a result of this contract must be provided to CWCB in hard copy and electronic format as part of the project documentation.

Performance Measures

Performance measures for this contract shall include the following:
(a) Performance standards and evaluation: Grantee will produce detailed deliverables for each task as specified. Grantee shall maintain receipts for all project expenses and documentation of the minimum in-kind contributions (if applicable) per the budget in Exhibit B. Per Water Plan Grant Guidelines, the CWCB will pay out the last 10% of the budget when the Final Report is completed to the satisfaction of CWCB staff. Once the Final Report has been accepted, and final payment has been issued, the purchase order or grant will be closed without any further payment.
(b) Accountability: Per Water Plan Grant Guidelines full documentation of project progress must be submitted with each invoice for reimbursement. Grantee must confirm that all grant conditions have been complied with on each invoice. In addition, per Water Plan Grant Guidelines, Progress Reports must be submitted at least once every 6 months. A Final Report must be submitted and approved before final project payment.
(c) Monitoring Requirements: Grantee is responsible for ongoing monitoring of project progress per Exhibit A. Progress shall be detailed in each invoice and in each Progress Report, as detailed above. Additional inspections or field consultations will be arranged as may be necessary.
(d) Noncompliance Resolution: Payment will be withheld if grantee is not current on all grant conditions. Flagrant disregard for grant conditions will result in a stop work order and cancellation of the Grant Agreement.

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Colorado Water Conservation Board

Water Plan Grant - Exhibit B
Budget and Schedule

Prepared Date: December 1, 2020

Name of Applicant: Colorado State University

Name of Water Project: Improving irrigation efficiency through the development of the hydraulic infrastructure at Irrigation Innovation Consortium Headquarters

Project Start Date: 4/1/2021

Project End Date: 4/15/2023

Task No.	Task Description	Task Start Date	Task End Date	Grant Funding Request	Match Funding	Total
-	CSU Procurement and Contracting	4/1/2021	4/15/2021	-	-	-
1	Electrical installation	4/15/2021	5/30/2021	$44,750	$44,750	$89,500
2	Mainline and Booster Pump Installation	4/15/2021	5/30/2021	$46,755	$46,755	$93,510
-	Project Update Report 1	-	10/15/2021	-	-	-
3	Establishment of Grass Reference Crop ETo Plot	4/15/2021	5/30/2021	$10,990	$10,990	$21,980
4	Installation of Mainline and Concrete Pad for VRI Pivot	4/15/2021	4/15/2022	$5,000	$5,000	$10,000
-	Project Update Report 2	-	4/15/2022	-	-	-
5	Installation of Automated Head Gate and Turnout Gate	4/15/2021	4/15/2022	$10,000	$10,000	$20,000
6	Installation of Mainline and Manifold for Drip Irrigation	4/15/2021	4/15/2022	$10,500	$10,500	$21,000
-	Project Update Report 3	-	10/15/2022	-	-	-
7	Demonstration and Outreach	4/15/2021	4/15/2023	$8,861	$10,190	$19,051
-	Project Final Report	-	4/15/2023	-	-	-
-	Facilities and Administration	-	-	$20,528	$19,199	$39,728
			Total	$157,384	$157,384	$314,769

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Colorado Water Conservati

Water Plan Grant - Detailed Budg
Fair and Reasonable Estir

Prepared Date: 11/12/20
Name of Applicant: Colorado State University
Name of Water Project: Improving irrigation efficiency through the development of the hydraulic in

EXAMPLE C: Construction

Sub-task	Unit	Quantity
Task 1 - Electrical Installation		
ELECTRICAL POWER (PER CSU COST ESTIMATE) PLUS $20K FOR PIVOT	EACH	1
4-INCH ELECTRICAL CONDUIT W/ PULL BOXES	LINEAR FOOT	1300
DESIGN REVISIONS (ELECTRICAL POWER & IRRIGATION)	EACH	1
Task 2 - Mainline and Booster Pump Installation		
POC AT WELL: 8-INCH CONNECTION, PIPING OVER DITCH	LS	1
BOOSTER PUMP MOUNTED ON CONCRETE PAD	EACH	1
WINTERIZATION ASSEMBLY	EACH	1
FILTRATION ASSEMBLY	EACH	1
6-INCH ISOLATION GATE VALVE ASSEMBLY	EACH	3
4-INCH ISOLATION GATE VALVE ASSEMBLY	EACH	1
1-INCH ISOLATION GATE VALVE ASSEMBLY	EACH	2
AIR VACUUM RELIEF VALVE ASSEMBLY	EACH	5
QUICK COUPLING VALVE ASSEMBLY	EACH	6
1-INCH PIPE AND WIRE SLEEVING AND PULL BOXES	LINEAR FOOT	1120
4-INCH DI PIPE FOR DITCH CROSSING	LINEAR FOOT	100
6-INCH MAINLINE PIPE	LINEAR FOOT	2500
Task 3 - Establishment of grass reference crop ET_o plot		
TURF RESEARCH: 1-INCH PVC LATERAL PIPE	LINEAR FOOT	4500
TURF RESEARCH: 1-INCH RCV ASSEMBLY WITH FLOW SENSOR	EACH	18
TURF RESEARCH: ROTARY SPRINKLERS INSTALL W/ FLEX PIPE	EACH	64
TURF CONTROLLER ON STRUT SYSTEM	EACH	1
BLOW OUT ASSEMBLY	EACH	2
TURF RESEARCH: SUBSURFACE DRIP IRRIGATION	EACH	1
Task 4 - Installation of Mainline and Concrete Pad for VRI Pivot		
VRI PIVOT- PAD,POC, AVR	EACH	1
Task 5 - Installation of Automated Head Gate and Turnout Gate		
RUBICON FLUME GATE RETROFIT AT EXISTING CHECK STRUCTURE	EACH	1

RUBICON PICOMETER DOWNSTREAM SAND DYKE HEADGATE	EACH	1
Task 6 - Installation of Mainline and Manifold for Drip Irrigation System		
SUBSURFACE DRIP IRRIGATION RESEARCH PLOTS	ACRE	7
Task 7 - Demonstration and Outreach		
C0-PI SALARY (Inflation and Fringe included) .25 of a month/year	MONTH	0.5
RESEARCH ASSISTANT 1 SALARY AND FRINGE	MONTH	1.1
PI Salary (Inflation and Fringe included) .12 of a month/year	MONTH	0.24
Facilities and Administration		
IDC required by CSU, 15% of direct costs (in-kind donation not included)	EACH	1
TOTAL		

on Board

et Estimate

nate

frastructure at Irrigation Innovation Consortium Headquarters

	Unit Cost		Total Cost		CWCB Funds		Matching Funds
$	60,000.00	$	60,000	$	30,000	$	30,000
$	15.00	$	19,500	$	9,750	$	9,750
$	10,000.00	$	10,000	$	5,000	$	5,000
$	5,000.00	$	5,000	$	2,500	$	2,500
$	5,000.00	$	5,000	$	2,500	$	2,500
$	150.00	$	150	$	75	$	75
$	5,000.00	$	5,000	$	2,500	$	2,500
$	4,000.00	$	12,000	$	6,000	$	6,000
$	3,000.00	$	3,000	$	1,500	$	1,500
$	500.00	$	1,000	$	500	$	500
$	1,600.00	$	8,000	$	4,000	$	4,000
$	500.00	$	3,000	$	1,500	$	1,500
$	3.00	$	3,360	$	1,680	$	1,680
$	30.00	$	3,000	$	1,500	$	1,500
$	18.00	$	45,000	$	22,500	$	22,500
$	3.00	$	13,500	$	6,750	$	6,750
$	300.00	$	5,400	$	2,700	$	2,700
$	20.00	$	1,280	$	640	$	640
$	500.00	$	500	$	250	$	250
$	150.00	$	300	$	150	$	150
$	1,000.00	$	1,000	$	500	$	500
$	10,000.00	$	10,000	$	5,000	$	5,000
$	10,000.00	$	10,000	$	5,000	$	5,000

$ 10,000.00	$ 10,000	$ 5,000	$ 5,000		
$ 3,000.00	$ 21,000	$ 10,500	$ 10,500		
$ 17,722.00	$ 8,861	$ 8,861	$ -		
$ 6,249.88	$ 6,763		$ 6,763		
$ 14,279.17	$ 3,427		$ 3,427		
15%	$ 39,728	$ 20,528	$ 19,199		
	$ 314,769	**$ 157,384**	**$ 157,384**		

$ 255,990

GENERAL DESCRIPTION

WELL WATER FROM AN EXISTING WELL IS USED. A BOOSTER PUMP WILL BE UTILIZED. PVC MAINLINE PIPE IS INSTALLED. A TURF PLOT AND A CONNECTION TO A CENTER PIVOT MUST BE INSTALLED.

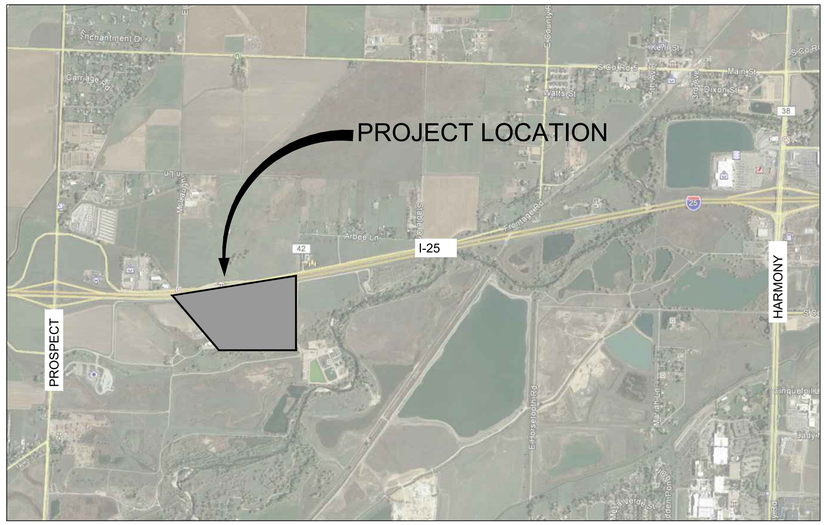
A SUMMARY OF CONTRACTOR TASKS ARE:

1. CONNECT TO EXISTING 8–INCH DISCHARGE FROM WELL #4. NEW MAINLINE TO BE ROUTED OVER SAND DYKE LATERAL. PROVIDE AND EXTEND MAINLINE PIPE TO TURF RESEARCH AREA, CENTER PIVOT STUB OUT, AND FUTURE DRIP AREAS AS SHOWN.
2. OBTAIN EXISTING BOOSTER PUMP FROM OWNER'S REPRESENTATIVE AND INSTALL BOOSTER PUMP.
3. INSTALL IRRIGATION SYSTEM FOR TURF RESEARCH PLOTS.
4. INSTALL CONNECTION TO VRI CENTER PIVOT.
5. INSTALL HEAD GATE ON SAND DIKE.

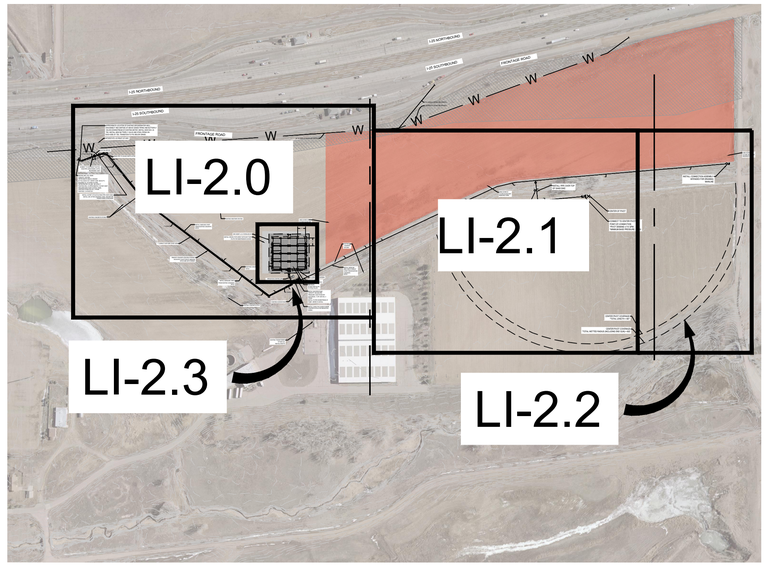
REFER TO THE PLANS FOR ADDITIONAL INFORMATION.

GENERAL NOTES

1. INSTALL BOOSTER PUMP IN STRICT ACCORDANCE TO THE PUMP MANUFACTURER'S GUIDELINES AND NEC CODES.
2. READ THOROUGHLY AND BECOME FAMILIAR WITH THE SPECIFICATIONS AND INSTALLATION DETAILS FOR THIS AND RELATED WORK PRIOR TO CONSTRUCTION.
3. COORDINATE UTILITY LOCATES ("CALL BEFORE YOU DIG") OF UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION.
4. DO NOT PROCEED WITH INSTALLATION IT IT IS OBVIOUS IN THE FIELD THAT OBSTRUCTIONS OR GRADE DIFFERENCES EXIST THAT MIGHT NOT HAVE BEEN CONSIDERED IN THE ENGINEERING, OR IF DISCREPANCIES IN CONSTRUCTION DETAILS, LEGEND, NOTES, OR SPECIFICATIONS ARE DISCOVERED. BRING ALL SUCH OBSTRUCTIONS OR DISCREPANCIES TO THE ATTENTION OF THE OWNER'S REPRESENTATIVE.
5. THE DRAWINGS ARE DIAGRAMMATIC. THEREFORE, THE FOLLOWING SHOULD BE NOTED:
   - A. COORDINATE PIPE ROUTING AND EXACT LOCATION OF VALVES, METERS, WINTERIZATION, STUB OUTS, PUMP STATIONS, ETC. WITH THE OWNER'S REPRESENTATIVE ON SITE PRIOR TO CONSTRUCTION.
   - B. USE ONLY STANDARD TEES AND ELBOW FITTINGS. USE OF CROSS TYPE FITTINGS IS NOT PERMITTED.
6. PROVIDE THE FOLLOWING COMPONENTS TO IIC PRIOR TO THE COMPLETION OF THE PROJECT:
   - A. TWO OPERATING KEYS FOR EACH TYPE OF MANUALLY OPERATED VALVE.
7. CONNECT ELECTRICAL POWER TO ITEMS REQUIRING POWER (IE. PUMP STATIONS) IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE AND ALL APPLICABLE LOCAL ELECTRIC UTILITY CODES.
8. WITH REGARD TO PIPE SIZING, THE FOLLOWING SHOULD BE NOTED:
   - A. IF A SECTION OF UNSIZED PIPE IS LOCATED BETWEEN TWO IDENTICALLY SIZED SECTIONS, THE UNSIZED PIPE IS THE SAME NOMINAL SIZE AS THE TWO SIZED SECTIONS.



SITE LOCATION MAP
NTS



KEYMAP
NTS

Aqua Engineering Inc.
Innovative Water Solutions

IRRIGATION INNOVATION CONSORTIUM
FORT COLLINS, COLORADO

IRRIGATION PLANS

IRRIGATION COVER SHEET AND NOTES

DATE	November 16, 2020
DESIGNED BY	JHK/RWB
DRAWN BY	JHK
CHECKED BY	RWB

REVISIONS
-
-
-
-

SHEET NO.
LI-1.0

File: G:\CSU\2018onCall\ITC\Well, Mainline, Small Turf, Pivot Stub\P-CSU-ITC PHASE A.dwg printed by Jason H. Klausner on 11/16/2020 12:14:11 PM using AutoCAD Version: 24.0s (LMS Tech)

LEGEND

SLEEVE/CONDUIT
*CLASS 200 PVC
*SIZE PER PLAN

MAINLINE PIPE
*CLASS 200 PVC
*SIZE PER PLAN

LATERAL PIPE: CLASS 160 PVC, 1–INCH UNLESS NOTED
*SOLVENT WELD SCH. 40 PVC FITTINGS

HEADER PIPE: CLASS 160 PVC, 1–INCH SIZE
*EXHAUST PIPING NOT SHOWN. USE SAME MATERIAL AS HEADER PIPE.
*SOLVENT WELD SCH. 40 PVC FITTINGS

CAPPED PIPE FOR FUTURE USE

REMOTE CONTROL VALVE ASSEMBLY
*DOWNSTREAM OF EACH REMOTE CONTROL VALVE IS A METER ASSEMBLY. THESE AREN'T SHOWN ON THE PLANS FOR SCHEMATIC CLARITY.

DRIP REMOTE CONTROL VALVE ASSEMBLY

INLINE DRIP BOUNDARY
*DRIPLINE WITH BUILT–IN PRESSURE REGULATING EMITTER INCLUDING 8–FOOT CHECK VALVE
*0.5 GPH/EMITTER: VARY EMITTER SPACING AND ROW SPACING FOR EACH SUBSURFACE DRIP ZONE. NOTE ROW SPACING ON THE AS BUILT DRAWINGS.

FLUSH VALVE ASSEMBLY
*REFER TO DETAIL

ZONE CONTROL VALVE
*REFER TO DETAIL

ISOLATION GATE VALVE ASSEMBLY
*MODEL (3–INCH AND LARGER): MATCO NORCA 10RT OR EQUAL
*NOMINAL SIZE OF GATE VALVE TO MATCH NOMINAL SIZE OF PIPE

QUICK COUPLING VALVE ASSEMBLY
*1–INCH, YELLOW CAP

(C) CONNECTION ASSEMBLY
*REFER TO DETAIL

(G) CANAL (SAND DIKE) CANAL GATE
*REFER TO DETAIL

[B] BOOSTER PUMP AND FILTER ASSEMBLY
*REFER TO DETAIL

[C] ENCLOSURE ASSEMBLY
*REFER TO DETAIL

(B) BLOW OUT ASSEMBLY
*REFER TO DETAIL

AIR VACUUM RELIEF VALVE ASSEMBLY
*WATERMAN AV–150 OR EQUAL
*SIZE: 2–INCH

[F] FLOW SENSOR ASSEMBLY
*ULTRASONIC
*FLOMEC QS200 OR EQUAL
*SIZE: SAME AS PIPE INDICATED ON PLAN

[W] WIRE PULL BOX

(A) IRRIGATION CONTROLLER
*WALL MOUNT, STAINLESS PEDESTAL
*120 VAC REQUIRED
*TWO–WIRE DECODER
*HAND HELD REMOTE

NOZZLE	FLOW(GPM)	RADIUS(FEET)
1.5	1.59	34'
4	4.10	42'
8	8.05	47'

A-1 INDICATES CONTROLLER AND STATION NUMBER
15 INDICATES LATERAL DISCHARGE IN GPM
1" INDICATES REMOTE CONTROL VALVE SIZE IN INCHES

VALVE BOXES:
1. FOR ALL VALVE ASSEMBLIES WITH EXCEPTION TO REMOTE CONTROL VALVES AND DRIP REMOTE CONTROL VALVES: COMPOSITE MATERIALS WITH GREEN LID.
2. DRIP REMOTE CONTROL VALVES AND REMOTE CONTROL VALVES TO BE PAIRED AND PLACED WITHIN A SINGLE 30"X48" DURALITE 3048 VALVE BOX OR EQUAL (INCLUDING ULTRASONIC SENSOR).

NOTES:
1. ACCEPTABLE POND GEOTEXTILE: 8 OZ. NONWOVEN
2. WIRE SPLICES: 3M DBR/Y–6
3. PIPE FITTINGS (4–INCH AND LARGER): LEEMCO OR HARCO DUCTILE IRON. USE JOINT RESTRAINT SYSTEM. INSTALL JOINT RESTRAINT ON EVERY OTHER PIPE JOINT.
4. PIPE FITTINGS (3–INCH AND SMALLER): SOLVENT WELD SCH. 40

Aqua Engineering Inc.
Innovative Water Solutions

IRRIGATION INNOVATION CONSORTIUM
FORT COLLINS, COLORADO
IRRIGATION PLANS

IRRIGATION LEGEND

DATE	November 16, 2020
DESIGNED BY	JHK/RWB
DRAWN BY	JHK
CHECKED BY	RWB

REVISIONS
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SHEET NO.
LI-1.1

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I-25 SOUTHBOUND

FRONTAGE ROAD

APPROXIMATE LOCATION OF EXISTING GROUNDWATER WELL. DISCONNECT AND DISPOSE OF ABOVE GRADE PIPING AND BUTTERFLY VALVES DOWNSTREAM OF EXISTING METER. INSTALL NEW SCH. 40 TEE. INSTALL NEW BUTTERFLY VALVE AND STEEL PIPING ON EACH SIDE OF TEE. TRANSITION TO PVC BELOW GRADE.

INTERSTATE I-25 RIGHT-OF-WAY

30" EX GREELEY WATER LINE (APPROX.)

30" EX GREELEY WATER LINE (APPROX.)

8" DUCTILE IRON

8" DUCTILE IRON

EXISTING BRIDGE

20'

8" DUCTILE IRON

BRING PIPE TO 36-INCH DEPTH AFTER AIR VACUUM RELIEF VALVE (ARV) ASSEMBLY

6" PVC

1" CONDUIT

CONNECT TO EXISTING 8" DUCTILE IRON PIPE USING ROMAC ALPHA RESTRAINED JOINT

EXISTING WELL NO.19253R
*CAPACITY: 400 GPM
*APPROXIMATE ANNUAL DEMAND
(AT FULL BUILD OUT, WORST CASE: 230 AC-FT)
ASSUMING ALL 50 ACRES IS CORN.
*APPROPRIATED VOLUME: 360 ACRE-FT
*EXISTING WELL IS APPROXIMATELY 20-FEET DEEP
*REQUIRES NEW PUMP CONTROL PANEL
*EXISTING POWER 230 VAC, 3 PHASE
*EXISTING 7.5 HP MOTOR

INSTALL 20-FEET OF DUCTILE IRON PIPE OVER CANAL. INSTALL ARV AFTER CROSSING CANAL AND BEFORE TRANSITIONING DOWN BANK.

INTERSTATE I-25 RIGHT-OF-WAY

6"

1" CONDUIT

EXISTING CONCRETE DITCHES

EXISTING WEATHER STATION

1" CONDUIT

INSTALL MAINLINE 3-FEET FROM EXISTING CONCRETE DITCH

AREA IN RED IS FUTURE INLINE DRIP RESEARCH AREA

SEE SHEET LI-2.3 FOR BLOW UP

INSTALL GRAVEL PATH (GRAY HATCH) BY TURF PLOTS FOR MAINTENANCE ACCESS

30'

30'

1" CONDUIT FOR PUMP START WIRE

6"

EXISTING CONCRETE DITCHES

6"

REMOVE CONCRETE AROUND HYDRANT. EXCAVATE TO BOTTOM OF MAINLINE DITCH AND CAP HYDRANT

6"

INSTALL MAINLINE AND 4-INCH CONDUIT 3-FEET FROM EXISTING CONCRETE DITCH

1" CONDUIT

EXISTING CONCRETE DITCH

6"

10' WIDE GRASS BORDER

IRRIGATION CONTROLLER
*PEDESTAL MOUNTED
*REQUIRES 120 VAC POWER

5' CRUSHED GRAVEL WALKING/DRIVING PATH

INSTALL MAINLINE 3-FEET FROM EXISTING CONCRETE DITCH

INDIVIDUAL 30'X30' TURF PLOTS 16 TOTAL PLOTS

6"

1" CONDUIT

1" CONDUIT

INSTALL BOOSTER PUMP
CAPACITY: 250-300 GPM
PRESSURE: 50-60 PSI BOOST
ELECTRICAL: 15 HP, 460 VAC, 3 PHASE
INSTALL FILTER DOWNSTREAM OF PUMP - REFER TO DETAIL

EXISTING ACCESS ROAD

INSTALL 6-INCH PVC SLEEVE UNDER CONCRETE DITCH FOR IRRIGATION WIRING

EXISTING CONCRETE DITCH

MATCHLINE SEE SHEET LI-2.1

40' 0' 20' 40' 80'

1" = 40'

SCALE MUST MEASURE 1 INCH OR DRAWING IS NOT TO SCALE.

N E S W

Aqua Engineering Inc.
Innovative Water Solutions

IRRIGATION INNOVATION CONSORTIUM
FORT COLLINS, COLORADO

IRRIGATION PLANS

IRRIGATION PLAN

DATE	November 16, 2020
DESIGNED BY	JHK/RWB
DRAWN BY	JHK
CHECKED BY	RWB

REVISIONS
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SHEET NO.
LI-2.0

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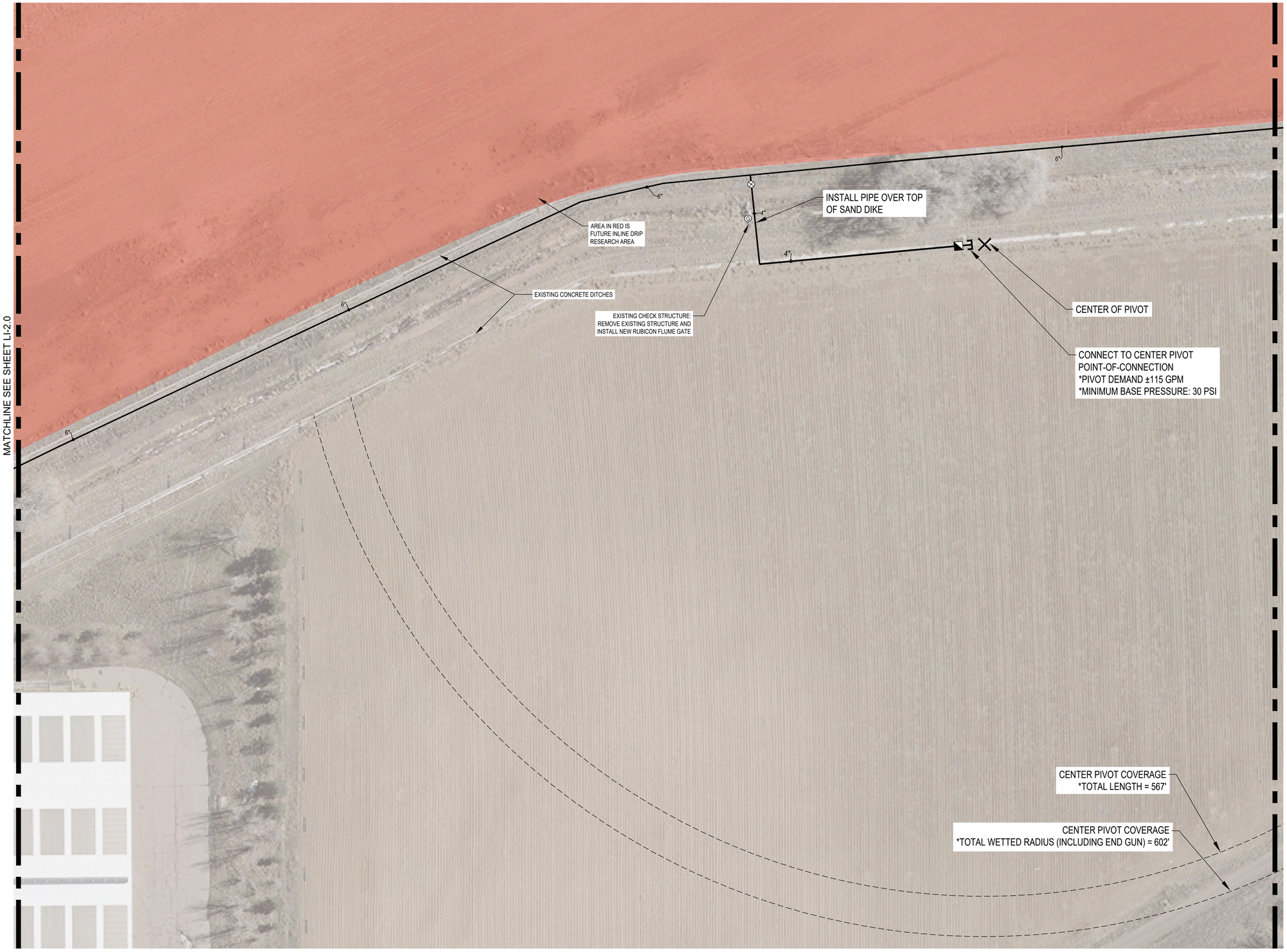

Aqua Engineering Inc.
Innovative Water Solutions

IRRIGATION INNOVATION CONSORTIUM
FORT COLLINS, COLORADO

IRRIGATION PLANS

IRRIGATION PLAN

DATE	November 16, 2020
DESIGNED BY	JHK/RWB
DRAWN BY	JHK
CHECKED BY	RWB

REVISIONS
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SHEET NO.
LI-2.1

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40' 0' 20' 40' 80'

1" = 40'

SCALE MUST MEASURE 1 INCH OR DRAWING IS NOT TO SCALE.

Aqua Engineering Inc.
Innovative Water Solutions

IRRIGATION INNOVATION CONSORTIUM
FORT COLLINS, COLORADO

IRRIGATION PLANS

IRRIGATION PLAN

DATE	November 16, 2020
DESIGNED BY	JHK/RWB
DRAWN BY	JHK
CHECKED BY	RWB

REVISIONS
-
-
-
-

SHEET NO.
LI-2.2

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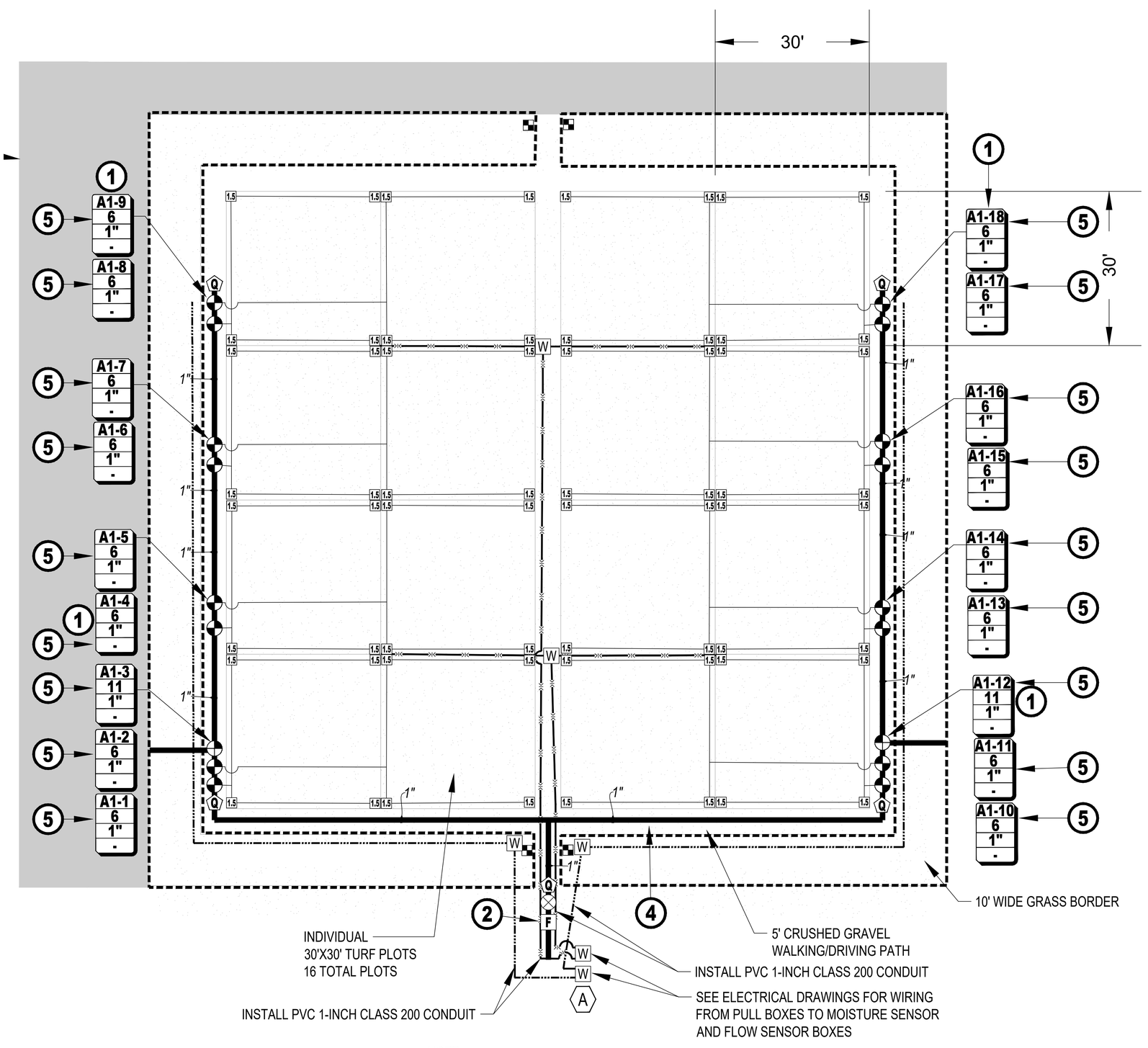

NOTE:
INSTALL ALL PIPE AND CONDUIT IN WALKWAY

5' 0' 2' 5' 10'
1" = 5'
SCALE MUST MEASURE 1 INCH OR DRAWING IS NOT TO SCALE.

N E S W

FLAG NOTES - THIS SHEET ONLY

1. INSTALL IRRIGATION DECODER GROUNDING EQUIPMENT THAT MEETS CONTROLLER MANUFACTURER'S GUIDELINES AT LOCATION ADJACENT TO INDICATED REMOTE CONTROL VALVE ASSEMBLY. COORDINATE EXACT LOCATION OF GROUNDING EQUIPMENT WITH IIC ON SITE PRIOR TO CONSTRUCTION. THE IRRIGATION CONTRACTOR IS RESPONSIBLE FOR GROUNDING THE ENTIRE TWO WIRE PATH PER MANUFACTURER'S GUIDELINES.
2. INSTALL FLOW SENSOR ASSEMBLY IN APPROXIMATE LOCATION. ROUTE WIRE TO CONTROL ENCLOSURE.
3. INSTALL GRAVEL PATH (GRAY HATCHED AREA) BY TURF PLOTS FOR MAINTENANCE ACCESS.
4. INSTALL 5-FOOT WIDE GRAVEL PATH FOR TURF PLOT AREA.
5. INSTALL ULTRASONIC SENSOR (FLOMEC OR EQUAL) DOWNSTREAM OF INDICATED REMOTE CONTROL VALVE OR DRIP REMOTE CONTROL VALVE ASSEMBLY. ROUTE WIRE TO CONTROL ENCLOSURE.

ADDITIONAL NOTES:
1. COORDINATE EXACT LOCATION OF TEST PLOT WITH IIC ON SITE PRIOR TO CONSTRUCTION.
2. IIC TO AMEND SOILS, ROTO-TILL, AND PERFORM FINAL GRADING PRIOR TO LAYING SOD OR SEED.
3. COORDINATE SEED TO BE INSTALLED WITH COLORADO STATE UNIVERSITY.
4. SEED IS TO BE DRILLED.

Aqua Engineering Inc.
Innovative Water Solutions

IRRIGATION INNOVATION CONSORTIUM
FORT COLLINS, COLORADO
IRRIGATION PLANS

TURF PLAN
BLOW UP

DATE	November 16, 2020
DESIGNED BY	JHK/RWB
DRAWN BY	JHK
CHECKED BY	RWB

REVISIONS
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SHEET NO.
LI-2.3

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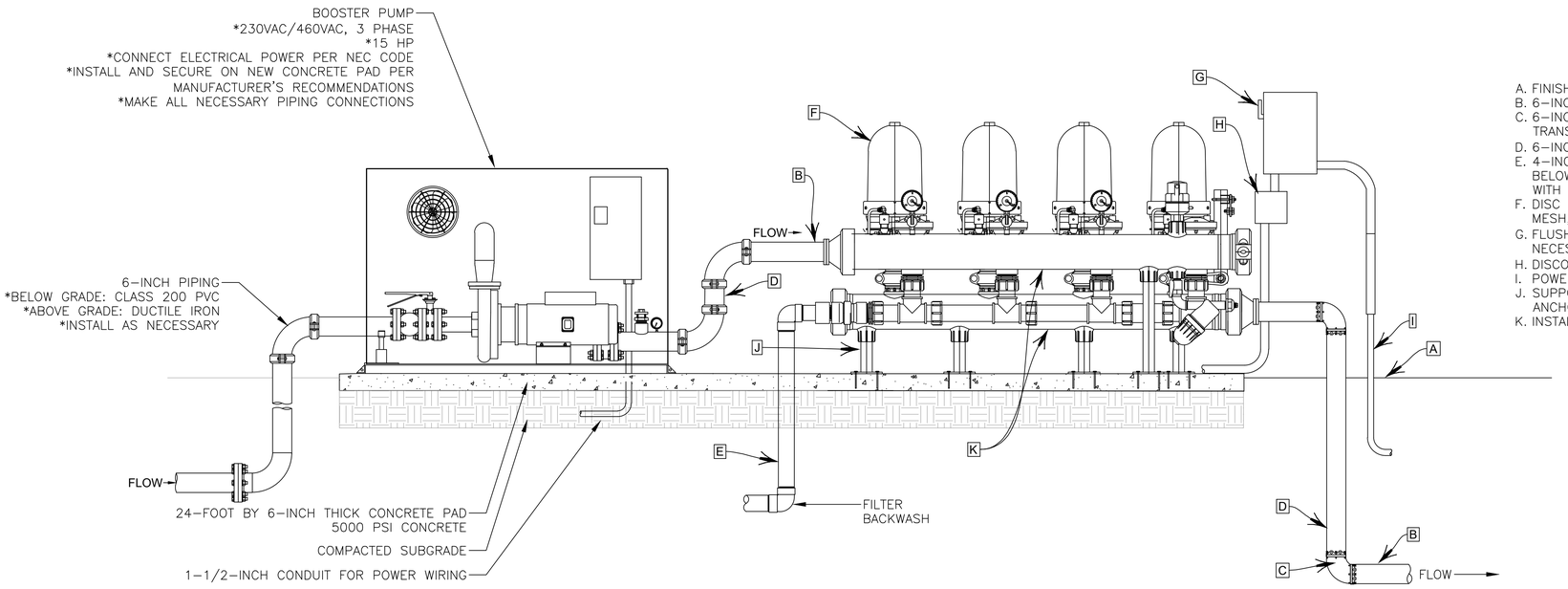

A. FINISH GRADE
B. 6-INCH PVC MAINLINE
C. 6-INCH DUCTILE IRON ELBOW WITH JOINT RESTRAINTS. INSTALL TRANSITION GASKETS AS NEEDED.
D. 6-INCH DUCTILE IRON PIPE (LENGTH AS REQUIRED)
E. 4-INCH FLUSH PIPING: SCH. 40 STEEL ABOVE GRADE, CLASS 200 PVC BELOW GRADE. ROUTE TO CONCRETE DITCH AND SEAL PENETRATION WITH HYDRAULIC CEMENT.
F. DISC FILTER: NETAFIM APOLLO DISC KLEEN, 4 FILTER UNITS, 120 MESH, BACKFLUSH CONTROLLER, PRE-PLUMBED, RATED FOR 400 GPM.
G. FLUSH CONTROLLER (NEMA 4 ENCLOSURE). MOUNT ON UNI-STRUT AS NECESSARY.
H. DISCONNECT (PER NEC CODE)
I. POWER SOURCE
J. SUPPORT STANDS ANCHORED TO CONCRETE PAD WITH CONCRETE ANCHOR BOLTS, TYPICAL
K. INSTALL BOILER DRAINS ON BOTTOM OF EXPOSED MANIFOLDS

NOTE:
1. DISC FILTER ASSEMBLY TO BE EXPOSED TO THE ENVIRONMENT. ENSURE CONTROLS AND ELECTRONICS ARE RATED FOR OUTDOOR USE AND CAN BE PROPERLY DRAINED (FOR WINTERIZATION PURPOSES).

1 BOOSTER PUMP AND FILTER ASSEMBLY

B

N.T.S.

Aqua Engineering Inc.
Innovative Water Solutions

IRRIGATION INNOVATION CONSORTIUM
FORT COLLINS, COLORADO

IRRIGATION PLANS

IRRIGATION DETAILS

DATE	November 16, 2020
DESIGNED BY	JHK/RWB
DRAWN BY	JHK
CHECKED BY	RWB

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SHEET NO.
LI-3.0

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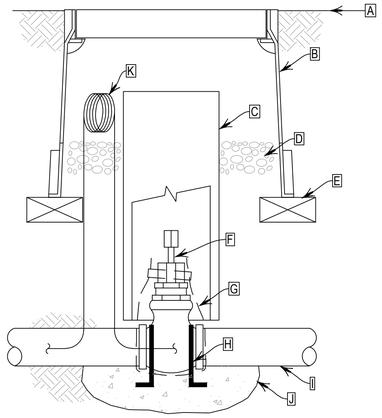
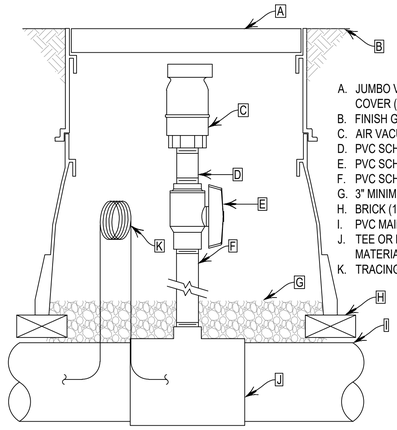


A. FINISH GRADE/TOP OF MULCH
B. 10" VALVE BOX WITH COVER
C. 6" PVC CL 200 PIPE (LENGTH AS REQUIRED)
D. 3" MINIMUM DEPTH OF 3/4" WASHED GRAVEL
E. BRICK (1 OF 2)
F. RESILIENT WEDGE GATE VALVE W/ 2" SQUARE OPERATING NUT, CONFORMING TO AWWA C-515
G. 3 MIL. PLASTIC WRAP WITH TAPED ENDS
H. #4 REBAR, TWO BARS WRAPPED OVER VALVE AND SECURED BY CONCRETE BLOCK
I. PVC MAINLINE
J. CONCRETE SUPPORT BLOCK USE A MINIMUM OF 3 CUBIC FEET OF CONCRETE
K. TRACING WIRE

NOTES:
1. NOMINAL SIZE OF GATE VALVE TO MATCH NOMINAL MAINLINE SIZE.
2. INSTALL A 4" THICK CONCRETE PAD BELOW VALVE WITH NO. 4 REBAR WHEN USING PUSH ON TYPE VALVES.
3. RESILIENT WEDGE GATE VALVE MAY HAVE EITHER MECHANICAL JOINT OR PUSH-ON GASKETED ENDS. THE OPERATOR IS A 2" SQUARE-WRENCH NUT.
4. ANCHOR ISOLATION VALVE TO CONCRETE BY BENDING REBAR OVER EACH END OF VALVE AND EXTENDING A MINIMUM OF 6" INTO CONCRETE SUPPORT BLOCK.
5. WRAP VALVE ENDS AND BODY IN 3 MIL. PLASTIC PRIOR TO POURING CONCRETE.
6. CONCRETE SUPPORT BLOCK IS TO BE POURED UNDER ISOLATION GATE VALVE. THE ISOLATION GATE VALVE IS NOT TO BE SET IN THE CONCRETE.

1 ISOLATION GATE VALVE ASSEMBLY

N.T.S.



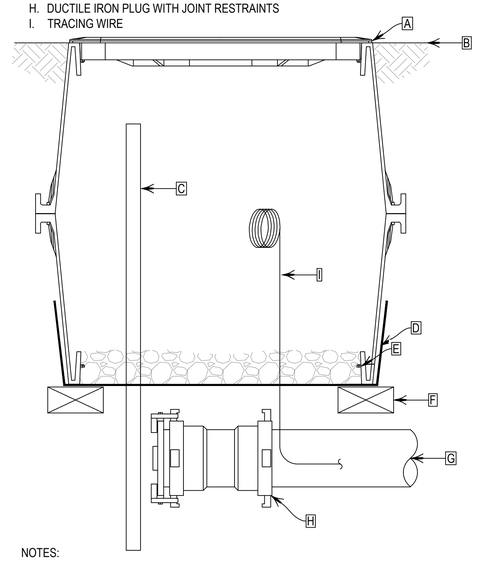
A. JUMBO VALVE BOX WITH EXTENSION AND COVER (HEIGHT AS REQUIRED)
B. FINISH GRADE/TOP OF MULCH
C. AIR VACUUM RELIEF VALVE
D. PVC SCH 80 NIPPLE (LENGTH AS REQUIRED)
E. PVC SCH 40 BALL VALVE (SIZE 2")
F. PVC SCH 80 NIPPLE (LENGTH AS REQUIRED)
G. 3" MINIMUM DEPTH OF 3/4" WASHED GRAVEL
H. BRICK (1 OF 4)
I. PVC MAINLINE PIPE
J. TEE OR EL: SEE SPECIFICATIONS FOR MATERIALS
K. TRACING WIRE

NOTES:
1. OPEN BALL VALVE IN ASSEMBLY 1/4 TURN UNTIL IRRIGATION SYSTEM IS FULLY CHARGED WITH WATER.
2. CLOSE VALVE DURING WINTERIZATION AND OPEN 1/2 TURN AFTER WINTERIZATION OF SYSTEM TO PROTECT VALVE DURING FREEZING WEATHER.
3. REPLACE PVC BALL VALVE WITH BRASS BALL VALVE IN THE EVENT AN AIR VACUUM RELIEF VALVE WITH MALE INLET IS USED.

2 AIR VACUUM RELIEF VALVE ASSEMBLY

N.T.S.

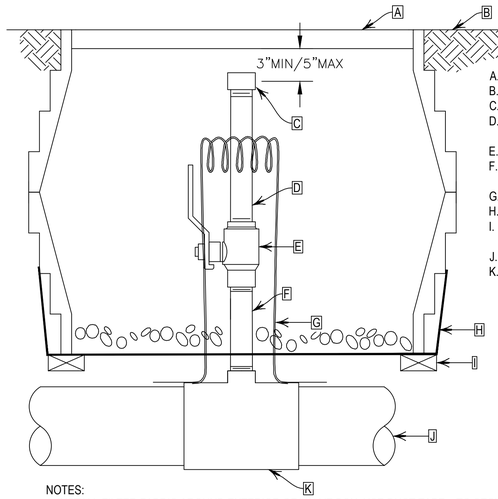
A. STANDARD VALVE BOX WITH LID
B. FINISH GRADE
C. 1-INCH SCH. 40 PIPE TO ACT AS INDICATOR, LENGTH AS REQUIRED
D. FILTER FABRIC
E. 3" MINIMUM DEPTH OF 3/4" WASHED GRAVEL
F. BRICKS (1 OF 4)
G. PVC MAINLINE PIPE
H. DUCTILE IRON PLUG WITH JOINT RESTRAINTS
I. TRACING WIRE



NOTES:
1. INSTALL FILTER FABRIC AROUND EXTERIOR OF VALVE BOX. USE DUCT TAPE TO SECURE FABRIC TO PIPE AND VALVE BOX.

3 MAINLINE STUB OUT DETAIL

N.T.S.

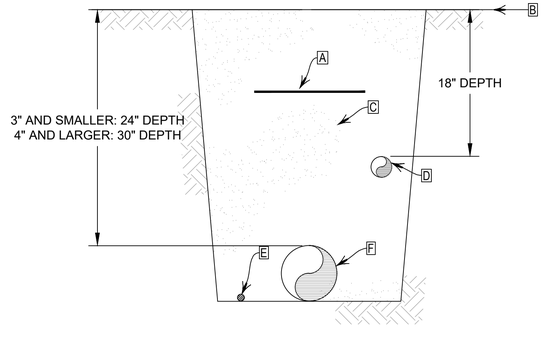


A. STANDARD VALVE BOX WITH LID
B. FINISH GRADE
C. GALVANIZED THREADED CAP (SIZE 2-INCH)
D. DUCTILE IRON NIPPLE (SIZE 2-INCH) (LENGTH AS REQUIRED)
E. CARBON STEEL BALL VALVE (SIZE 2-INCH)
F. DUCTILE IRON NIPPLE (SIZE 2-INCH) (LENGTH AS REQUIRED)
G. TRACING WIRE
H. FILTER FABRIC
I. BRICKS (CONTINUOUS END TO END AROUND BOTTOM OF VALVE BOX)
J. PVC MAINLINE PIPE
K. DUCTILE IRON SERVICE TEE

NOTES:
1. INSTALL FILTER FABRIC AROUND EXTERIOR OF VALVE BOX. USE DUCT TAPE TO SECURE FABRIC TO PIPE AND VALVE BOX.
2. BRAND VALVE BOX LID PER SPECIFICATIONS.

4 BLOW OUT ASSEMBLY

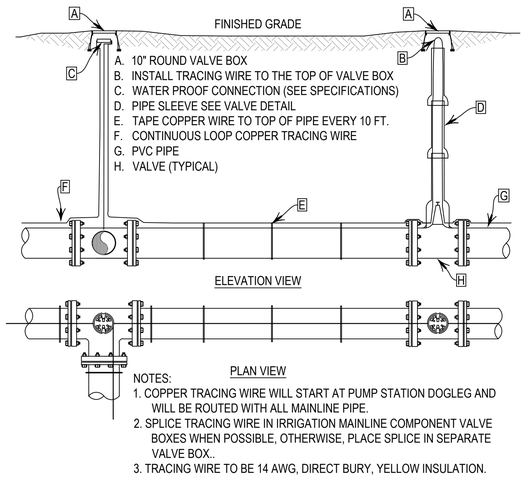
N.T.S.



A. WARNING TAPE
B. FINISH GRADE
C. BACKFILL
D. LATERAL PIPE
E. TWO WIRE CABLE
F. PRESSURIZED PIPE (DISTRIBUTION, MAINLINE, ETC.)

5 TRENCH DETAIL

N.T.S.



A. 10" ROUND VALVE BOX
B. INSTALL TRACING WIRE TO THE TOP OF VALVE BOX
C. WATER PROOF CONNECTION (SEE SPECIFICATIONS)
D. PIPE SLEEVE SEE VALVE DETAIL
E. TAPE COPPER WIRE TO TOP OF PIPE EVERY 10 FT.
F. CONTINUOUS LOOP COPPER TRACING WIRE
G. PVC PIPE
H. VALVE (TYPICAL)

NOTES:
1. COPPER TRACING WIRE WILL START AT PUMP STATION DOGLEG AND WILL BE ROUTED WITH ALL MAINLINE PIPE.
2. SPLICE TRACING WIRE IN IRRIGATION MAINLINE COMPONENT VALVE BOXES WHEN POSSIBLE, OTHERWISE, PLACE SPLICE IN SEPARATE VALVE BOX..
3. TRACING WIRE TO BE 14 AWG, DIRECT BURY, YELLOW INSULATION.

6 TRACING WIRE DETAIL

N.T.S.

Aqua Engineering Inc.
Innovative Water Solutions

IRRIGATION INNOVATION CONSORTIUM
FORT COLLINS, COLORADO

IRRIGATION PLANS

IRRIGATION DETAILS

DATE	November 16, 2020
DESIGNED BY	JHK/RWB
DRAWN BY	JHK
CHECKED BY	RWB

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SHEET NO.
LI-3.1

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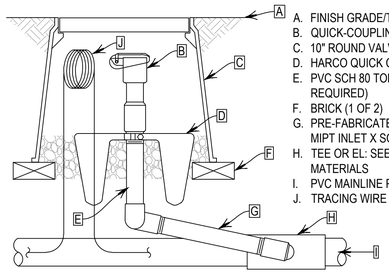
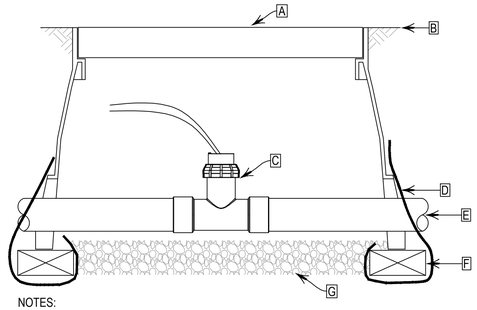


A. FINISH GRADE/TOP OF MULCH
B. QUICK-COUPLING VALVE
C. 10" ROUND VALVE BOX WITH COVER
D. HARCO QUICK COUPLER ANCHOR
E. PVC SCH 80 TOE NIPPLE (LENGTH AS REQUIRED)
F. BRICK (1 OF 2)
G. PRE-FABRICATED UNITIZED SWING JOINT 1" MIPT INLET X SOC OUTLET
H. TEE OR EL: SEE SPECIFICATIONS FOR MATERIALS
I. PVC MAINLINE PIPE
J. TRACING WIRE

NOTES:
1. FURNISH FITTINGS AND PIPING NOMINALLY SIZED IDENTICAL TO NOMINAL QUICK COUPLING VALVE INLET SIZE.
2. INSTALLATION HEIGHT OF QUICK COUPLER VALVE IN VALVE BOX MUST ALLOW PROPER OPERATION OF QUICK COUPLER KEY.
3. INSTALL SWING JOINT LAY ARM BETWEEN 30° AND 45° OF LATERAL PIPE IN ORDER TO ABSORB DOWNWARD IMPACT.

1 QUICK COUPLING VALVE ASSEMBLY

N.T.S.



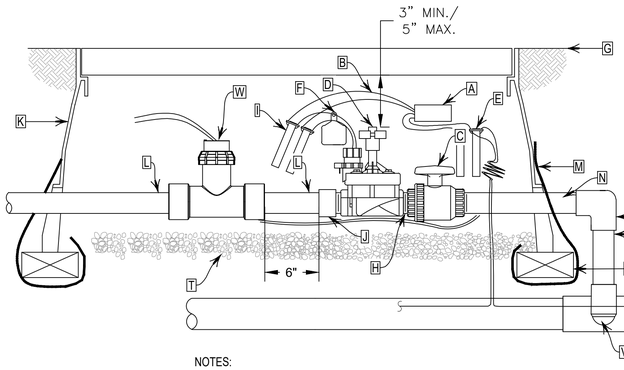
A. 12" VALVE BOX WITH COVER
B. FINISH GRADE/TOP OF MULCH
C. FLOW SENSOR: INSTALL FLOW SENSOR WIRE FROM SENSOR TO ENCLOSURE IN CONDUIT. SEE CONTROL CABINET ASSEMBLY DETAIL FOR ADDITIONAL NOTES.
D. FILTER FABRIC
E. PVC PIPE
F. BRICK (1 OF 4)
G. 3" MINIMUM DEPTH OF 3/4" WASHED GRAVEL

NOTES:
1. ALLOW 10 PIPE DIAMETERS UPSTREAM AND 5 PIPE DIAMETERS DOWNSTREAM OF STRAIGHT RUN OF PIPE TO ACHIEVE PROPER FLOW REGIME.
2. INSTALL FILTER FABRIC AROUND EXTERIOR OF VALVE BOX. USE DUCT TAPE TO SECURE FABRIC TO PIPE AND VALVE BOX.
3. DO NOT CUT OUT ENDS OF VALVE BOX UNNECESSARILY.
4. INSTALL SO THAT GRAVEL IS ONLY IN CONTACT WITH BOTTOM OF SENSOR ASSEMBLY.

2 FLOW SENSOR ASSEMBLY

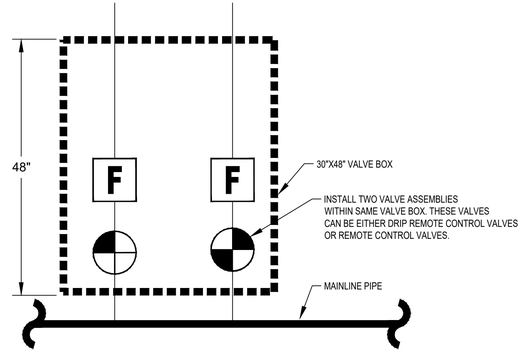
F

N.T.S.



A. DECODER
B. WIRE FROM DECODER TO VALVE SEE SPECIFICATIONS
C. PVC BALL VALVE
D. REMOTE CONTROL VALVE
E. WIRE CONNECTOR FROM TWO-WIRE CABLE TO DECODER (1 OF 2)
F. CHRISTY ID TAG
G. FINISH GRADE
H. PVC SCH 80 CLOSE NIPPLE
I. WIRE CONNECTOR FROM DECODER TO SOLENOID VALVE (1 OF 2)
J. PVC SCH 40 MALE ADAPTER
K. 30"X48" VALVE BOX WITH COVER
L. PVC LATERAL PIPE
M. FILTER FABRIC
N. PVC SCH 80 TOE NIPPLE (LENGTH AS REQUIRED)
O. PVC SCH 40 EL
P. PVC SCH 40 PIPE (LENGTH AS REQUIRED)
Q. BRICK (1 OF 4)
R. PVC MAINLINE
S. TWO-WIRE CABLE
T. 3" MINIMUM DEPTH OF 3/4" WASHED GRAVEL
U. TEE OR EL: SEE SPECIFICATIONS FOR MATERIALS
V. PVC SCH 80 TOE NIPPLE (LENGTH AS REQUIRED, HIDDEN) AND PVC SCH 40 EL
W. FLOW SENSOR: INSTALL FLOW SENSOR WIRE FROM SENSOR TO ENCLOSURE IN CONDUIT. SEE CONTROL CABINET ASSEMBLY DETAIL FOR ADDITIONAL NOTES.

NOTES:
1. USE VALVE BOX EXTENSION AS NECESSARY TO ACHIEVE MINIMUM DIMENSIONS ABOVE ASSEMBLY.
2. NOMINAL SIZE OF ALL COMPONENTS ARE TO BE THE SAME NOMINAL SIZE AS THE SOLENOID VALVE (SIZED AS SHOWN).
3. INSTALL FILTER FABRIC AROUND EXTERIOR OF VALVE BOX. USE DUCT TAPE TO SECURE FABRIC TO PIPE AND VALVE BOX.
4. TRANSITION TO PROPER LATERAL PIPE BURIAL DEPTH USING 45° ELBOW FITTINGS DOWNSTREAM OF REMOTE CONTROL VALVE ASSEMBLY.
5. DO NOT CUT OUT ENDS OF VALVE BOX UNNECESSARILY.
6. POSITION VALVE BOX OVER VALVE TO ALLOW ACCESS TO SOLENOID AND PROPER OPERATION OF BALL VALVE.
7. COIL 3-FEET OF WIRE FOR EACH DECODER FOR SERVICE PURPOSES.



3 REMOTE CONTROL VALVE ASSEMBLY

N.T.S.

Aqua Engineering Inc.
Innovative Water Solutions

IRRIGATION INNOVATION CONSORTIUM
FORT COLLINS, COLORADO
IRRIGATION PLANS

IRRIGATION DETAILS

DATE	November 16, 2020
DESIGNED BY	JHK/RWB
DRAWN BY	JHK
CHECKED BY	RWB

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SHEET NO.
LI-3.2

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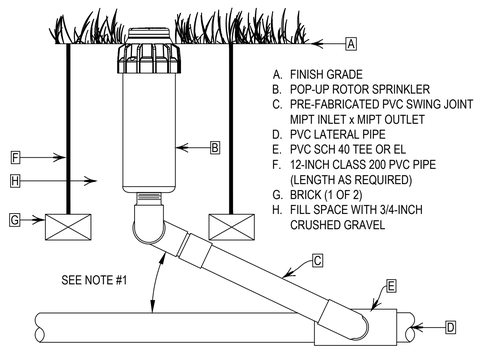
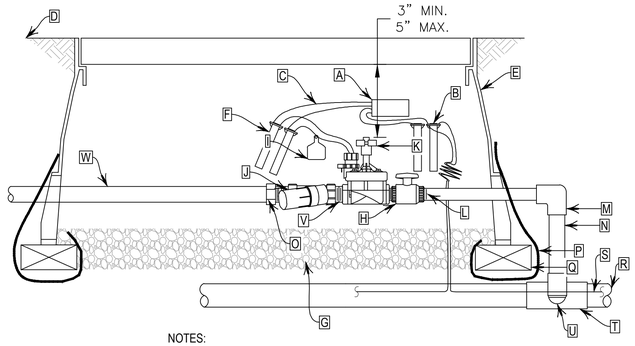


A. FINISH GRADE
B. POP-UP ROTOR SPRINKLER
C. PRE-FABRICATED PVC SWING JOINT MIPT INLET x MIPT OUTLET
D. PVC LATERAL PIPE
E. PVC SCH 40 TEE OR EL
F. 12-INCH CLASS 200 PVC PIPE (LENGTH AS REQUIRED)
G. BRICK (1 OF 2)
H. FILL SPACE WITH 3/4-INCH CRUSHED GRAVEL

NOTE:
1. INSTALL SWING JOINT LAY ARM BETWEEN 30° AND 45° OF LATERAL PIPE TO ABSORB DOWNWARD IMPACT.

1 POP-UP ROTOR SPRINKLER ASSEMBLY

N.T.S.

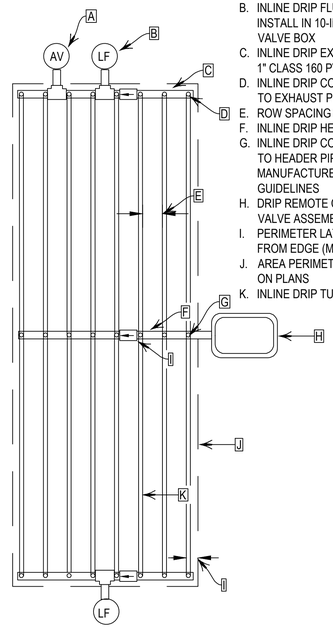


A. DECODER
B. WIRE CONNECTOR FROM TWO-WIRE CABLE TO DECODER (1 OF 2)
C. WIRE FROM DECODER TO VALVE SEE SPECIFICATIONS
D. FINISH GRADE/TOP OF MULCH
E. 30"X48" VALVE BOX WITH COVER
F. WIRE CONNECTOR FROM DECODER TO SOLENOID VALVE (1 OF 2)
G. 3" MINIMUM DEPTH OF 3/4" WASHED GRAVEL
H. PVC BALL VALVE
I. CHRISTY I.D. TAG
J. FILTRATION AND PRESSURE REGULATING DEVICE
K. REMOTE CONTROL VALVE
L. PVC SCH 80 TOE NIPPLE
M. PVC SCH 40 EL
N. PVC SCH 40 PIPE (TYPICAL) (LENGTH AS REQUIRED)
O. PVC SCH 40 ADAPTER
P. FILTER FABRIC
Q. BRICK (1 OF 4)
R. PVC MAINLINE
S. TWO-WIRE CABLE
T. TEE OR EL: SEE SPECIFICATIONS FOR MATERIALS
U. PVC SCH 80 TOE NIPPLE (LENGTH AS REQUIRED, HIDDEN) AND PVC SCH 40 EL
V. PVC SCH 80 NIPPLE
W. HEADER PIPE

NOTES:
1. USE VALVE BOX EXTENSION AS NECESSARY TO ACHIEVE MINIMUM DIMENSIONS ABOVE ASSEMBLY.
2. NOMINAL SIZE OF ALL COMPONENTS ARE TO BE THE SAME NOMINAL SIZE AS THE SOLENOID VALVE (SIZED AS SHOWN).
3. INSTALL FILTER FABRIC AROUND EXTERIOR OF VALVE BOX. USE DUCT TAPE TO SECURE FABRIC TO PIPE AND VALVE BOX.
4. TRANSITION TO PROPER LATERAL PIPE BURIAL DEPTH USING 45° ELBOW FITTINGS DOWNSTREAM OF REMOTE CONTROL VALVE ASSEMBLY.
5. DO NOT CUT OUT ENDS OF VALVE BOX UNNECESSARILY.
6. POSITION VALVE BOX OVER VALVE TO ALLOW ACCESS TO SOLENOID, AND PROPER OPERATION OF BALL VALVE.
7. COIL 3-FEET OF WIRE FOR EACH DECODER FOR SERVICE PURPOSES.

2 DRIP REMOTE CONTROL VALVE ASSEMBLY

N.T.S.

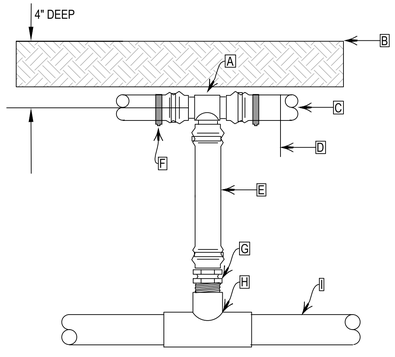


A. AIR VACUUM RELIEF VALVE - INSTALL IN 10-INCH ROUND VALVE BOX
B. INLINE DRIP FLUSH VALVE - INSTALL IN 10-INCH ROUND VALVE BOX
C. INLINE DRIP EXHAUST PIPE - 1" CLASS 160 PVC
D. INLINE DRIP CONNECTION TO EXHAUST PIPE
E. ROW SPACING PER PLANS
F. INLINE DRIP HEADER PIPE
G. INLINE DRIP CONNECTION TO HEADER PIPE PER MANUFACTURER'S GUIDELINES
H. DRIP REMOTE CONTROL VALVE ASSEMBLY
I. PERIMETER LATERALS 2" FROM EDGE (MINIMUM)
J. AREA PERIMETER SHOWN ON PLANS
K. INLINE DRIP TUBING

3 INLINE DRIP LAYOUT DETAIL

N.T.S.

A. TEE OR EL
B. FINISH GRADE OF SOIL
C. INLINE DRIP TUBING
D. "U" PIN
E. BLANK INLINE DRIP TUBING
F. STAINLESS STEEL PINCH CLAMP (TYP)
G. INLINE DRIP TUBING MALE ADAPTER
H. SCH 40 PVC SERVICE TEE OR EL WITH 3/4" SERVICE
I. INLINE DRIP HEADER OR EXHAUST PIPE

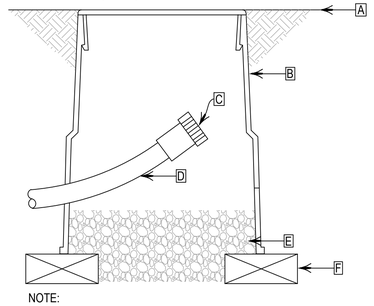


NOTES:
1. SECURE ALL BARB FITTINGS PER INLINE DRIP MANUFACTURER GUIDELINES.
2. "U" PIN INLINE DRIP TUBING EVERY 5 FEET TO HOLD IN PLACE BEFORE PLACING SOIL OVER TUBING.

4 HEADER/EXHAUST PIPE CONNECTION DETAIL

N.T.S.

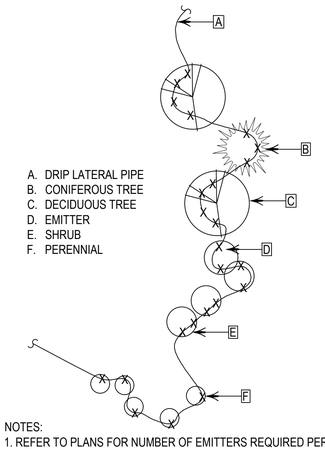
A. FINISH GRADE/TOP OF MULCH
B. 6" ROUND VALVE BOX WITH COVER
C. FLUSH CAP WITH HOSE THREAD CAP
D. DRIP IRRIGATION LATERAL
E. 3" MINIMUM DEPTH OF 3/4" WASHED GRAVEL
F. BRICK (1 OF 2)



NOTE:
1. INSTALL FLUSH CAP ASSEMBLY AT THE END OF EACH DRIP LATERAL SEGMENT.

5 FLUSH VALVE ASSEMBLY

N.T.S.



A. DRIP LATERAL PIPE
B. CONIFEROUS TREE
C. DECIDUOUS TREE
D. EMITTER
E. SHRUB
F. PERENNIAL

NOTES:
1. REFER TO PLANS FOR NUMBER OF EMITTERS REQUIRED PER PLANT.

6 POINT SOURCE DRIP PLACEMENT DETAIL

N.T.S.

Aqua Engineering Inc.
Innovative Water Solutions

IRRIGATION INNOVATION CONSORTIUM
FORT COLLINS, COLORADO

IRRIGATION PLANS

IRRIGATION DETAILS

DATE	November 16, 2020
DESIGNED BY	JHK/RWB
DRAWN BY	JHK
CHECKED BY	RWB

REVISIONS
-
-
-
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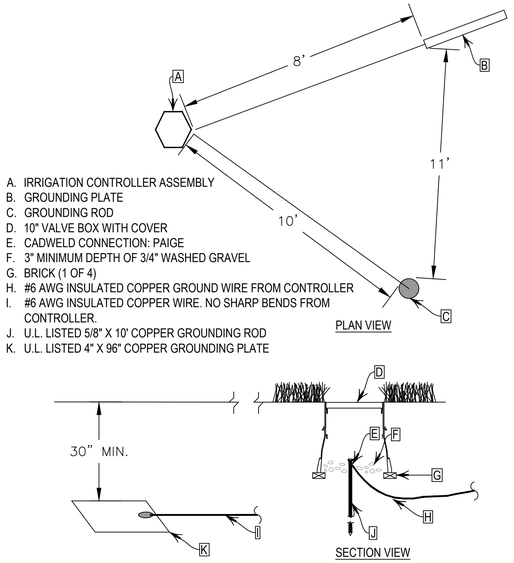
SHEET NO.
LI-3.3

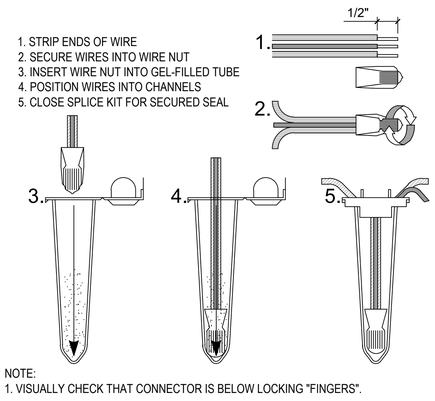
File: O:\CSU\2018OnCall\ITC\Well, Mainline, Small Turf, Pivot Stub\P--CSU--ITC PHASE A.dwg printed by Jason H. Klausner on 11/16/2020 12:14:43 PM using AutoCAD Version: 24.0s (LMS Tech)



A. IRRIGATION CONTROLLER ASSEMBLY
B. GROUNDING PLATE
C. GROUNDING ROD
D. 10" VALVE BOX WITH COVER
E. CADWELD CONNECTION: PAIGE
F. 3" MINIMUM DEPTH OF 3/4" WASHED GRAVEL
G. BRICK (1 OF 4)
H. #6 AWG INSULATED COPPER GROUND WIRE FROM CONTROLLER
I. #6 AWG INSULATED COPPER WIRE. NO SHARP BENDS FROM CONTROLLER.
J. U.L. LISTED 5/8" X 10' COPPER GROUNDING ROD
K. U.L. LISTED 4" X 96" COPPER GROUNDING PLATE

1 IRRIGATION CONTROLLER GROUNDING DETAIL

N.T.S.

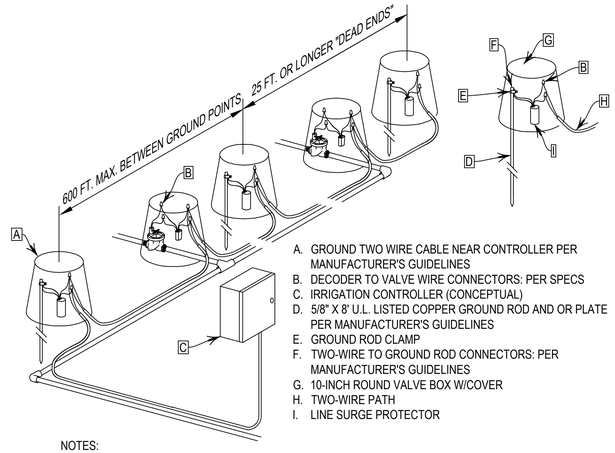


1. STRIP ENDS OF WIRE
2. SECURE WIRES INTO WIRE NUT
3. INSERT WIRE NUT INTO GEL-FILLED TUBE
4. POSITION WIRES INTO CHANNELS
5. CLOSE SPLICE KIT FOR SECURED SEAL

NOTE:
1. VISUALLY CHECK THAT CONNECTOR IS BELOW LOCKING "FINGERS".

2 WIRE SPLICE DETAIL

N.T.S.

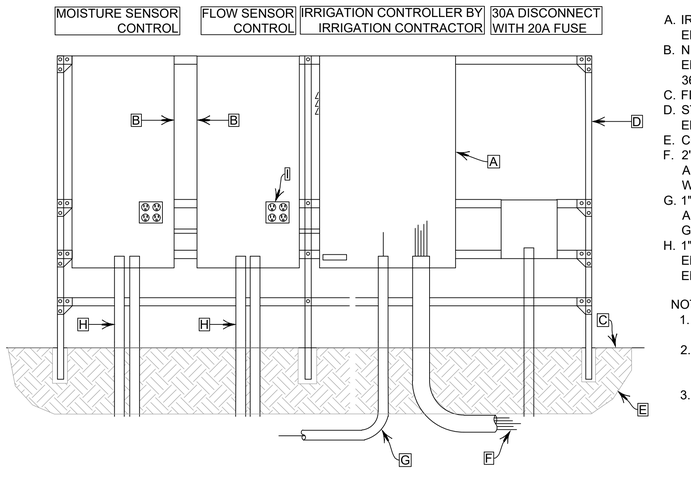


A. GROUND TWO WIRE CABLE NEAR CONTROLLER PER MANUFACTURER'S GUIDELINES
B. DECODER TO VALVE WIRE CONNECTORS: PER SPECS
C. IRRIGATION CONTROLLER (CONCEPTUAL)
D. 5/8" X 8' U.L. LISTED COPPER GROUND ROD AND OR PLATE PER MANUFACTURER'S GUIDELINES
E. GROUND ROD CLAMP
F. TWO-WIRE TO GROUND ROD CONNECTORS: PER MANUFACTURER'S GUIDELINES
G. 10-INCH ROUND VALVE BOX W/COVER
H. TWO-WIRE PATH
I. LINE SURGE PROTECTOR

NOTES:
1. ALL WIRE CONNECTION SHALL BE MADE WITH APPROVED CONNECTORS.
2. MAKE ALL WIRE SPLICES IN VALVE BOXES.
3. LEAVE A MINIMUM OF 36" EXTRA WIRE AT ALL SPLICE POINTS.
4. TEST EARTH TO GROUND RESISTANCE AT ALL GROUND POINTS.
5. EARTH TO GROUND RESISTANCE MUST MEET OR EXCEED MANUFACTURER REQUIREMENTS.
6. INSTALL ALL GROUND ASSEMBLIES IN VALVE BOXES.
7. INSTALL GROUNDING EQUIPMENT AS INDICATED ON THE IRRIGATION DOCUMENTS AND AS RECOMMENDED BY THE MANUFACTURER.

3 TWO WIRE GROUNDING SCHEMATIC

N.T.S.



A. IRRIGATION CONTROLLER IN ELCLOSURE
B. NEEMA 4 METALLIC HINGED ENCLOSURE WITH SOLID COVER 36" X 24" X 8"
C. FINISH GRADE
D. STRUT SYSTEM TO SUPPORT ELECTRICAL BOXES
E. COMPACTED SUBGRADE
F. 2" SCH 40 ELECTRICAL CONDUIT AND SWEEP EL FOR CONTROL WIRING
G. 1" SCH 40 ELECTRICAL CONDUIT AND SWEEP EL FOR ELECTRICAL GROUNDING
H. 1" EMT CONDUIT FROM ENCLOSURE TO PULL BOX (2 PER ENCLOSURE)

NOTES:
1. INSTALL CONTROLLER IN ENCLOSURE. ROUTE TWO-WIRE CABLE TO REMOTE CONTROL VALVES.
2. ROUTE WIRE FROM FLOW SENSOR TO ENCLOSURE IN CONDUIT. COIL 3' OF WIRE FOR EACH FLOW SENSOR IN ENCLOSURE. LABEL EACH WIRE WITH NUMBER OF REMOTE CONTROL VALVE.
3. INSTALL PULL BOX AT TERMINATION OF CONDUITS FROM ALL ENCLOSURES. USE STANDARD 12" VALVE BOX.

4 CONTROL CABINET ASSEMBLY

N.T.S.

Aqua Engineering Inc.
Innovative Water Solutions

IRRIGATION INNOVATION CONSORTIUM
FORT COLLINS, COLORADO

IRRIGATION PLANS

IRRIGATION DETAILS

DATE	November 16, 2020
DESIGNED BY	JHK/RWB
DRAWN BY	JHK
CHECKED BY	RWB

REVISIONS
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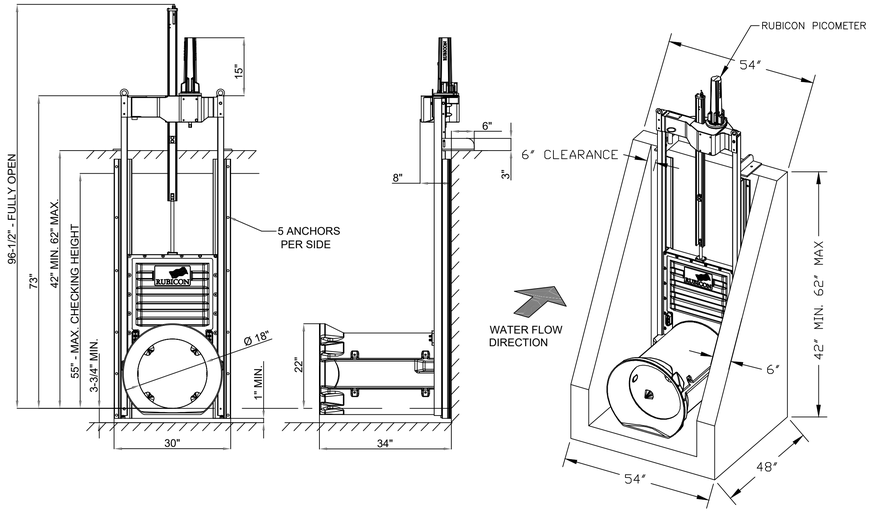
SHEET NO.
LI-3.4

File: G:\CSU\2018OnCall\ITC\Well, Mainline, Small Turf, Pivot Stub\P-CSU-ITC PHASE A.dwg printed by Jason H. Klausner on 11/16/2020 12:14:45 PM using AutoCAD Version: 24.0s (LMS Tech)



1 PICCOMETER AND FLUME GATE DETAIL ©

N.T.S.

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Aqua Engineering Inc.
Innovative Water Solutions

IRRIGATION INNOVATION CONSORTIUM
FORT COLLINS, COLORADO
IRRIGATION PLANS

IRRIGATION DETAILS

DATE	November 16, 2020
DESIGNED BY	JHK/RWB
DRAWN BY	JHK
CHECKED BY	RWB

REVISIONS
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SHEET NO.
LI-3.5

IIC - EAST FIELD TURF RESEARCH PLOTS WITH VRI PIVOT IRRIGATION COST ESTIMATE

COMPONENTS INCLUDE WELL CONNECTION, PIPING, BOOSTER PUMP, TURF AND SSDI RESEARCH PLOTS, VRI PIVOT

DATE: 11/12/2020
BY: RWB

Engineer: **Aqua Engineering Inc.**

CD SUBMITTAL

		DESCRIPTION	QUAN.	UNIT	UNIT COST	TOTAL	SUBTOTALS
		POC AT WELL: 8-INCH CONNECTION, PIPING OVER DITCH	1	LS	$5,000.00	$5,000.00	
		BOOSTER PUMP MOUNTED ON CONCRETE PAD	1	EA	$5,000.00	$5,000.00	
		WINTERIZATION ASSEMBLY	1	EA	$150.00	$150.00	
		FILTRATION ASSEMBLY	1	EA	$5,000.00	$5,000.00	
		6-INCH ISOLATION GATE VALVE ASSEMBLY	3	EA	$4,000.00	$12,000.00	
		4-INCH ISOLATION GATE VALVE ASSEMBLY	1	EA	$3,000.00	$3,000.00	
		1-INCH ISOLATION GATE VALVE ASSEMBLY	2	EA	$500.00	$1,000.00	
		AIR VACUUM RELIEF VALVE ASSEMBLY	5	EA	$1,600.00	$8,000.00	
		QUICK COUPLING VALVE ASSEMBLY	6	EA	$500.00	$3,000.00	
		1-INCH PIPE AND WIRE SLEEVING AND PULL BOXES	1,120	LF	$3.00	$3,360.00	
		4-INCH DI PIPE FOR DITCH CROSSING	100	LF	$30.00	$3,000.00	
		6-INCH MAINLINE PIPE	2,500	LF	$18.00	$45,000.00	
		TURF RESEARCH: 1-INCH PVC LATERAL PIPE	4,500	LF	$3.00	$13,500.00	
		TURF RESEARCH: 1-INCH RCV ASSEMBLY WITH FLOW SENSOR	18	EA	$300.00	$5,400.00	
		TURF RESEARCH: ROTARY SPRINKLERS INSTALL W/ FLEX PIPE	64	EA	$20.00	$1,280.00	
		TURF CONTROLLER ON STRUT SYSTEM	1	EA	$500.00	$500.00	
		BLOW OUT ASSEMBLY	2	EA	$150.00	$300.00	
		TURF RESEARCH: SUBSURFACE DRIP IRRIGATION	1	EA	$1,000.00	$1,000.00	
		RVI PIVOT- PAD,POC, AVR	1	EA	$10,000.00	$10,000.00	
		ELECTRICAL POWER (PER CSU COST ESTIMATE) PLUSS $20K FOR PIVOT	1	EA	$60,000.00	$60,000.00	
		4-INCH ELECTRICAL CONDUIT W/ PULL BOXES	1,300	LF	$15.00	$19,500.00	
		RUBICON FLUME GATE RETROFIT AT EXISTING CHECK STRUCTURE INSTALL	1	EA	$10,000.00	$10,000.00	
		RUBICON PICOMETER DOWNSTREAM SAND DIKE HEADGATE - INSTALL	1	EA	$10,000.00	$10,000.00	
		SUBSURFACE DRIP IRRIGATION RESEARCH PLOTS	7	AC	$3,000.00	$21,000.00	
		DESIGN REVISIONS (ELECTRICAL POWER & IRRIGATION)	1	EA	$10,000.00	$10,000.00	
		TOTAL				**$255,990.00**	

The Toro Company

8111 Lyndale Avenue South, Bloomington, Minnesota 55420-1196
www.thetorocompany.com

Joshua Friell, Ph.D.
Center for Technology, Research, and Innovation
The Toro Company
Bloomington, MN 55420

December 30, 2019

Dr. Reagan Waskom
Colorado State University
1033 Campus Delivery
E-102 Engineering Building
Fort Collins CO 80523-1033

Dr. Waskom:

In order to further the research capabilities of Colorado State University and the Irrigation Innovation Consortium, the Toro Company has made of gift of equipment valued at $69,414.20. Full ownership of the supplies and equipment listed in the attached document is given to Colorado State University and there is no expectation of payment or return of any of the products.

Please feel free to contact me with any further questions.

Regards,

Joshua C. Friell

Joshua Friell, Ph.D.
Sr. Principal Research Scientist

Attachment.

Toro Equipment and Cost Summary				
Model #	**Description**	**Total Qty.**	**Unit Price**	**Total**
SBDWS5U	Sentinel DC Decoder two-wire controller, stainless steel wall mount with UHF radio	1	$ 8,950.00	$ 8,950.00
SB-DDC-2	Decoders	24	$ 365.00	$ 8,760.00
SHHR	Sentinel Handheld Remote Control	1	$ 2,090.00	$ 2,090.00
SGIS-1-0	Sentinel software, computer equipment, peripheral hardware and 2 years NSN	1	$ 24,515.00	$ 24,515.00
100-SLSC	1" Quick coupler, single lug with stainless steel cover	10	$ 94.16	$ 941.60
100-SLK	1" Quick coupler key, single lug (use with all except ACME above)	2	$ 96.30	$ 192.60
100-MHS	1" hose swivel (use with all keys above)	2	$ 81.32	$ 162.64
P220GS-27-04DL	P220GS Series 1" scrubber valve with pressure regulation	16	$ 261.00	$ 4,176.00
T5PSS-RS	T5 Series 5" pop-up rotor with stainless steel riser and Rapid Set adjustment	64	$ 30.74	$ 1,967.36
GZK-25-MF-DCL	Drip zone kit with 1" P220G valve	3	$ 224.00	$ 672.00
RGP-212-10	DL2000 drip tubing, .5 gph emitters on 12" centers. 1000' roll	6	$ 535.00	$ 3,210.00
74943	5000 Series Rear Discharge 60" (152 cm) 25 HP EFI 747cc	1	$ 13,777.00	$ 13,777.00
				$ 69,414.20

November 30, 2020

Dr. Allan Andales
Principal Investigator
Irrigation Innovation Consortium
1170 Campus Delivery
Colorado State University
Fort Collins, CO 80523-1170

RE: Support of the IIC Water Plan Grant Application

Dear Dr. Andales:

On behalf of Rubicon Water (https://www.rubiconwater.com/), I am writing in support of Colorado State University's (CSU) Water Plan Grant application titled "Improving irrigation efficiency through the development of the hydraulic infrastructure at Irrigation Innovation Consortium (IIC) Headquarters". Our Company is a partner in the CSU-led IIC and subscribes to its mission of accelerating the development and adoption of needed water and energy efficient irrigation technologies and practices through public-private partnerships in both the agriculture and landscape sectors. The development of the hydraulic infrastructure at the IIC Headquarters in Fort Collins, CO will enable the development, testing, and broad dissemination of cutting-edge water efficient technologies and optimization strategies to enhance agricultural and landscape irrigation in Colorado and beyond.

In support of the development of IIC Headquarters, Rubicon Water is committed to an in-kind donation of equipment necessary for the implementation of automated canal flow at IIC Headquarters. The donation would include automated gate/meter systems to monitor and regulate water delivery to and from the farm via the Sand Dyke Lateral. We look forward to providing planning and design advice for appropriate installation of the equipment.

I look forward to the development of the hydraulic infrastructure at IIC Headquarters and continued collaboration with CSU in developing and demonstrating water and energy efficient irrigation technologies that will benefit Colorado, the U.S., and the international irrigation industry.

Sincerely,

Darren McGregor
General Manager, North America
Rubicon Water

RUBICON™

Rubicon Water

Rubicon Systems America, Inc.

Fort Collins
1501 S. Lemay Avenue
Suite 101
Fort Collins, CO 80524
toll free 1-877-440-6080
phone 970-482-3200
fax 970-482-3222
email inquiry@rubiconwater.com

Modesto
2318 Tenaya Drive
Modesto, CA 95354

Imperial
415 W Aten Road
Imperial, CA 92251

www.rubiconwater.com

November 23, 2020

Dr. Allan Andales
Principal Investigator
Irrigation Innovation Consortium
1170 Campus Delivery
Colorado State University
Fort Collins, CO 80523-1170

Dear Dr. Andales:
On behalf of Jain Irrigation, Inc. (https://www.jainsusa.com/), I am writing in support of Colorado State University's (CSU) Water Plan Grant application titled "Improving irrigation efficiency through the development of the hydraulic infrastructure at Irrigation Innovation Consortium (IIC) Headquarters". Our Company is a founding partner in the CSU-led IIC and subscribes to its mission of accelerating the development and adoption of needed water and energy efficient irrigation technologies and practices through public-private partnerships in both the agriculture and landscape sectors. The development of the hydraulic infrastructure at the IIC Headquarters in Fort Collins, CO will enable the development, testing, and broad dissemination of cutting edge water efficient technologies and optimization strategies to enhance agricultural and landscape irrigation in Colorado and beyond.

In support of the development of IIC Headquarters, Jain Irrigation, Inc. commits to an in-kind donation of drip irrigation equipment for up to 15 acres of agricultural fields. The donation will include Jain's revolutionary Turbo Tape® product that features built-in water filtration (through increased internal surface area) that could eliminate the need for dedicated filtration units in drip irrigation systems. We would be happy to provide planning and design advice for appropriate installation of the drip irrigation equipment.

I look forward to the development of the hydraulic infrastructure at IIC Headquarters and continued collaboration with CSU in developing and demonstrating water and energy efficient irrigation technologies that will benefit Colorado, the U.S., and the international irrigation industry.

Sincerely,

Aric Olson
President
Jain Irrigation, Inc.

2851 E. Florence Ave
Fresno, CA 93721
Ph: 800.695.7171
Fax: 888.434.3747

JAIN
www.jainsusa.com

PO Box 71447
Salt Lake City, UT 84171
(Jain Corporate Accounting,
Finance and Payroll)

740 Water St.
Watertown, NY 13601
Ph: 800.242.7467
Fax: 866.329.2427

Colorado Water Conservation Board
1313 Sherman St.
Denver, CO 80203

December 1, 2020

RE: Colorado Water Plan Grant Application

To Whom It May Concern:

Colorado State University (CSU) is pleased to submit the project proposal titled, "Improving irrigation efficiency through the development of the hydraulic infrastructure at Irrigation Innovation Consortium Headquarters" to the Colorado Water Conservation Board (CWCB) Water Plan Grants opportunity. Dr. Allan A. Andales will be the Principal Investigator (PI) and Dr. José L. Chávez will be the co-PI. We enthusiastically support this project and look forward to collaborating with CWCB if the proposal is funded.

As part of this proposed CWCB project, we will offer the following cash matching funds, for a total contribution of $157,384. These contributions will come from CSU's ongoing project titled "Irrigation Innovation Consortium" (IIC), which is supported by the Foundation for Food and Agriculture Research (FFAR).

Matching Funder Name	**Cash Match**	**In-Kind Match**	**Total Match Contribution**	**Status** *(acquired, committed, tentative)*
Colorado State University	$147,194	$10,190	$157,384	
Within Colorado State University Match:				
Irrigation Innovation Consortium[1]	$77,249	-	$77,249	Tentative[2]
FFAR	$69,945		$69,945	Acquired
PI Salary + Fringe		$3,427	$3,427	Acquired
Research Asst. Salary + Fringe		$6,763	$6,763	Acquired

[1]The IIC is a five-university collaborative research effort, led by CSU, to accelerate the development and adoption of water and energy efficient irrigation technologies and practices through public-private partnerships. The Foundation for Food and Agricultural Research (FFAR) provides funding for the project on a 1:1 basis with non-federal dollars. Funds from non-federal partners support individual projects, specific university collaborators, or the full IIC. Together with FFAR funds, these strategic collaborative partnerships will catalyze innovative technology development and enhanced strategies for irrigation efficiency. More information about the IIC can be found on their website: irrigationinnovation.org

[2]Subject to approval by the IIC Executive Committee, which will have its next meeting on 12/9/2020.

Sincerely,

Dr. Allan A. Andales
Colorado State University | Professor
IIC Principal Investigator

Dr. Timothy Martin
Executive Director
Irrigation Innovation Consortium
Colorado State University