BISHOP AREA WASTEWATER AUTHORITY

ENGINEERING REPORT FOR PRODUCTION, DISTRIBUTION, AND USE OF RECYCLED WATER

March, 2021

LUMOS & ASSOCIATES

Bishop Area Wastewater Authority

Engineering Report for Production, Distribution, and Use of Recycled Water

03/10/21

March, 2021

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BISHOP AREA WASTEWATER AUTHORITY
DRAFT ENGINEERING REPORT FOR THE PRODUCTION, DISTRIBUTION, AND USE OF RECYCLED WATER

March, 2021

1. INTRODUCTION

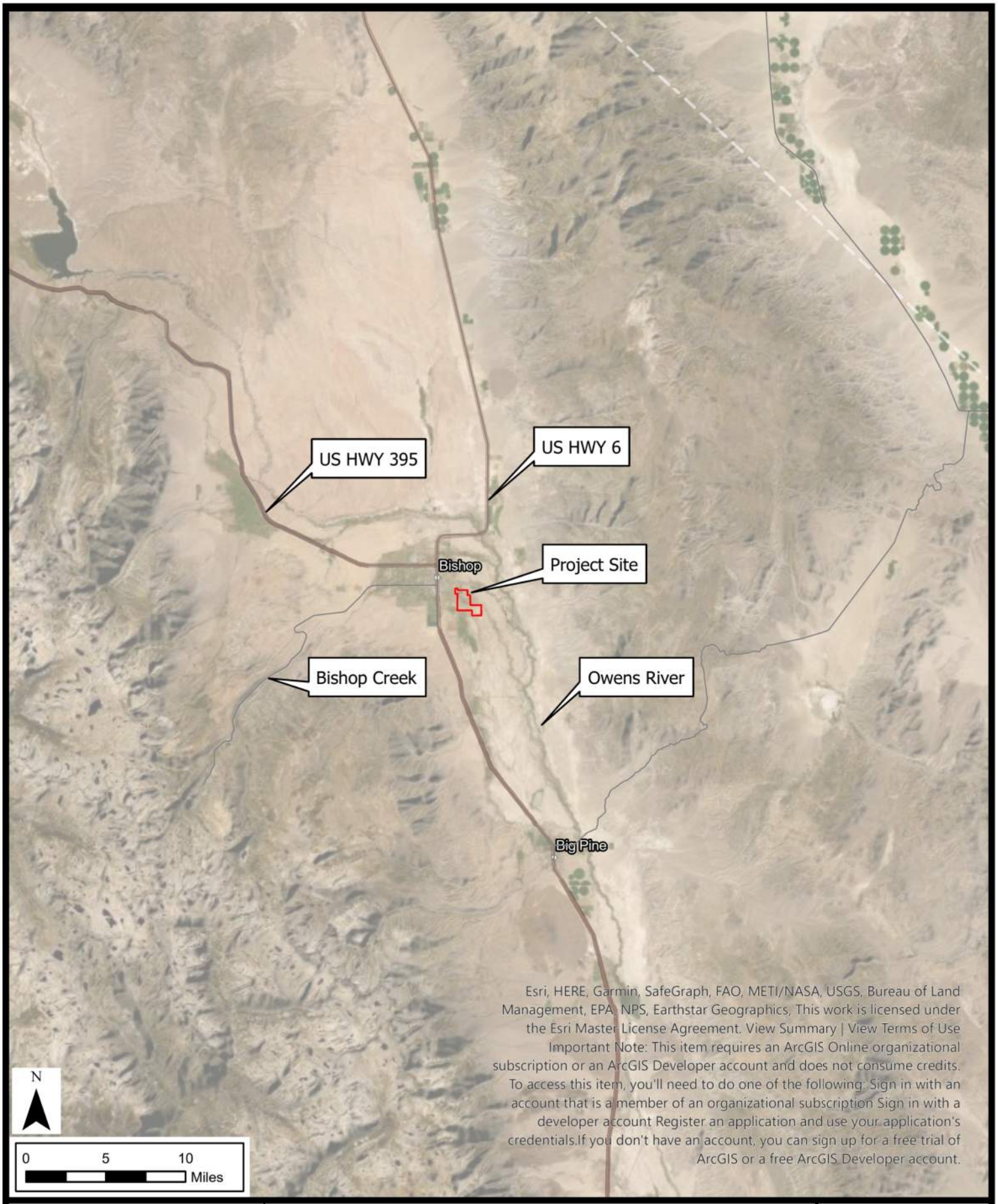
The Bishop Area Wastewater Authority (BAWA) is a joint powers authority (JPA) formed by and between the City of Bishop (City) and the Eastern Sierra Community Service District (District or ESCSD) under the provisions of Articles 1 through 4, Chapter 5, Division 7, of Title 1 of the State of California Government Code. The JPA specifically authorizes both entities, among other provisions, to "take all actions necessary to operate, maintain, and improve both the existing [undisinfected secondary effluent] irrigation system and create a new irrigation system…" for the purpose of combined undisinfected secondary effluent disposal purposes [1].

Both the City and the District operate municipal wastewater treatment plants on separate parcels located adjacent to each other. The two plants are located in Bishop, California, in the Owens River Valley. The valley is surrounded by the Sierra Nevada Mountains to the west and the White Mountains to the east, typical of the basin and range topography of the region. The area surrounding the treatment plants generally slopes southeast towards the Owens River. Both plants consist of aerated and partially mixed lagoons that produce undisinfected secondary treated effluent that has historically been disposed of via land application by flood irrigation of pasture for non-dairy cattle. Each plant is described in greater detail in Section 2.5 below. Vicinity, location, and USGS maps are provided in Figure 1, Figure **2**, and Figure **3**, respectively.

The City presently operates under Waste Discharge Requirements (WDRs) established by Board Order No. 6-94-025 as adopted by the California Regional Water Quality Control Board – Lahontan Region (LRWQCB) [2]. Similarly, the District operates under WDRs established by Board Order No. 6-94-024 as adopted by LRWQCB [3].

2. RECYCLED WATER PROJECT

As described in Section 1 above, both the City and the District operate wastewater treatment plants under separate WDRs. The City's wastewater treatment plant has a permitted design capacity of 1.6 million gallons per day (MGD), whereas the District's treatment plant has a permitted capacity of 0.85 MGD [1]. Under average day conditions the two plants treat a total cumulative flow of about 1.5 MGD (0.8 MGD from the City and 0.7 MGD from the District) [4]. Following treatment, undisinfected secondary effluent produced from each plant is primarily land applied via flood irrigation, although both the City and the District have percolation and evaporation ponds available as an alternative means of effluent disposal, though irrigation is the primary means of disposal during the irrigation season [5]. Flood irrigation is presently a joint operation by both the City and the District and consists of overlapping irrigation facilities on approximately 105 acres of land, a portion of which (approximately 40 acres) is currently owned by the City of Bishop with the balance being owned by the Los Angeles Department of Water and Power (LADWP) [4].



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Bishop Area Wastewater Authority

BAWA Title 22 Engineering Report
Vicinity Map

Inyo CA

Date:	2/19/2021
Scale:	1 : 500,000
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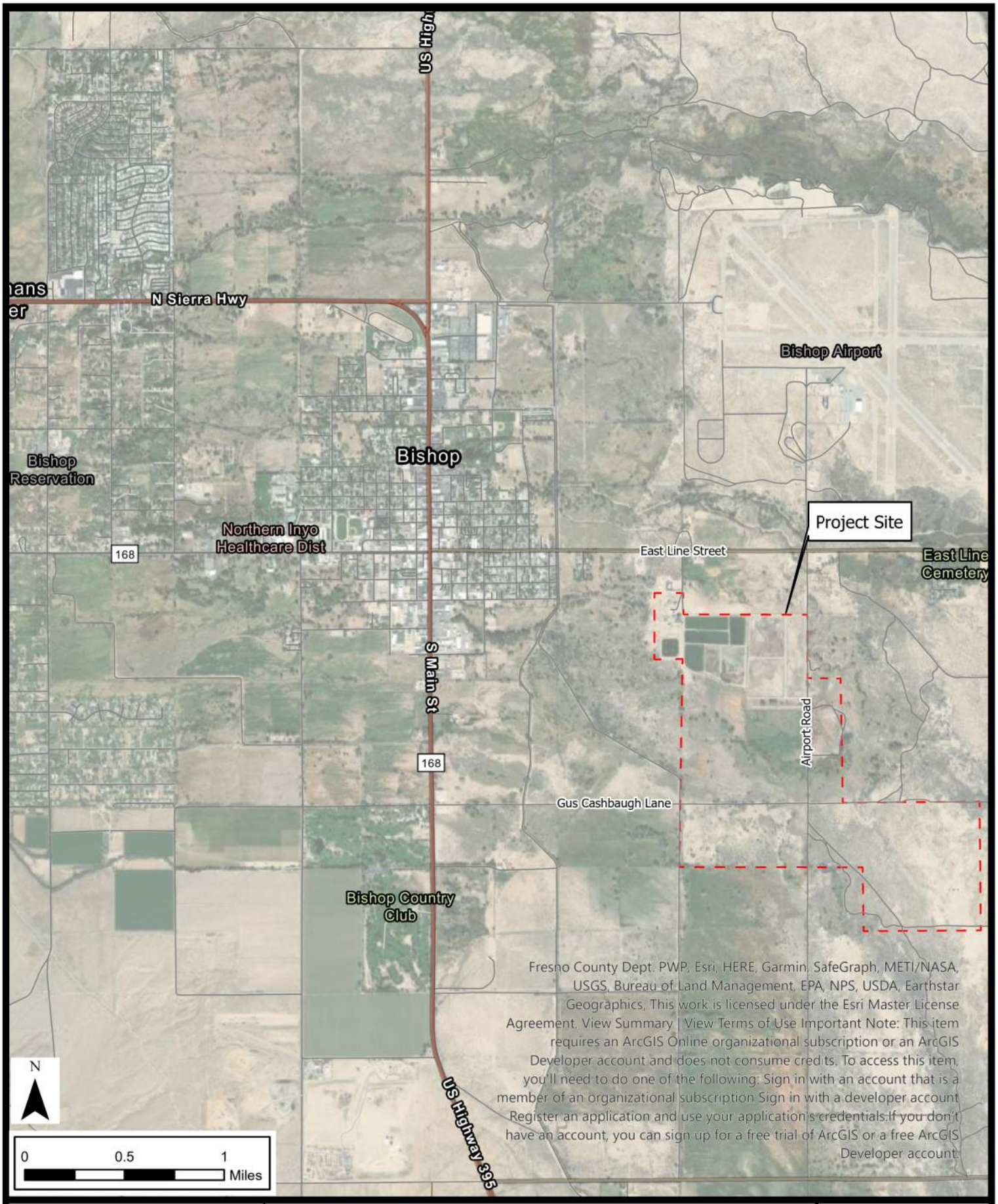
FIGURE	1 of 10



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Bishop Area Wastewater Authority

BAWA Title 22 Engineering Report
Location Map

Inyo CA

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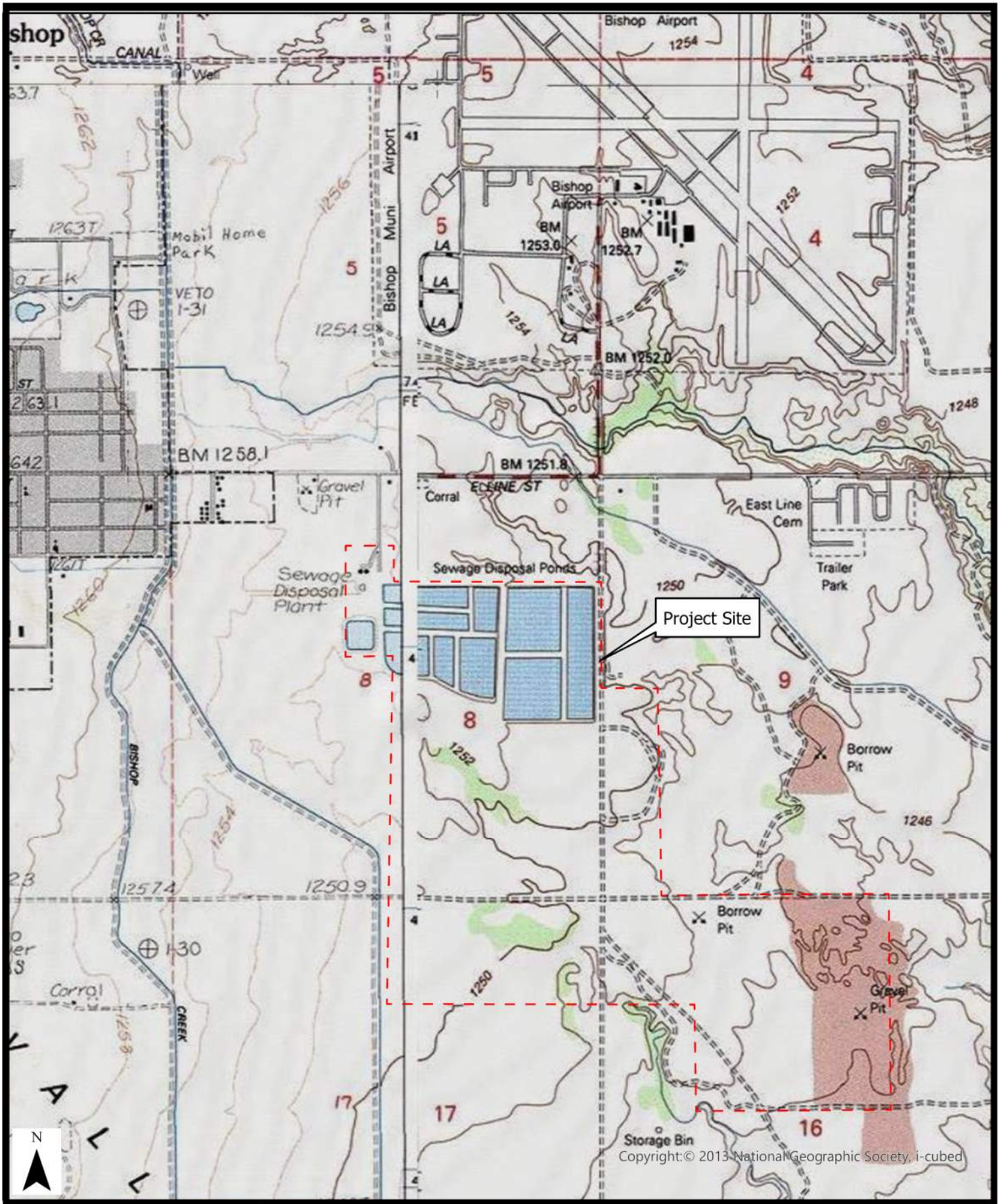

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Bishop Area Wastewater Authority

BAWA Title 22 Engineering Report

USGS Map

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Under both WDRs, a combined total of approximately 169 acres of land are permitted for effluent disposal via irrigation [6].

The proposed recycled water project will continue to provide undisinfected secondary effluent disposal via irrigation of non-food pasture crops for the production of non-dairy cattle as occurs under existing conditions. The application of recycled water for irrigation will change from the historic practice of flood irrigation to pressurized spray irrigation (sprinklers), which will provide a more efficient and consistent application of recycled water to the pasture crops at a rate that more closely matches the agronomic rate than can be achieved by flood irrigation.

The proposed project is contemplated as a three (3) phase project. Under Phase 1, the project will provide land application via spray irrigation to the currently irrigated lands, consisting of approximately 105± of the 169 total combined acres permitted for disposal under the current WDRs. Phase 2 of the proposed project will modify the location of, and significantly increase, the area available for land application via irrigation from the currently permitted 169 acres to a total of 342± acres, of which 302 acres are owned by LADWP and the approximately 40 remaining acres are owned by the City as described above. Under Phase 3, which will be predicated by future population growth and a resulting increase in wastewater flows at buildout of the Bishop area, an additional 132 acres of land will be added to the area available for land application [6]. It is important to note that the additional land identified in Phases 2 and 3 is presently owned by LADWP and both LADWP and BAWA are presently in negotiations for a sale of these lands (434 acres total) from LADWP to BAWA. At future buildout, the proposed project when fully implemented will consist of approximately 474 acres of irrigated land. Refer to Figure 10 for phasing.

The recycled water project will consist of a new combined effluent outfall facility following secondary treatment of the municipal wastewater produced by the City and the District. Following the combined outfall will be a new pump station equipped with a 120 horsepower (hp) vertical turbine pump and variable frequency drive (VFD), having a design flow rate of 1,450 gallons per minute (gpm). The pump station will supply water to a new distribution system consisting of polyvinyl-chloride (PVC) piping ranging from 4 to 12-inches in diameter and equipped with agricultural gun-style rotating sprinklers such as those manufactured by Nelson Irrigation or equivalent [7]. Under Phase 2, recycled water will be applied to approximately 302 acres of pasture land on property presently owned by LADWP that will be sold to the BAWA as described above [6].

The following sections discuss the rules and regulations governing the recycled water project, identify the project's producer, distributor, and user, as well describe the raw wastewater, treatment processes, plant reliability, supplemental water supply, monitoring and reporting requirements, and contingency plan for the recycled water project.

2.1 General

The City and the District will each continue to separately produce recycled water through their respective treatment plants. Both entities employ licensed operators on staff to operate and maintain each plant. Under the JPA, the City and the District will collectively distribute and use recycled water through a combined irrigation system and common

irrigation area, or land application area (LAA). Relative to the proposed recycled water project, the JPA specifically authorizes the City and the District to collectively "…manage the planning and implementation, including but not limited to construction, operation and administration of, the Interconnection and/or Sprinkler Irrigation Program [1]." In addition to irrigation for production of non-food pasture crops, beneficial use of the recycled water will also be accomplished by a third party contractor or lease holder for the purpose of non-dairy cattle production.

The roles of the project Producer/Distributor and User are further defined and delineated in greater detail under Section 2.2.1 below.

2.2 Rules and Regulations

The following procedures, restrictions, rules, and regulations are provided for the protection of public health and shall be imposed by the BAWA as the distributor of recycled water under the proposed project (refer to Section 2.2.1 below for definitions and delineations of the producer-distributor-user roles). All entities involved with the project shall adopt and adhere to the rules and regulations as outlined below. Primary enforcement of these rule and regulations rests with LRWQCB, with additional regulatory oversight provided by the State Water Resources Control Board's (SWRCB) Division of Drinking Water (DDW), San Bernardino office, as well as Inyo County Environmental Health Department.

2.2.1 Producer/Distributor Rules and Regulations

Rules and regulations specific to the proposed project's producer and distributor are as follows:

1) Discharge Specifications: Both the City's and the District's wastewater treatment plants shall produce secondary effluent meeting the requirements contained in their respective WDRs and as outlined in Table 1 below:

Table 1 - City of Bishop & Eastern Sierra CSD Wastewater Treatment Plant Effluent Quality Requirements

Parameter	Mean[1]	Maximum	Minimum
BOD[2], mg/L	50.0	–	NA
MBAS[3], mg/L	1.0	2.0	NA
pH	NA	9.0	6.0
DO[4], mg/L	NA	–	1.0

[1]Arithmetic mean of lab results for effluent samples collected in a period of 30 consecutive days.
[2]Biochemical Oxygen Demand (5 day, 20° C) for an unfiltered sample.
[3]Methylene Blue Active Substance
[4]Dissolved Oxygen

2) All recycled water produced and distributed for irrigation shall have less than 0.5 ml/L/hr of filterable solids.

3) All recycled water produced and distributed for irrigation shall comply with Article 4 of Title 22, California Code of Regulations.

4) The designated official for the City's wastewater treatment plant will be the Public Works Director, Deston Dishion. The designated official for the District's wastewater treatment plant will be the Chief Operator, Steven Nixon. Both designated officials will serve as the primary contact for regulatory agencies for the production of recycled water at their respective treatment plant. As BAWA Administrator, Deston Dishion will serve as the primary contact for regulatory agencies for the distribution of recycled water.

   Deston Dishion, Public Works Director, City of Bishop (760) 873-8458

   Steven Nixon, Chief Operator, Eastern Sierra CSD, (760) 872-8151

5) Operational staff will operate, maintain, and monitor their respective wastewater treatment plants. Operational staff will be responsible for performing monitoring and reporting requirements described in this report.

6) The designated official for the BAWA's distribution of recycled water will be Deston Dishion, BAWA Administrator.

7) Operational staff will adhere to the rules and regulations, as well as the contingency plan outlined in this report.

8) Maintenance staff will be available as required to attend to maintenance emergencies, as well as planned and unplanned maintenance activities which are necessary to ensure the continued compliance with the requirements of this report for recycled water production and distribution.

2.2.2 User Rules and Regulations

For the proposed project, there are two primary uses and users associated with the project, viz. – non-food pasture crop production and non-dairy cattle production (refer to Section 2.3.2 below for more detail). Rules and regulations specific to the proposed project's users are included below:

A. Non-food Pasture Crop Irrigation:

   1) The designated official to serve as the primary person in responsible charge of the daily operation and maintenance of the irrigation system and LAA, as well as the primary point of contact for regulatory agencies, will be the BAWA Administrator:

      Deston Dishion, Public Works Director, City of Bishop (760) 873-8458

2) BAWA operational staff shall be responsible for the effective implementation of irrigation best management practices for the pasture irrigation system, including:

a. Ensuring application rates do not exceed the agronomic rate of the pasture crops, or at a minimum the hydraulic capacity of the LAA.

b. Ensuring that no surface flow or other discharge of recycled water leaves the LAA.

c. Ensuring that standing water persisting longer than 48 hours does not occur as a result of irrigation practices.

3) The LAA shall be properly fenced and posted to restrict non-operational staff and other members of the public from accessing the site. Signage shall warn of the presence of recycled water for agricultural use.

4) BAWA shall maintain and promptly repair site fencing and signage of the LAA.

B. Non-Dairy Cattle Production:

1) The third party contractor or leaseholder shall provide stock watering from either surface water or groundwater sources. Per § 13521.1 of the California Statutes Related to Recycled Water, non-dairy cattle may only be watered with disinfected tertiary treated recycled water sources with approval of the state board. Therefore, stock watering with recycled water will not be allowed for this project. Stock watering sources shall have a 50-foot maintained buffer from recycled water applications. Surface water sources, such as the existing A-Drain water trap north of Gus-Cashbaugh Road, may continue to be used as stock watering sources provided the required setback from recycled water application is maintained.

2) The third party contractor or leaseholder shall ensure that stock animals do not damage the site fencing and make timely repairs to any fence or irrigation system damage that occurs during pasture times resulting from stock animals.

3) The third party contractor or leaseholder shall ensure that the congregation of stock animals does not cause significant local erosion that could result in ponding or runoff of recycled water.

2.2.3 Design, Construction, and Maintenance

BAWA will incorporate the following measures to ensure the protection of public health as it relates to the design, construction, and maintenance of the recycled water system. These measures are in compliance with the design requirements of the California-Nevada Section of the American Water Works Association (AWWA)

publication, *Guidelines for Distribution of Non-Potable Water*, as well as the irrigation system design prepared for BAWA by Laurel Ag and Water [8] [9]:

1) Purple Pipe: Because the recycled water will be supplied and used strictly for agricultural uses, and the site will be secured from public access by fencing and signage, purple pipe is not required per §116815, Part 12, Division 104, of the California Health and Safety Code.
2) Potable Water Supply: No potable water supply presently exists in the LAA. Connections of the recycled water system to any potable water supply are prohibited per Title 17 of the California Code of Regulations.
3) Horizontal Separation: Horizontal separation between any recycled waterline and any parallel potable, storm, or sanitary sewer line will be a minimum of 10-feet between outer diameters of pipes. Where this separation cannot be achieved, special construction methods to mitigate the separation non-compliance will be required. However, there are presently no other utility lines in the LAA and none are anticipated for future use.
4) Vertical Separation: Vertical separation between any recycled waterline and any crossing potable line will be a minimum of 12-inches between the outer diameters of the pipes, with potable water above. Where this separation cannot be achieved, special construction methods to mitigate the separation non-compliance will be required. However, there are presently no potable lines in the LAA and none are anticipated for future use.
5) Common Trench: Potable and recycled water lines are prohibited from being installed in a common trench. No potable lines are present or planned for the LAA in the future.
6) Signage: Signs shall be placed along the LAA fencing and at above ground appurtenances such as the irrigation pump, sprinkler heads, and valve vaults that inform BAWA staff and other approved users of the presence of recycled water. The signs shall read "CAUTION: RECYCLED WATER – DO NOT DRINK" in minimum ½-inch black or white letters on a purple (Pantone 512) background and shall be a minimum of 4-inches high by 8-inches long. Signs shall be placed at intervals of 500 feet along fences, at all gates and other access entrances, and parcel corners. In lieu of signs at sprinkler heads the vertical riser pipe shall have a purple warning sticker affixed with the above language clearly printed in black or white text.
7) Depth of Cover: The top of irrigation main lines shall have a minimum depth of cover of 36-inches. Sprinkler elbow laterals shall have a minimum depth of cover over top of pipe of 24-inches. Mainline air vent laterals shall have a minimum depth of cover over top of pipe of 30-inches.
8) Air Vent, Flush Out, and Pressure Relief Valves: Air vents shall provide for the relief of entrained air accumulating within the irrigation system. End of line flush outs will be installed to allow for the removal of recycled water and/or sediment from the pipe, either seasonally or as needed. Pressure relief valves (PRV) will protect the system in the event of over-pressurization. All runoff and excess recycled water shall be contained within the LAA and prevented from reaching surface water or drainage courses.
9) Solenoid Valves: Solenoid valves will be normally closed, solenoid operated, irrigation valves that open upon energization. Solenoid valves shall have a

resulting pressure loss of 0.4 PSI at a design flow rate of 1,200 GPM. Valves will be operated by an irrigation master control assembly using a time controller. The controller shall be located in a secured location protected from the elements, vandalism, and damage by cattle.

10) Valve Vaults: Valve assemblies shall be contained within valve vaults being either precast concrete or fiberglass construction. Valve covers shall be sturdy enough to protect the valve assembly from damage by cattle.
11) Sprinkler Risers: Sprinkler risers shall be galvanized rigid steel set in concrete foundations to protect the sprinkler from environmental (e.g. cattle) damage. The sprinkler assembly shall be a minimum of 48-inches above existing grade and equipped with a rotating gun-style sprinkler head.
12) Hose Bibs: Hose bibs attached to the recycled water system will not be allowed. As an alternative to hose bibs, quick connect couplers may be installed.

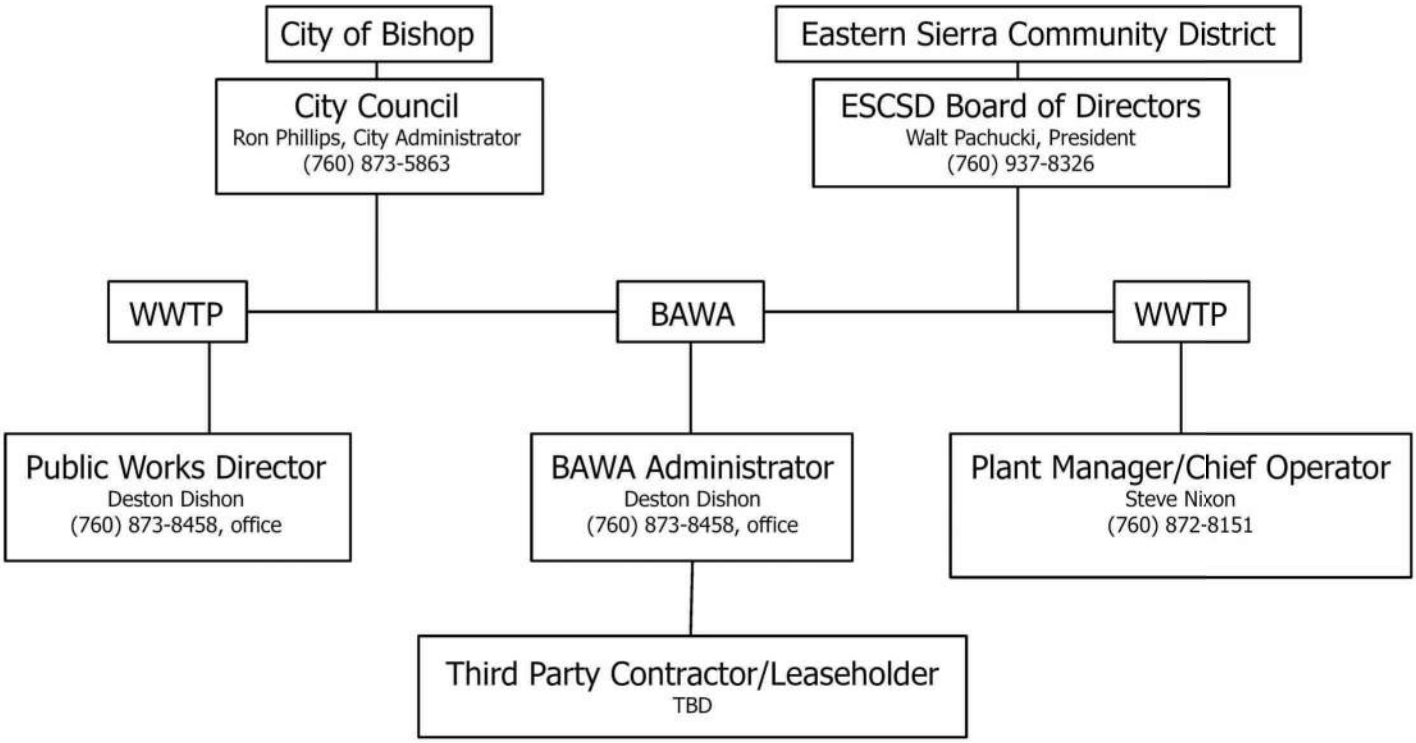
2.3 Producer-Distributor-User

The producer is the public or private entity that will treat and and/or distribute the recycled water used in the project [10]. The user will be the public or private entity that puts the recycled water to a designated beneficial use under the provisions of, and in compliance with, Sections 60301 through 60310 of California Code of Regulations, Title 22 [11].

2.3.1 Producer/Distributor

Both the City and the District will retain their separate and existing roles in the treatment of wastewater collected within their respective collection systems and service areas. By treating collected wastewater to comply with permit requirements described in both the City's and District's respective WDRs, each entity will be a producer of recycled water for the proposed project. The City's wastewater treatment plant is operated by the Public Works Director, Deston Dishion (Certificate No. 9434). The District's treatment plant is operated by Chief Plant Operator, Steven Nixon (Certificate No. 7471). Both the City and the District will comply with the applicable rules and regulations identified for producers of recycled water in Section 2.2.1 above. Organizational charts for the City, District, and BAWA, as well as the production, distribution and use of recycled water are shown in Figure 4 and Figure 5.

Under the terms of the JPA, BAWA will be the project distributor. BAWA will distribute recycled water produced from both plants and collected at a single combined outfall and apply the undisinfected secondary treated recycled water for beneficial use via irrigation of non-food pasture crops on properties located adjacent to and south of the treatment plans. BAWA will comply with the applicable rules and regulations identified for producers and distributors of recycled water in Section 2.2.1 above.



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Bishop Area Wastewater Authority

City of Bishop, ESCSD and BAWA,
Organizational Chart and Contact Info.

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Date:	2/19/2021
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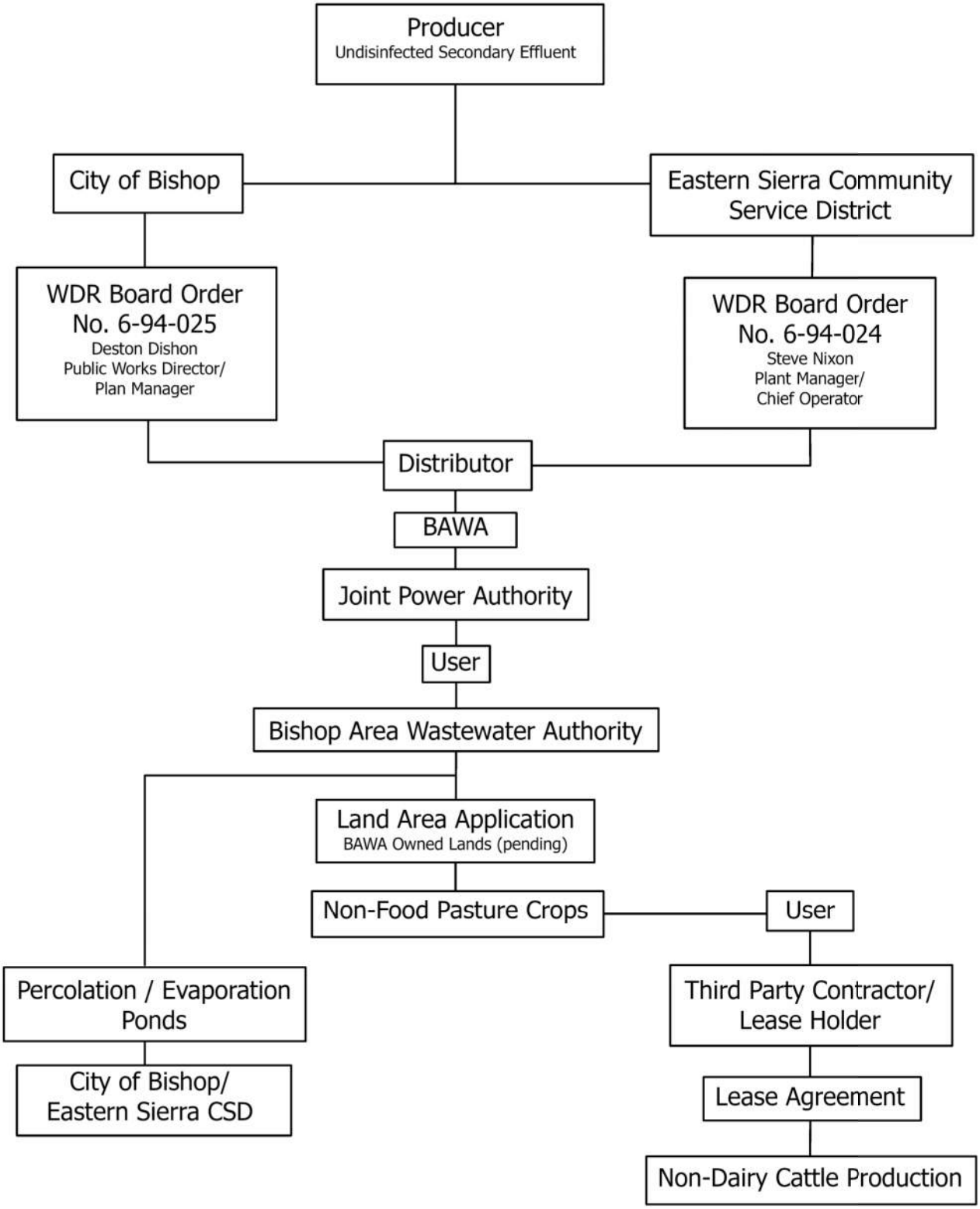

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Bishop Area Wastewater Authority

BAWA Title 22 Engineering Report

Organization Structure for Production, Distribution, and use of Recycled Water

Inyo CA

Date:	2/19/2021
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FIGURE	5 of 10

2.3.2 User

BAWA will be the public entity responsible for LAA activities for the primary beneficial use of producing non-food pasture crops, and as such will be the primary user of the recycled water produced by both the City and the District. Similarly, during non-irrigation seasons BAWA will continue to send undisinfected secondary treated recycled water to the existing percolation and evaporations ponds.

It is also expected that a third party contractor will lease the irrigated property for the production of non-dairy cattle similar to the current lease operation that exists presently. This third-party contractor will be the secondary user of the recycled water and will operate in accordance with, and under the provisions of, a lease agreement or similar contract with BAWA. The lease agreement will prohibit the leaseholder from operating the system. All users will comply with the applicable rules and regulations identified for recycled water users in Section 2.2.2 above.

2.4 Raw Wastewater

The raw wastewater conveyed to both treatments plants is representative of typical municipal wastewater. Both the City and the District's service areas include residential and commercial connections. The District also provides wastewater treatment for the Bishop Paiute Tribe through a service agreement. Background average influent characteristics for the City and the District were previously determined in the Joint Treatment and Nutrient Removal Feasibility Report, are included in Table 2 and Table 3 respectively.

Table 2 - City of Bishop Background Average Raw Wastewater Quality[1]

Constituent	Avg. Concentration
BOD_5, mg/L	279
Total Nitrogen, mg/L	38.5
TKN, mg/L	38.5
Ammonia, mg/L	24.5

[1]Based upon Joint Treatment and Nutrient Removal Feasibility Report [5]

Table 3 – Eastern Sierra CSD Background Average Raw Wastewater Quality[1]

Constituent	Avg. Concentration
BOD_5, mg/L	248
Total Nitrogen, mg/L	44.2
TKN, mg/L	32.3
Ammonia, mg/L	31.3

[1]Based upon Joint Treatment and Nutrient Removal Feasibility Report [5]

Additionally, more detailed wastewater chemical quality results were analyzed for both treatment plants. These analyses, which include ranges with median and 95th percentile values identified as well as the number of samples and dates, are included in Table 4 and Table 5 below for the City and the District, respectively. BOD_5 values averaged 213 mg/L and 165.9 mg/L, while median values for BOD_5 were 190 mg/L and 145 mg/L for the City and District, respectively. Peak loadings for BOD_5 in the City's raw wastewater were as high as 550 mg/L, and 273 mg/L for the District. Based upon these results, the raw wastewater, on average, is typical of residential strength wastewater [12].

Table 4 – City of Bishop Raw Wastewater (Influent) Chemical Analysis

	Consituent	MEDIAN	AVG.	MAX	MIN	CL95	Sample Size	Dates
Influent	BOD	190	213	550	83	470	21	01/2019-01/2021
	Ammonia as N	21.5	21.11	25	17	24.25	11	01/2020-01/2021
	Nitrite as N	0.028	0.028	0.31	0.023	0.19	10	01/2020-01/2021
	Nitrate as N	3.5	3.48	5.2	1.8	5.05	11	01/2020-01/2021
	TKN	22.2	21.79	26.4	17.5	25.20	11	01/2020-01/2021

Table 5 – Eastern Sierra CSD Raw Wastewater (Influent) Chemical Analysis

	Constituent	MEDIAN	AVG.	HIGH	LOW	CL95	Samples	Date
Influent	BOD	145	165.9	290	48	273	33	01/2018-12/2020
	Ammonia as N	33	31.84	37	21	36.4	13	01/2018-12/2020

The City of Bishop's collection system includes both residential and commercial connections. The City's commercial contributions include both restaurants and microbreweries, however, there are no industrial waste connections that contribute to the collection system. Restaurants are typically required to have grease interceptors, and the two microbreweries have basic pretreatment systems. The District's system consists primarily of residential connections, limited commercial/institutional connections, and one industrial connection. Connection counts for each entity are included in Table 6 and Table 7.

Table 6 - City of Bishop Active Sanitary Sewer Service Connections

Type	No. of Connections
Residential	823
Commercial	339

Table 7 - ESCSD Active Sanitary Sewer Service Connections

Type	No. of Connections
Residential	2,524
Commercial/Institutional	69
Industrial	1

2.5 Treatment Processes

The City's treatment process consists of a head works facility with screening and grit removal, primary clarification, and three (3) lagoons operated in series. The first pond, Pond 1, is a partially mixed, aerated lagoon with baffle curtains and is followed by polishing Ponds 2 and 3. From Pond 3, flow enters Pond 4 at which point it can be directed to land application or into Ponds 5 and 6 for disposal. Sludge from the primary clarifiers is further stabilized in digesters and dewatered in drying beds before disposal via landfill.

The City's treatment pond characteristics are included in Table 8 below:

Table 8 - City of Bishop Treatment Pond Characteristics

Pond	Length, ft	Width, ft[1]	Depth, ft	Side Slope[2]	Surface Area, AC	Volume, MG	Detention Time, Days[3]
Pond 1	913	275	6.5	3:1	5.75	11.1	13.9
Pond 2	605	358	6.5	3:1	5	9.6	12
Pond 3	925	260	6.5	3:1	5.5	10.7	13.4

[1]Average pond width.
[2]Assumed side slope
[3]At average daily flow of 0.8 MGD

The City's percolation/evaporation ponds have the hydraulic capacities described in Table 9 below:

Table 9 - City of Bishop Treatment Pond Characteristics [4]

Pond	Depth, ft	Surface Area, AC	Volume, MG
Pond 4	7	4.9	11.2
Pond 5	7	4.3	9.9
Pond 6	7	8.7	19.9

Similarly, the District's treatment process consists of a head works facility with screening and grit removal, primary clarification, and a single aerated and partially mixed lagoon. Lagoon effluent may be directed to land application or disposal in District Ponds 1, 2, and 3. Sludge from the District's primary clarifier is stabilized in a digester and dewatered in drying beds prior to disposal via landfill.

The District's aerated lagoon has the characteristics described in Table 10 below:

Table 10 – Eastern Sierra CSD
Treatment Pond Characteristics

Pond	Length, ft	Width, ft[1]	Depth, ft	Side Slope[2]	Surface Area, AC	Volume, MG	Detention Time, Days[3]
Pond 1	360	340	10	3:1	2.81	7.7	11

[1]Average pond width.
[2]Assumed side slope
[3]At average daily flow of 0.7 MGD

The City's percolation/evaporation ponds have the hydraulic capacities described in Table 11 below:

Table 11 – Eastern Sierra CSD
Evaporation/Percolation Pond Characteristics [4]

Pond	Depth, ft	Surface Area, AC	Volume, MG
Pond 1	5	14.5	23.6
Pond 2	5	14.8	24
Pond 3	5	14.9	24.3

Both the City and the District have plant operation and maintenance (O&M) manuals. The City's O&M manual was prepared by Gram-Phillips in 1978. The District's O&M manual was prepared by Kingman Engineers in 1977. A plant schematic and site plan of both treatment plants is provided in Figure 6 and Figure 7.

2.6 Plant Reliability Features

Compliance with the applicable portions of § 60333 - 60355 of the Water Recycling Criteria are described below, including those features of the existing treatment plants that provide reliability and redundancy for the project.

2.6.1 Bypass

Both the City and the District have the capacity to bypass discharge to the LAA and send undisinfected secondary treated recycled water to each entity's percolation/evaporation ponds. The City can also recirculate a portion of flow from Pond 3 back to Pond 1 to increase residence time of the wastewater within the treatment ponds. Similarly, the City can bypass flows to the District's percolation/evaporation ponds in an emergency. In an emergency, the District can bypass flows around the aerated lagoon to the percolation/evaporation ponds.

2.6.2 Alarms

Neither the City nor the District's treatment plants are staffed full time, however, each plant has an on-call operator that can respond to after-hours alarm conditions and/or emergencies. The City's plant is equipped with a SCADA system that

provides alarms for various operational conditions. The SCADA system relays alarm conditions to the on-call operator as well as at onsite control panels. Similarly, the District's plant is equipped with a security system that relays a general Plant Alarm for various alarm conditions as allowed by §60335 (d) of Title 22 of the California Water Recycling Criteria. The District's security system is monitored by a third party security contractor that notifies the treatment plant during business hours by dialing the main office phone number, while after-hours alarm conditions are relayed to the cell phone of the on call operator. Alarm conditions for both plants are outlined in Table 12 below.

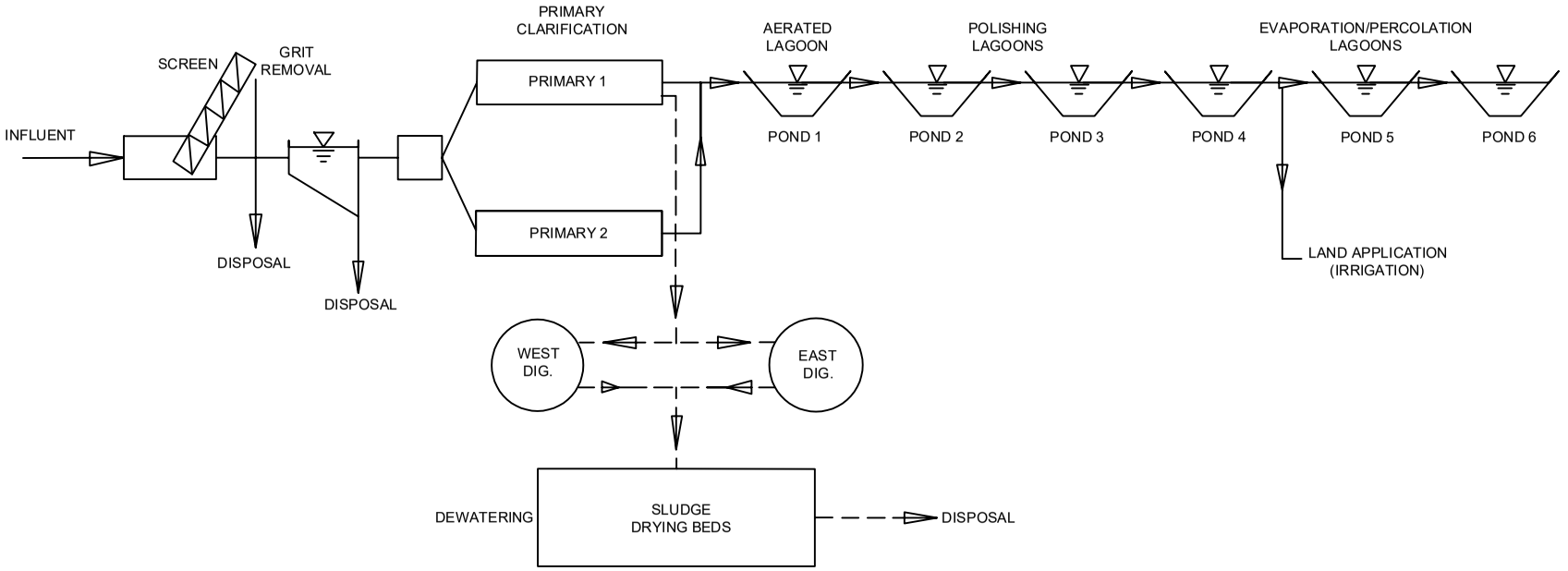
Table 12 – Alarm Conditions for the City of Bishop and Eastern Sierra CSD Treatment Plants

Alarm Condition	City of Bishop	Eastern Sierra CSD	Method of Notification
Loss of Power from the Normal Power Supply[1]	Yes	Yes	SCADA (City of Bishop); Security System (ESCSD)
Failure of a Biological Treatment Process[2]	No	No	Visual Observation/Inspection of Aeration System
Failure of a Disinfection Process[3]	No	No	NA
Failure of a Coagulation Process[3]	No	No	NA
Failure of a Filtration Process[3]	No	No	NA
Other Alarms	Lift Station Alarms	Lift Station Alarms	SCADA (City of Bishop); Security System (ESCSD)

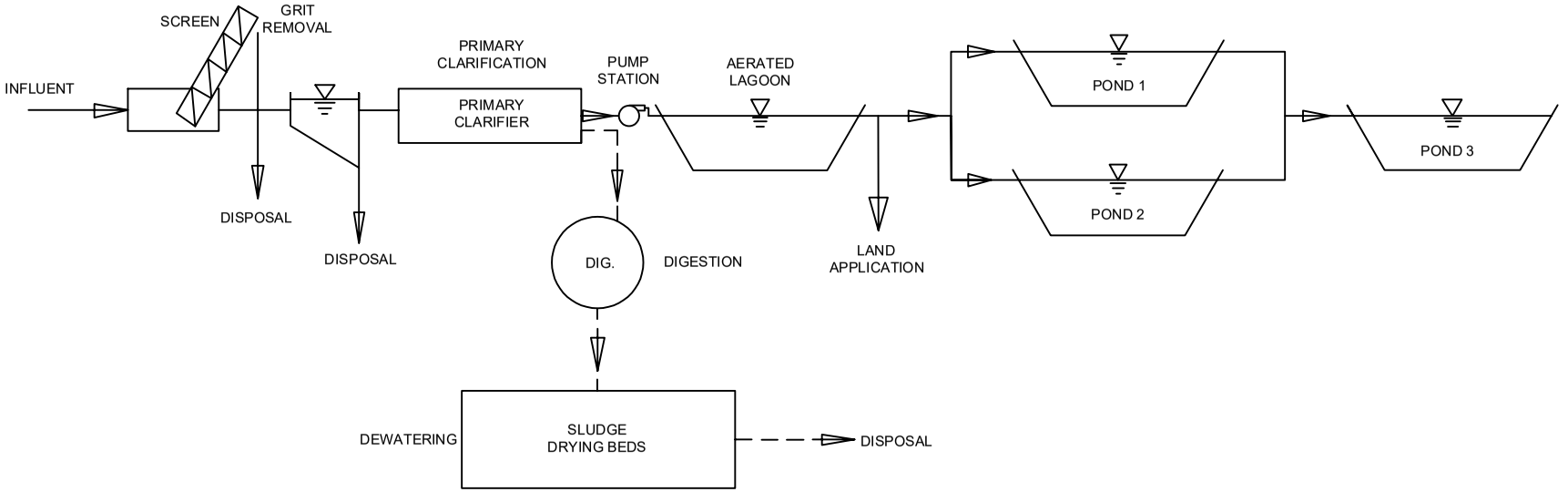
[1]Refer to Section 2.6.3 below for an expanded discussion on emergency power for each plant.

[2]Biological treatment processes for both plants are monitored through routinely scheduled and required effluent quality samples as described in Section 2.8 and are not tied to alarm conditions. The secondary treatment process is accomplished by mechanical aeration of the treatment ponds and issues with the aerators are addressed through visual observations during routine plant inspections.

[3]Neither plant is equipped with disinfection, coagulation, or filtration processes at this time.



CITY OF BISHOP EXISTING PROCESS DIAGRAM



E.S.C.S.D. EXISTING PROCESS DIAGRAM

Date: 2/19/2021
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FIGURE 6 of 10

Bishop Area Wastewater Authority

BAWA Title 22 Engineering Report
Plant Schematic

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Bishop Area Wastewater Authority

BAWA Title 22 Engineering Investigation
Treatment Plant Site Plan

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Bishop
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FIG. 7

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2.6.3 Power Supply

The City's wastewater treatment plant is equipped with an emergency generator that can supply the plant's electrical requirement during power outages. The District does not presently have an emergency generator but is in the process of applying for grant funding for a generator and automatic transfer switch (ATS) through the California Office of Emergency Services (Cal OES).

2.6.4 Emergency Storage

At average daily flow, the City has approximately 37 days of cumulative emergency storage volume available in Ponds 5 and 6. The City can also bypass flows to the District's percolation/evaporation ponds, providing up to an additional 90 days of emergency storage. The District has, at average daily flow, approximately 103 days of cumulative emergency storage volume available in Ponds 1, 2, and 3.

2.6.5 Primary Treatment

The City has redundant primary clarifiers that can produce primary effluent with one clarifier out of service. The District has a single primary clarifier, but can bypass the clarifier to the aerated lagoon if necessary.

2.6.6 Biological Treatment

Both the City and the District's plants provide secondary wastewater treatment in the partially mixed aerated lagoons. Each plant is equipped with multiple mechanical aerators. The multiple aerators provide a level of redundancy that allows aerators to be individually taken offline for repairs, maintenance, and/or replacement. Both plants have some level of excess treatment capacity. The City's plant has a permitted capacity of 1.6 MGD, which is approximately twice the average daily flow. The District has a permitted capacity of 0.85 MGD, which provides about 17.6% excess capacity at average daily flow.

2.7 Supplemental Water Supply

Supplemental water supplies are not required for the discharge areas designated for recycled water irrigation by the City and the District. When recycled water is unavailable, the pasture lands will temporarily fallow and dry. The relatively shallow depth to ground water will sustain deep rooting vegetation (e.g. trees, willow stands, upland communities, and other phreatophytes) during any time periods where recycled water is not applied via irrigation.

2.8 Monitoring and Reporting

Monitoring and reporting for both treatment plants are required by each entity's respective WDRs. These monitoring and reporting requirements ensure that each plant is achieving permit level compliance and treatment objectives. The monitoring and reporting schedule is included below:

Table 13 - City of Bishop & Eastern Sierra CSD
Monitoring and Reporting Schedule

Parameter	Units	Type	Frequency
Influent			
BOD_5	mg/L	Grab	Monthly
Total Flow	MG	Metered	Daily
Total Flow	MG	-	Monthly
Avg. Flow	MGD	-	Monthly
Instantaneous Peak Flow	MGD	Metered	Daily
Pond Freeboard	Feet	-	Monthly
Effluent			
Total Flow	MG	-	Monthly
pH	-	Grab	Monthly
BOD5	mg/L	Grab	Monthly
COD	mg/L	Grab	Quarterly
MBAS	mg/L	Grab	Quarterly
Total Filterable Residue	mg/L	Grab	Quarterly
Ground Water Monitoring			
Nitrate-Nitrogen	mg/L as N	Grab	Quarterly
MBAS	mg/L	Grab	Quarterly
Total Filterable Residue	mg/L	Grab	Quarterly
Depth to Ground Water	Feet	-	Quarterly

Water quality samples shall be obtained by trained personnel, and a chain of custody shall be prepared and adhered to in order to ensure the integrity of the reporting process. All water quality testing shall be performed by a laboratory approved by the state of California. Quarterly reports shall include the monitoring sample results for the preceding quarter and be submitted to LRWQCB.

An annual discharge report will be prepared and submitted to LRWQCB by January 30 of each year. The annual report will summarize the compliance record and any corrective actions taken or planned to ensure that the discharge and use of recycled water is in full compliance with the discharge requirements [2] [3].

2.9 Contingency Plan

Per §60323 (c) of the Water Recycling Criteria, a contingency plan for the recycled water must be prepared that assures no untreated or inadequately treated water is delivered to the use area. In order to prevent untreated or inadequately treated water from being

delivered to the LAA the wastewater leaving the plants would need to be temporarily diverted to the existing percolation/evaporation ponds. This contingency plan includes the following:

1) A list of conditions which would require an immediate diversion to take place
2) A description of the diversion procedures
3) A description of the diversion area including capacity, holding time, and return capabilities;
4) A plan for the disposal or treatment of any inadequately treated effluent;
5) A description of failsafe features in the event of a power failure; and,
6) A plan (including methods) for notifying the Regional Board, the State and local health departments, and other agencies as appropriate, of any treatment failures that could result in the delivery of inadequately treated recycled water to the use area.

2.9.1 Diversion Conditions

Possible conditions that would result in an immediate diversion to take place are as follows:

1) Loss of Power:
2) Failure of Irrigation Pump:
3) Failure to Meet WDRs for Effluent Quality:

2.9.2 Diversion Procedures

The loss or interruption of power is most problematic for flows entering the District's plant. Due to site topography, flows from the District's primary clarifiers are routed to a lift station that pumps into the aerated lagoon. In the event of a power failure, untreated flow will automatically bypass the lagoon and overflow into the discharge pipe towards the District's Ponds 1 and 2, and ultimately into the District's Pond 3. As described in Section 2.6.4 above, the District has approximately 103 days of emergency storage available when these ponds are empty. However, the magnitude of untreated flows entering the District's Ponds will be significantly reduced by mobilizing a temporary bypass pump and pumping to the City's headworks. Untreated flows that do enter the District's percolation/evaporation ponds will be bypass pumped back to the District's headworks through the use of portable temporary bypass pumps.

In the event that the City's plant loses power and has a concurrent failure of the emergency generator, untreated flows will still enter the City's Pond 1 under gravity and continue through Ponds 2 through 4. Under this diversion, flows entering Pond 4 would be directed to Ponds 5 and 6 by isolating the outlet of Pond 4 to the irrigation outfall. As described in Section 2.6.4 above, the City has about 37 days of emergency storage when these ponds are empty. Untreated flows that enter these ponds will need to be bypass pumped back to the City's headworks through the use of portable temporary bypass pumps.

If the irrigation pump should fail, flows to the irrigation outfall structure will eventually overtop and enter into open conveyance channels in the LAA. In the event that the irrigation pump should fail, the outlet of the City's Pond 4 will need to be isolated and flows diverted into the City's Ponds 5 and 6. At a combined average daily flow of 1.5 MGD (City plus District flows), these ponds will provide up to approximately 20 days of emergency storage. As this scenario would include treated water, bypass pumping of these flows back to the headworks is not required.

In the event that effluent from either the City or the District should fail to meet their respective WDRs for effluent quality limits based upon routine monitoring and reporting, then it will be necessary to divert flows from the irrigation outfall and into either the City's or the District's percolation/evaporation ponds. Flows diverted to the ponds will need to be temporarily bypass pumped back to the headworks of the plants for additional treatment.

2.9.3 Notification of Diversion

Immediately following a diversion, effluent violation, or an identified contingency plan failure that could result in the delivery of inadequately treated recycled water being delivered the LAA, BAWA will notify the following agencies by telephone:

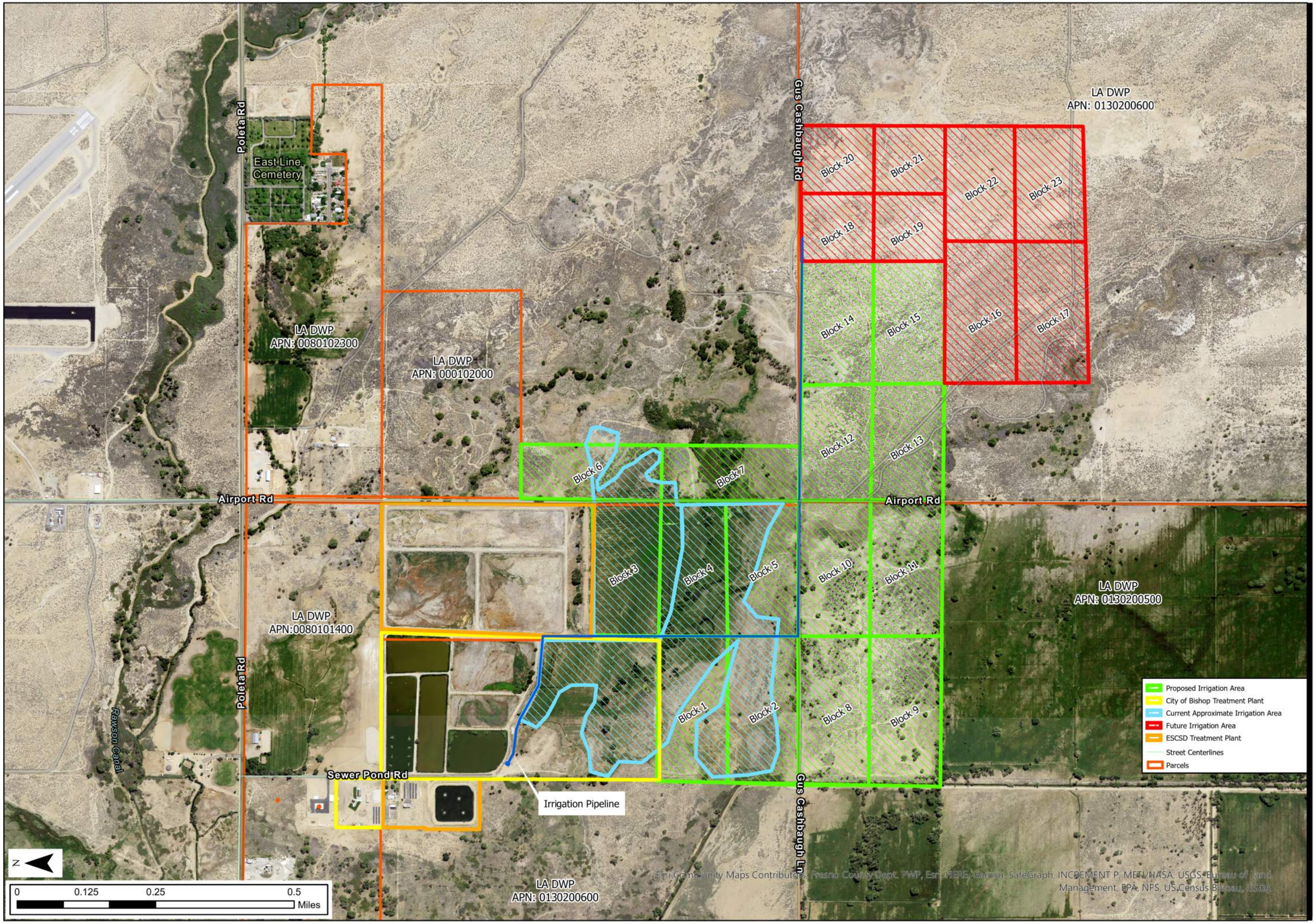
Lahontan Regional Water Quality Control Board (Region 6)
15095 Amargosa Road, Building 2 – Suite 210
Victorville, CA 92394
(760) 241-6583

State Water Resources Control Board
Division of Drinking Water District 13
464 W. 4th Street, Room 437
San Bernadino, CA 92401
(909) 383-4328

Inyo County Environmental Health
168 N. Edwards Street
Independence, CA 93526
(760) 878-0238

3. TRANSMISSION AND DISTRIBUTION SYSTEMS

The transmission and distribution facilities for the irrigation system are shown in Figure 8. This figure shows the proposed location of the irrigation outfall and pump station, the 12-inch transmission main, as well as the distribution system overlain on the LAA for both the Phase 1 and Phase 2 portions of the project. These figures provide land ownership information and parcel lines for the LAA and adjacent areas. No other potable, recycled, or sanitary sewer lines are located within or adjacent to the LAA. Detailed irrigation system design plans are included in the appendix.



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Bishop Area Wastewater Authority

BAWA Title 22 Investigation
Land Application Area Site Plan

Inyo
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FIG. 8

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4. USE AREAS

The following section describes the use area, or the LAA, as it relates to the intended use of recycled water for irrigation. The LAA is shown in detail in Figure 9.

4.1 Irrigation

The LAA proposed for this project consists of up to 474 acres of land that generally slopes gently towards the southeast. The LAA is located immediately south of both the City and the District's treatment plants. The LAA irrigation system will be developed over three (3) phases as described in Section 2 above. Existing land uses in the LAA will remain unchanged as this area is presently used for non-food pasture and non-dairy cattle production except for an unleased portion of the LAA included in Phase 2. Approximately 105± acres of the LAA are presently jointly irrigated via flood irrigation with undisinfected secondary recycled water by both the City and the District as allowed by their respective WDRs. Under the proposed recycled water project the land use will continue to be non-food pastureland for non-dairy cattle production to be irrigated with undisinfected secondary recycled water via pressurized spray irrigation as allowed by §60304(d) of Title 22 of the California Water Recycling Criteria:

> *(4) Fodder and fiber crops for pasture for animals not producing milk for human consumption.*

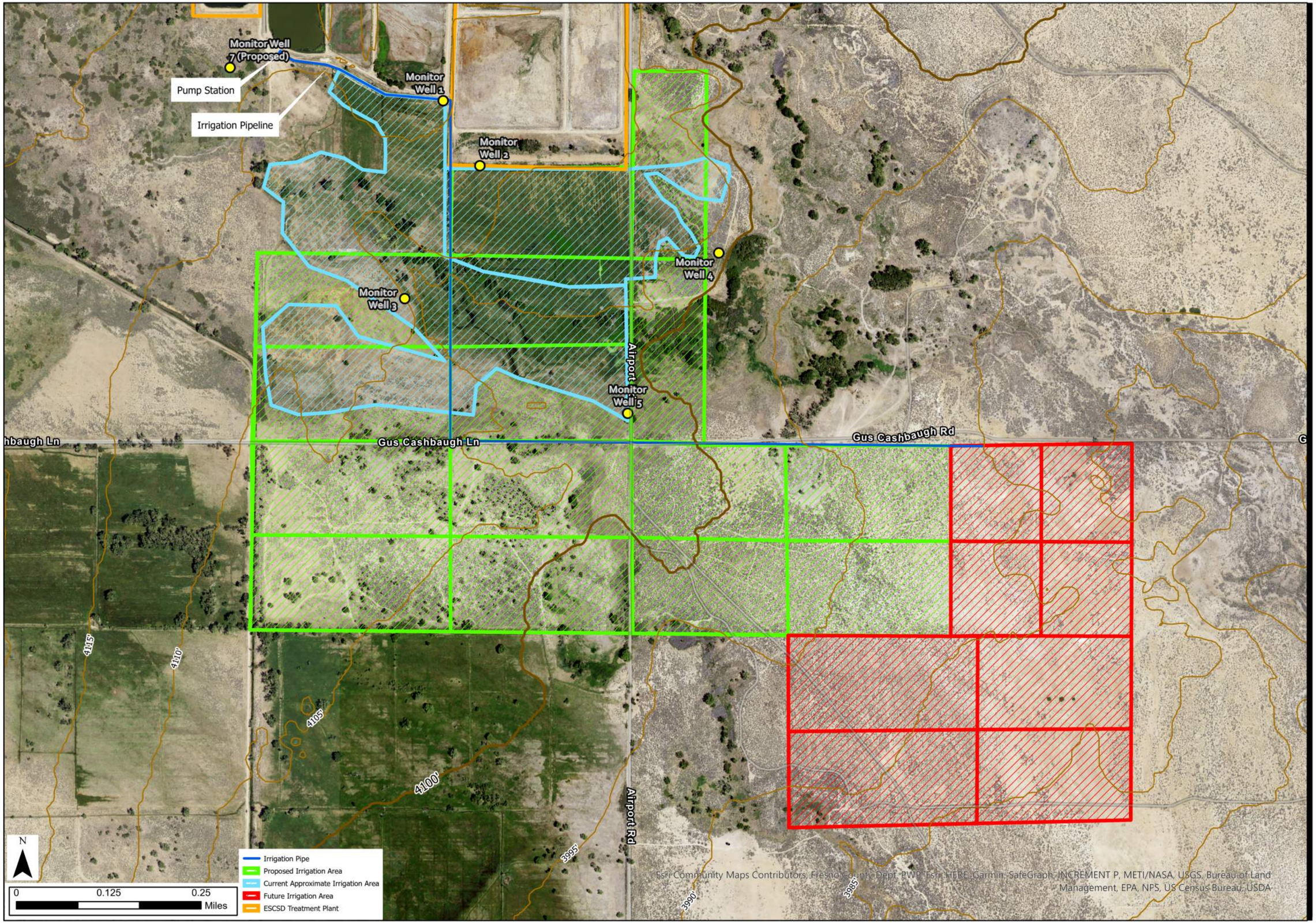
As described in Section 2.3 above, BAWA will be the primary distributor and user of the recycled water produced from both the City and the District's treatment plants. A third party contractor or leaseholder will also use the water for production of non-dairy cattle. LADWP currently owns about 434 acres of the LAA and has entered into land sale negotiations with BAWA for these portions of the LAA. No other governmental agency is anticipated to have jurisdiction over the LAA following the completion of the land sale.

4.1.1 Irrigation Demands & Tailwater

The undisinfected secondary recycled water will be applied to the LAA via pressurized spray irrigation at a rate that is designed to meet the agronomic rate of the pasture crops which is estimated at between 53.8 inches on a wet year and 58.2 inches on a dry year for a full 8-month irrigation season (March through October) [4]. At a minimum, the application rate of recycled water will not exceed the hydraulic capacity of the LAA soils so as to prevent ponding and associated runoff. As a result, no tailwater is anticipated from the proposed manner of irrigation.

4.1.2 Irrigation Setbacks

The proposed project will comply with the irrigation setbacks of §60310 of Title 22 of the California Water Recycling Criteria:



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Land Application Map

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FIG. 9

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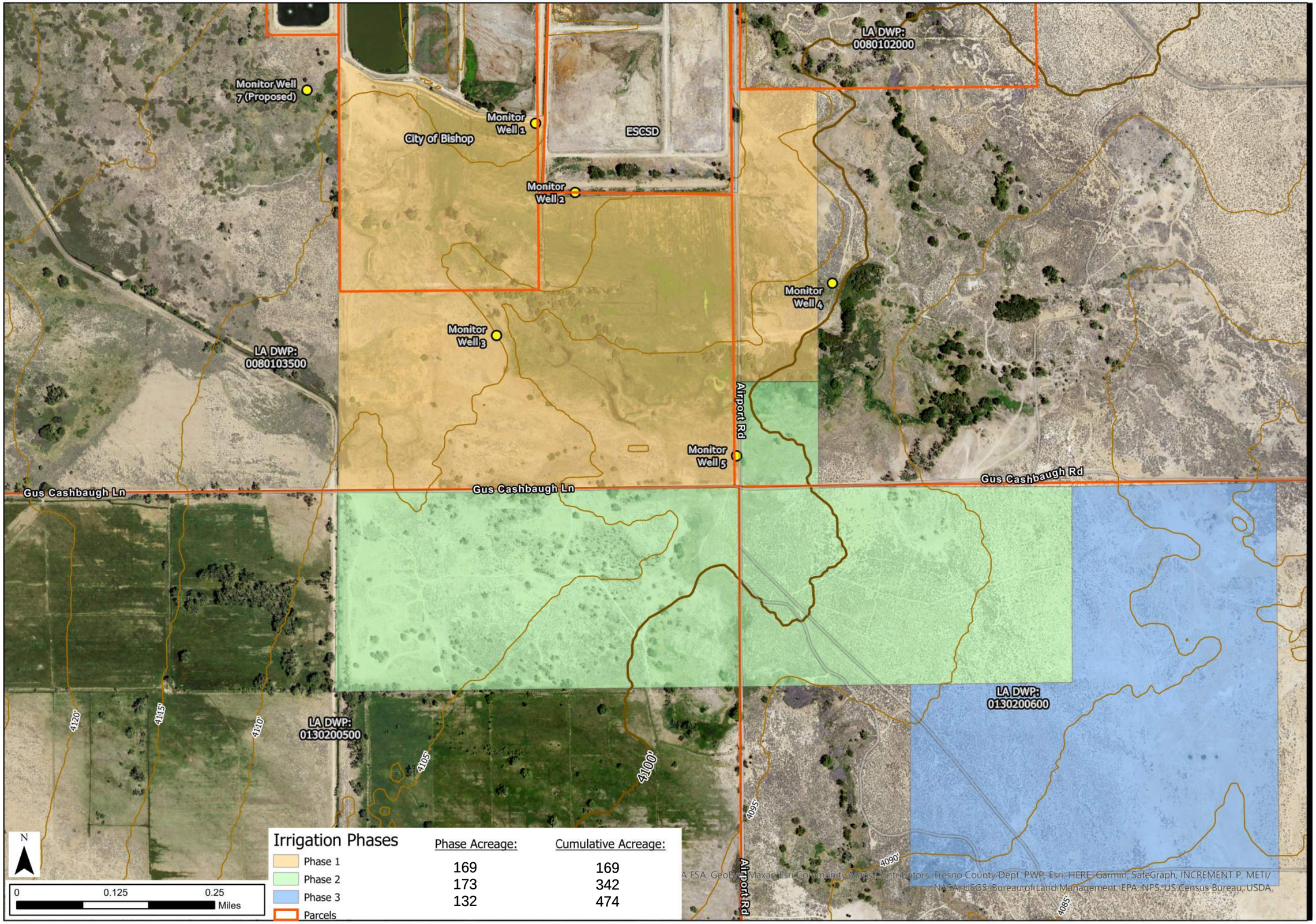

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Irrigation Phasing Map

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FIG. 10

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1) Wells: There are presently no domestic water facilities in or adjacent to the LAA. Due to land ownership adjacent to the LAA, which is exclusively owned by LADWP, no future domestic water facilities are anticipated. With the exception of monitoring wells owned by the City and the District, no other wells are known to exist within 1,000 feet of the LAA. The Department of Water Resources Water Data Library database does not indicate any groundwater monitoring stations within the LAA. Similarly, the California Natural Resources Agency's Well Completion Report Map Application does not indicate any production or domestic wells within or near the LAA.
2) Public Facilities and Residences: There are no public facilities or residences located within or adjacent to the LAA. Therefore, no spray, mist, or runoff will enter any dwelling, designated outdoor eating areas, or food handling facilities. Public exposure will be prevented by signage and exclusionary fencing. LADWP will also retain 100-foot easements centered on both Gus-Cashbaugh Lane and Airport Road, further preventing public exposure to irrigation with recycled water on the LAA.

4.2 Impoundments

For this project, recycled water will not be used in any new impoundments.

4.3 Cooling

For this project, recycled water will not be used in any impoundments.

4.4 Groundwater Recharge

Groundwater recharge with recycled water is not contemplated under this project.

4.5 Dual Plumbed Use Areas

This project does not contain a dual plumbed system.

4.6 Other Industrial Uses

This project does not contemplate industrial uses of recycled water.

4.7 Use Area Design

As described previously, undisinfected secondary recycled water will be applied to the LAA via spray irrigation of non-food pasture crops for the production of non-dairy cattle. The LAA is immediately adjacent to and south of the treatment plants owned and operated by both the City and the District. The City and the District, operating as BAWA under a JPA, will be the responsible entity for the distribution and use of recycled water. The use area design requirements are as follows:

1) Domestic Water System Protection and Cross Connection Prevention: Domestic water system protection is described in Section 4.1.2. Because no domestic water

system infrastructure exists presently nor is any future infrastructure planned for the LAA and adjacent areas, cross connection potential does not exist.

2) Recycled Water Runoff: As described in Section 4.1.1 above, tailwater conditions are not anticipated due to the efficiency of recycled water application via spray irrigation to the LAA. Additionally, Section 2.2.3 describes design parameters intended to protect the irrigation system from damage that could result in localized ponding and/or runoff.
3) Public Exclusion: The LAA will be fenced and signed to provide exclusion of the public. Fencing and signage are described in Sections 2.2.2 and 2.2.3.

4.8 Use Area Inspections and Monitoring

BAWA staff will be responsible for performing regular inspections and monitoring of the LAA. The inspection program will entail weekly site visits during the irrigation season to monitor the condition of the irrigation system and appurtenances, as well as the condition of the LAA and exclusionary fencing and signage. Site inspections should document and rectify areas of problems in the LAA. These potential problem areas include locations of ponding, runoff, overspray, damage to fencing, etc. Where ponding and runoff are observed, the application of spray irrigation should be adjusted to reduce the application rate.

4.9 Employee Training

BAWA will be responsible for providing employee training to ensure compliance with Title 22 Recycled Water Criteria. Preliminary training should be provided to all BAWA employees following installation of the irrigation system and then on an annual basis following. The training should cover the following topics:

1) WDRs as they pertain to recycled water treatment and production, storage, and distribution
2) Public health requirements for recycled water use
3) Public perception of recycled water
4) Recycled water system design requirements:
    a. Materials, Setbacks, Separation, Purple Paint
5) Diversions and regulatory notifications
6) System installation, protection, operation, and maintenance:
    a. Pumps and motors
    b. Pipelines, flush valves, air vents, and solenoid valves
    c. Sprinkler riser assemblies
    d. System controller
7) Safety:
    a. Pathogen presence and reduction in recycled water
    b. Best practices for exposure to recycled water, including a warning: "RECYCLED WATER – DO NOT DRINK"
    c. Proper hygiene when working with recycled water, including warnings against eating, drinking, handling of food, or smoking after physical contact with recycled water. Gloves and other physical barriers to be implemented to protect against exposure and proper hand washing/disinfection following exposure.

d. Covering of open wounds
e. Avoiding ingestion of recycled water and explicit prohibitions against drinking recycled water

8) Inspection criteria and system monitoring:
    a. Control of runoff and ponding
    b. Observation recording and documentation
9) Process for implementing system repairs

It will also be required that the above training for topics 5 through 8 at a minimum will be provided to the third party contractor or leaseholder. The third party contractor or leaseholder shall provide to BAWA written acknowledgment of having received recycled water training and adherence to the LAA site requirements, which includes prohibitions against operation or modification of the recycled water system. The written acknowledgement by the third party contractor or leaseholder shall explicitly state that use of the LAA is for the grazing production of non-dairy cattle only and that operation, modification, or change in the use of the system is to be performed solely by trained BAWA staff.

5. REFERENCES

[1] *Bishop Area Wastewater Authority Joint Excercise of Powers Agreement,* 2020.

[2] California Regional Water Quality Control Board - Lahontan Region, "Updated Waste Discharge Requirements for City of Bishop Sewage Treatment Facility," Lahontan, 1994.

[3] California Regional Water Quality Control Board - Lahontan Region, "Updated Waste Discharge Requirements for Eastern Sierra Community Services District Sewage Treatment Facility," Lahontan, 1994.

[4] Resource Concepts, Inc., "Land Area Calculations for Irrigation Alternatives," RCI, Carson City, 2019.

[5] R.O. Anderson Engineering, Inc., "Feasibility Report for Joint Treatment and Nutrient Removal," 2016.

[6] Los Angeles Department of Water and Power, "Bishop Area Wastewater Authority JPA Map," LADWP, Bishop, 2020.

[7] USDA NRCS, "Inventory and Evaluation - Sewer Project," USDA, Bishop, 2020.

[8] Laurel Ag and Water, *City of Bishop Wastewater-Pasture OPPUSI-000276,* Bishop, 2021.

[9] AWWA California-Nevada Section, *Guidelines for Distribution of Nonpotable Water,* AWWA, 1992.

[10] California Department of Health Services, "Guidelines for the Preparation of an Engineering Reportfor the Production, Distribution and Use of Recycled Water," 2001.

[11] State Water Resources Control Board, "California Code of Regulations, Title 22, Division 4. Environmental Health," 2015.

[12] United States Environmental Protection Agency, "Onsite Wastewater Treatment Systems Manual," USEPA, 2002.

[13] USDA NRCS, "Preliminary Draft Plan Map," USDA, Bishop, 2020.

[14] Nolte Associates, Inc., "City of Bishop Wastewater Master Plan," 2008.

[15] State of California, "California Statutes Related to Recycled Water & The State Board's Division of Drinking Water," State Board Division of Drinking Water, January 2019. [Online]. Available: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/lawbook/rwstatutes20190101.pdf. [Accessed 11 01 2021].

APPENDIX A
INFLUENT AND EFFLUENT WATER QUALITY DATA
FOR THE CITY OF BISHOP AND EASTERN SIERRA COMMUNITY SERVICE DISTRICT

City of Bishop						
Source	Constituent	Average (mg/L)	Max (mg/L)	Min (mg/L)	Confidence Level 95%	Samples
Influent	BOD	213	550	83	470	21
	Ammonia as N	21.11	25	17	24.25	11
	Nitrite as N	0.028	0.31	0.023	0.19	10
	Nitrate as N	3.48	5.2	1.8	5.05	11
	Total Kjeldahl Nitrogen	21.79	26.4	17.5	25.20	11
Effluent	BOD	44.1	110	16	64.40	20
	BOD Dissolved	3.885	7.2	0.7	5.50	21
	pH	7.75	8.3	7.4	8.20	21
	COD	126.7	210	74	198.00	7
	Methylene Blue Active Substance	0.19	0.23	0.13	0.23	3
	Ammonia as N	17.76	35.3	8.25	26.01	14
	Nitrite as N	0.033	0.079	0.0124	0.06	3
	Nitrate as N	4.07	6.7	2.1	5.66	14
	Total Kjeldahl Nitrogen	18.3	36	8.8	26.58	14
	Total Dissolve Solids	315	340	290	337.50	2
Wells	Nitrate as N	5.09	20	0.39	12.40	28
	Total Dissolved Solids	417	1390	190	636.00	23
	Ammonia as N	0.665	0.68	0.65	0.68	2
	Total Kjeldahl Nitrogen	0.67	-	-	-	1
	Total Nitrogen	4.6	-	-	-	1
Not-Detected Concentrations						
Wells	Methylene Blue Active Substance	-	-	-	-	26
	Nitrite as N	-	-	-	-	1
	Organic Nitrogen	-	-	-	-	2

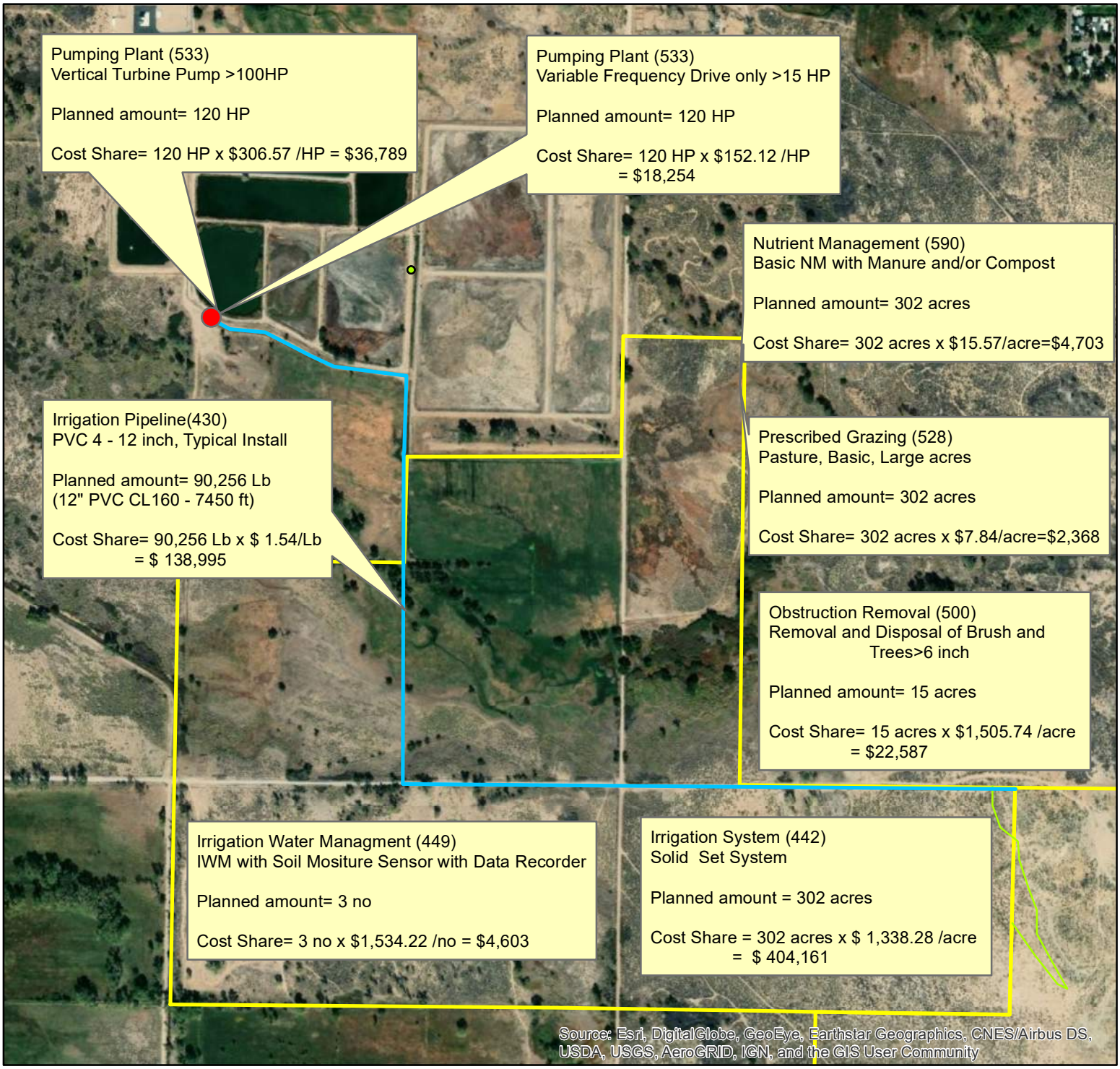
Eastern Siterra Community Services District						
Source	Constituent	Average (mg/L)	Max (mg/L)	Min (mg/L)	Confidence Level 95%	Samples
Influent	BOD	165.9	290	48	273	33
	Ammonia as N	31.84	37	21	36.4	13
Effluent	BOD	34.88	84	20	64.4	19
	COD	144.1	174	97	172.2	10
	Soluble BOD	35.12	216.5	15	93.975	14
	pH	7.29	7.8	6.93	7.5	30
	Ammonia as N	19.96	43	6.35	27.43	23
	Nitrite as N	0.035	0.14	0.022	0.053	22
	Nitrate as N	3.97	5.8	1.8	5.7	26
	Total Dissolved Solids	330.4	370	299	367.75	10
	Organic Nitrogen	2.095	7.13	0.15	6.195	4
	Total Kjeldahl Nitrogen	21.88	44	9	35.5	21
	Methylene Blue Active Substance	0.133	0.18	0.11	0.18	8
	Total Nitrogen	148	-	-	-	1
Wells	Nitrate as N	6.01	16.5	0.8	13.25	39
	Total Dissolved Solids	38.25	530	220	505	36
	Total Suspended Solids	77.7	248	4.8	215.72	4
Sludge	Total Alkalinity	2540	-	-	-	1
	Total Solids	1.79	-	-	-	1
	Volatile Acids	80.4	-	-	-	1
Not-Detected Concentrations						
Wells	Methylene Blue Active Substance	-	-	-	-	40

APPENDIX B
NRCS PRELIMINARY IRRIGATION DESIGN

Preliminary Draft Plan Map
(11/ 4/ 2020)

Agency: USDA NRCS
Field Office: Bishop
Prepared by: H. Lee
Date:11/4/2020

Customer: Sewer Project (Bishop)



Legend

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- Boundary_SewerExp

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PRELIMINARY DRAWING

PLAN VIEW_Scenario A

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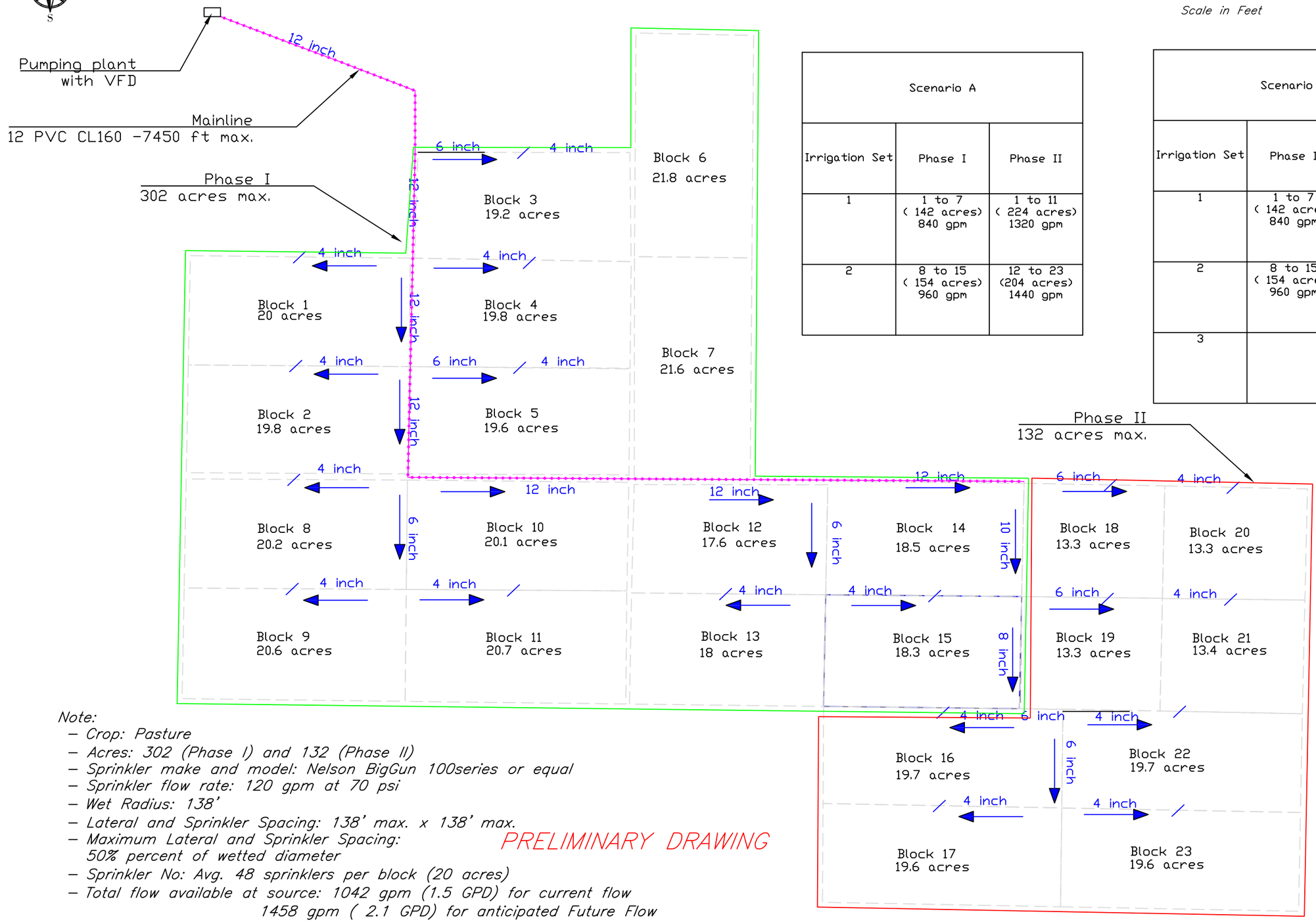
Scale in Feet



Scenario A		
Irrigation Set	Phase I	Phase II
1	1 to 7 (142 acres) 840 gpm	1 to 11 (224 acres) 1320 gpm
2	8 to 15 (154 acres) 960 gpm	12 to 23 (204 acres) 1440 gpm

Scenario B		
Irrigation Set	Phase I	Phase II
1	1 to 7 (142 acres) 840 gpm	1 to 7 (142 acres) 840 gpm
2	8 to 15 (154 acres) 960 gpm	8 to 15 (154 acres) 960 gpm
3		16 to 23 (132 acres) 960 gpm

Note:

- *Crop: Pasture*
- *Acres: 302 (Phase I) and 132 (Phase II)*
- *Sprinkler make and model: Nelson BigGun 100series or equal*
- *Sprinkler flow rate: 120 gpm at 70 psi*
- *Wet Radius: 138'*
- *Lateral and Sprinkler Spacing: 138' max. x 138' max.*
- *Maximum Lateral and Sprinkler Spacing: 50% percent of wetted diameter*
- *Sprinkler No: Avg. 48 sprinklers per block (20 acres)*
- *Total flow available at source: 1042 gpm (1.5 GPD) for current flow*
  1458 gpm (2.1 GPD) for anticipated Future Flow

Flow direction

PRELIMINARY DRAWING

Date 10/27/2020.
Designed Haejin Lee.
Drawn .
Checked .
Approved

Kern County, CA

PLAN VIEW
Sewer Project

Page 1 of 2

430,442,533

United States Department of Agriculture
USDA
Natural Resources Conservation Service

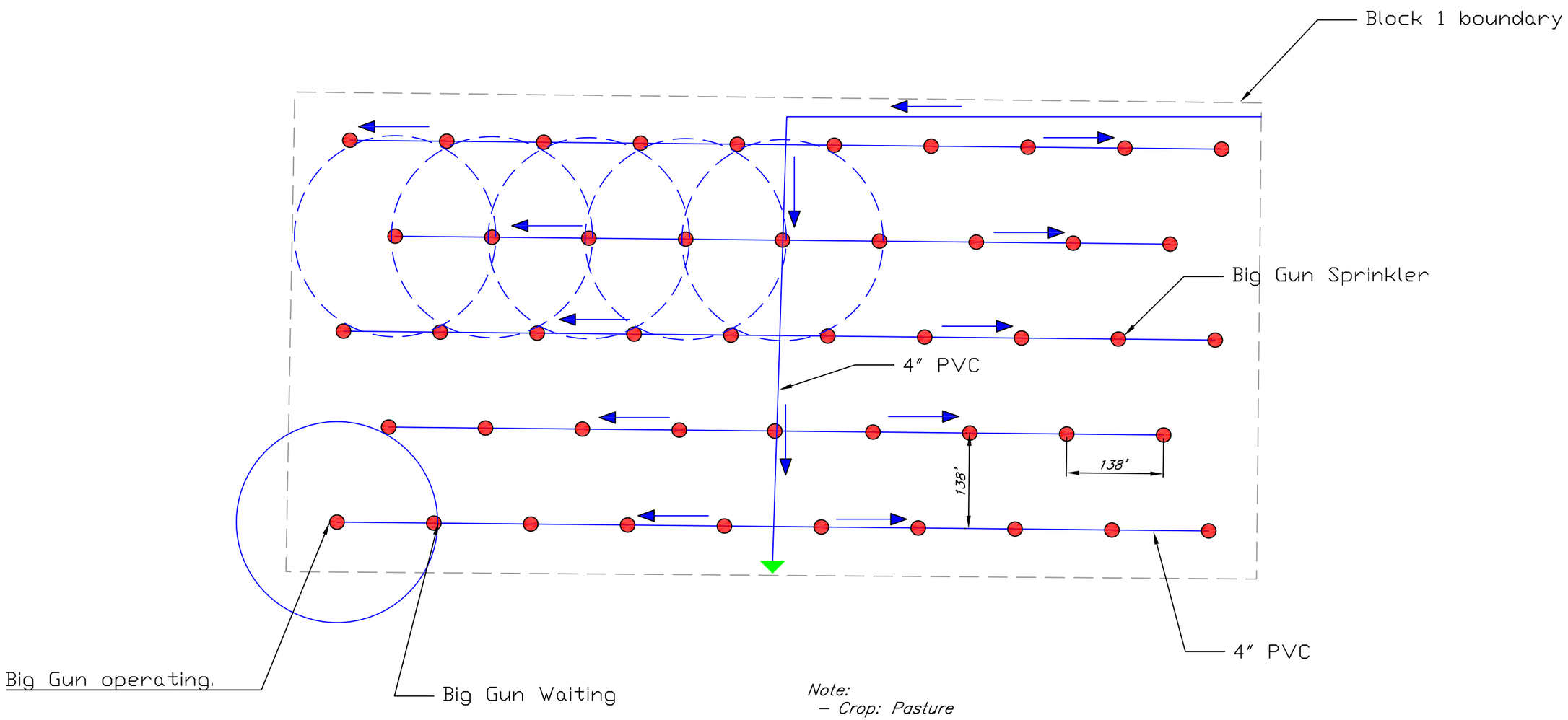
File No.
Sewer Project_Irrigation plan.dwg

Drawing No.
Bishop20-01

10/28/20 9:24 AM
Sheet 1 of 2.

PRELIMINARY DRAWING

(TYPICAL) PLAN VIEW for BLOCK #1



PRELIMINARY DRAWING

150 0 150 300 450

Scale in Feet

Note:

- *Crop: Pasture*
- *Acres: 302 (Phase I) and 132 (Phase II)*
- *Sprinkler make and model: Nelson BigGun 100series or equal*
- *Sprinkler flow rate: 120 gpm at 70 psi*
- *Wet Radius: 138'*
- *Lateral and Sprinkler Spacing: 138' max. x 138' max.*
- *Maximum Lateral and Sprinkler Spacing: 50% percent of wetted diameter*
- *Sprinkler No: Avg. 48 sprinklers per block (20 acres)*
- *Total flow available at source: 1042 gpm (1.5 GPD) for current flow*
  1458 gpm (2.1 GPD) for anticipated Future Flow

→ *Flow direction*

Designed Haejin Lee. Date 10/27/2020.
Drawn . Checked . Approved .

PLAN VIEW for Block #1
Sewer Project
Page 2 of 2

Los Angeles County, CA

441,430,533

United States Department of Agriculture
USDA
Natural Resources Conservation Service

File No. Sewer Project_Irrigation plan.dwg

Drawing No. Bishopp20-01

10/28/20 9:24 AM
Sheet 2 of 2.

the original
BIG GUN® SPRINKLER

NELSON

WWW.NELSONIRRIGATION.COM

NELSON BIG GUN® SPRINKLERS

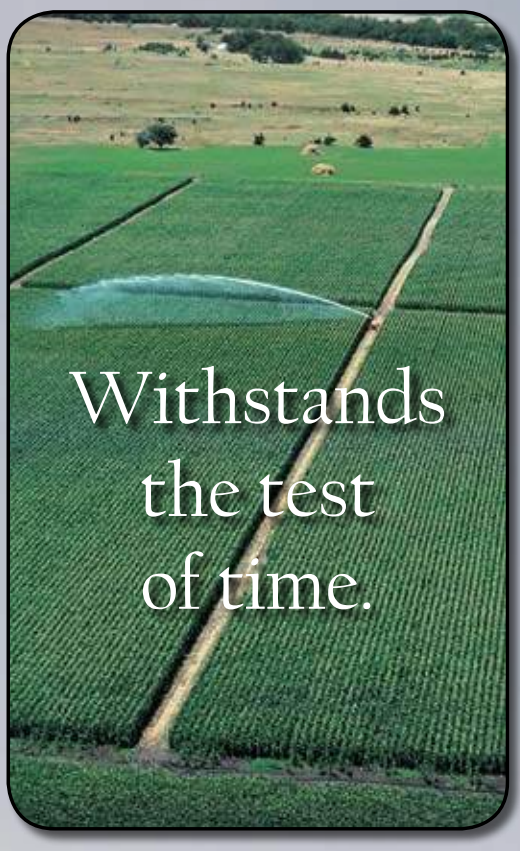
The Leader in Quality, Performance & Support

In the field of large-volume sprinklers, Nelson Big Guns® are recognized the world over as the leader in quality, performance and technical support. They are engineered and precision manufactured for heavy-duty reliability and long wear life. Every Nelson Big Gun® is subjected to the toughest inspection testing and quality control standards in the industry — including individual water testing of every gun at the factory.

Durable and reliable with engineered simplicity.

The preferred choice for tough applications.

NELSON www.nelsonirrigation.com



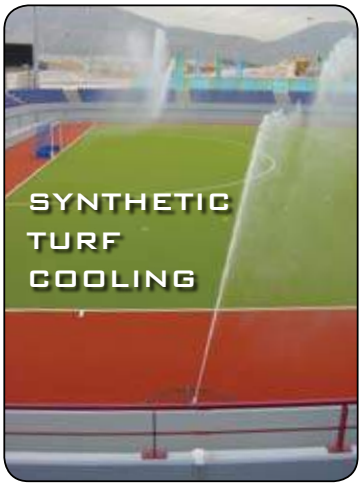
The only gun for hour after hour, year after year operation.

SET IT AND FORGET IT. A simple, positive, reliable adjustment allows for setting the arc to within 1 degree, without overriding the stops. The setting will not change over time, a concept proven with years in the field.

WORKS RIGHT OUT OF THE BOX. Nelson pioneered the concept of a slow, steady and uniform forward and reverse drive action. The drive vane automatically compensates through the full range of nozzle sizes and pressures.

APPLICATIONS

- Pivot End Gun Irrigation
- Traveler Irrigation
- Solid Set Irrigation
  - Corn, Sugar Cane, Pineapple, Pastures, etc.
- Environmental Applications
  - Feedlot Dust Suppression & Cooling
  - Wastewater Applications
  - Mining Dust Suppression
- Sports Field Applications
  - Turf Irrigation
  - Synthetic Turf Cooling & Conditioning



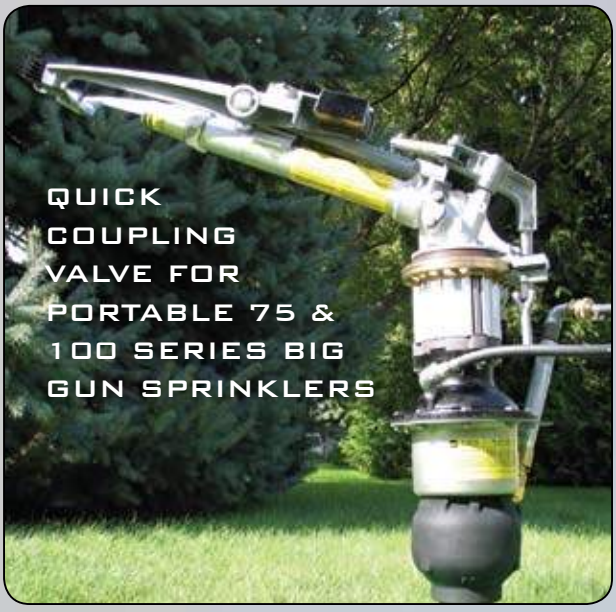
43° BIG GUN FOR DUST SUPPRESSION

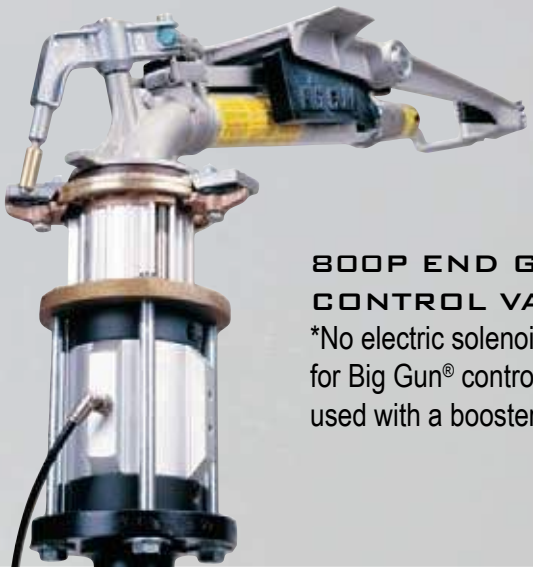
OPTIONS

- Adjustable Trajectory
- 800 Series Valve/Big Gun® Combination
- Nozzle Valve
- Quick Coupling Valve
- Special Coatings
- Add-on Kits: Secondary Nozzle, Wedge and Counterbalance

(See *Big Gun® Add-on Kits* literature for details.)

NOZZLE VALVE





800P END GUN CONTROL VALVE*

*No electric solenoid required for Big Gun® control when used with a booster pump

HEAVY DUTY — PRECIS

THE BIG GUN® NAME has a world-wide reputation for quality, performance and support in a number of heavy-duty agricultural and industrial applications.

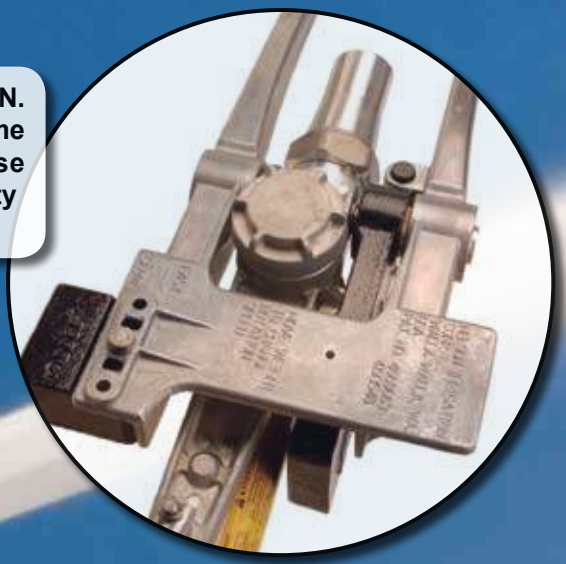
GREATEST RANGE OF OPTIONS. Full & part-circle sprinklers available in a variety of trajectory, nozzle & coating options.

TWIN BALL BEARING IN LOWER BEARING UNIT. Gun has a total of 9 ball bearings — all sealed and lifetime lubricated for long wear life and reliability.

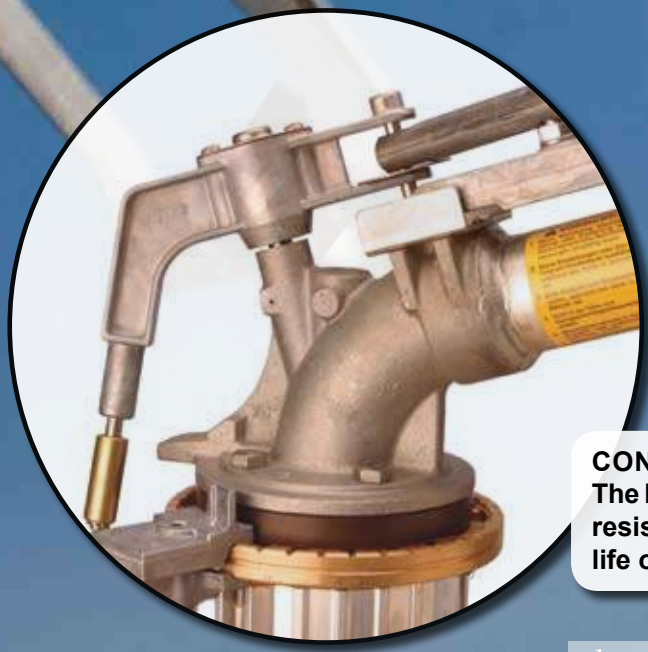
HAND ADJUSTABLE STOPS for Precise Arc Control.

SION MANUFACTURED

EXCELLENT DRIVE ACTION. The SR Series has the same slow forward and reverse speeds, increasing stability and improving uniformity.

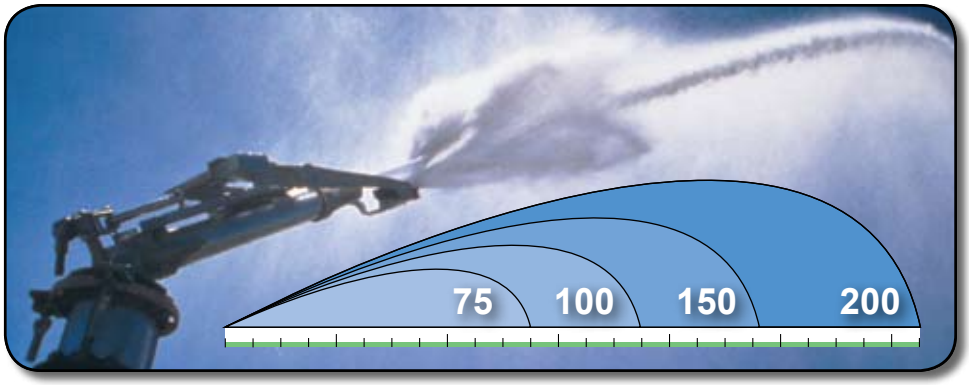


PATENTED PRESSURE AND FLOW COMPENSATING DRIVE SPOON eliminates need for adjustments throughout the full range of nozzle sizes and pressures.



CONSISTENT BRAKE LOAD. The brake provides a consistent resistance to rotation over the life of the gun.

BIG GUN® OPTIONS AVAILABLE



TO ORDER BIG GUNS® SPECIFY THE FOLLOWING:

Model No., Trajectory, Connection Size & Type, Nozzle Size & Type, Optional Coatings (Anodized or Anodized and Powder Coated) NOTE: Extended lead time may be necessary for large quantities of anodized or anodized and powder coated products.

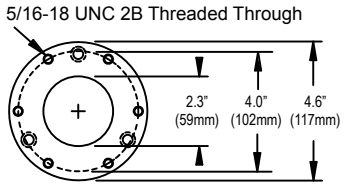
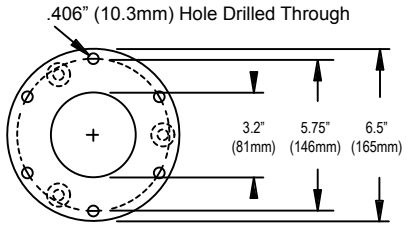
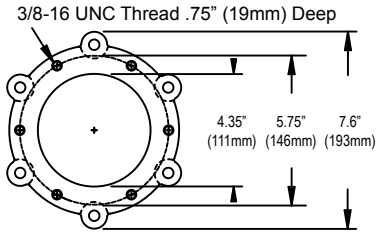
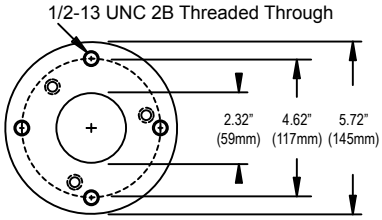
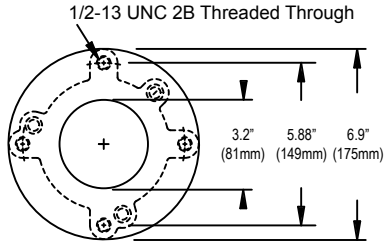
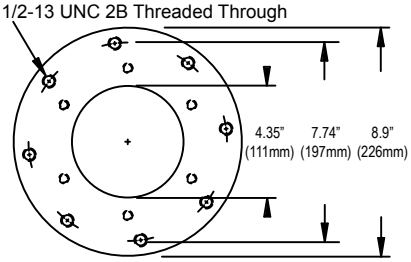
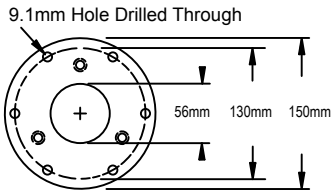
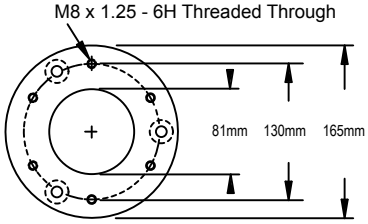
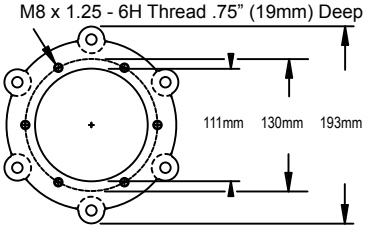
Specification Example: SR100 (24°), 2" FNPT, 100T-0.8"

	75 SERIES	100 SERIES	150 SERIES	200 SERIES
PERFORMANCE	30-160 GPM (6.8-36.3 M³/H)  25-80 PSI (1.75-6 Kg/cm²)	50-300 GPM (10-70 M³/H)  40-110 PSI (3.5-8 Kg/cm²)	100-630 GPM (23-150 M³/H)  50-120 PSI (3.5-9 Kg/cm²)	250-1200 GPM (55-275 M³/H)  60-130 PSI (4-9 Kg/cm²)
MODEL & TRAJECTORY	Full Circle F75: 21°, 24° / Part Circle SR75: 18°, 21°, 24°, 43°	Full Circle F100: 18°, 21°, 24°, 43° / Part Circle SR100: 18°, 21°, 24°, 43° / Part Circle SRA100: 15-45° Adjustable	Full Circle F150: 21°, 24° / Part Circle SR150: 21°, 24°, 27°, 43° / Part Circle SRA150: 15-45° Adjustable	Full Circle F200: 21°, 24°, 27° / Part Circle SR200: 21°, 24°, 27°
NOZZLE OPTIONS — 0.4-0.8" (10.2-20.3 mm) — TAPER	Not Available	0.5-1.0" (12.7-25.4 mm) — 100T (Specify Size)	0.7-1.4" (17.8-35.6 mm) — 150T (Specify Size)	1.05-1.9" (26.7-48.3 mm) — 200T (Specify Size)
NOZZLE OPTIONS — 0.4-0.8" (10.2-20.3 mm) — TAPER RING	TR75 (Specify Size)	100TR (Specify Size) — NA for SRNV	150TR (Specify Size)	Not Available
NOZZLE OPTIONS — 0.4-0.8" (10.2-20.3 mm) — RING	Not Available	100R (Includes Set of Rings) — NA for SRNV	150R (Includes Set of Rings)	200R (Includes Set of Rings)
SPECIAL OPTIONS	Not Available	Anodized & Powder Coated, Vaneless Range Tube*	Anodized & Powder Coated, Stainless Steel (SRA150 N/A), Vaneless Range Tube	Anodized & Powder Coated
ADD-ON KITS	HD Lower Bearing, 12° Wedge Kit, Counterbalance Kit, Stream Straightener Vane	Low-Pressure Drive Vane Kit, Counterbalance Kit, Secondary Nozzle Kit, 12° Wedge Kit, Stream Straightener Vane	Counterbalance Kit, Secondary Nozzle Kit, Stream Straightener Vane	Secondary Nozzle Kit (standard), 12° Wedge Kit (SR200 only)
MOUNTING DETAILS	Fits QC** & 2" 800 Series Valve	Fits QC** & 2" 800 Series Valve (QC NA for SRNV100)	Substantial thrust on riser, use 3" valve minimum	Substantial thrust on riser, use 4" valve minimum
CONNECTION OPTIONS	1 1/2" or 2" FNPT or FBSP ANSI/DIN Nelson or Euro Flange	2" FNPT or FBSP, 2 1/2" FNPT ANSI/DIN, Nelson or Euro Flange / 2" FNPT or FBSP for SRNV	Nelson, Euro or ANSI/DIN Flange Also, Nelson Flange to Female Adapters	Nelson, Euro or ANSI/DIN Flange Also, Nelson Flange to Female Adapters

*Vaneless Range Tube option is for wastewater applications containing hair, straw, etc.

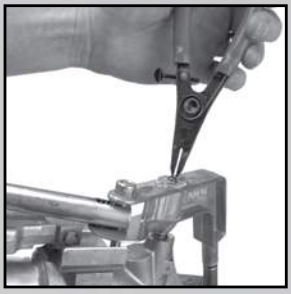
** The "Quick Coupling Valve" inlet is available in both 2" and 3" FNPT and FBSP for connection to the piping system. The "Quick Coupling Key" outlet is available in 2" FNPT, 2" FBSP, and Nelson Flange Connection for connection to the Big Gun.

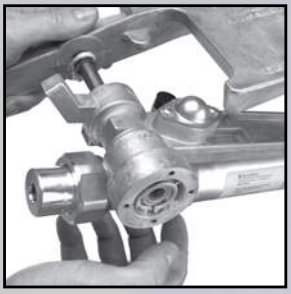
BIG GUN® FLANGE DETAILS

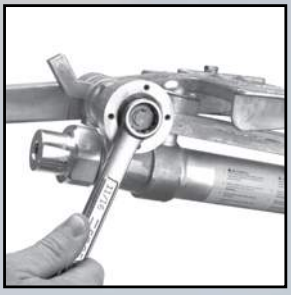
	75 & 100 SERIES	150 SERIES	200 SERIES
NELSON FLANGE	 Use 5/16-18 Bolts *Connects to 2" Nelson Flange Bolt Pattern*	 Use 3/8-16 Bolts & Nuts or M10 Bolts & Nuts *Connects to 3" Nelson Flange Bolt Pattern*	 Use 3/8-16 Bolts & Nuts *Connects to 4" Nelson Flange Bolt Pattern (F200 has same bolt pattern as SR150.)*
ANSI/DIN COMPATIBLE FLANGE	 Use 1/2-13 Bolts *Connects to 2" ANSI or 50mm DIN Flanges*	 Use 1/2-13 Bolts *Connects to 3" ANSI or 80mm DIN Flanges*	 Use 1/2-13 Bolts *Connects to 4" ANSI or 100mm DIN Flanges*
EURO FLANGE	 Use M8 Bolts & Nuts *Connects to European Traveler Flange*	 Use M8 x 1.25 Bolts *Connects to European Traveler Flange*	 Use M8 x 1.25 Bolts *Connects to European Traveler Flange*

Contact the factory or go to **www.nelsonirrigation.com** for Parts Lists, Operation & Maintenance Guides, Repair Kits, Dimensional Drawings, Add-on Kit literature & Thrust Force information.

Nelson Big Guns are easy to repair with readily available parts.







BIG GUN® PERFORMANCE (U.S. UNITS)

Flow and diameter (feet) information at various pressures with different nozzle sizes. (See information at bottom of page 11.)

75 TAPER RING NOZZLE — 24° TRAJECTORY

PSI	0.4"		0.45"		0.5"		0.55"		0.6"		0.65"		0.7"		0.75"		0.8"	
	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT
25*	—	—	—	—	—	—	42	146	50	155	59	161	69	167	80	174	91	182
30*	—	—	—	—	37	158	45	158	55	165	64	172	75	182	87	187	99	192
35	—	—	32	154	40	164	49	172	59	178	69	191	81	196	93	202	106	208
40	27	149	35	160	43	171	52	180	63	190	74	198	87	204	98	213	112	221
45	29	155	37	167	46	180	56	189	67	198	79	206	91	214	104	223	118	230
50	30	161	39	174	48	186	59	195	70	203	83	212	95	220	109	230	123	237
55	32	165	41	179	50	193	62	203	74	213	87	221	100	230	115	239	130	247
60	33	169	42	184	53	198	64	208	77	220	91	228	104	237	120	245	136	254
65	35	172	44	189	55	205	67	216	80	227	95	237	109	247	125	254	142	263
70	36	175	45	194	57	210	69	221	83	232	98	243	113	254	129	260	147	270
75	37	179	47	201	59	217	72	228	86	239	101	250	117	261	134	268	153	277
80	39	182	49	207	61	222	74	234	89	244	105	256	121	266	138	274	158	283

*Operating at pressures above 30 PSI provides better performance.

100 TAPER BORE NOZZLE — 24° TRAJECTORY

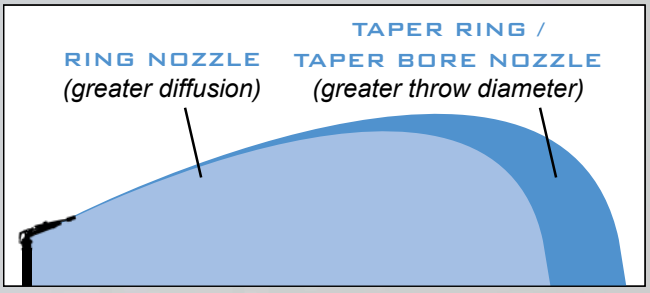
PSI	0.5"		0.55"		0.6"		0.65"		0.7"		0.75"		0.8"		0.85"		0.9"		1.0"	
	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT
40	47	191	57	202	66	213	78	222	91	230	103	240	118	250	134	256	152	262	—	—
50	50	205	64	215	74	225	87	235	100	245	115	256	130	265	150	273	165	280	204	300
60	55	215	69	227	81	240	96	250	110	260	126	270	143	280	164	288	182	295	224	316
70	60	225	75	238	88	250	103	263	120	275	136	283	155	295	177	302	197	310	243	338
80	64	235	79	248	94	260	110	273	128	285	146	295	165	305	189	314	210	325	258	354
90	68	245	83	258	100	270	117	283	135	295	155	306	175	315	201	326	223	335	274	362
100	72	255	87	268	106	280	123	293	143	305	163	316	185	325	212	336	235	345	289	372
110	76	265	92	278	111	290	129	303	150	315	171	324	195	335	222	344	247	355	304	380

150 TAPER BORE NOZZLE — 24° TRAJECTORY

PSI	0.7"		0.8"		0.9"		1.0"		1.1"		1.2"		1.3"		1.4"	
	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT
50	100	250	130	270	165	290	205	310	255	330	300	345	350	360	408	373
60	110	265	143	285	182	305	225	325	275	345	330	365	385	380	446	396
70	120	280	155	300	197	320	245	340	295	360	355	380	415	395	483	412
80	128	290	165	310	210	335	260	355	315	375	380	395	445	410	516	427
90	135	300	175	320	223	345	275	365	335	390	405	410	475	425	547	442
100	143	310	185	330	235	355	290	375	355	400	425	420	500	440	577	458
110	150	320	195	340	247	365	305	385	370	410	445	430	525	450	605	471
120	157	330	204	350	258	375	320	395	385	420	465	440	545	460	632	481

200 TAPER BORE NOZZLE — 27° TRAJECTORY

PSI	1.05"		1.1"		1.2"		1.3"		1.4"		1.5"		1.6"		1.75"		1.9"	
	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT	GPM	DIAM. FT
60	250	345	285	355	330	375	385	390	445	410	515	430	585	445	695	470	825	495
70	270	360	310	380	355	395	415	410	480	430	555	450	630	465	755	495	890	515
80	290	375	330	395	380	410	445	430	515	450	590	470	675	485	805	515	950	535
90	310	390	350	410	405	425	475	445	545	465	625	485	715	505	855	535	1005	555
100	325	400	370	420	425	440	500	460	575	480	660	500	755	520	900	550	1060	575
110	340	410	390	430	445	450	525	470	605	495	695	515	790	535	945	565	1110	590
120	355	420	405	440	465	460	545	480	630	505	725	530	825	550	985	580	1160	605
130	370	425	425	445	485	465	565	485	655	515	755	540	860	560	1025	590	1210	620



See opposite page for nozzle descriptions.

BIG GUN® PERFORMANCE (METRIC)

Flow and diameter (meters) information at various pressures with different nozzle sizes. (See information at bottom of page.)

75 TAPER RING NOZZLE TR75 — 24° TRAJECTORY

Kg/cm²	10.2 mm			11.4 mm			12.7 mm			14.0 mm			15.2 mm			16.5 mm			17.8 mm			19.1 mm			20.3 mm		
	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M
1.75*	—	—	—	—	—	—	—	—	—	2.64	9.5	44	3.17	11.4	48	3.72	13.4	49	4.30	15.5	51	4.91	17.7	54	5.59	20.1	56
2.00*	—	—	—	—	—	—	2.33	8.4	48	2.82	10.2	48	3.39	12.2	51	3.98	14.3	52	4.59	16.5	56	5.25	18.9	58	5.97	21.5	59
2.50	—	—	—	2.11	7.6	47	2.61	9.4	50	3.16	11.4	53	3.79	13.6	55	4.45	16.0	58	5.14	18.5	60	5.87	21.1	62	6.68	24.0	64
3.00	1.83	6.6	47	2.32	8.3	50	2.86	10.3	53	3.46	12.4	57	4.15	14.9	59	4.88	17.6	61	5.63	20.3	63	6.43	23.1	66	7.32	26.3	69
3.50	1.98	7.1	49	2.50	9.0	52	3.09	11.1	57	3.74	13.4	60	4.48	16.1	62	5.27	19.0	64	6.08	21.9	67	6.95	25.0	70	7.90	28.4	73
4.00	2.11	7.6	50	2.67	9.6	54	3.30	11.9	59	3.99	14.4	62	4.79	17.2	65	5.63	20.3	67	6.50	23.4	71	7.43	26.7	73	8.45	30.4	76
4.50	2.24	8.1	52	2.84	10.2	57	3.50	12.6	62	4.24	15.2	66	5.08	18.3	68	5.97	21.5	71	6.89	24.8	75	7.88	28.4	78	8.96	32.3	80
5.00	2.36	8.5	53	2.99	10.8	60	3.69	13.3	64	4.46	16.1	68	5.35	19.3	70	6.30	22.7	74	7.26	26.1	78	8.30	29.9	80	9.45	34.0	84
5.50	2.48	8.9	55	3.13	11.3	62	3.87	13.9	66	4.68	16.9	70	5.61	20.2	73	6.60	23.8	77	7.62	27.4	81	8.71	31.3	83	9.90	35.7	86
6.00	2.59	9.3	56	3.27	11.8	63	4.04	14.6	68	4.89	17.6	72	5.86	21.1	74	6.90	24.8	79	7.96	28.6	84	9.09	32.7	85	10.3	37.2	87

*Operating at pressures above 2 Kg/cm² provides better performance.

100 TAPER BORE NOZZLE — 24° TRAJECTORY

Kg/cm²	12.7 mm			14.0 mm			15.2 mm			16.5 mm			17.8 mm			19.1mm			20.3 mm			21.6 mm			22.9 mm			25.4 mm		
	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M
3.0	3.00	10.8	59.5	3.73	13.4	62.6	4.33	15.6	66.1	5.09	18.3	66.8	5.84	21.0	71.4	6.71	24.1	74.5	7.64	27.5	77.5	8.74	31.5	79.5	9.67	34.8	81.4	11.9	42.8	88.1
4.0	3.40	12.2	64.3	4.25	15.3	67.8	5.00	18.0	71.8	5.86	21.1	74.8	6.82	24.6	77.8	7.73	27.8	81.0	8.66	31.2	82.8	10.1	36.2	86.4	11.2	40.4	88.6	13.8	49.5	94.8
5.0	3.79	13.6	69.0	4.72	17.0	72.7	5.59	20.1	76.4	6.56	23.6	80.2	7.62	27.5	84.4	8.66	31.2	86.7	9.91	34.9	90.4	11.3	40.5	92.5	12.5	45.2	94.7	15.5	55.6	103
6.0	4.17	15.0	73.4	5.14	18.5	77.3	6.12	22.1	80.7	7.19	25.9	85.0	8.35	30.1	88.7	9.51	34.3	91.8	10.9	38.2	94.7	12.4	44.5	97.7	13.7	49.5	101	16.8	60.5	109
7.0	4.53	16.3	77.6	5.52	19.9	81.6	6.61	23.8	85.0	7.75	27.9	89.3	9.02	32.5	93.0	10.3	37.0	96.1	11.7	41.3	99.0	13.3	48.0	102.2	14.8	53.5	105	18.2	65.5	113
8.0	4.89	17.6	81.7	5.84	21.0	85.7	7.07	25.5	89.3	8.25	29.7	93.1	9.64	34.8	97.3	11.0	39.4	99.7	12.5	44.1	103	14.2	51.2	105.8	15.9	57.2	109	19.5	70.2	116

150 TAPER BORE NOZZLE — 24° TRAJECTORY

Kg/cm²	17.8 mm			20.3 mm			22.9 mm			25.4 mm			27.9 mm			30.5 mm			33.0 mm			35.6 mm		
	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M
3.5	6.39	23.0	76.0	8.29	29.8	82.0	10.5	37.8	88.0	13.0	46.9	95.0	15.9	57.1	101	19.0	68.3	105	22.3	80.1	110	25.8	92.9	114
4.0	6.83	24.6	79.6	8.86	31.9	85.6	11.2	40.4	91.6	13.9	50.1	97.8	16.9	61.0	104	20.3	73.0	109	23.8	85.7	114	27.4	98.6	118
5.0	7.63	27.5	85.4	9.91	35.7	91.6	12.6	45.2	98.6	15.6	56.0	105	18.9	68.2	111	22.7	81.7	117	26.6	95.8	121	30.8	111	126
6.0	8.36	30.1	89.7	10.9	39.1	96.7	13.8	49.5	104	17.0	61.3	110	20.8	74.7	117	24.9	89.5	123	29.1	105	128	33.6	121	133
7.0	9.03	32.5	95.0	11.7	42.2	101	14.9	53.5	108	18.4	66.3	114	22.4	80.7	122	26.8	96.6	128	31.5	113	134	36.4	131	139
8.0	9.66	34.8	99.3	12.5	45.1	105	15.9	57.2	112	19.7	70.8	118	24.0	86.3	126	28.7	103	132	33.7	121	138	38.9	140	145
9.0	10.2	36.9	104	13.3	47.9	110	16.8	60.6	117	20.9	75.1	123	25.4	91.5	131	30.4	110	137	35.7	129	143	41.1	148	149

200 TAPER BORE NOZZLE — 27° TRAJECTORY

Kg/cm²	26.7 mm			27.9 mm			30.5 mm			33.0 mm			35.6 mm			38.1 mm			40.6 mm			44.5 mm			48.3 mm		
	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M	L/S	M³/H	DIAM. M
4.0	15.5	55.7	104	17.8	63.9	106	20.3	73.1	112	23.8	85.8	117	27.5	98.9	123	32.2	116	129	36.1	130	134	42.9	154	141	50.7	183	149
5.0	17.3	62.3	111	19.9	71.5	117	22.7	81.7	121	26.7	96.0	126	30.7	111	132	36.0	130	138	40.3	145	143	48.0	173	152	56.7	204	158
6.0	19.0	68.2	115	21.8	78.3	121	24.9	89.5	126	29.2	105	132	33.7	121	138	39.4	142	144	44.2	159	149	52.6	189	158	62.1	224	164
7.0	20.5	73.7	122	23.5	84.6	128	26.9	96.7	134	31.5	114	140	36.3	131	146	42.6	153	152	47.7	172	159	56.8	204	168	67.1	241	175
8.0	21.9	78.8	126	25.1	90.4	132	28.7	103	138	33.7	121	144	38.9	140	152	45.5	164	159	51.0	184	165	60.7	218	174	71.7	258	182
9.0	23.2	83.6	130	26.6	95.9	136	30.4	110	142	35.8	129	148	41.2	148	157	48.3	174	164	54.1	195	170	64.4	232	180	76.0	274	188

Diameters are based on a 24° trajectory for the 75, 100 and 150 Series and a 27° trajectory for the 200 Series. The lower trajectory angles result in better wind fighting ability, but reduced throw distances. Throw reduction depends upon nozzle flow rate. In general, the throw distance is reduced approximately 3% with each 3° drop in trajectory angle. Use of the wedge insert to modify trajectory will affect distance. Big Gun® performance data has been obtained under ideal test conditions and may be adversely affected by wind, poor hydraulic entrance conditions or other factors. Test riser height of 3 feet (0.91 meters) above measurement surface. No representation regarding droplet condition, uniformity, application rate, or suitability for a particular application is made herein.

Additional nozzle options and sizes available. Go to www.nelsonirrigation.com or contact the factory for nozzle performance.

TAPER BORE NOZZLE. Most common nozzle type. Used where the available water flow and pressure are consistent. A nozzle size must be specified when ordering a Big Gun with a Taper Bore Nozzle. *The Nozzle Valve End Gun requires a Taper Bore Nozzle.*

RING NOZZLE SET. The Ring Nozzle Set is an easy and economic way of changing nozzles to match the available water flow and pressure. These are commonly used where the available water flow and pressure are variable and or when the Big Gun is shifted between various water sources with different capacities. The abrupt orifice of the nozzle is less efficient so the radius of throw is less than that achieved with an equivalent diameter Taper Bore nozzle. The abrupt orifice of the Ring Nozzle does break the stream of water up more, which can be an advantage in low pressure applications. The Ring Nozzle comes with a set of rings. *The Ring Nozzle should not be used with the Nozzle Valve End Gun.*

TAPER RING NOZZLE. This nozzle combines the changeability of a Ring Nozzle with some of the efficiency of a Taper Bore Nozzle. When ordering the Taper Ring Nozzle, specify the size as only one Taper Ring comes with the nozzle body and cap. Additional taper ring sizes can be purchased. *The Taper Ring Nozzle should not be used with the Nozzle Valve End Gun.*

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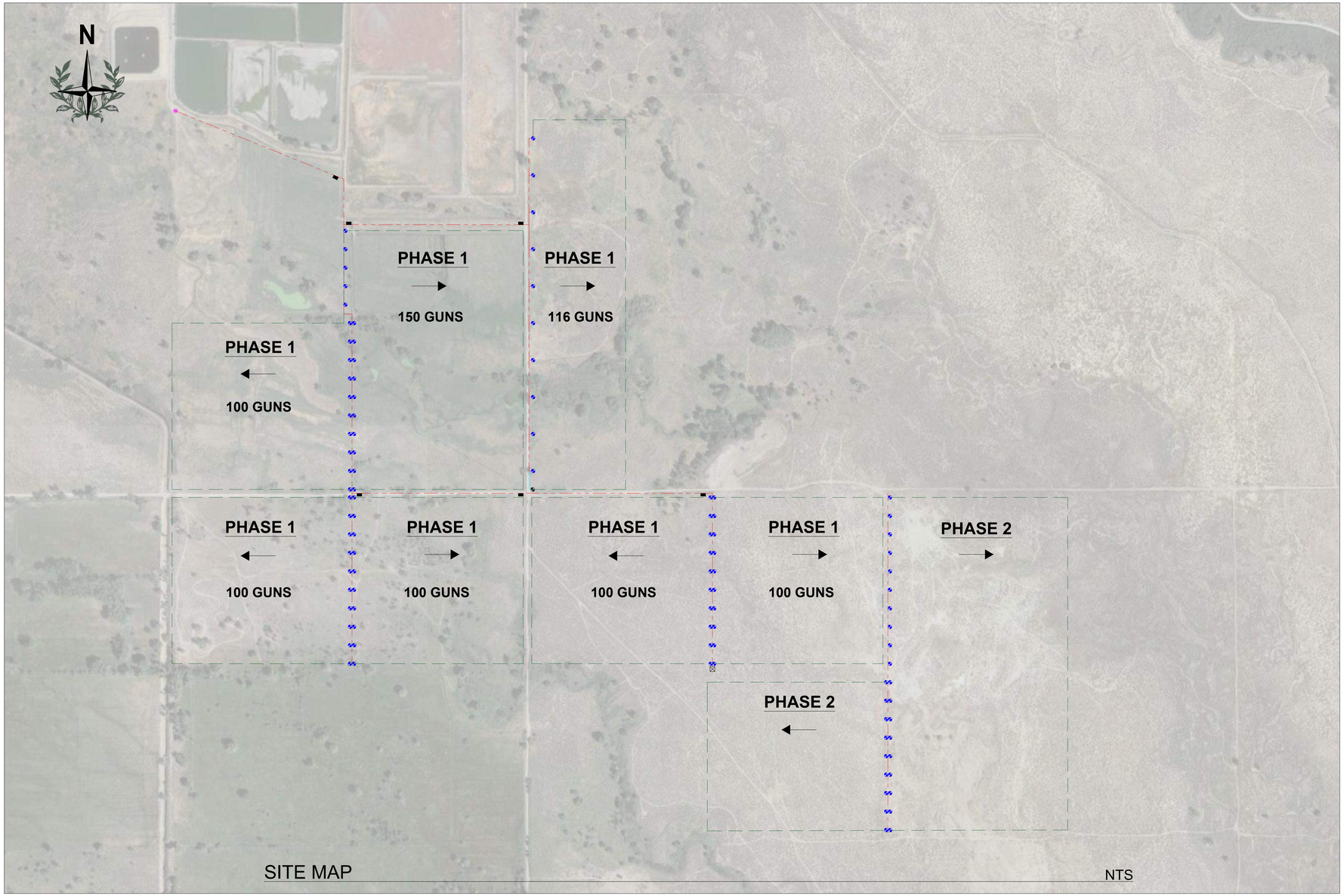
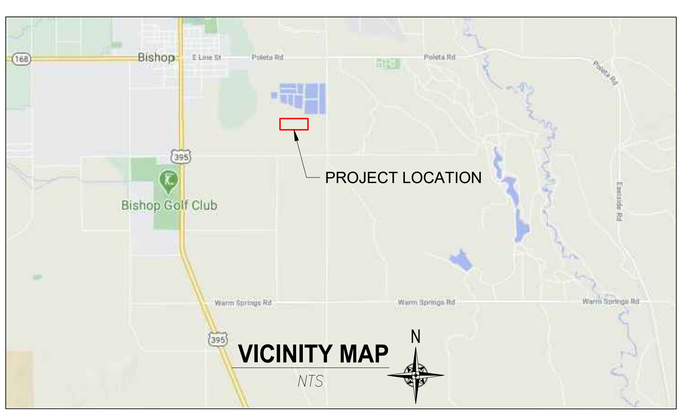
Tel: +61 7 3715 8555 Fax: +61 7 3715 8666 info@nelsonirrigation.com.au

APPENDIX C
LAUREL AG AND WATER IRRIGATION SYSTEM DESIGN DRAWINGS



SITE MAP NTS



PROJECT STATISTICS:

- CROP: PASTURE
- ACRES: 302 (PH: 1) 132 (PH:2)
- SPRINKLER: NELSON BIG GUN 100
- NZL. FLOW RATE: 120 GPM @ 70 PSI
- WET RADIUS: 138'
- LATERAL & SPRIKLER SPACING: 138' MAX. x 138' MAX.
- EACH LATERAL LINE CONSISTS OF 10 SPRINKLERS (1200 GPM)
- MAXIMUM LATERAL & SPRIKLER SPACING: 50% OF WETTED DIAMETER
- SPRINKLER NO. AVG. 48 PER BLOCK (20 ACRES)
- TOTAL FLOW AVAIL. AT SOURCE: 1042 GPM (CURRENT FLOW) 1458 GPM (FUTURE FLOW)

- VALVES: NELSON 6" & 8" 800 SERIES WITH TWIG/SOLENOID CONTROL
- PSI LOSS: .40 PSI @ 1200 GPM

SHEET INDEX

PREPARED BY: LAUREL AG & WATER

PREPARED FOR:
CITY OF BISHOP WASTEWATER-PASTURE OPPUSI-000276
POLETA RD & AIRPORT RD
BISHOP, CA

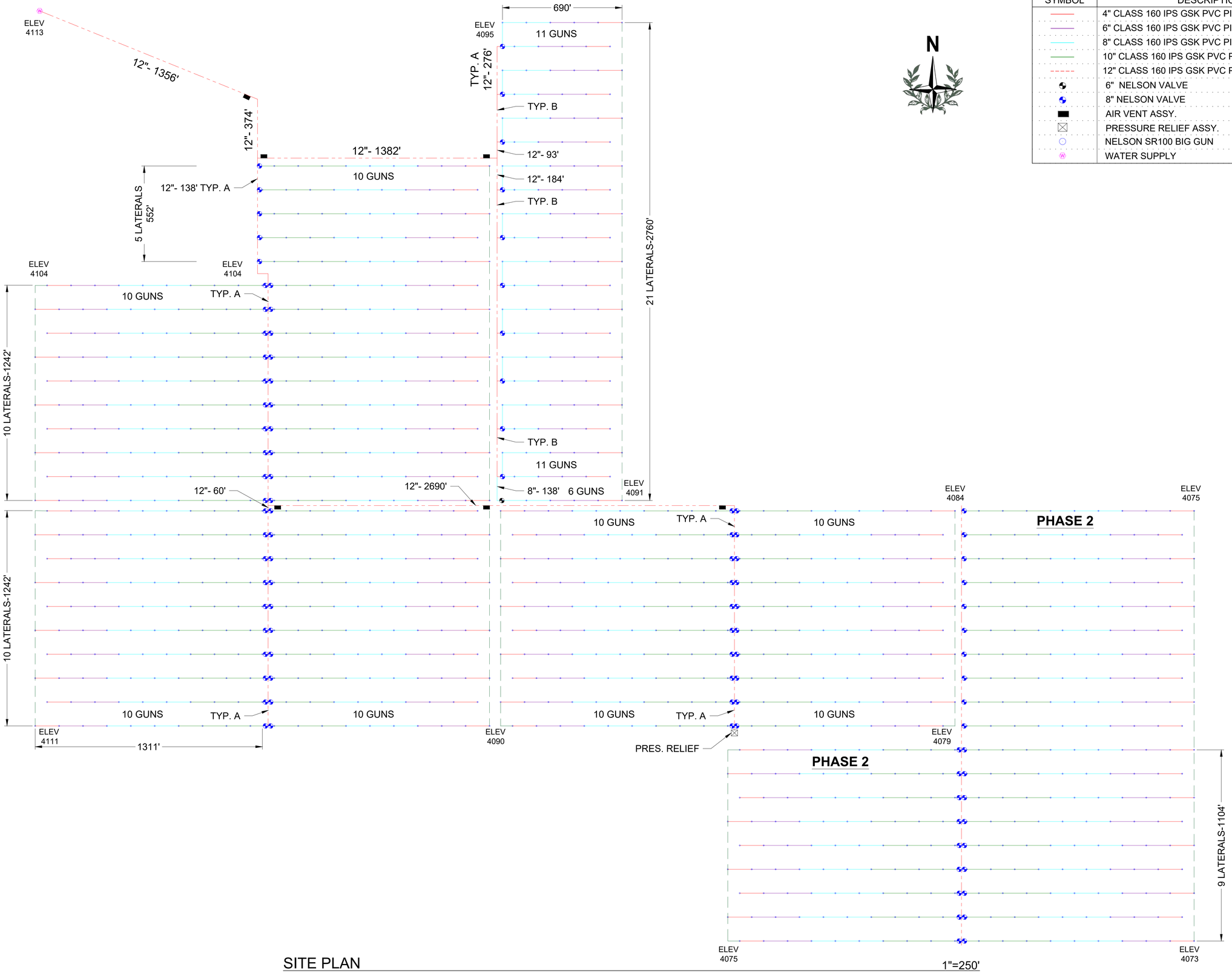
#	REVISIONS	DATE

DESIGN: N. MURRAY
DRAWING: N. MURRAY
APPROVAL: LAUREL DESIGN

COVER SHEET & PROJECT STATISTICS

DATE: 02/05/2021

SHEET: G-001



SYMBOL	DESCRIPTION
	4" CLASS 160 IPS GSK PVC PIPE
	6" CLASS 160 IPS GSK PVC PIPE
	8" CLASS 160 IPS GSK PVC PIPE
	10" CLASS 160 IPS GSK PVC PIPE
	12" CLASS 160 IPS GSK PVC PIPE
	6" NELSON VALVE
	8" NELSON VALVE
	AIR VENT ASSY.
	PRESSURE RELIEF ASSY.
	NELSON SR100 BIG GUN
	WATER SUPPLY

SITE PLAN 1"=250'

PREPARED BY:
LAUREL AG & WATER

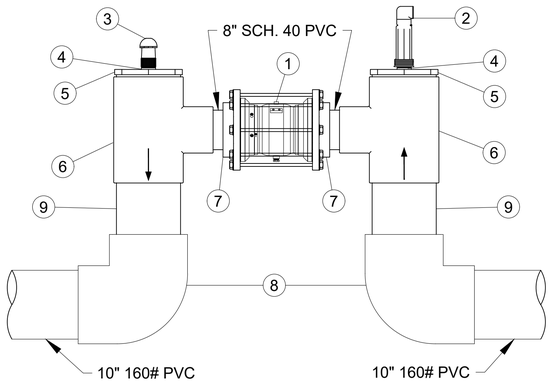
PREPARED FOR:
CITY OF BISHOP
WASTEWATER-PASTURE
OPPUSI-000276
POLETA RD & AIRPORT RD
BISHOP, CA

#	REVISIONS	DATE

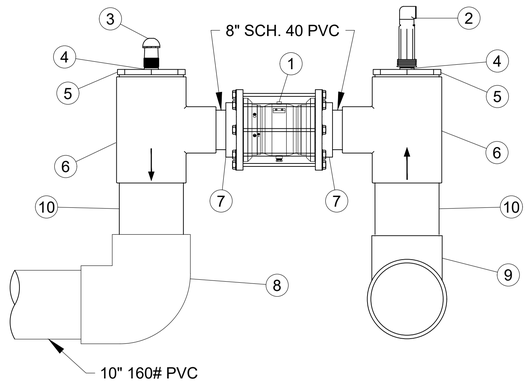
DESIGN: N. MURRAY
DRAWING: N. MURRAY
APPROVAL: LAUREL DESIGN

PROJECT
IRRIGATION PLAN

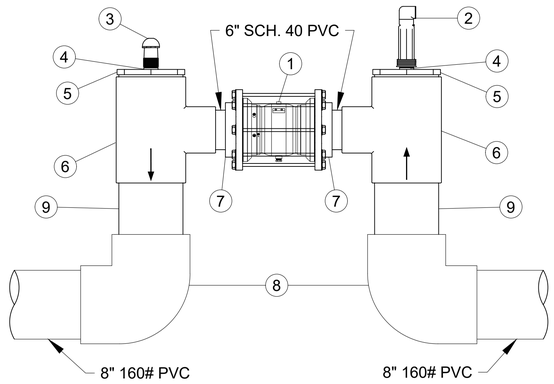
DATE: 02/05/2021
SHEET: CI-101



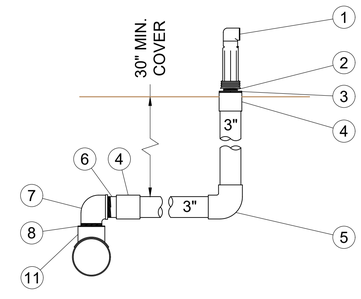
8" NELSON 800 VALVE W/ TWIG/SOLENOID - TYP. 60x		
LABEL	ITEM	#
1	8" NELSON 800 SERIES	1
2	2" PRO-AG VENT	1
3	2" GUARDIAN VENT	1
4	2" T.O.E. - SCH.80 PVC	2
5	10"x6" / 6"x2" RED. BUSHING	2
6	10"x8" TEE - SCH.40 PVC	2
7	8" PVC V/S FLANGE	2
8	10" SCH. 40 PVC 90°	2
9	10" SCH. 40 PVC	6'



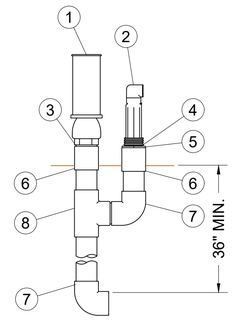
8" NELSON 800 VALVE W/ TWIG/SOLENOID - TYP. 15x		
LABEL	ITEM	#
1	8" NELSON 800 SERIES	1
2	2" PRO-AG VENT	1
3	2" GUARDIAN VENT	1
4	2" T.O.E. - SCH.80 PVC	2
5	10"x6" / 6"x2" RED. BUSHING	2
6	10"x8" TEE - SCH.40 PVC	2
7	8" PVC V/S FLANGE	2
8	10" SCH. 40 PVC 90°	1
9	12" x 10" 160# TEE	1
10	10" SCH. 40 PVC	6'



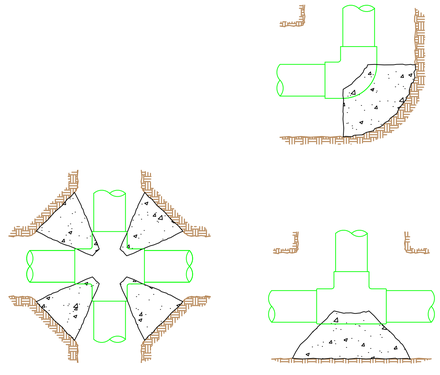
6" NELSON 800 VALVE W/ TWIG/SOLENOID - TYP. 1x		
LABEL	ITEM	#
1	6" NELSON 800 SERIES	1
2	2" PRO-AG VENT	1
3	2" GUARDIAN VENT	1
4	2" T.O.E. - SCH.80 PVC	2
5	8"x2" RED. BUSHING	2
6	8" x 6" TEE - SCH.40 PVC	2
7	6" PVC V/S FLANGE	2
8	8" SCH. 40 PVC 90°	2
9	8" SCH. 40 PVC	6'



MAINLINE AIR VENT ASSY. - 6x		
LABEL	ITEM	# PER ASSEM.
1	2" AIR VENT - NETAFIM PRO	1
2	2" T.O.E. - SCH.80 PVC	1
3	3" x 2" RED. BUSHING SCH.40 PVC	1
4	3" COUPLER - SCH.40 PVC	2
5	3" 90° ELBOW - SCH.40 PVC	1
6	3" T.O.E. - SCH 80 PVC	1
7	3" STREET 90° - GALV.	1
8	4" x 3" BUSHING - GALV.	1
9	12" x 4" EPXY. SADDLE	1
N/A	3" SCH.40 PVC PIPE	



3" FLUSHOUT W/ VENT & P.R.V. - 1x			
LABEL	ITEM	#	PROD. / INV. #
1	3" PRESSURE RELIEF VALVE- 120#	1	FRESNO SERIES 3100
2	2" CONTINUOUS ACTING VENT	1	NETAFIM PRO-AIR 65ARIB2PRO
3	Ø3" x 4" T.O.E. -SCH.80 PVC	1	
4	Ø2" x 3" T.O.E. -SCH.80 PVC	1	
5	3" SPIG x 2" SOC REDUCER BUSHING - SCH.40 PVC	1	SPEARS 437-338
6	3" COUPLER - SCH.40 PVC	2	SPEARS 429-030
7	3" x 90° ELBOW - SCH. 40 PVC	2	SPEARS 406-030
8	3" TEE - SCH.40 PVC	1	SPEARS 401-030
N/A	Ø3" PIPE - SCH.40 PVC	~8FT	



THRUST BLOCKS

FOR ALL PIPE 5" AND LARGER, USE AT EVERY CHANGE IN DIRECTION OR ELEVATION

PREPARED BY: LAUREL AG & WATER

PREPARED FOR:

CITY OF BISHOP WASTEWATER-PASTURE OPPUSI-000276

POLETA RD & AIRPORT RD
BISHOP, CA

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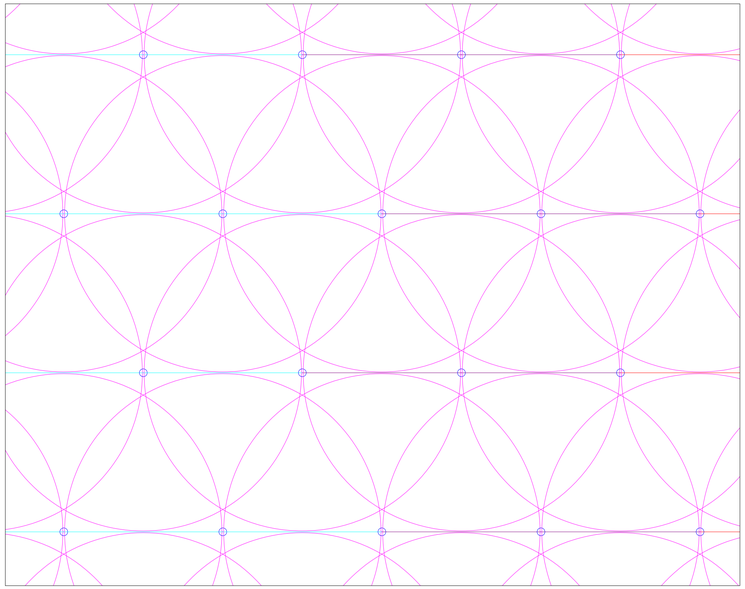
DESIGN: N. MURRAY
DRAWING: N. MURRAY
APPROVAL: LAUREL DESIGN

IRRIGATION DETAILS

DATE: 02/05/2021

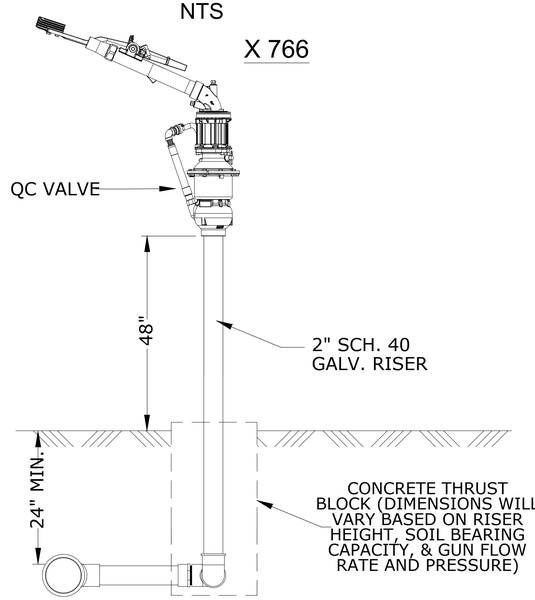
SHEET: CI-501

SPRINKLER PATTERN
NTS

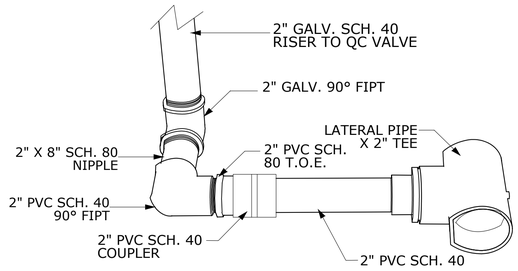


SR100 WITH QC VALVE & 2" ELBOW SWING JOINT ASSEMBLY STABALIZED W/ CONCRETE
NTS

X 766

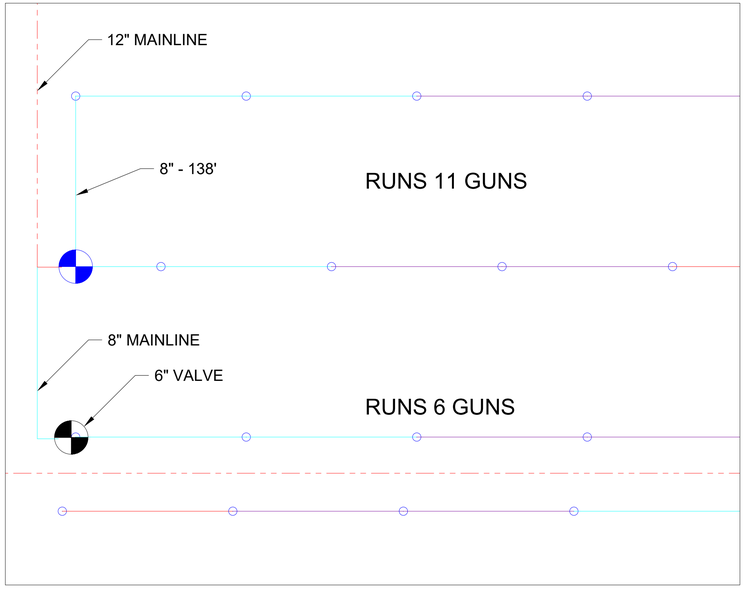


2" ELBOW SWING
JOINT ASSEMBLY

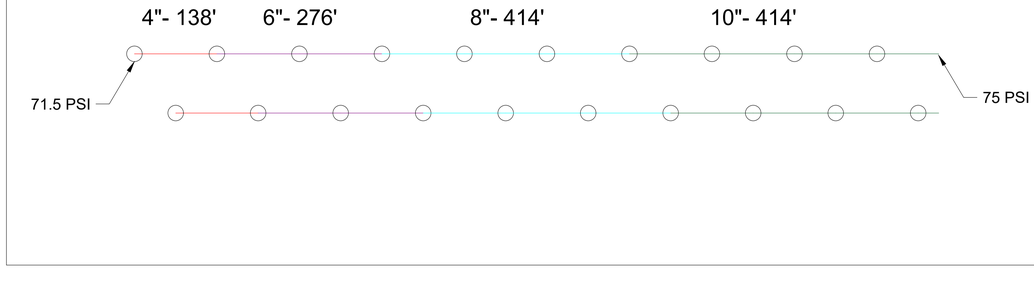


SWING JOINT DETAIL
NTS

SW CORNER BLOCK 7 DETAIL
NTS



LATERAL LOSS (10 HEADS)
NTS



PREPARED BY:
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OPPUSI-000276
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APPROVAL: LAUREL DESIGN

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SHEET: CI-501