



Reference: 020091.150

# Eel River Valley Groundwater Basin Water Quality Sampling and Analysis Plan

(June 22, 2021)

## 1.0 Introduction

The Sustainable Groundwater Management Act (SGMA) requires local governments and water agencies in California's designated high and medium priority groundwater basins, as defined by the California Department of Water Resources (DWR), to form Groundwater Sustainability Agencies (GSAs) and operate under a groundwater sustainability plan (GSP) by the year 2022. The Eel River Valley Basin, Basin No. 1-010 (ERVB or Basin; Figure 1) was designated as a medium priority basin in 2018 and the County is acting as the lead in the formation of the Humboldt County GSA and development of a GSP.

Humboldt County has received grant funding from the California Department of Water Resources (DWR), Proposition 68, for a wide range of data collection and analysis to support the preparation of a GSP. The grant scope of work includes the collection of water quality samples from 15 locations within the Basin. This plan describes the review of existing water quality data in the Basin, the rationale for sampling locations, the specific analytes that will be tested, and the sampling methods.

Upon completion of the sampling and analysis as described herein, a water quality technical memorandum summarizing findings will be prepared that includes a detailed summary of the historical data review, description of the new data collection, results of laboratory testing, and an evaluation and discussion of any groundwater quality areas of concern in the context of SGMA regulations. The findings from this work will support the description of general water quality in the hydrogeologic conceptual model, the characterization of the water quality sustainability indicator, and the development of sustainable management criteria.

## 2.0 Water Quality Data Review

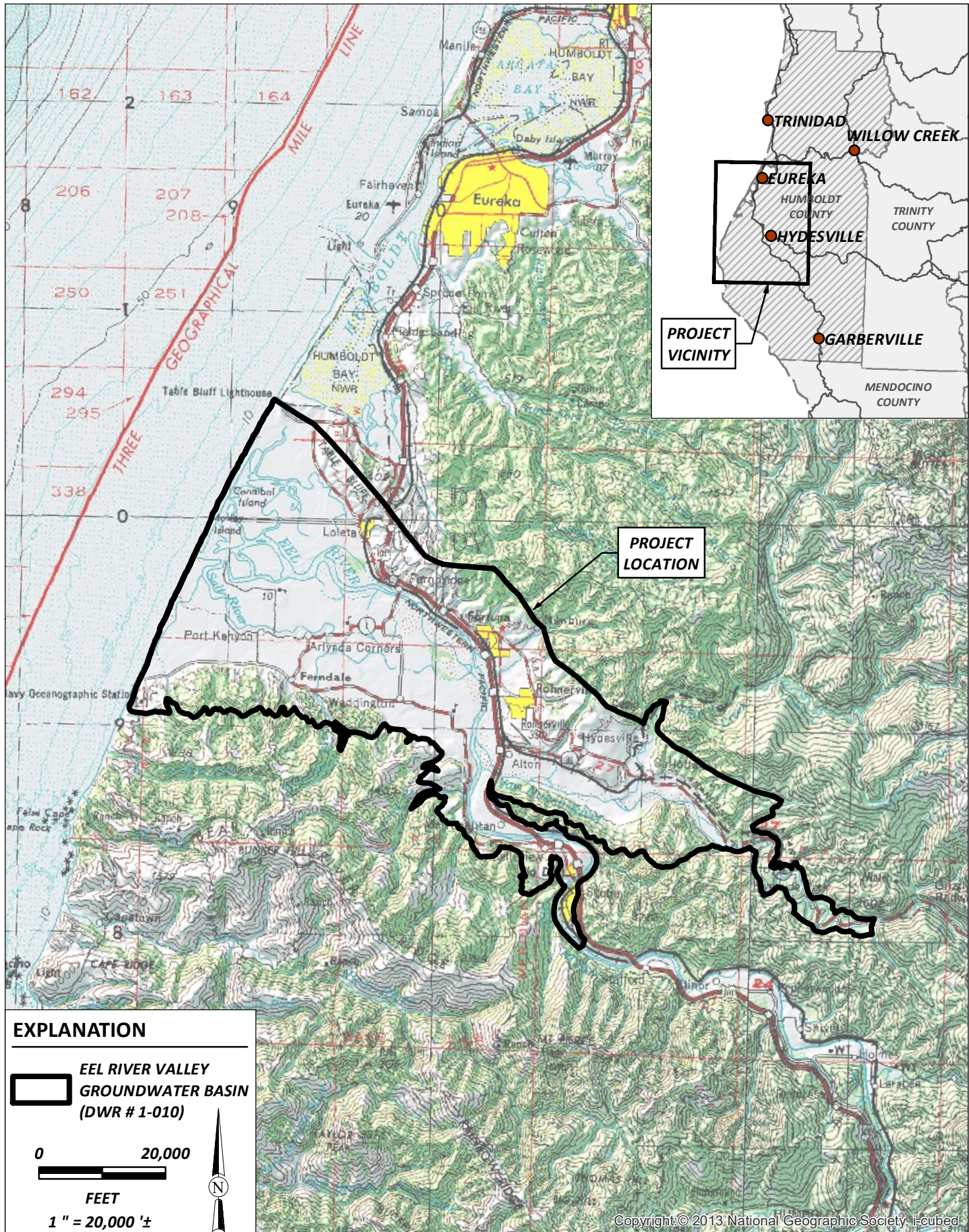
Historic water quality data was reviewed to screen for basin wide groundwater quality concerns that would inform the selection of sample locations.

Primary data sources reviewed included:


- Previous data compiled during the development of the 2016 alternative plan
- Municipality drinking-water consumer confidence reports
- The State Water Board's online data sources (SWRCB, 2019):
  - Geotracker/Groundwater Ambient Monitoring and Assessment (GAMA) program,
  - Surface Water Ambient Monitoring Program (SWAMP),
  - California Environmental Data Exchange Network (CEDEN),




Path: \\eureka\projects\2020\020091-Eel-River-GSP\GIS\PROJ\_MXD\150-Water-Quality\Fig1\_Project\_Location.mxd User Name: mcurran DATE: 6/17/21, 4:17PM




**EXPLANATION**

 **EEL RIVER VALLEY GROUNDWATER BASIN (DWR # 1-010)**

 **0 20,000 FEET**

**1" = 20,000' ±**



Copyright © 2013 National Geographic Society, I-cubed



Humboldt County  
 Eel River Valley Groundwater Sustainability Plan  
 Eureka, California

June 2021

Project Location

SHN 020091

Figure 1

## Water Quality Sampling and Analysis Plan

June 22, 2021

Page 2

- the Dairy General Order,
- the Dairy Representative Monitoring Program, and
- the Irrigated Lands Regulatory Program.
- The North Coast Regional Water Board's recently released "Staff Report for North Coast Hydrologic Region Salt and Nutrient Management Planning Groundwater Basin Evaluation and Prioritization" (RWQCB, 2020).

The focus of the review was to screen for water quality conditions within the basin that would provide insight into appropriate target locations for collection of the 15 water quality samples. The Geotracker/GAMA database and the RWQCB Staff Report were the only sources that provided data useful for selecting sample locations. Below we provide a summary of the relevant findings from our review of these two data sources. A more comprehensive discussion of water quality conditions will be included in the water quality technical memorandum and GSP.

### 2.1 Geotracker/Groundwater Ambient Monitoring and Assessment (GAMA) Program

Water quality data made available online as part of the State Water Board's GAMA program was compiled and presented in the 2016 alternative plan (SHN, 2016). Fifteen constituents were queried and analyzed in the GAMA database to evaluate water quality throughout the Basin. These constituents included aluminum, arsenic, barium, boron, cadmium, chloride, chromium, lead, mercury, nitrate, selenium, silver, sodium, specific conductance, and total dissolved solids (TDS). Only six of the 15 constituents have been detected over the last 40 years. None of the detected constituents were found to be above their respective water quality objectives. Analysis of the data trends indicate there is little to no increase in concentrations in the last 10-year period of record as compared to the entire data set.

In DWR's alternative assessment staff report (DWR, 2019) DWR staff expressed concern that decadal averages were used to evaluate water quality. To address this concern, the data for the 15 constituents evaluated in the 2016 alternative plan were reevaluated to assess the number of exceedances (values greater than the state maximum contaminant levels [MCLs]) for each constituent. This counted the exceedances using individual data points instead of the cumulative averages. No increasing trend was identified for any constituent and there were minimal exceedances over the last 10 years. A detailed discussion of the data analysis will be included in the water quality technical memorandum.

### 2.2 Regional Salt and Nutrient Management Review

The "Staff Report for North Coast Hydrologic Region Salt and Nutrient Management Planning Groundwater Basin Evaluation and Prioritization, 2020" public review draft released by the North Coast Regional Water Quality Control Board (RWQCB) provides basin-wide information on salt and nutrient concentrations.

Board staff developed priority levels for each basin based on a review and analysis of concentrations of total dissolved solids (TDS) and nitrates, the density of onsite wastewater treatment systems, types of agricultural crops, and the dairy animal count and density. The sampling results presented for nitrates



spanned from 2010 to 2020 and was associated with well locations and, therefore, provided an opportunity to evaluate the spatial distribution of exceedances, which primarily occurred within the central portion of the Lower Eel River Valley. The results for TDS were not reported with any spatial reference and, therefore, were not useful for identifying any specific problem areas. The Eel River Valley has been identified as a high priority basin for salts (defined as TDS in the report) and nutrients (defined as nitrate in the report).

### 2.3 Historical Data Conclusions

The GAMA program provides the most comprehensive water quality data for the basin, and available data indicates that the groundwater in the Eel River Valley appears to be of high quality and suitable for the intended municipal and agricultural uses. Furthermore, the water quality trends in the dataset have not shown any significant increase in measured concentrations. The findings presented in the Water Board's staff report on salt and nutrients in the Eel River Valley is an important consideration in selection of well locations with the primary area of concern being the central portion of the lower Eel River Valley.

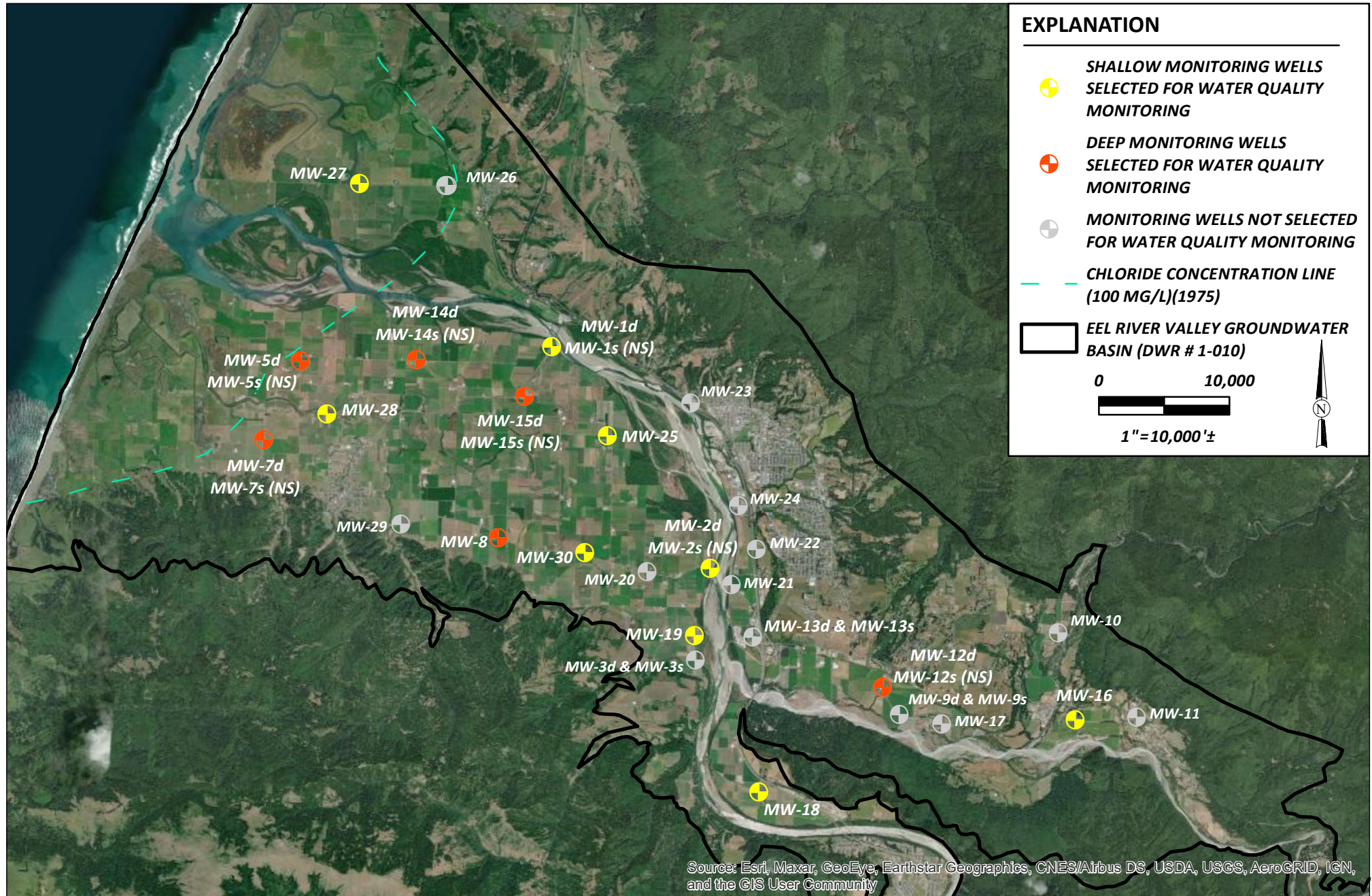
## 3.0 Sampling Locations

The County has 14 monitoring wells that were installed in Fall 2016 through DWR Proposition 1 Grant funding that supported the development of the alternative plan (SHN, 2016). An additional 23 wells are being installed as part of the project that is funded through a DWR Proposition 68 Grant. These 37 wells will form the primary network of dedicated monitoring wells for the GSP monitoring program. Unlike many other wells within the basin, the construction details and stratigraphy within which they were constructed is known. In addition, all wells are located within the County's right-of-way providing good access for sampling into the future.

The subset of wells from which the 15 water quality samples will be collected is shown on Figure 2 and was developed to optimize spatial coverage throughout the basin as well as representative portions of the underlying aquifers (wells screened in shallow and deep sections). Special consideration was given to areas where groundwater use is concentrated and/or has the potential to impact water quality. A good distribution (both horizontally and vertically) is necessary to develop a good baseline of water quality conditions for use in the hydrogeologic conceptual model and groundwater conditions section of the GSP. Table 1 identifies the wells that were selected and the rationale for inclusion.

Eleven (11) of the 15 planned sample locations are located within the lower Eel River Valley to help further characterize the water quality throughout this region of the basin. The selected well locations are positioned to characterize water quality upgradient from the area of concern, within the area, and downgradient of the area of concern.





**EXPLANATION**

- **SHALLOW MONITORING WELLS  
SELECTED FOR WATER QUALITY  
MONITORING**
- **DEEP MONITORING WELLS  
SELECTED FOR WATER QUALITY  
MONITORING**
- **MONITORING WELLS NOT SELECTED  
FOR WATER QUALITY MONITORING**
- **CHLORIDE CONCENTRATION LINE  
(100 MG/L)(1975)**
- EEL RIVER VALLEY GROUNDWATER  
BASIN (DWR # 1-010)**

0 10,000  
1" = 10,000'±

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Notes:  
(NS) - Not selected for water quality monitoring  
DWR- Department of Water Resources



Humboldt County  
Eel River Valley Groundwater Sustainability Plan  
Eureka, California  
June 2021

Humboldt County  
Groundwater Quality Well Locations  
SHN 020091  
Figure 2

## Water Quality Sampling and Analysis Plan

June 22, 2021

Page 4

**Table 1. Monitoring Wells Selected for Groundwater Quality Monitoring**

Well Identification	Shallow/Deep	Justification
MW-1d <sup>a</sup>	Shallow (60 ft)	Farthest downstream well immediately adjacent to the Eel River
MW-2d <sup>a</sup>	Shallow (60 ft)	Farthest upstream well immediately adjacent to the Eel River and near a surface water monitoring station
MW-5d <sup>a</sup>	Deep (210 ft)	Immediately east of the 100 mg/l chloride Isocontour line on the north side of the valley
MW-7d <sup>a</sup>	Deep (250 ft)	Immediately east of the 100 mg/l chloride Isocontour line on the south side of the valley
MW-8 <sup>a</sup>	Deep (150 ft)	Fills a spatial gap- Located on the southern edge of the valley with no other County wells
MW-12d	Deep (250 ft)	Central Van Duzen Valley
MW-14d <sup>a</sup>	Deep (250 ft)	Fills a spatial gap- located in the north central part of the valley with no other County wells
MW-15d <sup>a</sup>	Deep (250 ft)	Closest well to the center of the valley
MW-16	Shallow (60 ft)	Upper Van Duzen Valley
MW-18	Shallow (60 ft)	Located in Metropolitan
MW-19 <sup>a</sup>	Shallow (60 ft)	At the head of the Eel Valley-Immediately downstream of the Van Duzen and Eel River confluence
MW-25 <sup>a</sup>	Shallow (60 ft)	Fills a spatial gap-Located across the Eel River from Fortuna
MW-27	Shallow (60 ft)	Located in Loleta
MW-28 <sup>a</sup>	Shallow (60 ft)	Fills a vertical gap- other nearby water quality wells are all deep
MW-30 <sup>a</sup>	Shallow (60 ft)	Fills a spatial gap- located east of MW-8 and West of MW-19

<sup>a</sup> Well located in the Eel River Basin either upgradient, downgradient, or within the area of concern outlined in the Water Board Salt and Nutrient Staff Letter.



## 4.0 Laboratory Analyses

The groundwater quality samples are required to be analyzed for specific constituent groups outlined in the scope of work for the grant. At each location, samples will be tested for analytes within broad category groups, including metals, nutrients (nitrate), salts (TDS), organochlorine and organophosphorus pesticides, chlorinated herbicides, volatile organic compounds, semi-volatile organic compounds, polychlorinated biphenyls (PCBs), microbial contaminants, radioactive constituents, and physical parameters (pH, dissolved oxygen, redox potential, specific conductance, and temperature). Each broad category group contains many individual analytes.

Specific analytes belonging to each group were selected in order to determine an appropriate analytical testing method. Several analytical testing methods may exist for each group (for example, metals) but each analytical method tests for a different list of analytes belonging to that group (that is, one list for metals might test for arsenic and lead and another list for metals may not).

Analyte lists and testing methods typically used by municipal water suppliers were used as guides during the selection process. In some cases (metals, herbicides, salts) several analytical testing methods were selected in order to cover all of the individual analytes of interest. The broad category groups outlined in the grant and the specific analytical testing methods chosen to represent each group are shown in Table 2.

## 5.0 Field Methods and Procedures

Groundwater quality samples will be collected in accordance with the U.S. Environmental Protection Agency "Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells" guidelines (EPA, 2017). Following this standard operating procedure ensures that data quality objectives are reached and that each sample is collected in the same manner, allowing for direct comparisons of repeat measurements.

All monitoring and non-dedicated sampling equipment is decontaminated using a Liquinox® cleaner wash followed by a distilled water rinse. Decontamination occurs prior to being transported to the site and between sample collection at consecutive locations.

Each day, prior to field sampling, all equipment is function tested and calibrated, including the pH, electrical conductance, temperature, and turbidity meters used to perform low-flow monitoring for stabilization. Calibration procedures will be completed according to manufacturer recommendations. Low-flow sampling is completed using a pump and clean tubing that allows water to be collected at a slow rate directly from the monitoring wells screened interval. Pulling water from the screened interval ensures that the groundwater collected is fresh from the aquifer formation. The speed of pumping is determined by the recharge of the aquifer, so depth-to-water in the well is monitored during low-flow sampling and pump rates are adjusted, as necessary. Field measurements of temperature, pH, electrical conductance, and turbidity are collected every 3 minutes until stabilization is achieved (a minimum of three stabilized sets of parameters). Samples are then collected by decanting water directly into laboratory-supplied bottles.



Water Quality Sampling and Analysis Plan

June 22, 2021

Page 6

Table 2. Analytical Tests

Grant Category	Laboratory Test ID	Test	Example Analytes
Metals	ACDDIG	Acid Digestion	Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Hexavalent Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Vanadium, Zinc
	CHR6CW	Hexavalent Chromium	
	ICPMSW	ICP-MS Metals	
	ICPX	ICAP Metals	
	MERCW	Mercury	
Nutrients	ICNOW	Nitrate and/or Nitrite	Nitrate/Nitrite
Salts	ICIONW	Anions by Ion Chromatography	Fluoride, sulfate, chloride (no bromide)
	TDS	Total Dissolved Solids	Total dissolved solids
Pesticides	531W	N-methyl-carbamoyloximes and Carbam	3-hydroxycarbofuran, aldicarb, aldicarb sulfone, aldicarb sulfoxide, carbaryl, carbofuran, methiocarb, methomyl, oxamyl and propoxur
Herbicides	547W	Glyphosate	Glyphosate
	548W	Endothall	Endothall
	615	Chlorinated Herbicides	2,4-D, bentazon, dicamba, picloram, triclopyr, MCPA, MCPP, Dinoseb, Dichlorprop, Dalapon, 2,4-DB, 2,4,5-TP (Silvex), 2,4,5-T
VOCs (volatile organic compounds)	8260 List 6	EPA 8260, oxygenates, scavengers, BTEX, gas	33 analytes from EPA 8260, 5 oxygenates including MTBE, lead scavengers, benzene, toluene, ethylbenzene, xylenes, gasoline, and chlorinated hydrocarbons
SVOCs (semi-volatile organic compounds)	8270W	EPA 8270 SVOCs	Extended list (70+ analytes) including naphthalene and pentachlorophenol
PCB	PCB505	PCB by microextraction	Polychlorinated biphenyls (PCBs)
Microbial	TCQUANT	Coliform Quanti-tray	Coliform and fecal ( <i>e. coli</i> ) bacteria
Radioactive	GROALP	Gross Alpha	Alpha particles
Physical	ALKW	Alkalinity	alkalinity
	Field	pH, Electrical Conductance, and Temperature	Parameters measured in the field at time of sampling and not quantified at the laboratory



## Water Quality Sampling and Analysis Plan

June 22, 2021

Page 7

Sample bottles are labeled with sample date, sample time, requested analysis, location ID, and are stored in an ice-filled cooler. Samples are delivered to the laboratory within the required hold times and under standard chain-of-custody operating procedures.

Any wastewater generated when decontaminating field-sampling equipment and the well purge water will be discharged in an unpaved area at each well location.

North Coast Laboratories, Ltd., a California state certified laboratory has been contracted to conduct the analyses. It was essential that a local laboratory conduct the analyses due to short hold times for some analytes.

## 6.0 Closure

A water quality technical memorandum will be prepared following the review and analysis of the results. The results will also be incorporated into the description of the water quality conditions within the "Hydrogeologic Conceptual Model" chapter of the GSP.

Please call me at (707) 441-8855 if you have any questions.

Sincerely,

SHN



Jason Buck, CEG # 2641  
Certified Engineering Geologist

JRB/MLC:lam



## References Cited

SHN Consulting Engineers & Geologists, Inc. (December 2016). Eel River Valley Groundwater Basin, Humboldt County, California: Groundwater Sustainability Plan Alternative. Eureka, CA:SHN

State of California Department of Water Resources. (July 17, 2019). "Sustainable Groundwater Management Act, Program Alternative Assessment Staff Report, Eel River Valley (Basin No. 1-010)." NR:DWR.

State of California North Coast Regional Water Quality Control Board. (December 31, 2020) "Staff Report for North Coast Hydrologic Region Salt and Nutrient Management Planning Groundwater Basin Evaluation and Prioritization." Santa Rosa, CA:RWQCB.

State Water Resources Control Board. (November, 2019). "Sustainable Groundwater Management Act: Water Quality Frequently Asked Questions." Sacramento, CA:SWRCB.

U.S. Environmental Protection Agency, Region I. (July 30, 1996 Revised: September 19, 2017). "Low Stress (Low Flow) Purging And Sampling Procedure for The Collection of Groundwater Samples From Monitoring Wells. North Chelmsford, MA:EPA, Quality Assurance Unit.

