COUNTY OF HUMBOLDT

AGENDA ITEM NO.

For the meeting of: December 13, 2016

Date: December 8, 2016

To: Board of Supervisors

From: Thomas K. Mattson, Public Works Director

Subject: Groundwater Sustainability Plan Alternative for the Eel River Valley Groundwater Basin

RECOMMENDATION(S):
That the Board of Supervisors:
1. Receives a staff report regarding compliance with the Sustainable Groundwater Management Act for the Eel River Valley Groundwater Basin; and
2. Adopts the attached resolution authorizing preparation and submittal of a Groundwater Sustainability Plan Alternative and direct the Clerk of the Board to forward a fully executed copy of the resolution to the Director of Public Works.

SOURCE OF FUNDING: California Department of Water Resources – Proposition 1 Sustainable Groundwater Planning Grant Program; Water Management (1100251)

DISCUSSION:
The Sustainable Groundwater Management Act ("SGMA") was passed in September 2014. The intent of SGMA is to achieve sustainable management of groundwater resources for long-term reliability and multiple economic, social, and environmental benefits while avoiding undesirable results. Management responsibility is delegated to the local level with state oversight by the California Department of Water Resources ("DWR") and State Water Resources Control Board.

Prepared by Hank Seemann CAO Approval ______

REVIEW:
Auditor ______ County Counsel ______ Human Resources ______ Other ______

TYPE OF ITEM:
______ Consent
__X__ Departmental
______ Public Hearing
______ Other ______

PREVIOUS ACTION/REFERRAL:

Board Order No. H-2

Meeting of: October 6, 2015

BOARD OF SUPERVISORS, COUNTY OF HUMBOLDT
Upon motion of Supervisor Seconded by Supervisor

Ayes
Nays
Abstain
Absent

and carried by those members present, the Board hereby approves the recommended action contained in this Board report.

Dated: ______
By: ______
Kathy Hayes, Clerk of the Board

Compliance with SGMA is mandatory for high- and medium-priority basins and optional for low- and very low-priority basins. DWR's initial prioritization designated one medium-priority basin in Humboldt County – the Eel River Valley (Attachment 1) – and no high-priority basins.

SGMA identifies two compliance options for medium- and high-priority basins. One option is formation of a Groundwater Sustainability Agency ("GSA") and adoption of a Groundwater Sustainability Plan ("GSP"). GSA formation is required by June 30, 2017, and GSP adoption is required by January 2022. The second option is for a local entity to submit a Groundwater Sustainability Plan Alternative ("Alternative"), if an analysis of basin conditions demonstrates that the basin has operated within its sustainable yield over a period of at least 10 years. Alternatives must be submitted to DWR for review by January 1, 2017. On December 5, 2016, DWR released information describing the submittal process for Alternatives, including the requirement for action by a local public agency's governing body. If a local entity does not assume compliance responsibility for a medium- or high-priority basin, then the State Water Resources Control Board has the authority to prepare and implement a GSP, with fees charged to groundwater extractors for the costs of the State's intervention.

Although the County of Humboldt is not responsible for water supply within the Eel River Valley groundwater basin and is not required to assume SGMA compliance responsibility, the County organized the local response to SGMA soon after the legislation was passed. In October 2015, the Board of Supervisors directed Public Works to convene the Eel River Valley Groundwater Working Group ("Working Group") with representatives from agricultural, municipal, and environmental interests. The Working Group has convened seven meetings between October 2015 and December 2016. Presentations and minutes are available on the County website (www.humboldtgov.org/groundwater).

In July 2016, DWR awarded Humboldt County a Proposition 1 Sustainable Groundwater Planning Grant to complete the Eel River Valley Groundwater Basin Assessment ("Basin Assessment"). The Basin Assessment is a geologic and hydrogeologic investigation to support a determination whether the basin is being managed sustainably without causing undesirable results. SGMA defines "undesirable results" as one or more effects caused by groundwater conditions occurring throughout the basin. Potential undesirable results include significant and unreasonable lowering of groundwater levels, reduced groundwater storage, seawater intrusion, degraded water quality, land subsidence, or depletion of interconnected surface waters causing adverse impacts on beneficial uses. Sustainable yield is the maximum quantity of water that can be utilized over the long-term without causing undesirable results.

Public Works retained SHN Consulting Engineers and Geologists, Fisch Drilling, and the Humboldt County Resource Conservation District (HCRCD) to assist with the Basin Assessment. Field work was initiated in August 2016 and included installation of nine new monitoring wells, collection of water level measurements in over 60 wells, testing of aquifer characteristics, and collection of water surface and flow measurements in the Eel River. Groundwater monitoring depended on the assistance of residents and agricultural producers, Humboldt Creamery, Cheryl and Don Laffranchi, municipal water suppliers, HCRCD, and the Humboldt County Farm Bureau. Another round of groundwater monitoring will be conducted in

Spring 2017, and dataloggers deployed in selected monitoring wells to collect continuous data will be operated through Fall 2017.

The HCRCD developed an irrigation water use study (Attachment 2), and SHN developed a hydrogeologic conceptual model and preliminary water budget (Attachment 3). The results of the data collection and analysis are consistent with historical groundwater data and support the conclusion that the basin is being managed sustainably without causing undesirable results. A summary of the six sustainability indicators is provided in Attachment 4.

The results of the Basin Assessment indicate that there is sufficient evidence to prepare an Alternative for compliance with SGMA, and Public Works believes an Alternative is the most appropriate compliance option. The Alternative is intended to accomplish the same goals as a GSP, but does not require the formation and administration of a GSA, which allows for a more cost-effective use of limited resources. Public Works recommends that the Board adopt the attached resolution (Attachment 5) authorizing Public Works to prepare and submit an Alternative to DWR for review and approval. The technical content of the Alternative is currently in preparation and will be completed by the January 1, 2017 deadline.

If the Alternative is approved by DWR, the County of Humboldt will be required to perform a certain amount of periodic monitoring (yet to be defined) and submit annual reports. In addition, the Alternative would need to be updated in five years.

The June 30, 2017, deadline for forming a GSA does not apply if the Alternative has been submitted and is pending review with DWR. If the Alternative is disapproved (deemed inadequate), a GSA would need to be formed within six months from the date of disapproval.

DWR has indicated the intent to re-evaluate basin prioritization ratings for SGMA in mid-2017 based on new data and information. Because the HCRCD's estimates (Attachment 2) for irrigated acreage and irrigation water use were significantly lower than the amounts utilized in DWR's initial prioritization, there is the possibility that the priority rating for the Eel River Valley groundwater basin could be changed from medium- to low-priority. The likelihood of a change in prioritization is unknown. If this change occurs, then presumably the Alternative could be withdrawn or would be deemed no longer applicable.

FINANCIAL IMPACT:
Funds for the Basin Assessment are incorporated into the Fiscal Year 2016-17 budget in revenue line 1100251-525001 and expenditure line 1100251-3452. The total estimated cost for the study is $270,418. The Proposition 1 grant with DWR provides up to $250,000. The cost-share amount of $20,418 is funded from the General Fund portion of the Water Management budget. The costs for ongoing monitoring and reporting in future years will not be determined until later in 2017 after DWR reviews the Alternative submittal. These costs could affect the General Fund.

The requested action will advance two of the Board of Supervisors' core roles: providing for and maintaining infrastructure, and creating opportunities for improved safety and health.

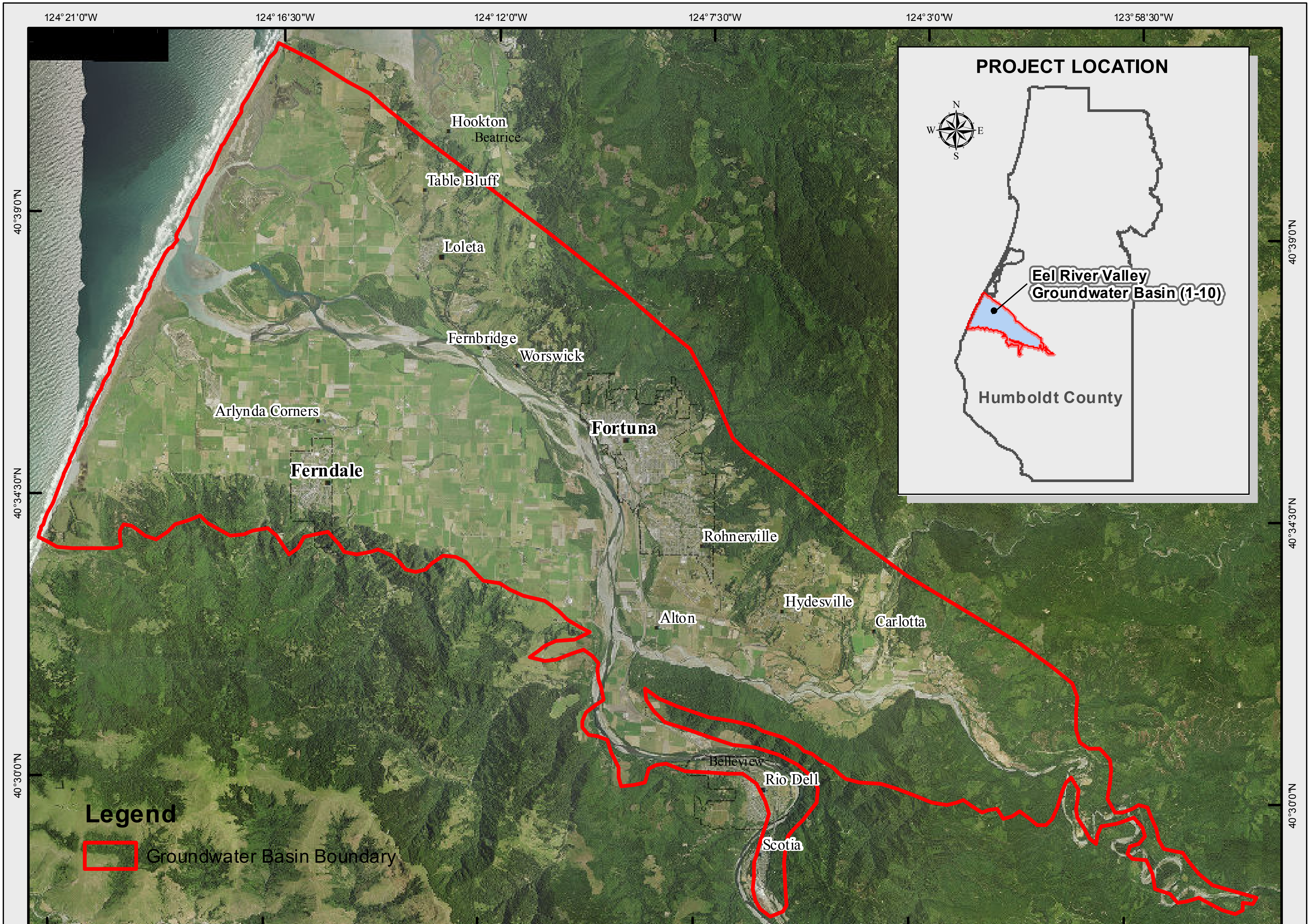
OTHER AGENCY INVOLVEMENT:
California Department of Water Resources, Humboldt County Division of Environmental Health, Planning and Building Department, Agricultural Commissioner, UC-Cooperative Extension, City of Fortuna, City of Rio Dell, Bear River Band of Rohnerville Rancheria, Hydesville Community Services District, Loleta Community Services District, Palmer Creek Community Services District, Riverside Community Services District, Scotia Community Services District.

ALTERNATIVES TO STAFF RECOMMENDATIONS:
The Board could choose not to submit the Alternative. Due to the short timeline, it is unlikely that another entity would be able to submit the Alternative by the January 1, 2017 deadline, and thus the Alternative would not be a compliance option for the basin. In this case a GSA would need to be formed by June 30, 2017, and a GSP would need to be adopted by January 2022. If either of these deadlines is unmet, then the State Water Resources Control Board would have the authority to intervene.

ATTACHMENTS:
1 Map
2 Technical Memorandum – Irrigation Water Use Study (HCRCD, 2016)
3 Water Balance Overview (SHN, 2016)
4 Summary of Sustainability Indicators
5 Resolution

Attachment 1

Map



Imagery: ESRI Basemap
Created: April 26, 2016
Humboldt County Public Works

Eel River Valley Groundwater Basin
Humboldt County, CA

N W E S
0 1.25 2.5 Miles

Attachment 1

Attachment 2

Technical Memorandum – Irrigation Water Use Study (HCRCD, 2016)

Humboldt County Resource Conservation District
5630 South Broadway Eureka, CA 95503
Phone (707) 442-6058 Ext. 5
hcrcd@yahoo.com

Technical Memorandum – Irrigation Water Use Study

Date: December 8, 2016

To: Hank Seemann, Humboldt County Department of Public Works (County)

From: Jill Demers, Executive Director, Humboldt County Resource Conservation District (HCRCD)

Re: Evaluation of Irrigated Acres and Irrigation Water Use Rates in the Eel River Valley Groundwater Basin

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This memorandum provides the results of the evaluation performed by the HCRCD to assist the County in characterizing irrigated lands and irrigation water use rates within the Eel River Valley Groundwater Basin, Humboldt County, CA to support the Eel River Valley Groundwater Working Group.

The purpose of this effort is to support agricultural producers, Humboldt County, and other stakeholders in preparing a response to the Sustainable Groundwater Management Act of 2014 by developing estimates of water use rates from agricultural irrigation that can account for annual variation in precipitation, crop production, and total acres irrigated in the Eel River Valley Groundwater Basin. A primary objective is to develop supporting data and information for estimates of water applied in an irrigation season and total number of acres irrigated for Water Year 2007 through 2016. Within Humboldt County, few (if any) irrigation systems are equipped with flow meters, therefore water use rates must be estimated indirectly. It is understood that the estimates of water use will be reasonable approximations of the aggregate irrigation practices within the Eel River Valley using the best available information; however, there will be an inherent level of variability and uncertainty.

HCRCD staff, along with County representatives, initially determined steps to be taken to identify the information provided in this memo. HCRCD also consulted regularly with Cheryl and Don Laffranchi from NorthCoast Pumphouse, who have 42 years of experience working with agricultural producers on irrigation systems and management practices in the basin, and Jeff Stackhouse, Humboldt County Livestock and Natural Resource Advisor University of California Cooperative Extension (UCCE) throughout this process. Below, we describe the sources of information, methods, and assumptions in calculating irrigated acres and water use rates in the basin.

1 METHODS

1.1 Water Year Classification

Long-term rainfall records (March 1963 through the present) were obtained from Rob Roberts and Jerry Lema of Ferndale, CA. A rain gauge has been operated at the Ferndale Museum (515 Shaw Avenue) since October 1994. The current rain gauge was manufactured by Productive Alternatives and was provided by the National Weather Service in the 1990s when the museum served as an official gauging site. From October 1970 through October 1994, daily rainfall measurements were collected by George Anderson at 1345 Main Street in Ferndale. Information regarding the location of the rain gauge from March 1963 through October 1970 was not readily available.

Monthly rainfall totals are shown in Attachment 1. Rainfall amounts are grouped by water year (for example, Water Year 2016 extends from October 2015 through September 2016).

In the coastal regions of Humboldt County, the typical growing season extends from April through October. Producers begin to operate irrigation systems in the spring when the soil moisture provided by rainfall is insufficient to support optimal vegetation growth. The end-date when irrigation systems are turned off is traditionally October 1, while the start-date will vary year to year primarily based on the timing and amounts of rainfall during the winter and spring, with wind and air temperature as secondary factors. For the purpose of this study, we classified three types of water years and estimated the start-date for and duration of an irrigation season in each type of water year as follows:

a) Dry water year – April 15 through October 1 (168 days)
b) Normal water year – May 15 through October 1 (138 days)
c) Wet water year – June 1 through October 1 (121 days)

To assist with classifying water year type, we grouped the wet-season rainfall amounts into four two-month totals (October-November, December-January, February-March, April-May). We compared the annual rainfall amount and the four two-month rainfall amounts to the 50-year averages and assigned a water year classification to each year using our professional judgment and historical knowledge of irrigation practices in the Eel River Valley Groundwater Basin. The classification of water years from 2007 through 2016 are shown in Attachment 1. For this ten-year period, there were a total of five dry years, three normal years, and two wet years.

1.2 Irrigated Acres

The HCRCD began the process of identifying and characterizing irrigated lands by digitizing in ArcGIS (ESRI© 2010) pastures and/or entire parcels within the Eel River Valley Groundwater Basin using the Department of Water Resources (DWR) Groundwater Basin 1-10 boundary GIS polygon (updated October 2016), current aerial imagery, our knowledge of current irrigation practices on the ground, interviews with agricultural producers, and consultations with professional experts Cheryl and Don Laffranchi, NorthCoast Pumphouse and Jeff Stackhouse, UCCE. We interviewed seven land managers and agricultural producers in the basin using the questionnaire developed by HCRCD and UCCE and provided as Attachment 2. We selected these producers to represent the different irrigation equipment types used in the basin and designed questions about their land management practices to capture information such as acres irrigated, the type of equipment used and irrigation infrastructure currently in place, the number of water sources and water source type used for irrigation water, seasonal irrigation scheduling, crop types grown or growing, and any planned future land management or equipment changes. Interviews and consultations took place during the months of September and October 2016.

We developed criteria and classified an area as irrigated if it was irrigated during the 2016 calendar year, irrigated within the last 5 years, or had irrigation infrastructure in place (e.g., agricultural well and functional irrigation pipeline(s) and/or irrigation equipment). We further characterized irrigated areas by crop type, water source, irrigation equipment type, and geographical area.

Based on information collected from agricultural producers and land managers, Don and Cheryl Laffranchi, and Jeff Stackhouse, we identified the dominant crop types grown throughout the basin in 2016. HCRCD and Jeff Stackhouse, UCCE, performed ground-truth verifications by driving around the basin to map and quantify crop types grown in 2016 and reviewing aerial imagery. We grouped crop types into four categories: pasture (grazed pastures/hay production/alfalfa production), corn, quinoa, and tree/row crops (including tree farms, vegetable production). We did not include small backyard vegetable gardens, nurseries and greenhouses, or cannabis. The cultivation of cannabis likely occurs in the basin, but at this time the extent of this crop type is not readily quantifiable, therefore it is not included in this study. We recommend future studies to quantify water usage associated with cannabis.

We identified three sources of water used for irrigation in the basin: surface water; groundwater; and reclaimed wastewater. Several pasture sites in the Ferndale, Fernbridge, Rio Dell/Metropolitan, and Scotia areas are irrigated using reclaimed wastewater from treatment plants (e.g., City of Ferndale, City of Rio Dell, Town of Scotia wastewater treatment plants) or from a milk production facility (i.e., Humboldt Creamery). Therefore, we characterized these pastures as irrigated by reclaimed wastewater. We characterized pastures where irrigation water is sourced from springs or surface water diversions as irrigated by surface water.

We determined that there are five dominant irrigation equipment types used in the basin: handline; traveling gun; center pivot; K-line; and wheel-line. The use of other irrigation equipment, such as hoses and flood irrigation, was infrequent and uncommon and we classified this equipment as other.

We assigned geographical area based on the proximity of an area to the nearest city or town. These designations include: Alton, Carlotta, Fernbridge, Ferndale, Fortuna, Hydesville, Loleta, Metropolitan, Rohnerville, Rio Dell, and Scotia.

We classified pastures and fields located within the Eel River Valley but outside of or bisected by the DWR basin boundary as irrigated due to irrigation water being sourced from groundwater well(s), the elevation of wells, and the proximity to the basin boundary. In addition, we classified areas where quinoa is grown and irrigation infrastructure is present as irrigated despite quinoa being a dry farm crop.

We completed area calculations within ArcGIS to obtain the total number of irrigated acres in the Eel River Valley Groundwater Basin and by geographical area, crop type, and irrigation equipment type. All maps were reviewed by Cheryl and Don Laffranchi of NorthCoast Pumphouse to verify designations and acreages based on their direct knowledge working with agricultural producers. Maps presenting the results of the 2016 irrigated acreage survey are provided in Attachments 3a – 3c.

1.3 Irrigation Water Use Rate

HCRCD interviewed seven producers as described in Section 1.2 and Attachment 2 to determine the producers' average number of irrigation events (referenced herein as "irrigation sets") in dry, normal, or wet water years (as described in Section 1.1). HCRCD and Don Laffranchi also reviewed aerial imagery of the basin and, based on historical working knowledge of the area, delineated pastures and parcels by the type of irrigation equipment used by individual producers. As described in Section 1.2, irrigation equipment used in the basin consists of five main types: handline; traveling gun; center pivot; K-line; and wheel-line. We identified a few instances of irrigation by other equipment types, however, because it was less than 0.001% of the total area, we excluded it from the water use rate calculations. In addition, HCRCD and Don Laffranchi conducted field calibrations and evaluations of irrigation equipment types at multiple sites throughout the basin. Field calibrations consisted of observing irrigation equipment while in operation, measuring area where water is applied by equipment type, calculating run times, and an evaluation of well and pump capacity by Don Laffranchi to calculate gallons per minute of water applied.

Our goal is to develop a reasonable estimate of the annual amount of groundwater used for irrigation. Therefore, we developed the average water use rate accounting only for acres irrigated by groundwater as determined in Section 1.2 and did not include surface water or reclaimed wastewater. Although crop type for 2016 was distinguished in our survey, we assumed that all irrigation water was applied to grazed pasture or hay and alfalfa production. This crop type represents over 85% of irrigation water usage in the Eel River Valley. Other crops require less irrigation; for example, irrigation for corn occurs less frequently, and quinoa is a dry farm crop. However, crop types grown in the Eel River Valley Groundwater Basin can change from year to year, and the crop type changes over the last ten years were not quantified. Therefore, we developed the average water use rate assuming all irrigation is applied for pasture to estimate the greatest potential irrigation water use for typical crops grown in the Eel River Valley. Future applications of the methodology developed in this memorandum could distinguish crop type, if desired. We also excluded cannabis, small backyard vegetable gardens, and nursery and greenhouse operations from this calculation.

We used the following equations to estimate the irrigation water use rates for a) the entire basin (acre feet/basin) and b) per acre (acre-feet/acre) for each water year. One acre-foot of water is equivalent to 325,851 gallons. This approach provides a weighted average of groundwater applied for irrigation based on equipment type.

Equation A:

$$Sum\left\{\left[\left(\frac{\left(\left(equipment\ type\ \frac{gallons}{minute}\right)\left(\frac{minutes}{set}\right)\right)}{\left(\frac{gallon}{acre\ feet}\right)}\right)\Big/\left(equipment\ type\ \frac{acres}{set}\right)\right]\times\left(\frac{sets}{water\ year}\right)\times\binom{equipment\ type}{irrigated\ acres}\right\}=\frac{acrefeet}{basin}\ water\ year$$

Equation B:

$$\frac{\left(\frac{acrefeet}{basin}\ water\ year\right)}{(total\ irrigated\ acres\ )}=\frac{acrefeet}{acre}water\ year$$

We describe the value of the parameters used in the equations below and provide Attachment 4 to show the detailed calculation steps. Calculation parameters for *Equation A* are:

Equipment type gallons/minute
Each type of equipment is capable of applying a different rate of water based on pump size, nozzle size, hose or pipe length, and pipe diameter. We averaged the results from producer interviews and field calibrations to estimate average gallons per minute (GPM) for each type of equipment.

Minutes/set
The number of minutes per set varies by equipment type used and the individual operation. We obtained estimates of hours/set from producer interviews and from this data, calculated the average minutes/set for each equipment type.

Gallons/acre foot
There are 325,851 gallons/acre-foot.

Equipment type acres/set
The area irrigated during a set will vary by operation based on size of individual fields and irrigation infrastructure. We obtained estimates of the acres/set during producer interviews and calculated the average acres/set for each equipment type.

Sets/water year
We classified each water year as dry, normal, and wet and determined the duration of the irrigation season in each water year in days as described in Section 1.1. We obtained estimates of number of sets per water year from producer interviews. On average, producers reported that they were able to irrigate an area every 26 – 30 days. We assigned the number of days between sets to each water year type: we assigned 26 days between sets to a dry year, 27 days between sets to a normal water year, and 30 days between sets to a wet water year. For each water year, we divided the number of days in an irrigation season by the number of days between sets to obtain sets/water year as follows:

a) Dry water year (April 15-October 1) – 6.5 sets per year
b) Normal water year (May 15-October 1) – 5.3 sets per year
c) Wet water year (June 1-October 1) – 4.0 sets per year

Equipment type irrigated acres
The number of acres irrigated by different equipment types using groundwater as described in Section 1.2 and Table 4.

For *Equation B*, the total irrigated acres parameter is the acres of land in the basin irrigated by groundwater sources only, as determined in Section 1.1.

2 RESULTS & DISCUSSION

2.1 Irrigated Acres

The total area of irrigated land in the Eel River Valley Groundwater Basin is estimated at 14,022 acres. Table 1 describes the amount of estimated irrigated land (acres) within the identified geographical areas. This estimate is less than what has previously been reported (DWR, 2012) as discussed in Section 3. We believe the estimate developed in our study more accurately captures on-the-ground conditions and reflects local data and professionals' knowledge of the basin. For example, we did not find extensive irrigation occurring in the western portions of the Eel River Valley Groundwater Basin (attachments 3a – 3b) and irrigation infrastructure is not in place. This is locally recognized to be due to landscape and soil features that provide "sub-irrigation", or moisture for crops from soil reserves. Similarly, there are other areas throughout the basin that we identified as not receiving irrigation and thus contributed to the lower estimate.

Table 1. Estimated area (acres) irrigated in each geographical area in the Eel River Basin Valley Groundwater, Humboldt County, CA.

Geographical Area	Acres
ALTON	887
CARLOTTA	383
FERNBRIDGE	160
FERNDALE	10,299
FORTUNA	13
HYDESVILLE	122
LOLETA	1,463
RIO DELL/METROPOLITAN	566
ROHNERVILLE	13
SCOTIA	116
Total Acres	**14,022**

Pasture accounts for 85% of the irrigated crop type in the basin (Table 2). Groundwater is the principle irrigation water source in the basin, accounting for 13,558 of the acres irrigated, or

97% of the basin (Table 3). Within the area where groundwater is the principle irrigation water source, handlines and traveling guns were the primary irrigation equipment types used (Table 4).

Table 2. Estimated area (acres) irrigated by crop type grown in 2016 in the Eel River Valley Groundwater Basin, Humboldt County, CA.

Crop Type Grown in 2016	Acres
Corn	1,750
Pasture	11,994
Quinoa	127
Tree/Row	151
Total Acres	**14,022**

Table 3. Estimated area (acres) irrigated by water source in the Eel River Valley Groundwater Basin, Humboldt County, CA.

Irrigation water source	Acres
Ground Water	13,558
Surface Water	126
Reclaimed Wastewater	339
Total Acres	**14,022**

Table 4. Total acres and percent of total acres irrigated by equipment type using groundwater in the Eel River Valley Groundwater Basin, Humboldt County, CA.

Equipment Type	Acres	% of Total Acres
Handline	7,044	52%
Traveling Gun	4,310	32%
Wheel Line	1,107	8%
K-Line	989	7%
Center Pivot	88	1%
Other	20	<0.001%
Total	**13,558**	**100%**

2.2 Irrigation Water Use Rates

We estimate that groundwater use throughout the Eel River Valley Groundwater Basin ranges from 10,265 acre-feet in a wet water year to 16,680 acre-feet in a dry water year (Table 5). Per acre, groundwater use ranges from 0.8 acre-feet/acres in a wet water year to 1.2 acre-feet/acres in a dry water year (Table 5).

Table 5. Irrigation groundwater use rate by water year in the Eel River Valley Groundwater Basin, Humboldt County, CA.

Water Year	Total Acre-Feet in Basin	Acre-Feet/Acre	Estimate of Water Use in Last 10 Years
Dry Irrigation Season (April 15th – October 1st)	16,680	1.2	2008, 2009, 2013, 2014, 2015
Normal Irrigation Season (May 15th – October 1st)	13,600	1.0	2007, 2012, 2016
Wet Irrigation Season (June 1st – October 1st)	10,265	0.8	2010, 2011

This effort attempts to estimate the annual amount of groundwater used for irrigation in the Eel River Valley Groundwater Basin. We believe that these estimates of water use are reasonable approximations of groundwater use within the Eel River Valley, however there will be an inherent level of variability and uncertainty. Variation exists between each agricultural operation, as each has its own land base, infrastructure and management approach. For example, the number of irrigation sets / water year can vary based on type of equipment, pasture configuration, equipment failures, scheduling irrigation by peak hour electrical use rates, and availability of labor. The results that are provided here represent the best information readily available from a sample of farms within the basin.

3 COMPARISON WITH OTHER PUBLISHED VALUES

USGS (1978)

The U.S. Geological Survey published "Ground-Water Conditions in the Eureka Area, Humboldt County, California, 1975" (Water-Resources Investigations 78-127) in December 1978. The estimated groundwater use in the Eel River floodplain and the Eel and Van Duzen River valleys upstream of the confluence for 1975 was 17,300 acre-feet (Table 3 in USGS, 1978). This estimate utilized the "energy-lift" method based on electricity usage records and pump information. The 1978 USGS report also presents data compiled by DWR from 1968 which indicated a total of 18,800 acre-feet over 11,700 acres within the same study area. The 1968 DWR data were based on the "land-use" method which utilized a unit applied-water factor ranging from 1.0 to 1.7 acre-feet per acre based on crop type. USGS (1978) concluded that groundwater pumpage had remained fairly stable from the late 1950s to the mid-1970s.

DWR (2003)

DWR updated "California's Groundwater" (Bulletin 118) in 2003. The description for the Eel River Valley Groundwater Basin (updated February 27, 2004) includes an estimate of 49,000 acre-feet of water use for agricultural purposes. The document does not provide an estimate of irrigated acreage or water use rate (acre-feet per acre) within the basin. The document references a survey conducted by DWR in 1996; however, additional information regarding the survey data or methodology is not provided. The results in the DWR Bulletin (2003) are significantly higher than the results presented in this memorandum.

DWR (2012)

In 2015, the DWR Red Bluff office provided Humboldt County an unpublished spreadsheet titled "Developed Water Use Balance" for the year 2010. This spreadsheet indicates an estimate of 21,900 acre-feet over 23,700 acres for the Lower Eel River detailed analysis unit (DAU) and 2,500 acre-feet over 3,100 acres for the Van Duzen DAU, for a total of 24,400 acre-feet over 26,800 acres within the groundwater basin. The implied water use rate over the entire basin is 0.91 acre-feet per acre. While the irrigated acreage values in DWR (2012) are nearly two times higher than the results presented in this memorandum, the water use rate in DWR (2012) is comparable to the water use rate we estimated for a normal water year.

USDA (2013)

U.S. Department of Agriculture published a 2013 Farm and Ranch Irrigation Survey (FRIS) [https://www.agcensus.usda.gov/Publications/2012/Online_Resources/Farm_and_Ranch_Irrigation_Survey/]. On Table 36 of USDA (2013), the average acre-feet of applied water per acre in California is 3.8 for "alfalfa and mixtures"; 2.8 for "all other hay (dry hay, greenchop, and silage)"; and 2.0 for "pastureland, all types." These results reflect state-wide averages and are not representative of the climatic characteristics of coastal Humboldt County. The close proximity to the Pacific Ocean leads to mild summer temperatures and regular occurrences of heavy fog. The relatively low air temperature and high relative humidity results in the North Coast having the lowest evapotranspiration rate in California, as shown on the state-wide Reference Evapotranspiration zone map (DWR, 1999). Therefore, water use rates within the Eel River Valley Groundwater Basin are expected to be significantly lower than warmer and more arid regions of the state.

4 OBSERVATIONS ON CHANGES OVER THE LAST 10 YEARS AND POTENTIAL CHANGES OVER THE NEXT 5 YEARS

Through producer interviews we identified changes to land management over the last 10 years and future changes planned for the next 5 years.

In the past 10 years, there has been an increase in the number of wells drilled in the Eel River Valley Groundwater Basin through cost-share assistance provided to eligible producers from the USDA-Natural Resources Conservation Service (NRCS) Environmental Quality Incentives

Program (EQIP) for Drought Assistance and the USDA-Farm Service Agency (FSA) Emergency Conservation Program (ECP). Older wells have also been deepened due to recent drought conditions. New infrastructure and/or improvements to existing irrigation systems have allowed some producers to increase the number of acres they irrigate. Producers have been and continue to replace older, inefficient irrigation equipment with newer, more efficient equipment. Currently, there are approximately 49 dairies that operate in the Eel River Valley Groundwater Basin. All except a few of these are now certified organic, which requires an increased focus on effective management of pastures, including irrigation. In the past 10 years, we have seen approximately 8 dairies switch to beef and/or crop-only production. In the last 3 years, there has been a trend towards more dry farm cropping (quinoa), although this crop type can be rotated with perennial pasture grassland crops. Overall, these changes are relatively small, and we do not believe there were any major changes in water use over the last 10 years.

In the next 5 years, land managers anticipate continued improvements of irrigation infrastructure and more efficiently applying irrigation water on crops. The types of crops grown may vary by year, and we expect crops to be influenced by factors such as climatic conditions and industry supply and demand.

5 ABOUT HCRCD

Established in 1987 as the Eel River Valley Resource Conservation District, the Humboldt County Resource Conservation District (HCRCD) has a proven track record of accomplishments with our local dairy industry, and has successfully implemented soil and water conservation projects with dairies for the past 17 years. The HCRCD recently completed the North Coast Irrigation Water and Fertigation Management Plan to provide increased knowledge to producers on practices that optimize irrigation water and fertilizer usage, increase sustainable use and conservation of groundwater resources, and improve pasture productivity.

Attachment 1: Monthly rainfall totals (inches) recorded in Ferndale, Humboldt County, CA

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Annual	Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Water Year Classification
1963						6.91	10.89	1.70	0.35	0.27	0.14	0.51						
1964	4.20	7.12	3.44	10.72	1.18	5.25	0.43	1.42	0.54	0.23	0.22	0.07	34.82					
1965	2.59	11.50	18.55	7.26	1.61	1.06	6.01	0.29	0.51	0.07	0.35	0.06	49.86					
1966	0.74	7.01	6.58	9.88	3.85	6.37	1.39	0.03	0.36	0.22	0.44	1.25	38.12					
1967	0.71	9.87	7.48	8.49	0.97	8.51	4.73	1.16	0.58	0.02	0.06	1.84	44.42	10.58	15.97	9.48	5.89	
1968	2.29	4.77	4.66	9.32	2.98	4.10	0.62	0.81	0.17	0.22	2.11	0.35	32.40	7.06	13.98	7.08	1.43	
1969	2.56	5.81	11.55	13.88	11.1	1.45	3.57	1.10	0.53	0.16	0.01	0.38	52.10	8.37	25.43	12.55	4.67	
1970	1.85	3.96	9.72	12.4	3.77	2.88	1.62	0.80	0.21	0.00	0.00	0.00	37.21	5.81	22.12	6.65	2.42	
1971	1.57	10.91	10.75	6.32	3.49	7.93	2.73	0.77	1.25	0.13	0.45	1.03	47.33	12.48	17.07	11.42	3.5	
1972	1.36	7.20	8.21	6.61	6.89	4.30	3.29	0.71	0.47	0.02	0.07	0.48	39.61	8.56	14.82	11.19	4	
1973	4.77	5.23	7.12	8.13	4.48	7.25	0.77	0.00	0.49	0.01	0.11	1.88	40.24	10.00	15.25	11.73	0.77	
1974	3.45	19.67	7.89	9.66	6.78	8.24	4.08	0.38	0.49	0.35	0.37	0.00	61.36	23.12	17.55	15.02	4.46	
1975	1.18	2.14	8.71	5.45	9.30	11.92	3.07	0.56	0.29	0.15	0.31	0.00	43.08	3.32	14.16	21.22	3.63	
1976	6.91	5.51	5.95	2.19	7.66	3.00	3.50	0.28	0.16	0.00	0.17	3.37	38.70	12.42	8.14	10.66	3.78	
1977	2.14	5.32	7.38	10.35	8.59	3.88	4.80	0.94	0.19	0.14	1.58	0.06	45.37	7.46	17.73	12.47	5.74	
1978	0.16	3.65	0.62	1.93	3.20	4.72	1.13	2.44	0.32	0.06	0.41	2.71	21.35	3.81	2.55	7.92	3.57	
1979	0.04	0.99	2.80	4.63	6.97	3.31	3.20	1.81	0.03	0.28	0.67	0.55	25.28	1.03	7.43	10.28	5.01	
1980	7.66	5.86	4.19	3.51	7.21	5.58	4.45	1.27	0.14	0.01	0.08	0.25	40.21	13.52	7.7	12.79	5.72	
1981	1.05	2.07	6.83	11.55	4.40	5.32	0.72	1.46	0.24	0.05	0.06	0.93	34.68	3.12	18.38	9.72	2.18	
1982	3.57	10.91	7.57	5.47	4.68	8.42	7.61	0.06	0.56	0.18	0.14	0.48	49.65	14.48	13.04	13.1	7.67	
1983	5.91	7.89	11.64	9.26	11.40	10.97	6.23	1.32	0.71	0.90	3.78	0.18	70.19	13.80	20.9	22.37	7.55	
1984	1.04	12.69	14.46	0.66	4.97	4.35	2.77	1.60	1.00	0.02	0.05	0.13	43.74	13.73	15.12	9.32	4.37	
1985	3.68	16.34	4.47	0.76	4.18	4.94	0.27	0.70	0.96	0.05	0.32	1.10	37.77	20.02	5.23	9.12	0.97	
1986	3.97	3.42	2.66	8.50	11.65	6.31	1.58	1.88	0.14	0.02	0.02	2.92	43.07	7.39	11.16	17.96	3.46	
1987	1.53	1.90	4.80	6.76	4.43	10.03	0.90	0.31	0.17	0.24	0.08	0.05	31.20	3.43	11.56	14.46	1.21	
1988	0.75	3.87	12.55	6.78	0.18	1.21	2.14	1.89	2.68	0.09	0.03	0.05	32.22	4.62	19.33	1.39	4.03	
1989	0.56	9.93	7.67	5.08	3.11	7.98	1.66	1.16	0.25	0.02	0.37	0.95	38.74	10.49	12.75	11.09	2.82	

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Annual	Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Water Year Classification
1990	3.25	2.01	0.71	7.46	5.77	3.18	1.45	3.65	0.23	0.43	0.51	0.12	28.77	5.26	8.17	8.95	5.1	
1991	2.07	2.89	2.63	0.91	3.36	7.84	1.43	1.88	0.31	0.43	0.93	0.08	24.76	4.96	3.54	11.2	3.31	
1992	1.24	2.33	2.10	3.18	6.70	4.41	1.87	0.22	0.72	0.19	0.15	0.17	23.28	3.57	5.28	11.11	2.09	
1993	1.98	2.57	10.44	8.20	6.20	4.36	4.60	3.70	1.71	0.49	0.64	0.27	45.16	4.55	18.64	10.56	8.3	
1994	0.47	1.77	7.61	5.54	8.59	2.86	3.12	1.49	0.57	0.13	0.04	0.20	32.39	2.24	13.15	11.45	4.61	
1995	0.50	7.21	7.69	16.22	2.17	12.52	6.72	1.38	1.11	0.26	0.19	0.46	56.43	7.71	23.91	14.69	8.1	
1996	0.58	1.32	11.97	9.70	8.53	3.33	5.02	1.90	0.03	0.07	0.11	0.75	43.31	1.90	21.67	11.86	6.92	
1997	2.43	5.19	23.13	9.71	2.50	2.65	2.76	0.44	1.13	0.07	0.63	0.85	51.49	7.62	32.84	5.15	3.2	
1998	2.68	8.36	5.95	14.76	17.08	8.79	3.51	3.48	0.76	0.53	0.14	0.17	66.21	11.04	20.71	25.87	6.99	
1999	2.26	11.80	6.05	4.95	12.13	10.43	3.00	1.40	0.30	0.17	0.65	0.15	53.29	14.06	11	22.56	4.4	
2000	1.79	7.97	4.93	10.70	9.71	3.00	3.38	2.22	0.56	0.26	0.14	0.44	45.10	9.76	15.63	12.71	5.6	
2001	3.13	3.41	2.29	5.18	5.61	2.96	3.04	0.46	0.77	0.33	0.54	0.24	27.96	6.54	7.47	8.57	3.5	
2002	0.95	7.66	11.50	6.36	5.58	4.87	2.45	0.80	0.22	0.11	0.05	0.18	40.73	8.61	17.86	10.45	3.25	
2003	0.26	3.93	26.71	4.98	3.63	6.55	12.98	1.45	0.09	0.06	0.47	0.45	61.56	4.19	31.69	10.18	14.43	
2004	0.72	6.39	11.08	7.65	11.01	2.36	1.35	1.36	0.23	0.19	0.43	0.31	43.08	7.11	18.73	13.37	2.71	
2005	6.29	2.34	8.79	7.25	3.07	6.88	4.86	3.27	3.03	0.10	0.14	0.08	46.10	8.63	16.04	9.95	8.13	
2006	1.83	6.17	14.52	9.89	6.42	13.04	4.69	0.89	0.27	0.14	0.02	0.16	58.04	8.00	24.41	19.46	5.58	
2007	0.54	7.36	7.78	1.96	12.04	3.01	2.66	1.23	0.29	0.84	0.05	0.23	37.99	7.90	9.74	15.05	3.89	Normal
2008	3.15	2.28	7.85	10.70	4.12	2.59	1.84	0.11	0.43	0.15	0.44	0.06	33.72	5.43	18.55	6.71	1.95	Dry
2009	1.25	3.87	6.37	1.43	7.91	5.44	1.11	1.99	0.24	0.21	0.16	0.56	30.54	5.12	7.8	13.35	3.1	Dry
2010	2.86	3.80	4.41	11.29	5.57	5.85	7.94	3.28	1.81	0.08	0.35	0.62	47.86	6.66	15.7	11.42	11.22	Wet
2011	4.29	5.41	11.19	1.71	5.08	12.30	4.22	1.37	1.62	0.20	0.17	0.27	47.83	9.70	12.9	17.38	5.59	Wet
2012	3.25	4.53	1.67	5.81	3.42	12.10	5.09	0.66	1.78	1.16	0.11	0.10	39.68	7.78	7.48	15.52	5.75	Normal
2013	2.41	8.90	11.11	2.88	1.73	3.64	1.87	0.85	0.46	0.06	0.23	2.07	36.21	11.31	13.99	5.37	2.72	Dry
2014	0.14	1.32	0.61	0.89	6.06	5.74	1.50	0.72	0.16	0.14	0.17	2.45	19.90	1.46	1.5	11.8	2.22	Dry
2015	5.56	4.15	10.72	1.13	7.82	2.20	4.06	0.25	0.13	0.19	0.57	0.68	37.46	9.71	11.85	10.02	4.31	Dry
2016	1.01	4.34	13.16	13.29	3.33	10.05	3.24	0.59	0.05	0.16	0.14	0.23	49.59	5.35	26.45	13.38	3.83	Normal
												50-year average	41.6	8.1	14.9	12.1	4.6	

Notes:

(1) Data provided by Rob Roberts and Jerry Lema. Gauge located at 515 Shaw Avenue since October 1994, and at 1345 Main Street from October 1970 to October 1994. Location prior to October 1970 was not determined.

(2) As an example, Water Year 2016 extends from October 2015 through September 2016

(3) Water year classification (Dry / Normal / Wet) is determined by comparing annual rainfall and four two-month rainfall totals to the 50-year average

Attachment 2: Producer Questionnaire

Irrigation Water Usage in Eel River Valley Basin

Interview questions for producers

Goal:
To determine irrigation water volumes applied to crops over growing seasons under normal, dry and wet years

1. What type of equipment do you use to irrigate?________________________________

   Equipment specs: (e.g. make/model, pump HP, pump rating if known, sprinkler nozzle size, pipe diameter)

   ____

   ____

   If applicable:

   a. What is head spacing distance? (distance between sprinkler heads along line)____________
   b. What is line spacing distance? (distance between lines in field)____________________
   c. How many sprinklers/heads used in a set (if applicable)________________________
      [a set is defined as 1 irrigation event]

2. Do you have plans to change your irrigation equipment?____________________________

   If yes, what type of irrigation system would you like to shift toward?____________________

3. Irrigation sources – groundwater wells or surface water or both?______________________

4. How many wells are used/available for irrigation?________________________________

   a. What are well depths, if known____
   b. Are there wells that could be accessed for sounding, and would you be willing to allow sampling?

   ____

5. If multiple wells, average # acres covered by each well______________________________

6. When do you **start** irrigating in spring: in a normal year? ________________________

   in a dry year?________________________

   in a wet year?________________________

Notes____

Questionnaire developed by Humboldt County Resource Conservation District and UCCE September 2016

1

7. When do you **stop** irrigating in fall: in a normal year? ______________________

in a dry year?______________________

in a wet year?______________________

Notes____

8. How many hours do you irrigate per set?______________________

Do hours per set change based on normal, dry or wet year?______________________

Notes____

9. How many sets can you/do you irrigate: in a normal year? ______________________

in a dry year?______________________

in a wet year?______________________

Notes____

10. How many acres do you irrigate each season?______________________

11. Does your irrigated acreage change annually?______________________

Notes____

12. Do you expect your irrigated acres to change in the future?______________________

13. How many times a year does each area or field get irrigated?______________________

14. How long does it take to make a complete rotation of all acreage?______________________

15. What kinds of crops are irrigated and average production (DM/tons/acre)______________________

____

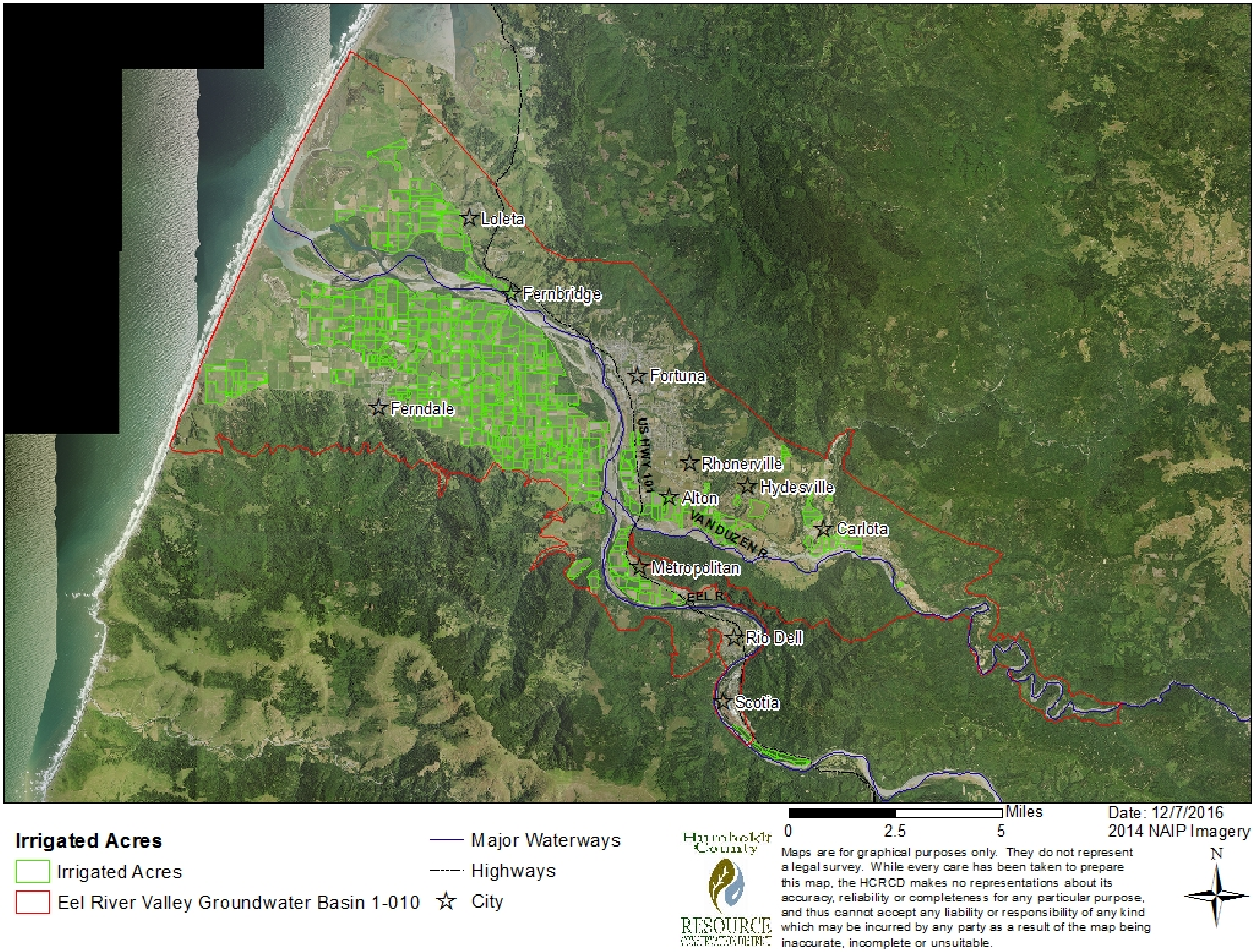
Irrigator's Equation to determine how much water applied (solve for "d"):

$Q \times d = t \times A$

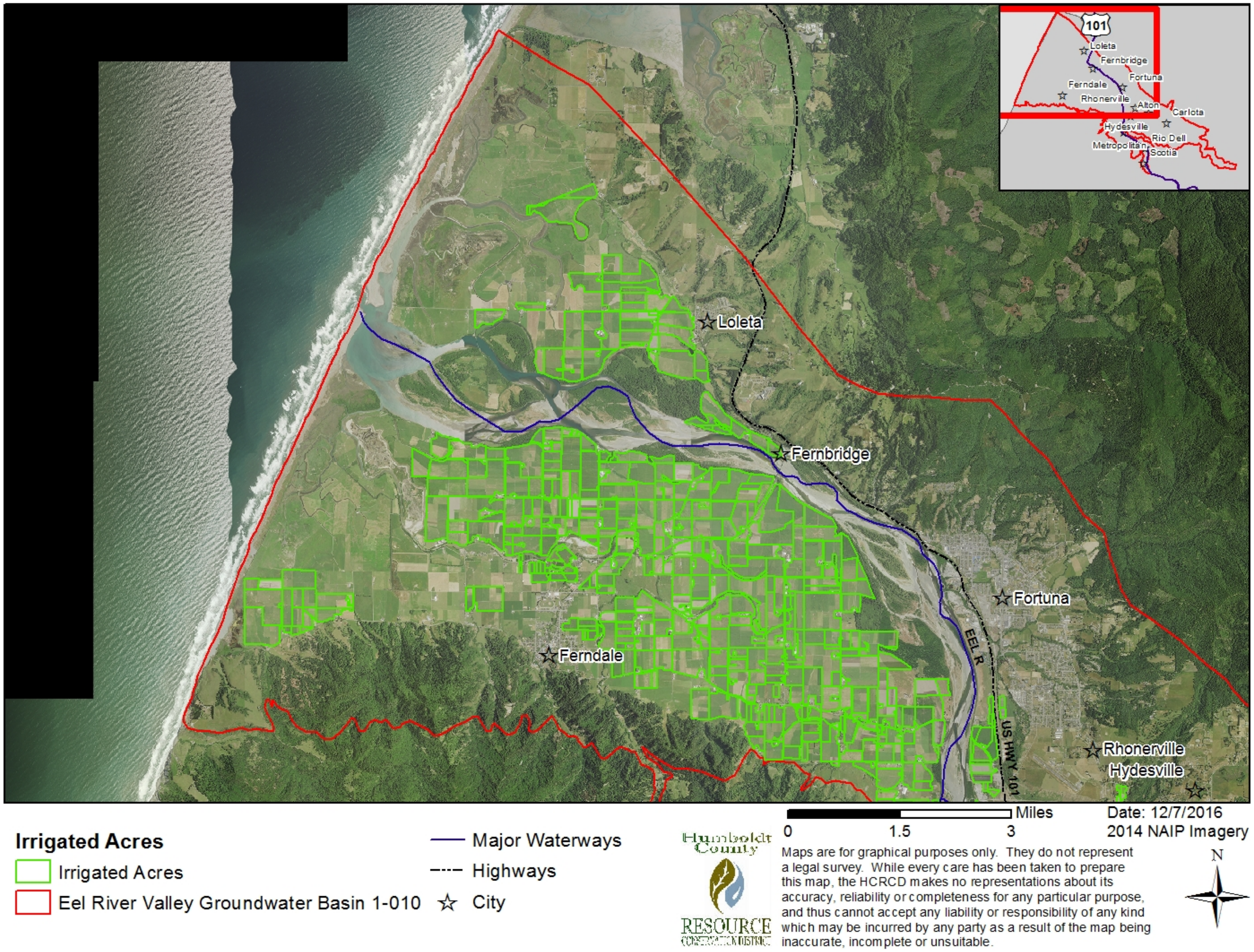
where
Q = flow rate in cubic feet per second (cfs)
t = set time or total time of irrigation (hours)
d = depth of water applied (inches)
A = area irrigated (Acres)

2

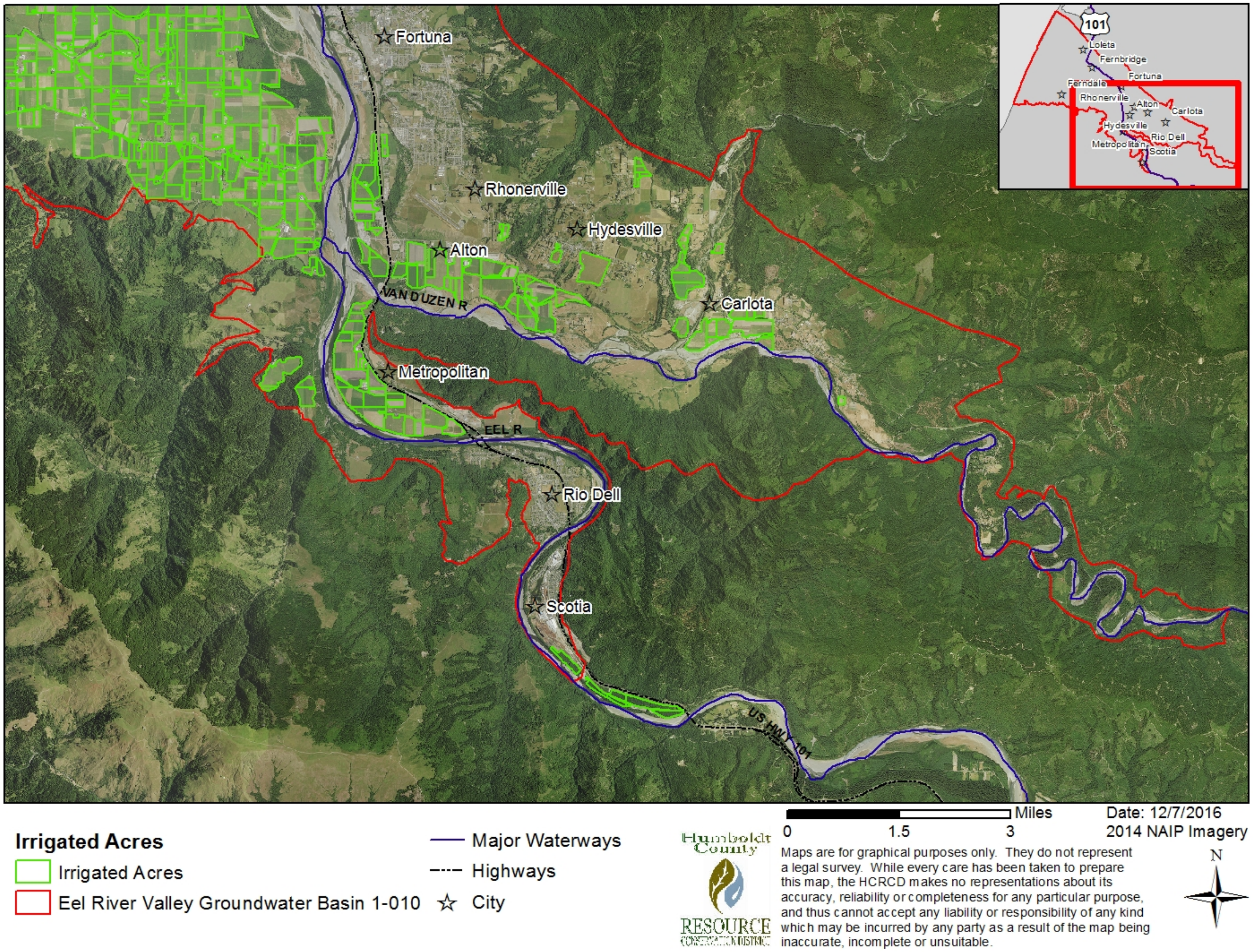
Attachment 3a: Irrigated acres in the Eel River Valley Groundwater Basin, Humboldt County, CA in 2016.



Attachment 3b: Irrigated acres in the Ferndale, Loleta, Fernbridge, and Fortuna geographical areas of the Eel River Valley Groundwater Basin, Humboldt County, CA in 2016.



Attachment 3c: Irrigated acres in the Fortuna, Rohnerville, Alton, Metropolitan, Hydesville, Carlotta, Rio Dell, and Scotia geographical areas, Eel River Valley Groundwater Basin, Humboldt County, CA in 2016.



Attachment 4: Groundwater Irrigation Use Rates Calculations. See Section 1.3 for the summary of sources of information, methods, and assumptions made in calculating water use rates and Table 5 for results.

Equation A:

$$Sum\left\{\left[\left(\frac{\left(\left(equipment\ type\ \frac{gallons}{minute}\right)\left(\frac{minutes}{set}\right)\right)}{\left(\frac{gallon}{acre\ feet}\right)}\right)\Big/\left(equipment\ type\ \frac{acres}{set}\right)\right]\times\left(\frac{sets}{water\ year}\right)\times\left(\begin{matrix}equipment\ type\\ irrigated\ acres\end{matrix}\right)\right\}=\frac{acrefeet}{basin}\ water\ year$$

Parameters included in Equation A:

<table>
<tr><th rowspan="2">Equipment Type</th><th rowspan="2">Gallons / Minute*</th><th rowspan="2">Minutes / Set*</th><th rowspan="2">Gallons / Acre-foot</th><th rowspan="2">Acres / Set*</th><th colspan="3">Sets / Water Year **</th><th rowspan="2">Acres Irrigated by Groundwater</th><th colspan="3">SUM {Equation A} = Acre-feet/Basin by Water Year</th></tr>
<tr><th>Wet Water Year</th><th>Normal Water Year</th><th>Dry Water Year</th><th>Wet Water Year</th><th>Normal Water Year</th><th>Dry Water Year</th></tr>
<tr><td>Handline</td><td>375</td><td>600</td><td rowspan="6">325,851</td><td>2.4</td><td rowspan="6">4.0</td><td rowspan="6">5.3</td><td rowspan="6">6.5</td><td>7,044</td><td>8,106.78</td><td>10,741.49</td><td>13,173.53</td></tr>
<tr><td>Traveling Gun</td><td>220</td><td>960</td><td>9.0</td><td>4,310</td><td>1,241.55</td><td>1,645.06</td><td>2,017.53</td></tr>
<tr><td>Pivot</td><td>200</td><td>1440</td><td>4.0</td><td>88</td><td>77.41</td><td>102.57</td><td>125.80</td></tr>
<tr><td>K-line</td><td>600</td><td>720</td><td>10.3</td><td>989</td><td>509.09</td><td>674.55</td><td>827.28</td></tr>
<tr><td>Wheel-line</td><td>300</td><td>720</td><td>8.9</td><td>1,107</td><td>329.82</td><td>437.01</td><td>535.95</td></tr>
<tr><td>Other</td><td>-</td><td>-</td><td>-</td><td>20</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>13,558</td><td>10,264.7</td><td>13,600.7</td><td>16,680.1</td></tr>
</table>

* Averaged from data collected during producer interviews

** Sets/water year is the estimated number of times any given acre is irrigated in a water year as calculated in Section 1.3.

Equation B:

$$\frac{\left(\frac{acrefeet}{basin}\ water\ year\right)}{(total\ irrigated\ acres\ )} = \frac{acrefeet}{acre} water\ year$$

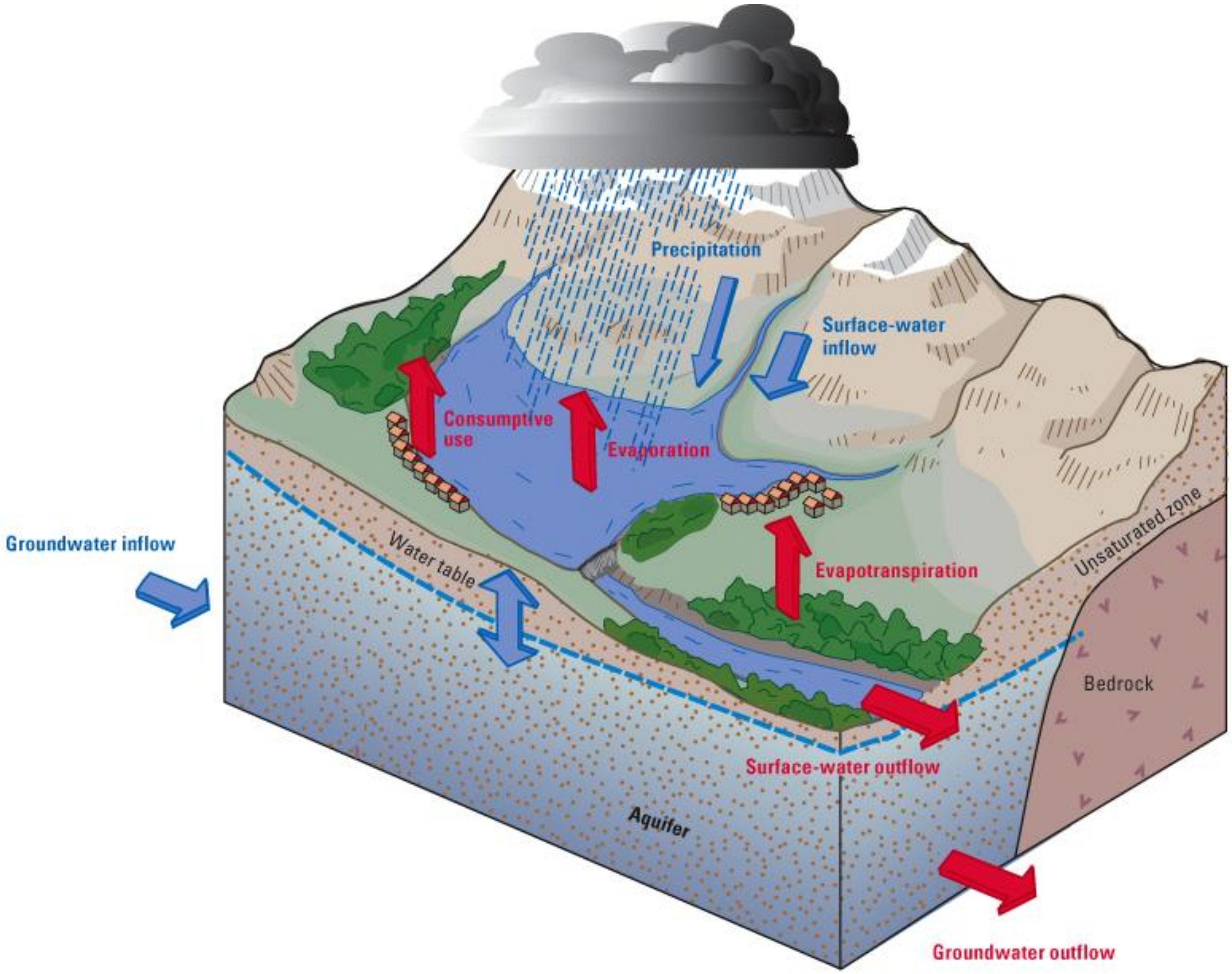
Equation B: Parameters and Results

Water Year	Total Acre-feet/Basin	Acre-feet/Acre
Dry	16,680	1.2
Normal	13,600	1.0
Wet	10,265	0.8

Attachment 3

Water Balance Overview (SHN, 2016)

Water Balance Overview



SHN Engineers & Geologists

Simplified Water Balance Equation

Based on the conditions of the Eel River Valley Groundwater Basin, the water balance equation can be reduced to:

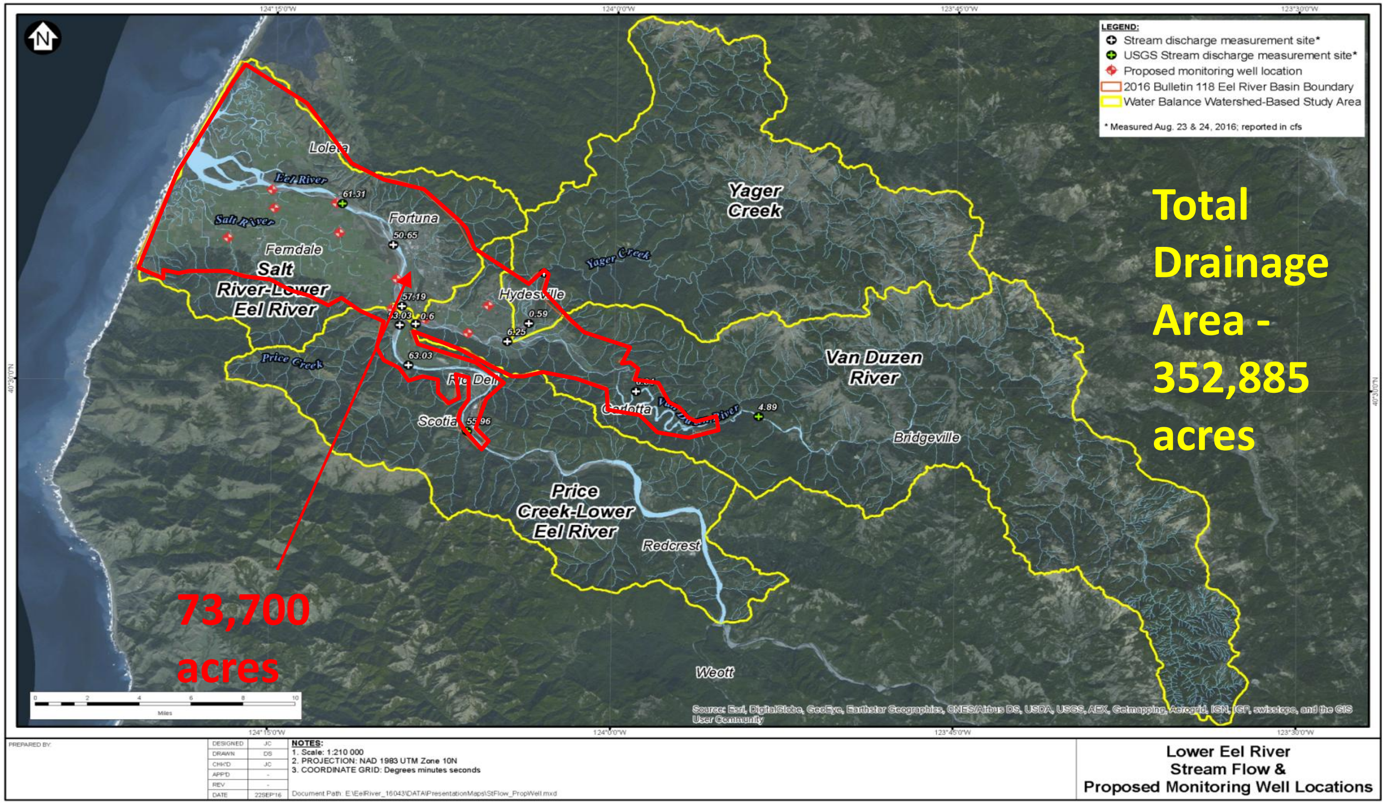
$$P + SW\downarrow in + GW\downarrow in = AET + SW\downarrow out + GW\downarrow out + \Delta S\downarrow SW + \Delta S\downarrow GW$$

Using a GIS Based model based on long-term climate averages, SW_{out} minus SW_{in} components can be represented by the total surface water runoff (RO) within the basin, and GW_{out} minus GW_{in} components can be represented by the total recharge (R) within the basin.

Precipitation = Evapotranspiration + Runoff + Recharge

Preliminary Water Balance – 5 Steps

- Step 1. Define the watershed boundary for all contributing surface water and groundwater inputs to the study area.



Introduction

Conceptual Hydrogeologic Setting

Preliminary Water Balance

Sustainability Indicators

What's Next?

Preliminary Water Balance – 5 Steps

- Step 2. Calculate the water balance components for the study area.

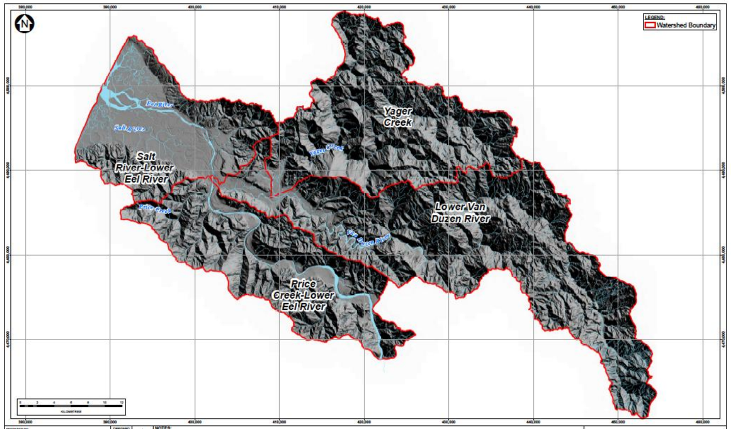
Precipitation – Evapotranspiration = **Surplus** (amount of water available for Recharge and Runoff)

Scotia Station – Water Balance	**Long Term Climate Average Water Balance – Thornthwaite and Mather (1957) Accounting Method**												
Pre-Development Water Balance (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Precipitation	199.7	186.4	175.9	89.8	48.3	16.8	3.4	3.3	14.8	56.9	130.9	249.4	1175.5
Temperature	9.5	10.1	10.8	11.8	13.6	15.2	16.6	17.1	16.5	14.7	11.4	8.9	13.0
Potential Evapotranspiration (PET)	30	32	43	53	71	83	95	91	76	61	37	26	698
P - PET	170	155	132	37	-23	-66	-91	-88	-62	-4	93	223	478
Change in Soil Moisture Storage	-4	-1	-9	-7	-17	-3	-6	2	8	10	17	10	0
Soil Moisture Storage	122	121	112	105	88	85	79	81	89	99	116	126	-
Actual Evapotranspiration (AET)	30	32	43	53	65	20	9	1	7	47	37	26	371
Soil Moisture Deficit (mm)	0	0	0	0	6	63	85	90	70	14	0	0	327
Surplus (P - AET)	170	155	132	37	-17	-3	-6	2	8	10	93	223	804

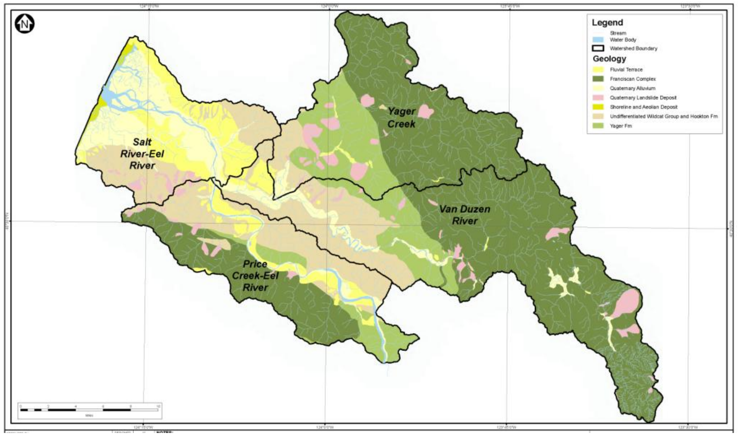
SHN Engineers & Geologists

Preliminary Water Balance – 5 Steps

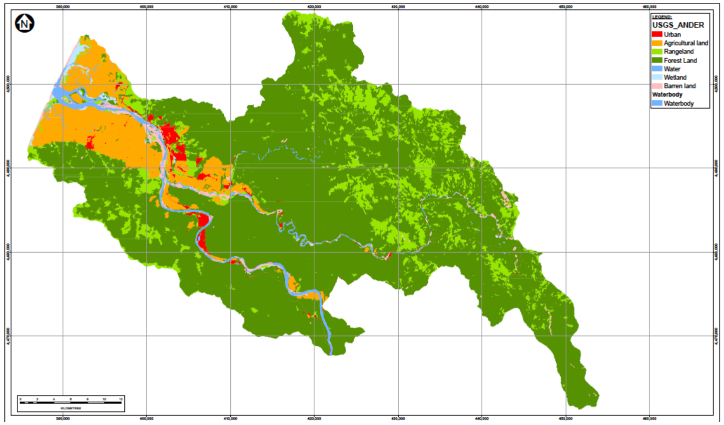
- Step 3. Partition Surplus into Recharge and Runoff based on key factors



Topography/Slope

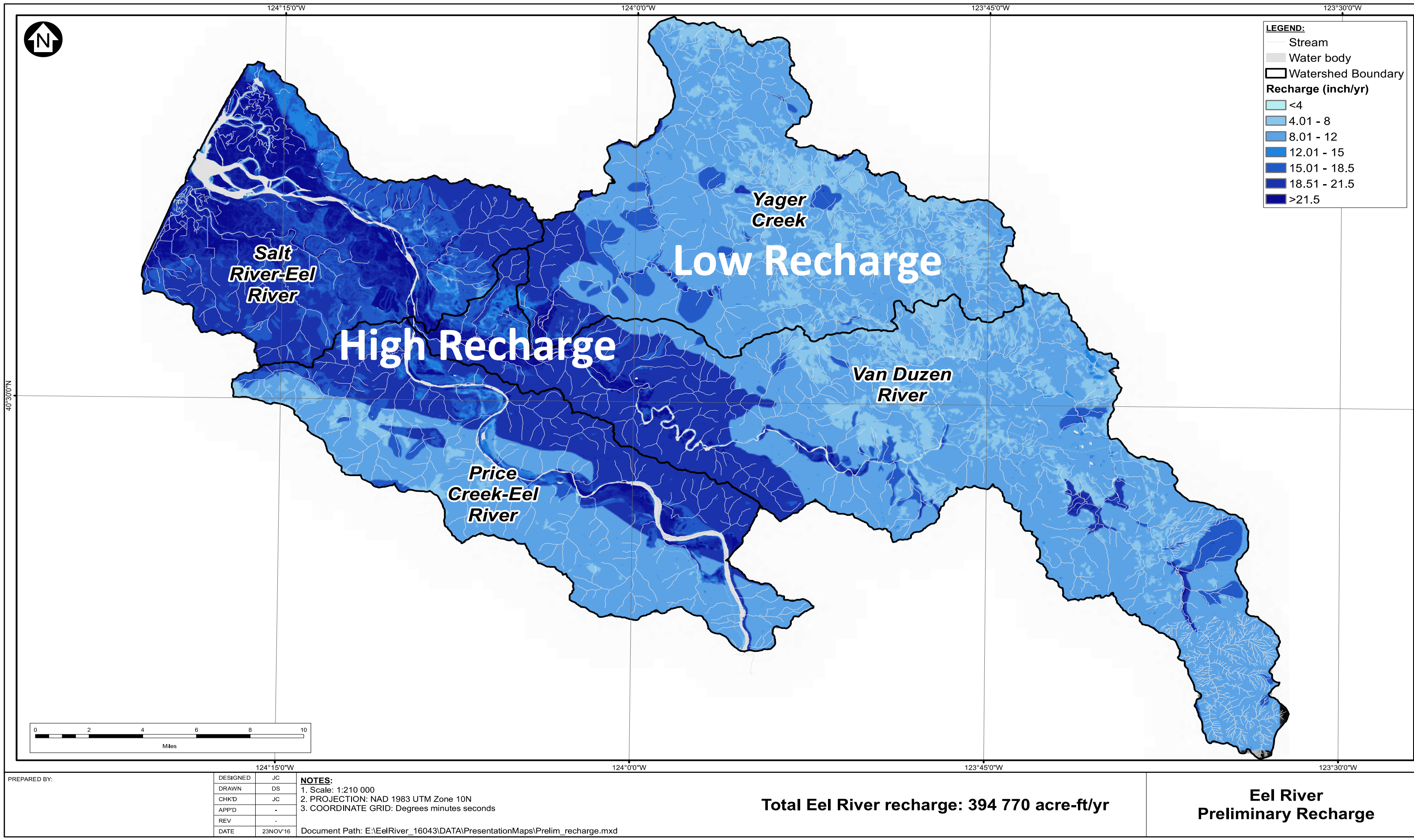


Geology/Soils



Land Use/Vegetation

GIS Based Water Balance Model - Preliminary Recharge



GIS Based Water Balance Model - Preliminary Runoff

Introduction

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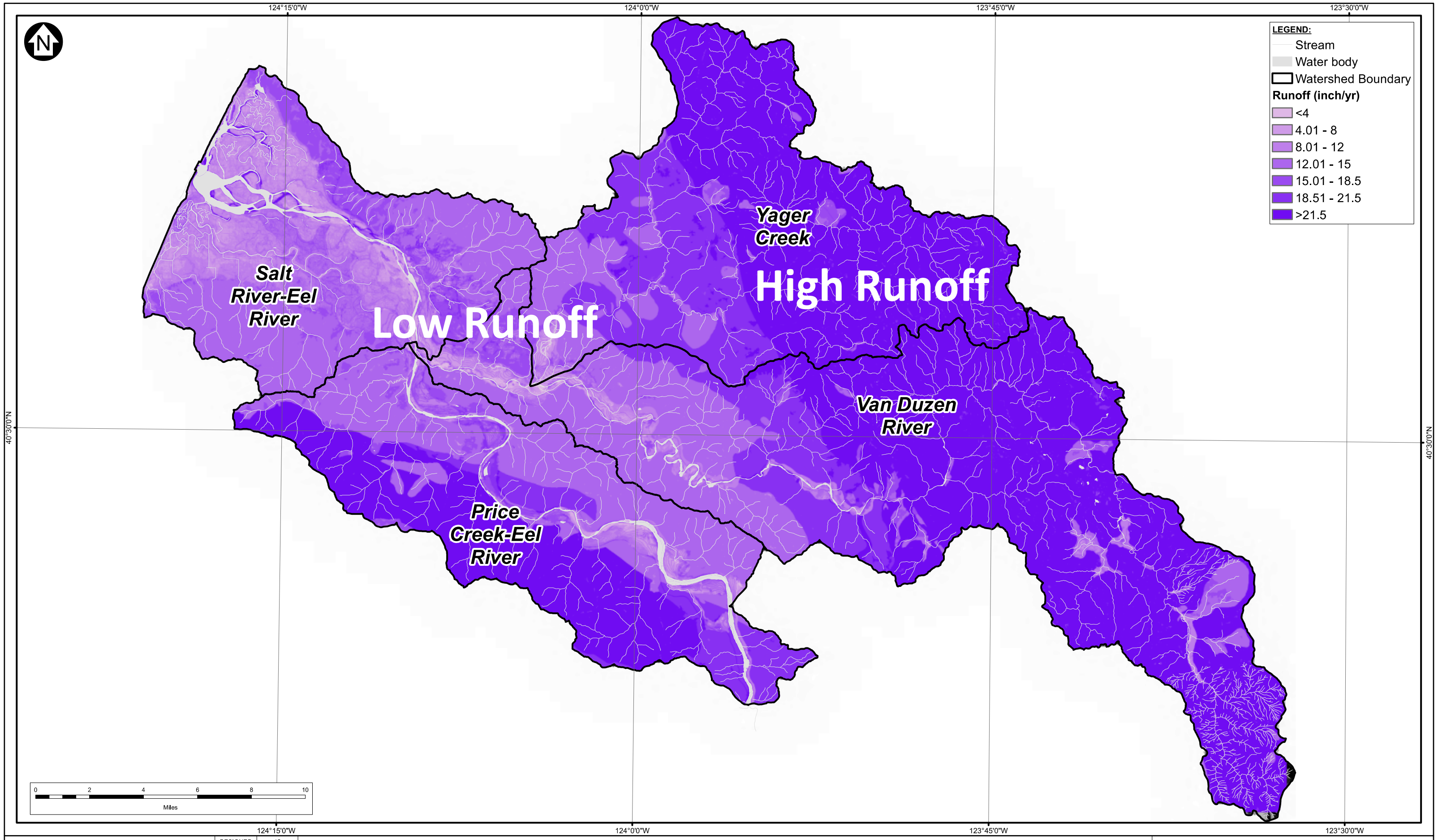


PREPARED BY:

DESIGNED	JC
DRAWN	DS
CHK'D	JC
APP'D	-
REV	-
DATE	23NOV'16

NOTES:
1. Scale: 1:210 000
2. PROJECTION: NAD 1983 UTM Zone 10N
3. COORDINATE GRID: Degrees minutes seconds

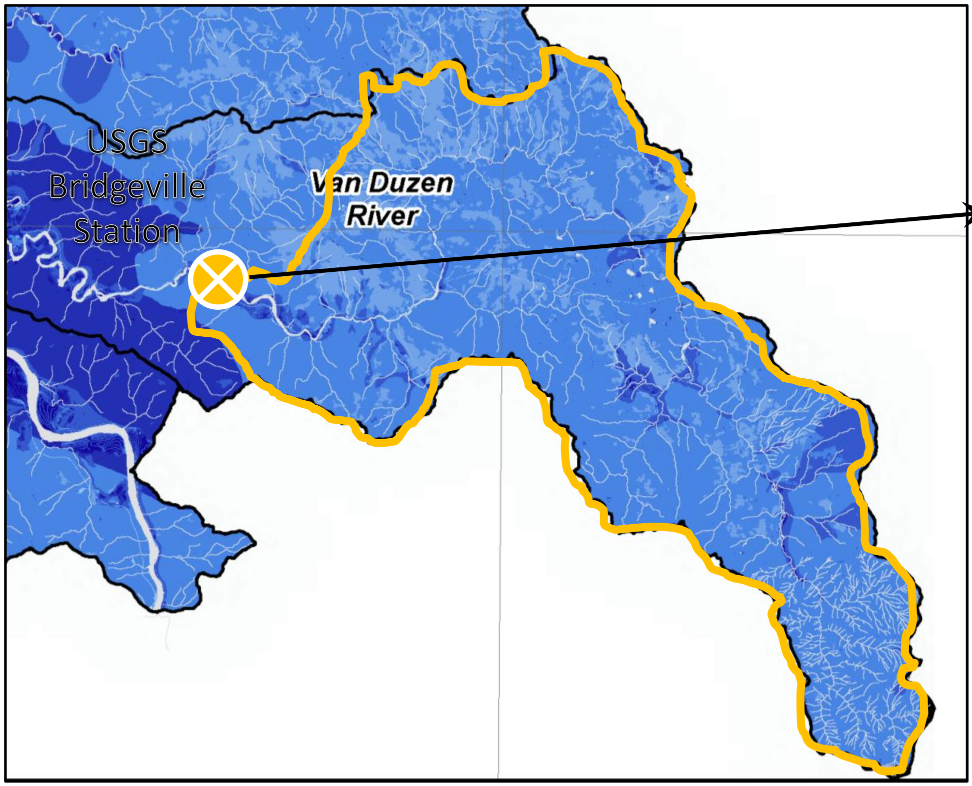
Document Path: E:\EelRiver_16043\DATA\PresentationMaps\Prelim_runoff.mxd

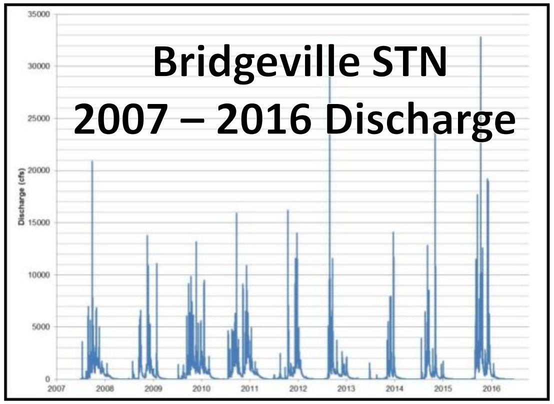
Total Eel River runoff: 536 066 acre-ft/yr

Eel River Preliminary Runoff

SHN Engineers & Geologists

Water Balance Model Calibration/ Validation: Upper Van Duzen Watershed





<u>Recharge – Baseflow Calibration</u>

- Modelled Annual Recharge (assumed to equal baseflow)
  – 98 cfs
- Estimated Average Bridgeville STN Baseflow
  – 65 cfs

Preliminary Water Balance – 5 Steps

- Step 4. Determine the percent (%) water demand taking into account irrigation, municipal and domestic water supply and water diversions.
- Step 5. Define a basin scale and sub-basin/sub-catchment stress level based on % water demand relative to a sustainable volume of available groundwater and surface water.

Water Demand

- From HCRCD (2016)
  - agricultural groundwater extraction totals 16,680 acre-feet/year (dry year)
  - municipal/ industrial/other uses total 3,000 acre-feet/year
- TOTAL = ~20,000 acre-feet/year

Water Sustainability

- Ratio of Average Annual Recharge to Water Demand
- Watershed Study Area (352,885 acres)
  - *Preliminary Recharge Estimate* – 394,770 acre-feet per year
  - Total Water Use – 20,000 acre-feet per year
  - Preliminary Water Stress – Approx. 5% of annual recharge is utilized
    - Low Stress

Attachment 4

Summary of Sustainability Indicators

Summary of Sustainability Indicators – Eel River Valley Groundwater Basin

Sustainability Indicator		Undesirable Results	Undesirable Results Present in Basin?	Evidence
1	Groundwater levels	Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply	No	1. Long-term monitoring data collected by Department of Water Resources in seven groundwater wells indicates stable groundwater levels over several decades. 2. Well elevation data collected since the mid-1980s indicate that groundwater levels generally do not drop below a minimum elevation during droughts, indicating reliable recharge. 3. Data collected from over 60 wells across the basin in Fall 2016 do not indicate exceptionally low groundwater levels.
2	Groundwater storage	Significant and unreasonable reduction of groundwater storage	No	Same as above
3	Seawater intrusion	Significant and unreasonable seawater intrusion	No	The position of the seawater/freshwater transition zone mapped in 2016 is comparable to the extent measured by U.S. Geological Survey in 1975.
4	Water quality	Significant and unreasonable degraded water quality	No	1. Analysis of historic water quality data collected as part of the State Water Resources Control Board's Groundwater Ambient Monitoring and Assessment Program indicate high quality groundwater conditions with respect to salts and nutrients. 2. Absence of large-scale contaminant plume affecting water supplies.
5	Land subsidence	Significant and unreasonable land subsidence	No	The stability of long-term groundwater elevations indicates that the factors leading to land subsidence are not present.
6	Beneficial uses of interconnected surface water	Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water	No	1. Stable groundwater levels over several decades. 2. Results of preliminary water balance indicate groundwater use represents approximately 5% of annual recharge to the basin. Less than 10% is generally considered sustainable. 3. The Lower Eel River maintains deep pools (depths of 7 to 14 feet) through the low-flow season, indicating reliable recharge. 4. Low-flow conditions in the Lower Van Duzen River and Lower Eel River are affected by substantial gravel deposits in the river channels which are legacies of the December 1964 flood. The Lower Van Duzen River and Lower Eel River carry significant underflow (subsurface flow within the channel deposits) during the low-flow season.

Date updated: December 8, 2016

Attachment 5

Resolution

BOARD OF SUPERVISORS, COUNTY OF HUMBOLDT, STATE OF CALIFORNIA
Certified copy of portion of proceedings, Meeting of December 13, 2016

RESOLUTION NO. _______

RESOLUTION AUTHORIZING THE PUBLIC WORKS DEPARTMENT TO SUBMIT A GROUNDWATER SUSTAINABILITY PLAN ALTERNATIVE FOR THE EEL RIVER VALLEY GROUNDWATER BASIN TO THE CALIFORNIA DEPARTMENT OF WATER RESOURCES

WHEREAS, the Department of Water Resources ("DWR") designated the Eel River Valley groundwater basin ("Basin") as a medium-priority basin for the initial prioritization under the Sustainable Groundwater Management Act which went into effect on January 1, 2015; and

WHEREAS, the Sustainable Groundwater Management Act authorizes local agencies to submit an Alternative to a Groundwater Sustainability Plan ("Alternative") that provides analysis of basin conditions demonstrating that the basin has operated within its sustainable yield over a period of at least 10 years (California Water Code §10733.6); and

WHEREAS, the content of an Alternative must contain the functional equivalent of Articles 5 and 7 of the Groundwater Sustainability Plan regulations (California Code of Regulations, Title 23, §358.2(d)); and

WHEREAS, an Alternative must be submitted to DWR for review by January 1, 2017, and every five years thereafter; and

WHEREAS, the County of Humboldt is a local public agency with land use responsibilities within the unincorporated areas of the Basin; and

WHEREAS, the County of Humboldt serves as the monitoring entity for the California Statewide Groundwater Elevation Monitoring program within the Basin in collaboration with DWR; and

WHEREAS, on October 6, 2015, the Board of Supervisors approved the formation of an Eel River Valley Groundwater Working Group to consist of stakeholders representing agricultural, municipal, and environmental interests and provide input on organizing the local response to the Sustainable Groundwater Management Act for the Eel River Valley; and

WHEREAS, the Eel River Valley Groundwater Working Group has convened seven meetings between October 21, 2015, and December 2, 2016; and

WHEREAS, in July 2016, DWR awarded the County of Humboldt a Proposition 1 Sustainable Groundwater Planning Grant to conduct a geologic and hydrogeologic investigation to determine whether groundwater levels within the Eel River Valley groundwater basin are declining or fluctuating to the point of causing impacts such as reduced groundwater storage, seawater intrusion, threatening or degrading water quality, land subsidence, and/or surface water depletion; and

WHEREAS, the results of the aforementioned technical studies indicate that there is sufficient evidence to prepare an Alternative for the Basin.

NOW, THEREFORE, BE IT RESOLVED BY THE HUMBOLDT COUNTY BOARD OF SUPERVISORS THAT:

BOARD OF SUPERVISORS, COUNTY OF HUMBOLDT, STATE OF CALIFORNIA
Certified copy of portion of proceedings, Meeting of December 13, 2016

1. In accordance with California Water Code §354.6(d) and §358.2(c)(3), the County of Humboldt has the legal authority to submit and implement an Alternative to a Groundwater Sustainability Plan for the Eel River Valley Groundwater Basin; and

2. The Public Works Department is hereby authorized to prepare and submit an Alternative to a Groundwater Sustainability Plan for the Eel River Valley Groundwater Basin by January 1, 2017.

Adopted on motion by Supervisor , seconded by Supervisor , and the following vote:

AYES:
NOES:
ABSENT:
ABSTAIN:

STATE OF CALIFORNIA
County of Humboldt

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the Seal of said Board of Supervisors.

KATHY HAYES
Clerk of the Board of Supervisors of the County of Humboldt, State of California

By: ____

Date: ____