2001 Report

SAN JOAQUIN RIVER WATER QUALITY IMPROVEMENT PROJECT, PHASE I WILDLIFE MONITORING REPORT

Prepared by

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EXECUTIVE SUMMARY

This report represents the biological monitoring results for first year of Phase I of the San Joaquin River Water Quality Improvement Project. Approximately 1,800 acres of an approximately 4,000-acre project site were planted with salt tolerant crops and irrigated with agricultural drainwater. This project is designed to reduce the amount of salt and selenium delivered to the San Luis Drain and Mud Slough through the Grassland Bypass.

Avian species diversity and numbers were relatively low for a 2,500-acre site and was comprised mostly of species that are common in disturbed and ruderal habitats.

Five Killdeer eggs were collected by H. T. Harvey and Associates. These eggs and a Mallard egg collected by the U. S Fish and Wildlife Service were analyzed for selenium and boron concentrations. Additionally, five eggs and four raptor pellets were collected by the U. S Fish and Wildlife Service and analyzed for selenium, boron, mercury, arsenic, strontium, and molybdenum.

All of the eggs analyzed contained at least partially elevated egg-selenium concentrations. Four of the eggs and three of the raptor pellets analyzed contained elevated egg-boron concentrations.

INTRODUCTION

The Panoche Drainage District has begun implementing Phase I of the San Joaquin River Water Quality Improvement Project (SJRIP). This project is designed to reduce the amount of salt and selenium delivered to the San Luis Drain and Mud Slough through the Grassland Bypass. The Panoche Drainage district, acting as the lead agency under the California Environmental Quality Act (CEQA) prepared a Negative Declaration for this project in September 2000. The Negative Declaration included the provision that a biological monitoring program would be developed in collaboration with the U. S. Fish and Wildlife Service (USFWS) that would be capable of detecting migratory bird impacts resulting from the project. This report represents the biological monitoring results for first year of Phase I of the SJQIP.

Project Description And Setting

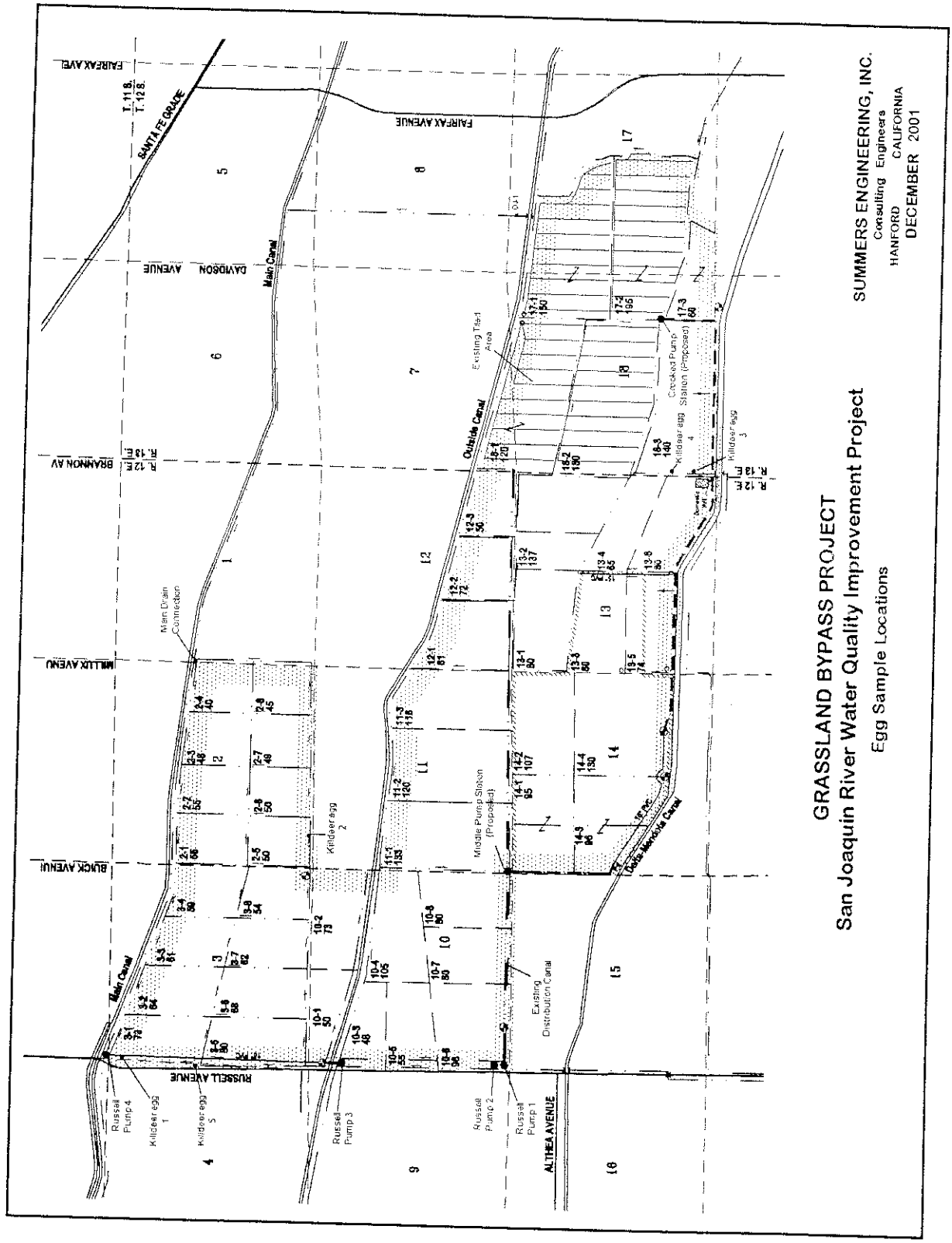
This year only a portion of Phase I was put into effect. Approximately 1,800 acres of crops were planted on approximately 4,000 acres obtained by the Panoche Drainage District. The project site is located west of the city of Firebaugh in Fresno County, California. The Irregularly shaped project site is bordered on the north by the Main Canal and on the south by the Delta-Mendota Canal. Russell Avenue is the eastern edge, and the western edge extends nearly to Fairfax Avenue (Figure 1).

The Proposed Project is the initial development of an In-Valley Treatment/Drainage Reuse Facility on up to 6,200 acres of land within the Grassland Drainage Area (GDA). Figure 1 shows the location of the facility within the GDA. This facility would dedicate specific lands for the irrigation of salt-tolerant crops with subsurface drainwater to reduce the volume; treat the concentrated drainwater to remove salt, selenium, and boron; and eventually dispose of the removed salts in valley to prevent them from discharging to the San Joaquin River. The facility is planned to handle up to one-quarter of the total drainwater produced in the GDA (25 percent of 52,000 acre-feet or approximately 15,000 acre-feet) and would be implemented in three phases, described in more detail below:

- Phase I: Purchase of land and planting of salt-tolerant crops
- Phase II: Installation of subsurface drainage and collection systems, initial treatment system
- Phase III: Completion of construction of treatment removal and salt disposal systems

Phase I: Subsurface drainwater from the GDA would be used to irrigate salt-tolerant crops on land ideally situated for this purpose. The land is adjacent to the channels containing collected Grassland drainwater, so the water can easily be captured and placed on the land. Since this land is also the lowest in elevation within the drainage area, collected water can be applied without excessive pumping costs. 4,000 acres have been purchased to date. Approximately 1,800 acres were planted in 2001

Figure 1. Project Location.



, thus preventing that water from being discharged to the San Joaquin River. Ongoing monitoring of soil and water constituents will be done to assure no irreversible changes occur and to protect groundwater.

Phase II: To continue to apply the salty water to the lands developed in Phase I, it will be necessary to install subsurface drainage systems so the land can be leached and a salt balance maintained. The water percolating below the root zone would be captured in the drainage system and passed on to the next, more salt-tolerant crop. In Phase II, the system would sequentially reuse drainwater on increasingly salt-tolerant crops to concentrate and decrease the volume of drainwater. The salt, selenium, and other constituents would be collected in the water coming out of the subsurface drainage systems. An initial phase of treatment would remove the salt and the selenium and much of the other constituents from the water, leaving usable water for agriculture or possibly other beneficial uses. The treatment system would be designed to tie in at any point in the reuse system. The salt would be deposited in approved waste units and not discharged to the San Joaquin River, resulting in additional reductions in salt and selenium discharges to the river.

Phase III: This final phase would be necessary to provide for maximum improvement to water quality in the San Joaquin River and to meet the ultimate reductions needed to meet future water quality objectives. This phase would include expansion of initial treatment (under Phase II) with additional construction of treatment facilities as well as additional waste disposal units.

Each phase of the facility would significantly reduce the quantity of drainwater discharged to the San Joaquin River. The treatment systems could also produce a product water sufficient in quality for reuse on agricultural lands within the GDA. The In-Valley Project would be designed to help the Grassland Area Farmers meet applicable water quality objectives for Water Year 2006 (October 1 ,2005); the applicable annual selenium load limit for 2006 (based on the current applicable total maximum monthly load) is 3,087 lbs. In comparison, the load value in the existing 1995 Use Agreement for Water Year 2001 is 5,661 lbs. Such a large reduction requires implementation of additional methods of drainage management.

Phase I of the facility was evaluated in an Initial Study and Negative Declaration adopted September 9, 2000 by Panoche Drainage District. Phases II and III of the facility were evaluated in the Grassland Bypass Project EIS/EIR finalized May 25, 2001. The current Project (Phase I) has independent utility and does not foreclose consideration of alternatives to the larger project or to the Project site. Even if the In-Valley Treatment/Drainage Reuse Project were to stop at Phase I without the later phases being implemented, it has value on its own for drainage management in the Panoche Drainage District and in the GDA. Also, the changes in proposed cropping patterns are not irreversible should the later phases not be implemented.

A portion of the Project site was evaluated for conversion to salt-tolerant crops and drainage reuse in 1997. Mercy Springs Water District encompasses 3,392 acres (55

percent of the site). The District prepared an Environmental Assessment for transfer of its Central Valley Project Class I water supply to Pajaro Valley Water Management Agency (ESA 1997). A Finding of No Significant Impact approved the transfer of 13,300 acre-feet of annual water supply to Pajaro Valley Water Management Agency on November 6, 1998. In 1999, a Final Environmental Assessment and Finding of No Significant Impact was approved for the transfer of 6,260 acre-feet per year of its annual Central Valley Project contract water to Pajaro Valley Water Management Agency, Santa Clara Valley Water District, and Westlands Water District (Provost & Pritchard 1999). These environmental documents covered the impacts of the water transfers including drainwater reuse, groundwater pumping, and cumulative effects.

A 259-acre parcel within the area proposed for purchase is within the Central California Irrigation District. This land has a water allocation associated with that district. This water supply would be allocated to other lands within the district that are owned by the landowner. This water has been so allocated previously as well as used on the subject property. With the Project, the water would be used on the landowners' other land and, therefore, is consistent with previous uses.

The current In-Valley Project Phase I proposal does not include any water transfers or additional groundwater pumping over existing conditions.

The subject property, containing 6,200 acres, is devoted entirely to irrigated field crops and closely related irrigation ditches, drain ditches, and conveyance canals. Two farm shop buildings and related structures are found here. The topography is nearly level to grade and flood/furrow irrigated. The highest elevation is found near the southeasterly corner at 164 feet above mean sea level, while the lowest point is found near a northcentral point at 136 feet above mean sea level. Thus, the elevation change within the subject property is approximately 28 feet over the 6,200-acre area. The shape of the property is irregular, conforming to the adjacent canals of the area. Access to the property is via Russell Avenue, a paved county road. Interior access is gained by typical improved farm roads. Utilities are found throughout the neighborhood and supplied to specific sites as required. Telephone and electric power are supplied by public utility. Natural gas is provided to specific sites, but is not generally supplied to rural locations.

MATERIALS AND METHODS

Bird Censuses

The project site was monitored for bird use by an ornithologist from H. T. Harvey and Associates on six occasions from April 25 to June 19, 2001. The site was censused by driving the roads that formed the field perimeters. Birds were identified and counted using 10X binoculars and a 20-60X spotting scope mounted on a tripod. The purpose of these surveys was to determine the species composition and relative abundance of bird species occurring on the project site during the breeding season.

Egg Collecting And Processing

Five Killdeer (*Charadrius vociferus*) eggs were collected from the project site by H. T. Harvey and Associates for selenium and boron analysis. The locations of the Killdeer nests that eggs were collected from are illustrated in Figure 1. A scientific collecting permit was obtained from the California Department of Fish and Game for the collection of bird eggs at the site. One egg was randomly collected from separate full-clutch (4 eggs) Killdeer nests. A Mallard (*Anas platyrhynchos*) egg collected by Joe Skorupa of the USFWS was also turned over to H. T. Harvey and Associates for selenium and boron analysis

All eggs were labeled with a permanent marker, placed in an egg carton, and transported from the field. All of the egg contents (including all membranes) were removed from the shell and transferred to 1 oz. Dynalon jars. The embryo was photographed and examined for abnormalities and stage of incubation (age) was noted. The embryo was also examined to determine if it was alive or dead. The egg contents were stored by freezing (0 ° C.).

Egg-Selenium Analysis

All egg contents that were collected by H. T. Harvey & Associates were shipped overnight, on dry ice, to the California Animal Health and Food Safety Laboratory at the University of California, Davis. This is not one of the labs that is utilized the USFWS, but Joseph Skorupa (USFWS) did indicate in a phone conversation that he considered this lab to be acceptable. Selected sub-samples were divided into two aliquots. The duplicate was spiked (known amounts of selenium were added to the aliquot) and the samples were tested to determine the accuracy of analysis. Selenium concentrations were determined using hydride generation atomic absorption. All egg selenium concentrations were presented as parts per million (ppm) based on dry tissue weight (dry wt).

RESULTS

Bird Censuses

Thirty-eight avian species were observed at the In-Valley Treatment Project site during this years study (Table 1). Avian numbers were highest in April, when numerous Cattle Egrets (*Bublucus ibis*) and migrating Whimbrels (*Nunenius phaeopus*) were present (Table 1). Red-winged Blackbirds (*Agelaius phoeniceus*) were the most numerous species observed on the project site. Fourteen species were either observed nesting on the site or nesting was suspected based on observations of courtship behavior or young. Numbers declined in May and June as fewer migrants were detected.

Egg Collecting And Processing

Six eggs were collected for selenium and boron analysis. Four of the Killdeer embryos were >6 days old and were alive and normal, the remaining Killdeer embryo and the mallard embryo were alive but too young (<3 days old) to determine their condition.

Egg-Selenium Analysis

The Mallard egg contained 6.2 ppm (dry wt.) selenium and 7.0 ppm (dry wt.) boron. The geometric mean egg-selenium content was 8.9 ppm (dry wt) for the five Killdeer eggs, and the range was 5.5 to 13.2 ppm selenium (Table 2). The geometric mean egg-boron content was 2.1 ppm (dry wt) for the five Killdeer eggs, and the range was 1.8 to 3.1 ppm selenium (Table 2).

The USFWS collected 5 bird eggs and 4 raptor pellets and had them analyzed for selenium, mercury, boron, arsenic, strontium, and molybdenum. The results are presented in Table 3.

Table 1. Avian Census Results at Panoche Drainage District's In Valley Treatment Project Site.

	2001					
	Apr. 25	May 09	May 16	May 23	June 12	June 19
Species						
Great Blue Heron		1	3			
Great Egret			1	2		
Snowy Egret	2	5		6	1	
Cattle Egret	150	24	37	1	4	
Black-crowned Night Heron			2	19		
White-faced Ibis			32	11		
* Mallard	8	7	4	4	6	5
Northern Pintail					1	
Cinnamon Teal	1		2		2	
Northern Harrier	4	1	2	1	2	1
* Swainson's Hawk		1	33	7	1	1
* Red-tailed Hawk	5	6	4	8	5	4
American Kestrel	1	1	4	2	2	1
Ring-necked Pheasant		1	2			
* Killdeer	16	21	42	29	25	25
Black-necked Stilt	2				2	
Whimbrel	134	143	55	17		
Least Sandpiper	6					
Mourning Dove	2	8	2			
* Burrowing Owl	3	3	4	3	3	8
* Western Kingbird	10	13	17	17	27	16
* Loggerhead Shrike	3	6	6	7	4	5
Common Raven	1	5	5	7	7	7
American Robin		1				
* Horned Lark	5	10		4		2
Barn Swallow			4	2		
Cliff Swallow				5		
European Starling	1					
American Pipit	52					
Savannah Sparrow	1					
* Song Sparrow	2	5	4	3	6	3
* Red-winged Blackbird	222	207	156	220	210	148
Tricolored Blackbird		4	13		13	
* Western Meadowlark	10	13	38	10	34	20
* Brewer's Blackbird	58	35	56	54	29	20
Brown-headed Cowbird	35	6	18	13	20	6
* House Finch	4	6	14	8	13	7
* House Sparrow	12	10	9	14	19	6
Total	**750**	**543**	**569**	**474**	**436**	**285**

* = Species for which evidence of nesting on the project site was observed this year.

Table 2. Egg-selenium and egg-boron concentrations at Panoche Drainage District's In Valley Treatment Project Site.

ID Number PDD	*Field Number PDD*	*Species*	*Date 2001*	*Embryo Condition* [a]	*Embryo Age (days)*	*Percent Moisture*	*Selenium (ppm dry wt)*	*Log base 10*	*Anti-log*
01	M-1B	Mallard	May 22	LU	?	70	6.2		
02	K1	Killdeer	Jun 12	LN	12	72	6.2	0.7924	
03	K2	Killdeer	Jun 19	LN	6-9	72	13.2	1.1206	
04	K3	Killdeer	Jun 19	LN	>20	74	8.4	0.9243	
05	K4	Killdeer	Jun 19	LU	3	74	9.3	0.9685	
06	K5	Killdeer	Jun 19	LN	>17	72	5.5	0.7404	
Arith/Geo Mean						72.8	9.3	0.9514	***8.9***
SD						1.51	2.88	0.1353	***1.4***
SE								0.0605	***1.1***
95% CI								0.8328	***6.8***
								1.0700	***11.8***

ID Number PDD	*Field Number PDD*	*Species*	*Date 2001*	*Embryo Condition* [a]	*Embryo Age (days)*	*Percent Moisture*	*Boron (ppm dry wt)*	*Log base 10*	*Anti-log*
01	M-1B	Mallard	May 22	LU	?	70	7.0		
02	K1	Killdeer	Jun 12	LN	12	72	2.1	0.3222	
03	K2	Killdeer	Jun 19	LN	6-9	72	2.8	0.4472	
04	K3	Killdeer	Jun 19	LN	>20	74	1.2	0.0792	
05	K4	Killdeer	Jun 19	LU	3	74	3.1	0.4914	
06	K5	Killdeer	Jun 19	LN	>17	72	1.8	0.2553	
Arith/Geo Mean						72.8	2.2	0.3190	***2.1***
SD						1.10	0.76	0.1850	***1.5***
SE								0.0827	***1.2***
95% CI								0.1569	***1.4***
								0.4812	***3.0***

[a] L= Live, D= Dead, N= Normal, A= Abnormal, U= Unknown.

Table 3. Summary of analysis of tissue samples collected by the U. S. Fish and Wildlife Service.*

	sample id	species	species	field weight	Percent Moisture	Se dry wt conc, ppm	Hg dry wt conc, ppm	B dry wt conc, ppm	As dry wt conc, ppm	Sr dry wt conc, ppm	Mo dry wt conc, ppm
Sample 1	**0562001A**	Mallard	EGG	45.1	69.2	6.48	0.288	3.66		14.1	0.94
Sample 2 H2O	**1262001A**	Brewer's Blackbird	EGG	4.2	90.4	7.21	<RL	3.76		19.4	4.80
Sample 3 H2O	**1262002A**	Brewer's Blackbird	EGG	4.5	91.9	15.47	<RL	13.4		63.7	5.95
Sample 4	**2662001A**	Western Kingbird	EGG	2.8	80.3	5.52	0.284				
Sample 5 H2O	**4062001A**	Loggerhead Shrike	EGG	3.3	90.3	7.37	0.372				
Sample 6	**BUOW1**	Burrowing Owl	PELLET	7.4	6.4	1.94	0.048	20.1	1.39	78.2	2.41
Sample 7	**BUOW2**	Burrowing Owl	PELLET	8.1	2.6	1.20	<RL	11.1	1.73	143	1.67
Sample 8	**BUOW3**	Burrowing Owl	PELLET	5.5	5.8	2.02	0.103	3.28	0.90	129	1.61
Sample 9	**SWHA1**	Swainson's Hawk	PELLET	11.1	5.6	0.70	<RL	12.0	2.00	34.3	1.62

*Provided by Joseph Skorupa, USFWS

DISCUSSION

The census data indicate that the project site is utilized by bird species common in agricultural habitats in the San Joaquin Valley. Both species diversity and relative abundance are lower than would be expected in native, undisturbed habitats. The tall vegetation in the pasture in section 2 provided nesting habitat for fair numbers of Red-winged Blackbirds and the irrigation of pastures and alfalfa provide temporary foraging opportunities for birds such and Cattle Egrets, White-faced Ibis (*Plegadis chihi*), and blackbirds. Swainson's Hawks, which are listed as threatened by the State of California, were observed on the project site and one pair attempted to nest. Two species listed as "species of concern" by the State of California, the Loggerhead Shrike and the California Horned Lark (*Eremophila alpestris actia*) were observed nesting on the project site, and White-faced Ibis, another "species of concern" were observed foraging, but not nesting on the project site.

All six of the eggs sent for analysis by H. T. Harvey and Associates contained egg-selenium concentrations above the background level (3 ppm dry wt.) for shorebirds. Two of the eggs contained selenium concentrations within the range (3.7 to 7.9 ppm) (CH2M-Hill et al. 1993) that has been associated with an increased probability of effects on avian reproduction. The other four eggs contained selenium concentrations within the range (8-18 ppm dry wt) associated with an increased probability of reduced hatchability (CH2M-Hill et al. 1993).

The eggs collected by the USFWS (Table 3) indicated similar results. The Mallard egg was from the same clutch as the Mallard egg analyzed by H. T. Harvey and Associates, and the result (6.5 ppm dry wt.) was similar. Four passerine eggs comprising two Brewer's Blackbird eggs containing 7.2 and 15.5 ppm Selenium, a Western Kingbird egg containing 5.5 ppm Selenium and a Loggerhead Shrike egg containing 7.4 ppm selenium were also collected.

The comments of Joseph Skorupa of the USFWS on these results are summarized thusly. The most recent analysis of laboratory data for Mallards (CH2M HILL 2000) suggests that at 8.4 ppm egg-selenium concentration there is a 10% depression in egg hatchability. Preliminary field data on Mallard eggs collected by the USFWS (during 2000 and 2001; $N > 1,000$ eggs) suggests that at about 6 ppm egg-selenium concentration there is about a 6% depression in egg hatchability. A group of consultants (Fairbrother et al. 1999) working for Kennecott Utah Copper argue that about 16 ppm selenium in eggs is required to cause a 10% depression in egg hatchability. According to Dr. Skorupa, the difference between CH2M HILL (2000) and Fairbrother et al. (1999) analysis of experimental laboratory data on Mallards is probably related to CH2M HILL basing their analysis on nearly twice as many laboratory points as Fairbrother et al. did. The sensitivity of passerines such as Brewer's Blackbirds and Western Kingbirds to elevated selenium levels is unknown. In the absence of more specific information, therefore, any eggs exceeding 10 ppm selenium should be considered a matter of concern until proven otherwise. Eggs below 6 ppm selenium should be considered safe until proven

otherwise. The sensitivity of shrikes to selenium is also unknown, though other carnivorous birds such as Screech Owls and American Kestrels appear to be less sensitive to selenium that Mallards, chickens, and some species of shorebirds (such as Killdeer and Black-necked Stilts). The shrike egg collected from the project site this year, though certainly elevated, should be considered unlikely to present appreciable reproductive risk until proven otherwise. In summary, based on these limited results, a minimal degree of risk (< 10% effect) seems very likely for Mallards and blackbirds. The kingbird and shrike egg results are unlikely indicative of any reproductive.

The results of boron analysis of the five Killdeer eggs collected by H. T. Harvey and Associates were at or below the 3 ppm dry weight background level (mean = 2.1 ppm, range = 1.8 ppm– 3.1 ppm). The Mallard egg contained 7.0 ppm boron. Only three eggs collected by the USFWS contained enough material to be analyzed for boron. The Mallard egg contained 3.7 ppm boron and the Brewer's Blackbird eggs contained 3.8 ppm and 13.4 ppm boron. The raptor pellets collected contained boron levels of 20.1 ppm, 11.1 ppm, 3.3 ppm, and 12.0 ppm. The presence of elevated boron-egg content indicates that boron should continue to be monitored in eggs collected from the project site.

It is difficult to access project impacts to breeding birds based solely on the 2001 egg analysis results since background (pre-project) levels of selenium and boron are unknown for the project area. Egg collection and analysis of potentially impacted species (Mallards, Killdeer, blackbirds) from sites that have similar characteristics and are nearby, but far enough away to be unaffected by the project (approximately 1 mile), would be helpful in determining the amount to which the project is contributing to the accumulation of these constituents in waterbird eggs.

LITERATURE CITED

CH2M-Hill. 2000. Relative Sensitivity of Avian Species to Selenium-related Reproductive Effects. Prepared for Chevron Richmond Refinery. 2485 Natomas Park Drive, Suite 600. Sacramento, CA 95833-2937.

CH2M-Hill, H. T. Harvey & Associates, and Gerald L. Horner. 1993. Cumulative impacts of agriculture evaporation basins on wildlife. Prepared for Department of Water Resources.

Environmental Science Associates (ESA). 1997. CVP Water Assignment from Mercy Springs District (Contract No. 14-06-200-3365A) to Pajaro Valley Water Management Agency, Preliminary Environmental Assessment. Prepared for Pajaro Valley Water Management Agency and Mercy Springs Water District. March 13, 1997.

Fairbrother, A., K. V. Brix, J. E. Toll, S. McKay, and W. J. Adams. 1999. Egg Selenium concentrations as predictors of avian toxicity. *Human and Ecological Risk Assessment*. 5:1229-1253.

Provost and Pritchard, Inc. 1999. CVP Water Supply Partial Contract from Mercy Springs Water District (Contract No. 14-06-200-3365A) to Pajaro Valley Water Management Agency, Santa Clara Valley Water District, and Westland Water District, Final Environmental Assessment and Finding of No Significant Impact. U. S. Bureau of Reclamation. April 12, 1999.

PERSONAL COMMUNICATIONS

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