

UNITED STATES DEPARTMENT OF THE INTERIOR
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**WATER-EXTRACTABLE GEOCHEMICAL DATA FOR
NATIVE AND IRRIGATED SOILS FROM THE
KENDRICK RECLAMATION PROJECT AREA, WYOMING, 1988-89**

by

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This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature. Any use of trade names is for descriptive purposes only and does not imply endorsement by the USGS.

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INTRODUCTION

The Kendrick Reclamation Project Area (KRPA) was one of nine areas selected for a reconnaissance study in 1986 to investigate the possibility of elevated trace-element concentrations in irrigation drainage (Severson, Wilson, and McNeal, 1987). Based on findings of this study (Peterson, Jones, and Morton, 1988), the Department of Interior-Irrigation Drainage Task Group selected KRPA as one of four areas for more detailed study. The detailed studies were to meet the following goals: (1) to determine whether irrigation-induced water-quality problems exist; and if so, (2) to provide the scientific understanding to mitigate or resolve identified problems. The working objective for each detailed study was defined as: Determine the extent, magnitude, and effects of contaminants associated with agricultural drainage; and, where effects are documented, determine the sources and exposure pathways that cause contamination.

In the 1930's, the Bureau of Reclamation began the Kendrick irrigation and drainage project in Natrona County, Wyoming (Fig. 1). Approximately 24,000 acres near Casper, Wyoming have been under irrigation since about 1946. Previous studies (Erdman and others, 1989; Severson and others, 1989a, b) were mainly concerned with defining the concentration, distribution, and variability of total major and trace elements in agricultural and native plants and soils of the KRPA. This report contains information on field and laboratory methods, especially the water-extraction procedure used to assess water-soluble, and presumed therefore, readily-available anions in soils and a listing of these analytical results. Previously published reports discuss, in detail, total selenium in plants and soils (Erdman and others, 1989), and lateral and depth variability of total chemical composition of soils (Severson and others, 1989a, b).

METHODS

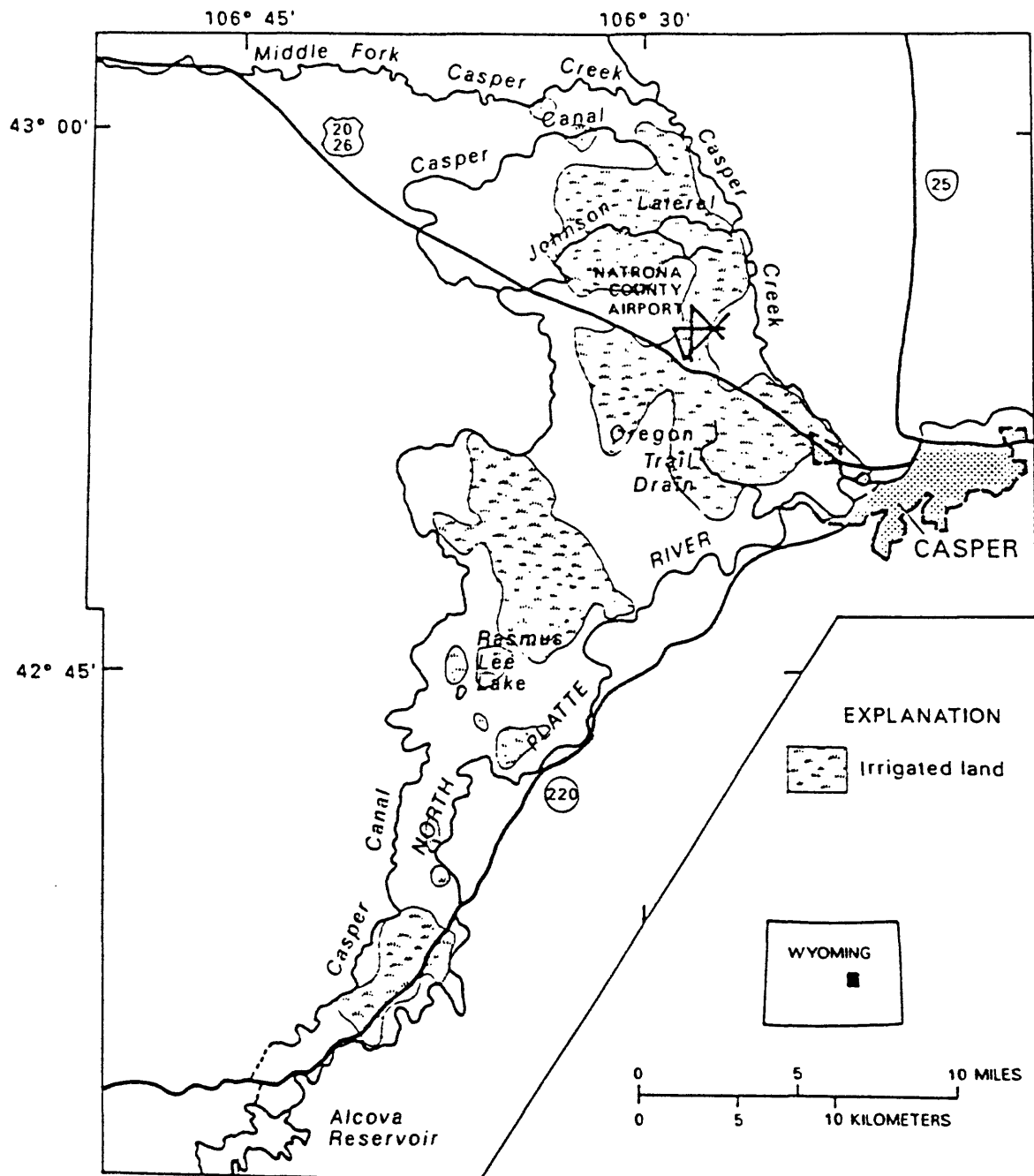
Field Sampling

Complete details of the field sampling are given in Erdman and others (1989) and Severson and others (1989a, b) and are summarized in this report. Irrigated agricultural soils are confined to two dominant geologic units, Quaternary alluvium and Cretaceous Cody shale. Surrounding the agricultural areas are uncultivated native soils developed on a variety of geologic units, including several marine Late Cretaceous formations containing carbonaceous shales and coals (Mesaverde, Lance, Meeteetse, and Niobrara) and several Tertiary formations containing bentonite, claystone, shale, and sandstone or siltstone (White River, Wind River, and Fort Union). Separate sampling plans were developed for the irrigated agricultural lands and the surrounding uncultivated native lands. Field sampling was conducted by scientists from the U.S. Geological Survey during the spring and summer of 1988.

Native Soils

A stratified, random sampling design was used to assess variation in trace-element content of sagebrush and native soil among and within geologic units identified on a geologic

Figure 1.--Index map showing location of the Kendrick Reclamation Project Area.



map (Crist, 1974). The study area occupied 25 townships. Twelve of the 25 townships were selected randomly for sampling. For each of the geologic units occurring in each township, two locations were selected randomly for sampling. The sampling was done at the pre-selected sites where they were accessible, and as close as possible where accessibility was limited. Figure 2 shows the locations of sampling sites for native soils and sagebrush. Table 1 list the townships sampled and the various geological formations represented by those townships.

At each site, a 3.5 inch bucket auger was used to obtain a native soil sample from the surface to a depth of approximately one meter. The one meter section was mixed in the field and a 1 kg sample collected. Big sagebrush (*Artemisia tridentata* Nutt.) was also collected when present at the soil sampling locations (see Erdman and others, 1989).

Irrigated Soils

The objective for this part of the study was to collect samples from presently or previously irrigated fields using a grid pattern that would allow the preparation of stable geochemical maps showing trace element spatial distribution in alfalfa and agricultural soils throughout the irrigated lands. The most efficient sampling plan and optimum grid size depends on knowledge of the spatial variability occurring over increments of distance on the landscape for the sampling media and the trace elements of interest. Because this information was not available for the KRPA, a grid size of one mile was chosen based on studies of trace element spatial variability in the Northern Great Plains (Severson and Tidball, 1979) and the San Joaquin Valley (Severson and others, 1987).

The Kendrick Reclamation Project encompasses about 24,000 irrigated acres (approximately 38 square miles). However, only portions of a given section are under irrigation, and parcels of irrigated land are not contiguous. The target sampling population was defined as parcels of irrigated land of 40 or more acres in size within a section; 110 sections met this criterion.

In June, 1988, soil samples were collected from 109 fields. Alfalfa (*Medicago sativa* L.), at the 10% bloom stage, was also collected from 105 fields (see Erdman and others, 1989). Figure 3 shows the location of the sampling sites for these agricultural samples. At each location, two sites approximately 100 meters apart were chosen for sampling. A 3.5 inch diameter bucket auger was used to obtain a soil sample from the surface to a depth of approximately one meter at each site. At each of the two sites within a sampling location, the one-meter soil sample was mixed and a 1 kg sample collected. The two samples of soil from a single location were composited in the laboratory after the soil had been air dried and disaggregated to <10 mesh. The composite samples of soil from each of the 109 locations were used for chemical analyses.

Laboratory Methods

All samples were mailed to the U.S. Geological Survey laboratories in Denver for preparation and analysis. The soil samples were dried under forced air at ambient temperatures. The dried samples were disaggregated with a mechanical ceramic mortar and

Figure 2.--Map showing locations of sampling sites for native soils at the Kendrick Reclamation Project Area.

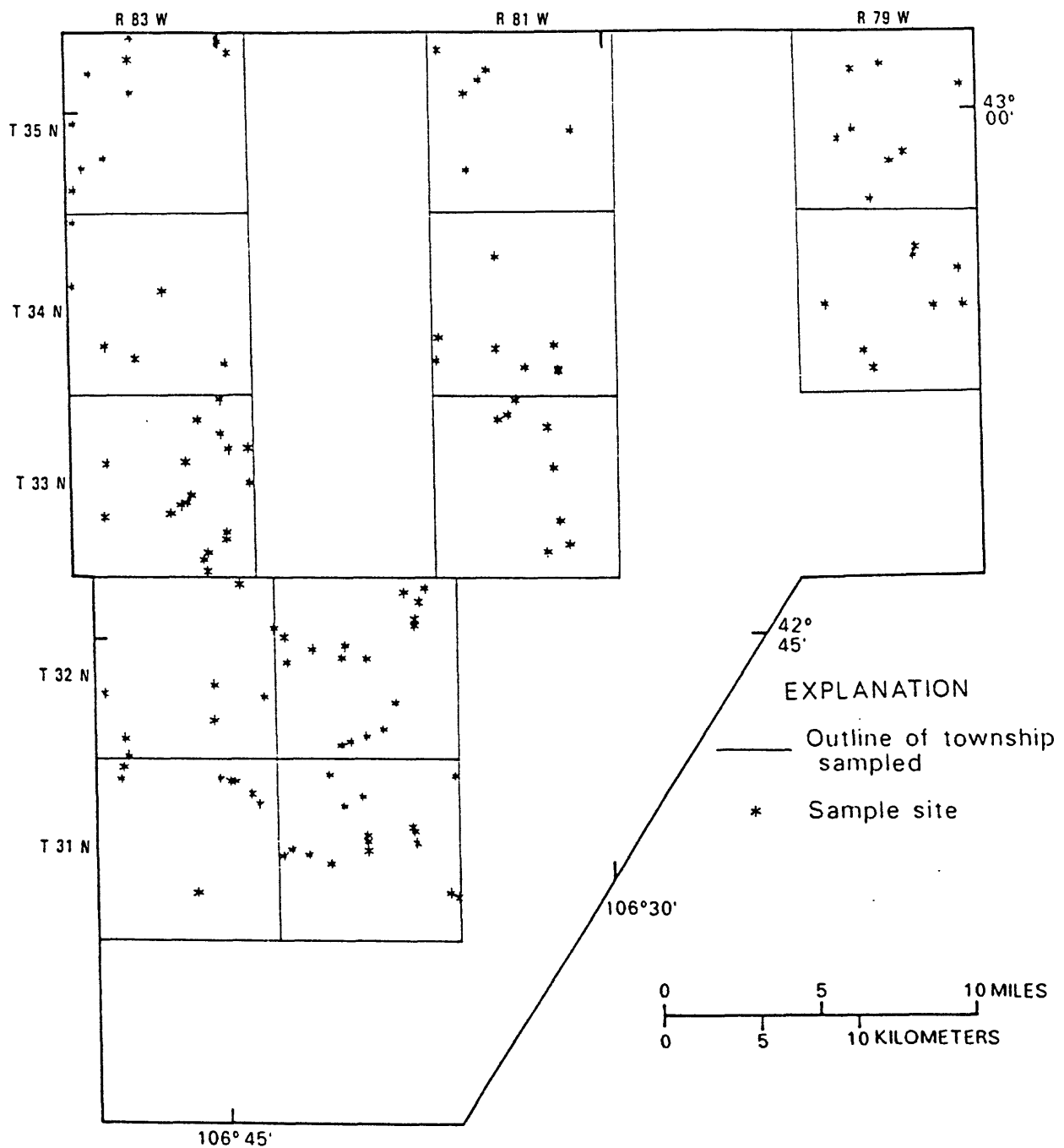
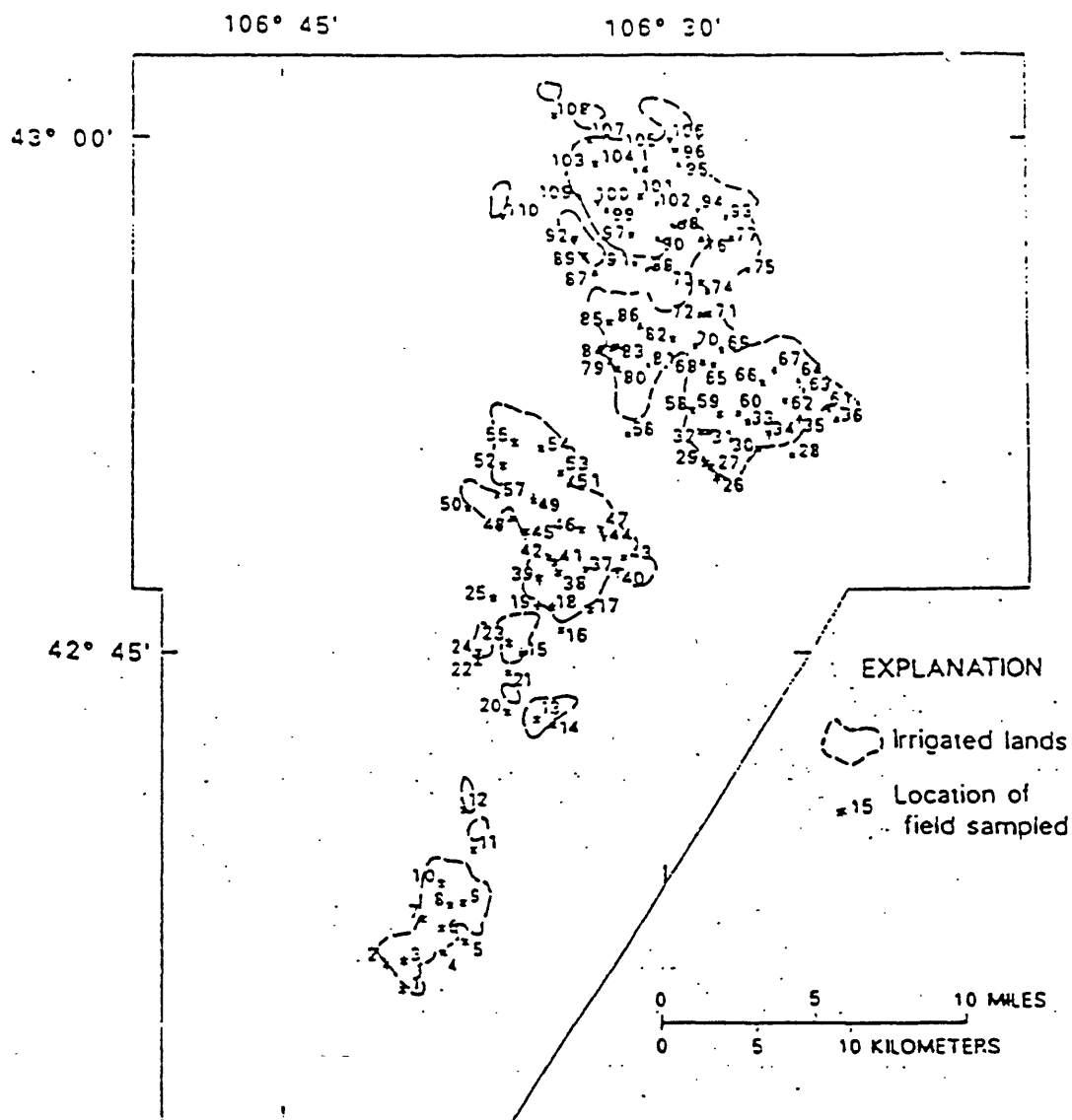


Figure 3.--Map showing locations of sampling sites for irrigated soils at the Kendrick Reclamation Project Area.



pestle and the <10 mesh (2 mm) material sieved and saved for analyses. A split of the minus 2 mm material was ground in a ceramic plate grinder to minus 100 mesh, and this material was used for all chemical analysis.

Water-Extraction Method

The water-extraction method used in this study was a simple 1:5 (soil:water) procedure. The method is as follows:

- 1) Weigh 5.00 g of the <10 mesh soil into a clean 2 oz square, high density polyethylene bottle. Add 25.0 mL demineralized water and swirl to evenly wet the soil.

- 2) Shake upright on a reciprocating shaker for 4 hr at about 120 oscillations per minute at room temperature. Let stand to settle; decant the clear liquid; and, filter through 0.45 micron filter.

- 3) Determine the common anions (fluoride, chloride, sulfate, nitrate, and phosphate) on this clear solution using ion chromatography. A Dionex model 2010i, equipped with an AG2A and AS4A anion separator columns and using suppressed conductivity, was used in this study. The eluent was a 0.0020 M sodium carbonate / 0.0007 M sodium bicarbonate solution providing an analysis time of 8 min, with analyte full scale conductivity levels ranging between 10 and 100 uS. Dilution may be required to bring the sample into the normal analytical range of the instrument. This is especially true for high sulfate soils common in the western United States. See Wilson and others (1987) for further details on the anion determinations.

- 4) Determine the specific conductivity of the extract. This will give an estimate of the total dissolved salts in the extract. A Myron L Company EP specific conductivity meter was used in this study. The filtered extract was simply poured into the meter's cell and the reading recorded in micromhos (microSiemens).

- 5) Determine extractable selenium and arsenic on a digested aliquot of this water extract. The digestion procedure has been modified from that given by Nygaard and Lowry (1982). Add a 10.0 g aliquot of the 1:5 extract to a thick-walled, 30 mL Teflon vessel and add 1 mL of a saturated potassium persulfate solution. Let it stand at room temperature for 1 hr. Add 1 mL of concentrated hydrochloric acid and heat covered at 110°C for 1 hr. Remove the cover and continue to heat until the volume is reduced to about 5 mL. This heating usually takes about 3 hr. Add 2 ml of concentrated hydrochloric and heat covered for 1 hr. Cool and transfer to a tared clean, 2 oz high density polyethylene bottle. Adjust the weight of the solution to 22 g with 6-N hydrochloric acid. This solution is compatible with the appropriate hydride generation manifold (Crock and Lichte, 1982; Sanzalone and Chao, 1987). Multiply the solution concentration by 10 (assuming all the weights and volumes given are used) and report the water-extractable arsenic and selenium as part per billion (ppb or as ug/L) on a dry weight basis. For duplicate extractions, a range of 10 - 15% relative standard deviation (RSD) is realistic. For randomly placed sample duplicates for this study, this RSD range was observed.

Great care must be taken while doing extraction work to remain consistent in the amount of analyte extracted and to compare one study area to another using extraction methods. Slight changes in an operation may greatly effect the amount extracted. These changes, for

example, include soil to extractant ratio, extraction vessel size or shape, temperature of the extraction, digestion method of the extract for extractable selenium (If selenium is present as an organic complex, low results will result if the extract is not digested properly.), and shaking speed or direction of the shaker used (see Crock and Severson, 1980).

RESULTS

Native soils

A listing of the analytical results for total chemistry for all of native samples from the KRPA is given in Severson and others (1989b). Table 3 lists water-extractable geochemical data for native soils. Extractable concentrations of nitrate, fluoride, phosphate, and arsenic were determined, but were consistently below the limit of determination as given in table 2. The soil samples are grouped by the geological formation that they represent. Fourteen geologic units were identified in the twelve townships selected randomly for sampling, but not all geologic units occurred in each township. The distribution of geologic units sampled within each township is given in table 1.

Irrigated soils

A complete listing of the analytical results for total chemistry for all of the irrigated samples from the KRPA is given in Severson and others (1989b). Table 4 lists the water-extractable selenium, specific conductance, and extractable anions for the irrigated soils. Water-extractable arsenic, fluoride, nitrate, and phosphate were determined, but for most samples, these variables were below the limits of determination and not reported.

ACKNOWLEDGEMENTS

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Table 1. Distribution of geologic units sampled from randomly selected townships at the Kendrick Reclamation Project Area.

[Numbers in body of table indicate number of samples collected from each geologic unit within each township. Explanation of geologic units: Qal, Quaternary alluvium; Qs, Quaternary sand dunes; Twru, Tertiary White River upper unit; Twrl, Tertiary White River lower unit; Twdr, Wind River Formation; Tfu, Tertiary Fort Union Formation; Kl, Cretaceous Lance Formation; Kfh, Cretaceous Fox Hills sandstone; Kml, Cretaceous Meeteetse Formation; Kmv, Cretaceous Mesaverde Formation; Kc, Cretaceous Cody shale; Ks, Cretaceous Steele shale; Kf, Cretaceous Frontier Formation; Kmt, Cretaceous Mowry and Thermopolis shale. -, unit not found in given township]

		Geologic Units													
Township	Range														
		---Twr---						----Klml----				--Kc--			
North	West	Qal	Qs	Twru	Twrl	Twdr	Tfu	Kl	Kfh	Kml	Kmv	Kc	Ks	Kf	Kmt
35	79	-	2	-	-	-	-	-	2	2	2	-	-	-	-
35	81	2	2	-	-	-	-	-	-	-	-	2	-	-	-
35	83	2	2	-	-	-	-	-	-	-	-	2	-	2	2
34	83	-	-	-	-	-	-	-	-	-	-	2	-	2	2
34	81	2	2	-	-	-	-	-	-	-	-	2	-	2	-
34	79	-	2	-	-	-	-	-	-	2	2	2	-	-	-
33	81	2	-	-	-	-	-	-	-	-	-	2	-	2	2
33	83	2	-	-	-	2	2	2	-	2	2	2	-	2	2
32	83	2	-	-	2	2	2	-	-	-	-	-	-	-	-
32	82	2	-	-	-	2	2	2	-	2	2	2	-	2	-
31	82	2	-	-	2	2	1	2	-	2	3	-	2	-	-
31	83	2	-	2	2	2	-	-	-	-	-	-	-	-	-

Table 2.--Limits of determination for anions reported (in solution).

Analytical method	Medium	Determination limit	Variables
Ion Chromatography	Water	2 ppm	Chloride, Fluoride, Sulfate
	Extract	5 ppm	Nitrate
		10 ppm	Ortho-phosphate
Continuous flow hydride generation	Water extract	2 ppb	Extractable Se, As

Table 3.--Water-extractable geochemical data for native soils collected from geologic units at the Kendrick Reclamation Project Area (extract basis)

Sample ID	Latitude	Longitude	Se, ppb Extract	Spec. Cond., microSiemens	Cl, ppm Extract	Sulfate, ppm Extract
K031QAL	430059	1063445	9	260	7	12
K032QAL	425819	1063518	62	2100	51	710
K051QAL	430143	1064431	35	2900	60	1900
K052QAL	430133	1064824	16	4000	37	3200
K081QAL	425317	1063203	20	1300	32	900
K082QAL	425233	1063153	11	2900	32	1500
K131QAL	424736	1063133	5	160	<2	9
K132QAL	424723	1063225	5	150	4	3
K151QAL	424928	1064357	42	1500	38	500
K152QAL	425004	1064628	120	1500	28	710
K161QAL	424320	1064333	70	3300	30	3200
K162QAL	424241	1064530	480	3000	150	1800
K171QAL	424600	1063729	34	3700	45	3200
K172QAL	424307	1063826	50	2700	30	2000
K221QAL	424101	1063609	80	700	57	84
K222QAL	423741	1063625	130	2300	24	920
K231QAL	424056	1064455	8	320	5	20
K232QAL	424033	1064403	18	220	2	3
K011QS	430042	1061609	21	140	2	<2
K012QS	430117	1061909	3	140	4	3
K031QS	430145	1063621	6	95	3	3
K032QS	430111	1063425	5	110	2	<2
K051QS	430202	1064453	7	90	5	4
K052QS	430212	1064817	3	120	2	3
K081QS	425240	1063311	8	60	3	2
K082QS	425237	1063155	54	600	13	280
K101QS	425424	1061609	3	110	<2	3
K102QS	425235	1061939	3	150	4	3
K231TWRU	424101	1064909	3	140	4	2
K232TWRU	423747	1064614	8	230	10	7
K161TWRL	424212	1064859	9	190	4	3
K162TWRL	424141	1064851	3	670	17	450
K221TWRL	423847	1064253	5	180	3	4
K222TWRL	423857	1064233	2	210	<2	10
K231TWRL	424122	1064903	10	160	<2	4
K232TWRL	424101	1064518	43	180	<2	6

Table 3.--Water-extractable geochemical data for native soils collected from geologic units at the Kendrick Reclamation Project Area (extract basis) (Continued)

Sample ID	Latitude	Longitude	Se, ppb Extract	Spec. Cond., microSiemens	Cl, ppm Extract	Sulfate, ppm Extract
K151TWDR	424656	1064540	4	60	2	<2
K152TWDR	424831	1064938	5	150	3	2
K161TWDR	424343	1064529	4	90	4	7
K162TWDR	424329	1064945	2	70	5	3
K171TWDR	424420	1064239	17	1300	5	790
K172TWDR	424502	1064244	8	80	2	<2
K221TWDR	424105	1064106	3	180	4	2
K222TWDR	424009	1064033	16	360	23	60
K231TWDR	424055	1064442	3	200	4	8
K232TWDR	424015	1064337	7	150	2	<2
K151TFU	424715	1064548	3	70	3	<2
K152TFU	425002	1064932	100	400	16	100
K161TFU	424633	1064426	23	70	8	<2
K162TFU	424517	1064308	26	1000	8	720
K171TFU	424441	1064141	10	130	5	4
K172TFU	424155	1064037	12	250	12	10
K221TFU	424026	1063948	37	300	6	70
K151KL	424728	1064538	5	100	<2	<2
K152KL	424836	1064704	7	150	3	3
K171KL	424426	1064032	29	500	35	110
K172KL	424201	1064014	8	200	<2	8
K221KL	423933	1063751	22	1200	12	900
K222KL	423919	1063937	3	170	2	230
K011KFH	430108	1062019	5	120	<2	<2
K012KFH	425845	1061820	22	4900	50	3800
K011KML	425924	1062019	6	140	<2	5
K012KML	425830	1061851	29	1400	8	860
K101KML	425602	1061758	5	130	2	2
K102KML	425525	1061620	8	150	<2	2
K151KML	424751	1064454	5	60	5	2
K152KML	424850	1064640	6	130	<2	2
K171KML	424446	1064024	75	1400	20	1000
K172KML	424210	1063037	15	280	7	24
K221KML	423926	1063746	3	230	2	40
K222KML	423909	1063937	6	130	<2	<2
K011KMV	425908	1062053	53	600	11	270
K012KMV	425724	1061939	8	140	<2	20
K101KMV	425546	1061803	5	130	<2	10
K102KMV	425421	1061717	3	150	2	3
K151KMV	424803	1064453	3	130	2	<2

Table 3.--Water-extractable geochemical data for native soils collected from geologic units at the Kendrick Reclamation Project Area (extract basis) (Continued)

Sample ID	Latitude	Longitude	Se, ppb Extract	Spec. Cond., microSiemens	Cl, ppm Extract	Sulfate, ppm Extract
K152KMV	424855	1064626	6	120	2	2
K171KMV	424424	1063934	9	270	8	22
K172KMV	424222	1063855	6	120	<2	2
K221KMV	423906	1063741	6	160	<2	2
K222KMV	423854	1063935	9	150	2	3
K223KMV	423849	1064155	6	100	<2	2
K031KC	425926	1063115	17	2100	18	1800
K032KC	430031	1063520	9	180	5	10
K051KC	430036	1064821	38	230	3	8
K052KC	430109	1064957	19	220	3	6
K061KC	425454	1064717	7	160	<2	5
K062KC	425251	1064452	310	600	50	190
K081KC	425549	1063416	12	240	<2	35
K082KC	425253	1063639	37	4400	2	2400
K101KC	425305	1062001	870	4900	13	4100
K102KC	425423	1062133	36	1000	8	500
K131KC	425145	1063333	6	50	2	<2
K132KC	424817	1063154	900	1100	140	2700
K151KC	425150	1064505	190	900	40	500
K152KC	424907	1064616	27	140	4	<2
K171KC	424623	1063714	67	480	35	58
K172KC	424531	1063739	7	180	3	6
K221KS	423733	1063605	3	180	3	8
K222KS	423832	1064105	3	170	6	3
K051KF	425942	1065035	7	60	<2	2
K052KF	425841	1064926	16	1000	9	600
K061KF	425321	1064931	3	150	2	2
K062KF	425300	1064821	8	160	<2	3
K081KF	425312	1063417	6	190	<2	5
K082KF	425332	1063632	15	2600	12	2500
K131KF	425119	1063353	4	50	<2	<2
K132KF	425058	1063221	8	180	2	6
K151KF	425025	1064446	2	50	4	<2
K152KF	425115	1064558	4	110	5	3
K171KF	424520	1063741	3	170	<2	2
K172KF	424617	1063804	8	180	<2	3
K051KMT	425749	1065038	3	200	<2	3
K052KMT	425825	1065017	87	1900	18	1000
K061KMT	425652	1065041	6	200	<2	4
K062KMT	425503	1065046	160	3900	38	3300
K131KMT	425111	1063416	5	170	3	8
K132KMT	424949	1063208	7	110	3	5
K151KMT	425027	1064401	3	150	4	3
K152KMT	425052	1064505	6	190	<2	3

Table 4.--Water-extractable geochemical data for irrigated soils from the Kendrick Reclamation Project Area (extract basis)

Sample ID	Latitude	Longitude	Se, ppb Extract	Spec. Cond., microSiemens	Cl, ppm Extract	Sulfate, ppm Extract
K001S	423507	1064018	7	310	<2	65
K002S	423550	1064057	2	1300	11	970
K003S	423556	1064015	9	440	<2	150
K004S	423611	1063841	3	210	2	14
K005S	423631	1063747	<2	800	12	160
K006S	423653	1063846	5	270	2	20
K007S	423709	1063931	4	200	4	17
K008S	423733	1063824	<3	200	2	13
K009S	423738	1063753	3	210	2	10
K010S	423810	1063844	3	190	2	13
K011S	423910	1063726	5	200	2	16
K012S	424021	1063750	40	7400	90	3600
K013S	424300	1063458	3	250	2	50
K014S	424251	1063418	3	300	6	15
K015S	424458	1063534	2	400	4	45
K016S	424538	1063359	5	310	6	20
K017S	424611	1063256	<3	220	2	17
K018S	424617	1063421	<2	250	3	4
K019S	424617	1063454	8	180	<2	8
K020S	424314	1063606	10	240	2	20
K021S	424423	1063605	3	270	<2	40
K022S	424443	1063715	700	1000	50	200
K023S	424516	1063603	70	1800	40	1000
K024S	424459	1063713	<2	220	<2	11
K025S	424632	1063638	53	420	22	88
K026S	425001	1062802	3	210	4	15
K027S	425020	1062816	3	200	<2	12
K028S	425039	1062504	<2	600	2	270
K029S	425026	1062829	<2	210	<2	10
K030S	425051	1062621	200	1100	12	800
K031S	425121	1062819	<3	210	2	10
K032S	425121	1062838	3	200	2	10
K033S	425137	1062647	22	410	6	120
K034S	425118	1062556	8	650	12	380
K035S	425145	1062445	100	600	16	230
K036S	425142	1062316	8	180	3	15
K037S	424721	1063305	3	190	2	5
K038S	424717	1063405	3	260	5	30
K039S	424706	1063451	6	170	2	5
K040S	424718	1063154	3	170	4	4

Table 4.--Water-extractable geochemical data for irrigated soils from the Kendrick Reclamation Project Area (extract basis) (Continued)

Sample ID	Latitude	Longitude	Se, ppb Extract	Spec. Cond., microSiemens	Cl, ppm Extract	Sulfate, ppm Extract
K041S	424734	1063413	13	290	3	40
K042S	424743	1063427	<2	230	3	15
K043S	424742	1063139	26	210	2	13
K044S	424816	1063226	17	430	6	100
K045S	424828	1063521	10	210	<2	15
K046S	424830	1063315	8	500	3	200
K047S	424832	1063231	13	230	<2	8
K048S	424851	1063556	30	700	15	400
K049S	424922	1063505	5	1700	8	1500
K050S	424908	1063738	2	230	<2	10
K051S	424949	1063342	3	230	3	16
K052S	425023	1063616	23	1400	45	800
K053S	425010	1063400	<3	200	4	6
K054S	425052	1063445	110	550	40	130
K055S	425102	1063547	14	370	2	80
K056S	425117	1063130	3	1400	40	1000
K057S	424931	1063630	17	600	11	250
K058S	425157	1062859	<2	260	<2	18
K059S	425152	1062754	44	700	6	330
K060S	425153	1062709	28	1000	30	500
K061S	425158	1062335	3	230	5	18
K062S	425214	1062520	10	390	7	68
K063S	425231	1062437	<2	200	2	7
K064S	425250	1062449	3	320	10	60
K065S	425317	1062808	3	330	13	50
K066S	425246	1062610	3	500	20	150
K067S	425309	1062543	11	170	2	15
K068S	425323	1062833	42	240	2	30
K069S	425343	1062749	2	250	2	20
K070S	425349	1062852	3	210	5	12
K071S	425447	1062820	7	180	4	6
K072S	425444	1062839	34	1800	90	1000
K073S	425540	1062835	2	800	10	430
K074S	425525	1062821	3	210	4	12
K075S	425601	1062645	3	250	7	50
K076S	425656	1062837	3	2600	60	2000
K077S	425658	1062725	57	1000	12	600
K079S	425326	1063208	4	160	4	5
K080S	425311	1063150	6	200	2	15

Table 4.--Water-extractable geochemical data for irrigated soils from the Kendrick Reclamation Project area (extract basis) (Continued)

Sample ID	Latitude	Longitude	Se, ppb Extract	Spec. Cond., microSiemens	Cl, ppm Extract	Sulfate, ppm Extract
K081S	425318	1063042	240	2500	100	1600
K082S	425402	1062943	77	510	20	200
K083S	425352	1063154	6	200	<2	13
K084S	425347	1063206	14	220	4	25
K085S	425432	1063210	7	360	<2	100
K086S	425559	1063241	6	210	2	16
K087S	425559	1063241	80	3400	30	2600
K088S	425602	1063044	67	1800	14	1300
K089S	425628	1063305	26	3800	29	2900
K090S	425657	1063020	14	1900	38	1700
K091S	425613	1063113	7	2800	8	2700
K092S	425657	1063325	12	3100	15	2500
K093S	425735	1062738	6	320	<2	45
K094S	425746	1062845	10	210	4	30
K095S	425909	1062928	3	220	<2	11
K096S	425909	1063928	9	1300	4	1100
K097S	425704	1063119	70	2300	13	2100
K098S	425720	1062944	7	230	7	40
K099S	425748	1063218	43	1800	10	1400
K100S	425759	1063237	34	2600	40	2400
K101S	425813	1063059	20	4800	30	4400
K102S	425759	1063022	8	200	2	13
K103S	425909	1063242	<2	250	<2	19
K104S	425859	1063111	130	2100	80	1300
K105S	425901	1063046	12	1000	12	500
K106S	425951	1062946	3	240	<2	55
K107S	425952	1063253	17	900	15	500
K108S	430036	1063413	<2	260	<2	20
K109S	425811	1063317	14	1400	10	1000
K110S	425736	1063616	45	2000	5	1900