

Soil Salinity Monitoring Report: 2013

Technical Memorandum

February 2014

Subject to Revision

SAN JOAQUIN RIVER
RESTORATION PROGRAM

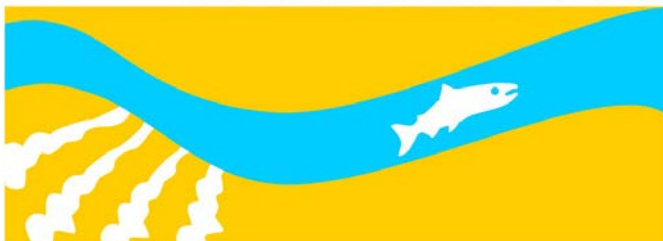


Table of Contents

1.0	Introduction	1-1
2.0	Methodology	2-1
2.1	EM38 Survey	2-1
2.2	Central Boring	2-1
2.3	Composite Sample	2-2
3.0	Field Quality Assurance/Quality Control Evaluations	3-1
4.0	Results	4-1
4.1	EM38 Salinity Surveys	4-5
4.2	EM 38 Data at New Baseline Sites.....	4-5
4.3	EMh Trends at Selected Sites	4-6
4.4	EMv Trends at Selected Sites	4-10
4.5	Change in Percentage of Inverted Salinity Profiles at Selected Sites.....	4-13
4.6	Soil Moisture Observations	4-15
5.0	Discussion	5-1
5.1	Crop Salt Tolerance Data.....	5-1
5.2	Depth to Shallow Groundwater	5-2
5.3	Soil Gypsum Content and Effects on Prediction of Crop Yield Potential	5-3
5.4	Root Zone Depth Observations	5-3
5.5	Irrigation System Types and Crop Type Factors	5-4
5.6	Determination of Long-Term Soil Salinity Trends	5-4
5.7	Seasonal Soil Salinity Variation	5-5
6.0	Recommendations	6-1
7.0	References	7-1

Tables

Table 3-1. Soil Samples, Field Replicates of Multi-Increment Spatial Composite Samples	3-1
Table 3-2. Relative Percent Difference of 0 to 12 inch Replicate Soil Samples.....	3-1
Table 4-1. Soil Salinity Trend Analysis Summary, 0 to 12 Inch Spatial Composite Samples 2010 Sites vs. 2013 Sites	4-1

Table 4-2. Soil Salinity Trend Analysis Summary, 0 to 12 Inch Spatial Composite Samples 2011 Sites vs. 2013 Sites	4-3
Table 4-3. Soil Salinity Trend Analysis Summary, 0 to 12 Inch Spatial Composite Samples 2012 Sites vs. 2013 Sites	4-4
Table 4-4. Surface Soil Salinity Trend Summary Baseline vs. 2013	4-5
Table 4-5. EM38 Data Summary of New Baseline Sites 2013, Corrected to 25 Degrees Celsius	4-6
Table 4-6. EMh Trends at Selected Sites.....	4-7
Table 4-7. EMh Trend Summary	4-9
Table 4-8. EMv Trends at Selected Sites, 2010 to 2013.....	4-10
Table 4-9. EMv Trend Summary	4-13
Table 4-10. Inverted Soil Salinity Profile Trends at Selected Sites, 2010 to 2013	4-14
Table 4-11. Inverted Salinity Profile Summary.....	4-15
Table 4-12. Soil Moisture Characteristics	4-16
Table 4-13. Capillary Fringe Summary Statistics.....	4-18
Table 5-1. Yield Potential of Selected Crops ¹	5-2
Table 5-2. Soil Salinity Spatial Variation in Drip Irrigated Orchards	5-4
Table 5-3. Seasonal Soil Salinity Variation in Surface Soils, 0 to 12 Inches	5-5

Figures

None.

Appendices

- A. Soil Salinity Data: 2013
- B. Soil Profile Logs
- C. Soil Salinity Baseline Sample Location Maps
- D. Soil Profile Abbreviations
- E. GPS Location Coordinates of Baseline Soil Borings
- F. Comparison of Electrical Conductivity of Soil Extract Data from 2010-2013

List of Abbreviations and Acronyms

bgs	below ground surface
dS/m	decisiemens per meter
ECe	electrical conductivity of the soil saturation extract
EM	electromagnetic soil conductivity
EMh	horizontal EM signal
EMv	vertical EM signal
FAO	Food and Agriculture Organization
GPS	global positioning system
GW	groundwater
in	inch
Meq	milliequivalents
meq/L	milliequivalents/liter
mS/m	milliSiemens per meter
QA/QC	quality assurance/quality control
SAR	Sodium Adsorption Ratio
SJRRP	San Joaquin River Restoration Program
USDA	U.S. Department of Agriculture
Wave	weighted average
PSA	particle size analysis

Additional abbreviations and acronyms (for the Soil Profile Logs) are located in Appendix D.

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1.0 Introduction

The baseline soil salinity monitoring program is a supporting investigation for the U.S. Bureau of Reclamation's San Joaquin River Restoration Program (SJRRP) Seepage Management Plan (Reclamation 2010). The primary purpose of the soil salinity evaluation is to determine baseline conditions and evaluate soil salinity trends over time. Other parameters evaluated as part of this study include:

- Water table depth;
- Capillary fringe thickness;
- Presence and depth of soil mottling and gleying;
- Soil moisture levels;
- Soil temperature;
- U.S. Department of Agriculture (USDA) soil texture;
- Soil reaction;
- Saturation percentage;
- Qualitative soil lime content;
- Root abundance and depth;
- Sodium adsorption ratio (selected samples);
- Soil gypsum content (selected samples); and
- Crop type and condition.

Twenty baseline soil salinity sites were established in the spring of 2013 (see Appendices C and E for site locations). These sites complement the existing 117 sites established in the spring of 2010, 2011, and 2012. Most of the previously investigated sites were reevaluated for soil salinity in 2013 to determine if soil salinity had changed. Eight additional sites (i.e., the "L" and "DF" series) that were specifically located by a landowner were also sampled. The following sites were not reevaluated in 2013: 18, 22, 25, 26, 27, and 28. The most common reason for not resampling a site is because access permission could not be obtained.

The winter of 2012/13 was much drier than normal. The winter rains were near normal early in the season but very dry conditions persisted after the first of the year. Conditions were too dry for leaching of salts and, in some fields, too dry for reliable electromagnetic (EM) soil conductivity (EM38) surveys.

Nearly all of the new sites were evaluated using soil samples and EM38 measurements. Two new sites, 133 and 134 were only evaluated with the EM38.

San Joaquin River Restoration Program

2013 was the last scheduled year of the baseline soil salinity sampling program. In 2014, only a few selected sites and sites requested by landowners will be sampled and/or EM surveyed.

2.0 Methodology

Soil sampling was typically done by a two or three man crew under the direction of a soil scientist.

2.1 EM38 Survey

An EM38 survey was conducted within a 100-foot radius of the initial selected site. The EM38 provides multiple real time soil salinity measurements. The instrument measures bulk soil electrical conductivity of an area about six feet long, five feet deep and about 2.5 feet wide. The EM38 instrument allows for:

- Collection of multiple real-time soil salinity measurements in a short period of time;
- Measurement of bulk soil electrical conductivity for a large volume of soil as compared to soil samples; and
- Collection of real-time information on soil salinity levels, salt distribution in the profile, and spatial variation of soil salinity within an area surrounding a boring site.

The EM38 survey can be conducted in the horizontal (EMh) or vertical (EMv) position. The EMh signal measures the top meter of soil. The EMv signal measures from the top two meters of soil. (Geonics 1998) For this project it is assumed the EMh generally measures the bulk soil electrical conductivity to a depth of about 30 inches, while the EMv generally reflects the bulk electrical conductivity of the 0 to 60-inch soil depth. Both readings can be used to estimate the soil salinity of the 0 to 36-inch soil zone (Rhoades, et al. 1989). The number of measurements can be increased if the survey area has variable readings. Following the measurements, the EM readings were averaged and adjusted for soil temperature (i.e., corrected to 25°C). The survey included least 12 paired EM measurements.

2.2 Central Boring

Following the EM38 survey, a final central boring soil sampling site was placed directly under a pair of EM measurements. The site selected for the central boring included EM measurements that were generally well within the range of readings measured surrounding the site. Sites with unusually high or low EM readings were typically not chosen as a central boring sites because these sites did not appear to represent the average condition for the site.

The central boring was hand augured and soil samples were collected at depths of 0 to 12, 12 to 30, and 30 to 60 inches. In a few cases (see Appendix A for sampling intervals), the soils could not be sampled to the full 60 inches due to hardpan layers or the presence of unstable saturated soils. The soil was examined and a soil profile log (Appendix B) was prepared using the U.S. Department of Agriculture (USDA) soil textural system and nomenclature. Special attention was given to the depth of mottling and/or gleying, capillary fringe thickness, and the depth to shallow groundwater.

2.3 Composite Sample

A separate multi-increment spatial composite soil sample of surface soil (0 to 12 inches) was collected from an area within a 100-foot radius of the central boring. These samples typically contained between 15 and 30 increments. These samples were collected with either a one-inch diameter Dakota or Oakfield probe. Baseline soil samples in field crops and row crops were collected in a stratified random manner to ensure that the top, sides, bed shoulders, and furrows were represented in the composite surface soil samples. Orchard and vineyard areas were carefully sampled to avoid underground plastic pipe manifolds and trench backfill; and to make sure that the spatial composite soil samples included increments collected from near the emitter, near the center of the tree rows, and areas near the edge of the tree canopy. In some cases soil sampling procedures were customized for each orchard or vineyard, depending on the type of irrigation system used. Replicate soil salinity samples were also collected from the area within a 100-foot radius around some of the boring sites. The multi-increment surface soil composite samples were used for most evaluations, including establishing baseline soil salinity values and estimating crop yield potential. A soil sample from a depth of 0 to 12 inches was also collected from the central site. This sample was mainly used for EM meter calibration and soil salinity profile characterization.

Soil samples were sent to the Fruitgrower's Laboratory in Santa Paula, California for analysis. A screenable testing procedure was used. If the electrical conductivity of the soil saturation extract (ECe) exceeded 3 deciSeimens per meter (dS/m) or the pH paste (pHp) was 8.5 or higher, a Sodium Adsorption Ratio (SAR) analysis was requested. The SAR is a ratio for soil extracts and irrigation water used to express the relative activity (i.e., excess) of sodium ions in exchange reactions with soil, specifically calcium and magnesium. The SAR is the result of the calculation, $Na^+ / [(Ca^{2+} + Mg^{2+})/2]^{1/2}$, where ionic concentrations are expressed in milliequivalents per liter (meq/L) (Ayers and Westcot, 1994). If the SAR testing found saturation extract calcium concentrations over 15 meq/L then calcium was determined on a 1:5 soil:water extract. This data was used to estimate soil gypsum content in milliequivalents per 100 grams (meq/100g).

Quality assurance/Quality control (QA/QC) of laboratory salinity data was provided by the Environmental Monitoring Branch of Reclamation's Sacramento Regional office. All laboratory data presented in this report met or exceeded SJRRP acceptance criteria.

3.0 Field Quality Assurance/Quality Control Evaluations

Field evaluation of soil sampling procedures and sampling errors was evaluated by the crew by comparing replicate samples. Refer to the 2010 baseline soil salinity report presented in the *2011 Annual Technical Report, Appendix A, Report 5* (Reclamation 2011) for detailed information on field and EM38 replicate sampling. The sampling techniques proved to be reliable in prior years, therefore, only limited field replicate samples were taken in 2013. The results of these replicate sampling operations are presented in Table 3-1.

Table 3-1. Soil Samples, Field Replicates of Multi-Increment Spatial Composite Samples

Sample Site	Initial Result	Replicate Result	Relative Percent Difference
104-13 0-12 30x	2.16	2.33	7.6
105-13 0-12 30x	1.48	1.86	22.8
80-13 0-12 30x	3.50	3.60	2.8
122-13 0-12 30x	1.27	1.41	10.4
Df-2 0-12 30x	4.86	4.25	13.4
100-13 0-12 30x	1.51	1.03	37.8

Key:

ECe = electrical conductivity of the soil extract

A summary of all field QA/QC data collected since 2010 is presented in Table 3-2. The relative percent difference (RPD) data was sorted by irrigation system type. RPD is the difference between two numbers divided by the average of the two numbers multiplied by 100.

Table 3-2. Relative Percent Difference of 0 to 12 inch Replicate Soil Samples

Irrigation System Type	Number of Sites	Average RPD	RPD for 95% Confidence Interval
Gravity/sprinkler	15	13.8	7.9 - 19.7
Drip-, micro-sprinkler	9	16.0	8.7 - 23.2
All sites	24	14.6	10.1 - 19.1

Quality control evaluations based on field replicate sample data suggested the following:

- Gravity and sprinkler irrigated sites with salinity level changes of over 20 percent indicate that the salinity at the site has increased or decreased over time. Changes less than 20 percent may be due to random spatial soil salinity variation, sampling

- error, and/or laboratory error and may not represent a significant change in soil salinity.
- Sites irrigated with micro-sprinklers or drip irrigation should have changes over 25 percent in order to be confident that soil salinity has changed.
 - Field data presented in this report considers soil salinity stable if the most recent soil ECe level is between 80 and 120 percent of the original baseline ECe.
 - Comparison of 0 to 12 inch soil salinity samples at the central boring site with the multi-increment spatial composite samples collected within a 100-foot radius of the central boring site indicated an average RPD of approximately 33 percent. Some samples had RPD values as high as 100 percent.
 - The central boring samples appear to be somewhat less saline than the composite samples. Possible reasons for the lower salinity could be that the central borings were typically placed in the furrows while the composite borings collected increments from furrows, beds, and bed shoulders.
 - The salinity data at some sites may have a slight negative skew where the median salinity value is less than the mean value.
 - Soil salinity data from single borings should be used with caution. The salinity values at central borings may not reflect the average salinity conditions in the area and are more likely to underestimate soil salinity of the area.
 - Paired soil samples were collected from several sampling depth intervals at sites about 10 feet apart. These samples were collected at the central borings. Samples were collected in the same depth zone about 10 feet apart. The RPD values for these paired samples averaged 12.2 while the RPD range was 7.8 to 36.6.
 - Two surface composite soil samples that were collected in 2010 were reanalyzed in 2013. The purpose of these reruns was to confirm the long shelf life of dried soil samples stored in plastic bags and to check soil preparation and mixing procedures used at the laboratory. Both rerun sample results were very close to the original values for all parameters.

Eight replicate EM 38 surveys were conducted mostly in the 2010 soil sampling event. A summary of the RPD values between different operators surveying the same site in the same time period are presented below:

- Average RPD for EMh: 6.5
- Average RPD for EMv: 4.8

EM38 surveys measure large volumes of soil therefore much of the micro-variation within short distances does not affect the signal readings. Normally, at least 12 pairs of EM38 readings were collected within a 100 foot radius of the central soil boring site.

4.0 Results

A comparison of surface soil salinity data at sites sampled in the spring of 2010, 2011, and 2012 with salinity data collected in the spring of 2013 is presented in Tables 4-1 through 4-3. Nearly all sites were resampled in 2013. The survey area was affected by events that could have changed soil salinity levels including: (1) the dry winters of 2012 and 2013 limited leaching incidental to rainfall and (2) no SJRRP river flows were released below Sack dam (i.e., into Reach 4A) in 2012 or 2013.

River flows has the potential to affect soil salinity in the following manner:

- Raise the level and duration of shallow groundwater levels into the root zone and increase upflux of water and salts dissolved in the water.
- Reduce the salinity of irrigation water diverted at the Mendota Pool and Sack Dam.
- Increase seepage and increase the need for artificial drainage. In areas where drainage water and irrigation supplies are mixed prior to reapplying to fields, this increased drainage water may cause an overall increase in soil salinity to the more saline water being applied.

Table 4-1. Soil Salinity Trend Analysis Summary, 0 to 12 Inch Spatial Composite Samples 2010 Sites vs. 2013 Sites

Site	2010 ECe (dS/m)	2013 ECe (dS/m)	Change	Percent of 2010 Baseline
1	0.99	1.71	Increase	173
2	4.72	5.16	Increase	109
3	7.20	3.23	Decrease	45
4	1.80	1.94	Increase	108
5	4.36	2.86	Decrease	66
6	1.49	1.01	Decrease	68
7	1.77	1.76	Decrease	99
8	0.96	0.56	Decrease	58
9	0.98	1.39	Increase	142
10	1.50	0.57	Decrease	38
11	1.23	0.73	Decrease	59
12	4.89	5.51	Increase	113
13	7.21	4.71	Decrease	65
14	2.78	4.72	Increase	170
15	0.81	1.84	Increase	227
16	2.69	3.25	Increase	121
17	8.35	10.8	Increase	129
19	1.54	4.11	Increase	267
20	1.62	3.73	Increase	230

**Table 4-1. Soil Salinity Trend Analysis Summary, 0 to 12 Inch Spatial Composite Samples
2010 Sites vs. 2013 Sites**

Site	2010 ECe (dS/m)	2013 ECe (dS/m)	Change	Percent of 2010 Baseline
21	2.09	2.02	Decrease	97
23	0.69	0.70	Increase	101
24	1.47	2.23	Increase	152
29	2.25	2.57	Increase	114
30	1.88	2.21	Increase	118
31	2.90	3.07	Increase	106
32	1.70	0.92	Decrease	54
33	1.16	3.10	Increase	267
34	1.32	2.57	Increase	195
35	1.51	2.32	Increase	154
36	1.94	1.88	Decrease	96
37	1.72	0.98	Decrease	57
38	1.79	1.69	Decrease	94
39	1.89	2.48	Increase	131
40	1.88	4.03	Increase	215
41	2.37	0.89	Decrease	38
42	1.82	3.95	Increase	217
43	1.18	2.23	Increase	189
44	1.80	3.64	Increase	202
45	0.95	2.84	Increase	299
46	0.95	1.73	Increase	182
47	1.09	1.12	Increase	103
48	0.99	1.26	Increase	127
49	1.10	2.92	Increase	265
50	4.95	5.52	Increase	112
51	3.39	3.51	Increase	104
52	2.24	1.21	Decrease	54
53	0.94	1.65	Increase	175
54	1.53	1.67	Increase	109
55	0.87	1.31	Increase	151
56	1.37	4.15	Increase	303
57	1.31	1.32	Increase	101
58	1.10	0.99	Decrease	90
59	1.16	1.37	Increase	118
60	7.83	20.9	Increase	267
61	16.0	20.1	Increase	126
62	6.25	11.8	Increase	189
63	2.04	1.05	Decrease	51
64	0.83	0.90	Increase	108
65	0.59	1.11	Increase	188
66	0.79	1.38	Increase	175
67	0.57	0.74	Increase	130
69	0.77	1.18	Increase	153
70	1.43	1.81	Increase	127
71	1.26	1.60	Increase	127
73	0.87	1.78	Increase	205

**Table 4-1. Soil Salinity Trend Analysis Summary, 0 to 12 Inch Spatial Composite Samples
2010 Sites vs. 2013 Sites**

Site	2010 ECe (dS/m)	2013 ECe (dS/m)	Change	Percent of 2010 Baseline
74	1.54	1.59	Increase	103
75	3.13	1.86	Decrease	59
76	11.3	7.23	Decrease	64
79	7.13	10.9	Increase	153
2010	All sites	Average	Increase	136

Key:

ECe = electrical conductivity of the saturated soil extract

dS/m = decisiemens per meter

**Table 4-2. Soil Salinity Trend Analysis Summary, 0 to 12 Inch
Spatial Composite Samples 2011 Sites vs. 2013 Sites**

Site	2011 ECe (dS/m)	2013 ECe (dS/m)	Change	Percent of 2011 Baseline
80	1.27	3.55	Increase	280
81	1.04	3.81	Increase	366
82	1.18	2.42	Increase	205
83	1.11	2.95	Increase	266
84	8.43	11.9	Increase	141
85	1.01	1.53	Increase	151
86	0.92	2.14	Increase	233
87	1.12	0.86	Decrease	77
88	0.80	0.61	Decrease	76
89	0.46	0.83	Increase	180
90	5.53	5.27	Decrease	95
91	6.26	4.27	Decrease	68
93	1.07	1.96	Increase	183
94	1.07	0.81	Decrease	76
95	0.26	0.42	Increase	162
96	0.68	1.18	Increase	174
97	3.46	3.35	Decrease	97
99	0.72	0.82	Increase	114
100	1.48	1.27	Decrease	86
101	2.08	5.06	Increase	243
Df1	2.13	2.78	Increase	131
Df2	2.44	4.56	Increase	187
L21	1.85	1.84	Decrease	99
L26	1.55	0.96	Decrease	62
L28	1.70	1.01	Decrease	59
L48	1.31	1.85	Increase	141
L50	1.27	2.33	Increase	183

Table 4-2. Soil Salinity Trend Analysis Summary, 0 to 12 Inch Spatial Composite Samples 2011 Sites vs. 2013 Sites

Site	2011 ECe (dS/m)	2013 ECe (dS/m)	Change	Percent of 2011 Baseline
L66/68	0.47	1.74	Increase	370
2011	All sites	Average	Increase	167

Key:

ECe = electrical conductivity of the saturated soil extract
 dS/m = decisiemens per meter

Table 4-3. Soil Salinity Trend Analysis Summary, 0 to 12 Inch Spatial Composite Samples 2012 Sites vs. 2013 Sites

Site	2012 ECe (dS/m)	2013 ECe (dS/m)	Change	Percent of 2012 Baseline
102	4.19	4.03	Decrease	96
103	3.86	3.06	Decrease	79
104	3.65	2.25	Decrease	62
105	3.69	1.67	Decrease	45
106	0.92	2.15	Increase	234
107	0.91	0.71	Decrease	78
108	1.42	0.81	Decrease	57
109	1.09	0.73	Decrease	67
110	5.02	2.01	Decrease	42
111	21.9	19.7	Decrease	90
112	13.2	7.32	Decrease	55
113	27.8	14.4	Decrease	52
116	4.97	4.24	Decrease	85
All	Average	Average	Decrease	80
All years	All sites	Average	Increase	137

Key:

ECe = electrical conductivity of the saturated soil extract
 dS/m = decisiemens per meter

Table 4-4 presents a summary of the salinity trend data. Sites with ECe values less than 1.0 in both 2012 and 2013 were tallied separately in Table 4-4 because this level is typically favorable for all crops. Sites with changes of less than 20 percent were considered stable based on sampling and laboratory error determinations. It should be noted that surface soil salinity rose in Reach 4B on the southwest side of the San Joaquin River. However, SJRRP Interim/Restoration Flows have yet to be released into Reach 4B. Salinity trends at Reach 4B sites are listed separately in Table 4-4.

Table 4-4. Surface Soil Salinity Trend Summary Baseline vs. 2013

Trend	Number of Sites (All Sites)	Number of Sites (Reach 4B Sites Only)
Increasing	51	10
Decreasing	27	0
Stable	27	6
Sites with ECe less than 1 dS/m	7	0

Key:

ECe = electrical conductivity of the saturated soil extract

dS/m = decisiemens per meter

4.1 EM38 Salinity Surveys

EM38 surveys were generally conducted in a circular area within a 100-foot radius of the central boring site. At least 12 pairs of EM measurements were collected at each site in a stratified random manner (see description in Section 2.0 Methodology). As mentioned previously, the EMh reading measures soil salinity in roughly the top 30 inches of soil while the EMv reading measures soil salinity in roughly the top 60 inches of soil. The EMh signal is strongest near the soil surface while the maximum EMv signal comes from about 16-inches below the soil surface. The EMh signal strength is sometimes considered a good representation of soil salinity for plant growth and salt tolerance evaluations since the signal strength from different soil depth intervals tends to follow plant water uptake patterns. Both the EMh and EMv readings can be used to estimate bulk soil salinity levels over a depth of 0 to 36 inches (Rhoades et al. 1989). The signal data can be used to estimate bulk soil electrical conductivity; however, it is difficult to predict soil saturation extract salinity values from EM data. Soil texture, temperature, and soil moisture content, as well as soil salinity levels, affect the EM signal data. All EM38 measurements collected at the sites were adjusted for soil temperature, and then averaged. Statistical methods were used to determine the 95 percent confidence range. The percentage of inverted soil salinity readings is also listed as a potential indicator of land productivity. During the dry spring of 2013, 27 of the sites were judged to be too dry for reliable EM38 surveys. Original site selection criteria included optimum soil moisture conditions for the EM surveys. Subsequent sampling of the same sites is done regardless of soil moisture conditions due to time constraints and access permission time windows. EM38 data is presented in Tables 4-5 through 4-7.

4.2 EM 38 Data at New Baseline Sites

Table 4-5 presents a summary of EM38 data at the new baseline sites established during the spring of 2013. All data in Table 4-5 are corrected to a standard temperature of 25 degrees Celsius. Soils at three sites were too dry for reliable EM38 surveys and were omitted from the table.

**Table 4-5. EM38 Data Summary of New Baseline Sites 2013,
Corrected to 25 Degrees Celsius**

Site	Number of Observations	EMh (mS/m)	EMh 95 Percent Confidence Interval	EMv (mS/m)	EMv 95 Percent Confidence Interval	Percent Inverted Profiles
118	14	127.1	121.8-132.4	148.7	142-155.4	0
120	15	71.2	66.7-75.7	83.5	73.0-94.0	20
121	13	48.4	45.2-51.6	75.2	66.8-83.6	8
122	14	24.2	22.7-25.7	44.4	41.6-47.2	0
123	15	59.6	52.1-67.1	72.7	62.7-82.7	33
124	11	51.6	46.7-56.5	72.8	64.6-81.2	0
125	14	32.7	29.9-35.5	53.7	47.4-60.0	0
126	12	44.6	40.9-48.3	56.1	50.2-62.0	0
127	15	42.4	39.0-45.8	49.7	45.3-54.1	13
128	13	48.0	46.2-49.8	60.7	58.8-62.6	0
130	16	67.5	55.5-79.5	110.7	94.9-126.5	0
131	15	66.0	56.2-75.8	96.3	82.0-110.6	0
132	14	73.0	67.2-78.8	107.4	99.7-115.1	0
133	14	66.8	60.1-73.5	96.3	85.1-107.5	0
134	12	58.5	53.2-63.8	83.8	76.8-90.8	8
136	12	68.2	63.1-73.3	84.7	79.5-89.9	0

A comparison of baseline EM38 data collected in baseline years to EM data collected in 2013 at the same sites is presented in Tables 4-6 and 4-7. Baseline years include data from 2010, 2011, and 2012. Soil moisture conditions were similar at most sites in the respective baseline year and the 2013 sampling event.

4.3 EMh Trends at Selected Sites

The EMh reading generally indicates bulk soil electrical conductivity at the 0 to 30-inch depth. The EMh signal return is strongest near the soil surface and decreases with depth (Geonics 1998). The EMh signal provides meaningful information since it tends to emulate crop water uptake patterns. However, the EMh signal can underestimate soil salinity if dry saline surface soils are present. This is generally not the case during late winter and early spring in the survey area.

Table 4-6. EMh Trends at Selected Sites

Site-Baseline Year	Average in Baseline Year EMh (mS/m)	Average 2013 EMh (mS/m)	General Trend	Percent of baseline year	Significant at 95 percent?
2-10	23.2	39.7	Increase	171	Yes
3-10	42.1	51.6	Increase	123	No
4-10	22.5	42.7	Increase	190	Yes
5-10	53.9	58.0	Increase	108	No
6-10	9.9	14.4	Increase	145	Yes
7-10	21.2	17.8	Decrease	84	No
8-10	22.2	12.2	Decrease	55	Yes
10-10	16.1	14.8	Decrease	92	No
11-10	30.4	30.4	Stable	100	No
13-10	41.5	32.2	Decrease	78	No
14-10	29.1	39.5	Increase	136	Yes
15-10	61.1	84.5	Increase	138	Yes
17-10	38.9	48.7	Increase	125	No
19-10	30.4	62.8	Increase	207	Yes
20-10	49.6	64.8	Increase	131	Yes
21-10	19.6	33.1	Increase	169	Yes
29-10	29.3	40.2	Increase	137	Yes
30-10	36.2	50.6	Increase	140	Yes
31-10	33.5	43.6	Increase	130	Yes
32-10	70.3	67.7	Decrease	96	No
33-10	39.7	70.5	Increase	178	Yes
34-10	90.7	82.7	Decrease	91	Yes
35-10	33.5	55.6	Increase	166	Yes
36-10	54.0	72.6	Increase	134	Yes
37-10	40.1	35.1	Decrease	88	No
38-10	53.7	53.4	Decrease	99	No
39-10	49.8	54.6	Increase	110	No
40-10	59.7	65.9	Increase	110	No
41-10	49.8	49.4	Decrease	99	No
42-10	39.9	57.2	Increase	143	Yes
43-10	49.0	74.2	Increase	151	Yes
44-10	42.9	64.0	Increase	149	Yes
45-10	57.5	78.9	Increase	137	No
46-10	68.1	86.3	Increase	127	No
47-10	60.3	69.7	Increase	116	Yes
48-10	43.1	47.9	Increase	111	No
49-10	62.0	64.6	Increase	104	No
50-10	88.3	106.9	Increase	121	Yes
51-10	122.5	117.6	Decrease	96	No
52-10	91.4	80.9	Decrease	89	Yes
53-10	58.4	118.8	Increase	203	Yes
54-10	49.1	77.6	Increase	158	Yes
55-10	25.4	45.2	Increase	178	Yes
56-10	38.4	57.2	Increase	149	Yes

Table 4-6. EMh Trends at Selected Sites

Site-Baseline Year	Average in Baseline Year EMh (mS/m)	Average 2013 EMh (mS/m)	General Trend	Percent of baseline year	Significant at 95 percent?
57-10	34.5	46.0	Increase	133	Yes
58-10	51.5	58.3	Increase	113	Yes
59-10	45.2	39.2	Decrease	87	Yes
61-10	107.2	104.9	Decrease	98	No
62-10	42.7	63.5	Increase	149	Yes
63-10	79.2	40.4	Decrease	51	Yes
64-10	64.8	56.4	Decrease	87	Yes
65-10	51.4	42.8	Decrease	83	Yes
66-10	34.1	39.8	Increase	117	No
67-10	40.1	37.0	Decrease	92	No
68-10	31.4	70.3	Increase	224	Yes
69-10	64.8	54.0	Decrease	83	Yes
70-10	98.8	95.0	Decrease	96	No
71-10	56.7	53.0	Decrease	93	No
72-10	150.4	198.0	Increase	132	Yes
73-10	120.2	158.5	Increase	132	Yes
75-10	63.1	87.8	Increase	139	Yes
76-10	52.6	50.4	Decrease	96	No
78-10	55.0	78.3	Increase	142	Yes
All Sites with 2010 Baseline			Increase	124	
80-11	44.4	48.0	Increase	108	No
81-11	32.3	42.9	Increase	133	No
82-11	22.4	29.9	Increase	133	Yes
83-11	83.5	132.6	Increase	159	Yes
84-11	82.4	84.3	Increase	102	No
85-11	37.4	39.0	Increase	104	No
87-11	40.3	32.2	Decrease	80	Yes
88-11	25.6	29.0	Increase	113	No
89-11	40.3	47.4	Increase	118	Yes
90-11	139.3	107.4	Decrease	77	Yes
91-11	191.5	211.6	Increase	110	No
92-11	89.3	126.7	Increase	142	Yes
93-11	88.5	106.3	Increase	120	Yes
94-11	92.2	90.2	Decrease	98	No
95-11	4.4	8.4	Increase	191	Yes
96-11	9.8	25.9	Increase	264	Yes
97-11	65.1	40.4	Decrease	62	Yes
98-11	73.1	83.6	Increase	114	Yes
99-11	47.3	57.9	Increase	122	Yes
100-11	35.2	43.4	Increase	123	Yes
101-11	79.5	90.2	Increase	113	No
L21-11	41.4	58.0	Increase	140	Yes

Table 4-6. EMh Trends at Selected Sites

Site-Baseline Year	Average in Baseline Year EMh (mS/m)	Average 2013 EMh (mS/m)	General Trend	Percent of baseline year	Significant at 95 percent?
L26-11	62.2	66.2	Increase	106	No
L28-11	78.4	82.6	Increase	105	No
L48-11	25.2	46.5	Increase	185	Yes
L50-11	54.4	48.4	Decrease	89	No
L66-11	31.8	47.1	Increase	148	Yes
DF1-11	39.2	58.1	Increase	148	Yes
All Sites with 2011 Baseline			Increase	130	
102-12	33.6	38.8	Increase	115	Yes
105-12	24.5	28.4	Increase	116	No
107-12	32.0	29.6	Decrease	93	No
108-12	48.0	42.7	Decrease	89	Yes
109-12	38	36.1	Decrease	95	No
110-12	90.1	55.7	Decrease	62	Yes
111-12	24	22.5	Decrease	94	No
112-12	128.2	169.4	Increase	132	Yes
113-12	112.2	154.2	Increase	137	Yes
114-12	57.2	76.3	Increase	133	Yes
115-12	54.2	64.1	Increase	118	No
116-12	61.4	51.9	Decrease	85	Yes
117-12	5.2	6.0	Increase	115	No
All Sites with 2012 Baseline			Increase	106	
All Sites, Regardless of Baseline Year			Increase	118	

ECe is corrected to 25 degrees Celsius

Key:

mS/m = microsiemens per meter

EMh = horizontal position

EMv = vertical EM signal

Table 4-7. EMh Trend Summary

Trend Analysis 95 Percent Confidence Level	Number of Sites 2010–2013	Number of Sites 2011–2013	Number of Sites 2012–2013	All Sites
Increase	29	14	4	21
Decrease	8	3	3	13
No significant change	26	11	6	31
Average percent of baseline EMh value	124	130	106	118

Key:

EMh = horizontal position

The data indicates an increase in bulk soil salinity in the top 30-inches of soil (active root zone). However, the data also indicate that bulk soil salinity was more stable between

2012 and 2013. Areas in Reach 4B near the Eastside Bypass generally remained saline. These lands contain native salts. Soil reclamation of these lands is inhibited by high groundwater levels. Bulk soil salinity also increased somewhat in the portion of Reach 4B southwest of the river where SJRRP Interim Flows have yet to be released. No SJRRP Interim Flows were released into Reach 4A during 2012 or 2013.

4.4 EMv Trends at Selected Sites

The EMv reading generally measures bulk soil electrical conductivity in the 0 to 60-inch zone. The signal returns are low at the soil surface and peak at a depth of about 16-inches and gradually diminish to a depth of about 6.5 feet (Geonics 1998). The EMv signal best represents subsoil and substrata soil salinity conditions. The presence of wet and saturated layers in the top 6.5 feet of soil can increase the EMv value and lead to an overestimation of soil salinity. The EMv trends between baseline years and 2013 at selected sites are presented in Table 4-8. Table 4-9 presents a summary of the measured EMv trends. Overall the bulk soil salinity in the top five feet of soil appears to have increased slightly.

Table 4-8. EMv Trends at Selected Sites, 2010 to 2013

Site-Baseline Year	Average EMv Baseline Year (mS/m)	Average EMV 2013 (mS/m)	Change	Percent of Baseline Year	Significant at 95 Percent?
2-10	23.7	40.6	Increase	171	Yes
3-10	36.8	50.7	Increase	138	No
4-10	25.0	53.8	Increase	215	Yes
5-10	51.4	66.2	Increase	129	Yes
6-10	9.9	16.5	Increase	167	Yes
7-10	25.1	21.3	Decrease	85	No
8-10	25.5	19.9	Decrease	78	Yes
10-10	16.8	20.9	Increase	124	Yes
11-10	37.2	32.4	Decrease	87	No
12-10	24.5	20.0	Decrease	82	No
13-10	39.0	35.1	Decrease	90	No
14-10	33.3	47.7	Increase	143	Yes
15-10	72.8	82.0	Increase	113	No
16-10	27.3	28.4	Increase	104	No
17-10	35.2	33.1	Decrease	94	No
19-10	35.4	54.9	Increase	155	Yes
20-10	59.9	79.9	Increase	133	Yes
21-10	32.7	45.6	Increase	139	No
29-10	48.3	48.4	Increase	100	No
30-10	44.4	54.9	Increase	124	No
31-10	33.2	42.7	Increase	129	Yes
32-10	99.2	88.0	Decrease	89	Yes
33-10	57.6	87.0	Increase	151	Yes

Table 4-8. EMv Trends at Selected Sites, 2010 to 2013

Site-Baseline Year	Average EMv Baseline Year (mS/m)	Average EMV 2013 (mS/m)	Change	Percent of Baseline Year	Significant at 95 Percent?
34-10	112.8	104.2	Decrease	92	No
35-10	43.1	64.9	Increase	151	Yes
36-10	68.8	86.4	Increase	126	Yes
37-10	66.1	61.3	Decrease	93	No
38-10	81.9	79.6	Decrease	97	No
39-10	69.8	82.7	Increase	118	Yes
40-10	91.1	91.2	Increase	100	No
41-10	86.8	77.4	Decrease	89	No
42-10	67.3	78.3	Increase	116	No
43-10	74.7	84.6	Increase	113	No
44-10	66.9	79.9	Increase	119	No
45-10	66.7	97.0	Increase	145	Yes
46-10	90.2	103.3	Increase	115	No
47-10	84.9	77.7	Decrease	92	Yes
48-10	61.8	54.5	Decrease	88	Yes
49-10	91.7	101.8	Increase	111	Yes
50-10	136.2	121.3	Decrease	89	No
51-10	162.2	166.7	Increase	103	No
52-10	125.7	105.1	Decrease	84	Yes
53-10	95.2	162.9	Increase	171	Yes
54-10	78.9	92.9	Increase	118	No
55-10	36.5	47.8	Increase	131	Yes
56-10	39.1	49.2	Increase	126	No
57-10	42.3	53.3	Increase	126	Yes
58-10	68.3	72.5	Increase	106	No
59-10	60.4	49.6	Decrease	82	Yes
60-10	49.9	50.6	Increase	101	No
61-10	130.2	102.4	Decrease	79	Yes
62-10	53.5	73	Increase	136	Yes
63-10	101.7	58.8	Decrease	58	Yes
64-10	81.7	79.4	Decrease	97	No
65-10	79.9	66.1	Decrease	83	Yes
66-10	49.8	46.1	Decrease	93	No
67-10	61.8	53.1	Decrease	86	Yes
68-10	51.9	94.5	Increase	182	Yes
69-10	80.7	72.2	Decrease	89	Yes
70-10	135.3	135.3	Stable	100	No
71-10	78.2	48.3	Decrease	62	Yes
72-10	177.2	201.5	Increase	114	No
73-10	169.5	170.9	Increase	101	No
75-10	98.1	122.3	Increase	125	No
76-10	43.2	44.3	Increase	103	No

Table 4-8. EMv Trends at Selected Sites, 2010 to 2013

Site-Baseline Year	Average EMv Baseline Year (mS/m)	Average EMV 2013 (mS/m)	Change	Percent of Baseline Year	Significant at 95 Percent?
77-10	67.8	107.3	Increase	158	Yes
78-10	74.5	87.1	Increase	117	No
79-10	91.6	89.9	Decrease	98	No
All Sites with 2010 Baseline			Increase	114	
80-11	66.2	67.3	Increase	101	No
81-13	40.9	50.4	Increase	123	No
82-13	31.0	33.4	Increase	108	No
83-11	119.9	149.5	Increase	125	No
84-11	90.3	106.5	Increase	118	No
85-11	49.5	50.2	Increase	101	No
87-11	67.7	43.2	Decrease	64	Yes
88-11	44.9	43.1	Decrease	96	No
89-11	67.0	73.1	Increase	109	No
90-11	160.4	145.6	Decrease	91	No
91-11	232.6	278.7	Increase	120	Yes
92-11	118.9	160.2	Increase	135	Yes
93-11	123.9	143.1	Increase	115	Yes
94-11	118.6	122.8	Increase	104	No
95-11	6.6	8.4	Increase	127	No
96-11	12.5	23.9	increase	191	Yes
97-11	77.7	44.5	Decrease	57	Yes
98-11	91.1	95.5	Increase	105	No
99-11	67.6	71.9	Increase	106	No
100-11	41.5	56.7	Increase	137	Yes
101-11	104.3	124.0	Increase	119	No
L21-11	63.8	82.0	Increase	129	Yes
L26-11	80.4	87.6	Increase	109	No
L28-11	113.3	89.0	Decrease	79	Yes
L48-11	37.2	63.9	Increase	172	Yes
L50-11	78.5	73.1	Decrease	93	No
L66-11	49.5	67.7	Increase	137	Yes
Df1-11	64.3	85.8	Increase	133	Yes
All Sites with 2011 Baseline			Increase	224	
102-12	52.6	60.2	Increase	114	Yes
105-12	35.8	42.7	Increase	119	Yes
106-12	27.8	23	Decrease	83	No
107-12	51.9	45.7	Decrease	88	No
108-12	70.9	60.9	Decrease	86	Yes
109-12	60.9	52.3	Decrease	86	No
110-12	99.3	78.7	Decrease	79	Yes
111-12	26.0	28.6	Increase	110	No

Table 4-8. EMv Trends at Selected Sites, 2010 to 2013

Site-Baseline Year	Average EMv Baseline Year (mS/m)	Average EMV 2013 (mS/m)	Change	Percent of Baseline Year	Significant at 95 Percent?
112-12	210.6	196.1	Decrease	93	No
113-12	158.9	171.6	Increase	108	No
114-12	82.9	92.5	Increase	112	Yes
115-12	88.0	85.1	Decrease	97	No
116-12	53.7	56.4	Increase	105	No
117-12	5.4	7.8	Increase	144	Yes
All Sites with 2012 Baseline			Increase	102	
All Sites, Regardless of Baseline Year			Increase	112	

ECe is corrected to 25 degrees Celsius

Key:

mS/m = microsiemens per meter

EMv = vertical EM signal

Table 4-9. EMv Trend Summary

Trend Analysis 95 Percent Confidence Level	Number of Sites 2010–2013	Number of Sites 2011–2013	Number of Sites 2012–2013	All Sites
Increase	21	9	4	30
Decrease	12	3	2	16
Stable	35	16	8	57
Percent of baseline EMv value	114	114	102	112

4.5 Change in Percentage of Inverted Salinity Profiles at Selected Sites

The presence of inverted soil salinity profiles (i.e., surface soil salinity higher than subsoil salinity) is an indicator of adverse soil salinity conditions that are often related to a shallow water table. A significant increase in the percentage of inverted soil salinity profiles near the salinity sites is a cause for concern. Table 4-10 presents a summary of inverted salinity profile trends from 2010 through 2013 at sites affected by excess salts. Table 4-11 presents a summary of the direction change of the salinity trends for all sites for the period between 2010 and 2012.

Table 4-10. Inverted Soil Salinity Profile Trends at Selected Sites, 2010 to 2013

Site	2010 Inverted Profile (percent)	2011 Inverted Profile (percent)	2012 Inverted Profile (percent)	2013 Inverted Profile (percent)	Change	Peak Year
13	82	ND	60	36	Decrease	2012
14	17	ND	27	14	Decrease	2012
16	8	ND	Too dry	8	No trend	

Table 4-10. Inverted Soil Salinity Profile Trends at Selected Sites, 2010 to 2013

Site	2010 Inverted Profile (percent)	2011 Inverted Profile (percent)	2012 Inverted Profile (percent)	2013 Inverted Profile (percent)	Change	Peak Year
17	76	69	83	79	No trend	2013
50	8	ND	40	0	Decrease	2012
51	0	ND	67	0	No trend	2012
56	43	67	86	71	Increase	2012
60	0	31	73	33	Increase	2012
61	15	19	88	69	Increase	2012
62	0	19	60	19	Increase	2012
70	8	ND	13	0	Decrease	2012
72	17	ND	77	50	Increase	2012
75	0	ND	0	7	Increase	2013
76	78	36	62	50	Decrease	2010
78	Too dry	7	13	35	Increase	2013
79	44	50	57	7	Decrease	2012
84	ND	35	50	14	Decrease	2012
90	ND	31	21	0	Decrease	2011
91	ND	8	0	0	Decrease	2011
97	ND	8	36	31	Increase	2012
98	ND	0	6	6	Increase	2012
99	ND	0	0	0	No trend	
100	ND	7	0	0	Decrease	2011
101	ND	0	0	0	No trend	
111	ND	ND	0	15	Increase	2013
112	ND	ND	13	0	Decrease	2012
113	ND	ND	0	36	Increase	2013
116	ND	ND	56	40	Decrease	2012

Key:
ND = no data

Table 4-11. Inverted Salinity Profile Summary

Change Direction from Baseline Year	Number of Events that Occurred
Increase	11
Decrease	12
Stable	5

On sites with elevated soil salinity levels it appears that the percentage of inverted soil salinity profiles peaked in 2012 but has decreased since. Overall the number of inverted salinity profiles has remained fairly stable.

4.6 Soil Moisture Observations

Table 4-12 summarizes soil moisture observations found in spring 2013 at sites where shallow groundwater was encountered. Most of the sites listed are soil sampling sites. However, some of the sites listed are unsampled exploratory borings evaluated during seepage hotline call response investigations, flow bench soil evaluations, or geophysical investigations. In some cases, field soil moisture observations were adjusted based on gravimetric soil moisture data from the laboratory. Interpretation of laboratory data was based on the premise that field capacity moisture levels are 50 percent of the saturation percentage. If field soil moisture levels exceeded 50 percent of the saturation percentage then a capillary fringe condition was assumed. This moisture relationship may not be valid for sodic soils, very coarse or fine textured soils, or soils containing hardpan fragments.

Field observations of capillary fringe thickness have proven to be challenging. Capillary fringe soil moisture evaluations have proven to be especially difficult in fine-textured soils due to the limited macropore space. Field observations are more reliable in medium- and coarse-textured soils. In some cases, the water table seemed to rise into unsaturated zones. Capillary fringe zone thickness is quite variable over time and spatially. The thickness of the capillary fringe probably varies over short distances because the capillary fringe zone typically has an irregular upper boundary (Fetter 2001). The depth-to-capillary-fringe data listed in Table 4-12 should be considered as estimates. The substrata textural characterization column represents the most common USDA textural family of the often stratified soils in the three to five foot depth zone.

Table 4-12. Soil Moisture Characteristics

Site	Date	Substrata Texture	Depth to Mottling (in)	Depth to Capillary Fringe (in)	Depth to Water Table (in)	Capillary Fringe Thickness (in)
2	2-12-13	Sandy	Over 60	42	54	12
3	2-12-13	C loamy	21	30	46	16
5	2-13-13	Loamy	20	54	66	12
40	3-27-13	Loamy	60	35	53	18
41	3-27-13	Loamy	25	25	53	28
42	3-27-13	Loamy	20	30	64	34
43	3-28-13	Loamy	24	54	66	12
44	3-28-13	Loamy	37	50	62	12
45	4-19-13	C loamy	20	50	55	5
46	4-19-13	C loamy	18	40	66	26
48	4-24-13	C loamy	21	56	69	13
49	4-24-13	Loamy	27	37	47	10
50	4-24-13	Loamy	26	50	60	10
51	4-12-13	Loamy	24	31	41	10
52	4-12-13	Loamy	25	30	39	9
53	4-12-13	Loamy	25	37	53	16
55	4-19-13	Loamy	25	30	47	17

Table 4-12. Soil Moisture Characteristics

Site	Date	Substrata Texture	Depth to Mottling (in)	Depth to Capillary Fringe (in)	Depth to Water Table (in)	Capillary Fringe Thickness (in)
64	3-18-13	F loamy	22	41	53	12
70	2-26-13	C loamy	44	36	37	1
74	4-24-13	C silty	26	40	54	24
79	3-4-13	Loamy	43	50	58	8
84	3-1-13	C loamy	19	66	72	6
89	3-5-13	Loamy	34	34	44	10
90	3-5-13	Loamy	20	23	27	3
91	3-5-13	Loamy	20	18	23	5
93	3-14-13	Loamy	22	48	53	5
101	4-19-13	Loamy	26	46	51	5
118	2-26-13	C loamy	22	36	40	4
130	3-20-13	F silty	22	46	52	4
131	3-20-13	Loamy	22	43	53	10
132	3-20-13	Loamy	41	52	75	23
133	3-21-13	Loamy	27	40	56	16
L28	3-22-13	Loamy	none	24	48	11
Vpzs4a1	1-31-13	Sandy	18	55	59	4
Vpzs4a2	1-31-13	Sandy	1	18	26	6
Vpz2b7	2-15-13	Sandy	34	24	30	6
Vpz2b88	2-15-13	Sandy	50	78	86	8
Iest3ex	4-18-13	C loamy	56	41	52	11
Pz4b11	4-18-13	C loamy	36	60	76	16
Pz4b12	4-18-13	Loamy	22	44	47	3
Iestex4	5-1-13	Loamy	24	43	48	5

A statistical summary of capillary fringe thickness at boring sites examined between 2009 and 2013 is presented in Table 4-13. The data in Table 4-13 represents the full capillary fringe interval. The anoxic portion of the capillary fringe is assumed to be the lower half of the full capillary fringe zone. The upper portion of the capillary fringe is assumed to contain sufficient air for plant root development and water uptake (Sands 2009). Capillary fringe thickness in sandy soils averaged over approximately seven inches, while the thickness in all other soil textural family's averaged over approximately 15 inches.

Table 4-13. Capillary Fringe Summary Statistics

Year	Average Thickness (inches)	95 Percent Confidence Interval (inches)	Range (inches)
2013	11.4	9.1 - 13.6	1 - 34
2012	16.2	13.2 - 19.2	2 - 44
2011	13.6	11.1 - 16.1	4 - 36
2009, 2010	13.8	10.7 - 17.1	1 - 36
Average, All years	13.8		1 - 44

5.0 Discussion

Analysis of EM38 data and soil samples collected from 2010 through 2013 indicates increasing surface soil salinity conditions in the SJRRP study area. Salinity of subsoils and substrata have also increased slightly. Surface soils at most sites appear to be more saline in 2013 than in 2010. Possible reasons for this increase include the following:

- The dry winter of 2012/13 did not provide sufficient rainfall for leaching surface soils. Rainfall is nearly pure water and effectively leaches salts.
- In some areas plants transpire shallow groundwater and pull salts upward within the groundwater.
- The salinity of the Sacramento-San Joaquin Delta water increased relative to 2010 and 2011. This water is the primary source of irrigation supply for lands west of the San Joaquin River in the Central California Irrigation District and San Luis Canal Company, and in the Columbia Canal Company east of the San Joaquin River.
- Some sites were affected by shallow groundwater even in areas with no river flows, such as Reaches 4A and 4B, where no SJRRP Interim Flows were released in 2012 or 2013.
- Groundwater rises likely associated with high flood release flows during the winter of 2010 and the early summer of 2011 may have brought salts into surface soils at some sites (e.g., Sites 56 and 60).
- Incomplete leaching near the edges of the dripline in drip- and micro-sprinkler irrigated orchards leads to salt accumulation at the outside edge of the wetted areas.
- In some areas drain effluent from new drains was mixed with irrigation water, thus increasing the salinity of the irrigation water.

5.1 Crop Salt Tolerance Data

Soil salinity levels can be compared to crop salt tolerance tables to estimate relative yield reductions. Crop salt tolerance data used in this report are from the Food and Agriculture Organization (FAO) Annex 1 (FAO 2002) to Handbook 29 (FAO 1985). The annex to Handbook 29 reproduces data from Maas and Grattan published in 1999. In some cases, only qualitative crop salt tolerance data are available. In these cases the midpoint of the qualitative range on the graph was used to estimate relative yield. Field observations suggest that pistachios are salt tolerant. A literature review indicates that pistachios are more salt tolerant than the Maas and Grattan data set (1999) indicates. Salt tolerance data

for pistachios are based on recent information published by University of California experts (Ferguson 2002, 2011).

A listing of relative yields at successively higher ECe levels for crops commonly grown in the SJRRP damage assessment area are listed in Table 5-1.

Table 5-1. Yield Potential of Selected Crops¹

Crop	Relative Yield Percent ² ECe dS/m Threshold	Yield Decrease per EC Unit Over the Threshold Value	Relative Yield at ECe 2 ds/m	Relative Yield at ECe 3 dS/M	Relative Yield at ECe 4 dS/m
Alfalfa	2	7.3%	100	93	85
Tomatoes	2.5	9.9%	100	95	85
Field beans ³	1	19%	81	62	42
Corn	1.7	12%	96	84	72
Almonds	1.5	19%	90	71	52
Pistachios	4.2	7.4%	100	100	100
Lima beans ^{3,4}	4.5	7.7%	100	100	100
Cantaloupes	1	8.4%	92	83	75
Pomegranates ⁴	2.3	10.3%	100	93	82
Forage wheat	4.5	2.6%	100	100	100
Cotton	7.7	5.2%	100	100	100
Grapes	1.5	9.6%	95	86	76

Notes:

¹United Nations Food and Agriculture Organization, Irrigation and Drainage paper #29; Annex 1 (FAO 2002)

²ECe values above 3 may require a soil gypsum content adjustment to determine yield decreases.

³Lima beans are more tolerant than field beans;

⁴Only qualitative data was available. Salt tolerance was estimated from Figure A1-1 of Annex 1, FAO paper 29.

Key:

dSm = decisiemens per meter

ECe = electrical conductivity of the soil extract

5.2 Depth to Shallow Groundwater

The effect of saturated soil conditions on crops is difficult to determine. The type of crop, time of year, oxygen content of the water, and the salinity of the groundwater all affect yield potential. Observations and landowner information in the survey area indicate that water table depths shallower than 20 inches (1.7 ft) will prevent cultivation and harvesting of crops. The U.S. Department of the Interior, Bureau of Reclamation, Drainage Manual (Reclamation 1993) contains information showing approximate yield potential for deep- and shallow- rooted crops at varying water table depths.

5.3 Soil Gypsum Content and Effects on Prediction of Crop Yield Potential

Limited soil testing in the fall of 2010 suggested that some soils in the lower Reach 4A area with an ECe over about 4 dS/m contain natural or applied gypsum. Saline lands in Reach 2B appeared to have a different ECe/gypsum level relationship. Gypsum and sulfur are periodically applied to surface soils on some lands. Sulfur reacts with soluble calcium dissolved from lime (calcium carbonate) in the soil to form gypsum. Since gypsum is a sparingly soluble salt, relatively more gypsum is dissolved in the saturation extract than is dissolved in the soil water. Therefore, FAO Annex 1 (FAO 2002) and most other salt tolerance data sources (Maas 1993) recommend subtracting a value of 2 dS/m from the saturation extract ECe value when gypsum is present before using salt tolerance data to estimate yield potential. The ECe of the soil layers containing gypsum should be adjusted before averaging soil ECe values with the other soil depth zones.

Many soils in Reaches 4A, 4B, and 2B with an ECe over 3 dS/m and more than 15 meq/liter of calcium in the saturation extract were tested for calcium in a 1:5 soil:water extract. If significantly more calcium was dissolved in the 1:5 extract on a dry soil weight basis, then the soils were assumed to contain residual gypsum.

5.4 Root Zone Depth Observations

Soil logs completed in 2011 and 2012 contained notes on root zone depth. The presence and abundance of roots were noted on some of the soil logs. Hand-auger borings provide limited information on root zone depth since the small diameter of the boring may miss some of the coarser roots. Roots were commonly observed above a depth of about three to four feet. Crops with roots observed at depths deeper than five feet included alfalfa, grapes, almonds, and walnuts. One grower reported that he observed roots of 1-year-old almond trees to a depth of 6.5 feet in a large gas line trench excavated through his orchard.

The FAO Soils Bulletin 42 (FAO 1979) reports:

While a rooting depth of 150 cm (5 feet) is ideal in a well drained friable soil, experience has shown that many irrigated annual and perennial crops produce excellent yields with a well drained effective root zone depth of 90 cm (3 feet)

5.5 Irrigation System Types and Crop Type Factors

Drip irrigated fields are more difficult to obtain representative samples than gravity irrigated fields (Hanson 2006). Soil salinity patterns, buried infrastructure, and in some cases wire trellises and/or metal stakes were present in some tracts. Backfill from trenching and pits associated with tree planting is also present on some of the tree row berms. EM surveys and surface soil sampling patterns took these issues into account. In drip-irrigated tomato and melon fields, half the sampled sites were in the furrows and the other half were from near the shoulder of the crop beds. EM38 surveys in orchards and vineyards were also conducted to measure salinity in various positions relative to the tree and drip emitter locations. Growers tend to schedule drip irrigations based on crop water use, and little leaching of salts takes place during the growing season. Leaching that does occur is confined to areas near the drip emitters. Salts tend to accumulate near the soil surface at the margins of the areas wetted by the drippers or micro-sprinklers (FAO 1985). Drip-irrigated sites are sometimes leached during the off season by winter rains and /or gravity or sprinkler irrigation methods. Soil samples at saline drip-irrigated orchard sites were collected both in the tree row near the emitters and in interrow areas to determine soil salinity levels that the tree roots are exposed to. A summary of soil sampling to determine soil salinity variation due to irrigation system uniformity issues is presented in Table 5-12.

Table 5-2. Soil Salinity Spatial Variation in Drip Irrigated Orchards

Site	Depth (inches)	Number of Increments in Composite	Tree Row ECe (dS/m)	Interrow ECe (dS/m)	Average ECe (dS/m)
60-11	0-12	15	3.30	3.11	3.21
61-11	0-12	15	10.5	12.0	11.25
84-11	0-12	15	9.73	7.13	8.43
62-11	0-12	15	6.97	5.14	6.06
1-12	0-12	12	2.71	2.23	2.47
1-13	0-12	15	2.29	1.22	1.76

Key:

ECe = electrical conductivity of the soil extract

dS/m = decisiemens per meter

5.6 Determination of Long-Term Soil Salinity Trends

Long-term springtime soil salinity trends will be determined based primarily on the 0 to 12-inch spatial composite surface soil samples and the EM38 signal data that is adjusted for soil temperature. Typically, the 95 percent confidence level is used to evaluate significant soil salinity trends, but other confidence ranges can also be determined from the data.

Soil salinity levels from March through April were used for this comparison. This time period is critical as it usually has the lowest soil salinity levels of the season and is also

the salinity level of the soil just before planting season. Winter rains and pre-irrigation cause leaching and tend to even out soil salinity levels. Soils typically are near field capacity and are relatively easy to sample between March and April. EM38 measurements are also easiest to interpret when the soil is near field capacity and surface soils are moist.

5.7 Seasonal Soil Salinity Variation

Soil salinity levels later in the growing season tend to change in response to irrigation and drying cycles due to crop water use (FAO 1985). Salinity micro-variation patterns in soils also become more pronounced later in the crop season. Seasonal soil salinity is normally highest following crop moisture extraction after the last irrigation event and prior to pre-irrigation or rainfall. Table 5-3 presents surface soil salinity information from the “DF” and “L” series samples collected at the same location on different dates throughout the year. Soil samples were collected from the side (shoulder) of the beds at nearly the same location (within 2 meters of each other) in fields that were drip irrigated. A subsurface drain system was installed on part of the area in late 2010.

Table 5-3. Seasonal Soil Salinity Variation in Surface Soils, 0 to 12 Inches

Site	ECe (dS/m) 7/15/2010	ECe (dS/m) 9/16/2010	ECe (dS/m) 2/15/2011	ECe (dS/m) 4/14/2011	ECe (dS/m) 4/10/2012	ECe (dS/m) 3/22/2013	Average ECe (dS/m) All Events
DF1	1.46	3.34	1.40	1.55	1.79	2.78	2.05
DF2	1.60	3.42	1.60	2.04	2.52	4.56	2.62
L21	3.64	1.92	1.30	2.23	2.23	1.84	2.19
L26	5.83	2.79	0.90	2.15	1.99	0.96	2.44
L28	1.90	2.04	0.60	0.48	1.51	1.01	1.26
L48	4.75	5.57	N/A	1.06	1.93	1.85	3.03
L50	1.52	3.21	N/A	1.15	NA	2.33	2.05
L68	3.24	4.41	1.60	0.72	1.02	1.74	2.12

Key:

N/A = not available

dS/m = decisiemens per meter

ECe = electrical conductivity of the soil extract

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6.0 Recommendations

Based on the data collected between 2010 and 2013, the following recommendations are presented.

1. All sites should be resampled during the spring at 5-year intervals. The following sites are located in important locations and should be sampled and/or EM38 surveyed more often: 42, 60, 61, 62, 70, 79, 84, 90, 91, 111, 112, and L28. If an EM38 survey indicates soil salinity has changed at one of these strategic sites soil sampling should be considered.
2. Soil sampling methods to predict salinity levels on drip- and micro-sprinkler irrigated orchards and field crops should be evaluated. Potentially, the central boring could be placed within a few feet of the drip emitter or micro-sprinkler to better estimate the salinity of the soil in the most active rooting zone or a separate multi-increment composite soil sample could be collected within the wetted perimeter of the dripper or microsprinkler.
3. The EM38 meter data should only be used on fields that have recently been irrigated. If the field is too dry to obtain a Dakota or Oakfield probe core, it is also too dry for EM38 evaluations. The EM38 performs best at or near field capacity. This moisture level occurs approximately one day following an irrigation event in sandy soils and approximately two days following irrigation on medium- and fine-textured soils. ECe can be estimated for drier soils but the accuracy and reliability is much lower than for soils near field capacity.
4. Continue to use a capillary fringe (anoxic portion) adjustment of 0.5 foot for sandy soils (including sands, gravelly sands, and loamy sands) and a 1.0-foot adjustment for all soils heavier than loamy sand, including loamy fine sands to establish groundwater level thresholds for SJRRP monitoring wells.
5. Soil salinity of entire fields can be mapped using the EM38. This can be done by walking or by mechanized methods. A grid or transect survey with calibration soil samples collected at 10 to 12 selected sites in each field is recommended. Most agricultural universities, including Fresno State, now have mobile equipment to conduct these types of surveys. Computer statistical and mapping programs are also available to process the extensive data generated with this type of survey.
6. A literature search should be conducted to obtain existing information on capillary fringe issues relating to use of water from the zone and the zones effect on crop production. Upon completion of the literature search, in-place monitoring of seasonal water table depths and capillary fringe thickness may be an appropriate research project to support the SJRRP Seepage Management Program. Existing information suggests that the thickness of capillary fringe zones can vary within short distances. Tensiometers, transiometers, watermark sensors, or other

appropriate instrumentation could be used in conjunction with a monitoring well. These sites would need to be set up in a field to be most useful. The following hypothesis should be tested:

- a. Capillary fringe zones should be thinnest when groundwater is in or near the crop root zone in the summer time when plants are rapidly transpiring water.
 - b. The air percentage should increase gradually as distance from the free water surface increases. Although the lower portion of the capillary fringe may be anoxic the upper portion should contain some air.
 - c. The capillary fringe zone should be thicker when water tables are well below the root zone.
 - d. The water table and capillary fringe zone should be shallowest just after pre-irrigation.
 - e. The capillary fringe zones should be relatively thick following pre-irrigation and before crop emergence.
 - f. The thickness of the capillary fringe zone should vary somewhat within short distances since the upper boundary is probably irregular due to pore size differences and soil structure channels in medium and fine textured soils.
7. Obtain land owner soil salinity data from current and past years and compare E_{Ce} values with current values at the SJRRP sites.
 8. Install shallow observation wells near salinity monitoring sites 90 and 91. Shallow groundwater has been observed at these sites during extended periods with no bypass flow. The historic thresholds for these sites should be better documented prior to the permanent increase in SJRRP flows. The water tables appear to fluctuate between 1.5 and three feet at these sites.

7.0 References

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Appendix A

Soil Salinity Data Summary

Appendix A – Soil Salinity Data Summary

Table A-1. Soil Salinity Summary of All Sites Sampled in 2013

Site; Depth (in)	Sample Type	pHp	ECe (dS/m)	SAR	Gypsum Content (mEq/100g)
1-13; 0-12	15 increment composite berms	5.87	2.29		
1-13; 0-12	15 increment composite row	6.63	1.22		
1-13; 0-12	Central site hand augur boring	6.98	0.48		
1-13; 12-30	Central site hand augur boring	7.38	0.28		
1-13; 30-60	Central site hand augur boring	7.51	0.15		
2-13; 0-12	30 increment spatial composite	7.29	5.16	9.7	0.00
2-13; 0-12	Central site hand augur boring	7.64	2.71	8.4	0.00
2-13; 12-30	Central site hand augur boring	7.21	3.69		
2-13; 30-60	Central site hand augur boring	7.76	0.21		
3-13; 0-12	30 increment spatial composite	7.73	3.23	14.5	0.00
3-13; 0-12	Central site hand augur boring	7.64	3.07	14.1	0.00
3-13; 12-30	Central site hand augur boring	7.06	5.19	9.5	0.00
3-13; 30-60	Central site hand augur boring	6.92	1.23		
4-13; 0-12	30 increment spatial composite	7.95	1.94		
4-13; 0-12	Central site hand augur boring	7.81	2.07		
4-13; 12-30	Central site hand augur boring	7.81	5.96	14.2	0.00
4-13; 30-60	Central site hand augur boring	7.55	0.61		
5-13; 0-12	30 increment spatial composite	7.35	2.86		
5-13; 0-12	Central site hand augur boring	7.34	3.03	7.0	0.00
5-13; 12-30	Central site hand augur boring	7.70	6.70	13.7	0.00
5-13; 30-60	Central site hand augur boring	7.40	0.93		
6-13; 0-12	30 increment spatial composite	7.23	1.01		
6-13; 0-12	Hand augured central boring	7.19	0.81		
6-13; 12-30	Hand augured central boring	7.75	2.09		
6-13; 30-56	Hand augured central boring	7.48	1.18		
7-13; 0-12	30 increment spatial composite	6.95	1.76		
7-13; 0-12	Hand augured central boring	6.96	1.15		
7-13; 12-30	Hand augured central boring	7.48	0.99		
7-13; 30-60	Hand augured central boring	7.38	1.82		
8-13; 0-12	30 increment spatial composite	7.01	0.56		
8-13; 0-12	Hand augured central boring	7.12	0.76		
8-13; 12-30	Hand augured central boring	7.26	1.27		
8-13; 30-60	Hand augured central boring	7.04	1.18		
9-13; 0-12	30 increment spatial composite	7.22	1.39		
9-13; 0-12	Hand augured central boring	6.96	1.73		
9-13; 12-30	Hand augured central boring	7.16	1.24		
9-13; 30-60	Hand augured central boring	7.54	0.57		
10-13; 0-12	30 increment spatial composite	6.92	0.57		
10-13; 0-12	Hand augured central boring	6.89	0.52		

Table A-1. Soil Salinity Summary of All Sites Sampled in 2013

Site; Depth (in)	Sample Type	pHp	ECe (dS/m)	SAR	Gypsum Content (mEq/100g)
10-13; 12-30	Hand augured central boring	7.32	1.03		
10-13; 30-60	Hand augured central boring	7.47	0.42		
11-13; 0-12	30 increment spatial composite	7.65	0.73		
11-13; 0-12	Hand augured central boring	7.22	0.62		
11-13; 12-30	Hand augured central boring	7.65	0.35		
11-13; 30-60	Hand augured central boring	7.85	0.53		
12-13; 0-12	30 increment spatial composite	7.54	5.51	12.2	0.00
12-13; 0-12	Hand augured central boring	7.76	5.57	17.7	0.00
12-13; 12-30	Hand augured central boring	7.81	1.60		
12-13; 30-60	Hand augured central boring	7.84	0.20		
13-13; 0-12	30 increment spatial composite	6.65	4.71	7.7	0.00
13-13; 0-12	Hand augured central boring	6.89	4.60	6.8	0.00
13-13; 12-30	Hand augured central boring	7.44	3.23	7.4	0.00
13-13; 30-58	Hand augured central boring	7.69	2.91		
14-13; 0-12	30 increment spatial composite	7.66	4.72	5.7	0.00
14-13; 0-12	Hand augured central boring	7.43	5.93	5.0	0.00
14-13; 12-30	Hand augured central boring	7.88	3.67	8.1	0.00
14-13; 30-60	Hand augured central boring	8.01	2.10		
15-13; 0-12	30 increment spatial composite	7.41	1.84		
15-13; 0-12	Hand augured central boring	7.60	0.84		
15-13; 12-30	Hand augured central boring	7.71	0.93		
15-13; 30-60	Hand augured central boring	7.76	1.00		
16-13; 0-12	30 increment spatial composite	7.23	3.25	10.3	0.00
16-13; 0-12	Hand augured central boring	7.29	1.63		
16-13; 12-30	Hand augured central boring	7.48	2.52		
16-13; 30-60	Hand augured central boring	7.32	0.78		
17-13; 0-12	30 increment spatial composite	8.02	10.8	17.9	6.3
17-13; 0-12	Hand augured central boring	7.98	12.0	18.9	7.6
17-13; 12-30	Hand augured central boring	7.62	5.87	4.0	0.00
17-13; 30-60	Hand augured central boring	7.12	0.97		
19-13; 0-12	30 increment spatial composite	7.45	4.11	8.8	0.00
19-13; 0-12	Hand augured central boring	7.62	2.72		
19-13; 12-30	Hand augured central boring	7.97	2.26		
19-13; 30-60	Hand augured central boring	8.13	1.32		
20-13; 0-12	24 increment spatial composite	7.50	3.73		
20-13; 0-12	Hand augured central boring	7.56	2.05		
20-13; 12-30	Hand augured central boring	7.94	1.70		
20-13; 30-60	Hand augured central boring	7.88	3.10		
21-13; 0-12	30 increment spatial composite	7.26	2.02		
21-13; 0-12	Hand augured central boring	7.32	1.33		
21-13; 12-30	Hand augured central boring	7.58	1.10		
21-13; 30-60	Hand augured central boring	6.89	1.87		
23-13; 0-12	30 increment spatial composite	6.78	0.70		
23-13; 0-12	Hand augured central boring	6.63	0.56		

Table A-1. Soil Salinity Summary of All Sites Sampled in 2013

Site; Depth (in)	Sample Type	pHp	ECe (dS/m)	SAR	Gypsum Content (mEq/100g)
23-13; 12-30	Hand augured central boring	7.11	0.34		
23-13; 30-60	Hand augured central boring	7.61	0.10		
24-13; 0-12	30 increment spatial composite	7.05	2.23		
24-13; 0-12	Hand augured central boring	7.12	1.01		
24-13; 12-30	Hand augured central boring	7.09	1.14		
24-13; 30-60	Hand augured central boring	6.60	0.21		
29-13; 0-12	25 increment spatial composite	6.78	2.57		
29-13; 0-12	Hand augured central boring	6.92	4.22	4.4	0.00
29-13; 12-30	Hand augured central boring	7.19	2.86		
29-13; 30-60	Hand augured central boring	7.51	1.05		
30-13; 0-12	30 increment spatial composite	7.05	2.21		
30-13; 0-12	Hand augured central boring	7.53	1.64		
30-13; 12-30	Hand augured central boring	7.60	2.54		
30-13; 30-60	Hand augured central boring	7.83	2.71		
31-13; 0-12	30 increment spatial composite	7.20	3.07	4.4	0.00
31-13; 0-12	Hand augured central boring	7.36	2.46		
31-13; 12-30	Hand augured central boring	7.47	3.98	5.2	0.00
31-13; 30-60	Hand augured central boring	7.67	0.68		
32-13; 0-12	30 increment spatial composite	7.41	0.92		
32-13; 0-12	Hand augured central boring	7.46	0.84		
32-13; 12-30	Hand augured central boring	7.62	2.25		
32-13; 30-60	Hand augured central boring	7.49	4.14	9.0	0.00
33-13; 0-12	30 increment spatial composite	7.66	3.10	3.1	0.00
33-13; 0-12	Hand augured central boring	7.62	2.35		
33-13; 12-30	Hand augured central boring	7.71	2.63		
33-13; 30-60	Hand augured central boring	7.57	2.70		
34-13; 0-12	30 increment spatial composite	7.45	2.57		
34-13; 0-12	Hand augured central boring	7.17	2.65		
34-13; 12-30	Hand augured central boring	7.52	1.11		
34-13; 30-60	Hand augured central boring	8.28	0.87		
35-13; 0-12	30 increment spatial composite	6.80	2.32		
35-13; 0-12	Hand augured central boring	6.65	1.30		
35-13; 12-30	Hand augured central boring	7.31	1.28		
35-13; 30-60	Hand augured central boring	7.55	1.64		
36-13; 0-12	30 increment spatial composite	6.88	1.88		
36-13; 0-12	Hand augured central boring	6.92	0.81		
36-13; 12-30	Hand augured central boring	7.28	0.83		
36-13; 30-60	Hand augured central boring	7.89	1.23		
37-13; 0-12	30 increment spatial composite	7.03	0.98		
37-13; 0-12	Hand augured central boring	7.43	0.95		
37-13; 12-30	Hand augured central boring	7.42	1.05		
37-13; 30-60	Hand augured central boring	7.81	0.96		
38-13; 0-12	30 increment spatial composite	7.40	1.69		
38-13; 0-12	Hand augured central boring	7.39	1.22		

Table A-1. Soil Salinity Summary of All Sites Sampled in 2013

Site; Depth (in)	Sample Type	pHp	ECe (dS/m)	SAR	Gypsum Content (mEq/100g)
38-13; 12-30	Hand augured central boring	7.43	1.08		
38-13; 30-60	Hand augured central boring	8.03	1.15		
39-13; 0-12	30 increment spatial composite	7.84	2.48		
39-13; 0-12	Hand augured central boring	7.89	1.09		
39-13; 12-30	Hand augured central boring	8.05	1.24		
39-13; 30-60	Hand augured central boring	8.38	0.77		
40-13; 0-12	30 increment spatial composite	6.66	4.03	3.3	0.00
40-13; 0-12	Hand augured central boring	6.69	2.98		
40-13; 12-30	Hand augured central boring	7.08	1.35		
40-13; 30-60	Hand augured central boring	7.68	2.05		
41-13; 0-12	30 increment spatial composite	7.48	0.89		
41-13; 0-12	Hand augured central boring	7.48	0.94		
41-13; 12-30	Hand augured central boring	8.02	1.18		
41-13; 30-60	Hand augured central boring	7.81	2.08		
42-13; 0-12	30 increment spatial composite	6.37	3.95	2.5	0.00
42-13; 0-12	Hand augured central boring	6.35	4.16	2.2	0.00
42-13; 12-30	Hand augured central boring	6.43	3.67	3.9	0.00
42-13; 30-60	Hand augured central boring	7.17	2.07		
43-13; 0-12	30 increment spatial composite	7.27	2.23		
43-13; 0-12	Hand augured central boring	7.08	1.40		
43-13; 12-30	Hand augured central boring	7.29	1.78		
43-13; 30-60	Hand augured central boring	7.79	2.01		
44-13; 0-12	30 increment spatial composite	6.83	3.64	2.5	0.00
44-13; 0-12	Hand augured central boring	6.95	2.69		
44-13; 12-30	Hand augured central boring	7.38	1.76		
44-13; 30-60	Hand augured central boring	8.01	2.01		
45-13; 0-12	30 increment spatial composite	7.45	2.84	3.9	0.00
45-13; 0-12	Hand augured central boring	7.64	2.82		
45-13; 12-30	Hand augured central boring	7.71	4.20	9.3	0.00
45-13; 30-60	Hand augured central boring	7.65	2.99		
46-13; 0-12	30 increment spatial composite	7.67	1.73		
46-13; 0-12	Hand augured central boring	7.60	1.18		
46-13; 12-30	Hand augured central boring	7.91	1.11		
46-13; 30-60	Hand augured central boring	8.06	2.89		
47-13; 0-12	30 increment spatial composite	7.47	1.12		
47-13; 0-12	Hand augured central boring	7.54	1.32		
47-13; 12-30	Hand augured central boring	7.80	1.06		
47-13; 30-60	Hand augured central boring	8.19	1.20		
48-13; 0-12	30 increment spatial composite	7.84	1.26		
48-13; 0-12	Hand augured central boring	7.84	1.04		
48-13; 12-30	Hand augured central boring	8.05	0.68		
48-13; 30-60	Hand augured central boring	8.01	1.09		
49-13; 0-12	30 increment spatial composite	7.70	2.92		
49-13; 0-12	Hand augured central boring	7.80	0.99		

Table A-1. Soil Salinity Summary of All Sites Sampled in 2013

Site; Depth (in)	Sample Type	pHp	ECe (dS/m)	SAR	Gypsum Content (mEq/100g)
49-13; 12-30	Hand augured central boring	7.83	1.41		
49-13; 30-60	Hand augured central boring	7.93	1.91		
50-13; 0-12	30 increment spatial composite	7.81	5.52	5.9	0.00
50-13; 0-12	Hand augured central boring	7.82	2.80		
50-13; 12-30	Hand augured central boring	7.91	3.30	7.3	0.00
50-13; 30-60	Hand augured central boring	7.80	5.45	13.3	0.00
51-13; 0-12	30 increment spatial composite	7.90	3.51	6.4	0.00
51-13; 0-12	Hand augured central boring	8.02	1.34		
51-13; 12-30	Hand augured central boring	7.84	6.48	9.8	0.00
51-13; 30-60	Hand augured central boring	7.65	8.92	10.2	0.00
52-13; 0-12	30 increment spatial composite	7.80	1.21		
52-13; 0-12	Hand augured central boring	7.70	1.12		
52-13; 12-30	Hand augured central boring	7.68	1.62		
52-13; 30-60	Hand augured central boring	7.90	2.39		
53-13; 0-12	30 increment spatial composite	7.62	1.65		
53-13; 0-12	Hand augured central boring	7.61	2.39		
53-13; 12-30	Hand augured central boring	7.72	3.68	9.0	0.00
53-13; 30-60	Hand augured central boring	7.52	11.6	11.7	0.00
54-13; 0-12	30 increment spatial composite	7.86	1.67		
54-13; 0-12	Hand augured central boring	7.86	1.22		
54-13; 12-30	Hand augured central boring	7.94	1.20		
54-13; 30-60	Hand augured central boring	8.15	1.15		
55-13; 0-12	30 increment spatial composite	7.68	1.31		
55-13; 0-12	Hand augured central boring	7.65	1.87		
55-13; 12-30	Hand augured central boring	7.83	0.95		
55-13; 30-60	Hand augured central boring	7.81	0.64		
56-13; 0-12	30 increment spatial composite	7.06	4.15	3.7	0.00
56-13; 0-12	Hand augured central boring	7.26	2.63		
56-13; 12-30	Hand augured central boring	7.33	2.49		
56-13; 30-60	Hand augured central boring	7.27	1.50		
57-13; 0-12	30 increment spatial composite	6.99	1.32		
57-13; 0-12	Hand augured central boring	6.96	0.65		
57-13; 12-30	Hand augured central boring	6.95	2.52		
57-13; 30-60	Hand augured central boring	6.77	5.96	4.1	0.00
58-13; 0-12	30 increment spatial composite	7.70	0.99		
58-13; 0-12	Hand augured central boring	7.60	1.04		
58-13; 12-30	Hand augured central boring	7.70	0.86		
58-13; 30-60	Hand augured central boring	7.80	0.91		
59-13; 0-12	30 increment spatial composite	7.45	1.37		
59-13; 0-12	Hand augured central boring	7.38	1.72		
59-13; 12-30	Hand augured central boring	7.68	1.09		
59-13; 30-60	Hand augured central boring	7.62	1.89		
60-13; 0-12	30 increment spatial composite	7.24	20.9	4.1	0.12
60-13; 0-12	Hand augured central boring	7.50	7.47	2.9	0.00

Table A-1. Soil Salinity Summary of All Sites Sampled in 2013

Site; Depth (in)	Sample Type	pHp	ECe (dS/m)	SAR	Gypsum Content (mEq/100g)
60-13; 12-30	Hand augured central boring	7.48	7.04	2.8	0.02
60-13; 30-60	Hand augured central boring	7.60	6.26	2.7	0.03
61-13; 0-12	30 increment spatial composite	7.69	20.1	19.1	2.08
61-13; 0-12	Hand augured central boring	7.45	25.3	19.3	4.03
61-13; 12-30	Hand augured central boring	7.61	13.6	12.2	0.34
61-13; 30-60	Hand augured central boring	7.91	7.24	8.0	0.00
62-13; 0-12	30 increment spatial composite	7.56	11.8	8.2	0.89
62-13; 0-12	Hand augured central boring	7.67	7.70	6.4	0.00
62-13; 12-30	Hand augured central boring	7.90	5.59	4.6	0.00
62-13; 30-60	Hand augured central boring	8.3	1.91		
63-13; 0-12	30 increment spatial composite	7.30	1.05		
63-13; 0-12	Hand augured central boring	7.21	1.05		
63-13; 12-30	Hand augured central boring	7.72	1.41		
63-13; 30-60	Hand augured central boring	8.09	1.08		
64-13; 0-12	30 increment spatial composite	7.68	0.90		
64-13; 0-12	Hand augured central boring	7.64	0.76		
64-13; 12-30	Hand augured central boring	7.83	0.79		
64-13; 30-60	Hand augured central boring	8.13	1.46		
65-13; 0-12	30 increment spatial composite	7.12	1.11		
65-13; 0-12	Hand augured central boring	6.89	1.03		
65-13; 12-30	Hand augured central boring	7.35	1.38		
65-13; 30-60	Hand augured central boring	7.67	2.35		
66-13; 0-12	30 increment spatial composite	6.85	1.38		
66-13; 0-12	Hand augured central boring	7.06	0.90		
66-13; 12-30	Hand augured central boring	7.34	0.73		
66-13; 30-60	Hand augured central boring	7.95	0.79		
67-13; 0-12	30 increment spatial composite	6.82	0.74		
67-13; 0-12	Hand augured central boring	6.67	0.60		
67-13; 12-30	Hand augured central boring	7.07	1.13		
67-13; 30-60	Hand augured central boring	7.38	1.64		
69-13; 0-12	20 increment spatial composite	7.76	1.18		
69-13; 0-12	Hand augured central boring	7.68	1.38		
69-13; 12-30	Hand augured central boring	7.96	1.13		
69-13; 30-46	Hand augured central boring	8.06	2.69		
70-13; 0-12	30 increment spatial composite	7.77	1.81		
70-13; 0-12	Hand augured central boring	7.91	1.58		
70-13; 12-30	Hand augured central boring	8.02	5.25	13.0	0.00
70-13; 30-60	Hand augured central boring	7.94	5.11	10.9	0.00
71-13; 0-12	30 increment spatial composite	6.82	1.60		
71-13; 0-12	Hand augured central boring	7.02	0.93		
71-13; 12-30	Hand augured central boring	6.86	1.79		
71-13; 30-60	Hand augured central boring	7.42	2.03		
73-13; 0-12	30 increment spatial composite	7.65	1.78		
73-13; 0-12	Hand augured central boring	7.89	1.02		

Table A-1. Soil Salinity Summary of All Sites Sampled in 2013

Site; Depth (in)	Sample Type	pHp	ECe (dS/m)	SAR	Gypsum Content (mEq/100g)
73-13; 12-30	Hand augured central boring	7.96	2.35		
73-13; 30-60	Hand augured central boring	8.19	2.50		
74-13; 0-12	30 increment spatial composite	7.88	1.59		
74-13; 0-12	Hand augured central boring	7.75	1.59		
74-13; 12-30	Hand augured central boring	7.54	2.27		
74-13; 30-60	Hand augured central boring	7.88	3.13	6.2	0.00
75-13; 0-12	30 increment spatial composite	7.91	1.86		
75-13; 0-12	Hand augured central boring	7.78	1.96		
75-13; 12-30	Hand augured central boring	7.61	7.90	10.1	0.00
75-13; 30-60	Hand augured central boring	7.35	9.14	8.1	0.00
76-13; 0-12	30 increment spatial composite	7.27	7.23	8.7	0.00
76-13; 0-12	Hand augured central boring	7.59	9.05	10.2	0.12
76-13; 12-30	Hand augured central boring	7.78	6.92	12.8	0.00
76-13; 30-60	Hand augured central boring	7.83	4.09	14.9	0.00
79-13; 0-12	22 increment spatial composite	7.73	10.9	18.0	0.00
79-13; 0-12	Hand augured central boring	7.83	7.51	14.7	0.00
79-13; 12-30	Hand augured central boring	8.02	5.21	12.3	0.00
79-13; 30-60	Hand augured central boring	8.24	2.46		
80-13; 0-12	30 increment spatial composite	7.29	3.50	2.2	0.43
80-13; 0-12	30 increment replicate	7.16	3.60	1.7	0.65
80-13; 0-12	Hand augured central boring	6.39	3.64	2.0	0.10
80-13; 12-30	Hand augured central boring	7.11	2.91		
80-13; 30-60	Hand augured central boring	7.75	2.36		
81-13; 0-12	30 increment spatial composite	6.86	3.81	2.1	0.00
81-13; 0-12	Hand augured central boring	7.00	3.51	1.6	0.91
81-13; 12-30	Hand augured central boring	6.66	1.85		
81-13; 30-60	Hand augured central boring	7.56	0.27		
82-13; 0-12	30 increment spatial composite	6.70	2.42		
82-13; 0-12	Hand augured central boring	7.10	2.21		
82-13; 12-30	Hand augured central boring	7.19	6.29	12.7	0.00
82-13; 30-60	Hand augured central boring	7.21	5.73	13.0	0.00
83-13; 0-12	30 increment spatial composite	7.16	2.95		
83-13; 0-12	Hand augured central boring	7.33	2.34		
83-13; 12-30	Hand augured central boring	7.65	3.34	9.5	0.00
83-13; 30-60	Hand augured central boring	8.05	3.38	17.7	0.00
84-13; 0-12	30 increment spatial composite	7.87	11.9	15.4	0.00
84-13; 0-12	Hand augured central boring	7.84	5.67	7.8	0.00
84-13; 12-30	Hand augured central boring	8.33	4.58	32.5	0.00
84-13; 30-50	Hand augured central boring	8.47	3.59	36.1	0.00
85-13; 0-12	30 increment spatial composite	8.05	1.53		
85-13; 0-12	Hand augured central boring	7.98	1.57		
85-13; 12-30	Hand augured central boring	8.05	1.38		
85-13; 30-60	Hand augured central boring	8.13	1.28		
86-13; 0-12	30 increment spatial composite	6.80	2.14		

Table A-1. Soil Salinity Summary of All Sites Sampled in 2013

Site; Depth (in)	Sample Type	pHp	ECe (dS/m)	SAR	Gypsum Content (mEq/100g)
86-13; 0-12	Hand augured central boring	6.80	0.80		
86-13; 12-30	Hand augured central boring	7.03	1.16		
86-13; 30-60	Hand augured central boring	7.64	2.76		
87-13; 0-12	30 increment spatial composite	6.92	0.86		
87-13; 0-12	Hand augured central boring	6.82	0.76		
87-13; 12-30	Hand augured central boring	7.29	2.54		
87-13; 30-60	Hand augured central boring	7.77	3.87	5.8	0.00
88-13; 0-12	30 increment spatial composite	7.11	0.61		
88-13; 0-12	Hand augured central boring	7.09	0.66		
88-13; 12-30	Hand augured central boring	8.22	0.67		
88-13; 30-60	Hand augured central boring	7.83	1.44		
89-13; 0-12	30 increment spatial composite	6.84	0.83		
89-13; 0-12	Hand augured central boring	7.36	1.33		
89-13; 12-30	Hand augured central boring	7.42	0.99		
89-13; 30-60	Hand augured central boring	7.79	1.38		
90-13; 0-12	30 increment spatial composite	7.67	5.27	9.5	0.00
90-13; 0-12	Hand augured central boring	7.47	9.01	12.3	0.00
90-13; 12-30	Hand augured central boring	7.72	7.68	12.7	0.00
90-13; 30-48	Hand augured central boring	7.73	4.64	6.9	0.00
91-13; 0-12	30 increment spatial composite	8.03	4.27	11.2	0.00
91-13; 0-12	Hand augured central boring	7.89	3.38	12.7	0.00
91-13; 12-30	Hand augured central boring	8.06	14.2	42.5	0.00
91-13; 30-52	Hand augured central boring	8.16	14.0	46.3	0.00
93-13; 0-12	30 increment spatial composite	7.35	1.96		
93-13; 0-12	Hand augured central boring	6.89	1.44		
93-13; 12-30	Hand augured central boring	7.59	3.68	10.0	0.00
93-13; 30-60	Hand augured central boring	7.71	12.0	15.1	0.00
94-13; 0-12	30 increment spatial composite	7.98	0.81		
94-13; 0-12	Hand augured central boring	7.96	0.70		
94-13; 12-30	Hand augured central boring	8.20	0.64		
94-13; 30-60	Hand augured central boring	8.34	1.49		
95-13; 0-12	30 increment spatial composite	7.23	0.42		
95-13; 0-12	Hand augured central boring	7.05	0.56		
95-13; 12-30	Hand augured central boring	6.29	0.11		
95-13; 30-60	Hand augured central boring	7.84	0.29		
96-13; 0-12	30 increment spatial composite	7.35	1.18		
96-13; 0-12	Hand augured central boring	7.29	1.25		
96-13; 12-30	Hand augured central boring	7.50	2.08		
96-13; 30-52	Hand augured central boring	7.51	0.98		
97-13; 0-12	30 increment spatial composite	7.05	3.35	2.8	0.19
97-13; 0-12	Hand augured central boring	7.41	3.91	4.2	1.15
97-13; 12-30	Hand augured central boring	7.69	5.84	12.2	0.00
97-13; 30-60	Hand augured central boring	7.41	4.16	21.6	0.00
99-13; 0-12	20 increment spatial composite	7.33	0.82		

Table A-1. Soil Salinity Summary of All Sites Sampled in 2013

Site; Depth (in)	Sample Type	pHp	ECe (dS/m)	SAR	Gypsum Content (mEq/100g)
99-13; 0-12	Hand augured central boring	7.33	0.65		
99-13; 12-30	Hand augured central boring	7.54	1.63		
99-13; 30-60	Hand augured central boring	7.45	2.48		
100-13; 0-12	30 increment spatial composite	7.39	1.51		
100-13; 0-12	30 increment field replicate	7.35	1.03		
100-13; 0-12	Hand augured central boring	7.81	0.54		
100-13; 12-30	Hand augured central boring	8.19	0.78		
100-13; 30-60	Hand augured central boring	7.87	2.45		
101-13; 0-12	30 increment spatial composite	7.64	5.06	4.4	1.4
101-13; 0-12	Hand augured central boring	7.79	2.81		
101-13; 12-30	Hand augured central boring	7.64	4.83	4.1	5.1
101-13; 30-60	Hand augured central boring	7.88	7.79	11.2	0.7
102-13; 0-12	30 increment spatial composite	7.63	4.03	7.8	0.00
102-13; 0-12	Hand augured central boring	7.36	1.21		
102-13; 12-30	Hand augured central boring	7.70	1.70	6.0	0.00
102-13; 30-60	Hand augured central boring	7.84	2.02		
103-13; 0-12	30 increment spatial composite	7.34	3.06	8.3	0.00
103-13; 0-12	Hand augured central boring	7.33	1.75		
103-13; 12-30	Hand augured central boring	7.61	2.54		
103-13; 30-60	Hand augured central boring	7.66	1.80		
104-13; 0-12	30 increment spatial composite	7.23	2.16		
104-13; 0-12	30 increment field replicate	7.14	2.33		
104-13; 0-12	Hand augured central boring	7.46	1.45		
104-13; 12-30	Hand augured central boring	7.92	1.24		
104-13; 30-60	Hand augured central boring	7.74	2.43		
105-13; 0-12	30 increment spatial composite	7.74	1.48		
105-13; 0-12	30 increment field replicate	7.45	1.86		
105-13; 0-12	Hand augured central boring	7.4	1.07		
105-13; 12-30	Hand augured central boring	7.37	1.09		
105-13; 30-60	Hand augured central boring	7.56	0.92		
106-13; 0-12	30 increment spatial composite	6.80	2.15		
106-13; 0-12	Hand augured central boring	6.78	1.29		
106-13; 12-30	Hand augured central boring	7.33	5.03	8.5	0.00
106-13; 30-60	Hand augured central boring	7.23	6.01	9.5	0.00
107-13; 0-12	30 increment spatial composite	6.94	0.71		
107-13; 0-12	Hand augured central boring	6.75	0.93		
107-13; 12-30	Hand augured central boring	7.72	1.56		
107-13; 30-55	Hand augured central boring	7.84	1.56		
108-13; 0-12	30 increment spatial composite	6.81	0.81		
108-132; 0-12	Hand augured central boring	7.04	1.00		
108-13; 12-30	Hand augured central boring	7.46	1.87		
108-13; 30-60	Hand augured central boring	8.09	2.54		
109-13; 0-12	30 increment spatial composite	6.92	0.73		
109-13; 0-12	Hand augured central boring	6.68	0.67		

Table A-1. Soil Salinity Summary of All Sites Sampled in 2013

Site; Depth (in)	Sample Type	pHp	ECe (dS/m)	SAR	Gypsum Content (mEq/100g)
109-13; 12-30	Hand augured central boring	7.04	0.61		
109-13; 30-60	Hand augured central boring	7.42	1.21		
110-13; 0-12	30 increment spatial composite	8.08	2.01		
110-13; 0-12	Hand augured central boring	7.83	2.20		
110-13; 12-30	Hand augured central boring	7.85	4.03	6.9	0.00
110-13; 30-48	Hand augured central boring	7.88	4.37	6.5	0.00
111-13; 0-12	30 increment spatial composite	6.89	19.7	11.0	0.00
111-13; 0-12	Hand augured central boring	7.00	25.8	11.5	0.00
111-13; 12-30	Hand augured central boring	7.55	10.5	10.1	0.00
111-13; 30-60	Hand augured central boring	7.76	9.34	9.0	0.00
112-13; 0-12	30 increment spatial composite	7.19	7.32	7.7	0.00
112-13; 0-12	Hand augured central boring	7.11	8.55	7.0	0.00
112-13; 12-30	Hand augured central boring	7.14	10.2	6.8	0.00
112-13; 30-60	Hand augured central boring	7.67	5.13	8.1	0.00
113-13; 0-12	30 increment spatial composite	7.49	14.4	10.6	0.00
113-13; 0-12	Hand augured central boring	7.50	14.2	11.9	0.00
113-13; 12-30	Hand augured central boring	7.72	8.64	10.0	0.00
113-13; 30-60	Hand augured central boring	7.87	7.79	8.7	0.00
114-13; 0-15	7 increment calibration sample	7.65	3.75	5.7	0.74
114-13; 15-30	7 increment calibration sample	7.75	4.48	6.8	0.00
116-13; 0-12	30 increment spatial composite	7.33	4.24	1.7	2.4
116-13; 0-12	Hand augured central boring	7.51	6.48	3.1	0.00
116-13; 12-30	Hand augured central boring	7.58	5.55	4.6	0.00
116-13; 30-60	Hand augured central boring	7.76	2.74		
118-13; 0-12	30 increment spatial composite	8.05	1.62		
118-13; 0-12	Hand augured central boring	7.95	1.78		
118-13; 12-30	Hand augured central boring	8.11	1.99		
118-13; 30-60	Hand augured central boring	8.56	1.89		
119-13; 0-12	30 increment spatial composite	6.77	1.63		
119-13; 0-12	Hand augured central boring	7.29	0.50		
119-13; 12-30	Hand augured central boring	7.73	0.75		
119-13; 30-60	Hand augured central boring	7.87	0.34		
120-13; 0-12	30 increment spatial composite	7.44	1.50		
120-13; 0-12	Hand augured central boring	7.63	1.22		
120-13; 12-30	Hand augured central boring	7.70	1.80		
120-13; 30-60	Hand augured central boring	7.56	3.52	107	0.00
121-13; 0-12	30 increment spatial composite	7.56	1.84		
121-13; 0-12	Hand augured central boring	7.59	1.40		
121-13; 12-30	Hand augured central boring	7.65	1.19		
121-13; 30-60	Hand augured central boring	7.79	1.03		
122-13; 0-12	30 increment spatial composite	7.69	1.27		
122-13; 0-12	30 increment field replicate	7.58	1.41		
122-13; 0-12	Hand augured central boring	7.67	0.75		
122-13; 12-30	Hand augured central boring	7.57	1.82		

Table A-1. Soil Salinity Summary of All Sites Sampled in 2013

Site; Depth (in)	Sample Type	pHp	ECe (dS/m)	SAR	Gypsum Content (mEq/100g)
122-13; 30-60	Hand augured central boring	8.03	1.12		
123-13; 0-12	30 increment spatial composite	7.59	9.35	7.2	0.58
123-13; 0-12	Hand augured central boring	7.19	30.3	15.8	2.36
123-13; 12-30	Hand augured central boring	7.80	7.96	10.0	0.00
123-13; 30-60	Hand augured central boring	8.21	4.28	13.6	0.00
124-13; 0-12	30 increment spatial composite	7.65	1.46		
124-13; 0-12	Hand augured central boring	7.53	1.10		
124-13; 12-30	Hand augured central boring	7.67	1.94		
124-13; 30-60	Hand augured central boring	7.82	3.68	3.4	0.13
125-13; 0-12	30 increment spatial composite	7.29	1.62		
125-13; 0-12	Hand augured central boring	7.48	1.07		
125-13; 12-30	Hand augured central boring	7.70	0.88		
125-13; 30-60	Hand augured central boring	8.15	1.27		
126-13; 0-12	30 increment spatial composite	7.12	1.24		
126-13; 0-12	Hand augured central boring	7.11	0.92		
126-13; 12-30	Hand augured central boring	6.90	0.77		
126-13; 30-60	Hand augured central boring	7.65	1.37		
127-13; 0-12	30 increment spatial composite	6.73	1.06		
127-13; 0-12	Hand augured central boring	6.89	1.16		
127-13; 12-30	Hand augured central boring	6.84	1.91		
127-13; 30-60	Hand augured central boring	6.86	2.07		
128-13; 0-12	30 increment spatial composite	7.28	1.07		
128-13; 0-12	Hand augured central boring	6.84	0.72		
128-13; 12-30	Hand augured central boring	7.43	0.62		
128-13; 30-60	Hand augured central boring	7.85	0.85		
129-13; 0-12	30 increment spatial composite	7.32	1.23		
129-13; 0-12	Hand augured central boring	7.18	0.43		
129-13; 12-30	Hand augured central boring	7.20	0.43		
129-13; 30-60	Hand augured central boring	7.45	0.28		
130-13; 0-12	30 increment spatial composite	7.72	1.90		
130-13; 0-12	Hand augured central boring	7.83	1.48		
130-13; 12-30	Hand augured central boring	7.83	1.80		
130-13; 30-60	Hand augured central boring	7.88	1.47		
131-13; 0-12	30 increment spatial composite	6.89	0.93		
131-13; 0-12	Hand augured central boring	7.03	0.86		
131-13; 12-30	Hand augured central boring	7.59	2.80		
131-13; 30-60	Hand augured central boring	7.74	2.76	8.2	0.00
132-13; 0-12	30 increment spatial composite	7.41	1.16		
132-13; 0-12	Hand augured central boring	7.13	2.12		
132-13; 12-30	Hand augured central boring	7.65	2.26		
132-13; 30-60	Hand augured central boring	7.81	4.09	9.9	0.00
135-13; 0-12	20 increment spatial composite	7.55	0.83		
135-13; 0-12	Hand augured central boring	7.16	0.38		
135-13; 12-30	Hand augured central boring	8.16	0.64		

Table A-1. Soil Salinity Summary of All Sites Sampled in 2013

Site; Depth (in)	Sample Type	pHp	ECe (dS/m)	SAR	Gypsum Content (mEq/100g)
135-13; 30-60	Hand augured central boring	8.30	1.43		
136-13; 0-15	8x composite calibration	7.17	1.24		
136-13; 15-30	8x composite calibration	7.53	6.00	6.9	0.00
L21; 0-12	30 increment spatial composite	7.22	1.84		
L21; 0-12	Hand augured central boring	7.41	1.15		
L21; 12-24	Hand augured central boring	7.49	2.42		
L21; 24-36	Hand augured central boring	7.66	2.71		
L21; 36-48	Hand augured central boring	7.78	2.07		
L21; 48-60	Hand augured central boring	7.78	1.58		
L21; 60-72	Hand augured central boring	7.88	1.56		
L26; 0-12	30 increment spatial composite	7.01	0.96		
L26; 0-12	Hand augured central boring	6.97	0.83		
L26; 12-24	Hand augured central boring	7.32	0.91		
L26; 24-36	Hand augured central boring	7.91	1.33		
L26; 36-48	Hand augured central boring	7.82	3.10	7.1	0.00
L26; 48-60	Hand augured central boring	7.56	4.22	6.2	0.00
L26; 60-72	Hand augured central boring	7.48	4.87	5.3	0.00
L28; 0-12	30 increment spatial composite	7.37	1.01		
L28; 0-12	Hand augured central boring	7.33	0.86		
L28; 12-24	Hand augured central boring	7.60	0.74		
L28; 24-36	Hand augured central boring	7.86	0.96		
L28; 36-48	Hand augured central boring	7.95	1.46		
L28; 48-60	Hand augured central boring	7.99	1.91		
L48; 0-12	30 increment spatial composite	6.83	1.85		
L48; 0-12	Hand augured central boring	7.20	1.40		
L48; 12-24	Hand augured central boring	7.35	2.61		
L48; 24-36	Hand augured central boring	7.12	2.82		
L48; 36-48	Hand augured central boring	7.17	2.18		
L48; 48-60	Hand augured central boring	7.11	1.73		
L48; 60-72	Hand augured central boring	7.35	2.46		
L50; 0-12	30 increment spatial composite	6.64	2.33		
L50; 0-12	Hand augured central boring	6.58	2.51		
L50; 12-24	Hand augured central boring	6.79	1.38		
L50; 24-36	Hand augured central boring	7.00	0.78		
L50; 36-48	Hand augured central boring	7.67	0.82		
L50; 48-60	Hand augured central boring	8.05	0.86		
L50; 60-72	Hand augured central boring	8.07	0.91		
L66; 0-12	30 increment spatial composite	7.26	1.74		
L66; 0-12	Hand augured central boring	7.03	1.63		
L66; 12-24	Hand augured central boring	7.47	1.69		
L66; 24-36	Hand augured central boring	7.34	2.18		
L66; 36-48	Hand augured central boring	7.50	1.45		
L66; 48-60	Hand augured central boring	7.76	1.06		
L66; 60-72	Hand augured central boring	7.94	1.19		

Table A-1. Soil Salinity Summary of All Sites Sampled in 2013

Site; Depth (in)	Sample Type	pHp	ECe (dS/m)	SAR	Gypsum Content (mEq/100g)
DF-1; 0-12	30 increment spatial composite	6.59	2.78		
DF-1; 0-12	Hand augured central boring	6.77	2.79		
DF-1; 12-24	Hand augured central boring	6.92	2.30		
DF-1; 24-36	Hand augured central boring	7.04	1.64		
DF-1; 36-48	Hand augured central boring	7.62	1.68		
DF-1; 48-60	Hand augured central boring	7.67	2.34		
DF-1; 60-72	Hand augured central boring	7.82	2.76		
DF-2; 0-12	30 increment spatial composite	6.65	4.86	2.6	0.00
DF-2; 0-12	30 increment field replicate	6.63	4.25	2.6	0.00
DF-2; 0-12	Hand augured central boring	6.78	5.01	2.4	0.00
DF-2; 12-24	Hand augured central boring	6.83	2.94		
DF-2; 24-36	Hand augured central boring	7.10	0.92		
DF-2; 36-48	Hand augured central boring	7.35	0.52		
DF-2; 48-60	Hand augured central boring	7.39	0.48		
DF-2; 60-72	Hand augured central boring	7.36	0.50		

Appendix B

Soil Profile Logs

Site 1

San Joaquin River Seepage Management Program

Well or Boring# sjrbs 1-10 Sampler: brummer Date: 2/26/2010
 Location(UTM/NAD83) e0743958 n4073204 Landform floodplain NRCS Map Unit chino fsl
 Location Notes 120 ft west of tpole down 10th interow
 Topography nearly level Vegetation & Conditon young grapes fair
 Irrigation System Type: drip Irrigation Quadrant one-five
 Avg EM Measurements; EM_v 35 EM_H 21 EM Calibration Site: EM_v 35 Emh 17
 Soil Temperature, °C (2") 14c (16") 15c

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-14	fsl	14	54	10yr 4/2	0	vm	none				friable
	14-20	sl	6	78	10yr 6/2	0	vm	none				friable
	20-60	sand	1	98	10yr 6/3	0	sm	few				faint mottles
	0-12 17x						21.6		6.9	0.99	34.6	17x composite
	0-12						20.5		6.79	0.64	32.1	
	12-30in						11.5		7.13	0.42	25.5	
	30-60						5.7		7.18	0.49	28.1	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Metal grape stakes
 thin loam lense at about 55 inches
 em survey 20-150 from east row edge
 site is in levee repair area
 em readings taken in center of row between tire tracks
 soil sample in center of row

EM38 Measurements: EM _v		EM _H	
	28	32	40
	35	35	38
	28	22	36
	34	21	33
	35	18	29
	37	21	31
	37	18	35

Site 2

San Joaquin River Seepage Management Program

Well or Boring# 2-10 Sampler: brummer, lee Date: 3/1/2010
 Location(UTM/NAD83) 10s 0736518 4074698n Landform oxbow floodplain NRCS Map Unit grangeville fsl
 Location Notes 400 ft west and 50 feet south of obs well 2b-1
 Topography nearly level Vegetation & Conditon grain
 Irrigation System Type: gravity checks Irrigation Quadrant 3/5
 Avg EM Measurements; (tcor) EM_v 18.5 (23.2) EM_H 19.0 (23.2) EM Calibration Site: EM_v 39.5 Emh 46.1
 Soil Temperature, °C (2") 16 (16") 14

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-16	loam	17	46	grey	0	vm	none				friable
	16-28	fsl	12	58	greybr	0	vm	none				
	28-46	lfs	6	83	pale brn	0	moist	none				
	46-60	sand	1	97	ltbrngr	0	sm	none				loose, single grained
	60-86	cosand	0	100	ltgrbm	0	wet-sat	none				cap fringe at 5.5 feet
16	0-12 30x						13.3		7.29	4.72	41.6	
17	0-12						19.3		7.44	3.91	40.4	
18	12to30						15.4		6.99	4.7	29.2	
21	30-60						6.3		7.27	0.5	24.7	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

installed temporary well
 site has variable salinity and depth to sand
 total well depth 6.4; stickup 2.9
 sand layers prevent capillary rise
 hole caved from 76-86 inches
 water table depth 5.2 feet

		EM38 Measurements: EM _v EM _H				EM _v EM _H	
Emv	Emh	Emv	Emh				
				9.3	7.3	27.6	29.9
16	14	42	34	10	10.1	36.2	44.4
20	17	25	24	13	14	51.2	57.8
14	11	11	8	10.7	11.5	27.6	31.1
10	8	6	3	12.6	16.7	12.7	14.9
9	9	8	6	18.9	23.1	12.7	13.3
9	8	11	10	39.5	46.1	10.9	12.2
10.8	9.1	17.7	18.4	30	34.3	31	35.5
11.4	11.2	15.7	16.6	18.8	21		

Site 3

San Joaquin River Seepage Management Program

Well or Boring# sjrpp 3-10 Sampler: brummelee Date: 3/1/2010
 Location(UTM/NAD83) 10s 073 6571 405 4537 Landform floodplain oxbow NRCS Map Unit grangeville fsl
 Location Notes 350 feet east of mendota pool slough
 Topography nearly level Vegetation & Condition grain
 Irrigation System Type: gravity check Irrigation Quadrant 2/5
 Avg EM Measurements; (tcor) EM_V 28.3 (36.) EM_H 36.1 (42.1) EM Calibration Site: EM_V 21.2 Emh 29.4
 Soil Temperature, °C (2") 18c (16") 14c

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-12	loam	18	40	dkgray	0	vm	none				friable
	12to26	loam	18	45	dkgrbr	0	moist	none				friable
	26-44	fsl	8	60	brgray	0	moist	few				faint
	44-54	sand	2	98	ltgray	0	s moist	none				
	54-60	cosand	0	100	ltgray	0	wet	none				cap. Fringe
22	0-12 30x						16.3		7.45	7.56	39.9	sar 14.9
23	0-12 30xrep						17.6		7.62	6.88	38.7	sar 13.4
24	0-12						15.6		7.56	11.7	41.9	sar 20.6
26	12to30						14.2		6.98	1.96	36.7	
27	30-60						7.7		7.22	1.2	22.7	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

site is 350 feet from mendota pool.
 depth to sand varies from 6 to over 36 in.
 sand layers prevent capillary rise into upper root zone.
 water table about 58 inches

EM38 Measurements:		EM _V	EM _H	EM _V	EM _H
emv	emh				
27.6	39.7	18	23.1	39.7	48.2
		10.3	9	37.4	55
47	52.1	11.4	8.9	21.6	21.8
50.7	47.7	9.4	10.2	16.7	22.1
53.4	48.6	17.6	21.7	18	23.3
45.7	59.6	20.1	29.4	34	41.5
24.9	29.1	19.1	31.7	24.4	58.7
43.2	55.5	39.3	64.3	21.2	29.4

Site 4

San Joaquin River Seepage Management Program

Well or Boring# 04-10 Sampler: Brummer Date: 3/2/10
 Location(UTM/NAD83) 10S 0735406 4074621 Landform Floodplain NRCS Map Unit Gba Grangeville fsl
 Location Notes About 300 ft South of big cottonwood tree slightly saline - alkali
 Topography Nearly Level Vegetation & Conditon Grain; Fair condition
 Irrigation System Type: Gravity check Irrigation Quadrant 3/5
 Avg EM Measurements; (T, Cor) EM_v 20.0(25.6) EM_H 18.4(22.5) EM Calibration Site: EM_v 20.3 EM_H 18.3
 Soil Temperature, °C (2") 16 °C (16") 14 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-18	SiL	16	25	Dk.Gry	+	VM-M	None				Friable
	18-52	SiL	17	25	Lt.BrnGry	0	SM	None				Soft
	52-30	FSL	8	60	Lt.BrnGry	0	ND	Com				Distinct Mottles
28	0-12	30x					18.4		7.87	1.8	45.2	
31	0-12						21.3		7.76	1.45	46.1	
32	12-30						15.4		7.96	3.21	56	
33	30-60						7.6		7.46	2.16	47.6	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

About 300 ft from Mendota Pool
 Excellent Profile
 No sign of water table or capillary fringe
 Too dry for good EM readings; 18-60"

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
20.5	18	19.8	16.7	13.3	11.8	17.9	16.7
21.7	20.7	16.2	14.3	16.4	13.7	24.3	26.2
18.2	15.6	13.9	13.3	32	33.8	20.3	18.3 *
25.1	23.4	13	10.7	18.8	16		
30.6	28.3	13.9	12.9	21.9	19.2		
22.6	21.1	12.6	13.1	26.1	21.7		

Site 5

San Joaquin River Seepage Management Program

Well or Boring# 05-10 Sampler: Brummer Date: 3/2/10
 Location(UTM/NAD83) 10S 0735693 4074638 Landform Floodplain NRCS Map Unit CgbA; Chino Loam
 Location Notes About 250 ft west of Pump Moderately saline/alkaline
 Topography Nearly Level Vegetation & Conditon Grain
 Irrigation System Type: Gravity check Irrigation Quadrant 3/5
 Avg EM Measurements; (T, Cor) EM_v 44.8(57.4) EM_H 44.1(53.9) EM Calibration Site: EM_v 56.8 EM_H 50.5
 Soil Temperature, °C (2") 16 °C (16") 14 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-18	L	20	38	V.DkGry	0	VM	None				Friable
	18-30	SiL	21	25	Pale BrnGry	0	M	None				Friable
	30-49	L	15	48	Pale BrnGry	0	M	Few				Few Faint Mottles
	49-60	FSL	15	55	BrnGry	0	M	Com				Common Mottles
35	0-12	30x					22.9		7.23	4.36	56	SAR = 5.1
36	0-12						27.6		6.78	4.23	53.7	SAR = 4.3
37	12-30						24.5		7.23	5.41	49.7	SAR = 7.2
38	30-60						24.7		7.52	1.77	43.8	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:	EM38 Measurements:		EM _v	EM _H	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
About 250 ft West of Pump; 150 ft from Mendota Pool	46.9	46.2	47.8	46.8	45.3	48.3	50.9	51		
No sign of water table or capillary fringe	59.7	53	49.9	58.7	46.9	46.7	56.8	50.5 *		
	49.1	52.4	47.9	51.4	39.1	39.1				
	37.1	36.9	46.6	45.7	28.8	34.6				
	17.2	15.7	42.8	35.9	60.1	51.8				
	34.1	31.9	40.9	42.3	48.4	42.8				

Site 6

San Joaquin River Seepage Management Program

Well or Boring# sjrrp 6-10 Sampler: brummer Date: 3/2/2010
 Location(UTM/NAD83) 0734938 4074468 Landform floodplain NRCS Map Unit chino loam
 Location Notes 250 feet se of well 2b-2 silt saline /alk
 Topography nearly level Vegetation & Conditon grain fair
 Irrigation System Type: gravity check Irrigation Quadrant 2//5
 Avg EM Measurements; (tcor) EM_V 7.7 (9.9) EM_H 7.9 (9.9) EM Calibration Site: EM_V 8.7 Emh 8
 Soil Temperature, °C (2") 15c (16") 14c

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-14	loam	18	35	vdk gray	ne	vm	none				friable
	14-28	loam	16	40	palebrn		sm	none				firm -slightly hard
	28-46	fsl	10	65	palebrn		dry	few				silt hard
	46-60	ls	4	86	palebrn		dry	common				soft
41	0-12 30x						21		7.12	1.49	48.7	
42	0-12						24		6.78	1.08	49.8	
43	12to30						9.4		7.08	1.42	47.4	
44	30-60						2.5		7	1.26	20.1	too dry for em

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

dryness at depth may have affected Emv readings.

EM38 Measurements: EM _V		EM _H	EM _V /EM _H	
	7	6.9	9.1	9.8
	6.4	6	8.2	8.8
	6.3	6	9	8.5
	6.5	7	7.1	8.1
	5.7	6.2	7.7	7.8
	8.8	10.6	9.7	9.6
			8.7	8

Site 7

San Joaquin River Seepage Management Program

Well or Boring# 07-10 Sampler: Brummer Date: 3/2/10
 Location(UTM/NAD83) 10S 0731237 4079776 Landform Floodplain NRCS Map Unit Cma; Columbia FSL
 Location Notes about 250 east of well r3-7 tape measured 247 feet east of well r3-7
 Topography Nearly Level Vegetation & Conditon Idle; fallow cropland
 Irrigation System Type: Gravity furrow Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_v 19.6(25.1) EM_H 17.8(21.2) EM Calibration Site: EM_v 26.3 EM_H 24.2
 Soil Temperature, °C (2") 17 °C (16") 14 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-17	L	17	40	Dk Gry	0	VM	None				Friable
	17-34	SiL	20	30	Dk.GryBrn	0	M	Few				Distinct Mottles
	34-43	VFSL	10	65	Pale Brn	0	M	Com				V.Friable
	43-46	Sand	2	98	Lt.Brn	0	M	None				Loose; S.G.
	46-60	LFS	5	85	Grey	0	M	Com				Slight Gley-Color; Sd lense 56-58"
												Slight gley color at 60"
46	0-12	30x					20.5		7.03	1.77	41.4	
47	0-12						22.6		7.01	0.82	40	
48	12-30						23.1		7.07	2.94	51.5	
51	30-60						17.7		6.90	2.06	37.1	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:	EM38 Measurements:				EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
Good Profile for irrigation					22.9	20.5	25.5	23.7	26.3	24.2 *
No sign of water table or capillary fringe					19	16.5	14.5	13.5		
					12.6	12	15.1	13.6		
					19	19.2	17.2	16.3		
					18.9	19	24.7	23.1		
					17.6	17	22	18		

Site 8

San Joaquin River Seepage Management Program

Well or Boring# 08-10 Sampler: Brunner Date: 3/2/10
 Location(UTM/NAD83) 10S 0731536 4079437 Landform Floodplain NRCS Map Unit Cma; Columbia FSL
 Location Notes About 300 ft East from Farm Rd; 250 ft from ditch
 Topography Nearly Level Vegetation & Conditon Fallow, irrigated cropland
 Irrigation System Type: Gravity furrow Irrigation Quadrant 3/5
 Avg EM Measurements: (T, Cor) EM_v 19.9(25.5) EM_H 16.1(22.2) EM Calibration Site: EM_v 22.8 18.1 24.2
 Soil Temperature, °C (2") 11 °C (16") 14 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-18	L	18	38	Dk Gry	NE	VM	None				V.Friable
	18-28	Lt.L	12	50	Brn Gry	NE	VM	None				V. Friable; almost FSL texture
	28-46	Lt.FSL	6	72	Brn Gry	NE	VM	Few				V.Friable
	46-60	SiL	17	32	Brn Gry	NE	Wet					Contains LFS layers at 50-54"
52	0-12						20.4		6.83	0.93	37.4	0-12 Avg = 0.955
53	0-12	20x					18.6		6.88	0.96	35.4	RPD 1.0
54	0-12	20x Replicate Sample\					19.2		6.87	0.95	35.9	
55	12-30						19.3		7.32	0.71	37.9	
56	30-60						30.8		6.88	1.23	40	Capillary Fringe

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Excellent Profile
 Field Replicate is different samples collected 20x
 No water table at 60"

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
20.3	18.9	19.9	15.6	15.1	13		
20.3	17.8	22.1	16.5	21.4	17.3		
18.6	14.2	20.3	16.3	18.2	12.2		
22.8	18.1 *	20.6	17				
22.9	17.6	18.8	15.3				
24.3	19.8	13.6	12				

Site 9

San Joaquin River Seepage Management Program

Well or Boring# sjrrp 9-10 Sampler: brumme dominguez Date: 3/2/2010
 Location(UTM/NAD83) 0730099 4080196n Landform floodplain NRCS Map Unit riverwash
 Location Notes about 400 feet se of well r3-5
 Topography nearly level Vegetation & Conditon fallow, irrigated cropland
 Irrigation System Type: gravity furrow Irrigation Quadrant 4//5
 Avg EM Measurements; (tcor) EM_V 13.1 (17.6) EM_H 12.6 (17.0) EM Calibration Site: EM_V 11.9 Emh 10.6
 Soil Temperature, °C (2") 12 (16") 12

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-8	sl	10	68	dkgray	0	vm	none				very friable
	8to23	ls	4	89	brgray	0	vm	none				loose, single grained
	23-60	sand	1	99	ltgrbrn	0	moist	none				few iron stains in sand at 57 inches
57	0-12						18.4		7.09	0.71	28.4	
58	0-12 30x						12.4		7.18	0.98	29.6	
61	12to30						8.4		7.35	0.36	36.3	
62	30-60						8.3		7.44	0.41	35.1	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

site is about 400 feet from the river
 this site is about 3 feet lower than obs well r3-5
 sandy soil; no sign of water table to 60 inches.

EM38 Measurements:		EM _V	EM _H	EM _V	EM _H
		11.9	12	16.1	13.7
		12.3	12.1	15.8	14
		13.8	13.6	13.4	13.4
		15.2	13.8	11.5	12.5
		12.5	12.3	11.5	11.6
		15.6	12.5	11.9	10.6
		11.4	12.1	10.6	13.1

Site 10

San Joaquin River Seepage Management Program

Well or Boring# 10-10 Sampler: Brummer/Dominguez Date: 3/2/10
 Location(UTM/NAD83) 10S 0729656 4080526 Landform Floodplain NRCS Map Unit CmA; Columbia FSL
 Location Notes About 275 ft NE of vent pipe; perpendicular to road
 Topography Nearly Level Vegetation & Conditon Fallow irrigated cropland
 Irrigation System Type: Gravity; Furrow Irrigation Quadrant 4/5
 Avg EM Measurements: (T, Cor) EM_v 12.8(16.8) EM_H 12.0(16.1) EM Calibration Site: EM_v 12 EM_H 11.2
 Soil Temperature, °C (2") 12 °C (16") 13 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-10	SL	12	70	Dk.Brn.Gry	NE	VM	None				V.Friable
	10-19	L	18	40	Dk.Brn.Gry	NE	VM	None				Friable
	19-40	L	15	45	Pale Brn	NE	M	None				
	40-60	S	2	98	Lt.BrnGry	NE	M	Few				Contains LFS lenses w/mottles
64	0-12	30x					13.8		6.59	1.5	30.1	
65	0-12						13.7		6.5	0.86	27.3	
66	12-30						10.2		6.62	1.42	36.3	
67	30-60						5.4		7.05	0.66	25.7	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

No sign of water table to 60 inches
 few iron stains below 34 inches

EM38 Measurements:

EM _v EM _H		EM _v EM _H		EM _v EM _H		EM _v EM _H	
12.5	12.3	12	11.5	15.3	13.7		
14.5	13	10.7	9.5	14	13.1		
13.7	12.6	11.8	10.4	13.5	12.1		
12.8	13.1	10.3	9.6	12	11.2 *		
16.5	14.8	10.4	10.4	12.2	10.6		
12.9	13.1	14.3	12.6	11.6	11.5		

Site 11

San Joaquin River Seepage Management Program

Well or Boring# 11-10 Sampler: Brummer/Dominguez Date: 3/9/10
 Location(UTM/NAD83) 10S 0737207 4074296 Landform Floodplain NRCS Map Unit Cr; Chino Loam
 Location Notes About 275 ft North of City Pump
 Topography Nearly Level Vegetation & Conditon Grain; fair to poor stand
 Irrigation System Type: Gravity Irrigation Quadrant 2/5
 Avg EM Measurements: (T, Cor) EM_v 27.0(37.2) EM_H 21.5(30.4) EM Calibration Site: EM_v 25 EM_H 19
 Soil Temperature, °C (2") 10 °C (16") 11 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-7	SiL	20	25	V.Dk Gry	NE	VM	None				Friable; Granular
	7-14	L	18	35	Dk.Gry	NE	VM	None				MM Blocky
	14-26	Lt.SiCL	28	25	GryBrn	NE	M	None				Slightly Firm
	26-57	SL	8	64	Brn	NE	M	Few				Faint Mottles
	57-60	Lt.SiCL	29	25	Grey	NE	VM	Few				Faint Mottles
70	0-12	20x					19.7		7.52	1.34	38.5	0-12" ave 1.225; RPD 18.8%
71	0-12	20x Replicate					18.9		7.48	1.11	37.3	
72	0-12						20.6		6.92	1.08	35.6	
73	12-30						15		7.53	1.35	32.7	
74	30-60						11.4		7.61	3.1	29.7	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

No sign of water table or capillary fringe to 60 inches
 Almonds 360 ft to the south
 Site is about 700-800 ft from edge of Pool
 site is east of the menddota pool

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H
23	19.3	35.5	31.2
23.1	17.6	32	24.1
20.5	18.8	34.6	26.2
21.5	17	31.9	23
22.6	17.6	31.5	22.5
27.4	24.3	26.3	18.5

EM _v	EM _H	EM _v	EM _H
25	19 *		
24.1	19.3		
25.4	24.6		

Site 12

San Joaquin River Seepage Management Program

Well or Boring# 12-10 Sampler: Brunner Date: 3/9/10
 Location(UTM/NAD83) 10S 0737721 4074671 Landform Floodplain/Oxbow NRCS Map Unit Cr; Chino Loam
 Location Notes About 280 ft west & 180 ft North of field break on road
 Topography Nearly Level Vegetation & Conditon Fallow - Cropland, weeds, idle
 Irrigation System Type: Gravity Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_v 17.3(24.5) EM_H 13.7(19.4) EM Calibration Site: EM_v 19.7 EM_H 14.1
 Soil Temperature, °C (2") 10 °C (16") 10 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-6	FSL	9	60	Dk.Gry	NE	VM	None				Friable
	6-15	FSL	11	57	GryBrn	NE	VM	None				Weak Fine Blocky; Many Roots
	15-41	FSL	8	60	Brn	NE	M	None				V.Friable; Micacious
	41-51	LFS	5	78	Pale Brn	NE	M	Few				Faint Mottles
	51-60	FS	2	96	Lt.Gry	NE	M	Few				Faint Iron Stain Mottles
75	0-12	30x					17.9		7.68	4.89	39.1	SAR = 9.7
76	0-12						17.4		7.98	1.12	36.1	
77	12-30						17.7		7.76	2.24	39.6	
78	30-60						12.2		7.69	0.26	39.9	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:	EM38 Measurements:				EM _v EM _H		EM _v EM _H		EM _v EM _H	
	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
No sign of water table or capillary fringe to 60 inches	22.2	15.4	17.7	13.1	44.5	35.7	11.1	7.9		
DWR S-35 is about 500 ft to the SE	14	9.7	18.2	15	15.5	12.9	12.5	8.1		
Site is about 300 ft west of Pool	10.6	6.8	13.8	9.9	21.2	21.3				
Field is about 2-3 ft higher than the pool level	10.1	6.4	11.4	7.9	17.7	13.8				
	18.6	15.2	17.5	16.1	11.6	8.6				
	16.7	15.8	22.9	20.4	19.7	14.1 *				

Site 13

San Joaquin River Seepage Management Program

Well or Boring# 13-10 Sampler: Brummer/Dominguez Date: 3/9/10
 Location(UTM/NAD83) 10S 0738647 4074095 Landform Floodplain/Oxbow NRCS Map Unit Cr; Chino Loam
 Location Notes About 300 ft west of stake for L-22
 Topography Nearly Level Vegetation & Conditon Pistaccios; good trees
 Irrigation System Type: Drip Irrigation Quadrant _____
 Avg EM Measurements; (T, Cor) EM_v 29.0(39.0) EM_H 34.0(41.5) EM Calibration Site: EM_v 26.3 EM_H 32.4
 Soil Temperature, °C (2") 16 °C (16") 12 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-8	L	21	35	V.Dk. Gry	0	VM	None				Granular
	8-19	Lt.SiCL	29	20	Dk Gry	0	VM	None				MM Blocky
	19-44	SiL	19	25	Brn	0	M	None				Friable
	44-53	Lt.L	14	50	Pale Brn	0	M	None				V.Friable
	53-60	VFSL	12	54	Pale Brn	0	M	Few				V.Friable; V.Faint Mottles
80	0-12	30x					16.1		6.44	7.21	38.4	SAR = 7.2
81	0-12						17.9		6.29	9.7	42.2	SAR = 4.9
82	12-30						19.3		7.45	2.84	49.3	
83	30-60						11.1		7.63	1.03	41.7	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:	EM38 Measurements:			
	EM _v	EM _H	EM _v	EM _H
No sign of water table or capillary fringe to 60 inches	25.6	29.3	24	26
Some Sulfur grains on soil surface	23.2	26.5	35.3	24.1
0-12" has a few sulfur grains	18	24.4	37.7	37.5
Site has mostly inverted EM readings possibly due to sulfur in the top foot ?	15.5	22.1	16	32.9
	16.5	31	28.6	33.4
Soil surface is mostly barren	39.5	56.9	41.7	44.3

EM _v	EM _H	EM _v	EM _H
41.4	44.7	26.9	23.5
28.7	36.1	29.1	32.4
26.3	32.4 *	43.4	27.8
16.4	52.6	38.9	44.3
40.5	37.9		
25.4	30.7		

Site 14

San Joaquin River Seepage Management Program

Well or Boring# 14-10 Sampler: Brummer/Dominguez Date: 3/9/10
 Location(UTM/NAD83) 10S 0739503 4073486 Landform Floodplain NRCS Map Unit Cr; Chino Loam
 Location Notes About 350 ft south of San Joaquin River; about 800 ft west of San Mateo Rd
 Topography Nearly Level Vegetation & Conditon Pistaccios; good trees
 Irrigation System Type: Drip Irrigation Quadrant _____
 Avg EM Measurements; (T, Cor) EM_v 33.3(41.6) EM_H 29.1(33.9) EM Calibration Site: EM_v 32 EM_H 26.8
 Soil Temperature, °C (2") 18 °C (16") 15 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-5	L	18	40	Dk Gry	NE	VM	None				Granular
	5-20	HSL	16	54	Dk Gry	NE	M	None				WM Blocky
	20-50	SL	12	58	Gry Brn	NE	SM	None				V.Friable
	50-55	LS	5	85	Lt. Gry Brn	NE	SM	None				Loose, SG
	55-58	S	2	96	Lt. Gry	NE	SM	None				Loose, SG
	58-60	L	15	40	Pale Brn	NE	M	Few				Few Faint Mottles
85	0-12	30x					13.4		7.8	2.78	34.6	
86	0-12						14.1		7.74	1.56	34.3	
87	12-30						7.9		7.55	4.1	33.6	SAR = 6.1
88	30-60						4		7.83	1.63	22.4	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

No sign of water table or capillary fringe to 60 inches
 Good Profile for irrigation
 20-50" coarser with depth

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H
31.2	24.1	27.7	26.6
31.4	27.5	28.3	28.8
27.2	34.4	45.5	38.1
33.4	27.6	44.7	38.5
34.2	30.9	39.4	33.3
24.5	22.2	34.6	25.6

EM _v	EM _H	EM _v	EM _H
31.8	31.9		
33.7	26.8		
32	26.8 *		
36	29.9		
28.8	22		

Site 15

San Joaquin River Seepage Management Program

Well or Boring# 15-10 Sampler: Brunner Date: 3/9/10
 Location(UTM/NAD83) 10S 073500 4074018 Landform Floodplain NRCS Map Unit merced clay
 Location Notes About 200 ft North of DWR Stake A-25
 Topography Nearly Level Vegetation & Conditon Alfalfa; poor and grassy
 Irrigation System Type: Gravity Check Irrigation Quadrant 3/5
 Avg EM Measurements; (T, Cor) EM_v 54.1(72.8) EM_H 51.2(61.1) EM Calibration Site: EM_v 68 EM_H 62
 Soil Temperature, °C (2") 17 °C (16") 12 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-4	C	42	20	V.DkGry	NE	VM	None				Granular
	4-28	C	45	20	V.DkGry	NE	VM	None				SM Blocky to 16"
	28-52	HCL	38	25	Grey	NE	M	Few				Faint Orange & Brown Mottling
	52-60	SCL	23	50	Olive Brn	NE	M	Com				Rust colors
90	0-12	30x					26.8		7.3	0.81	56.3	
91	0-12						26.9		7.42	0.74	55.9	
92	12-30						30.6		7.49	1.17	68.2	
93	30-60						18.6		7.54	1.18	45.4	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

No sign of water table or capillary fringe to 60 inches
 300-400 ft from pool
 Ground surface appears to be lower than pool

EM38 Measurements:

	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
	66	61	65	62	52	50	68	62 *
	51	49	60	60	47	40	54	50
	42	41	67	64	61	59	59	55
	37	35	63	56	58	60	60	55
	26	26	37	34	54	57	68	63
	56	52	38	35	56	52		

Site 16

San Joaquin River Seepage Management Program

Well or Boring# 16-10 Sampler: Brummer/ Dominguez Date: 3/9/10
 Location(UTM/NAD83) 10S 0728982 4081271 Landform Floodplain NRCS Map Unit CMA columbia fst
 Location Notes About 300 ft South and 300 ft East of Well R3-6(?)
 Topography Nearly Level Vegetation & Conditon Fallow, Irrigated Land
 Irrigation System Type: Gravity Check Irrigation Quadrant 3/5
 Avg EM Measurements; (T, Cor) EM_v 24.2(33.4) EM_H 23.0(28.1) EM Calibration Site: EM_v 20.1 EM_H 19.8
 Soil Temperature, °C (2") 16 °C (16") 11 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-6	L	16	45	Dk.BrnGry	NE	VM	None				Granular
	6-14	L	18	40	Dk.BrnGry	NE	VM	None				WM Blocky
	14-25	Lt.L	10	50	Brn	NE	M	None				V.Friable
	25-54	CsSd	0	99	White	NE	SM	None				Loose; SG
	54-57	LFS	4	85	Grey	NE	SM	Com				Faint Iron Mottles
	57-60	S	2	96	Lt.Gry	NE	ND	None				Few Faint Iron Stains
94	0-12	30x					19.3		7.25	2.69	36.9	
95	0-12						21.3		7.28	0.98	39	
96	12-30						12.4		6.73	3.87	38.5	
97	30-60						2.7		7.30	0.57	30.8	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:	EM38 Measurements:				EM _v	EM _H	EM _v	EM _H
No sign of water table or capillary fringe to 60 inches	22.2	22.2	37.2	31.7	21	21	20.2	19.4
Could not pick up sand at 28" w/o using sand auger	20.3	20.2	34.9	31	20.8	24.6		
	21.5	23.6	26.2	22.7	27.5	25.7		
	18.7	16.7	30.2	28.4	21.7	22		
	28.8	27.8	14.6	13.7	20.4	17.9		
	18.4	16.8	34.4	31.7	20.1	19.8 *		

Site 17

San Joaquin River Seepage Management Program

Well or Boring# 17-10 Sampler: Brummer Date: 3/11/10
 Location(UTM/NAD83) 10S 0739808 4073906 Landform Floodplain NRCS Map Unit DN: Dello Sandy Loam
 Location Notes About 310 ft South of Well at San Mateo Crossing
 Topography Nearly Level Vegetation & Conditon Young Palm Trees; Fair; about 10 dead trees close to River
 Irrigation System Type: Drip Irrigation Quadrant _____
 Avg EM Measurements; (T, Cor) EM_v 29.5(35.2) EM_H 35.7(38.9) EM Calibration Site: EM_v 27.4 EM_H 38.4
 Soil Temperature, °C (2") 21 °C (16") 17 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-5	L	16	40	Dk.GryBrn	0	M	None				platy structure
	5-12	L	18	38	Dk.GryBrn	NE	M	None				MM Blocky
	12-22	L	17	44	Dk.GryBrn	NE	M	None				Friable
	22-31	LS	4	85	Gry.Brn	NE	SM	None				Loose; SG
	31-51	S	2	96	Lt.Gry	NE	SM	None				
	51-63	HSIL	26	20	Brn.Gry	NE	VM	Few -Faint Mottles in spots				Thin L layer at 63"
	63-82	FSL	7	65	Reddish Brn	NE	M	Few				
	82-90	FSL	6	65	Reddish Brn	NE	VM	Few				LFS in spots; Micacious
	90-109	FSL	7	68	Reddish Brn	NE	W-Sat	Com				capillary fringe 90-100 inches
98	0-12	24x					17.1		7.97	9.23	39.3	SAR = 10.3
100	0-12	24x Replicate					16		7.95	7.47	37.8	SAR = 11.5
101	0-12						13		7.80	10.9	39	SAR = 13.5
102	12-30						11.5		7.44	5.95	38.8	SAR = 3.9
103	30-60						23.7		7.06	1.66	45.3	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Suction on auger at 104"
 Water table at 100" after 15 minutes
 A few sulfur granuals on ground surface
 Surface appears to be disturbde to about 5 inches
 Compacted, Platy, Asphalt chips near surface?
 Re-measured EM on 4/21/10: 0-6" Wet from Rain,
 21-Apr 6-24" slightly moist, 24-30" Moist
 21-Apr Water table at 42"
 boring caved to 101 inches

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H
30.2	32.1	26.6	25.8
25.6	25.7	25.4	28.5
31.4	39.5	26.5	21.8
29.3	42.9	27.9	35.5
41.7	38.4	22.7	32.4
37	32.1	25.2	28.7

EM _v	EM _H	EM _v	EM _H
40.5	60.7	Re-Measured on 4/21/10	
39.8	51.1	28	69 Tree Dripline
26.6	31.4	37	49 Tree Dripline
27.4	38.4 *	41	56 Tree Dripline
17.6	42.6	31	40 Tree Row
		33	45 Tree Row

Site 18

San Joaquin River Seepage Management Program

Well or Boring# 18-10 Sampler: Brummer/ Dominguez Date: 3/11/10
 Location(UTM/NAD83) 10S 0726118 4085697 Landform Floodplain NRCS Map Unit CoA; Columbia LS
 Location Notes About 300 ft east of R3-1; Boring is in cut area
 Topography Nearly Level Vegetation & Conditon Alfalfa; Fair to Poor stand
 Irrigation System Type: Gravity Irrigation Quadrant 3/5
 Avg EM Measurements: (T, Cor) EM_v 46.0(68.4) EM_H 37.8(48.4) EM Calibration Site: EM_v 39 EM_H 37
 Soil Temperature, °C (2") 14 °C (16") 13 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-5	L	18	40	Dk.Gry	NE	M	None				Friable; Granular
	5-14	L	21	40	Dk.Gry	NE	M	None				Firm; MM Blocky
	14-20	L	18	40	Brn.Gry	NE	M	Few				Friable; Very Faint Mottles
	20-27	FSL	15	58	Gry.Brn	NE	SM	Few				Friable
	27-60	S	1	98	Lt.Gry	NE	SM	Few				Loose; Single Grained
												Very Faint Iron Stains below 30"
105	0-12	30x					16.1		7.61	1.02	39.9	
106	0-12						18.6		7.74	1.26	42	
107	12-30						12.4		7.86	5.11	44	SAR = 18.6
108	30-60						2.4		8.09	0.36	33.1	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:	EM38 Measurements:	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
No sign of water table or capillary fringe to 60 inches		42	38	44	39	39	37 *
		49	40	46	32	42	39
		51	42	77	60	41	38
		69	58	58	44	34	24
		42	34	37	26		
		33	29	32	24		

Site 19

San Joaquin River Seepage Management Program

Well or Boring# 19-10 Sampler: Brunner Date: 3/11/10
 Location(UTM/NAD83) 10S 0725981 4085529 Landform Floodplain NRCS Map Unit CMA; Columbia FSL
 Location Notes About 250 Ft South and 280 ft east of well R3-2
 Topography Nearly Level Vegetation & Conditon Alfalfa; Fair
 Irrigation System Type: Gravity Check Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_v 27.6(35.4) EM_H 27.3(30.4) EM Calibration Site: EM_v 29 EM_H 28
 Soil Temperature, °C (2") 20 °C (16") 14 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-7	L	19	35	Dk.Gry	NE	VM	None				Friable; Granular
	7-18	L	21	30	Dk.Gry	NE	VM	None				WF Blocky
	18-29	Lt.L	12	50	Gry.Brn	NE	M	Few				Very Faint Iron Stains
	29-57	VFSL	8	62	Yel.Brn	NE	SM	Few				very faint mottles; feels like loess
	57-60	LVFS	5	80	Lt.Gry	NE	SM	Few				faint mottles; feels like loess
110	0-12	30x					22.6		7.59	1.54	43.7	
111	0-12				10YR 3/1		21.7		7.38	1.27	42.3	V.Dk. Gry
112	12-30				10YR 5/3		15.4		7.58	6.26	42.7	SAR = 11.1; Brown
113	30-60				10YR 5/4		5.2		7.79	2.37	37.8	Yellow-Brn

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

No sign of water table or capillary fringe to 60 inches
 Excellent Orchard Profile
 29-60" very soft and friable

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
26	26	18	17	23	24
30	28	20	20	31	30
22	25	19	23	29	28 *
34	39	31	30	42	41
37	31	40	38	28	28
19	20	24	22	23	20

Site 20

San Joaquin River Seepage Management Program

Well or Boring# 20-10 Sampler: Brummer/Dominguez Date: 3/11/10
 Location(UTM/NAD83) 10S 0726116 4085357 Landform Floodplain NRCS Map Unit CMA; Columbia FSL
 Location Notes About 250 ft North of Well R3-3
 Topography Nearly Level Vegetation & Conditon Fair Alfalfa
 Irrigation System Type: Gravity Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_V 44.5(59.9) EM_H 41.6(49.6) EM Calibration Site: EM_V 45 EM_H 45
 Soil Temperature, °C (2") 17 °C (16") 12 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-6	SiL	21	28	Dk.Gry	NE	VM	None				Friable; Granular
	6-18	SiL	24	25	Dk.Gry	NE	VM	None				MM Blocky
	18-45	SiCL	30	20	Gry.Brn	NE	M	Few				Faint Orange Mottles
	45-55	L	19	35	Brn	NE	M	Few				Friable; Faint mottles
	55-60	Lt.FSL	6	62	Brn	NE	M	Few				V.Friable; Faint mottles; micacious
114	0-12	30x			10YR 4/1		21.7		7.66	1.62	42.7	Dk.Gry
115	0-12				10YR 4/1		21.1		7.41	1.84	46.4	Dk.Gry
116	12-30				10YR 3/2		17.6		7.64	3.15	52.4	Dk.Gry Brn
117	30-60				10YR 5/3		10.4		7.43	6.38	45.7	SAR=14.3

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Coarse Roots to 20" depth
 Few roots to 60" plus depth
 No sign of capillary fringe or water table at 60" depth
 Excellent field crop profile

EM38 Measurements:

	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H
	46	42	68	59	25	26		
	52	45	47	45	40	42		
	41	39	31	31	45	42		
	59	58	40	39	34	32		
	48	36	34	34	45	45 *		
	70	57	31	35				

Site 21

San Joaquin River Seepage Management Program

Well or Boring# 21-10 Sampler: Brummer Date: 3/11/10
 Location(UTM/NAD83) 10S 0726869 4083892 Landform Floodplain NRCS Map Unit CrB; Columbia Soils
 Location Notes About 300 ft east of well R3-4 Channel
 Topography Nearly Level Vegetation & Conditon Fallow irrigated cropland
 Irrigation System Type: Gravity Irrigation Quadrant 2/5
 Avg EM Measurements; (T, Cor) EM_V 26.8(32.7) EM_H 17.2(19.6) EM Calibration Site: EM_V 20.4 EM_H 15
 Soil Temperature, °C (2") 19 °C (16") 16 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-6	FSL	10	55	Dk.GryBrn	NE	M	None				Friable
	6-17	L	17	40	Dk.GryBrn	NE	VM	None				WM Blocky
	17-29	Lt.L	13	50	Gry.Brn	NE	M	Few				Very Faint Rust Mottles
	29-46	FSL	12	55	Brn	NE	M	Few				V.Friable; Faint mottles
	46-51	S	2	96	Lt.Gry	NE	SM	Few				Loose; S.G; Faint mottles
	51-60	LFS	5	80	Grey	NE	M	Many				V.Friable; Prominent mottling
118	0-12	30x					19.6		7.37	2.09	37.2	Micacious throughout Dk.GryBrn
120	0-12				10YR 4/2		19.7		7.51	1.38	36.5	
121	12-30				10YR 5/3		13.1		7.48	0.93	40	Dk.Gry Brn
122	30-60				10YR 4/3		10.6		7.46	2.38	39.5	Brown

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Good Profile
 No sign of watertable or capillary fringe

EM38 Measurements:

EM _V		EM _H		EM _V		EM _H	
16.6	10.9	23.4	14.8	17.7	9.1		
20.9	10	45	29.4	20.7	11		
17.8	8.8	45.8	31.9	16.7	18.2		
38.2	26.4	46.5	32.1	20.4	15.0 *		
23.8	15.9	34.1	21.8	21.4	13.6		
24.8	12.3	21.7	10	26.9	18.7		

Site 22

San Joaquin River Seepage Management Program

Well or Boring# 22-10 Sampler: Brummer Date: 3/16/10
 Location(UTM/NAD83) 11s 233102 4080341 Landform Low Terrace NRCS Map Unit Tujunga LS
 Location Notes About 180 ft East of Obs Well 2
 Topography Nearly Level Vegetation & Conditon Good Pomegranites
 Irrigation System Type: Drip Irrigation Quadrant _____
 Avg EM Measurements; (T, Cor) EM_V 15.3(17.4) EM_H 7.2(7.1) EM Calibration Site: EM_V 14.9 EM_H 8.3
 Soil Temperature, °C (2") 26 °C (16") 19 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-5	Lt.SL	6	75	Brn	NE	M	None				V.Friable
	5-28	Gr.LS	4	80	Brn	NE	M	None				WF Blocks
	28-56	Co.S	1	99	Lt.Gry	NE	M	Few				Few Iron Stains below 48"
124	0-12	12x					7		5.58	0.21	27.3	
125	0-12						7		5.62	0.12	27.7	
126	12-30						7.8		5.93	0.31	25.1	
127	30-56						4.4		6.47	0.27	27.8	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

No sign of capillary fringe
 No Calsite
 Stopped by gravels at 56"
 EM & 12x composite collected from both sides of boring
 Wire trellis may have impact on EM readings??
 Site is 200 ft in on rows 26-27

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H
15.1	8.5	16.3	7.3
16.1	7.1	15.4	7.2
15.3	6.5	15.2	6.8
14.7	6.2	13.2	7.1
15.2	6.5	17	7.7
15.5	6.5	14.9	8.3 *

EM _V	EM _H	EM _V	EM _H

Site 23

San Joaquin River Seepage Management Program

Well or Boring# 23-10 Sampler: Brummer/Burnett Date: 3/16/10
 Location(UTM/NAD83) 10S 0740770 4072914 Landform River Oxbow NRCS Map Unit GaA; Grangeville FSL
 Location Notes About 350 ft NW of Pump
 Topography Nearly Level Vegetation & Condition Grasses; Sheep Pasture; grasses & fiddleneck
 Irrigation System Type: None Irrigation Quadrant _____
 Avg EM Measurements; (T, Cor) EM_V 5.0 (6.3) EM_H 4.4 (5.0) EM Calibration Site: EM_V 4.6 EM_H 3.2
 Soil Temperature, °C (2") 19 °C (16") 15 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-6	SL	6	70	Gry Brn	NE	M	None				V.Friable; Granular
	6-14	Lt.SL	6	75	Gry Brn	NE	M	None				Friable; WkCo Blocky
	14-20	SL	8	65	Gry Brn	NE	M	None				
	20-26	LS	5	80	Lt.Brn	NE	SM	None				
	26-60	S	0	99	Lt.Gry	NE	D	None				Loose; Dry
128	0-12	30x					13.7		6.41	0.69	29.6	
130	0-12						16.6		6.31	0.45	31	
131	12-30						7.9		6.83	0.54	22.5	
132	30-60						1.1		7.41	0.11	31.1	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

EM readings are very unstable
 26-60" about 10% fine gravel
 26-60" Loose; Hard to pick up w/sand augers
 Two GPS instruments plot site 7 meters apart?

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H	EM _V	EM _H
3.8	3.7	5.2	5	4.6	3.2 *
5	3.9	5.4	4.8	3.7	2.8
7.9	6	3.3	3.8	3.7	4.2
4.7	4.5	4.6	4.4		
6.8	6.3	4.8	3.5		
5.7	5.7	6.4	3.4		

Site 24

San Joaquin River Seepage Management Program

Well or Boring# 24-10 Sampler: Brummer/Burnett Date: 3/16/10
 Location(UTM/NAD83) 10S 071754 4072461 Landform Oxbow Terrace NRCS Map Unit GaA; Grangeville FSL
 Location Notes About 400 ft NW of Well
 Topography Nearly Level Vegetation & Condition Grasses; Sheep Pasture; grasses & fiddleneck
 Irrigation System Type: Idle Land Irrigation Quadrant None
 Avg EM Measurements; (T, Cor) EM_V 8.6 (11.9) EM_H 8.1 (8.8) EM Calibration Site: EM_V 7.6 EM_H 6.7
 Soil Temperature, °C (2") 21 °C (16") 11 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-7	L	18	35	Dk.Gry Brn	0	M	None				V.Friable; Granular
	7-16	SiL	20	30	Dk.Gry Brn	0	M	None				Friable; WkF Blocky
	16-30	SiCL	36	25	Dk.Gry	0	SM	None				drab color; strong blocky
	30-45	SiCL	33	25	Brn.Gry	0	SM	Few				Few Iron Stains
	45-60	S	2	96	V.Pale Brn	0	D	Com				Iron Stains; More Gry w/depth
133	0-12	30x					26.6		6.77	1.47	57	
134	0-12						25.5		6.91	0.88	58.9	
135	12-30						20.8		6.67	1.76	61.8	
136	30-60						5.6		6.39	0.65	33.4	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

16-30" Firm, Strong Structure
 Good Profile; No sign of water table or capillary fringe
 Substrata may be too dry for good EM readings
 Area has shallow surface sloughs

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H
9.7	9.2	8.7	7.8
10.1	8.8	6.6	5.7
8.3	6.9	6.5	5.9
9.9	8.8	6	5.5
10.7	10.5	9.6	12.1
8	7.5	11.7	11.4

EM _V	EM _H	EM _V	EM _H
8.7	9.1		
7.6	6.7 *		
9.4	7.6		
6.8	6		

Site 25

San Joaquin River Seepage Management Program

Well or Boring# 25-10 Sampler: Brummer/Burnett Date: 3/17/10
 Location(UTM/NAD83) 10S 0721838 4097988 Landform Oxbow Terrace NRCS Map Unit CMdA; Columbia FSL over
 Location Notes About 370 ft East of Well R4A-7 deep hardpan
 Topography Nearly Level Vegetation & Conditon Fallow; Irrigated
 Irrigation System Type: Gravity Furrows Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_V 52.8(67.6) EM_H 36.2(41.2) EM Calibration Site: EM_V 47 EM_H 30
 Soil Temperature, °C (2") 19 °C (16") 14 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-8	L	21	35	V.Dk.Gry	+	VM	None				V.Friable; Granular
	8-17	L	23	30	Dk.Gry	++	VM	None				Friable; WkM Blocky
	17-27	L	20	35	Gry.Brn	+++	M	None				Mixed Coloring
	27-60	HSL	16	55	Yel.Brn	+++	M	None				Contains sand size HP Fragments
137	0-12	30x					26.5		7.51	1.18	55.8	
138	0-12	30x - Replicate					26.3		7.49	1.67	56.7	
139	0-12						26.2		7.52	0.8	53.1	
140	0-12	Paired Calsite					26.8		7.7	0.74	48.9	
141	12-30						27		7.72	0.9	49	
142	12-30	Paired Calsite					27		7.71	0.99	46.1	
143	30-60						19		7.86	1.17	27.4	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

EM Readings are at Calsite
 Site has been pre-irrigated
 1/2 of composite sampled in furrows and 1/2 in beds
 No sign of water table or capillary fringe
 Stopped by hardpan in Cal boring 12 ft to the west
 No mottling in this profile

EM38 Measurements:

EM _V		EM _H		EM _V		EM _H	
44	30	42	30	61	46		
46	30	45	26	60	41		
48	36	45	28	47	30 * Calsite		
56	42	43	30	66	42		
65	44	48	34	65	43		
53	36	54	36	62	47		

Site 26

San Joaquin River Seepage Management Program

Well or Boring# 26-10 Sampler: Brummer/Burnett Date: 3/17/10
 Location(UTM/NAD83) 10S 0722797 4095765 Landform Low Terrace NRCS Map Unit CmtA; Columbia FSL
 Location Notes About 300 ft N. of Well R3-8 over Temple
 Topography Nearly Level Vegetation & Condition Fallow; Irrigated
 Irrigation System Type: Gravity Furrows Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_V 39.8(47.5) EM_H 27.3(27.3) EM Calibration Site: EM_V 59 EM_H 33
 Soil Temperature, °C (2") 25 °C (16") 17 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-8	FSL	14	60	Dk.Gry	0	VM	None				V.Friable; Granular
	8-14	L	17	45	Dk.Gry	0	VM	None				WF Blocky
	14-18	Lt.SiCL	28	22	Grey	0	VM	None				Firm; Drab Grey Coloring
	18-34	Lt.L	14	50	Gr.Brn	0	VM	Few				V.Friable
	34-46	Lt.SiCL	--	--	Dk.Gry	0	M	Com				Drab
	46-61	S	1	98	Lt.Gry	0	M	Few				Loose; S.G.
	61-62	SiCL	35	15	Gry	0	M	Com				Firm
144	0-12	30x					14.5		8.05	1.15	30.6	
145	0-12						17.3		7.48	0.48	30.8	
146	12-30						13.3		7.83	1.19	46.8	
147	30-60						16.1		7.60	1.7	31.9	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Field has been Pre-Irrigated for Tomatoes
 50% of EM readings and 50% of samples collected in beds
 Joe & Roger EM Survey Replicate Site
 RPD; 1% Emh (27.5/27.2) 2.3%Emv (39.3/40.7)

EM38 Measurements:	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H
Joe -->	35	27	18	16	59	35		
	34	20	49	30	59	33 *		
	26	20	43	35	36	32		
	34	20	60	40				
	17	13	53	43				
	27	14	40	32				
EM38 Measurements:	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H
Roger -->	34	26	44	37	16	13		
	44	24	52	28	33	18		
	39	33	42	35	34	29		
	59	29	39	23				
	51	39	20	18				
	72	41	24	15				

Site 27

San Joaquin River Seepage Management Program

Well or Boring# 27-10 Sampler: Brunner Date: 3/17/10
 Location(UTM/NAD83) 10S 0723109 4095236 Landform Low Terrace NRCS Map Unit CmtA; Columbia FSL
 Location Notes About 250 ft from edge of San Joaquin River over Temple
 Topography Nearly Level Vegetation & Condition Fallow; Irrigated; Bare Soil
 Irrigation System Type: Gravity Furrows Irrigation Quadrant 3/5
 Avg EM Measurements; (T, Cor) EM_V 63.2(77.1) EM_H 46.0(51.2) EM Calibration Site: EM_V 75 EM_H 47
 Soil Temperature, °C (2") 20 °C (16") 16 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-4	L	19	35	Dk.Gry.Brn	0	VM	None				V.Friable; Granular
	4-14	SiL	20	25	Dk.Gry.Brn	0	VM	None				Mod.Med Blocky
	14-31	Lt.L	14	50	Brn.Gry	0	VM	Few				V.Friable; Faint Mottling
	31-52	CL	30	25	V.Dk.Gry	0	M	None				Firm
	52-60	L	23	35	Dk.Gry	0	M	None				Firm
148	0-12	30x					21.4		7.36	0.93	45.4	
151	0-12	30x Replicate					20.5		7.29	0.95	41.5	
152	0-12						20.4		7.2	0.77	44.9	
153	12-30						18.8		7.40	1.54	39.1	
154	30-60						27.5		7.14	2.16	62.2	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Pre-Irrigated for Tomatoes
 Micacious Profile
 31-52" may be buried soil zone
 Sampled 50% beds/furrows
 Joe & Roger EM Survey Replicate Site
 RPD; Emh (46.5/45.2) Emv (62.6/63.7)
 rpd emh 2.8 emv 1.7

EM38 Measurements:	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H
Joe -->	75	47 *	88	61	67	45		
	58	48	64	54	50	44		
	65	44	52	34	63	44		
	48	41	56	43				
	61	42	70	47				
	67	57	55	46				
Roger -->	55	43	68	57	54	38		
	64	38	70	50	73	46		
	52	41	49	36	58	49		
	59	39	71	44				
	62	48	62	46				
	84	54	74	49				

Site 28

San Joaquin River Seepage Management Program

Well or Boring# 28-10 Sampler: Brummer/Burnett/Dominguez Date: 3/17/10
 Location(UTM/NAD83) 10S 0721708 4098727 Landform Low Terrace NRCS Map Unit CmA; Columbia FSL
 Location Notes About 300 ft from field edge over Temple
 Topography Nearly Level Vegetation & Condition Fallow; Irrigated; Bare Soil
 Irrigation System Type: Gravity Furrows Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_V 47.0(56.7) EM_H 36.4(37.2) EM Calibration Site: EM_V 57 EM_H 34
 Soil Temperature, °C (2") 24 °C (16") 17 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-6	L	17	35	Dk.Gry	NE	VM	None				V.Friable
	6-19	SiL	22	26	Dk.Gry	NE	VM	None				Friable; MM Blocky
	19-28	SiL	19	22	Gry.Brn	NE	VM	Com				Distinct Mottlings
	28-40	L	17	35	Dk.Gry	NE	M	None				Friable
	40-60	SCL	23	50	Dk.Gry	NE	M	None				Firm
155	0-12	30x					23.9		7.28	1.13	49.8	
156	0-12						25.8		7.25	0.78	51.8	
157	12-30						29.5		7.48	0.96	58.3	RPD Paired; 9.8%
158	12-30	Paired Sample					28.5		7.36	0.87	56.6	
159	30-60						16.5		7.24	0.84	39.7	
160	30-60	Paired Sample					15.7		7.37	1.07	38.4	RPD Paired; 23.9%

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Pre-Irrigated for Tomatoes
 No sign of water table or capillary fringe
 Paired samples 15 ft apart and 2 rows over
 30-60 paired samples are different colors? 15 ft apart?
 Joe & Roger EM Survey Replicate Site
 RPD; Emv (44.8/49.2) Emh (35.4/37.3)

EM38 Measurements:	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H
Joe -->	43	39	33	32	36	36		
	61	40	42	31	56	31		
	47	44	30	35	45	43		
	55	38	48	30	57	34 *		
	40	36	30	29				
	47	34	47	34				
EM38 Measurements:	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H
Roger -->	65	38	45	31	56	34		
	51	48	35	36	44	39		
	67	39	48	31	67	38		
	41	42	36	31	49	47		
	51	32	56	34				
	35	37	41	40				

Site 29

San Joaquin River Seepage Management Program

Well or Boring# 29-10 Sampler: Brummer Date: 3/18/10
 Location(UTM/NAD83) 10S 0725576 4091086 Landform Low Terrace NRCS Map Unit GaA; Grangeville FSL
 Location Notes About 300 ft into orchard row 15
 Topography Nearly Level Vegetation & Condition Young Pistaccio Orchard
 Irrigation System Type: Drip Irrigation Quadrant _____
 Avg EM Measurements; (T, Cor) EM_V 37.7(48.3) EM_H 33.7(39.3) EM Calibration Site: EM_V 39 EM_H 31
 Soil Temperature, °C (2") 18 °C (16") 14 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-5	L	19	40	Dk.BrnGry	NE	M	None				V.Friable; Granular
	5-12	L	21	35	Dk.GryBrn	NE	M	None				Friable; WkM Blocky
	12-34	Lt.L	15	50	Gry.Brn	NE	VM	None				V.Friable
	34-48	FSL	8	70	Lt.Brn	NE	VM	None				V.Friable
	48-60	LS	5	80	Lt.Brn	NE	VM	None				Contains thin LFS layers
162	0-12	30x					15.3		6.61	2.25	44.2	
163	0-12						15.4		6.42	0.56	39.1	
164	12-30						19.1		7.56	0.61	40.5	
165	30-60						12.3		7.83	0.62	23.5	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:	EM38 Measurements:		EM _V EM _H		EM _V EM _H		EM _V EM _H	
	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H
Site is inter-row grass area	37	38	44	32	26	25		
Excellent Profile - No sign of water table	43	38	38	26	32	32		
About 600 ft from San Joaquin River	41	30	29	31	39	31 *		
	39	40	36	40				
	40	35	41	43				
	38	27	42	37				

Site 30

San Joaquin River Seepage Management Program

Well or Boring# 30-10 Sampler: Brummer/Dominguez/Burnett Date: 3/18/10
 Location(UTM/NAD83) 10S 0723784 4093984 Landform Low Terrace NRCS Map Unit CmtA; Columbia FSL
 Location Notes About 250 ft from end of Row 100 Over Temple
 Topography Nearly Level Vegetation & Conditon Young Pistaccio
 Irrigation System Type: Drip Irrigation Quadrant NA
 Avg EM Measurements; (T, Cor) EM_v 37.2(44.4) EM_H 34.7(36.2) EM Calibration Site: EM_v 46 EM_H 40
 Soil Temperature, °C (2") 23 °C (16") 17 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-4	L	19	35	Dk.Gry	NE	M	None				V.Friable; Granular
	4-20	L	21	35	Gry Brn	NE	M	None				Friable; MM Blocky
	20-40	SiL	18	25	Brn	NE	M	None				V.Friable
	40-52	LFS	5	80	Lt.Brn	NE	M	None				V.Friable
	52-60	FS	2	96	Lt.BrnGry	NE	M	None				S.G; Loose
166	0-12	20x					14.9		6.88	1.87	41.5	
167	0-12	20x Replicate					14.6		6.78	1.89	39.7	
168	0-12						17.5		7.19	0.8	42	
169	12-30						23.5		7.57	2.02	49.4	
170	30-60						13.5		7.76	1.53	32.7	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Excellent Orchard Profile
 No Water table
 EM Replicate Survey:
 Joe: Ave--> 38.2 35.9
 Roger: Ave--> 36.2 33.5
 RPD % --> 5.4% 6.9%

EM38 Measurements:

	EM _v	EM _H	EM _v	EM _H
Joe B -->	46	40 *	45	44
	47	46	43	39
	28	26	42	40
	25	26	37	37
	38	35	40	32
	31	36	33	32
	34	31	43	42
	42	43		

	EM _v	EM _H	EM _v	EM _H
RB-->	31	32	29	25
	54	43	33	28
	42	39	31	38
	38	36	32	29
	41	37	23	28
	40	35	45	37
	40	35	30	25
	34	35		

Site 31

San Joaquin River Seepage Management Program

Well or Boring# 31-10 Sampler: Brummer/Burnett Date: 3/18/10
 Location(UTM/NAD83) 10S 0723402 4095264 Landform Low Terrace NRCS Map Unit CmA; Columbia FSL
 Location Notes Abut 250 ft down row 14L; North side
 Topography Nearly Level Vegetation & Conditon Young Pistaccio; Fair
 Irrigation System Type: Drip Irrigation Quadrant NA
 Avg EM Measurements; (T, Cor) EM_v 28.1(33.2) EM_H 29.8(33.5) EM Calibration Site: EM_v 34 EM_H 27
 Soil Temperature, °C (20 °C) (16" 17 °C)

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-7	SiL	19	30	Brn.Gry	NE	M	None				V.Friable; Granular
	7-21	L	22	30	Gry Brn	NE	M	None				Friable; MM Blocky
	21-30	LS	5	80	Lt. Brn	NE	SM	None				Loose, Single Grained
	30-60	S	1	98	Lt. Gry	NE	SM	None				Loose, Single Grained
172	0-12	30x					18.7		7.04	2.9	44.6	
173	0-12						14		7.08	0.84	39.9	
174	12-30						10.2		7.44	3.39	29.7	
175	30-60						2.2		7.97	0.29	32.2	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

site is about 5 feet higher than river

No Water table

EM Replicate Survey:

Joe: Ave--> EM_v 28.3 EM_H 30.3
 Roger: Ave--> 27.8 29.3
 RPD % --> 1.8% 3.4%

EM38 Measurements:

Joe B -->	EM _v	EM _H	EM _v	EM _H	RB-->	EM _v	EM _H	EM _v	EM _H
	34	27 *	26	35		33	30	24	25
	32	29	30	29		30	32	24	29
	24	33	27	38		27	28	30	37
	15	15	31	29		19	20	23	30
	18	19	28	36		18	19	42	32
	42	37	33	33		17	20	33	38
	28	25	34	33		22	26	46	38
	23	36				29	36		

Site 32

San Joaquin River Seepage Management Program

Well or Boring# 32-10 Sampler: Brummer/Burnett Date: 3/18/10
 Location(UTM/NAD83) 10S 0724460 4093302 Landform Low Terrace NRCS Map Unit GaA; Grangeville FSL
 Location Notes About 260 ft from edge of orchard
 Topography Nearly Level Vegetation & Conditon Mature Almonds; Good
 Irrigation System Type: Drip Irrigation Quadrant NA
 Avg EM Measurements; (T, Cor) EM_v 77.3(99.2) EM_H 66.0(70.3) EM Calibration Site: EM_v 93 EM_H 76
 Soil Temperature, °C (2") 22 °C (16") 14 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-5	SiL	19	25	V.Dk. Gry	NE	M	None				Friable; Granular
	5-12	SiL	23	25	Brn Gry	NE	M	None				Friable; MM Blocky
	12-34	SiL	20	25	Brn Gry	NE	M	None				Friable
	34-60	SiCL	30	20	Gry	NE	SM	None				Firm
176	0-12	30x					21.7		7.51	1.7	44.7	
177	0-12						22.8		7.44	1.4	47	
178	12-30						30.5		7.41	2.8	54.2	
179	30-60						20.2		7.56	3.42	65.7	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:	EM38 Measurements:	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H	
About 300 ft east of Columbia Canal	Joe B -->	93	76 *	87	68	RB-->	92	66	90	68
17 tree in on Row 60-59		98	75	74	61		78	65	75	67
No Sign of Water table or Capillary Fringe		79	68	86	76		73	65	69	62
EM Replicate Survey:		61	52	76	67		81	70	48	50
Joe: Ave-->		79.6	68	55	55		76	65	76	54
Roger: Ave-->		74.9	63.9	79	65		61	56	79	62
RPD % -->		6.1%	6.2%	89	77		85	68	69	75
				83	60		72	66		

Site 33

San Joaquin River Seepage Management Program

Well or Boring# 33-10 Sampler: Brummer/Burnett/Dominguez Date: 3/18/10
 Location(UTM/NAD83) 10S 0725061 4092447 Landform Low Terrace NRCS Map Unit GaA; Grangeville FSL
 Location Notes About 250 ft west of edge of orchard
 Topography Nearly Level Vegetation & Conditon Young Non-Bearing Almonds
 Irrigation System Type: Drip Irrigation Quadrant NA
 Avg EM Measurements; (T, Cor) EM_v 45.4(57.6) EM_H 39.7(39.7) EM Calibration Site: EM_v 51 EM_H 49
 Soil Temperature, °C (2") 25 °C (16") 18 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-4	CL	30	25 (vf)	Dk Gry	+	M	None				Compacted
	4-28	SiCL	30	15 (vf)	Dk Gry	0	M	None				Wk. Fine SBK
	28-40	Lt.SiC	40	10 (vf)	Dk Gry	0	M	None				More resistance on auger at 28"
	40-56	SiC	45	10	Ol. Brn	0	M	None				Hard to Auger
	56-60	C	50	5	Ol. Brn	+	M	None				Compacted; Seg. Carbonates
182	0-12	20x					26.3		7.75	1.29	58.8	Dominguez RPD 23.4
183	0-12	20x - Replicate					25.6		7.78	1.02	56.2	Brummer Ave 1.16
184	0-12						22.3		7.76	1.35	57.7	
185	12-30						18.5		7.54	3.71	67	
186	30-60						17.2		7.41	4.67	70.7	SAR=7.1

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:	EM38 Measurements:				EM _v	EM _H	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
About 1200 ft from San Joaquin R.	Joe B -->	51	49 *	40	36	RB-->	35	32	61	55		
Sulfur pellets visible on the ground surface		45	38	37	37		42	40	69	56		
No Sign of Water table or Capillary Fringe		51	46	42	35		37	26	63	52		
EM Replicate Survey:	EM _v	EM _H					42	33	40	36		
Joe: Ave-->	45.2	39.7					44	39	34	30		
Roger: Ave-->	45.6	39.6					47	48	34	29		
RPD % -->	0.8%	0.3%					46	41	42	37		
Basin Soil			47	46			48	40				

Site 34

San Joaquin River Seepage Management Program

Well or Boring# 34-10 Sampler: Brummer/Dominguez Date: 3/23/10
 Location(UTM/NAD83) 10S 0724126 4089859 Landform Basin, mixed NRCS Map Unit 130; Gepford Clay
 Location Notes About 500 ft east and 200 ft north of well MW76; About 120 ft in from head of field
 Topography Nearly Level Vegetation & Conditon Tomato Beds; Pre-irrigated
 Irrigation System Type: Gravity-Furrow Irrigation Quadrant 2/5
 Avg EM Measurements: (T, Cor) EM_v 96.5(117.8) EM_H 76.0(90.7) EM Calibration Site: EM_v 118 EM_H 78
 Soil Temperature, °C (2") 17 °C (16") 16 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:	
SJRBS	0-12	C	42	25	Dk Gry	0	VM	None				Firm	
	12-45	C	40	25	Dk.GryBrn	+	VM	None				Firm	
	45-60	CL	32	25	Yel.Brn	+	M	None				Firm to Friable	
	(45-60 inch; texture lighter with depth)												
187	0-12	20x - 50/50 beds and furrows sampled						20		7.4	1.32	67	
188	0-12	Boring is in bottom of furrow						25.7		7.31	0.73	62.9	
189	12-30						26.3		7.54	1.26	70.1		
190	30-60						18.3		7.67	1.8	66.9		

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

EM Survey 50/50 beds and furrows
 No sign of water table or capillary fringe
 Self granulating surface soil

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H
83	78	106	68
116	78	74	72
91	84	107	73
116	82	79	72
76	67	107	76
108	73	78	76

EM _v	EM _H	EM _v	EM _H
117	81		
82	77		
112	79		
116	74		
82	73		
118	78 *		
83	78		
79	80		

Site 35

San Joaquin River Seepage Management Program

Well or Boring# 35-10 Sampler: Brummer/Dominguez Date: 3/23/10
 Location(UTM/NAD83) 10S 0725652 4090182 Landform Floodplain NRCS Map Unit 320:El Nido SL-Drained
 Location Notes About 310 feet in on first row North of well MW10-74
 Topography Nearly Level Vegetation & Conditon Young Almonds
 Irrigation System Type: Gravity-?? Irrigation Quadrant 3/5 ?
 Avg EM Measurements; (T, Cor) EM_v 36.1(43.1) EM_H 28.1(33.5) EM Calibration Site: EM_v 38 EM_H 29
 Soil Temperature, °C (2") 17 °C (16") 17 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-7	L	15	42	Dk Gry	NE	M	None				Friable; Granular
	7-14	L	20	40	Dk.Gry.Brn	NE	M	None				Friable; M,St, ABK
	14-27	L	16	45	Brn.Gry	NE	M	None				V. Friable
	27-44	VFSL	12	55	Gry Brn	NE	M	None				V. Friable
	44-60	CL	35	25	Dk.Gry.Brn	NE	M	Few - Distinct Fe Mottles at 50"				Firm
192	0-12	30x					13.3		6.79	1.48	43.1	Split Sample; 15x; RPD 4% Avg1.51
193	0-12	30x Replicate					13.2		6.79	1.54	44	
194	0-12						15.1		6.71	0.7	41.3	
195	12-30						16.9		6.95	2.19	39.3	
196	30-60						21.9		7.43	1.05	56.9	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

sampled in weedy area between tree rows
 No sign of water table or capillary fringe

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
36	28	37	26	39	32
41	34	32	25	46	40
35	26	32	22	38	29 *
31	24	34	23		
31	30	37	28		
		37	26		

Site 36

San Joaquin River Seepage Management Program

Well or Boring# 36-10 Sampler: Brummer/Dominguez Date: 3/23/10
 Location(UTM/NAD83) 10S 0725237 4090139 Landform Low Terrace NRCS Map Unit 320:El Nido SL-Drained
 Location Notes About 35 ft SSW of well
 Topography Nearly Level Vegetation & Conditon Young Almonds
 Irrigation System Type: Drip Irrigation Quadrant _____
 Avg EM Measurements; (T, Cor) EM_v 57.7(68.8) EM_H 49.6(54.0) EM Calibration Site: EM_v 57 EM_H 48
 Soil Temperature, °C (2") 21 °C (16") 17 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-6	L	19	35	Dk.Gry.Brn	0	M	None				V.Friable; Granular
	6-12	L	21	35	Dk.Gry.Brn	0	M	None				Friable; WM Blocky
	12-25	Lt.CL	29	35	Dk.Gry.Brn	0	M	None				Firm
	25-48	Lt.CL	28	45	Brn	0	M	None				Firm
	48-60	CL	32	40	Yel.Brn	++	M	Few -faint yellow-orange				Firm; Seg.Carbonates at 54"
197	0-12	20x					17.7		6.77	1.94	47.4	
198	0-12						16.7		6.44	0.84	44	
199	12-30						18.2		6.65	1.49	47.9	
200	30-60						14.5		7.28	0.79	52.3	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

25-48" contains some SCL zones
 No sign of water table or capillary fringe

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
58	51	62	56	51	42
59	51	61	51	58	47
54	47	59	50	63	50
56	50	59	52	57	48 *
62	61	57	50	55	45
60	50	50	46	58	46

Site 37

San Joaquin River Seepage Management Program

Well or Boring# 37-10 Sampler: Brummer Date: 3-23-10 revised 4-15-2011
 Location(UTM/NAD83) 10S 0714092 4109387 Landform Terrace NRCS Map Unit 228; Palazzo SL
 Location Notes about 300 ft WNW of Well MW91 Partially Drained
 Topography Nearly Level Vegetation & Conditon Tomato Beds
 Irrigation System Type: Drip Irrigation Quadrant Drip 2/5
 Avg EM Measurements: (T, Cor) EM_v 58.0(66.1) EM_H 40.1(40.1) EM Calibration Site: EM_v 72 EM_H 55
 Soil Temperature, °C (2") 25 °C (16") 19 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-6	SL	7	72	Dk.Gry.Brn	NE	M	None				Granular
	6-11	HSL	15	65	Dk.Gry.Brn	NE	M	None				WM Blocky
	11-30	CL	29	30	DK Gry	NE	M	None				Firm
	30-55	L	24	40	Brn Gry	NE	M	None				Friable
	55-60	CL	30	30	Gry	NE	VM	Few - Faint Olive Grey in spots				Firm
4/15/2011	60-72	sicl	29	25	gray	ne	vm-wet					seg carbs
4/15/2011	72-84	loam	24	42	gray	ne	wet					gray green gleyed
203	0-12	15x					9.2		6.67	1.37	30.9	Split sample; RPD 40.1; Ave 1.72
204	0-12	15x Replicate					8.3		6.59	2.07	31.1	
205	0-12						19.4		6.64	1.97	31.4	
206	12-30						29.1		6.61	1.6	58.7	
207	30-60						28.6		7.01	1.69	50.7	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. numeric values indicate percent moisture by weight

Site Remarks:

55-60" may be top of capillary fringe
 No sign of water table
 Sampled in Furrow
 Comp EM 50/50 furrow/beds
 4/15/2011 water table 7 feet 2 inches from top of bed
 cap fringe at 70-84 inches to b
 sand streak just west of boring

EM38 Measurements:

	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
	64	41	58	37	70	50	58	34
	74	55	80	65	61	43	57	36
	51	32	59	41	57	36		
	63	44	43	30	76	56		
	52	33	23	15	63	39		
	55	44	24	16	72	55 *		

Site 38

San Joaquin River Seepage Management Program

Well or Boring# 38-10 Sampler: Brummer/Dominguez Date: 3-23-2010 rev 4-15-2011
 Location(UTM/NAD83) 10S 0714031 4109080 Landform Basin NRCS Map Unit 228; Palazzo SL
 Location Notes About 350 ft South of well MW92B Partially Drained
 Topography Nearly Level Vegetation & Conditon Tomato Beds
 Irrigation System Type: Drip Irrigation Quadrant Drip 3/5
 Avg EM Measurements; (T, Cor) EM_v 70.3(81.9) EM_H 54.8(53.7) EM Calibration Site: EM_v 80 EM_H 59
 Soil Temperature, °C (2") 26 °C (16") 18 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-6	L	20	40	Dk.Gry	0	M	None				Firm; Compacted
	6-15	L	25	33	Dk.Gry	0	VM	None				Firm; WM Blocky
	15-37	CL	28	35	DK.Brn.Gry	0	M	None				Firm
	37-44	SiCL	30	20	Olive Brn	+	M	None				Com.Segregated Carbonates
	44-60	L	25	35	Grey	+++	M	Few - faint; below 44"				Com.Segregated Carbonates
	60-64	L	25	35	Grey	+++	W	Few				May Be Capillary Fringe
4/15/2011	64-78	I	23	30	grey		vm-w	few				seg carbs or gypsum
208	0-12	20x					19.2		7.23	1.79	46.1	
209	0-12						18.2		6.85	1.59	44.6	
210	12-30						20.6		7.08	1.84	53.3	
212	30-60						20.3		7.58	1.96	52.5	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

numeric values indicate percent moisture by weight

Site Remarks:	EM38 Measurements:				EM _v EM _H			
	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
Em & Composite sampe collected 50/50 Furrow/Beds	86	66	68	58	86	65	63	51
No Free Water at 64" - 60-64" may be top of Cap. Fringe	71	52	47	39	64	49	58	46
Boring is in furrow	81	74	66	56	86	71		
Comp EM 50/50 furrow/beds	70	48	54	41	65	50		
4-15-2011 water table is 6 feet 4 inches from top of bed	75	59	72	55	72	58		
after 15 minutes, cap fringe at 46 inches	65	49	67	49	80	59 *		

Site 39

San Joaquin River Seepage Management Program

Well or Boring# 39-10 Sampler: Brummer/Dominguez Date: 3-23-2010 rev4-15-2011
 Location(UTM/NAD83) 10S 0713755 4108999 Landform Basin NRCS Map Unit 228; Palazzo SL
 Location Notes About 250 ft North of Well 93 stake Partially Drained
 Topography Nearly Level Vegetation & Conditon Tomato Beds
 Irrigation System Type: Drip Irrigation Quadrant Drip 2/5
 Avg EM Measurements: (T, Cor) EM_v 59.9(69.8) EM_H 46.7(49.8) EM Calibration Site: EM_v 73 EM_H 55
 Soil Temperature, °C (2") 22 °C (16") 18 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-6	L	21	40	Dk.Gry	0	VM	None				Friable; Granular
	6-14	L	24	40	Dk.Gry	0	VM	None				Firm; MM Blocky
	14-28	Lt.L	16	45	Gry	0	VM	None				Friable
	28-40	Lt.CL	28	30	Dk.Olive Brn	+	M	Few				Firm; Faint mottling
	40-60	Hvy.L	25	40	Lt.Gry	+++	M	None				Firm; Com. Seg. Carbonates
4/15/2011	60-64	loam	26	30	gray		sat	few				faint rust mottles
213	0-12	20x					17		7.69	1.89	42	
214	0-12						19.2		7.64	1.36	46.3	
215	12-30						24.1		7.72	2.33	46	
216	30-60						16.2		8.10	1.93	57.4	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:	EM38 Measurements:		EM _v EM _H		EM _v EM _H		EM _v EM _H	
	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
em and composite sample collected 50/50 bed/furrow	66	63	52	37	73	55 *		
No sign of water table or capillary fringe	55	38	46	29	59	47		
Boring is in furrow	68	56	65	51	61	47		
Comp EM 50/50 furrow/beds	58	42	57	40				
40-60" contains thin LtCL and SCL layers	66	62	67	53				
4-15-2011 water table is 67 inches from top of bed after 10 minutes; cap fringe 60-67 inches	57	39	58	36				

Site 40

San Joaquin River Seepage Management Program

Well or Boring# 40-10 Sampler: Brummer/Dominquez Date: 3/24/2010
 Location(UTM/NAD83) 0712912 4110379 Landform Low Terraces NRCS Map Unit palazzo sl poorly drained
 Location Notes about 250 ft North of well 98? stake
 Topography N. Level Vegetation & Conditon Tomato Beds
 Irrigation System Type: Drip Irrigation Quadrant drip 2/5
 Avg EM Measurements; EM_V 71 EM_H 47 EM Calibration Site: EM_V 79 EM_H 42
 Soil Temperature, °C (2") 14 (16") 14

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-5	L	18	40	Brn-Gry	NR	VM	none				V.Friable
	5-17	L	17	40	Brn-Gry	NR	VM	none				Friable; MM Blocky
	17-40	CL	38	25	Lt.Brn	NR	M	none				Firm
	40-55	Lt.FSL	6	68	Lt.Brn	NR	VM	none				V.Friable; LFS layers
	55-60	SICL	34	20	Drab Gry	NR	VM	few				orange mottles
217	0-12 20x						23.1		6.89	1.88	49.1	
218	0-12						16.8		6.87	0.6	41.8	
219	12-30in						37.1		7.16	1.07	58.3	
220	30-60						26		7.71	2.68	41.1	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks: A numeric value indicates percent moisture by weight

EM38 Measurements:		EM _V	EM _H	EM _V	EM _H
This boring is in the furrow		102	53	78	44
EM and Comp samples 50% furrow/beds		76	53	54	39
Few very faint mottles below 44"		87	56	81	48
water table is deeper than 60 inches		59	43	63	47
about 400 ft from old river channel		64	40	84	49
40-55 inches contrasting textures increase moisture content		47	38	73	53
possible cap fringe at 55 inches					

Site 41

San Joaquin River Seepage Management Program

Well or Boring# 41-10 Sampler: Brummer/Dominguez Date: 3/24/10
 Location(UTM/NAD83) 10S 0711064 4110893 Landform Low Terrace NRCS Map Unit 139; Bolfar CL
 Location Notes about 250 ft from tail end of field Partially Drained
 Topography Nearly Level Vegetation & Condition Tomato Beds; fallow
 Irrigation System Type: Gravity, Drip Irrigation Quadrant 3/5
 Avg EM Measurements; (T, Cor) EM_V 71.1(86.8) EM_H 43.9(49.8) EM Calibration Site: EM_V 86 EM_H 40
 Soil Temperature, °C (2") 20 °C (16") 16 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-6	L	20	35	Dk.BrnGry	NE	VM	None				V.Friable; granular
	6-16	L	23	35	Dk.BrnGry	NE	VM	None				WF Blocky
	16-42	LFS	5	75	Lt.Brn	NE	VM	None				V.Friable
	42-55	L	17	45	Brn	NE	Wet	Few				Capillary Fringe
	55-60	SiCL	30	20	GryBrn	NE	Sat	None				Saturated
223	0-12	22x					19.7		7.53	2.37	47	
224	0-12						12.6		7.57	1.13	47.4	
225	12-30						19.5		7.7	2.53	35.4	
226	30-55						28.2		7.69	2.123	36	
PSA	4"	L	24	37								

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S; a numeric value indicates % moisture by weight

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:	EM38 Measurements:		EM _V EM _H		EM _V EM _H		EM _V EM _H		EM _V EM _H	
	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H
Casual Water in River Channel 350 ft to the north	86	46	49	44	41	40	81	34		
Site is in an oxbow area	64	58	83	46	76	42	95	43		
42-55" Very Faint Mottling	91	49	50	51	47	41	86	40 *		
Water Table was at 55" after 5 minutes	61	58	83	35	81	41				
	85	43	50	46	47	38				
	81	53	72	36	84	38				

Site 42

San Joaquin River Seepage Management Program

Well or Boring# 42-10 Sampler: Brummer/Dominguez Date: 3/24/10
 Location(UTM/NAD83) 10S 0712295 4110390 Landform Floodplain NRCS Map Unit 228; Palazzo SL
 Location Notes about 250 ft NW of stake for MW98 Partially Drained
 Topography Nearly Level Vegetation & Condition Tomato Beds
 Irrigation System Type: Gravity, Drip Irrigation Quadrant 3/5 - 4/5
 Avg EM Measurements; (T, Cor) EM_V 55.1 (67.3) EM_H 38.3(39.9) EM Calibration Site: EM_V 61 EM_H 32
 Soil Temperature, °C (2") 23 °C (16") 16 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-6	L	21	45	Dk.Gry	NE	VM	None				Friable; Granular
	6-15	L	21	40	Dk.Gry	NE	VM	None				MM Blocky
	15-29	SiCL	32	20	Grey	NE	VM	None				Firm
	29-39	SiCL	30	20	Ol.Brwn	NE	VM	None				Firm
	39-45	S	1	98	V.Lt.Grey	NE	SM	None				Loose; Single Grained
	45-74	Lt.L	14	45	Pale Brn	NE	VM-Wet	Few-(Com & distinct below 54")				Capillary Fringe at about 54"
227	0-12	22x					18.1		6.69	1.82	43.2	
228	0-12						16.6		6.67	1.06	38.9	
229	12-30						26.7		6.78	0.93	55.5	
230	30-60						25.2		7.15	1.35	42.8	
PSA	3"	L	21	48.5								

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. A numeric value indicates percent moisture by weight

Site Remarks:	EM38 Measurements:			
	EM _V	EM _H	EM _V	EM _H
Thick Cap. Fringe in Lt.Loam and VFSL soil zones 54-74"	57	31	41	32
Estimated water table at about 84" bgs	43	34	41	33
Site is in an old oxbow area	60	37	64	38
River channel about 350 ft south; choked with willows & tules	40	32	53	42
River channel has casual (stagnant) water	64	42	73	52
	39	33	51	40

Site 43

San Joaquin River Seepage Management Program

Well or Boring# 43-10 Sampler: Brummer/Dominguez Date: 3/24/10
 Location(UTM/NAD83) 10S 0711758 4110101 Landform Basin NRCS Map Unit 228; Palazzo SL
 Location Notes about 300 ft SW of well MW99; about 300 ft east of open drain Partially Drained
 Topography Nearly Level Vegetation & Condition Tomato Beds; Fallow
 Irrigation System Type: Gravity, Drip Irrigation Quadrant 3/5
 Avg EM Measurements; (T, Cor) EM_V 62.6(74.7) EM_H 45.0(49.0) EM Calibration Site: EM_V 78 EM_H 42
 Soil Temperature, °C (2") 21 °C (16") 17 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
SJRBS	0-6	Hvy.L	26	30	V.Dk.Gry	0	VM	None				Firm; Compacted
	6-14	H.SIL	26	24	V.Dk.Gry	0	VM	None				Firm; MM Blocky
	14-25	CL	32	25	V.Dk.Gry	0	M	None				Firm
	25-38	CL	28	30	Yel.Brn	+	M	None				Firm; Com Carbonates
	38-60	Hvy.L	25	40	Brn.Yel	++	VM-W	None				Many Carbonates
	60-70	L	22	40	Brn.Yel	+++	Sat	None				Many Seg.Carbonates
												Contains Cem.Carb Fragmnts
232	0-12	22x					21.8		7.45	1.18	51.2	
233	0-12						22		7.04	0.74	54.7	
234	12-30						20.7		7.35	0.61	52.9	
235	30-60						17.8		7.83	1.13	38.9	
PSA	27"	HL/LtCL	27	41								

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

A numeric value indicates percent soil moisture by weight

Site Remarks:

Profile is Saturated below 60"
 capillary fringe zone about 38-54 inches
 Water table was 54" after 10 minutes
 Westside Basin Alluvium
 EM Reading in Furrows(F) and Beds(B)
 EM Beds Avg --> EM_V = 52.4; EM_H = 42.9
 EM Furrows Avg --> EM_V = 72.8; EM_H = 47.0
 EM Average of both F & B-->EM_V=62.6; EM_H=45.0

EM38 Measurements:

	EM _V	EM _H	EM _V	EM _H
F 86	52	F 82	53	
B 56	45	B 62	49	
F 71	51	F 84	55	
B 50	44	B 54	43	
F 74	47	F 68	44	
B 56	48	B 43	35	

	EM _V	EM _H	EM _V	EM _H
F 60	36			
B 48	38			
F 69	51			
B 57	47			
F 78	47 *			
B 46	37			
F 56	34			

Site 44

San Joaquin River Seepage Management Program

Well or Boring# 44-10 Sampler: Brummer/Dominguez Date: 3/24/10
 Location(UTM/NAD83) 10S 0711289 4109758 Landform Basin-Westside NRCS Map Unit 228; Palazzo SL
 Location Notes about 250 ft NW of well MW100; about 300 ft from open drain Partially Drained
 Topography Nearly Level Vegetation & Condition Tomato Beds; Fallow; Pre-Irrigated
 Irrigation System Type: Gravity, Drip Irrigation Quadrant 3/5
 Avg EM Measurements; (T, Cor) EM_V 57.4(66.9) EM_H 39.4(42.9) EM Calibration Site: EM_V 75 EM_H 40
 Soil Temperature, °C (2") 21 °C (16") 18 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:	
	0-5	SL	14	54	Dk.Gry	0	VM	None				V.Friable; Granular	
	5-22	L	20	40	Dk.Gry	0	VM	None				Friable; WM Blocky	
	22-39	CL	30	40	Drab Gry	+	M	Few				Firm; Faint Fe Stains	
	39-57	Lt.CL	28	35	Brn	+	M	Few				Friable	
	57-62	SCL	23	50	Brn.Ye	+	VM	Com				Friable; Rust (Fe) mottles	
236	0-12	22x (50/50 composite sampled furrow/beds)						15.3		7.24	1.8	44.5	
237	0-12						13.8		6.83	0.62	42.9		
238	12-30						17		7.4	0.59	44.6		
239	30-60						17.5		7.68	1.55	39.8		
PSA	50"	Hvy.L	25	45									

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. numeric values indicate percent moisture by weight

Site Remarks:

Boring is in Furrow
 EM Readings are 50/50 Furrow(F) and Beds (B)
 Excellent profile for irrigation
 62" may be top of Capillary Fringe

EM38 Measurements:

	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H
F 63	37	F 53	29	F 80	53			
B 44	36	B 45	36	B 58	49			
F 63	40	F 69	41	F 75	40 *			
B 39	33	B 52	46	B 52	43			
F 54	29	F 72	42	F 74	50			
B 34	26	B 49	40					

Site 45

San Joaquin River Seepage Management Program

Well or Boring# 45-10 Sampler: Brummer Date: 3/30/10
 Location(UTM/NAD83) 10S 0703868 4111691 Landform Basin NRCS Map Unit 139; Bolfar CL
 Location Notes about 300 ft North of Well MW107 Partially Drained
 Topography Nearly Level Vegetation & Condition Spotty Alfalfa growth
 Irrigation System Type: Gravity Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_v 53.3(66.7) EM_H 41.1(57.5) EM Calibration Site: EM_v 72 EM_H 51
 Soil Temperature, °C (2") 16 °C (16") 15 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-15	CL	30	30	Dk.Gry	NE	M	None				Firm; 0-2" dry
	15-34	CL	30	35	Grey	NE	VM	None				Firm
	34-48	Lt.SCL	20	52	GryBrn	NE	VM	Com				Distinct Iron Stain Mottles
	48-64	HSL	17	56	Brn	NE	W-S	Com				Capillary Fringe
240	0-12	30x					12.1		7.16	0.95	38.7	
243	0-12						14.3		7.26	0.62	36.8	
244	12-30						17		7.57	1.12	34	
245	30-60						17.7		7.44	3.94	36.3	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

EM Readings Vary; May be questionable due to cell phone in pocket
 Alfalfa stand is spotty
 Water table is at 56" after 10 minutes
 cap fringe zone 48-56in.

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H
28	22	53	41
26	19	34	30
26	24	57	45
68	52	74	60
70	52	40	31
72	54	29	22

EM _v	EM _H	EM _v	EM _H
72	51 *		
72	53		
79	60		

Site 46

San Joaquin River Seepage Management Program

Well or Boring# 46-10 Sampler: Brummer/Dominguez Date: 3/30/10
 Location(UTM/NAD83) 10S 0704703 4112169 Landform Basin-WS NRCS Map Unit 139; Bolfar CL
 Location Notes about 250 ft from tail end of field; 250 ft east of open drain Partially Drained
 Topography Nearly Level Vegetation & Condition Bare; Pre-Irrigated Beds
 Irrigation System Type: Gravity Irrigation Quadrant 3/5
 Avg EM Measurements; (T, Cor) EM_v 73.9(90.2) EM_H 55.8(68.1) EM Calibration Site: EM_v 71 EM_H 53
 Soil Temperature, °C (2") 16 °C (16") 16 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-5	SiCL	30	25	Dk.Gry	0	VM	None				Friable
	5-20	SiCL	32	25	Dk.Gry	0	VM	None				Firm; MM Blocky
	20-31	L	24	35	Olive Brn	+++	VM	Few				Segregated Carbonates
	31-52	Lt.L	15	50	Pale Brn	++	VM-W	Few				Friable; FSL in spots
	52-60	Gr.L	22	40	Yel.Brn	++	Wet	Few				Faint Fe Mottles
												Free water at 60"
246	0-12	30x (50/50 in furrows and beds)					20.2		7.62	0.95	48.7	
247	0-12						20.6		7.35	1.06	57.4	
248	12-30						19.9		8.00	1.17	43.4	
249	30-60						19.8		8.07	2.47	29.2	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

EM Survey in Furrows only
 Capillary Fringe starts at about 40"
 Water table rose to 56.5" after 15 minutes

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H
71	55	73	53
74	59	95	72
67	53	82	62
65	48	77	57
73	56	75	61
71	51	72	51

EM _v	EM _H	EM _v	EM _H
65	49		
71	53 *		
72	52		
79	60		

Site 47

San Joaquin River Seepage Management Program

Well or Boring# 47-10 Sampler: Brummer/Dominguez Date: 3/30/10
 Location(UTM/NAD83) 10S 0704328 4113606 Landform Basin-WS NRCS Map Unit 170; Dos Palos CL
 Location Notes about 800 ft from MW106; 250 ft into field; about 400 ft from river edge Partially Drained
 Topography Nearly Level Vegetation & Condition Bare; Pre-Irrigated Beds
 Irrigation System Type: Gravity Irrigation Quadrant 3/5
 Avg EM Measurements; (T, Cor) EM_V 71.2(84.9) EM_H 52.9(60.3) EM Calibration Site: EM_V 73 EM_H 53
 Soil Temperature, °C (2") 19 °C (16") 17 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:	
	0-4	SiL	23	25	Dk.Gry	NE	M	None				Friable; 0-1" Dry	
	4-17	SiCL	28	25	Dk.Gry	NE	M	None				M Cs Blocky	
	17-30	SiL	21	25	Olive Brn	NE	VM	None				Segregated Carbonates	
	30-54	Hvy.L	26	30	Pale Brn	NE	M-W	None				Friable; Seg. Carbonates	
	54-64	L	18	35	Pale Brn	NE	Wet-Sat	Few				V.Faint Mottles	
250	0-12	30x (50/50 Furrows and Beds)						20.1		7.7	1.09	53.8	
251	0-12						18.6		7.41	1.19	53.3		
253	12-30						20.8		7.97	0.84	51.9		
254	30-60						19.7		8.2	1.57	43		

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

EM Survey in Furrows only; Boring in Furrow
 Capillary Fringe starts at about 46"
 Water table rose to 55" after 15 minutes
 30-54" Loam & Silt Loam Layers, Fine Silty Strata
 capillary Fringe zone 46-55 inches

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H
73	51	69	53
75	62	69	51
68	50	73	55
64	46	74	51
71	52	75	58
65	45	79	62

EM _V	EM _H	EM _V	EM _H
73	53 *		
68	51		
72	54		

Site 48

San Joaquin River Seepage Management Program

Well or Boring# 48-10 Sampler: Brummer/Dominguez Date: 3/30/10
 Location(UTM/NAD83) 10S 0705403 4113163 Landform Terrace NRCS Map Unit 139; Bolfar Clay Loam
 Location Notes about 350 ft south of MW105 stake; 250 ft into field from tail end Partially Drained
 Topography Nearly Level Vegetation & Conditon Bare; Pre-Irrigated Beds
 Irrigation System Type: Gravity Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_V 53.0(61.8) EM_H 38.7(43.1) EM Calibration Site: EM_V 51 EM_H 34
 Soil Temperature, °C (2") 20 °C (16") 18 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-4	L	23	35	Dk.Gry	NE	D-M	None				Friable; Granular
	4-16	L	24	40	Dk.Gry	NE	VM	None				Firm; WM Blocky
	16-34	FSL	14	60	Pale Brn	NE	VM	None				
	34-50	L	21	40	Pale Brn	NE	VM	None				
	50-60	Lt.L	17	40	Brn.Yel	NE	VM-W	Few (starts at 45")				Capillary Fringe
	60-63	Lt.L	17	40	Brn.Yel	NE	Sat	Few				V.Faint Mottles
255	0-12	30x					18		7.95	0.99	42.3	
256	0-12						17.6		7.76	0.95	45.4	
257	12-30						14.6		8.07	0.73	25.9	
258	12-30	(Rep)					13.8		8.02	0.74	26.9	rep is from same hole rpd 1.4%
259	30-60						17.1		8.02	1.47	31.7	
PSA	42"	L	17	47.5								

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Hole is saturated at 60"
 Water table is at 60" after 10 minutes
 Faint Mottling starts at 45"
 capillary fringe zone 45-50

EM38 Measurements:

	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H
	50	38	54	33	51	34 *
	54	42	52	37	53	35
	52	41	67	43	52	42
	50	41	58	44		
	50	39	51	40		
	48	35	53	37		

Site 49

San Joaquin River Seepage Management Program

Well or Boring# 49-10 Sampler: Brummer/Dominguez Date: 3/30/10
 Location(UTM/NAD83) 10S 0707252 4113542 Landform Terrace NRCS Map Unit 139; Bolfar Clay Loam
 Location Notes about 250 ft from tail end of field Partially Drained
 Topography Nearly Level Vegetation & Conditon Bare; Pre-Irrigated
 Irrigation System Type: Gravity Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_V 76.9(91.7) EM_H 55.7(62.0) EM Calibration Site: EM_V 76 EM_H 54
 Soil Temperature, °C (2") 20 °C (16") 17 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-14	C	42	30	Dk.Gry	NE	M	None				Firm; 0-3" Dry, Cloddy
	14-27	Hvy.CL	36	30	Brn	NE	M	None				Firm
	27-41	Lt.CL	28	30	Pale Brn	NE	VM	Few				Friable
	41-51	CL	33	30	Pale Brn	NE	VM	Com				Firm; Segregated Carbonates
	51-62	CL	34	25	Brn.Yellow	NE	VM-W	Many				Firm; Capillary Fringe at 51"
												Some Lt.CL in spots
260	0-12	30x					16.8		7.72	1.1	47.6	
261	0-12						14.6		7.46	1.13	53	
264	12-30						18.2		7.81	1.32	45	
265	30-60						20.7		8.00	1.55	44.5	
PSA	7"	CL	34	30								

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Site is about 350 ft from the river
 No Water table; estimated it may be about 72"
 Capillary Fringe starts at about 51"
 cap fringe estimate 51-72

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H	EM _V	EM _H
78	58	81	60	76	54 *
78	55	80	61	79	52
73	49	82	62	80	60
74	50	78	58		
69	54	74	55		
76	55	76	53		

Site 50

San Joaquin River Seepage Management Program

Well or Boring# 50-10 Sampler: Brummer/Dominguez Date: 3/30/10
 Location(UTM/NAD83) 10S 0705937 4113452 Landform Low Terrace NRCS Map Unit 139 Bolfor CL
 Location Notes about 250 ft in from tail of field Partially Drained
 Topography Nearly Level Vegetation & Condition Crop Beds; Cotton Residue
 Irrigation System Type: Gravity Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_V 116.9(136.2) EM_H 81.1(88.3) EM Calibration Site: EM_V 164 EM_H 66(Furrow)
 Soil Temperature, °C (2") 21 °C (16") 18 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:	
	0-6	L	19	38	Dk Gry	nr	VM	None				V.Friable; Granular	
	6-15	L	20	35	Dk Gry		VM	None				Friable; WF Blocky	
	15-43	FSL	12	58	BrnGry		VM-W	Few				Few faint mottles at 30"	
	43-52	L	18	44	Ol brn		W	Many				Friable; Iron Mottles	
	52-60	FSL	14	60	Ol.Brn		W-Sat					Free water at 5'8"	
266	0-12	30x 50% furrows and 50% beds						16.6		7.77	4.95	38.3	SAR=5.8
267	0-12						14.9		7.8	0.97		38.6	
268	12-30						15.8		7.94	3		25.9	
269	30-60						16.3		7.77	5.12		34.2	SAR=11.8

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

15" beds; Poor EM Calsite due to large beds
 EM readings are 50/50 beds/furrows
 Water table at 4.6 ft from bottom of furrow after 10 minutes
 Open drain 300 ft to the west

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H
107	114 F	67	65 B	98	95 B		
185	90 F	124	59 F	181	90 F		
90	75 B	78	68 B	75	76 B		
59	57 B	140	85 F	164	66 F *		
146	77 F	89	91 B	80	83 B		
76	72 B	153	72 F	192	124 F		

Site 51

San Joaquin River Seepage Management Program

Well or Boring# 51-10 Sampler: Brummer/Dominguez Date: 3/31/10
 Location(UTM/NAD83) 10S 0705676 4114894 Landform Low Terrace NRCS Map Unit TSA; Temple Loam
 Location Notes about 250 ft in from tail of field; 400 ft SSE of Well 103 Slightly Saline
 Topography Nearly Level Vegetation & Condition _____ Beds: pre-irrigated
 Irrigation System Type: Gravity Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_V 126.6(162.2) EM_H 95.6(122.5) EM Calibration Site: EM_V 125 EM_H 81
 Soil Temperature, °C (2") 14 °C (16") 14 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-5	L	17	45	BrnGry	0	SM	None				V.Friable; Granular
	5-14	SCL	20	50	BrnGry	0	M	None				Friable; WM Blocky
	14-39	GrL	23	40	Lt.Gry	++	M-VM	None				Contains seg carbonates
	39-60	Lt.L	16	45	Pale Brn	++	W-S	Com				V.Fri; Capillary Fringe
270	0-12	30x					15		7.81	3.39	37.1	50/50 Furrow/Bed samples
271	0-12						11.4		7.81	2.79	36.2	
273	12-30						19.6		7.93	3.49	30.6	
274	30-60						21.9		7.68	9.99	33	SAR=7.7

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Water table is 4.1 ft after 10 minutes
 PSA at 8" = 22% clay; 28% silt; 50% sand
 PSA texture is Fine SCL
 All EM Readings are in the furrow

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H
120	76	168	132
115	83	168	121
124	98	134	101
117	101	120	81
139	107	108	79
161	122	92	73

EM _V	EM _H	EM _V	EM _H
123	104		
113	103		
106	71		
125	81 *		
114	85		
131	103		

Site 53

San Joaquin River Seepage Management Program

Well or Boring# 53-10 Sampler: Brummer/Dominguez Date: 3/31/10
 Location(UTM/NAD83) 10S 0705634 4113574 Landform Oxbow Floodplain NRCS Map Unit CaA; Columbia FSL
 Location Notes about 300 ft north of the San Joaquin River
 Topography Nearly Level Vegetation & Condition Good Alfalfa
 Irrigation System Type: Gravity check Irrigation Quadrant 3/5
 Avg EM Measurements; (T, Cor) EM_V 79.8(95.2) EM_H 52.4(58.4) EM Calibration Site: EM_V 74 EM_H 50
 Soil Temperature, °C (2") 20 °C (16") 17 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-4	Hvy L	26	30	Brn.Gry	nr	SM	None				Firm
	4-27	Lt.CL	29	30	Brn.Gry		SM	None				Firm; MM Blocky
	27-39	VFSL	10	60	Lt.Brn		M-VM	Few				Very Faint Iron stains
	39-60	L	19	40	Lt.Brn		VM-W	Com				Fri; F. Loamy strata L/FSL/SL
	60-64	SiCL	35	25	Dk.Gry		Wet	Few				Drab Color
279	0-12	30x					12		7.79	0.94	43.8	
280	0-12						10.7		7.6	0.97	46.8	
281	12-30						20.9		7.94	1.46	50.2	
282	30-60						24.8		7.83	4.49	46.1	SAR=7.9

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Capillary Fringe at about 45 inches
 Water table over 64 inches after 15 minutes
 Bottom of hole is wet
 60-64" may be buried soil

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H
74	50	92	62
71	47	88	55
84	53	70	44
94	61	71	51
92	57	71	48
89	59	71	48

EM _V	EM _H	EM _V	EM _H
79	52		
66	46		
71	47		
85	55		
89	56		

Site 54

San Joaquin River Seepage Management Program

Well or Boring# 54-10 Sampler: Brummer/Dominguez Date: 3/31/10
 Location(UTM/NAD83) 10S 0698816 4115433 Landform Basin NRCS Map Unit 170; Dos Palos CL
 Location Notes about 270 ft north of tail end of field Partially Drained
 Topography Nearly Level Vegetation & Conditon Cotton Beds
 Irrigation System Type: Gravity Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_V 66.1(78.9) EM_H 46.1(49.1) EM Calibration Site: EM_V 74 EM_H 41
 Soil Temperature, °C (2") 22 °C (16") 17 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:	
	0-6	Lt.SiCL	28	35	GryBrn	nr	M	None				Friable	
	6-26	SiCL	34	22	Ol.Gry		VM	None				Firm; WM Blocky	
	26-47	CL	30	30	Olive		M	None				Segregated Carbonates	
	47-60	L	18	35	Brn.Yel		VM	Few				V.Friable; Faint Fe stains	
	60-62	FSL	14	60	Brn.Yel		W	Few				V.Friable; Faint Fe stains	
285	0-12	30x 50/50 furrow and beds						16		7.89	1.53	54.9	
286	0-12						19.1		7.85	0.62	52.6		
287	12-30						19.7		8.05	0.78	53.3		
288	30-60						18.6		8.11	1.38	44.7		

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Water table is at 4.8 ft after 15 minutes
 Boring in Furrow; Does not seem saturated 60-64" ?
 Possibly a thin saturated lense
 26-47" contain segregated lime concretions & fragments

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H
79	48 F	50	45 B
50	44 B	78	52 F
75	42 F	55	48 B
53	46 B	80	47 F
74	43 F	53	46 B
81	54 F	79	48 F

EM _V	EM _H	EM _V	EM _H
54	46 B		
74	41 *F		
52	45 B		
71	42 F		

Site 55

San Joaquin River Seepage Management Program

Well or Boring# 55-10 Sampler: Brummer/Dominguez Date: 3/31/10
 Location(UTM/NAD83) 10S 0699005 4115943 Landform Low Terrace NRCS Map Unit 180;El Nido CL
 Location Notes about 250 ft from tail of field Partially Drained
 Topography Nearly Level Vegetation & Conditon Fallow beds; volunteer cucumbers
 Irrigation System Type: Gravity Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_V 32.0(36.5) EM_H 24.9(25.4) EM Calibration Site: EM_V 35 EM_H 23
 Soil Temperature, °C (2") 24 °C (16") 19 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:	
	0-6	L	18	40	Brn.Gry	0	VM	None				V.Friable; Granular	
	6-19	L	20	42	Brn.Gry	0	VM	None				Friable; WF Blocky	
	19-25	FSL	8	65	DkBrn	0	VM	None				Micacious	
	25-37	LFS	4	80	Brn	0	VM	None					
	37-48	LS	4	80	Gry.Brn	0	VM	None					
	48-60	LFS	5	78	Gry.Brn	0	Wet	Few				56-60" sand	
289	0-12	30x 50/50 beds/furrows sampled						16.2		7.75	0.87	41.2	
290	0-12						15		7.74	0.78	77.5?		
291	12-30						17.3		7.89	0.68	35.4		
293	30-52						18		7.87	0.61	45.9		

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Saturated at 52"
 EM readings in furrows
 Hole caved at 52"; Sampled to 52"
 Water table 3.9 ft after 15 minutes
 Site is about 500 ft from River
 cap fringe is thin at this site

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H
30	20	27	22
28	23	25	21
31	25	34	29
31	25	38	29
30	22	48	38
27	21	40	33

EM _V	EM _H	EM _V	EM _H
30	22		
36	25		
35	23 *		
27	23		
27	23		

Site 56

San Joaquin River Seepage Management Program

Well or Boring# 56-10 Sampler: Brummer/Dominguez Date: 4/6/10
 Location(UTM/NAD83) 10S 0718476 4100781 Landform Floodplain NRCS Map Unit CmA; Columbia FSL
 Location Notes about 150 ft east of well and 250 ft from orchard row edge
 Topography Nearly Level Vegetation & Condition Good Almonds; Young trees
 Irrigation System Type: Drip Irrigation Quadrant _____
 Avg EM Measurements; (T, Cor) EM_v 31.3(39.1) EM_H 32.2(38.4) EM Calibration Site: EM_v 32 EM_H 28
 Soil Temperature, °C (2") 17 °C (16") 15 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-5	L	18	40	BrnGry	NE	VM	None				Granular
	5-12	L	20	35	BrnGry		M	Few-Com				MM Blocky
	12-23	Lt.L	15	40	BrnGry		M	Com				V. Friable
	23-55	VFLS	5	80	Lt.Gry		M-VM	Com				V.Friable; Distinct Fe Mottles
	55-60	VFSL	6	75	Grey		VM	Com				V.Friable; Prominent Fe Mottles
294	0-12	30x					21.9		7.22	1.37	50.5	
295	0-12						21.5		7.29	1.17	52.8	
296	12-30						13.9		7.43	1.55	41.7	
297	30-60						14.2		7.23	1.85	41.0	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Site is in center of orchard row
 Profile is Micacious
 No Water table to 60"

EM38 Measurements:

EM _v		EM _H		EM _v		EM _H		EM _v		EM _H	
37	28	21	20	52	61	32	28*				
38	32	17	15	31	30	28	27				
32	35	31	38	43	46	22	20				
27	46	29	28	22	30						
37	32	23	26	37	28						
36	42	38	35	24	30						

Site 57

San Joaquin River Seepage Management Program

Well or Boring# 57-10 Sampler: Brummer/Dominguez Date: 4/6/10
 Location(UTM/NAD83) 10S 0719203 4100082 Landform Floodplain NRCS Map Unit CmA; Columbia FSL
 Location Notes about 115 ft east of concrete irrigation vent pipe
 Topography Nearly Level Vegetation & Conditon Good Almonds
 Irrigation System Type: Drip Irrigation Quadrant Drip; 3/5
 Avg EM Measurements; (T, Cor) EM_v 35.5(42.3) EM_H 31.0(34.5) EM Calibration Site: EM_v 34 EM_H 24
 Soil Temperature, °C (2") 20 °C (16") 17 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-5	L	18	35	BrnGry	NE	M	None				Granular
	5-14	L	20	45	Dk.Gry	NE	M	None				MF Blocky
	14-36	VFSL	9	62	Lt.BrnGry	NE	M	None				
	36-50	SiL	22	25	Grey	NE	M-SM	None				
	50-60	Lt.L	12	50	Lt Gry	NE	SM	None				VFS Lenses
298	0-12	30x					14.9		7.24	1.31	47.6	
299	0-12						19.2		7.05	0.8	45.8	
300	12-30						11.6		7.68	0.71	41.1	
301	12-30	paired sample					11.4		7.53	0.78	37.7	Paired Sample 8.1% RPD
302	30-60						18.7		7.25	1.24	40.2	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Site is about 300 ft from San Joaquin River
 No Water table to 60"

EM38 Measurements:

EM _v		EM _H		EM _v		EM _H		EM _v		EM _H	
31	31	38	29	28	25	34	24 *				
38	38	41	35	25	22	31	24				
42	34	41	37	34	29						
37	32	34	35	39	36						
40	33	38	34	42	38						
35	32	35	32	26	20						

Site 58

San Joaquin River Seepage Management Program

Well or Boring# 58-10 Sampler: Brummer/Dominguez Date: 4/6/10
 Location(UTM/NAD83) 10S 0719887 4099522 Landform LowTerrace/Basin NRCS Map Unit CmA; Columbia FSL
 Location Notes about 250 ft from tail of field over Temple
 Topography Nearly Level Vegetation & Condition Idle Field; Bedded; Disked Corn
 Irrigation System Type: Gravity/Furrow Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_v 58.6(68.3) EM_H 44.2(51.5) EM Calibration Site: EM_v 61 EM_H 49
 Soil Temperature, °C (2") 18 °C (16") 18 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:	
	0-4	L	20	35	Dk.Gry	NE	VM	None				Friable; Granular	
	4-15	L	20	32	Dk.Gry	NE	VM	None				Firm; MM Blocky	
	15-38	HSiL	26	25	Grey	NE	M	Few				Firm; Very faint Mottles	
	38-50	Lt.SiCL	29	25	Grey	NE	M	Few				Contains thin sand lenses	
	50-60	Lt.CL	28	38	Yel.Brn	++	M	Few				Segregated Carbonates; salts	
305	0-12	20x Bed/Furrows 50/50 -->Dominguez						26.8		7.59	1.05	52.5	
306	0-12	Replicate 20x Bed/Furrows 50/50-->Brummer						24.6		7.67	1.14	50.6	RPD = 6.5%
307	0-12						27.4		7.55	1.4	53.5		
308	12-30						28.5		7.62	1.83	68.5		
309	30-60						23.4		7.63	1.71	53.6		

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

EM Survey is in furrows
 No Water table to 60" after 20 minutes
 This is a large oxbow area; good alfalfa in field to the south
 Very faint Yellowish mottles may not be redoximorphic

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H
65	44	52	38
57	46	52	42
51	41	48	30
55	46	58	48
55	44	62	43
59	43	67	48

EM _v	EM _H	EM _v	EM _H
67	44	66	56
57	39		
53	43		
60	49		
61	49 *		
68	47		

Site 59

San Joaquin River Seepage Management Program

Well or Boring# 59-10 Sampler: Brummer/Dominguez Date: 4/6/10
 Location(UTM/NAD83) 10S 0718297 4103525 Landform LowTerrace NRCS Map Unit CaA; Columbia FSL
 Location Notes About 260 ft from head of field
 Topography Nearly Level Vegetation & Conditon Fair Alfalfa
 Irrigation System Type: Gravity-Check Irrigation Quadrant 2/5
 Avg EM Measurements; (T, Cor) EM_v 48.3(60.4) EM_H 37.0(45.2) EM Calibration Site: EM_v 45 EM_H 34
 Soil Temperature, °C (2") 16 °C (16") 15 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-12	L	16	40	Dk.Gry	0	VM	None				Friable
	12-23	SL	12	55	GryBrn	0	VM	Few				Friable
	23-40	SiL	22	25	Dk.Gry	0	M	Few				Firm
	40-59	L	24	30	Lt.Gry	+++	VM	None				Com.Carbonates
	59-60	Hardpan										Could not recover
310	0-12	30X					21.5		7.5	1.16	37.6	
311	0-12						21.2		7.52	1.13	39.2	
312	12-30						24		7.72	1.06	49.2	
314	30-59						25.9		7.84	1.78	45.2	pH Not Valid

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Limey Hard Pan at 59 inches
 No water table to 60"
 40-60" contains hardpan fragments
 30-59" are two unlike strata; pHp is not valid
 PSA at 18" 15.4%Clay, 33.6%Silt, 51%Sand --> SL
 possible cap fringe zone 40-60 inches

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H
55	43	42	32
55	45	42	30
58	41	54	43
55	41	53	40
59	46	49	36
50	41	54	42

EM _v	EM _H	EM _v	EM _H
31	24		
36	29		
41	31		
45	34 *		
45	34		
46	34		

Site 60

San Joaquin River Seepage Management Program

Well or Boring# 60-10 Sampler: Brummer/Dominguez Date: 4/8/10
 Location(UTM/NAD83) 10S 0716834 4110324 Landform Basin Rim NRCS Map Unit FrA; Fresno Loam
 Location Notes about 250 ft from edge of orchard Moderately Saline
 Topography Nearly Level Vegetation & Condition Good Young Orchard
 Irrigation System Type: Drip - Micro Irrigation Quadrant _____
 Avg EM Measurements; (T, Cor) EM_v 41.8(49.9) EM_H 35.3(42.1) EM Calibration Site: EM_v 43 EM_H 30
 Soil Temperature, °C (2") 17 °C (16") 17 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-18	L	18	45	BrnGry	+	M	None				Friable
	18-43	SL	15	60	Lt.Brn	++	M	None				Hardpan Fragments
	43-60	Lt.SCL	20	55	Lt.Brn	++	M	Few				Consolidated; many hardpan fragments; v.faint mottles
315	0-12	20X					15		7.66	7.83	35.2	SAR = 3.0
316	0-12						14.7		7.99	1.36	33.7	
317	12-30						18.3		7.85	2.68	30.5	
318	30-60						18.4		8.03	3.06	32.8	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Site has raw substrata, probably recently ripped
 Profile contains hardpan fragments;
 No sign of a watertable.
 Salts must be near the dripline?

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H
41	32	43	35
32	32	43	41
50	39	46	33
33	48	46	39
34	28	40	37
37	34	37	32

EM _v	EM _H	EM _v	EM _H
47	32		
43	30 *		
45	32		
52	40		

Site 61

San Joaquin River Seepage Management Program

Well or Boring# 61-10 Sampler: Brummer/Dominguez Date: 4/8/10
 Location(UTM/NAD83) 10S 0714651 4111886 Landform Basin Rim NRCS Map Unit FrA; Fresno Loam
 Location Notes about 250 ft from edge of field; at second T-Pole Moderately Saline
 Topography Nearly Level Vegetation & Condition Young Pistaccios; Fair
 Irrigation System Type: Drip - Micro Irrigation Quadrant _____
 Avg EM Measurements; (T, Cor) EM_v 109.2(130.2) EM_H 94.1(107.2) EM Calibration Site: EM_v 131 EM_H 102
 Soil Temperature, °C (2") 19 °C (16") 17 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-6	L	23	40	Dk.Gry	++	M	None				Friable
	6-19	Hvy L	26	35	Dk.Gry		M	None				Firm; MCsBlocky; CL 16-19 ¹
	19-38	L	24	40	Lt.Gry		VM	None				Many Hardpan Fragments
	38-48	L	17	40	Lt.Gry		W-Sat	None				Friable below hardpan
	48-60	FSL	16	54	Brn		Sat	None				Friable
319	0-12	20x					22.4		7.69	16.0	41.3	SAR= 15.8
320	0-12						19.2		7.61	6.16	40.5	SAR= 7.2
321	12-30						20		7.54	8.67	39.2	SAR= 9.7
322	30-60						28.9		7.81	5.28	34.5	SAR=10.9
PSA	50"	FSL	8	57								

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Boring is about 500 ft from Eastside ByPass Levee
 Recently ripped substrata? Soil is raw
 Water table is at 3.1 ft bgs after 2 hours-->stable
 Almost stopped by coarse hardpan fragments
 cap fringe zone about 24-37 inches
 soil may contain native salts

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H
101	116	110	102
114	98	79	62
93	84	126	98
103	69	127	104
149	86	105	82
110	112	103	96

EM _v	EM _H	EM _v	EM _H
99	108		
103	93		
105	96		
92	71		
131	102 *		
113	103		
112	106		

Site 62

San Joaquin River Seepage Management Program

Well or Boring# 62-10 Sampler: Brummer/Dominguez Date: 4/8/10
 Location(UTM/NAD83) 10S 0714672 4114100 Landform Basin Rim NRCS Map Unit FSA; Fresno Loam
 Location Notes about 260 ft into orchard Slightly Saline
 Topography Nearly Level Vegetation & Condition Young Pistaccios
 Irrigation System Type: Drip - Micro Irrigation Quadrant _____
 Avg EM Measurements; (T, Cor) EM_v 48.0(53.5) EM_H 40.1(42.7) EM Calibration Site: EM_v 43 EM_H 36
 Soil Temperature, °C (2") 22 °C (16") 20 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-4	L	20	42	BrnGry	NE	M	None				Cloddy
	4-15	Hvy.L	26	35	BrnGry	NE	M	None				MM Blockly
	15-57	L	19	42	Brown	NE	VM	None				Hardpan fragmnts; 3 HSL Layers
	57-64	L	16	45	Dk.Brn	NE	W-Sat	Few				Faint Mottles; Micacious
325	0-12	30x					18.2		7.58	6.3	34.4	SAR=4.7; Oakfield Probe
326	0-12						17.2		7.7	4.1	32.8	SAR=4.5
327	12-30						22		7.78	5.09	35.3	SAR=4.8
328	30-60						18.9		8.11	1.6	34.9	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

About 300 ft from a large ditch
 Free water at 62" during boring
 Water table at 4.9 ft after 15 minutes

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
43	37	52	38	43	36		
45	37	46	45	49	39		
45	42	47	36	39	37		
43	35	49	44	43	36 *		
52	40	65	47	50	40		
45	37	49	45	59	51		

Site 63

San Joaquin River Seepage Management Program

Well or Boring# 63-10 Sampler: Brummer/Dominguez Date: 4/8/10
 Location(UTM/NAD83) 10S 0715114 4108450 Landform Basin NRCS Map Unit 228; Palazzo SL
 Location Notes about 260 ft into the field Partially Drained
 Topography Nearly Level Vegetation & Condition Tomato Beds; Bare; Not Pre-Irrigated
 Irrigation System Type: Gravity-Drip Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_v 87.3(101.7) EM_H 68.0(79.2) EM Calibration Site: EM_v 100 EM_H 76
 Soil Temperature, °C (2") 18 °C (16") 18 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-6	CL	30	25	Dk.Gry	NE	M	None				Friable; Granular
	6-16	CL	33	30	Dk.Gry	NE	VM	None				Firm; SF Blocky
	16-28	Hvy.L	25	35	GryBrn	NE	VM	None				
	28-49	SCL	21	50	Ol.Gry	NE	VM	None				Cemented Fragmnts; Sand
	49-60	SCL	20	50	Ol.Brn	NE	Wet	Few				Cemented Fragmnts; Sand
329	0-12	30X					20.3		7.17	2.04	54	
330	0-12						22.9		7.1	3.98	53.7	2.5Y 4/1; SAR=2.5
331	12-30						27.5		7.36	5.2	51.5	2.5Y 4/2; SAR=6.6
332	30-57						29.3		7.52	5.95	40.8	2.5Y 5/2; SAR=7.4

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. A numeric value indicates percent moisture by weight

Site Remarks:

Free Water at 57" during boring
 Water Table at 51" after 15 minutes (measured from bottom of Furrow)
 Site is 150 ft SW of Temp Obs Well Nickel 2
 Capillary Fringe may be about 30" cap fringe 30-51 inches

EM38 Measurements:	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
	74	58	88	72	75	61		
	96	64	101	74	79	63		
	73	58	74	59	65	55		
	84	64	112	88	100	76 *		
	77	63	90	69	76	60		
	102	81	94	74	90	73		
					108	80		

Site 64

San Joaquin River Seepage Management Program

Well or Boring# 64-10 Sampler: Brummer/Dominguez Date: 4/8/10
 Location(UTM/NAD83) 10S 0714130 4107879 Landform Basin _____ NRCS Map Unit 181; Escano CL
 Location Notes about 250 ft from head of field Partially Drained _____
 Topography Nearly Level Vegetation & Condition Alfalfa; Good young crop
 Irrigation System Type: Gravity-Check Irrigation Quadrant 2/5
 Avg EM Measurements; (T, Cor) EM_v 67.3(81.7) EM_H 56.9(64.8) EM Calibration Site: EM_v 68 EM_H 57
 Soil Temperature, °C (2") 19 °C (16") 15 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-5	Lt.CL	28	30	Dk Gry	NE	VM	None				Firm
	5-20	SiCL	30	25	Dk Gry	NE	VM	None				Firm; MM Blocky
	20-50	Lt.CL	28	28	Grey	+++	VM-W	None				Firm; Segregated Carbonates
	50-60	CL	30	30	Ol. Grey	NE	Sat	Few				Faint Mottles
334	0-12	20X					27.6		7.23	0.83	54.7	20x Compacted Cores 8-12"
335	0-12						29.1		7.14	1.02	58.9	5Y 3/1
336	12-30						32.1		7.45	0.86	59.2	5Y 4/2
337	30-50						30.9		7.78	1.13	43.9	5Y 4/2; watertable at 50"

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Numeric values indicate percent soil moisture by weight

Site Remarks:

About 300 ft from Woods Slough channel
 Water table at 43" after 15 minutes
 Capillary fringe may start at 24"
 Lots of Nettles in alfalfa field
 capillary fringe zone 24-43 inches

EM38 Measurements:

	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
	72	61	64	54	68	57 *		
	74	61	62	53	65	58		
	72	61	64	53	61	53		
	72	65	68	55				
	67	53	68	57				
	60	49	72	63				

Site 65

San Joaquin River Seepage Management Program

Well or Boring# 65-10 Sampler: Brummer/Dominguez Date: 4/15/10
 Location(UTM/NAD83) 0719604 4099044 Landform Low Terrace NRCS Map Unit 320; El Nido SL, Drained
 Location Notes about 260 ft from field edge; 300 ft from OBS Well 144A
 Topography Nearly Level Vegetation & Condition Excellent Alfalfa
 Irrigation System Type: Gravity Irrigation Quadrant 3/5 ?
 Avg EM Measurements; (T, Cor) EM_V 60.6(79.9) EM_H 40.1(51.4) EM Calibration Site: EM_V 67 EM_H 43
 Soil Temperature, °C (2") 14 °C (16") 13 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-12	L	25	32	BrnGry	NR	M	None				0-4" V.Moist, Friable
	12-32	SiCL	29	25	DkBrnGry	NR	M	None				Firm
	32-47	SiL	21	25	BrnGry	NR	VM	Com				Iron Mottles, Friable
	47-88	SiCL	30	25	DkGry	NR	VM	Few				Firm
	88-95	SiCL	30	25	Ol.Gry	NR	VM	Few				Seg. Carbonates, Firm
	95-116	L	21	30	Ol.Brn	NR	VM-W	Few				Cap.Fringe, Friable
338	0-12	30x					17		6.84	0.59	40.8	
339	0-12						16.6		6.81	0.96	46.3	
340	12-30						20.7		7.28	0.96	56.1	
341	30-60						32.1		7.47	1.5	65.2	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Water is at 6.2 ft in backhoe pit about 30 ft from CCID well 144A
 EM could be questionable due to cell phone in pocket.
 Saturated at 112" 112"-116" contains cemented fragments
 Water table 8'11" after 15 minutes
 Water table 8'11" after 25 minutes

EM38 Measurements: EM _V		EM _H	EM _V	EM _H
	63	41	63	42
	67	43*	59	41
	59	34	47	30
	65	42	52	37
	65	44	62	41
	64	43	66	43
	64	44	57	37

Site 66

San Joaquin River Seepage Management Program

Well or Boring# 66-10 Sampler: Brummer/Dominguez Date: 4/15/10
 Location(UTM/NAD83) 0718624 4101241 Landform Low Terrace NRCS Map Unit 115;Boflor L; Drained
 Location Notes 250 ft from OBS Well MW90
 Topography Nearly Level Vegetation & Condition Fallow Corn beds
 Irrigation System Type: Gravity Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_V 39.8(49.8) EM_H 30.6(34.1) EM Calibration Site: EM_V 35 EM_H 25
 Soil Temperature, °C (2") 20 °C (16") 15 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-11	L	21	30	DkGr	NR	VM	None				0-2" dry, cloddy
	11-25	L	23	30	Gry	NR	VM	None				Friable
	25-38	Lt.L	15	45	GryBrn	NR	VM	Com				V.Friable
	38-86	LFS	4	85	Lt.Gry	NR	M-VM	Many				Iron Mottles
	86-120	S	1	96	Gry	NR	VM	Few				Micacious; V.Friable
	120-124	S	1	98	Lt.Gry	NR	Wet	Com				Sand becomes coarser w/depth
344	0-12	30x					23.9		6.97	0.79	48.8	
345	0-12						22.4		7.36	0.63	48.3	
346	12-30						24.7		7.57	0.75	42.2	
347	30-60						14.6		7.65	0.77	34.2	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

No water table at 10 ft from top of beds.
 Wet at 120" Water table is below 10 after 30 minutes
 Estimated water table depth is 11.0 ft from top of beds

EM38 Measurements: EM _V		EM _H	EM _V	EM _H
	34	27	46	35
	37	28	50	37
	35	28	54	48
	42	29	44	30
	32	22	39	32
	25	22	38	29
	37	27	44	33
	35	25*	45	37

Site 67

San Joaquin River Seepage Management Program

Well or Boring# 67-10 Sampler: Brummer/Dominguez Date: 4/15/10
 Location(UTM/NAD83) 0718966 4100103 Landform Basin NRCS Map Unit 320; El Nido SL; Drained
 Location Notes about 150 ft in from the field edge
 Topography Nearly Level Vegetation & Condition Fair, Yellowing gone
 Irrigation System Type: Gravity Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_V 49.4(61.8) EM_H 35.2(40.1) EM Calibration Site: EM_V 52 EM_H 37
 Soil Temperature, °C (2") 19 °C (16") 15 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-20	CL	32	30	Dk Gry	NR	M	None				Firm
	20-44	L	20	32	DkBrnGry	NR	VM	None				Friable, LtL Layers
	44-64	HCL	39	35	Dk Gry	NR	VM	None				V.Firm
	64-75	CL	30	35	Ol. Gry	+++	VM	Few				Seg. Carbonates
	75-94	HL	26	40	Ol. Gry	+++	VM	Few				Faint Iron Mottles
	94-110	L	20	40	P.Brn	+++	VM-S	Few				Faint Iron Mottles
348	0-12	30x					18.2		6.97	0.57	44.9	
349	0-12						17.1		6.83	0.56	52	
350	12-30						21.3		7.28	0.71	52.6	
351	30-60						25.7		7.41	0.82	55.3	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

94-110" texture becomes lighter with depth; LtL, 14% clay at 110"
 Nearly FSL at 110"
 Free water at 108"
 Water table is 8'3" after 15 minutes
 EM Furrows 3x 50/50 furrow/beds

EM38 Measurements: EM _V		EM _H	EM _V		EM _H
		59	37	46	32
		53	37	54	35
		49	37	48	35
		49	37	48	31
		47	34	55	41
		44	34	45	31
		54	38	44	31
		52	37*	43	36

Site 68

San Joaquin River Seepage Management Program

Well or Boring# 68-10 Sampler: Brummer/Lee Date: 4/19/10
 Location(UTM/NAD83) 0712042 4110742 Landform Low Terrace NRCS Map Unit MpA; Merced SiL
 Location Notes about 300 ft SE of well MW97 Slightly Saline
 Topography Nearly Level Vegetation & Condition Fallow disked grain
 Irrigation System Type: Gravity Irrigation Quadrant _____
 Avg EM Measurements; (T, Cor) EM_V 41.5(51.9) EM_H 28.2(31.4) EM Calibration Site: EM_V 51.3 EM_H 31.7
 Soil Temperature, °C (2") 20 °C (16") 15 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-6	FSL	14	55	BrnGry		M	None				
	6-12	L	17	45	BrnGry		M	None				
	12-18	Lt.FSL	6	72	BrnGry		M	None				
	18-33	LFS	4	90	Lt.Gry		VM	Few				Faint iron stains
	33-48	VFSL	10	55	Lt.Gry		VM-Wet	Few				Capillary Fringe?
NS												

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S; Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Soil Profile is too variable to sample
 Many Sand Streaks in the area

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H
27.1	17	16.7	10.1	46.7	34.1	94.2	73.3
32.1	23.1	30.2	22.2	29.8	18.8	29.7	21.6
43.3	28.1	40.1	28.4	17.1	10.3	13.2	10.1
43.5	29.4	82.1	55	13.5	8.5	13.8	8.7
39.4	32.6	75.7	44.2	51.3	31.7*	12.2	7.2
43.9	32.1	82.6	55.1	80.3	55.5		

Site 69

San Joaquin River Seepage Management Program

Well or Boring# 69-10 Sampler: Brummer/Lee Date: 4/19/10
 Location(UTM/NAD83) 0712715 4111510 Landform Basin Rim NRCS Map Unit CoA: Columbia Channeled (Fresno?)
 Location Notes about 250 ft NE of well MW96
 Topography Nearly Level Vegetation & Condition Alfalfa, Good
 Irrigation System Type: Gravity Check Irrigation Quadrant 2/5
 Avg EM Measurements; (T, Cor) EM_v 67.7(80.7) EM_H 59.5(64.8) EM Calibration Site: EM_v 65 59 31.7
 Soil Temperature, °C (2") 21 °C (16") 17 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-16	CL	32	30	V.DkGry	NR	VM	None				Firm
	16-24	CL	30	30	DkGry	NR	VM	None				Color Varigated w/olive gry
	24-33	L	21	35	Ol. Gry	NR	VM	None				Semi consolidated
	33-48	Lt.L	15	45	Ol. Gry	++	W-Sat	Few				Hardpan Fragments(many)
357	0-12						24.6		7.63	0.77	55.8	
358	0-12						26.2		7.56	0.82	57.5	
359	12-30						24.8		7.75	0.87	53.1	
360	30-48				Ol.Gry (5Y 5/2)		22.8		7.96	2.76	35.9	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S; Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Stopped by consolidated hardpan at 48"
 Free water at 48"
 Water table 3.9 ft after 15 minutes
 Capillary fringe at about 30"

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H
70	63	67	60	74	68		
71	65	63	52	64	57		
65	58	67	57	62	56		
80	70	63	55	65	59*		
80	68	70	61	64	55		
63	53	67	57	64	57		

Site 70

San Joaquin River Seepage Management Program

Well or Boring# 70-10 Sampler: Brummer/Lee Date: 4/19/10
 Location(UTM/NAD83) 10S 0713208 4112315 Landform Basin NRCS Map Unit MpA; Merced SiL
 Location Notes about 250 ft South of well MW95 Slightly Saline
 Topography Nearly Level Vegetation & Conditon Alfalfa, Poor-Fair
 Irrigation System Type: Gravity Check Irrigation Quadrant 2/5
 Avg EM Measurements; (T, Cor) EM_V 113.4(135.3) EM_H 98.8(98.8) EM Calibration Site: EM_V 104 EM_H 91
 Soil Temperature, °C (2") 25 °C (16") 17 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-12	CL	33	30	Dk Gry	NE	VM	None				Firm
	12-22	Lt.CL	29	30	Dk Gry	NE	W	None				Varigated Color w/olive gry
	22-29	Lt.CL	27	35	Brn Gry	NE	W	None				
	29-40	SCL	21	52	GryBrn	NE	W	Few				Faint Iron Stains
	40-49	SL	10	70	GryBrn	NE	Sat	Few				Faint Iron Stains
	49-60	LS	4	85	GryBrn	NE	Sat	Few				Faint Iron Stains
361	0-12	20x					23.7		7.81	1.43	51.4	
362	0-12				Ol.Gry		24		7.66	1.55	52	5Y 4/1
364	12-30				Ol.Gry		27.5		7.9	5.4	45.7	5Y 5/2 SAR=12.9
365	30-48				Ol.Gry		13.1		7.89	5.62	27.8	5Y 4/2 SAR=13.9
367	0-15	Calsite11	32				VM:26.4%		7.62	2.03	61.2	Emv=154; Emh=130
368	15-30	Calsite12	34				VM:26.3%		7.83	7.04	67.7	SAR = 18.5

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Water table at 2'2" after 20 minutes
 Capillary Fringe about 12"
 Calsite 11/12:
 0-15" CL; 32% clay; very moist
 15-30" CL; 34% clay; very moist

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H
92	95	98	80
106	99	136	120
92	83	150	121
70	87	96	87
115	96	152	119
91	78	134	110

EM _V	EM _H	EM _V	EM _H
95	79		
104	91*		
130	106		
154	130**Calsite		

Site 71

San Joaquin River Seepage Management Program

Well or Boring# 71-10 Sampler: Brummer/Lee Date: 4/26/10
 Location(UTM/NAD83) 10S 730072 4079781 Landform Low Terrace NRCS Map Unit 282 Tachi
 Location Notes about 260 ft from orchard edge
 Topography Nearly Level Vegetation & Conditon Good Almonds
 Irrigation System Type: Drip Irrigation Quadrant NA
 Avg EM Measurements; (T, Cor) EM_V 70.2(78.2) EM_H 64.9(56.7) EM Calibration Site: EM_V 68 EM_H 62
 Soil Temperature, °C (2") 32 °C (16") 20 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-6	L	23	35	V.Dk Gry	ND	VM	None				Friable
	6-31	Lt.CL	28	35	Dk.Gry	ND	M	None				Firm
	31-49	SiL	22	25	Gry Brn	ND	SM	None				Friable
	49-60	SiCL	31	20	Ol. Gry	ND	SM	Few				V.Firm; Few salts
												V.Faint Mottles
369	0-12	20x					18.6		7.76	1.26	51.2	
370	0-12						21.3		6.71	0.54	46.6	
371	12-30						20.3		6.7	2.65	59.9	
372	30-60						20.6		7.34	2.09	74.9	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Water table 12 ft bgs in nearby well
 About 300 ft NNW of CCID Well; No wt to 5 ft plus

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H
60	60	52	59
70	63	62	69
79	69	66	65
71	68	77	64
82	58	68	58
62	61	73	65

EM _V	EM _H	EM _V	EM _H
83	75	62	66
75	68	74	62
75	71	59	62
74	61	64	73
82	68	68	62*
77	65		

Site 72

San Joaquin River Seepage Management Program

Well or Boring# 72-10 Sampler: Brummer/Lee Date: 4/26/10
 Location(UTM/NAD83) 10S 729721 4079490 Landform Terrace NRCS Map Unit 282 Tachi
 Location Notes 100x50 foot poor crop area
 Topography Nearly Level Vegetation & Conditon Poor spot; yellow stunted Almonds
 Irrigation System Type: Drip Irrigation Quadrant NA
 Avg EM Measurements; (T, Cor) EM_V 159.1(177.2) EM_H 172(150.4) EM Calibration Site: EM_V 179 EM_H 181
 Soil Temperature, °C (2") 32 °C (16") 20 °C ??

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
374	0-15	CL	32	30	Dk.Gry	ND	VM	None				Firm; Calsite 13
375	15-30	CL	36	30	Dk.Gry	ND	VM	None				Firm; Calsite 14
374	0-15	Calsite 13					25.6		7.81	1.48	76.4	
375	15-30	Calsite 14					30.5		7.74	6.22	93.6	SAR 10.2

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:	EM38 Measurements:				EM _V EM _H		EM _V EM _H	
	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H	EM _V	EM _H
Calsite is in stunted tree area; Calsite 13/14	146	158	157	222				
Yellow trees, 50-80 ft from drain.	150	129	144	175				
Water table in obs well355 about 10.3 ft bgs	133	125	178	145				
Owner reports water table rose to 6 ft in well last yr	130	155	147	189				
Owner reports water table brought salts to root zone	152	221	179	181 *				
	257	256 R	135	146 R				
	134	124 T	185	182 T				

Site 73

San Joaquin River Seepage Management Program

Well or Boring# 73-10 Sampler: Brummer/Lee Date: 4/26/10
 Location(UTM/NAD83) 10S 729694 4079575 Landform Terrace/basin rim NRCS Map Unit 282 Tachi
 Location Notes about 240 ft from edge of orchard
 Topography Nearly Level Vegetation & Conditon Fair Almonds, pale green leaves
 Irrigation System Type: Drip Irrigation Quadrant Drip
 Avg EM Measurements; (T, Cor) EM_v 148.8(169.5) EM_H 130.1(120.2) EM Calibration Site: EM_v 132 EM_H 117
 Soil Temperature, °C (2") 29 °C (16") 19 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-6	SiCL	30	25	Dk.Gry	ND	VM	None				Friable
	6-27	H.SiCL	37	20	Dk.Gry	++	M	None				V.Firm; Seg Carbonates
	27-60	HCL	39	30	Dk.Ol.Gry	++	SM	None-Few				Seg.Carbonates increase with depth; V. Firm
376	0-12	20x					22.1		7.82	0.87	68	
377	0-12						22.9		7.73	0.65	69.7	
378	12-30						24.7		7.79	2.3	85.2	
379	30-60						16		7.91	1.97	79.6	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Area is affected by drain backup
 A few faint orange mottles below 40"
 Trees look good but not as good as the trees to the east where Emh are 30-40.
 No water table to 5 ft plus

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H
138	125	148	126
154	130	127	122
152	126	137	119
165	143	132	99
144	129	221	187
172	135	146	141

EM _v	EM _H	EM _v	EM _H
139	124		
127	137		
124	120		
132	117*	Central Boring	
130	119		
169	128		
181	145		

Site 74

San Joaquin River Seepage Management Program

Well or Boring# 74-10 Sampler: Brummer/Dominguez Date: 4/27/10
 Location(UTM/NAD83) 10S 706688 4412604 Landform WS Basin NRCS Map Unit 189 Bolfor CL
 Location Notes about 235 ft from head of field Partially Drained
 Topography Nearly Level Vegetation & Conditon Bare Cotton Beds; pre-irrigated
 Irrigation System Type: Gravity Irrigation Quadrant 2/5
 Avg EM Measurements; (T, Cor) EM_V 69.9(83.4) EM_H 52.1(62.1) EM Calibration Site: EM_V 69 EM_H 50
 Soil Temperature, °C (2") 17 °C (16") 17 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-5	L	23	35	Dk.Gry	+	VM	None				0-1" clay crust cracks
	5-25	HL	26	35	Dk.Gry	++	VM	None				Varegated w/Olive Gry;
	25-44	HL	25	38	Ol.Gry	++	VM	None				Firm
	44-64	Lt.L	15	40	Pale Brn	++	VM-W	Few				V.Friable
	64-66	Lt.CL	28	30	Grey		Sat	None				Gleyed
380	0-12	20x Beds					20.9		7.84	1.49	45.7	On Beds, Rpd 5.9"
381	0-12	20x Furrow					20.2		7.87	1.58	47.2	In Furrows
384	0-12						19.1		7.69	1.94	46.5	
385	12-30						22.1		7.85	2.29	45.9	
386	30-60						21.8		7.92	2.41	36.9	Capillary Fringe Zone

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Water table about 5.3 ft; after 20 minutes 64"
 Saturated at 64"
 5-12" WM Blocky
 Cracks on surface are 2" deep.
 Borings in furrow are about 290 ft W of Obs Well stake BF
 About 600 ft NW of USBR Obs well stake
 Plot on map is accurate; 235 ft into field
 Gps from Google earth;

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H
66	46	62	56
75	52	70	52
89	58	75	54
79	54	72	53
68	55	63	50
62	57	69	52

EM _V	EM _H	EM _V	EM _H
68	51		
68	44		
66	43		
65	63		
69	50*		
68	48		
75	53		

Site 75

San Joaquin River Seepage Management Program

Well or Boring# 75-10 Sampler: Brummer/Dominguez Date: 4/27/10
 Location(UTM/NAD83) 10S 712174 4110871 Landform Low Terrace NRCS Map Unit MpA Merced SiL
 Location Notes about 230 from field edge Slightly Saline
 Topography Nearly Level Vegetation & Conditon Wheat stubble, disked, silage
 Irrigation System Type: Gravity Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_V 84.2(98.1) EM_H 60.5(63.1) EM Calibration Site: EM_V 102 EM_H 69
 Soil Temperature, °C (2") 23 °C (16") 18 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-4	FSL	15	52	BmGry	ND	M	None				Dry to 2"; Friable
	4-20	L	21	38	BmGry	ND	M	None				MM Blocky
	20-31	L	25	40	Dk Gry	ND	VM	None				Buried A horizon
	31-49	Lt.L	16	50	BmGry	ND	VM	None				Very Friable
	49-66	Lt.SiCL	28	20	(drab)Grey	ND	VM	Few				Faint orange mottles
387	0-12	30x					14.2		7.73	3.13	43.6	
388	0-12						13.1		7.72	3.04	43.3	
389	12-30						20.6		7.72	9.89	48.1	SAR=9.3
390	30-60						23.7		7.69	7.64	52.2	SAR=9.1

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

EM readings are variable; sand streaks in the area
 49-60" has faint orange mottles on drab grey background
 Water table is 5.4 ft bgs after 15 minutes
 46-66" may be capillary fringe

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H
115	91	48	38
107	75	60	55
85	58	104	71
77	52	84	68
78	54	31	20
105	76	84	56

EM _V	EM _H	EM _V	EM _H
100	70	41	26
125	89	79	59
129	93		
85	61		
102	69*		
47	28		

Site 76

San Joaquin River Seepage Management Program

Well or Boring# 76-10 Sampler: Brummer/Dominguez Date: 4/27/10
 Location(UTM/NAD83) 10S 739814 4073740 Landform Low Terrace NRCS Map Unit Cr, Chino Loam
 Location Notes 260 ft from edge of orchard
 Topography Nearly Level Vegetation & Conditon Pistaccios; Fair
 Irrigation System Type: Drip Irrigation Quadrant NA
 Avg EM Measurements; (T, Cor) EM_V 37.9(43.2) EM_H 50.4(52.6) EM Calibration Site: EM_V 41 EM_H 67
 Soil Temperature, °C (2") 23 °C (16") 19 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-6	Lt.L	15	38	BmGry	0	M	None				Friable
	6-25	L	18	38	BmGry	0	VM	None				WF Blocky
	25-40	SiL	19	25	BmGry	0	M	Few				Very Faint Iron Stains
	40-59	L	16	45	Bm	0	M	Few				Stratified SiL/L/FSL
	59-63	LS	3	92	Grey	0	M	Few				Poor Recovery
391	0-12	30x					15.1		7.64	11.3	44.3	SAR=11.8
392	0-12						15.1		7.43	9.23	44.1	SAR=8.4
394	12-30						15.2		7.77	5.02	49.8	SAR=12.8
395	30-60						12.5		8.12	2.19	43.3	
396	0-15	Calsite15 - Loam, 16% clay					16.9		7.2	15.5	46.5	6x SAR=12.1
397	15-30	Calsite16 - Loam, 16% clay					20.1		7.92	1.8	42.9	5x

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Cal EMV = 42 Cal EMH = 104
 Calsited is 30 ft to south edge of Dripline
 Salts on surface on dripline edges
 No water table to 63"
 Obs1 = 3.5 ft to wt bgs
 Obs2 = 6.9 ft to wt bgs

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H
41	60	30	40
59	68	44	50
36	46	17	33
24	39	41	51
40	48	34	34
52	44	31	46

EM _V	EM _H	EM _V	EM _H
29	53	41	67*
39	50	33	40
59	58	37	46
26	48	45	48
36	73	22	61
56	56		

Site 77

San Joaquin River Seepage Management Program

Well or Boring# 77-10 Sampler: Brunner Date: 4/30/10
 Location(UTM/NAD83) 10S 744554 4073219 Landform Low Terrace NRCS Map Unit CfA; Chino FSL
 Location Notes 150 ft from first T-Pole
 Topography Nearly Level Vegetation & Conditon _____ Grapes: good crop & vigor
 Irrigation System Type: Drip Irrigation Quadrant NA
 Avg EM Measurements; (T, Cor) EM_V 58.2(67.8) EM_H 35.4(38.6) EM Calibration Site: EM_V 67 EM_H 45
 Soil Temperature, °C (2") 21 °C (16") 18 °C ?

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color 10YR	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:	
398	0-15	SiL	21	25	BrnGry;4/1	0	M	None				Friable; 5x comp	
399	15-30	Lt.L	18	35	BrnGry;4/1	0	M	None				Friable; 5x comp	
	30-36	Lt.L	15	50	BrnGry;4/1	0	M	None					
398	0-15	Calsite 17	EM is on center of rows					18.5		7.39	0.93	54.7	
399	15-30	Calsite 18						25.2		7.05	1.26	54.5	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Areas near canal have salts showing on vine beds
 Salts decrease with distance from canal
 Drain sump appears in-operable
 Few salts on surface to the south. EM Cal could be questionable due to powerline or metal trellis
 EM near powerline is marked as **
 EM 200 ft from powerline is marked as *

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H
36	25	56	28
38	32	59	28
46	29	70	44
50	32	67	39
55	29	72	41
52	30 **	73	46

EM _V	EM _H	EM _V	EM _H
74	48	62	32
67	45*	63	33
41	33		
48	29		
58	34		
54	34		

Site 78

San Joaquin River Seepage Management Program

Well or Boring# 78-10 Sampler: Brunner Date: 5/6/10
 Location(UTM/NAD83) 10S 715346 4111452 Landform Basin Rim NRCS Map Unit FrA; Fresno L
 Location Notes about 200 ft from head of field Moderately Saline
 Topography Nearly Level Vegetation & Conditon Grain silage stubble
 Irrigation System Type: Gravity Irrigation Quadrant 1/5
 Avg EM Measurements: (T, Cor) EM_v _____ EM_H _____ EM Calibration Site: EM_v _____ EM_H _____
 Soil Temperature, °C (2") _____ (16") _____

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
NS	0-36	L	18	40			M-VM					Friable
NS	36	Hardpan										Lime-Silica Hardpan

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks: Stopped by hardpan in 4 different borings in the NE portion of this field. Hardpan limits rootzone. Field is not adequately ripped no salinity data at this site

EM38 Measurements:	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H	EM _v	EM _H

Site 79

San Joaquin River Seepage Management Program

Well or Boring# 79-10 Sampler: Brummer/Lee Date: 5/8/10
 Location(UTM/NAD83) 10S 714907 4111237 Landform Basin Rim NRCS Map Unit FrA, Fresno Loam
 Location Notes about 250 ft from tail of field; about 700 ft from levee Moderately Saline
 Topography Nearly Level Vegetation & Condition Poor wheat, bare & grasses
 Irrigation System Type: Gravity Irrigation Quadrant 4/5
 Avg EM Measurements; (T, Cor) EM_V 78.6(91.6) EM_H 82.2(91.5) EM Calibration Site: EM_V 82 EM_H 90
 Soil Temperature, °C (2") 20 °C (16") 18 °C

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-11	L	21	40	Lt. Gry	NE	M	None				Friable
	11-40	SL	9	65	GryBrn	NE	M-VM	None				Many HP Fragments, V.Hard
	40-48	FSL	12	55	GryBrn	NE	W	None				Softly Consolidated
	48-57	FSL	11	58	GryBrn	NE	Sat	None				Common Carbonates
	57-63	SL	8	68	GryBrn	NE	Sat	None				
403	0-12	22x					26.7		8.07	7.13	45.2	SAR=17.5
404	0-12						26.6		7.9	8.2	44.7	SAR=21.0
405	12-30						29.3		7.95	6.28	44.9	SAR=11.5
406	30-48						26.5		8.25	2.46	35.6	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong NE=Not Evaluated

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Nearly stopped by hardpan at 25"
 Too wet to harvest 80 ft to the southwest
 Few faint mottles in hardpan fragments just above HP layer
 Water table at 2.4 ft after 20 minutes
 Stopped by HP in 4 different locations to the NE
 in this same field; HP 20-36"
 lime silica cemented hardpan

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H
84	76	90	99
77	76	69	83
80	73	67	57
81	78	73	89
88	80	63	81
85	93	79	96

EM _V	EM _H	EM _V	EM _H
86	132		
75	53		
76	75		
74	67		
82	90*		
86	82		

Site 80

San Joaquin River Seepage Management Program

Well or Boring# 80-11 Sampler: brummer, hernandez Date: 3/10/2011
 location wgs84 0733822 4076266 Landform low terrace NRCS Map Unit 320 El nido sl
 Location Notes 300 feet north of well site mw130; 1st row east of stake drained
 Topography nearly level Vegetation & Conditon young almonds good; alfalfa in inter row
 Irrigation System Type: drip Irrigation Quadrant na
 Avg EM Measurements; (tcor25c EM_v 53 EM_H 38 EM Calibration Site: EM_v 51 Emh 38.5
 Root depth inches coarse alfalfa roots to 60in plus Soil Temperature, °C (2") 18 (16") 15

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-12	loam	19	35	dkgray	0	moist	none				v friable
	12to29	sil	23	20	vdgray	0	vm	none				friable; common roots
	29-43	lt loam	16	40	brown	0	moist	none				v friable
	43-60	SiC	42	20	gray	++	s moist	none				v firm; drab; common seg carbs
428	0-12 30x						16.8		7.56	1.27		
429	0-12						16.4		7.2	1.05		
430	12to30						25.6		7.46	2.96		
431	30-60						19.5		7.8	2.17		

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

gray salts on beds
 site in center of inter row
 no sign of cap fringe or water table to 60 in
 no rust mottles in profile
 it appears that subsoil was mixed into tree rows. (trenching)?

EM38 Measurements:			
EM _v	EM _H	EM _v	EM _H
52	41	57	40
51	37	51	36
55	38	56	31
42	32	51	37
64	46	55	41
63	43	41	34
51 39*		51 38*	

Site 81

San Joaquin River Seepage Management Program

Well or Boring# 81-11 Sampler: brummer / hernandez Date: 3/10/2011
 location wgs84 0733498 4076819 Landform low terrace NRCS Map Unit 325 palazzo sl
 Location Notes 300 feet from ccid well; 2 rows east of well drained
 Topography nearly level Vegetation & Conditon young almonds; alfalfa in interrow
 Irrigation System Type: drip Irrigation Quadrant na
 Avg EM Measurements; (tcor25c EM_v 34 EM_H 29 EM Calibration Site: EM_v 27 Emh 21
 Root depth inches alfalfa roots to about 2 feet Soil Temperature, °C (2") 20 (16") 16

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-14	loam	20	40	dkbrgr	0	m-v	none				friable
	14to26	sl	14	58	dkgrbr	0	vm	none				v friable
	26-39	ls	4	84	brown	0	vm	none				v friable
	39-60	sand	1	98	ltbrgr	0	moist	none				loose, single grained
433	0-12 30x						21.1		7.41	1.04	46.4	
434	0-12						18.4		7.44	0.73	40.6	
435	12to30						17.3		7.54	0.32	27	
436	30-60						3.6		7.82	0.14	32	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

no sign of cap fringe or water table to 60 inches
 water table in nearby ccid well about 13.2 feet bgs
 subsoil mixed into tree beds
 site in middle of inter row
 good mature almonds 450 feet to northeast

EM38 Measurements:			
EM _v	EM _H	EM _v	EM _H
27	24	27	26
22	21	25	21
26	22	24	25b
32	27	37	30
35	30	48	41
25	20	53	45
27	22	57	49
33	36bedtop	51	41

Site 82

San Joaquin River Seepage Management Program

Well or Boring# 82-11 Sampler: brummer ,hernandez Date: 3/10/2011
 location wgs84 0734475 4076599 Landform low terrace NRCS Map Unit 320 el nido sl
 Location Notes 200 feet from end of orchard; about 320 feet nw of well site drained
 Topography nearly level Vegetation & Conditon fair almonds
 Irrigation System Type: micro sprinkler Irrigation Quadrant na
 Avg EM Measurements; (tcor25c EM_v 24 EM_H 19 EM Calibration Site: EM_v 23 Emh 18
 Root depth inches roots to 32 inches Soil Temperature, °C (2") 18 (16") 14

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-20	sl	10	68	grbrown	0	vm	none				v friable
	20-32	sl	14	60	grbrown	0	vm	none				v friable
	32-46	sand	1	96	ltbrown	ne	vm	none				single grained; loose
	46-64	sand	1	96	ltbrgray	ne	vm	none				contains fsl lenses
	64-76	sand	2	95	brown	ne	vm	none				wet fsl lense at 68-70 in
438	0-12 30x						15.4		7.63	1.18	31.2	
439	0-12						14.8		7.62	0.86	30.5	
440	12to30						13.3		7.58	1.98	25.3	
441	30-60						9.2		7.13	5.35	23.4	sar 15.3 gypsum content 0.0

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

no water table to 76 in after 15 minutes
 site in interow at edge of canopy
 fsl lenses are above field capacity
 may be wet from boundary conditions
 water table in ccid well about 1000 feet noth is about 10.2 feet bgs

EM38 Measurements:			
EM _v	EM _H	EM _v	EM _H
23	18*	28	20
23	18*	9	12 outlier
22	19	25	22
24	17	22	17
23	18	19	15
23	19	21	14
27	24	32	23
		27	25

Site 83

San Joaquin River Seepage Management Program

Well or Boring# 83-11 Sampler: brummer / hernandez Date: 3/10/2011
 location wgs84 0732587 40775231 Landform basin rim NRCS Map Unit 282 tachi clay
 Location Notes 200 feet east of ccid well
 Topography nearly level Vegetation & Conditon young almonds alfalfa in interows
 Irrigation System Type: drip Irrigation Quadrant na
 Avg EM Measurements; (tcor25c EM_v 96 EM_H 78 EM Calibration Site: EM_v 95.5 Emh 79.5
 Root depth inches coarse alfalfa roots to 60 in plus Soil Temperature, °C (2") 22 (16") 15

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-15	hcl	38	30	dkgray	trace	vm	none				firm, sticky
	15to28	sicl	35	25	dkgray	+	vm	none				firm
	28-60	clay	43	28	dkgray	++	m-sm	none				firm;segregated carbonates
443	0-12 26x						26.8		7.54	1.11	64.5	
444	0-12						26.3		7.53	0.84	68.1	
445	12to30						26.7		7.67	2.93	66.7	
446	30-60						20.8		7.93	3.04	82.8	sar 16.9 gypsum 0.0

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight.

Site Remarks:

no cap fringe or water table to 60 inches
 soil recovery difficult in comp sample
 water table was about 11 feet bgs in ccid well 200 feet to west

EM38 Measurements:			
EM _v	EM _H	EM _v	EM _H
102	93	101	82
113	94	90	75
108	96	106	85
83	70b	114	93
89	70	110	98
40	34	95	78*
		96	81*

Site 84

San Joaquin River Seepage Management Program

Well or Boring# 84-11 Sampler: brummer / hernandez Date: 3-18=2011
 location wgs84 1715190e 411 2578n Landform basin NRCS Map Unit fresno
 Location Notes 200 feet west of bird house
 Topography nearly level Vegetation & Conditon young pistaccios
 Irrigation System Type: micro sprinklers Irrigation Quadrant _____
 Avg EM Measurements; (tcor25c EM_v 71 EM_H 64 EM Calibration Site: EM_v 92 Emh 75
 Root depth inches grass roots to 30 inches Soil Temperature, °C (2") 14 (16") 14

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-15	loam	20	40	dkgr	++	m-v	none				very friable
	15-22	silt loam	23	25	brgray	++	vm	none				friable
	22-46	loam	24	35	dkolbr	+	vm-wet	none				friable
	46-60	loam	15	45	olbrown	++	sat	none				slow k, Hp fragments
458	0-12 15x tr	tree row					16.6		8.11	9.73	32.4	sar 19.4 gypsum 0.0
459	0-12 15xIR	inter row					17.9		8.36	7.13	35.8	sar 29.4 gypsum 0.0
460	0-12						13.9		8.39	5.45	33.7	sar 25.5 gypsum 0.0
461	12to30						18.2		8.75	6.58	41.2	sar 63.3 gypsum 0.0
462	30-60						21.4		8.72	7.22	29.8	sar 80.2 gypsum 0.0

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. numeric values indicate percent moisture by weight

Site Remarks:

tree beds are about 8 inches higher than boring site
 capillary fringe at 28 inches
 free water at 46 inches
 common hardpan fragments below 46 inches
 water table 3 feet 9 inches at site; 4 feet 5 inches below tree berm; after 15 minutes

EM38 Measurements:			
EM _v	EM _H	EM _v	EM _H
91	62	90	50
69	45	74	68
60	40	76	72
86	69	52	56b
67	73	65	90b
55	46	62	82b
67	56	74	53b
79	82	21	56b
99	76	27	50b
104	85	92	75*

Site 85

San Joaquin River Seepage Management Program

Well or Boring# 85-11 Sampler: brummer / hernandez Date: 3/18/2011
 location wgs84 0716410e 4111659n Landform basin rim NRCS Map Unit fresno
 Location Notes 250 feet from road; about 700 feet se of obswell mw-116
 Topography nearly level Vegetation & Condition fair alfalfa
 Irrigation System Type: gravity / check Irrigation Quadrant 3/5
 Avg EM Measurements; (tcor25c EM_V _____ EM_H _____ EM Calibration Site: EM_V 34 Emh 26
 Root depth inches _____ Soil Temperature, °C (2") 14 (16") 12

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-15	loam	20	38	brgray	++	moist	none				friable
	15-26	hsl	16	55	brgray	++	moist	none				friable
	26-36	chsl	10	68	brown	++	moist	none				slightly cemented; hp fragments
	36-42	hsl	18	52	brown	+++	very moist	none				slightly cemented , hp fragments
475	0-12 30x						22.1		8.25	1.09	36.2	carlos
476	0-12 30x rep						22		8.3	0.93	39.5	joe, field replicate
477	0-12						22.5		8.23	1.18	38.5	
478	12to30						23.3		8.35	0.83	34.5	
479	30-45						27.4		8.48	0.89	37.4	capillary fringe zone.

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

26-45in contains hardan fragments
 stopped by lime silica hardpan at 45 inches
 26-45in cemented and somewhat consolidated
 no sign of water table to 45 inches

EM38 Measurements: EM _V		EM _H		EM _V		EM _H	
	33		26		46		42
	31		22		48		37
	44		34		36		29
	42		31		40		31
	33		34		28		21
	34		26		29		22

34 26*

Site 86

San Joaquin River Seepage Management Program

Well or Boring# 86-11 Sampler: brummer / dominguez Date: 3/31/2011
 location wgs84 0716357 4105337 Landform low terrace NRCS Map Unit 228 palazzo sl
 Location Notes 250 feet into field p drained
 Topography _____ Vegetation & Conditon alfalfa , old stand
 Irrigation System Type: gravity / check Irrigation Quadrant 3//5
 Avg EM Measurements; (tcor25c EM_v 59 EM_H 42 EM Calibration Site: EM_v 65 Emh 45
 Root depth inches roots to 64 inches plus Soil Temperature, °C (2") 16 (16") 16

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-14	sil	25	20	vdkgray	0	wet	none				firm
	14-26	sicl	29	20	vdkgray	0	vm	none				firm
	26-40	sil	27	20	grbrown	0	vm	none				firm
	40-48	loam	18	35	grbrown	+	vm	none				friable
	48-60	fsl	16	55	grbrown	+	wet	common				rust mottles; friable
ns	60-64	sil	24	20	dkgray	ne	wet-sat	common				
482	0-12 20x						25.2		7.17	0.92	42.6	
483	0-12						29.5		7.12	0.9	45.2	
484	12to30						26.2		7.41	0.94	37.8	
485	30-60						33.5		7.72	2.27	43	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

capillary fringe at 48 inches
 water table 61 inches BGS after 15 minutes
 river flow over 2000 cfs
 capillary fringe about 14 inches thick field observation
 lab data suggest cap fringe is 4 feet thick.

EM38 Measurements:			
EM _v	EM _H	EM _v	EM _H
64	45	58	43
62	44	51	40
63	44	57	42
52	38	59	42
60	42	65	46
54	37	58	41
60	43	65	45*

Site 87

San Joaquin River Seepage Management Program

Well or Boring# 87-11 Sampler: brummer dominguez Date: 3/31/2011
 location wgs84 0716724 4105380 Landform low terrace NRCS Map Unit 228 palazzo sl
 Location Notes about 250 feet from tail ditch and 400 feet from ccid well 190 partially drained
 Topography nearly level Vegetation & Conditon fallow; cotton beds
 Irrigation System Type: gravity furrow Irrigation Quadrant 3//5
 Avg EM Measurements; (tcor25c EM_v 59 EM_H 39 EM Calibration Site: EM_v 59 Emh 43
 Root depth inches root channels to 40 inches Soil Temperature, °C (2") 23 (16") 19

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-8	loam	18	40	brgr	trace	vmoist	none				very friable
	8to15	fsl	12	60	brgray	trace	vmoist	none				very friable
	15-28	loam	17	45	dkgray	trace	vmoist	none-few				rust mottles at 24 inches
	28-46	sil	20	28	dkgray	+	moist	few				faint rust mottles seg carbs
	46-60	sil	23	25	olive gr	+	moist	none				seg carbonates; firm
486	0-12 20x						18.2		7.34	1.12	38.5	50/50 furrows/ beds
487	0-12						15.4		6.92	0.78	32.8	
488	12to30						28.3		7.26	3.24	46.1	sar 5.7 gypsum 0.0
489	30-60						23.9		7.49	3.53	58	sar 5.7 gypsum 0.0

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

water table depth in CCID well 190 is 8.3 feet; about 7.8feet bgs
 no sign of water table or capillary fringe in soil boring
 profile is micacious

EM38 Measurements:			
EM _v	EM _H	EM _v	EM _H
61	37	75	46
57	37	68	42
61	37	53	33
63	42	59	43
59	43	50	32
59	43	48	28

Site 88

San Joaquin River Seepage Management Program

Well or Boring# 88-11 Sampler: brummer dominguez Date: 3/31/2011
 location wgs84 0717105 4104884 Landform floodplain NRCS Map Unit 178 el nido sl
 Location Notes 350 feet sw of well poorly drained
 Topography nearly level Vegetation & Conditon cotton beds
 Irrigation System Type: gravity / furrow Irrigation Quadrant 4/5
 Avg EM Measurements; (tcor25c EM_v 39 EM_H 23 EM Calibration Site: EM_v 40 Emh 24
 Root depth inches _____ Soil Temperature, °C (2") 27 (16") 18

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-14	fsl	10	62	brgray	0	vm	none				very friable
	14-27	sl	8	65	brgray	0	vm	none				very friable
	27-44	ltloam	14	48	gray	0	moist	none-few				drab color
	44-60	hloam	25	30	dkgray	0	s moist	few				firm;faint iron mottles,drab
491	0-12 20x						16.8		7.1	0.8	31.6	50/50 beds/furrows
492	0-12						17.8		7	0.44	32.7	
493	12to30						13.4		7.58	1.69	33	
494	30-60						18.4		7.47	2.26	49	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

rust mottles at 40 inches
 no sign of water table of cap fringe to 60 inches
 about 500 feet from river
 boring in furrow
 27-44 vsl in spots
 44-60 few segregated carbonates; profile is micacious
 water table in ccid well 0.5 downstream is about 3 feet bgs

EM38 Measurements:			
EM _v	EM _H	EM _v	EM _H
41	26	35	21
40	23	37	24
42	23	37	22
34	18	33	21
38	22	47	28
38	21	40	24

Site 89

San Joaquin River Seepage Management Program

Well or Boring# 89-11 Sampler: brummer /dominguez Date: 3/31/2011
 location wgs84 07010940 4111180 Landform floodplain NRCS Map Unit columbia soils
 Location Notes near river; 400 feet ne of pump channelled
 Topography nearly level Vegetation & Conditon alfalfa; good
 Irrigation System Type: gravity Irrigation Quadrant 2/5
 Avg EM Measurements; (tcor25c EM_V 52 EM_H 35 EM Calibration Site: EM_V 55 Emh 37
 Root depth inches roots to 48 inches Soil Temperature, °C (2") 18 (16") 14

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-19	fsl	10	62	brgray	0	vmoist	none				very friable
	19-38	loam	24	30	vdkgray	0	vmoist	none				buried surface soil
	38-50	h loam	25	35	olive gray	++	vm-wet	none				firm; segregated carbonates
	50-60	h loam	26	30	olive gray	+++	wet-sat	none				firm; segregated carbonates
496	0-12 20x						17.7		6.69	0.47	29.3	dominguez
497	0-12 20xrep						16.6		6.66	0.45	26.8	brummer
498	0-12						18		7.36	0.94	31.3	
499	12to30						33.3		7.24	0.73	41.5	
500	30-60						27.6		8.08	1.34	49.8	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

cap fringe at 48 inches
 42-60 in; contains hardpan fragments
 suction at 54 inches
 water table 52 inches after 20 minutes

EM38 Measurements:			
EM _V	EM _H	EM _V	EM _H
61	43	57	38
53	35	56	37
39	24	53	35
51	33	50	34
51	32	50	33
52	34	55*	37

Site 90

San Joaquin River Seepage Management Program

Well or Boring# 90-11 Sampler: brummer Date: 4/1/2011
 location wgs84 0710005 4112976 Landform floodplain NRCS Map Unit merced cl
 Location Notes 350 feet from tail of field; field is leveled in cut area about 18 inches below field to the west slightly saline
 Topography nearly level Vegetation & Condition fallow
 Irrigation System Type: gravity Irrigation Quadrant 3/5 or 4/5
 Avg EM Measurements; (tcor25c EM_v 138 EM_H 134 EM Calibration Site: EM_v 148 Emh 144
 Root depth inches _____ Soil Temperature, °C (2") 23 (16") 18

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-15	h loam	24	30	dkgray	++	wet	none				friable to firm
	15-32	lt cl	28	40	brown	++	vmoist	none				firm
	32-40	loam	20	38	olive brown	++	wet	few				few hp fragments
	40-45	loam	20	38	olbrown	++	sat	few				common hp fragments
501	0-12 20x						24.5		7.92	5.53	39.5	sar 10.8 gypsum 0.0
502	0-12						24.6		7.91	5.87	39.9	sar 11.1 gypsum 0.0
503	12 to 30						22.5		7.77	12.7	32.9	sar 14.7 gypsum 0.0
504	30-44						21.1		7.83	9.15	35.2	sar 10.5 gypsum 0.0

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

cap fringe extends nearly to soil surface
 water table 18 inches after 30 minutes
 32-45in very faint rust mottles; segregated carbonates; cemented fragments
 psa sample at 24 inches
 sand 56
 silt 25
 clay 19
 heavy sandy loam (USDA)

EM38 Measurements:			
EM _v	EM _H	EM _v	EM _H
140	170	150	142
144	143	154	146
124	103	118	134
144	145	128	124
148	156	109	103
122	123	147	137
101	94	158	127
167	147	148	144

Site 91

San Joaquin River Seepage Management Program

Well or Boring# 91-11 Sampler: brummer Date: 4/1/2011
 location wgs84 0709974 4114980 Landform basin NRCS Map Unit merced clay
 Location Notes about .25 miles from eastside bypass slightly saline
 Topography nearly level Vegetation & Conditon good alfafa
 Irrigation System Type: gravity / check Irrigation Quadrant 3/5
 Avg EM Measurements; (tcor25c EM_V 191 EM_H 164 EM Calibration Site: EM_V 189 Emh 152
 Root depth inches _____ Soil Temperature, °C (2") 18 (16") 16

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-17	loam	25	30	dkgray	++	vmoist	none				firm
	17-33	sl	12	65	brown	++	wet	none				friable
	33-45	loam	17	43	brown	++	saturated	few				friable
	45-66	loam	20	40	brown	++	saturated	few				60-66in poor returns
506	0-12 20x						25.7		7.99	6.26	42.4	sar 16.0 gypsum 0.0
507	0-12						22		8.13	4.37	41.7	sar 19.1 gypsum 0.0
508	12to30						22.4		8.18	15.4	22.3	sar 48.6 gypsum 0.0
509	30-60						26.8		8.19	15.3	26	sar 51.8 gypsum 0.0

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent soil moisture by weight

Site Remarks:

water in nearby drain about 3 feet below ground surface
 33-45in; few faint rust mottles
 suction at 33 inches
 wt 24 inches after 30 minutes
 cap fringe at about 17 inches

EM38 Measurements:			
EM _V	EM _H	EM _V	EM _H
183	159	200	170
195	145	190	159
180	180	194	154
179	139	192	173
189	160	194	176
201	204	189*	152

Site 92

San Joaquin River Seepage Management Program

Well or Boring# 92-11 Sampler: brummer Date: 4/1/2011
 location wgs84 0708928 4114999 Landform basin NRCS Map Unit merced cl
 Location Notes 100 yards east of chamberlin road slightly saline
 Topography nearly level Vegetation & Conditon good alfalfa
 Irrigation System Type: gravity Irrigation Quadrant 4/5
 Avg EM Measurements; (tcor25c EM_V 102 EM_H 84 EM Calibration Site: EM_V 120 Emh 96
 Root depth inches _____ Soil Temperature, °C (2") 22 (16") 18

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-18	cl	30	30	dkgray	ne	vm	none				firm
	18-36	cl	32	25	olivegray		vm	none				firm
510	0-18	3x					22.4		7.29	1.77	50.5	calsite
511	18-36	3x					25		7.61	4.34	50.2	sar 8.4 gypsum 0.0

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight.

Site Remarks:

em38 had trouble balancing; phase balance
 water table over 36 inches
 calsite is in fill area; somewhat elevated relative to adjacent field

EM38 Measurements:		EM _V	EM _H	EM _V	EM _H
		122	101	91	78
		123	100	93	76
		120*	96	102	86
		102	81	111	90
		89	69	106	92
		84	69	104	82
		82	67	99	85

Site 93

San Joaquin River Seepage Management Program

Well or Boring# 93-11 Sampler: brummer / dominguez Date: 4/12/2011
 location wgs84 0706811e 4114311n Landform basin NRCS Map Unit mpa merced sil
 Location Notes 200 feet from tail of field; about 500 feet from old river overwashed
 Topography nearly level Vegetation & Conditon good young alfalfa
 Irrigation System Type: gravity check Irrigation Quadrant 4/5
 Avg EM Measurements; (tcor25c EM_V 102 EM_H 74 EM Calibration Site: EM_V 102 Emh 75
 Root depth inches common roots to 39 inches Soil Temperature, °C (2") 17c (16") 16c

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-18	ltcl	28	40	dkgray	trace	moist	none				firm
	18-39	scl	29	50	brgray	+	vm	none				common roots;firm
	39-51	loam	24	40	olivegr	++	vm	few				segregated carbonates; faint rust
	51-60	loam	25	35	olivegr	++	wet-sat	common				common carbs; hp frags; mottles
532	0-12 20x						21.3		7.52	1.71	45.2	
533	0-12						19		6.64	1.46	45.5	
534	12to30						22.7		7.79	3.14	45.7	sar 12.4 gypsum 0.0
535	30-60						21.6		7.97	7.79	40	sar 16.2 gypsum 0.0

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

psa 28 inches; 27/50
 12-39in; lt cl in spots;
 water table is 53 inches bgs after 15 minutes
 cap fringe less than 1 foot thick

EM38 Measurements:			
EM _V	EM _H	EM _V	EM _H
114	81	104	82
100	69	105	87
90	63	108	82
85	62	109	75
81	65	109	72
103	76	110	76
		102*	75

Site 94

San Joaquin River Seepage Management Program

Well or Boring# 94-11 Sampler: brummer / dominguez Date: 4/12/2011
 location wgs84 0706396e 4116632n Landform basin NRCS Map Unit mma merced cl
 Location Notes 250 feet from head of field slightly saline
 Topography nearly level Vegetation & Conditon good alfalfa; young stand
 Irrigation System Type: gravity check Irrigation Quadrant 2/5
 Avg EM Measurements; (tcor25c EM_v 99 EM_H 79 EM Calibration Site: EM_v 94 Emh 73
 Root depth inches roots to 30 inches plus Soil Temperature, °C (2") 18 (16") 17

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-17	clay	45	22	vdkggray	+	moist	none				very firm
	17-35	SiC	47	15	olgray	++	vm	none				segregated carbonates
	35-52	cl	32	25	olgray	+++	vm-wet	few				rust mottles; seg carbonates
	52-60	cl	30	30	olgray	+++	saturated	few				rust mottles
538	0-12 20x						25.5		7.83	1.07	63.3	
539	0-12						23		7.7	1.13	64.1	
540	12to30						25.2		8.06	1.38	65.9	
541	30-60						30.2		8.01	2.85	57.3	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

psa 11inches; 46% clay, 15 % sand, 39% silt
 cap fringe zone less than 12 in thick
 water table 42in after 15 minutes
 52-60in few rust mottles; cemented frags; segregated carbonates; too wet to sample

EM38 Measurements:		EM _v	EM _H	EM _v	EM _H
		93	76	83	65
		96	87	83	72
		121	91	80	64
		127	96	97	77
		116	92	95	71
		108	85	94*	73

Site 95

San Joaquin River Seepage Management Program

Well or Boring# 95-11 Sampler: brummer / lee Date: 4/18/2011
 location wgs84 36.80062 120.16115 Landform low terrace NRCS Map Unit _____
 Location Notes 180 feet ne of road; about 220 feet from river
 Topography nearly level Vegetation & Conditon walnuts; poor; many skips in area
 Irrigation System Type: gravity Irrigation Quadrant 3/5
 Avg EM Measurements; (tcor25c EM_v 6 EM_H 5 EM Calibration Site: EM_v 5.1 Emh 3.9
 Root depth inches roots to 7 feet plus Soil Temperature, °C (2") 28 (16") 20

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-15	fsl	8	65	brgray	0	moist	none				fine and very fine sand fraction
	15-34	ltfsl	5	75	grbrown	0	vm	none				single grained; loose
	34-59	ls	4	82	ltgray	0	vm	none				single grained; loose
	59-92	ltloam	15	45	brgray	0	wet-sat	common				rust mottles; v friable
	92-96	sand	2	92	grbrown	0	saturated	common				rust mottles; v friable
625	0-12 20x						12.1		6.28	0.26	40	
626	0-12						9.2		7.29	0.45	40.8	
627	12to30						8.2		6.83	0.18	43.1	
628	30-60						10.4		7.24	0.25	40.4	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight.

Site Remarks:

psa at 84 inches: sand 32%; silt 62%; clay 6%; light silt loam
 hp fragments on soil surface
 profile is micacious
 site is next to walnut stump
 cap fringe 59-75 inches
 calcarious hardpan frags on surface are not related to soil; must be soil ammendment
 water table 75 inches after 15 minutes

EM38 Measurements:		EM _v	EM _H	EM _v	EM _H
		4.9	3.9	5.5	4.5
		6.9	5	4.5	3.2
		6.8	5.6	3.6	2.8
		6.4	4.1	8.2	7.5
		9	6.8	4.1	4.4
		6.2	4.3	5.1*	3.9

Site 96

San Joaquin River Seepage Management Program

Well or Boring# 96-11 Sampler: brummer // dominguez Date: 4/21/2011
 location wgs84 36.76647 120.26504 Landform low terrace NRCS Map Unit _____
 Location Notes about 250 feet into field
 Topography nearly level Vegetation & Condition fair alfalfa
 Irrigation System Type: gravity check Irrigation Quadrant 3/5
 Avg EM Measurements; (tcor25c EM_V 12 EM_H 10 EM Calibration Site: EM_V 16.2 Emh 9.7
 Root depth inches _____ Soil Temperature, °C (2") 26 (16") 21

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-12	lt loam	16	40	brgray	0	s moist	none				v friable
	12to26	sil	21	25	brgray	0	moist	none				friable
	26-50	co sand	1	98	redbrn	0	sm-m	few				rust stains
	50-60	gr sand	0	98	redbrn	0	vm-wet	common				rust stains; 20 percent gravel
629	0-12 20x						8.2		6.92	0.68	39.1	
630	0-12						9.9		6.97	0.59	38.2	
631	12to30						13.4		7.34	0.97	33.1	
632	30-60						7		7.45	0.41	28.8	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight.

Site Remarks:

water table 56 inches after 20 minutes
 river flow at 6400 cfs
 near earlier exploration boring ls2
 26-50in 10-15 percent fine gravel
 cap fringe about 6 inches thick

EM38 Measurements:			
EM _V	EM _H	EM _V	EM _H
12.7	11.7	8.4	7.9
14.4	11.4	7.4	7.2
13.9	11.5	12.2	9.8
8.4	9	13.1	11.9
7.5	6.9	16.8	13.8
7.4	6.6	9.7	11.2
13.3	11.5	10.2	9.7

Site 97

San Joaquin River Seepage Management Program

Well or Boring# 97-11 Sampler: brummer / dominguez Date: 4/21/2011
 location wgs84 36.76875 120.23832 Landform flood plain NRCS Map Unit _____
 Location Notes about 300 feet from well fa7
 Topography nearly level Vegetation & Conditon good almonds
 Irrigation System Type: gravity Irrigation Quadrant 2/5
 Avg EM Measurements; (tcor25c EM_V 67 EM_H 59 EM Calibration Site: EM_V 70.1 Emh 63.2
 Root depth inches roots to 60 inches plus Soil Temperature, °C (2") 18 (16") 18

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-18	loam	19	32	dkgray	0	vm	none				friable
	18-56	sil	21	27	brgray	0	wet	few				loam in spots
	56-60	hsil	25	20	brgray	0	saturated	few				
635	0-12 20x						27.4		7.46	3.46	34.4	sar 4.6 gypsum 0.0
636	0-12						27		7.1	4.1	53.2	sar 4.3 gypsum 2.23 meq/100gr
637	12to30						34.1		7.62	2.97	63	
638	30-60						51.9		7.59	4.2	58.2	sar 24.4 gypsum 0.0

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight.

Site Remarks:

river flow 6400 cfs
 cap fringe 18-55 inches
 water table 55 inches after 15 minutes
 0-18 fine and very fine micacious sand fraction

EM38 Measurements:			
EM _V	EM _H	EM _V	EM _H
68.5	63.7	70.4	58.3
78.5	61.4	60.2	48
97.2	77.8	53.4	50.8
63.3	52.4	49.9	64.0 berm
61.2	55.6	73.8	63.6
54.4	48.6	70.1*	63.2

Site 98

San Joaquin River Seepage Management Program

Well or Boring# 98-11 Sampler: brummer Date: 4/21/2011
 location wgs84 36.76656 120.24119 Landform floodplain NRCS Map Unit _____
 Location Notes 150 feet from orchard edge
 Topography nearly level Vegetation & Conditon good almonds
 Irrigation System Type: gravity Irrigation Quadrant 5/5
 Avg EM Measurements; (tcor25c EM_v 82 EM_H 65 EM Calibration Site: EM_v 75 Emh 61
 Root depth inches _____ Soil Temperature, °C (2") 20 (16") 18

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-15	loam	19	35			vm	none				friable
	15-30	loam	20	40			vm	none				
639	0-15 3x	cal 27					27.4		7.6	3.38	55.9	sar 3.1 gypsum content 0.38
640	15-30 3x						25.3		8.02	6.08	48.8	sar 11.7 gypsum content 0.0

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight.

Site Remarks:

calsite
 balanced meter
 had trouble balancing meter

EM38 Measurements:			
EM _v	EM _H	EM _v	EM _H
79	62	91	70
79	64	72	61
79	61	81	63
93	74	71	57
93	69	68	59
100	78	75	61*

Site 99

San Joaquin River Seepage Management Program

Well or Boring# 99-11 Sampler: brummer Date: 4/25/2011
 location wgs84 36.94052 120.47375 Landform low terrace NRCS Map Unit _____
 Location Notes about 200 feet from columbia canal; 400 feet from river
 Topography nearly level Vegetation & Conditon good almonds; mature
 Irrigation System Type: micro sprinkler Irrigation Quadrant na
 Avg EM Measurements; (tcor25c EM_v 57 EM_H 43 EM Calibration Site: EM_v 59 Emh 50
 Root depth inches roots to 68 inches Soil Temperature, °C (2") 21 (16") 17

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-15	sil	20	30	dkgray	ne	vm	none				friable; common roots
	15-50	loam	18	40	dkgrbr		vm	none				friable; many roots
	50-68	sicl	32	25	vdkgray		vm-wet	few				firm; few roots
656	0-12 20x						18.3		6.59	0.72	42.3	
657	0-12						21		6.37	0.74	45.2	
658	12to30						23.1		7.56	0.93	51.8	
659	30-60						27.2		7.7	2.5	61.4	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

15-50in fine silty strata l, sil
 cap fringe 42-67
 water table about 67 inches after 20 minutes
 full canopy; few faint mottles at 60 inches plus

EM38 Measurements:			
EM _v	EM _H	EM _v	EM _H
69	50	51	41
58	41	47	39
62	43	62	51
53	37	55	42
48	42	58	37
51	45	68	48
67	46	48	39
59 50*			

Site 100

San Joaquin River Seepage Management Program

Well or Boring# 100-11 Sampler: brummer Date: 4/25/2011
 location wgs84 36.78338 120.34859 Landform floodplain NRCS Map Unit _____
 Location Notes about 400 feet from mendota pool
 Topography nearly level Vegetation & Condition mature almonds; some lower limbs appear to be dead
 Irrigation System Type: micro sprinklers Irrigation Quadrant na
 Avg EM Measurements; (tcor25c EM_v 36 EM_H 31 EM Calibration Site: EM_v 38 Emh 34
 Root depth inches very few roots below 3 feet Soil Temperature, °C (2") 19 (16") 18

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-8	sl	14	60	vdkgray	ne	vm	none				v friable
	8to26	loam	20	38	brgray		moist	none				v friable
	26-42	lt loam	15	45	brown		moist	none				very friable
	42-60	fsl	12	60	brown		m-vm	none				very friable
	60-68	fsl	8	65	brown		vm	none				coarser with depth
	68-76	lfs	5	89	pale br		vm	none				very friable
	76-96	loam	16	40	pale br		vm	none				v friable
	96-110	loam	20	35	pale br		vm	few				faint rust mottles; firm
660	0-12 20x						14.2		7.19	1.48	33.9	
661	0-12						13.6		7.46	1.31	34.2	
662	12to30						19.6		8.37	1.83	41.2	
663	30-60						13.1		8.11	3.85	31.3	sar 8.6 gypsum content 0.0

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

24-42 v/sl in spots
 no sign of cap fringe or water table to 110 inches
 excellent orchard soil; nearby pumps provide drainage

EM38 Measurements: EM _v EM _H EM _v EM _H			
	45	37	28 22
	39	32	28 28
	41	36	35 26
	32	27	35 26
	29	32	39 33
	28	25	34 28
	36	33	45 39
	38	34*	

Site 101

San Joaquin River Seepage Management Program

Well or Boring# 101-11 Sampler: brummer Date: 5/3/2011
 location wgs84 37.16387n 120.77039w Landform basin NRCS Map Unit dos palos cl
 Location Notes at canal bend; 280 feet north of canal edge; 250 feet from field edge partially drained
 Topography nearly level Vegetation & Condition young cotton
 Irrigation System Type: gravity Irrigation Quadrant 3/5
 Avg EM Measurements: (tcor25c EM_v 96 EM_H 80 EM Calibration Site: EM_v 99 Emh 78
 Root depth inches root channels thruout profile Soil Temperature, °C (2") 25 (16") 21

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-18	ltcl	28	35	vdkg	++	vm	none				friable
	18-31	ltcl	28	35	brown	++	vm	none				friable; seg carbonates
	31-38	hi	26	40	darkbr	+++	vm	few				v faint rust; many carbonates
	38-64	fsl	12	62	rdbn	+	wet	few				common carbonate concretions
	64-68	ltl	15	48	rdbn	+	saturated	common				suction at 64 inches
665	0-12 30x						17.9		7.87	2.08	46.4	beds and furrows
666	0-12						15.8		7.93	1.84	45.7	
667	12to30						20.2		8.37	2.1	49.9	
668	30-60						22		8.54	5.91	43	sar 27.2 gypsum 0.0

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

capillary fringe 38-50 inches
 water table 50 inches after 15 minutes
 1-2 inches of dry mulch on soil surface
 low cotton beds; cotton just emerging

EM38 Measurements:		EM _v	EM _H	EM _v	EM _H
		92	75	148	113
		73	65	117	102
		66	53	99	82
		83	68	96	88
		97	79	108	82
		117	92	99	78 *
bed		87	91	81	64
furrow		98	78	72	63

Site 102

San Joaquin River Seepage Management Program

Well or Boring# 102-12 Sampler: brummer lee Date: 1/31/2012
 location wgs84 0740981 4072645 Landform low terrace NRCS Map Unit chino loam
 Location Notes 180 feet east of tail across from row 100 70ft north and 180 ft east of wellsite r2b-5
 Topography nearly level Vegetation & Conditon good grapes
 Irrigation System Type: gravity Irrigation Quadrant 3/5
 Avg EM Measurements; (tcor25c EM_V 39 EM_H 26 EM Calibration Site: EM_V 39 Emh 25
 Root depth inches 40 inches plus Soil Temperature, °C (2") 13 (16") 12

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-12	loam	17	45	grbrown	0	moist	none				friable
	12to39	loam	18	40	grbrown	0	s moist	none				friable
	39-47	sil	25	20	grbrown	0	s moist	none				firm
	47-60	sicl	28	20	brgray	0	s moist	few				very faint firm
	60-80	ltsicl	28	20	brgray		moist	few				firm
	80-95	loam	19	35	brgray		moist	few				friable
	95-110	fsl	15	60	brgray		vm-wet	common				prominent
	110-126	sil	23	20	gray		vm	few				black specs, firm
						no3-n						
676	0-12 30x					<1	11.1		7.26	4.19	48.9	slee,sar4.2,gypsum 1.5
677	0-12					<1	10.6		6.43	3.94	46.8	sar3.5,gypsum 5.2
678	12to30					<1	8.9		6.13	3.78	38.7	sar 5.2, gypsum 0.00
679	30-60						12		7.27	4.96	32.8	sar 6.6, gypsum 0.00

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.

	EM38 Measurements: EM _V		EM _H	
30-39; borderline vfls; excess vegetative growth in area last year; placed red marks on vines	42	27	36	26
and grape stakes opposite central site; yellowish material on soil surface (gypsum)	40	25	40	31
scraped yellowish material away before auguring. Excellent profile for irrigation; EM and comp	39	24	40	26
samples down three rows 100 feet each way from boring. No water table to 126 inches after 15	39	25*	39	26
minutes; Em survey may be questionable due to metal grape wire and trellises in area	35	21	43	28
cap fringe adjustment 1.0 feet	36	23	45	29
too dry for reliable EM38 survey	38	25	36	23

Site 103

San Joaquin River Seepage Management Program

Well or Boring# 103-12 Sampler: brummer, lee Date: 1/31/2012
 Location wgs84 0741408 4072344 Landform low terrace NRCS Map Unit chino loam
 Location Notes 150ft north and 180 ft east of wellsite pz2b-3
 Topography nearly level Vegetation & Conditon good grapes
 Irrigation System Type: gravity Irrigation Quadrant 3/5
 Avg EM Measurements; (tcor25c EM_v _____ EM_H _____ EM Calibration Site: EM_v _____ Emh _____
 Root depth inches roots to 60 inches plus Soil Temperature, °C (2") _____ (16") _____

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-20	loam	15	45	grbrown	0	smoist	none				very friable
	20-38	sl	14	60	grbrown	0	smoist	none				friable
	38-48	ltsl	8	70	brown	0	nd	none				friable
	48-68	sand	2	96	ltbrgr	0	nd	none				loose
	68-90	ltclay	40	30	brgray		smoist	few				very firm, faint
	90-107	cl	34	40	brown		moist	common				firm
	107-126	sl	9	65	rdbrown		vm	common				coarser with depth
						no3-n						
	0-12 30x					<1	8		6.42	3.85	47.1	slee, sar 4.8, gypsum 0.9
	0-12					<1	7.6		6.49	3.83	48.2	sar 4.8, gypsum 0.6
	12to30					<1	6.6		7.08	1.53	34.6	
	30-60					3	2.5		7.37	2.32	28.3	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.
 site is about 200 feet from the river levee
 124-126inches; very moist to wet loamy sand with many mottles; may be top of capillary fringe
 no water table to 126 inches after 5 minutes; estimated water table depth is about 11 feet;
 comp sample collected from a three row area extending 100 feet down each row from the central boring; No em survey due to metal grape trellis and wire.
 cap fringe adjustment 1.0 feet;

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H
none			

Site 104

San Joaquin River Seepage Management Program

Well or Boring# 104-12 Sampler: brummer, lee Date: 1/31/2012
 location wgs84 0741273 4072906 Landform low terrace NRCS Map Unit grangeville fsl
 Location Notes site is between rows 56 and 57 about 200 feet west and 70 feet south of wellsite pz2b-4
 Topography nearly level Vegetation & Conditon good grapes
 Irrigation System Type: gravity Irrigation Quadrant 2/5
 Avg EM Measurements; (tcor25c EM_v _____ EM_H _____ EM Calibration Site: EM_v _____ EM_H _____
 Root depth inches 48-60 common roots Soil Temperature, °C (2") _____ (16") _____

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-10	loam	18	40	brgray	0	smoist	none				very friable
	10to22	fsl	14	55	grbrown	0	smoist	none				very friable
	22-48	lt sl	6	70	grbrown	0	smoist	none				very friable
	48-60	ls	4	80	ltbrgr	0	moist	few				very friable
	60-96	sand	2	96	ltbrgr		moist	few				loose
	96-120	grs	0	99	ltgray		m-vn	few				15% fine gravel
	120-128	cos	0	99	ltgray		wet-sat	none				micacious river sand
					nc3-n							
	0-12 30x				2 mg/l		7.3		6.52	3.65	44.8	slee, sar3.8, gypsum 1.6
	0-12				<1		8.7		6.91	3.36	43.1	sar 5.1, gypsum 0.1
	12to30				<1		7.5		7.7	2.29	27.9	
	30-60				<1		5.4		8.08	1.62	30.8	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.
 36-60 inches contains some thin v_{fsl} layers; capillary fringe about 6-10 inches thick; water table at 10.3 feet after 5 minutes; hole caved to 10.3 feet; red paint on grape stakes opposite the central boring. The comp sample was collected down three rows centered by the central boring. No em survey due to the presence of metal trellisis; comp sample area extended 100 feet down the rows from the central boring. cap fringe adjustment 0.5 feet

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H
none			

Site 105

San Joaquin River Seepage Management Program

Well or Boring# 105-12 Sampler: brummer, lee Date: 2/10/2012
 location wgs84 0740979 4072332 Landform low terrace NRCS Map Unit chino loam
 Location Notes 170 feet east and 110 feet north of wellsite pz2b-6; between rows 13 and 14; red paint on grape stakes
 Topography nearly level Vegetation & Conditon good grapes
 Irrigation System Type: gravity Irrigation Quadrant 3/5
 Avg EM Measurements; (tcor25c EM_v EM_H EM Calibration Site: EM_v 27 Emh 19
 Root depth inches over 60 inches Soil Temperature, °C (2") 14 (16") 13

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-10	loam	23	35	dkgray	0	moist	none				friable
	1to27	ltcl	28	30	dkgray	0	moist	none				firm
	27-44	loam	20	35	grbrown	0	moist	none				very friable
	44-61	fsl	12	55	brown	0	moist	none				very friable
	61-70	sil	24	20	pbrown		vmoist	few-com				common mottles at 68in
	70-86	loam	17	34	pbrown		vmoist	common				very friable
	86-118	vfsl	12	60	rbrown		vmoist	many				contains thin loam layers
	118-140	lfs	4	85	ltgrbr		vmoist	common				contains sand layers
						no3-n						
692	0-12 30x					<1 mg/l	10.2		6.87	3.6	43.2	slee, sar4.0 gypsum 0.5
693	0-12					<1	12.4		6.08	3.54	45.4	sar 4.7 gypsum 0.4 meq/100gr
694	12to30					<1	11.7		6.91	2.23	41.6	
695	30-60					<1	8.1		7.17	1.22	28.7	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.

em survey may be ?? Due to metal grape trellisis
 area was affected by powdery mildew last year
 excellent profile for irrigation
 appears to have gypsum disked into surface; yellow-white compound
 no water table after 10 minutes to 11.8 feet
 capillary fringe factor is 1.0 feet
 too dry for reliable EM38 survey

EM38 Measurements: EM _v		EM _H	EM _v EM _H	
Emv	Emh			
		32	26	25 17
23	15	29	20	27 19*
20	16	28	20	31 21
20	14	24	22	31 22
18	13	22	15	27 17
21	15	23	16	26 17
26	18	32	21	23 15
		31	21	25 16

Site 106

San Joaquin River Seepage Management Program

Well or Boring# 106-12 Sampler: brummer, shamp Date: 3/14/2012
 location wgs84 0734349 4076799 Landform low terrace NRCS Map Unit 320 el nido sl
 Location Notes about 215 feet into the orchard
 Topography nearly level Vegetation & Conditon fair almonds
 Irrigation System Type: micro sprinklers Irrigation Quadrant _____
 Avg EM Measurements; EM_v 22 EM_h 17 EM Calibration Site: EM_v 22.5 Emh 16.5
 Root depth inches _____ Soil Temperature, °C (2") 16 (16") 15

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-10	fsl	9	65	brgray	0	moist	none				very friable
	10to39	fsl	7	62	grbrown	0	vmoist	none				very friable
	39-45	fsl	7	62	grbrown	0	vmoist	few				friable, very faint rust mottles
	45-60	sil	22	25	dkgray	0	vmoist	common				firm, rust mottles
885	0-12 30x						7.8		6.5	0.92	37.4	
886	0-12						7.9		6.61	1.55	38.5	
887	12to30						13.8		6.63	2.66	47.8	
888	30-60						26.9		6.19	6.82	52.5	sar 11.1 gypsum 0.00

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:	EM38 Measurements: EM _v		EM _h		EM _v /EM _h	
	Emv	Emh				
some dead almond stumps nearby; painted one stump red; no water table to 60 inches after 10 minutes; site is offset about 300 feet from ccid obswell			15.5	10.1	23.2	22.5
0-39in micacious	22.5	16.5	17.9	12	20.5	15.3
too dry for reliable EM38 survey	20	15	22.9	22.4	13.1	8.2
	23	15.9	24.1	19.1	25.5	20.7
	15.4	12.8	32.8	21	36.9	34.6
			27.3	19.8	19.8	14.8
					16.6	15.5

Site 107

San Joaquin River Seepage Management Program

Well or Boring# 107-12 Sampler: brummer, shamp Date: 3/21/2012
 location wgs84 0745970 4106967 Landform low terrace NRCS Map Unit palazzo sl
 Location Notes about 500 feet from river and 300 feet from tail of field partially drained
 Topography nearly level Vegetation & Condition bedded, disked cotton stubble
 Irrigation System Type: gravity, furrow Irrigation Quadrant 3/5
 Avg EM Measurements; EM_v 41 EM_h 26 EM Calibration Site: EM_v 49 Emh 31
 Root depth inches _____ Soil Temperature, °C (2") 16 (16") 14

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-16	loam	18	35	grbrown		vmoist	none				friable
	16-26	lt loam	16	40	grbrown		vmoist	none				contains fsl layers
	26-39	sil	22	25	brgray		vmoist	none				
	39-60	cl	37	30	olgray		moist	none				few carbonates
	60-71	cl	35	30	olgray		vmoist	few				faint rust mottles
	71-87	scl	24	50	olgray		wet	few				coarser with depth
	87-93	sl	15	60	olgray		wet	few				
	93-117	lt loam	15	45	olgray		wet	few				sand fraction is fine
	117-124	sl	12	60	olgray		saturated	common				rust mottled
	0-12	30x					20.7		6.34	0.91	42	shamp 50-50 beds/furrows
	0-12						20		6.35	0.9	39.7	
	12to30						24.4		6.58	0.79	40.4	
	30-60						17.9		7.28	1.19	45	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.

em38 indicates sand streaks in area; water table 8.4 after 15 min
 capillary fringe from 71 -100 inches

EM38 Measurements:		EM _v	EM _h	EM _v	EM _h
emv	emh				
		49	32	41	29
26	17	35	22	44	29
56	37	21	12	49	31
51	34	18	10	54	36
52	31	39	24	41	30
49	31	35	21	28	20

Site 108

San Joaquin River Seepage Management Program

Well or Boring# 108-12 Sampler: brummer, shamp Date: 3/21/2012
 location wgs84 0715891 4107295 Landform low terrace NRCS Map Unit palazzo sl
 Location Notes 200 feet into field partially drained
 Topography nearly level Vegetation & Conditon disked fallow, bedded
 Irrigation System Type: gravity furrow Irrigation Quadrant 3/5
 Avg EM Measurements; EM_v 58 EM_h 42 EM Calibration Site: EM_v 59 Emh 47
 Root depth inches _____ Soil Temperature, °C (2") 19 (16") 16

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-14	loam	22	35	dkgray	0	vmoist	none				friable
	14-23	sil	20	25	vdgray	0	vmoist	none				firm
	23-43	sil	22	25	olbr	++	moist	none				firm
	43-62	hsl	18	52	olbr	++	sm-m	none				crunchy,firm
	62-72	loam	18	33	olgr		moist	few				friable, faint rust
	72-82	sl	10	60	olgr		vmoist	few				friable, faint rust
	82-88	sl	10	60	olgr		vmoist	none				calcium cemented in spots
	88-94	loam	18	40	olgr		vm-wet	few				friable
	94-115	loam	18	35	olgr		wet-sat	few				suction at 9 feet
	0-12 30x						23.9		6.16	1.42	50.2	shamp
	0-12						23.6		6.41	1.72	52.3	
	12to30						26.8		7.35	1.6	51.2	
	30-60						20.8		7.93	1.67	36.6	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks: Numeric values indicate percent moisture by weight.

43-62in, many calcium cemented frags; may be scl
 cappillary fringe 91-98 inches
 water table 8.1 after 15 minutes
 82-88in, very hard hardpan remnant, ca cemented
 psa 50in
 sand 42
 silt 46
 clay 12 texture light loam

EM38 Measurements:		EM _v	EM _h	EM _v	EM _h
Emv	Emh				
		61	47	47	33
62	44	72	47	47	34
59	44	66	45	58	42
59	47	65	45	52	42
		55	37	61	50
		54	39	52	35

Site 109

San Joaquin River Seepage Management Program

Well or Boring# 109-12 Sampler: brummer, shamp Date: 3/21/2012
 location wgs84 0715608 4107125 Landform basin NRCS Map Unit palazzo sl
 Location Notes 265 feet from tail of field wp265 partially drained
 Topography nearly level Vegetation & Conditon disked stubble, bedded
 Irrigation System Type: gravity, furrow Irrigation Quadrant 4/5
 Avg EM Measurements; EM_v 50 EM_h 43 EM Calibration Site: EM_v 52 Emh 35
 Root depth inches to 30 inches Soil Temperature, °C (2") 19 (16") 16

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-21	loam	20	35	dkgray	0	vm-wet	none				friable
	21-45	fsl	14	55	brgray	0	vmoist	few-com				vfriable
	45-54	ltsicl	28	25	vdkg	trace	vmoist	few				firm, faint rust
	54-62	cl	37	25	dkolgr	trace	vmoist	few				very firm
	62-82	sic	42	20	dkolgr		vmoist	few				firm, faint rust
	82-100	sicl	35	20	dkolgr		wet-sat	few				
	100-106	cl	30	35	olgray		saturated	few				friable
	0-12	30x					22.6		6.44	1	44.8	shamp
	0-12						22.5		6.85	1.07	44.2	
	12to30						22.1		7.31	0.92	33.8	
	30-60						29		7.37	1.06	42.1	cap fringe 45-68 lab

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.

0-21 site is wet from recent irrigation and rainfall
 water table 5.8 after 15 minutes
 capillary fringe about 8 inches thick; hard to evaluate in heavy soil
 lab data indicates cap fringe about 24 inches thick.

EM38 Measurements: EM _v		EM _h	EM _v EM _h	
emv	emh			
		47	31	43 28
49	31	40	26	52 32
48	33	42	27	60 41
42	26	42	31	61 44
52	35	55	34	66 48

Site 110

San Joaquin River Seepage Management Program

Well or Boring# 110-12 Sampler: brummer Date: 3/23/2012
 location wgs84 0715446 4110580 Landform basin rim NRCS Map Unit Fresno loam
 Location Notes about 500 feet from bypass levee silt saline / alkali
 Topography nearly level Vegetation & Condition poor wheat
 Irrigation System Type: gravity, check Irrigation Quadrant 4/5
 Avg EM Measurements; EM_v 79 emh 70 EM Calibration Site: EM_v 97 Emh 77
 Root depth inches roots to 36 plus Soil Temperature, °C (2") 14 (16") 13

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-18	h loam	25	30	dkgray	++	vmoist	none				common roots
	18-25	h loam	25	30	olgray	++	wet	none				
	25-40	hsl	17	55	olbrown	++	vm-wet	none				ripped hardpan
	40-48	lt loam	17	35	olbrown	++	saturated	few				rust mottles
	48-52	lt loam	17	35	olgray	++	saturated	few				too wet to sample
	0-12 30x						27.4		7.65	5.02	45.9	brummer
	0-12						28.2		7.84	3.75	44.2	
	12to30						27.2		7.87	6.03	37.7	
	30-48						29.5		8.19	3.68	42.3	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks: Numeric values indicate percent moisture by weight.

24-40in many hardpan fragments
 18-25in wet soil may be perched on hardpan
 water table 2.4 feet after 20 minutes
 18-29 capillary fringe zone

EM38 Measurements:		EM _v	EM _H	EM _v	EM _H
emv	emh				
74	71	92	88	81	63
		61	56	66	49
112	109	100	91	72	61
98	96	67	59	57	46
92	77	64	55	68	56
		103	86	69	62

Site 111

San Joaquin River Seepage Management Program

Well or Boring# 111-12 Sampler: J. Brummer; S. Lee Date: 3/27/2012
 location wgs84 0714487 4110028 Landform basin NRCS Map Unit _____
 Location Notes 340 feet from the edge of the field, 400 feet from obswell stake
 Topography nearly level Vegetation & Condition bedded fallow
 Irrigation System Type: gravity, furrow Irrigation Quadrant 2/5
 Avg EM Measurements; EM_V _____ EM_H _____ EM Calibration Site: EM_V 225 Emh 184
 Root depth inches _____ Soil Temperature, °C (2") 17 (16") 16

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-11	sil	24	25	vdkggray	0-+	vm	none				friable to firm
	11to36	loam	21	35	olgray	++	m-vm	none				friable
	36-52	loam	18	40	olgray	++	vm	few				few hardpan fragments
	52-62	loam	18	35	olgray	++	wet	few				suction at 61 inches
	62-78	sil	23	25	olgray	++	saturated	few				faint rust mottles
	0-12 30x											lee, 50/50 beds, furrows
	0-12											
	12to30											
	30-60											

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.

EM38 Measurements:

Area is subject to flooding during high flows. Surface layer appears to have applied gypsum fragments. Capillary fringe about 6 inches thick. 36-52in contains ripped lime silica hardpan. water table is 4.7 below the bottom of the furrow and 5.4 feet below the top of the beds after 20 minutes.

EM _V	EM _H	EM _V	EM _H
212	162	162	148
232	207	198	155
257	233	296	266
206	152	278	200
154	130	239	203
172	126	241	188
168	137	213	165
		225	184

Site 112

San Joaquin River Seepage Management Program

Well or Boring# 112-12 Sampler: J. Brummer; S. Lee Date: 3/27/2012
 location wgs84 0714584 4109516 Landform low terrace NRCS Map Unit columbia channel
 Location Notes 320 feet from head of field, about 500 feet from well stake
 Topography nearly level Vegetation & Condition bedded fallow
 Irrigation System Type: gravity, furrow Irrigation Quadrant 2/5
 Avg EM Measurements; EM_V _____ EM_H _____ EM Calibration Site: EM_V 181 Emh 101
 Root depth inches _____ Soil Temperature, °C (2") 18 (16") 16

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-15	sl	12	62	brgray	0	moist	none				friable
	15-20	loam	18	35	black	0	moist	none				buried A horizon
	20-36	sil	24	25	dkgray	++	moist	few				drab color, firm
	36-64	sil	20	25	olgray	+	m-vn	few				friable faint mottles
	64-78	loam	17	48	olgray	++	wet-sat	few				contains thin sl layers, rust
	0-12	30x										lee, 66/34 beds/furrows
	0-12											
	12to30											
	30-60											

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks: Numeric values indicate percent moisture by weight.

EM38 Measurements:	EM _V	EM _H	EM _V	EM _H
large 3 foot wide beds. Boring measurements are from the bottom of the furrow. Beds are 12 in high; water table is 6.3 feet from the top of the beds after 15 minutes; capillary fringe only a few in thick; 36-64; contains a few hardpan fragments;	188	105	182	89
	141	79	104	117bed
	154	111	186	92
	200	133	175	105
	217	138	152	154bed
	196	115	225	130
	207	105	134	77
	182	101	117	109bed

Site 113

San Joaquin River Seepage Management Program

Well or Boring# 113-12 Sampler: J. Brummer; S. Lee Date: 3/27/2012
 location wgs84 0715406 4110089 Landform basin NRCS Map Unit _____
 Location Notes 300 feet from the head of the field
 Topography nearly level Vegetation & Condition bedded corn stubble
 Irrigation System Type: gravity furrow Irrigation Quadrant 2/5
 Avg EM Measurements; EM_V _____ EM_H _____ EM Calibration Site: EM_V 130 Emh 96
 Root depth inches _____ Soil Temperature, °C (2") 19 (16") 17

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-19	loam	19	40	brgray	++	moist	none				friable
	19-25	chloam	20	40	olbrown	++	moist	none				contains dense hardpan layer
	25-33	loam	17	42	olbrown	++	moist	none				few hardpan fragments
	33-40	fsl	12	60	olbrown	++	vm	none				friable
	40-52	lt loam	15	40	olbrown	++	vm	none				
	52-64	loam	19	35	dkbrown	++	vm	few				varegated colors, com carbonates
	64-74	loam	18	40	brown	++	wet	few				
	74-80	sl	6	78	brown	++	saturated	none				
	0-12 30x											lee 50/50 beds/furrows
	0-12											
	12to30											
	30-60											

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.
 9 inch high beds; Boring in furrow; Large hp chunks on surface;
 Mottles are faint rust mottles; suction at 74 inches; water table
 is 6.0 feet from the top of the beds after 15 minutes.
 all other measurements on log are from the bottom of the furrow;

EM38 Measurements:		EM _V	EM _H	EM _V	EM _H
Emv	Emh	142	88	130	96
128	102	127	112		
127	121	132	88		
106	85	135	100		
117	77	156	107		
158	119	140	93		

Site 114

San Joaquin River Seepage Management Program

Well or Boring# 114-12 Sampler: J. Brummer; S. Lee Date: 3/27/2012
 location wgs84 0716241 4110014 Landform basin NRCS Map Unit _____
 Location Notes 320 feet from the head of the field
 Topography nearly level Vegetation & Condition bedded fallow
 Irrigation System Type: gravity furrow Irrigation Quadrant 2/5
 Avg EM Measurements; EM_V _____ EM_H _____ EM Calibration Site: EM_V _____ EM_H _____
 Root depth inches _____ Soil Temperature, °C (2") 18 (16") 16

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
ns	0-9	loam	21	40	brgray	++	moist	none				friable
	9to34	ch sl	10	60	brown	++	moist	none				common hardpan fragments
	34-55	sl	15	55	brown	++	vmoist	few				friable
	55-75	fsl	12	57	brown	++	vmoist	few				friable
	75-100	sil	19	25	grbrown	trace	vmoist	few				friable
	100-130	fsl	15	55	grbrown	trace	wet	few				suction at 129 inches

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks: Numeric values indicate percent moisture by weight.
 em38 only; 9-34in; contains lime silica hardpan fragments;
 water table is 10.7 feet deep from the top of the beds after 15 minutes
 all other measurements are from the bottom of the furrow.
 cap fringe about 21 inches thick;

EM38 Measurements:		EM _V	EM _H	EM _V	EM _H
Emv	Emh	73	46	81	54
61	45	69	51	82	58
61	50	64	50	64	46
72	52	62	44	72	53
72	47	72	53	63	45
				50	42

Site 115

San Joaquin River Seepage Management Program

Well or Boring# 115-12 Sampler: J. Brummer; S. Lee Date: 3/27/2012
 location wgs84 0716451 4109626 Landform basin NRCS Map Unit _____
 Location Notes 320 feet from the head of the field
 Topography nearly level Vegetation & Condition bedded, wide deep beds
 Irrigation System Type: gravity furrow Irrigation Quadrant 2/5
 Avg EM Measurements; EM_v _____ EM_h _____ EM Calibration Site: EM_v _____ Emh _____
 Root depth inches _____ Soil Temperature, °C (2") 19 (16") 17

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-25	loam	22	30	brgray	+	moist	none				friable
	25-49	ch sl	9	65	olbrown	++	moist	none				common hardpan fragments
	49-64	fsl	11	65	olbrown	++	vmoist	few				friable
	64-88	loam	21	35	brgray	++	vmoist	few				friable
	88-109	fsl	14	60	brgray	+	vmoist	few				few cemented fragments
	109-118	sl	8	68	brgray	+	vmoist	few				v friable
	118-128	fsl	14	55	brgray	+	vmoist	common				partially cemented in spots

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.

em readings in furrows unless indicated otherwise; em38 only
 No water table encountered to a depth of 140 inches from the top of the beds; Nearby wells are pumping irrigation water;

EM38 Measurements:		EM _v	EM _h	EM _v	EM _h
Emv	Emh	71	49	97	56
67	49	87	49	78	52
73	39	48	39bed	69	43
78	53	74	40	75	44
51	49bed	70	44	68	39
69	48	105	69		

Site 116

San Joaquin River Seepage Management Program

Well or Boring# 116-12 Sampler: brummer lee Date: 4/19/2012
 location wgs84 0719312 4102130 Landform basin rim NRCS Map Unit Rossi loam,
 Location Notes wp 282 slt saline alkali
 Topography nearly level, boring in 2 foot cut area Vegetation & Conditon almonds, pale green and yellow foliage
 Irrigation System Type: drip Irrigation Quadrant _____
 Avg EM Measurements; EM_v 47 EM_H 55 EM Calibration Site: EM_v 65 Emh 69
 Root depth inches roots to 64 inches Soil Temperature, °C (2") 20 (16") 19

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-9	loam	22	35	dkgray	+	vm	none				friable
	9to21	loam	21	40	olive gray	++	moist	none				mixed colors, dkgr
	21-30	loam	20	35	olive gray	+++	moist	none				contains hp frags
	30-60	loam	18	40	olive gray	++	vm	none				friable, stratified l/sil/tl
	60-72	fsl	13	54	olbrown	+	m-vm	none				friable
	72-82	fsl	8	60	olbrown	0	vm	few				v friable, v faint rust mottles
	82-102	sil	20	25	pale br	0	vm	few				stratified l, sil
	102-112	loam	17	40	pale br	0	vm	few				
	112-140	sil	21	25	pale br	0	m-vm	few				loam in spots, firm
1204	0-12 30x	lee	75rows/25 beds				18.8		7.39	4.97	50.7	sar 2.6 gypsum 7.9 meq/100 gr
1205	0-12						20.5		7.62	4.94	50.5	sar 3.6 gypsum 6.1
1206	12to30						26.9		7.72	3.26	51.5	sar 4.3 gypsum 0.00
1207	30-60						15.9		7.68	3.31	31.7	sar 6.1 gypsum 0.00

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.

site is about 100 feet from the orchard edge. Backhoe pit is about 90 feet to the north.

sulfur granuales on surface; hardpan fragments from 10-30 inches; no water table to 140 inches

no reaction to hcl below about 82 inches;

EM38 Measurements:		EM _v	EM _H	EM _v	EM _H
		53	65	35	80
		58	54	44	54
		35	54	59	58
		56	60	58	58
		51	46	44	42
		34	59	34	47
		51	51	34	49

Site 117

San Joaquin River Seepage Management Program

Well or Boring# 117-12 (also sam3) Sampler: brummer, lee Date: 4/25/2012
 location wgs84 0732383 4078668 Landform low terrace NRCS Map Unit columbia fsl
 Location Notes about 230 feet into field
 Topography nearly level Vegetation & Conditon young corn, just emerging
 Irrigation System Type: gravity / furrow Irrigation Quadrant 3/5
 Avg EM Measurements; EM_v 5 Emh 5 EM Calibration Site: EM_v Emh
 Root depth inches Soil Temperature, °C (2") 25 (16") 20

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
ns	0-16	ltsl	7	75	grbrown		m-vn	none				very friable
	16-27	fsl	8	62	grbrown		vm	none				very friable
	27-34	ls	4	86	grbrown		vm	none				contains lfs lenses
psa	34-90	sand	1	98	ltgray		moist	few				very faint rust mottles
psa	90-117	sand	0	99	ltgray		vm	few				very faint rust mottles
	117-132	sand	0	99	ltgray		wet-sat	few				very faint rust mottles

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks: Numeric values indicate percent moisture by weight. EM38 Measurements: EM_v | EM_H | EM_v | EM_H

suction at 10.5 feet; water table 10.0. boring caved to 10.0; capillary fringe about 3-4 inches thick; em38 indicates very low soil salinity levels;	4.6	5.5	5.7	5.6
	4.7	8.1	5.2	5.1
	3.6	4.3	6	4.8
	3.2	4.4	5.8	4.4
	4.7	4.7	5.2	5.2
	4	5.4	5.5	4.6
	4.2	5.5	5.1	4.8

Site 118

San Joaquin River Seepage Management Program

Well or Boring# 118-13 Sampler: brummer Date: 2/26/2013
 location wgs84 0712331 4113797 Landform basin NRCS Map Unit merced sicl
 Location Notes about 1000 feet west of el nido stream gauge over fresno hardpan
 Topography nearly level Vegetation & Conditon fallow moderately saline
 Irrigation System Type: gravity Irrigation Quadrant 3/5
 Avg EM Measurements; EM_v 106 EM_h 98 EM Calibration Site: EM_v 102 Emh 99
 Root depth inches _____ Soil Temperature, °C (2") 13.9 (16") 8.8

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-22	h sicl	38	25	vdkgr	+	moist	none				firm
	22-39	hcl	38	30	drab gray	++	vm	few				firm, very faint
	39-50	hloam	26	30	brgray	++	m-vm	few				very faint friable
	50-60	sl	14	60	brgray	++	w-sat	few				sand size hp frags
1385	0-12 30x						27.6		8.05	1.62	67.4	brummer
1386	0-12						27.8		7.95	1.78	64.8	
1387	12to30						31.1		8.11	1.99	74.3	
1388	30-58						23.7		8.56	1.89	76.2	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.
 manure applied to soil surface
 saturated at 54 inches; water table 3.3 feet after 15 minutes
 thin capillary fringe; seems like confined saturated layer;
 drainage ditch 250 feet to the east has tailwater from nearby field.
 psa 20in
 sand 18.5
 silt 40.5
 clay 41
 texture light silty clay

EM38 Measurements:			
EM _v	EM _h	EM _v	EM _h
100	94	95	94
98	96	124	112
107	94	123	111
102	99	104	101
110	100	112	106
111	96	104	98
100	86	95	85

Site 119

San Joaquin River Seepage Management Program

Well or Boring# 119-13 Sampler: brummer hernandez Date: 2/27/2013
 location wgs84 0726983 4082760 Landform low terrace NRCS Map Unit columbia fsl
 Location Notes about 400-500 feet from river
 Topography nearly level Vegetation & Conditon fallow, pre irrigated beds
 Irrigation System Type: gravity Irrigation Quadrant 4/5
 Avg EM Measurements; EM_v 10 EM_h 3 EM Calibration Site: EM_v 10.1 Emh 3
 Root depth inches _____ Soil Temperature, °C (2") 6.2 (16") 10.6

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-12	lt sl	6	78	brown		sm	none				very friable
	12to18	ls	3	85	lt gray		sm	none				loose single grained
	18-64	sand	1	97	brown		sm	none				loose single grained
1391	0-12 30x						7.5		6.77	1.63	25.7	hernandez
1392	0-12						7.7		7.29	0.5	24.7	
1393	12to30						1.9		7.73	0.75	25.9	
1394	30-60						2.6		7.87	0.34	30.8	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

disked cotton stubble bedded
 unusual EM readings; too dry
 no water table or capillary fringe to 64 inches

EM38 Measurements: EM _v		EM _h	EM _v /EM _h	
9.2		3	11.4	2.2
8.5		2	12.2	2.4
9.9		3	10.2	1.5
9.5		3.5	10.3	1
12.2		4.4	10.4	2.4
8.8		1.7	10.2	2.5
			10.1	3

Site 120

San Joaquin River Seepage Management Program

Well or Boring# 120-13 Sampler: brummer hernandez Date: 2/27/2013
 location wgs84 0727833 4082300 Landform low terrace NRCS Map Unit temple cl
 Location Notes site about 300 feet from levee and observation well
 Topography nearly level Vegetation & Condition fallow
 Irrigation System Type: gravity Irrigation Quadrant 4/5
 Avg EM Measurements; EM_v 60 EM_H 49 EM Calibration Site: EM_v 53 Emh 45
 Root depth inches over 52 inches Soil Temperature, °C (2") 8.8 (16") 10.6

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-15	clay	45	25	dkgray	trace	moist	none				firm
	15-29	clay	48	30	vdgray	+	sm	none				segregated carbonates, firm
	29-43	clay	43	38	gray	+	sm	very few				common carbonates
	43-52	sc	36	50	gray	+	sm	few				common carbonates
	52-60	sl	12	60	redbr	trace	moist	common				friable
	60-64	ls	5	80	yelbrn		vm	common				medium and coarse sand
1395	0-12 30x						21.9		7.44	1.5	76.7	hernandez
1396	0-12						23		7.63	1.12	75.9	
1397	12to30						21.9		7.7	1.8	94.5	
1398	30-60						17		7.56	3.52	67.4	sar 10.7 gypsum 0.00

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.

EM38 Measurements: EM_v | EM_H

bedded for pre irrigation; disked cotton stubble; 0-2in dry self granulating clay
 no water table to 64 inches; possible cap fringe at 64 inches; 52-64 coarser with depth

EM _v	EM _H	EM _v	EM _H
50	44	58	45
51	52	72	53
25	47	74	56
64	54	77	52
60	52	89	58
63	42	59	53
53	51	50	38
		53	45

Site 121

San Joaquin River Seepage Management Program

Well or Boring# 121-13 Sampler: brummer papendeck Date: 2/28/2013
 Location wgs84 0716797 4106221 Landform low terrace NRCS Map Unit merced cl overwashed
 Location Notes about 350 feet from obswell m-3 silt saline
 Topography nearly level Vegetation & Conditon tomatoe beds
 Irrigation System Type: gravity Irrigation Quadrant 3/5
 Avg EM Measurements; EM_v 55 Emh 34 EM Calibration Site: EM_v 62 Emh 37
 Root depth inches _____ Soil Temperature, °C (2") 10 (16") 11.2

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-25	fsl	12	60	brgray		vm	none-few				mottled at 12 inches
	25-32	vfsl	10	58	brgray		wet	common				friable
	32-47	cl	32	30	dkgray		vm	common				firm
	47-56	sicl	29	25	drab gray		vm	few				firm
	56-60	lt sicl	27	25	gray		vm	few				common carbonates
1438	0-12 30x						19.8		7.56	1.84	38.8	50/50 beds/furrows
1439	0-12						20.1		7.59	1.4	41.6	
1440	12to30						27.1		7.65	1.19	46.4	
1441	30-60						22.3		7.79	1.03	68.7	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.

EM38 Measurements:

site recently pre-irrigated; no water table to 60in after 10 minutes
 profile is micacious; hard to evaluate cap fringe in cl soil; 32-38in nearly black may be buried soil
 est capfringe 47-60in
 25-32in wet from soil boundary conditions

EM _v	EM _h	EM _v	EM _h
43	37	67	36
60	40	41	27
69	45	61	35
66	41	50	34
65	36	47	33
39	42b	62	37
		42	40

Site 122

San Joaquin River Seepage Management Program

Well or Boring# 122-13 Sampler: brummer papendeck Date: 2/28/2013
 location wgs84 0716135 4107648 Landform low terrace NRCS Map Unit columbia soils
 Location Notes _____ channeled
 Topography nearly level Vegetation & Condition tomatoe beds
 Irrigation System Type: gravity Irrigation Quadrant 2/5
 Avg EM Measurements; EM_v 31 EM_H 18 EM Calibration Site: EM_v 33 Emh 17
 Root depth inches _____ Soil Temperature, °C (2") 11.2 (16") 10

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-22	lt fsl	7	62	brgray	0	vm	none				very friable
	22-34	sil	22	25	black	0	vm	few				buried A horizon, rust mottles
	34-41	loam	18	40	gray	0	m	few				drab gray color
	41-55	sl	14	60	drab gray	+++	m	few				compact; contains hp fragments
	55-62	sl	12	62	drab gray	++	m	few				
1442	0-12 30x						15.4		7.69	1.27	42.2	jeff 50/50 beds/furrows
1443	0-12 30x rep						15.2		7.58	1.41	41.8	joe
1444	0-12						15.7		7.67	0.75	40.9	
1445	12to30						37.3		7.57	1.82	52.6	
1446	30-60						16.1		8.03	1.12	32.4	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.
 0-22 may be fill from leveling; no water table or capfringe to 62 inches boring in furrow

EM38 Measurements: EM _v EM _H EM _v EM _H			
	33	19	15
	27	19	21
	34	20	20
	26	15	19
	29	14	17
	31	16	17
	25	17	17

Site 123

San Joaquin River Seepage Management Program

Well or Boring# 123-13 Sampler: brummer hernandez Date: 3/1/2013
 location wgs84 0715154 4113612 Landform basin rim es NRCS Map Unit fresno fsl
 Location Notes 200 feet west of birdhouse wp303 strong alkali
 Topography nearly level Vegetation & Condition fair pistaccios
 Irrigation System Type: micro sprinklers Irrigation Quadrant _____
 Avg EM Measurements; EM_v 55 EM_H 49 EM Calibration Site: EM_v 65 Emh 45
 Root depth inches _____ Soil Temperature, °C (2") 16.1 (16") 12.8

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-22	loam	19	45	grbr	+	moist	none				friable
	22-46	lt sl	6	75	grbr	++	sm-m	none				contains hp fragments
	46-51	hp(sl)	8	70	grbr	++	sm-m	none				hardpan
	51-68	loam	19	35	brown	++	vm-wet	few				faint rust mottles
												sar 7.2 gypsum 0.58
1459	0-12 30x						11.2		7.59	9.35	34.2	5x beds carlos
1460	0-12						11.3		7.19	30.3	30.3	sar 15.8 gypsum 2.36
1461	12to30						12		7.8	7.96	25.3	sar 10 gypsum 0.00
1462	30-60						11.9		8.21	4.28	28.9	sar 13.6 gypsum 0.00

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.
 almost stopped by hardpan at 50 inches; no water to 68 inches after 10 minutes
 60-68in probably top of cap fringe
 surface must be too dry for em38.

EM38 Measurements: EM _v		EM _H	EM _v		EM _H
65	45	68	49		
72	45	55	72		
84	59	58	53		
63	34	64	45		
49	38	41	75		
41	52	32	50		
61	37	35	37		
38	43				

Site 124

San Joaquin River Seepage Management Program

Well or Boring# 124-13 Sampler: brummer hernandez Date: 3/1/2013
 location wgs84 0716400 4106765 Landform low terrace NRCS Map Unit merced sicl
 Location Notes 200 feet from tail of field overwashed
 Topography nearly level Vegetation & Conditon good wheat
 Irrigation System Type: gravity Irrigation Quadrant 4/5
 Avg EM Measurements; EM_v 52 EM_H 38 EM Calibration Site: EM_v 48 Emh 45
 Root depth inches _____ Soil Temperature, °C (2") 11.2 (16") 10

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-11	fsl	15	55	grbr	trace	vm	none				friable
	11to22	sil	17	30	dkgray	trace	vm	few				friable
	22-29	sil	22	25	black	++	vm	few				buried soil
	29-49	sl	8	65	drab gray	++	moist	few				contains hp fragments
	49-61	sl	7	65	drab gray	++	moist	few				very friable
1463	0-12 30x						22.6		7.65	1.46	43	carlos
1464	0-12						26.4		7.53	1.1	49.4	
1465	12to30						34.8		7.67	1.94	65.7	
1466	30-60						25.3		7.82	3.68	36.9	sar 3.4 gypsum 0.13 meq/100gr

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.
 light loam at 61 inches; site irrigated about 1 day ago
 no water table to 61 inches; 29-61 common carbonates
 possible cap fringe below 30 inches (lab)

EM38 Measurements:		EM _v	EM _H	EM _v	EM _H
		48	45	32	23
		47	38	59	49
		45	32	55	43
		57	38	55	41
		67	41	60	36
		41	37		

Site 125

San Joaquin River Seepage Management Program

Well or Boring# 125-13 Sampler: brummer hernandez Date: 3/1/2013
 location wgs84 0715386 4108640 Landform low terrace NRCS Map Unit columbia soils
 Location Notes 250 feet east of obswell m-6 wp305 channeled
 Topography nearly level Vegetation & Condition tomatoe beds
 Irrigation System Type: gravity Irrigation Quadrant 4/5
 Avg EM Measurements; EM_V 39 EM_H 27 EM Calibration Site: EM_V 43 Emh 24
 Root depth inches _____ Soil Temperature, °C (2") 15.6 (16") 11.2

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-8	fsl	9	65	brgray	0	m	none				very friable
	8to16	loam	15	45	brgray	0	m	none				very friable
	16-26	sil	16	30	dkgray	0	vm	few				friable
	26-38	sil	16	28	black	0	m	none				buried soil
	38-60	loam	17	35	drab gray	++	vm	few				very faint
	60-68	loam	17	35	drab gray	++	vm	few				contains hp fragments
1469	0-12 30x						17		7.29	1.62	47.8	50/50 beds/furrows carlos
1470	0-12						18.4		7.48	1.07	46	
1471	12to30						36.2		7.7	0.88	65	
1472	30-60						37.8		8.15	1.27	51.8	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.
 boring in furrow; no water table to 68 inches after 10 minutes
 wet at 68 inches; top of cap fringe?
 possible cap fringe below 38 inches (lab)

EM38 Measurements: EM _V		EM _H	EM _V EM _H	
	43	24	27	24
	32	29	40	23
	47	20	35	32
	29	28	44	19
	31	30	41	33
	50	26	56	31
	29 28b		44 24f	

Site 126

San Joaquin River Seepage Management Program

Well or Boring# 126-13 Sampler: brummer Date: 3/6/2013
 location wgs84 0722826 4095027 Landform low terrace NRCS Map Unit el nido sl
 Location Notes 500 feet from obswell drained
 Topography nearly level Vegetation & Conditon spotty alfalfa, old stand
 Irrigation System Type: gravity Irrigation Quadrant 2/5
 Avg EM Measurements; EM_v 41 EM_h 33 EM Calibration Site: EM_v 43 Emh 34
 Root depth inches _____ Soil Temperature, °C (2") 12.3 (16") 11.7

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-22	sil	20	28	dkgray		m	none				friable
	22-28	sil	21	25	gray		m	few				silt firm
	28-45	lt loam	14	50	brgray		m	few				very friable
	45-55	lt fsl	6	70	brgray		m	few				very friable
	55-60	ls	3	82	brgray		m	few				very faint; single grained; loose
1519	0-12 30x						18.3		7.12	1.24	48.5	
1520	0-12						20.7		7.11	0.92	49	
1521	12to30						24.7		6.9	0.77	50	
1522	30-60						19.1		7.65	1.37	39.4	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

no water table or cap fringe to 60 inches; mottles are very faint
 area may have been grazed by sheep

EM38 Measurements:			
EM _v	EM _H	EM _v	EM _H
45	35	45	38
39	33	40	31
30	27	43	34
29	25	47	37
33	28	46	37
44	35	56	41

Site 127

San Joaquin River Seepage Management Program

Well or Boring# 127-13 Sampler: brummer hernandez Date: 3/6/2013
 location wgs84 0723708 4094523 Landform low terrace NRCS Map Unit el nido sl
 Location Notes wp307 300 feet west of obswell wp307 drained
 Topography nearly level Vegetation & Condition fair alfalfa
 Irrigation System Type: gravity Irrigation Quadrant 2/5
 Avg EM Measurements; EM_V 36 EM_H 31 EM Calibration Site: EM_V 36 Emh 32
 Root depth inches _____ Soil Temperature, °C (2") 11.7 (16") 10.6

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-16	loam	23	32	dkgray	0	m	none				friable -firm
	16-25	sil	20	30	gray	0	m	very few				common roots
	25-41	lt loam	12	40	ltbr	0	sm	few				rust mottles; very friable
	41-51	vfsl	9	60	ltbr	trace	sm	none				very friable
	51-62	sil	19	25	brown	trace	sm	few				friable, very faint rust mottles
1523	0-12 30x						15.2		6.73	1.06	42.3	carlos
1524	0-12						19.2		6.89	1.16	46.9	
1525	12to30						26.4		6.84	1.91	60	
1526	30-60						12.6		6.86	2.07	52	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.
 no water table or cap fringe to 62 inches; area has been grazed by sheep
 psa 4 inches
 sand 37
 silt 41
 clay 22
 texture loam

EM38 Measurements:

EM _V	EM _H	EM _V	EM _H
24	31	34	31
36	33	40	33
40	33	51	43
39	32	40	37
32	24	26	28
39	33	33	30
27	23	36 32*	
29	26		

Site 128

San Joaquin River Seepage Management Program

Well or Boring# 128-13 Sampler: brummer hernandez Date: 3/15/2013
 location wgs84 0727047 4084529 Landform low terrace NRCS Map Unit temple clay loam
 Location Notes 12 trees in: between rows 9 and 10 300 ft east of well e3
 Topography nearly level Vegetation & Conditon young almonds first leaf
 Irrigation System Type: micro sprinkler Irrigation Quadrant _____
 Avg EM Measurements; EM_v 49 EM_h 38 EM Calibration Site: EM_v 49 Emh 34
 Root depth inches _____ Soil Temperature, °C (2") 14.5 (16") 15.6

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-18	lt sil	14	32	brgray	0	vm	none				very friable
	18-26	loam	14	40	grbrown	0	m	none				very friable
	26-36	lt loam	10	45	pale br	0	sm	none				very fine sand
	36-60	sic	40	25	dkgray	trace	sm	few				firm, well structured
1561	0-12 30x						17.7		7.28	1.07	51.1	carlos
1562	0-12						16.2		6.84	0.72	47.6	
1563	12to30						10.8		7.43	0.62	41	
1564	30-60						23.6		7.85	0.85	78	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

no water table or cap fringe to 60inches
 36-60in rust mottles
 psa 48 inches
 sand 6.5
 silt 39.5
 clay 54
 texture clay

EM38 Measurements:

EM _v	EM _h	EM _v	EM _h
49	37	54	33
48	43	53	40
48	39	52	39
48	39	47	38
47	37	49	36
52	40	44	38
		49	34

Site 129

San Joaquin River Seepage Management Program

Well or Boring# 129-13 Sampler: brummer hernandez Date: 3/15/2013
 location wgs84 0727553 4083276 Landform low terrace NRCS Map Unit temple clay loam
 Location Notes site between rows 11 and 12; 14 trees in; 350ft north of well e1
 Topography nearly level Vegetation & Condition young almonds first leaf
 Irrigation System Type: micro sprinklers Irrigation Quadrant _____
 Avg EM Measurements; EM_v 25 EM_h 25 EM Calibration Site: EM_v 14 Emh 16
 Root depth inches _____ Soil Temperature, °C (2") 14.5 (16") 13.9

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-14	lt scl	20	60	dkgray		wet-vn	none				
	14-20	co sl	8	70	dkredbr		vm	none				
	20-27	ls	4	86	brown		m	none				coarser with depth
	27-42	sand	1	97	ltbrgr		m	none				
	42-61	sand	0	99	ltrdbn		m	few				very faint rust stains
1565	0-12 30x						12.8		7.32	1.23	45.4	carlos 5x beds
1566	0-12						15.3		7.18	0.43	31	
1567	12to30						8.1		7.2	0.43	27.4	
1568	30-60						3.8		7.45	0.28	29.3	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.
 part of soil surface wet and part is dry; no water table or cap fringe to 61 inches
 heavier soils to southeast

EM38 Measurements: EM _v		EM _H	EM _v EM _H	
16	24		70	61
18	14		60	43
15	13		29	34
10	14		15	18
26	31		12	14
67	59		10	14
15	23		12	15
14	16		14	16
20	23			

Site 130

San Joaquin River Seepage Management Program

Well or Boring# 130-13 Sampler: brummer Date: 3/20/2013
 location wgs84 0714956 4107013 Landform westside basin NRCS Map Unit bolfar cl
 Location Notes wp311 partially drained
 Topography nearly level Vegetation & Conditon bedded corn stubble
 Irrigation System Type: gravity Irrigation Quadrant 4/5
 Avg EM Measurements; EM_v 88 Emh 54 EM Calibration Site: EM_v 98 Emh 59
 Root depth inches _____ Soil Temperature, °C (2") 15.1 (16") 14.5

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-11	loam	18	40	brgray		m-v	none				very friable
	11to22	fsl	10	65	grbrown		vm	none				very friable
	22-56	sicl	30	20	dkgray		m	few				firm, rust mottles
	56-72	sicl	30	20	gray		vm-sat	few				firm
	72-78	lt sicl	29	20	olgr		sat	common				very firm, rust mottles
1605	0-12 30x						18		7.72	1.9	45.6	
1606	0-12						14.5		7.83	1.48	41.1	
1607	12to30						20		7.83	1.8	45.2	
1608	30-60						14.9		7.88	1.47	58	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.
 site has been pre irrigated
 suction at 62 inches
 water table 4.3 BOF after 15 minutes; 5.1 to b
 boring in furrow; all measurements are from the bottom of the furrow;
 open drain 300 feet to east is flowing

 psa 4in 76in
 sand 52.5 24
 silt 31.5 53
 clay 16 23
 tex hfsil sil

EM38 Measurements:

EM _v	EM _H	EM _v	EM _H
91	59	70	37
103	65	81	49
122	81	49	33
113	73	52	27
78	45	56	37
106	67	60	36
102	72	85	46
134	90	98	59

Site 131

San Joaquin River Seepage Management Program

Well or Boring# 131-13 Sampler: brummer Date: 3/20/2013
 location wgs84 0714960 4107402 Landform westside basin NRCS Map Unit palazzo sl
 Location Notes wp312 partially drained
 Topography nearly level Vegetation & Condition bedded cotton stubble
 Irrigation System Type: gravity Irrigation Quadrant 3/5
 Avg EM Measurements; EM_v 75 EM_h 53 EM Calibration Site: EM_v 76 Emh 55
 Root depth inches _____ Soil Temperature, °C (2") 15.1 (16") 13.9

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-22	sil	24	22	dkgr		vm	none				0-3in dry
	22-37	ltloam	14	40	brgray		vm	common				prominent rust mottles
	37-44	sil	19	30	dkgr		vm	few				friable
	44-49	sl	10	62	dkgr		vm	few				friable
	49-60	cl	31	30	gray		m-vm	few		2.8		firm
	60-65	ltcl	28	30	gray		vm	few				
	65-76	hl	25	30	drabgr		vm-sat	common				
1611	0-12 30x						17.9		6.89	0.93	47.9	50/50 beds furrows
1612	0-12						20.3		7.03	0.86	48.3	
1613	12to30						24.7		7.59	2.8	50.6	
1614	30-60						16.1		7.74	2.76	46	sar 8.2 gypsum 0.00

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.
 boring and em survey in furrows;
 measurements are from the bottom of the furrow
 water table 4.4 after 15 minutes
 capillary fringe less than 1 foot thick
 variable em38 readings indicate coarser soils nearby.

EM38 Measurements:			
EM _v	EM _h	EM _v	EM _h
82	64	59	49
84	55	42	34
92	59	44	30
91	68	27	13
104	67	85	61
90	62	87	61
87	67	75	54
76	55		

Site 132

San Joaquin River Seepage Management Program

Well or Boring# 132-13 Sampler: brummer Date: 3/20/2013
 location wgs84 0715375 4107447 Landform westside basin NRCS Map Unit palazzo sl
 Location Notes wp313 partially drained
 Topography nearly level Vegetation & Condition bedded cotton stubble
 Irrigation System Type: gravity Irrigation Quadrant 2/5
 Avg EM Measurements; EM_v 86 EM_H 60 EM Calibration Site: EM_v 90 Emh 70
 Root depth inches _____ Soil Temperature, °C (2") 16.2 (16") 15.1

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-14	loam	16	42	brgray	0	vm	none				very friable
	14-41	sil	19	30	dkgray	+	vm	none				friable
	41-52	cl	30	30	gray	+	m	few				firm, faint rust mottles
	52-67	loam	23	28	olgray	++	vm	few				few carbonates
	67-77	loam	19	35	olgray	++	vm	common				
	77-89	fsl	14	58	olgray	++	vm	common				
	89-92	sl	10	60			wet-sat					
	92-96	hsil	27	20			sat					may be barrier to sl
1615	0-12 30x						21.7		7.41	1.16	45.6	
1616	0-12						16.1		7.13	2.12	47.9	
1617	12to30						27.5		7.65	2.26	54.8	
1618	30-60						20.2		7.81	4.09	59.9	sar 9.9 gypsum 0.00

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.
 site has been pre irrigated
 water table is 6.4 after 15 minutes
 cap fringe 52-75in
 boring in furrow; all measurements from bof
 psa 56 inches
 sand 33.5
 silt 41
 clay 25.5
 texture heavy loam

EM38 Measurements:		EM _v	EM _H	EM _v	EM _H
		91	74	95	59
		88	61	94	66
		81	60	86	59
		64	48	91	58
		82	60	66	47
		111	76	89	56
		78	48	90	70

Site 133

San Joaquin River Seepage Management Program

Well or Boring# 133-13 Sampler: brummer papandek Date: 3/21/2013
 location wgs84 0714639 4107175 Landform ws basin NRCS Map Unit bolfar cl
 Location Notes wp314 partially drained
 Topography nearly level Vegetation & Conditon bedded corn stubble
 Irrigation System Type: gravity Irrigation Quadrant 2/5
 Avg EM Measurements; EM_V 76 EM_H 54 EM Calibration Site: EM_V 77 Emh 61
 Root depth inches _____ Soil Temperature, °C (2") 15.6 (16") 14.5

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
ns	0-10	sicl	30	25	dkgray	0	moist	none				firm
	10to17	hloam	25	35	dkgray	0	vm	none				friable
	17-27	loam	17	40	dkgray	+	vm	none				very friable
	27-40	lfs	4	87	ltrdbr	+	vm	few				loose single grained
	40-72	loam	17	45	bluegray		vm-w	few				gleyed
	72-94	sil	18	25	bluegray	0	w-sat	none				gleyed
	94to100	fsl	12	60	bluegray		sat	none				gleyed
	100-130	ls	4	90	bluegray		sat	none				sandy strata; sm (jeff)

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.
 em38 only, not sampled
 suction at 54 inches
 100-130 mostly sand but contains thin ls,sl and sil lenses
 strong gleyed color indicates stagnant anarobic conditions below 40 inches
 water table 4.7ft after 15 minutes
 hard to log saturated sandy strata from 100-130 inches
 all measurements are from the bottom of a 10 inch deep furrow
 estimated capillary fringe from 40-56 inches

EM38 Measurements:			
EM _V	EM _H	EM _V	EM _H
77	53	97	60
72	52	64	49
68	52	79	59
89	61	54	45
100	66	46	29
97	71	58	46
77	61	87	55

Site 134

San Joaquin River Seepage Management Program

Well or Boring# 134-13 Sampler: brummer Date: 3/27/2013
 location wgs84 0714659 4107419 Landform ws basin NRCS Map Unit bolfar clay loam
 Location Notes 200 feet east of well w8 wp316 partially drained
 Topography nearly level Vegetation & Condition bedded fallow
 Irrigation System Type: gravity Irrigation Quadrant 4/5
 Avg EM Measurements; EM_v 67 EM_h 49 EM Calibration Site: EM_v 62 EM_h 56
 Root depth inches _____ Soil Temperature, °C (2") 17.2 (16") 13.3

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
ns	0-12	loam	20	35			moist	none				
ns	12to30	lt silcl	28	25			moist	none				

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:
 EM38 only
 0-2in nearly dry

Numeric values indicate percent moisture by weight.

EM38 Measurements:		EM _v	EM _h	EM _v	EM _h
		76	58	59	41
		61	55	56	39
		61	46	57	35
		64	44	76	54
		80	54	81	61
		65	47	78	54

Site 135

San Joaquin River Seepage Management Program

Well or Boring# 135-13 Sampler: brummer hernandez Date: 4/3/2013
 location wgs84 0736301 4072889 Landform low terrace NRCS Map Unit chino loam
 Location Notes about 300 feet from fresno slough
 Topography nearly level Vegetation & Conditon alfalfa
 Irrigation System Type: gravity Irrigation Quadrant 2/5
 Avg EM Measurements; EM_v 23 EM_h 18 EM Calibration Site: EM_v 20 Emh 15
 Root depth inches _____ Soil Temperature, °C (2") 12.8 (16") 15.1

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-14	loam	18	45	brgray		sm-m	none				friable
	14-31	lt sl	6	72	ltbrgr		sm	none				very friable ls in spots
	31-47	loam	24	35	brgray		sm	none				friable
	47-60	loam	20	35	whitish		sm	none				common carbonates
1751	0-12 20x						11.7		7.55	0.83	38.6	hernandez
1752	0-12						9.9		7.16	0.38	37.3	
1753	12to30						6.2		8.16	0.64	35.6	
1754	30-60						14.6		8.3	1.43	44.7	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks:

Numeric values indicate percent moisture by weight.
 no water table or cap fringe to 60 inches
 too dry for good EM survey
 psa 40 inches
 sand 32
 silt 47
 clay 21
 texture loam

EM38 Measurements:			
EM _v	EM _h	EM _v	EM _h
19	14	35	25
21	17	16	13
22	16	16	13
21	19	19	14
29	24	19	14
25	37	20	15

Site 136

San Joaquin River Seepage Management Program

Well or Boring# 136-13 Sampler: brummer hernandez Date: 4/3/2013
 location wgs84 0736471 4072841 Landform low terrace NRCS Map Unit _____
 Location Notes 9 trees in from well stake
 Topography nearly level Vegetation & Conditon good almonds
 Irrigation System Type: gravity Irrigation Quadrant 4/5
 Avg EM Measurements; EM_v _____ EM_H _____ EM Calibration Site: EM_v 78 emh 61
 Root depth inches _____ Soil Temperature, °C (2") 13.3 (16") 15.1

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-15	sl	15	55	dkgray		vm	none				friable 0-3in wet
	15-46	sil	17	30	brgray		vm	none				friable
1755	0-15 8x						14.5		7.17	1.24	35.4	cal site
1756	15-30 8x						19.1		7.53	6	50.3	sar 6.9 gypsum 0.00

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong
² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;
 Field capacity will be considered very moist. Wet will be considered capillary fringe conditions.

Site Remarks: Numeric values indicate percent moisture by weight.
 site was too wet for standard survey, too much ponded water from recent irrigation.
 right center of row
 no water table to 46 inches
 em calibration site in relatively dryer area

EM38 Measurements:			
EM _v	EM _H	EM _v	EM _H
79	61	62	62
69	51	64	47
65	51	56	42
78	61	61	46
66	50	69	50
68	46	78	60

Site L21

San Joaquin River Seepage Management Program

Well or Boring# L21 Sampler: brummer, dominguez, weir Date: 4/14/2011
 location location wgs84 37.0908384 120.5747684 Landform basin NRCS Map Unit palazzo sl
 Location Notes three feet from initial boring hole; found old augur hole partially drained
 Topography level Vegetation & Conditon beds
 Irrigation System Type: drip Irrigation Quadrant _____
 Avg EM Measurements; EM_v 52 EM_H 37 EM Calibration Site: EM_v 47 Emh 34
 Soil Temperature, °C (2") 18 (16") 16

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-12	loam			vdkgray		vm	none				friable
	12to30	sil			brown		vm	none				
	30-48	cl			vdkgray		vm	few				silt sticky; silt plastic
	48-60	scl			vdkgrbr		wet	few				gritty; silt sticky
4/14/2011	60-98	ltcl			grey		wet-sat	few				rust mottles
	98-112	sand	1	98	grey		saturated	few				
550	0-12 20x						13.8		7.08	1.85	37.1	
551	0-12						13.7		6.16	2.23	36.9	
552	12to24						21.9		7.45	1.96	34.7	
553	24-36						24.2		7.6	1.75	40	boundary conditions
554	36-48						17.3		7.72	2.25	43.2	
55	48-60						13.4		7.4	1.77	44	
556	60-72						9.7		7.42	1.56	41.1	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

mottles at 30 inches
 samples on bed shoulder
 4-14-2011 resample site is 3 feet from initial boring
 suction at 9 feet
 water table 70 inches after 10 minutes
 capillary fringe 45-70 inches
 em on broad tomatoe beds
 wet at 45 inches

EM38 Measurements:			
EM _v	EM _H	EM _v	EM _H
43	31	61	43
46	33	44	30
49	36	43	31
39	28	63	44
64	42	57	38
66	46	47	34

Site L26

San Joaquin River Seepage Management Program

Well or Boring# L26 Sampler: brummer, dominguez weir Date: 4/14/2011
 location wgs84 37.09461 120.5789834 Landform basin NRCS Map Unit palazzo sl
 Location Notes site is close to the edge of the field 30-40 feet from edge partially drained
 Topography level Vegetation & Conditon cotton beds
 Irrigation System Type: drip Irrigation Quadrant _____
 Avg EM Measurements; EM_v _____ EM_h _____ EM Calibration Site: EM_v _____ EM_h _____
 root zone 0-48in Soil Temperature, °C (2") (16")

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-12	sil			dk brown		vm	none				
	12to36	loam			dk brown		vm	none				
	36-60	cl			black		vm	few				common carbonates
4/14/2011	60-72	cl					wet	few				faint rust mottles; firm
4/14/2011	72-78	ltcl					saturated					
543	0-12 20x						16.4		7.27	1.55	41.8	
544	0-12						17.5		7.16	2.15	44	
545	12to24						19		7.34	1.53	42.2	
546	24-36						19.9		7.81	1.6	46.7	
547	36-48						24.7		7.62	2.22	58.1	
548	48-60						23.1		7.62	2.3	54.5	
549	60-72						20.6		7.73	2.51	52	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

soil moisture levels are based on lab data
 samples from bed shoulder
 water table over 60 inches deep
 water table 6 feet 3 inches after 10 minutes 4-14-2011
 capillary fringe 5-6.3 feet
 site under power lines no em38 survey
 roots to 48 inches

EM38 Measurements:			
EM _v	EM _h	EM _v	EM _h
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Site L28

San Joaquin River Seepage Management Program

Well or Boring# L28 Sampler: brummer, dominguez, weir Date: 4/14/2011
 location wgs84 37.0976634 120.5795468 Landform basin NRCS Map Unit palazzo sl
 Location Notes 350 feet into field partially drained
 Topography level Vegetation & Conditon cotton beds
 Irrigation System Type: drip Irrigation Quadrant _____
 Avg EM Measurements; EM_v 93 EM_h 72 EM Calibration Site: EM_v 98 Emh 78
 root zone _____ Soil Temperature, °C (2") 20 (16") 16

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-12	sicl			vdkgray		moist	none				firm
	12to24	sil			vdkgray		moist	none				
	24-40	cl			ltredbr		vm-wet	none				
	40-50	sand			ltolivebr		wet	few				few faint
	50-60	cl			dkgrbrown		saturated	few				segregated carbonates
559	0-12 20x						22		6.96	1.7	57.9	
560	0-12						23.6		6.74	0.48	46.6	
561	12to24						29.6		7.09	0.62	52.3	
562	24-36						26.9		7.52	0.94	62.8	
563	36-48						27.8		7.71	1.26	61.7	
564	48-60						37.8		7.96	1.94	49.9	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

soil moisture levels indicate possible capillary fringe conditions below 24 inches
 esimated cap fringe 20-40 inches
 em in furrows
 water table 40 inches from top of bed

EM38 Measurements:			
EM _v	EM _h	EM _v	EM _h
103	74	101	77
94	75	99	79
90	66	97	63
74	67	93	74
71	60	108	68
86	64	98	78

Site L48

San Joaquin River Seepage Management Program

Well or Boring# L48 Sampler: brummer, dominguez, weir Date: 4/14/2011
 location wgs84 37.1021418 120.5867234 Landform basin NRCS Map Unit palazzo sl
 Location Notes about 350 feet into field partially drained
 Topography nearly level Vegetation & Conditon tomatoe beds
 Irrigation System Type: drip Irrigation Quadrant 3/5
 Avg EM Measurements; EM_v 33 EM_H 23 EM Calibration Site: EM_v none Emh _____
 root zone _____ Soil Temperature, °C (2") 21 (16") 19

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-15	sil			dkbrown		vm	none				friable
	15to24	sand			gray		vm	none				
	24-30	sand			dk gray		vm	few				
	30-36	scl			dark brown		vm	few				mottles at 32 inches
	36-50	sl			dkgrbrown		vm	few				
	50-60	sand			dkyelbrown		vm	few				
4/14/2011	60-90	sand	1	97			vm	few				
4/14/2011	90-102	sand	1	97			wet-sat	few				sicl lense at 90 inches
566	0-12 20x						15.7		7.03	1.31	38.9	
567	0-12						15.1		6.77	1.06	35.4	
568	12to24						10.4		7.26	1.32	33.8	
569	24-36						15.8		7.33	1.62	41.3	
570	36-48						24		6.86	2.78	45.5	
571	48-60						15.3		6.7	2.61	29.9	
572	60-72						18.2		6.57	3.37	28.6	sar 5.8 gypsum 0.0

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

samples from bed shoulder
 4-14-2011 water table 7 feet 8 inches
 sand streaks in area; low em zones
 cap fringe about 2.8 feet thick

EM38 Measurements: EM _v		EM _H	
29	22	49	35
36	24	20	14
25	16	18	12
18	12	45	34
45	33	36	23
46	34	25	18

Site L50

San Joaquin River Seepage Management Program

Well or Boring# L50 Sampler: brummer, dominguez, weir Date: 4/14/2011
 location wgs84 37.10488 120.5898782 Landform alluvium NRCS Map Unit palazzo sl
 Location Notes about 350 feet into field partially drained
 Topography nearly level Vegetation & Conditon cotton beds
 Irrigation System Type: drip Irrigation Quadrant _____
 Avg EM Measurements; EM_v 69 EM_h 50 EM Calibration Site: EM_v 70 Emh 62
 root zone _____ Soil Temperature, °C (2") 21 (16") 19

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-12	loam			vdkgrbr		vm	none				
	12to24	loam			vdkgrbr		vm	none				
	24-30	sicl			black		vm	none				
	30-48	sicl			grbrown		vm	none				
	48-60	scl			grbrown		vm	none				
4/14/2011	60-74	loam	20	40	gray		vm-wet	few				cap fringe
	74-84	sl			gray		wet-sat	few				stratified ls,sl,loam; gleyed
575	0-12 20x						14.6		6.65	1.27	36.3	
576	0-12						16.3		6.51	1.15	36.2	
577	12to24						18.4		6.61	1.08	38.7	
578	24-36						31		7.25	1.28	59.5	
579	36-48						28.2		7.85	2.63	46.6	cap fringe
580	48-60						28.5		8.01	1.57	45.6	cap fringe
581	60-72						21.5		8.07	1.34	37.8	cap fringe

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

samples from bed shoulder
 water table about 78 inches
 cap fringe 36-78 inches (lab data)
 drainline about 250 feet to west

EM38 Measurements: EM _v EM _h EM _v EM _h			
	77	59	67 51
	76	51	60 39
	64	41	63 54
	68	44	75 50
	69	43	74 47
	64	58	70 62

Site L68

San Joaquin River Seepage Management Program

Well or Boring# I68 Sampler: brummer.weir.dominguez Date: 4/14/2011
 location wgs84 37 1081334 120 5926634 Landform basin NRCS Map Unit palazzo sl
 Location Notes about 150 feet into field partially drained
 Topography level Vegetation & Condition newly plowed wide beds
 Irrigation System Type: drip Irrigation Quadrant _____
 Avg EM Measurements; EM_V 44 EM_H 29 EM Calibration Site: EM_V 46 Emh 30
 root zone 30 inches; in zone above compact clay Soil Temperature, °C (2") 21 (16") 19

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-12	fsl			yelbrn		moist	none				loose surface
	12to30	sl			brown		moist	none				compacted, friable
	30-36	clay			dkredgr		wet	common				sticky, plastic, firm
	36-60	clay			dkredgr		vm	none				very firm
4/14/2011	60-74	clay			grey		vm-wet	none				firm
4/14/2011	74-84	fsl			grey		sat	common				rust mottles
583	0-12 20x						11.2		6.91	0.47	32	
584	0-12						11.7		7.48	0.72	45.8	
585	12to24						13.3		7.33	0.36	34.6	
586	24-36						38.3		7.64	0.56	49.7	
587	36-48						29		7.51	0.74	63.6	
588	48-60						27.2		7.65	0.86	69	
589	60-72						26.9		7.92	0.88	61.7	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

mottles at 30 inches
 4-14-201 em top of beds
 water table about 6.2 feet bgs after 10 minutes
 cap fringe 60-74 inches
 this may be the same site as I66 log from 9-15-2010
 soil is wet from abrupt boundary conditions from 24-30 inches

EM38 Measurements:			
EM _V	EM _H	EM _V	EM _H
41	27	41	29
45	30	51	35
41	29	51	34
38	26	43	28
42	28	40	26
43	28	46	30

Site DF-1

San Joaquin River Seepage Management Program

Well or Boring# df 1 Sampler: brummer, hernandez Date: 4/15/2011
 location wgs84 37.1122668 120.5920034 Landform basin NRCS Map Unit palazzo sl
 Location Notes 120-150 feet into field partailly drained
 Topography level Vegetation & Conditon beds
 Irrigation System Type: drip Irrigation Quadrant _____
 Avg EM Measurements; EM_v 55 EM_H 39 EM Calibration Site: EM_v 58 Emh 41
 root zone _____ Soil Temperature, °C (2") 25 (16") 18c

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-12	sil			dkgray		moist	none				dry surface crust
	12to24	l			vdkgrbrn		moist	none				
	24-36	cl			vdkgray		vm-wet	few				mottled at 32 inches
	36-48	sil			dusky red		vm-wet	few				faint rust mottles
	48-60	scl			yelbrown		wet	none				gleyed
4/14/2011	60-66	loam	25	35	gleyed		sat	few				too wet to sample
618	0-12 20x						13		6.91	2.13	41.7	
619	0-12						15.8		7.02	1.55	41.9	
620	12to24						37.1		7.05	1.13	45.6	
621	24-36						33.6		7.27	1.82	62.3	
622	36-48						23.9		7.38	1.56	58.2	
623	48-60						27.2		7.68	2.05	46.4	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

found old boring hole
 samples collected from bed shoulder
 48-66in; common carbonates and salts
 4-14-2011 water table 54 inches after 15 minutes
 cap fringe 32-54 inches
 site 4 feet from old boring hole

EM38 Measurements:		EM _v	EM _H	EM _v	EM _H
Emv	Emh	63	45	50	35
63	45	62	44	55	39
43	29	55	38	63	43
52	40	53	29	61	43
57	40	52	39	48	31
58	41	41	32	63	43

Site DF-2

San Joaquin River Seepage Management Program

Well or Boring# df 2 Sampler: brummer, dominguez weir Date: 4/14/2011
 location wgs84 37.1134216 120.5987766 Landform floodplain NRCS Map Unit palazzo sl
 Location Notes about 400 feet into field partially drained
 Topography level Vegetation & Condition tomatoes
 Irrigation System Type: drip Irrigation Quadrant _____
 Avg EM Measurements; EM_v 42 Emh 38 EM Calibration Site: EM_v 33 Emh 30
 Soil Temperature, °C (2") 22 (16") 18

PROFILE DESCRIPTION AND LABORATORY DATA

Sample No.	Depth (Inches)	USDA Texture	% Clay	% Sand	Color	Reaction to HCL ¹	Moisture Content ²	Mottles	pH Paste	ECe dS/m	Sat. %	Notes:
	0-12	loam			dkgrbrn		vm	none				compacted
	12to20	sl			dkgrbrn		vm	none				friable,slightly plastic, non sticky
	20-62	fsl			ltbrgray		vm-wet	none				
4/14/2011	62-72	sand	1	97	ltbrgray		wet-sat	few				faint rust mottles
591	0-12 25x						17.5		6.58	2.44	42.5	
592	0-12						18.7		6.34	2.04	44.5	
593	12to24						17.1		7	2.15	40.6	
594	24-36						13.3		7.43	2.52	37.7	
595	36-48						14.3		7	2.06	38.2	
596	48-60						24.1		7.51	1.84	36.4	
597	60-72						23.6		7.23	2.07	28.6	

¹ Lime content; HCL reaction 0 none; + slight; ++ moderate +++ strong

² Soil moist: nearly dry=nd; slightly moist = sm; moist = m; very moist= vm; wet = w; saturated=S;

Field capacity will be considered very moist. Wet will be considered capillary fringe conditions. Numeric values indicate percent moisture by weight

Site Remarks:

mottles at 62 inches
 samples from bed shoulders
 14-Apr capillary fringe at 42-65 inches
 14-Apr water table 65 inches after 15 minutes

EM38 Measurements:	EM _v	EM _h	EM _v	EM _h
14-Apr	37	31	58	53
	21	22	59	50
	23	25	54	48
	40	30	36	33
	58	55	39	36
	60	54	25	28
			33	30*

Appendix C
Soil Salinity Baseline Sample Location
Maps

Appendix C – Soil Salinity Baseline Sample Location Maps

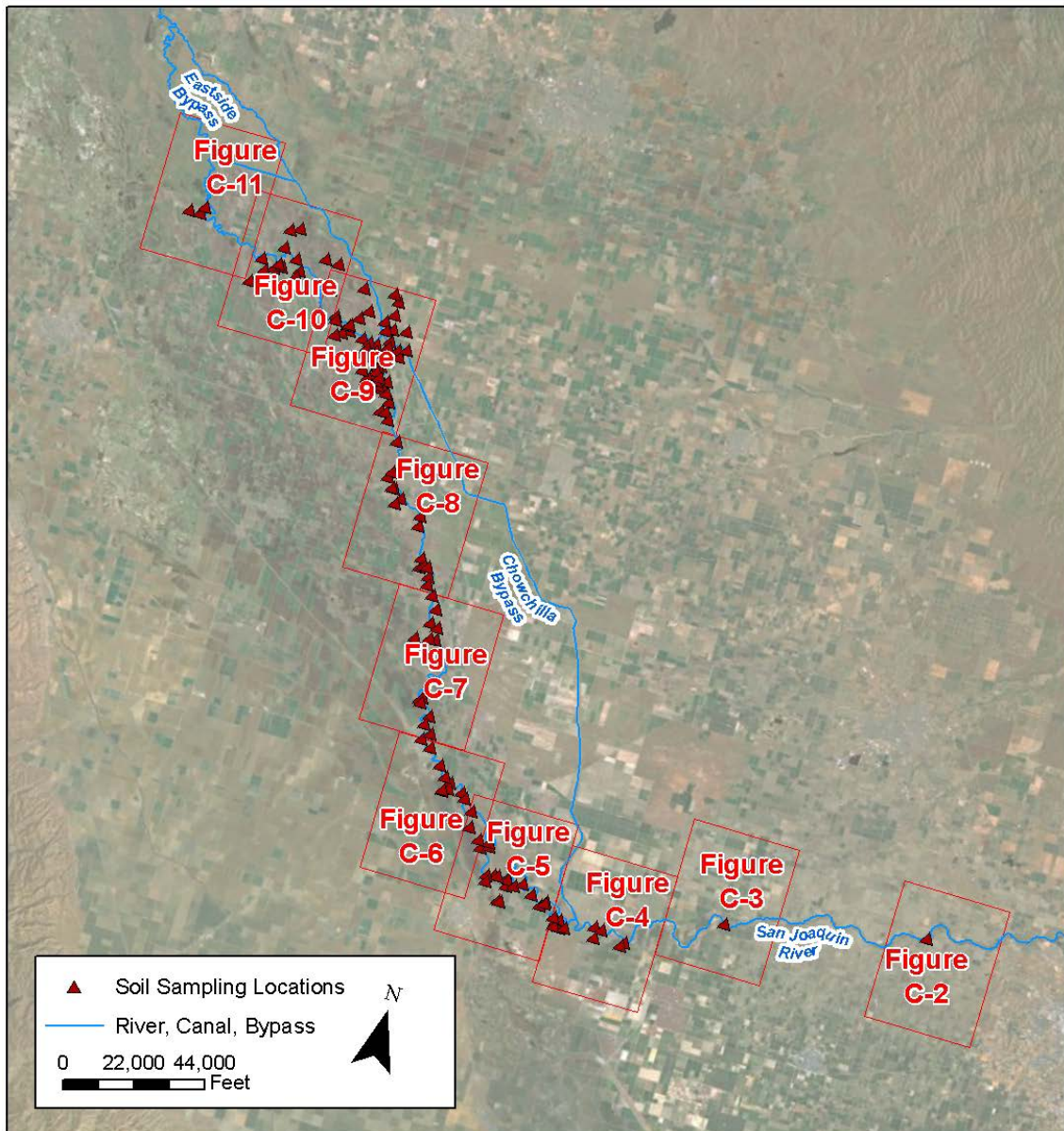


Figure C-1.
Soil Salinity Sampling Sites



Figure C-2.
Soil Salinity Sampling Sites, Local Map (1 of 10)

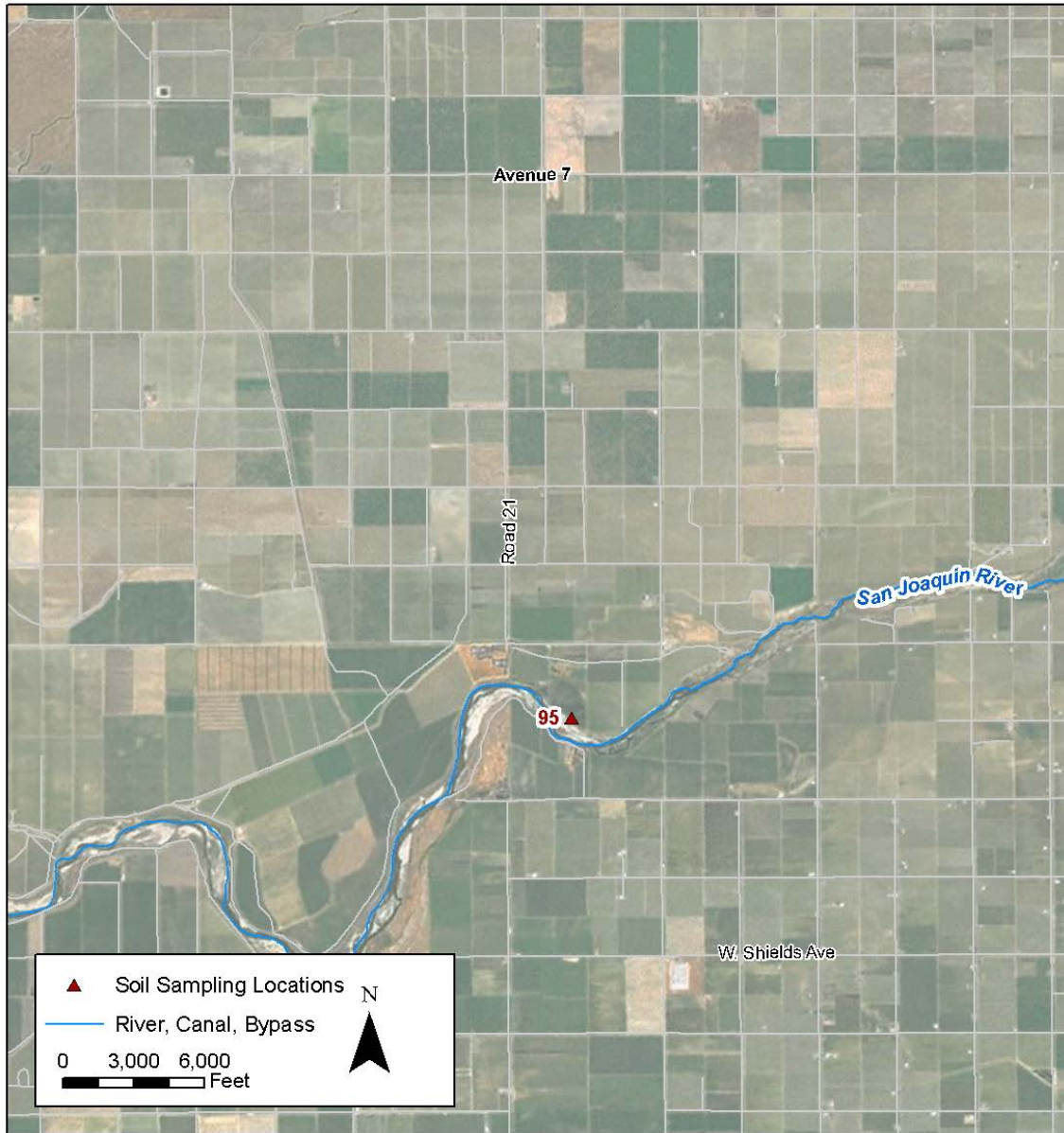


Figure C-3.
Soil Salinity Sampling Sites, Local Map (2 of 10)

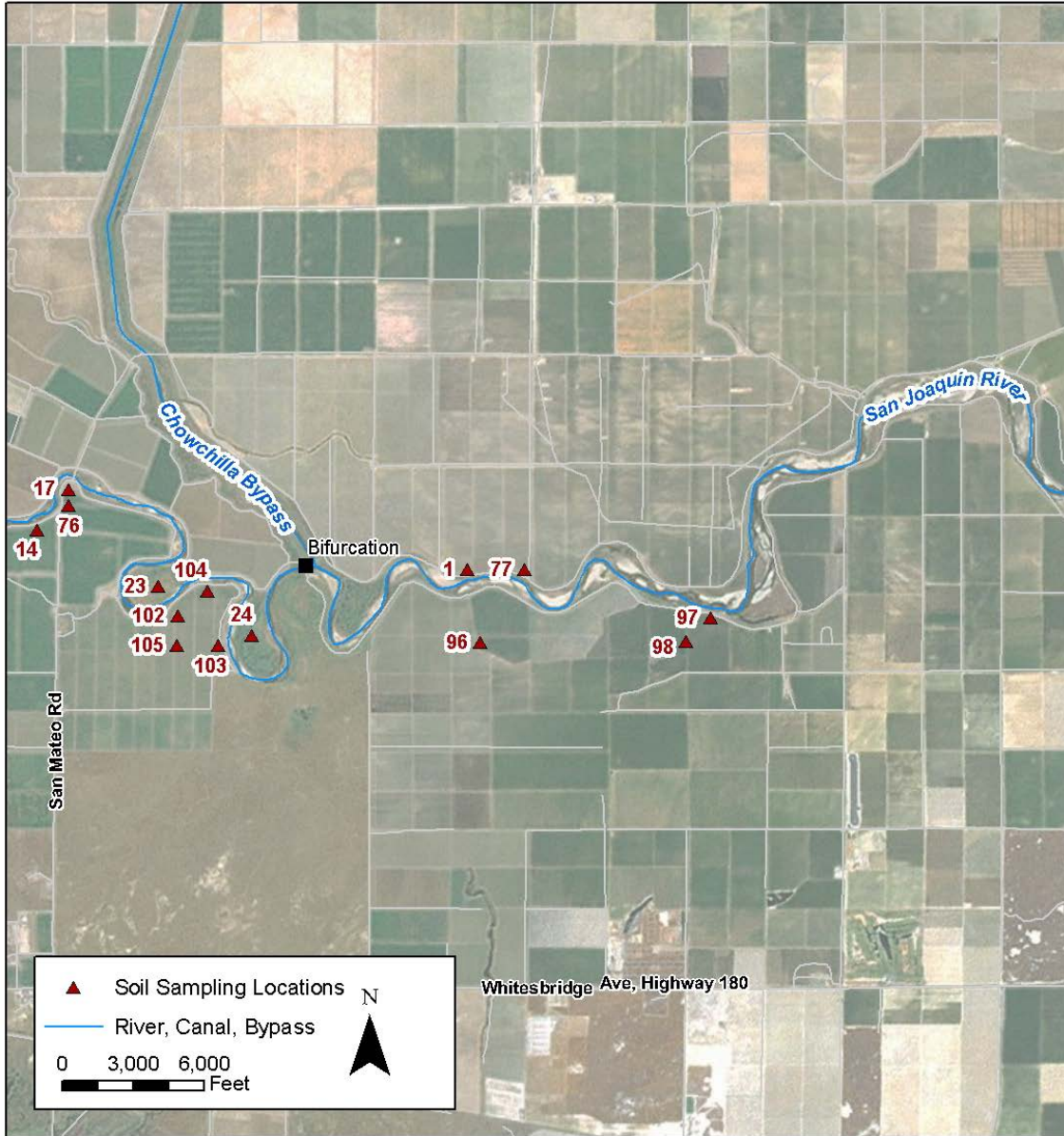


Figure C-4.
Soil Salinity Sampling Sites, Local Map (3 of 10)

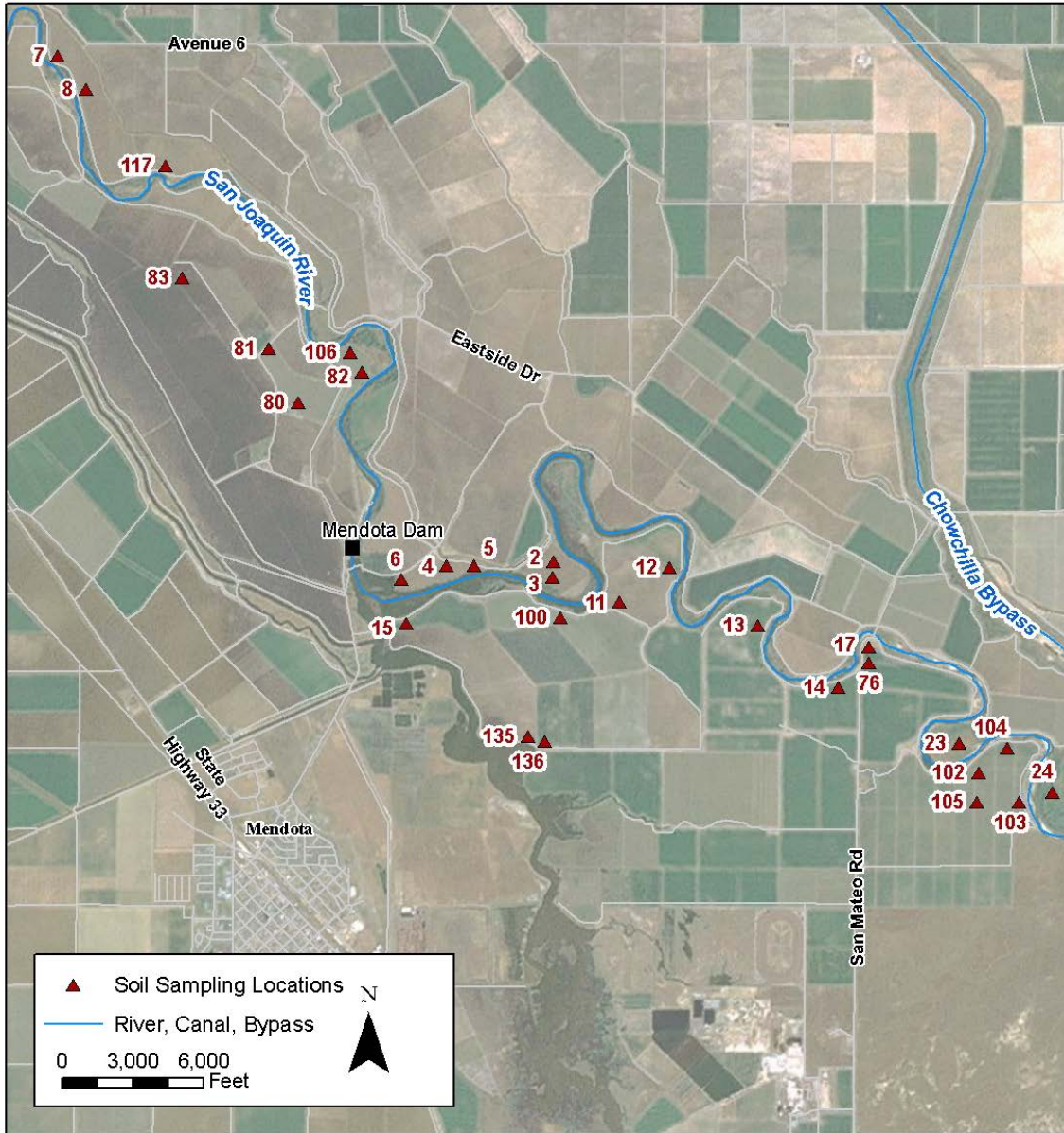


Figure C-5.
Soil Salinity Sampling Sites, Local Map (4 of 10)

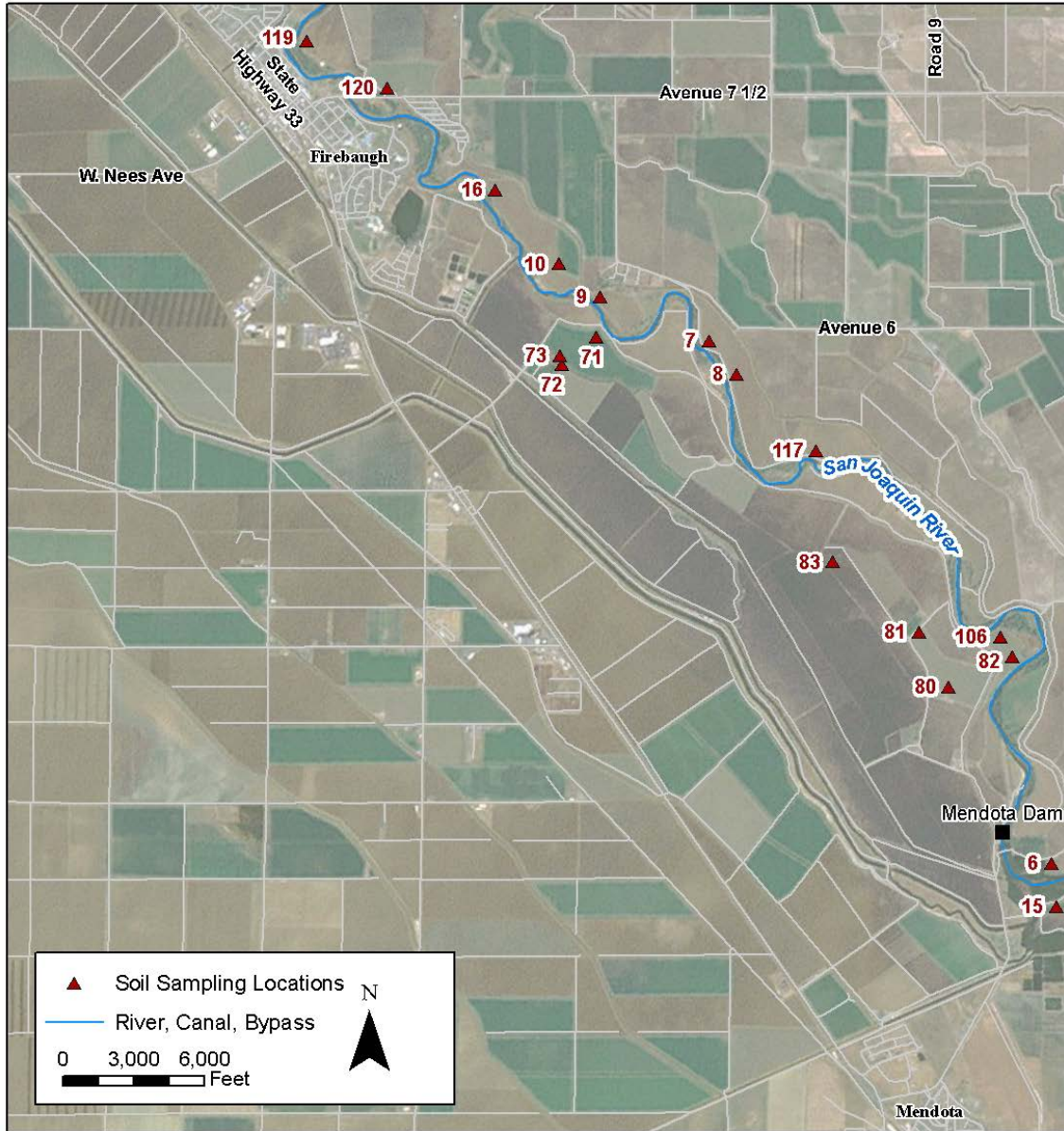


Figure C-6.
Soil Salinity Sampling Sites, Local Map (5 of 10)

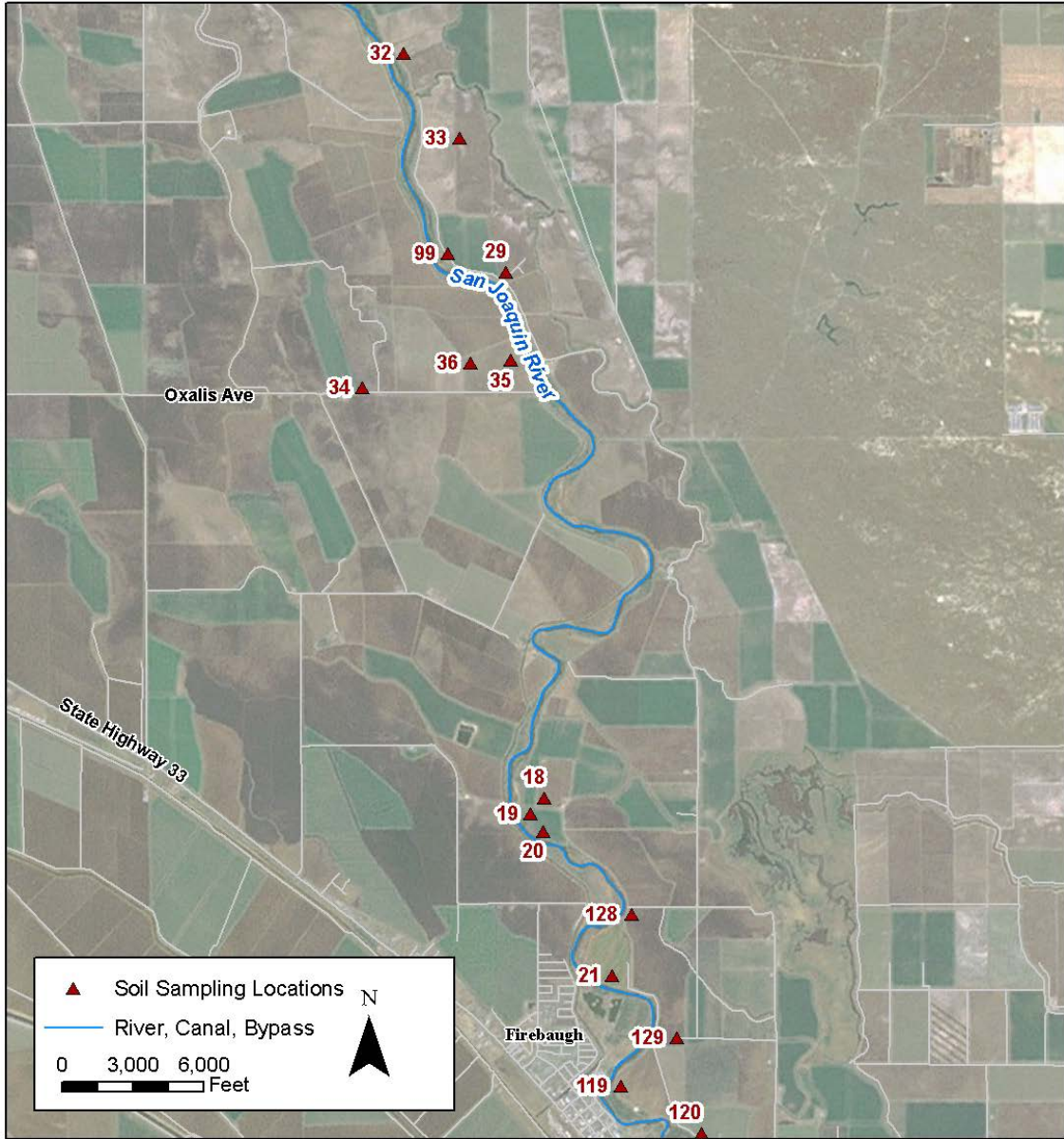


Figure C-7.
Soil Salinity Sampling Sites, Local Map (6 of 10)

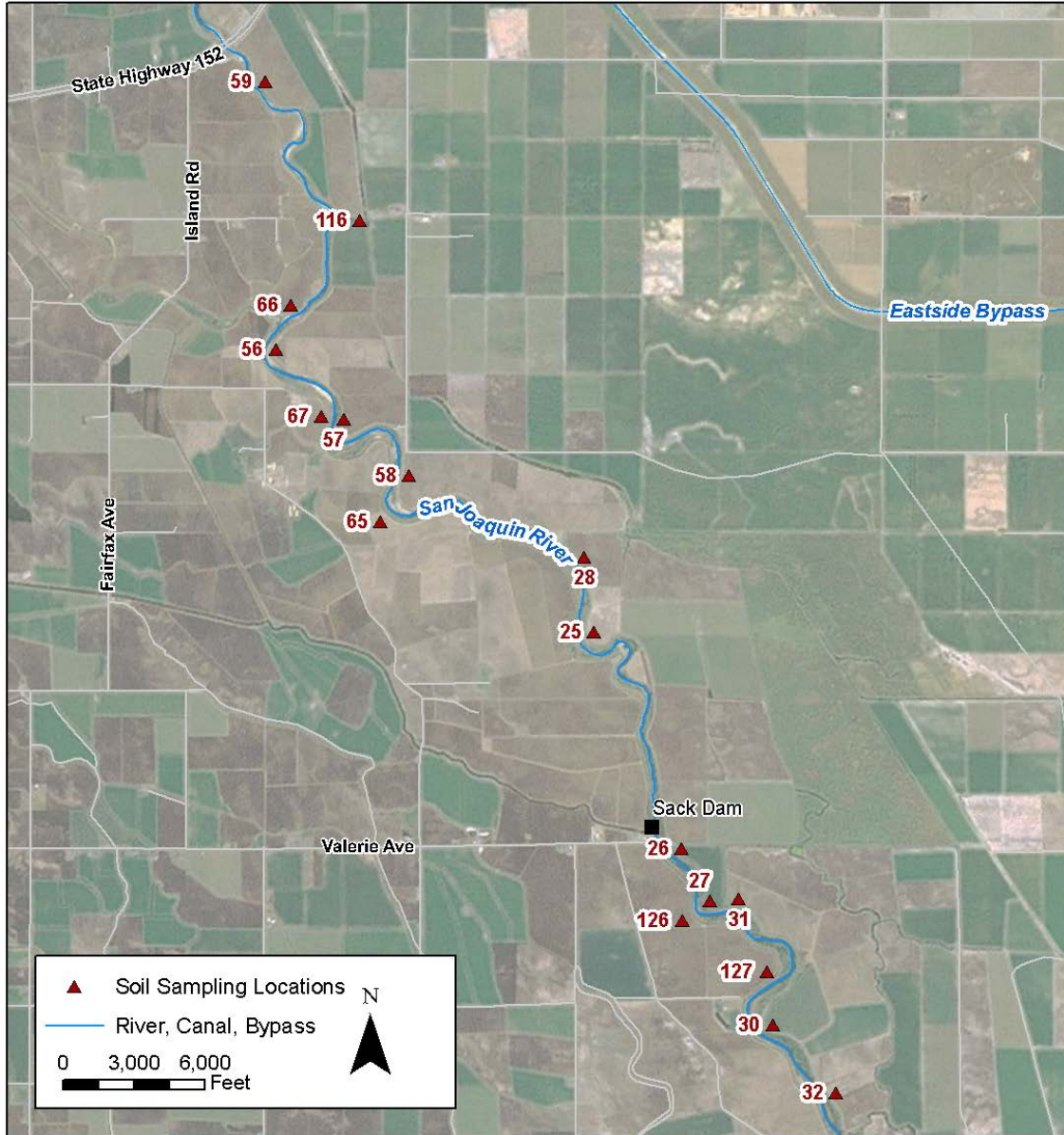


Figure C-8.
Soil Salinity Sampling Sites, Local Map (7 of 10)

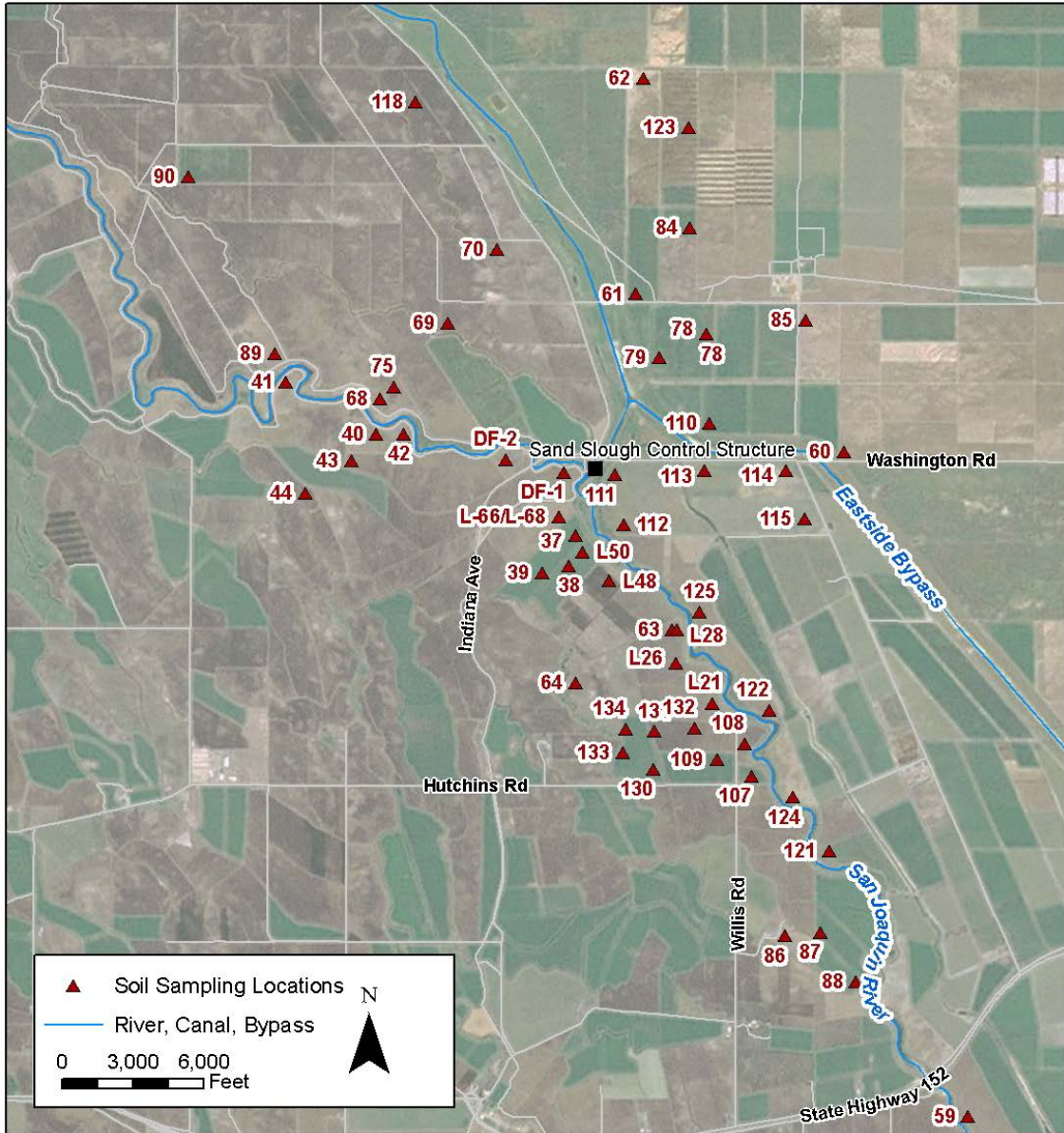


Figure C-9.
Soil Salinity Sampling Sites, Local Map (8 of 10)

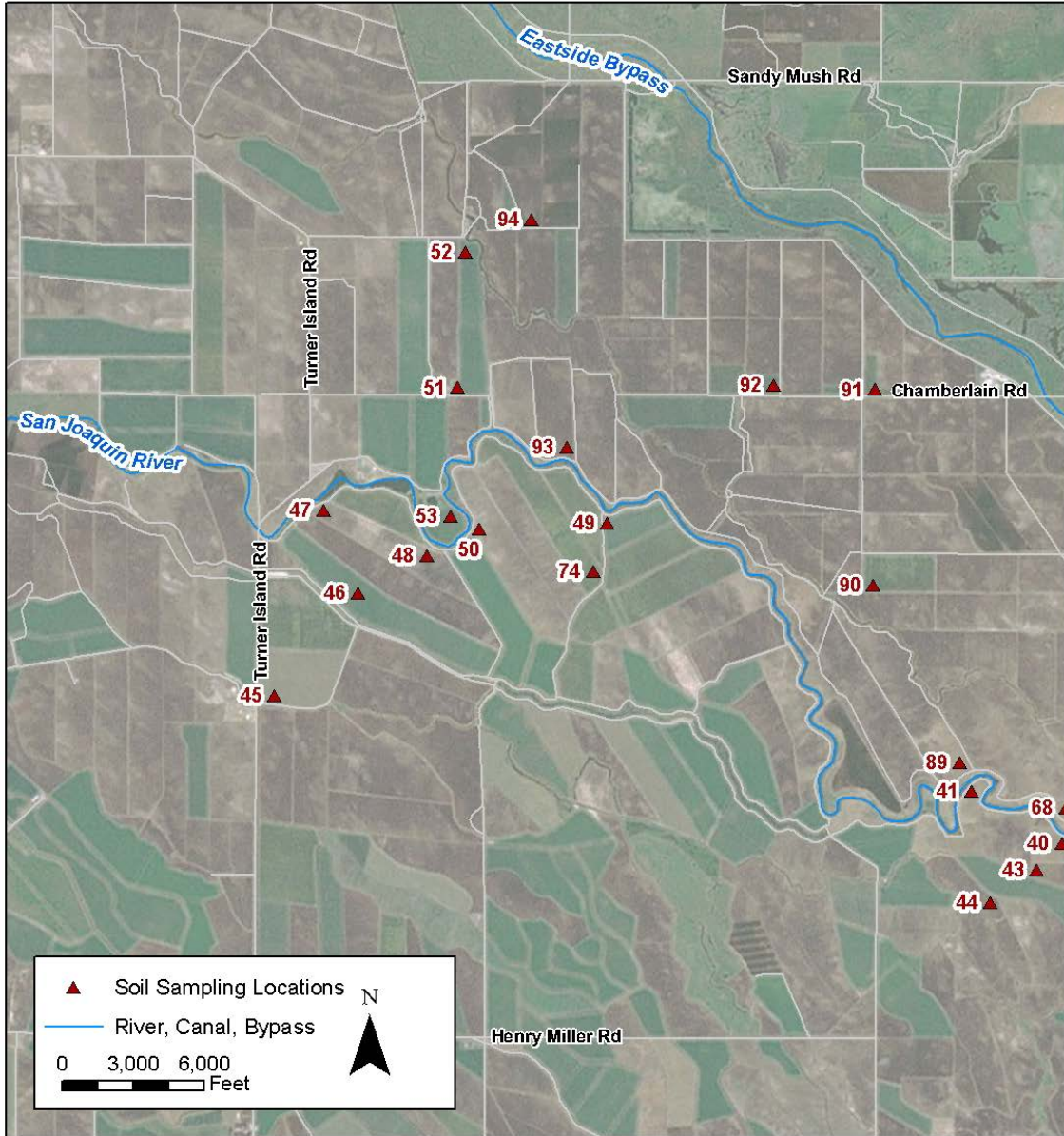


Figure C-10.
Soil Salinity Sampling Sites, Local Map (9 of 10)

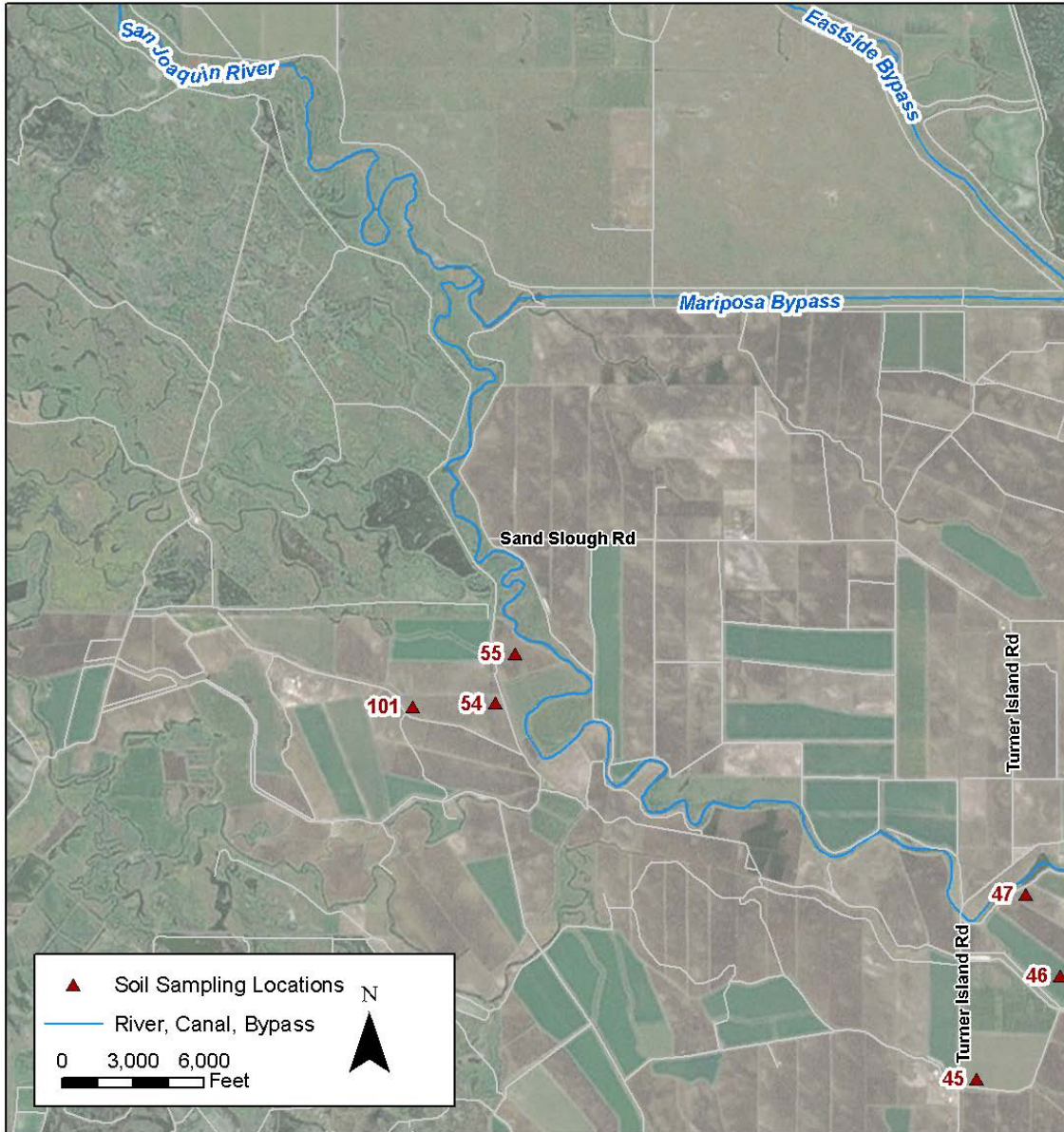


Figure C-11.
Soil Salinity Sampling Sites, Local Map (10 of 10)

Appendix D

Soil Profile Abbreviations

Appendix D – Soil Profile Abbreviations

Soil Colors

Br	brown
Brgr	brownish gray
Dk	dark
Gr	gray
Grbr	grayish brown
Olbr	olive brown
Pbrn	pale brown
Yel	yellow

Soil Texture

C	clay
Ch	channery
Cl	clay loam
Co	coarse
Cos	coarse sand
F	fine
Fsl	fine sandy loam
Gr	gravelly
H	heavy
L	loam
Lfs	loamy fine sand
Ls	loamy sand
Lt	light
Ltl	light loam
S	sand
Scl	sandy clay loam
Sic	silty clay
Sicl	silty clay loam
Sil	silt loam
Sl	sandy loam
Vfsl	very fine sandy loam
V	very

Soil Structure

Bl	blocky
M	moderate
Med	medium
Sab	subangular blocky
Sg	single grained
St	strong
W	weak

Other

30X	30 increment composite soil sample
Avg	average
BGS	below ground surface
Cal	calibration sample for EM38 interpretation
Cap	capillary fringe
ECe	electrical conductivity of the saturation extract
EM38	Instrument that measures electrical conductivity of the soil.
EMh	EM38 reading in the horizontal position
EMv	EM38 reading in the vertical position
Fe	iron
Ft	feet
Gyp	gypsum
HCL	hydrochloric acid (dilute)
In	inches
Ne	not evaluated
NRCS	Natural Resources Conservation Service
Ns	not sampled
Obs well	observation well
Paired	paired soil samples
pHp	soil reaction of the soil saturated paste
Psa	particle size analysis
Rep	field replicate soil sample
SAR	sodium adsorption ratio
Sat	saturated
Slt	slight
SP	saturation percentage
Tcor	Temperature corrected to 25°C
TOC	top of casing
Wt	water table
X	multi increment composite soil sample

Appendix E
GPS Location Coordinates of Baseline Soil
Salinity Sampling Sites

Appendix E – GPS Location Coordinates of Baseline Soil Salinity Sampling Sites

GPS locations of the San Joaquin River Restoration Program Baseline Soil Salinity monitoring sites are presented in this appendix.

Each sample location is named with a unique “site” identifier (e.g., 73). The site identifier will be followed by a year denoting the year of the sample (e.g., 13 for 2013). For example, an identifier of 73-13 means that site 73 was sampled in 2013.

Table E-1. 2010 Soil Sampling Sites

Site	Easting ¹	Northing ¹	Waypoint	Owner	Notes
1-10	743958	4073204	104	Cal land trust	
2-10	736518	4074698	105	Mitigation trust	
3-10	736511	4074537	106	Mitigation trust	
4-10	735406	4074621	107	Mitigation trust	
5-10	735693	4074638	109	Mitigation trust	
6-10	734938	4074468	110	Mitigation trust	
7-10	731237	4079776	111	Samarin	
8-10	731536	4079437	112	Samarin	
9-10	730099	4080196	113	Samarin	
10-10	729656	4080526	114	Samarin	
11-10	737207	4074296	116	B and B	
12-10	737721	4074671	117	B and B	
13-10	738647	4074095	118	Baker	
14-10	739503	4073486	119	Baker	
15-10	735002	4074018	120	B and B	
16-10	728982	4081271	121	Samarin	
17-10	739808	4073906	124	Baker	
18-10	726118	4085697	125	Lehman	
19-10	725981	4085529	126	Pirtle	
20-10	726116	4085357	127	Pirtle	
21-10	726869	4083892	128	Pirtle	
22-10	233102	4080241 11s	130	Whitmore	
23-10	740770	4072941	131	Farmers WD	
24-10	741754	4072461	132	Farmers WD	
25-10	721838	4097966	133	Clayton	
26-10	722797	4095765	134	Clayton	
27-10	723109	4095236	135	Clayton	
28-10	721708	4098727	136	Clayton	
29-10	725576	4091086	137	B and B	
30-10	723784	4093984	138	B and B	

Table E-1. 2010 Soil Sampling Sites

Site	Easting ¹	Northing ¹	Waypoint	Owner	Notes
31-10	723402	4095264	139	B and B	
32-10	724460	4093302	140	B and B	
33-10	725061	4092447	141	B and B	
34-10	724126	4089859	142	Nickel	
35-10	725652	4090182	143	Nickel	
36-10	725237	4090139	144	Nickel	
37-10	714092	4109387	145	Nickel	
38-10	714031	4109080	146	Nickel	
39-10	713755	4108999	147	Nickel	
40-10	712012	4110379	148	Nickel	
41-10	711064	4110893	149	Nickel	
42-10	712295	4110390	150	Nickel	
43-10	711758	4110101	151	Nickel	
44-10	711289	4109758	152	Nickel	
45-10	703868	4111691	154	Bowles	
46-10	704703	4112769	155	Bowles	
47-10	704328	4113606	156	Bowles	
48-10	705403	4113163	157	Bowles	
49-10	707252	4113542	158	Bowles	
50-10	705937	4113452	159	Bowles	
51-10	705676	4114894	160	Butts	
52-10	705717	4116285	161	Butts	
53-10	705634	4113574	162	Butts	
54-10	698816	4115433	163	Bowles	
55-10	699005	4115943	164	Bowles	
56-10	718476	4100781	165	Harman	
57-10	719203	4100082	166	Harman	
58-10	719887	4099522	167	Harman	
59-10	718297	4103525	168	Harman	
60-10	716834	4110324	169	Rainbow or.	
61-10	714651	4111886	170	Rainbow or.	
62-10	714672	4114100	171	Rainbow or.	
63-10	715114	4108450	172	Nickel	
64-10	714130	4107879	173	Nickel	
65-10	719604	4099044	175	Cotta	
66-10	718624	4101241	176	Cotta	
67-10	718966	4100103	178	Cotta	
68-10	712042	4110742	179	lest	No samples
69-10	712715	4111540	180	lest	
70-10	713208	4112305	181	lest	
71-10	730072	4079781	182	Burkhart	
72-10	729721	4079490	183	Burkhart	
73-10	729694	4079575	184	Burkhart	
74-10	707115	4113044	250	Bowles	WGS84

Table E-1. 2010 Soil Sampling Sites

Site	Easting ¹	Northing ¹	Waypoint	Owner	Notes
75-10	712174	4110871	185	lest	
76-10	739814	4073740	186	Baker	
77-10	744554	4073219	187	Cal land	
78-10	715386	4111497	246	lest	WGS84 ns
79-10	714907	4111237	190	lest	

Note

¹ Datum is UTM NAD83, Zone 10S; except 22-10 is Zone 11S

Table E-2. San Juan Ranch Baseline Sites

Site	Latitude (degrees minutes seconds) ¹	Longitude (degrees minutes seconds) ¹	Waypoint	Notes
DF-2	37 6 48.32	120 35 55.59	280	
DF-1	37 6 44.16	120 35 31.21	279	
L-66/L-68	37 6 29.28	120 35 33.59	278	maybe same site
L50	37 6 17.57	120 35 23.56	315	
L48	37 6 7.71	120 35 12.20	277	
L28	37 5 51.59	120 34 46.37	276	
L26	37 5 40.60	120 34 44.34	275	
L21	37 5 27.02	120 34 29.16	274	

Notes

¹ Datum is WGS84

The San Juan Ranch sites were first sampled in September along with sites 37-10, 38-10, 39-10, and 64-10. These sites were all resampled in April of 2011 and were added to the baseline salinity site inventory.

Table E-3. Soil Sampling Sites Added in 2011

Site	Easting ¹	Northing ¹	Waypoint	Notes	Owner
80-11	0733822	4076266	210	utm	coburn
81-11	0733498	4076819	211	utm	coburn
82-11	0734475	4076599	212	utm	coburn
83-11	0732587	4077523	213	utm	coburn
84-11	0715190	4112578	214	utm	rainbow
85-11	0716410	4111659	215	utm	lest
86-11	0716357	4105337	216	utm	willis
87-11	0716724	4105380	217	utm	willis
88-11	0717105	4104884	218	utm	willis
89-11	0710940	4111180	219	utm	lest
90-11	0710005	4112976	220	utm	lest
91-11	0709974	4114980	221	utm	lest
92-11	0708928	4114999	222	utm	lest
93-11	0706811	4114311	223	utm	lest
94-11	0706396	4116632	224	utm	lest

Note

¹ Datum is WGS84

Table E-4. Soil Sampling Sites Added in 2011

Site	Latitude ¹ (decimal degrees)	Longitude ¹ (decimal degrees)	Waypoint	Notes	Owner
95-11	36.80062	120.16115	239	lat/long degrees manning	
96-11	36.76647	120.26504	240	lat/long	LS farms
97-11	36.76875	120.23832	241	lat/long	LS farms
98-11	36.76656	120.24119	242	lat/long	LS farms
99-11	36.94052	120.47375	244	lat/long	B+B
100-11	36.78338	120.34859	245	lat/long	B+B
101-11	37.16387	120.77039	247	lat/long	Bowles
78-11	37.12506	120.57550	246	lat/long, site moved lest	

Notes

¹ Datum is WGS84

Appendix E – GPS Location Coordinates of Baseline Soil Salinity Sampling Sites

Table E-5. Soil Sampling Sites Added in 2012

Site	Easting ¹	Northing ¹	Waypoint	Notes	Owner
102-12	0740981	4072645	255		Peracchi
103-12	0741408	4072344	256		Peracchi
104-12	0741273	4072906	257		Peracchi
105-12	0740979	4072332	258		Peracchi
106-12	0734349	4076799	262		Coburn
107-12	0715970	4106967	263		Nickel
108-12	0715891	4107295	264		Nickel
109-12	0715608	4107125	265		Nickel
110-12	0715446	4110580	266		Iest
111-12	0714487	4110028	268		Pombo
112-12	0714584	4109516	269		Pombo
113-12	0715406	4110089	270		Pombo
114-12	0716246	4110114	271	em only	Pombo
115-12	0716451	4109626	272	em only	Pombo
116-12	0719312	4102130	282		Harman
117-12	0732383	4078668	285	em only	Samarin

Note

¹ Datum is UTM WGS84

Table E-6. Soil Sampling Sites Added in 2013

Site	Easting ¹	Northing ¹	Waypoint	Notes	Owner
118-13	0712331	4113797	298		Iest
119-13	0726983	4082760	299		Burkhart
120-13	0727833	4082300	300		Burkhart
121-13	0716797	4106221	301		Menefee
122-13	0716135	4107648	302		Menefee
123-13	0715154	4113612	303		Rainbow
124-13	0716400	4106765	304		Menefee
125-13	0715386	4108640	305		Menefee
126-13	0722826	4095027	306		Redfern
127-13	0723708	4094523	307		Redfern
128-13	0727047	4084529	308		Elrod
129-13	0727553	4083276	309		Elrod
130-13	0714356	4107013	311		Nickel
131-13	0714960	4107402	312		Nickel
132-13	0715875	4107447	313		Nickel
133-13	0714639	4107175	314	em only	Nickel
134-13	0714659	4107419	316	em only	Nickel
135-13	0736301	4072889	317		B+B
136-13	0736471	4072841	318	em only	B+B

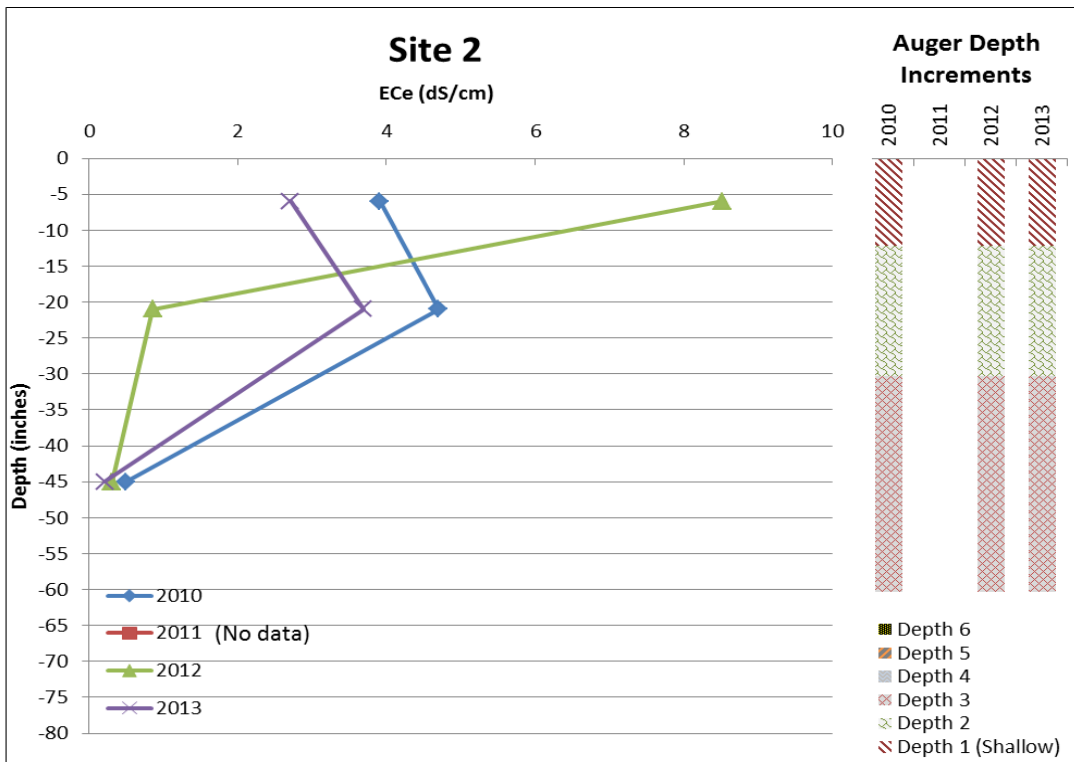
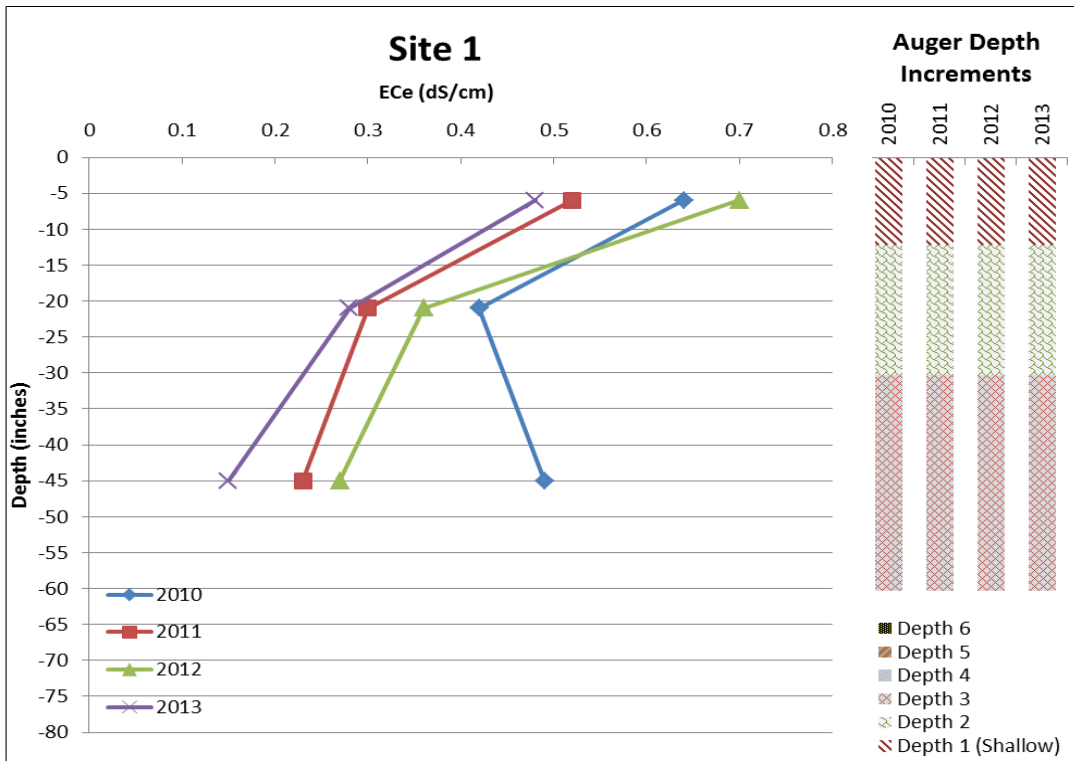
Note

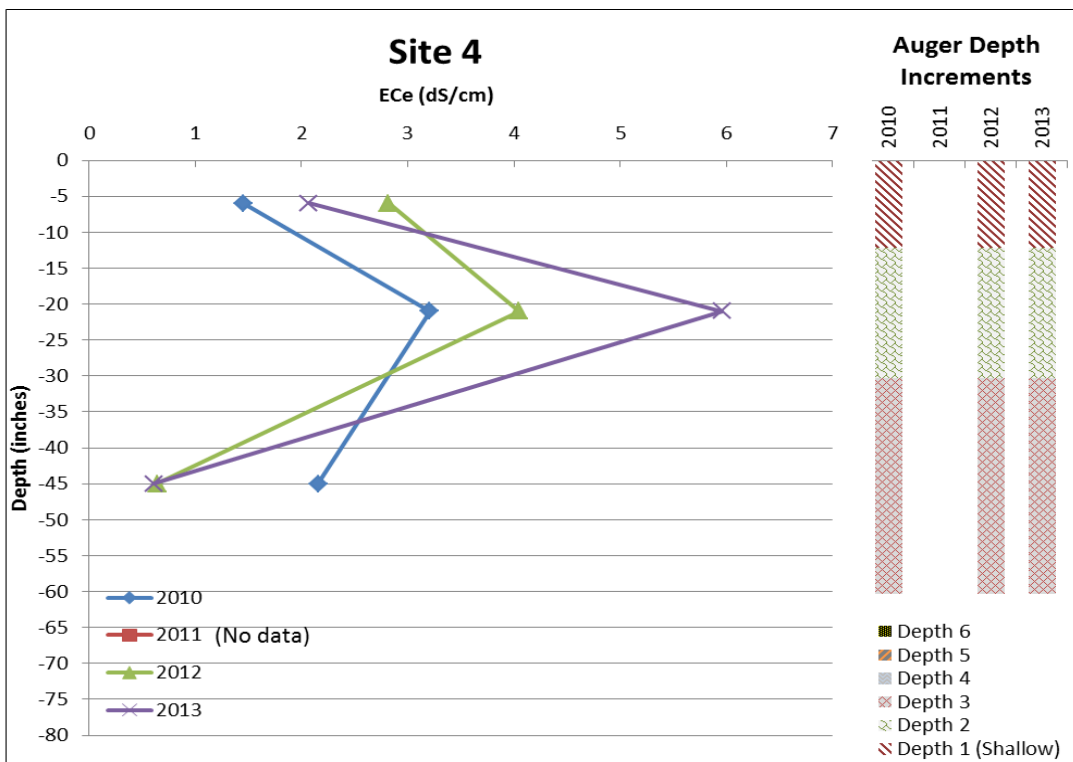
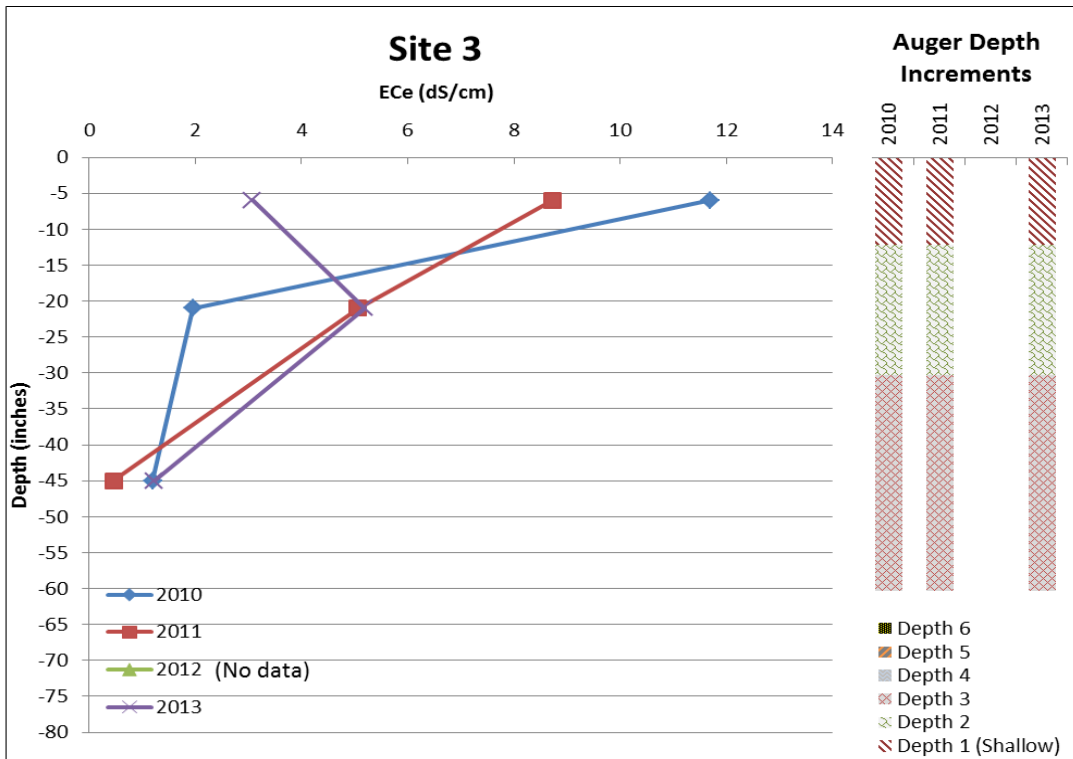
¹ Datum is UTM WGS84

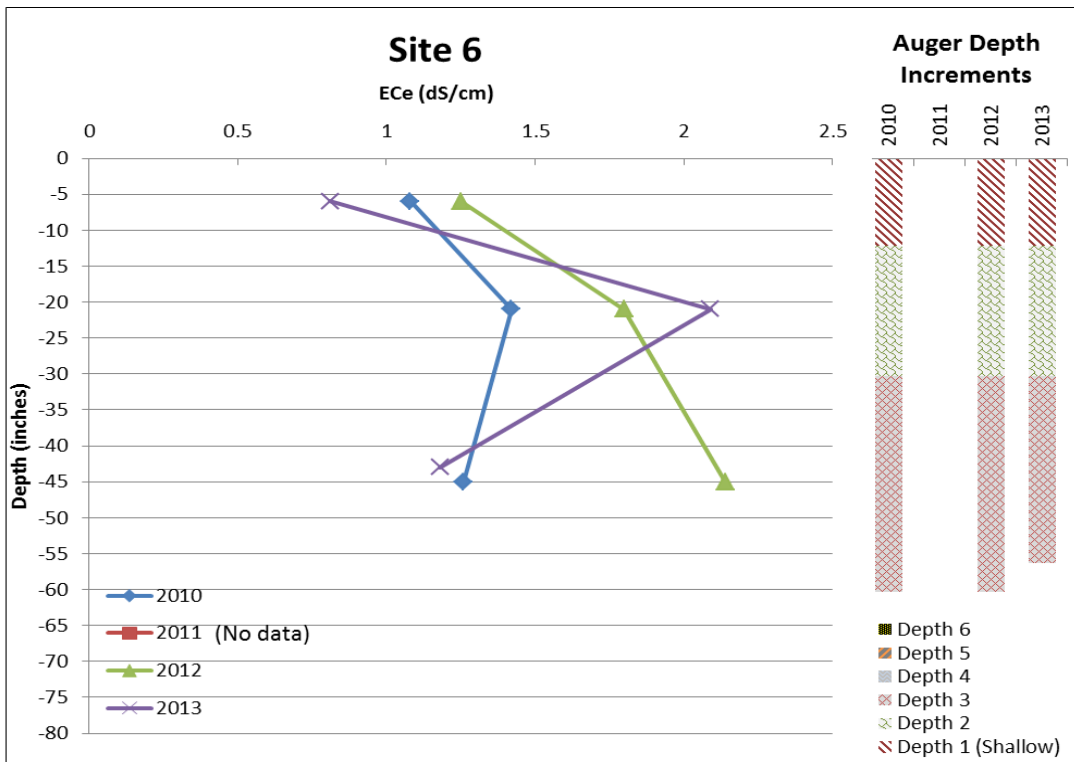
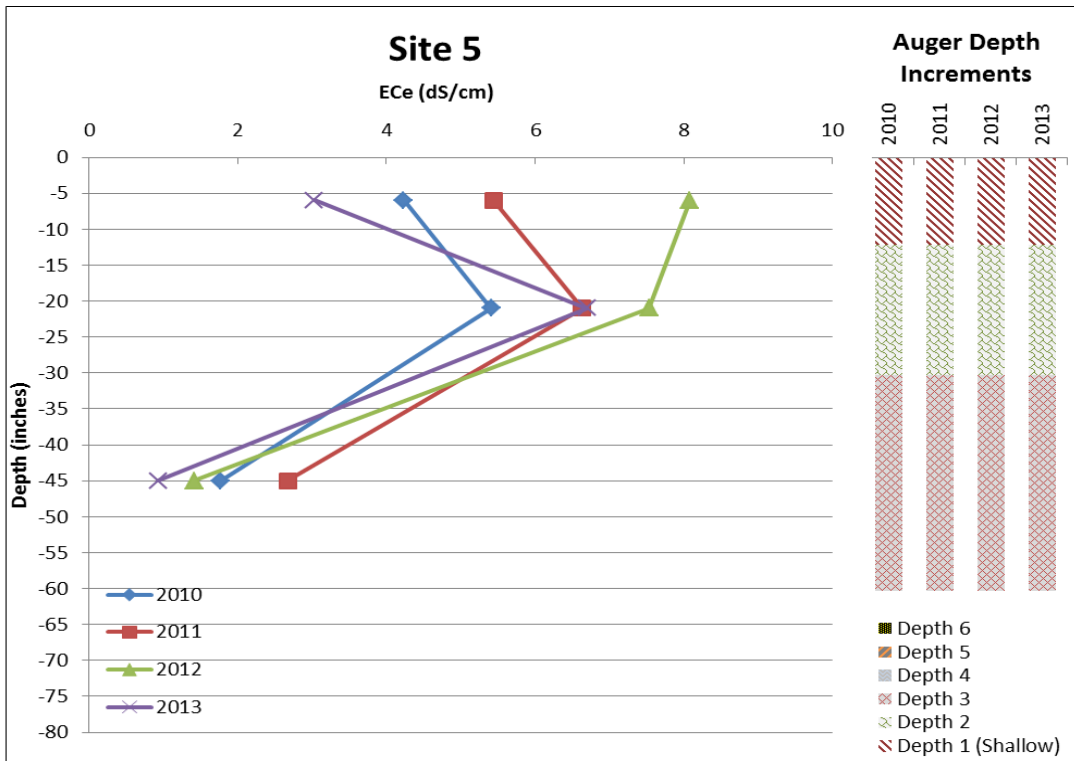
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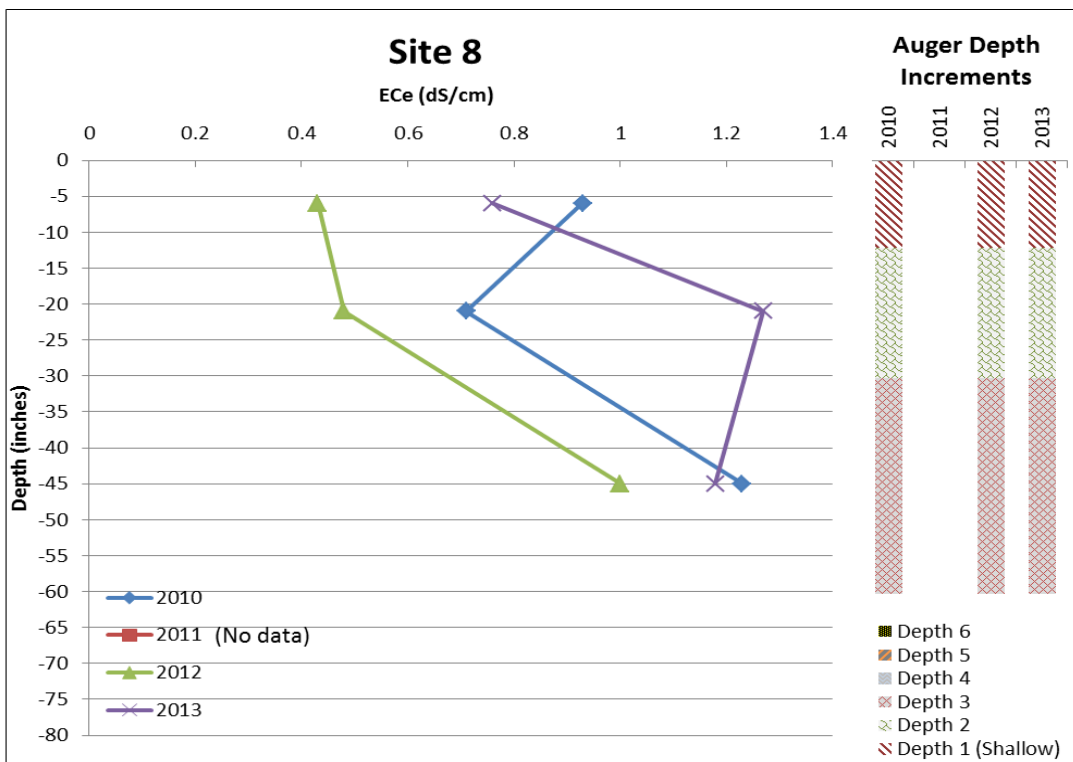
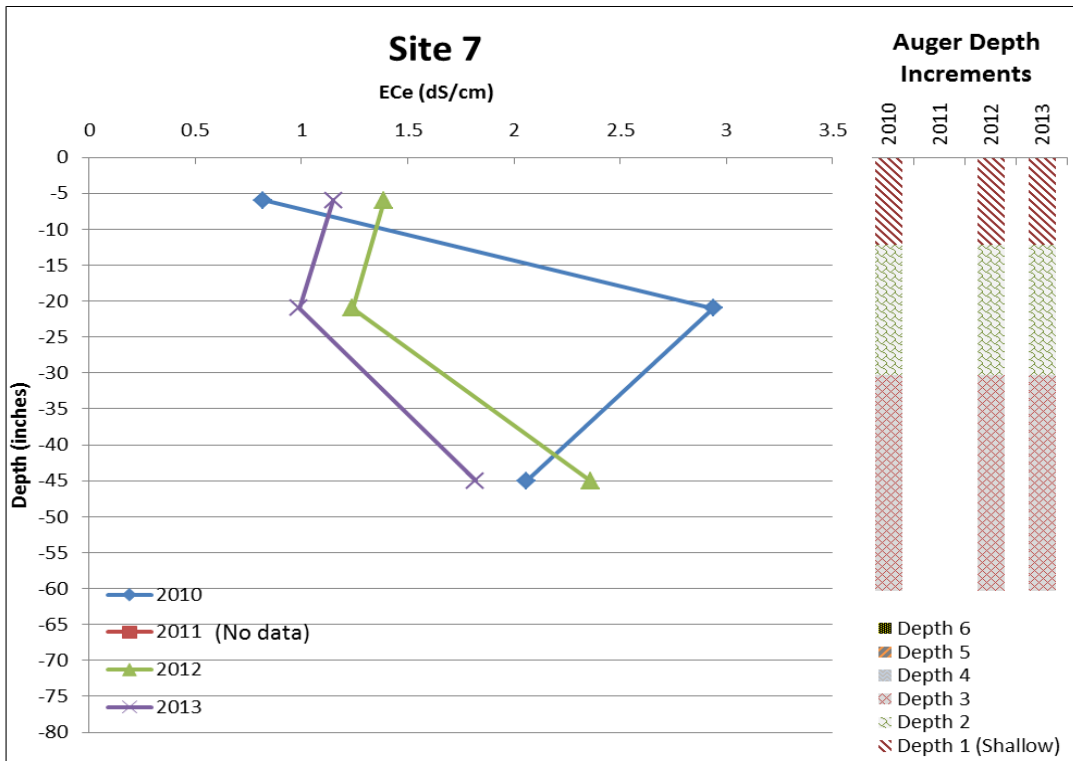
Appendix F
Comparison of Electrical Conductivity of
Soil Extract Data from 2010-2013

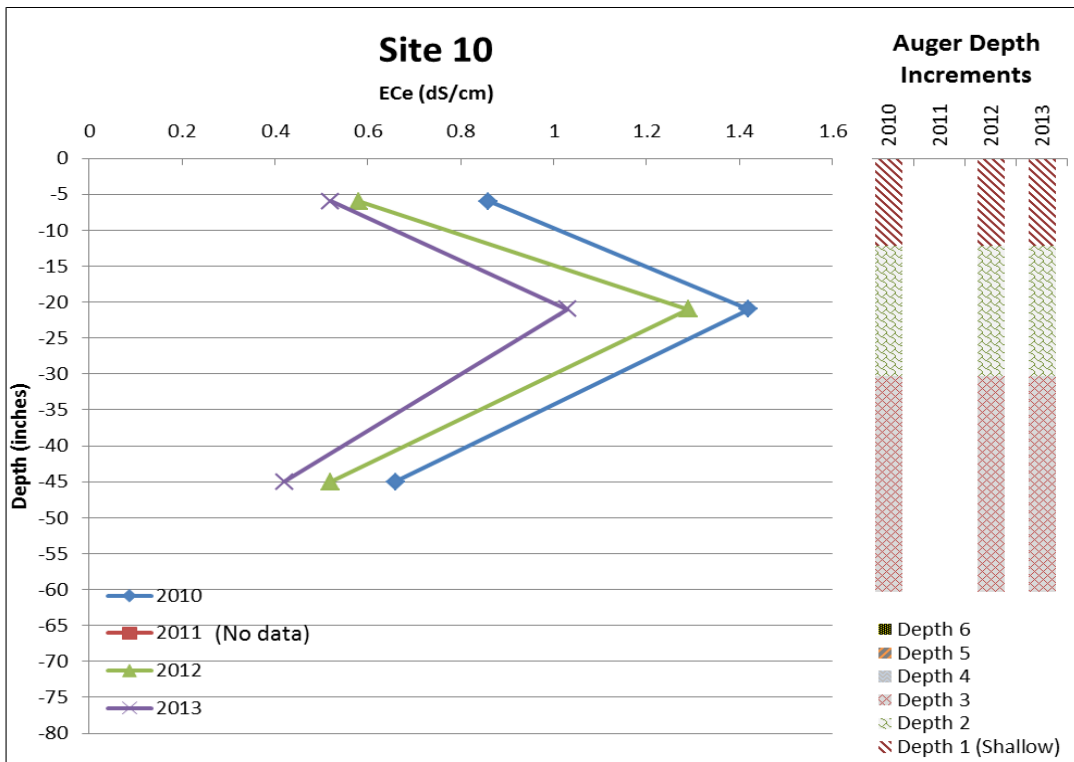
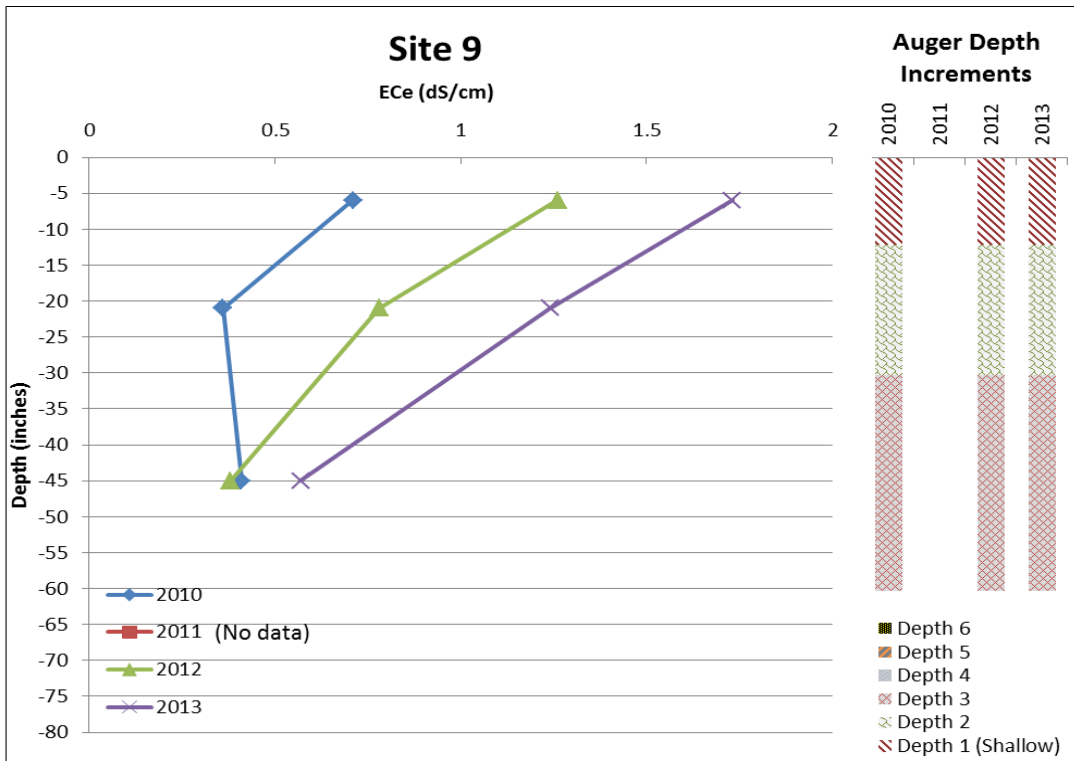
Appendix F – Comparison of Electrical Conductivity of Soil Extract Data from 2010-2013

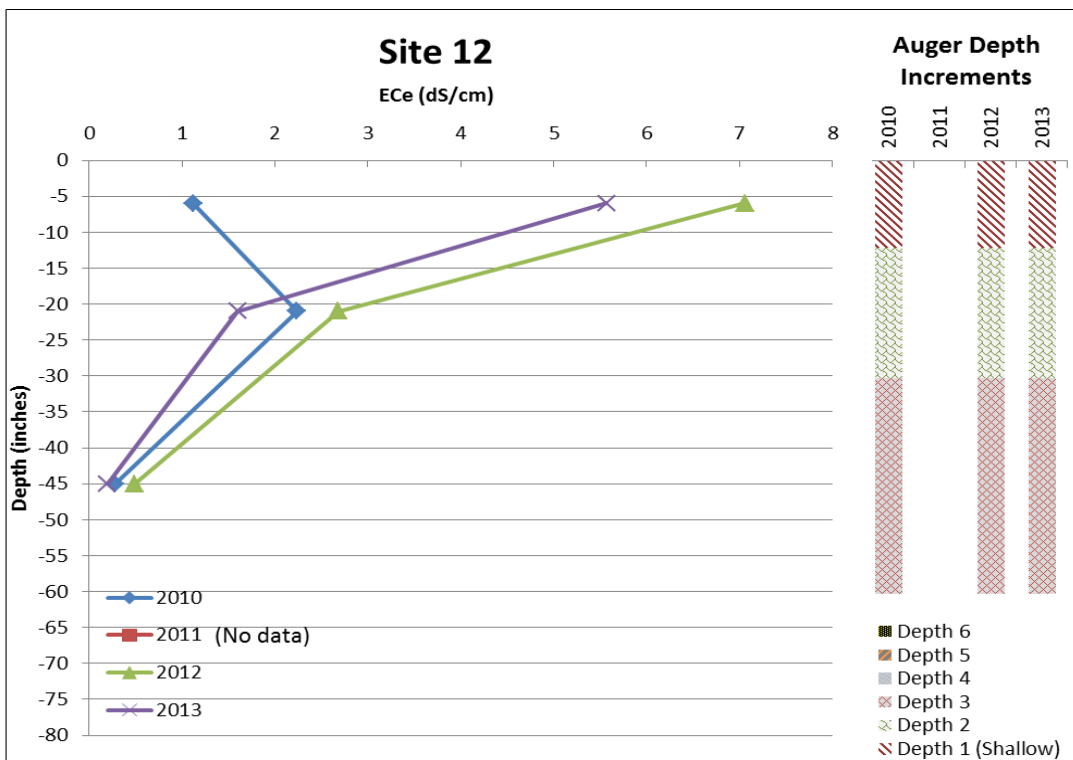
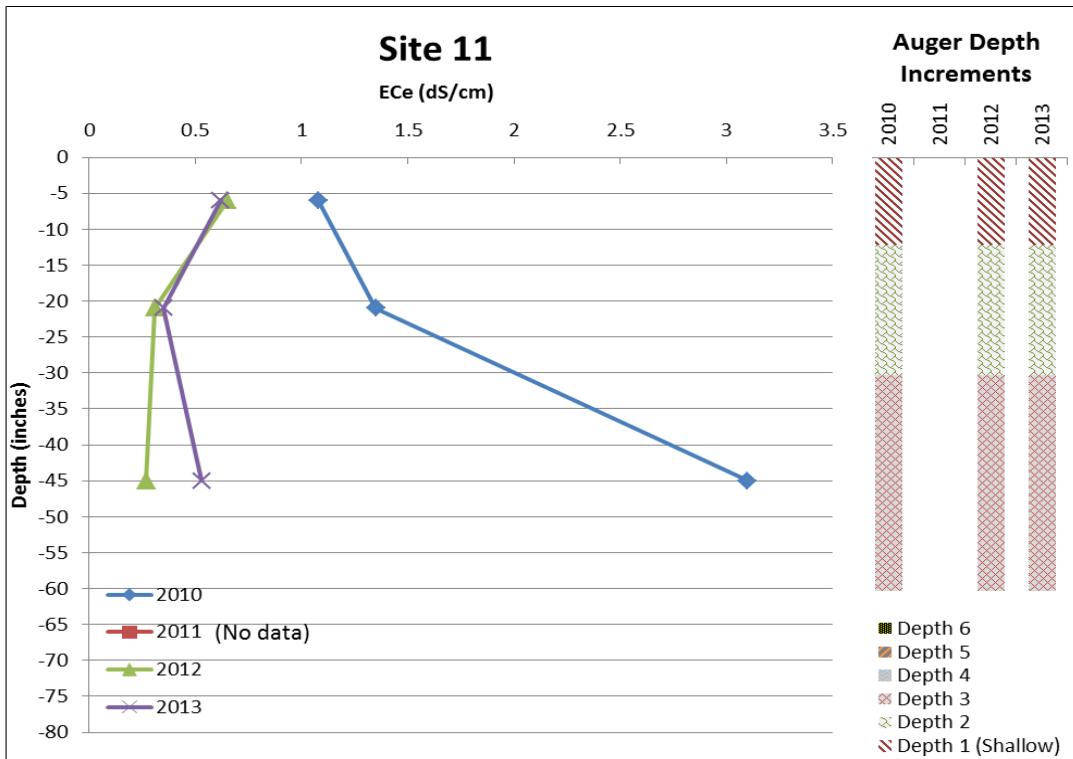


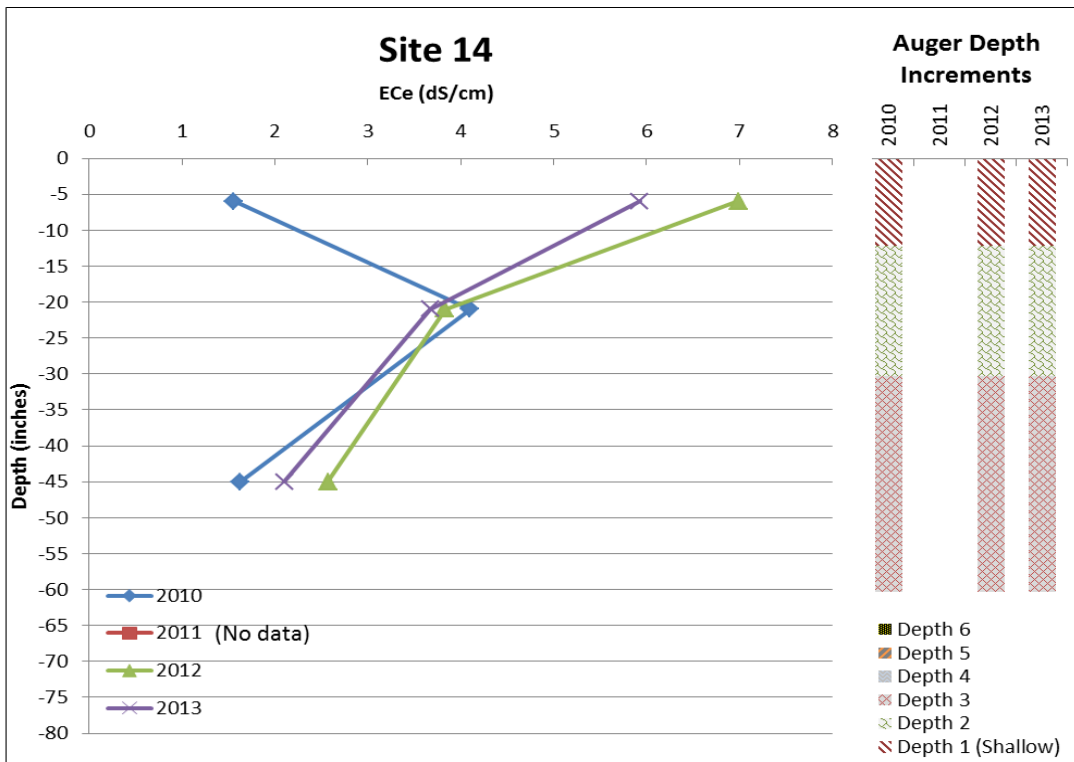
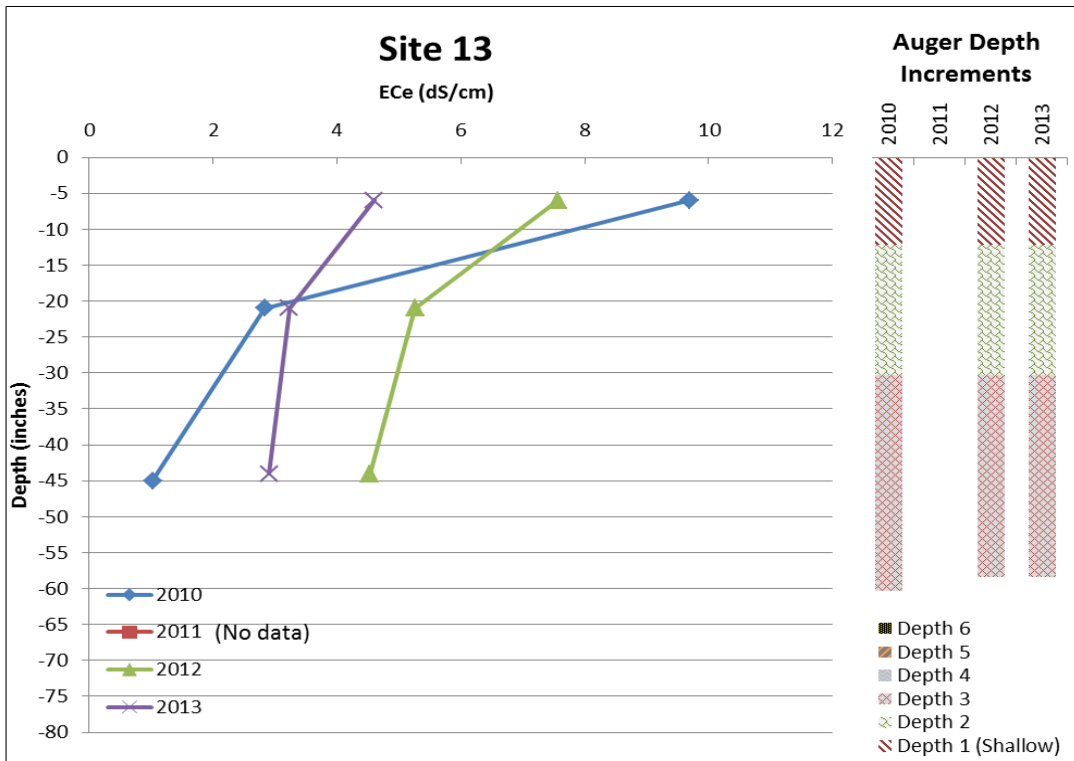


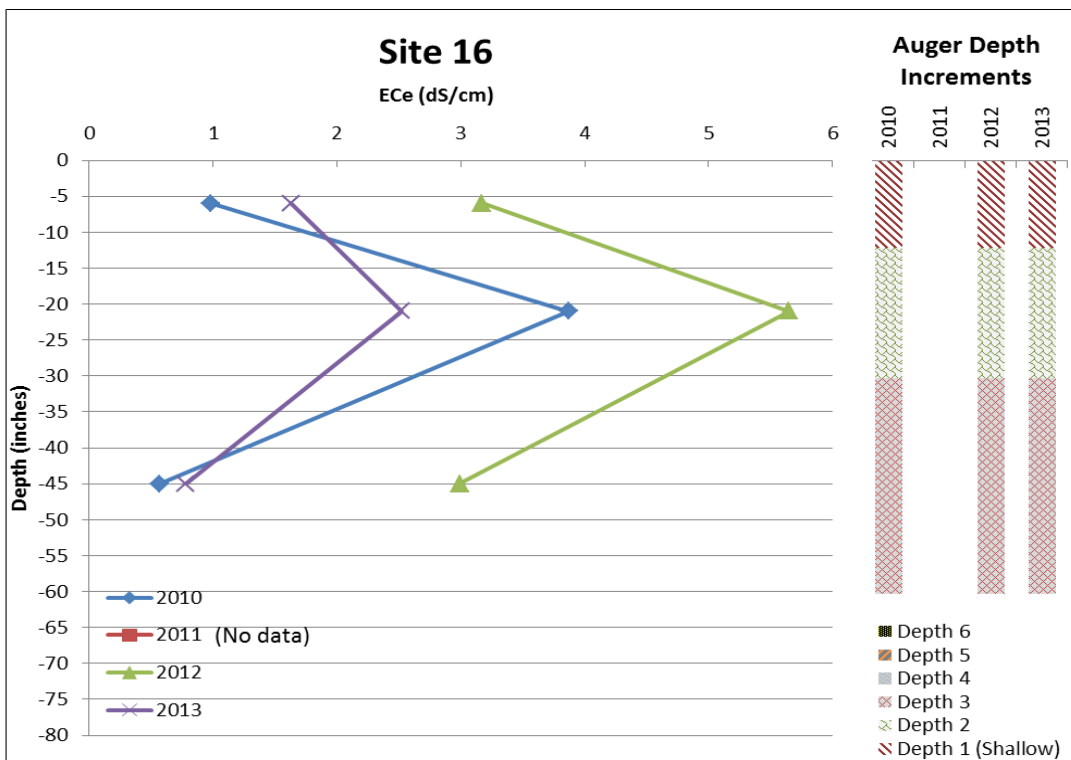
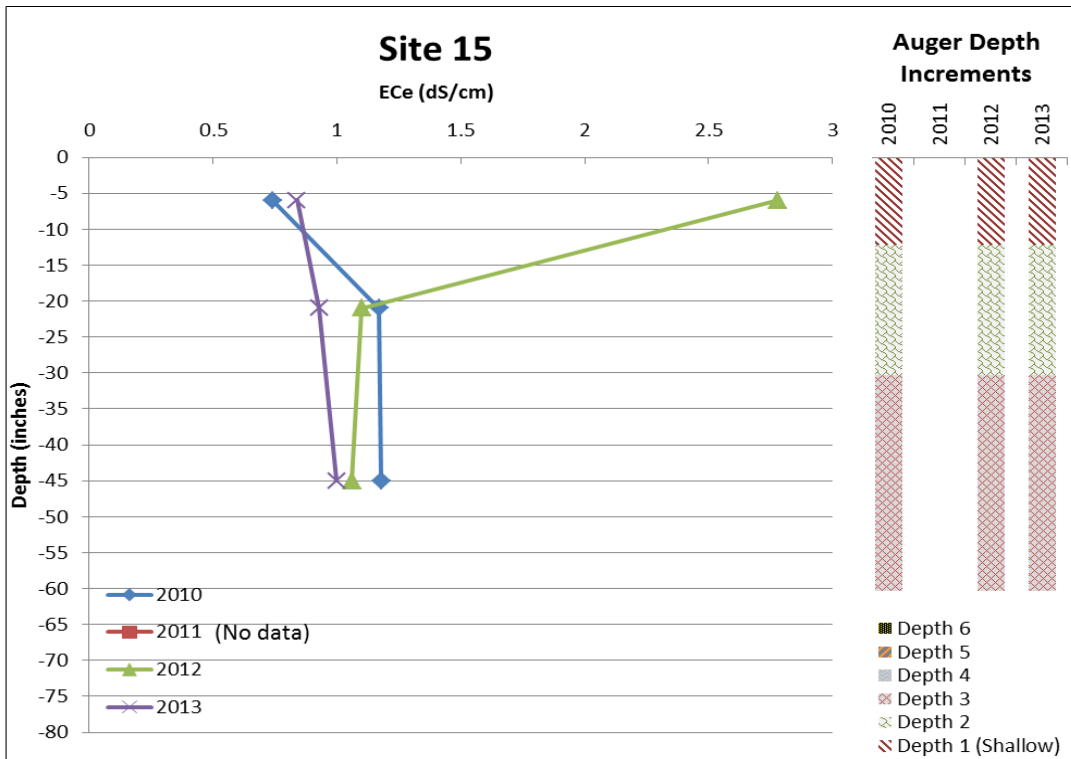


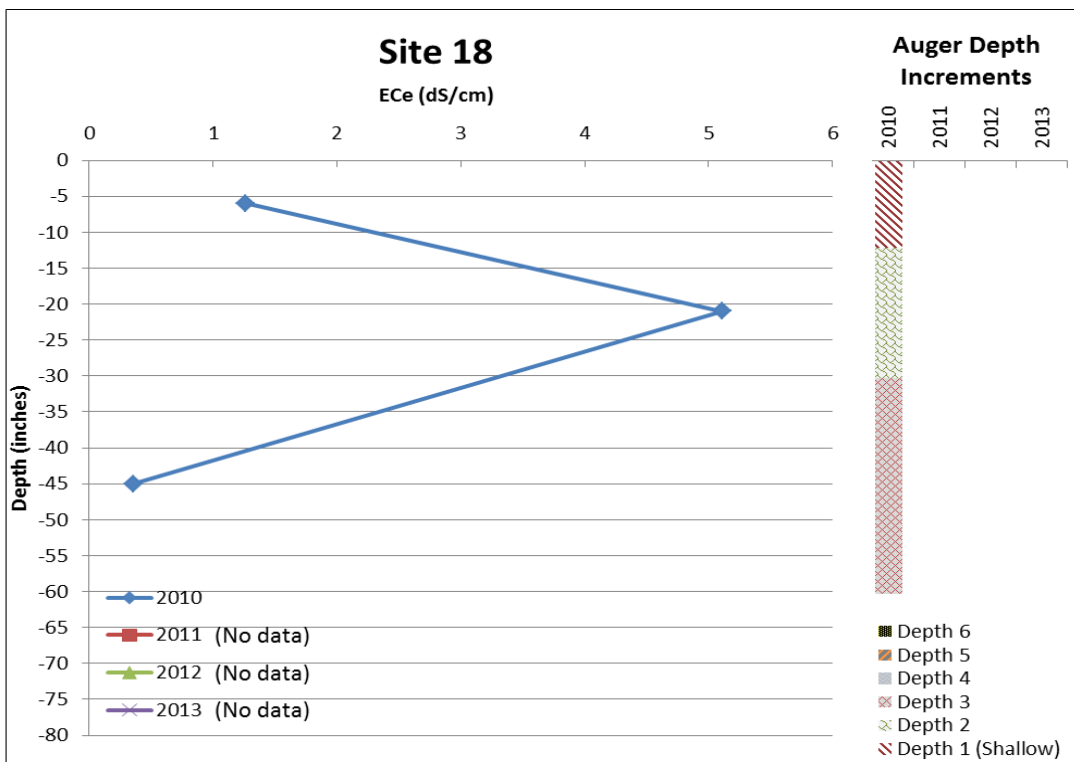
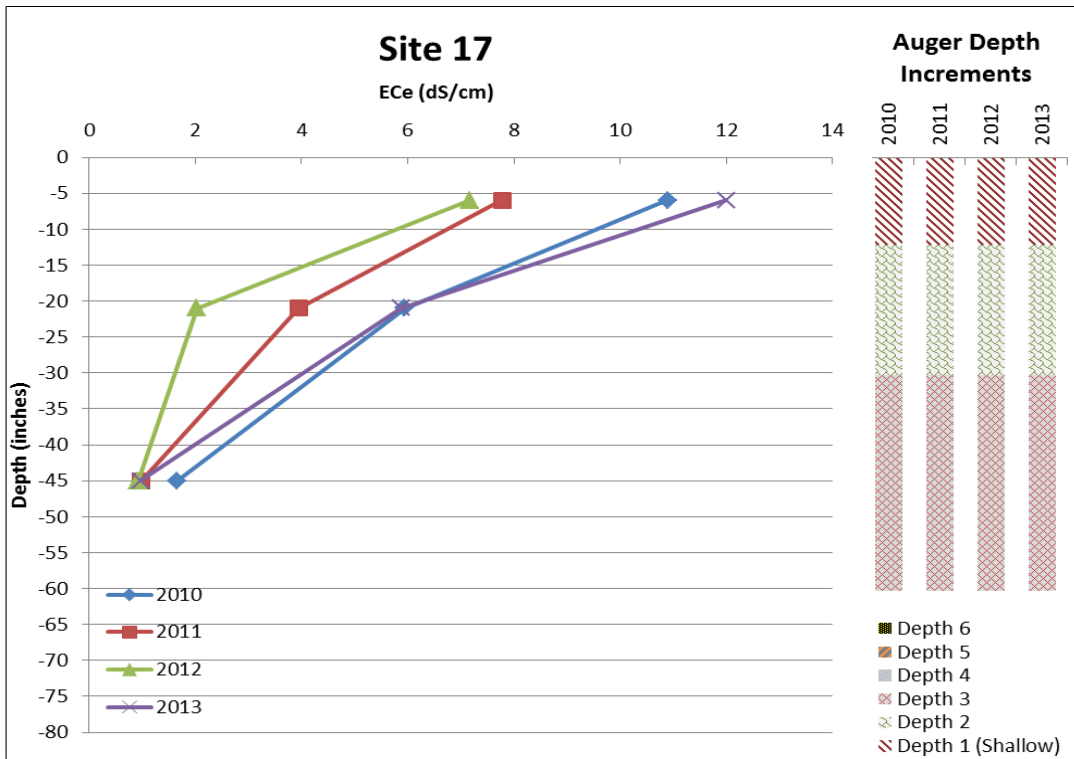


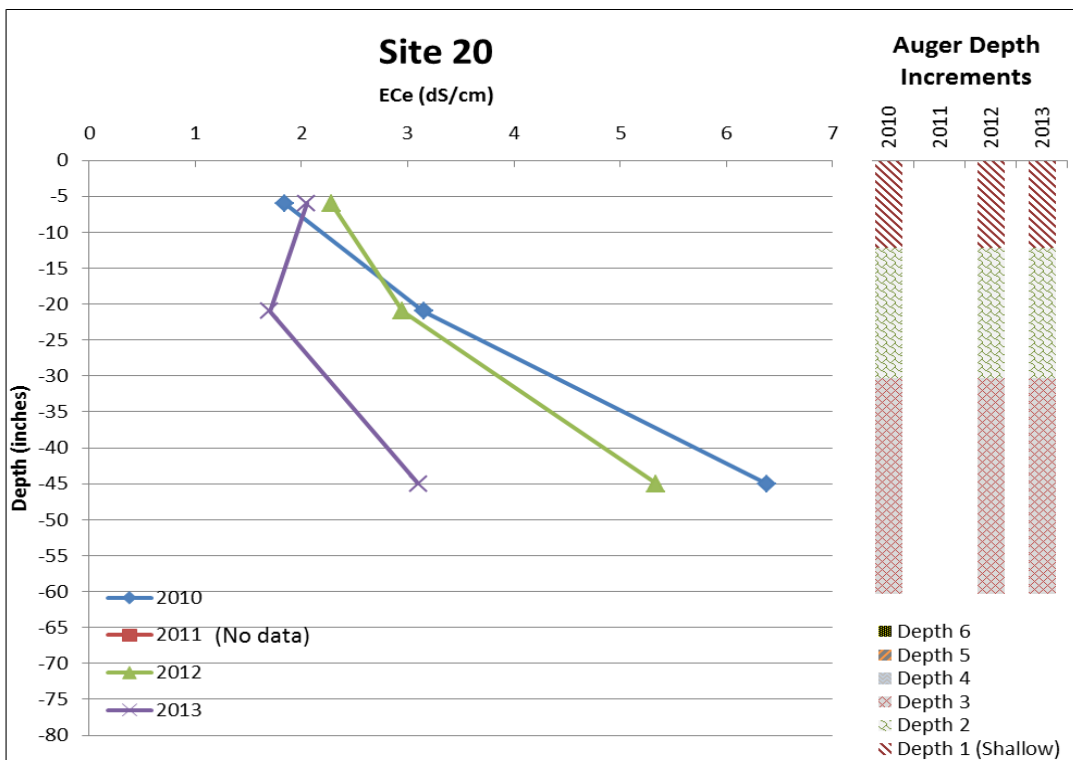
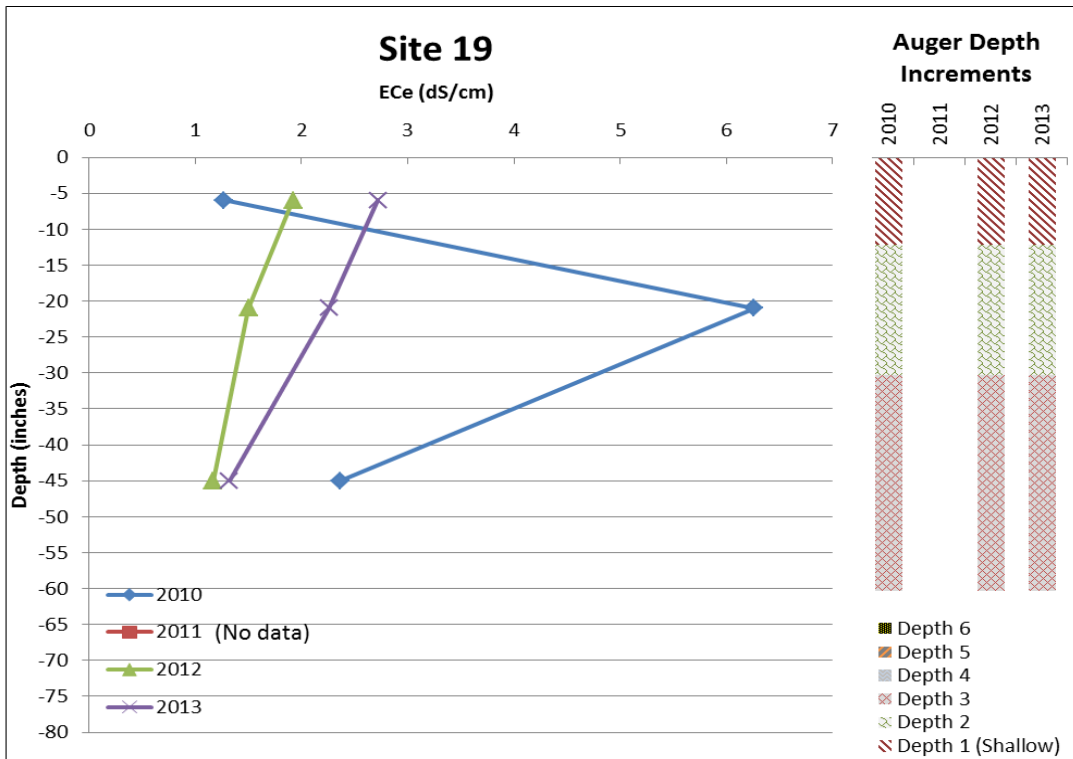


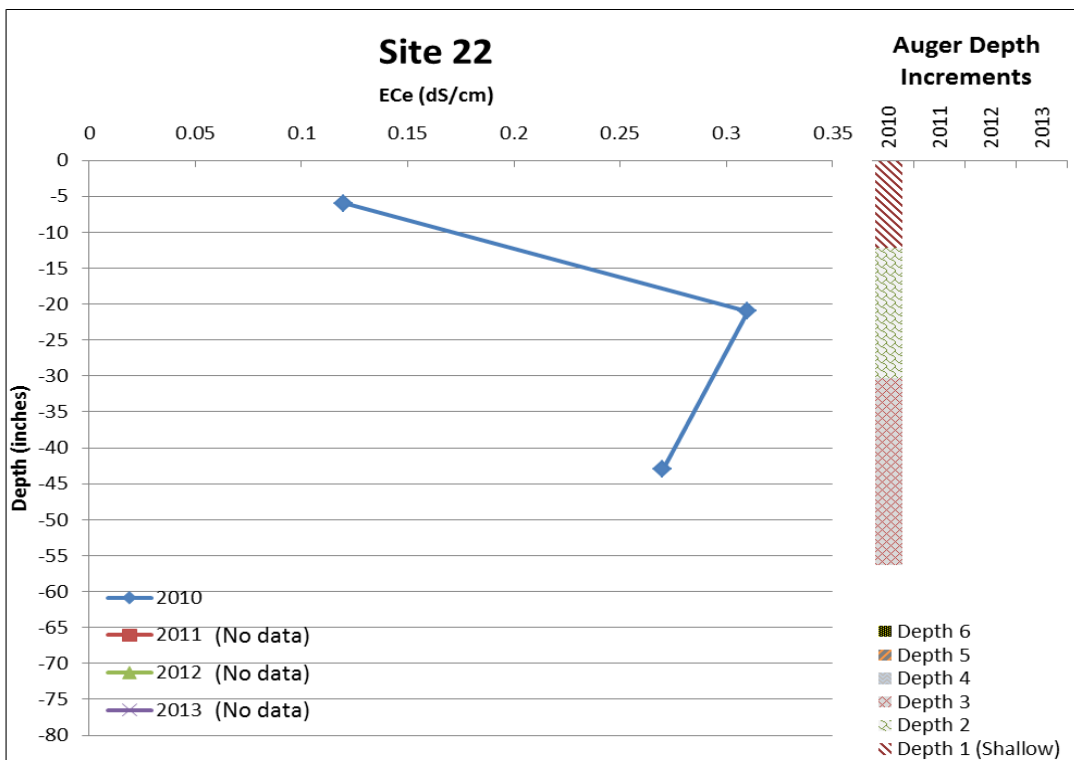
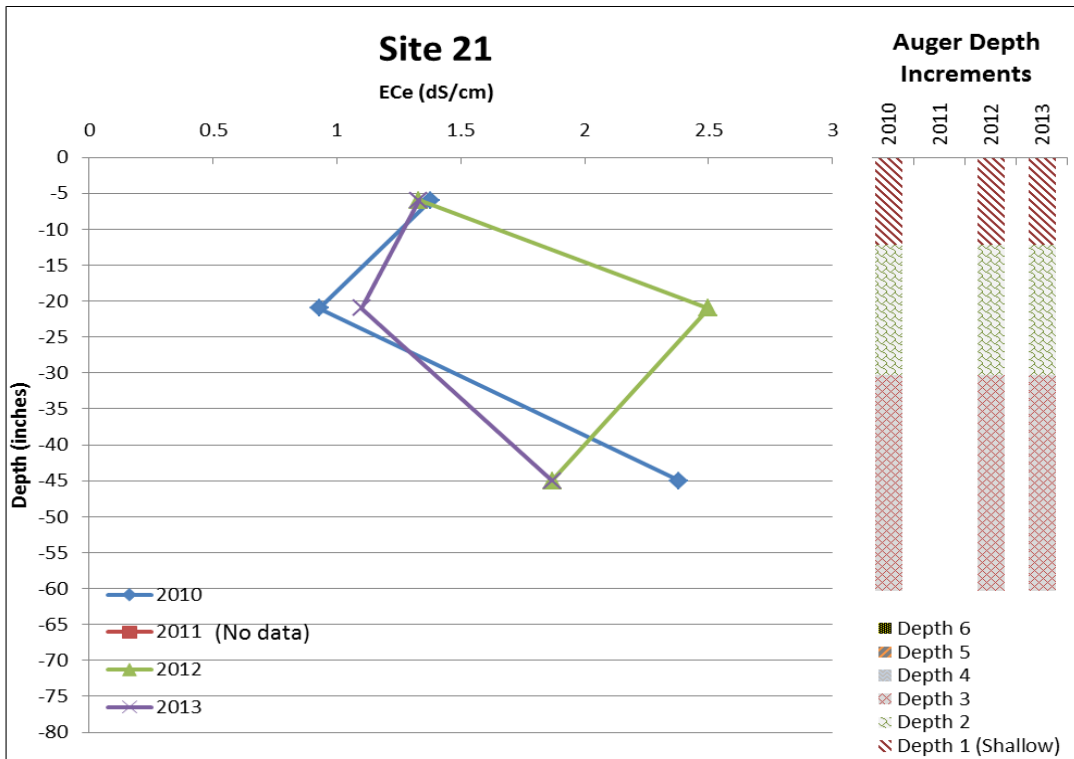


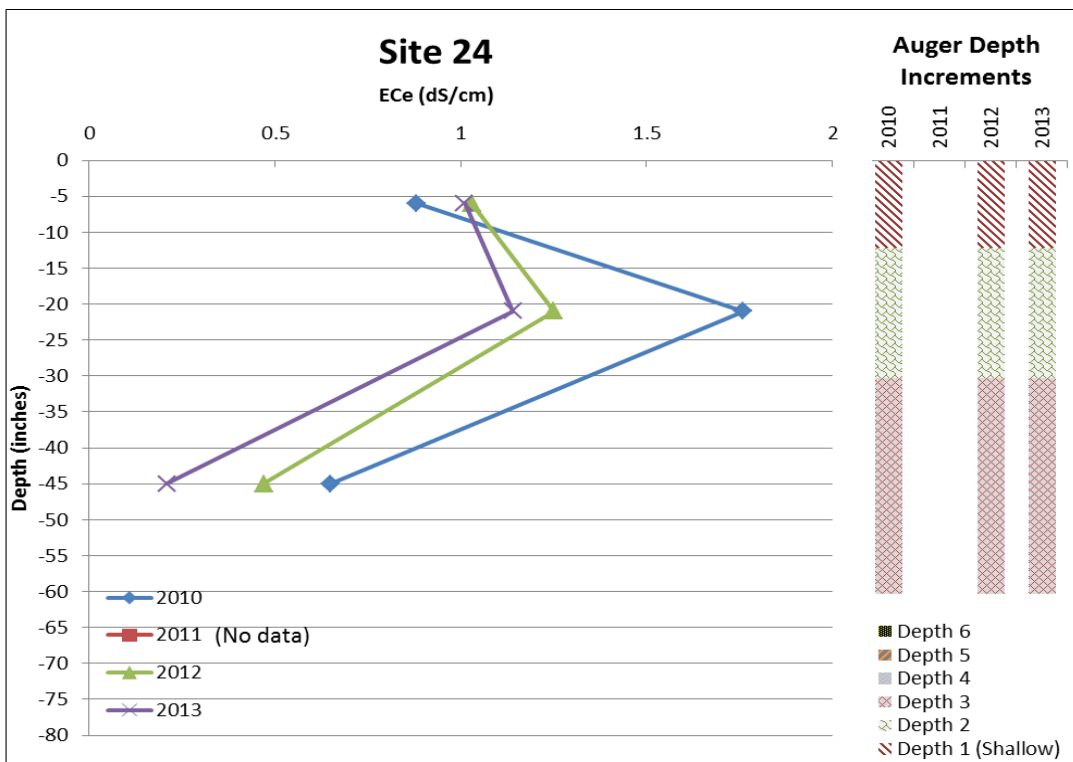
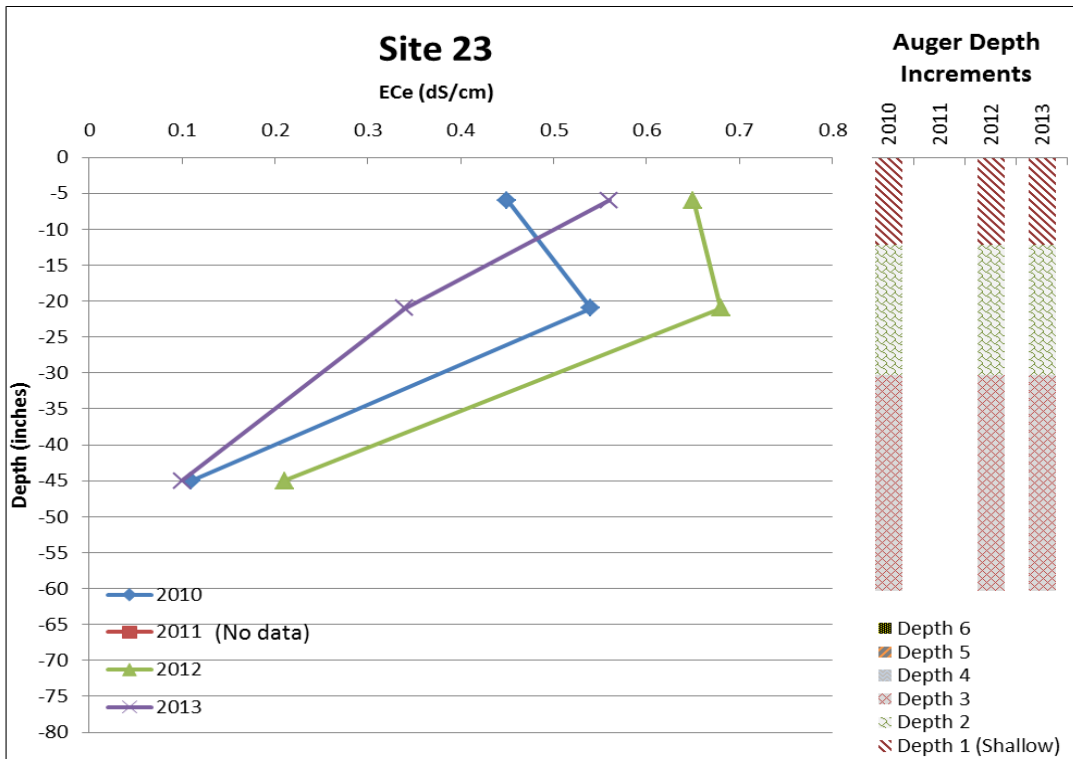


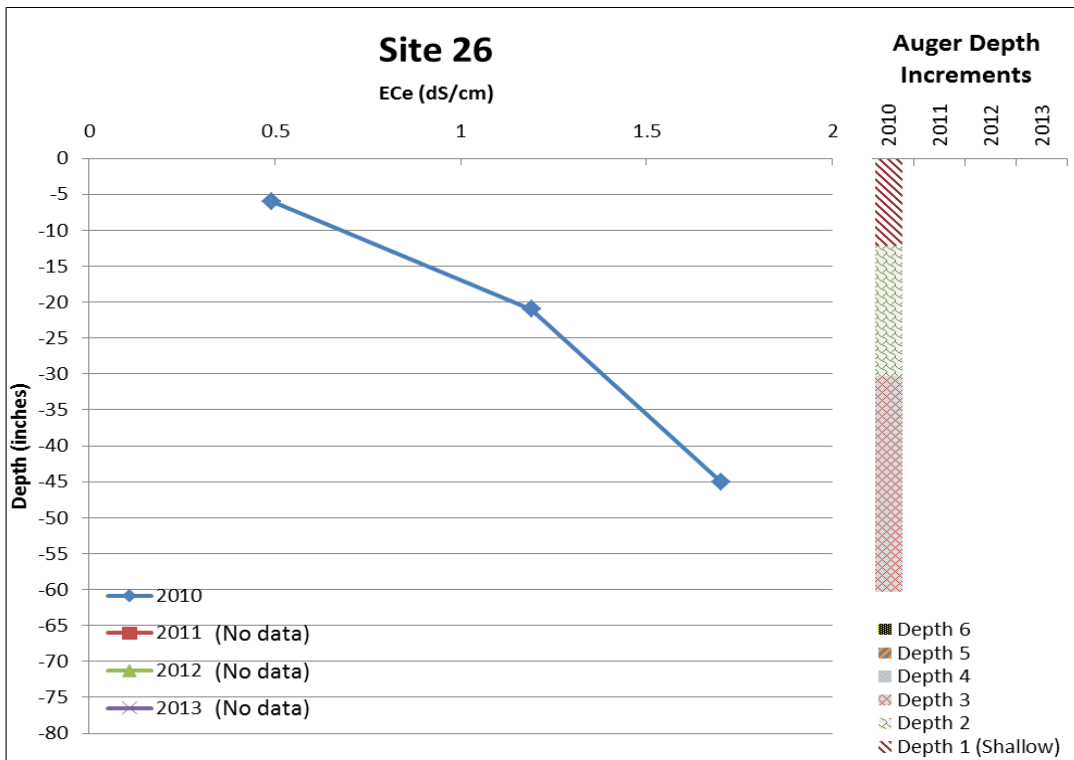
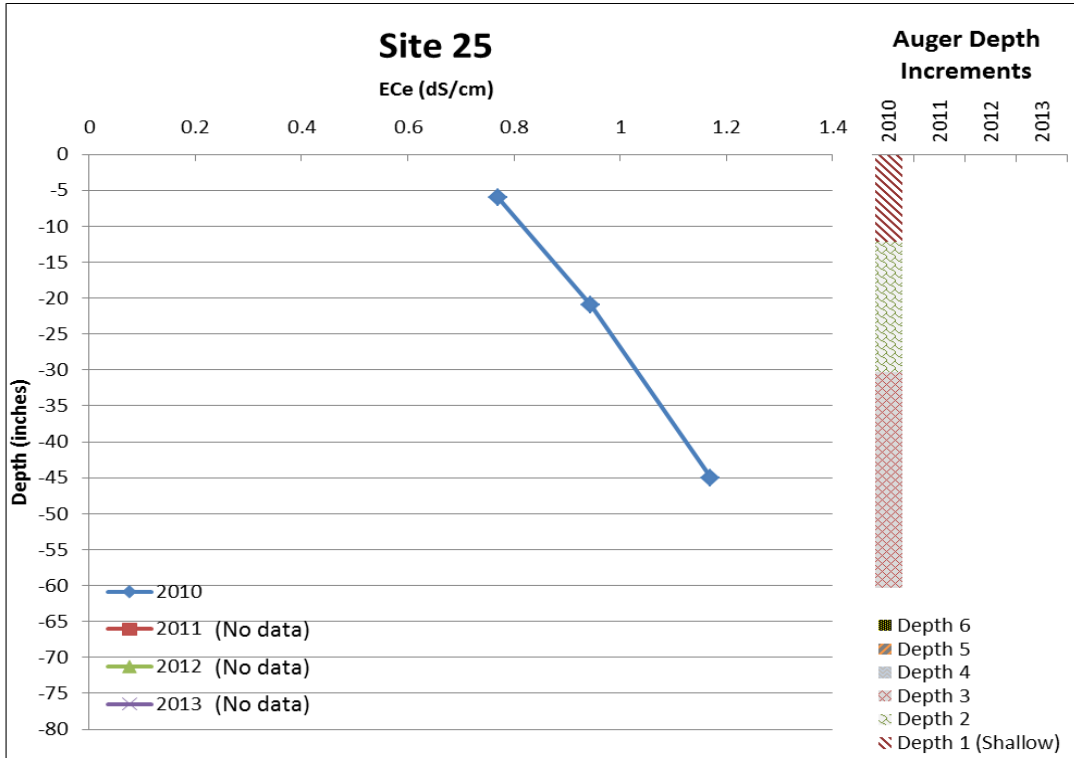


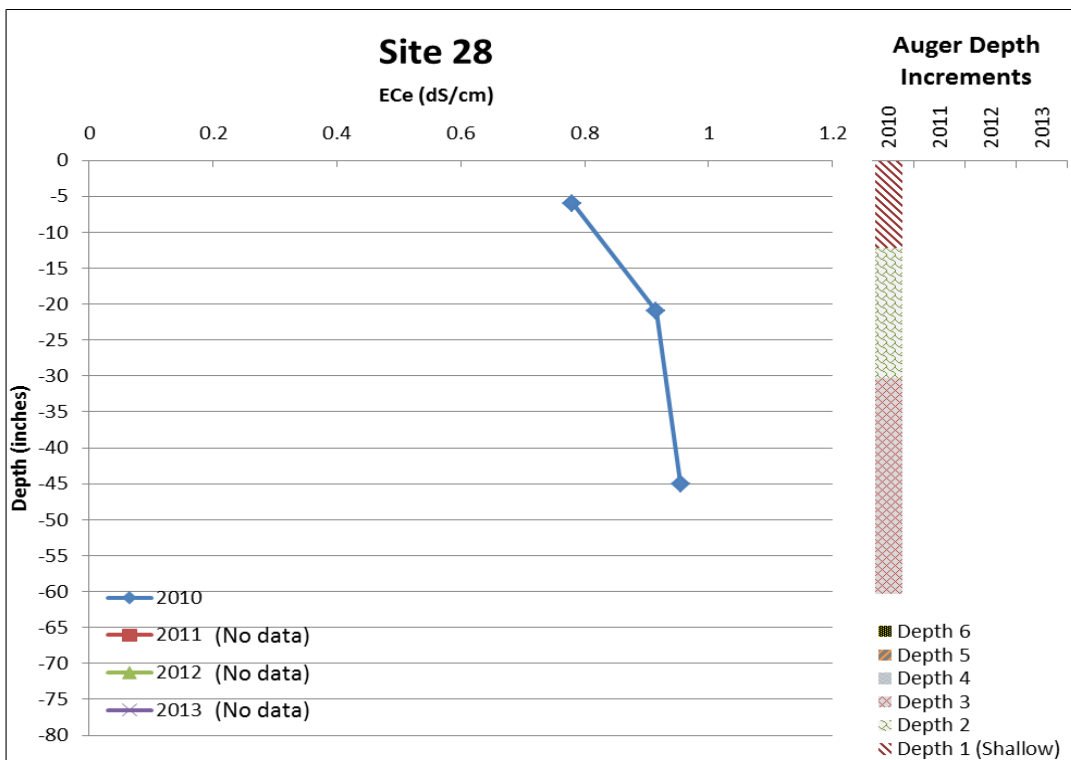
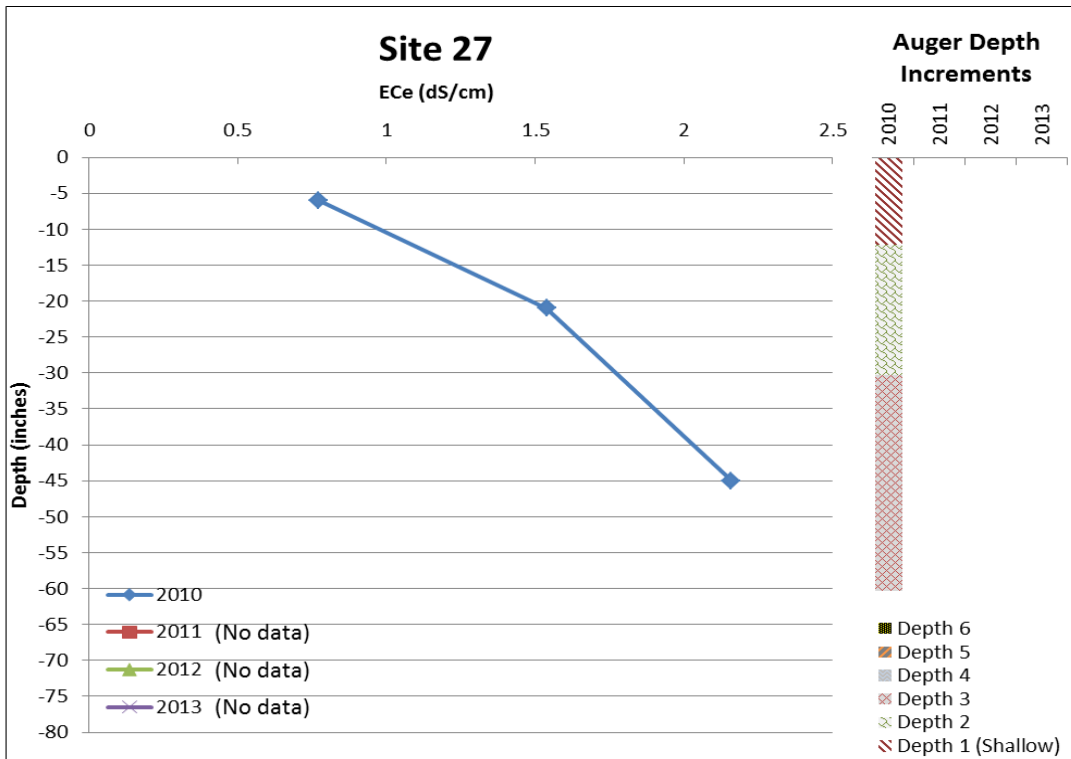


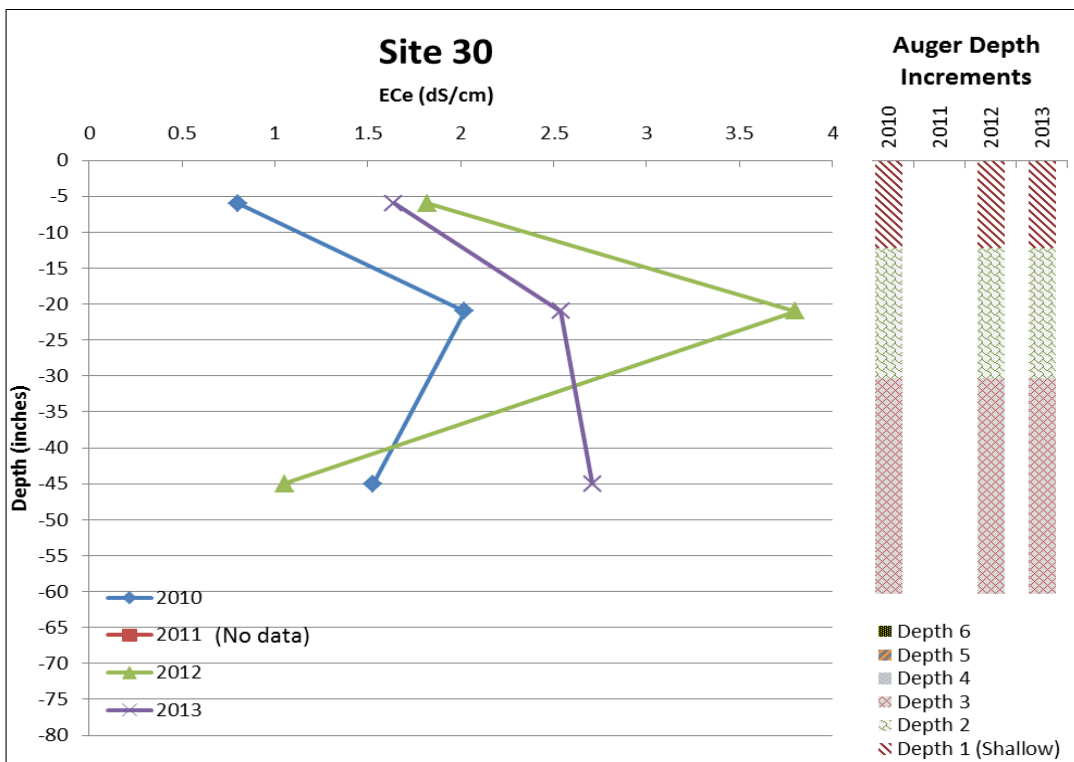
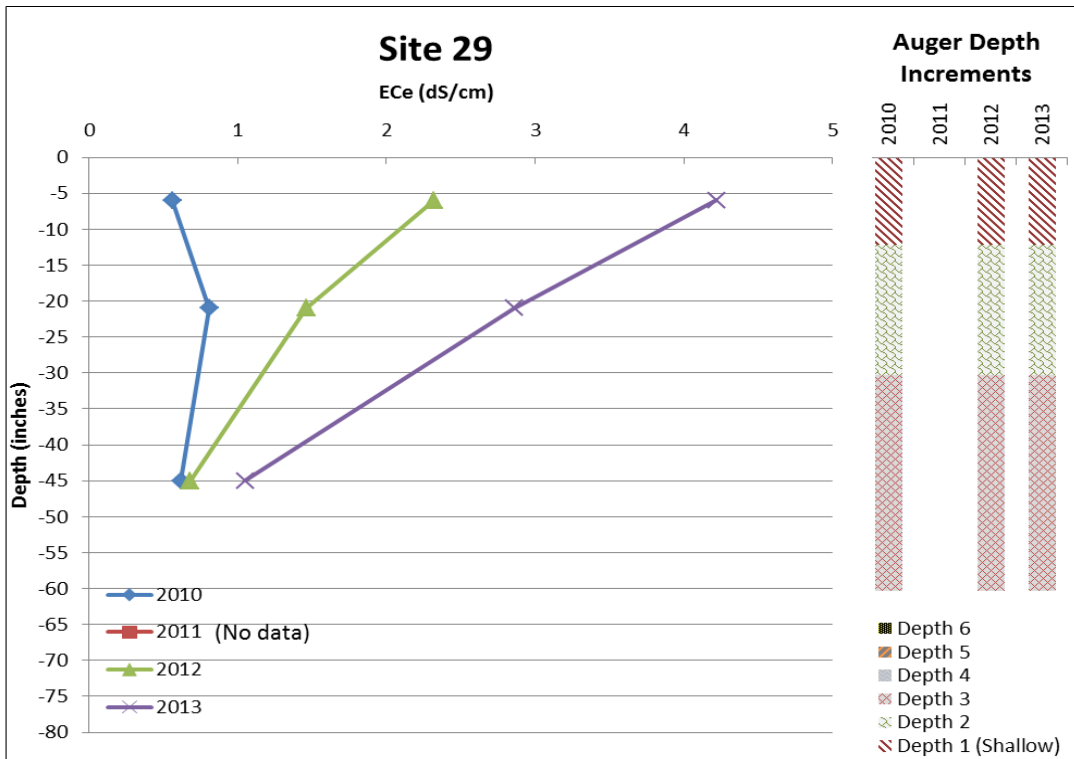


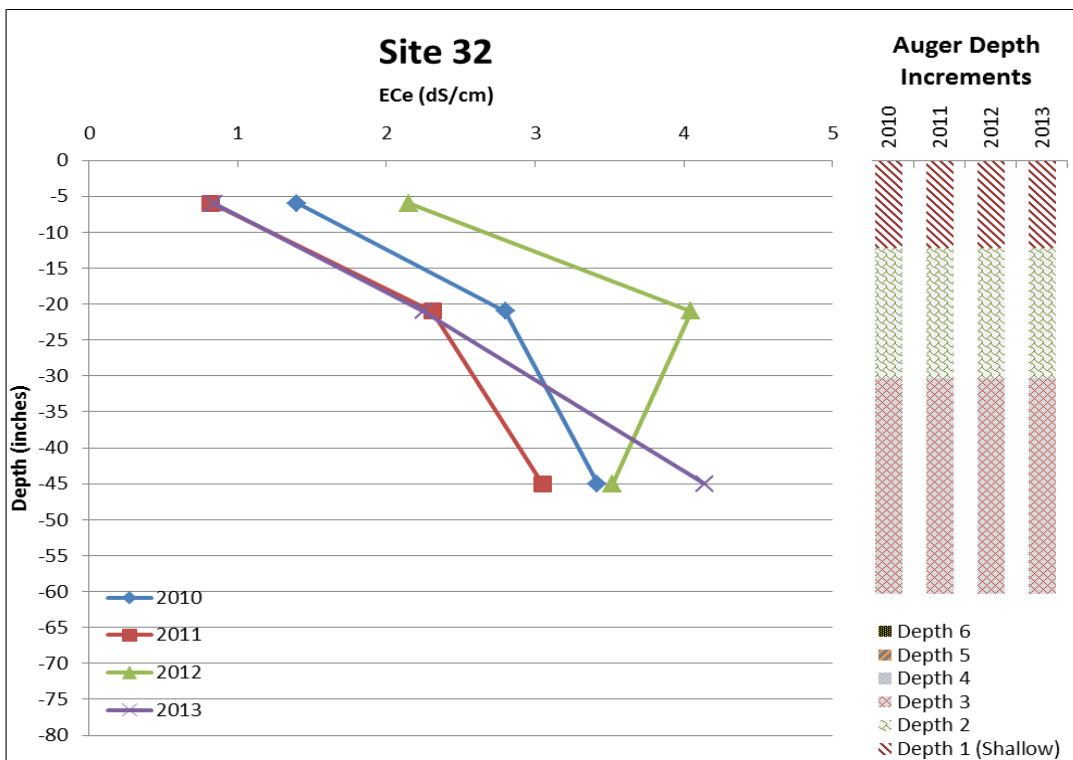
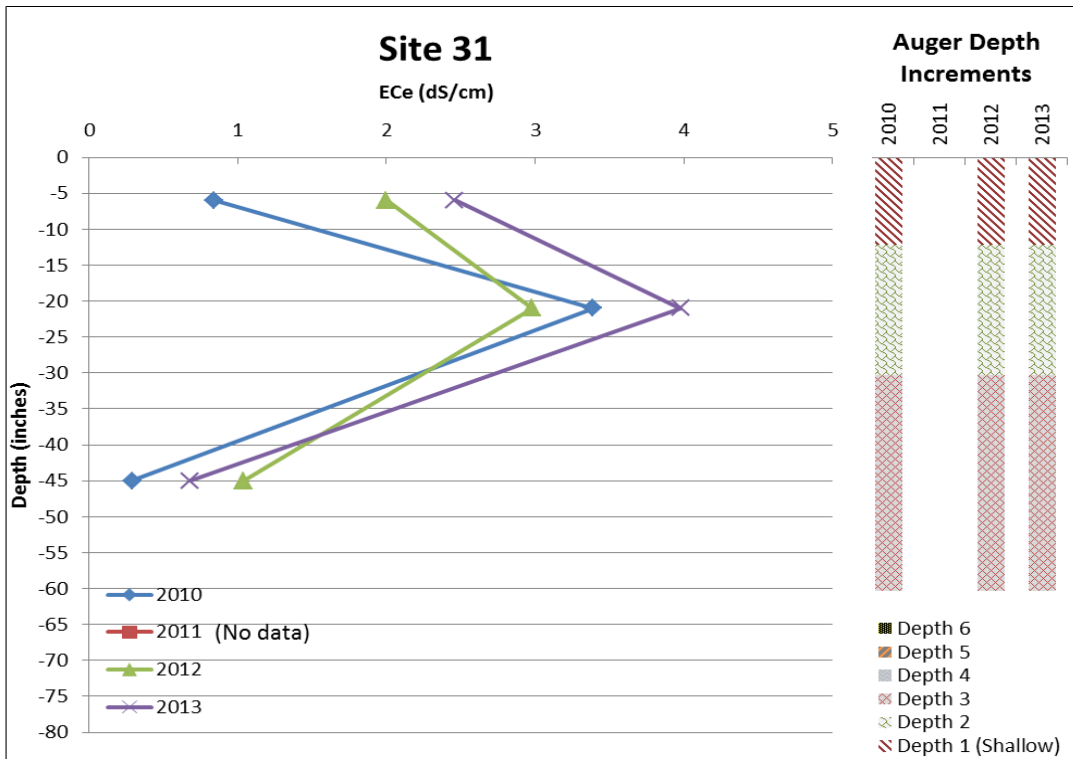


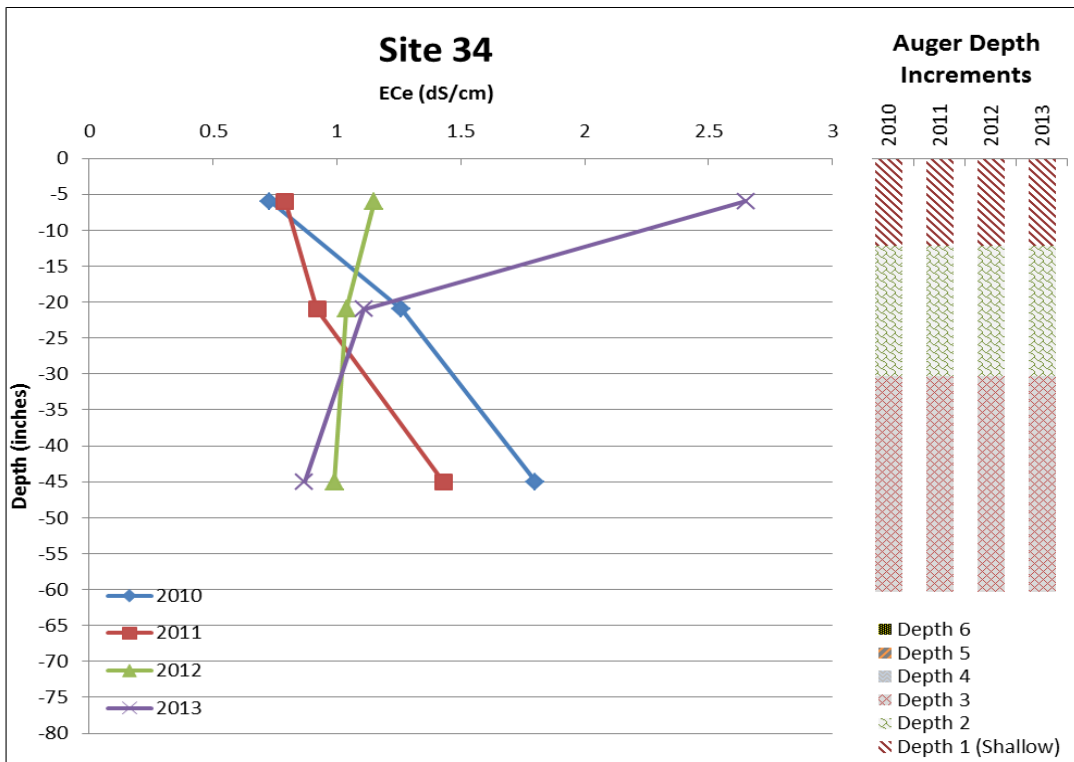
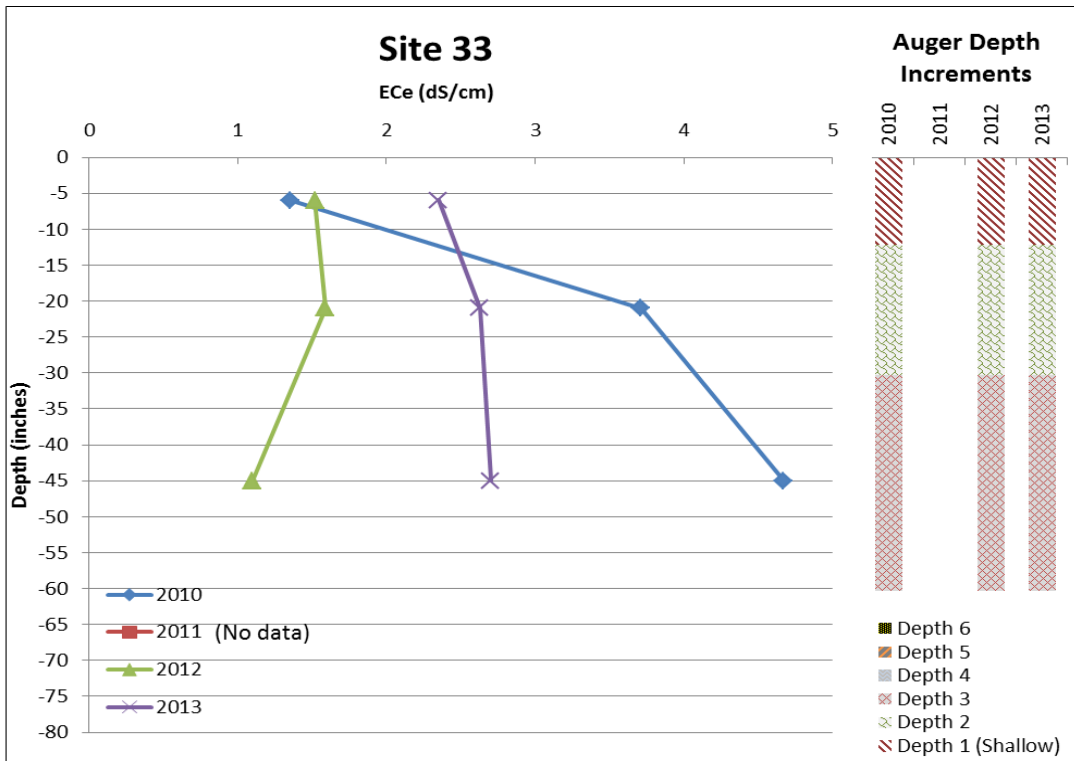


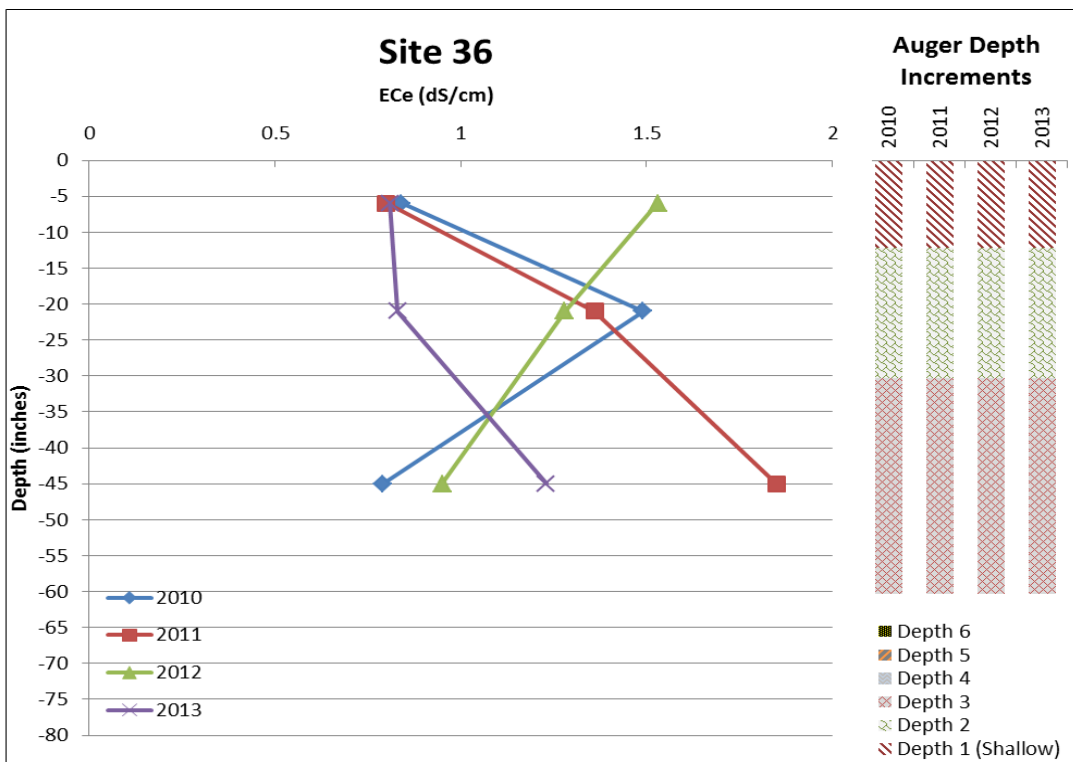
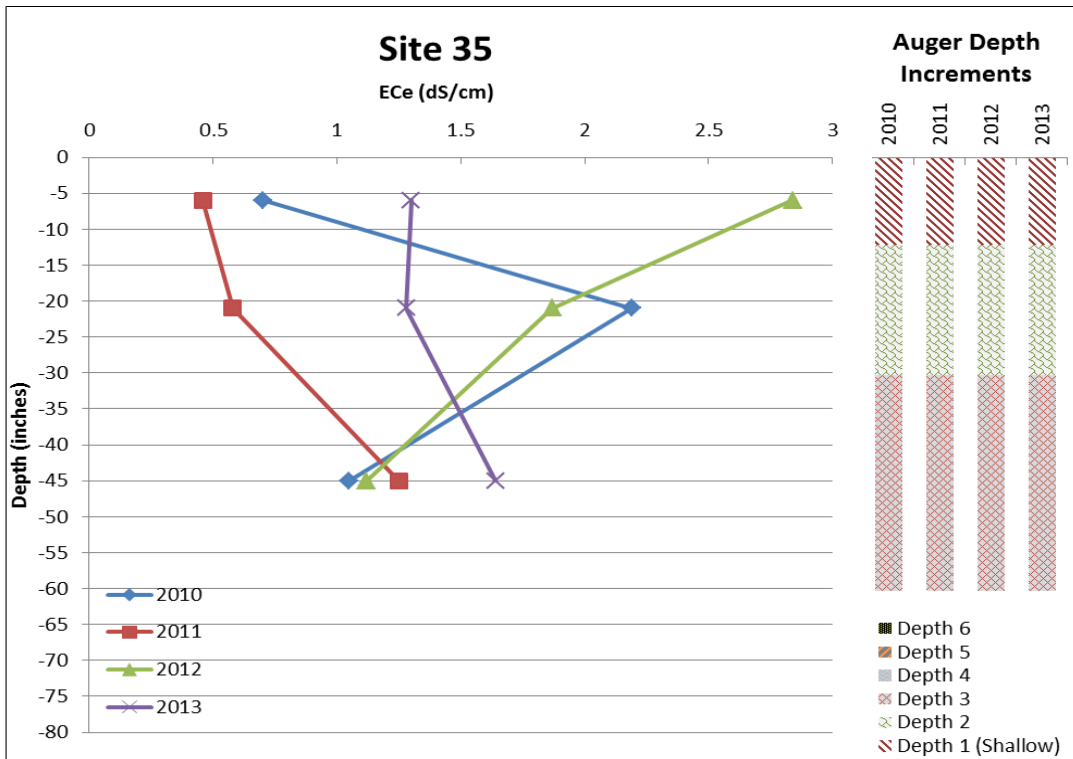


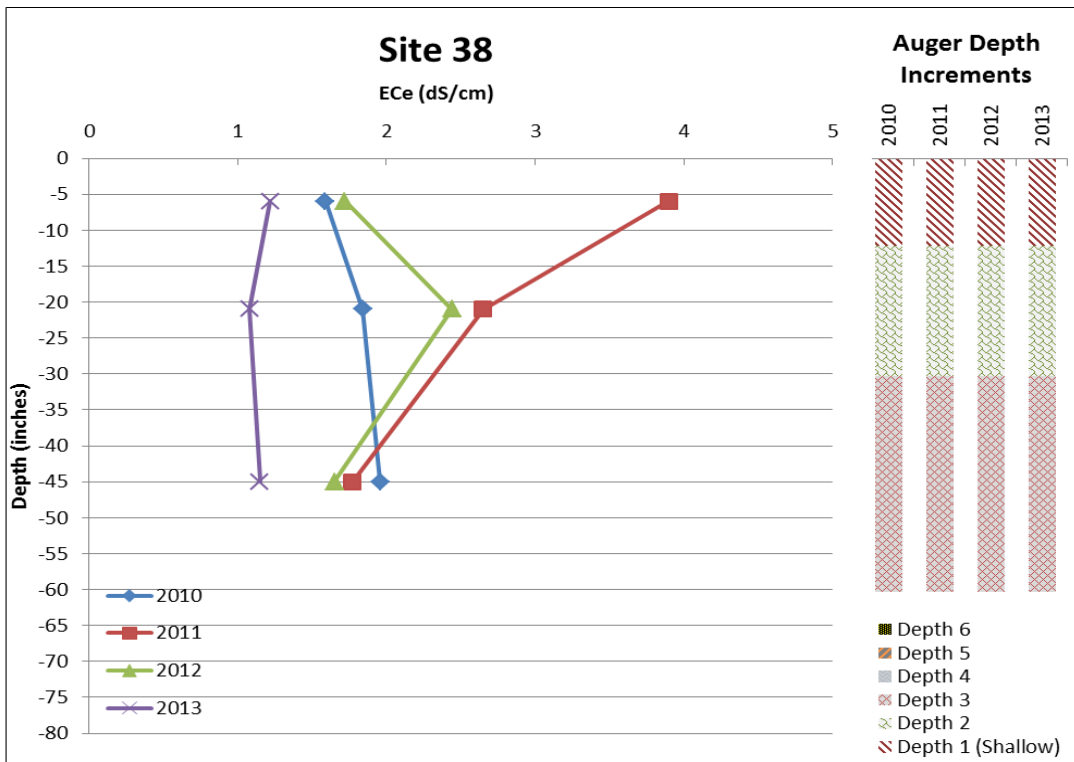
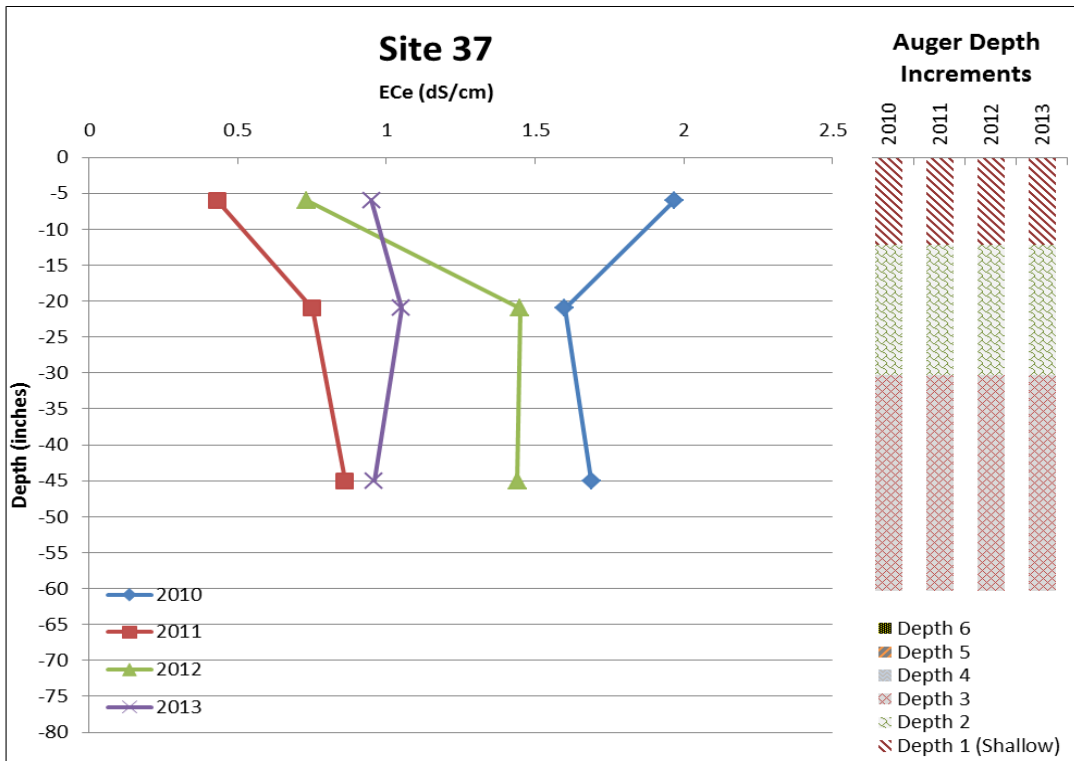


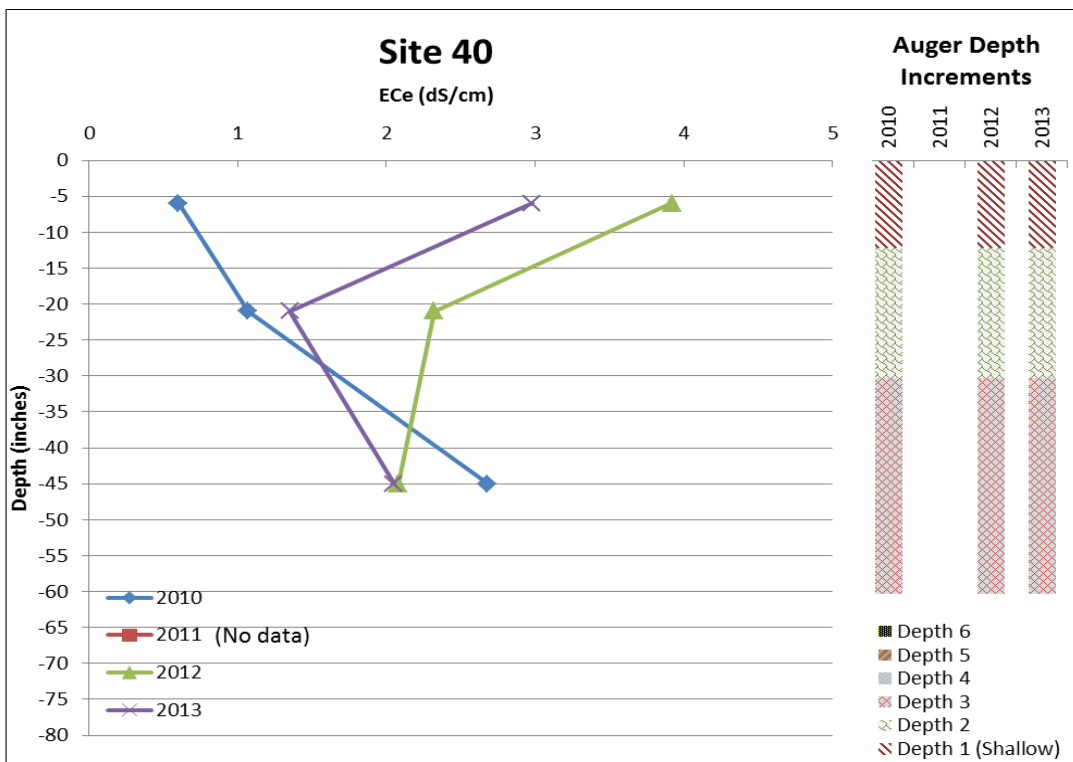
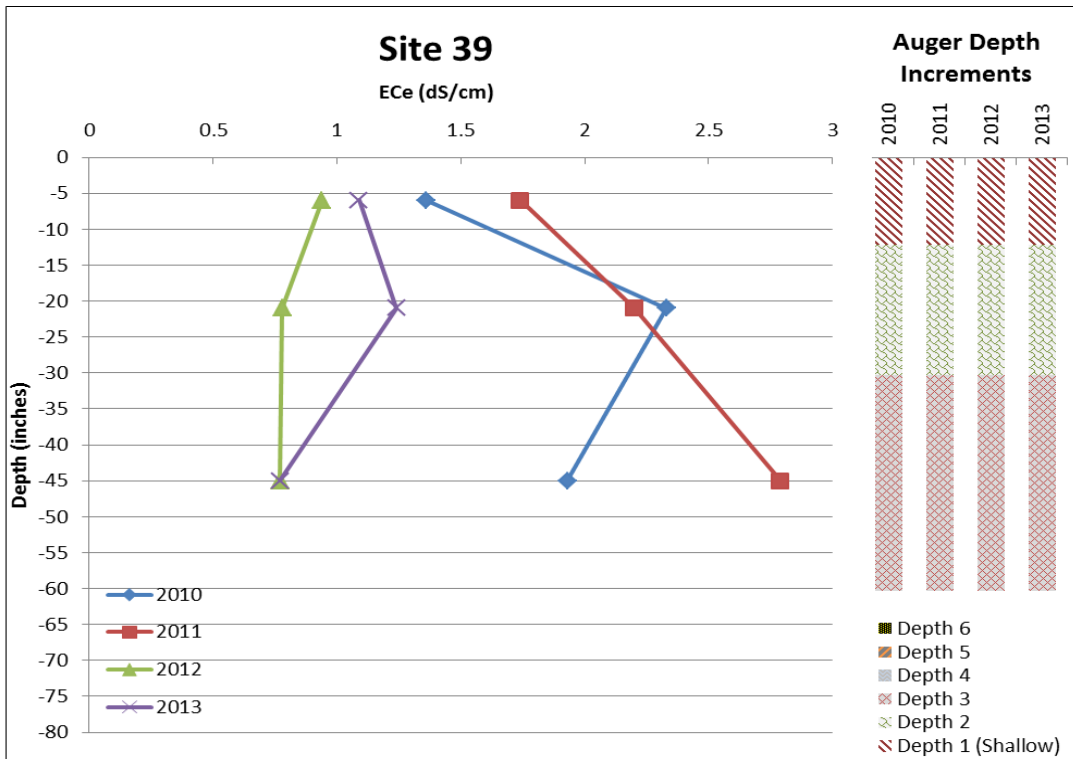


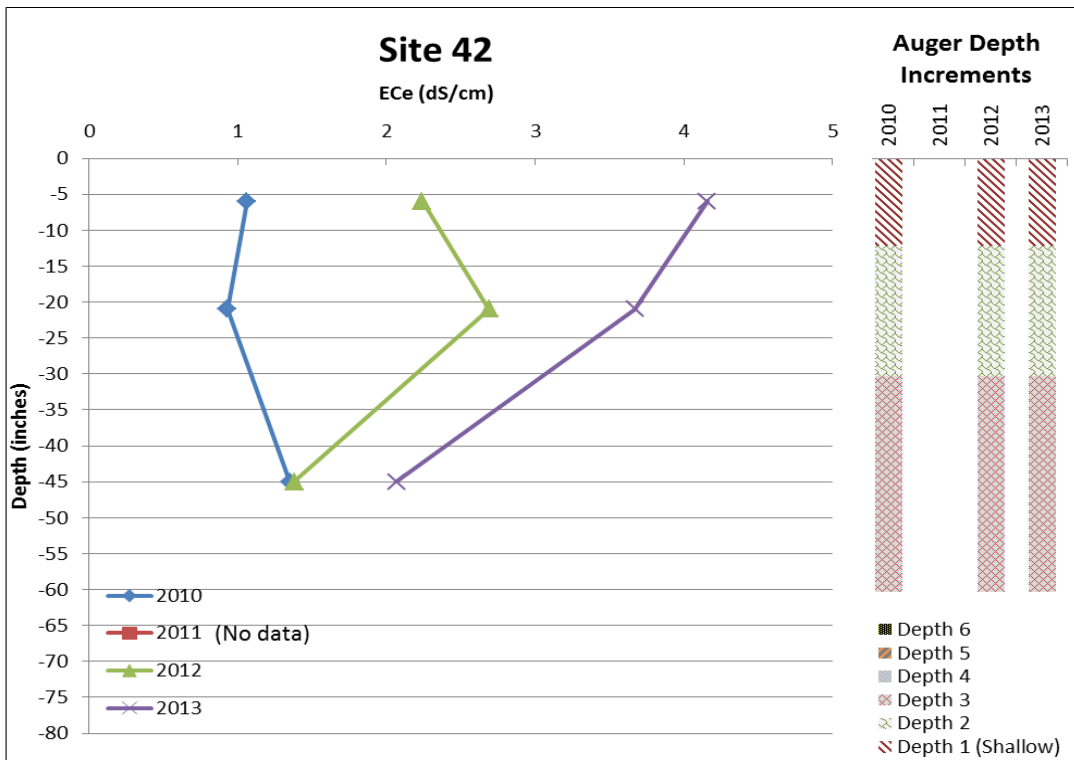
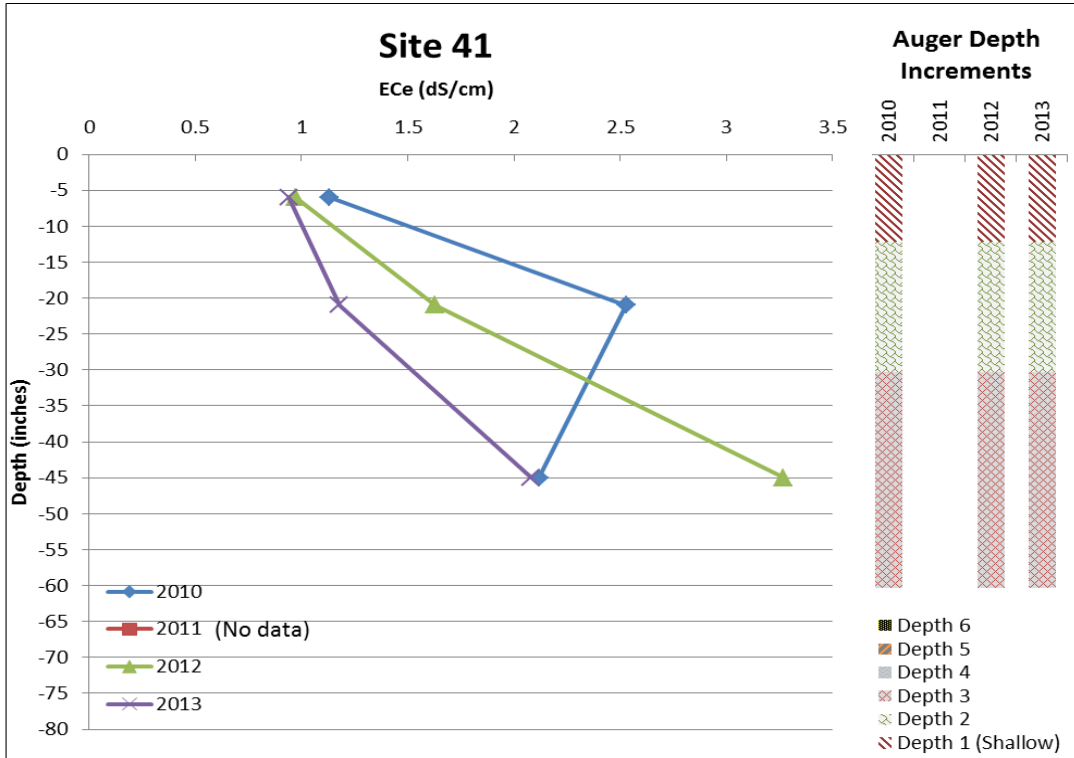


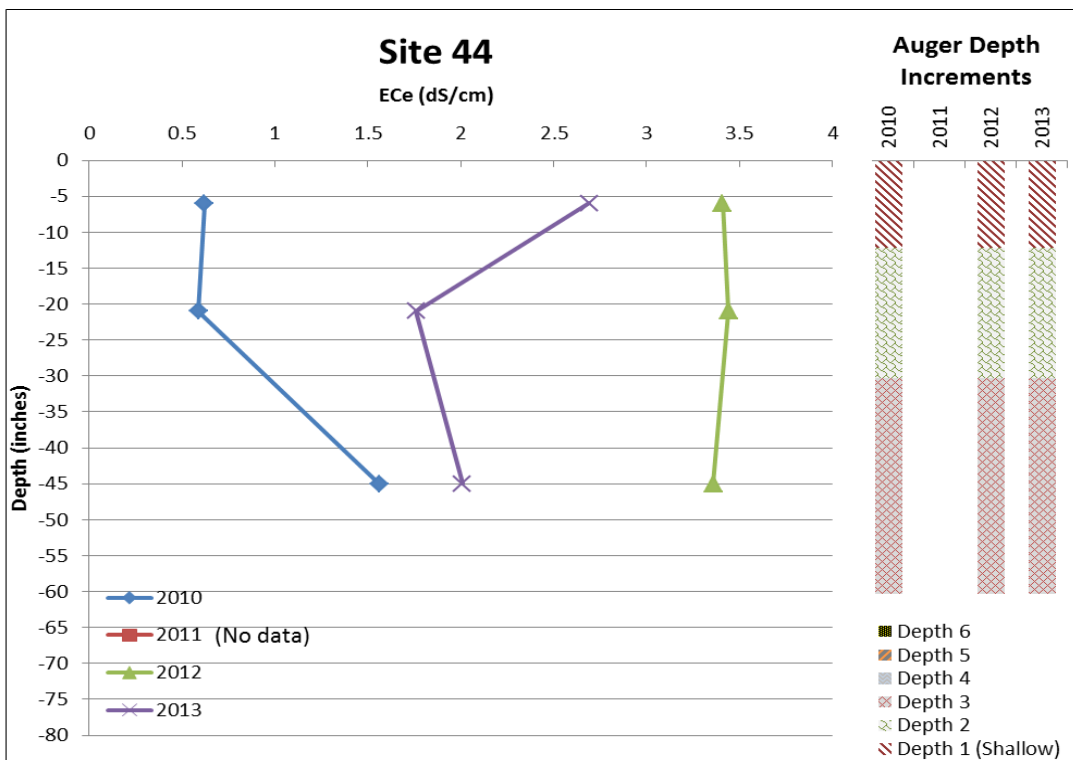
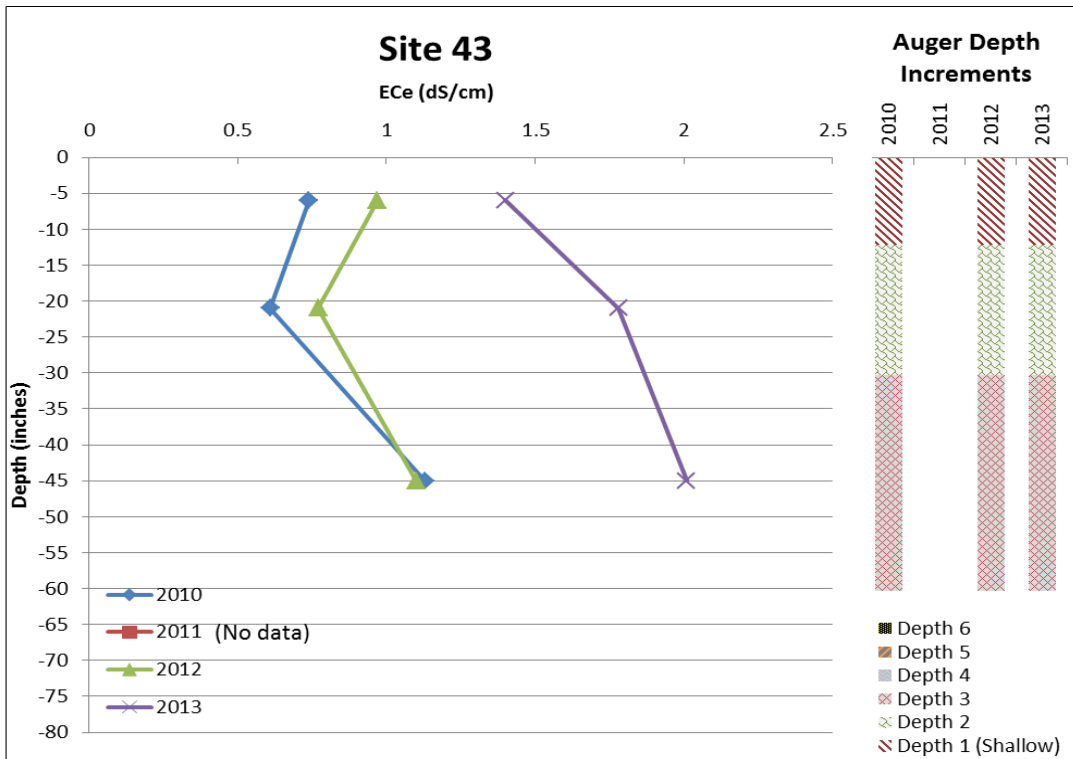


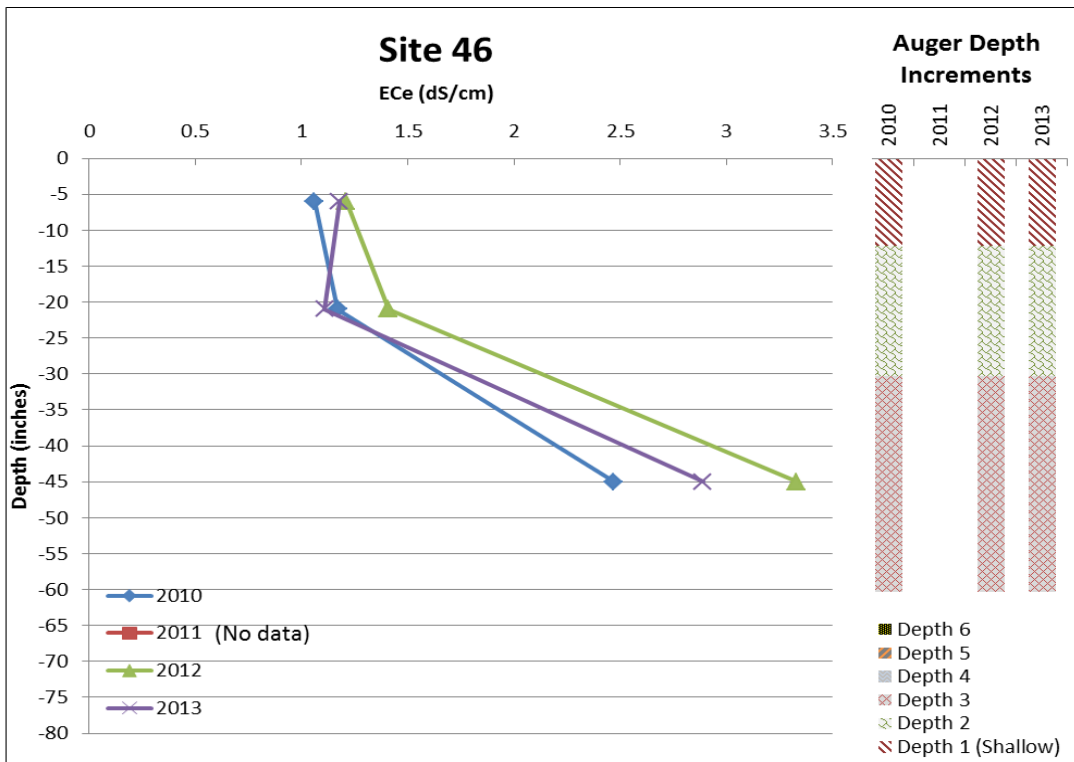
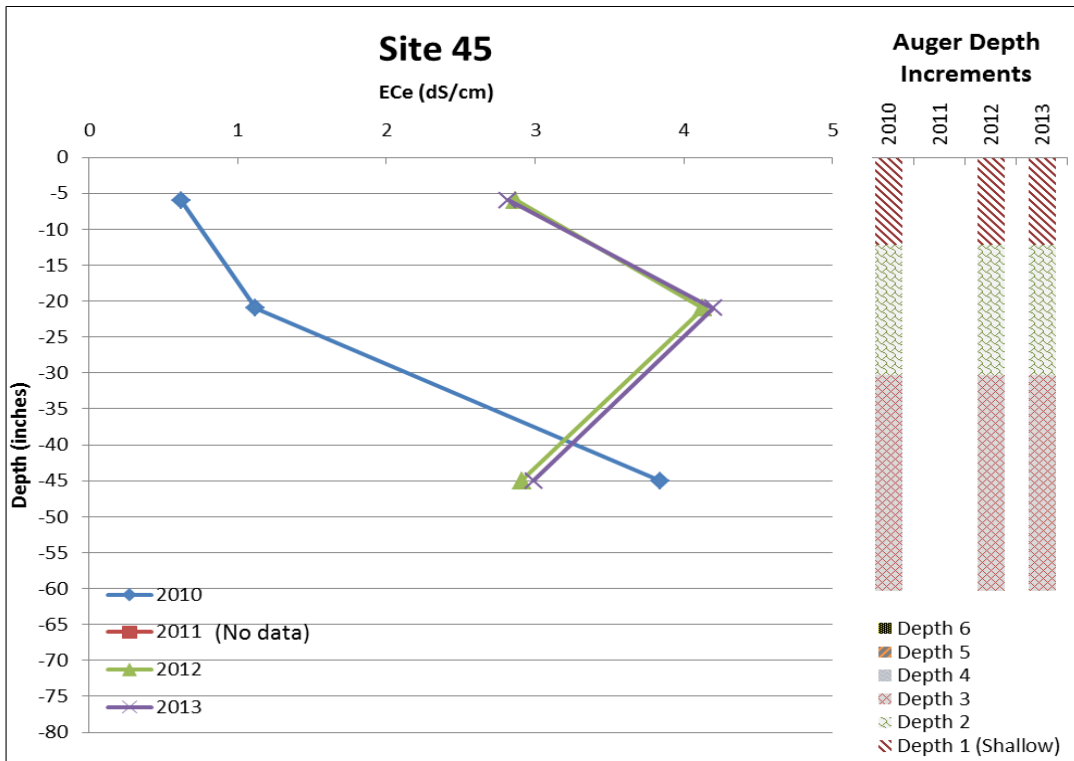


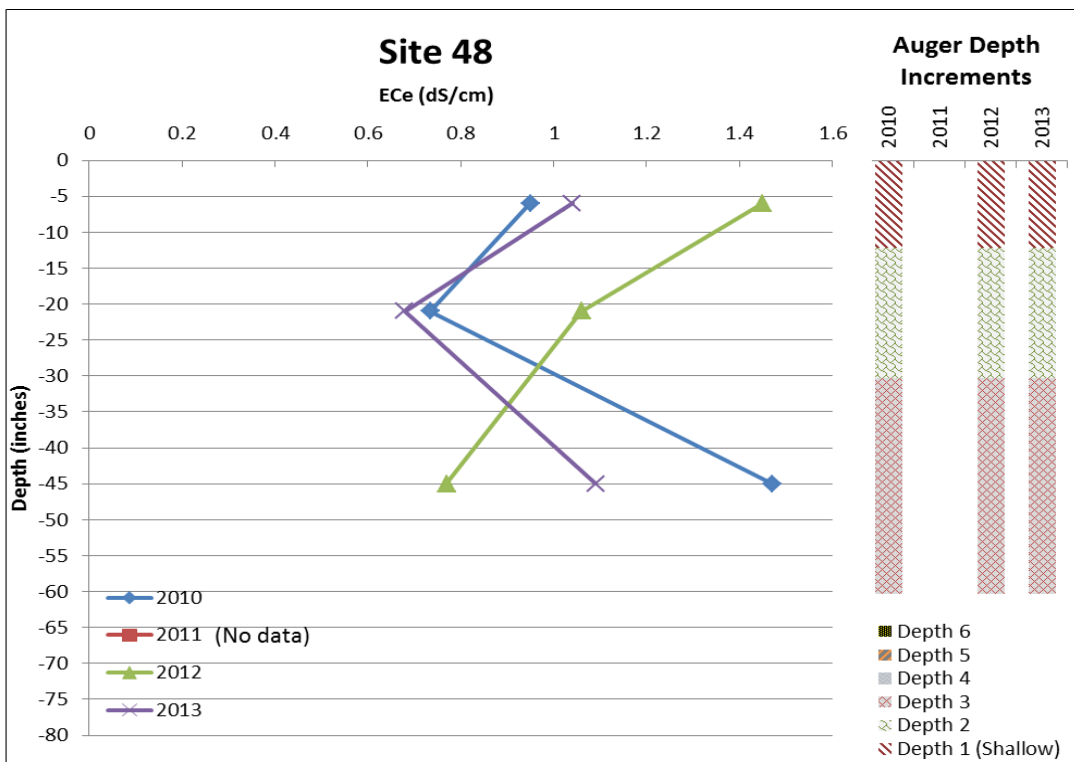
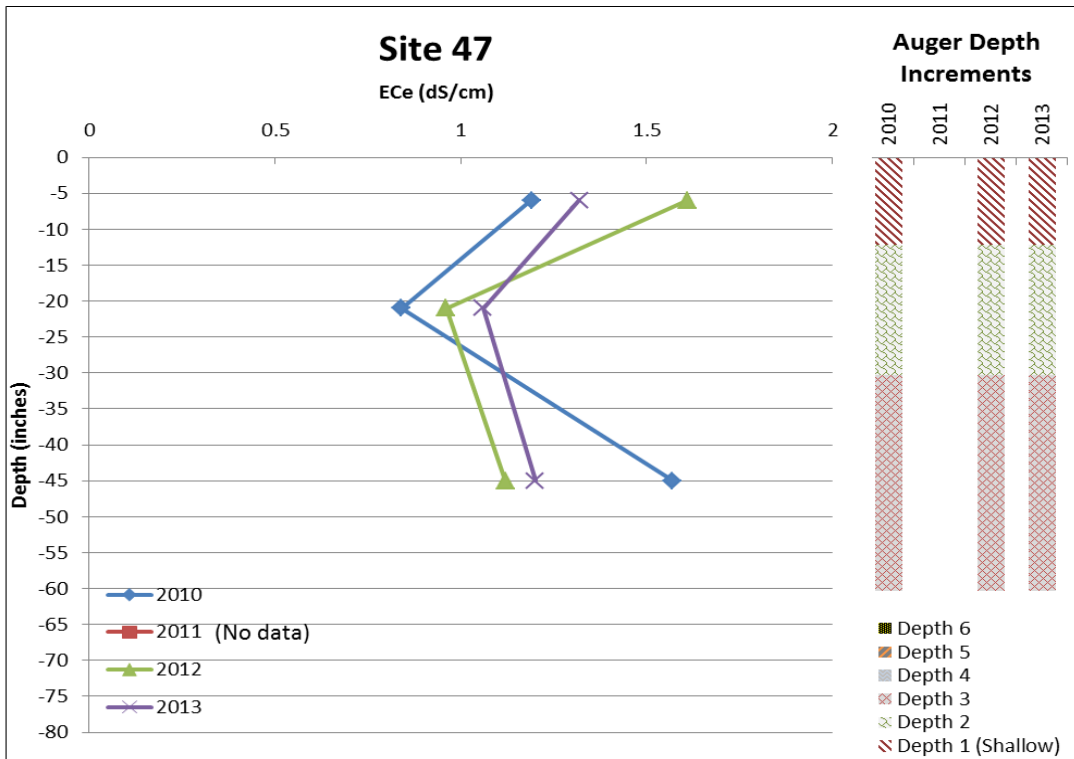


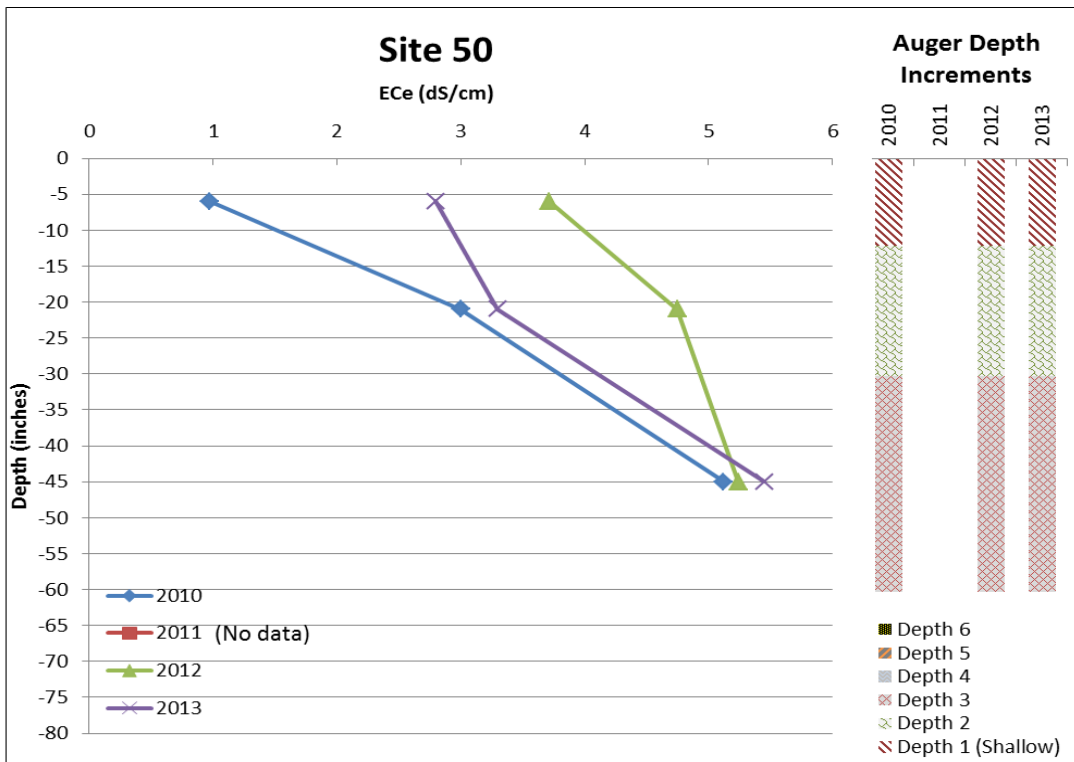
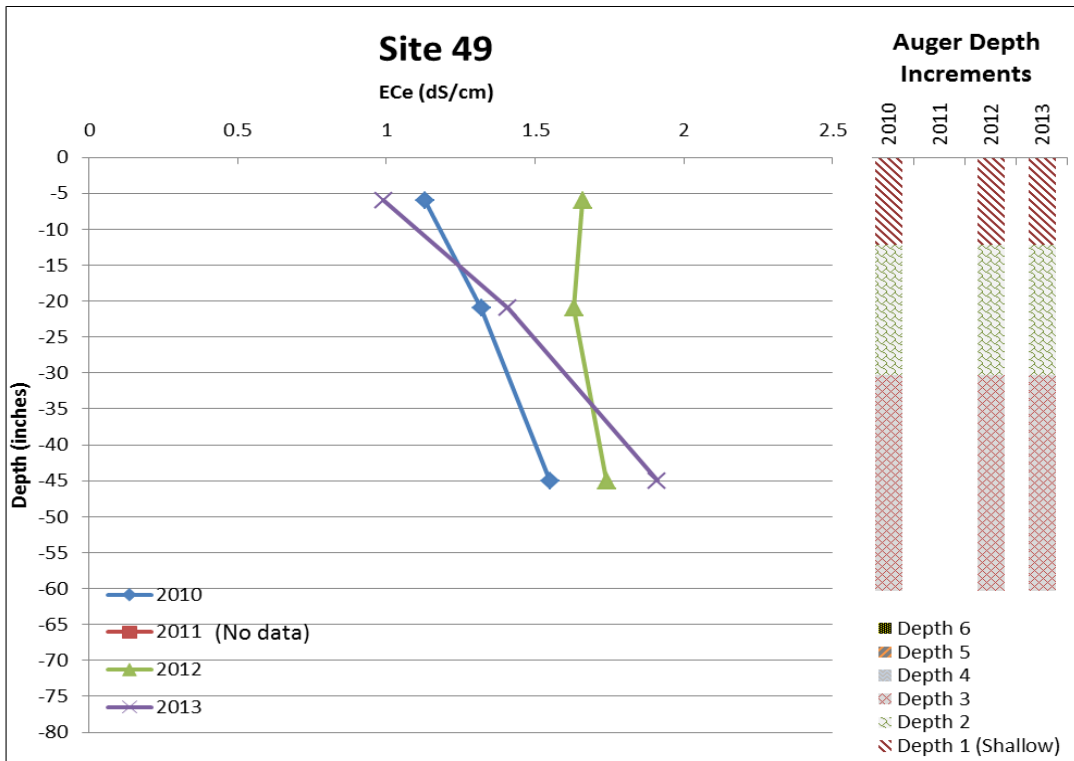


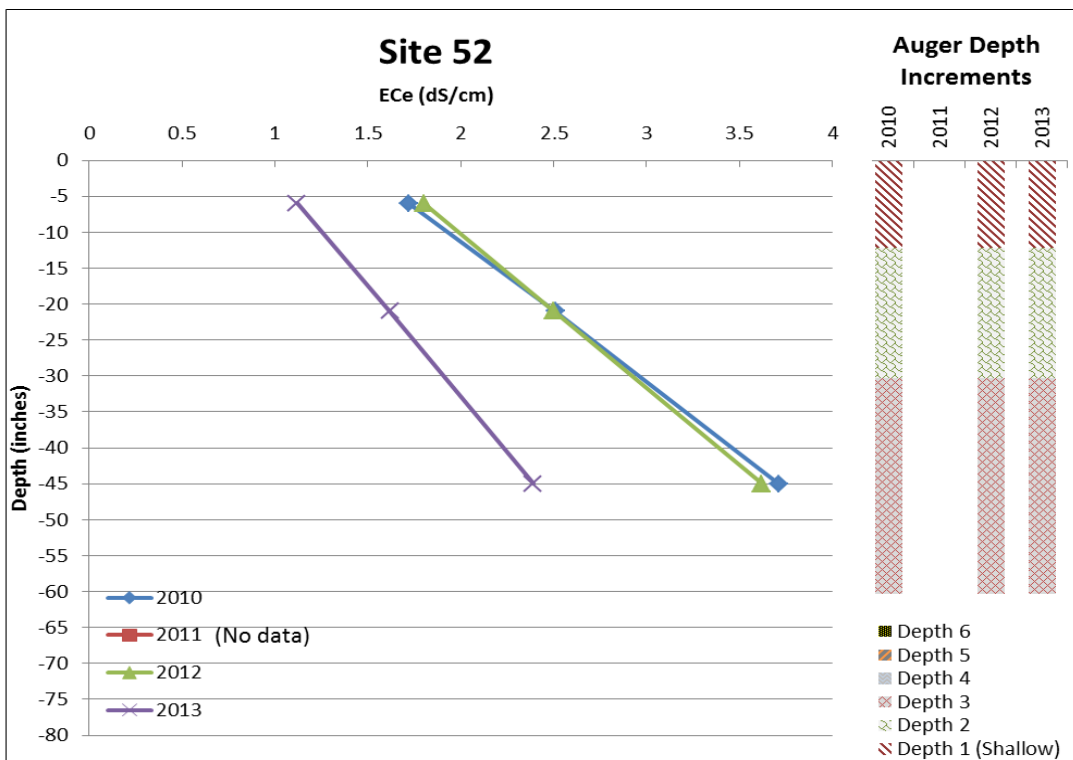
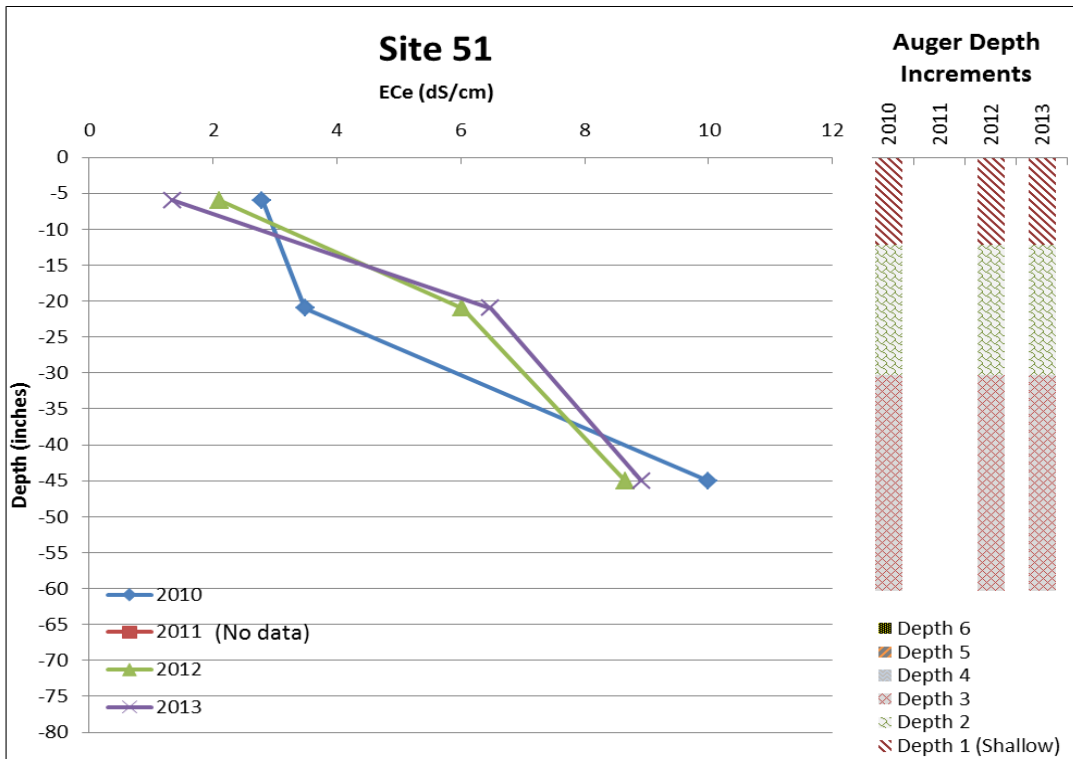


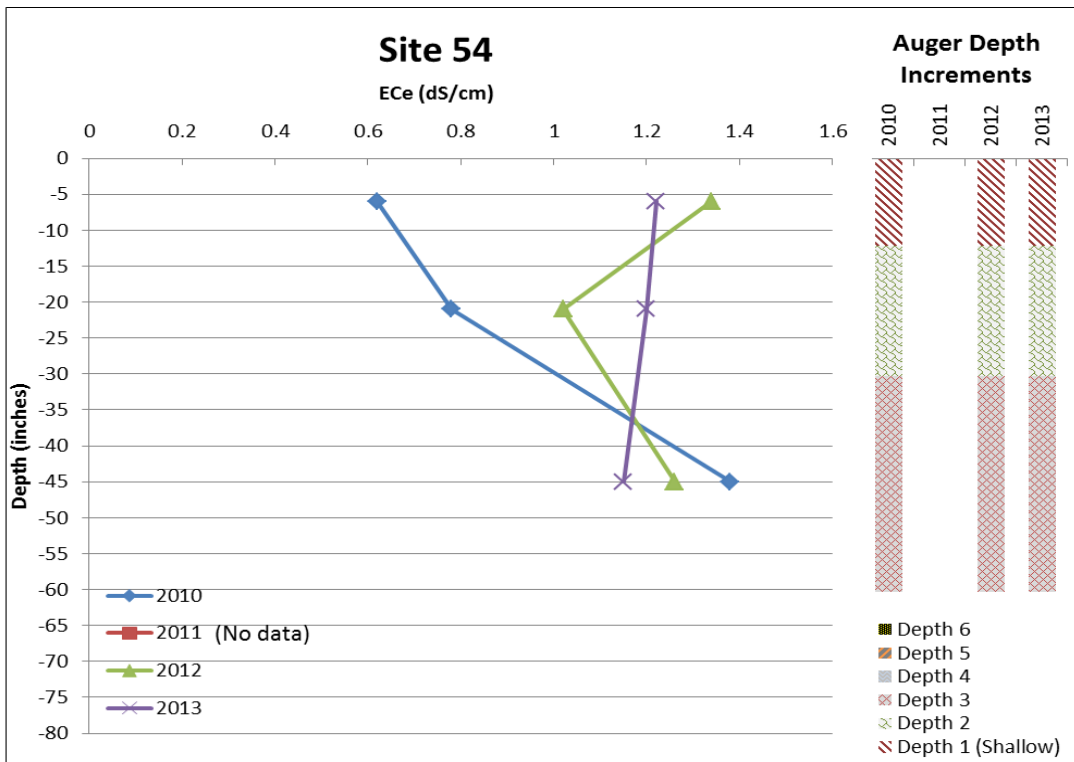
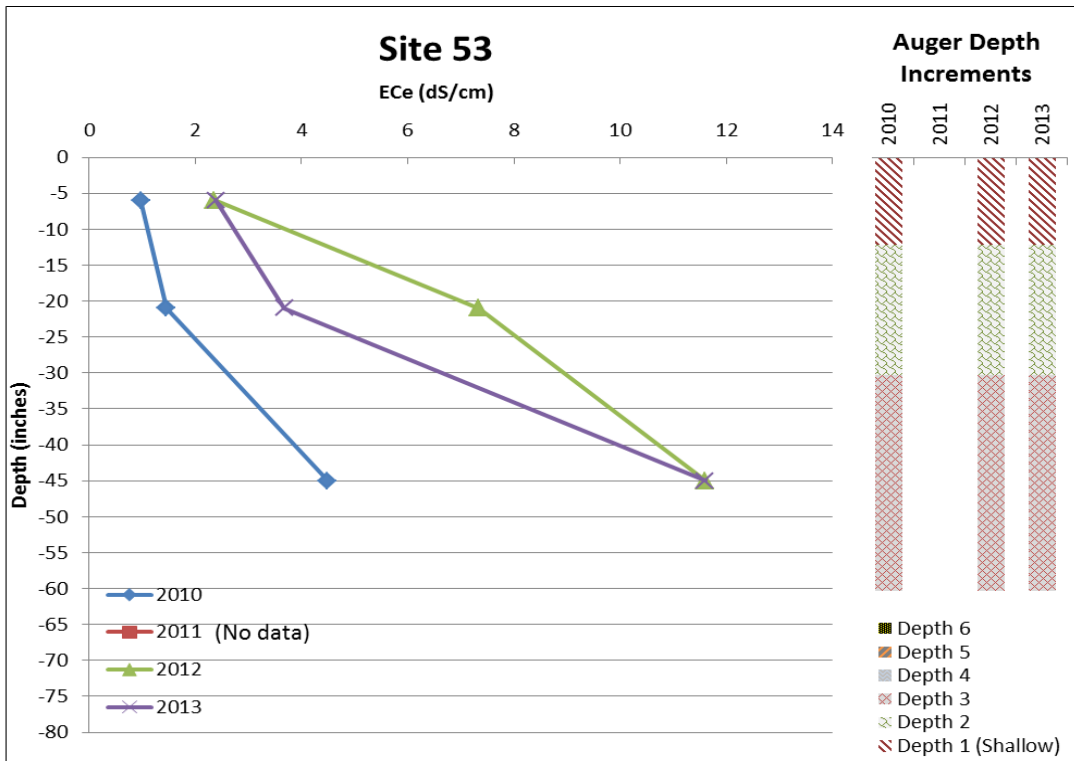


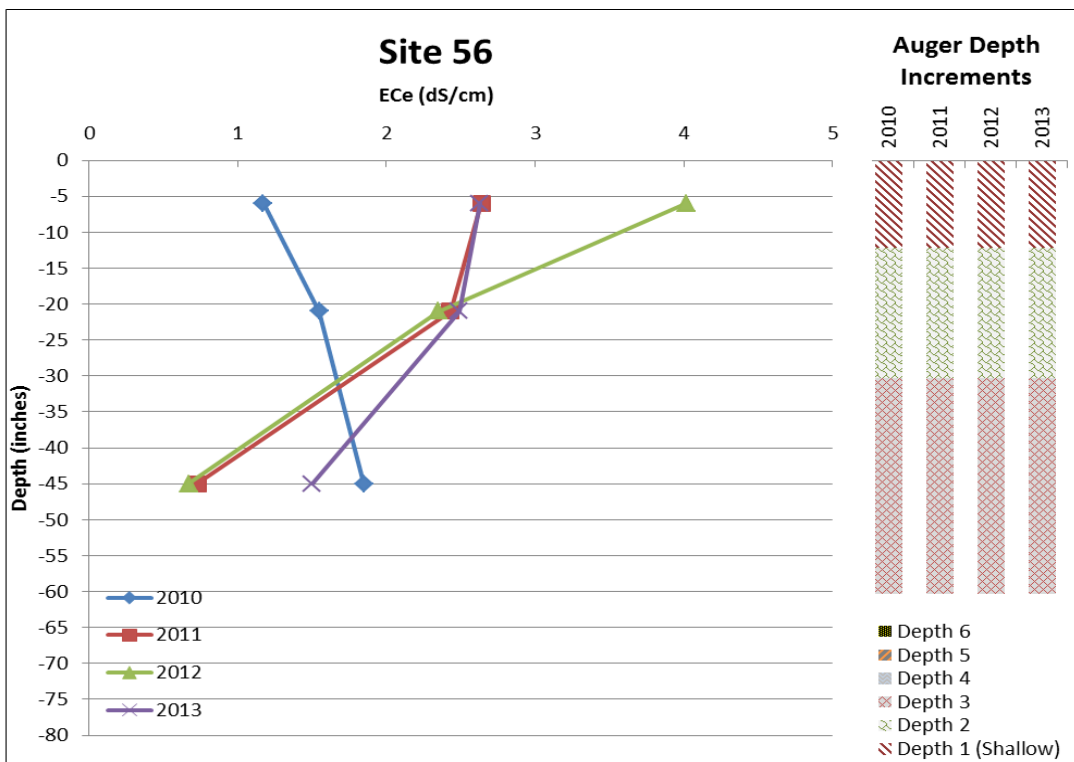
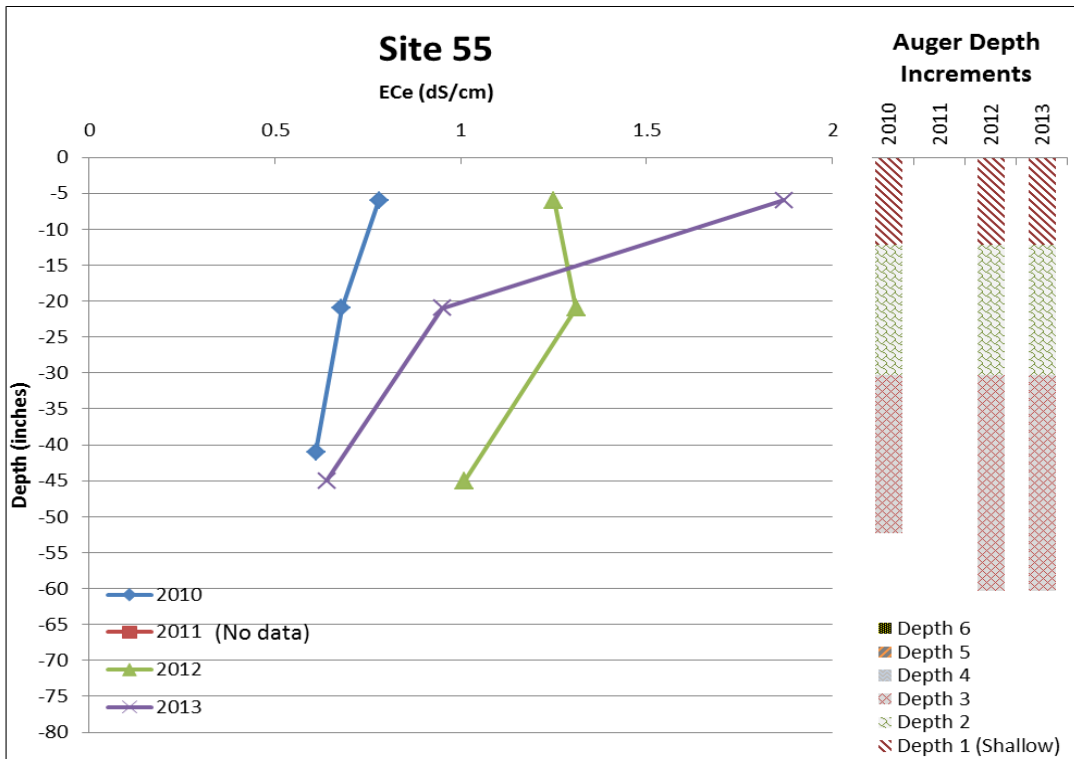


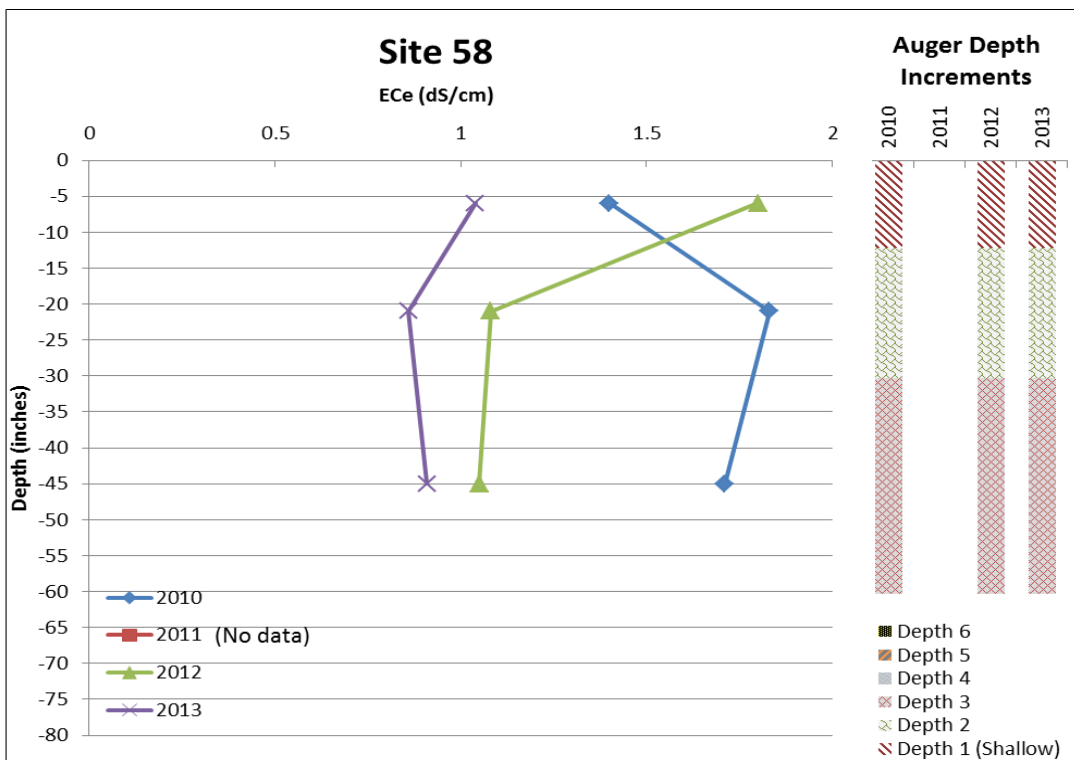
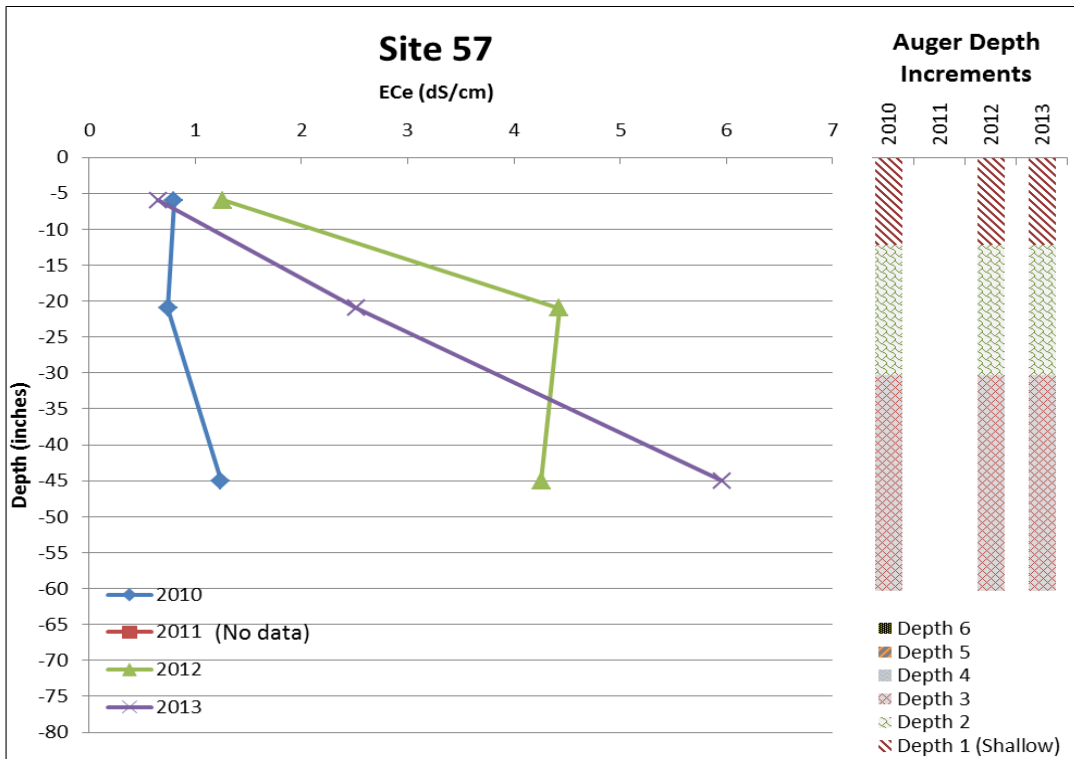


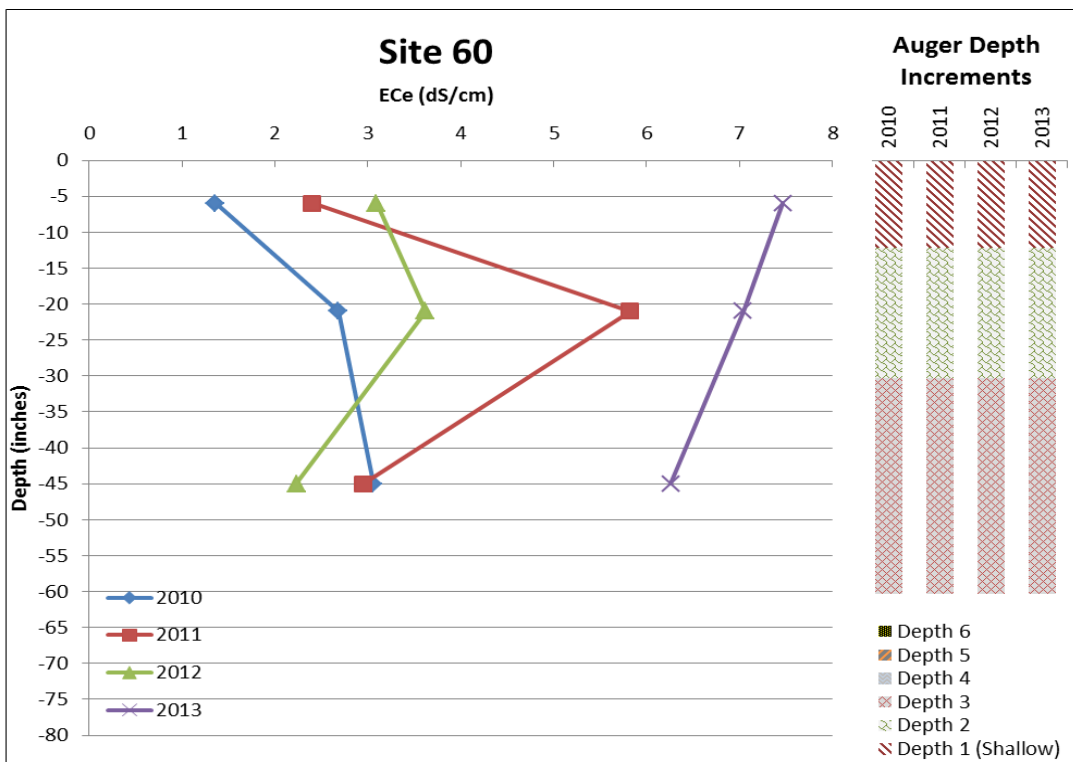
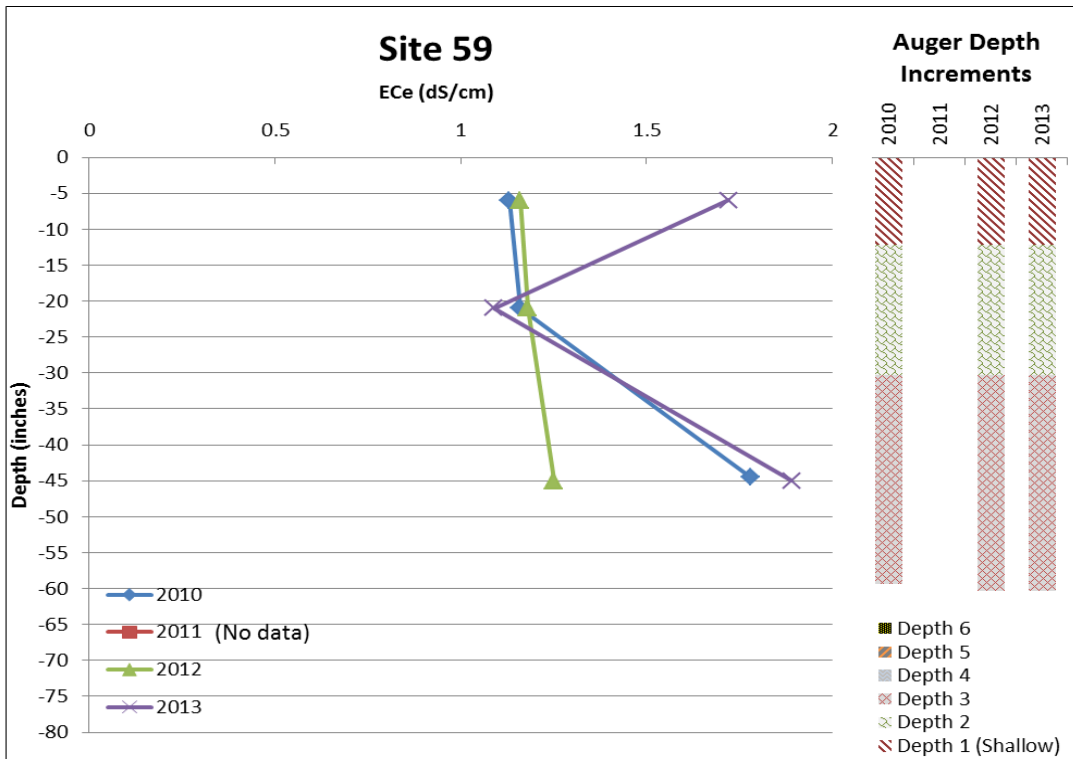


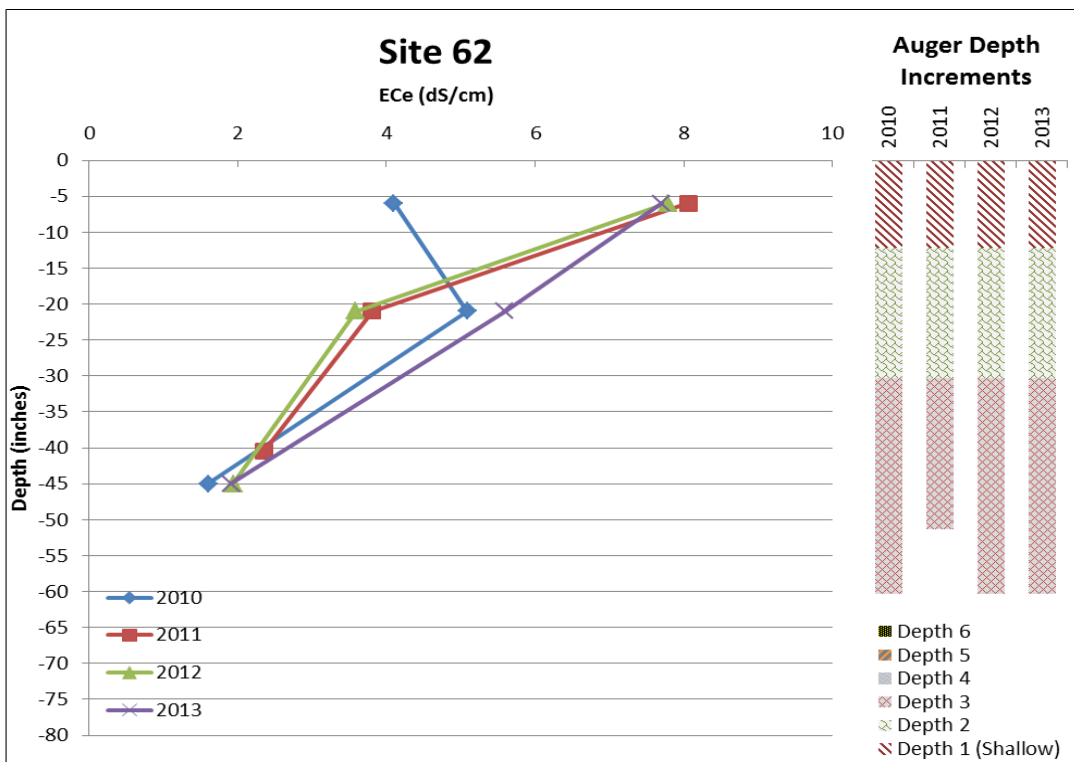
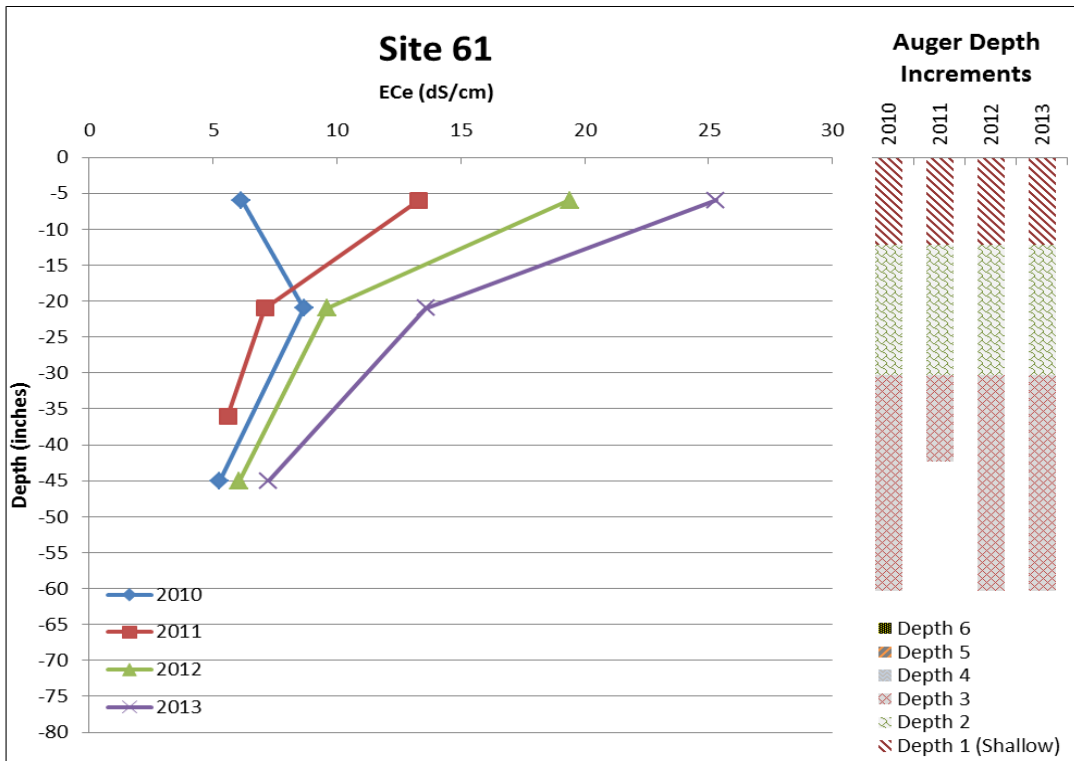


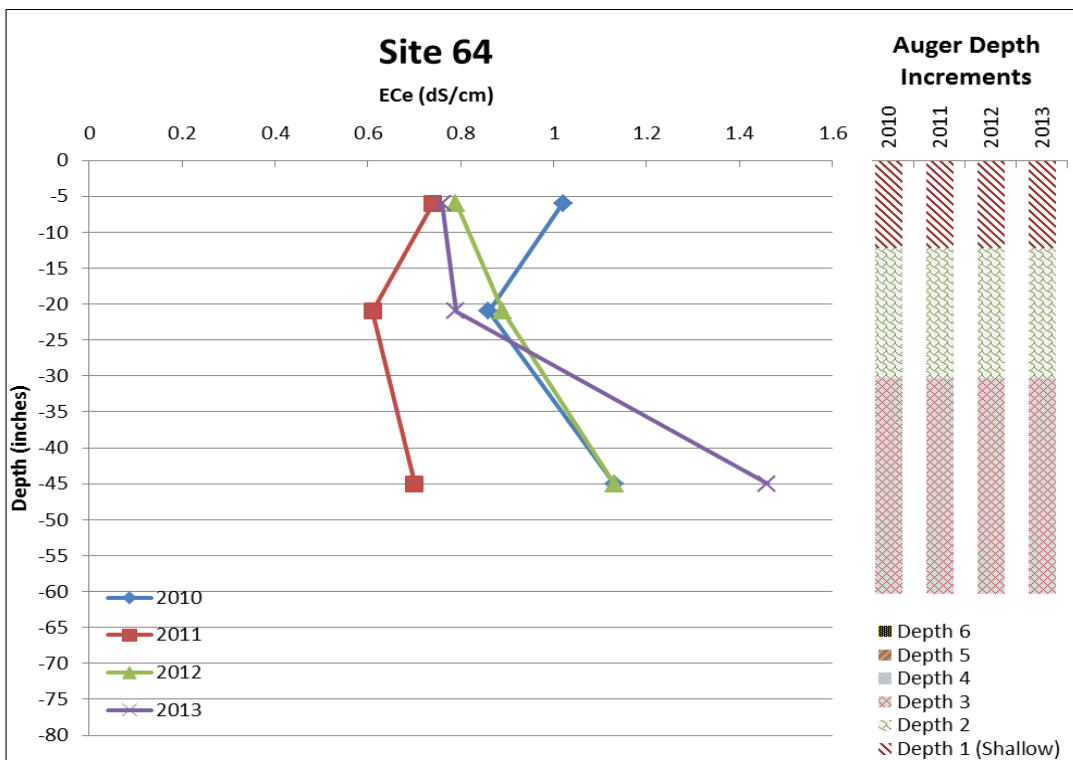
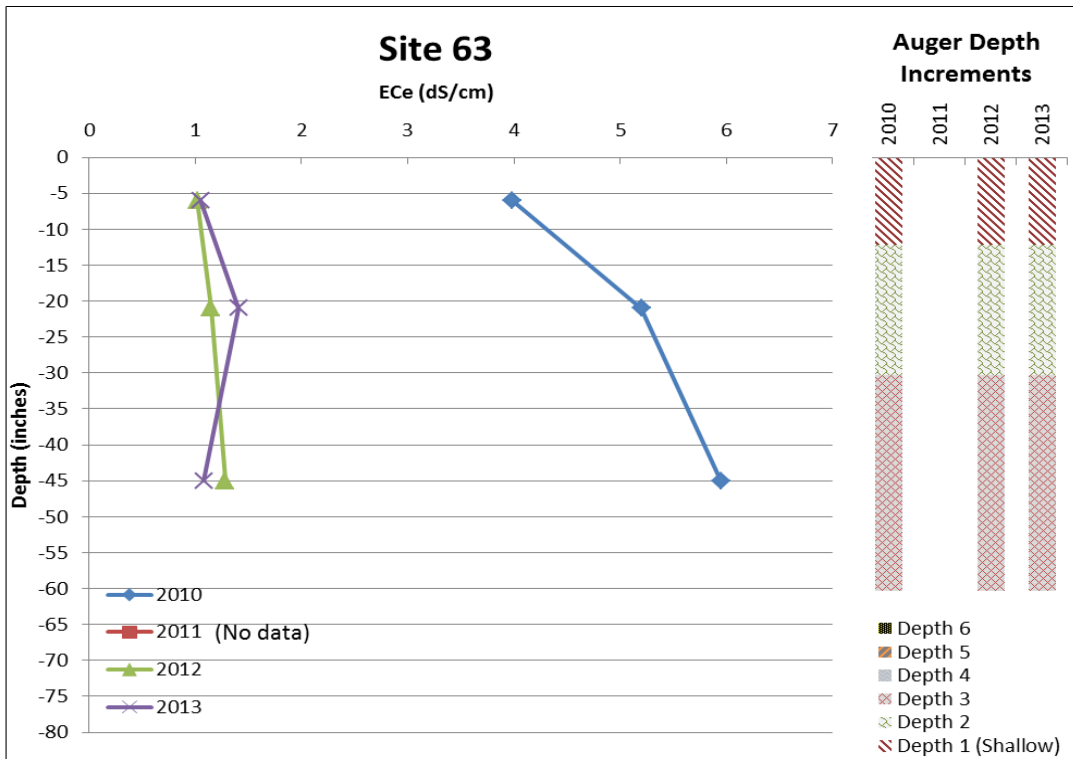


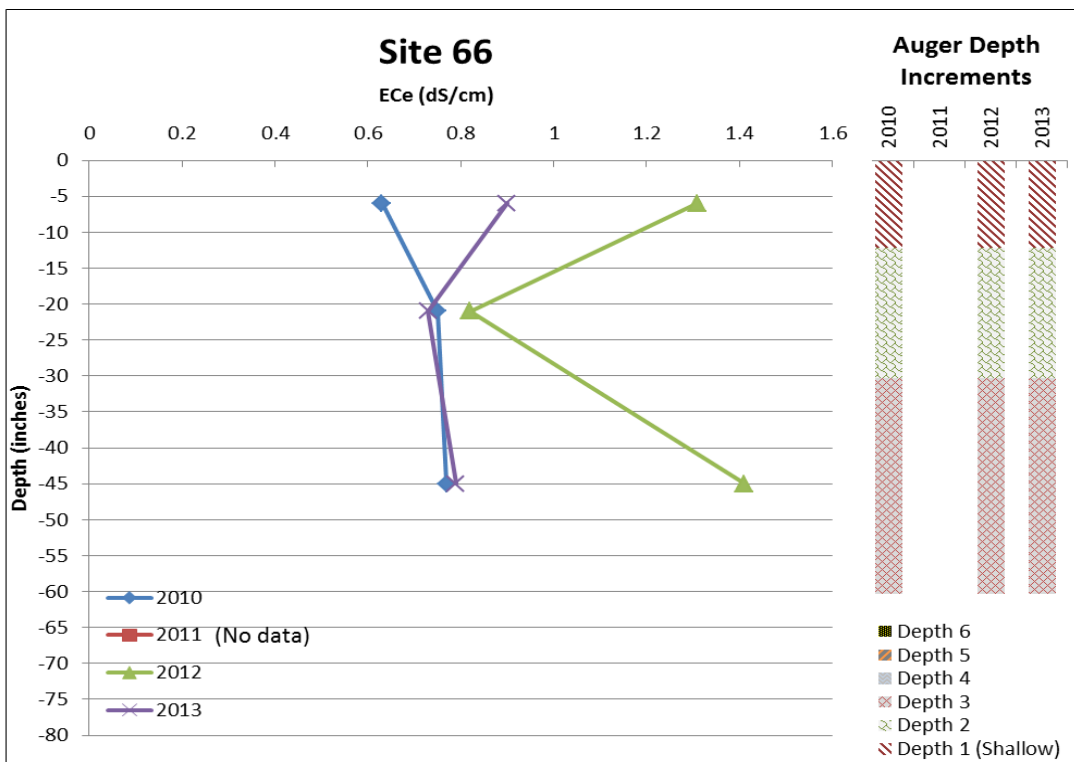
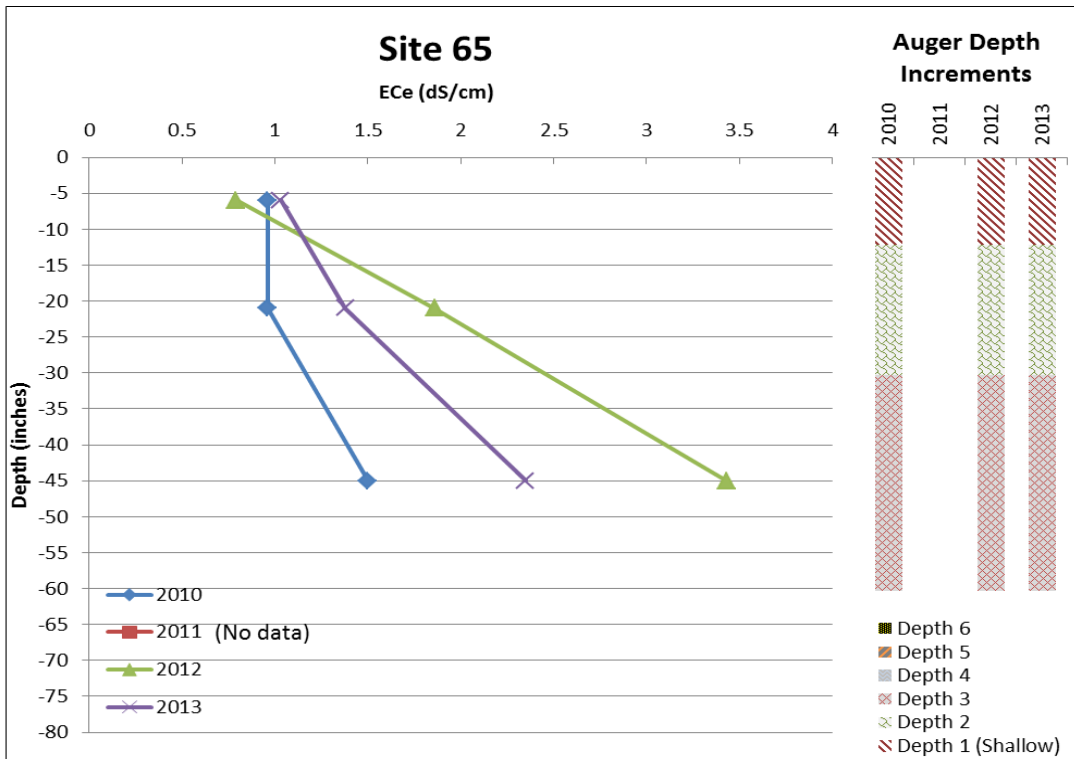


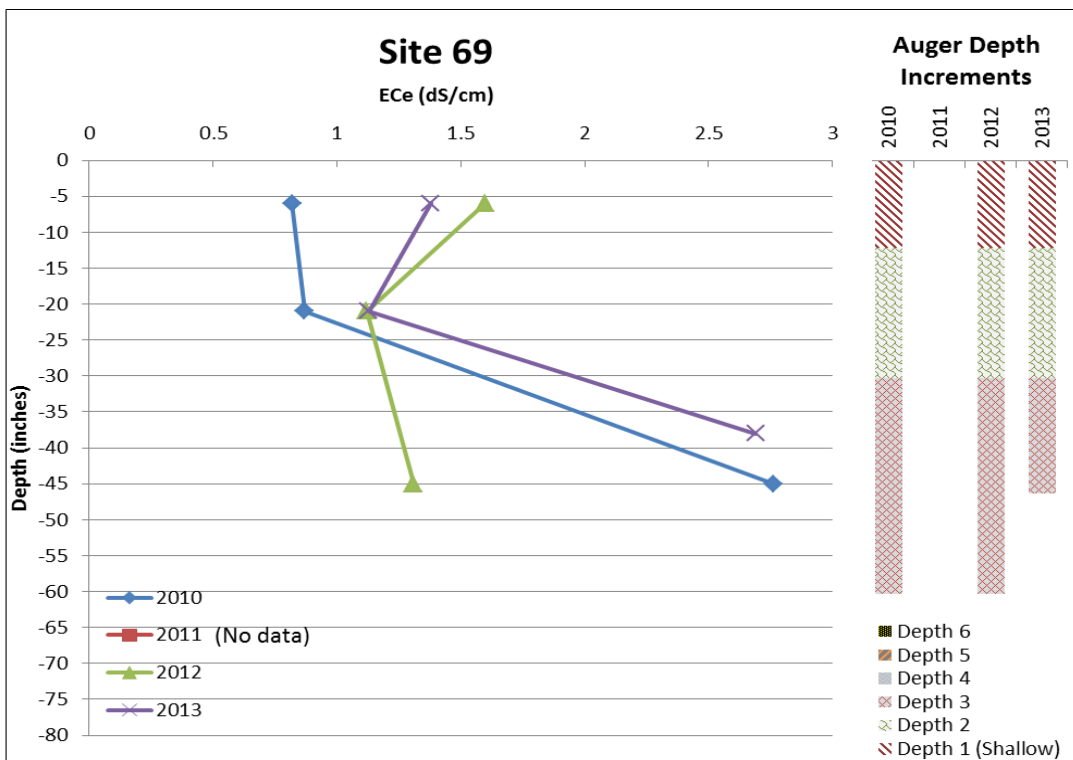
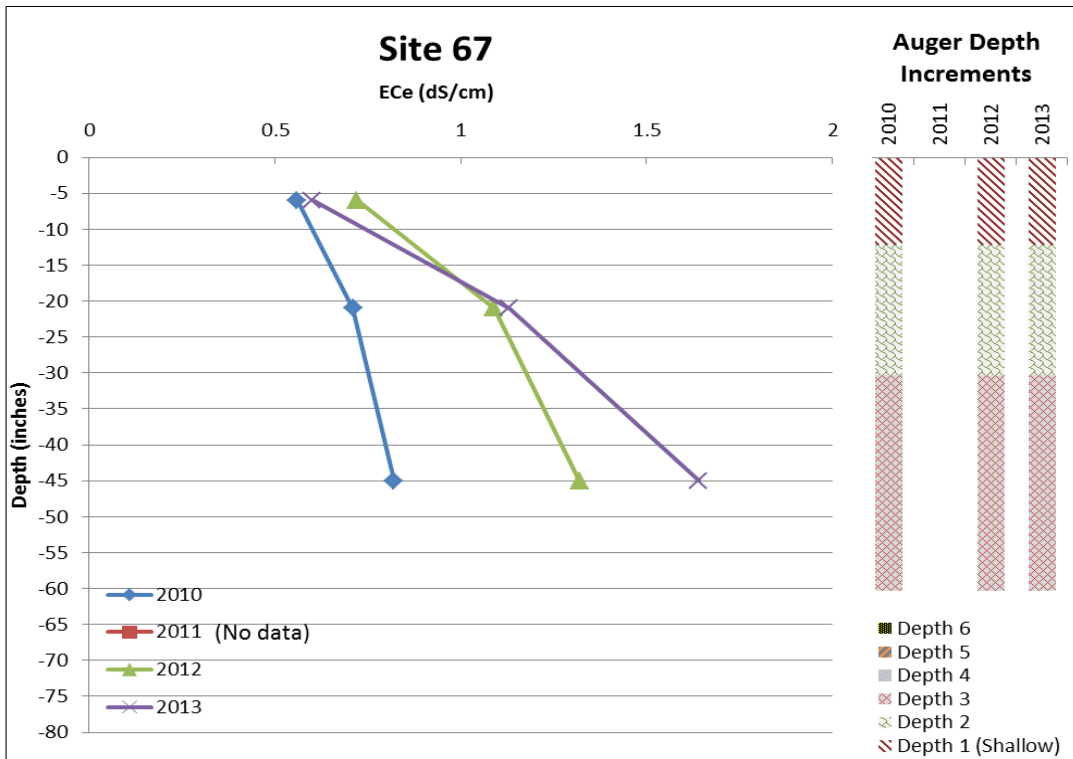


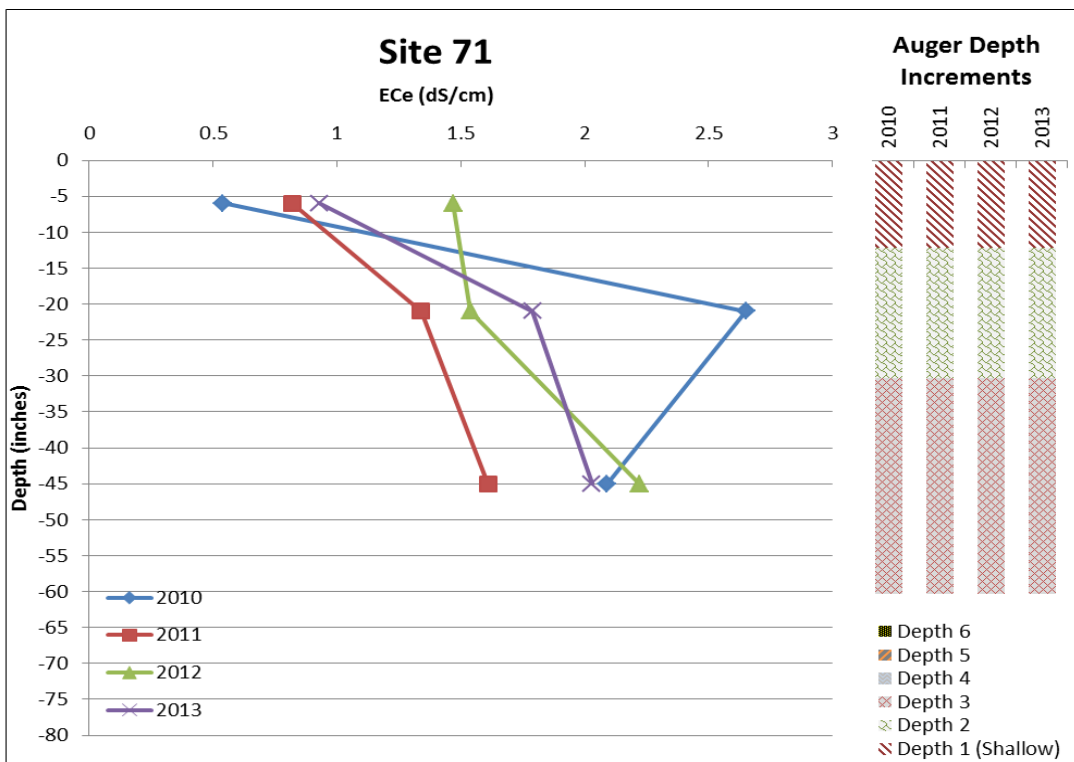
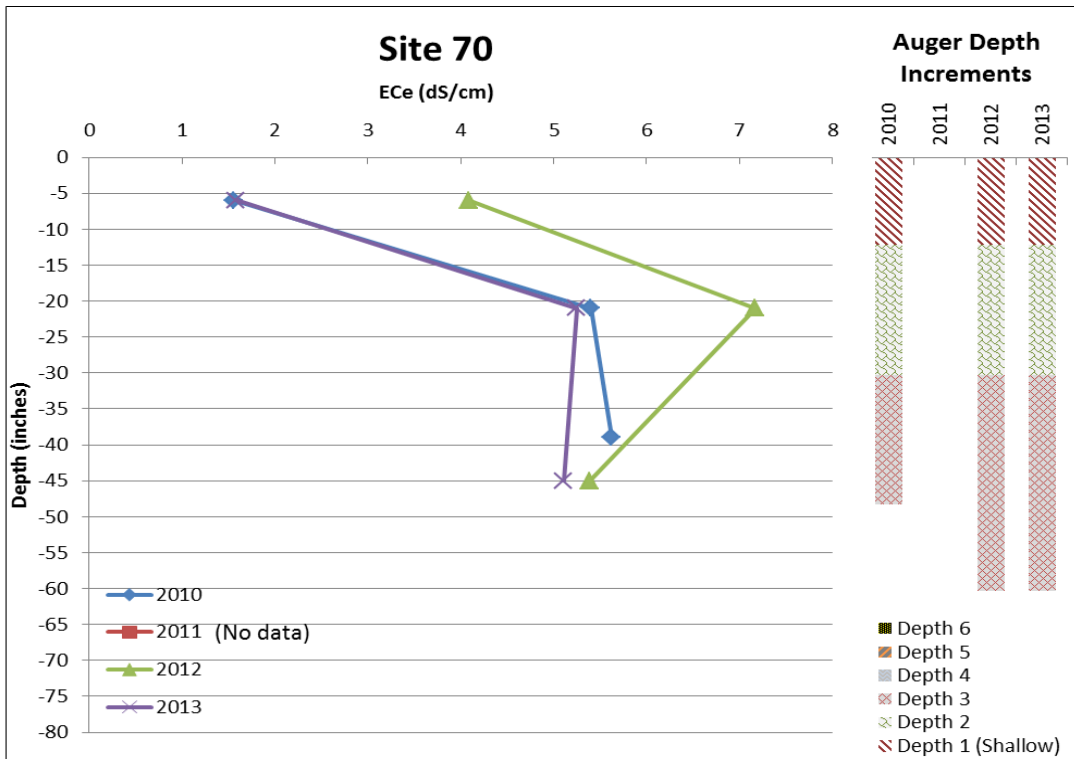


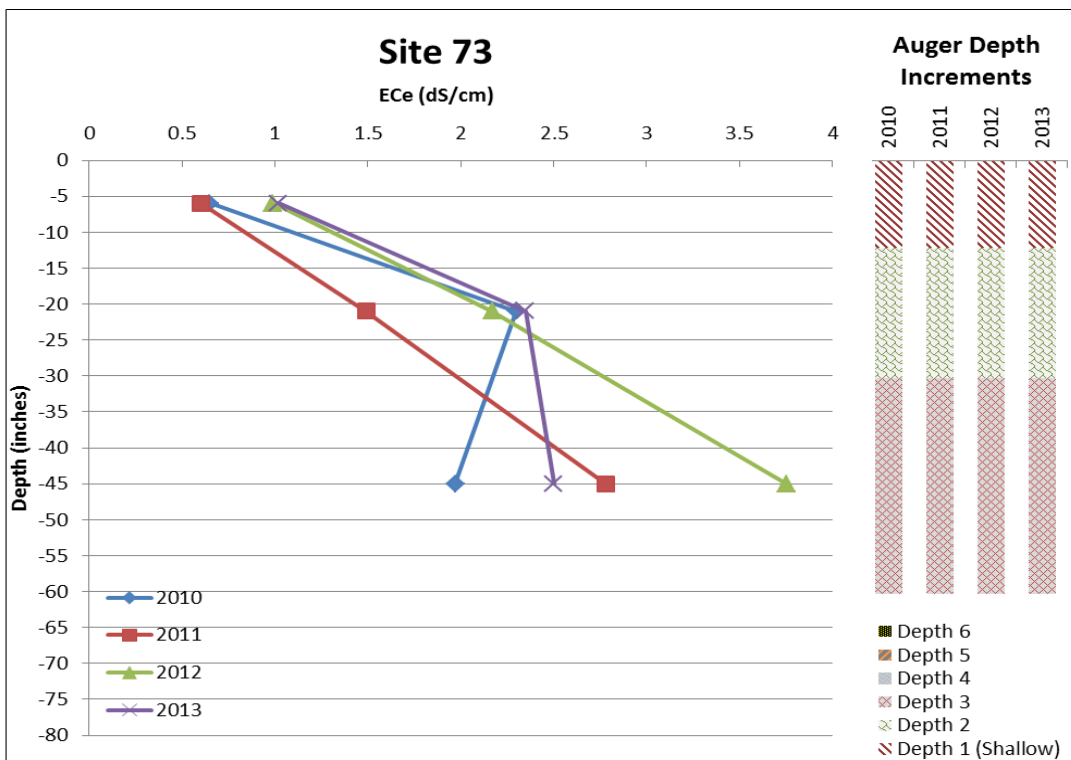
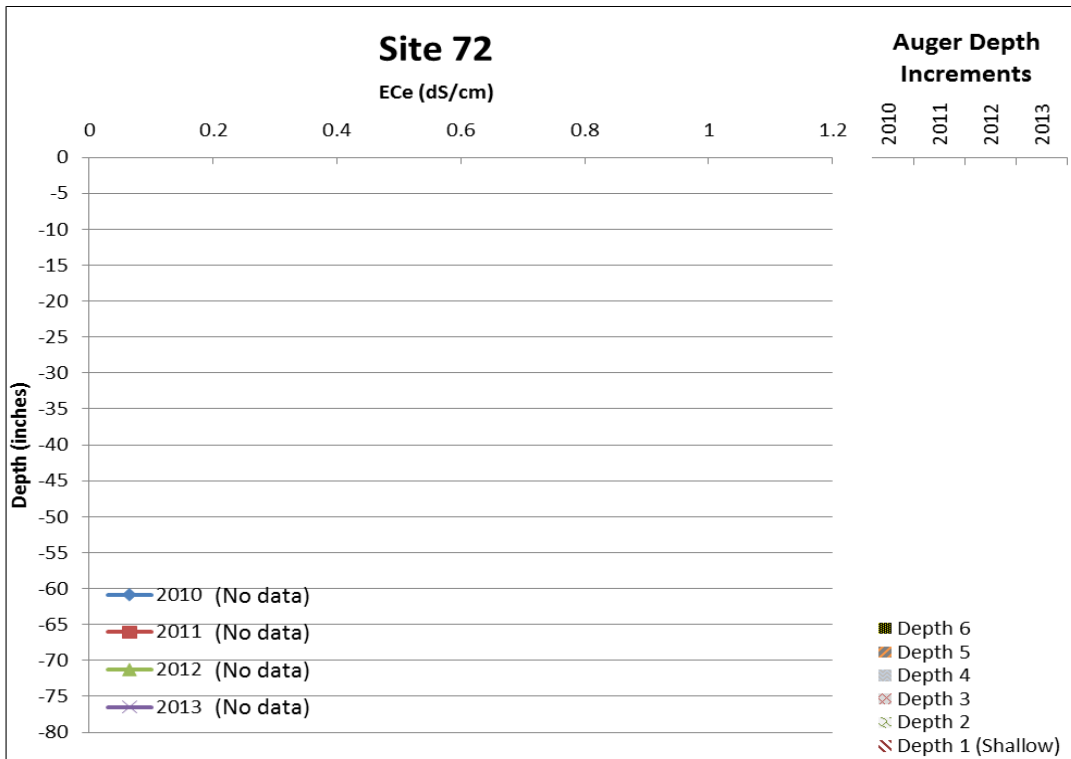


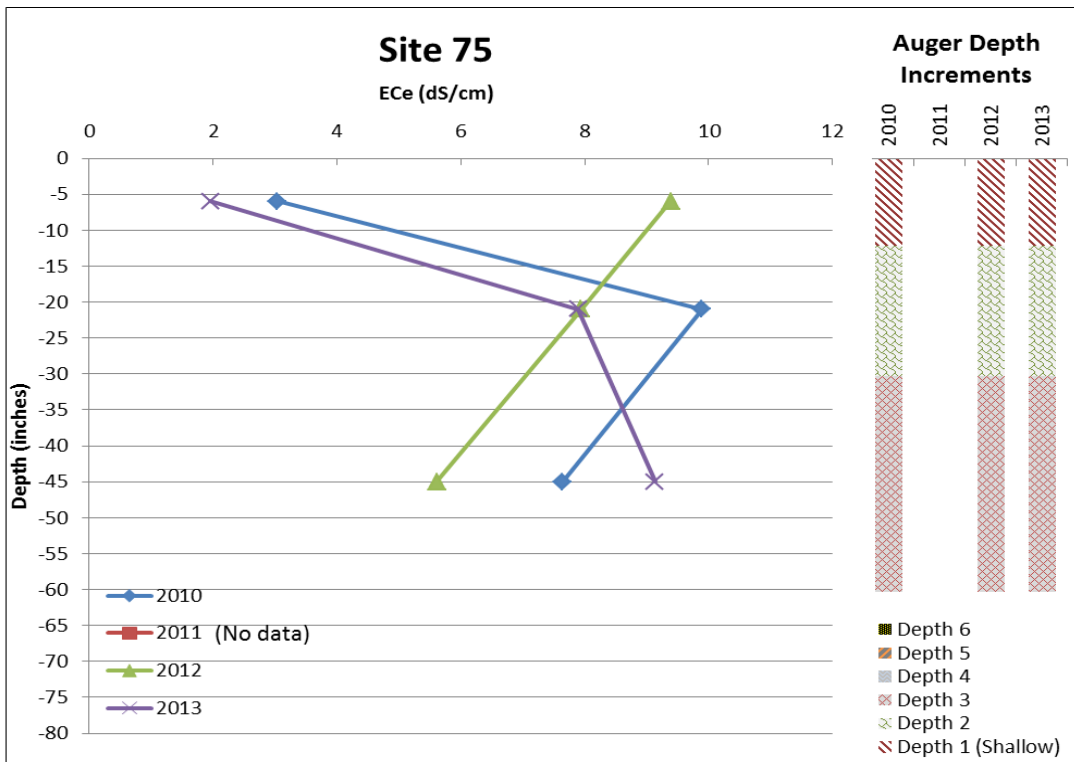
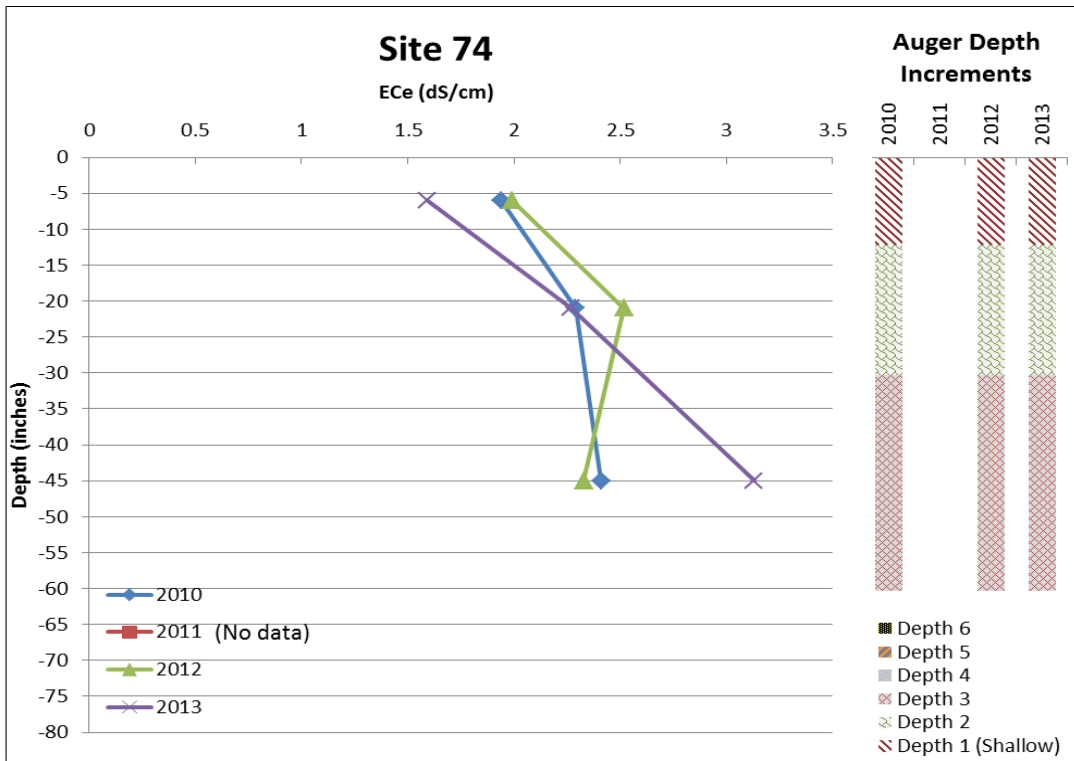


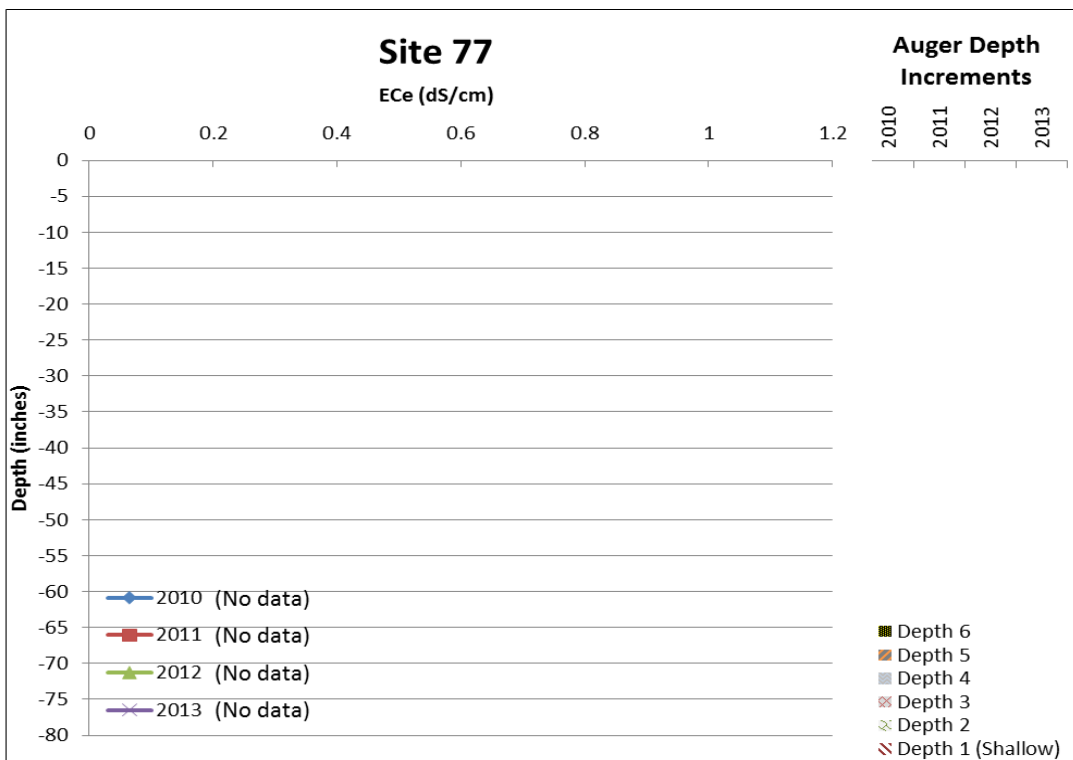
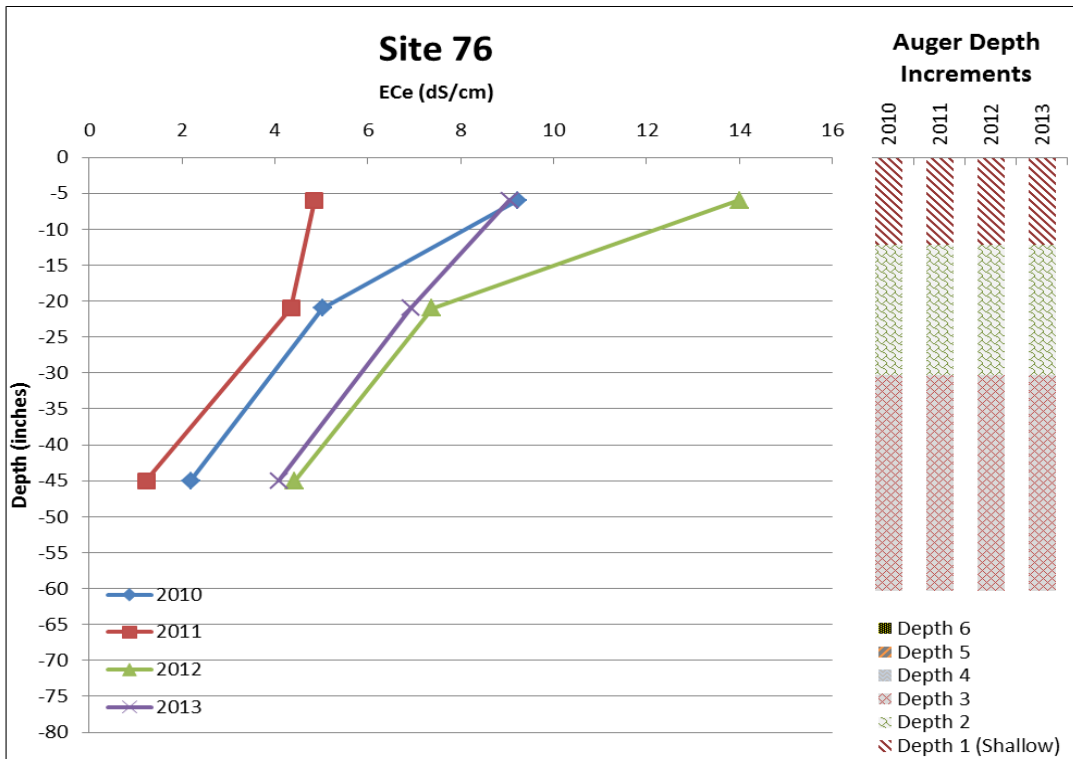


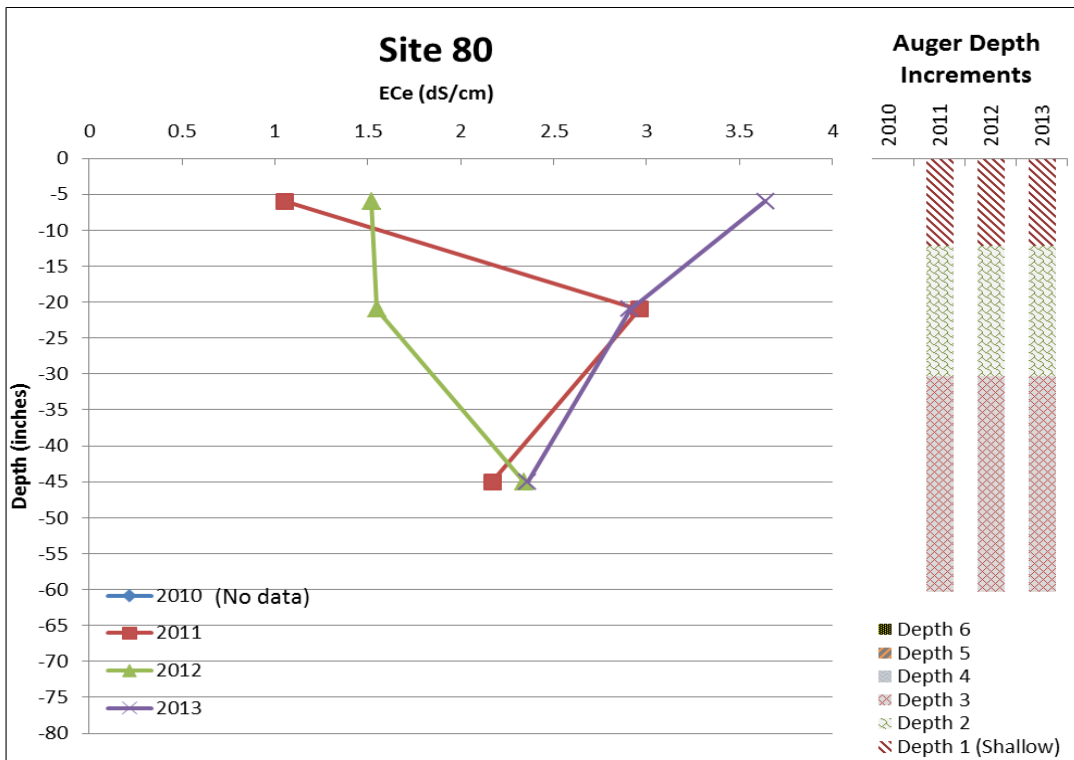
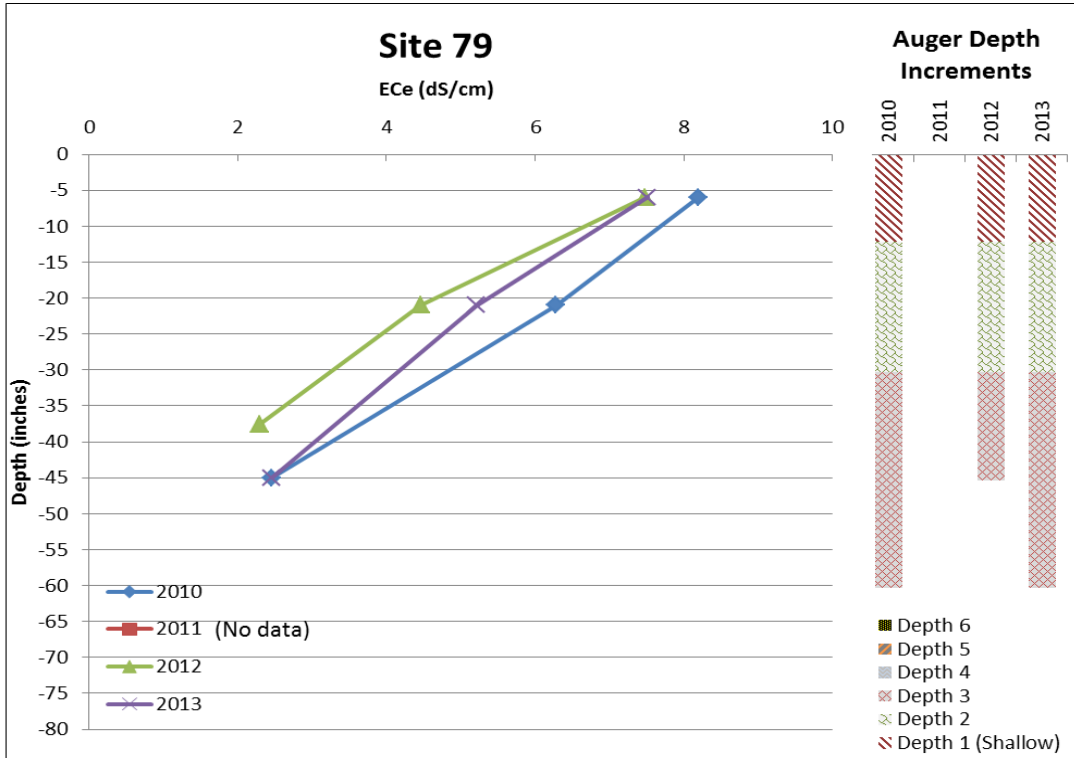


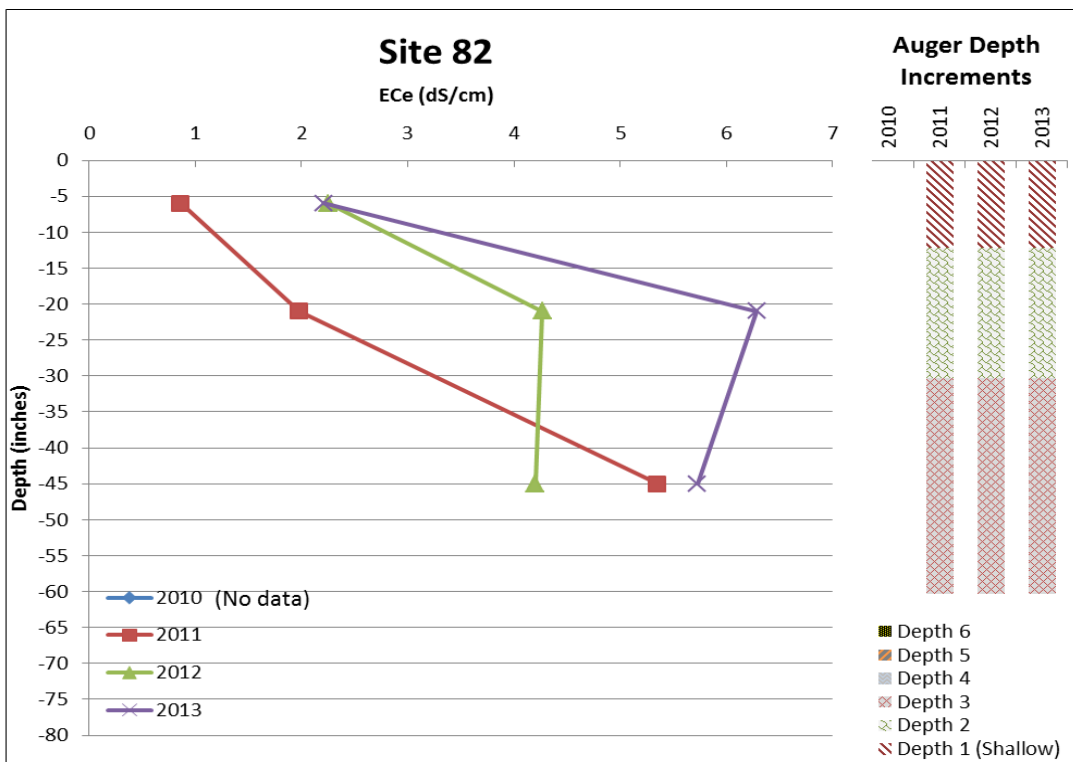
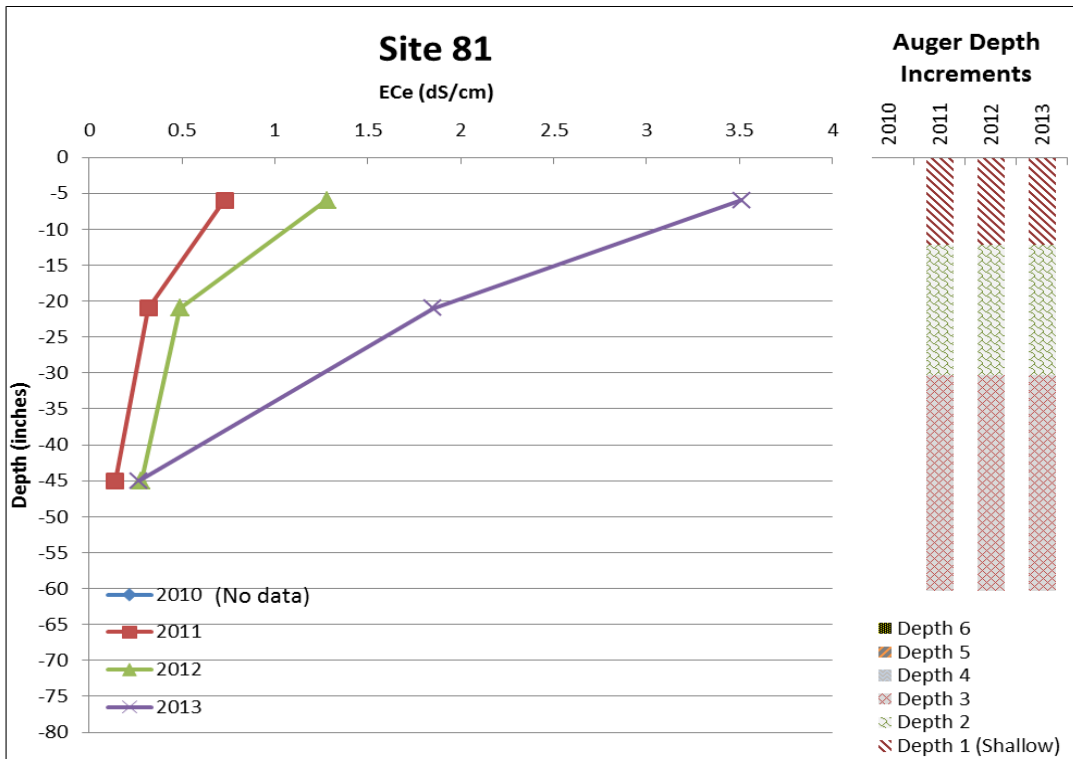


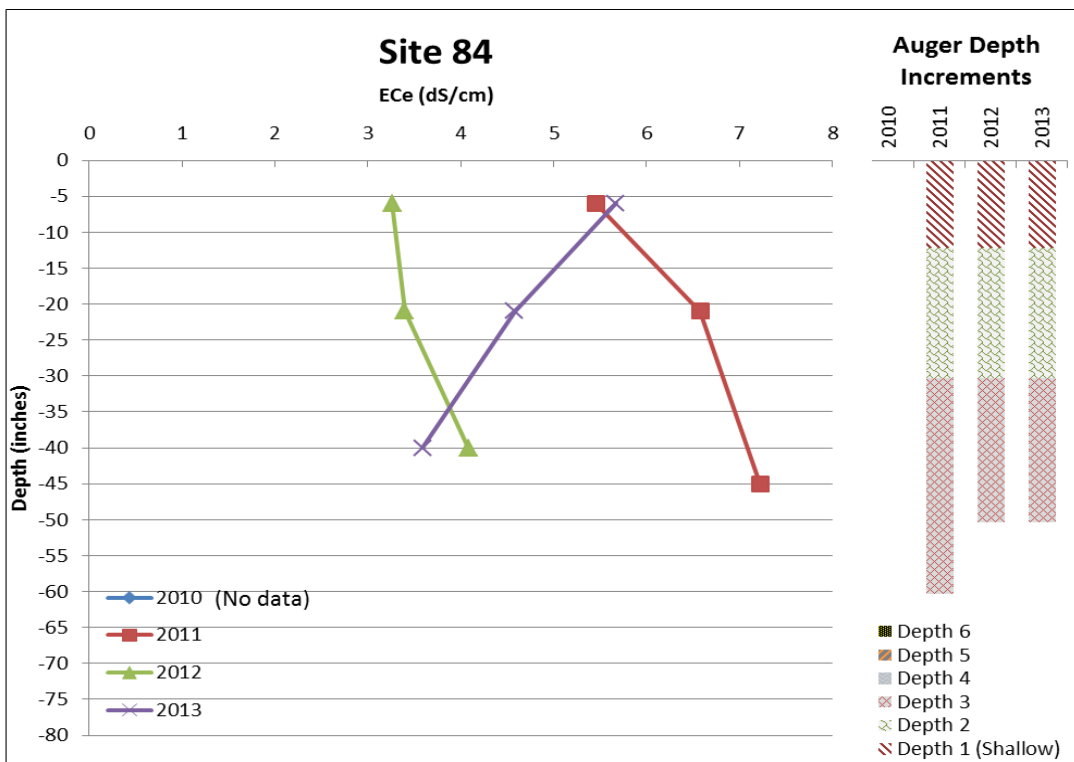
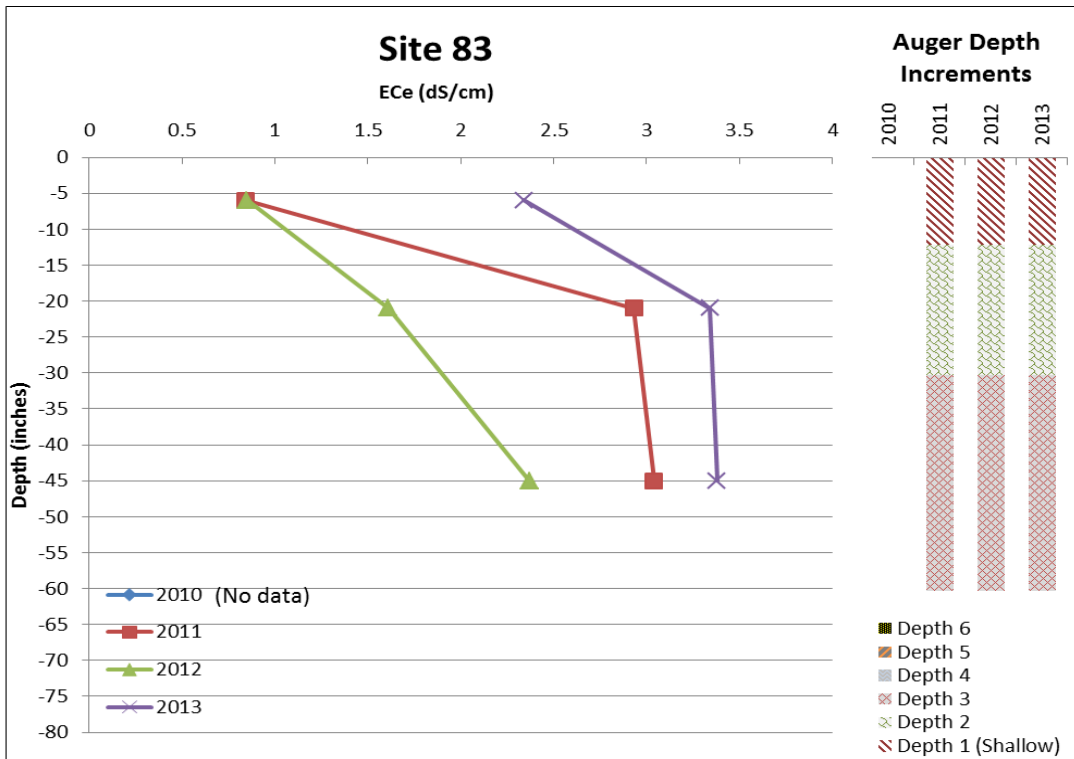


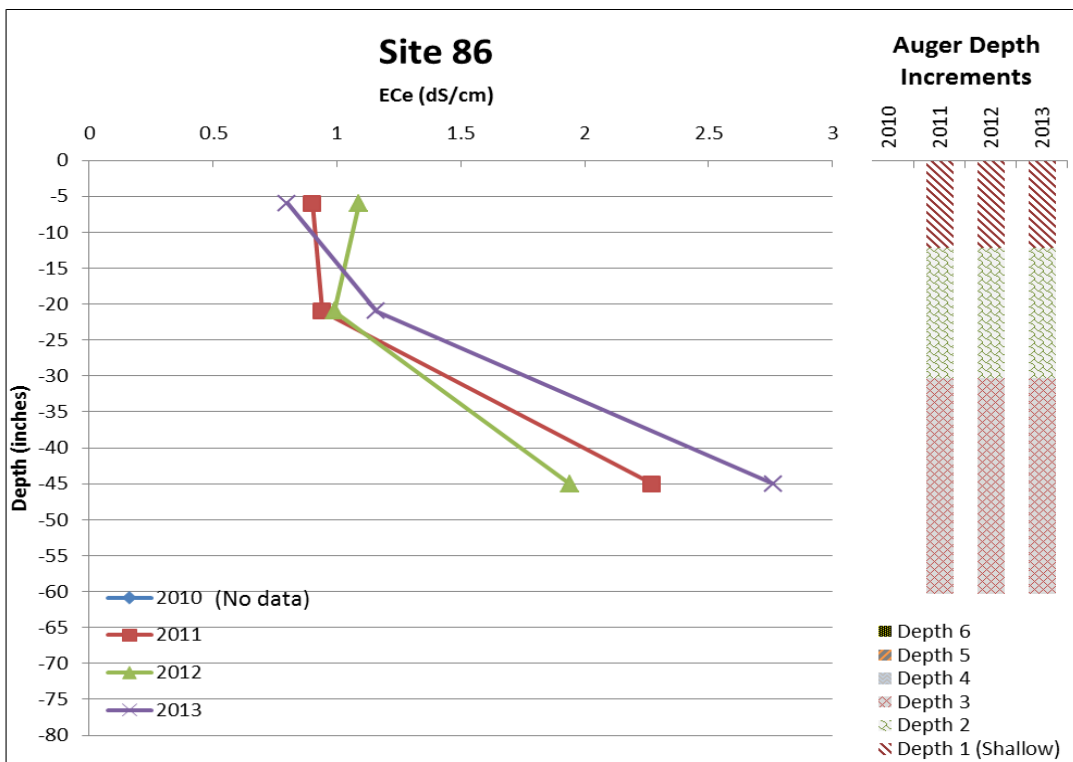
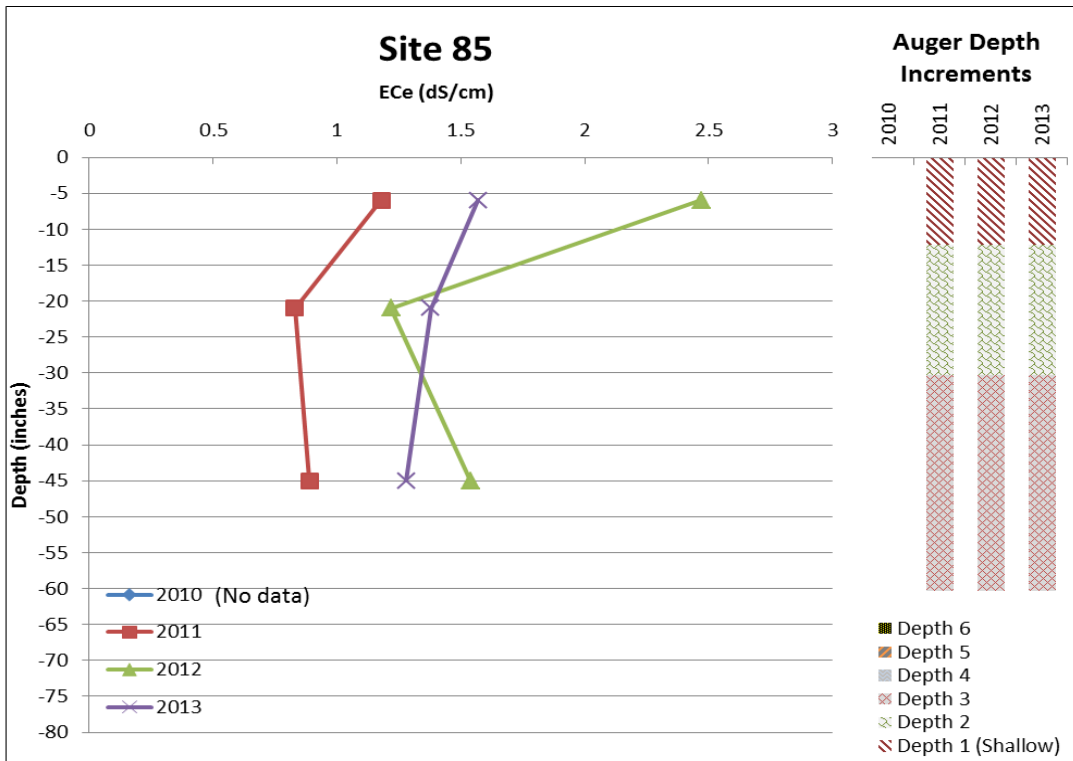


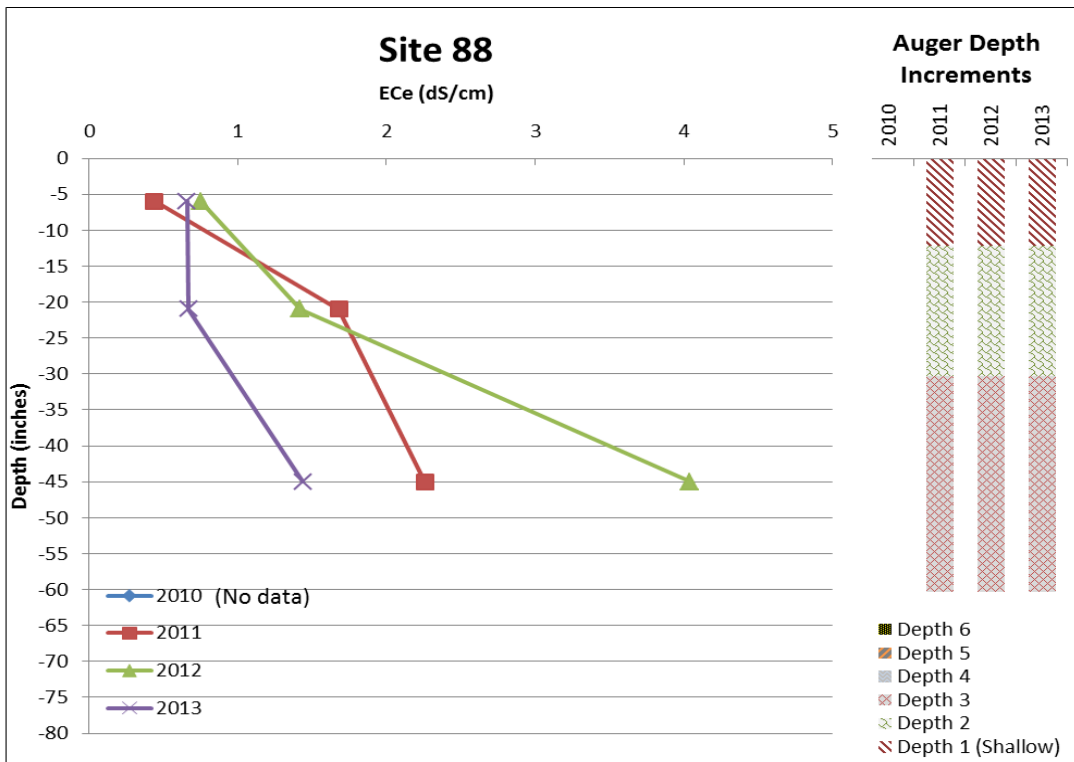
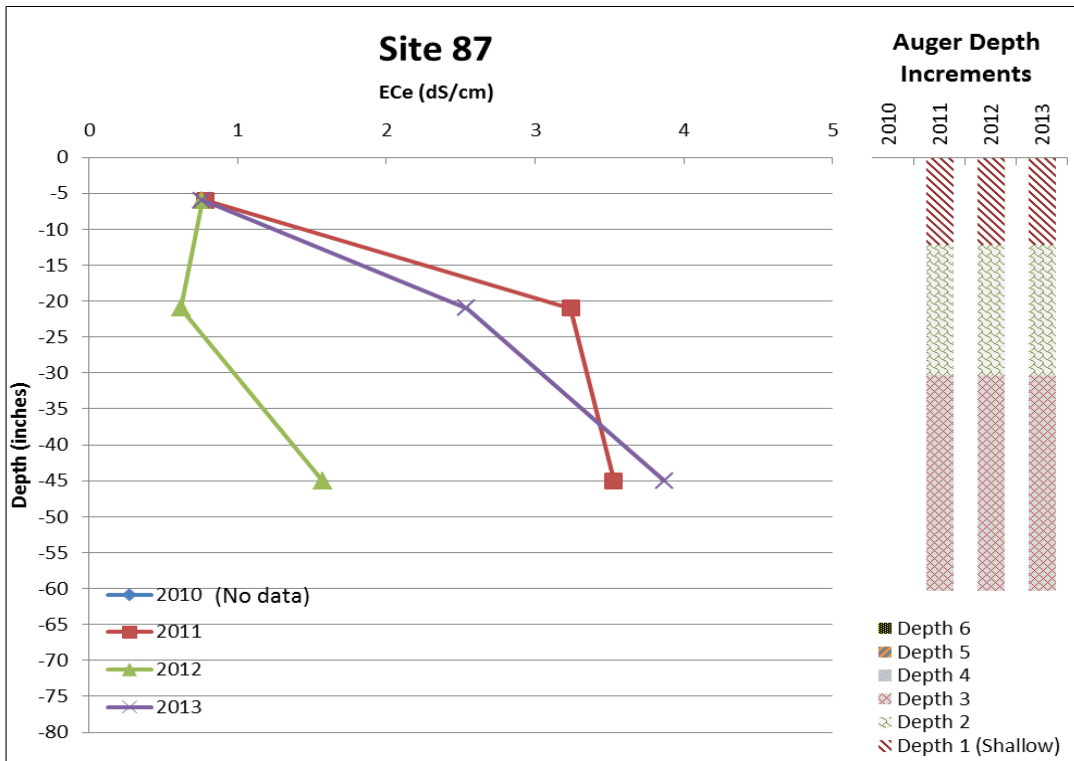


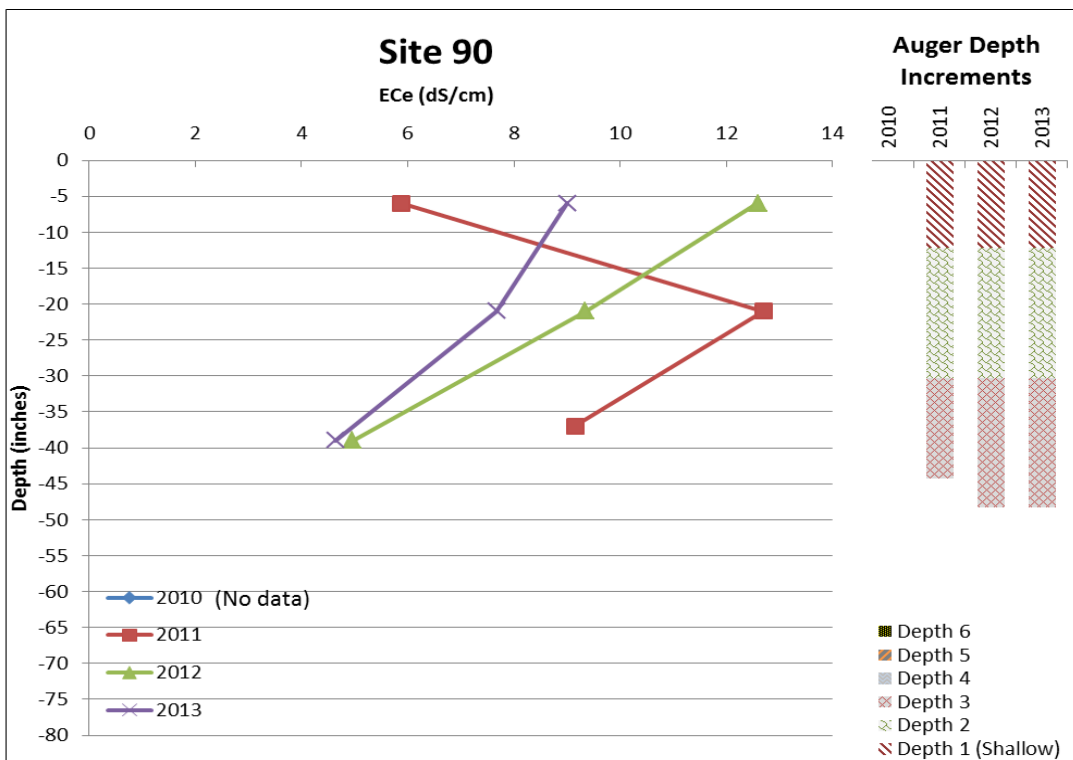
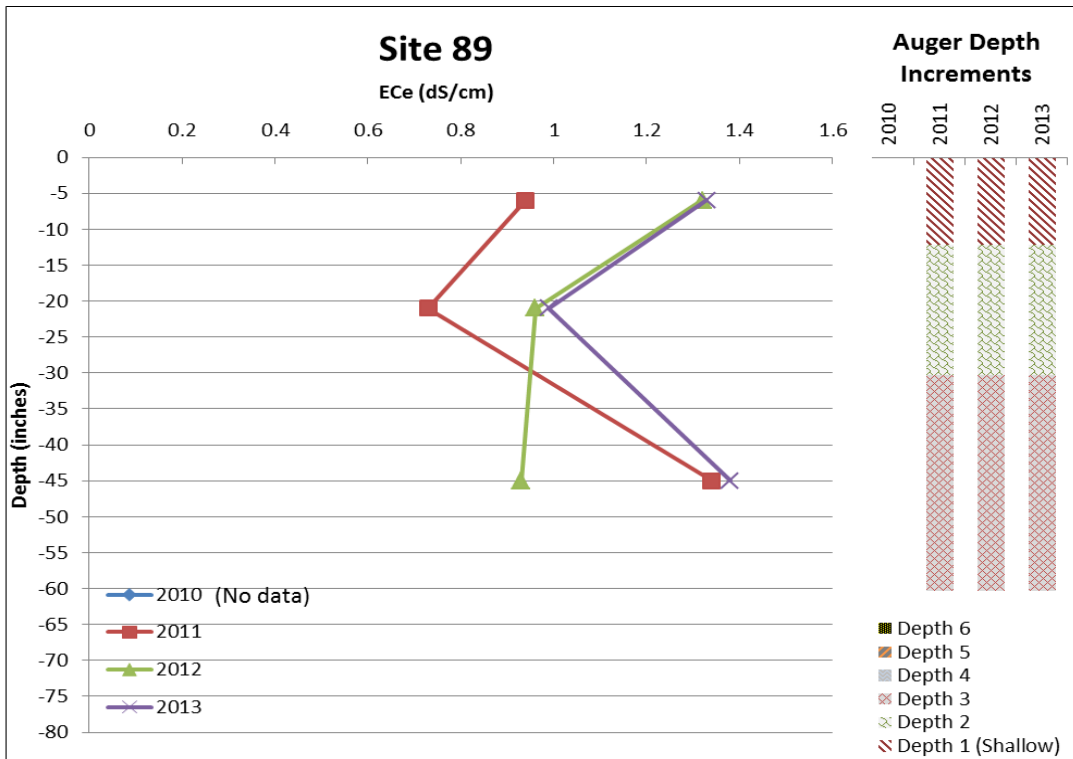


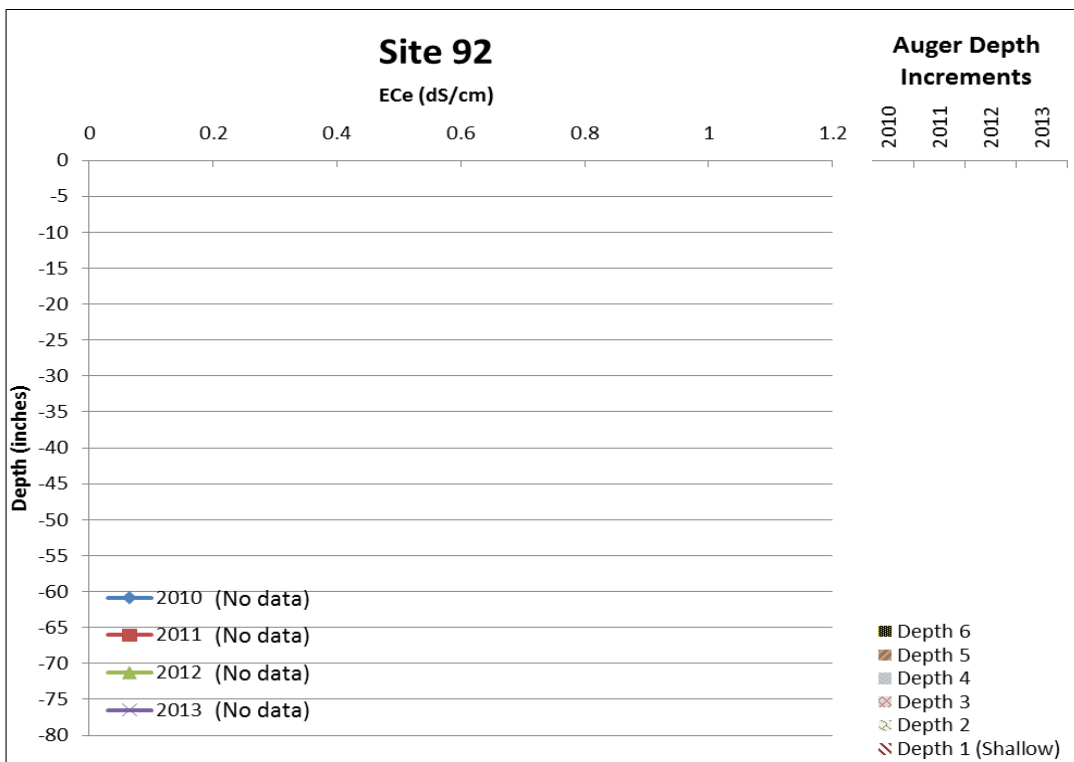
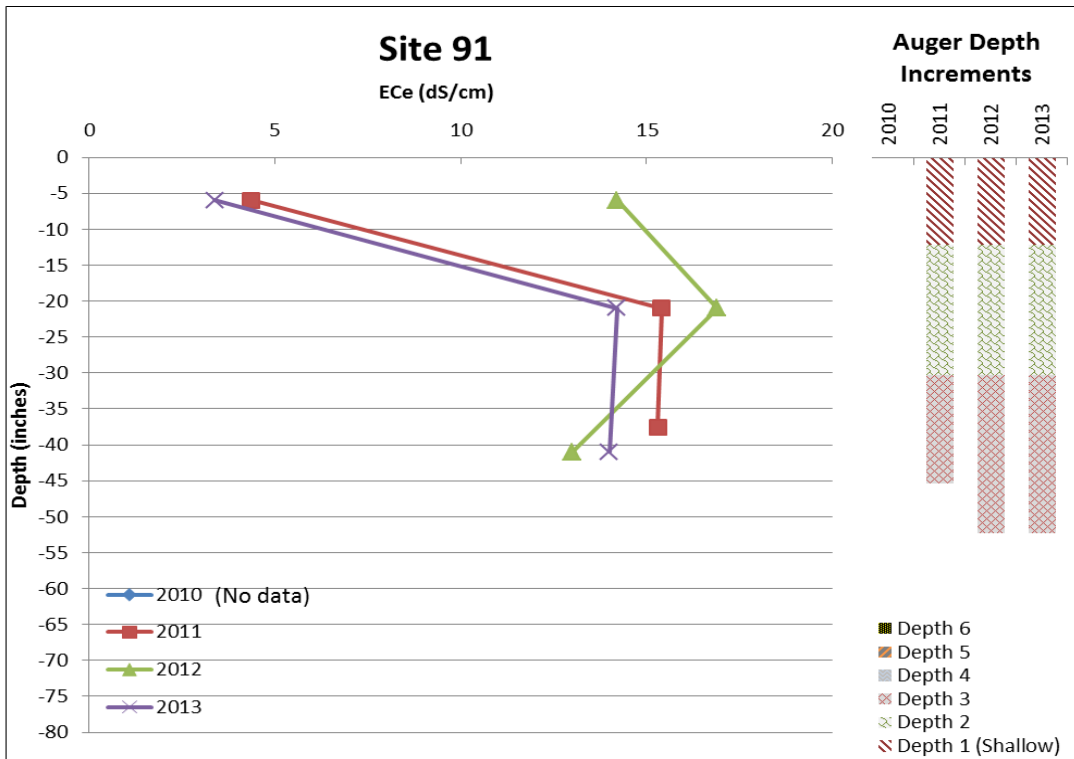


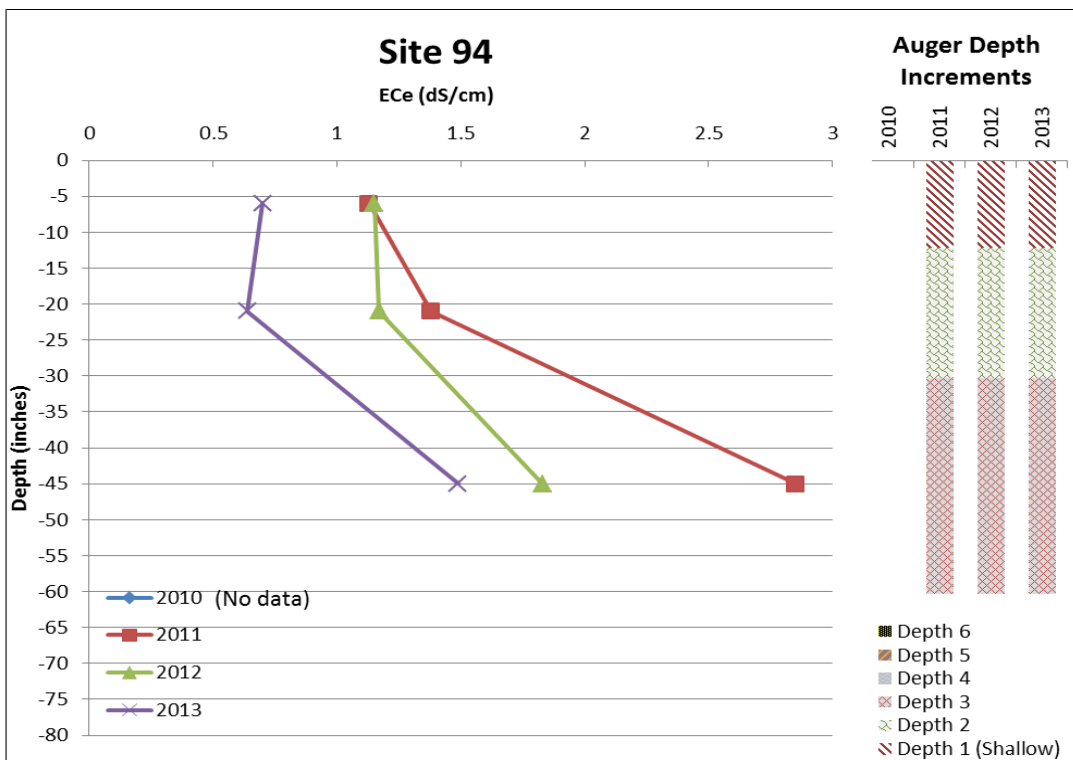


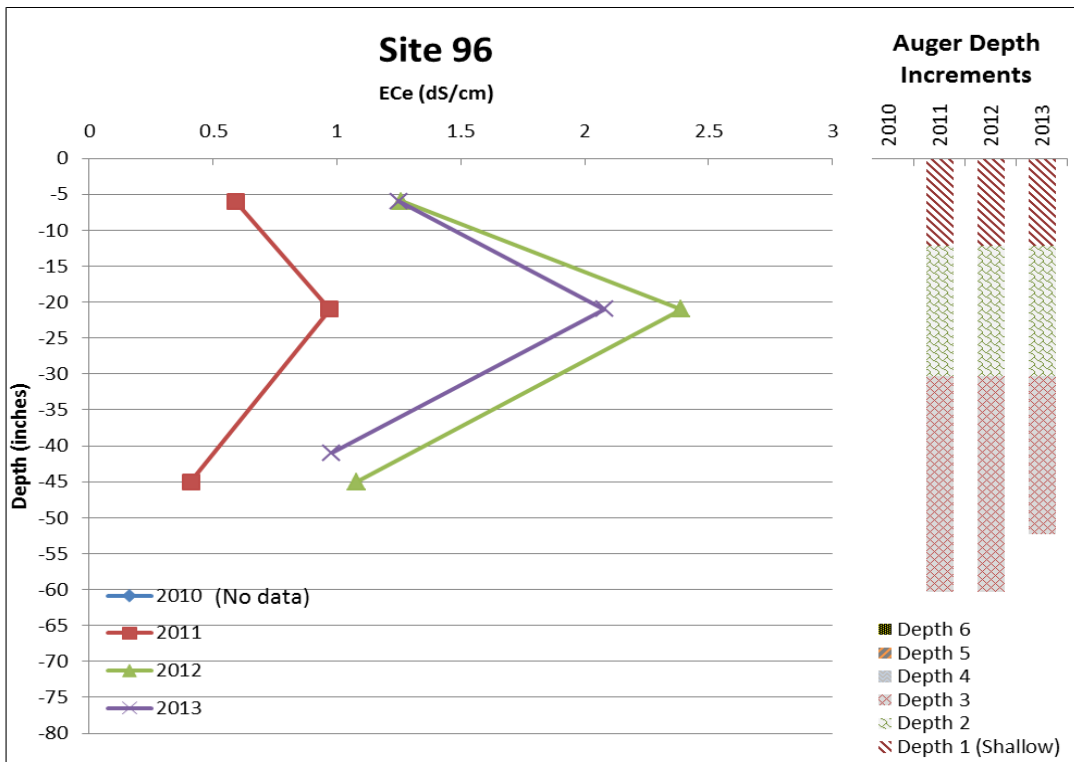
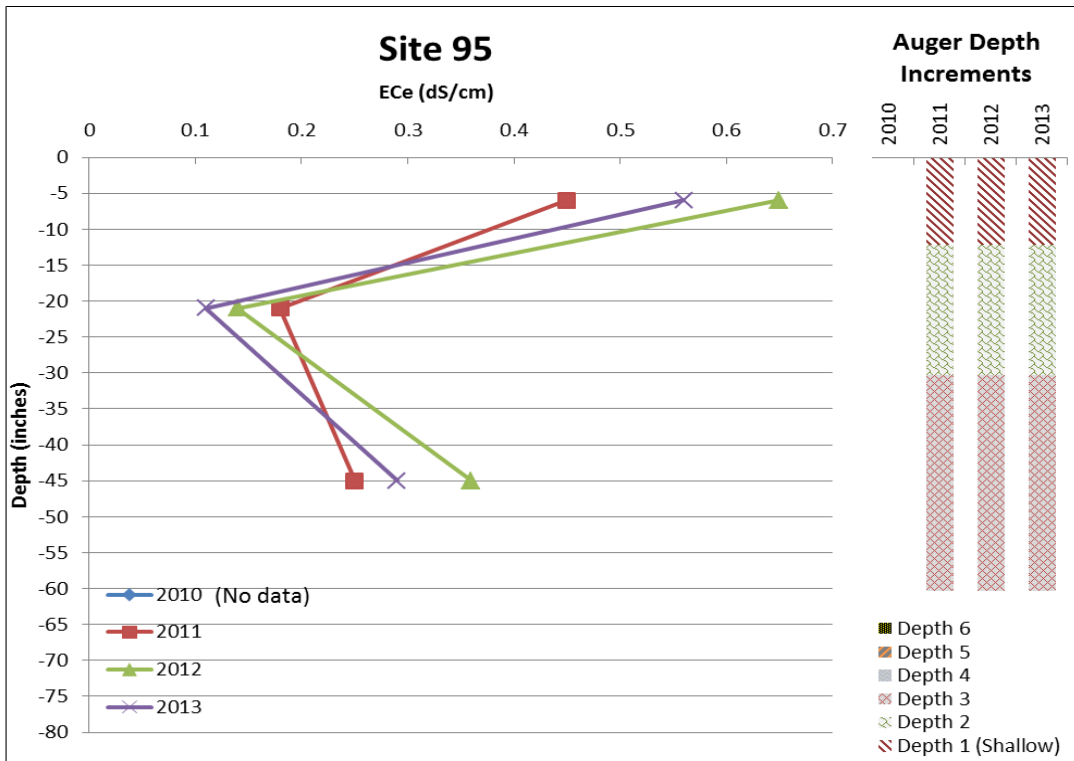




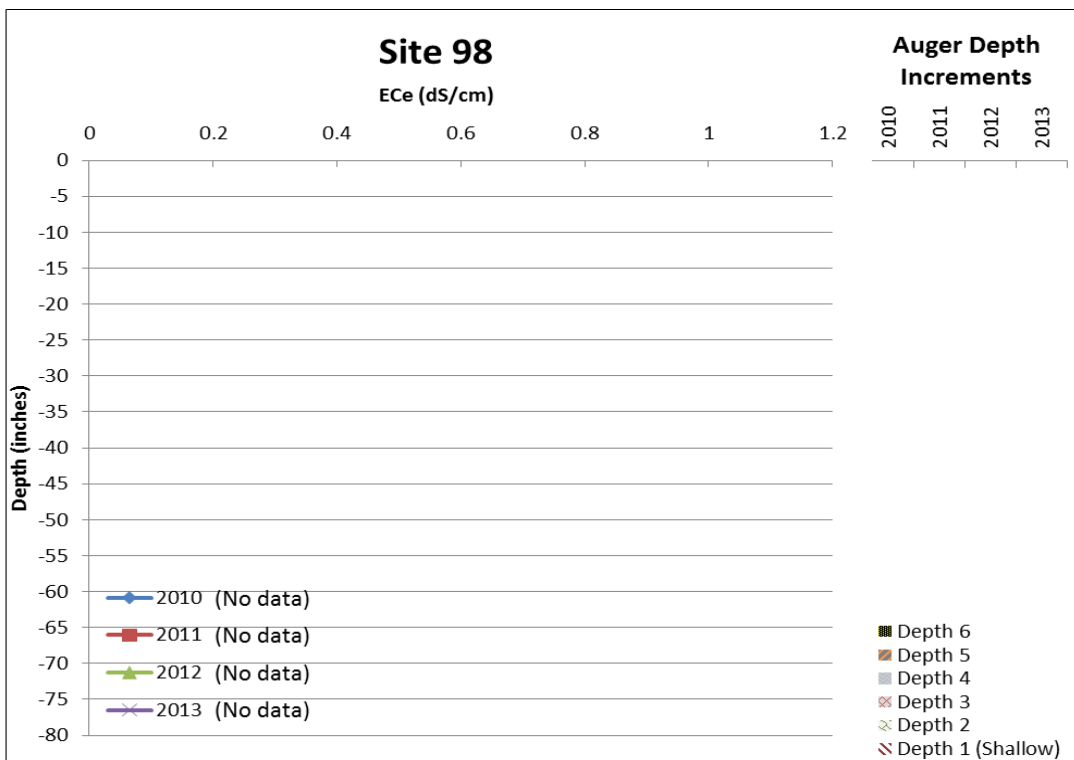
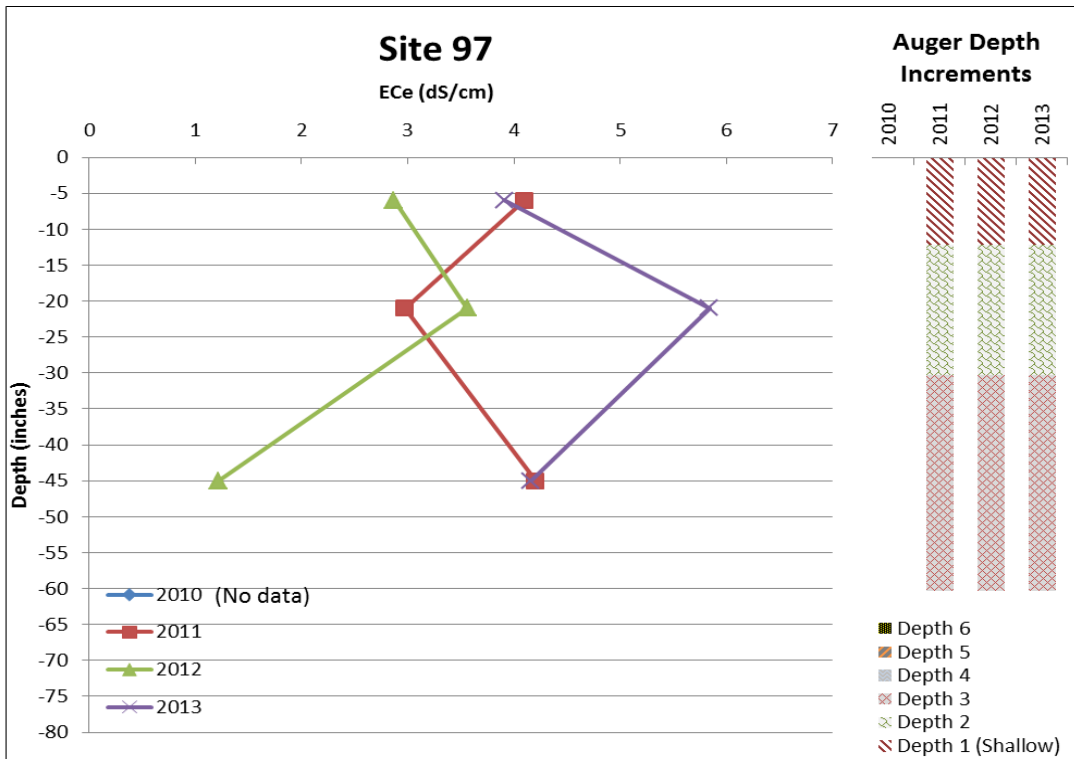


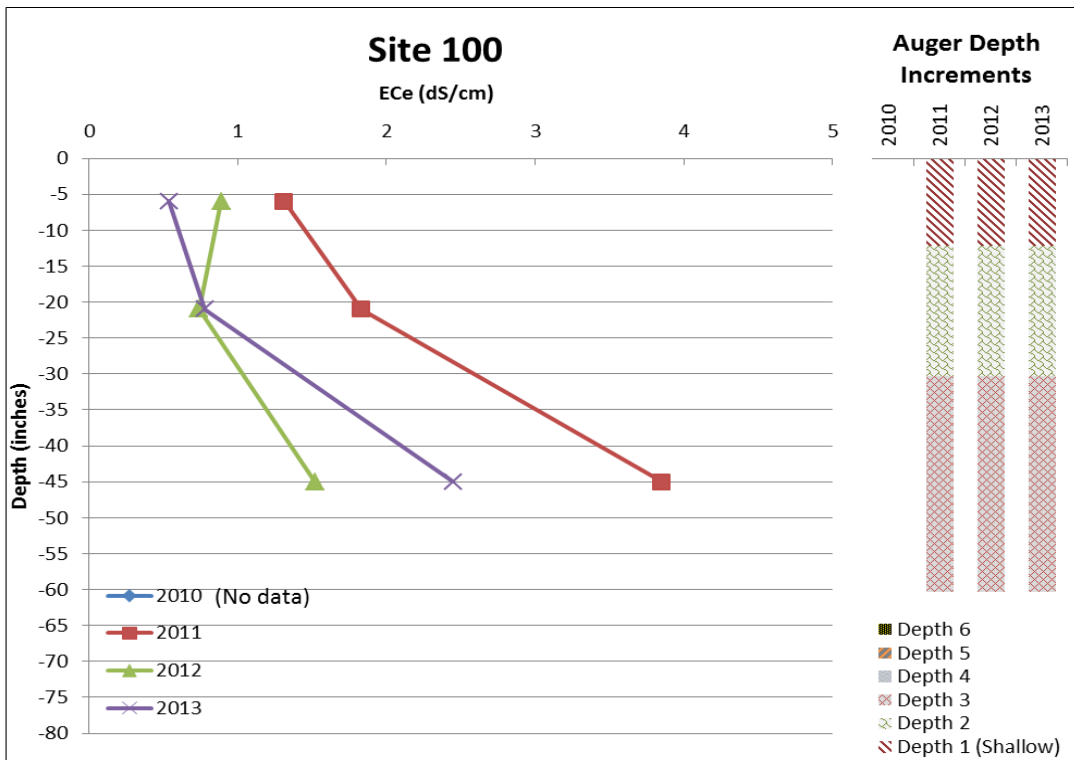
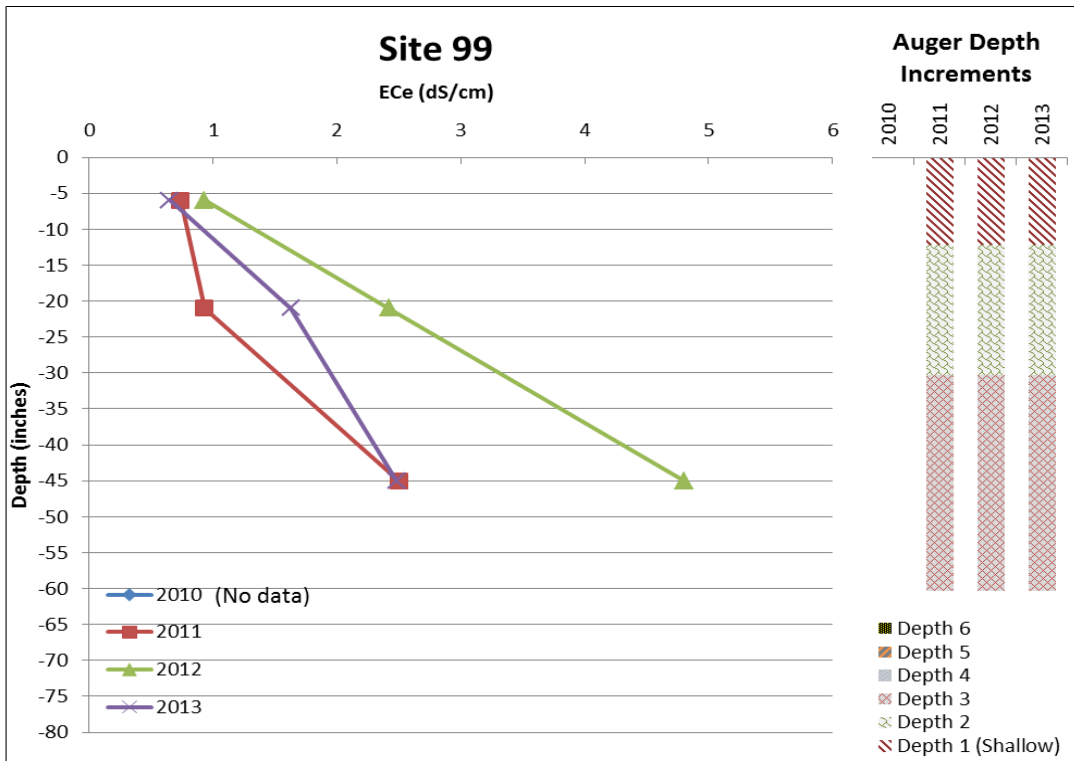


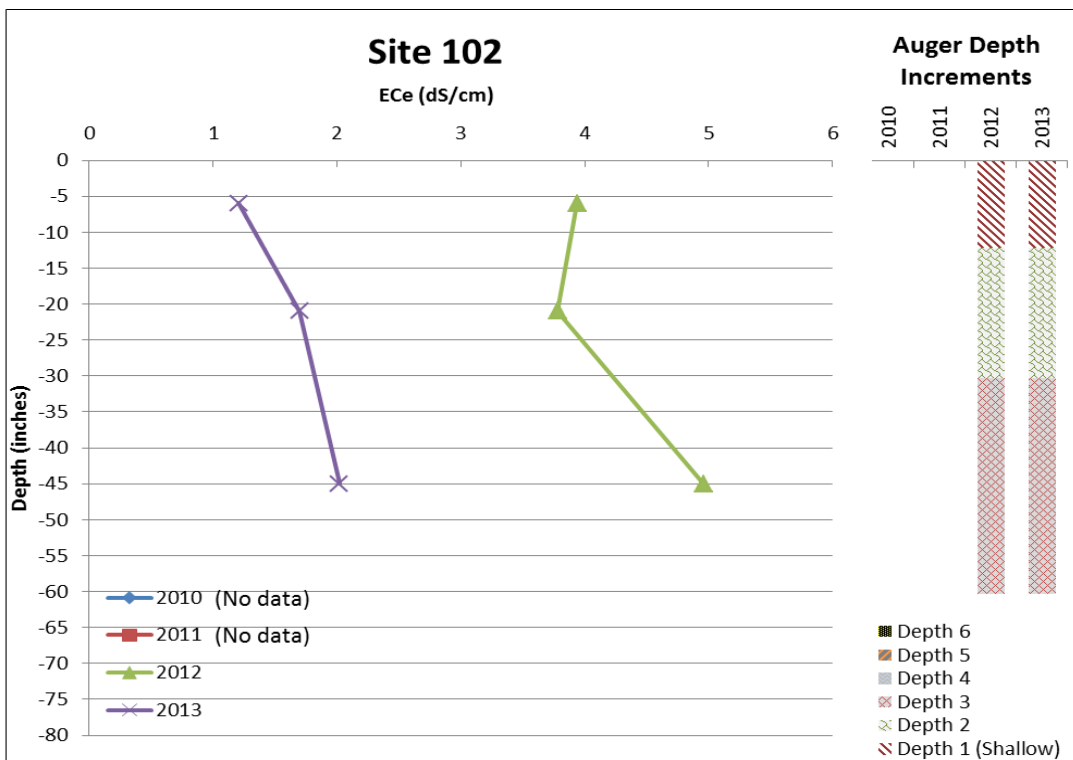


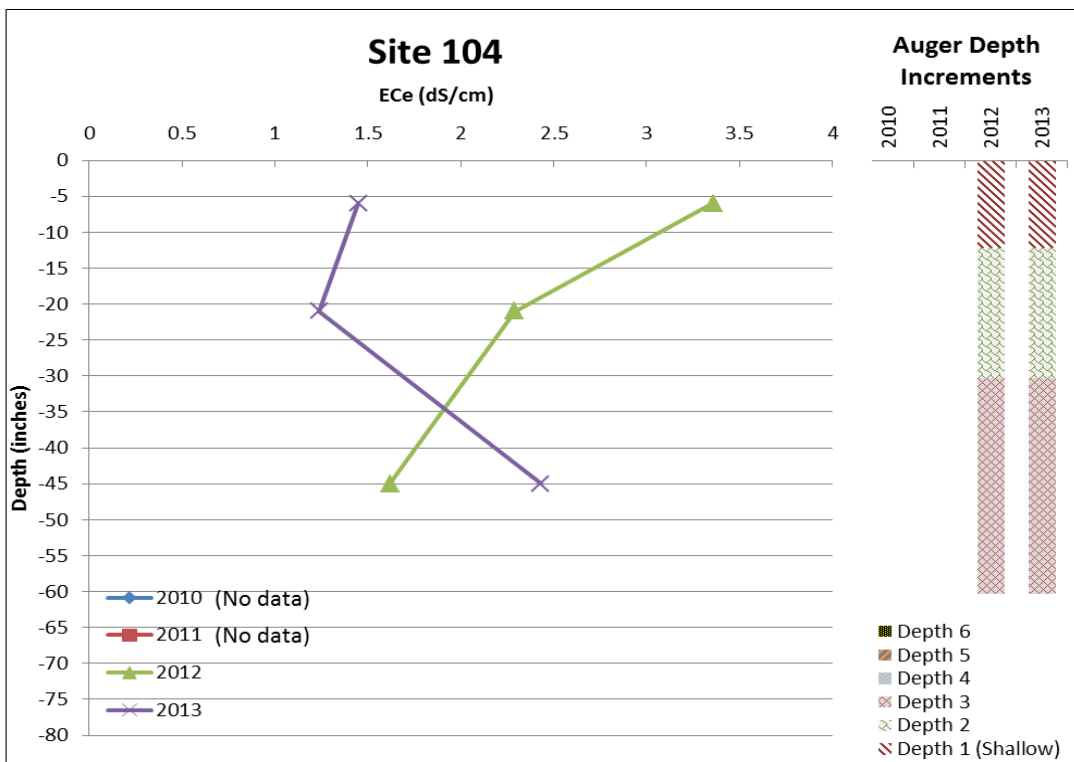
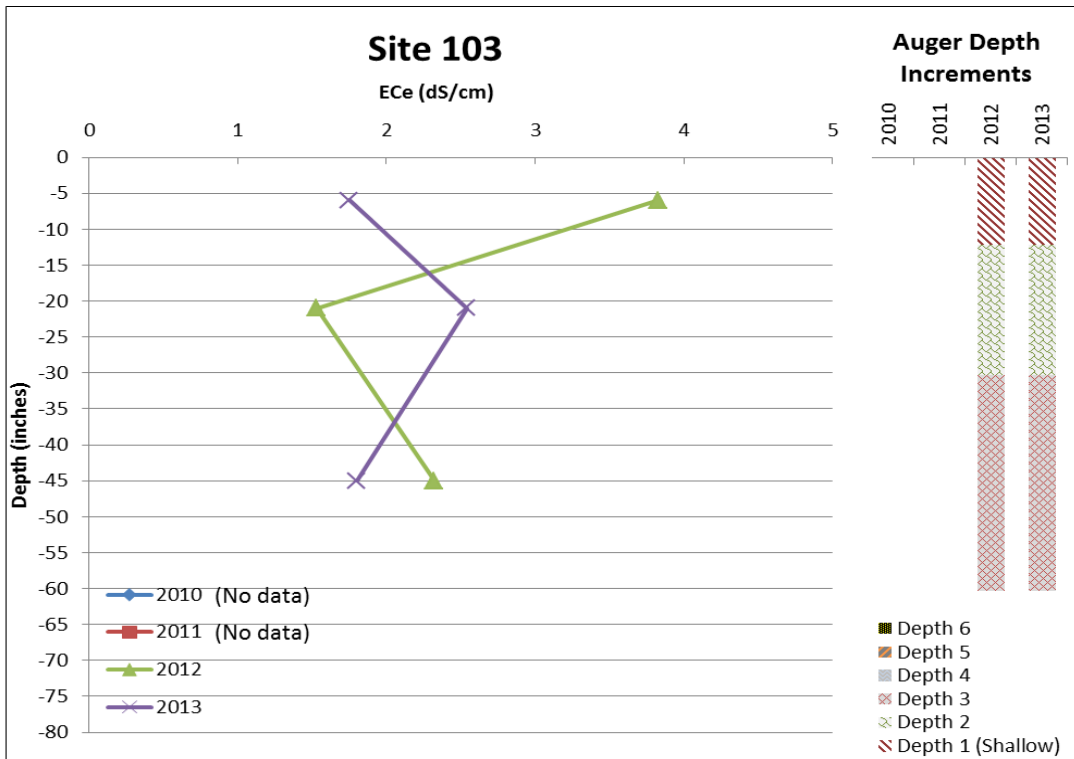


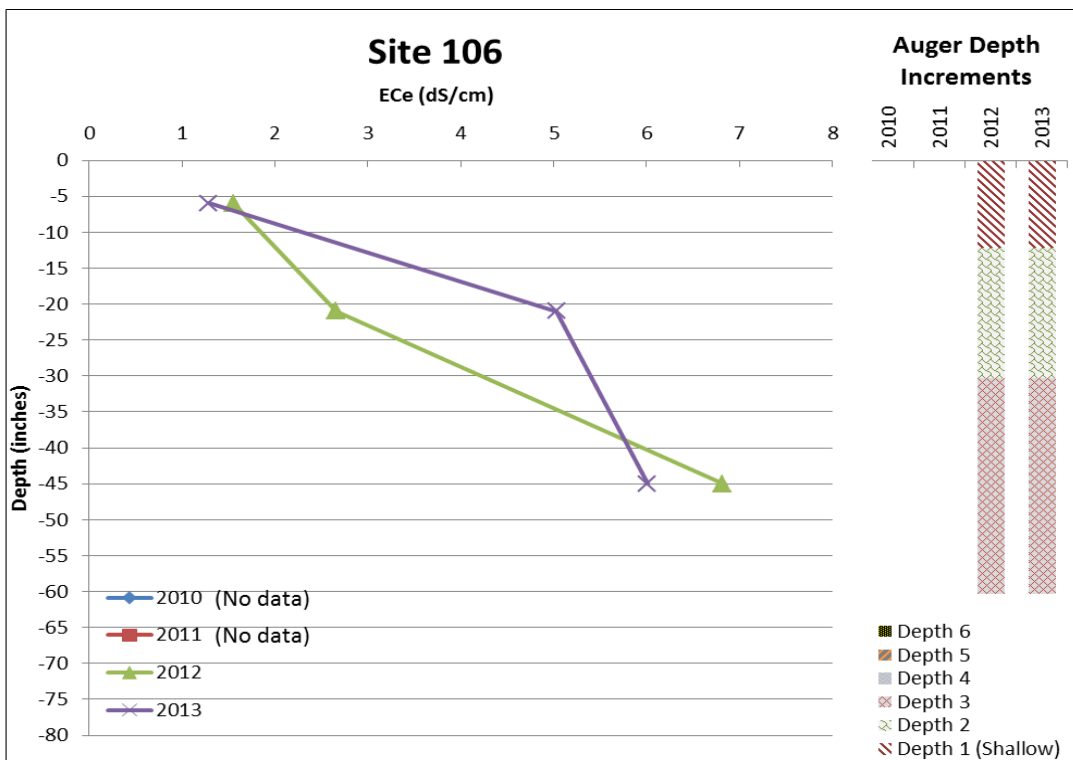
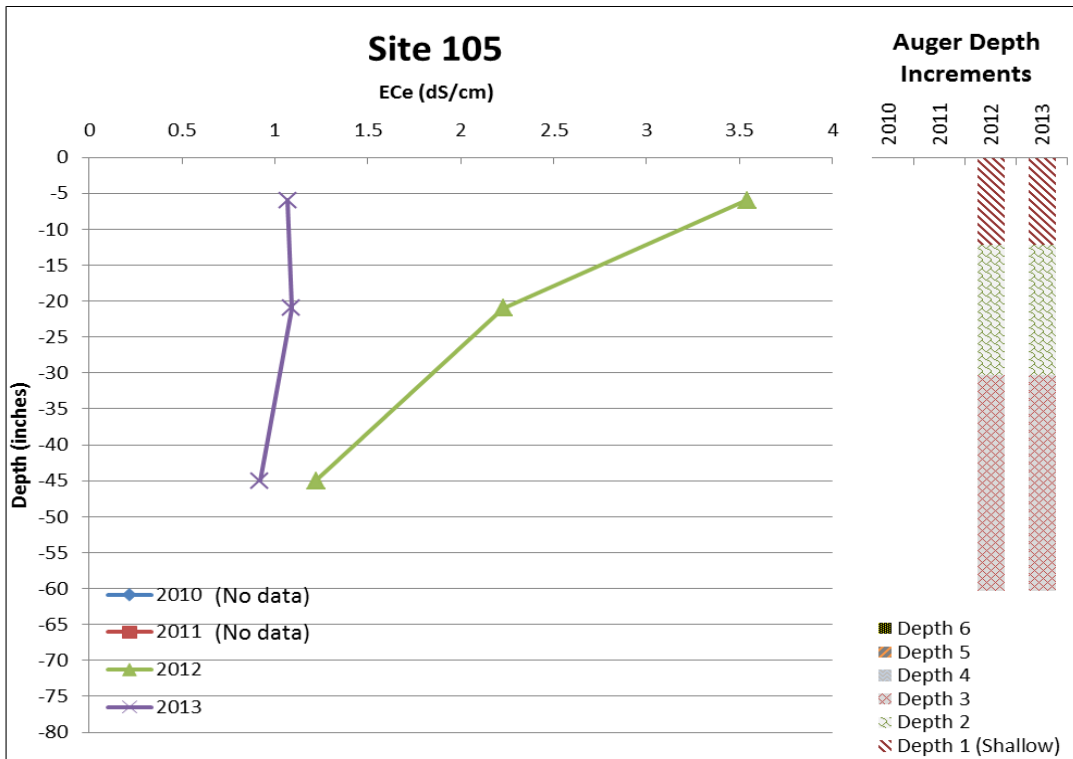
Appendix F - Comparison of Electrical Conductivity of Soil Extract Data from 2010-2013

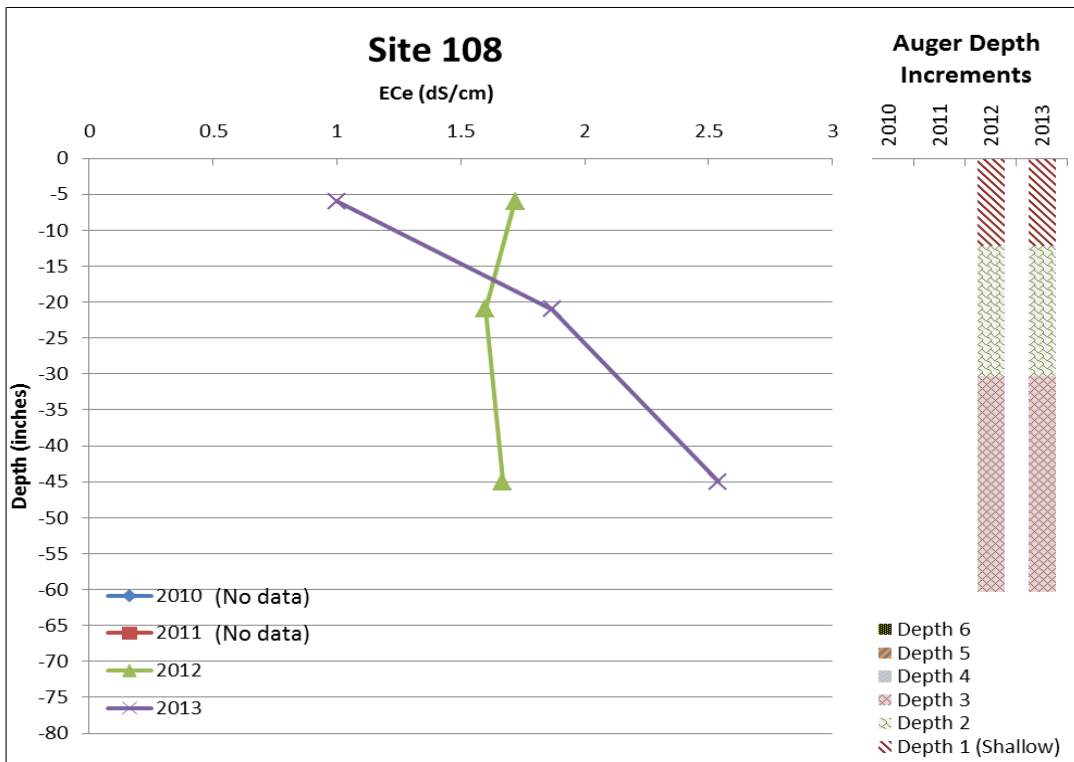
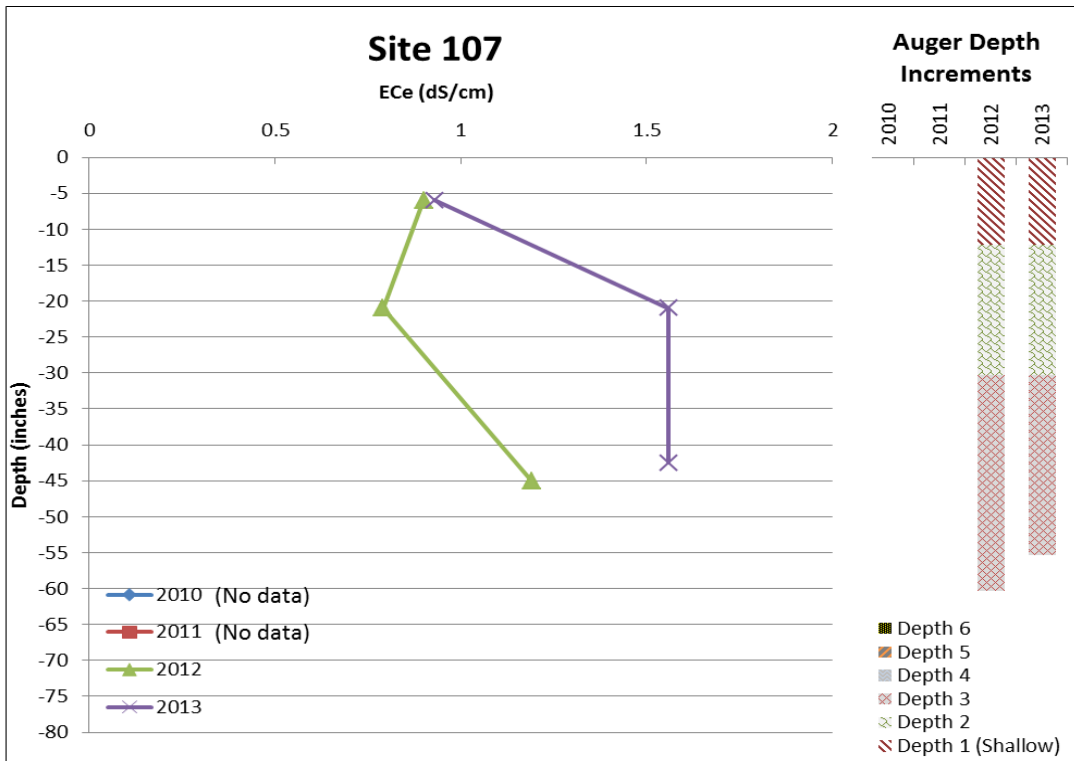




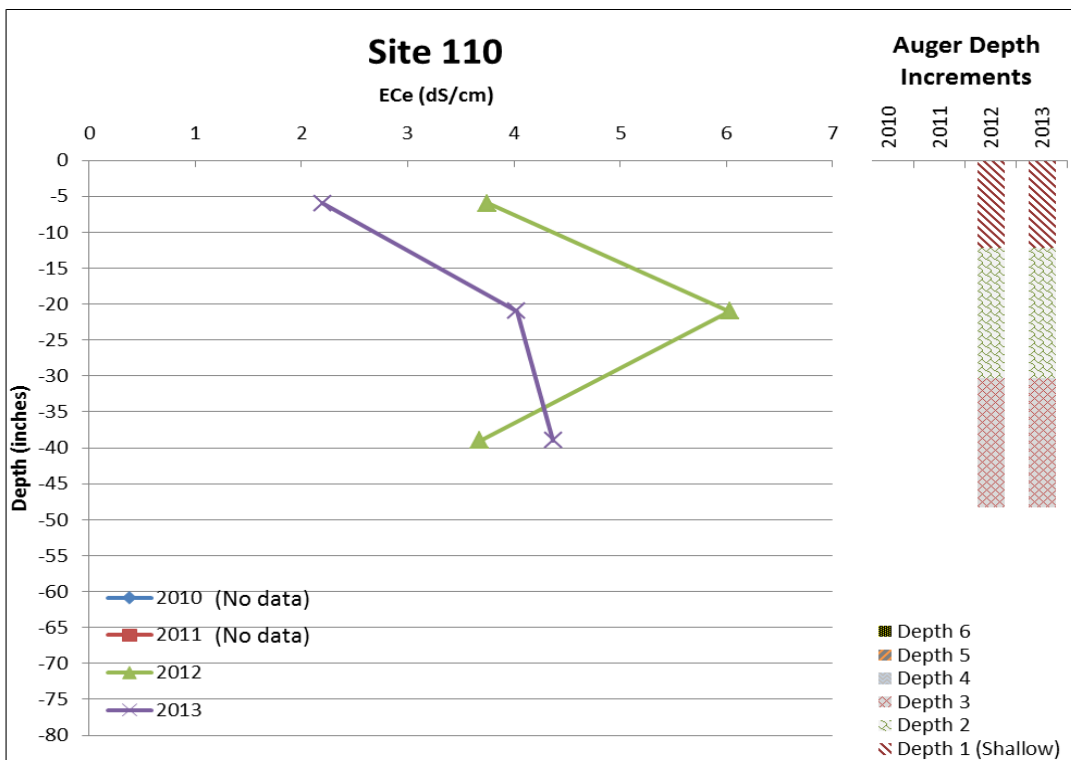
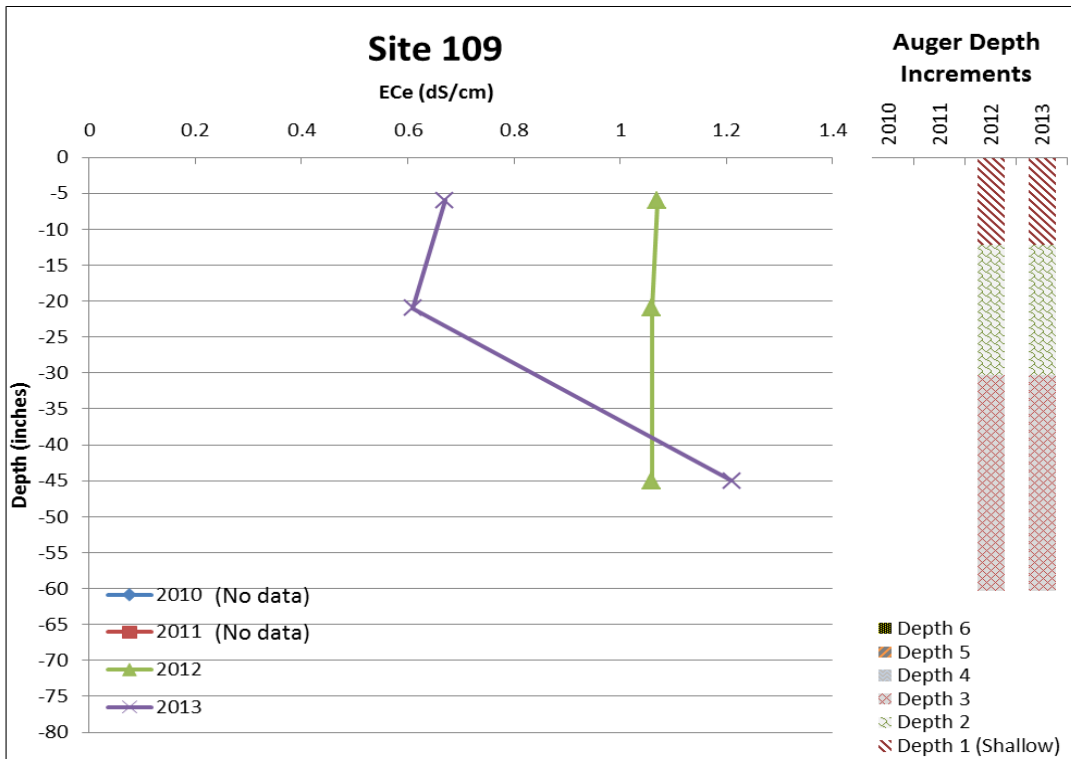


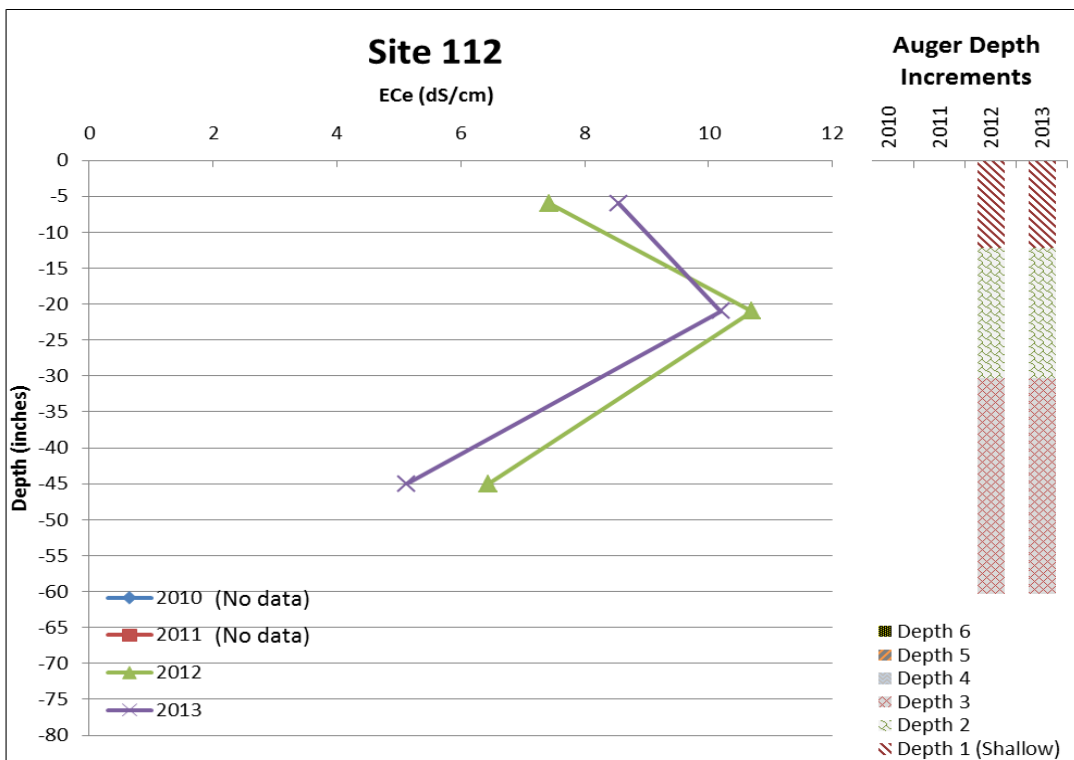
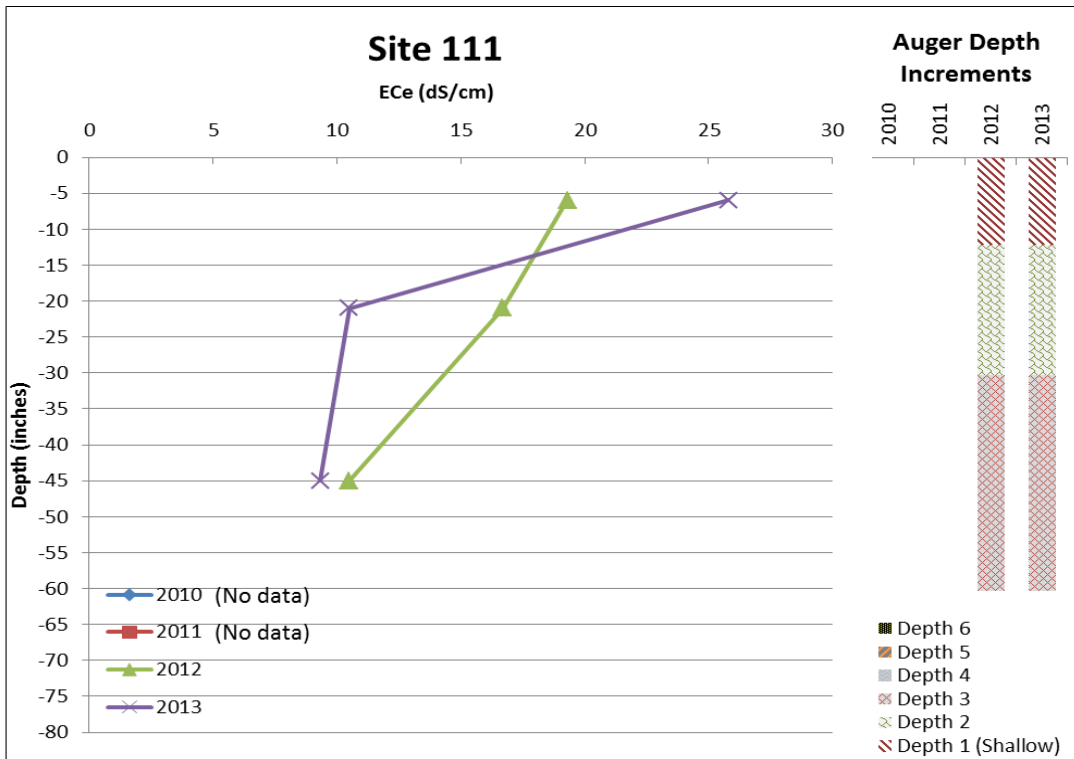




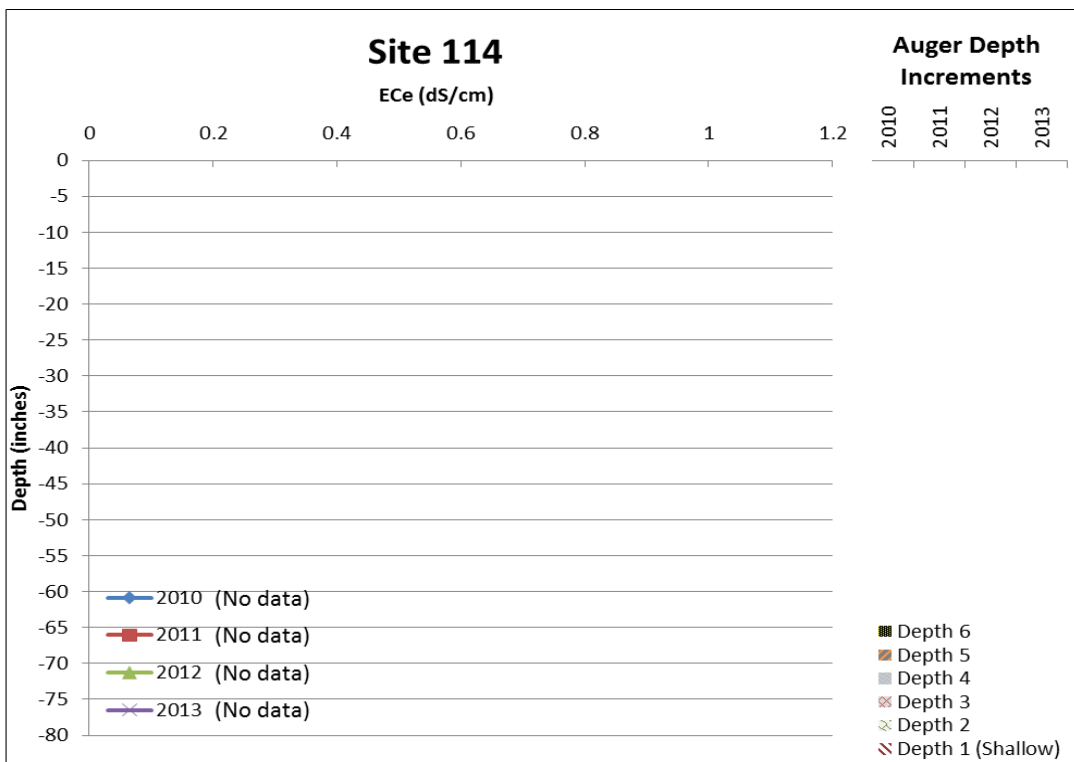
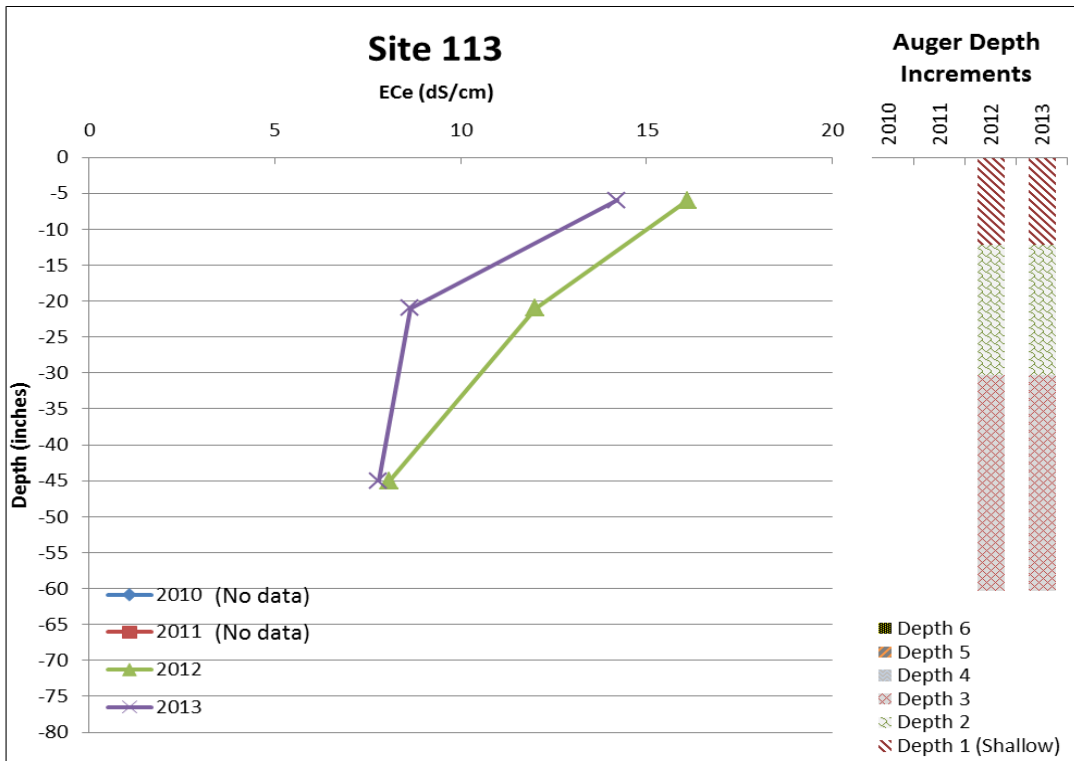


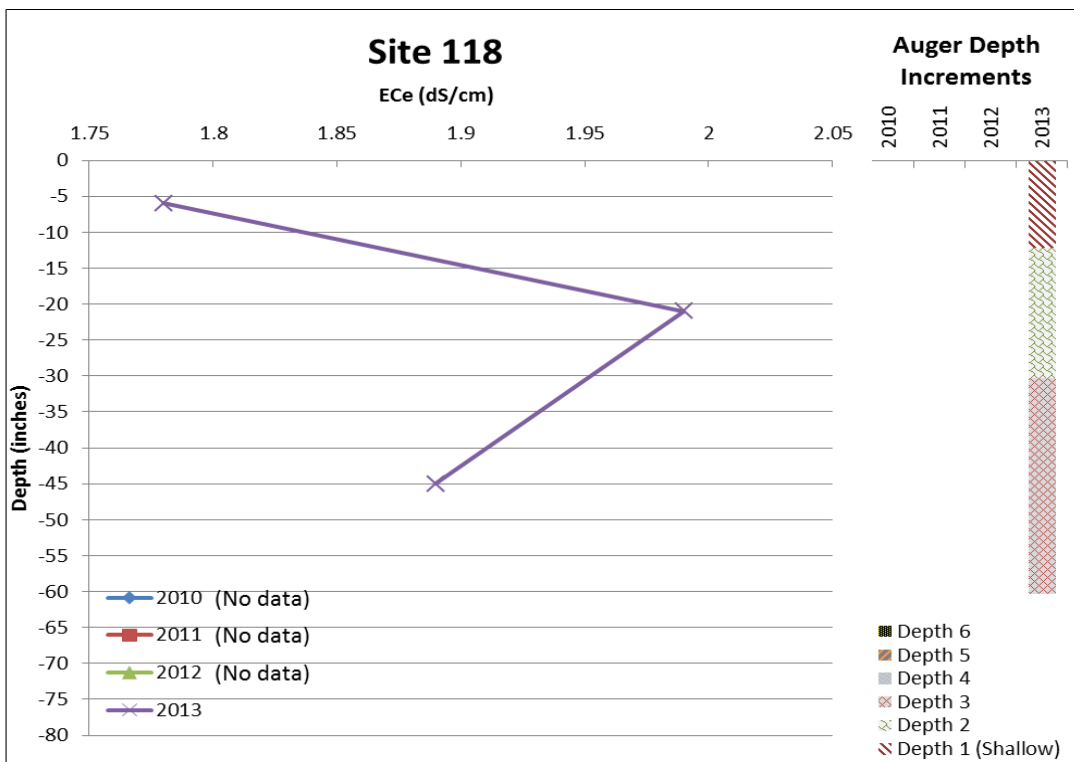
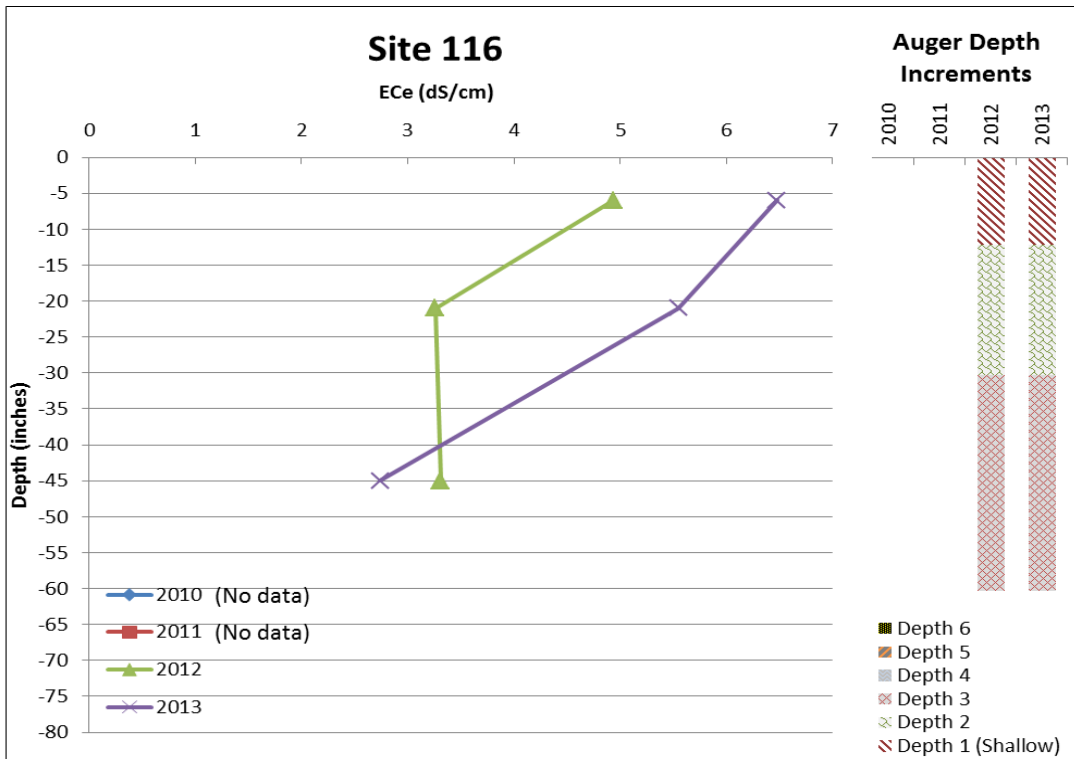
Appendix F - Comparison of Electrical Conductivity of Soil Extract Data from 2010-2013

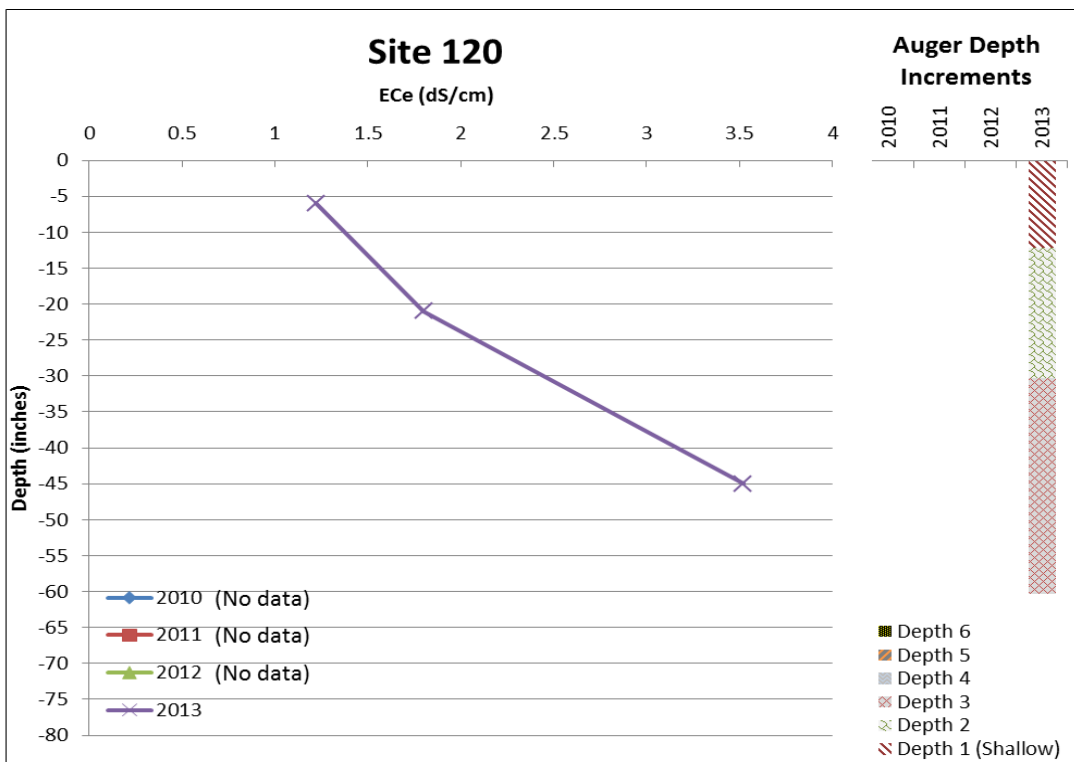
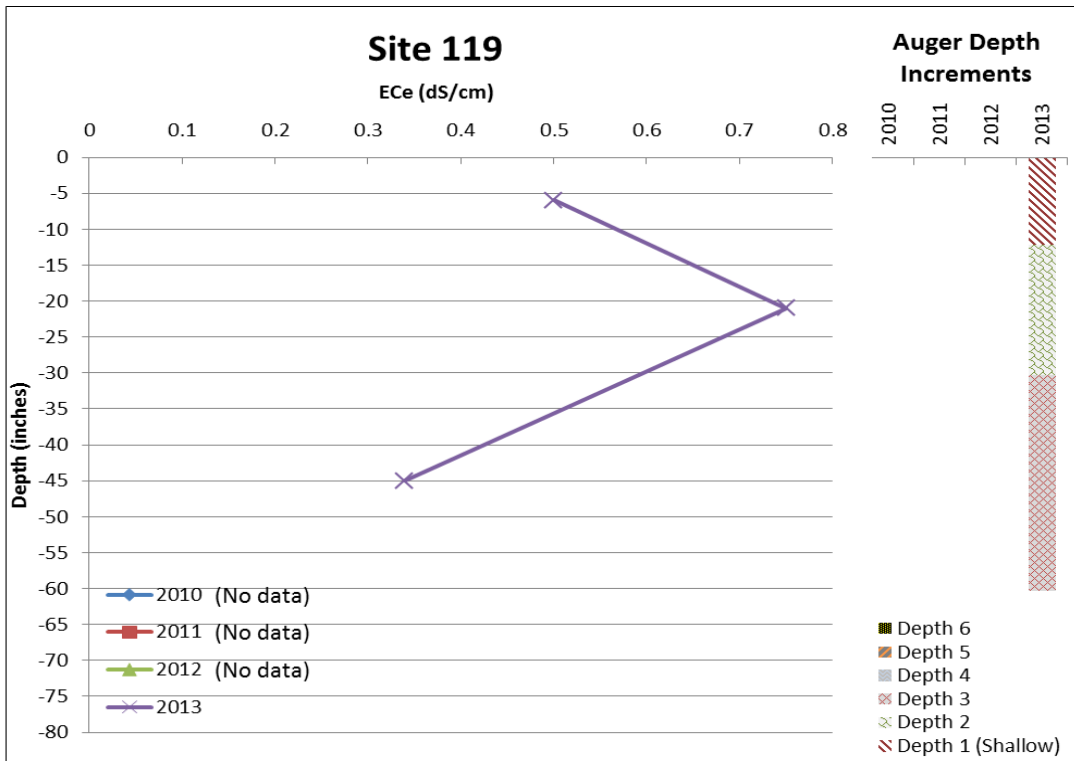


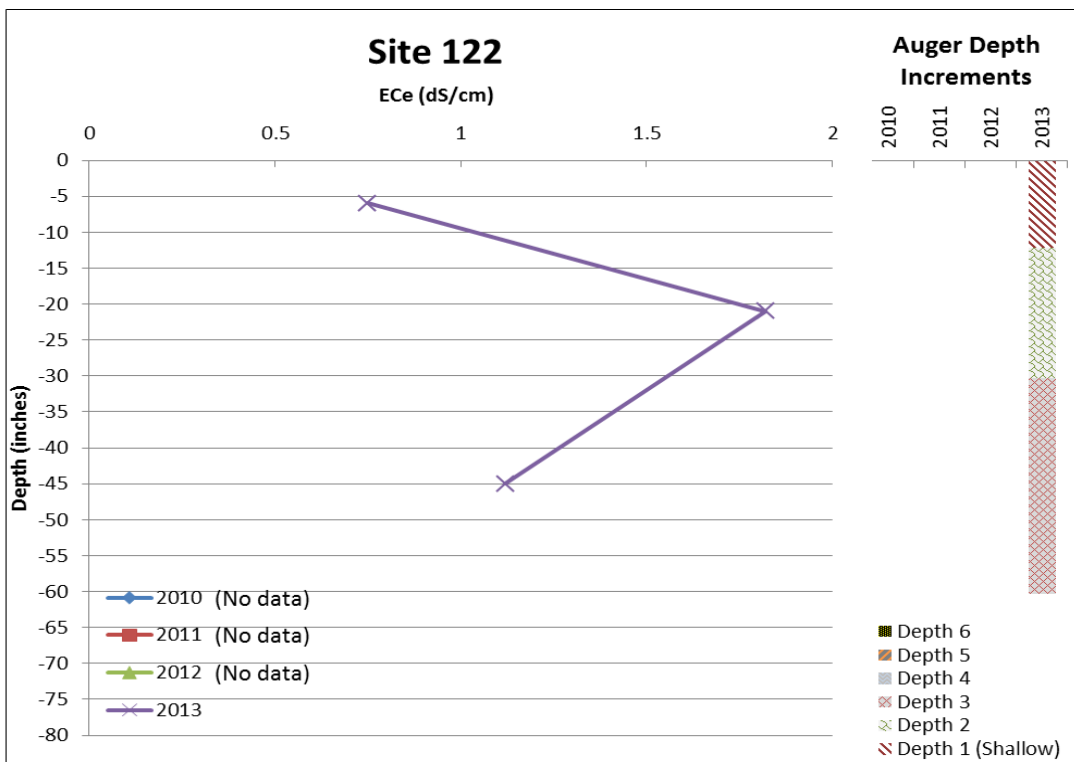
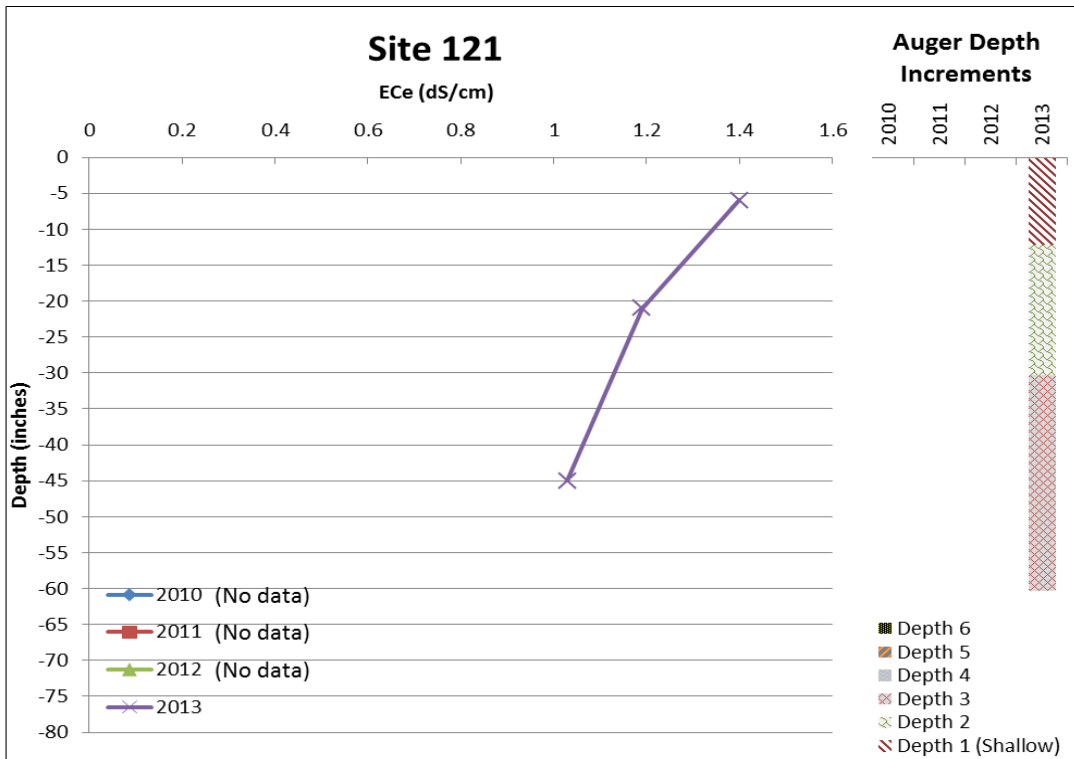


Appendix F - Comparison of Electrical Conductivity of Soil Extract Data from 2010-2013

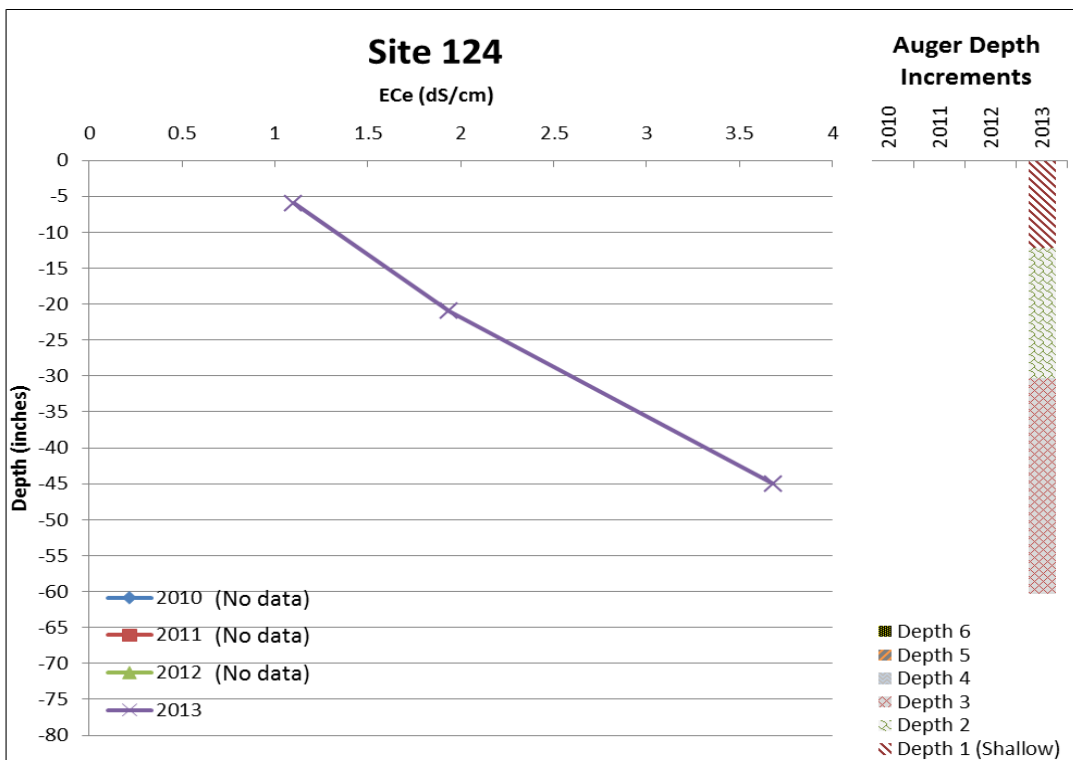
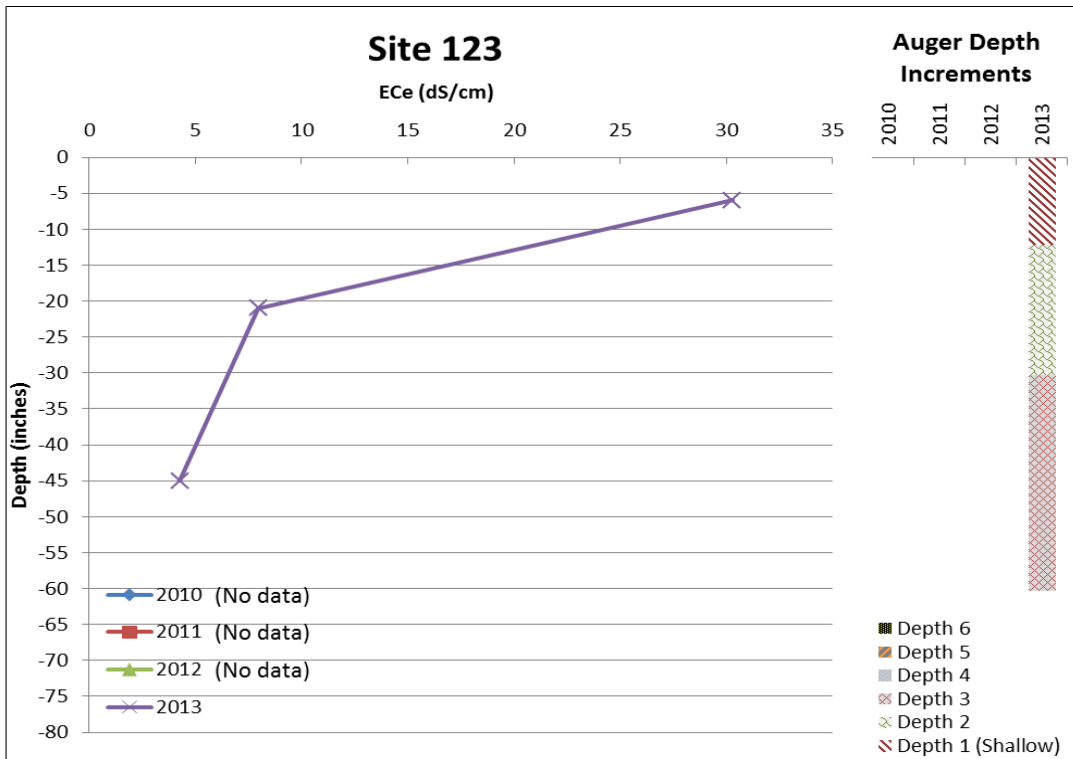


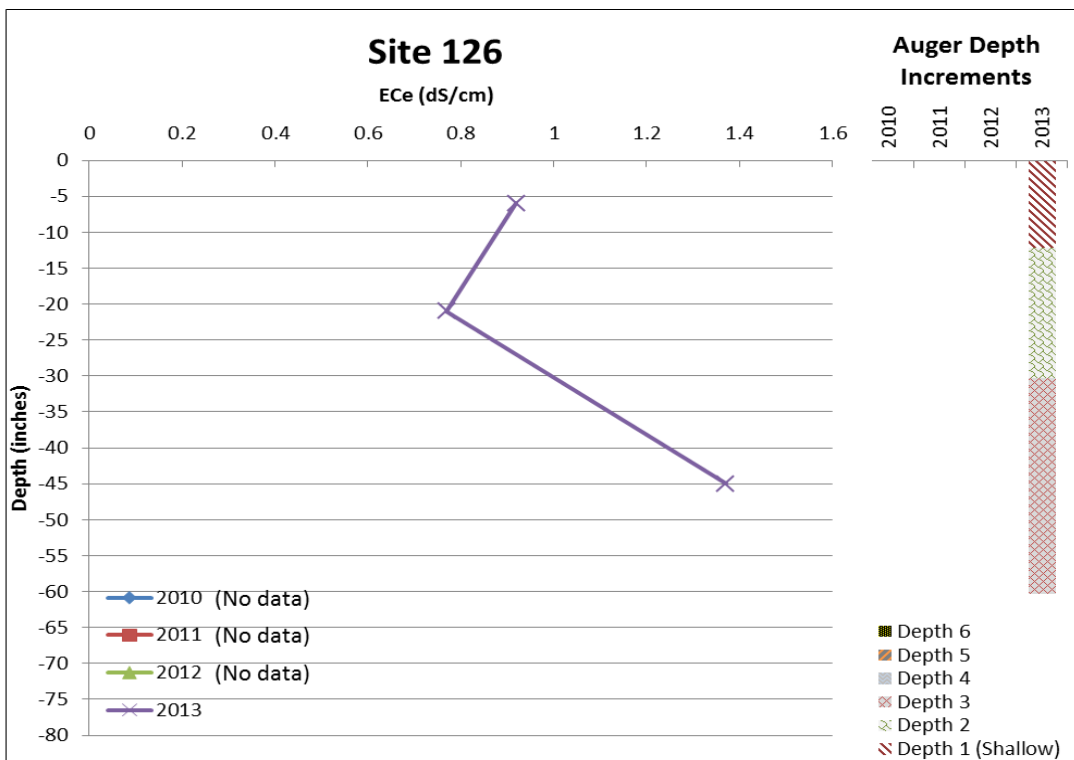
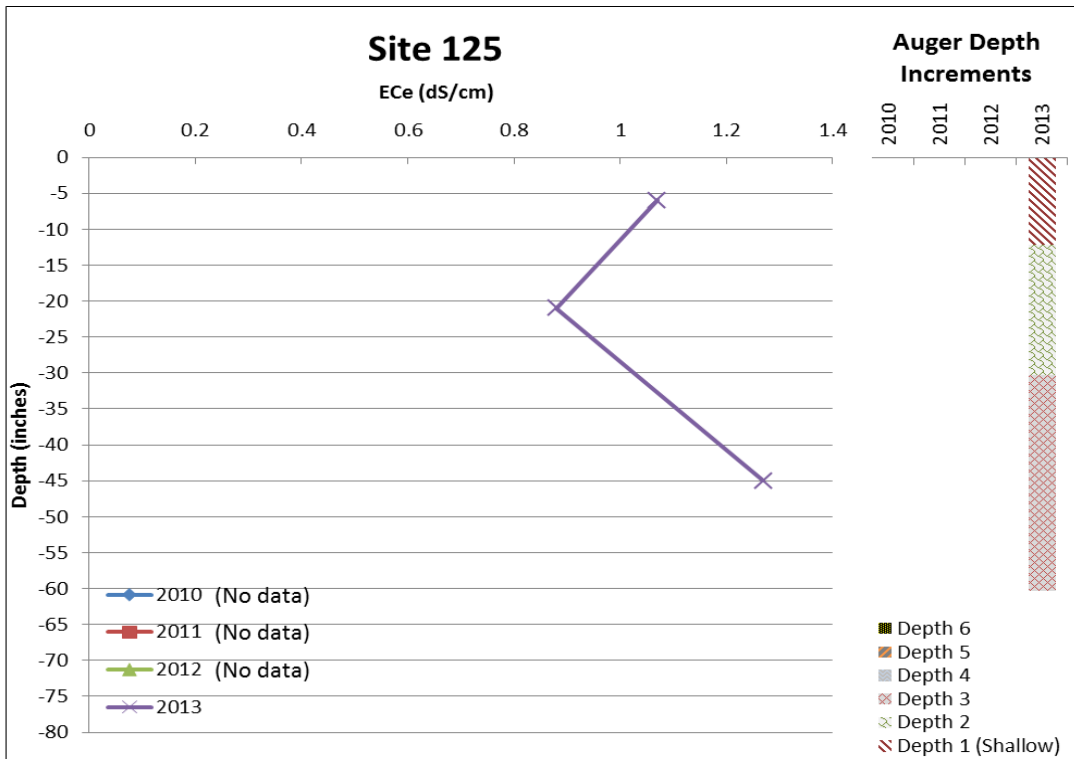






Appendix F - Comparison of Electrical Conductivity of Soil Extract Data from 2010-2013





Appendix F - Comparison of Electrical Conductivity of Soil Extract Data from 2010-2013

