CHICOT AQUIFER SUMMARY, 2014

AQUIFER SAMPLING AND ASSESSMENT PROGRAM

APPENDIX 10 TO THE 2015 TRIENNIAL SUMMARY REPORT

PARTIAL FUNDING PROVIDED BY THE CWA

ASSET

AQUIFER SAMPLING AND ASSESSMENT PROGRAM

Contents

BACKGROUND

The Louisiana Department of Environmental Quality's (LDEQ) Aquifer Sampling and Assessment Program (ASSET) is an ambient monitoring program established to determine and monitor the quality of groundwater produced from Louisiana's major freshwater aquifers. The ASSET Program samples approximately 200 water wells located in 14 aquifers and aquifer systems across the state. The sampling process is designed so that all 14 aquifers and aquifer systems and associated wells are monitored every three years.

In order to better assess the water quality of a particular aquifer, an attempt is made to sample all ASSET Program wells producing from it in a narrow time frame. To more conveniently and economically promulgate those data collected, a summary report on each aquifer is prepared separately. Collectively, these aquifer summaries make up, in part, the ASSET Program's Triennial Summary Report.

Analytical and field data contained in this summary were collected from wells producing from the Chicot aquifer during the 2014 state fiscal year (July 1, 2013 - June 30, 2014). This summary will become Appendix 10 of the ASSET Program Triennial Summary Report for 2015.

These data show that from April through June 2014, 21 wells were sampled which produce from the Chicot aquifer. Of these 21 wells, 11 are classified as public supply, four industrial, two observation, two domestic and one each irrigation and recovery. The wells are located in 12 parishes in southwest Louisiana.

Figure 10-1 shows the geographic locations of the Chicot aquifer and the associated wells. Table 10-1 lists those wells and their corresponding parish, date sampled, owner, depth, and use classification.

Well data, including well location and aquifer assignment, for registered water wells were obtained from the Louisiana Department of Natural Resources water well registration data file.

GEOLOGY

The Chicot aquifer system consists of fining upward sequences of gravels, sands, silts, and clays of the Pleistocene Prairie, intermediate, and high terrace deposits of southwestern Louisiana. The medium to coarse-grained sand and gravel aquifer units dip and thicken toward the Gulf, thin slightly toward the west into Texas, and thicken toward the east where they are overlain by alluvium of the Atchafalaya and Mississippi rivers. The aquifers are confined, have a finer texture, and are increasingly subdivided by silts and clays southward from the northern limit of the outcrop area in southern Vernon and Rapides parishes.

In the Lake Charles area, the Chicot is divided into the shallow alluvial sands, the “200-foot” sand, the “500-foot” sand, and the “700-foot” sand. East of Calcasieu parish the Chicot is divided into the “upper sand” (in hydraulic connection to the Atchafalaya sand, Abbeville sand, and “200-foot” sand) and the “lower sand” (“700-foot” sand). The “500-foot” sand is largely isolated except where it merges with the “700-foot” sand north of Calcasieu Parish. Fresh water in the Chicot and other southwestern Louisiana aquifers is separated from fresh water in southeast Louisiana by a saltwater ridge along the western edge of the Mississippi River valley. Salt water occurs within the Chicot along the coast and in isolated bodies north of the coast.

HYDROGEOLOGY

Recharge to the Chicot occurs primarily through the direct infiltration of rainfall in the interstream, upland outcrop-subcrop areas. Recharge also occurs by water movement from the Atchafalaya alluvium, downward infiltration through the clays south of the primary recharge outcrop area, upward movement from the underlying Evangeline aquifer, and inflow from the Vermilion and Calcasieu rivers. Water movement is generally toward the pumping centers at Lake Charles and Eunice. However, there is little movement of water from the west because of pumping in the Orange, Texas area. The hydraulic conductivity varies between 40-220 feet/day.

The maximum depths of occurrence of freshwater in the Chicot range from 100 feet above sea level, to 1,000 feet below sea level. The range of thickness of the fresh water interval in the Chicot is 50 to 1,050 feet. The depths of the Chicot wells that were monitored in conjunction with the ASSET Program range from 66 to 697 feet.

PROGRAM PARAMETERS

The field parameters checked at each ASSET Program well sampling site and the list of conventional parameters analyzed in the laboratory are shown in Table 10-2. The inorganic (total metals) parameters analyzed in the laboratory are listed in Table 10-3. These tables also show the field and analytical results determined for each analyte. For quality control, duplicate samples were taken for each parameter from wells BE-378, CU-1125, and JD-862.

In addition to the field, conventional and inorganic analytical parameters, the target analyte list includes three other categories of compounds: volatiles, semi-volatiles, and pesticides/PCBs. Due to the large number of analytes in these categories, tables were not prepared showing the analytical results for these compounds. A discussion of any detections from any of these three categories, if necessary, can be found in their respective sections. Tables 10-8, 10-9 and 10-10 list the target analytes for volatiles, semi-volatiles and pesticides/PCBs, respectively.

Tables 10-4 and 10-5 provide a statistical overview of field and conventional data, and inorganic data for the Chicot aquifer, listing the minimum, maximum, and average results for these parameters collected in the FY 2014 sampling. Tables 10-6 and 10-7 compare these same parameter averages to historical ASSET derived data for the Chicot aquifer, from fiscal years 1996, 1999, 2002, 2005, 2008, and 2011.

The average values listed in the above referenced tables are determined using all valid, reported results, including those reported as non-detect, or less than the detection limit (< DL). Per Departmental policy concerning statistical analysis (including contouring purposes), one-half the DL is used in place of zero when non-detects are encountered. However, the minimum value is reported < DL, not one-half the DL. If all values for a particular analyte are reported as < DL, then the minimum, maximum, and average values are all reported as < DL.

Due to the variability in the laboratory's reporting detection limits caused by dilution factors, whenever an analyte in question is not detected, the standard reporting detection limit value for each analytical method is used as the DL when performing statistical calculations.

Figures 10-2, 10-3, 10-4, and 10-5, respectively, represent the contoured data for pH, total dissolved solids (TDS), chloride, and iron. Charts 10-1 through 10-16 represent the trend of the graphed parameter, based on the averaged value of that parameter for each three-year reporting period. Discussion of historical data and related trends is found in the **Water Quality Trends and Comparison to Historical ASSET Data** section.

INTERPRETATION OF DATA

Under the Federal Safe Drinking Water Act, EPA has established maximum contaminant levels (MCLs) for pollutants that may pose a health risk in public drinking water. An MCL is the highest level of a contaminant that EPA allows in public drinking water. MCLs ensure that drinking water does not pose either a short-term or long-term health risk. While not all wells sampled were public supply wells, the ASSET Program uses the MCLs as a benchmark for further evaluation.

EPA has set secondary standards, which are defined as non-enforceable taste, odor, or appearance guidelines. Field and laboratory data contained in Tables 10-2 and 10-3 show that one or more secondary MCL (SMCL) was exceeded in 19 of the 21 wells sampled in the Chicot aquifer.

Field and Conventional Parameters

Table 10-2 shows the field and conventional parameters for which samples are collected at each well and the analytical results for those parameters. Table 10-4 provides an overview of this data for the Chicot aquifer, listing the minimum, maximum, and average results for these parameters.

Federal Primary Drinking Water Standards: A review of the analysis listed in Table 10-2 for field or conventional parameters for this reporting period.

ASSET wells reporting turbidity levels greater than 1.0 NTU do not exceed the Primary MCL of 1.0, as this standard applies to public supply water wells that are under the direct influence of surface water. The Louisiana Department of Health has determined that no public water supply well in Louisiana was in this category.

Federal Secondary Drinking Water Standards: A review of the analysis listed in Table 10-2 shows that three wells exceeded the SMCL for pH, one well exceeded the SMCL for color, and eight wells exceeded the SMCL for TDS. Laboratory results override field results in exceedance determination, thus only laboratory results will be counted in determining SMCL exceedance numbers. Following is a list of SMCL parameter exceedances with well number and results:

pH (SMCL = 6.5 – 8.5 SU):

BE-412 – 6.05 SU
V-535 – 6.35 SU
R-6947Z – 5.18 SU

Color (SMCL = 15 PCU):

LF-572 – 61 PCU

Total Dissolved Solids (SMCL = 500 mg/L or 0.5 g/L):

	LAB RESULTS (in mg/L)	FIELD MEASURES (in g/L)
AC-8316Z	624 mg/L	0.563 g/L
CN-92	984 mg/L	1.090 g/L
CU-862	544 mg/L	0.489 g/L
EV-673	528 mg/L	0.465 g/L
JD-862	536 mg/L, Duplicate – 444 mg/L (< SMCL)	0.580 g/L (Original and Duplicate)
SMN-109	796 mg/L	0.763 g/L
VE-151	556 mg/L	0.627 g/L
VE-862	592 mg/L	0.701 g/L

Inorganic Parameters

Table 10-3 shows the inorganic (total metals) parameters for which samples are collected at each well and the analytical results for those parameters. Table 10-5 provides an overview of this data for the Chicot aquifer, listing the minimum, maximum, and average results for these parameters.

Federal Primary Drinking Water Standards: A review of the analyses listed on Table 10-3 shows that observation well SMN-109 exceeded the MCL for antimony. The MCL for antimony is 6 µg/L, whereas this well reported value was 9.53 µg/L. Because this well is not a drinking water source, public or private, it does not supply water for any other purpose than monitoring, and because there is no previous occurrence of antimony in this well, it was determined that this observation well would be sampled again, on its normal schedule, in three years. No other Chicot aquifer well sampled by the ASSET Program exceeded an MCL for total metals.

Federal Secondary Drinking Water Standards: Laboratory data contained in Table 10-3 shows that 14 of the 21 wells sampled exceeded the secondary MCL for iron as shown in the following list:

Iron (SMCL = 300 µg/L):

AC-8316Z – 2,990 µg/L
CU-10192Z – 732 µg/L
CU-1366 – 385 µg/L
EV-673 – 1,240 µg/L
JD-862 – 2,140 µg/L, Duplicate – 2,190
SMN-109 – 1,280 µg/L
VE-862 – 978 µg/L
BE-378 – 2,230 µg/L, Duplicate – 2,230 µg/L
CU-1125 – 859 µg/L, Duplicate – 1,700 µg/L
CU-1471 – 774 µg/L
I-7312Z – 925 µg/L
LF-572 – 784 µg/L
VE-151 – 3,330 µg/L
VE-882 – 1,220 µg/L

Volatile Organic Compounds

Table 10-8 shows the volatile organic compound (VOC) parameters for which samples are collected at each well. Due to the number of analytes in this category, analytical results are not tabulated; however, any detection of a VOC would be discussed in this section.

There were no confirmed detections of VOCs at or above their respective detection limits during the FY 2014 sampling of the Chicot aquifer.

Semi-Volatile Organic Compounds

Table 10-9 shows the semi-volatile organic compound (SVOC) parameters for which samples are collected at each well. Due to the number of analytes in this category, analytical results are not tabulated; however any detection of a SVOC would be discussed in this section.

There were no confirmed detections of SVOCs at or above their respective detection limits during the FY 2014 sampling of the Chicot aquifer.

Pesticides and PCBs

Table 10-10 shows the pesticide and PCB parameters for which samples are collected at each well. Due to the number of analytes in this category, analytical results are not tabulated; however any detection of a pesticide or PCB would be discussed in this section.

There were no confirmed detections of pesticides or PCBs at or above their respective detection limits during the FY 2014 sampling of the Chicot aquifer.

WATER QUALITY TRENDS AND COMPARISON TO HISTORICAL ASSET DATA

Analytical and field data show that the quality and characteristics of ground water produced from the Chicot aquifer exhibit some changes when comparing current data to that of the six previous sampling rotations (three, six, nine, twelve, fifteen, and eighteen years prior). These comparisons are in Tables 10-6 and 10-7, and in Charts 10-1 to 10-16 of this summary. Over the eighteen-year period, 10 analytes have shown general increases in average concentrations, while seven have shown general decreases. Analytes exhibiting increases are: alkalinity, ammonia, barium, chloride, hardness, iron, salinity, specific conductance (field and lab), TDS and TKN. Analytes exhibiting decreases are: color, copper, nitrite-nitrate, sulfate, temperature, total phosphorus, and zinc. All other analyte averages have remained consistent, or have been non-detect for this period. The number of secondary exceedances in the Chicot aquifer has decreased from the previous sampling in FY 2011 from 35 SMCL exceedances, to 26 in FY 2014.

SUMMARY AND RECOMMENDATIONS

In summary, the data show that the ground water produced from this aquifer is hard[1] and is of fair quality when considering short-term or long-term health risk guidelines. Laboratory data show that one ASSET well sampled during the Fiscal Year 2014 monitoring of the Chicot aquifer exceeded the primary MCL for antimony in an observation well. No other primary MCL was exceeded in any other well. The data also show that this aquifer is of poor quality when considering taste, odor, or appearance guidelines, due to the number of wells (14) exceeding the SMCL for iron.

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[1] Classification based on hardness scale from: Peavy, H. S. et al. *Environmental Engineering*. New York: McGraw-Hill, 1985.

Comparison to historical ASSET-derived data shows some change in the quality or characteristics of the Chicot aquifer, with 10 parameters showing increases in average concentrations and seven parameters showing decreases in average concentrations. The remainder of the parameter averages has continued to be consistent over the previous eighteen-year period.

It is recommended that the wells assigned to the Chicot aquifer be re-sampled as planned, in approximately three years, with special attention given to observation well SMN-109 and the reported occurrence of antimony. In addition, several wells should be added to the 21 currently in place to increase the well density for this aquifer.

Table 10-1: List of Wells Sampled, Chicot Aquifer – FY 2014

Well ID	Parish	Date	Owner	Depth (Feet)	Well Use
AC-539	Acadia	4/28/2014	City Of Rayne	251	Public Supply
AC-8316Z	Acadia	4/28/2014	Private Owner	165	Domestic
BE-378	Beauregard	6/17/2014	Transcontinental Gas Pipeline	172	Industrial
BE-412	Beauregard	4/29/2014	Boise - Deridder	202	Industrial
BE-488	Beauregard	6/17/2014	Singer Water District	262	Public Supply
CN-92	Cameron	6/26/2014	USGS	443	Observation
CU-10192Z	Calcasieu	6/9/2014	Axiall	230	Recovery
CU-1125	Calcasieu	6/9/2014	LDOTD	570	Public Supply
CU-1366	Calcasieu	6/17/2014	City Of Lake Charles	685	Public Supply
CU-1471	Calcasieu	6/9/2014	Axiall	525	Industrial
CU-862	Calcasieu	6/9/2014	Citgo Petroleum Corporation	560	Industrial
EV-673	Evangeline	4/28/2014	City Of Mamou	247	Public Supply
I-7312Z	Iberia	5/13/2014	Breaux Electric	180	Public Supply
JD-862	Jefferson Davis	5/12/2014	City Of Welsh	697	Public Supply
LF-572	Lafayette	4/28/2014	LUS	570	Public Supply
R-6947Z	Rapides	5/12/2014	Private Owner	110	Domestic
SMN-109	St. Martin	6/26/2014	USGS	375	Observation
V-535	Vernon	4/29/2014	Marlow Fire Station	66	Public Supply
VE-151	Vermilion	5/13/2014	Vermilion Oaks Country Club	250	Irrigation
VE-862	Vermilion	5/13/2014	Town of Gueydan	249	Public Supply
VE-882	Vermilion	5/13/2014	City of Kaplan	279	Public Supply

Table 10-2: Summary of Field and Conventional Data, Chicot Aquifer – FY 2014

Well ID	pH SU	Sal. ppt	Sp. Cond. mmhos/cm	Temp Deg. C	TDS g/L	Alk mg/L	Cl mg/L	Color PCU	Hard. mg/L	Nitrite-Nitrate (as N) mg/L	NH3 mg/L	Tot. P mg/L	Sp. Cond. umhos/cm	SO4 mg/L	TDS mg/L	TKN mg/L	TSS mg/L	Turb. NTU
	LABORATORY DETECTION LIMITS† →					5	0.25/ 1.25	1	5	0.01	0.05	0.05	10	0.25/1.25 2.5/6.25	10	0.1	4	0.3
	FIELD PARAMETERS					LABORATORY PARAMETERS												
AC-539	7.63	0.28	0.587	22.43	0.382	256	27.0	1	176	0.06	0.56	0.11	606	< DL	32	1.00	< DL	< DL
AC-8316Z	7.41	0.43	0.866	21.73	0.563	334	75.0	13	292	< DL	1.47	0.28	874	22.9	624	2.08	< DL	13.7
BE-378	6.91	0.16	0.327	22.23	0.213	64	40.5	9	80	0.01	< DL	0.47	328	5.1	392	< DL	< DL	0.8
BE-378*	6.91	0.16	0.327	22.23	0.213	70	40.5	9	84	< DL	< DL	0.45	331	5.0	360	< DL	< DL	0.4
BE-412	6.05	0.02	0.053	20.47	0.034	10	6.0	< DL	< DL	0.02	< DL	< DL	58	0.3	52	0.15	< DL	< DL
BE-488	6.90	0.03	0.070	21.23	0.045	16	6.2	< DL	< DL	< DL	< DL	< DL	78	0.6	176	< DL	< DL	0.4
CN-92	7.71	0.85	1.677	23.22	1.090	260	375.0	5	172	< DL	0.50	0.05	1,720	0.6	984	0.50	< DL	< DL
CU-10192Z	7.80	0.19	0.393	22.37	0.256	140	15.6	< DL	64	< DL	0.23	0.24	521	1.4	368	0.40	< DL	1.8
CU-1125	7.62	0.17	0.348	22.64	0.226	106	24.3	9	120	< DL	< DL	0.28	356	2.3	252	0.36	< DL	2.4
CU-1125*	7.62	0.17	0.348	22.64	0.226	128	24.4	< DL	204	0.01	0.13	0.22	358	2.0	264	0.43	< DL	1.5
CU-1366	7.23	0.19	0.393	23.76	0.256	100	34.1	5	100	< DL	0.12	0.25	407	3.6	412	0.12	< DL	0.6
CU-1471	7.62	0.24	0.509	24.63	0.331	164	66.3	< DL	52	0.02	0.19	0.25	405	2.0	272	0.44	< DL	3.7
CU-862	6.72	0.37	0.752	24.48	0.489	180	141.0	< DL	88	< DL	< DL	0.13	781	0.2	544	0.40	6	20.5
EV-673	6.87	0.35	0.715	21.52	0.465	264	77.2	9	164	< DL	0.30	0.41	731	0.5	528	0.38	< DL	7.7
I-7312Z	7.38	0.21	0.435	22.22	0.283	242	4.6	< DL	< DL	< DL	0.13	0.20	463	< DL	244	0.31	< DL	3.4
JD-862	6.98	0.44	0.893	24.44	0.580	130	199.0	< DL	152	< DL	0.20	0.46	910	< DL	536	0.18	5	15.9
JD-862*	6.98	0.44	0.893	24.44	0.580	140	201.0	< DL	140	< DL	0.21	0.44	914	< DL	444	0.41	5	15.4
LF-572	7.57	0.18	0.382	20.86	0.248	170	6.0	61	172	< DL	0.24	0.30	391	4.3	344	1.08	< DL	4.0
R-6947Z	5.18	0.02	0.054	20.37	0.035	6	4.7	< DL	< DL	0.15	< DL	0.08	62	0.8	32	< DL	< DL	< DL
SMN-109	6.92	0.58	1.173	21.61	0.763	416	151.0	5	292	< DL	0.82	0.16	1280	0.3	796	0.73	< DL	3.8
V-535	6.35	0.01	0.023	20.33	0.015	< DL	3.2	5	< DL	0.01	< DL	< DL	28	0.4	< DL	0.17	< DL	< DL
VE-151	7.35	0.48	0.964	22.14	0.627	382	105.0	< DL	128	< DL	0.57	0.38	994	1.3	556	0.59	10	25.5
VE-862	7.69	0.53	1.078	22.58	0.701	400	139.0	< DL	212	< DL	2.10	0.24	1140	< DL	592	1.82	< DL	3.0
VE-882	7.47	0.39	0.790	21.54	0.513	400	48.6	< DL	248	< DL	1.00	0.34	839	< DL	472	0.96	< DL	4.6

†Detection limits vary due to dilution factor *Denotes Duplicate Sample Shaded cells exceed EPA Secondary Standards

Table 10-3: Summary of Inorganic Data, Chicot Aquifer – FY 2014

Well ID	Antimony µg/L	Arsenic µg/L	Barium µg/L	Beryllium µg/L	Cadmium µg/L	Chromium µg/L	Copper µg/L	Iron µg/L	Lead µg/L	Mercury µg/L	Nickel µg/L	Selenium µg/L	Silver µg/L	Thallium µg/L	Zinc µg/L
Laboratory Detection Limits	5	4	5	2	2	4	2	100	1	0.0002	3	5	1	2	6
AC-539	< DL	< DL	463	< DL	< DL	< DL	3.1	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
AC-8316Z	< DL	< DL	641	< DL	< DL	< DL	2.4	2,990	< DL	< DL	< DL	< DL	< DL	< DL	< DL
BE-378	< DL	< DL	122	< DL	< DL	< DL	< DL	2,230	< DL	< DL	< DL	< DL	< DL	< DL	< DL
BE-378*	< DL	< DL	122	< DL	< DL	< DL	< DL	2,230	< DL	< DL	< DL	< DL	< DL	< DL	< DL
BE-412	< DL	< DL	94	< DL	< DL	< DL	3.2	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
BE-488	< DL	< DL	75	< DL	< DL	< DL	11.1	< DL	1.2	< DL	< DL	< DL	< DL	< DL	19.4
CN-92	< DL	< DL	875	< DL	< DL	< DL	2.4	266	< DL	< DL	< DL	< DL	< DL	< DL	91.6
CU-10192Z	< DL	< DL	194	< DL	< DL	< DL	< DL	732	< DL	< DL	< DL	< DL	< DL	< DL	< DL
CU-1125	< DL	< DL	219	< DL	< DL	< DL	< DL	859	< DL	< DL	< DL	< DL	< DL	< DL	< DL
CU-1125*	< DL	< DL	448	< DL	< DL	< DL	< DL	1,700	< DL	< DL	< DL	< DL	< DL	< DL	< DL
CU-1366	< DL	< DL	234	< DL	< DL	< DL	< DL	385	< DL	< DL	< DL	< DL	< DL	< DL	< DL
CU-1471	< DL	< DL	189	< DL	< DL	< DL	< DL	774	< DL	< DL	< DL	< DL	< DL	< DL	16.2
CU-862	< DL	< DL	248	< DL	< DL	< DL	< DL	201	< DL	< DL	< DL	< DL	< DL	< DL	260.0
EV-673	< DL	< DL	292	< DL	< DL	< DL	4.9	1,240	< DL	< DL	3.97	< DL	< DL	< DL	12.8
I-7312Z	< DL	< DL	159	< DL	< DL	< DL	3.8	925	< DL	< DL	< DL	< DL	< DL	< DL	< DL
JD-862	< DL	< DL	748	< DL	< DL	< DL	< DL	2,140	< DL	< DL	< DL	< DL	< DL	< DL	< DL
JD-862*	< DL	< DL	759	< DL	< DL	< DL	< DL	2,190	< DL	< DL	3.39	< DL	< DL	< DL	< DL
LF-572	< DL	< DL	211	< DL	< DL	< DL	< DL	784	< DL	< DL	< DL	< DL	< DL	< DL	< DL
R-6947Z	< DL	< DL	46	< DL	< DL	< DL	8.1	< DL	< DL	< DL	3.82	< DL	< DL	< DL	55.4
SMN-109	9.53	< DL	748	< DL	< DL	< DL	< DL	1,280	< DL	< DL	< DL	< DL	< DL	< DL	476.0
V-535	< DL	< DL	28	< DL	< DL	< DL	16.8	105	< DL	< DL	< DL	< DL	< DL	< DL	8.4
VE-151	< DL	< DL	349	< DL	< DL	< DL	< DL	3,330	< DL	< DL	< DL	< DL	< DL	< DL	7.4
VE-862	< DL	< DL	928	< DL	< DL	< DL	4.2	978	2.9	< DL	< DL	< DL	< DL	< DL	< DL
VE-882	< DL	< DL	546	< DL	< DL	< DL	< DL	1,220	< DL	< DL	< DL	< DL	< DL	< DL	< DL

*Denotes Duplicate Sample   Exceed EPA Primary Standards   Exceed EPA Secondary Standards

Table 10-4: Field and Conventional Statistics, FY 2014 ASSET Wells

	PARAMETER	MINIMUM	MAXIMUM	AVERAGE
FIELD	pH (SU)	5.18	7.80	7.12
	Salinity (ppt)	0.01	0.85	0.29
	Specific Conductance (mmhos/cm)	0.023	1.677	0.585
	Temperature (^{O}C)	20.33	24.63	22.34
	TDS (g/L)	0.015	1.090	0.381
LABORATORY	Alkalinity (mg/L)	< DL	416	182
	Chloride (mg/L)	3.2	375.0	75.6
	Color (PCU)	< DL	64	6
	Hardness (mg/L)	< DL	292	123
	Nitrite - Nitrate, as N (mg/L)	< DL	0.15	0.02
	Ammonia, as N (mg/L)	< DL	2.10	0.37
	Total Phosphorus (mg/L)	< DL	0.47	0.24
	Specific Conductance (umhos/cm)	28	1,720	607
	Sulfate (mg/L)	< DL	22.9	2.3
	TDS (mg/L)	< DL	984	387
	TKN (mg/L)	< DL	2.08	0.53
	TSS (mg/L)	< DL	10	< DL
	Turbidity (NTU)	< DL	25.5	5.4

Table 10-5: Inorganic Statistics, FY 2014 ASSET Wells

PARAMETER	MINIMUM	MAXIMUM	AVERAGE
Antimony (µg/L)	< DL	9.53	< DL
Arsenic (µg/L)	< DL	< DL	< DL
Barium (µg/L)	28	928	364
Beryllium (ug/L)	< DL	< DL	< DL
Cadmium (ug/L)	< DL	< DL	< DL
Chromium (µg/L)	< DL	< DL	< DL
Copper (µg/L)	< DL	16.8	3.1
Iron (µg/L)	< DL	3,330	1,115
Lead (µg/L)	< DL	2.9	< DL
Mercury (µg/L)	< DL	< DL	< DL
Nickel (µg/L)	< DL	4.0	< DL
Selenium (µg/L)	< DL	< DL	< DL
Silver (µg/L)	< DL	< DL	< DL
Thallium (µg/L)	< DL	< DL	< DL
Zinc (µg/L)	< DL	476.0	41.3

Table 10-6: Triennial Field and Conventional Statistics, ASSET Wells

	PARAMETER	AVERAGE VALUES BY FISCAL YEAR						
		FY 1996	FY 1999	FY 2002	FY 2005	FY 2008	FY 2011	FY 2014
FIELD	pH (SU)	7.08	7.01	7.03	7.22	7.33	7.28	7.12
	Salinity (Sal.) (ppt)	0.26	0.33	0.25	0.27	0.31	0.30	0.29
	Specific Conductance (mmhos/cm)	0.534	0.650	0.5230	0.540	0.630	0.610	0.585
	Temperature (OC)	22.68	23.20	21.85	22.38	22.47	20.91	22.34
	TDS (Total dissolved solids) (g/L)	-	-	-	0.350	0.400	0.400	0.381
LABORATORY	Alkalinity (Alk.) (mg/L)	200	189	193	190	216	210	182
	Chloride (Cl) (mg/L)	67.5	59.6	51.6	59.7	85.9	67.7	75.6
	Color (PCU)	22	13	14	13	24	9	6
	Hardness (mg/L)	130	123	127	133	162	162	123
	Nitrite - Nitrate , as N (mg/L)	< DL	< DL	< DL	< DL	< DL	< DL	0.02
	Ammonia, as N (NH3) (mg/L)	0.36	0.35	0.41	0.32	0.36	0.40	0.37
	Total Phosphorus (P) (mg/L)	0.24	0.25	0.13	0.23	0.21	0.20	0.24
	Specific Conductance (umhos/cm)	594	552	502	539	660	571	607
	Sulfate (SO4) (mg/L)	2.1	2.8	1.5	2.0	2.8	3.3	2.3
	TDS (Total dissolved solids) (mg/L)	369	352	302	322	384	370	387
	TKN (mg/L)	0.35	0.67	0.58	0.50	0.43	0.63	0.53
	TSS (Total suspended solids) (mg/L)	20	5	4	18	4	7	< DL
	Turbidity (Turb.) (NTU)	13.8	14.6	13.8	16.2	20.8	12.3	5.4

Table 10-7: Triennial Inorganic Statistics, ASSET Wells

PARAMETER	AVERAGE VALUES BY FISCAL YEAR						
	FY 1996	FY 1999	FY 2002	FY 2005	FY 2008	FY 2011	FY 2014
Antimony (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Arsenic (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Barium (µg/L)	277.6	312.0	297.0	359.0	389.8	326.9	364
Beryllium (ug/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Cadmium (ug/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Chromium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Copper (µg/L)	14.4	35.8	25.7	42.2	7.2	4.8	3.1
Iron (µg/L)	1,824	1,971	1,795	3,074	2,238	1,432	1,115
Lead (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Mercury (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Nickel (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Selenium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Silver (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Thallium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Zinc (µg/L)	346.7	152.3	123.5	620.7	105.0	123.4	41.3

Table 10-8: VOC Analytical Parameters

COMPOUND	METHOD	DETECTION LIMIT (µg/L)
1,1,1-TRICHLOROETHANE	624	0.5
1,1,2,2-TETRACHLOROETHANE	624	0.5
1,1,2-TRICHLOROETHANE	624	0.5
1,1-DICHLOROETHANE	624	0.5
1,1-DICHLOROETHENE	624	0.5
1,2-DICHLOROBENZENE	624	0.5
1,2-DICHLOROETHANE	624	0.5
1,2-DICHLOROPROPANE	624	0.5
1,3-DICHLOROBENZENE	624	0.5
1,4-DICHLOROBENZENE	624	0.5
BENZENE	624	0.5
BROMODICHLOROMETHANE	624	0.5
BROMOFORM	624	0.5
BROMOMETHANE	624	0.5
CARBON TETRACHLORIDE	624	0.5
CHLOROBENZENE	624	0.5
CHLOROETHANE	624	0.5
CHLOROFORM	624	0.5
CHLOROMETHANE	624	0.5
CIS-1,3-DICHLOROPROPENE	624	0.5
DIBROMOCHLOROMETHANE	624	0.5
ETHYL BENZENE	624	0.5
METHYLENE CHLORIDE	624	0.5
O-XYLENE (1,2-DIMETHYLBENZENE)	624	0.5
STYRENE	624	0.5
TERT-BUTYL METHYL ETHER	624	0.5
TETRACHLOROETHYLENE (PCE)	624	0.5
TOLUENE	624	0.5
TRANS-1,2-DICHLOROETHENE	624	0.5
TRANS-1,3-DICHLOROPROPENE	624	0.5
TRICHLOROETHYLENE (TCE)	624	0.5
TRICHLOROFLUOROMETHANE (FREON-11)	624	0.5
VINYL CHLORIDE	624	0.5
XYLENES, M & P	624	1

Table 10-9: SVOC Analytical Parameters

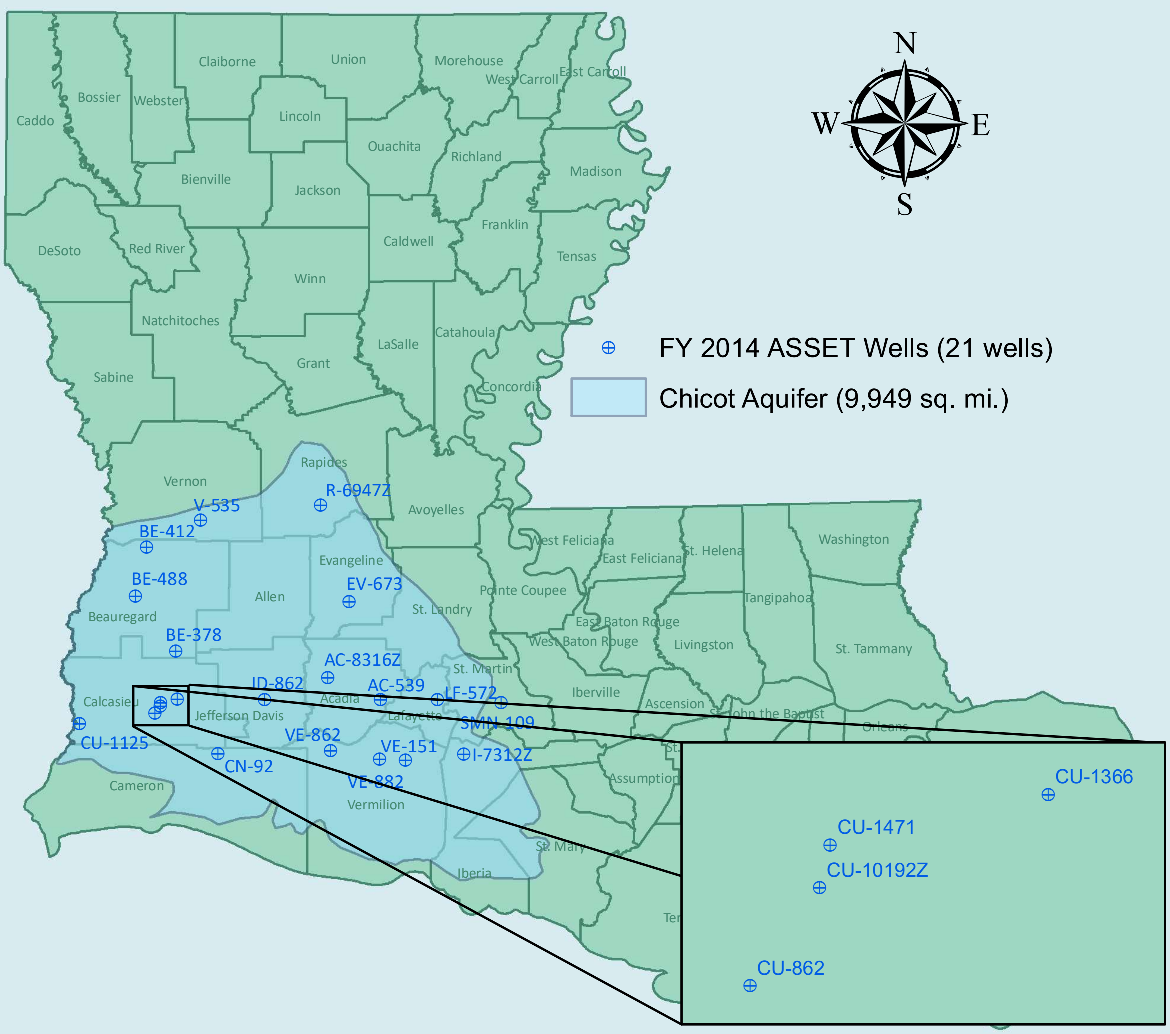
COMPOUND (SVOC)	METHOD	DETECTION LIMIT (µg/L)
1,2,3-TRICHLOROBENZENE	625	0.5
1,2,4-TRICHLOROBENZENE	625	5.1
2,4,6-TRICHLOROPHENOL	625	5.1
2,4-DICHLOROPHENOL	625	5.1
2,4-DIMETHYLPHENOL	625	5.1
2,4-DINITROPHENOL	625	20
2,4-DINITROTOLUENE	625	5.1
2,6-DINITROTOLUENE	625	5.1
2-CHLORONAPHTHALENE	625	5.1
2-CHLOROPHENOL	625	5.1
2-NITROPHENOL	625	10
3,3'-DICHLOROBENZIDINE	625	5.1
4,6-DINITRO-2-METHYLPHENOL	625	10
4-BROMOPHENYL PHENYL ETHER	625	5.1
4-CHLORO-3-METHYLPHENOL	625	5.1
4-CHLOROPHENYL PHENYL ETHER	625	5.1
4-NITROPHENOL	625	20
ACENAPHTHENE	625	5.1
ACENAPHTHYLENE	625	5.1
ANTHRACENE	625	5.1
BENZIDINE	625	20
BENZO(A)ANTHRACENE	625	5.1
BENZO(A)PYRENE	625	5.1
BENZO(B)FLUORANTHENE	625	5.1
BENZO(G,H,I)PERYLENE	625	5.1
BENZO(K)FLUORANTHENE	625	5.1
BENZYL BUTYL PHTHALATE	625	5.1
BIS(2-CHLOROETHOXY) METHANE	625	5.1
BIS(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	625	5.1
BIS(2-CHLOROISOPROPYL) ETHER	625	5.1
BIS(2-ETHYLHEXYL) PHTHALATE	625	5.1
CHRYSENE	625	5.1
DIBENZ(A,H)ANTHRACENE	625	5.1
DIETHYL PHTHALATE	625	5.1
DIMETHYL PHTHALATE	625	5.1
DI-N-BUTYL PHTHALATE	625	5.1
DI-N-OCTYLPHTHALATE	625	5.1
FLUORANTHENE	625	5.1

COMPOUND (SVOC)	METHOD	DETECTION LIMIT (µg/L)
FLUORENE	625	5.1
HEXACHLOROBENZENE	625	5.1
HEXACHLOROBUTADIENE	625	5.1
HEXACHLOROCYCLOPENTADIENE	625	10
HEXACHLOROETHANE	625	5.1
INDENO(1,2,3-C,D)PYRENE	625	5.1
ISOPHORONE	625	5.1
NAPHTHALENE	625	5.1
NITROBENZENE	625	5.1
N-NITROSODIMETHYLAMINE	625	5.1
N-NITROSODI-N-PROPYLAMINE	625	10
N-NITROSODIPHENYLAMINE	625	5.1
PENTACHLOROPHENOL	625	10
PHENANTHRENE	625	5.1
PHENOL	625	5.1

Table 10-10: Pesticides and PCBs

COMPOUND	METHOD	DETECTION LIMITS (µg/L)
ALDRIN	608	0.051
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	608	0.051
ALPHA ENDOSULFAN	608	0.051
ALPHA-CHLORDANE	608	0.051
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	608	0.051
BETA ENDOSULFAN	608	0.051
CHLORDANE	608	0.2
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	608	0.051
DIELDRIN	608	0.051
ENDOSULFAN SULFATE	608	0.051
ENDRIN	608	0.051
ENDRIN ALDEHYDE	608	0.051
ENDRIN KETONE	608	0.051
HEPTACHLOR	608	0.051
HEPTACHLOR EPOXIDE	608	0.051
METHOXYCHLOR	608	0.051
P,P'-DDD	608	0.051
P,P'-DDE	608	0.051
P,P'-DDT	608	0.051
PCB-1016 (AROCHLOR 1016)	608	0.51
PCB-1221 (AROCHLOR 1221)	608	0.51
PCB-1232 (AROCHLOR 1232)	608	0.51
PCB-1242 (AROCHLOR 1242)	608	0.51
PCB-1248 (AROCHLOR 1248)	608	0.51
PCB-1254 (AROCHLOR 1254)	608	0.51
PCB-1260 (AROCHLOR 1260)	608	0.51
TOXAPHENE	608	3.1

Figure 10-1: Location Plat, Chicot Aquifer



Aquifer boundary digitized from Louisiana Hydrologic Map No. 2: Areal Extent of Freshwater in Major Aquifers of Louisiana, Smoot, 1986: USGS/LDOTD Report 86-4150.

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Figure 10-2: Map of pH Data

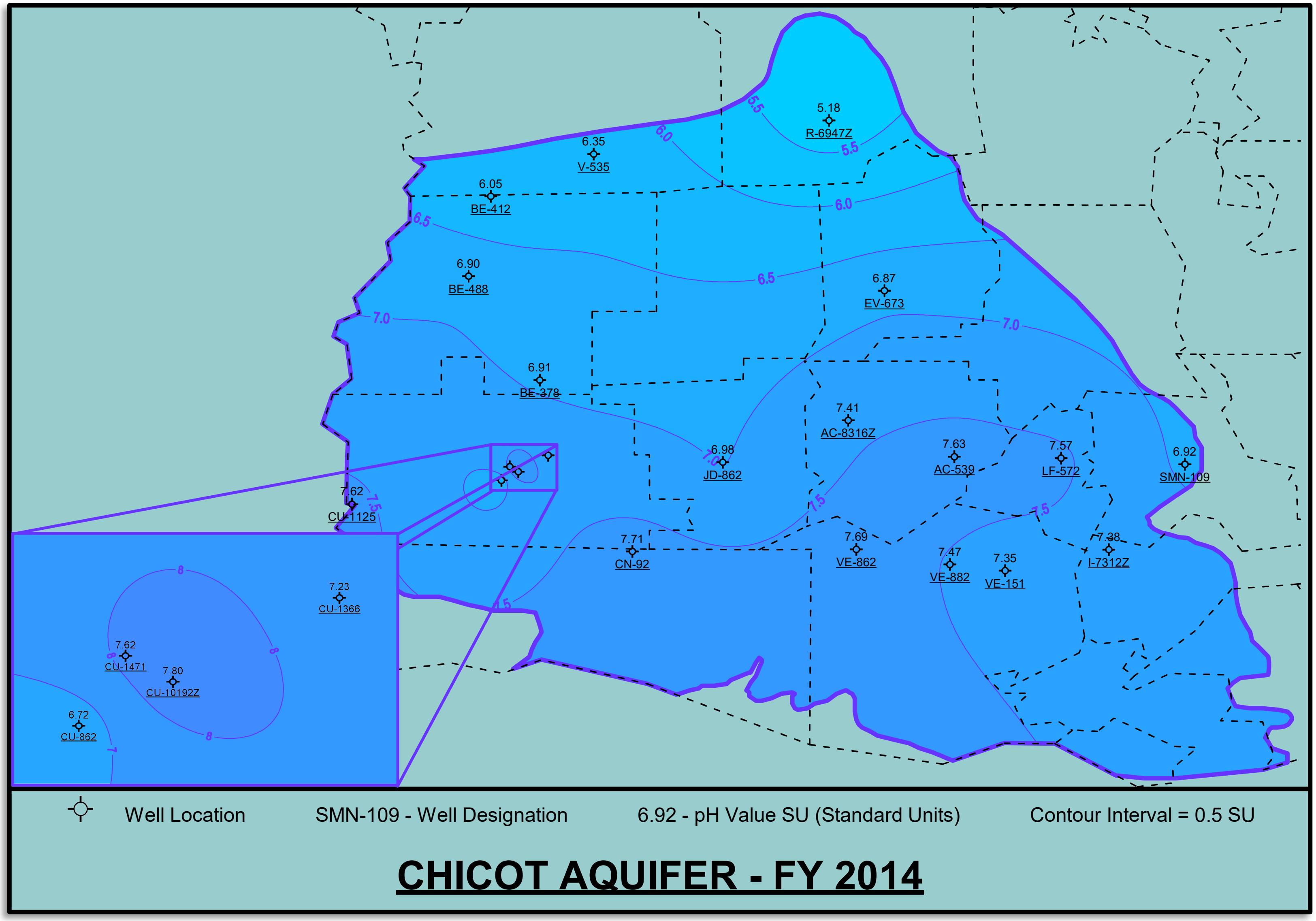

Figure 10-3: Map of TDS Lab Data

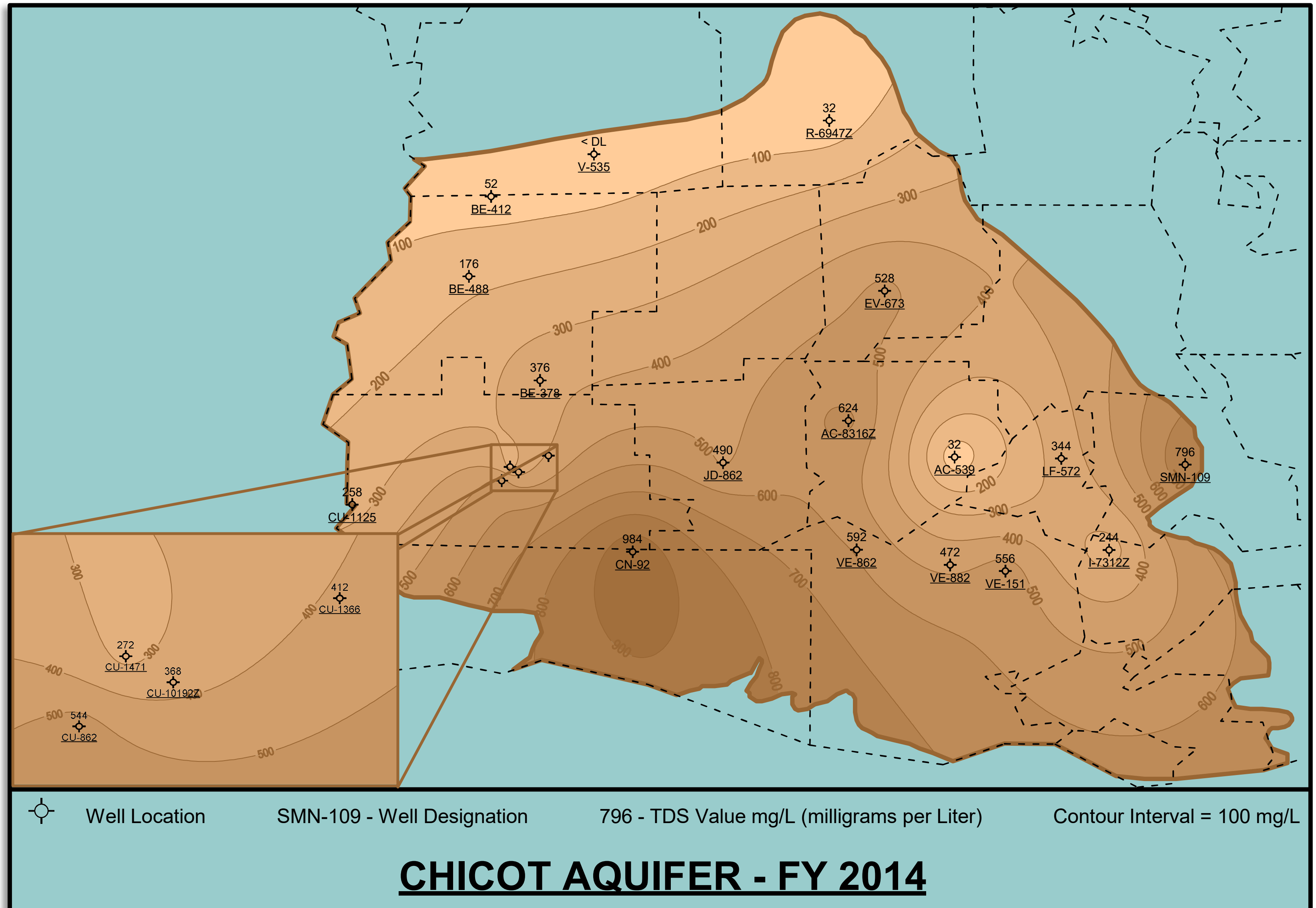

Figure 10-4: Map of Chloride Data

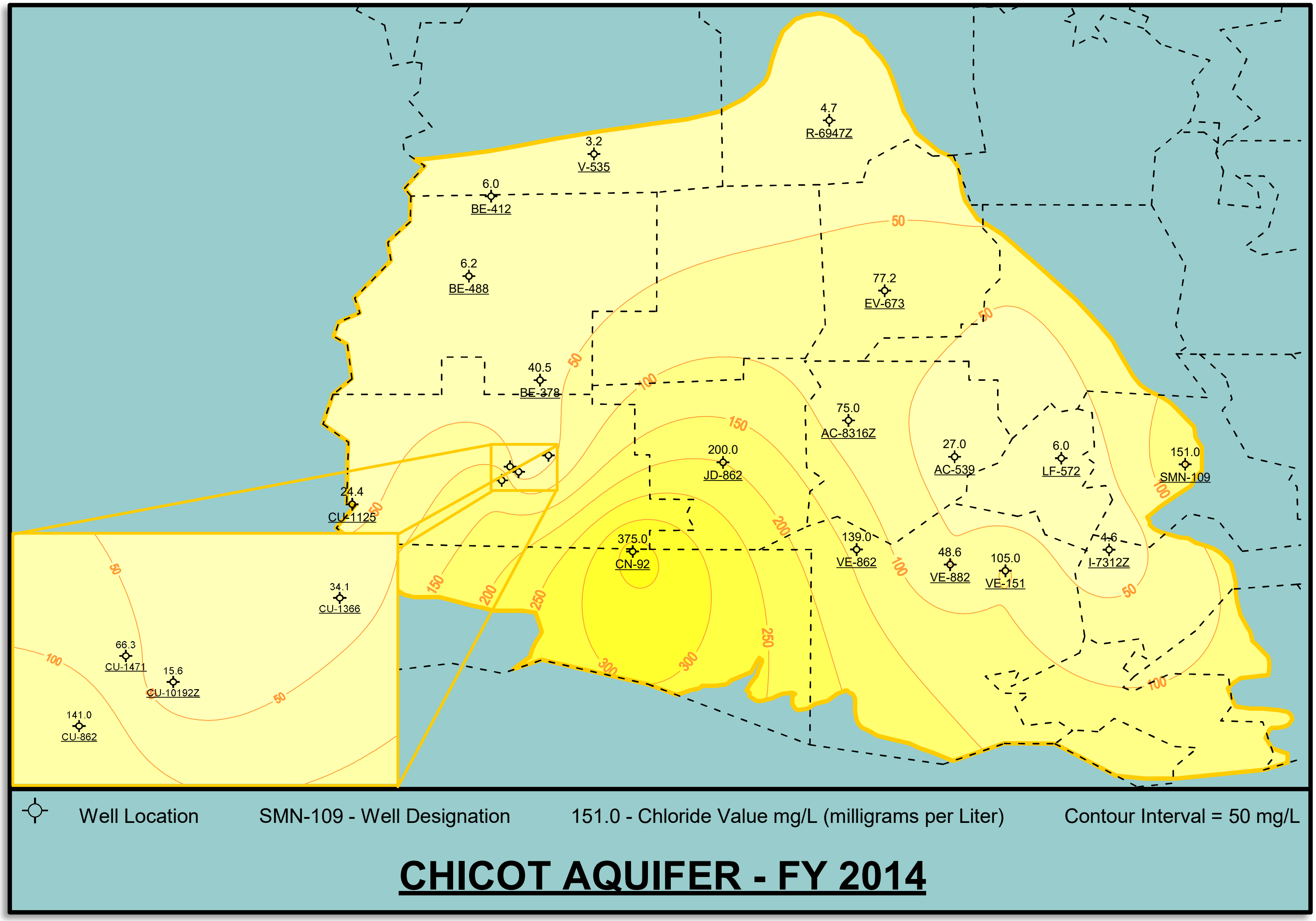

Figure 10-5: Map of Iron Data

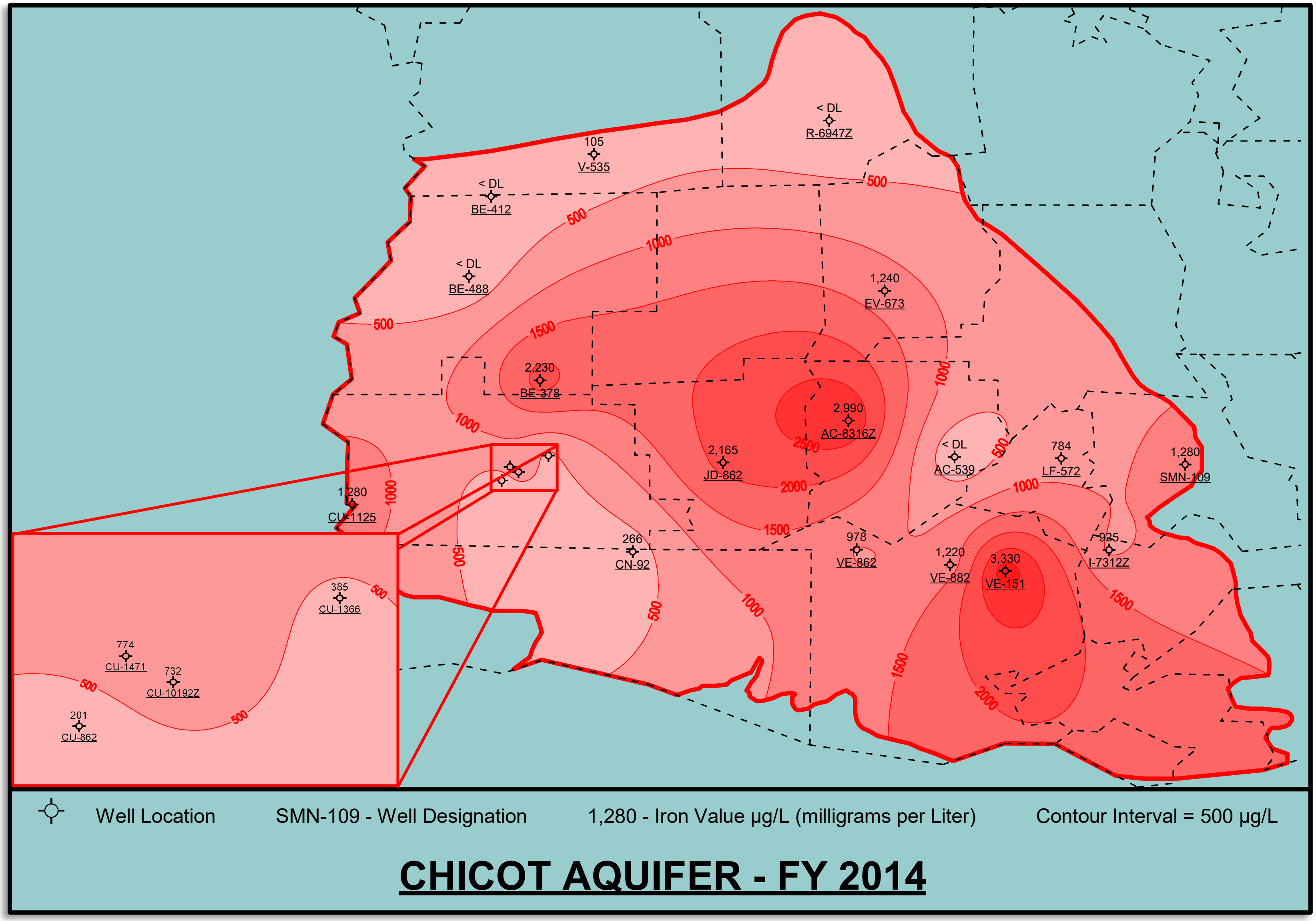

Chart 10-1: Temperature Trend

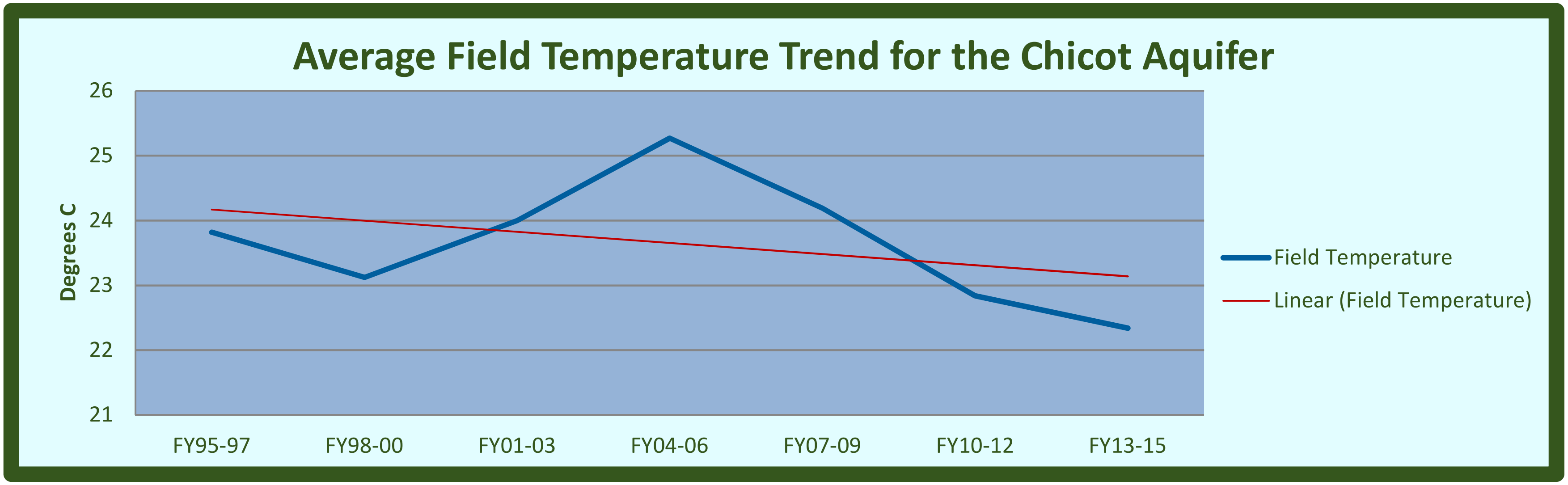

Chart 10-2: pH Trend

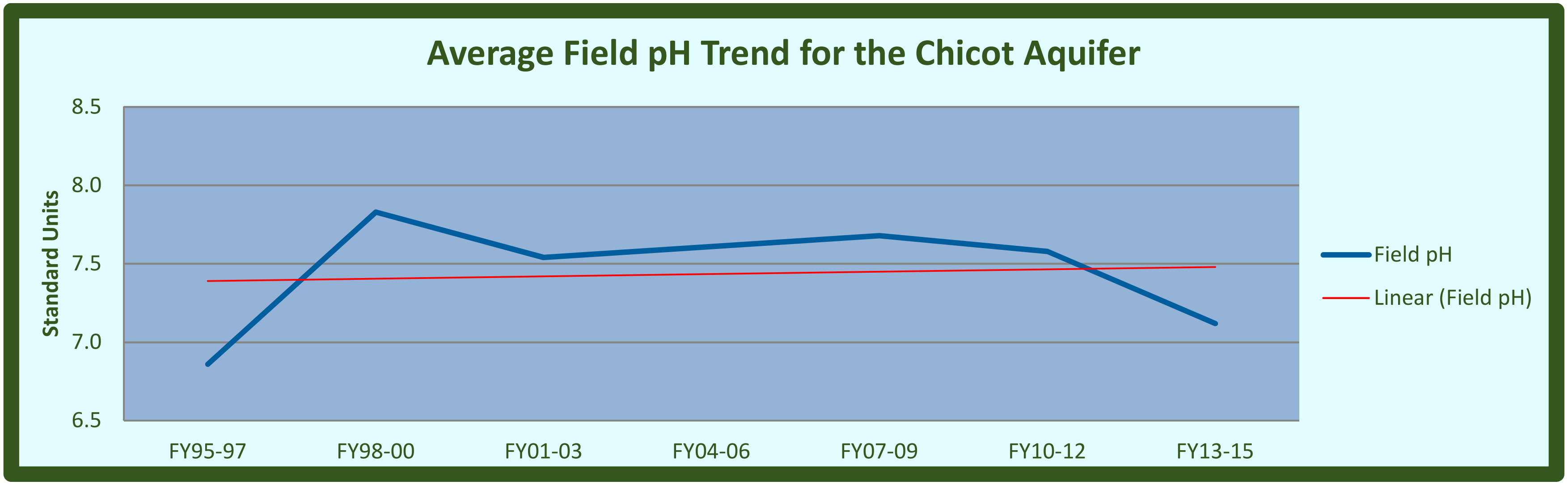

Chart 10-3: Field Specific Conductance Trend

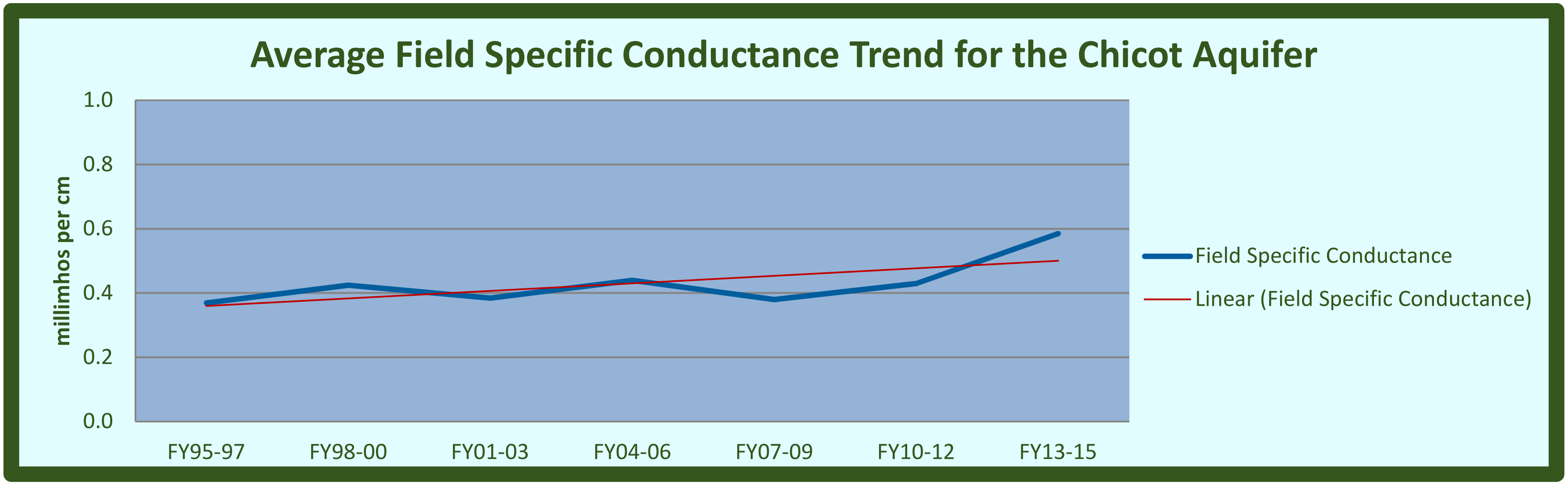

Chart 10-4: Lab Specific Conductance Trend

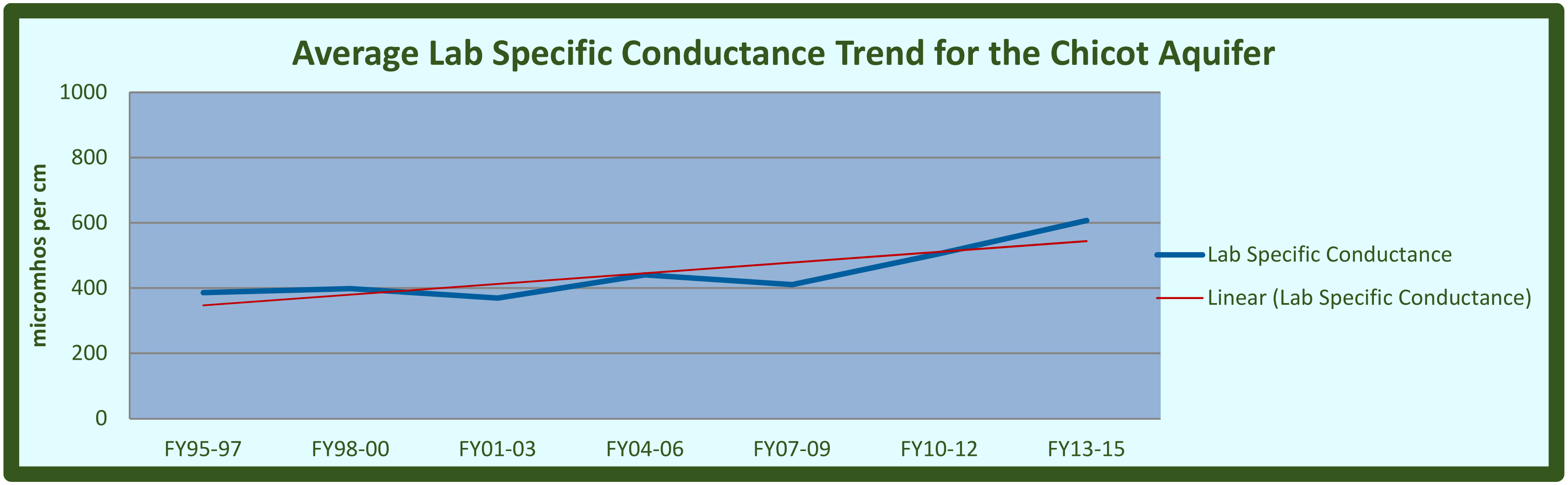

Chart 10-5: Field Salinity Trend

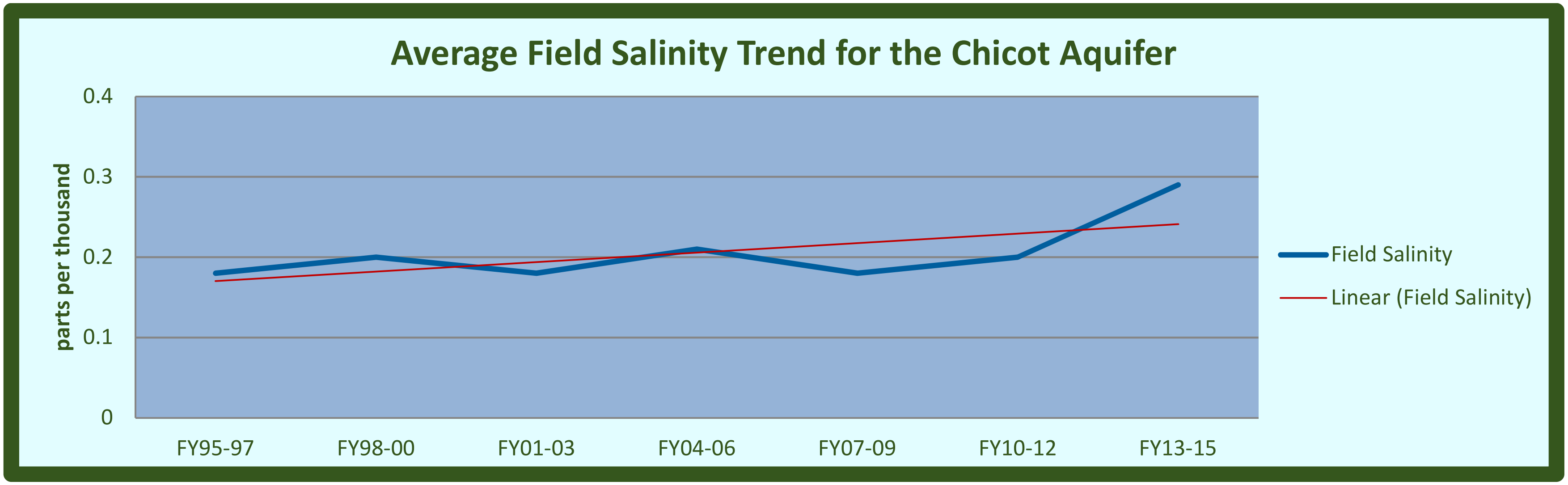

Chart 10-6: Chloride Trend

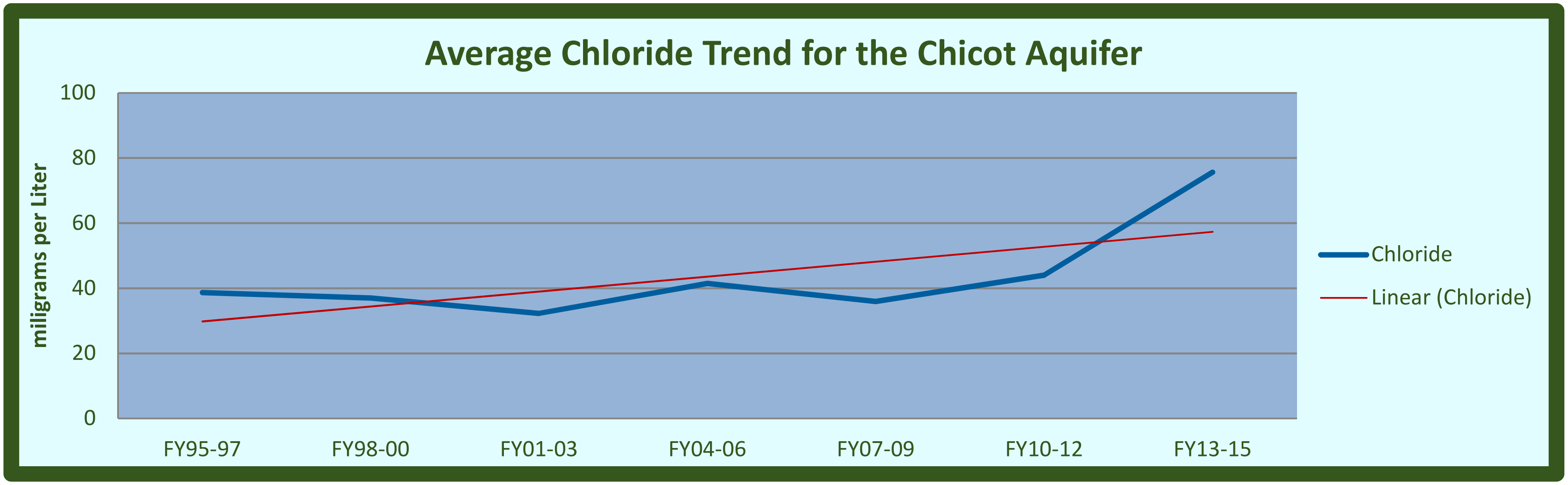

Chart 10-7: Alkalinity Trend

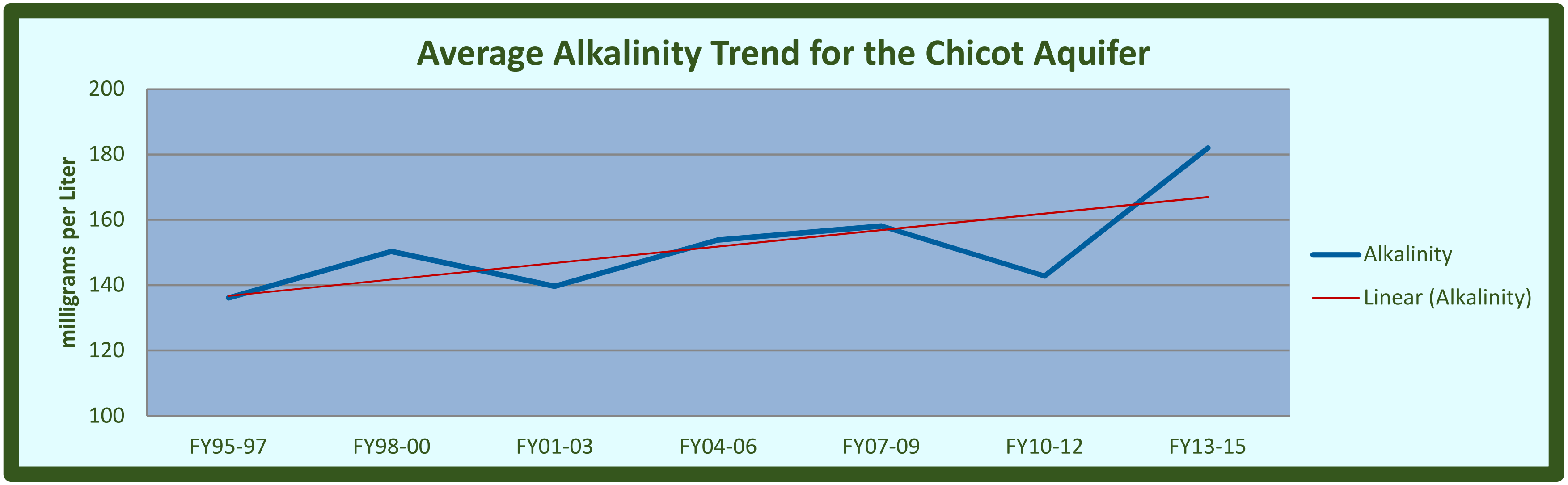

Chart 10-8: Color Trend

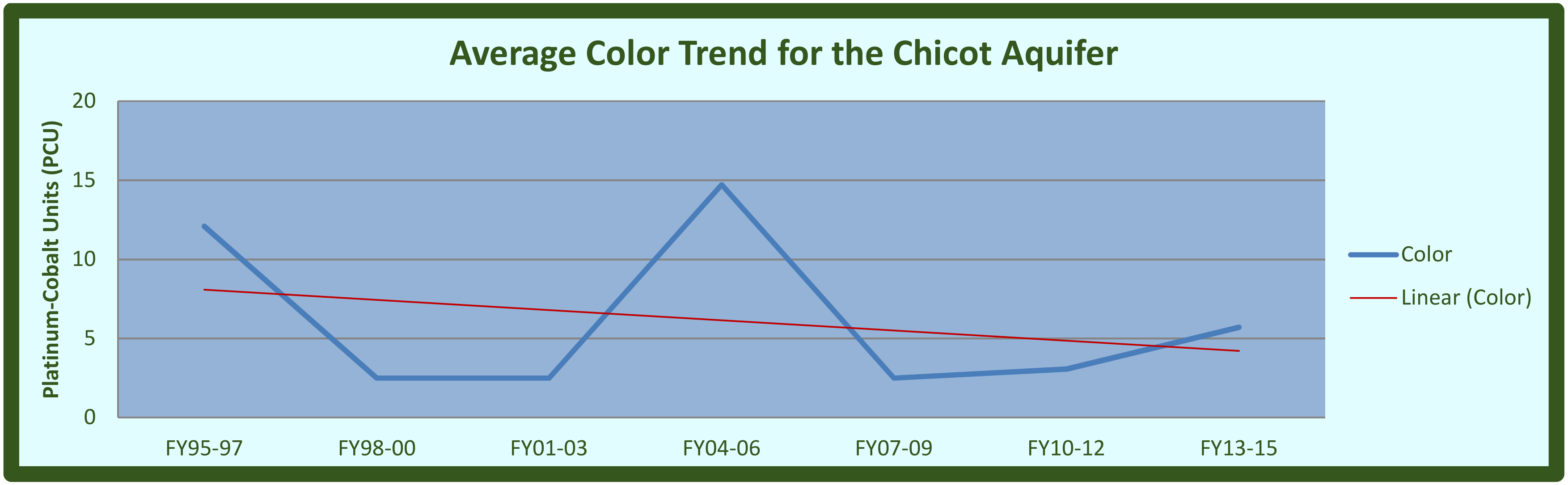

Chart 10-9: Sulfate Trend

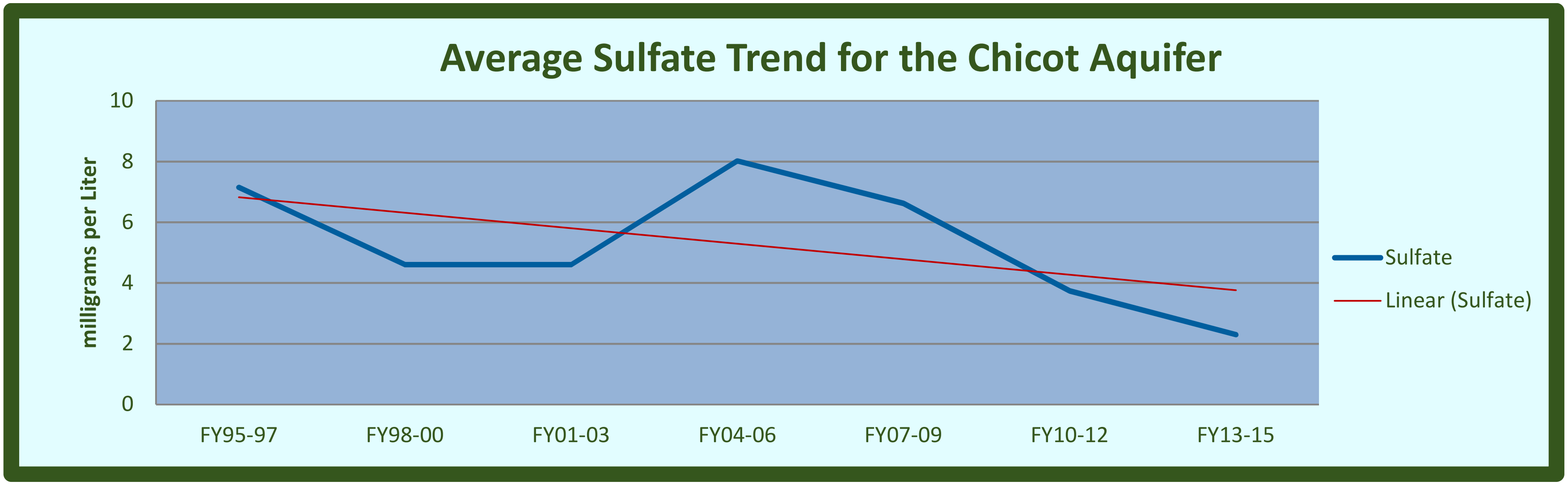

Chart 10-10: Total Dissolved Solids Trend

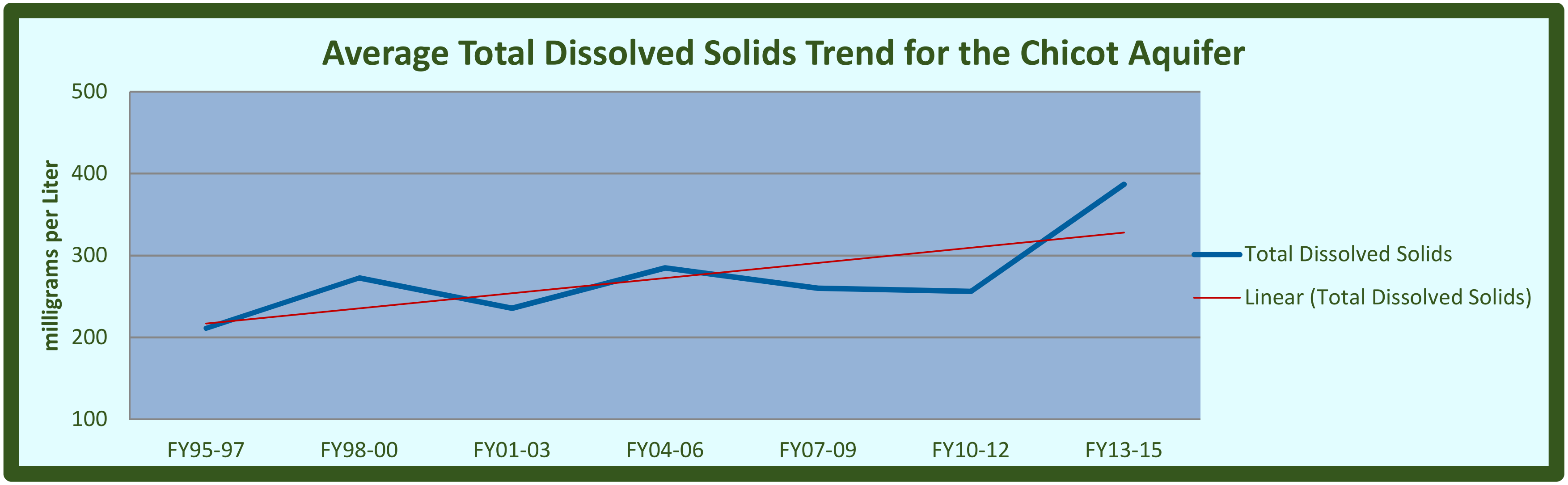

Chart 10-11: Hardness Trend

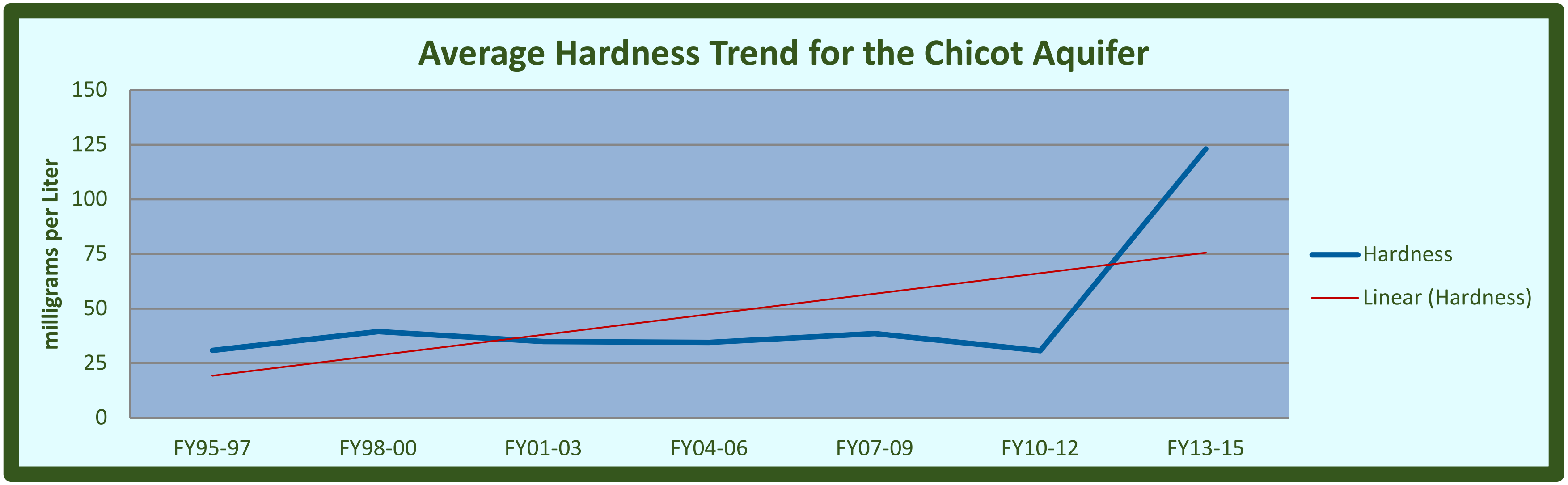

Chart 10-12: Ammonia Trend

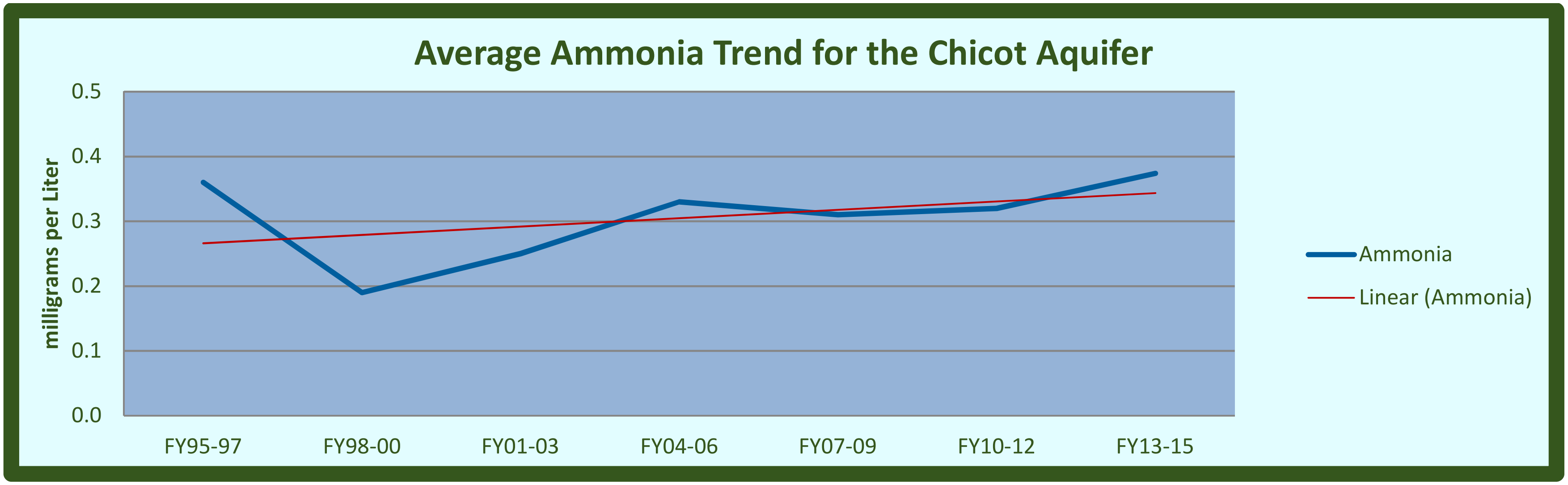

Chart 10-13: Nitrite – Nitrate Trend

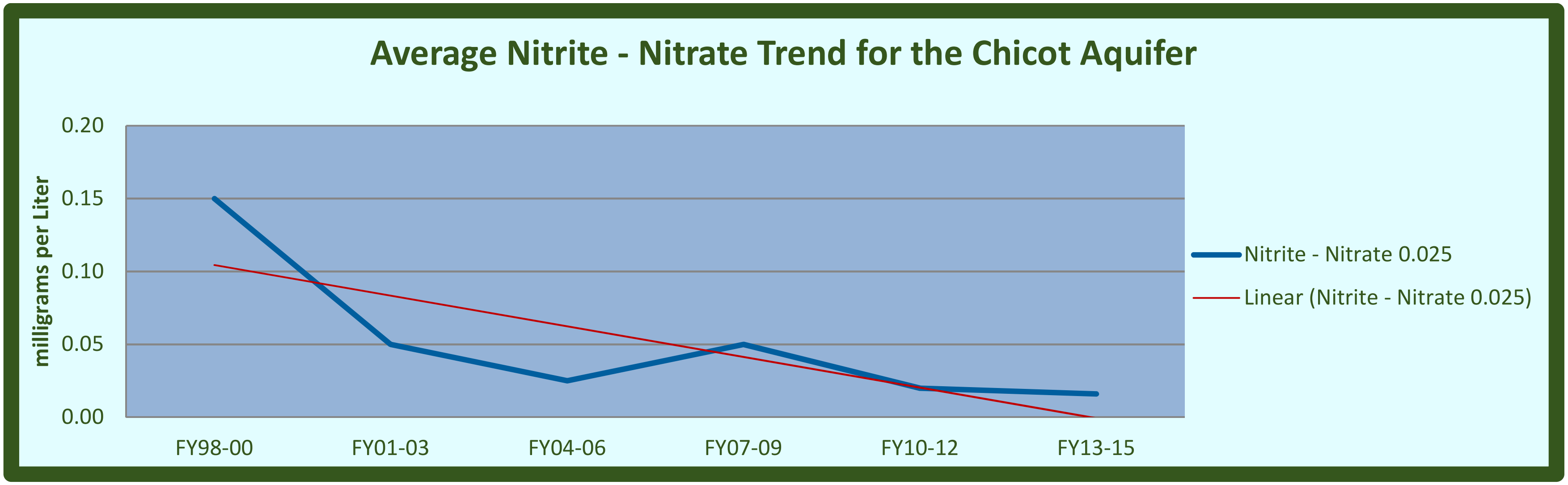

Chart 10-14: TKN Trend

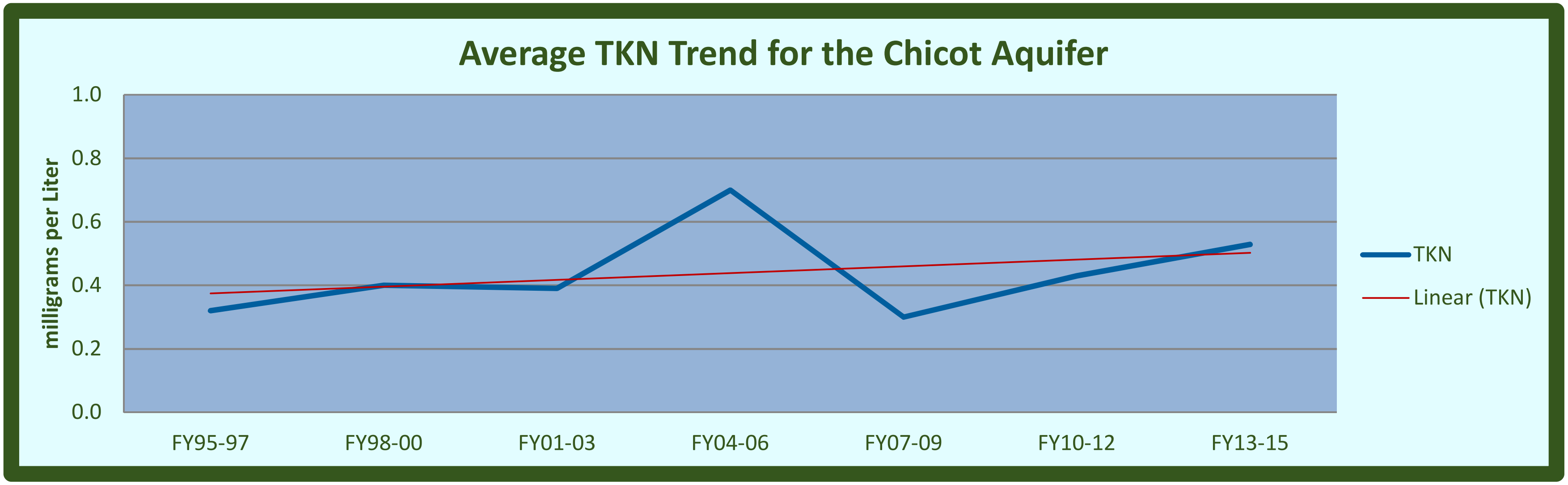

Chart 10-15: Total Phosphorus Trend

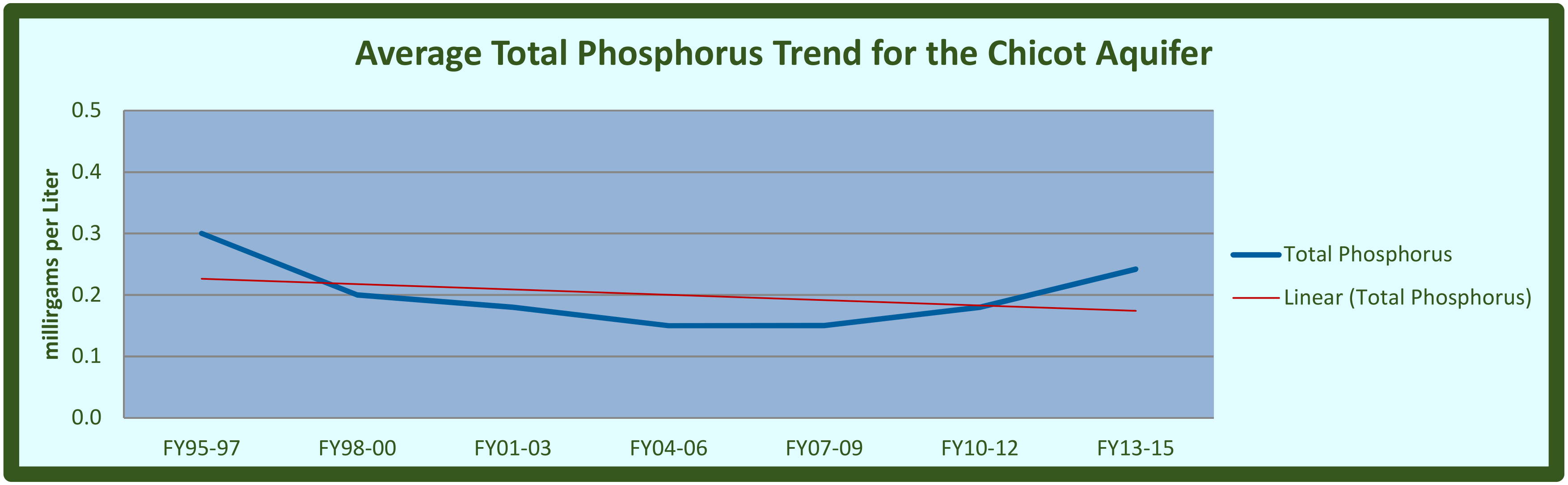

Chart 10-16: Iron Trend