MISSISSIPPI RIVER ALLUVIAL AQUIFER SUMMARY, 2014
AQUIFER SAMPLING AND ASSESSMENT PROGRAM

APPENDIX 8 TO THE 2015 TRIENNIAL SUMMARY REPORT

PARTIAL FUNDING PROVIDED BY THE CWA

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 are monitored on a rotating basis, within a three-year period so that each well is 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 Mississippi River Alluvial aquifer, during the 2014 state fiscal year (July 1, 2013 - June 30, 2014). This summary will become Appendix 8 of the ASSET Program Triennial Summary Report for 2015.

These data show that from July through December 2013, 22 wells were sampled which produce from the Mississippi River Alluvial aquifer. Seven of these 22 wells are classified as domestic, seven are classified as irrigation, seven as public supply, and one as an industrial use well. The wells are located in 14 parishes along or near the Mississippi River.

Figure 8-1 shows the geographic locations of the Mississippi River Alluvial aquifer and the associated wells, whereas Table 8-1 lists the wells in the aquifer along with their total depths, use made of produced waters, and date sampled.

Well data for registered water wells were obtained from the Louisiana Department of Natural Resources water well registration data file.

GEOLOGY

Mississippi River alluvium consists of fining upward sequences of gravel, sand, silt, and clay. The aquifer is poorly to moderately well sorted, with fine-grained to medium-grained sand near the top, grading to coarse sand and gravel in the lower portions. It is confined by layers of silt and clay of varying thicknesses and extent. The Mississippi River Alluvial aquifer consists of two distinct components; valley trains and meander-belt deposits which are closely related hydrologically.

HYDROGEOLOGY

The Mississippi River Alluvial aquifer is hydraulically connected with the Mississippi River and its major streams. Recharge is accomplished by direct infiltration of rainfall in the river valley, lateral and upward movement of water from adjacent and underlying aquifers, and overbank stream flooding. The amount of recharge from rainfall depends on the thickness and permeability of the silt and clay layers overlying it. Water levels fluctuate seasonally in response to precipitation trends and river stages. Water levels are generally within 30 to 40 feet of the land surface, and movement is downgradient and toward rivers and streams. Natural discharge occurs by seepage of water into the Mississippi River and its streams, but some water moves into the aquifer when stream stages are above aquifer water levels. The hydraulic conductivity varies between 10 and 530 feet/day.

The maximum depths of occurrence of freshwater in the Mississippi River Alluvial range from 20 feet below sea level to 500 feet below sea level. The range of thickness of the fresh water interval in the Mississippi River Alluvial is 50 to 500 feet. The depths of the Mississippi River Alluvial aquifer wells monitored in conjunction with ASSET program range from 30 feet to 352 feet below land surface, with an average depth of 133 feet.

PROGRAM PARAMETERS

The field parameters checked at each ASSET well sampling site and the list of conventional parameters analyzed in the laboratory are shown in Table 8-2. The inorganic (total metals) parameters analyzed in the laboratory are listed in Table 8-3. These tables also show the field and analytical results determined for each analyte. For quality control, duplicate samples were taken for each parameter at wells CO-YAKEY, MA-206, SMN-33, and WC-91.

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 8-8, 8-9, and 8-10 list the target analytes for volatiles, semi-volatiles and pesticides/PCBs, respectively.

Tables 8-4 and 8-5 provide a statistical overview of field and conventional, and inorganic data for the Mississippi River Alluvial aquifer, listing the minimum, maximum, and average results for these parameters collected in the FY 2014 sampling. Tables 8-6 and 8-7 compare these same parameter averages to historical ASSET-derived data for the Mississippi River Alluvial 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 8-2, 8-3, 8-4, and 8-5 respectively, represent the contoured values for pH, total dissolved solids, chloride, and iron. Charts 8-1 through 8-16 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 primary standards, or 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 does use the MCLs as a benchmark for further evaluation.

EPA has also set secondary standards, which are defined as non-enforceable taste, odor, or appearance guidelines. Field and laboratory data contained in Tables 8-2 and 8-3 show that one or more secondary MCLs (SMCLs) were exceeded in 20 of the 22 wells sampled in the Mississippi River Alluvial aquifer, with 38 SMCLs being exceeded.

Field and Conventional Parameters

Table 8-2 shows the field and conventional parameters for which samples are collected at each well and the analytical results for those parameters. Table 8-4 provides an overview of this data for the Mississippi River Alluvial aquifer, listing the minimum, maximum, and average results for these parameters.

Federal Primary Drinking Water Standards: A review of the analysis listed in Table 8-2 shows that no primary MCL was exceeded for field or conventional parameters for this reporting period. Those 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 is in this category.

Federal Secondary Drinking Water Standards: A review of the analysis listed in Table 8-2 shows that one well exceeded the SMCL for chloride, six wells exceeded the SMCL for color, and 12 wells exceeded the SMCL for total dissolved solids (TDS). Laboratory results override field results in exceedance determinations, thus only lab results will be counted in determining SMCL exceedance numbers for TDS. Following is a list of SMCL parameter exceedances with well number and results:

Chloride (SMCL = 250 mg/L):

FR-1358 – 270 mg/L

Color (SMCL = 15 color units (PCU)):

AV-462 – 112.0 PCU	CT-489 – 15.0 PCU
EB-885 – 119.0 PCU	IB-363 – 42.0 PCU
TS-FORTENB – 15.0 PCU	WC-91 – 20.1 PCU, Duplicate – 12.5 PCU, (< SMCL)

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

	LAB RESULTS (in mg/L)	FIELD MEASURES (in g/L)
AV-126	692 mg/L	0.548 g/L
AV-462	1,190 mg/L	0.951 g/L
AV-5135Z	808 mg/L	0.659 g/L
CO-YAKEY	816 mg/L, Duplicate – 812 mg/L	0.717 g/L (Original and Duplicate)
CT-489	716 mg/L	0.590 g/L
FR-1358	812 mg/L	0.809 g/L
IB-COM	744 mg/L	0.841 g/L
MA-206	572 mg/L, Duplicate – 584 mg/L	0.504 g/L (Original and Duplicate)
PC-5515Z	576 mg/L	0.552 g/L
TS-61	668 mg/L	0.594 g/L
WC-527	748 mg/L	0.747 g/L
WC-91	600 mg/L, Duplicate – 608 mg/L	0.627 g/L (Original and Duplicate)

Inorganic Parameters

Table 8-3 shows the inorganic (total metals) parameters for which samples are collected at each well and the analytical results for those parameters. Table 8-5 provides an overview of inorganic data for the Mississippi River Alluvial aquifer, listing the minimum, maximum, and average results for these parameters.

Federal Primary Drinking Water Standards: A review of the analyses listed on Table 8-3 shows that the Primary MCL for arsenic was exceeded in four of the 22 wells sampled for this period:

Arsenic (MCL = 10 µg/L):

EB-885 – 32.8 µg/L	IB-363 – 28.8 µg/L
MA-206 – 10.5 µg/L, Duplicate 10.6 µg/L	TS-FORTENB – 17.2 µg/L

Federal Secondary Drinking Water Standards: Laboratory data contained in Table 8-3 shows that 19 wells exceeded the secondary MCL for iron:

Iron (SMCL = 300 µg/L)

AV-126 – 16,000 µg/L	AV-462 – 5,020 µg/L
CO-YAKEY – 14,300 µg/L, Duplicate – 15,200 µg/L	CT-489 – 10,200 µg/L
EB-885 – 3,840 µg/L	EC-370 – 14,300 µg/L
FR-1358 – 5,010 µg/L	IB-363 – 1,750 µg/L
IB-COM – 6,920 µg/L	MA-206 – 11,800 µg/L, Duplicate – 11,800 µg/L
MO-871 – 7,510 µg/L	PC-5515Z – 5,370 µg/L
R-730 – 367 µg/L	RI-RAYVIL – 782 µg/L
SMN-33 – 1,830 µg/L, Duplicate – 1,860 µg/L	TS-61 – 10,200 µg/L
TS-FORTENB – 9,630 µg/L	WC-527 – 3,800 µg/L
WC-91 – 875 µg/L, Duplicate – 952 µg/L	

Volatile Organic Compounds

Table 8-8 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.

Two VOCs were reported in one domestic-use well, CO-YAKEY. Phenol and pyrene were detected at 43 µg/L and 50 µg/L, respectively. Even though there are no MCLs established for these compounds, close attention will be given to this well in future monitoring. No other VOC was detected at or above its detection limit during the FY 2014 sampling of the Mississippi River Alluvial aquifer.

Semi-Volatile Organic Compounds

Table 8-9 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 any SVOC at or above its detection limit during the FY 2014 sampling of the Mississippi River Alluvial aquifer.

Pesticides and PCBs

Table 8-10 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.

No pesticide or PCB was detected at or above its detection limit during the FY 2014 sampling of the Mississippi River Alluvial aquifer.

WATER QUALITY TRENDS AND COMPARISON TO HISTORICAL ASSET DATA

Analytical and field data show that the quality and characteristics of groundwater produced from the Mississippi River Alluvial aquifer exhibit some fluctuations when comparing current data to that of the six previous sampling rotations (three, six, nine, twelve, fifteen, and eighteen years prior). These comparisons can be found in Tables 8-6 and 8-7, and in Charts 8-1 to 8-16 of this summary. Over the eighteen-year period, five analytes have shown a slight to general increase in concentration. These analytes are: pH, specific conductance (field and lab), salinity, chloride, and sulfate. For this same period, nine analytes have demonstrated a nominal decrease in concentrations, which are: temperature, alkalinity, ammonia, color, copper, nitrite-nitrate, TKN, iron, and total phosphorus. All remaining analytes were stable or continue to be below detection limits.

The number of wells with secondary MCL exceedances has increased since the previous sampling. In FY 2011, 19 wells reported one or more secondary exceedances with 33 SMCLs exceeded. Sample results for FY 2014 show that there were 38 SMCL exceedances with one or more exceedances in 20 of the 22 wells sampled.

However, the number of wells with arsenic detections and MCL exceedances in FY 2014 has decreased since FY 2011. In FY 2011, 10 wells reported detections of arsenic with six wells exceeding the primary MCL of 10 µg/L. In FY 2014 five wells reported detections of arsenic with four exceeding the primary MCL.

SUMMARY AND RECOMMENDATIONS

In summary, the data show that the ground water produced from the Mississippi River Alluvial aquifer is hard.[1] The primary MCL for arsenic was the only short-term or long-term health risk guideline that was exceeded; however, this exceedance occurred in four of the 22 wells sampled in this aquifer. The data also show that this aquifer is of poor quality when considering short-term or long-term health risk guidelines, and is of poor quality when considering taste, odor, or appearance guidelines, with 38 secondary MCLs exceeded in 20 wells.

Comparison to historical ASSET-derived data shows only moderate fluctuations in the quality or characteristics of the Mississippi River Alluvial aquifer, with five parameters showing increases in concentration and nine parameters decreasing in concentration. This historical comparison shows that the number of wells with SMCL exceedances and the total number of SMCL exceedances have increased.

The occurrence of arsenic in the Mississippi River Alluvial aquifer has been established by historical activities of this program, with current sampling results supporting those previous findings. Sampling results for this reporting period, FY 2014, show that a total of five wells reported detections of arsenic, while four of those five exceeded the primary MCL for arsenic (10 µg/L). As a standard procedure of the ASSET Program, all well owners receive the results of their well sampling, while those well owners with primary MCL exceedances are given additional information about the particular compound, its health effects and possible treatment methods.

It is recommended that the wells assigned to the Mississippi River Alluvial aquifer be re-sampled as planned, in approximately three years, with continued attention given to the occurrence of arsenic in this aquifer. In addition, several wells should be added to those currently in place to increase the well density for this aquifer.

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

Table 8-1: List of Wells Sampled, Mississippi River Alluvial Aquifer–FY 2014

Well ID	Parish	Date	Owner	Depth (Feet)	Well Use
AV-126	Avoyelles	7/23/2013	Hamburg Mills	155	Domestic
AV-462	Avoyelles	7/23/2013	La Delta Plantation	110	Irrigation
AV-5135Z	Avoyelles	7/23/2013	Private Owner	110	Domestic
CO-YAKEY	Concordia	12/18/2013	Private Owner	150	Domestic
CT-489	Catahoula	12/18/2013	La Delta Plantation	144	Irrigation
CT-DENNIS	Catahoula	10/31/2013	Private Owner	30	Domestic
EB-885	East Baton Rouge	10/30/2013	La State University	352	Irrigation
EC-370	East Carroll	7/24/2013	Hollybrook Land	119	Irrigation
FR-1358	Franklin	11/20/2013	Macon Ridge Research Station	60	Irrigation
IB-363	Iberville	10/30/2013	Syngenta Crop Protection, Inc.	225	Industrial
IB-COM	Iberville	7/31/2013	Private Owner	185	Domestic
MA-206	Madison	11/21/2013	Tallulah Water Service	130	Public Supply
MO-871	Morehouse	9/18/2013	Private Owner	80	Irrigation
PC-5515Z	Pointe Coupee	7/31/2013	Private Owner	156	Domestic
RI-469	Richland	11/20/2013	Liddieville Water System	90	Public Supply
RI-730	Richland	11/21/2013	Start Water System	101	Public Supply
RI-RAYVIL	Richland	11/21/2013	Rayville Water Department	230	Public Supply
SMN-33	St. Martin	7/31/20132	LDOTD/Lafayette District	125	Public Supply
TS-61	Tensas	11/20/2013	Town of St. Joseph	140	Public Supply
TS-FORTENB	Tensas	12/18/2013	Private Owner	33	Domestic
WC-527	West Carroll	9/18/2013	Private Owner	85	Irrigation
WC-91	West Carroll	7/24/2013	New Carroll Water Association	115	Public Supply

Table 8-2: Summary of Field and Conventional Data, Mississippi River Alluvial Aquifer–FY 2014

Well ID	pH SU	Sal. ppt	Sp. Cond. mmhos per 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. µmmhos per cm	SO4 mg/L	TDS mg/L	TKN mg/l	TSS mg/L	Turb. NTU
	LABORATORY DETECTION LIMITS† →					5	0.25/ 12.5	1	5/25	0.01/ 0.25	0.05	0.05/ 0.25	10	0.25/ 25	10	0.1	4	0.3/ 1.5
	FIELD PARAMETERS					LABORATORY PARAMETERS												
AV-126	6.93	0.41	0.843	20.88	0.548	400	24.8	4.7	448	0.02	0.59	2.38	814	20.5	692	0.57	38	80.0
AV-462	7.44	0.74	1.463	18.92	0.951	417	126.0	112.0	440	0.02	0.27	0.30	1,480	227.0	1,190	0.34	5	46.8
AV-5135Z	7.12	0.50	1.013	19.39	0.659	317	124.0	12.4	432	0.03	0.26	0.19	1,040	104.0	808	0.28	< DL	< DL
CO-YAKEY	7.10	0.55	1.104	14.98	0.717	550	38.4	12.0	560	< DL	3.34	1.11	1,080	< DL	816	4.09	33	160.0
CO-YAKEY*	7.10	0.55	1.104	14.98	0.717	548	39.2	12.0	500	< DL	2.62	1.36	1,090	< DL	812	5.16	14	120.0
CT-489	7.08	0.45	0.907	19.68	0.590	436	26.0	15.0	400	< DL	1.00	< DL	896	0.3	716	1.64	< DL	56.5
CT-DENNIS	6.80	0.10	0.202	20.63	0.132	66	11.2	3.0	60	0.02	< DL	< DL	215	3.8	144	0.70	< DL	< DL
EB-885	7.11	0.39	0.800	20.65	0.520	416	12.4	119.0	384	< DL	2.57	0.26	790	< DL	476	2.87	6	34.5
EC-370	7.26	0.32	0.659	18.03	0.429	341	12.8	8.6	400	0.10	1.26	2.05	634	< DL	412	1.45	28	152.0
FR-1358	6.92	0.62	1.245	20.02	0.809	254	270.0	< DL	80	0.01	0.28	0.36	1,310	17.6	812	1.13	22	22.0
IB-363	7.60	0.30	0.612	18.62	0.398	224	50.1	42.0	176	< DL	1.96	0.67	614	15.7	392	1.43	< DL	9.2
IB-COM	7.26	0.65	1.295	22.28	0.841	306	236.0	< DL	272	< DL	0.42	0.34	1,330	< DL	744	0.49	5	38.3
MA-206	7.16	0.38	0.776	19.68	0.504	426	14.0	7.0	120	< DL	1.10	0.94	743	4.2	572	1.66	32	101.0
MA-206*	7.16	0.38	0.776	19.68	0.504	444	14.0	3.0	100	< DL	1.18	0.94	748	4.3	584	3.03	30	123.0
MO-871	7.18	0.32	0.648	17.77	0.421	248	41.3	7.0	232	< DL	0.65	0.53	627	24.9	408	0.40	14	23.6
PC-5515Z	7.41	0.42	0.849	19.31	0.552	370	46.3	< DL	280	< DL	1.22	0.64	858	< DL	576	1.25	31	53.5
RI-469	6.91	0.13	0.276	19.64	0.179	42	35.2	< DL	30	5.30	< DL	0.20	278	6.1	320	0.58	4	< DL
RI-730	7.28	0.23	0.483	19.68	0.314	156	38.1	< DL	168	1.90	0.06	< DL	478	30.5	396	0.30	< DL	< DL
RI-RAYVIL	7.54	0.23	0.477	19.48	0.310	220	18.5	< DL	200	< DL	0.41	< DL	489	< DL	400	0.78	< DL	3.0
SMN-33	7.66	0.21	0.439	17.06	0.285	216	22.5	9.0	260	< DL	1.07	0.51	456	< DL	328	1.17	< DL	4.2
SMN-33*	7.66	0.21	0.439	17.06	0.285	206	22.4	5.0	268	< DL	1.10	0.52	457	< DL	340	1.14	< DL	3.8
TS-61	7.14	0.45	0.914	19.87	0.594	466	16.0	< DL	48	< DL	1.92	0.60	894	< DL	668	2.91	23	111.0
TS-FORTENB	7.45	0.40	0.815	15.87	0.529	406	17.7	15.0	360	< DL	1.16	1.17	809	< DL	436	1.90	18	75.0
WC-527	6.75	0.57	1.149	17.67	0.747	< DL	95.9	< DL	392	0.09	0.56	0.34	1,120	42.0	748	0.30	7	26.9
WC-91	7.39	0.48	0.965	18.02	0.627	322	130.0	20.1	380	0.02	0.22	0.82	1,010	13.4	600	0.55	< DL	6.8
WC-91*	7.39	0.48	0.965	18.02	0.627	321	129.0	12.4	432	0.07	0.23	0.81	999	13.2	608	0.52	< DL	7.5

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

Table 8-3: Summary of Inorganic Data, Mississippi River Alluvial 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†	5/25	4/20	5/25	2/10	2/10	4/20	2/10	100/ 500	1/5	0.0002	3/15	5/25	1/5	2/10	6/30
AV-126	< DL	< DL	566	< DL	< DL	< DL	5.1	16,000	6.9	< DL	< DL	< DL	< DL	< DL	218.0
AV-462	< DL	< DL	59	< DL	< DL	< DL	< DL	5,020	< DL	< DL	< DL	< DL	< DL	< DL	< DL
AV-5135Z	< DL	< DL	177	< DL	< DL	< DL	< DL	261	< DL	< DL	< DL	< DL	< DL	< DL	< DL
CO-YAKEY	< DL	< DL	896	< DL	< DL	< DL	< DL	14,300	< DL	< DL	< DL	< DL	< DL	< DL	7.3
CO-YAKEY*	< DL	< DL	978	< DL	< DL	< DL	2.2	15,200	< DL	< DL	3.9	< DL	< DL	< DL	11.2
CT-489	< DL	< DL	486	< DL	< DL	< DL	3.2	10,200	< DL	< DL	4.0	< DL	< DL	< DL	31.1
CT-DENNIS	< DL	< DL	67	< DL	< DL	< DL	18.3	105	< DL	< DL	< DL	< DL	< DL	< DL	29.9
EB-885	< DL	32.8	692	< DL	< DL	< DL	< DL	3,840	< DL	< DL	< DL	< DL	< DL	< DL	< DL
EC-370	< DL	< DL	521	< DL	< DL	< DL	< DL	14,300	< DL	< DL	< DL	< DL	< DL	< DL	43.2
FR-1358	< DL	< DL	206	< DL	< DL	< DL	< DL	5,010	< DL	< DL	3.8	< DL	< DL	< DL	< DL
IB-363	< DL	28.8	421	< DL	< DL	< DL	< DL	1,750	< DL	< DL	< DL	< DL	< DL	< DL	< DL
IB-COM	< DL	< DL	713	< DL	< DL	< DL	< DL	6,920	< DL	< DL	< DL	< DL	< DL	< DL	116.0
MA-206	< DL	10.5	548	< DL	< DL	< DL	< DL	11,800	< DL	< DL	< DL	< DL	< DL	< DL	< DL
MA-206*	< DL	10.6	544	< DL	< DL	< DL	< DL	11,800	< DL	< DL	< DL	< DL	< DL	< DL	< DL
MO-871	< DL	7.47	332	< DL	< DL	< DL	< DL	7,510	< DL	< DL	< DL	< DL	< DL	< DL	< DL
PC-5515Z	< DL	< DL	1,210	< DL	< DL	< DL	< DL	5,370	< DL	< DL	< DL	< DL	< DL	< DL	< DL
RI-469	< DL	< DL	36	< DL	< DL	4.12	3.6	< DL	< DL	< DL	3.5	< DL	< DL	< DL	220.0
RI-730	< DL	< DL	127	< DL	< DL	< DL	< DL	367	< DL	0.0002	< DL	< DL	< DL	< DL	12.3
RI-RAYVIL	< DL	< DL	145	< DL	< DL	< DL	< DL	782	< DL	0.0002	< DL	< DL	< DL	< DL	< DL
SMN-33	< DL	< DL	580	< DL	< DL	< DL	< DL	1,830	< DL	< DL	< DL	< DL	< DL	< DL	< DL
SMN-33*	< DL	< DL	570	< DL	< DL	< DL	< DL	1,860	< DL	< DL	< DL	< DL	< DL	< DL	< DL
TS-61	< DL	< DL	849	< DL	< DL	< DL	< DL	10,200	< DL	0.0005	< DL	< DL	< DL	< DL	< DL
TS-FORTENB	< DL	17.2	414	< DL	< DL	< DL	4.0	9,630	< DL	< DL	< DL	< DL	< DL	< DL	208.0
WC-527	< DL	< DL	407	< DL	< DL	< DL	< DL	3,800	< DL	< DL	< DL	< DL	< DL	< DL	< DL
WC-91	< DL	< DL	163	< DL	< DL	< DL	< DL	875	< DL	< DL	< DL	< DL	< DL	< DL	51.0
WC-91*	< DL	< DL	165	< DL	< DL	< DL	< DL	952	< DL	< DL	< DL	< DL	< DL	< DL	49.2

†Detection limits vary due to dilution factor. *Denotes Duplicate Sample Exceeds EPA Primary Standard Exceeds EPA Secondary Standards

Table 8-4: FY 2014 Field and Conventional Statistics, ASSET Wells

	PARAMETER	MINIMUM	MAXIMUM	AVERAGE
FIELD	pH (SU)	6.75	7.66	7.22
	Salinity (ppt)	0.10	0.74	0.40
	Specific Conductance (mmhos/cm)	0.202	1.463	0.816
	Temperature (^{O}C)	14.98	22.28	18.76
	TDS (g/L)	0.132	0.951	0.530
LABORATORY	Alkalinity (mg/L)	< DL	550	312
	Chloride (mg/L)	11.2	270.0	63.0
	Color (PCU)	< DL	119.0	16.3
	Hardness (mg/L)	30	560	286
	Nitrite - Nitrate, as N (mg/L)	< DL	5.30	0.29
	Ammonia, as N (mg/L)	< DL	3.34	0.98
	Total Phosphorus (mg/L)	< DL	2.38	0.66
	Specific Conductance (µmhos/cm)	215	1,480	818
	Sulfate (mg/L)	< DL	277.0	20.3
	TDS (mg/L)	144	1,190	577
	TKN (mg/L)	0.28	5.16	1.41
	TSS (mg/L)	< DL	38	13
	Turbidity (NTU)	< DL	160.0	48.4

Table 8-5: FY 2014 Inorganic Statistics, ASSET Wells

PARAMETER	MINIMUM	MAXIMUM	AVERAGE
Antimony (µg/L)	< DL	< DL	< DL
Arsenic (µg/L)	< DL	32.8	5.7
Barium (µg/L)	36	1,210	457
Beryllium (µg/L)	< DL	< DL	< DL
Cadmium (µg/L)	< DL	< DL	< DL
Chromium (µg/L)	< DL	< DL	< DL
Copper (µg/L)	< DL	118.3	2.2
Iron (µg/L)	< DL	16,000	6,143
Lead (µg/L)	< DL	6.9	< DL
Mercury (µg/L)	< DL	0.0005	< DL
Nickel (µg/L)	< DL	4.0	1.9
Selenium (µg/L)	< DL	< DL	< DL
Silver (µg/L)	< DL	< DL	< DL
Thallium (µg/L)	< DL	< DL	< DL
Zinc (µg/L)	< DL	220.0	40.0

Table 8-6: 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)	6.70	6.63	6.91	6.98	7.22	7.35	7.22
	Salinity (ppt)	0.35	0.39	0.41	0.40	0.44	0.40	0.40
	Specific Conductance (mmhos/cm)	0.760	0.790	0.810	0.800	0.890	0.811	0.816
	Temperature (^{O}C)	19.09	20.60	20.13	19.62	20.40	19.13	18.76
	TDS (g/L)	-	-	-	0.520	0.580	0.530	0.530
LABORATORY	Alkalinity (mg/L)	306	328	316	347	336	240	312
	Chloride (mg/L)	68.2	55.2	44.8	48.6	75.2	54.9	63.0
	Color (PCU)	26.0	16.1	47.7	38.0	17.2	4.9	16.3
	Hardness (mg/L)	300	310	304	298	341	294	286
	Nitrite - Nitrate, as N (mg/L)	0.31	0.29	0.72	0.19	0.29	0.21	0.29
	Ammonia, as N (mg/L)	1.26	1.00	0.95	1.10	0.85	0.85	0.98
	Total Phosphorus (mg/L)	0.49	0.54	0.54	0.59	0.48	0.57	0.66
	Specific Conductance (μmhos/cm)	769	804	770	766	872	709	818
	Sulfate (mg/L)	7.7	25.2	24.8	22.5	30.9	17.0	20.3
	TDS (mg/L)	674	495	482	489	521	577	577
	TKN (mg/L)	1.34	1.43	1.27	1.36	0.99	1.24	1.41
	TSS (mg/L)	19	15	12	16	14	12	13
	Turbidity (NTU)	46.32	62.12	57.86	75.25	61.00	52.84	48.43

Table 8-7: 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)	12.7	14.6	9.2	14.3	9.5	10.5	5.7
Barium (μg/L)	474	412	404	524	404	403	457
Beryllium (μg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Cadmium (μg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Chromium (μg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Copper (μg/L)	9.9	8.6	6.2	< DL	< DL	< DL	2.2
Iron (μg/L)	5,022	4,690	6,008	8,726	5,985	5,045	6,143
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	5.1	1.9
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)	43.5	177.2	48.3	29.6	28.0	61.8	40.0

Table 8-8: VOC Analytical Parameters

COMPOUND	METHOD	DETECTION LIMIT (µg/L)
1,1-Dichloroethane	624	2 / 0.5
1,1-Dichloroethene	624	2 / 0.5
1,1,1-Trichloroethane	624	2 / 0.5
1,1,2- Trichloroethane	624	2 / 0.5
1,1,2,2-Tetrachloroethane	624	2 / 0.5
1,2-Dichlorobenzene	624	2 / 0.5
1,2-Dichloroethane	624	2 / 0.5
1,2-Dichloropropane	624	2 / 0.5
1,2,3-Trichlorobenzene	624	2 / 0.5
1,3-Dichlorobenzene	624	2 / 0.5
1,4-Dichlorobenzene	624	2 / 0.5
Benzene	624	2 / 0.5
Bromoform	624	2 / 0.5
Carbon Tetrachloride	624	2 / 0.5
Chlorobenzene	624	2 / 0.5
Dibromochloromethane	624	2 / 0.5
Chloroethane	624	2 / 0.5
trans-1,2-Dichloroethene	624	2 / 0.5
cis-1,3-Dichloropropene	624	2 / 0.5
Bromodichloromethane	624	2 / 0.5
Methylene Chloride	624	2 / 0.5
Ethyl Benzene	624	2 / 0.5
Bromomethane	624	2 / 0.5
Chloromethane	624	2 / 0.5
o-Xylene	624	2 / 0.5
Styrene	624	2 / 0.5
Methyl-t-Butyl Ether	624	2 / 0.5
Tetrachloroethene	624	2 / 0.5
Toluene	624	2 / 0.5
trans-1,3-Dichloropropene	624	2 / 0.5
Trichloroethene	624	2 / 0.5
Trichlorofluoromethane	624	2 / 0.5
Chloroform	624	2 / 0.5
Vinyl Chloride	624	2 / 0.5
m- & p-Xylenes	624	2 / 1

Table 8-9: SVOC Analytical Parameters

COMPOUND	METHOD	DETECTION LIMIT (µg/L)
1,2,4-Trichlorobenzene	625	5
2-Chloronaphthalene	625	5
2-Chlorophenol	625	5
2-Methyl-4,6-dinitrophenol	625	10
2-Nitrophenol	625	10
2,4-Dichlorophenol	625	5
2,4-Dimethylphenol	625	5
2,4-Dinitrophenol	625	20
2,4-Dinitrotoluene	625	4
2,4,6-Trichlorophenol	625	5
2,6-Dinitrotoluene	625	5
3,3'-Dichlorobenzidine	625	5
4-Bromophenyl phenyl ether	625	5
4-Chloro-3-methylphenol	625	5
4-Chlorophenyl phenyl ether	625	5
4-Nitrophenol	625	20
Acenaphthene	625	5
Acenaphthylene	625	5
Anthracene	625	5
Benzidine	625	20
Benzo[a]pyrene	625	5
Benzo[k]fluoranthene	625	5
Benzo[a]anthracene	625	5
Benzo[b]fluoranthene	625	5
Benzo[g,h,i]perylene	625	5
Bis(2-chloroethoxy)methane	625	5
Bis(2-ethylhexyl)phthalate	625	5
Bis(2-chloroethyl)ether	625	5
Bis(2-chloroisopropyl)ether	625	5
Butylbenzylphthalate	625	5
Chrysene	625	5
Dibenzo[a,h]anthracene	625	5
Diethylphthalate	625	5
Dimethylphthalate	625	5
Di-n-butylphthalate	625	5
Di-n-octylphthalate	625	5
Fluoranthene	625	5

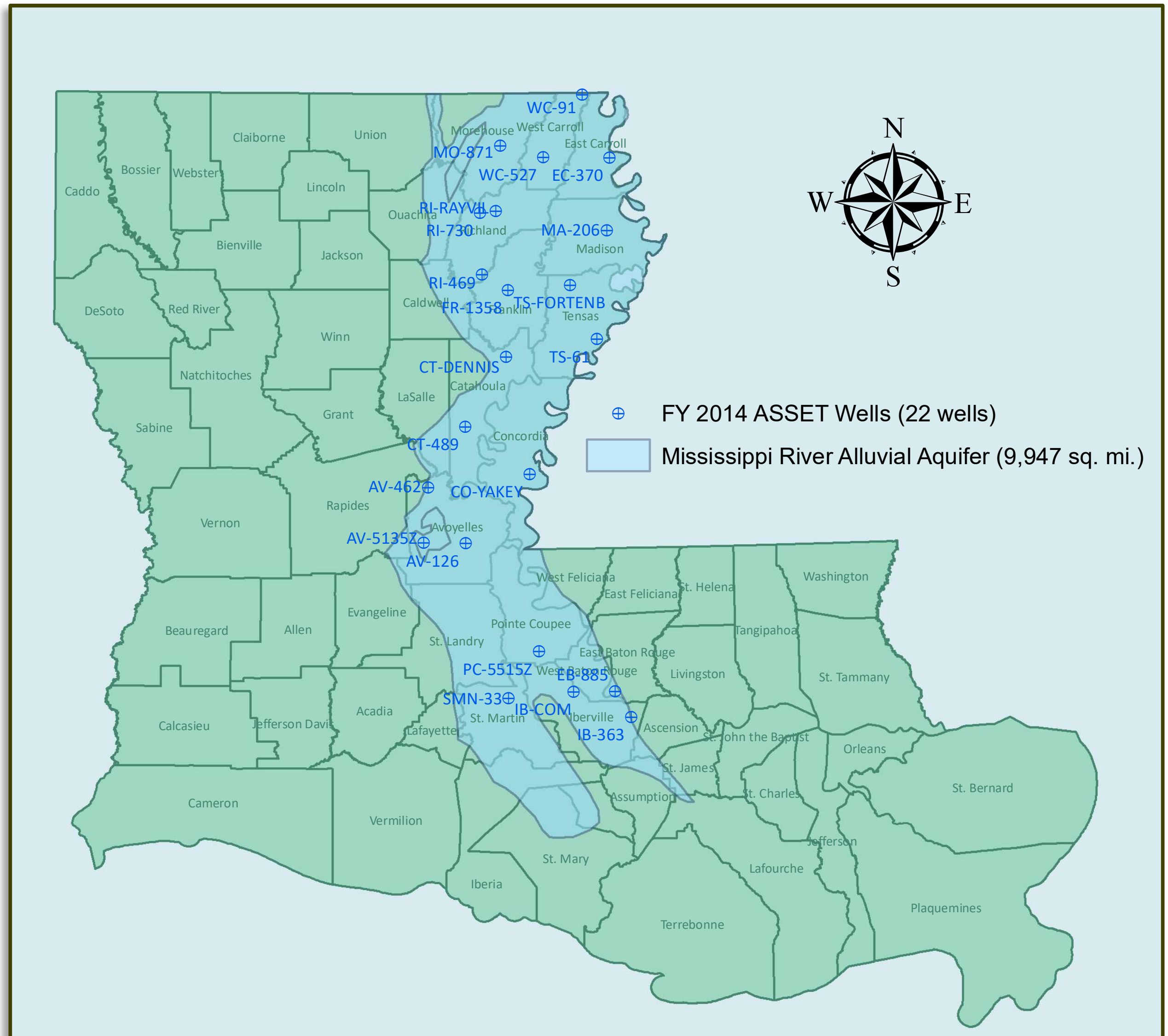
Table 8-9: SVOCs (Continued)

COMPOUND	METHOD	DETECTION LIMIT (µg/L)
Fluorene	625	5
Hexachlorobenzene	625	5
Hexachlorobutadiene	625	5
Hexachlorocyclopentadiene	625	10
Hexachloroethane	625	5
Indeno[1,2,3-cd]pyrene	625	5
Isophorone	625	5
Naphthalene	625	5
Nitrobenzene	625	5
N-Nitrosodimethylamine	625	5
N-Nitrosodiphenylamine	625	5
N-nitroso-di-n-propylamine	625	10
Pentachlorophenol	625	10
Phenanthrene	625	5
Phenol	625	5
Pyrene	625	5

Table 8-10: Pesticides and PCBs

COMPOUND	METHOD	DETECTION LIMITS (µg/L)
4,4'-DDD	608	0.05
4,4'-DDE	608	0.05
4,4'-DDT	608	0.05
Aldrin	608	0.05
Alpha-Chlordane	608	0.05
alpha-BHC	608	0.05
beta-BHC	608	0.05
delta-BHC	608	0.05
gamma-BHC	608	0.05
Chlordane	608	0.2
Dieldrin	608	0.05
Endosulfan I	608	0.05
Endosulfan II	608	0.05
Endosulfan Sulfate	608	0.05
Endrin	608	0.05
Endrin Aldehyde	608	0.05
Endrin Ketone	608	0.05
Heptachlor	608	0.05
Heptachlor Epoxide	608	0.05
Methoxychlor	608	0.05
Toxaphene	608	3
Gamma-Chlordane	608	0.05
PCB-1016	608	0.5
PCB-1221	608	0.5
PCB-1232	608	0.5
PCB-1242	608	0.5
PCB-1248	608	0.5
PCB-1254	608	0.5
PCB-1260	608	0.5

Figure 8-1: Location Plat, Mississippi River Alluvial 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 8-2: Map of pH Data

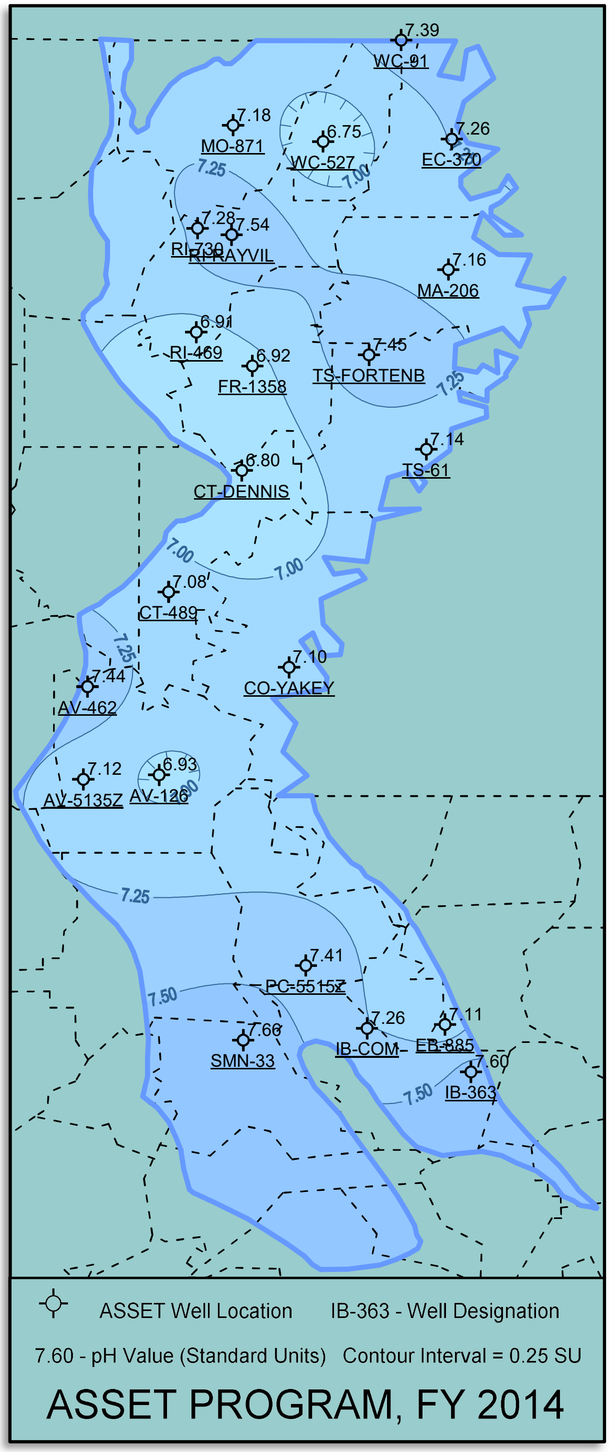

Figure 8-3: Map of TDS Data

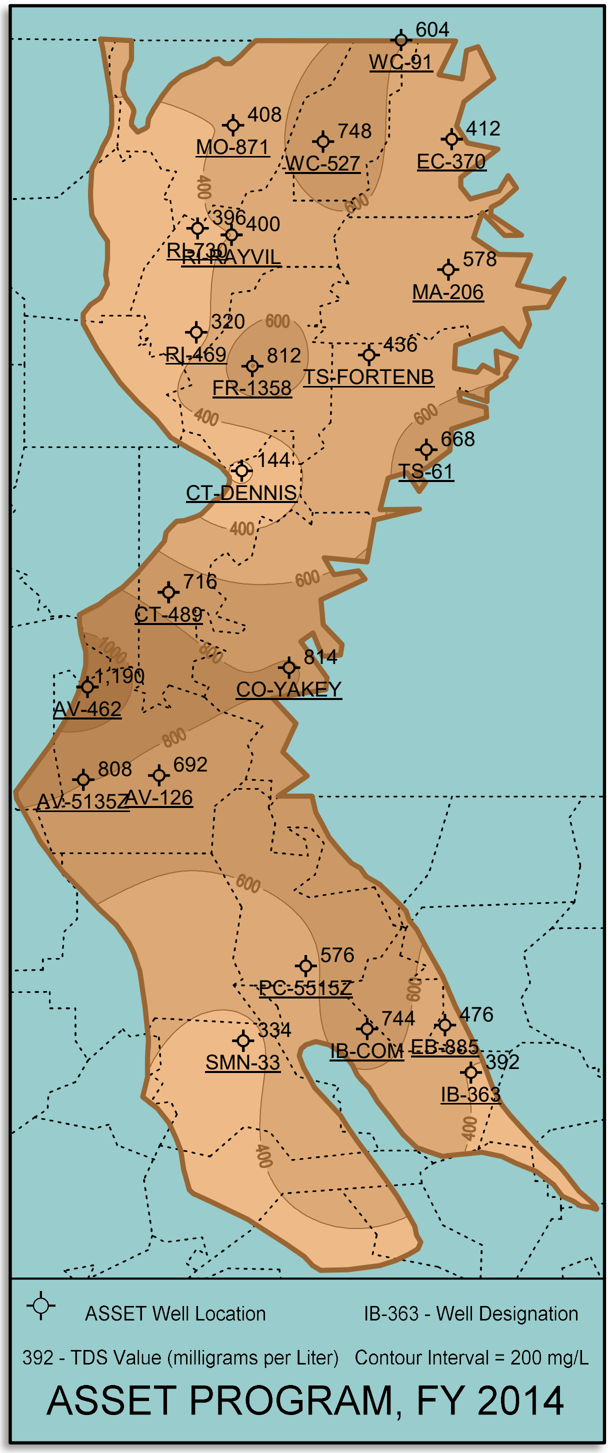

Figure 8-4: Map of Chloride Data

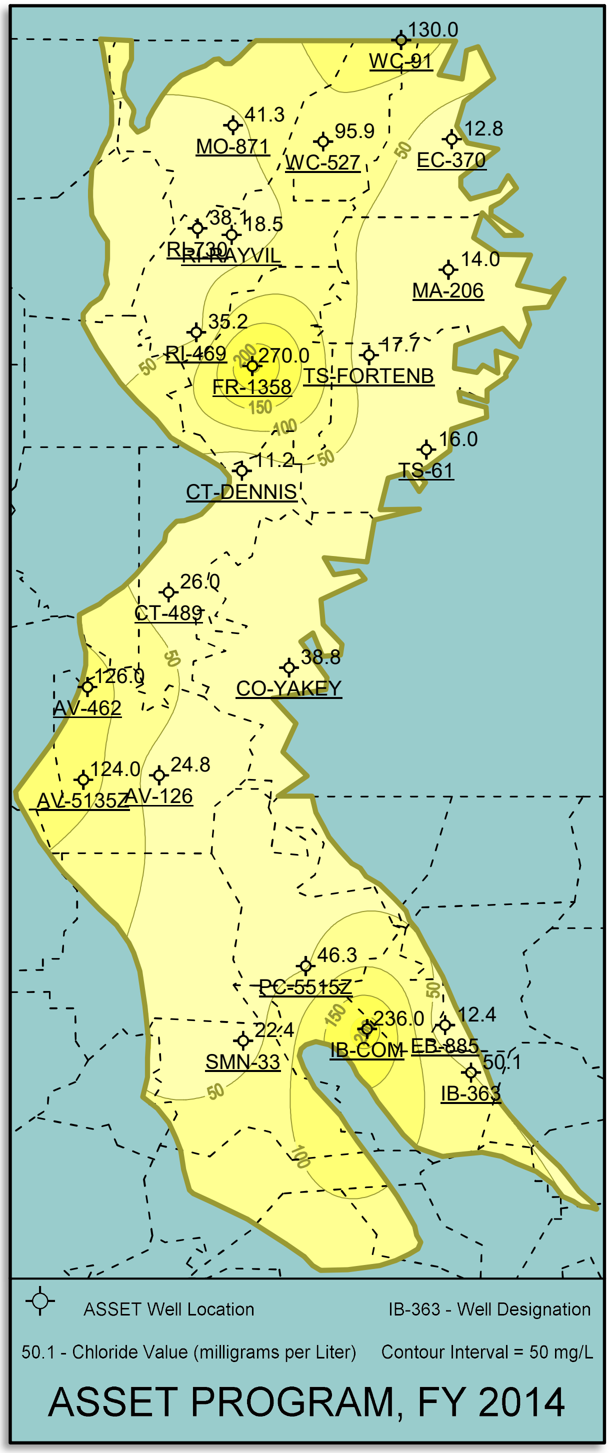

Figure 8-5: Map of Iron Data

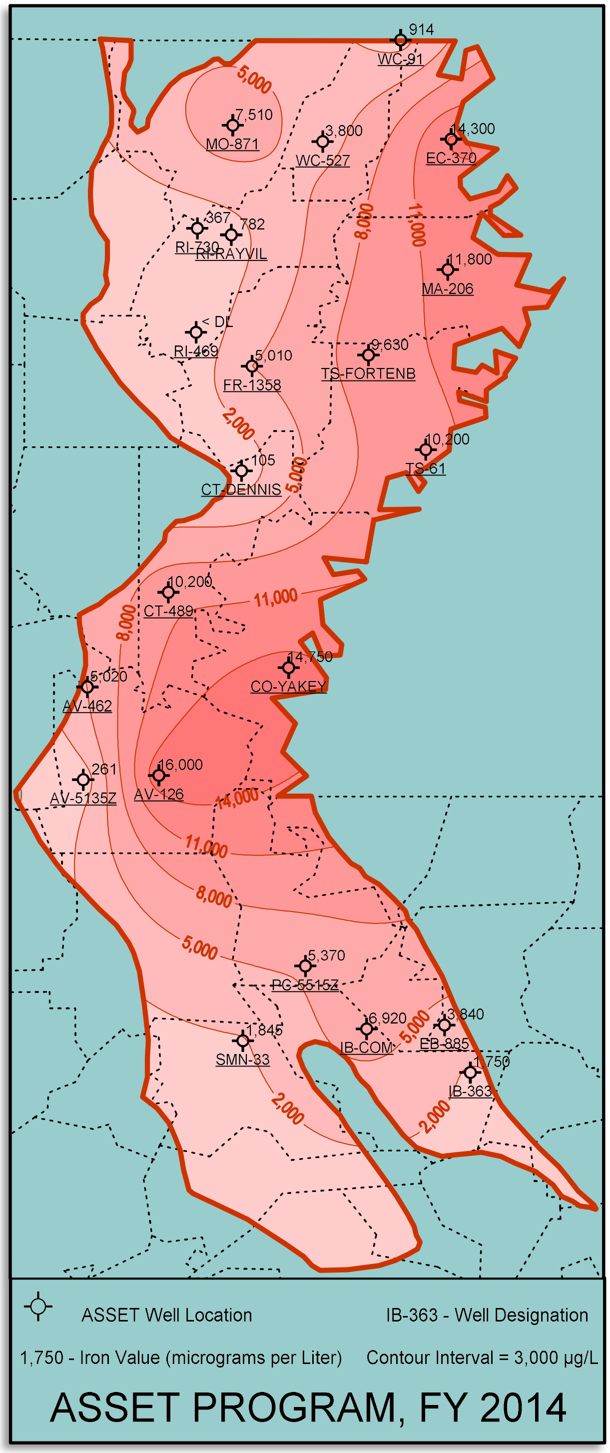

Chart 8-1: Temperature Trend

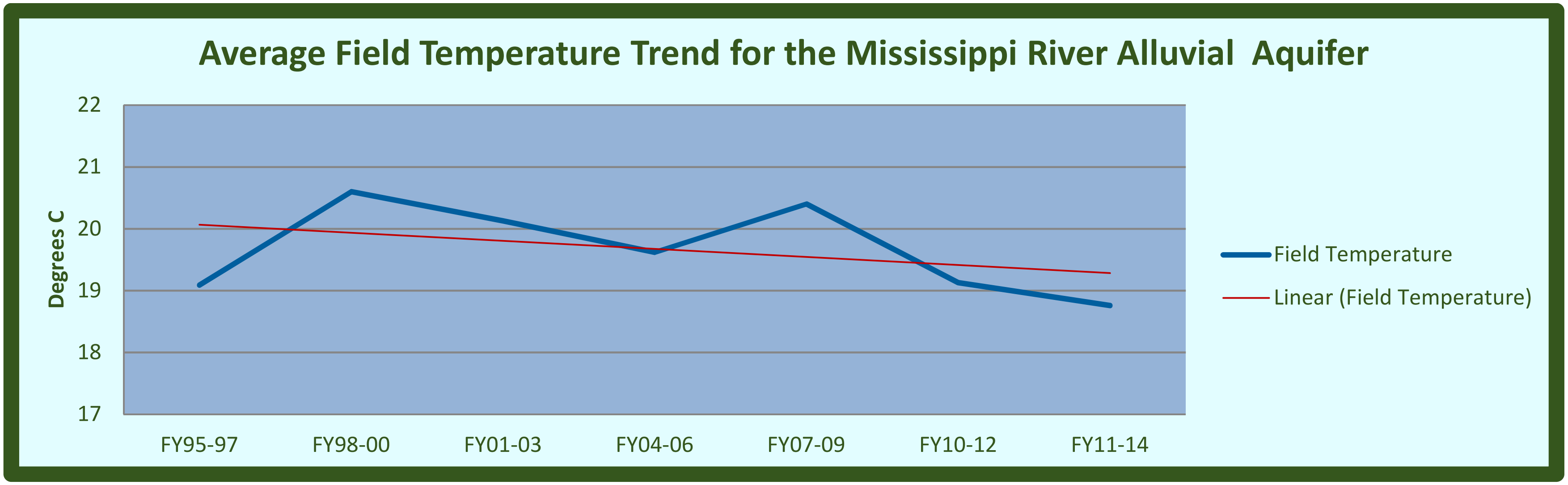

Chart 8-2: pH Trend

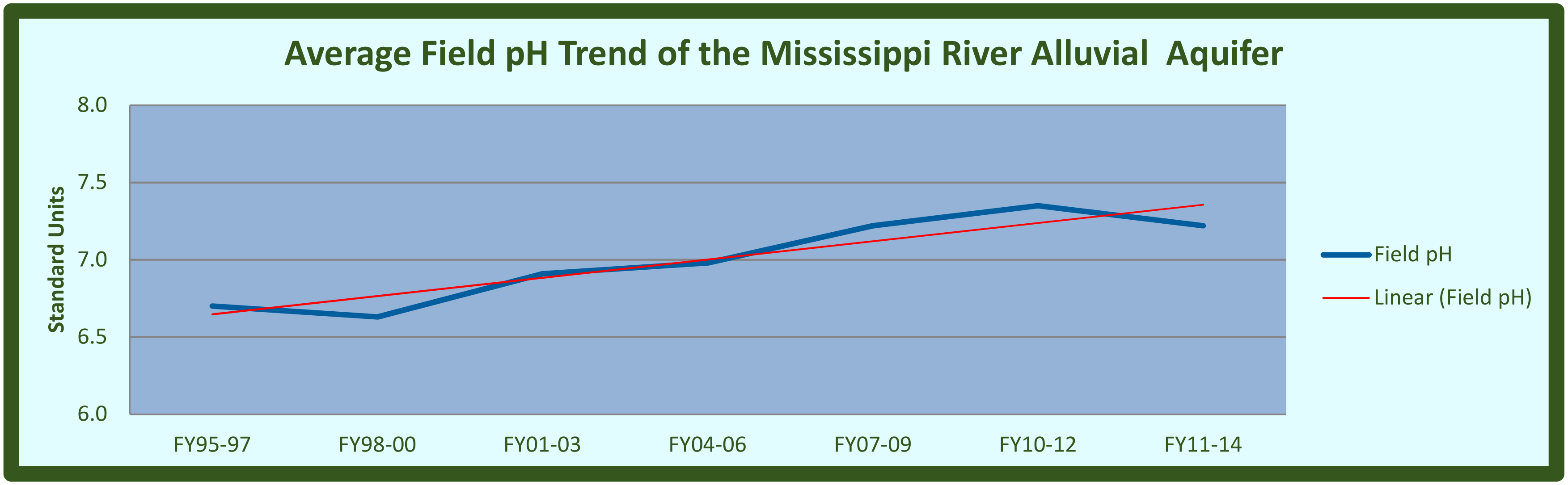

Chart 8-3: Field Specific Conductance Trend

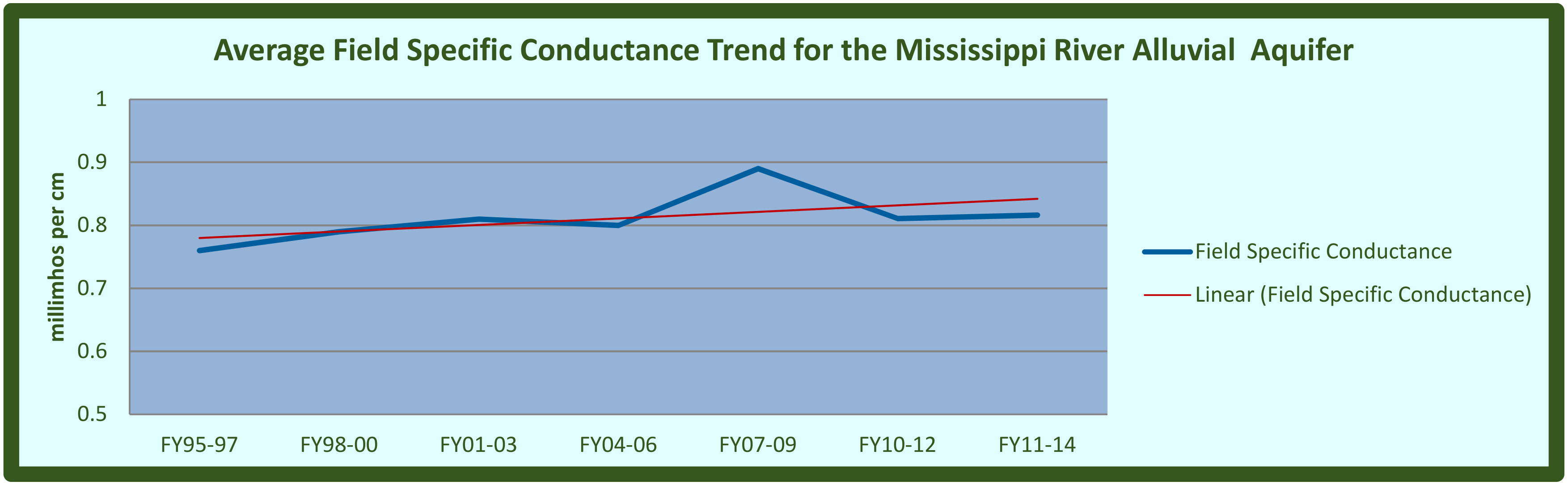

Chart 8-4: Lab Specific Conductance Trend

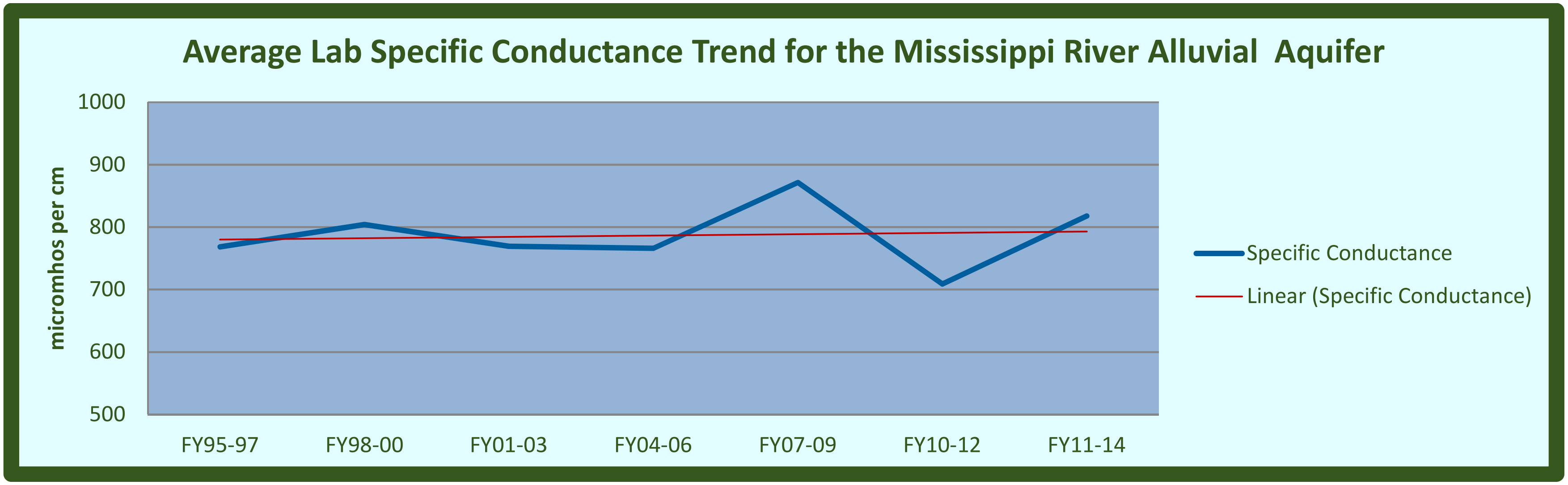

Chart 8-5: Field Salinity Trend

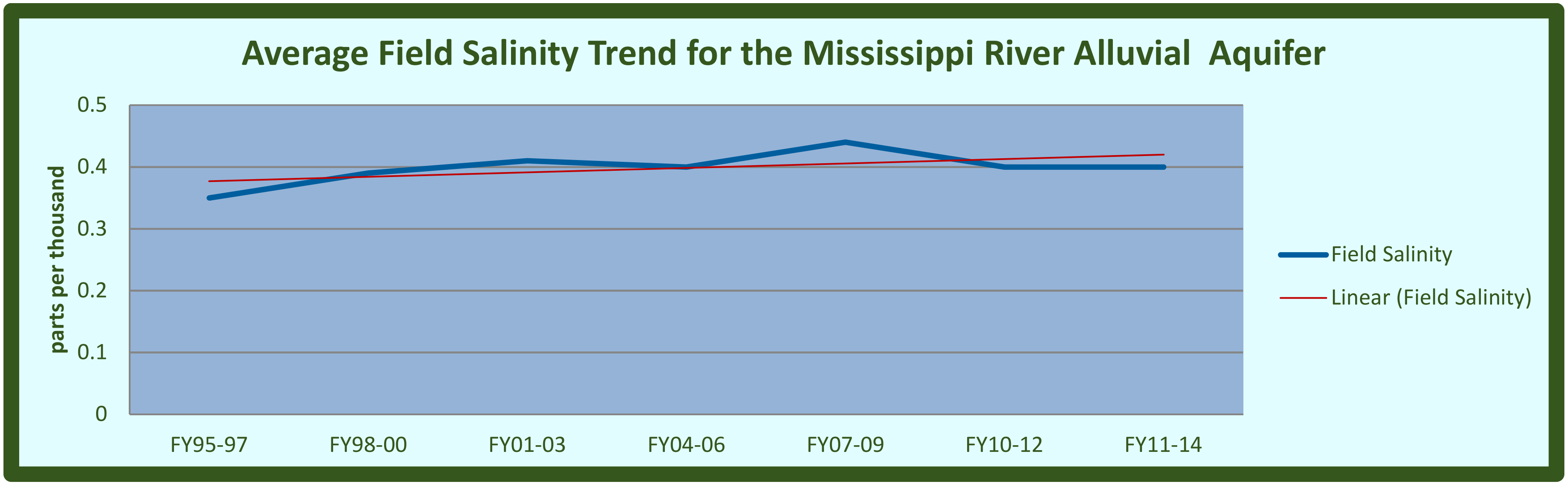

Chart 8-6: Chloride Trend

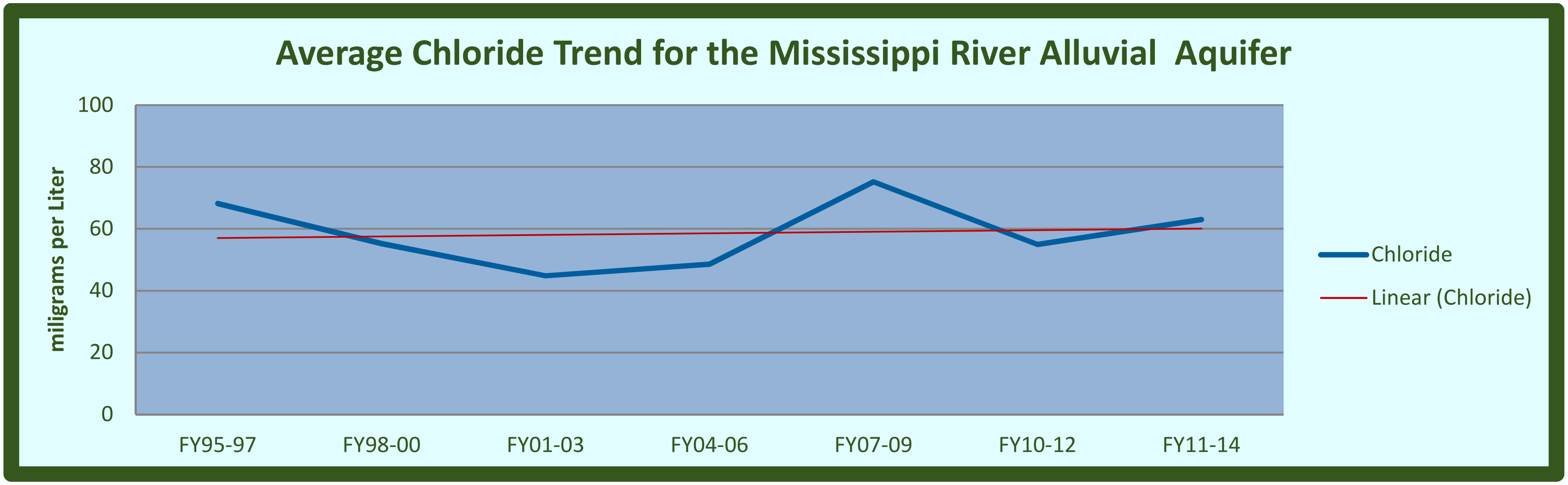

Chart 8-7: Alkalinity Trend

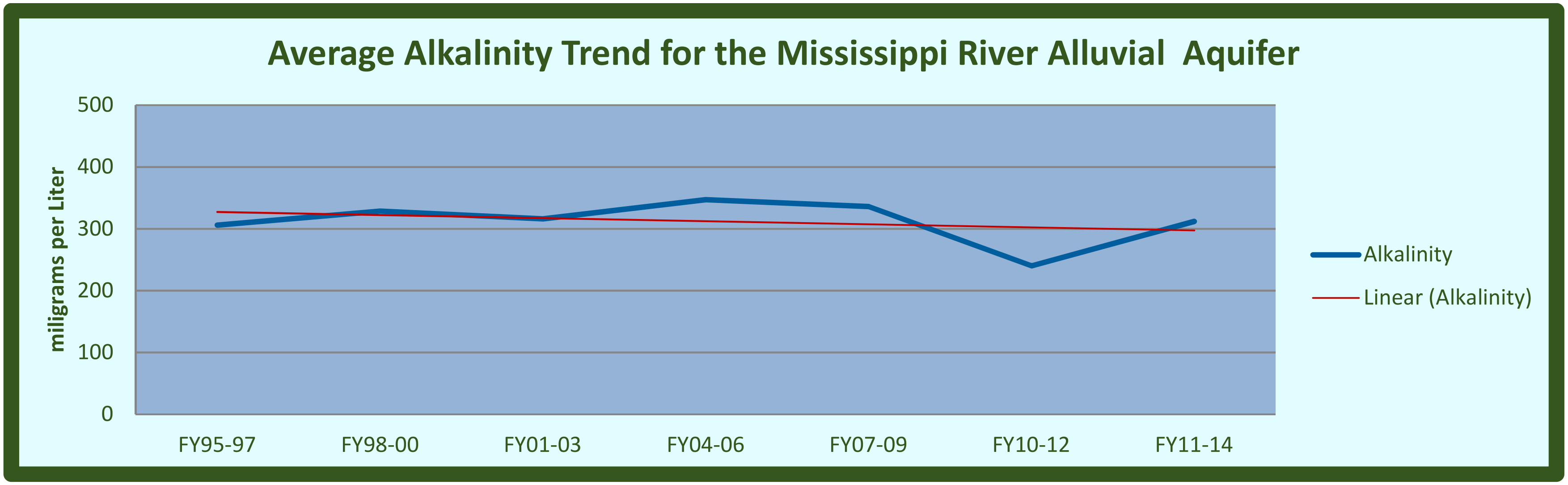

Chart 8-8: Color Trend

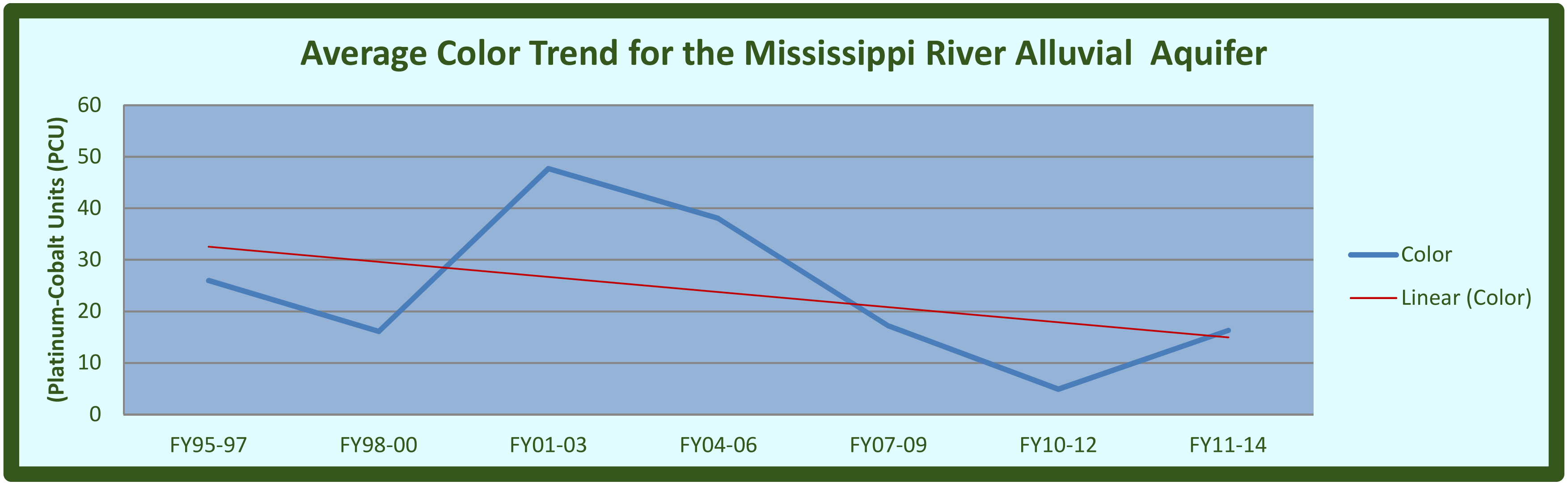

Chart 8-9: Sulfate Trend

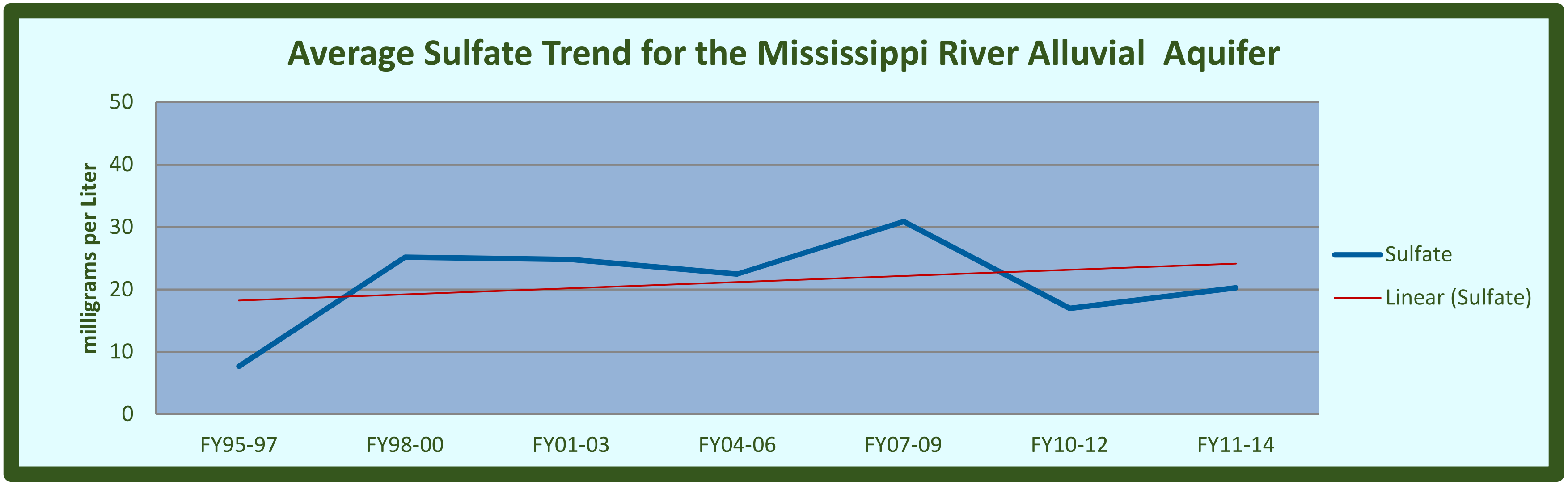

Chart 8-10: Total Dissolved Solids Trend

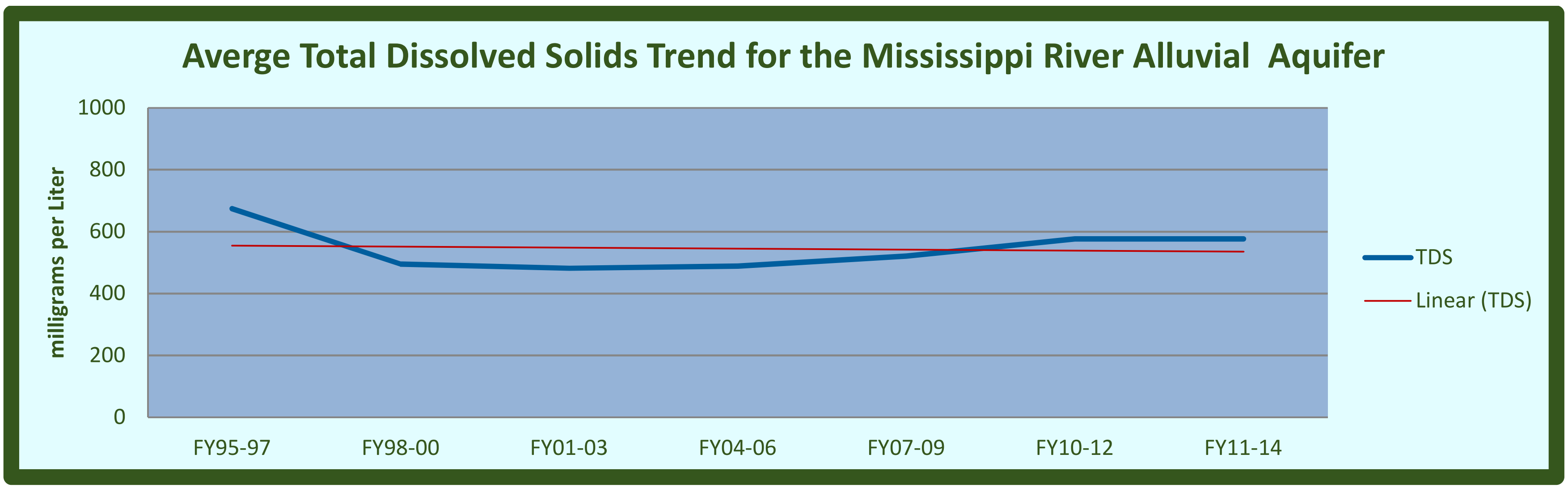

Chart 8-11: Hardness Trend

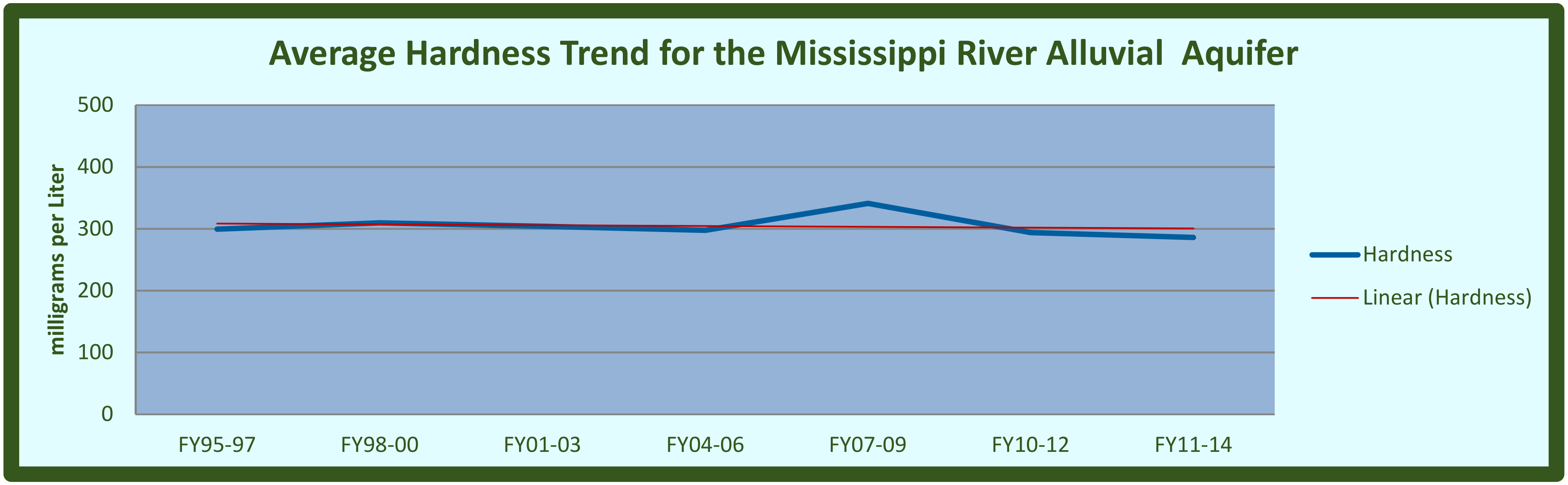

Chart 8-12: Ammonia Trend

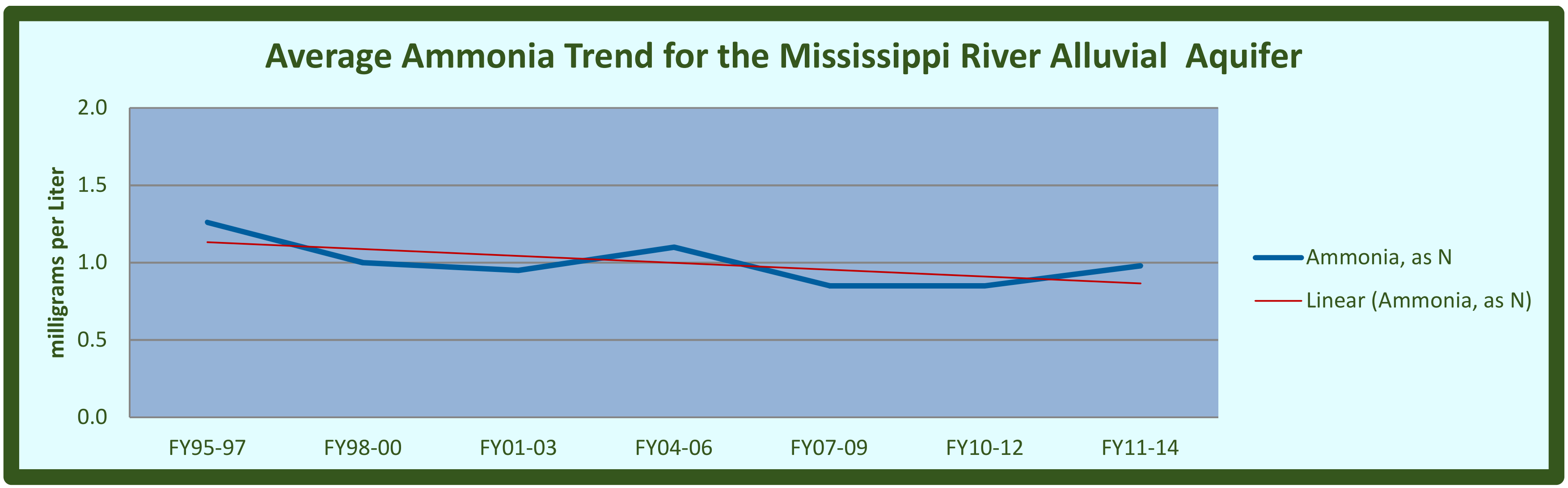

Chart 8-13: Nitrite – Nitrate Trend

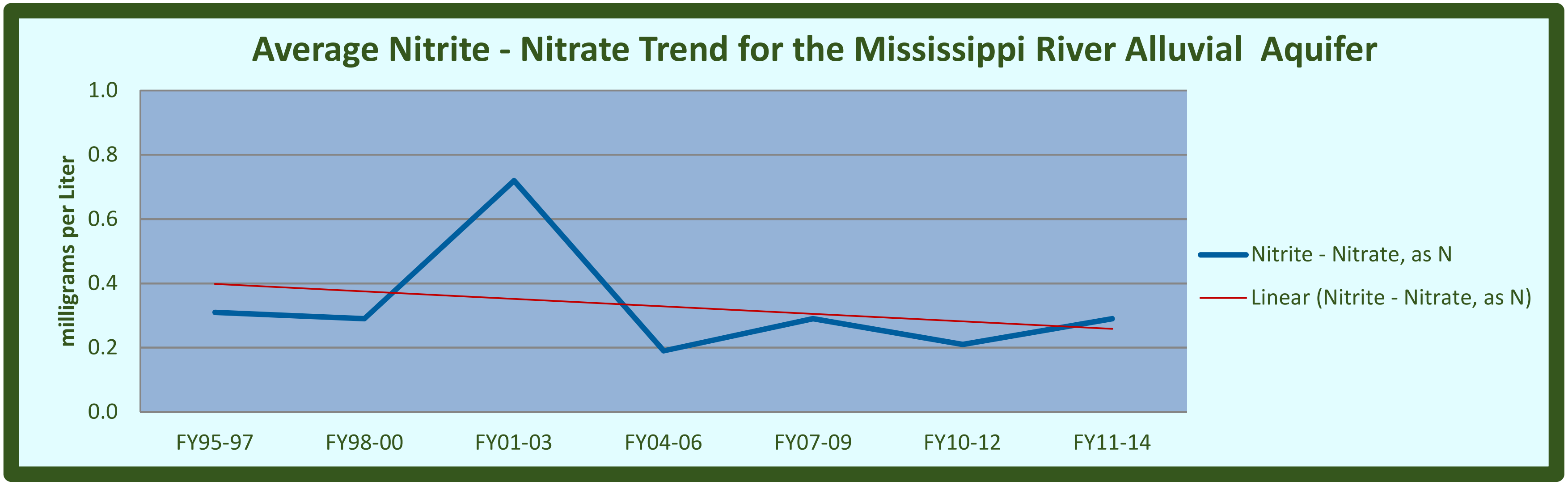

Chart 8-14: TKN Trend

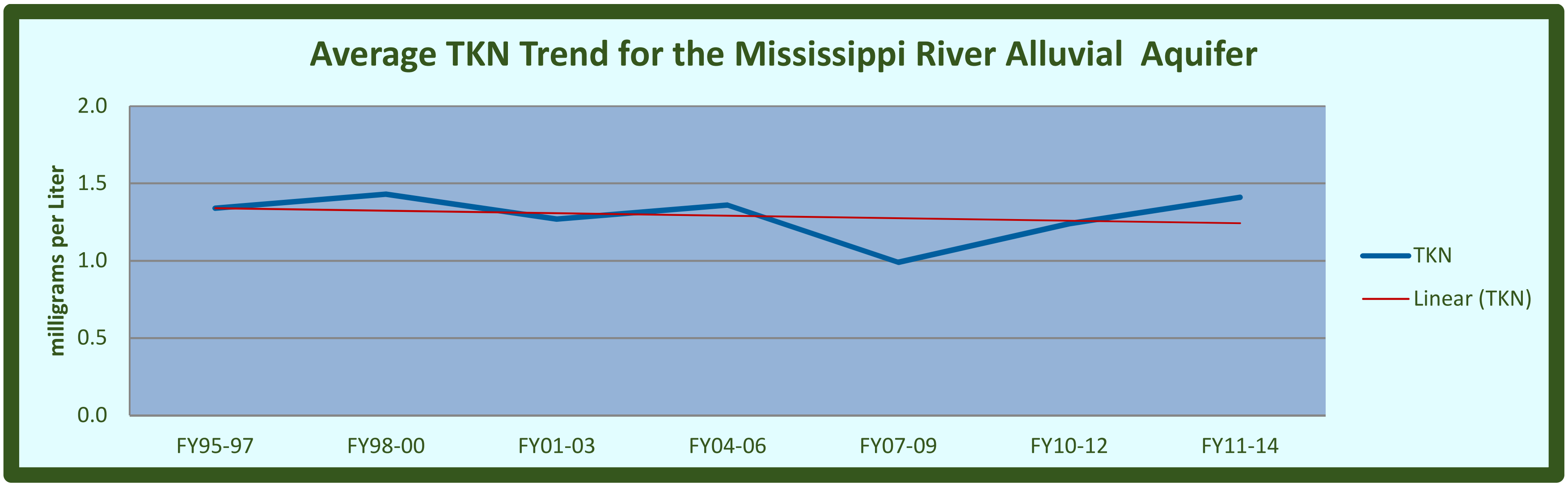

Chart 8-15: Total Phosphorus Trend

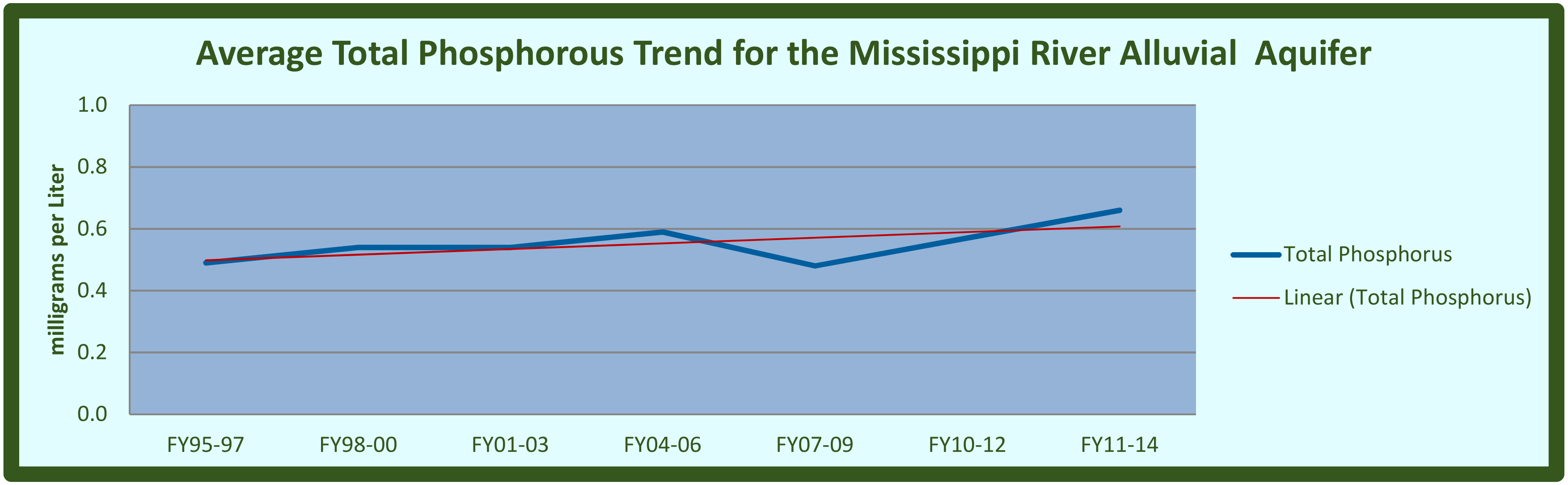

Chart 8-16: Iron Trend