RED RIVER ALLUVIAL AQUIFER SUMMARY, 2007

AQUIFER SAMPLING AND ASSESSMENT PROGRAM

APPENDIX 3 TO THE 2009 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 ground water 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 fourteen 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 will make up, in part, the ASSET Program's Triennial Summary Report for 2009.

Analytical and field data contained in this summary were collected from wells producing from the Red River Alluvial aquifer, during the 2007 state fiscal year (July 1, 2006 - June 30, 2007). This summary will become Appendix 3 of ASSET Program Triennial Summary Report for 2009.

These data show that in December 2006, 5 wells were sampled which produce from the Red River Alluvial aquifer. Three of the 5 are classified as irrigation and 1 each of industrial and domestic. The wells are located in 5 parishes along the Red River.

Figure 3-1 shows the geographic locations of the Red River Alluvial aquifer and the associated wells, whereas Table 3-1 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 Transportation and Development’s Water Well Registration Data file.

GEOLOGY

Red 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.

HYDROGEOLOGY

The Red River Alluvial aquifer is hydraulically connected with the Red 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 Red 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 Red River Alluvial range from 20 feet above sea level, to 160 feet below sea level. The range of thickness of the fresh water interval in the Red River Alluvial is 50 to 200 feet. The depths of the Red River Alluvial wells that were monitored in conjunction with the ASSET Program range from 58 to 89 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 3-2. The inorganic (total metals) parameters analyzed in the laboratory are listed in Table 3-3. These tables also show the field and analytical results determined for each analyte. For quality control, a duplicate sample was taken for each parameter at well G-5193Z.

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 3-8, 3-9 and 3-10 list the target analytes for volatiles, semi-volatiles and pesticides/PCBs, respectively.

Tables 3-4 and 3-5 provide a statistical overview of field and conventional data, and inorganic data for the Red River Alluvial aquifer, listing the minimum, maximum, and average results for these parameters collected in the FY 2007 sampling. Tables 3-6 and 3-7 compare these same parameter averages to historical ASSET-derived data for the Red River Alluvial aquifer, from fiscal years 1995, 1998, 2001 and 2004.

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

Figures 3-2, 3-3, 3-4, and 3-5 respectively, represent the contoured data for pH, total dissolved solids (TDS), chloride (Cl), and iron. Charts 3-1 through 3-16 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 Office of Environmental Assessment does use 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 3-2 and 3-3 show that one or more secondary MCLs (SMCLs) were exceeded in all of the five wells sampled in the Red River Alluvial aquifer, with a total of eight SMCLs being exceeded.

Field and Conventional Parameters

Table 3-2 shows the field and conventional parameters for which samples are collected at each well and the analytical results for those parameters. Table 3-4 provides an overview of this data for the Red 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 3-2 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 and Hospitals 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 3-2 shows that three wells exceeded the SMCL for total dissolved solids. 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:

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

	LAB RESULTS (in mg/L)	FIELD MEASURES (in g/L)
CD-431	502 mg/L	0.61 g/L
CD-859	460 mg/L (<SMCL)	0.53 g/L
G-5193Z	472 mg/L, Duplicate 466 mg/L (<SMCL)	0.55 g/L, Duplicate 0.55 g/L
NA-SWANSON	566 mg/L	0.66 g/L
RR-345	634 mg/L	0.72 g/L

Inorganic Parameters

Table 3-3 shows the inorganic (total metals) parameters for which samples are collected at each well and the analytical results for those parameters. Table 3-5 provides an overview of inorganic data for the Red 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 3-3 shows that no primary MCL was exceeded for total metals.

Federal Secondary Drinking Water Standards: Laboratory data contained in Table 3-3 shows that all 5 wells exceeded the secondary MCL for iron:

Iron (SMCL = 300 ug/L):

CD-431	11,000 ug/L
CD-859	4,700 ug/L
G-5193Z	9,330 ug/L, Duplicate 9,470 ug/L
NA-SWANSON	4,690 ug/L
RR-345	7,110 ug/L

Volatile Organic Compounds

Table 3-8 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.

No VOC was detected at or above its detection limit during the FY 2007 sampling of the Red River Alluvial aquifer.

Semi-Volatile Organic Compounds

Table 3-9 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.

Bis(2-ethylhexyl)phthalate (BEHP), a common lab and field contaminant, was detected in well CD-431, an industrial use well at a concentration of 44 ug/L, exceeding the MCL of 6 ug/L. BEHP has not been detected in previous or subsequent routine sampling of this well. Therefore it is the opinion of this Office that the detection of BEHP was due to field and/or lab contamination and not due to contamination of the Red River Alluvial aquifer. There were no other confirmed detections of SVOCs during the FY 2007 sampling of the Red River Alluvial aquifer.

Pesticides and PCBs

Table 3-10 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 2007 sampling of the Red River Alluvial 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 Red River aquifer exhibit some changes when comparing current data to that of the four previous sampling rotations (three, six, nine and twelve years prior). These comparisons can be found in Tables 3-6 and 3-7, and in Charts 3-1 to 3-16 of this summary. Over the twelve-year period, 2 analytes have shown a general increase in concentration. These analytes are pH and iron. For this same time period, 9 analytes have demonstrated a decrease in concentrations: temperature, field and lab specific conductance, salinity, chloride, sulfate, TDS, ammonia, nitrite-nitrate, TKN, and to a lesser degree hardness and total phosphorus. Color was not analyzed by the laboratory, therefore not reported for the FY 2007 aquifer summary.

Current sample results show that all 5 wells reported one or more secondary exceedances with a total of 8 SMCL exceedances. The FY 2004 sampling of the Red River Alluvial aquifer shows that all 6 wells also reported one or more SMCL exceedances with a total of 11 exceedances.

SUMMARY AND RECOMMENDATIONS

In summary, the data show that the ground water produced from this aquifer is very hard[1] but is of good quality when considering short-term or long-term health risk guidelines. Laboratory data show that no program well that was sampled during the Fiscal Year 2007 monitoring of the Red River Alluvial aquifer exceeded a primary MCL. The data also show that this aquifer is of fair to poor quality when considering taste, odor, or appearance guidelines, with at least one secondary MCL being exceeded in each of the wells monitored.

Comparison to historical ASSET-derived data shows some change in the quality or characteristics of the Red River Alluvial aquifer, with 2 parameters showing consistent increases in concentration and 9 parameters decreasing in concentration.

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

---

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

Table 3-1: List of Wells Sampled, Red River Alluvial Aquifer – FY 2007

DOTD Well Number	Parish	Date	Owner	Depth (Feet)	Well Use
CD-431	CADDO	12/5/2006	CERTAINTEED	62	INDUSTRIAL
CD-859	CADDO	12/5/2006	PRIVATE OWNER	58	IRRIGATION
G-5193Z	GRANT	12/4/2006	PRIVATE OWNER	75	DOMESTIC
NA-SWANSON	NATCHITOCHES	12/4/2006	PRIVATE OWNER	80	IRRIGATION
RR-345	RED RIVER	12/4/2006	PRIVATE OWNER	89	IRRIGATION

Table 3-2: Summary of Field and Conventional Data, Red River Alluvial Aquifer – FY 2007

DOTD WELL NUMBER	Temp Deg. C	pH SU	Sp. Cond. mmhos/cm	Sal. ppt	TDS g/L	Alk mg/L	Cl mg/L	Color PCU	Sp. Cond. umhos/cm	SO4 mg/L	TDS mg/L	TSS mg/L	Turb. NTU	NH3 mg/L	Hard. mg/L	Nitrite-Nitrate (as N) mg/L	TKN mg/L	Tot. P mg/L
	LABORATORY DETECTION LIMITS →					2.0	1.3	5	10	1.25/1.3	4	4	1	0.1	5.0	0.05	0.10	0.05
	FIELD PARAMETERS					LABORATORY PARAMETERS												
CD-431	22.94	7.21	0.936	0.46	0.61	418	44.2	Not Analyzed by Lab	875	6.9	502	34.5	146.0	1.46	412	<0.05	‡1.92	0.6
CD-859	20.22	6.97	0.822	0.40	0.53	396	14.4		782	30.2	460	6	25.7	0.55	414	<0.05	0.73	0.44
G-5193Z	19.38	7.00	0.852	0.42	0.55	441	13.5		813	3.8	472	17	76.6	0.54	441	<0.05	‡0.61	0.72
G-5193Z*	19.38	7.00	0.852	0.42	0.55	442	13		814	3.4	466	15.5	71.6	0.55	449	<0.05	‡0.81	0.75
NA-SWANSON	19.79	6.95	1.019	0.51	0.66	542	24.3		989	8.2	566	11	50.3	0.72	485	<0.05	0.87	0.53
RR-345	19.66	6.96	1.104	0.55	0.72	503	43.4		1079	57.1	634	14.5	71.2	0.82	572	<0.05	0.88	0.5

*Denotes Duplicate Sample ‡Reported from a Dilution Shaded cells exceed EPA Secondary Standards

Table 3-3: Summary of Inorganic Data, Red River Alluvial Aquifer – FY 2007

DOTD Well Number	Antimony ug/L	Arsenic ug/L	Barium ug/L	Beryllium ug/L	Cadmium ug/L	Chromium ug/L	Copper ug/L	Iron ug/L	Lead ug/L	Mercury ug/L	Nickel ug/L	Selenium ug/L	Silver ug/L	Thallium ug/L	Zinc ug/L
Laboratory Detection Limits	1	3	2	1	0.5	3	3	20	3	0.05	3	4	0.5	1	10
CD-431	<1	<3	429	<1	<0.5	<3	<3	11000	9	<0.05	<3	<4	<0.5	<1	2907
CD-859	<1	4.8	522	<1	<0.5	<3	<3	4700	<3	<0.05	<3	<4	<0.5	<1	<10
G-5193Z	<1	<3	453	<1	<0.5	<3	4.1	9330	<3	<0.05	<3	<4	<0.5	<1	<10
G-5193Z*	<1	<3	464	<1	<0.5	<3	3.5	9470	<3	<0.05	<3	<4	<0.5	<1	<10
NA-SWANSON	<1	<3	553	<1	<0.5	<3	5.5	4690	<3	<0.05	<3	<4	<0.5	<1	12.8
RR-345	<1	<3	344	<1	<0.5	<3	<3	7110	<3	<0.05	<3	<4	<0.5	<1	<10

*Denotes Duplicate Sample. Shaded cells exceed EPA Secondary Standards

Table 3-4: FY 2007 Field and Conventional Statistics, ASSET Wells

	PARAMETER	MINIMUM	MAXIMUM	AVERAGE
FIELD	Temperature (°C)	19.38	22.94	20.23
	pH (SU)	6.95	7.21	7.02
	Specific Conductance (mmhos/cm)	0.822	1.104	0.930
	Salinity (ppt)	0.40	0.55	0.46
	TDS (g/L)	0.534	0.718	0.610
LABORATORY	Alkalinity (mg/L)	396	542	457
	Chloride (mg/L)	13.0	44.2	25.5
	Specific Conductance (umhos/cm)	782	1079	892
	Sulfate (mg/L)	3.4	57.1	18.3
	TDS (mg/L)	460	634	517
	TSS (mg/L)	6.0	34.5	16.4
	Turbidity (NTU)	25.7	146.0	73.6
	Ammonia, as N (mg/L)	0.54	1.46	0.77
	Hardness (mg/L)	412	572	462
	Nitrite - Nitrate, as N (mg/L)	<0.05	<0.05	<0.05
	TKN (mg/L)	0.61	1.99	0.97
	Total Phosphorus (mg/L)	0.44	0.75	0.59

Table 3-5: FY 2007 Inorganic Statistics, ASSET Wells

PARAMETER	MINIMUM	MAXIMUM	AVERAGE
Antimony (ug/L)	<1	<1	<1
Arsenic (ug/L)	<3.0	4.8	<3.0
Barium (ug/L)	344	553	461
Beryllium (ug/L)	<1	<1	<1
Cadmium (ug/L)	<0.5	<0.5	<0.5
Chromium (ug/L)	<3	<3	<3
Copper (ug/L)	<3.0	5.5	<3.0
Iron (ug/L)	4,690	11,000	7,717
Lead (ug/L)	<3	9	<3
Mercury (ug/L)	<0.05	<0.05	<0.05
Nickel (ug/L)	<3	<3	<3
Selenium (ug/L)	<4	<4	<4
Silver (ug/L)	<0.5	<0.5	<0.5
Thallium (ug/L)	<1	<1	<1
Zinc (ug/L)	<10	2,907	490

Table 3-6: Triennial Field and Conventional Statistics, ASSET Wells

	PARAMETER	FY 1995 AVERAGE	FY 1998 AVERAGE	FY 2001 AVERAGE	FY 2004 AVVERAGE	FY 2007 AVERAGE
FIELD	Temperature (^{O}C)	21.00	19.88	20.50	20.55	20.23
	pH (SU)	6.67	6.81	7.64	7.22	7.02
	Specific Conductance (mmhos/cm)	1.128	1.060	1.328	0.940	0.930
	Salinity (ppt)	0.54	0.53	0.67	0.47	0.46
	TDS (g/L)	-	-	-	0.610	0.610
LABORATORY	Alkalinity (mg/L)	504.4	485.2	446.0	476.0	457.0
	Chloride (mg/L)	45.3	42.8	163.4	31.8	25.5
	Color (PCU)	24.6	5.0	30.0	22.5	-
	Specific Conductance (umhos/cm)	1099.8	1093.6	1398.2	953.3	892.0
	Sulfate (mg/L)	69.3	62.2	52.1	29.9	18.3
	TDS (mg/L)	716.0	699.2	817.6	593.7	517.0
	TSS (mg/L)	18.8	13.6	12.5	17.1	16.4
	Turbidity (NTU)	56.0	54.4	44.7	68.3	73.6
	Ammonia, as N (mg/L)	1.27	0.54	0.88	0.86	0.77
	Hardness (mg/L)	506.8	453.8	353.7	454.2	462.0
	Nitrite - Nitrate, as N (mg/L)	<0.05	0.11	<0.05	<0.05	<0.05
	TKN (mg/L)	4.96	0.95	1.05	0.81	0.97
	Total Phosphorus (mg/L)	0.79	0.38	0.51	0.61	0.59

Table 3-7: Triennial Inorganic Statistics, ASSET Wells

PARAMETER	FY 1995 AVERAGE	FY 1998 AVERAGE	FY 2001 AVERAGE	FY 2004 AVERAGE	FY 2007 AVERAGE
Antimony (ug/L)	<5	<5	<5	<5	<1
Arsenic (ug/L)	<10	<5	<5	<5	<3.0
Barium (ug/L)	400.98	102.08	218.68	386.86	461.00
Beryllium (ug/L)	<5	<5	<1	<1	<1
Cadmium (ug/L)	<5	<5	1.04	<1	<0.5
Chromium (ug/L)	12.4	<5	<5	<5	<3
Copper (ug/L)	19.9	968.7	<5.0	10.3	<3.0
Iron (ug/L)	6,122.4	3,339.5	3,396.2	5,977.3	7,717.0
Lead (ug/L)	32	<10	<10	14	<3
Mercury (ug/L)	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel (ug/L)	10.4	1,041.4	<5	<5	<3
Selenium (ug/L)	<5	<5	<5	<5	<4
Silver (ug/L)	<5	<5	1.1	<1	<0.5
Thallium (ug/L)	<5	<5	<2	<5	<1
Zinc (ug/L)	185.6	<10.0	41.7	65.5	490.0

Table 3-8: VOC Analytical Parameters

COMPOUND	METHOD	DETECTION LIMIT (ug/L)
1,1-Dichloroethane	624	2
1,1-Dichloroethene	624	2
1,1,1-Trichloroethane	624	2
1,1,2-Trichloroethane	624	2
1,1,2,2-Tetrachloroethane	624	2
1,2-Dichlorobenzene	624	2
1,2-Dichloroethane	624	2
1,2-Dichloropropane	624	2
1,3- Dichlorobenzene	624	2
1,4-Dichlorobenzene	624	2
Benzene	624	2
Bromoform	624	2
Carbon tetrachloride	624	2
Chlorobenzene	624	2
Dibromochloromethane	624	2
Chloroethane	624	2
trans-1,2-Dichloroethene	624	2
cis-1,3-Dichloropropene	624	2
Bromodichloromethane	624	2
Methylene chloride	624	2
Ethyl benzene	624	2
Bromomethane	624	2
Chloromethane	624	2
o-Xylene	624	2
Styrene	624	2
Methylt-butyl ether	624	2
Tetrachloroethene	624	2
Toluene	624	2
trans-1,3-Dichloropropene	624	2
Trichloroethene	624	2
Trichlorofluoromethane	624	2
Chloroform	624	2
Vinyl chloride	624	2
Xylenes, m & p	624	4

Table 3-9: SVOC Analytical Parameters

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

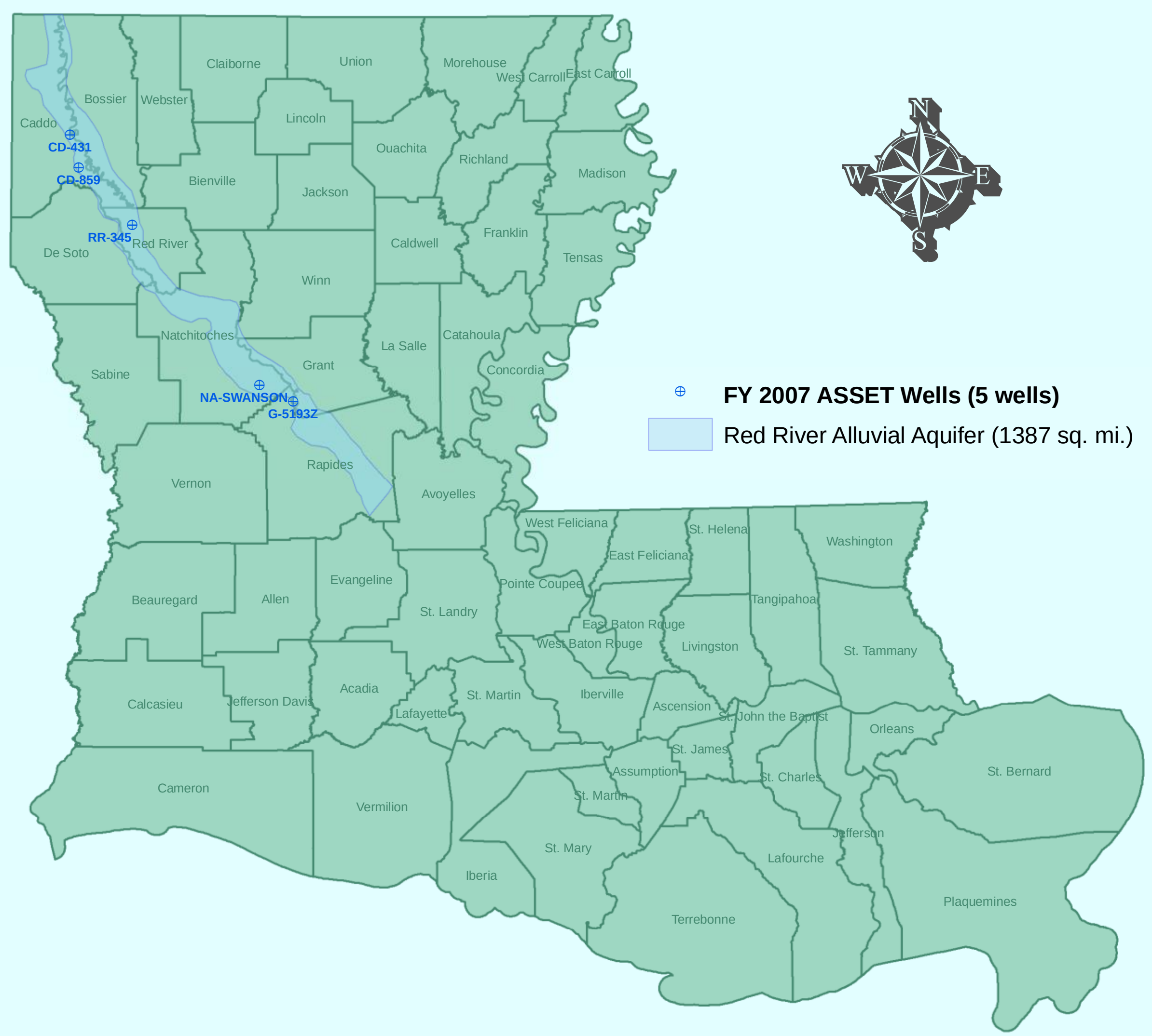
Table 3-9: SVOCs (Continued)

COMPOUND	METHOD	DETECTION LIMIT (ug/L)
Butylbenzylphthalate	625	10
Chrysene	625	10
Dibenzo[a,h]anthracene	625	10
Diethylphthalate	625	10
Dimethylphthalate	625	10
Di-n-butylphthalate	625	10
Di-n-octylphthalate	625	10
Fluoranthene	625	10
Fluorene	625	10
Hexachlorobenzene	625	10
Hexachlorobutadiene	625	10
Hexachlorocyclopentadiene	625	10
Hexachloroethane	625	10
Indeno[1,2,3-cd]pyrene	625	10
Isophorone	625	10
Naphthalene	625	10
Nitrobenzene	625	10
N-Nitrosodimethylamine	625	10
N-Nitrosodiphenylamine	625	10
N-nitroso-di-n-propylamine	625	10
Pentachlorobenzene	625	10
Pentachlorophenol	625	20
Phenanthrene	625	10
Phenol	625	20
Pyrene	625	10

Table 3-10: Pesticides and PCBs

COMPOUND	METHOD	DETECTION LIMITS (ug/L)
4,4'-DDD	8081	0.1
4,4'-DDE	8081	0.1
4,4'-DDT	8081	0.1
Aldrin	8081	0.05
Alpha-Chlordane	8081	0.05
alpha-BHC	8081	0.05
beta-BHC	8081	0.05
delta-BHC	8081	0.05
gamma-BHC	8081	0.05
Dieldrin	8081	0.1
Endosulfan I	8081	0.05
Endosulfan II	8081	0.1
Endosulfan Sulfate	8081	0.1
Endrin	8081	0.1
Endrin Aldehyde	8081	0.1
Endrin Ketone	8081	0.1
Heptachlor	8081	0.05
Heptachlor Epoxide	8081	0.05
Methoxychlor	8081	0.5
Toxaphene	8081	2
Gamma-Chlordane	8081	0.05
PCB-1016	8082	1
PCB-1221	8082	1
PCB-1232	8082	1
PCB-1242	8082	1
PCB-1248	8082	1
PCB-1254	8082	1
PCB-1260	8082	1

Figure 3-1: Location Plat, Red 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.

ASSET PROGRAM, FY 2007

Figure 3-2: Map of pH Data

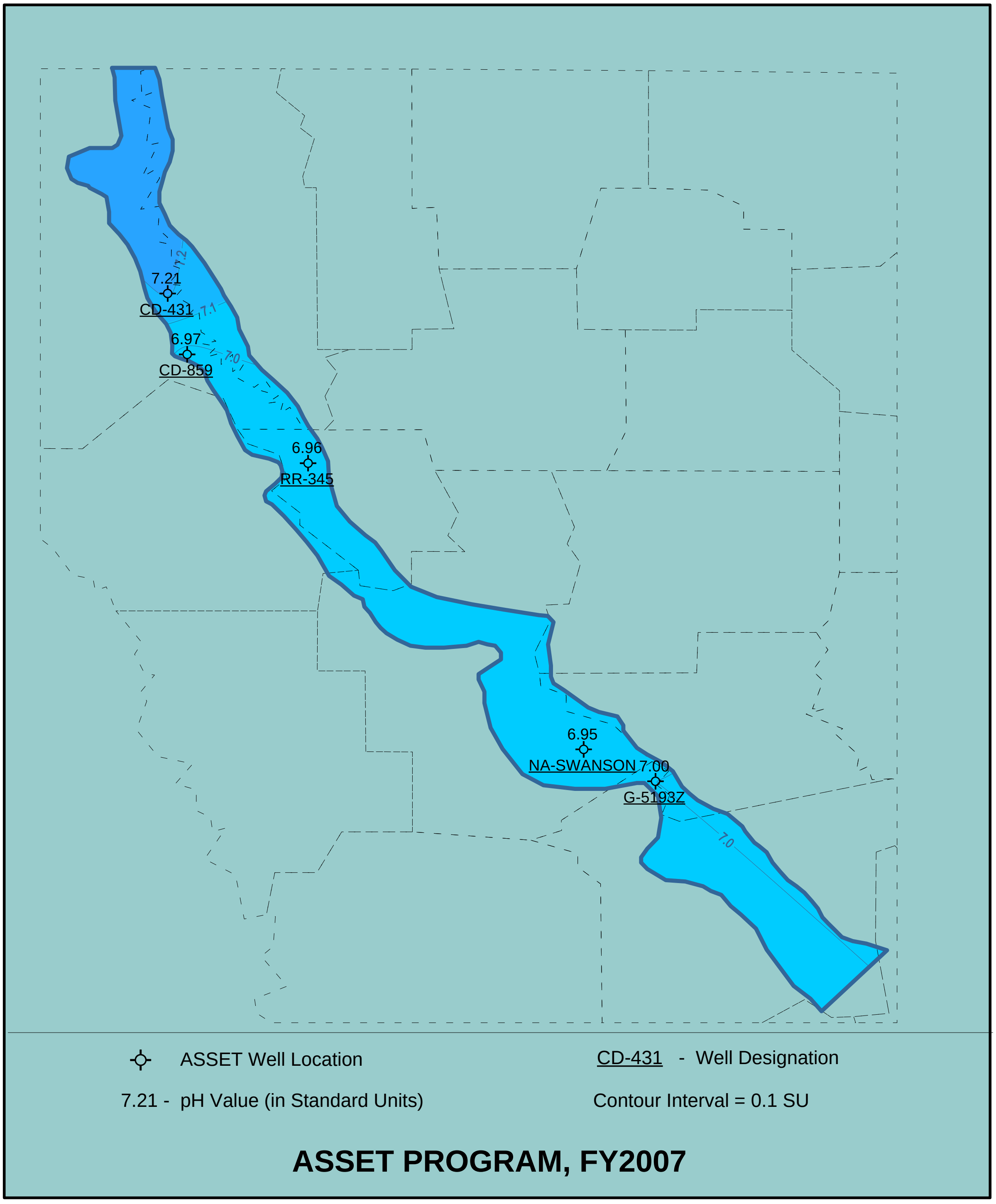


Figure 3-3: Map of TDS Lab Data

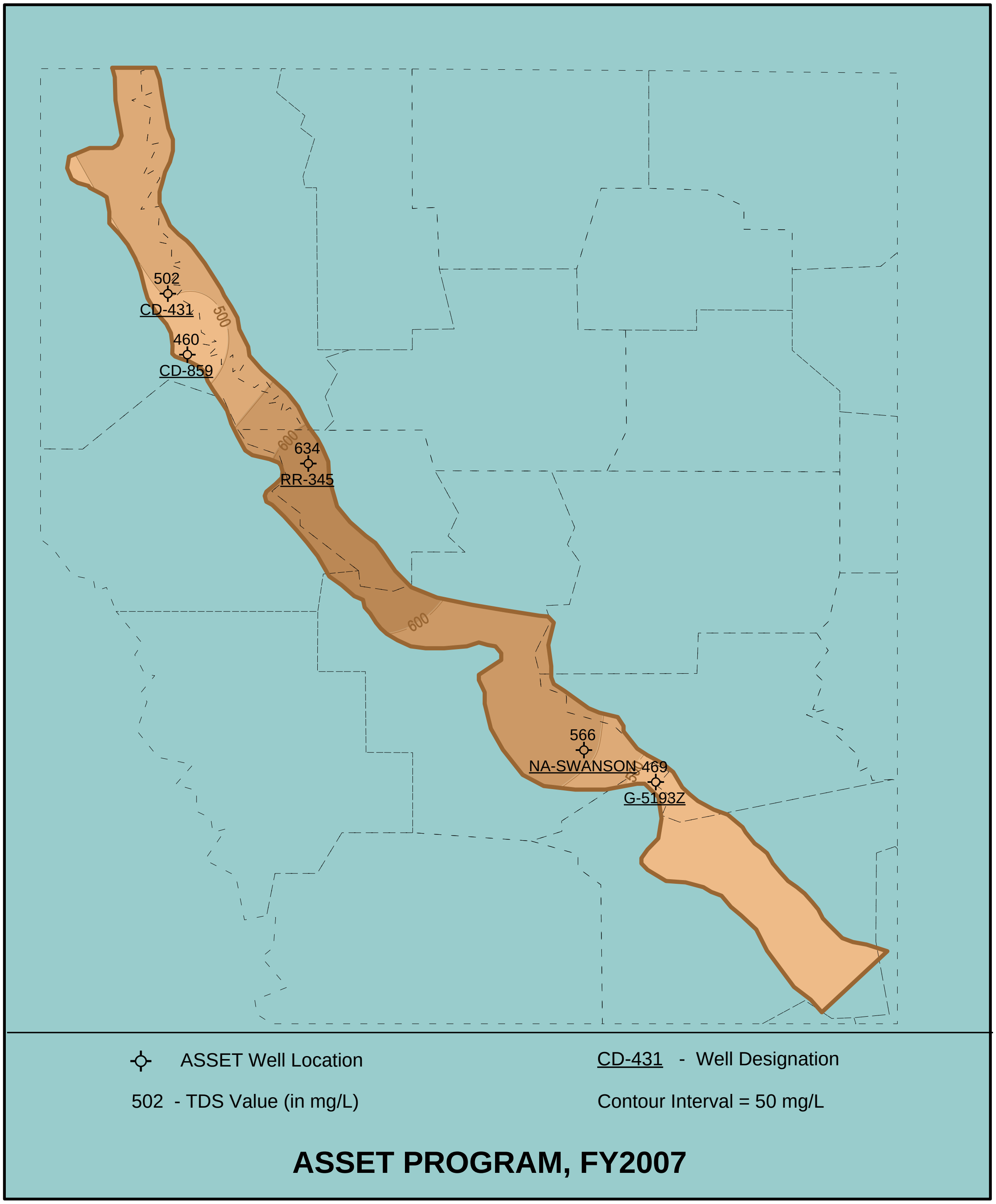


Figure 3-4: Map of Chloride Data

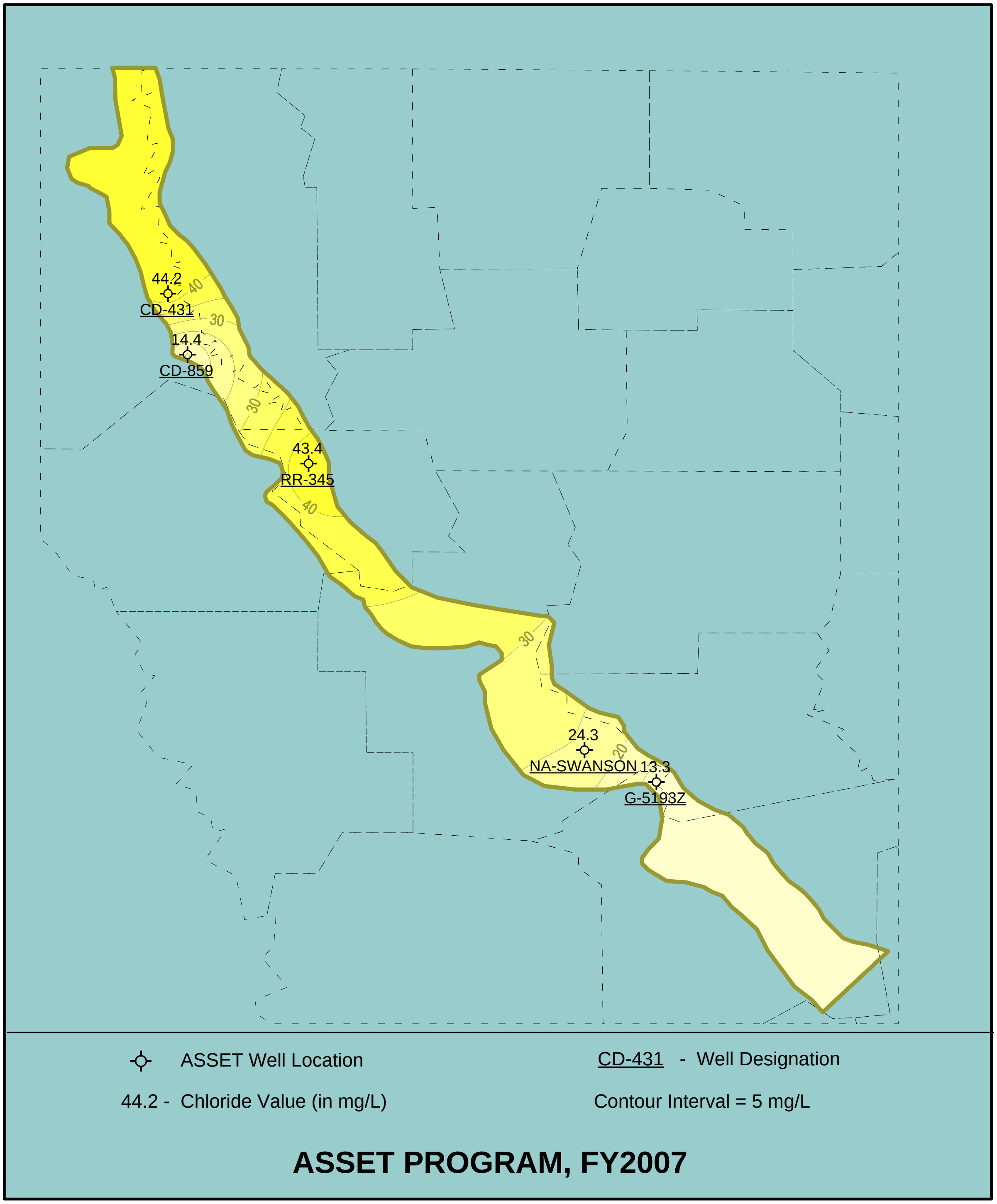


Figure 3-5: Map of Iron Data

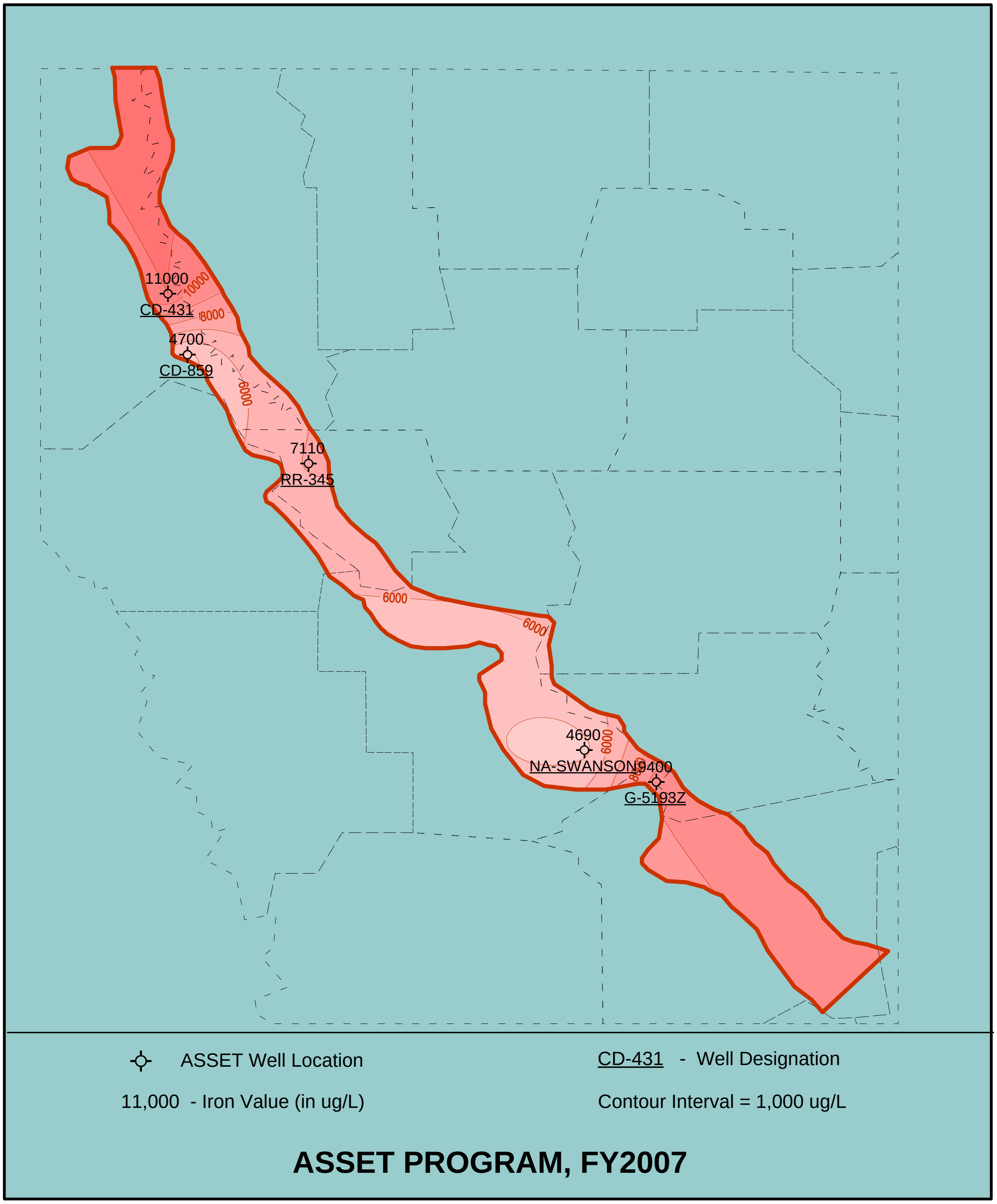


Chart 3-1: Temperature Trend

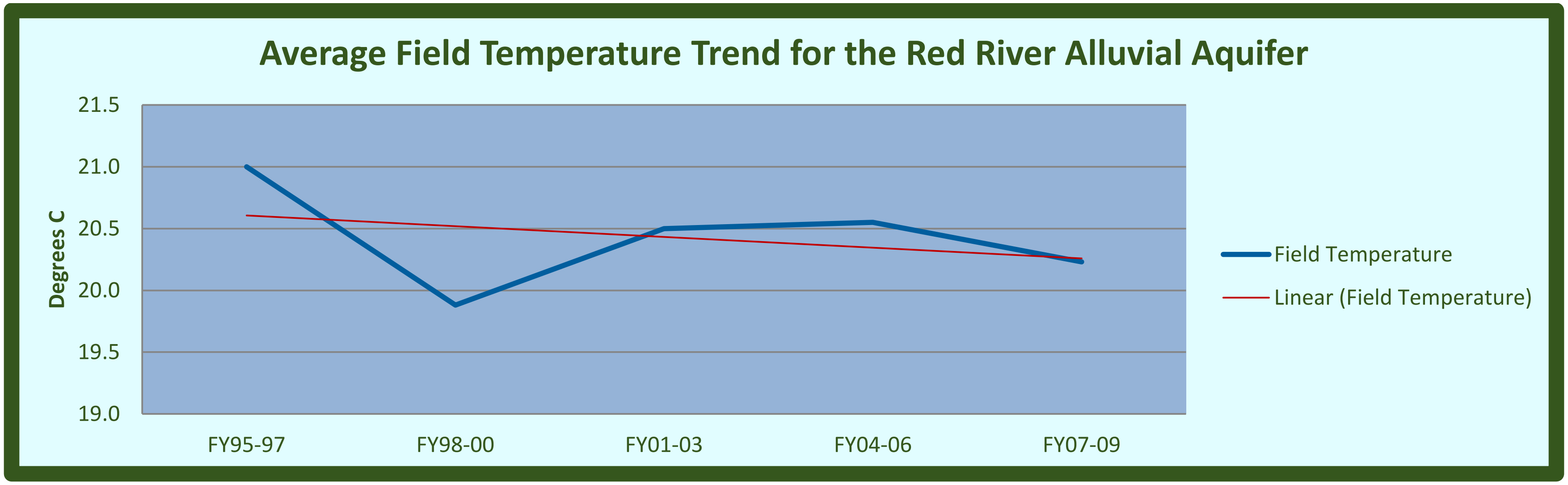


Chart 3-2: pH Trend

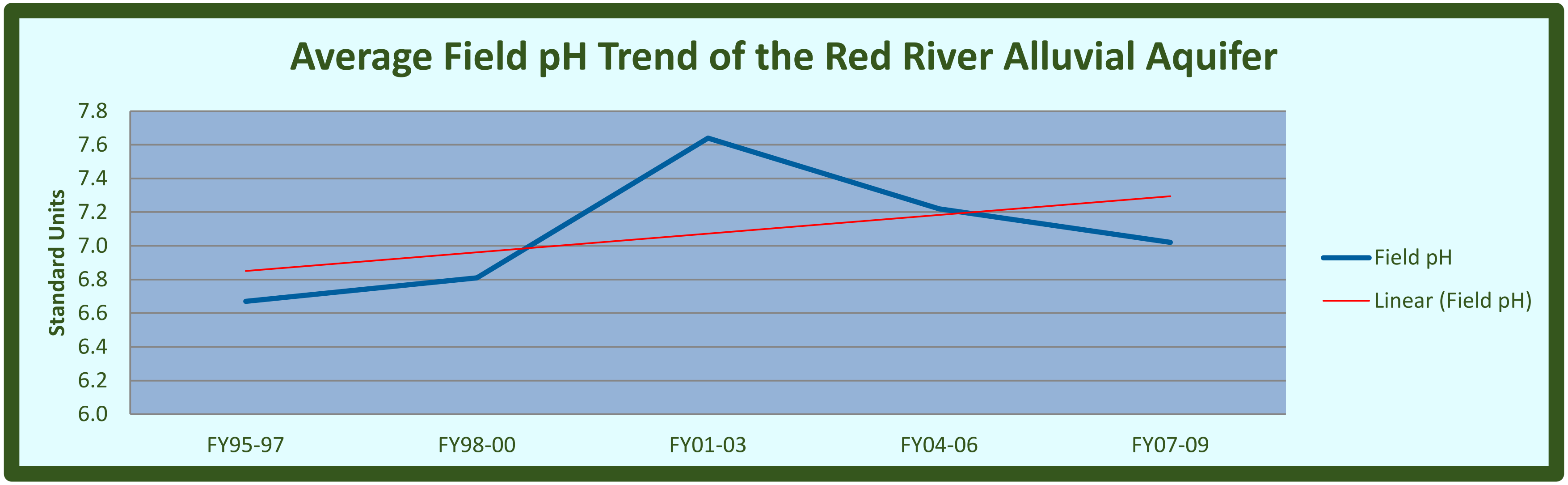


Chart 3-3: Field Specific Conductance Trend

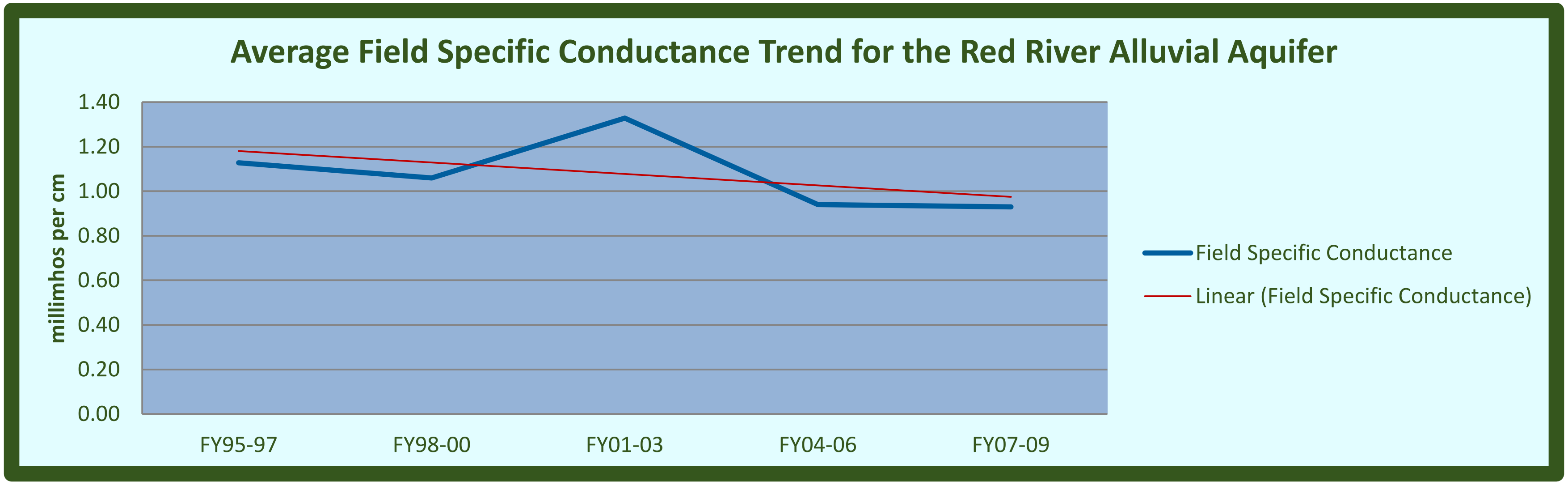


Chart 3-4: Lab Specific Conductance Trend

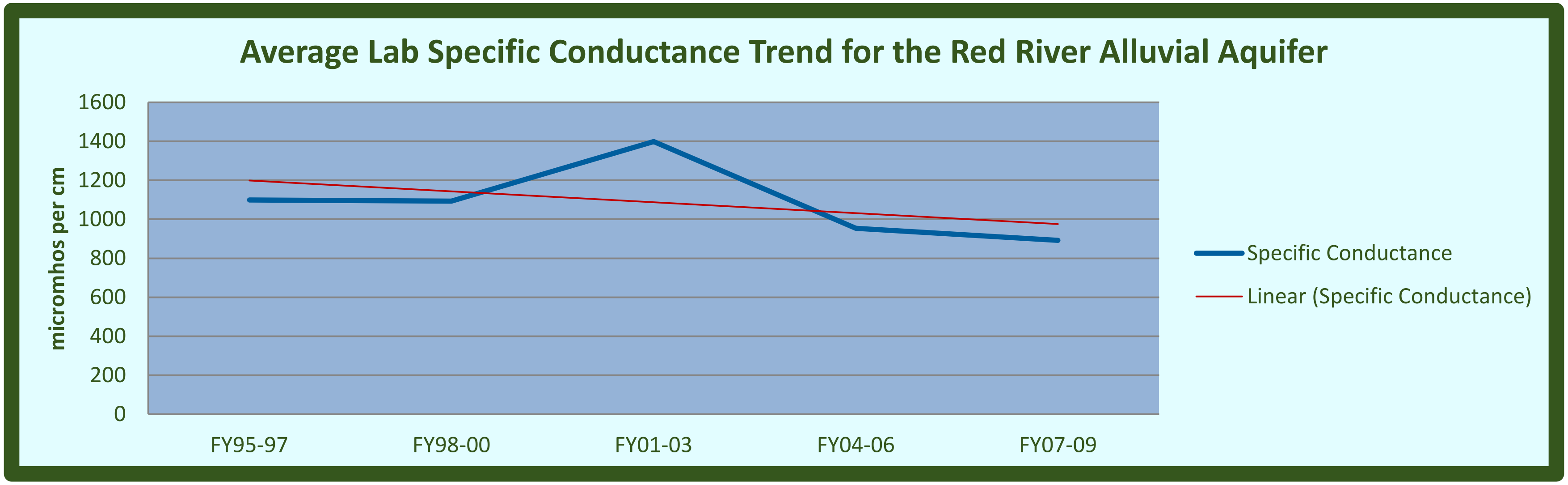


Chart 3-5: Field Salinity Trend

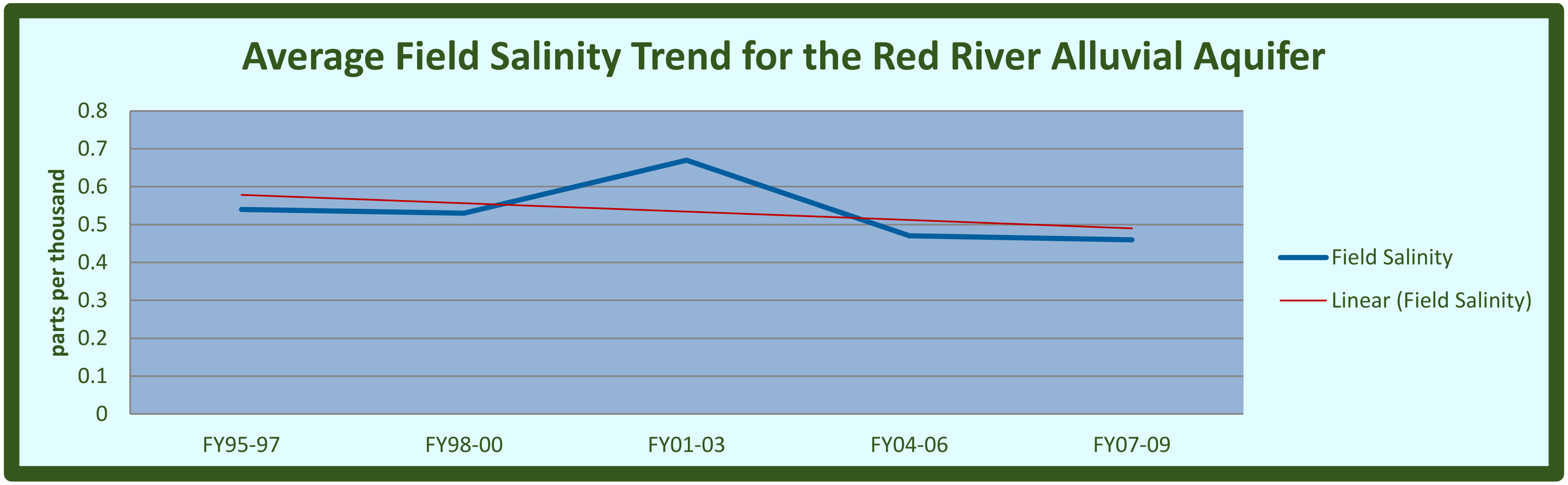


Chart 3-6: Alkalinity Trend

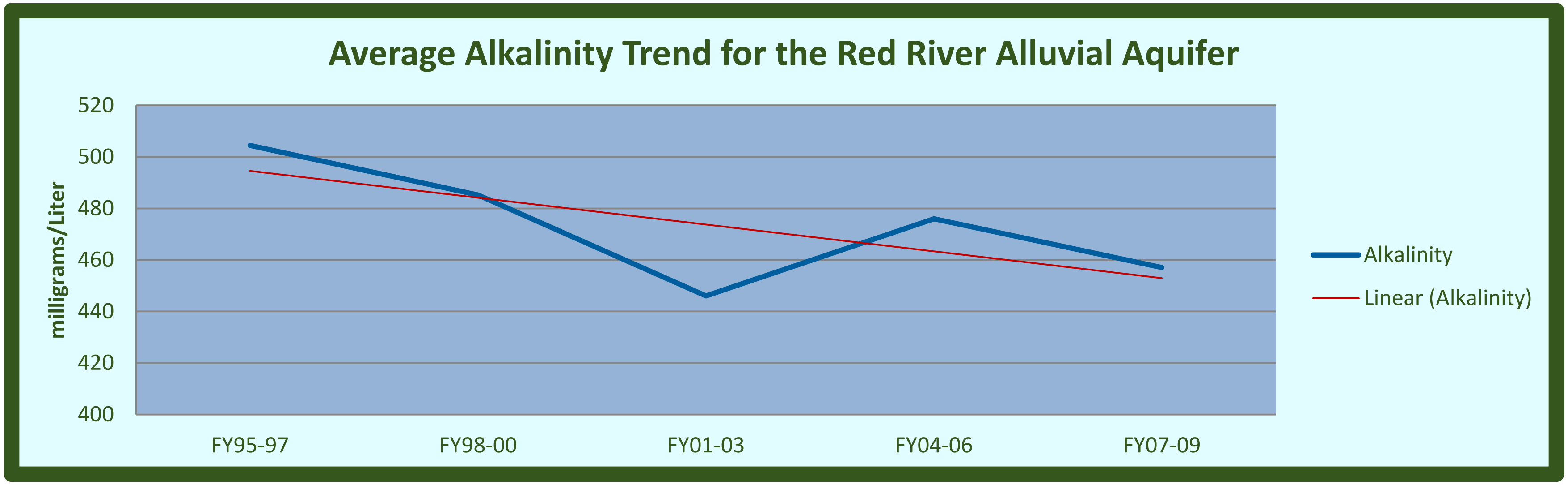


Chart 3-7: Chloride Trend

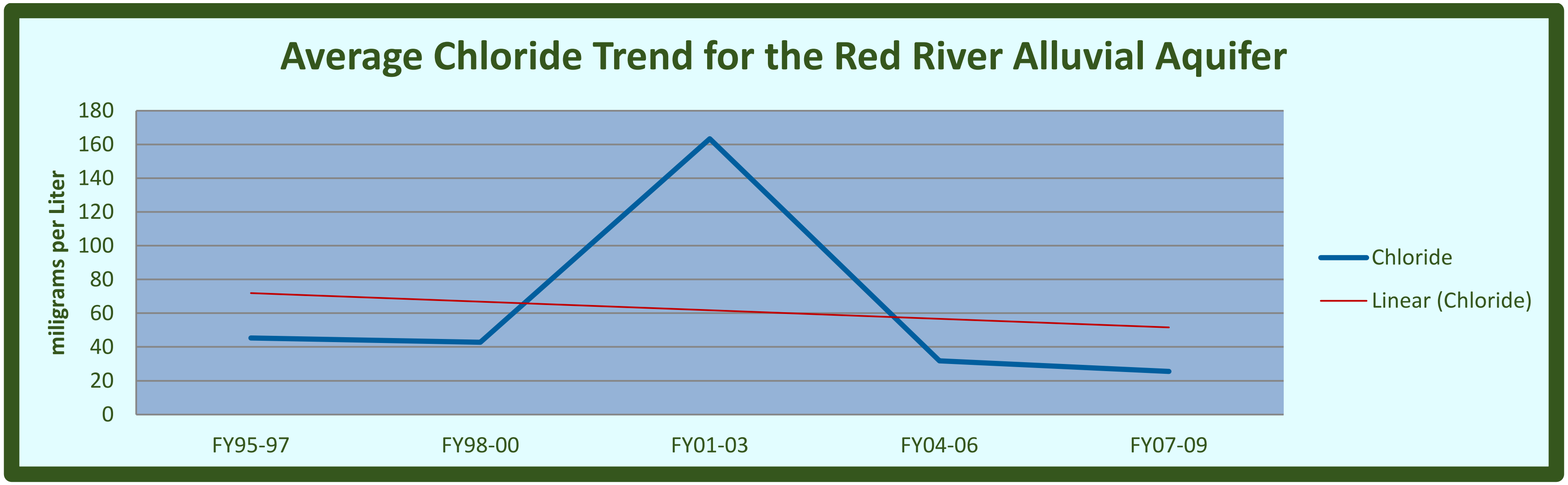


Chart 3-8: Color Trend

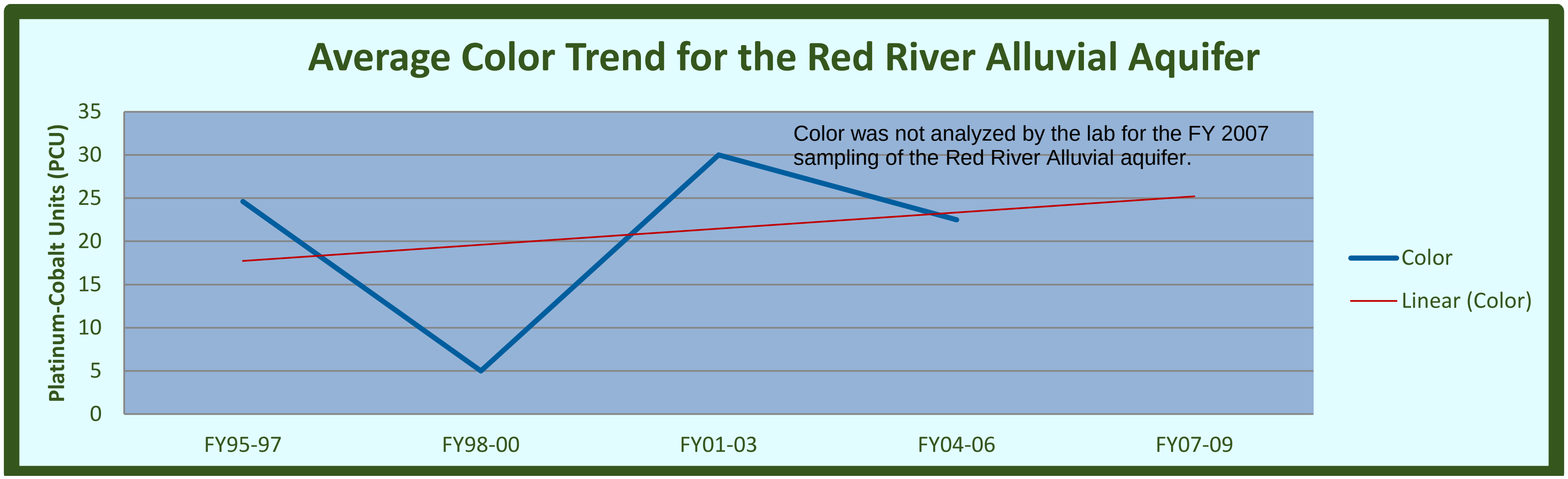


Chart 3-9: Sulfate (SO4) Trend

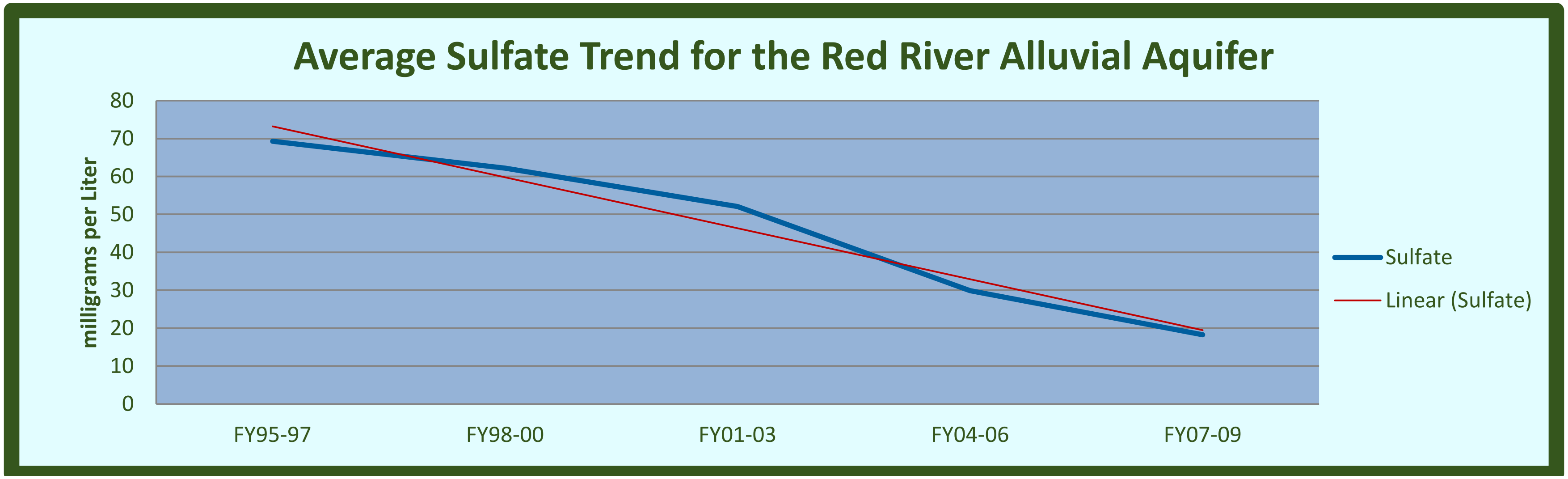


Chart 3-10: Total Dissolved Solids Trend

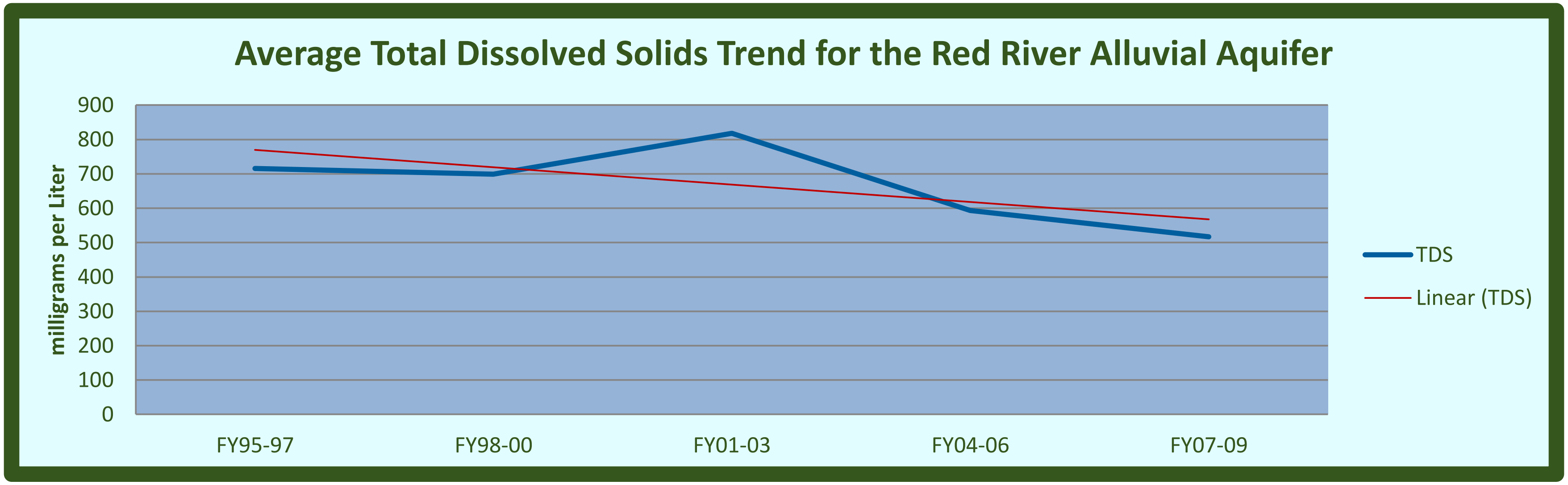


Chart 3-11: Ammonia Trend

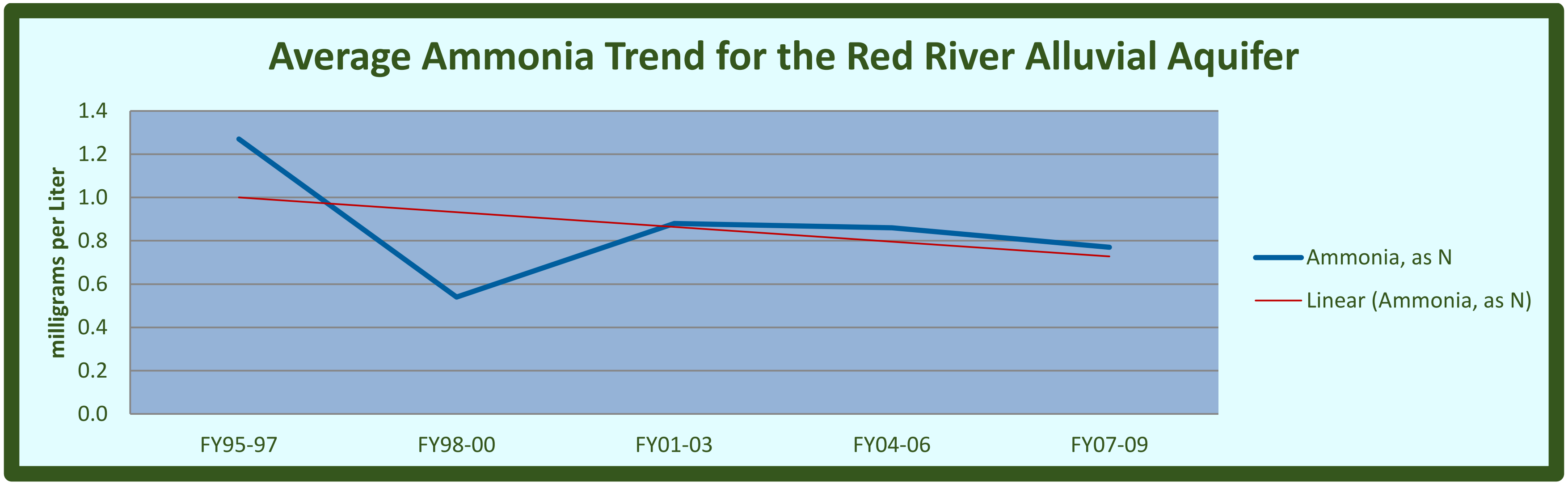


Chart 3-12: Hardness Trend

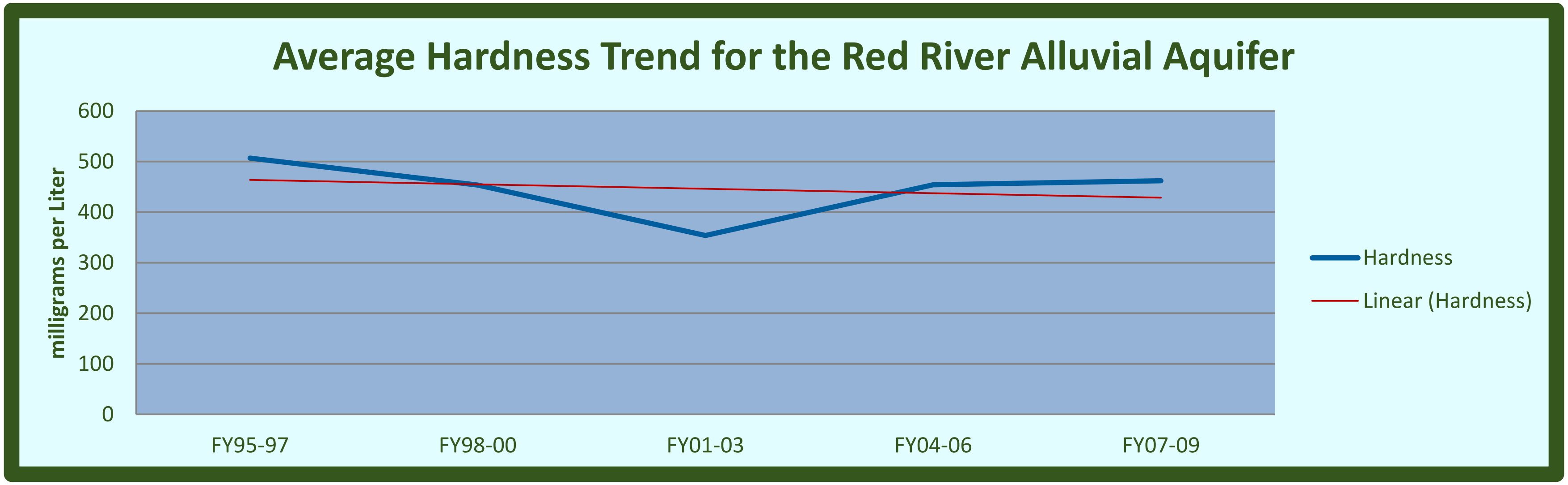


Chart 3-13: Nitrite – Nitrate Trend

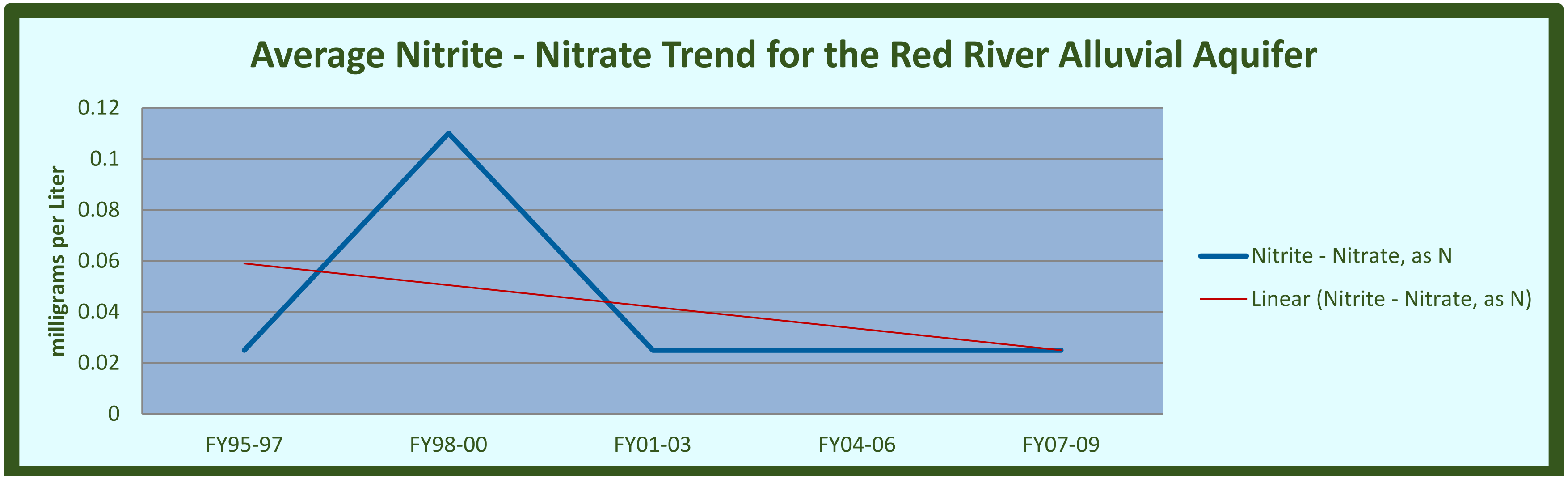


Chart 3-14: TKN Trend

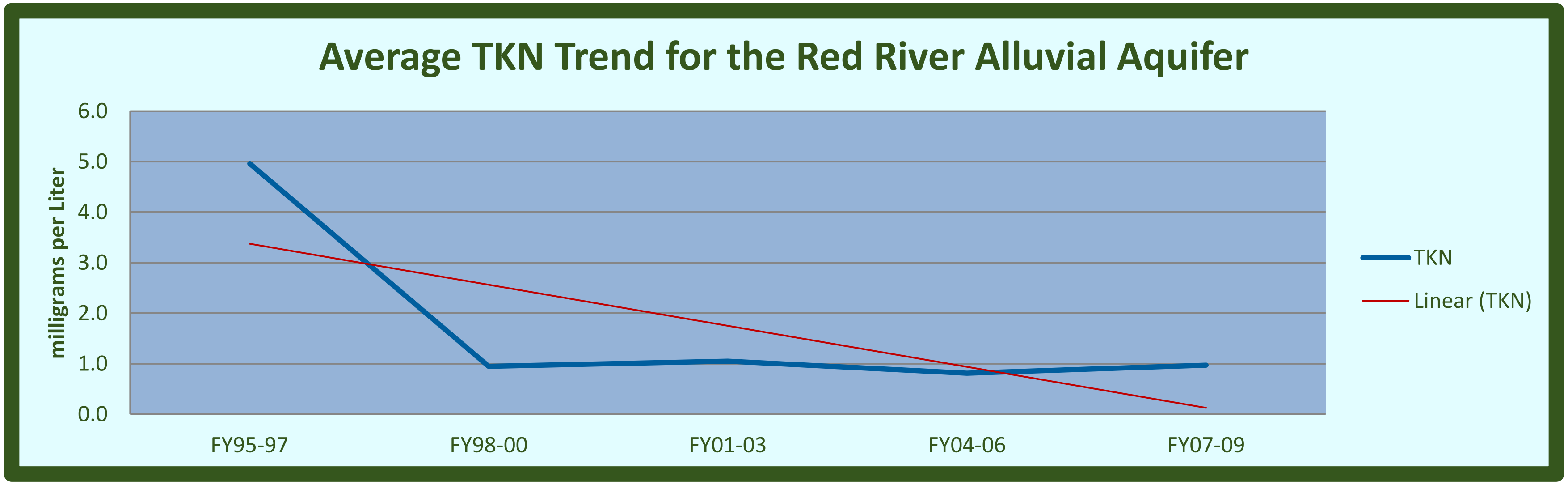


Chart 3-15: Total Phosphorus Trend

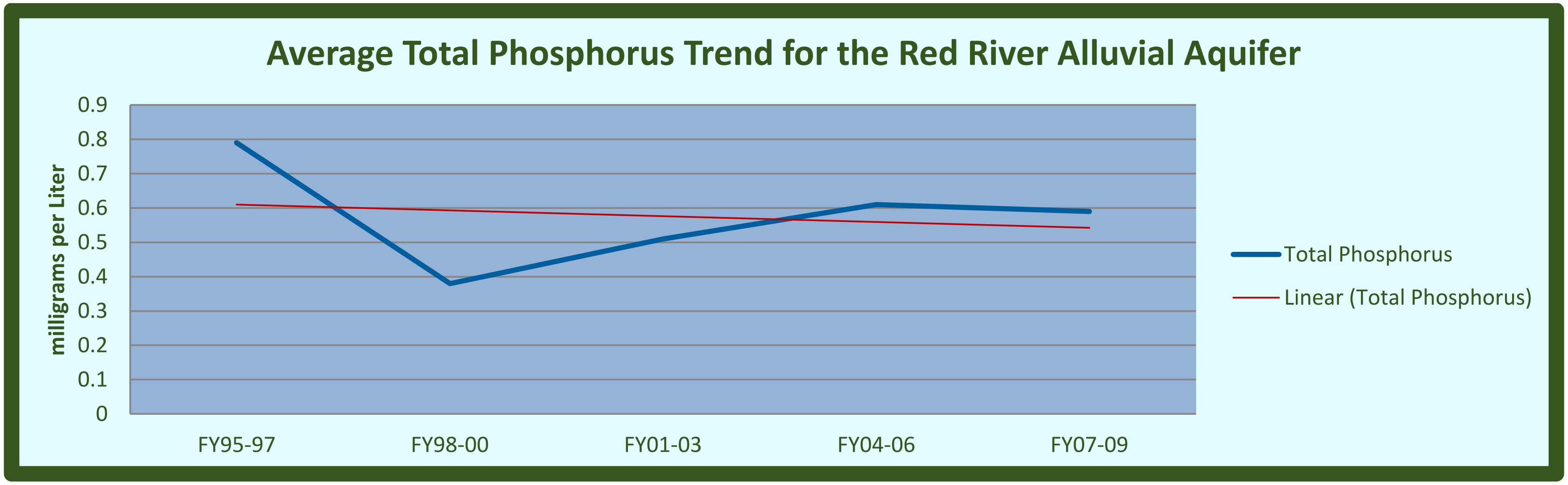


Chart 3-16: Iron Trend