



TECHNICAL MEMORANDUM NO. 2

PROJECT: **Reclassification of the Alafia River, Hillsborough County
From Class III to Class I**

TITLE: **Status and Trends of Fluoride, Arsenic, and TDS
Concentrations in the Alafia River**

PREPARED BY: **Marty Clasen, PBS&J**

DATE: **December 2007**

PURPOSE AND OBJECTIVES

The Alafia River is currently classified as Class III: Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife. Tampa Bay Water utilizes the Alafia River as a potable water supply source and is currently pursuing the reclassification of the river or portions of the river to Class I: Potable Water Supply.

The Florida Department of Environmental Protection (FDEP) lists the surface water quality criteria for Class I and Class III waters in Florida Administrative Code (F.A.C.) Chapter 62-302.530. One of the parameters in the classification list that has a lower standard for Class I in the proposed reclassification is fluoride. The Class III fluoride standard is 10 milligrams per liter (mg/l) and the Class I fluoride standard is 1.5 mg/l. Arsenic and total dissolved solids (TDS) are also parameters of potential concern for Tampa Bay Water. The Class I and Class III arsenic standards are 10 and 50 micrograms per liter ($\mu\text{g/l}$), respectively. The Class I TDS standard is 500 mg/l as a monthly average and 1,000 mg/l maximum. There is no TDS limit for Class III surface water.

This technical memorandum provides a review of the available historical fluoride, arsenic and TDS concentrations in the Alafia River and nearby rivers and a recommendation as to whether a variance might be needed for fluoride in order to demonstrate attainability for Class I standards.

Several long-term surface water monitoring stations exist along the Alafia River. Additionally, background water quality data are available from the Manatee River and Little Manatee River. Surface water quality databases from the United States Geological Survey (USGS), the United States Environmental Protection Agency (USEPA), the Hillsborough County Environmental Protection Commission (HCEPC), and Tampa Bay Water were reviewed for this project.

DATA SOURCES AND METHODS

Table 1 summarizes the available surface water quality data from the four agencies (USGS, USEPA, HCEPC, and Tampa Bay Water). The USGS database contains the longest period of record for fluoride and the Tampa Bay Water database has the shortest period of record. USGS stations on the Manatee River and Little Manatee River were also reviewed for background comparisons.

Table 1 – Data Sources

Agency	Station	Parameter	POR	Total Years
USGS	Alafia at Lithia	Fluoride	1/29/57 thru 9/30/99	42
USGS	North Prong Keyville	Fluoride	1/27/65 thru 8/29/05	40
USGS	South Prong near Lithia	Fluoride	3/25/65 thru 8/12/94	29
USGS	Alafia at Riverview	Fluoride	9/12/62 thru 6/9/70	8
USGS	South Prong near Lithia	Arsenic	5/22/72 thru 8/12/94	22
USGS	South Prong near Lithia	TDS	5/22/67 thru 8/12/94	27
USGS	Manatee River Myakka Head	Fluoride	4/25/66 thru 8/31/05	39
USGS	Little Manatee	Fluoride	10/1/56 thru 9/30/99	36
USGS	Little Manatee Ft. Lonesome	Fluoride	1/27/65 thru 8/29/05	40
USGS	Little Manatee Ft. Lonesome	TDS	5/17/67 thru 8/12/94	27
USGS	Manatee River Myakka Head	Arsenic	10/2/72 thru 9/1/04	32
USGS	Manatee River Myakka Head	TDS	12/1/66 thru 8/31/05	39
HCEPC	Alafia River Hwy 41	Fluoride	1/9/74 thru 12/21/05	31
HCEPC	Alafia River Hwy 301	Fluoride	9/23/99 thru 12/21/05	6
HCEPC	Alafia River Bell Shoals Rd	Fluoride	1/23/74 thru 12/21/05	31
HCEPC	North Prong Alafia	Fluoride	1/22/74 thru 12/21/05	31
HCEPC	South Prong Alafia	Fluoride	1/22/74 thru 12/21/05	31
HCEPC	South Prong Bethlehem Rd	Fluoride	5/6/81 thru 12/21/05	24
HCEPC	South Prong Bethlehem Rd	TDS	5/6/81 thru 11/14/01	20
HCEPC	North Prong Alafia	TDS	12/12/01 thru 12/21/05	5

Agency	Station	Parameter	POR	Total Years
USEPA	Alafia River Hwy 41	Fluoride	3/28/60 thru 5/31/78	18
USEPA	Alafia River above Lithia	Fluoride	1/6/55 thru 11/22/76	21
USEPA	South Prong Alafia River	Fluoride	10/16/73 thru 5/27/87	14
USEPA	Alafia River Hwy 301	Fluoride	1/23/74 thru 12/9/98	24
USEPA	Alafia River Turkey Creek	Fluoride	12/1/92 thru 8/18/94	2
Tampa Bay Water	Alafia River Intake *	Fluoride TDS	11/15/99 thru 10/21/04	5
Tampa Bay Water	Alafia River Intake *	Arsenic	8/8/00 thru 10/21/04	4
Tampa Bay Water	Alafia Pump Station *	Fluoride TDS	4/8/03 thru 11/2/06	3
Tampa Bay Water	Alafia Pump Station *	Arsenic	2/9/04 thru 11/2/06	2
Tampa Bay Water	Alderman Ford Park *	Fluoride TDS	12/8/89 thru 3/8/05	16
Tampa Bay Water	Alafia River CR 39 *	Fluoride TDS	4/13/05 thru 10/4/06	2
Tampa Bay Water	North Prong Alafia *	Fluoride TDS	12/8/89 thru 10/4/06	17
Tampa Bay Water	South Prong Alafia *	Fluoride TDS	12/8/89 thru 10/16/06	17

* Active Station

BACKGROUND

Fluoride levels in surface water typically vary according to location and proximity to emission sources. Worldwide surface water concentrations of fluoride generally vary from 0.01 to 0.3 mg/l. Seawater generally contains more fluoride than fresh water, with concentrations ranging from 1.2 to 1.5 mg/l (IPCS, Environmental Health Criteria for Fluorides). Higher levels of fluoride have been measured in areas where the natural rock is rich in fluoride, and elevated inorganic fluoride levels are often seen in regions where there is geothermal or volcanic activity (25 to 50 mg/l in hot springs and geysers and as much as 2,800 mg/l in certain East African Rift Valley lakes). Anthropogenic discharges can also lead to increased levels of fluoride in the environment. Fluoride is a component of most types of soil, with total fluoride concentrations ranging from 20 to 1,000 micrograms per gram ($\mu\text{g/g}$) in areas without natural phosphate or fluoride deposits and up to several thousand $\mu\text{g/g}$ in mineral soils with phosphate or fluoride deposits (IPCS, Environmental Health Criteria for Fluorides).

The Alafia River flows through the heart of the central Florida phosphate mining region in Polk County and Hillsborough County. Phosphate ore is present in the Bone Valley Formation and the Alafia River cuts through areas where the Bone Valley Formation outcrops at the land surface in

Hillsborough County. The mineral containing the phosphate ore is apatite. Apatite is composed of calcium, phosphorus, oxygen, and fluorine in the formula $\text{Ca}_{10}(\text{PO}_4)_6\text{F}_2$. The fluorine combines with calcium to form calcium fluoride (CaF), the common form of fluoride measured in the surface water.

Chemical analyses of sedimentary apatite from the Bone Valley Formation in Ridgewood and Fort Meade, Florida indicate the fluorine content ranges from 3.8 to 4.1 percent. Chemical analyses of commercial “pebble” and concentrate ore from the land-pebble phosphate district are similar, with fluorine content ranging from 3.68 to 3.81 percent (Field Guidebook Geology and Geochemistry of the Bone Valley Formation and Its Phosphate Deposits, West Central Florida, 1964).

The source of the calcium fluoride detected in the Alafia River is most likely related to the naturally occurring fluorine contained in the Bone Valley Formation. The concentration of fluoride in the Alafia River was most likely influenced by the phosphate mining activities over the past 116 years (the first recorded production of land-pebble phosphate was in 1891).

Arsenic can be naturally occurring in surface water and ground water in Florida and may be derived from arsenopyrite associated with organic layers in limestone formations. During the phosphate mining process, arsenic-bearing limestones may be exposed and eventually contribute arsenic to surface water systems.

TDS is a measure of the sum total of major anions and cations dissolved in the surface water. Natural TDS concentrations can vary seasonally and can be influenced by phosphate mining discharges.

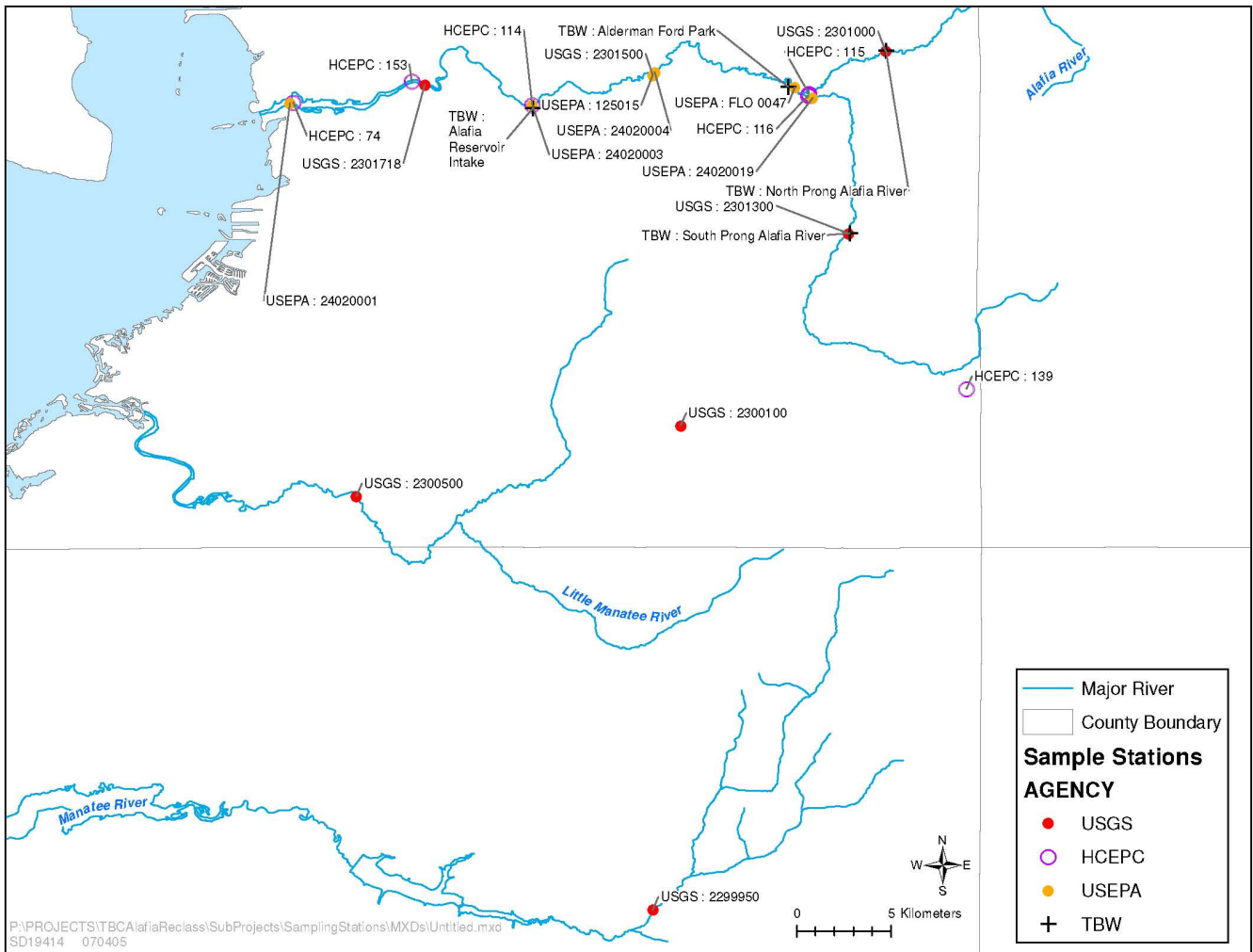
ALAFIA RIVER FLUORIDE DATA

Period of record surface water quality data were obtained from the USGS webportal online data base, the HCEPC website, the USEPA STORET site, and from Tampa Bay Water. The fluoride concentration in mg/l was plotted graphically versus sample date for selected Alafia River sites. Additionally, fluoride concentration data were also plotted for USGS 02300100 Little Manatee River Near Ft. Lonesome and for USGS 02299950 Manatee River Near Myakka Head to compare to background levels away from phosphate mining areas. Sample station locations for USGS, HCEPC, USEPA, and Tampa Bay Water are shown on Figure 1.

The longest periods of record for fluoride data from the Alafia River include 42 years for the USGS station at Lithia, 31 years for the HCEPC station at Bell Shoals Road, and 24 years for the USEPA station at Highway 301. Tampa Bay Water fluoride data is more recent with periods of record ranging from one year to 17 years.

Historical trends in fluoride concentrations were reviewed by river segments, including the North Prong of the Alafia River, the South Prong of the Alafia River, and the Alafia River below the confluences of the North and South Prongs. Additionally, background fluoride levels were reviewed from the Manatee River and Little Manatee River for comparison purposes.

Figure 1



NORTH PRONG ALAFIA RIVER

Three stations are presented in this report with data from the North Prong Alafia River including the USGS station at Keysville, the HCEPC station 115 (just upstream of the confluence), and the Tampa Bay Water station.

Figure 2

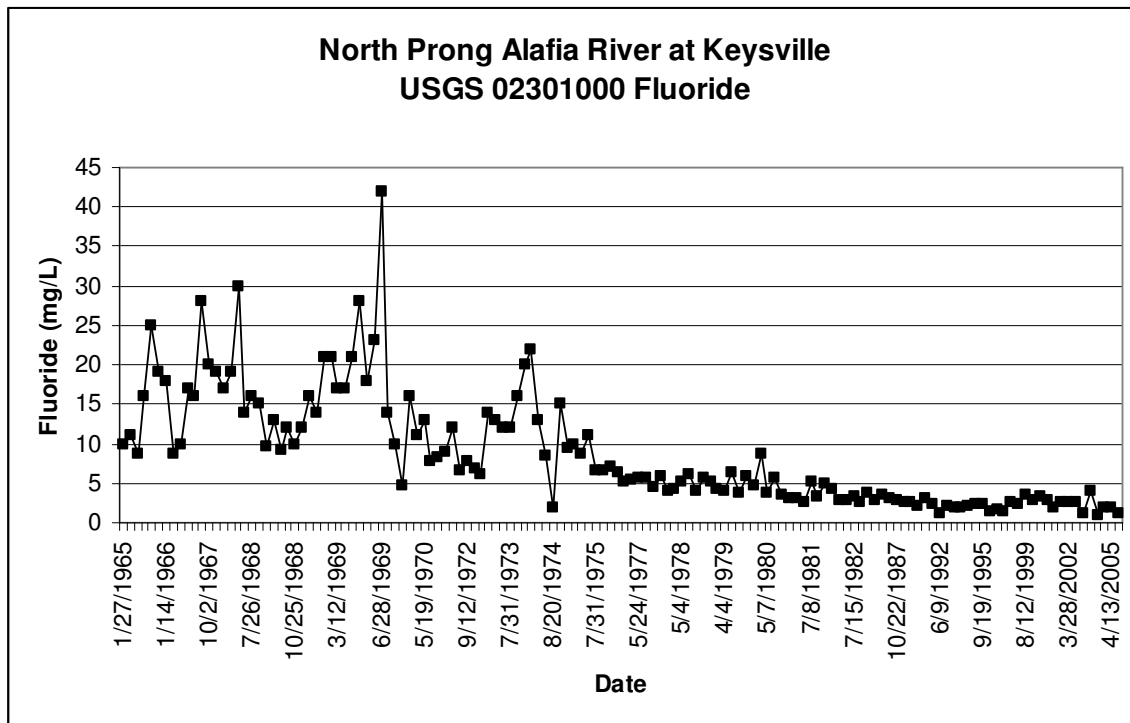


Figure 2 shows the fluoride data for the North Prong Alafia River USGS station near Keysville. Data are available from 1965 through 2005 when data collection ended. Fluoride concentrations range from 42 mg/l to 0.9 mg/l over the period of record. Fluoride levels decreased from a range of 10 to 30 mg/l during the period from 1965 to 1975 to an average of less than 5 mg/l after 1980.

Figure 3

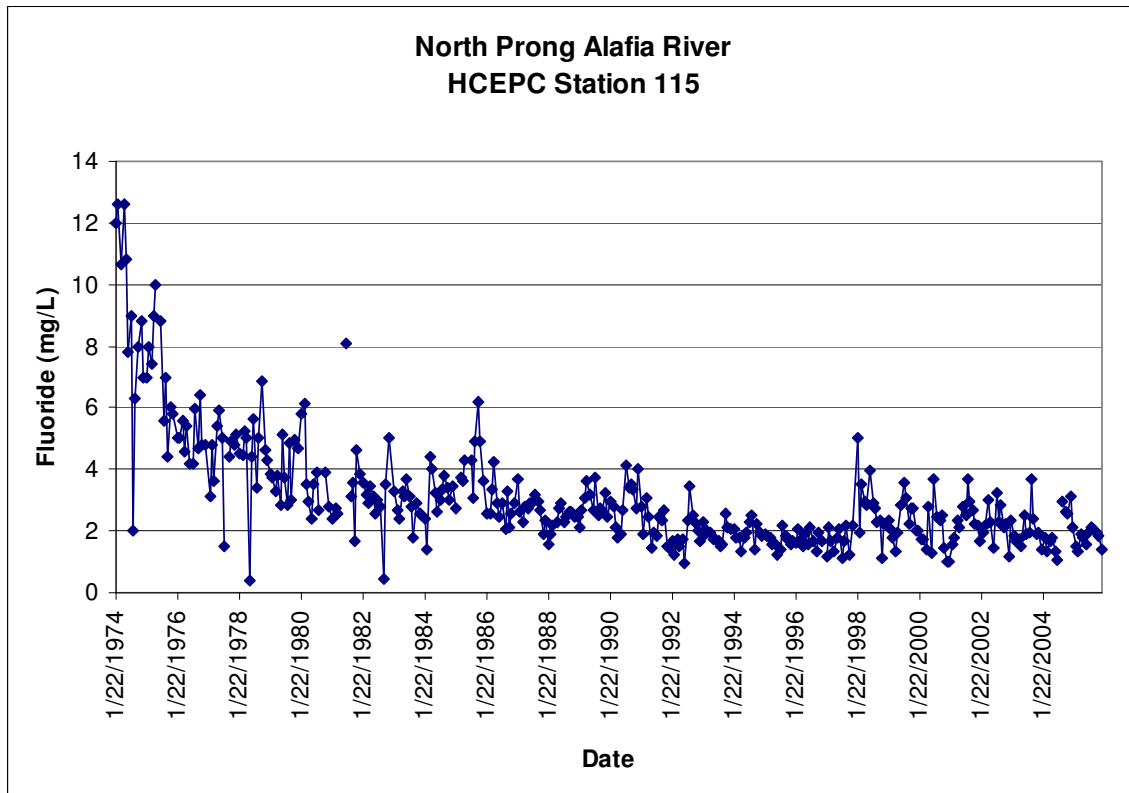


Figure 3 shows the fluoride data for the North Prong Alafia River HCEPC Station 115. Data are available from 1974 through 2005. Fluoride concentrations range from 12.6 mg/l to 0.4 mg/l over the period of record. Fluoride levels decreased sharply from 12 mg/l to less than 4 mg/l from 1974 to 1980 and stabilized near 2 mg/l.

Figure 4

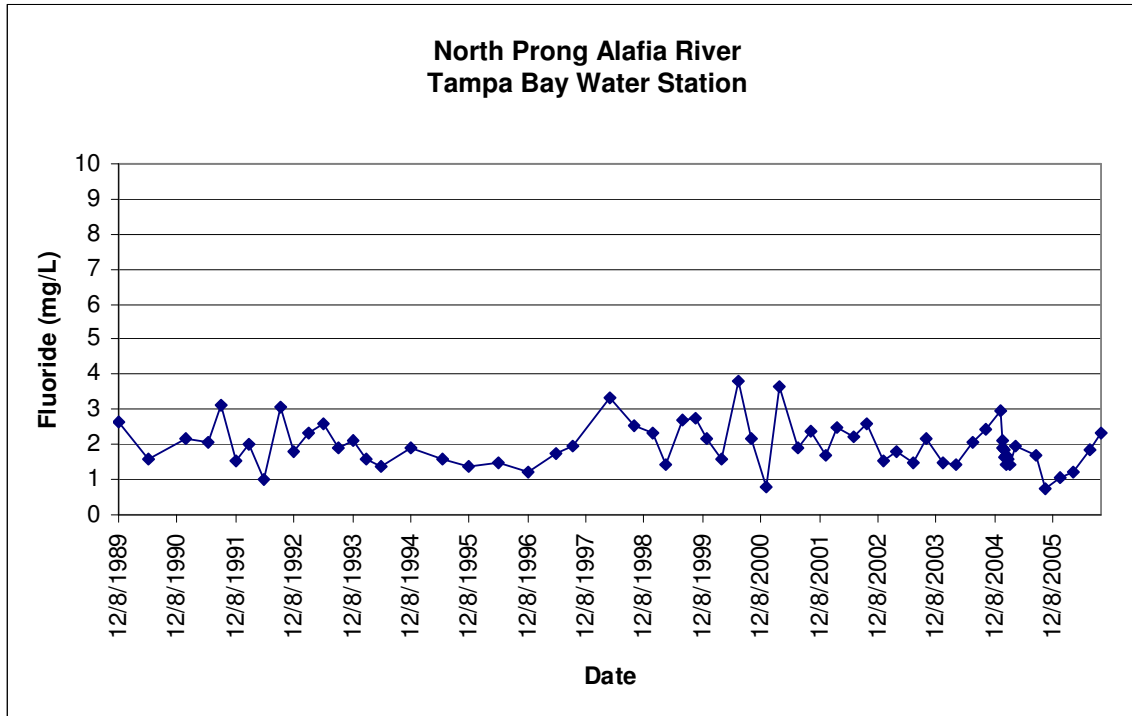


Figure 4 shows fluoride data for the North Prong Alafia River Tampa Bay Water station. Data are available from 1989 through 2006. Fluoride concentrations range from 3.8 mg/l to 0.72 mg/l over the period of record. Fluoride levels are stable at approximately 1 to 3 mg/l.

In summary, the three stations on the North Prong Alafia River indicate that fluoride concentrations have decreased dramatically from the 1960s and 1970s and appear to have stabilized at levels ranging from 1 to 4 mg/l.

SOUTH PRONG ALAFIA RIVER

Four sampling stations are presented with fluoride data from the South Prong Alafia River including the USGS station near Lithia, the HCEPC station 116 near the confluence of the North Prong and South Prong, the USEPA station, and the Tampa Bay Water station.

Figure 5

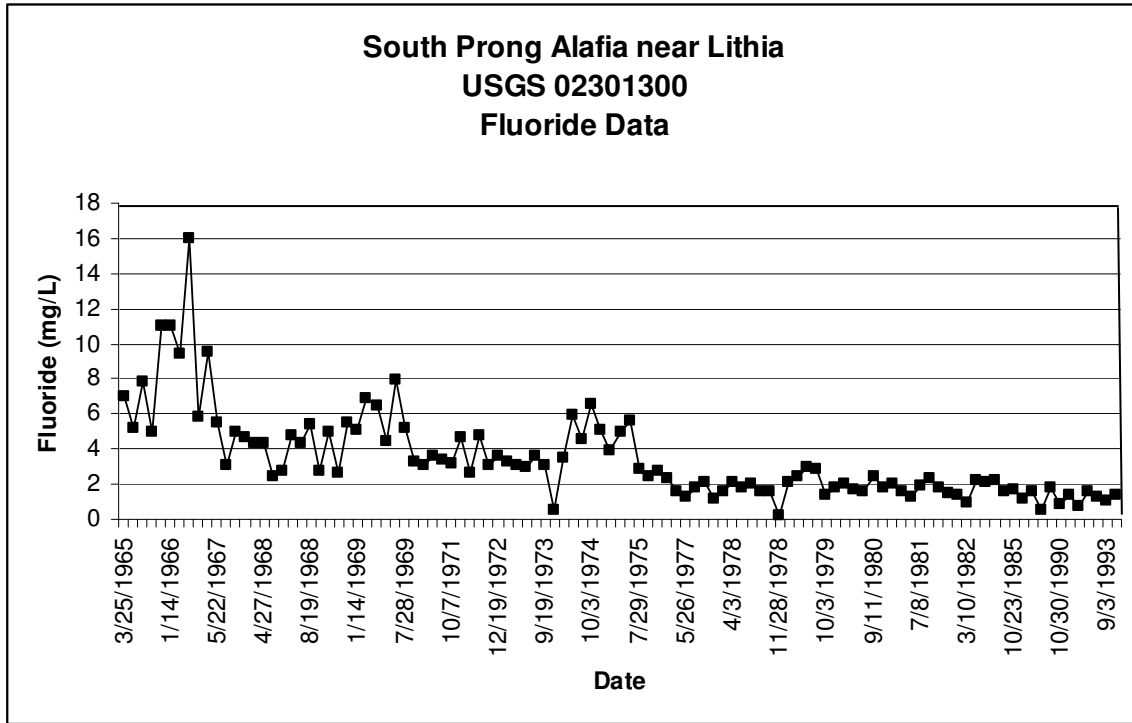


Figure 5 shows fluoride data for the South Prong Alafia River USGS station near Lithia. Data are available from March 25, 1965 through March 1993 when data collection ended. Fluoride concentrations range from 16 mg/l to 0.2 mg/l. The trend is very similar to the North Prong graph, with fluoride values decreasing from a range of 5 to 10 mg/l over the period from 1965 to 1975 and then stabilizing at values generally less than 2 mg/l.

Figure 6

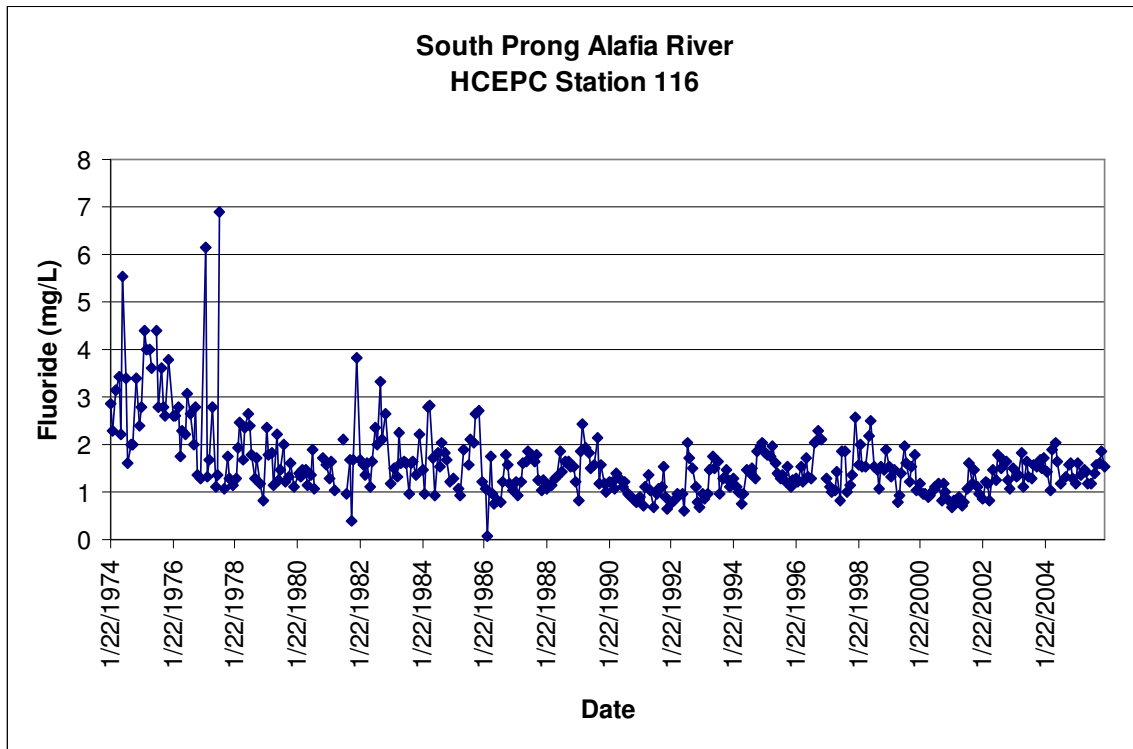


Figure 6 shows fluoride data for the South Prong Alafia River HCEPC station 116 just upstream of the confluence of the South Prong and North Prong. Data are available from 1974 through 2005. Fluoride concentrations range from 6.9 mg/l to 0.07 mg/l. Again, a similar trend is observed. Fluoride concentrations decrease from 1974 to 1980 and remain relatively stable between 1 mg/l and 2 mg/l after 1986.

Figure 7

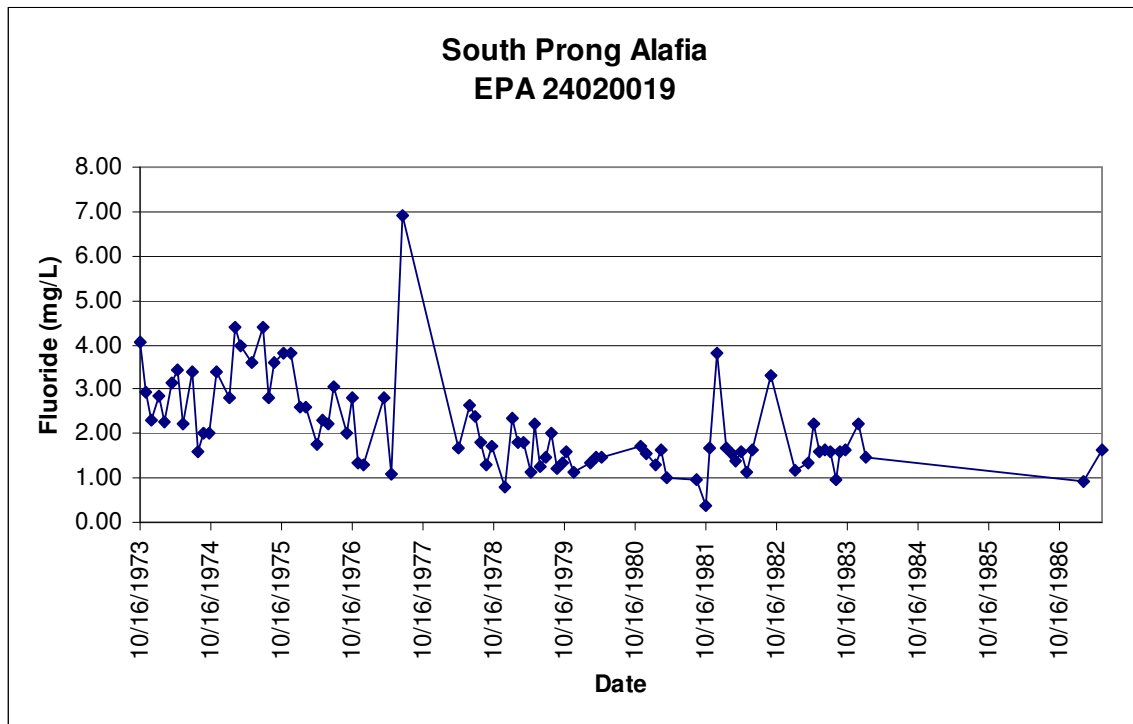


Figure 8

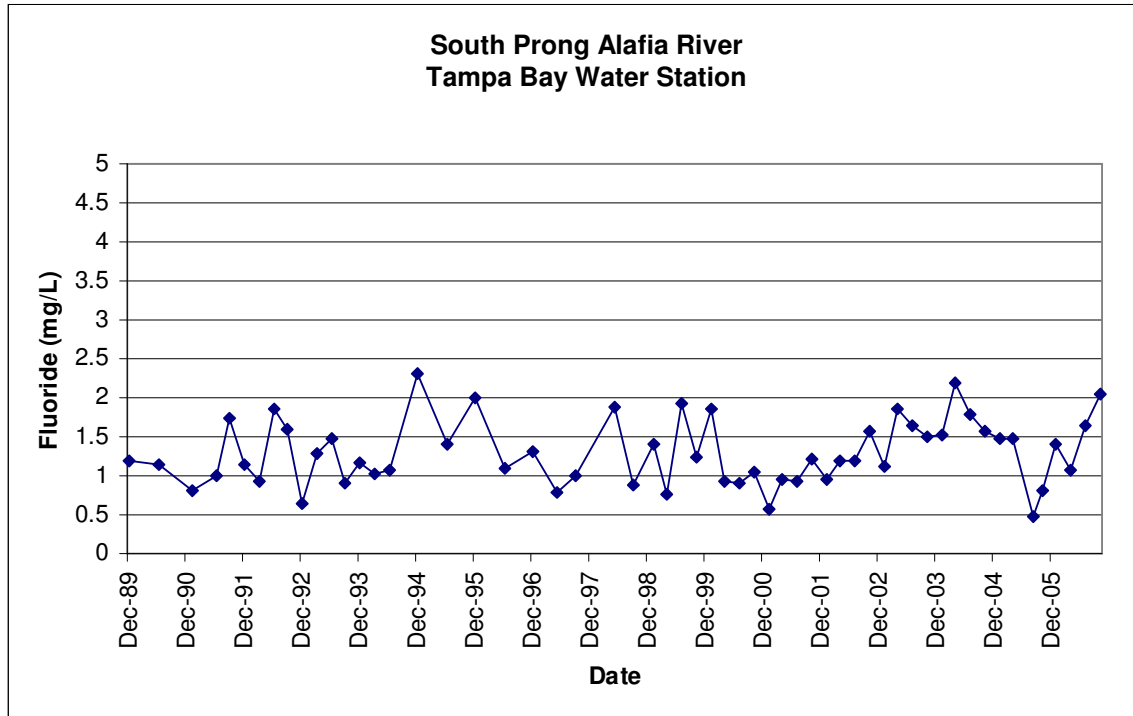


Figure 8 shows fluoride data for the South Prong Alafia River Tampa Bay Water station. Data are available from 1989 through 2006. Fluoride concentrations range from 2.32 mg/l to 0.48 mg/l. The data set begins in 1989 and does not show the higher levels of fluoride before 1980. Fluoride concentrations show no particular trend and range between 0.5 mg/l and 2 mg/l.

In summary, historical fluoride data from the South Prong Alafia River indicate that fluoride concentrations have decreased significantly from the 1960s and 1970s and appear to have stabilized at levels ranging from 1 to 2 mg/l, very near the Class I standard of 1.5 mg/l.

ALAFIA RIVER BELOW THE CONFLUENCES OF THE NORTH PRONG AND SOUTH PRONG

For the lower reaches of the Alafia River, below the confluences of the North Prong and the South Prong, fluoride data from three surface water monitoring sites were reviewed. These sites include the USGS station near Lithia, the USEPA station at Highway 301, and the HCEPC station at Highway 41.

Figure 9

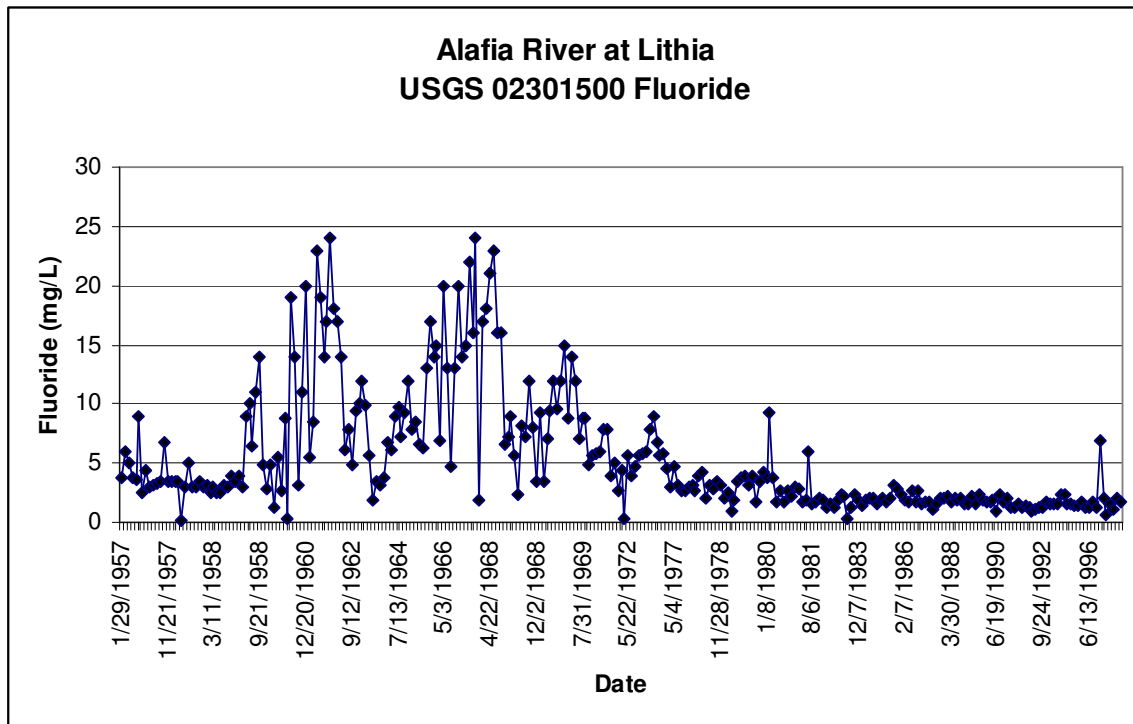


Figure 9 shows fluoride data from the USGS station at the Alafia River near Lithia. Data are available from 1957 through 1999 when data collection ended. Fluoride concentrations range from 24 mg/l to 0.2 mg/l over the period of record. The trend is similar to the North Prong and South Prong. Fluoride concentrations decreased dramatically from a range of approximately 10 to 25 mg/l over the period from 1957 to 1975 to levels less than 2 mg/l after 1980.

Figure 10

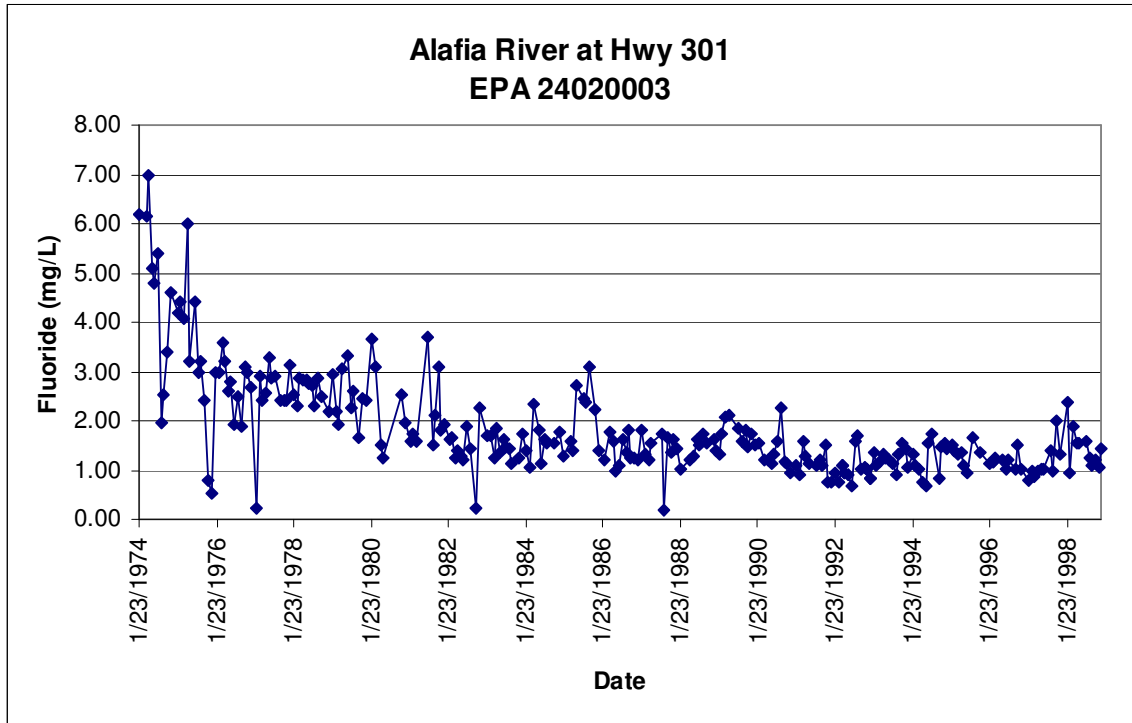


Figure 10 shows fluoride data from the USEPA Alafia River Hwy 301 station. This station is located downgradient from the USGS monitoring station at Lithia station. Data are available from January 23, 1974 through December 9, 1998 when data collection ended. Fluoride concentrations range from 7.0 mg/l to 0.19 mg/l over the period of record. The trend is similar to the USGS stations with values decreasing from 1974 to 1980 and then stabilizing between 1 and 2 mg/l.

Figure 11

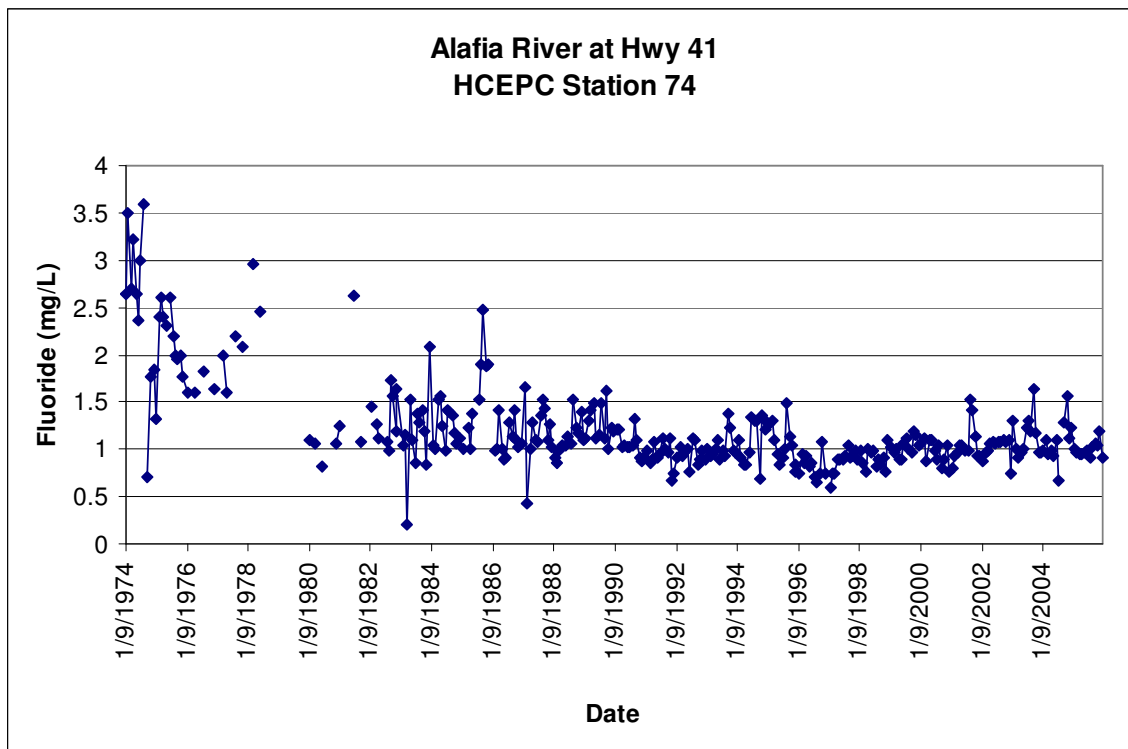


Figure 11 shows fluoride data from the HCEPC Alafia River Hwy 41 station. This station is located downgradient from the EPA Hwy 301 station. Data are available from January 9, 1974 through December 21, 2005. Fluoride concentrations range from 3.6 mg/l to 0.2 mg/l over the period of record. The trend is similar to the USGS and USEPA stations with values decreasing from 1974 to 1980 and then stabilizing near 1 mg/l.

In summary, the lower reaches of the Alafia River generally have lower concentrations of fluoride compared to the upper reaches and levels have been generally below the Class I standard of 1.5 mg/l since the 1980s.

FLUORIDE CONCENTRATIONS FROM THE LITTLE MANATEE RIVER AND MANATEE RIVER

Fluoride data were reviewed from USGS stations on the Little Manatee River and the Manatee River for comparison purposes. The Little Manatee River is located south of the Alafia River. Most of the Little Manatee River is in Hillsborough County, except for the southern branch which is located in Manatee County. The Manatee River is located entirely in Manatee County, south of the Little Manatee River.

Figure 12

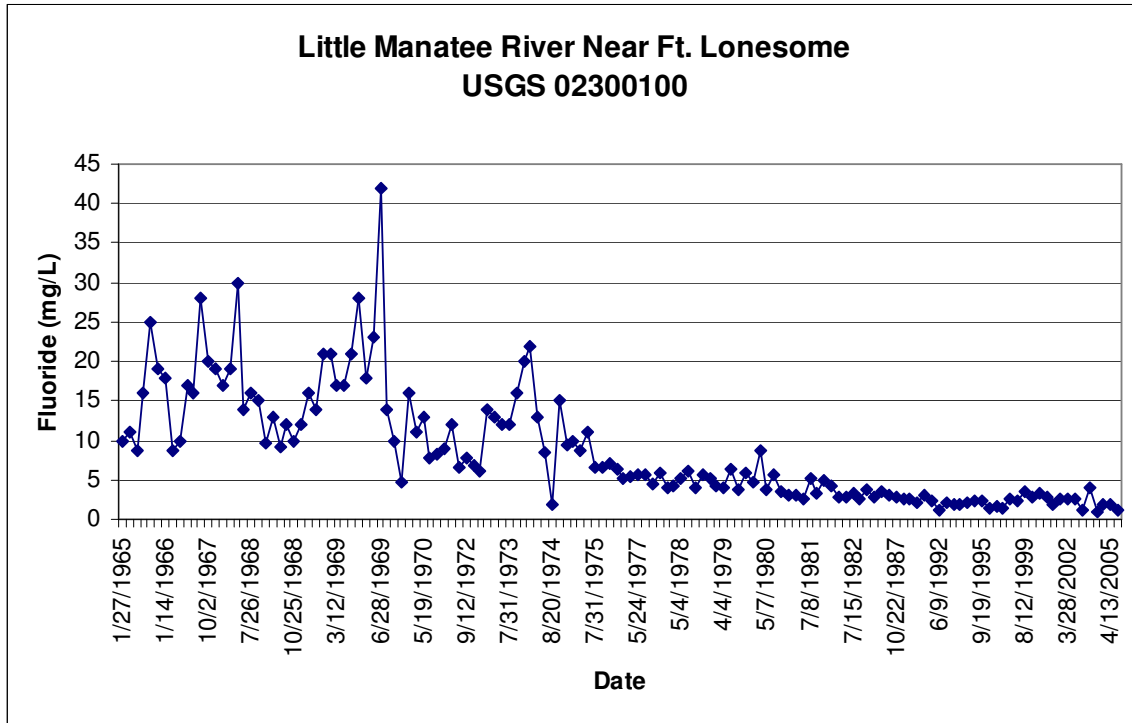


Figure 12 shows fluoride data from the Little Manatee River near Ft. Lonesome. The upper reaches of the Little Manatee River (near Ft. Lonesome) are located in phosphate mining areas. Data are available from January 27, 1965 through August 29, 2005. Fluoride concentrations ranged from 42 mg/l to 0.9 mg/l over the period of record. The trend is very similar to the Alafia River with higher fluoride concentrations from 1965 to 1975 and then a decrease in concentrations and stabilization from 1980 through 2005.

Figure 13

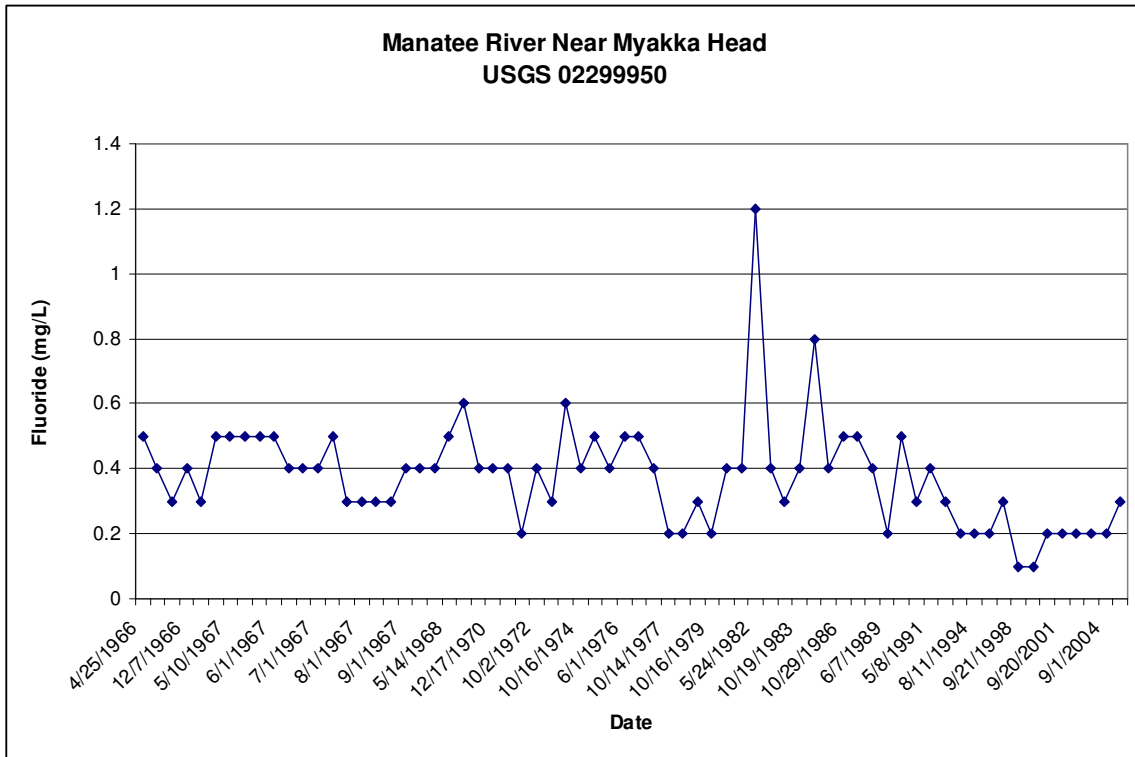


Figure 13 shows fluoride data from the Manatee River near Myakka Head. Data are available from April 25, 1966 through August 31, 2005. Fluoride concentrations ranged from 1.2 mg/l to 0.1 mg/l over the period of record. The Manatee River is south of the main phosphate mining area and appears not to have been impacted by mining as far as fluoride levels are concerned. The Manatee River may be representative of background fluoride levels for this region of Florida.

An evaluation of the fluoride trend in the Alafia River was conducted by a consultant for Mosaic (ECT Environmental Consulting & Technology, Inc., letter to Mosaic Fertilizer, LLC dated July 6, 2006, “Hopewell Mine Surface Water Impact Assessment”). ECT evaluated the fluoride data from the Alafia River at Lithia station for the period 1980 through 2004. Table 2 summarizes the analysis for 5-year periods, showing that the mean fluoride concentration is 1.4 mg/l and the median value is 1.3 mg/l.

Table 2 – Fluoride Concentrations Alafia at Lithia

Time Period	Mean Value	Median Value
1980 - 1984	1.8 mg/l	1.6 mg/l
1985 - 1989	1.6 mg/l	1.5 mg/l
1990 – 1994	1.2 mg/l	1.2 mg/l
1995 – 1999	1.3 mg/l	1.2 mg/l
2000 – 2004	1.2 mg/l	1.2 mg/l
1980 - 2004	1.4 mg/l	1.3 mg/l

An excerpt from the referenced letter states:

“a long term plot of Fluoride data from samples collected in the Alafia at Lithia show decreasing levels of Fluoride from the beginning of the record through 1979. These decreases are likely associated with changes in water management and treatment practices at the various mines discharging into the Alafia basin. Since 1980, concentrations have continued to decline although at a slower rate, remaining essentially stable at the average of 1.4 mg/l. This long term stable concentration reflects the establishment of best practices for mine and water management treatment. Mosaic, along with its predecessors and competitors have followed these practices since their establishment with the advent of NPDES permitting for phosphate mines in the late 1970s. The effectiveness of these practices is reflected in the long term stability of the fluoride concentration in the river over the last 25 years. During that period, mining activity has waxed and waned with variations in the phosphate market, however, the mean and median concentration of Fluoride measured at the Lithia station have remained essentially constant, indicating that variations in the amount of mining in the basin do not cause measurable variations in this value.”

The historical fluoride data show that phosphate mining had impacts on surface water quality. Figures 14 and 15 show how the phosphate mining area has changed from pre-1975 to 2006.

Figure 14

Figure 14 (attached to this memorandum) shows nonmandatory reclamation phosphate lands. Nonmandatory reclamation applies to lands mined prior to 1975. This map gives an approximation of phosphate mined areas before 1975. Before 1975, phosphate mining was concentrated in the northernmost portion of the Bone Valley Formation in parts of Hillsborough and Polk counties.

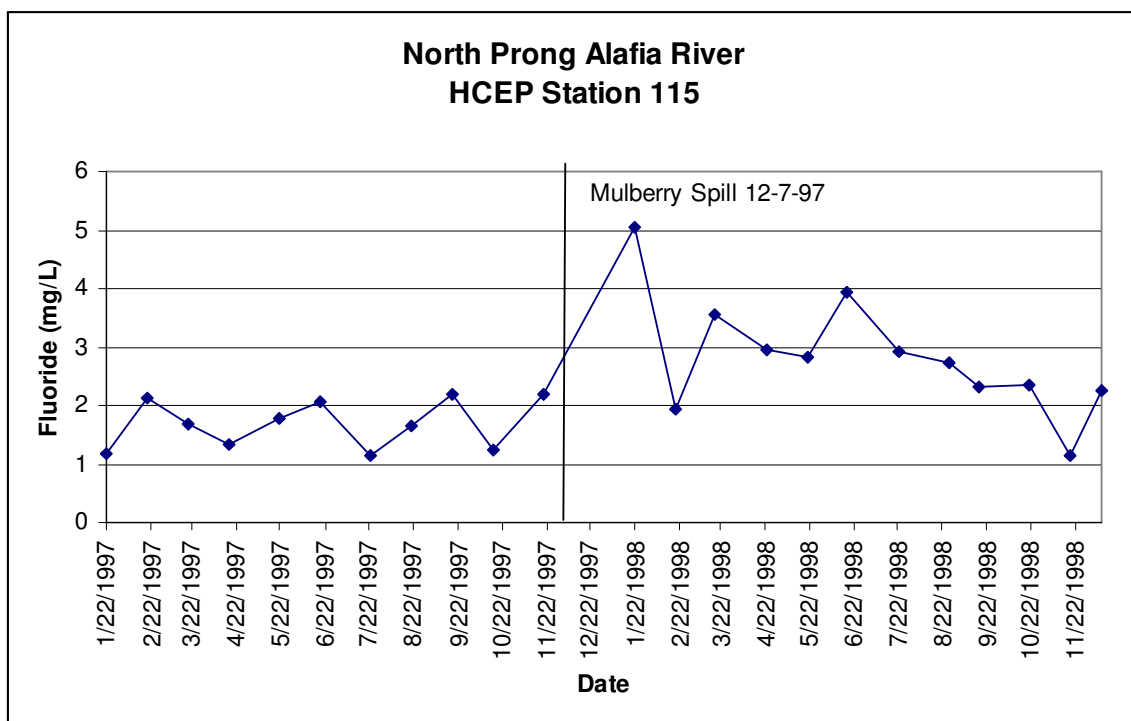
Figure 15

Figure 15 (attached to this memorandum) shows the mandatory reclamation phosphate mines as of January 2006 and gives an approximation of currently mined areas. The main difference between Figure 14 and Figure 15 is that the phosphate mining has moved from north to south into Manatee and Hardee counties.

PHOSPHATE MINING RELEASES

The phosphate mining industry has had numerous documented releases and spills of process wastewater into the Alafia River and its tributaries. Fluoride concentrations in the North Prong of the Alafia River show an apparent increase after mining discharges in 1997 and 2004-2005. On December 7, 1997, the Mosaic Mulberry Plant discharged 50,000,000 to 60,000,000 gallons of process wastewater into Skinned Sapling Creek, a tributary of the North Prong of the Alafia River. Figure 16 shows fluoride concentrations from the HCEPC Station 115 during 1997 and 1998. The Mulberry Spill is indicated with a vertical line. The subsequent sampling on December 22, 1997 showed the highest fluoride concentration in the two-year period of 5.04 mg/l.

Figure 16



FDEP granted Mosaic an Emergency Order to discharge process wastewater into the North Prong of the Alafia River from September 10, 2004 through February 10, 2005. Figure 17 shows fluoride concentrations for 2004 and 2005 from the HCEPC station 115. The Emergency Order discharge period is shown with two vertical lines. Fluoride concentrations increased from 1.08 mg/l to 3.13 mg/l after the discharge of process wastewater. Figure 18 shows fluoride data from the Tampa Bay Water Station on the North Prong of the Alafia River. The effects of the emergency order discharge are evident as fluoride concentrations increased from 2.07 mg/l to 2.98 mg/l after the release. The data indicate that phosphate mining releases of process water impact the fluoride levels in the North Prong of the Alafia River.

Figure 17

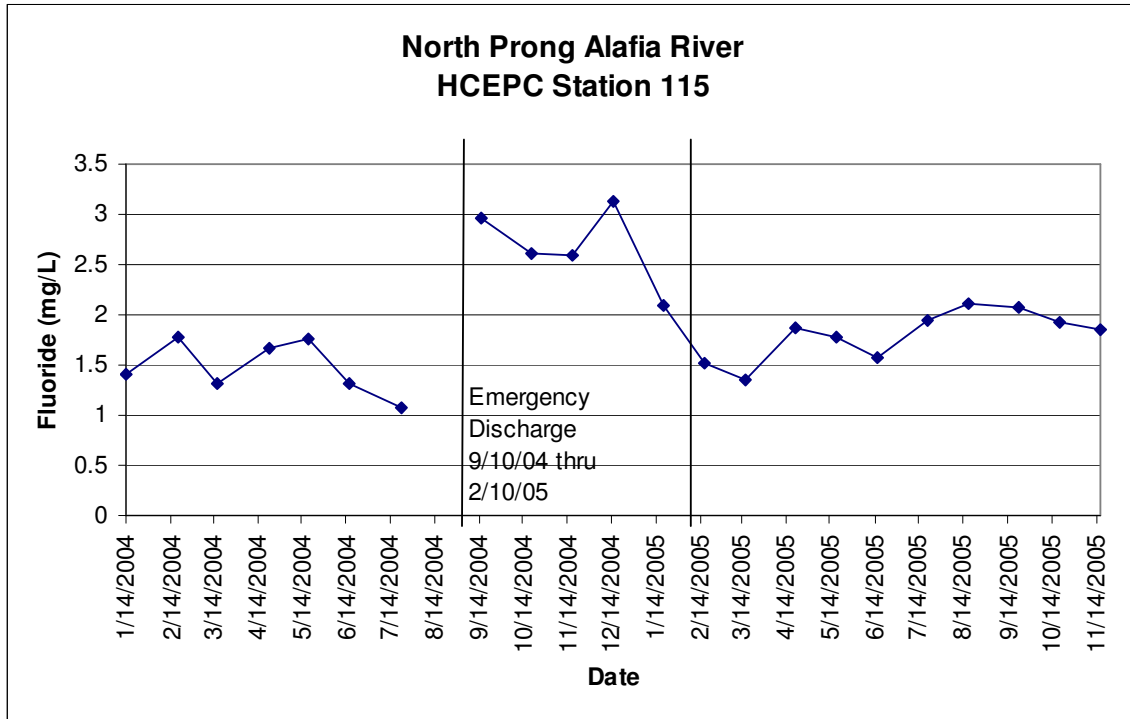
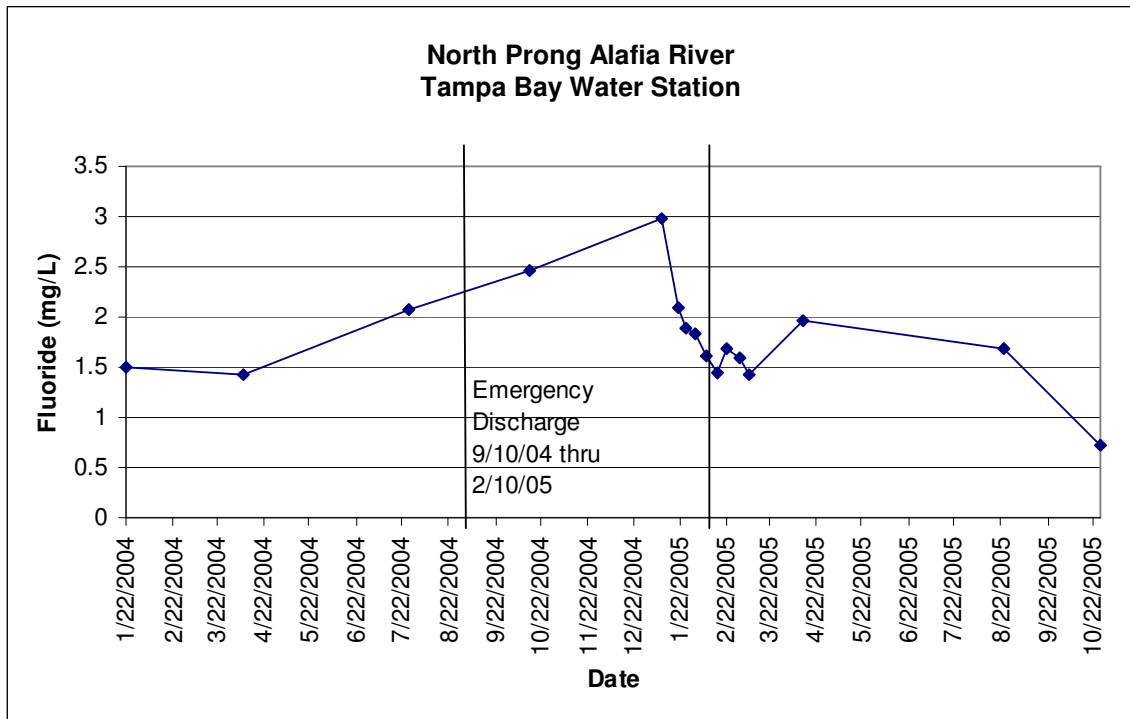


Figure 18



ARSENIC DATA

Long-term arsenic data are available for two stations: South Prong Alafia near Lithia/USGS 02301300 and Manatee River near Myakka Head/USGS 02299950. The Little Manatee River near Ft. Lonesome/USGS 02300100 had one data point for arsenic, a value of 1.0 µg/l on August 23, 1982. Recent arsenic data are available from two Tampa Bay Water Alafia River stations: the Alafia River Intake station and the Alafia Pump station.

Figure 19 shows arsenic data for the South Prong Alafia River near Lithia. Data are available from May 22, 1972 through August 12, 1994. Arsenic concentrations ranged from 20.0 µg/l to 1.0 µg/l over the period of record. The arsenic values decreased from 20.0 µg/l in 1972 to 1.0 µg/l in 1975 and remained relatively stable from 1975 through 1994, ranging from 1.0 to 2.0 µg/l.

Figure 19

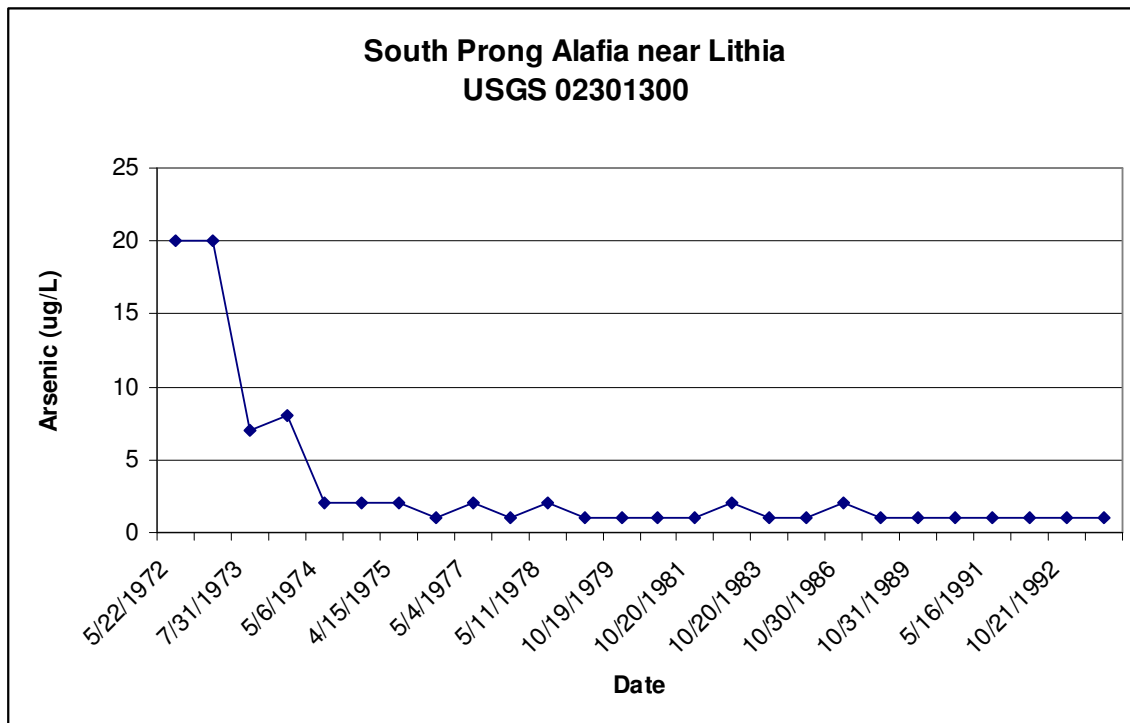


Figure 20 shows the arsenic data for the Manatee River near Myakka Head. Data are available from October 21, 1972 through September 1, 2004 when data collection ended. Arsenic concentrations ranged from 10.0 µg/l to nondetect over the period of record. The arsenic values decreased from 10.0 µg/l in 1972 to nondetect in 1980 and remained relatively stable from 1980 to 2004, ranging from 1.0 µg/l to 3.0 µg/l.

Figure 20

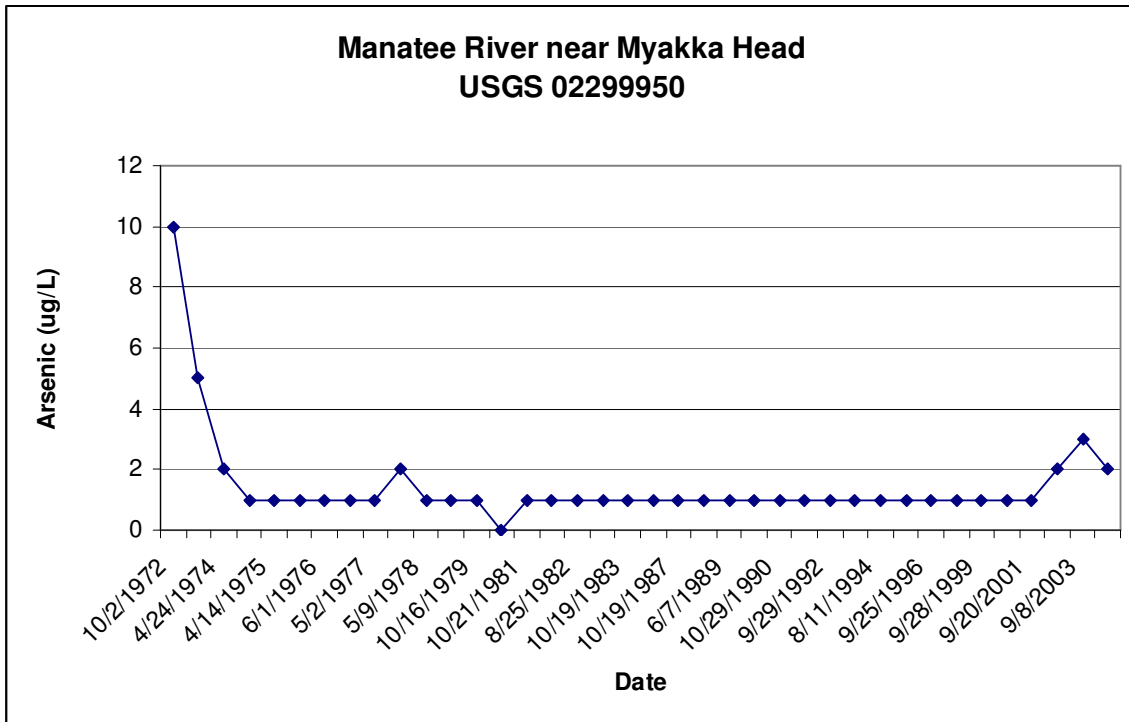
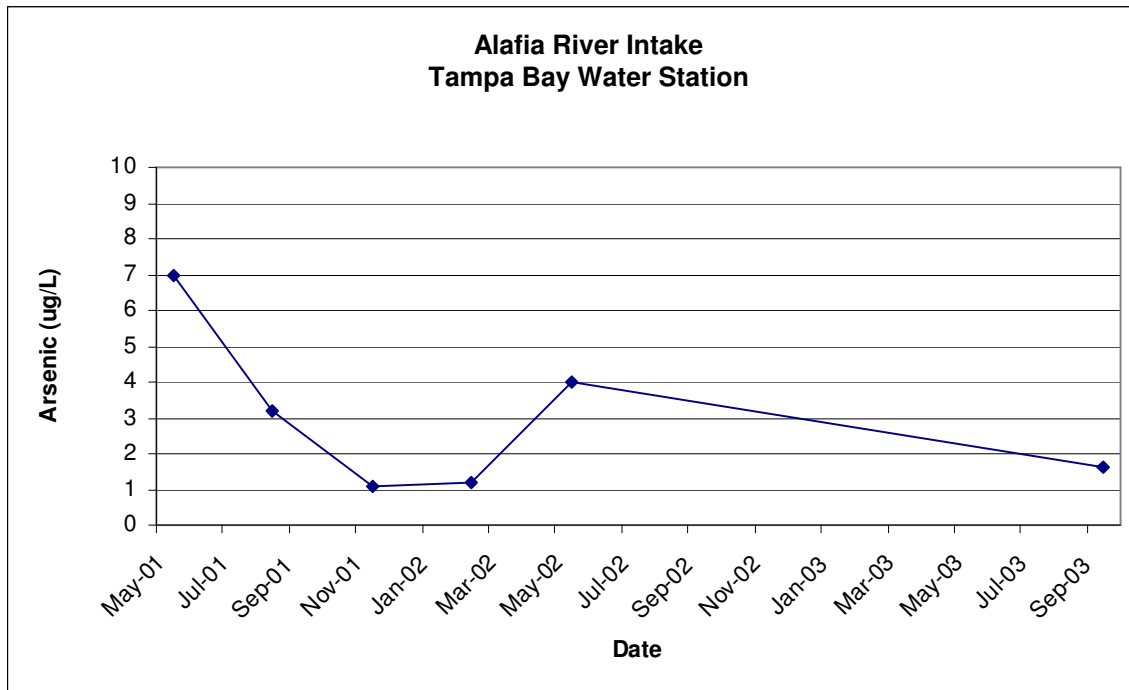


Figure 21 shows arsenic data for the Alafia Reservoir Intake/Tampa Bay Water. Data are available from August 8, 2000 through October 21, 2004 when data collection ended. Arsenic concentrations ranged from 7.0 µg/l to undetected over the period of record. Arsenic was not detected from October 1, 2003 through October 21, 2004.

Figure 21



The trend in arsenic concentrations is very similar to the trends shown for fluoride. Arsenic levels decreased during the 1970s and then stabilized from the late 1970s through the available period of record. The Class I standard for arsenic is 10 µg/l, therefore this parameter is of no concern with regard to attainability for the Alafia River reclassification. Available arsenic data for the Alafia River indicate that levels have been below 10 µg/l since 1974.

TDS DATA

TDS data are available for 11 stations: South Prong Alafia near Lithia/USGS 02301300, Manatee River near Myakka Head/USGS 02299950, Little Manatee River near Ft. Lonesome/USGS 02300100, South Prong Bethlehem Road/HCEPC 139, North Prong Alafia River/HCEPC 115, Alafia River Intake/Tampa Bay Water, Alafia Pump Station/Tampa Bay Water, Alderman Ford Park/Tampa Bay Water, Alafia CR 39/Tampa Bay Water, North Prong Alafia River/Tampa Bay Water, and South Prong Alafia River/Tampa Bay Water. For all 11 stations, the TDS data showed no discernable trends. TDS values fluctuated between approximately 50 and 650 mg/l and appear to have had no relationship to early phosphate mining activities. The Class I criteria for TDS are less than or equal to 500 mg/l monthly average and less than 1,000 mg/l maximum. Available TDS data for the Alafia River indicate that values are within the current Class I criteria. TDS graphs are presented in Attachments 1,3, and 4.

DISCUSSION

The period of record data indicate that fluoride concentrations in the South Prong of the Alafia River and in the Alafia River below the confluence of the North Prong and South Prong have decreased dramatically from the 1950s through the late 1970s and have stabilized at levels near 1.4 mg/l, which is slightly below the Class I surface water standard of 1.5 mg/l. Fluoride concentrations in the North Prong are slightly above the 1.5 mg/l standard. The Alafia River has been influenced by phosphate mining activities, but the data indicate that this influence has been reduced and that the fluoride levels have remained relatively stable since 1980. It is impossible to determine the “true” background fluoride concentration for the Alafia River because mining activities began in 1891 and the earliest fluoride concentration data available is from 1957. The reason for the reduction in fluoride levels during recent decades may be a combination of better mining practices and an overall reduction in the area being mined. The reduction in fluoride levels in the lower reaches of the Alafia, below the confluences of the North Prong and South Prong, may also be affected by dilution due to increased flows into the river and less mining activities downstream of the confluences of the North and South Prong. The maintenance of improved water quality should continue to be evaluated through ongoing monitoring and review of future discharge permit conditions.

The water quality data indicate that the mean and median fluoride concentration has been below 1.5 mg/l from 1980 through 2004 in the South Prong and lower reaches of the Alafia River. Infrequent exceedances of the Class I standard for fluoride in the North Prong of the Alafia River may warrant further evaluation. After a review of available data, PBS&J believes that Class I surface water standards are attainable and recommends that Tampa Bay Water proceed with the reclassification of the Alafia River to Class I status, without requesting an exemption for fluoride.

REFERENCES

Environmental Consulting and Technology, letter to Mosaic Fertilizer, LLC dated July 6, 2006, “Hopewell Mine Surface Water Impact Assessment”

Field Guidebook Geology and Geochemistry of the Bone Valley Formation and Its Phosphate Deposits, West Central Florida, 1964.

FDEP F.A.C. Ch 62-302.530, <http://www.dep.state.fl.us/water/wetlands/erp/rules/guide/htm>

IPCS, “Environmental Health Criteria for Fluorides”, EHC 227, Chapter 1: Summary and Conclusions, p. 4, section 1.4

<http://www.greenfacts.org/fluoride/fluorides-3/02-environment.htm>

USEPA STORET Legacy Data Center

<http://www.epa.gov/storet/dbtop.html>

USGS Hydrologic Data Web Portal

<http://hdwp.er.usgs.gov/HDWP.asp>