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February 15, 2012

Mr. Chris Countie
Water Supply Manager
Pennichuck Water Works
200 Concord Street
Nashua, NH 03064

RE: Pennichuck Water Works
2007 – 2011 Tributary Sampling Data

Dear Mr. Countie:

The purpose of this letter report is to present the results of the tributary sampling program performed May 2007 through December 2011 as well as any recommendations for changes to the program. The program began in conjunction with the preparation of a Watershed Restoration Plan for the Pennichuck Brook Water Supply Watershed and included dry and wet weather sampling of nine tributaries and recording of continuous tributary flows through the use of data loggers. No sampling was performed in 2009 due to a "freeze" on projects during ownership negotiations between Pennichuck Water Works and the City of Nashua. **Figure 1** shows the nine sampling locations.

## Background

Pennichuck Water Works, in coordination with NRPC, has been collecting data from the watershed since 1991. Over this time, sampling locations and parameters varied until around 2005, at which time a sampling program using a specific set of water quality parameters was developed for nine tributaries within the watershed. This program was further refined in 2007 to include continuous flow monitoring and the collection of winter samples, beginning a more complete data set. This letter report focuses on the full data set collected beginning in 2007.

## Monitoring Locations

The nine tributary sampling locations are shown on Figure 1 with descriptions provided in the following table.

| Station | Description | Station | Description |
|---|---|---|---|
| 01-BRB | Boire Field Brook, Tinker Road | 01-WCH | South Merrimack Road Bridge |
| 09-PEN | Holt Pond Dam | 01-XWB | Unnamed Trib to Witches Brook |
| 09T-PEN | Route 101A Bridge | 02-WCH | Ames Road Bridge off Route |
| 09-XPB | Unnamed Trib to Pennichuck Brook on 101A | 12-PEN | Nevins Road Bridge |
| | | 01-MUD | Farley Road Bridge |

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## Data Collection

Monitoring activities presented in this report include those beginning in May of 2007 through December 2011 and excluding 2009 as previously described. During this time, CEI collected water quality and flow data to aid in determining the health of each tributary. In 2011, dry weather samples were collected on March 30$^{th}$, May 2$^{nd}$, August 4$^{th}$, September 14$^{th}$, November 7$^{th}$ and December 20$^{th}$ and analyzed for Total Coliform, E.coli, Ammonia-N, TKN (kjeldahl-N), Total Phosphorus and Total Suspended Solids. CEI also performed field analysis of pH, Conductivity, Dissolved Oxygen and Temperature during these dates. All data was tabulated and input into a water quality database.

Electronic data loggers were installed at all locations on May 21, 2007 to determine the relative contribution of each stream to Pennichuck Brook and to track long-term trends in flow. The surface water data loggers read and record water levels every 30 minutes. During previous monitoring efforts in 2005 and 2006, staff gauges were installed at the nine locations and stage-discharge relations were created based on field measurements. Using the stage-discharge equations, the water levels recorded by the data loggers can convert to an approximate flow for the river at each point in time. Data loggers were downloaded to a field laptop for analysis approximately every six weeks each year.

Due to changes in stream profiles, new stage-discharge equations were developed for stations 01-WCH and 02-WCH during the 2007 and 2008 monitoring period. The original stage-discharge curves developed using the 2005 and 2006 data are still valid for all other streams. In 2011 additional flow data was collected at 01-WCH, further modifying its stage-discharge equation. The adjustment has been carried through all of the data collected for that site and is represented in the Tributary Flow Data chart (see attached). Periodic adjustments to flow equations may also be made when a data logger is taken out for repairs and/or replaced. In these cases, the original stage-discharge curves still apply and the adjustment is only made to reflect a change in elevation in the setting of the data logger. These adjustments are noted in the database table where all data is recorded.

## Data Results

The sampling data results were analyzed for trends and correlations, as well as any unexpected data outliers. Overall, stations 09-XPB and 01-BFB continue to show the highest concentrations. However, the overall trendline is decreasing with lower concentrations than in previous years.

**Seasonal**
Samples taken during the summer months in 2007, 2008, 2010 and 2011 roughly correlate to one another. As expected, temperature rises during summer months along with ammonia, phosphorus and bacteria levels.

Dissolved oxygen is inversely proportional to the above parameters as it tends to fall during warmer months and recover during colder periods. Dissolved oxygen surface water quality standards specify a minimum concentration of 5.0 mg/L. Readings below 4.0 mg/L would be considered dangerous to aquatic organisms. Samples from stations 09T-PEN, 09-XPB, and 01-WCH continue to exceed standards in 2011, consistent with 2007, 2008 and 2010 data. Station 09-PEN also exceeded standards in 2011. However, there was an overall improvement in DO levels in these stations when comparing 2007-2010 to 2011.

Winter sampling was performed in March and December 2011. Overall, winter concentrations are lower than the rest of the year and there is no apparent trend or correlation with the high levels detected in January 2008.

**Wet and Dry Weather**
Several attempts were made to collect comprehensive wet weather samples however, in most cases, a sample could not be collected from all stations at the same time due to localized weather patterns. Wet weather samples were collected on June 10$^{th}$, August 16$^{th}$, October 14$^{th}$, November 7$^{th}$ and December 20$^{th}$. An analysis of dry and wet weather data shows similar ranges in contaminant concentrations with dry weather concentrations slightly higher than wet weather overall. This is possible as wet weather has larger volumes of water which would dilute concentrations, particularly in data collected after the first flush. Overall, wet weather data for TKN and Phosphorus decreased from previous years, while TSS and Ammonia-N remained consistent with 2010 concentrations. Station 01-BFB continues to have the highest phosphorus concentrations under wet weather.

**Stream Flow**
Flow results measured at all stations are roughly correlated to each other, as seen by similar rise and fall trends. Data available for the year varied by location. Data loggers for locations 09-PEN, 09T-PEN, 09-XPB and 01-MUD were repaired/replaced in January 2012. Data gaps are shown on the "Tributary Flow Data" figures for any missing or negative data, however, overall these data gap issues have been reduced with the replacement of alkaline batteries with new longer life lithium batteries on March 30, 2011.

Additional stream velocity measurements were collected at 01-WCH to provide a better fit for the stage-discharge curve for calibration purposes.

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**Total Suspended Solids (TSS)**
TSS represents suspended material in the water. It can smother benthic macroinvertebrates as it settles to river bottoms, correlates with high phosphorus loadings, and also result in decreased dissolved oxygen. TSS can also hide other pollutants, such as bacteria, complicating disinfection. High TSS levels may result from erosion of disturbed areas (e.g., construction sites) and of natural stream banks.

Dry weather TSS levels were low throughout the 2011 sampling program, with no notable TSS spikes. Historically, elevated levels of TSS have been associated with increased flows, which is to be expected as runoff washed sediments into the streams from surfaces and stream bank erosion. TSS does not have a numeric standard specified in the New Hampshire surface water quality standards. Some states set a TSS standard of 30 mg/L.

**Total Phosphorus**
Phosphorus is a nutrient essential to plants and in excess amounts can cause algal blooms, particularly in fresh water systems. Algal blooms increase oxygen during the day in turn decreasing oxygen at night, resulting in a net loss, and make water less attractive. Phosphorus can indicate the presence of sewage, animal waste, lawn fertilizer, erosion and may also come from natural wetlands.

Stations 09-XPB, 09T-PEN and 01-XWB showed the highest overall phosphorus concentrations during dry weather sampling. Stations 12-PEN, 01-MUD and 01-WCH had higher than normal readings in September 2011, with lower comparative concentrations during the other sampling rounds. A strong correlation was not apparent with TSS levels in 2011 due to the low TSS concentrations observed. However, the one small increase in TSS at station 01-MUD did correlate with the highest phosphorus concentrations. Conductivity levels also peaked during this time. This is logical as phosphorus is largely contained in sediments flushed into the tributaries during storm events. Unlike nitrogen in the nitrate form which flushes quickly, TSS and the attached particulate phosphorus take longer to enter the water body. Overall, phosphorus levels show a declining trend since 2007 and the start of the watershed restoration program as shown on **Figure 2**.

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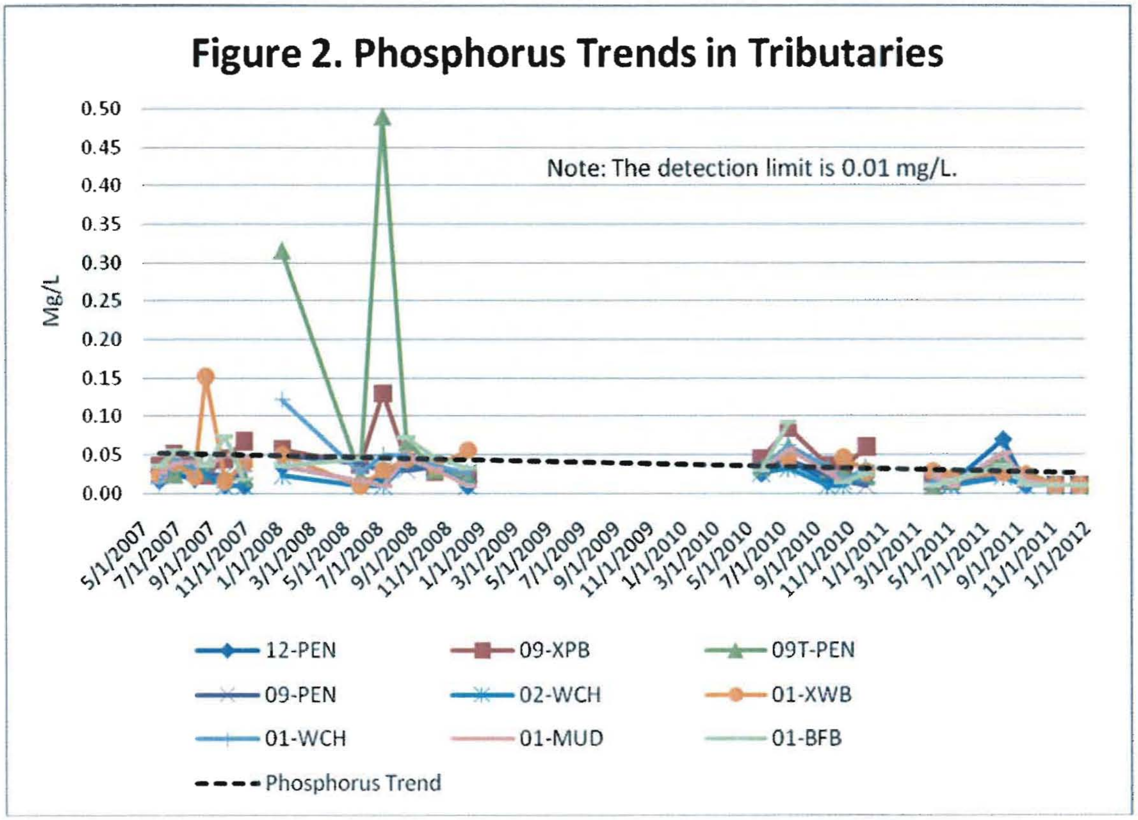


While there is no numeric standard for phosphorus, the NHDES level of concern is 0.05 mg/L. In 1976, the EPA also recommended phosphorus limits of 0.05 mg/L for streams. Only naturally occurring phosphorus should be present, typically from 0.014 to 0.017 mg/L under natural conditions. Levels of 0.015 mg/L in lakes and ponds are often set as a goal to support recreational uses of the water and decrease algae blooms.

**Total Kjeldahl Nitrogen (TKN)**

Nitrogen is a nutrient essential for algae and other plant growth and excess amounts can lead to nuisance algae blooms. TKN represents organic nitrogen and ammonia nitrogen, which can indicate the presence of sewage, animal waste, fertilizer, erosion, or other types of pollution. TKN readings at all stations in 2011 were below the detection limit of 0.5 mg/L. TKN does not have a numeric standard specified in the New Hampshire surface water quality standards.

**Ammonia**

As with TKN, ammonia is a nutrient that contributes to plant growth.

Ammonia toxicity is dependent on pH levels. When the pH is below 8.75, $NH4^+$ dominates. Basic pH above 9.75 can cause NH3 to dominate, which is more toxic to aquatic species. Measurement of TKN and ammonia allows for estimation of organic nitrogen by subtracting the concentration of ammonia nitrogen from TKN. Ammonia should be less than 0.64 mg/L as per New Hampshire water quality standards. All samples continue to meet water quality standards for ammonia.

**Escherichia Coliform Bacteria (*E.coli*)**
E. coli represents bacteria associated with the fecal matter of warm-blooded animals. It is often used to determine whether water is safe for swimming and requires treatment for use as drinking water. It may indicate the presence of sewage or wildlife.

E.coli levels were generally higher during summer and fall months and lower during winter periods, consistent with historical data. The elevated E.coli levels seen in 02-WCH in May of 2008 did not repeat itself in 2010 or 2011. The highest E.coli levels of 248.1 mpn/100 ml and 178.9 mpn/100 ml were recorded in September at station 01-BFB and 01-WCH, respectively, which is consistent with historic data. Despite these high summer readings, as with the other sampling parameters, the overall trend in E.coli is downward. E.coli should not exceed 153 cts/100 mL for any single sample, based on numeric standards for Class A waters.

**pH**
pH measures the acidity of water and can affect biological processes in water important to aquatic life. It can also affect the treatment process for drinking water.

pH appears relatively constant during the 2011 period, generally ranging between 6 and 7.5, further confirming that the extreme dips in pH identified in August of 2007 and October of 2008 are likely anomalies associated with equipment malfunctions. The Class A NH Surface Water Quality Standard for pH is between 6.5 and 8.0 unless naturally occurring.

**Conductivity**
Conductivity measures the total dissolved solids including free ion (charged particles) content in water and can indicate the presence of chlorides, and total dissolved solids including nitrates, sulfates, phosphates, and sodium, magnesium, calcium, iron, and aluminum ions. Possible sources include road salt, septic systems, wastewater treatment plants, urban/agricultural runoff or naturally occurring from surrounding geology. Polluted water usually has a higher conductivity than unpolluted water.

Conductivity levels were relatively consistent between sampling stations in 2011 with a rise in the summer and fall and decline in spring and winter. Levels decreased from levels observed in 2010 and are more in line with 2007 and 2008 data. New Hampshire water quality standards do not specify a numeric standard for conductivity, however, a waterbody with conductivity greater than 2000 umhos/cm would be considered high in dissolved solids.

## Recommended Changes to the Monitoring Program

Pennichuck has been collecting streamflow data since 2007. The data was originally collected to help calibrate the model used in the 2008 Watershed Restoration Plan and continues to be collected to provide overall trend data and information for future modeling efforts.

While the information does allow Pennichuck to track the impacts of new development and progress of watershed efforts on streamflow, the current level of data collection can be cut back to help control costs, while still providing valuable information. More wear and tear is evident on the dataloggers, and in 2012, more repair/troubleshooting work was performed, resulting in additional expenses beyond the typical contingency carried for this. In light of this, CEI is recommending that "problem" dataloggers be removed and sent for repair at the end of the sampling program, rather than throughout the duration of the program. This will minimize the time spent coordinating with the datalogger vendor, by limiting it to the end of the year to address all problems at once. CEI will rely on the staff gages at each station to calculate flows during sampling dates, allowing for correlation of flow to samples, while data loggers are out. CEI will also grab periodic flow measurements using a flow velocity meter to ensure that the existing stage-discharge curves remain valid, with no significant changes to stream channel geometry. This will provide enough information to fill in data gaps associated with data logger issues at a more reasonable cost.

CEI also recommends that the data loggers be adjusted to take readings at an hourly interval, instead of the current 30 minute interval. This will allow for accurate data comparisons, while not overloading the units and stressing the battery life of the unit.

Sampling should continue as follows:

| Proposed Sampling Schedule |
|---|
| February |
| March |
| April |
| July |
| August |
| September |
| November |

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If you have any questions or require any additional information, please do not hesitate to contact me at (800) 725-2550, ext. 308.

Sincerely,

COMPREHENSIVE ENVIRONMENTAL INC.

Rebecca Balke

Rebecca Balke, P.E.
Project Manager

Attachments:

- Figure 1. Site Locations and Names
- 2007-2011 Trendline Graphs for: Tributary Flow Data; DO; Temperature; TSS; Total Phosphorus; TKN; Ammonia-N; E.coli; Total Coliform; pH; and Conductivity.

225 Cedar Hill Street, Marlborough, Massachusetts 01752 508-281-5160 Fax: 508-281-5136
21 Depot Street, Merrimack, New Hampshire 03054 603-424-8444 Fax: 603-424-8441
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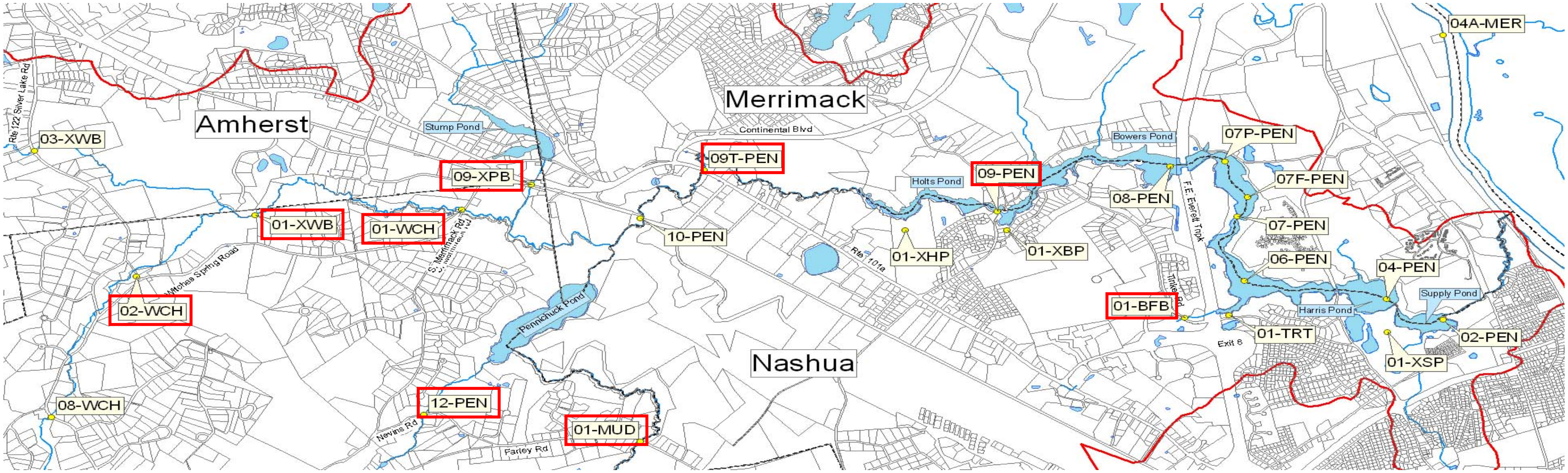
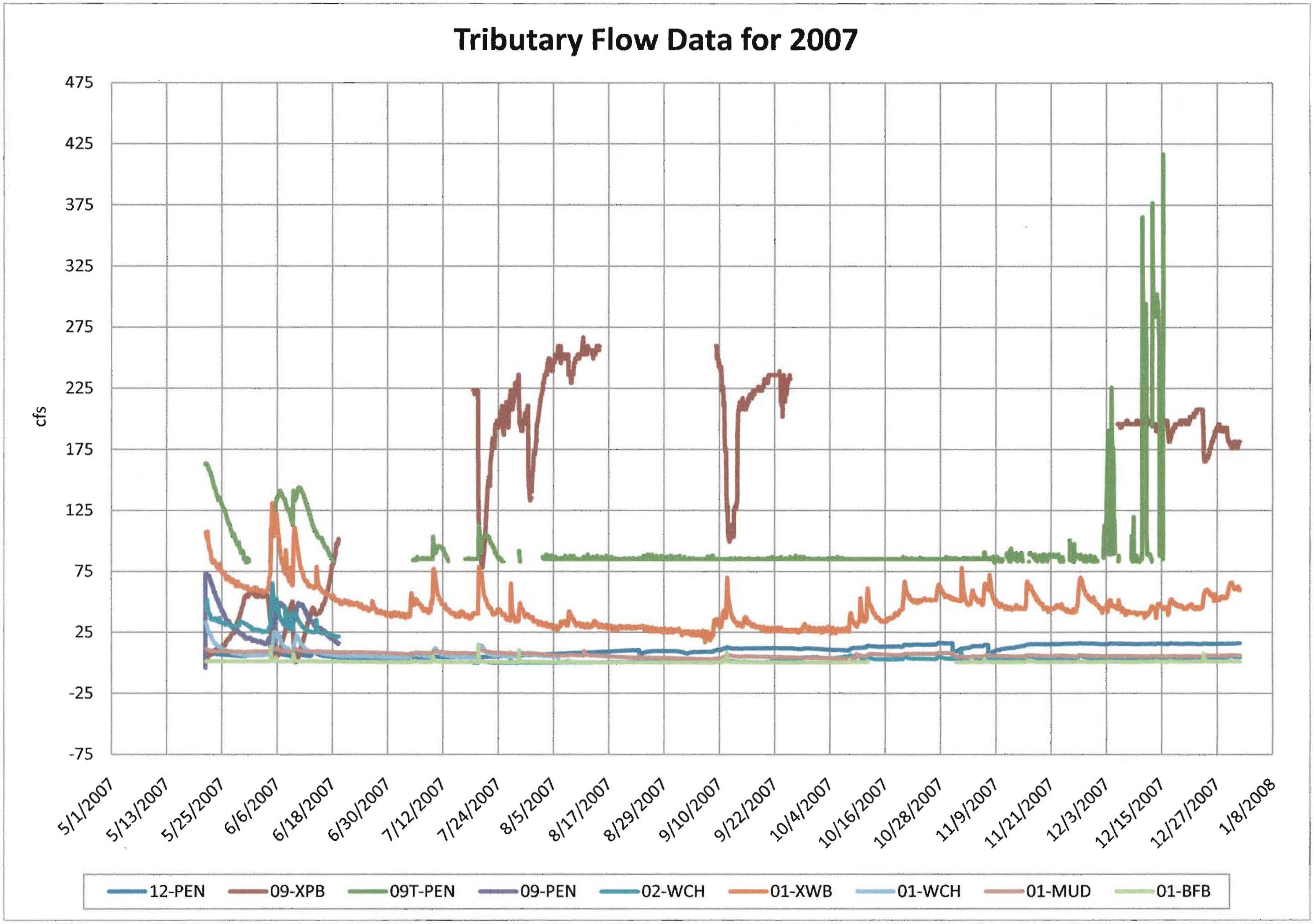


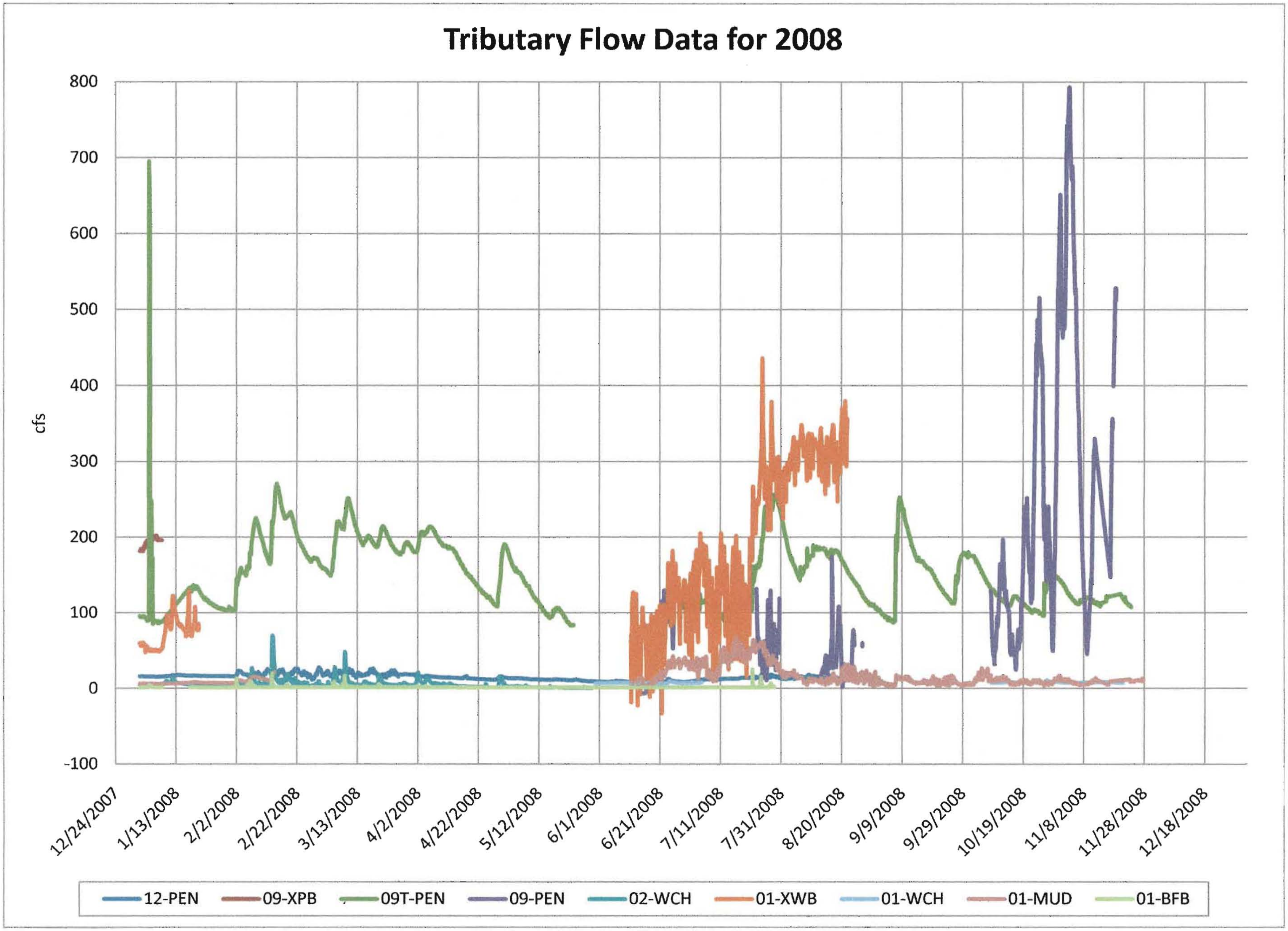

| Old Name | New DES Name | Descriptions | | |
|---|---|---|---|---|
| **T-1** | **01-BFB** | Boire Field Brook - Tinker Road | | |
| **T-2** | **09-PEN** | Holt Pond Dam | | |
| **T-3** | **09T-PEN** | Route 101A Bridge | | |
| **T-4** | **09-XPB** | Unnamed Trib to Pennichuck Brook | | |
| **T-5** | **01-WCH** | South Merrimack Road Bridge | | |
| **T-6** | **01-XWB** | Unnamed Trib to Witches Brook | | |
| **T-7** | **02-WCH** | Ames Road Bridge off Route 122 | | |
| **T-8** | **12-PEN** | Nevins Road Bridge | | |
| **T-9** | **01-MUD** | Farley Road Bridge | | |

| Old Name | New DES Name | Descriptions | | | |
|---|---|---|---|---|---|
| B1 | 07F-PEN | Bowers Pond - 700' US of Bowers | | | |
| B2 | 08-PEN | Bowers Pond - Middle | | | |
| H1 | 04-PEN | Harris Pond - 100' US of Harris | | | |
| H2 | 06-PEN | Harris Pond - Middle | | | |
| R1 | 07P-PEN | Bowers Pond - 1/4 mile DS of E | | | |
| R2 | 04A-MER | Merrimack River - Boat Launch | | | |
| S1 | 02-PEN | Supply Pond - 25 ' Upstream of | | | |

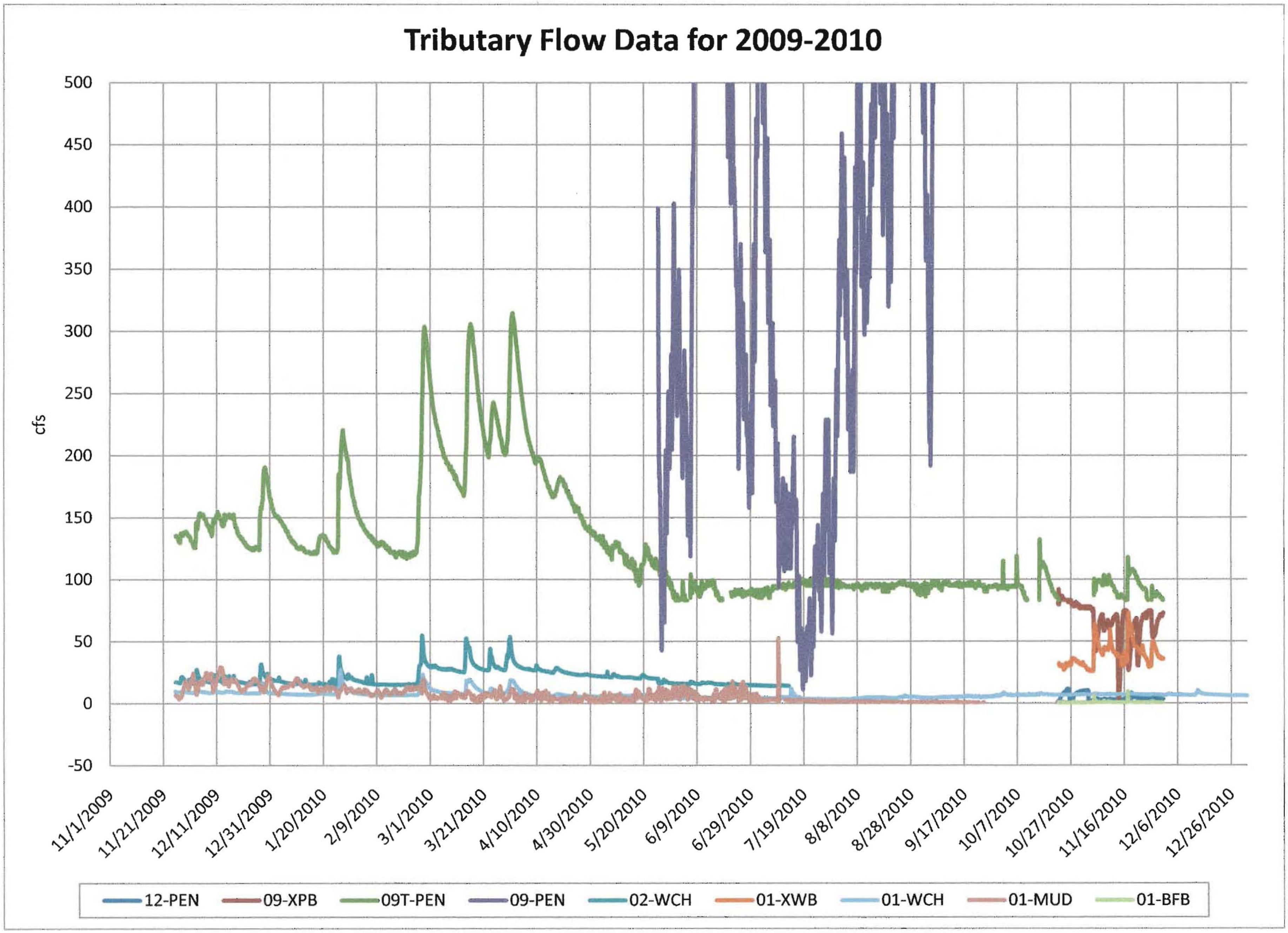
**FIGURE 1: Site Locations and Names**



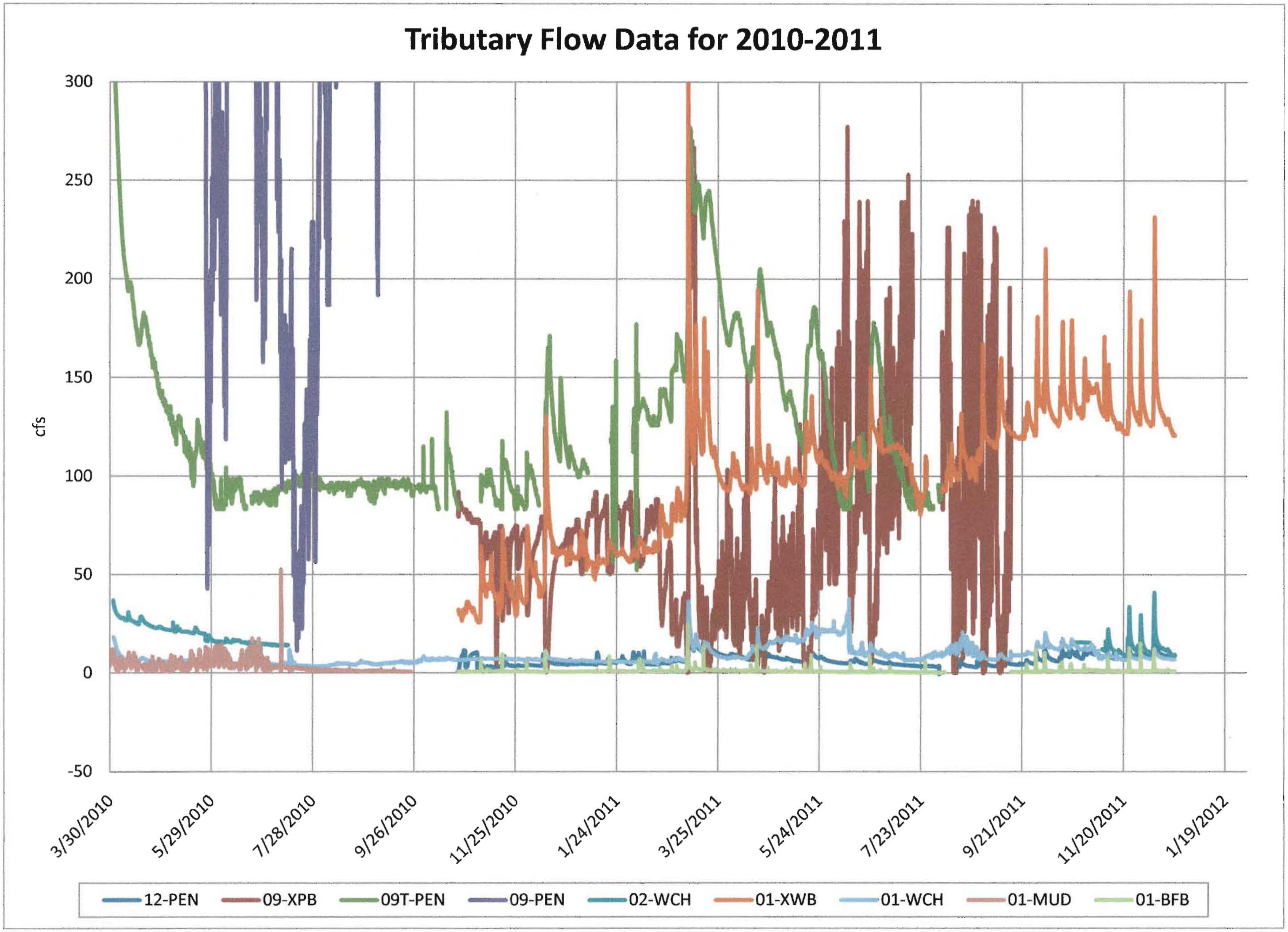
Tributary Flow Data for 2007
cfs
475
425
375
325
275
225
175
125
75
25
-25
-75
5/1/2007
5/13/2007
5/25/2007
6/6/2007
6/18/2007
6/30/2007
7/12/2007
7/24/2007
8/5/2007
8/17/2007
8/29/2007
9/10/2007
9/22/2007
10/4/2007
10/16/2007
10/28/2007
11/9/2007
11/21/2007
12/3/2007
12/15/2007
12/27/2007
1/8/2008
12-PEN
09-XPB
09T-PEN
09-PEN
02-WCH
01-XWB
01-WCH
01-MUD
01-BFB



Tributary Flow Data for 2008
cfs
800
700
600
500
400
300
200
100
0
-100
12/24/2007
1/13/2008
2/2/2008
2/22/2008
3/13/2008
4/2/2008
4/22/2008
5/12/2008
6/1/2008
6/21/2008
7/11/2008
7/31/2008
8/20/2008
9/9/2008
9/29/2008
10/19/2008
11/8/2008
11/28/2008
12/18/2008
12-PEN
09-XPB
09T-PEN
09-PEN
02-WCH
01-XWB
01-WCH
01-MUD
01-BFB



Tributary Flow Data for 2009-2010
cfs
500
450
400
350
300
250
200
150
100
50
0
-50
11/1/2009
11/21/2009
12/11/2009
12/31/2009
1/20/2010
2/9/2010
3/1/2010
3/21/2010
4/10/2010
4/30/2010
5/20/2010
6/9/2010
6/29/2010
7/19/2010
8/8/2010
8/28/2010
9/17/2010
10/7/2010
10/27/2010
11/16/2010
12/6/2010
12/26/2010
12-PEN
09-XPB
09T-PEN
09-PEN
02-WCH
01-XWB
01-WCH
01-MUD
01-BFB


Tributary Flow Data for 2010-2011
300
250
200
150
100
50
0
-50
cfs
3/30/2010
5/29/2010
7/28/2010
9/26/2010
11/25/2010
1/24/2011
3/25/2011
5/24/2011
7/23/2011
9/21/2011
11/20/2011
1/19/2012
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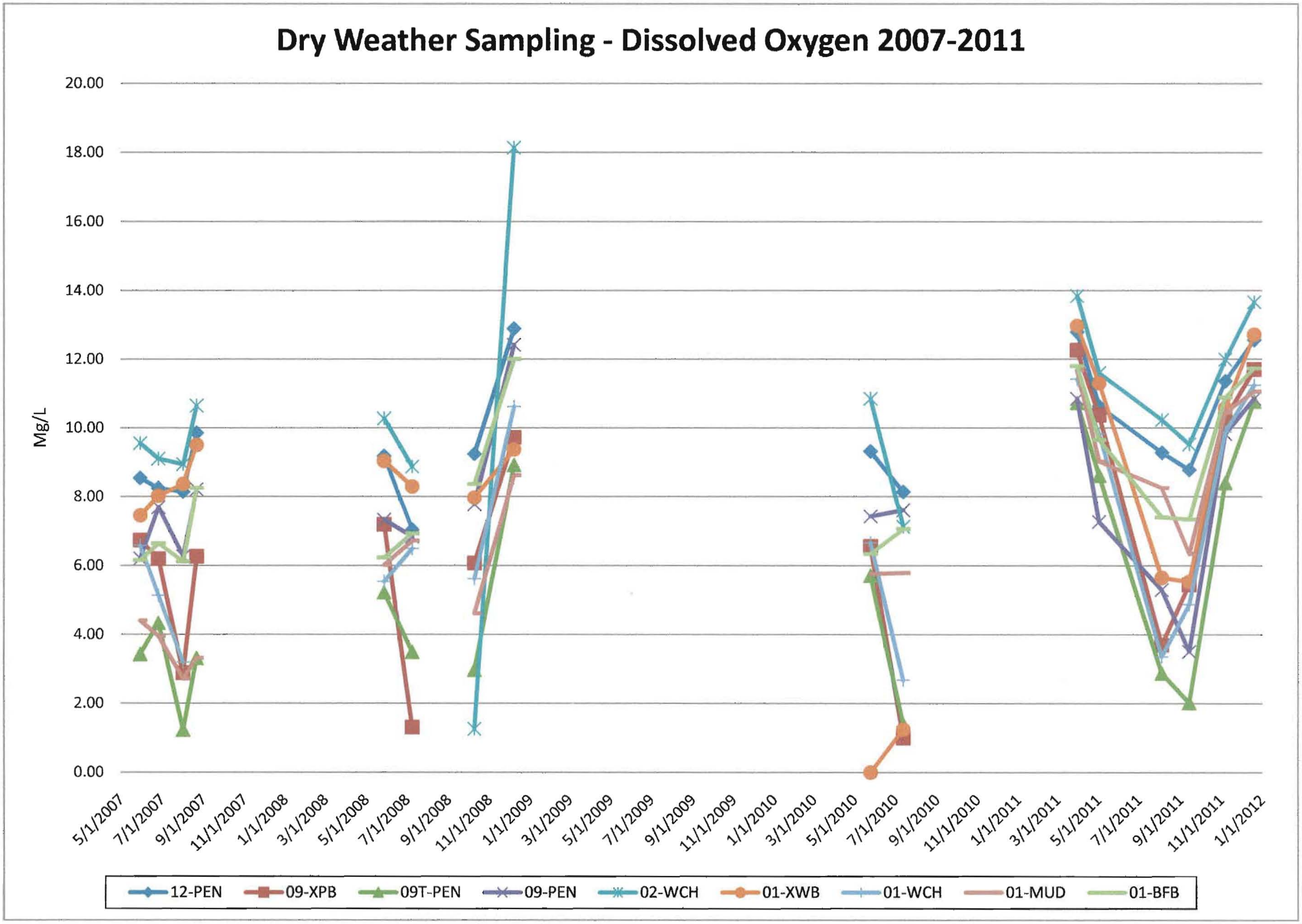
01-WCH
01-MUD
01-BFB



Dry Weather Sampling - Dissolved Oxygen 2007-2011
Mg/L
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
5/1/2007
7/1/2007
9/1/2007
11/1/2007
1/1/2008
3/1/2008
5/1/2008
7/1/2008
9/1/2008
11/1/2008
1/1/2009
3/1/2009
5/1/2009
7/1/2009
9/1/2009
11/1/2009
1/1/2010
3/1/2010
5/1/2010
7/1/2010
9/1/2010
11/1/2010
1/1/2011
3/1/2011
5/1/2011
7/1/2011
9/1/2011
11/1/2011
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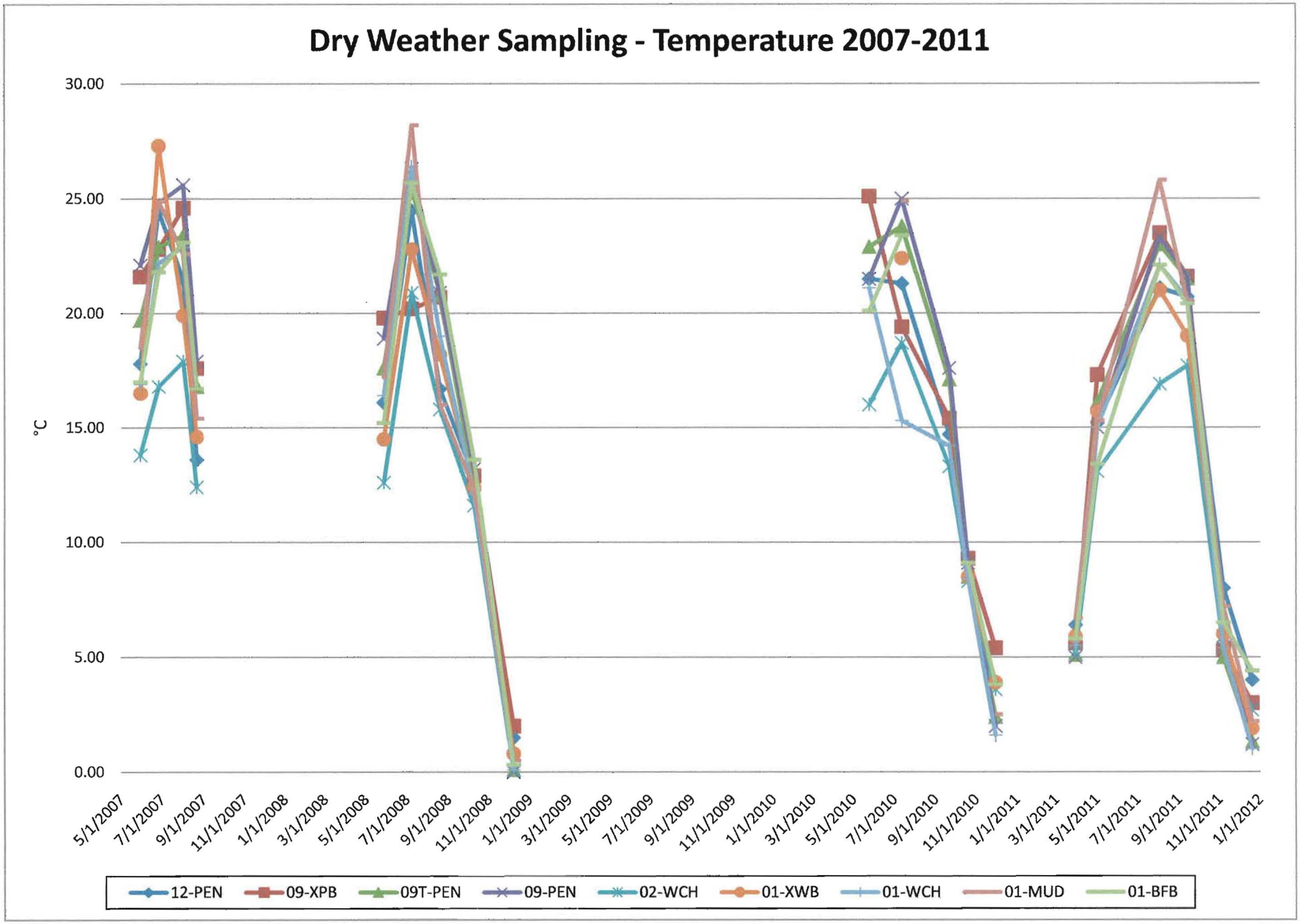
01-WCH
01-MUD
01-BFB


Dry Weather Sampling - Temperature 2007-2011
30.00
25.00
20.00
15.00
10.00
5.00
0.00
°C
5/1/2007
7/1/2007
9/1/2007
11/1/2007
1/1/2008
3/1/2008
5/1/2008
7/1/2008
9/1/2008
11/1/2008
1/1/2009
3/1/2009
5/1/2009
7/1/2009
9/1/2009
11/1/2009
1/1/2010
3/1/2010
5/1/2010
7/1/2010
9/1/2010
11/1/2010
1/1/2011
3/1/2011
5/1/2011
7/1/2011
9/1/2011
11/1/2011
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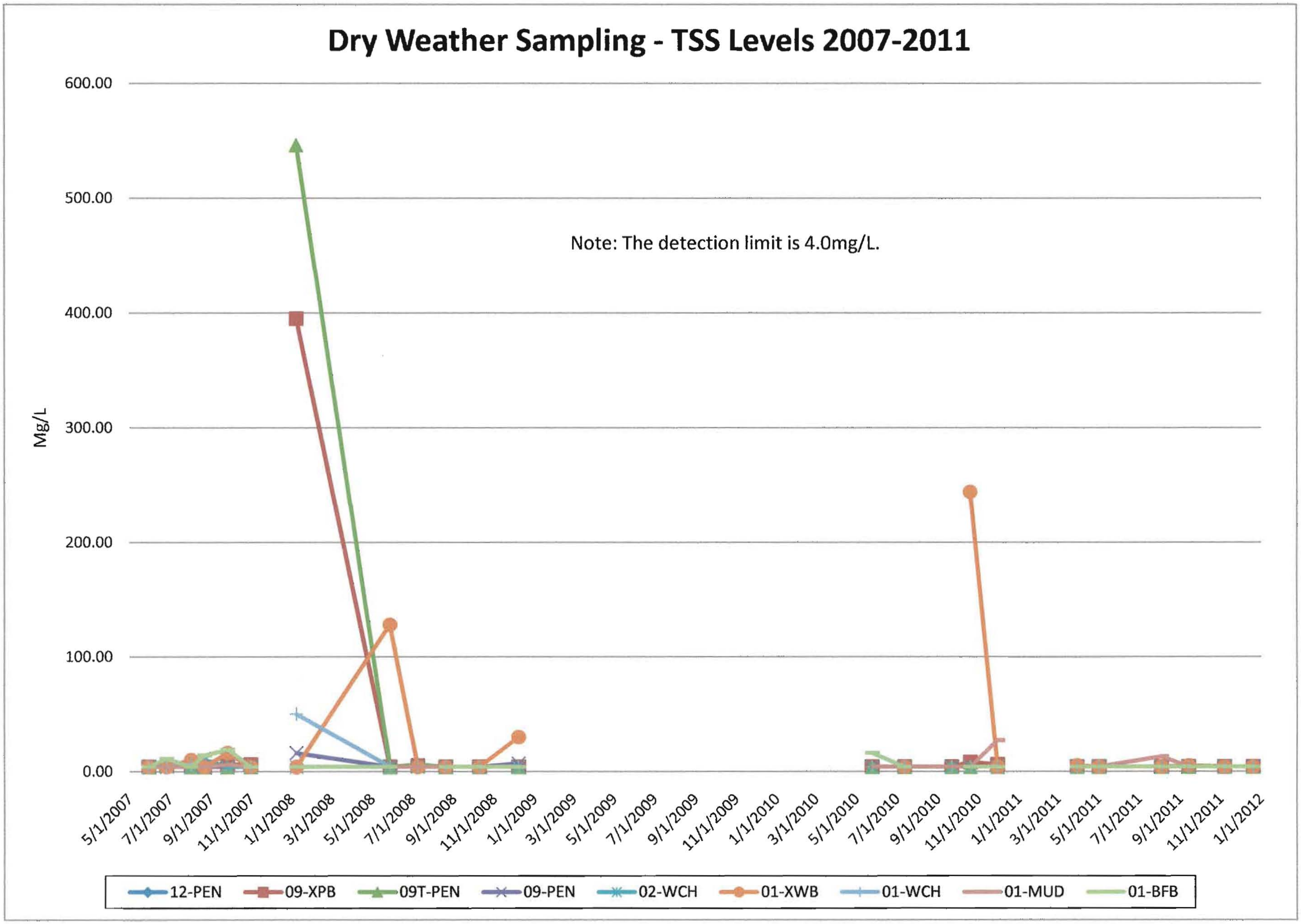
01-MUD
01-BFB


Dry Weather Sampling - TSS Levels 2007-2011
Note: The detection limit is 4.0mg/L.
Mg/L
600.00
500.00
400.00
300.00
200.00
100.00
0.00
5/1/2007
7/1/2007
9/1/2007
11/1/2007
1/1/2008
3/1/2008
5/1/2008
7/1/2008
9/1/2008
11/1/2008
1/1/2009
3/1/2009
5/1/2009
7/1/2009
9/1/2009
11/1/2009
1/1/2010
3/1/2010
5/1/2010
7/1/2010
9/1/2010
11/1/2010
1/1/2011
3/1/2011
5/1/2011
7/1/2011
9/1/2011
11/1/2011
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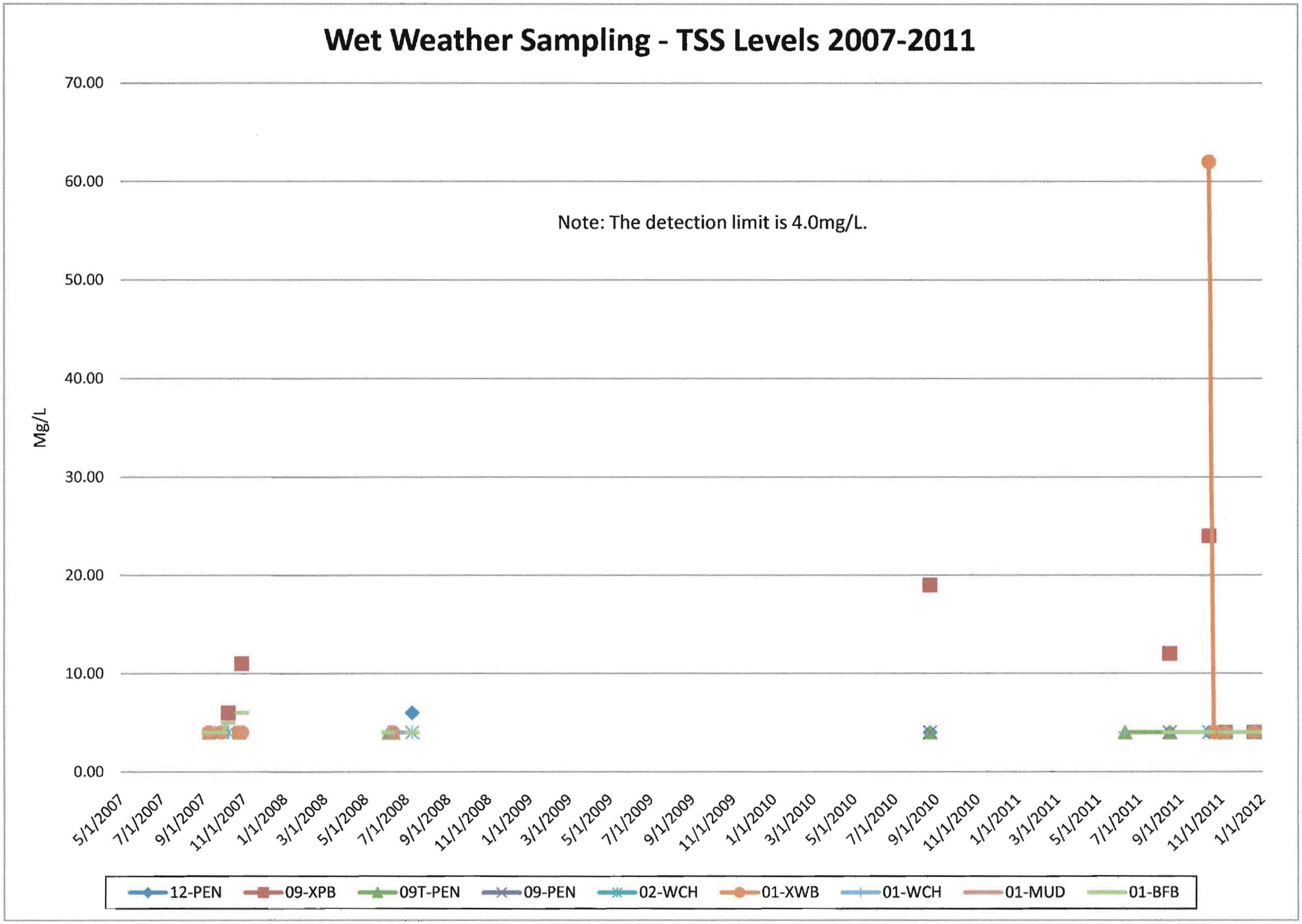
01-WCH
01-MUD
01-BFB



Wet Weather Sampling - TSS Levels 2007-2011
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Mg/L
Note: The detection limit is 4.0mg/L.
5/1/2007
7/1/2007
9/1/2007
11/1/2007
1/1/2008
3/1/2008
5/1/2008
7/1/2008
9/1/2008
11/1/2008
1/1/2009
3/1/2009
5/1/2009
7/1/2009
9/1/2009
11/1/2009
1/1/2010
3/1/2010
5/1/2010
7/1/2010
9/1/2010
11/1/2010
1/1/2011
3/1/2011
5/1/2011
7/1/2011
9/1/2011
11/1/2011
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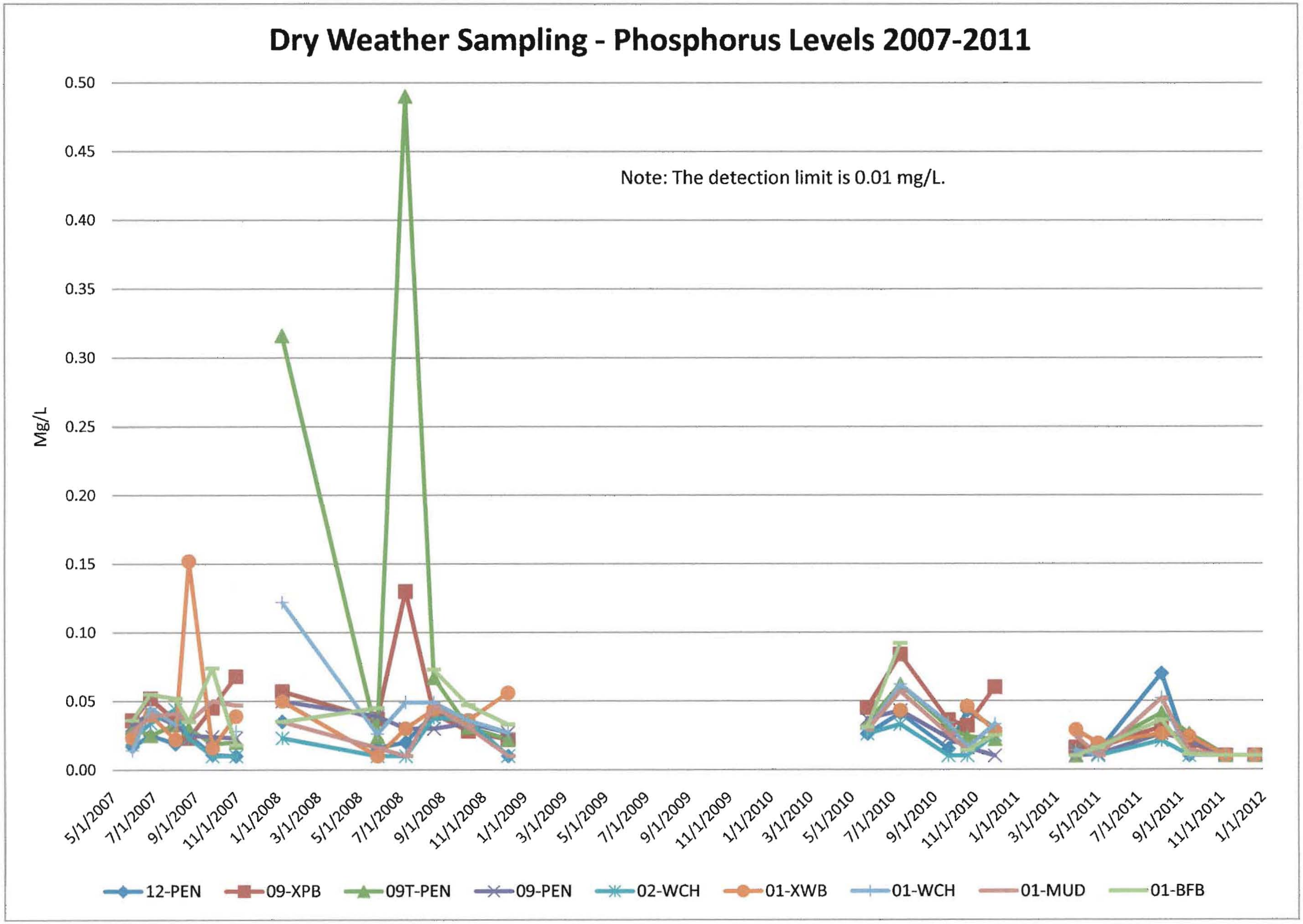
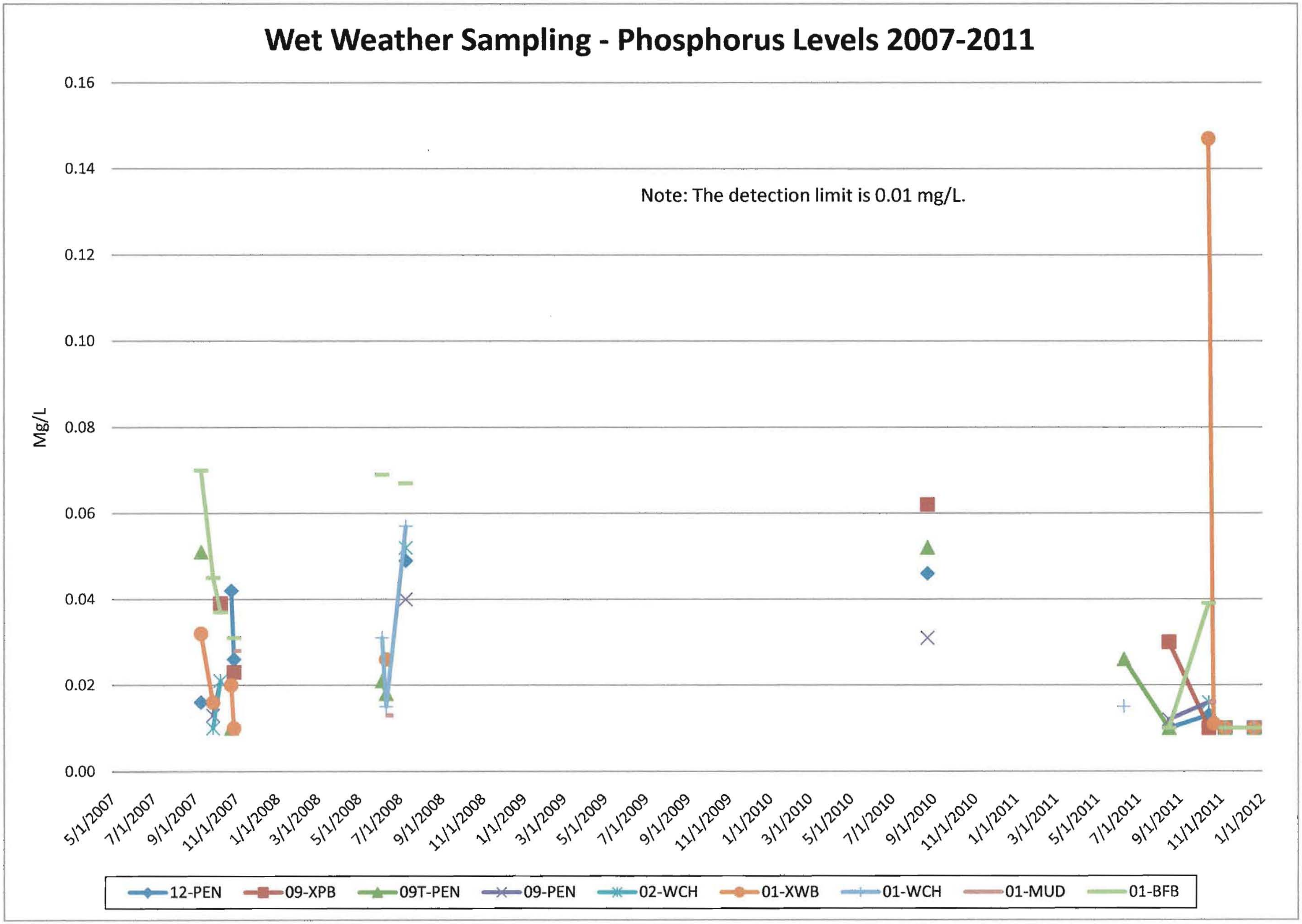
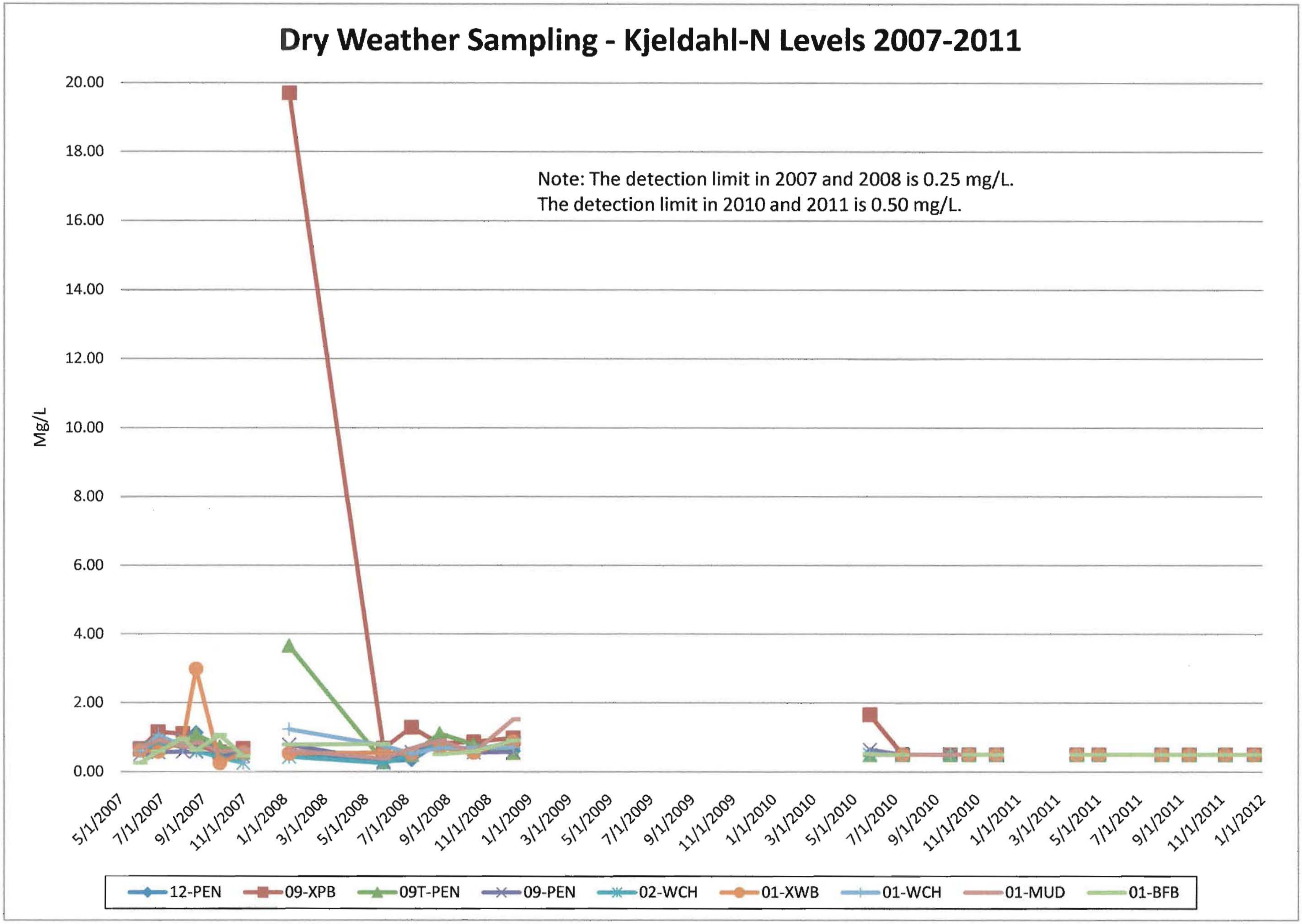
01-WCH
01-MUD
01-BFB

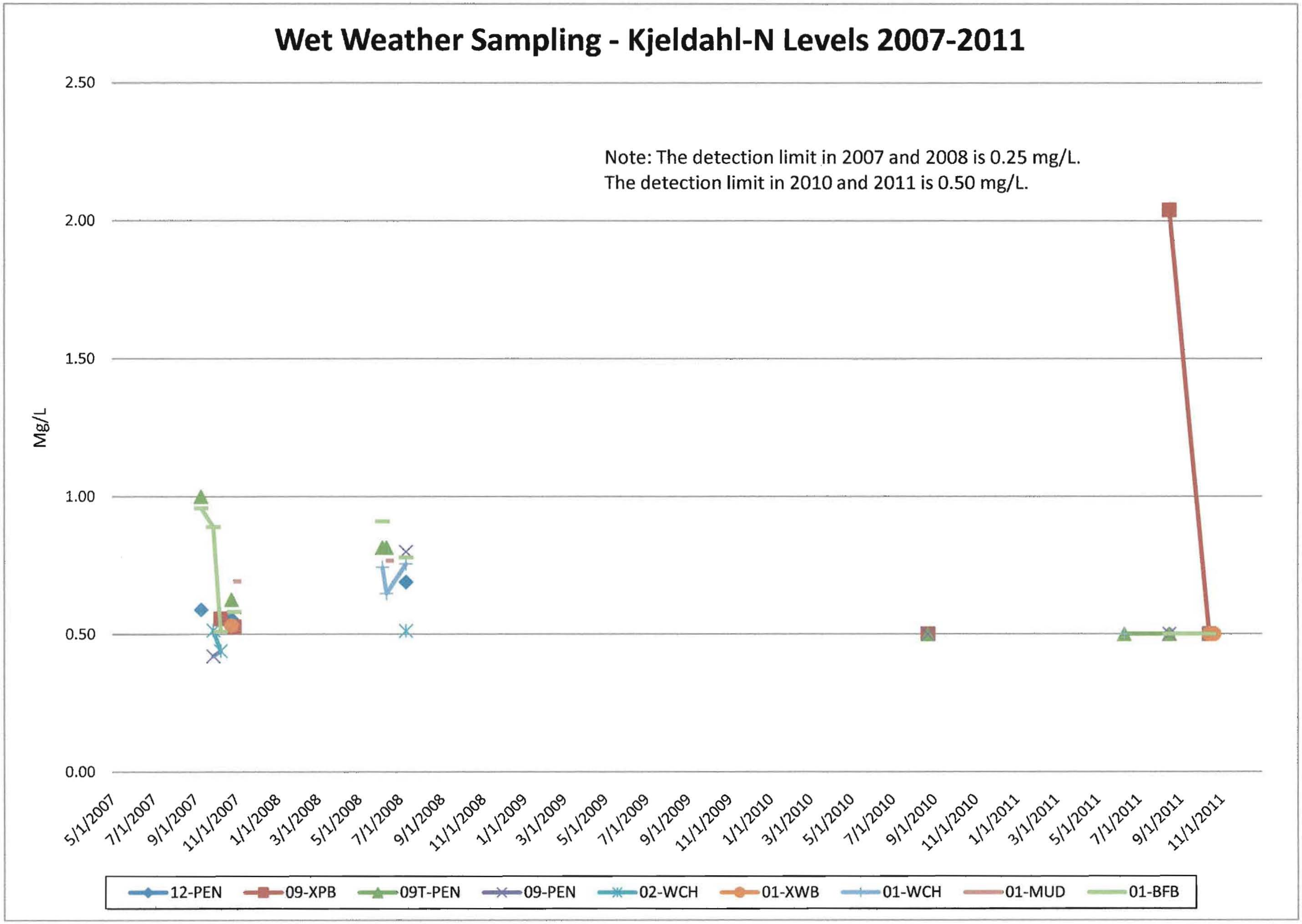


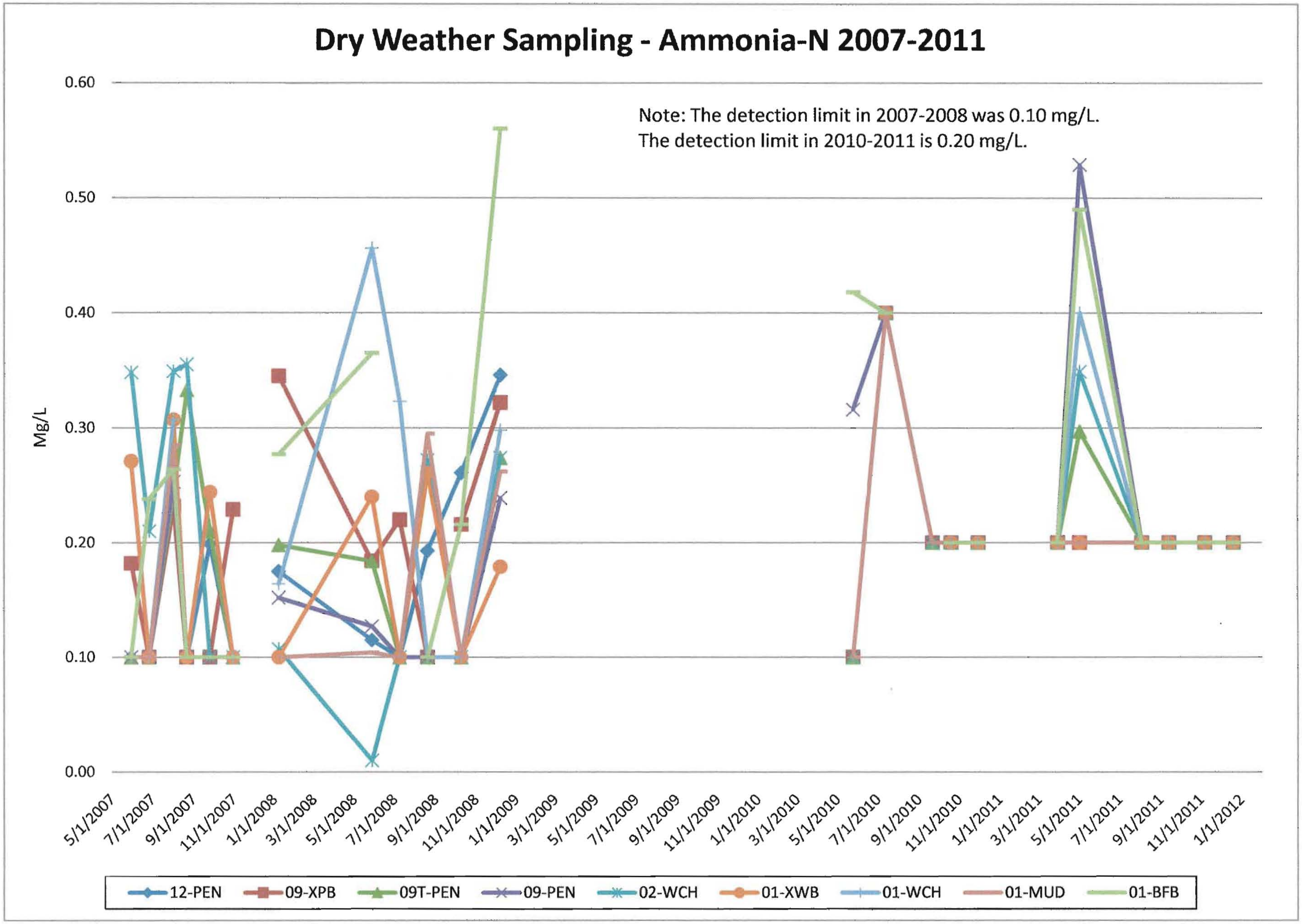
Dry Weather Sampling - Phosphorus Levels 2007-2011
Note: The detection limit is 0.01 mg/L.
Mg/L
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
5/1/2007
7/1/2007
9/1/2007
11/1/2007
1/1/2008
3/1/2008
5/1/2008
7/1/2008
9/1/2008
11/1/2008
1/1/2009
3/1/2009
5/1/2009
7/1/2009
9/1/2009
11/1/2009
1/1/2010
3/1/2010
5/1/2010
7/1/2010
9/1/2010
11/1/2010
1/1/2011
3/1/2011
5/1/2011
7/1/2011
9/1/2011
11/1/2011
1/1/2012
12-PEN
09-XPB
09T-PEN
09-PEN
02-WCH
01-XWB
01-WCH
01-MUD
01-BFB

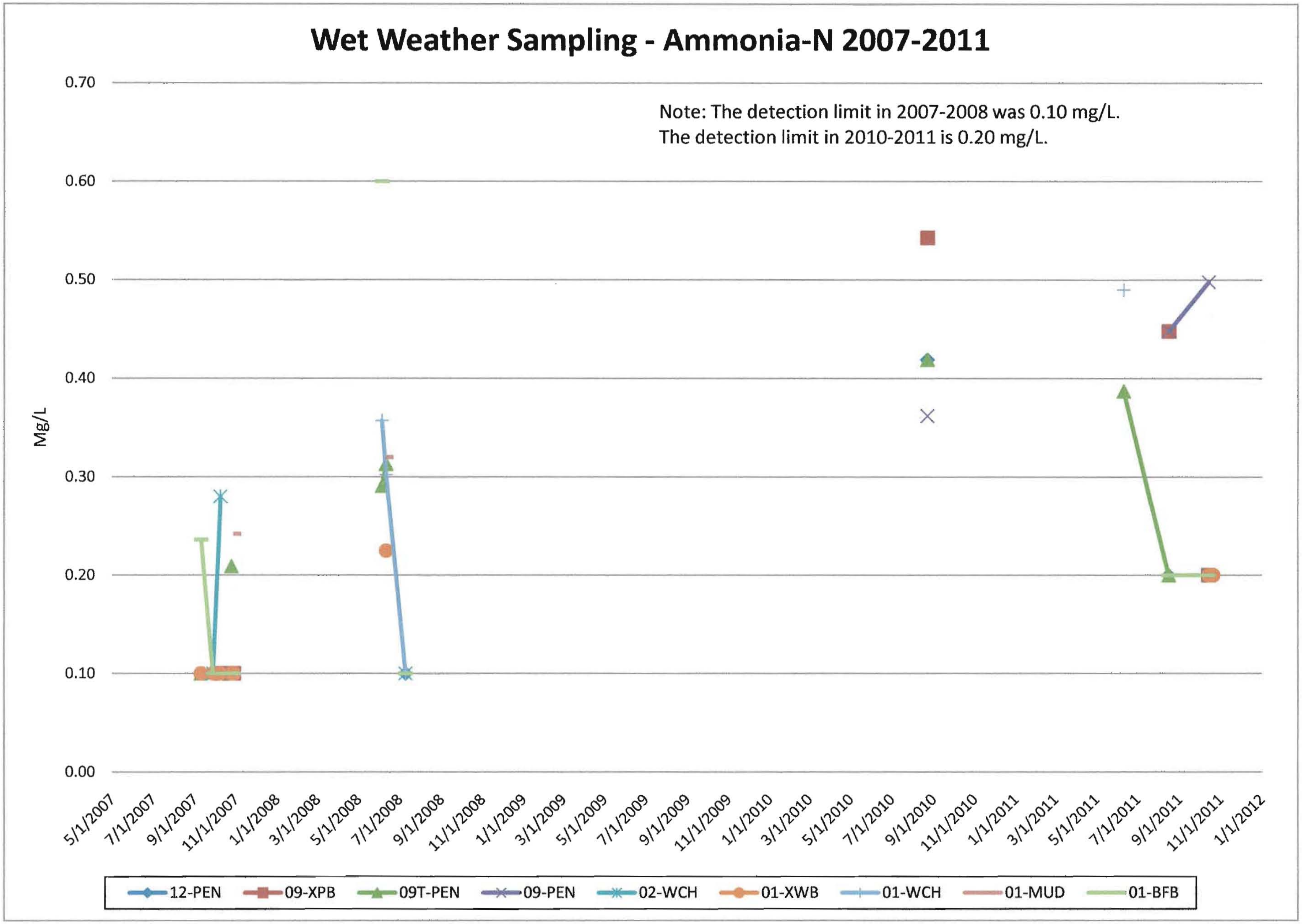


Wet Weather Sampling - Phosphorus Levels 2007-2011
Note: The detection limit is 0.01 mg/L.
Mg/L
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
5/1/2007
7/1/2007
9/1/2007
11/1/2007
1/1/2008
3/1/2008
5/1/2008
7/1/2008
9/1/2008
11/1/2008
1/1/2009
3/1/2009
5/1/2009
7/1/2009
9/1/2009
11/1/2009
1/1/2010
3/1/2010
5/1/2010
7/1/2010
9/1/2010
11/1/2010
1/1/2011
3/1/2011
5/1/2011
7/1/2011
9/1/2011
11/1/2011
1/1/2012
12-PEN
09-XPB
09T-PEN
09-PEN
02-WCH
01-XWB
01-WCH
01-MUD
01-BFB

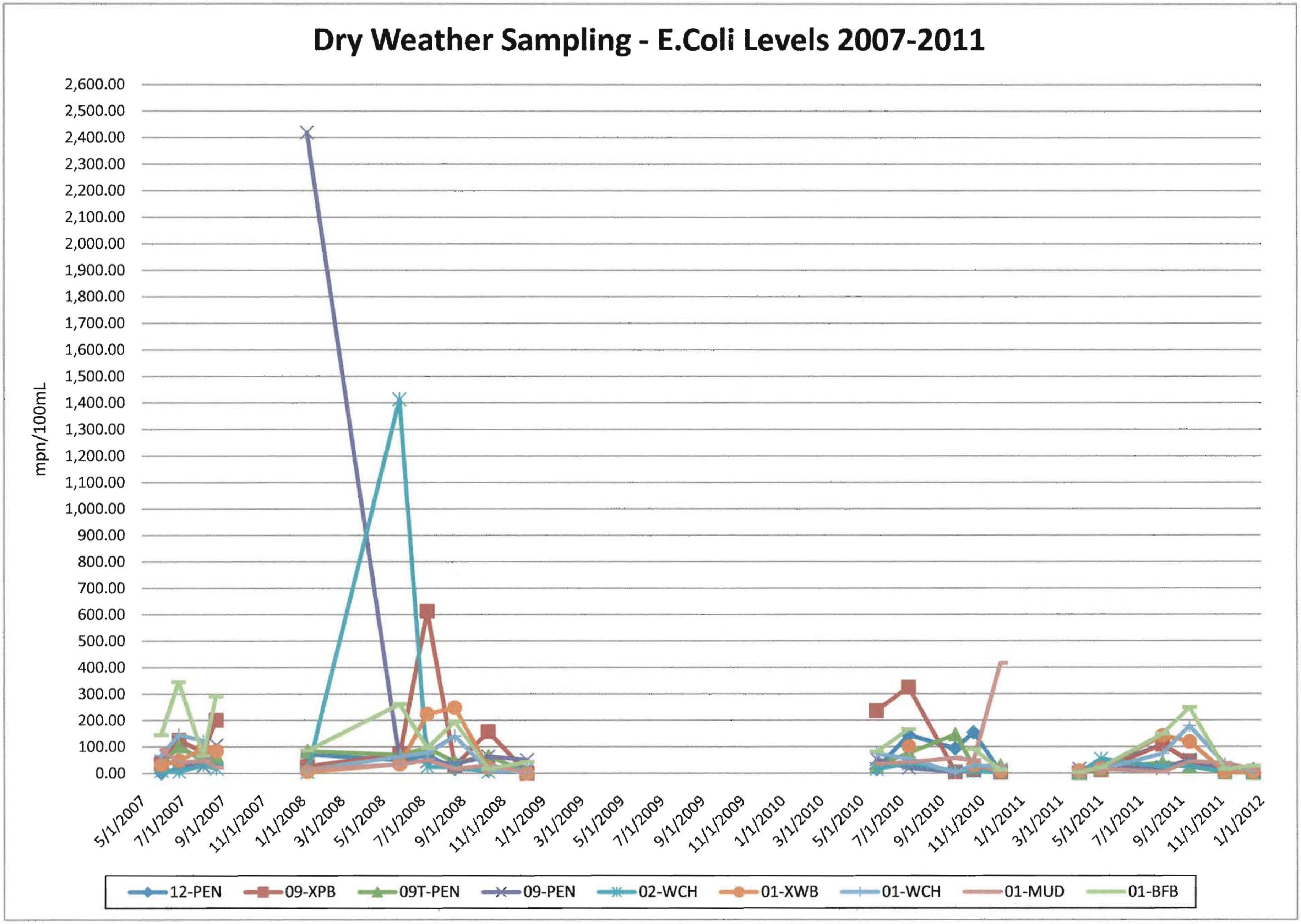

Dry Weather Sampling - Kjeldahl-N Levels 2007-2011
Note: The detection limit in 2007 and 2008 is 0.25 mg/L.
The detection limit in 2010 and 2011 is 0.50 mg/L.
Mg/L
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
5/1/2007
7/1/2007
9/1/2007
11/1/2007
1/1/2008
3/1/2008
5/1/2008
7/1/2008
9/1/2008
11/1/2008
1/1/2009
3/1/2009
5/1/2009
7/1/2009
9/1/2009
11/1/2009
1/1/2010
3/1/2010
5/1/2010
7/1/2010
9/1/2010
11/1/2010
1/1/2011
3/1/2011
5/1/2011
7/1/2011
9/1/2011
11/1/2011
1/1/2012
12-PEN
09-XPB
09T-PEN
09-PEN
02-WCH
01-XWB
01-WCH
01-MUD
01-BFB


Wet Weather Sampling - Kjeldahl-N Levels 2007-2011
Note: The detection limit in 2007 and 2008 is 0.25 mg/L.
The detection limit in 2010 and 2011 is 0.50 mg/L.
Mg/L
2.50
2.00
1.50
1.00
0.50
0.00
5/1/2007
7/1/2007
9/1/2007
11/1/2007
1/1/2008
3/1/2008
5/1/2008
7/1/2008
9/1/2008
11/1/2008
1/1/2009
3/1/2009
5/1/2009
7/1/2009
9/1/2009
11/1/2009
1/1/2010
3/1/2010
5/1/2010
7/1/2010
9/1/2010
11/1/2010
1/1/2011
3/1/2011
5/1/2011
7/1/2011
9/1/2011
11/1/2011
12-PEN
09-XPB
09T-PEN
09-PEN
02-WCH
01-XWB
01-WCH
01-MUD
01-BFB

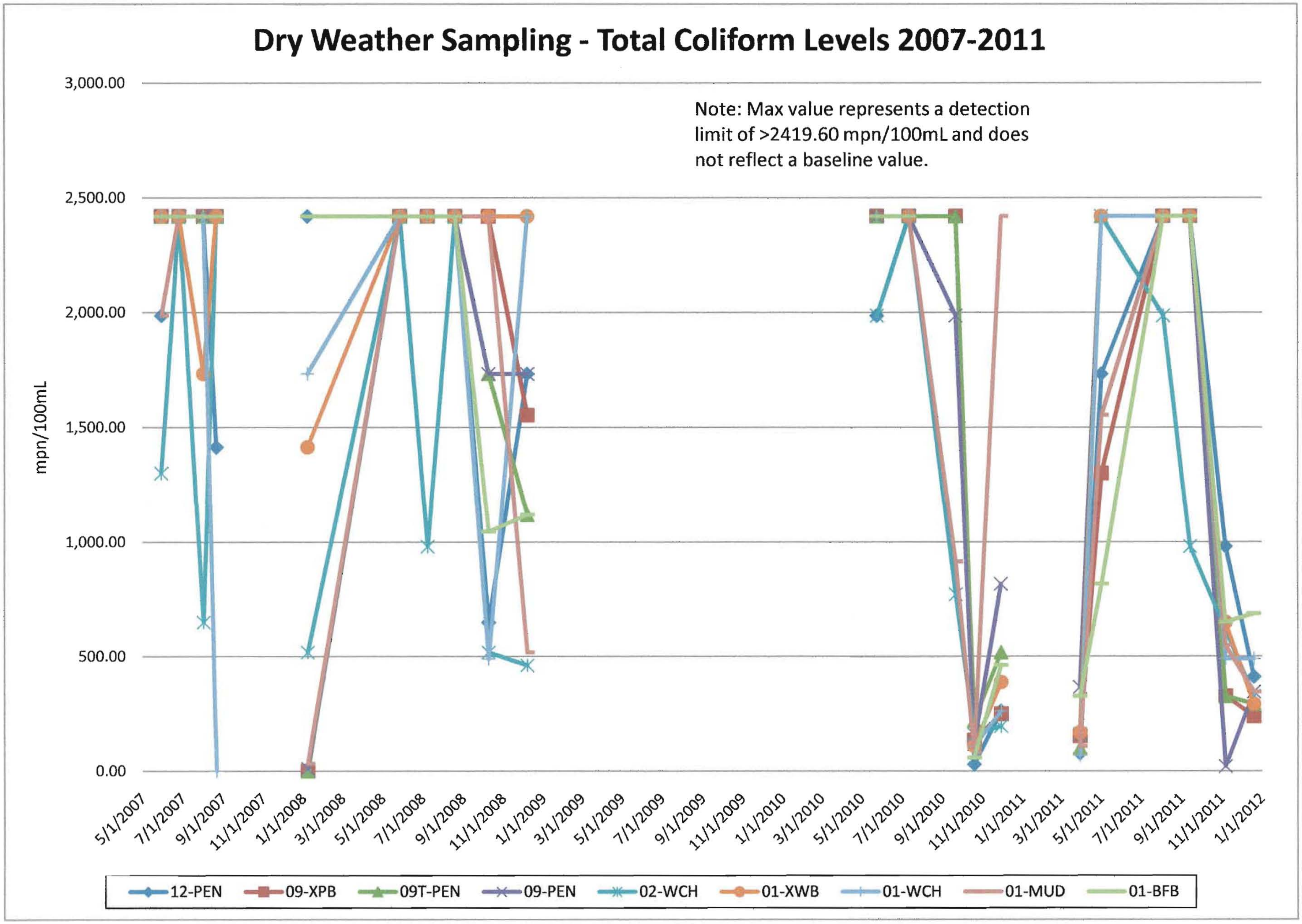

Dry Weather Sampling - Ammonia-N 2007-2011
Note: The detection limit in 2007-2008 was 0.10 mg/L.
The detection limit in 2010-2011 is 0.20 mg/L.
Mg/L
0.60
0.50
0.40
0.30
0.20
0.10
0.00
5/1/2007
7/1/2007
9/1/2007
11/1/2007
1/1/2008
3/1/2008
5/1/2008
7/1/2008
9/1/2008
11/1/2008
1/1/2009
3/1/2009
5/1/2009
7/1/2009
9/1/2009
11/1/2009
1/1/2010
3/1/2010
5/1/2010
7/1/2010
9/1/2010
11/1/2010
1/1/2011
3/1/2011
5/1/2011
7/1/2011
9/1/2011
11/1/2011
1/1/2012
12-PEN
09-XPB
09T-PEN
09-PEN
02-WCH
01-XWB
01-WCH
01-MUD
01-BFB



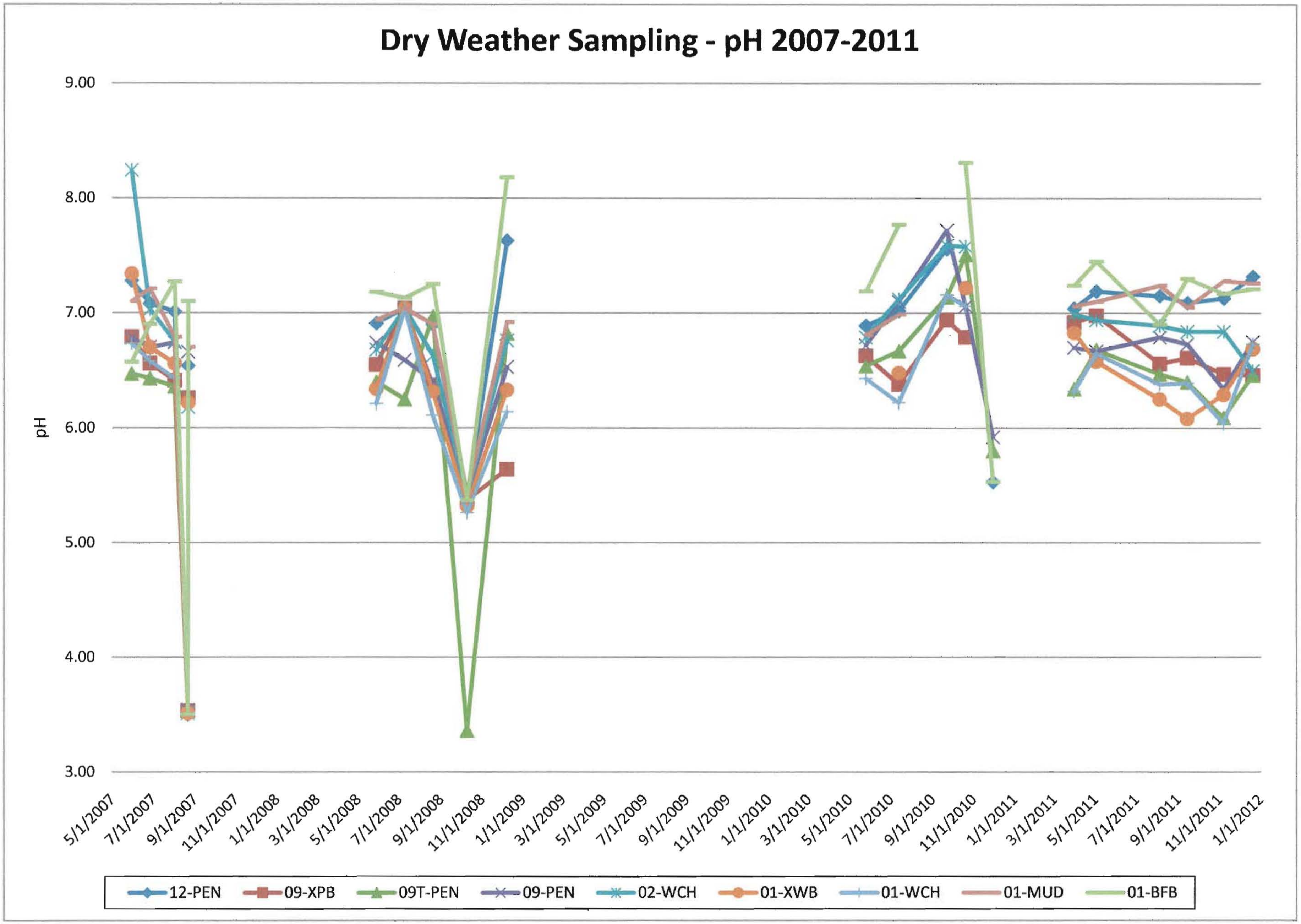
Wet Weather Sampling - Ammonia-N 2007-2011
Note: The detection limit in 2007-2008 was 0.10 mg/L.
The detection limit in 2010-2011 is 0.20 mg/L.
Mg/L
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
5/1/2007
7/1/2007
9/1/2007
11/1/2007
1/1/2008
3/1/2008
5/1/2008
7/1/2008
9/1/2008
11/1/2008
1/1/2009
3/1/2009
5/1/2009
7/1/2009
9/1/2009
11/1/2009
1/1/2010
3/1/2010
5/1/2010
7/1/2010
9/1/2010
11/1/2010
1/1/2011
3/1/2011
5/1/2011
7/1/2011
9/1/2011
11/1/2011
1/1/2012
12-PEN
09-XPB
09T-PEN
09-PEN
02-WCH
01-XWB
01-WCH
01-MUD
01-BFB

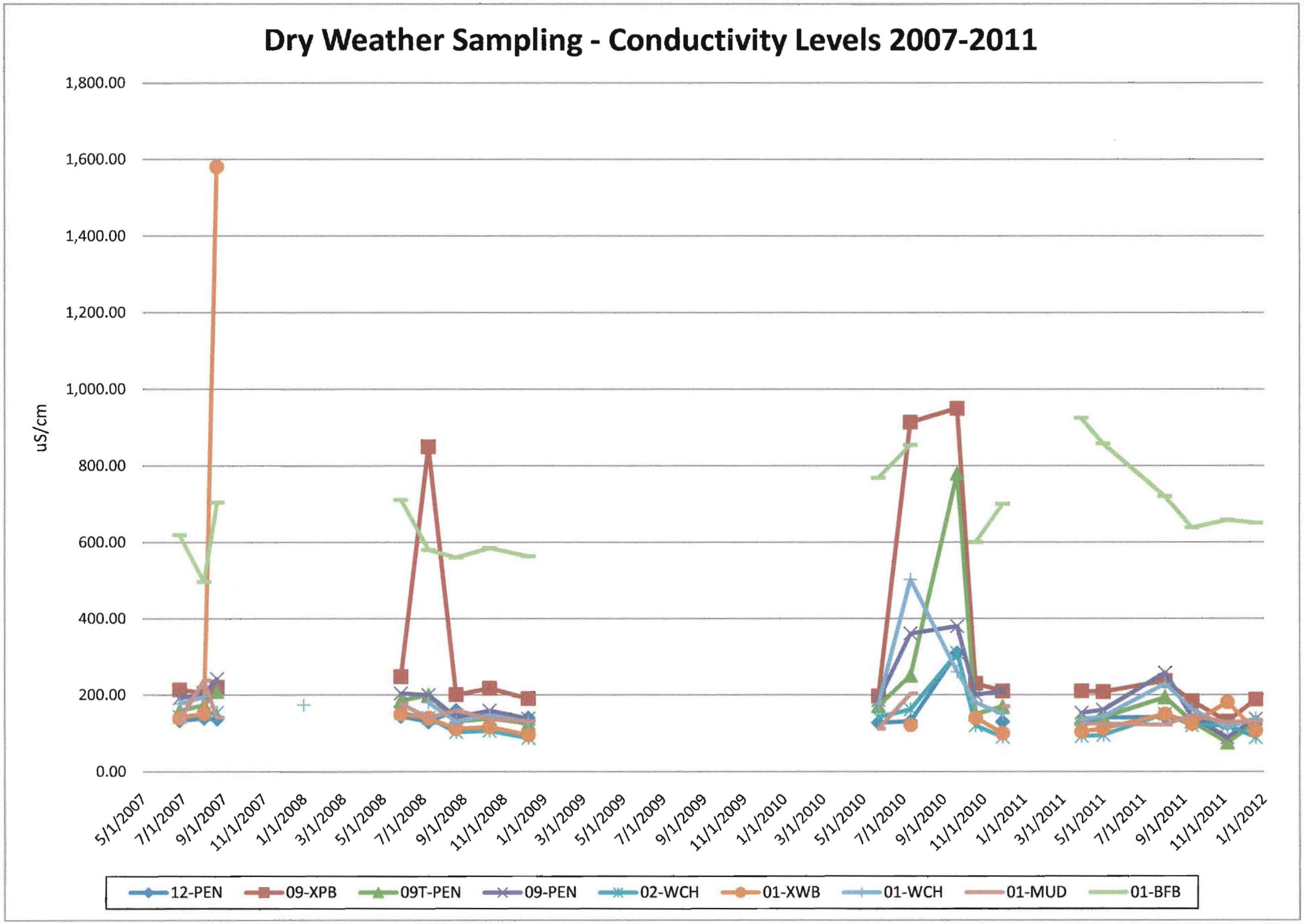


Dry Weather Sampling - E.Coli Levels 2007-2011
mpn/100mL
2,600.00
2,500.00
2,400.00
2,300.00
2,200.00
2,100.00
2,000.00
1,900.00
1,800.00
1,700.00
1,600.00
1,500.00
1,400.00
1,300.00
1,200.00
1,100.00
1,000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
5/1/2007
7/1/2007
9/1/2007
11/1/2007
1/1/2008
3/1/2008
5/1/2008
7/1/2008
9/1/2008
11/1/2008
1/1/2009
3/1/2009
5/1/2009
7/1/2009
9/1/2009
11/1/2009
1/1/2010
3/1/2010
5/1/2010
7/1/2010
9/1/2010
11/1/2010
1/1/2011
3/1/2011
5/1/2011
7/1/2011
9/1/2011
11/1/2011
1/1/2012
12-PEN
09-XPB
09T-PEN
09-PEN
02-WCH
01-XWB
01-WCH
01-MUD
01-BFB



Dry Weather Sampling - Total Coliform Levels 2007-2011
Note: Max value represents a detection limit of >2419.60 mpn/100mL and does not reflect a baseline value.
mpn/100mL
3,000.00
2,500.00
2,000.00
1,500.00
1,000.00
500.00
0.00
5/1/2007
7/1/2007
9/1/2007
11/1/2007
1/1/2008
3/1/2008
5/1/2008
7/1/2008
9/1/2008
11/1/2008
1/1/2009
3/1/2009
5/1/2009
7/1/2009
9/1/2009
11/1/2009
1/1/2010
3/1/2010
5/1/2010
7/1/2010
9/1/2010
11/1/2010
1/1/2011
3/1/2011
5/1/2011
7/1/2011
9/1/2011
11/1/2011
1/1/2012
12-PEN
09-XPB
09T-PEN
09-PEN
02-WCH
01-XWB
01-WCH
01-MUD
01-BFB


Dry Weather Sampling - pH 2007-2011
9.00
8.00
7.00
6.00
5.00
4.00
3.00
pH
5/1/2007
7/1/2007
9/1/2007
11/1/2007
1/1/2008
3/1/2008
5/1/2008
7/1/2008
9/1/2008
11/1/2008
1/1/2009
3/1/2009
5/1/2009
7/1/2009
9/1/2009
11/1/2009
1/1/2010
3/1/2010
5/1/2010
7/1/2010
9/1/2010
11/1/2010
1/1/2011
3/1/2011
5/1/2011
7/1/2011
9/1/2011
11/1/2011
1/1/2012
12-PEN
09-XPB
09T-PEN
09-PEN
02-WCH
01-XWB
01-WCH
01-MUD
01-BFB



Dry Weather Sampling - Conductivity Levels 2007-2011
1,800.00
1,600.00
1,400.00
1,200.00
1,000.00
800.00
600.00
400.00
200.00
0.00
uS/cm
5/1/2007
7/1/2007
9/1/2007
11/1/2007
1/1/2008
3/1/2008
5/1/2008
7/1/2008
9/1/2008
11/1/2008
1/1/2009
3/1/2009
5/1/2009
7/1/2009
9/1/2009
11/1/2009
1/1/2010
3/1/2010
5/1/2010
7/1/2010
9/1/2010
11/1/2010
1/1/2011
3/1/2011
5/1/2011
7/1/2011
9/1/2011
11/1/2011
1/1/2012
12-PEN
09-XPB
09T-PEN
09-PEN
02-WCH
01-XWB
01-WCH
01-MUD
01-BFB