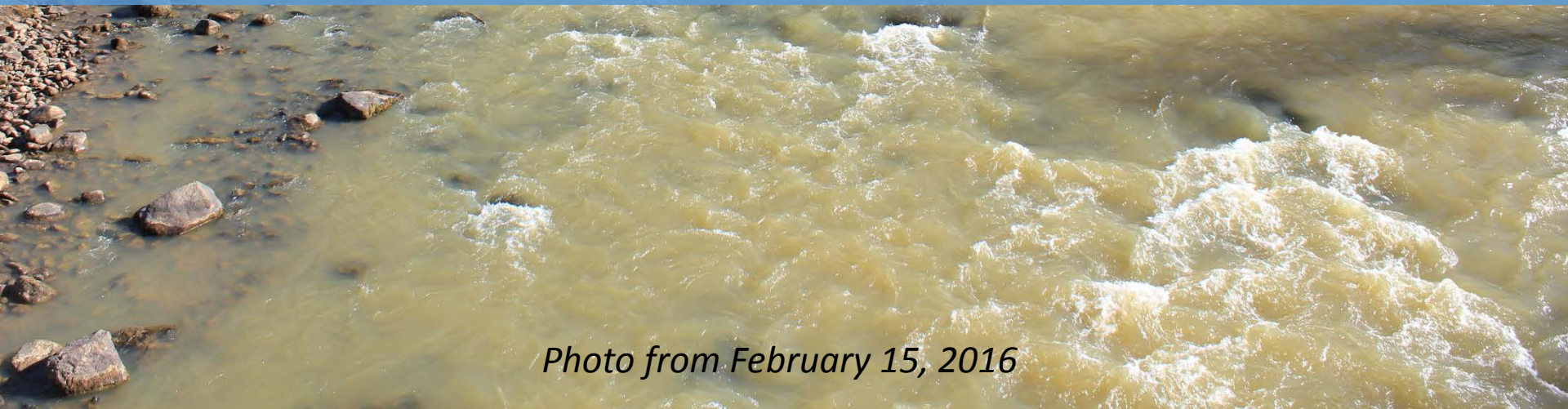


# Has anyone noticed the color of Animas River this spring?

With a heightened awareness since the Gold King Mine release, many people in the community have begun to note the color of the Animas River.

The Animas River naturally turns various shades of brown during spring runoff as a result of snowmelt and suspended sediment.



*Photo from February 15, 2016*

# “The river looked a bit orange today, should I be concerned?”

Mountain Studies Institute (MSI) has been monitoring water quality of the Animas River at Rotary Park in Durango before, during, and after the 2015 Gold King Mine release. We plan to continue monitoring during spring runoff in 2016. We collected our first water quality sample of the season on February 15 2016 and now have water quality data from February, March, April, May, and June.

*Visit the Mountain Studies Institute website for more information:*

[www.mountainstudies.org](http://www.mountainstudies.org)

*Photo from February 15, 2016*




So far in the spring of 2016, MSI has collected 17 samples from Feb through June





For perspective, these are spring runoff photos compared to the color of the Gold King Mine plume on August 7, 2015.



A scenic view of a river with a bridge and houses in the background. The river is flowing through a rocky bed, and the water is a yellowish-brown color. In the background, there are houses and trees, some with snow on the ground.

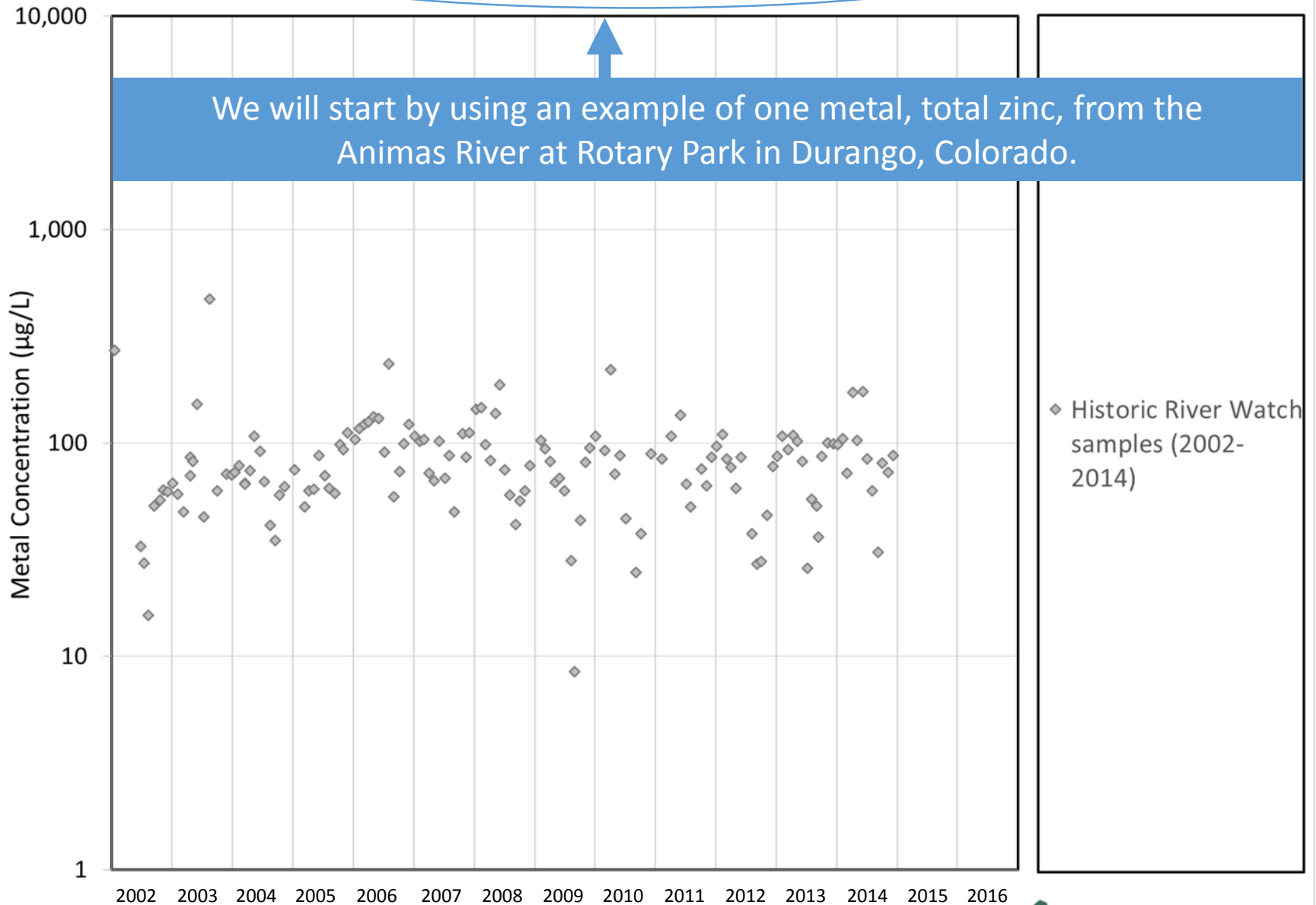
Click through the following pages to learn how metal concentrations in the Animas River so far in the Spring of 2016 compare to water quality standards and observations from before, during, and after the Gold King Mine release...

...or skip ahead to the end for a summary

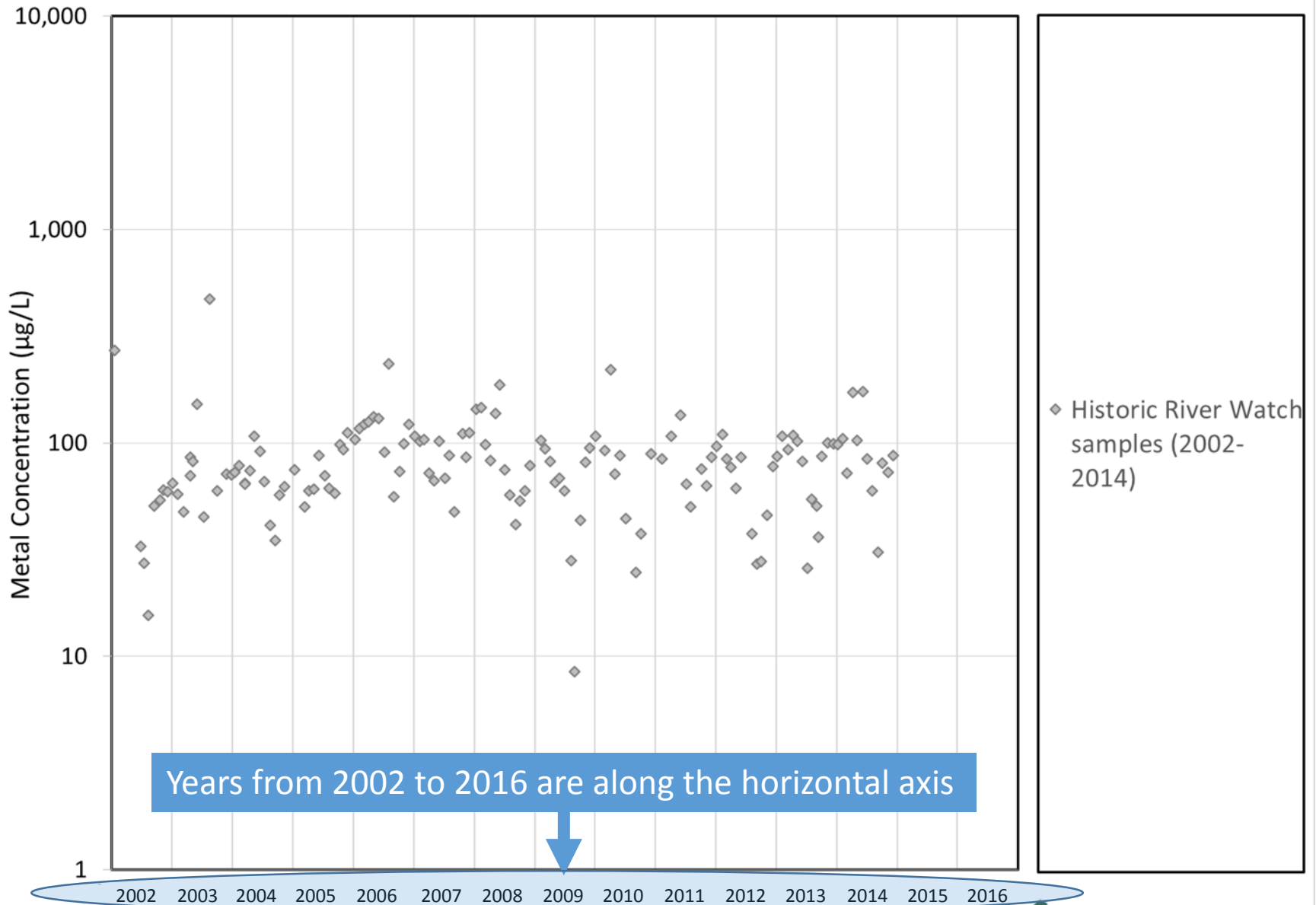
*Please keep in mind that this is an example from only one location (Rotary Park in Durango) on the Animas River and may not be indicative of the entire Animas River watershed.*

Total Zinc, Animas River at Durango, CO: 2002-2016

We will start by using an example of one metal, total zinc, from the Animas River at Rotary Park in Durango, Colorado.



# Total Zinc, Animas River at Durango, CO: 2002-2016



# Total Zinc, Animas River at Durango, CO: 2002-2016

10,000

1,000

Metal Concentration ( $\mu\text{g/L}$ )

100

10

1

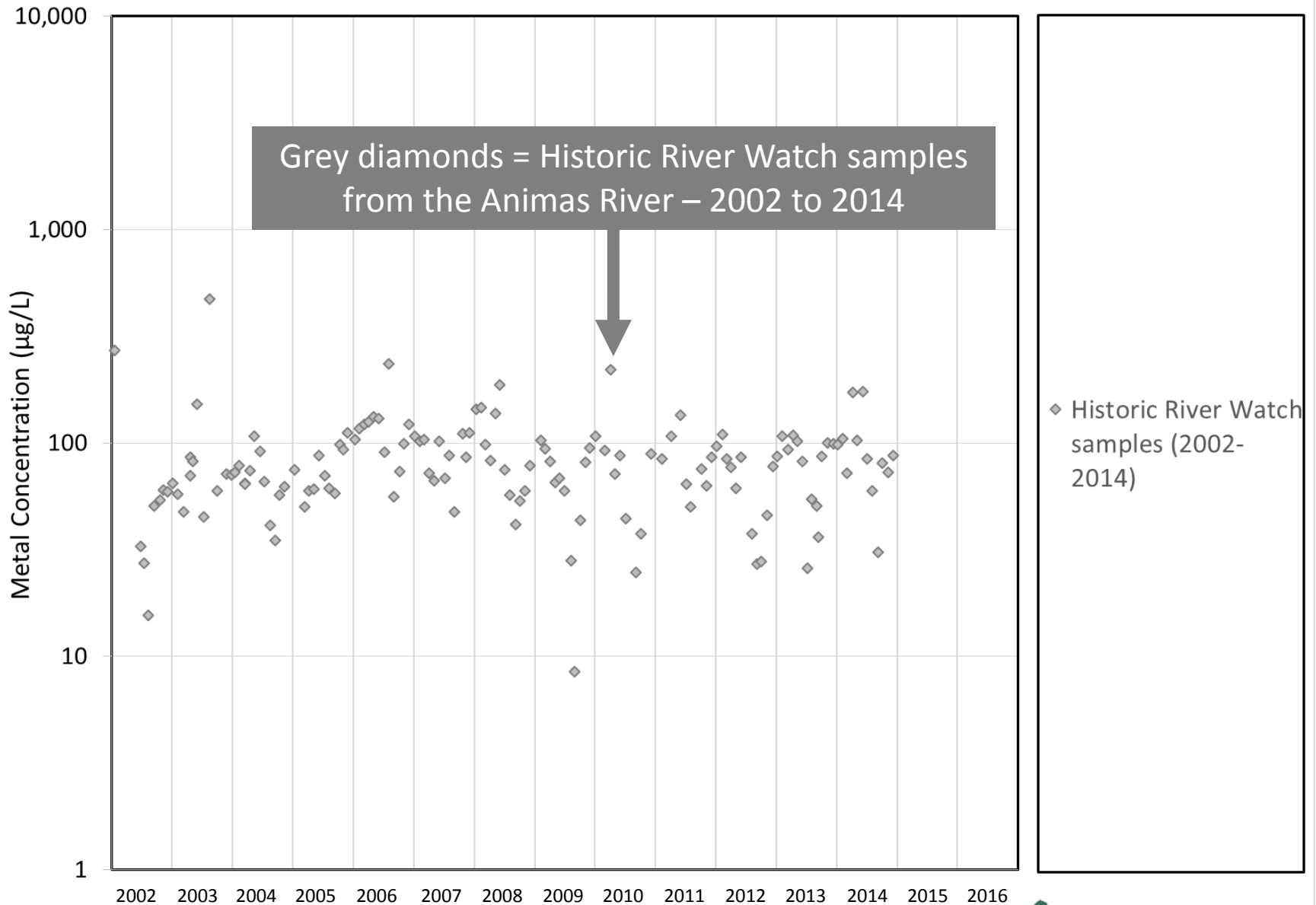
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016

Metal concentration ( $\mu\text{g/L}$ ), log scale, is on the vertical axis

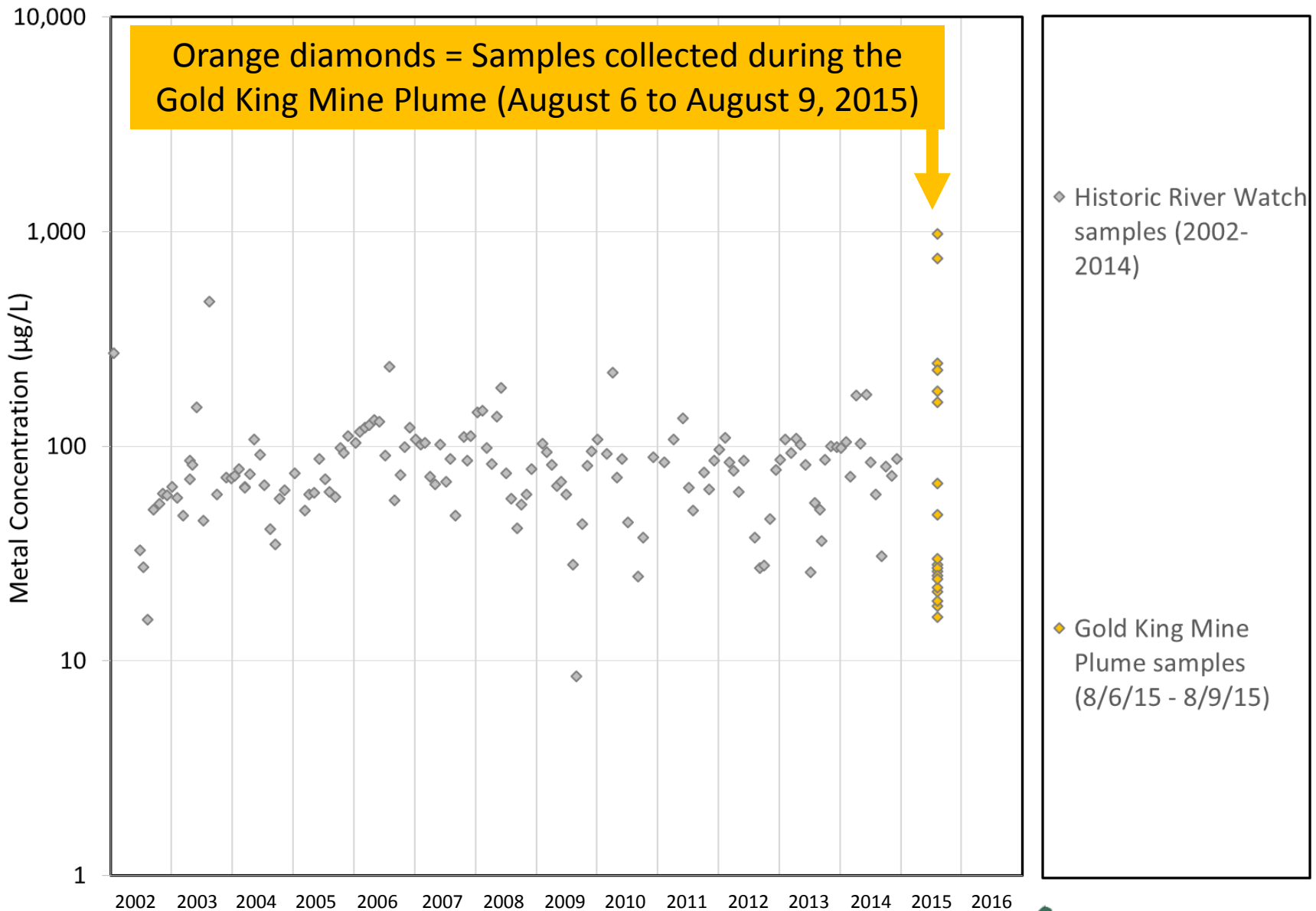
◆ Historic River Watch samples (2002-2014)



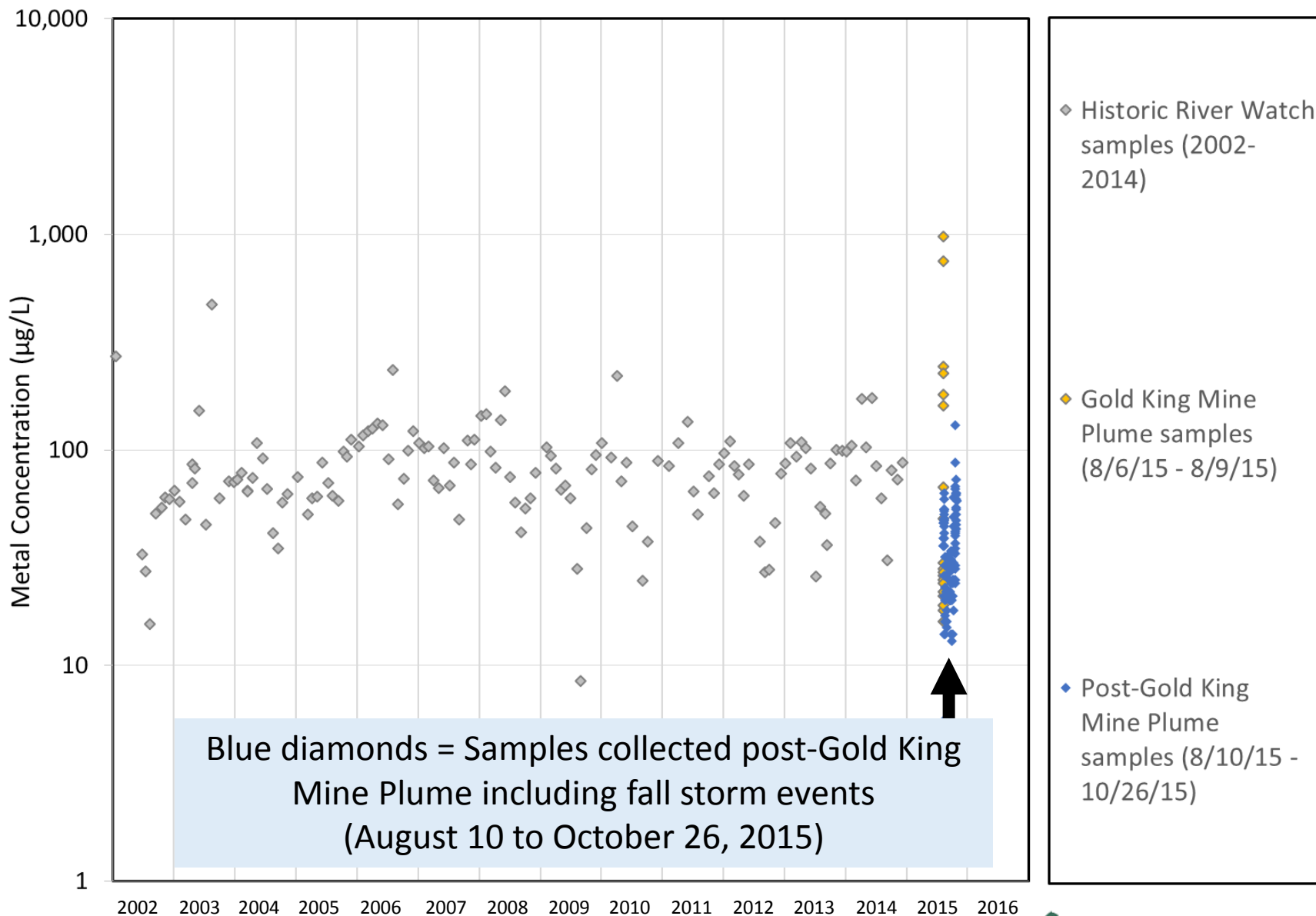
# Total Zinc, Animas River at Durango, CO: 2002-2016



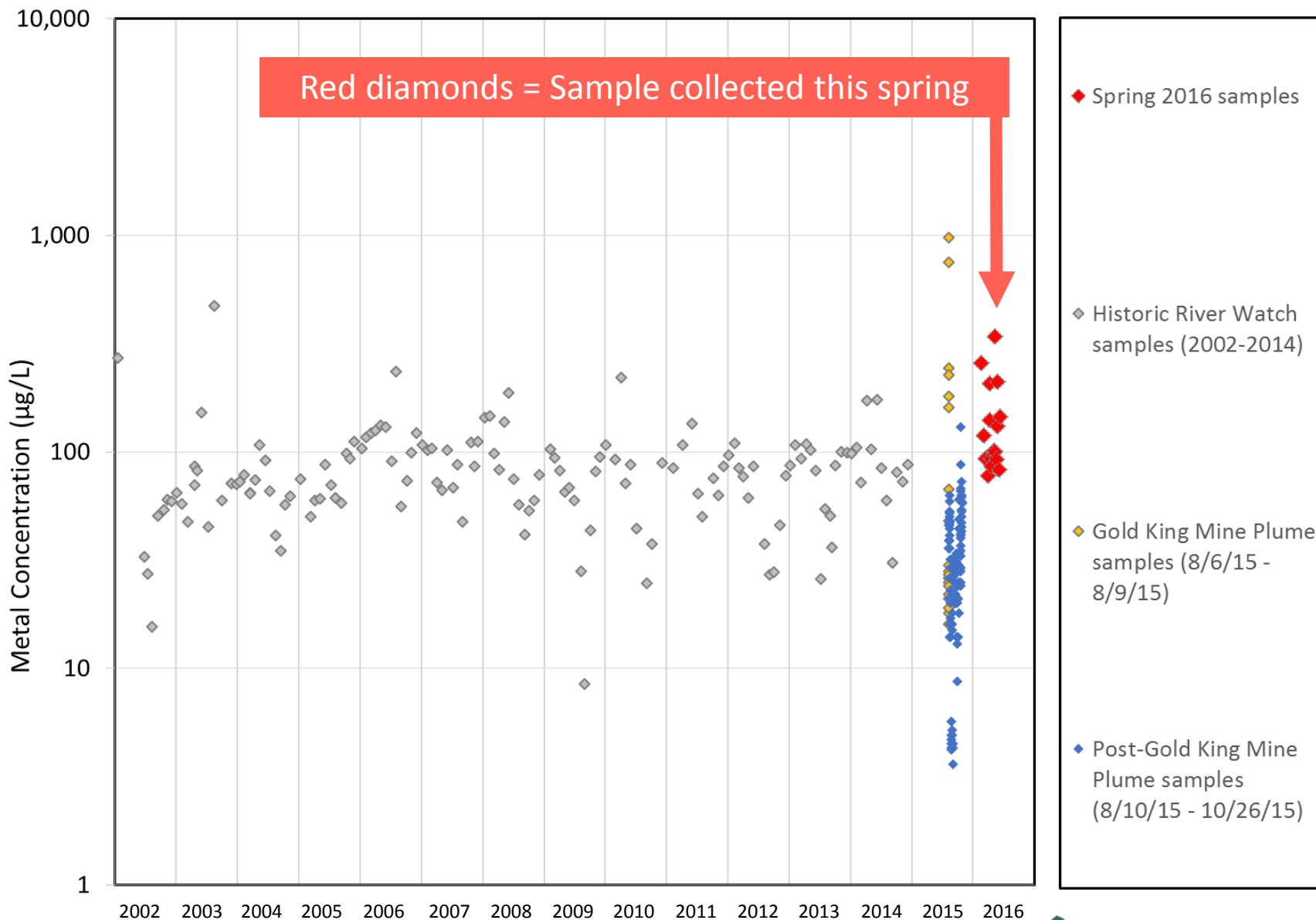
# Total Zinc, Animas River at Durango, CO: 2002-2016



# Total Zinc, Animas River at Durango, CO: 2002-2016

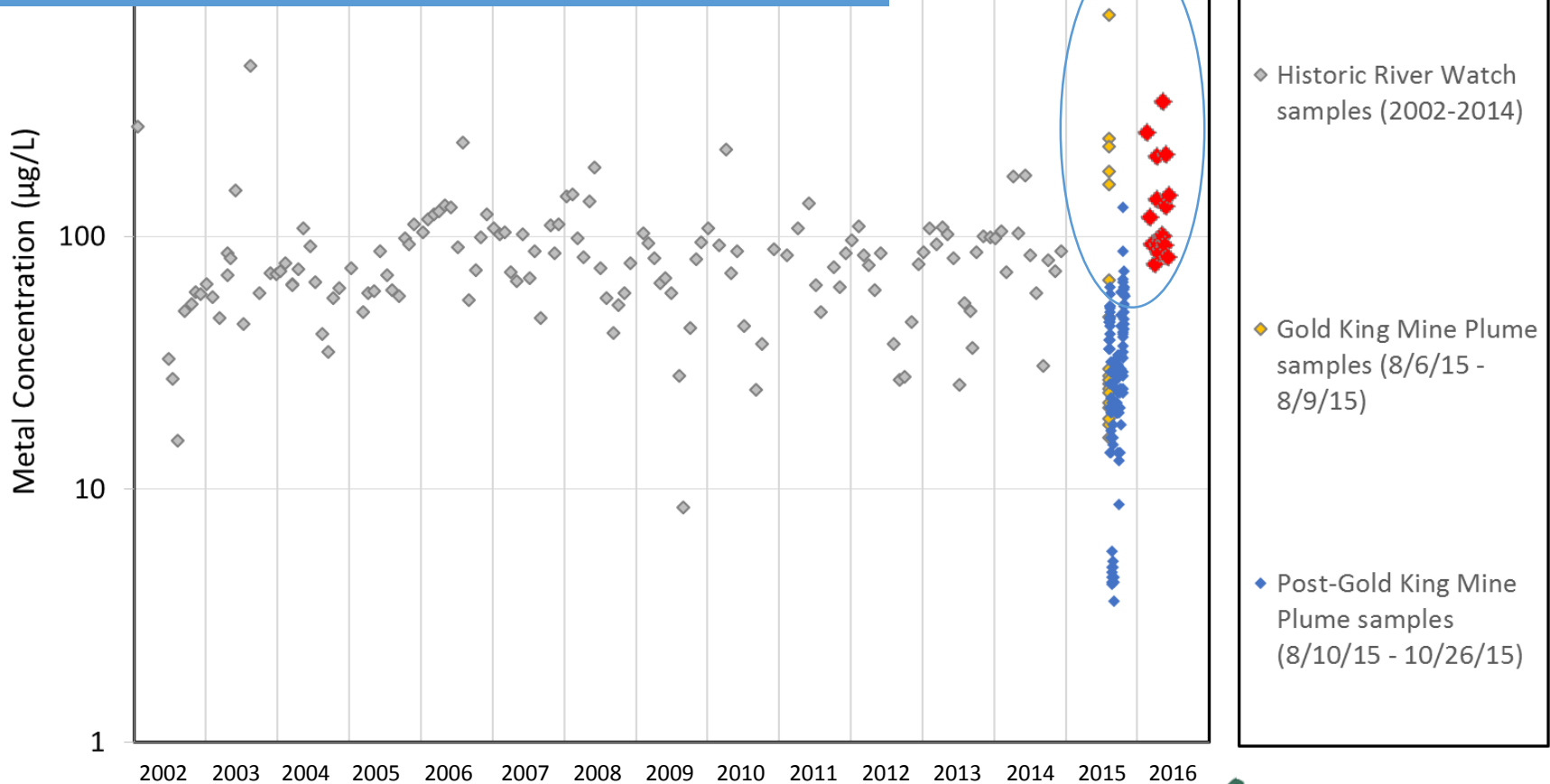


# Total Zinc, Animas River at Durango, CO: 2002-2016

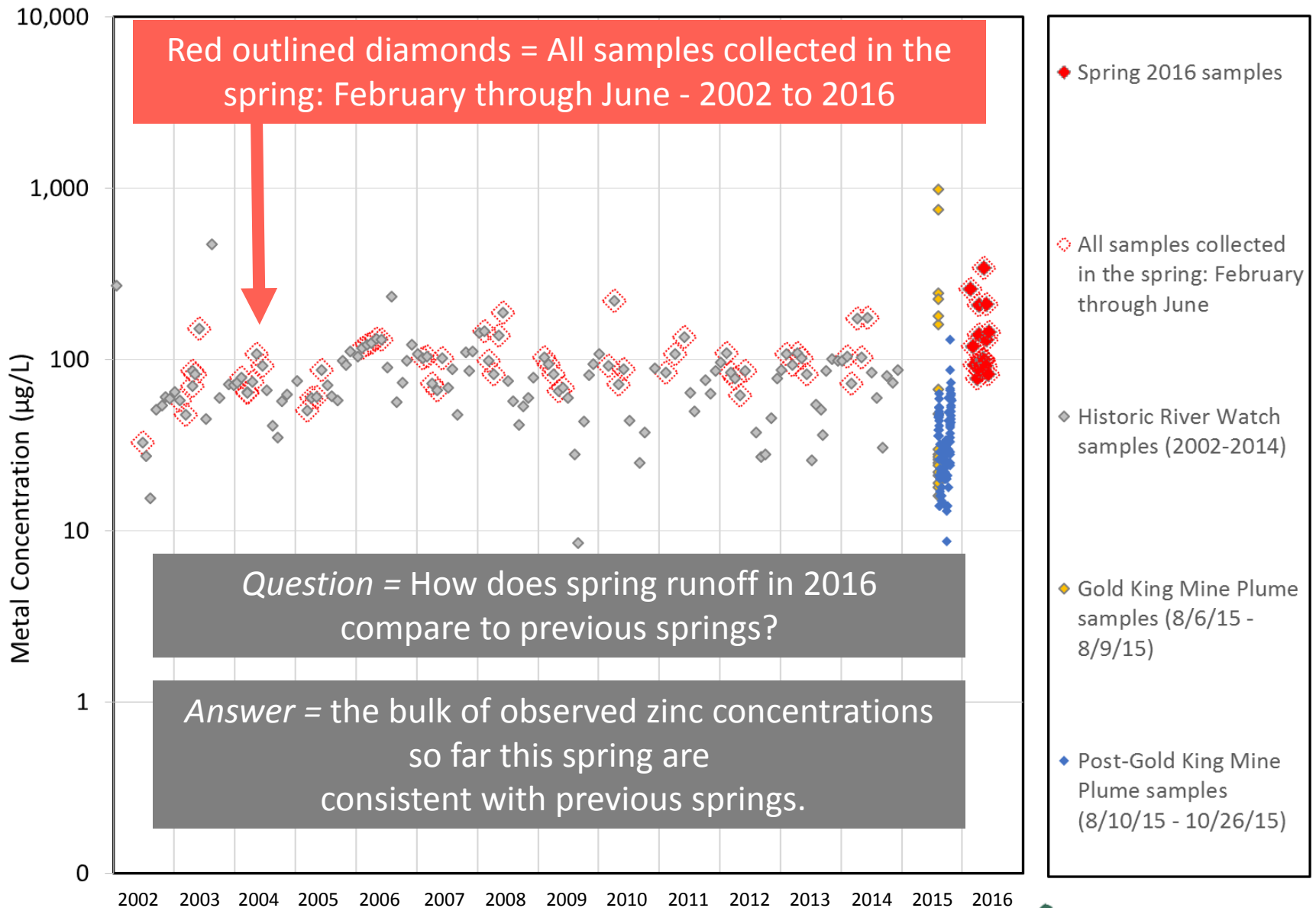


*Question = How does the spring 2016 concentrations compare to concentrations during the 2015 Gold King Mine plume?*

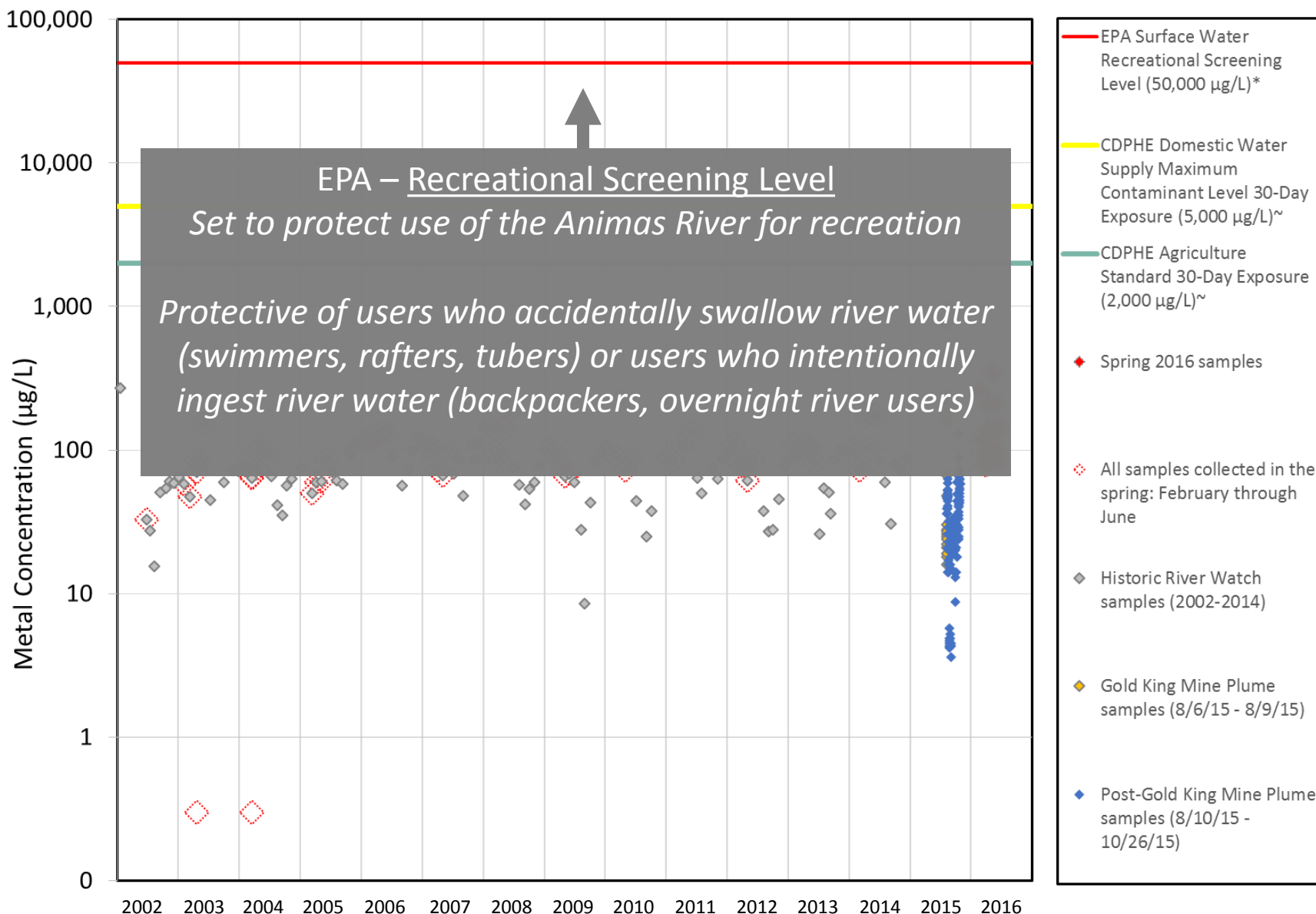
*Answer = Spring 2016 concentrations were less than concentrations observed at the peak of the Gold King Mine plume.*



## Total Zinc, Animas River at Durango, CO: 2002-2016



## Total Zinc, Animas River at Durango, CO: 2002-2016

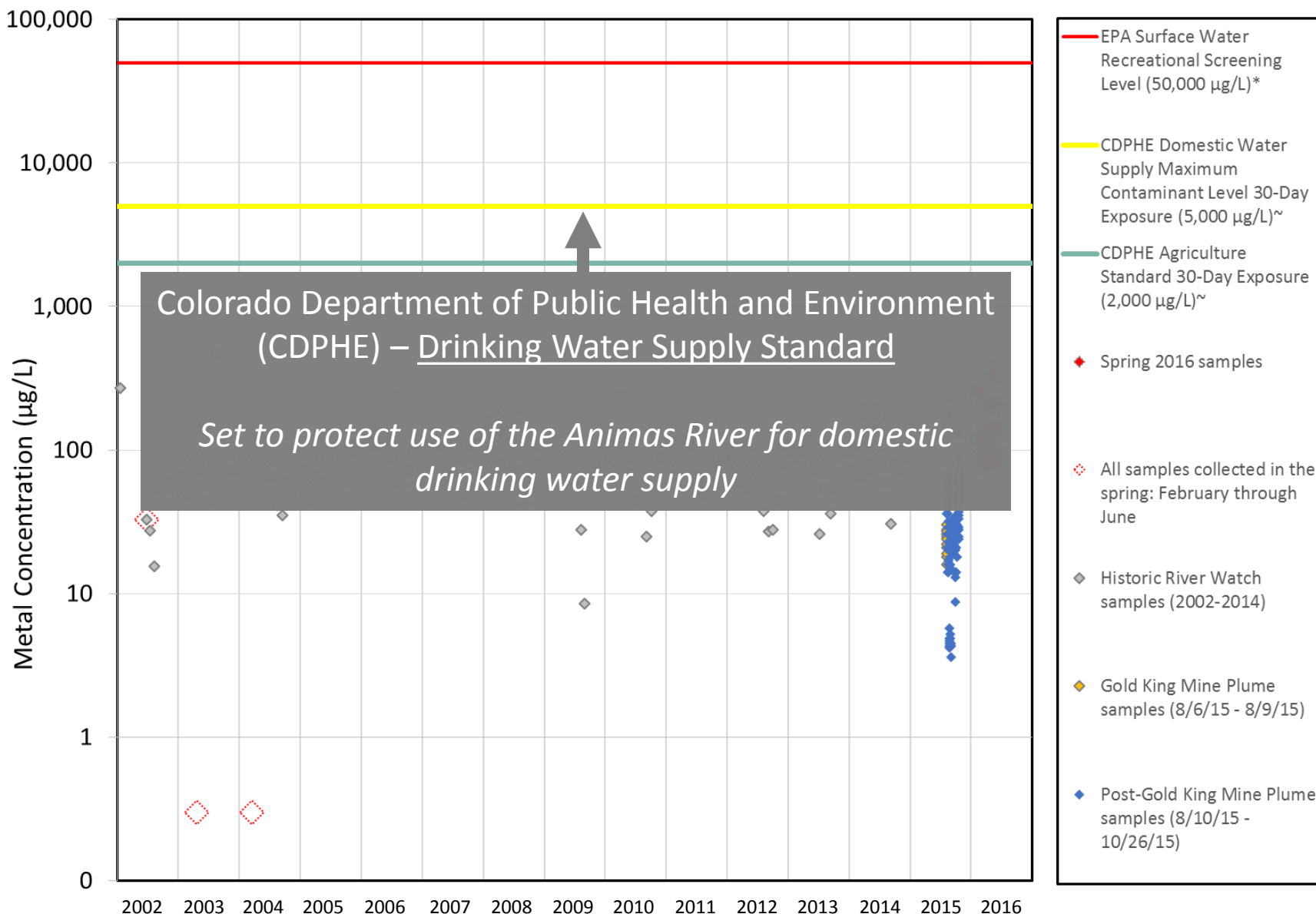


\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.

## Total Zinc, Animas River at Durango, CO: 2002-2016



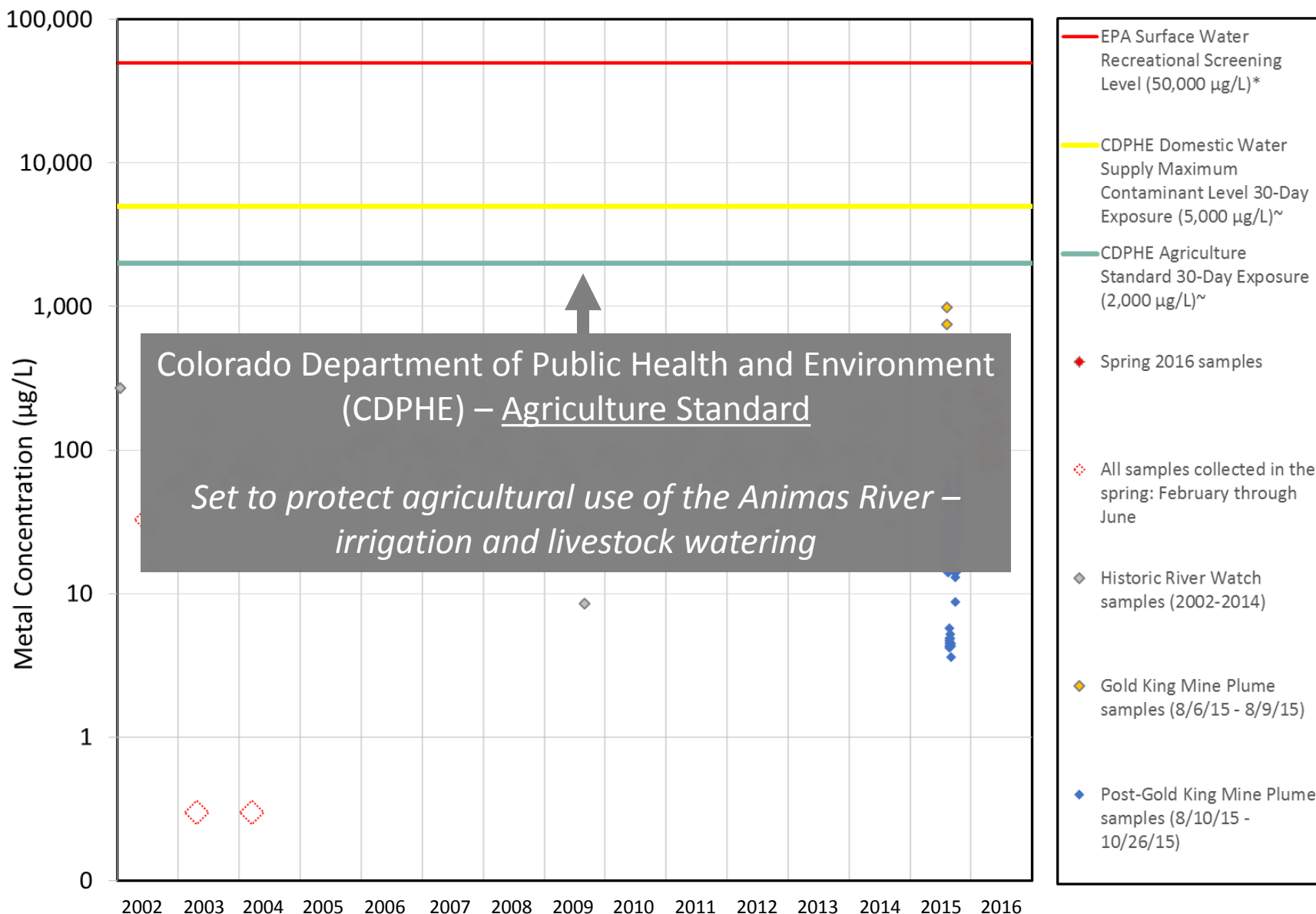
\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.



## Total Zinc, Animas River at Durango, CO: 2002-2016

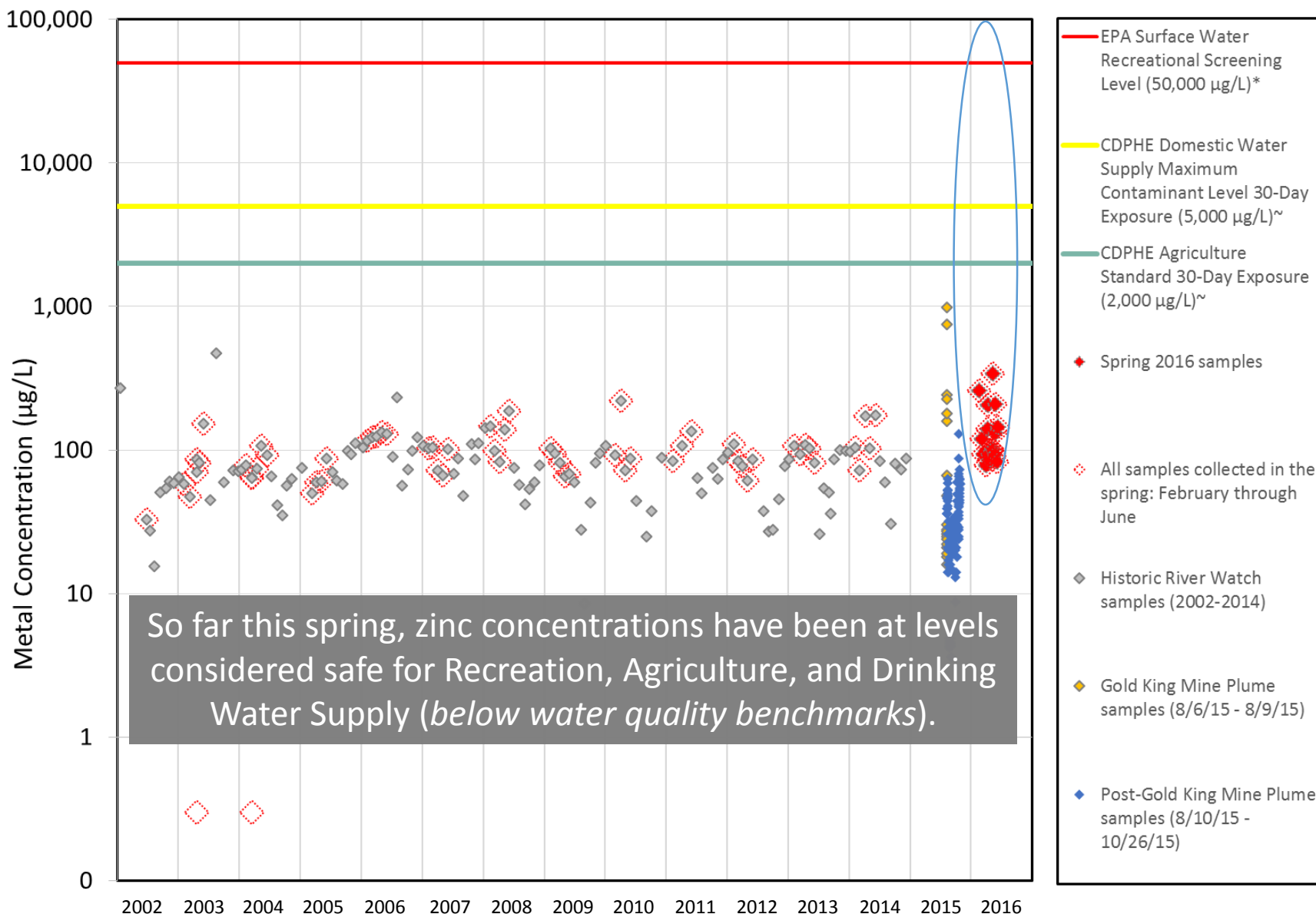


\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.

## Total Zinc, Animas River at Durango, CO: 2002-2016

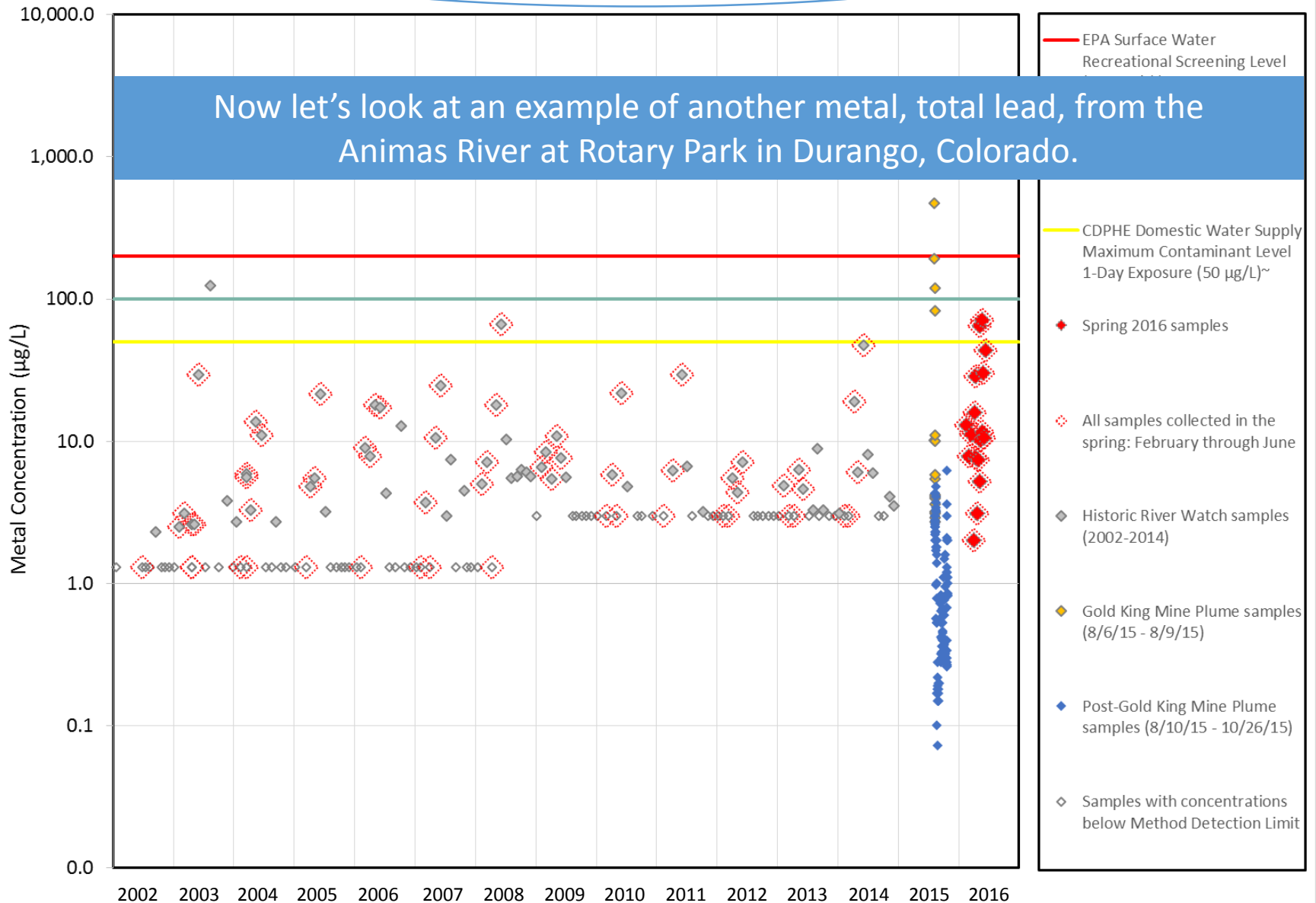


\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.

## Total Lead, Animas River at Durango, CO: 2002-2016

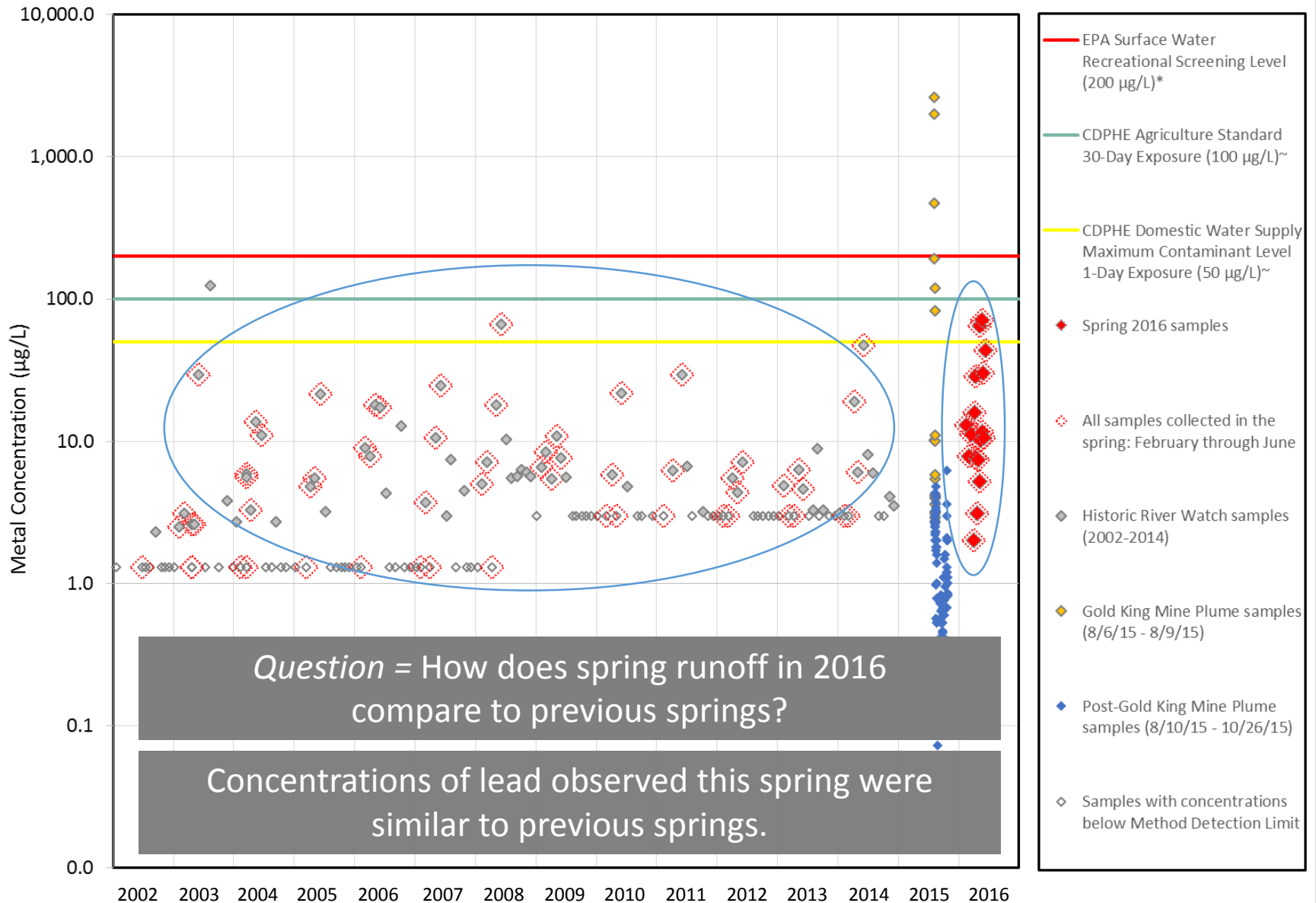


\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.

## Total Lead, Animas River at Durango, CO: 2002-2016

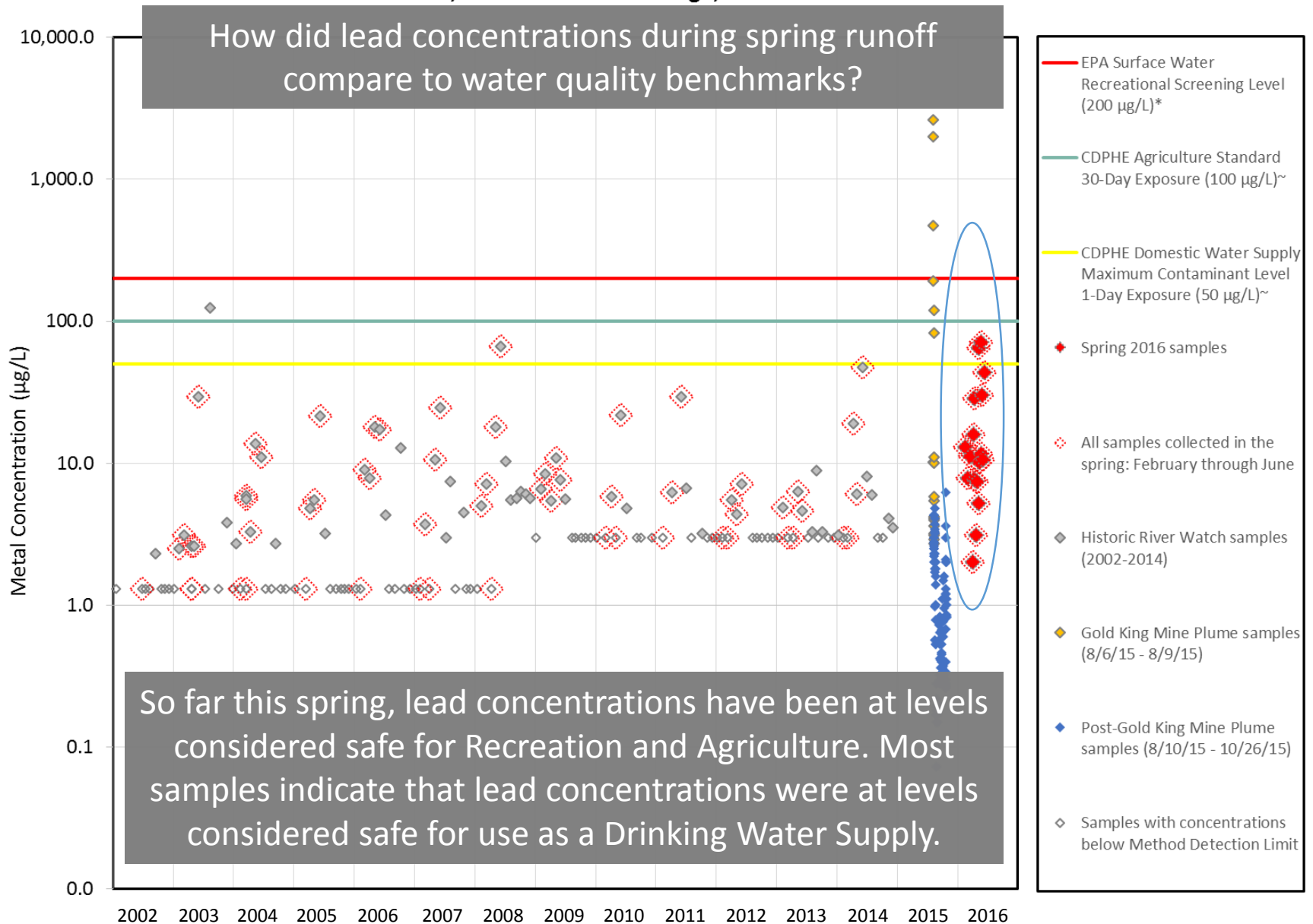


\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.

## Total Lead, Animas River at Durango, CO: 2002-2016

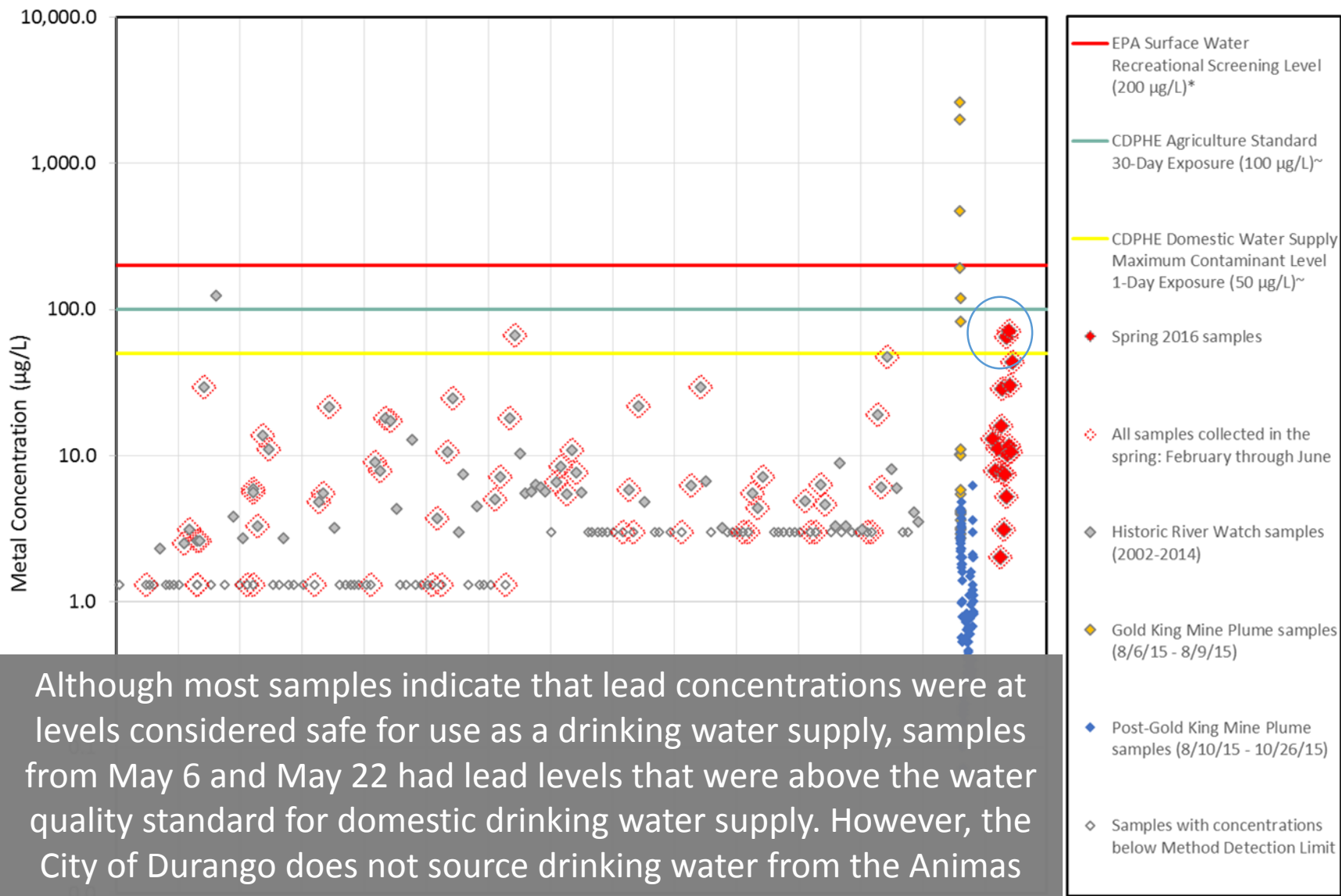


\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.

## Total Lead, Animas River at Durango, CO: 2002-2016

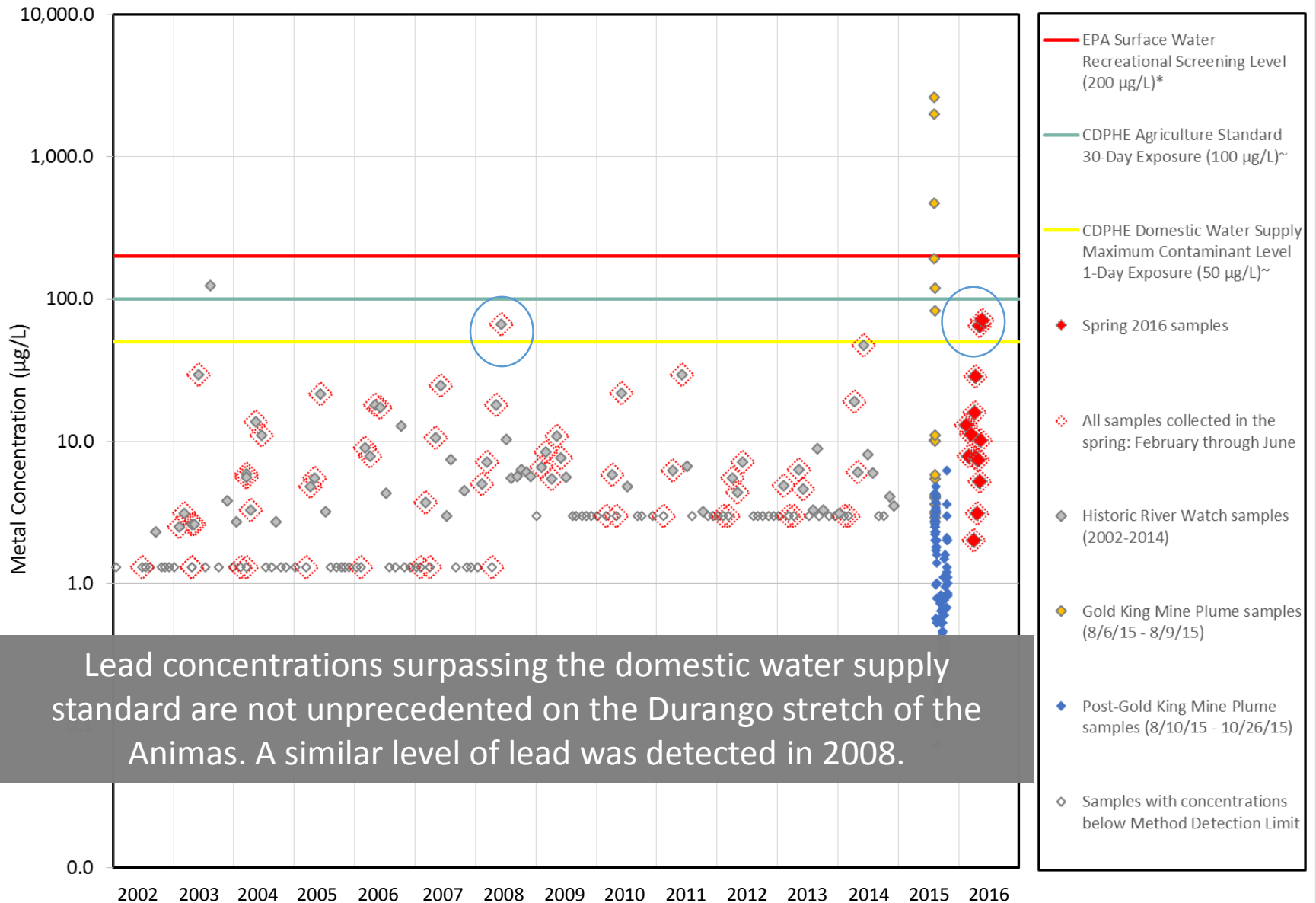


Although most samples indicate that lead concentrations were at levels considered safe for use as a drinking water supply, samples from May 6 and May 22 had lead levels that were above the water quality standard for domestic drinking water supply. However, the City of Durango does not source drinking water from the Animas River during spring runoff and treated city water meets all drinking water standards.

total of 30 years.

o, CO.

## Total Lead, Animas River at Durango, CO: 2002-2016

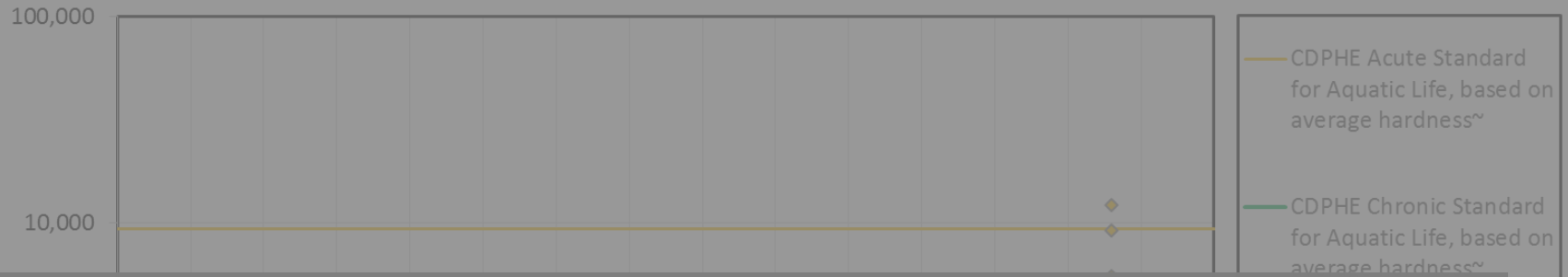


\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.

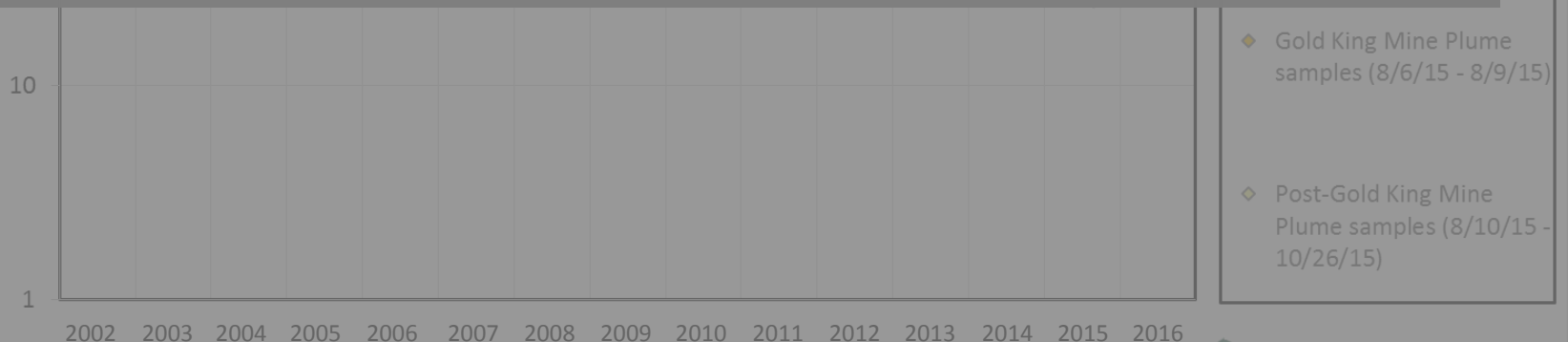
Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.

## Aluminum, total - Animas River at Durango, CO



To see graphs for additional metals,  
please visit the Mountain Studies Institute  
online:

[www.MountainStudies.org/AnimasRiver](http://www.MountainStudies.org/AnimasRiver)



~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34. Standards vary with water hardness.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO



# So far, have metals during spring runoff been higher than water quality benchmarks?



Recreation

*None*



Agriculture

*None*



Drinking  
Water Supply



*manganese,  
dissolved*



*lead,  
total*



Aquatic Life

*Acute*

*None*

*Chronic*



*aluminum,  
total*



*iron,  
total*

*Note: t=total recoverable; d=dissolved*

# Should I be concerned?



So far, the Animas River has contained low levels of metals during spring runoff.

*So, what does that mean?  
The good news is:*

Metal concentrations during spring runoff were not high enough to surpass:



EPA Recreational Screening Levels



CDPHE Aquatic Life Acute Water Quality Standards



CDPHE Agricultural Water Quality Standards

# Should I be concerned?

*More good news:*

Cu

Se

Zn

Metals most thought to be harmful to aquatic life, copper, zinc, and selenium, did not surpass CDPHE Aquatic Life water quality standards during spring runoff, during fall 2015 storm events, or during the Gold King Mine release.

As

Hg

Metals of particular concern, arsenic and mercury, did not surpass water quality standards during spring runoff.

# Should I be concerned?



Manganese and lead surpassed CDPHE Domestic Drinking Water Quality Standards during spring runoff.

However:

- City of Durango does not source drinking water from the Animas River during Spring Runoff
- When the City of Durango does source drinking water from the Animas River, water is thoroughly treated and meets all water quality regulations.
- Manganese at this level is not of concern for human health. The concern is associated with aesthetic effects, such as staining of appliances.

# Should I be concerned?

*But, there were some concerns:*



Aluminum and iron surpassed CDPHE Chronic Standards for Aquatic Life during spring runoff. High levels of aluminum and iron are not unprecedented, they have occurred during spring runoff in previous years.

It is important to note that there are large natural sources of aluminum and iron in the Animas River watershed that are not related to mining activities.

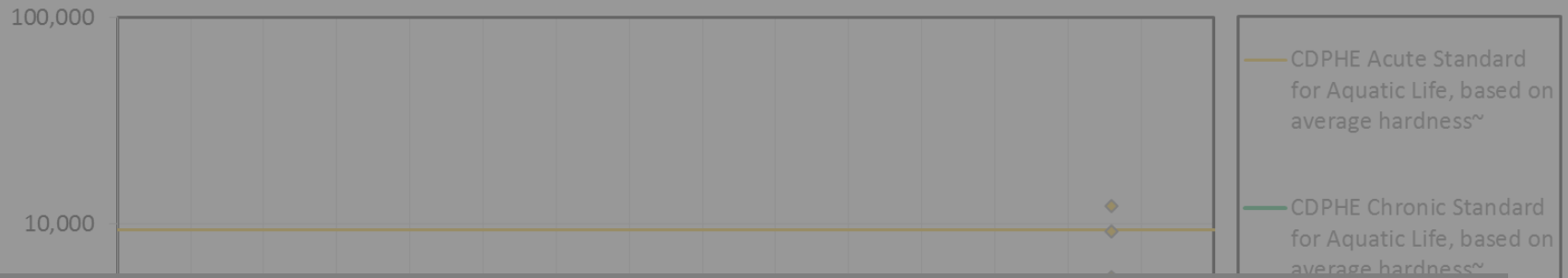
Mountain Studies Institute, Colorado Parks and Wildlife, Southern Ute Indian Tribe, and other organizations will continue to monitor aquatic life to assess overall river health.

# So...Should I be concerned?

We know that metal contamination from natural sources and mine-related sources have negatively impacted water quality of the Animas River for over a hundred years.

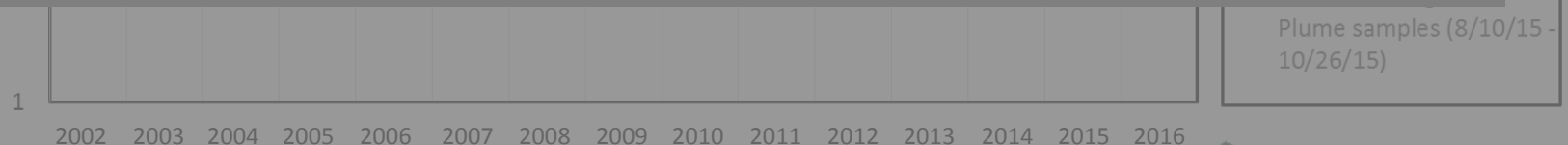
Some of the water quality data from spring of 2016 have been encouraging – we have no indication of any threat to human health from Animas River water, but the data do raise some concerns for aquatic life in the Durango stretch of the Animas River. These concerns can only be addressed by continued monitoring of water quality and aquatic life.

## Aluminum, total - Animas River at Durango, CO



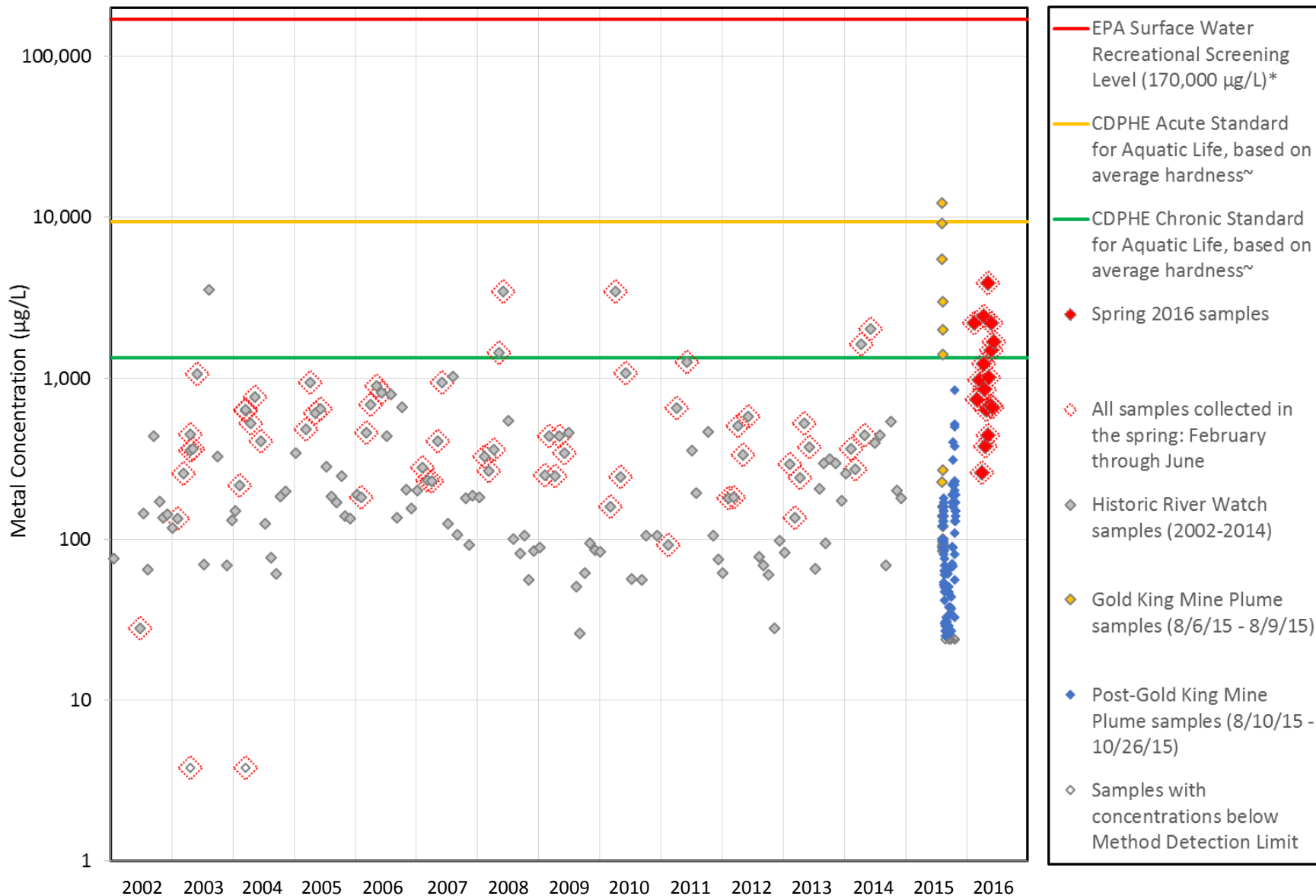
If you are interested in diving deeper into the data on your own, visit The Mountain Studies Institute online at: [www.MountainStudies.org](http://www.MountainStudies.org)

*...or check out the following pages for graphs of more metals.*



~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34. Standards vary with water hardness.  
Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO

## Total Aluminum, Animas River at Durango, CO: 2002-2016



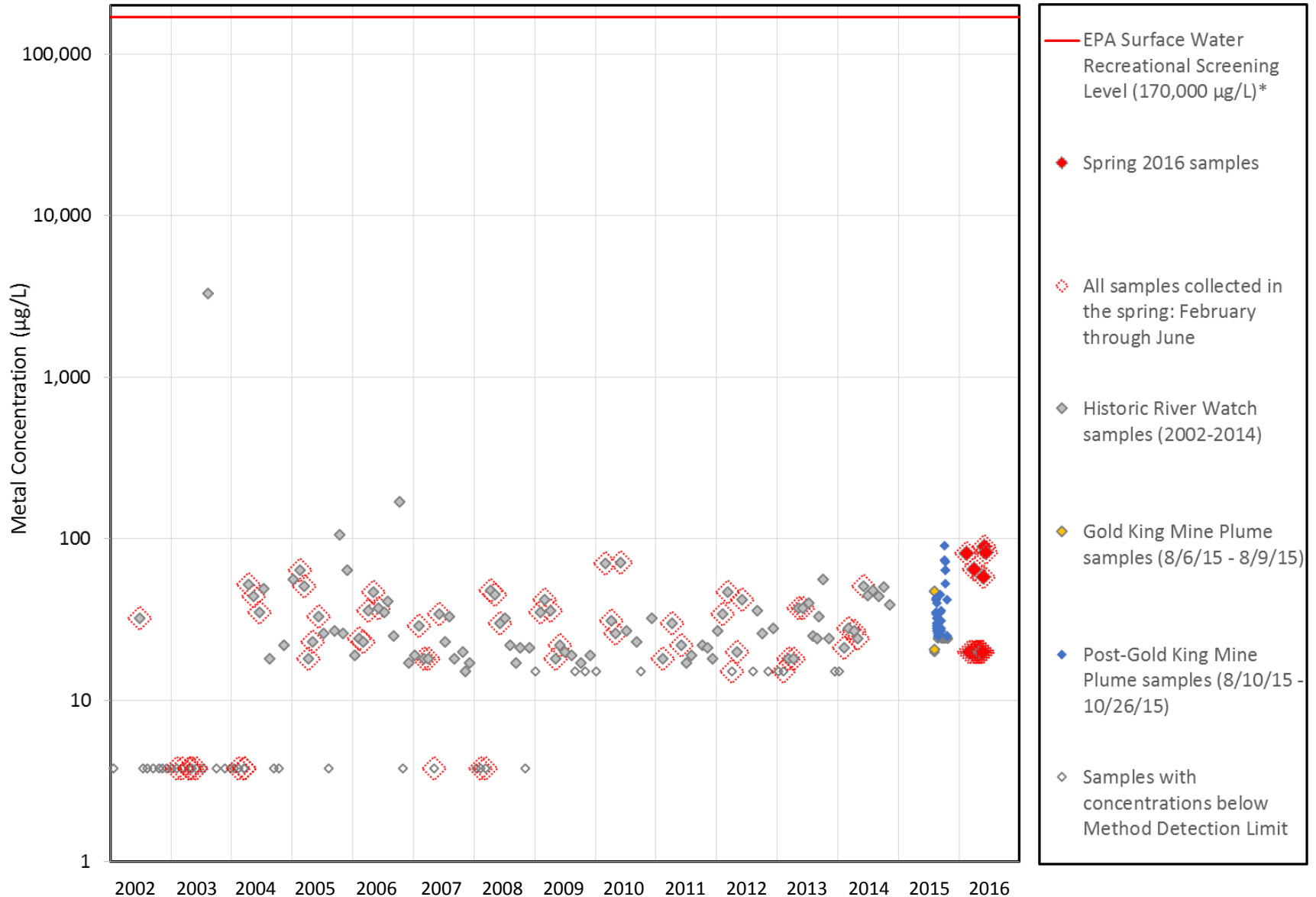
\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34. Standards vary with water hardness and are plotted here using an average water hardness of the Animas River at this location, 208 mg/L.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO



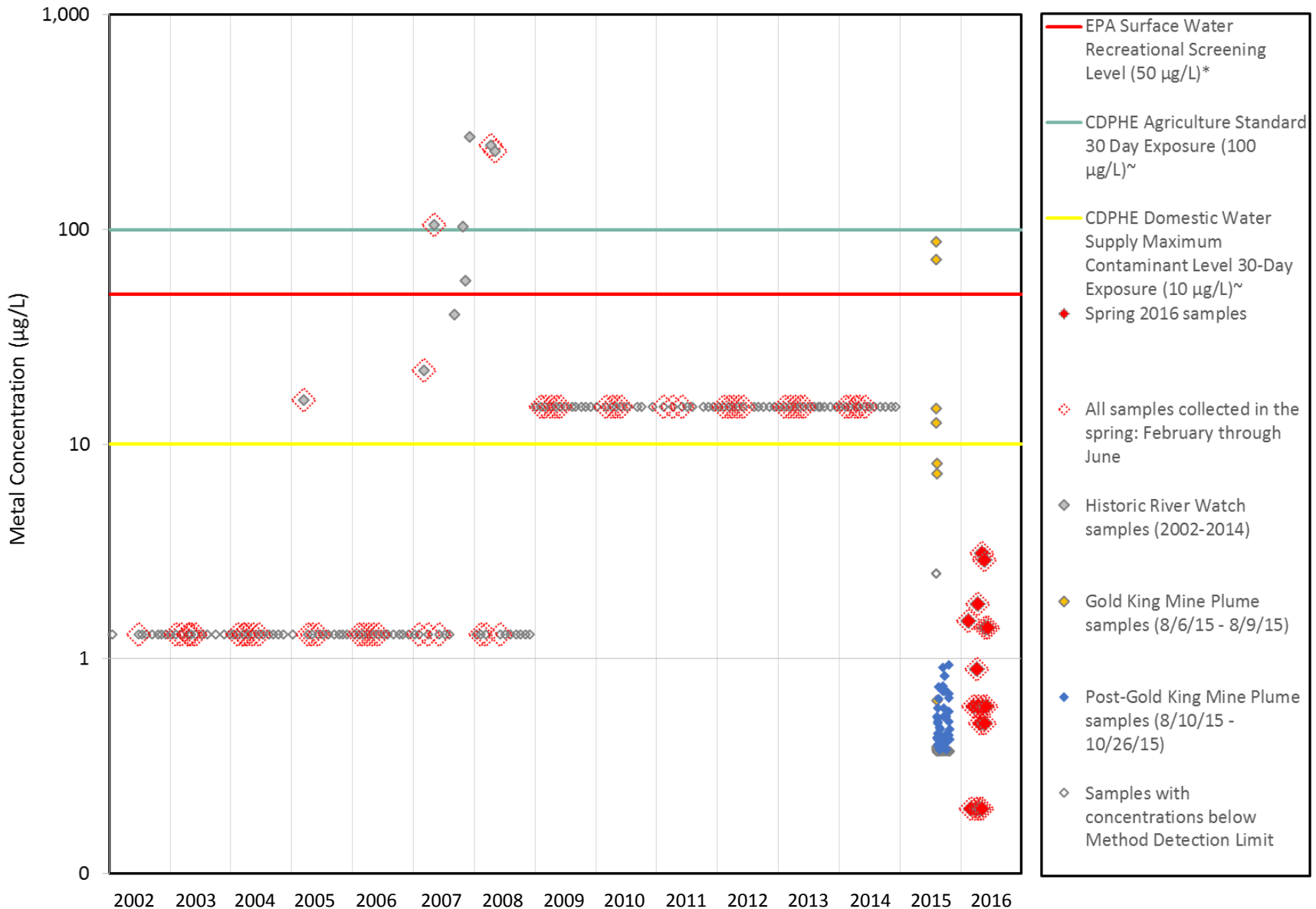
## Dissolved Aluminum, Animas River at Durango, CO: 2002-2016



\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.

## Total Arsenic, Animas River at Durango, CO: 2002-2016

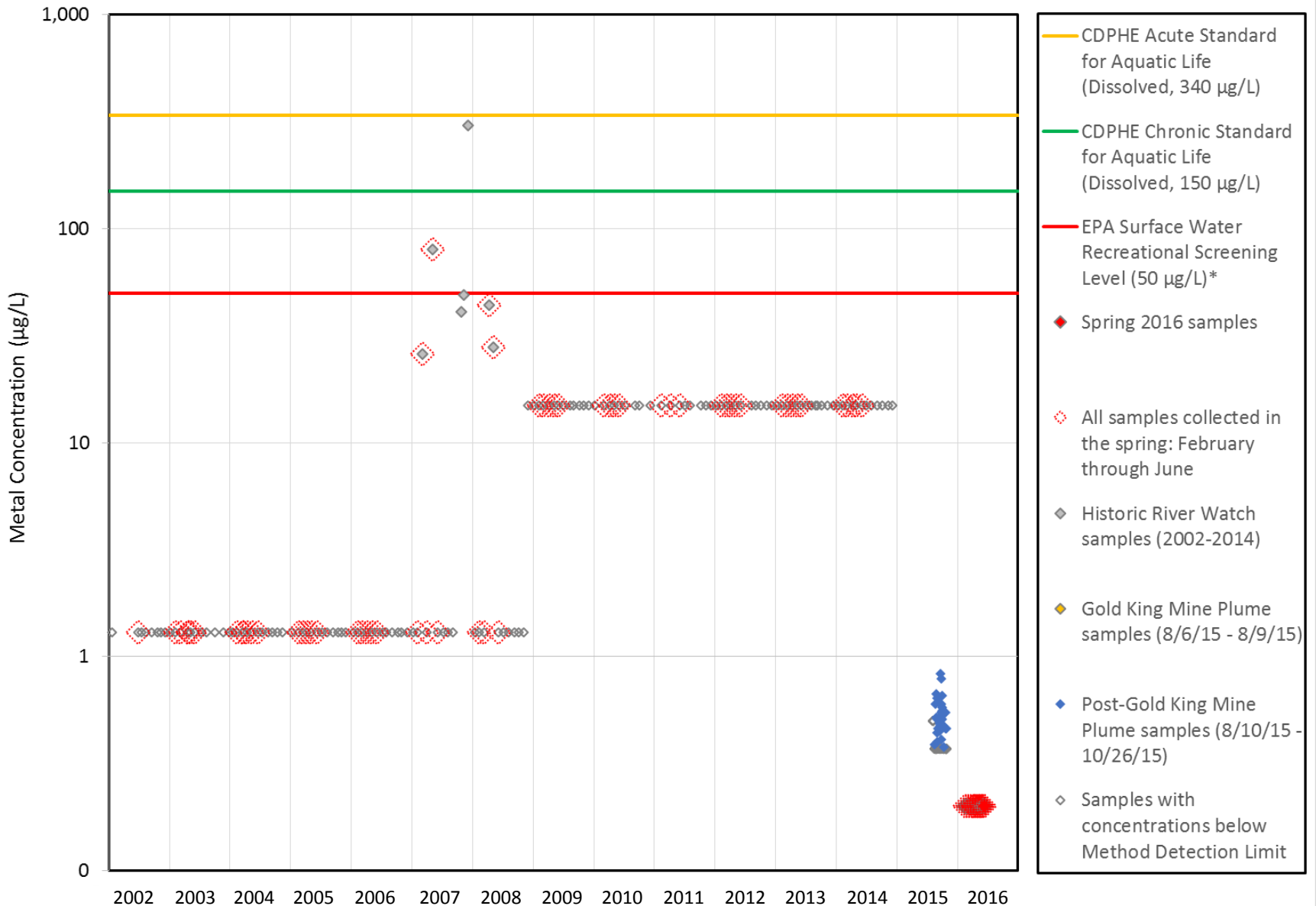


\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years

~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.

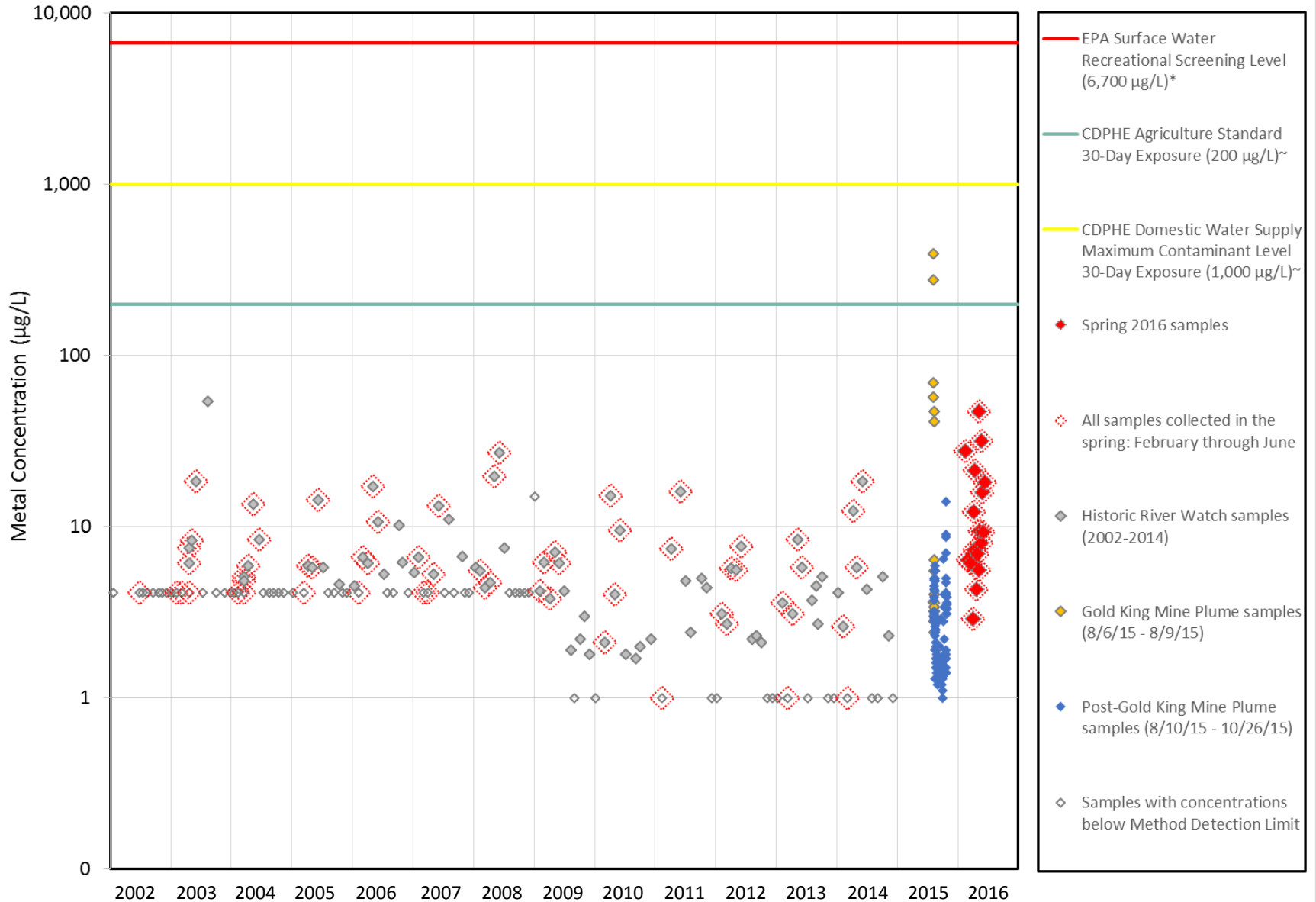
Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO

## Dissolved Arsenic, Animas River at Durango, CO: 2002-2016



\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of filtered water per day, from the Animas, orally, for 64 days each year for a total of 30 years.  
 Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.

## Total Copper, Animas River at Durango, CO: 2002-2016

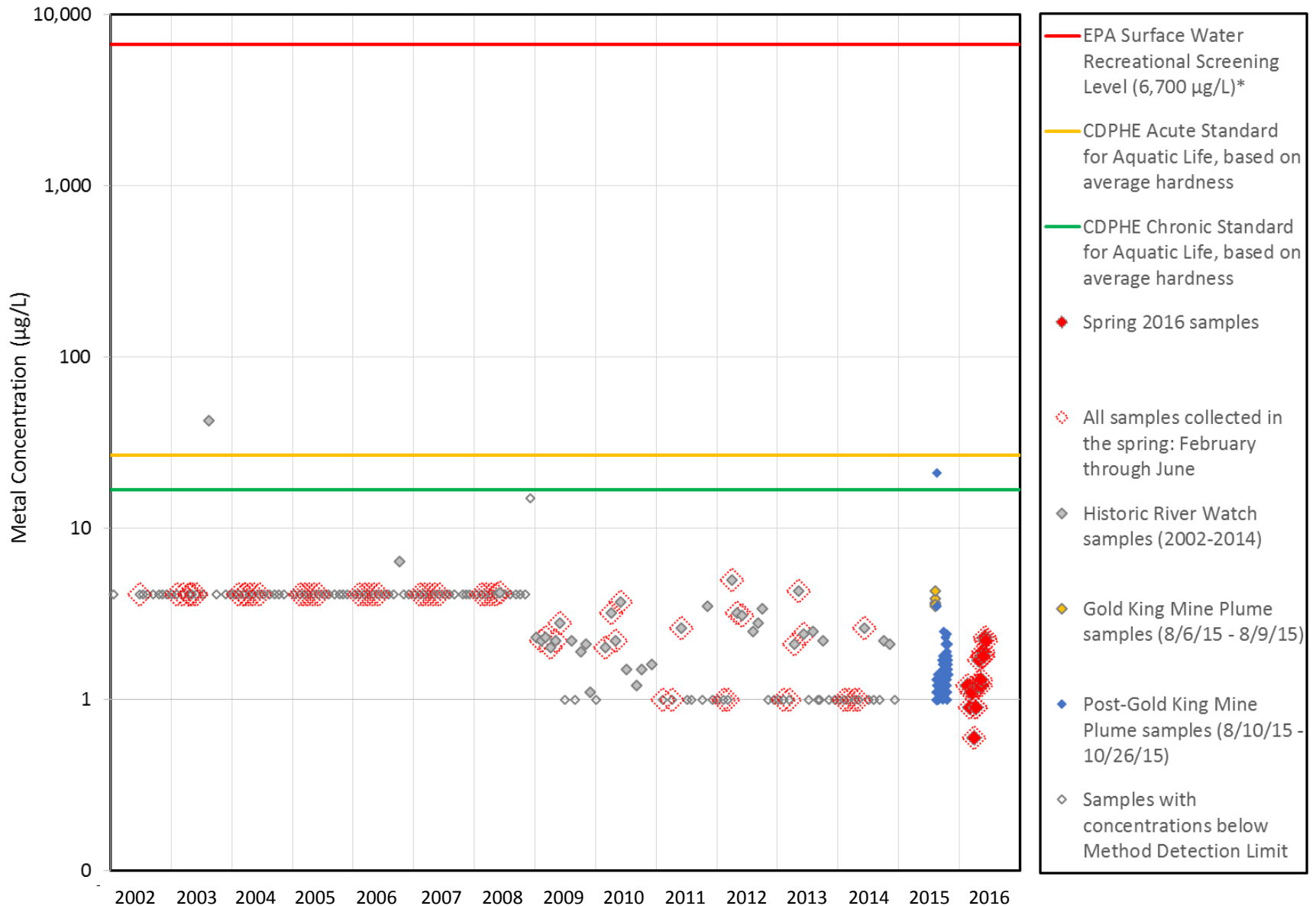


\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.

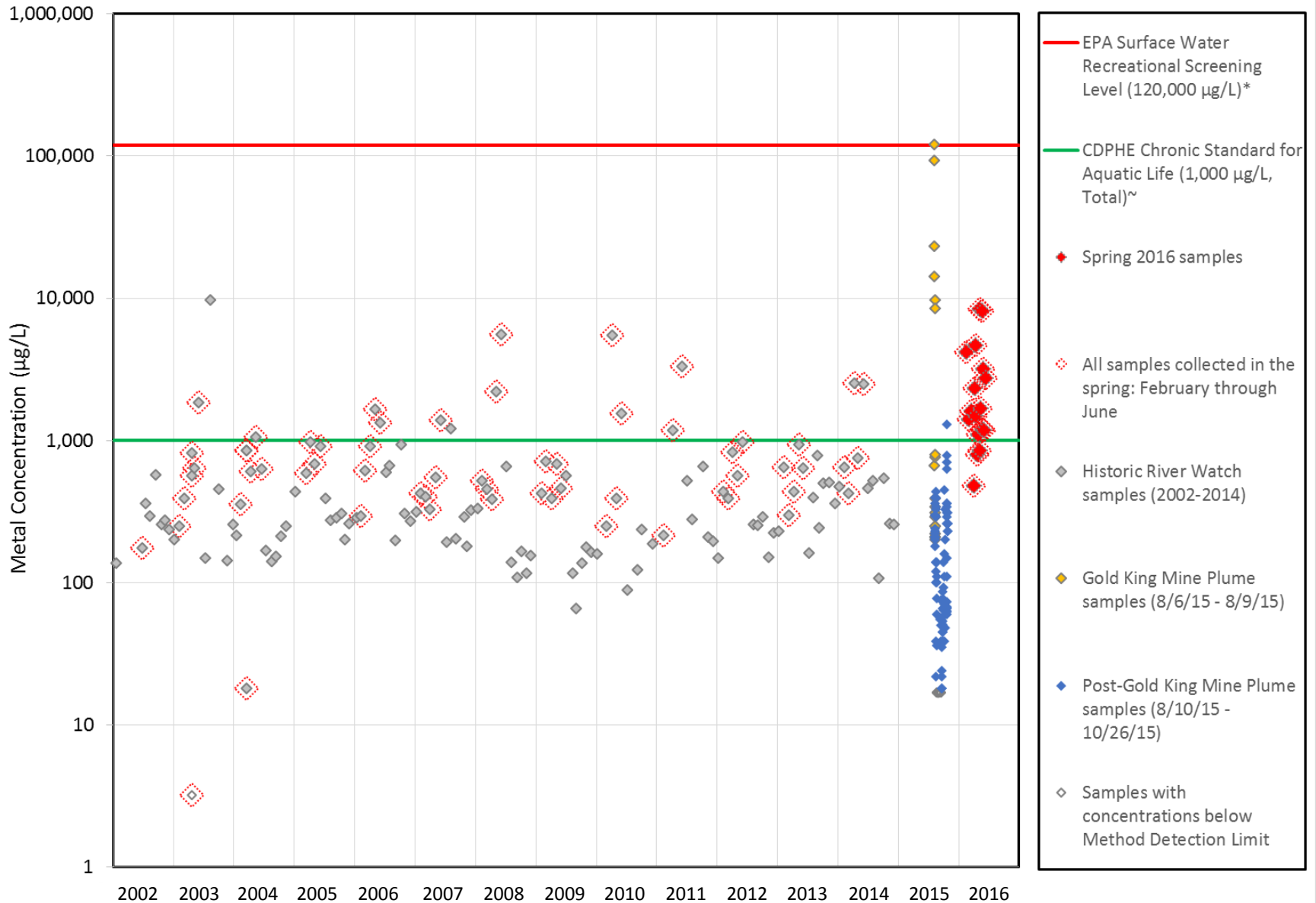
Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO

## Dissolved Copper, Animas River at Durango, CO: 2002-2016



\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.  
 ~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34. Standards vary with water hardness and are plotted here using an average water hardness of the Animas River at this location, 208 mg/L.  
 Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO

## Total Iron, Animas River at Durango, CO: 2002-2016

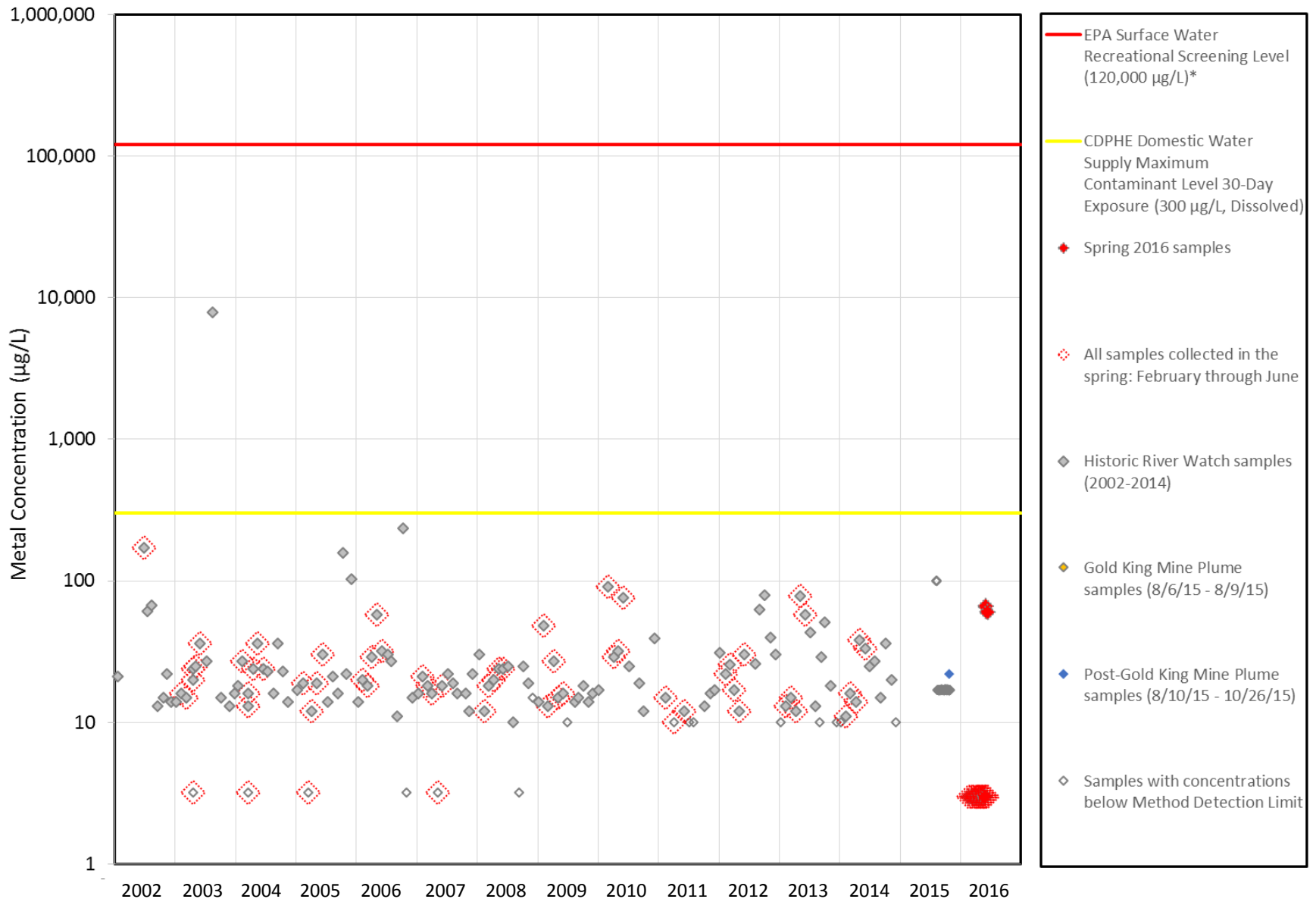


\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of filtered water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO

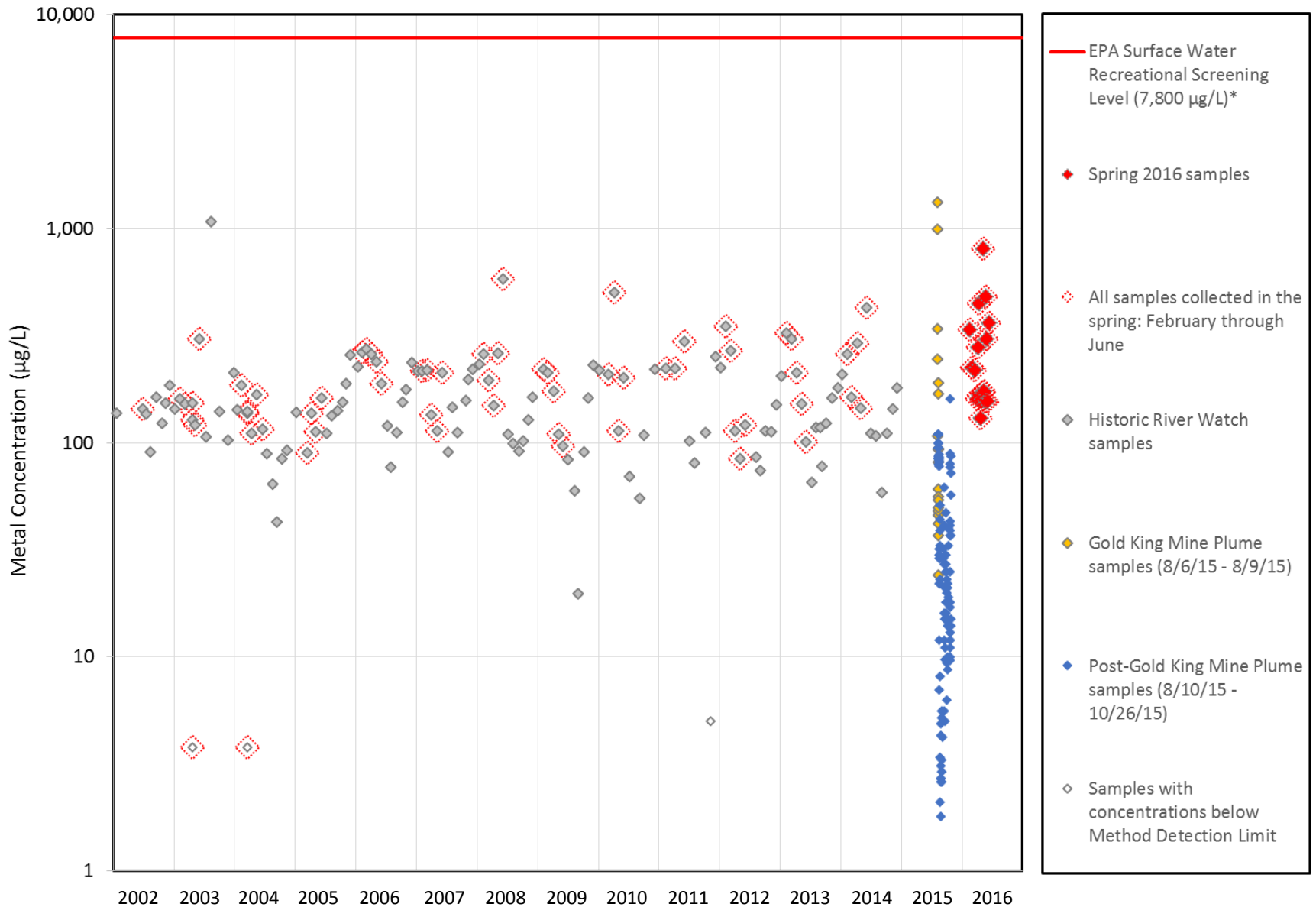
## Dissolved Iron, Animas River at Durango, CO: 2002-2016



\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of filtered water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.

## Total Manganese, Animas River at Durango, CO: 2002-2016

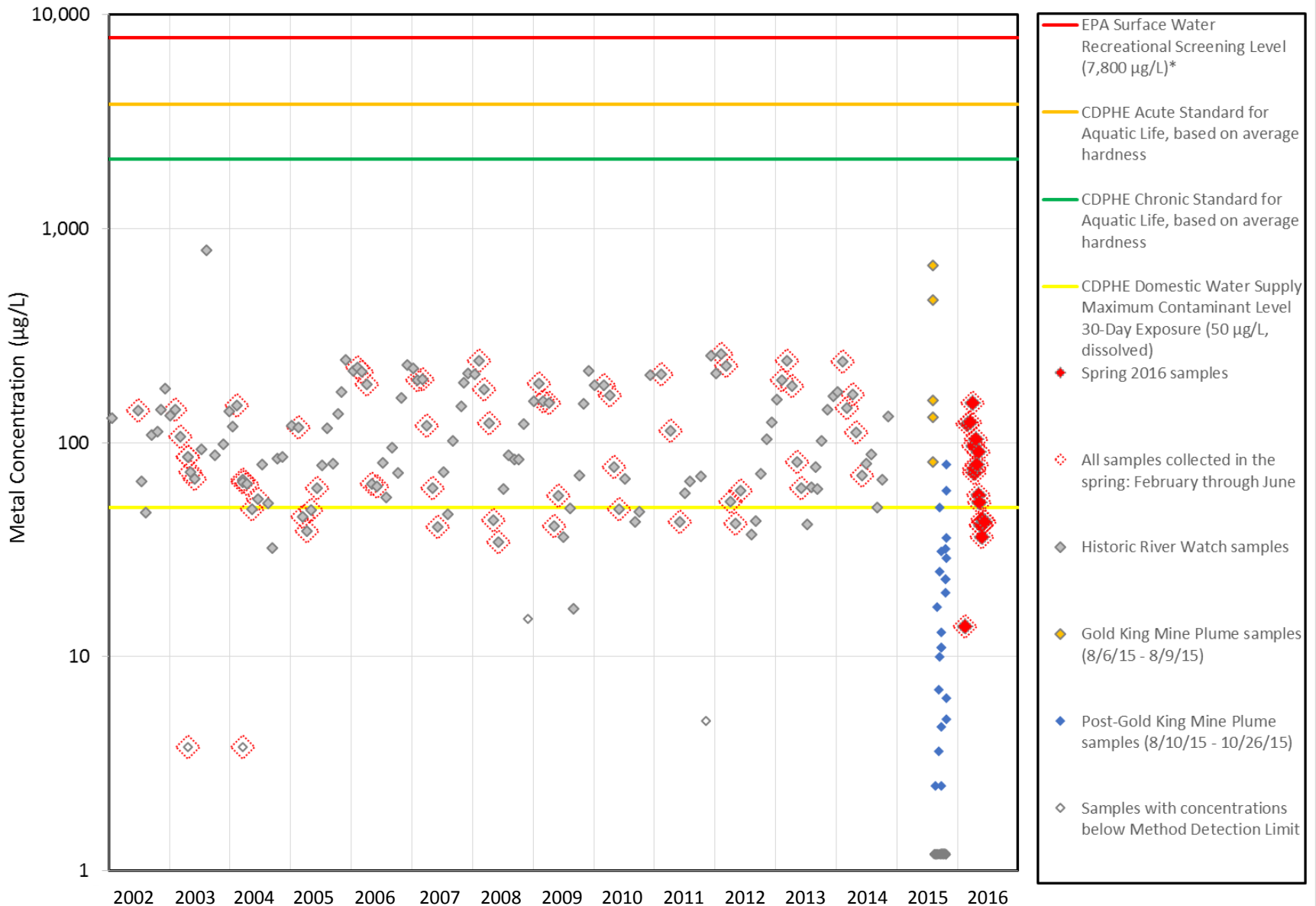


\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of filtered water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO



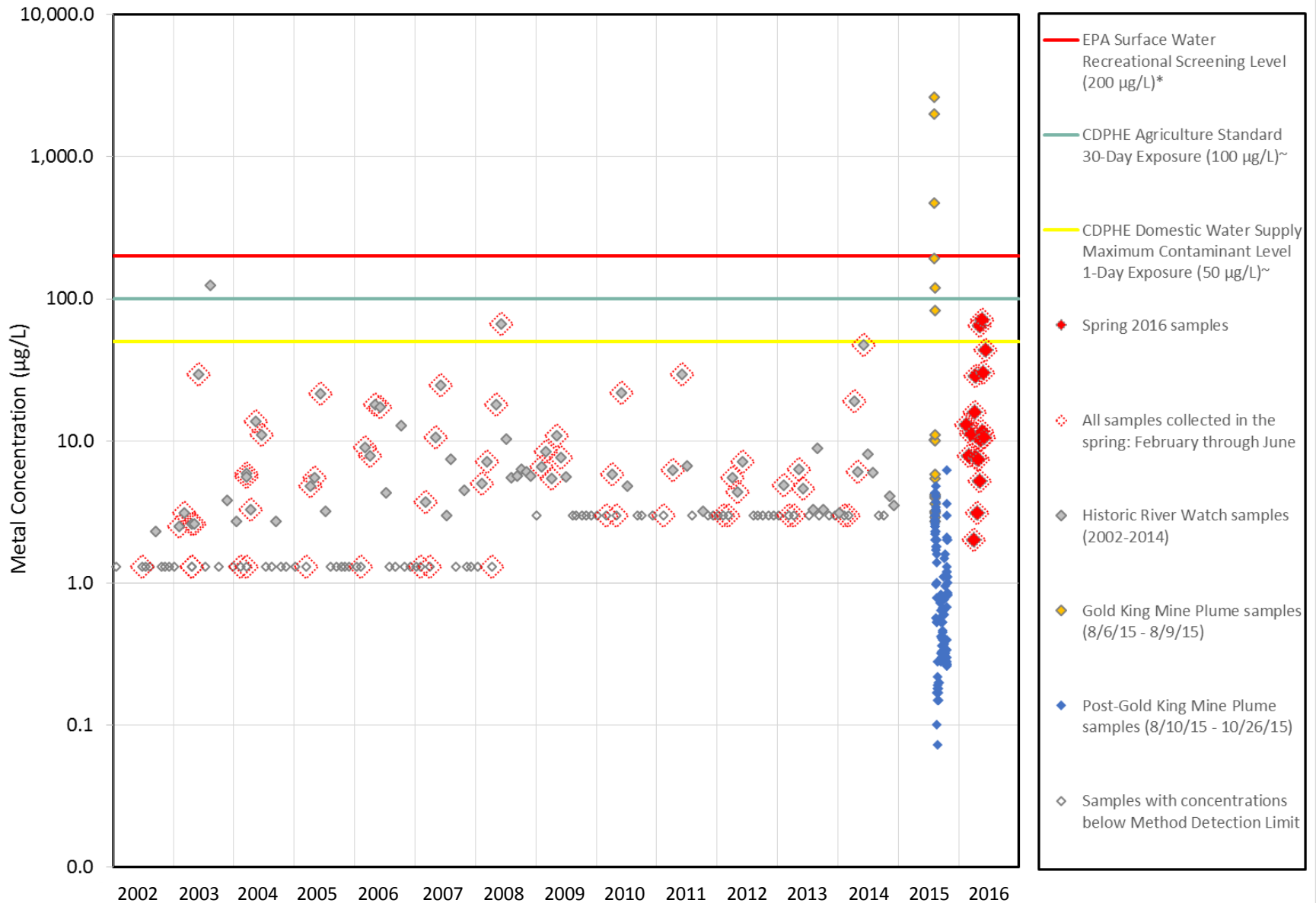
## Dissolved Manganese, Animas River at Durango, CO: 2002-2016



- EPA Surface Water Recreational Screening Level (7,800 µg/L)\*
- CDPHE Acute Standard for Aquatic Life, based on average hardness
- CDPHE Chronic Standard for Aquatic Life, based on average hardness
- CDPHE Domestic Water Supply Maximum Contaminant Level 30-Day Exposure (50 µg/L, dissolved)
- ◆ Spring 2016 samples
- ◇ All samples collected in the spring: February through June
- ◆ Historic River Watch samples
- ◆ Gold King Mine Plume samples (8/6/15 - 8/9/15)
- ◆ Post-Gold King Mine Plume samples (8/10/15 - 10/26/15)
- ◇ Samples with concentrations below Method Detection Limit

\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of filtered water per day, from the Animas, orally, for 64 days each year for a total of 30 years.  
 Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.

## Total Lead, Animas River at Durango, CO: 2002-2016

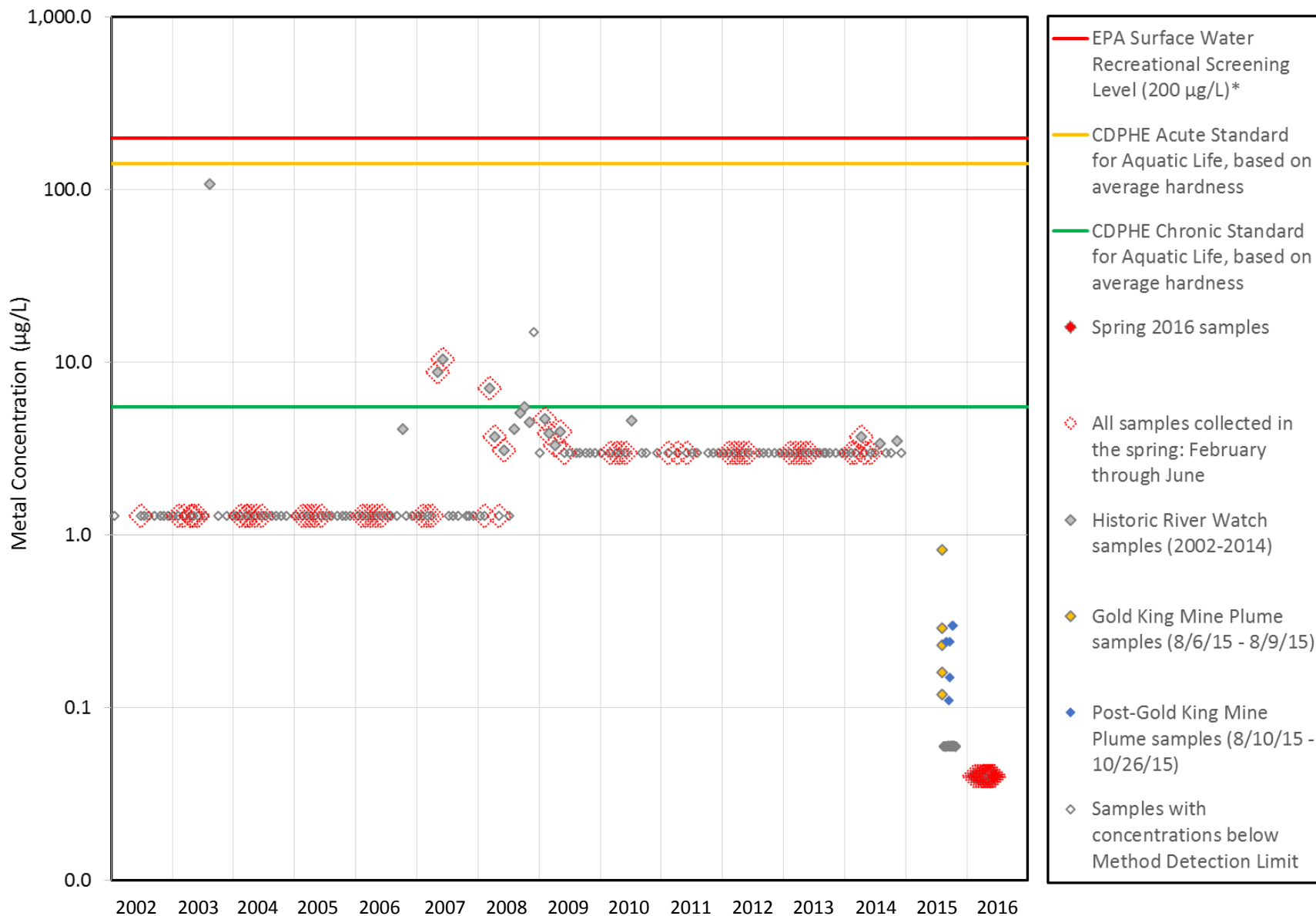


\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.

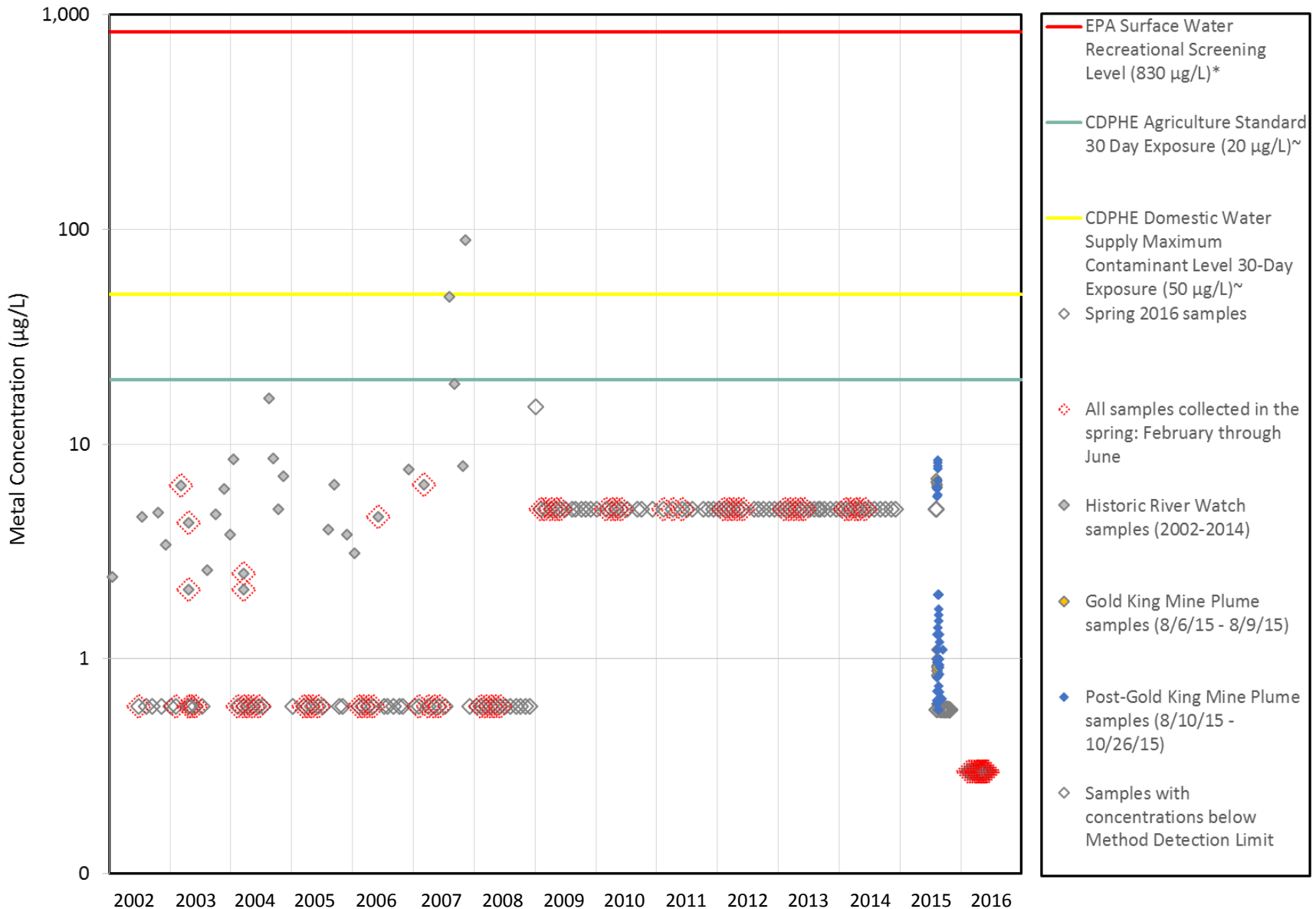
Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.

## Dissolved Lead, Animas River at Durango, CO: 2002-2016



\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of filtered water per day, from the Animas, orally, for 64 days each year for a total of 30 years.  
 Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.

## Total Selenium, Animas River at Durango, CO: 2002-2016

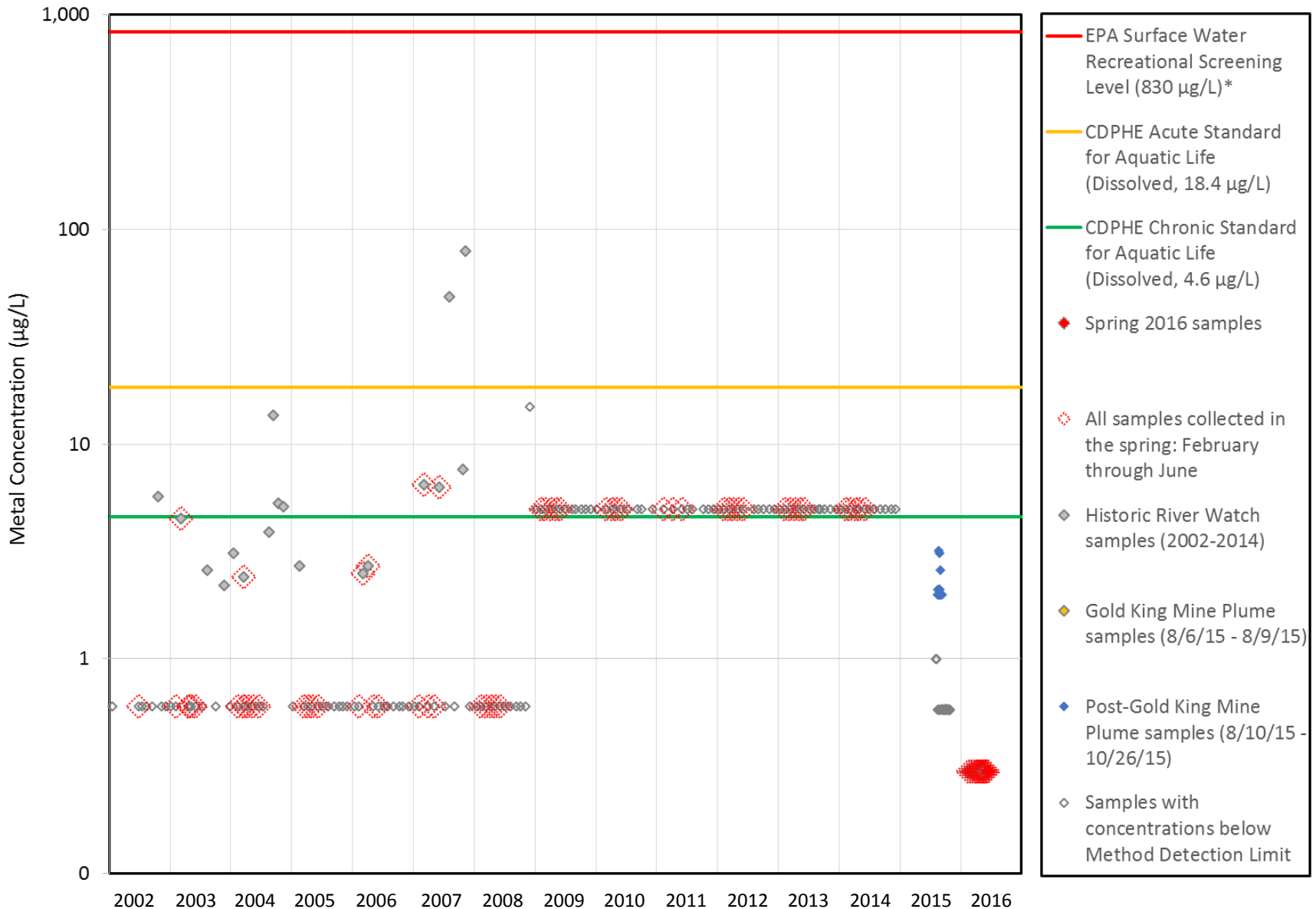


\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of filtered water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.

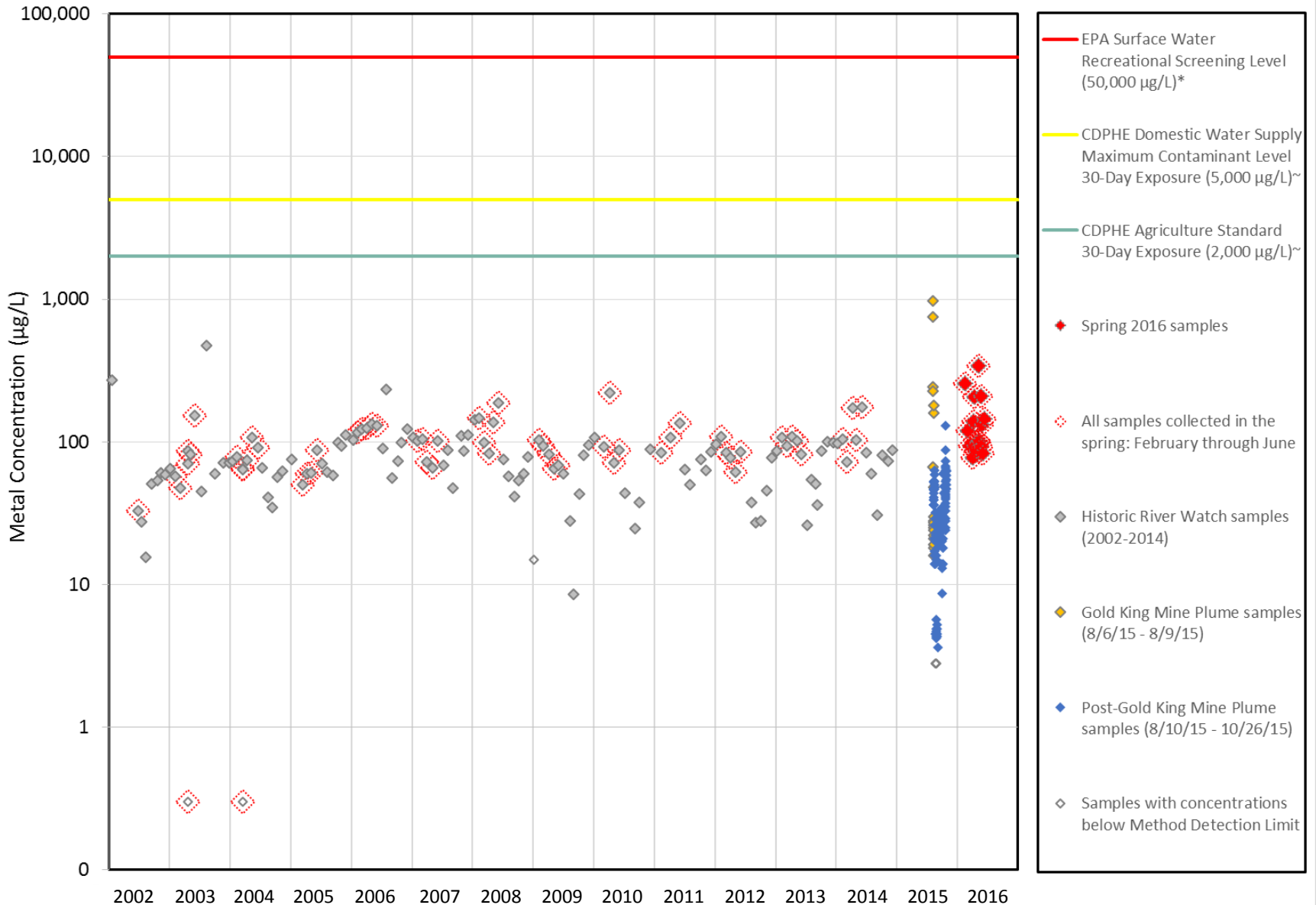
Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.

## Dissolved Selenium, Animas River at Durango, CO: 2002-2016



\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of filtered water per day, from the Animas, orally, for 64 days each year for a total of 30 years.  
 Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.

## Total Zinc, Animas River at Durango, CO: 2002-2016

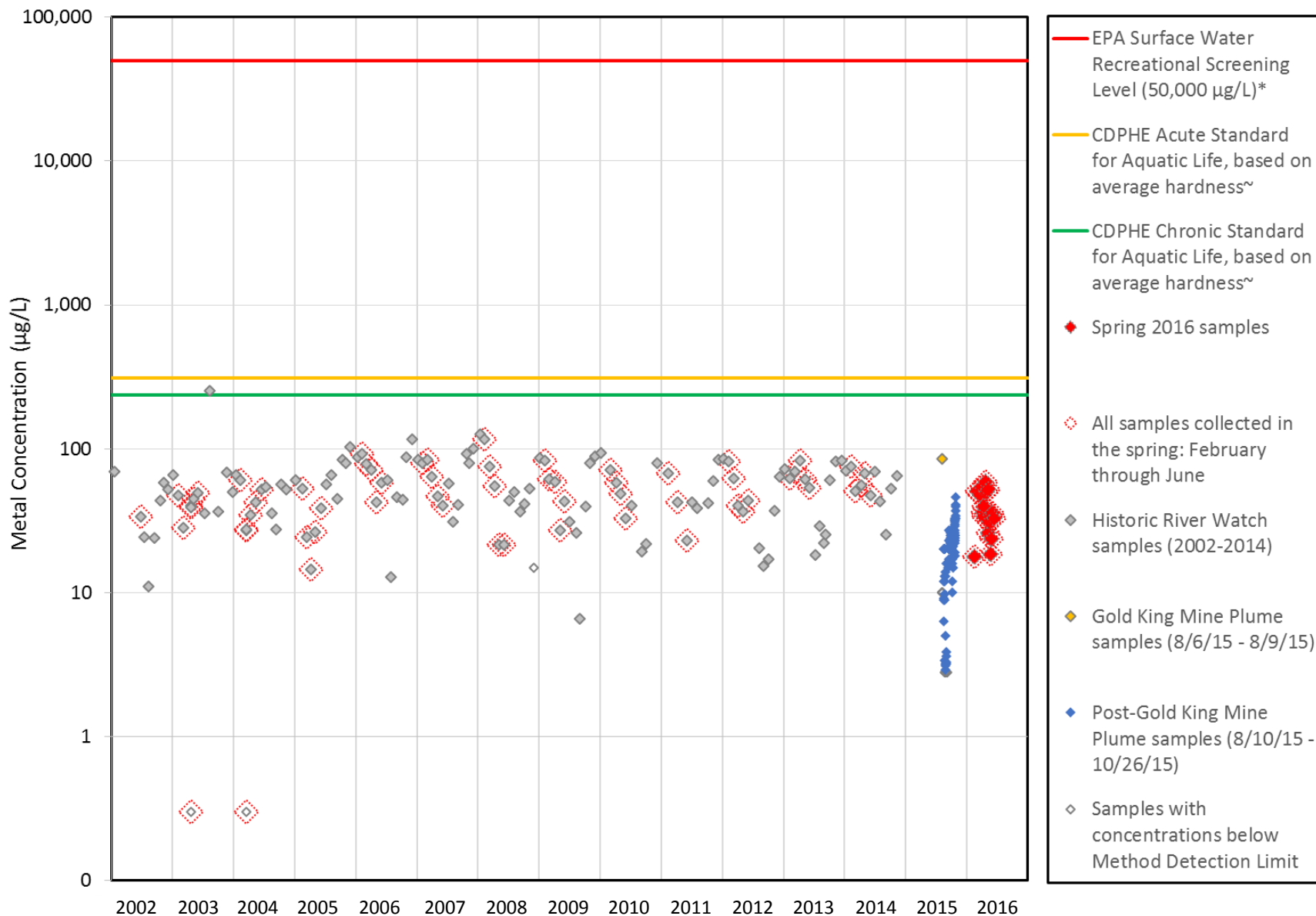


\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

\*\*Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO

## Dissolved Zinc, Animas River at Durango, CO: 2002-2016



\* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, or any, for 64 days each year for a total of 30 years.

~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34. Standards vary with water hardness and are plotted here using an average water hardness of the Animas River at this location, 208 mg/L.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO