2015 SOURCE REDUCTION EFFECTIVENESS ANALYSIS

A review of the Milwaukee Metropolitan Sewerage District's progress with source reduction programs and pollutant trends—in influent, effluent and biosolids products, since the approval of the District's Pre-Treatment Program in 1983

Milwaukee Metropolitan
Sewerage District

MMSD
PARTNERS FOR A CLEANER ENVIRONMENT

13-080

Milwaukee Metropolitan Sewerage District
2015 Source Reduction Effectiveness Analysis

Table of Contents

Summary

Appendix

Introduction

The mission of the Milwaukee Metropolitan Sewerage District (District) is to cost effectively protect public health and the environment and to prevent pollution and enhance the quality of area waterways. While the removal of pollutants through the wastewater reclamation process is a self-evident responsibility, the District also has a responsibility, by law, to prevent the discharge of pollutants into the treatment system, that is, to minimize pollutants before they ever get into the reclamation facility. The District's largest and oldest source reduction program is the Pretreatment Program, which is required by federal and state law. The primary focus of this program is wastewater produced during manufacturing. Other source reduction programs are the Household Hazardous Waste Program, Medicine Collection Program and the Mercury Reduction Program.

This annual report provides the data summarizing the performance of each of these programs in 2015, along with some historical perspective.

Pretreatment Program

According to federal and state law, any public water reclamation facility that has both (1) a design capacity of 5 million gallons per day (MGD) or more and (2) receives wastewater from industrial users must have a pretreatment program. The peak design flows of the District's two water reclamation facilities are 330 MGD for Jones Island WRF and 300 MGD for South Shore WRF. Many industrial facilities use the District's sewerage system. Thus, the District must have a pretreatment program.

The Wisconsin Department of Natural Resources (DNR) is the approval authority for the District's Pretreatment Program. The DNR initially approved the pretreatment program in December 1983. The discharge permit that the DNR issues to the District includes Pretreatment Program requirements.

The Pretreatment Program enforces a combination of federal standards and local limits at significant industrial users. The District's local requirements are in Chapter 11, MMSD Rules.

Generally, a facility is a significant industrial user if a facility meets one or more of the following criteria:

1. A facility is in a category covered by federal standards;

2. The facility discharges more than 25,000 gallons per day of process wastewater, unless the District makes a finding of no potential to adversely affect the sewerage system; or

3. The facility has violated a general prohibition or local limit.

During 2015, the Pretreatment Program involved 11,076 District staff hours and a budget of $932,049. This budget provides funding to meet the requirements of our WPDES permit and Chapter 11 Rules. This includes inspections, monitoring and other required oversight activities. At the end of 2015, the Pretreatment Program included 127 significant industrial users.

The following table shows the historical person hours, budgets, and number of significant industrial users, for each of the past 20 years.

Year	Person - Hours	Budget (Expenditure Year $)	Number of Significant Industrial Users
1996	29,500	1,982,000	149
1997	29,500	1,975,000	162
1998	27,400	1,900,000	162
1999	25,000	1,800,000	161
2000	22,400	1,650,000	143
2001	21,900	1,550,000	155
2002	18,780	1,238,000	150
2003	16,959	1,328,000	150
2004	15,300	1,162,705	143
2005	15,163	1,094,749	139
2006	15,118	1,074,178	137
2007	15,118	1,074,178	141
2008	13,878	992,028	139
2009	14,000	1,040,139	130
2010	13,200	1,055,200	127
2011	13,020	1,052,276	124
2012	12,960	970,698	126
2013	10,277	977,197	125
2014	10,620	940,205	126
2015	**11,076**	**932,049**	**127**

Household Hazardous Waste Program

Households use many products for which disposal in household garbage or pouring down a drain is inappropriate. Yet, these waste materials need to go somewhere. To fulfill the need for a safe and convenient disposal option, the District began supporting household hazardous waste collection efforts by the City of Milwaukee in the early 1990s. District support initially involved providing volunteers to handle wastes at annual one-day or two-day collection events at temporary collection sites. The District's program officially began in 1996, when the District established a permanent collection site in Menomonee Falls in conjunction with several days of collection at temporary sites. The District established a second permanent collection site in Franklin in 1998 and a third permanent site in Milwaukee in 2006. In addition to the permanent sites, the program collects waste at various temporary sites throughout the year. The program collected 832,357 pounds of material from 12,933 participants in 2015.

The following table shows the amount of material collected per year, since the beginning of the program.

Year	Household Hazardous Waste Collected (lbs)
1996	285,000
1997	411,194
1998	381,438
1999	725,072
2000	835,258
2001	971,923
2002	938,725
2003	1,103,000
2004	1,107,058
2005	1,016,601
2006	1,326,732
2007	1,306,475
2008	998,133
2009	1,095,425
2010	996,811
2011	895,383
2012	977,176
2013	866,609
2014	909,919
2015	**832,357**

Mercury Reduction Program

The District has been a leader in mercury reduction for decades. Work has included mercury collection programs, a thermostat recycling initiative, mercury in schools clean sweeps, a work shop for health care providers, and the requirement for dental offices to implement BMPs (best management practices) and separators for amalgam.

Mercury pollution is a significant problem in Wisconsin. Currently, a fish consumption advisory applies to every lake and stream in the state. Aquatic environments create methyl mercury, a developmental and degenerative neurotoxin. Methyl mercury bio-accumulates. Therefore, ambient concentrations must be very low to prevent adverse effects. The water quality criterion for mercury is 1.3 ng/L (parts per trillion). Mercury may be released unintentionally, such as during the burning of coal, or intentionally, by the improper disposal of mercury-containing materials. By promoting alternatives and proper disposal, the District has reduced the risk that the mercury will be released to the environment.

The first major product of the program was the nationally recognized Mercury Source Sector Assessment for the Greater Milwaukee Area (September 1997). That document provided estimates of all mercury uses and releases from all possible sectors.

Outreach began in 1998, when the District promoted separate mercury collection programs to health care facilities, dental facilities, schools, and industrial facilities. From 1998 to 1999, the District provided a WDNR developed curriculum package to local schools. In 1999, the District promoted the use of non-mercury thermostats and the recycling of mercury thermostats by providing educational materials to thermostat wholesalers, large home improvement retailers, and heating, ventilating, and air conditioning installers and service providers, within the District. Since 2000, activities have included an exhibit at the State Fair, presentations to audiences of all sizes, and Pollution Prevention Week advertisements in local newspapers. Using grant funding, thousands of pounds of mercury-containing materials were collected, from sources within the District, and recycled.

The latest step in the mercury reduction program has been to require dental offices to implement BMPs and separators for amalgam. In the past, this sector was the dominant source of mercury discharges to sewerage systems. Dental amalgam is 50% mercury. Dental work may cause amalgam to be discharged via vacuum systems that remove waste amalgam from the mouth. In some cases, dental offices may also discharge unused or excess amalgam, instead of segregating it for recycling. BMPs include separators that will remove 95% or more of the amalgam from vacuum system discharges. These separators are commercially available now and their effectiveness is ensured by criteria established by the International Standards Organization. Instead of a traditional permit and sampling regulatory program, the District has taken a different approach with dental offices, which involves general rules, extensive outreach, self-certification, and occasional inspections. In 2004, the District adopted rules which require both best management practices and separators for amalgam.

To ensure that households have a convenient and safe option to get rid of mercury containing materials, the District's household hazardous waste program continues to collect these items.

Medicine Collection Program

Recent research has found a variety of pharmaceuticals in aquatic environments. To reduce the risk that unused medicines will be released to the environment, the District is working in conjunction with Police Departments throughout the County, in a program under DEA that gives residents a way to properly dispose of unused medication all year long. Medicine collections in Milwaukee County have accumulated 5,850 pounds in 2015, and more than 28 tons of unused medications since 2006.

Participating Police Departments	
Bayside	Oak Creek
Brown Deer	River Hills
Cudahy	Shorewood
Fox Point	South Milwaukee
Franklin	St. Francis
Greendale	Wauwatosa
Greenfield	West Allis
Milwaukee (Districts 2-7)	West Milwaukee
Whitefish Bay	

Source Reduction Results

The District has historically scrutinized several pollutants in its influent, effluent, and biosolids products. This is because: (1) they are relatively toxic in the environment, (2) they are present in significant quantities in process and domestic wastewater discharges, and (3) federal or state biosolids limits apply to these pollutants.

Laboratory results for those pollutants show that the District's source reduction programs have been effective. Such pollutant reductions are the result of the District's source reduction programs, along with the movement of heavy manufacturing to other areas, the implementation of more efficient manufacturing processes, and the increasing amount of self-policing by industrial facilities.

Historical trends for concentrations for several pollutants in the District's influent, effluent, and biosolids products, are presented in charts included in the appendix of this report.

Future Directions

The Pretreatment Program will continue, as required by law. Continued vigilance of significant industrial users will always be necessary to ensure that existing pretreatment systems remain effective and address changes to discharges at existing facilities and discharges from new facilities. New products, processes and industries, as well as changes in regulations, require our Senior Industrial Waste Engineers to keep current with technology, regulatory requirements and the Milwaukee business climate. Generally, the program is mature; therefore, additional major reductions for routine pollutants are unlikely.

The Household Hazardous Waste Program continues to provide a valuable service. In 2016, the program includes three permanent collection sites and seven days of collection at temporary sites.

Regarding mercury, the local focus will continue to be on implementing the District requirements for amalgam at dentist offices. On a national level, the US EPA is currently proposing to cover all Dental Dischargers either as a Dental Industrial User or a Significant Industrial User, under the new Dental Category, 40 CFR Part 441. The proposed new rule would require amalgam separators that remove at least 99.0% of total mercury from amalgam process wastewater, along with other amalgam management practices and annual reporting. The District has provided comments that support having a rule, but not in its current form.

The medicine collection program will continue under DEA, with collections at police stations throughout Milwaukee County.

While the primary focus of past source reduction has been reducing pollutants through these programs, several newer initiatives will become more important at keeping pollution out of our system and ultimately our watersheds in the future. These include research associated with emerging contaminants such as pharmaceuticals, personal care products and man-made materials such as nanomaterials and microplastics; programs targeting nutrient reduction such as the TMDLs; and programs focusing on flow reduction such as Green Infrastructure projects and Private Property Inflow & Infiltration (PPI&I).

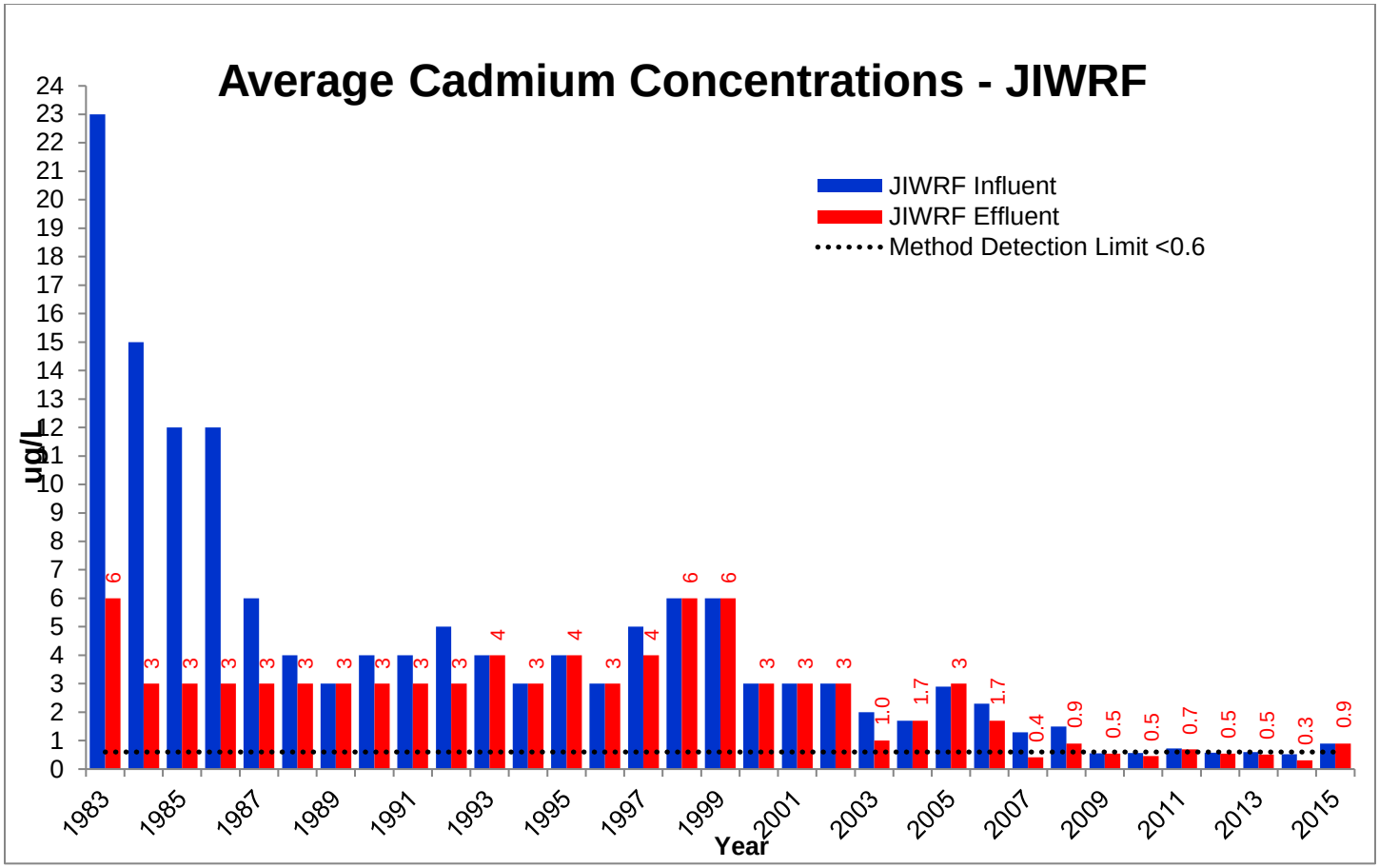
Going forward, the District intends to continue its industrial inspections and monitoring, screen new industries and other unregulated discharges, and maintain its knowledge base as it relates to emerging issues and changing regulatory requirements.

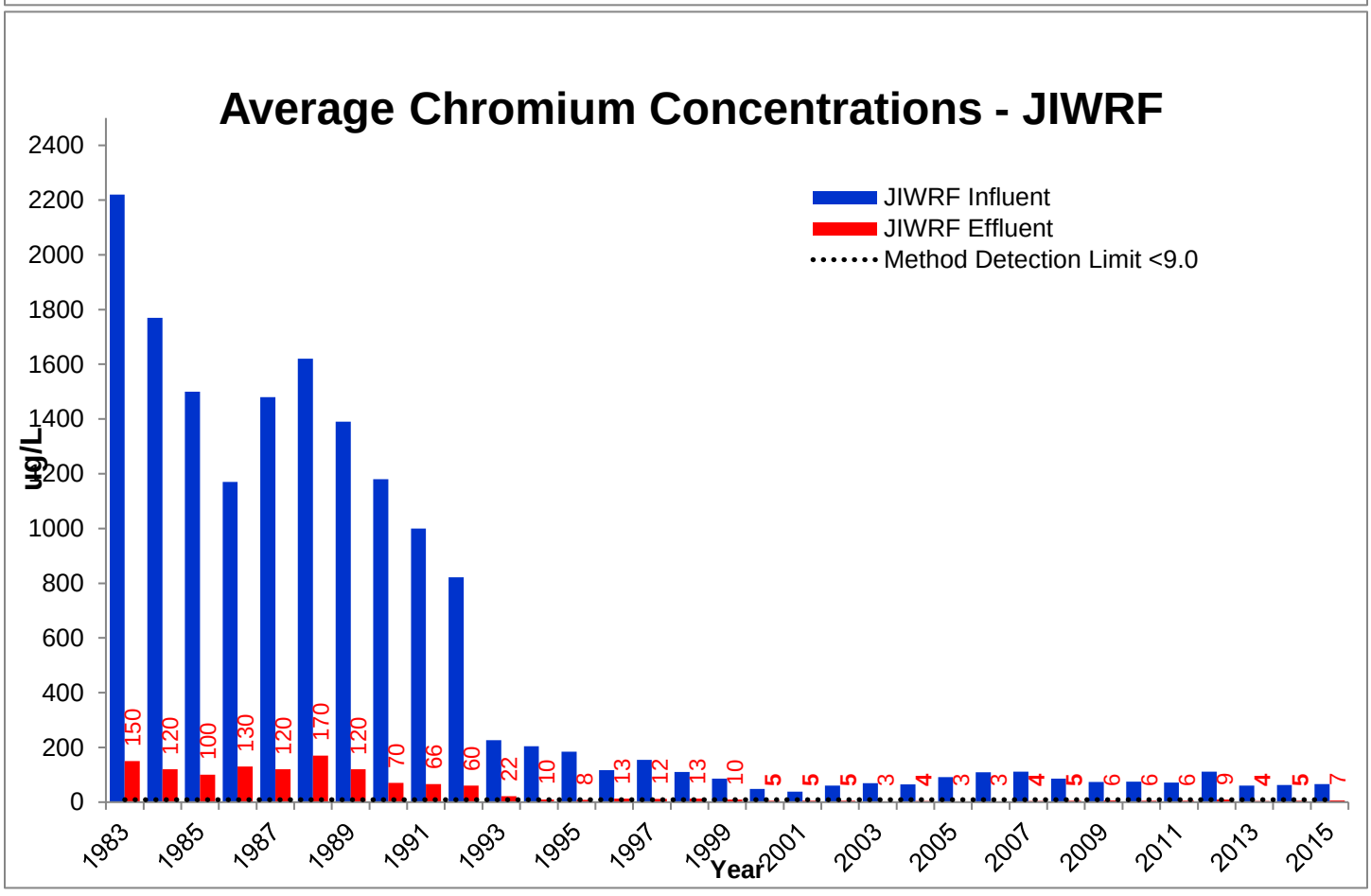
Historical Reductions in Pollutant Concentrations

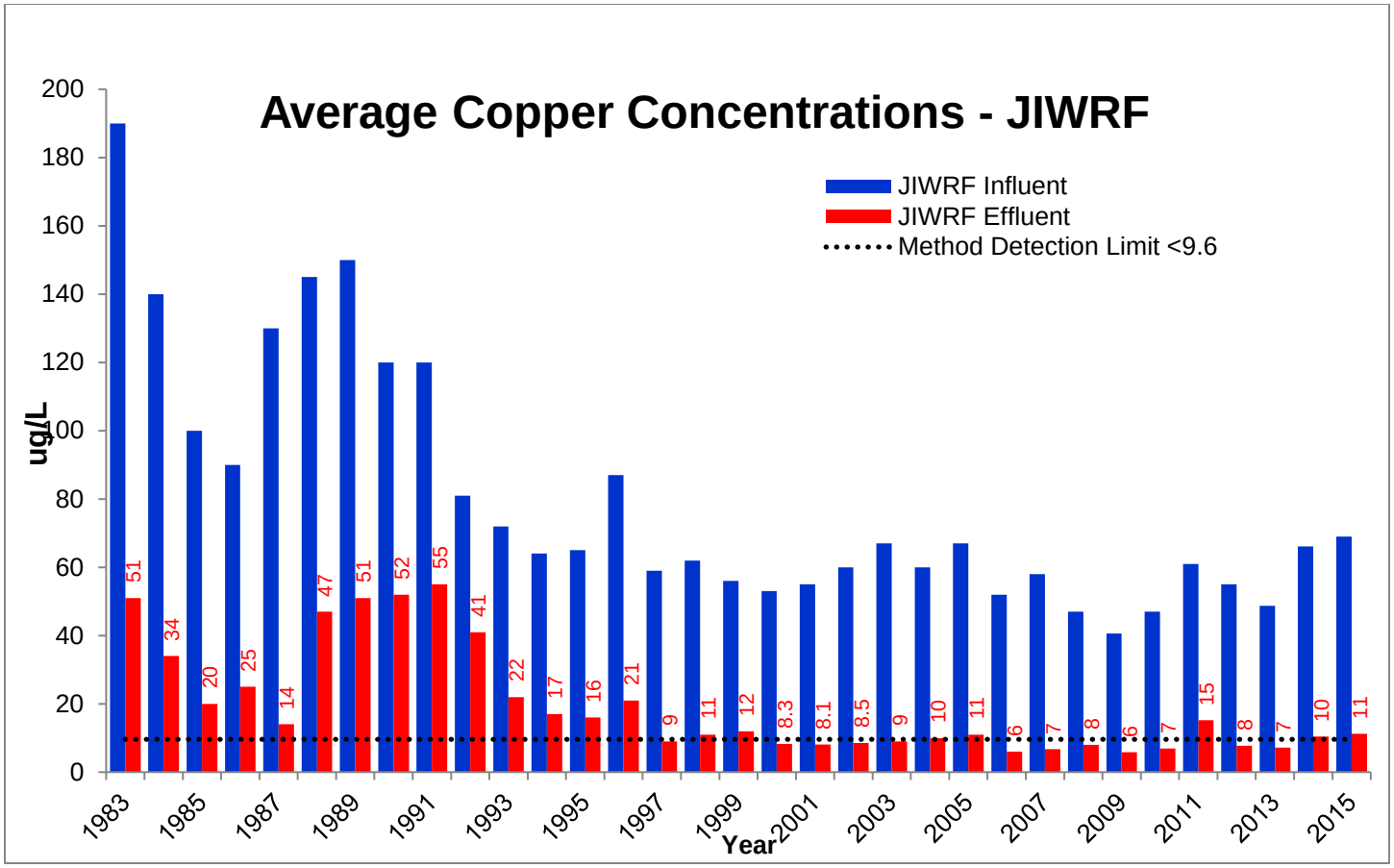
Source	Pollutant	Annual Average Concentrations		Percent Reduction
		1983	2015	(since 1983)
Jones Island Influent	Cadmium	23	1	96%
(ug/L)	Chromium	2220	66	97%
	Copper	190	69	64%
	Lead	130	28	78%
	Nickel	120	14	88%
	Zinc	540	146	73%
South Shore Influent	Cadmium	7	1	87%
(ug/L)	Chromium	1130	16	99%
	Copper	130	71	45%
	Lead	100	26	74%
	Nickel	200	9	96%
	Zinc	360	145	60%
Milorganite Biosolids	Cadmium	45	1	98%
(mg/kg)	Chromium	4170	234	94%
	Copper	390	254	35%
	Lead	410	44	89%
	Nickel	130	30	77%
	Zinc	1300	536	59%

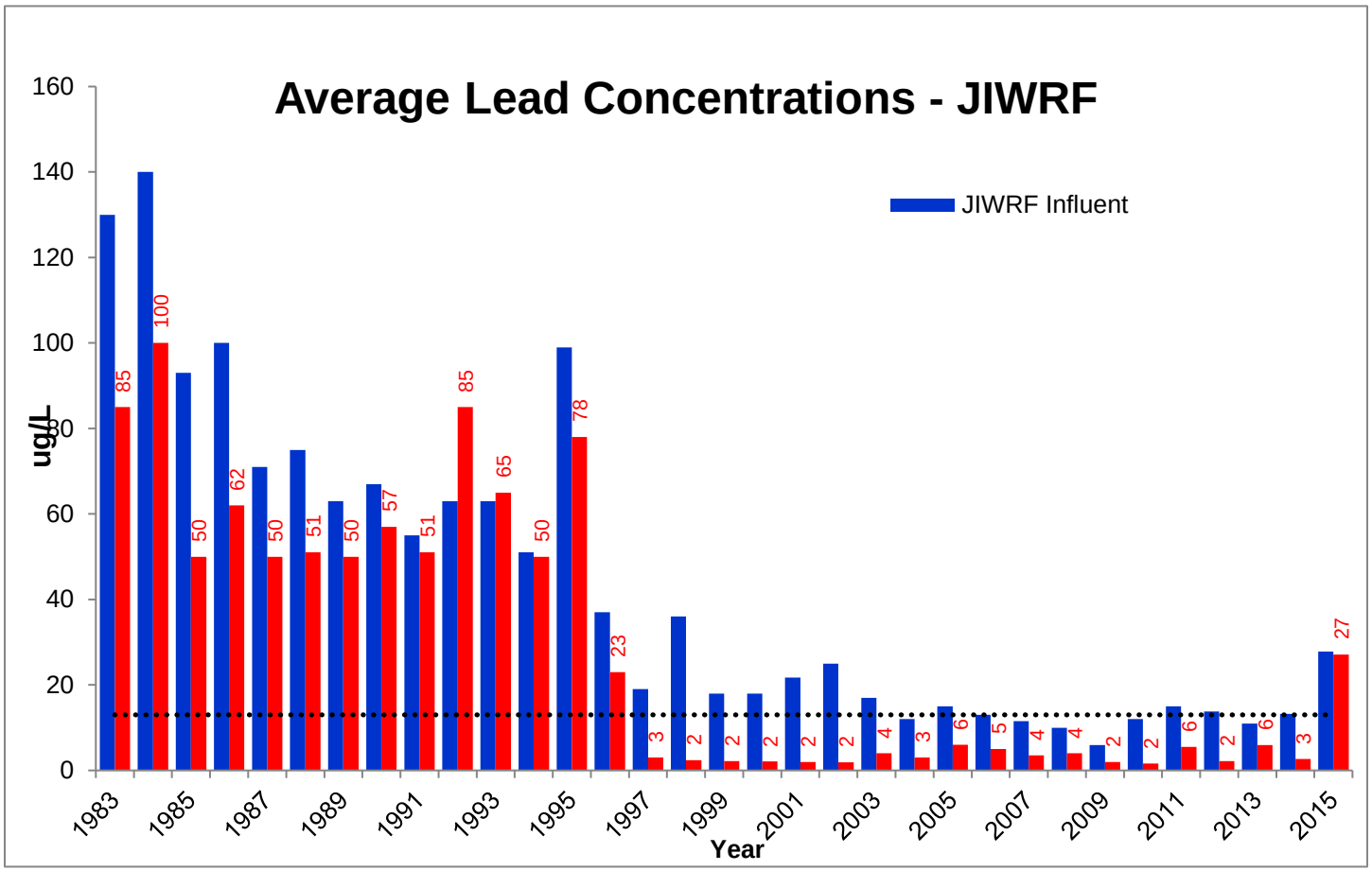
Pollutant Concentrations

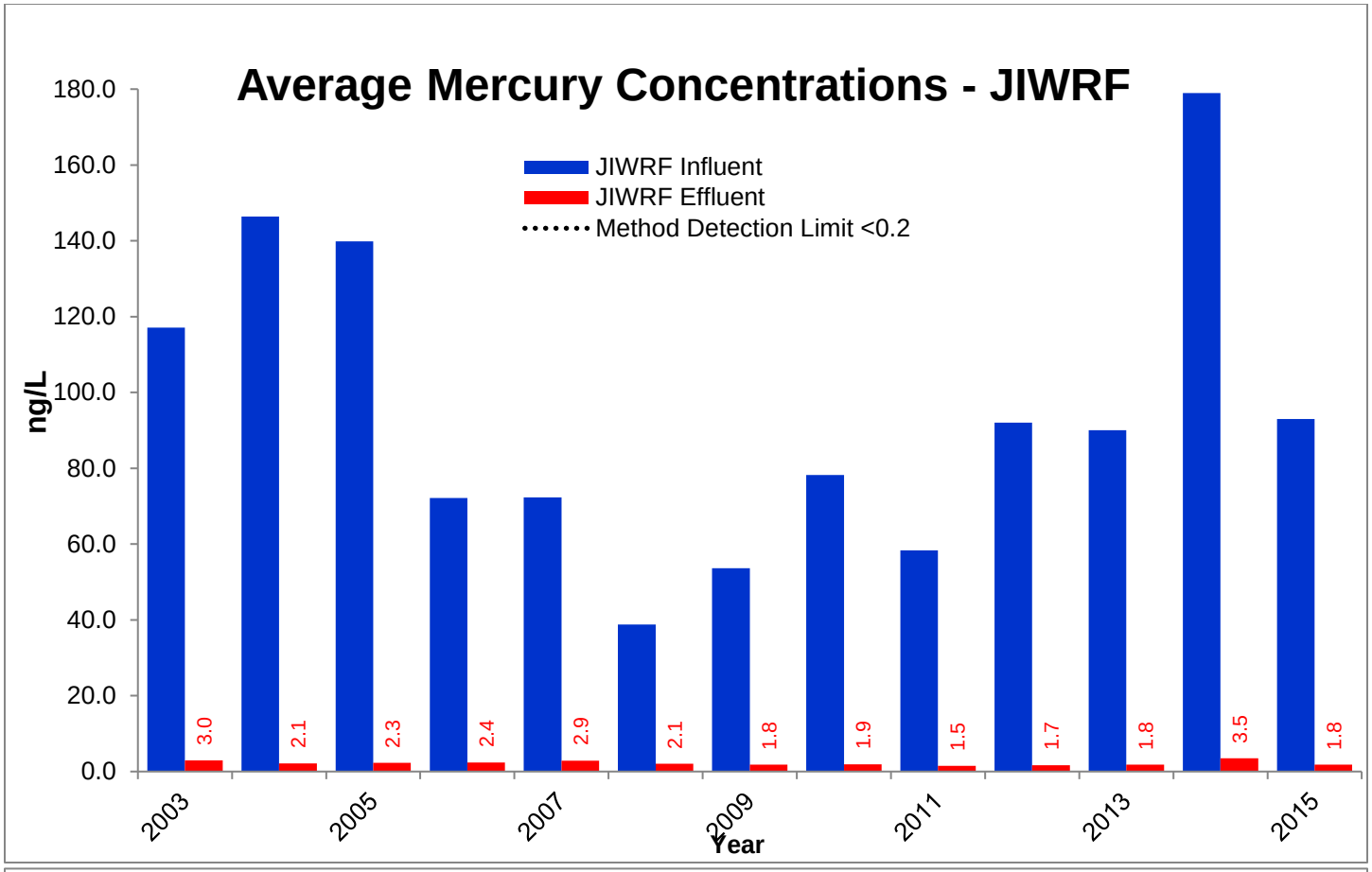
Jones Island Water Reclamation Facilities

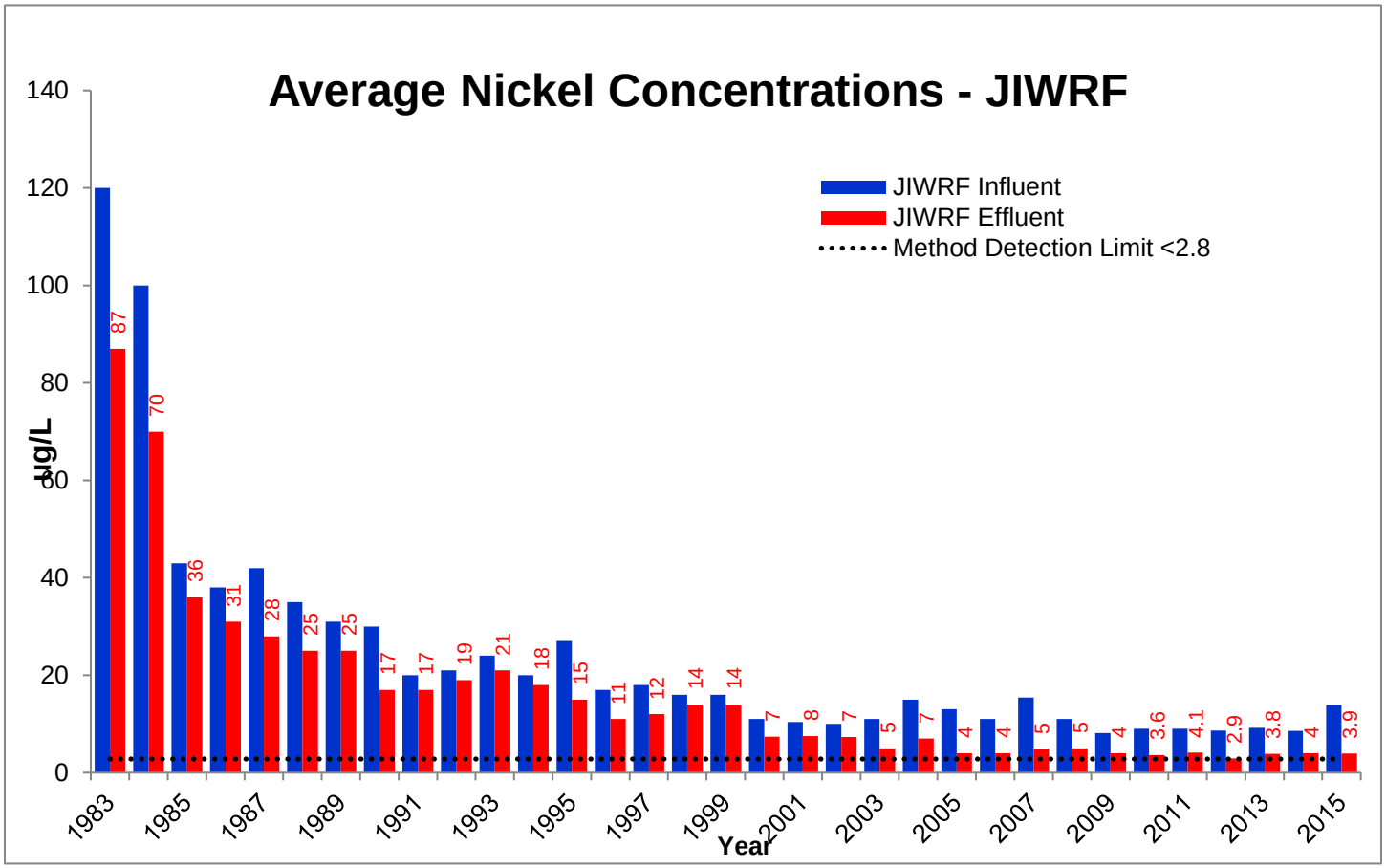

Average Cadmium Concentrations - JIWRF
JIWRF Influent
JIWRF Effluent
Method Detection Limit <0.6
ug/L
Year

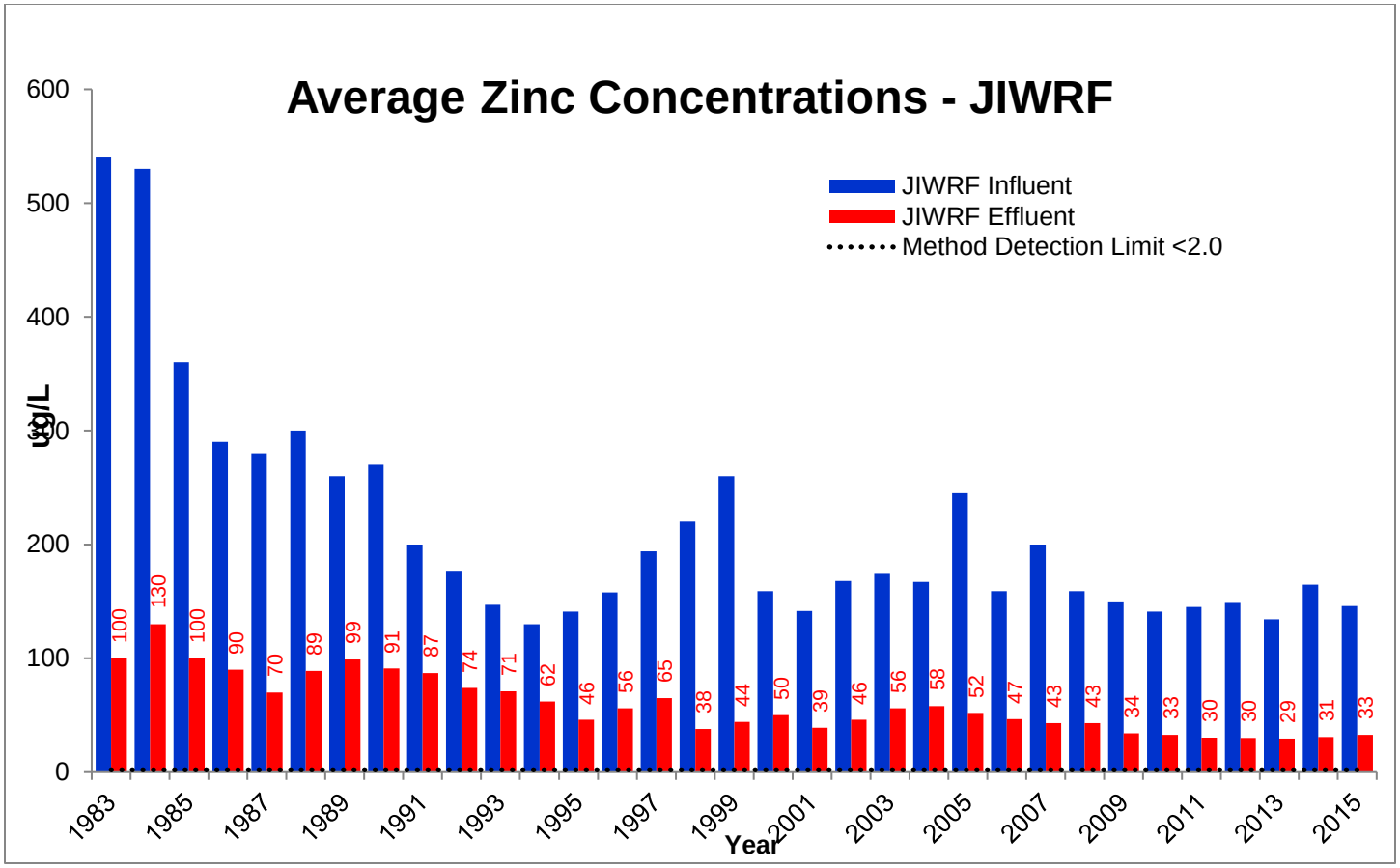

Average Chromium Concentrations - JIWRF
JIWRF Influent
JIWRF Effluent
Method Detection Limit <9.0
ug/L
Year


Average Copper Concentrations - JIWRF
JIWRF Influent
JIWRF Effluent
Method Detection Limit <9.6
ug/L
Year
200
180
160
140
120
100
80
60
40
20
0
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
51
34
20
25
14
47
51
52
55
41
22
17
16
21
9
11
12
8.3
8.1
8.5
9
10
11
6
7
8
6
7
15
8
7
10
11


Average Lead Concentrations - JIWRF
JIWRF Influent
ug/L
Year
160
140
120
100
80
60
40
20
0
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
85
100
50
62
50
51
50
57
51
85
65
50
78
23
3
2
2
2
2
2
4
3
6
5
4
4
2
2
6
2
6
3
27

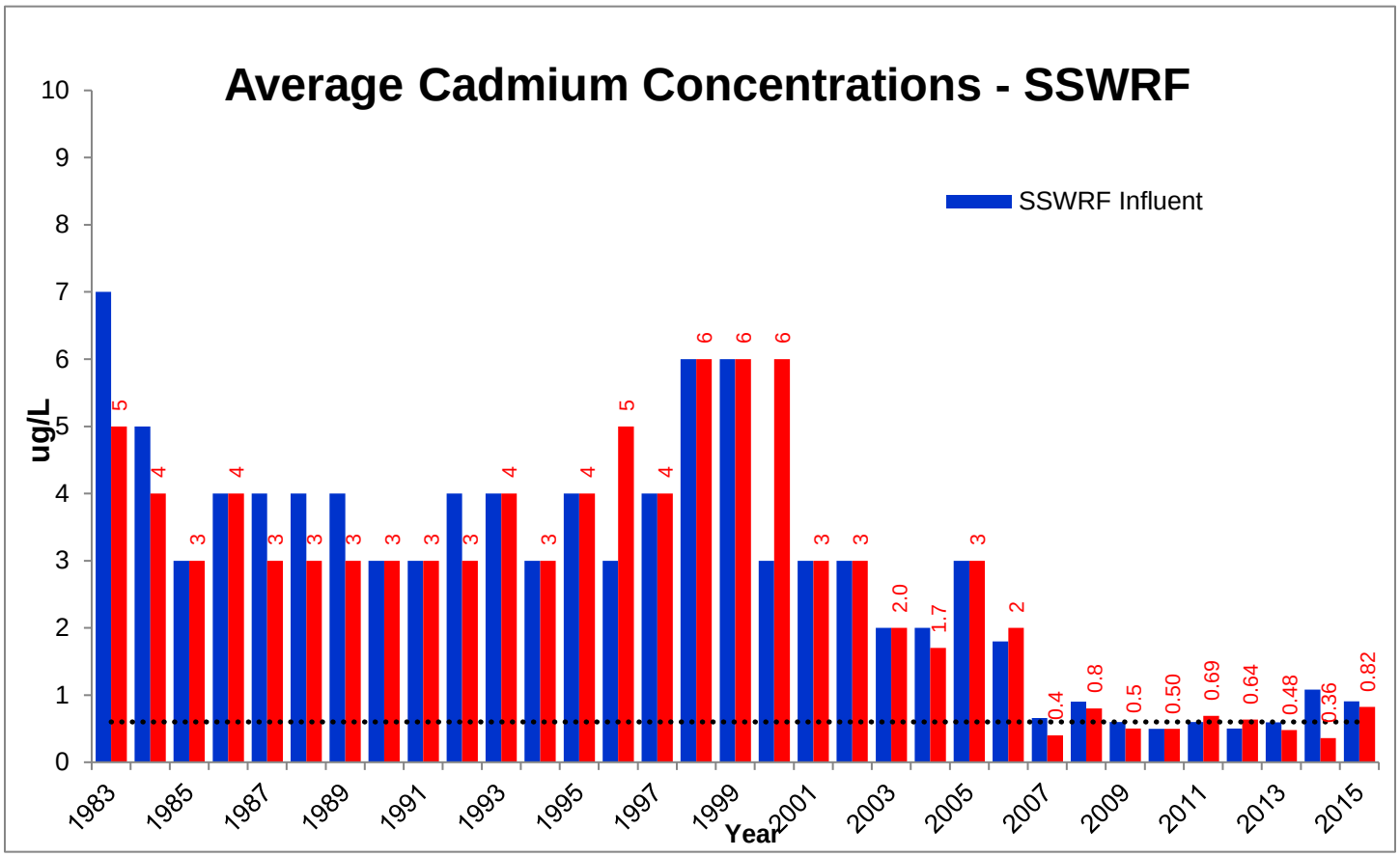

Average Mercury Concentrations - JIWRF
JIWRF Influent
JIWRF Effluent
Method Detection Limit <0.2
ng/L
Year
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
2003
2005
2007
2009
2011
2013
2015
3.0
2.1
2.3
2.4
2.9
2.1
1.8
1.9
1.5
1.7
1.8
3.5
1.8

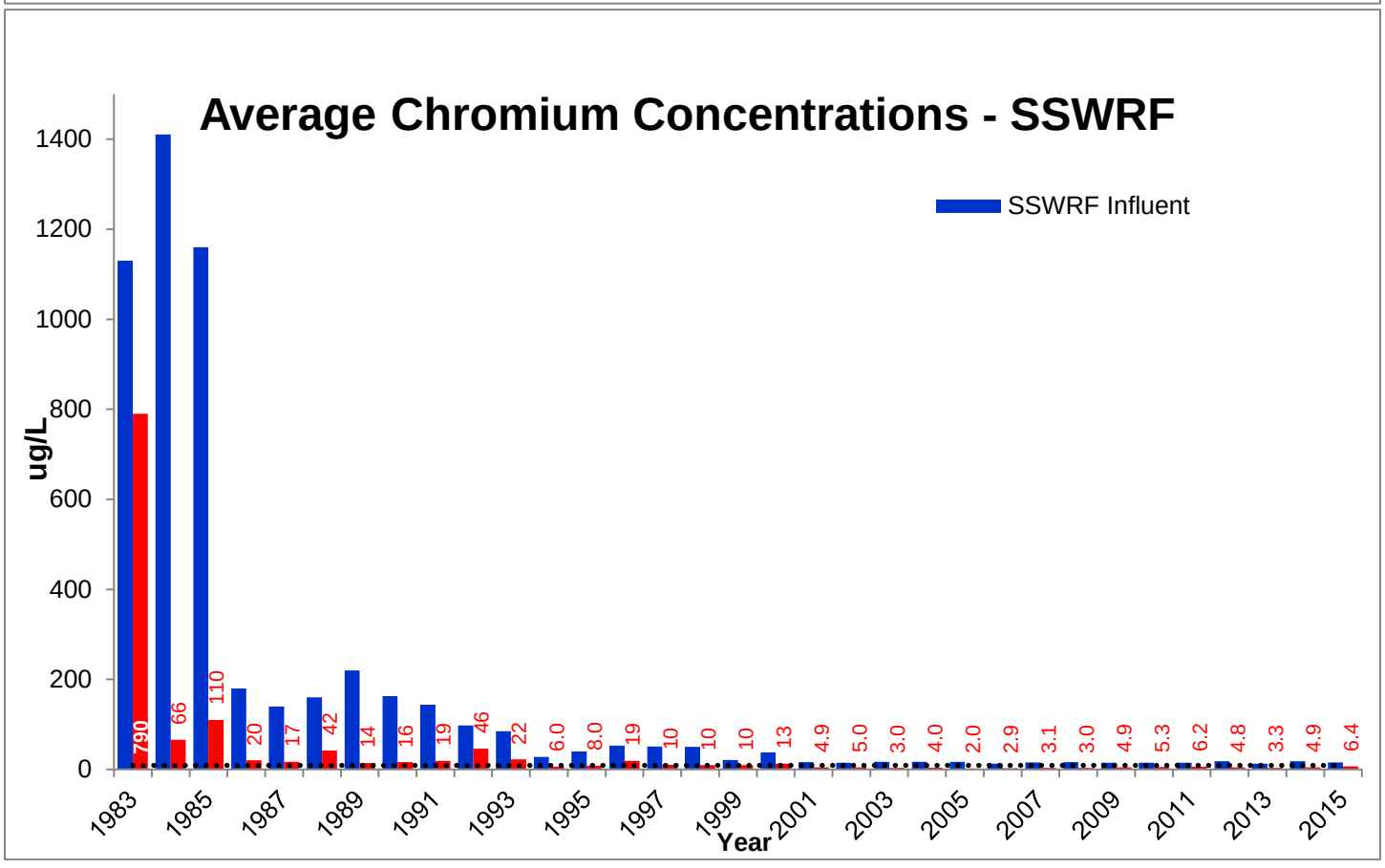

Average Nickel Concentrations - JIWRF
JIWRF Influent
JIWRF Effluent
Method Detection Limit <2.8
ug/L
Year
140
120
100
80
60
40
20
0
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
87
70
36
31
28
25
25
17
17
19
21
18
15
11
12
14
14
7
8
7
5
7
4
4
5
5
4
3.6
4.1
2.9
3.8
4
3.9

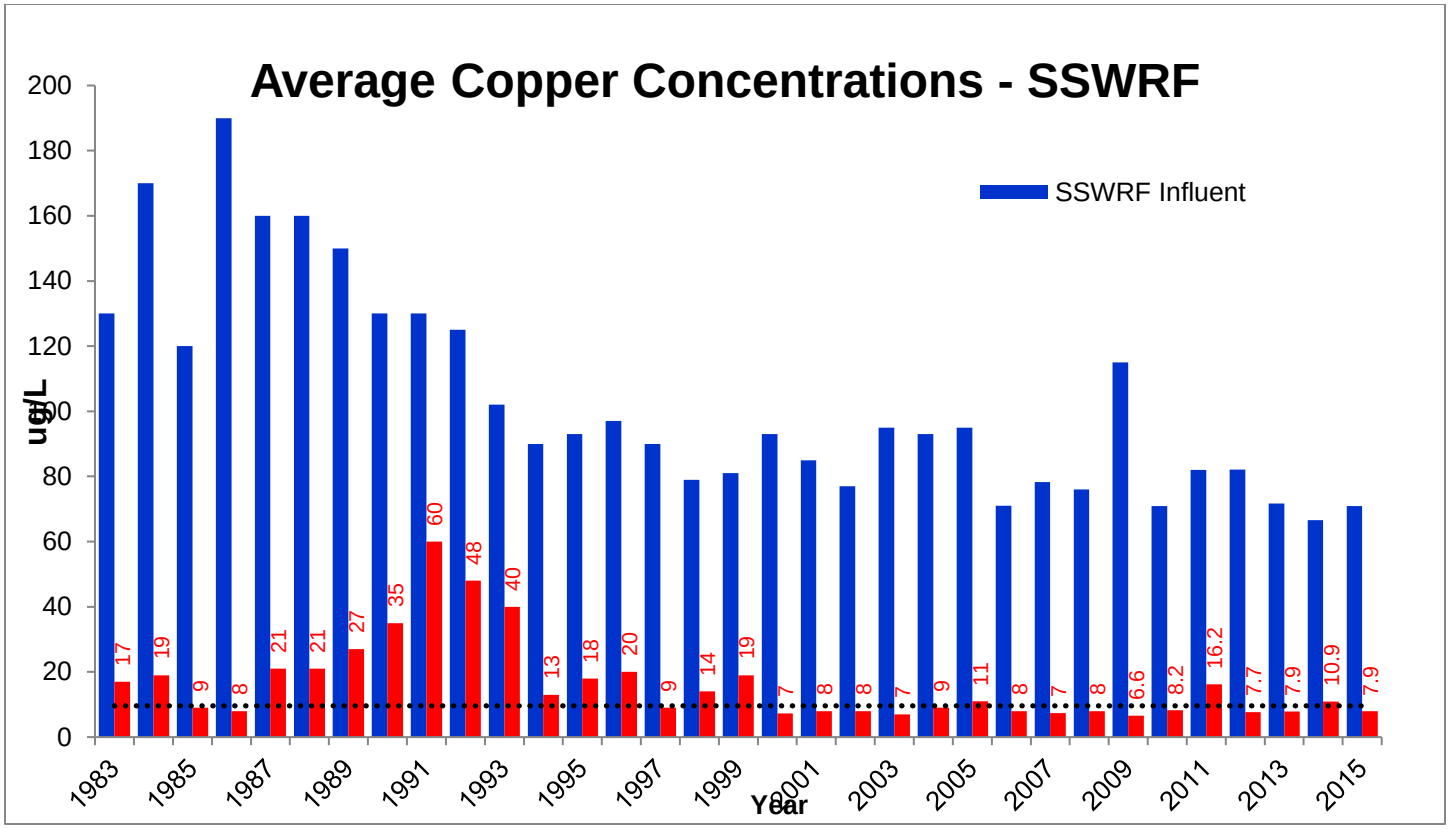

Average Zinc Concentrations - JIWRF
JIWRF Influent
JIWRF Effluent
Method Detection Limit <2.0
µg/L
Year
600
500
400
300
200
100
0
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
100
130
100
90
70
89
99
91
87
74
71
62
46
56
65
38
44
50
39
46
56
58
52
47
43
43
34
33
30
30
29
31
33

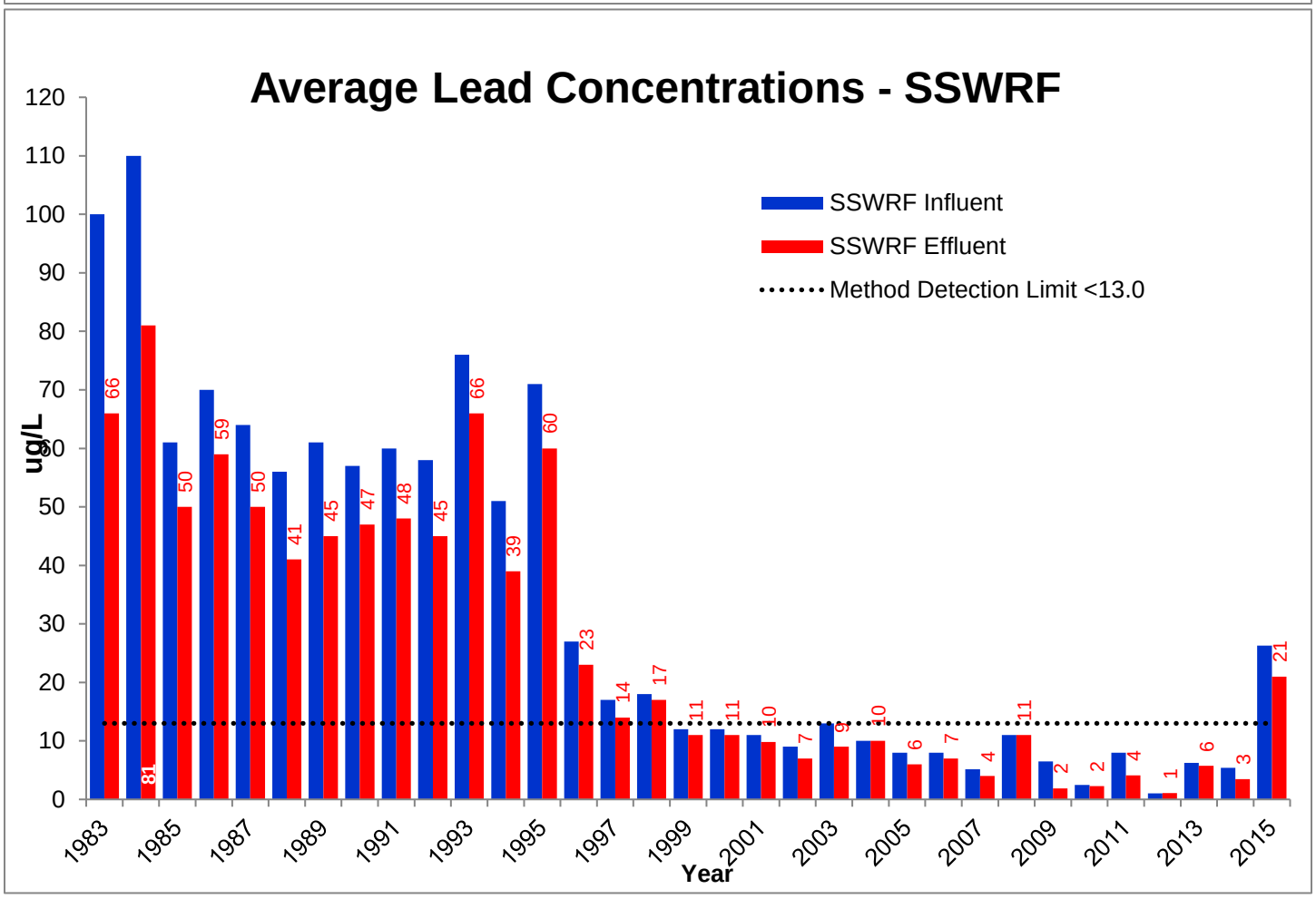
Pollutant Concentrations

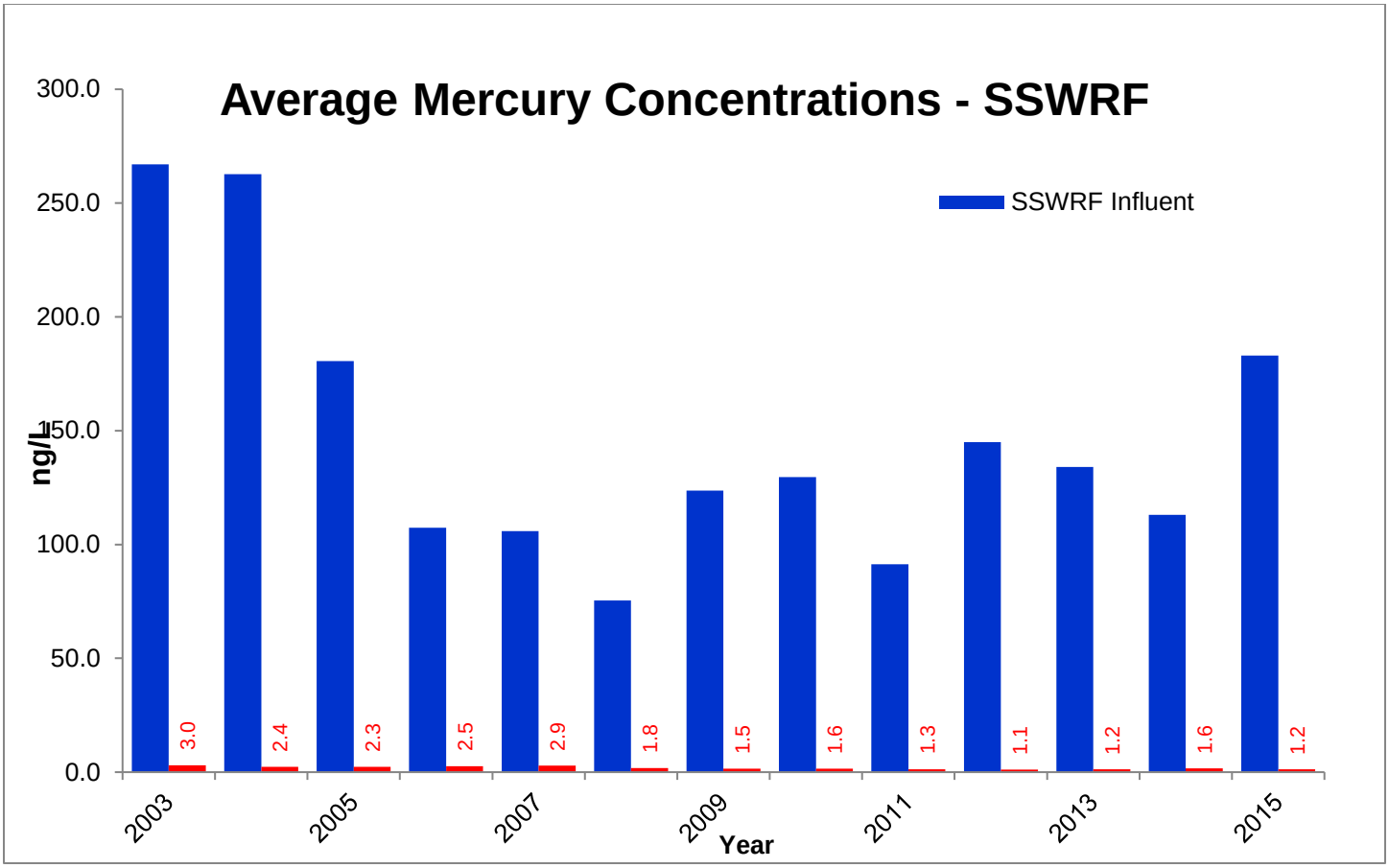
South Shore Water Reclamation Facilities

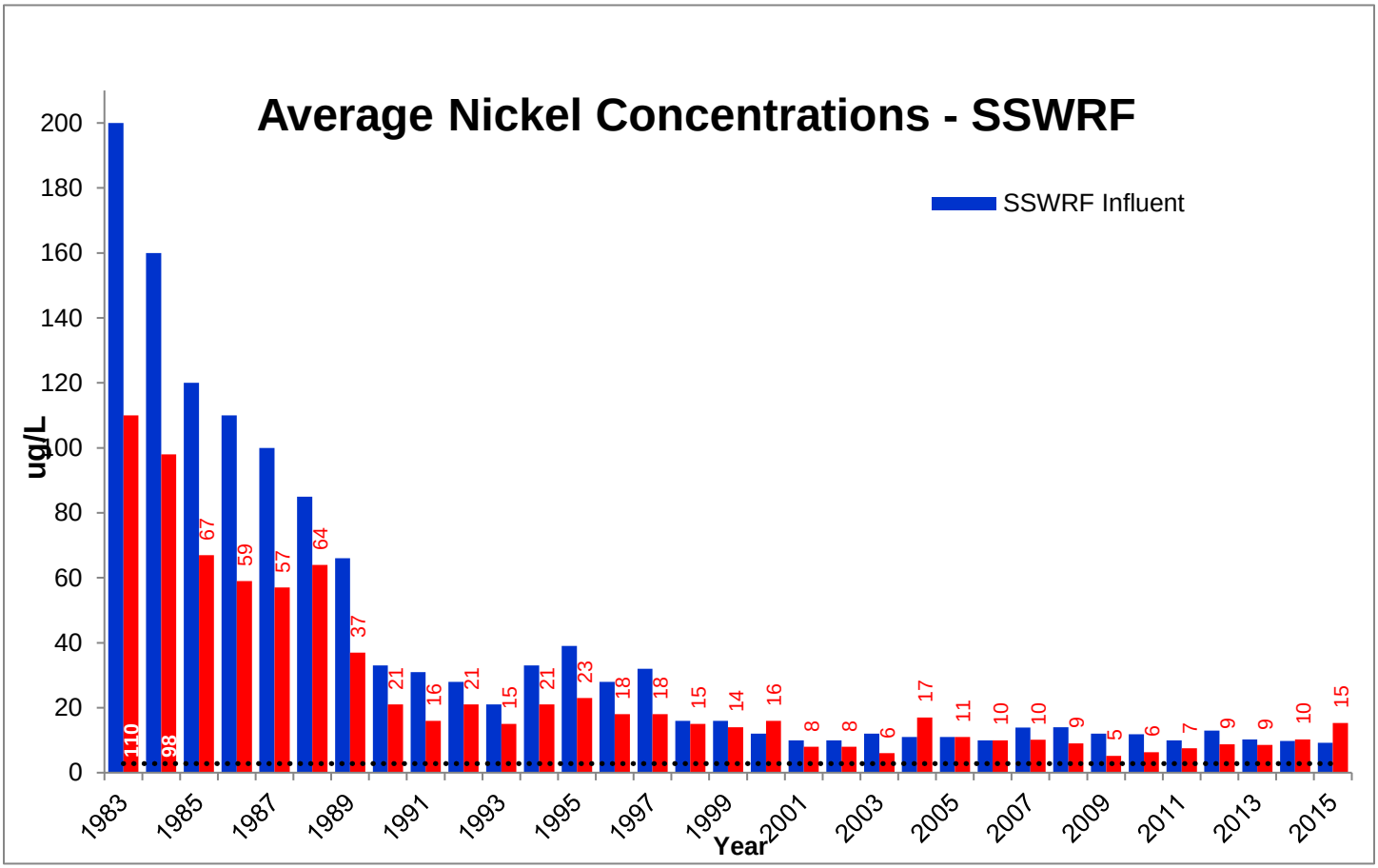

Average Cadmium Concentrations - SSWRF
SSWRF Influent
ug/L
Year
0
1
2
3
4
5
6
7
8
9
10
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
5
4
3
4
4
3
4
3
3
3
3
3
4
3
4
4
5
4
6
6
6
3
3
3
2.0
1.7
3
2
0.4
0.8
0.5
0.50
0.69
0.64
0.48
0.36
0.82

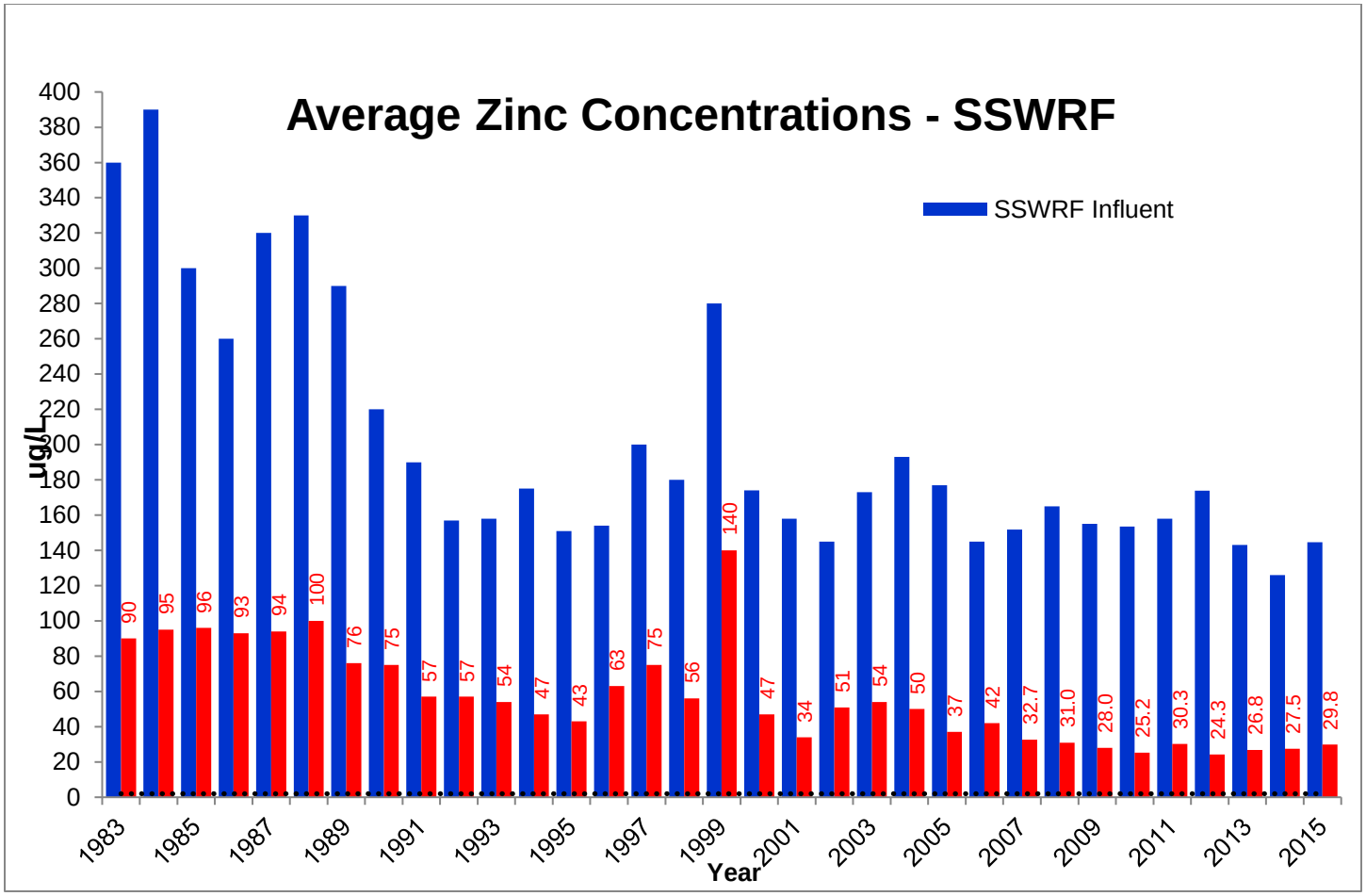

Average Chromium Concentrations - SSWRF
SSWRF Influent
ug/L
Year
0
200
400
600
800
1000
1200
1400
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
790
66
110
20
17
42
14
16
19
46
22
6.0
8.0
19
10
10
10
13
4.9
5.0
3.0
4.0
2.0
2.9
3.1
3.0
4.9
5.3
6.2
4.8
3.3
4.9
6.4


Average Copper Concentrations - SSWRF
SSWRF Influent
ug/L
Year
200
180
160
140
120
100
80
60
40
20
0
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
17 19 9 8 21 21 27 35 60 48 40 13 18 20 9 14 19 7 8 8 7 9 11 8 7 8 6.6 8.2 16.2 7.7 7.9 10.9 7.9

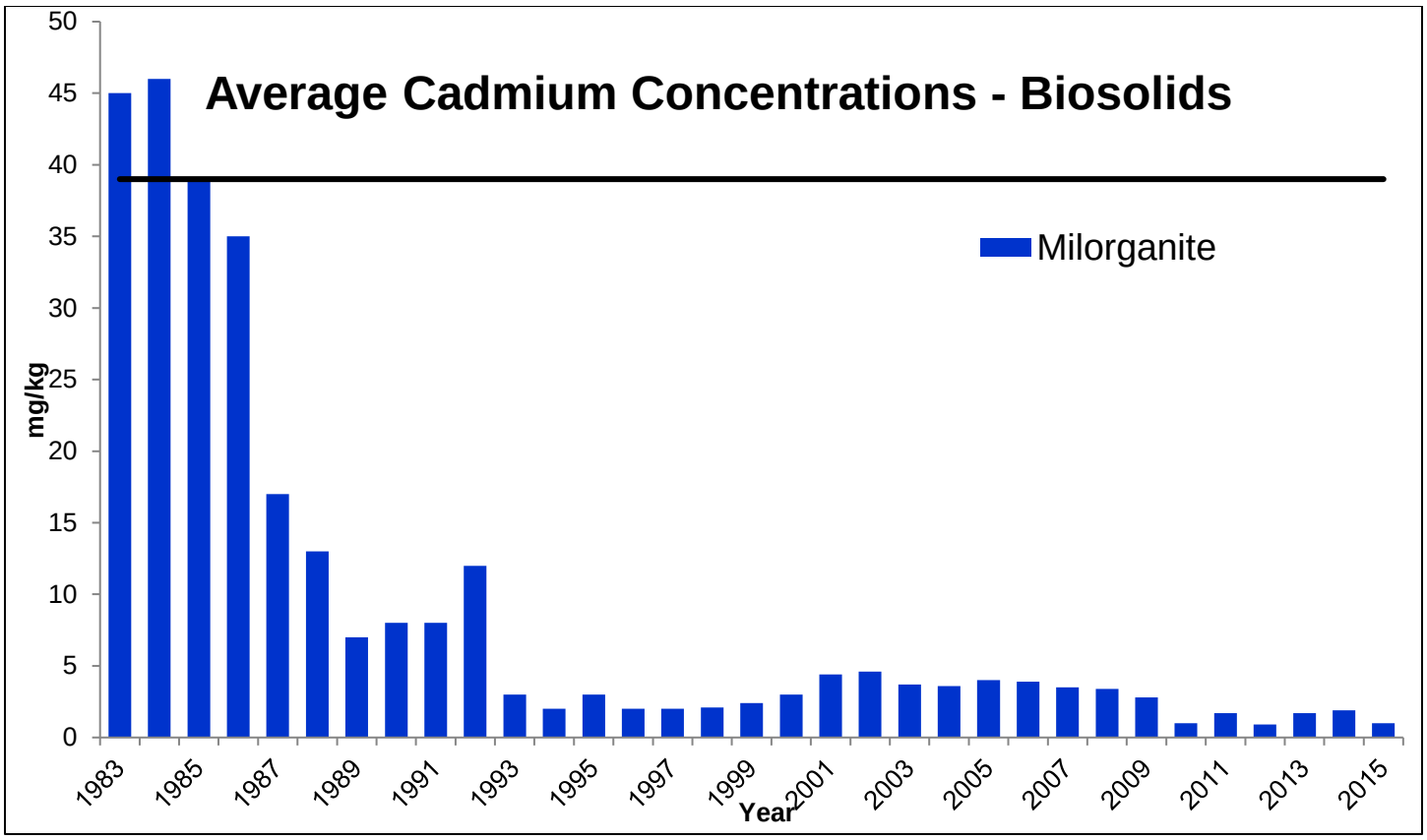

Average Lead Concentrations - SSWRF
SSWRF Influent
SSWRF Effluent
Method Detection Limit <13.0
ug/L
Year
120
110
100
90
80
70
60
50
40
30
20
10
0
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
66 81 50 59 50 41 45 47 48 45 66 39 60 23 14 17 11 11 10 7 9 10 6 7 4 11 2 2 4 1 6 3 21

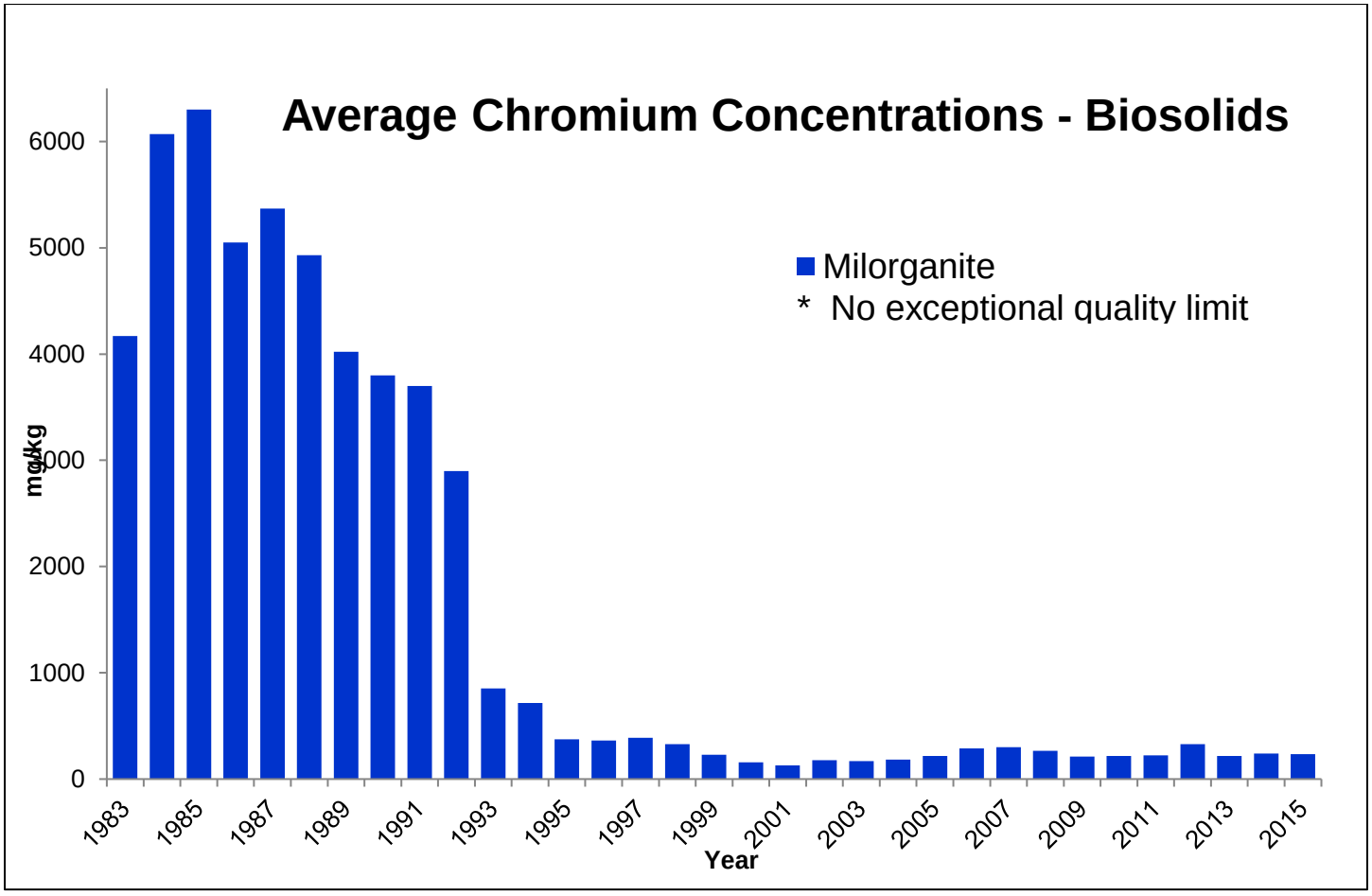

Average Mercury Concentrations - SSWRF
SSWRF Influent
ng/L
300.0
250.0
200.0
150.0
100.0
50.0
0.0
3.0
2.4
2.3
2.5
2.9
1.8
1.5
1.6
1.3
1.1
1.2
1.6
1.2
2003
2005
2007
2009
2011
2013
2015
Year

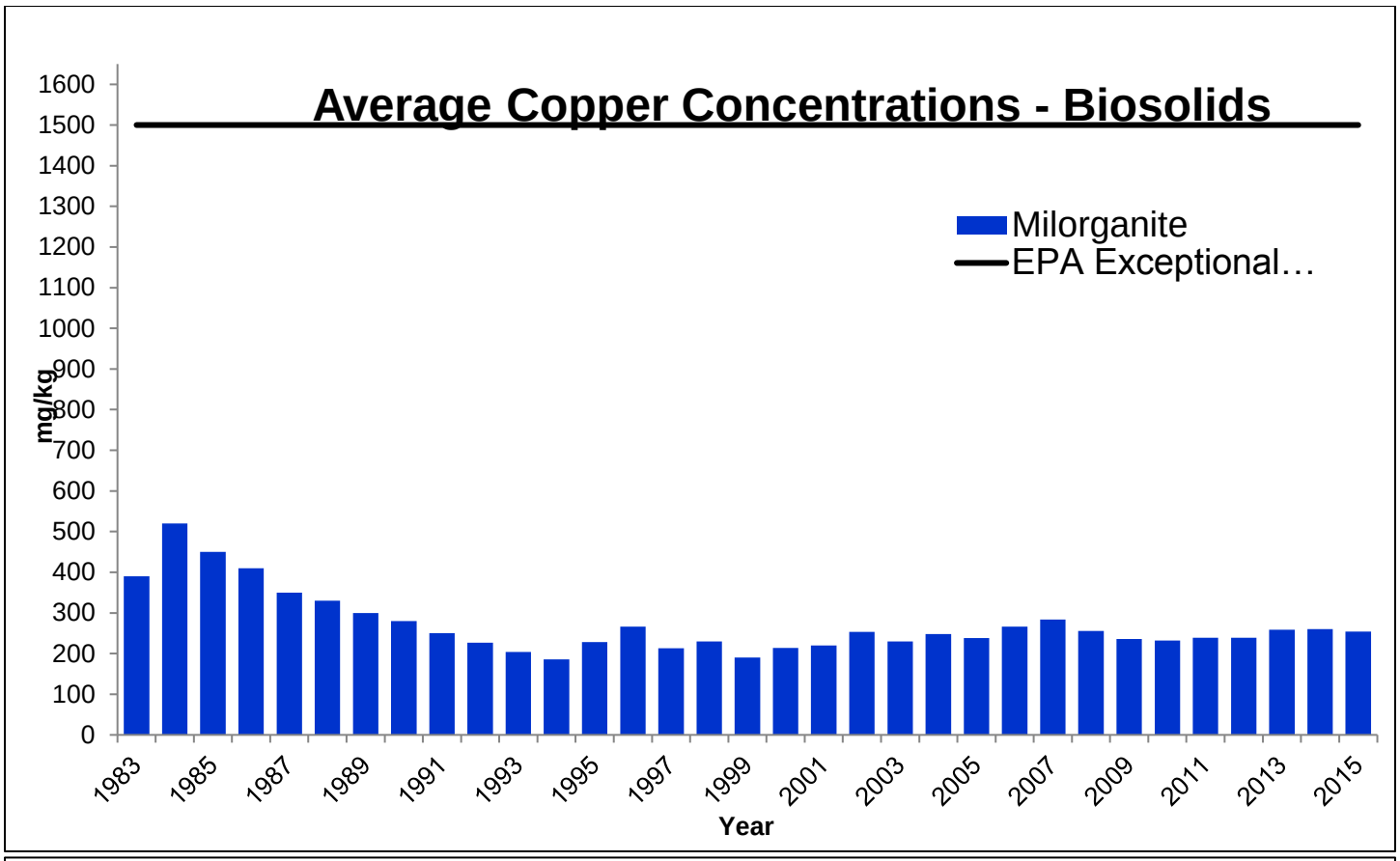

Average Nickel Concentrations - SSWRF
SSWRF Influent
ug/L
200
180
160
140
120
100
80
60
40
20
0
110
98
67
59
57
64
37
21
16
21
15
21
23
18
18
15
14
16
8
8
6
17
11
10
10
9
5
6
7
9
9
10
15
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
Year

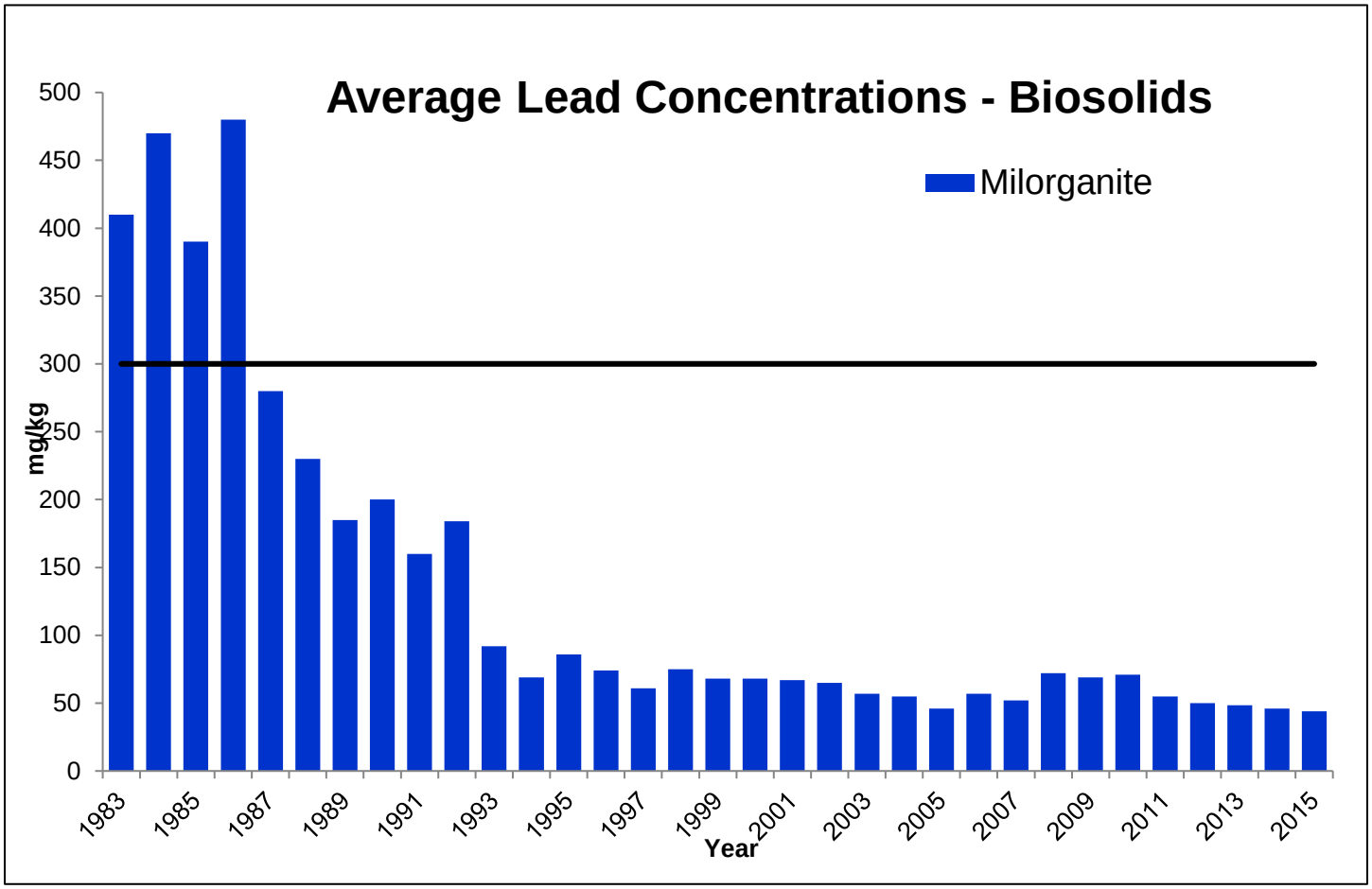

Average Zinc Concentrations - SSWRF
SSWRF Influent
ug/L
Year
400
380
360
340
320
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
90
95
96
93
94
100
76
75
57
57
54
47
43
63
75
56
140
47
34
51
54
50
37
42
32.7
31.0
28.0
25.2
30.3
24.3
26.8
27.5
29.8

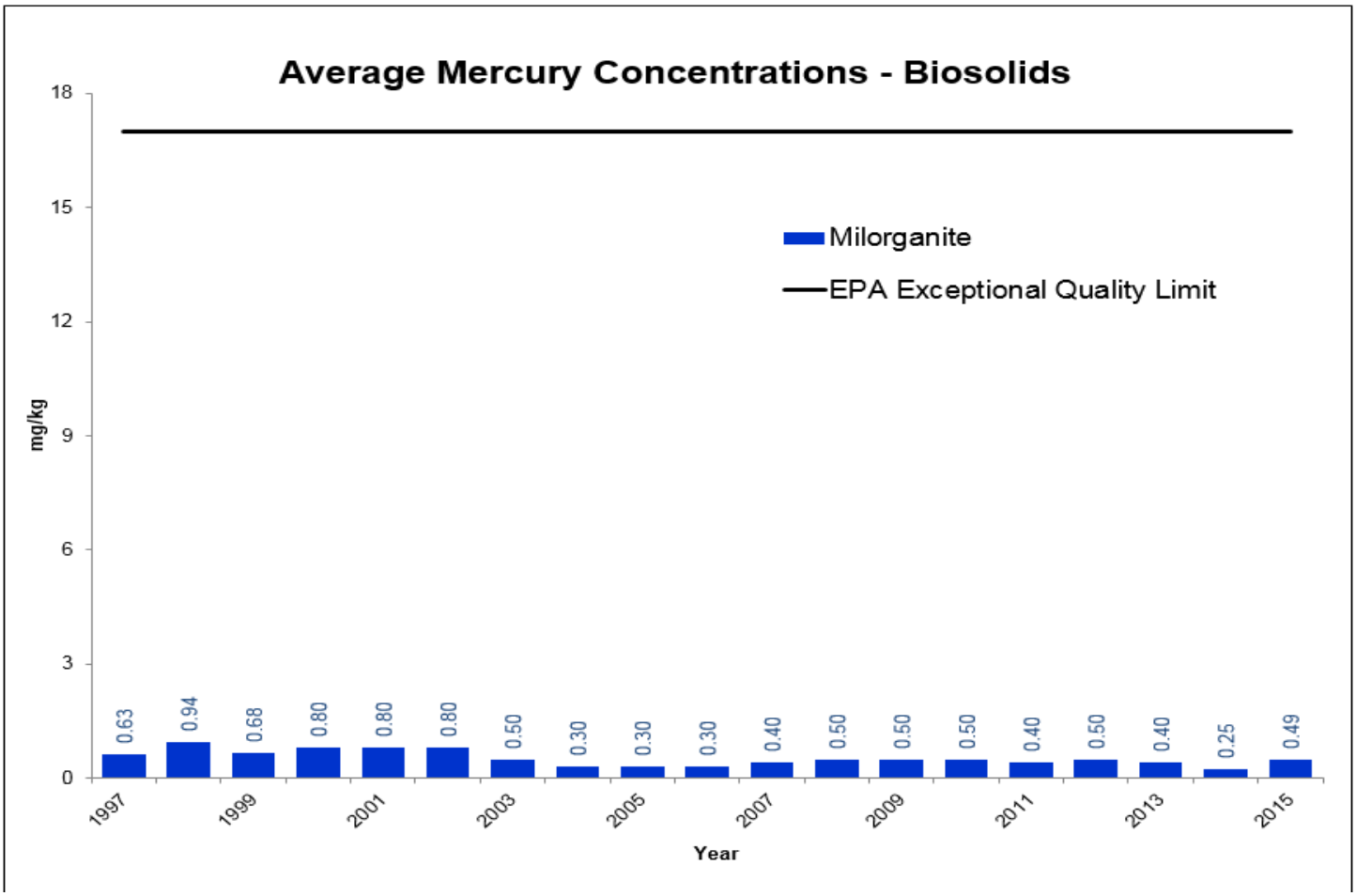
Biosolids

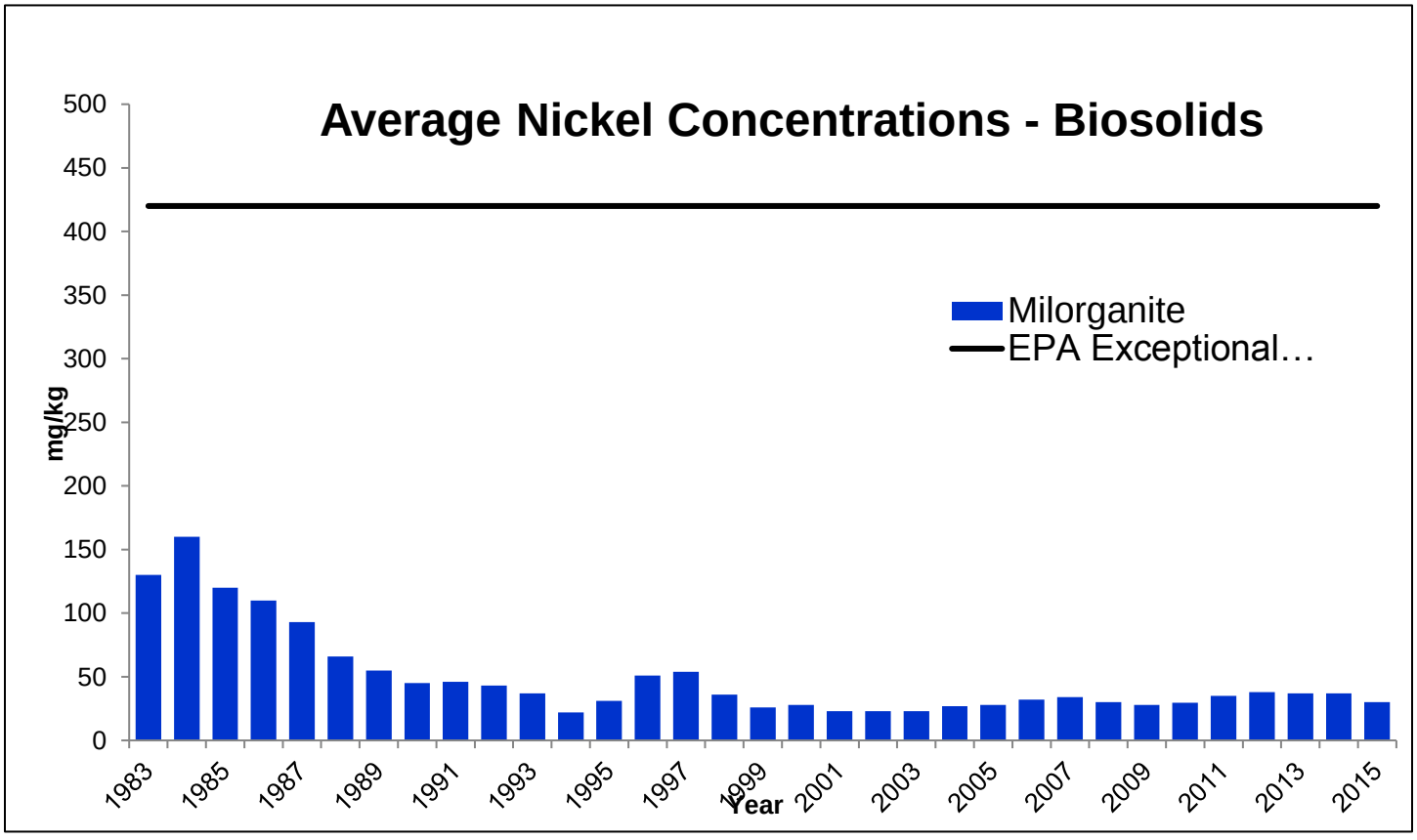

Average Cadmium Concentrations - Biosolids
Milorganite
mg/kg
Year
0
5
10
15
20
25
30
35
40
45
50
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015

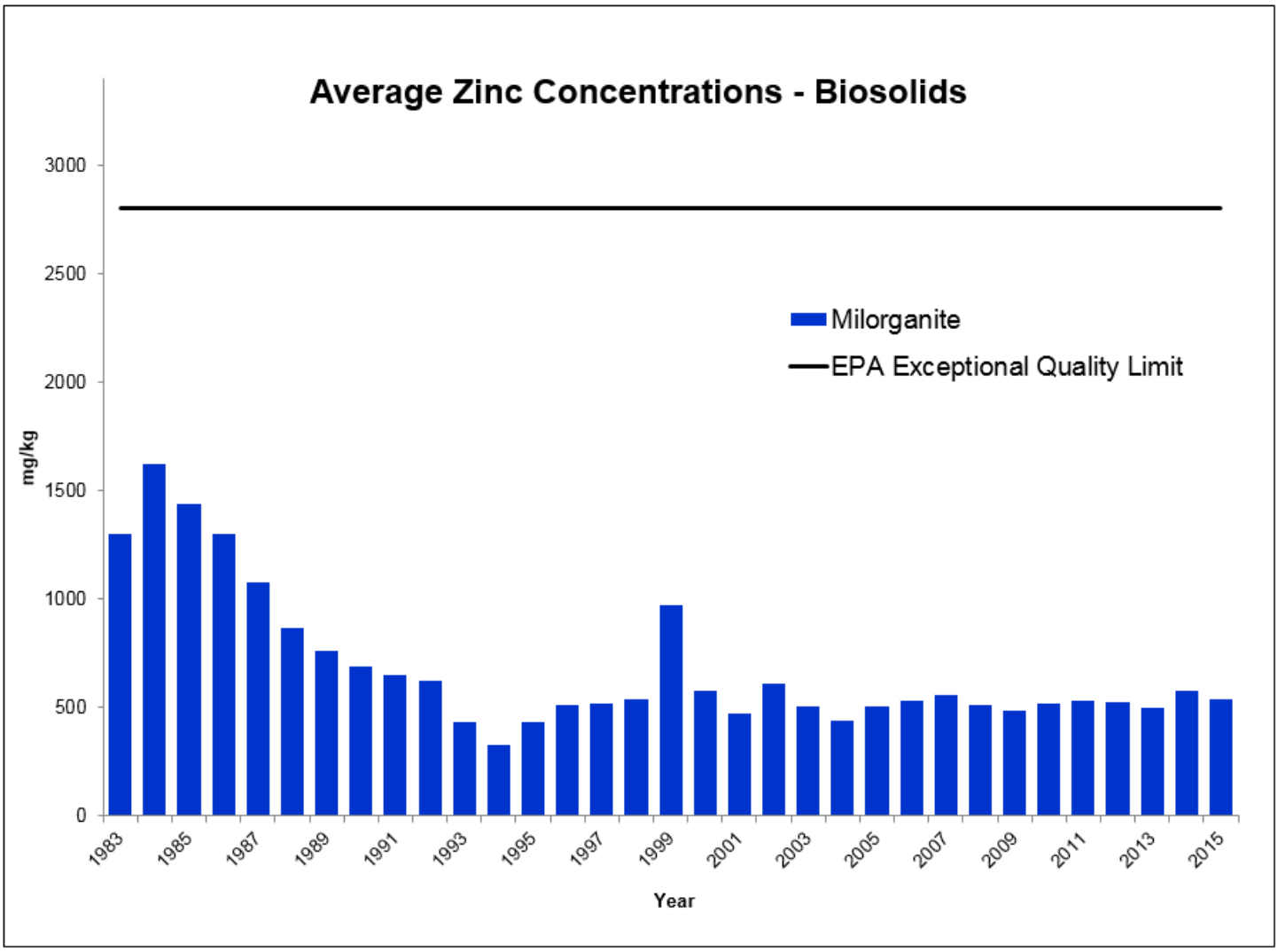

Average Chromium Concentrations - Biosolids
Milorganite
* No exceptional quality limit
mg/kg
Year
0
1000
2000
3000
4000
5000
6000
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015


Average Copper Concentrations - Biosolids
Milorganite
EPA Exceptional…
mg/kg
Year


Average Lead Concentrations - Biosolids
Milorganite
mg/kg
Year


Average Mercury Concentrations - Biosolids
18
15
12
9
6
3
0
mg/kg
Milorganite
EPA Exceptional Quality Limit
0.63
0.94
0.68
0.80
0.80
0.80
0.50
0.30
0.30
0.30
0.40
0.50
0.50
0.50
0.40
0.50
0.40
0.25
0.49
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
Year


Average Nickel Concentrations - Biosolids
500
450
400
350
300
250
200
150
100
50
0
mg/kg
Milorganite
EPA Exceptional…
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
Year


Average Zinc Concentrations - Biosolids
3000
2500
2000
1500
1000
500
0
mg/kg
Milorganite
EPA Exceptional Quality Limit
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
Year