Spatial Distributions and temporal trends of contaminants in the St Clair R and Implications for Lake Erie

Water Quality Monitoring and Surveillance

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WQMS programs –St. Clair R

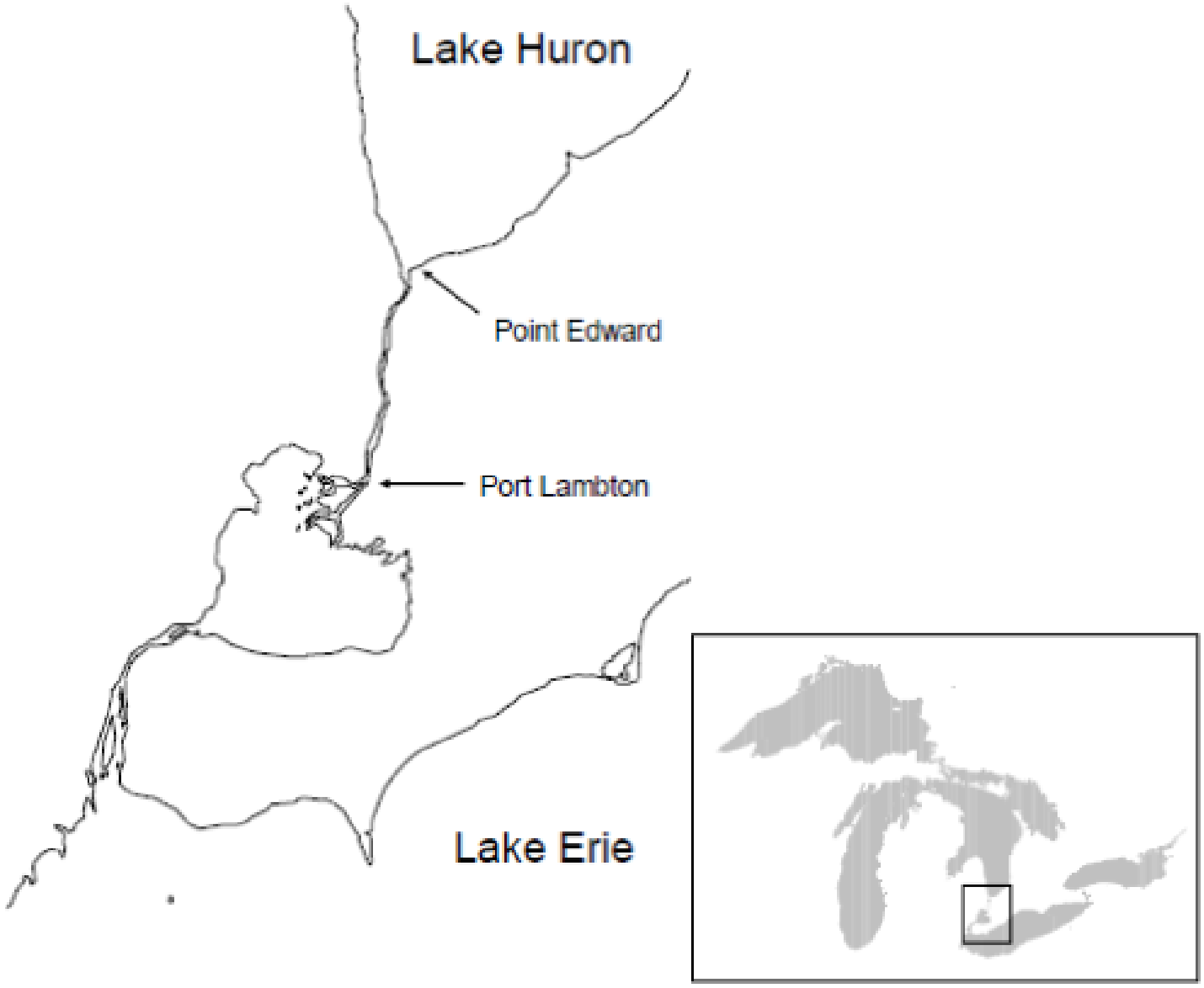
- Great Lakes sediment monitoring program (GLSMP) 1996 (recently CMP) formerly GLSAP
- St. Clair upstream/downstream (u/d) program 1987; GLAP
- Areas of Concern monitoring program; GLAP ; St. Clair R. Survey 2008

St. Clair R. U/D Program

- Purpose: to assess the differences in water quality between the head and mouth of the river and relate these to chemical inputs from the Canadian shoreline
- Measure the effectiveness of source remediation activities

St. Clair R. U/D Program

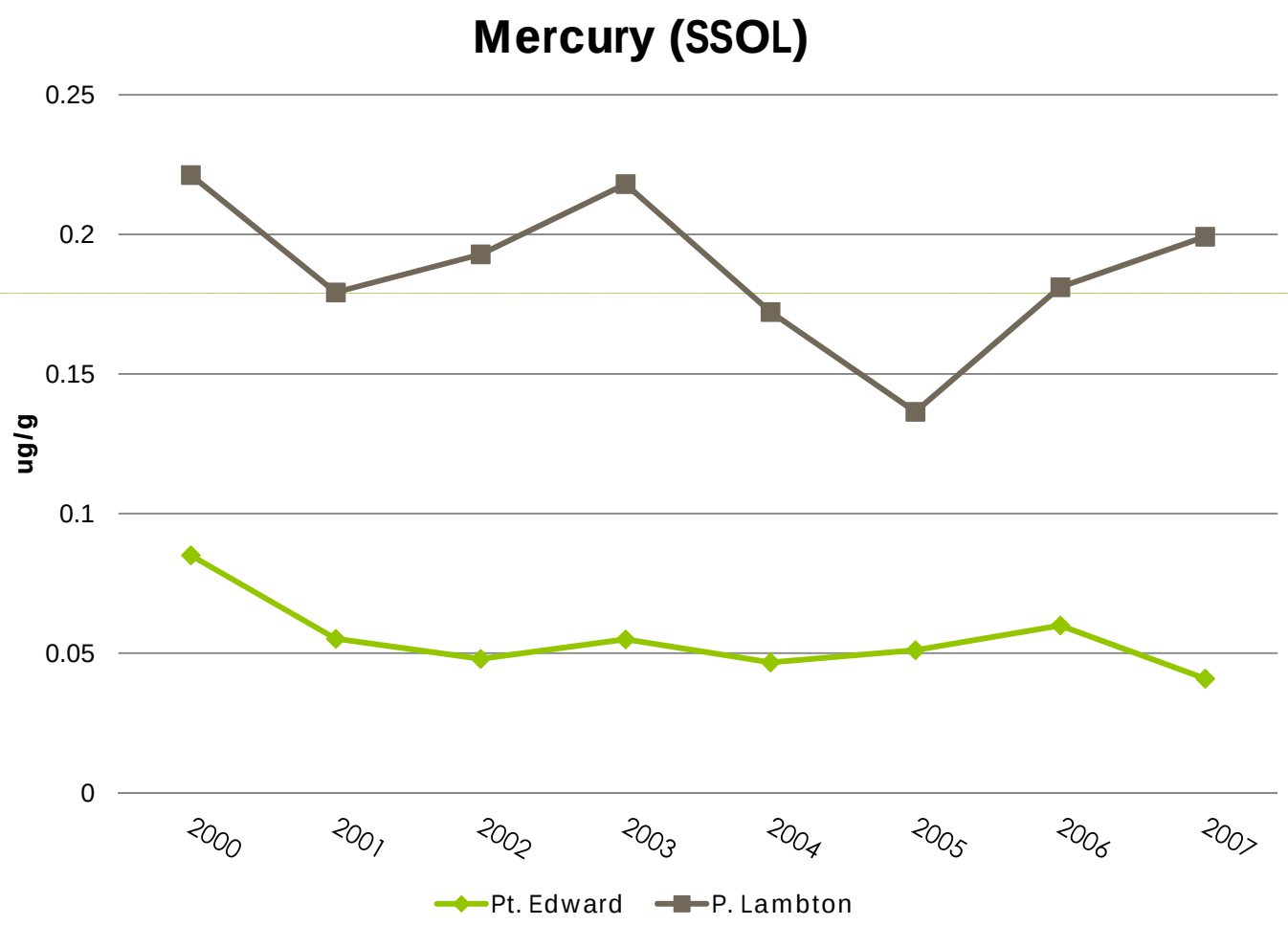
- Two permanent sampling locations established in 1987 at the head (Point Edward) and mouth (Port Lambton) of the river
- Water centrifuged for dissolved and suspended solids
- OCs, PAHs, metals, mercury, nutrients, MI

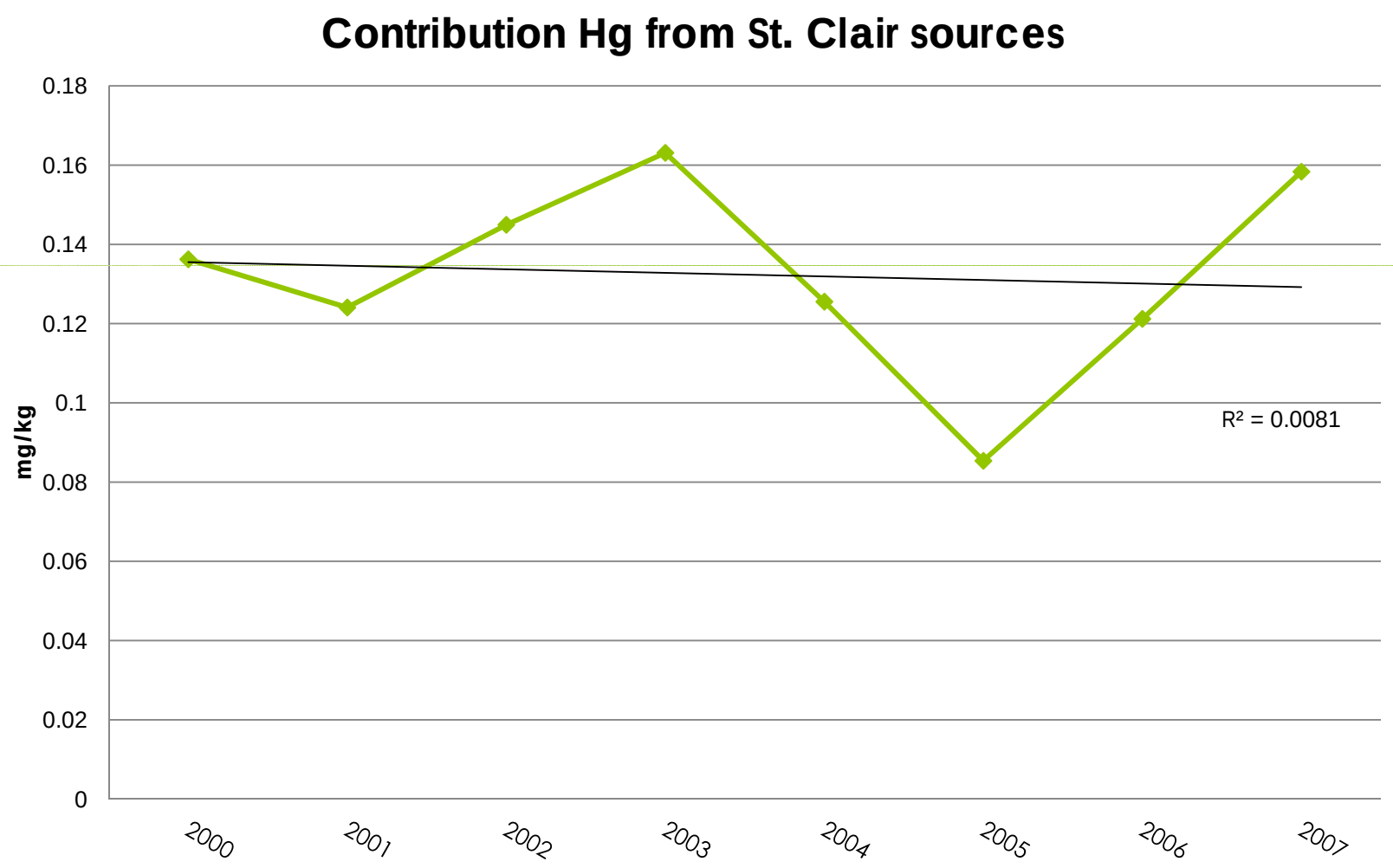

Lake Huron
Point Edward
Port Lambton
Lake Erie

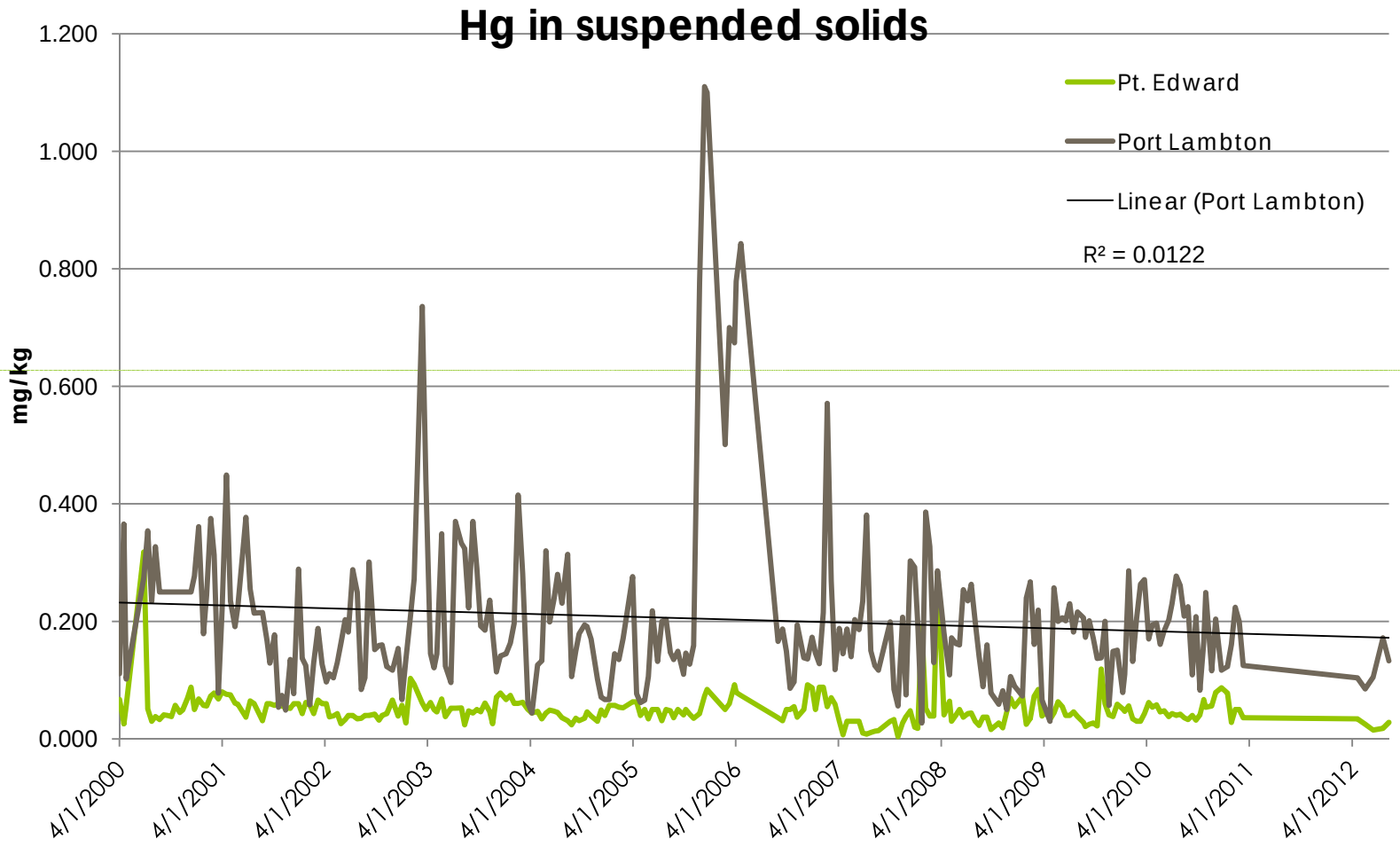
Trends for 2000-2007

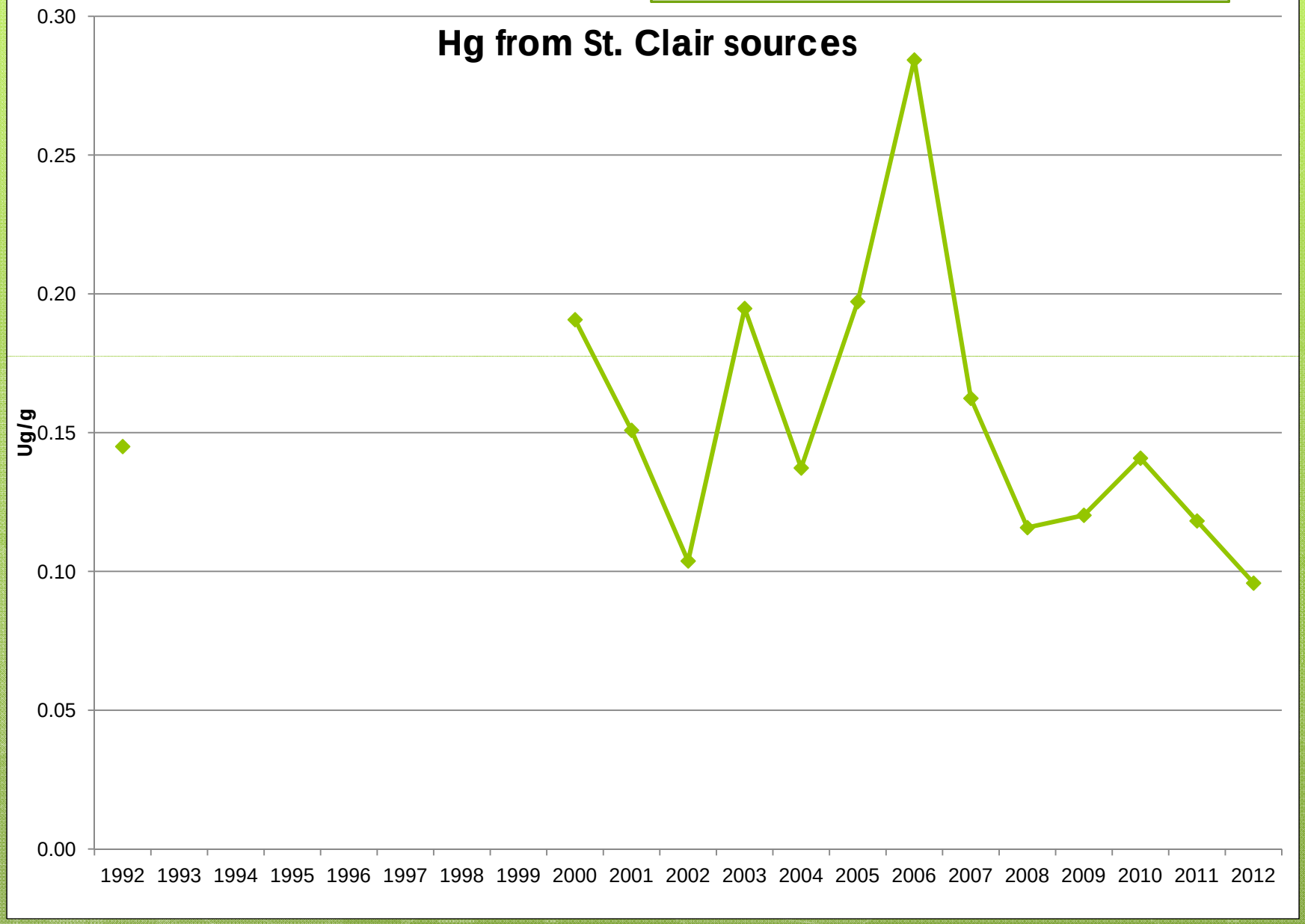
	Point Edward			Port Lambton		
	Phase	Trend	Significance	Phase	Trend	Significance
Hexachlorobutadiene	Diss	D	NS	Diss	D	NS
	ssol	D	S	ssol	D	NS
Octachlorostyrene	Diss	D	S	Diss	D	S
	ssol	U	NS	ssol	U	NS
Hexachlorobenzene	Diss	D	NS	Diss	U	S
	ssol	D	S	ssol	U	NS
Mercury	Whole	D	S	Whole	U	NS
Acenaphthylene	Diss	D	NS	Diss	U	S
	ssol	U	NS	ssol	U	NS
DDT	Diss	D	S	Diss	U	NS
	ssol	U	NS	ssol	D	S
PeCB	Diss	D	S	Diss	U	S
	ssol	D	S	ssol	U	NS

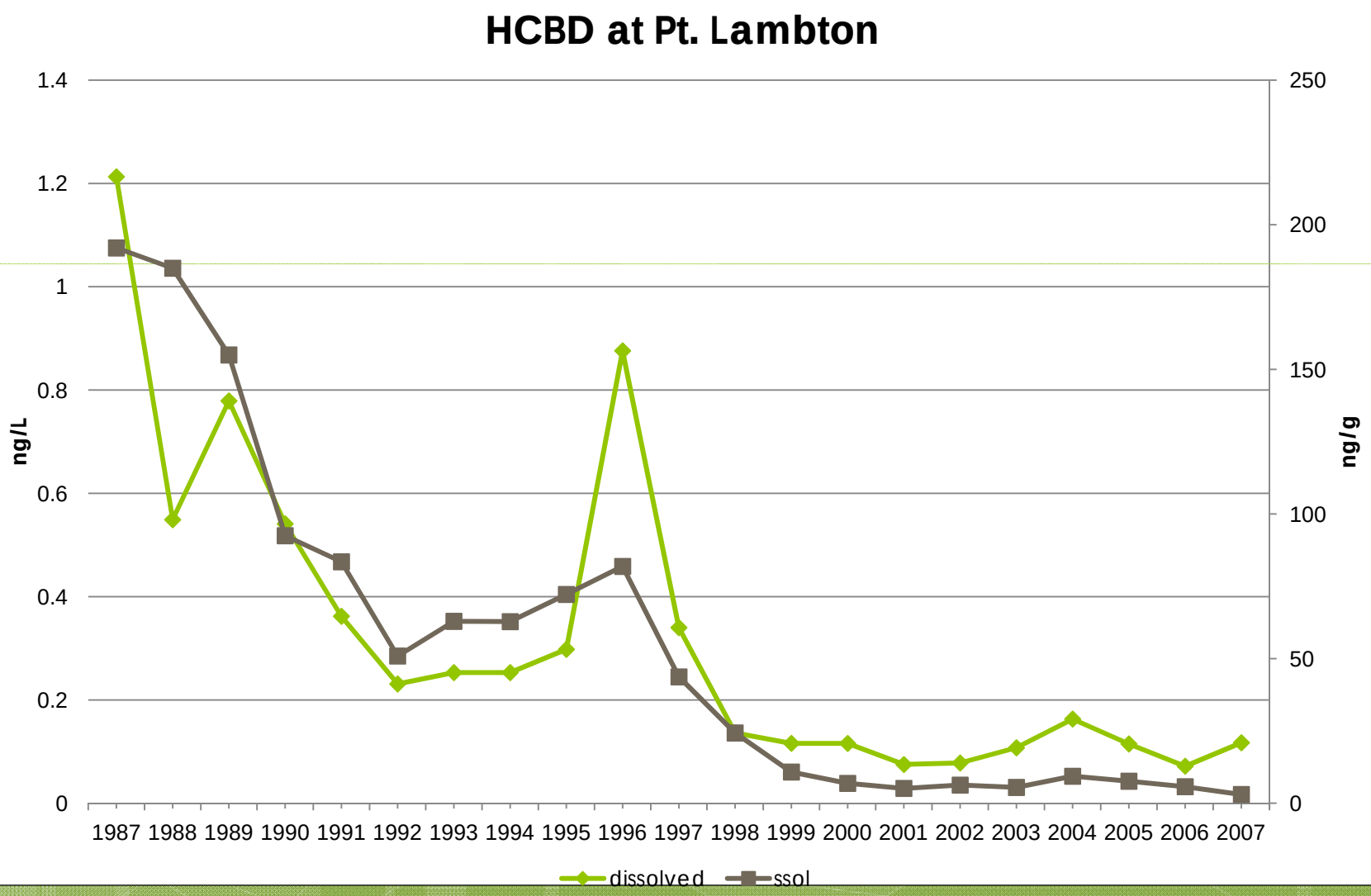
Diss	Dissolved
ssol	Suspended solids
D	downward
U	Upward
S	Significant
NS	Not significant

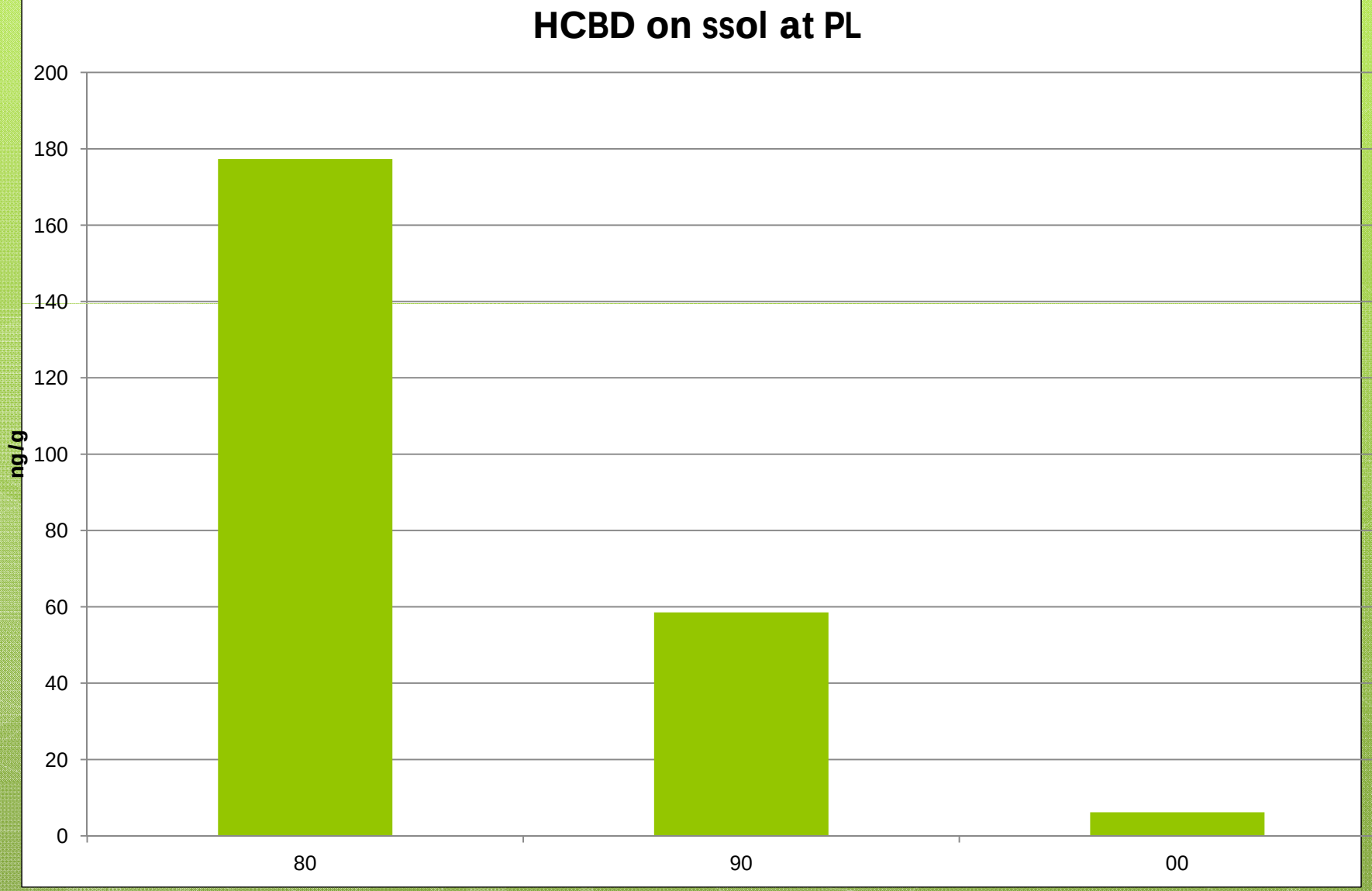

Mercury (SSOL)
0.25
0.2
0.15
0.1
0.05
0
ug/g
2000
2001
2002
2003
2004
2005
2006
2007
Pt. Edward
P. Lambton


Contribution Hg from St. Clair sources
mg/kg
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
2000
2001
2002
2003
2004
2005
2006
2007
R² = 0.0081


Hg in suspended solids
1.200
1.000
0.800
0.600
0.400
0.200
0.000
mg/kg
Pt. Edward
Port Lambton
Linear (Port Lambton)
R² = 0.0122
4/1/2000
4/1/2001
4/1/2002
4/1/2003
4/1/2004
4/1/2005
4/1/2006
4/1/2007
4/1/2008
4/1/2009
4/1/2010
4/1/2011
4/1/2012

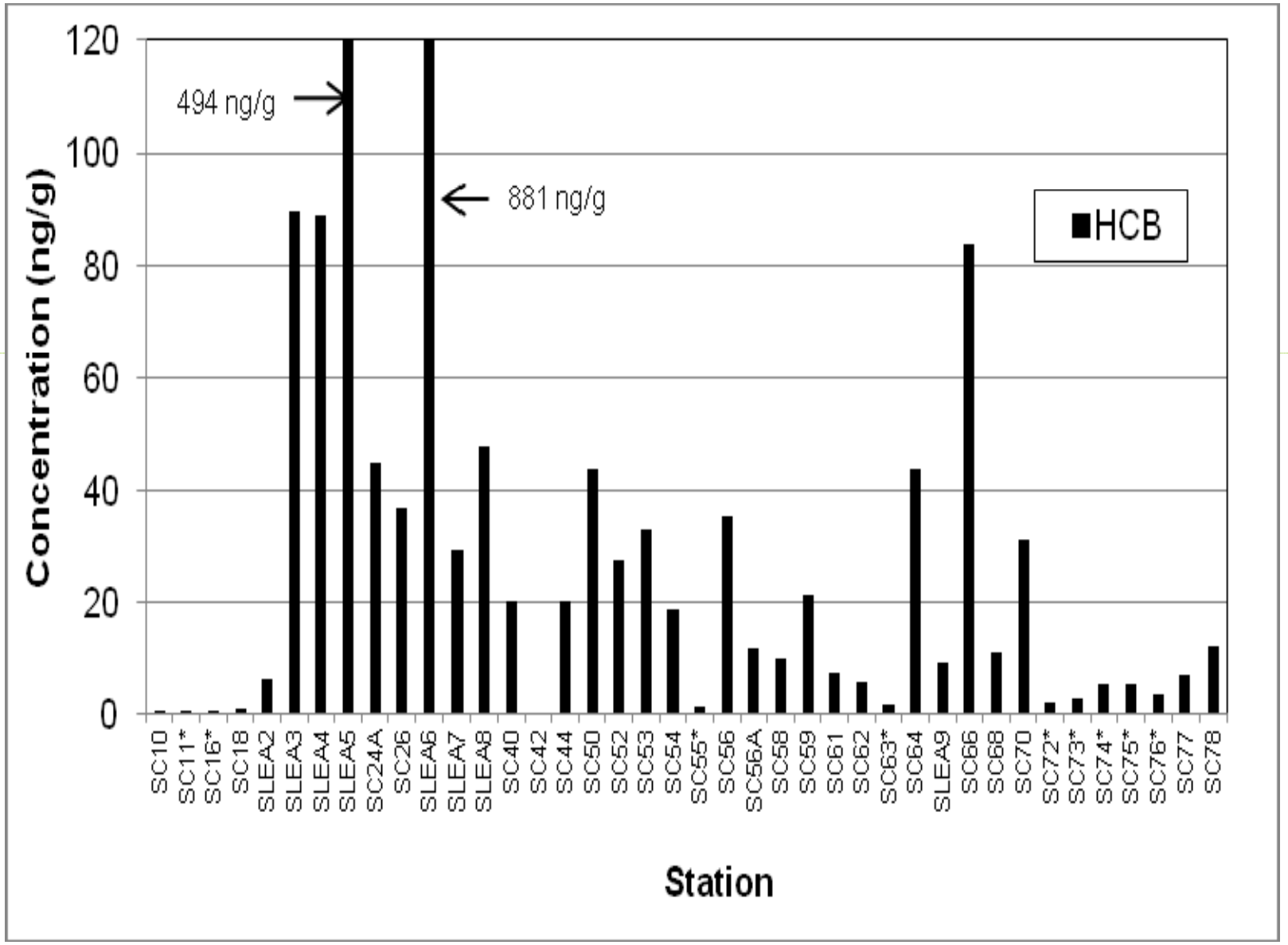

Hg from St. Clair sources
Ug/g
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012


HCBD at Pt. Lambton
ng/L
ng/g
1.4
1.2
1
0.8
0.6
0.4
0.2
0
250
200
150
100
50
0
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007
dissolved
ssol


HCBD on ssol at PL
ng/g
200
180
160
140
120
100
80
60
40
20
0
80
90
00

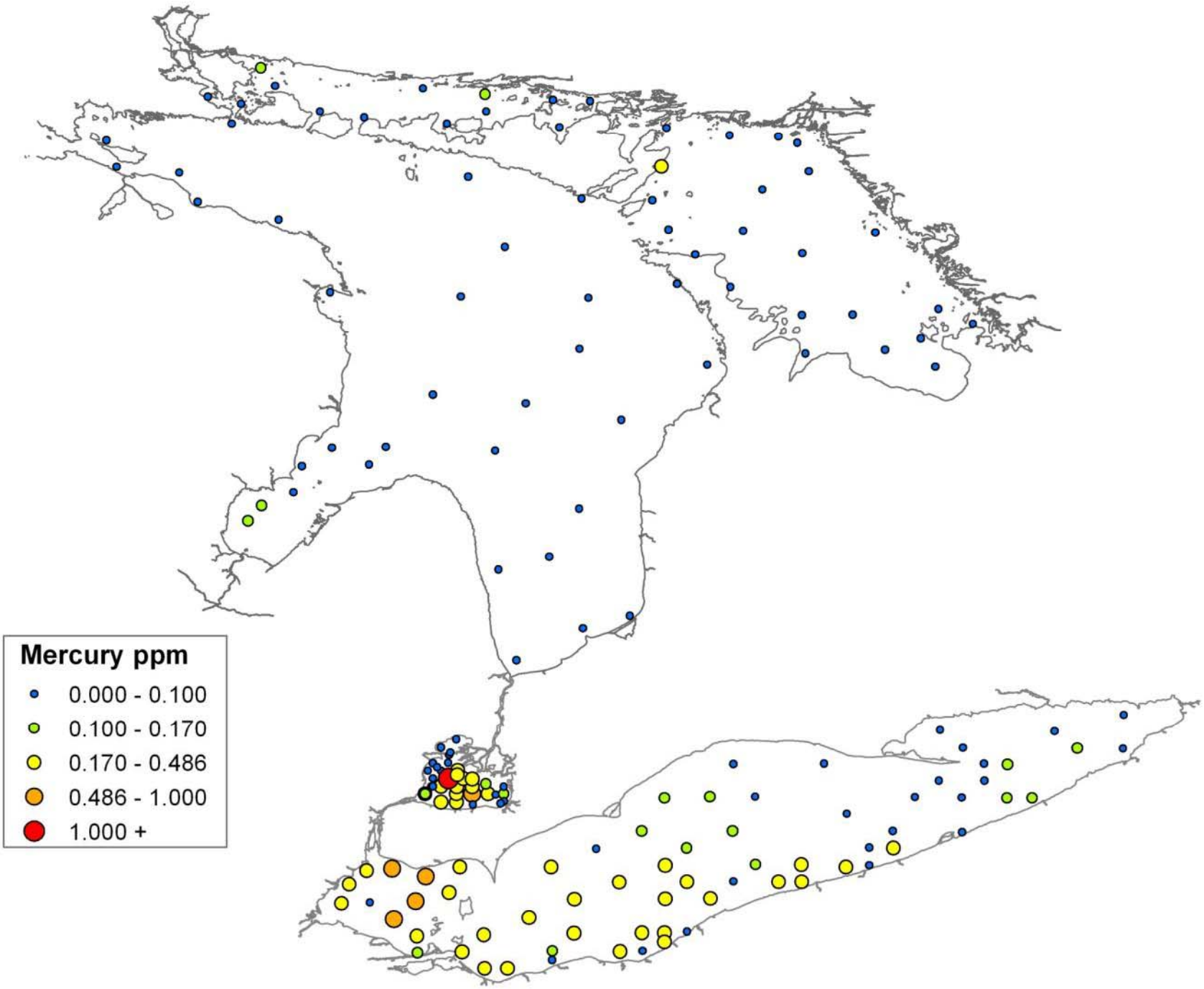

Lake Huron
St. Clair River
SC1
SC2
SLEA1
SC6a
SC10
SC11
SC16
SC18
SLEA2
6664
SLEA3
6663
SLEA4
SLEA5
SC24A
SC26
SLEA6
SLEA7
SLEA8
SC40
SC40A
SC42
SC44
SC46
SC47
SC50
SC52A
SC52
SC53
SC54
SC55
SC56
SC56A
SC58
SC58A
SC59
SC60
SC61
SC63
SC62
SLEA9
SC66
SC68
SC78
SC78A
SC78B
SC70
SC72
SC74
SC73
SC75
SC76
SC77

		total mercury	methyl mercury	methyl mercury	
	µg/g	µg/g	ng/g	%	
Mean		0.614	5.41	2.3	
RSD		45	105	78	
Min		0.017	0.78	0.2	
Max		9.16	38.4	6.6	
Median		0.329	4.21	1.4	
		%			
TEL	0.17	69(31)[1]			
PEL	0.486	31(14)			
LEL	0.2	67(30)			
SEL	2	2(1)			
% of stations exceeding the guidelines (number of stations shown in brackets)					


120
100
80
60
40
20
0
494 ng/g
881 ng/g
HCB
Concentration (ng/g)
SC10
SC11*
SC16*
SC18
SLEA2
SLEA3
SLEA4
SLEA5
SC24A
SC26
SLEA6
SLEA7
SLEA8
SC40
SC42
SC44
SC50
SC52
SC53
SC54
SC55*
SC56
SC56A
SC58
SC59
SC61
SC62
SC63*
SC64
SLEA9
SC66
SC68
SC70
SC72*
SC73*
SC74*
SC75*
SC76*
SC77
SC78
Station

Great Lakes sediment management program (GLSMP)

- Comprehensive surveys 1996-2003 (GLSAP,Chris Marvin)
- Synoptic work in current years funded through Chemicals Management Program (CMP)
- Comprehensive survey Lake Erie 2014


Mercury ppm
0.000 - 0.100
0.100 - 0.170
0.170 - 0.486
0.486 - 1.000
1.000 +

conclusions

- The St. Clair R. U/D program is an important program to show the results of remediation and management initiatives over the entire river temporally
- AOC monitoring identifies localized issues within an AOC
- GLSMP identifies the overall contaminant levels in the Great Lakes as well ,and overtime the improvements from to upstream initiatives

conclusions

- Most chemicals have shown substantial decrease in the St. Clair over time
- There are still some localized areas in the upper reaches of the river that have exceedances
- We can expect to see improvements in the bottom sediments of Lake Erie in upcoming surveys