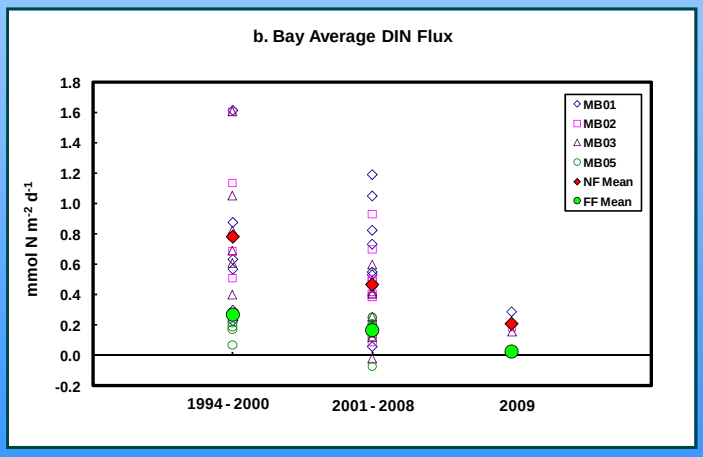
APPENDIX I

2009 Benthic Nutrient Cycling
MWRA Workshop 2010

DIN Flux for Nearfield and Farfield: 2009 compared to pre- and post-relocation of the MWRA outfall



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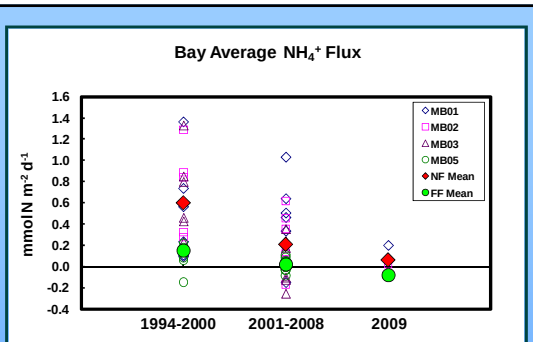
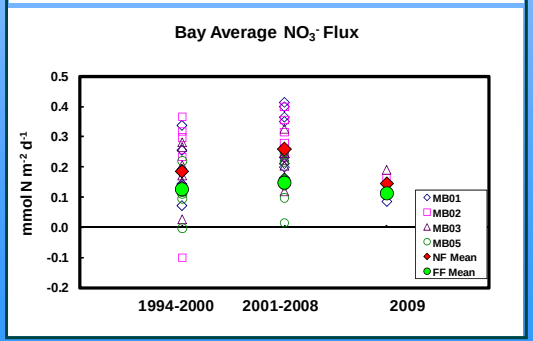
Components of the DIN Flux

Majority of the DIN flux is comprised of NH_4^+, which continues to show a downward trend





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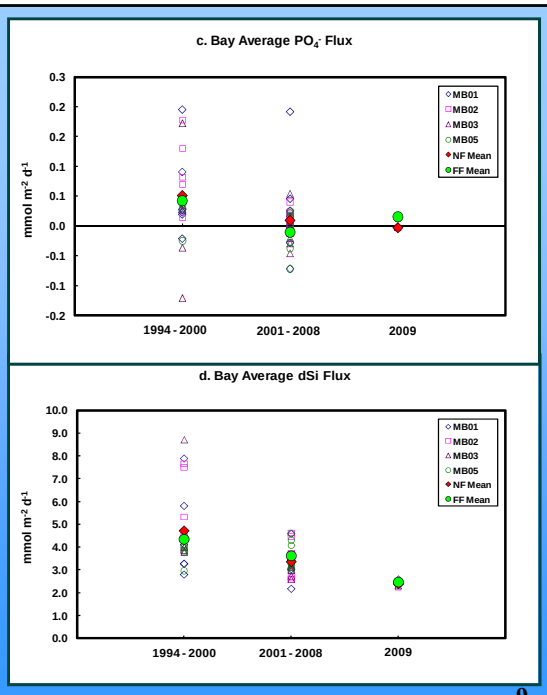
PO_4^- and Si Fluxes for Nearfield and Farfield:

2009 data compared to pre- and post-relocation of the MWRA outfall show no change or a downward trend



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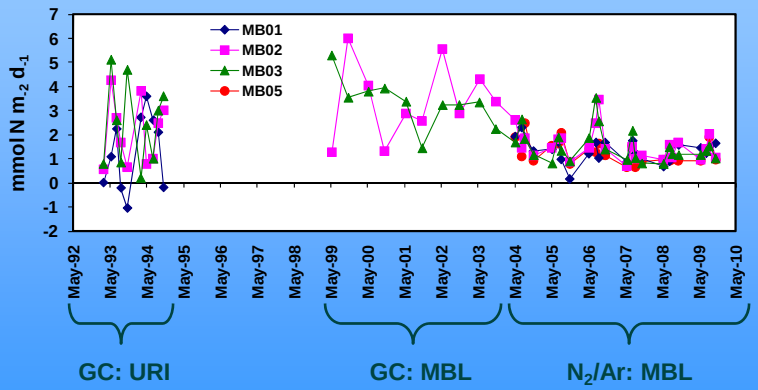
Bay Denitrification 1993-2009



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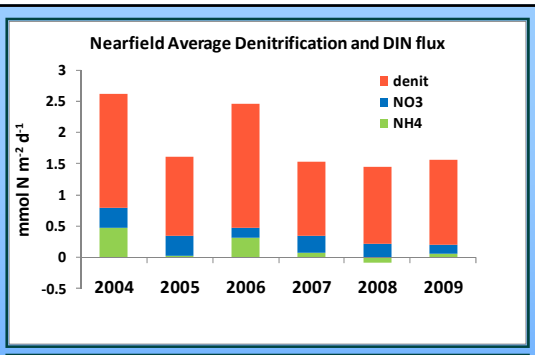
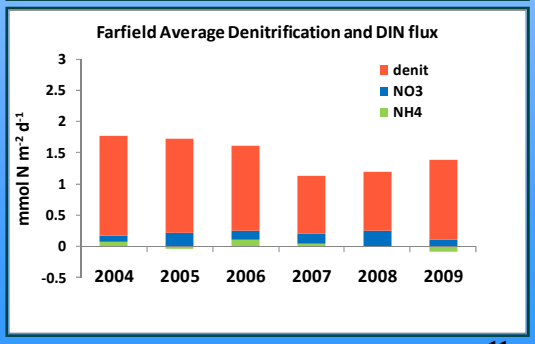
Denitrification compared to DIN Flux, 2004-2009

Denitrification typically accounts for over 70% of the combined flux.

Nearfield: average of three stations (MB01, MB02, MB03), four surveys/year

Farfield: single station (MB05), four surveys/year





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Conclusions for 2009

Massachusetts Bay

No indication of increased OM loading to nearfield

No change in redox conditions

No increase in SOD or nutrient fluxes

No discernible change in denitrification, which remains the major component of remineralized N

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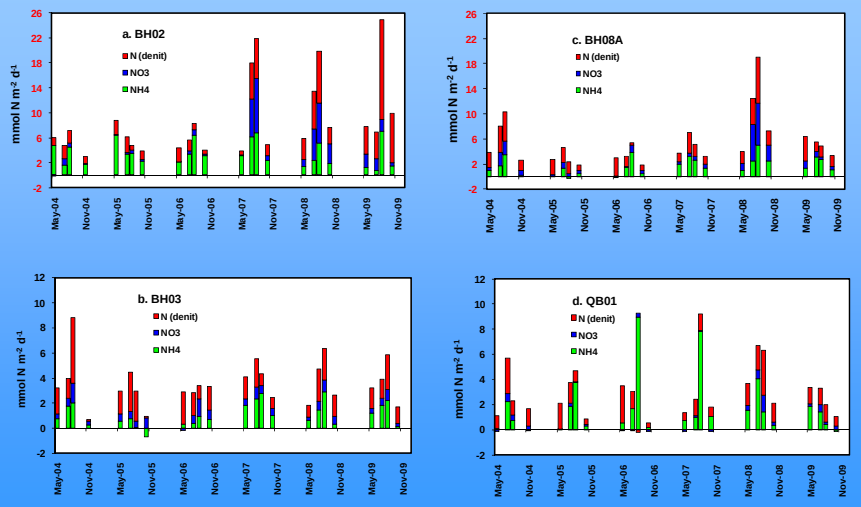
Denitrification compared to DIN Flux, 2004-2009



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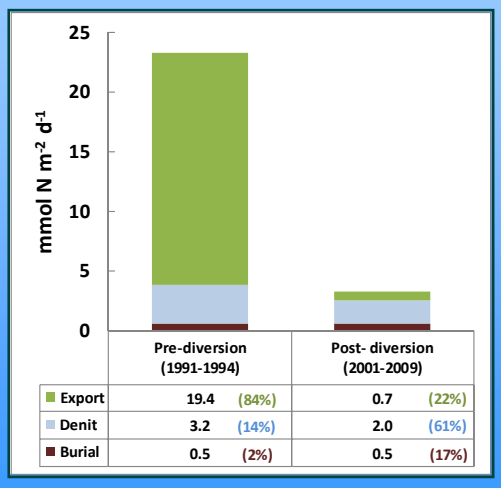
Harbor Annual Nitrogen Budget



	Pre-diversion (1991-1994)		Post- diversion (2001-2009)	
Export	19.4	(84%)	0.7	(22%)
Denit	3.2	(14%)	2.0	(61%)
Burial	0.5	(2%)	0.5	(17%)

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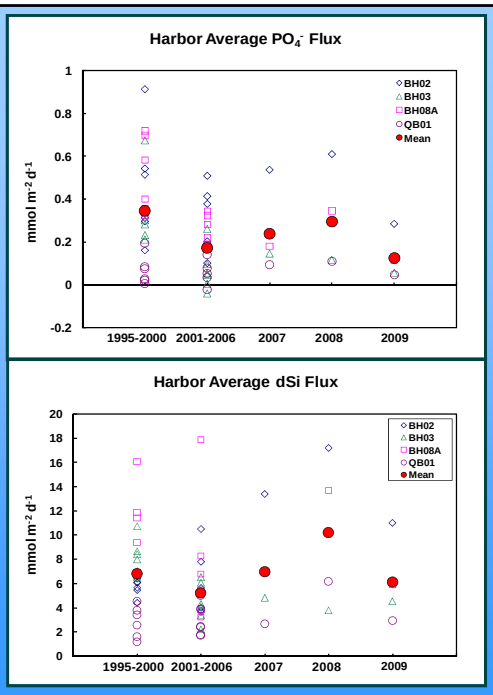
PO_4^- and dSi Fluxes

2009 compared to 2007-2008 and to pre- and post-relocation of the MWRA outfall

Also returning to post-relocation levels



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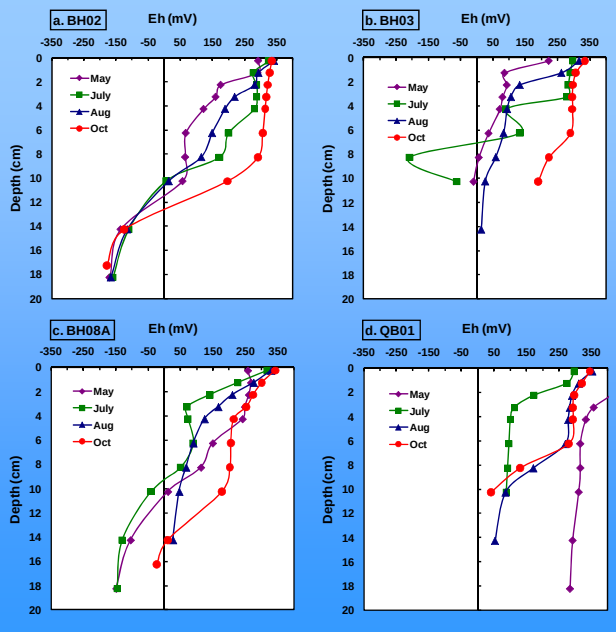
Harbor Eh Profiles 2009



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Conclusions for 2009
Boston Harbor

SOD and nutrient fluxes at Station BH02 and BH08A returning to post-relocation levels from elevated rates observed in 2008

Reduced fluxes related to reduced amphipod abundance

Post-relocation SOD and nutrient fluxes remain lower than baseline

High summer rates of denitrification at Station BH02

Relative importance of denitrification increased with reduction of loading; now accounts for ~60% of the N budget

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Sam Kelsey at the B Buoy, 12/09

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APPENDIX II

FIELD RESULTS

Appendix II. Station names, survey IDs, date of survey, station locations, near-bottom water sampling depth, temperature, dissolved oxygen (D.O.) and salinity for Boston Harbor and Massachusetts Bay stations visited in 2009.

Station	Survey	Date	Latitude	Longitude	Depth (m)	Temp. (°C)	D.O. (mg/L)	Salinity (psu)
BH02	NC091	5/18/2009	42.34348	-71.00211	10	10.1	9.64	31.1
	NC092	7/14/2009	42.34362	-71.00205	9	14.4	8.20	30.4
	NC093	8/11/2009	42.34372	-71.00235	8	15.8	9.18	30.5
	NC094	10/14/2009	42.3436	-71.00191	12	10.9	9.16	31.1
BH03	NC091	5/18/2009	42.33055	-70.96175	8	10.4	9.67	30.7
	NC092	7/14/2009	42.33075	-70.96165	8	16.2	8.21	29.9
	NC093	8/11/2009	42.3306	-70.96181	7	16.7	8.68	30.3
	NC094	10/14/2009	42.3308	-70.96172	10	10.9	9.17	31.1
BH08A	NC091	5/18/2009	42.29080	-70.92226	9	11.1	9.51	31.0
	NC092	7/14/2009	42.29077	-70.92229	7	17.5	8.03	30.0
	NC093	8/11/2009	42.29102	-70.92198	7	16.5	9.81	30.7
	NC094	10/14/2009	42.291	-70.92218	9	11.0	9.21	31.2
QB01	NC091	5/18/2009	42.29348	-70.98766	4	12.1	9.35	30.3
	NC092	7/14/2009	42.29357	-70.98760	3	18.6	7.43	29.6
	NC093	8/11/2009	42.2937	-70.98801	3	17.8	8.65	30.4
	NC094	10/14/2009	42.29355	-70.98787	5	11.0	9.34	30.8
MB01	NC091	5/19/2009	42.40303	-70.83723	32	3.9	9.35	32.4
	NC092	7/13/2009	42.40302	-70.83728	33	7.4	10.05	31.8
	NC093	8/10/2009	42.40298	-70.83735	32	8.2	9.91	31.8
	NC094	10/13/2009	42.40318	-70.83725	33	9.3	6.69	31.7
MB02	NC091	5/19/2009	42.39245	-70.83440	32	3.9	9.36	32.4
	NC092	7/13/2009	42.39248	-70.83430	33	7.7	10.07	31.7
	NC093	8/10/2009	42.39258	-70.83425	33	8.3	9.95	31.7
	NC094	10/13/2009	42.39257	-70.83435	33	9.6	7.15	31.6
MB03	NC091	5/19/2009	42.34775	-70.81638	33	4.2	9.71	32.3
	NC092	7/13/2009	42.34789	-70.81603	32	7.8	9.23	31.7
	NC093	8/10/2009	42.34792	-70.81622	32	8.0	8.65	31.8
	NC094	10/13/2009	42.348	-70.81612	35	9.8	7.25	31.6
MB05	NC091	5/19/2009	42.41642	-70.65179	44	3.8	11.02	32.7
	NC092	7/13/2009	42.41658	-70.65202	41	6.9	10.47	32.1
	NC093	8/10/2009	42.41665	-70.65195	38	8.6	10.37	32.0
	NC094	10/13/2009	42.41645	-70.65197	42	8.8	7.69	31.8