

Mr. Mostafa Mehran
Arkansas Department of Environmental Quality
5301 Northshore Drive
North Little Rock, Arkansas 72118

**Re: Transmittal of Fate and Transport Model Input Values
And Regression Analysis Documentation
Whirlpool Corporation
Fort Smith, Arkansas
EPA No. ARD042755389
AFIN No. 66-00048
CAO LIS 13-202**

Dear Mr. Mehran:

Ramboll Environ US Corporation (Ramboll Environ), on behalf of Whirlpool Corporation, is submitting the attached fate and transport model input values and regression analysis documentation (regression curves, regression slopes and residual graphs). We are submitting the attached information based upon the informal feedback received from the Arkansas Department of Environmental Quality (ADEQ) during our previous discussions and webinar regarding the fate and transport model. Please contact me if you need any additional information or if you have any further questions.

Yours sincerely,



Michael F. Ellis, PE
Principal

D +1 314 590 2967
M +1 314 229 5617
mellis@environcorp.com

cc: T. Hynum – ADEQ
J. Rich - ADEQ
C. Johnson – ADEQ
A. Cusher – ADEQ
B. Karwowski – Whirlpool Corporation
D. Noel – Whirlpool Corporation

Attachments:

Fate and Transport Model Input Values
Regression Analysis Documentation [regression curves, regression slopes and residual graphs for Trichloroethene (Appendix E) and Cis-1,2-Dichloroethene and Vinyl chloride (Appendix D)]

Date February 26, 2016

Ramboll Environ
1807 Park 270 Drive
Suite 320
St. Louis, MO 63146
USA

T +1 314 590 2950
F +1 314 590 2951
www.ramboll-environ.com

NORTH & SOUTH PLUME FATE AND TRANSPORT MODEL INPUTS

Whirlpool Facility - Fort Smith, Arkansas

NORTH PLUME MODEL INPUTS

Groundwater Model (simulates flow direction and groundwater velocity in North Plume area)

Implemented in MODFLOW using Groundwater Vistas (GWV) software.

Steady-state model based on observed groundwater conditions in Q4 2015.

INPUT VALUE	SOURCE
Water Level Elevations	Measured Q4 2015
Constant Head Boundaries	Extrapolated from draft potentiometric surface map based on Q4 2015 water level data, and manually adjusted to correlate with the known, observed direction of groundwater flow.
No Flow Boundaries	Set parallel to groundwater flow direction north of plume and beyond Mill Creek.
Precipitation Recharge	0.0013 feet/day (estimated parameter, ~ 8% of annual 2015 rainfall) applied to unpaved area of model domain.
Hydraulic Conductivity (K)	The range of hydraulic conductivity values used for the flow model was 0.5 to 100 feet/day. Hydraulic conductivity testing has been performed at various locations within the north, south and northeast plumes and the hydraulic conductivities have ranged from 0.1 to 100 feet/day with an overall average hydraulic conductivity of 9 feet/day. Hydraulic conductivities in the north plume have ranged from 0.3 to 100 feet/day with an average hydraulic conductivity in the north plume of 17 feet/day. The hydraulic conductivities used in the flow model are representative of the site conditions. These measured hydraulic conductivities are typical ranges for silty, clayey sand/gravel aquifers.
Layer Elevation/Thickness	The flow model simulates confined aquifer flow in the Basal Transmissive Zone. Lateral groundwater flow in the upper fine grained unit consisting of silty clay and silt and the underlying dry shale is not significant due to the low permeabilities of these layers (perched water has been characterized in the upper fine grained unit; however, this perched water does not significantly contribute to flow based upon monitoring of vertical flow gradients). The top and bottom elevations of the Basal Transmissive Zone were identified from boring logs at each well location. The flow model then interpolated the thickness of the Basal Transmissive Zone between the well locations. The minimum Basal Transmissive Zone thickness was set to 1 foot to facilitate flow within the model.

Transport Model
(simulates fate and transport of TCE in the North Plume)

Implemented in MT3D using Groundwater Vistas (GWV) software.

Simulation period: Q4 2015 to 2065 (50 years).

INPUT VALUE	SOURCE
Groundwater Flow	MODFLOW model
Effective Porosity	Set to 0.2. Site measured values are 0.22 and 0.24 at ITMW-10 and 11 and range from 0.23 to 0.31 at MW-92, MW-93 and MW-172. The value of 0.2 is set beyond the conservative end of the range (i.e. higher effective porosity decreases time to achieve MCL, see sensitivity analysis); actual porosity expected and documented to be higher.
Initial TCE Distribution	Interpolated from sample data, Q4 2015.
Sorption Parameters	
- Bulk Density	1.9 grams per milliliters (g/mL). Average of measurements from clayey gravel and sand samples collected at MW-92, MW-93 and MW-172.
- Organic Carbon Fraction (foc)	0.020. Average of measurements from samples used to calculate bulk density.
- Fraction Organic Carbon Partitioning Coefficient (Koc)	Log Koc = 2.0 – published value [US Geological Survey (USGS)]. Koc = 100 mL/g
- Soil Distribution Coefficient (Kd)	$Kd = foc * Koc = 2 \text{ mL/g}$
Dispersion Coefficients	10 feet along flow path, 1 foot lateral to flow, 0.1 foot vertical. These are low values relative to the size of the plume, since limited spreading of the plume has been observed. Also, since groundwater velocities are low, dispersion is not expected to be significant.
TCE biodegradation half-life rate	Regression analysis was performed to generate the representative average degradation rate within the north plume of -0.15. The fate and transport model was calibrated to match the representative average degradation rate as much as practical at a representative location by adjusting the TCE biodegradation half-life rate as described below. The representative location chosen for the north plume model calibration was MW-46R as it is located away from (and thus unaffected by) the ISCO and ISCR treatment areas and the degradation rate calculated via

INPUT VALUE	SOURCE
	<p>regression analysis for MW-46R is similar to the representative average degradation rate (-0.11 versus -0.15).</p> <p>To calibrate the fate and transport model, the future TCE concentration trend at MW-46R needed to be matched as close as practical to the degradation rate of -0.15. This was accomplished through an iteration process where TCE half-life rates were entered into the model and the slope of future TCE concentrations at the representative location were evaluated to see if they compare to the average degradation rate of -0.15. The best fit identified at MW-46R was a TCE biodegradation half-life rate of 110 days which produced a future TCE concentration trend slope of -0.14. This -0.14 slope represents a slightly lower degradation rate than the target of -0.15 and therefore yields a slightly conservative rate of decline for TCE relative to the average historical trend for the north plume.</p> <p>In the limited ISCR zone at the northeast boundary of the north plume, the TCE biodegradation half-life rate was reduced to 11 days to simulate the known, observed faster reactions occurring at this location.</p>

The fate and transport model demonstrates the TCE concentration in groundwater in the north plume will be reduced to the MCL within approximately 30 to 35 years.

SOUTH PLUME MODEL INPUTS

Groundwater Model (simulates flow direction and groundwater velocity in South Plume area)

Implemented in MODFLOW using Groundwater Vistas (GWV) software.

Steady-state model based on observed groundwater conditions in Q4 2015.

INPUT VALUE	SOURCE
Water Level Elevations	Measured Q4 2015
Constant Head Boundaries	Extrapolated from draft potentiometric surface map based on Q4 2015 water level data, and manually adjusted to correlate with the known, observed direction of groundwater flow.
No Flow Boundaries	Set parallel to groundwater flow direction west of plume and beyond north site boundary.
Precipitation Recharge	None (region mostly paved).
Hydraulic Conductivity (K)	The range of hydraulic conductivity values used for the model was 0.5 to 100 feet/day. Hydraulic conductivity testing has been performed at various locations within the north, south and northeast plumes and the hydraulic conductivities have ranged from 0.1 to 100 feet/day with an overall average hydraulic conductivity of 9 feet/day. Hydraulic conductivities in the south plumes have ranged from 0.1 to 35 feet/day with an overall average hydraulic conductivity of 7 feet/day. Although the hydraulic conductivities used in the flow model are marginally higher than the average hydraulic conductivities measured for the south plume, these hydraulic conductivities remain representative of the site conditions. These measured hydraulic conductivities are typical ranges for silty, clayey sand/gravel aquifers.
Layer Elevation/Thickness	The flow model simulates confined aquifer flow in the Basal Transmissive Zone. Lateral groundwater flow in the upper fine grained unit consisting of silty clay and silt and the underlying dry shale is not significant due to the low permeabilities of these layers (perched water has been characterized in the upper fine grained unit; however, this perched water does not significantly contribute to flow based upon monitoring of vertical flow gradients). The top and bottom elevations of the Basal Transmissive Zone were identified from boring logs at each well location. The flow model then interpolated the thickness of the Basal Transmissive Zone between the well locations. The minimum Basal Transmissive Zone thickness was set to 1 foot to facilitate flow within the model.

Transport Model
(simulates fate and transport of TCE in the South Plume)

Implemented in MT3D using Groundwater Vistas (GWV) software.

Simulation period: Q4 2015 to 2055 (40 years).

INPUT VALUE	SOURCE
Groundwater Flow	MODFLOW model
Effective Porosity	Set to 0.2. Site measured values are 0.22 and 0.24 at ITMW-10 and 11 and range from 0.23 to 0.31 at MW-92, MW-93 and MW-172. The value of 0.2 is set beyond the conservative end of the range (i.e. higher effective porosity decreases time to achieve MCL, see sensitivity analysis); actual porosity expected and documented to be higher.
Initial TCE Distribution	Interpolated from sample data, Q4 2015.
Sorption Parameters	
- Bulk Density	1.9 grams per milliliter (g/mL). Average of measurements from clayey gravel and sand samples collected at MW-92, PW-93 and MW-172.
- Organic Carbon Fraction (foc)	0.020. Average of measurements from samples used to calculate bulk density.
- Fraction Organic Carbon Partitioning Coefficient (Koc)	Log Koc = 2.0 – published value [US Geological Survey (USGS)]. Koc = 100 mL/g
- Soil Distribution Coefficient (Kd)	Kd = foc* Koc = 2 mL/g
Dispersion Coefficients	10 feet along flow path, 1 foot lateral to flow, 0.1 foot vertical. These are low values relative to the size of the plume, since limited spreading of the plume has been observed. Also, since groundwater velocities are low, dispersion is not expected to be significant.
TCE biodegradation half life	Regression analysis was performed to generate the representative average degradation rate within the source area and south plume were -0.04 (ITMW-19 and MW-25) and -0.15 (average degradation rate for ITMW-4, ITMW-5, ITMW-7 ITMW-9 and MW-30), respectively. The fate and transport model was calibrated to match the representative average degradation rate as much as practical in the source area and the distant portions of the south plume by adjusting the TCE biodegradation half-life rate as described below. The representative location chosen for model calibration for the source area was ITMW-19 and MW-25. The long term data trends at ITMW-19

INPUT VALUE	SOURCE
	<p>and MW-25 prior to ISCO treatments both exhibited slopes of -0.04 (decreasing concentrations for MW-25 and ITMW-19 are also depicted on Figure 4-4 in the Two Year Technical Review Report) (the slope MW-25 is -0.67 if the data from November 2010 through May 2014 is evaluated, but selection of the -0.04 slope adds further conservatism to the regression analysis and subsequent fate and transport modeling). To calibrate the fate and transport model for the south plume at the source area, the future TCE concentration trend at ITMW-19 and MW-25 needed to be matched as close as practical to the degradation rate of -0.04. This was accomplished through an iteration process where TCE half-life rates were entered into the model and the slope of future TCE concentrations at the representative location were evaluated to see if they compare to the average degradation rate of -0.04. The best fit identified a TCE biodegradation half-life rate of 300 days which produced a future TCE concentration trend slope of -0.04 at ITMW-19 and MW-25. This -0.04 slope is a match relative to the average historical trend for the source area of the south plume.</p> <p>As described above, monitoring wells ITMW-4, ITMW-5, ITMW-7 ITMW-9 and MW-30 exhibited an average slope of -0.15 through regression analysis. To calibrate the fate and transport model for the remainder of the south plume, the future TCE concentration trends at these southern wells needed to be matched as close as practical to the degradation rate of -0.15. This was accomplished through an iteration process where TCE half-life rates were entered into the model and the slope of future TCE concentrations at the representative location were evaluated to see if they compare to the average degradation rate of -0.15. The best fit identified a TCE biodegradation half-life rate of 150 days which produced a future TCE concentration trend slope of -0.09. This -0.09 slope represents a slightly lower degradation rate than the target of -0.15 and therefore yields a slightly conservative rate of decline for TCE relative to the average historical trend for the south plume.</p>

The fate and transport model demonstrates groundwater in the south plume will not migrate offsite beyond the property boundaries at concentrations above the MCL.

APPENDIX E

Regression Analysis

Groundwater sample results for trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride (VC) at individual monitoring wells located in the northern plume and southern plume were used to evaluate the attenuation of these constituents. A stepwise approach was used as follows:

- The concentrations of TCE, cis-1,2-DCE and VC in each individual well from historic sampling events through the fourth quarter 2015 were compiled for this evaluation (the TCE data is provided in the Appendix and the cis-1,2-DCE and VC data are provided in Appendix D).
- A specific maximum detection limit was set for the analytes at each well based on the analyte's highest recorded detection limit historically recorded at that well. A consistent detection limit is required for all samples to obtain a valid regression analysis.
- Chemical concentrations that were recorded as non-detect or were detected at lower than one-half of the specific maximum detection limit were modified to the one-half the specific maximum detection limit value.
- These values, the associated sample dates, and the frequency of detection (FOD) were entered into a monitored natural attenuation (MNA) spreadsheet for each individual well that automated the regression calculations.
- The regression model for each constituent was not calculated if the FOD for that constituent was below 50%.
- The regression of log transformed concentration data was used to calculate the slope, determine if the slope was significantly different from zero, and determine regression residuals (difference in concentrations comparing the actual data with the predicted concentration from the trend line see the concentration trend charts and the respective residual graphs for specific wells in the individual well analyses section).

The output of this evaluation includes a regression line, an estimate of the slope, and a residual graph of the three analytes for each well (TCE, cis-1,2-DCE and VC). The regression was used to determine if the trend at the well being evaluated for a particular chemical of interest is increasing, not significant, or decreasing. The residual graphs from the regression were evaluated to verify if the modeled values fit the measured data at each well and meet the statistical assumptions of linear regression. The regression residuals from valid models produced residuals plots with random deviations from the measured values, homogenous variances, and no temporal trends in the residuals (regression residuals consist of the difference between the actual concentration and the predicted concentration from the trend line, and the results of this comparison are provided on the residual graphs). Poor, or invalid models present residual plots with systematic or structured regression residuals¹.

Wells that show impacts from the ISCO or ISCR injections were further assessed by excluding data from sampling events after the injections to address the likelihood that degradation rates

¹ If the residual data points in the residual graph are randomly dispersed in the graph, a linear regression model is appropriate; otherwise, a non-linear model is more appropriate.

are temporarily enhanced by ISCO and ISCR treatment and therefore result in inaccurate estimates of the baseline rate of reduction. This adds a measure of conservatism to the model in that Site data with faster degradation rates are not included in this analysis. Data from some wells were further refined by determining the maximum historic concentration of a respective analyte and only including data from that specific sampling event forward to provide a more valid estimate of current degradation rates.

The goal of this regression analysis and the associated refinements was to estimate slopes that characterize the 'average or representative' rate of reduction in the concentrations so that the representative slope can be used to determine a TCE degradation rate constant or half-life. The refinements are designed to target the time period that will best reflect current conditions and to limit the influence of the ISCO injections and other transient processes that confound the estimate.

The historical contaminant concentration trends at a given location are a function of various factors: groundwater velocity, flow direction, retardation, concentration distribution, reaction rates, etc. For the MNA analysis, the regression lines were fit to measured Site data and the slopes reflect the combined influence of all these Site-specific factors. The data evaluated for each well, plots of the data points, fitted line, regression residuals for each line, calculated slope, and a short description of the results were compiled and are included in this appendix on a well by well basis. The slopes used to calculate the northern and southern plume degradation rates are discussed below.

Northern Plume Degradation Rate:

To represent the overall representative TCE degradation rate for the North Plume, the regression slope values for wells in the North Plume with declining concentration trends were averaged resulting in an average value of -0.15. The slope values used for this calculation are shown below:

Location	Slope [a]
MW-23	-0.13
MW-24	-0.08
MW-32	-0.13
MW-33	-0.08
MW-34	-0.03
MW-35R	-0.15
MW-41	-0.14
MW-46R	-0.11
MW-56	-0.48
MW-58	-0.06
MW-65	-0.16

RW-69	-0.09
MW-70	-0.16
IW-73	-0.27
IW-74	-0.02
IW-76	-0.28
IW-78	-0.21
IW-79	-0.10
IW-80	-0.11
Max	-0.48
Min	-0.02
Average	-0.15

[a] Slopes in units of $\ln(\mu\text{g/l})/\text{year}$

Southern Plume Degradation Rate:

For evaluation of the South Plume, the plume extent was divided into two regions - one region encompassing the source area where ISCO treatment was performed consisting of monitoring wells ITMW-11 to ITMW-15, ITMW-18, ITMW-19 and MW-25, and one region covering the remainder of the plume. The regression trends near the source area were temporally variable and difficult to generalize as a result of ISCO treatments and/or highly variable monitoring results prior to ISCO treatment. The long term data trends at MW-25 and ITMW-19 prior to ISCO treatments (both slopes of -0.04) were selected as representative of the source area² (decreasing concentrations for MW-25 and ITMW-19 are also depicted on Figure 4-4).

Since there are few downgradient wells near the tail of the plume with histories of detected values or long-term data records, the model concentration trends were set to not exceed the average of predicted degradation rates at downgradient wells ITMW-4, 5, 7, 9 and MW-30, listed below. The average of these rates based on regression trends using all data, or maximum refined analysis interpretation where applicable, produced a regression slope of -0.15, equal to the North Plume average.

Location	Slope [a]
ITMW-4	-0.11

² The regression analysis for MW-25 indicates a slope of -0.04 for the data from February 1999 through May 2014 (i.e. prior to ISCO at this location), and this is the slope used for comparison for selection of the TCE biodegradation half-life value for fate and transport modeling. MW-25 was also assessed by selecting a maximum historic concentration (i.e. 270 mg/L in November 2010) followed by performance of regression analysis for the data set from November 2010 through May 2014 which produced a regression slope of -0.67 indicating a more significant rate of degradation in the source area prior to ISCO. However, this “concentration peak” at MW-25 is not distinctive and did not represent a significant change above the trend line; and therefore, the data may not have represented a real peak and could have been the result of natural variation. The more conservative regression analysis and assessment of residuals considering the February 1999 through May 2014 data set has been utilized for regression analysis and subsequent fate and transport modeling.

ITMW-5	-0.05
ITMW-7	-0.40
ITMW-9	-0.19
MW-30	-0.02

Average **-0.15**

[a] Slopes in units of $\ln(\mu\text{g/l})/\text{year}$

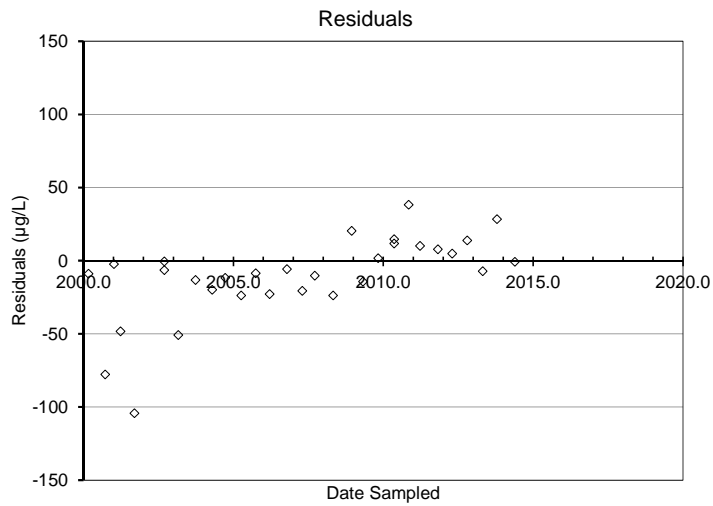
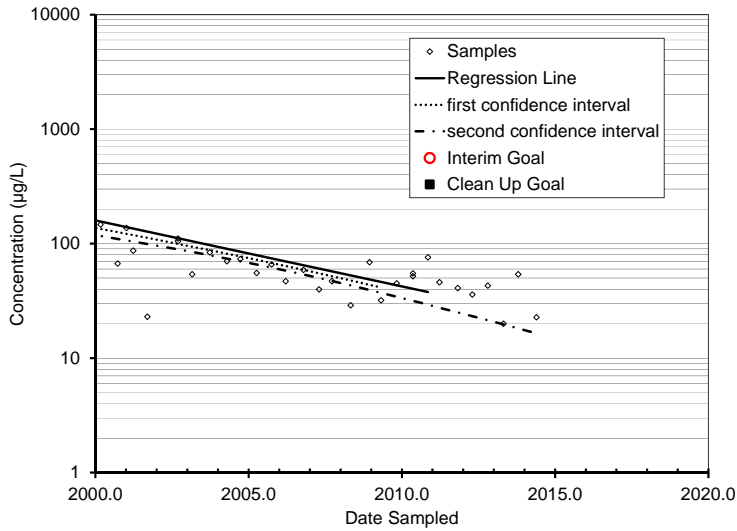
Individual Well Analyses

North Plume, Well MW-23

Date	Value	Included in Regression
12/1/1996	210	Yes
5/1/1997	2400	Yes
2/1/1999	350	Yes
2/1/1999	440	Yes
3/1/2000	147	Yes
9/21/2000	67	Yes
1/5/2001	137	Yes
3/26/2001	87	Yes
9/11/2001	23	Yes
9/11/2002	111	Yes
9/11/2002	105	Yes
2/27/2003	54	Yes
9/25/2003	83.9	Yes
4/15/2004	70.3	Yes
9/22/2004	73.4	Yes
4/5/2005	55.5	Yes
9/29/2005	65.8	Yes
3/17/2006	47.1	Yes
10/14/2006	59	Yes
4/19/2007	39.9	Yes
9/19/2007	47	Yes
4/29/2008	29	Yes
12/10/2008	69	Yes
4/27/2009	32	Yes
10/29/2009	45	Yes
5/12/2010	55	Yes
5/12/2010	52	Yes
11/5/2010	76	Yes
3/23/2011	46	Yes
10/27/2011	41	Yes
4/18/2012	36	Yes
10/19/2012	43	Yes
4/25/2013	20	Yes
10/16/2013	54	Yes
5/22/2014	22.8	Yes
7/8/2014	27.8	No
9/12/2014	62.1	No
10/23/2014	189	No
1/15/2015	115	No
4/14/2015	57.5	No
7/23/2015	37.8	No
10/8/2015	0.65	No

North Plume, Well MW-23

Date Range: 12/1/1996 to 5/22/2014 (ISCO Impacts Excluded)



FOD 100%

Slope -0.13

p-value < 0.001

Regression residuals are appropriately distributed

Slope is negative

Regression fit is acceptable

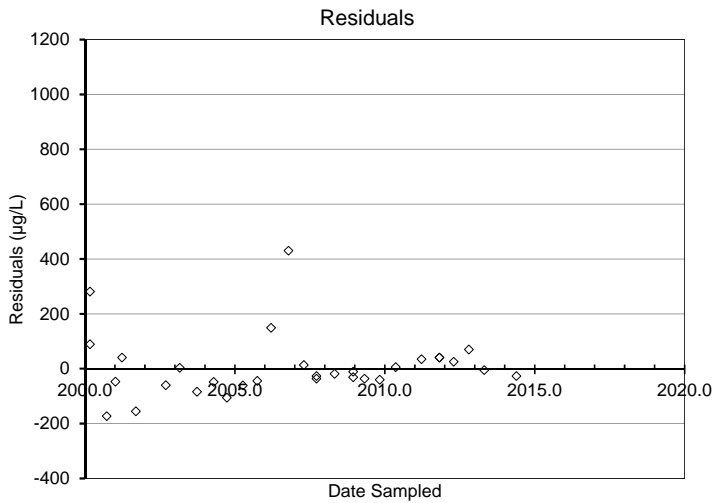
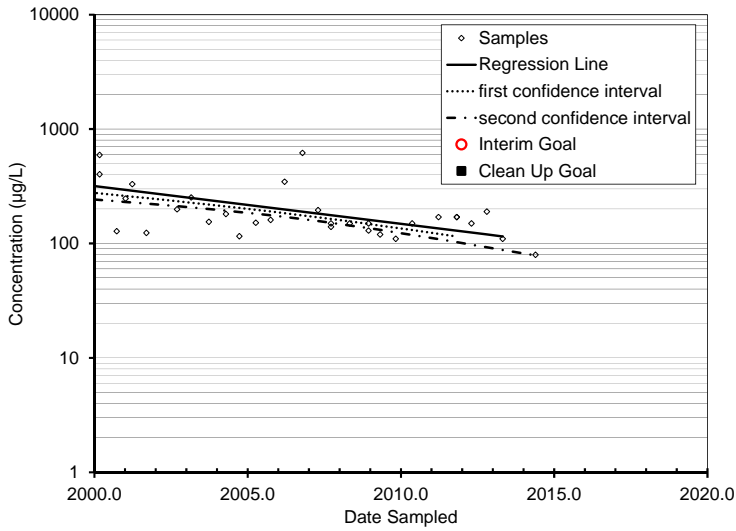
Slope used to estimate degradation rate

North Plume, Well MW-24

Date	Value	Included in Regression
2/1/1999	1400	Yes
3/1/2000	403	Yes
3/1/2000	595	Yes
9/21/2000	128	Yes
1/5/2001	247	Yes
3/26/2001	330	Yes
9/11/2001	124	Yes
9/11/2002	199	Yes
2/27/2003	253	Yes
9/25/2003	155	Yes
4/15/2004	181	Yes
9/23/2004	116	Yes
4/6/2005	152	Yes
9/29/2005	161	Yes
3/16/2006	347	Yes
10/14/2006	620	Yes
4/19/2007	196	Yes
9/20/2007	140	Yes
9/20/2007	150	Yes
4/29/2008	150	Yes
12/10/2008	150	Yes
12/10/2008	130	Yes
4/27/2009	120	Yes
10/29/2009	110	Yes
5/12/2010	150	Yes
3/23/2011	170	Yes
10/27/2011	170	Yes
10/27/2011	170	Yes
4/18/2012	150	Yes
10/19/2012	190	Yes
4/25/2013	110	Yes
5/22/2014	79.7	Yes
7/8/2014	102	No
9/12/2014	55.7	No
10/23/2014	33.1	No
1/15/2015	26.9	No
4/16/2015	18.8	No
7/23/2015	178	No
10/8/2015	44.1	No

North Plume, Well MW-24

Date Range: 2/2/1999 to 5/22/2014 (ISCO Impacts Excluded)



FOD 100%

Slope -0.076

p-value < 0.001

Regression residuals are appropriately distributed

Slope is negative

Regression fit is acceptable

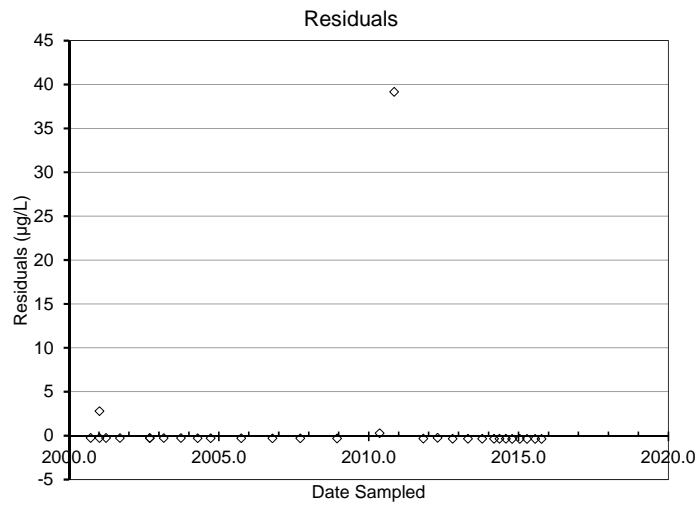
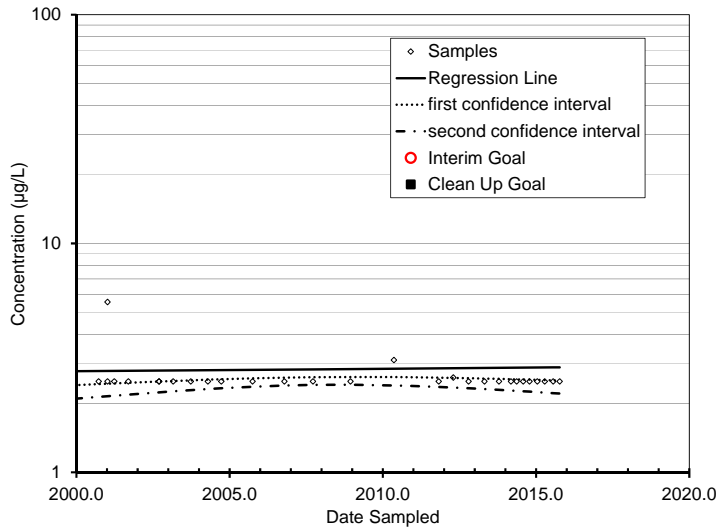
Slope used to estimate degradation rate

North Plume, Well MW-27

Date	Value	Included in Regression
12/7/1999	2.5	Yes
12/9/1999	2.5	Yes
9/21/2000	2.5	Yes
1/5/2001	2.5	Yes
1/5/2001	5.55	Yes
3/26/2001	2.5	Yes
9/11/2001	2.5	Yes
9/11/2002	2.5	Yes
9/11/2002	2.5	Yes
2/27/2003	2.5	Yes
9/25/2003	2.5	Yes
4/15/2004	2.5	Yes
9/22/2004	2.5	Yes
9/29/2005	2.5	Yes
10/14/2006	2.5	Yes
9/19/2007	2.5	Yes
12/10/2008	2.5	Yes
5/12/2010	3.1	Yes
11/5/2010	42	Yes
10/27/2011	2.5	Yes
4/18/2012	2.6	Yes
10/18/2012	2.5	Yes
4/24/2013	2.5	Yes
10/15/2013	2.5	Yes
3/7/2014	2.5	Yes
5/13/2014	2.5	Yes
7/30/2014	2.5	Yes
10/14/2014	2.5	Yes
1/14/2015	2.5	Yes
4/13/2015	2.5	Yes
7/22/2015	2.5	Yes
10/7/2015	2.5	Yes

North Plume, Well MW-27

Date Range: 12/7/1999 to 10/7/2015



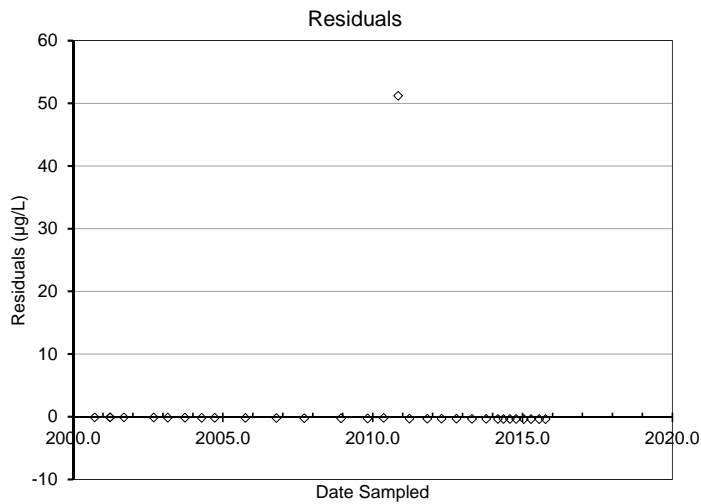
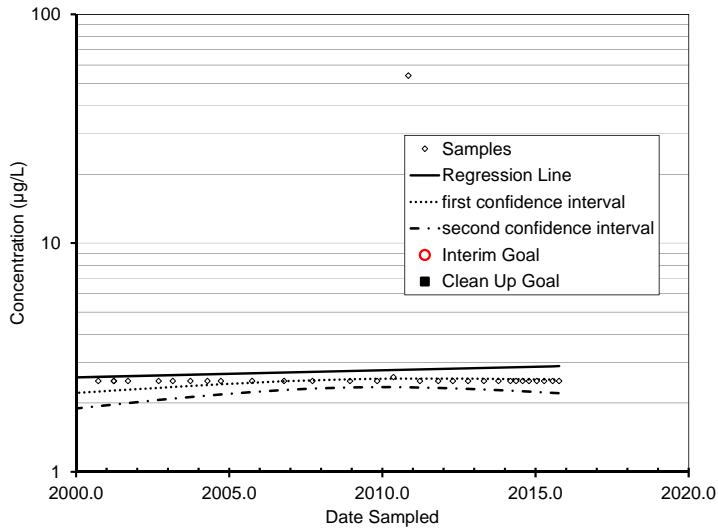
FOD 30%
Slope not calculated
p-value not calculated
Regression not calculated due to low FOD (< 50%)

North Plume, Well MW-28

Date	Value	Included in Regression
12/9/1999	2.5	Yes
12/9/1999	2.5	Yes
9/21/2000	2.5	Yes
3/27/2001	2.5	Yes
3/27/2001	2.5	Yes
9/11/2001	2.5	Yes
9/11/2002	2.5	Yes
2/27/2003	2.5	Yes
9/25/2003	2.5	Yes
4/15/2004	2.5	Yes
9/22/2004	2.5	Yes
9/30/2005	2.5	Yes
10/14/2006	2.5	Yes
9/19/2007	2.5	Yes
12/10/2008	2.5	Yes
10/29/2009	2.5	Yes
5/12/2010	2.6	Yes
11/5/2010	54	Yes
3/23/2011	2.5	Yes
10/27/2011	2.5	Yes
4/19/2012	2.5	Yes
10/17/2012	2.5	Yes
4/24/2013	2.5	Yes
10/15/2013	2.5	Yes
3/6/2014	2.5	Yes
5/13/2014	2.5	Yes
7/30/2014	2.5	Yes
10/14/2014	2.5	Yes
1/14/2015	2.5	Yes
4/13/2015	2.5	Yes
7/22/2015	2.5	Yes
10/7/2015	2.5	Yes

North Plume, Well MW-28

Date Range: 12/9/1999 to 10/7/2015



FOD=13%

Slope not calculated due to low FOD

p-value = Not calculated

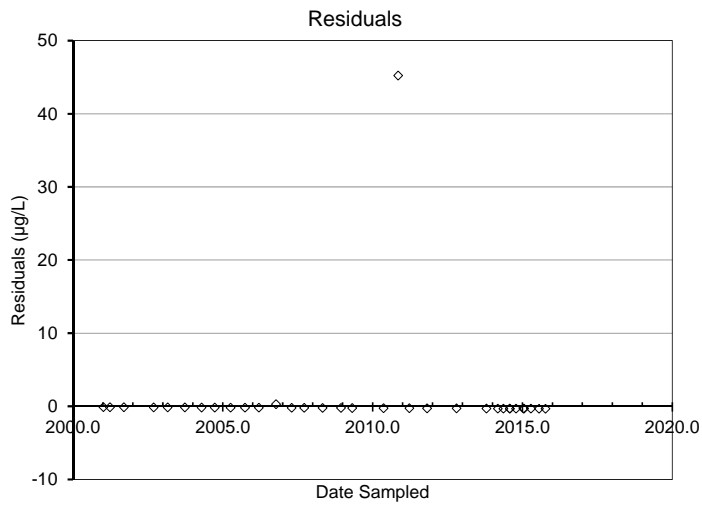
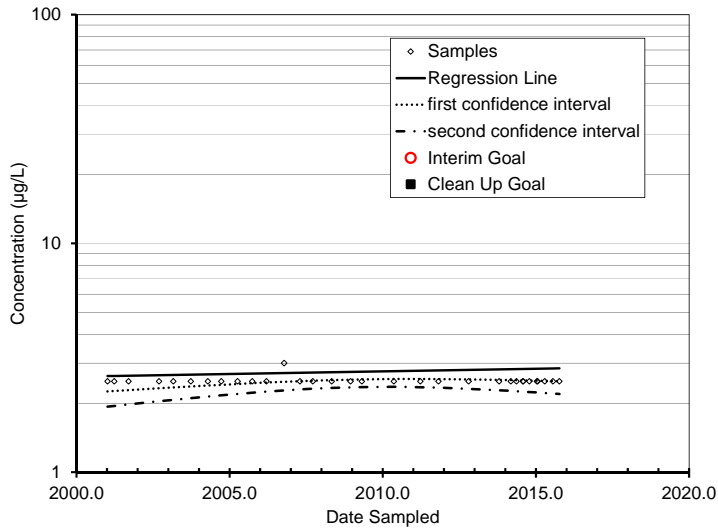
Regression not calculated due to low FOD (< 50%)

North Plume, Well MW-31

Date	Value	Included in Regression
1/5/2001	2.5	Yes
3/26/2001	2.5	Yes
9/13/2001	2.5	Yes
9/11/2002	2.5	Yes
2/28/2003	2.5	Yes
9/25/2003	2.5	Yes
4/15/2004	2.5	Yes
9/23/2004	2.5	Yes
4/5/2005	2.5	Yes
9/27/2005	2.5	Yes
3/15/2006	2.5	Yes
10/11/2006	3	Yes
4/19/2007	2.5	Yes
9/18/2007	2.5	Yes
4/30/2008	2.5	Yes
12/11/2008	2.5	Yes
4/25/2009	2.5	Yes
5/12/2010	2.5	Yes
11/7/2010	48	Yes
3/23/2011	2.5	Yes
10/26/2011	2.5	Yes
10/19/2012	2.5	Yes
10/18/2013	2.5	Yes
3/6/2014	2.5	Yes
5/13/2014	2.5	Yes
7/30/2014	2.5	Yes
7/30/2014	2.5	Yes
10/14/2014	2.5	Yes
1/12/2015	2.5	Yes
1/19/2015	2.5	Yes
4/14/2015	2.5	Yes
7/21/2015	2.5	Yes
10/6/2015	2.5	Yes

North Plume, Well MW-31

Date Range: 1/5/2001 to 10/6/2015



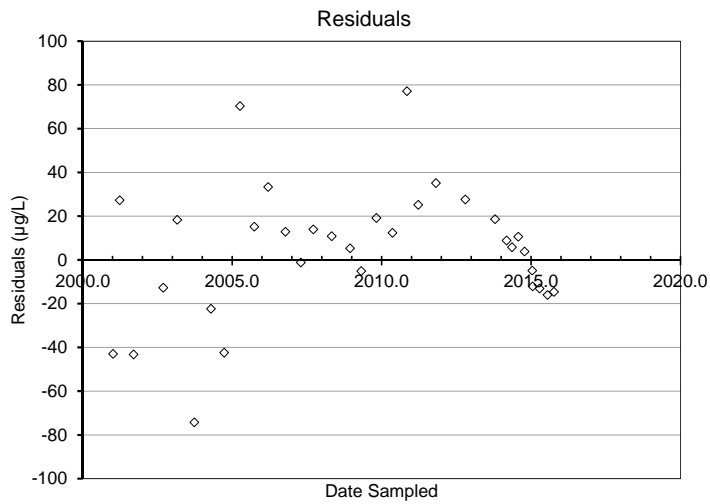
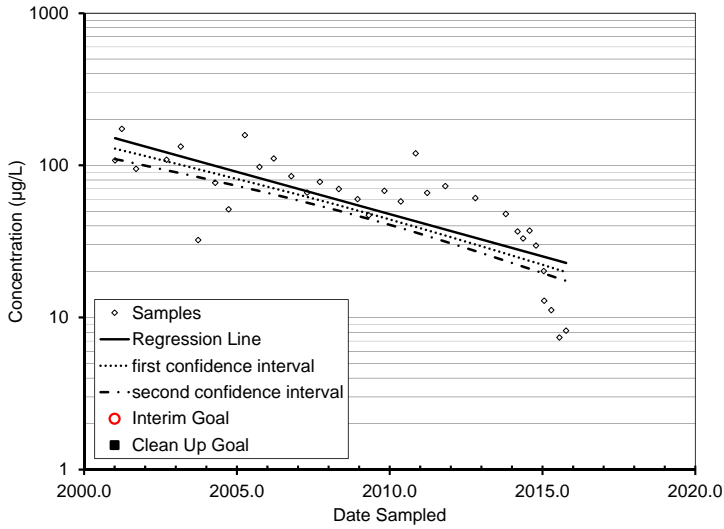
FOD= 9%
Slope not calculated
p-value not calculated
Regression not calculated due to low FOD (< 50%)

North Plume, Well MW-32

Date	Value	Included in Regression
1/5/2001	108	Yes
3/27/2001	174	Yes
9/13/2001	95	Yes
9/11/2002	109	Yes
2/28/2003	133	Yes
9/25/2003	32.3	Yes
4/15/2004	76.9	Yes
9/23/2004	51.4	Yes
4/5/2005	158	Yes
9/27/2005	97.6	Yes
3/15/2006	111	Yes
10/12/2006	85	Yes
4/19/2007	66.3	Yes
9/18/2007	78	Yes
4/30/2008	70	Yes
12/11/2008	60	Yes
4/25/2009	47	Yes
10/28/2009	68	Yes
5/12/2010	58	Yes
11/6/2010	120	Yes
3/24/2011	66	Yes
10/26/2011	73	Yes
10/19/2012	61	Yes
10/18/2013	48	Yes
3/8/2014	36.8	Yes
5/13/2014	33.1	Yes
7/29/2014	37.2	Yes
10/14/2014	29.7	Yes
1/14/2015	20.2	Yes
1/19/2015	12.9	Yes
4/15/2015	11.2	Yes
7/11/2015	7.4	Yes
10/7/2015	8.2	Yes

North Plume, Well MW-32

Date Range: 1/5/2001 to 10/7/2015



FOD 100%

Slope -0.13

p-value < 0.001

Slope is negative

Regression fit is acceptable

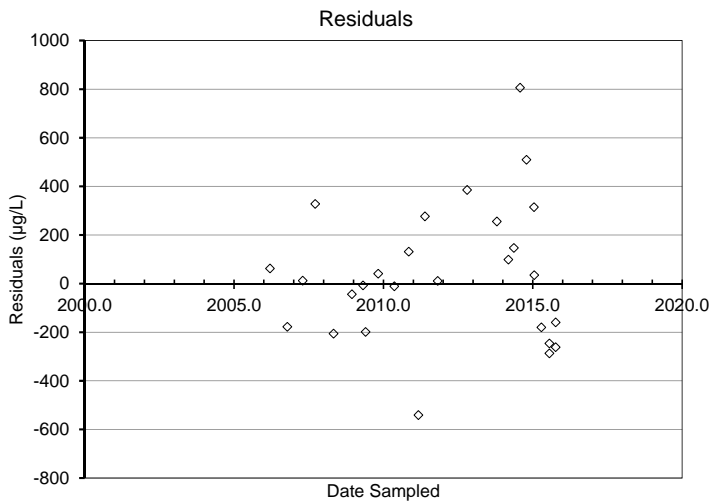
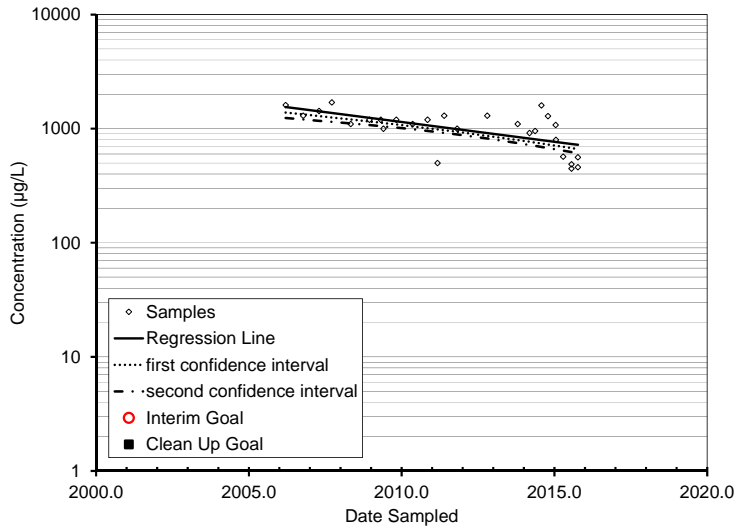
Slope used to estimate degradation rate

North Plume, Well MW-33

Date	Value	Included in Regression
1/5/2001	120	No
3/27/2001	260	No
9/13/2001	310	No
9/11/2002	450	No
2/28/2003	274	No
9/25/2003	198	No
4/15/2004	871	No
9/23/2004	798	No
4/5/2005	1430	No
9/27/2005	1030	No
3/15/2006	1610	Yes
10/12/2006	1300	Yes
4/19/2007	1430	Yes
9/18/2007	1700	Yes
4/30/2008	1100	Yes
12/11/2008	1200	Yes
4/25/2009	1200	Yes
5/27/2009	1000	Yes
10/28/2009	1200	Yes
5/12/2010	1100	Yes
11/6/2010	1200	Yes
3/4/2011	500	Yes
5/23/2011	1300	Yes
10/26/2011	1000	Yes
10/19/2012	1300	Yes
10/18/2013	1100	Yes
3/8/2014	918	Yes
5/14/2014	954	Yes
7/29/2014	1600	Yes
10/15/2014	1290	Yes
1/14/2015	1080	Yes
1/18/2015	799	Yes
4/15/2015	570	Yes
7/22/2015	447	Yes
7/22/2015	488	Yes
10/8/2015	562	Yes
10/8/2015	460	Yes

North Plume, Well MW-33

Date Range: 3/15/2006 to 10/8/2015

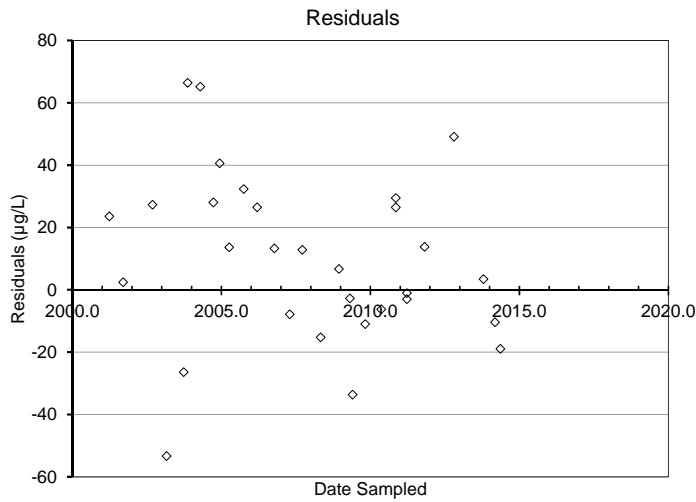
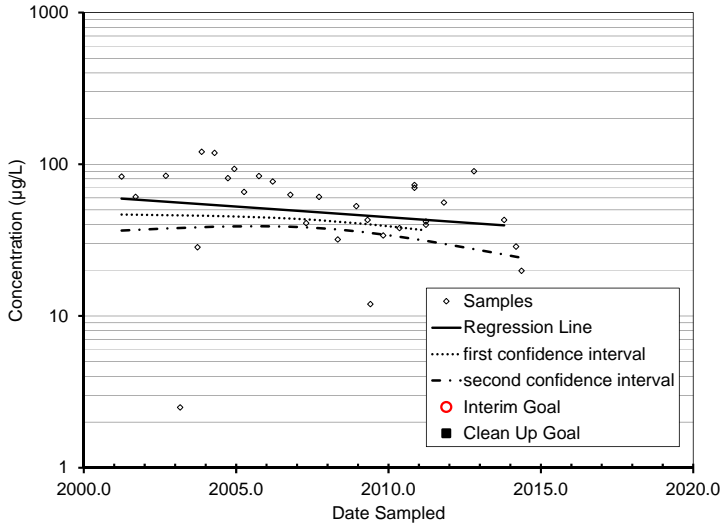


FOD 100%
Slope -0.08
p-value < 0.001
Slope is negative
Regression fit is acceptable
Slope used to estimate degradation rate

North Plume, Well MW-34

Date	Value	Included in Regression
3/28/2001	83	Yes
9/13/2001	61	Yes
9/9/2002	84	Yes
2/28/2003	2.5	Yes
9/25/2003	28.4	Yes
11/14/2003	121	Yes
4/15/2004	119	Yes
9/23/2004	81.1	Yes
12/9/2004	93.3	Yes
4/5/2005	65.8	Yes
9/30/2005	83.7	Yes
3/14/2006	77.1	Yes
10/11/2006	63	Yes
4/18/2007	41	Yes
9/19/2007	61	Yes
4/30/2008	32	Yes
12/10/2008	53	Yes
4/24/2009	43	Yes
5/27/2009	12	Yes
10/28/2009	34	Yes
5/12/2010	38	Yes
11/7/2010	70	Yes
11/7/2010	73	Yes
3/24/2011	40	Yes
3/24/2011	42	Yes
10/26/2011	56	Yes
10/20/2012	90	Yes
10/17/2013	43	Yes
3/8/2014	28.7	Yes
5/13/2014	19.9	Yes
7/29/2014	78.2	No
10/15/2014	47.7	No
1/13/2015	22	No
4/14/2015	13.8	No
7/21/2015	3.5	No
10/8/2015	4.5	No

North Plume, Well MW-34
 Date Range: 3/28/2001 to 5/13/2014



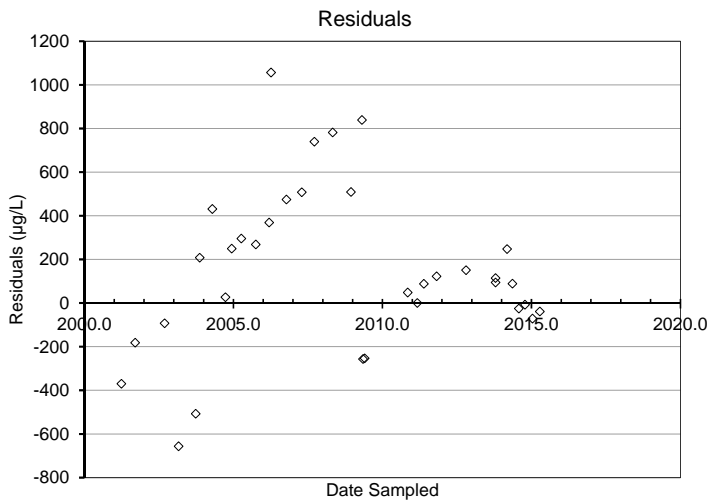
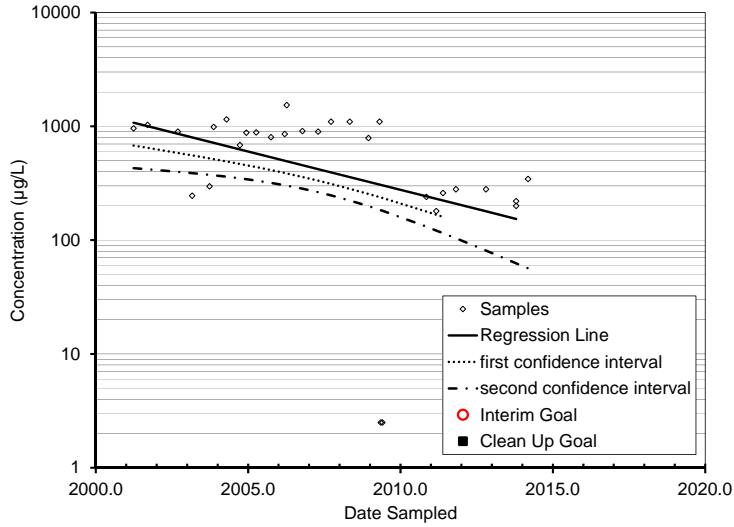
FOD 97%
 Slope -0.032
 p-value > 0.05
 Slope is not significant
 Residuals are acceptable
 Slope used to estimate degradation rate

North Plume, Well MW-35R

Date	Value	Included in Regression
3/28/2001	960	Yes
9/13/2001	1030	Yes
9/9/2002	900	Yes
2/28/2003	246	Yes
9/25/2003	297	Yes
11/14/2003	990	Yes
4/15/2004	1150	Yes
9/23/2004	685	Yes
12/9/2004	880	Yes
4/6/2005	886	Yes
9/30/2005	804	Yes
3/14/2006	858	Yes
4/6/2006	1540	Yes
10/11/2006	910	Yes
4/18/2007	900	Yes
9/19/2007	1100	Yes
4/30/2008	1100	Yes
12/11/2008	790	Yes
4/24/2009	1100	Yes
5/7/2009	2.5	Yes
5/27/2009	2.5	Yes
11/5/2010	240	Yes
3/4/2011	180	Yes
5/23/2011	260	Yes
10/25/2011	280	Yes
10/20/2012	280	Yes
10/17/2013	200	Yes
10/17/2013	220	Yes
3/8/2014	345	Yes
5/13/2014	183	No
7/30/2014	64.7	No
10/14/2014	79.2	No
1/13/2015	10.9	No
4/14/2015	39.5	No
7/21/2015	33.7	No
10/7/2015	15.4	No

North Plume, Well MW-35R

Date Range: 3/28/2001 to 3/8/2014



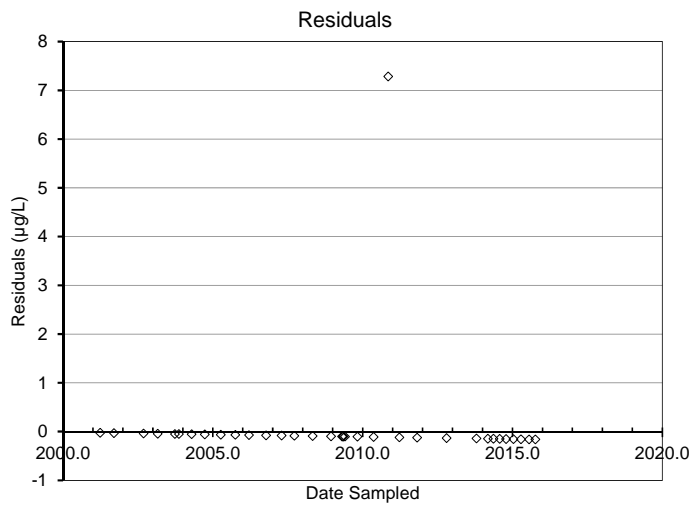
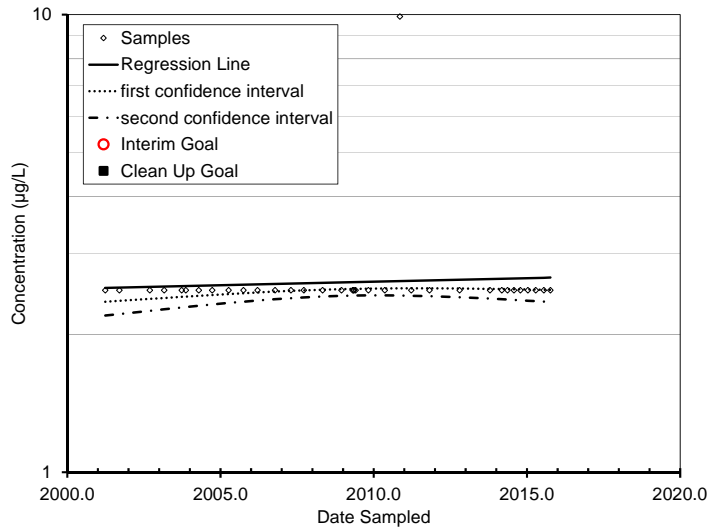
FOD 94%
Slope -0.15
p-value 0.043
Slope is negative
Regression fit is acceptable
Slope used to estimate degradation rate

North Plume, Well MW-36

Date	Value	Included in Regression
3/28/2001	2.5	Yes
9/13/2001	2.5	Yes
9/9/2002	2.5	Yes
2/28/2003	2.5	Yes
9/25/2003	2.5	Yes
11/14/2003	2.5	Yes
4/15/2004	2.5	Yes
9/23/2004	2.5	Yes
4/6/2005	2.5	Yes
9/30/2005	2.5	Yes
3/17/2006	2.5	Yes
10/11/2006	2.5	Yes
4/18/2007	2.5	Yes
9/20/2007	2.5	Yes
4/30/2008	2.5	Yes
12/11/2008	2.5	Yes
4/24/2009	2.5	Yes
5/7/2009	2.5	Yes
5/8/2009	2.5	Yes
5/28/2009	2.5	Yes
10/28/2009	2.5	Yes
5/12/2010	2.5	Yes
11/7/2010	9.9	Yes
3/24/2011	2.5	Yes
10/26/2011	2.5	Yes
10/19/2012	2.5	Yes
10/17/2013	2.5	Yes
3/6/2014	2.5	Yes
5/13/2014	2.5	Yes
7/29/2014	2.5	Yes
10/14/2014	2.5	Yes
1/12/2015	2.5	Yes
4/14/2015	2.5	Yes
7/20/2015	2.5	Yes
10/6/2015	2.5	Yes

North Plume, Well MW-36

Date Range: 3/28/2001 to 10/6/2015



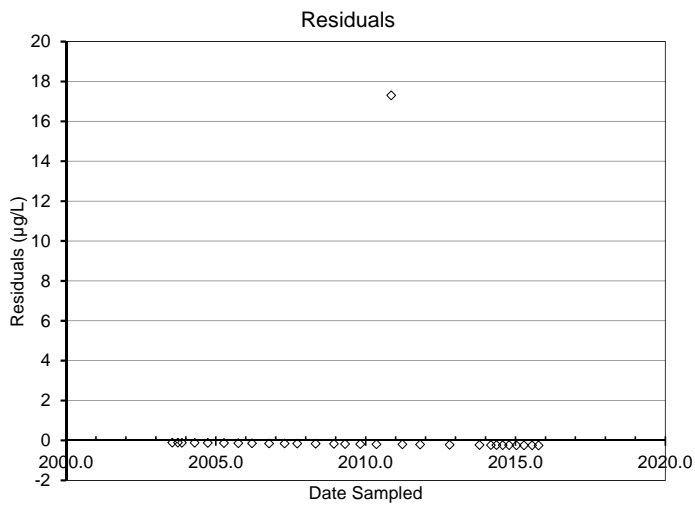
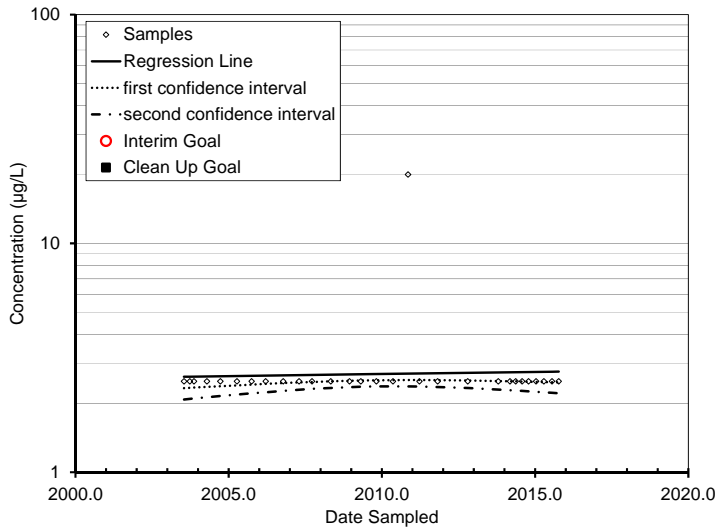
FOD 9%
Slope not calculated
p-value not calculated
Regression not calculated due to low FOD (< 50%)

North Plume, Well MW-39

Date	Value	Included in Regression
7/18/2003	2.5	Yes
9/25/2003	2.5	Yes
11/14/2003	2.5	Yes
4/15/2004	2.5	Yes
9/23/2004	2.5	Yes
4/8/2005	2.5	Yes
9/30/2005	2.5	Yes
3/17/2006	2.5	Yes
10/11/2006	2.5	Yes
4/18/2007	2.5	Yes
9/19/2007	2.5	Yes
4/30/2008	2.5	Yes
12/9/2008	2.5	Yes
4/24/2009	2.5	Yes
10/27/2009	2.5	Yes
5/11/2010	2.5	Yes
11/7/2010	20	Yes
3/24/2011	2.5	Yes
10/26/2011	2.5	Yes
10/19/2012	2.5	Yes
10/18/2013	2.5	Yes
3/6/2014	2.5	Yes
5/13/2014	2.5	Yes
7/29/2014	2.5	Yes
10/13/2014	2.5	Yes
1/12/2015	2.5	Yes
4/14/2015	2.5	Yes
7/20/2015	2.5	Yes
10/7/2015	2.5	Yes

North Plume, Well MW-39

Date Range: 7/18/2003 to 10/7/2015



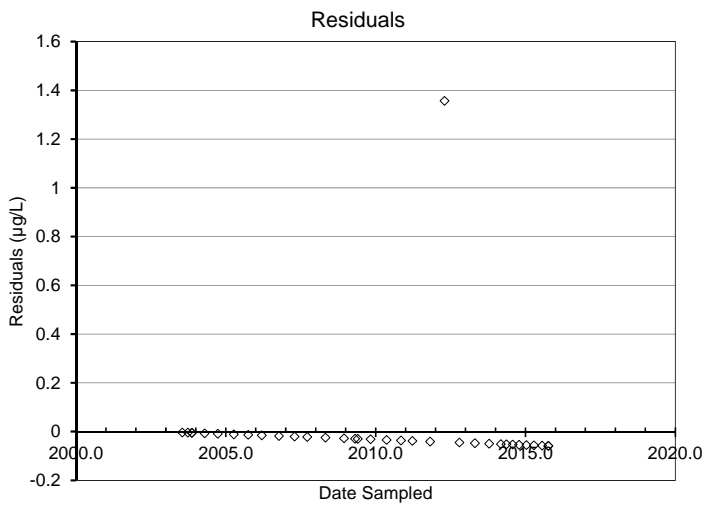
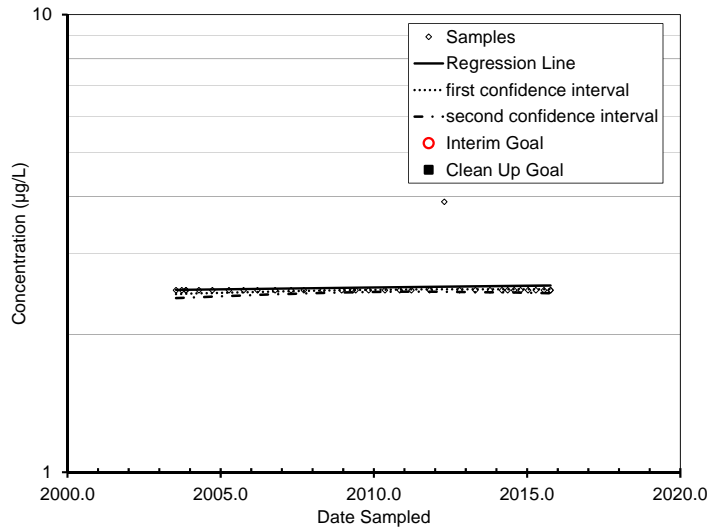
FOD 10%
Slope not calculated
p-value not calculated
Regression not calculated due to low FOD (< 50%)

North Plume, Well MW-40

Date	Value	Included in Regression
7/18/2003	2.5	Yes
9/25/2003	2.5	Yes
11/14/2003	2.5	Yes
11/14/2003	2.5	Yes
4/15/2004	2.5	Yes
9/23/2004	2.5	Yes
4/7/2005	2.5	Yes
9/29/2005	2.5	Yes
3/14/2006	2.5	Yes
10/10/2006	2.5	Yes
4/18/2007	2.5	Yes
9/18/2007	2.5	Yes
4/28/2008	2.5	Yes
12/11/2008	2.5	Yes
4/24/2009	2.5	Yes
5/27/2009	2.5	Yes
10/29/2009	2.5	Yes
5/12/2010	2.5	Yes
11/4/2010	2.5	Yes
3/23/2011	2.5	Yes
10/26/2011	2.5	Yes
4/18/2012	3.9	Yes
10/17/2012	2.5	Yes
4/23/2013	2.5	Yes
10/15/2013	2.5	Yes
3/6/2014	2.5	Yes
5/12/2014	2.5	Yes
7/29/2014	2.5	Yes
10/13/2014	2.5	Yes
1/12/2015	2.5	Yes
4/14/2015	2.5	Yes
7/20/2015	2.5	Yes
10/6/2015	2.5	Yes
10/6/2015	2.5	Yes

North Plume, Well MW-40

Date Range: 7/18/2003 to 4/14/2015



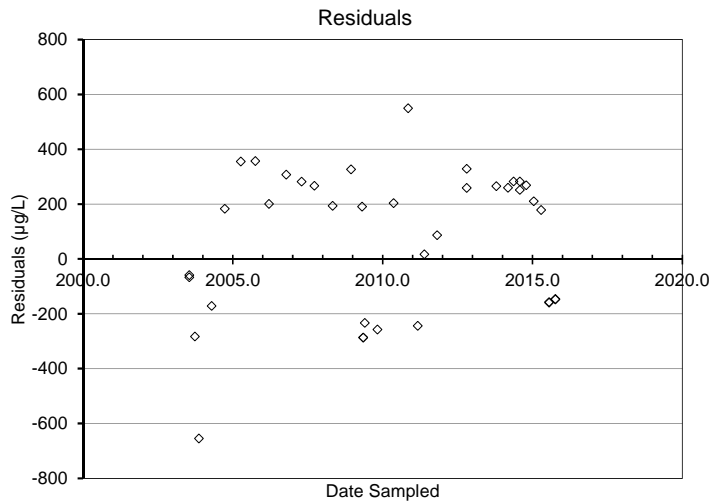
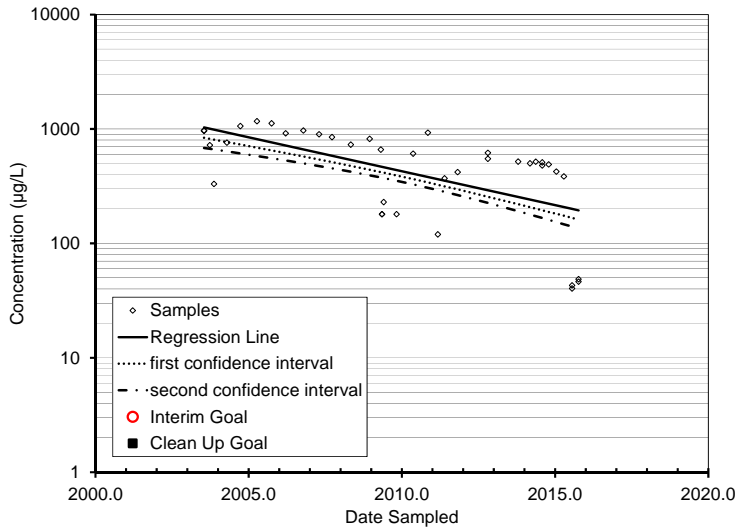
FOD 12%
Slope not calculated
p-value not calculated
No exceedances, regression analysis not performed

North Plume, Well MW-41

Date	Value	Included in Regression
7/18/2003	972	Yes
7/18/2003	964	Yes
9/25/2003	722	Yes
11/14/2003	331	Yes
4/15/2004	760	Yes
9/23/2004	1060	Yes
4/7/2005	1170	Yes
9/30/2005	1120	Yes
3/17/2006	917	Yes
10/13/2006	970	Yes
4/18/2007	900	Yes
9/20/2007	850	Yes
4/30/2008	730	Yes
12/11/2008	820	Yes
4/24/2009	660	Yes
5/7/2009	180	Yes
5/8/2009	180	Yes
5/27/2009	230	Yes
10/28/2009	180	Yes
5/13/2010	610	Yes
11/5/2010	930	Yes
3/4/2011	120	Yes
5/23/2011	370	Yes
10/25/2011	420	Yes
10/20/2012	620	Yes
10/20/2012	550	Yes
10/16/2013	520	Yes
3/7/2014	501	Yes
5/14/2014	518	Yes
7/30/2014	511	Yes
7/30/2014	480	Yes
10/15/2014	491	Yes
1/14/2015	425	Yes
4/15/2015	386	Yes
7/21/2015	43	Yes
7/21/2015	40.4	Yes
10/6/2015	48.7	Yes
10/6/2015	46.4	Yes

North Plume, Well MW-41

Date Range: 7/18/2003 to 10/6/2015



FOD 100%

Slope -0.14

p-value < 0.001

Regression residuals are appropriately distributed

Slope is negative

Regression fit is acceptable

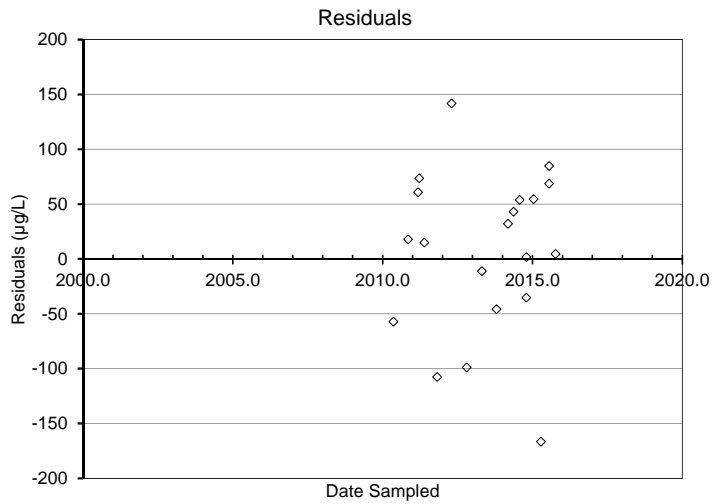
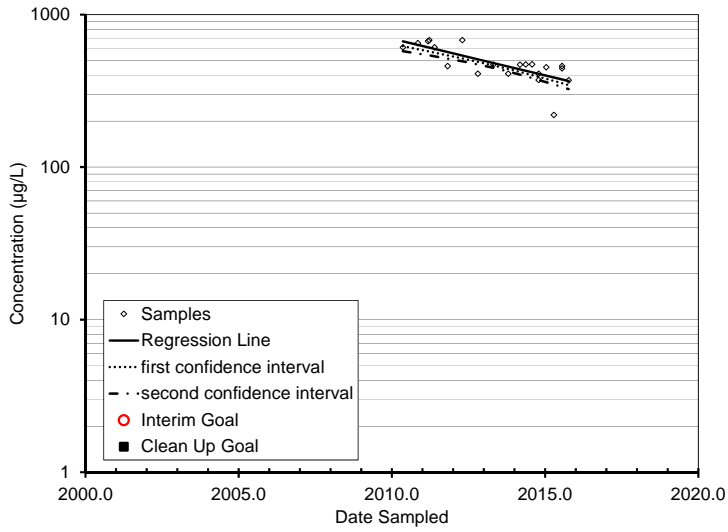
Slope used to estimate degradation rate

North Plume, Well MW-46R

Date	Value	Included in Regression
11/14/2003	39.9	No
4/15/2004	77.1	No
9/23/2004	142	No
4/6/2005	210	No
9/28/2005	222	No
3/16/2006	111	No
4/6/2006	300	No
10/11/2006	450	No
4/17/2007	440	No
9/18/2007	420	No
4/29/2008	430	No
12/9/2008	310	No
4/25/2009	460	No
5/27/2009	2.5	No
10/27/2009	390	No
12/21/2009	410	No
5/11/2010	610	Yes
11/5/2010	650	Yes
3/7/2011	670	Yes
3/22/2011	680	Yes
5/23/2011	610	Yes
10/26/2011	460	Yes
4/18/2012	680	Yes
10/20/2012	410	Yes
4/23/2013	470	Yes
10/18/2013	410	Yes
3/7/2014	469	Yes
5/14/2014	471	Yes
7/29/2014	472	Yes
10/16/2014	373	Yes
10/16/2014	410	Yes
1/13/2015	452	Yes
4/14/2015	220	Yes
7/21/2015	444	Yes
7/21/2015	460	Yes
10/7/2015	371	Yes

North Plume, Well MW-46R

Date Range: 5/11/2010 to 10/7/2015 (ISCO Impacts Excluded)



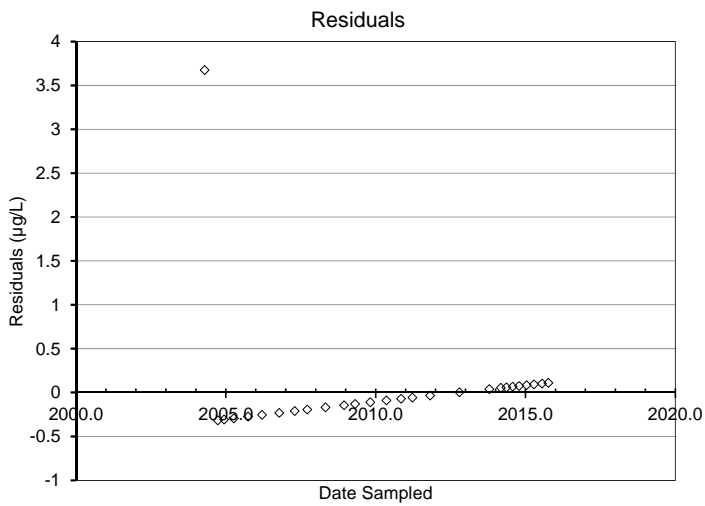
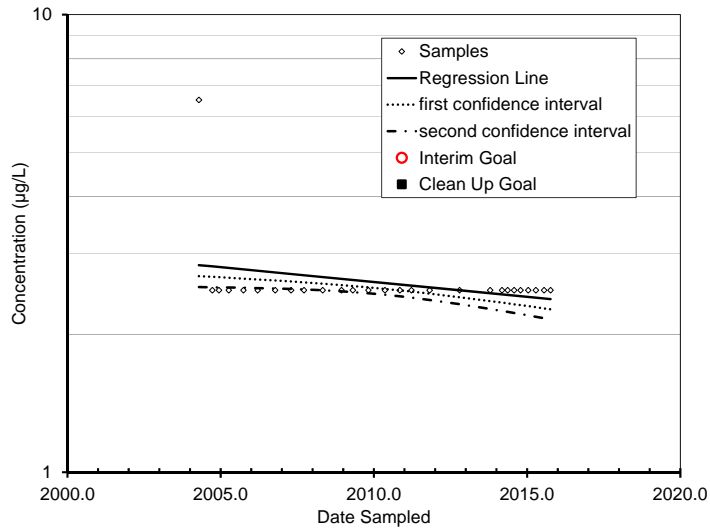
FOD 97%
Slope -0.11
p-value < 0.001
Slope is negative
Regression fit is acceptable
Slope used to estimate degradation rate

North Plume, Well MW-50

Date	Value	Included in Regression
4/15/2004	6.51	Yes
9/23/2004	2.5	Yes
12/10/2004	2.5	Yes
4/6/2005	2.5	Yes
9/28/2005	2.5	Yes
3/17/2006	2.5	Yes
10/12/2006	2.5	Yes
4/19/2007	2.5	Yes
9/19/2007	2.5	Yes
4/29/2008	2.5	Yes
12/10/2008	2.5	Yes
4/24/2009	2.5	Yes
10/27/2009	2.5	Yes
5/11/2010	2.5	Yes
11/5/2010	2.5	Yes
3/23/2011	2.5	Yes
10/25/2011	2.5	Yes
10/17/2012	2.5	Yes
10/16/2013	2.5	Yes
3/6/2014	2.5	Yes
5/13/2014	2.5	Yes
7/28/2014	2.5	Yes
10/14/2014	2.5	Yes
1/13/2015	2.5	Yes
4/14/2015	2.5	Yes
7/21/2015	2.5	Yes
10/6/2015	2.5	Yes

North Plume, Well MW-50

Date Range: 4/15/2004 to 10/6/2015



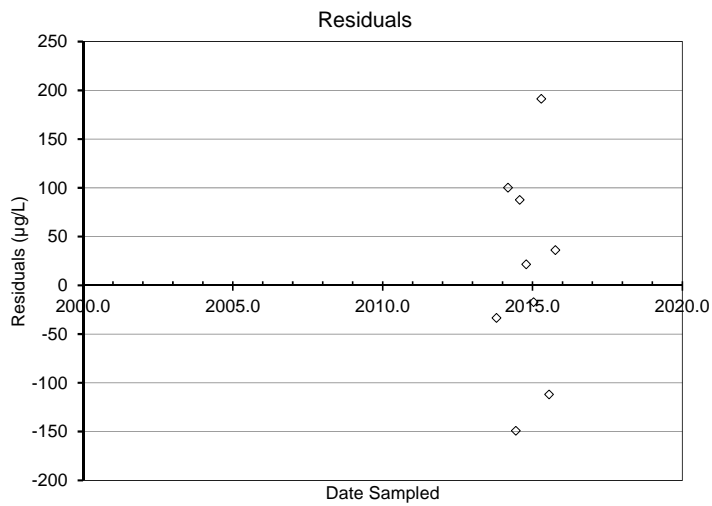
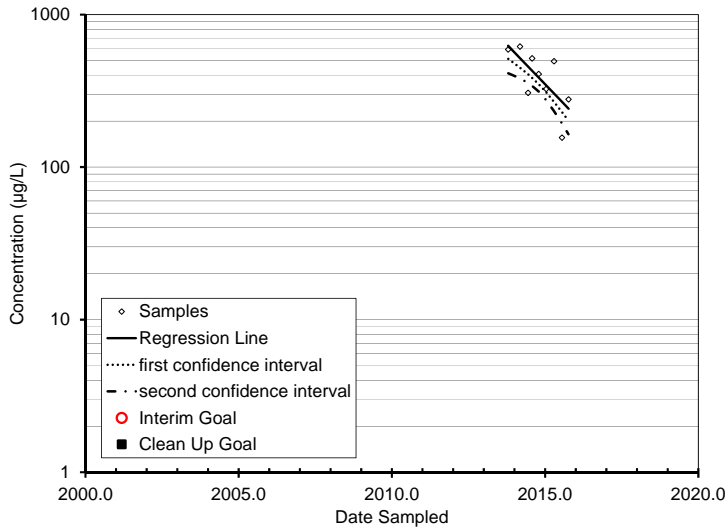
FOD 15%
Slope not calculated
p-value not calculated
Regression not calculated due to low FOD (< 50%)

North Plume, Well MW-56

Date	Value	Included in Regression
12/10/2004	90.2	No
4/8/2005	88.2	No
9/28/2005	207	No
3/16/2006	8.7	No
10/14/2006	110	No
4/19/2007	2.5	No
9/19/2007	38	No
4/29/2008	4	No
12/10/2008	93	No
4/24/2009	14	No
10/27/2009	8.7	No
5/12/2010	230	No
3/23/2011	71	No
10/25/2011	150	No
10/20/2012	470	No
10/17/2013	590	Yes
3/7/2014	618	Yes
6/11/2014	307	Yes
7/29/2014	516	Yes
10/15/2014	408	Yes
1/13/2015	326	Yes
4/16/2015	495	Yes
7/20/2015	156	Yes
10/6/2015	278	Yes

North Plume, Well MW-56

Date Range: 10/17/2013 to 10/6/2015 (ISCO Impacts Excluded)



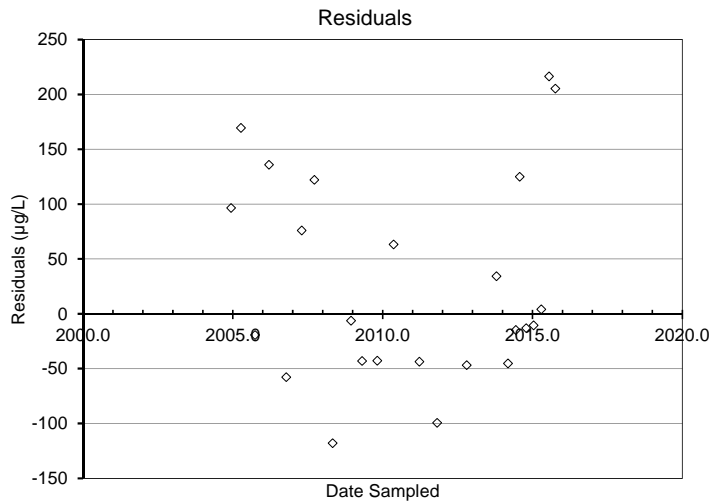
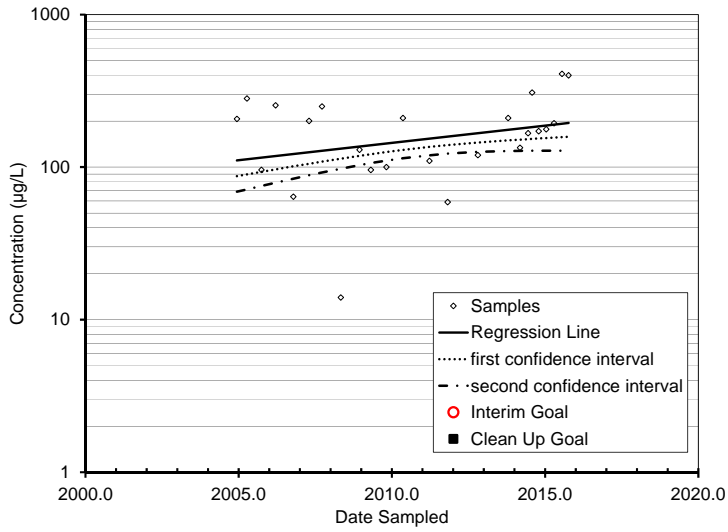
FOD 95%
Slope -0.48
p-value <0.05
Slope is negative
Regression fit is acceptable
Slope used to estimate degradation rate

North Plume, Well MW-57

Date	Value	Included in Regression
12/10/2004	207	Yes
4/8/2005	282	Yes
9/28/2005	96	Yes
3/16/2006	254	Yes
10/13/2006	64	Yes
4/19/2007	201	Yes
9/20/2007	250	Yes
4/30/2008	14	Yes
12/10/2008	130	Yes
4/24/2009	96	Yes
10/27/2009	100	Yes
5/12/2010	210	Yes
3/23/2011	110	Yes
10/25/2011	59	Yes
10/20/2012	120	Yes
10/17/2013	210	Yes
3/7/2014	134	Yes
6/11/2014	167	Yes
7/29/2014	308	Yes
10/15/2014	172	Yes
1/13/2015	177	Yes
4/16/2015	194	Yes
7/20/2015	409	Yes
10/6/2015	400	Yes

North Plume, Well MW-57

Date Range: 12/10/2004 to 10/6/2015



FOD 100%

Slope 0.052

p-value > 0.05

Regression residuals are biased

Slope trend is not significant

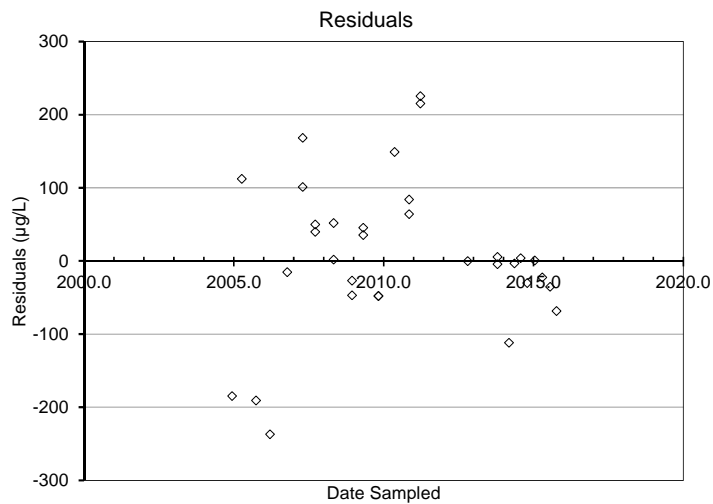
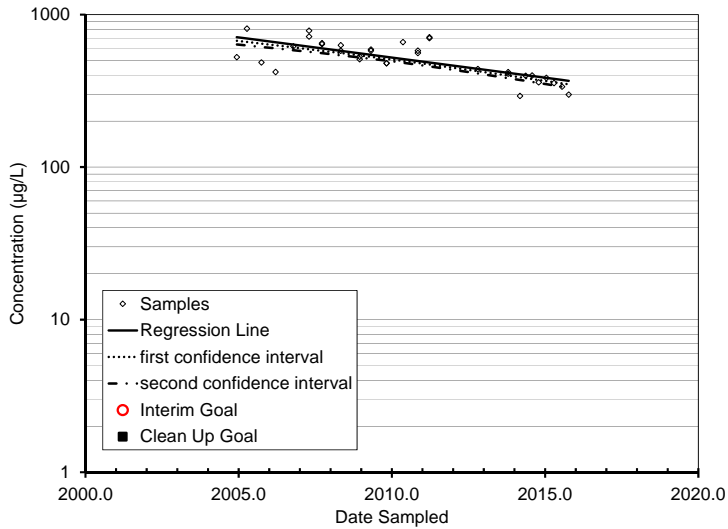
Slope not used to estimate degradation rate

North Plume, Well MW-58

Date	Value	Included in Regression
12/9/2004	526	Yes
4/7/2005	809	Yes
9/28/2005	486	Yes
3/16/2006	421	Yes
10/13/2006	620	Yes
4/19/2007	784	Yes
4/19/2007	717	Yes
9/19/2007	650	Yes
9/19/2007	640	Yes
4/30/2008	630	Yes
4/30/2008	580	Yes
12/11/2008	530	Yes
12/11/2008	510	Yes
4/25/2009	590	Yes
4/25/2009	580	Yes
10/28/2009	480	Yes
10/28/2009	480	Yes
5/12/2010	660	Yes
11/6/2010	560	Yes
11/6/2010	580	Yes
3/24/2011	710	Yes
3/24/2011	700	Yes
10/20/2012	440	Yes
10/17/2013	410	Yes
10/17/2013	420	Yes
3/7/2014	293	Yes
5/12/2014	397	Yes
7/29/2014	399	Yes
10/15/2014	360	Yes
1/14/2015	385	Yes
4/16/2015	356	Yes
7/21/2015	337	Yes
10/8/2015	299	Yes

North Plume, Well MW-58

Date Range: 12/9/2004 to 10/8/2015



FOD 100%

Slope -0.061

p-value < 0.001

Regression residuals are appropriately distributed

Slope is negative

Regression fit is acceptable

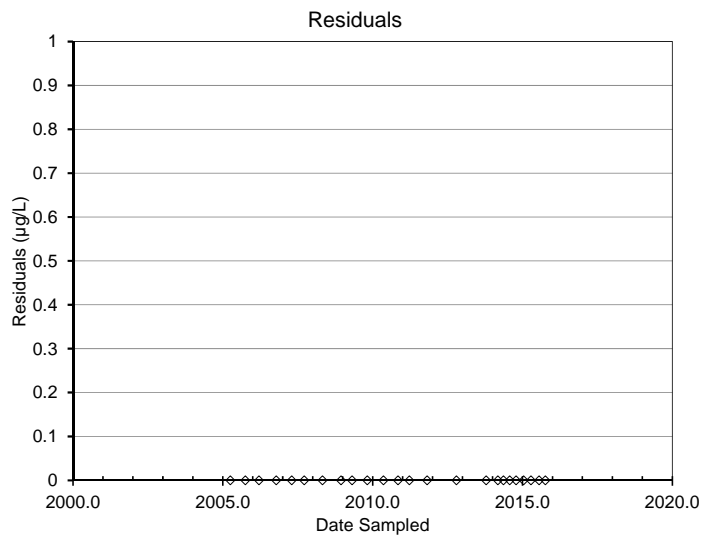
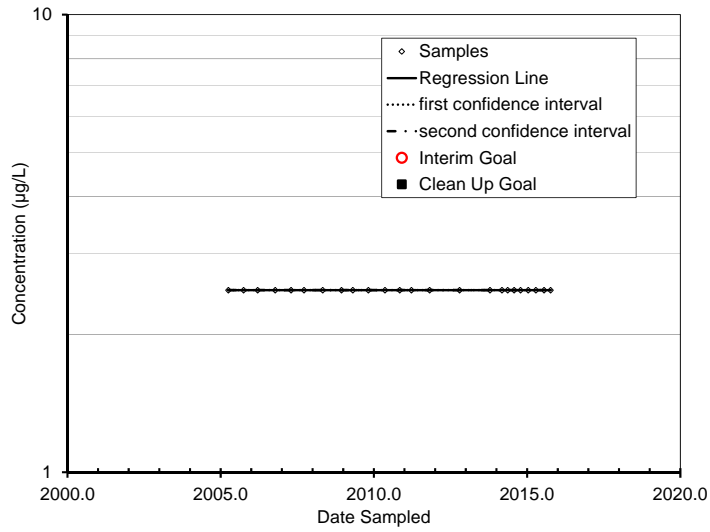
Slope used to estimate degradation rate

North Plume, Well MW-60

Date	Value	Included in Regression
4/1/2005	2.5	Yes
9/30/2005	2.5	Yes
3/17/2006	2.5	Yes
10/12/2006	2.5	Yes
4/19/2007	2.5	Yes
9/19/2007	2.5	Yes
4/29/2008	2.5	Yes
12/10/2008	2.5	Yes
4/24/2009	2.5	Yes
10/27/2009	2.5	Yes
5/11/2010	2.5	Yes
11/4/2010	2.5	Yes
3/23/2011	2.5	Yes
10/25/2011	2.5	Yes
10/17/2012	2.5	Yes
10/15/2013	2.5	Yes
3/6/2014	2.5	Yes
5/13/2014	2.5	Yes
7/28/2014	2.5	Yes
10/14/2014	2.5	Yes
1/13/2015	2.5	Yes
4/14/2015	2.5	Yes
7/21/2015	2.5	Yes
10/6/2015	2.5	Yes

North Plume, Well MW-60

Date Range: 4/1/2005 to 10/6/2015



FOD 8%

Slope not calculated

p-value not calculated

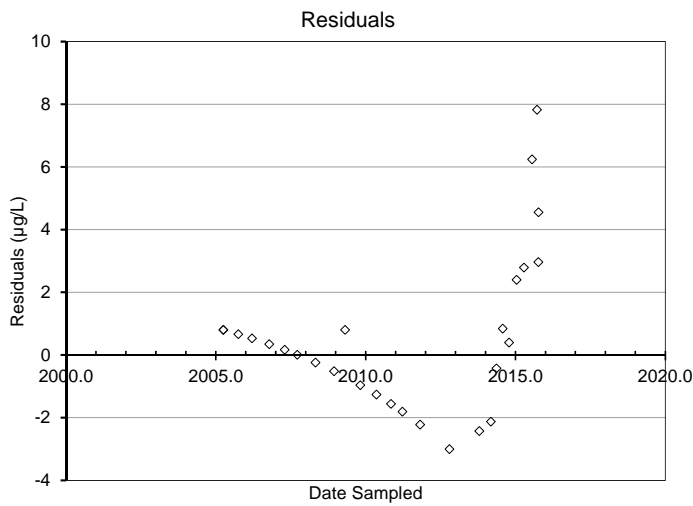
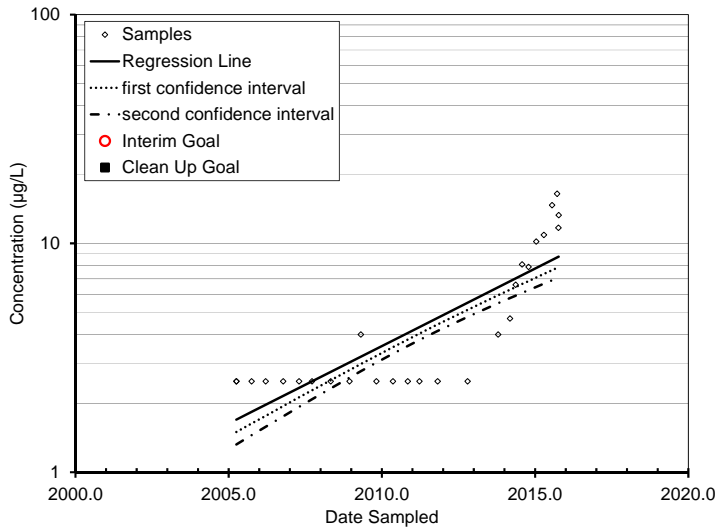
No exceedances, regression analysis not performed

North Plume, Well MW-61

Date	Value	Included in Regression
4/1/2005	2.5	Yes
4/1/2005	2.5	Yes
9/30/2005	2.5	Yes
3/17/2006	2.5	Yes
10/12/2006	2.5	Yes
4/19/2007	2.5	Yes
9/19/2007	2.5	Yes
4/29/2008	2.5	Yes
12/10/2008	2.5	Yes
4/24/2009	4	Yes
10/27/2009	2.5	Yes
5/11/2010	2.5	Yes
11/4/2010	2.5	Yes
3/23/2011	2.5	Yes
10/25/2011	2.5	Yes
10/17/2012	2.5	Yes
10/16/2013	4	Yes
3/6/2014	4.7	Yes
5/13/2014	6.6	Yes
7/28/2014	8.1	Yes
10/14/2014	7.9	Yes
1/13/2015	10.2	Yes
4/14/2015	10.9	Yes
7/21/2015	14.7	Yes
9/19/2015	16.5	Yes
10/5/2015	11.7	Yes
10/8/2015	13.3	Yes

North Plume, Well MW-61

Date Range: 4/1/2005 to 10/8/2015



FOD 61%

Slope 0.16

p-value < 0.001

Slope is positive

Regression residuals are not appropriately distributed

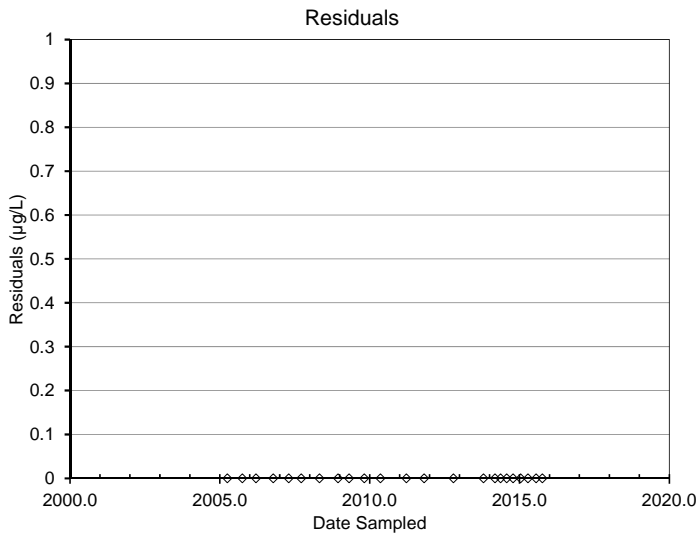
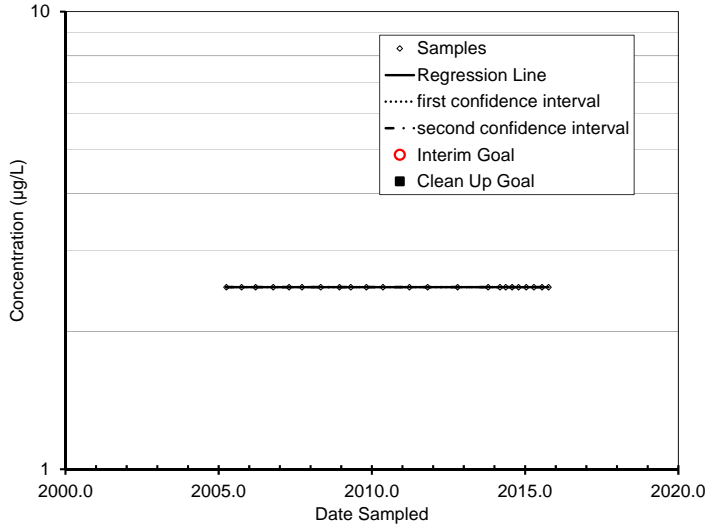
Slope not used to estimate degradation rate

North Plume, Well MW-62

Date	Value	Included in Regression
4/1/2005	2.5	Yes
9/30/2005	2.5	Yes
3/16/2006	2.5	Yes
10/12/2006	2.5	Yes
4/19/2007	2.5	Yes
9/19/2007	2.5	Yes
4/29/2008	2.5	Yes
12/10/2008	2.5	Yes
4/24/2009	2.5	Yes
10/27/2009	2.5	Yes
5/11/2010	2.5	Yes
3/23/2011	2.5	Yes
10/25/2011	2.5	Yes
10/17/2012	2.5	Yes
10/17/2013	2.5	Yes
3/7/2014	2.5	Yes
5/14/2014	2.5	Yes
7/29/2014	2.5	Yes
10/14/2014	2.5	Yes
1/13/2015	2.5	Yes
4/14/2015	2.5	Yes
7/21/2015	2.5	Yes
10/6/2015	2.5	Yes

North Plume, Well MW-62

Date Range: 4/1/2005 to 10/6/2015



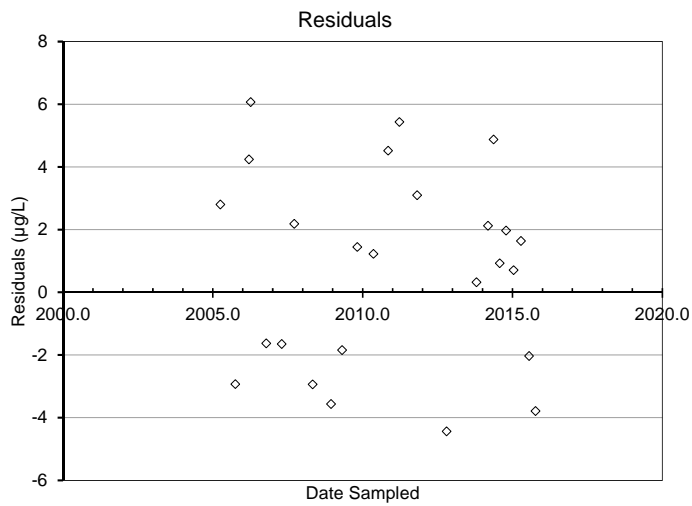
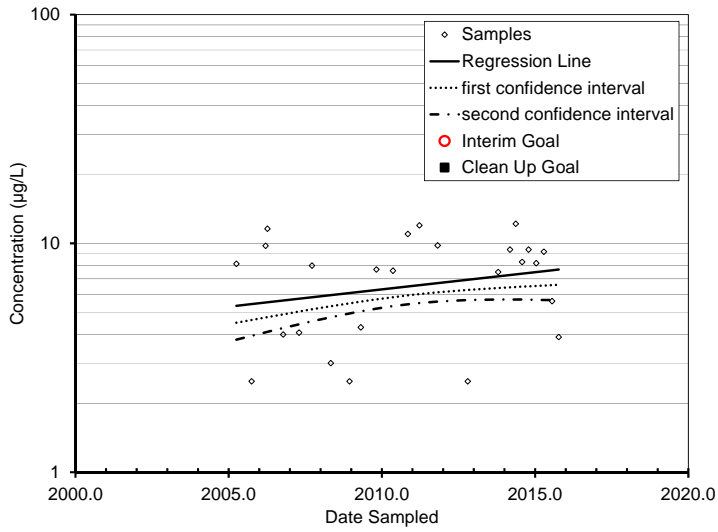
FOD 13%
Slope not calculated
p-value not calculated
No exceedances, regression analysis not performed

North Plume, Well MW-63

Date	Value	Included in Regression
4/1/2005	8.14	Yes
9/30/2005	2.5	Yes
3/16/2006	9.76	Yes
4/6/2006	11.6	Yes
10/12/2006	4	Yes
4/19/2007	4.08	Yes
9/19/2007	8	Yes
4/30/2008	3	Yes
12/10/2008	2.5	Yes
4/24/2009	4.3	Yes
10/27/2009	7.7	Yes
5/11/2010	7.6	Yes
11/6/2010	11	Yes
3/23/2011	12	Yes
10/25/2011	9.8	Yes
10/19/2012	2.5	Yes
10/17/2013	7.5	Yes
3/7/2014	9.4	Yes
5/14/2014	12.2	Yes
7/28/2014	8.3	Yes
10/14/2014	9.4	Yes
1/13/2015	8.2	Yes
4/14/2015	9.2	Yes
7/21/2015	5.6	Yes
10/8/2015	3.9	Yes

North Plume, Well MW-63

Date Range: 4/1/2005 to 10/8/2015



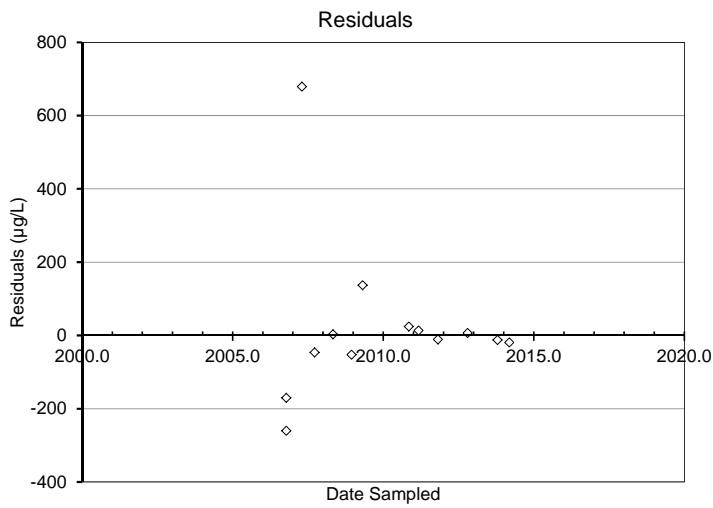
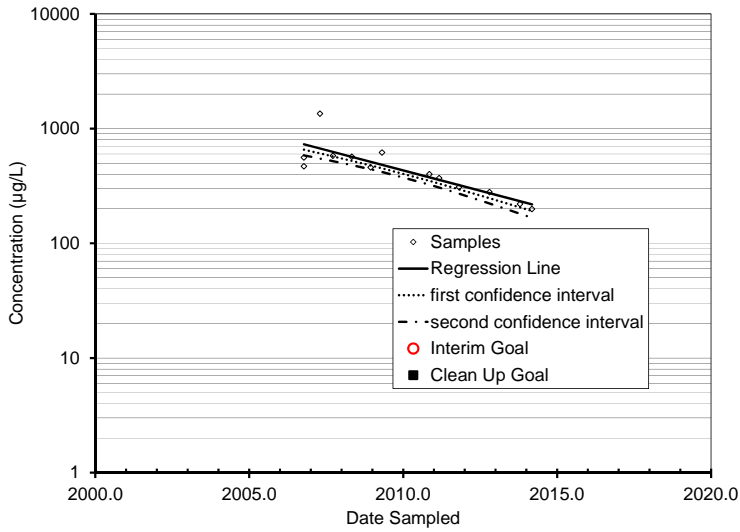
FOD 88%
Slope 0.035
p-value 0.26
Regression residuals are appropriately distributed
Slope is positive
Slope not used to estimate degradation rate

North Plume, Well MW-65

Date	Value	Included in Regression
10/11/2006	470	Yes
10/11/2006	560	Yes
4/19/2007	1350	Yes
9/20/2007	580	Yes
4/30/2008	570	Yes
12/11/2008	460	Yes
4/24/2009	620	Yes
11/7/2010	400	Yes
3/4/2011	370	Yes
10/25/2011	310	Yes
10/20/2012	280	Yes
10/17/2013	220	Yes
3/8/2014	199	Yes
5/14/2014	195	No
7/30/2014	17.1	No
10/14/2014	30.8	No
1/13/2015	19.2	No
4/15/2015	16	No
7/20/2015	26.3	No
10/7/2015	0.28	No

North Plume, Well MW-65

Date Range: 10/11/2006 to 3/8/2014 (ISCO Impacts Excluded)



FOD100%

Slope -0.16

p-value < 0.001

Regression residuals are appropriately distributed

Slope is negative

Regression fit is acceptable

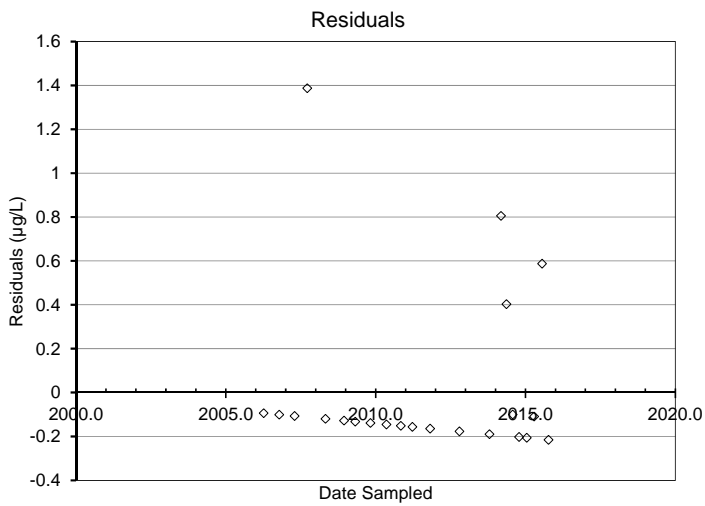
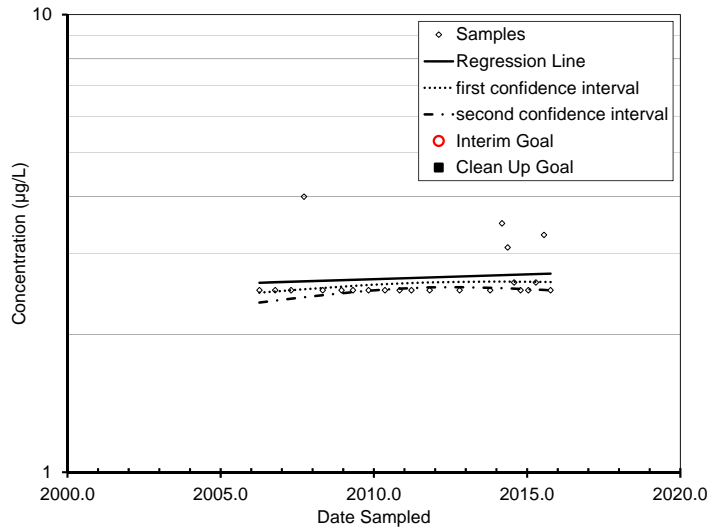
Slope used to estimate degradation rate

North Plume, Well MW-66

Date	Value	Included in Regression
4/6/2006	2.5	Yes
10/12/2006	2.5	Yes
4/18/2007	2.5	Yes
9/19/2007	4	Yes
4/29/2008	2.5	Yes
12/10/2008	2.5	Yes
4/25/2009	2.5	Yes
10/28/2009	2.5	Yes
5/11/2010	2.5	Yes
11/3/2010	2.5	Yes
3/24/2011	2.5	Yes
10/26/2011	2.5	Yes
10/17/2012	2.5	Yes
10/17/2013	2.5	Yes
3/7/2014	3.5	Yes
5/13/2014	3.1	Yes
7/28/2014	2.6	Yes
10/13/2014	2.5	Yes
1/14/2015	2.5	Yes
4/15/2015	2.6	Yes
7/20/2015	3.3	Yes
10/6/2015	2.5	Yes

North Plume, Well MW-66

Date Range: 4/6/2006 to 10/6/2015



FOD 59%

Slope not calculated

p-value not calculated

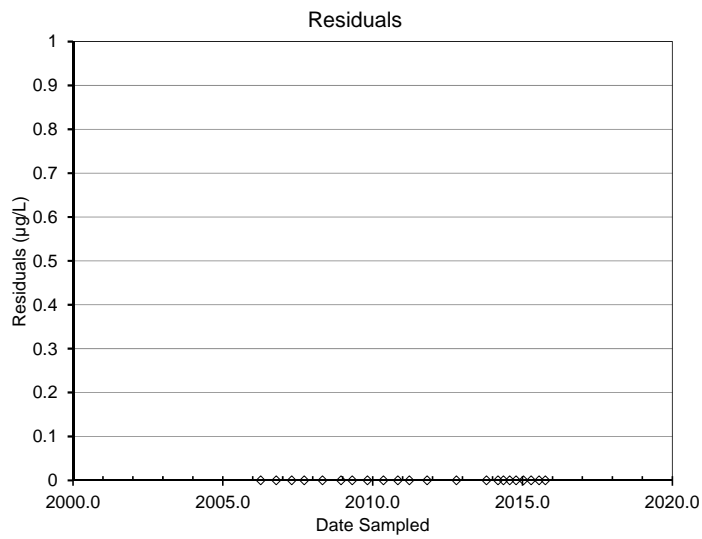
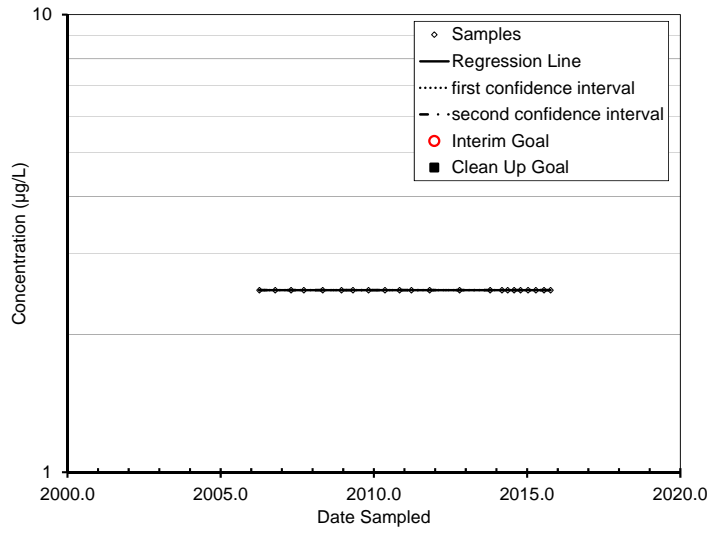
No exceedances, regression analysis not performed

North Plume, Well MW-67

Date	Value	Included in Regression
4/6/2006	2.5	Yes
10/12/2006	2.5	Yes
4/19/2007	2.5	Yes
9/18/2007	2.5	Yes
4/29/2008	2.5	Yes
12/10/2008	2.5	Yes
4/25/2009	2.5	Yes
10/28/2009	2.5	Yes
5/11/2010	2.5	Yes
11/3/2010	2.5	Yes
3/24/2011	2.5	Yes
10/26/2011	2.5	Yes
10/17/2012	2.5	Yes
10/17/2013	2.5	Yes
3/7/2014	2.5	Yes
5/13/2014	2.5	Yes
7/28/2014	2.5	Yes
10/13/2014	2.5	Yes
1/12/2015	2.5	Yes
4/15/2015	2.5	Yes
7/20/2015	2.5	Yes
10/6/2015	2.5	Yes

North Plume, Well MW-67

Date Range: 4/6/2006 to 10/6/2015



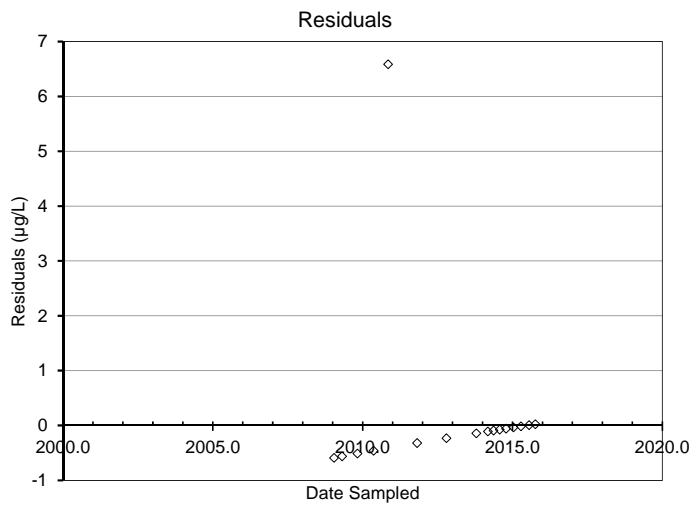
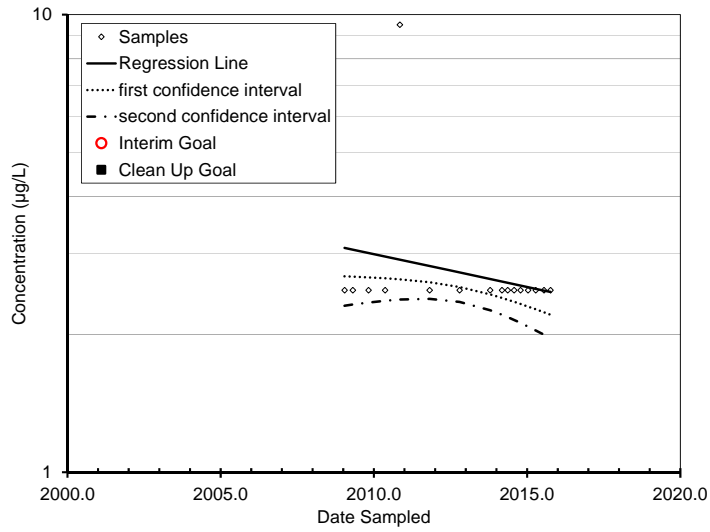
FOD 14%
Slope not calculated
p-value not calculated
No exceedances, regression analysis not performed

North Plume, Well MW-68

Date	Value	Included in Regression
1/15/2009	2.5	Yes
4/24/2009	2.5	Yes
10/28/2009	2.5	Yes
5/13/2010	2.5	Yes
11/6/2010	9.5	Yes
10/26/2011	2.5	Yes
10/17/2012	2.5	Yes
10/16/2013	2.5	Yes
3/6/2014	2.5	Yes
5/14/2014	2.5	Yes
7/29/2014	2.5	Yes
10/14/2014	2.5	Yes
1/12/2015	2.5	Yes
4/13/2015	2.5	Yes
7/20/2015	2.5	Yes
10/6/2015	2.5	Yes

North Plume, Well MW-68

Date Range: 1/15/2009 to 10/6/2015



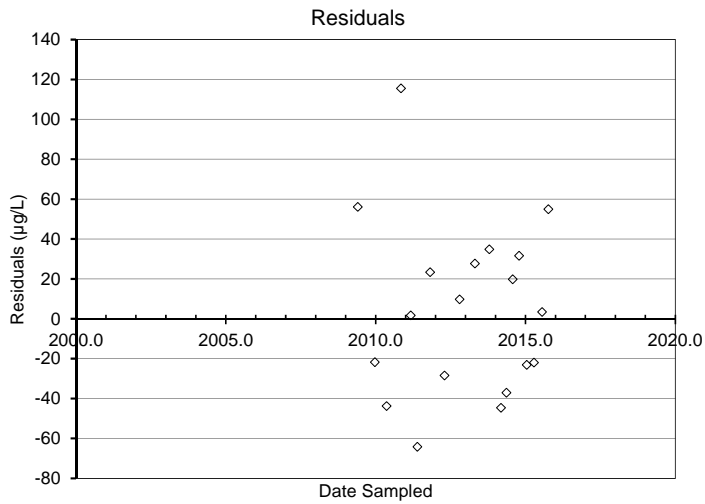
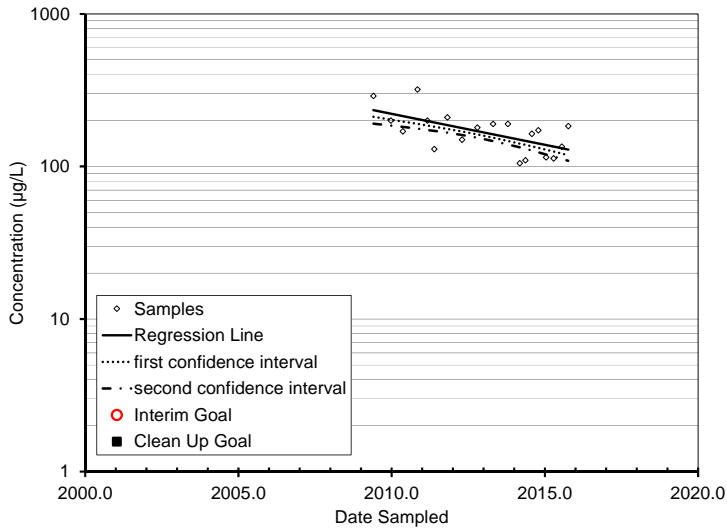
FOD 13%
Slope not calculated
p-value not calculated
Regression not calculated due to low FOD

North Plume, Well RW-69

Date	Value	Included in Regression
1/15/2009	170	No
4/24/2009	62	No
5/27/2009	290	Yes
12/21/2009	200	Yes
5/13/2010	170	Yes
11/4/2010	320	Yes
3/3/2011	200	Yes
5/23/2011	130	Yes
10/26/2011	210	Yes
4/18/2012	150	Yes
10/18/2012	180	Yes
4/23/2013	190	Yes
10/16/2013	190	Yes
3/7/2014	105	Yes
5/13/2014	110	Yes
7/29/2014	164	Yes
10/14/2014	173	Yes
1/14/2015	115	Yes
4/14/2015	113	Yes
7/21/2015	135	Yes
10/6/2015	184	Yes

North Plume, Well RW-69

Date Range: 5/27/2009 to 10/6/2015 (ISCO Impacts Excluded)



FOD 100%

Slope -0.093

p-value <0.01

Regression residuals are appropriately distributed

Slope is negative

Regression fit is acceptable

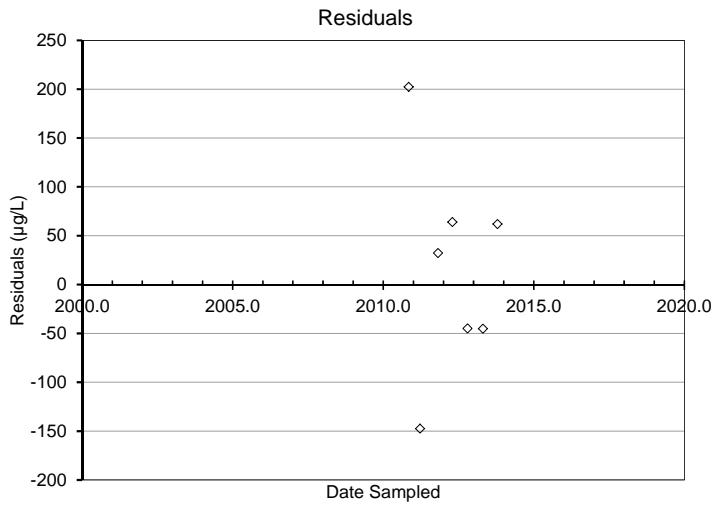
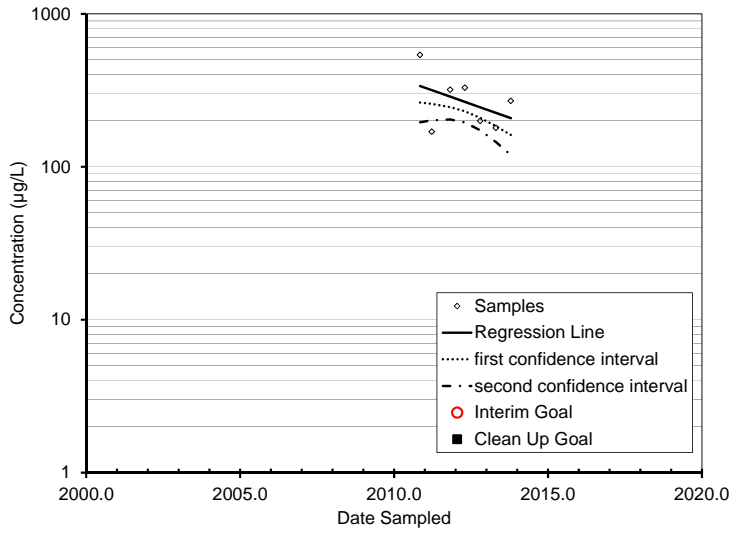
Slope used to estimate degradation rate

North Plume, Well MW-70

Date	Value	Included in Regression
11/4/2010	540	Yes
3/22/2011	170	Yes
10/26/2011	320	Yes
4/18/2012	330	Yes
10/18/2012	200	Yes
4/23/2013	180	Yes
10/16/2013	270	Yes

North Plume, Well MW-70

Date Range: 11/4/2010 to 10/16/2013 (ISCO Impacts Excluded)



FOD 100%

Slope -0.16

p-value < 0.05

Regression residuals are appropriately distributed

Slope is negative

Regression fit is acceptable

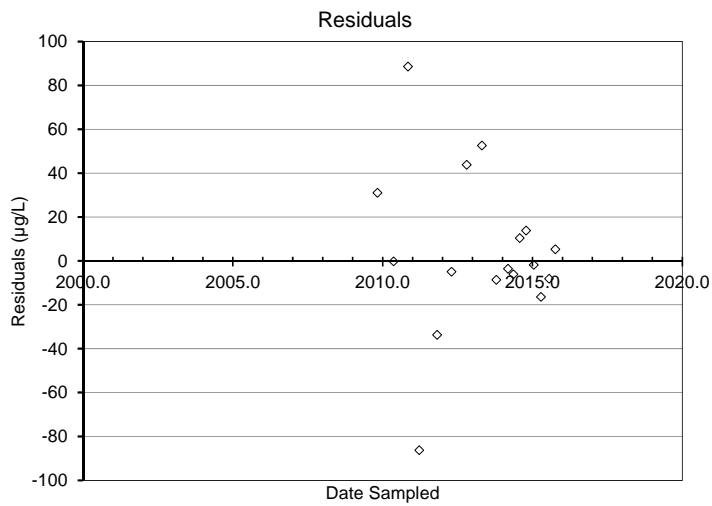
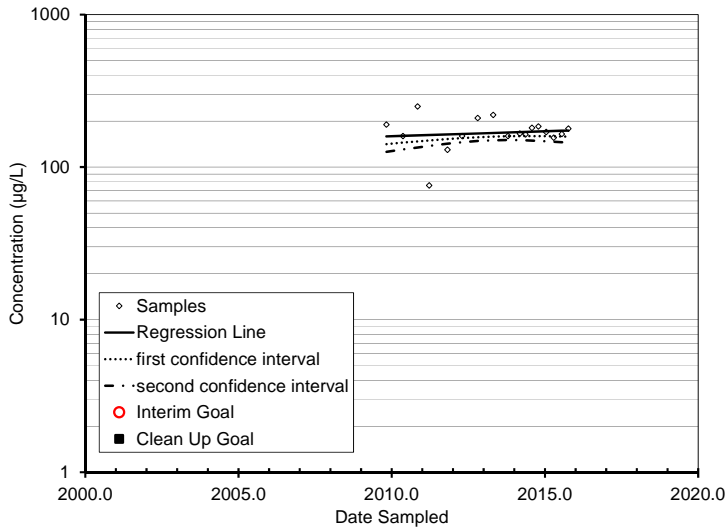
Slope used to estimate degradation rate

North Plume, Well MW-71

Date	Value	Included in Regression
10/28/2009	190	Yes
5/13/2010	160	Yes
11/4/2010	250	Yes
3/22/2011	76	Yes
10/26/2011	130	Yes
4/18/2012	160	Yes
10/20/2012	210	Yes
4/23/2013	220	Yes
10/16/2013	160	Yes
3/7/2014	166	Yes
5/13/2014	164	Yes
7/29/2014	181	Yes
10/14/2014	185	Yes
1/14/2015	170	Yes
4/14/2015	156	Yes
7/20/2015	165	Yes
10/6/2015	179	Yes

North Plume, Well MW-71

Date Range: 10/28/2009 to 10/6/2015



FOD100%

Slope 0.015

p-value >0.05

Regression residuals are potentially biased

Slope trend is not significant

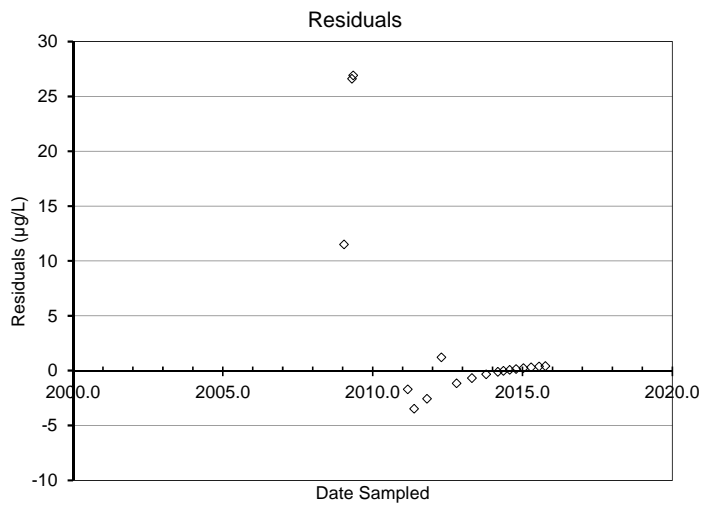
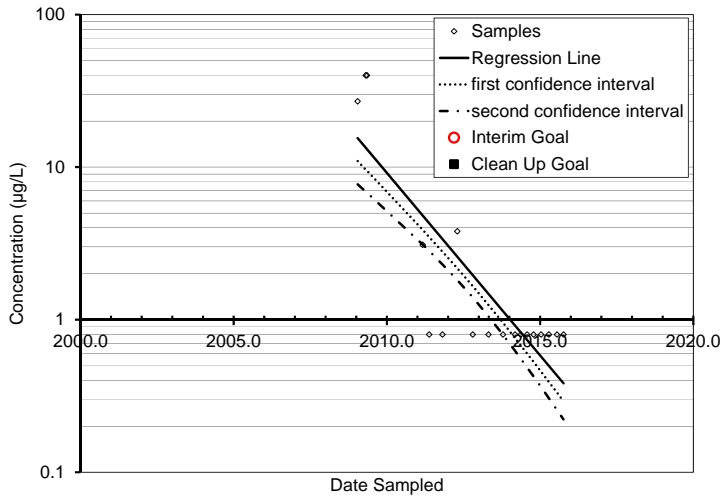
Slope not used to estimate degradation rate

North Plume, Well IW-72

Date	Value	Included in Regression
1/16/2009	27	Yes
4/23/2009	40	Yes
5/8/2009	40	Yes
3/3/2011	3.1	Yes
5/19/2011	0.8	Yes
10/24/2011	0.8	Yes
4/17/2012	3.8	Yes
10/19/2012	0.8	Yes
4/24/2013	0.8	Yes
10/15/2013	0.8	Yes
3/6/2014	0.8	Yes
5/12/2014	0.8	Yes
7/29/2014	0.8	Yes
10/13/2014	0.8	Yes
1/12/2015	0.8	Yes
4/15/2015	0.8	Yes
7/20/2015	0.8	Yes
10/6/2015	0.8	Yes

North Plume, Well IW-72

Date Range: 1/16/2009 to 10/6/2015



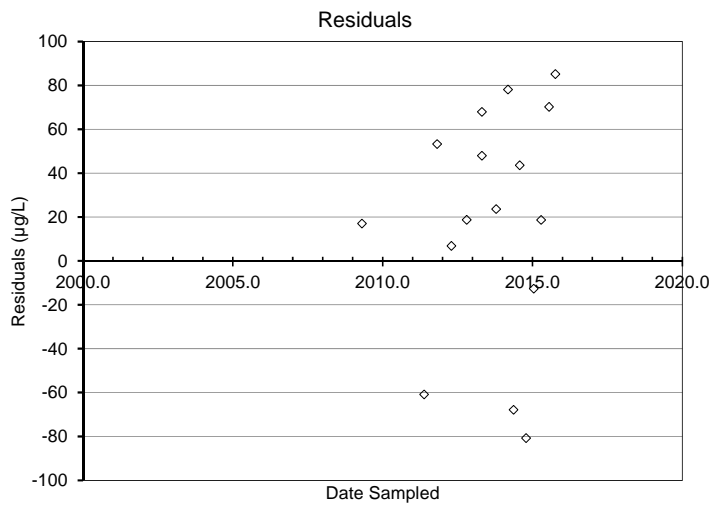
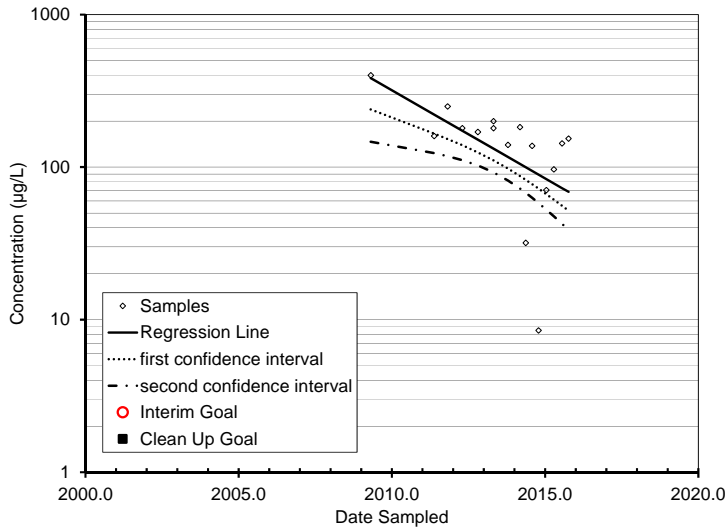
FOD 39%
Slope not calculated
p-value not calculated
Regression not calculated due to low FOD (< 50%)

North Plume, Well IW-73

Date	Value	Included in Regression
4/23/2009	400	Yes
5/19/2011	160	Yes
10/25/2011	250	Yes
4/17/2012	180	Yes
10/20/2012	170	Yes
4/24/2013	200	Yes
4/24/2013	180	Yes
10/15/2013	140	Yes
3/7/2014	183	Yes
5/14/2014	31.9	Yes
7/29/2014	138	Yes
10/14/2014	8.5	Yes
1/14/2015	70.8	Yes
4/15/2015	96.8	Yes
7/21/2015	143	Yes
10/6/2015	154	Yes

North Plume, Well IW-73

Date Range: 4/23/2009 to 10/6/2015



FOD 100%

Slope -0.27

p-value 0.041

Regression residuals are appropriately distributed

Slope is negative

Regression fit is acceptable

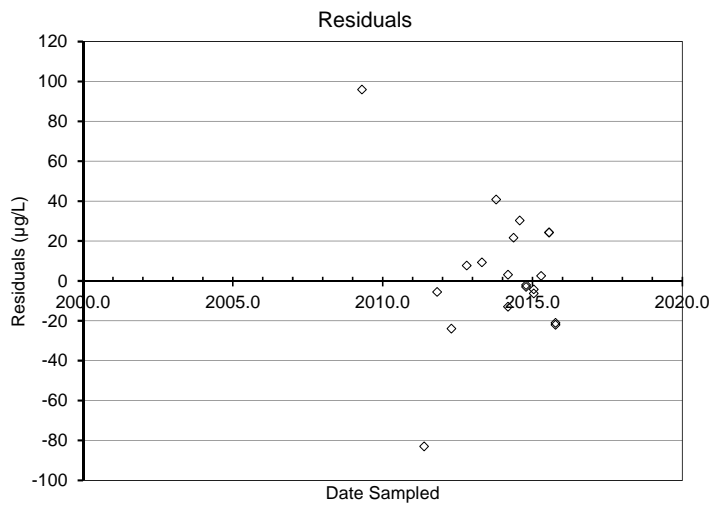
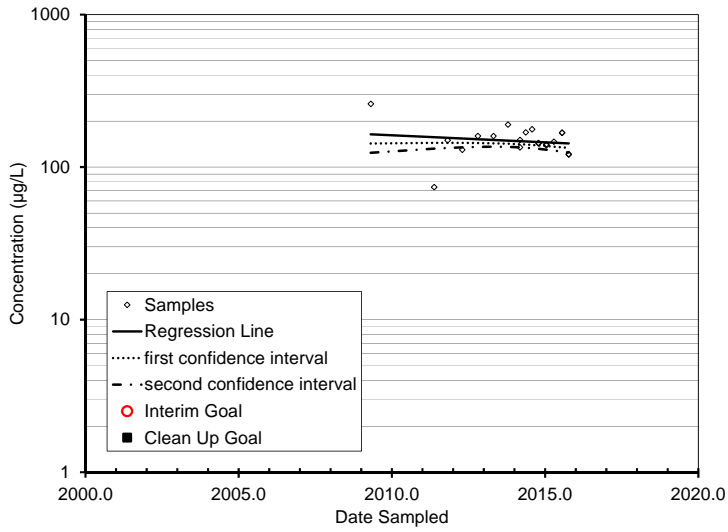
Slope used to estimate degradation rate

North Plume, Well IW-74

Date	Value	Included in Regression
4/23/2009	260	Yes
5/19/2011	74	Yes
10/25/2011	150	Yes
4/17/2012	130	Yes
10/20/2012	160	Yes
4/24/2013	160	Yes
10/15/2013	190	Yes
3/7/2014	135	Yes
3/7/2014	151	Yes
5/14/2014	169	Yes
7/29/2014	177	Yes
10/14/2014	143	Yes
10/14/2014	144	Yes
1/14/2015	139	Yes
1/14/2015	141	Yes
4/15/2015	147	Yes
7/21/2015	168	Yes
7/21/2015	168	Yes
10/7/2015	121	Yes
10/7/2015	122	Yes

North Plume, Well IW-74

Date Range: 4/23/2009 to 10/7/2015



FOD 100%

Slope -0.021

p-value 0.521

Regression residuals are appropriately distributed

Slope is not significant

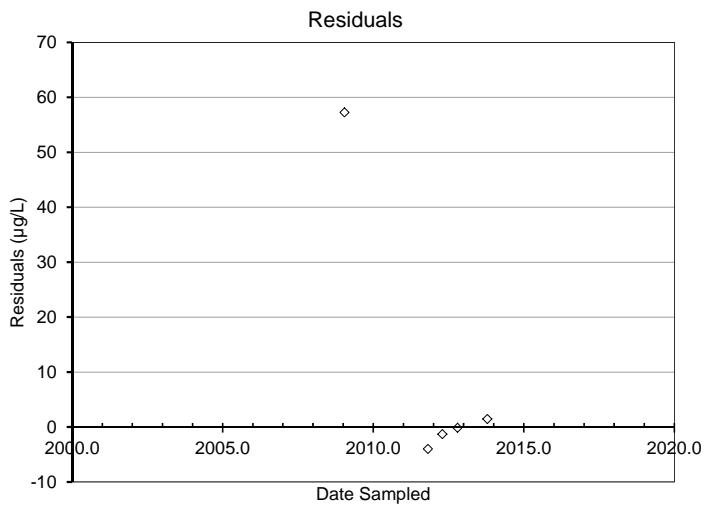
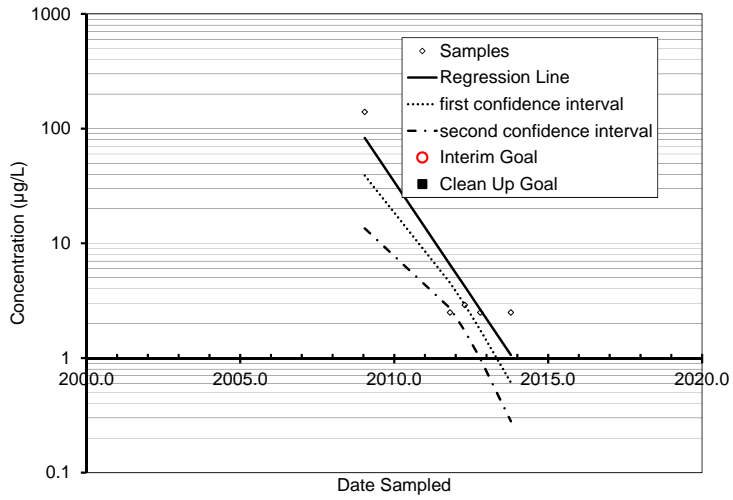
Slope used to estimate degradation rate

North Plume, Well IW-75

Date	Value	Included in Regression
1/16/2009	140	Yes
10/25/2011	2.5	Yes
4/17/2012	2.9	Yes
10/18/2012	2.5	Yes
10/15/2013	2.5	Yes

North Plume, Well IW-75

Date Range: 1/16/2009 to 10/15/2013



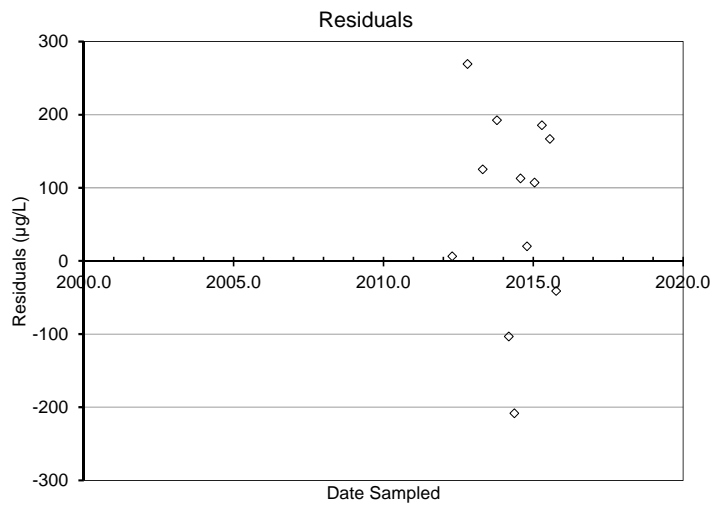
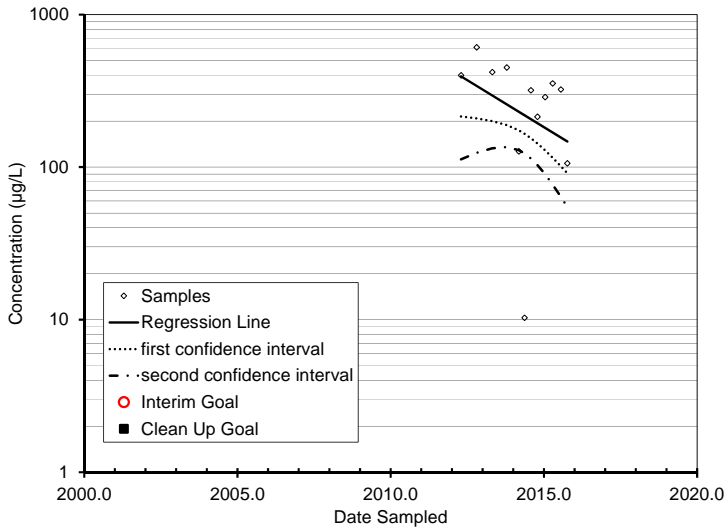
FOD 40%
Slope not calculated
p-value not calculated
Regression not calculated due to low FOD (< 50%)

North Plume, Well IW-76

Date	Value	Included in Regression
4/23/2009	730	No
5/7/2009	460	No
3/4/2011	380	No
5/23/2011	460	No
10/25/2011	130	No
4/17/2012	400	Yes
10/20/2012	610	Yes
4/24/2013	420	Yes
10/15/2013	450	Yes
3/8/2014	127	Yes
5/14/2014	10.3	Yes
7/29/2014	319	Yes
10/15/2014	214	Yes
1/14/2015	288	Yes
4/15/2015	354	Yes
7/21/2015	323	Yes
10/6/2015	106	Yes

North Plume, Well IW-76

Date Range: 4/17/2012 to 10/6/2015



FOD 100%

Slope -0.28

p-value >0.05

Regression residuals are appropriately distributed

Slope is not significant

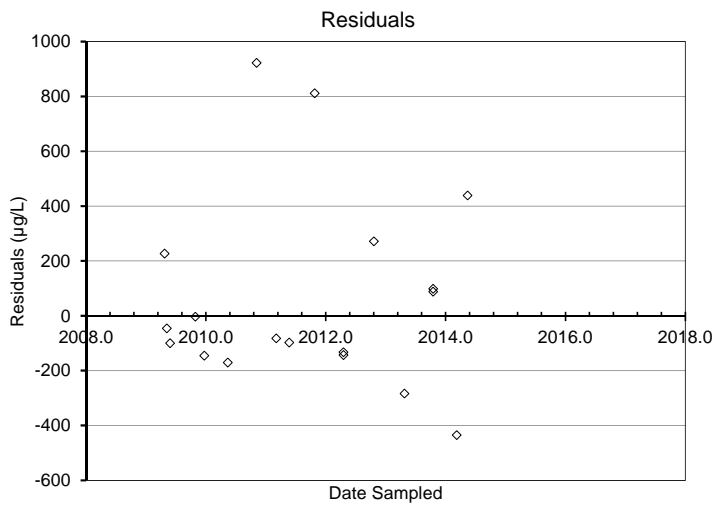
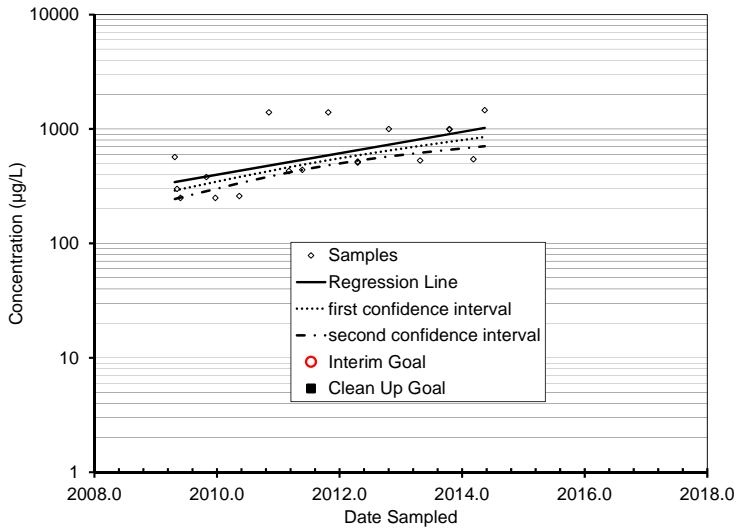
Slope used to estimate degradation rate

North Plume, Well IW-77

Date	Value	Included in Regression
4/23/2009	570	Yes
5/7/2009	300	Yes
5/27/2009	250	Yes
10/28/2009	380	Yes
12/21/2009	250	Yes
5/13/2010	260	Yes
11/5/2010	1400	Yes
3/4/2011	430	Yes
5/23/2011	440	Yes
10/25/2011	1400	Yes
4/17/2012	520	Yes
4/17/2012	510	Yes
10/19/2012	1000	Yes
4/24/2013	530	Yes
10/16/2013	1000	Yes
10/16/2013	990	Yes
3/8/2014	546	Yes
5/14/2014	1460	Yes
7/9/2014	1200	No
7/29/2014	1540	No
10/15/2014	741	No
10/23/2014	554	No
1/14/2015	201	No
4/14/2015	153	No
7/21/2015	130	No
10/8/2015	24.3	No

North Plume, Well IW-77

Date Range: 4/23/2009 to 5/14/2014 (ISCO Impacts Excluded)



FOD 100%

Slope 0.22

p-value <0.01

Regression residuals are potentially biased

Slope is not significant

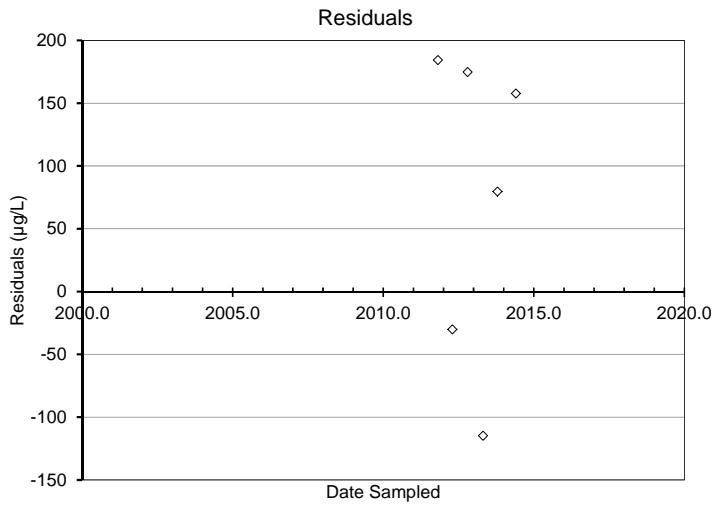
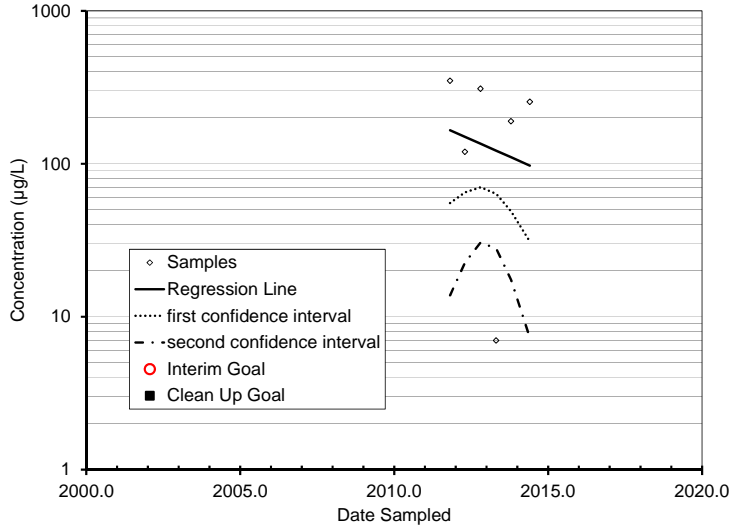
Slope not used to estimate degradation rate

North Plume, Well IW-78

Date	Value	Included in Regression
10/25/2011	350	Yes
4/18/2012	120	Yes
10/20/2012	310	Yes
4/24/2013	7	Yes
10/17/2013	190	Yes
5/28/2014	255	Yes
9/11/2014	39.6	No

North Plume, Well IW-78

Date Range: 10/25/2011 to 5/28/2014 (ISCO Impacts Excluded)



FOD 100%

Slope -0.21

p-value >0.05

Regression residuals are potentially biased

Slope is trend is not significant

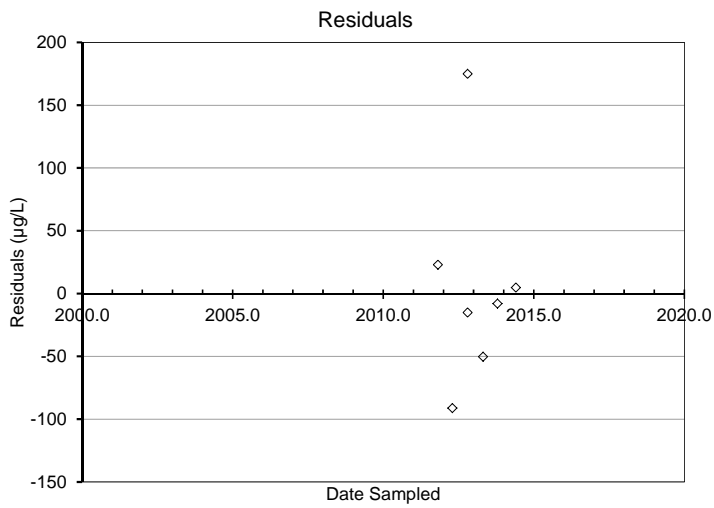
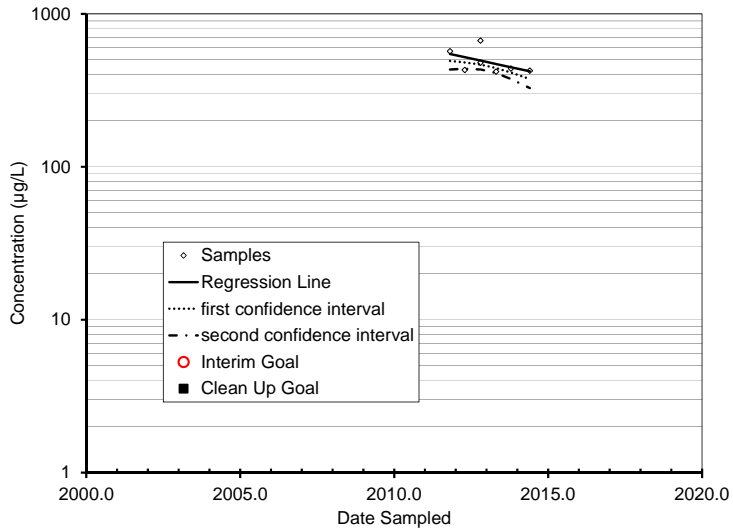
Slope not used to estimate degradation rate

North Plume, Well IW-79

Date	Value	Included in Regression
10/25/2011	570	Yes
4/17/2012	430	Yes
10/20/2012	670	Yes
10/20/2012	480	Yes
4/24/2013	420	Yes
10/17/2013	440	Yes
5/28/2014	426	Yes
9/11/2014	105	No

North Plume, Well IW-79

Date Range: 10/25/2011 to 5/28/2014 (ISCO Impacts Excluded)



FOD 100%

Slope -0.10

p-value >0.05

Regression residuals are appropriately distributed

Slope is not significant

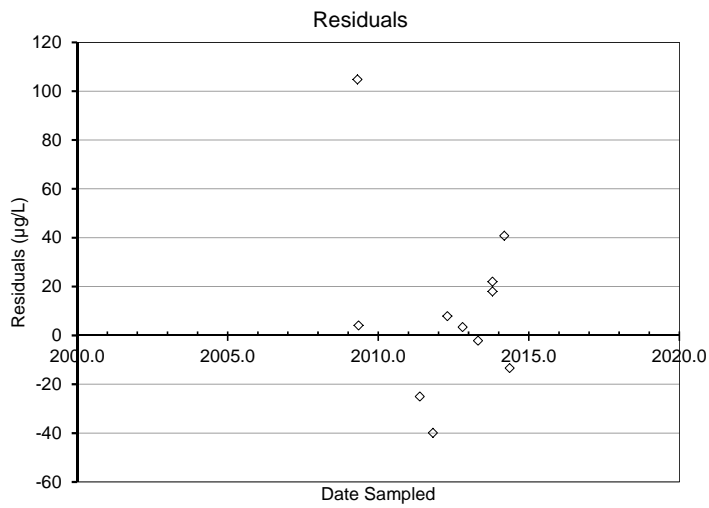
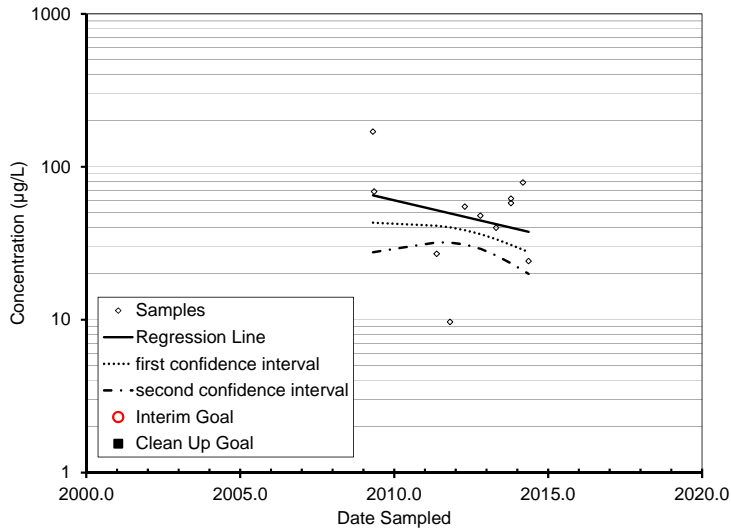
Slope used to estimate degradation rate

North Plume, Well IW-80

Date	Value	Included in Regression
4/23/2009	170	Yes
5/7/2009	69	Yes
5/19/2011	27	Yes
10/25/2011	9.7	Yes
4/17/2012	55	Yes
10/19/2012	48	Yes
4/24/2013	40	Yes
10/17/2013	58	Yes
10/17/2013	62	Yes
3/8/2014	79.1	Yes
5/13/2014	24.2	Yes
7/30/2014	25.6	No
10/14/2014	11.8	No
1/13/2015	7.1	No
4/14/2015	9.2	No
7/21/2015	12.5	No
10/6/2015	10.6	No

North Plume, Well IW-80

Date Range: 4/23/2009 to 5/13/2014 (ISCO Impacts Excluded)



FOD 100%

Slope -0.11

p-value >0.05

Regression residuals are appropriately distributed

Slope is not significant

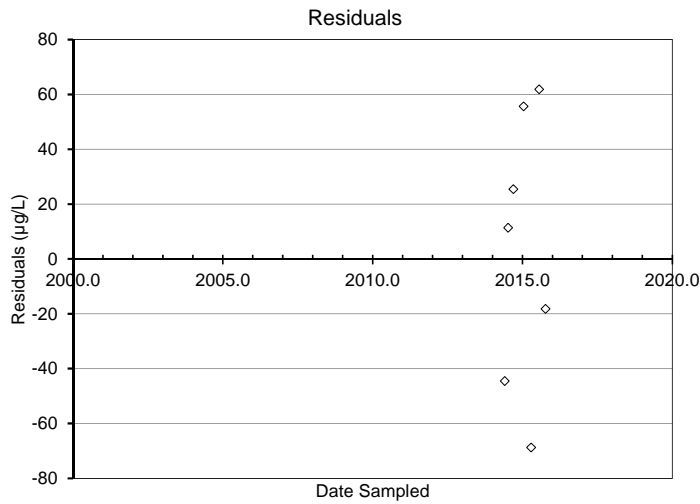
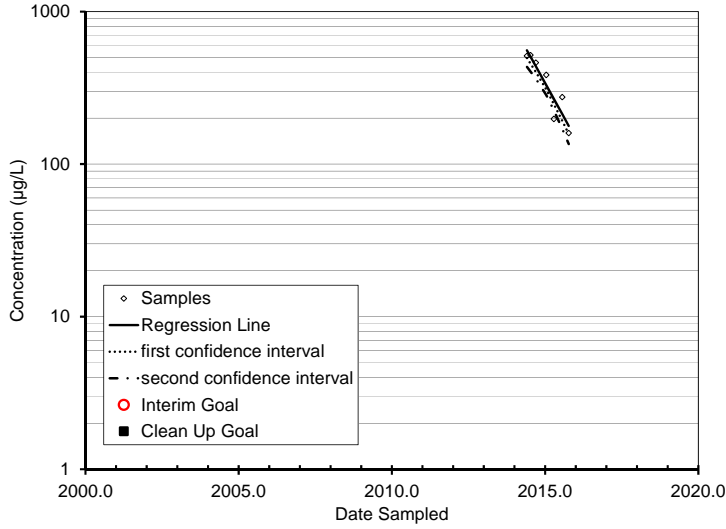
Slope used to estimate degradation rate

North Plume, Well MW-81

Date	Value	Included in Regression
5/29/2014	512	Yes
7/9/2014	518	Yes
9/11/2014	463	Yes
1/13/2015	385	Yes
4/15/2015	198	Yes
7/22/2015	275	Yes
10/8/2015	160	Yes

North Plume, Well MW-81

Date Range: 5/29/2014 to 10/8/2015



FOD 100%

Slope -0.84

p-value <0.01

Regression residuals are appropriately distributed

Slope is negative

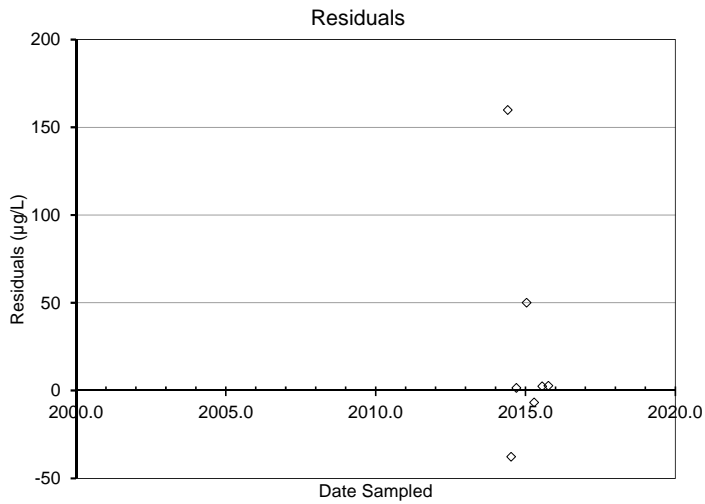
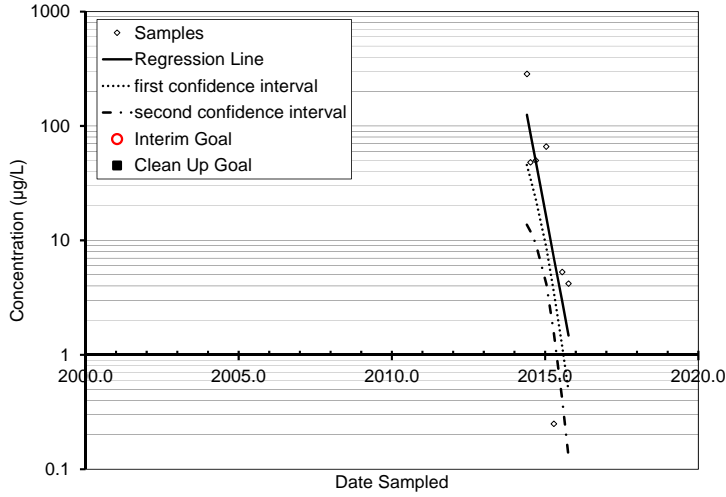
Regression fit not used to estimate degradation due to low sample size

North Plume, Well MW-82

Date	Value	Included in Regression
5/28/2014	285	Yes
7/9/2014	48.2	Yes
9/11/2014	50	Yes
1/13/2015	66	Yes
4/15/2015	0.25	Yes
7/22/2015	5.3	Yes
10/6/2015	4.2	Yes

North Plume, Well MW-82

Date Range: 5/28/2014 to 10/6/2015



FOD 86%

Slope -3.27

p-value >0.05

Regression residuals are appropriately distributed

Slope is not significant

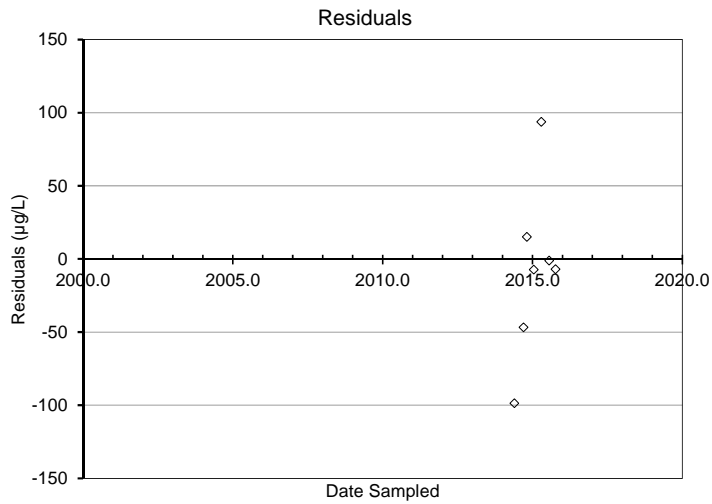
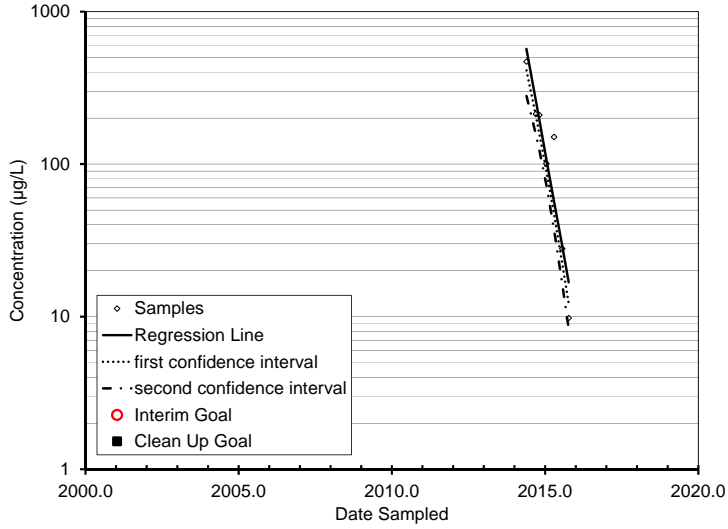
Regression fit not used to estimate degradation rate due to low sample size

North Plume, Well MW-83

Date	Value	Included in Regression
5/23/2014	470	Yes
9/12/2014	213	Yes
10/23/2014	210	Yes
1/15/2015	101	Yes
4/16/2015	151	Yes
7/22/2015	27.9	Yes
10/8/2015	9.8	Yes

North Plume, Well MW-83

Date Range: 5/23/2014 to 10/8/2015



FOD 100%

Slope -2.6

p-value <0.01

Regression residuals are appropriately distributed

Slope is negative

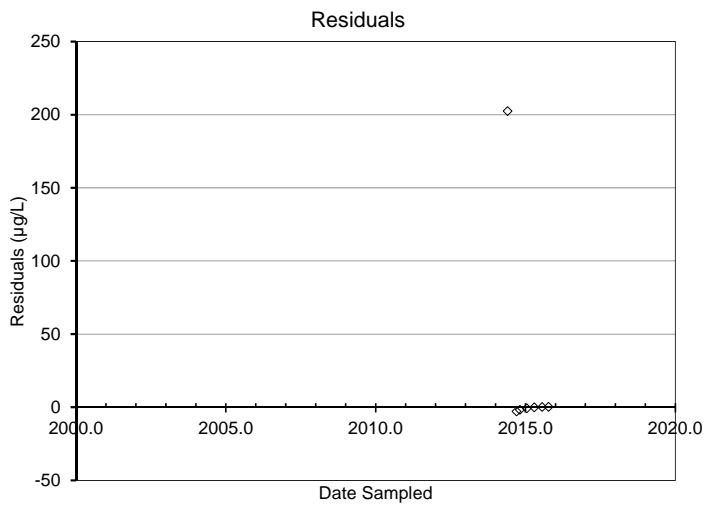
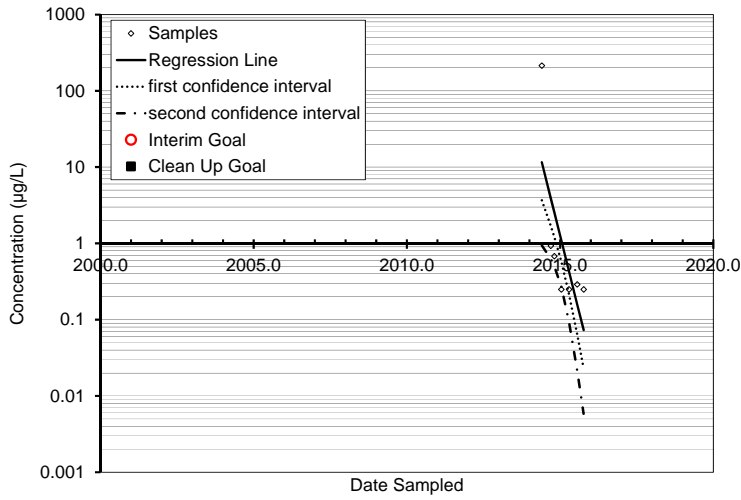
Regression not used to estimate degradation rate due to low sample size

North Plume, Well MW-84

Date	Value	Included in Regression
5/27/2014	214	Yes
9/12/2014	0.93	Yes
10/23/2014	0.68	Yes
1/14/2015	0.25	Yes
4/16/2015	0.25	Yes
7/23/2015	0.29	Yes
10/7/2015	0.25	Yes

North Plume, Well MW-84

Date Range: 5/27/2014 to 10/7/2015



FOD 57%

Slope -3.7

p-value >0.05

Regression residuals are appropriately distributed

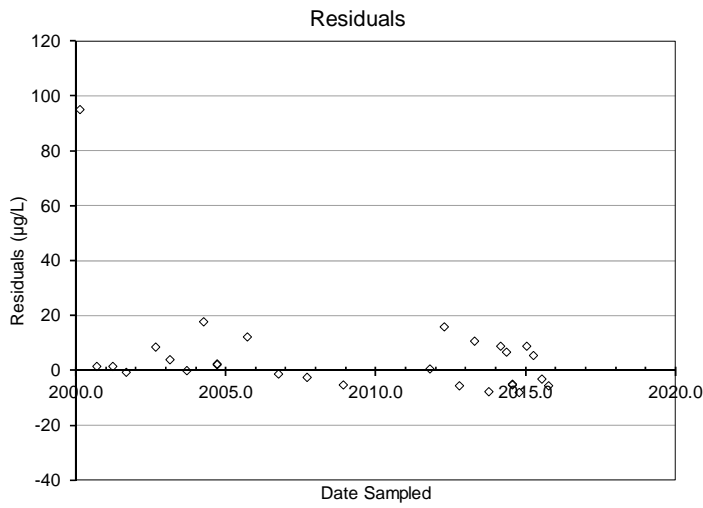
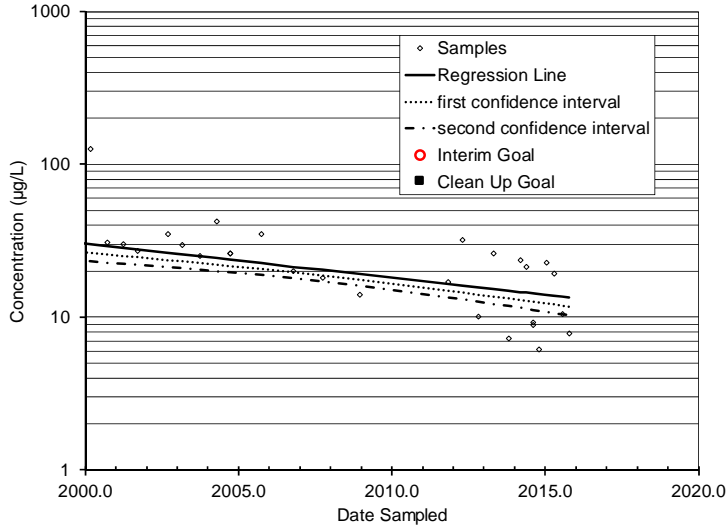
Slope is not significant

Regression fit not used to estimate degradation rate due to low sample size

South Plume, Well ITMW-1

Date	Value	Included in Regression
11/1/1993	10	Yes
12/1/1996	21	Yes
2/1/1999	37	Yes
3/1/2000	125	Yes
9/19/2000	30.7	Yes
3/27/2001	30	Yes
9/11/2001	27	Yes
9/10/2002	35	Yes
2/27/2003	29.6	Yes
9/23/2003	25	Yes
4/13/2004	42.2	Yes
9/21/2004	26	Yes
9/21/2004	26.1	Yes
9/28/2005	34.7	Yes
10/14/2006	20	Yes
9/20/2007	18	Yes
12/9/2008	14	Yes
10/27/2011	17	Yes
4/18/2012	32	Yes
10/19/2012	10	Yes
4/24/2013	26	Yes
10/15/2013	7.2	Yes
3/8/2014	23.4	Yes
5/13/2014	21.3	Yes
7/30/2014	9.2	Yes
7/30/2014	8.9	Yes
10/15/2014	6.1	Yes
1/14/2015	22.7	Yes
4/15/2015	19.2	Yes
7/22/2015	10.5	Yes
10/7/2015	7.8	Yes

South Plume, Well ITMW-1
 Date Range: 11/1/1993 to 10/7/2015



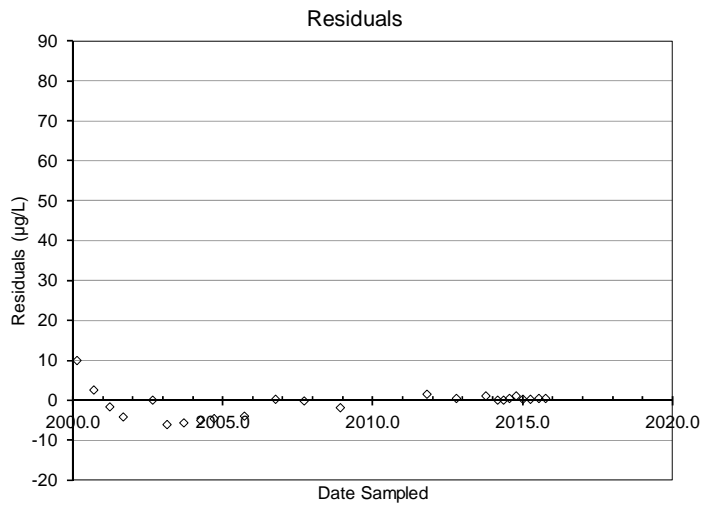
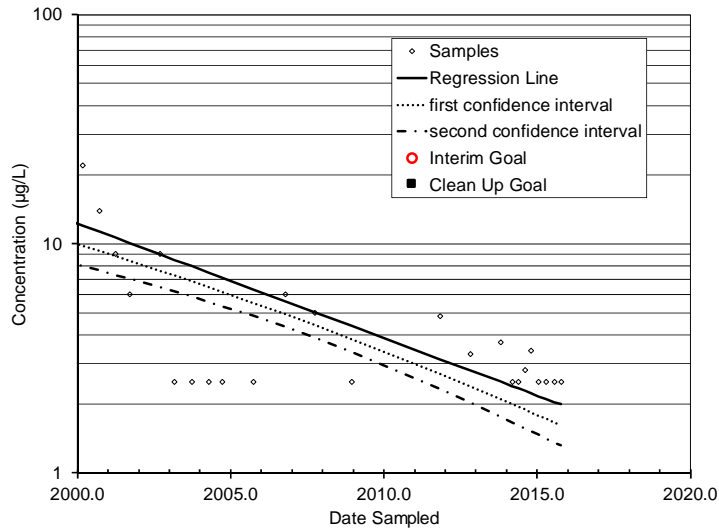
FOD 100%
 Slope -0.052
 p-value <0.01
 Regression residuals are potentially biased
 Slope is negative
 Slope not used to estimate degradation rate

South Plume, Well ITMW-4

Date	Value	Included in Regression
12/1/1996	75	Yes
2/1/1999	93	Yes
3/1/2000	22	Yes
9/20/2000	13.9	Yes
3/28/2001	9	Yes
9/13/2001	6	Yes
9/10/2002	9	Yes
2/28/2003	2.5	Yes
9/23/2003	2.5	Yes
4/14/2004	2.5	Yes
9/22/2004	2.5	Yes
9/27/2005	2.5	Yes
10/11/2006	6	Yes
9/20/2007	5	Yes
12/9/2008	2.5	Yes
10/25/2011	4.8	Yes
10/17/2012	3.3	Yes
10/14/2013	3.7	Yes
3/6/2014	2.5	Yes
5/13/2014	2.5	Yes
7/30/2014	2.8	Yes
10/16/2014	3.4	Yes
1/13/2015	2.5	Yes
7/22/2015	2.5	Yes
10/6/2015	2.5	Yes

South Plume, Well ITMW-4

Date Range: 12/1/1996 to 10/6/2015



FOD 77%

Slope -0.12

p-value <0.001

Regression residuals are appropriately distributed

Slope is negative

Regression fit is acceptable

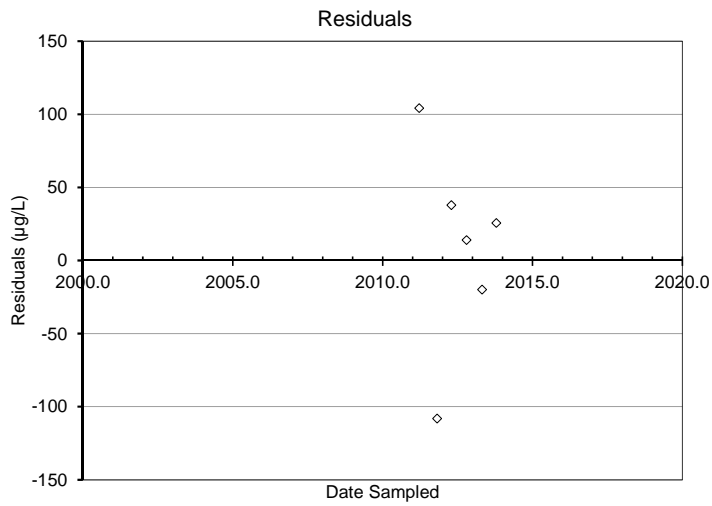
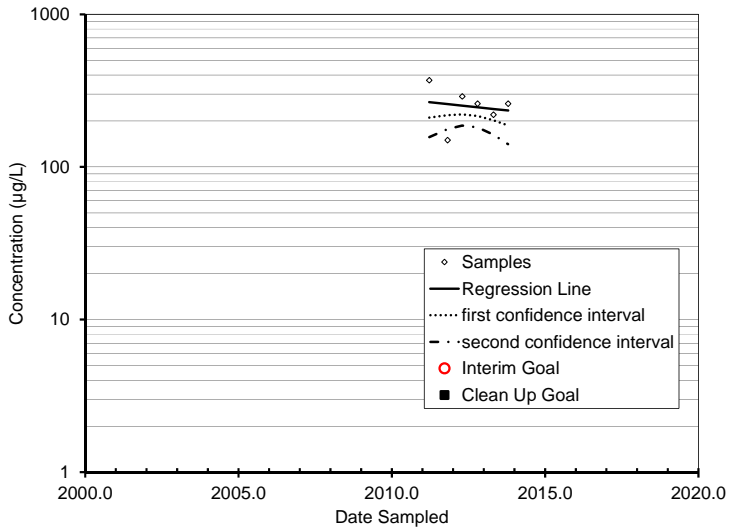
Slope used to estimate degradation rate

South Plume, Well ITMW-5

Date	Value	Included in Regression
2/1/1999	86	No
3/1/2000	73	No
9/20/2000	85	No
3/28/2001	100	No
9/13/2001	72	No
9/10/2002	108	No
2/28/2003	90.4	No
9/24/2003	97.3	No
4/14/2004	83.9	No
9/22/2004	105	No
4/6/2005	93.2	No
4/6/2005	87	No
9/28/2005	79	No
9/28/2005	82.1	No
3/14/2006	92	No
3/14/2006	98.4	No
10/10/2006	110	No
4/18/2007	115	No
9/20/2007	120	No
4/29/2008	120	No
12/9/2008	200	No
4/27/2009	160	No
5/11/2010	190	No
11/6/2010	350	No
3/22/2011	370	Yes
10/25/2011	150	Yes
4/17/2012	290	Yes
10/18/2012	260	Yes
4/25/2013	220	Yes
10/16/2013	260	Yes

South Plume, Well ITMW-5

Date Range: 3/22/2011 to 10/16/2013 (Refined Analysis)



FOD 100%

Slope -0.049

p-value >0.05

Residuals are appropriated distributed

Slope is not significant

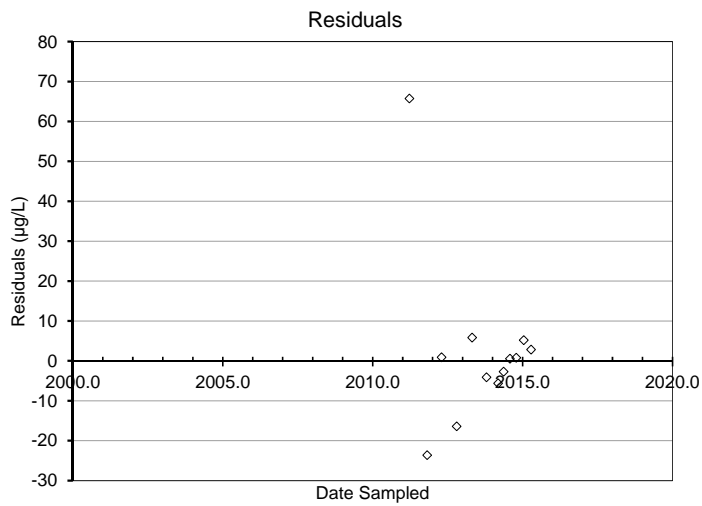
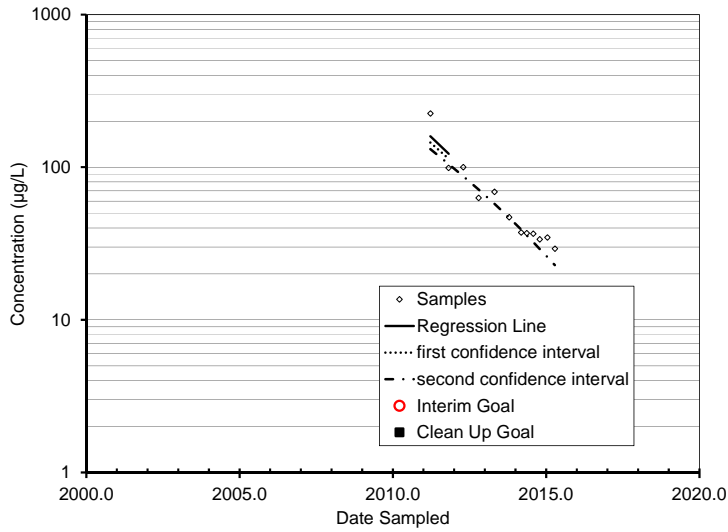
Slope used to estimate degradation rate

South Plume, Well ITMW-7

Date	Value	Included in Regression
12/1/1996	290	No
5/1/1997	380	No
6/1/1999	320	No
6/1/1999	300	No
3/1/2000	262	No
3/1/2000	207	No
9/19/2000	207	No
9/21/2000	109	No
3/28/2001	161	No
9/13/2001	139	No
9/10/2002	137	No
9/10/2002	128	No
2/27/2003	172	No
9/24/2003	125	No
4/14/2004	201	No
9/22/2004	132	No
4/7/2005	122	No
9/28/2005	100	No
3/14/2006	153	No
10/10/2006	140	No
4/17/2007	83	No
9/21/2007	72	No
4/30/2008	70	No
12/11/2008	66	No
4/27/2009	87	No
10/28/2009	60	No
5/10/2010	73	No
3/23/2011	225	Yes
10/25/2011	99	Yes
4/18/2012	100	Yes
10/18/2012	63	Yes
4/25/2013	69	Yes
10/17/2013	47	Yes
3/8/2014	37.4	Yes
5/14/2014	37	Yes
7/30/2014	36.7	No
10/15/2014	33.7	No
1/14/2015	34.7	No
4/14/2015	29.3	No
7/22/2015	26.4	No
10/8/2015	27.6	No

South Plume, Well ITMW-7

Date Range: 3/23/2011 to 5/14/2014 (ISCO Impacts Excluded, Refined)



FOD 100%

Slope -0.40

p-value < 0.001

Regression residuals are appropriately distributed

Slope is negative

Regression fit is acceptable

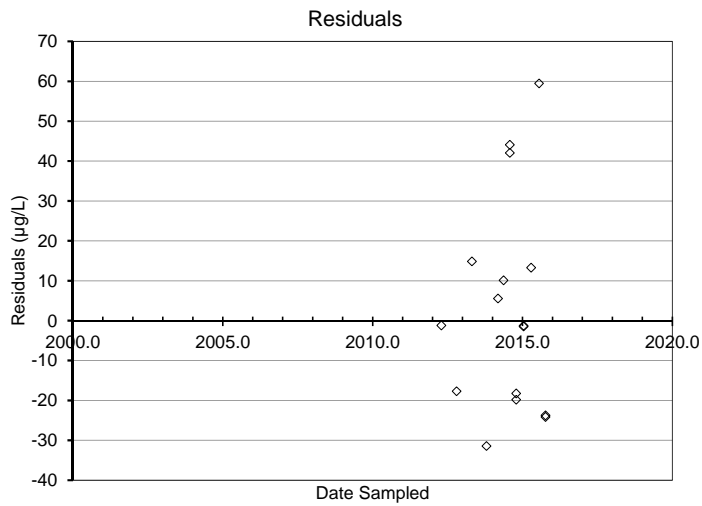
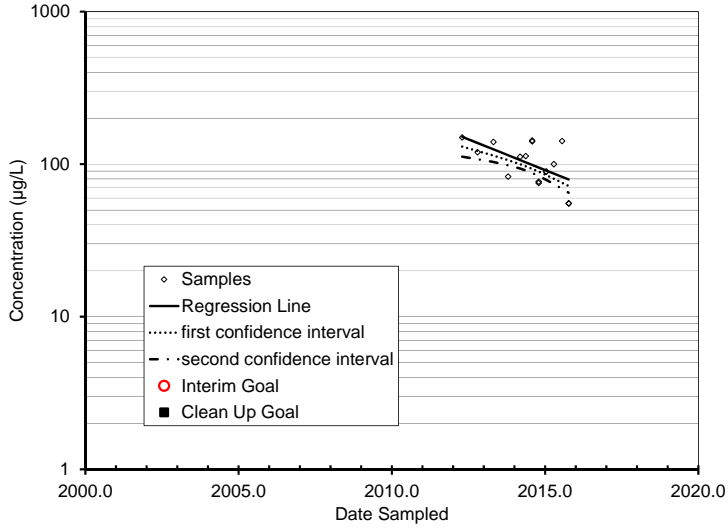
Slope used to estimate degradation rate

South Plume, Well ITMW-9

Date	Value	Included in Regression
12/1/1996	230	No
5/1/1997	7	No
2/1/1999	40	No
3/1/2000	69	No
9/20/2000	57.3	No
9/20/2000	54.8	No
3/28/2001	40	No
9/13/2001	40	No
9/10/2002	61	No
2/28/2003	54.2	No
9/23/2003	91	No
9/23/2003	97.6	No
4/14/2004	71.8	No
9/22/2004	80.7	No
4/6/2005	79	No
9/27/2005	98.8	No
3/14/2006	101	No
10/11/2006	110	No
4/17/2007	79	No
9/20/2007	76	No
4/28/2008	82	No
12/9/2008	90	No
4/27/2009	110	No
10/27/2009	120	No
10/27/2009	120	No
5/11/2010	130	No
3/22/2011	120	No
10/25/2011	90	No
4/17/2012	150	Yes
10/18/2012	120	Yes
4/24/2013	140	Yes
10/17/2013	83	Yes
3/8/2014	112	Yes
5/14/2014	113	Yes
7/30/2014	143	Yes
7/30/2014	141	Yes
10/15/2014	75.3	Yes
10/15/2014	76.9	Yes
1/13/2015	89.4	Yes
1/13/2015	89.6	Yes
4/15/2015	100	Yes
7/21/2015	142	Yes
10/7/2015	55.6	Yes
10/7/2015	55.2	Yes

South Plume, Well ITMW-9

Date Range: 4/17/2012 to 10/7/2015 (Refined Analysis)



FOD 100%

Slope -0.19

p-value 0.02

Slope is negative

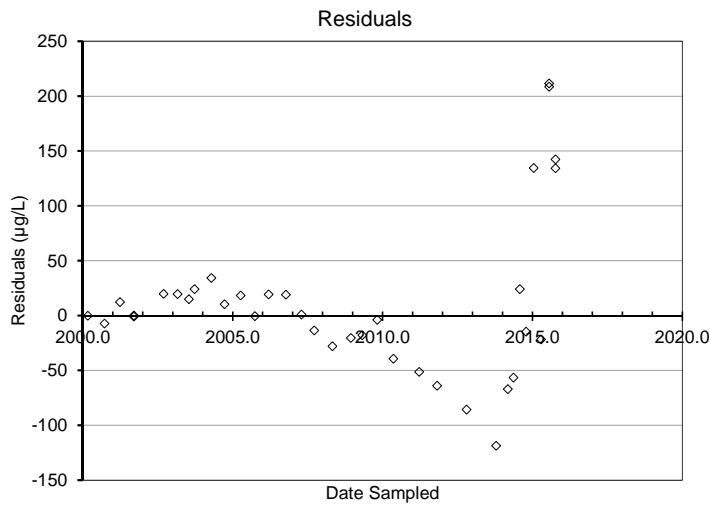
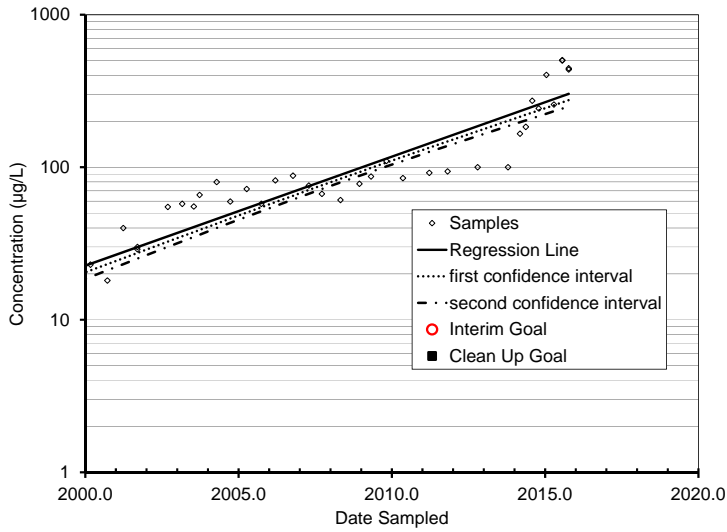
Regression is acceptable

Slope used to estimate degradation rate

South Plume, Well ITMW-10

Date	Value	Included in Regression
12/1/1996	4	Yes
2/1/1999	25	Yes
3/1/2000	23	Yes
9/20/2000	18.1	Yes
3/28/2001	40	Yes
9/13/2001	29	Yes
9/13/2001	30	Yes
9/10/2002	55	Yes
2/28/2003	57.6	Yes
7/16/2003	55.3	Yes
9/23/2003	65.9	Yes
4/14/2004	80	Yes
9/22/2004	59.6	Yes
4/6/2005	72.1	Yes
9/28/2005	57.6	Yes
3/14/2006	82	Yes
10/10/2006	88	Yes
4/17/2007	76	Yes
9/20/2007	67	Yes
4/28/2008	61	Yes
12/9/2008	78	Yes
4/27/2009	87	Yes
10/27/2009	110	Yes
5/11/2010	85	Yes
3/22/2011	92	Yes
10/25/2011	94	Yes
10/18/2012	100	Yes
10/15/2013	100	Yes
3/6/2014	166	Yes
5/14/2014	184	Yes
7/30/2014	273	Yes
10/15/2014	243	Yes
1/14/2015	403	Yes
4/15/2015	258	Yes
7/22/2015	501	Yes
7/22/2015	504	Yes
10/7/2015	437	Yes
10/7/2015	445	Yes

South Plume, Well ITMW-10
Date Range: 12/1/1996 to 10/7/2015



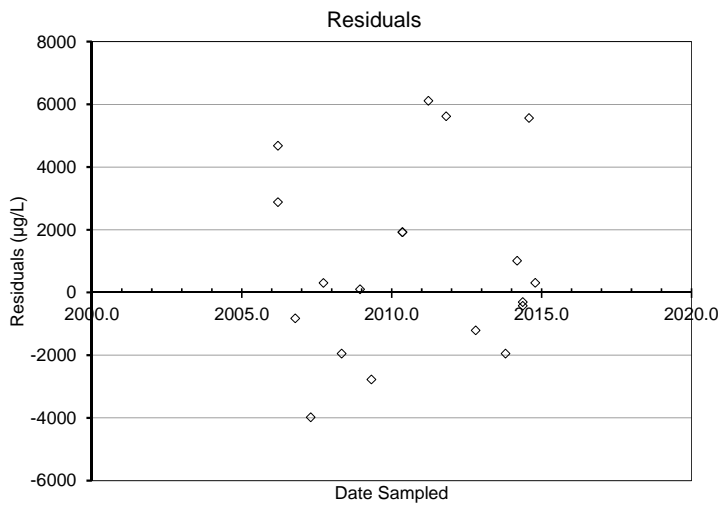
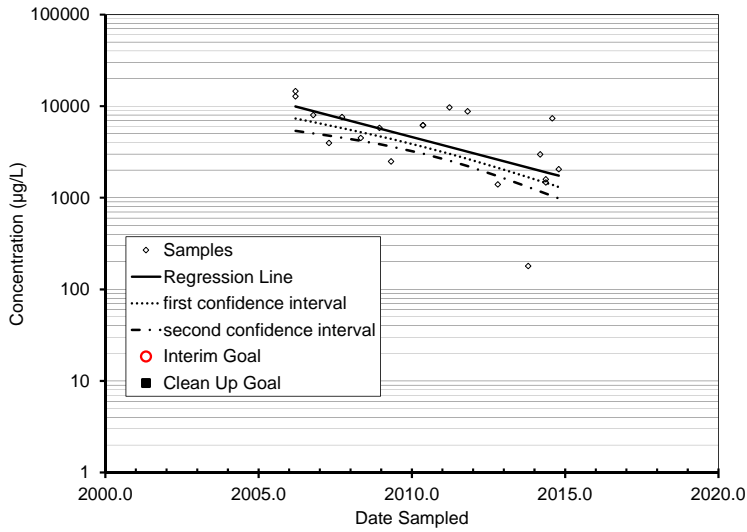
FOD 100%
Slope 0.16
p-value < 0.001
Slope is positive
Regression residuals are not appropriately distributed
Slope not used to estimate degradation rate

South Plume, Well ITMW-11

Date	Value	Included in Regression
1/1/1990	19000	No
11/1/1990	4700	No
2/1/1991	3400	No
11/1/1993	2300	No
12/1/1996	510	No
2/1/1999	650	No
3/1/2000	3370	No
9/19/2000	8030	No
3/27/2001	7000	No
9/13/2001	6000	No
11/20/2001	2.5	No
9/9/2002	7100	No
9/9/2002	800	No
2/26/2003	4110	No
2/26/2003	3630	No
9/24/2003	3990	No
4/13/2004	3160	No
9/21/2004	3450	No
4/7/2005	4210	No
9/29/2005	3910	No
3/16/2006	14600	Yes
3/16/2006	12800	Yes
10/13/2006	8000	Yes
4/19/2007	3970	Yes
9/21/2007	7600	Yes
4/30/2008	4500	Yes
12/10/2008	5800	Yes
4/27/2009	2500	Yes
5/11/2010	6200	Yes
5/11/2010	6200	Yes
3/23/2011	9700	Yes
10/26/2011	8800	Yes
10/19/2012	1400	Yes
10/17/2013	180	Yes
3/8/2014	2980	Yes
5/15/2014	1470	Yes
5/15/2014	1590	Yes
7/31/2014	7380	Yes
10/15/2014	2050	Yes
12/4/2014	1530	No
1/15/2015	68.3	No
4/15/2015	2.5	No
7/22/2015	33.2	No
10/7/2015	721	No

South Plume, Well ITMW-11

Date Range: 3/16/2006 to 10/15/2014 (ISCO Impacts Excluded, Refined)



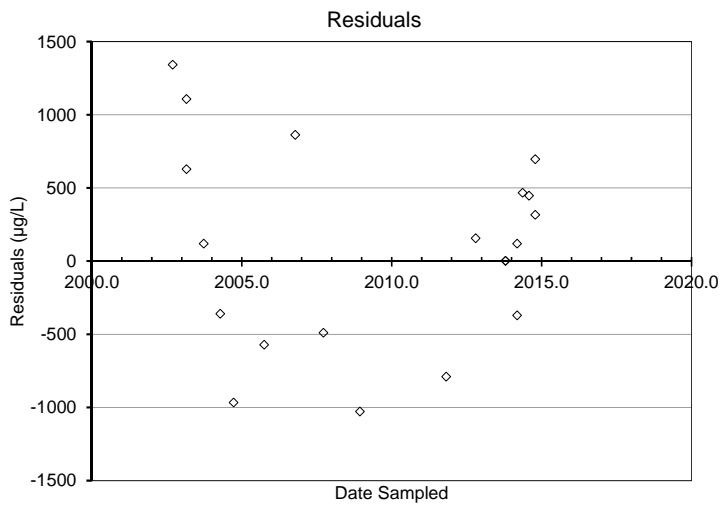
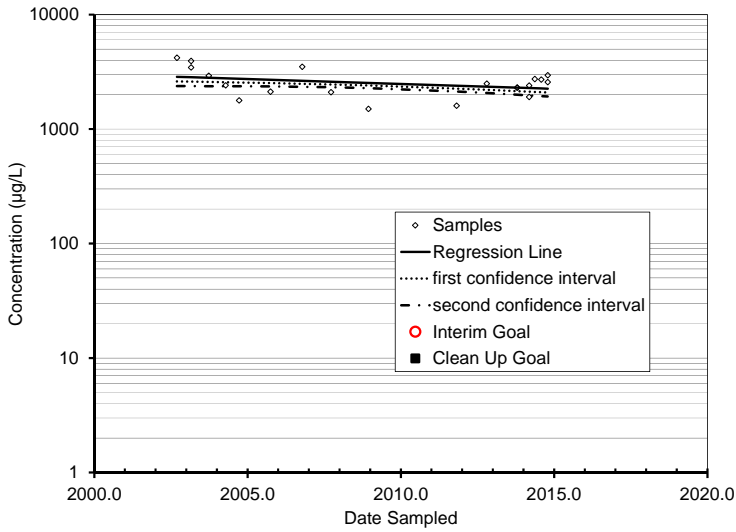
FOD 100%
Slope -0.20
p-value <0.01
Slope is negative
Regression residuals are biased
Slope not used to estimate degradation rate

South Plume, Well ITMW-12

Date	Value	Included in Regression
11/1/1990	2400	No
2/1/1991	2100	No
11/1/1993	2500	No
12/1/1996	1200	No
2/1/1999	3100	No
3/1/2000	3110	No
9/19/2000	3350	No
3/27/2001	3900	No
9/13/2001	3100	No
11/20/2001	2400	No
9/11/2002	4200	Yes
2/26/2003	3460	Yes
2/26/2003	3940	Yes
9/24/2003	2920	Yes
4/13/2004	2410	Yes
9/21/2004	1780	Yes
9/29/2005	2120	Yes
10/13/2006	3500	Yes
9/21/2007	2100	Yes
12/9/2008	1500	Yes
10/26/2011	1600	Yes
10/19/2012	2500	Yes
10/17/2013	2300	Yes
10/17/2013	2300	Yes
3/8/2014	1910	Yes
3/8/2014	2400	Yes
5/14/2014	2740	Yes
7/31/2014	2710	Yes
10/15/2014	2950	Yes
10/15/2014	2570	Yes
7/23/2015	652	No
10/7/2015	314	No

South Plume, Well ITMW-12

Date Range: 9/11/2002 to 10/15/2014 (ISCO Impacts Excluded, Refined)



FOD 100%

Slope -0.020

p-value >0.05

Slope is not significant

Regression residuals are not appropriately distributed

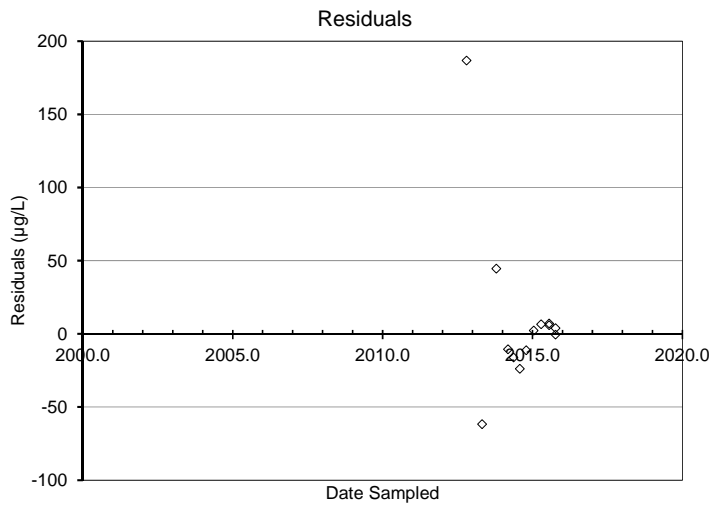
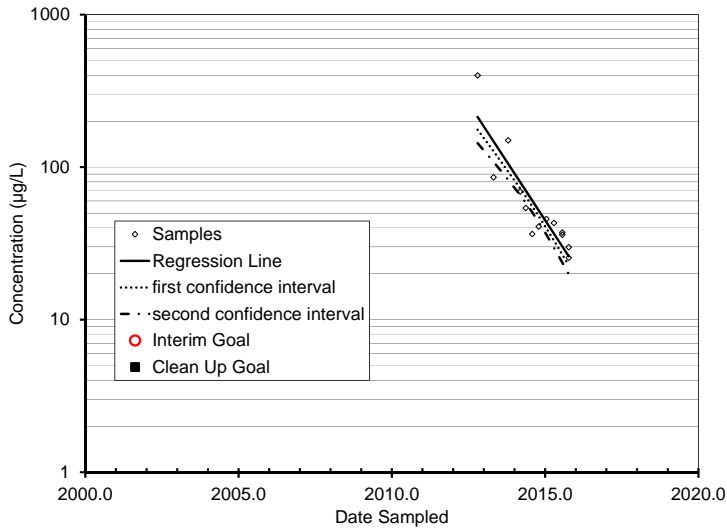
Slope not used to estimate degradation rate

South Plume, Well ITMW-13

Date	Value	Included in Regression
11/1/1990	34	No
2/1/1991	32	No
12/1/1996	36	No
2/1/1999	36	No
3/1/2000	37	No
9/19/2000	22.4	No
3/28/2001	44	No
9/13/2001	35	No
9/9/2002	99	No
9/9/2002	81	No
2/26/2003	70.2	No
9/24/2003	159	No
4/13/2004	48.4	No
9/21/2004	25.5	No
4/7/2005	71.8	No
9/30/2005	72.7	No
3/16/2006	141	No
10/14/2006	100	No
4/18/2007	83.1	No
9/20/2007	28	No
4/29/2008	69	No
12/10/2008	26	No
4/27/2009	79	No
10/27/2009	18	No
5/12/2010	97	No
3/23/2011	130	No
10/27/2011	64	No
10/27/2011	65	No
4/19/2012	97	No
10/18/2012	400	Yes
4/25/2013	86	Yes
10/16/2013	150	Yes
3/8/2014	69.3	Yes
5/14/2014	54	Yes
7/30/2014	36.5	Yes
10/15/2014	40.8	Yes
1/14/2015	45.8	Yes
4/15/2015	43.1	Yes
7/22/2015	36.1	Yes
7/22/2015	37.3	Yes
10/7/2015	29.9	Yes
10/7/2015	25.5	Yes

South Plume, Well ITMW-13

Date Range: 10/18/2012 to 10/7/2015 (Refined)



FOD= 100%

Slope -0.71

p-value <0.001

Slope is negative

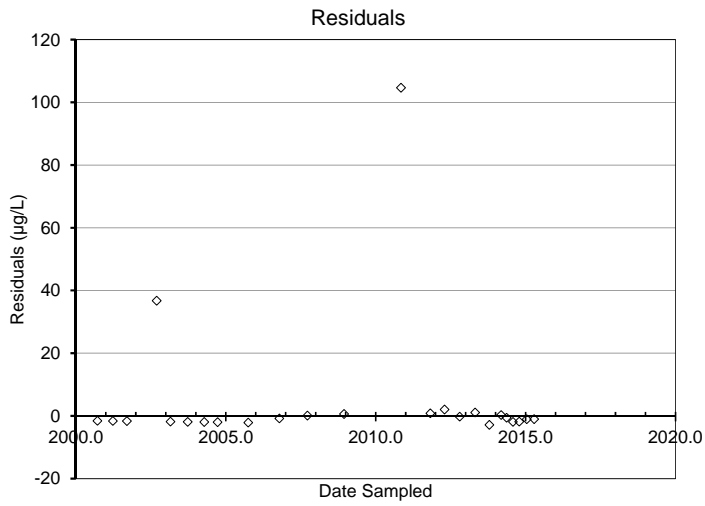
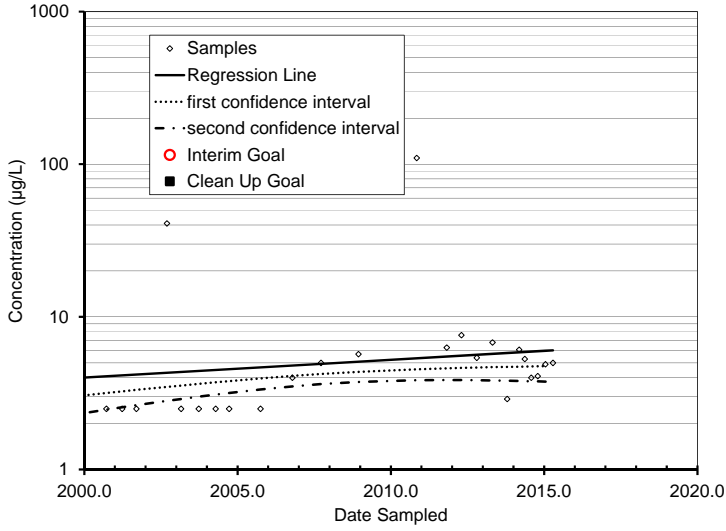
Regression residuals are biased

Slope not used to estimate degradation rate

South Plume, Well ITMW-14

Date	Value	Included in Regression
11/1/1993	6	Yes
9/19/2000	2.5	Yes
3/27/2001	2.5	Yes
9/13/2001	2.5	Yes
9/11/2002	41	Yes
2/26/2003	2.5	Yes
9/24/2003	2.5	Yes
4/13/2004	2.5	Yes
9/21/2004	2.5	Yes
9/30/2005	2.5	Yes
10/14/2006	4	Yes
9/21/2007	5	Yes
12/10/2008	5.7	Yes
11/4/2010	110	Yes
10/27/2011	6.3	Yes
4/19/2012	7.6	Yes
10/19/2012	5.4	Yes
4/25/2013	6.8	Yes
10/16/2013	2.9	Yes
3/8/2014	6.1	Yes
5/14/2014	5.3	Yes
7/30/2014	4	Yes
10/15/2014	4.1	Yes
1/14/2015	4.9	Yes
4/15/2015	5	Yes
7/22/2015	4.3	Yes
10/7/2015	4.6	Yes

South Plume, Well ITMW-14
 Date Range: 11/1/1993 to 10/7/2015



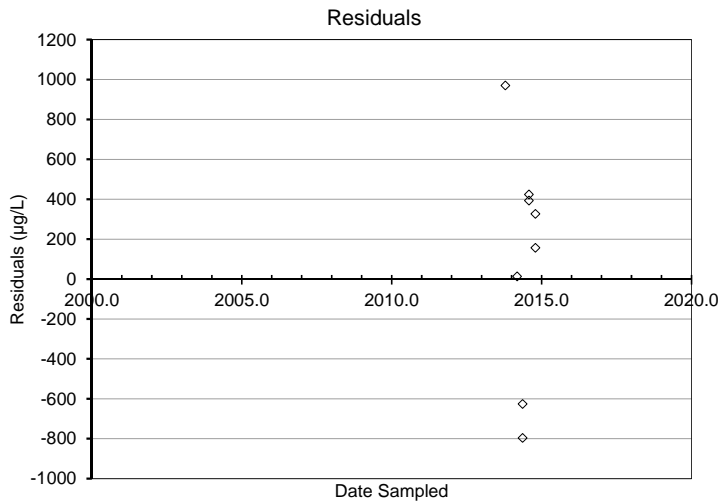
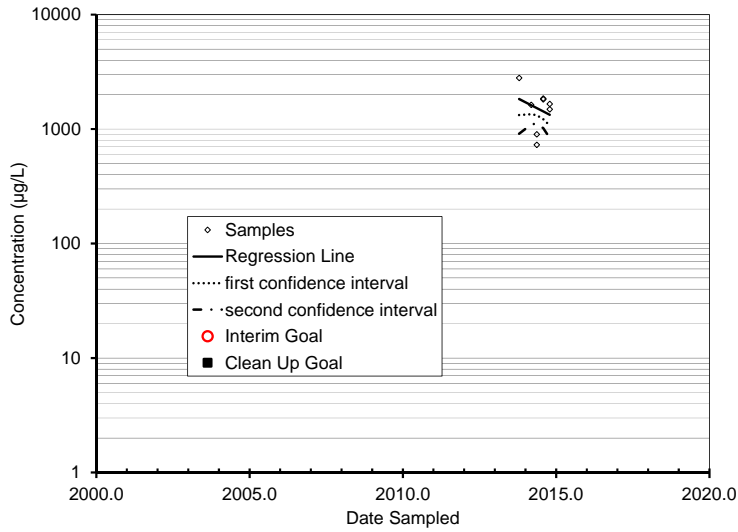
FOD 70%
 Slope 0.022
 p-value >0.05
 Regression residuals are potentially biased
 Slope trend is not significant
 Slope not used to estimate degradation rate

South Plume, Well ITMW-15

Date	Value	Included in Regression
11/1/1990	2500	No
2/1/1991	1700	No
4/15/1991	2000	No
4/19/1991	2100	No
4/20/1991	2400	No
11/1/1993	4300	No
12/1/1996	240	No
2/1/1999	400	No
3/1/2000	339	No
9/19/2000	362	No
9/19/2000	376	No
3/28/2001	290	No
9/13/2001	380	No
9/13/2001	370	No
11/20/2001	157	No
9/11/2002	320	No
2/26/2003	301	No
9/25/2003	490	No
4/14/2004	334	No
9/21/2004	774	No
4/7/2005	685	No
9/29/2005	862	No
3/16/2006	908	No
10/13/2006	680	No
4/19/2007	591	No
9/21/2007	1000	No
4/29/2008	100	No
12/10/2008	1100	No
4/27/2009	2800	No
5/11/2010	2800	No
10/26/2011	1100	No
10/19/2012	240	No
10/16/2013	2800	Yes
3/8/2014	1630	Yes
5/14/2014	899	Yes
5/14/2014	729	Yes
7/30/2014	1850	Yes
7/30/2014	1820	Yes
10/16/2014	1660	Yes
10/16/2014	1490	Yes
12/5/2014	63	No
1/15/2015	61.7	No
1/15/2015	56.5	No
4/15/2015	101	No
7/22/2015	110	No
10/7/2015	38.9	No

South Plume, Well ITMW-15

Date Range: 10/16/2013 to 10/16/2014 (ISCO Impacts Excluded)



FOD 100%

Slope -0.32

p-value >0.05

Slope is not significant

Regression residuals are not appropriately distributed

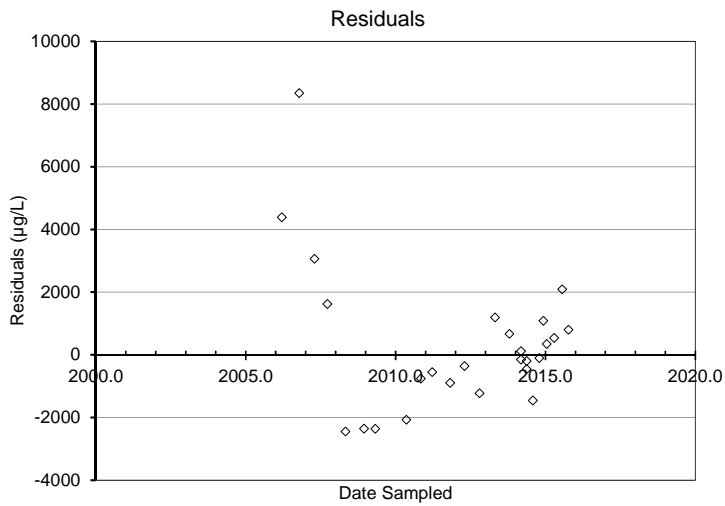
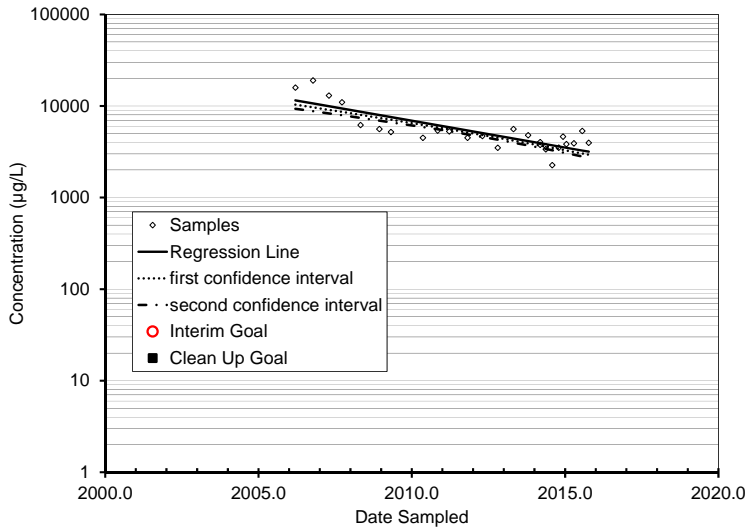
Slope not used to estimate degradation rate

South Plume, Well ITMW-17

Date	Value	Included in Regression
2/1/1991	21000	No
4/15/1991	21000	No
4/24/1991	21000	No
11/1/1993	18000	No
12/1/1996	9300	No
2/1/1999	11000	No
3/1/2000	6780	No
9/19/2000	5500	No
1/5/2001	8310	No
3/28/2001	6700	No
9/13/2001	6300	No
9/11/2002	6500	No
2/26/2003	4380	No
9/25/2003	6090	No
4/14/2004	5050	No
4/14/2004	4920	No
9/21/2004	5760	No
4/7/2005	5750	No
9/29/2005	5460	No
3/15/2006	15900	Yes
10/12/2006	19000	Yes
4/18/2007	13000	Yes
9/21/2007	11000	Yes
4/29/2008	6200	Yes
12/10/2008	5600	Yes
4/27/2009	5200	Yes
5/11/2010	4500	Yes
11/4/2010	5400	Yes
3/22/2011	5300	Yes
10/26/2011	4500	Yes
4/19/2012	4700	Yes
10/19/2012	3500	Yes
4/25/2013	5600	Yes
10/17/2013	4800	Yes
3/8/2014	3770	Yes
3/8/2014	4040	Yes
5/15/2014	3370	Yes
5/15/2014	3630	Yes
7/30/2014	2260	Yes
10/16/2014	3510	Yes
12/5/2014	4630	Yes
1/15/2015	3840	Yes
4/15/2015	3920	Yes
7/22/2015	5350	Yes
10/7/2015	3970	Yes

South Plume, Well ITMW-17

Date Range: 3/15/2006 to 10/7/2015 (ISCO Impacts Excluded)



FOD 100%

Slope -0.14

p-value < 0.001

Regression residuals are biased

Slope is negative

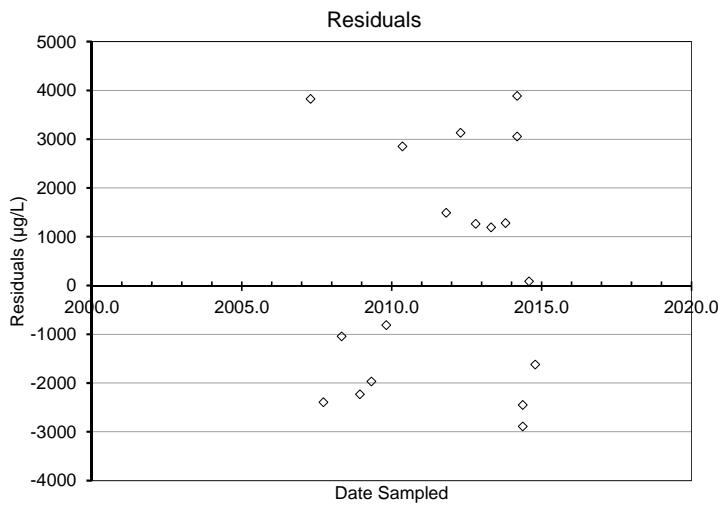
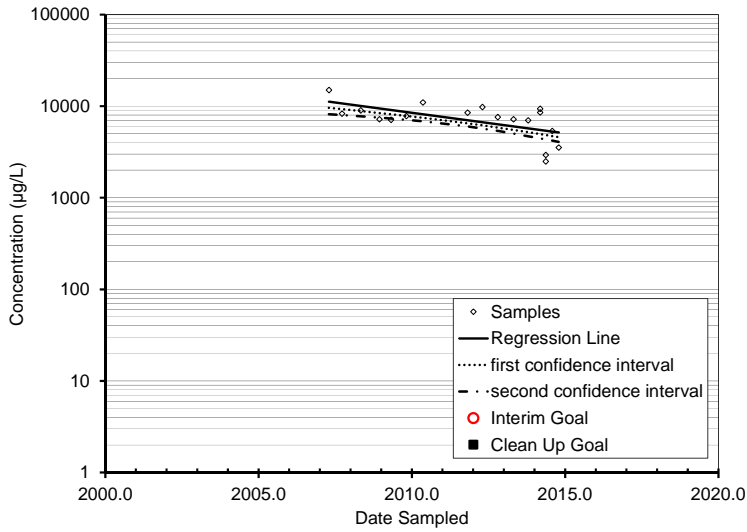
Slope not used to estimate degradation rate

South Plume, Well ITMW-18

Date	Value	Included in Regression
2/1/1991	3700	No
11/1/1993	4500	No
12/1/1996	1600	No
2/1/1999	6300	No
3/1/2000	3560	No
9/19/2000	4080	No
3/27/2001	4000	No
3/27/2001	4200	No
9/11/2001	4100	No
9/11/2002	6700	No
2/26/2003	5110	No
9/24/2003	7700	No
4/13/2004	7740	No
9/21/2004	7050	No
4/8/2005	7080	No
9/29/2005	4660	No
3/15/2006	5750	No
10/13/2006	6600	No
4/18/2007	15000	Yes
9/21/2007	8300	Yes
4/30/2008	9000	Yes
12/9/2008	7200	Yes
4/27/2009	7100	Yes
10/27/2009	7800	Yes
5/11/2010	11000	Yes
10/26/2011	8500	Yes
4/19/2012	9800	Yes
10/19/2012	7600	Yes
4/25/2013	7200	Yes
10/17/2013	7000	Yes
3/8/2014	9380	Yes
3/8/2014	8550	Yes
5/15/2014	2500	Yes
5/15/2014	2940	Yes
7/31/2014	5360	Yes
10/15/2014	3540	Yes
12/4/2014	3690	No
1/15/2015	488	No
4/16/2015	43.5	No
7/23/2015	22.9	No
10/8/2015	12.9	No
10/8/2015	12.4	No

South Plume, Well ITMW-18

Date Range: 4/18/2007 to 10/15/2014 (ISCO Impacts Excluded)



FOD 100%

Slope -0.10

p-value <0.01

Slope is negative

Regression residuals are not appropriately distributed

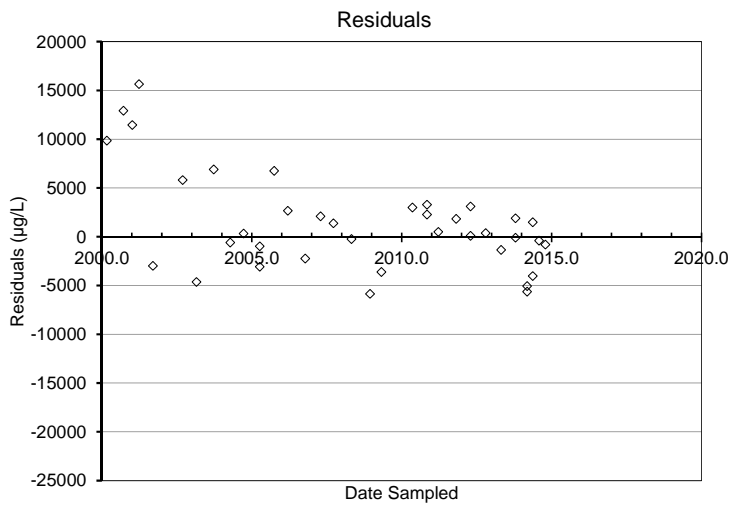
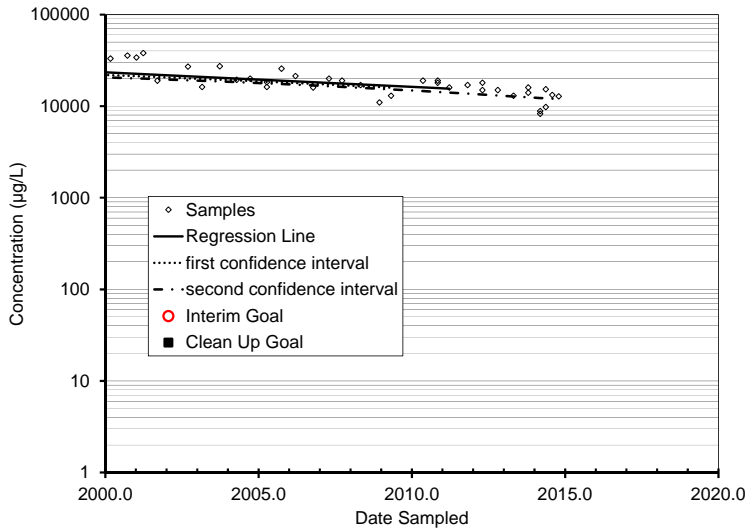
Slope not used to estimate degradation rate

South Plume, Well ITMW-19

Date	Value	Included in Regression
2/1/1991	9900	Yes
11/1/1993	27000	Yes
12/1/1996	25000	Yes
2/1/1999	33000	Yes
3/1/2000	33100	Yes
9/19/2000	35700	Yes
1/5/2001	34000	Yes
3/28/2001	38000	Yes
9/13/2001	19000	Yes
9/11/2002	27000	Yes
2/26/2003	16200	Yes
9/24/2003	27300	Yes
4/13/2004	19400	Yes
9/21/2004	20000	Yes
4/7/2005	18300	Yes
4/7/2005	16200	Yes
9/29/2005	25700	Yes
3/15/2006	21300	Yes
10/12/2006	16000	Yes
4/18/2007	20000	Yes
9/21/2007	19000	Yes
4/29/2008	17000	Yes
12/10/2008	11000	Yes
4/27/2009	13000	Yes
5/11/2010	19000	Yes
11/4/2010	19000	Yes
11/4/2010	18000	Yes
3/22/2011	16000	Yes
10/26/2011	17000	Yes
4/19/2012	15000	Yes
4/19/2012	18000	Yes
10/19/2012	15000	Yes
4/25/2013	13000	Yes
10/18/2013	16000	Yes
10/18/2013	14000	Yes
3/8/2014	8850	Yes
3/8/2014	8270	Yes
5/15/2014	15300	Yes
5/15/2014	9780	Yes
7/31/2014	13300	Yes
10/16/2014	12800	Yes
12/5/2014	33.5	No
1/15/2015	17.4	No
4/15/2015	594	No
7/23/2015	15.2	No
10/8/2015	87.1	No

South Plume, Well ITMW-19

Date Range: 2/1/1991 to 10/16/2014 (ISCO Impacts Excluded)



FOD 100%

Slope -0.037

p-value < 0.001

Regression residuals are potentially biased

Slope is negative

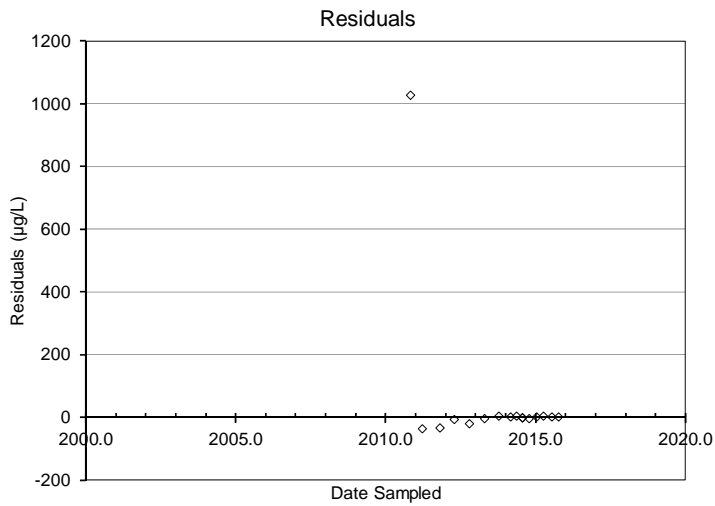
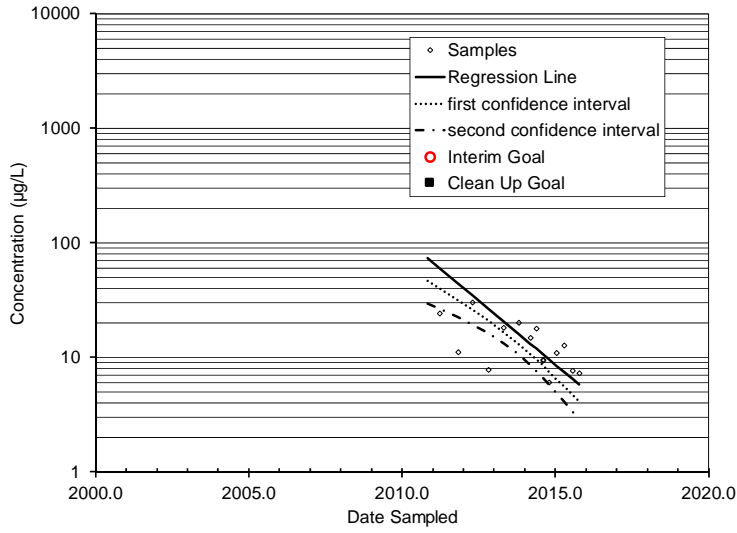
Slope not used to estimate degradation rate

South Plume, Well ITMW-21

Date	Value	Included in Regression
3/1/1991	21	No
11/1/1993	37	No
12/1/1996	150	No
2/1/1999	190	No
3/1/2000	196	No
9/19/2000	192	No
3/28/2001	123	No
9/13/2001	116	No
9/10/2002	13	No
2/26/2003	39.5	No
9/23/2003	9.09	No
4/14/2004	52.9	No
9/22/2004	7.8	No
9/28/2005	6.45	No
10/12/2006	9	No
9/21/2007	10	No
12/9/2008	15	No
10/27/2009	14	No
11/4/2010	1100	Yes
3/22/2011	24	Yes
10/25/2011	11	Yes
4/17/2012	30	Yes
10/19/2012	7.7	Yes
4/24/2013	18	Yes
10/15/2013	20	Yes
3/6/2014	14.8	Yes
5/14/2014	17.6	Yes
7/30/2014	9.3	Yes
7/30/2014	9.4	Yes
10/15/2014	6	Yes
1/14/2015	10.8	Yes
4/14/2015	12.7	Yes
7/22/2015	7.6	Yes
10/8/2015	7.2	Yes

South Plume, Well ITMW-21

Date Range: 11/4/2010 to 10/8/2015 (ISCO Impacts Excluded)



FOD 100%

Slope -0.51

p-value < 0.01

Regression residuals are potentially biased

Slope is negative

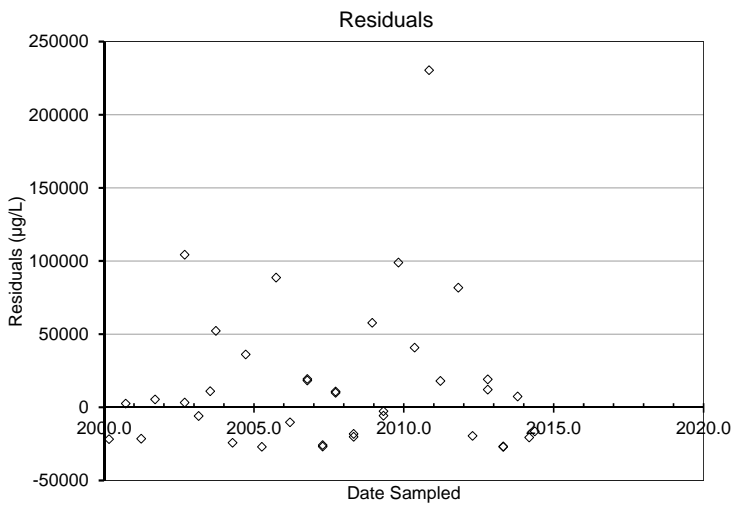
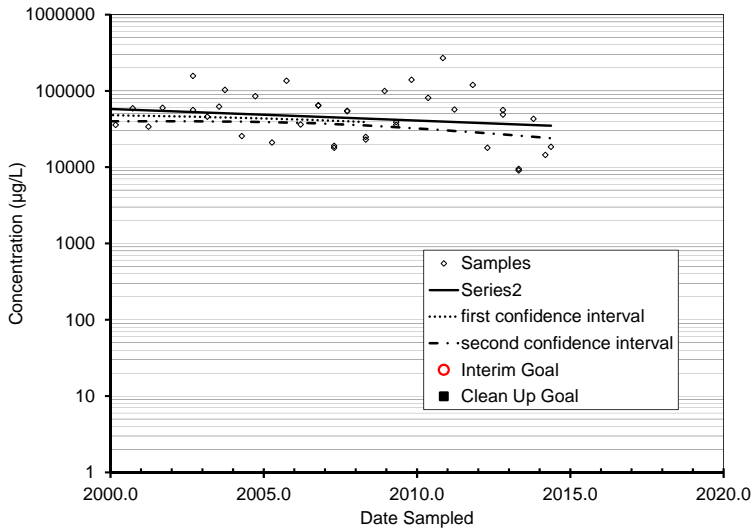
Slope not used to estimate degradation rate

South Plume, Well MW-25

Date	Value	Included in Regression
2/1/1999	29000	Yes
2/1/1999	27000	Yes
12/1/1999	94500	Yes
3/1/2000	35900	Yes
9/21/2000	59000	Yes
3/28/2001	34000	Yes
9/13/2001	60000	Yes
9/9/2002	157000	Yes
9/9/2002	56000	Yes
2/26/2003	45900	Yes
7/17/2003	62200	Yes
9/24/2003	103000	Yes
4/14/2004	25600	Yes
9/21/2004	85200	Yes
4/7/2005	21100	Yes
9/28/2005	136000	Yes
3/15/2006	36300	Yes
10/12/2006	64000	Yes
10/12/2006	65000	Yes
4/18/2007	19000	Yes
4/18/2007	18000	Yes
9/21/2007	54000	Yes
9/21/2007	55000	Yes
4/29/2008	23000	Yes
4/29/2008	25000	Yes
12/10/2008	100000	Yes
4/27/2009	36000	Yes
4/27/2009	39000	Yes
10/27/2009	140000	Yes
5/11/2010	81000	Yes
11/4/2010	270000	Yes
3/22/2011	57000	Yes
10/26/2011	120000	Yes
4/17/2012	18000	Yes
10/19/2012	56000	Yes
10/19/2012	49000	Yes
4/25/2013	9100	Yes
4/25/2013	9500	Yes
10/18/2013	43000	Yes
3/8/2014	14500	Yes
5/15/2014	18500	Yes
7/9/2014	49900	No
7/31/2014	71700	No
10/16/2014	42500	No
10/24/2014	59800	No
12/5/2014	2620	No
1/15/2015	2510	No
4/16/2015	4650	No
7/23/2015	39800	No
10/8/2015	68700	No

South Plume, Well MW-25

Date Range: 2/1/1999 to 5/15/2014 (ISCO Impacts Excluded)



FOD 100%

Slope -0.04

p-value > 0.05

Regression residuals are appropriately distributed

Slope trend is not significant

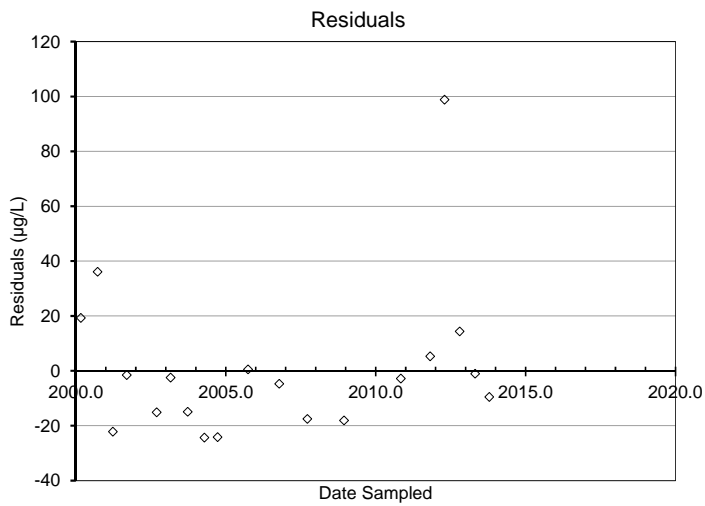
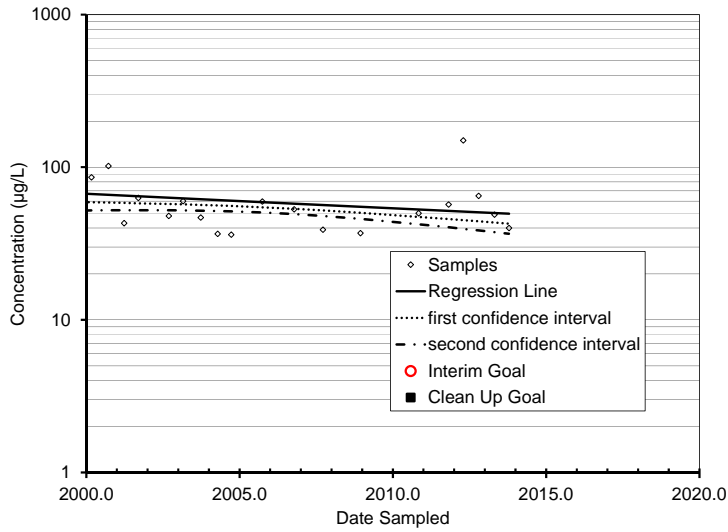
Slope used to estimate degradation rate

South Plume, Well MW-30

Date	Value	Included in Regression
12/1/1999	115	Yes
12/9/1999	115	Yes
3/1/2000	86	Yes
9/20/2000	102	Yes
3/27/2001	43	Yes
9/11/2001	63	Yes
9/10/2002	48	Yes
2/27/2003	60	Yes
9/24/2003	46.8	Yes
4/14/2004	36.6	Yes
9/22/2004	36.2	Yes
9/28/2005	59.6	Yes
10/12/2006	53	Yes
9/20/2007	39	Yes
12/10/2008	37	Yes
11/3/2010	50	Yes
10/26/2011	57	Yes
4/18/2012	150	Yes
10/18/2012	65	Yes
4/25/2013	49	Yes
10/14/2013	40	Yes

South Plume, Well MW-30

Date Range: 12/1/1999 to 10/14/2013



FOD 100%

Slope -0.022

p-value >0.05

Regression residuals are appropriately distributed

Slope trend is not significant

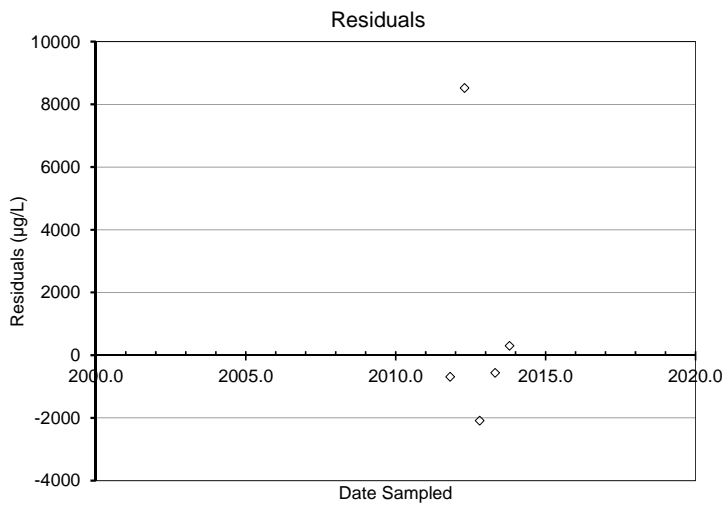
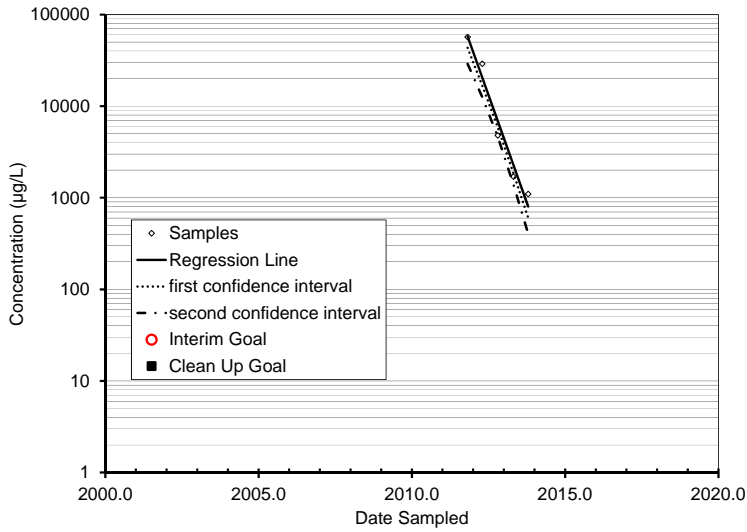
Slope used to estimate degradation rate

South Plume, Well MW-37

Date	Value	Included in Regression
9/14/2001	5000	No
11/20/2001	2.5	No
9/11/2002	1400	No
2/27/2003	4050	No
7/17/2003	2560	No
9/24/2003	3700	No
4/13/2004	5190	No
9/21/2004	5030	No
4/5/2005	5310	No
9/29/2005	6780	No
3/16/2006	11200	No
10/13/2006	13000	No
10/13/2006	13000	No
4/19/2007	9490	No
9/21/2007	22000	No
4/30/2008	16000	No
12/10/2008	24000	No
4/27/2009	11000	No
10/27/2009	37000	No
5/11/2010	33000	No
11/4/2010	54000	No
3/22/2011	36000	No
10/26/2011	57000	Yes
4/18/2012	29000	Yes
10/19/2012	4800	Yes
4/25/2013	1700	Yes
10/17/2013	1100	Yes

South Plume, Well MW-37

Date Range: 10/26/2011 to 10/17/2013 (ISCO Impacts Excluded)



FOD 96%

Slope -2.2

p-value <0.001

Slope is negative

Regression residuals are not appropriately distributed

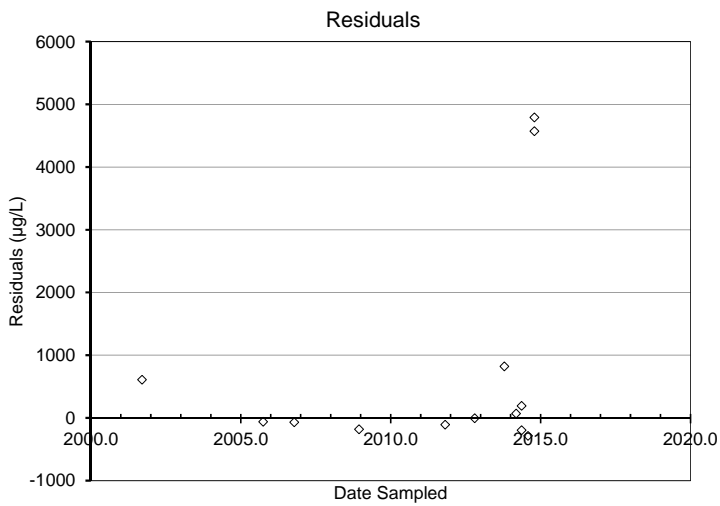
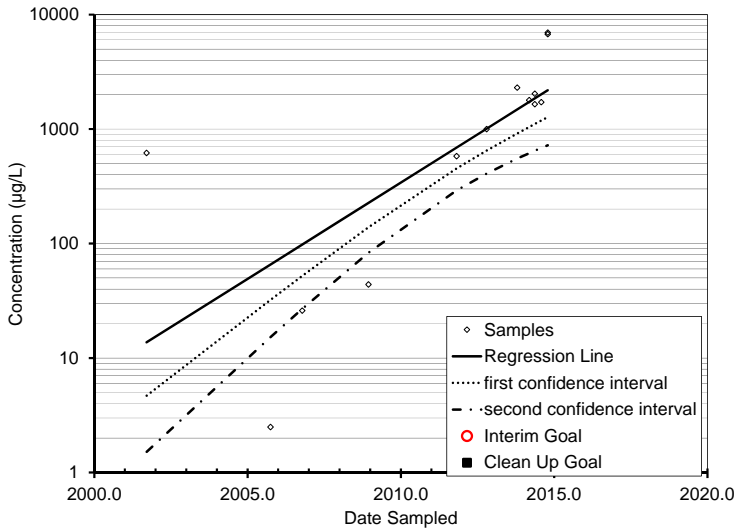
Slope not used to estimate degradation rate

South Plume, Well MW-38

Date	Value	Included in Regression
9/14/2001	620	Yes
9/29/2005	2.5	Yes
10/13/2006	26	Yes
12/10/2008	44	Yes
10/26/2011	580	Yes
10/18/2012	1000	Yes
10/16/2013	2300	Yes
3/8/2014	1790	Yes
5/14/2014	2040	Yes
5/14/2014	1650	Yes
7/31/2014	1720	Yes
10/16/2014	6970	Yes
10/16/2014	6750	Yes
12/4/2014	3190	No
1/15/2015	3910	No
1/15/2015	5440	No
4/16/2015	3060	No
7/23/2015	3420	No
12/4/2014	3190	No

South Plume, Well MW-38

Date Range: 9/14/2001 to 10/16/2014 (ISCO Impacts Excluded)



FOD 92%

Slope 0.38

p-value <0.01

Slope is positive

Regression residuals are not appropriately distributed

Slope not used to estimate degradation rate

APPENDIX D

Plume Regression for cis-1,2-Dichloroethene and Vinyl Chloride

As discussed in Section 4.4 of the text, the use of monitored natural attenuation (MNA) carries with it an expectation of achieving site specific remedial action objectives within a certain timeframe. To examine the time to reach remedial action objectives, trends of contaminant concentrations were reviewed, regression analysis was performed, and this information was used to simulate site specific degradation of the main contaminant [trichloroethylene (TCE)] over time.

The breakdown of TCE daughter products [(cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride (VC)] is another line of evidence for the occurrence of natural attenuation. However, it is important to evaluate the rate of cis-1,2-DCE and VC creation and degradation over time, especially as the build-up of these constituents can occur if breakdown does not keep pace with the creation of daughter products as TCE degrades.

A discussion of the regression analysis for TCE is included in Section 4.4.1 of the text (See Appendix E). Regression analysis was also performed at site specific individual monitoring wells for cis-1,2-DCE and VC. Data used for this analysis included historic sampling events beginning in 2000 and ending with the fourth quarter of 2015. Each individual well data set was reviewed and chemical concentrations that were recorded as non-detect or were detected at lower than one-half of the method detection limit were set to one-half the method detection limit value. The frequency of detection (FOD) in lab data was used to initially determine the quality of the data during the MNA evaluations. The regression model for each constituent was considered to be invalid if the FOD for an analyte was below 50%. Estimated concentrations were considered as detected values, which in each instance resulted in a higher or more conservative assumed concentration. The regression of log transformed concentration data was then used to calculate the slopes for each specific well.

The output of this evaluation includes a regression curve, a slope and a graph of the regression residuals for the daughter products present at each well (cis-1,2-DCE and VC). The regression trend line documents whether the trend at the well being evaluated for a particular chemical of interest is increasing, not significant, or decreasing. The residuals graphs from the regression were evaluated to verify if the model fits the measured values at each well and meets the statistical assumptions of linear regression. Valid models produced residuals graphs with random deviations from the measured values, homogenous variances and no temporal trends, while poor models presented systematic or structured regression residuals. The goal of this regression analysis was to estimate slopes that characterize the 'average or representative' rate of reduction in the concentrations. These slopes can then be used to determine the degradation rate constants or half-lives.

The historical contaminant concentration trends at a given location are a function of various factors: groundwater velocity, flow direction, retardation, concentration distribution, reaction rates, etc. For the MNA analysis, the regression lines were fit to measured Site data and the slopes reflect the combined influence of all these Site-specific factors. Additional conservatism was applied to the analysis since wells that show impacts from the ISCO or ISCR injections were analyzed by excluding sampling events that occurred after the injection to address and

normalize statistical biases (excluding data which typically indicated significant TCE reductions) and some wells were refined by determining the maximum historic concentration of a respective analyte and only including data from that specific sampling event forward.

To represent the overall TCE degradation rate for the both the North Plume and the South Plume, the regression slope values for wells in the North Plume with declining concentration trends were averaged, resulting in an average value of -0.15 (Appendix E). The regression slope values for wells in the South Plume with declining concentration trends were also averaged, resulting in a value of -0.15 (Appendix E).

The same averaging process for the regression slope values was completed for cis-1,2-DCE and VC in the North Plume and the South Plume. The data from wells that may have been excluded based upon TCE regression analysis are considered for cis-1,2-DCE and VC since the data set for each constituents is assessed independently. The wells and corresponding slope values are listed in the tables below. The data tables and regression results for each of these individual wells are provided at the end of this appendix. The

CIS-1,2-DCE

North Plume		South Plume	
Location	Slope [a]	Location	Slope [a]
IW-76	-0.24	ITMW-1	-0.02
MW-81	-0.73	ITMW-13	-0.10
RW-69	-0.10	ITMW-17	-0.05
		ITMW-7	-0.12
Average	-0.36	Average	-0.07

VINYL CHLORIDE

North Plume		South Plume	
Location	Slope [a]	Location	Slope [a]
NA	---	MW-38	-0.33
Average	---	Average	-0.33

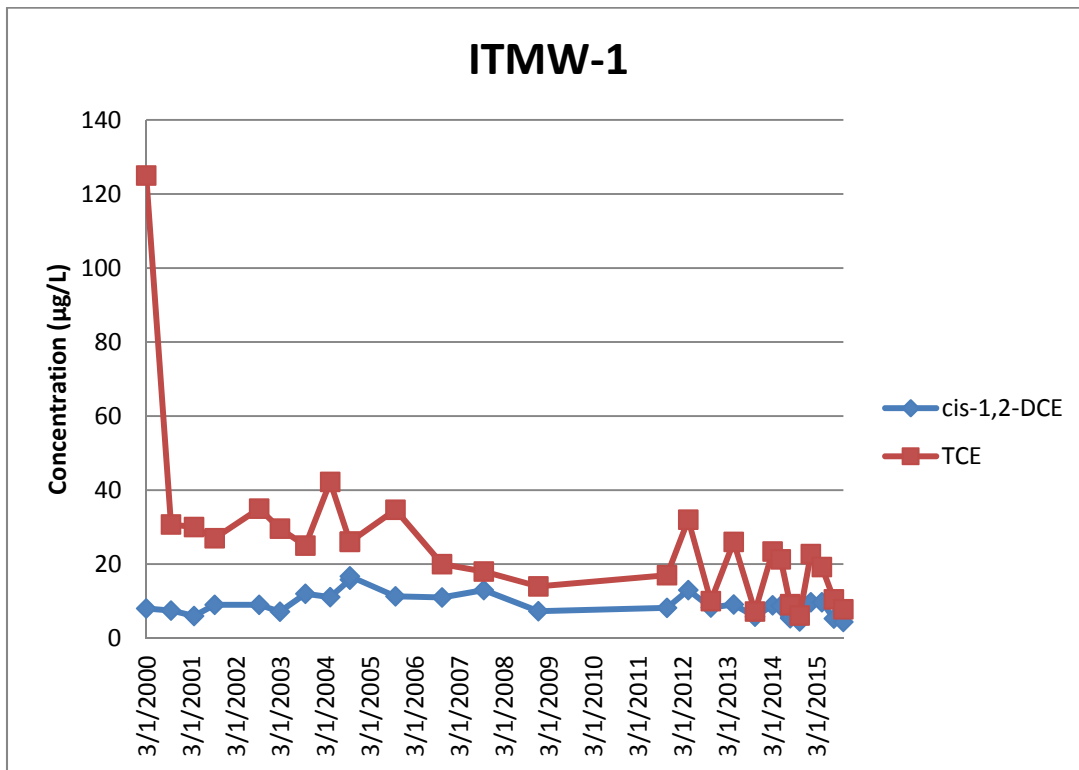
[a] Slopes in units of $\ln(\mu\text{g/L})/\text{year}$

The average cis-1,2-DCE slopes are -0.36 for the northern plume and -0.07 for the southern plume. No wells with valid regression were identified for VC in the northern plume and a value of -0.33 was identified for the southern plume (as shown on the tables above).

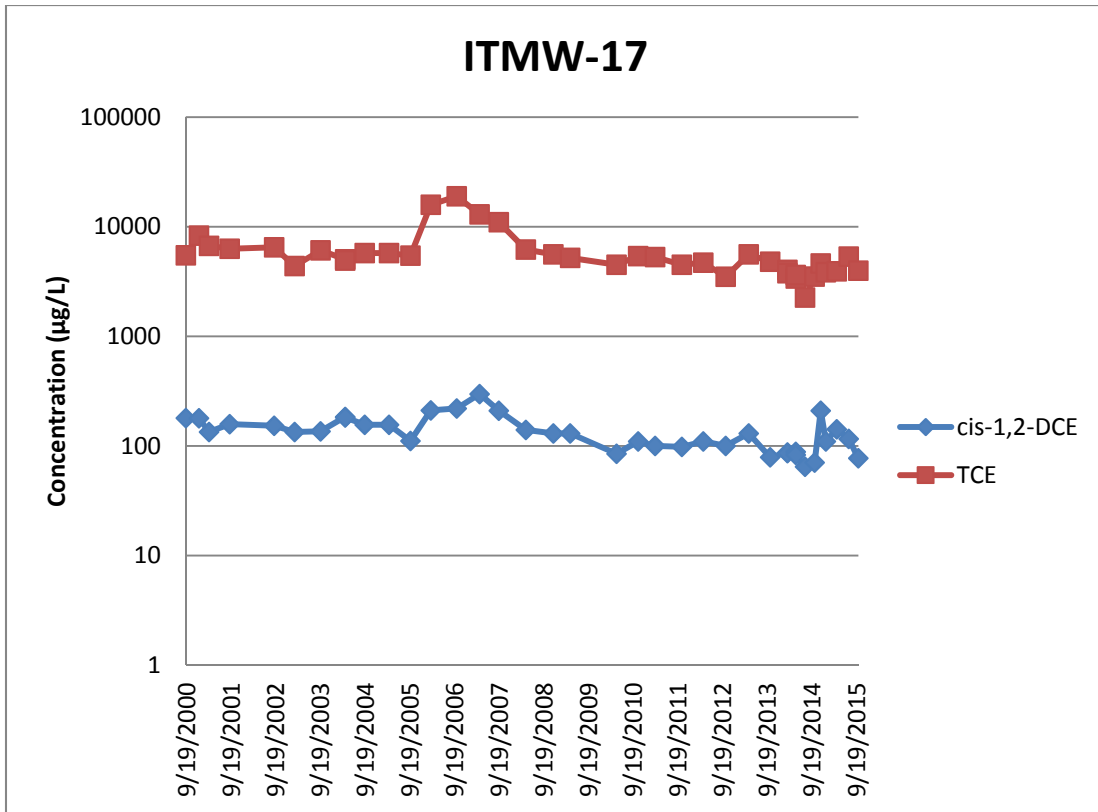
The northern plume cis-1,2-DCE and southern plume VC degradation rates are much more rapid than the TCE degradation rates for both the north and south plume of 0.15 $\ln(\mu\text{g/L})/\text{year}$. Therefore, the daughter products (when the daughter products are detected) are degrading

faster than the degradation/bioremediation cycle can create them and therefore a “stall” or potential high level of these breakdown products is not likely.

The degradation rate of cis-1,2-DCE in the southern plume is 0.07 ln($\mu\text{g/L}$)/year is less than the TCE rate of 0.15 ln($\mu\text{g/L}$)/year. However a review of the cis-1,2-DCE concentrations at the locations in the southern plume with the shallowest slopes [ITMW-1 (slope of -0.02) and ITMW-17 (slope of -0.05)], shows an increasing cis-1,2-DCE trend at ITMW-1 until September 2004, at which point the slope (or decreasing trend) steepens. Also fluctuations of cis-1,2-DCE after September 2004 appear to trend fluctuations in TCE, although to a lesser amplitude as shown below.



ITMW-17 also had a fairly shallow regression slope (-0.05) for cis-1,2-DCE. A review of the TCE and cis-1,2-DCE data from this location shows that the cis-1,2-DCE is matching the pattern of TCE concentration fairly well as shown in the chart below. Therefore cis-1,2-DCE is not increasing as a result of a MNA stall.



The northern plume degradation rate for VC could not be calculated as only one well (IW-73) contained a sufficient amount of VC data necessary for statistical evaluation via regression analysis. However, the concentration of VC at IW-73 as of October 2015 was 0.59 µg/L (J flagged), therefore VC is not being generated at this location in sufficient quantities to affect remedial action levels.

VC is not detected in the north plume at sufficient quantities to be of concern during future degradation of the north plume; however, monitoring will continue to assess VC conditions in the north plume. Cis-1,2-DCE concentration trends appear to be mimicking the TCE concentrations trends; therefore, cis-1,2-DCE concentrations are not expected to increase as a result of future degradation of the south plume.

Individual Well Analyses

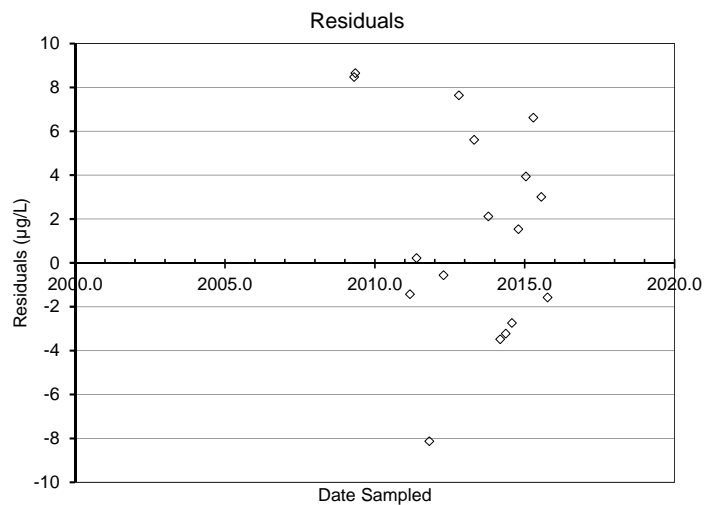
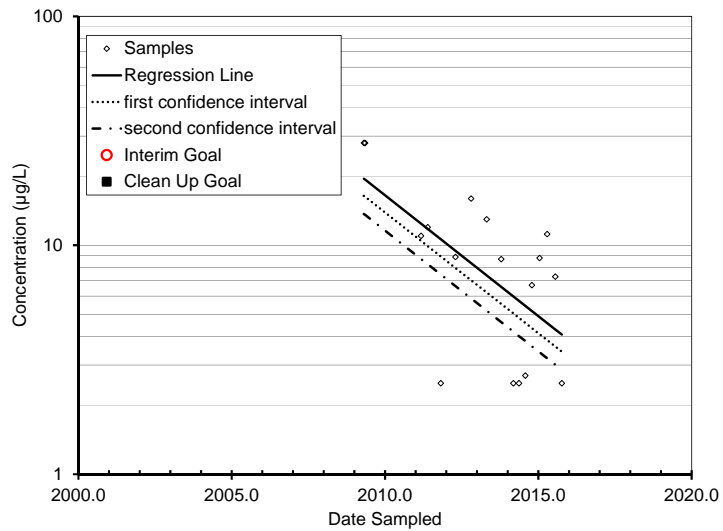
North Plume, Well IW-76
Cis-1,2-dichloroethene

Date	Value	Included in Regression
4/23/2009	28	Yes
5/7/2009	28	Yes
3/4/2011	11	Yes
5/23/2011	12	Yes
10/25/2011	2.5	Yes
4/17/2012	8.9	Yes
10/20/2012	16	Yes
4/24/2013	13	Yes
10/15/2013	8.7	Yes
3/8/2014	2.5	Yes
5/14/2014	2.5	Yes
7/29/2014	2.7	Yes
10/15/2014	6.7	Yes
1/14/2015	8.8	Yes
4/15/2015	11.2	Yes
7/21/2015	7.3	Yes
10/6/2015	2.5	Yes

North Plume, Well IW-76

Cis-1,2-dichloroethene

Date Range: 4/23/2009 to 10/6/2015



FOD 94%

Slope -0.24

p-value < 0.01

Regression residuals are appropriately distributed

Slope is negative

Regression fit is acceptable

Slope used to estimate degradation rate

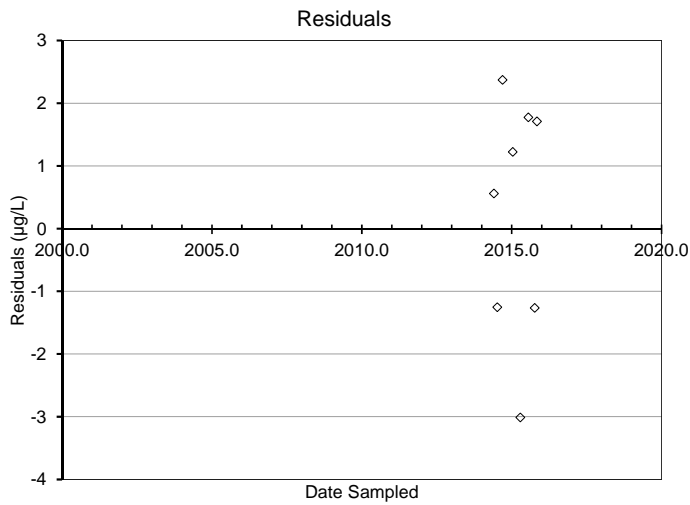
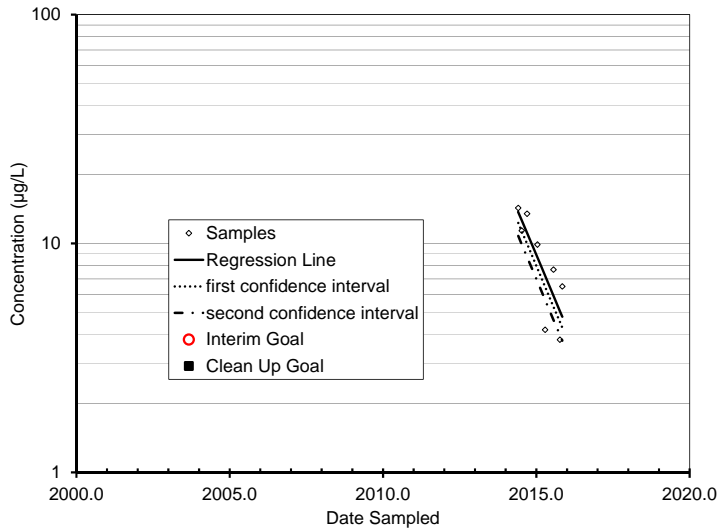
North Plume, Well MW-81
Cis-1,2-dichloroethene

Date	Value	Included in Regression
5/29/2014	14.3	Yes
7/9/2014	11.4	Yes
9/11/2014	13.5	Yes
1/13/2015	9.9	Yes
4/15/2015	4.2	Yes
7/22/2015	7.7	Yes
10/8/2015	3.8	Yes
11/5/2015	6.5	Yes

North Plume, Well MW-81

Cis-1,2-dichloroethene

Date Range: 5/29/2014 to 11/5/2015



FOD 100%

Slope -0.73

p-value < 0.05

Regression residuals are appropriately distributed

Slope is negative

Regression fit is acceptable

Slope used to estimate degradation rate

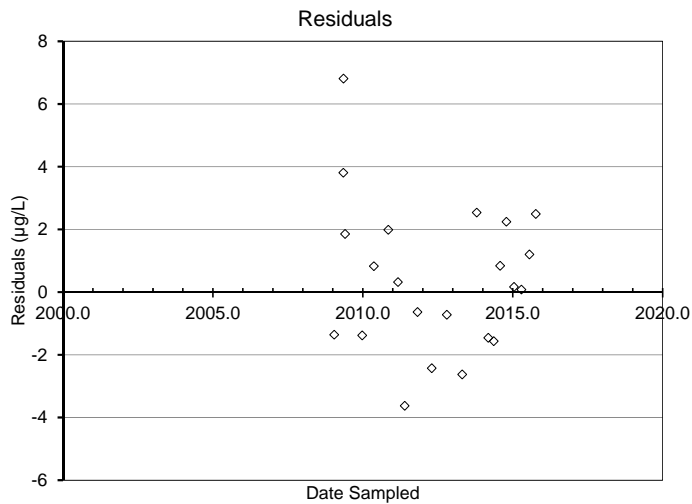
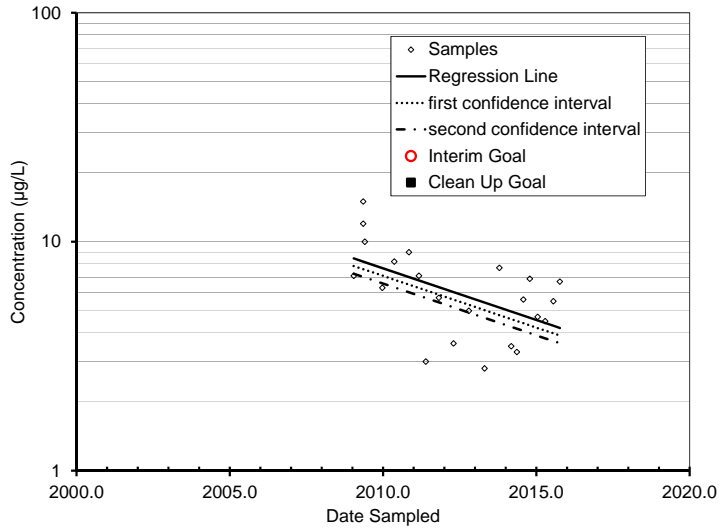
North Plume, Well RW-69
Cis-1,2-dichloroethene

Date	Value	Included in Regression
1/15/2009	7.1	Yes
4/24/2009	5	Yes
5/7/2009	12	Yes
5/8/2009	15	Yes
5/27/2009	10	Yes
12/21/2009	6.3	Yes
5/13/2010	8.2	Yes
11/4/2010	9	Yes
3/3/2011	7.1	Yes
5/23/2011	3	Yes
10/26/2011	5.7	Yes
4/18/2012	3.6	Yes
10/18/2012	5	Yes
4/23/2013	2.8	Yes
10/16/2013	7.7	Yes
3/7/2014	3.5	Yes
5/13/2014	3.3	Yes
7/29/2014	5.6	Yes
10/14/2014	6.9	Yes
1/14/2015	4.7	Yes
4/14/2015	4.5	Yes
7/21/2015	5.5	Yes
10/6/2015	6.7	Yes

North Plume, Well RW-69

Cis-1,2-dichloroethene

Date Range: 1/15/2009 to 10/6/2015



FOD 100%

Slope -0.10

p-value < 0.01

Regression residuals are appropriately distributed

Slope is negative

Regression fit is acceptable

Slope used to estimate degradation rate

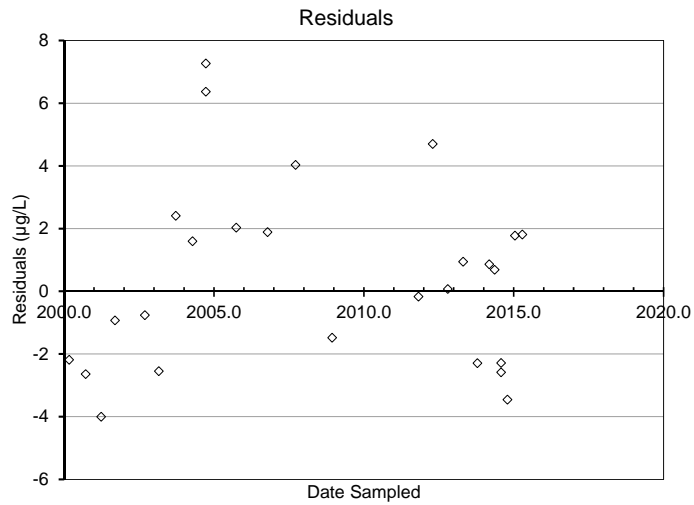
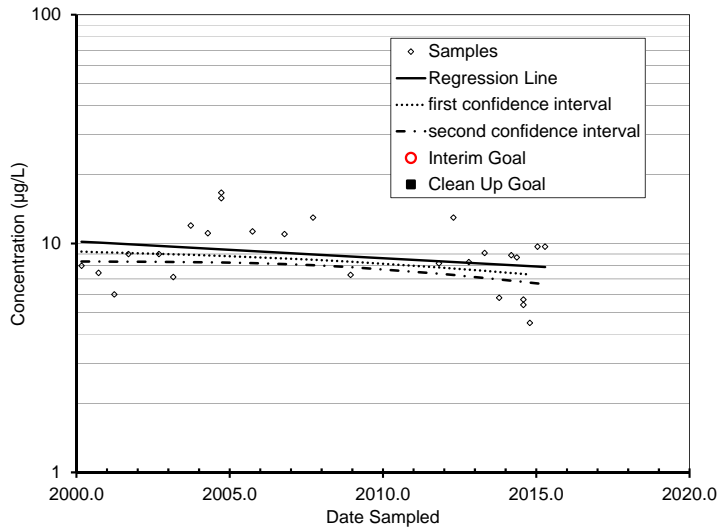
South Plume, Well ITMW-1
Cis-1,2-dichloroethene

Date	Value	Included in Regression
3/1/2000	8	Yes
9/19/2000	7.45	Yes
3/27/2001	6	Yes
9/11/2001	9	Yes
9/10/2002	9	Yes
2/27/2003	7.14	Yes
9/23/2003	12	Yes
4/13/2004	11.1	Yes
9/21/2004	16.7	Yes
9/21/2004	15.8	Yes
9/28/2005	11.3	Yes
10/14/2006	11	Yes
9/20/2007	13	Yes
12/9/2008	7.3	Yes
10/27/2011	8.2	Yes
4/18/2012	13	Yes
10/19/2012	8.3	Yes
4/24/2013	9.1	Yes
10/15/2013	5.8	Yes
3/8/2014	8.9	Yes
5/13/2014	8.7	Yes
7/30/2014	5.7	Yes
7/30/2014	5.4	Yes
10/15/2014	4.5	Yes
1/14/2015	9.7	Yes
4/15/2015	9.7	Yes
7/22/2015	5.3	Yes
10/7/2015	4.4	Yes

South Plume, Well ITMW-1

Cis-1,2-dichloroethene

Date Range: 3/1/2000 to 10/7/2015



FOD 100%

Slope -0.02

p-value > 0.05

Regression residuals are appropriately distributed

Slope is negative

Regression fit is acceptable

Slope used to estimate degradation rate

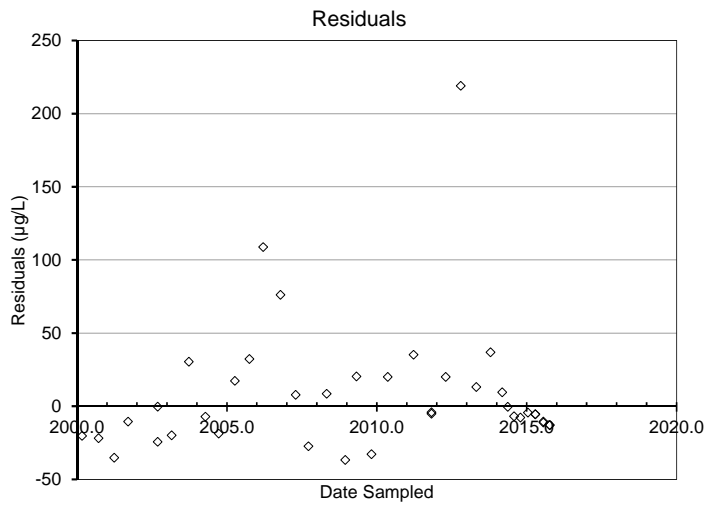
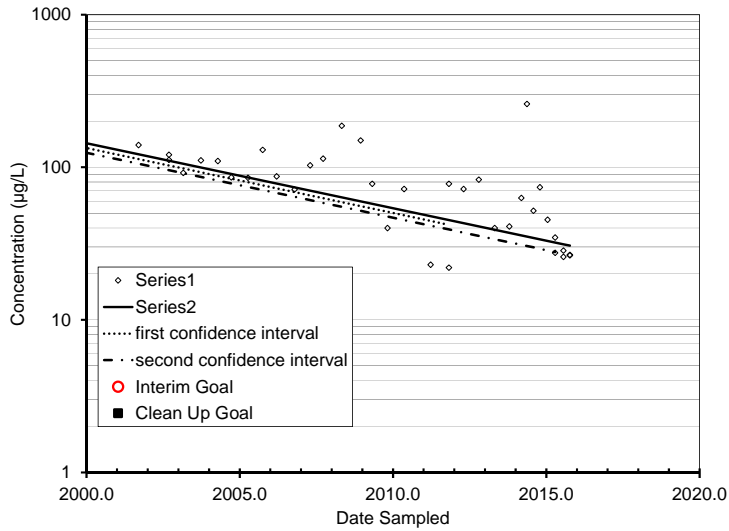
South Plume, Well ITMW-13
Cis-1,2-dichloroethene

Date	Value	Included in Regression
2/1/1999	140	Yes
3/1/2000	121	Yes
9/19/2000	112	Yes
3/28/2001	92	Yes
9/13/2001	111	Yes
9/9/2002	110	Yes
9/9/2002	86	Yes
2/26/2003	85.5	Yes
9/24/2003	130	Yes
4/13/2004	87.2	Yes
9/21/2004	71.6	Yes
4/7/2005	103	Yes
9/30/2005	114	Yes
3/16/2006	187	Yes
10/14/2006	150	Yes
4/18/2007	78	Yes
9/20/2007	40	Yes
4/29/2008	72	Yes
12/10/2008	23	Yes
4/27/2009	78	Yes
10/27/2009	22	Yes
5/12/2010	72	Yes
3/23/2011	83	Yes
10/27/2011	40	Yes
10/27/2011	41	Yes
4/19/2012	63	Yes
10/18/2012	260	Yes
4/25/2013	52	Yes
10/16/2013	74	Yes
3/8/2014	45.3	Yes
5/14/2014	34.7	Yes
7/30/2014	27.5	Yes
10/15/2014	25.9	Yes
1/14/2015	28.5	Yes
4/15/2015	26.5	Yes
4/15/2015	26.7	Yes
7/22/2015	20.1	Yes
7/22/2015	20.8	Yes
10/7/2015	17.6	Yes
10/7/2015	17.8	Yes

South Plume, Well ITMW-13

Cis-1,2-dichloroethene

Date Range: 2/1/1999 to 10/7/2015



FOD 100%

Slope -0.10

p-value <0.001

Regression residuals are appropriately distributed

Slope is negative

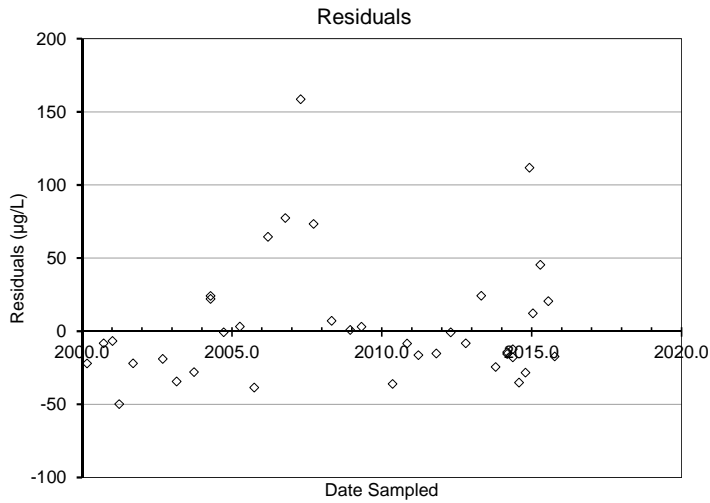
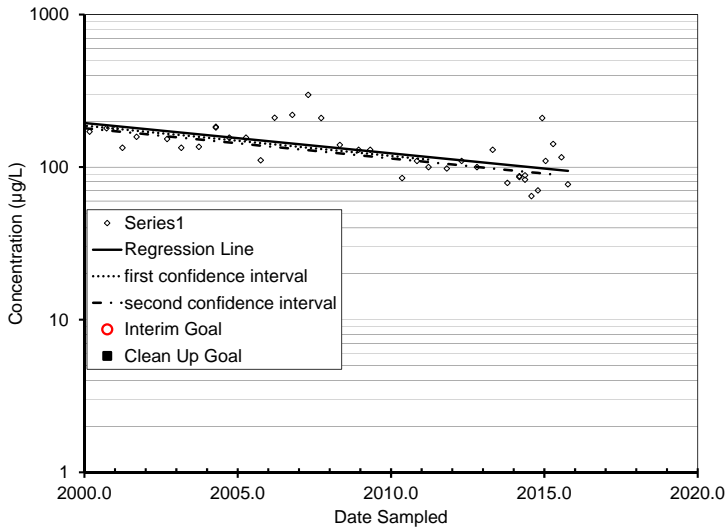
Regression fit is acceptable

Slope used to estimate degradation rate

South Plume, Well ITMW-17
Cis-1,2-dichloroethene

Date	Value	Included in Regression
2/1/1999	240	Yes
3/1/2000	171	Yes
9/19/2000	180	Yes
1/5/2001	179	Yes
3/28/2001	134	Yes
9/13/2001	158	Yes
9/11/2002	153	Yes
2/26/2003	134	Yes
9/25/2003	136	Yes
4/14/2004	184	Yes
4/14/2004	182	Yes
9/21/2004	156	Yes
4/7/2005	156	Yes
9/29/2005	111	Yes
3/15/2006	211	Yes
10/12/2006	220	Yes
4/18/2007	298	Yes
9/21/2007	210	Yes
4/29/2008	140	Yes
12/10/2008	130	Yes
4/27/2009	130	Yes
5/11/2010	85	Yes
11/4/2010	110	Yes
3/22/2011	100	Yes
10/26/2011	98	Yes
4/19/2012	110	Yes
10/19/2012	100	Yes
4/25/2013	130	Yes
10/17/2013	79	Yes
3/8/2014	86.1	Yes
3/8/2014	87.3	Yes
5/15/2014	88.5	Yes
5/15/2014	82.9	Yes
7/30/2014	64.7	Yes
10/16/2014	70.5	Yes
12/5/2014	210	Yes
1/15/2015	110	Yes
4/15/2015	142	Yes
7/22/2015	116	Yes
10/8/2015	77.2	Yes

South Plume, Well ITMW-17
Cis-1,2-dichloroethene
Date Range: 2/1/1999 to 10/8/2015



FOD 100%
Slope -0.05
p-value <0.001
Regression residuals are appropriately distributed
Slope is negative
Regression fit is acceptable
Slope used to estimate degradation rate

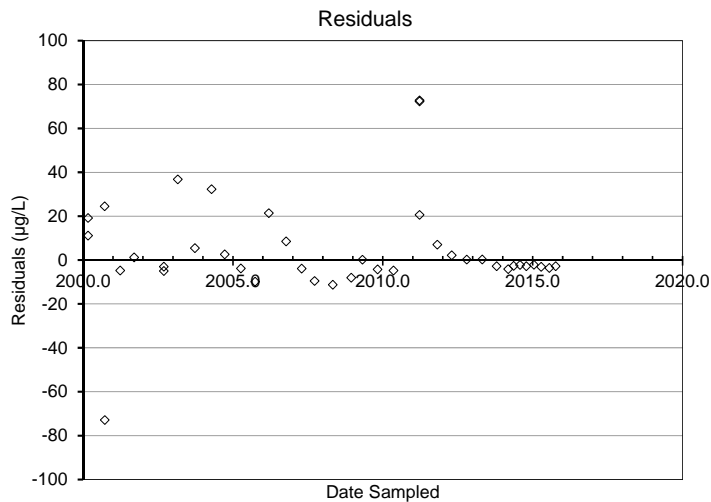
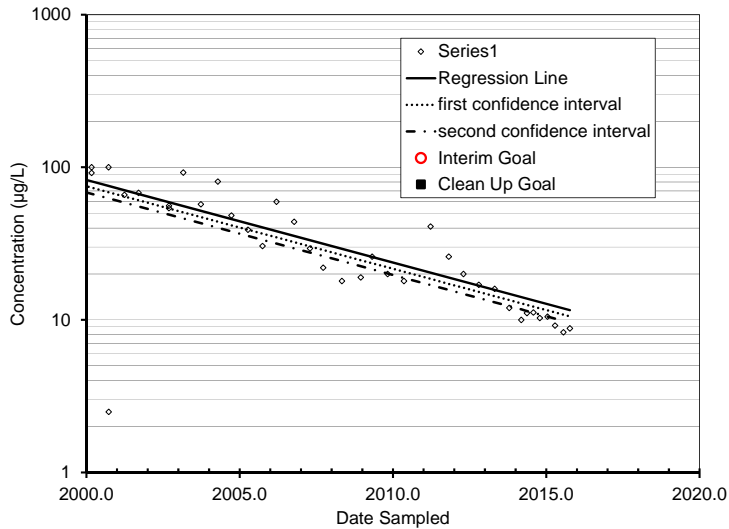
South Plume, Well ITMW-7
Cis-1,2-dichloroethene

Date	Value	Included in Regression
5/1/1997	180	Yes
6/1/1999	144	Yes
6/1/1999	140	Yes
3/1/2000	100	Yes
3/1/2000	92	Yes
9/19/2000	100	Yes
9/21/2000	2.5	Yes
3/28/2001	66	Yes
9/13/2001	68	Yes
9/10/2002	56	Yes
9/10/2002	54	Yes
2/27/2003	92.5	Yes
9/24/2003	57.3	Yes
4/14/2004	80.7	Yes
9/22/2004	48.4	Yes
4/7/2005	39	Yes
9/28/2005	30.5	Yes
3/14/2006	59.5	Yes
10/10/2006	44	Yes
4/17/2007	29.4	Yes
9/21/2007	22	Yes
4/30/2008	18	Yes
12/11/2008	19	Yes
4/27/2009	26	Yes
10/28/2009	20	Yes
5/10/2010	18	Yes
3/23/2011	41	Yes
3/23/2011	92.7	Yes
3/23/2011	93.2	Yes
10/25/2011	26	Yes
4/18/2012	20	Yes
10/18/2012	17	Yes
4/25/2013	16	Yes
10/17/2013	12	Yes
3/8/2014	10	Yes
5/14/2014	11.1	Yes
7/30/2014	11.2	Yes
10/15/2014	10.3	Yes
1/14/2015	10.5	Yes
4/14/2015	9.2	Yes
7/22/2015	8.3	Yes
10/8/2015	8.8	Yes

South Plume, Well ITMW-7

Cis-1,2-dichloroethene

Date Range: 5/1/1997 to 10/8/2015



FOD 100%

Slope -0.12

p-value <0.001

Regression residuals are appropriately distributed

Slope is negative

Regression fit is acceptable

Slope used to estimate degradation rate

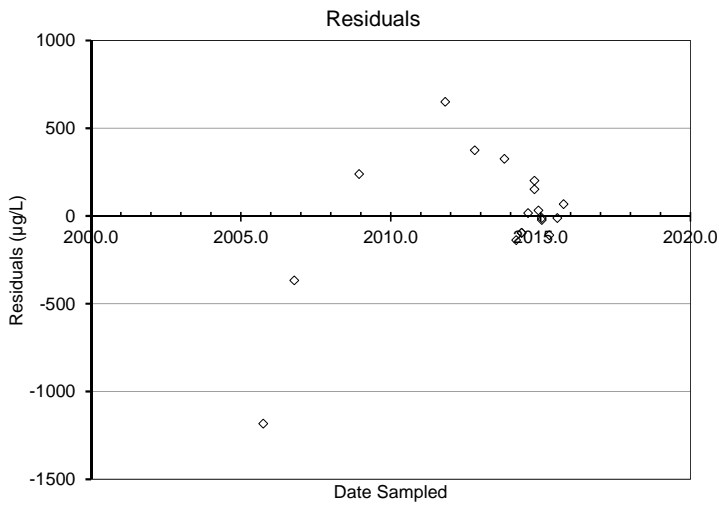
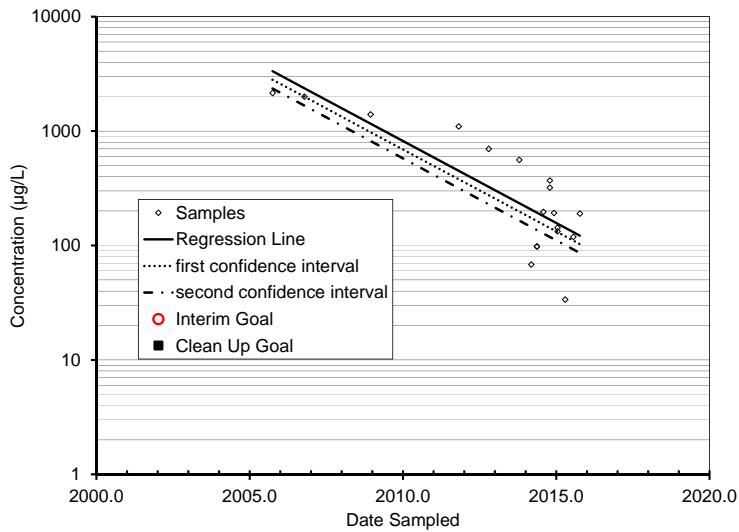
South Plume, Well MW-38
Vinyl chloride

Date	Value	Included in Regression
9/29/2005	2150	Yes
10/13/2006	2000	Yes
12/10/2008	1400	Yes
10/26/2011	1100	Yes
10/18/2012	700	Yes
10/16/2013	560	Yes
3/8/2014	68.4	Yes
5/14/2014	98.2	Yes
5/14/2014	97.9	Yes
7/31/2014	197	Yes
10/16/2014	370	Yes
10/16/2014	321	Yes
12/4/2014	193	Yes
1/15/2015	133	Yes
1/15/2015	143	Yes
4/16/2015	33.7	Yes
7/23/2015	119	Yes
10/8/2015	190	Yes

South Plume, Well MW-38

Vinyl chloride

Date Range: 9/14/2001 to 10/8/2015



FOD 100%

Slope -0.33

p-value <0.001

Regression residuals are appropriately distributed

Slope is negative

Regression fit is acceptable

Slope used to estimate degradation rate