Environmental Functional Area

Environmental Stewardship Planning & Monitoring Group

UCRL-AR-10191-17-4

Lawrence Livermore National Laboratory (LLNL) Experimental Test Site (Site 300)

Compliance Monitoring Program for Closed Pit 1 Landfill

Fourth Quarter/Annual Report for 2017

Author

Richard G. Blake

Lawrence Livermore National Laboratory

Lawrence Livermore National Laboratory is operated by Lawrence Livermore National Security, LLC, for the U.S. Department of Energy, National Nuclear Security Administration under Contract DE-AC52-07NA27344.

Contents

Summary iii
Introduction 1
Compliance Monitoring Program Overview 4
Quality Assurance 4
Description of Report Contents 5
Summary of Analytical Results 6
Detection Monitoring Wells 6
Evaluation Monitoring Wells 8
Inspection and Maintenance Summary 10
References 11
Acknowledgments 13
Abbreviations and Acronyms 14

Appendices

Appendix A. Tables and Figures of Groundwater Measurements A-1
Appendix B. Statistical Methods for Release Detection B-1
Appendix C. Quality Assurance Samples C-1
Appendix D. Constituents of Concern and Monitoring Frequencies D-1
Appendix E. Well Specification and Construction Details for Detection Monitoring and Evaluation Monitoring Wells E-1
Appendix F. Hydrographs for All Compliance Monitoring Wells F-1
Appendix G. Field Logs for Compliance Monitoring and Evaluation Monitoring Wells G-1
Appendix H. Statistical Limits and Graphs of Ground Water Measurements H-1

Figures

Figure 1. Location of LLNL Site 300 1
Figure 2. Location of closed landfill Pit 1 at LLNL Site 300 2
Figure 3. Locations of Pit 1 compliance monitoring wells 3
Figure 4. Freon-113 concentrations in water samples collected from detection ground water monitoring wells around Pit 1 8

Figure 5. Perchlorate concentrations in water samples collected from detection ground water monitoring wells around Pit 1 8

Figure 6. Tritium activities in water samples collected from detection ground water monitoring wells around Pit 1 9

Tables

Table 1. MCLs for radioactivity in drinking water 5

Table A-1. Pit 1 detection monitoring wells, constituents of concern, SLs, and quarterly analytical results for 2017 ..... A-1

Table A-2. Pit 1 additional PCP constituents for the fourth quarter 2017 analytical results for detection monitoring wells A-5

Table A-3. Pit 1 evaluation monitoring wells, constituents of concern, physical parameters, and analytical results for the fourth quarter 2017 ..... A-6

Table A-4. Pit 1 groundwater well routine sampling dates A-7

Table A-5. Pit 1 VOC Reporting Limits A-8

Table C-1. Pit 1 quality assurance for routine, duplicate, and field blank samples for the fourth quarter 2017 ..... C-1

Table D-1. Pit 1 Constituents of concern and monitoring frequencies. D-1

Table E-1. Well specification and construction details of the Pit 1 monitoring network. E-1

Summary

This fourth quarter report for 2017 summarizes compliance activities performed at the Lawrence Livermore National Laboratory (LLNL) Experimental Test Site (Site 300) landfill known as Pit 1. Compliance activities at the pit consist of groundwater sampling and analysis, pit cap inspections, and reporting of analytical results. Groundwater measurements are contained in **Appendix A, Tables A-1** to **A-4**.

No evidence of a new release of constituents of concern (COC) from Pit 1 was indicated by the fourth quarter groundwater measurements. Analytical data did, however detect two constituents of concern, by detecting total uranium above the statistical limits (SL) during this period in three monitoring wells and zinc in one well. Details of these SL detections have been described in past reports and are discussed in detail in the Summary of Analytical Results section of this report. The presence of these COC does not indicate significant evidence of a release from Pit 1.

There were no formal inspections of Pit 1 this quarter, however, the pit cap and drainage structures continue to function properly, and the vegetation cover and drainage systems are in proper operating condition.

Introduction

This fourth quarter report for 2017 summarizes compliance monitoring results for a closed landfill known as Pit 1 at LLNL's Site 300. Site 300 is a 28.3 square kilometer (km^2) (10.9 square miles [mi^2]) site located in the Altamont Hills approximately 10.5 km (6.5 mi) southwest of downtown Tracy, California (**Figure 1**). The landfill is located in the northern portion of the site (**Figure 2**). Closure of this unlined Class I waste management unit was completed with waste in place in December 1992 following a California Department of Health Services (now Department of Toxic Substances Control, or DTSC) approved Resource Conservation and Recovery Act (RCRA) Closure and Post-Closure Plan (PCP) using the LLNL Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Federal Facilities Agreement (FFA) process. Site 300 is owned by the U.S. Department of Energy (U.S. DOE) and is operated by Lawrence Livermore National Security, LLC.

Because Pit 1 is not part of a response action conducted under CERCLA, the post-closure monitoring and reporting for the Pit 1 Landfill is conducted under a Waste Discharge Requirements Order 93-100 and the February 19, 2010 Monitoring and Reporting Program issued by the California Regional Water Quality Control Board (CRWQCB), Central Valley Region.

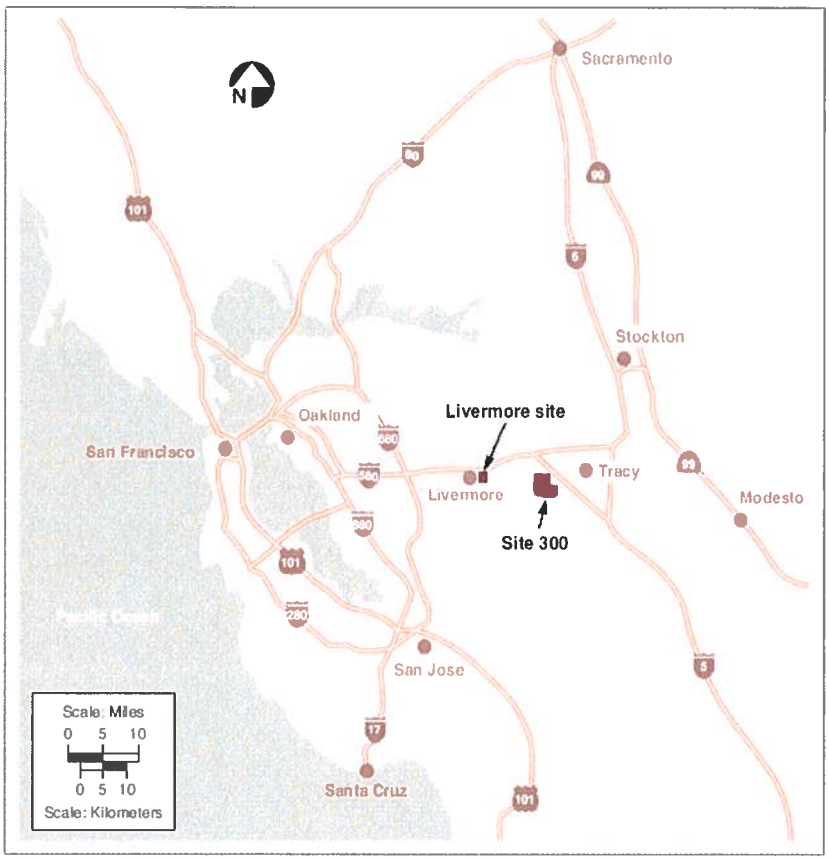


Figure 1. Location of LLNL Site 300.

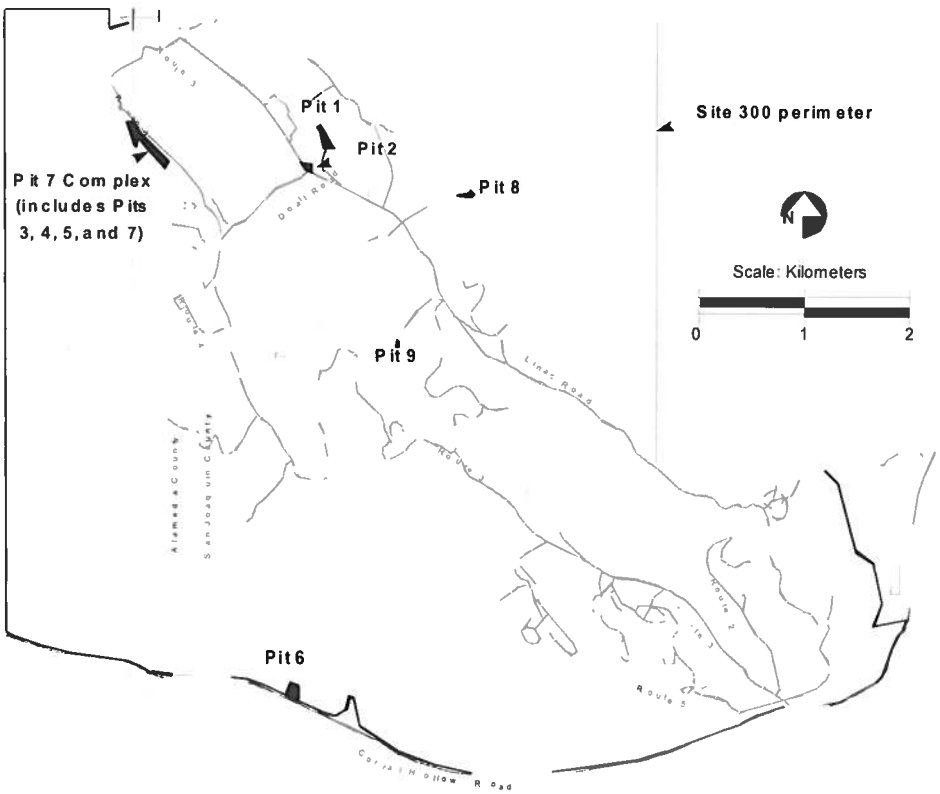


Figure 2. Location of closed Pit 1 landfill at LLNL Site 300.

Pit 1 is located in the Elk Ravine drainage area about 300 meters (m) or 984 feet (ft) above mean sea level (MSL). Groundwater generally flows in an east-northeast direction beneath Pit 1 **(Figure 3)**, following the inclination (dip) of underlying Miocene-age sedimentary rocks (Webster-Scholten, 1994).

The current monitoring network at Pit 1 consists of twelve monitoring wells. These include eight detection monitoring wells and four evaluation monitoring wells **(Figure 3)**. The detection monitoring wells that are used to sample the groundwater in the vicinity of Pit 1 include: wells K1-01C and K1-07 located hydrologically upgradient from Pit 1; down-gradient wells K1-02B, K1-04, K1-05, and W-PIT1-2326; and cross-gradient wells K1-08 and K1-09. The primary objective of the detection monitoring wells is to detect any new release of constituents of concern to groundwater. Constituents of concern, as defined by Title 23 of the California Code of Regulations (CCR), Chapter 15, are waste constituents, reaction products, and hazardous constituents that are reasonably expected to be in or derived from waste buried in the Pit 1 Landfill. LLNL collects, analyzes, and statistically evaluates one sample quarterly from each detection monitoring well.

The evaluation monitoring wells are all downgradient of Pit 1 wells and include K1-06, W-PIT1-2620, W-PIT1-2209, and W-865-2005 as required by the Monitoring Reporting Program (MRP). Well W-PIT1-02 is no longer sampled because it was abandoned and replaced

by well W-PIT1-2620 during the third quarter of 2011 due to well damage. These evaluation monitoring wells were added to Pit 1 monitoring and reporting requirements to track existing plumes of perchlorate and tritium from an up-gradient source. LLNL collects and analyzes one sample quarterly from each evaluation monitoring well and annually conducts trend analyses for tritium and perchlorate.

All the wells are screened in the uppermost water-bearing zone in the Neroly Formation lower blue sandstone unit ($Tnbs_1/Tnbs_0$). The Neroly Formation contains the main aquifer beneath Site 300. Pit 2, which was closed before RCRA was enacted, is hydrologically upgradient from Pit 1. In 1992, a 2.4 m (8 ft) thick RCRA cap containing an impermeable layer of clay that is 0.6 m (2 ft) thick was constructed over Pit 1. The cap prevents rainwater from percolating through the waste buried in the pit. A water diversion channel was constructed around the pit cap to remove storm water runoff. The diversion channel empties into the adjacent arroyo, the headwater of Elk Ravine.

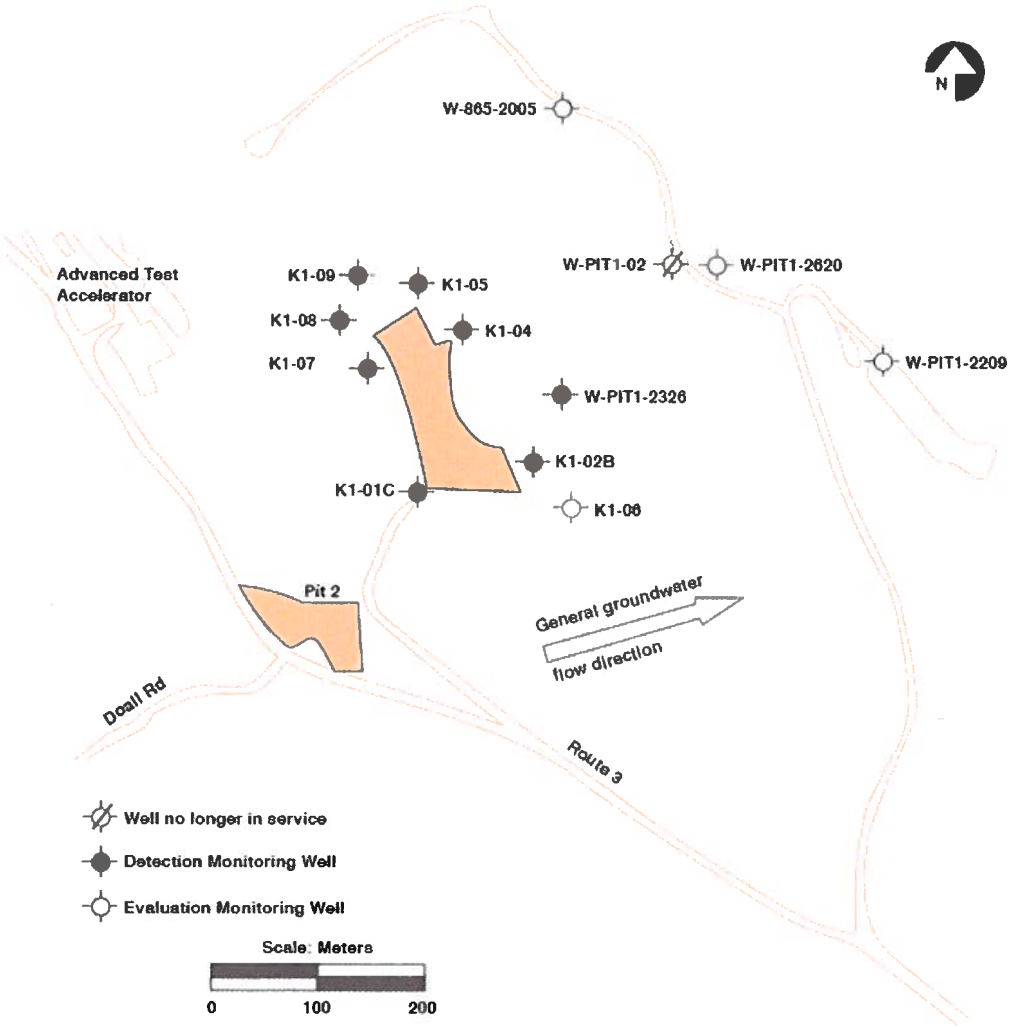


Figure 3. Locations of Pit 1 compliance monitoring wells.

Compliance Monitoring Program Overview

This report fulfills quarterly requirements set forth in the following two documents: (1) Waste Discharge Requirements (WDR) Order 93-100 and the February 18, 2010, MRP No. 93-100, administered by the California CVRWQCB (CVRWQCB 1993 and 2010) and (2) LLNL Site 300 RCRA Closure and Post-Closure Plans (PCPs), Landfill Pits 1 and 7 (Rogers/Pacific Corporation 1990). The PCP was approved by the California Department of Health Services (currently the California Department of Toxic Substances Control). The combined requirements include quarterly groundwater sampling and analyses to detect potential releases of constituents of concern from the landfill, annual and post-major storm event visual inspections of pit cap integrity, repairs as necessary to maintain the integrity of the landfill and its water-diversion system, annual measurements of cap survey markers to detect subsidence, an annual inspection of the cap by an independent engineer, and quarterly written monitoring reports.

Quality Assurance

To ensure quality data, LLNL works within the established Quality Assurance (QA) program of the LLNL Environment, Safety & Health Directorate. LLNL uses protocols and procedures that cover all aspects of groundwater sampling, sample tracking, and data management. These written protocols and procedures are contained in the *LLNL Livermore Site and Site 300 Environmental Restoration Project Standard Operating Procedures (SOPs)* (Goodrich and Lorega, 2016), and the *Environmental Monitoring Plan* (Gallegos, 2012). SOPs are used to minimize inadvertent sample contamination and maintain sample integrity from the well to the analytical laboratory. Data management SOPs ensure that all laboratory measurements are received, accurately recorded, and properly stored both in a computer database and in hardcopy format.

Each quarter, a duplicate (collocated) set of groundwater samples is collected from each monitoring network and a set of blank samples is prepared from a randomly chosen well. In addition, equipment blanks are prepared and analyzed to ensure that sampling equipment is properly cleaned before use. Each day, when samples are collected for volatile organic compound (VOC) analysis, a trip blank (prepared at the analytical laboratory) is carried into the field. It is returned unopened to the analytical laboratory for VOC analysis. If VOCs are detected in a trip blank and in any of the routine samples obtained that day, sample results may be discounted, and new sampling may be performed.

As required by Executive Order 12770, measurements are reported in *Système Internationale* (SI) units. The SI unit for radioactivity is the becquerel (Bq), equal to 1 nuclear disintegration per second. The more commonly used unit, picocurie (pCi), is equal to 1 nuclear disintegration per 27 seconds. As a convenience, maximum contaminant levels (MCLs) for radioactivity in drinking water are given in both becquerels per liter (Bq/L) and picocuries per liter (pCi/L) in **Table 1**. Note that MCLs are provided for reference only, because this report does not involve wells used for potable domestic, livestock, or industrial water supply.

Table 1. MCLs for radioactivity in drinking water.

Radiological parameter	**MCL** (Bq/L)	**MCL** (pCi/L)
Gross alpha	0.555	15
Gross beta	1.85	50
Tritium	740	20,000
Radium (total)	0.185	5
Uranium (total)	0.74	20

Description of Report Contents

The "Summary of Analytical Results" section reviews any constituents of concern detected in groundwater during the fourth quarter of 2017 from detection monitoring and perchlorate and tritium in evaluation monitoring wells. Constituents of concern measurements that exceeded SLs or MCLs in drinking water are discussed in this report.

Appendix A contains the groundwater analytical measurements for the fourth quarter of 2017. Pit 1 data are in **Tables A-1**, **A-2**, and **A-3**. **Table A-4** shows the sample dates for Pit 1, and **A-5** shows the reporting limits (RLs) for the Pit 1 VOC constituents of concern. In **Tables A-1** through **A-3**, results that are less than the RL are prefaced with a less than sign (<). Note that the **Appendix A** tables may include some small negative values for radioactivity measurements. These are below the method RLs and are calculated values. They simply indicate that the radioactivity for that groundwater sample is less than a low reference standard. **Appendix A** also contains a groundwater elevation contour map (Figure A-1) of water levels from the $Tnbs_1/Tnbs_0$ Hydrostratigraphic Unit (HSU) at Pit 1. This map is only presented in the second and fourth quarter compliance monitoring reports.

Appendix B explains the methods used to determine the SL of concentration for a constituent of concern. Requirements for statistical treatment of groundwater data are established in the CCR, Title 23, Division 3, Chapter 15, Section 2550.7. LLNL uses a statistical prediction limit method to implement intrawell comparisons. The method uses the average and standard deviation of historical measurements to calculate a SL value. If a routine quarterly constituent of concern measurement exceeds its SL and is confirmed by retesting, it is reported to the CVRWQCB as statistically significant evidence of a release.

Appendix C contains the results for QA sample analyses performed during the fourth quarter of 2017 at Pit 1 (**Table C-1**).

Appendix D consists of **Table D-1** summarizing constituents of concern and the sampling frequencies in the monitoring network for the pit. The regulatory drivers for each constituent of concern are also included in **Table D-1**.

Appendix E consists of **Table E-1** and presents well specification and construction details for detection monitoring and evaluation monitoring wells.

Appendix F consists of hydrographs for all compliance monitoring wells.

Appendix G consists of field logs for all compliance monitoring wells.

Appendix H consists of the statistical limits and graphs of ground water measurements.

Summary of Analytical Results

This section summarizes the analytical results for Pit 1 for the fourth quarter of 2017 and reports on the requirements of the CVRWQCB Pit 1 MRP and post closure plan requirements. During the fourth quarter monitoring period, no new releases of constituents of concern to groundwater from the pit are evident in the data. As part of the MRP, statistical limits (SLs) used to monitor groundwater constituents of concern are shown on **Table A-1**. The MRP requires that two confirmation samples be collected from wells with constituents of concern exceeding SLs. If either of the two confirmation samples exceeds the SL, a finding of statistically significant evidence of a release is confirmed and a seven-day notification letter must be submitted to the CVRWQCB. The statistical tests used to evaluate this data are those identified in **Appendix B**.

Detection Monitoring Wells

Analytical results indicate that there were no new constituents of concern detected at Pit 1 detection monitoring wells. Analytical data did, however detect two constituents of concern above the statistical limit (SL). These include total uranium in routine samples from three different wells and zinc from one well. The presence of this COC does not indicate a significant evidence of a release from Pit 1 and details of these SL detections are explained below.

The total uranium activities detected above the SL from routine samples were from wells W-K1-02B (0.183 Bq/L, [SL=0.145 Bq/L]), K1-04 (0.093 Bq/L, [SL=0.085 Bq/L]), K1-05 (0.115 Bq/L, [SL=0.115 Bq/L]), and well W-PIT1-2326 (0.157 Bq/L, [SL=0.139 Bq/L]). The total uranium activity in these wells and other Pit 1 wells have been discussed in past reports (Blake, 2011; Blake, 2015) and in letters to the CVRWQCB (Schultz, 2010 [90-Day Letter]; Pierce, 2011 [Seven-Day Written Notification]).

As stated in these letters and reports, the analysis and information that LLNL provided to the CVRWQCB indicated that the total uranium activities in the Pit 1 wells have historically had natural uranium signatures and are within background ranges. LLNL conducted additional analyses (Blake, 2011) for uranium isotopes on various Pit 1 monitoring wells to further investigate total uranium at Pit 1. LLNL concluded in these cases, that the uranium 235/238 isotopic ratios were very close to a ratio of 0.0072 indicating that the uranium in the Pit 1 wells is of natural origin. This information therefore indicates that the SL exceedance of total uranium in Pit 1 wells does not indicate a significant evidence of a release of total uranium from the pit.

During this period, only one other COC was detected above its statistical limit during routine sampling. At well K1-09, zinc was detected at 20 µg/L (equal to both the reporting limit and the statistical limit). This result was, however, reported with an LLNL requested analysis code (WGMGMET3) that was not the same as had been specified on the chain of custody (WGMGMET1). LLNL requested a revised report. The revised report indicated a zinc concentration of 25 µg/L. The two analyses were performed on the same day using different instruments. Zinc had previously been detected K1-09 in 2007 (50 µg/L) and 2009 (32 µg/L), and three times in the 1990s at 20 µg/L (the statistical limit for zinc at this well was set at the reporting limit due to the preponderance of non-detections in the historical record). The current results are within the range of historical results and at this point appear unlikely to represent a

new release. None the less, LLNL has ordered two resamples from this well to be analyzed for zinc.

The concentrations of selected VOCs detected in groundwater samples from detection monitoring wells are summarized and presented as total VOCs (**Table A-2**). VOCs were detected in the groundwater samples from down-gradient well K1-05 (22 µg/L), and cross-gradient wells K1-08 (33 µg/L) and K1-09 (51 µg/L). VOC values are similar to levels reported last quarter. The only VOC observed in these samples was Freon-113. Freon-113 arises from a source at Building 865, about 300 m (984 ft) west of Pit 1 (Ferry and Holtzapple, 2006). While Freon-113 is not a constituent of concern for Pit 1, concentrations have generally decreased from historic maxima, and in the past few years the concentrations appear to be stable or declining.

In addition to the normal reporting on constituents of concern with statistical limits, this report evaluates additional constituents that historically have elevated concentrations and are monitored under the post closure plan or under LLNL's surveillance monitoring program under DOE Order 458.1. For this annual report, Freon-113 results for ground waste samples collected from monitoring wells K1-05, K1-08, and K1-09 are plotted on **Figure 4**.

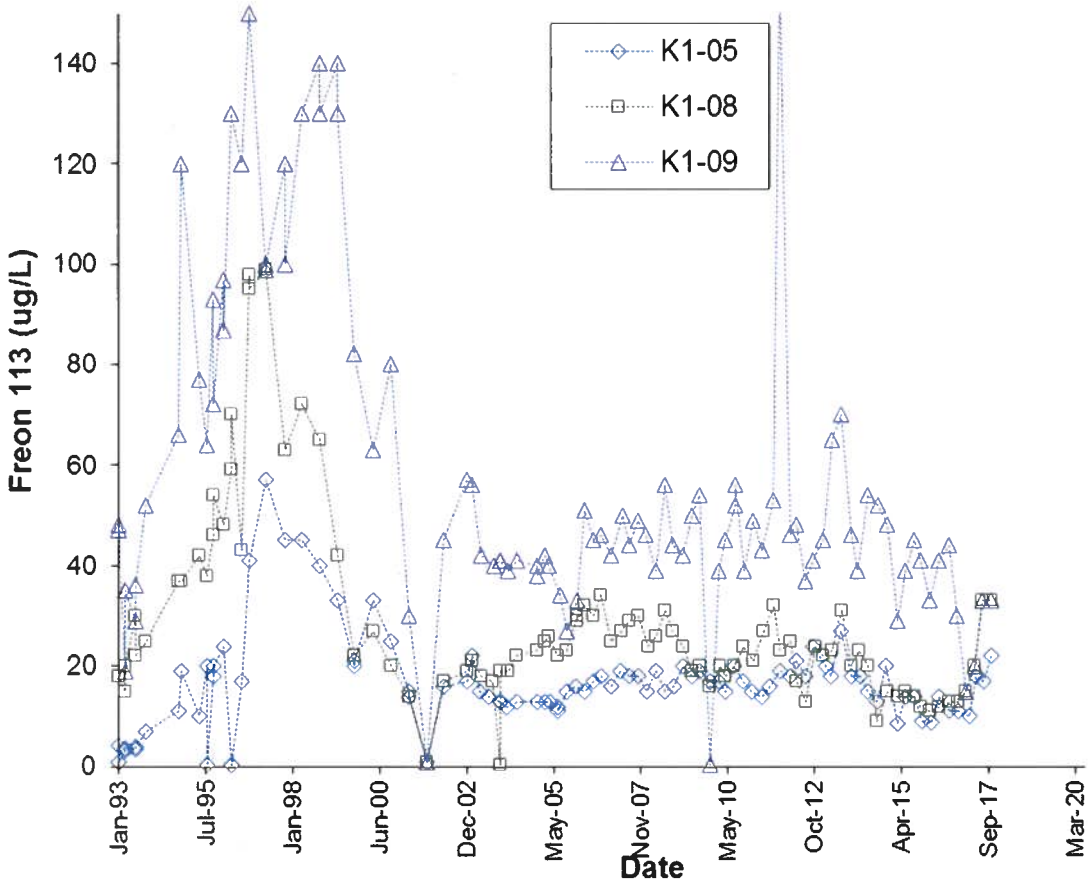


Figure 4. Freon-113 concentrations in water samples collected from detection ground water monitoring wells around Pit 1.

Evaluation Monitoring Wells

Evaluation monitoring wells are required by the MRP and sample analytical results from these wells are shown on **Table A-3**. The table lists physical parameters as well as the results of perchlorate and tritium analyses. These wells are used to track existing plumes of perchlorate and tritium from an up-gradient source. As required by the MRP, annual trend analyses graphs for both percholorate and tritium evaluation monitoring wells are presented in each fourth quarter/annual report. During this quarter, evaluation monitoring well K1-06 was not sampled due to insufficient water.

During the fourth quarter 2017, analytical results indicate that the perchlorate was detected in one evaluation monitoring well (W-PIT1-2620) at 4.9 µg/L, slightly above the reporting limit of 4.0 µg/L but less than the 6.0 µg/L MCL for perchlorate. The perchlorate concentration in this well is similar to concentrations reported in previous quarterly reports. LLNL will continue to monitor the perchlorate concentrations in all evaluation monitoring wells.

Tritium activity was detected in one of the four evaluation monitoring wells. The well W-PIT1-2620 detected tritium at 74.0 Bq/L, similar to the 69.9 Bq/L activity reported last quarter. The detection limit of tritium is 3.7 Bq/L, and the MCL for tritium in drinking water is 740 Bq/L.

For this annual report, perchlorate results for ground water samples collected from evaluation monitoring wells W-PIT1-02, W-PIT1-2209, W-865-2005, K1-06, and W-PIT1-2620 are plotted on **Figure 5**.

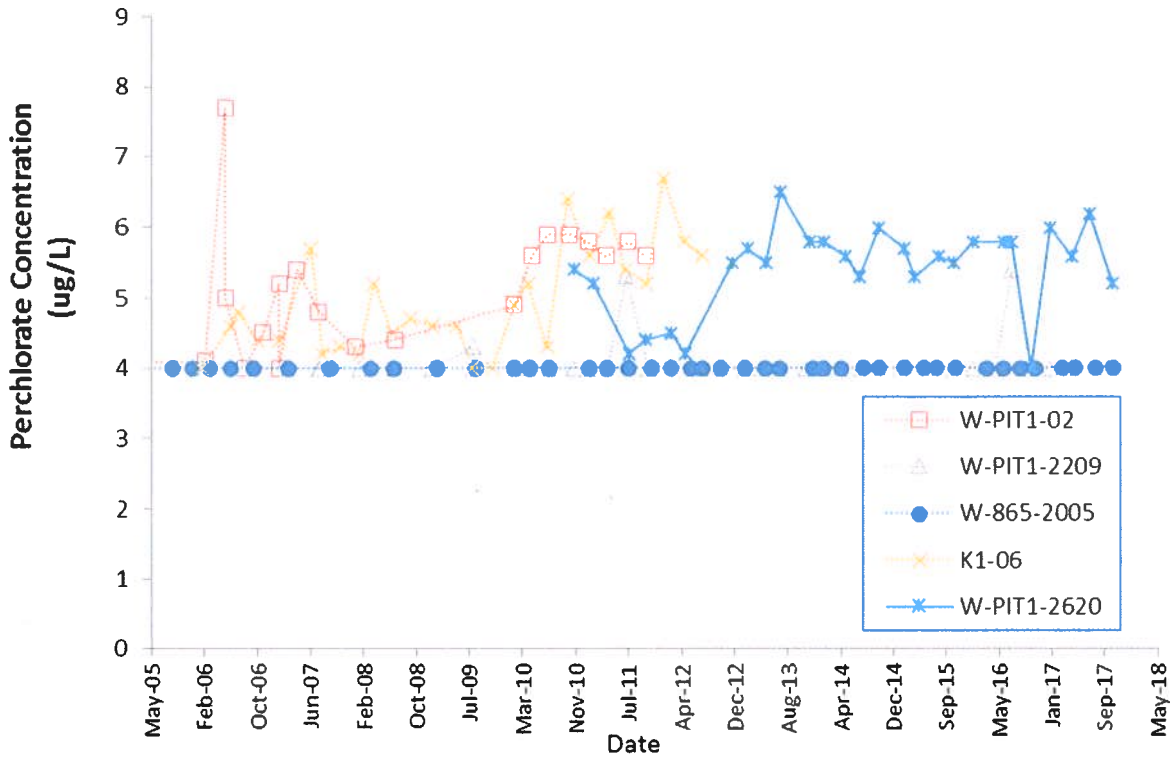


Figure 5. Perchlorate concentrations in water samples collected from evaluation ground water monitoring wells around Pit 1

For this annual report, tritium results for ground water samples collected from evaluation monitoring wells W-PIT1-02, W-PIT1-2209, W-865-2005, K1-06, and W-PIT1-2620 are plotted on **Figure 6 (See Below)**.

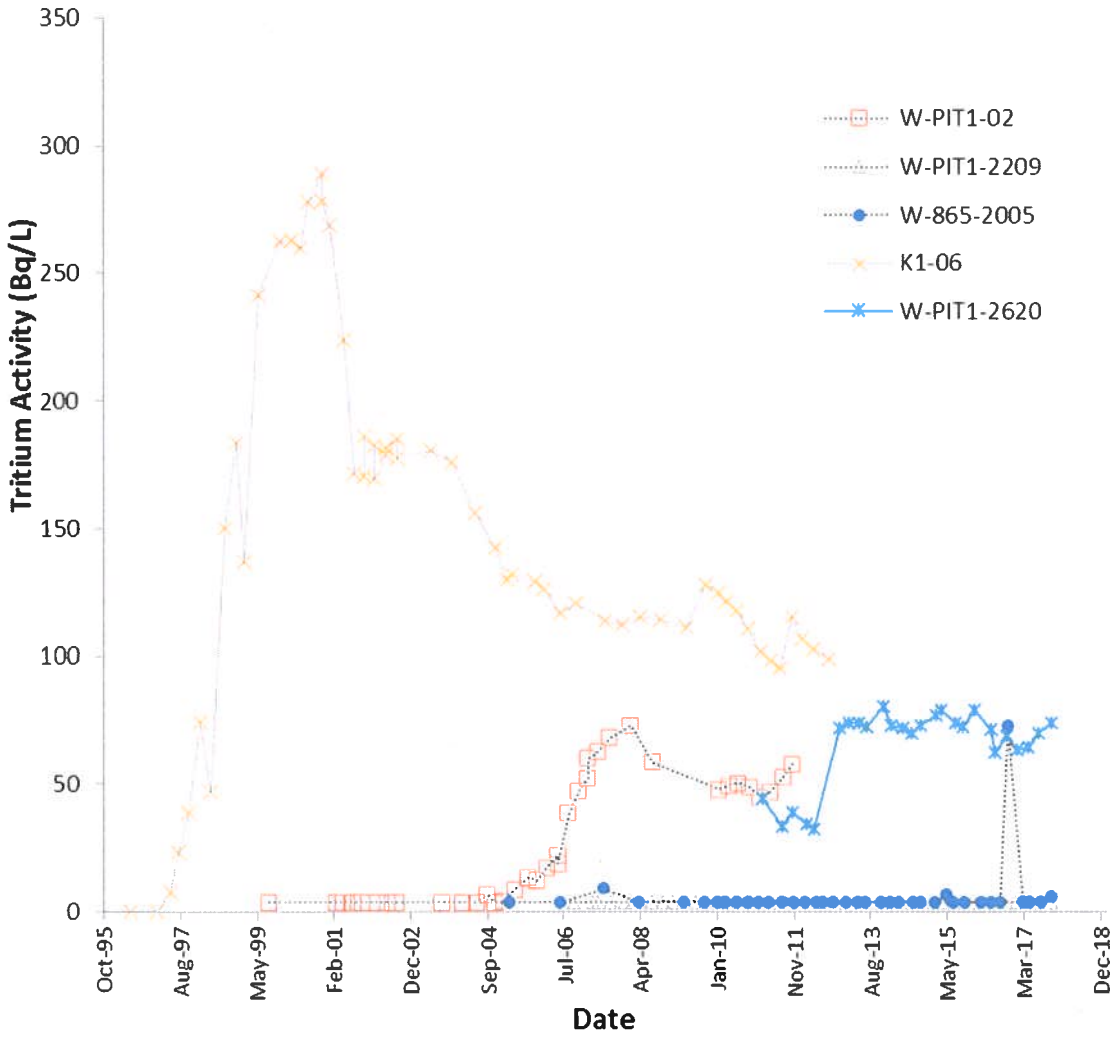


Figure 6. Tritium activities in water samples collected from evaluation ground water monitoring wells around Pit 1.

Inspection and Maintenance Summary

There were no formal inspections of Pit 1 this quarter, however, the pit cap and drainage structures continue to function properly, and the vegetation cover and drainage systems are in proper operating condition.

References

Blake, R. G. (2017), *LLNL Experimental Test Site 300 Compliance Monitoring Program for RCRA-Closed Landfill Pit 1, Fourth Quarter Report 2016*, Lawrence Livermore National Laboratory, Livermore, Calif. (UCRL-AR-10191-16-4).

Blake, R. G. (2016), *LLNL Experimental Test Site 300 Compliance Monitoring Program for RCRA-Closed Landfill Pit 1, Fourth Quarter Report 2015*, Lawrence Livermore National Laboratory, Livermore, Calif. (UCRL-AR-10191-15-4).

Blake, R. G. (2015), *LLNL Experimental Test Site 300 Compliance Monitoring Program for RCRA-Closed Landfill Pit 1, Fourth Quarter Report 2014*, Lawrence Livermore National Laboratory, Livermore, Calif. (UCRL-AR-10191-14-4).

Blake, R. G. (2014), *LLNL Experimental Test Site 300 Compliance Monitoring Program for RCRA-Closed Landfill Pit 1, Fourth Quarter Report 2013*, Lawrence Livermore National Laboratory, Livermore, Calif. (UCRL-AR-10191-13-4).

Blake, R. G., (2011), *LLNL Experimental Test Site 300 Compliance Monitoring Program for RCRA-Closed Landfill Pit 1, Third Quarter Report 2011*, Lawrence Livermore National Laboratory, Livermore, Calif. (UCRL-AR-10191-11-3).

Campbell, C. C., (2008), *LLNL Experimental Test Site 300 Compliance Monitoring Program for RCRA-Closed Landfills Pits 1 and 7, Annual Report for 2008*, Lawrence Livermore National Laboratory, Livermore, Calif. (UCRL-AR-10191-08-4).

Campbell, C. C., (2006), *LLNL Experimental Test Site 300 Compliance Monitoring Program for RCRA-Closed Landfills Pits 1 and 7, Annual Report for 2006*, Lawrence Livermore National Laboratory, Livermore, Calif. (UCRL-AR-10191-06-4).

Central Valley Regional Water Quality Control Board (1993), Order No. 93-100, Waste Discharge Requirements for University of California Lawrence Livermore National Laboratory, Site 300 and U.S. Department of Energy, Landfill Pits 1 and 7, San Joaquin County (June 25, 1993).

Central Valley Regional Water Quality Control Board (2010), Revised Monitoring and Reporting Program No. 93-100, Revision 3, Lawrence Livermore National Laboratory, Site 300, San Joaquin County, CA (February 18, 2010).

Dominic, K. (2010), Letter from the California Regional Water Quality Control Board, Central Valley Region, to Bruce Schultz, Environmental Functional Area on December 14, 2010 Re: "90-Day Report: Statistically Significant Evidence of a Release of Radium-226 and Total Uranium from Pit 1 at the Lawrence Livermore National Laboratory Experimental Test Site 300."

Ferry, L. S., and C. S. Holtzapple (2006), *Characterization Summary Report for the Building 865 Study Area at Lawrence Livermore National Laboratory, Site 300*, Lawrence Livermore National Laboratory, Livermore, CA, September 30, 2006.

Ferry, L. S., and M. Buscheck, Ed. (2015), *2014 Annual Compliance Monitoring Report, Lawrence Livermore National Laboratory, Site 300*, Lawrence Livermore National Laboratory, Livermore, Calif. (UCRL-AR-206319-14).

Gallegos, G. M. (Ed.) (2015), *Environmental Monitoring Plan*, Lawrence Livermore National Laboratory, Livermore, Calif. (UCRL-ID-106132 Rev. 7).

Goodrich, R., and G. Lorega (2016), *LLNL Livermore Site and Site 300 Environmental Restoration Project Standard Operating Procedures (SOPs)*, Lawrence Livermore National Laboratory, Livermore, Calif. (UCRL-MA-109115 Rev. 15).

Hoppes, W. G., et al. (1992), *Draft Report of Waste Discharge, LLNL Site 300*, Table 1 (UCRL-AR-110071).

Kato, T. T. (2014), Seven-Day Letter: "Statistically Significant Evidence of a Release of Barium from Lawrence Livermore National Laboratory Experimental Site (Site 300) Pit 1." Letter to Aimee Phiri, Central Valley Regional Water Quality Control Board, dated December 17, 2014, from Thomas Kato, Environmental Functional Area Manager, Livermore, Calif. (ESH-EFA-WQ-14-7514).

Pierce, M. (2011), Seven-Day Written Notification: "Statistically Significant Evidence of a Release of Total uranium from Lawrence Livermore National Laboratory Experimental Test (Site 300) Pit 1." Letter to Marcus Pierce, California Environmental Protection Agency, Central Valley Regional Water Quality Control Board, dated July 29, 2011, from Bruce Schultz, Environmental Functional Area Manager, Livermore, Calif. (ESH-EFA-WQ-11-1871 / EFA11-081)

Schultz, H. B. (2010), 90-Day Report: "Statistically Significant Evidence of a Release of Radium-226 and Total uranium from Pit 1 at the Lawrence Livermore National Laboratory Experimental Test Site 300." Letter to Kathryn Dominic, California Environmental Protection Agency, Central Valley Regional Water Quality Control Board, dated October 22, 2010, from Bruce Schultz, Environmental Functional Area Manager, Livermore, Calif. (WAMA 10-006).

Schultz, H. B. (2011), Seven-Day Written Notification: "Statistically Significant Evidence of Total Uranium and Tritium from Lawrence Livermore National Laboratory Experimental Site (Site 300) Pit 1." Letter to Marcus Pierce, Central Valley Regional Water Quality Control Board, dated July 29, 2011, from Bruce Schultz, Environmental Functional Area Manager, Livermore, Calif. (ESH-EFA-WQ-11-1871).

Webster-Scholten, C. P. (Ed.) (1994), *Final Site-Wide Remedial Investigation Report, Lawrence Livermore National Laboratory, Site 300*, Lawrence Livermore National Laboratory, Livermore, Calif. (UCRL-AR-108131).

Acknowledgments

The compliance monitoring program for Pit 1 could not be conducted without the dedicated efforts of many people. Angelina Mora provided essential administrative and editorial assistance. Don MacQueen provided detailed analytical information. Suzie Chamberlain provided detailed analytical information and performed quality reviews and data table preparation. Eric Walter coordinated the sampling activities. Mario Silva sampled the monitoring wells and packaged the samples for shipment. Della Burruss, Beth Schad, John Radyk, and Lisa Graves provided excellent data management support and ensured data quality. Off-site analytical support was provided by BC Laboratories, Inc., Eberline Lab, and GEL Laboratory. We thank John Scott and Jim Woollett at Site 300 for their cooperation in this effort. Hydrogeologic and graphic assistance was provided by Jonathan McKaskey. A draft of this report was reviewed by LLNL peers, including the LLNL Environmental Restoration Department Site Assistant Program Manager Dolores Loll whose suggestions and improvements were very much appreciated and incorporated into this report.

Abbreviations and Acronyms

Bq	becquerel (international unit of radioactivity equal to 27 pCi)
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CVRWQCB	Central Valley Regional Water Quality Control Board
DOE	U.S. Department of Energy
DTSC	Department of Toxic Substances Control (California)
EFA	Environmental Functional Area (LLNL)
ERD	Environmental Restoration Department
FFA	Federal Facility Agreement
ft	foot (used as a measure of elevation above MSL)
HSU	Hydrostratigraphic Unit
km	kilometer
km^2	square kilometer
L	liter
LLNL	Lawrence Livermore National Laboratory
m	meter
m^2	square meter
MCL	maximum contaminant level (for drinking water)
mg	milligram
MRP	Monitoring and Reporting Plan
MSL	mean sea level (datum for elevation measurements)
µg	microgram
pCi	picocurie (unit of radioactivity equal to 0.037 Bq)
PCP	post-closure plan
QA	quality assurance
RCRA	Resource Conservation and Recovery Act
RL	reporting limit (contractual concentration near zero)
SI	*Système Internationale* (units of measurement)
Site 300	Experimental Test Site, LLNL
SL	statistically determined concentration limit
SOP	standard operating procedure
$Tnbs_0$	Neroly Formation basal sandstone
$Tnbs_1$	Neroly Formation lower blue sandstone
VOC	volatile organic compound
WDR	Waste Discharge Requirements (permit)

Appendix A

Tables and Figures of Groundwater Measurements

Table A-1. Pit 1 detection monitoring wells, constituents of concern, SLs, and quarterly analytical results for 2017.

Quarter			1	2	3	4
COC (units)	**Well**	**SL**	**Result**	**Result**	**Result**	**Result**
Arsenic (µg/L)	K1-01C	–[(a)]	Dry	10	12	12
	K1-07	–[(a)]	13	7.9	6.6	10
	K1-02B	15	12	11	12	11
	K1-04	16	13	12	12	12
	K1-05	18	16	15	15	14
	K1-08	17	14	16	14	14
	K1-09	16	14	13	13	13
	W-PIT1-2326	14	12	9.9	12	12
Barium (µg/L)	K1-01C	–[(a)]	Dry	27	<25	<25
	K1-07	–[(a)]	31	27	<25	29
	K1-02B	26	26	25	<25	<25
	K1-04	32	31	30	32	30
	K1-05	43	37	37	39	39
	K1-08	49	43	43	43	42
	K1-09	51	48	41	42	43
	W-PIT1-2326	46	38	40	38	40
Beryllium (µg/L)	K1-01C	–[(a)]	Dry	<0.5	<0.5	<0.5
	K1-07	–[(a)]	<0.5	<0.5	<0.5	<0.5
	K1-02B	0.5	<0.5	<0.5	<0.5	<0.5
	K1-04	0.5	<0.5	<0.5	<0.5	<0.5
	K1-05	0.5	<0.5	<0.5	<0.5	<0.5
	K1-08	0.5	<0.5	<0.5	<0.5	<0.5
	K1-09	0.5	<0.5	<0.5	<0.5	<0.5
	W-PIT1-2326	0.5	<0.5	<0.5	<0.5	<0.5
Cadmium (µg/L)	K1-01C	–[(a)]	Dry	<0.5	<0.5	<0.5
	K1-07	–[(a)]	<0.5	<0.5	<0.5	<0.5
	K1-02B	0.52	<0.5	<0.5	<0.5	<0.5
	K1-04	0.5	<0.5	<0.5	<0.5	<0.5
	K1-05	0.5	<0.5	<0.5	<0.5	<0.5
	K1-08	0.5	<0.5	<0.5	<0.5	<0.5
	K1-09	0.5	<0.5	<0.5	<0.5	<0.5
	W-PIT1-2326	0.5	<0.5	<0.5	<0.5	<0.5
Cobalt (µg/L)	K1-01C	–[(a)]	Dry	<25	<25	<25
	K1-07	–[(a)]	<25	<25	<25	<25
	K1-02B	25	<25	<25	<25	<25
	K1-04	25	<25	<25	<25	<25
	K1-05	25	<25	<25	<25	<25
	K1-08	25	<25	<25	<25	<25
	K1-09	25	<25	<25	<25	<25
	W-PIT1-2326	25	<25	<25	<25	<25

Table A-1. Pit 1 detection monitoring wells, constituents of concern, SLs, and quarterly analytical results for 2017.

Quarter			1	2	3	4
COC (units)	**Well**	**SL**	**Result**	**Result**	**Result**	**Result**
Copper (µg/L)	K1-01C	–[a]	Dry	<10	<10	<10
	K1-07	–[a]	<10	<10	<10	<10
	K1-02B	60	<10	<10	<10	<10
	K1-04	10	<10	<10	<10	<10
	K1-05	30	<10	<10	<10	<10
	K1-08	10	<10	<10	<10	<10
	K1-09	10	<10	<10	<10	<10
	W-PIT1-2326	10	<10	<10	<10	<10
Lead (µg/L)	K1-01C	–[a]	Dry	<2	<2	<2
	K1-07	–[a]	<2	<2	<2	<2
	K1-02B	2	<2	<2	<2	<2
	K1-04	2	<2	<2	<2	<2
	K1-05	2	<2	<2	<2	<2
	K1-08	2	<2	<2	<2	<2
	K1-09	2	<2	<2	<2	<2
	W-PIT1-2326	2	<2	<2	<2	<2
Nickel (µg/L)	K1-01C	–[a]	Dry	29	7.5	<5
	K1-07	–[a]	<5	<5	<5	31
	K1-02B	9	<5	<5	<5	<5
	K1-04	5	<5	<5	<5	<5
	K1-05	13	<5	<5	<5	<5
	K1-08	5	<5	<5	<5	<5
	K1-09	5	<5	<5	<5	<5
	W-PIT1-2326	5	<5	<5	<5	<5
Vanadium (µg/L)	K1-01C	–[a]	Dry	64	65	68
	K1-07	–[a]	65	51	48	50
	K1-02B	59	49	46	48	42
	K1-04	46	37	39	36	30
	K1-05	79	62	68	70	61
	K1-08	78	54	64	60	54
	K1-09	69	60	57	58	52
	W-PIT1-2326	63	46	52	50	49
Zinc (µg/L)	K1-01C	–[a]	Dry	<20	<20	<20
	K1-07	—[a]	<20	<20	<20	<20
	K1-02B	98	<20	<20	<20	20
	K1-04	51	<20	<20	<20	<20
	K1-05	24	<20	<20	<20	<20
	K1-08	20	<20	<20	<20	<20
	K1-09	20	<20	<20	<20	20
	W-PIT1-2326	48	<20	<20	<20	27

Table A-1. Pit 1 detection monitoring wells, constituents of concern, SLs, and quarterly analytical results for 2017.

Quarter			1	2	3	4
COC (units)	**Well**	**SL**	**Result**	**Result**	**Result**	**Result**
Radium 226 (Bq/L)[b]	K1-01C	–[a]	Dry	0.009	0.007	0.011
	K1-07	–[a]	0.003	0.006	0.006	0.003
	K1-02B	0.012	0.038[c]	0.008	0.003	0.000
	K1-04	0.012	0.045[c]	0.002	0.003	0.004
	K1-05	0.012	0.010	0.010	0.004	0.007
	K1-08	0.009	–[d]	0.003	0.006	0.006
	K1-09	0.012	0.001	0.003	0.008	0.004
	W-PIT1-2326	0.019	0.005	0.005	0.003	-0.003
Tritium (Bq/L)	K1-01C	–[a]	Dry	23.0	26.6	25.7
	K1-07	–[a]	0.814	1.96	1.25	3.02
	K1-02B	158	111	100	109	95.8
	K1-04	19.2	16.9	19.7	18.5	10.7
	K1-05	11.4	9.21	6.59	8.29	9.88
	K1-08	10.7	6.88	8.10	8.14	6.96
	K1-09	8.66	0.925	8.88	6.70	7.99
	W-PIT1-2326	133	86.9	79.9	91.4	94.4
Uranium (total, Bq/L)	K1-01C	–[a]	Dry	0.136	0.170	0.176
	K1-07	–[a]	0.116	0.108	0.119	0.122
	K1-02B	0.145	0.171	0.164	0.175	0.183
	K1-04	0.085	0.081	0.077	0.097	0.093
	K1-05	0.115	0.111	0.110	0.124	0.115
	K1-08	0.149	0.125	0.123	0.109	0.132
	K1-09	0.137	0.128	0.121	0.135	0.126
	W-PIT1-2326	0.139	0.167	0.139	0.142	0.157
Thorium 228 (Bq/L)	K1-01C	–[a]	Dry	0.001	0.000	0.000
	K1-07	–[a]	0.001	0.001	-0.001	0.000
	K1-02B	0.003	0.000	0.000	-0.001	0.000
	K1-04	0.005	0.000	0.000	0.000	0.000
	K1-05	0.003	0.000	0.000	0.001	0.000
	K1-08	0.004	0.002	0.000	0.001	-0.001
	K1-09	0.008	0.000	0.001	0.000	0.000
	W-PIT1-2326	0.005	-0.001	0.000	0.000	0.000
Thorium 232 (Bq/L)	K1-01C	–[a]	Dry	0.001	0.000	0.001
	K1-07	–[a]	0.000	0.000	0.000	0.000
	K1-02B	0.004	0.000	0.000	0.000	0.001
	K1-04	0.001	0.000	0.000	0.000	0.000
	K1-05	0.004	0.001	0.000	0.000	0.000
	K1-08	0.004	0.000	0.000	0.000	0.000
	K1-09	0.002	0.000	0.000	0.000	0.000
	W-PIT1-2326	0.001	0.000	0.000	0.000	0.000

Table A-1. Pit 1 detection monitoring wells, constituents of concern, SLs, and quarterly analytical results for 2017.

Quarter			1	2	3	4
COC (units)	**Well**	**SL**	**Result**	**Result**	**Result**	**Result**
HMX (µg/L)	K1-01C	– [(a)]	Dry	<0.83	<0.73	<0.9
	K1-07	– [(a)]	<1	<1	<1	<0.75
	K1-02B	1	<0.9	<0.87	<1	<1
	K1-04	1	<0.9	<1	<0.6	<0.85
	K1-05	1	<1	<1	<0.7	<1
	K1-08	1	<0.9	<1	<1	<0.9
	K1-09	1	<0.78	<1	<0.83	<0.66
	W-PIT1-2326	1	<1	<0.7	<0.9	<0.4
RDX (µg/L)	K1-01C	– [(a)]	Dry	<0.83	<0.73	<0.9
	K1-07	– [(a)]	<1	<1	<1	<0.75
	K1-02B	1	<0.9	<0.87	<1	<1
	K1-04	1	<0.9	<1	<0.6	<0.85
	K1-05	1	<1	<1	<0.7	<1
	K1-08	1	<0.9	<1	<1	<0.9
	K1-09	1	<0.78	<1	<0.83	<0.66
	W-PIT1-2326	1	<1	<0.7	<0.9	0.92

[(a)] Wells K1-01C and K1-07 have no release detection SLs for COCs because they are upgradient of Pit 1.

(b) Radioactivity measurements are corrected for the background radioactivity inside the measurement chamber. A negative result for radioactivity indicates that the sample measured lower than the background by the amount shown. Radioactivity values shown as 0.000 measured less than 0.0005 Bq/L.

(c) Data for radium 226 for wells K1-02B and K1-04 were considered suspect during the first quarter due to a field sampling error. Field sample bottles identification labels were improperly applied and data are unreliable and not be used in the first quarter 2017 report. Data has been flagged and removed from the LLNL data base.

[(d)] Water sample for well K1-08 not analyzed due to breakage of bottle during transport to the analytical lab. The laboratory notified LLNL but resampling efforts were not communicated.

Table A-2. Pit 1 additional PCP constituents for the fourth quarter 2017 analytical results for detection monitoring wells.

	Monitoring Wells							
	K1-01C	K1-07	K1-02B	K1-04	K1-05	K1-08	K1-09	W-PIT1-2326
Date Sampled	Nov 21	Oct 10	Oct 9	Oct 16	Oct 11	Oct 17	Oct 10	Oct 25
Depth to water (ft)	107.78	142.05	136.52	157.96	172.44	155.63	161.55	180.02
Ground water elevation (ft)	974.16	967.58	970.71	964.71	958.42	967.11	965.13	967.77
Field pH (Units)	7.54	7.60	7.49	8.42	7.67	7.92	7.77	7.74
Field Specific Conductance (µmhos/cm)	684	582	743	618	620	631	643	717
Field Temperature (Degrees C)	18.9	22.4	22.1	20.7	21.4	20.2	21.8	22.6
Gross alpha (Bq/L)	0.167	0.153	0.175	0.051	0.129	0.116	0.176	0.158
Gross beta (Bq/L)	0.259	0.169	0.149	0.083	0.148	0.092	0.145	0.090
Nitrate (as NO3) (mg/L)	34	21	30	25	35	33	34	31
Perchlorate (µg/L)	<4	<4	4.5	<4	<4	<4	<4	4.4
Total VOCs (calculated) (µg/L)	ND	0.54	ND	ND	22	33	51	ND
Freon 113 (µg/L)	<0.5	0.54	<0.5	<0.5	22	33	51	<0.5

Note:

ND = Not detected above reporting limit. Reporting limits vary with individual VOCs.

Table A-3. Pit 1 evaluation monitoring wells, constituents of concern, physical parameters, and analytical results for fourth quarter 2017.

	W-PIT1-2620	W-PIT1-2209	W-865-2005
Date Sampled	Oct 30	Oct 2	Oct 31
Depth to water (ft)	233.64	218.68	328.60
Ground water elevation (ft)	946.23	947.37	946.27
Tritium (Bq/L)	74.0	-1.20	0.470
Field pH (Units)	7.92	7.82	8.31
Field Specific Conductance (μmhos/cm)	769	680	618
Field Temperature (Degrees C)	20.2	21.2	18.2
Perchlorate (μg/L)	4.9	<4	<4

Table A-4. Pit 1 groundwater well routine sampling dates.

Location	Quarter	Sample Date
K1-01C	1	3-Jan-2017
	2	18-May-2017
	3	24-Jul-2017
	4	21-Nov-2017
K1-02B	1	30-Jan-2017
	2	1-May-2017
	3	17-Jul-2017
	4	9-Oct-2017
K1-04	1	26-Jan-2017
	2	15-May-2017
	3	25-Jul-2017
	4	16-Oct-2017
K1-05	1	1-Mar-2017
	2	15-May-2017
	3	25-Jul-2017
	4	11-Oct-2017
K1-07	1	10-Jan-2017
	2	1-May-2017
	3	17-Jul-2017
	4	10-Oct-2017
K1-08	1	24-Jan-2017
	2	24-May-2017
	3	18-Jul-2017
	4	17-Oct-2017
K1-09	1	9-Jan-2017
	2	27-Apr-2017
	3	24-Jul-2017
	4	10-Oct-2017
W-PIT1-2326	1	16-Feb-2017
	2	24-May-2017
	3	10-Jul-2017
	4	25-Oct-2017
K1-06	1	30-Jan-2017
	2	24-May-2017
	3	6-Jul-2017
	4	9-Oct-2017
W-PIT1-2209	1	5-Jan-2017
	2	18-May-2017
	3	6-Jul-2017
	4	2-Oct-2017
W-PIT1-2620	1	5-Jan-2017
	2	18-May-2017
	3	10-Jul-2017
	4	30-Oct-2017
W-865-2005	1	2-Mar-2017
	2	4-May-2017
	3	8-Aug-2017
	4	31-Oct-2017

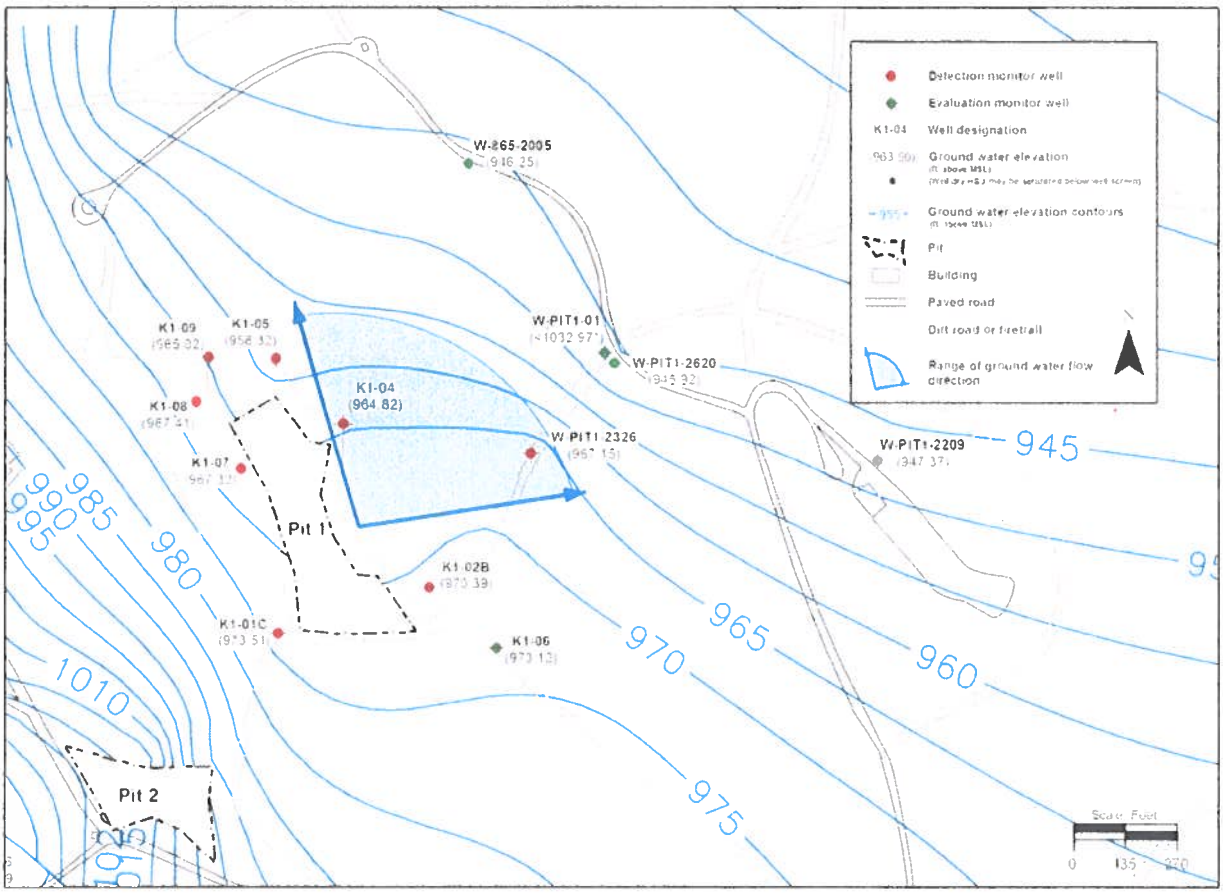


Figure A-1. Ground water elevation contour map for the $Tnbs_1/Tnbs_0$ HSU at Pit 1.

Appendix B

Statistical Methods for Release Detection

Appendix B

Statistical Methods for Release Detection

Statistical monitoring of the RCRA closure and PCP for the Pit 1 landfill is described in the Revised MRP No. 93-100 (February 18, 2010) to satisfy the provisions of CCR Title 23, Chapter 15, Section 2550.7.

LLNL uses an intrawell comparison for each analyte at each down-gradient and cross-gradient well to detect potential releases of constituents of concern to ground water. Intrawell tests compare each measurement at a well to past measurements at that well to detect increases in concentration that statistically exceed the variation historically seen at that well.

Where sufficient detections are available, LLNL uses a statistical prediction limit method to implement intrawell comparisons. The method uses the average and standard deviation of historical measurements to calculate a SL value. The SL is calculated so that it will be exceeded by approximately one percent of individual measurements when there has not been a release. When too few detections are available, either the analytical reporting limit or maximum recent detection is used as an SL. The SLs currently in use are documented in the MRP.

Each quarter, each measurement is compared with its associated SL. The SL comparison is augmented by a verification procedure containing two discreet retests, in accordance with CCR Title 23, Chapter 15, Section 2550.7. This protects against false positives due to other causes, such as analytical error in the laboratory. Retests are used when the original measurement exceeds the SL. If either or both retests also exceed the SL, the result is considered a "statistically significant evidence of a release." Based on the MRP, monitoring is conducted to evaluate SL detections for all constituents of concern in **Table A-1** detection monitoring wells. In addition, sampling is performed to evaluate whether tritium and perchlorate results for ground water samples collected from evaluation monitoring wells near Pit 1 indicate a release from Pit 1 or another source.

A change of the SL for total uranium at well W-PIT1-2326 was sent to the CVRWQCB in a letter request on June 13, 2011 because the total uranium values at the well had been elevated for several quarters. However, the value was below the closed upgradient well. The SL for this well continued to be slightly elevated during the remainder of 2011 and during the first quarter of 2012. LLNL communicated with the CVRWQCB in past letters and quarterly reports that we did not believe that the total uranium activities in this monitoring well represent statistical evidence of a release from Pit 1. LLNL's conclusion is based on samples collected from upgradient wells, as well as the natural uranium-235/238 ratio at the well. In the June 13, 2011 letter, LLNL proposed to update the total uranium SL from 3.12 pCi/L (0.115 Bq/L) to 3.75 pCi/L (0.139 Bq/L) for this well. LLNL received a letter response from the CVRWQCB on July 16, 2012 indicating that the CVRWQCB agreed to the SL changes proposed by LLNL, and changes were incorporated into this report commencing during the third quarter of 2012.

Appendix C

Quality Assurance Samples

Table C-1. Pit 1 quality assurance for routine, duplicate, and field blank samples for the fourth quarter 2017.

		K1-08	K1-08	PIT1FB
Constituent [a]	**Units**	Routine (Oct 17)	Duplicate (Oct 17)	Field blank (Oct 25)
Arsenic	µg/L	14	14	<2
Barium	µg/L	42	43	<25
Beryllium	µg/L	<0.5	<0.5	<0.5
Cadmium	µg/L	<0.5	<0.5	<0.5
Cobalt	µg/L	<25	<25	<25
Copper	µg/L	<10	<10	<10
Lead	µg/L	<2	<2	<2
Nickel	µg/L	<5	<5	<5
Vanadium	µg/L	54	57	<25
Zinc	µg/L	<20	<20	28
Nitrate (as NO3)	mg/L	33	33	<0.5
Perchlorate	µg/L	<4	<4	<4
He compounds				
HMX	µg/L	<0.9	<0.8	<0.77
RDX	µg/L	<0.9	<0.8	<0.77
Radioactivity				
Radium 226 [b]	Bq/L	0.006 ± 0.004	0.005 ± 0.000	0.004 ± 0.004
Tritium	Bq/L	6.96 ± 3.13	7.77 ± 3.25	-0.855 ± 2.34
Uranium (total)	Bq/L	0.132 ± 0.017	0.124 ± 0.016	0.004 ± 0.004
Thorium 228	Bq/L	-0.001 ± 0.001	0.001 ± 0.001	0.001 ± 0.001
Thorium 232	Bq/L	0.000 ± 0.001	0.000 ± 0.001	0.000 ± 0.001
Gross alpha	Bq/L	0.116 ± 0.048	0.122 ± 0.049	0.021 ± 0.013
Gross beta	Bq/L	0.092 ± 0.028	0.101 ± 0.029	0.025 ± 0.020

[a] As standard QA protocol, trip blanks were submitted with all samples in Table C-1. This quarter, all trip blank analyses were non-detects.

[a] Radioactivity is corrected for the background radioactivity inside the measurement apparatus. Negative activity indicates that the sample contained less than the background activity by the amount shown. Radioactivity equal to or less than the 2-sigma uncertainty shown is considered to be a nondetection.

Appendix D

Constituents of Concern and Monitoring Frequencies

Table D-1. Pit 1 constituents of concern and monitoring frequencies. [a]

Constituent	WDR [b]	PCP [c]	Pit 1
Arsenic	X		Q
Barium	X		Q
Beryllium	X		Q
Cadmium	X		Q
Chloride		X	A
Chromium		X	SA
Cobalt	X		Q
Copper	X		Q
Iron		X	SA
Lead	X		Q
Manganese		X	SA
Mercury		X	SA
Nickel	X		Q
Nitrate		X	SA
Selenium		X	SA
Silver		X	SA
Sodium		X	SA
Sulfate		X	A
Vanadium	X		Q
Zinc	X		Q
Total organic carbon (TOC)		X	A
Total organic halides (TOX)		X	A
EPA Method 601		X	
EPA Method 624		X	A
EPA Method 625		X	A
EPA Method 608		X	A
Gross alpha and gross beta		X	SA
Radium 226	X		Q
Thorium 228	X		Q
Thorium 232	X		Q
Tritium	X		Q
Perchlorate	X		Q
Uranium (total)	X		Q
HMX	X		Q
RDX	X		Q
Ground water elevation		X	SA
Ground water temperature		X	SA
pH		X	SA
Specific conductance		X	SA

[a] Monitoring frequencies are: Q (quarterly); SA (semiannually); A (annually).

[b] Constituents of concern required to be monitored by WDR 93-100 (CVRWQCB, 2010).

[c] Additional constituents of concern required to be monitored by the post-closure plan (Rogers/Pacific Corporation, 1990).

Appendix E

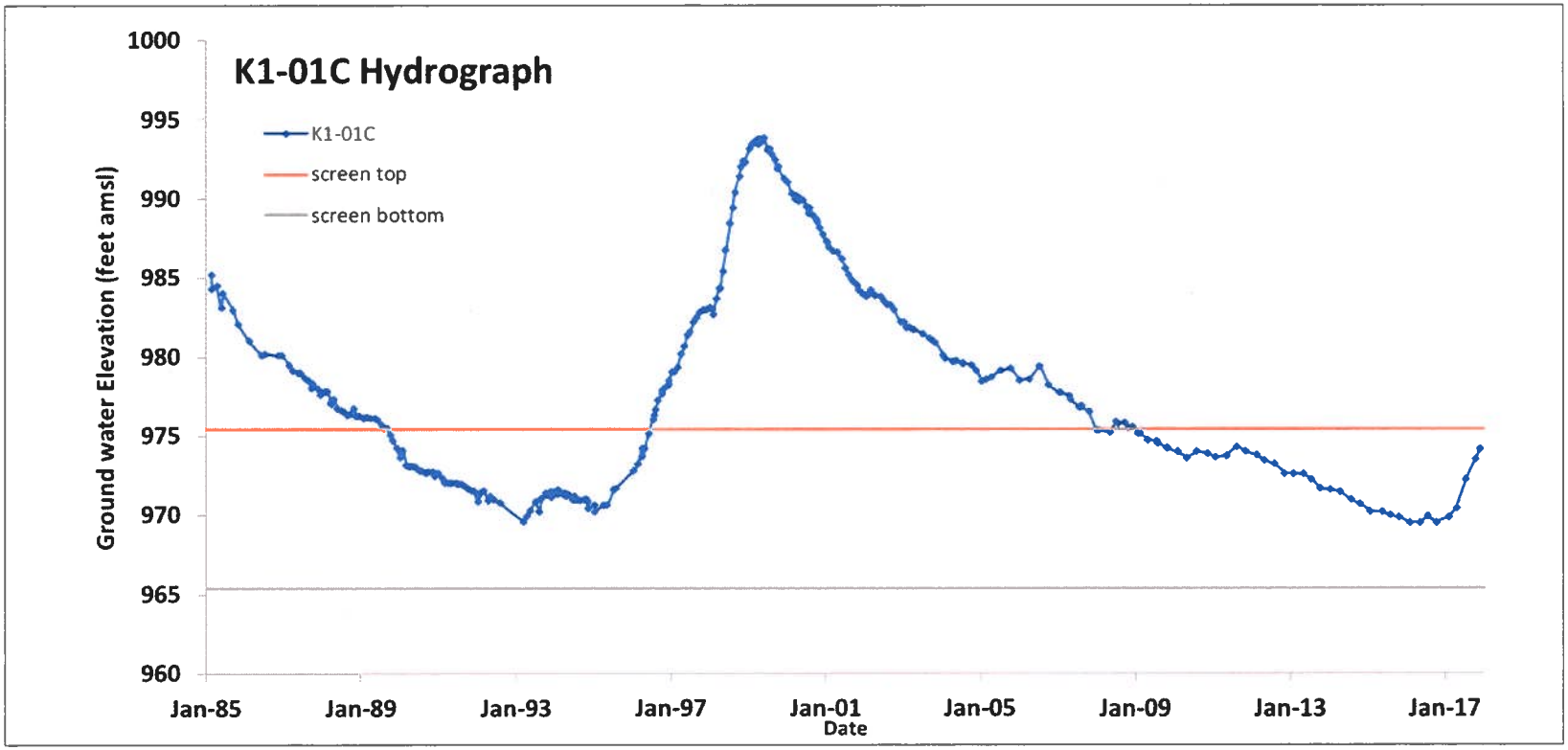
Well Specification and Construction Details for Detection Monitoring and Evaluation Monitoring Wells

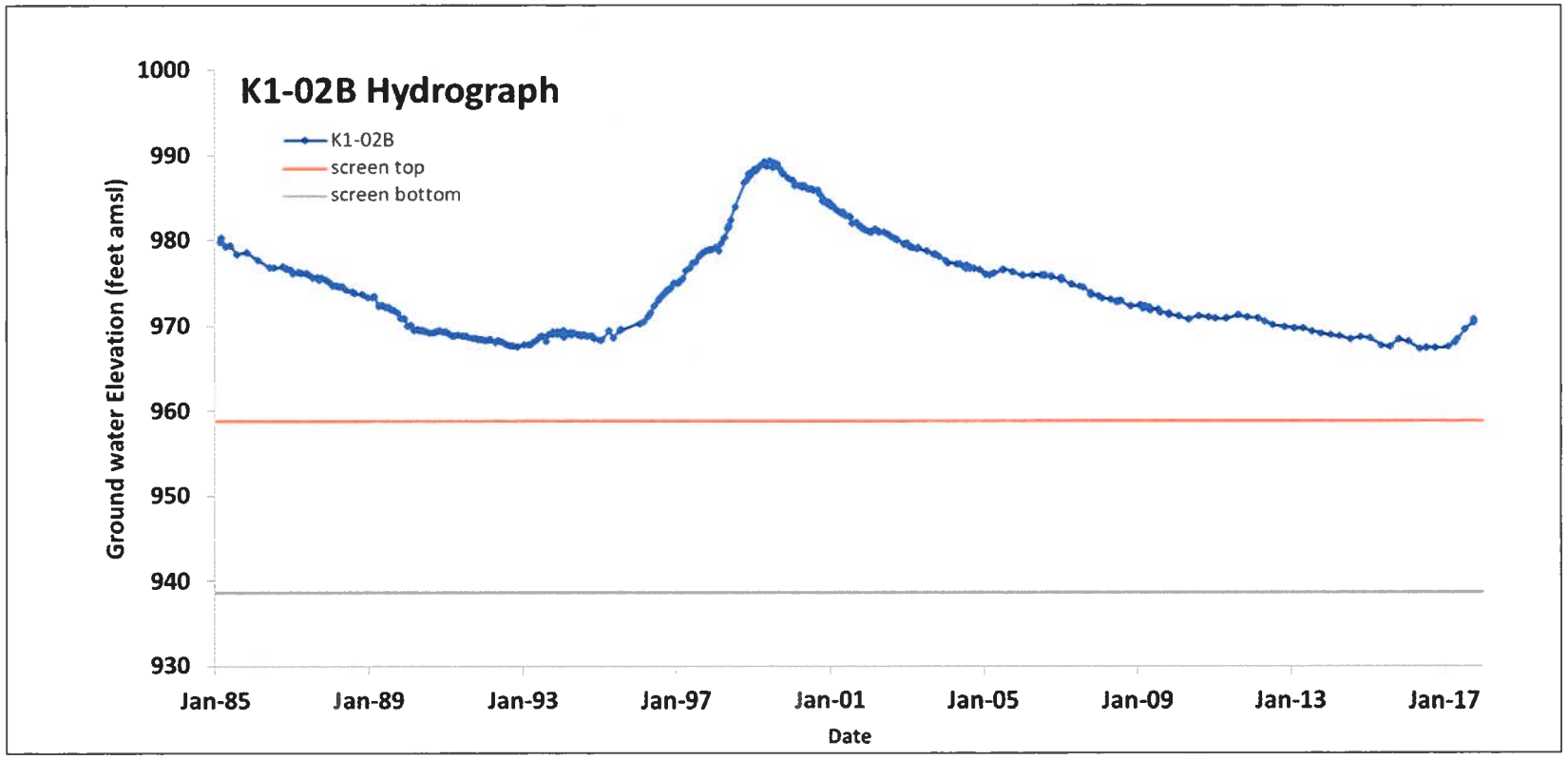
Table E-1. Well specification and construction details of the Pit 1 monitoring network.

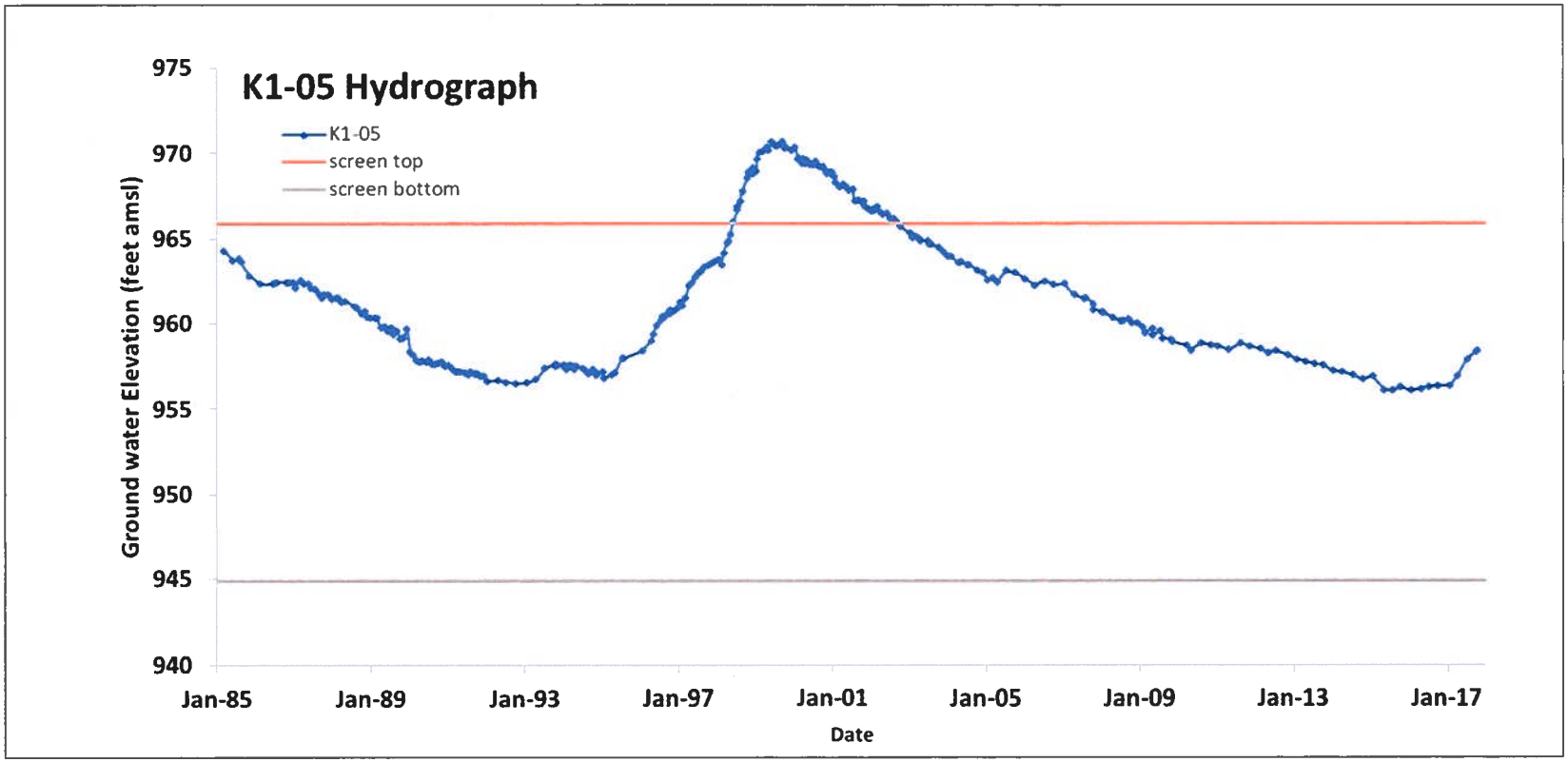
Well	HSU	Northing	Easting	Ground Surface Evaluation	Reference Evaluation	Elevation of Screen Top	Elevation of Screen Bottom	Elevation of Bentonite Top	Elevation of Bentonite Bottom	Elevation of Filter Pack Top	Elevation of Filter Pack Bottom	Elevation of Casing Bottom
K1-01C	$Tnbs_1/Tnbs_0$	427774.28	1699062.3	1,078.92	1,081.94	975.42	965.42	998.92	986.92	986.92	955.92	965.42
K1-02B	$Tnbs_1/Tnbs_0$	427893.78	1699452.58	1,105.23	1,107.23	958.73	938.73	985.23	982.13	982.13	932.73	938.73
K1-04	$Tnbs_1/Tnbs_0$	428315.51	1699231.7	1,120.00	1,122.67	937.00	920.00	978.00	968.00	968.00	919.00	919.00
K1-05	$Tnbs_1/Tnbs_0$	428485.47	1699057.58	1,128.86	1,130.86	965.86	944.86	None	None	972.86	941.86	944.86
K1-06	$Tnbs_1/Tnbs_0$	427736.68	1699627.38	1,087.54	1,089.54	982.54	972.54	None	None	995.54	971.54	972.54
K1-07	$Tnbs_1/Tnbs_0$	428199.97	1698965.54	1,106.63	1,109.63	978.63	958.63	985.63	983.93	983.93	956.63	956.63
K1-08	$Tnbs_1/Tnbs_0$	428373.1	1698848.94	1,120.72	1,122.74	979.72	954.72	991.22	985.72	985.72	952.72	952.72
K1-09	$Tnbs_1/Tnbs_0$	428488.09	1698880.26	1,124.68	1,126.68	969.68	934.68	978.18	975.68	975.68	932.68	932.68
W-865-2005	$Tnbs_1/Tnbs_0$	428990.64	1699555.36	1,272.87	1,274.87	942.87	922.87	954.87	950.87	950.87	919.87	921.87
W-PIT1-02	$Tnbs_1/Tnbs_0$	428494.39	1699912.16	1,179.30	1,181.30	929.30	919.30	942.30	934.30	934.30	911.30	918.30
W-PIT1-2209	$Tnbs_1/Tnbs_0$	428221.94	1700615.69	1,164.05	1,166.05	919.05	899.05	939.05	929.05	929.05	896.05	898.05
W-PIT1-2326	$Tnbs_1/Tnbs_0$	428240.21	1699717.26	1,145.79	1,147.79	930.79	911.09	960.79	949.79	949.79	905.79	910.67
W-PIT1-2620	$Tnbs_1/Tnbs_0$	428473.29	1699935.03	1,177.87	1,179.87	932.87	917.97	947.87	942.57	942.57	914.87	917.55

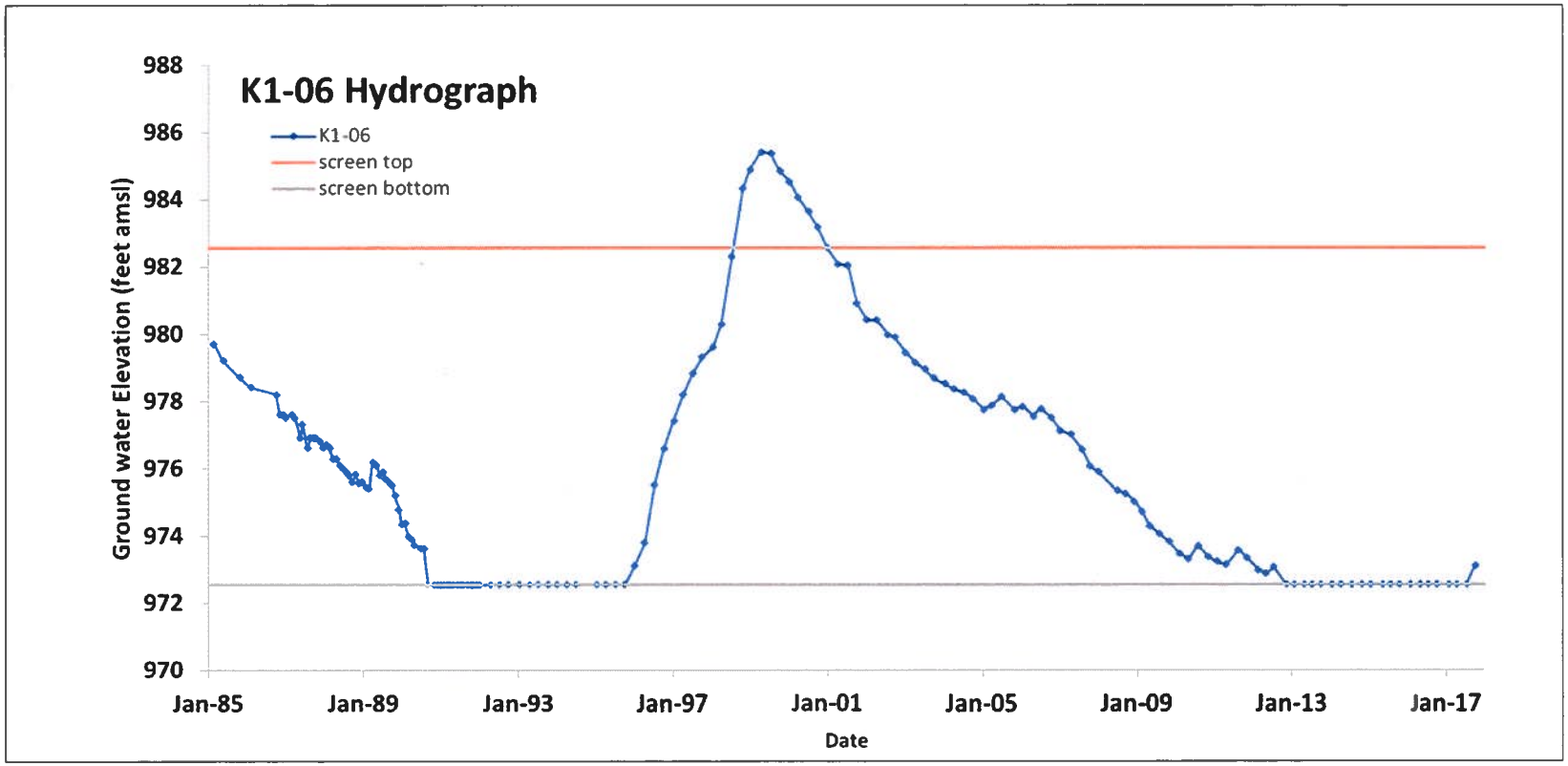
Appendix F

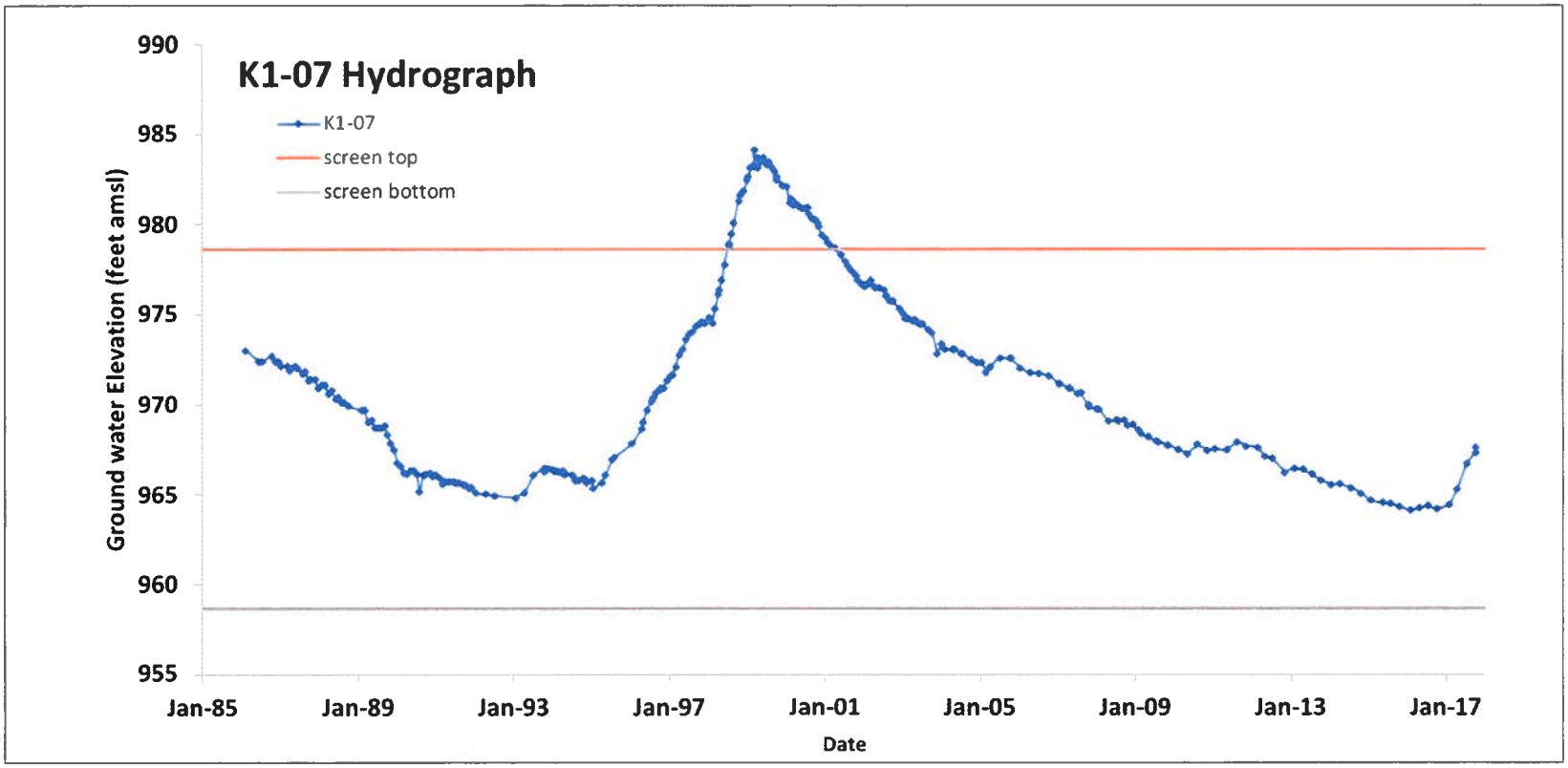
Hydrographs for All Compliance Monitoring Wells

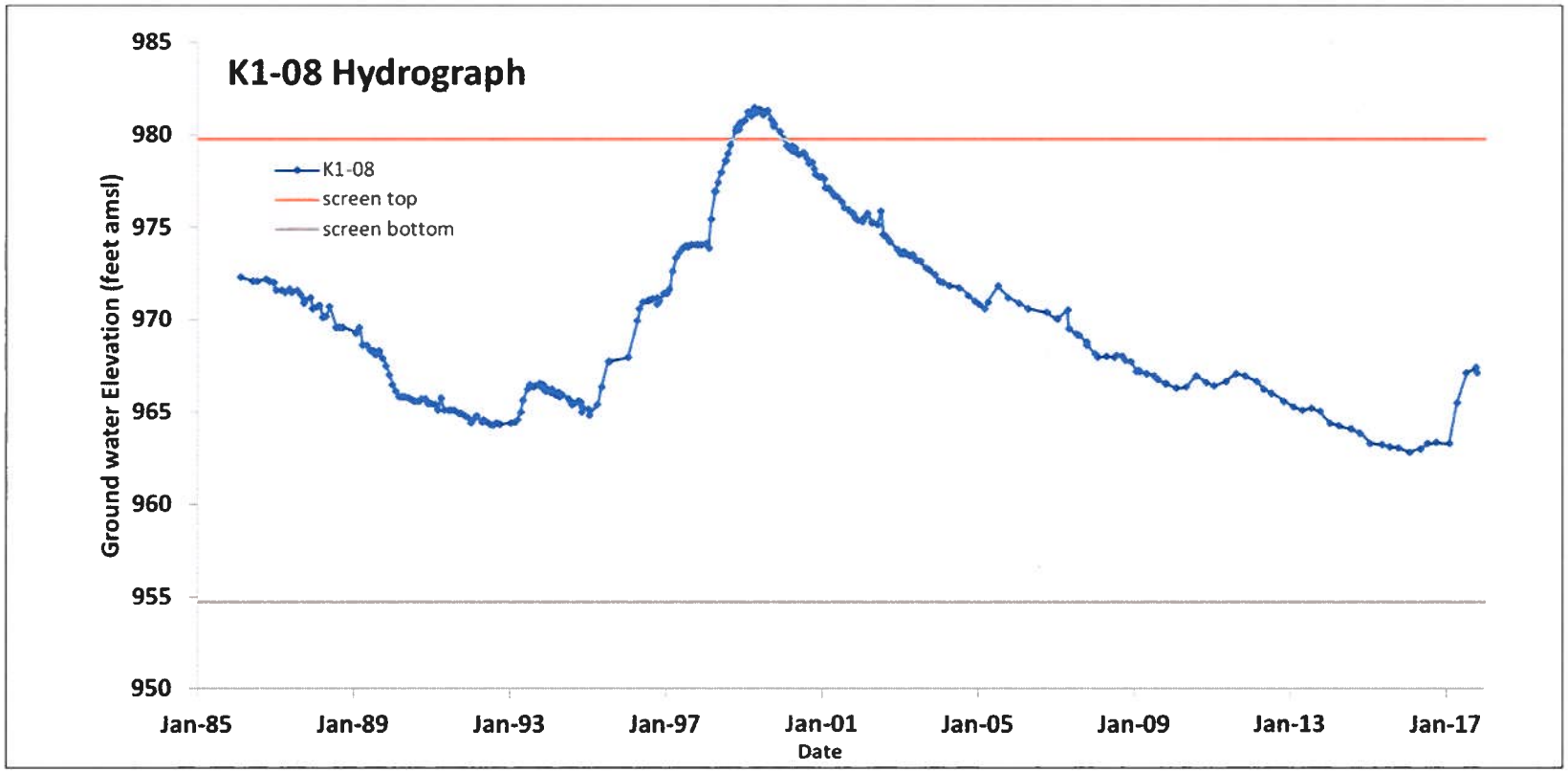

K1-01C Hydrograph
K1-01C
screen top
screen bottom
Ground water Elevation (feet amsl)
1000
995
990
985
980
975
970
965
960
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Date

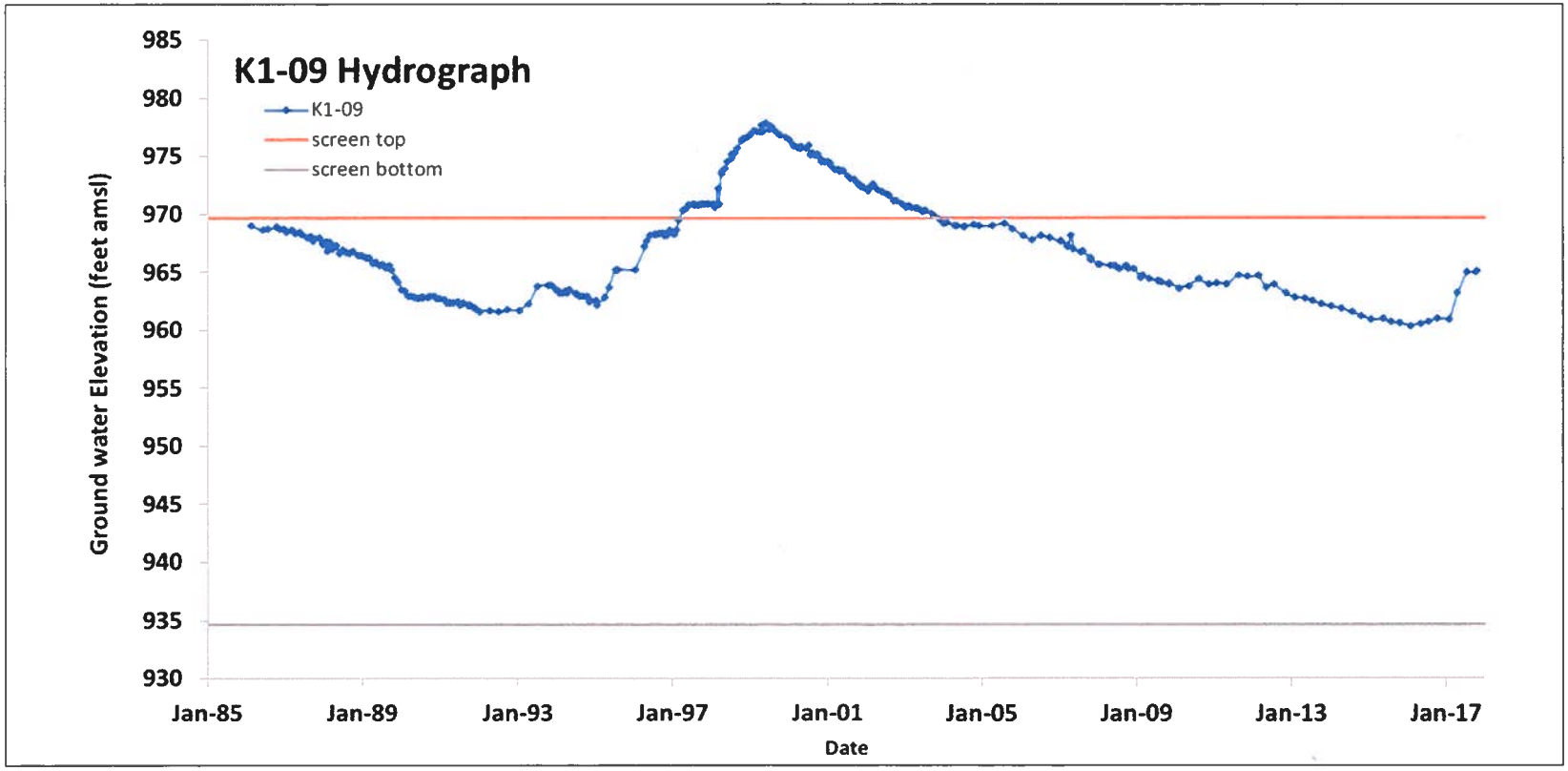

K1-02B Hydrograph
K1-02B
screen top
screen bottom
Ground water Elevation (feet amsl)
1000
990
980
970
960
950
940
930
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Date

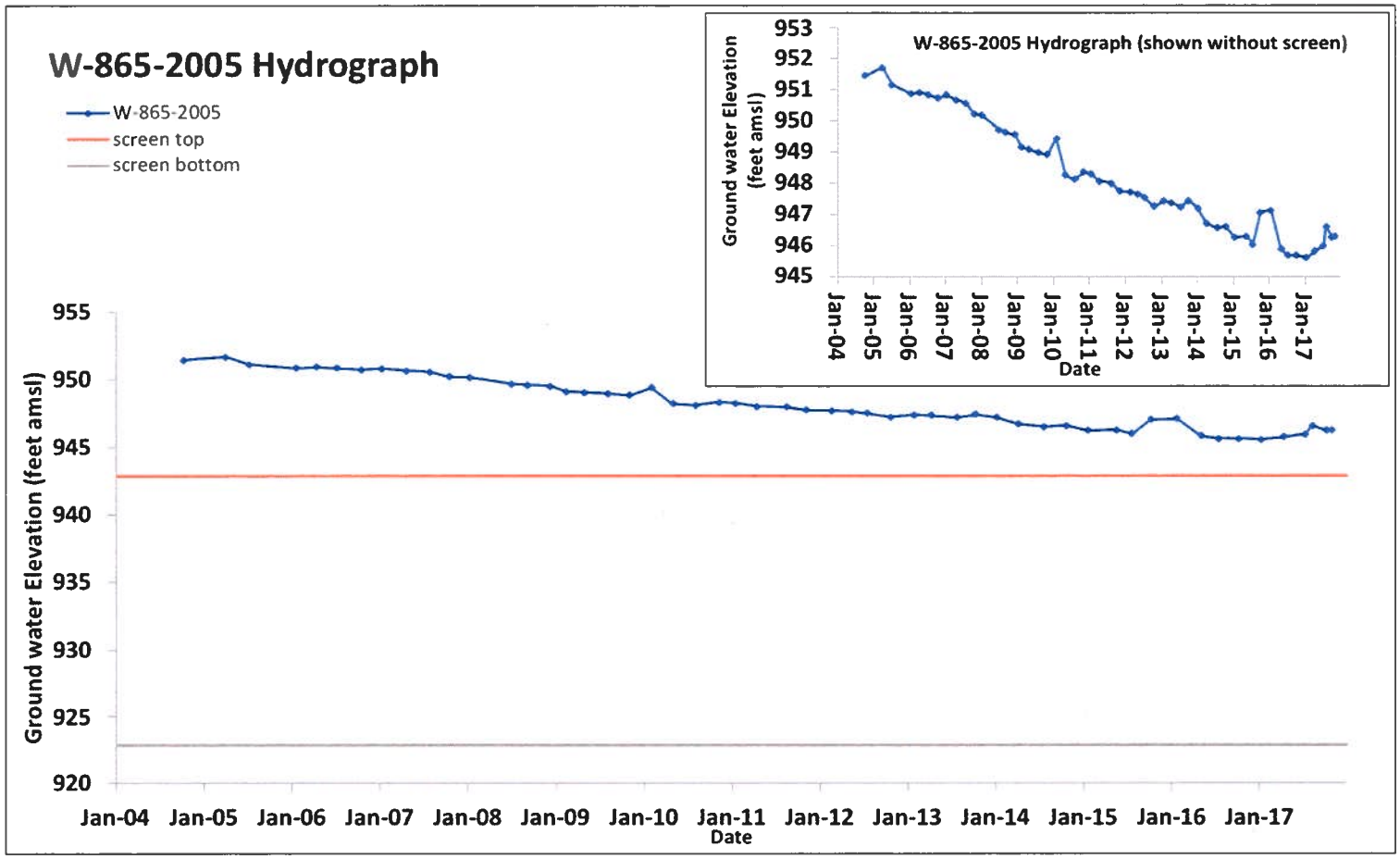

K1-05 Hydrograph
K1-05
screen top
screen bottom
Ground water Elevation (feet amsl)
975
970
965
960
955
950
945
940
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Date

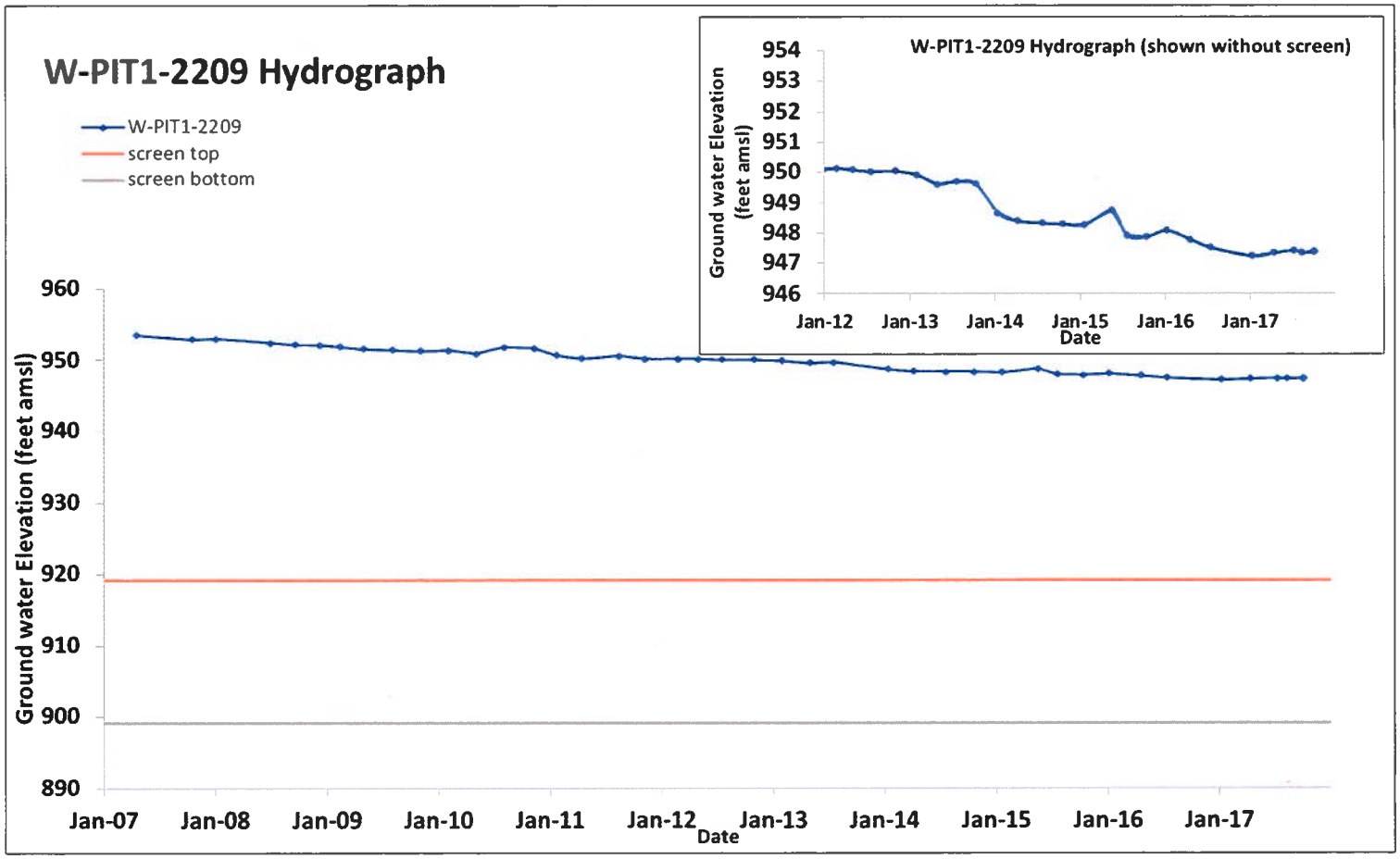

K1-06 Hydrograph
K1-06
screen top
screen bottom
Ground water Elevation (feet amsl)
988
986
984
982
980
978
976
974
972
970
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Date

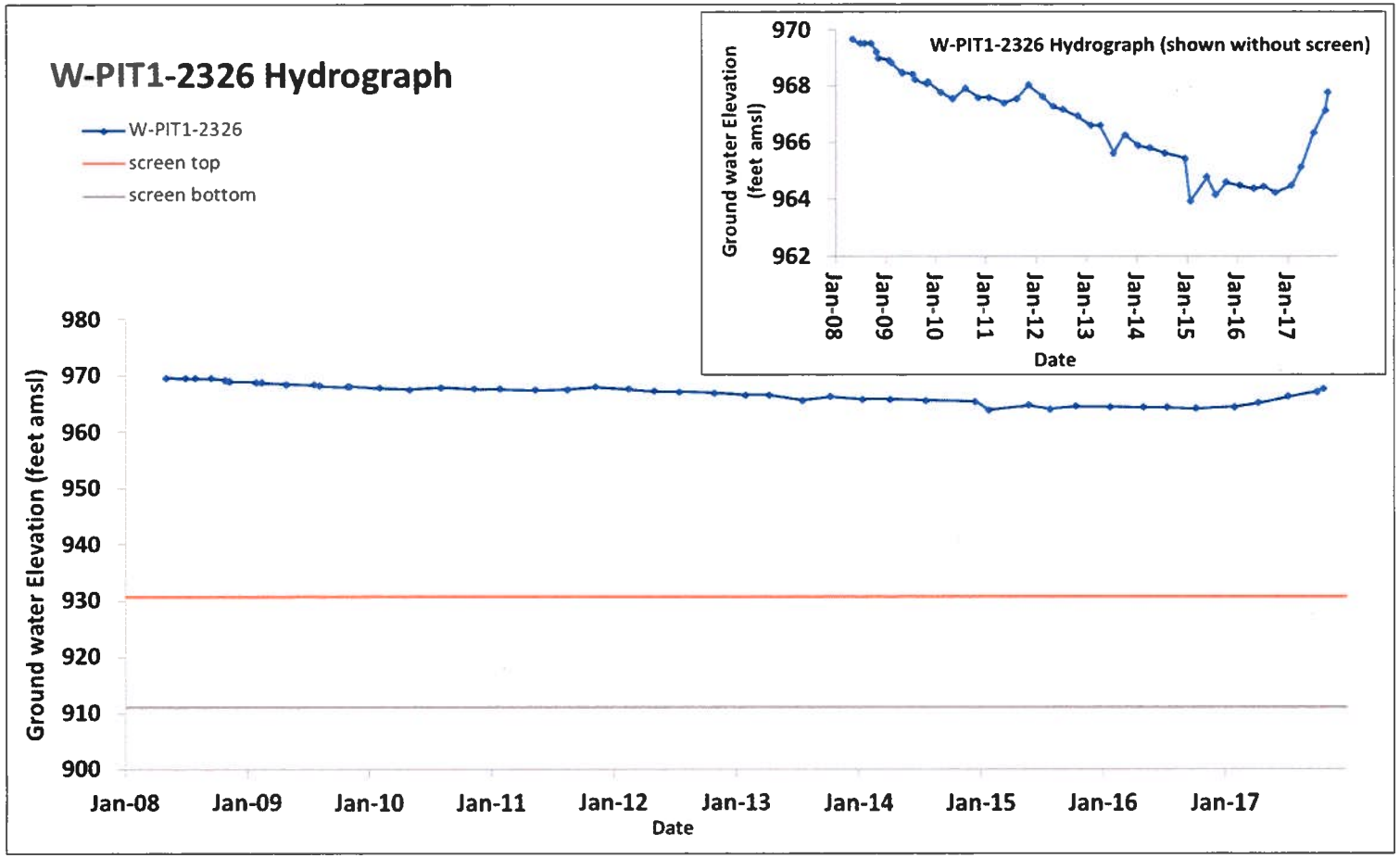

K1-07 Hydrograph
K1-07
screen top
screen bottom
Ground water Elevation (feet amsl)
990
985
980
975
970
965
960
955
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Date

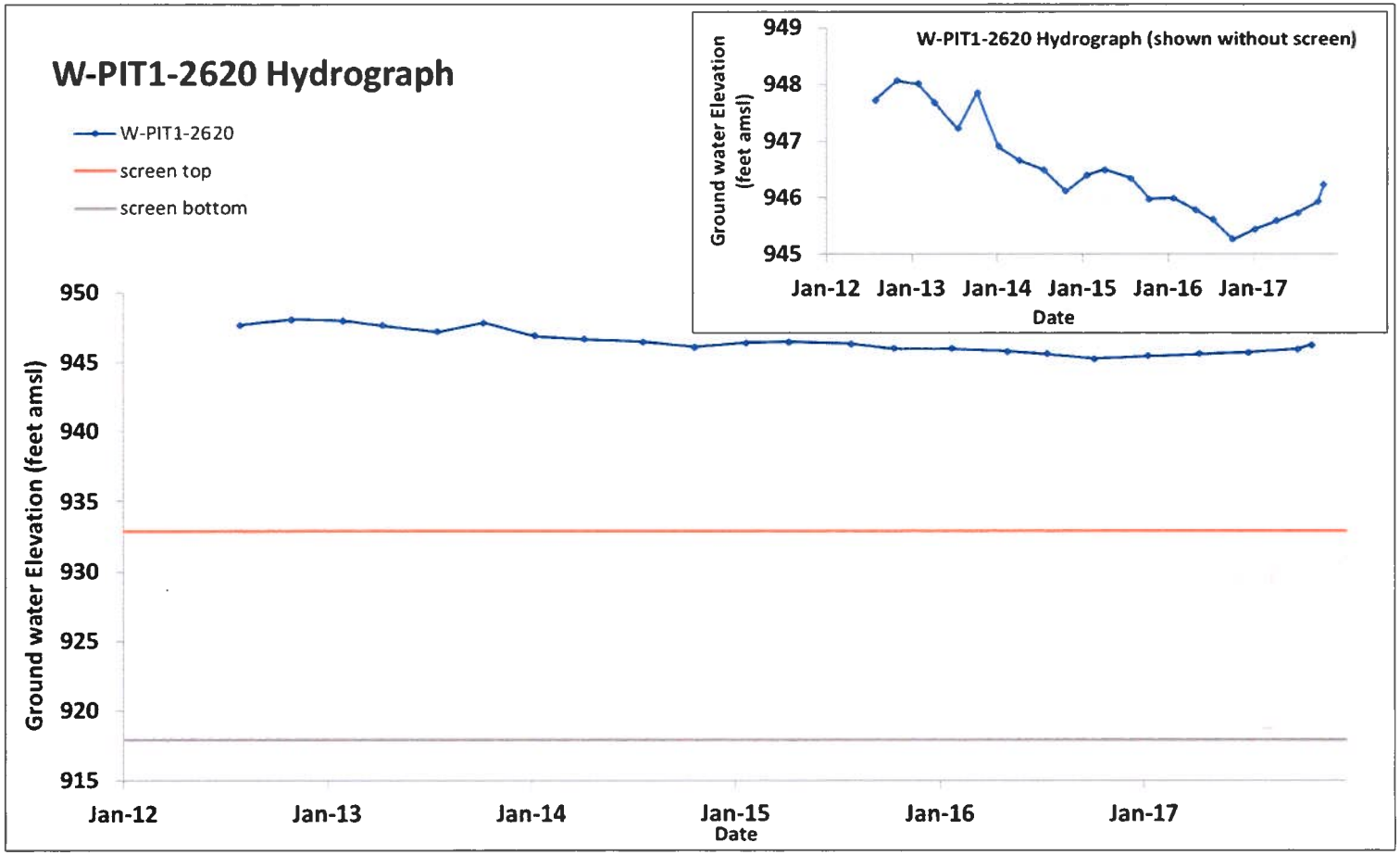

K1-08 Hydrograph
K1-08
screen top
screen bottom
Ground water Elevation (feet amsl)
985
980
975
970
965
960
955
950
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Date


K1-09 Hydrograph
K1-09
screen top
screen bottom
Ground water Elevation (feet amsl)
985
980
975
970
965
960
955
950
945
940
935
930
Jan-85
Jan-89
Jan-93
Jan-97
Jan-01
Jan-05
Jan-09
Jan-13
Jan-17
Date


W-865-2005 Hydrograph
W-865-2005
screen top
screen bottom
Ground water Elevation (feet amsl)
955
950
945
940
935
930
925
920
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Date
W-865-2005 Hydrograph (shown without screen)
Ground water Elevation (feet amsl)
953
952
951
950
949
948
947
946
945
Date


W-PIT1-2209 Hydrograph
W-PIT1-2209
screen top
screen bottom
Ground water Elevation (feet amsl)
960
950
940
930
920
910
900
890
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Date
W-PIT1-2209 Hydrograph (shown without screen)
Ground water Elevation (feet amsl)
954
953
952
951
950
949
948
947
946
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Date


W-PIT1-2326 Hydrograph
W-PIT1-2326
screen top
screen bottom
Ground water Elevation (feet amsl)
980
970
960
950
940
930
920
910
900
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Date
W-PIT1-2326 Hydrograph (shown without screen)
Ground water Elevation (feet amsl)
970
968
966
964
962
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Date


W-PIT1-2620 Hydrograph
W-PIT1-2620
screen top
screen bottom
Ground water Elevation (feet amsl)
950
945
940
935
930
925
920
915
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Date
W-PIT1-2620 Hydrograph (shown without screen)
Ground water Elevation (feet amsl)
949
948
947
946
945
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Date

Appendix G

Field Logs for Compliance Monitoring and Evaluation Monitoring Wells

All Ground Water Sampling Data

Target Sample Date: 21-NOV-2017 Month: Norm Qtr: 4 Norm Year: 2017

WELL ID: R1-01C AREA INFO: S300/EWFA/PIT1

DATE: 21-Nov-2017 LOG BOOK (DOCUMENT CONTROL) #: AA34076

PURGE METHOD/SAMPLE METHOD: Grundfos / GRVS CONTAMINANT PRESENT: NO3-37/3H<1000 pCi/L

SCREENED INTERVAL (ft-bmp): 106.82 - 116.82 PUMP INTAKE DEPTH: 115.43

CASING DEPTH(installed/sounded)(ft-bmp): 113.50 / 122.40 on 26-JAN-15 CASING VOL (Gal/Time): 4.04

DEPTH TO WATER(ft-bmp): 108.43 on 04-OCT-17 107.78 VOLUME FACTOR: 0.500

WATER IN CASING (ft): 8.09 14.62 CASING DIAMETER/TCASING HT(in): 3.5 / 3.02

TIME PUMP ON: 0957 INITIAL FLOW RATE (Q=GPM):

TIME PUMP OFF: MEASURED BY:FLOW METER/ GRAD CYL./ BUCKET/ OTHER

TIME	Q	GAL PURGED	VOLUMES	pH	TEMP C	SC	mV	OG	DTW
1002		—	—	7.54	18.9	684.3	-112	1	—

METER	SERIAL #	CALIBRATED
pH :	610084	YES/NO
SC :		YES/NO
mV :		YES/NO
H2O:		YES/NO

SAMPLER/EMPLOYER: silva90
PROJECT: 3EMG
SAMPLE PRESERVATION/AMT of REAGENT: NA
PURGE VOL/EXCESS H2O DEST: 0.00 / None
TF LOCATION: Collect

QC SAMPLE ID: — QC LAB(S): — QC SAMPLE TIME: —

SAMPLE ID (VERIFY): R1-01C / GRUS TIME COLLECTED: 1009

LAB	LAB_LOC_NAME	REQUESTED ANALYSIS	#	TYPE	SAMPLER_REMARKS
GE	K1-01C	AS:FILTER	0	O	
GE	K1-01C	AS:THISO	2	1L P	
GE	K1-01C	AS:UISO	2	1L P	
BB	K1-01C	E300.0:NO3	1	250 ml P	
BB	K1-01C	E300.0:PERC	1	250 ml P	1/3-1/2 headspace, & agitate
BB	K1-01C	E8260	3	40 mL V	
BB	K1-01C	E8330:R+H	3	1L A	
GE	K1-01C	E900	1	1L P	
GE	K1-01C	E900:FILTER	0	O	
GE	K1-01C	E906	1	250 ml GA	
PF	K1-01C	RA226	1	1L P	
PF	K1-01C	RA226:FILTER	0	O	
BB	K1-01C	WGMGMET1	1	1L P	
BB	K1-01C	WGMGMET1:FILTER	0	O	

Revision: 10/28/2015

All Ground Water Sampling Data

Target Sample Date: 09-OCT-2017 Month: Norm Qtr: 4 Norm Year: 2017

WELL ID: K1-02B AREA INFO: S300/EWFA/PIT1

DATE: 09-Oct-2017 LOG BOOK (DOCUMENT CONTROL) #: AA34058

PURGE METHOD/SAMPLE METHOD: Grundfos / 3VBS CONTAMINANT PRESENT: NO3-33/PERC-6.4/H3>1000 PCi/L

SCREENED INTERVAL (ft-bmp): 148.80 - 168.80 PUMP INTAKE DEPTH: 169.10

CASING DEPTH(installed/sounded)(ft-bmp): 166.50 / 174.55 on 14-AUG-14 CASING VOL (Gal/Time): 15.45 19.0 x 3 = 57. Gal

DEPTH TO WATER(ft-bmp): 137.59 on 17-JUL-17 136.52 VOLUME FACTOR: 0.500

WATER IN CASING (ft): 30.91 38.03 CASING DIAMETER/TCASING HT(in): 3.5 / 2.00

TIME PUMP ON: 0944 INITIAL FLOW RATE (Q=GPM): 1.2 Q

TIME PUMP OFF: 1042 MEASURED BY: FLOW METER/ GRAD CYL./ BUCKET/ OTHER

TIME	Q	GAL PURGED	VOLUMES	pH	TEMP C	SC	mV	LOG	DTW
1000		19	1	7.53	22.0	744.3	163	1	140.69
1016		38	2	7.55	22.3	744.9	132	1	140.88
1032		57	3	7.51	22.2	743.7	130	1	141.00
1034				7.49	22.2	741.8	129	1	
1036				7.49	22.1	742.7	131	1	

METER	SERIAL #	CALIBRATED
pH :	G10089	YES/NO
SC :		YES/NO
mV :		YES/NO
H2O:		YES/NO

SAMPLER/EMPLOYER: silva90
PROJECT: 3EMG
SAMPLE PRESERVATION/AMT of REAGENT: NA
PURGE VOL/EXCESS H2O DEST: 46.35 / PIT7-SRC
TF LOCATION: PIT7-SRC

QC SAMPLE ID: — QC LAB(S): — QC SAMPLE TIME: —

SAMPLE ID (VERIFY): K1-02B/3VES TIME COLLECTED: 1042

LAB	LAB_LOC_NAME	REQUESTED ANALYSIS	#	TYPE	SAMPLER_REMARKS
GE	K1-02B	AS:FILTER	0	O	
GE	K1-02B	AS:THISO	2	1L P	
GE	K1-02B	AS:UISO	2	1L P	
BB	K1-02B	E300.0:NO3	1	250 ml P	
BB	K1-02B	E300.0:PERC	1	250 ml P	1/3-1/2 headspace, & agitate
BB	K1-02B	E8260	3	40 mL V	
BB	K1-02B	E8330:R+H	3	1L G	
GE	K1-02B	E900	1	1L P	
GE	K1-02B	E900:FILTER	0	O	
GE	K1-02B	E906	1	250 ml GA	
PF	K1-02B	RA226	1	1L P	
PF	K1-02B	RA226:FILTER	0	O	
BB	K1-02B	WGMGMET1	1	1L P	
BB	K1-02B	WGMGMET1:FILTER	0	O	

All Ground Water Sampling Data

Target Sample Date: 16-OCT-2017 Month: Norm Qtr: 4 Norm Year: 2017

WELL ID: K1-04 AREA INFO: S300/EWPA/PIT1

DATE: 16-Oct-2017 LOG BOOK (DOCUMENT CONTROL) #: AA34061

PURGE METHOD/SAMPLE METHOD: Grundfos / 3VES CONTAMINANT PRESENT: NO3-28

SCREENED INTERVAL (ft-bmp): 185.97 - 202.97 PUMP INTAKE DEPTH: 195.10

CASING DEPTH(installed/sounded)(ft-bmp): 201.00 / 204.15 on 28-JAN-15 CASING VOL (Gal/Time): 22.53 23.1 X 3cv = 69.3 Gal

DEPTH TO WATER(ft-bmp): 158.60 on 25-JUL-17 157.96 VOLUME FACTOR: 0.500

WATER IN CASING (ft): 45.07 46.19 CASING DIAMETER/TCASING HT(in): 3.5 / 2.67

TIME PUMP ON: 0933 INITIAL FLOW RATE (Q=GPM): 10

TIME PUMP OFF: 1053 MEASURED BY: FLOW METER/ GRAD CYL./ BUCKET/ OTHER

TIME	Q	GAL PURGED	VOLUMES	pH	TEMP C	SC	mV	OG	DTW
0956		23.1	1	8.45	20.8	618.4	154	1	163.97
1019		46.2	2	8.43	20.9	618.1	150	1	170.32
1043		69.3	3	8.41	20.8	620.9	147	1	* NM Probe Sticks
1045				8.40	20.8	619.3	144	1	
1047				8.42	20.7	618.2	140	1	

METER	SERIAL #	CALIBRATED
pH :	610581	YES/NO
SC :		YES/NO
mV :		YES/NO
H2O:		YES/NO

SAMPLER/EMPLOYER: silva90
PROJECT: 3EMG
SAMPLE PRESERVATION/AMT of REAGENT: NA
PURGE VOL/EXCESS H2O DEST: 67.58 / S300-DRUM
TF LOCATION: S300

QC SAMPLE ID: — QC LAB(S): — QC SAMPLE TIME: —

SAMPLE ID (VERIFY): K1-04 / 3VES TIME COLLECTED: 1053

LAB	LAB_LOC_NAME	REQUESTED ANALYSIS	#	TYPE	SAMPLER_REMARKS
GE	K1-04	AS:FILTER	0	O	
GE	K1-04	AS:THISO	2	1L P	
GE	K1-04	AS:UISO	2	1L P	
BB	K1-04	E300.0:NO3	1	250 ml P	
BB	K1-04	E300.0:PERC	1	250 ml P	1/3-1/2 headspace, & agitate
BB	K1-04	E8260	3	40 mL V	
BB	K1-04	E8330:R+H	3	1L A	
GE	K1-04	E900	1	1L P	
GE	K1-04	E900:FILTER	0	O	
GE	K1-04	E906	1	250 ml GA	
PF	K1-04	RA226	1	1L P	
PF	K1-04	RA226:FILTER	0	O	
BB	K1-04	WGMGMET1	1	1L P	
BB	K1-04	WGMGMET1:FILTER	0	O	

Revision: 10/28/2015

All Ground Water Sampling Data

Target Sample Date: 11-OCT-2017 Month: Norm Qtr: 4 Norm Year: 2017

WELL ID: K1-05 AREA INFO: S300/EWFA/PIT1

DATE: 11-Oct-2017 LOG BOOK (DOCUMENT CONTROL) #: AA34060

PURGE METHOD/SAMPLE METHOD: GF / 3VES CONTAMINANT PRESENT: FREON 113-19.0/NO3-37

SCREENED INTERVAL (ft-bmp): 165.30 - 186.30 INTAKE DEPTH: 0.00

CASING DEPTH(installed/sounded)(ft-bmp): 184.00 / 186.30 on 21-NOV-84 CASING VOL (Gal/Time): 13.28 14.1 x 3 = 42.3 G

DEPTH TO WATER(ft-bmp): 172.98 on 25-JUL-17 172.44 VOLUME FACTOR: 1.020

WATER IN CASING (ft): 13.02 13.86 CASING DIAMETER/TCASING HT(in): 5 / 2.00

TIME PUMP ON: 0912 INITIAL FLOW RATE (Q=GPM): .81

TIME PUMP OFF: 1016 MEASURED BY: FLOW METER/ GRAD CYL./ BUCKET/ OTHER

TIME	Q	GAL PURGED	VOLUMES	pH	TEMP C	SC	mV	OG	DTW
0930		14.1	1	7.76	20.5	620.4	73	1	177.49
0947		28.2	2	7.71	21.2	616.8	90	1	177.59
1005		42.3	3	7.70	21.3	618.2	92	1	177.88
1007				7.69	21.3	619.7	91	1	
1009				7.67	21.4	620.3	88	1	

METER	SERIAL #	CALIBRATED
pH :	610084	YES/NO
SC :		YES/NO
mV :		YES/NO
H2O:		YES/NO

SAMPLER/EMPLOYER: silva90
PROJECT: 3EMG
SAMPLE PRESERVATION/AMT of REAGENT: NA
PURGE VOL/EXCESS H2O DEST: 39.84 / S300-DRUM
TF LOCATION: S300

QC SAMPLE ID: — QC LAB(S): — QC SAMPLE TIME: 1016

SAMPLE ID (VERIFY): K1-05 / 3045 TIME COLLECTED: 1016

LAB	LAB_LOC_NAME	REQUESTED ANALYSIS	#	TYPE	SAMPLER_REMARKS
GE	K1-05	AS:FILTER	0	O	
GE	K1-05	AS:THISO	2	1L P	
GE	K1-05	AS:UISO	2	1L P	
BB	K1-05	E300.0:NO3	1	250 ml P	
BB	K1-05	E300.0:PERC	1	250 ml P	1/3-1/2 headspace, & agitate
BB	K1-05	E8260	3	40 mL V	
BB	K1-05	E8330:R+H	3	1L A	
GE	K1-05	E900	1	1L P	
GE	K1-05	E900:FILTER	0	O	
GE	K1-05	E906	1	250 ml GA	
PF	K1-05	RA226	1	1L P	
PF	K1-05	RA226:FILTER	0	O	
BB	K1-05	WGMGMET1	1	1L P	
BB	K1-05	WGMGMET1:FILTER	0	O	

All Ground Water Sampling Data

Target Sample Date: 10-OCT-2017 Month: Norm Qtr: 4 Norm Year: 2017

WELL ID: K1-07 AREA INFO: S300/EWPA/PIT1

DATE: 10-Oct-2017 LOG BOOK (DOCUMENT CONTROL) #: AA34059

PURGE METHOD/SAMPLE METHOD: GP / 3VES CONTAMINANT PRESENT: NO3-34

SCREENED INTERVAL (ft-bmp): 131.30 - 151.30 INTAKE DEPTH: 0.00

CASING DEPTH(installed/sounded)(ft-bmp): 150.00 / 153.30 on 28-OCT-85 CASING VOL (Gal/Time): 8.49 9.3x3cu = 27.9Gal

DEPTH TO WATER(ft-bmp): 142.73 on 17-JUL-17 142.05 VOLUME FACTOR: 0.826

WATER IN CASING (ft): 10.27 11.25 CASING DIAMETER/TCASING HT(in): 4.5 / 3.00

TIME PUMP ON: 0915 INITIAL FLOW RATE (Q=GPM): 1.0 Q

TIME PUMP OFF: 0953 MEASURED BY: FLOW METER/ GRAD CYL./ BUCKET/ OTHER

TIME	Q	GAL PURGED	VOLUMES	pH	TEMP C	SC	mV	OG	DTW
0925		9.8	1	7.69	20.8	597.9	-91	1	143.52
0934		18.6	2	7.61	21.2	597.6	-105	1	145.12
0943		27.9	3	7.62	22.1	580.3	-71	1	146.89
0945				7.60	22.2	581.8	-66	1	
0947				7.60	22.4	582.2	-65	1	

METER SERIAL # CALIBRATED
pH : 616084 YES/NO
SC : YES/NO
mV : YES/NO
H2O: YES/NO

SAMPLER/EMPLOYER: silva90
PROJECT: 3EMG
SAMPLE PRESERVATION/AMT of REAGENT: AA
PURGE VOL/EXCESS H2O DEST: ~~25.46 /~~ S300-DRUM
TF LOCATION: S300

QC SAMPLE ID: — QC LAB(S): — QC SAMPLE TIME: —

SAMPLE ID (VERIFY): K1-07 / 3VES TIME COLLECTED: 0953

LAB	LAB_LOC_NAME	REQUESTED ANALYSIS	#	TYPE	SAMPLER_REMARKS
GE	K1-07	AS:FILTER	0	O	
GE	K1-07	AS:THISO	2	1L P	
GE	K1-07	AS:UISO	2	1L P	
BB	K1-07	E300.0:NO3	1	250 ml P	
BB	K1-07	E300.0:PERC	1	250 ml P	1/3-1/2 headspace, & agitate
BB	K1-07	E8260	3	40 mL V	
BB	K1-07	E8330:R+H	3	1L G	
GE	K1-07	E900	1	1L P	
GE	K1-07	E900:FILTER	0	O	
GE	K1-07	E906	1	250 ml GA	
PF	K1-07	RA226	1	1L P	
PF	K1-07	RA226:FILTER	0	O	
BB	K1-07	WGMGMET1	1	1L P	
BB	K1-07	WGMGMET1:FILTER	0	O	

Revision: 10/28/2015

All Ground Water Sampling Data

Target Sample Date: 17-OCT-2017 Month: Norm Qtr: 4 Norm Year: 2017

WELL ID: K1-08 AREA INFO: S300/EWPA/PIT1

DATE: 17-Oct-2017 LOG BOOK (DOCUMENT CONTROL) #: AA34062

PURGE METHOD/SAMPLE METHOD: GP / 3VES CONTAMINANT PRESENT: FREON 113-37/NO3-36

SCREENED INTERVAL (ft-bmp): 143.32 - 168.32 INTAKE DEPTH: 0.00

CASING DEPTH(installed/sounded)(ft-bmp): 168.00 / 170.32 on 31-OCT-85 CASING VOL (Gal/Time): 11.99 12 + 3w = 36 Gal

DEPTH TO WATER(ft-bmp): 155.51 on 18-JUL-17 155.63 VOLUME FACTOR: 0.826

WATER IN CASING (ft): 14.51 14.69 CASING DIAMETER/TCASING HT(in): 4.5 / 2.02

TIME PUMP ON: 0936 INITIAL FLOW RATE (Q=GPM): ~~10~~ Q .8

TIME PUMP OFF: 1032 MEASURED BY: FLOW METER/ GRAD CYL./ BUCKET/ OTHER

TIME	Q	GAL PURGED	VOLUMES	pH	TEMP C	SC	mV	OG	DTW
0951		12	1	7.97	20.2	629.7	33	1	164.12
1005		24	2	7.93	20.2	633.2	30	1	No WC
1020		36	3	7.91	20.1	632.8	27	1	no WC
1022				7.92	20.3	631.2	28	1	Top of Pump
1024				7.92	20.2	630.9	27	1	

METER	SERIAL #	CALIBRATED
pH :	610084	YES/NO
SC :		YES/NO
mV :		YES/NO
H2O:		YES/NO

SAMPLER/EMPLOYER: silva90
PROJECT: 3EMG
SAMPLE PRESERVATION/AMT OF REAGENT: N/A
PURGE VOL/EXCESS H2O DEST: 35.96 / S300-DRUM
TF LOCATION: S300

QC SAMPLE ID: K1-78Y QC LAB(S) GEL, BCLABS-BAK, ALS-PARAGON QC SAMPLE TIME: 1210

SAMPLE ID (VERIFY): K1-08 / 3VES TIME COLLECTED: 1032

LAB	LAB_LOC_NAME	REQUESTED ANALYSIS	#	TYPE	SAMPLER_REMARKS
GE	K1-08	AS:FILTER	0	O	
GE	K1-78Y	AS:FILTER	0	O	
GE	K1-08	AS:THISO	2	1L P	
GE	K1-78Y	AS:THISO	2	1L P	
GE	K1-08	AS:UISO	2	1L P	
GE	K1-78Y	AS:UISO	2	1L P	
BB	K1-08	E300.0:NO3	1	250 ml P	
BB	K1-78Y	E300.0:NO3	1	250 ml P	
BB	K1-08	E300.0:PERC	1	250 ml P	1/3-1/2 headspace, & agitate
BB	K1-78Y	E300.0:PERC	1	250 ml P	1/3-1/2 headspace, & agitate
BB	K1-08	E8260	3	40 mL V	
BB	K1-78Y	E8260	3	40 mL V	
BB	K1-08	E8330:R+H	3	1L A	
BB	K1-78Y	E8330:R+H	3	1L A	
GE	K1-78Y	E900	1	1L P	
GE	K1-08	E900	1	1L P	
GE	K1-08	E900:FILTER	0	O	
GE	K1-78Y	E900:FILTER	0	O	
GE	K1-08	E906	1	250 ml GA	
GE	K1-78Y	E906	1	250 ml GA	
PF	K1-08	RA226	1	1L P	
PF	K1-78Y	RA226	1	1L P	
PF	K1-08	RA226:FILTER	0	O	

Revision: 10/28/2015 Page: 1 of 2

All Ground Water Sampling Data

Target Sample Date: 17-OCT-2017 Month: Norm Qtr: 4 Norm Year: 2017

WELL ID: K1-08 AREA INFO: S300/EWFA/PIT1

DATE: 17-Oct-2017 LOG BOOK (DOCUMENT CONTROL) #: AA34062

PURGE METHOD/SAMPLE METHOD: GP / 3VBS CONTAMINANT PRESENT: PRBON 113-37/NO3-36

SCREENED INTERVAL (ft-bmp): 143.32 - 168.32 INTAKE DEPTH: 0.00

CASING DEPTH(installed/sounded)(ft-bmp): 168.00 / 170.32 on 31-OCT-85 CASING VOL (Gal/Time): 11.99

DEPTH TO WATER(ft-bmp): 155.51 on 18-JUL-17 VOLUME FACTOR: 0.826

WATER IN CASING (ft): 14.51 CASING DIAMETER/TCASING HT(in): 4.5 / 2.02

TIME PUMP ON: INITIAL FLOW RATE (Q=GPM):

TIME PUMP OFF: MEASURED BY:FLOW METER/ GRAD CYL./ BUCKET/ OTHER

TIME	Q	GAL PURGED	VOLUMES	pH	TEMP C	SC	mV	OG	DTW

METER	SERIAL #	CALIBRATED
pH :		YES/NO
SC :		YES/NO
mV :		YES/NO
H2O:		YES/NO

SAMPLER/EMPLOYER: silva90
PROJECT: 3EMG
SAMPLE PRESERVATION/AMT of REAGENT:
PURGE VOL/EXCESS H2O DEST: 35.96 / S300-DRUM
TF LOCATION: S300

QC SAMPLE ID: K1-78Y QC LAB(S): BCLABS-BAK, ALS-PARAGN QC SAMPLE TIME:

SAMPLE ID (VERIFY): TIME COLLECTED:

LAB	LAB_LOC_NAME	REQUESTED ANALYSIS	#	TYPE	SAMPLER_REMARKS
PF	K1-78Y	RA226:FILTER	0	O	
BB	K1-78Y	WGMGMET1	1	1L P	
BB	K1-08	WGMGMET1	1	1L P	
BB	K1-78Y	WGMGMET1:FILTER	0	O	
BB	K1-08	WGMGMET1:FILTER	0	O	

All Ground Water Sampling Data

Target Sample Date: 10-OCT-2017 Month: Norm Qtr: 4 Norm Year: 2017

WELL ID: K1-09 AREA INFO: S300/EWFA/PIT1

DATE: 10-Oct-2017 LOG BOOK (DOCUMENT CONTROL) #: AA34059

PURGE METHOD/SAMPLE METHOD: GF / 3VES CONTAMINANT PRESENT: FREON 113-120.0

SCREENED INTERVAL (ft-bmp): 157.30 - 192.30 INTAKE DEPTH: 0.00

CASING DEPTH(installed/sounded)(ft-bmp): 192.00 / 194.30 on 05-NOV-85 CASING VOL (Gal/Time): 26.66 27.1 X 3cu = 81 Gal

DEPTH TO WATER(ft-bmp): 161.73 on 24-JUL-17 161.55 VOLUME FACTOR: 0.826

WATER IN CASING (ft): 32.27 32.75 CASING DIAMETER/TCASING HT(in): 4.5 / 2.00

TIME PUMP ON: 1029 INITIAL FLOW RATE (Q-GPM): 1.2

TIME PUMP OFF: 1148 MEASURED BY: FLOW METER / GRAD CYL./ BUCKET/ OTHER

TIME	Q	GAL PURGED	VOLUMES	pH	TEMP C	SC	mV	OG	DTW
1052		27	1	7.80	22.1	640.7	118	1	166.81
1114		52	2	7.82	21.8	645.6	89	1	Probe Sticking
1137		81	3	7.80	21.7	645.3	79	1	↓
1139				7.79	21.8	643.8	77	1	
1141				7.77	21.8	642.9	75	1	

METER	SERIAL #	CALIBRATED
pH :	616584	YES/NO
SC :		YES/NO
mV :		YES/NO
H2O:		YES/NO

SAMPLER/EMPLOYER: silva90
PROJECT: 3EMG
SAMPLE PRESERVATION/AMT of REAGENT: NA
PURGE VOL/EXCESS H2O DEST: 79.98 / S300-DRUM
TF LOCATION: S300

QC SAMPLE ID: — QC LAB(S): — QC SAMPLE TIME: —

SAMPLE ID (VERIFY): K1-09/3VES TIME COLLECTED: 1148

LAB	LAB_LOC_NAME	REQUESTED ANALYSIS	#	TYPE	SAMPLER_REMARKS
GE	K1-09	AS:FILTER	0	O	
GE	K1-09	AS:THISO	2	1L P	
GE	K1-09	AS:UISO	2	1L P	
BB	K1-09	E300.0:NO3	1	250 ml P	
BB	K1-09	E300.0:PERC	1	250 ml P	1/3-1/2 headspace, & agitate
BB	K1-09	E8260	3	40 mL V	
BB	K1-09	E8330:R+H	3	1L G	
GE	K1-09	E900	1	1L P	
GE	K1-09	E900:FILTER	0	O	
GE	K1-09	E906	1	250 ml GA	
PF	K1-09	RA226	1	1L P	
PF	K1-09	RA226:FILTER	0	O	
BB	K1-09	WGMGMET1	1	1L P	
BB	K1-09	WGMGMET1:FILTER	0	O	

Revision: 10/28/2015 Page: 1 of 1

All Ground Water Sampling Data

Target Sample Date: 25-OCT-2017 Month: Norm Qtr: 4 Norm Year: 2017

WELL ID: W-PIT1-2326 AREA INFO: S300/EWFA/PIT1

DATE: 25-Oct-2017 LOG BOOK (DOCUMENT CONTROL) #: AA34066

PURGE METHOD/SAMPLE METHOD: / 3VES CONTAMINANT PRESENT:

SCREENED INTERVAL (ft-bmp): 217.30 - 237.02 INTAKE DEPTH: 0.00

CASING DEPTH(installed/sounded)(ft-bmp): 235.12 / 237.42 on 09-OCT-07 CASING VOL (Gal/Time): 56.58 58.5 X 3cv = 175.5 Gal

DEPTH TO WATER(ft-bmp): 181.65 on 10-JUL-17 180.02 VOLUME FACTOR: 1.020

WATER IN CASING (ft): 55.47 57.40 CASING DIAMETER/TCASING HT(in): 5 / 2.00

TIME PUMP ON: 0847 INITIAL FLOW RATE (Q=GPM): 2.5 Q

TIME PUMP OFF: MEASURED BY: FLOW METER/ GRAD CYL./ BUCKET/ OTHER

TIME	Q	GAL PURGED	VOLUMES	pH	TEMP C	SC	mV	OG	DTW
0911		58.5	1	7.74	22.5	723.3	81	1	181.12
0935		117	2	7.78	22.7	718.9	92	1	182.70
1000		175.5	3	7.77	22.6	718.2	90	1	183.41
1002				7.76	22.6	717.5	87	1	
1004				7.74	22.6	717.3	88	1	

METER	SERIAL #	CALIBRATED
pH :	6160864	YES/NO
SC :		YES/NO
mV :		YES/NO
H2O:		YES/NO

SAMPLER/EMPLOYER: silva90
PROJECT: 3EMG
SAMPLE PRESERVATION/AMT of REAGENT: NA
PURGE VOL/EXCESS H2O DEST: 169.74 / PIT7-SRC
TF LOCATION: PIT7-SRC

QC SAMPLE ID: PIT1FB QC LAB(S): BCLABS-BAK, ALS-PARAGN, GEL QC SAMPLE TIME: 1017

SAMPLE ID (VERIFY): W-PIT1-2326 / 3VES TIME COLLECTED: 1017

LAB	LAB_LOC_NAME	REQUESTED ANALYSIS	#	TYPE	SAMPLER_REMARKS
GE	W-PIT1-2326	AS:FILTER	0	O	
GE	PIT1FB	AS:FILTER	0	O	
GE	W-PIT1-2326	AS:THISO	2	1L P	
GE	PIT1FB	AS:THISO	2	1L P	
GE	PIT1FB	AS:UISO	2	1L P	
GE	W-PIT1-2326	AS:UISO	2	1L P	
BB	W-PIT1-2326	E300.0:NO3	1	250 ml P	
BB	PIT1FB	E300.0:NO3	1	250 ml P	
BB	PIT1FB	E300.0:PERC	1	250 ml P	1/3-1/2 headspace, & agitate
BB	W-PIT1-2326	E300.0:PERC	1	250 ml P	1/3-1/2 headspace, & agitate
BB	W-PIT1-2326	E8260	3	40 mL V	
BB	PIT1FB	E8260	3	40 mL V	
BB	W-PIT1-2326	E8330:R+H	3	1L A	
BB	PIT1FB	E8330:R+H	2	1L A	
GE	PIT1FB	E900	1	1L P	
GE	W-PIT1-2326	E900	1	1L P	
GE	W-PIT1-2326	E900:FILTER	0	O	
GE	PIT1FB	E900:FILTER	0	O	
GE	W-PIT1-2326	E906	1	250 ml GA	
GE	PIT1FB	E906	1	250 ml GA	
PF	W-PIT1-2326	RA226	1	1L P	
PF	PIT1FB	RA226	1	1L P	
PF	W-PIT1-2326	RA226:FILTER	0	O	

Revision: 10/28/2015 Page: 1 of 2

All Ground Water Sampling Data

Target Sample Date: 25-OCT-2017 Month: Norm Qtr: 4 Norm Year: 2017

WELL ID: W-PIT1-2326 AREA INFO: S300/EWFA/PIT1

DATE: 25-Oct-2017 LOG BOOK (DOCUMENT CONTROL) #: AA34066

PURGE METHOD/SAMPLE METHOD: / 3VES CONTAMINANT PRESENT:

SCREENED INTERVAL (ft-bmp): 217.30 - 237.02 INTAKE DEPTH: 0.00

CASING DEPTH(installed/sounded)(ft-bmp): 235.12 / 237.42 on 09-OCT-07 CASING VOL (Gal/Time): 56.58

DEPTH TO WATER(ft-bmp): 181.65 on 10-JUL-17 VOLUME FACTOR: 1.020

WATER IN CASING (ft): 55.47 CASING DIAMETER/TCASING HT(in): 5 / 2.00

TIME PUMP ON: INITIAL FLOW RATE (Q=GPM):

TIME PUMP OFF: MEASURED BY:FLOW METER/ GRAD CYL./ BUCKET/ OTHER

TIME	Q	GAL PURGED	VOLUMES	pH	TEMP C	SC	mV	OG	DTW

METER	SERIAL #	CALIBRATED
pH :		YES/NO
SC :		YES/NO
mV :		YES/NO
H2O:		YES/NO

SAMPLER/EMPLOYER: silva90
PROJECT: 3EMG
SAMPLE PRESERVATION/AMT of REAGENT:
PURGE VOL/EXCESS H2O DEST: 169.74 / PIT7-SRC
TF LOCATION: PIT7-SRC

QC SAMPLE ID:PIT1FB QC LAB(S): BCLABS-BAK, ALS-PARAGN QC SAMPLE TIME:

SAMPLE ID (VERIFY): TIME COLLECTED:

LAB	LAB_LOC_NAME	REQUESTED ANALYSIS	#	TYPE	SAMPLER_REMARKS
PF	PIT1FB	RA226:FILTER	0	O	
BB	PIT1FB	WGMGMET1	1	1L P	
BB	W-PIT1-2326	WGMGMET1	1	1L P	
BB	PIT1FB	WGMGMET1:FILTER	0	O	
BB	W-PIT1-2326	WGMGMET1:FILTER	0	O	

Revision: 10/28/2015

All Ground Water Sampling Data

Target Sample Date: 09-OCT-2017 Month: Norm Qtr: 4 Norm Year: 2017

WELL ID: K1-06 AREA INFO: S300/EWPA/PIT1

DATE: 09-Oct-2017 LOG BOOK (DOCUMENT CONTROL) #: AA34058

PURGE METHOD/SAMPLE METHOD: PB / GRBA CONTAMINANT PRESENT: 3H>1000pCi/L

SCREENED INTERVAL (ft-bmp): 107.30 - 117.30 INTAKE DEPTH: 0.00

CASING DEPTH(installed/sounded)(ft-bmp): 115.00 / 117.30 on 19-NOV-84 CASING VOL (Gal/Time): 0.00

DEPTH TO WATER(ft-bmp): >117.00 on 10-JUL-17 Dry VOLUME FACTOR: 1.020

WATER IN CASING (ft): 0.00 CASING DIAMETER/TCASING HT(in): 5 / 2.00

TIME PUMP ON: INITIAL FLOW RATE (Q=GPM):

TIME PUMP OFF: MEASURED BY:FLOW METER/ GRAD CYL./ BUCKET/ OTHER

TIME	Q	GAL PURGED	VOLUMES	pH	TEMP C	SC	mV	OG	DTW

METER	SERIAL #	CALIBRATED
pH :		YES/NO
SC :		YES/NO
mV :		YES/NO
H2O:		YES/NO

SAMPLER/EMPLOYER: silva90
PROJECT: 3EMG
SAMPLE PRESERVATION/AMT of REAGENT:
PURGE VOL/EXCESS H2O DEST: 0.00 / None
TF LOCATION: Collect

QC SAMPLE ID: QC LAB(S): QC SAMPLE TIME:

SAMPLE ID (VERIFY): TIME COLLECTED:

LAB	LAB_LOC_NAME	REQUESTED ANALYSIS	#	TYPE	SAMPLER_REMARKS
TS	K1-06	E300.0:PERC	1	250 mL P	1/3-1/2 headspace, & agitate
GE	K1-06	E906	1	250 ml GA	

Dry, No Samples

NOTE:
Purge rate/time: N/A since est_sus_flow = 0
Purge Volume: 0 gal.
Revision: 10/28/2015

Page: 1 of 1

All Ground Water Sampling Data

Target Sample Date: 02-OCT-2017 Month: Norm Qtr: 4 Norm Year: 2017

WELL ID: W-PIT1-2209 AREA INFO: S300/EWPA/PIT1

DATE: 02-Oct-2017 LOG BOOK (DOCUMENT CONTROL) #: AA34056

PURGE METHOD/SAMPLE METHOD: GP / 3VES CONTAMINANT PRESENT:

SCREENED INTERVAL (ft-bmp): 247.30 - 267.30 PUMP INTAKE DEPTH: 265.20

CASING DEPTH(installed/sounded)(ft-bmp): 266.00 / 268.20 on 11-MAY-06 CASING VOL (Gal/Time): 50.25 50.5 x 3cv = 151.5 Gal

DEPTH TO WATER(ft-bmp): 218.74 on 10-AUG-17 218.68 VOLUME FACTOR: 1.020

WATER IN CASING (ft): 49.26 49.52 CASING DIAMETER/TCASING HT(in): 5 / 2.00

TIME PUMP ON: 1042 INITIAL FLOW RATE (Q=GPM): 2.0 Q

TIME PUMP OFF: 1209 MEASURED BY: FLOW METER/ GRAD CYL./ BUCKET/ OTHER

TIME	Q	GAL PURGED	VOLUMES	pH	TEMP C	SC	mV	OG	DTW
1107		50.5	1	7.77	21.2	669.7	24	1	229.33
1133		101	2	7.82	21.1	676.3	64	1	232.39
1159		151.5	3	7.81	21.1	682.3	67	1	233.47
1201				7.82	21.2	684.1	65	1	
1203				7.82	21.2	679.8	69	1	

METER	SERIAL #	CALIBRATED
pH :	610084	YES/NO
SC :		YES/NO
mV :		YES/NO
H2O:		YES/NO

SAMPLER/EMPLOYER: silva90
PROJECT: 3GIV 3CMP 3EMG
SAMPLE PRESERVATION/AMT of REAGENT: NA
PURGE VOL/EXCESS H2O DEST: 150.74 / None
TF LOCATION: Collect

QC SAMPLE ID: — QC LAB(S): — QC SAMPLE TIME: —

SAMPLE ID (VERIFY): W-PIT1-2209 / 3VES TIME COLLECTED: 1209

LAB	LAB_LOC_NAME	REQUESTED ANALYSIS	#	TYPE	SAMPLER_REMARKS
GE	W-PIT1-2209	AS:FILTER	0	O	
GE	W-PIT1-2209	AS:UISO	2	1L P	
BB	W-PIT1-2209	E300.0:NO3	1	250 ml P	
BB	W-PIT1-2209	E300.0:PERC	1	250 ml P	1/3-1/2 headspace, & agitate
BB	W-PIT1-2209	E624MOD	3	40 mL V	
GE	W-PIT1-2209	E906	1	250 ml GA	

Revision: 10/28/2015 Page: 1 of 1

All Ground Water Sampling Data

Target Sample Date: 30-OCT-2017 Month: Norm Qtr: 4 Norm Year: 2017

WELL ID: W-PIT1-2620 AREA INFO: S300/EWFA/PIT1

DATE: 30-Oct-2017 LOG BOOK (DOCUMENT CONTROL) #: AA34067

PURGE METHOD/SAMPLE METHOD: Grundfos / 3VES CONTAMINANT PRESENT:

SCREENED INTERVAL (ft-bmp): 247.30 - 262.20 PUMP INTAKE DEPTH: 254.97

CASING DEPTH(installed/sounded)(ft-bmp): 260.32 / 262.50 on 04-SEP-12 CASING VOL (Gal/Time): 28.73 29.5 x 3 vol = 88.5 Gal

DEPTH TO WATER(ft-bmp): 234.15 on 10-JUL-17 233.64 VOLUME FACTOR: 1.020

WATER IN CASING (ft): 28.17 28.86 CASING DIAMETER/TCASING HT(in): 5 / 2.00

TIME PUMP ON: 0939 INITIAL FLOW RATE (Q=GPM): 1.5

TIME PUMP OFF: MEASURED BY: FLOW METER/ GRAD CYL./ BUCKET/ OTHER

TIME	Q	GAL PURGED	VOLUMES	pH	TEMP C	SC	mV	OG	DTW
0959		29.5	1	7.95	20.3	785.4	98	1	235.58
1019		59	2	7.91	20.1	779.7	102	1	235.77
1039		88.5	3	7.95	20.3	778.6	108	1	235.98
1041				7.94	20.2	777.5	106	1	
1043				7.92	20.2	769.2	103	1	

METER	SERIAL #	CALIBRATED
pH :	610084	YES/NO
SC :		YES/NO
mV :		YES/NO
H2O:		YES/NO

SAMPLER/EMPLOYER: silva90
PROJECT: 3EMG 3GIV
SAMPLE PRESERVATION/AMT of REAGENT: NA
PURGE VOL/EXCESS H2O DEST: 86.20 / PIT7-SRC
TF LOCATION: PIT7-SRC

QC SAMPLE ID: W-PIT1-241Y QC LAB(S): GEL, BCLABS-BAK, TALSAC QC SAMPLE TIME: 1329

SAMPLE ID (VERIFY): W-PIT1-2620 / 3VES TIME COLLECTED: 1051

LAB	LAB_LOC_NAME	REQUESTED ANALYSIS	#	TYPE	SAMPLER_REMARKS
TS	W-PIT1-2620	E300.0:PERC	1	250 mL P	1/3-1/2 headspace, & agitate
TS	W-PIT1-241Y	E300.0:PERC	1	250 mL P	1/3-1/2 headspace, & agitate
TS	W-PIT1-2620	E624MOD	~~3~~ 9	40 mL V	
TS	W-PIT1-241Y	E624MOD	~~3~~ 3	40 mL V	
BB	W-PIT1-2620	E8260	3	40 mL V	
BB	W-PIT1-241Y	E8260	3	40 mL V	
GE	W-PIT1-2620	E906	1	250 ml GA	
GE	W-PIT1-241Y	E906	1	250 ml GA	

All Ground Water Sampling Data

Target Sample Date: 31-OCT-2017 Month: Norm Qtr: 4 Norm Year: 2017

WELL ID: W-865-2005 AREA INFO: S300/EWFA/865

DATE: 31-Oct-2017 LOG BOOK (DOCUMENT CONTROL) #: AA34068

PURGE METHOD/SAMPLE METHOD: PB / GRBA CONTAMINANT PRESENT:

SCREENED INTERVAL (ft-bmp): 332.30 - 352.30 INTAKE DEPTH: 0.00

CASING DEPTH(installed/sounded)(ft-bmp): 351.00 / 353.20 on 11-DEC-03 CASING VOL (Gal/Time): 25.22

DEPTH TO WATER(ft-bmp): 328.27 on 08-AUG-17 328.60 VOLUME FACTOR: 1.020

WATER IN CASING (ft): 24.73 24.6 CASING DIAMETER/TCASING HT(in): 5 / 2.00

TIME PUMP ON: — INITIAL FLOW RATE (Q=GPM): —

TIME PUMP OFF: — MEASURED BY:FLOW METER/ GRAD CYL./ BUCKET/ OTHER

TIME	Q	GAL PURGED	VOLUMES	pH	TEMP C	SC	mV	OG	DTW
0944		—	—	8.31	18.2	617.9	85	1	—

METER SERIAL # CALIBRATED
pH : 610084 YES/NO
SC : YES/NO
mV : YES/NO
H2O: YES/NO

SAMPLER/EMPLOYER: silva90
PROJECT: 3EMG 3GIV
SAMPLE PRESERVATION/AMT of REAGENT: NA
PURGE VOL/EXCESS H2O DEST: 0.00 / S300-DRUM
TF LOCATION: S300

QC SAMPLE ID: 865FB W-865-64Y QC LAB(S): TALSAC, BCLABS-BAK, GEL QC SAMPLE TIME: 1101

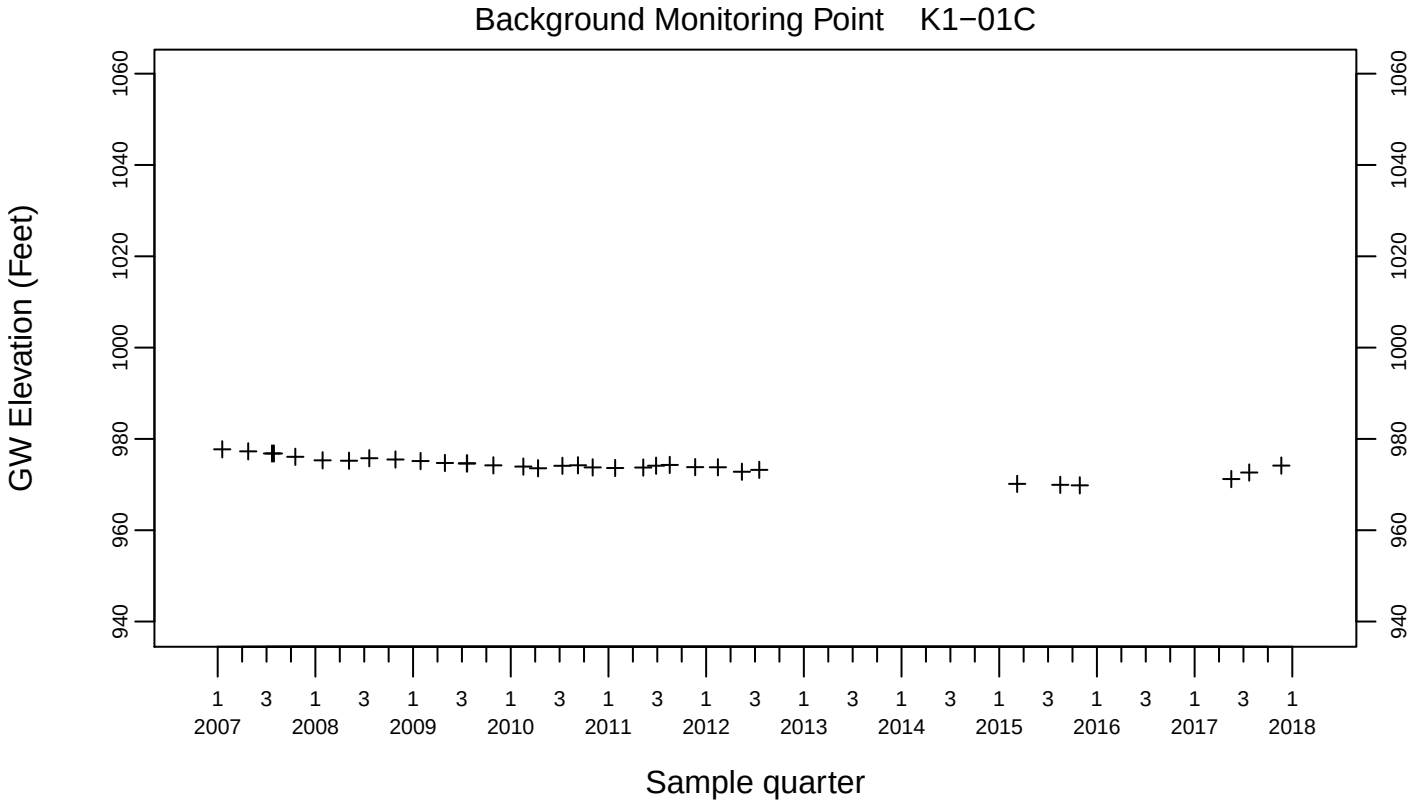
SAMPLE ID (VERIFY): W-865-2005 / GRBA TIME COLLECTED: 1010

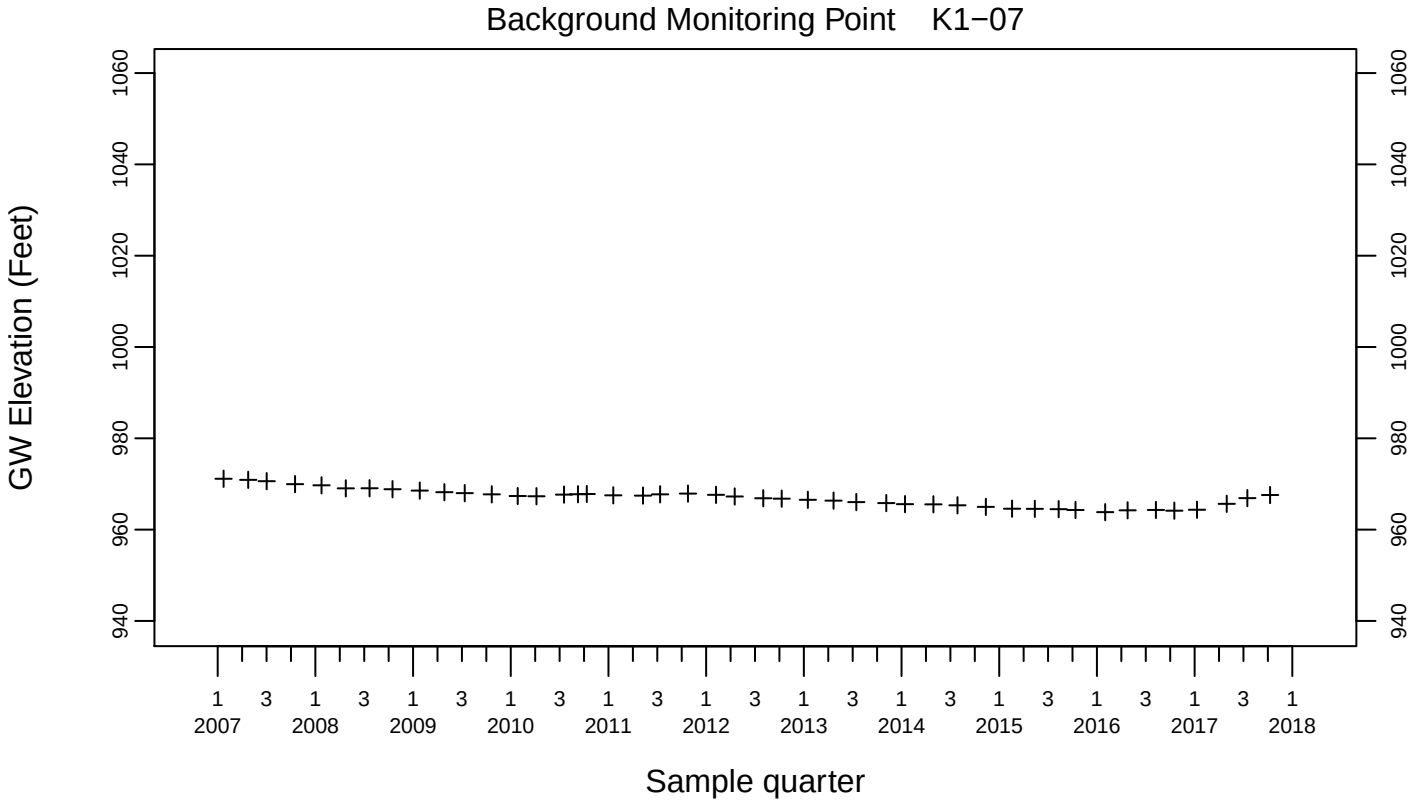
LAB	LAB_LOC_NAME	REQUESTED ANALYSIS	#	TYPE	SAMPLER_REMARKS
TS	W-865-2005	E300.0:PERC	1	250 mL P	1/3-1/2 headspace, & agitate
TS	865FB	E300.0:PERC	1	250 mL P	1/3-1/2 headspace, & agitate
TS	W-865-64Y	E300.0:PERC	1	250 mL P	1/3-1/2 headspace, & agitate
BB	865FB	E8260	3	40 mL V	
BB	W-865-64Y	E8260	3	40 mL V	
BB	W-865-2005	E8260	3	40 mL V	
GE	865FB	E906	1	250 ml GA	
GE	W-865-64Y	E906	1	250 ml GA	
GE	W-865-2005	E906	1	250 ml GA	

Appendix H

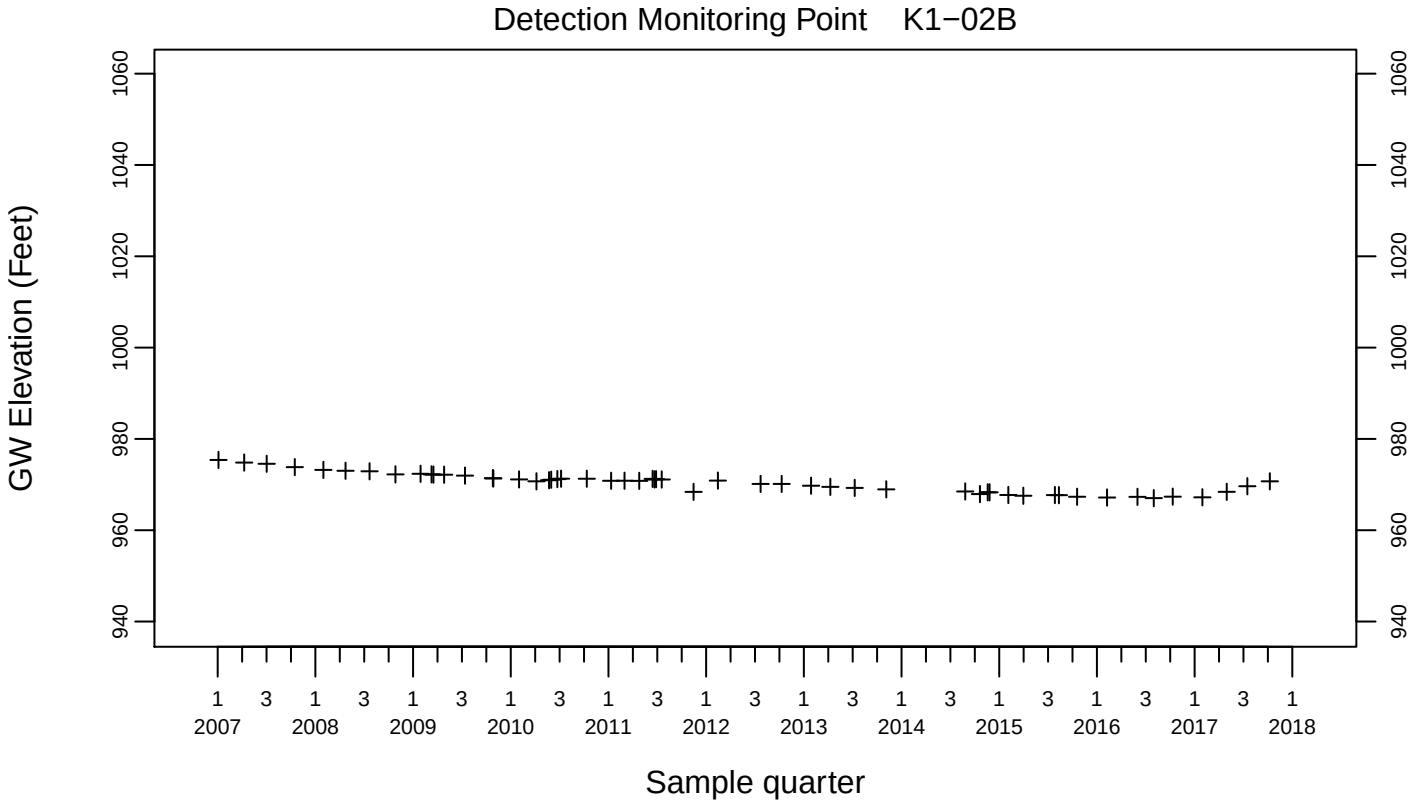
Statistical Limits and Graphs of Ground Water Measurements

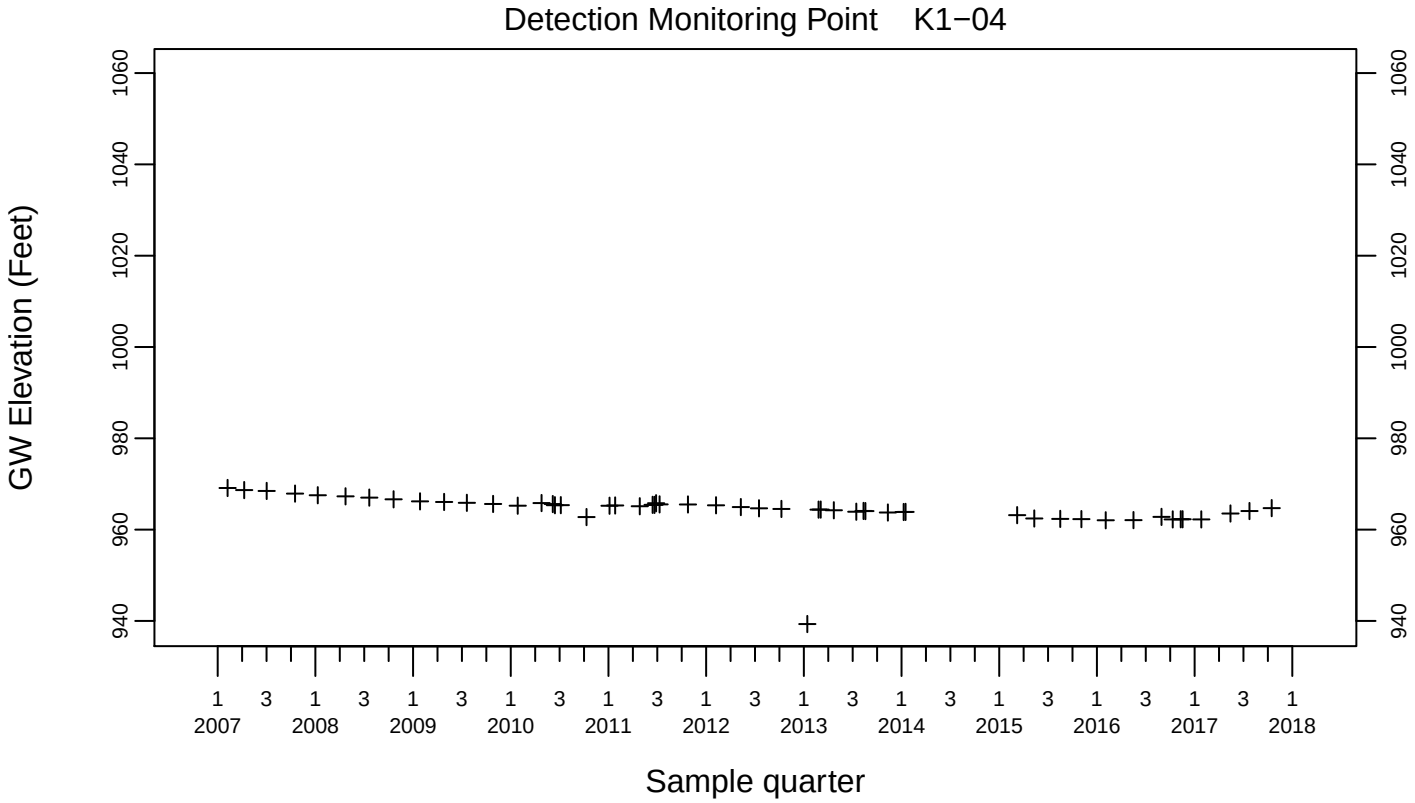
Pit 1 Area
GW Elevation (Feet)



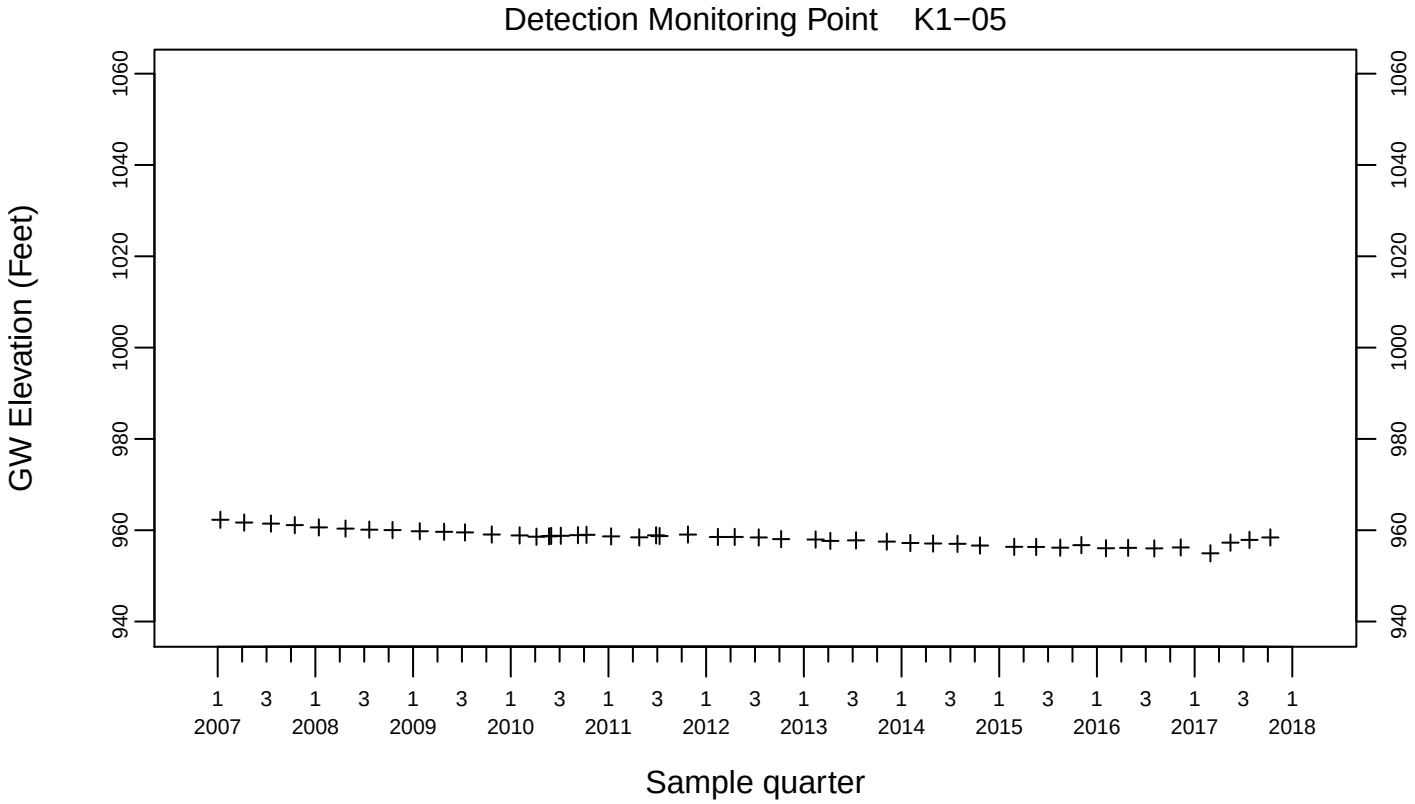


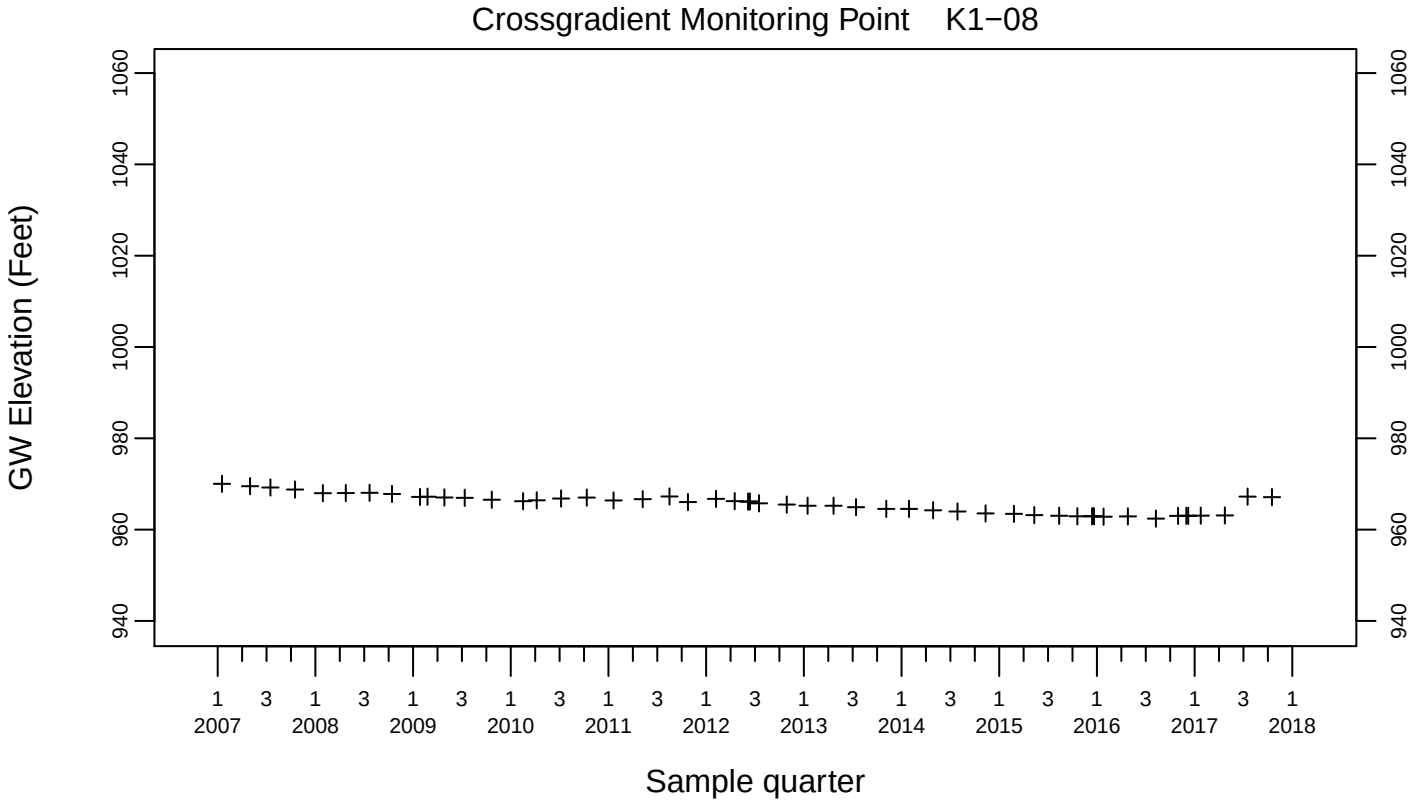
Pit 1 Area
GW Elevation (Feet)



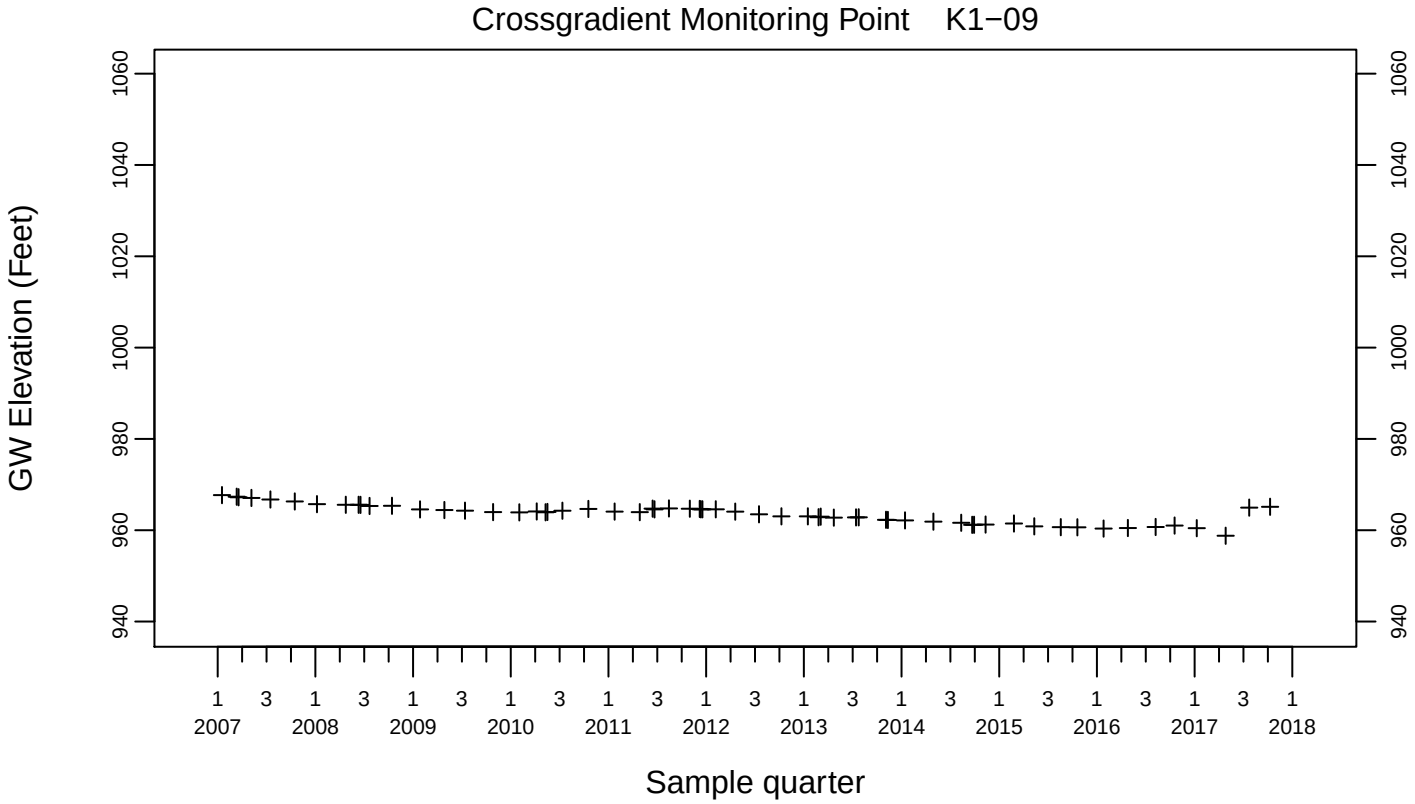


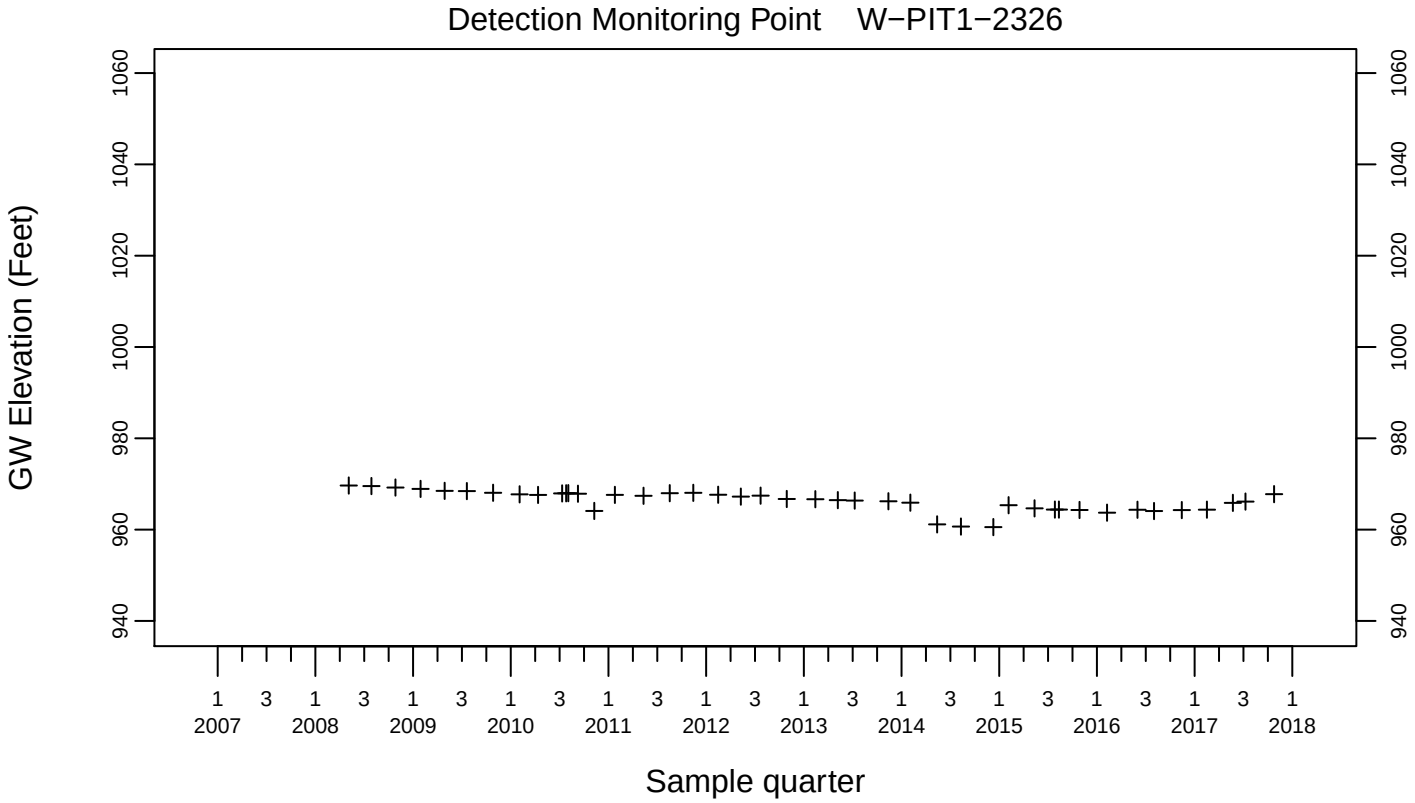
Pit 1 Area
GW Elevation (Feet)



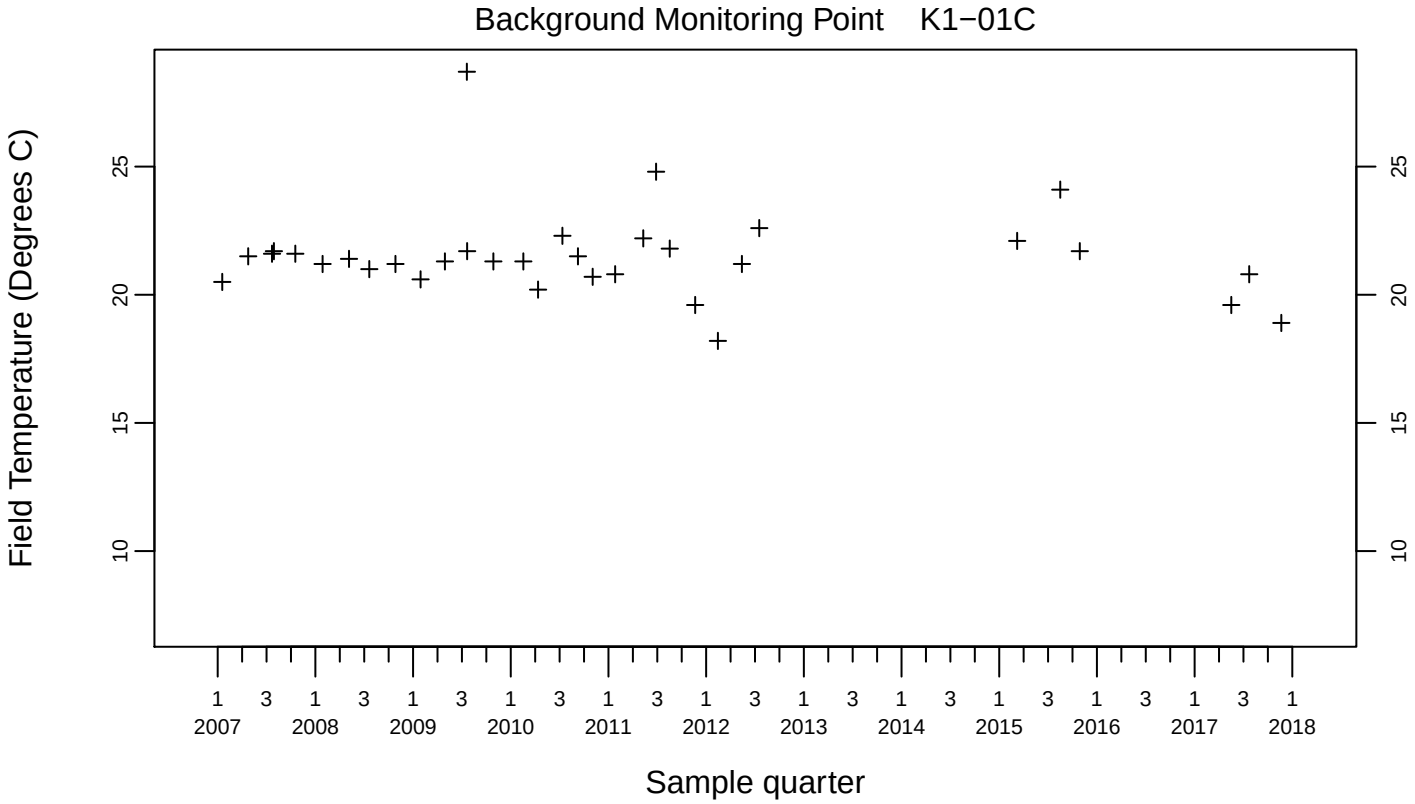


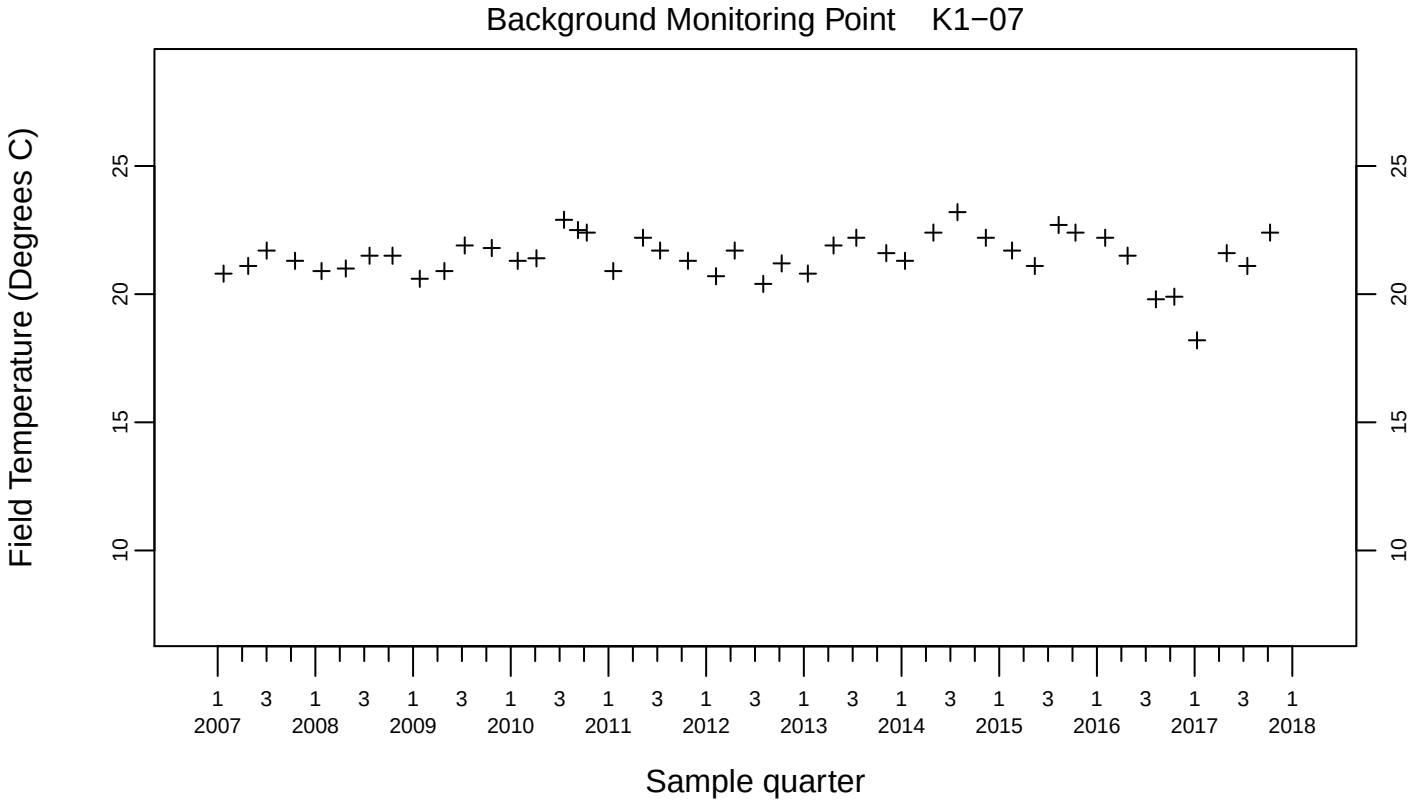
Pit 1 Area
GW Elevation (Feet)



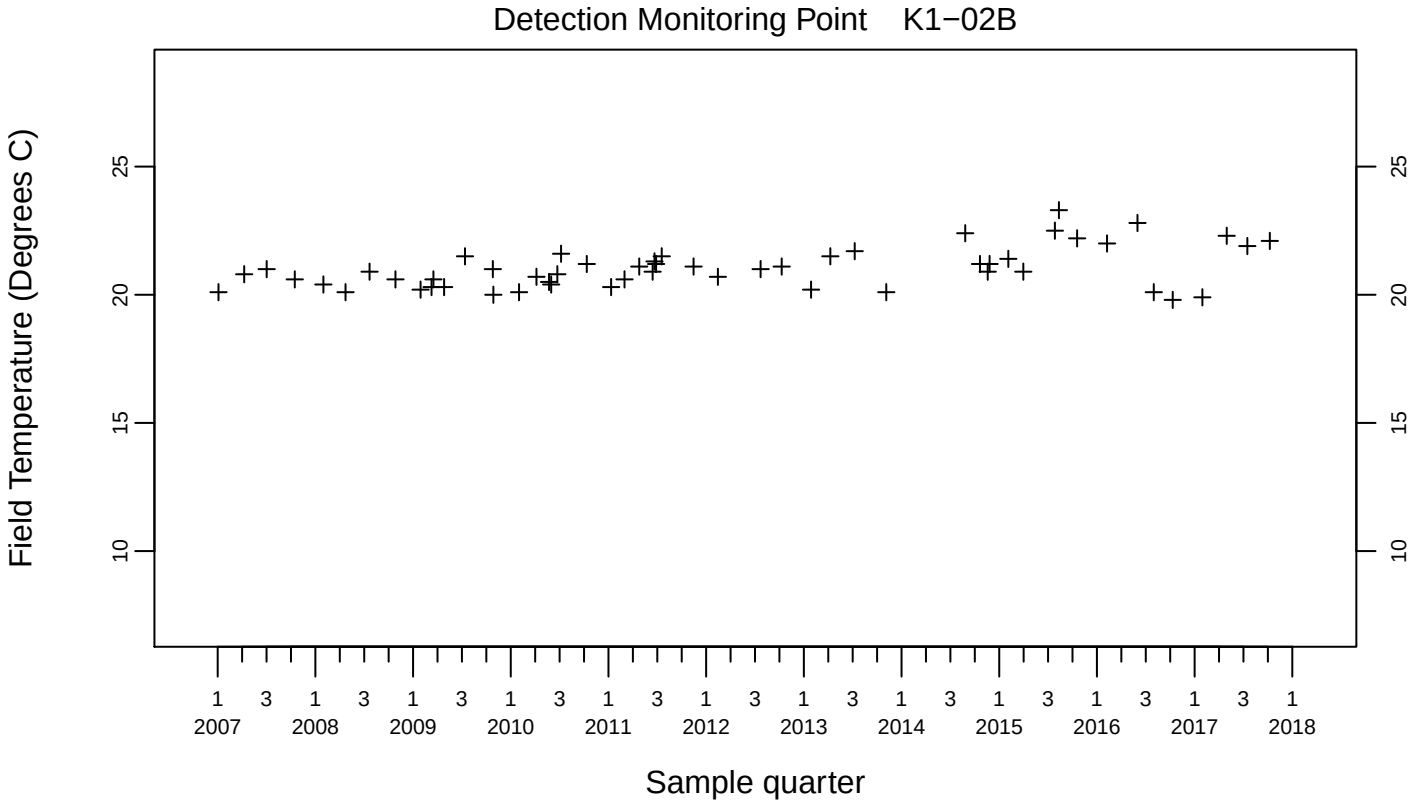


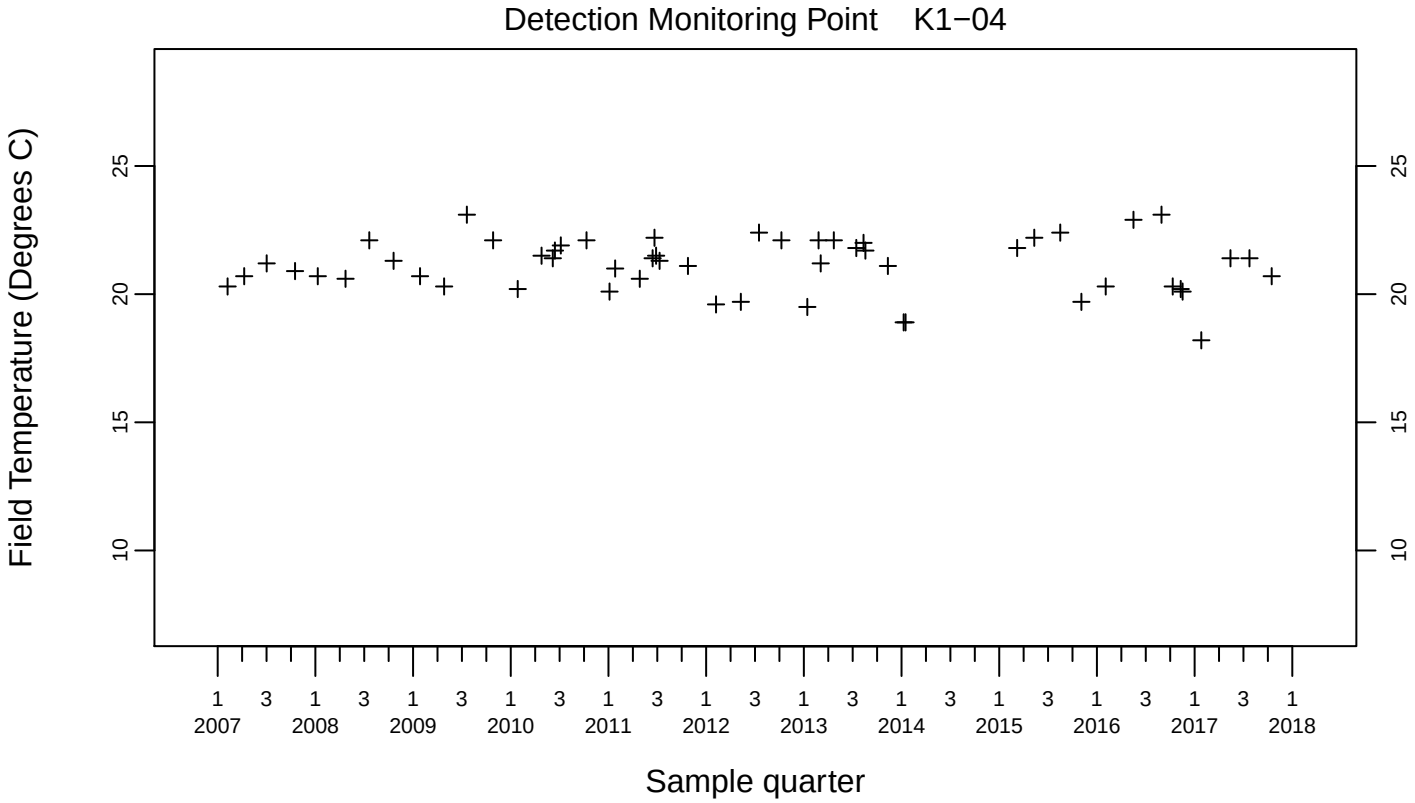
Pit 1 Area
Field Temperature (Degrees C)



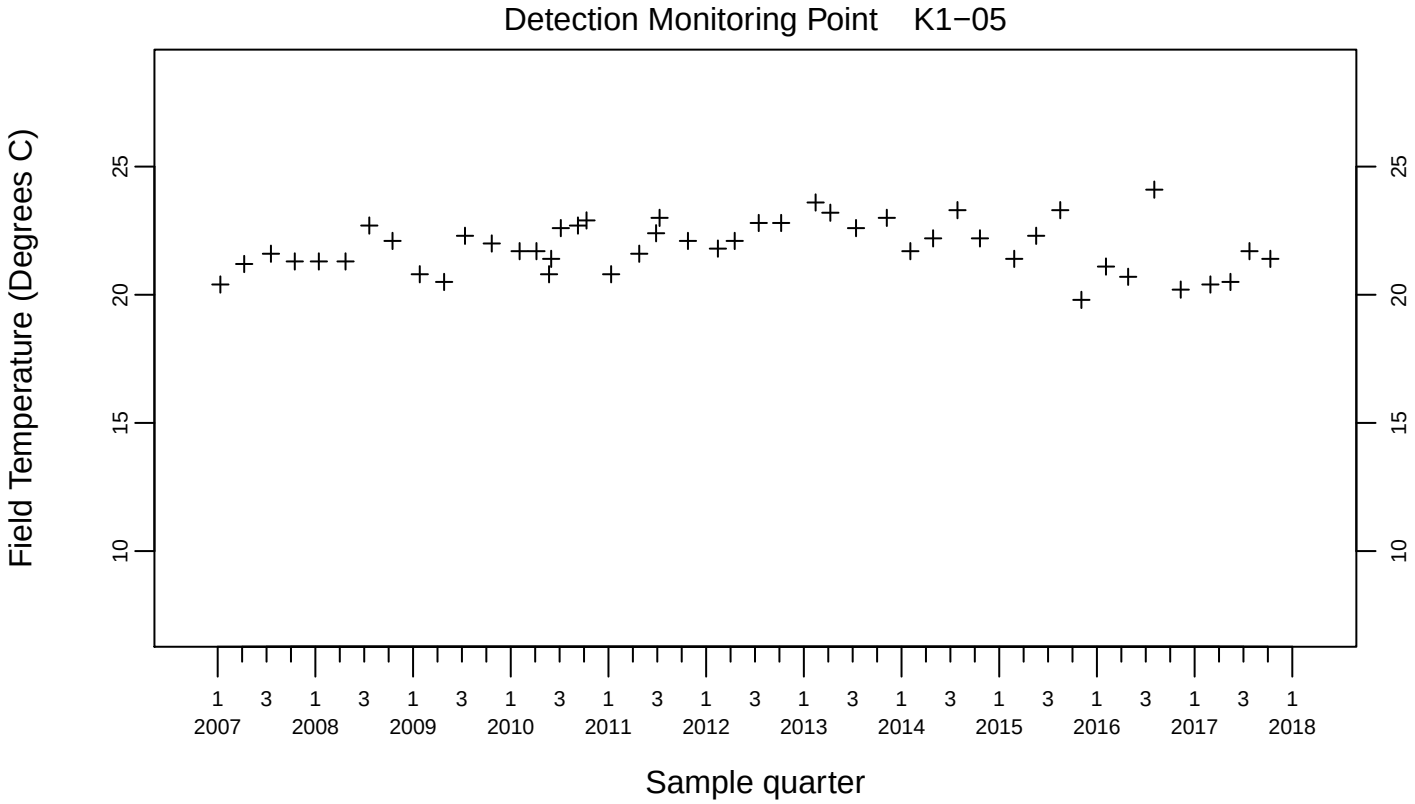


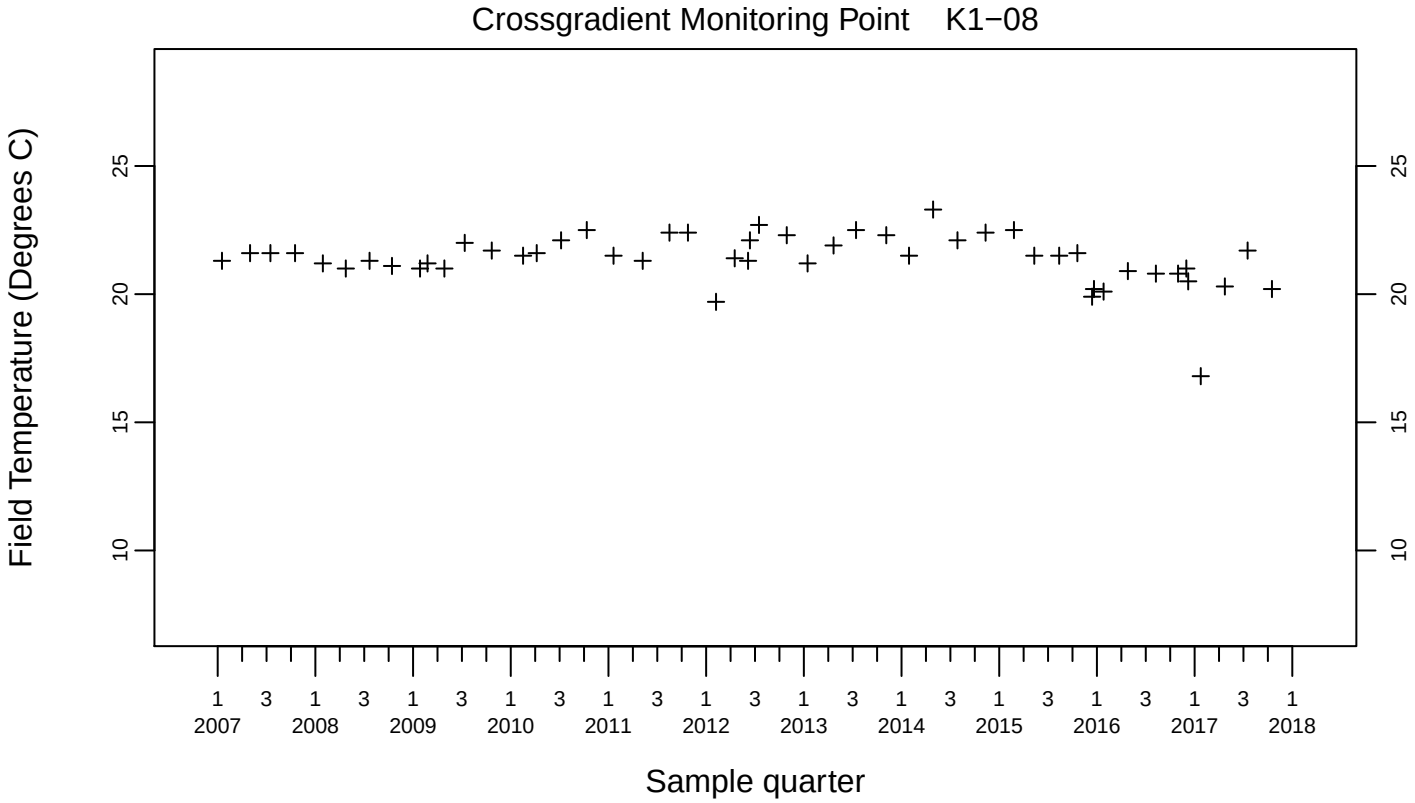
Pit 1 Area
Field Temperature (Degrees C)



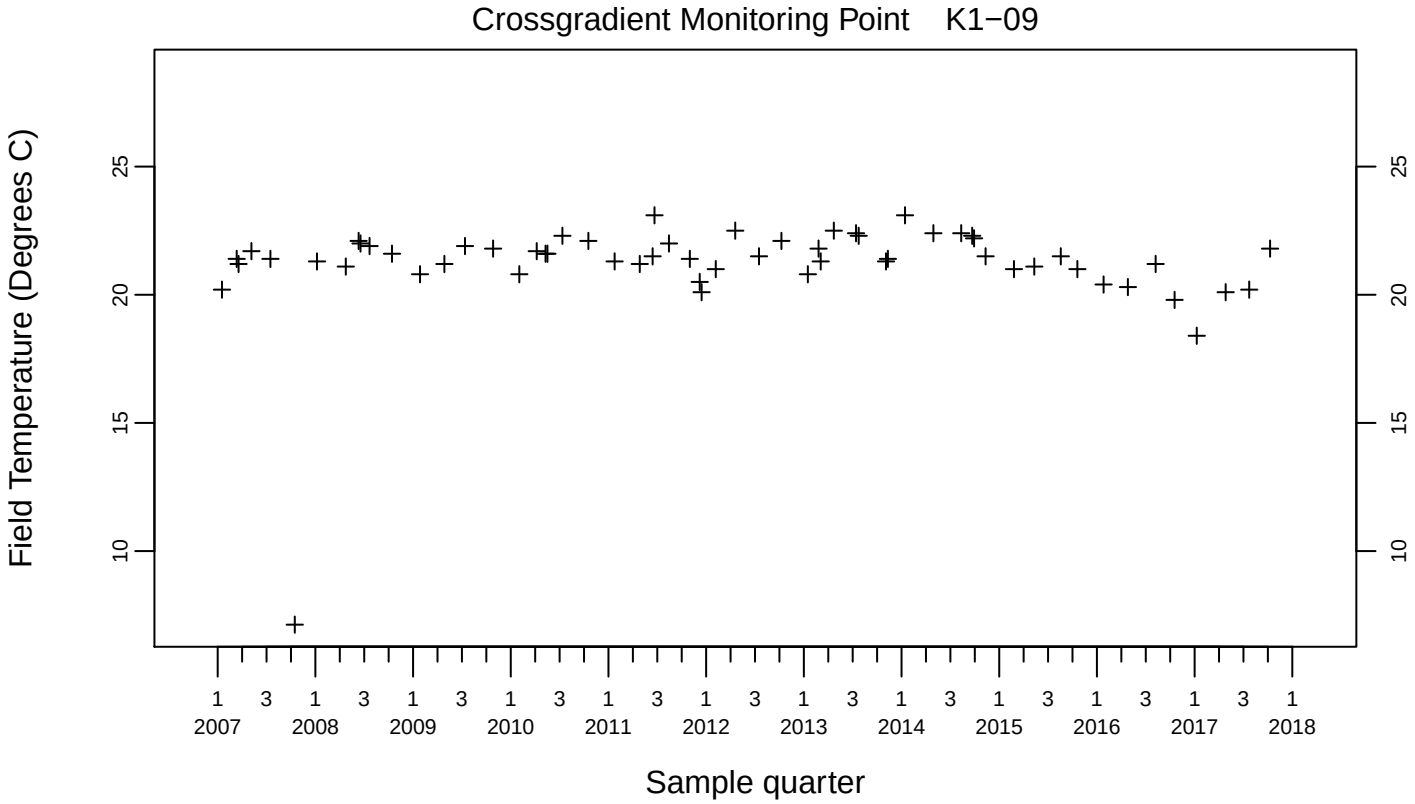


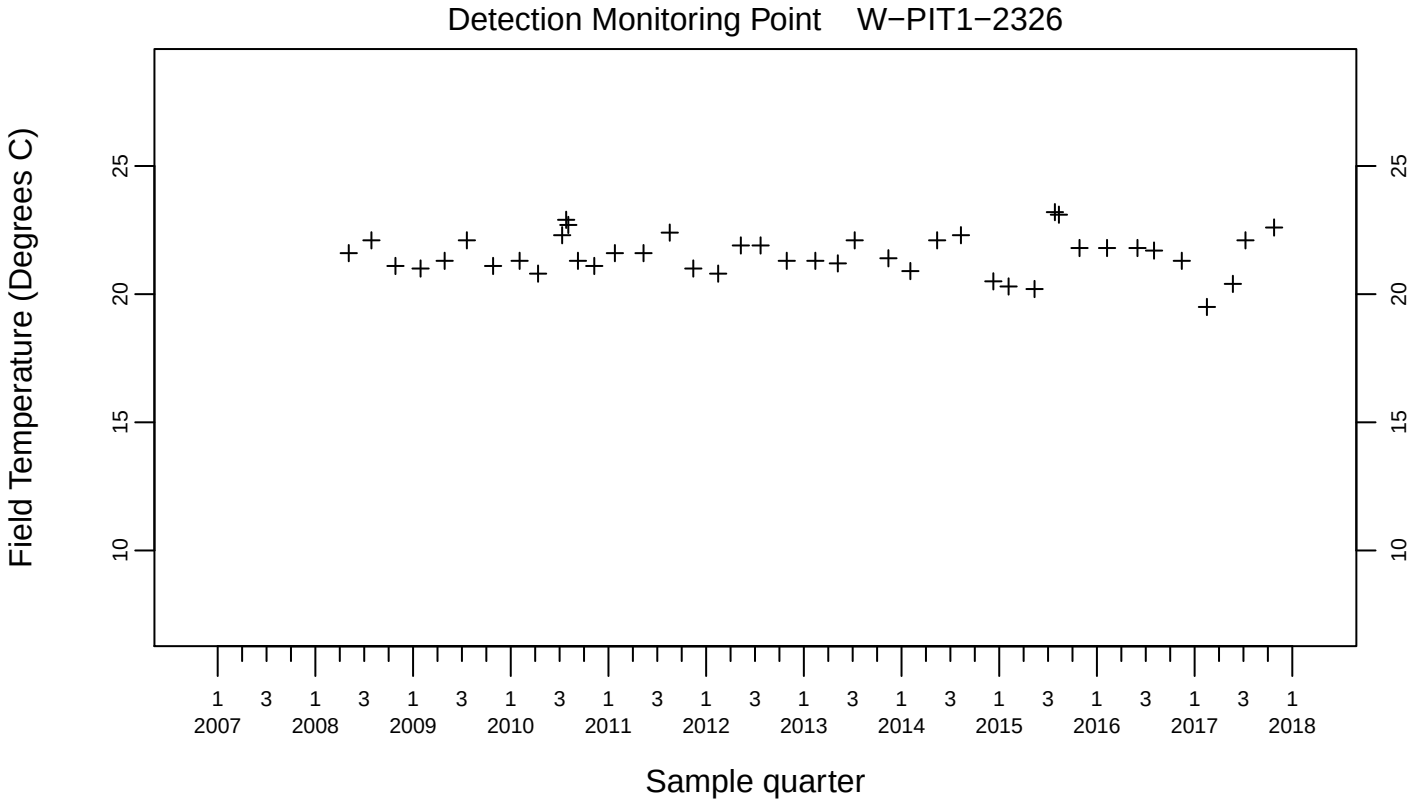
Pit 1 Area
Field Temperature (Degrees C)

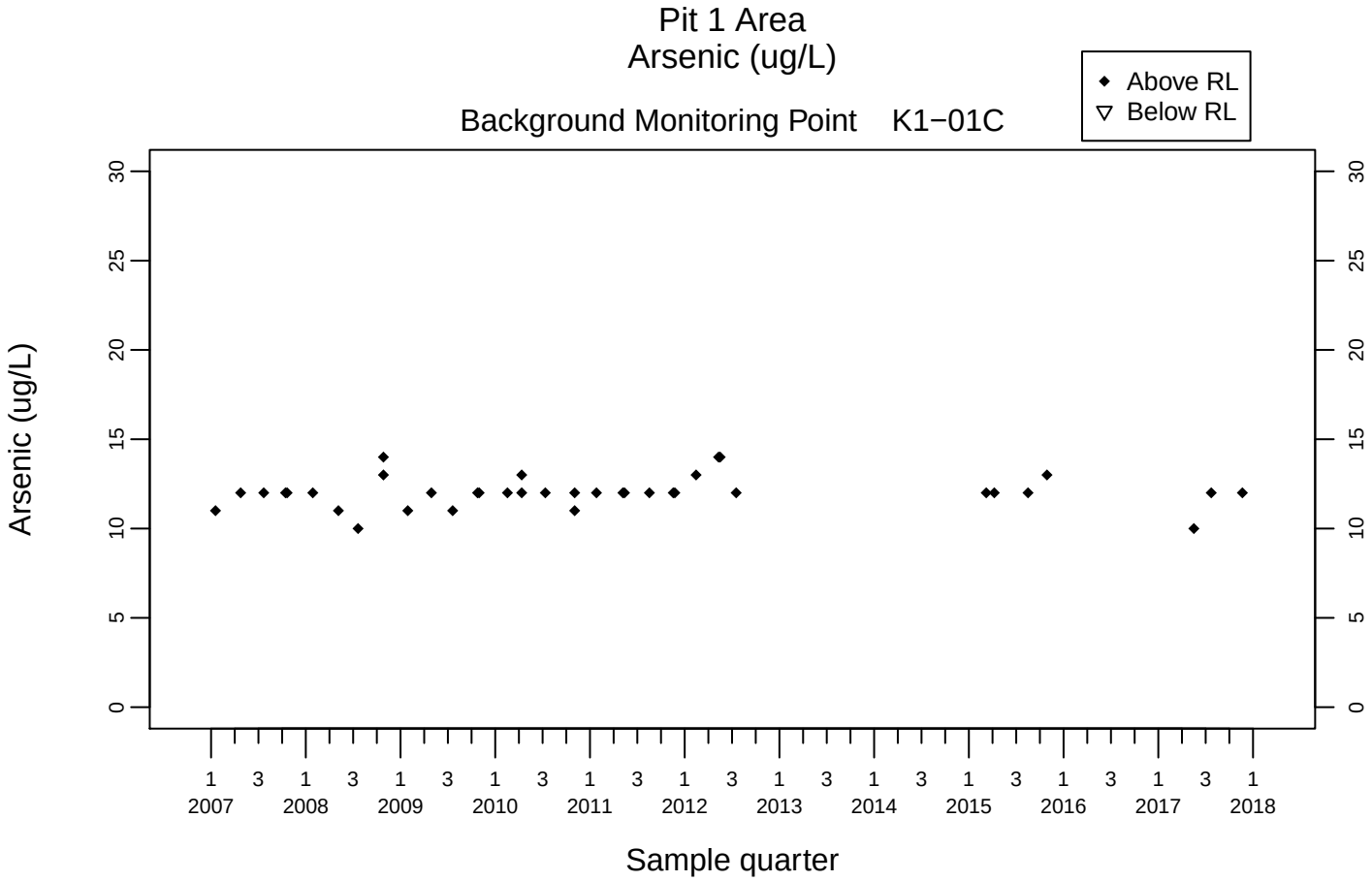


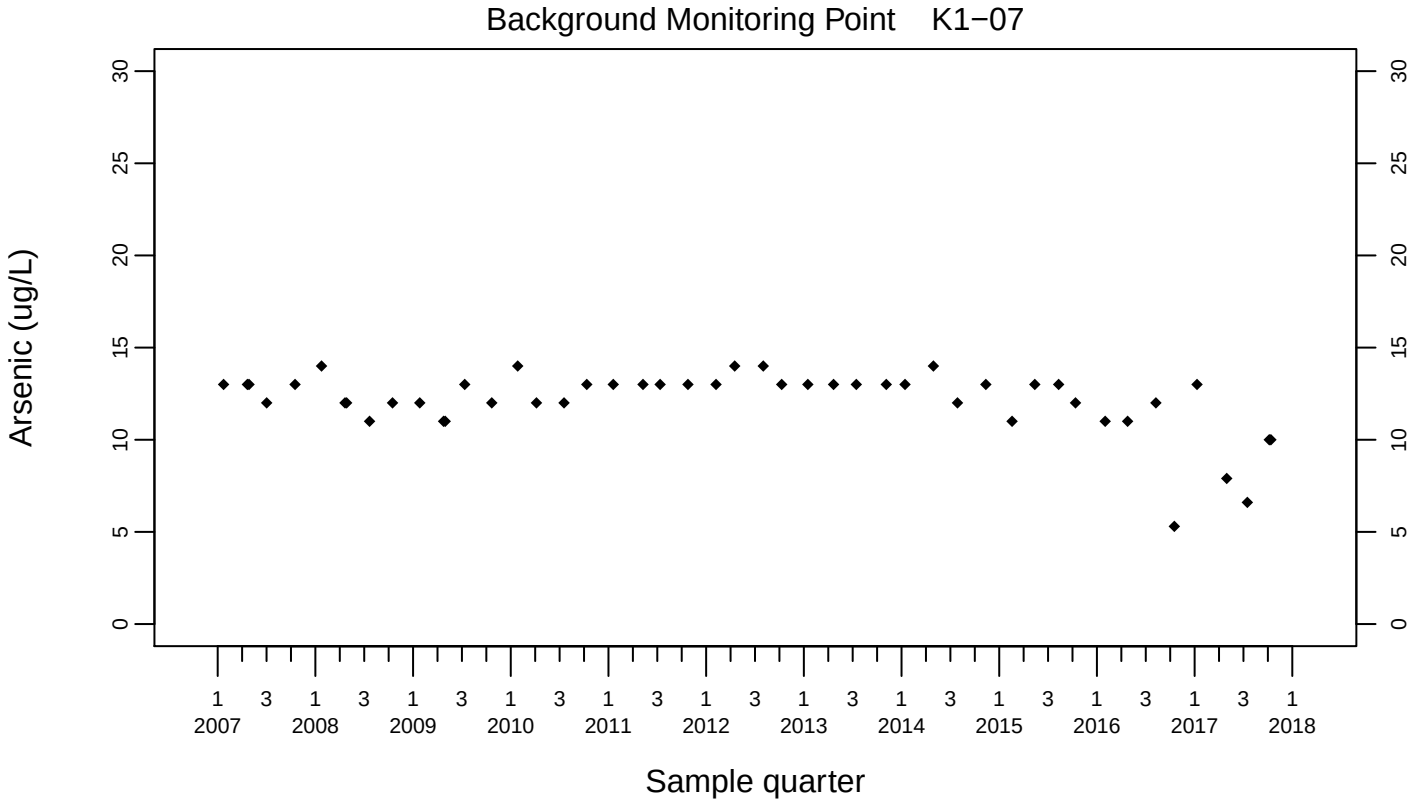


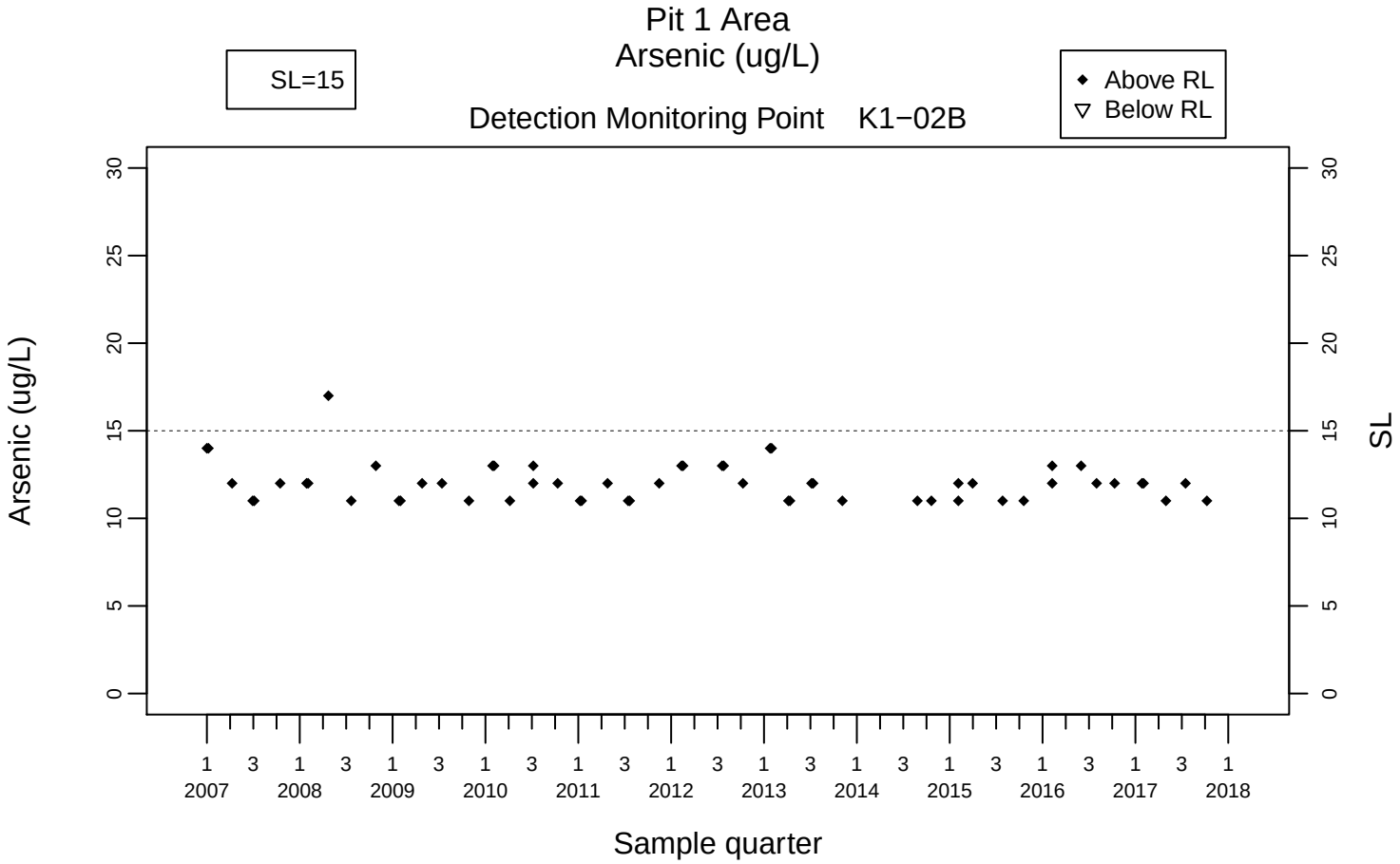
Pit 1 Area
Field Temperature (Degrees C)

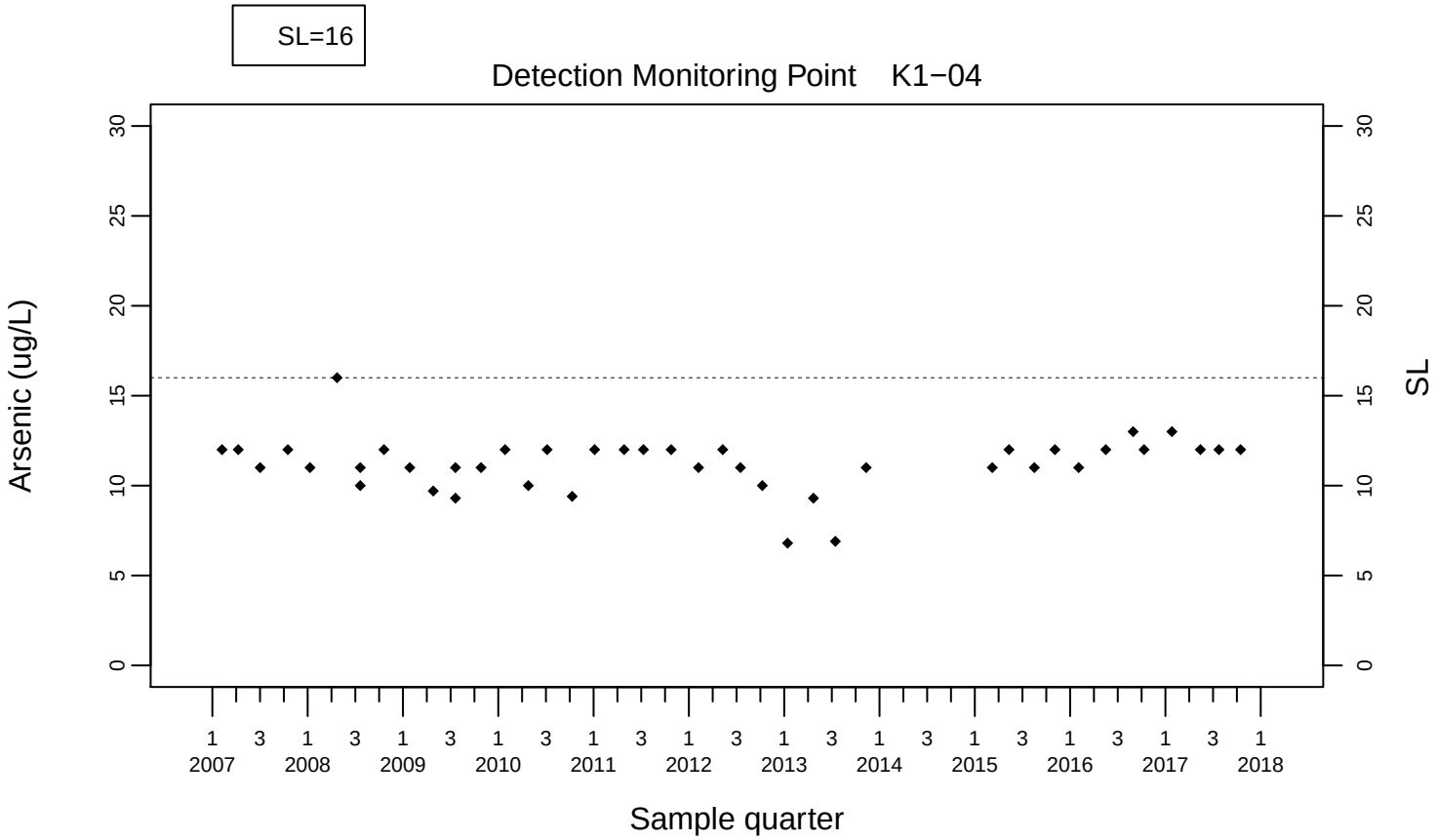


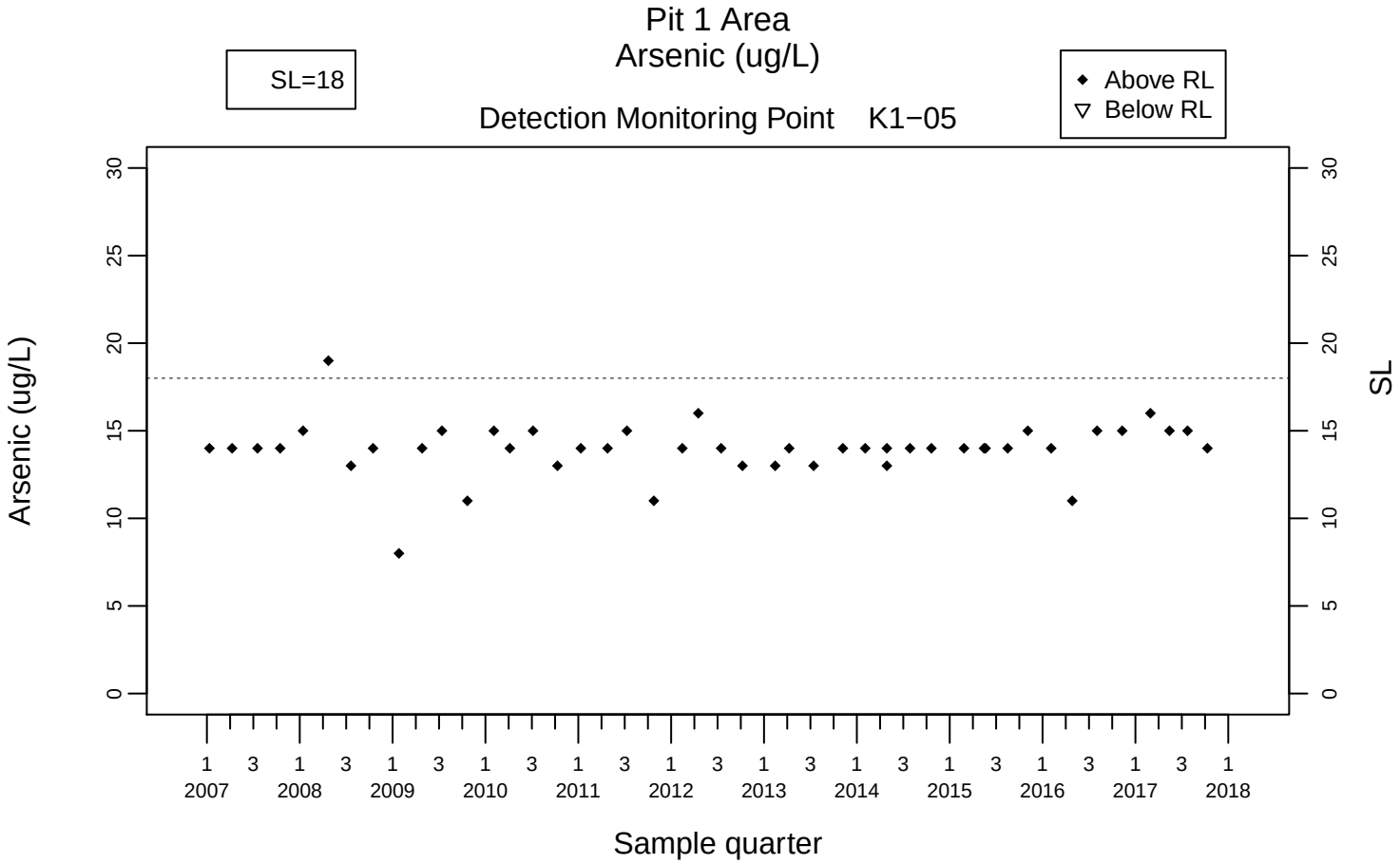


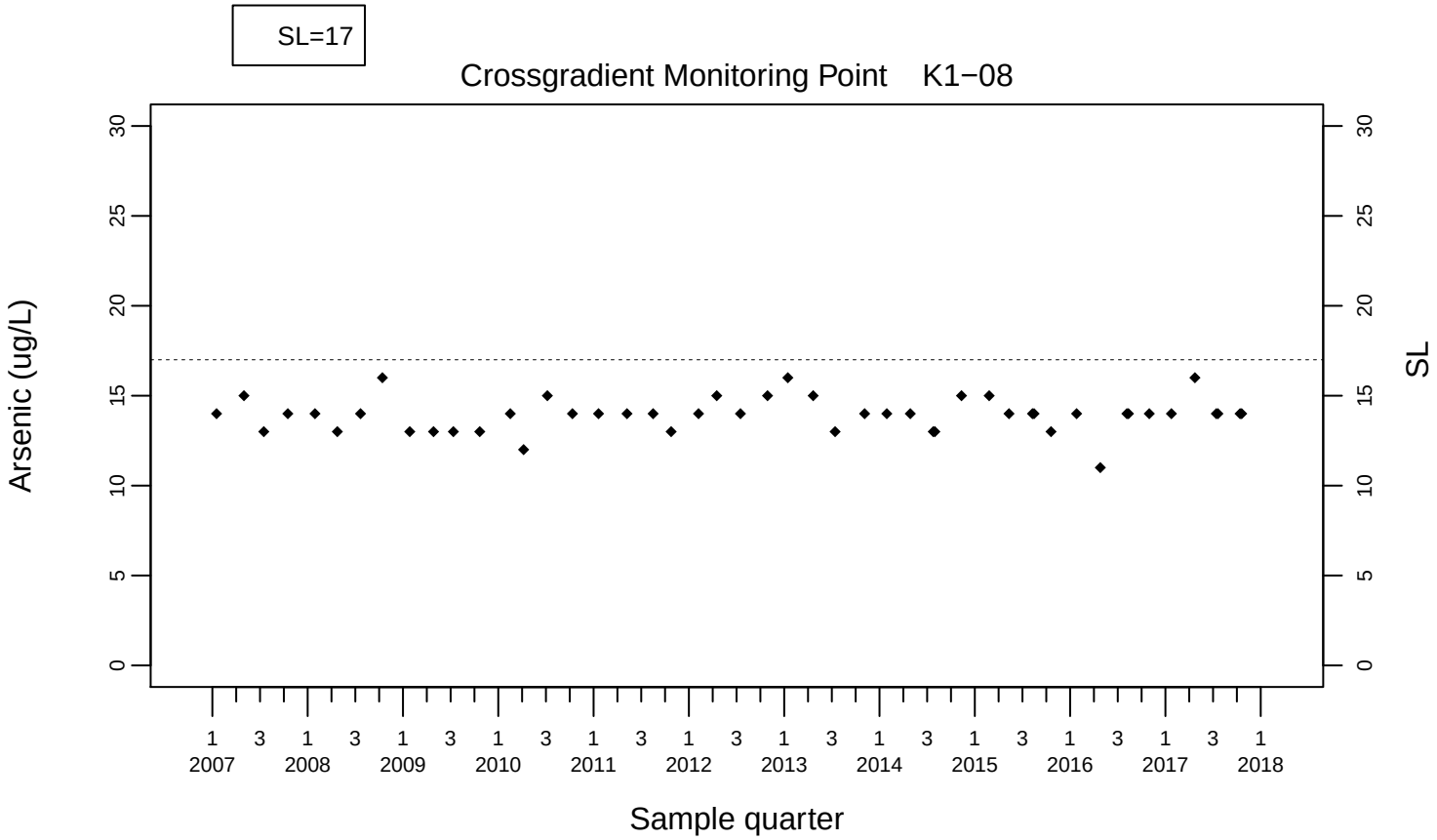

Pit 1 Area
Arsenic (ug/L)
Background Monitoring Point K1−01C
Above RL
Below RL
Arsenic (ug/L)
Sample quarter

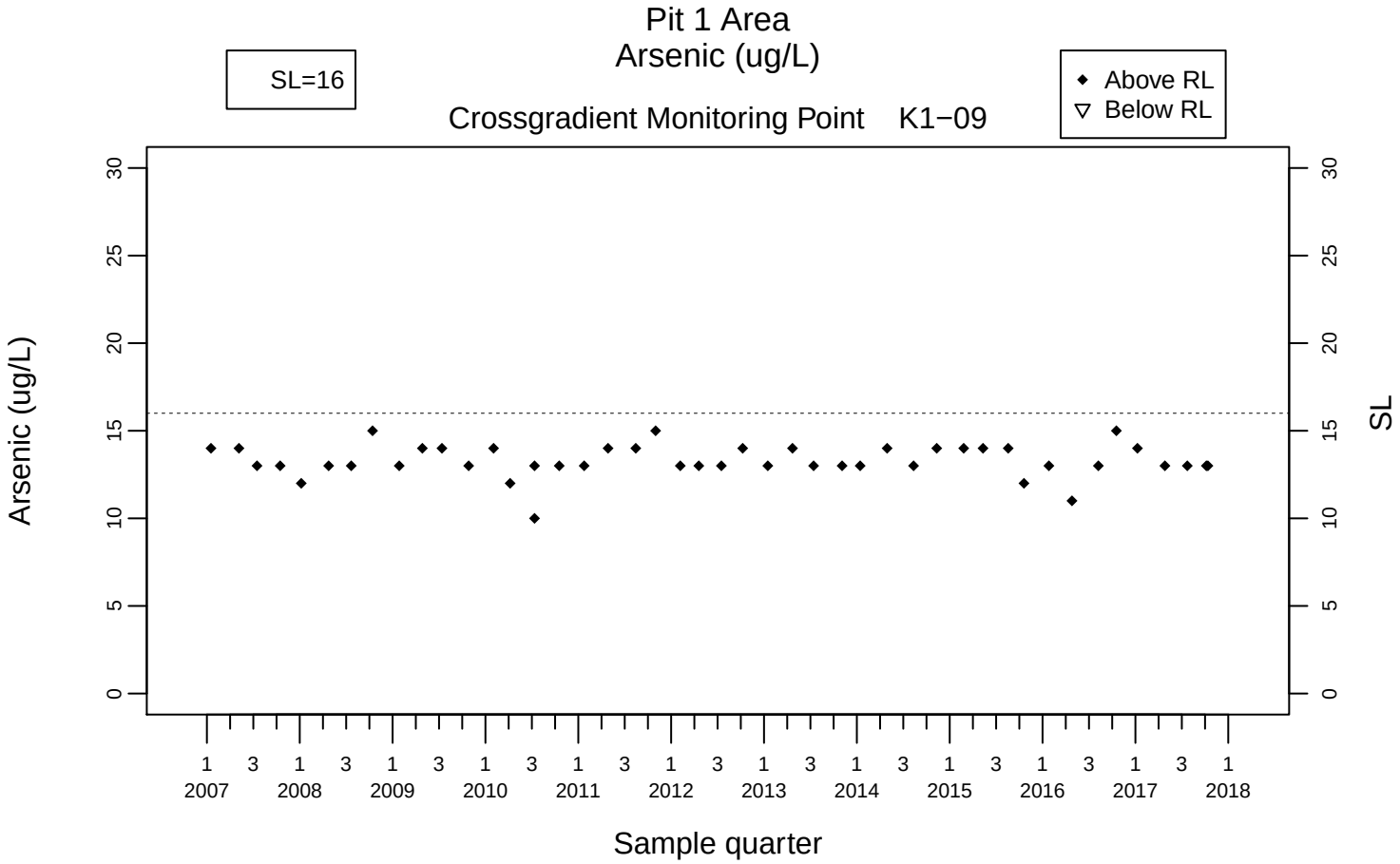

Background Monitoring Point K1−07
Arsenic (ug/L)
Sample quarter

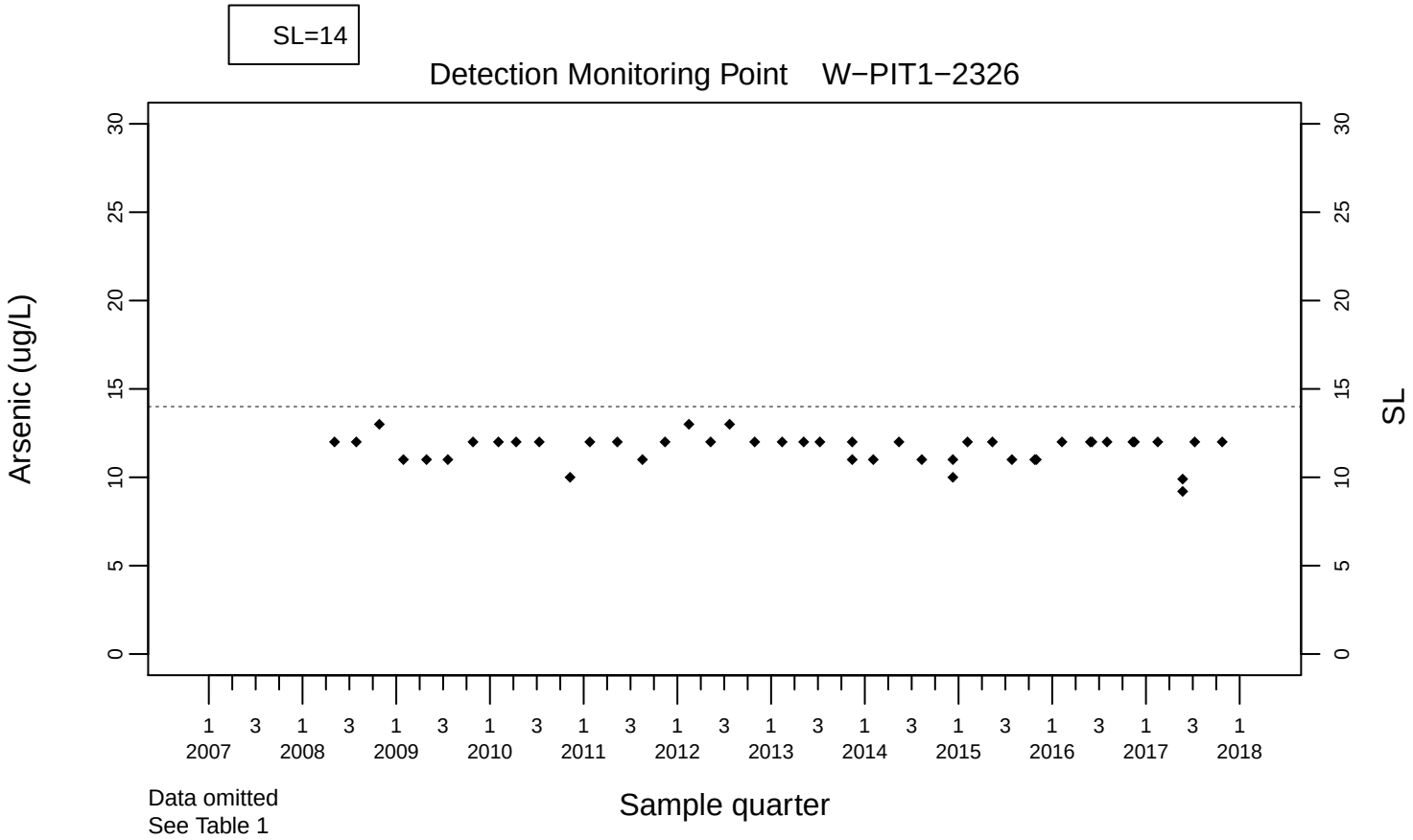

Pit 1 Area
Arsenic (ug/L)
SL=15
Above RL
Below RL
Detection Monitoring Point K1−02B
Arsenic (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

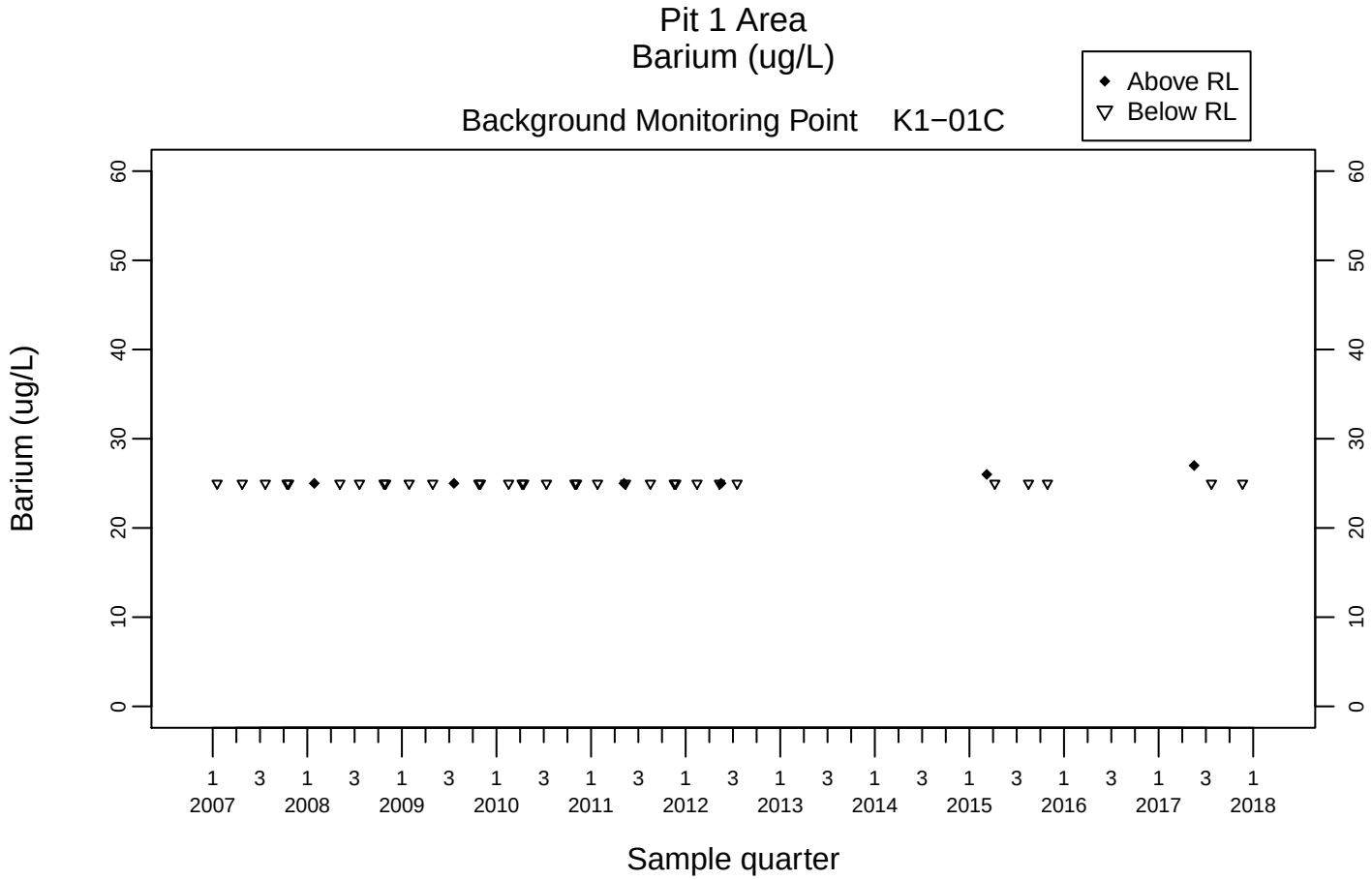

SL=16
Detection Monitoring Point K1−04
Arsenic (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

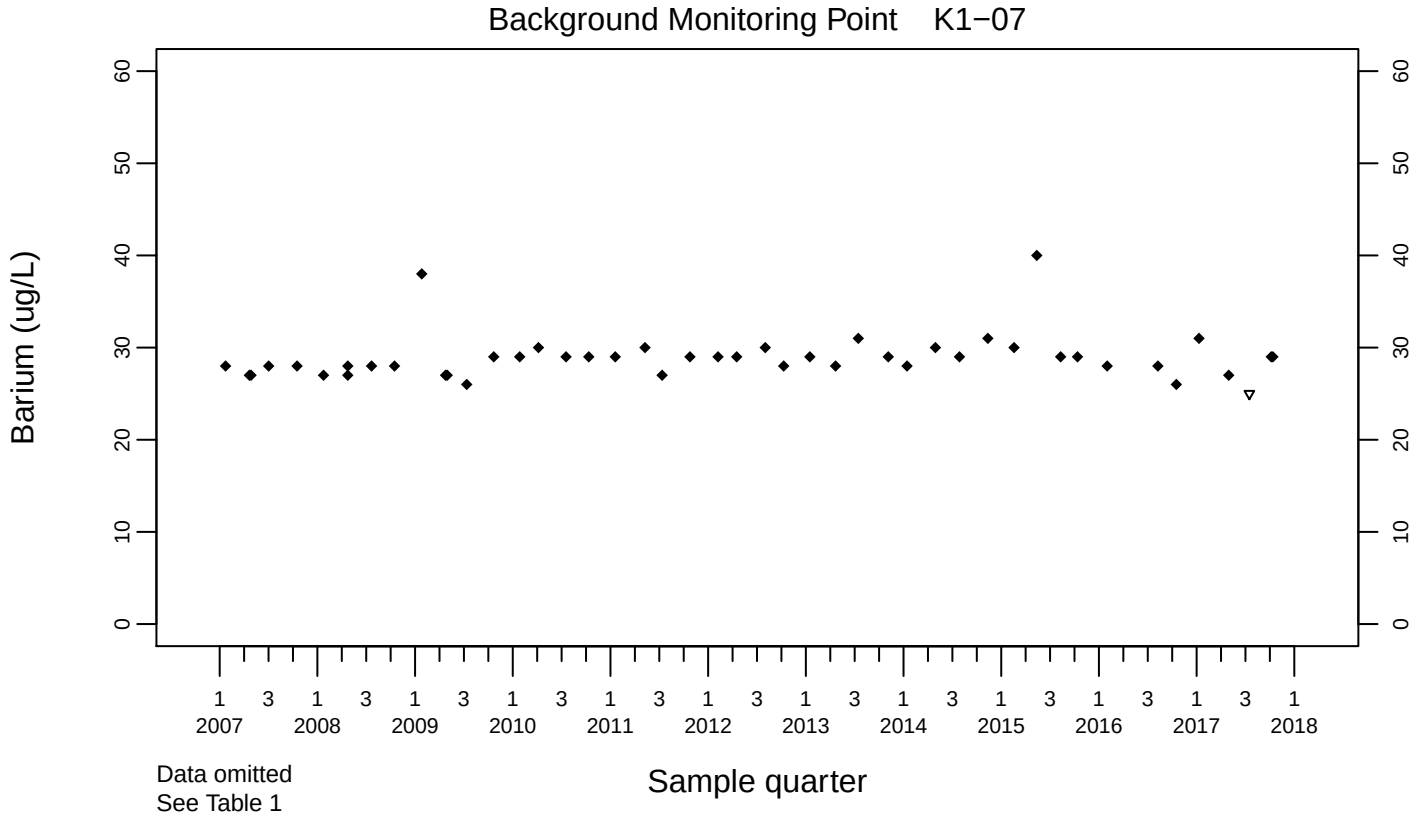

Pit 1 Area
Arsenic (ug/L)
SL=18
Above RL
Below RL
Detection Monitoring Point K1−05
Arsenic (ug/L)
SL
Sample quarter


SL=17
Crossgradient Monitoring Point K1−08
Arsenic (ug/L)
SL
Sample quarter

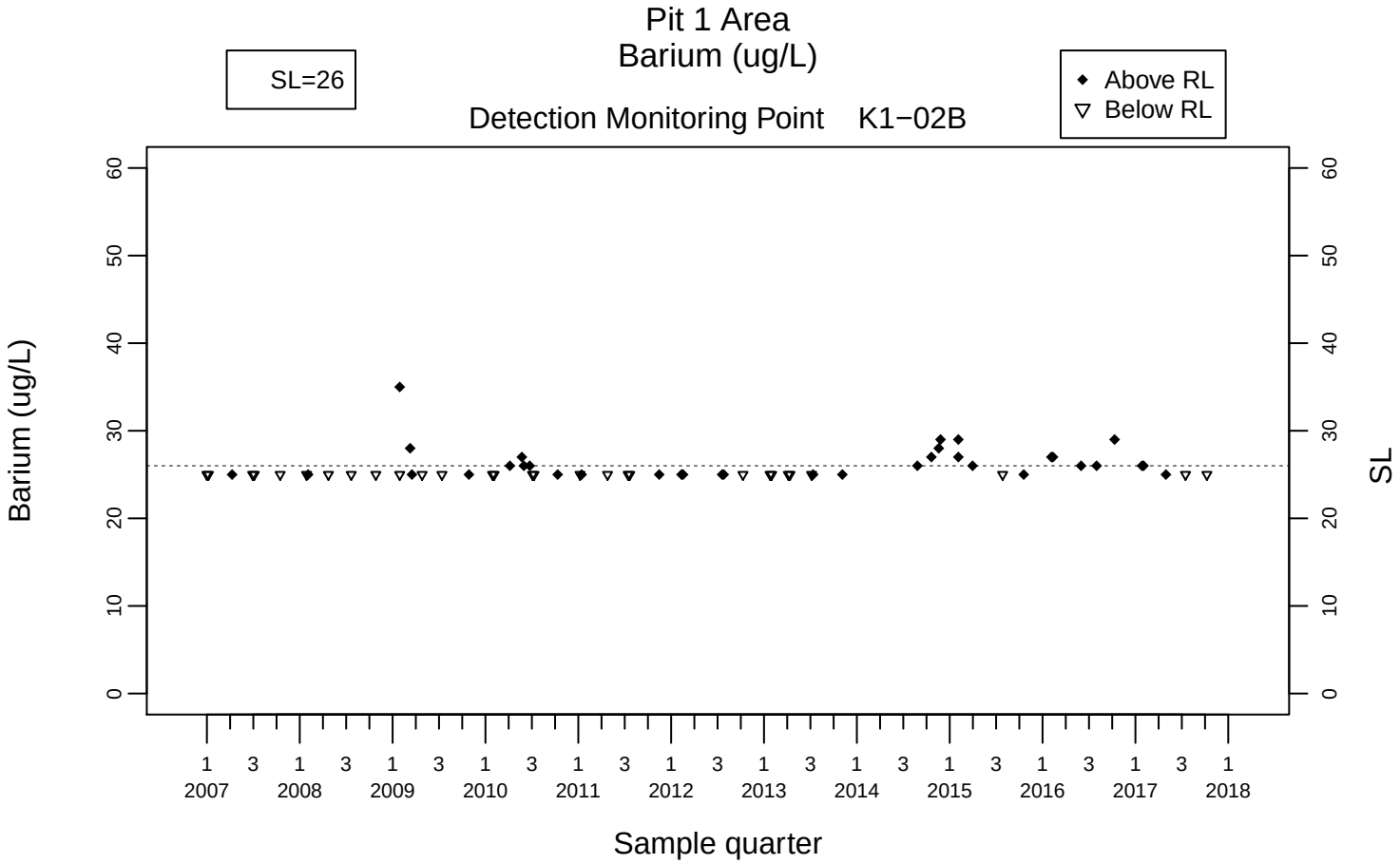

Pit 1 Area
Arsenic (ug/L)
SL=16
Above RL
Below RL
Crossgradient Monitoring Point K1−09
Arsenic (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

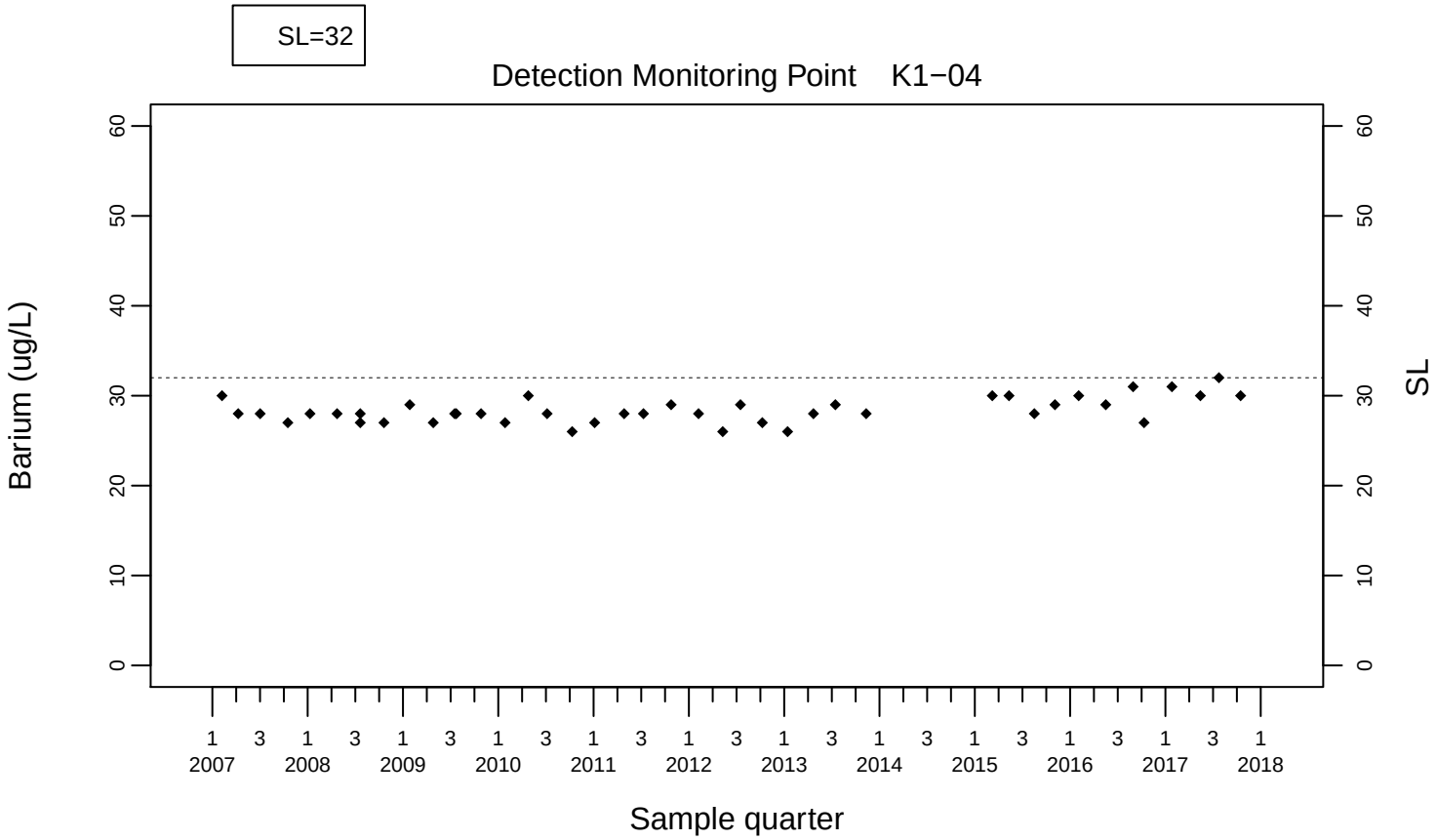

SL=14
Detection Monitoring Point W−PIT1−2326
Arsenic (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Data omitted
See Table 1

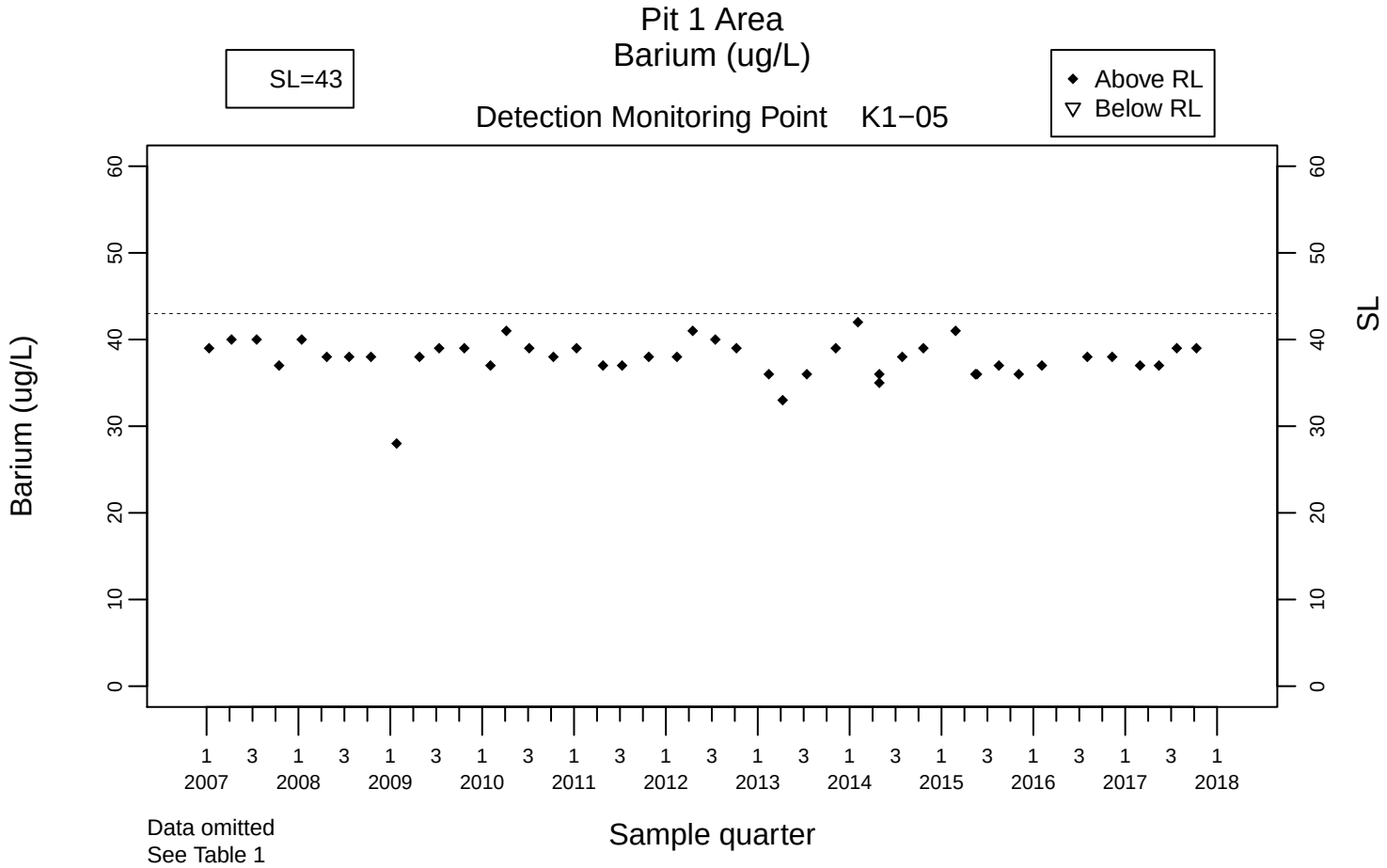


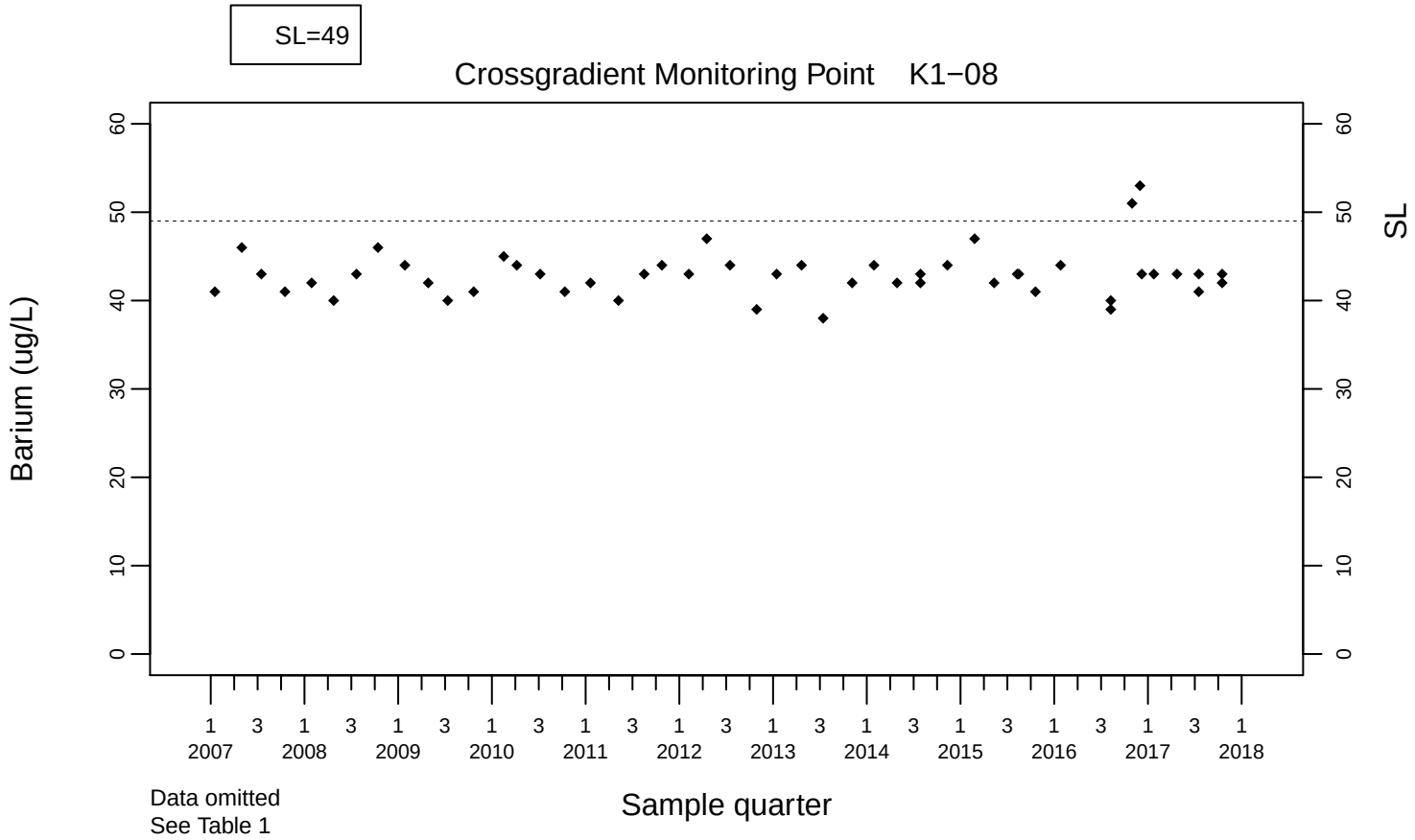


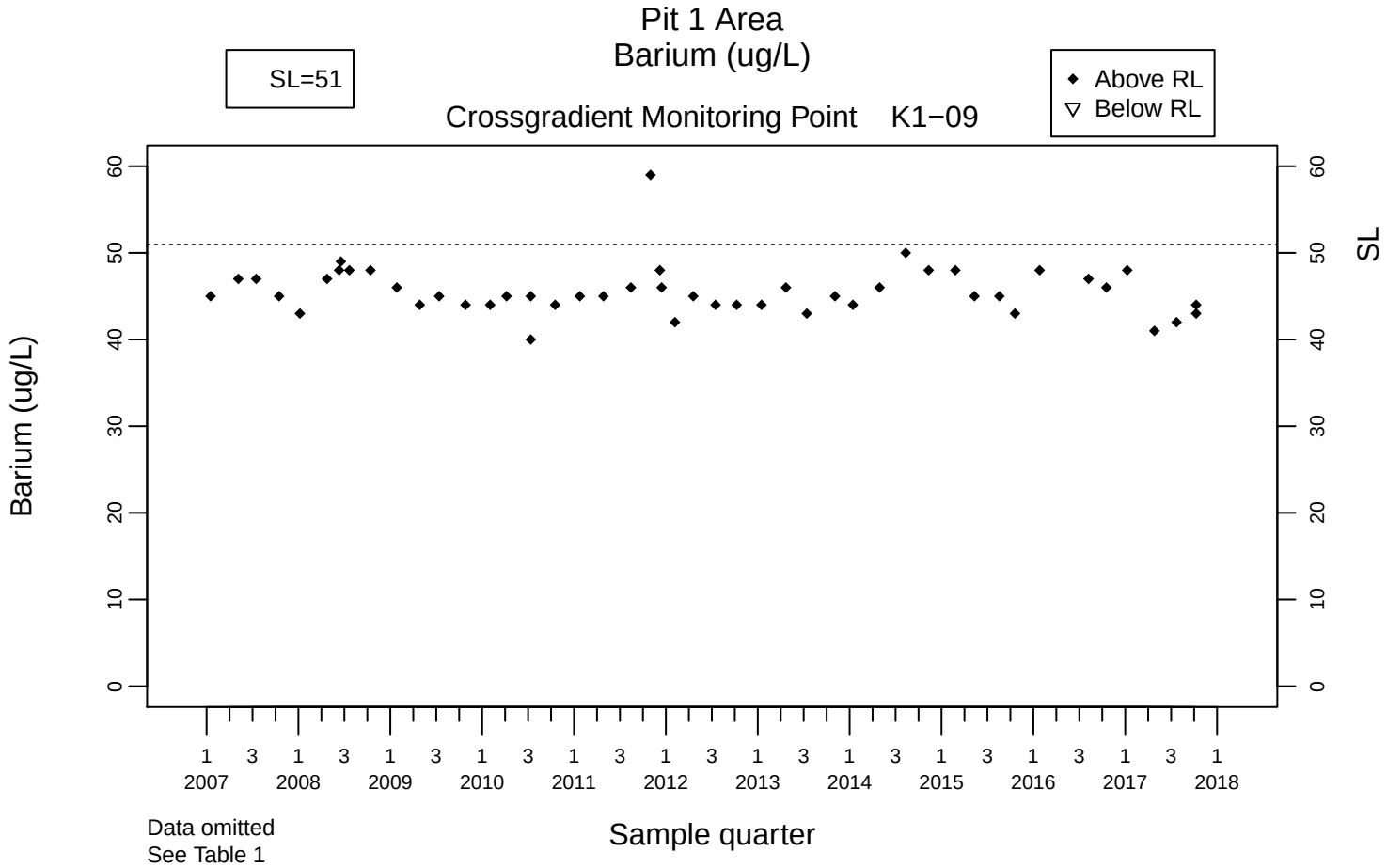
Data omitted
See Table 1

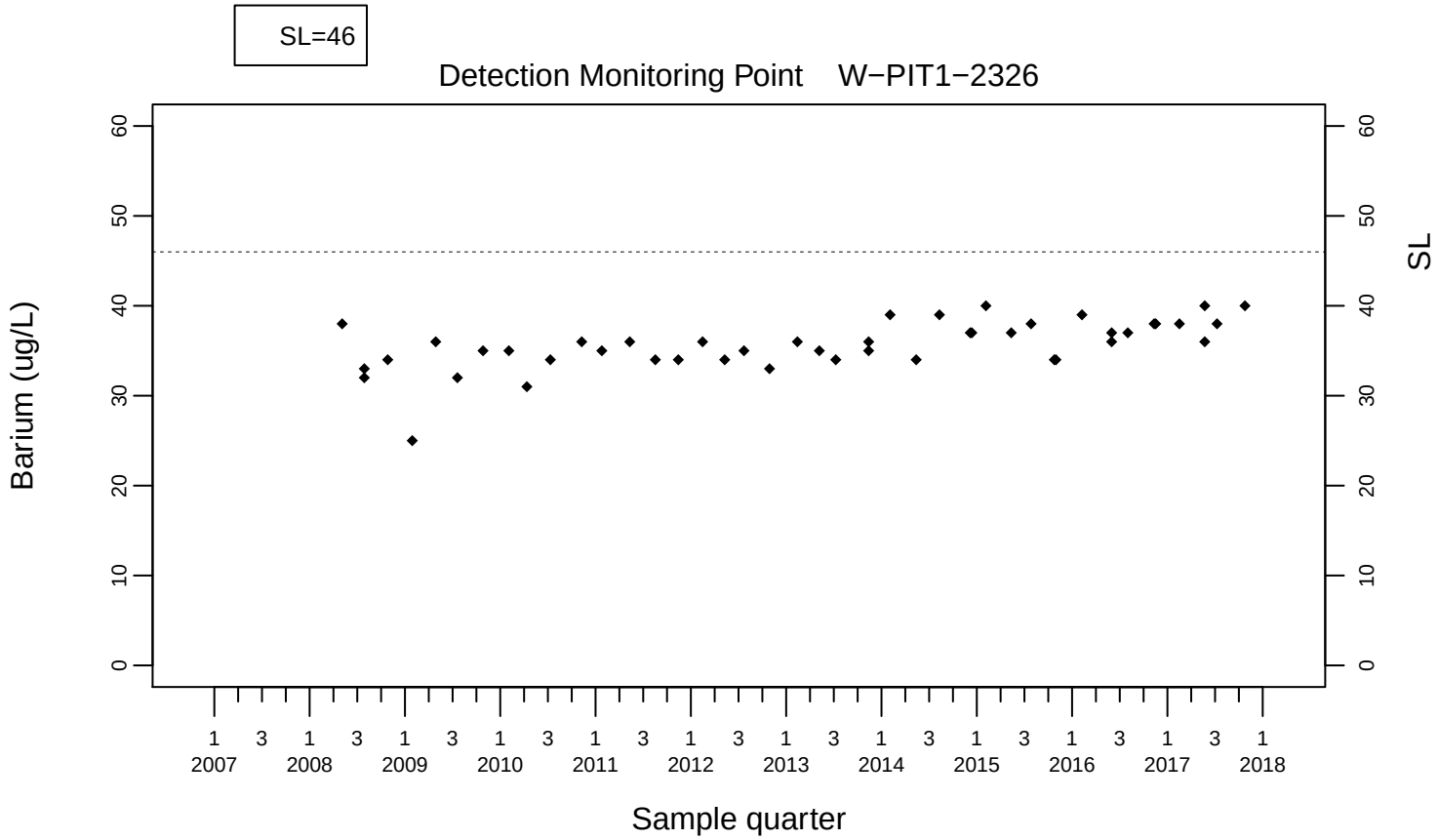

Pit 1 Area
Barium (ug/L)
SL=26
Above RL
Below RL
Detection Monitoring Point K1−02B
Barium (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

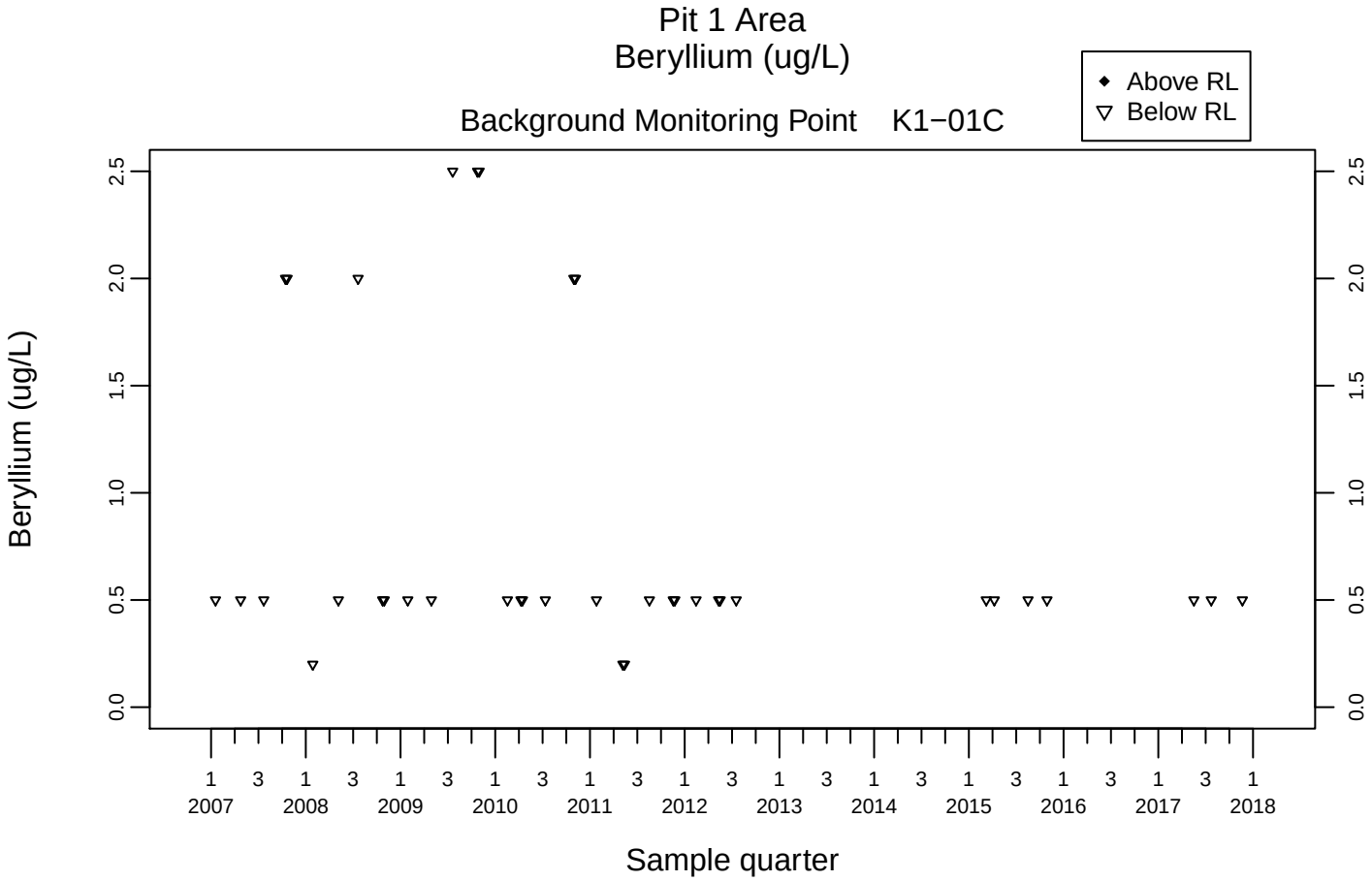

SL=32
Detection Monitoring Point K1−04
Barium (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

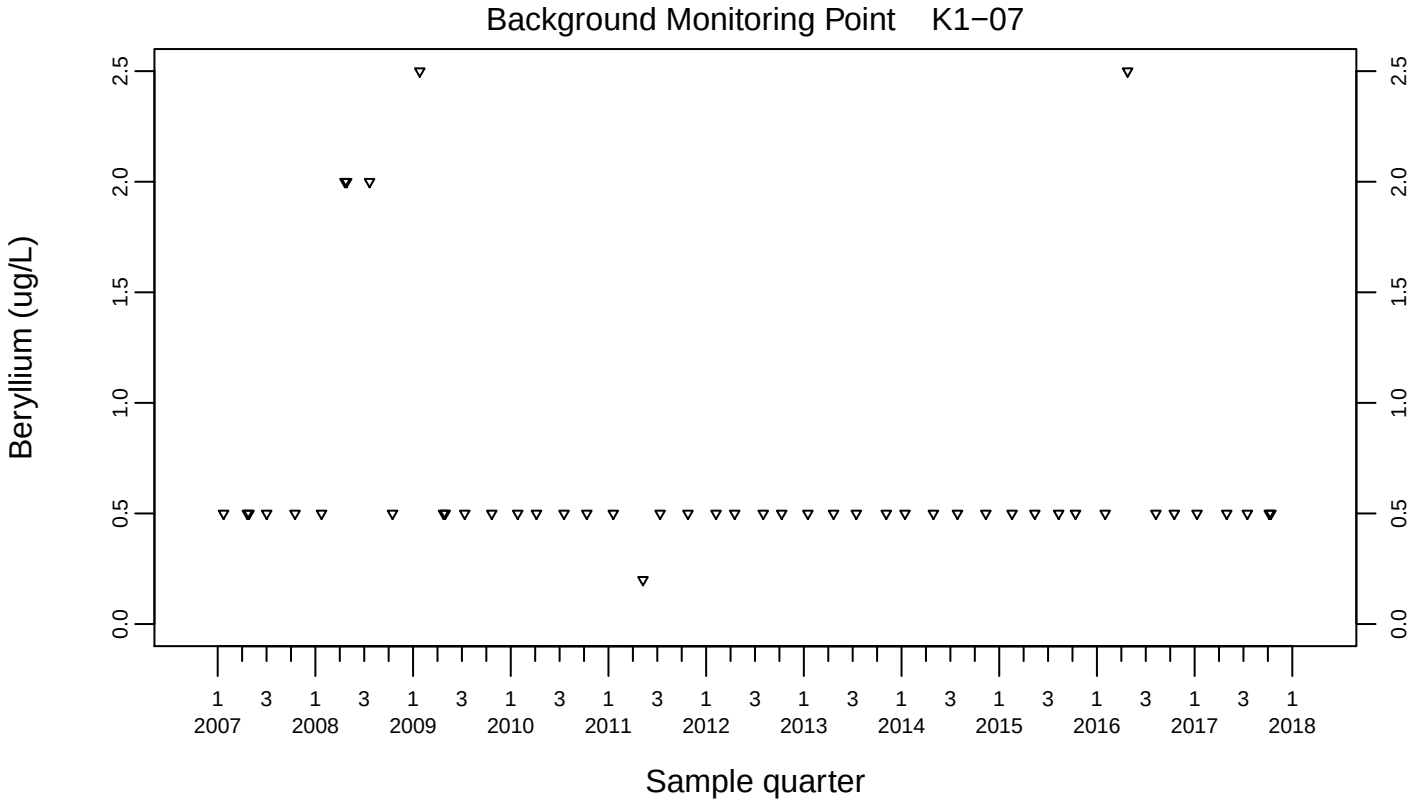

Pit 1 Area
Barium (ug/L)
SL=43
Above RL
Below RL
Detection Monitoring Point K1−05
Barium (ug/L)
SL
Sample quarter
Data omitted
See Table 1

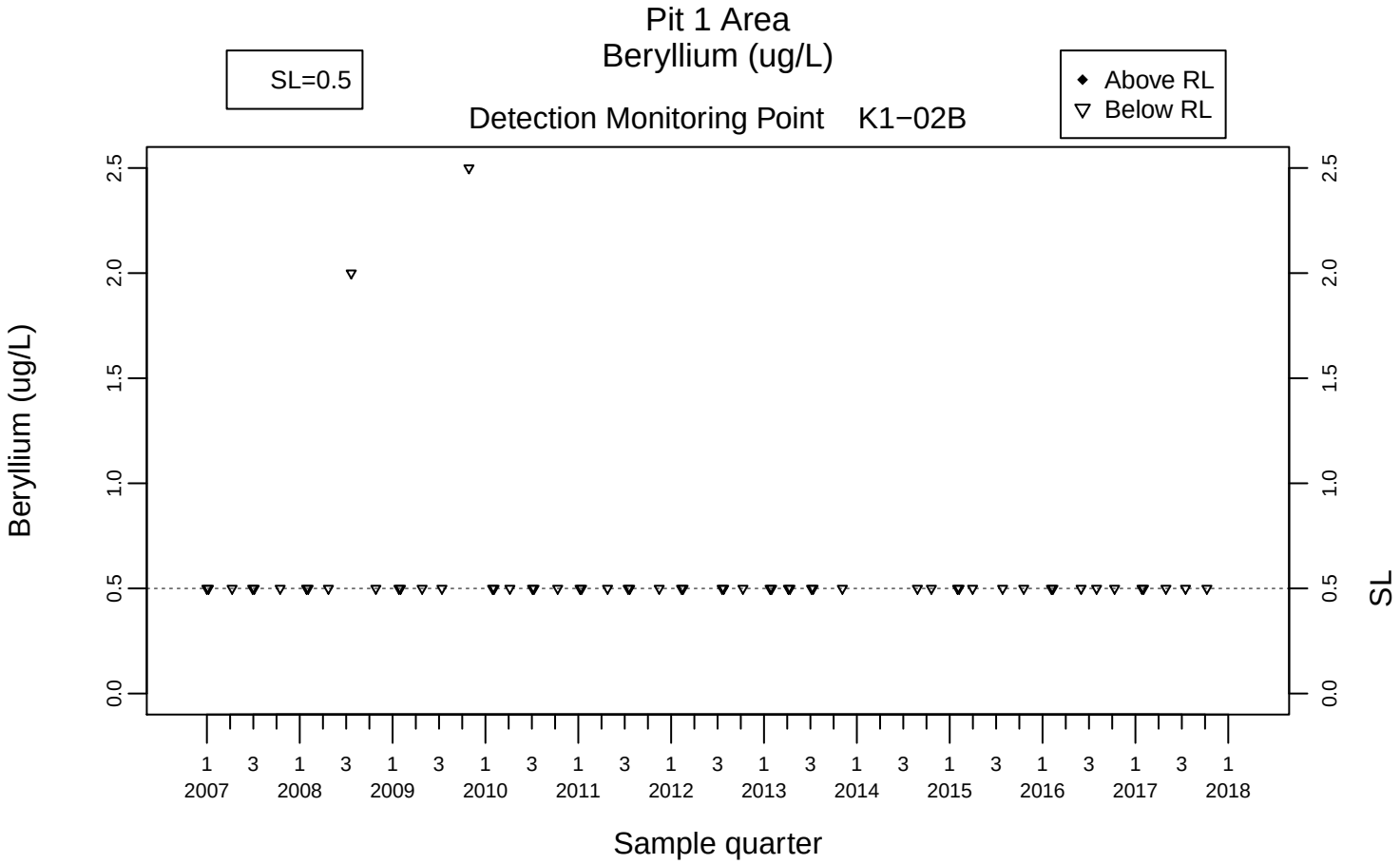

SL=49
Crossgradient Monitoring Point K1−08
Barium (ug/L)
SL
Sample quarter
Data omitted
See Table 1

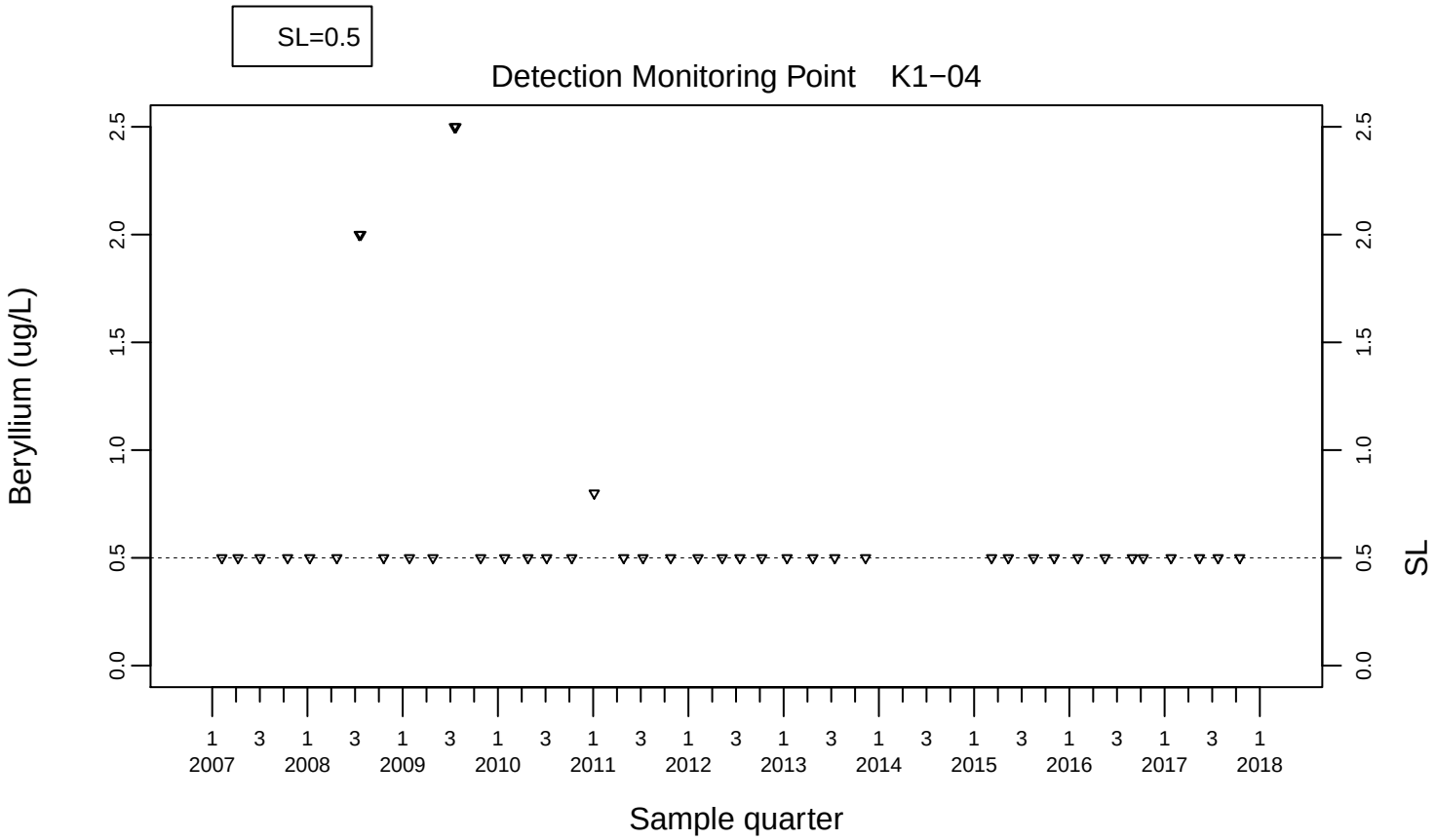

Pit 1 Area
Barium (ug/L)
SL=51
Crossgradient Monitoring Point K1−09
Above RL
Below RL
Barium (ug/L)
SL
Sample quarter
Data omitted
See Table 1

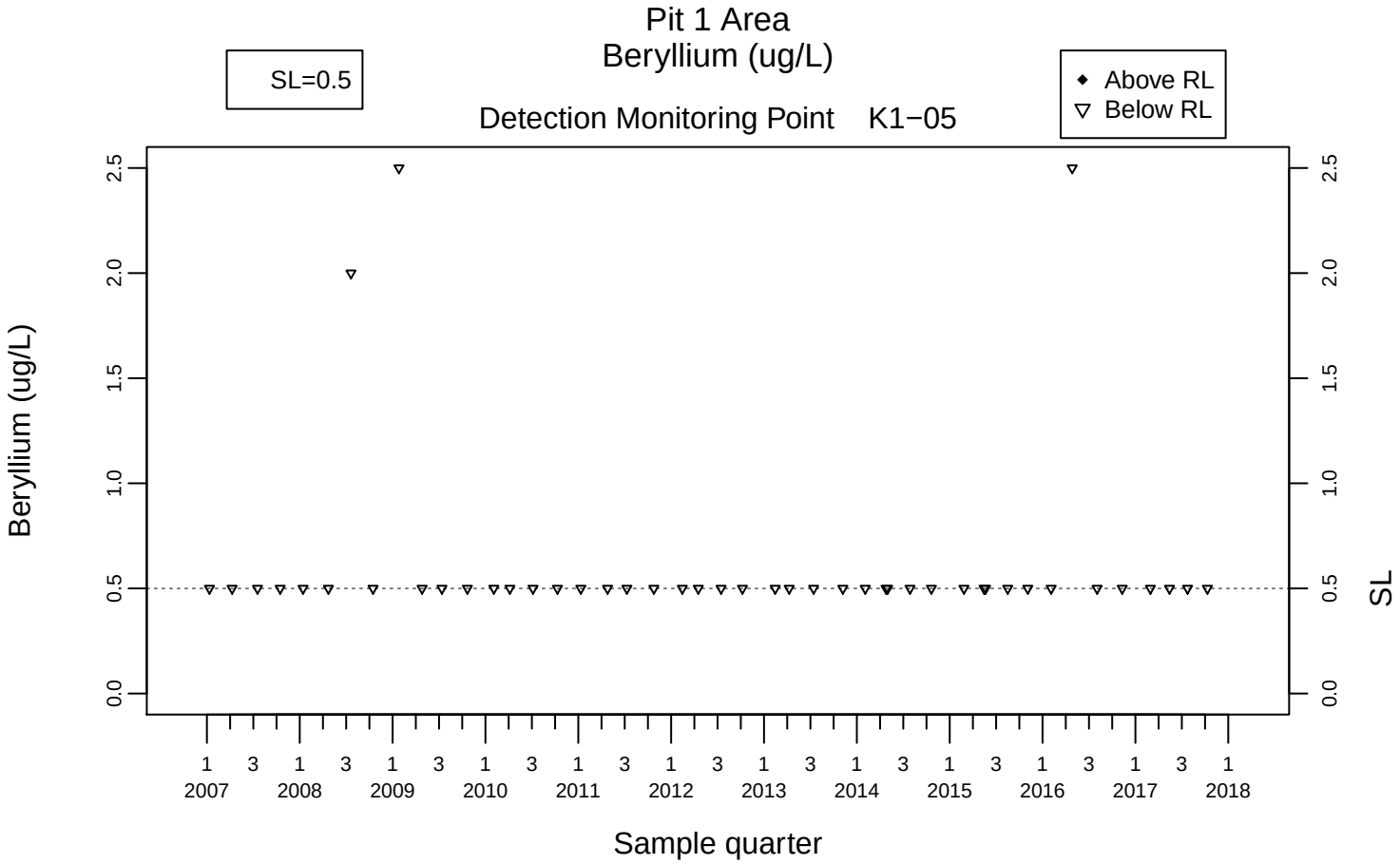

SL=46
Detection Monitoring Point W−PIT1−2326
Barium (ug/L)
SL
Sample quarter

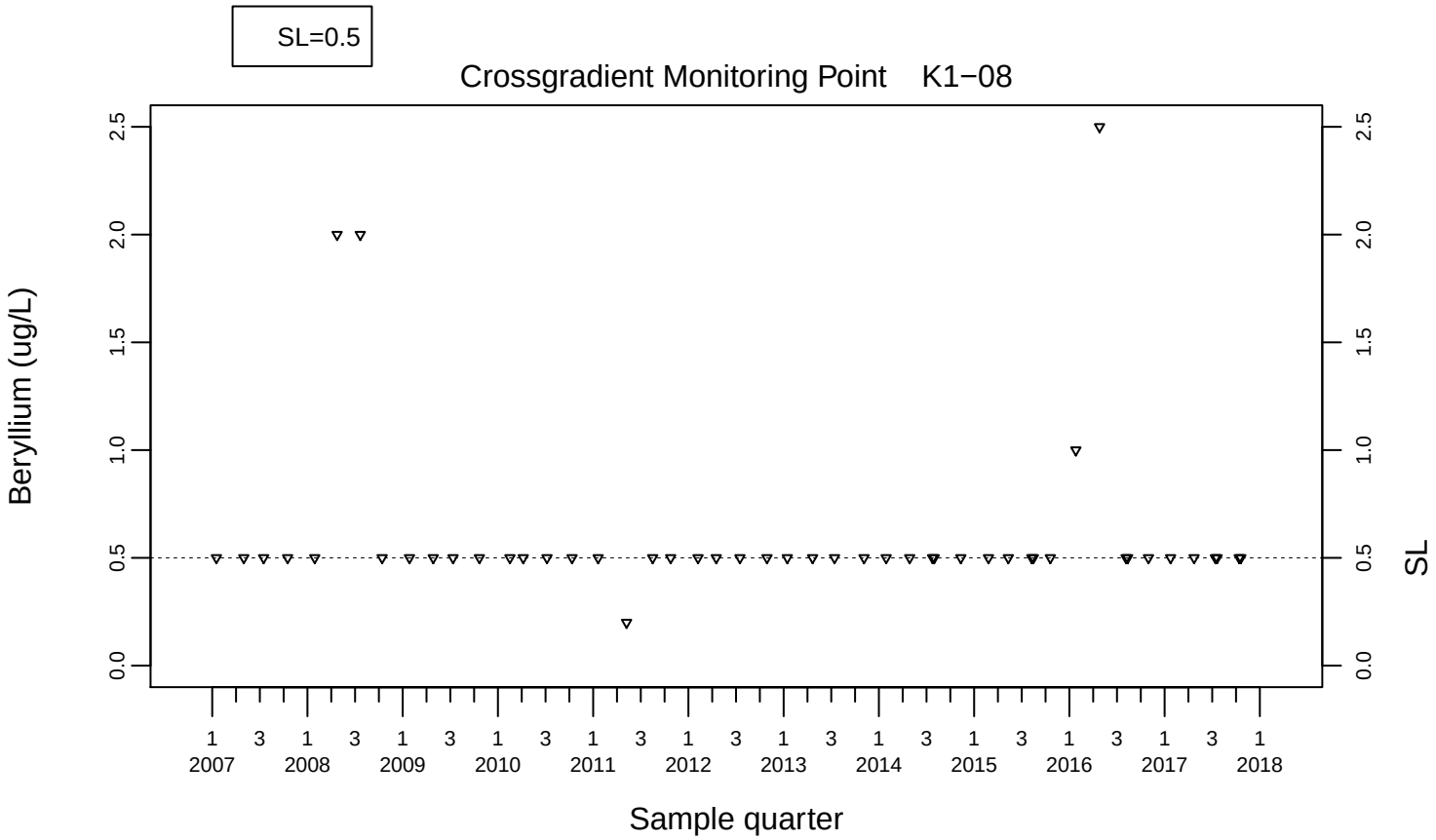

Pit 1 Area
Beryllium (ug/L)
Background Monitoring Point K1−01C
Above RL
Below RL
Beryllium (ug/L)
Sample quarter

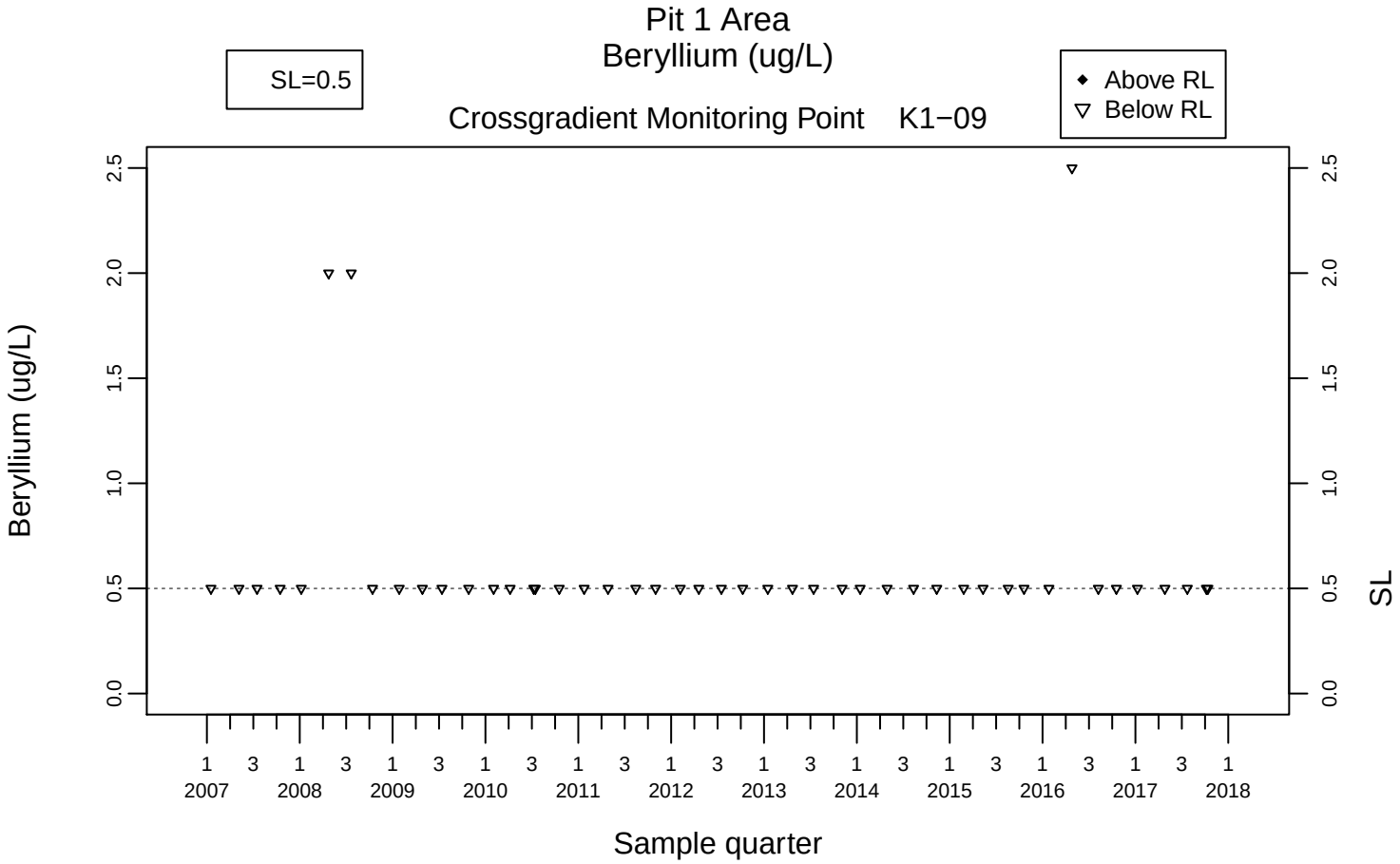

Background Monitoring Point K1−07
Beryllium (ug/L)
Sample quarter

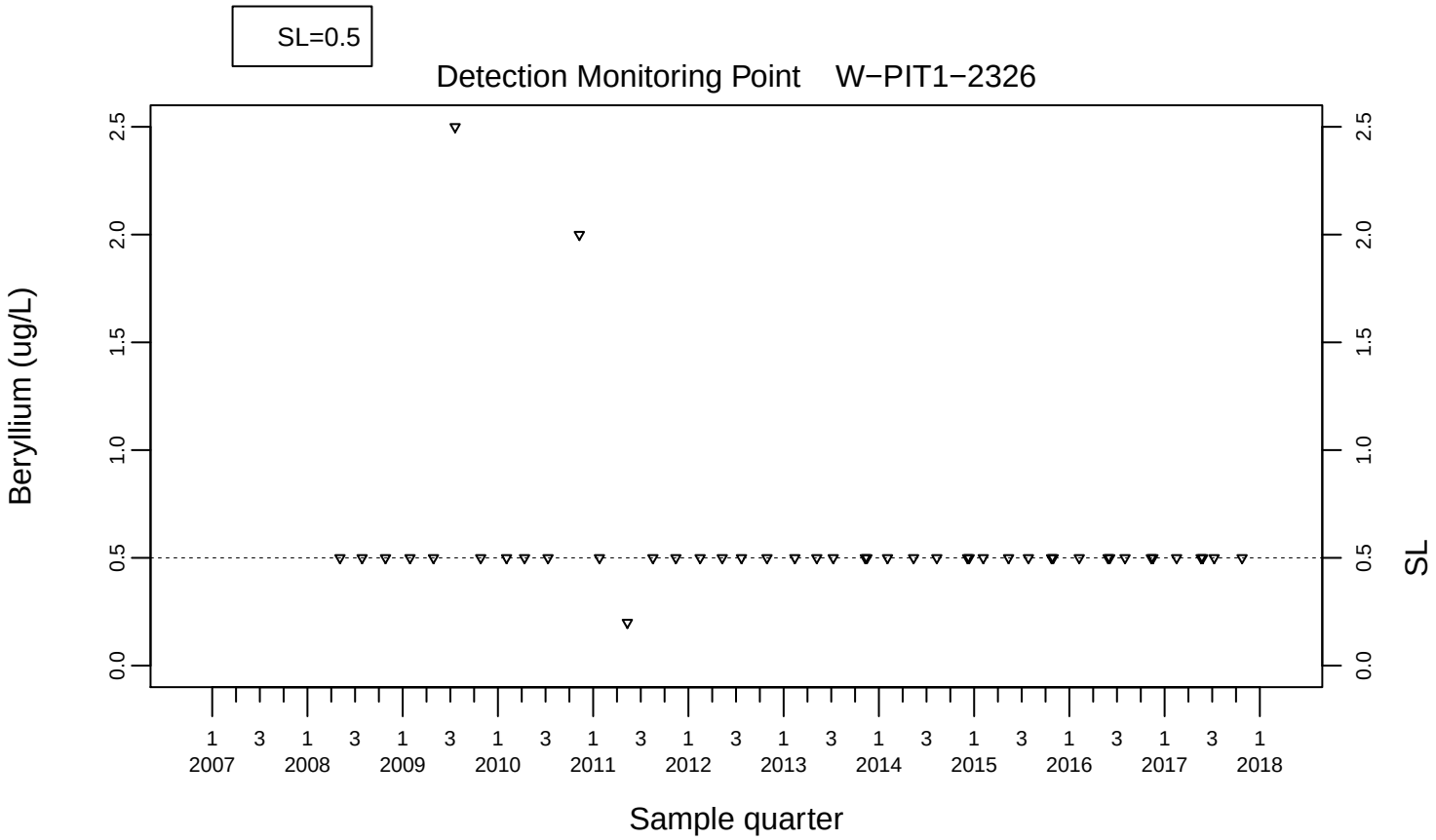

Pit 1 Area
Beryllium (ug/L)
SL=0.5
Above RL
Below RL
Detection Monitoring Point K1−02B
Beryllium (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

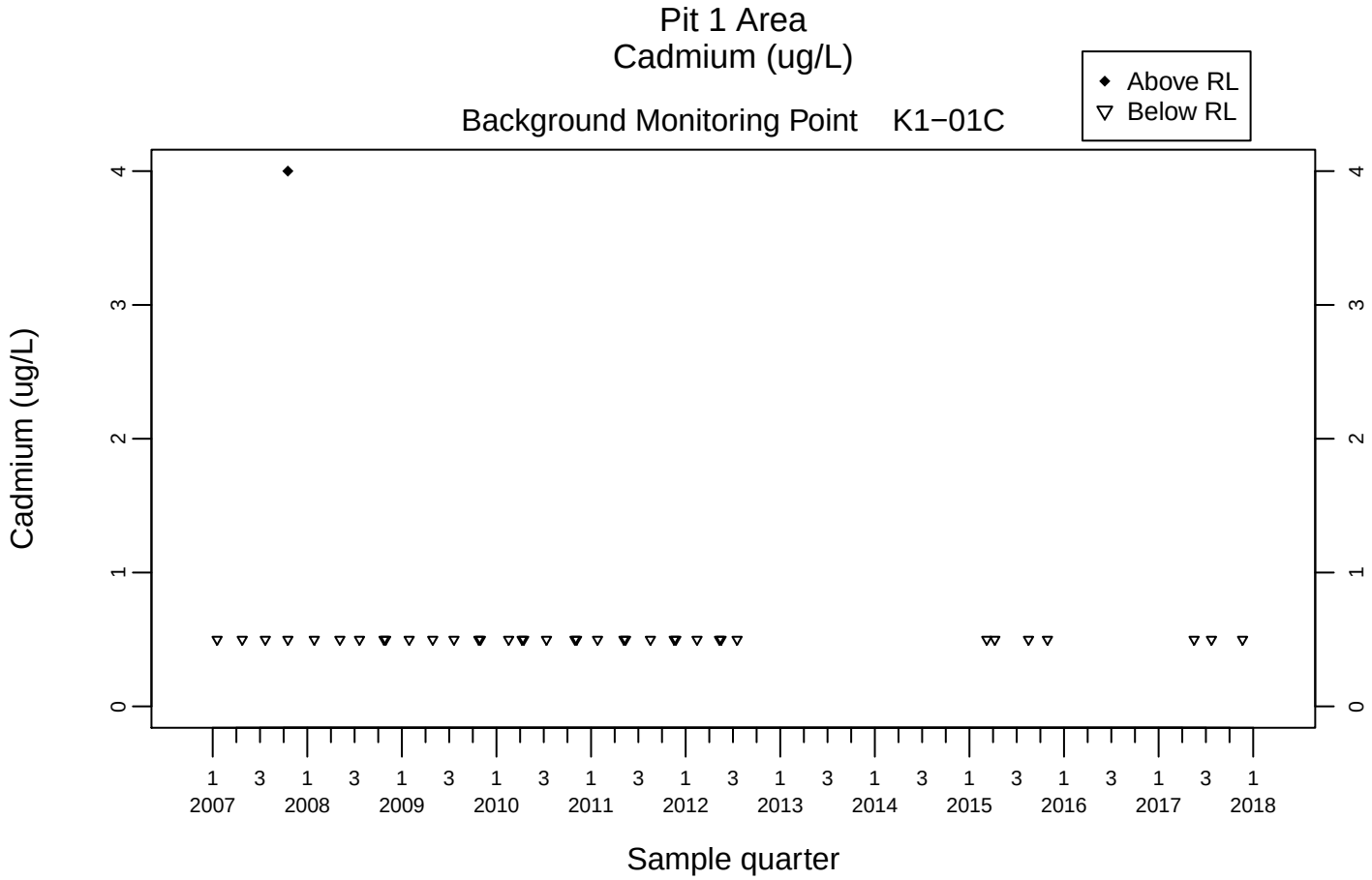

SL=0.5
Detection Monitoring Point K1−04
Beryllium (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

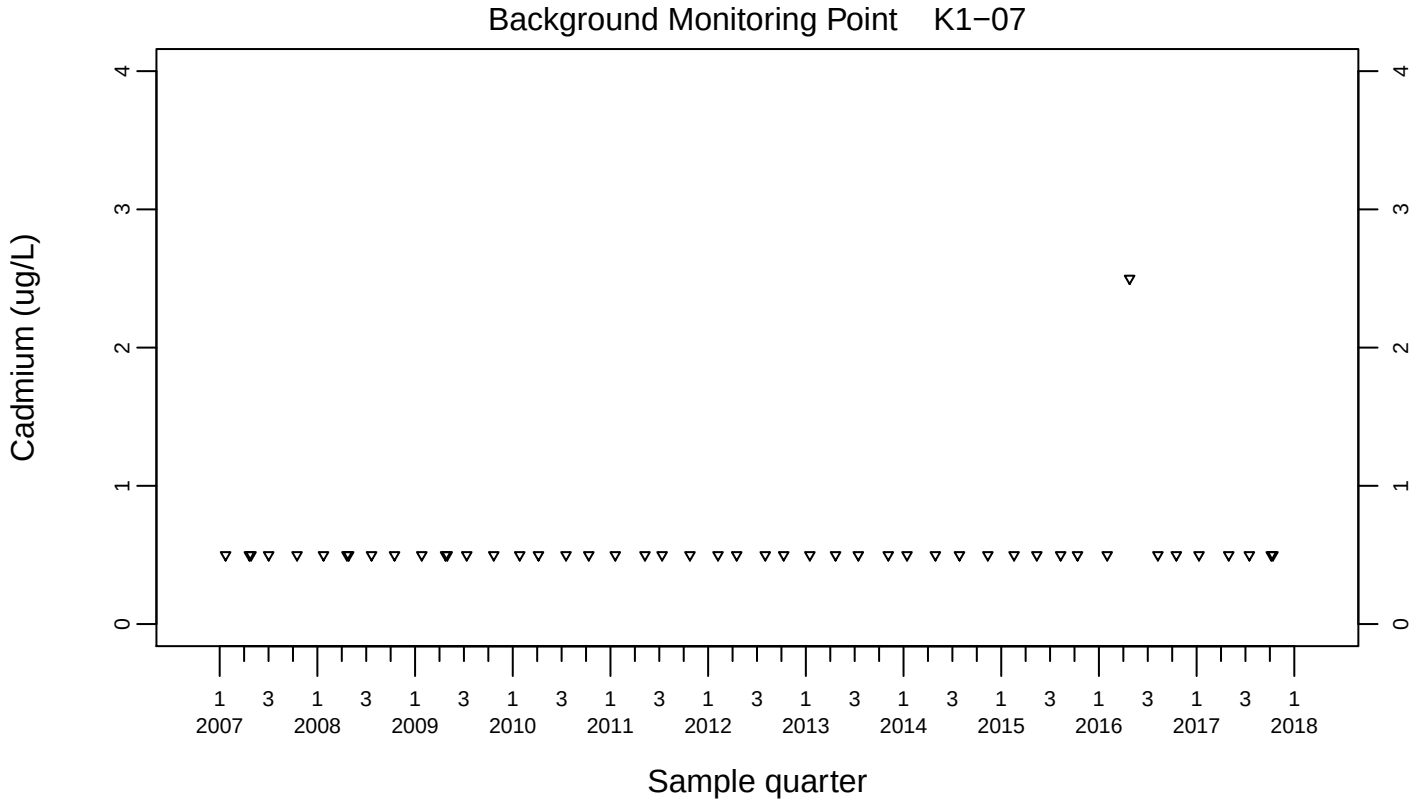

Pit 1 Area
Beryllium (ug/L)
SL=0.5
Above RL
Below RL
Detection Monitoring Point K1−05
Beryllium (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

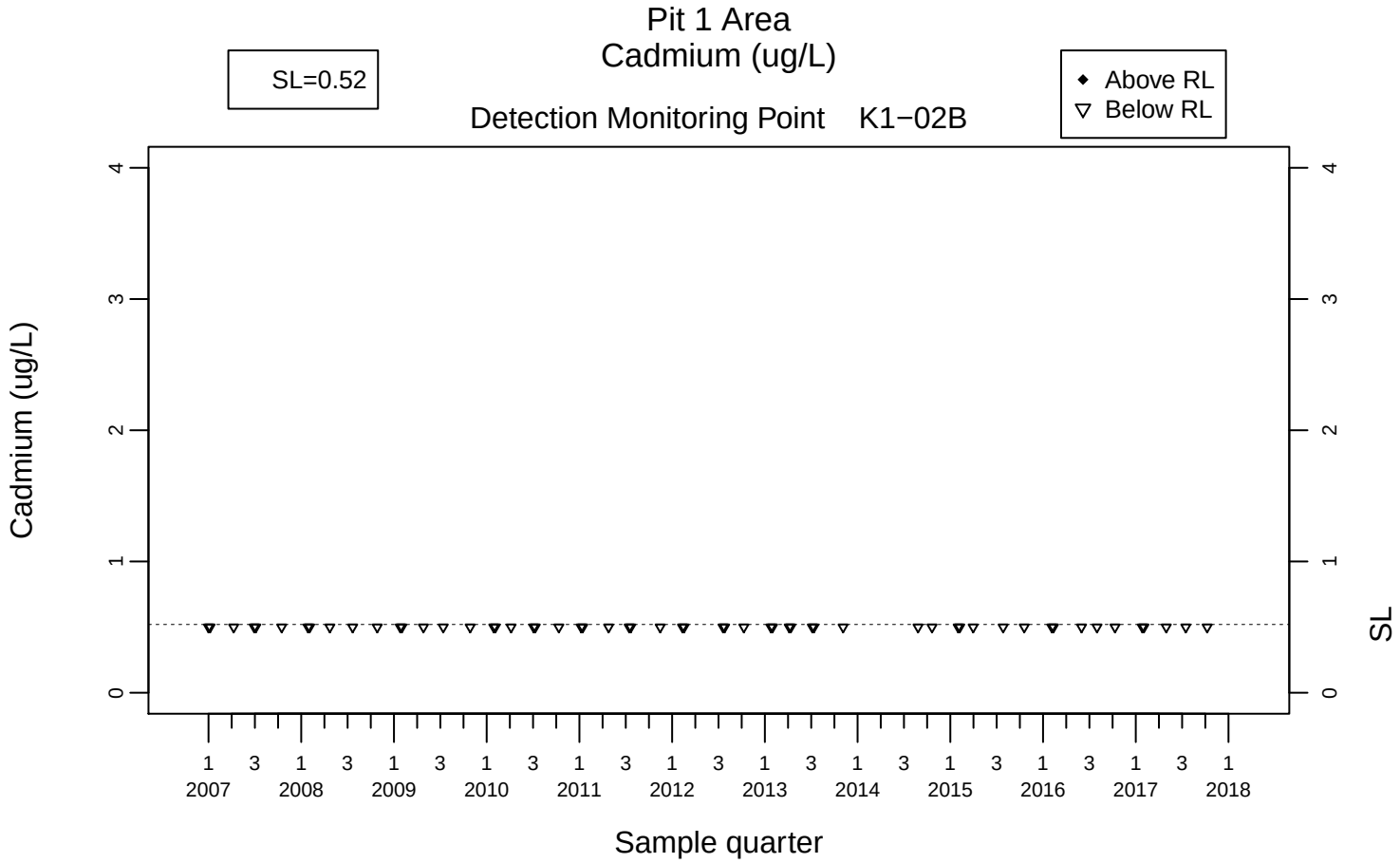

SL=0.5
Crossgradient Monitoring Point K1−08
Beryllium (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

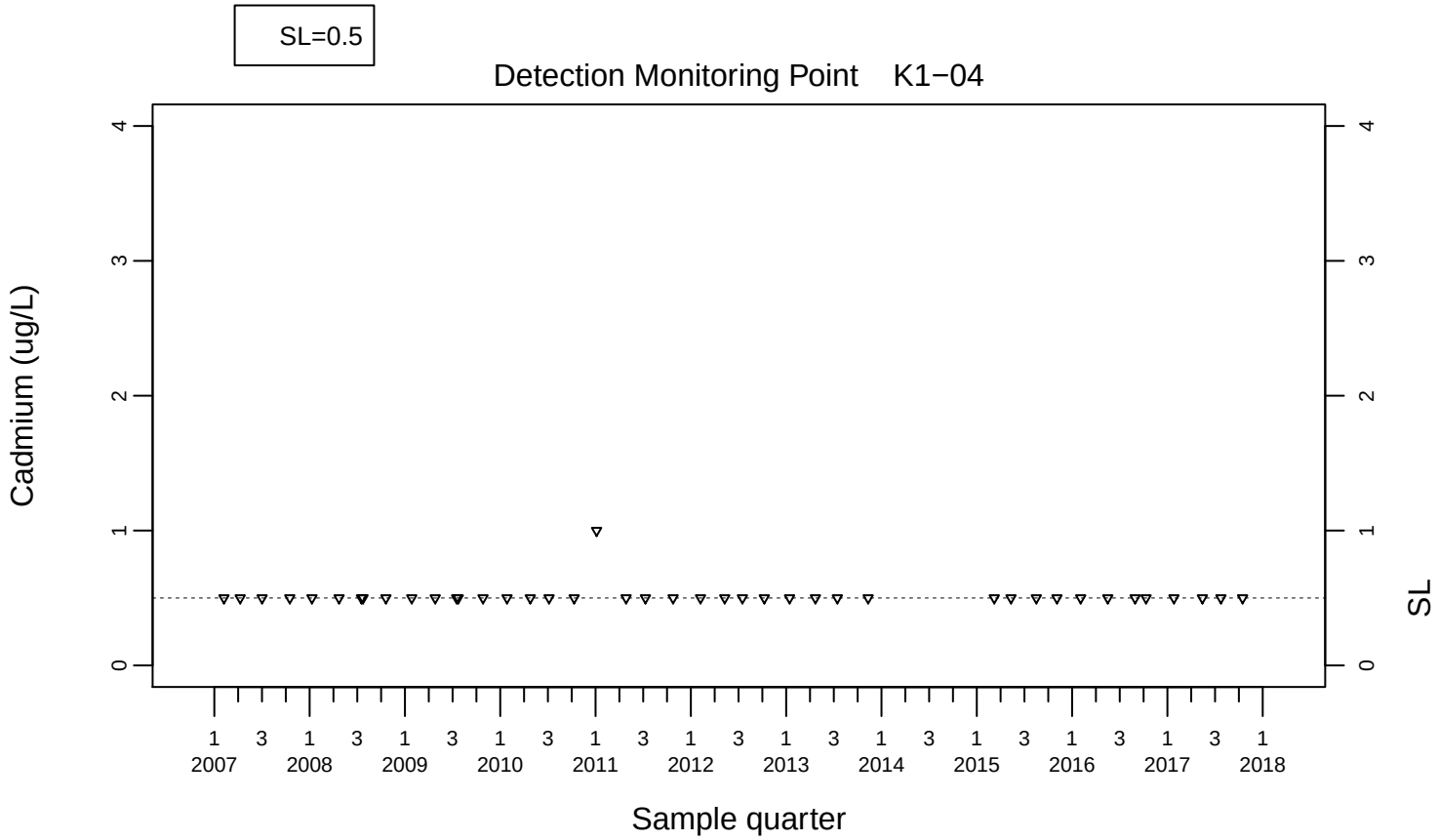

Pit 1 Area
Beryllium (ug/L)
SL=0.5
Crossgradient Monitoring Point K1−09
Above RL
Below RL
Beryllium (ug/L)
SL
Sample quarter

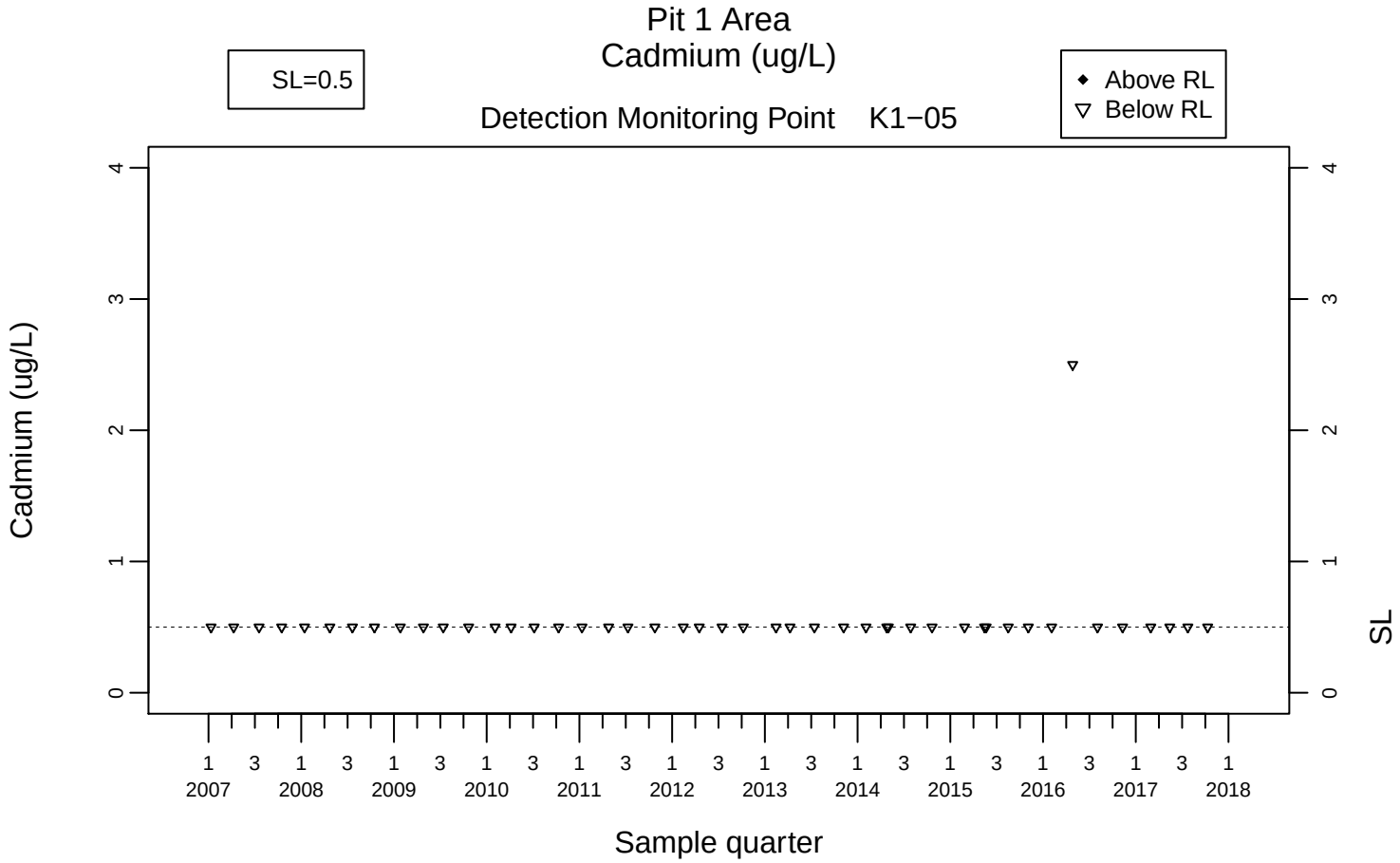

SL=0.5
Detection Monitoring Point W−PIT1−2326
Beryllium (ug/L)
SL
Sample quarter

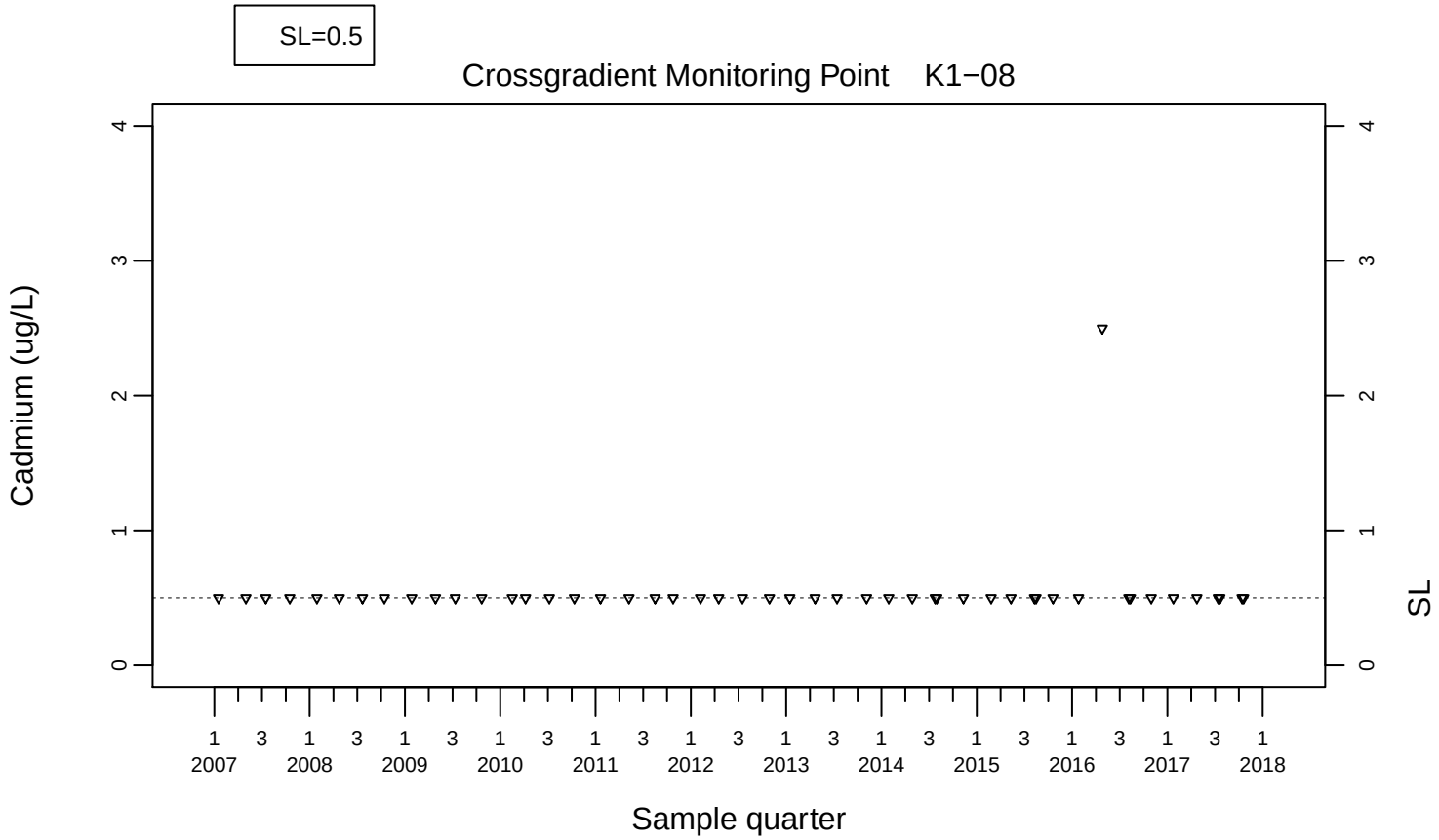

Pit 1 Area
Cadmium (ug/L)
Background Monitoring Point K1−01C
Above RL
Below RL
Cadmium (ug/L)
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

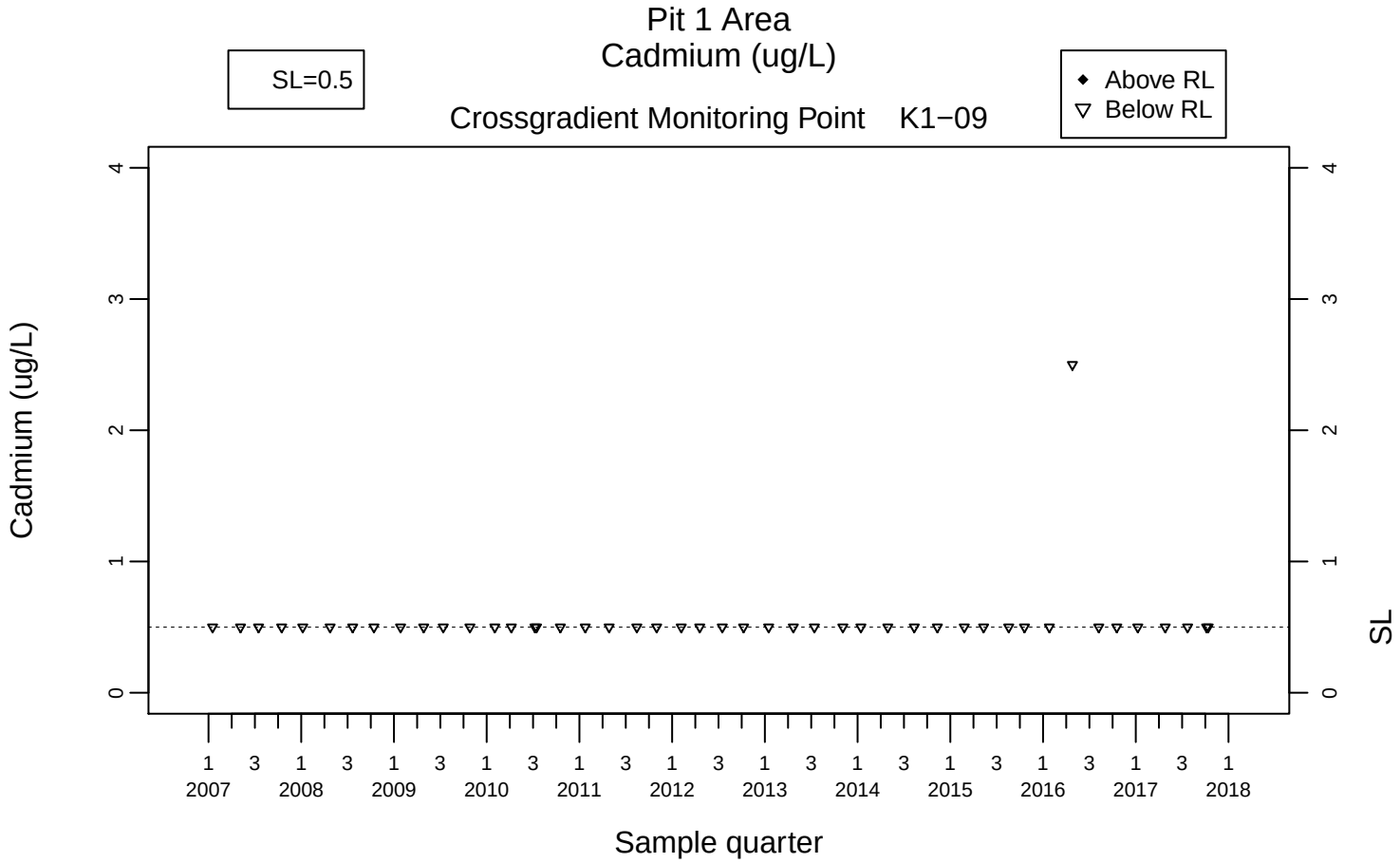

Background Monitoring Point K1−07
Cadmium (ug/L)
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

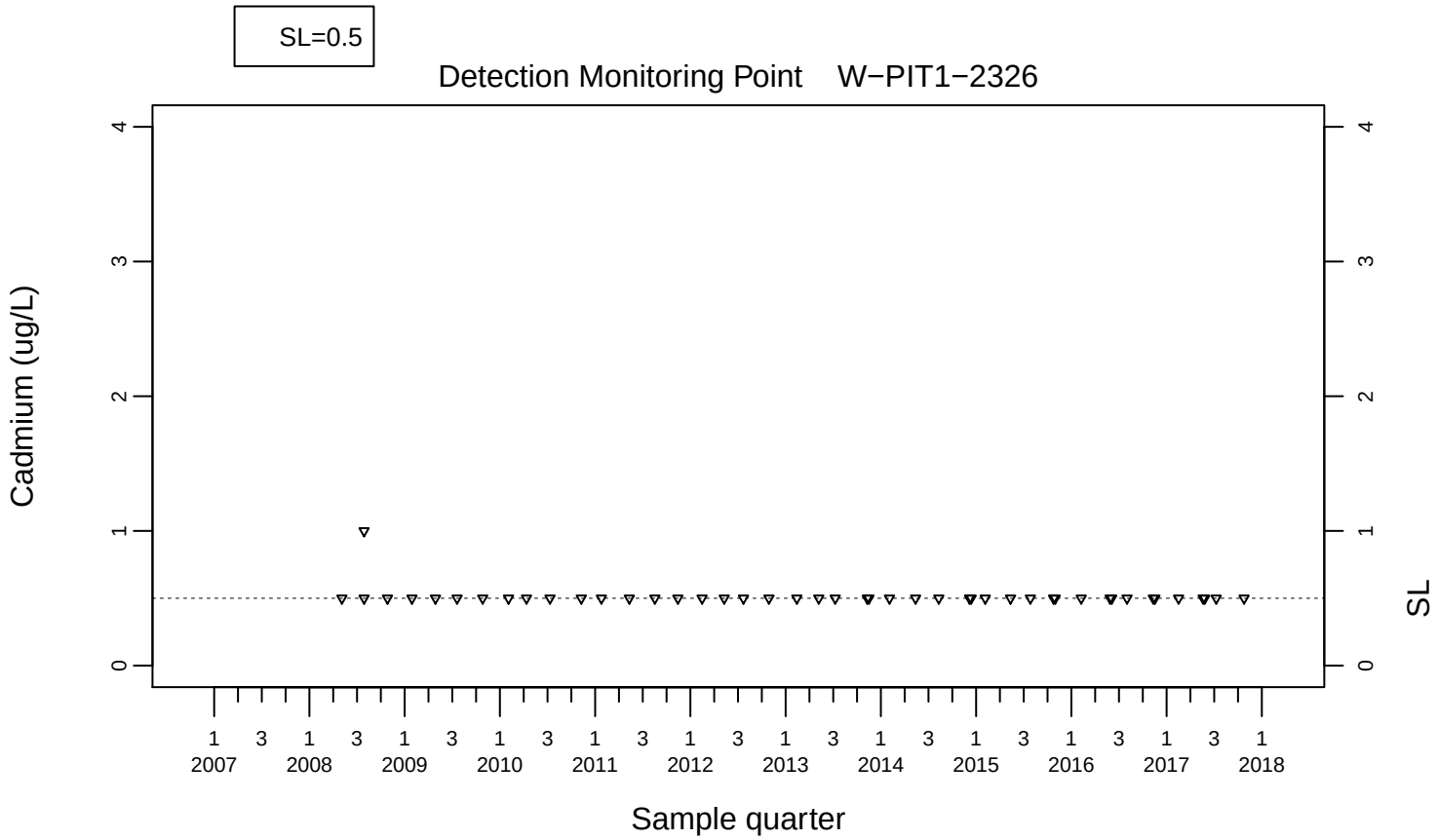

Pit 1 Area
Cadmium (ug/L)
SL=0.52
Above RL
Below RL
Detection Monitoring Point K1−02B
Cadmium (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

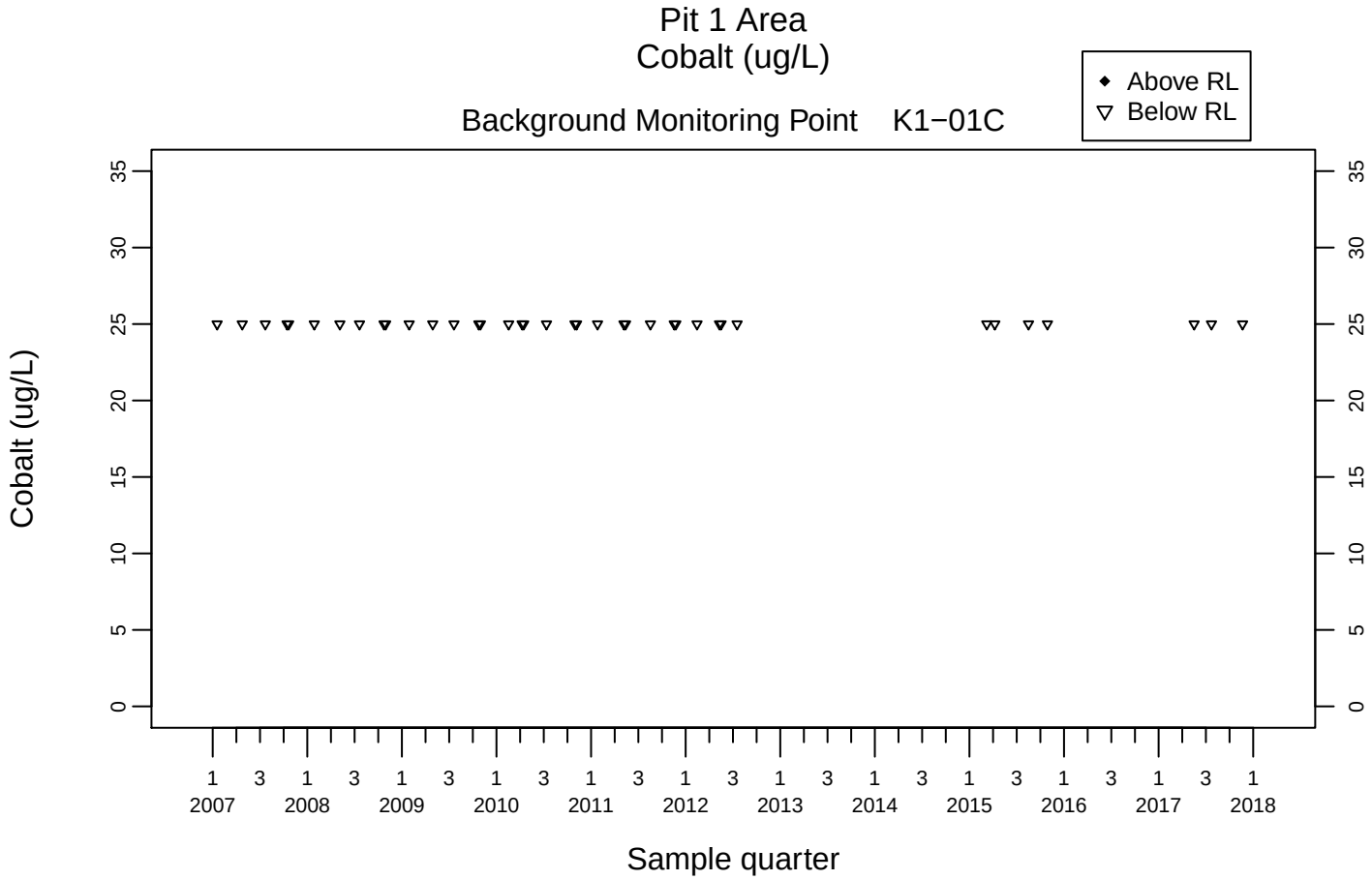

SL=0.5
Detection Monitoring Point K1−04
Cadmium (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

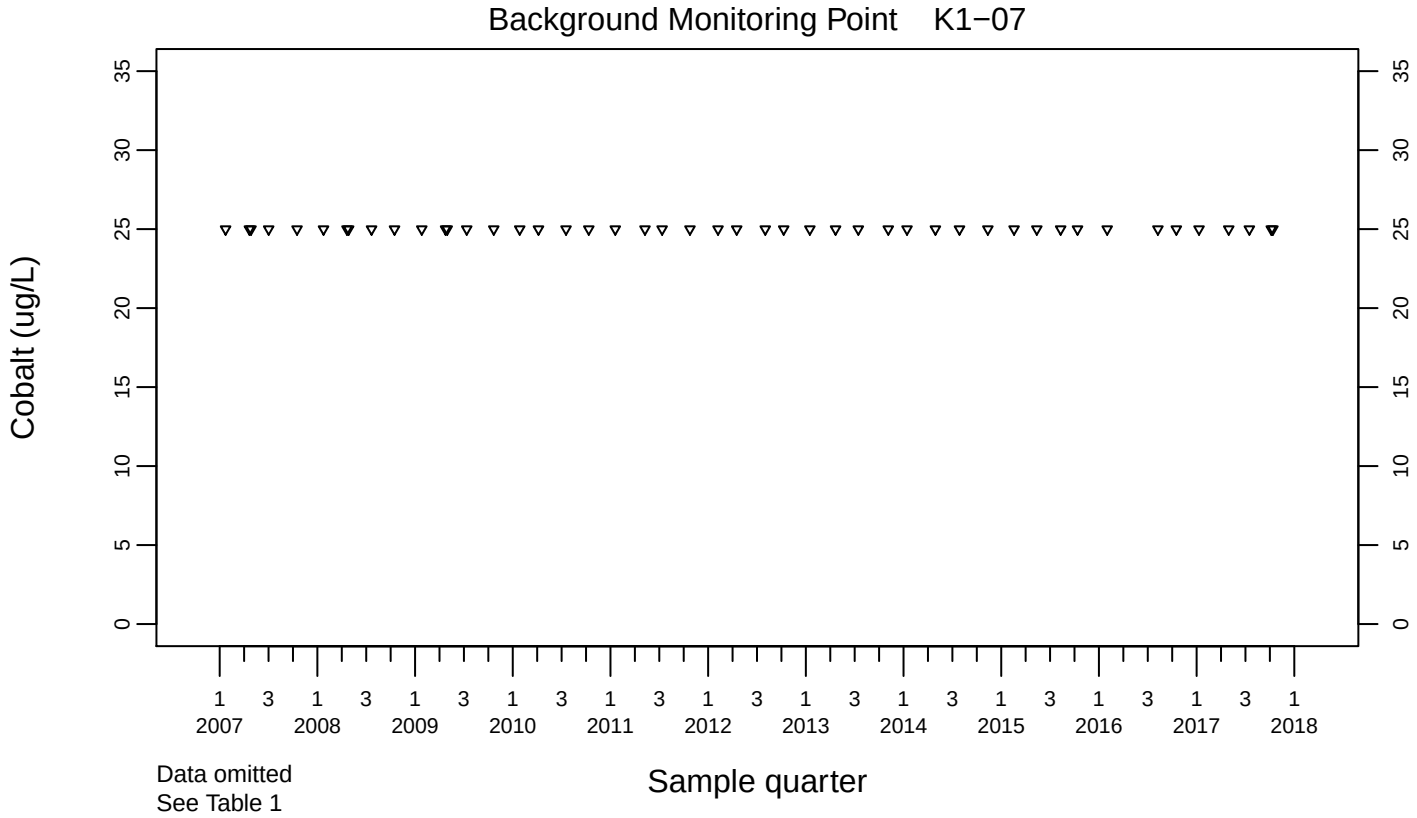

Pit 1 Area
Cadmium (ug/L)
SL=0.5
Above RL
Below RL
Detection Monitoring Point K1−05
Cadmium (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018


SL=0.5
Crossgradient Monitoring Point K1−08
Cadmium (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

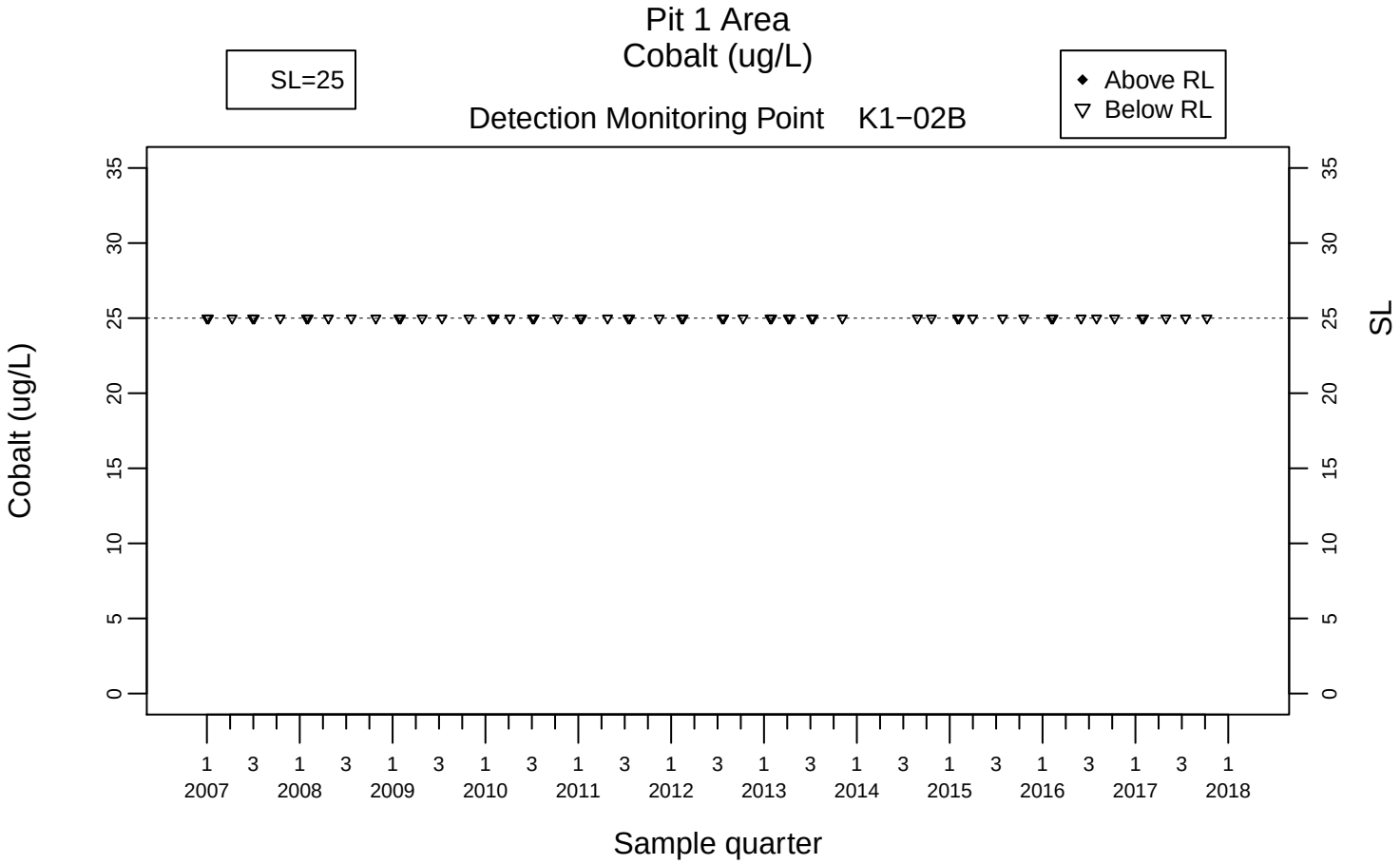

Pit 1 Area
Cadmium (ug/L)
SL=0.5
Crossgradient Monitoring Point K1−09
Above RL
Below RL
Cadmium (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

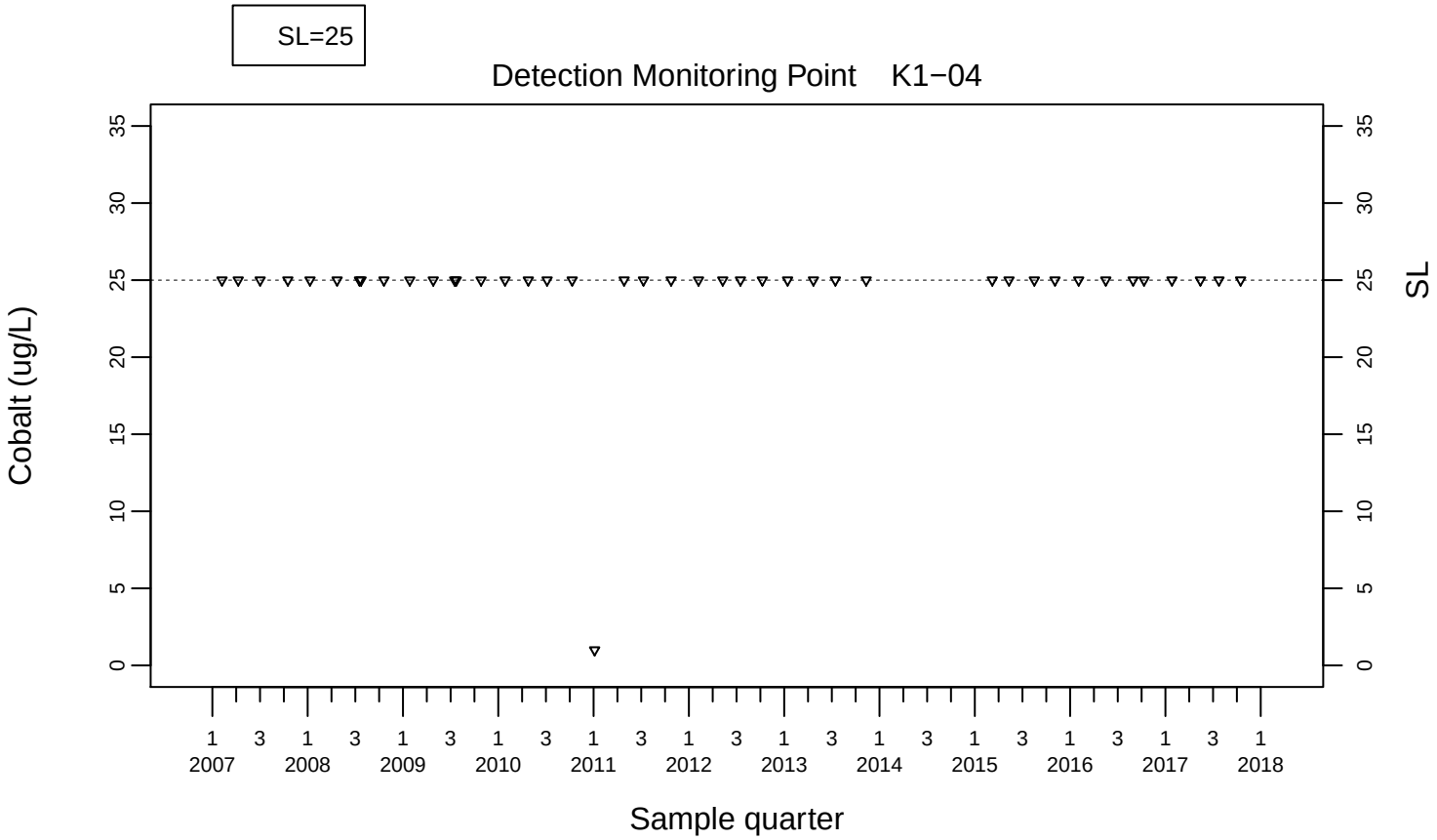

SL=0.5
Detection Monitoring Point W−PIT1−2326
Cadmium (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

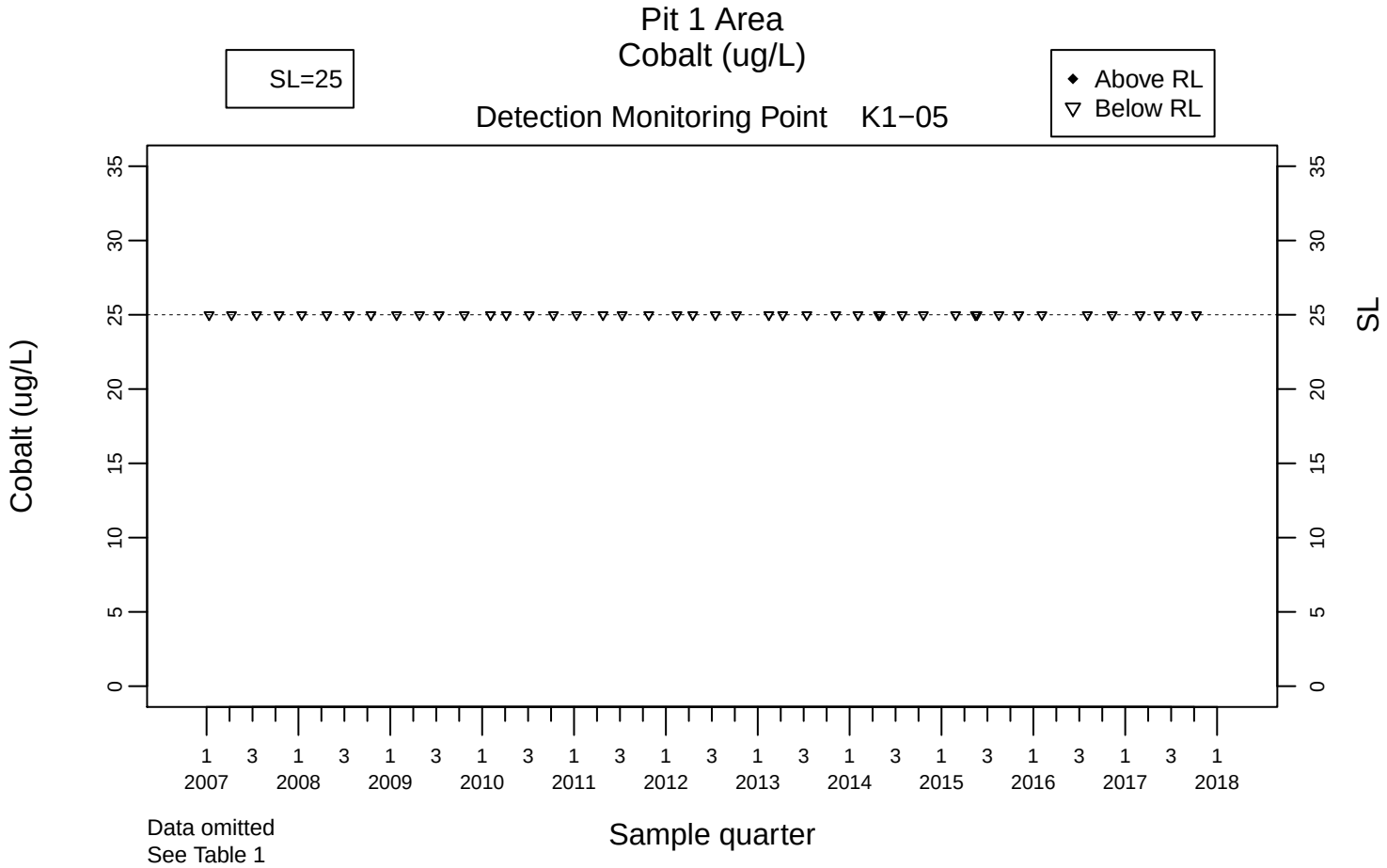


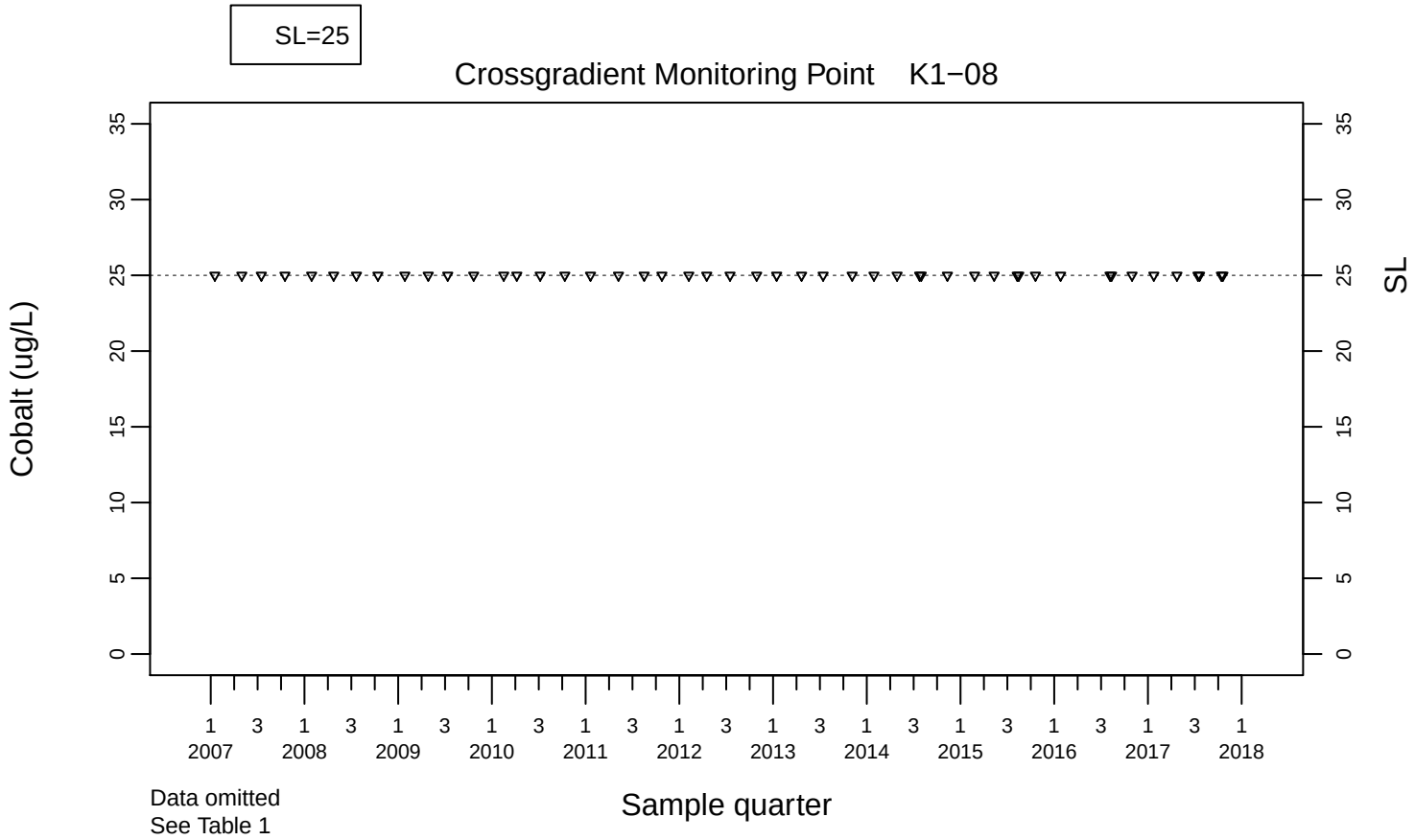


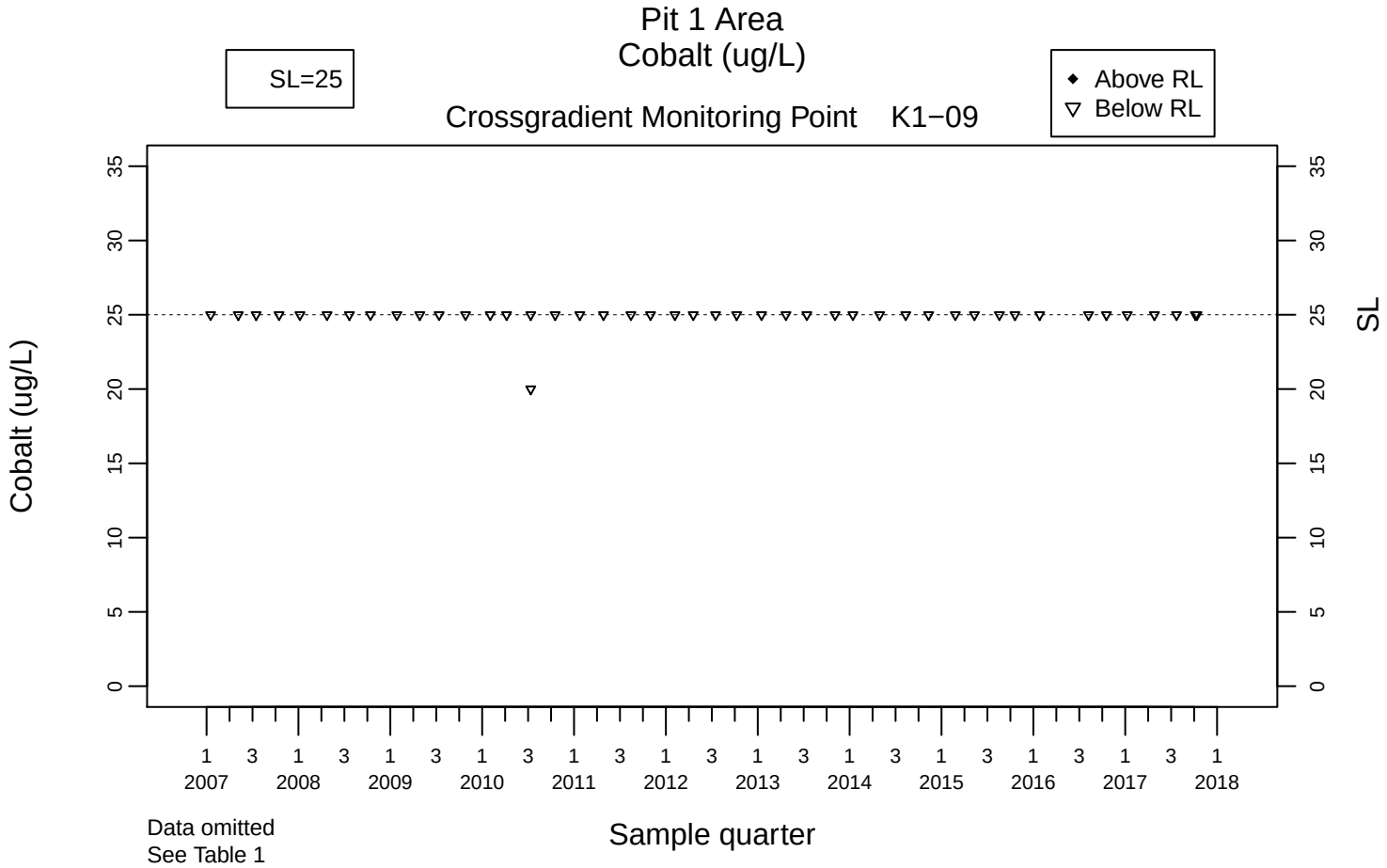
Data omitted
See Table 1

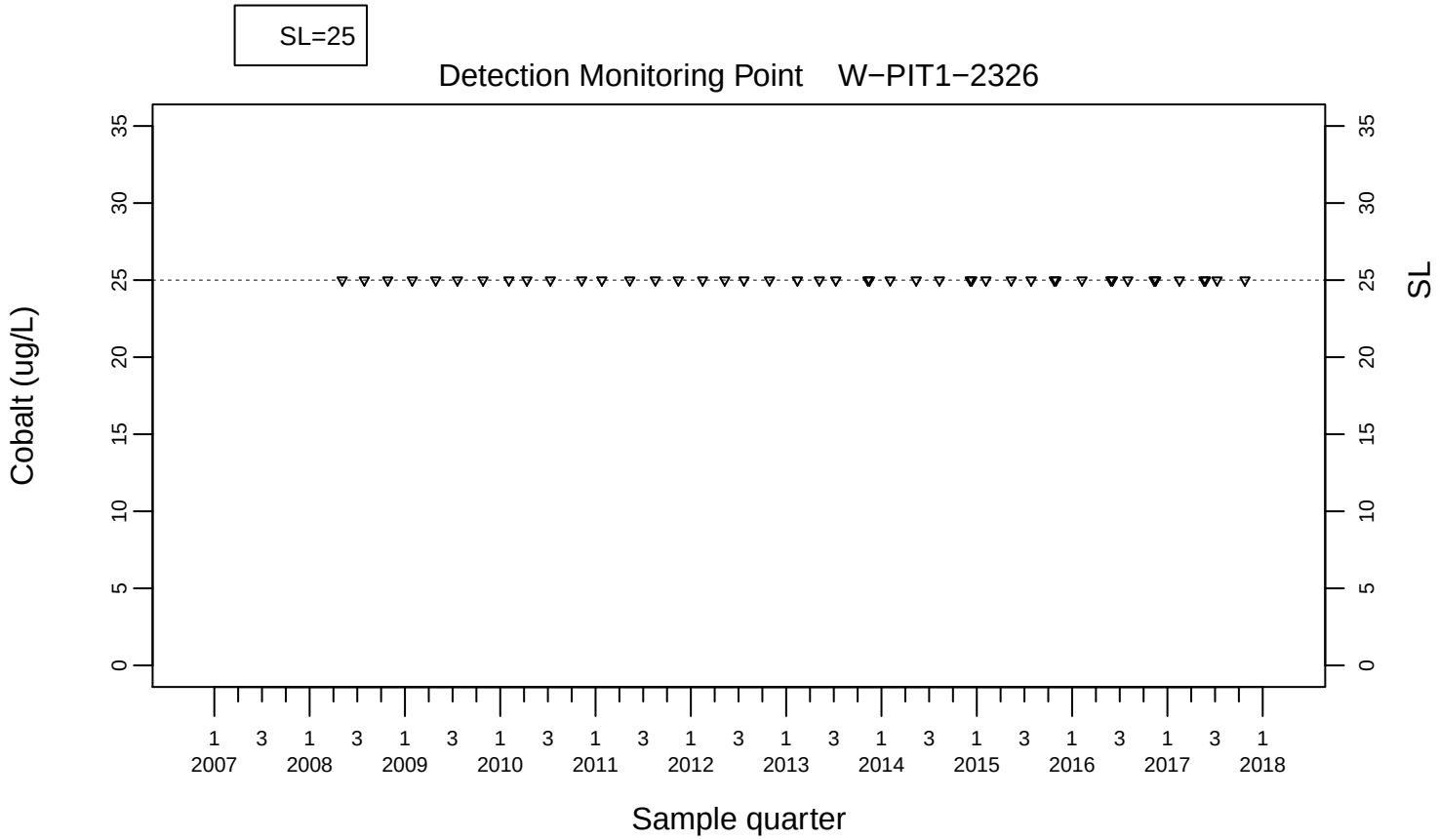

Pit 1 Area
Cobalt (ug/L)
SL=25
Above RL
Below RL
Detection Monitoring Point K1−02B
Cobalt (ug/L)
SL
Sample quarter

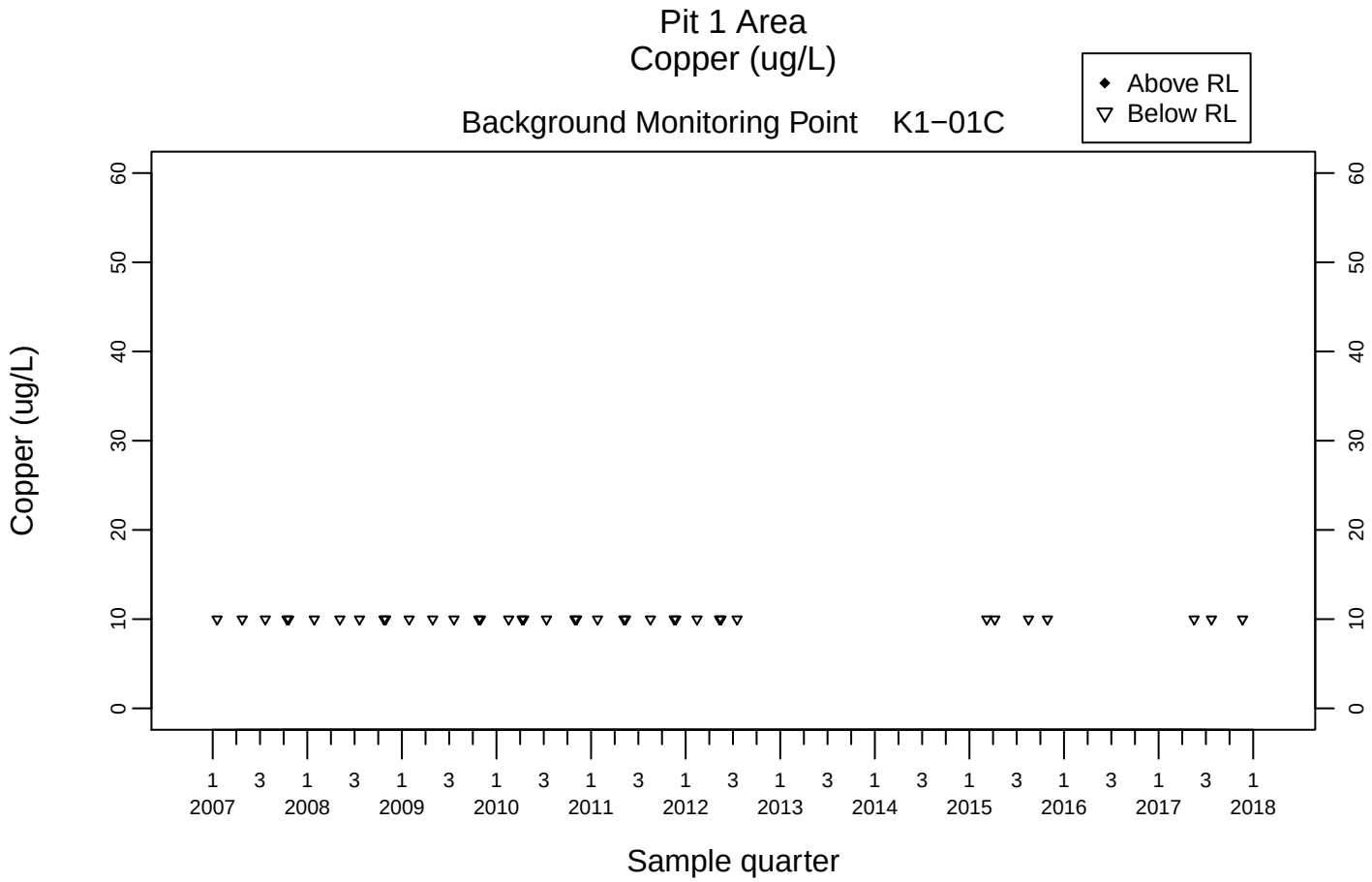

SL=25
Detection Monitoring Point K1−04
Cobalt (ug/L)
SL
Sample quarter

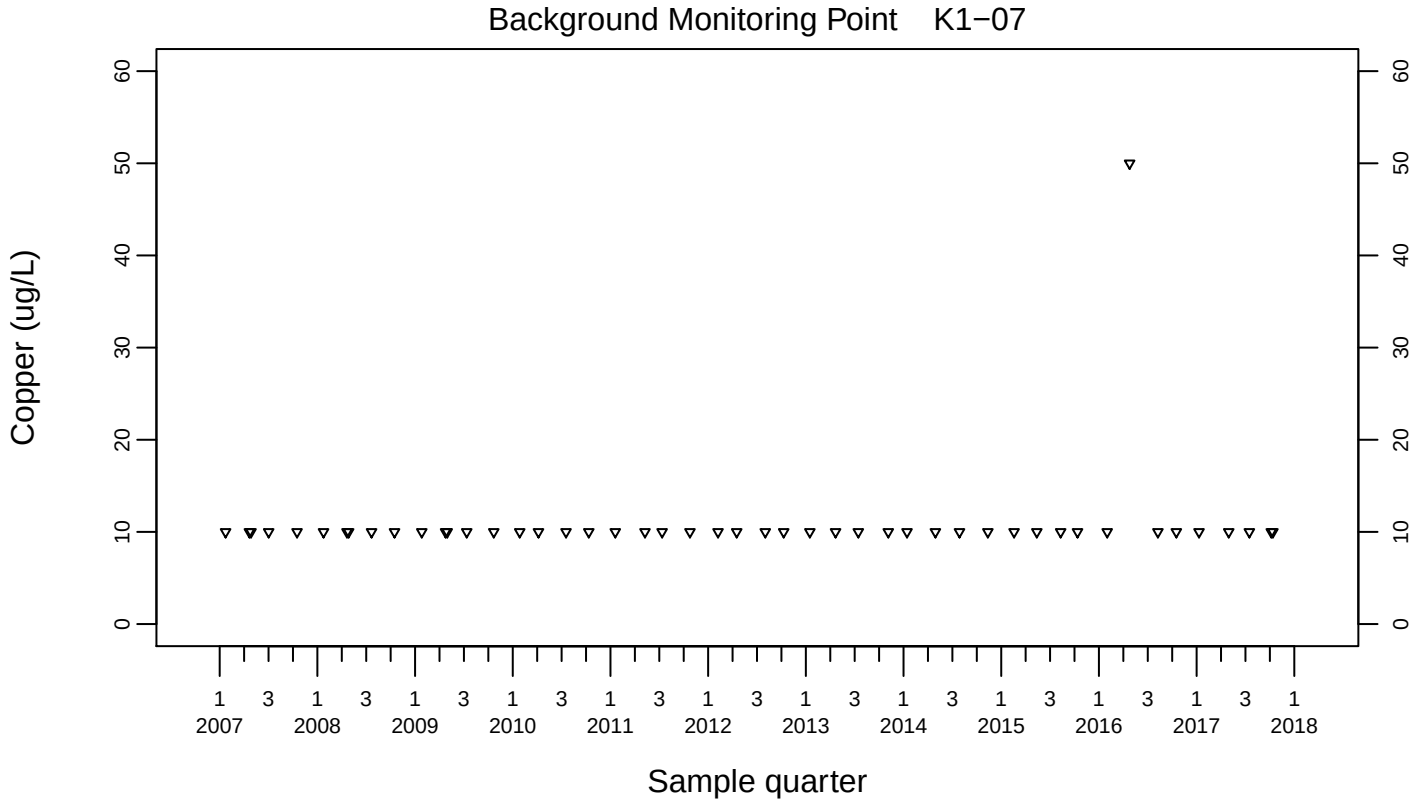

Pit 1 Area
Cobalt (ug/L)
SL=25
Above RL
Below RL
Detection Monitoring Point K1−05
Cobalt (ug/L)
SL
Sample quarter
Data omitted
See Table 1

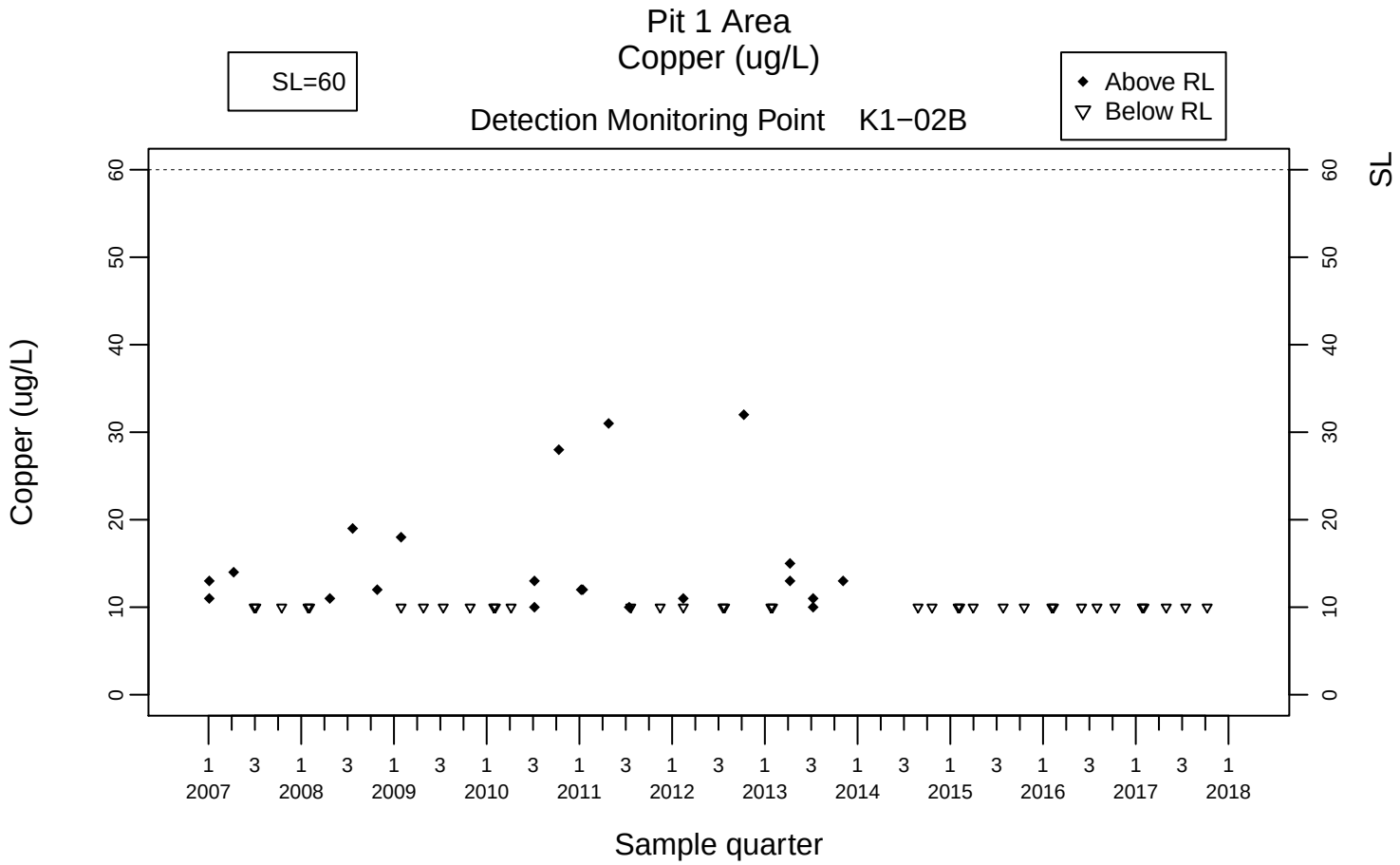

SL=25
Crossgradient Monitoring Point K1−08
Cobalt (ug/L)
SL
Sample quarter
Data omitted
See Table 1

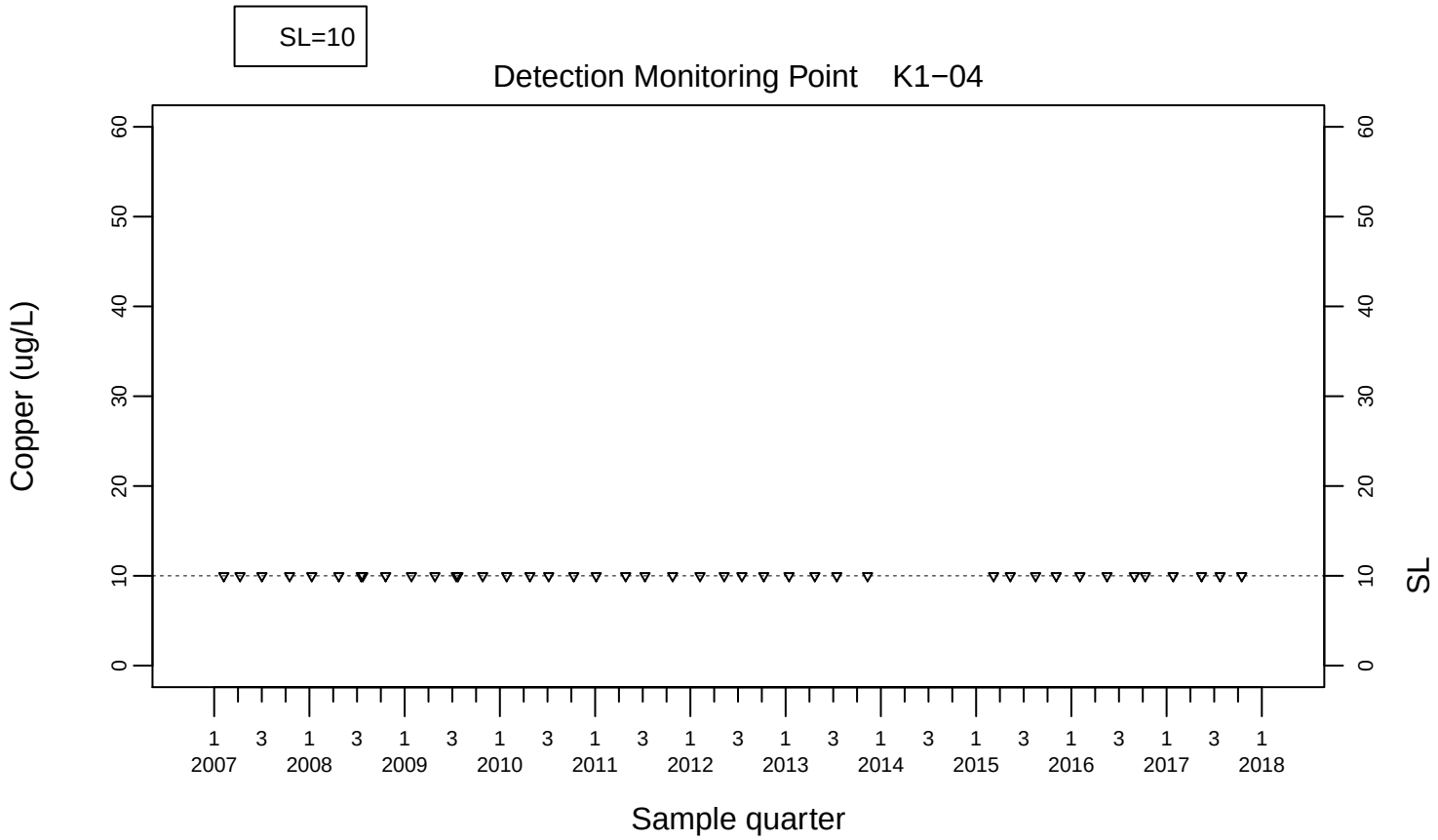

Pit 1 Area
Cobalt (ug/L)
SL=25
Above RL
Below RL
Crossgradient Monitoring Point K1−09
Cobalt (ug/L)
SL
Sample quarter
Data omitted
See Table 1

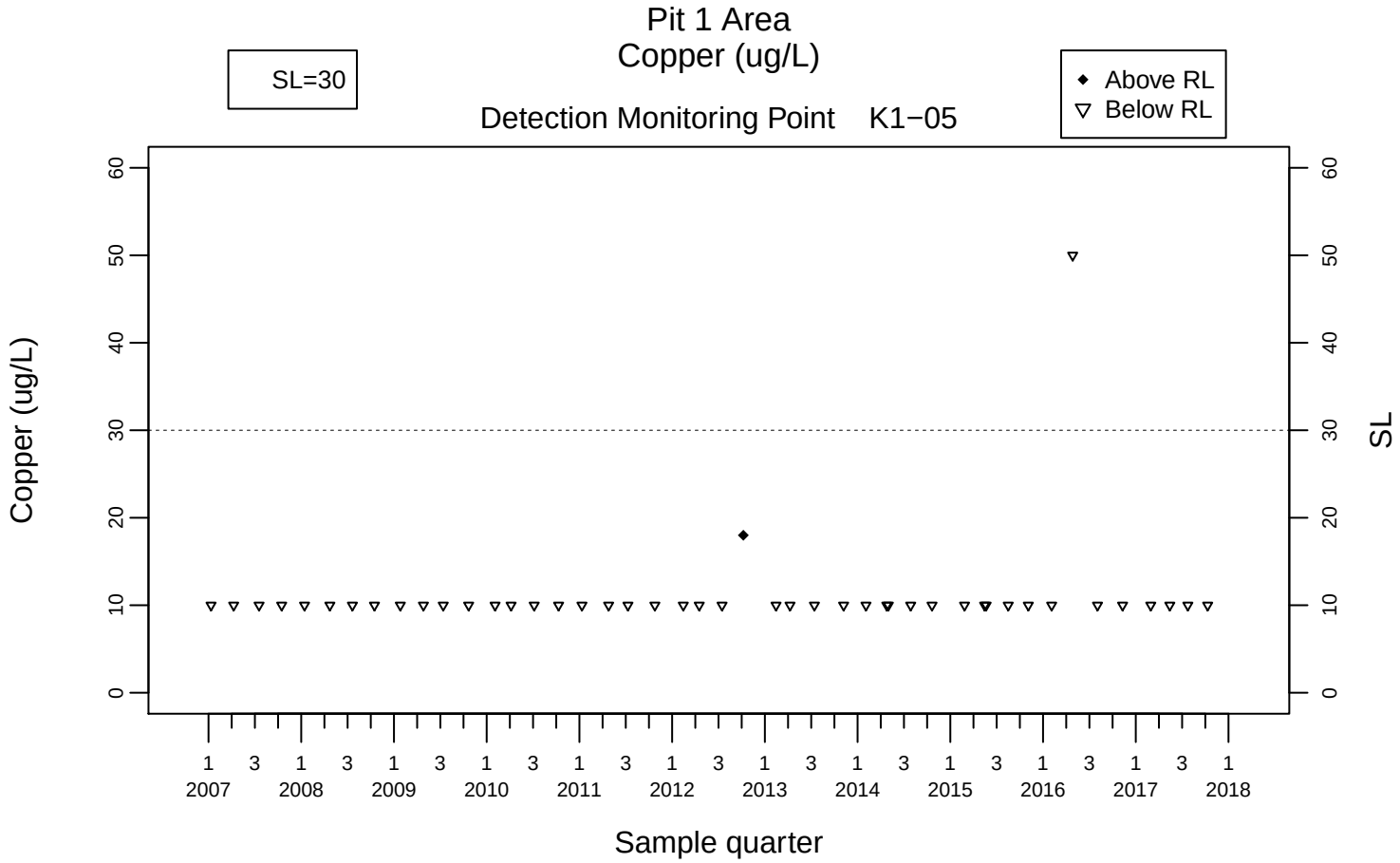

SL=25
Detection Monitoring Point W−PIT1−2326
Cobalt (ug/L)
SL
Sample quarter

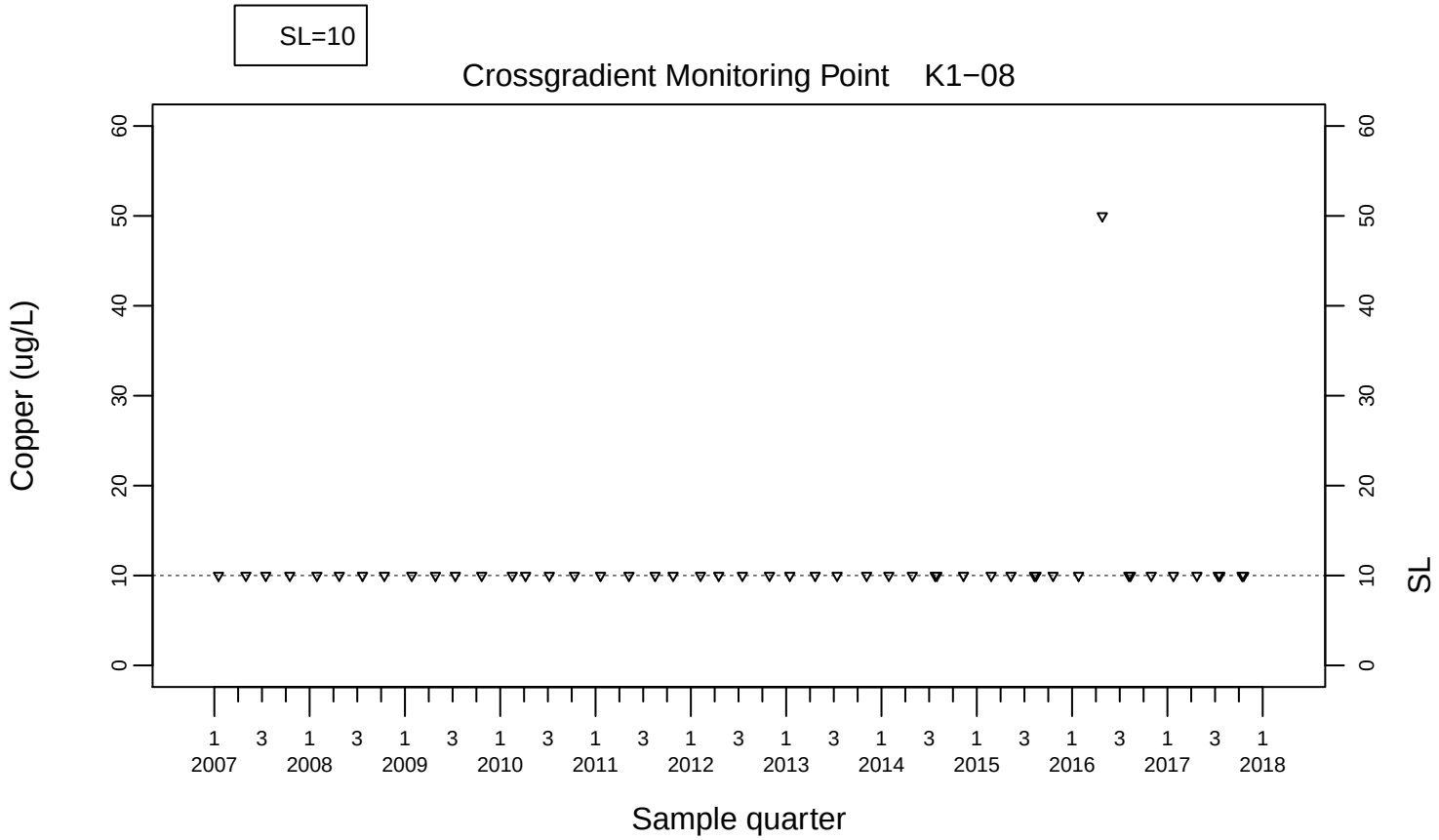

Pit 1 Area
Copper (ug/L)
Background Monitoring Point K1−01C
Above RL
Below RL
Copper (ug/L)
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

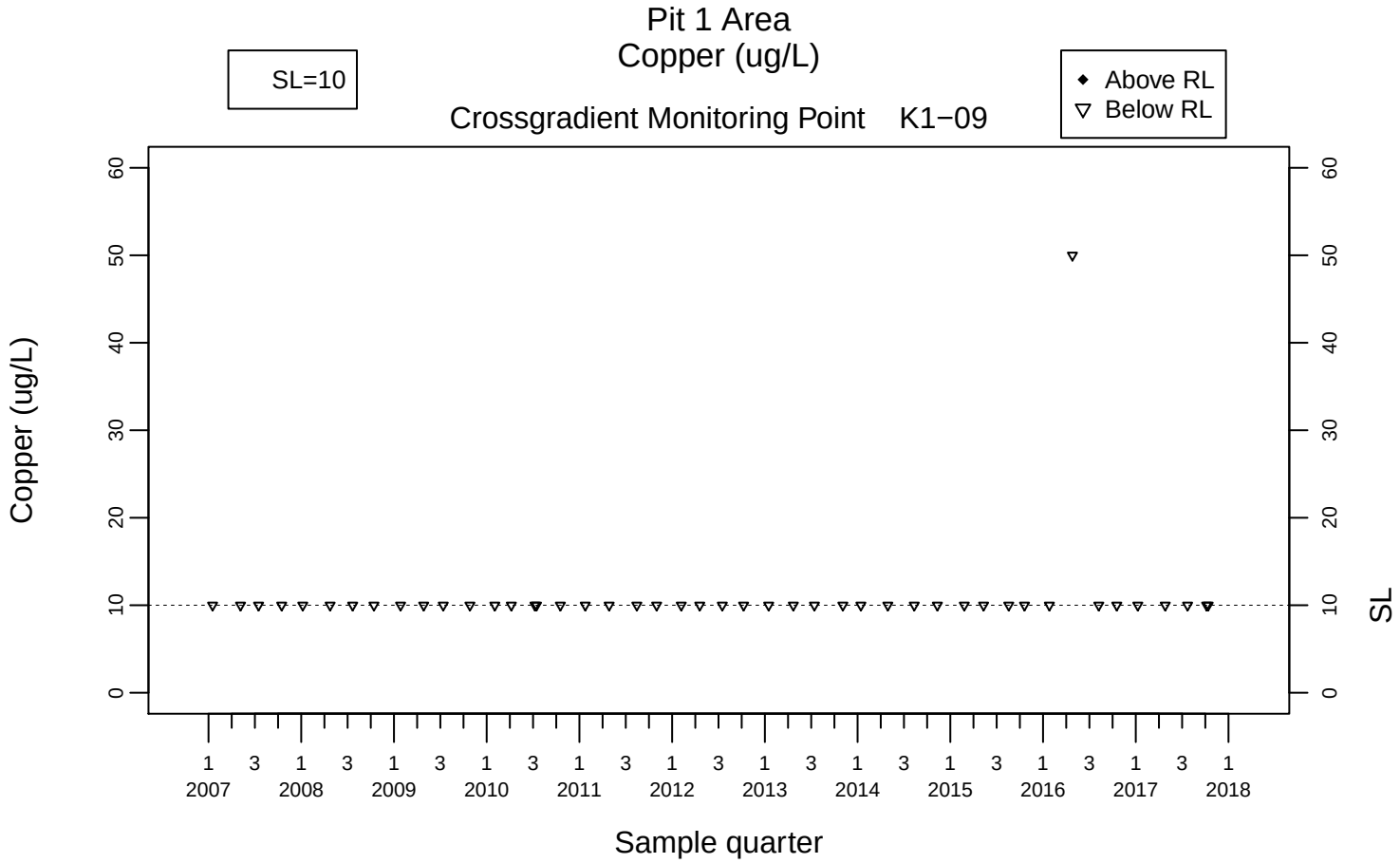

Background Monitoring Point K1−07
Copper (ug/L)
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

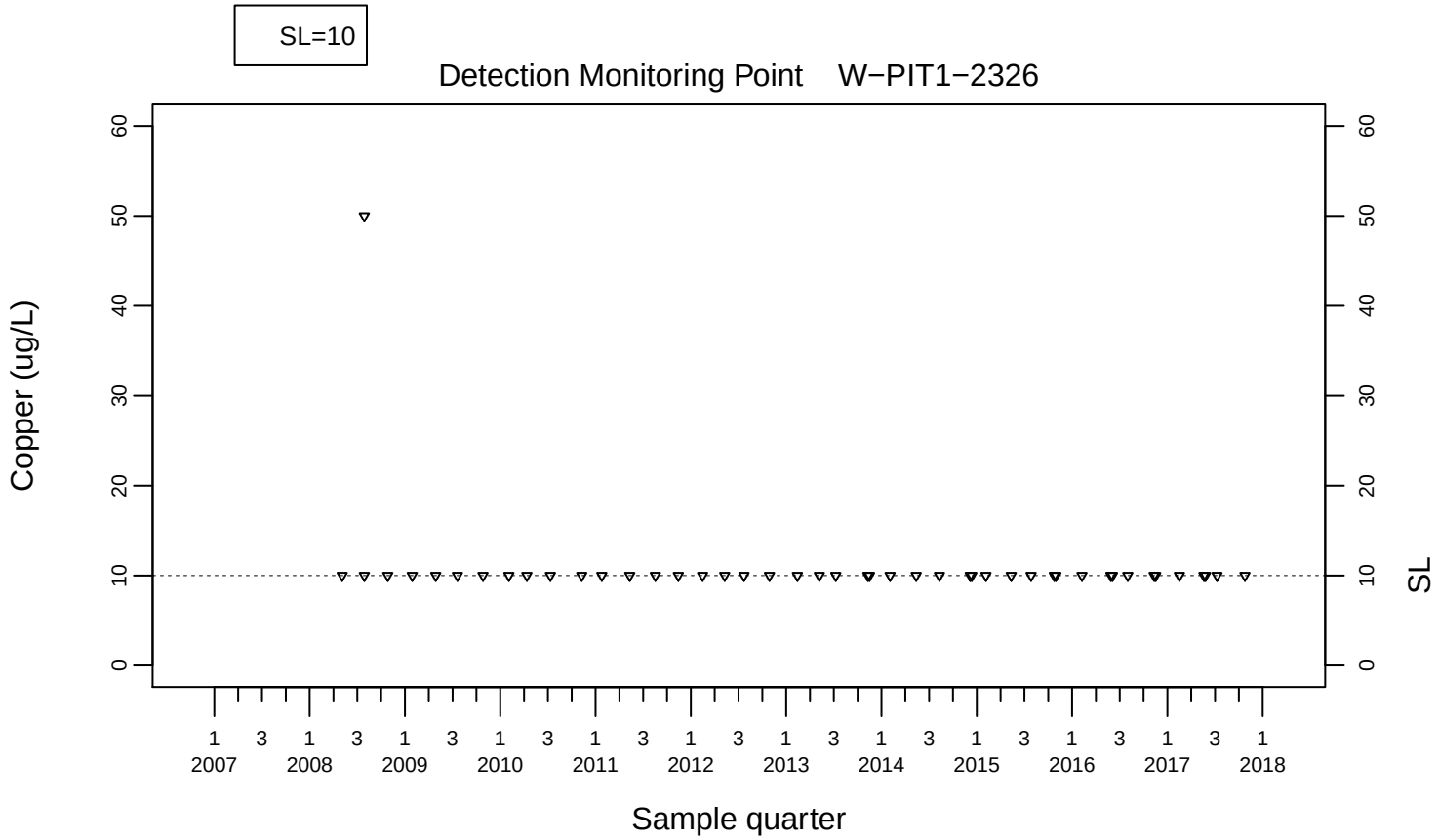

Pit 1 Area
Copper (ug/L)
SL=60
Above RL
Below RL
Detection Monitoring Point K1−02B
Copper (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

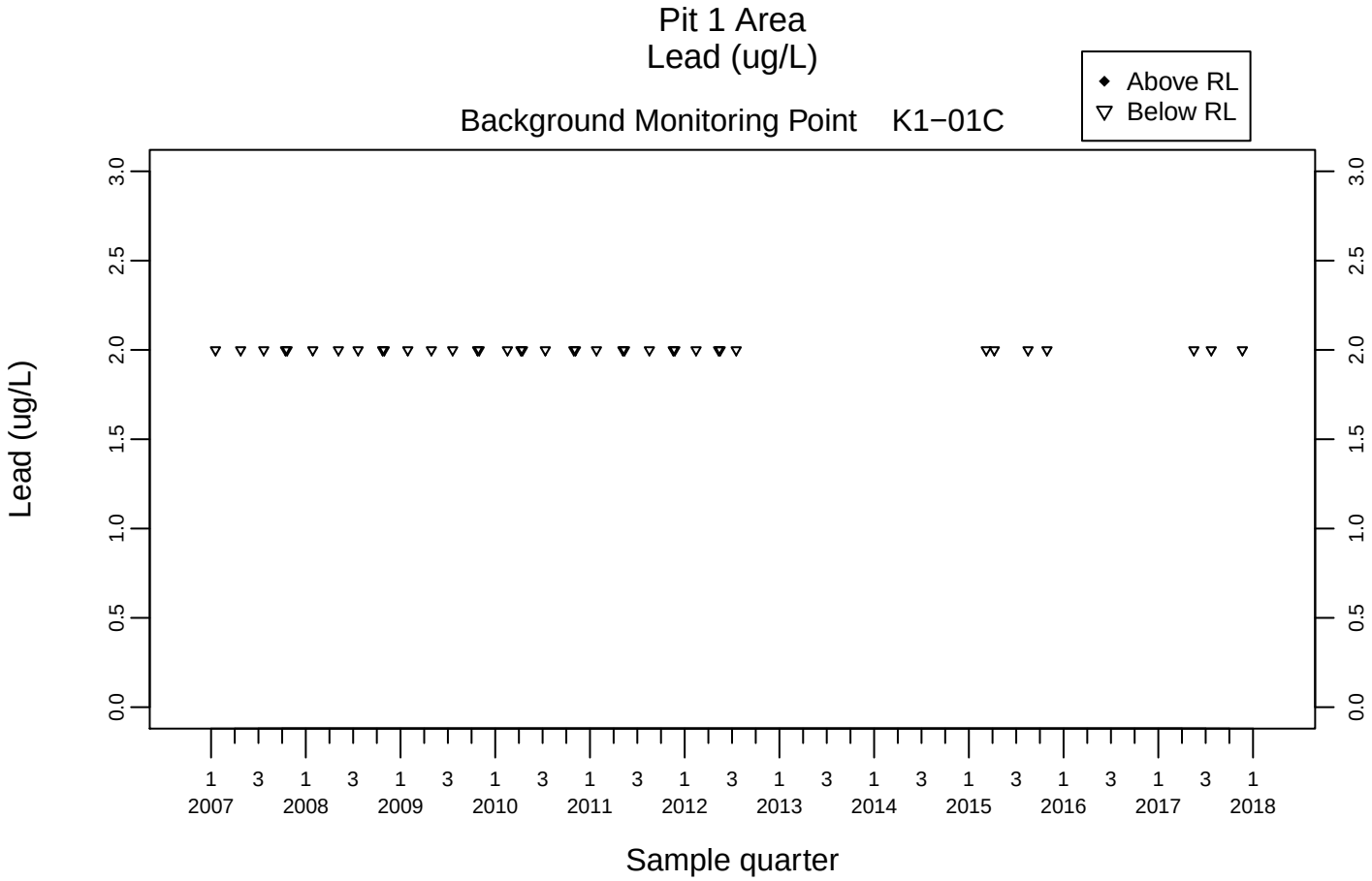

SL=10
Detection Monitoring Point K1−04
Copper (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

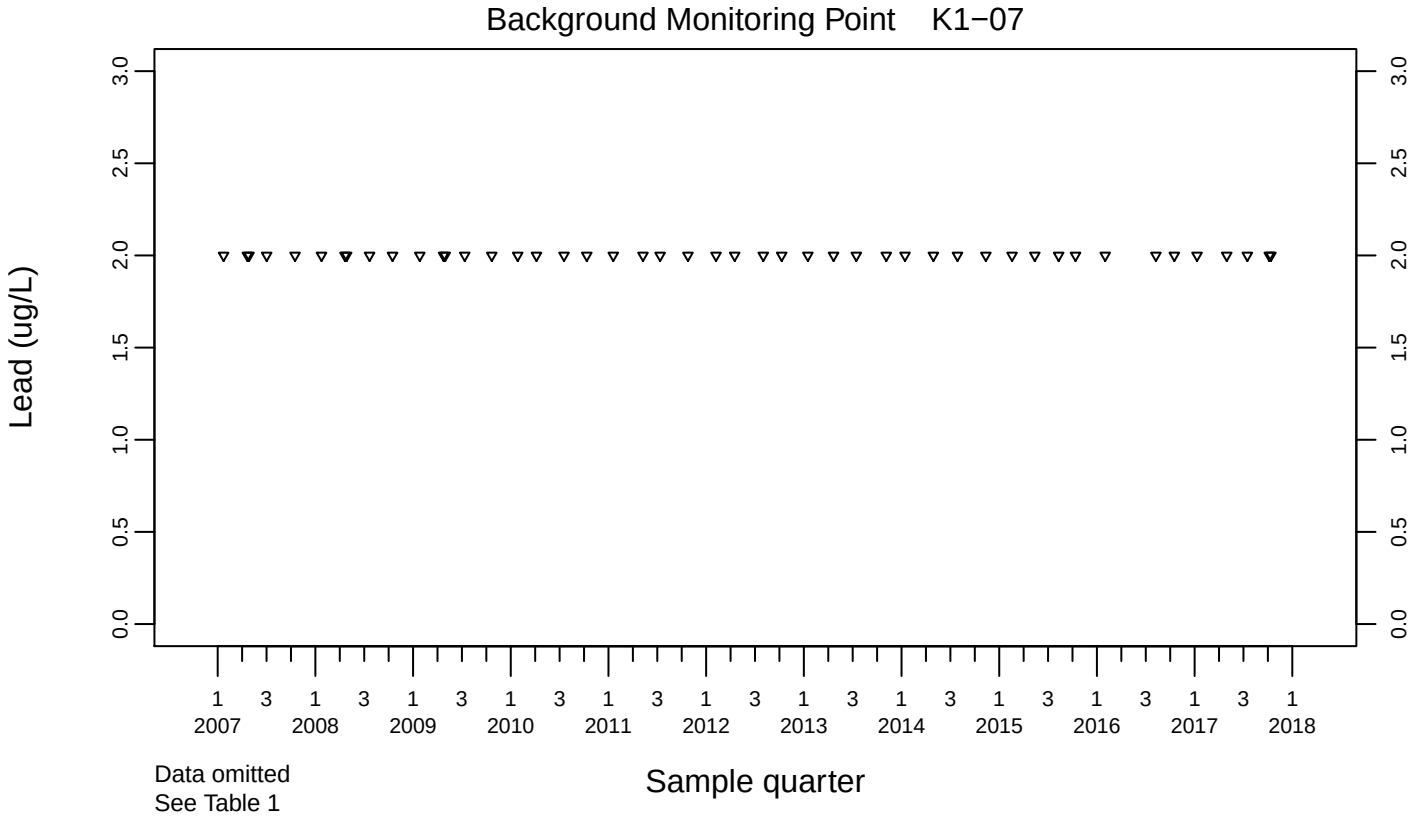

Pit 1 Area
Copper (ug/L)
SL=30
Detection Monitoring Point K1−05
Above RL
Below RL
Copper (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

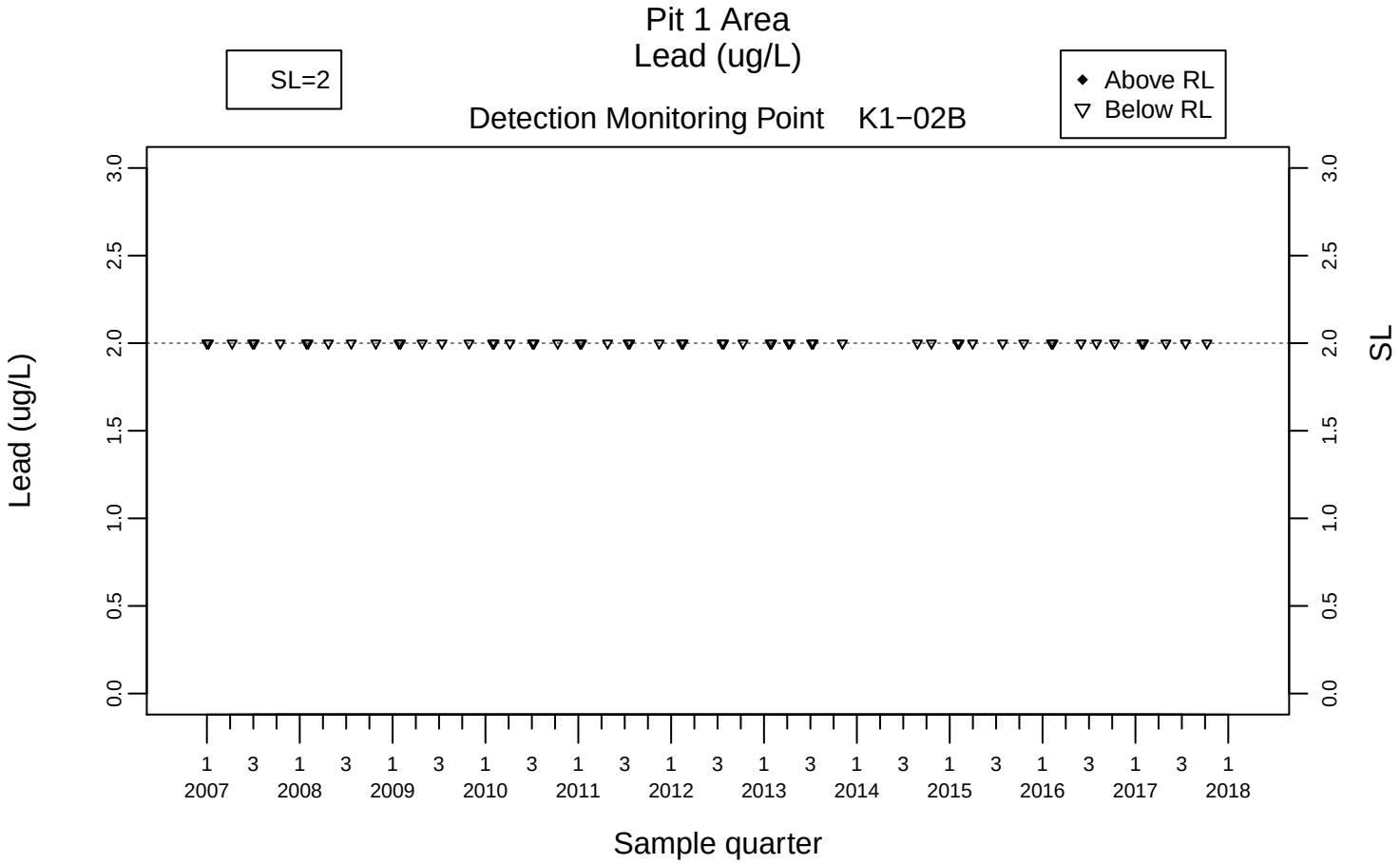

SL=10
Crossgradient Monitoring Point K1−08
Copper (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

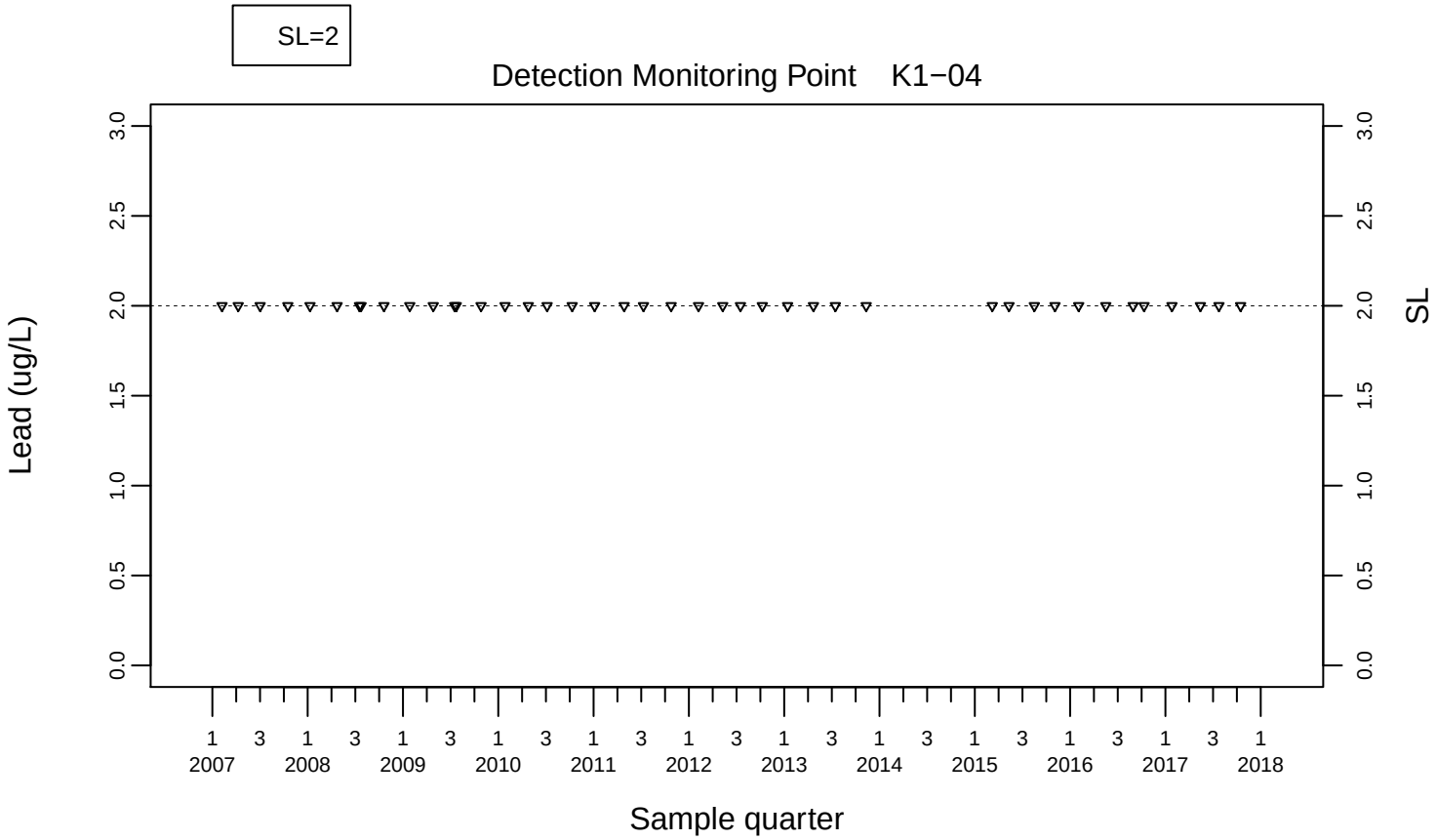

Pit 1 Area
Copper (ug/L)
SL=10
Above RL
Below RL
Crossgradient Monitoring Point K1−09
Copper (ug/L)
SL
Sample quarter

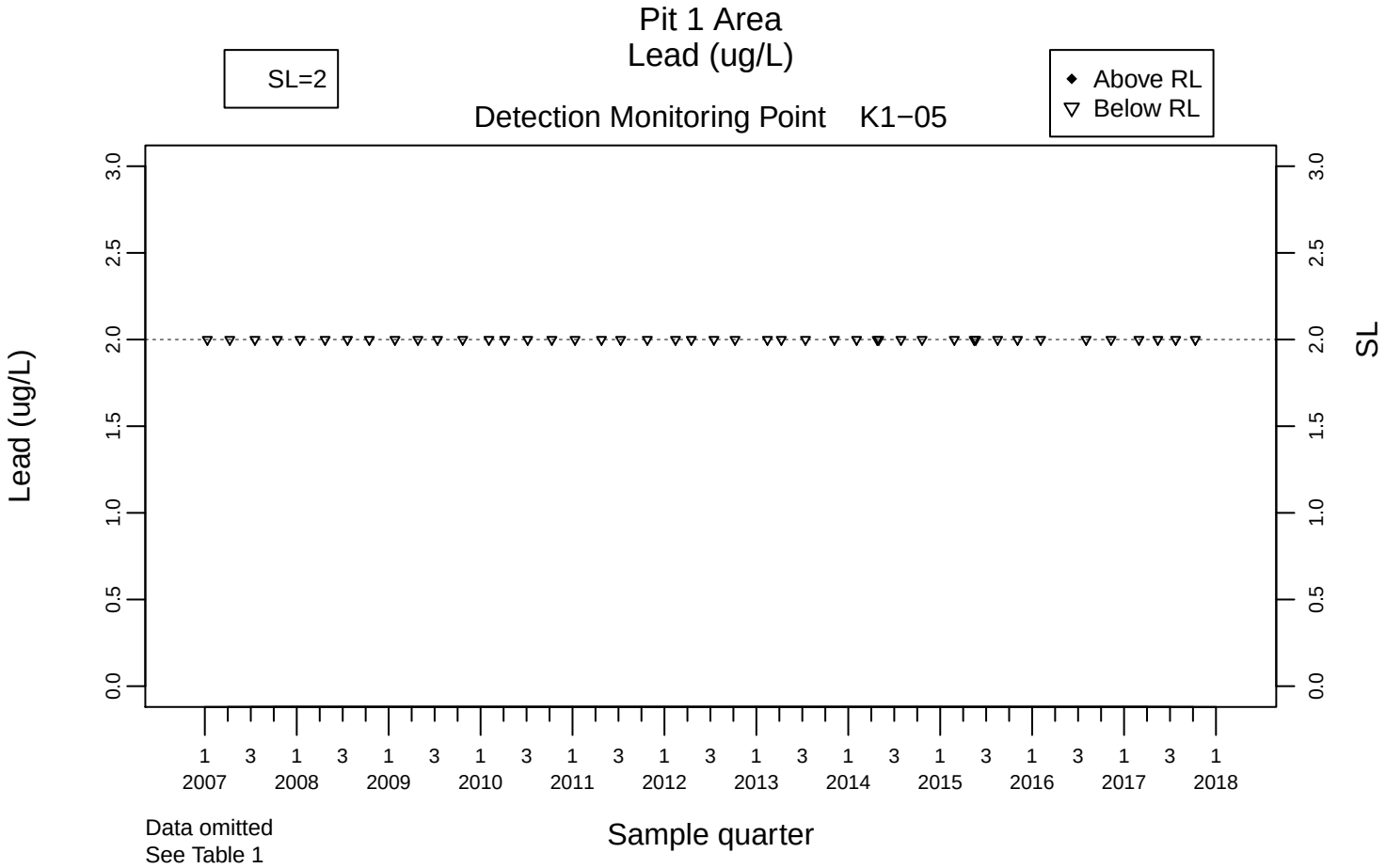

SL=10
Detection Monitoring Point W−PIT1−2326
Copper (ug/L)
SL
Sample quarter

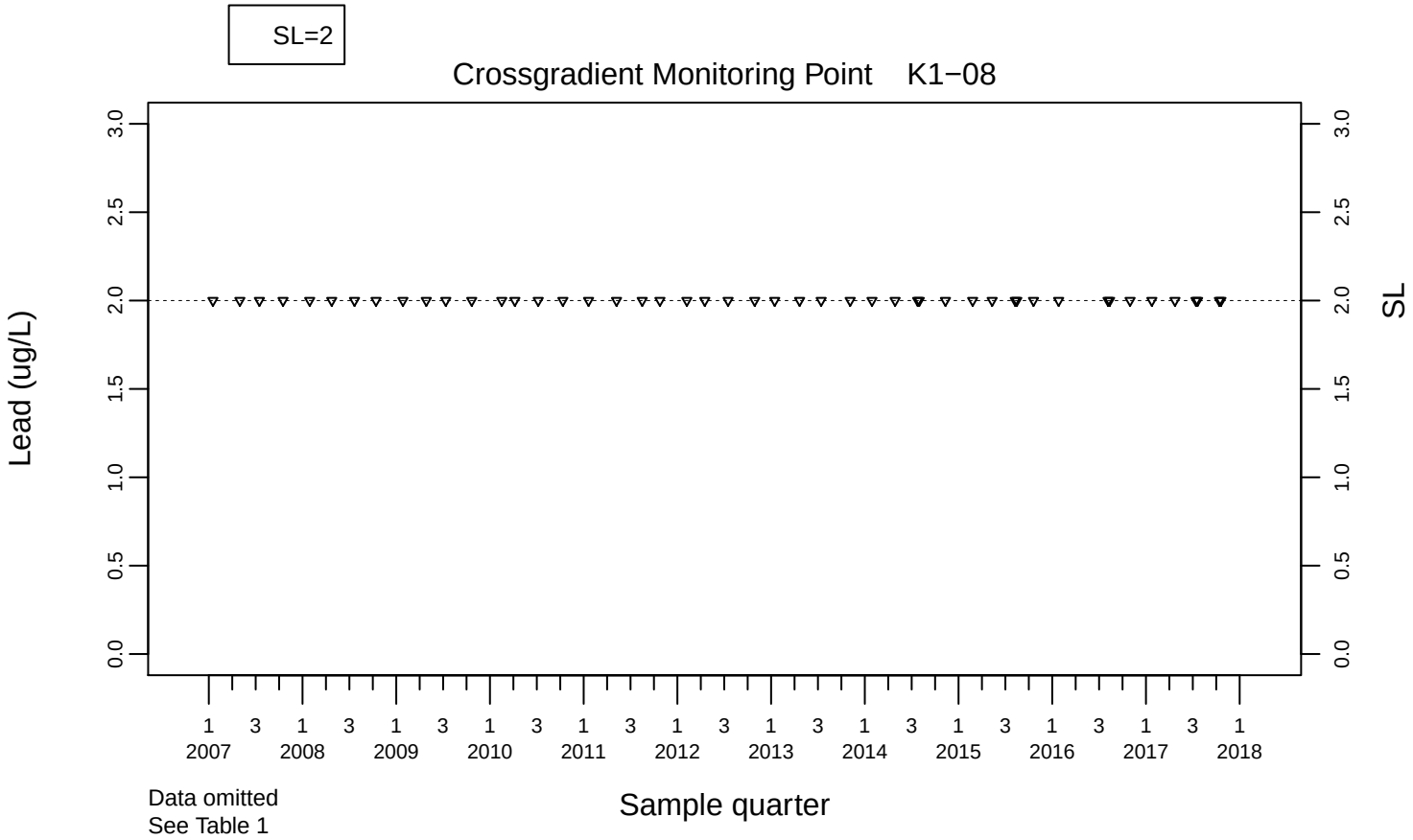

Pit 1 Area
Lead (ug/L)
Background Monitoring Point K1−01C
Above RL
Below RL
Lead (ug/L)
Sample quarter

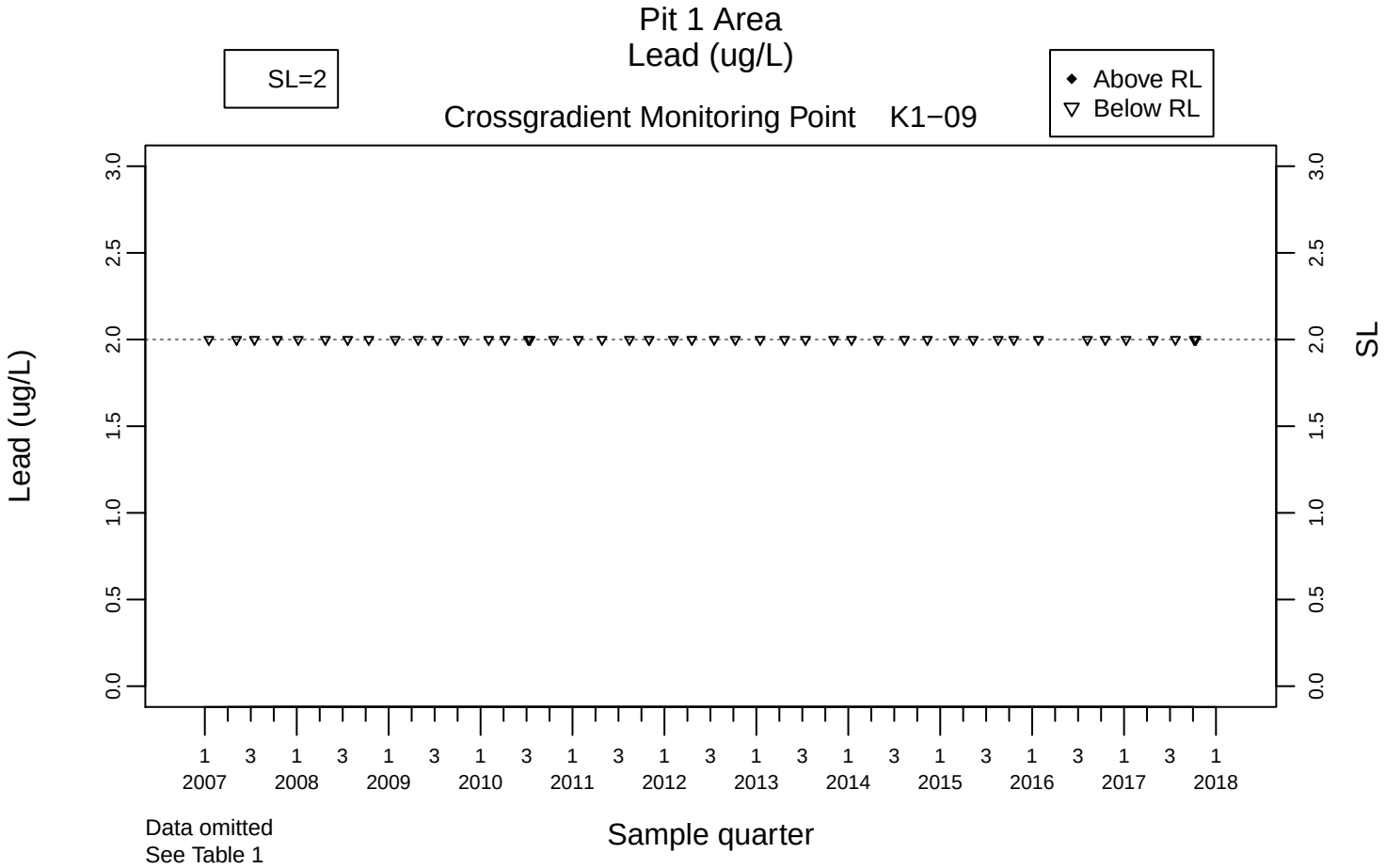

Background Monitoring Point K1−07
Lead (ug/L)
Sample quarter
Data omitted
See Table 1

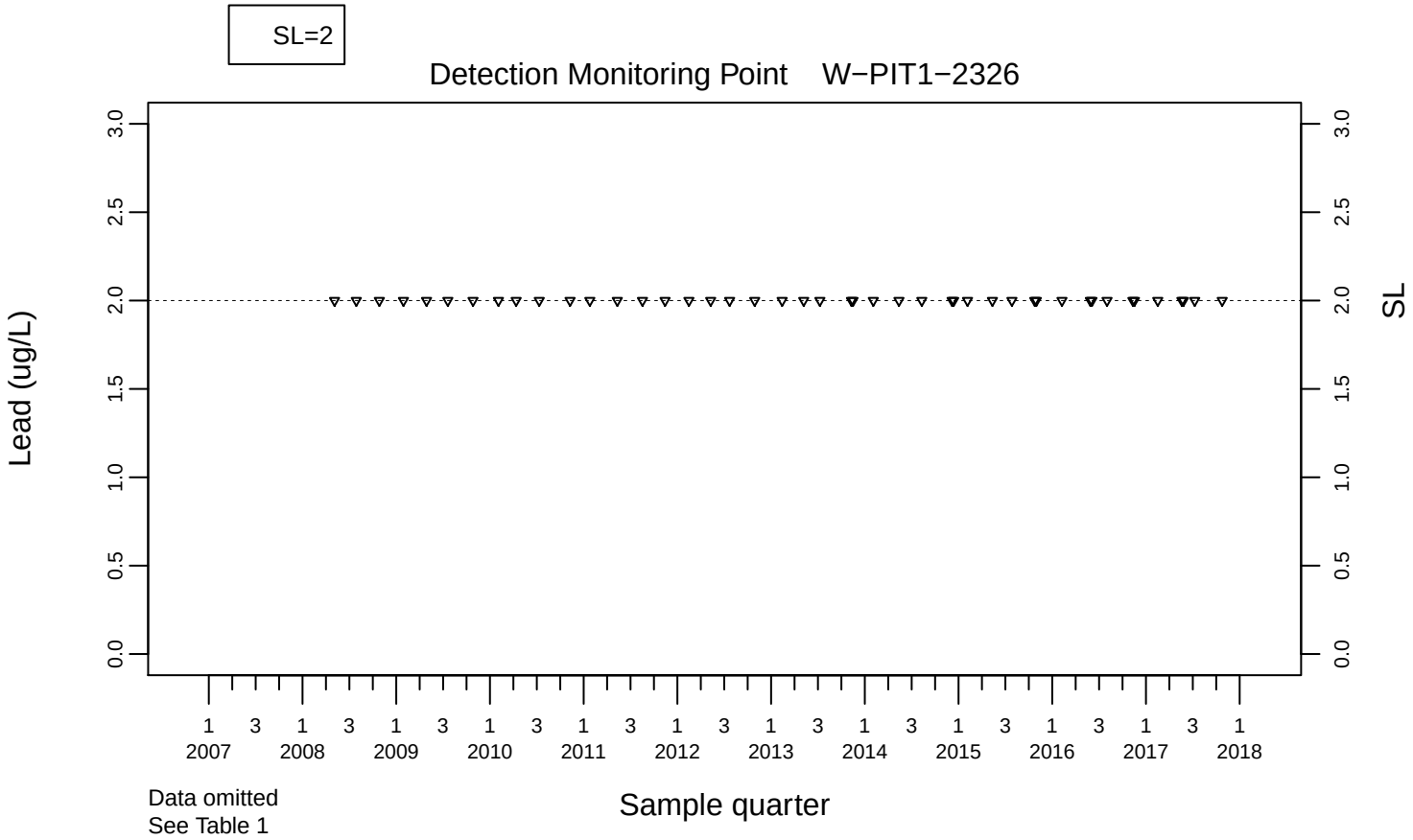

Pit 1 Area
Lead (ug/L)
SL=2
Above RL
Below RL
Detection Monitoring Point K1−02B
Lead (ug/L)
SL
Sample quarter

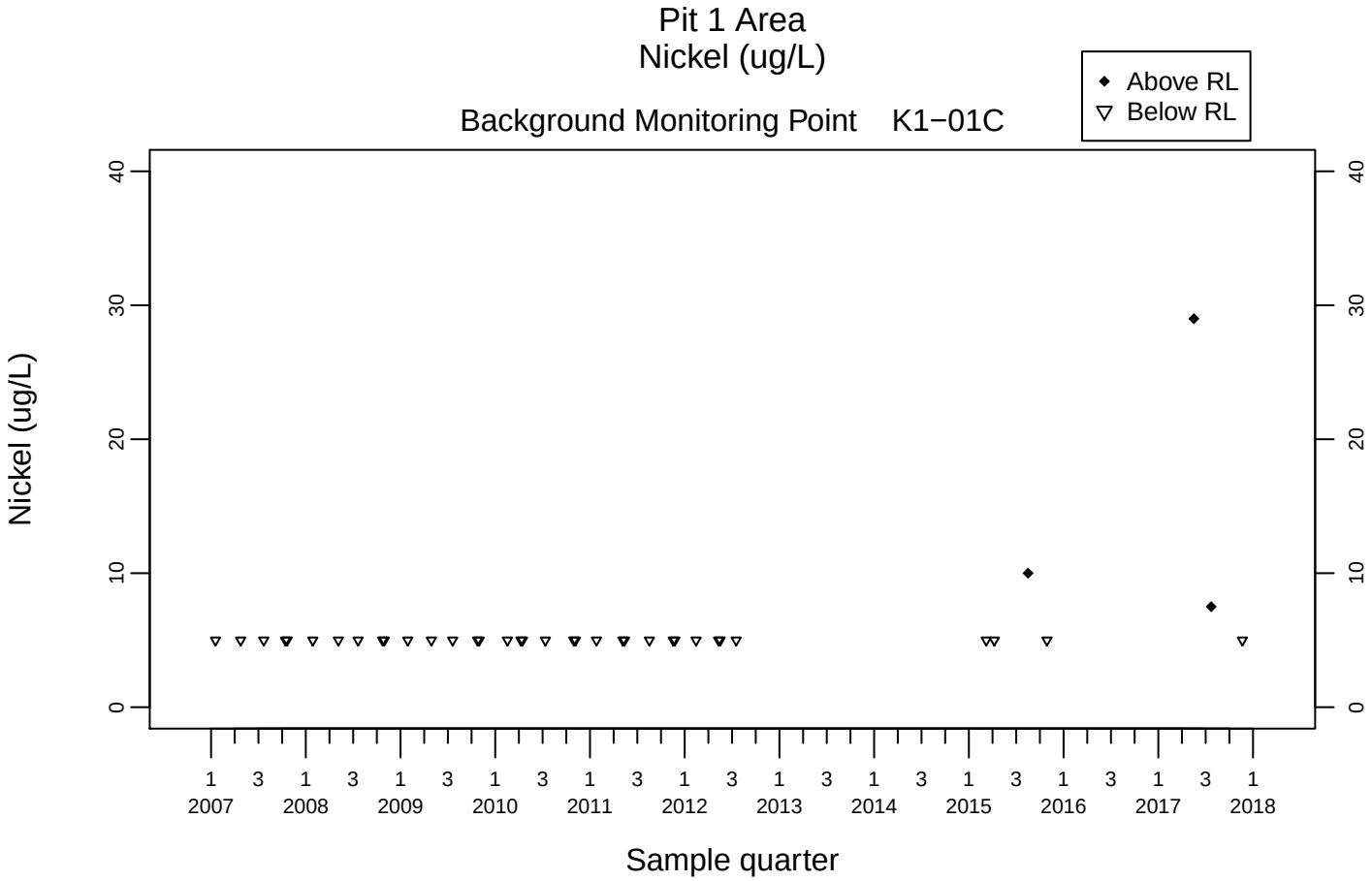

SL=2
Detection Monitoring Point K1−04
Lead (ug/L)
SL
Sample quarter

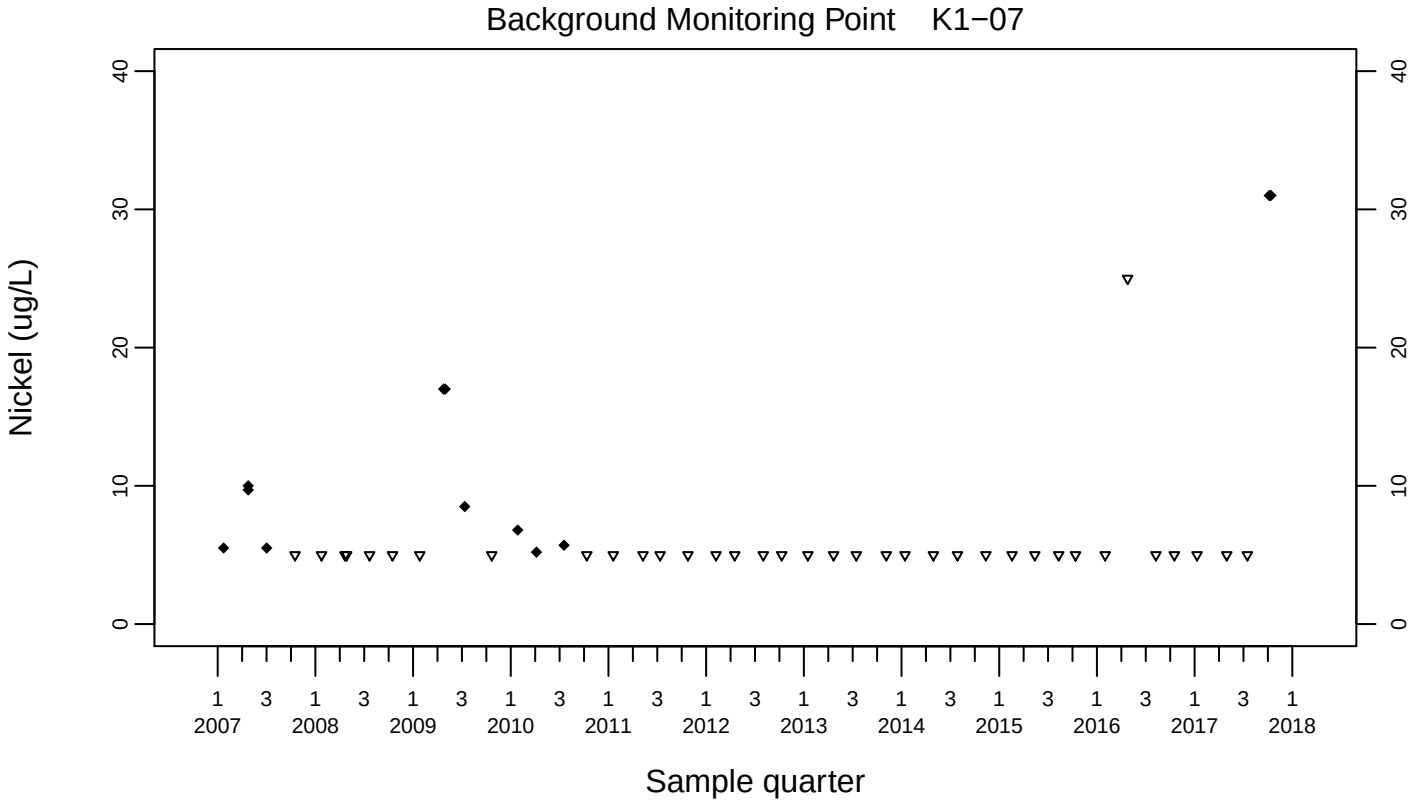

Pit 1 Area
Lead (ug/L)
SL=2
Above RL
Below RL
Detection Monitoring Point K1−05
Lead (ug/L)
SL
Sample quarter
Data omitted
See Table 1

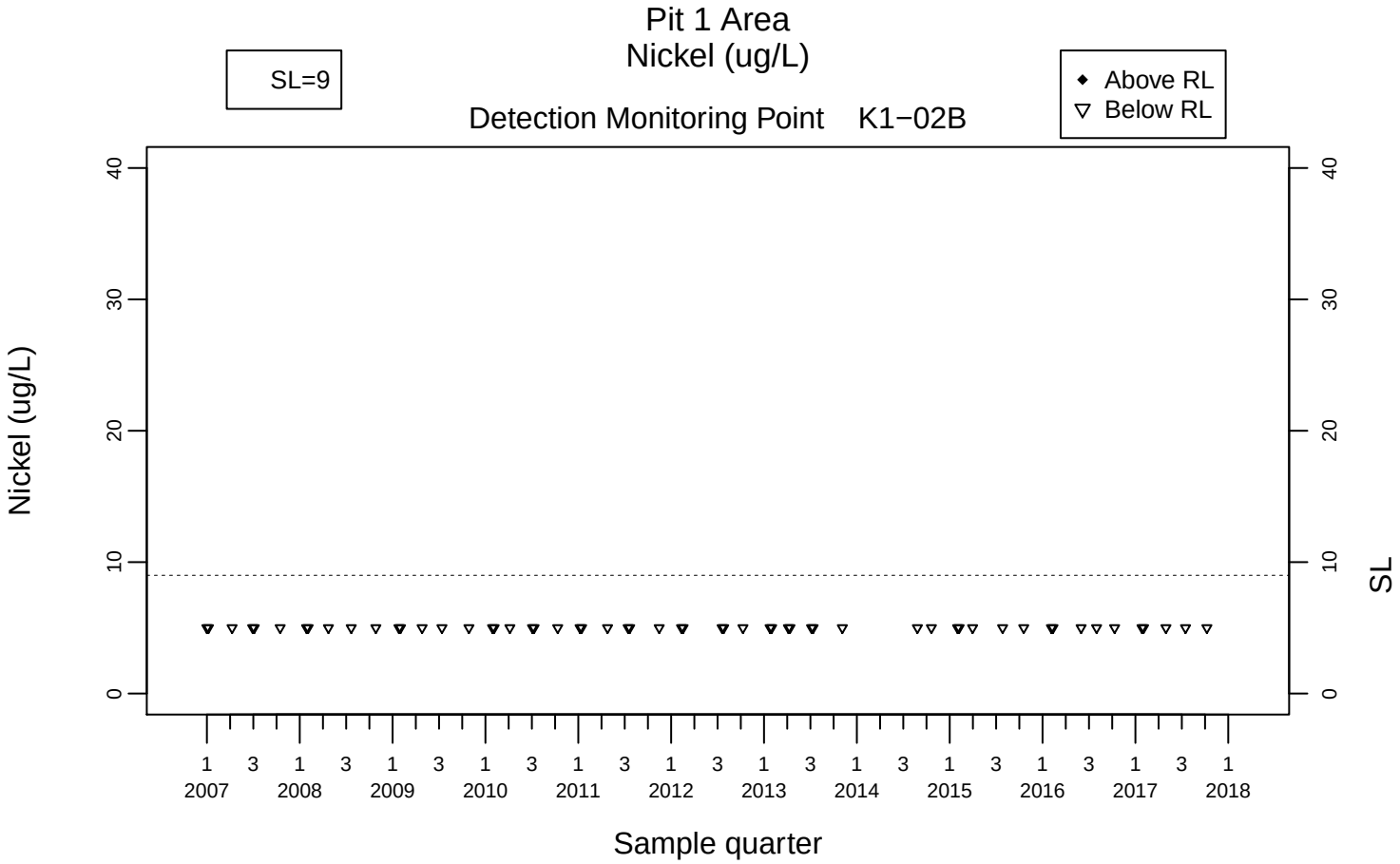

SL=2
Crossgradient Monitoring Point K1−08
Lead (ug/L)
SL
Sample quarter
Data omitted
See Table 1

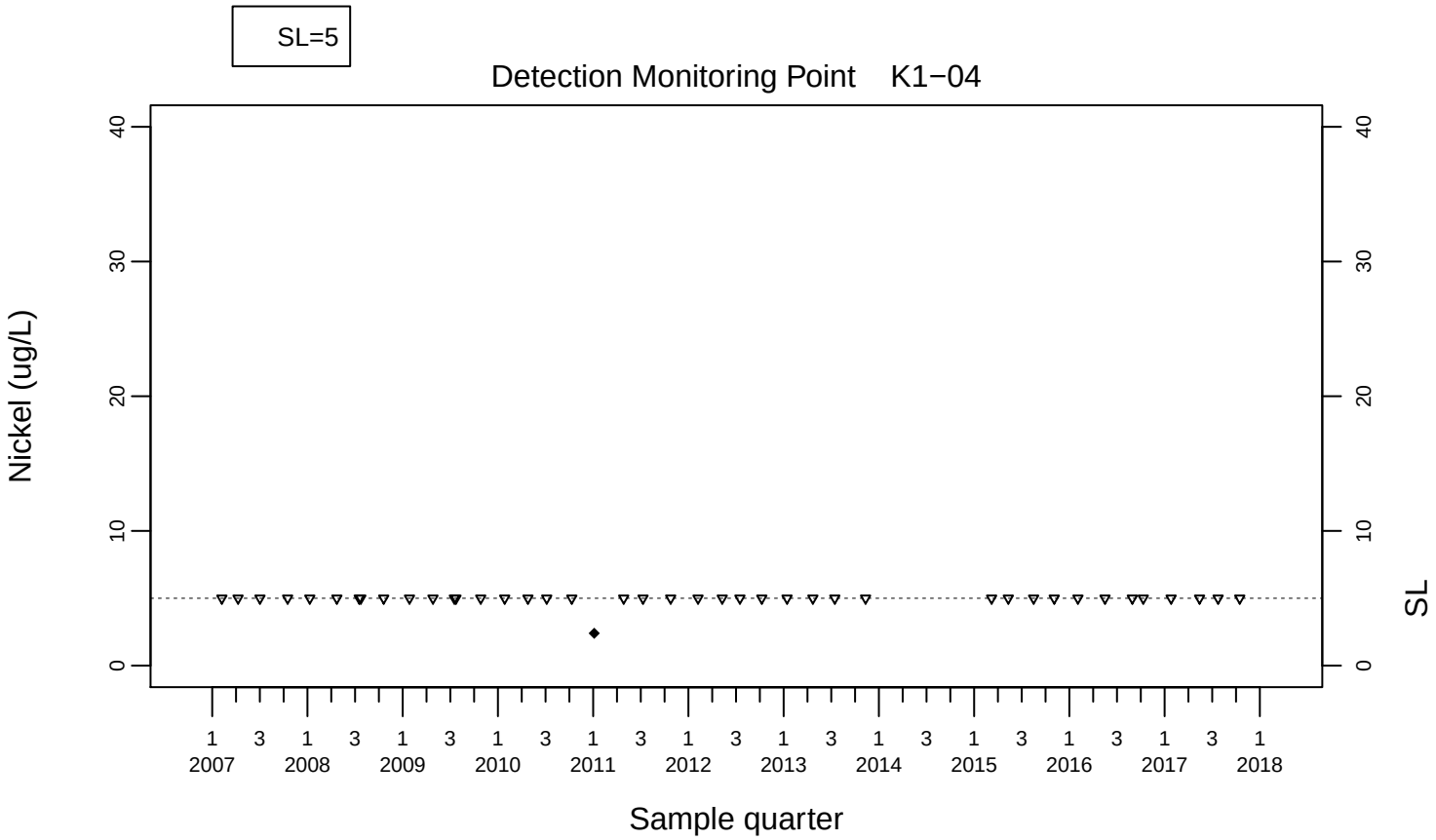

Pit 1 Area
Lead (ug/L)
SL=2
Above RL
Below RL
Crossgradient Monitoring Point K1−09
Lead (ug/L)
SL
Sample quarter
Data omitted
See Table 1

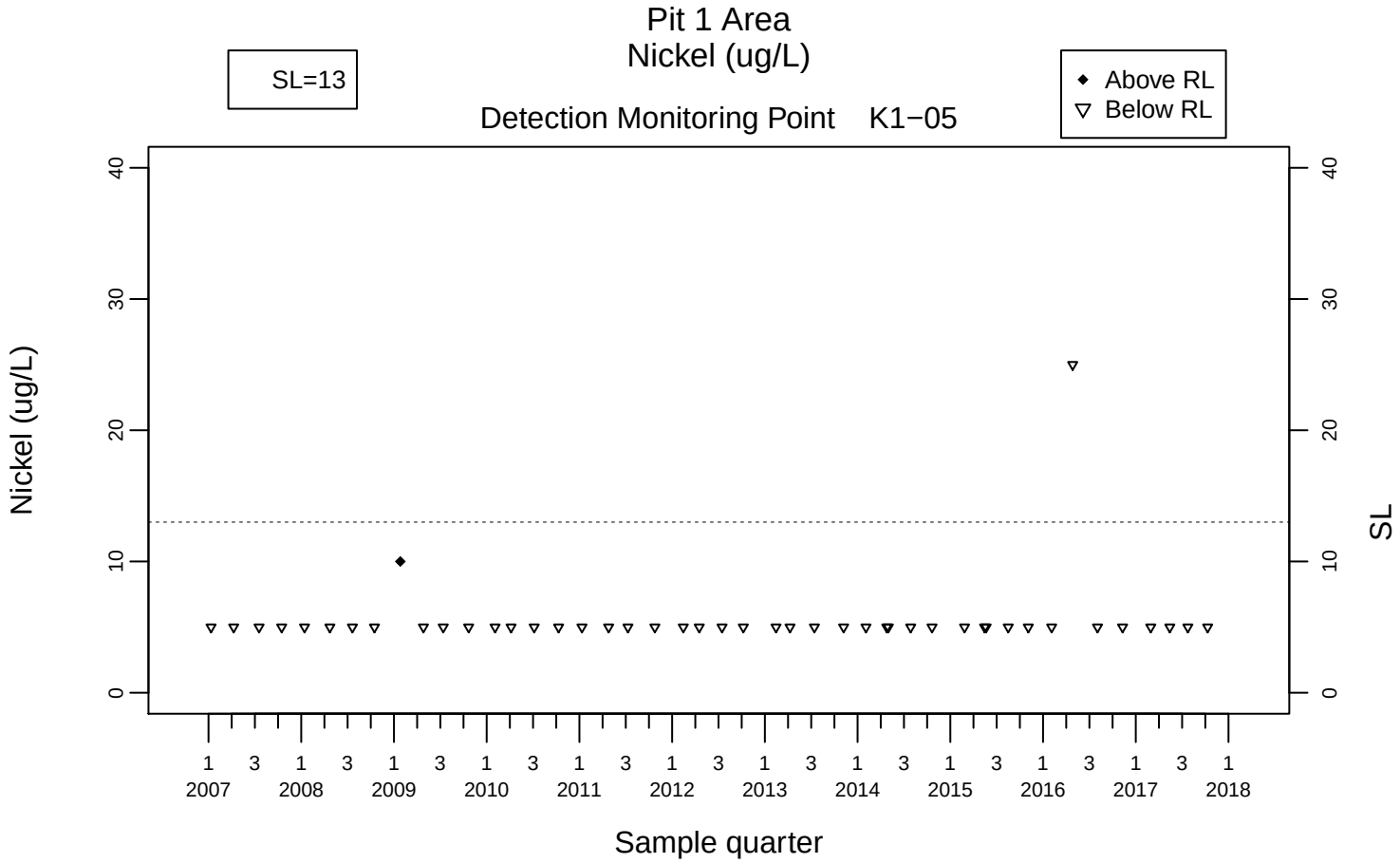

SL=2
Detection Monitoring Point W−PIT1−2326
Lead (ug/L)
SL
Sample quarter
Data omitted
See Table 1

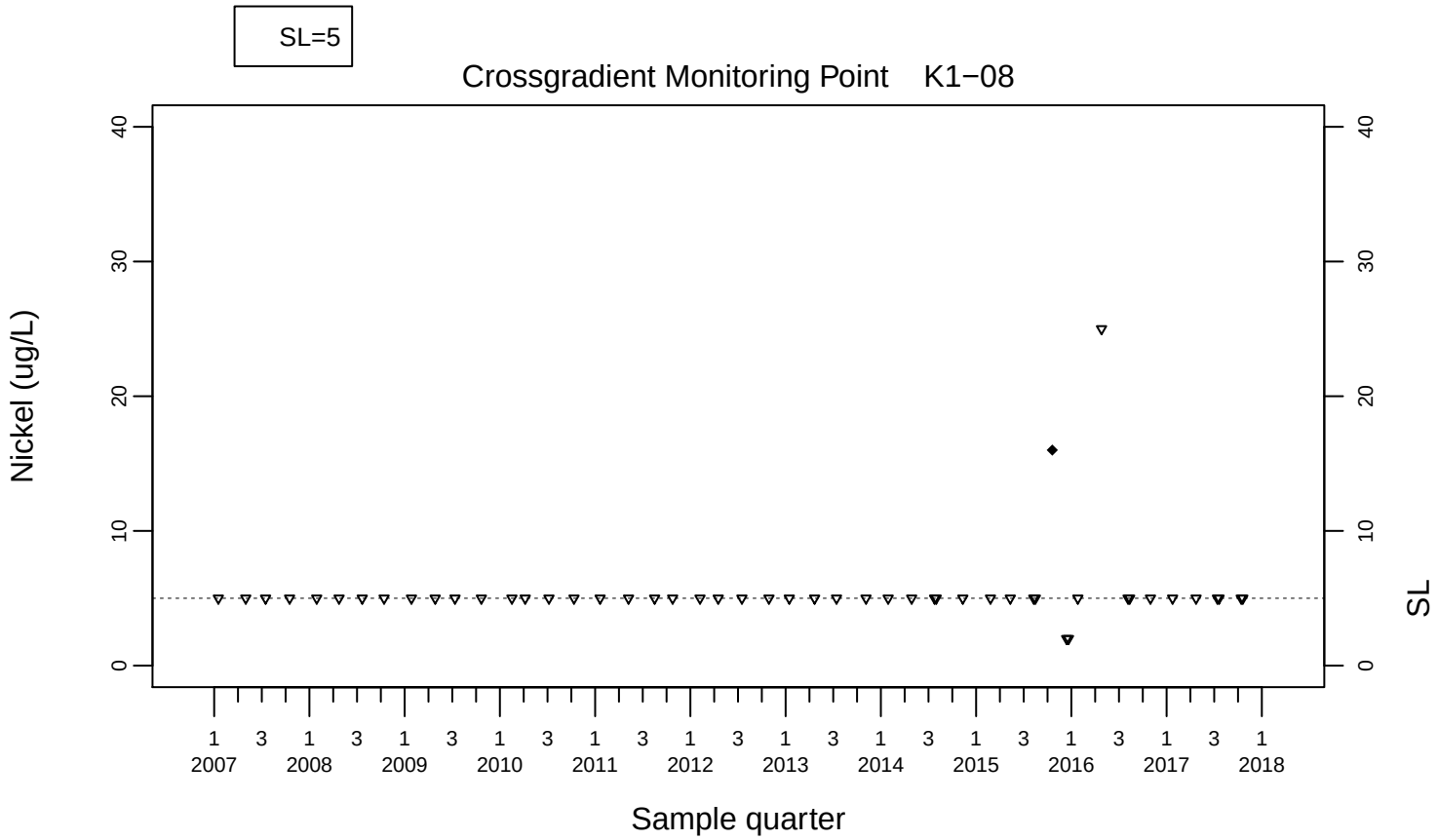

Pit 1 Area
Nickel (ug/L)
Background Monitoring Point K1−01C
Above RL
Below RL
Nickel (ug/L)
0
10
20
30
40
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

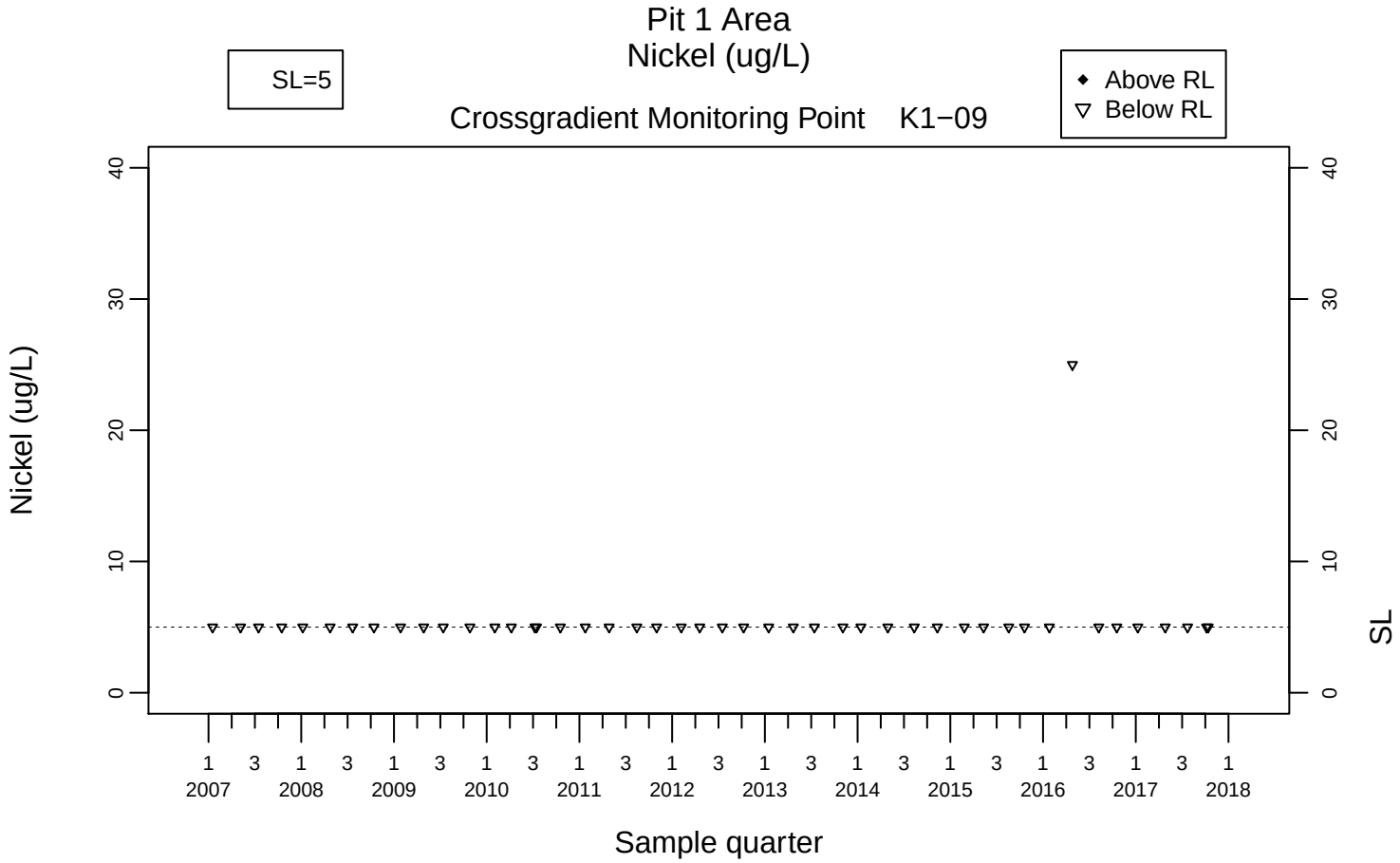

Background Monitoring Point K1−07
Nickel (ug/L)
0
10
20
30
40
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

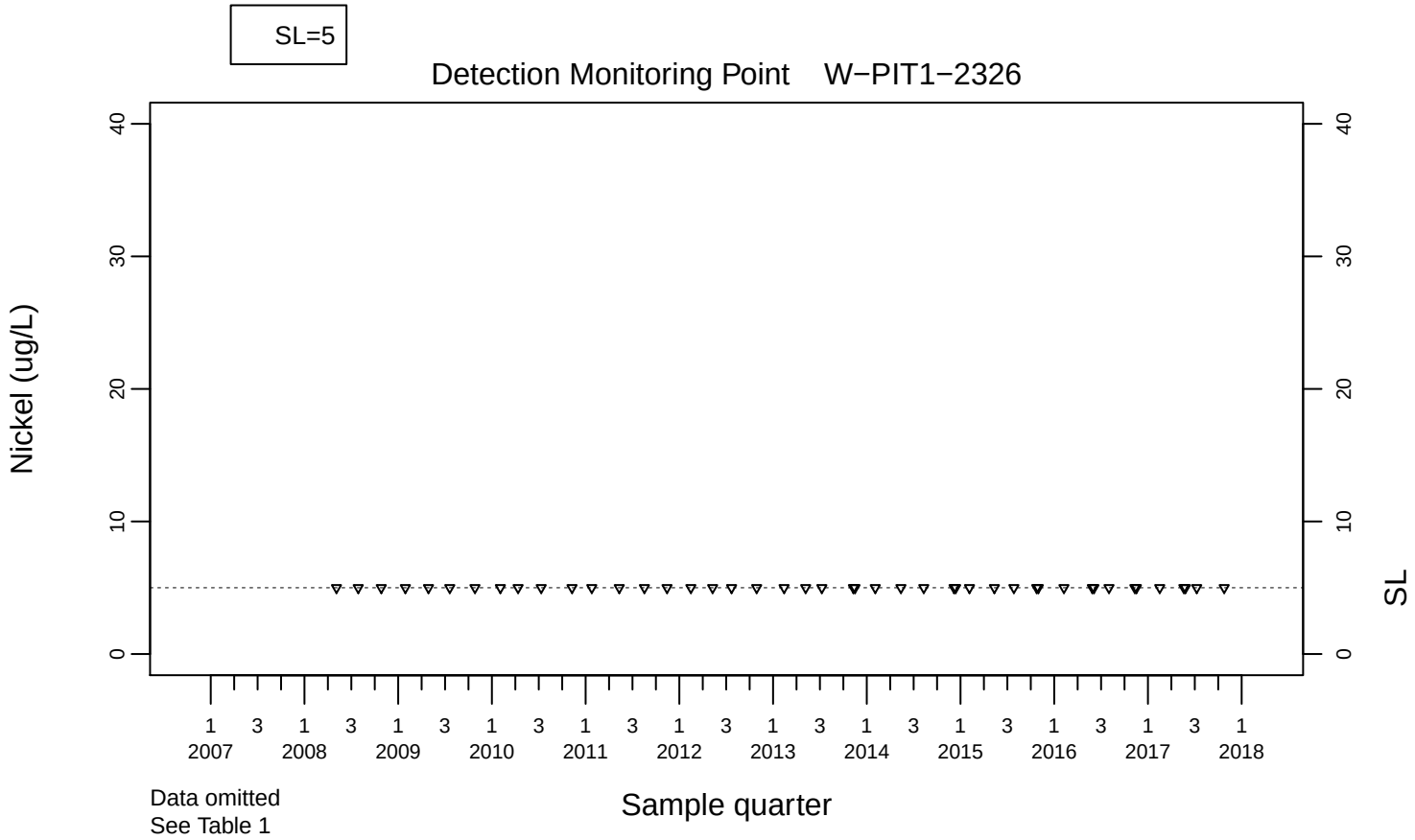

Pit 1 Area
Nickel (ug/L)
SL=9
Above RL
Below RL
Detection Monitoring Point K1−02B
Nickel (ug/L)
SL
Sample quarter
0
10
20
30
40
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

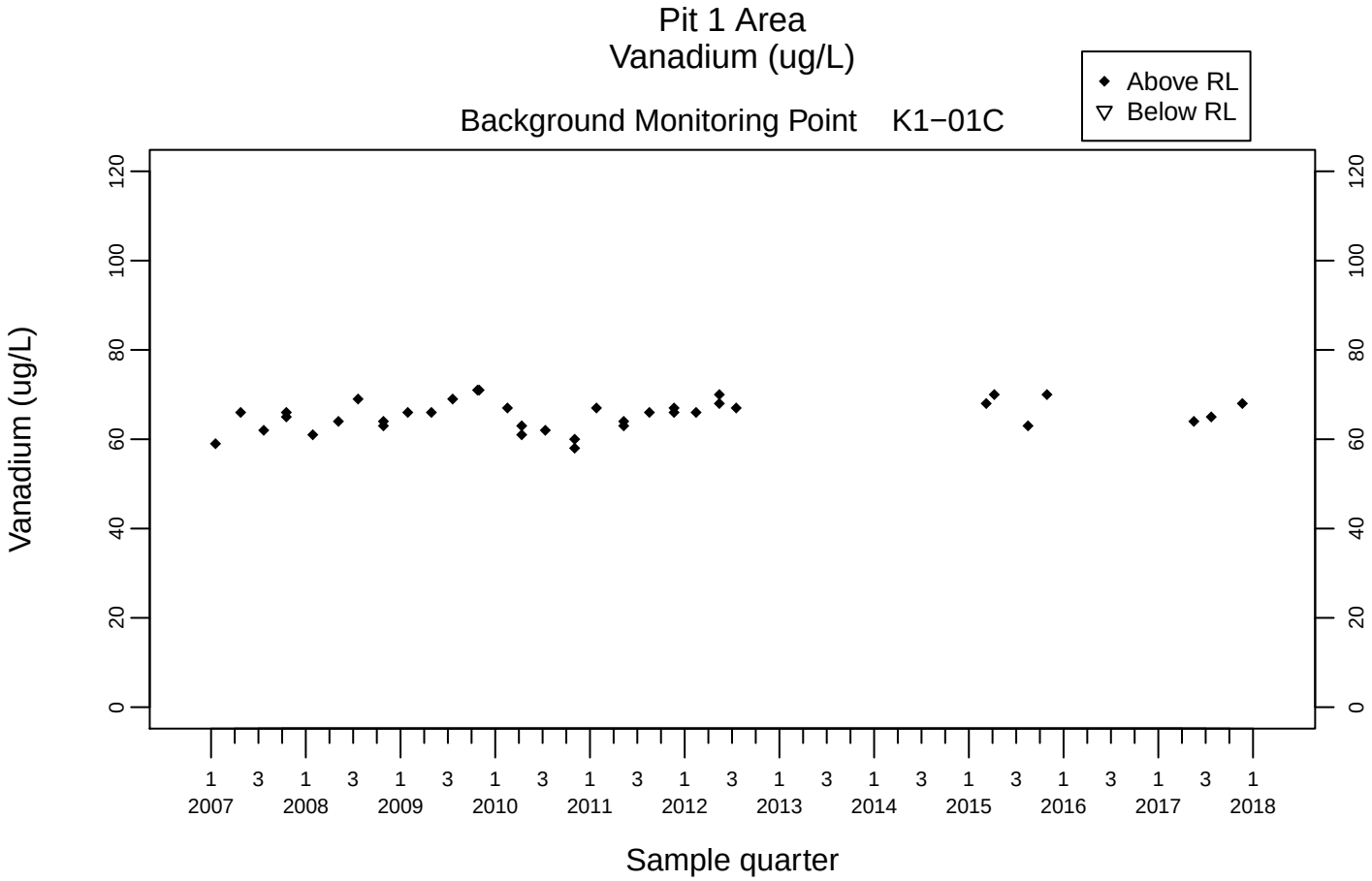

SL=5
Detection Monitoring Point K1−04
Nickel (ug/L)
SL
Sample quarter
0
10
20
30
40
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

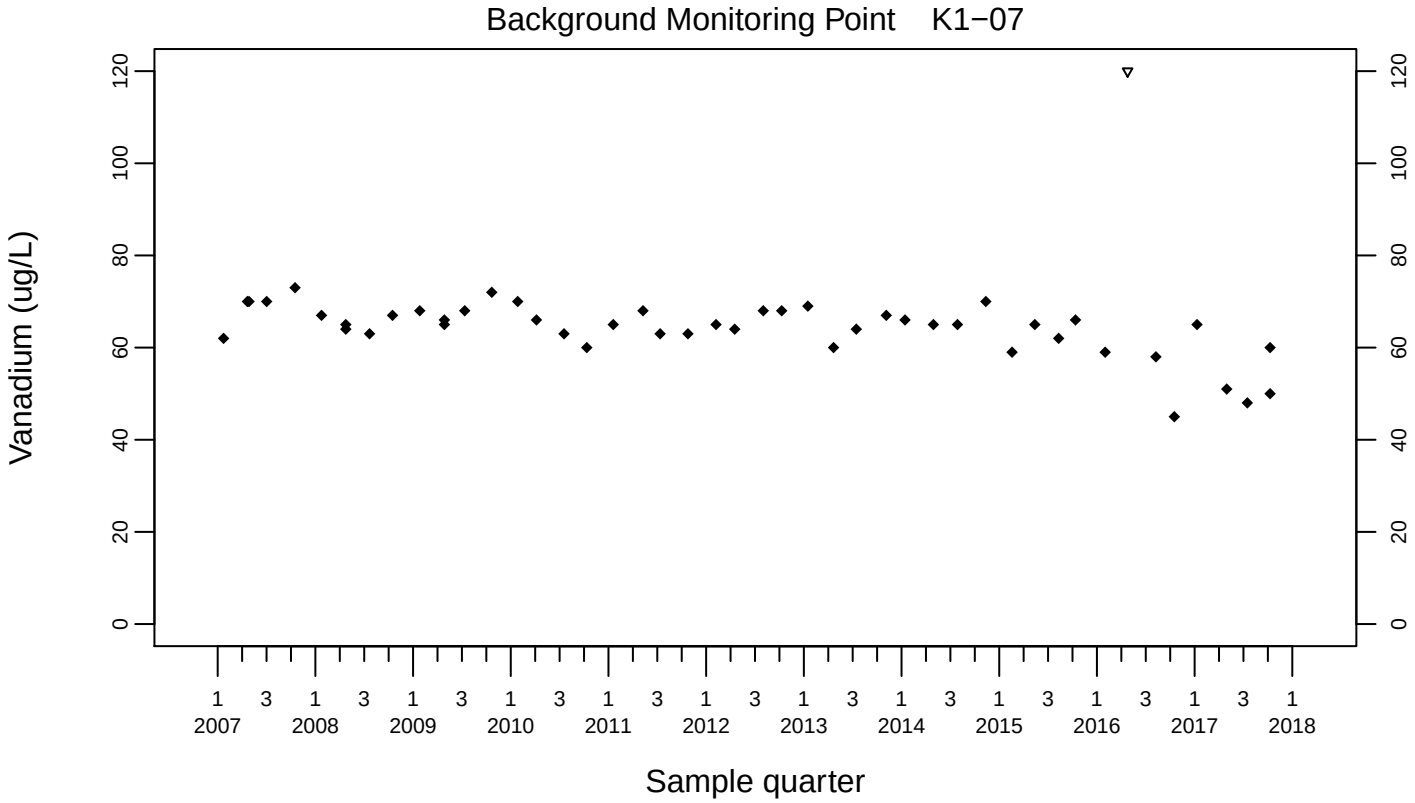

Pit 1 Area
Nickel (ug/L)
SL=13
Above RL
Below RL
Detection Monitoring Point K1−05
Nickel (ug/L)
SL
Sample quarter
0
10
20
30
40
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

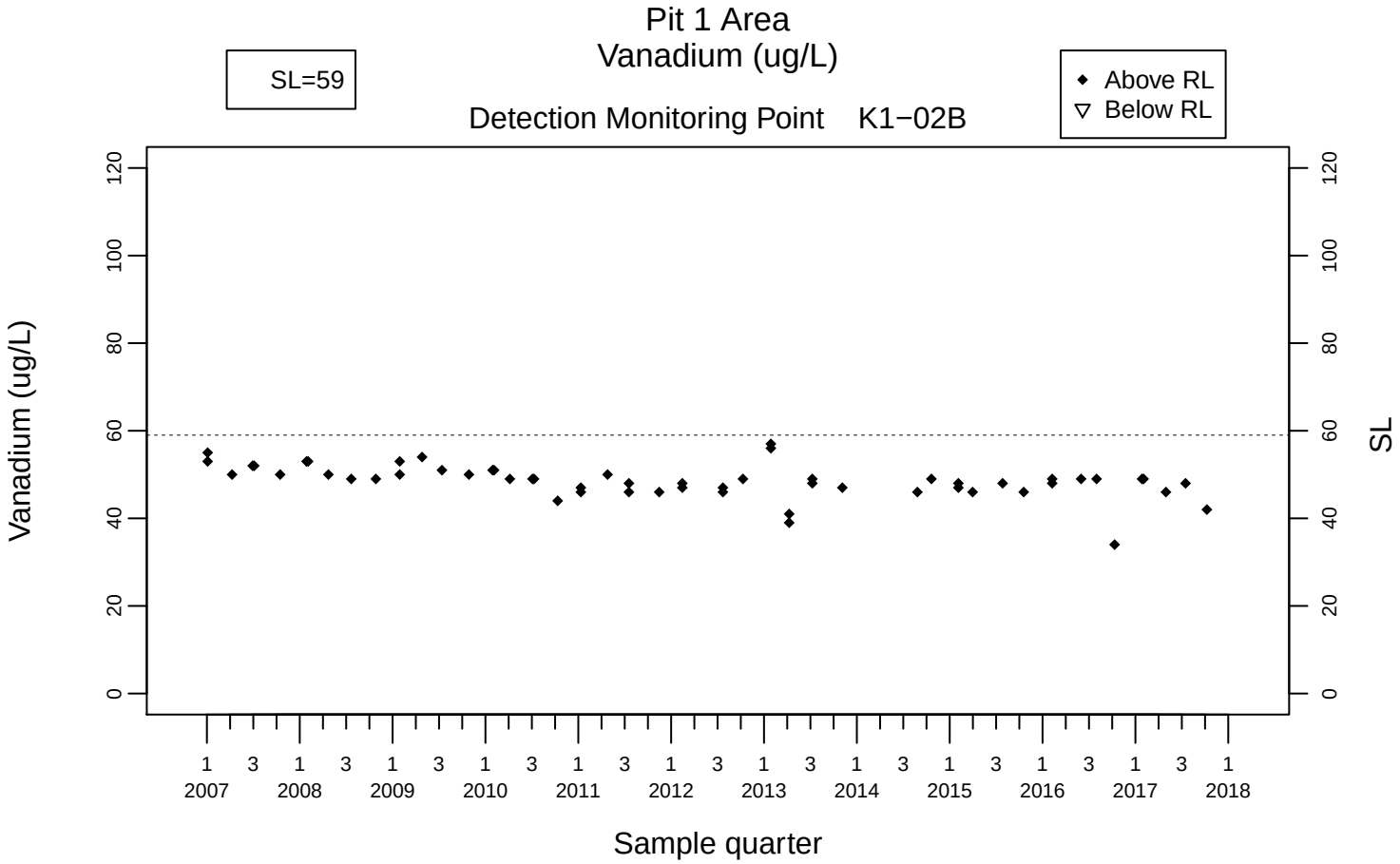

SL=5
Crossgradient Monitoring Point K1−08
Nickel (ug/L)
SL
Sample quarter
0
10
20
30
40
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

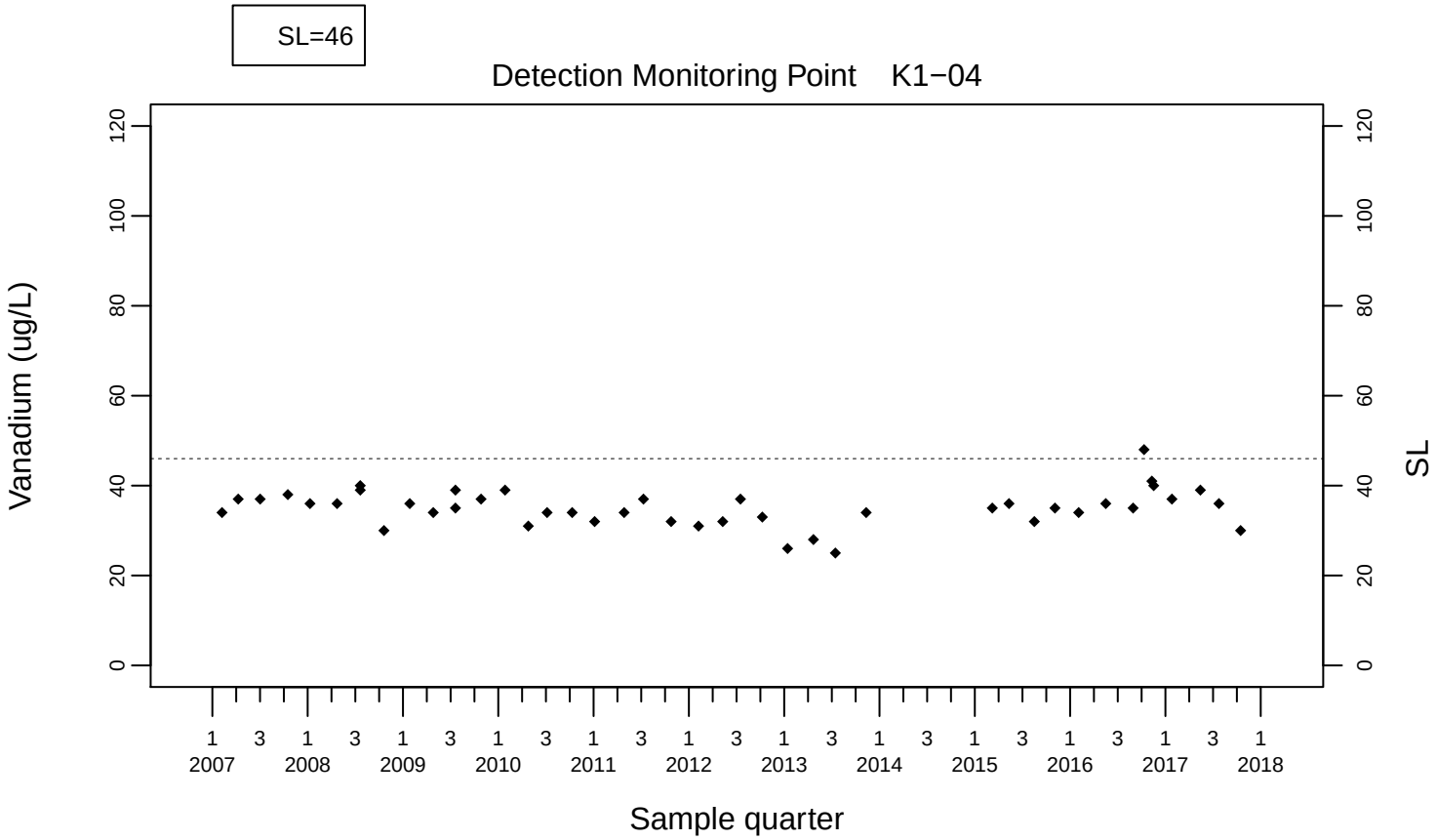

Pit 1 Area
Nickel (ug/L)
SL=5
Above RL
Below RL
Crossgradient Monitoring Point K1−09
Nickel (ug/L)
SL
Sample quarter

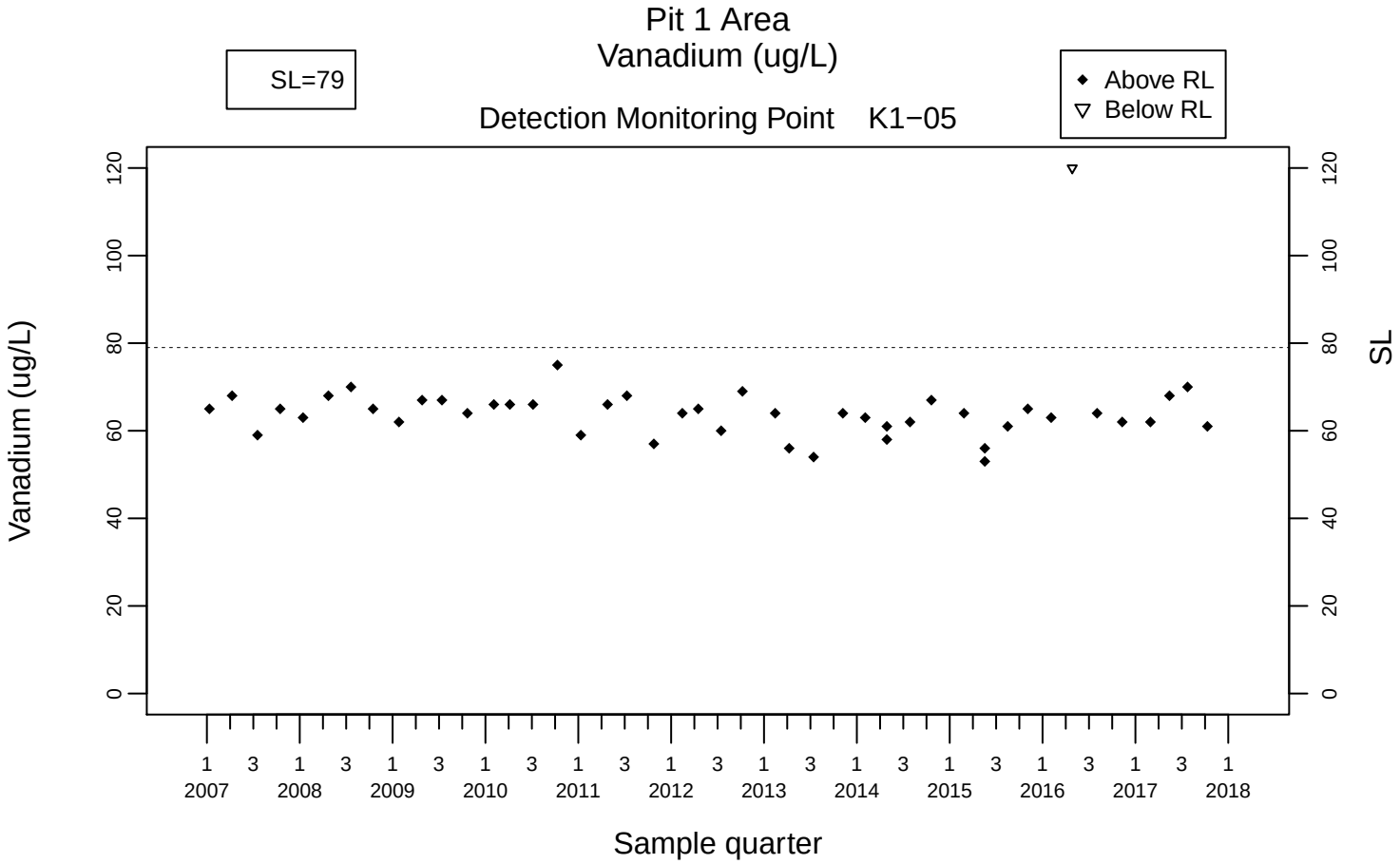

SL=5
Detection Monitoring Point W−PIT1−2326
Nickel (ug/L)
SL
Sample quarter
Data omitted
See Table 1

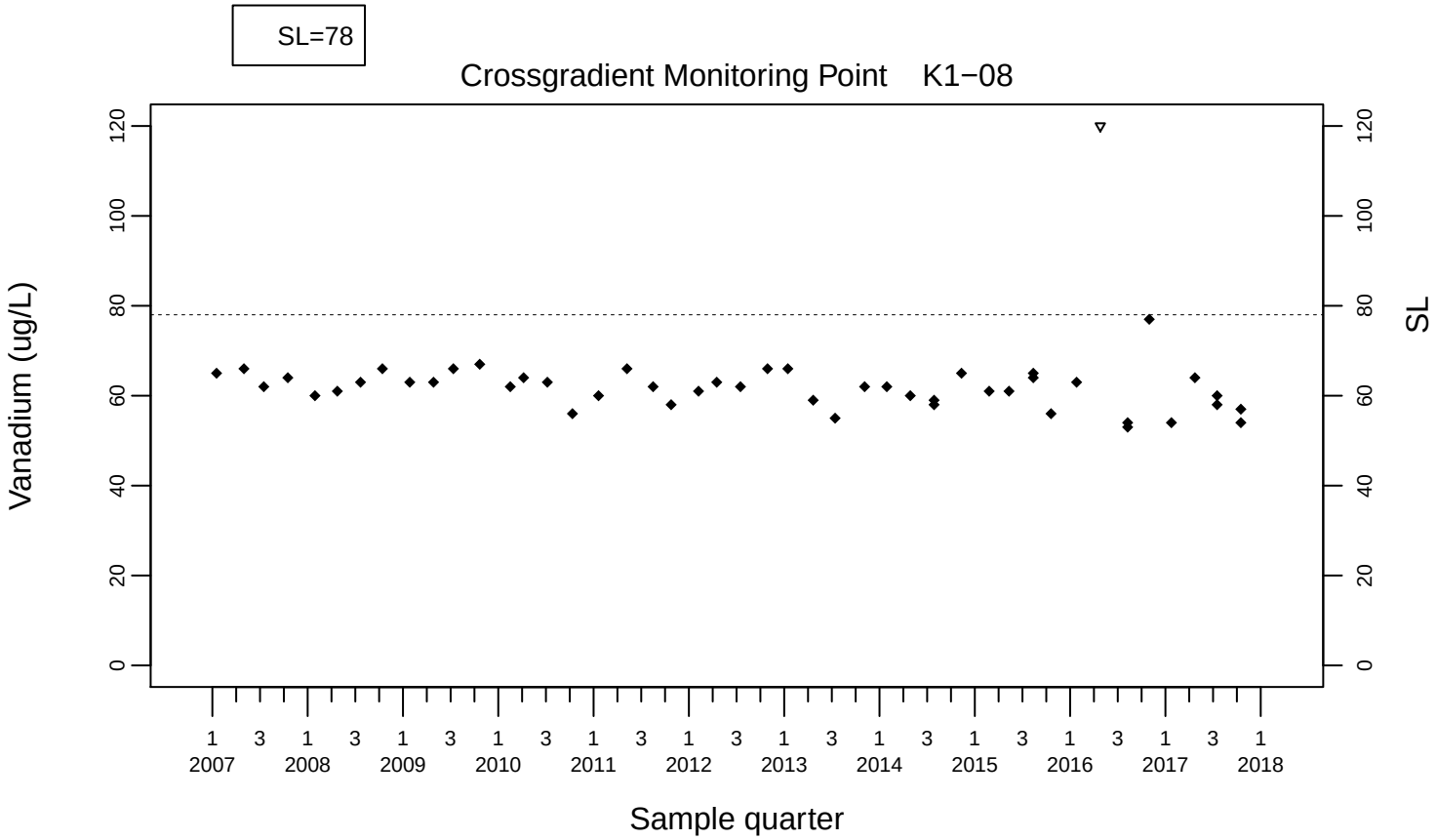

Pit 1 Area
Vanadium (ug/L)
Background Monitoring Point K1−01C
Above RL
Below RL
Vanadium (ug/L)
0
20
40
60
80
100
120
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

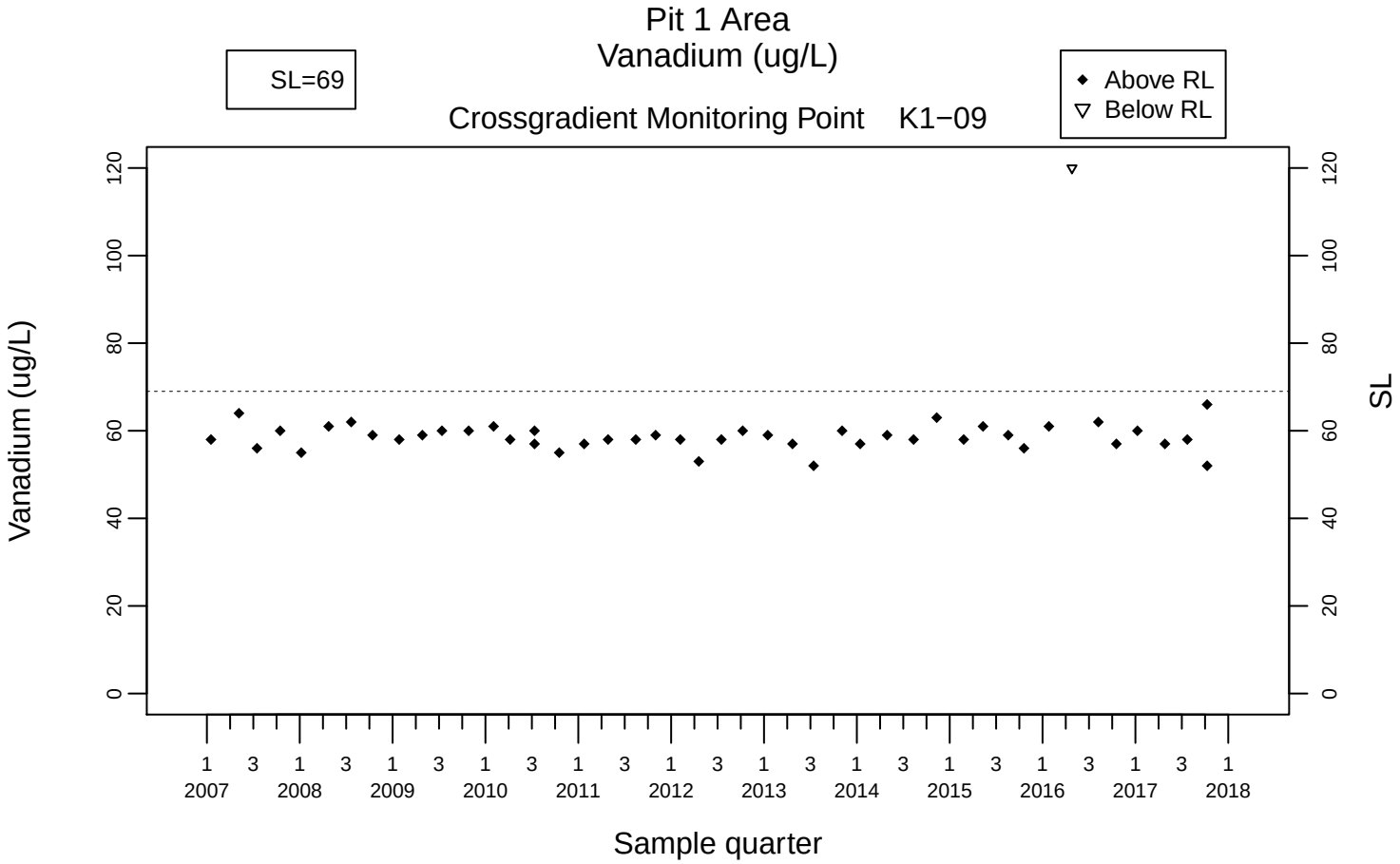

Background Monitoring Point K1−07
Vanadium (ug/L)
0
20
40
60
80
100
120
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

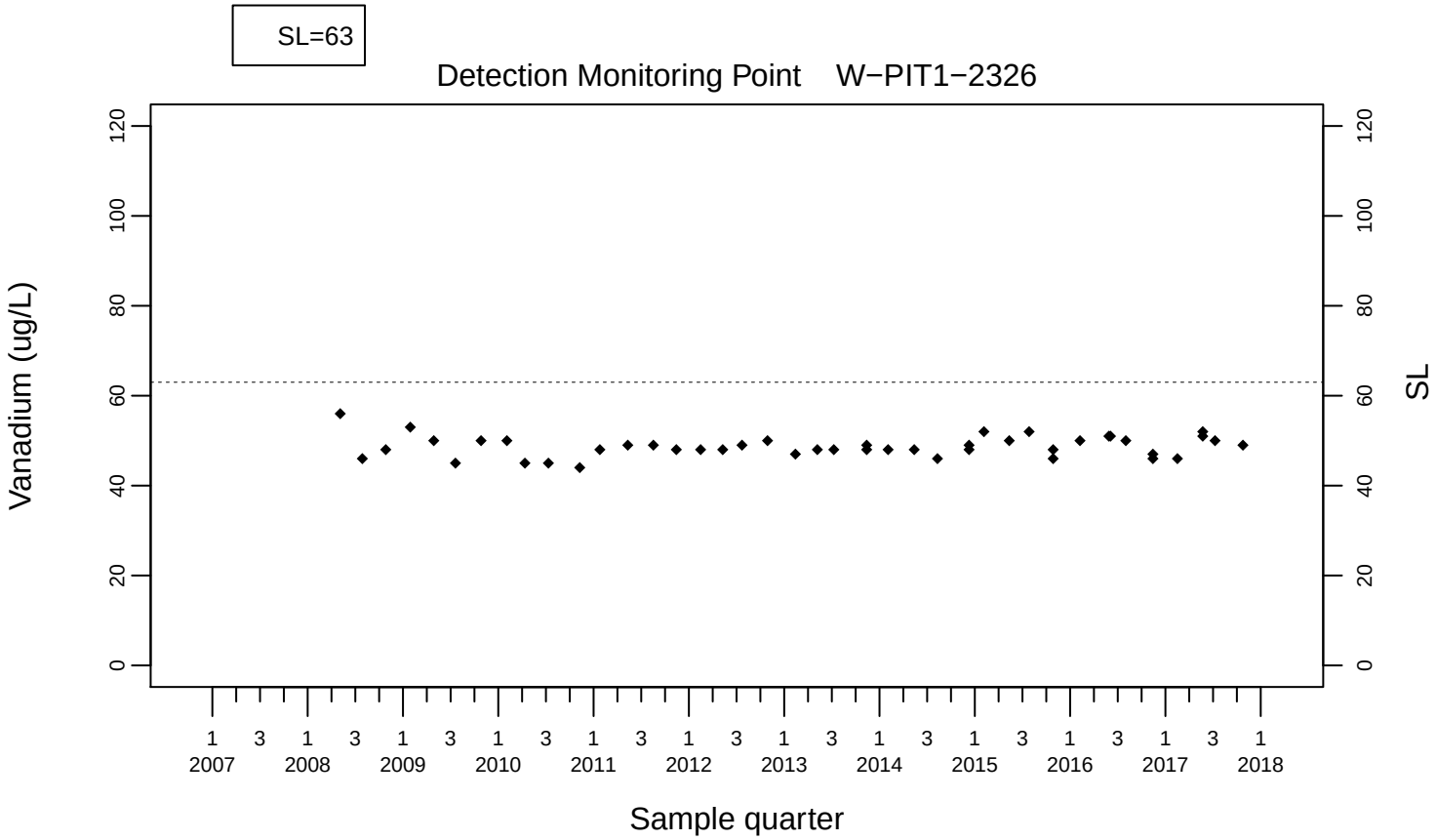

Pit 1 Area
Vanadium (ug/L)
SL=59
Above RL
Below RL
Detection Monitoring Point K1−02B
Vanadium (ug/L)
SL
Sample quarter
0
20
40
60
80
100
120
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

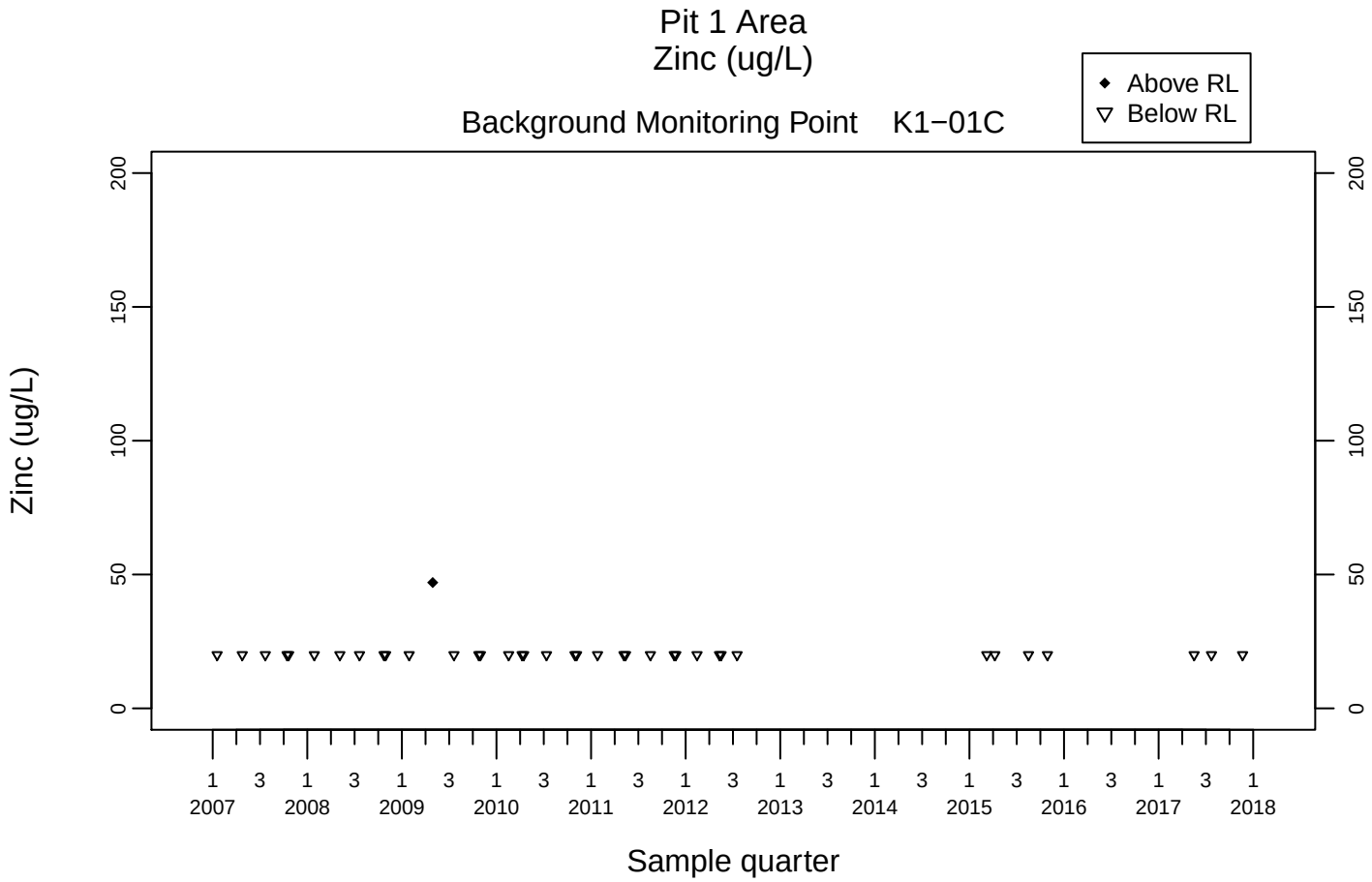

SL=46
Detection Monitoring Point K1−04
Vanadium (ug/L)
SL
Sample quarter
0
20
40
60
80
100
120
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

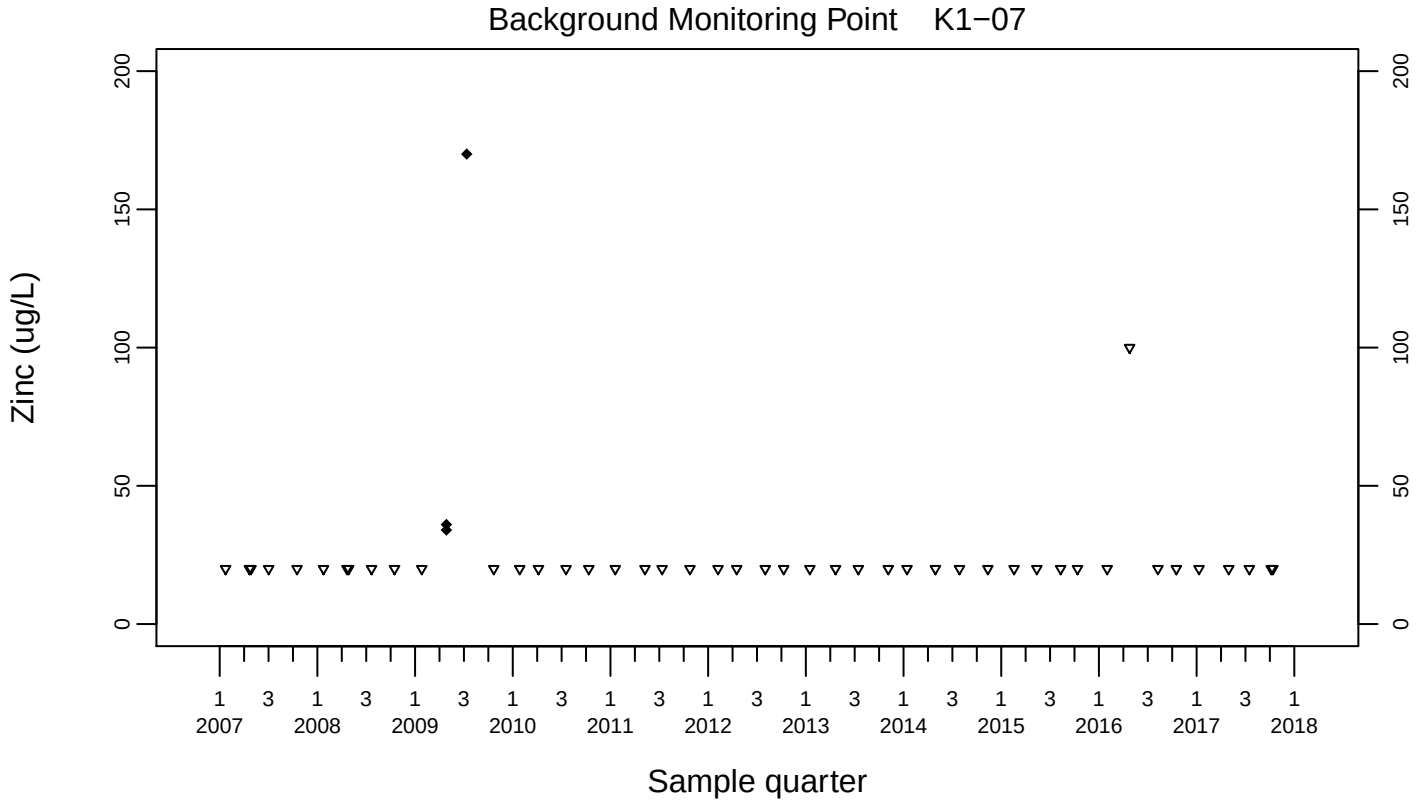

Pit 1 Area
Vanadium (ug/L)
SL=79
Above RL
Below RL
Detection Monitoring Point K1−05
Vanadium (ug/L)
SL
Sample quarter

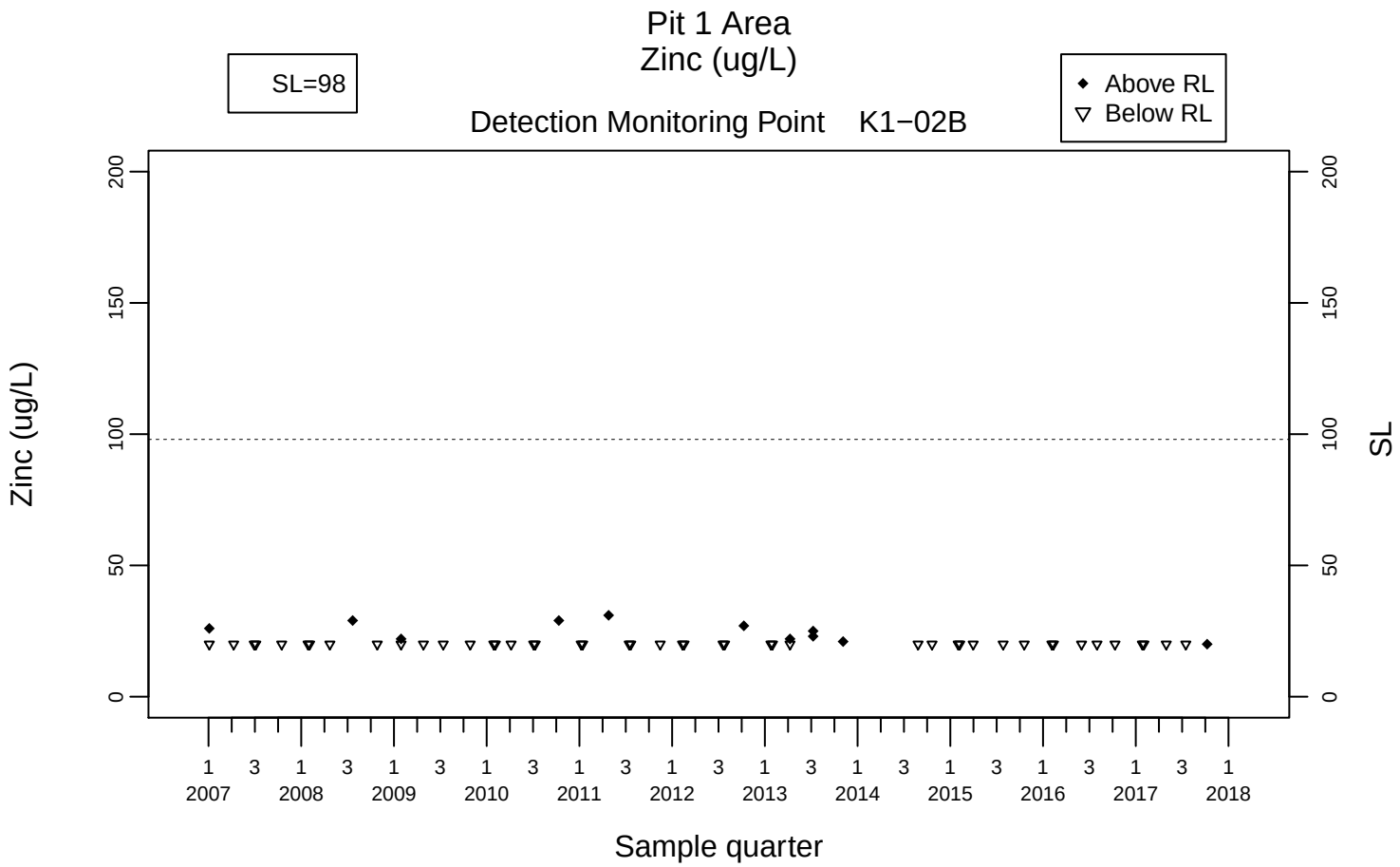

SL=78
Crossgradient Monitoring Point K1−08
Vanadium (ug/L)
SL
Sample quarter

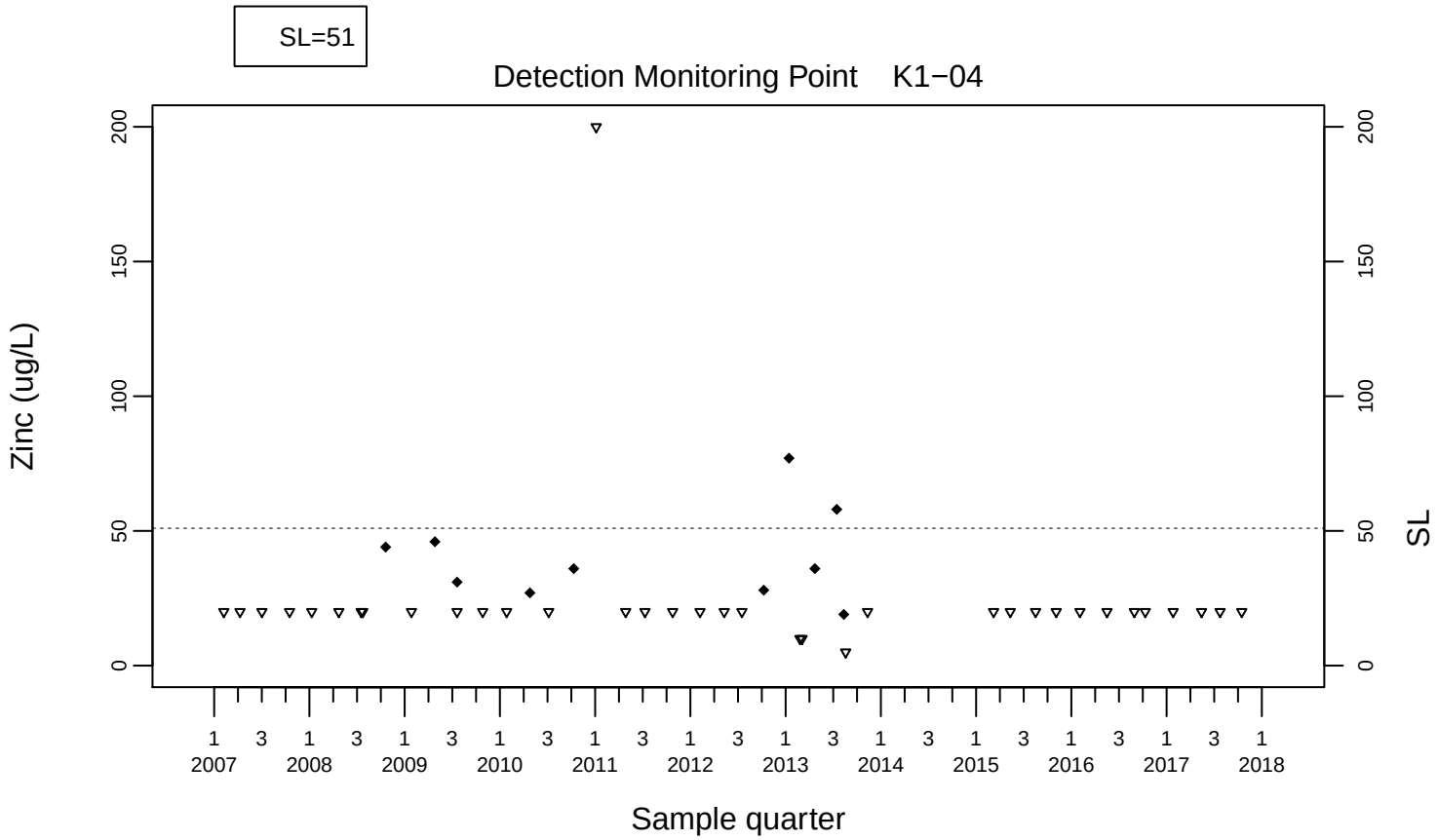

Pit 1 Area
Vanadium (ug/L)
SL=69
Crossgradient Monitoring Point K1−09
Above RL
Below RL
Vanadium (ug/L)
SL
Sample quarter

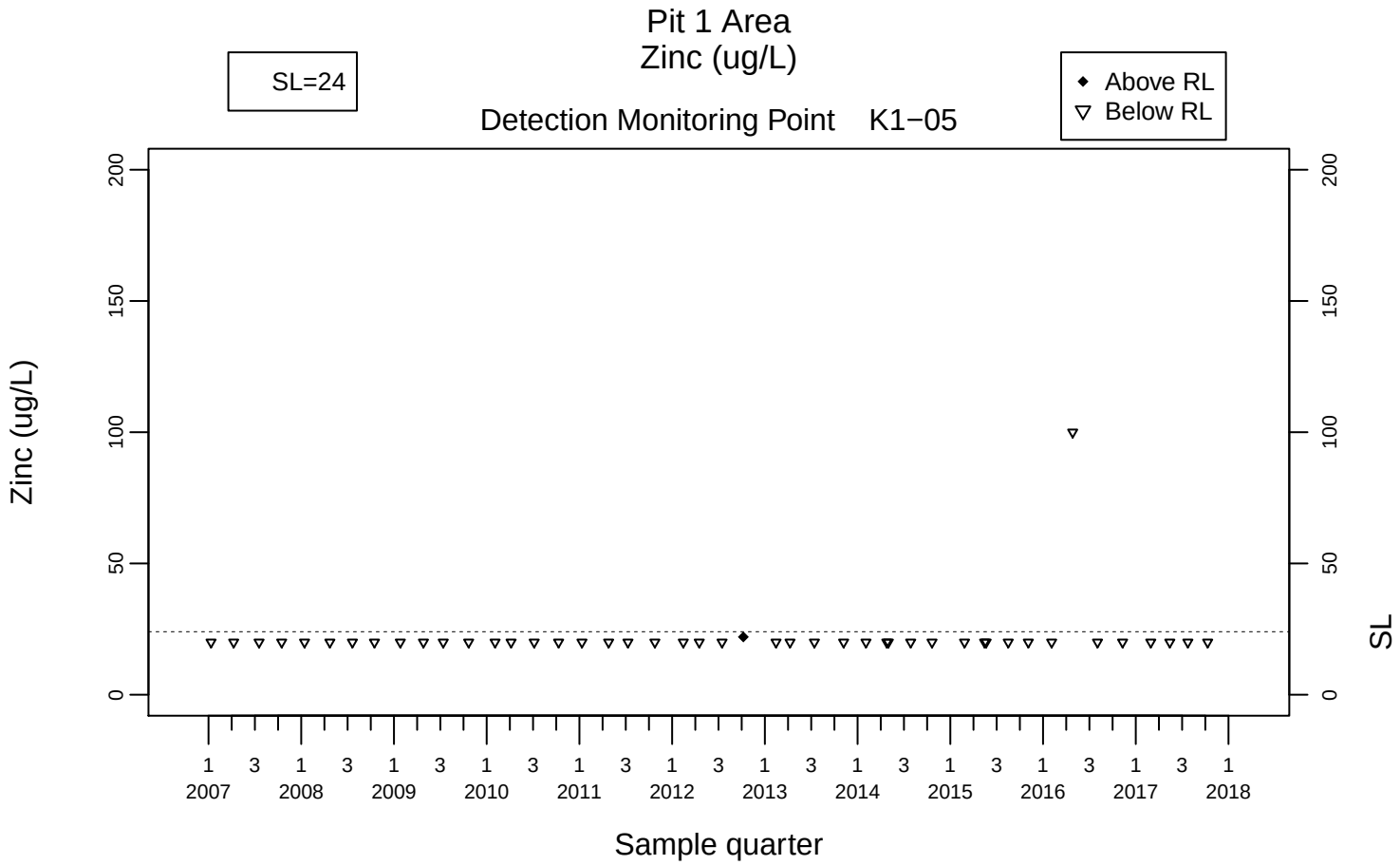

SL=63
Detection Monitoring Point W−PIT1−2326
Vanadium (ug/L)
SL
Sample quarter

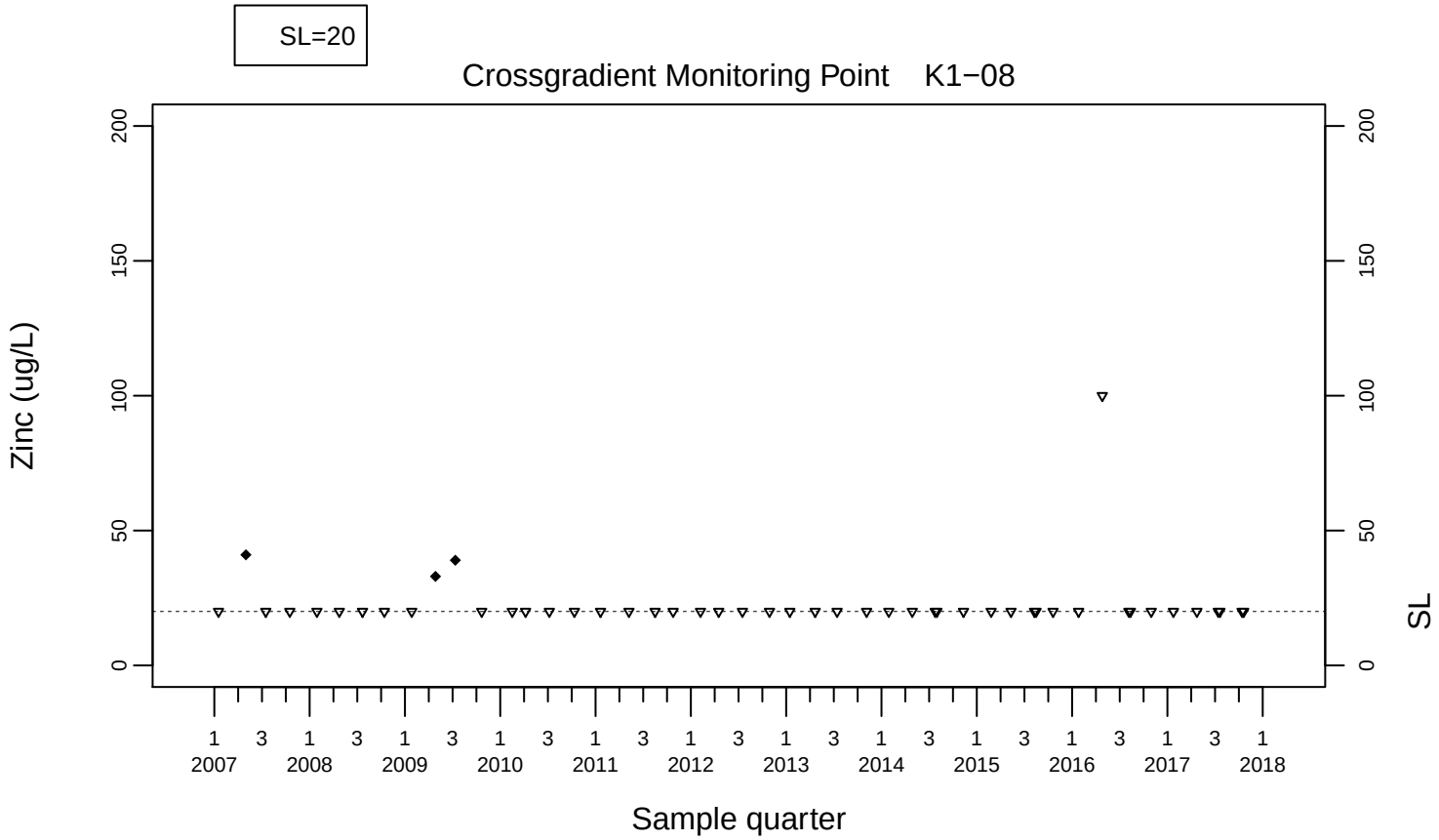

Pit 1 Area
Zinc (ug/L)
Background Monitoring Point K1−01C
Above RL
Below RL
Zinc (ug/L)
0
50
100
150
200
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

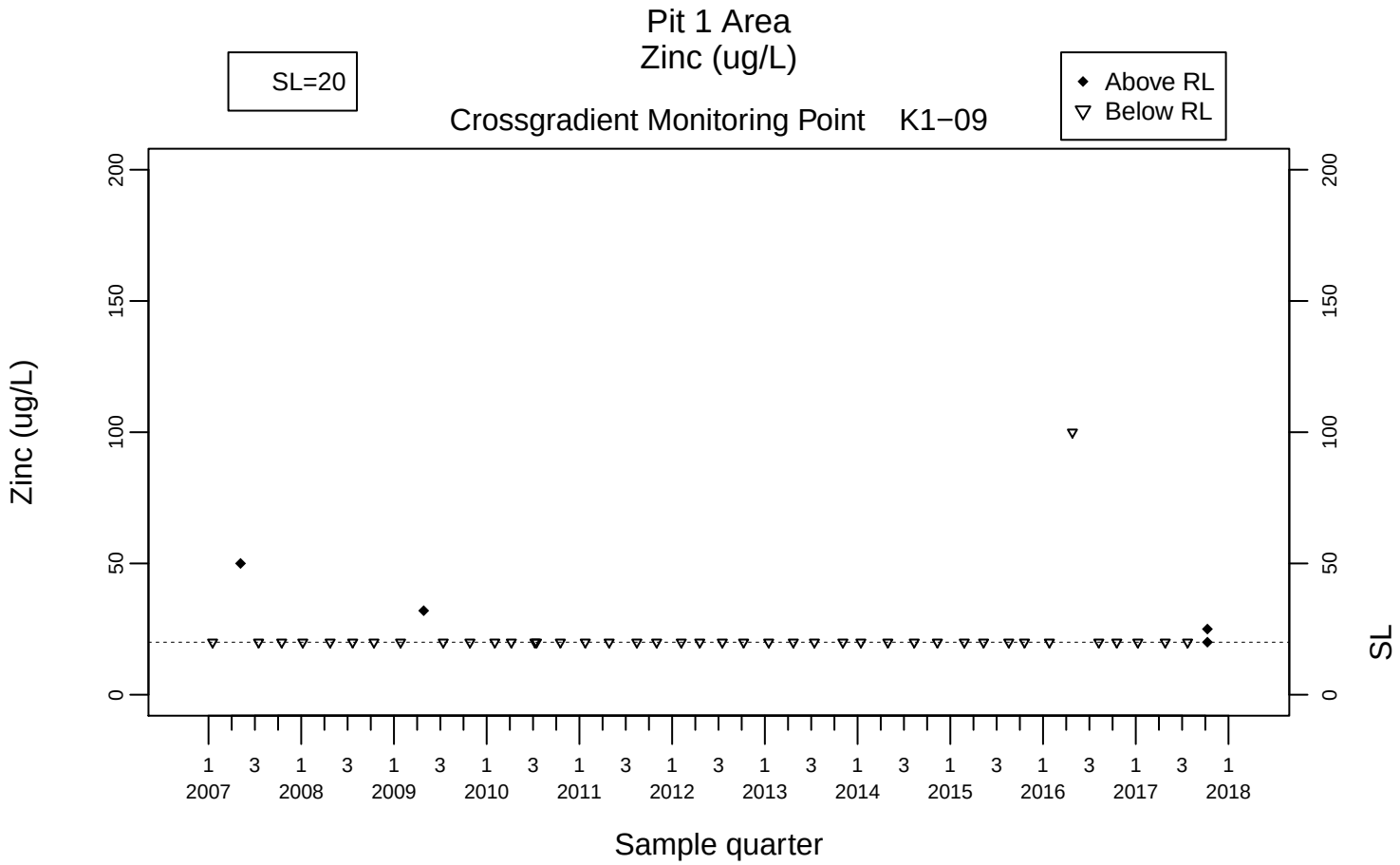

Background Monitoring Point K1−07
Zinc (ug/L)
0
50
100
150
200
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

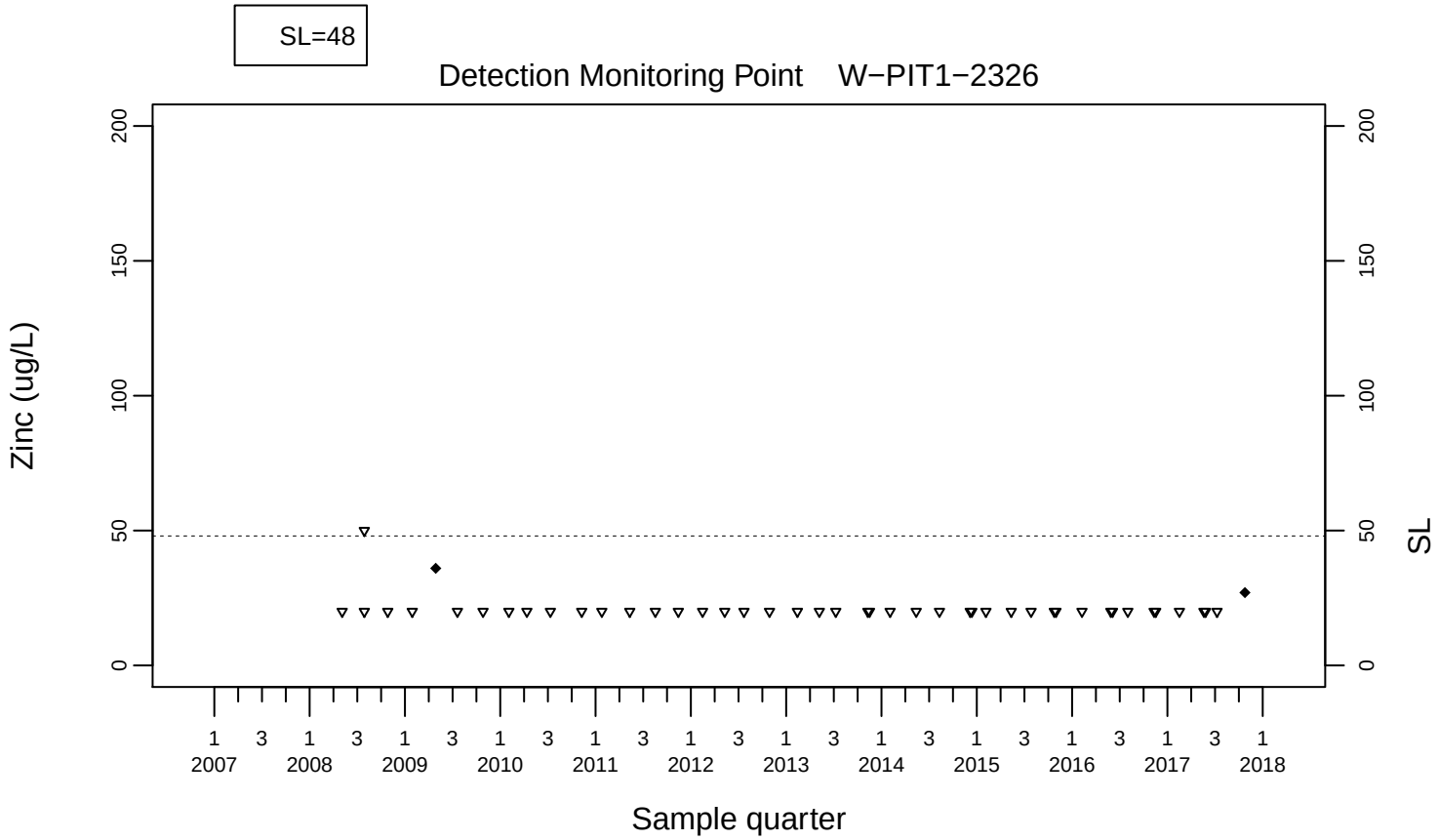

Pit 1 Area
Zinc (ug/L)
SL=98
Above RL
Below RL
Detection Monitoring Point K1−02B
Zinc (ug/L)
SL
Sample quarter

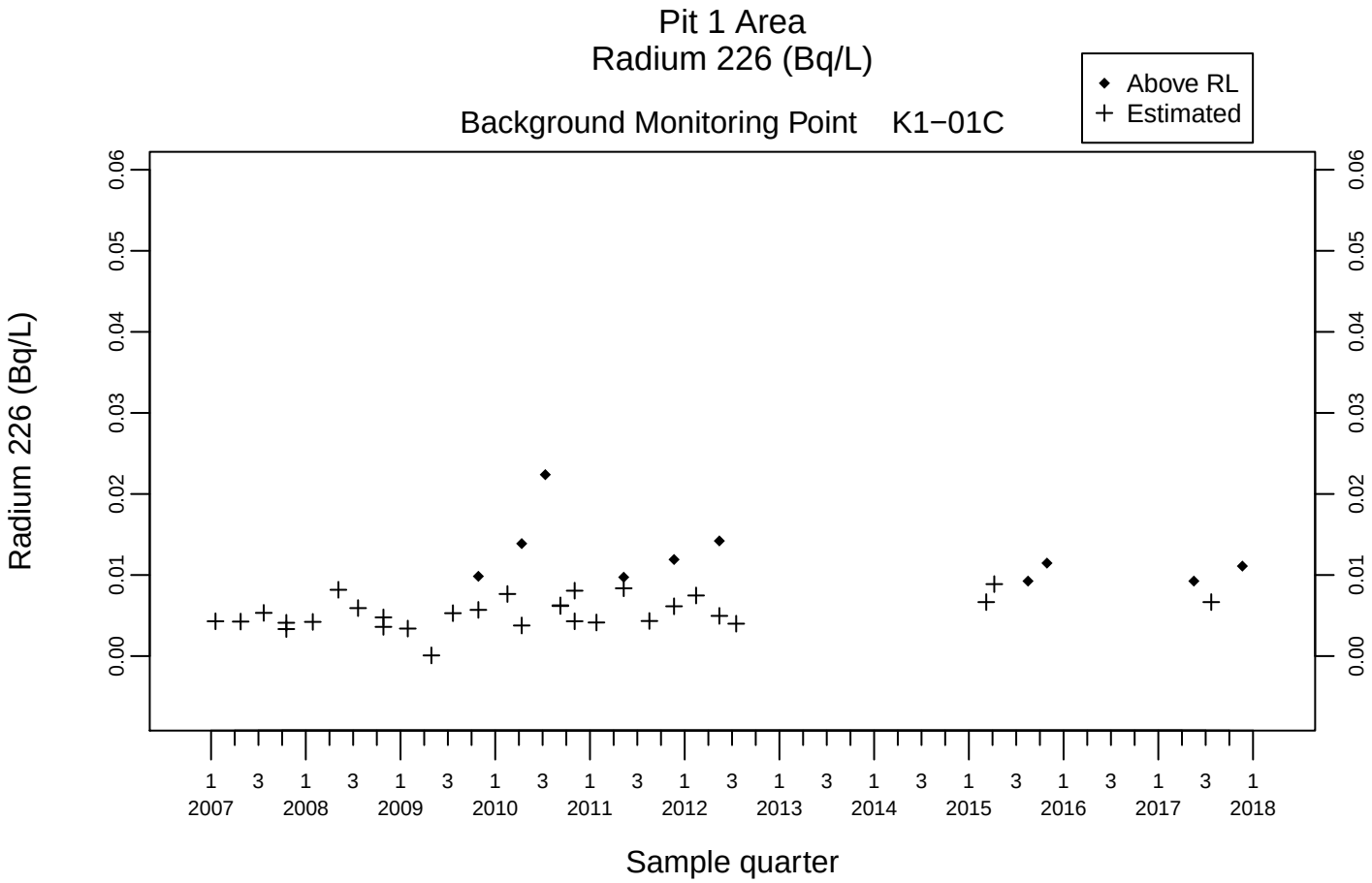

SL=51
Detection Monitoring Point K1−04
Zinc (ug/L)
SL
Sample quarter

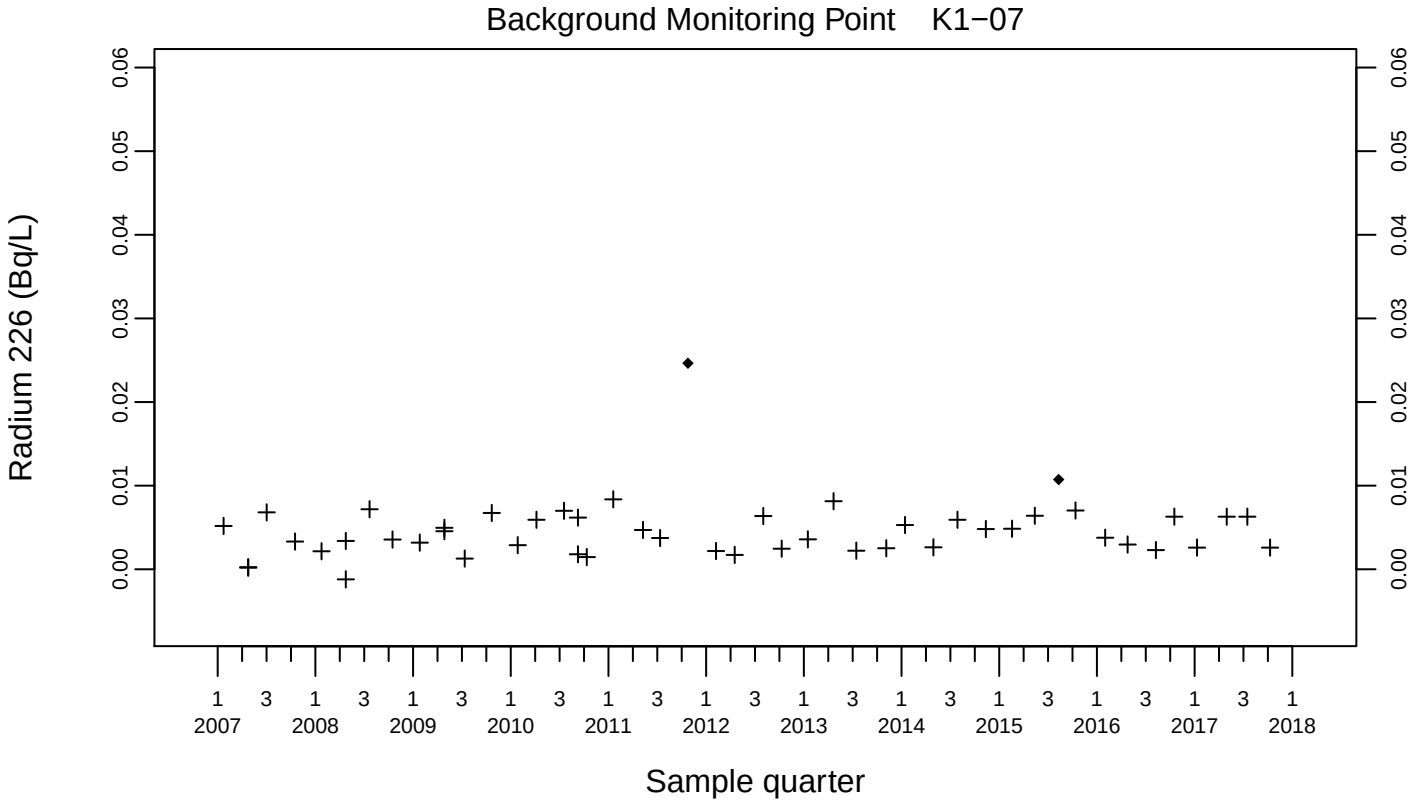

Pit 1 Area
Zinc (ug/L)
SL=24
Detection Monitoring Point K1−05
Above RL
Below RL
Zinc (ug/L)
SL
Sample quarter

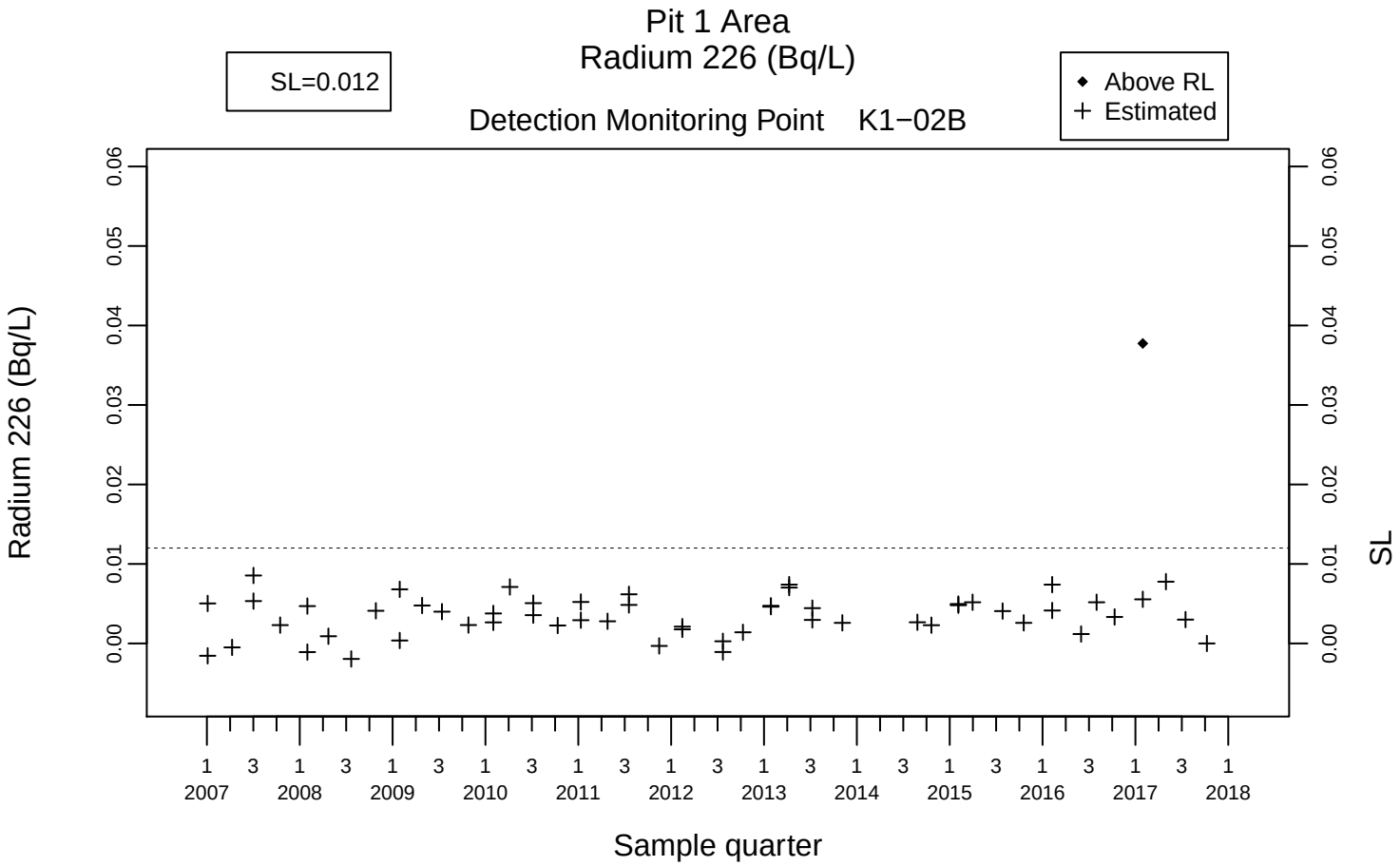

SL=20
Crossgradient Monitoring Point K1−08
Zinc (ug/L)
SL
Sample quarter

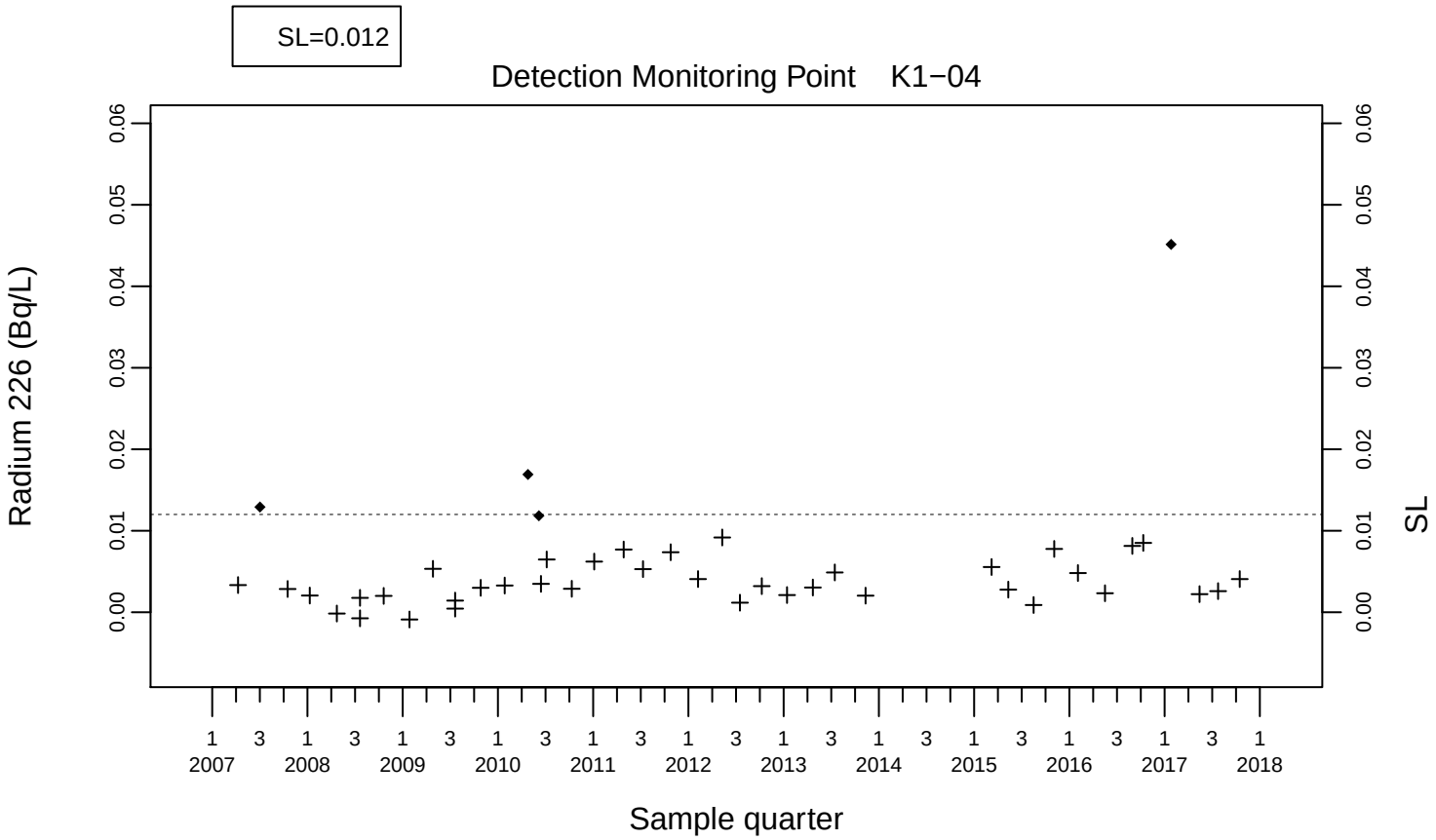

Pit 1 Area
Zinc (ug/L)
SL=20
Crossgradient Monitoring Point K1−09
Above RL
Below RL
Zinc (ug/L)
SL
Sample quarter

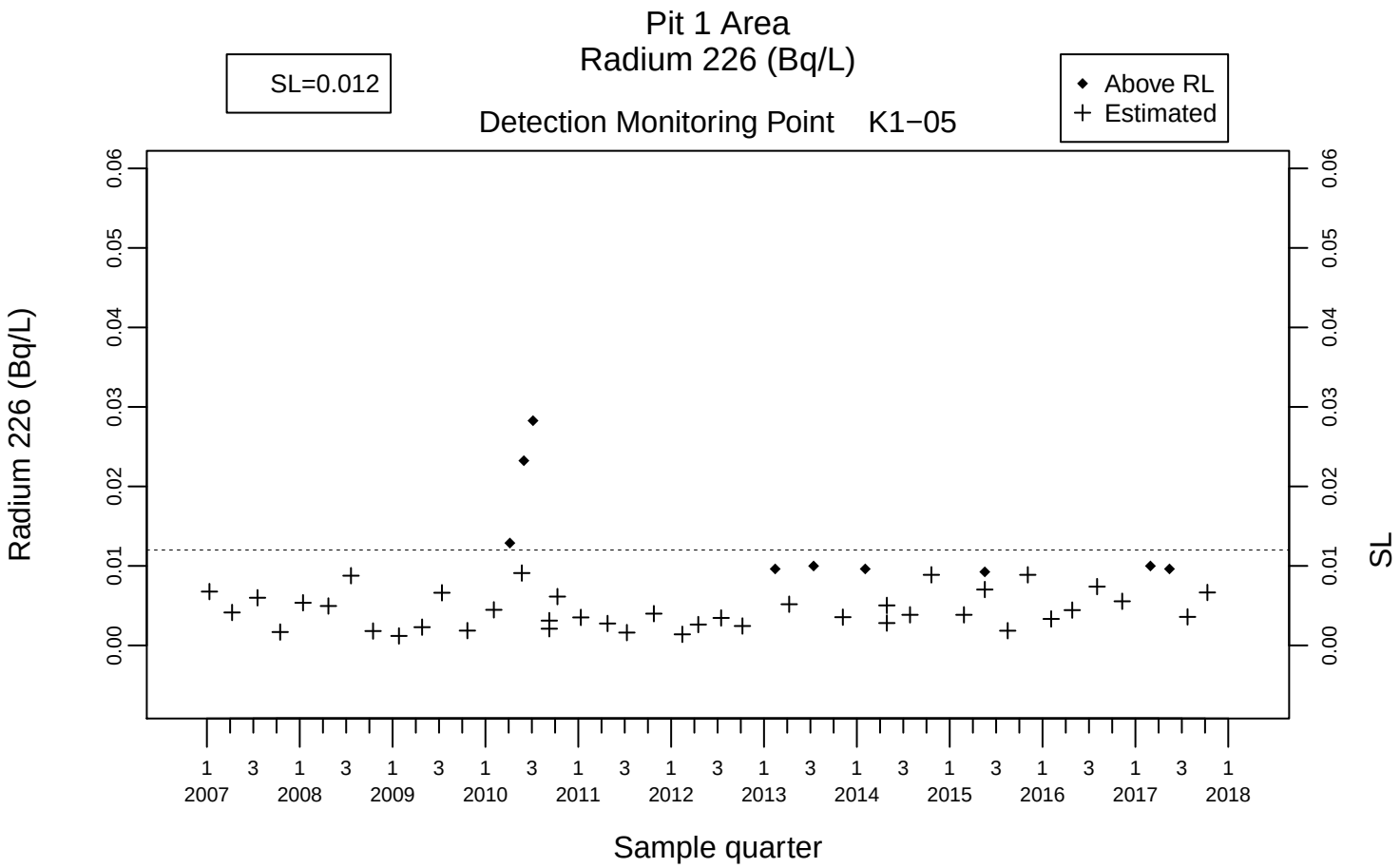

SL=48
Detection Monitoring Point W−PIT1−2326
Zinc (ug/L)
SL
Sample quarter

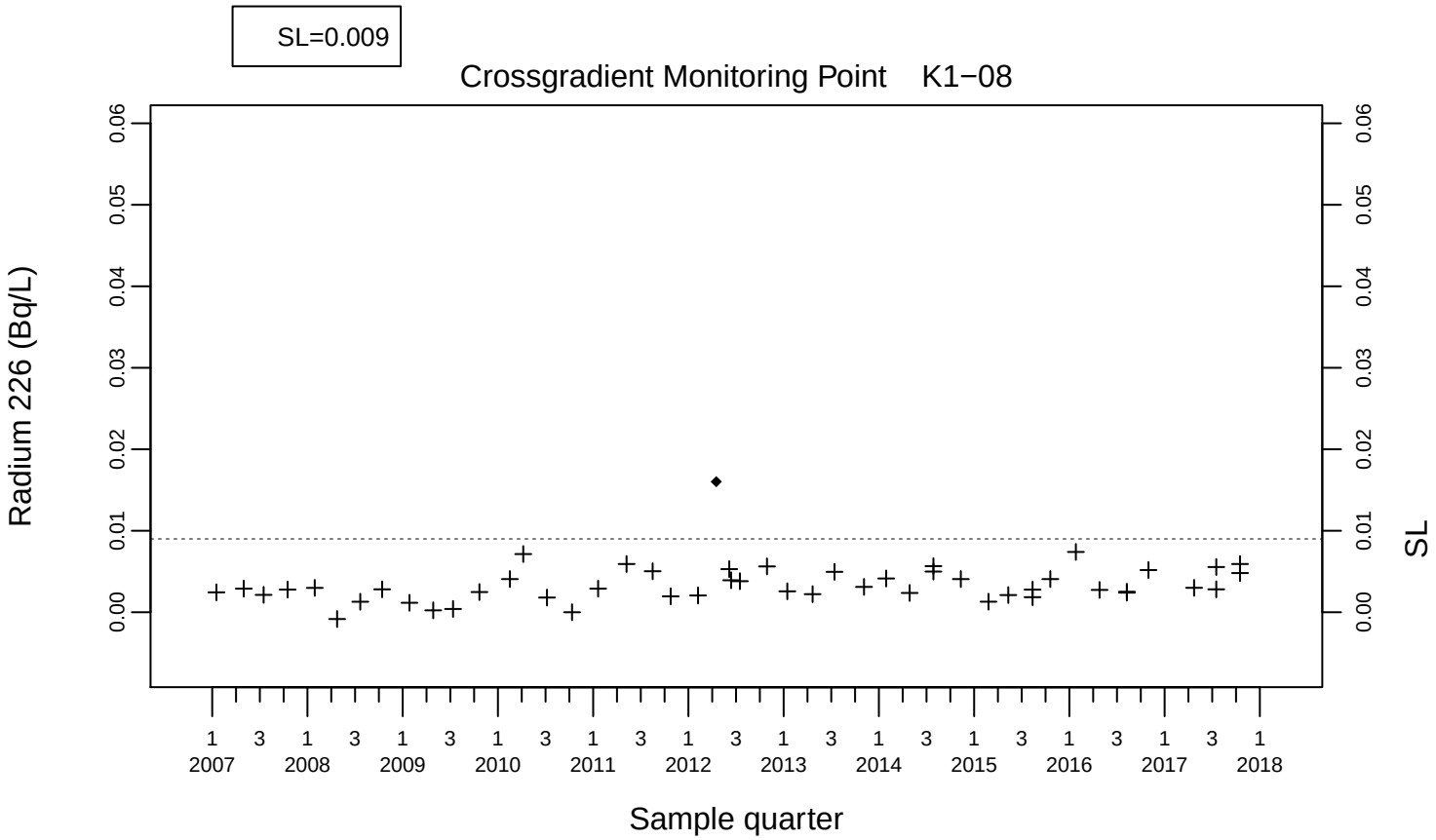

Pit 1 Area
Radium 226 (Bq/L)
Above RL
Estimated
Background Monitoring Point K1−01C
Radium 226 (Bq/L)
0.00
0.01
0.02
0.03
0.04
0.05
0.06
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

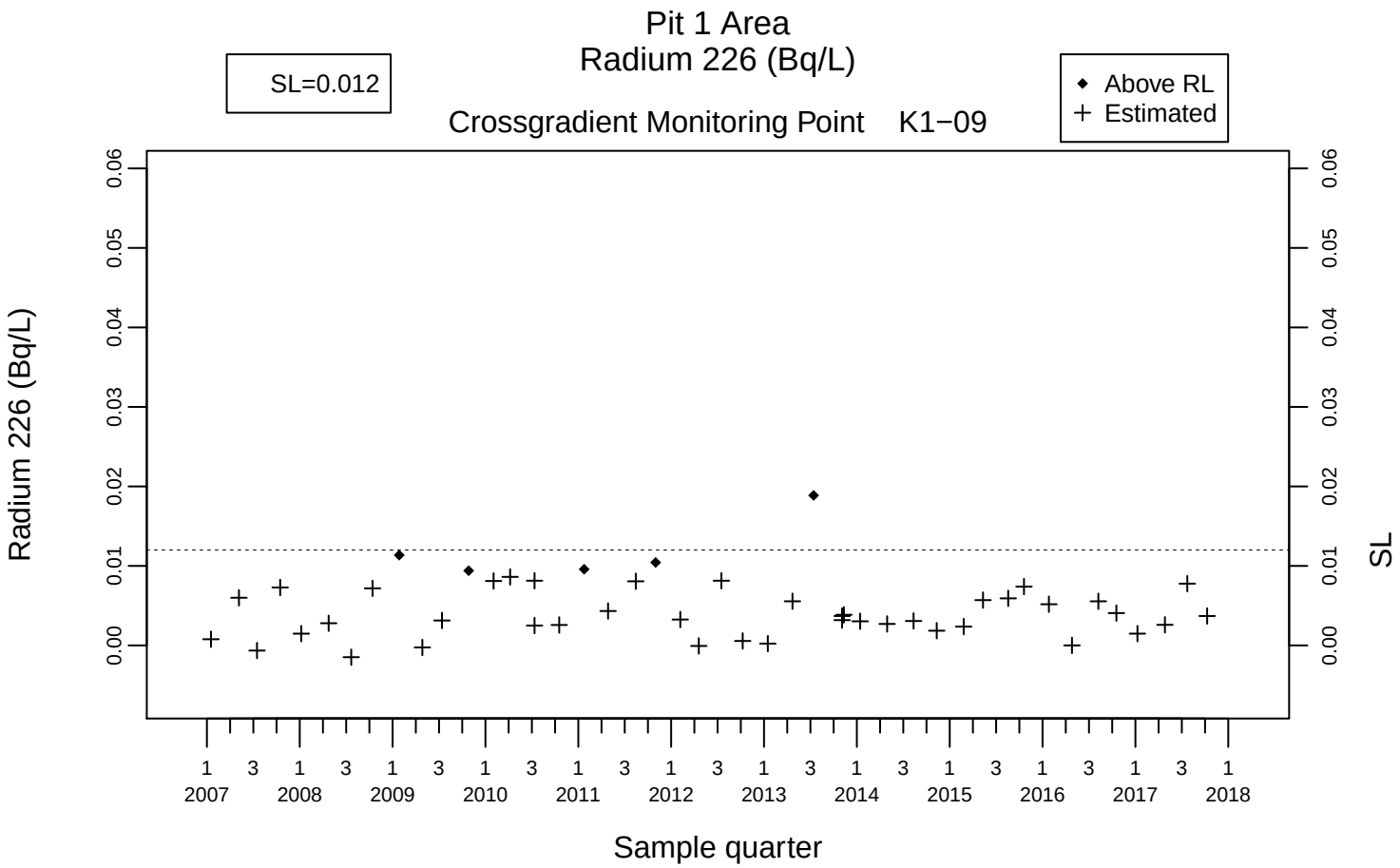

Background Monitoring Point K1−07
Radium 226 (Bq/L)
0.00
0.01
0.02
0.03
0.04
0.05
0.06
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

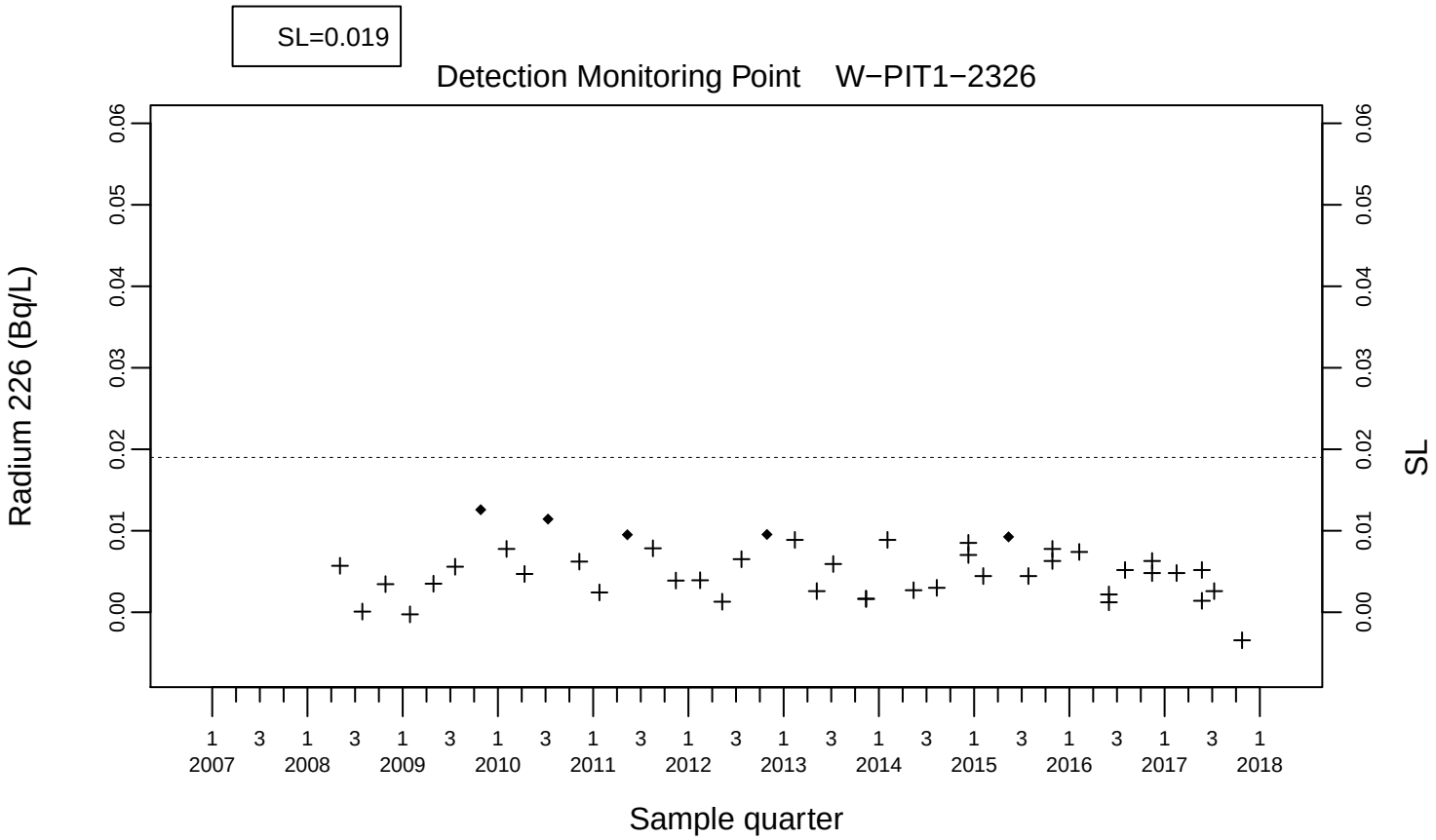

Pit 1 Area
Radium 226 (Bq/L)
SL=0.012
Above RL
Estimated
Detection Monitoring Point K1−02B
Radium 226 (Bq/L)
SL
Sample quarter

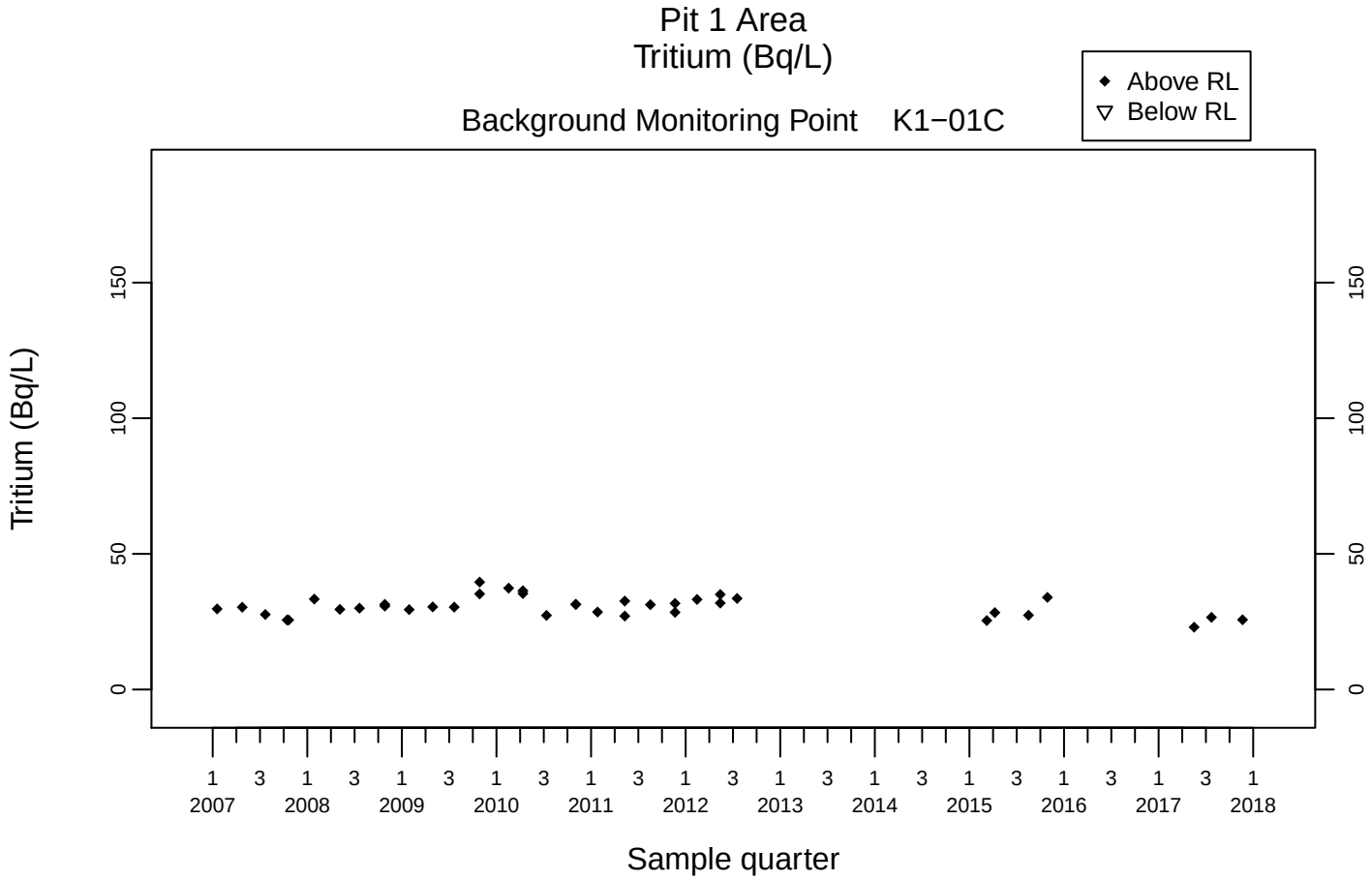

SL=0.012
Detection Monitoring Point K1−04
Radium 226 (Bq/L)
SL
Sample quarter

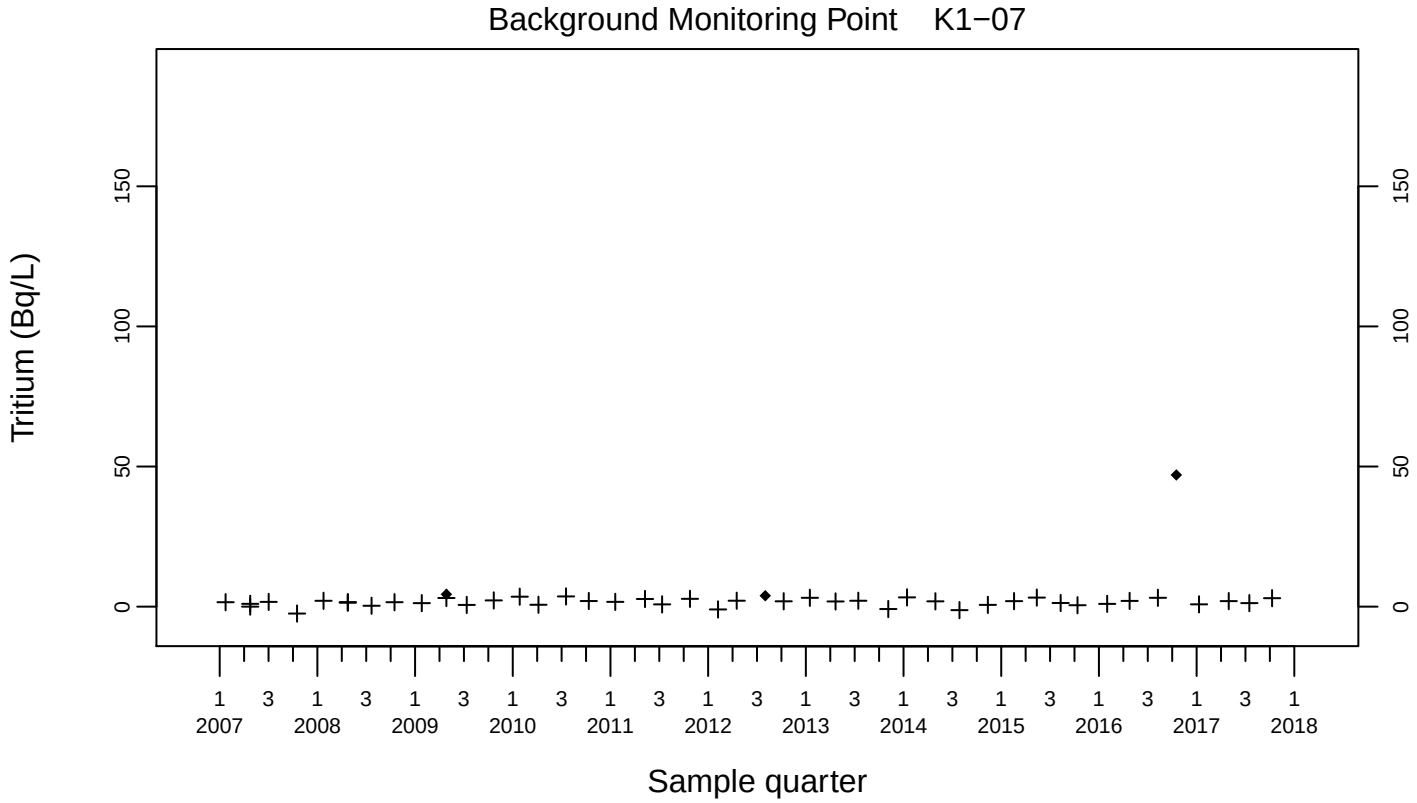

Pit 1 Area
Radium 226 (Bq/L)
SL=0.012
Above RL
Estimated
Detection Monitoring Point K1−05
Radium 226 (Bq/L)
SL
Sample quarter

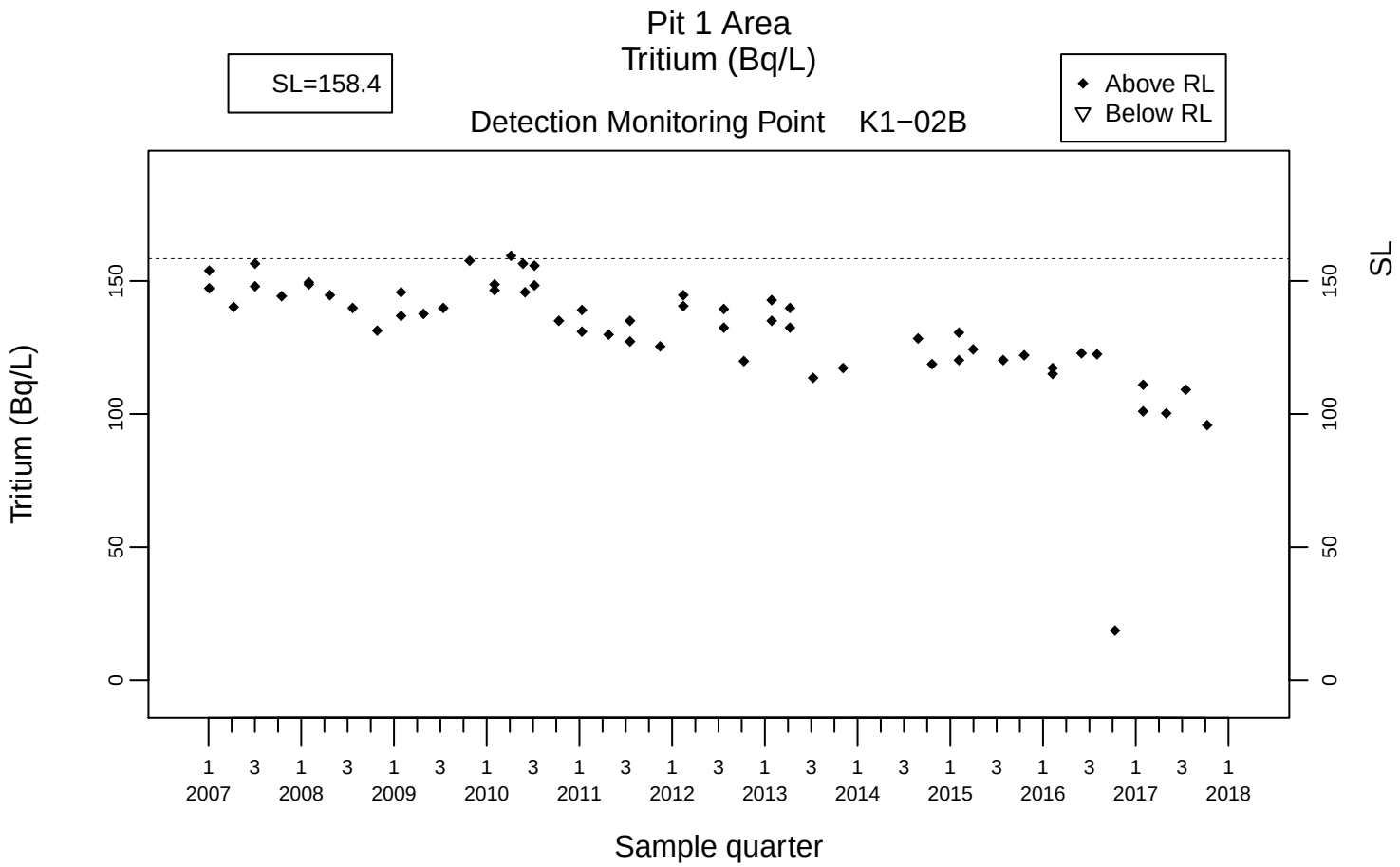

SL=0.009
Crossgradient Monitoring Point K1−08
Radium 226 (Bq/L)
SL
Sample quarter

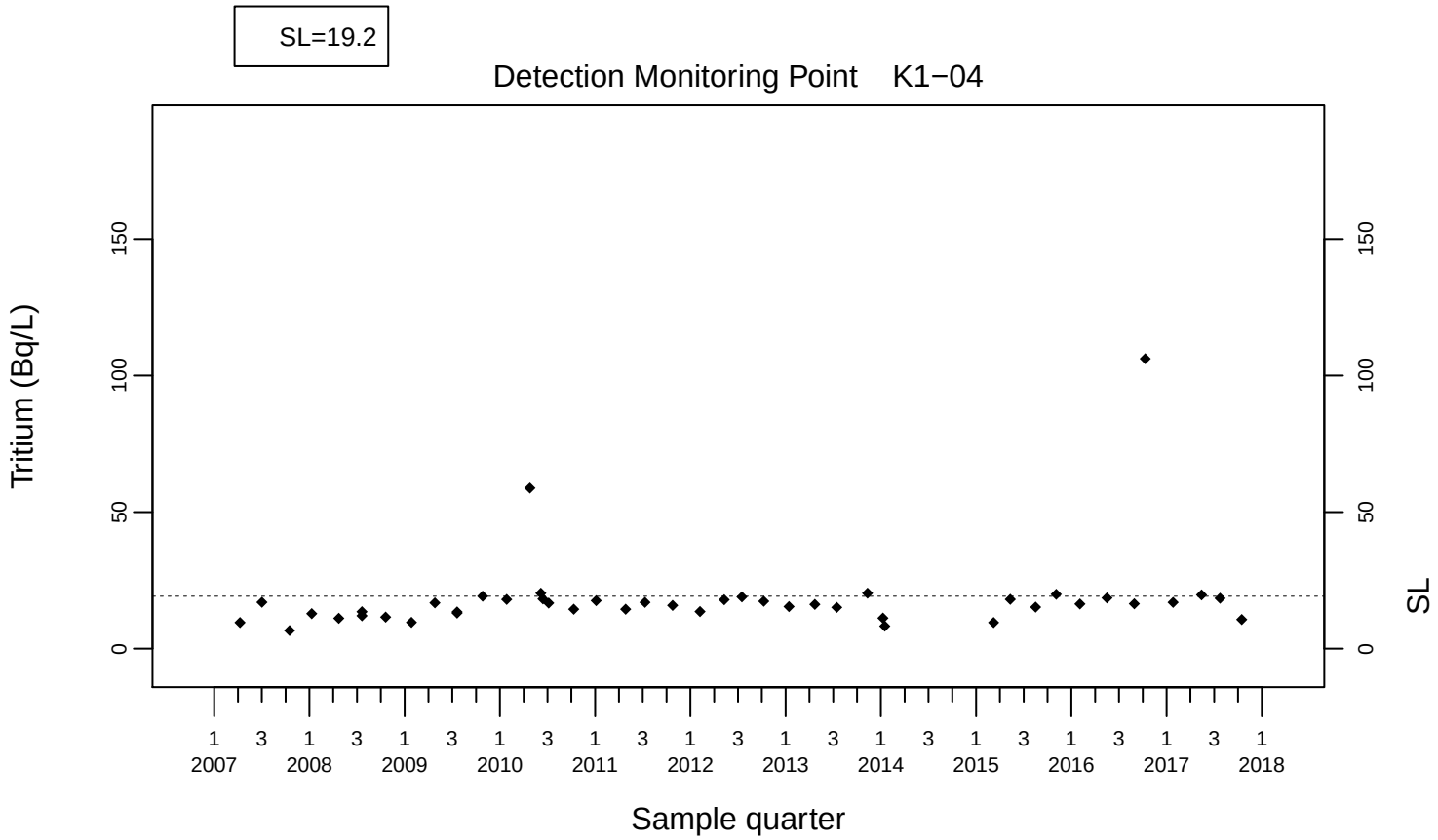

Pit 1 Area
Radium 226 (Bq/L)
SL=0.012
Above RL
Estimated
Crossgradient Monitoring Point K1−09
Radium 226 (Bq/L)
SL
Sample quarter

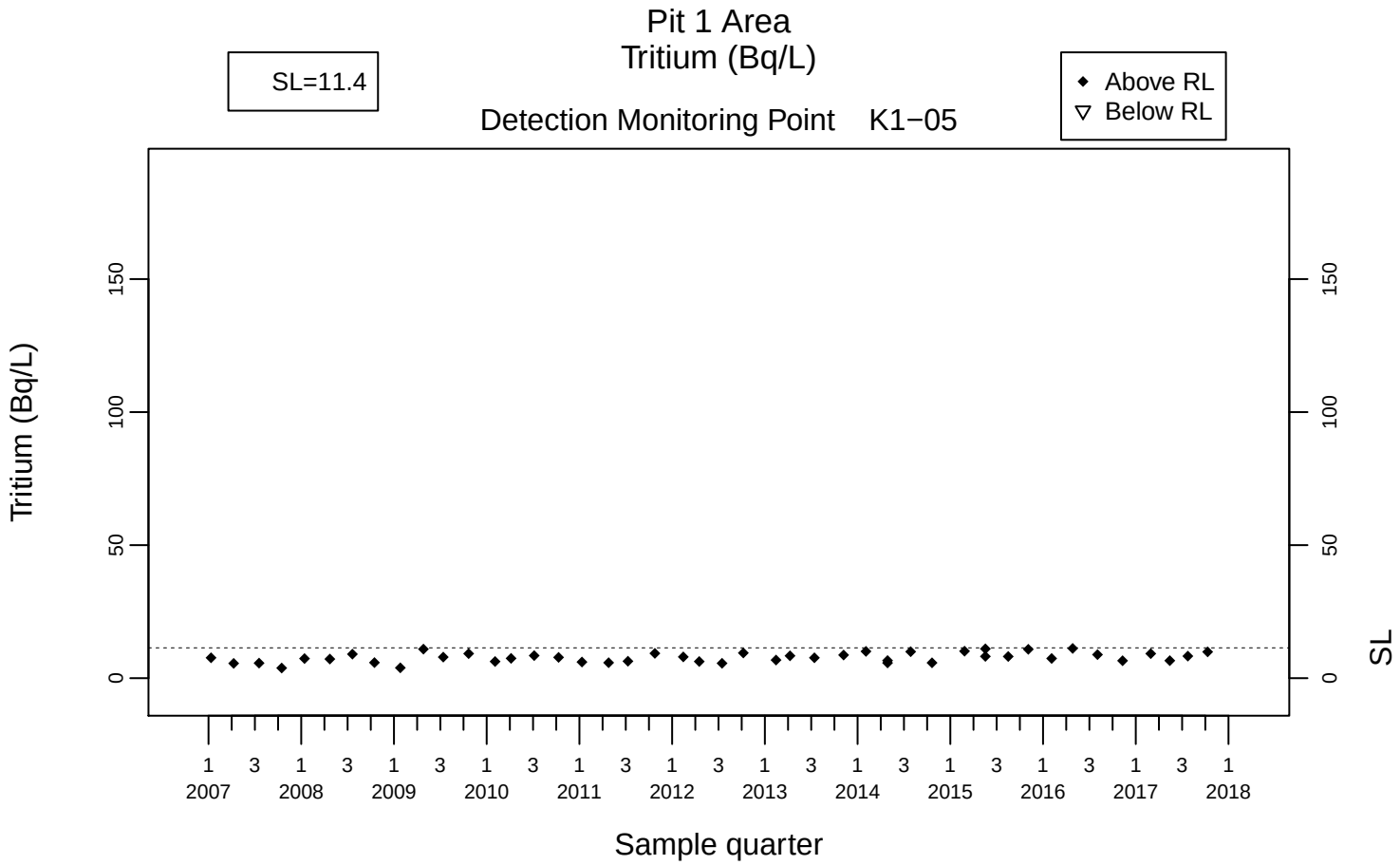

SL=0.019
Detection Monitoring Point W−PIT1−2326
Radium 226 (Bq/L)
SL
Sample quarter

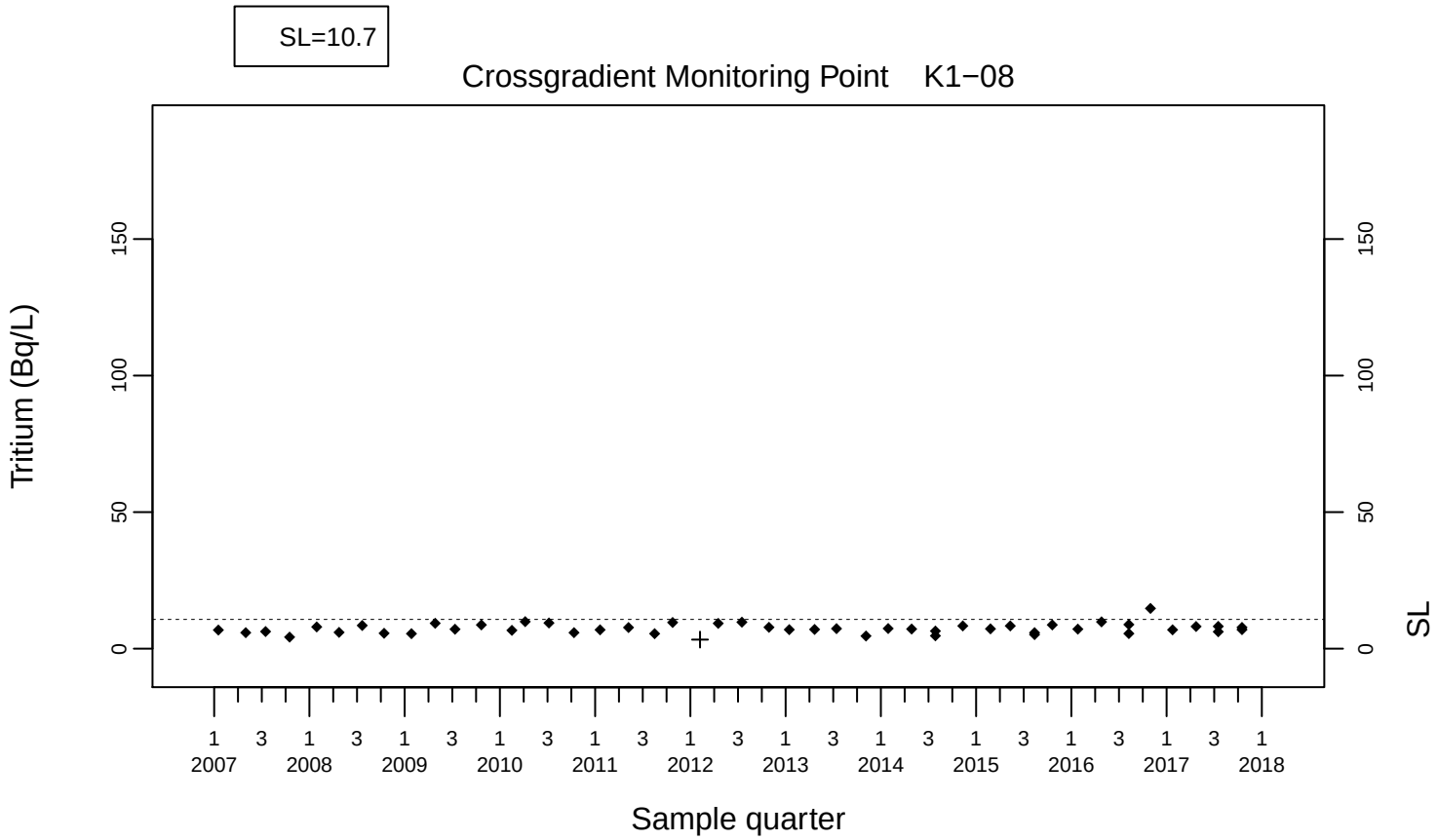

Pit 1 Area
Tritium (Bq/L)
Background Monitoring Point K1−01C
Above RL
Below RL
Tritium (Bq/L)
0
50
100
150
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

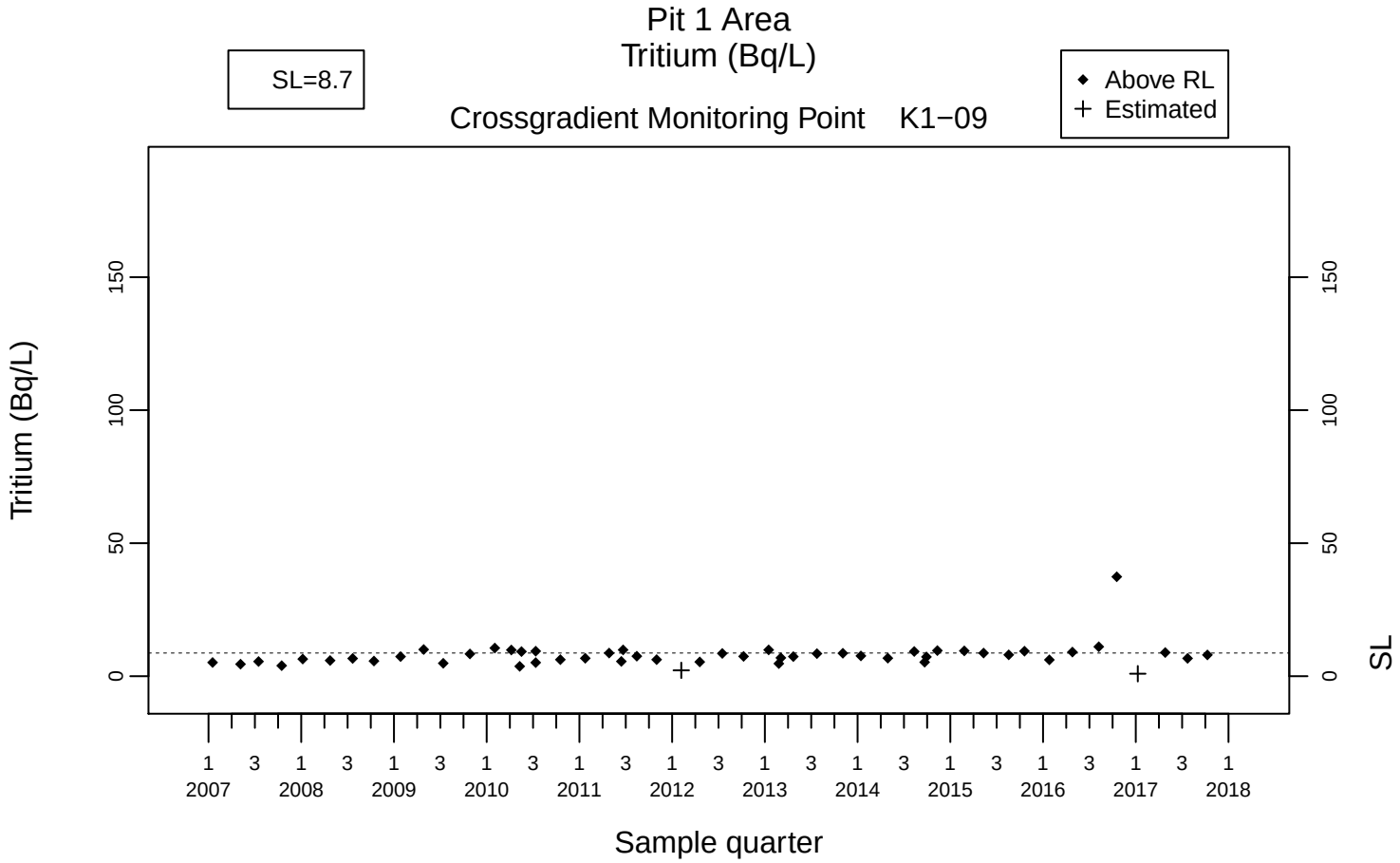

Background Monitoring Point K1−07
Tritium (Bq/L)
0
50
100
150
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

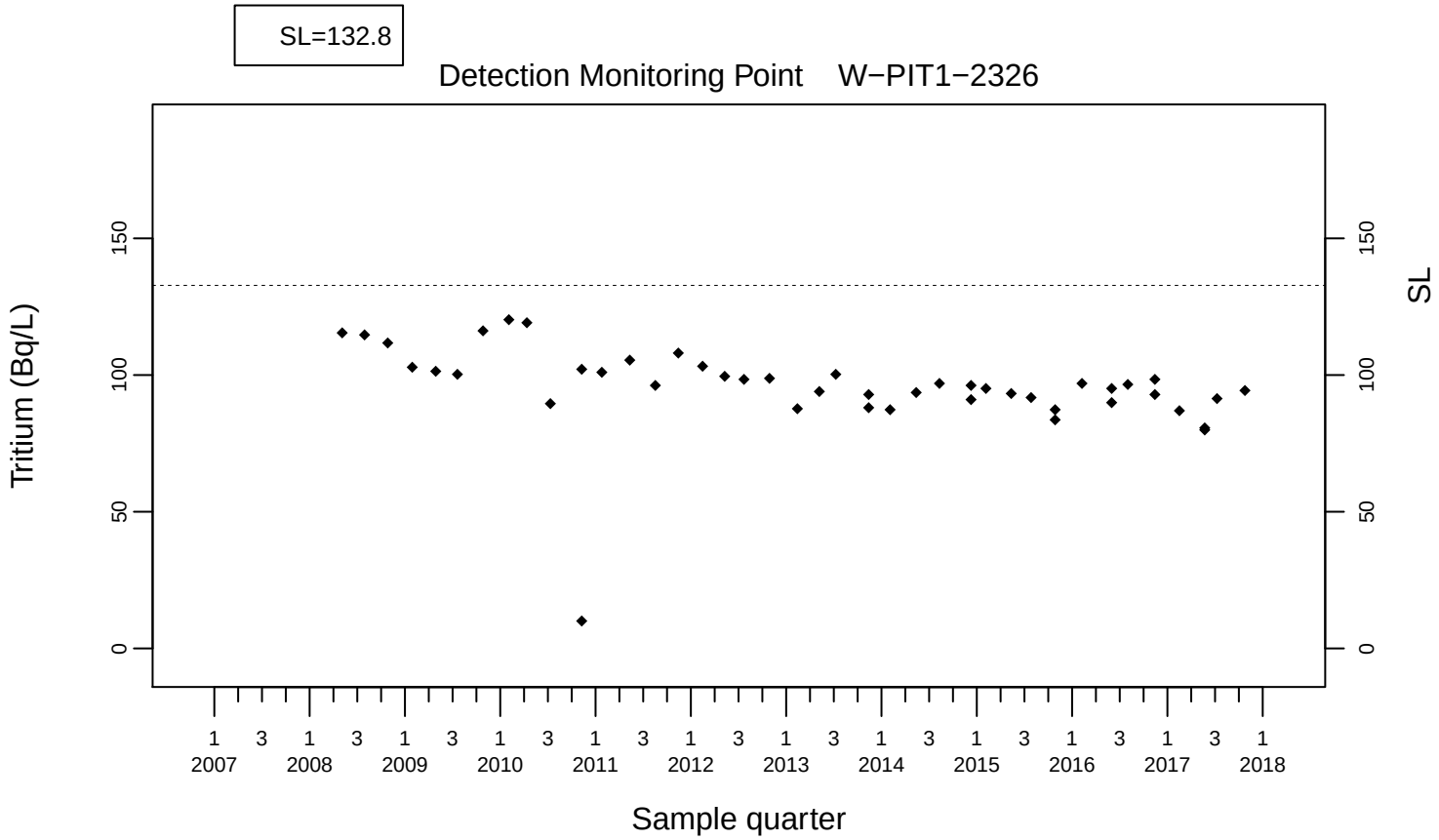

Pit 1 Area
Tritium (Bq/L)
SL=158.4
Detection Monitoring Point K1−02B
Above RL
Below RL
Tritium (Bq/L)
SL
0
50
100
150
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

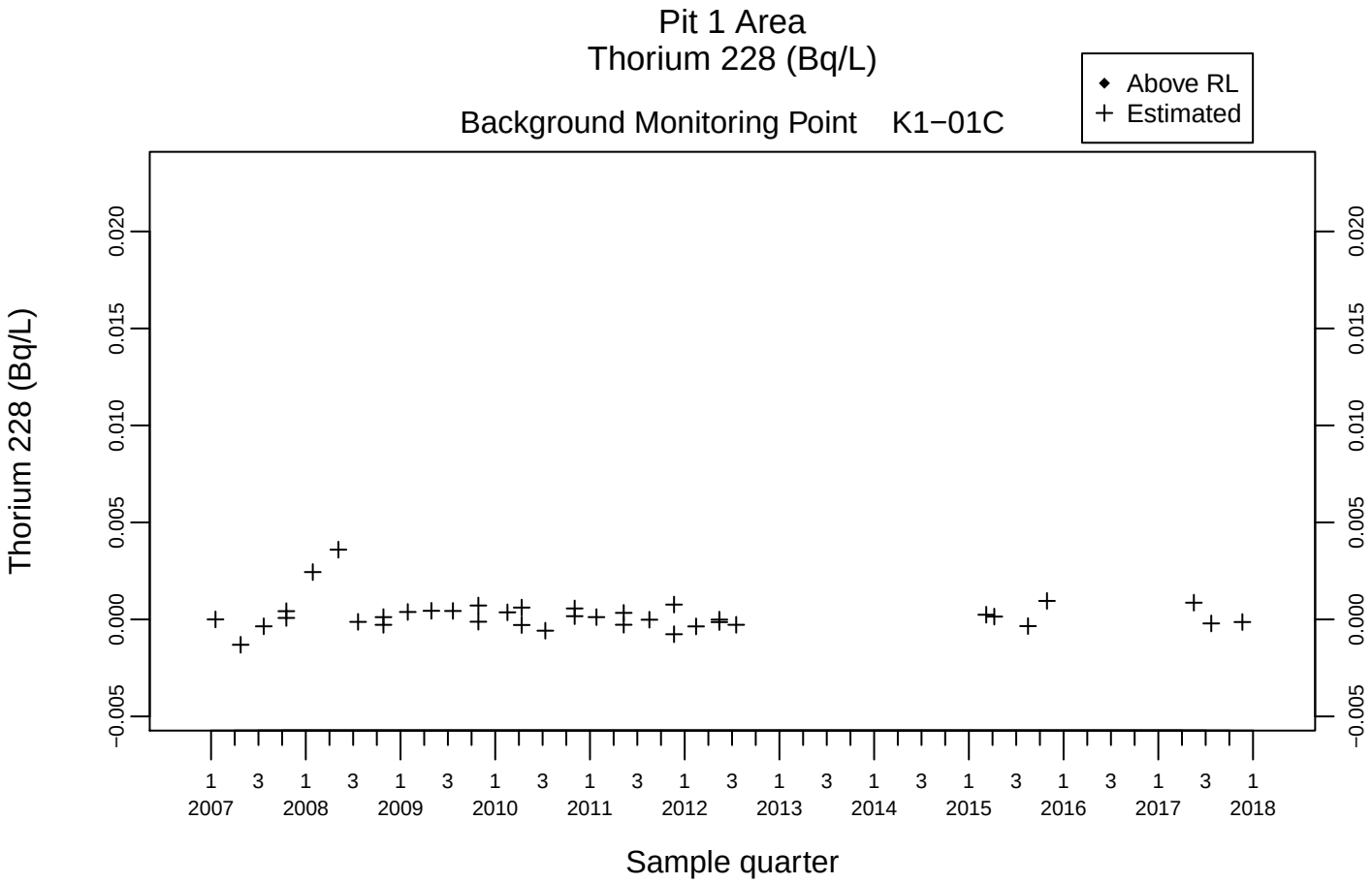

SL=19.2
Detection Monitoring Point K1−04
Tritium (Bq/L)
SL
0
50
100
150
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

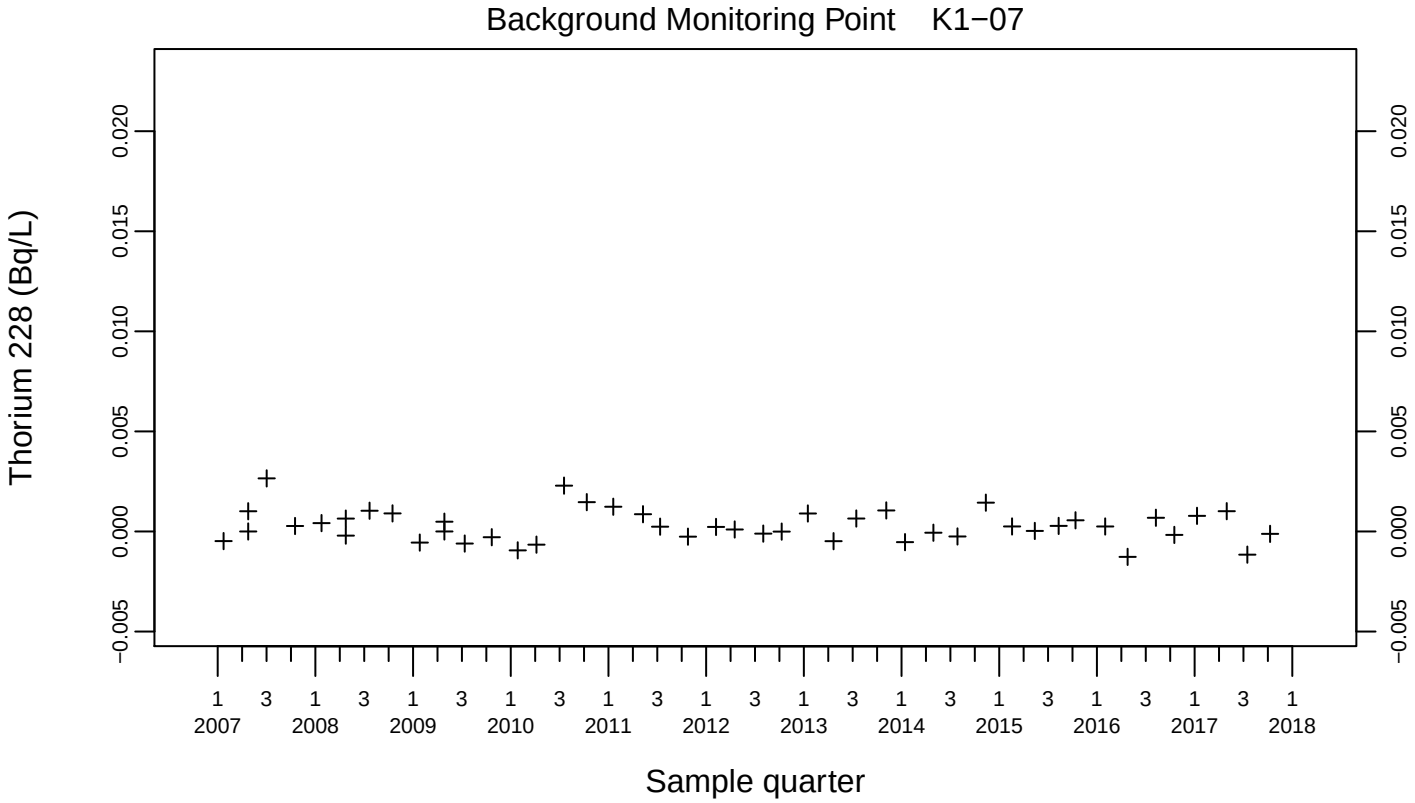

Pit 1 Area
Tritium (Bq/L)
SL=11.4
Detection Monitoring Point K1−05
Above RL
Below RL
Tritium (Bq/L)
SL
Sample quarter

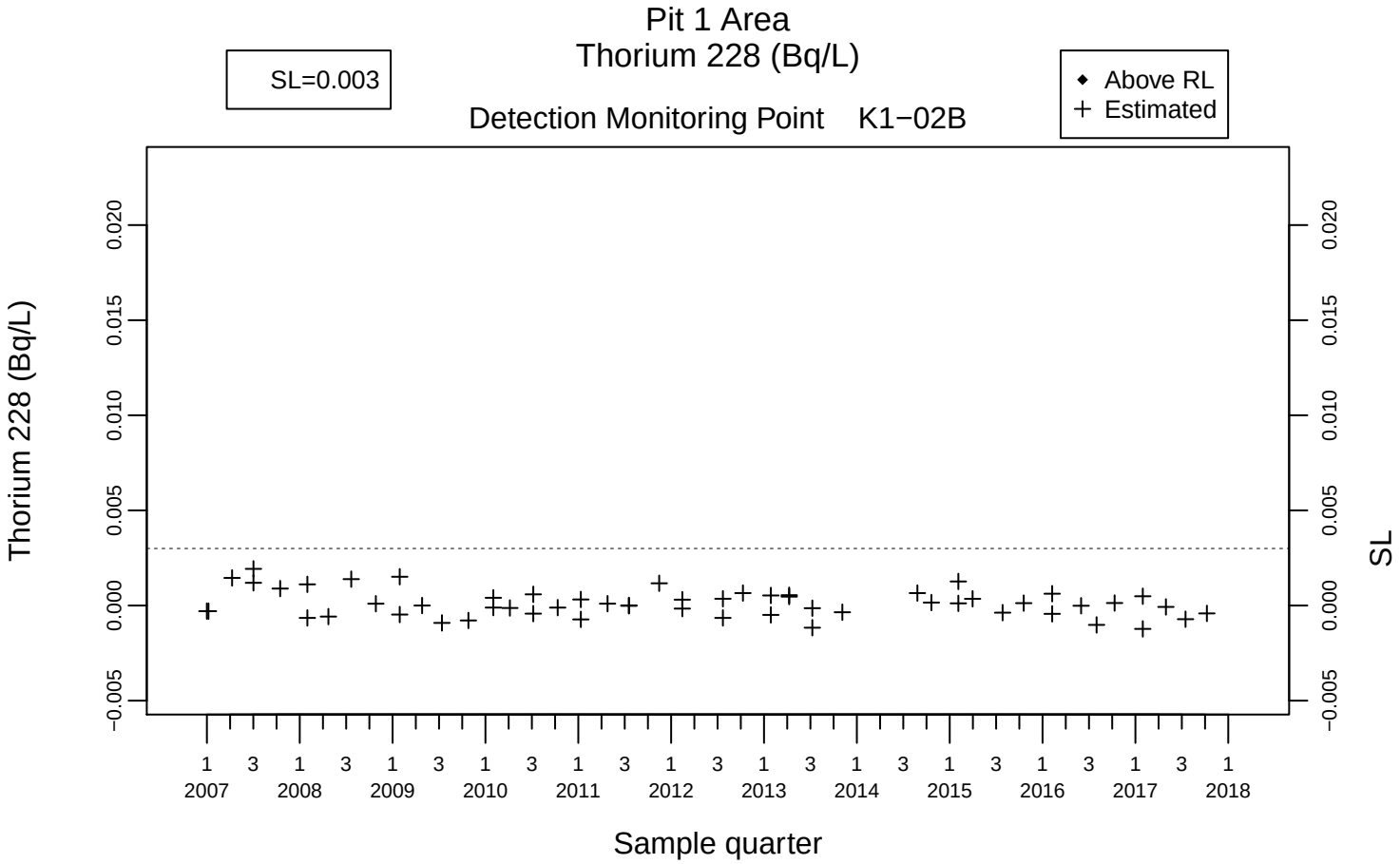

SL=10.7
Crossgradient Monitoring Point K1−08
Tritium (Bq/L)
SL
Sample quarter

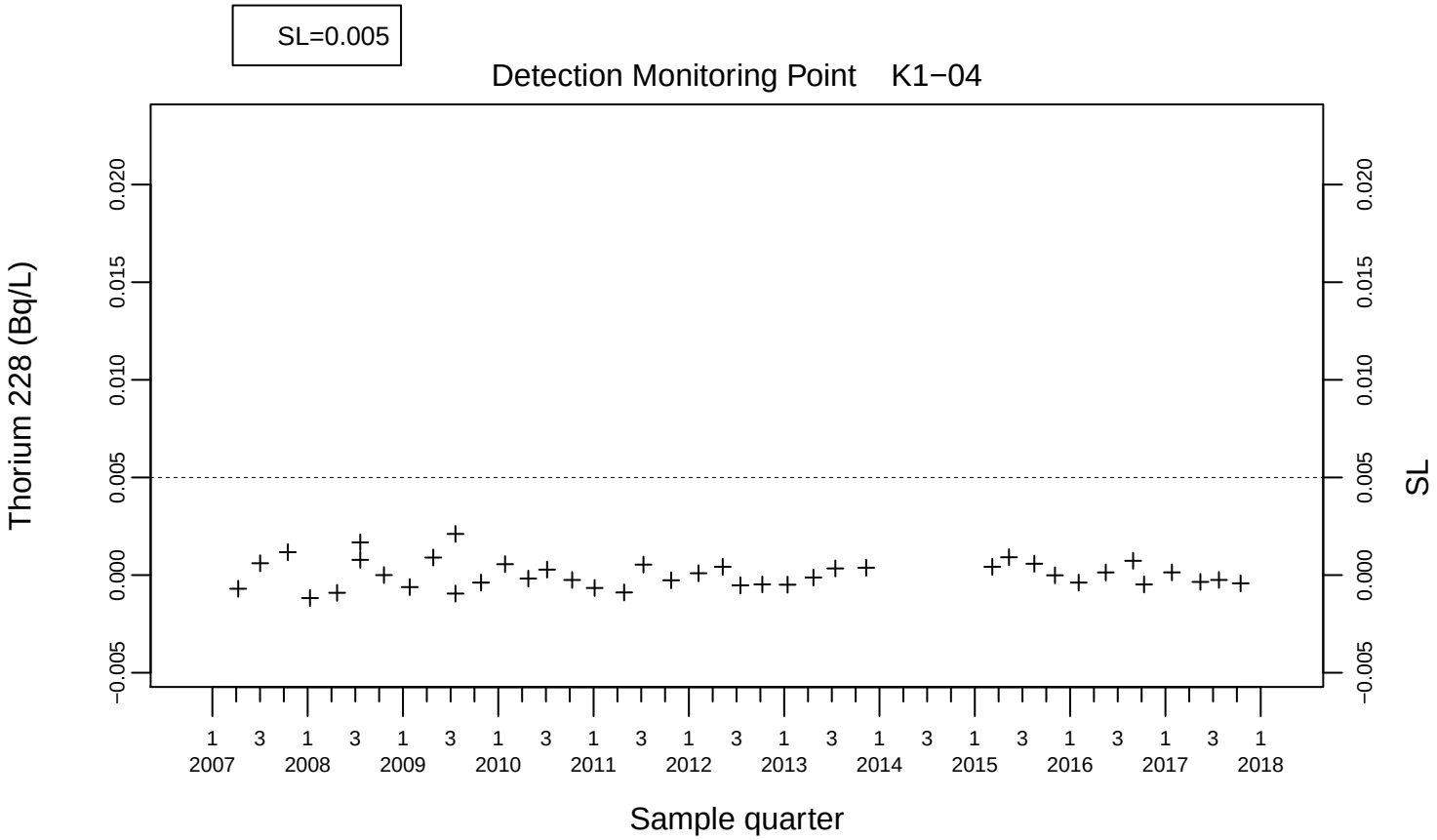

Pit 1 Area
Tritium (Bq/L)
SL=8.7
Crossgradient Monitoring Point K1−09
Above RL
Estimated
Tritium (Bq/L)
SL
Sample quarter

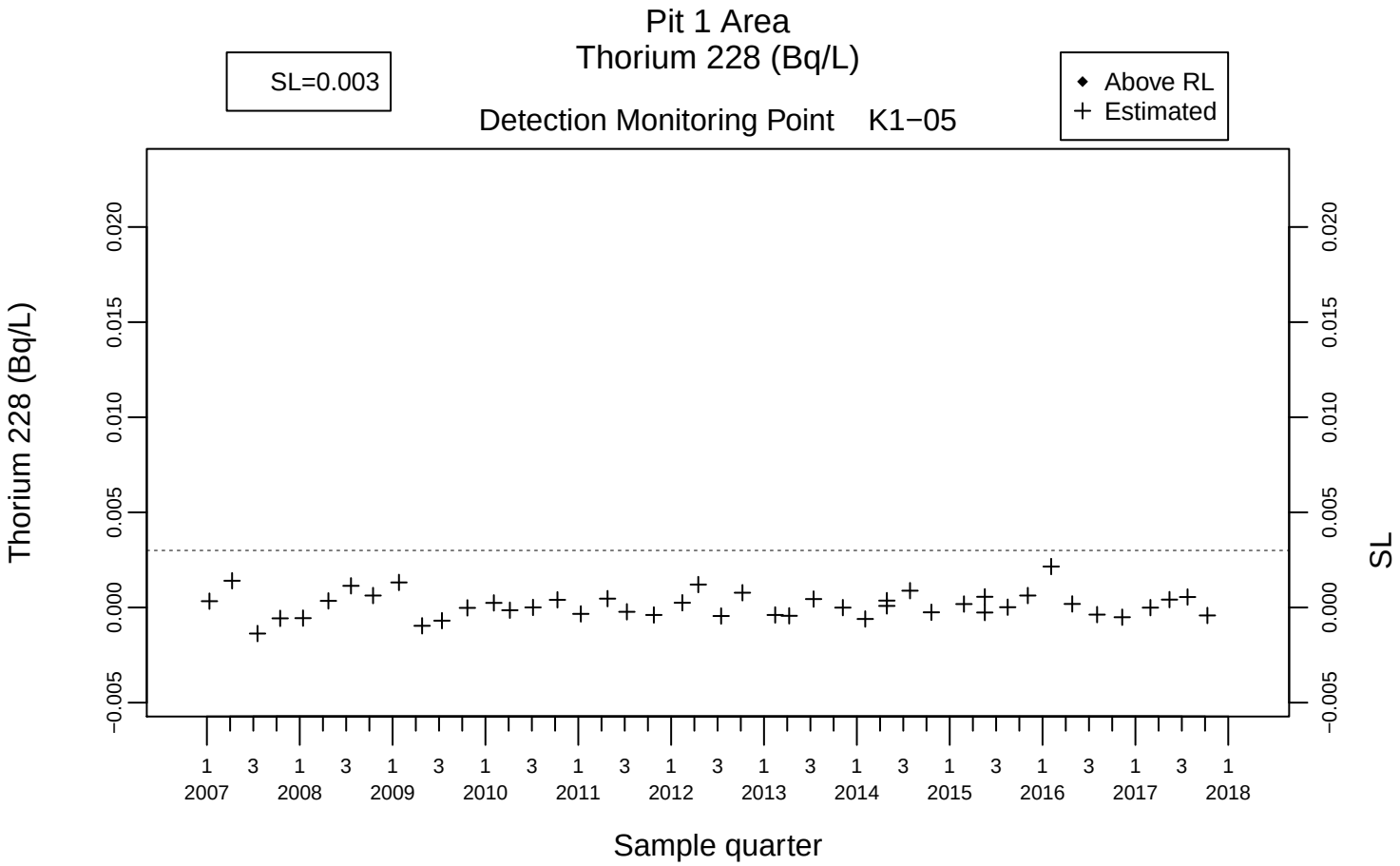

SL=132.8
Detection Monitoring Point W−PIT1−2326
Tritium (Bq/L)
SL
Sample quarter

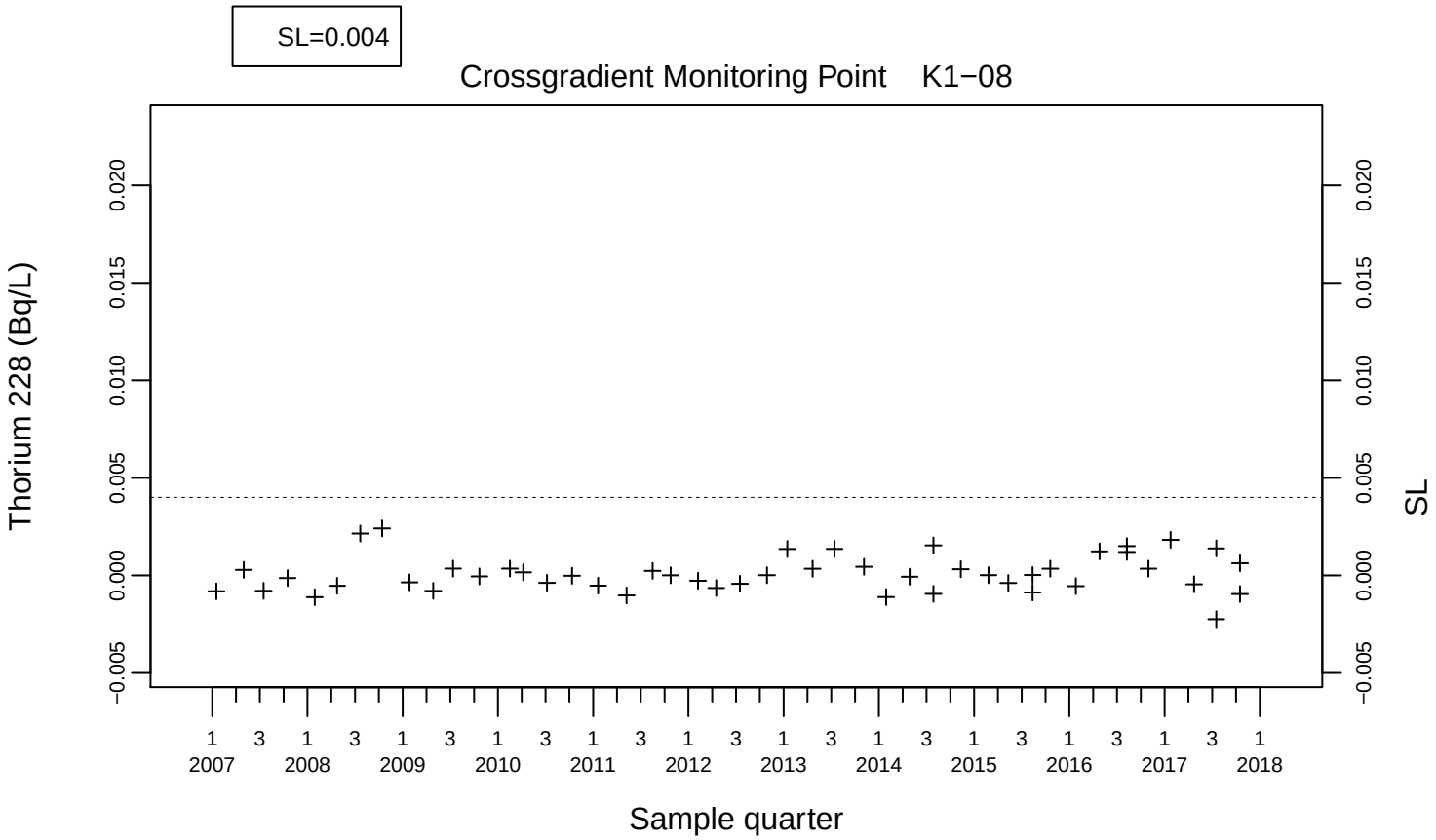

Pit 1 Area
Thorium 228 (Bq/L)
Above RL
Estimated
Background Monitoring Point K1−01C
Thorium 228 (Bq/L)
0.020
0.015
0.010
0.005
0.000
−0.005
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

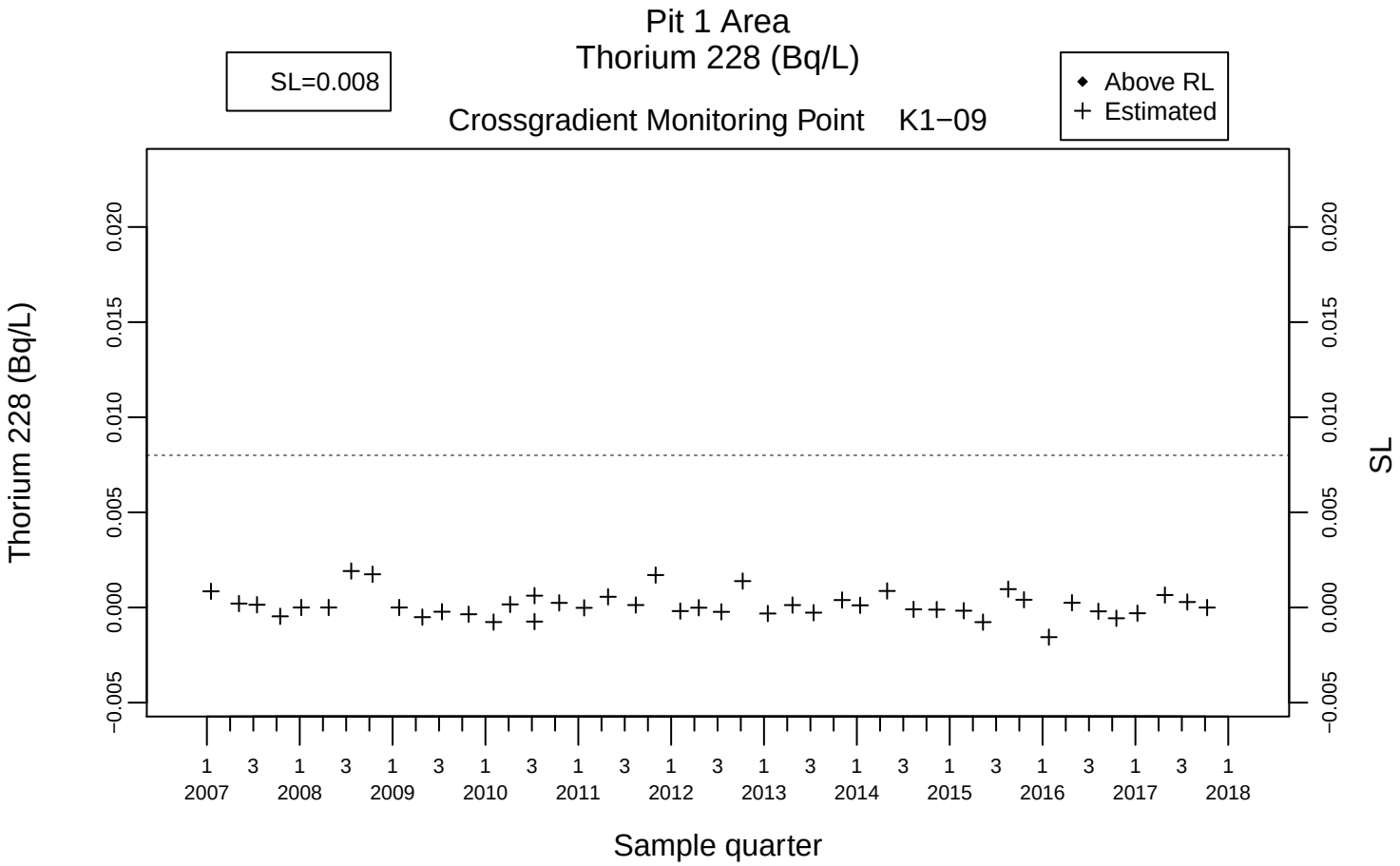

Background Monitoring Point K1−07
Thorium 228 (Bq/L)
0.020
0.015
0.010
0.005
0.000
−0.005
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

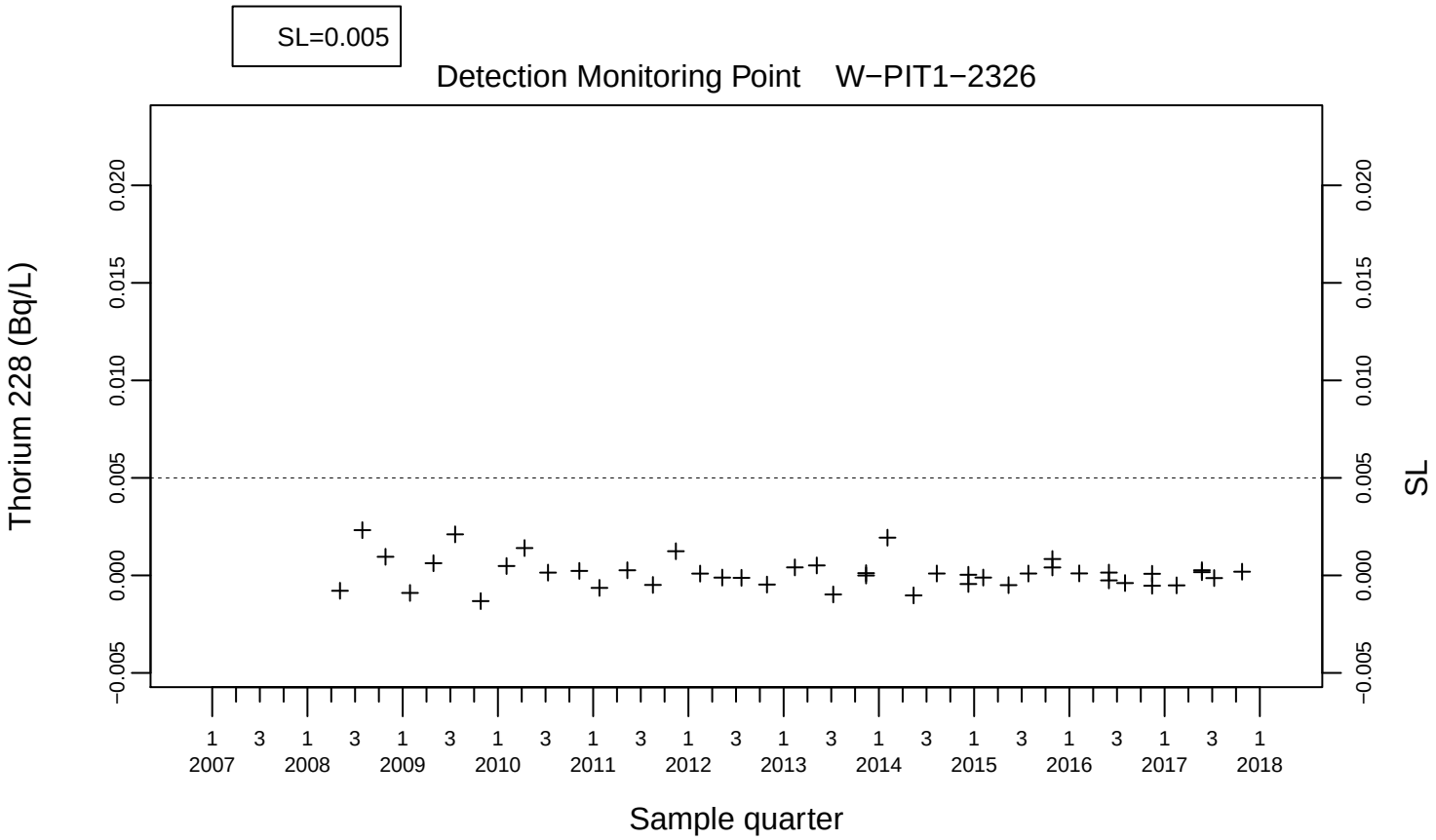

Pit 1 Area
Thorium 228 (Bq/L)
SL=0.003
Above RL
Estimated
Detection Monitoring Point K1−02B
Thorium 228 (Bq/L)
SL
Sample quarter

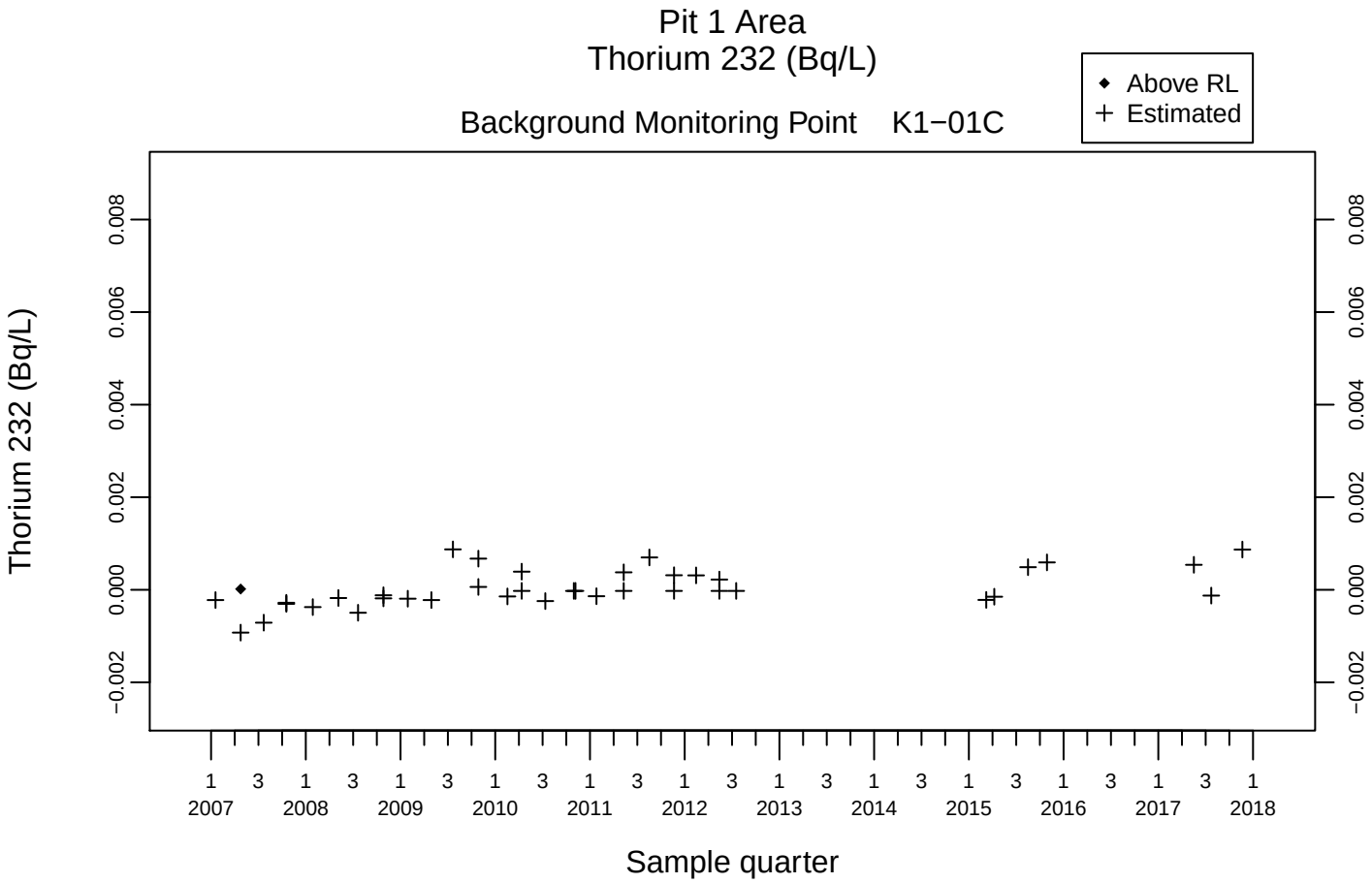

SL=0.005
Detection Monitoring Point K1−04
Thorium 228 (Bq/L)
SL
Sample quarter

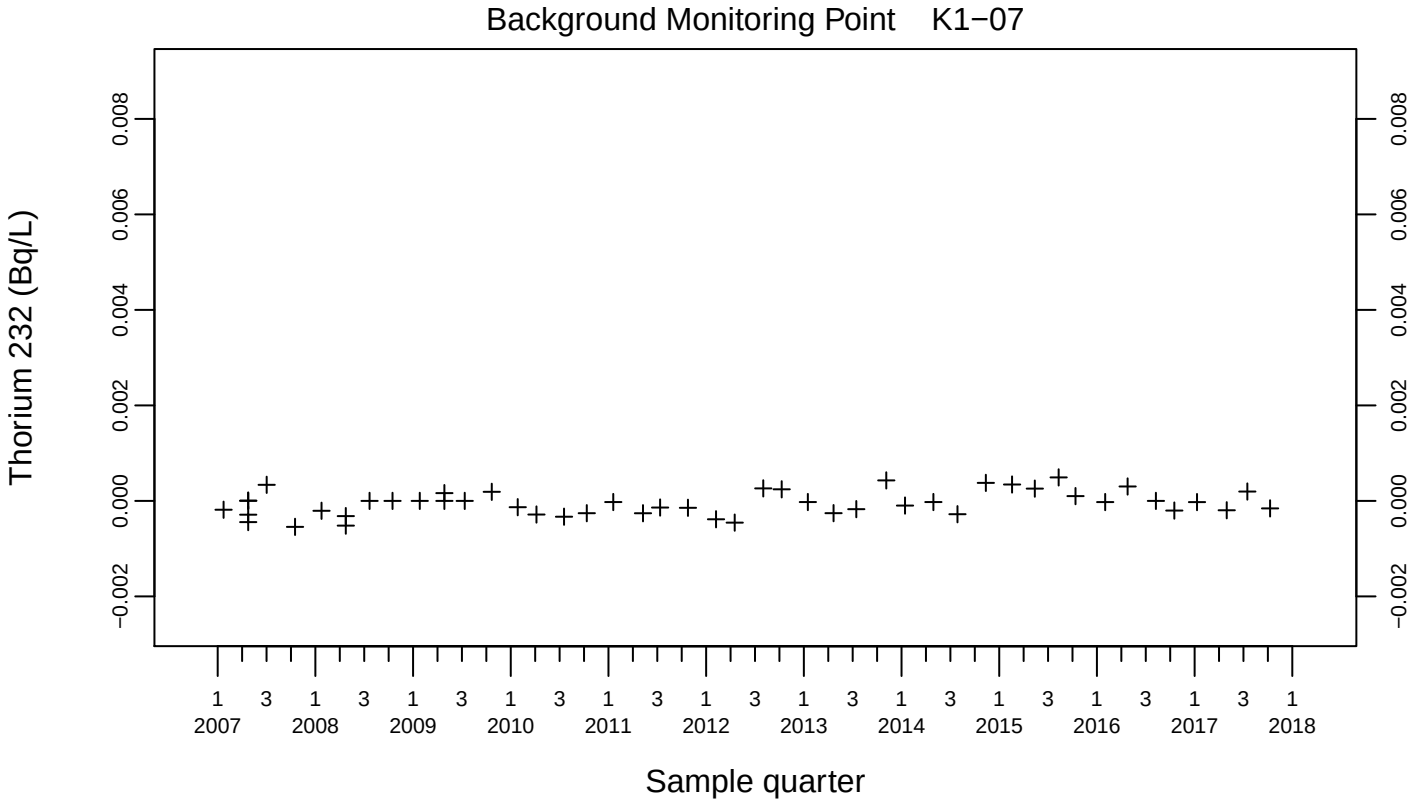

Pit 1 Area
Thorium 228 (Bq/L)
SL=0.003
Above RL
Estimated
Detection Monitoring Point K1−05
Thorium 228 (Bq/L)
SL
Sample quarter

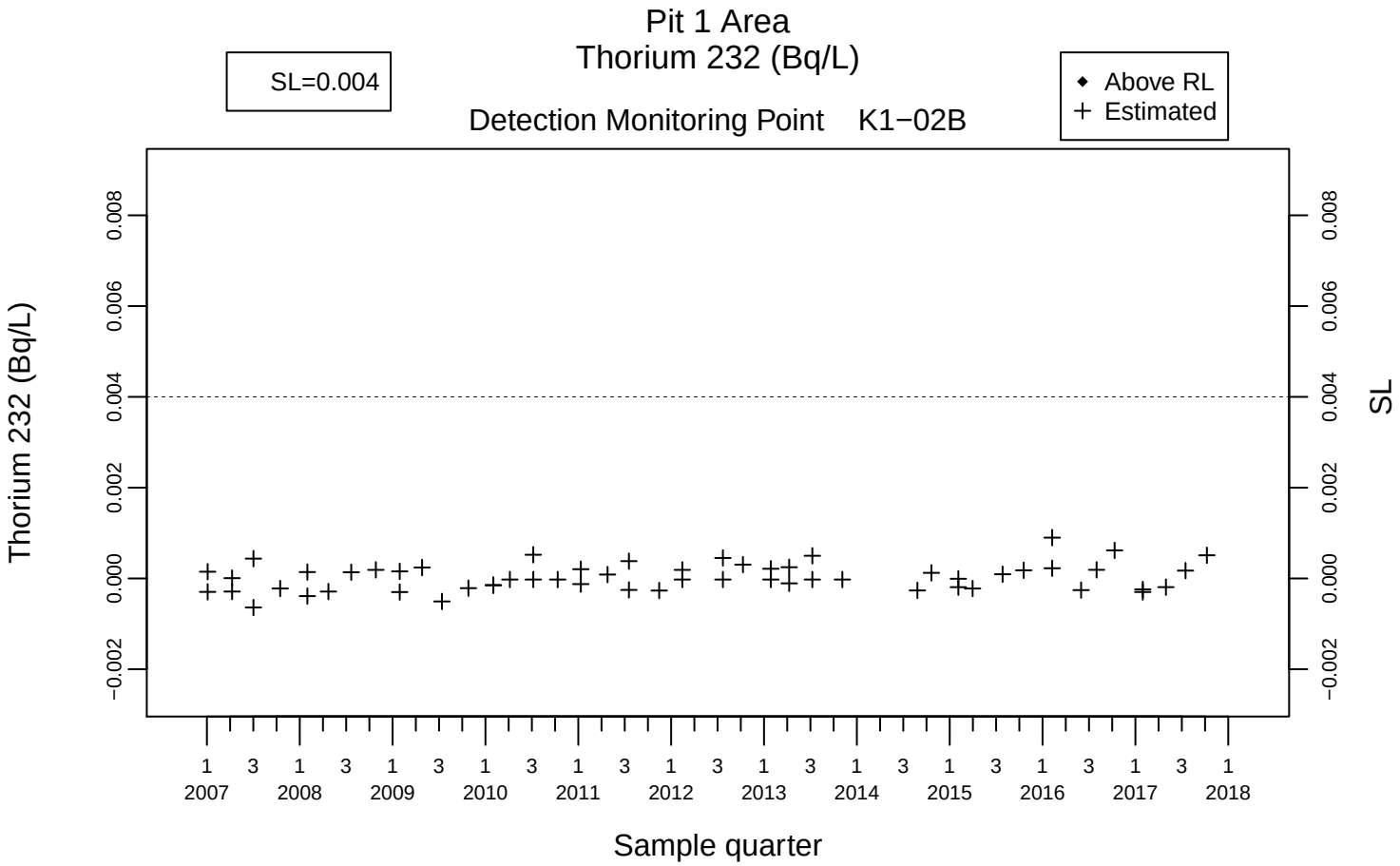

SL=0.004
Crossgradient Monitoring Point K1−08
Thorium 228 (Bq/L)
SL
Sample quarter

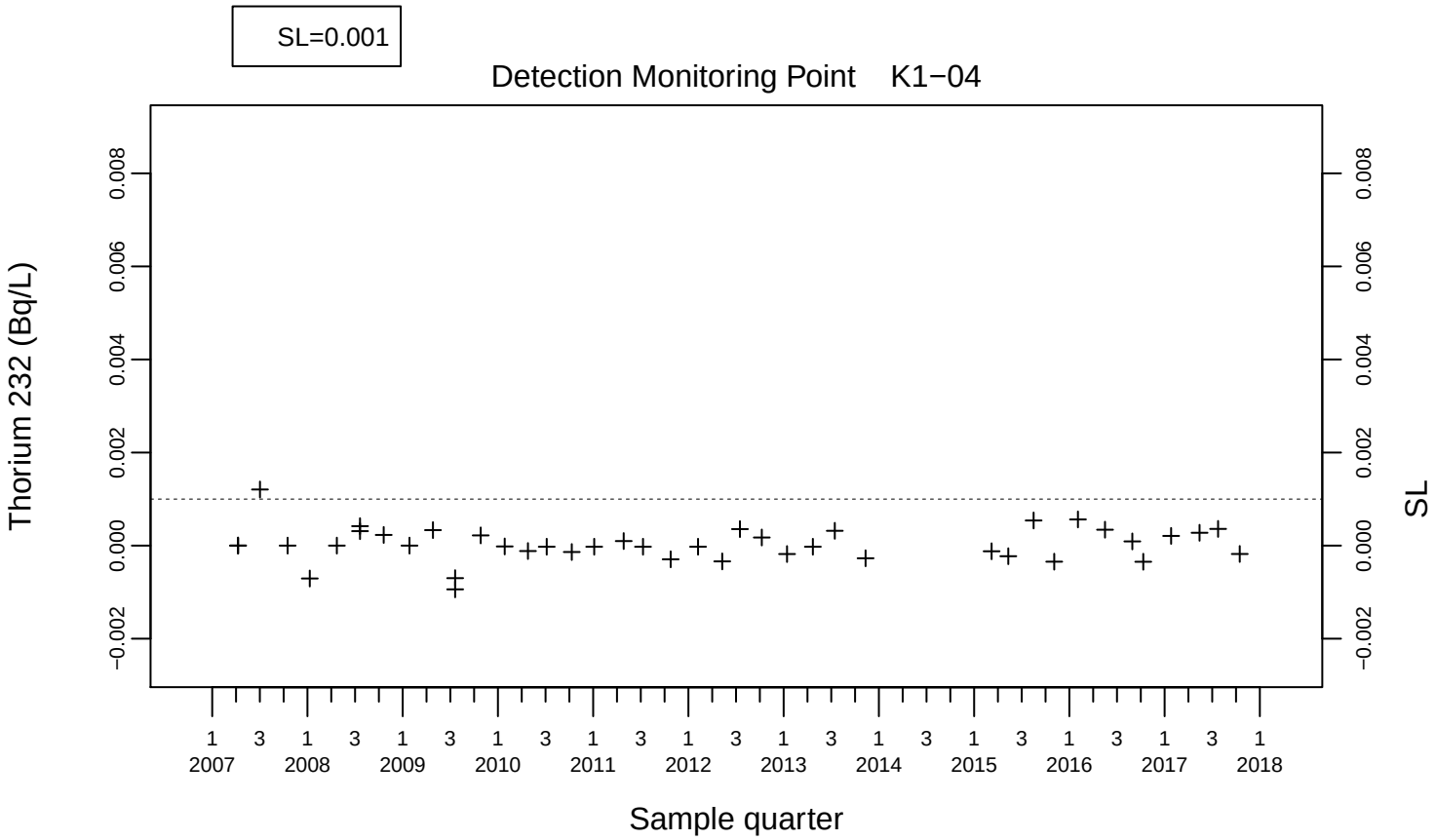

Pit 1 Area
Thorium 228 (Bq/L)
SL=0.008
Crossgradient Monitoring Point K1−09
Above RL
Estimated
Thorium 228 (Bq/L)
SL
Sample quarter

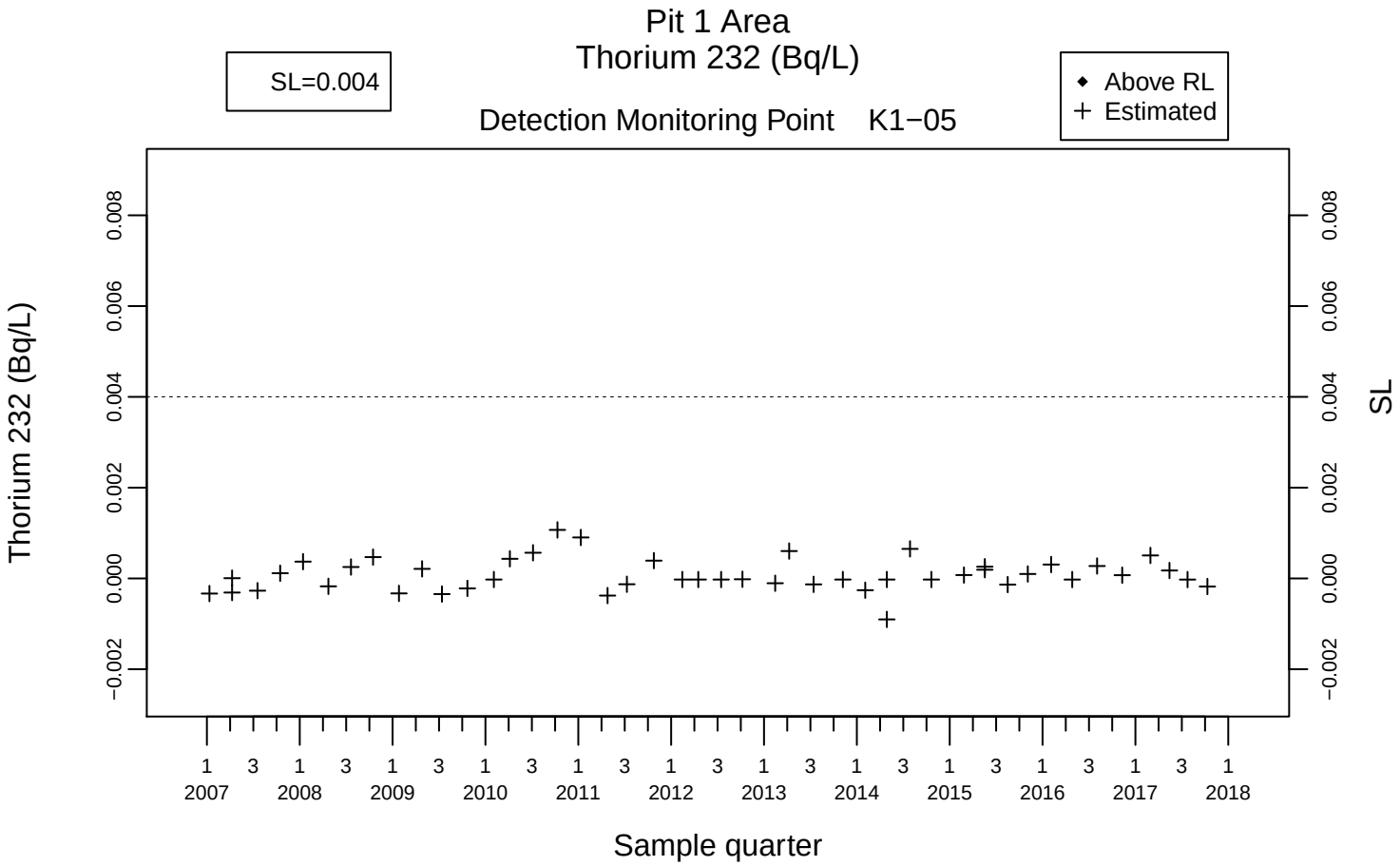

SL=0.005
Detection Monitoring Point W−PIT1−2326
Thorium 228 (Bq/L)
SL
Sample quarter

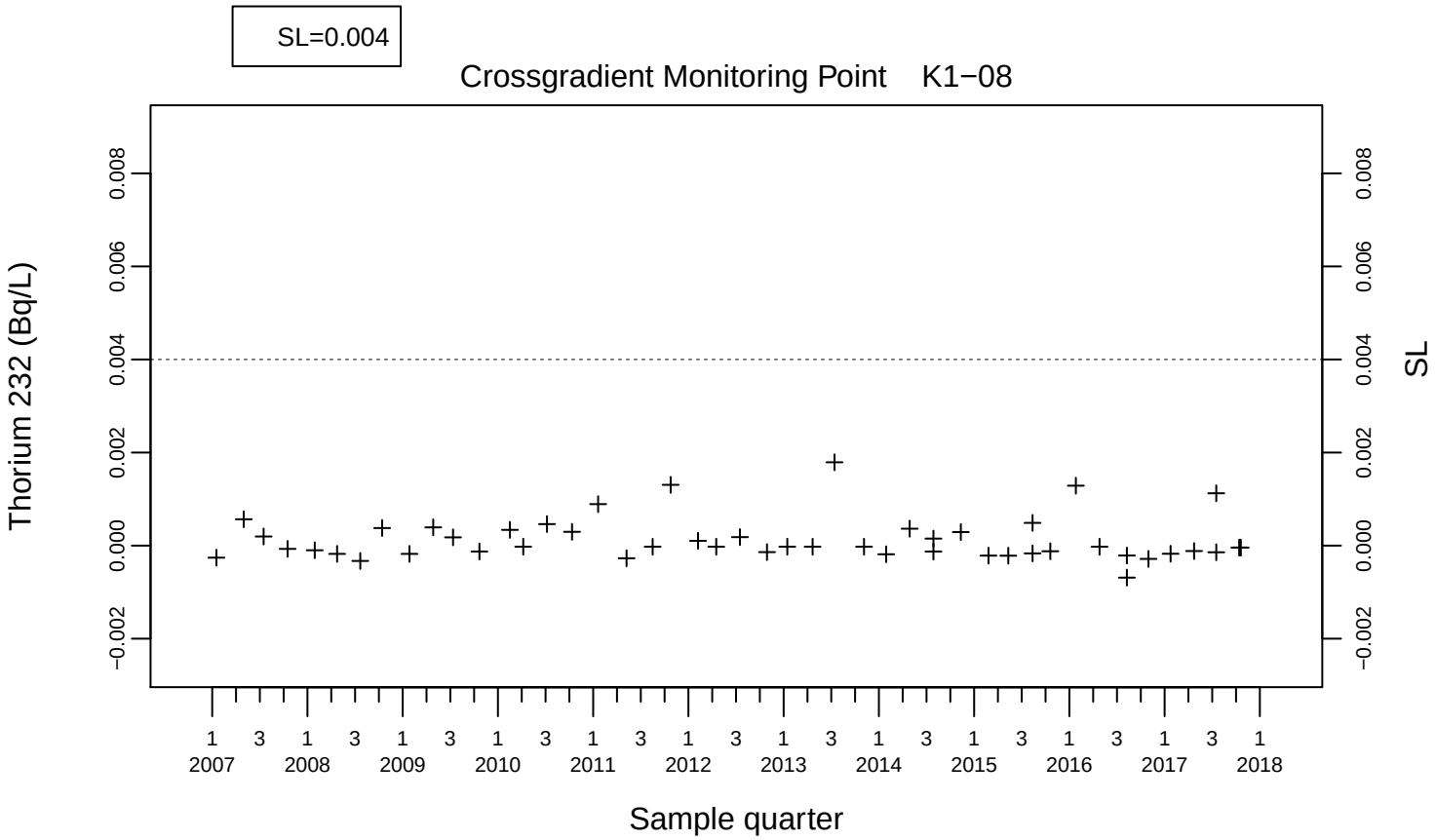

Pit 1 Area
Thorium 232 (Bq/L)
Above RL
Estimated
Background Monitoring Point K1−01C
Thorium 232 (Bq/L)
0.008
0.006
0.004
0.002
0.000
−0.002
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

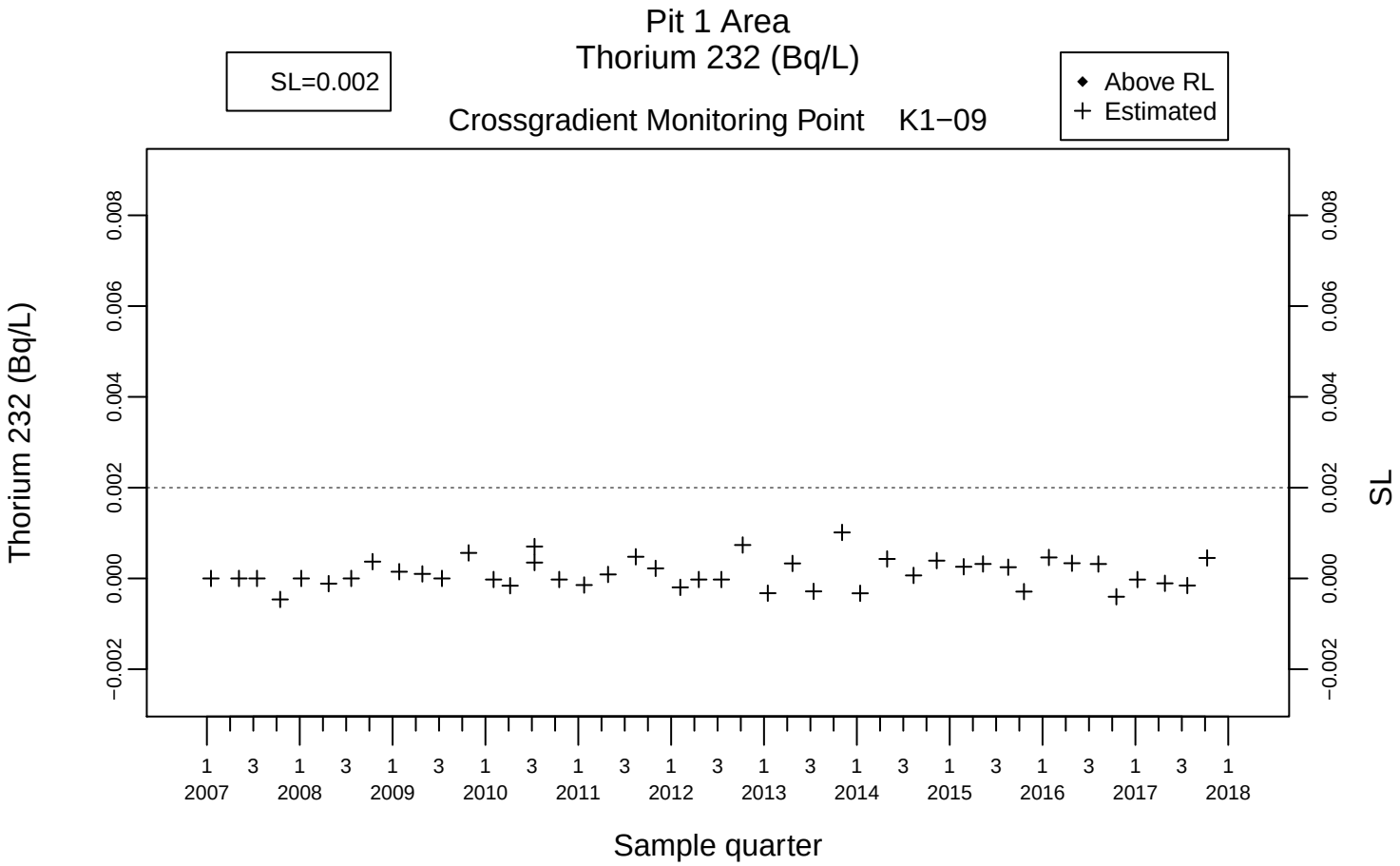

Background Monitoring Point K1−07
Thorium 232 (Bq/L)
0.008
0.006
0.004
0.002
0.000
−0.002
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

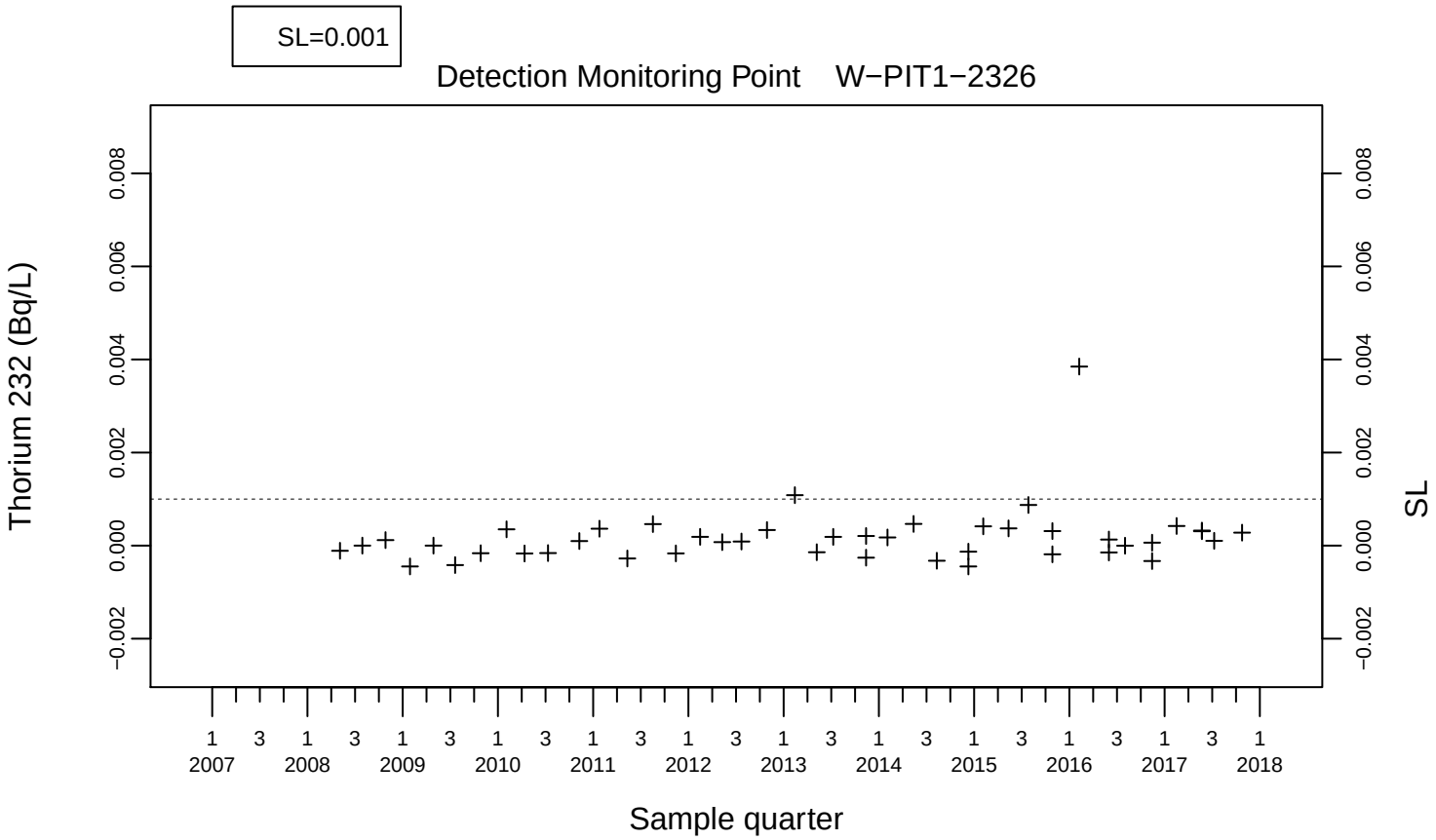

Pit 1 Area
Thorium 232 (Bq/L)
SL=0.004
Above RL
Estimated
Detection Monitoring Point K1−02B
Thorium 232 (Bq/L)
SL
Sample quarter

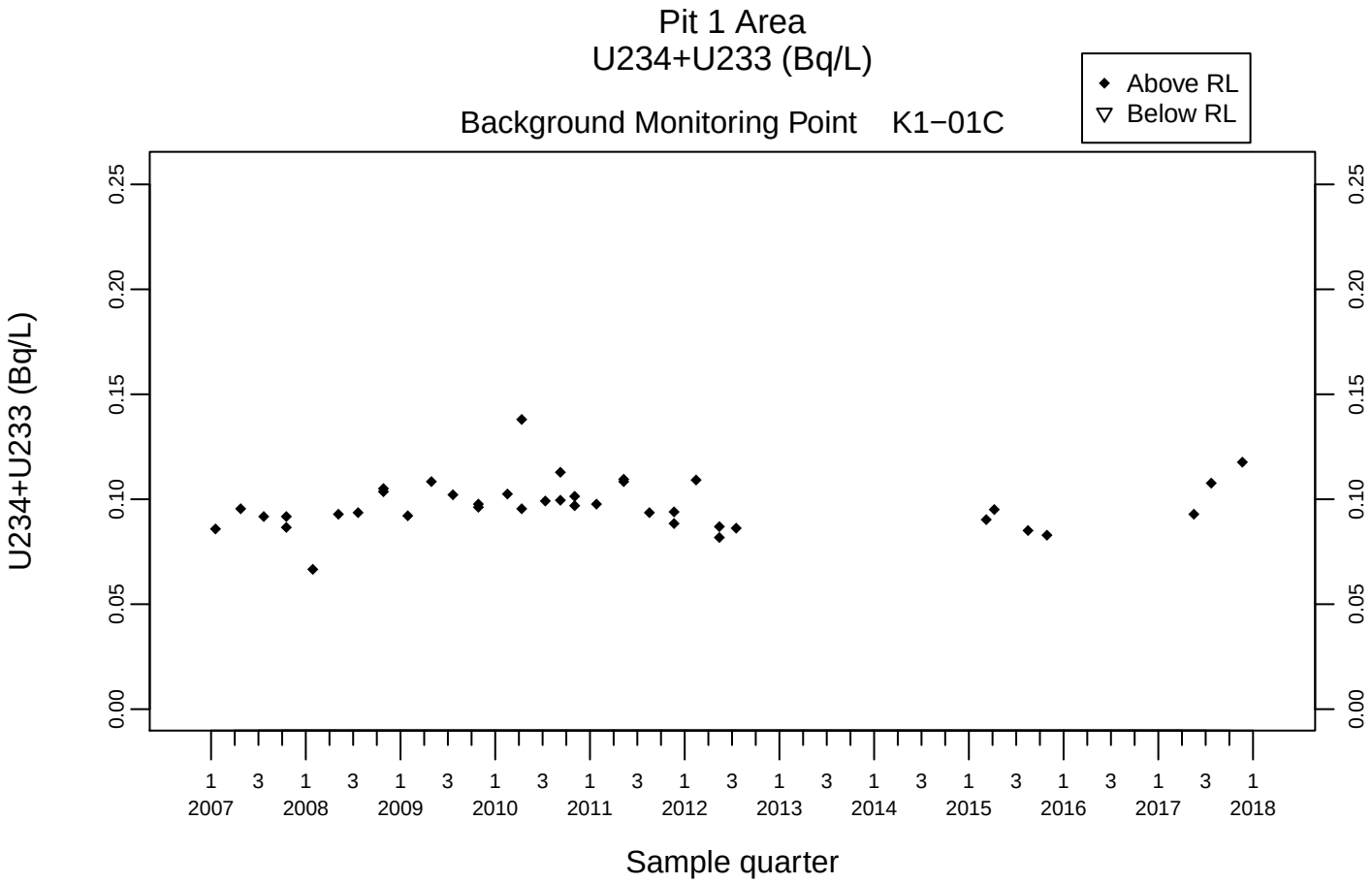

SL=0.001
Detection Monitoring Point K1−04
Thorium 232 (Bq/L)
SL
Sample quarter

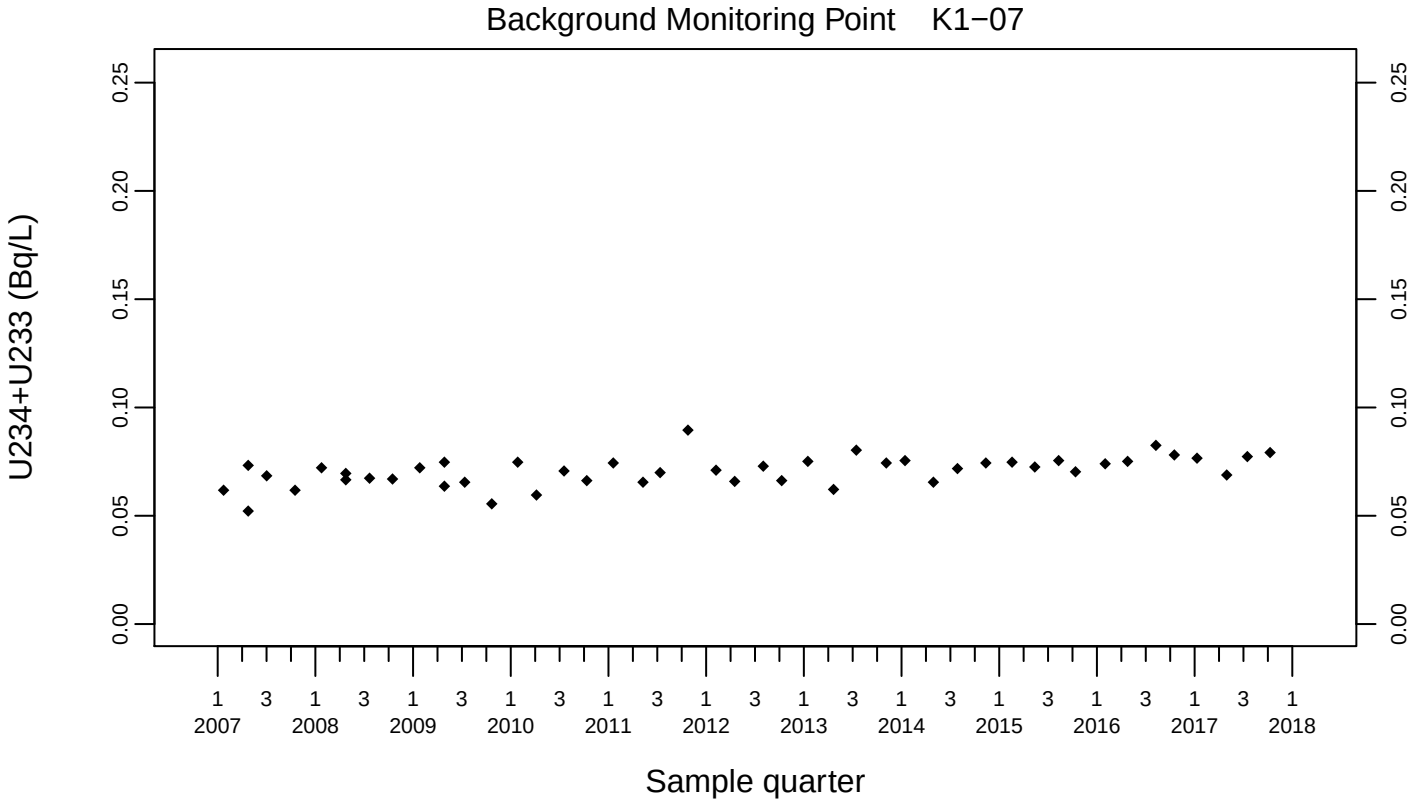

Pit 1 Area
Thorium 232 (Bq/L)
SL=0.004
Above RL
Estimated
Detection Monitoring Point K1−05
Thorium 232 (Bq/L)
SL
Sample quarter

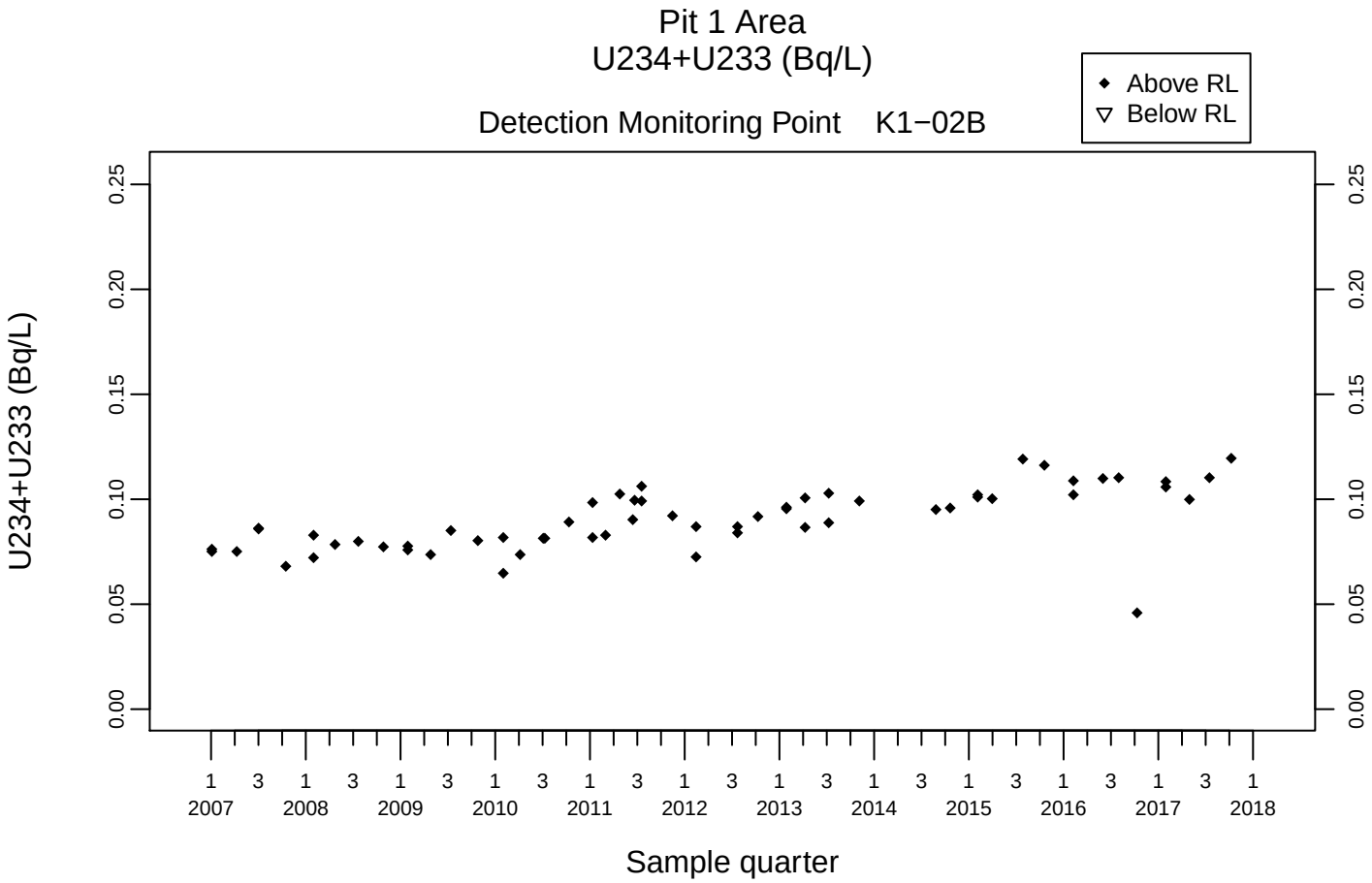

SL=0.004
Crossgradient Monitoring Point K1−08
Thorium 232 (Bq/L)
SL
Sample quarter

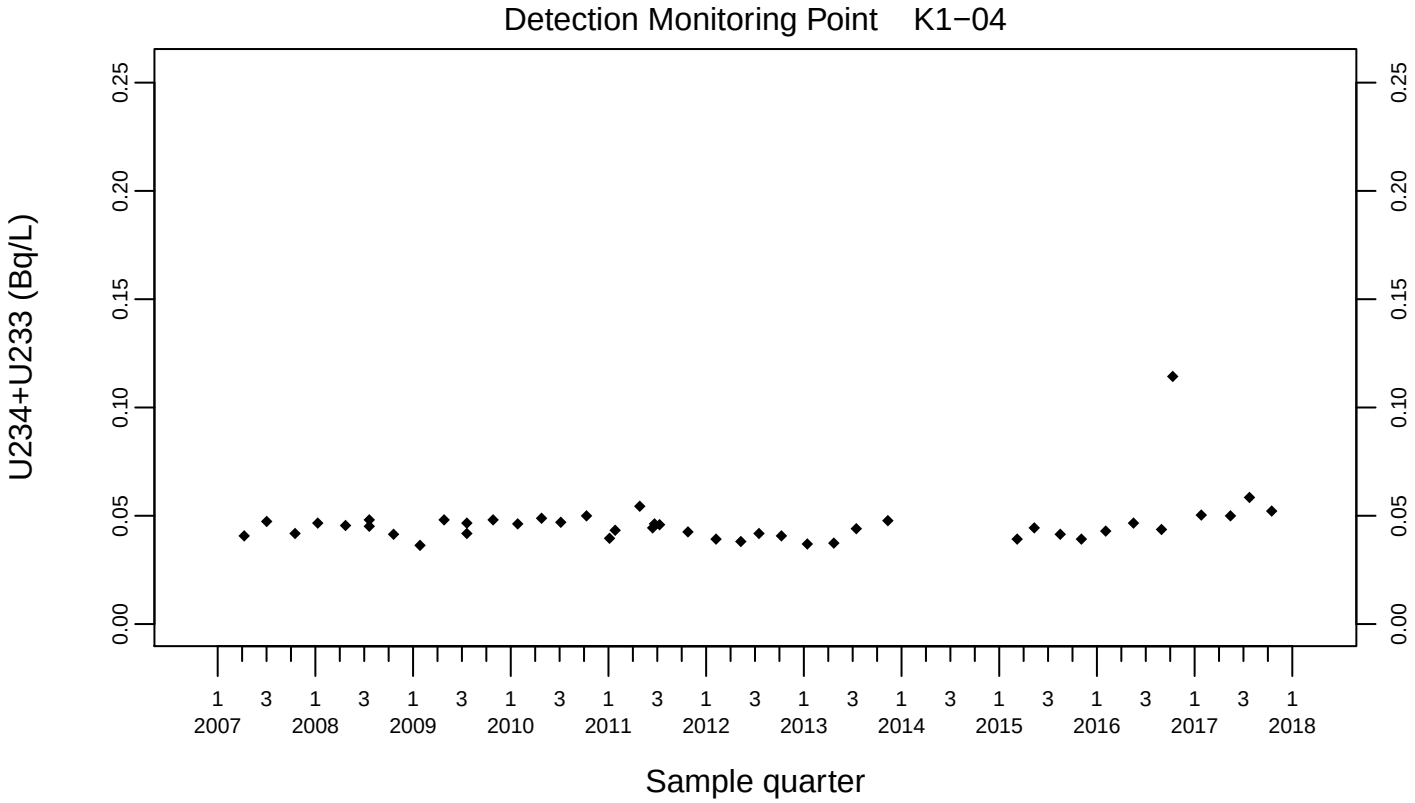

Pit 1 Area
Thorium 232 (Bq/L)
SL=0.002
Crossgradient Monitoring Point K1−09
Above RL
Estimated
Thorium 232 (Bq/L)
SL
Sample quarter

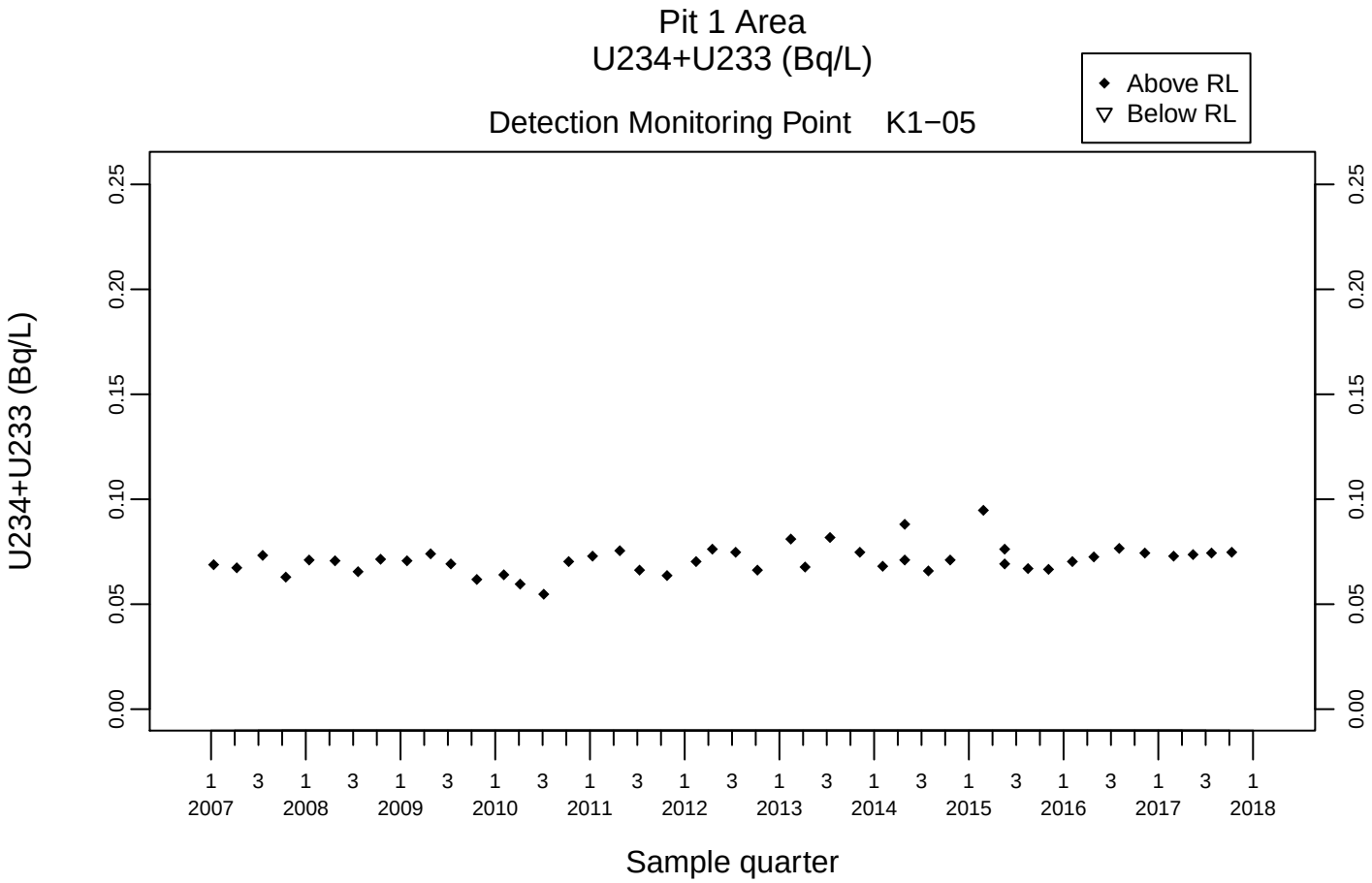

SL=0.001
Detection Monitoring Point W−PIT1−2326
Thorium 232 (Bq/L)
SL
Sample quarter

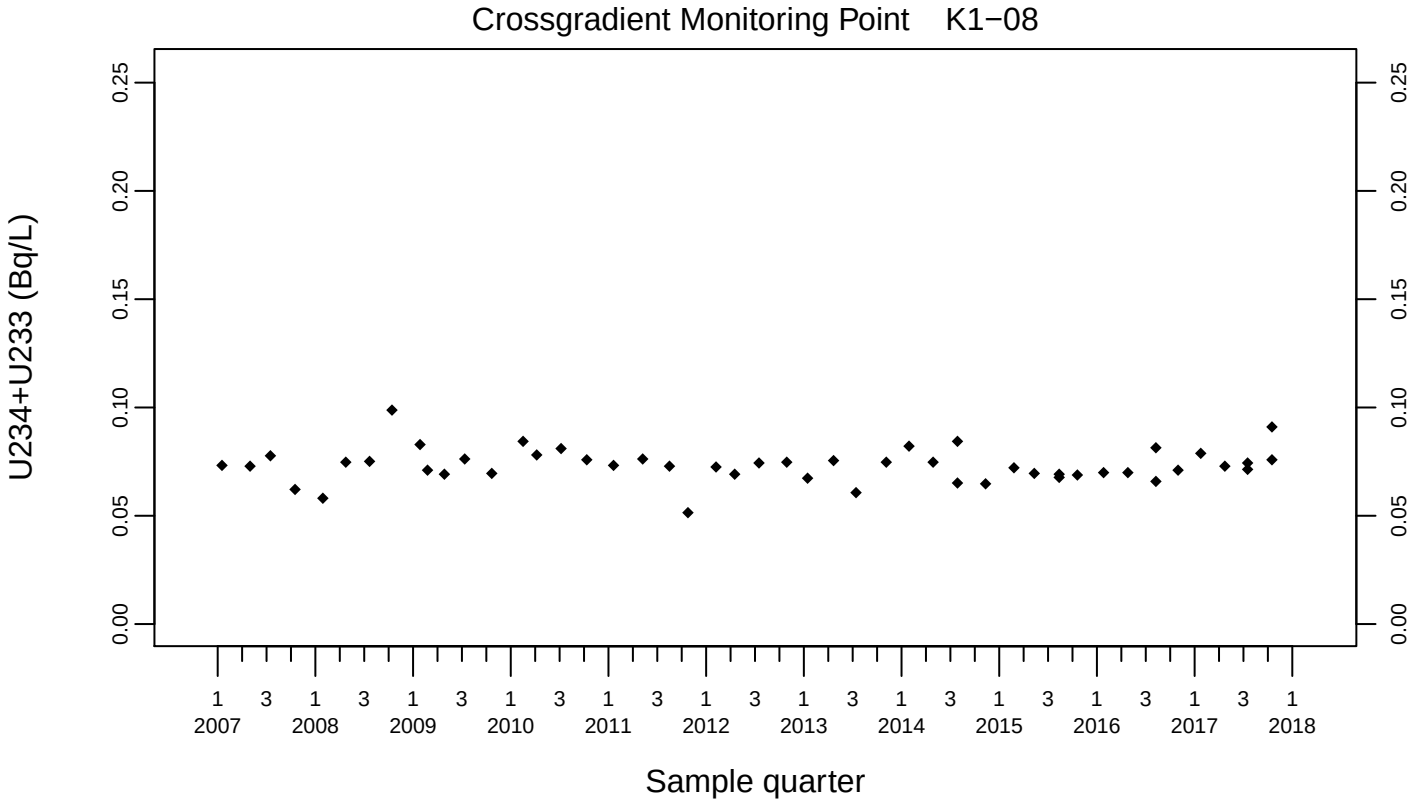

Pit 1 Area
U234+U233 (Bq/L)
Background Monitoring Point K1−01C
Above RL
Below RL
U234+U233 (Bq/L)
0.00
0.05
0.10
0.15
0.20
0.25
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

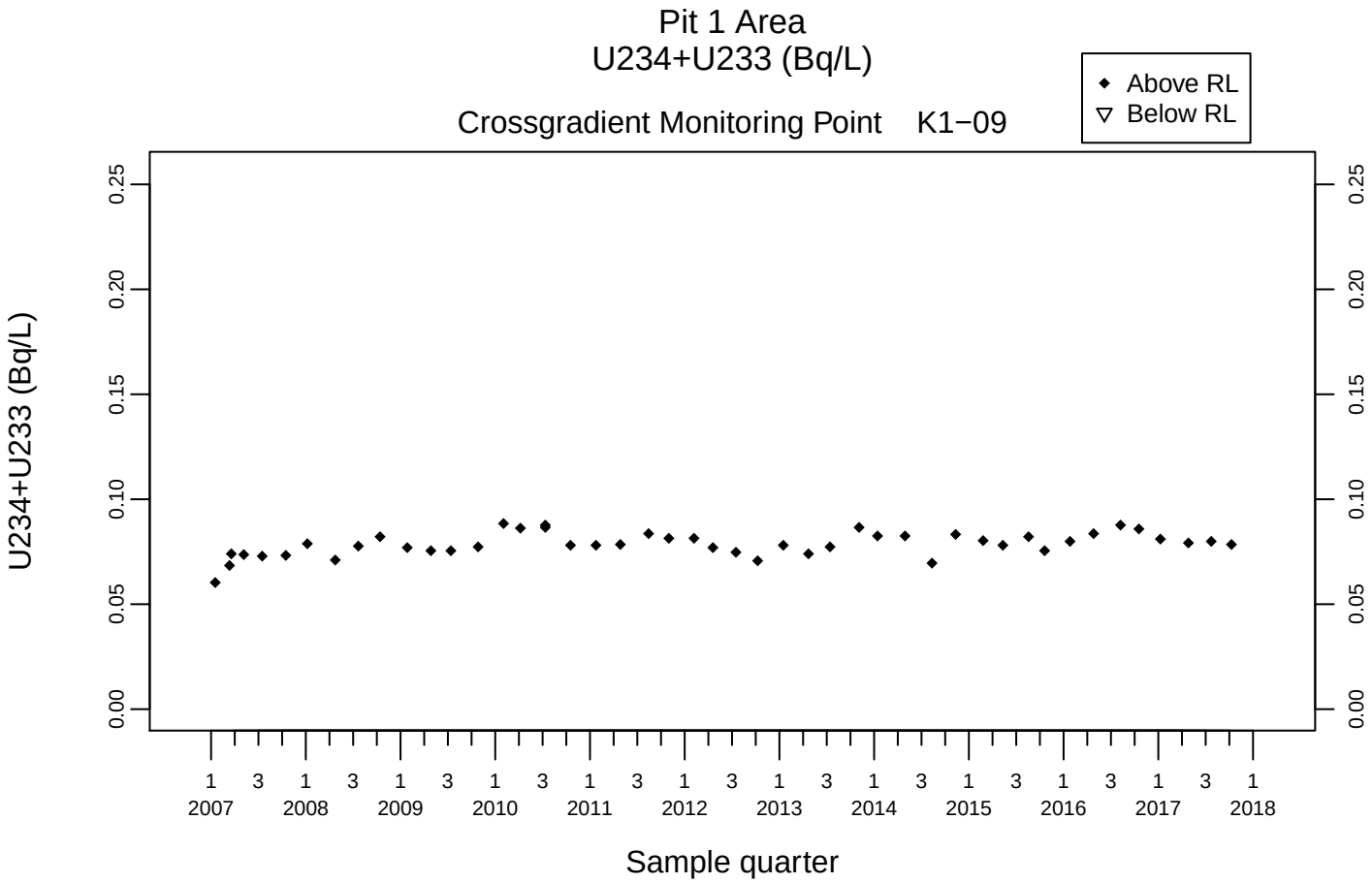

Background Monitoring Point K1−07
U234+U233 (Bq/L)
0.00
0.05
0.10
0.15
0.20
0.25
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

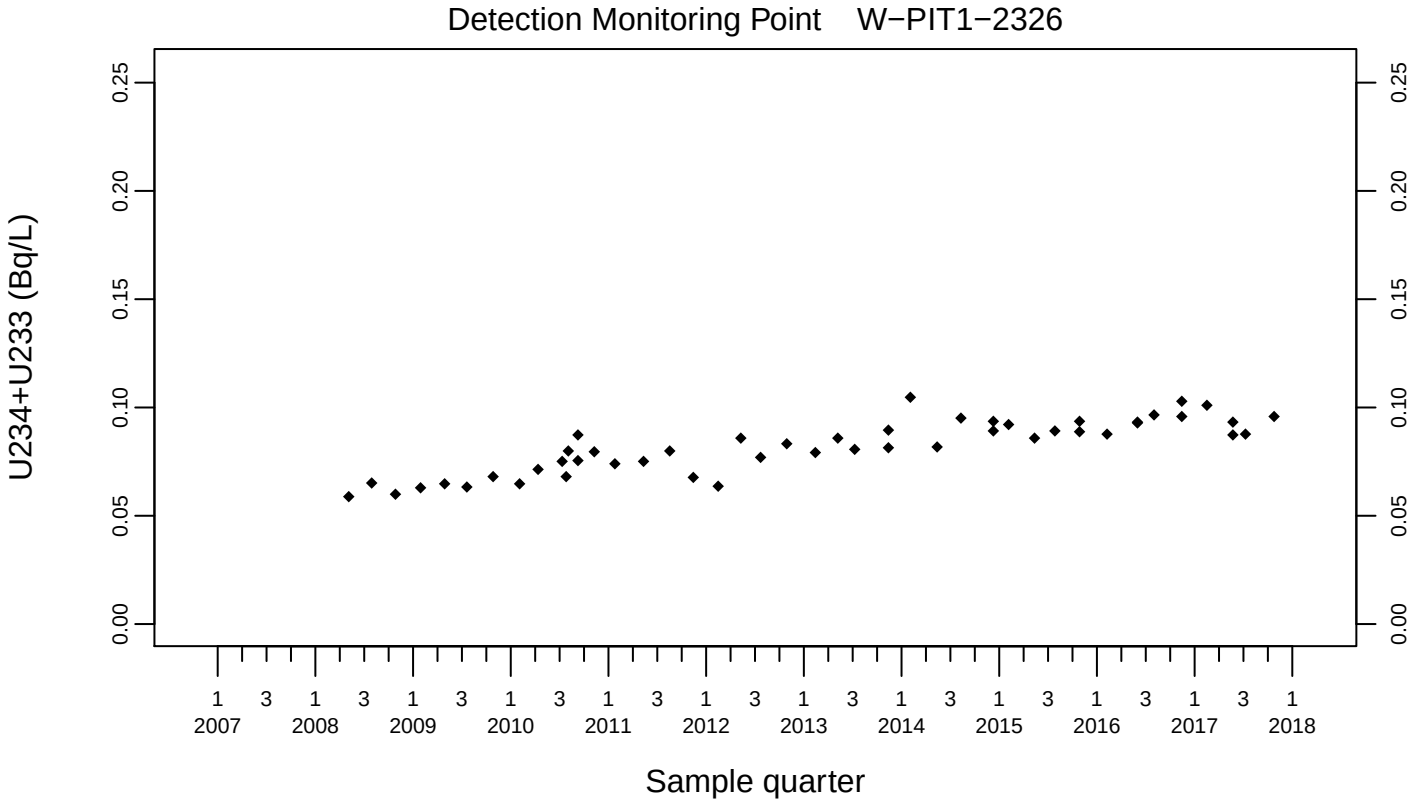

Pit 1 Area
U234+U233 (Bq/L)
Above RL
Below RL
Detection Monitoring Point K1−02B
U234+U233 (Bq/L)
0.00
0.05
0.10
0.15
0.20
0.25
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

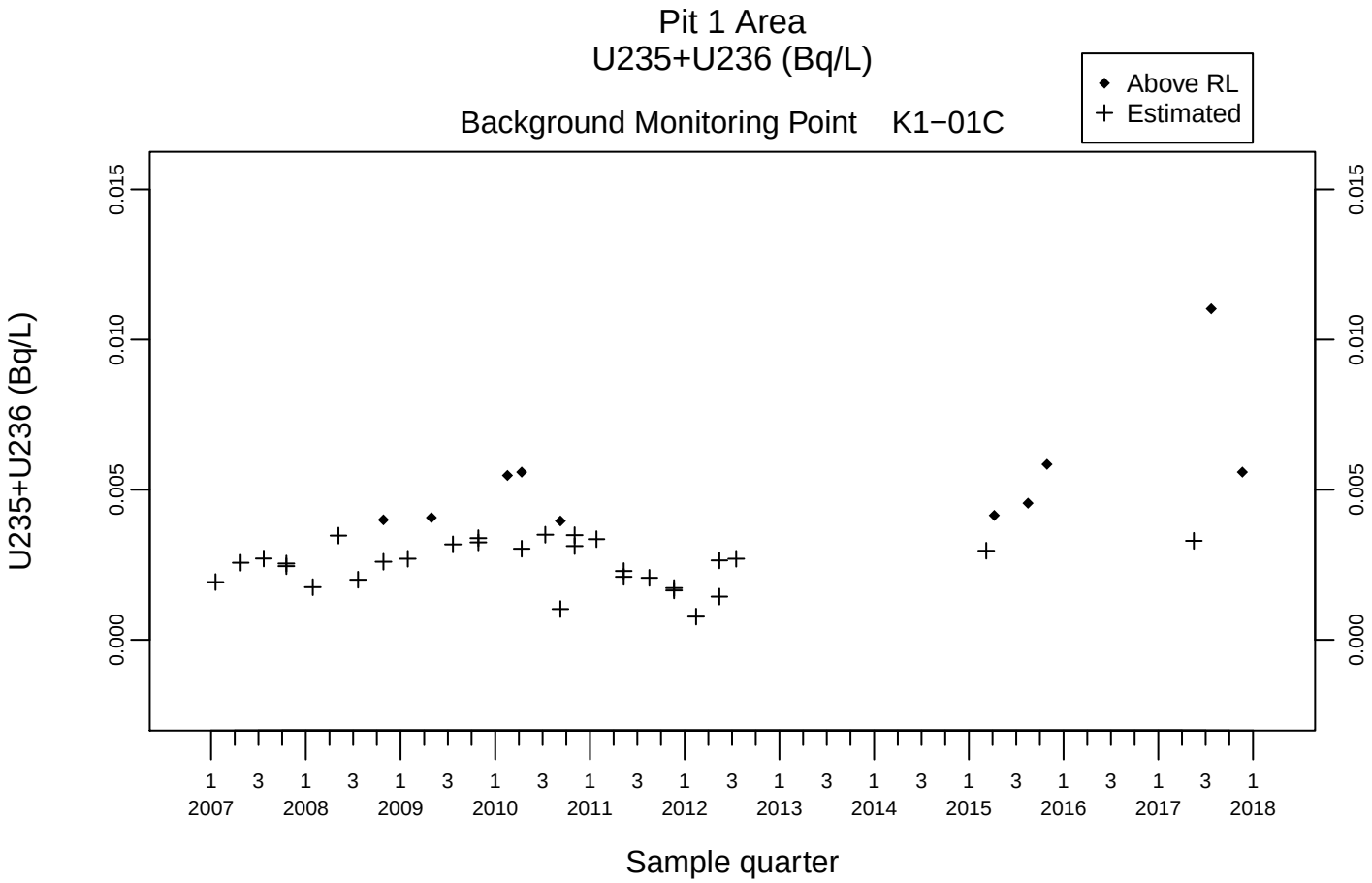

Detection Monitoring Point K1−04
U234+U233 (Bq/L)
0.00
0.05
0.10
0.15
0.20
0.25
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

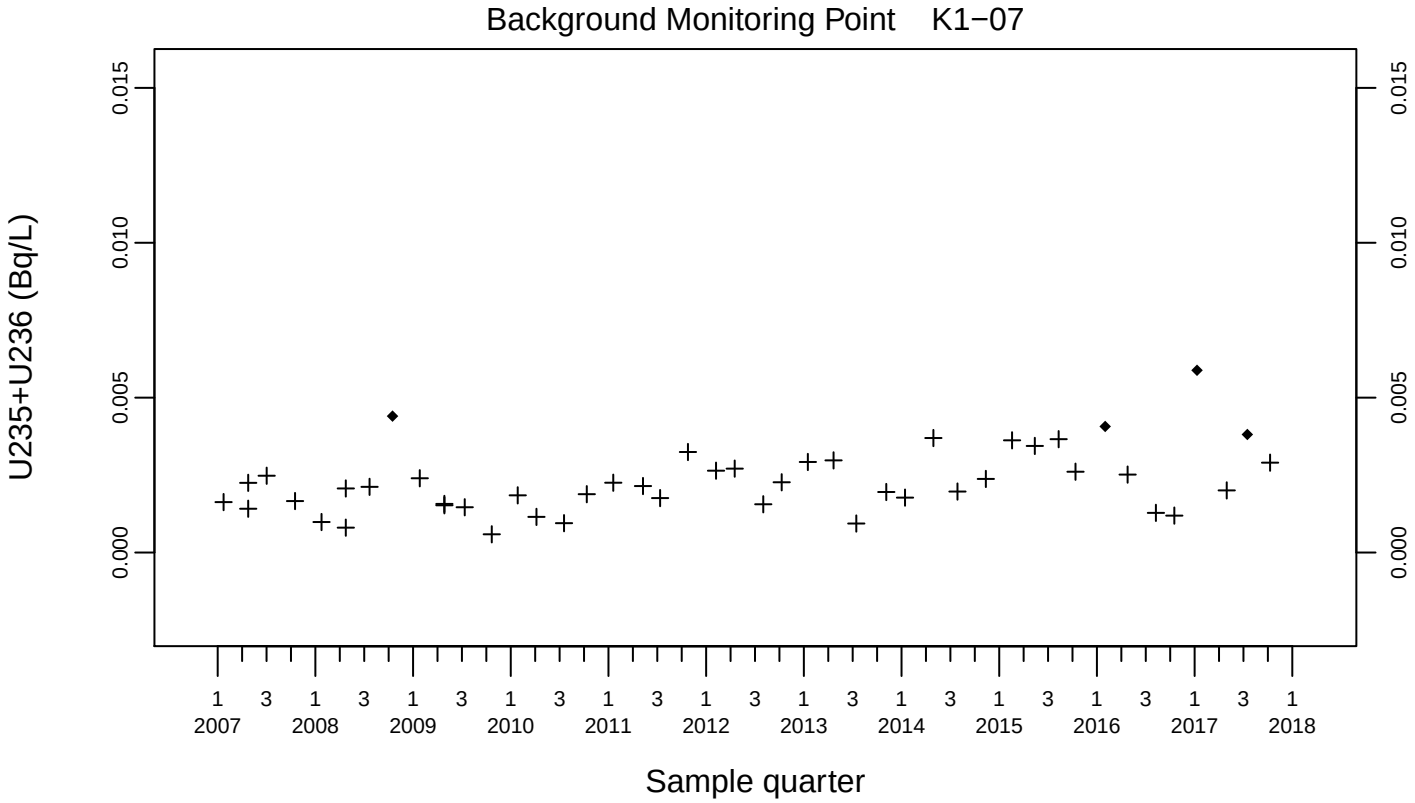

Pit 1 Area
U234+U233 (Bq/L)
Detection Monitoring Point K1−05
Above RL
Below RL
U234+U233 (Bq/L)
0.00
0.05
0.10
0.15
0.20
0.25
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

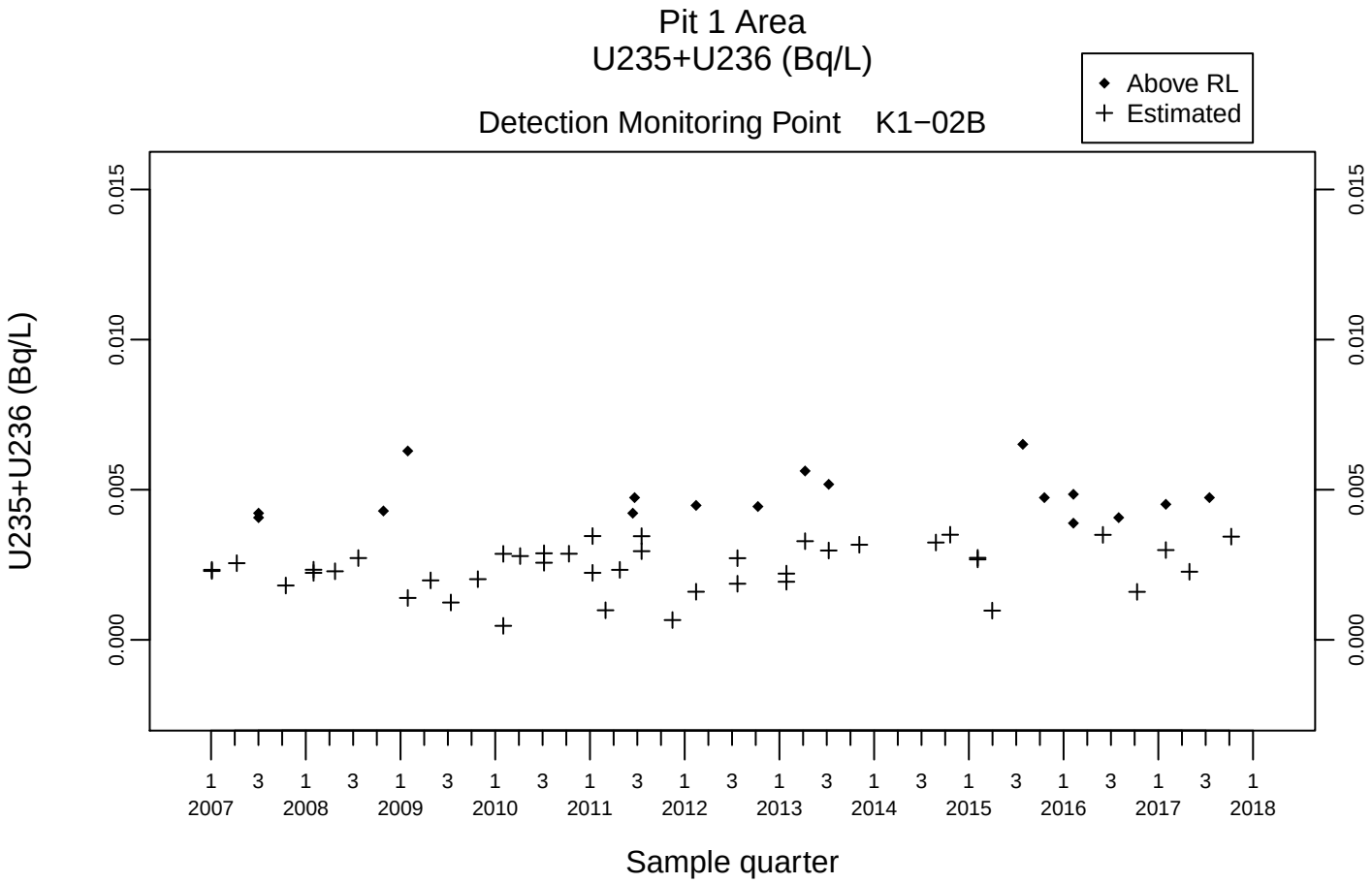

Crossgradient Monitoring Point K1−08
U234+U233 (Bq/L)
0.00
0.05
0.10
0.15
0.20
0.25
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

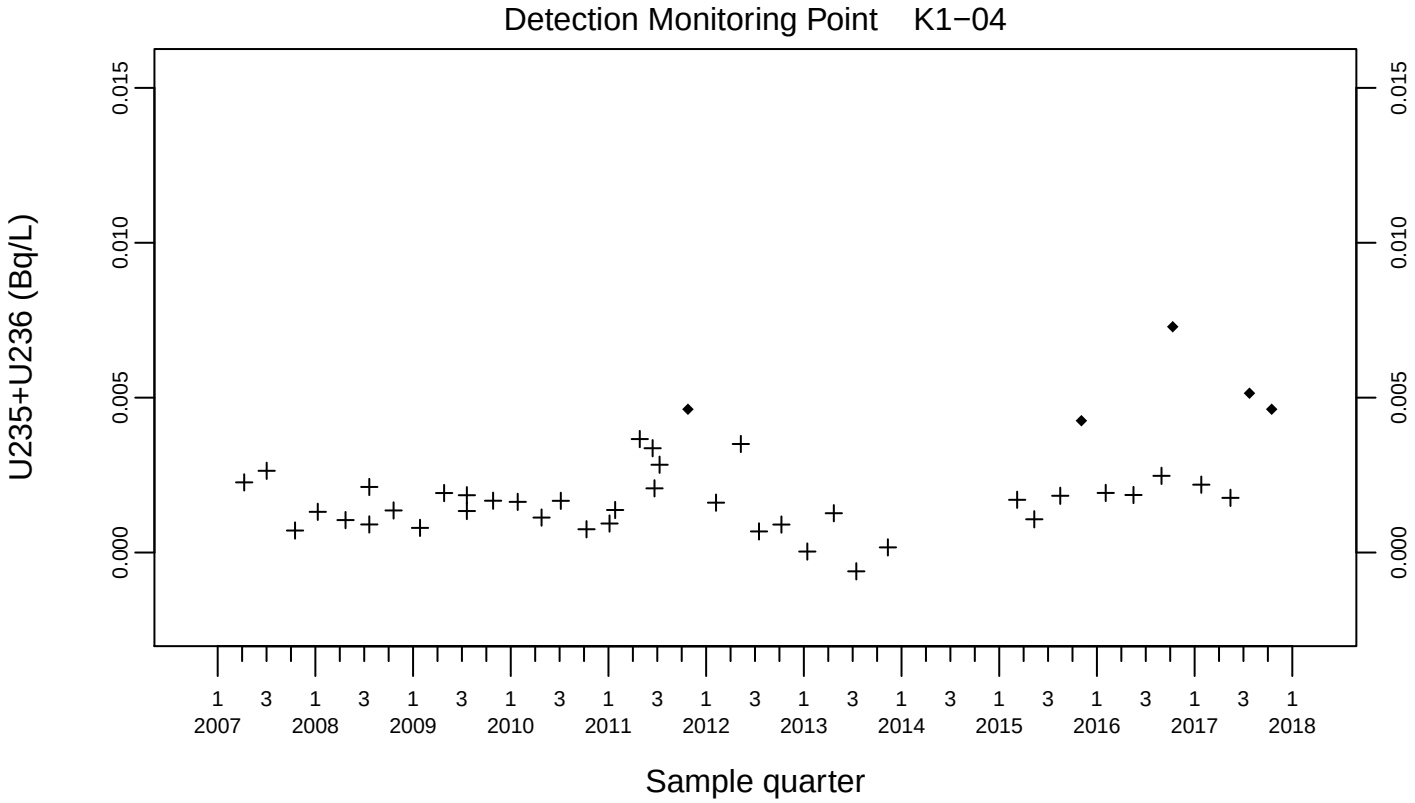

Pit 1 Area
U234+U233 (Bq/L)
Crossgradient Monitoring Point K1−09
Above RL
Below RL
U234+U233 (Bq/L)
0.00
0.05
0.10
0.15
0.20
0.25
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

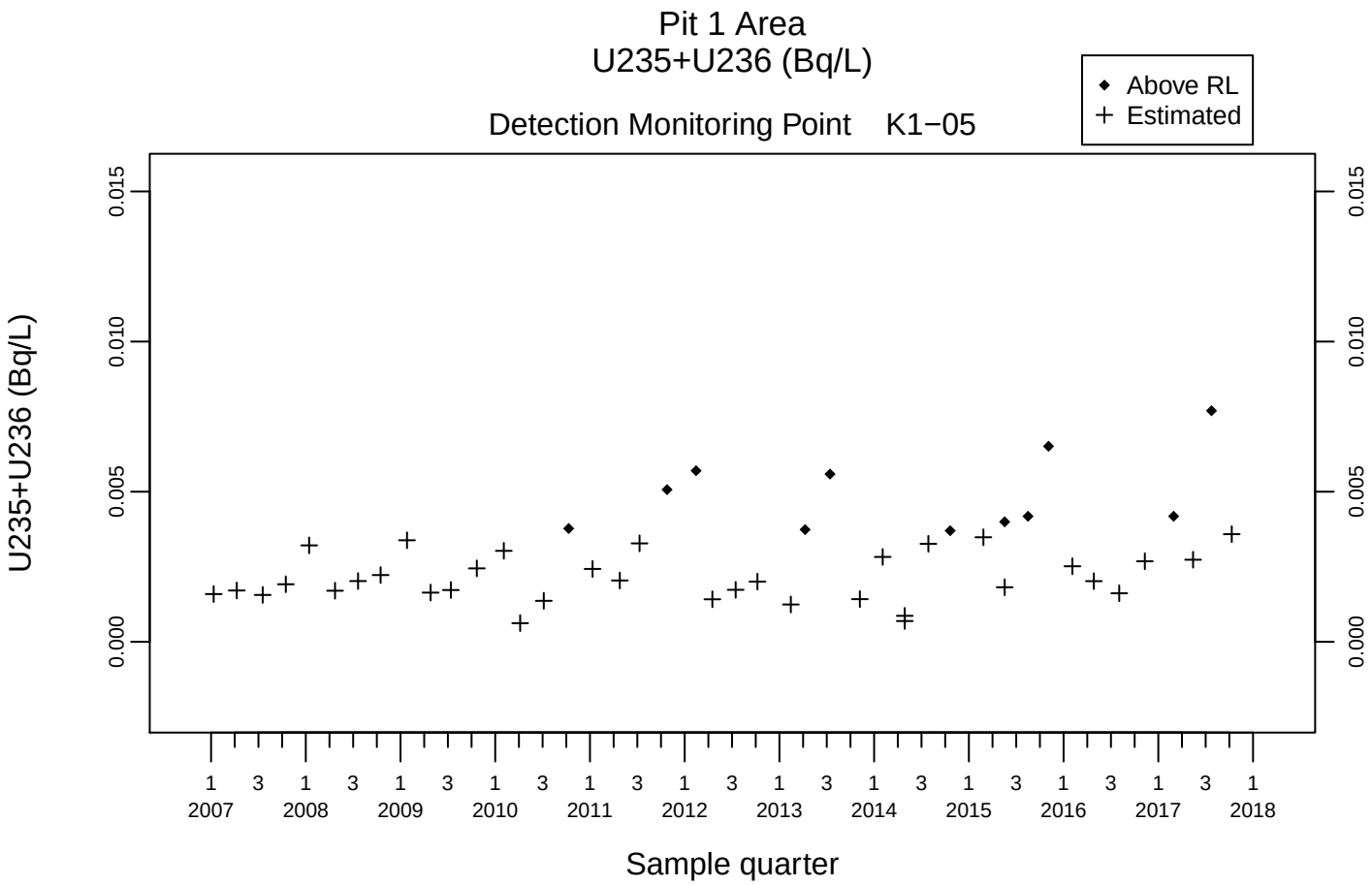

Detection Monitoring Point W−PIT1−2326
U234+U233 (Bq/L)
0.00
0.05
0.10
0.15
0.20
0.25
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

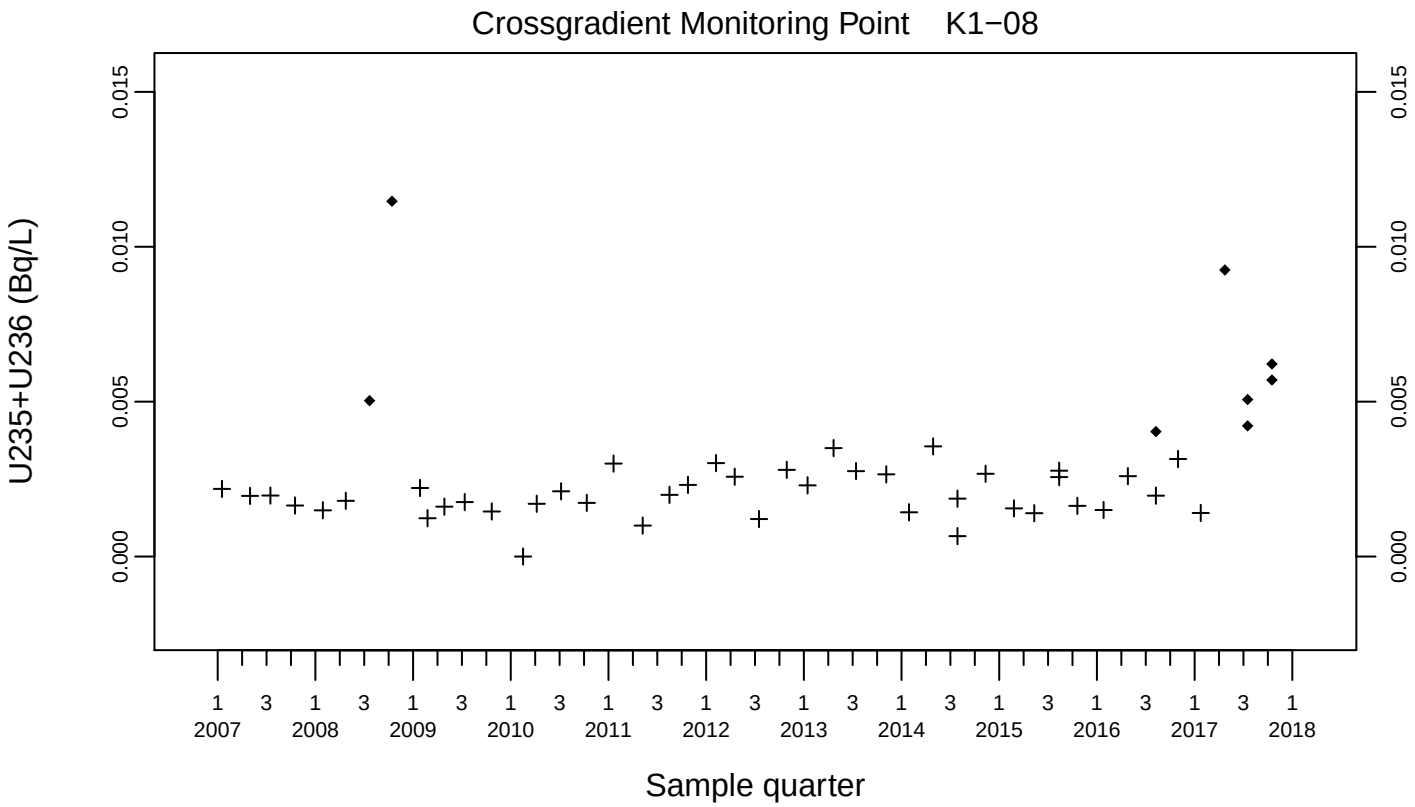

Pit 1 Area
U235+U236 (Bq/L)
Above RL
Estimated
Background Monitoring Point K1−01C
U235+U236 (Bq/L)
0.000
0.005
0.010
0.015
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

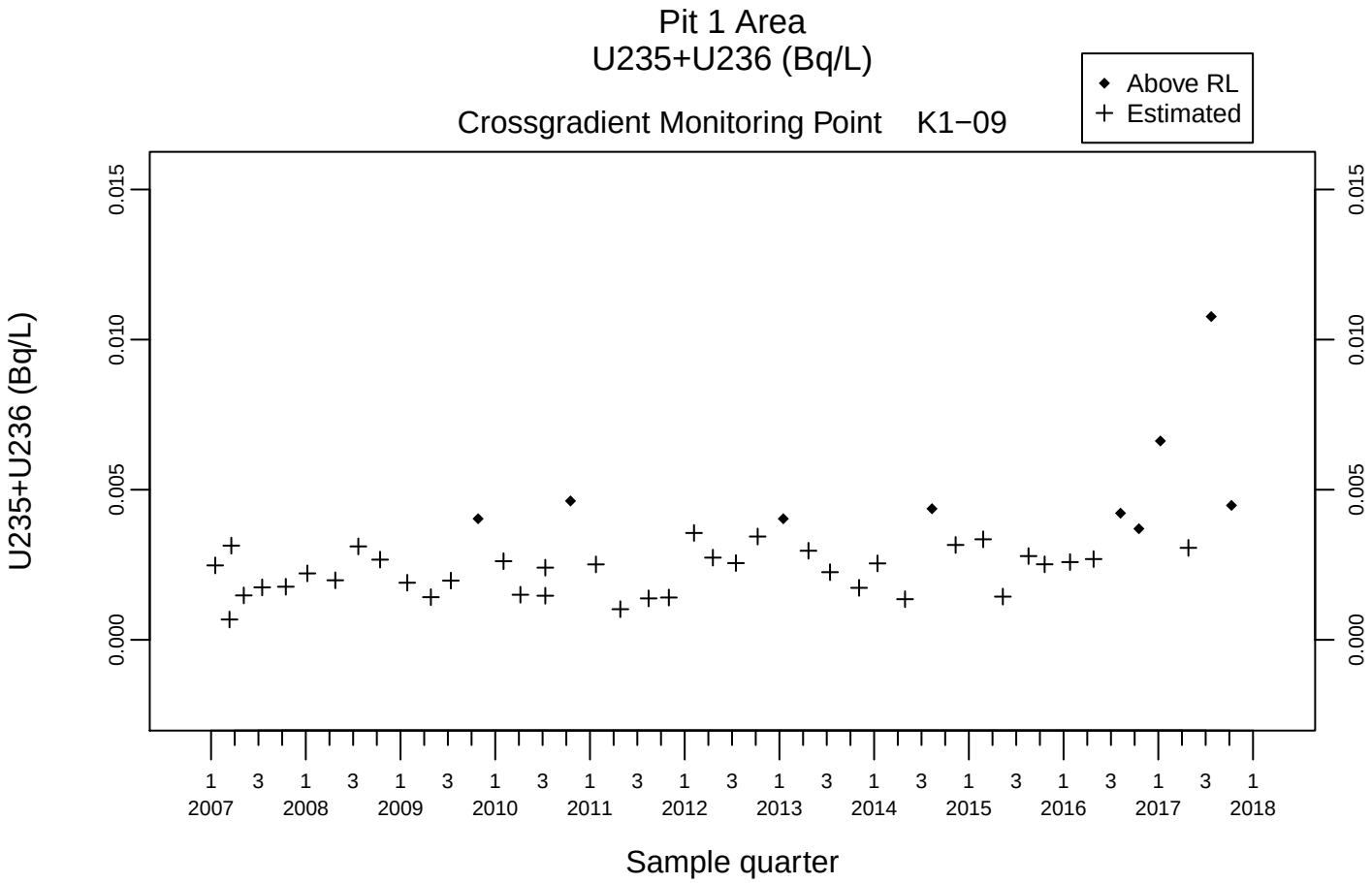

Background Monitoring Point K1−07
U235+U236 (Bq/L)
0.000
0.005
0.010
0.015
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

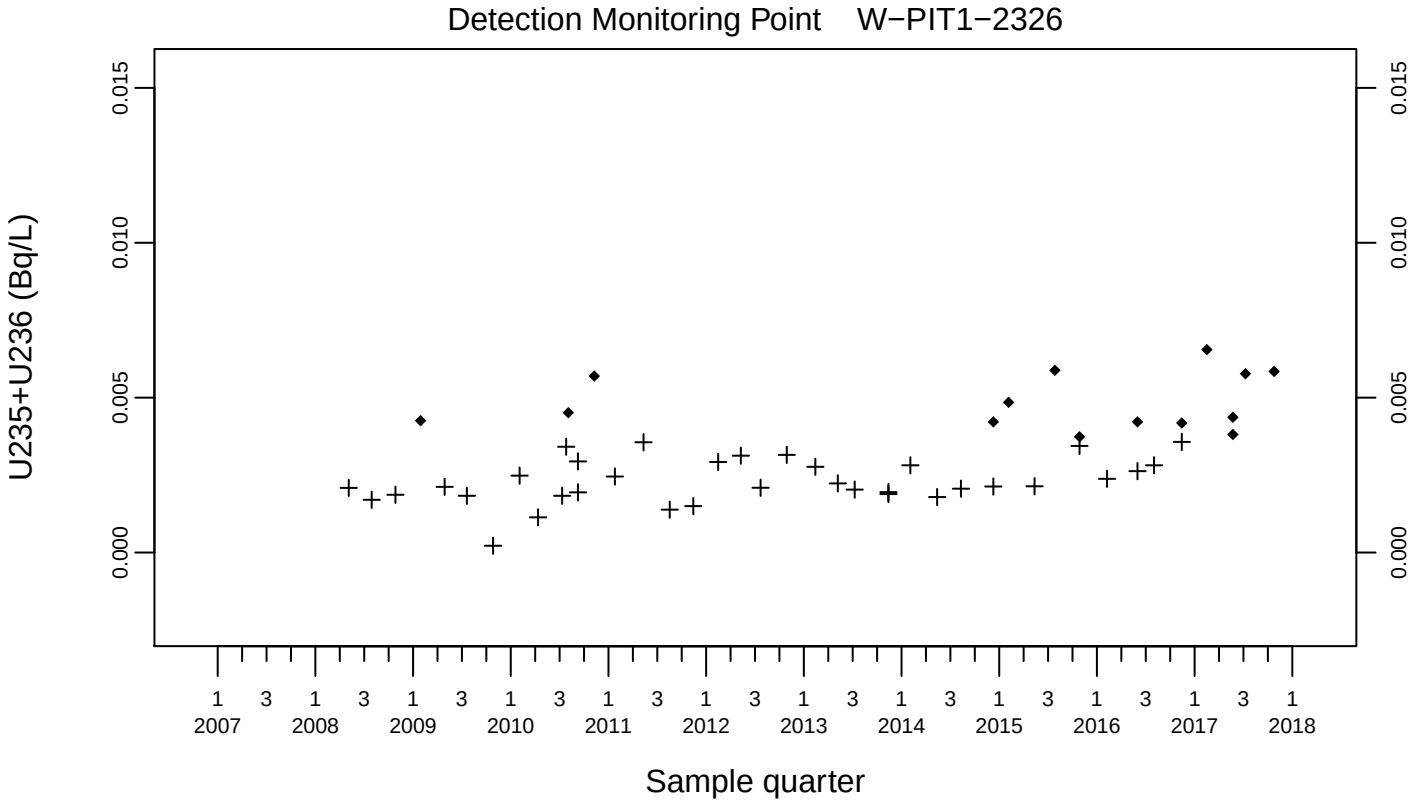

Pit 1 Area
U235+U236 (Bq/L)
Above RL
Estimated
Detection Monitoring Point K1−02B
U235+U236 (Bq/L)
0.000
0.005
0.010
0.015
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

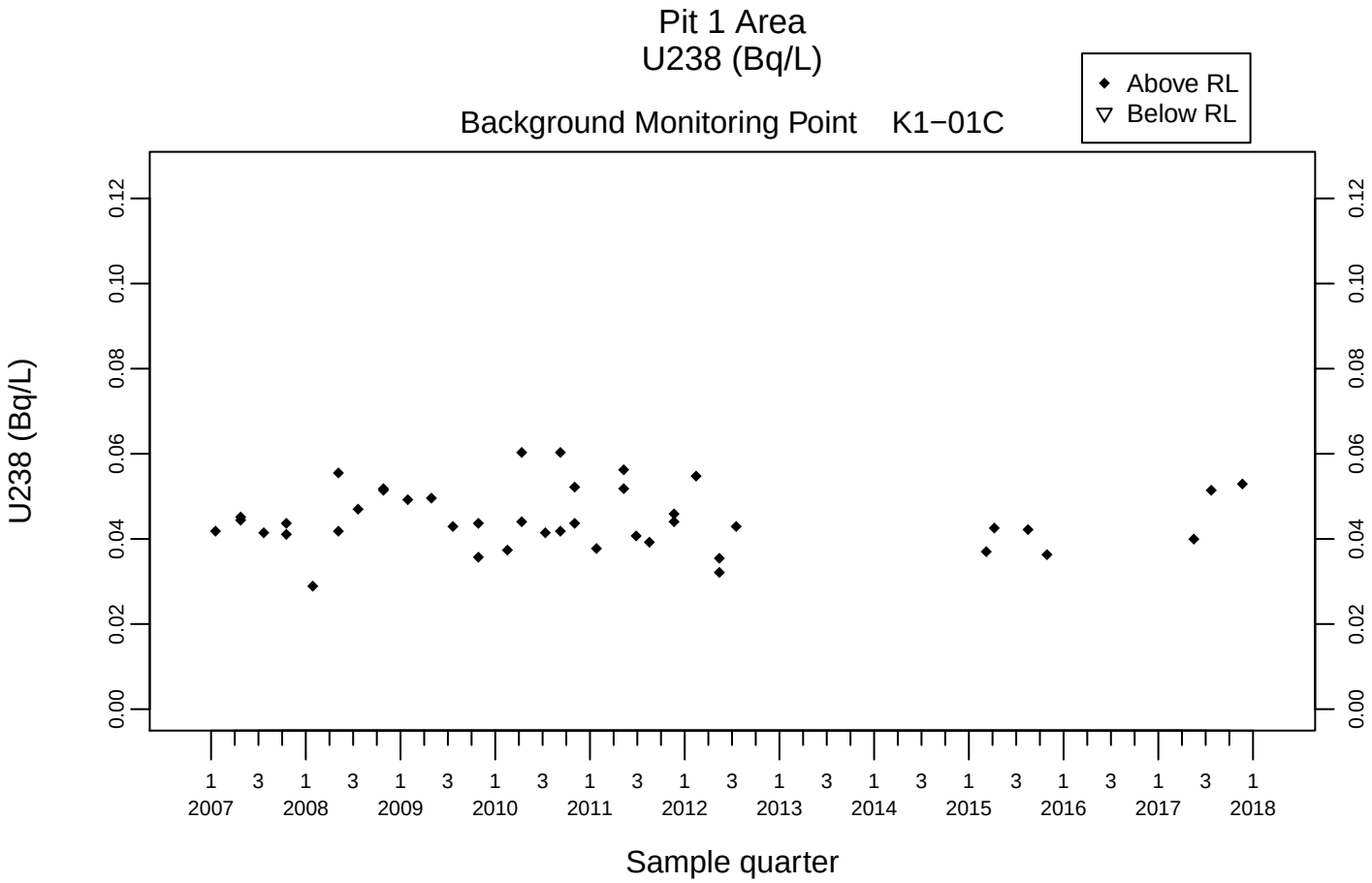

Detection Monitoring Point K1−04
U235+U236 (Bq/L)
0.000
0.005
0.010
0.015
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

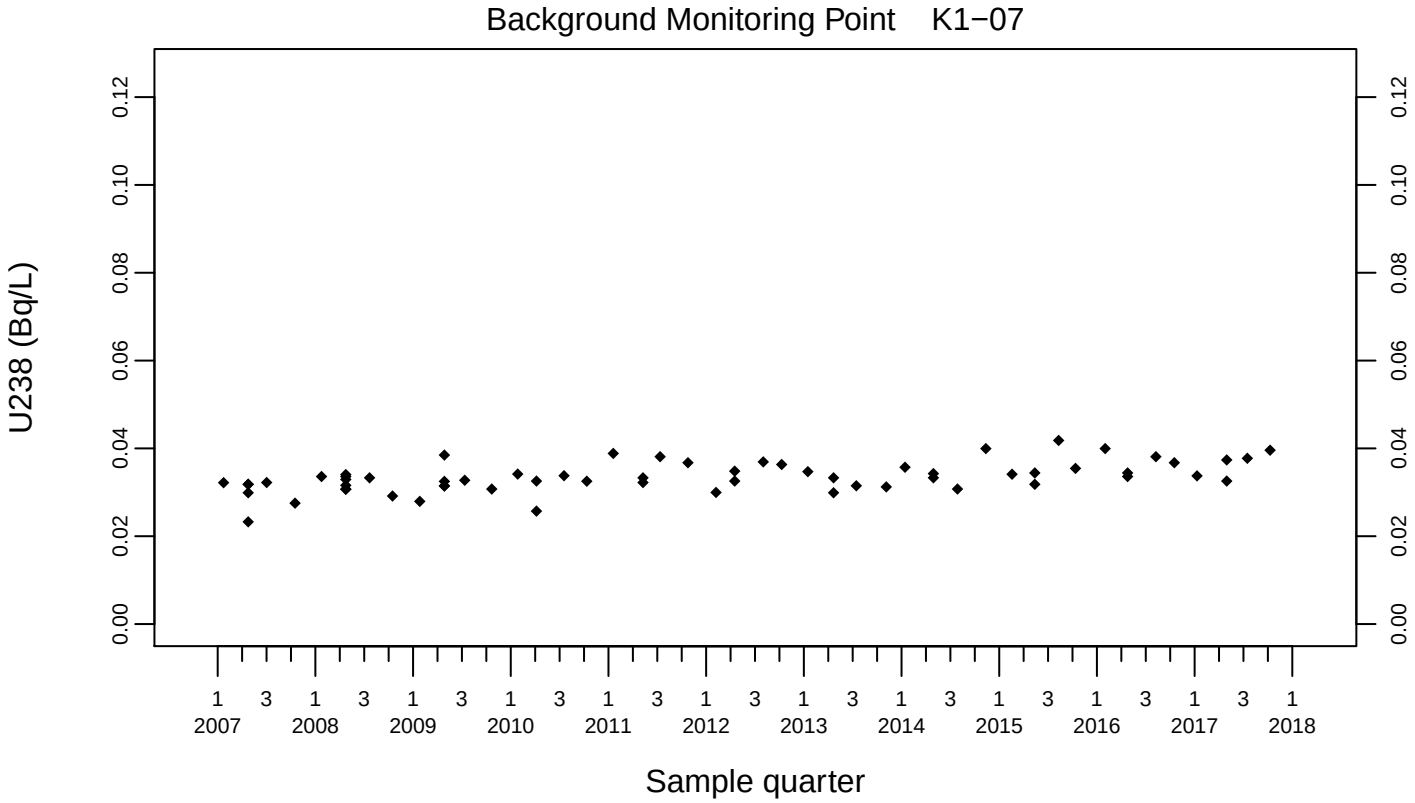

Pit 1 Area
U235+U236 (Bq/L)
Detection Monitoring Point K1−05
Above RL
Estimated
U235+U236 (Bq/L)
0.000
0.005
0.010
0.015
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

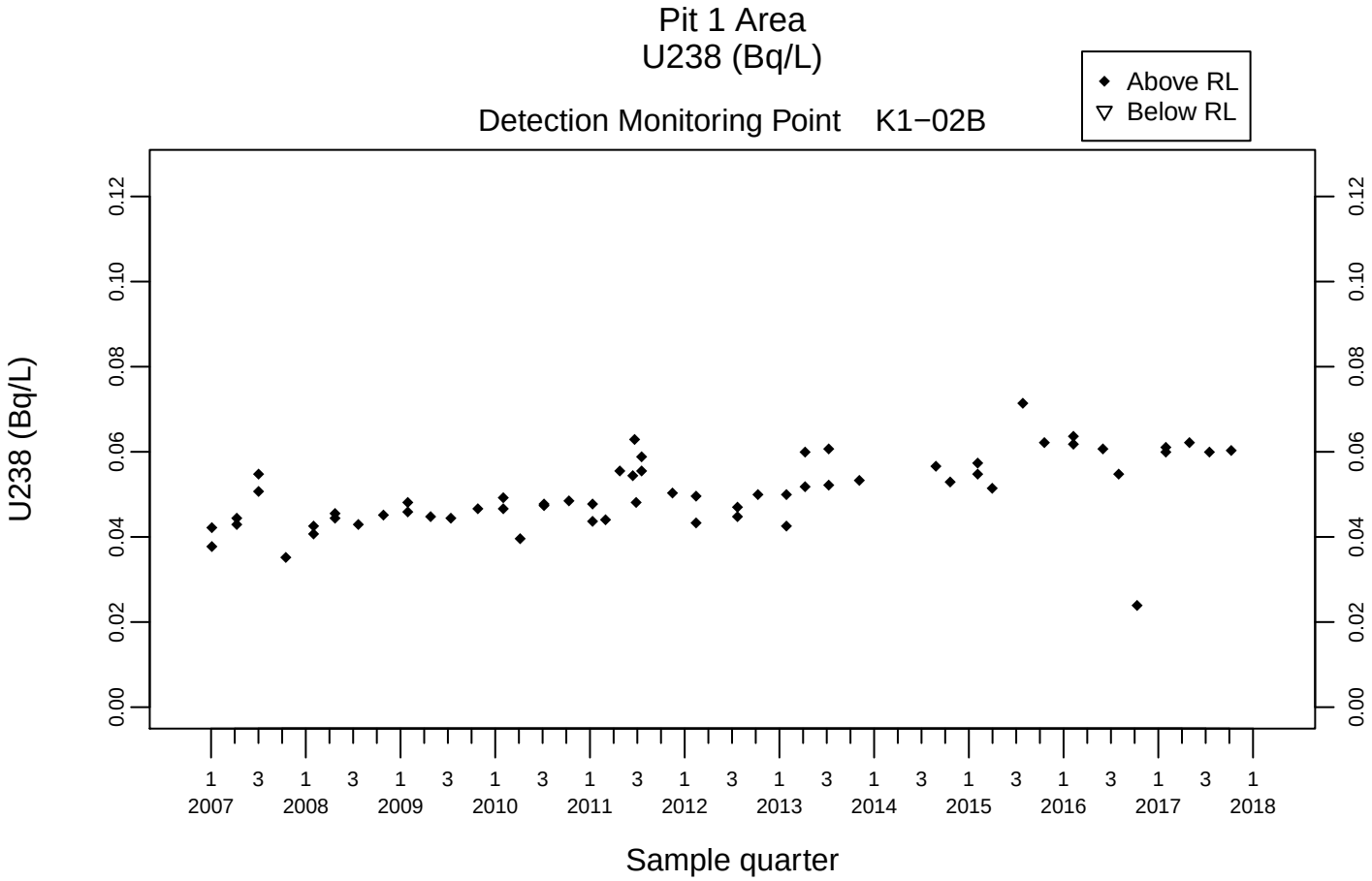

Crossgradient Monitoring Point K1−08
U235+U236 (Bq/L)
0.000
0.005
0.010
0.015
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

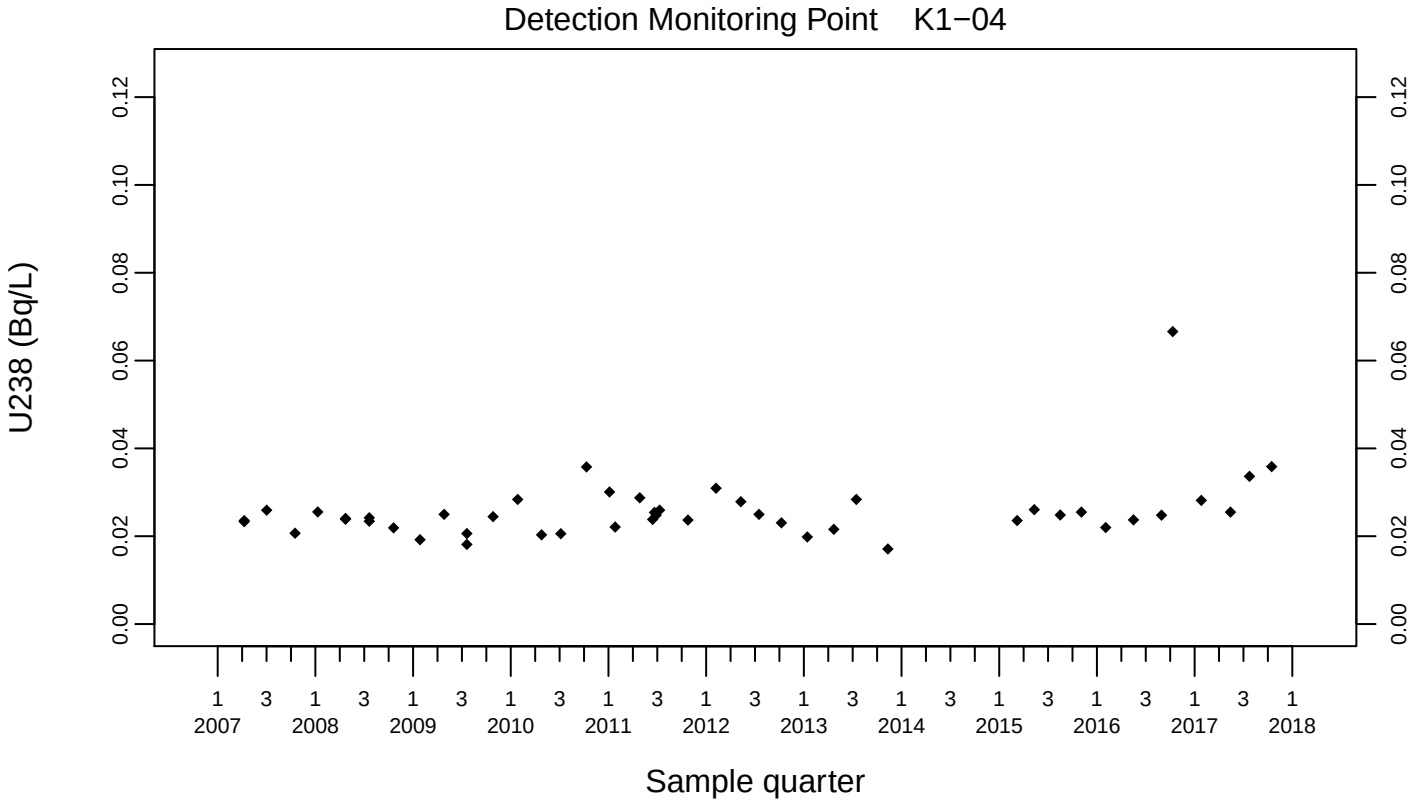

Pit 1 Area
U235+U236 (Bq/L)
Crossgradient Monitoring Point K1−09
Above RL
Estimated
U235+U236 (Bq/L)
0.000
0.005
0.010
0.015
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

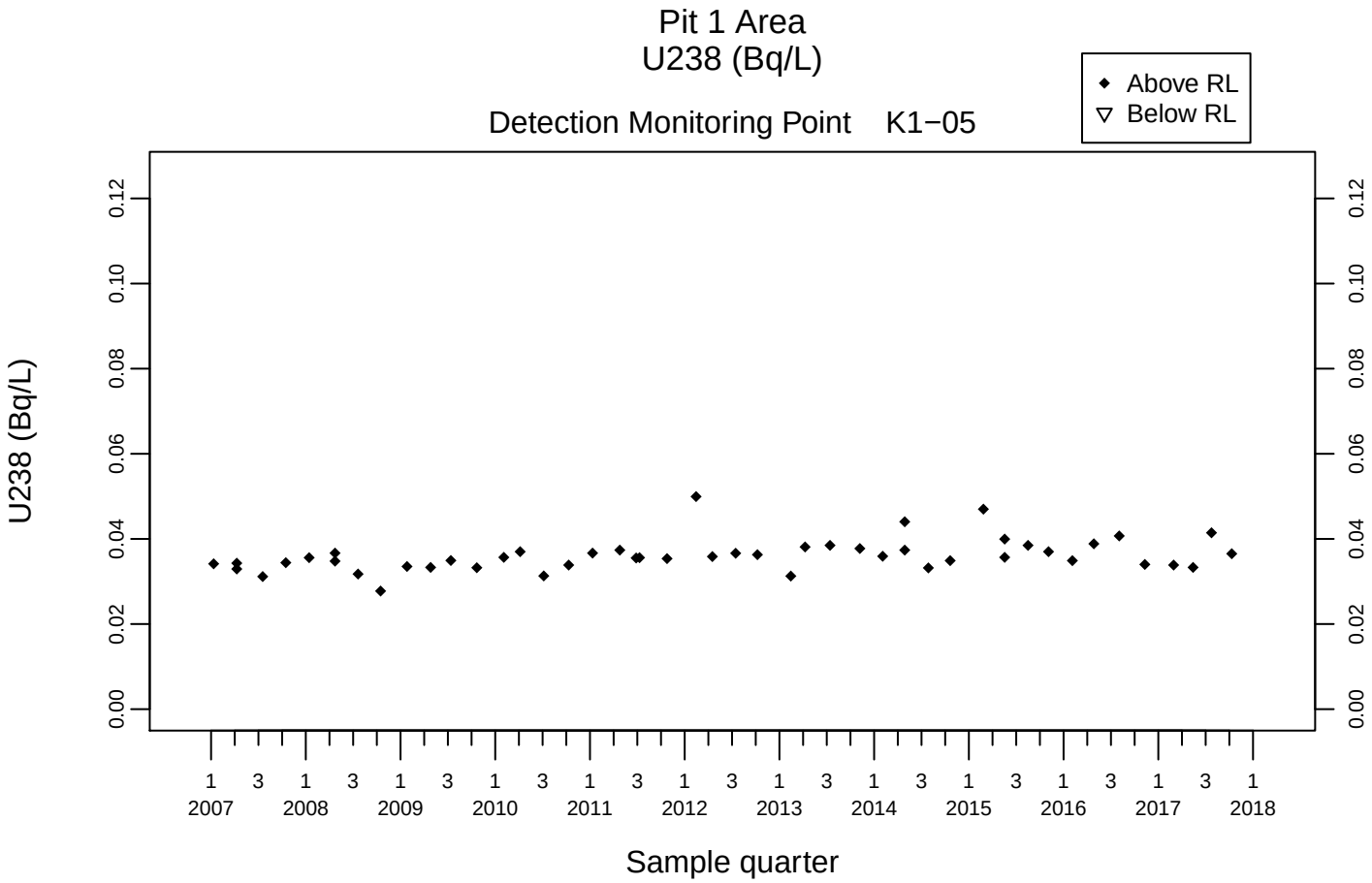

Detection Monitoring Point W−PIT1−2326
U235+U236 (Bq/L)
0.000
0.005
0.010
0.015
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

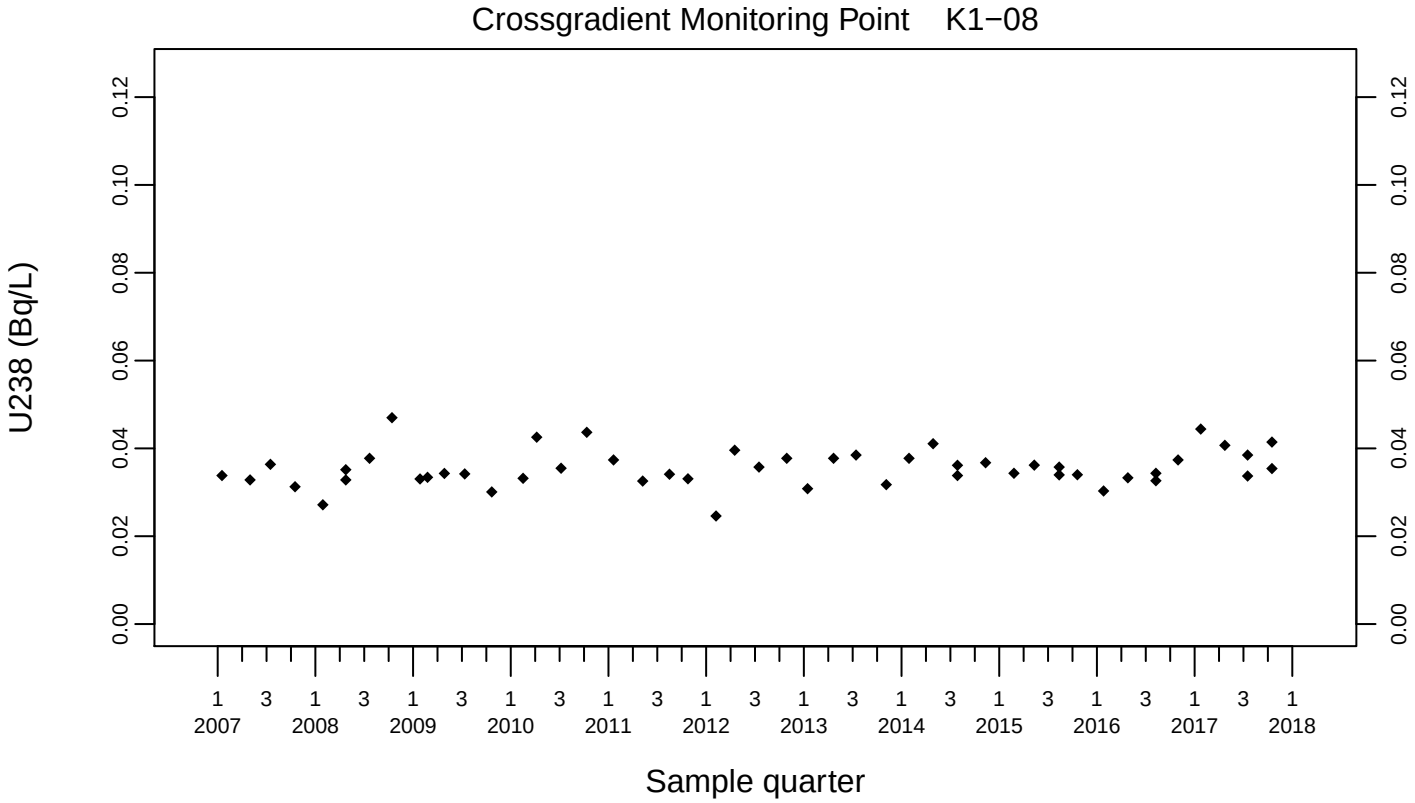

Pit 1 Area
U238 (Bq/L)
Background Monitoring Point K1−01C
Above RL
Below RL
U238 (Bq/L)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

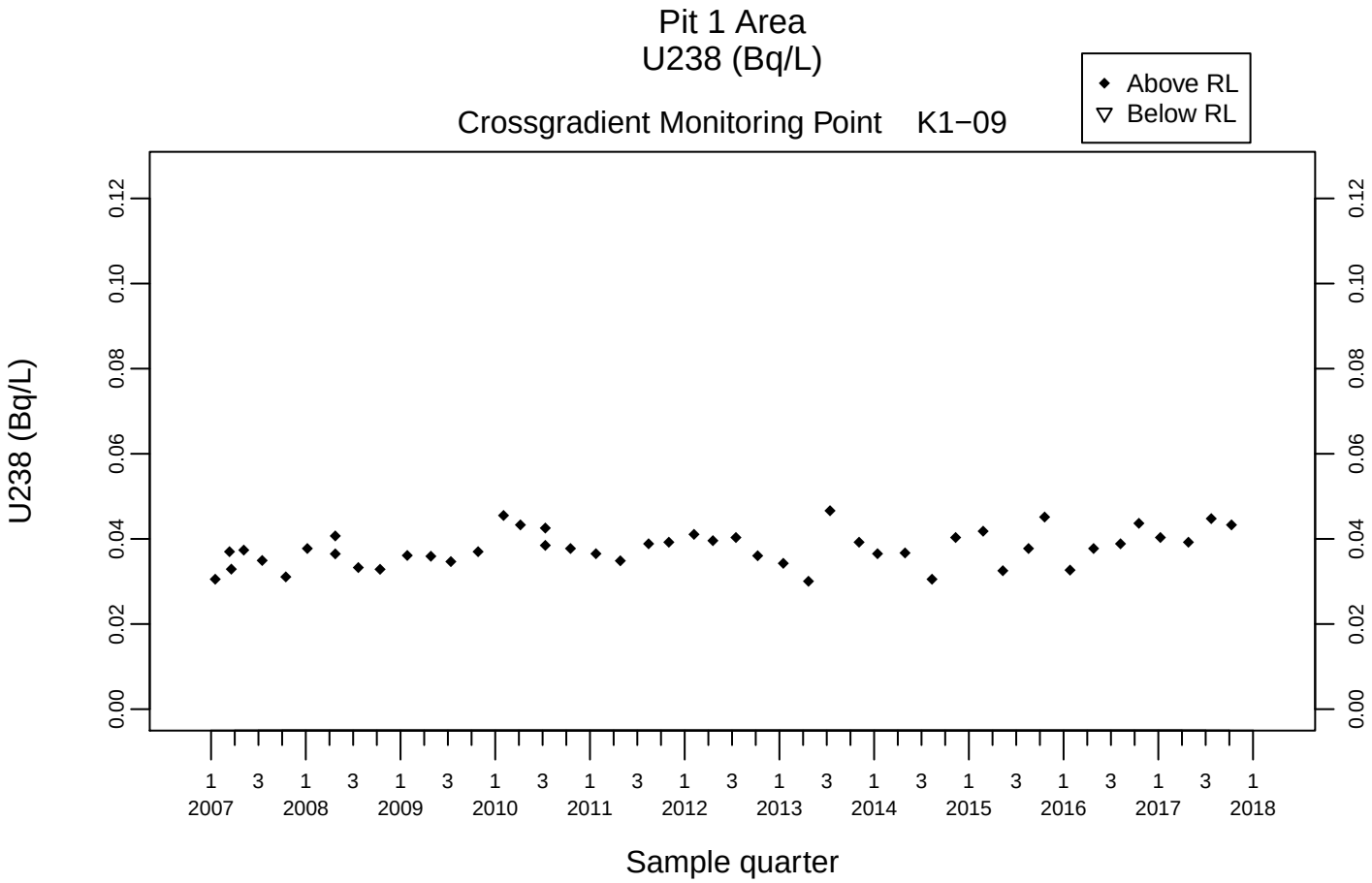

Background Monitoring Point K1−07
U238 (Bq/L)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

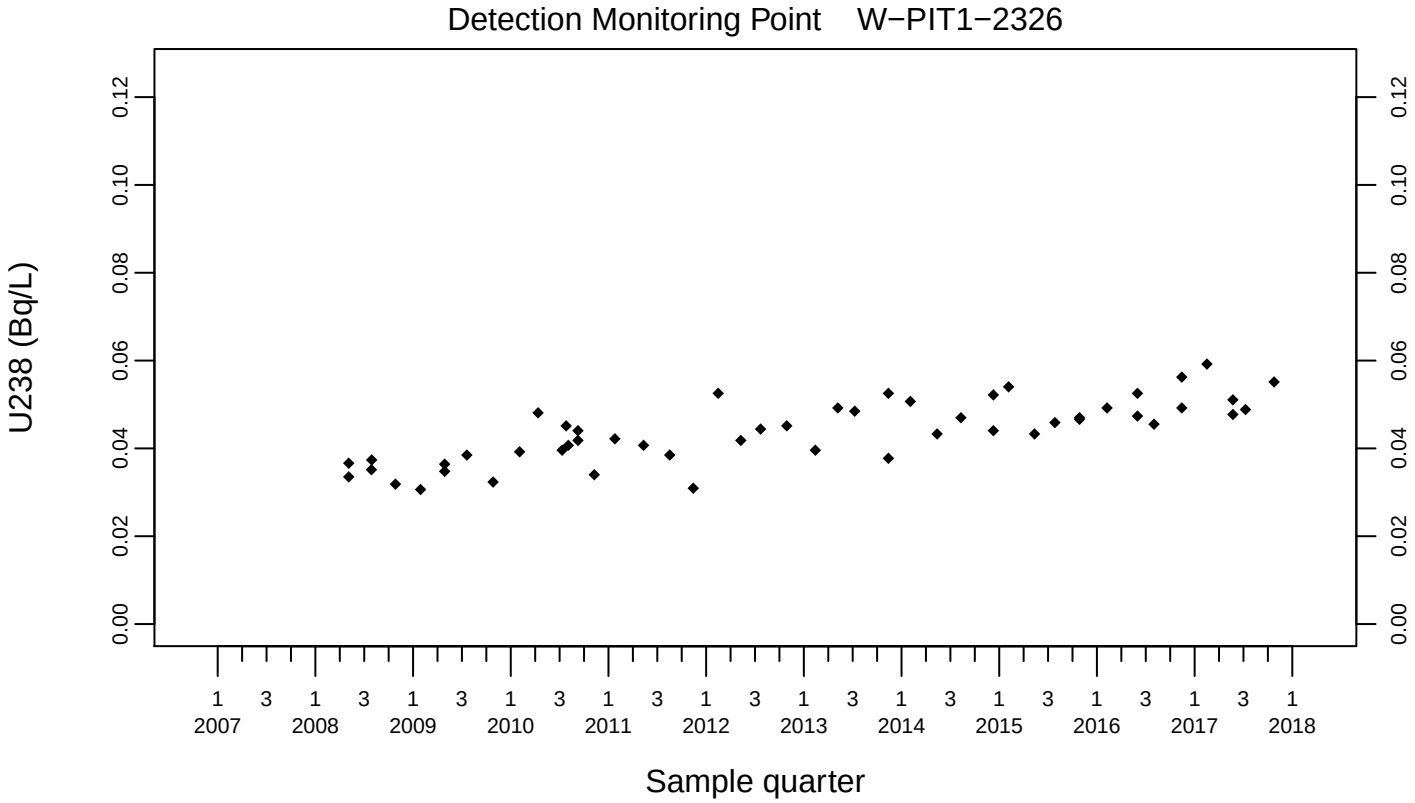

Pit 1 Area
U238 (Bq/L)
Detection Monitoring Point K1−02B
Above RL
Below RL
U238 (Bq/L)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

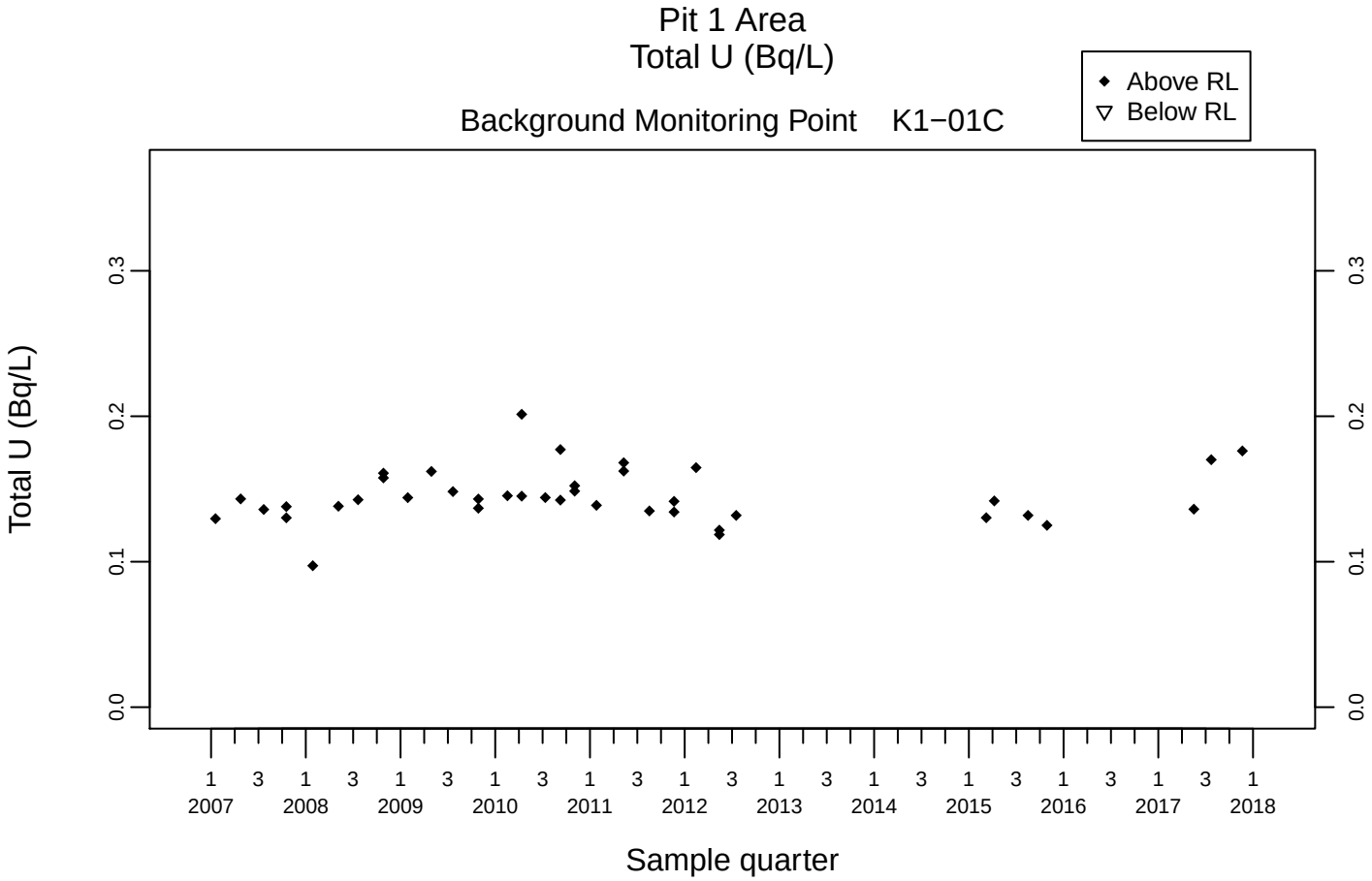

Detection Monitoring Point K1−04
U238 (Bq/L)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

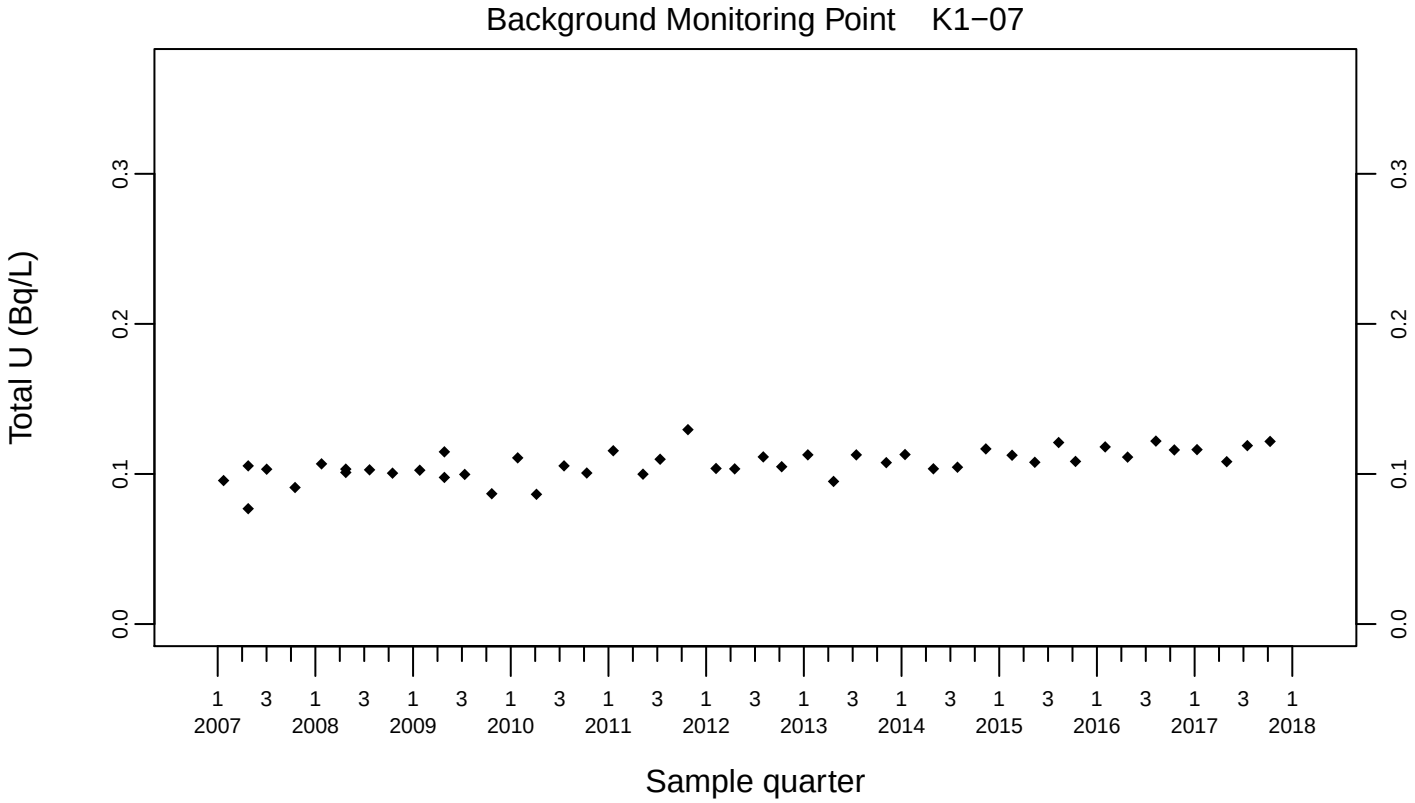

Pit 1 Area
U238 (Bq/L)
Detection Monitoring Point K1−05
Above RL
Below RL
U238 (Bq/L)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

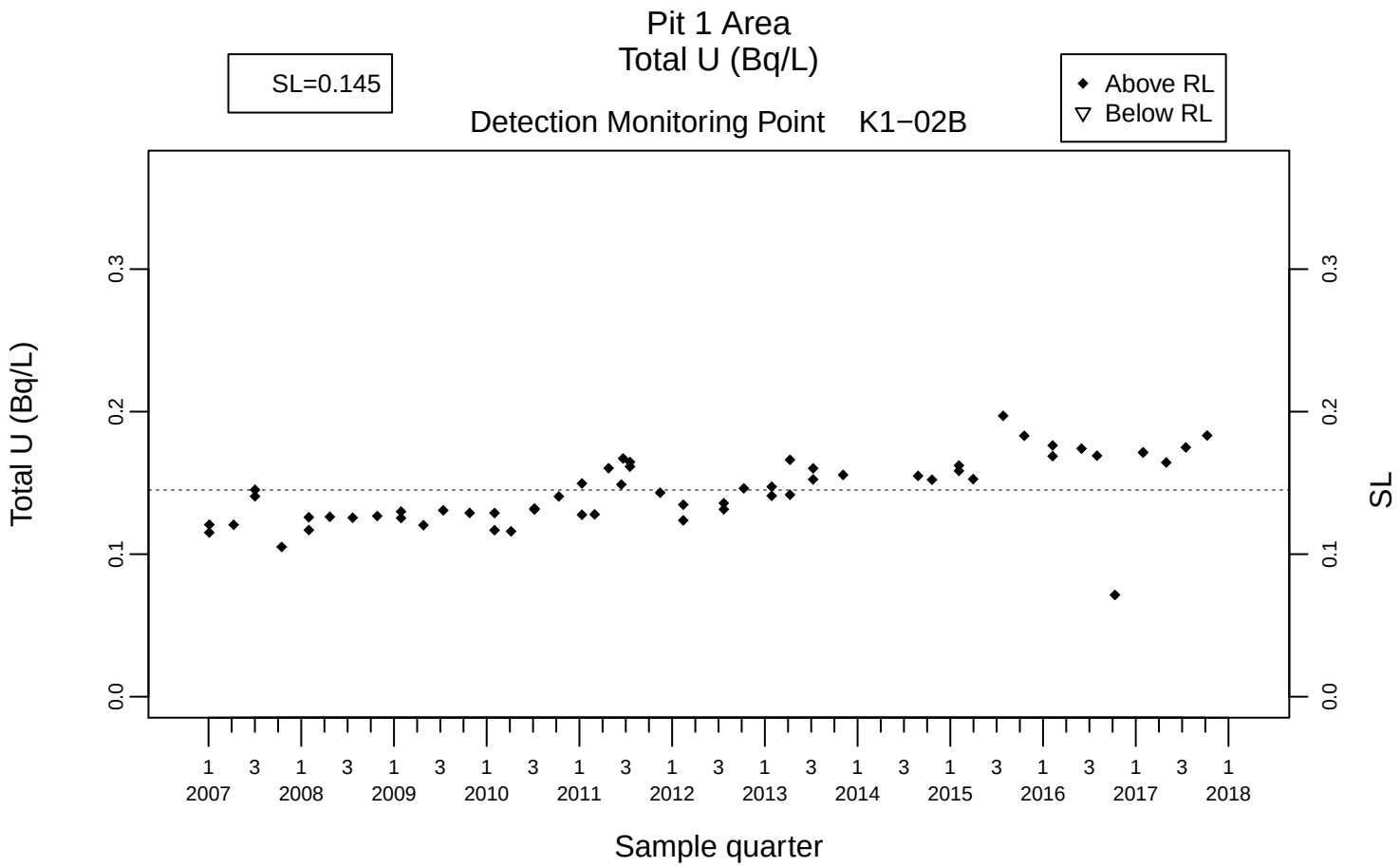

Crossgradient Monitoring Point K1−08
U238 (Bq/L)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

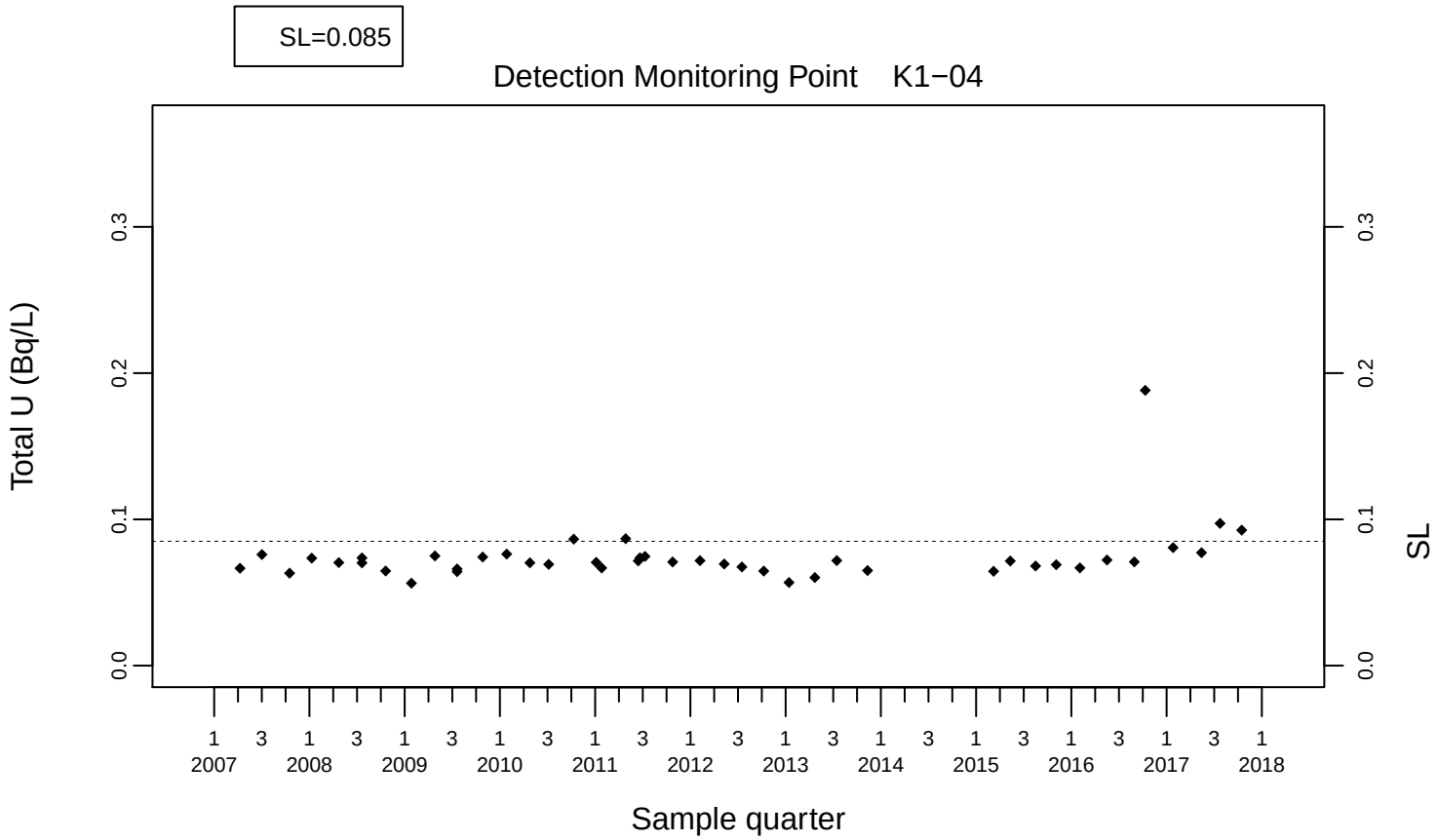

Pit 1 Area
U238 (Bq/L)
Crossgradient Monitoring Point K1−09
Above RL
Below RL
U238 (Bq/L)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

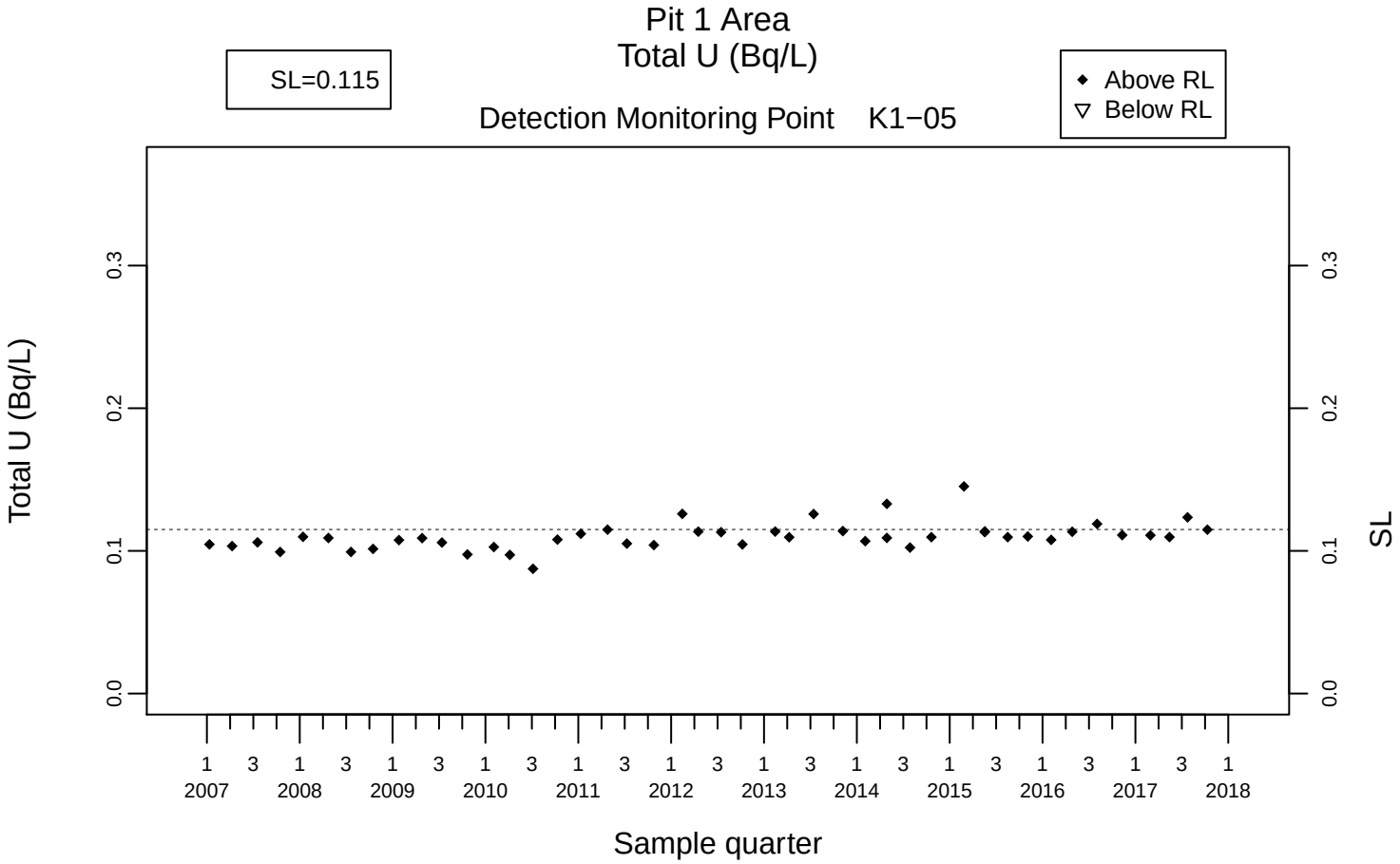

Detection Monitoring Point W−PIT1−2326
U238 (Bq/L)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

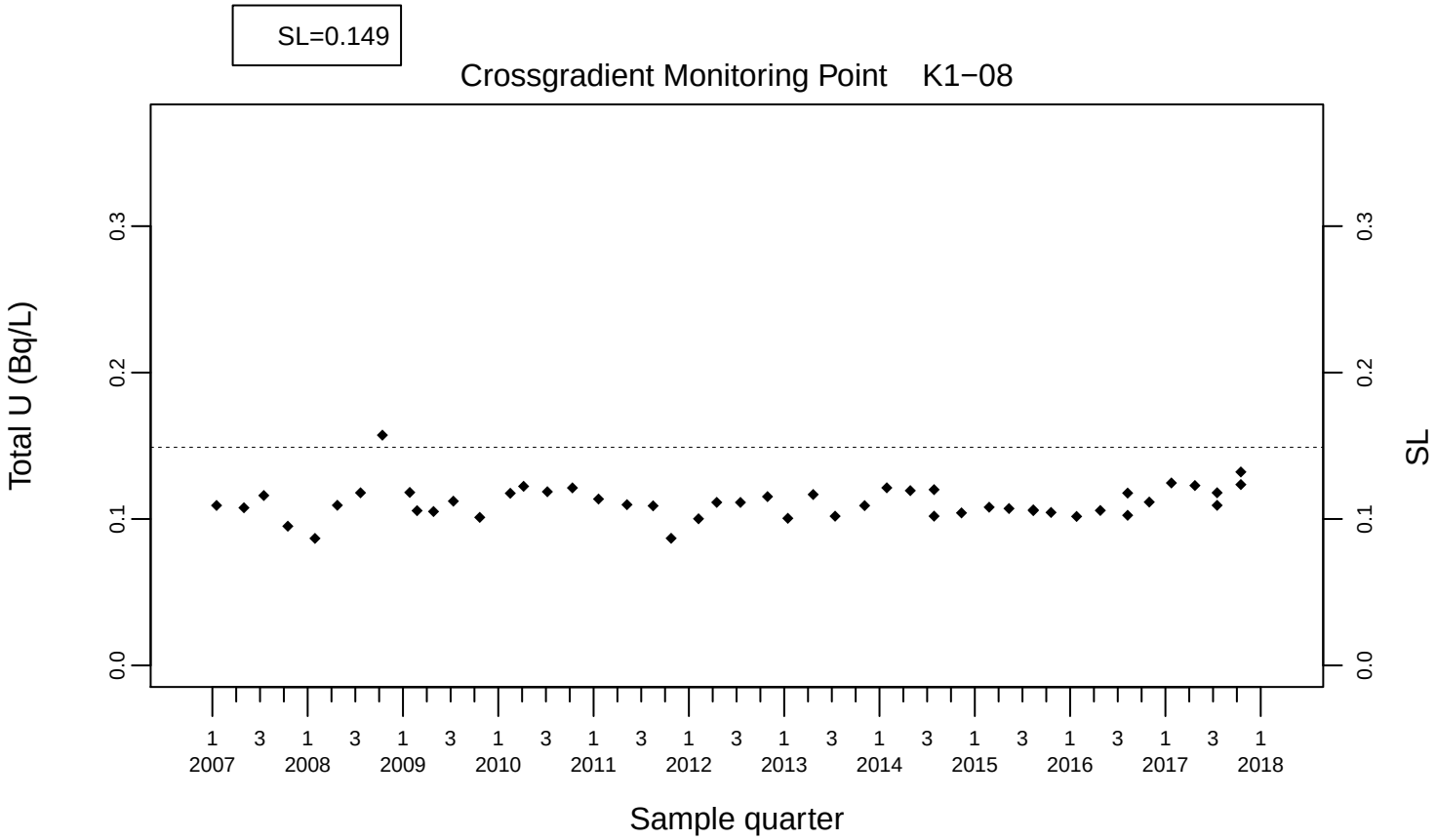

Pit 1 Area
Total U (Bq/L)
Background Monitoring Point K1−01C
Above RL
Below RL
Total U (Bq/L)
0.0
0.1
0.2
0.3
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

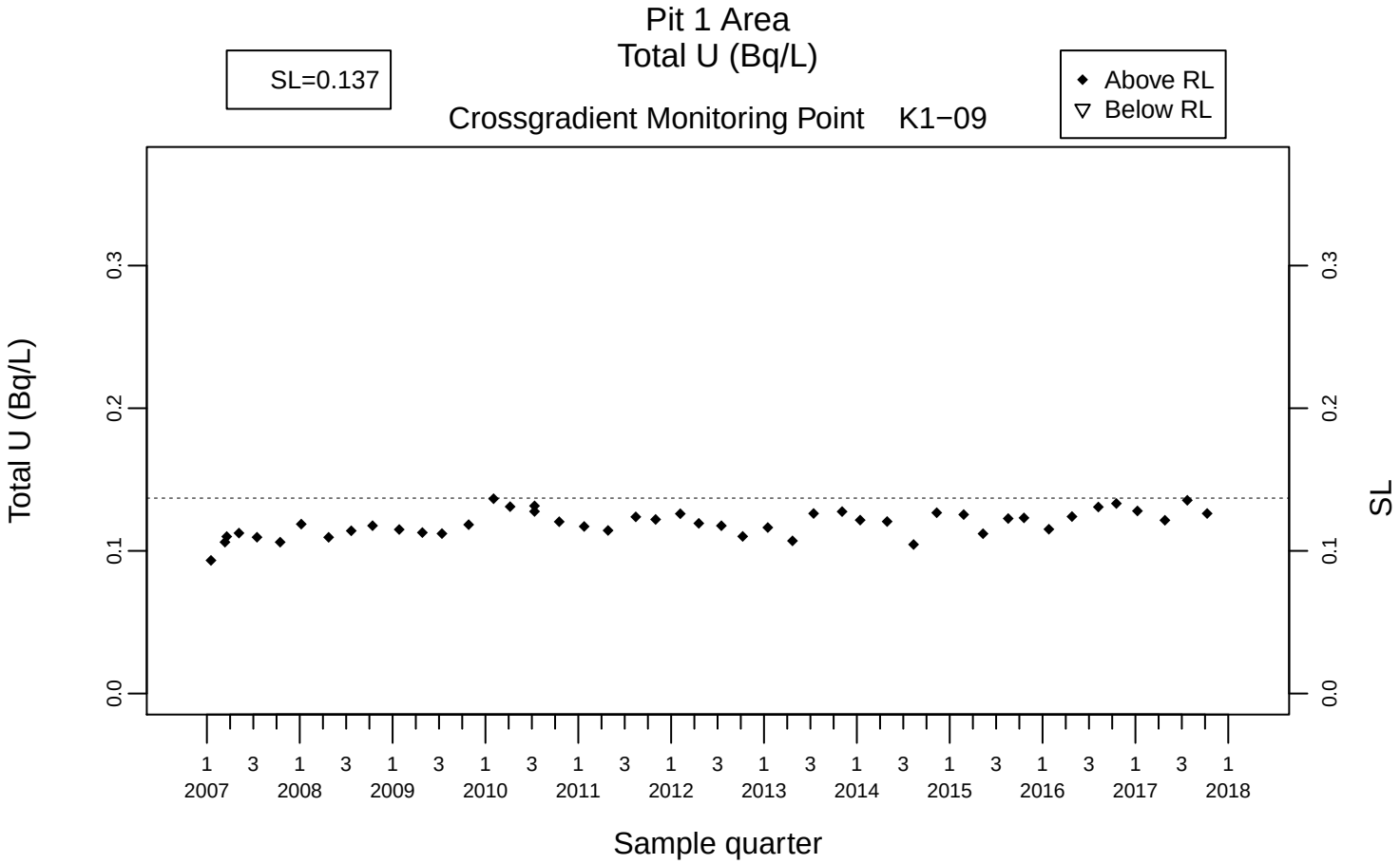

Background Monitoring Point K1−07
Total U (Bq/L)
0.0
0.1
0.2
0.3
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

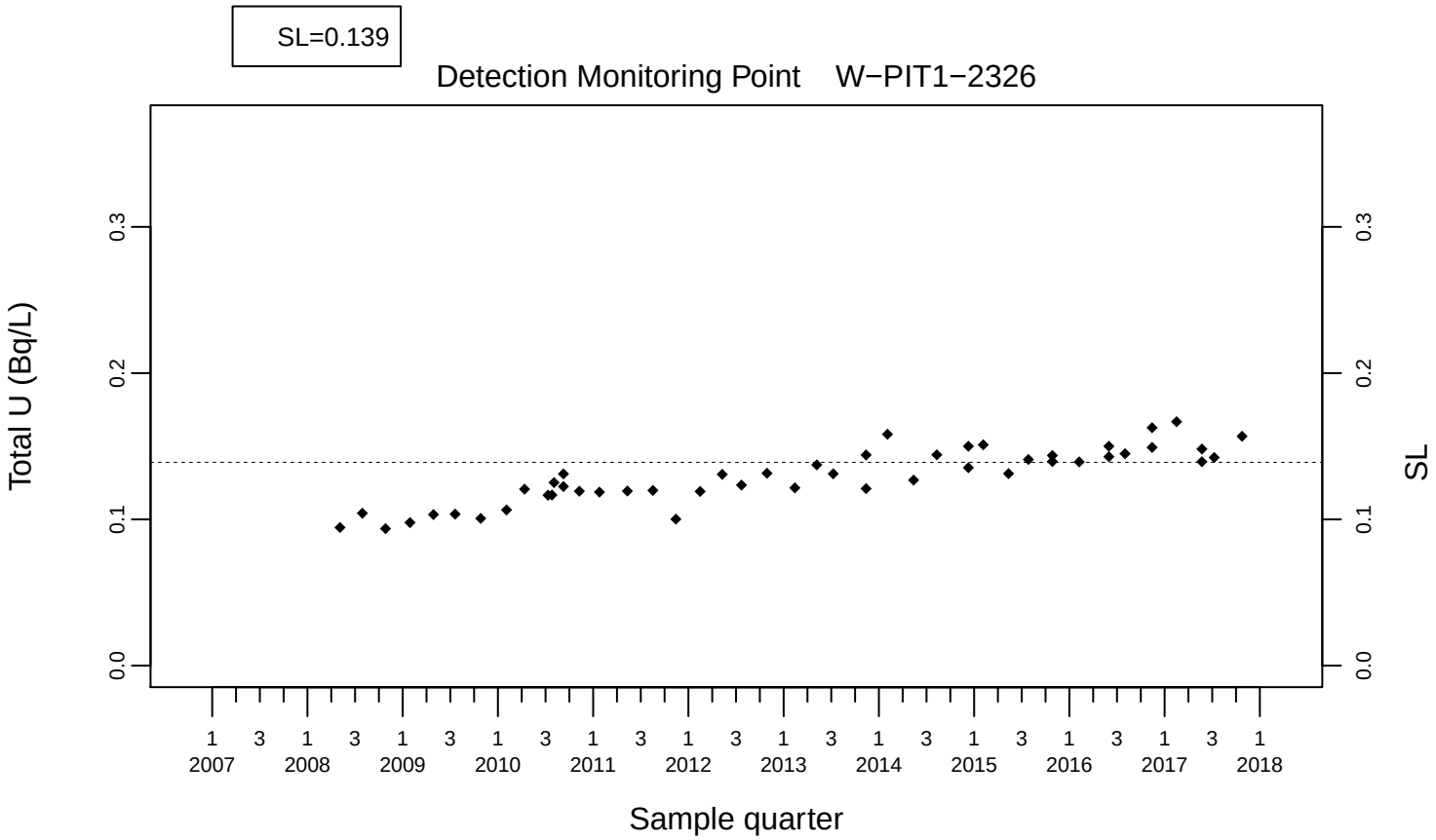

Pit 1 Area
Total U (Bq/L)
SL=0.145
Above RL
Below RL
Detection Monitoring Point K1−02B
Total U (Bq/L)
SL
0.0
0.1
0.2
0.3
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

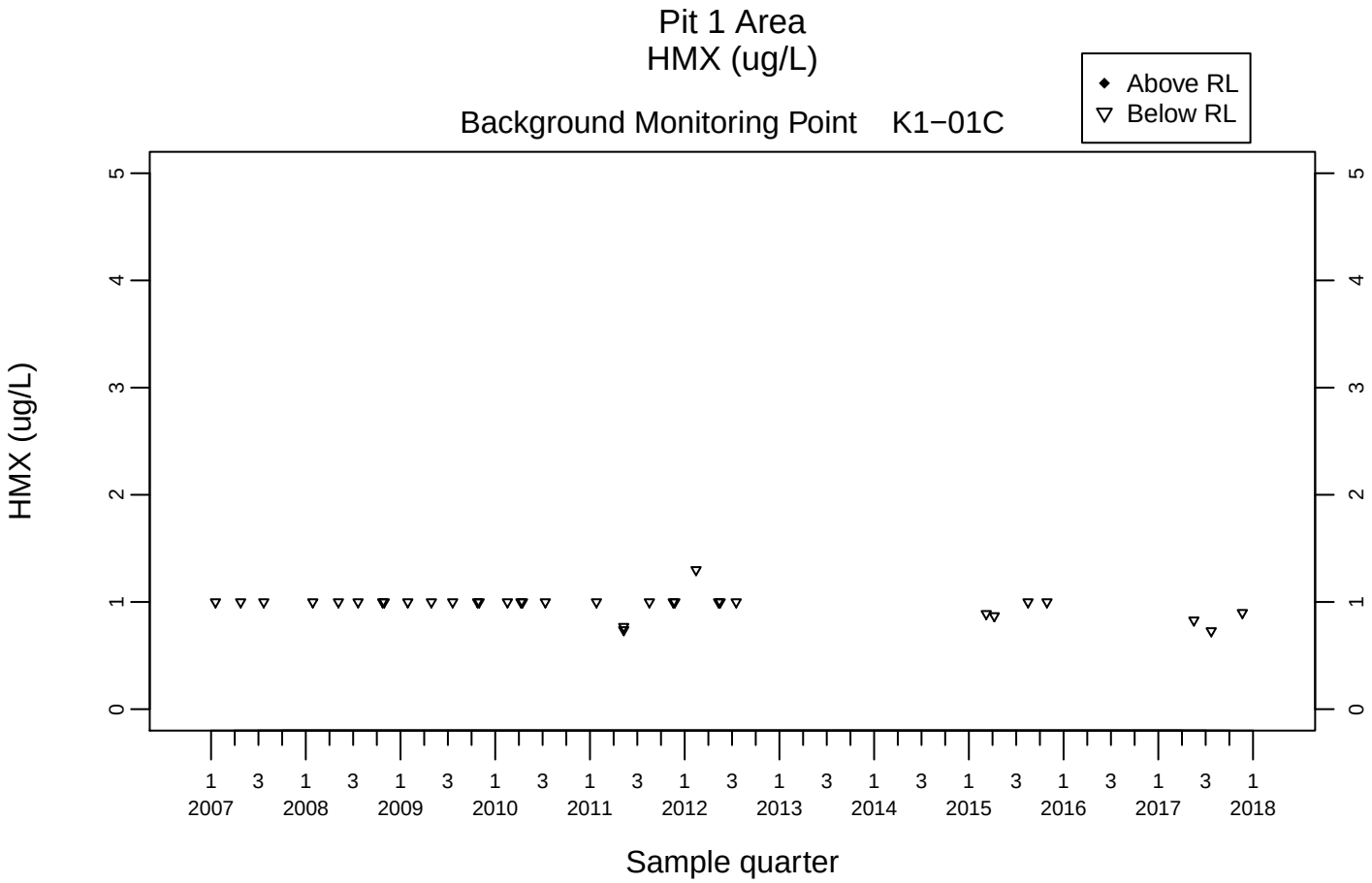

SL=0.085
Detection Monitoring Point K1−04
Total U (Bq/L)
SL
0.0
0.1
0.2
0.3
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

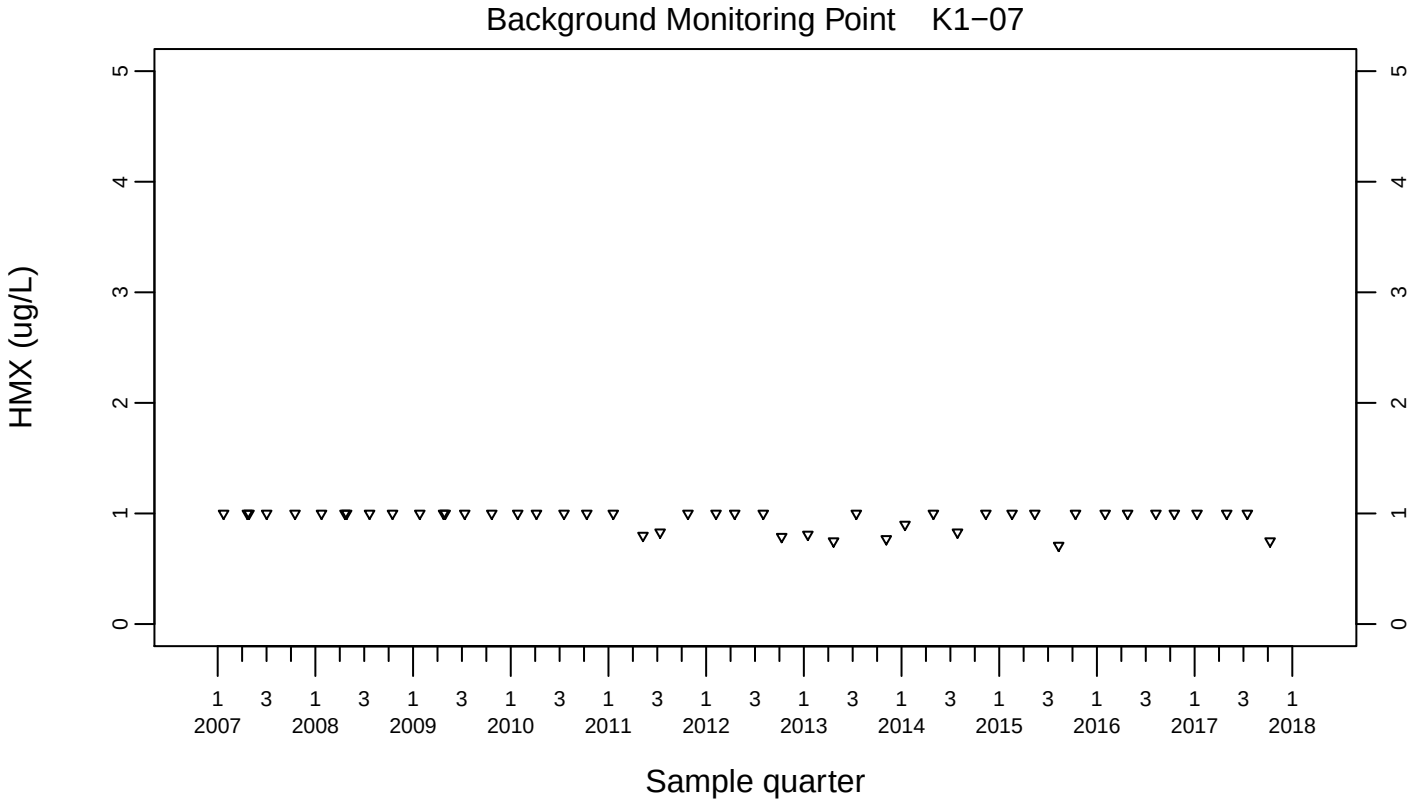

Pit 1 Area
Total U (Bq/L)
SL=0.115
Above RL
Below RL
Detection Monitoring Point K1−05
Total U (Bq/L)
SL
0.0
0.1
0.2
0.3
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

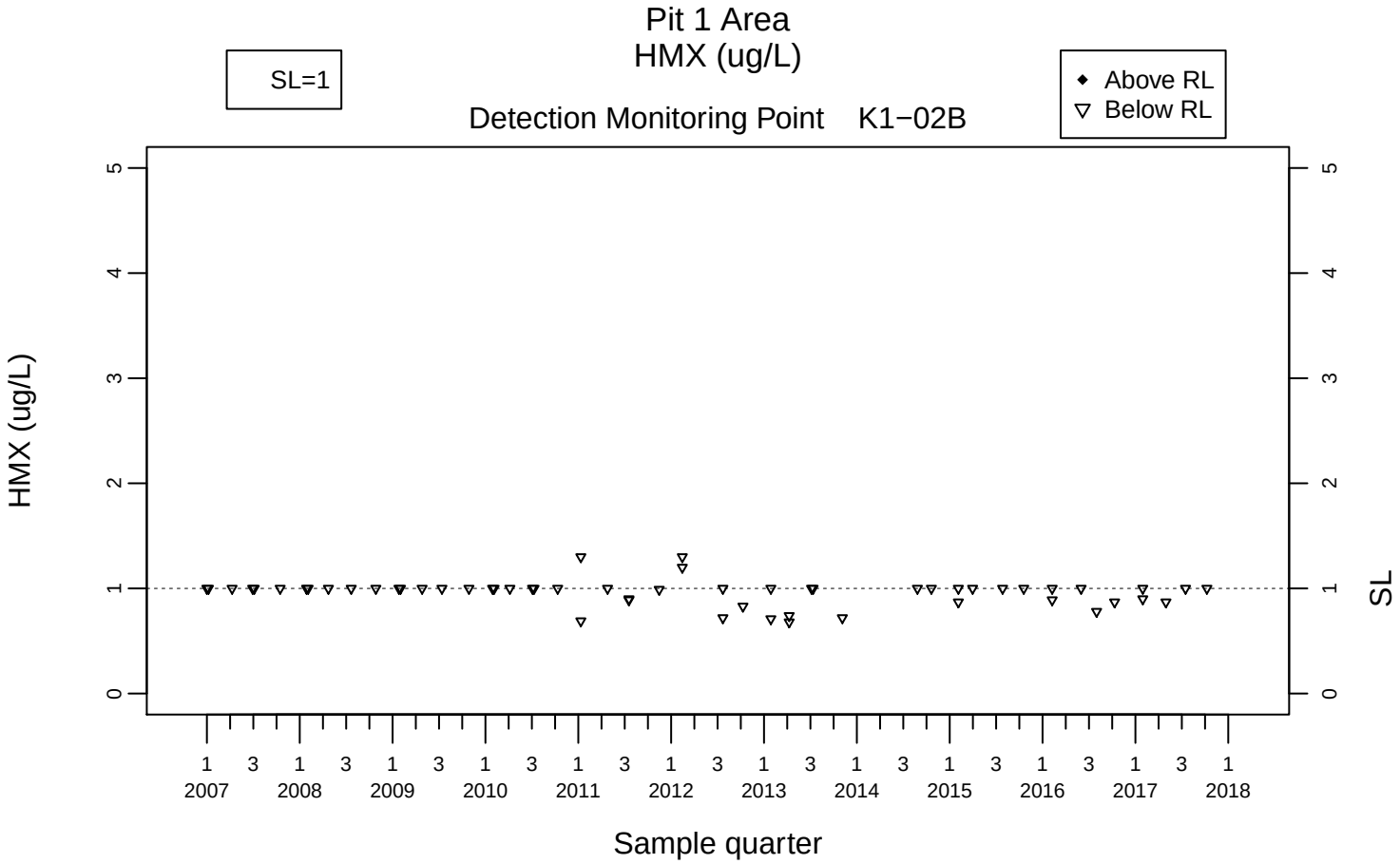

SL=0.149
Crossgradient Monitoring Point K1−08
Total U (Bq/L)
SL
0.0
0.1
0.2
0.3
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

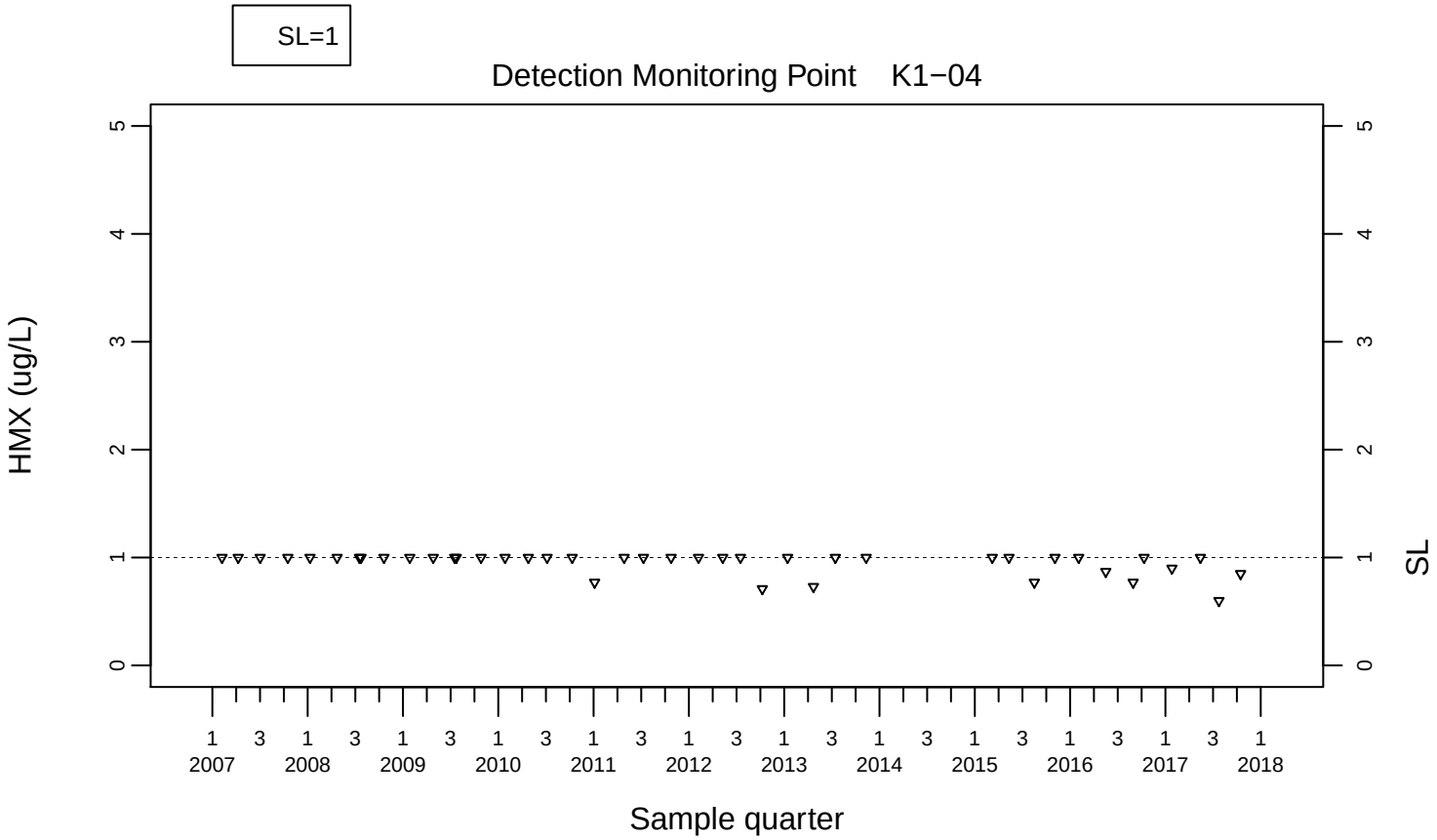

Pit 1 Area
Total U (Bq/L)
SL=0.137
Crossgradient Monitoring Point K1−09
Above RL
Below RL
Total U (Bq/L)
SL
Sample quarter

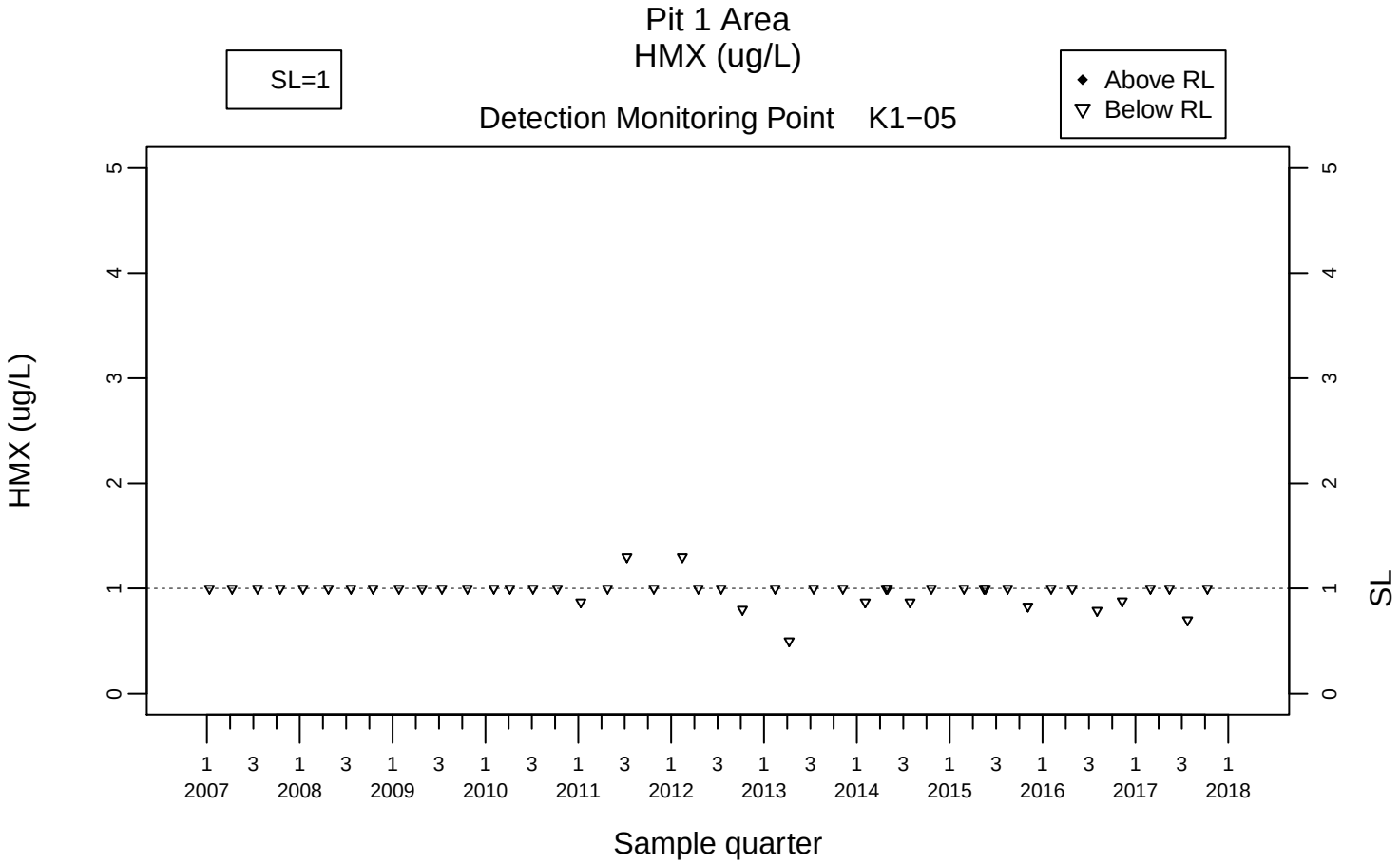

SL=0.139
Detection Monitoring Point W−PIT1−2326
Total U (Bq/L)
SL
Sample quarter

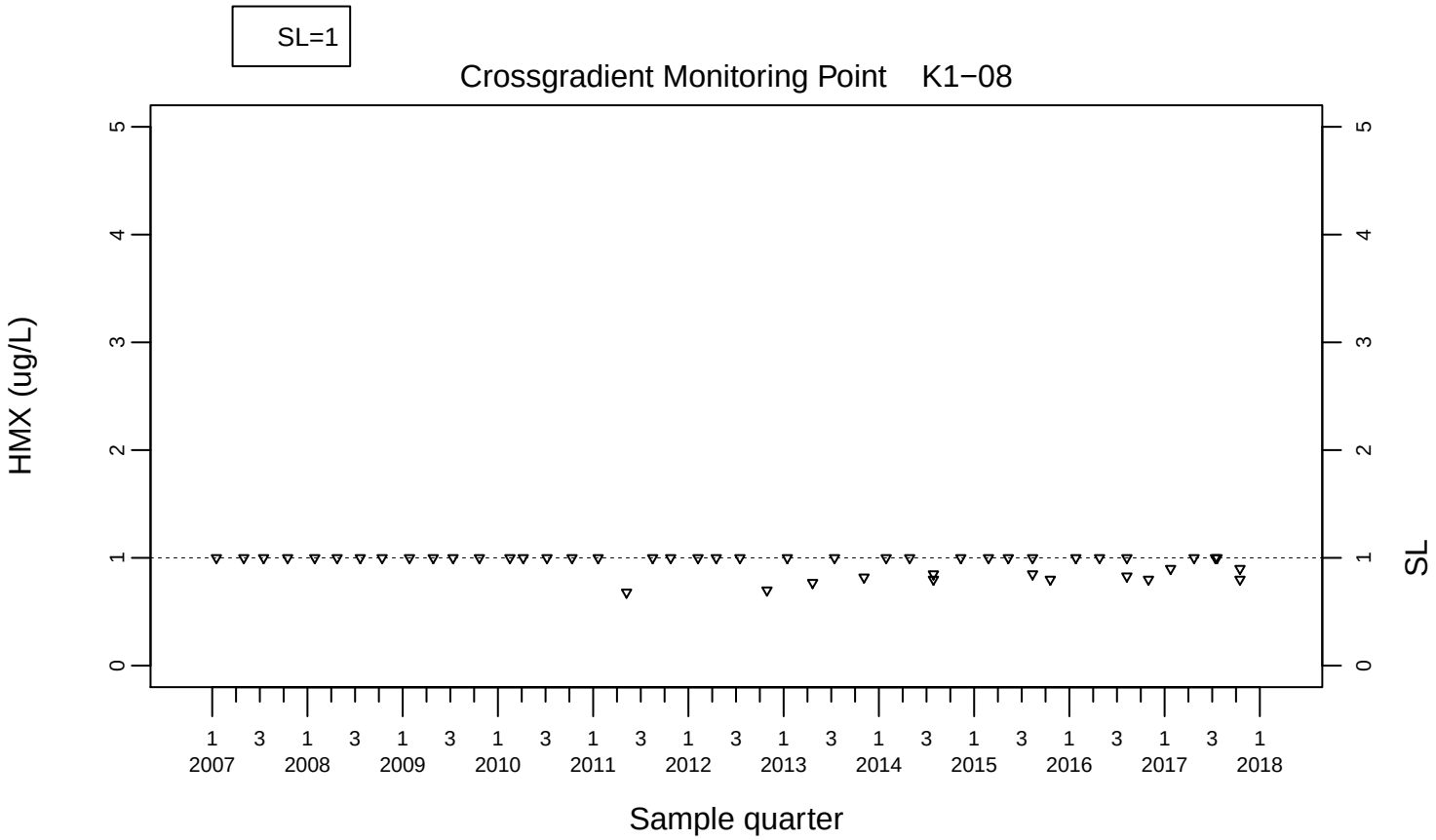

Pit 1 Area
HMX (ug/L)
Background Monitoring Point K1−01C
Above RL
Below RL
HMX (ug/L)
Sample quarter

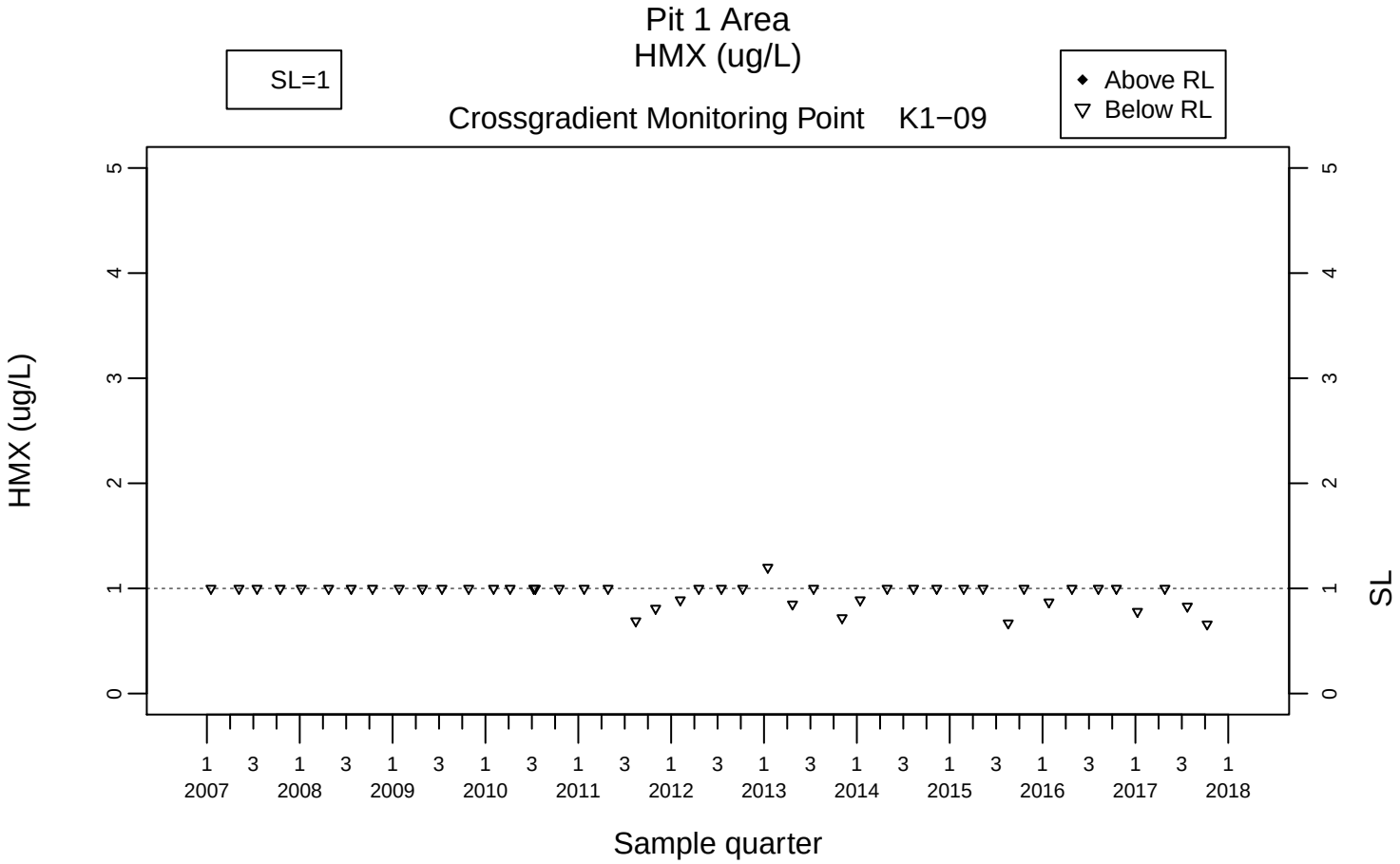

Background Monitoring Point K1−07
HMX (ug/L)
Sample quarter

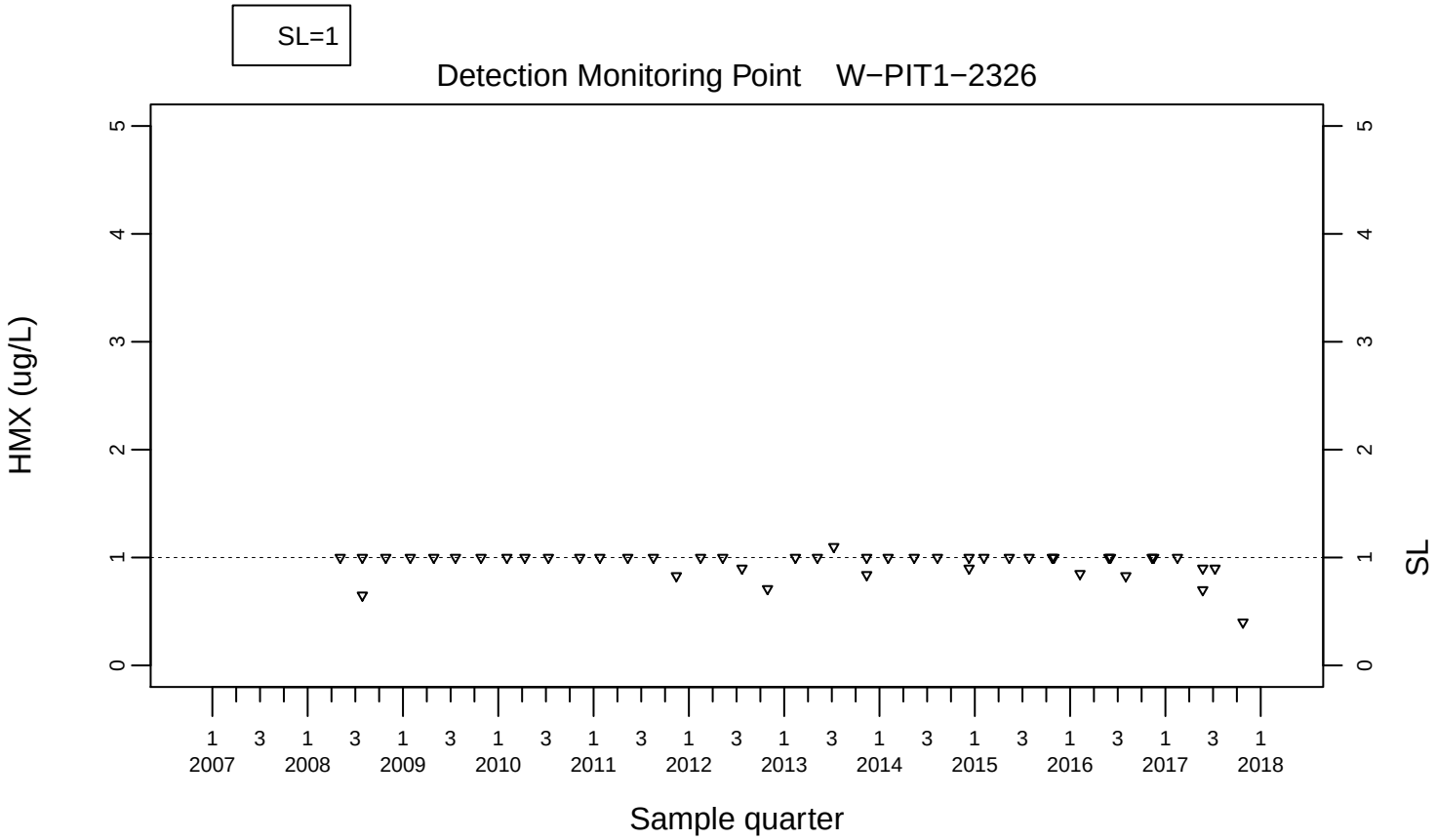

Pit 1 Area
HMX (ug/L)
SL=1
Above RL
Below RL
Detection Monitoring Point K1−02B
HMX (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

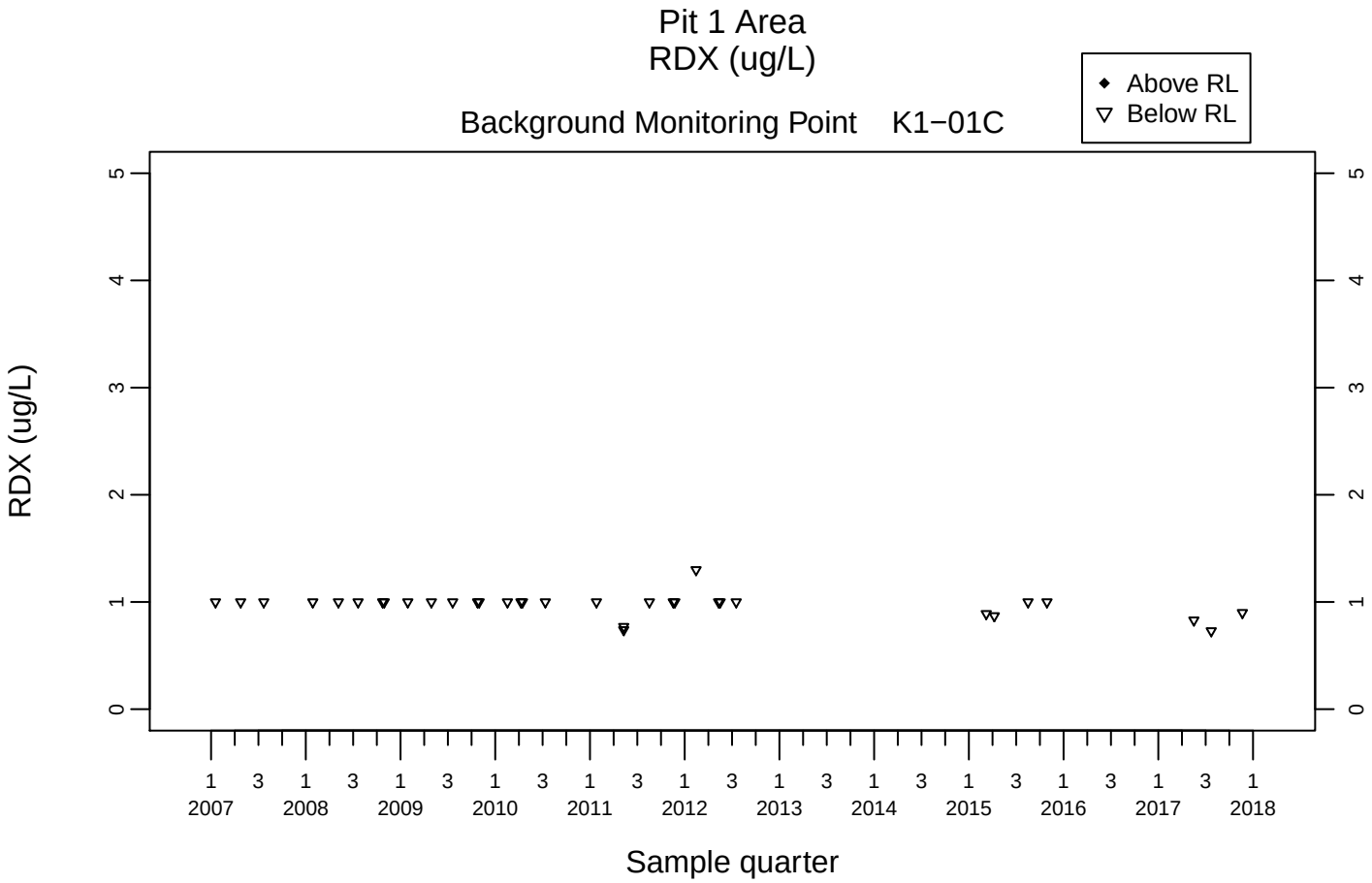

SL=1
Detection Monitoring Point K1−04
HMX (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

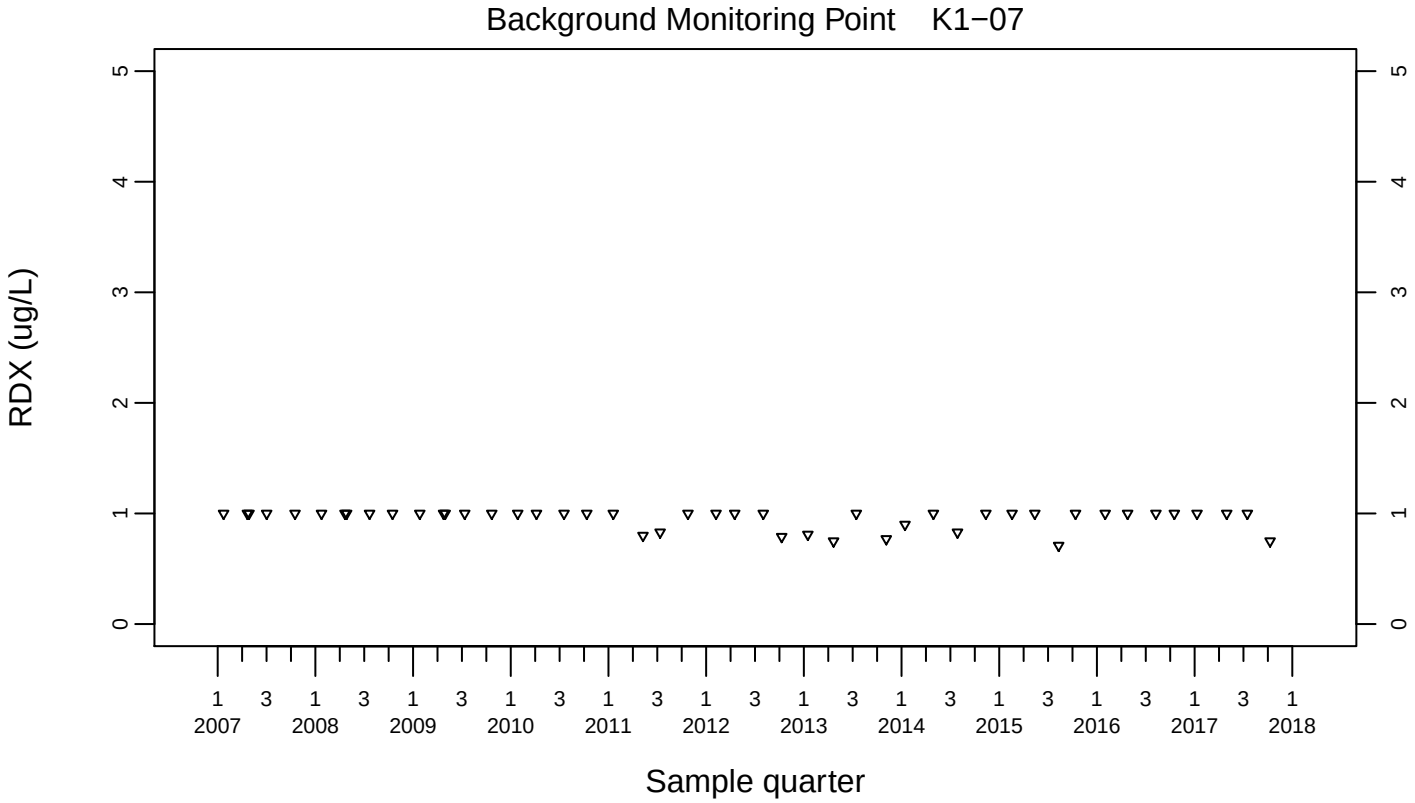

Pit 1 Area
HMX (ug/L)
SL=1
Above RL
Below RL
Detection Monitoring Point K1−05
HMX (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

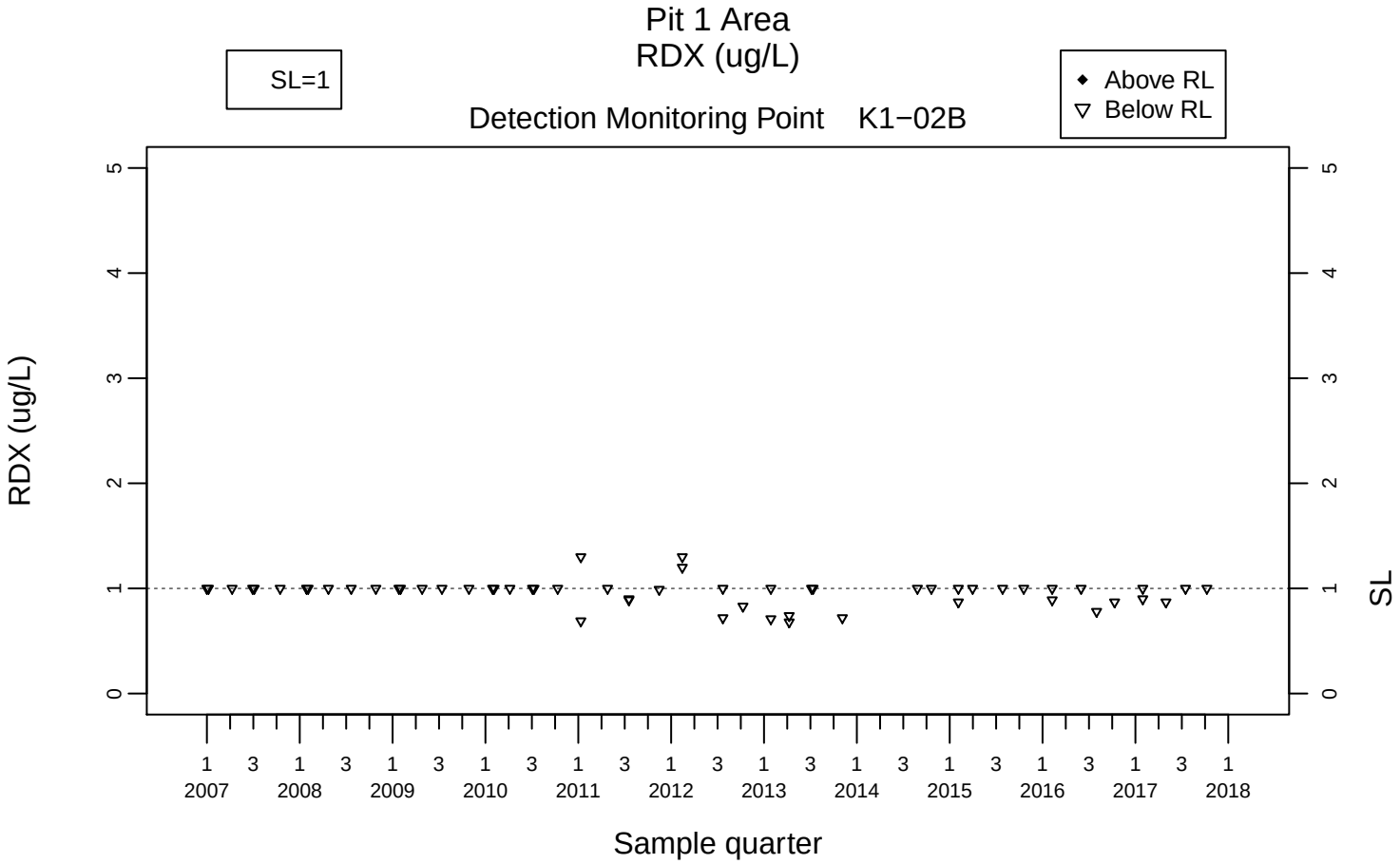

SL=1
Crossgradient Monitoring Point K1−08
HMX (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

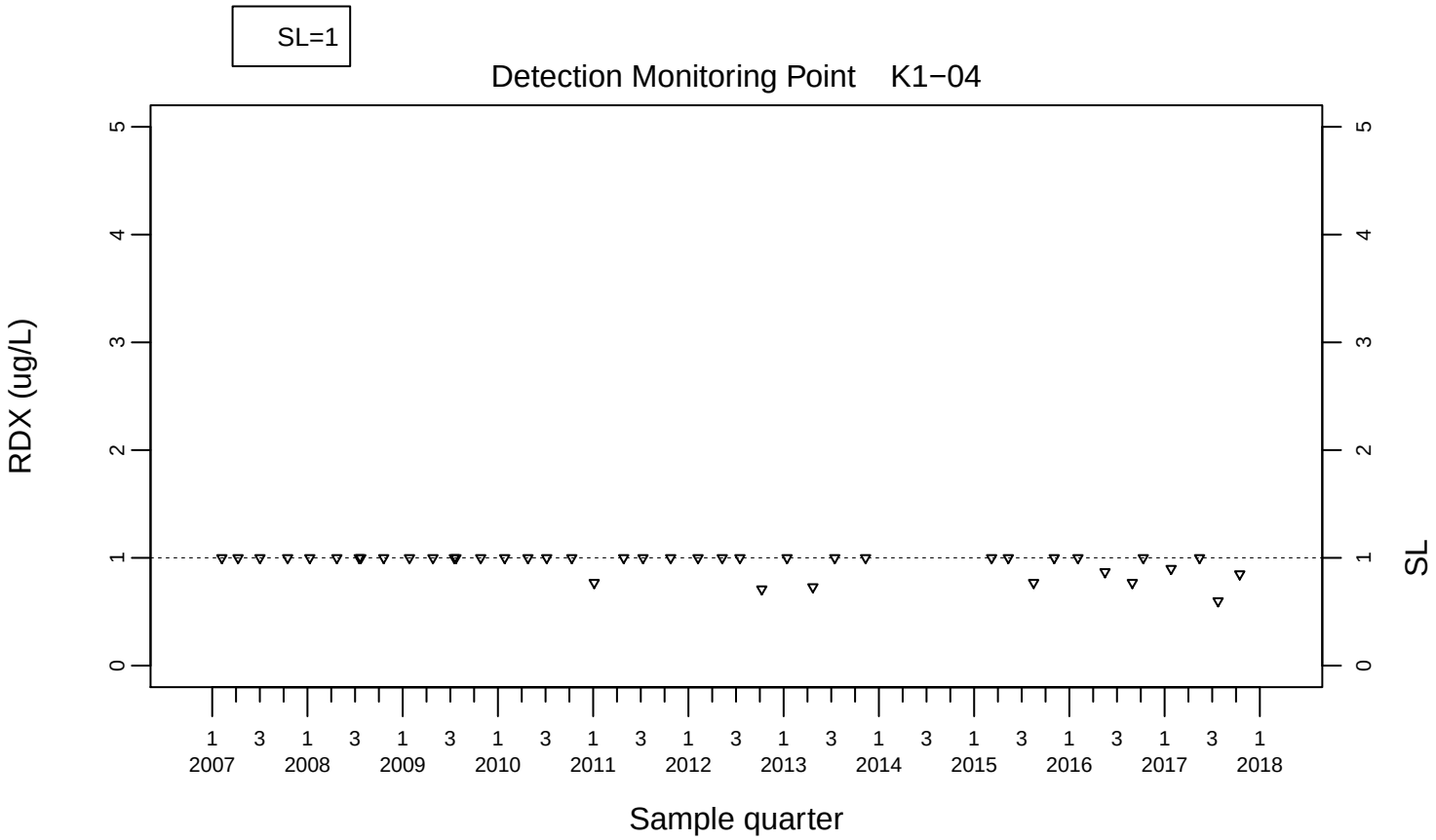

Pit 1 Area
HMX (ug/L)
SL=1
Above RL
Below RL
Crossgradient Monitoring Point K1−09
HMX (ug/L)
SL
Sample quarter

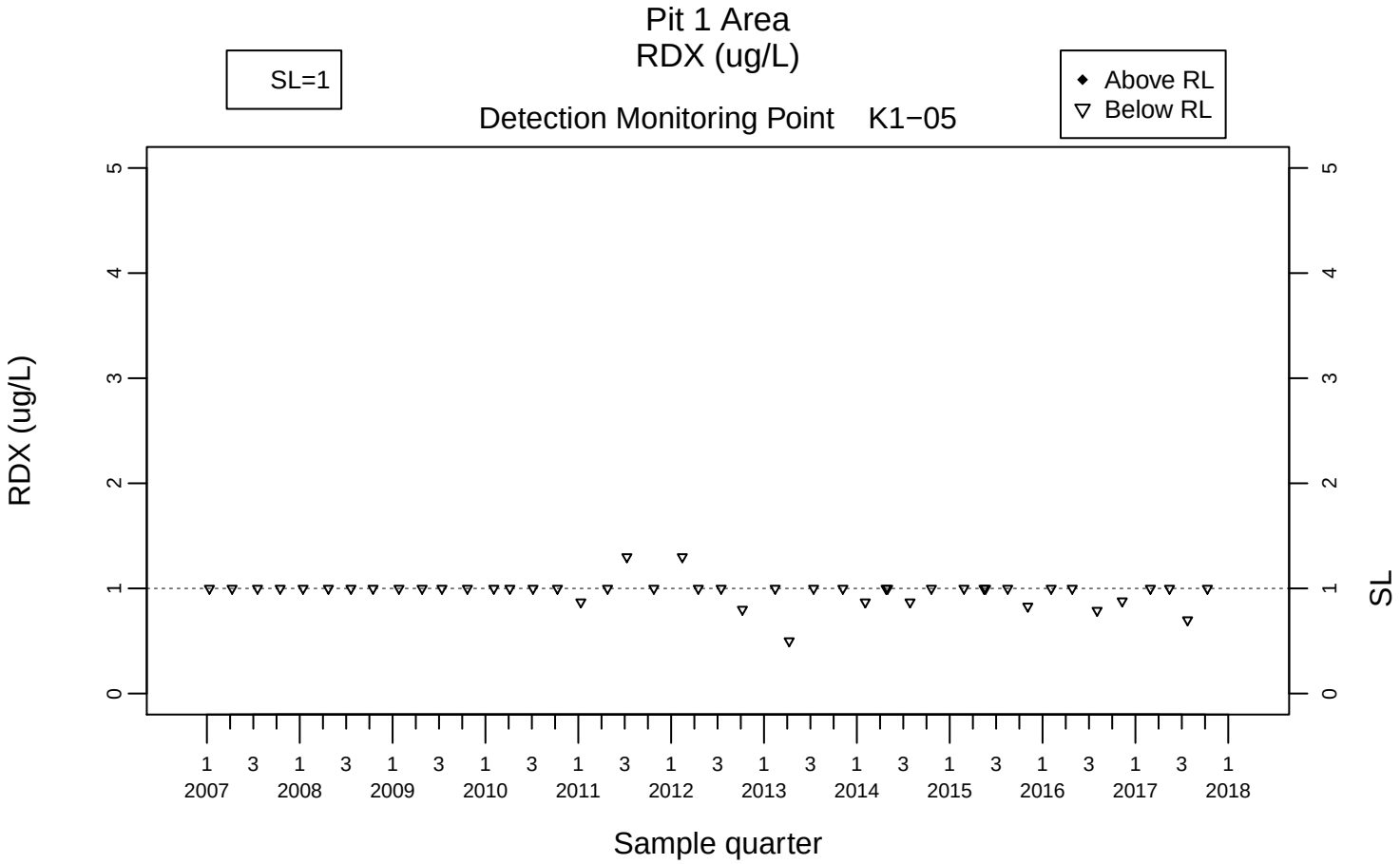

SL=1
Detection Monitoring Point W−PIT1−2326
HMX (ug/L)
SL
Sample quarter

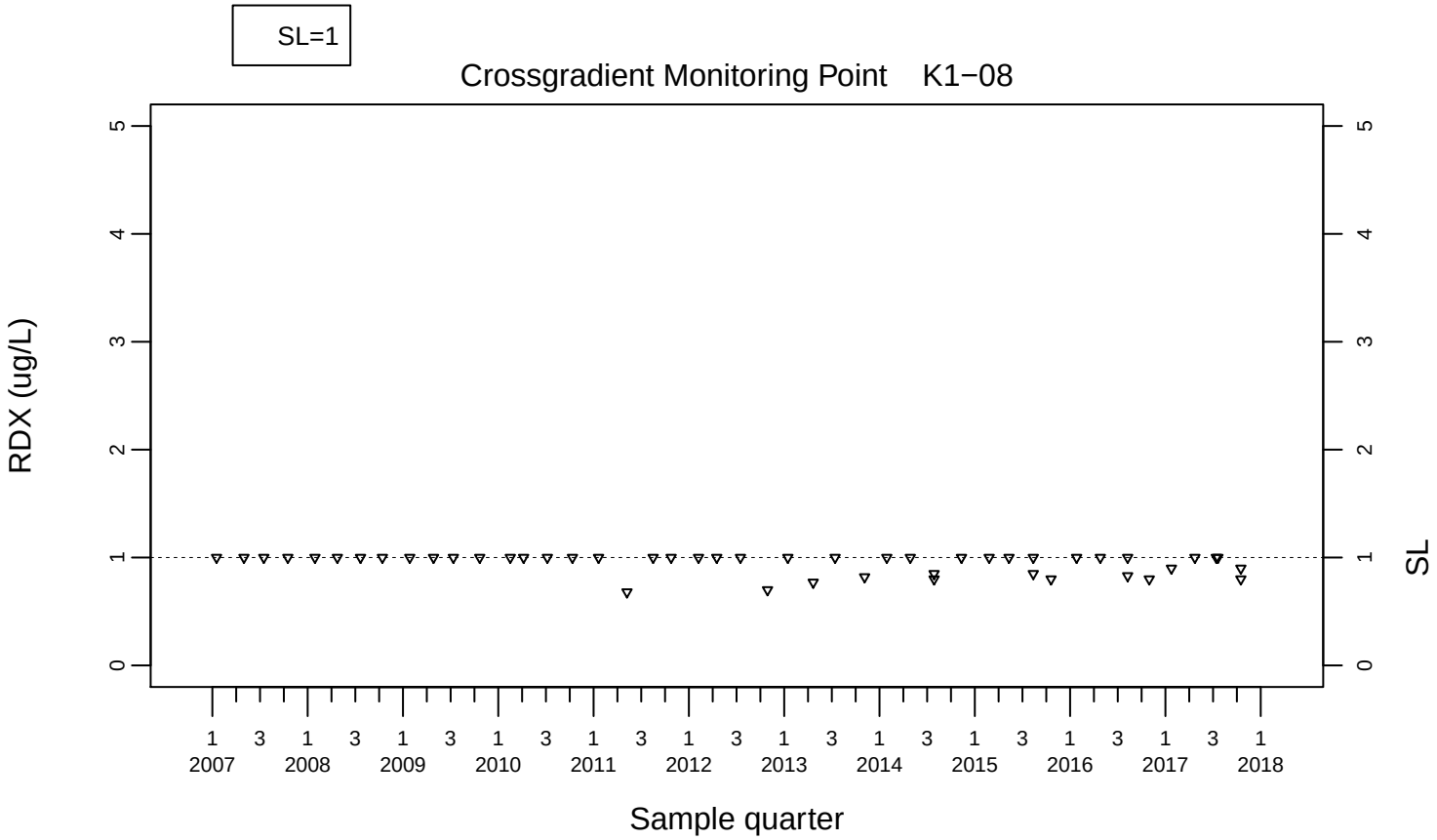

Pit 1 Area
RDX (ug/L)
Above RL
Below RL
Background Monitoring Point K1−01C
RDX (ug/L)
0
1
2
3
4
5
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

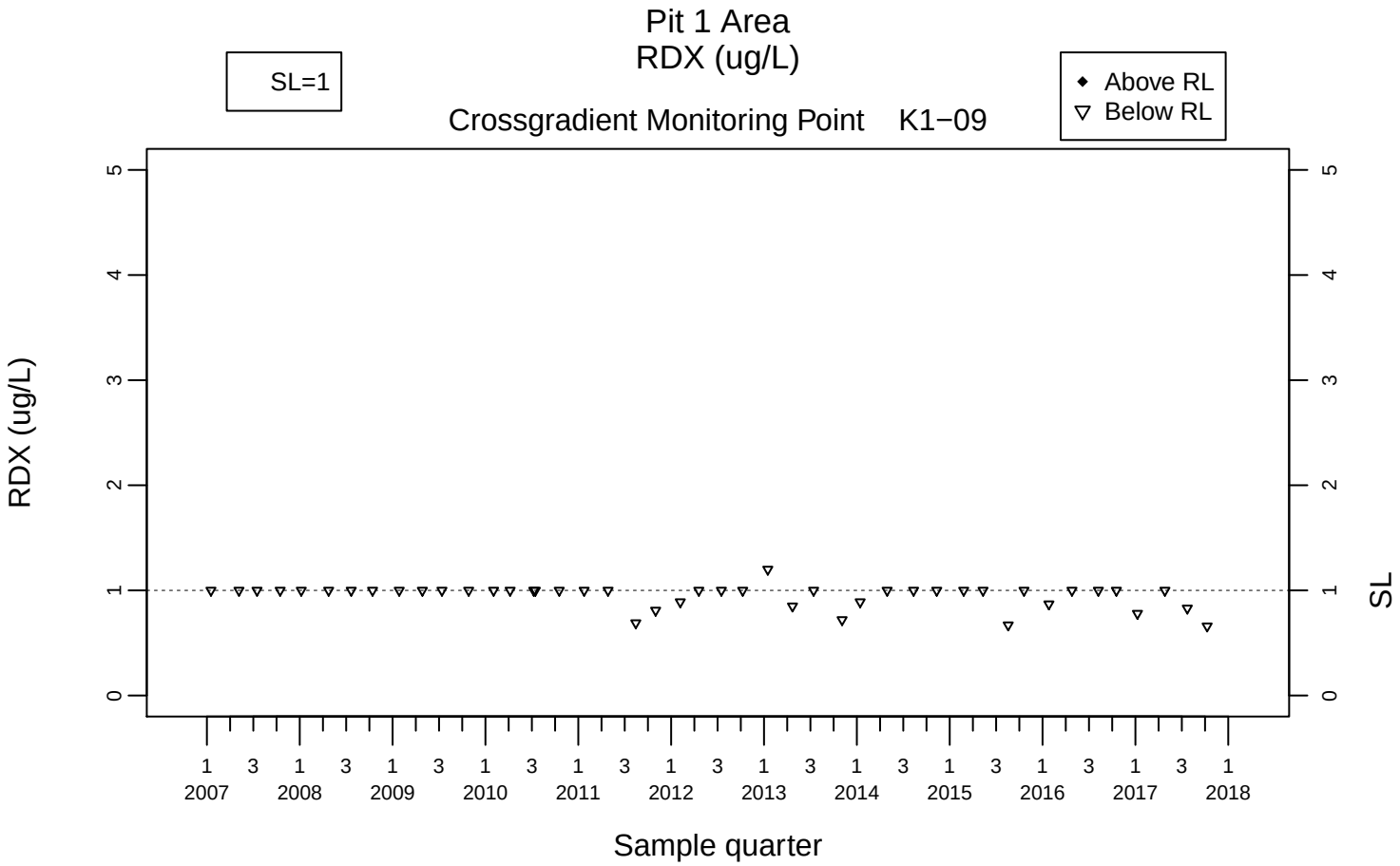

Background Monitoring Point K1−07
RDX (ug/L)
0
1
2
3
4
5
1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Sample quarter

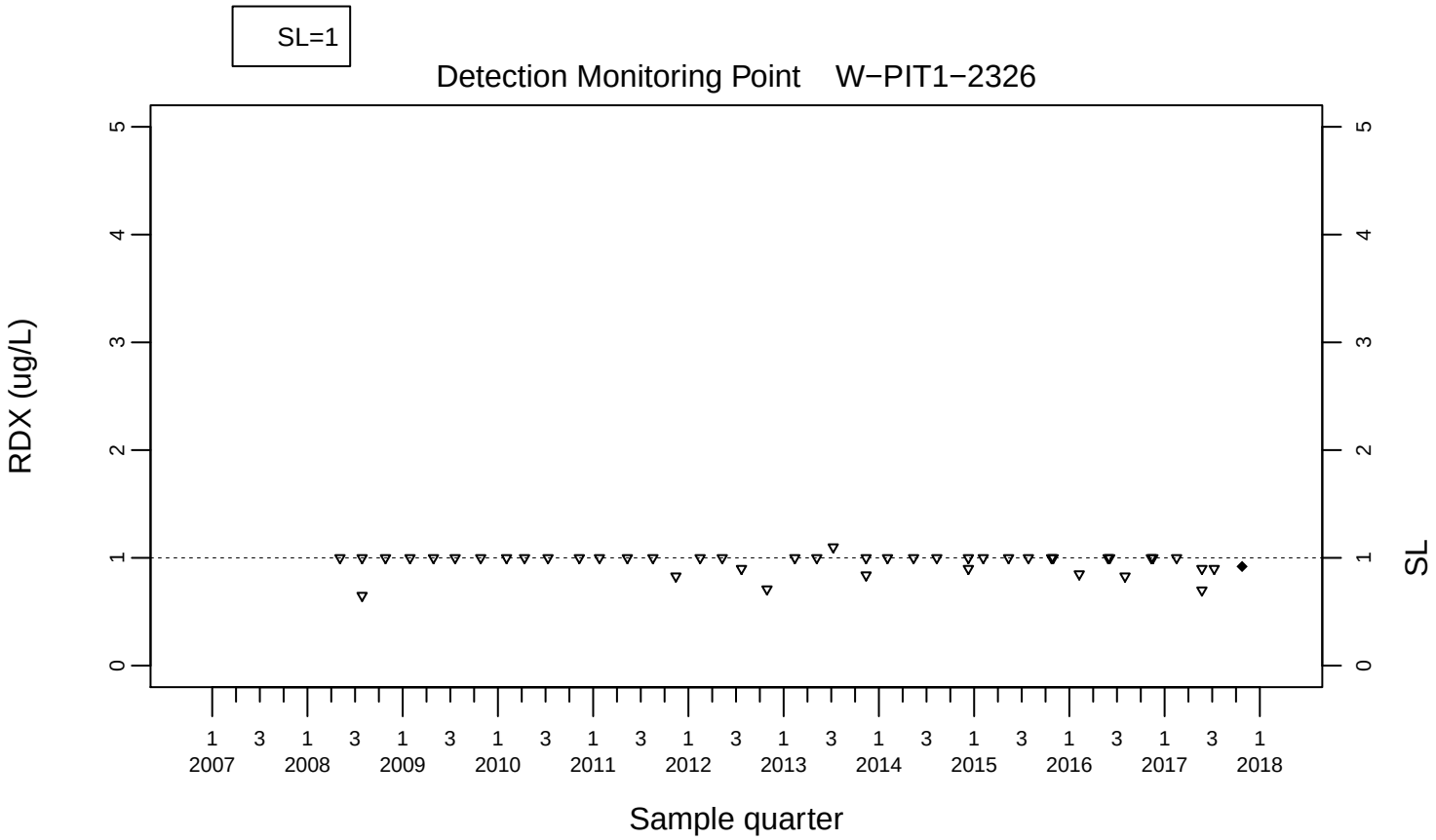

Pit 1 Area
RDX (ug/L)
SL=1
Above RL
Below RL
Detection Monitoring Point K1−02B
RDX (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018


SL=1
Detection Monitoring Point K1−04
RDX (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018


Pit 1 Area
RDX (ug/L)
SL=1
Above RL
Below RL
Detection Monitoring Point K1−05
RDX (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018


SL=1
Crossgradient Monitoring Point K1−08
RDX (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018


Pit 1 Area
RDX (ug/L)
SL=1
Above RL
Below RL
Crossgradient Monitoring Point K1−09
RDX (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018


SL=1
Detection Monitoring Point W−PIT1−2326
RDX (ug/L)
SL
Sample quarter
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

Environmental Functional Area, **Lawrence Livermore National Laboratory**
P.O. Box 808, L-627, Livermore, California 94551