



**Biennial Effectiveness Monitoring Report (EMR) for
Monitored Natural Attenuation (MNA) at the C-Area
Burning/Rubble Pit (131-C) and Old C-Area
Burning/Rubble Pit (NBN) Operable Unit (U)**

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EXECUTIVE SUMMARY

The final remedy for the C-Area Burning/Rubble Pit (CBRP) Operable Unit (OU) is Soil Vapor Extraction (SVE) and Monitored Natural Attenuation (MNA) with Land Use Controls (LUC). The MicroBlower™ SVE system began operating in 2004. It continues to remove volatile organic compounds (VOCs) from the fine-grained sediment within the vadose zone of the CBRP OU at a greater rate than vadose zone mass transport models indicate would be necessary to control migration to groundwater. Over the past two years VOCs were removed at an estimated average rate of 15.0 pounds per year. In general, groundwater monitoring data indicates that this selected remedy is working as anticipated and remains protective.

The CBRP monitoring network includes 18 monitoring wells, 12 MNA stations, and five (5) surface water sampling stations in the Twin Lakes and the Fourmile Branch (FMB). Savannah River Nuclear Solutions, LLC (SRNS), conducts groundwater monitoring in accordance with the CBRP OU Effectiveness Monitoring Plan (EMP) as approved by the Core Team (U.S. Environmental Protection Agency [USEPA], the South Carolina Department of Environmental Services [SCDES], and the United States Department of Energy [USDOE]). This document summarizes data collected in 2023 and 2024.

In general, the analytical results from samples collected at the MNA stations and surface water sampling points exhibit decreasing contaminant concentration trends. Detections of cis-1,2-dichloroethylene (cis-1, 2- DCE), vinyl chloride (VC), and ethylene in samples collected from the wetland and surface water sampling locations demonstrate that reductive dechlorination of TCE and tetrachloroethylene (PCE) is occurring in the distal portions of the CBRP OU plume.

The EMP identifies TCE groundwater concentration levels for selected individual wells that “trigger” additional attention. TCE groundwater concentrations at all monitoring wells associated with the CBRP OU were below their respective trigger levels. PCE, TCE, and VC exceeded MCLs in at least one or more of the groundwater samples collected during the 2023-2024 sampling events. The other refined contaminants of concern (RCOCs) (1,1-DCE, cis-1,2-DCE, DCM), did not exceed MCLs in any of the groundwater samples. There were also no MCL exceedances for any RCOCs in any of the surface water samples collected during the 2023-2024 sampling events.

Monitoring well CRP 8D and monitoring well CRP 6DR were added (2014 and 2017, respectively) to the CBRP OU monitoring well network to help delineate and differentiate the CBRP OU TCE plume from the CAGW OU TCE plume. In 2023 and 2024, the TCE concentrations were below the detection limit in the groundwater samples collected at monitoring wells CRP 8D and CRP 6DR.

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LIST OF ABBREVIATIONS AND ACRONYMS

amsl	above mean sea level
CBRP	C-Area Burning/Rubble Pit
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cis-1,2-DCE	cis-1,2-dichloroethylene
cm	centimeter
cm/yr	centimeter per year
CSM	conceptual site model
1,1-DCE	1,1-dichloroethylene
DCM	dichloromethane
DPT	direct push technology
EMP	Effectiveness Monitoring Plan
EMR	Effectiveness Monitoring Report
EQL	Estimated Quantitation Limit
FMB	Fourmile Branch
ft	feet
ft/year	feet per year
ft ³ /min	cubic feet per minute
GA	Gordon Aquifer
GCU	Gordon Confining Unit
in	inches/inch
in/yr	inches per year
J	EPA functional guideline code for estimated quantity
kg	kilograms
km	kilometers
KSZ	key source zone
L/min	liters per minute
LAZ	Lower Aquifer Zone
lbs	pounds
LUC	land use control
µg/L	microgram per liter
µg/kg	microgram per kilogram
m	meter
m/yr	meters per year
MAZ	Middle Aquifer Zone
MCL	maximum contaminant level
mi	mile
min	minute
MNA	monitored natural attenuation
NBN	no building number
OU	operable unit
PCE	tetrachloroethylene
POC	Point of compliance
ppmv	parts per million vapor

LIST OF ABBREVIATIONS AND ACRONYMS *(Continued/End)*

RA	remedial action
RAO	remedial action objective
RCOC	refined Constituent of Concern
RCRA	Resource Conservation and Recovery Act
RGO	Remedial Goal Objective
ROD	Record of Decision
SCDES	South Carolina Department of Environmental Services
SRNL	Savannah River National Laboratory
SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
SVE	soil vapor extraction
TCCZ	Tan Clay Confining Zone
TCLC	Tan Clay Lower Clay
TCUC	TAN Clay Upper Clay
TCE	trichloroethylene
trans-1,2-DCE	trans-1,2-dichloroethylene
UAZ	Upper Aquifer Zone
USDOE	United States Department of Energy
USEPA	U.S. Environmental Protection Agency
UTRA	Upper Three Runs Aquifer
VC	vinyl chloride
VOC	volatile organic compound
WSRC	Washington Savannah River Company LLC (October 2005 through August 2008)
WSRC	Westinghouse Savannah River Company (before October 2005)
yr	year

1.0 INTRODUCTION

The C-Area Burning/Rubble Pit (CBRP) Operable Unit (OU) is listed as a Resource Conservation and Recovery Act (RCRA) 3004(u) Solid Waste Management Unit/Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) unit in Appendix C of the Federal Facility Agreement (FFA 1993) for the Savannah River Site (SRS). The final remedy for the CBRP OU consists of a Low Permeability Cover, a Soil Vapor Extraction (SVE), Monitored Natural Attenuation (MNA) with Land Use Controls (LUCs), and annual monitoring with biennial reporting. This Effectiveness Monitoring Report (EMR) documents groundwater monitoring well and surface water data collected in 2023 and 2024, in compliance with the *Monitored Natural Attenuation Effectiveness Monitoring Plan for the C-Area Burning/Rubble Pit Operable Unit (131-C) and Old C-Area Burning/Rubble Pit (NBN) (U)* (EMP) (Savannah River Nuclear Solutions [SRNS] 2009a) as approved by the Core Team (U.S. Environmental Protection Agency [USEPA], the South Carolina Department of Environmental Services [SCDES], and the United States Department of Energy [USDOE]). The previous EMR covered the years 2021-2022 (SRNS 2023).

2.0 OPERABLE UNIT DESCRIPTION AND HISTORY

C-Area occupies a centrally located portion of the SRS in Barnwell County, South Carolina (Figure 1). C-Reactor, located inside C-Area, achieved criticality in March 1955 and was operational until 1985. In 1985, the reactor was placed in warm standby and transitioned to cold standby in 1987. Past activities associated with C-Reactor operations have resulted in groundwater contamination beneath CBRP OU. Release of trichloroethylene (TCE) and tetrachloroethylene (PCE) to the environment occurred during operations at the CBRP source unit, resulting in a groundwater contamination plume beneath CBRP OU. TCE is the principal volatile organic compound (VOC) in the groundwater, while PCE is at lower concentrations from an upgradient source. Additional groundwater contaminants that have also historically exceeded their maximum contaminant levels (MCLs) include dichloromethane (DCM), 1,1-dichloroethylene (1,1-DCE), cis-1,2-dichloroethylene (cis-1,2-DCE), and vinyl chloride (VC).

The CBRP OU encompasses VOC contaminated groundwater (tritium is excluded and is part of C-Area Groundwater [CAGW] OU) and surface water in the immediate vicinity and directly downgradient of the CBRP. The TCE contaminated groundwater plume originates beneath the western end of the CBRP and migrates west towards the Twin Lakes and the Fourmile Branch (FMB). The Upper Three Runs Aquifer (UTRA) vertically confines the CBRP TCE plume and TCE contamination exceeding the MCL (5 ug/L) from the plume, outcrops into the wetlands and surface water of the Twin Lakes and the FMB.

The areas at the CBRP OU that constituted source area units of contamination to the groundwater, were previously remediated under the unit-specific interim Record of Decision (ROD) (Westinghouse Savannah River Company [WSRC] 1998) to reduce the toxicity, mobility, or volume of the contamination. In 1999, a low permeability soil cover was installed, and SVE and air sparging systems were installed as components of an interim action to control the VOC source in the vadose zone. In 2004, a MicroBlower™ SVE system replaced the air sparging and active SVE system (Figure 2). The MicroBlower™ SVE system continues to passively recover the VOCs that diffuse from the fine-grained soils located approximately nine (9) meters (m) (30 feet [ft]) below ground surface at the western end of CBRP. The final ROD was issued in July 2008 (Washington Savannah River Company [WSRC] 2008).

2.1 Remedial Action Requirements and Objectives

As stated in the ROD (WSRC 2008), the scope of the CBRP OU final remedial action (RA) encompasses all the TCE contaminated vadose zone, groundwater, and surface water immediately beneath and downgradient of the CBRP OU to the Twin Lakes and the FMB. The final RA for the CBRP OU includes 1) a MicroBlower™ SVE system to control residual TCE in the vadose zone; 2) MNA with LUC boundaries; and 3) maintenance of the low permeability soil cover.

Maintaining a low permeability soil cover on the CBRP achieves the Remedial Action Objective (RAO) to prevent exposure of ecological receptors to heptachlorodibenzodioxin in the pit surface sediments.

Operating the MicroBlower™ SVE system achieves the RAO to prevent migration of TCE from the CBRP vadose zone soils to the groundwater at levels that will exceed the MCL. The Remedial

Goal Objective (RGO) for TCE concentration in vadose zone soils is 58 microgram per kilogram ($\mu\text{g}/\text{kg}$).

The RAOs for groundwater are the following:

- Treat and/or mitigate groundwater contaminated above MCLs,
- prevent human exposure to groundwater contaminated with VOCs above MCLs,
- reduce the concentration of VOCs in the groundwater to levels at or below their MCLs, and attenuate the groundwater plume to the extent possible, and
- prevent discharge of contaminated groundwater to surface water resulting in concentrations exceeding their MCLs.

As TCE concentrations continue to decline, it is anticipated that RAOs will be met by SVE, MNA, and LUCs (SRNS 2009b). CBRP OU LUCs include the following objectives:

- Restrict on-site worker access and prevent unauthorized contact, removal, or excavation of contaminated media (i.e., surface and vadose zone soils),
- maintain the integrity of any current or future remediation or monitoring systems (i.e., soil cover, SVE systems, and groundwater monitoring wells),
- prevent access to or use of groundwater and surface water until RGOs are attained,
- prohibit the development and use of property for residential housing, elementary schools, childcare facilities, and playgrounds, and
- prevent construction of inhabitable buildings without an evaluation of indoor air quality to address vapor intrusion.

MNA will meet the RAO to reduce the levels of VOCs in surface water at or below their MCLs.

2.2 Land Use Control Boundary and Monitoring Network

The SRS identified the area in which groundwater contamination from the CBRP OU exceeds applicable MCLs and developed a LUC boundary. The CBRP OU LUC boundary (Figure 3) encompasses all the groundwater exceeding MCLs from the CBRP west to the FMB and covers approximately 30 acres. Groundwater use restrictions inside the LUC boundary will be enforced while groundwater contaminant levels exceed MCLs.

As outlined in the EMP (SRNS 2009a), the monitoring network at CBRP OU includes 18 monitoring wells, 12 MNA stations, and five (5) surface water stations (Figure 3). Monitoring well CRP 8D and monitoring well CRP 6DR were added (2014 and 2017, respectively) to the CBRP OU monitoring well network to help delineate and differentiate the CBRP OU TCE groundwater plume from the CAGW OU TCE groundwater plume.

3.0 SITE HYDROGEOLOGY

3.1 Physiographic Setting

The CBRP OU is located on a broad, convex ridge within the FMB watershed approximately 2,000 feet west of C-Area Reactor Building (105-C) (Figure 1). Local relief ranges from 89.9 m (295 ft) above mean sea level (amsl) to 48.2 m (158 ft) amsl along the FMB. The ground surface slopes gently to the west from the CBRP OU to the FMB. The FMB discharges into the Savannah River floodplain and associated swamps approximately 12.9 kilometers (km) (eight [8] miles {mi}) downstream from its confluence with the Twin Lakes drainage.

3.2 Hydrogeologic Setting

The aquifer of concern within the CBRP OU area is part of the Floridan aquifer system. The aquifer is divided into two (2) units separated by a confining unit. From top to bottom, they are known as the UTRA, the Gordon Confining Unit (GCU), and the Gordon Aquifer (GA). The UTRA occurs between the water table surface and the GCU. The UTRA is sub-divided into three (3) aquifer zones: The Upper Aquifer Zone (UAZ); the Middle Aquifer Zone (MAZ); and the Lower Aquifer Zone (LAZ). The UAZ and LAZ are divided by an informal aquitard referred to as the “Tan Clay Confining Zone” (TCCZ). The MAZ resides as a sandy to clayey-sand zone between the Tan Clay

Upper Clay (TCUC) and the Tan Clay Lower Clay (TCLC) layers of the TCCZ. While the hydraulic conductivities vary within each of the aquifer zones, the overall average groundwater velocity is 21.3 meters per year (m/yr) (70 feet per year [ft/yr]) for the UTRA between the CBRP OU to the points of discharge along FMB (WSRC 2001a). A detailed description of the hydrostratigraphic units relevant to the CBRP OU can be found in the RCRA Facility Investigation/Remedial Investigation report (WSRC 2002).

The 30-year (yr) average (1994 through 2024) for SRS rainfall was 121.14 centimeter per year (cm/yr) (47.69 inches per year [in./yr]), based on data from the SRS 700-A rain gauge (Savannah River National Laboratory [SRNL] 2025). In 2023, SRS received 153.47 centimeters (cm) (60.42 inches [in.]) of rainfall and in 2024, 143.26 cm (56.40 in.) of rainfall (SRNL, 2025). An estimated 31.8 cm/yr (12.5 in/yr) rainfall contributes to groundwater recharge, while the remainder is lost to evapotranspiration or run-off to surface water (WSRC 2003b). Years with above average rainfall will tend to provide more groundwater recharge, and the water table elevation will tend to rise. Years with below average rainfall will tend to provide less groundwater recharge, and the water table elevation will tend to fall.

Appendix B presents hydrographs of recorded water levels at the CBRP OU monitoring points from 1995 to 2024. Collocated monitoring points are grouped and displayed on the same hydrograph for comparison. Overall, water levels have remained consistent since circa 2022 and all 2023 and 2024 water level data did not exceed the maximum recorded water level or minimum. A slight water level increasing trend was observed at some of the monitoring points screened in the UAZ, MAZ, and upper LAZ (Figures B-2, 3, 6, 7,13, 14, and 15). Some of the data from the relatively shallow screened wells reflect the difference in the amounts of rainfall received in 2023 and 2024 with a slight increase in 2023 water levels followed by a slight decrease in 2024 (Figures B-1, 4, 5, and 6). Most of the monitoring points near the FMB and the Twin Lakes, and the monitoring points screened in the GA remained unchanged (Figures B-7, 8, 9, 10, 11, 12, 14, and 15) with the exception of two (2) monitoring point locations indicating a slight decrease or a slight decrease followed by an increase between 2023 and 2024 (Figures B-10 and 13).

4.0 MONITORING AND REPORTING

The CBRP OU RA start date was on May 13, 2009, and sampling of the CBRP OU monitoring network began in December 2009. Table 1 is the complete list of monitoring network stations. Table 2 shows the sampling schedule for monitoring wells, MNA stations, and surface water stations, established in the EMP (SRNS 2009a). Sample collection occurred at all the CBRP OU stations in 2023 and 2024, (SVE wells, MNA stations, and surface water) per the sampling schedule.

The appendices A through E present analytical results. Appendix A tabulates monitoring data from 2023 and 2024. Appendix B presents hydrographs of water levels at monitoring points since 1995. Appendix C consists of time-series plots of VOCs at the monitoring wells, the MNA stations, and the surface water stations since 1995. Appendix D is a series of monitoring network maps with fourth quarter 2023 and 2024 TCE groundwater concentrations depicted. Appendix E is a series of potentiometric surface maps for the various aquifers. The following sections discuss analytical results.

4.1 Vadose Zone Monitoring

The MicroBlower™ SVE system consists of four (4) SVE wells and is located on the western end of CBRP (Figure 2). Installed in 2004, the SVE system (an interim remedial action) helps to control residual TCE from migrating out of the vadose zone. A vadose zone mass transport model (WSRC 2004) predicted that a minimum annual recovery rate of 0.82 kilograms (kg) (1.8 pounds [lbs]) of TCE for the operation year would be adequate to control vadose VOC migration to the groundwater. During 2023 and 2024, the system exceeded the minimal annual recovery rate with an estimated 24-month total of 13.62 kg (30.02 lbs) of VOCs removed.

4.2 Groundwater Monitoring Well Network

The current monitoring network includes 35 monitoring stations, i.e., 18 monitoring wells, 12 MNA stations, and five (5) surface water sampling stations in the Twin Lakes and the FMB (Figure 3). One (1) monitoring well in the original network, CRP 3C, was abandoned in 2009 and is no longer sampled. Monitoring well CRP 8D was added to the CBRP OU monitoring network in 2014

and monitoring well CRP 6DR was added in 2017 to help delineate and differentiate the CBRP OU TCE plume from the CAGW OU TCE plume.

The Conceptual Site Model (CSM) for the CBRP OU TCE plume depicts the combination of the MicroBlower™ SVE system and the low-permeability soil cover have achieved source control, such that TCE is no longer contaminating the groundwater beneath the CBRP OU at concentrations above the MCL (Figure 4). Particle track analysis indicates it takes between 37 and 63 years for groundwater under the CBRP OU to reach points of discharge along the FMB (WSRC 2001b). As the TCE is transported from the CBRP OU to the point of discharge, attenuation greatly decreases the concentration of TCE in the groundwater. The CSM reflects TCE biodegradation to primarily occur through the organic-rich sediments at the wetland groundwater discharge points along the Twin Lakes and the FMB, with de minimis biodegradation occurring in the groundwater plume during transport through the CBRP OU.

Monitoring well data are used to assess the effectiveness of the SVE system and the low-permeability soil cover on groundwater VOC concentrations. The monitoring well data are also used to evaluate VOC plume contraction, expansion, and attenuation in the UTRA and GA as the TCE plume travels from the CBRP to the points of CRBP OU groundwater discharge.

MNA station and surface water station data are used to assess the overall attenuation (biodegradation, volatilization, sorption, dilution, dispersion, and diffusion) of the VOC plume from the CBRP OU source area to the points of discharge. Each MNA station has two (2) wells: a lower “B” well; and an upper “A” well. Comparisons are made between the TCE concentrations in the lower and upper wells, as well as the concentrations of TCE degradation products (cis-1,2-DCE, VC, and ethylene). The CSM predicts higher TCE concentrations in the lower wells, but higher concentrations of TCE degradation products in the upper wells, due to biodegradation occurring as the TCE groundwater plume discharges upward to surface water at a given location. The monitoring network overall is designed to verify the attainment of the RGO.

4.3 Groundwater Elevation Measurements and Groundwater Flow Direction

Historic groundwater elevations, from the present extending back to 1995, are displayed as hydrographs in Appendix B. Potentiometric surfaces for fourth quarter 2023 and 2024 were

mapped for each aquifer (Appendix E). Water levels near the CBRP OU in water table wells CRP 3D and CRP 5D remained relatively unchanged from 2022 with the exception of a slight decrease in water elevation at CRP 3D between 2023 and 2024.

Within the CBRP OU LUC boundary, groundwater in the UTRA and the GA flows west from the CBRP towards the FMB (Appendix E). In the southwest portion of the CBRP OU, groundwater flow in the UAZ, MAZ, and upper portion of the LAZ, does change slightly from a westerly direction to the west-southwest direction as it nears the confluence of the FMB and Twin Lakes discharge point (Appendix E).

On average, there is an approximately 10-ft head difference between the UAZ and LAZ near the source area in the eastern portion of the CRBP OU, based on well cluster CRP 5C and CRP 5D. The head difference indicates a downward vertical gradient in addition to the horizontal gradient. In the central portion of the CRBP OU, there is an approximately 6-ft head difference between the UAZ and MAZ on average, based on well clusters CRP 18C and CRP 18D, and CRP 22CL and CRP 22CU, indicating a relatively less downward vertical gradient in addition to the horizontal gradient. In the distal portion of the CRBP OU near the FMB, there is very little head difference (approximately 1-ft) between the upper MAZ and lower MAZ wells. In 2024, MNA station clusters CRP 45A and CRP 45B, CRP 46A and CRP 46B, and CRP 50A and CRP 50B, CRP 51A and CRP 51B, and CRP 52A and CRP 52B, indicate a slight downward vertical gradient as expected in these locations, but occasionally the gradient reverses (Figure E-3 MNA monitoring stations CRP 48A and B).

4.4 Groundwater and Surface Water Compliance

Per the EMP (SRNS 2009a), monitoring well samples are analyzed for seven (7) constituents:

- 1,1-dichloroethylene (1,1-DCE)
- cis-1,2-dichloroethylene (cis-1,2-DCE)
- trans-1,2-dichloroethylene (trans-1,2-DCE)
- vinyl chloride (VC)
- tetrachloroethylene (PCE)
- trichloroethylene (TCE)
- dichloromethane (DCM)

MNA station samples are analyzed for these seven (7) constituents as well as ethylene. Sample results are compared with two (2) different benchmarks: 1) MCLs (Table 3); and 2) Trigger Levels

(Table 4) established in the CBRP OU EMP (SRNS 2009a). Six (6) of the seven (7) constituents, excluding trans-1,2-DCE, were identified as refined Constituents of Concern (RCOCs) in the Corrective Measures Implementation/Remedial Action Implementation Plan (SRNS 2009c) and are listed with the respective MCLs in Table 3. Eight (8) monitoring well stations and one (1) surface water station are assigned as a plume definition well, key source zone well, LUC boundary wells, and a MNA point of compliance (POC) station. These stations have designated trigger levels for TCE (except the plume definition well) and are listed in Table 4 with the recent maximum TCE groundwater result for each station. The Core Team will be convened to determine a path forward if TCE concentrations exceed a trigger level for any of the stations listed in Table 4.

4.5 Soil Vapor Extraction Results

Vapor samples are collected twice annually (second quarter and fourth quarter) at each of the four (4) MicroBlower™ SVE units. Samples are analyzed for concentrations of TCE and PCE, and the flow rate and total concentrated solvent results for each quarter sample collection is applied to the calendar months (January – May [fourth quarter sample from the previous year], June – November [second quarter sample from the current year], and December [fourth quarter sample from the current year]). The units are inspected daily to confirm operation, and the days of operation are recorded as operating hours per month. The complete details for each SVE unit are displayed in the 2023 and 2024 MicroBlower Data Tables (Appendix F). The four (4) MicroBlower™ SVE units operated with an estimated 99% utility in 2023 and 2024. The mass removal from each SVE unit is derived using the equation below.

$$\text{Mass (pounds removed)} = \left[\text{Flow} \frac{\text{ft}^3}{\text{min}} \times 60 \frac{\text{min}}{\text{hr}} \right] \times \left[\frac{\text{TCE (ppmv)}}{1,000,000} \right] \times [\text{Operating Hours}] \times \left[\frac{131.4}{24.46} \right] \times \left[\frac{28.3}{454} \right]$$

Molecular mass for TCE = 131.4 g/mole

1 mole of gas = 24.46L (at standard temperature and pressure)

1 cubic ft = 28.3 L

1 lb = 454 g

The sum total of mass removed is then conservatively reduced by 50% to account for possible fluctuations in the flow rate and hours of operation. The calculated total annual removal for 2023 was approximately 7.05 kg (15.55 lbs) of VOCs (PCE was also detect but below 0.01%). The

calculated total annual removal in 2024 was approximately 6.56 kg (14.47 lbs) of VOCs. Total annual TCE removal from each SVE unit location and annual sum total for 2023 and 2024 are displayed in Table 5. The Table 5 data show that well SVE-27 removed the most amount of VOC mass for the two-year period, while well SVE-19B removed the least amount of VOC mass for the two-year period. Based on these conditions over the last two years, the average annual removal rate of TCE from the subsurface was calculated to be approximately 6.81 kg/yr (15.01 lbs/yr.). The reported VOC removal rates for 2023 and 2024 are lower than the average rate for 2021 and 2022 of 8.89 kg/yr (19.59 lbs/yr).

4.6 Groundwater and Surface Water Results

All prescribed samples were successfully collected during 2023-2024. Table A-1 in Appendix A presents the field data and analytical results for samples collected during the 2023 and 2024 CBRP OU groundwater and surface water sampling events. Appendix C presents RCOCs time-series plots for the CBRP OU wells, monitoring stations, and surface water locations. Three (3) of the six (6) RCOCs exceeded MCLs in at least one (1) or more of the groundwater samples collected during the 2023-2024 sampling events (PCE, TCE, and VC). The other RCOCs (1,1-DCE, cis-1,2-DCE, DCM) in addition to trans-1,2-DCE, did not exceed MCLs in any of the groundwater samples. There were no MCL exceedances for RCOCs or trans-1,2-DCE in any of the surface water samples collected during the 2023-2024 sampling events.

Appendix D consists of figures depicting TCE concentrations and plume delineations in groundwater and surface water based on 2023 and 2024 analytical results. As originally described in the EMP (SRNS 2009a), other VOC contaminants associated with CBRP OU are not included in Appendix D because they 1) generally coincide with the TCE contamination; 2) are lower in concentration than TCE; and 3) behave similarly in groundwater as TCE. Figure 5 indicates the presence of biodegradation products (cis-1,2-DCE and VC) primarily along the Twin Lakes and the FMB monitoring stations (CRP 45A/B through CRP 51A/B), which is consistent with the CBRP OU CSM.

Analyte concentrations in CBRP OU groundwater and surface water during 2023-2024 generally continued with the previous relatively stable or slightly decreasing trends at most sample locations. Sample results for specific RCOCs are described below.

4.6.1 Trichloroethylene

TCE is the major groundwater contaminant at CBRP OU. During the 2023-2024 sampling period, TCE was detected at 20 of 35 monitoring stations. TCE concentrations met or exceeded the MCL of 5 microgram per liter ($\mu\text{g/L}$) at nine (9) station sample locations, which included seven (7) monitoring wells and two (2) MNA stations. None of the samples collected at the surface water station locations, exceeded the TCE MCL. None of the samples collected at the station locations listed in Table 4, exceeded TCE trigger levels. The highest reported TCE groundwater concentration was 2,510 $\mu\text{g/L}$, from the November 2023 sample collected at monitoring well CRP 20CU. The 2023 and 2024 TCE groundwater plumes and groundwater sample concentrations for all monitoring stations are shown on the figures located in Appendix D.

As TCE is the primary contaminant at CBRP OU, its occurrence can be used to delineate the physical extent of the total groundwater contaminant plume. The groundwater plume emanates westward from the CBRP, extending towards the FMB (Figures D-1 through D-5). The groundwater plume, vertically constrained to the UTRA, can be found within all three (3) UTRA aquifer zones. The 2024 TCE plume has not changed significantly in concentration or extent since last reported in the 2021-2022 EMR (SRNS 2023). The upgradient wells CRP 3D and CRP 18D are continuing their long-term decline. The reported CRP 3D TCE groundwater sample concentrations 7.49 $\mu\text{g/L}$ and 7.41 $\mu\text{g/L}$ (2023/2024) are just above the MCL, indicating that the 1999 remediation activities at the CBRP were successful in cutting off the contamination pathway to the UTRA. Overall, the TCE groundwater sample concentrations are decreasing throughout the monitoring network.

In 2000, SRNS reported the highest TCE groundwater sample concentrations at monitoring wells CRP 3D and CRP 18D (nearest to the CBRP source). Since 2000, TCE groundwater sample concentrations have steadily decreased at these locations along with other monitoring well locations in the CRBP-OU with the exception of CRP-20CU (downgradient and farther from the

CBRP source). Monitoring well CRP 20CU has had increasing TCE groundwater sample concentrations since 2002 and was the highest reported TCE groundwater sample concentration for 2024. This steady increase is an indication that the portion of the TCE groundwater plume with the highest concentration mass is passing through CRP 20CU. The location and subsequent shift in concentrations, are also consistent with groundwater flow rates and groundwater model particle tracks depicted in Figure 6 (WSRC 2001b). The TCE groundwater sample concentration average trend for all monitoring stations has been relatively stable from 2009 to 2024 (Figure 7) and the maximum concentration of the plume, currently centered on CRP 20CU, has the biggest impact to the average TCE concentration of the overall plume. The overall TCE groundwater sample concentration average trend long-term (2000-2024) though, indicates a significant TCE concentration decrease in the CBRP OU groundwater. In addition, from 2010 to 2024, the number of monitoring stations exceeding the TCE MCL have decreased from approximately 42% (13 of 31 stations sampled) down to approximately 26% (9 of 35 stations sampled). This decrease in the number of stations where TCE groundwater sample concentrations exceed the MCL is an indication of a contracting plume in addition to the decrease in concentration. Each aquifer zone and surface water body impacted by the CBRP OU TCE plume is discussed in detail below.

UAZ

Analytical data for TCE groundwater sample concentrations in the UAZ are presented in Appendix A and Appendix D, Figure D-1 (2023) and Figure D-3 (2024). The 2024 TCE groundwater plume emanates to the west and downgradient from the CBRP source area with elevated TCE groundwater sample concentrations reported at monitoring well CRP 18D, continuing west and farther downgradient, to monitoring well CRP 22CU.

During 2023-2024, groundwater sample concentrations exceeding the TCE MCL were seen at three (3) of the six (6) UAZ monitoring wells (CRP 3D, CRP 18D and CRP 22CU) and two (2) of the four (4) UAZ MNA stations (CRP 45A and CRP 45B). In 2024, the UAZ well with the highest TCE groundwater sample concentration was CRP 18D (15.3 µg/L). Overall, there is less TCE in the UAZ than in former years. The near-source monitoring well CRP 3D TCE reported groundwater sample concentration was 43,200 µg/L in 2000 (Figure 132), but only 7.41 µg/L in

2024 (below the 459 µg/L trigger level listed in Table 4). Likewise, the downgradient monitoring well CRP 22CU TCE reported groundwater sample concentration was 954 µg/L in 2000 (Figure C-138), but only 7.82 µg/L in 2024. The TCE groundwater plume migrates from the UAZ into the TCCZ and MAZ prior to discharging into the FMB.

TCCZ and MAZ

Analytical data for TCE groundwater sample concentrations in the TCCZ and MAZ stations are presented in Appendix A and shown in Appendix D (combined with data for the LAZ), Figure D-2 (2023) and Figure D-4 (2024). Currently, the bulk of VOC contamination mass at the CBRP OU resides in the MAZ and TCCZ. There are three (3) monitoring wells and four (4) MNA stations screened in the MAZ. There are four (4) MNA stations and one (1) monitoring well screened in the TCCZ.

In 2023, monitoring well CRP 20CU had the highest reported TCE groundwater sample concentration (2,510 µg/L). The 2023 TCE groundwater sample concentration is slightly higher than the reported 2022 and 2024 results (2,430 µg/L, 2,280 µg/L). Historically, TCE groundwater sample concentrations have steadily increased at monitoring well CRP 20U from a low value of 334 µg/L in 2000 to the highest reported value of 2,600 µg/L in 2018 (Figure C-137). This trend is an indication that the portion of the TCE groundwater plume with the highest concentration mass is passing through CRP 20CU which is consistent with groundwater flow rates and groundwater model particle tracks depicted in Figure 6. CBRP cross sectional views from 2000, 2012, and 2024 (Figures 8, 9, and 10, respectively) illustrate the progression of the TCE contaminant mass plume concentration and the westerly migration towards the FMB.

Excessive amounts of rainfall from November 1, 1997, through April 30, 1998, (114.98 cm [45.27 inches]) contributed to the transmission of a large quantity of TCE mass from the vadose zone into the UTRA, as observed in well CRP 3D (Figure C-132). This event occurred prior to the installation of the CBRP soil cover (installed in 1999). This TCE mass “hotspot” has been migrating in a westerly direction from the CBRP OU source area towards the FMB, from 1998 to present (Figures 8 through 10). This hotspot is currently impacting TCE groundwater sample concentrations at monitoring well CRP 20CU. Although the 2024 TCE groundwater sample

concentrations are elevated in the MAZ at the monitoring well CRP 20CU (2,280 µg/L), the TCE hotspot concentrations have decreased approximately 95% in comparison to the 43,200 µg/L groundwater sample concentration collected in November 2000 at monitoring well CRP 3D (the hotspot original location).

TCE was not detected in 2024 samples collected from other monitoring wells that are downgradient from the CBRP source area (MAZ monitoring well CRW 12C and TCCZ monitoring well CRW 12D). Monitoring wells CRW 12C and CRW 12D (LUC boundary wells) are near the northern most extent of the TCE plume and TCE groundwater sample concentrations observed above detection limit at these locations has occurred only once (8.34 µg/L in 2010) at CRW 12C.

TCE-contaminated groundwater within the MAZ and TCCZ is discharging into the wetlands of the FMB near MNA stations CRP 48B, CRP 50B, and CRP 51A and B. The TCE maximum reported groundwater sample concentrations from the sampling events in 2023 and 2024 were below MCL at CRP 51A (2.19 µg/L in 2023) and CRP 51B (4.53 µg/L in 2023). Concentrations below the estimated quantitation limit (EQL) were assigned the EPA functional guideline code for estimated quantity of (J) at CRP 48B (0.4 J in 2023), CRP 50B (0.370 J in 2023).

LAZ

Analytical data for TCE groundwater sample concentrations in the LAZ stations are presented in Appendix A and shown in Appendix D (combined with data for the MAZ), Figure D-2 (2023) and Figure D-4 (2024). In 2023 and 2024, TCE groundwater sample concentrations were at or exceeding TCE MCL in three (3) of the five (5) monitoring well locations screened in the LAZ (CRW 10C, CRW010CU, and CRP 20CL).

Monitoring well CRP 20CL (paired with UAZ well CRP 20CU) reported groundwater sample concentrations of 41.9 µg/L and 43.4 µg/L (2023 and 2024 respectively). The 2023 and 2024 TCE groundwater sample concentrations are lower than the reported 2022 concentration (53.9 µg/L). The TCE groundwater sample concentrations at this location are continuing to decline from the maximum reported concentration of 8,330 µg/L collected in 2003 (Figure C-137).

Monitoring wells CRW 10C and CRW010CU (LUC boundary wells) are the additional two (2) LAZ monitoring wells with TCE MCL exceedances. The maximum reported TCE groundwater sample concentration at monitoring well CRW 10C was 5.17 µg/L in November 2024. The maximum reported TCE groundwater sample concentration at CRW010CU was 10.8 µg/L. The maximum reported TCE groundwater sample concentrations for both wells are below the 13.6 µg/L trigger levels listed in Table 4. Historically, the reported TCE groundwater sample concentrations at monitoring well CRW010CU have exceeded the trigger level since 2009 (Figure C-145). However, several lines of evidence indicate that contamination at the CRW010CU and CRW 10C location is associated with the CAGW OU northern VOC plume and not the CBRP OU VOC plume.

Figure 11 is a contamination map illustrating two (2) distinct groundwater plumes and the maximum historic TCE sample concentrations for stations sampled between 1985 and 2016. The two (2) plumes are separated by an uncontaminated zone evidenced by monitoring wells CRP 4, CRP 6DR, and CRP 8D, as well as three (3) 1998 direct push technology (DPT) groundwater sample locations (CRSB-88, CRSB-89, and CRSB-90). Groundwater monitoring has ceased at monitoring well CRP 4. During groundwater monitoring of CRP 4D from 1991 until 2005, TCE was not detected or was less than the MCL, with the exception of a TCE groundwater sample concentration 11.0 µg/L collected in 1991. All groundwater samples from well CRP 6DR have been below detection limits from 1996 to 2024 (Figure C-134). TCE was not detected in the 2023 and 2024 samples collected from monitoring well CRP 8D. Historically, TCE has not been detected in most of the samples collected at monitoring well CRP 8D with exception of the maximum reported TCE groundwater sample concentration 1.24 µg/L in August 2003 (Figure C-135).

Figure 11 water table contours (WSRC 2003a) indicate that groundwater passing through the CRW 10 well cluster originates from the reactor area, rather than from the CBRP area. The CAGW OU groundwater model particle tracks depicted in Figure 12 (WSRC, 2000) also indicate the predominant flow path from the CBRP OU is towards the FMB, away from the CRW 10 well cluster. Monitoring well CRP 8D is located between the CBRP OU source area and monitoring well CRW 010CU. The maximum TCE groundwater sample concentration at CRP 8D was only

1.24 µg/L, in 2003, which suggests that it is very unlikely that a flow path exists connecting CRW010CU with a source at the CBRP OU.

SRS concludes that TCE contamination in monitoring wells CRW010CU and CRW 10C originate from the CAGW OU plume. However, monitoring of the CRW 10 well cluster will continue.

Gordon Aquifer (GA)

Analytical data for the TCE groundwater sample concentrations of the GA wells are tabulated in Appendix A, and are presented Appendix D, Figure D-5. All three (3) monitoring wells screened in the GA (CRP022A, CRW 10A and CRW 12A), were sampled in 2023 and 2024, and all reported TCE groundwater sample concentrations were below detection limits.

Groundwater Plume Development

Cross -sections of the TCE groundwater plume are presented in Figures 8 through 10, showing the concentrations and extent of the TCE in 2000, 2012, and 2024, respectively. The figures depict the migration and change in concentrations of the plume and migration of the hotspot from the source area over time.

Surface Water

Analytical data for TCE surface water sample concentrations of the surface water stations are tabulated in Appendix A, and are presented in Appendix D, Figure D-1 (2023) and Figure D-3 (2024). In 2023 and 2024, three (3) of the five (5) surface water stations reported TCE surface water sample concentrations above the detection limit (TL-02, TL-04, and TL-05). The 2024 reported TCE surface water sample concentration at the TL-02 surface station (3.11 µg/L) was a slight increase from the 2022 and 2023 surface water sample concentrations (2.77 µg/L and 2.64 µg/L, respectively), but continues to decline from the maximum reported concentration of 10.1 µg/L in 2003 (Figure C-148). The 2024 TCE surface water sample concentration at TL-04 of 1.63 µg/L is above the normal reported non-detect or J value at this location but is below the maximum TCE surface water sample concentration of 4.00 µg/L reported in November 2014 (Figure C-150). The 2024 TCE surface water sample concentration for the TL-05 surface water station, 1.40 µg/L,

is in line with the decreasing trend from the maximum reported TCE surface water sample concentration of 22.80 µg/L reported in 2010 (Figure C-151).

The CBRP OU TCE groundwater plume currently appears to be discharging to the Twin Lakes surface water primarily at the TL-05 station, based on the highest reported TCE surface water sample concentrations at TL-05 and the lack of TCE and degradation product sample concentrations reported at the other surface water stations. Surface water station TL-05 is cross gradient to the MAZ monitoring well CPR-20CU and LAZ monitoring well CPR-20CL, which are situated along the central axis of the TCE groundwater plume, where the hotspot currently located. The reported TCE sample concentrations at the FMB surface water stations TL-03 and TL-04, have never exceeded the TCE MCL.

Time to Reach RGOs

The ROD (WSRC 2007) for the CBRP OU indicated MNA would require 70 years before all areas of the VOC groundwater plume would be below the RGOs based on groundwater modeling of the remedial alternatives. In 2000, the maximum reported TCE groundwater plume concentration was 43,200 µg/L at monitoring well CRP 3D and in 2024, the maximum reported TCE groundwater plume concentration was 2,280µg/L at monitoring well CRP 20CU. If the 2000 TCE reported groundwater sample concentration is reduced by 5.30 half-lives (2000-2024, 24 years) the resulting TCE concentration is 1,098 µg/L*, which is relatively close to the concentration (2,280 µg/L) reported at monitoring well CRP 20CU in 2024.

43,200 µg/L A_0 (2000 concentration), $\lambda = 0.693/t_h$ ($t_h = 4.53$) (Howard 1991), $t = 24$ yrs

$$* A = A_0 \times e^{-\lambda t}$$

A simplistic comparison, using current data, would be to consider just degradation of the TCE and ignore the discharge, dilution, and diffusion. Using the following equation above (with the reported 2024 maximum TCE groundwater plume concentration and the RGO), the time (number of years) for the CBRP OU VOC groundwater plume concentrations to be below RGOs would be approximately 40 years*:

2,280 µg/L (A_0), the TCE MCL is 5 µg/L (A) half-life for TCE is 4.53 years (t_h)

$$*t = (t_h \times \ln(A/A_0)) / (-0.693) = 40.02 \text{ years} \simeq 40 \text{ years}$$

The 40-year estimate is the same as the 2022 estimate, which supports the 2003 modeling estimate of 70 years (WSRC 2003b).

Likewise, the TCE plume maximum transit of 724 m (2,376 ft) from CRP 3D (maximum TCE concentration reported in 2000) to CRP 20CU over 18 years (maximum concentration reported at CRP 20CU in 2018) yields 40 m/yr (132 ft/yr), which is a reasonable flow velocity for the UAZ. Assuming the plume maximum was approximately halfway to FMB in 2018, then the plume will undergo another 4 half-lives of decay while traveling through the TCCZ and the LAZ and arriving in the FMB wetlands at a concentration of approximately 162 $\mu\text{g/L}$ at the CRP 50 and CRP 51 well clusters.

$$2,600 \mu\text{g/L } A_0 \text{ (2018 concentration), } \lambda = 0.693/t_h \text{ (} t_h = 4.53 \text{) (Howard 1991)., } t = 18.2 \text{ yrs}$$

$$* A = A_0 \times e^{-\lambda t}$$

At this point biodegradation in the wetlands is likely to reduce the TCE concentration to below MCLs, as historically observed at well CRP 50B.

4.6.2 Tetrachloroethylene

Analytical data for PCE sample concentrations of all the sample stations are tabulated in Appendix A, Table A-1. In the 2023-2024, PCE sample concentrations reported above the detection limit were collected at monitoring wells CRP 5C, CRP 18C, CRP 20CL, CRP 20CU, CRW010C and CRW010CU. However, only monitoring well CRP 5C PCE sample concentrations exceeded the PCE MCL of 5.0 $\mu\text{g/L}$ (5.14 $\mu\text{g/L}$, 2023 and 8.27 $\mu\text{g/L}$, 2024). PCE sample concentrations at monitoring well CRP 5C overall, have been decreasing in value and indicate a downward trend since the maximum 2007 reported sample concentration of 14.2 $\mu\text{g/L}$ (Figure C-93). Monitoring well CRP 5C is screened in the LAZ and is upgradient from the CBRP. The location of monitoring well CRP-5C, in relation to the CRBP, may indicate the PCE groundwater plume emanating below the CBRP OU could be attributed to a different source (with past C-Reactor operations) that is upgradient from the CBRP. PCE sample concentrations have never been reported above the detection limit at any of the surface water monitoring stations in the CRBP-OU.

4.6.3 Cis-1,2-Dichloroethylene

Analytical data for cis-1,2-DCE sample concentrations of all the sample stations are tabulated in Appendix A, Table A-1. During the 2023-2024 sampling events, cis-1,2-DCE was detected in four (4) of the 18 monitoring wells, eight (8) of the 12 MNA stations, and three (3) of the five (5) surface water stations. Monitoring well CRP-20U had the highest reported cis-1,2-DCE sample concentration of 38.3 µg/L (2023). None of the 2023 and 2024 reported cis-1,2-DCE sample concentrations from monitoring wells, MNA stations, or surface water stations, exceeded the cis-1,2-DCE MCL (70 µg/L).

Cis-1,2-DCE is prevalent along the longitudinal axis of the TCE groundwater plume in the UAZ and cis-1,2-DCE groundwater sample concentrations have been observed from the CRPB source (i.e., CRP 3D), continuing downgradient to the wetlands of Twin Lakes and the FMB. There is a general overall decreasing trend observed in many of the time series plots (Figures C-41 through C-55) from relatively higher cis-1,2-DCE groundwater sample concentrations (above cis-1,2-DCE MCL) in UAZ monitoring wells at the start of the CBRP remediation activities in 2000, to relatively low groundwater sample concentrations (below cis-1,2-DCE MCL) in 2012 (with the exception of monitoring well CRP 20CU). Monitoring Wells CRP 3D and CRP 18D along the longitudinal plume axis (proximal to the source) exemplify this trend (Figure C-41 and C-45). However, cis-1,2-DCE groundwater sample concentrations at CRP 20CU (Figure C-46) increased from 4.58 µg/L in 2003 to 40.5 µg/L in 2017. The groundwater sample concentration has relatively stayed the same since, with reported groundwater sample concentrations of 41.60 µg/L in 2023 and 34.5 µg/L in 2024.

The cis-1,2-DCE groundwater sample concentrations at MNA station CRP 50B increased from 0.70 µg/L in 2010 to 181 µg/L in 2018 then have consistently decreased in concentration to 20.4 µg/L in 2024 (Figure C-51). The cis-1,2-DCE groundwater sample concentrations at MNA station CRP 48B increased from 0.60 µg/L (2010) to a maximum concentration of 28 µg/L (2013) but has consistently decreased to the current concentration of 6.33 µg/L in 2024 (Figure C-50). This increasing/decreasing trend is seen at other MNA station locations (Figure C-48, 49, and 52). The fluctuations in cis-1,2-DCE concentrations at some of the MNA stations indicate that

biodegradation is primarily occurring as TCE is discharged from the MAZ into the wetlands of Twin Lakes and the FMB.

TCE groundwater sample concentrations appear to control the cis-1,2-DCE concentrations observed along the axis of the plume. The increases in TCE and cis-1,2-DCE groundwater sample concentrations at monitoring well CRP 20CU are likely due to the hotspot, previously located at CRP 18D, which has been impacting CRP 20CU. Likewise, the TCE groundwater plume discharging along the Twin Lakes and FMB wetlands appears to be impacting cis-1,2-DCE concentrations observed currently at MNA stations CRP 48B and CRP 50B. The absence of TCE at MNA station CRP 50B, along with the elevated levels of cis-1,2-DCE, VC, and ethylene, is an indication of the significant amount of biodegradation occurring in the distal portion of the TCE groundwater plume in the wetland areas.

Surface water station cis-1,2-DCE sample concentrations have never been above the MCL at any of the surface water monitoring stations. The maximum reported cis-1,2-DCE surface water sample concentration was 30.6 µg/L at TL-05 in 2010 and has since decreased in concentration to 1.12 µg/L in 2024.

4.6.4 Vinyl Chloride

Analytical data for VC sample concentrations of all the sample stations are tabulated in Appendix A, Table A-1. During the 2023-2024 sampling period, VC was detected in one (1) of the 18 monitoring wells, seven (7) of the 12 MNA stations, and one (1) surface water station which borders the Twin Lakes area and the FMB. The 2023 reported VC groundwater concentration for monitoring well CRP 20CU and surface water station TL-05 were below the VC MCL (2 µg/L) and below EQL of 1 µg/L (0.370 J µg/L at CRP 20CU and 0.360 J µg/L at TL-05).

Four (4) of the seven (7) MNA stations reported VC groundwater sample concentrations below the VC MCL (2 µg/L) and below EQL of 1 µg/L (CRP-45A, 46A, 46B, and 48A). In 2023, the reported VC groundwater sample concentration for MNA station 48B was 2.07 µg/L (exceeding the VC MCL of 2 µg/L) but reported below the VC MCL in 2024 (1.42 µg/L). Most of the MNA station clusters (CRP 46, 48, 51, and 52) have reported relatively low VC groundwater

concentrations or decreasing trends since monitoring began at the MNA stations in 2000 (Figures C-29, 30, 32 and 33), but station clusters CRP 45 and CRP 50 present a more complex behavior.

The reported VC groundwater sample concentrations at CRP 45B were below the detection limit in 2002 and again in 2004, but increased steadily thereafter, reaching 30 µg/L in 2012. The VC groundwater sample concentrations at CRP 45B have declined to below detection limits since November 2020 (Figure C-28). The MNA stations CRP 50A and 50B both exceeded the VC MCL with 2023 reported groundwater sample concentrations of 3.76 and 149 µg/L, respectively. The VC groundwater sample concentration for MNA CRP 50B decreased to 77.1 µg/L in 2024. Historically, the VC groundwater sample concentrations at CRP 50B have been fluctuating between high concentrations and low concentrations. The VC groundwater sample concentrations at MNA station CRP 50A follow the same time-series trends as CRP 50B, but at lower concentrations (Figure C-31). Coupled with the increasing cis-1,2-DCE and ethylene groundwater sample concentrations at this location, the trends may indicate that an elevated portion of the TCE groundwater plume has reached the CRP 50 MNA station cluster and a significant amount of TCE biodegradation is occurring in the distal portion of the TCE groundwater plume in the wetland areas.

TL-05 was the only surface water station to consistently report VC sample concentrations exceeding the MCL (Figure C-40) The VC sample concentrations at TL-05 have decreased from a maximum concentration of 7.51 µg/L in 2010 to below the EQL (2 µg/L) in 2018. The 2023 reported VC sample concentration was 0.360 µg/L (below the EQL 1.0 µg/L).

4.6.5 Ethylene

Analytical data for ethylene sample concentrations from all of the MNA and surface water stations are tabulated in Appendix A, Table A-1. During the 2023-2024 sampling period, ethylene ground sample concentrations above the detection limit were reported at two (2) of 12 MNA stations. The ethylene groundwater sample concentrations at MNA station CRP 50B were 54.3 µg/L in 2023 and 27.5 µg/L in 2024. The reported ethylene groundwater sample concentration at MNA station CRP 50A was 10.1 µg/L in 2023 but was not detected in 2024 (Figure C-84). Ethylene is a biodegradation product of VC and the reported ethylene groundwater concentrations are expected

and consistent with the reported VC groundwater sample concentrations at these stations. During the 2023-2024 sampling period, ethylene was not detected above the detection limit at any of the surface water stations. There is no MCL for ethylene.

4.6.6 Dichloromethane (Methylene Chloride)

Analytical data for dichloromethane sample concentrations from all the sample stations are tabulated in Appendix A, Table A-1. During the 2023-2024 sampling period, dichloromethane was detected at four (4) of the 35 stations. Dichloromethane groundwater sample concentrations were reported below the MCL (5 µg/L) in 2024 at monitoring wells CRW 10A, CRW 10C, CRW 010CU, and CRP 6DR (2.13 µg/L, 1.99 µg/L, 2.29 µg/L, and 1.96 µg/L, respectively). In general, dichloromethane does not show a distinct trend at any of the CBRP OU wells, rather sporadic detections were observed at all wells spanning the groundwater monitoring history of the CBRP OU (Figures C-61 through C-80). Dichloromethane is also a common laboratory contaminant. Based on the frequency of results above detection over the years, the low concentrations of the samples above the detection limit, and random distribution of those results above the detection limit at all wells, it appears that the reported detections of dichloromethane were due to lab contamination and do not represent true aquifer conditions within the CBRP OU.

4.6.7 MNA Summary

The monitoring well network groundwater data are used to track and evaluate the VOC groundwater plume beneath the CRBP OU as the plume travels from the CBRP to the points of discharge. In 2000, SRNS reported the highest TCE groundwater sample concentration (hotspot) at the monitoring well nearest to the CBRP source (UAZ monitoring well CRP 3D at 43,200 µg/L). The highest reported TCE groundwater sample concentration collected during 2023-2024 was 2,510 µg/L at the monitoring well CRP 20CU location (approximately 724 m [2,376 ft] from CRP 3D). The monitoring well data indicate that the hotspot at the CBRP OU resides now in the MAZ and TCCZ. The TCE hotspot concentration has decreased approximately 95% in comparison to the 43,200 µg/L groundwater sample concentration collected in November 2000 at monitoring well CRP 3D (the hotspot original location). The monitoring well groundwater sample data

indicates the groundwater plume is attenuating (i.e., sorption, dilution, dispersion, and diffusion) while migrating west through the CRBP OU towards the Twin Lakes and the FMB.

The MNA station data and the surface water station data are used to assess the attenuation of the VOC plume at the points of discharge (to the Twin Lakes and the FMB) and area of the CRBP OU that is proximal to the points of discharge. During the 2023-2024 sampling period, the majority and the highest reported groundwater sample concentrations of cis-1,2-DCE, VC, and ethylene were detected at the CBRP-OU MNA stations (well clusters CRP 45, CRP 48, and CRP 50). Cis-1,2-DCE, VC, and ethylene are VOC degradation products associated with microbial reductive dechlorination of TCE. As stated earlier, increased concentration levels of cis-1,2-DCE, VC, and ethylene in the distal portion of the plume (wetland areas) relative to the upgradient (proximal) portion of the plume, indicate the bulk of the plume attenuation in the MNA well cluster locations is occurring due to biodegradation. Field condition parameters collected at the time of groundwater sampling (Table A-1) indicate that low DO and ORP values, coupled with increased amounts of decomposing organic material, create a more conducive environment for increased microbial activities relative to the conditions in the plume upgradient. Although pH levels are relatively low in the wetland areas, which can suppress or stop microbial growth, microbial growth in the wetlands appears sustainable with these conditions and the breakdown of TCE and the daughter products continues (Clemson, 2010).

In 2023 and 2024, the highest reported groundwater concentration samples for these constituents were collected from MNA station CRP 50B (28.8 µg/L cis-1,2-DCE, 149 µg/L VC, and 54.3 ethylene) Sample concentrations at the MNA station paired with CRP 50B (CRP 50A) for the same constituents were below EQL for cis-1,2-DCE, 3.76 µg/L for VC, and 10.1 µg/L for ethylene. This trend in higher concentrations at the “B” wells relative to the paired “A” wells is consistent with the CSM which predicts increased biodegradation occurring as groundwater migrates upward from the lower screened “B” well elevation through the higher screened “A” well elevation, discharging to the Twin Lakes and the FMB. The relatively higher concentrations of the TCE daughter products (B to A) could be attributed to longer residence time of TCE in the organic rich sediments. The exception to this trend with paired MNA station wells occurred during 2023 and 2024 at MNA station pair CRP 45A. At this location, the trend of increased concentrations in “B” well to “A”

well reversed. This reversal is consistent with the change in the potentiometric surface at this location. The recorded water level at monitoring well CRP 45A was slightly lower than the water level recorded at CRP 45B, indicating a downward flow in the groundwater direction.

Historically, the groundwater sample data collected from the monitoring network for cVOCs indicate decreasing trends over time. From 2010 to 2024, the number of monitoring stations exceeding the TCE MCL have decreased from approximately 42% (13 of 31 stations sampled) down to approximately 26% (9 of 35 stations sampled). This decrease in the number of stations where TCE groundwater sample concentrations exceed the MCL is an indication of a contracting plume in addition to the decrease in concentration. The ROD (WSRC 2007) for the CBRP OU indicated MNA would require 70 years before all areas of the VOC groundwater plume would be below the RGOs. Using the TCE half-life of 4.53 year (Howard 1991), the maximum reported TCE groundwater concentration of 2,280 µg/L at monitoring well CRP 20CU is consistent with the reduction of the hotspot original concentration of 43,200 µg/L at monitoring well CPR 3D. The highest reported TCE groundwater sample concentration from 2018 at CRP 20CU was 2,600 µg/L. Assuming approximately four (4) more half-lives before that portion of the plume enters the wetlands, the concentration will be approximately 162 µg/L. As this portion of the TCE plume continues through the wetland soils near MNA station cluster CRP 50, it will continue to attenuate and undergo biodegradation. Biodegradation is estimated to yield another 99% reduction in TCE discharging to FMB (WSRC 2001b). Attenuation during plume transport coupled with an increase in biodegradation in wetland soils, is anticipated to reduce TCE concentrations so that the FMB surface water will never exceed the TCE MCL (5 µg/L).

5.0 SUMMARY

Annual inspection and maintenance continue for the low permeability soil cover which minimizes rainwater infiltration at the CBRP OU.

Data collected over the past two years indicate the MicroBlower™ SVE system has removed approximately 6.81 kg/yr (15.01 lbs/yr.). This exceeds the TCE minimal annual recovery rate of 0.82 kg/yr (1.8 lbs/yr) (WSRC 2004) estimated to control the vadose zone source and prevents migration of TCE to the groundwater.

During 2023-2024 sampling period, overall VOC concentrations continued to decrease in most of the wells in the monitoring network. The exception to this decreasing trend is the increasing trend in TCE groundwater concentrations at monitoring well CRP 20CU from 2002 (45 µg/L) to the maximum reported concentration in 2018 of 2,600 µg/L. This increasing trend correlates with the decreasing trend beginning at the same time frame at the upgradient monitoring well CRP 18D. This is consistent with the westward migration of the hotspot portion of the groundwater plume from CRP 18D to CRP 20CU.

An additional increasing trend in TCE groundwater concentrations was occurring at the monitoring well CRP 18C where concentrations increased in 2014 from 29.0 µg/L to 83.8 µg/L by 2021. Concentrations have been decreasing since 2021 to the reported 2024 concentration of 45.4 µg/L. This increasing/decreasing (pulse) trend in TCE concentrations at this location is consistent with the sorption of TCE in the TCUC from the UAZ and subsequent delayed desorption of residual TCE from the TCUC into the MAZ, which could account for the temporary increase in concentration.

In general, the MNA stations and surface water sampling points exhibit an overall decreasing VOC concentration trend consistent with the decreasing trends of the monitoring wells. MNA station CRP 50B reported the highest concentrations for degradation products VC, ethylene, and cis-1,2-DCE (with the exception of slightly higher value at CRP 20CU of cis-1,2-DCE). These relatively high concentrations of daughter products compared to concentrations reported at proximal locations to the CBRP source, indicate that biodegradation is a key component of MNA for VOCs in the distal portions of the CBRP OU plume.

Fluctuations in TCE concentrations at the downgradient wells are expected until residual contamination from the hotspot has completely discharged to the FMB and the Twin Lakes. Fluctuations in TCE degradation compounds are also expected at the MNA stations in the FMB and Twin Lakes wetland areas. The hotspot TCE concentrations, transport time, and attenuation mechanisms were incorporated into the 2003 CBRP OU groundwater model, which estimates the entire TCE plume will be below MCLs in 70 years.

The 2024 maximum TCE groundwater sample concentration (2,280µg/L) at monitoring well CRP 20CU is much lower than the 2003 maximum TCE sample concentration (8,330 µg/L) at co-located well CRP 20CL. As indicated by the past reported surface water station TCE sample concentrations at TL-03 and TL-04 (Figures C-149 and 150), the 2003 maximum reported TCE sample concentration for monitoring well CRP 20CL (8,330 µg/L) never led to a reported TCE MCL exceedance in the FMB. It is unlikely the reported 2024 TCE sample concentration at monitoring well CRP 20CU will result in a future TCE MCL exceedance in the FMB.

Monitoring well CRW010CU reported TCE groundwater sample concentrations below the trigger level in 2023 and 2024. Groundwater flow paths and groundwater data indicate that the CAGW OU TCE plume from the reactor area impacts well CRW010CU, not the CBRP OU TCE plume. In addition, groundwater monitoring wells CRP 6DR and CRP 8D are now monitored to help delineate and differentiate the CBRP OU TCE plume from the CAGW OU TCE plume. SRS recommends that wells CRW010CU, CRW 10A, and CRW 10C be removed from the CBRP monitoring program and replaced by wells CRP 6DR and CRP 8D as LUC boundary wells.

SRNS recommends in future sampling events, at 5-yr increments, that methane be added to the suite of analytes and Bio-Trap® samplers are utilized to further assess the conditions and record microbial activity in the wetland areas. In addition, SRNS recommends that the two sampling events for the biennial report occur at different time intervals (i.e., winter/summer), to monitor the effects/changes (if any) due to seasonal changes. The next CBRP OU EMR is scheduled for June 2027 (Table 2) and will discuss data collected in 2025 and 2026.

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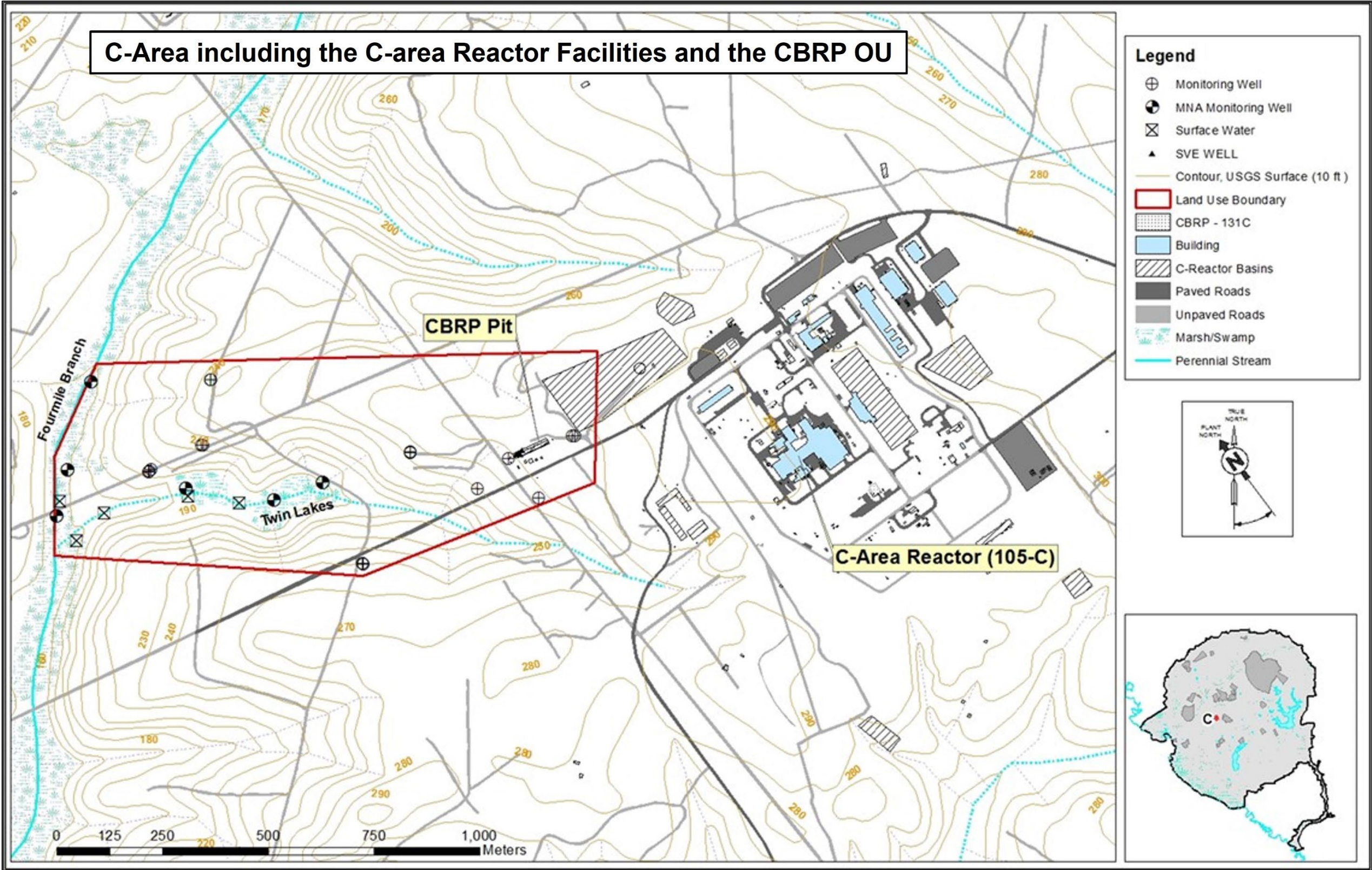


Figure 1. CBRP Location in Relation to the C-Reactor Facilities

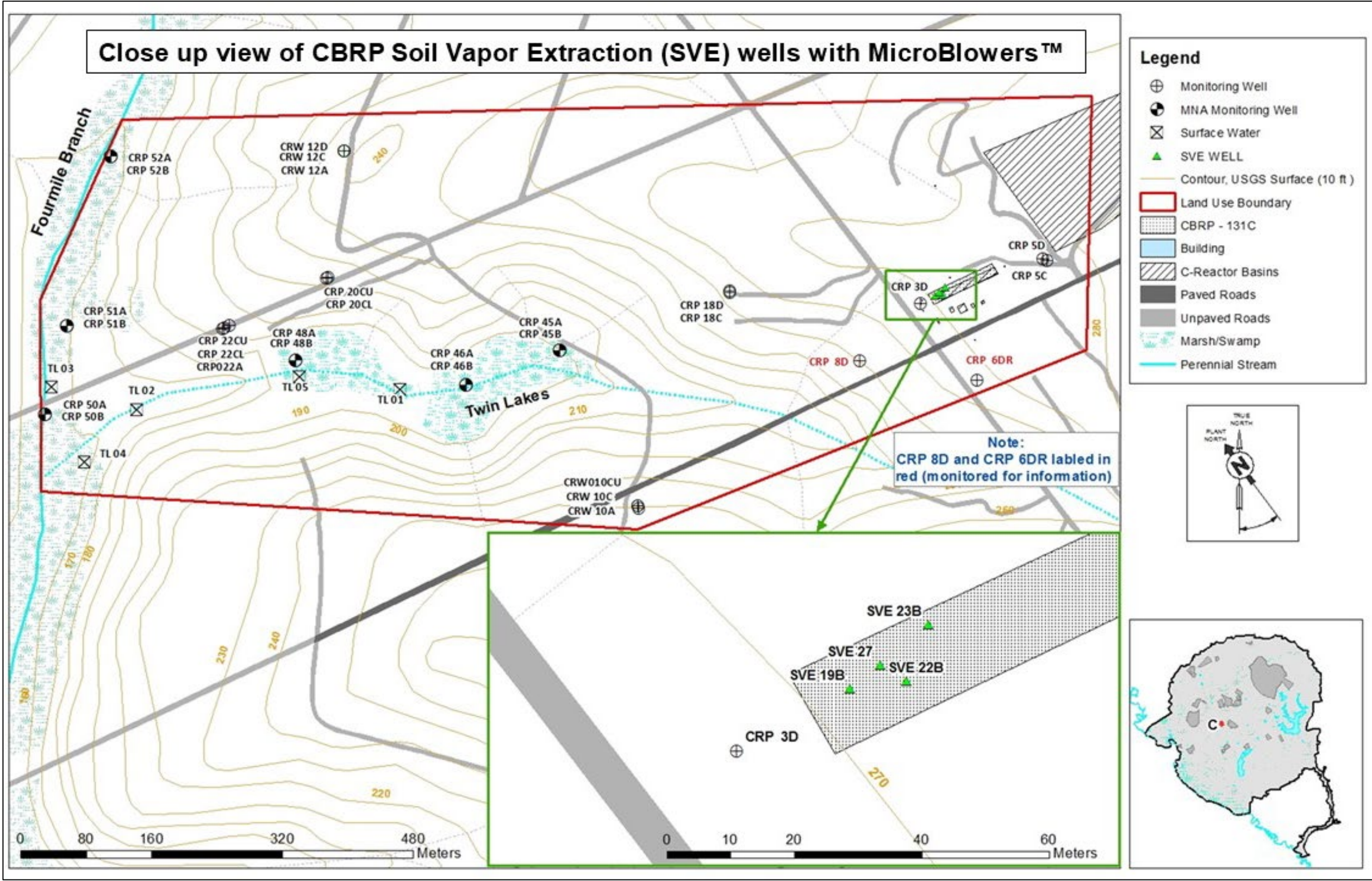


Figure 2. SVE System located at the Western Edge of CBRP

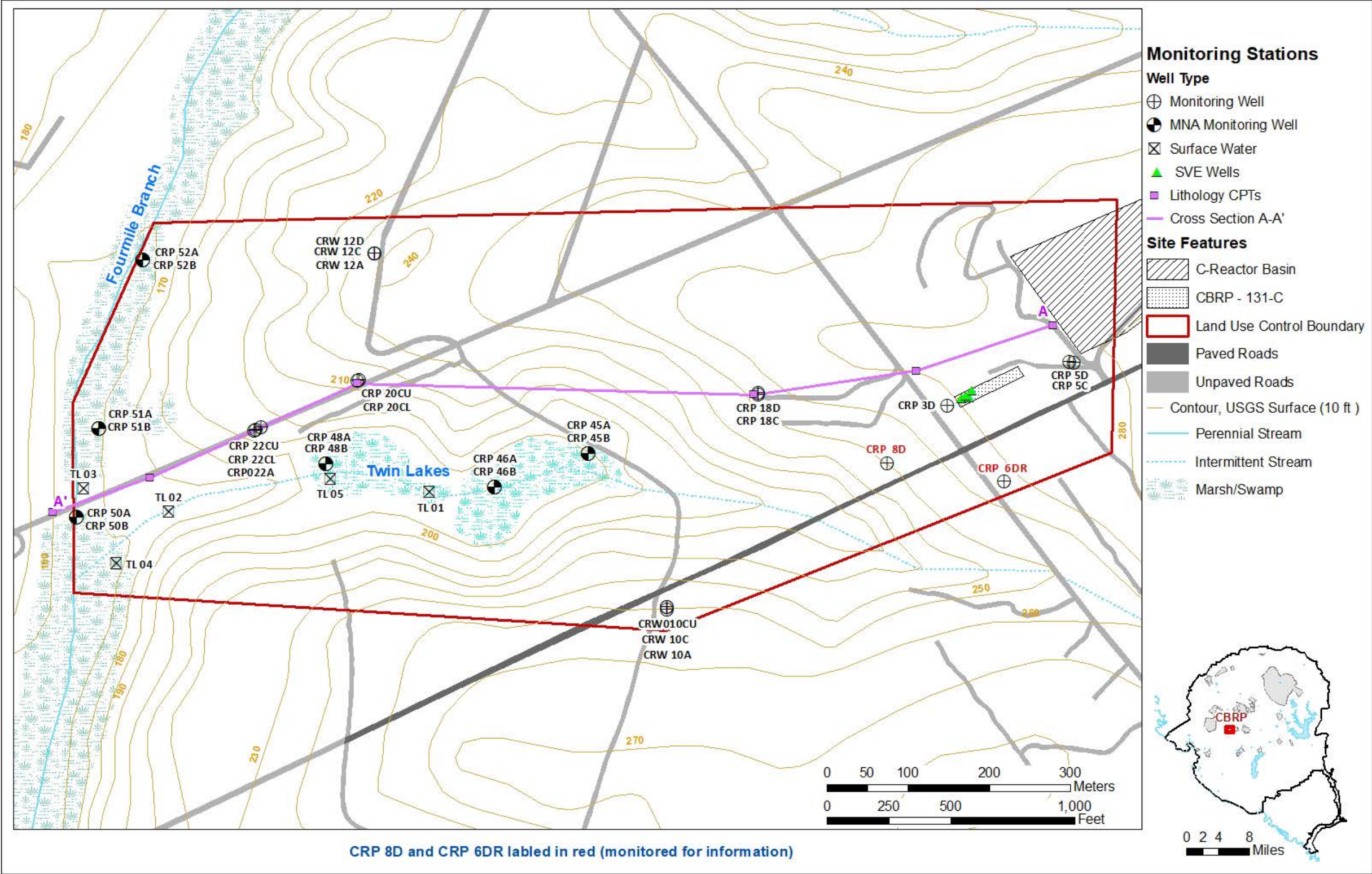


Figure 3. CBRP OU LUC Boundary

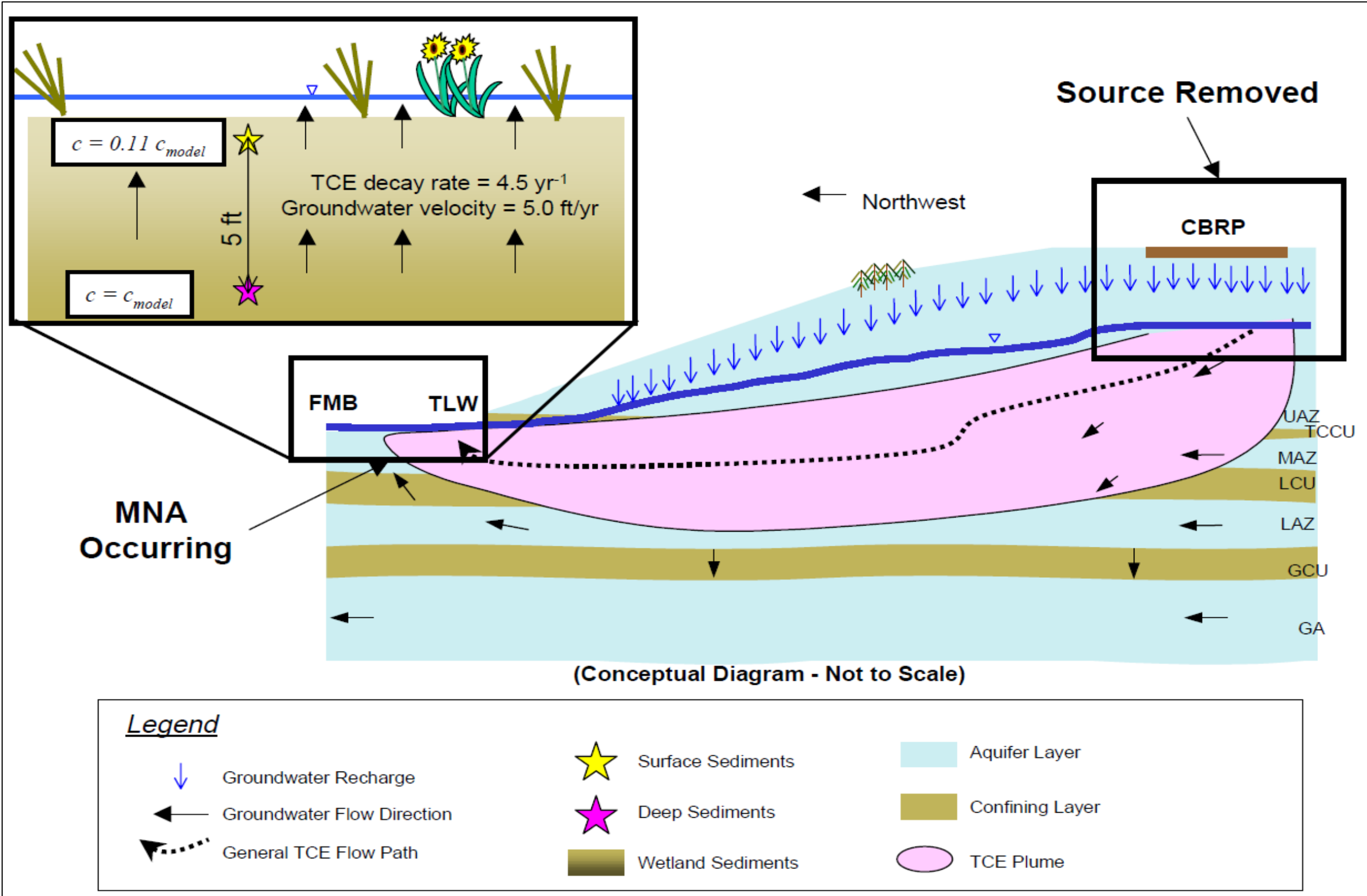


Figure 4. CBRP OU TCE Plume Conceptual Site Model

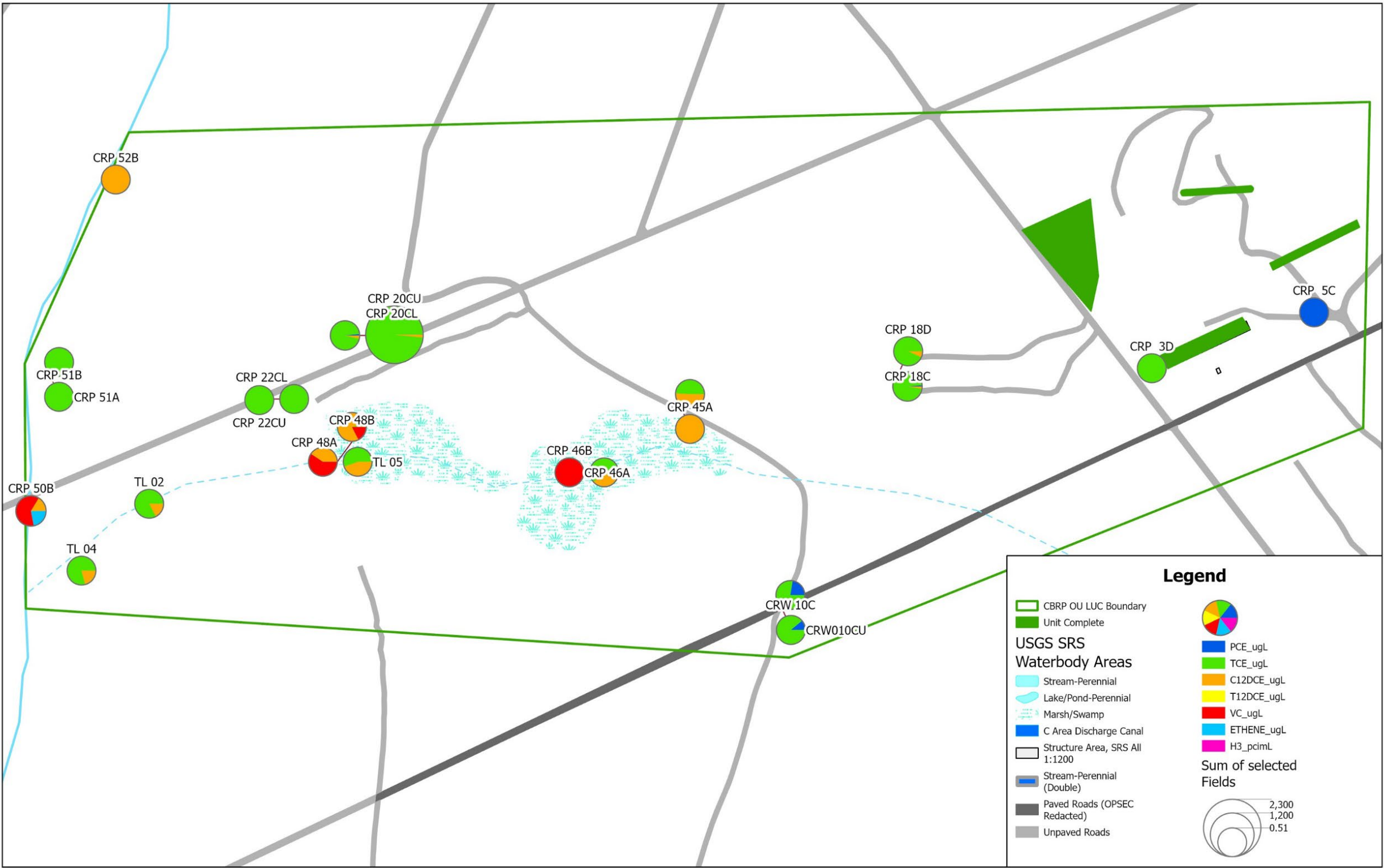


Figure 5. Station VOCs Concentrations Above Detection Limit Pie Chart 4Q24.

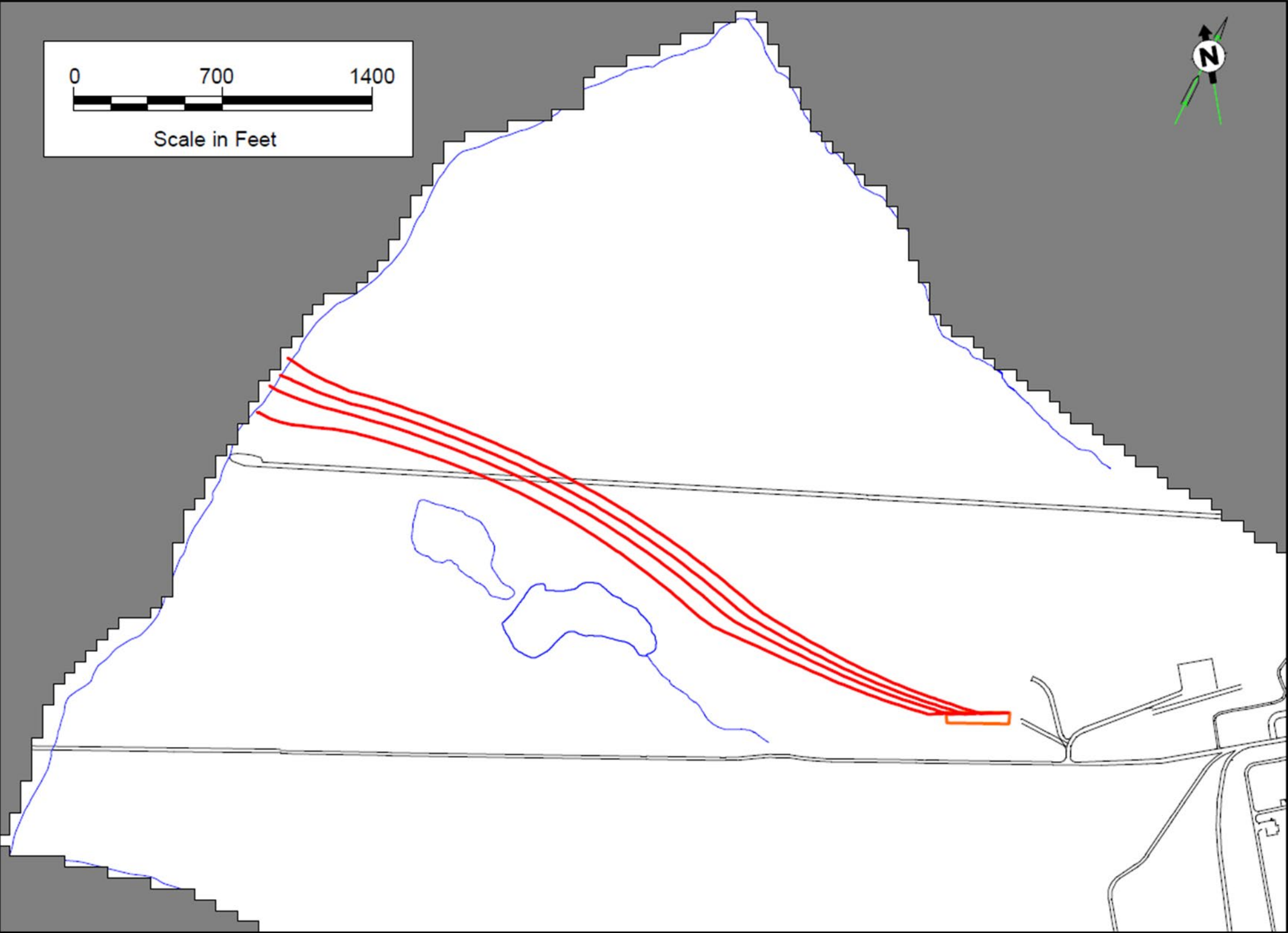


Figure 6. CBRP OU Groundwater Model Particle Tracks (WSRC-TR-2001-00298)

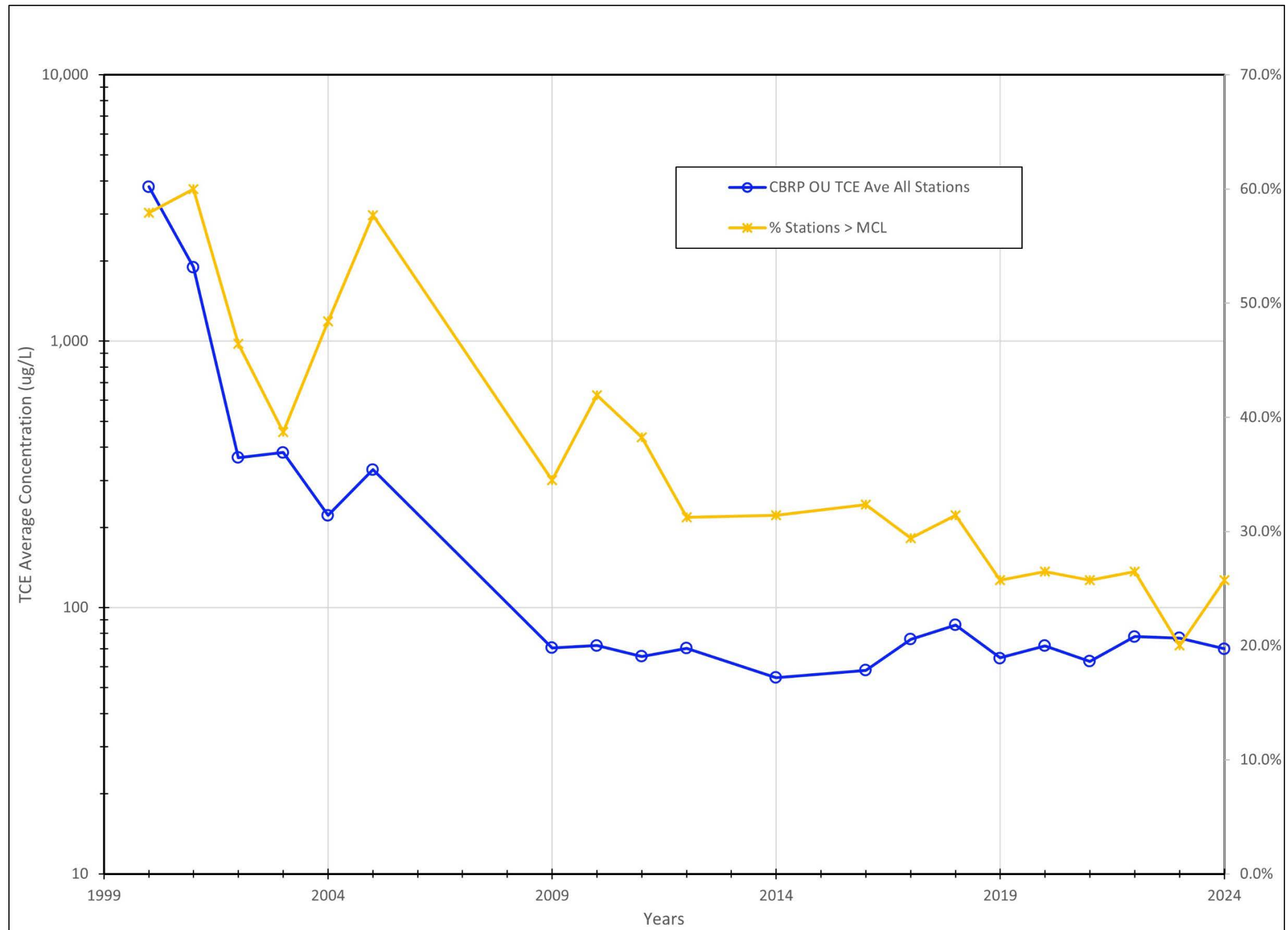


Figure 7. CBRP OU 2000-2024 Station Average TCE Concentration Trend

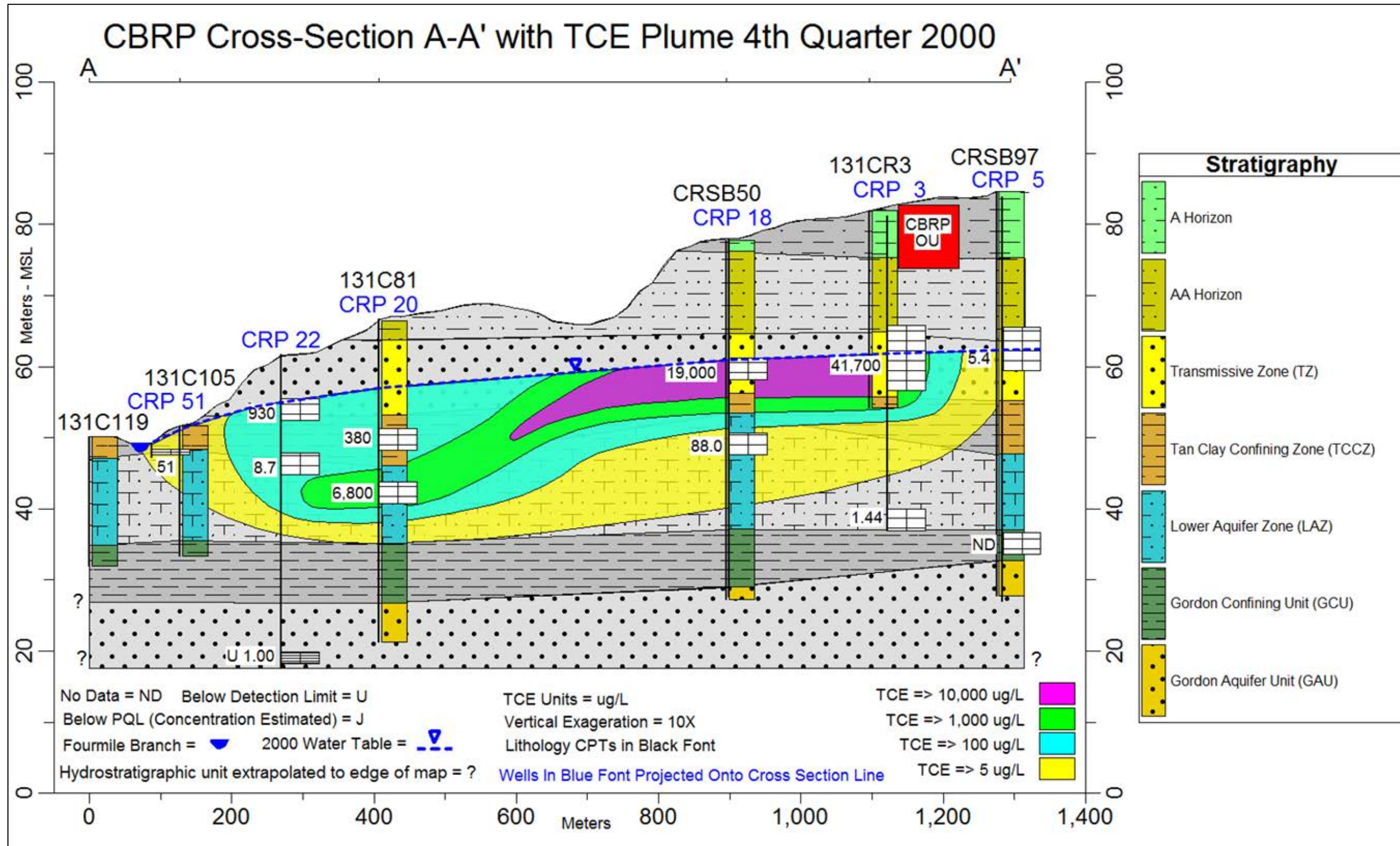


Figure 8. Plume Cross Section, Fourth Quarter 2000

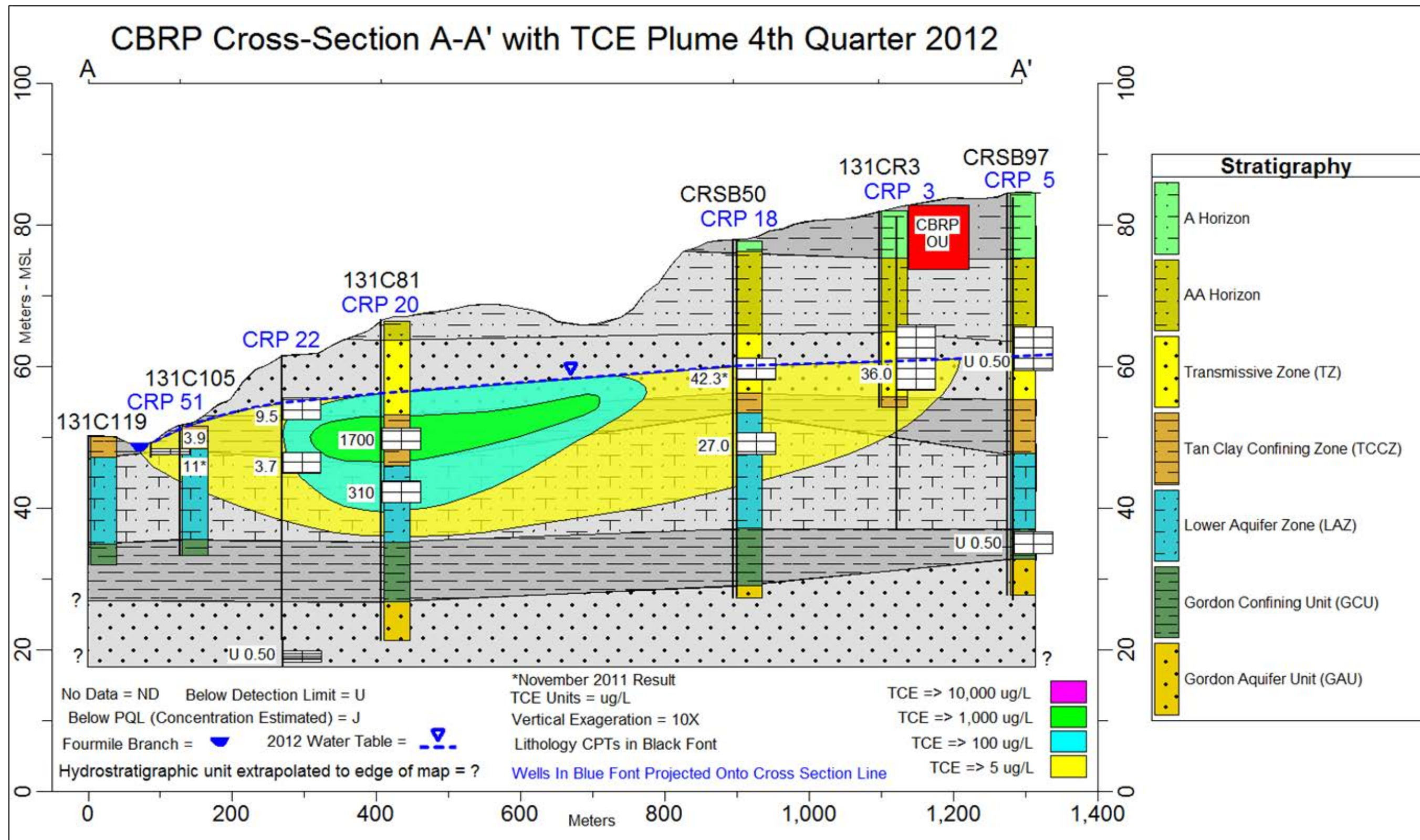


Figure 9. CBRP Plume Cross Section, Fourth Quarter 2012

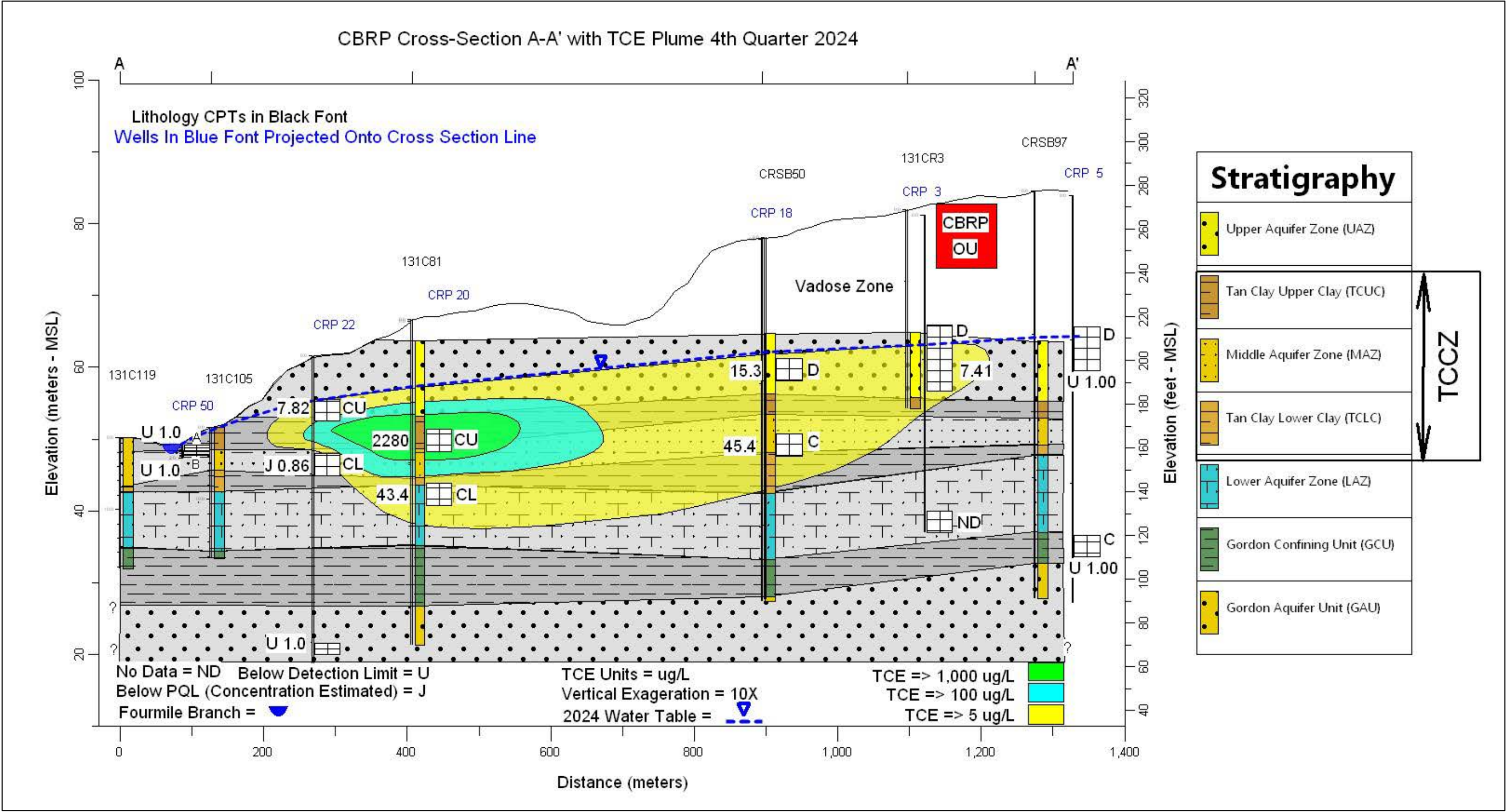


Figure 10. CBRP Plume Cross Section, Fourth Quarter 2024

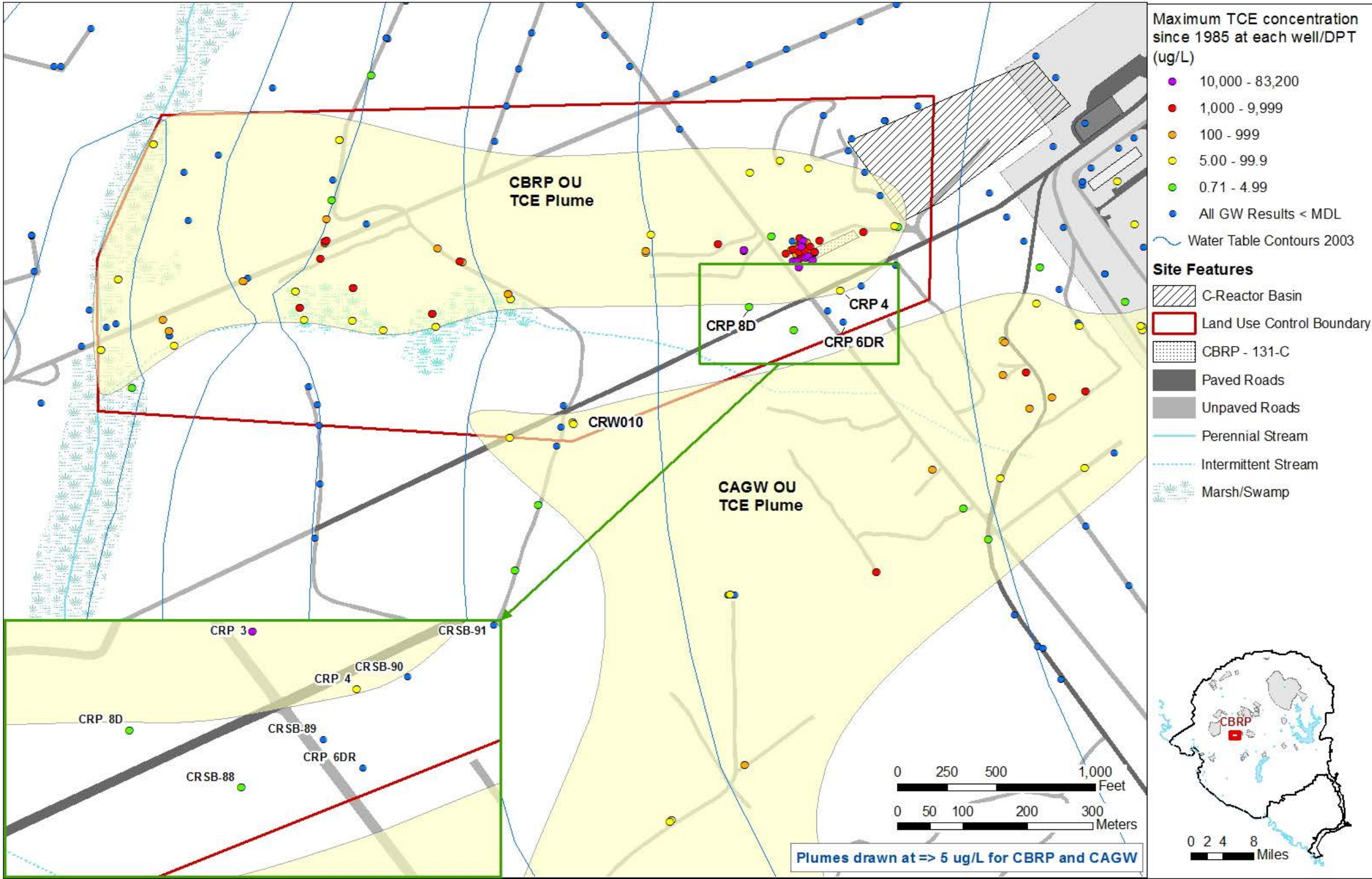


Figure 11. Maximum TCE concentrations for C-Area (1985-2016)

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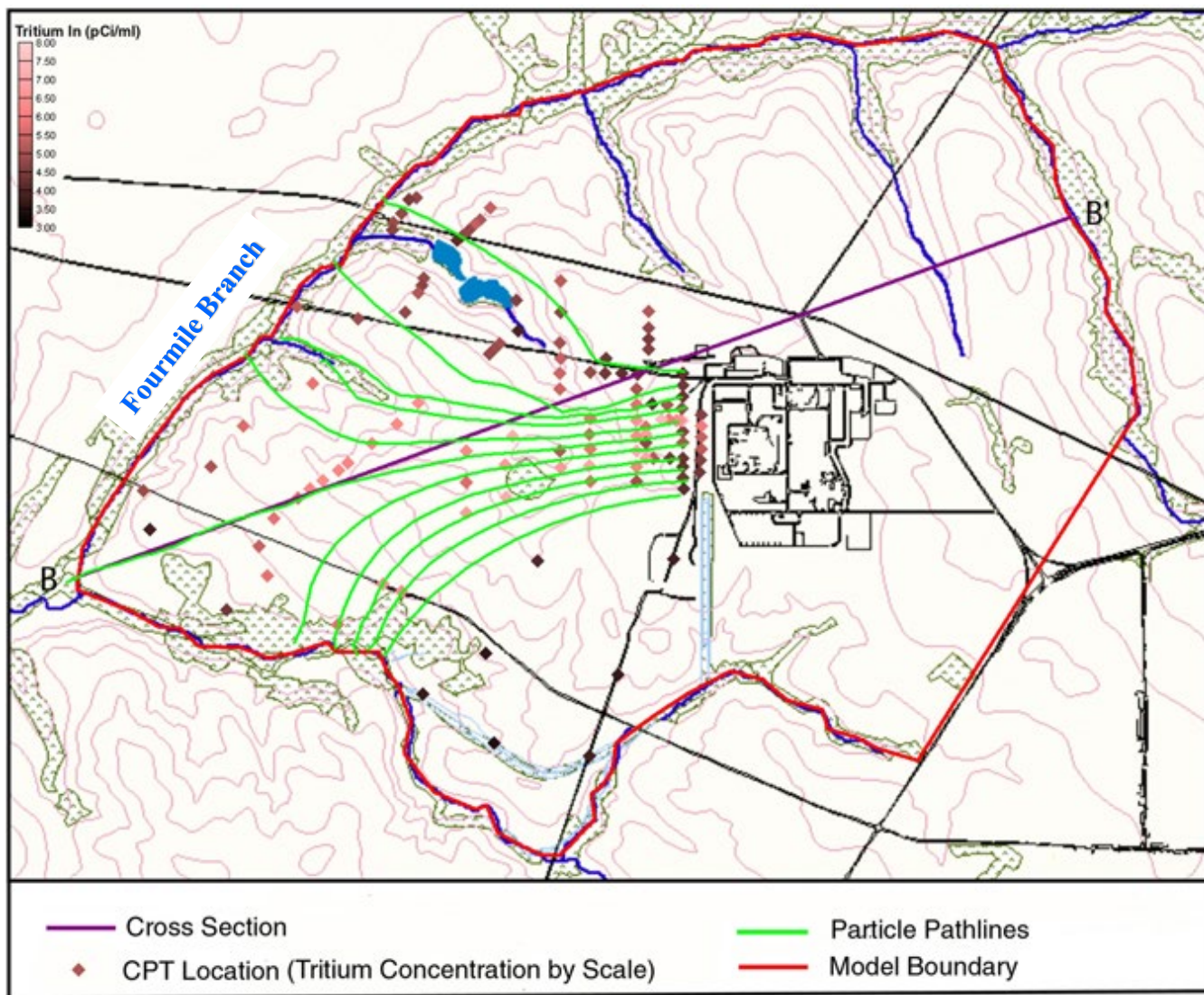


Figure 12. CAGW OU Groundwater Model Particle Tracks (WSRC-RP-2000-4096)

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Table 1. CBRP Groundwater Monitoring Stations

Station ID	Screen Zone	Station Type	Screen Depth (ft bgs) ¹		Well Diameter (in) ²	Total Depth ft bgs	Ground Elevation (ft amsl) ³
			Top	Bottom			
CRP 3D	UAZ	Monitoring Well	51	71	2	77.5	265.3
CRP 5C	LAZ	Monitoring Well	155	165	2	166.8	275.1
CRP 5D	UAZ	Monitoring Well	60	80	2	86.5	274.6
CRP 6DR	UAZ	Monitoring Well	47.3	67.3	2	75	261.5
CRP 8D	UAZ	Monitoring Well	35	55	2	63	246
CRP 18C	MAZ	Monitoring Well	89.8	99.8	2	100	256.02
CRP 18D	UAZ	Monitoring Well	55.23	65.26	2	66	256.07
CRP 20CL	LAZ	Monitoring Well	74.8	84.8	2	85	218.55
CRP 20CU	MAZ	Monitoring Well	50.15	60.15	2	60.5	218.95
CRP022A	GA	Monitoring Well	137	142	4	147.3	201.96
CRP 22CL	LAZ	Monitoring Well	45	55	2	56	202.26
CRP 22CU	UAZ	Monitoring Well	20	30	2	30.3	201.82
CRP 45A	UAZ	MNA station	4.33	5.83	2	6.16	197.8
CRP 45B	UAZ	MNA station	7.83	9.33	2	9.66	197.8
CRP 46A	UAZ	MNA station	3.2	4.5	1	5.5	189.48
CRP 46B	UAZ	MNA station	6.2	7.5	1	8.3	189.48
CRP 48A	TCCZ	MNA station	4.58	6.08	2	6.41	175.48
CRP 48B	TCCZ	MNA station	5.7	7	1	8	175.48
CRP 50A	TCCZ	MNA station	3	4.3	1	5.5	163.3
CRP 50B	TCCZ	MNA station	4.7	6	1	6	163.3
CRP 51A	MAZ	MNA station	2.9	4.2	1	5.4	161.68
CRP 51B	MAZ	MNA station	4.2	5.5	1	6.7	161.68
CRP 52A	MAZ	MNA station	2.58	4.08	2	4.41	162.88
CRP 52B	MAZ	MNA station	4.3	5.6	1	6.9	162.88
CRW 10A	GAU	Monitoring Well	157.2	162.9	4	163.2	246.83
CRW 10C	LAZ	Monitoring Well	111.6	117.3	4	117.3	246.83
CRW010CU	LAZ	Monitoring Well	90	100	4	105.3	246.31
CRW 12A	GA	Monitoring Well	131	136.7	4	137	231.44
CRW 12C	MAZ	Monitoring Well	80.2	85.9	4	85.9	231.44
CRW 12D	TCCZ	Monitoring Well	59.5	65.2	4	65.2	231.44
TL 01	NA	Surface Water	NA ⁴	NA	NA	NA	NA
TL 02	NA	Surface Water	NA	NA	NA	NA	NA
TL 03	NA	Surface Water	NA	NA	NA	NA	NA
TL 04	NA	Surface Water	NA	NA	NA	NA	NA
TL 05	NA	Surface Water	NA	NA	NA	NA	NA

1. ft bgs = feet below ground surface.
2. in = inches
3. ft amsl = feet above mean sea level
4. NA = not applicable

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Table 2. Sampling and Reporting Schedule

Year	Month	SVE Wells	Monitoring Wells	MNA Stations	Surface Sampling	Report
2009	Oct-Dec	X	X	X	X	
2010	Apr-Jun	X	X*	X	X	
	Oct-Dec	X	X	X	X	
2011	Apr-Jun	X		X	X	X
	Oct-Dec	X	X	X	X	
2012	Apr-Jun	X		X	X	
	Oct-Dec	X	X	X	X	
2013	Apr-Jun	X				X
	Oct-Dec	X	X	X	X	
2014	Apr-Jun	X				
	Oct-Dec	X	X	X	X	
2015	Apr-Jun	X				X
	Oct-Dec	X	X	X	X	
2016	Apr-Jun	X				
	Oct-Dec	X	X	X	X	
2017	Apr-Jun	X				X
	Oct-Dec	X	X	X	X	
2018	Apr-Jun	X				
	Oct-Dec	X	X	X	X	
2019	Apr-Jun	X				X
	Oct-Dec	X	X	X	X	
2020	Apr-Jun	X				
	Oct-Dec	X	X	X	X	
2021	Apr-Jun	X				X
	Oct-Dec	X	X	X	X	
2022	Apr-Jun	X				
	Oct-Dec	X	X	X	X	
2023	Apr-Jun	X				X
	Oct-Dec	X	X	X	X	
2024	Apr-Jun	X				
	Oct-Dec	X	X	X	X	
2025	Apr-Jun	X				X
	Oct-Dec	X	X	X	X	

*Only CRP022A and CRW010CU

Table 3. RGOs/MCLs for the RCOCs

RCOC*	RGO/MCL	Units
1,1-Dichloroethylene	7	µg/L
cis-1,2-Dichloroethylene	70	µg/L
Dichloromethane	5	µg/L
Tetrachloroethylene	5	µg/L
Trichloroethylene	5	µg/L
Vinyl Chloride	2	µg/L

*Trans-1,2-dichloroethylene and ethylene are not RCOCs, but concentrations are reported in Appendices A and C.

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Table 4. Groundwater and Surface Water TCE Trigger Levels

Station ID	Well Type	Compliance Use	Station Maximum 2023 – 2024 (µg/L)	TCE Trigger Level
CRP 3D	Monitoring Well	KSZ Monitoring Well	7.49	= > 459 µg/L
CRP 20CU	Monitoring Well	Plume Definition Well	2,510	NA
CRW 10A	Monitoring Well	LUC Boundary Well	<EQL (1)	= > 13.6 µg/L
CRW 10C	Monitoring Well	LUC Boundary Well	5.17	= > 13.6 µg/L
CRW010CU	Monitoring Well	LUC Boundary Well	10.80	= > 13.6 µg/L
CRW 12A	Monitoring Well	LUC Boundary Well	<EQL (1)	= >5 µg/L (MCL)
CRW 12C	Monitoring Well	LUC Boundary Well	<EQL (1)	= >5 µg/L (MCL)
CRW 12D	Monitoring Well	LUC Boundary Well	<EQL (1)	= >5 µg/L (MCL)
TL 04	Surface Water	MNA POC	1.63	= >5 µg/L (MCL)
KSZ = Key Source Zone LUC = Land Use Control MNA = Monitored Natural Attenuation POC = Point of Compliance		NA = Not Applicable EQL = Estimated Quantitation Limit MCL = Maximum Contaminant Level		

Table 5. CBRP SVE Wells TCE vadose zone removal 2023-2024

CBRP SVE MicroBlower™ Data		
Station I.D.	TCE¹ (ppmv)²	TCE (lbs)³
Calendar year 2023		
SVE-19B	11.83	0.33
SVE-22B	113.14	5.28
SVE-23B	57.34	0.61
SVE-27	213.46	9.33
Totals⁴	395.77	15.55
Calendar year 2024		
SVE-19B	16.80	0.51
SVE-22B	122.45	4.70
SVE-23B	57.74	0.90
SVE-27	191.20	8.36
Total lbs	388.19	14.47
1. TCE = trichlorethylene 2. ppmV= parts per million vapor 3. lbs = pounds 4. TCE total lbs are 50% of calculated values . See section 4.5 for details.		

APPENDIX A

CBRP OU Analytical Data 2023-2024

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Table A-1, CBRP OU Monitoring Results, 2023 and 2024			Field Data											VOCs								
			SAMPLE COLLECTION DATE	DEPTH TO WATER	WATER ELEVATION	TURBIDITY	PH	TOTAL ALKALINITY (AS CaCO3)	WATER TEMPERATURE	VOLUME PURGED	SPECIFIC CONDUCTANCE	DISSOLVED OXYGEN	OXIDATION/REDUCTION POTENTIAL	FIELD CONDITIONS	1,1-DICHLOROETHYLENE	CHLOROETHENE (VINYL CHLORIDE)	CIS-1,2-DICHLOROETHYLENE	DICHLOROMETHANE (METHYLENE CHLORIDE)	ETHYLENE	TETRACHLOROETHYLENE (PCE)	TRANS-1,2-DICHLOROETHYLENE	TRICHLOROETHYLENE (TCE)
Station	Well Use	Aquifer Zone				15							7	2	70	5		5	100	5		
CRP 45A	MNA Monitoring Well	TZ_UAZ_UTRAU	16-Nov-23	7	194.8	10.7	4.7	0	16.3	1	30	3.38	38	NC	<EQL (1)	[0.78]	2.16	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	<EQL (1)
			3-Dec-24	3.91	197.89	14.3	5.5	6	14.7	1	18	2.13	176	176	NC	<EQL (1)	<EQL (1)	8.11	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)
CRP 45B	MNA Monitoring Well	TZ_UAZ_UTRAU	16-Nov-23	3.33	194.97	3.3	5.2	12	17.2	1	20	5.21	92	NC	<EQL (1)	<EQL (1)	7.8	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	<EQL (1)
			3-Dec-24	3.31	194.99	13.9	5	14	15.3	1	30	2.84	113	113	T	<EQL (1)	<EQL (1)	1.17	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)
CRP 46A	MNA Monitoring Well	TZ_UAZ_UTRAU	16-Nov-23	3.2	189.28	7.4	6.2	12	17	0.5	41	7.31	13	NC	<EQL (1)	[0.68]	<EQL (1)	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	<EQL (1)
			3-Dec-24	3.17	189.31	6.4	6	11	13.9	1	28	2.87	74	74	NC	<EQL (1)	<EQL (1)	[0.41]	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)
CRP 46B	MNA Monitoring Well	TZ_UAZ_UTRAU	16-Nov-23	3.1	187.78	2.6	6.3	62	16.6	1	148	4.89	-24	NC	<EQL (1)	<EQL (1)	[0.95]	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	<EQL (1)
			3-Dec-24	3.09	187.79	6.2	5.8	29	14.1	1	150	3.22	-35	-35	NC	<EQL (1)	[0.77]	<EQL (1)	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)
CRP 48A	MNA Monitoring Well	TCCZ	16-Nov-23	3.75	175.48	10.3	4	0	15.7	1	18	5.9	316	X	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	<EQL (1)
			3-Dec-24	3.73	175.5	21.3	5	12	16.3	1	26	3.77	3	3	T	<EQL (1)	[0.73]	[0.5]	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)
CRP 48B	MNA Monitoring Well	TCCZ	16-Nov-23	8	171.08	21.3	5.8	10	17	0	42	3.6	22	T	<EQL (1)	2.07	7.01	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	1.08
			3-Dec-24	3.07	176.01	4.4	6.1	23	16.8	1	41	3.63	-49	-49	NC	<EQL (1)	1.42	6.33	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)
CRP 50A	MNA Monitoring Well	TCCZ	16-Nov-23	5.4	161.1	12.1	5.7	45	16.3	0	131	5.4	78	NC	<EQL (1)	3.76	<EQL (1)	<EQL (5)	[10.1]	<EQL (1)	<EQL (1)	<EQL (1)
			3-Dec-24	5.29	161.21	14.5	5.1	5	6.4	0.5	96	4.84	31	31	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)
CRP 50B	MNA Monitoring Well	TCCZ	16-Nov-23	5.8	159	14.3	5.5	8	17.6	0	37	5.2	68	NC	[0.62]	1.49	28.8	<EQL (5)	54.3	<EQL (1)	<EQL (1)	[0.37]
			3-Dec-24	5.65	159.15	6.5	5.4	5	14.3	1	34	4.85	-17	-17	T	<EQL (1)	7.1	20.4	<EQL (5)	27.5	<EQL (1)	<EQL (1)
CRP 51A	MNA Monitoring Well	MAZ_TC	16-Nov-23	2.43	162.55	2.7	5.3	3	16.1	1	46.3	1.1	211	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	2.19
			3-Dec-24	2.56	162.42	14.5	5.5	3	14.1	1	19	4.66	108	108	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)
CRP 51B	MNA Monitoring Well	MAZ_TC	16-Nov-23	1.97	161.71	3.9	5	0	17.3	1	18.5	1.3	246	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	4.53
			3-Dec-24	1.89	161.79	14	4.8	0	15.8	1	19	4.78	175	175	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)
CRP 52A	MNA Monitoring Well	MAZ_TC	16-Nov-23	3.36	165.27	13.4	5.1	0	15.8	2	17.6	1.2	202	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	<EQL (1)
			3-Dec-24	1.54	167.09	3.9	4.5	0	12	1	19	3.99	196	196	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)
CRP 52B	MNA Monitoring Well	MAZ_TC	16-Nov-23	1.3	163.38	4.7	6	16	14	1	59.6	1.1	218	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	<EQL (1)
			3-Dec-24	4.38	160.3	10.1	5.2	4	8.6	2	37	4.21	83	83	T	<EQL (1)	<EQL (1)	[0.78]	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)
CRP 3D	Monitoring Well	TZ_UAZ_UTRAU	13-Nov-23	64.2	203.5	4.3	5.7	10	18.7	0	43	4.4	251	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	7.49
			3-Dec-24	64.72	202.98	46.7	5	0	17.4	0	46	4.1	NS	NS	T	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)
CRP 5C	Monitoring Well	LAZ_UTRAU	13-Nov-23	83.6	193.7	3.6	6.3	8	18.3	0	68	4.2	164	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	5.14	<EQL (1)	<EQL (1)
			19-Nov-24	82.92	194.38	2.5	6.5	16	19.4	0	134	4.1	NS	NS	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	8.27	<EQL (1)
CRP 5D	Monitoring Well	TZ_UAZ_UTRAU	13-Nov-23	71	205.9	9.7	6.6	42	18.1	0	13	0	217	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	<EQL (1)
			19-Nov-24	71.01	205.89	4.3	5.9	5	18.9	0	17	4.4	NS	NS	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)
CRP 6DR	Monitoring Well	TZ_UAZ_UTRAU	13-Nov-23	60.1	203.8	1.1	5.4	8	18.9	6	24	4.1	246	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	<EQL (1)
			20-Nov-24	59.42	204.48	1.4	5.1	0	19.3	5	28	4.2	0	0	NC	<EQL (1)	<EQL (1)	<EQL (1)	[1.96]	NS	<EQL (1)	<EQL (1)

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Table A-1, CBRP OU Monitoring Results, 2023 and 2024 (continued)			Field Data										VOCs									
			SAMPLE COLLECTION DATE	DEPTH TO WATER	WATER ELEVATION	TURBIDITY	PH	TOTAL ALKALINITY (AS CaCO3)	WATER TEMPERATURE	VOLUME PURGED	SPECIFIC CONDUCTANCE	DISSOLVED OXYGEN	OXIDATION/REDUCTION POTENTIAL	FIELD CONDITIONS	1,1-DICHLOROETHYLENE	CHLOROETHENE (VINYL CHLORIDE)	CIS-1,2-DICHLOROETHYLENE	DICHLOROMETHANE (METHYLENE CHLORIDE)	ETHYLENE	TETRACHLOROETHYLENE (PCE)	TRANS-1,2-DICHLOROETHYLENE	TRICHLOROETHYLENE (TCE)
Station	Well Use	Aquifer Zone				15								7	2	70	5		5	100	5	
CRP 8D	Monitoring Well	TZ_UAZ_UTRAU	13-Nov-23	45.9	202.8	0.9	5.2	6	18.7	6	20	4.4	263	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	<EQL (1)
			3-Dec-24	46.24	202.46	1.5	4.8	0	18.5	6	21	NS	NS	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	<EQL (1)
CRP 18C	Monitoring Well	MAZ_UTRAU	14-Nov-23	62.79	195.51	1.2	5.8	5	17.5	2	26	NS	NS	NC	<EQL (1)	<EQL (1)	1.67	<EQL (5)	NS	[0.57]	<EQL (1)	60.7
			16-Dec-24	63.25	195.05	3.1	5.3	0	18	1	28	NS	NS	NC	<EQL (1)	<EQL (1)	1.16	<EQL (5)	NS	[0.6]	<EQL (1)	45.4
CRP 18D	Monitoring Well	TZ_UAZ_UTRAU	14-Nov-23	55.08	203.32	3.3	5.6	5	18.3	2	38	NS	NS	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	6.09
			3-Dec-24	57.52	200.88	7.3	5.8	3	19.2	1	36	NS	NS	NC	<EQL (1)	<EQL (1)	1.1	<EQL (5)	NS	<EQL (1)	<EQL (1)	15.3
CRP 20CL	Monitoring Well	LAZ_UTRAU	14-Nov-23	39.5	181.41	0.1	5.5	6	19.4	16	22	4.2	227	NC	<EQL (1)	<EQL (1)	1.49	<EQL (5)	NS	[0.7]	<EQL (1)	41.9
			16-Dec-24	39.12	181.79	0.3	5.2	0	19.3	15	23	NS	NS	NC	<EQL (1)	<EQL (1)	1.66	<EQL (5)	NS	[0.71]	<EQL (1)	45.4
CRP 20CU	Monitoring Well	MAZ_UTRAU	14-Nov-23	32.5	188.7	1.3	5.5	8	20	8	24	4.4	241	NC	<EQL (1)	[0.37]	38.3	<EQL (5)	NS	1.32	[0.49]	2510
			16-Dec-24	33.8	187.4	46.7	5	0	17.4	9	46	NS	NS	NC	<EQL (1)	<EQL (1)	34.5	<EQL (5)	NS	1.5	[0.41]	2280
CRP 22CL	Monitoring Well	LAZ_UTRAU	14-Nov-23	30	174.67	5.1	5.6	6	19	10	25	4.2	223	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	[0.67]
			3-Dec-24	29.67	175	2.8	4.8	0	19.8	9	23	NS	NS	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	[0.86]
CRP 22CU	Monitoring Well	TZ_UAZ_UTRAU	14-Nov-23	23.1	181.03	1.6	5.2	0	19.2	8	21	4.4	229	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	1.98
			3-Dec-24	22.58	181.55	2.5	4.9	0	19.8	5	23	NS	NS	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	7.82
CRP022A	Monitoring Well	GAU	14-Nov-23	54.2	150.52	4.7	6	16	18.6	0	148	4.1	218	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	<EQL (1)
			3-Dec-24	54.2	150.52	5.5	6.1	32	16.4	0	281	NS	NS	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	<EQL (1)
CRW 10A	Monitoring Well	GAU	14-Nov-23	91.68	157.31	90.1	7.4	31	16.3	6	112	NS	NS	T	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	<EQL (1)
			21-Nov-24	91.15	157.49	98.9	7.1	33	17.7	8	114	NS	NS	T	<EQL (1)	<EQL (1)	<EQL (1)	[2.13]	NS	<EQL (1)	<EQL (1)	<EQL (1)
CRW 10C	Monitoring Well	LAZ_UTRAU	14-Nov-23	63.84	185.15	4.3	6.2	8	16.7	1	22	NS	NS	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	[0.99]	<EQL (1)	5
			21-Nov-24	61.05	187.78	2.3	5.9	3	17.9	1	22	NS	NS	NC	<EQL (1)	<EQL (1)	<EQL (1)	[1.99]	NS	1.49	<EQL (1)	5.17
CRW 12A	Monitoring Well	GCU	20-Nov-23	79.71	153.86	1	5.8	3	18.9	3	60	2.4	168	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	<EQL (1)
			3-Dec-24	79.82	153.75	1.5	5.8	4	17.7	3	61	NS	NS	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	<EQL (1)
CRW 12C	Monitoring Well	MAZ_TC	20-Nov-23	50.37	183.2	1.3	5.3	1	18.7	1	32	5.78	222	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	<EQL (1)
			3-Dec-24	50.02	182.55	1.1	5.4	3	17.9	1	33	NS	NS	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	<EQL (1)
CRW 12D	Monitoring Well	TCCZ	20-Nov-23	45.14	188.43	2	4.9	0	18.6	1	43	4.73	258	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	<EQL (1)
			3-Dec-24	44.88	188.69	0.2	4.8	0	17.5	1	44	NS	NS	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	<EQL (1)	<EQL (1)	<EQL (1)
CRW010CU	Monitoring Well	LAZ_UTRAU	14-Nov-23	62.08	186.75	0.9	6.5	13	15.7	0	49	NS	NS	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	NS	[0.75]	<EQL (1)	9.15
			21-Nov-24	62.6	186.23	2.2	6.6	6	14.2	0	44	NS	NS	NC	<EQL (1)	<EQL (1)	<EQL (1)	[2.29]	NS	1.34	<EQL (1)	10.8

Table A-1, CBRP OU Monitoring Results, 2023 and 2024 (continued, end)			Field Data										VOCs									
			SAMPLE COLLECTION DATE	DEPTH TO WATER	WATER ELEVATION	TURBIDITY	PH	TOTAL ALKALINITY (AS CaCO3)	WATER TEMPERATURE	VOLUME PURGED	SPECIFIC CONDUCTANCE	DISSOLVED OXYGEN	OXIDATION/REDUCTION POTENTIAL	FIELD CONDITIONS	1,1-DICHLOROETHYLENE	CHLOROETHENE (VINYL CHLORIDE)	CIS-1,2-DICHLOROETHYLENE	DICHLOROMETHANE (METHYLENE CHLORIDE)	ETHYLENE	TETRACHLOROETHYLENE (PCE)	TRANS-1,2-DICHLOROETHYLENE	TRICHLOROETHYLENE (TCE)
			day-month-year	ft	ft	NTU	pH	mg/L	degC	gal	uS/cm	mg/L	mV		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Station	Well Use	Aquifer Zone			15								7	2	70	5		5	100	5		
TL 01	Surface Water	TZ_UAZ_UTRAU	20-Nov-23	NS	NS	23.8	5.8	4	13.4	NS	24	2.68	147	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	<EQL (1)
			26-Nov-24	NS	NS	13.8	5.5	5	12.5	NS	29	1.9	86	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	<EQL (1)
TL 02	Surface Water	TZ_UAZ_UTRAU	20-Nov-23	NS	NS	6.8	7.5	14	13.5	NS	18	3.89	106	NC	<EQL (1)	<EQL (1)	[0.71]	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	2.64
			26-Nov-24	NS	NS	2.1	5.3	3	12.4	NS	18	2.8	180	NC	<EQL (1)	<EQL (1)	[0.65]	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	3.11
TL 03	Surface Water	MAZ_TC	20-Nov-23	NS	NS	8.4	7.2	13	13.1	NS	77	4.76	139	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	<EQL (1)
			26-Nov-24	NS	NS	4.1	5.9	11	13.2	NS	55	3.88	243	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	<EQL (1)
TL 04	Surface Water	MAZ_TC	20-Nov-23	NS	NS	4.9	7.1	7	13.3	NS	5.21	5.21	103	NC	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	<EQL (1)
			26-Nov-24	NS	NS	6.4	5.6	3	12.1	NS	21	2.6	115	NC	<EQL (1)	<EQL (1)	[0.43]	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	1.63
TL 05	Surface Water	TZ_UAZ_UTRAU	20-Nov-23	NS	NS	6.8	6.5	6	13.9	NS	23	4.78	121	NC	<EQL (1)	[0.36]	1.54	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	2.63
			26-Nov-24	NS	NS	5.8	5.1	3	12.5	NS	21	1.9	136	NC	<EQL (1)	<EQL (1)	1.12	<EQL (5)	<EQL (25)	<EQL (1)	<EQL (1)	1.4

Explanation

##	EPA Functional Guideline Code of 'J' was applied to the result, indicating an estimated quantity.
<EQL(##)	Constituent was below detection. The sample-specific Estimated Quantitation Limit is in parentheses.
REJ	Result exceeds applicable limit.
REJ	Result Rejected.
	Result is less than the applicable limit and without EPA Functional Guideline qualifiers.
NS	Requested to be sampled but was not. See comments as to why not.
Blue Text	Not a required sample analysis.

A	Abandoned
C	Continuously pumping well / flowing stream
D	Dry well. No sample collected.
NS	Not sampled.
T	High turbidity. Some portions of the sample may not be analyzed.
X	Well pumped dry. Samples collected after well recovered.
N	Field parameters not stable when sample collected.
NC	No comment.

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APPENDIX B

CBRP OU Hydrographs

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Figure B-1.

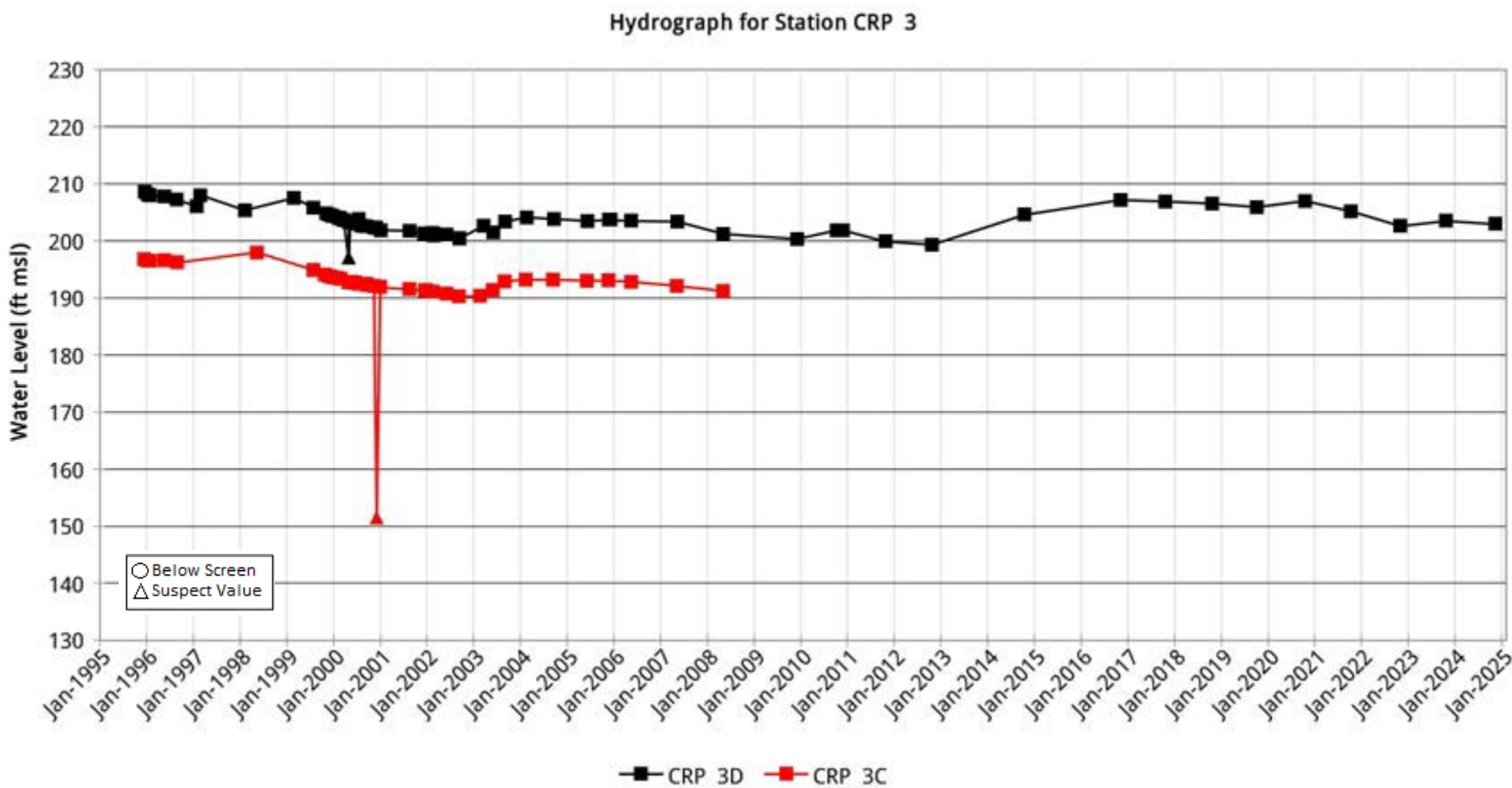


Figure B-2.

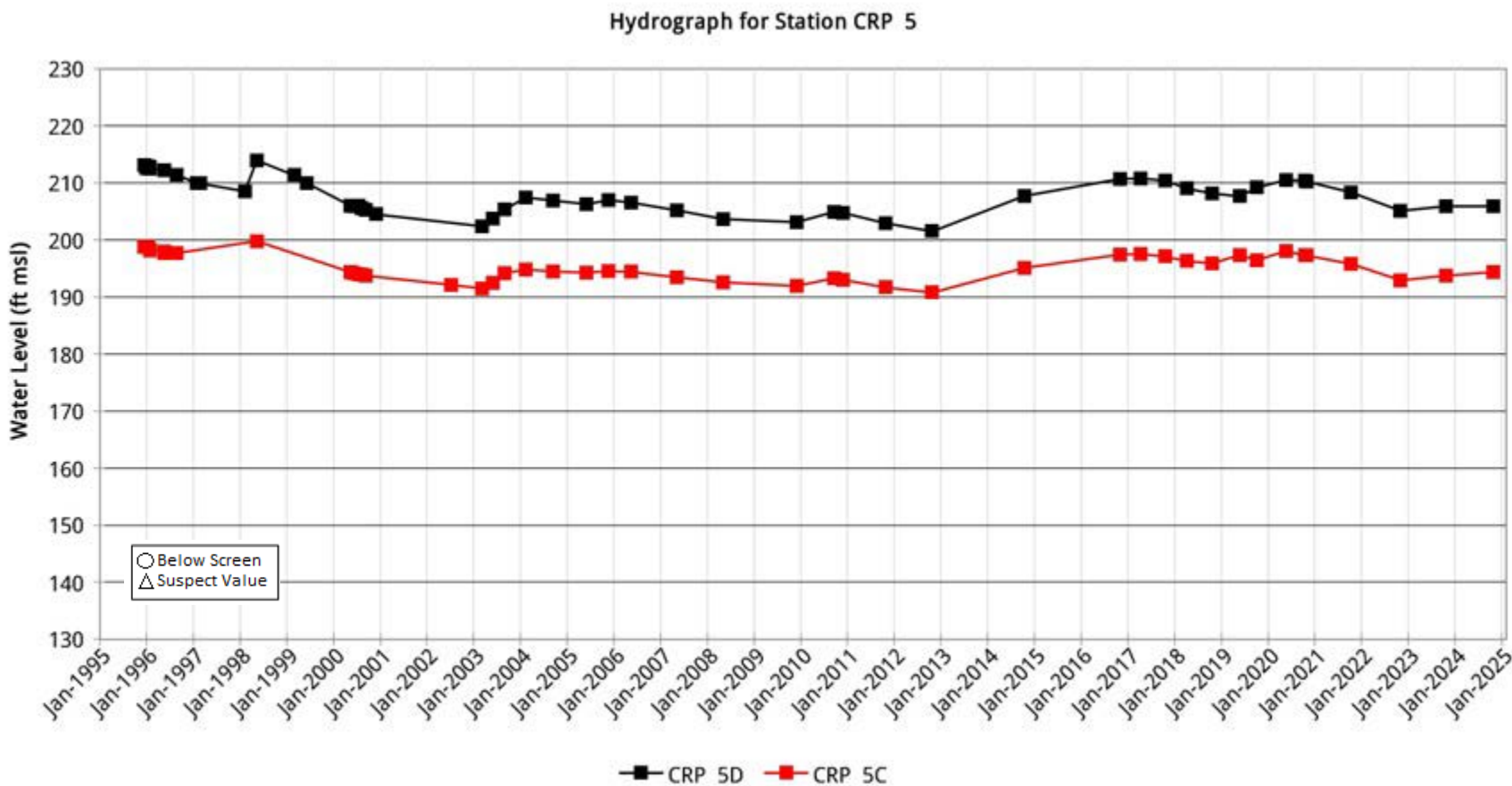


Figure B-3.

Hydrograph for Station CRP 6DR

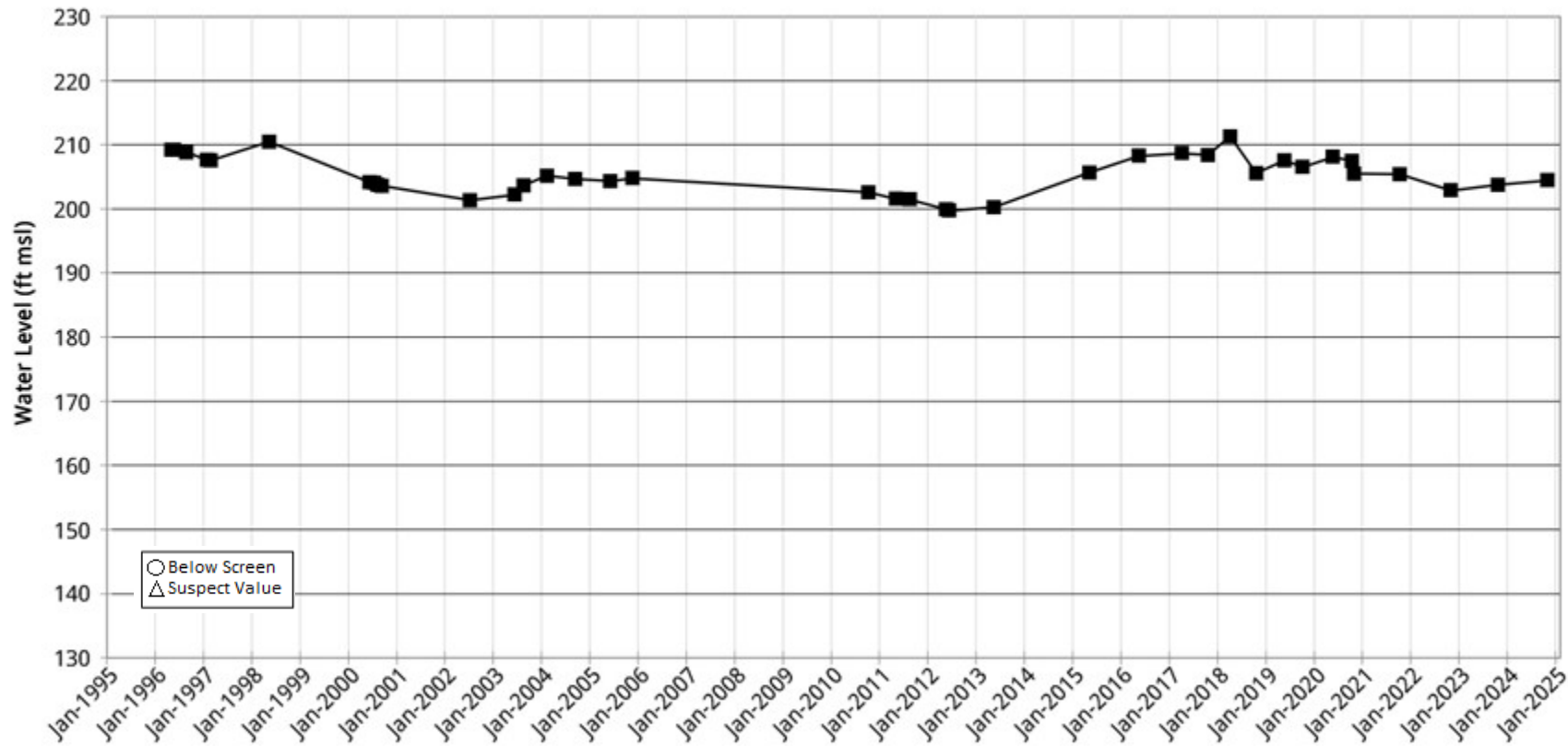


Figure B-4.

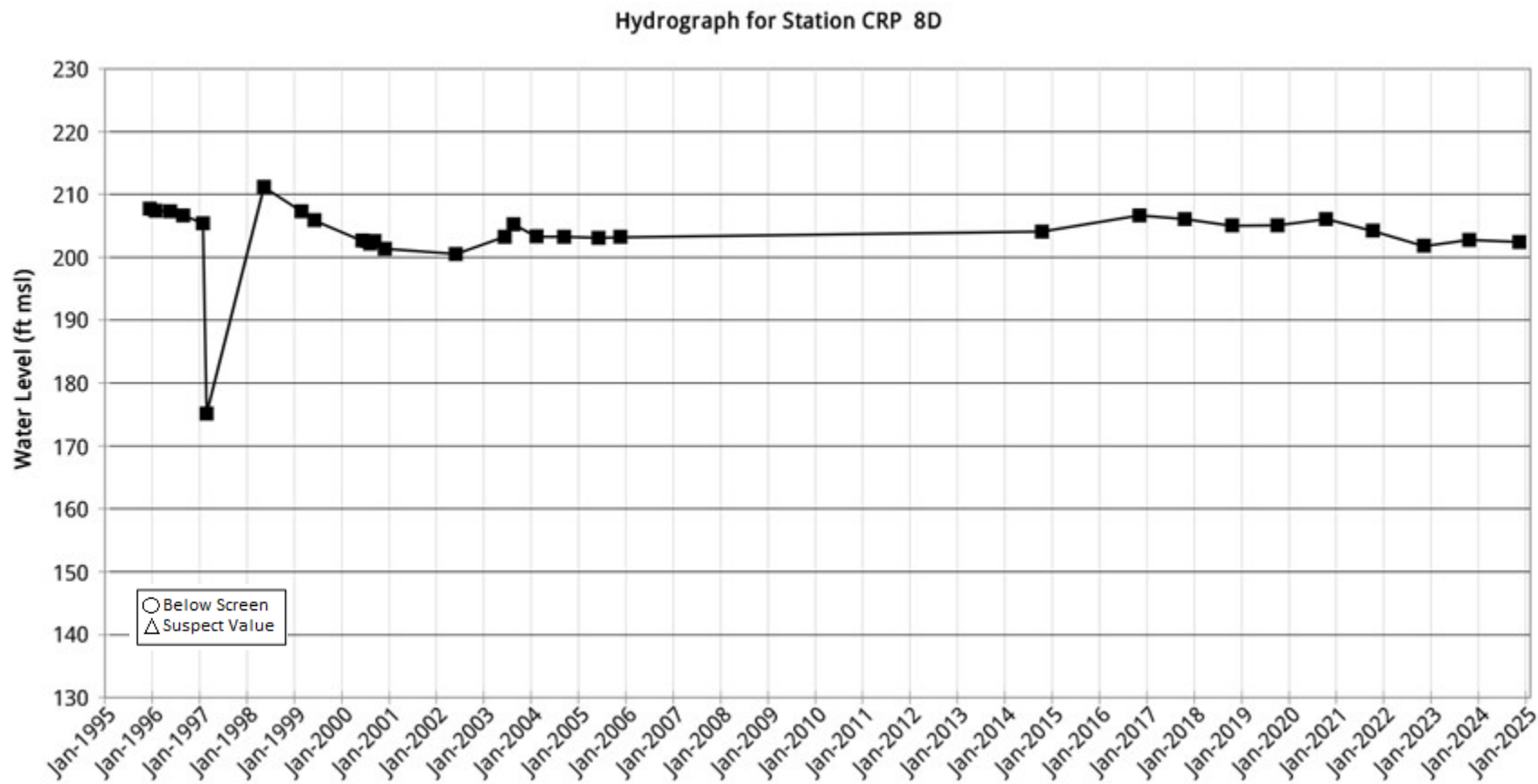


Figure B-5.

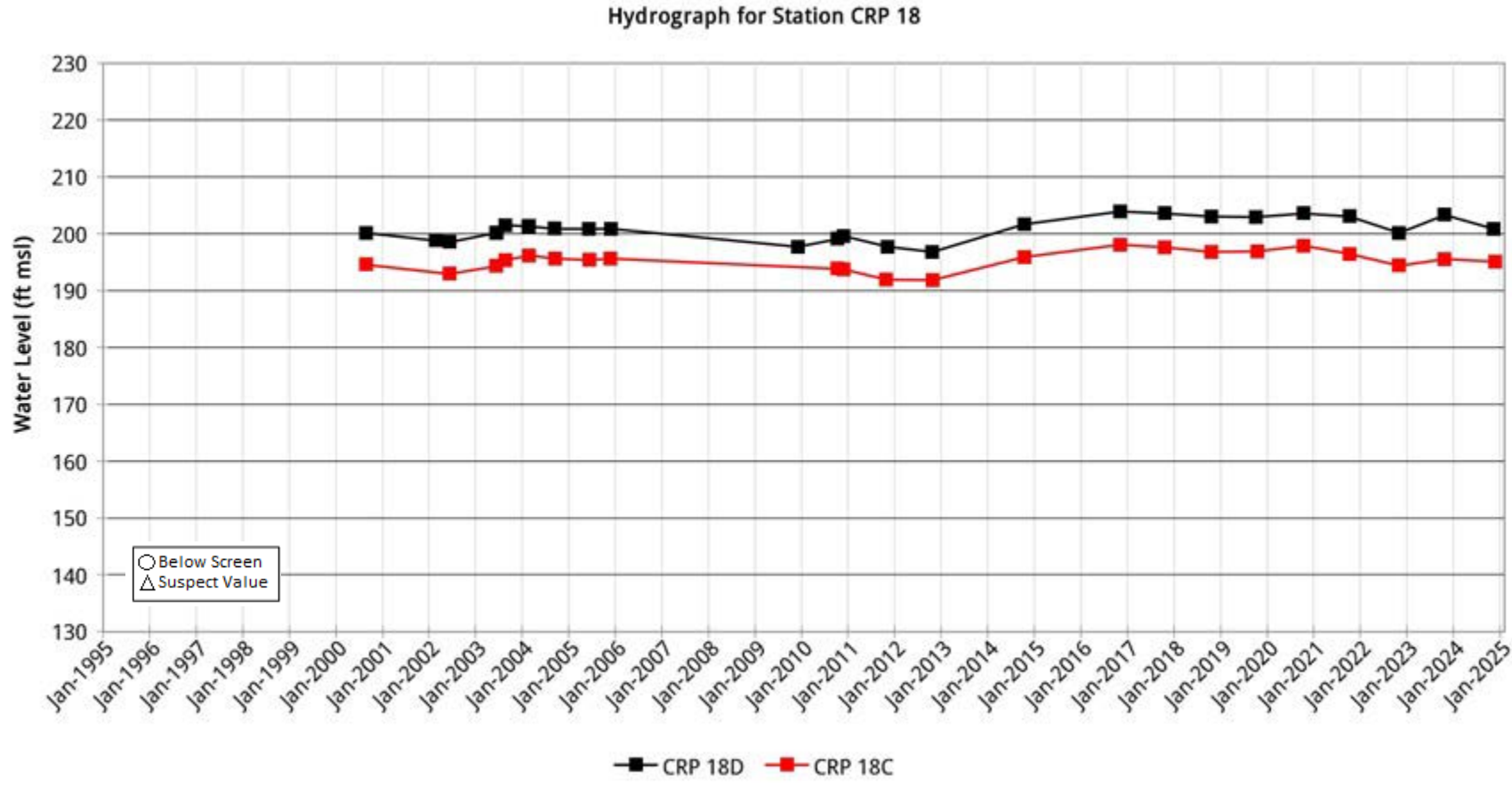


Figure B-6.

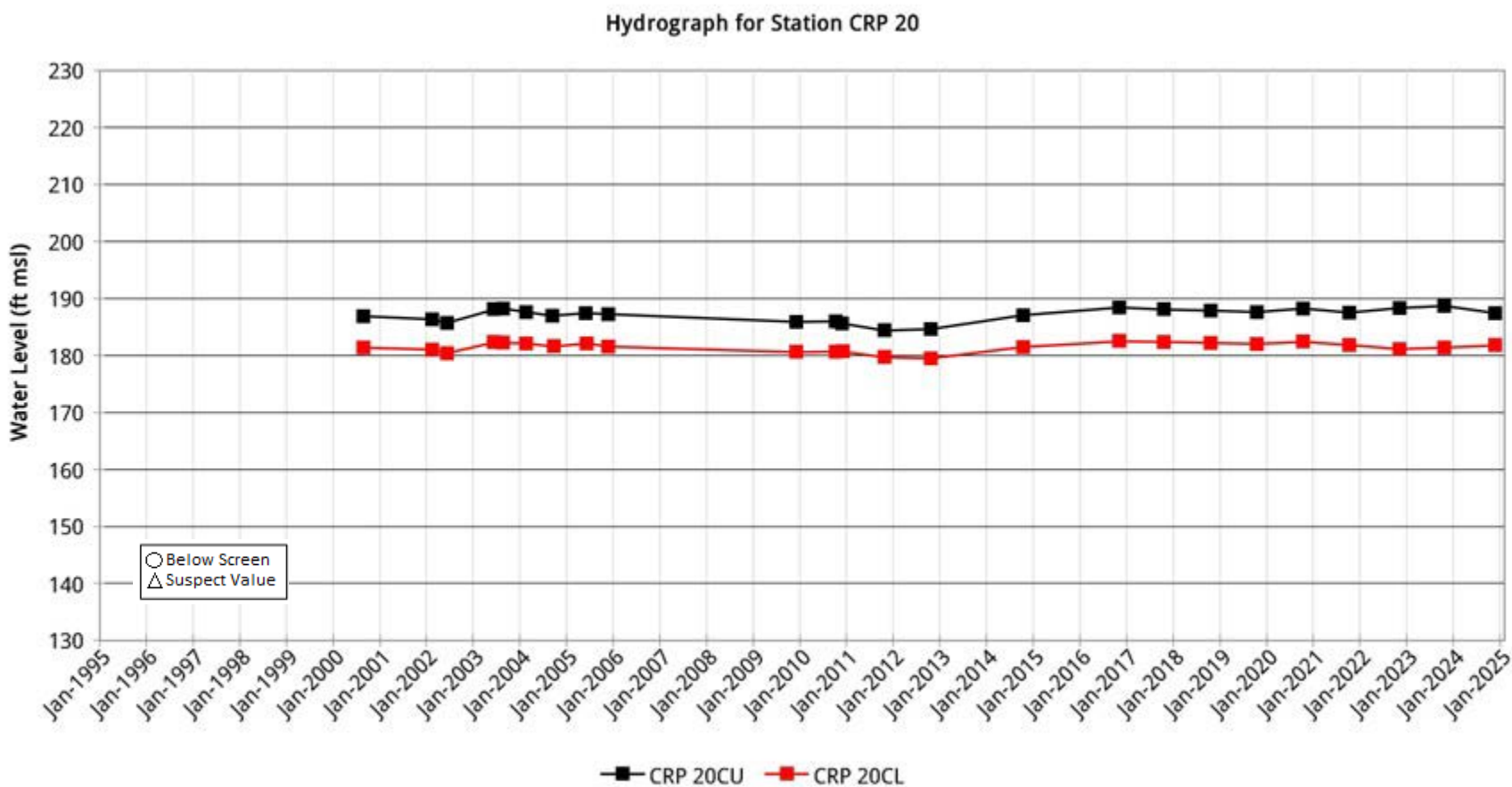


Figure B-7.

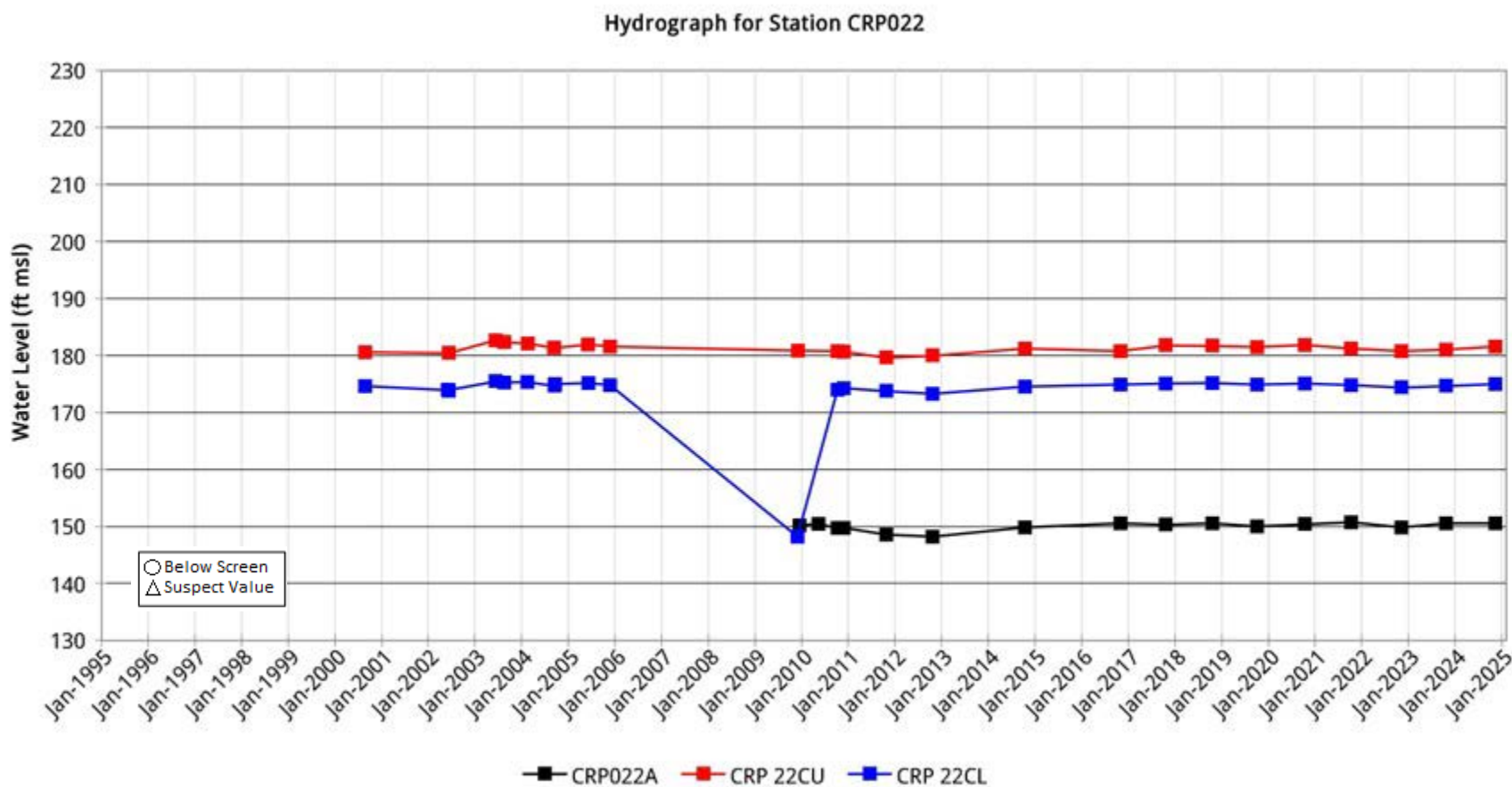


Figure B-8.

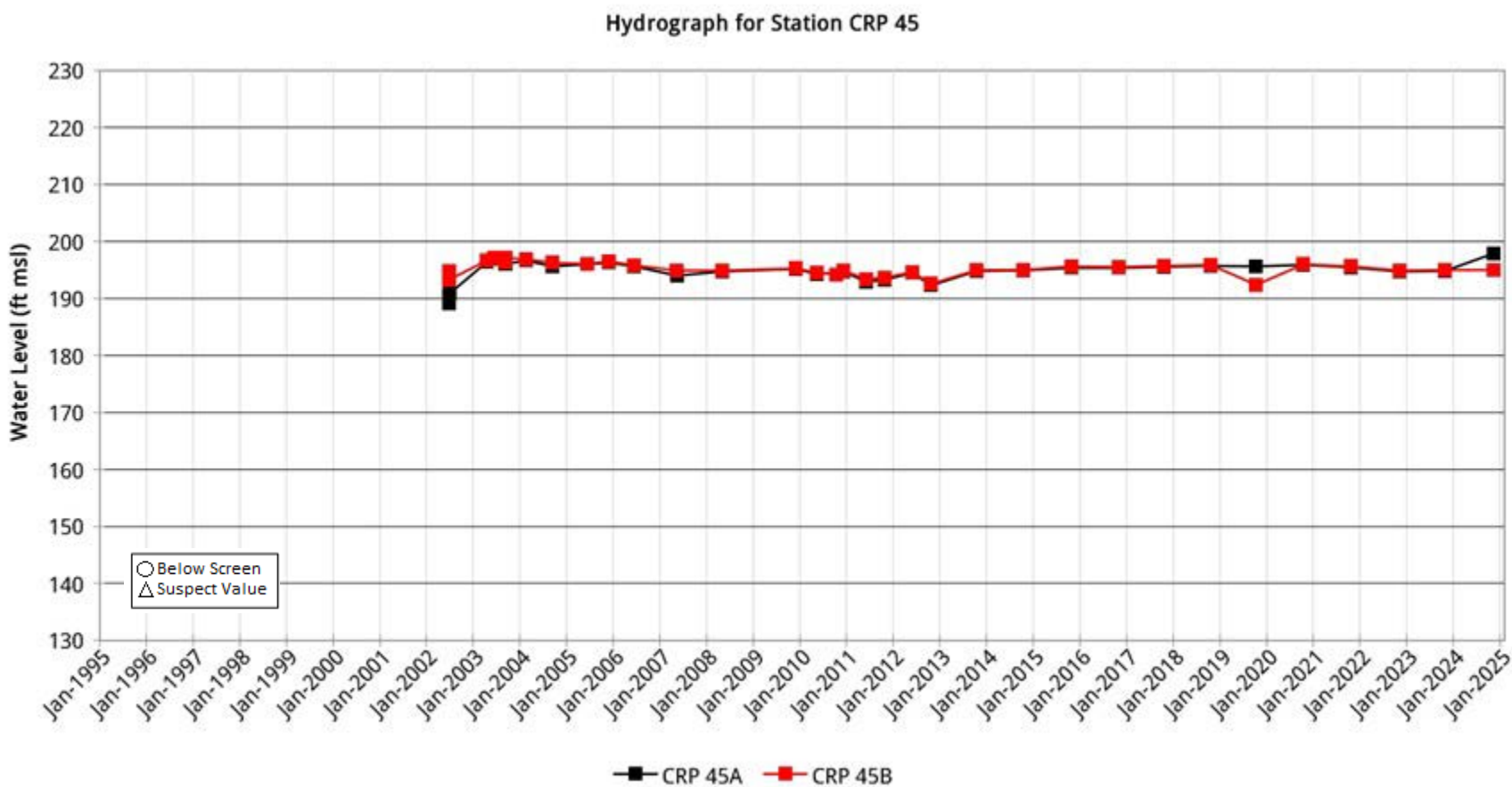


Figure B-9.

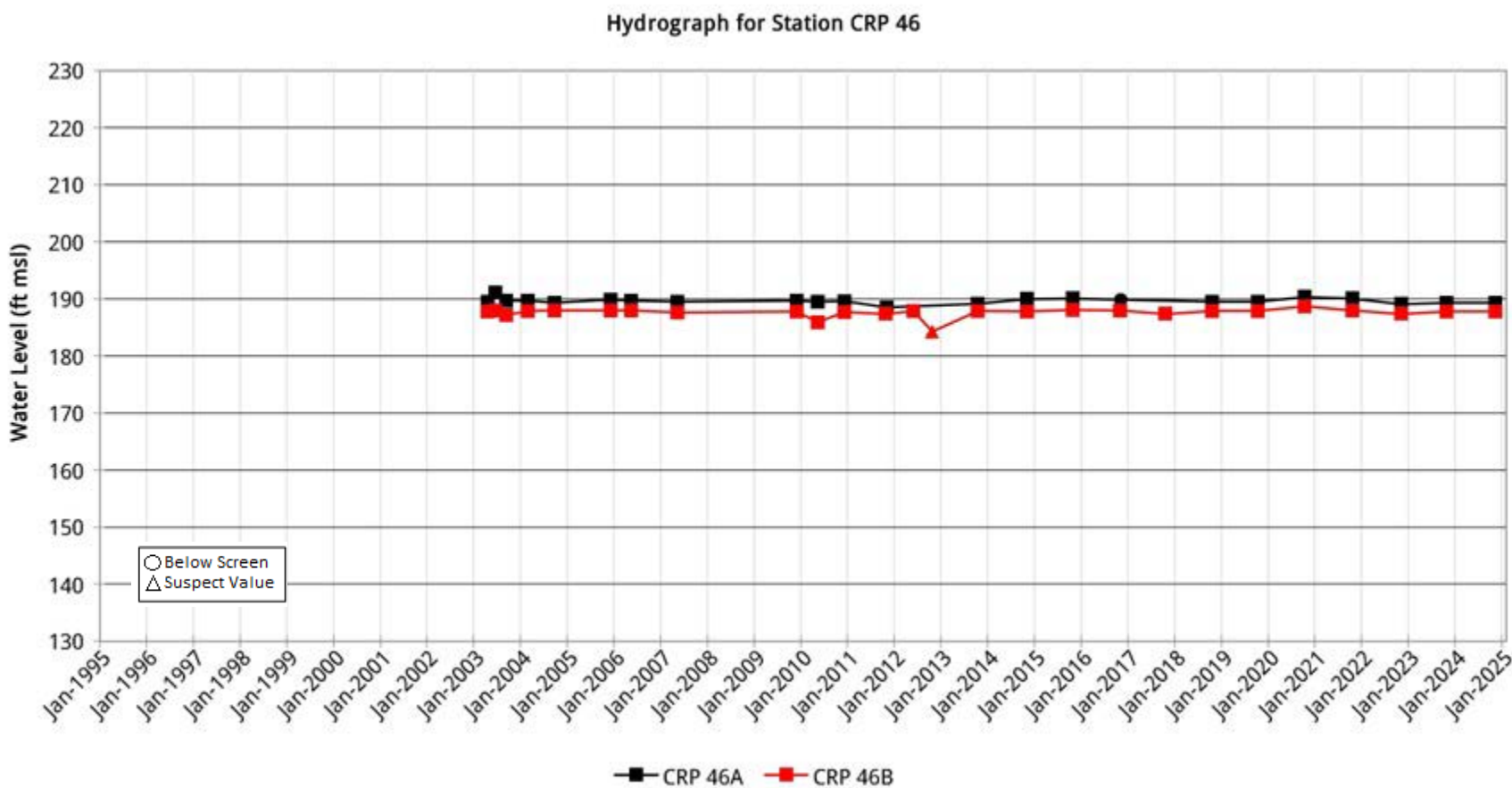


Figure B-10.

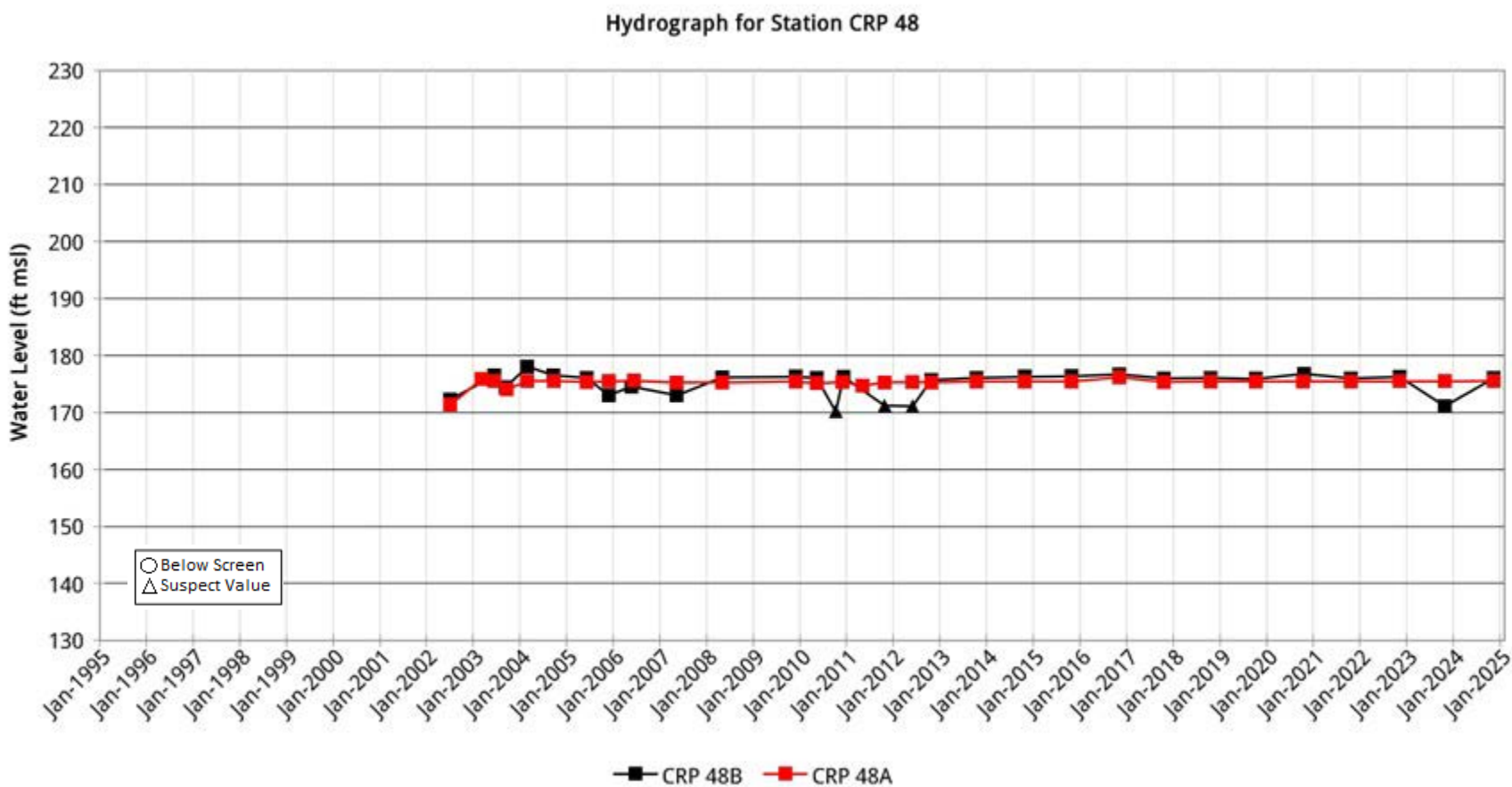


Figure B-11.

Hydrograph for Station CRP 50

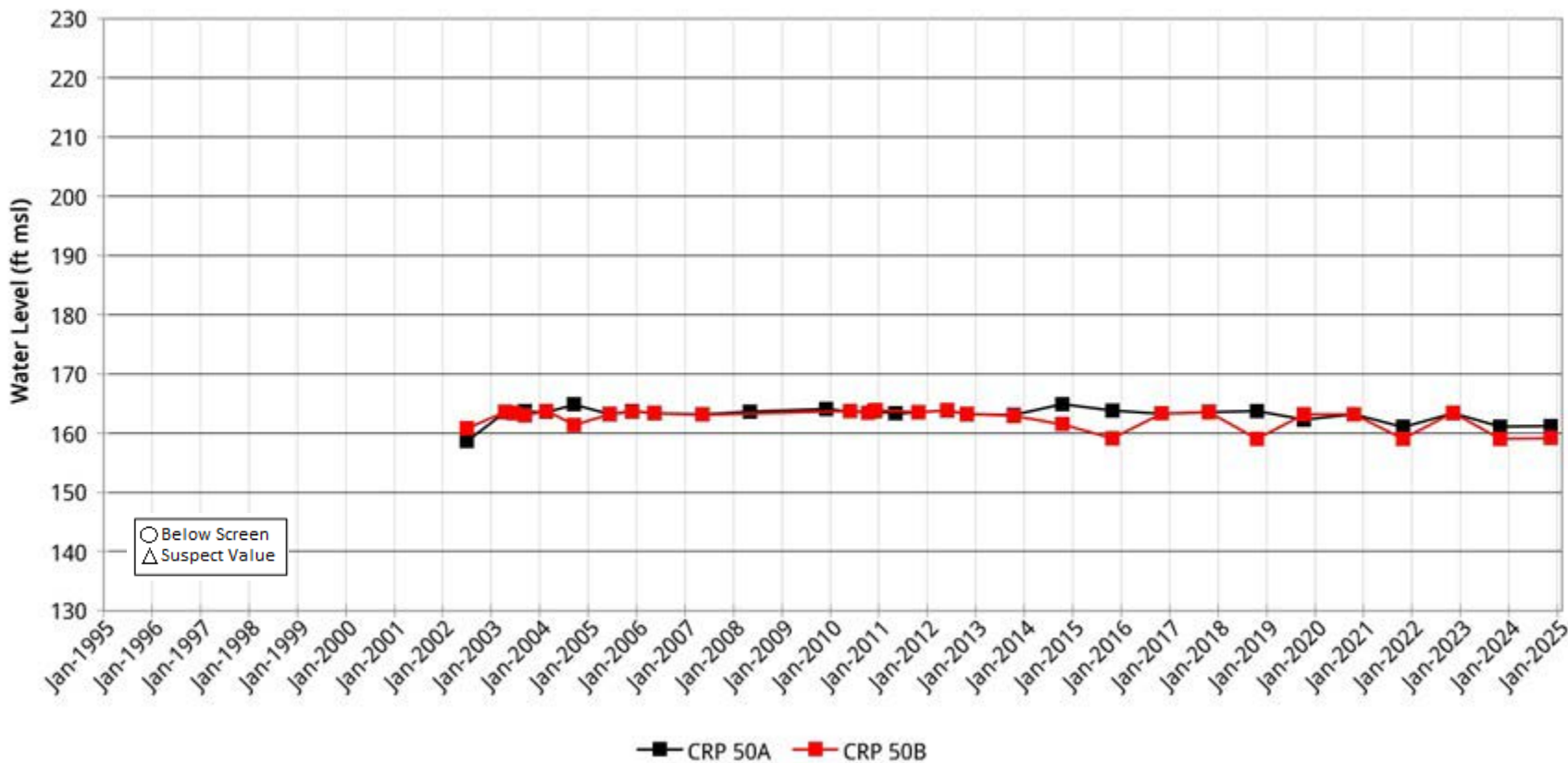


Figure B-12.

Hydrograph for Station CRP 51

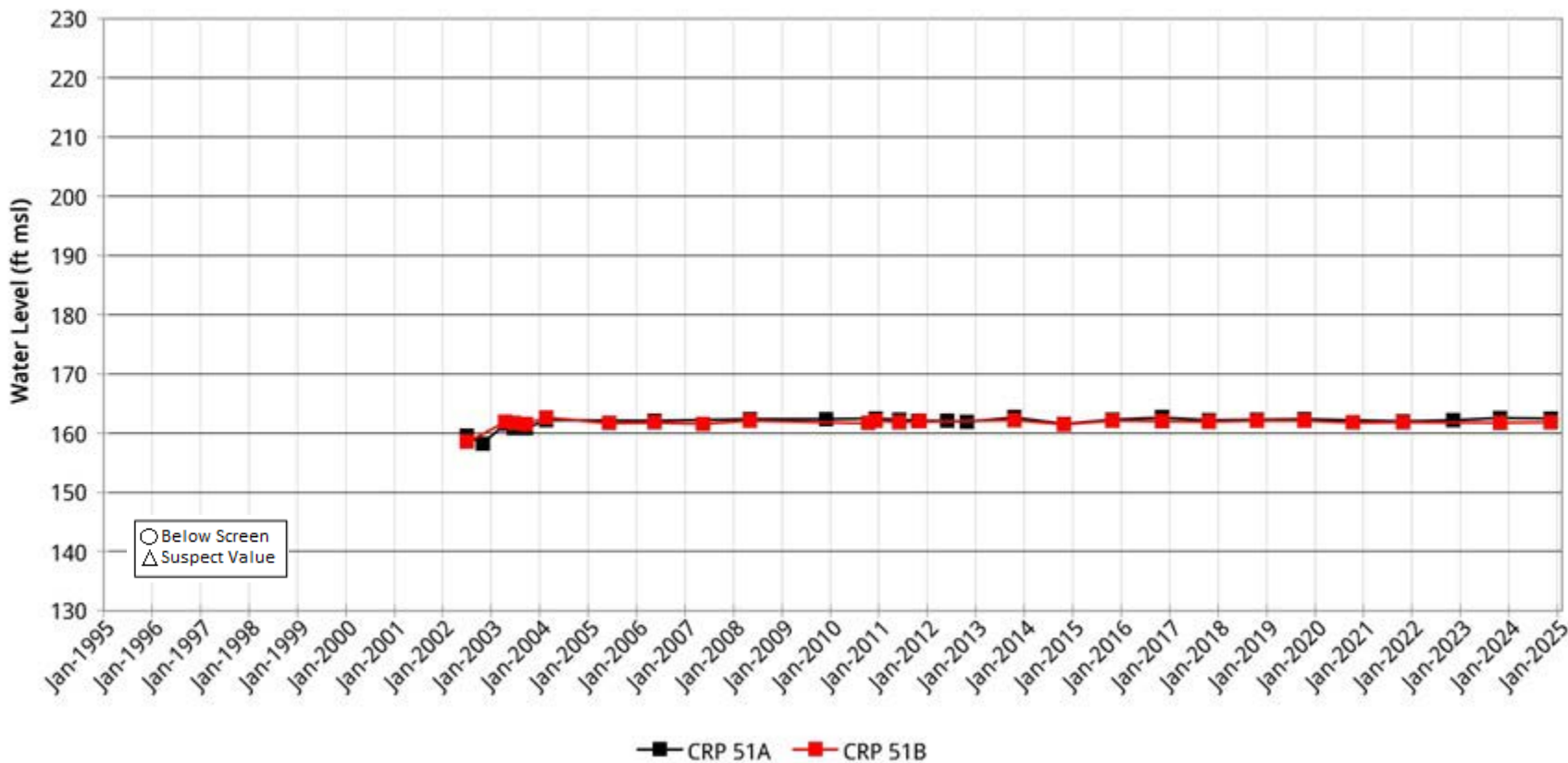


Figure B-13.

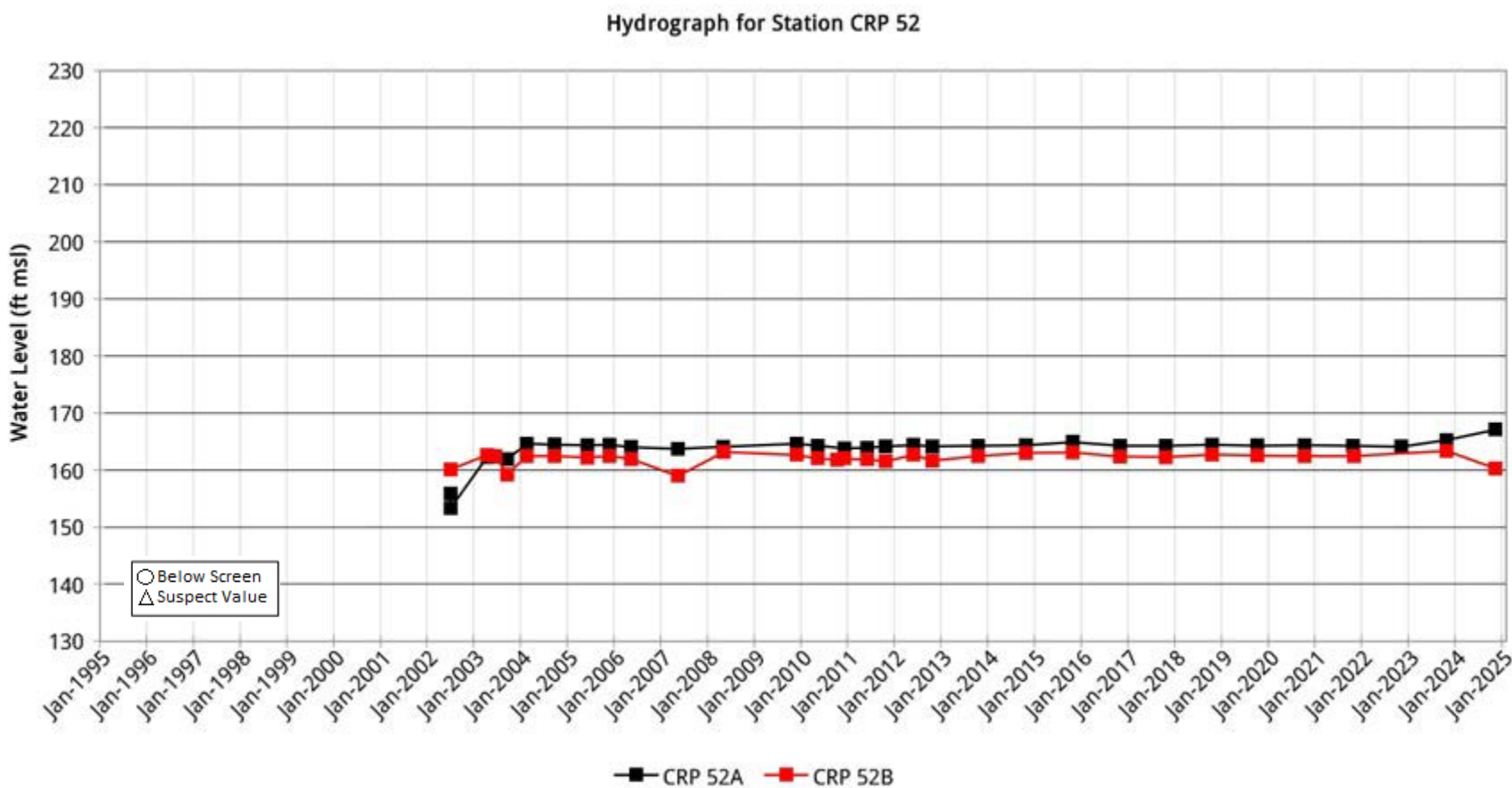


Figure B-14.

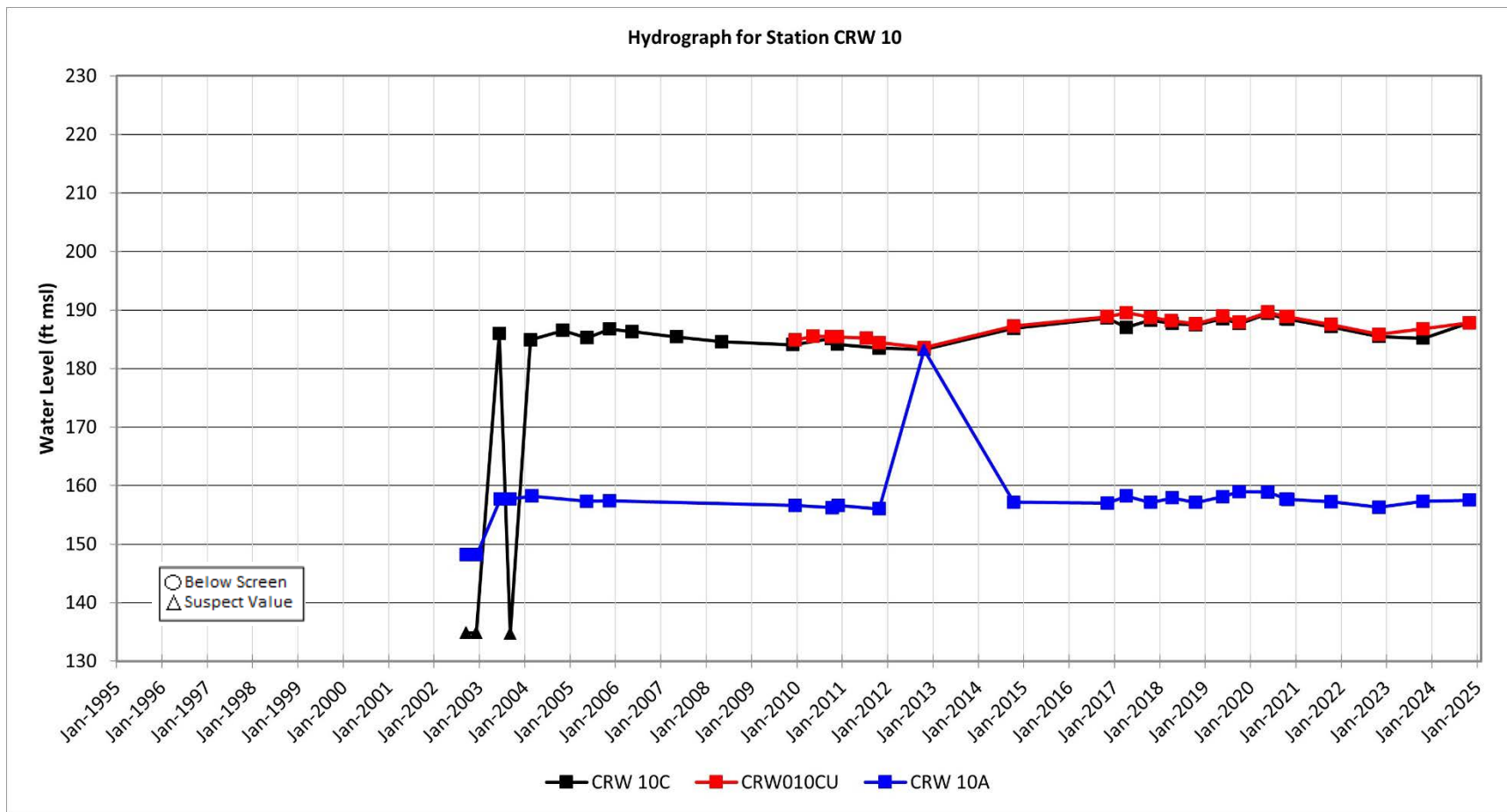
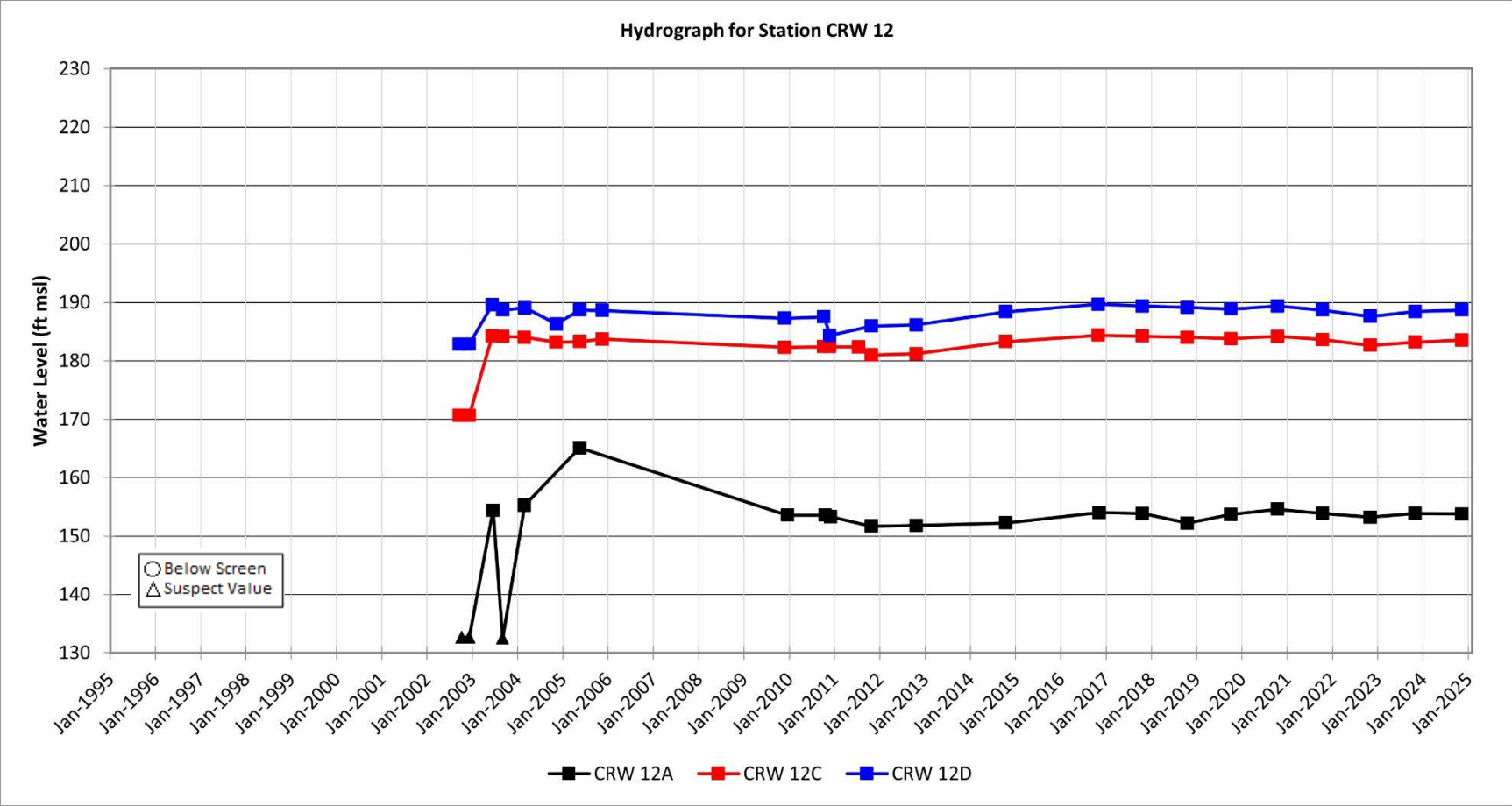


Figure B-15.



Biennial EMR for MNA at the CBRP OU (U) 2023-2024
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APPENDIX C

Time-Series Plots

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Figure C-1.

Time Series Plot for 1,1-Dichloroethylene Station for CRP 3

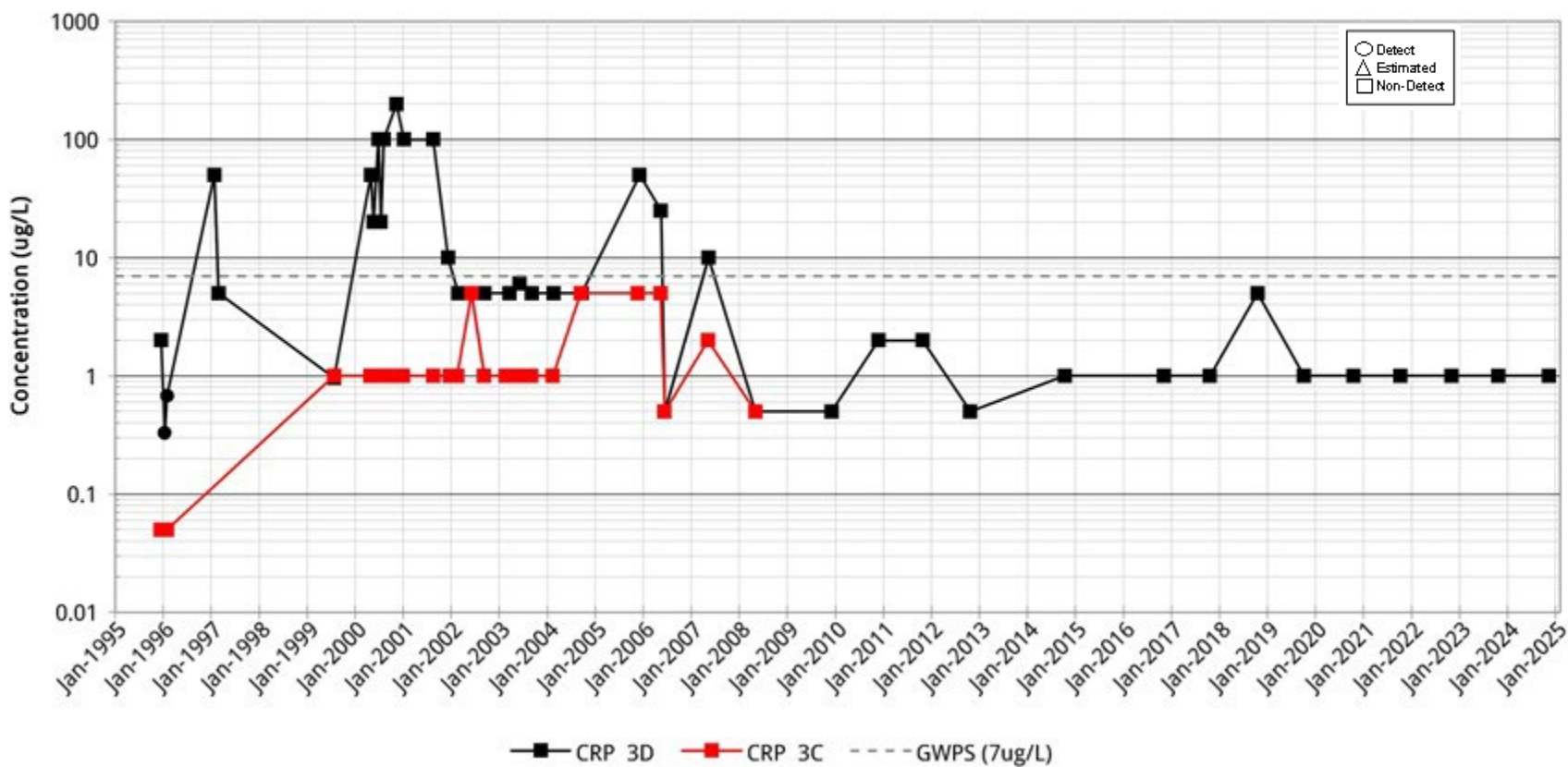


Figure C-2.

Time Series Plot for 1,1-Dichloroethylene Station for CRP 5

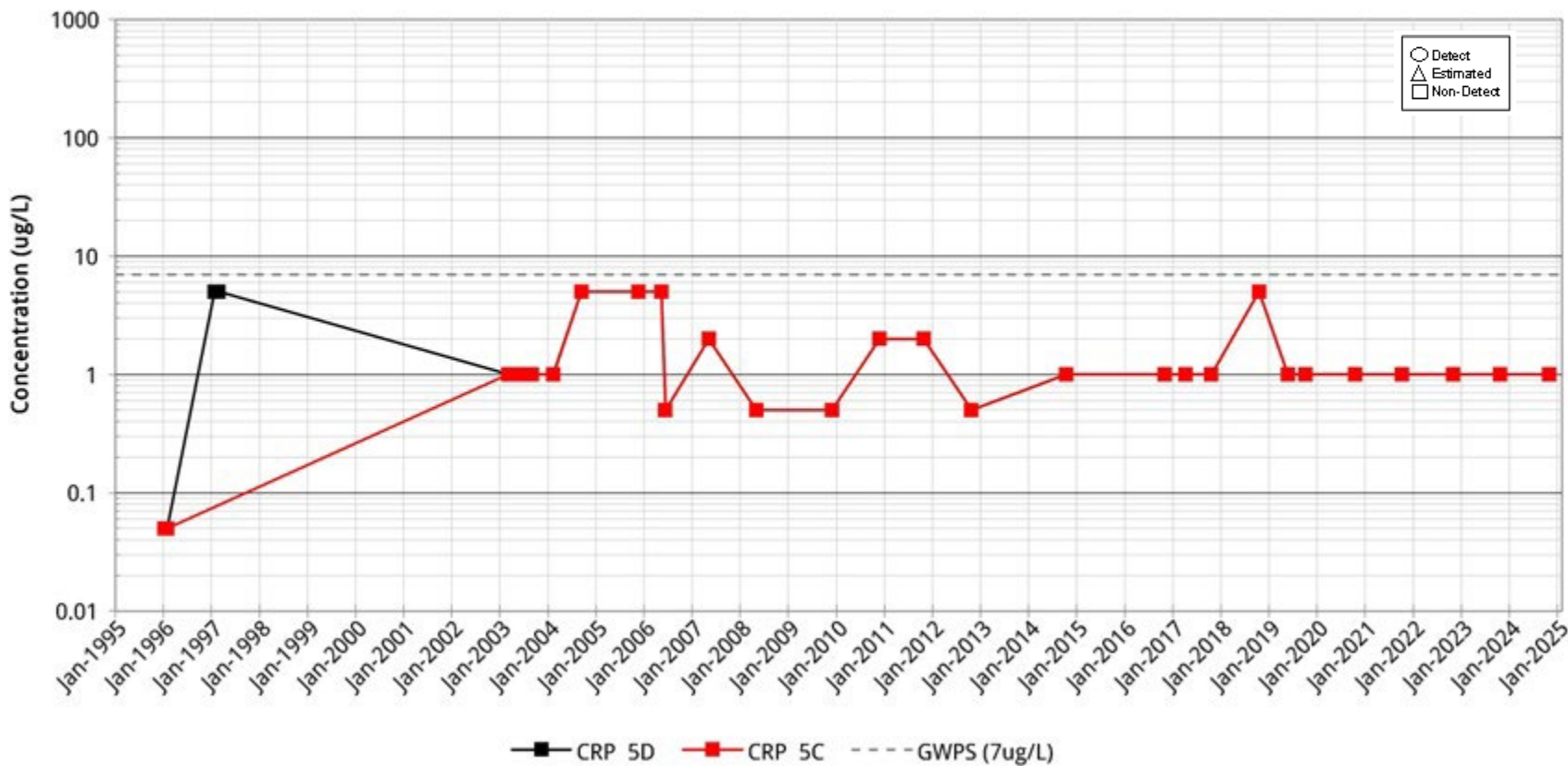


Figure C-3.

Time Series Plot for 1,1-Dichloroethylene Station for CRP 6

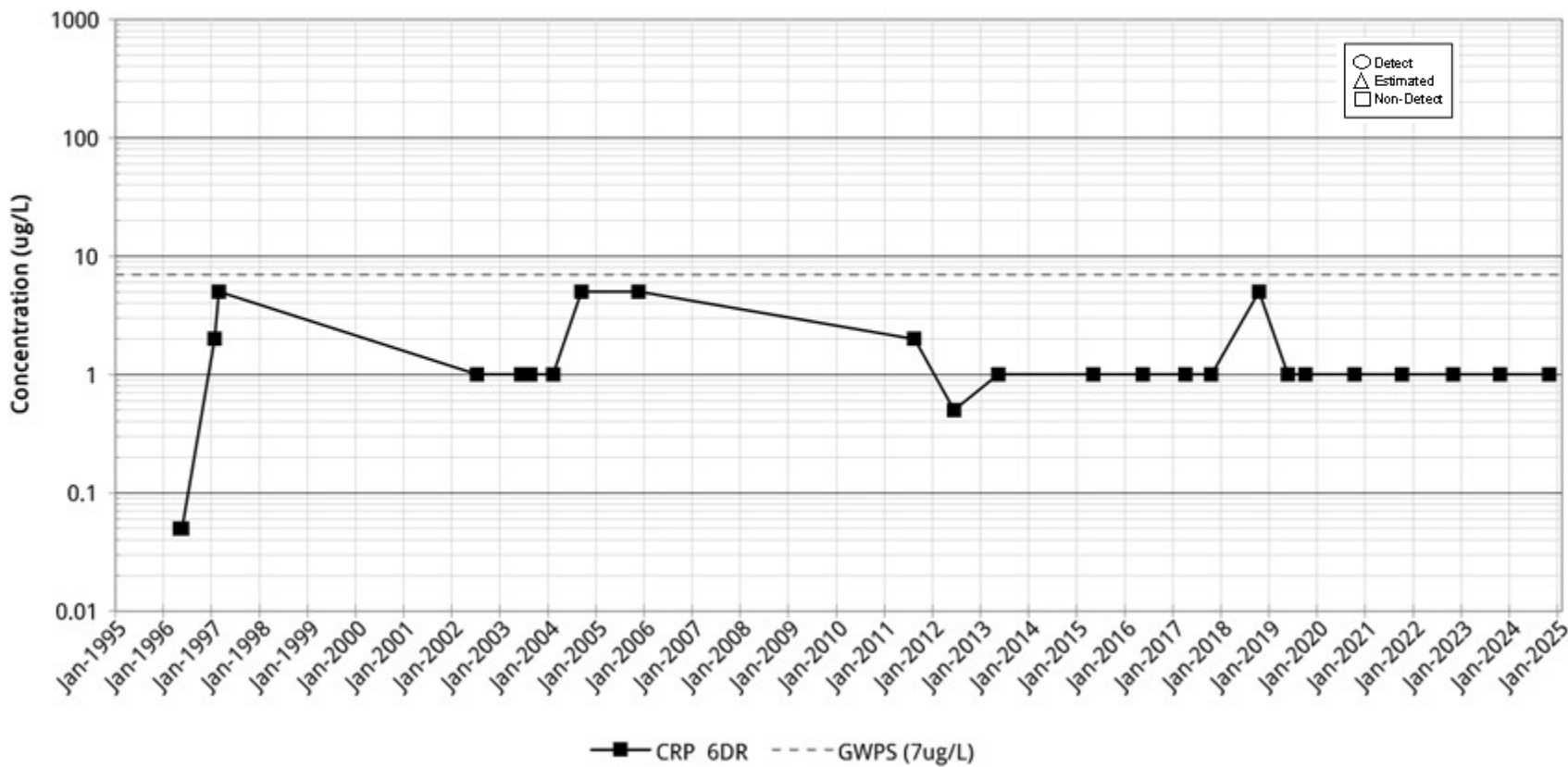


Figure C-4.

Time Series Plot for 1,1-Dichloroethylene Station for CRP 8

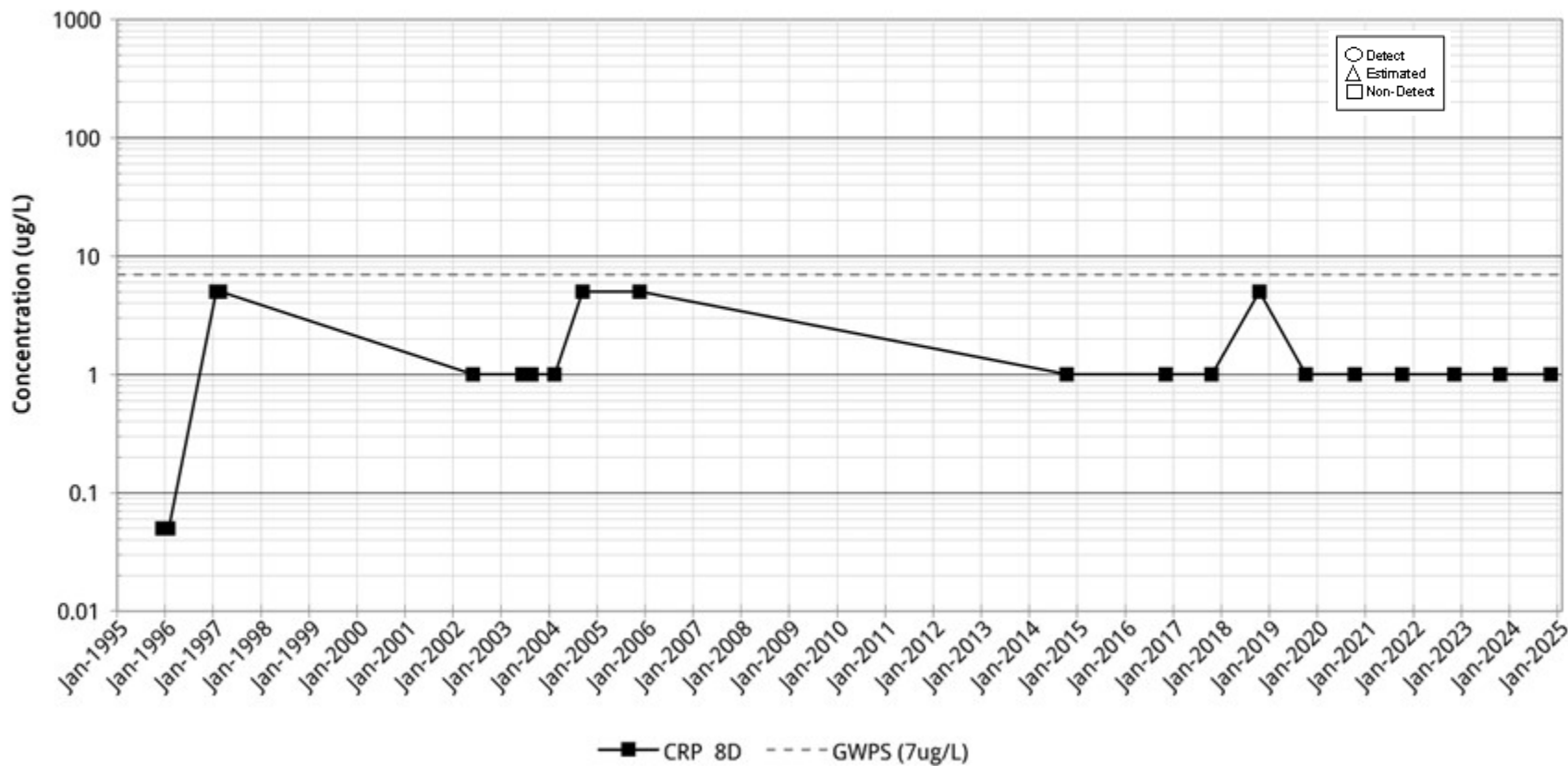


Figure C-5.

Time Series Plot for 1,1-Dichloroethylene Station for CRP 18

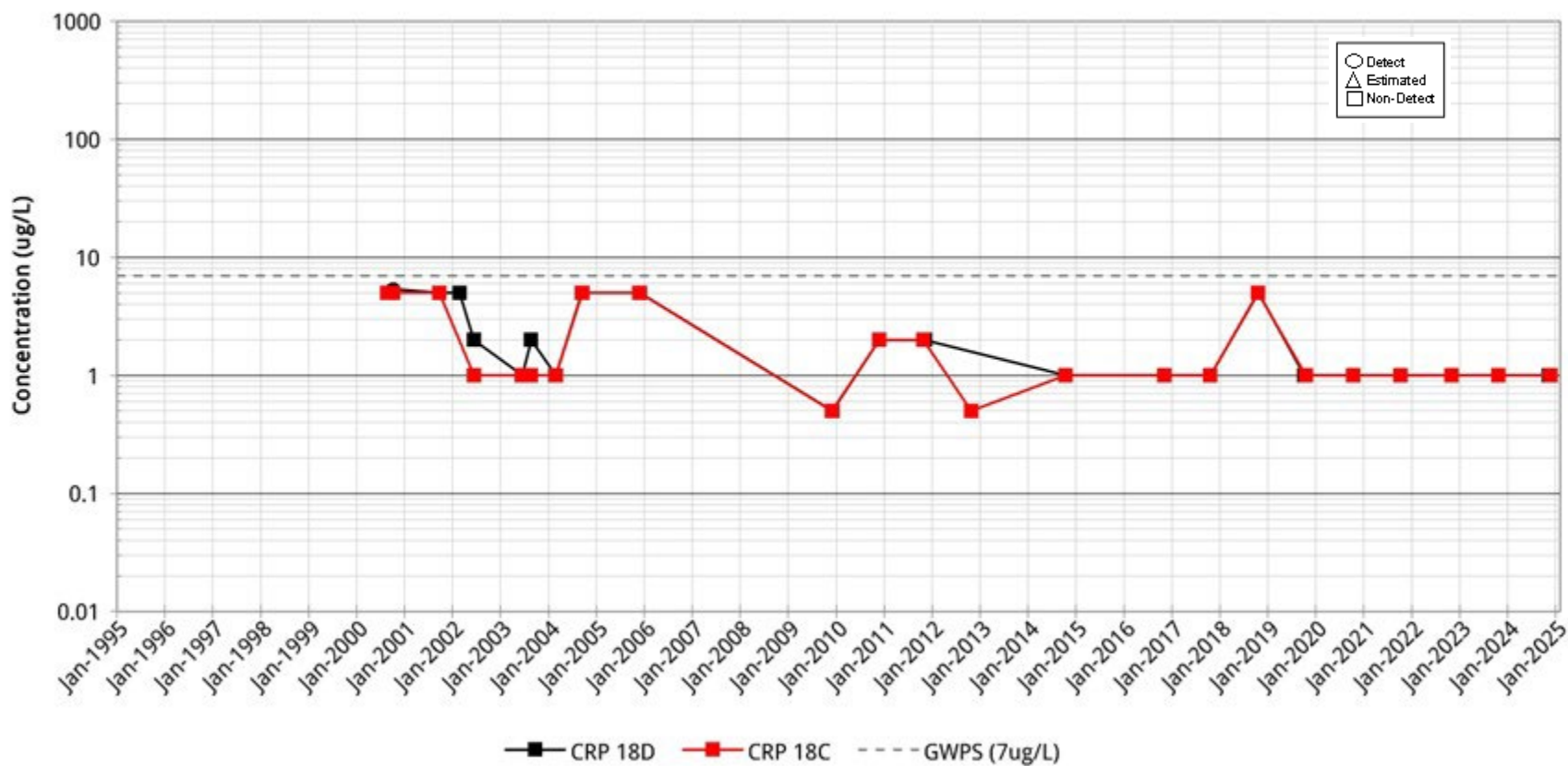


Figure C-6.

Time Series Plot for 1,1-Dichloroethylene Station for CRP 20

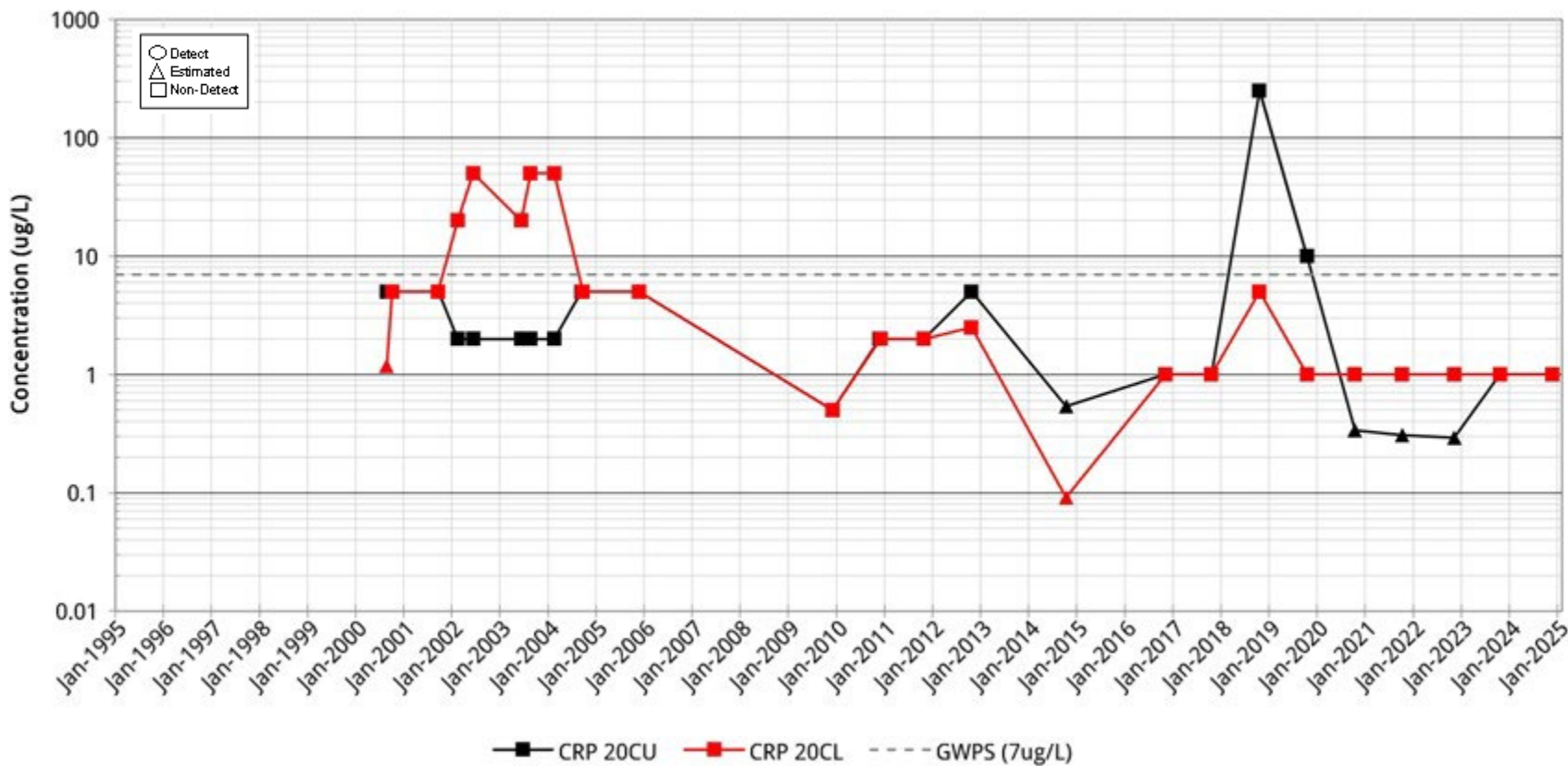


Figure C-7.

Time Series Plot for 1,1-Dichloroethylene Station for CRP022

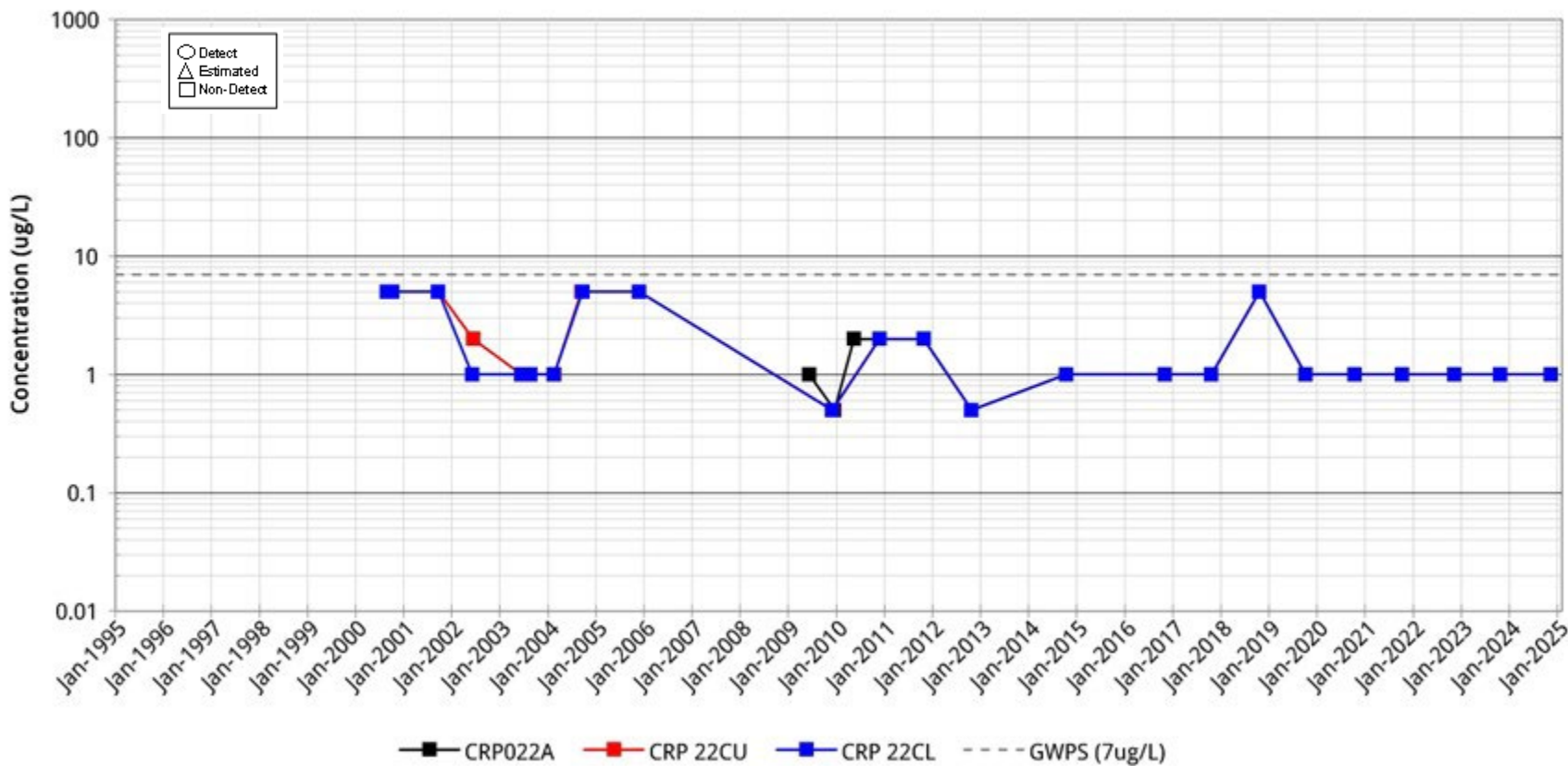


Figure C-8.

Time Series Plot for 1,1-Dichloroethylene Station for CRP 45

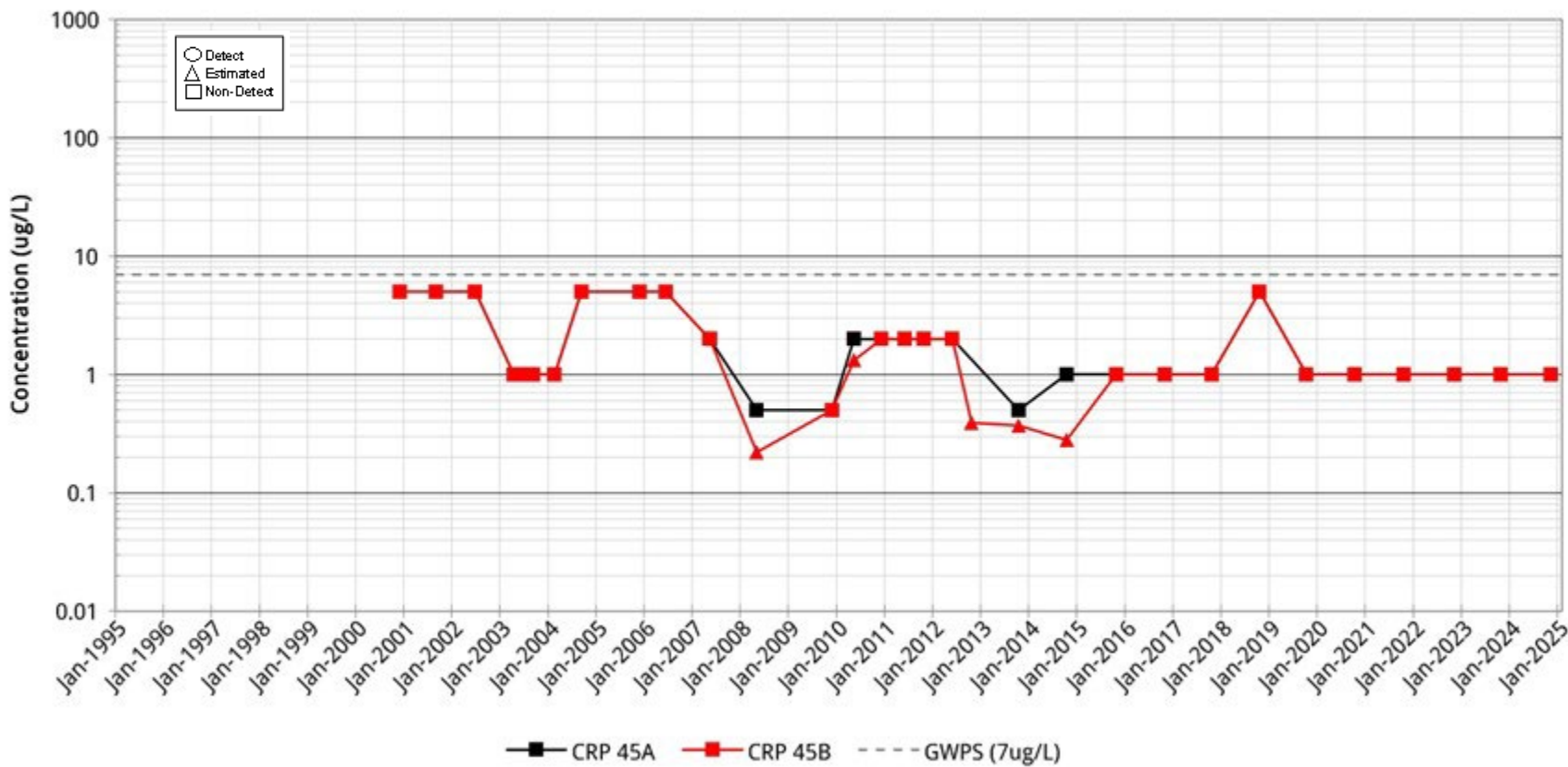


Figure C-9.

Time Series Plot for 1,1-Dichloroethylene Station for CRP 46

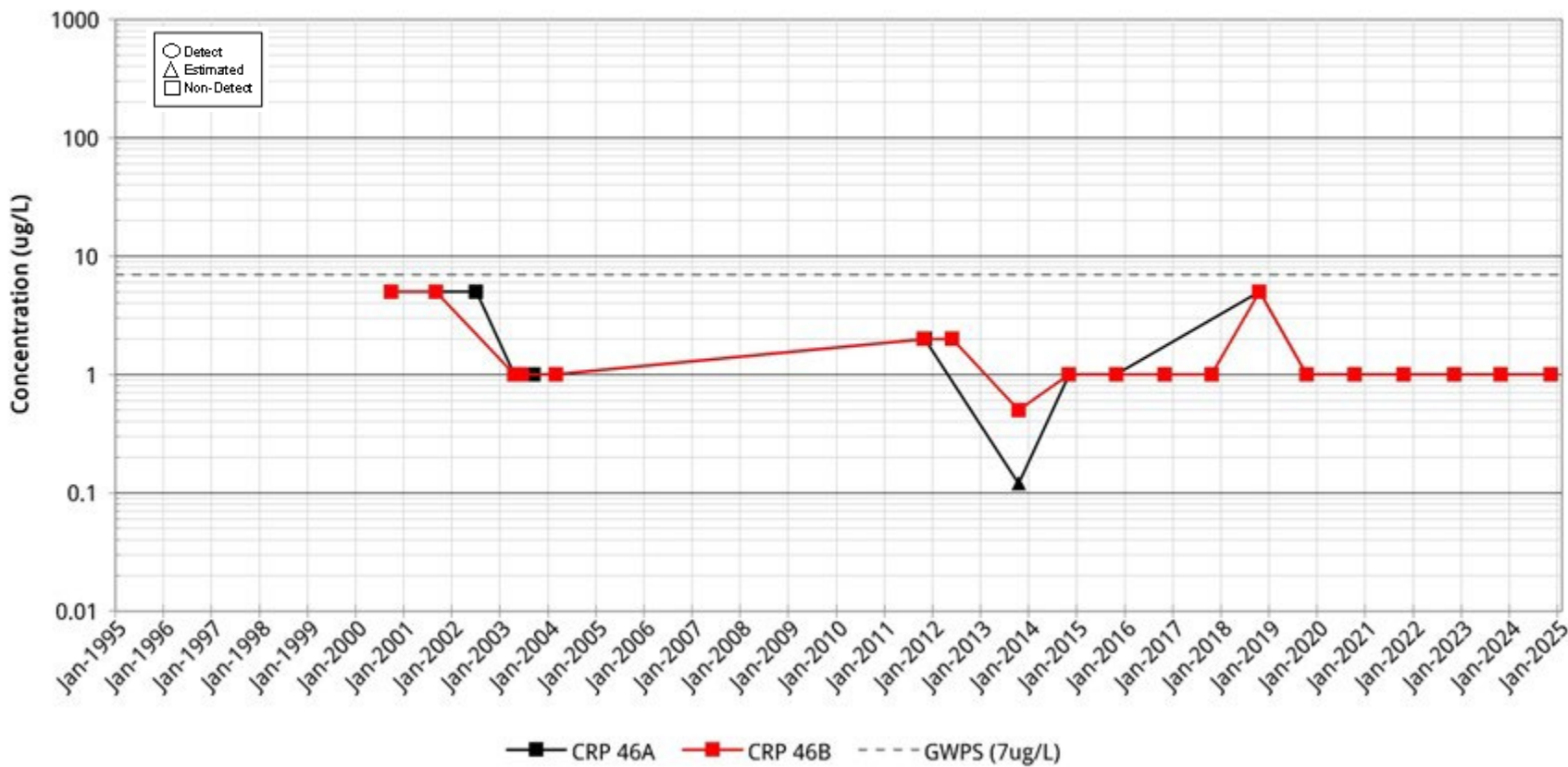


Figure C-10.

Time Series Plot for 1,1-Dichloroethylene Station for CRP 48

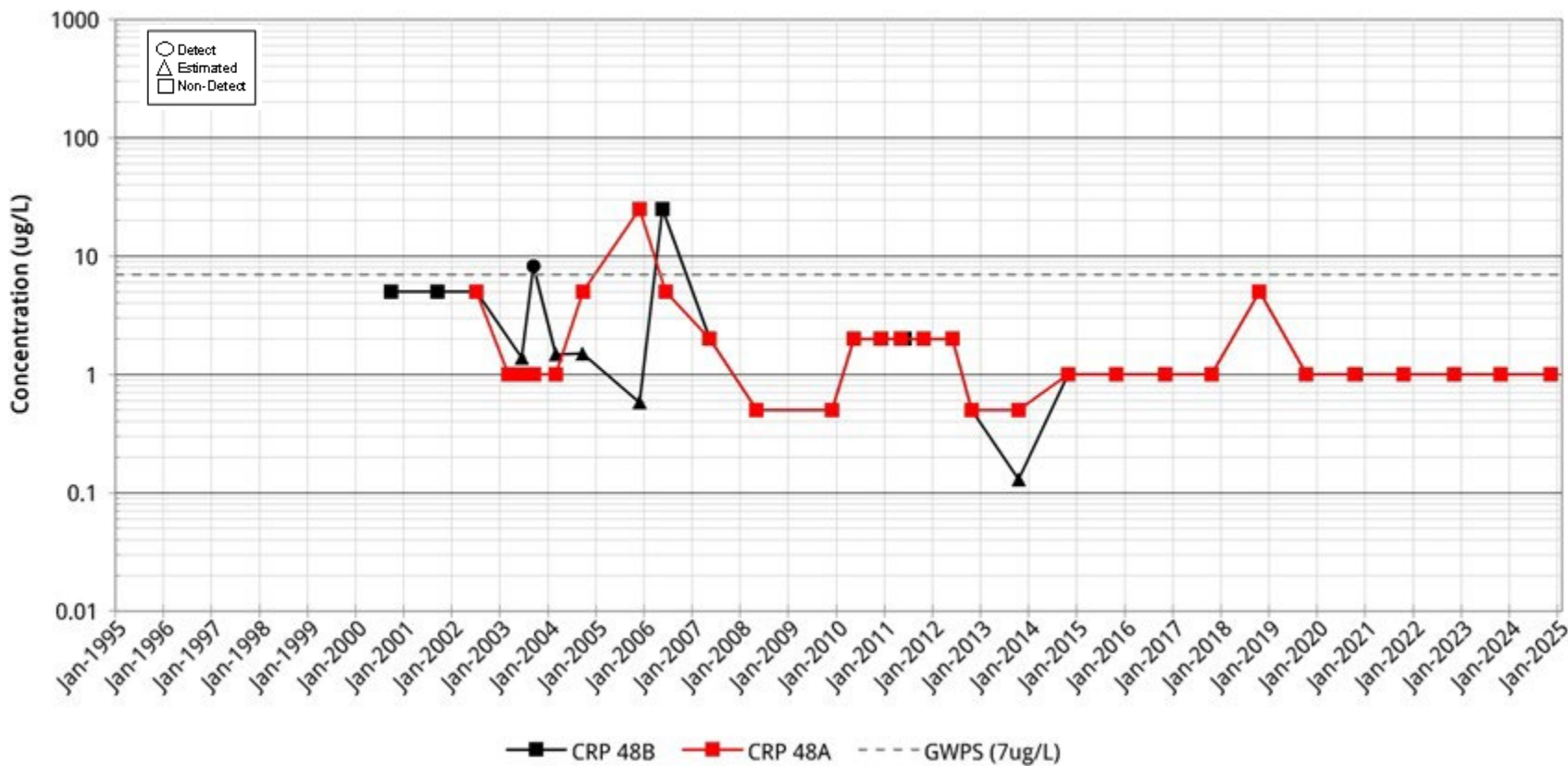


Figure C-11.

Time Series Plot for 1,1-Dichloroethylene Station for CRP 50

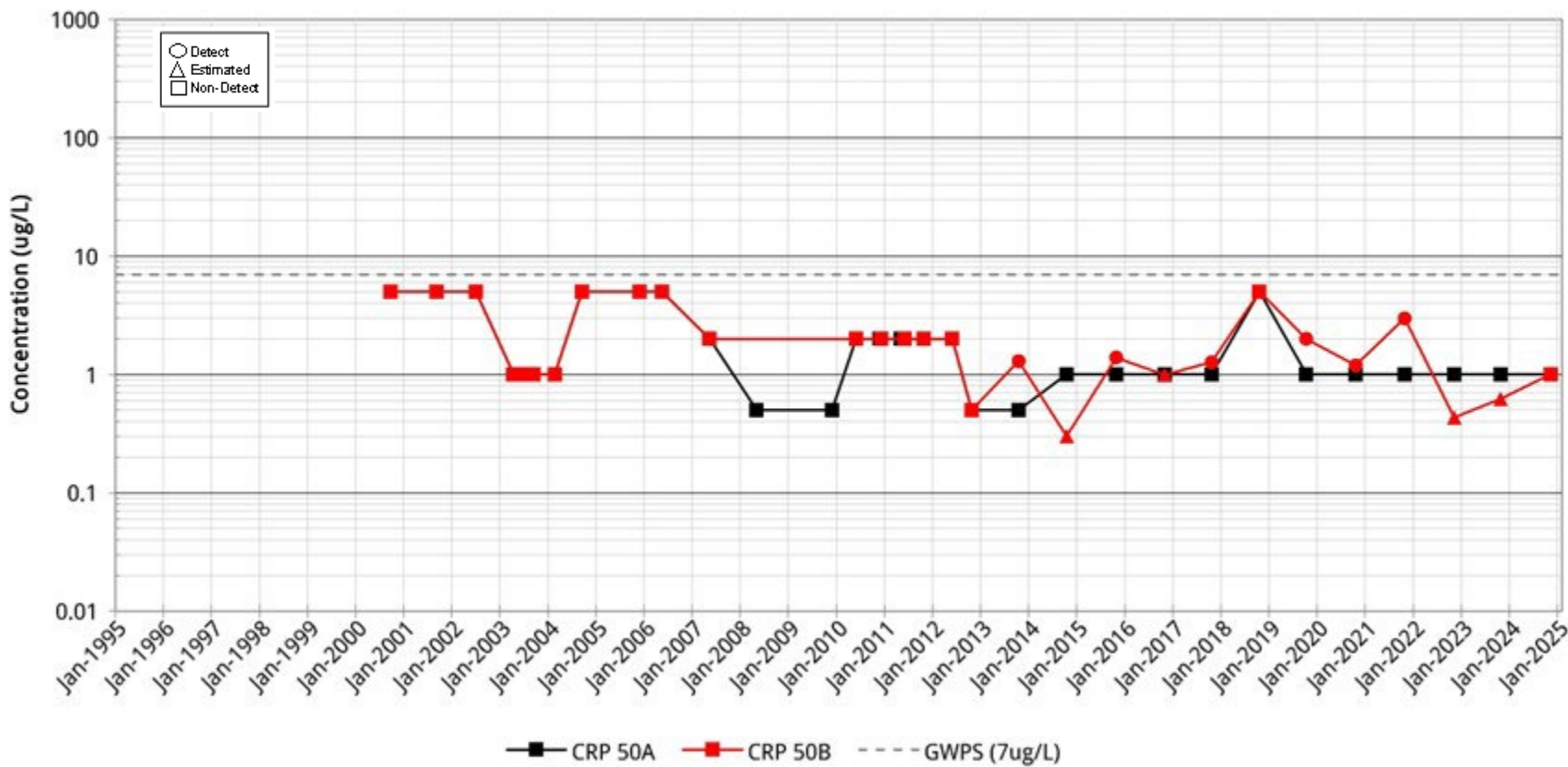


Figure C-12.

Time Series Plot for 1,1-Dichloroethylene Station for CRP 51

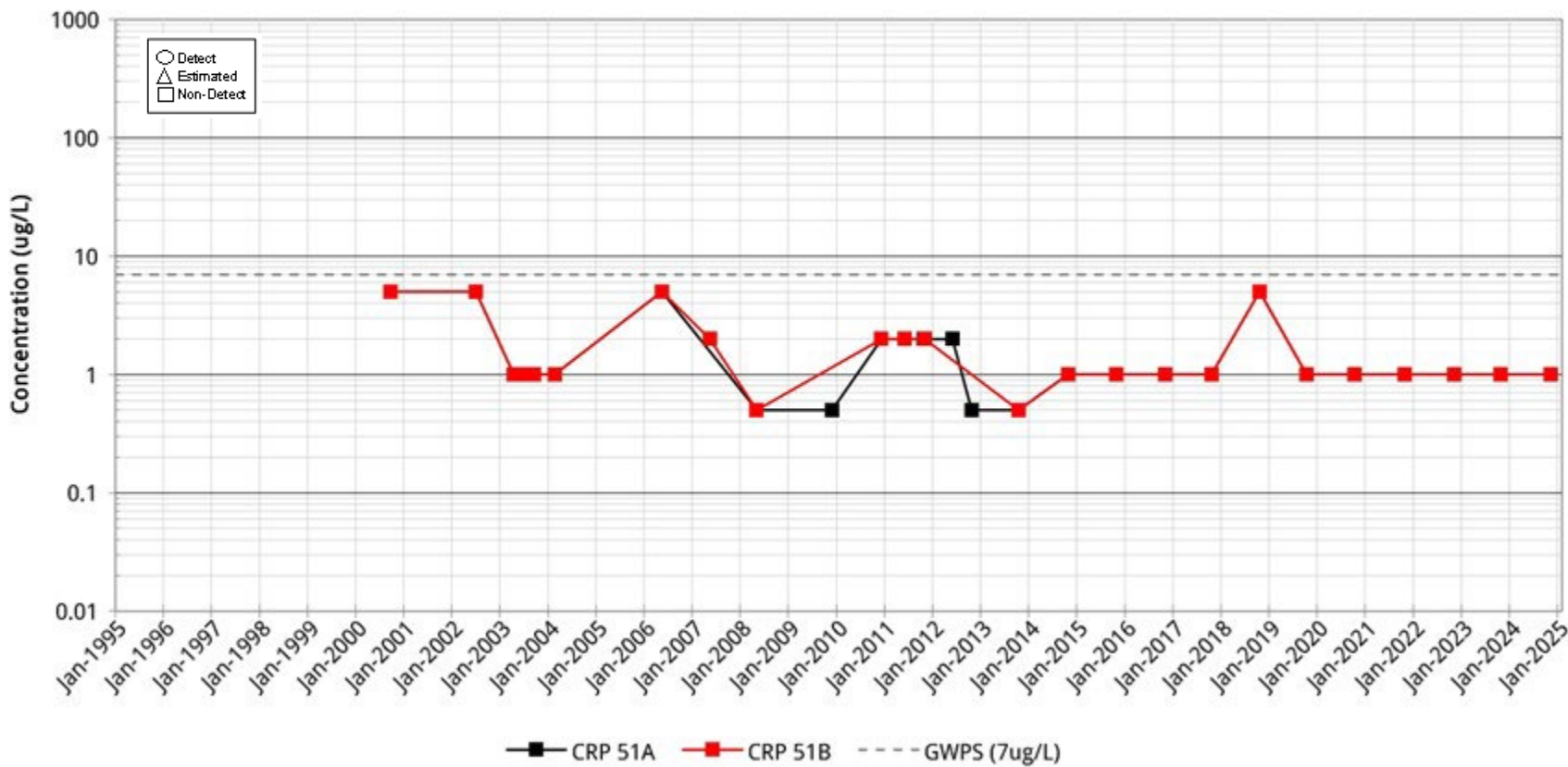


Figure C-13.

Time Series Plot for 1,1-Dichloroethylene Station for CRP 52

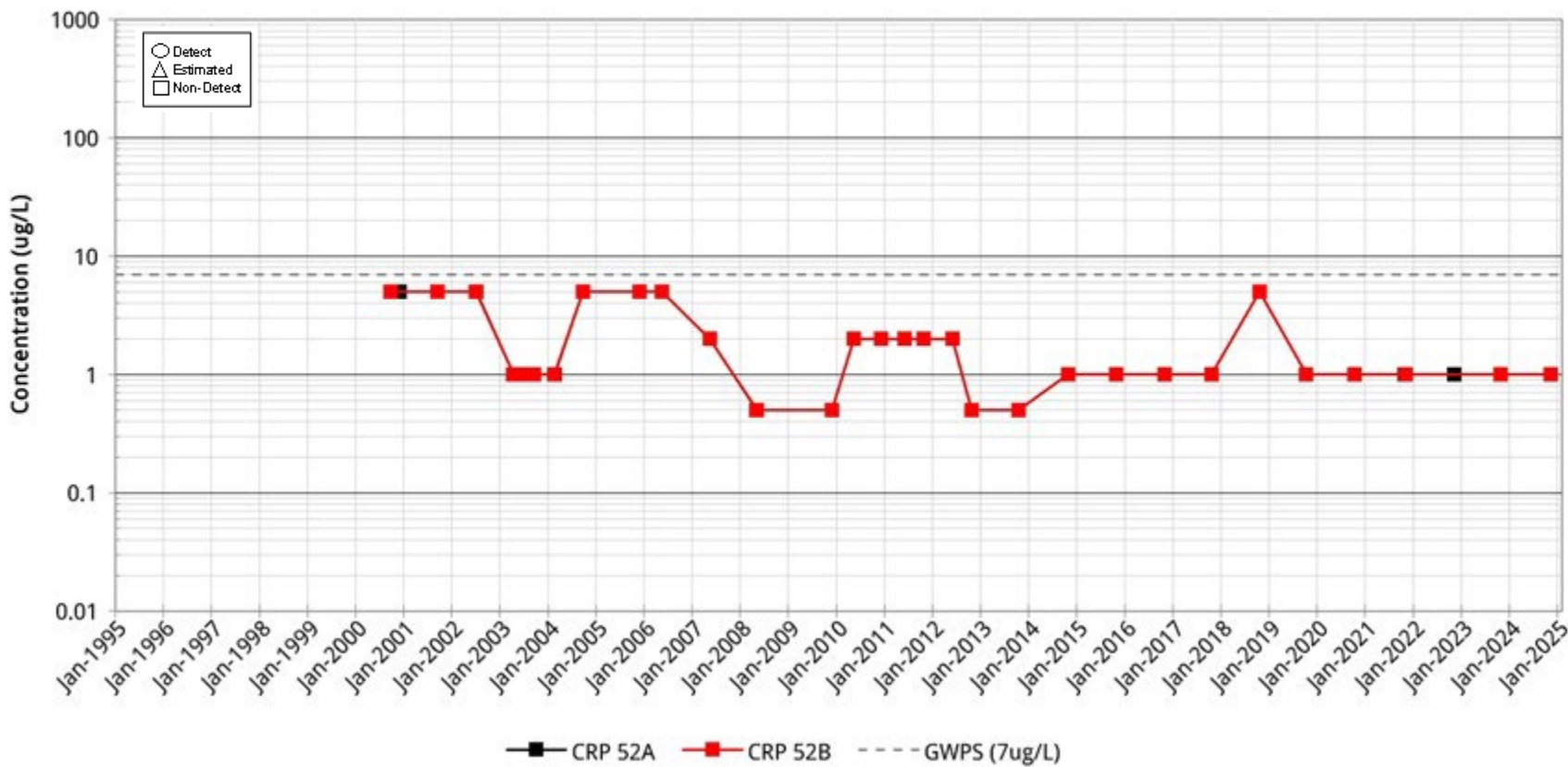


Figure C-14.

Time Series Plot for 1,1-Dichloroethylene Station for CRW 10

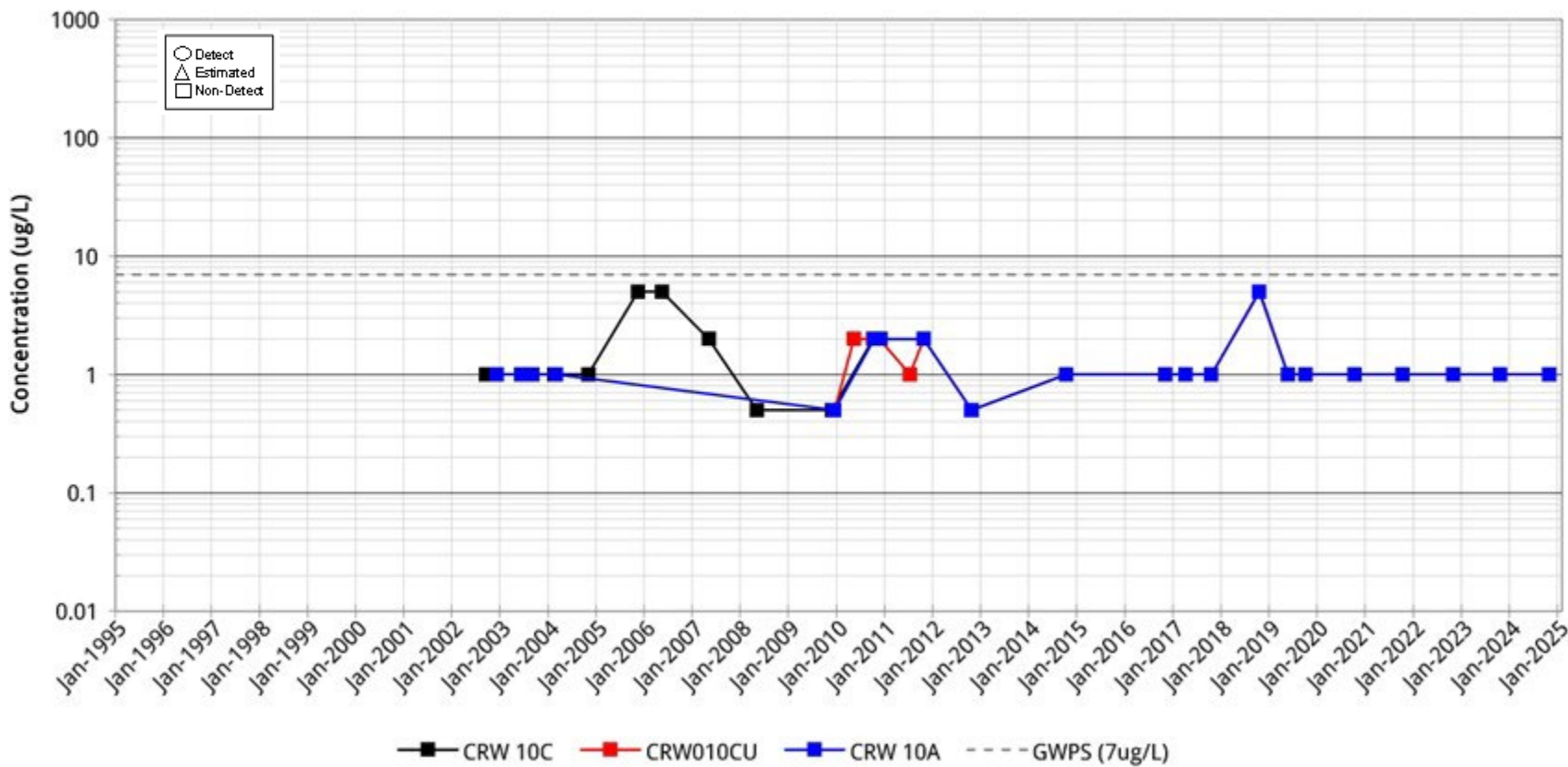


Figure C-15.

Time Series Plot for 1,1-Dichloroethylene Station for CRW 12

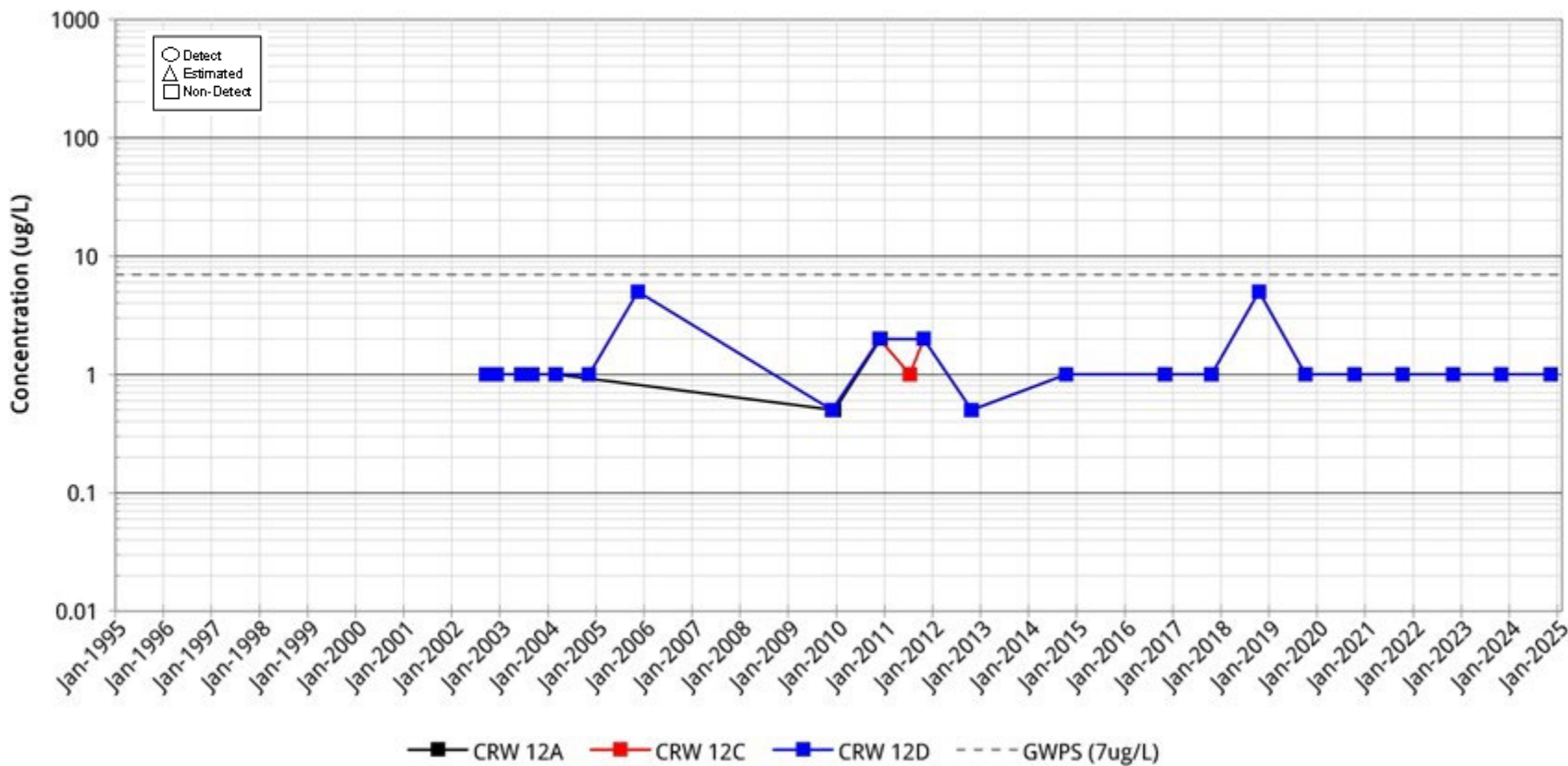


Figure C-16.

Time Series Plot for 1,1-Dichloroethylene Station for TL 01

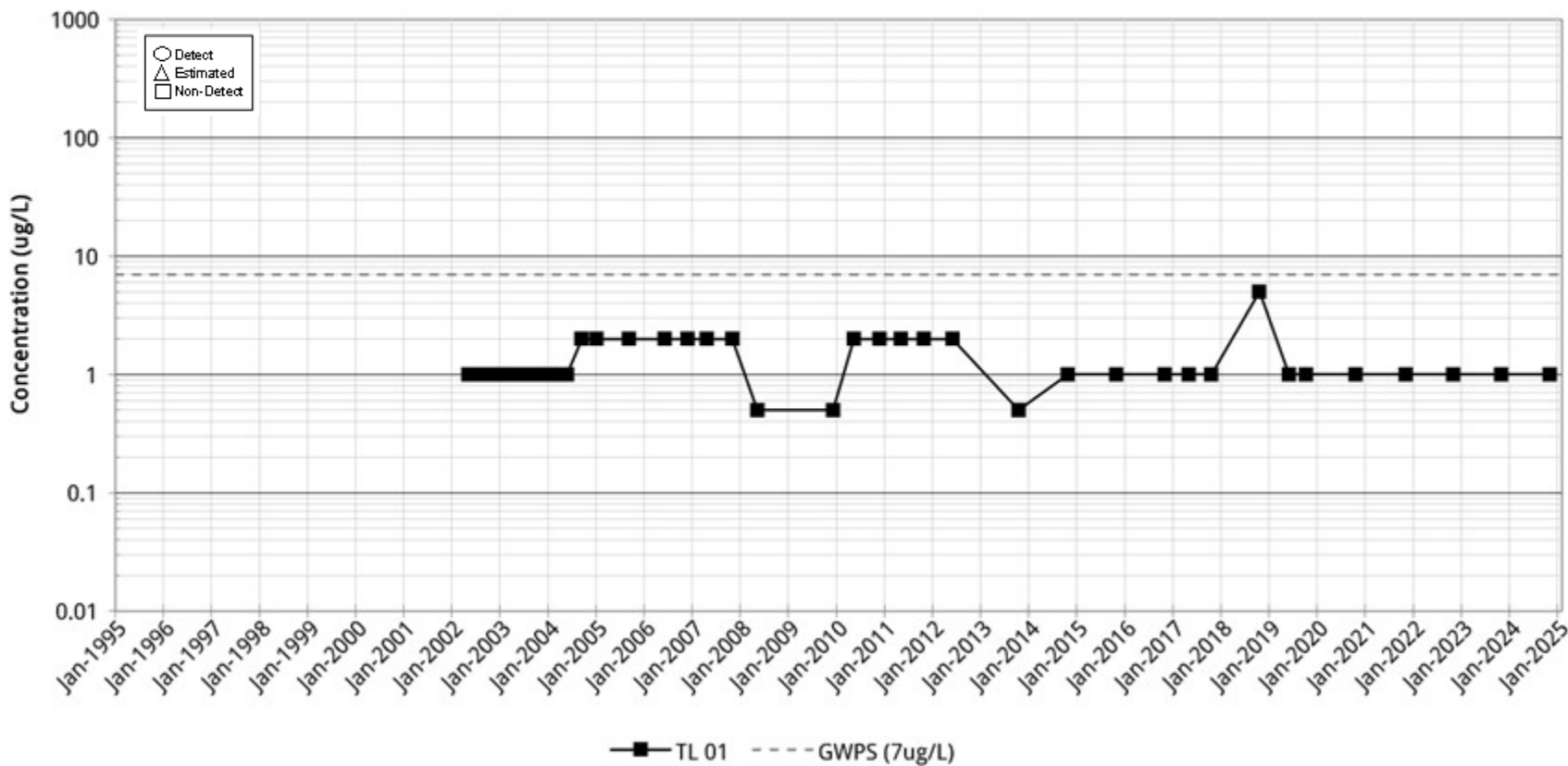


Figure C-17.

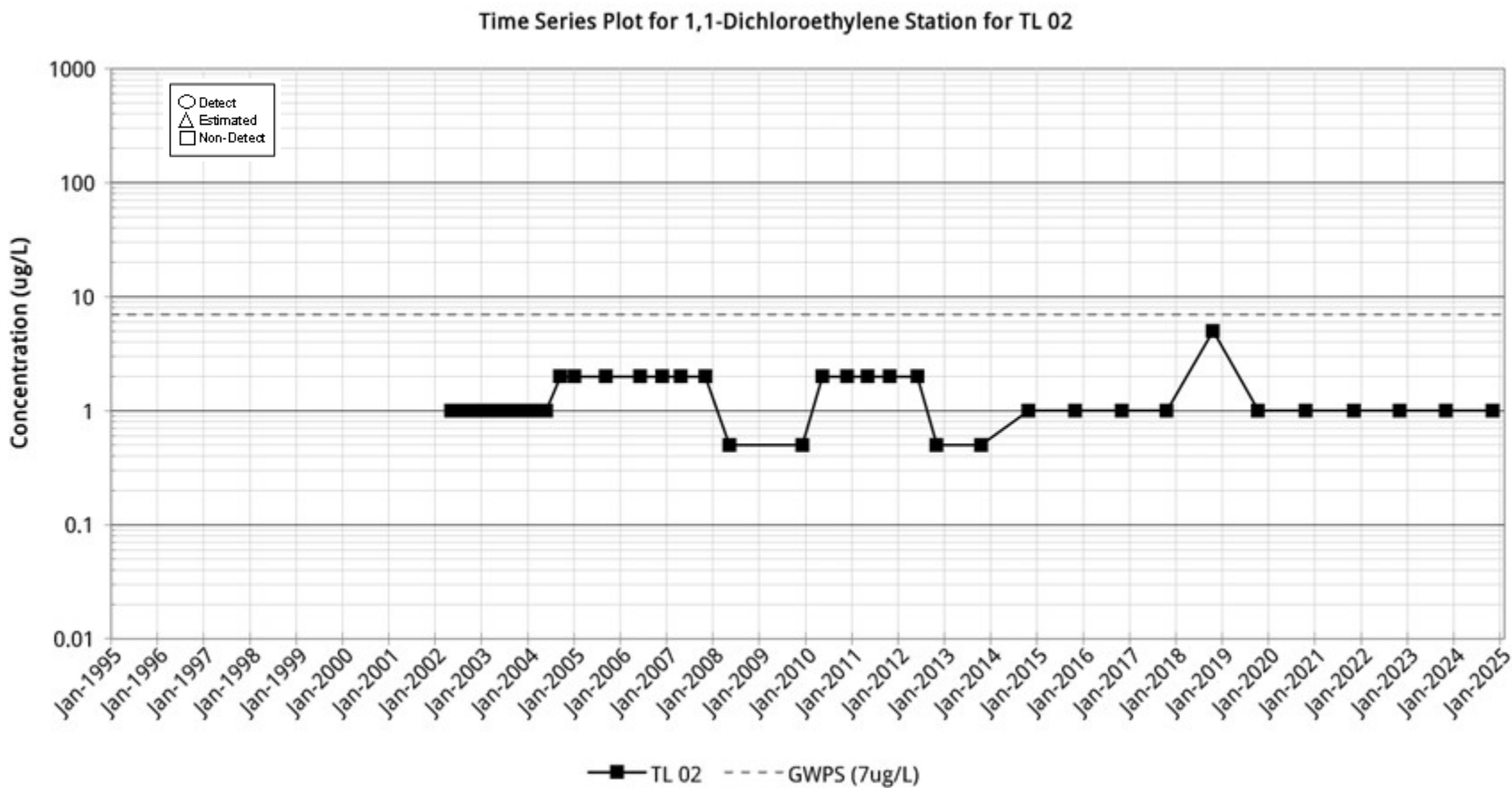


Figure C-18.

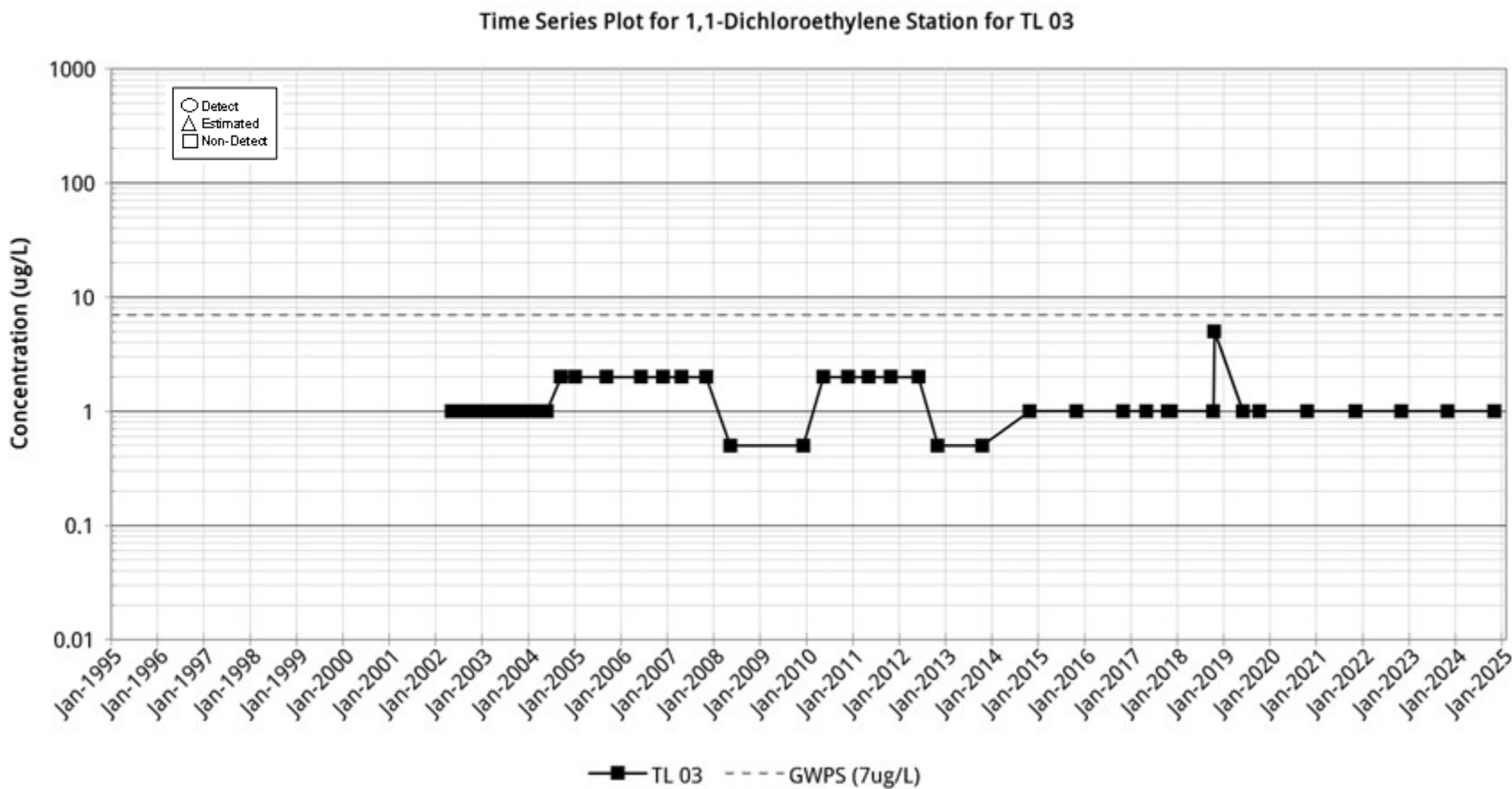


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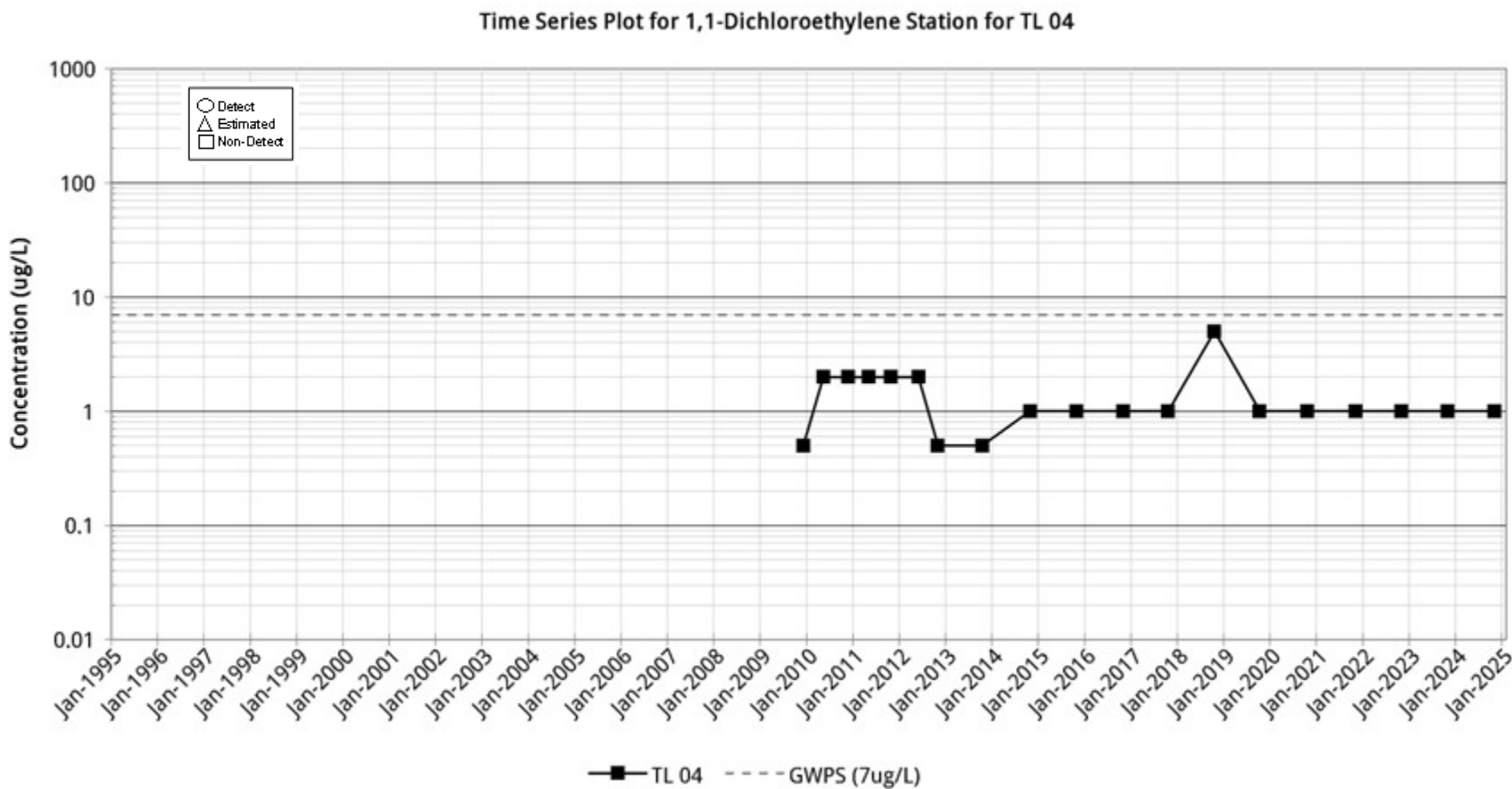


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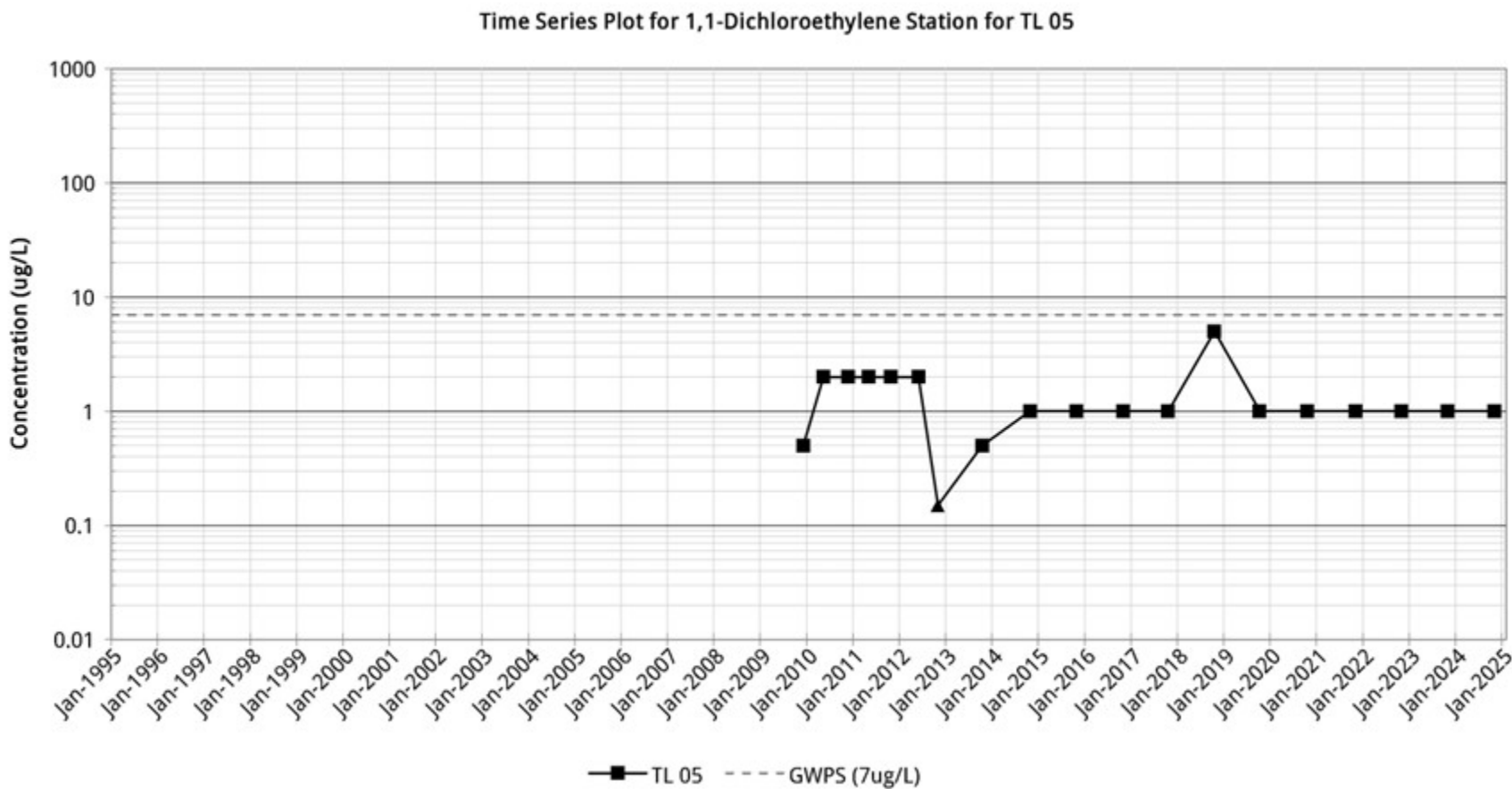


Figure C-21.

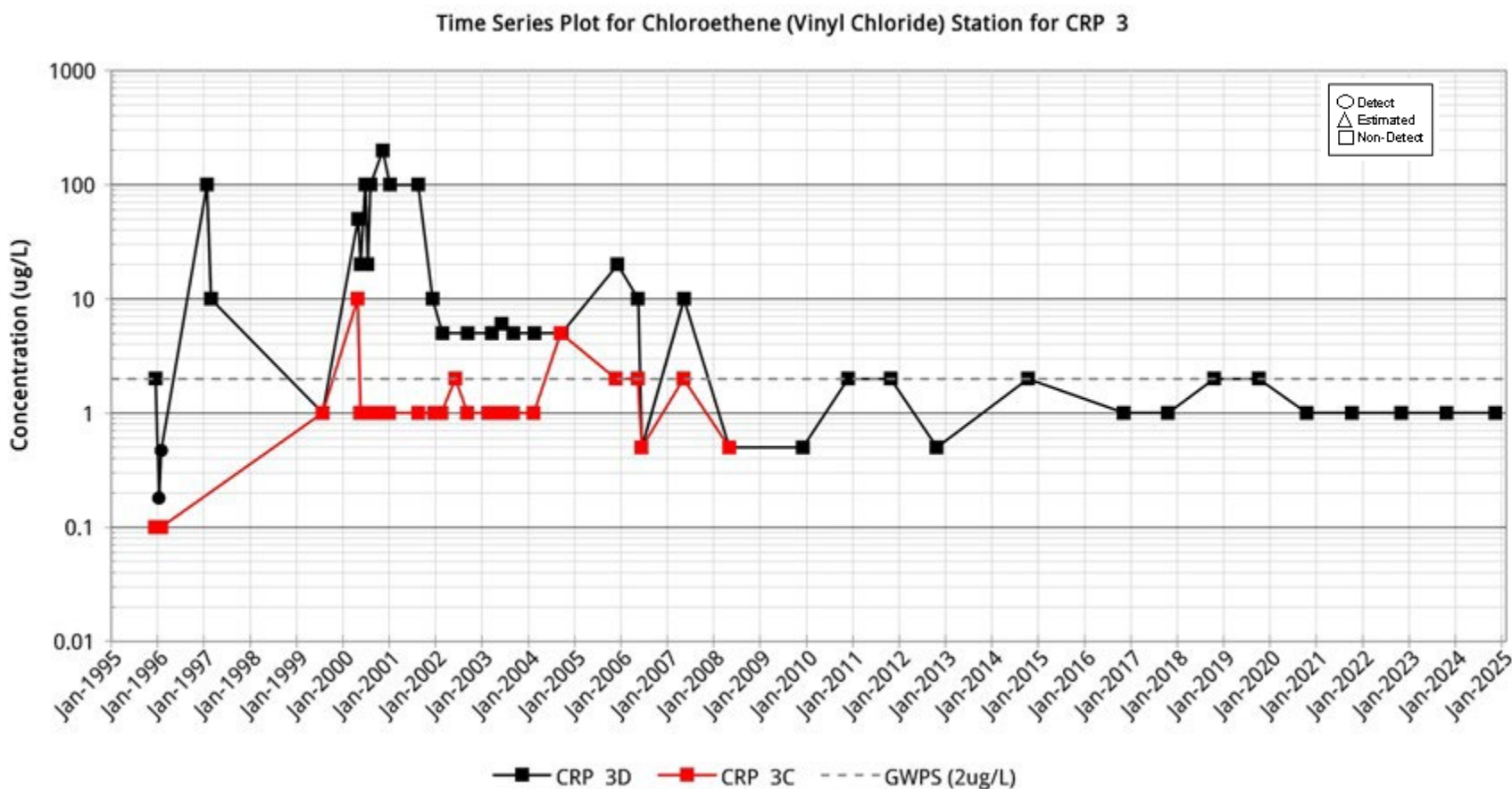


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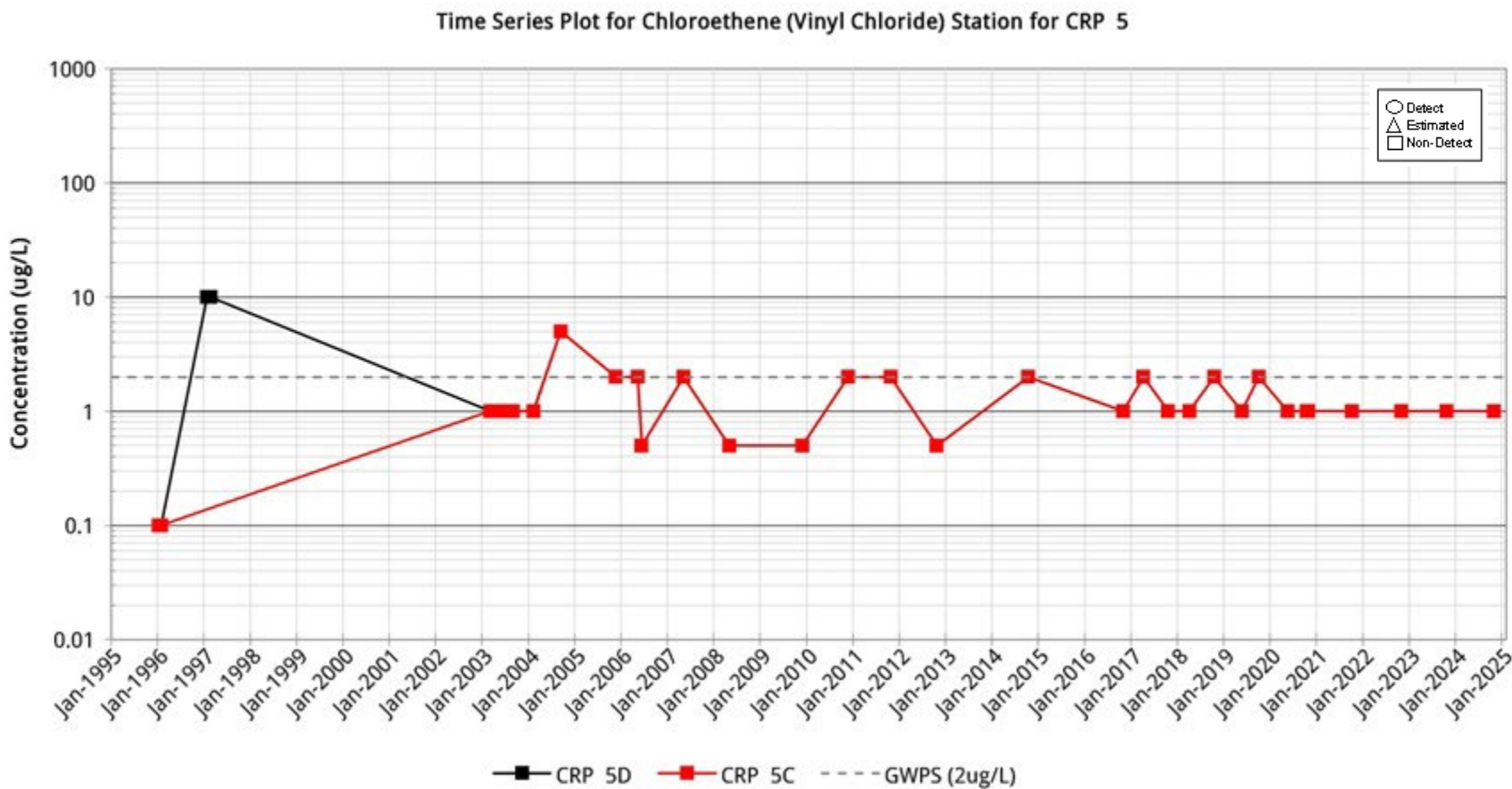


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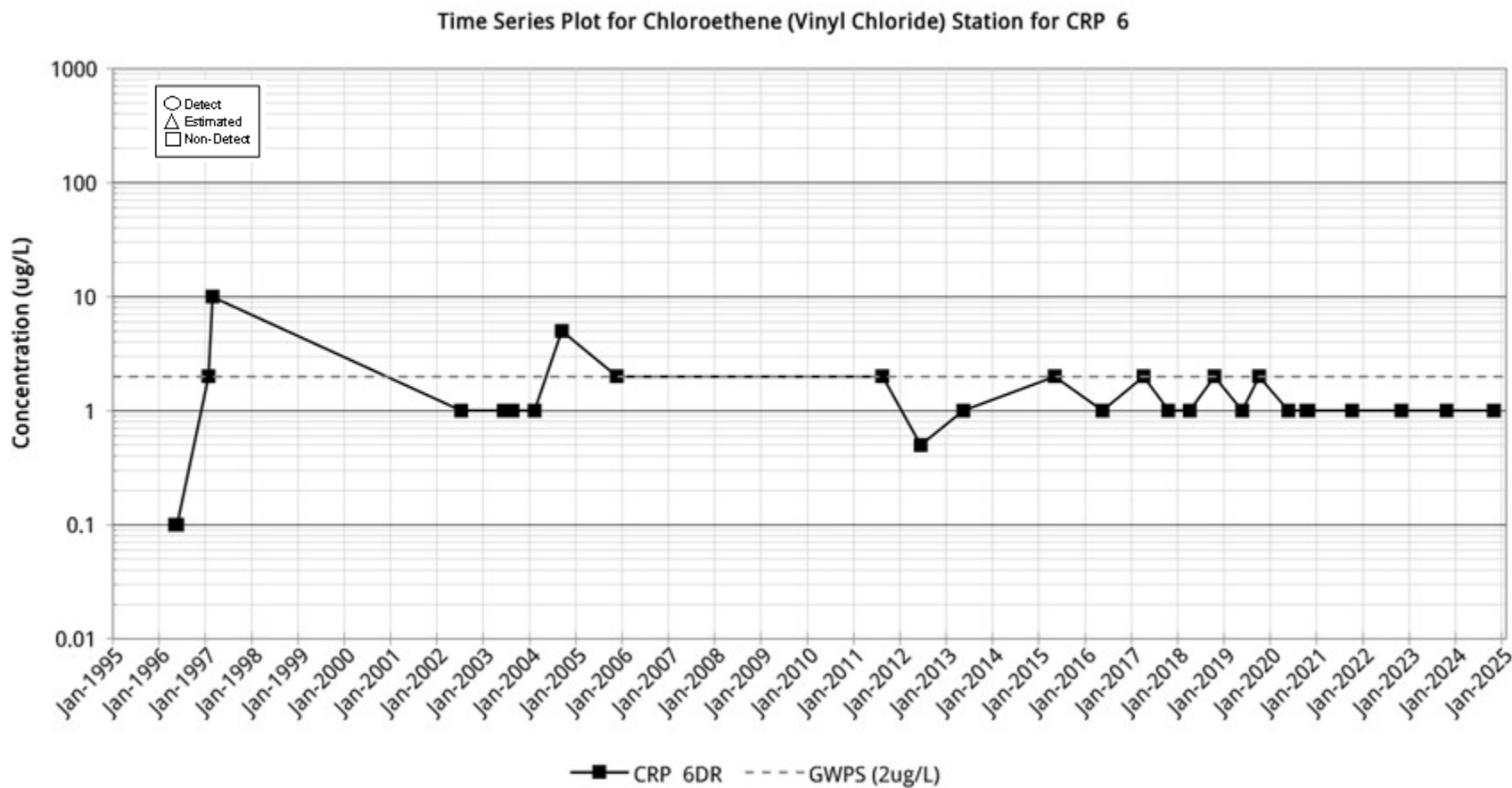


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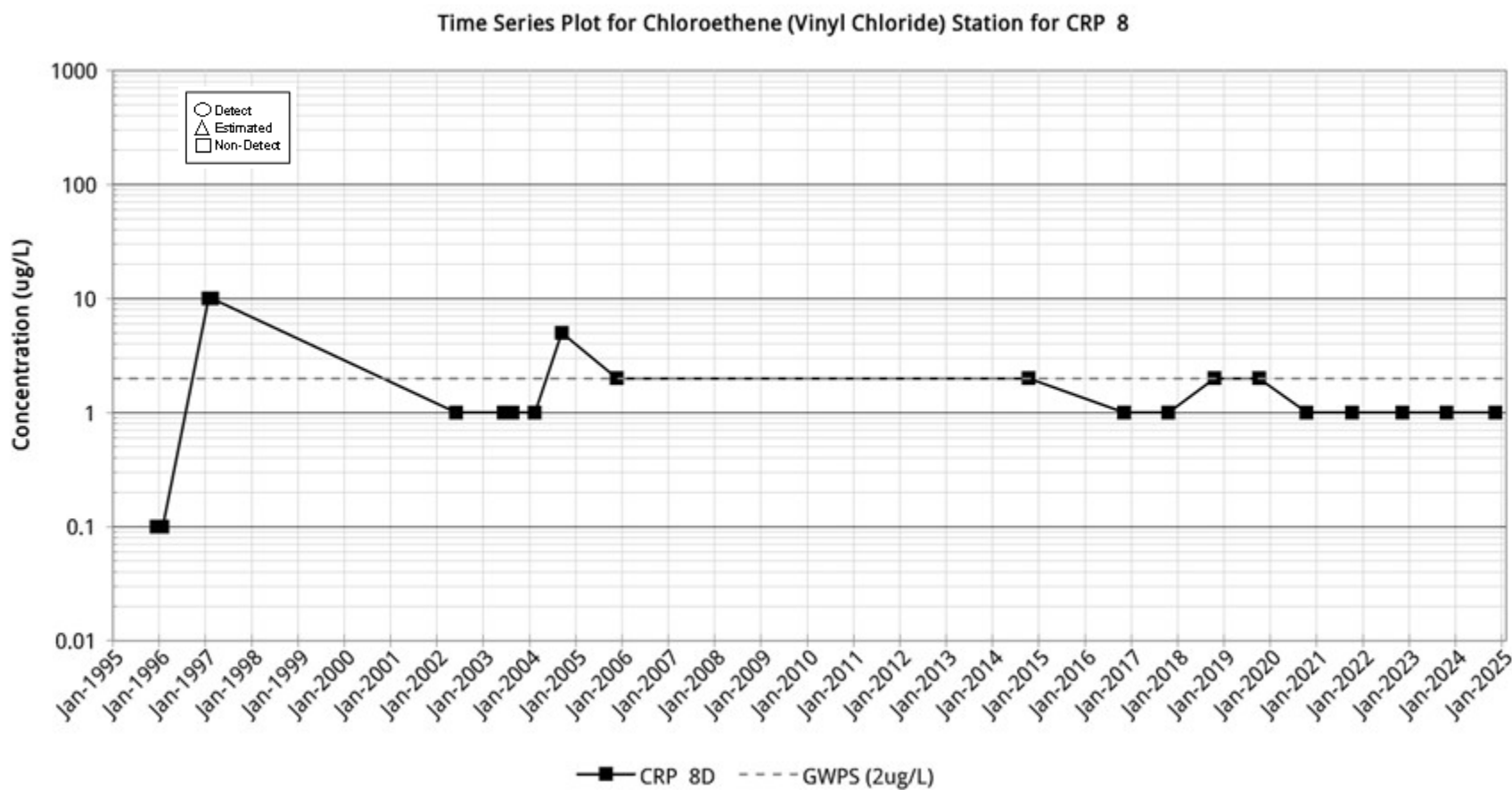


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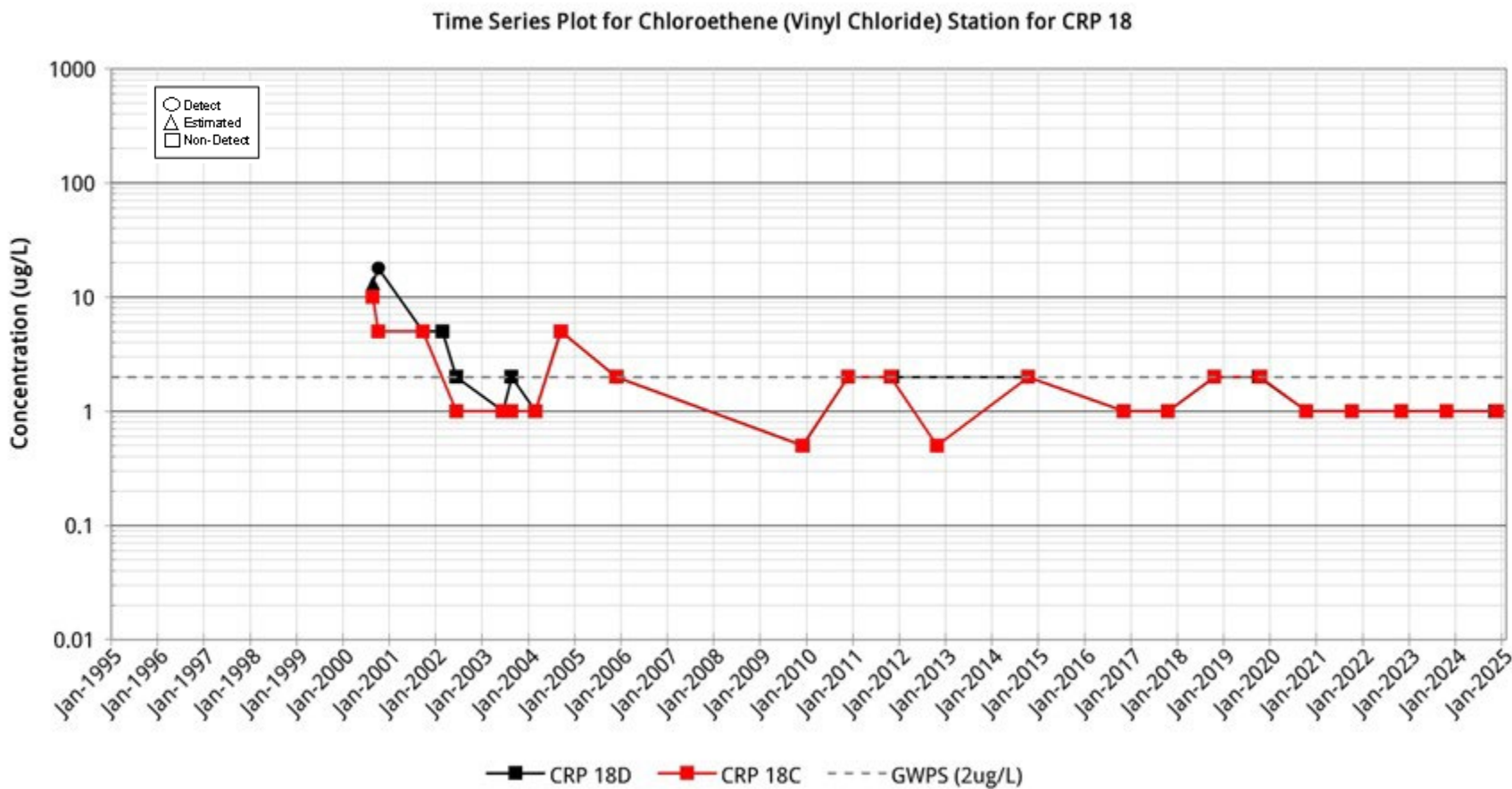


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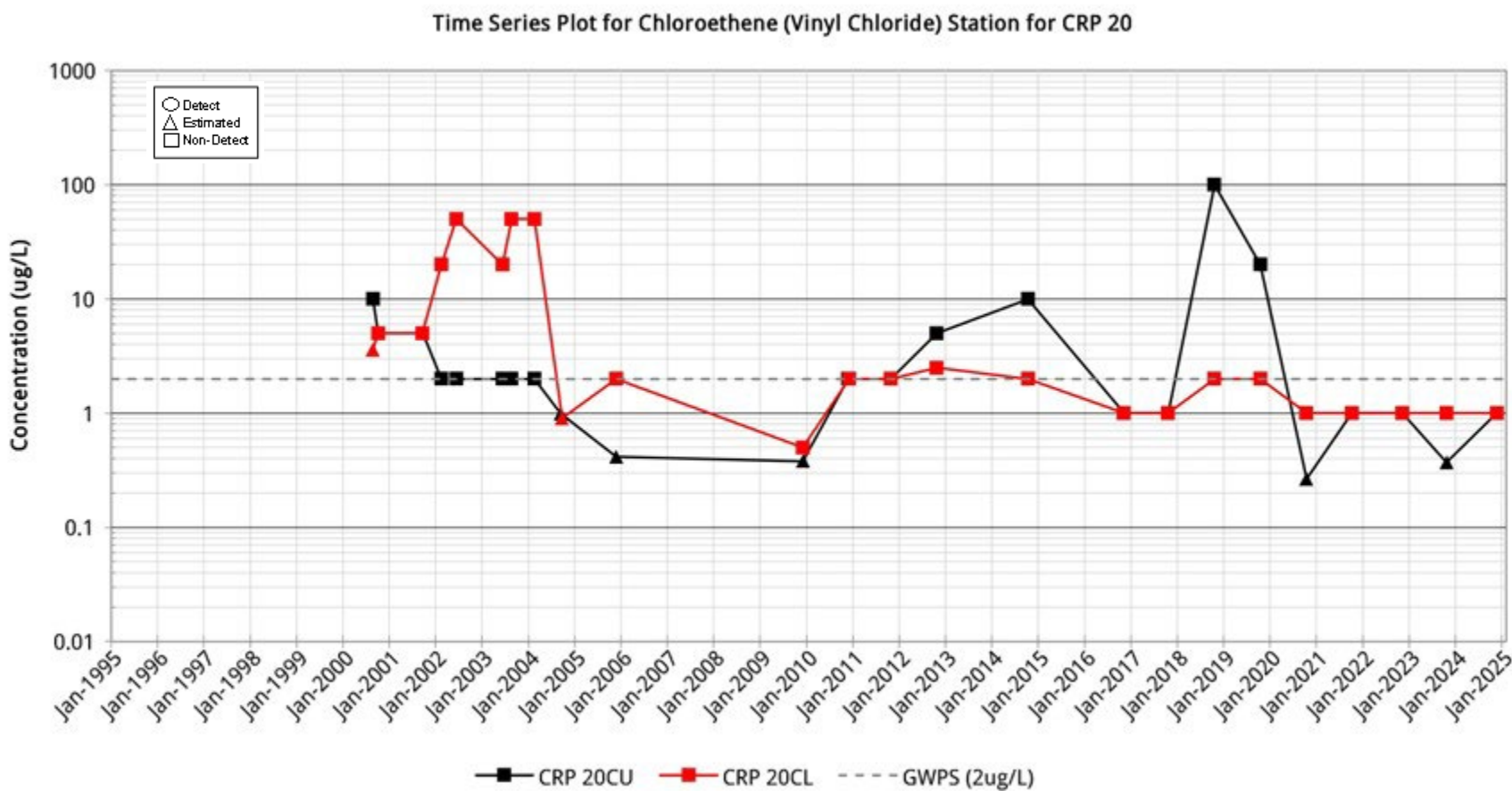


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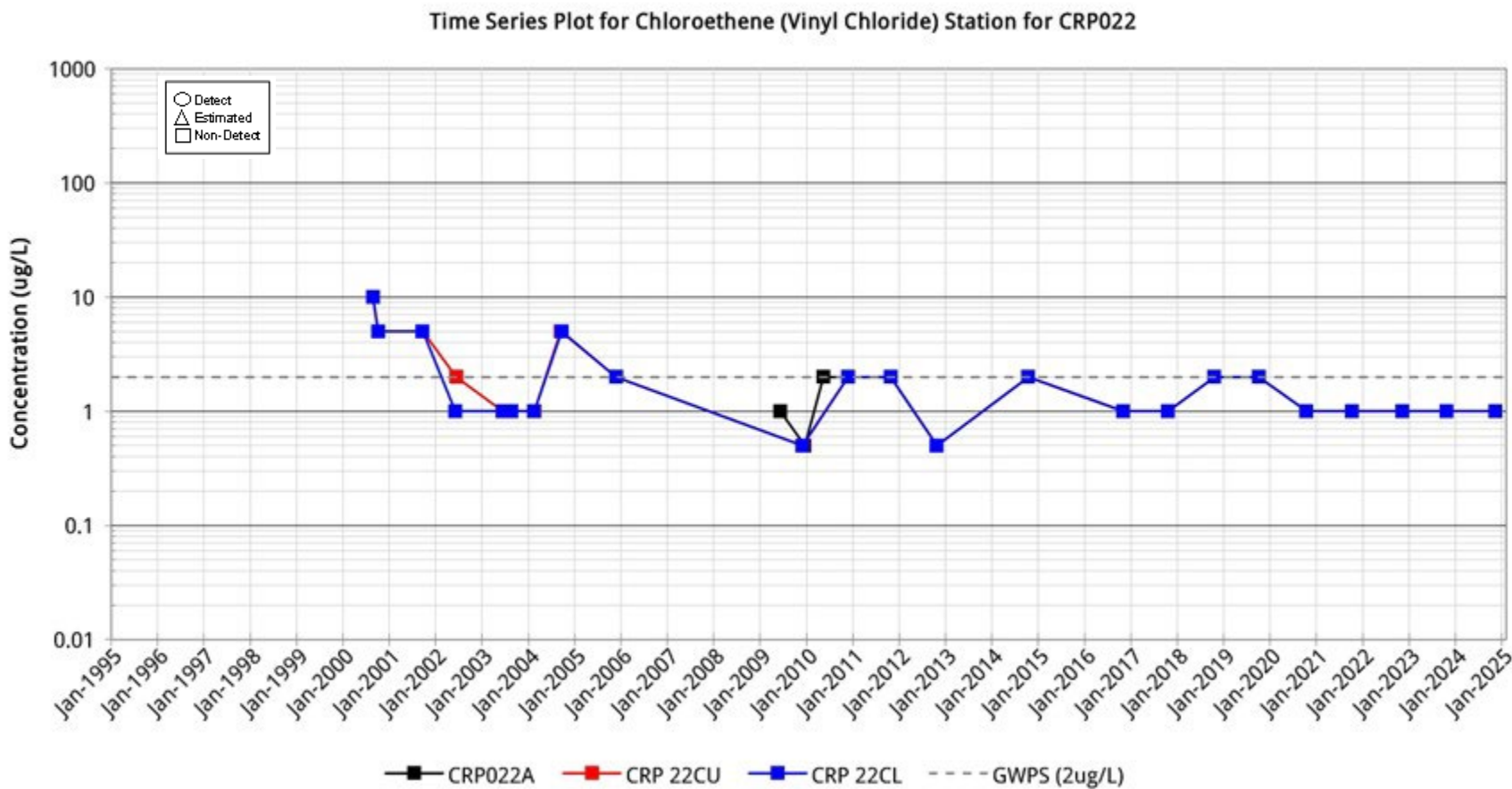


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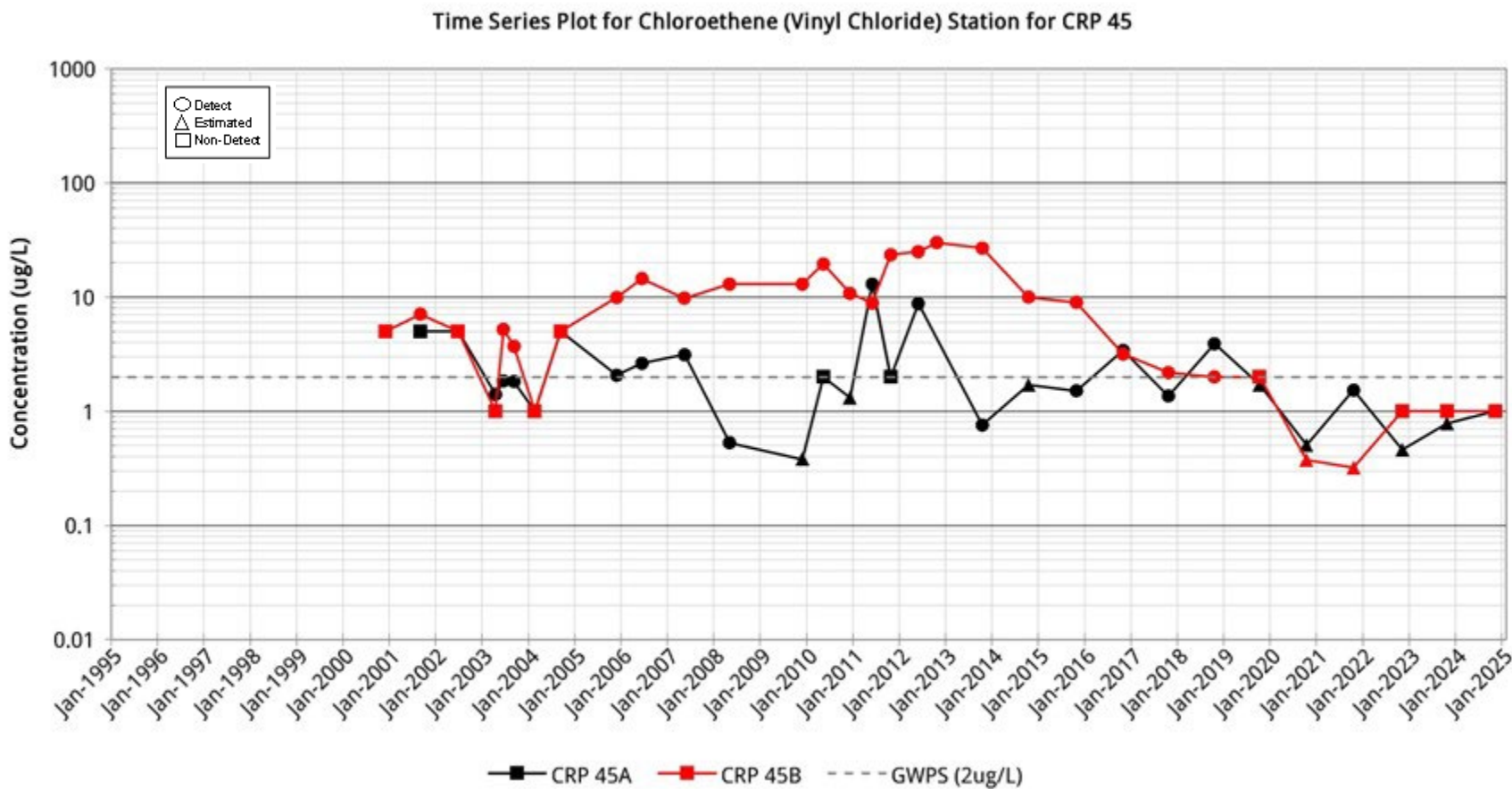


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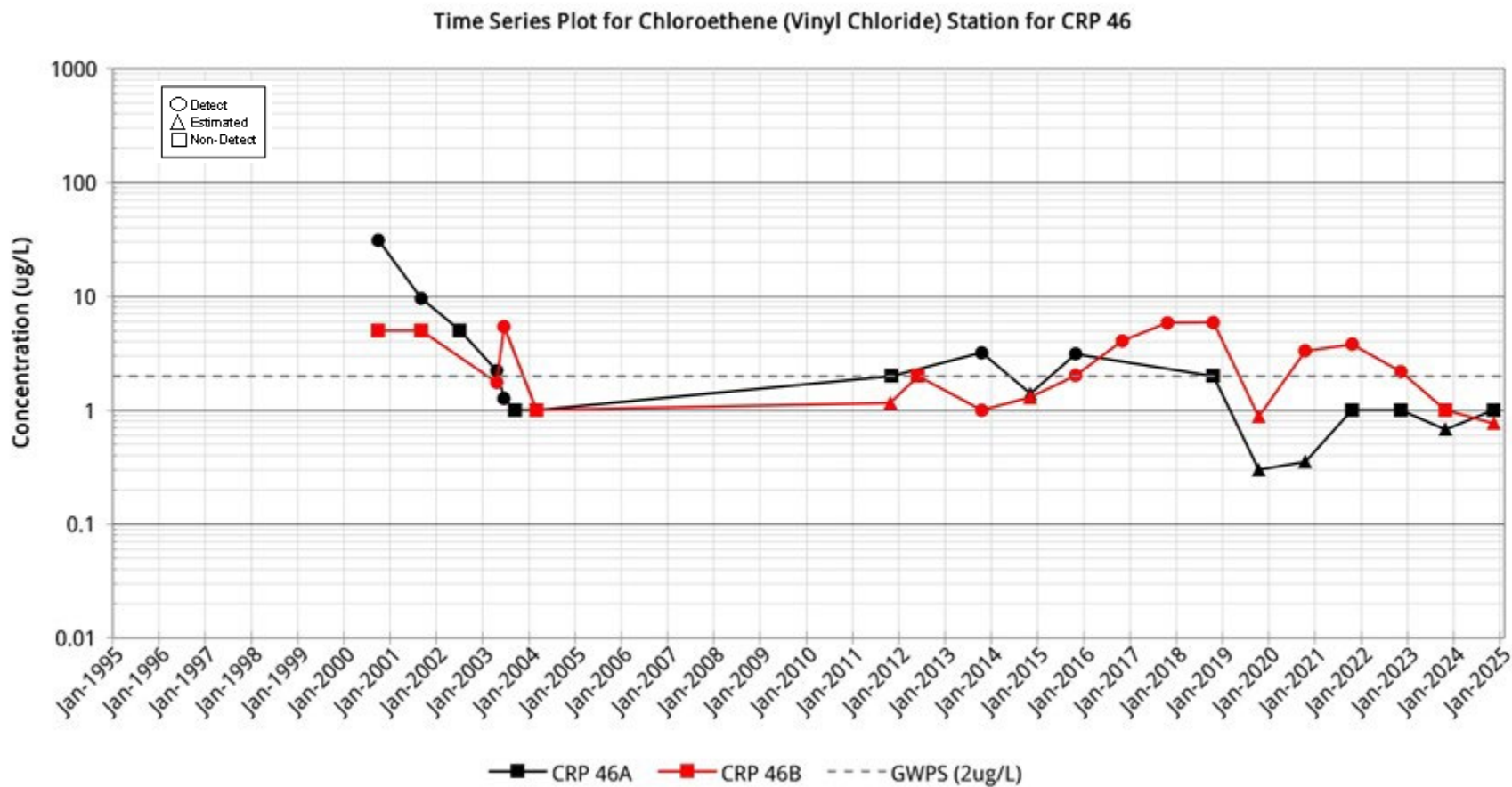


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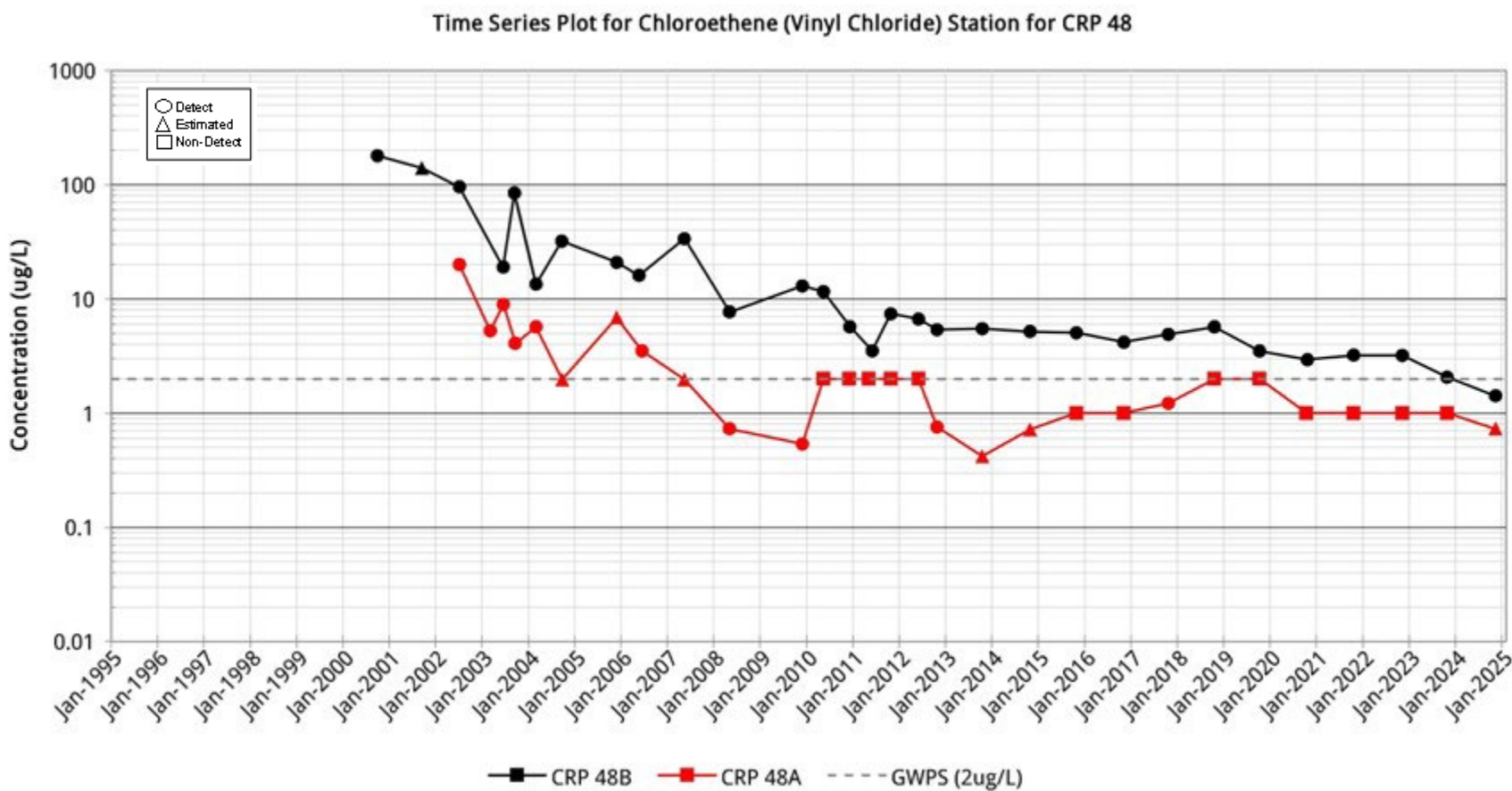


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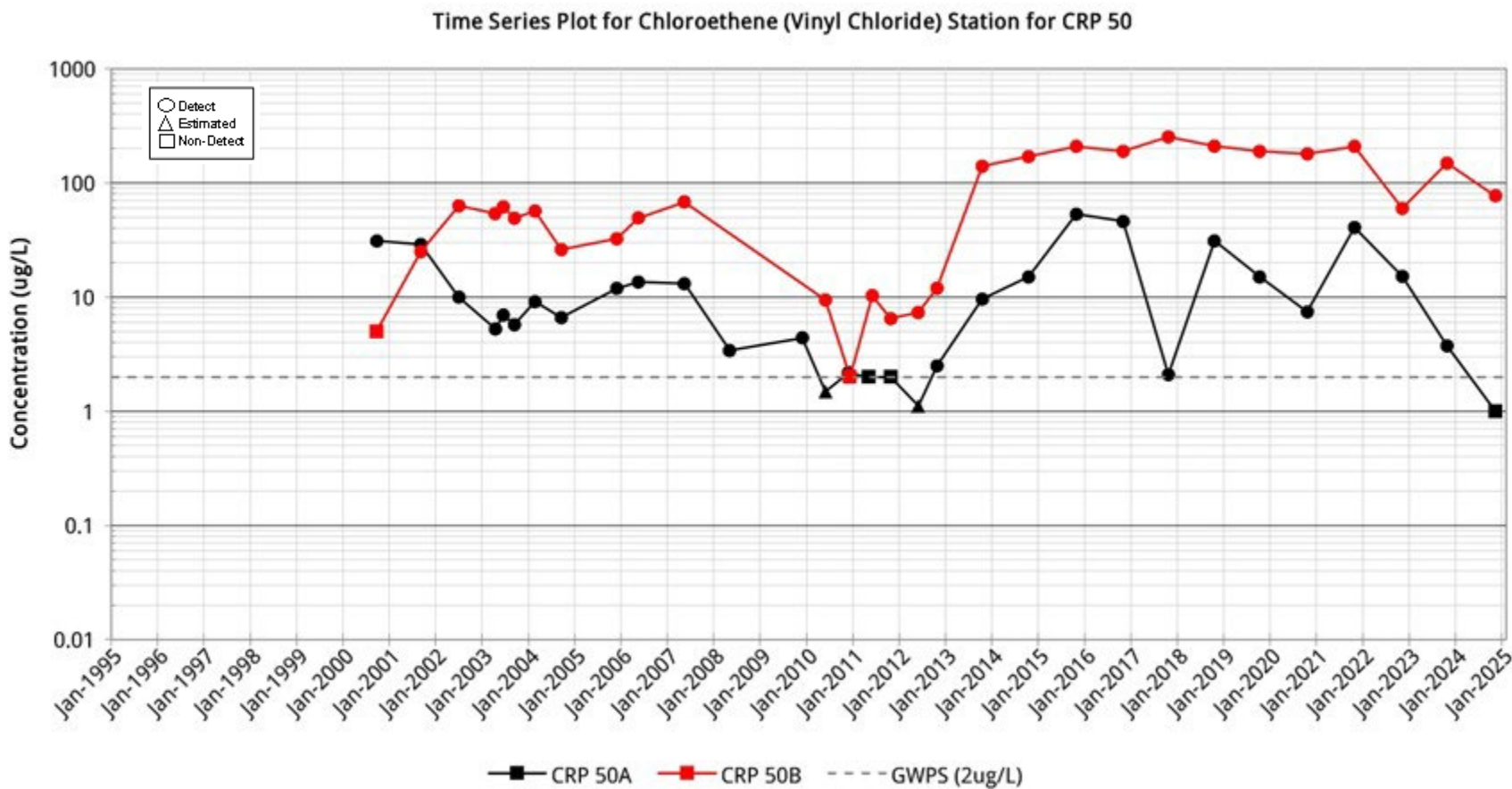


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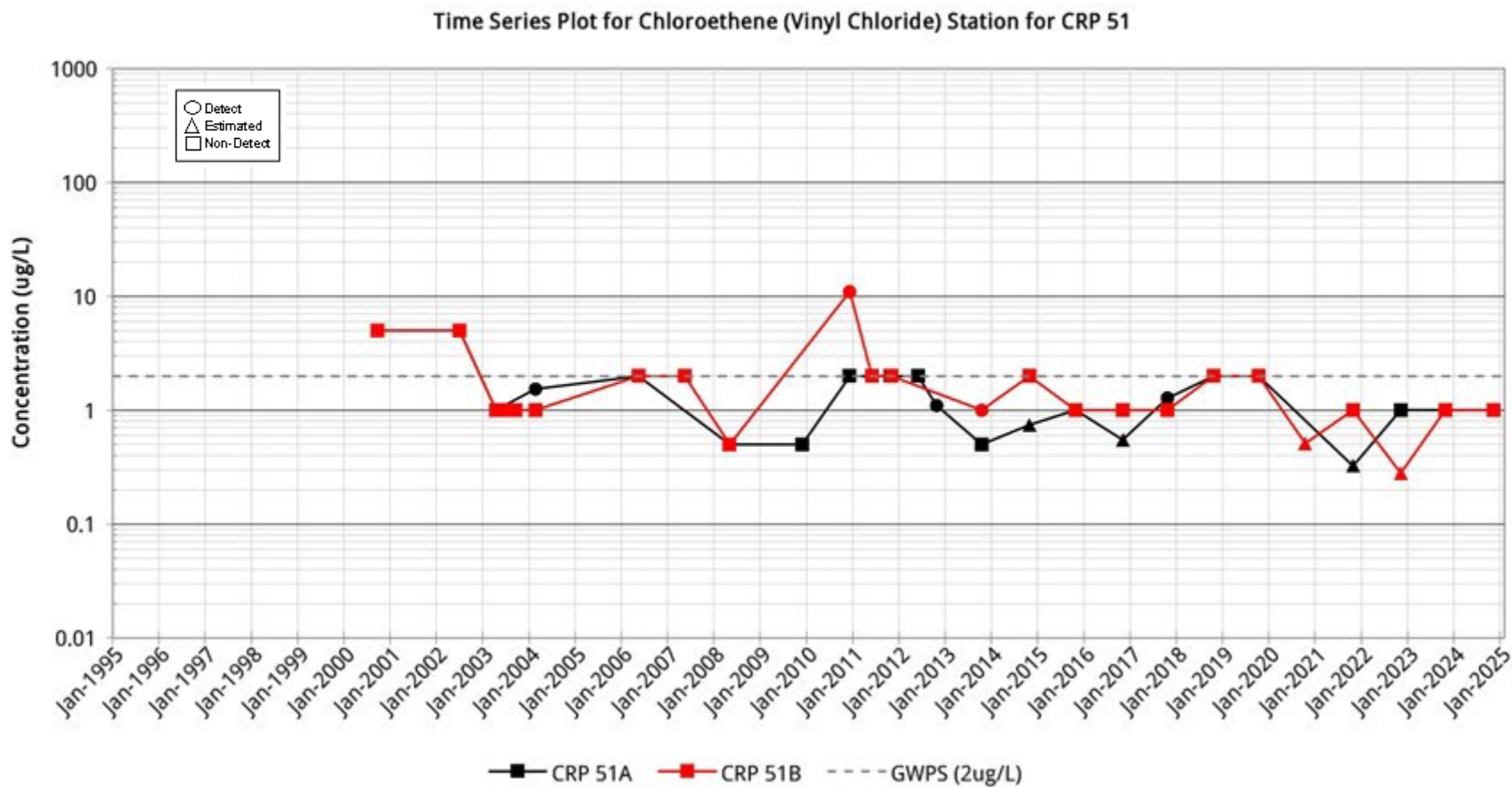


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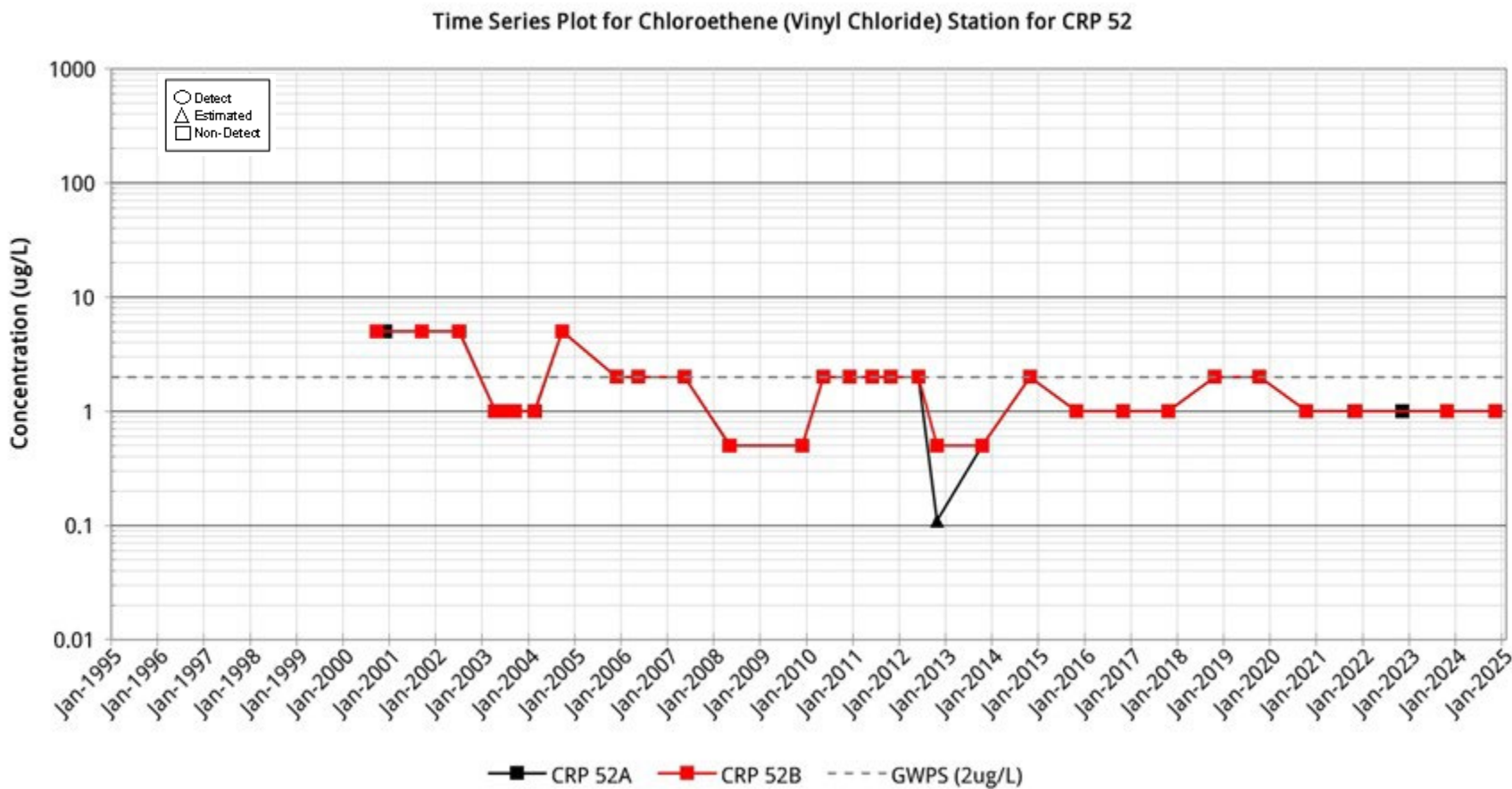


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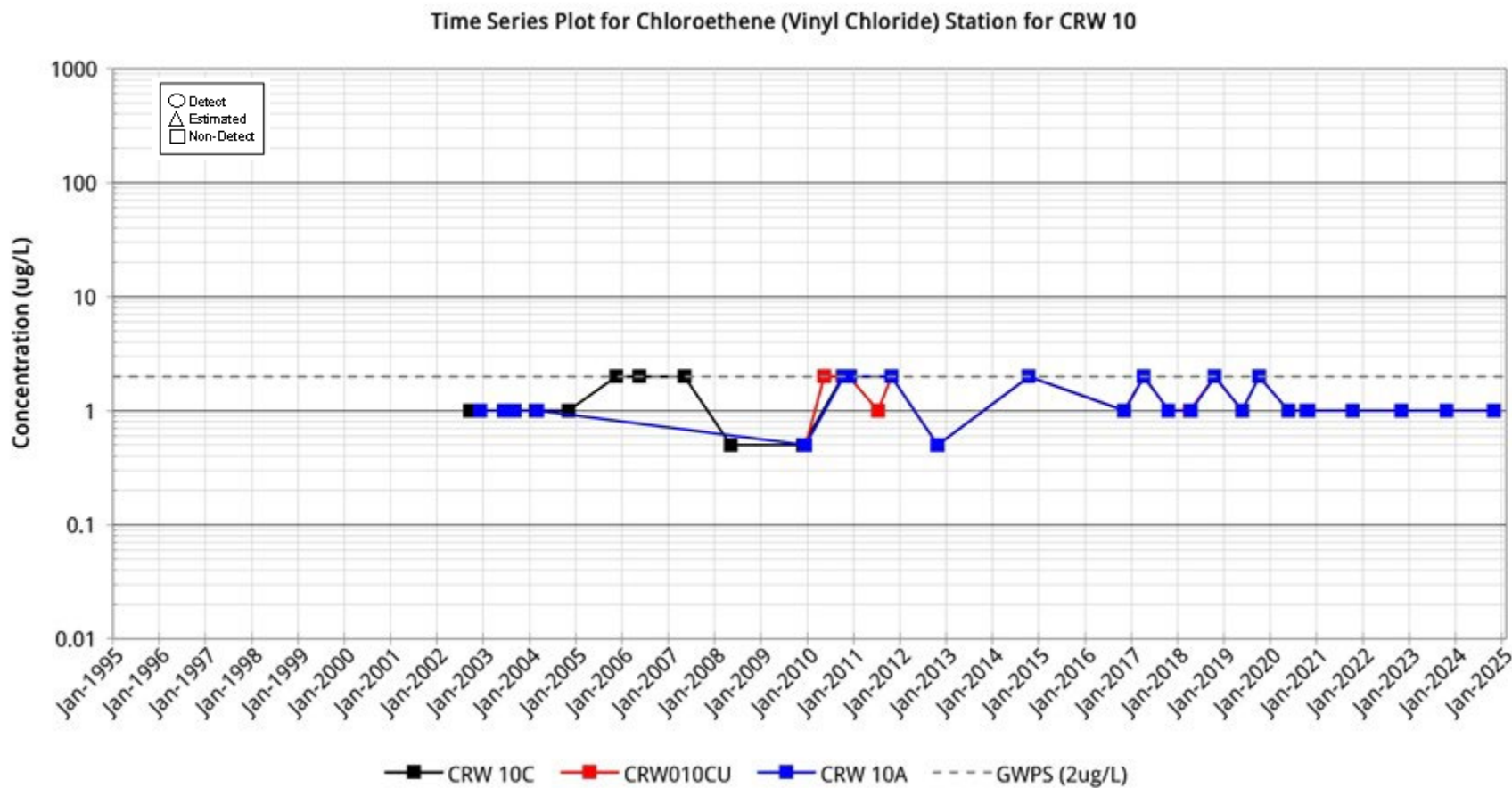


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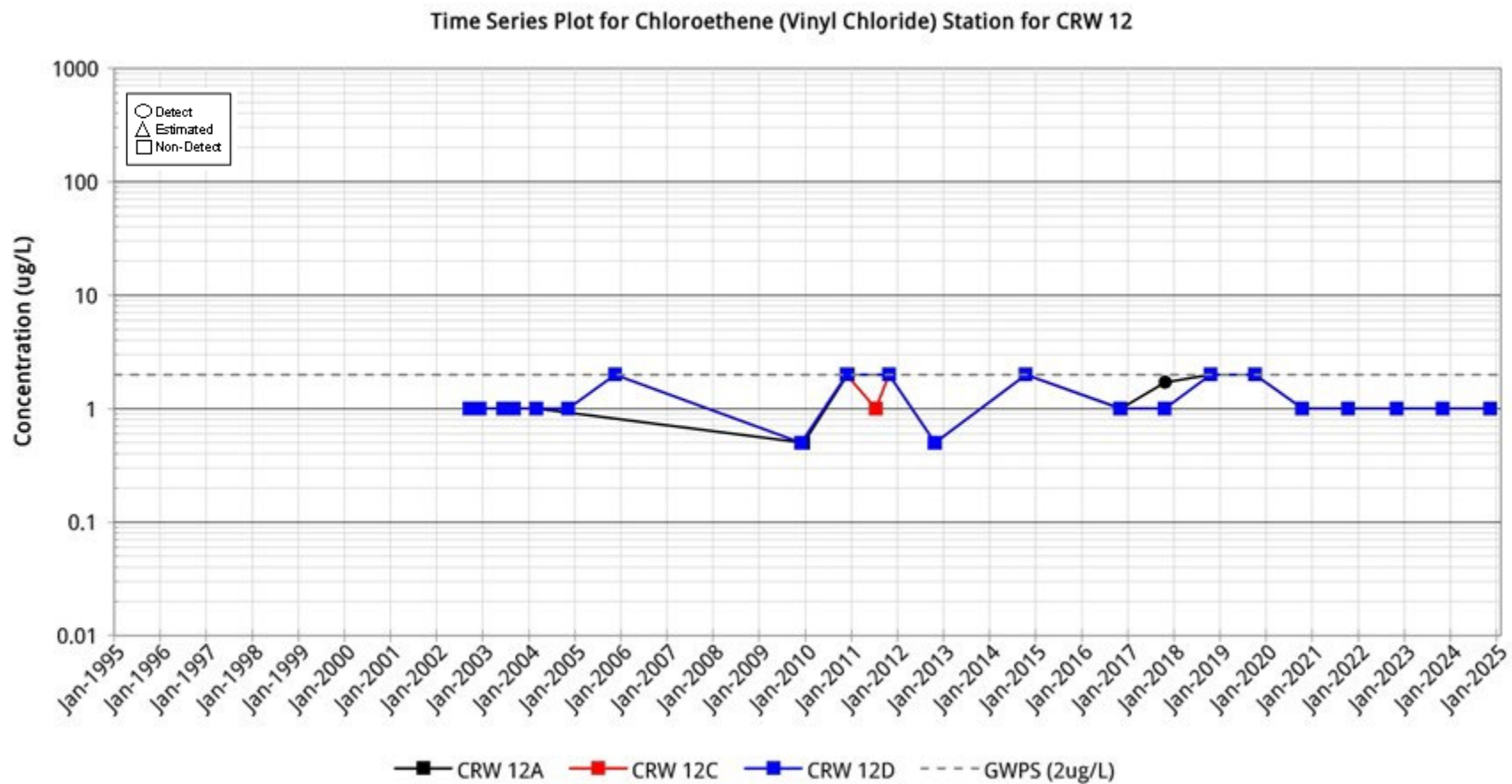


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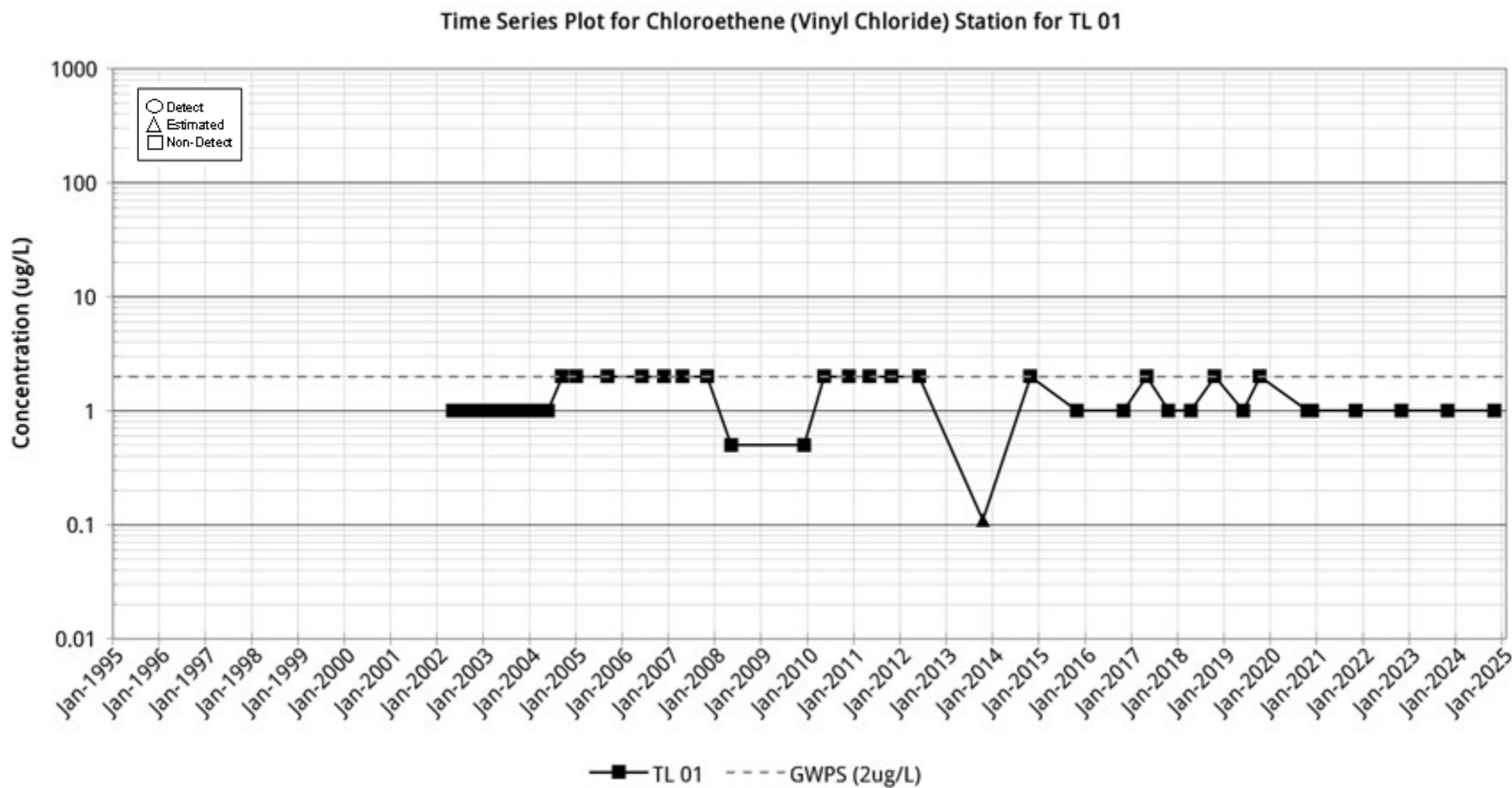


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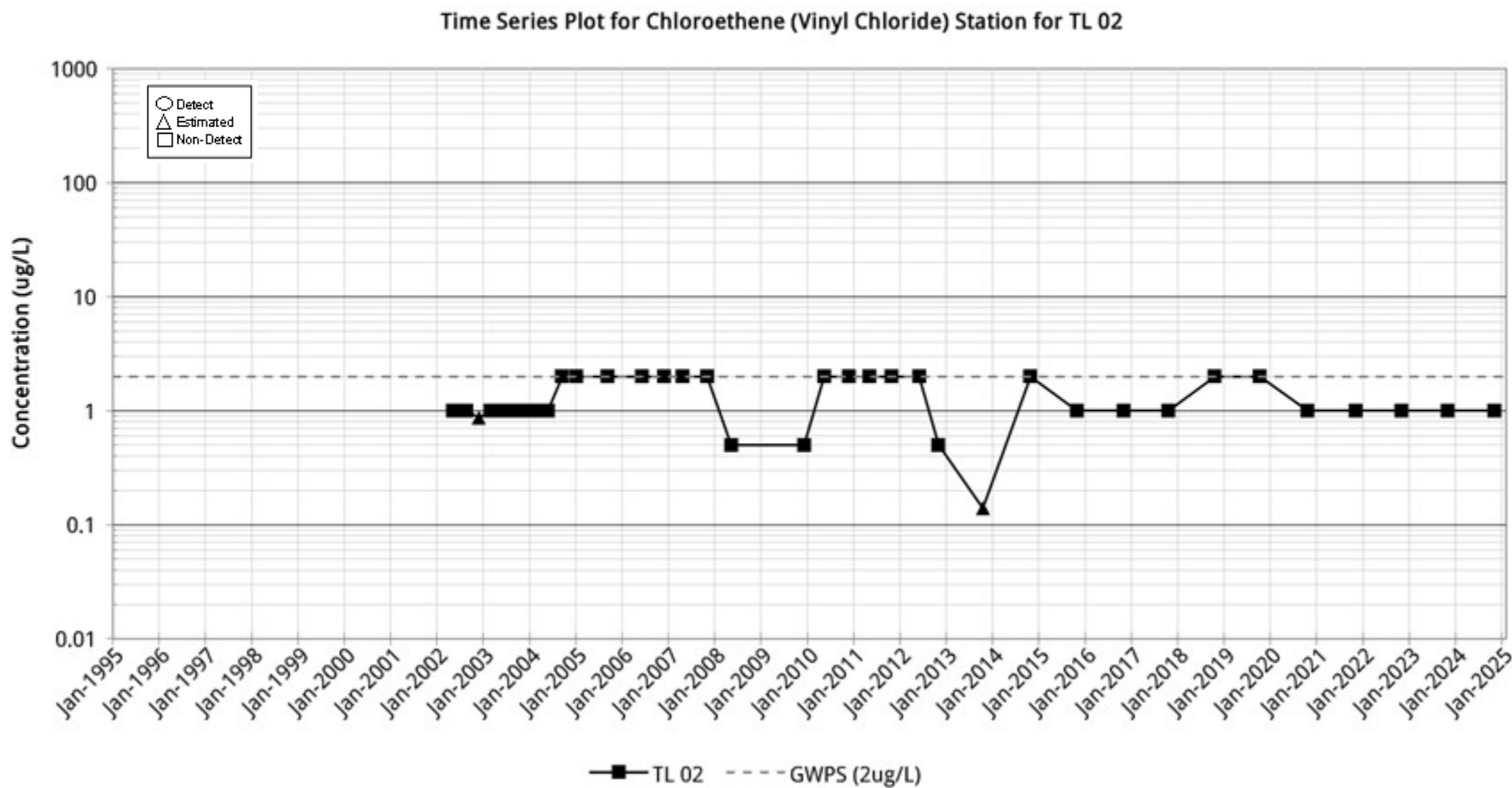


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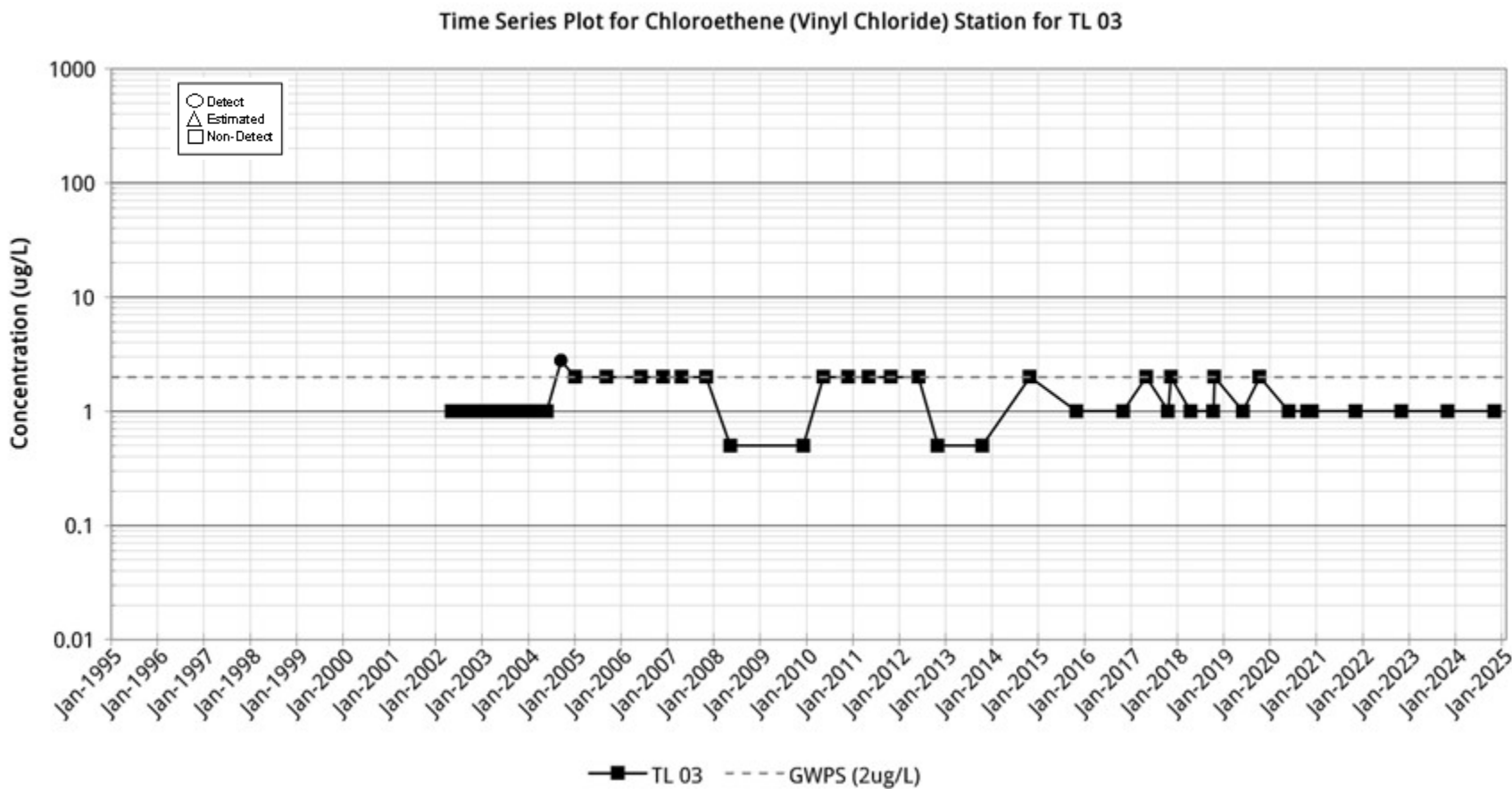


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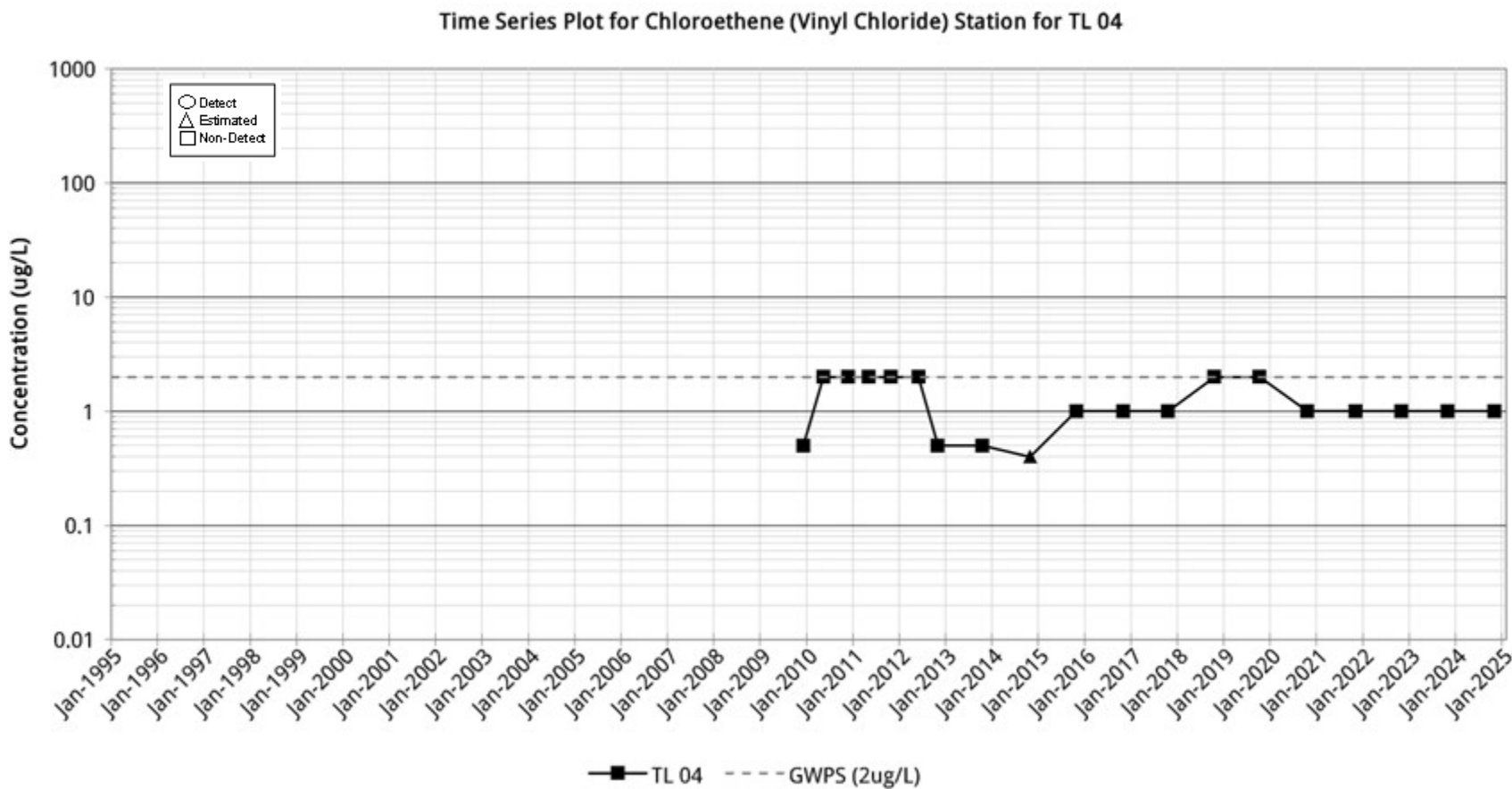


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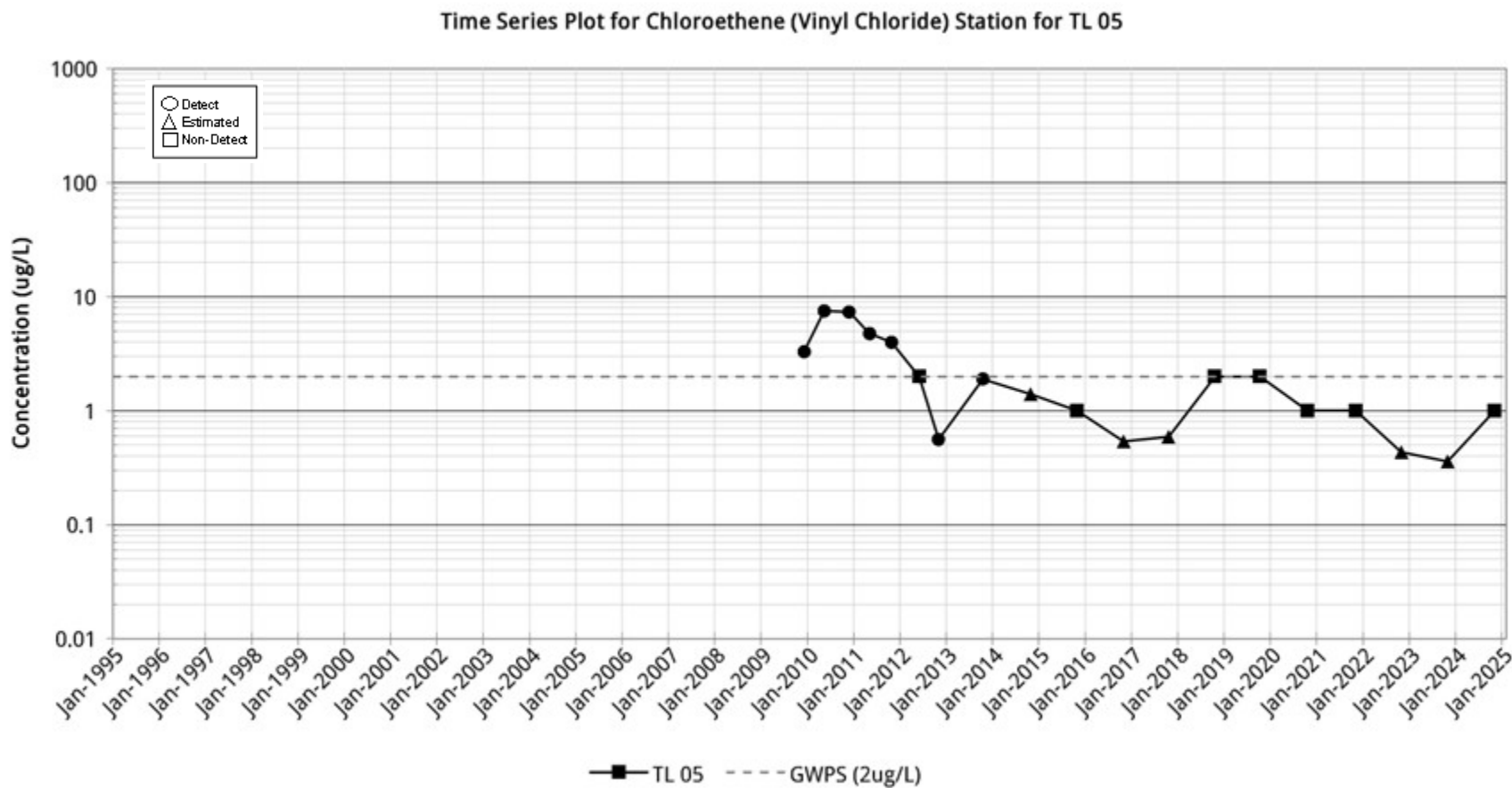


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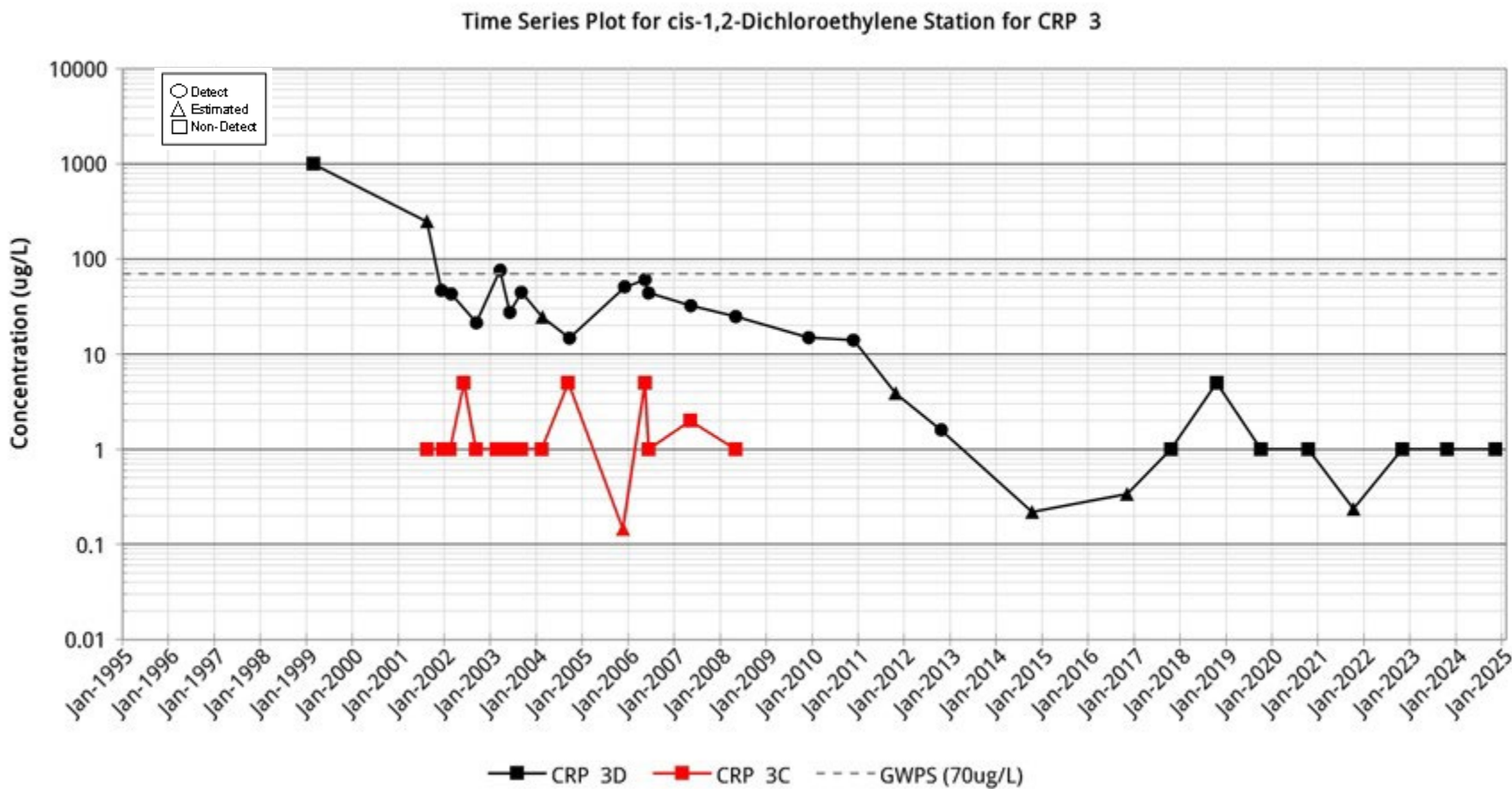


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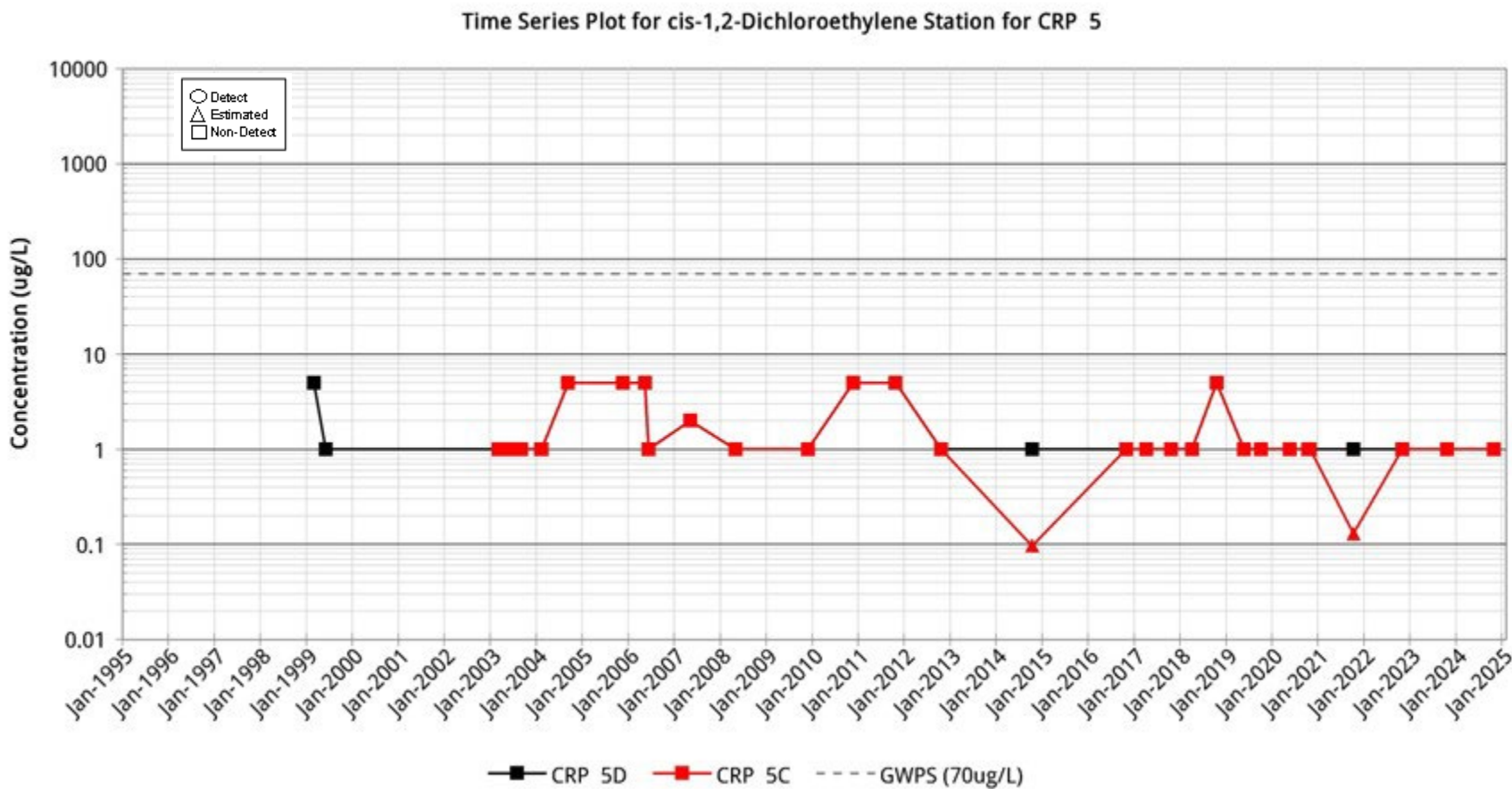


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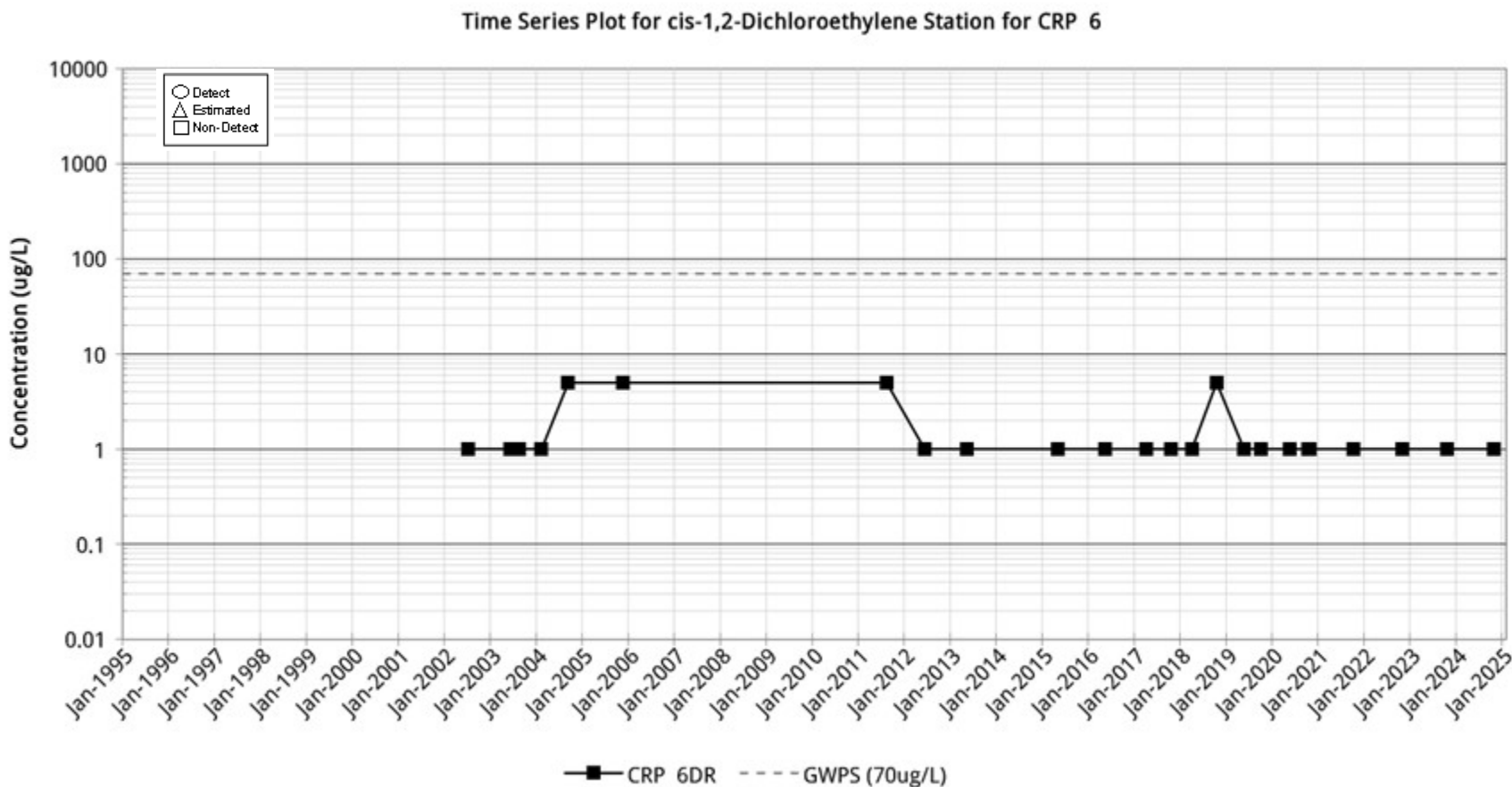


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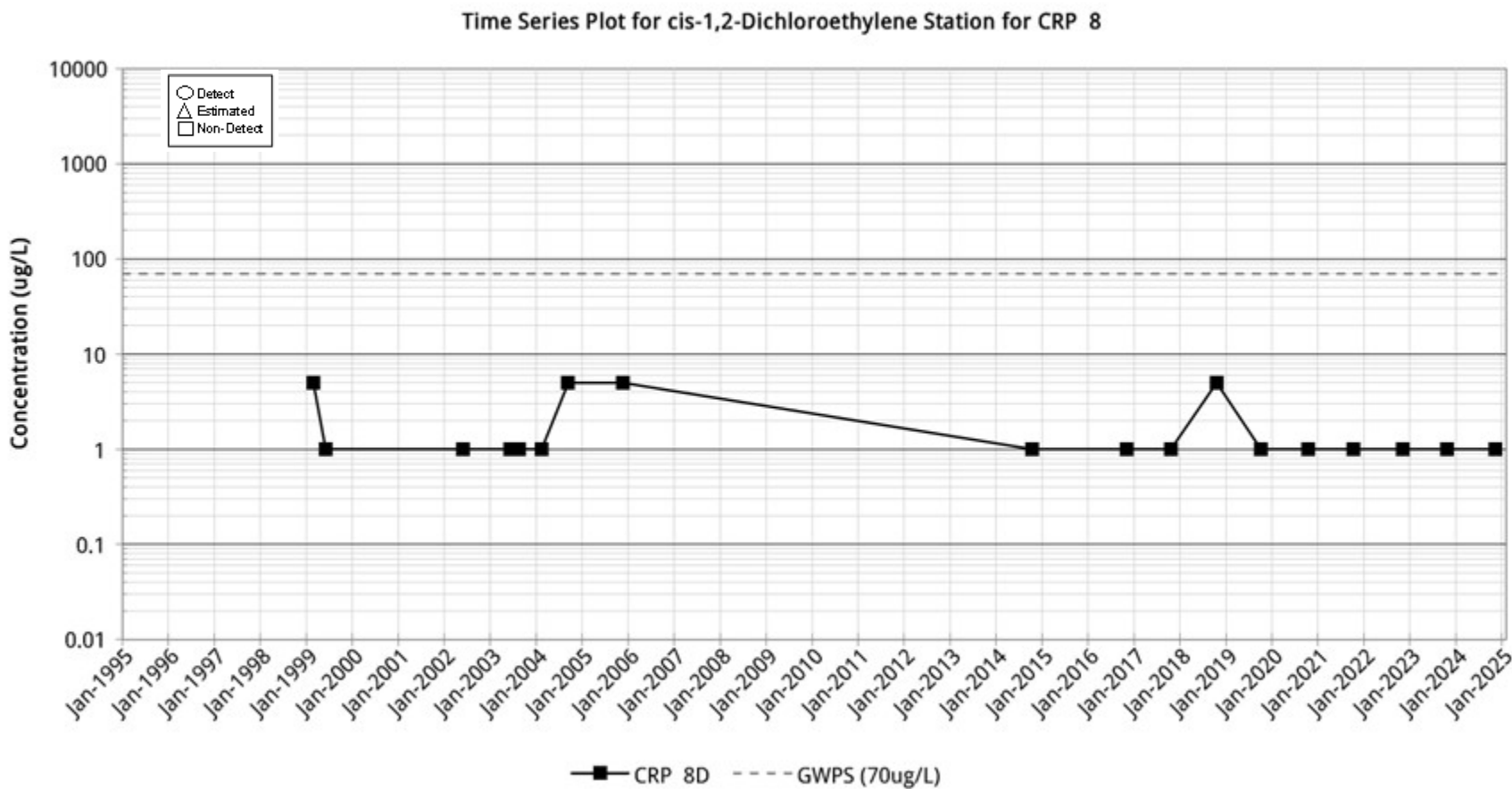


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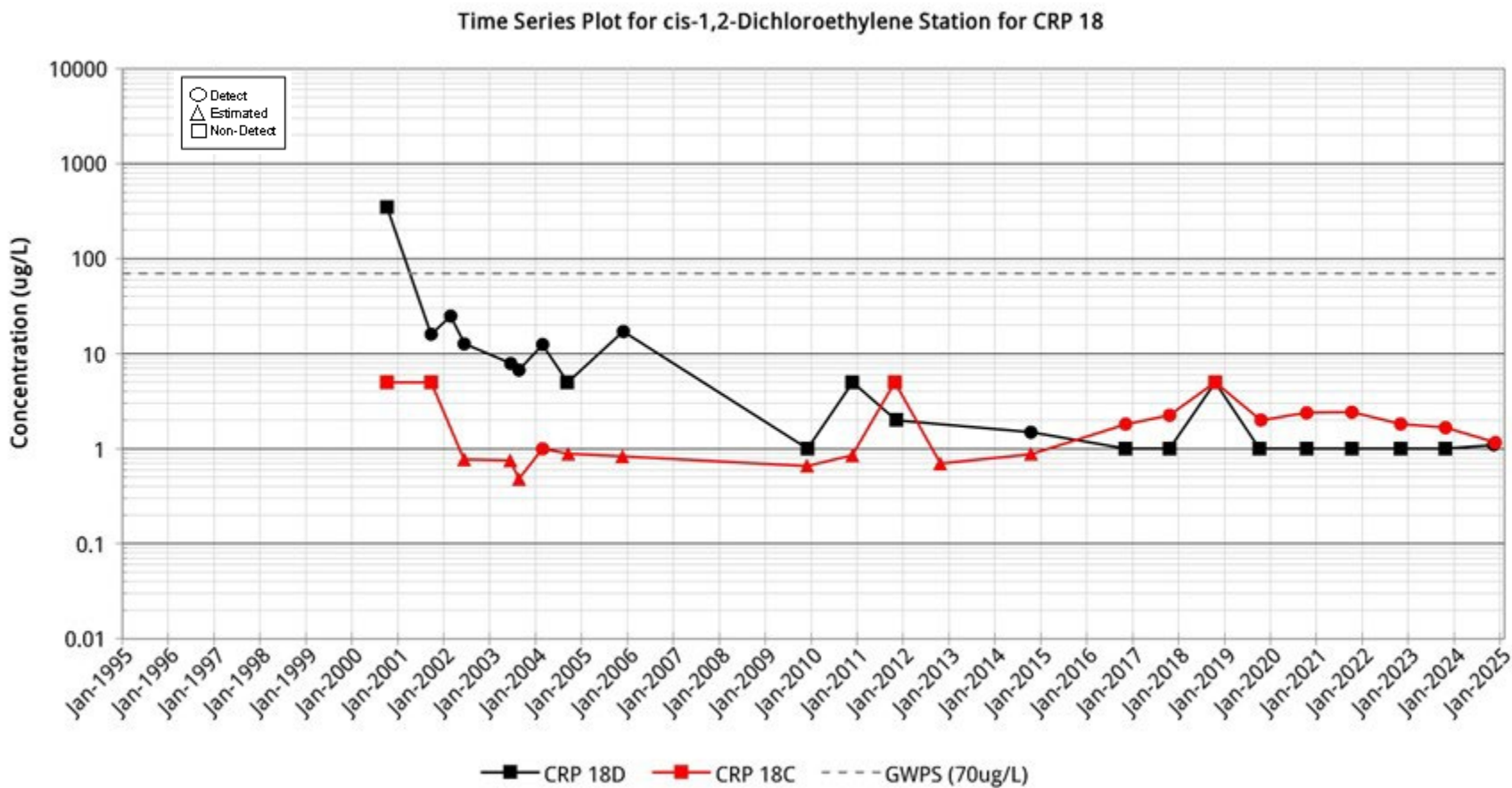


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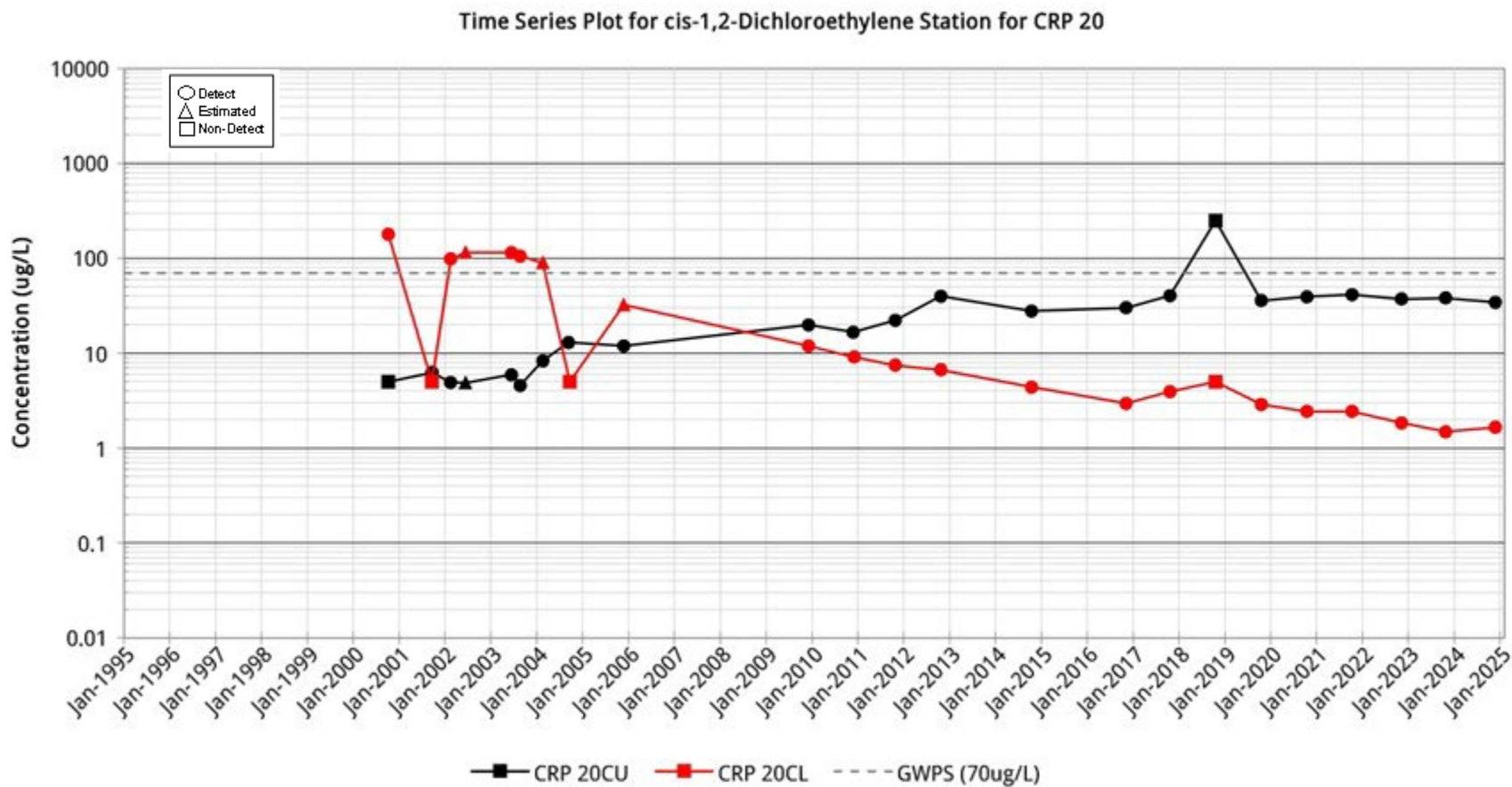


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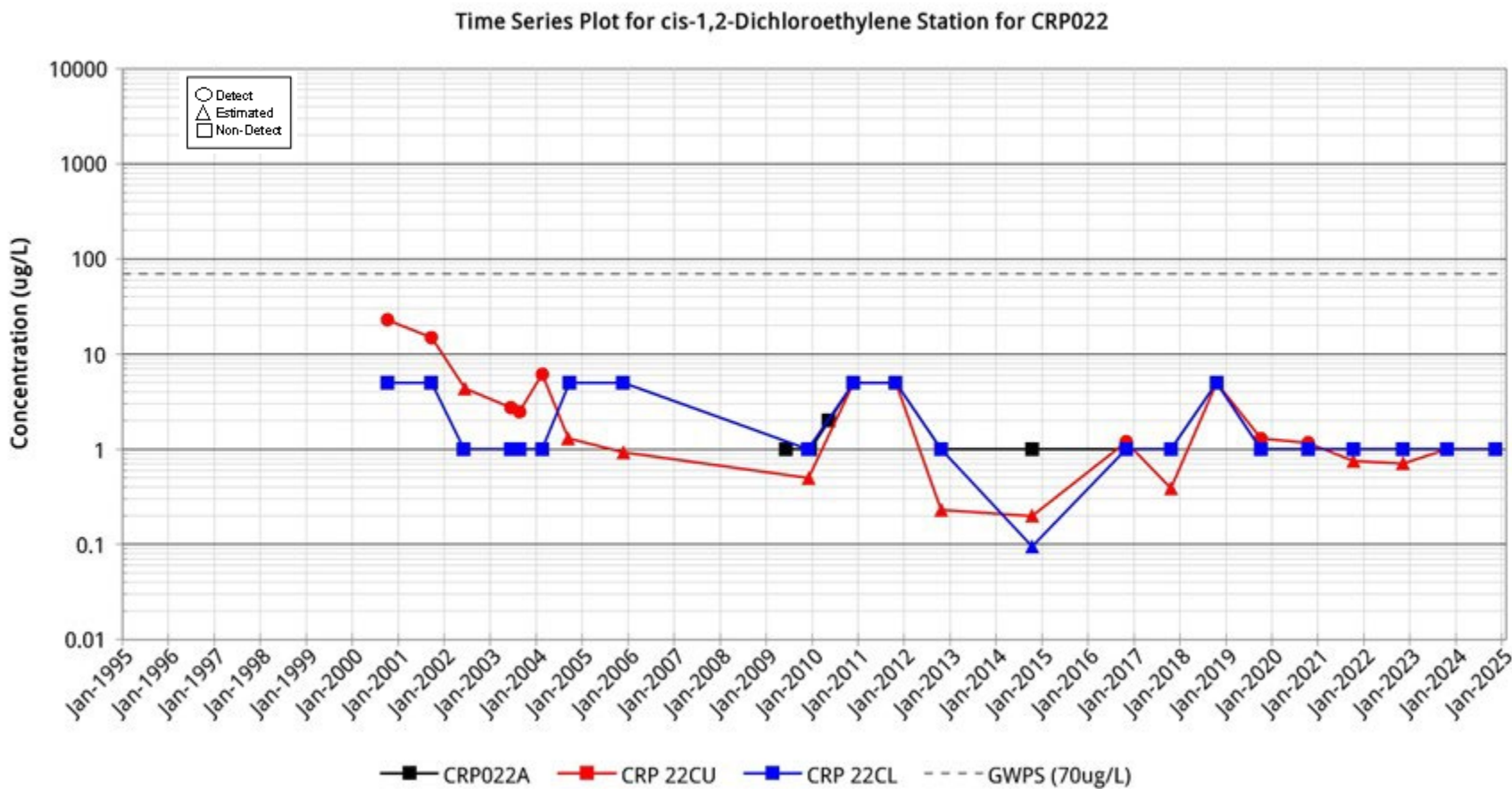


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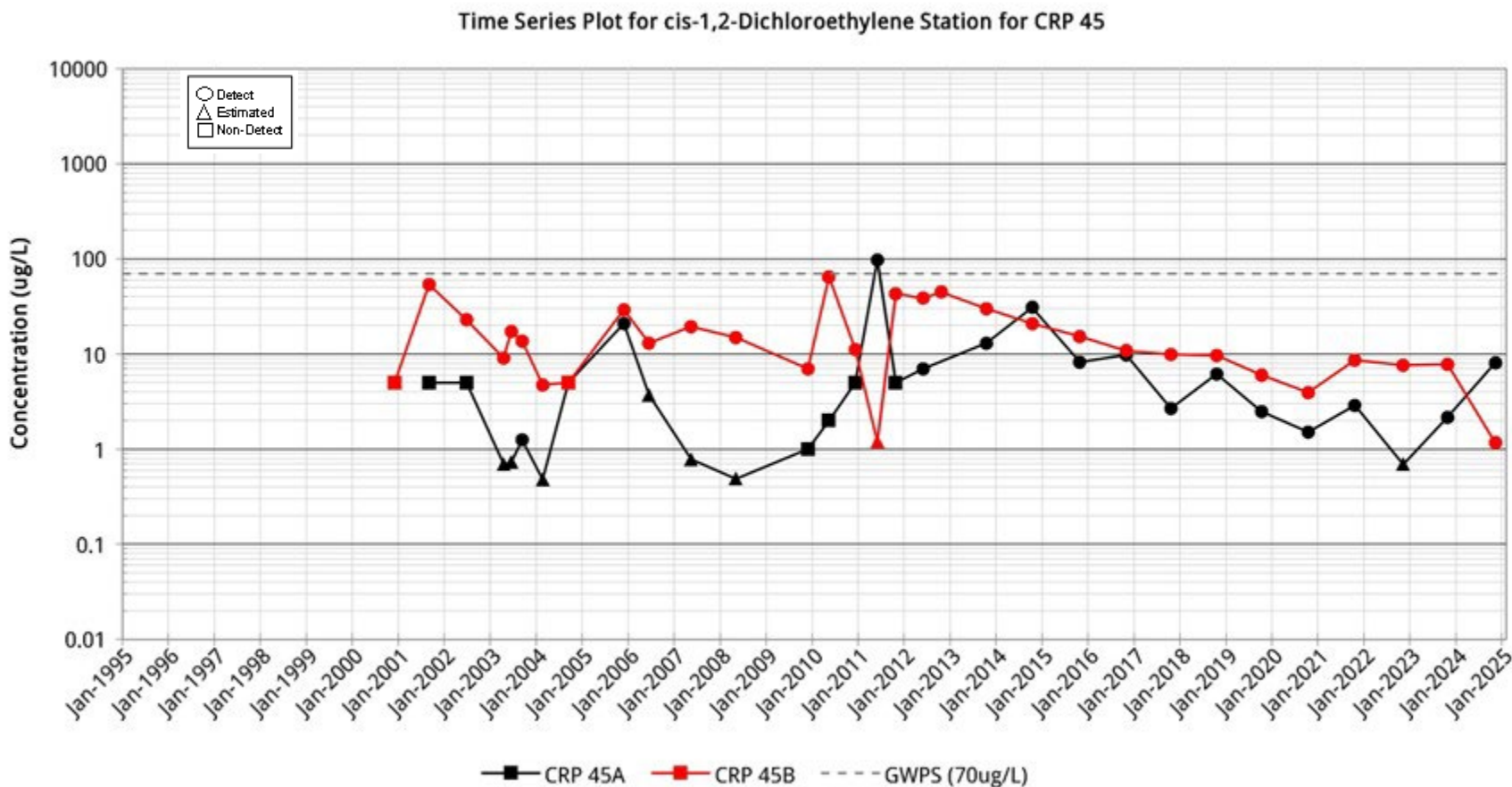


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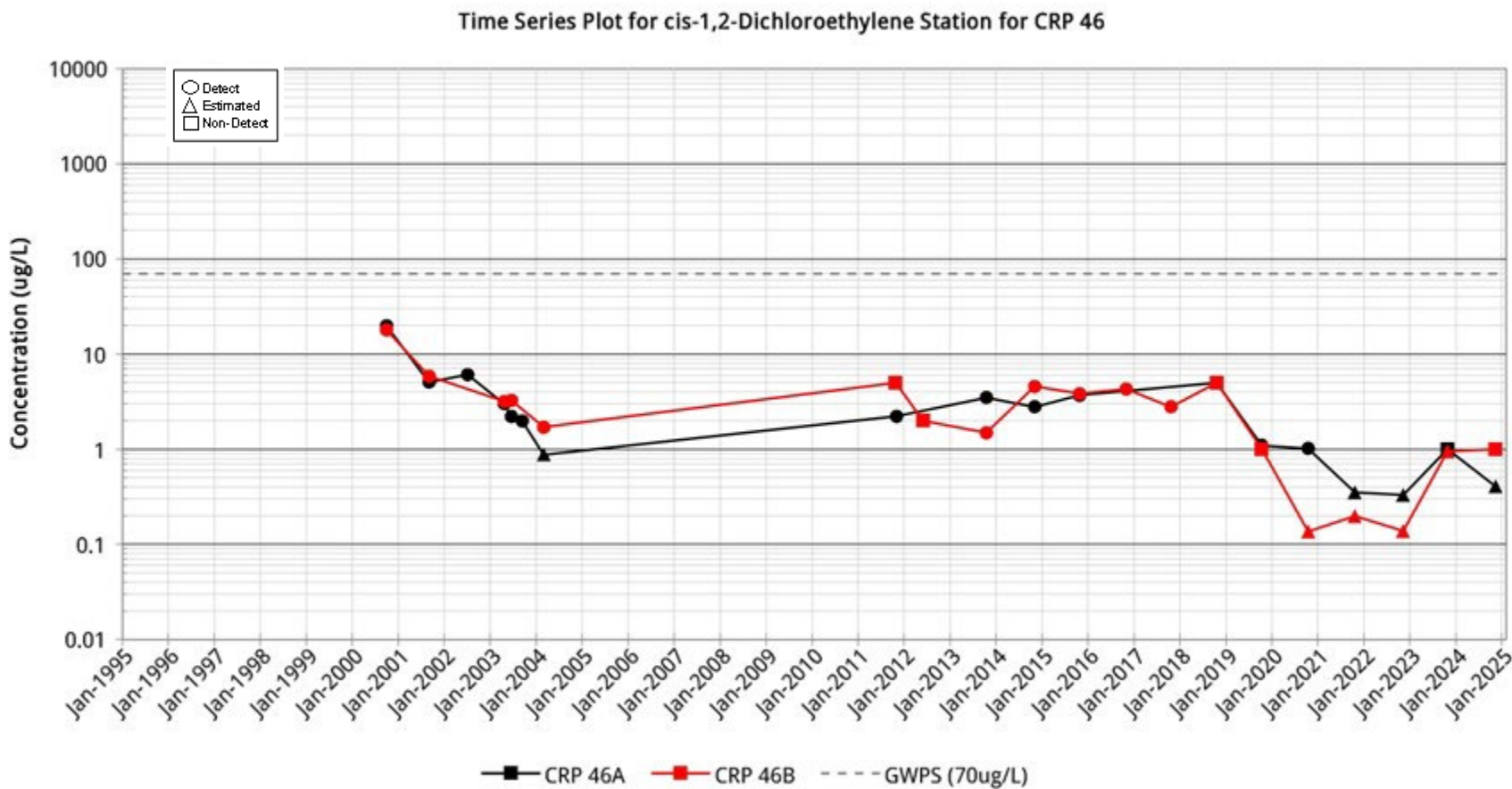


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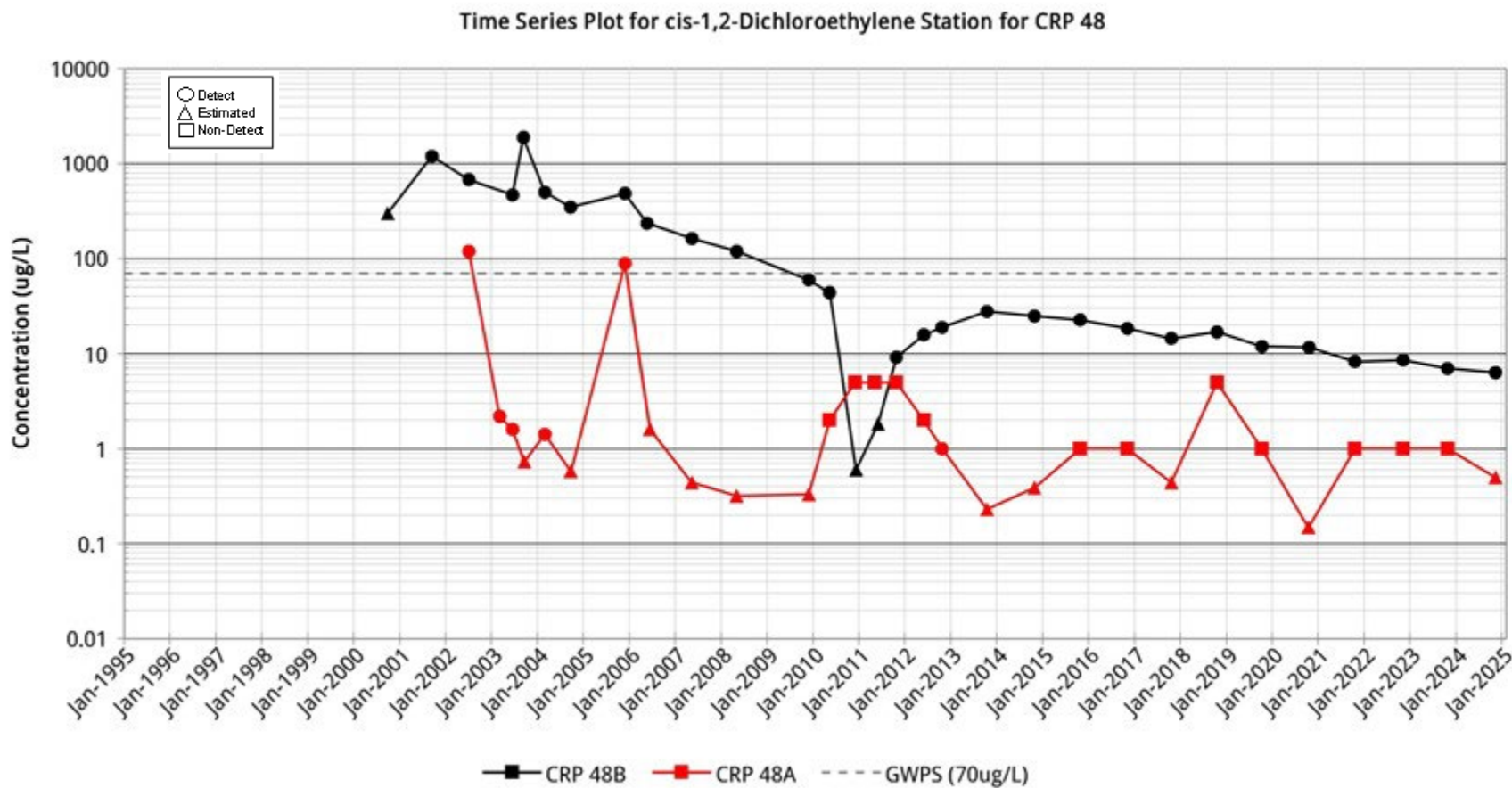


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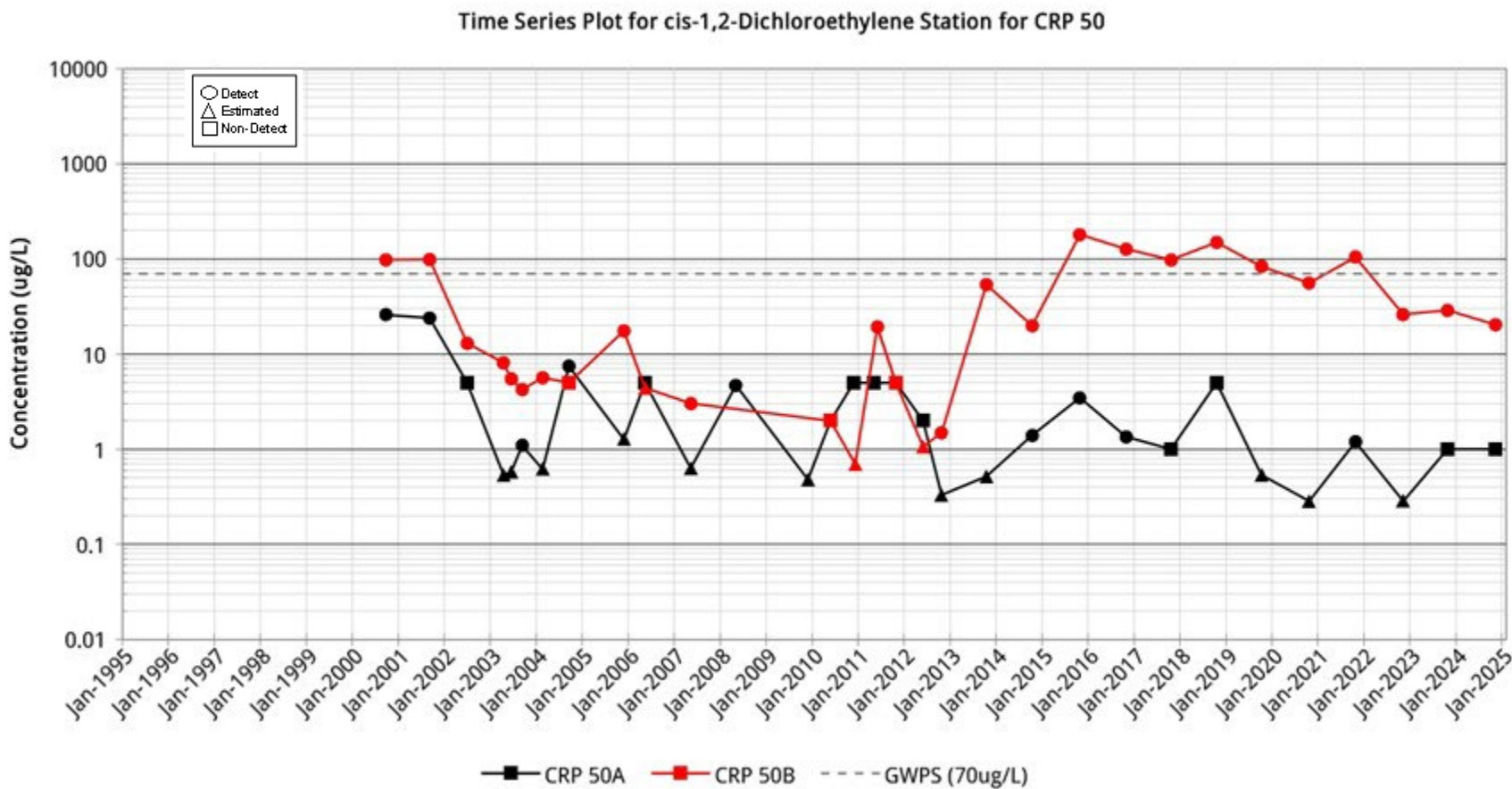


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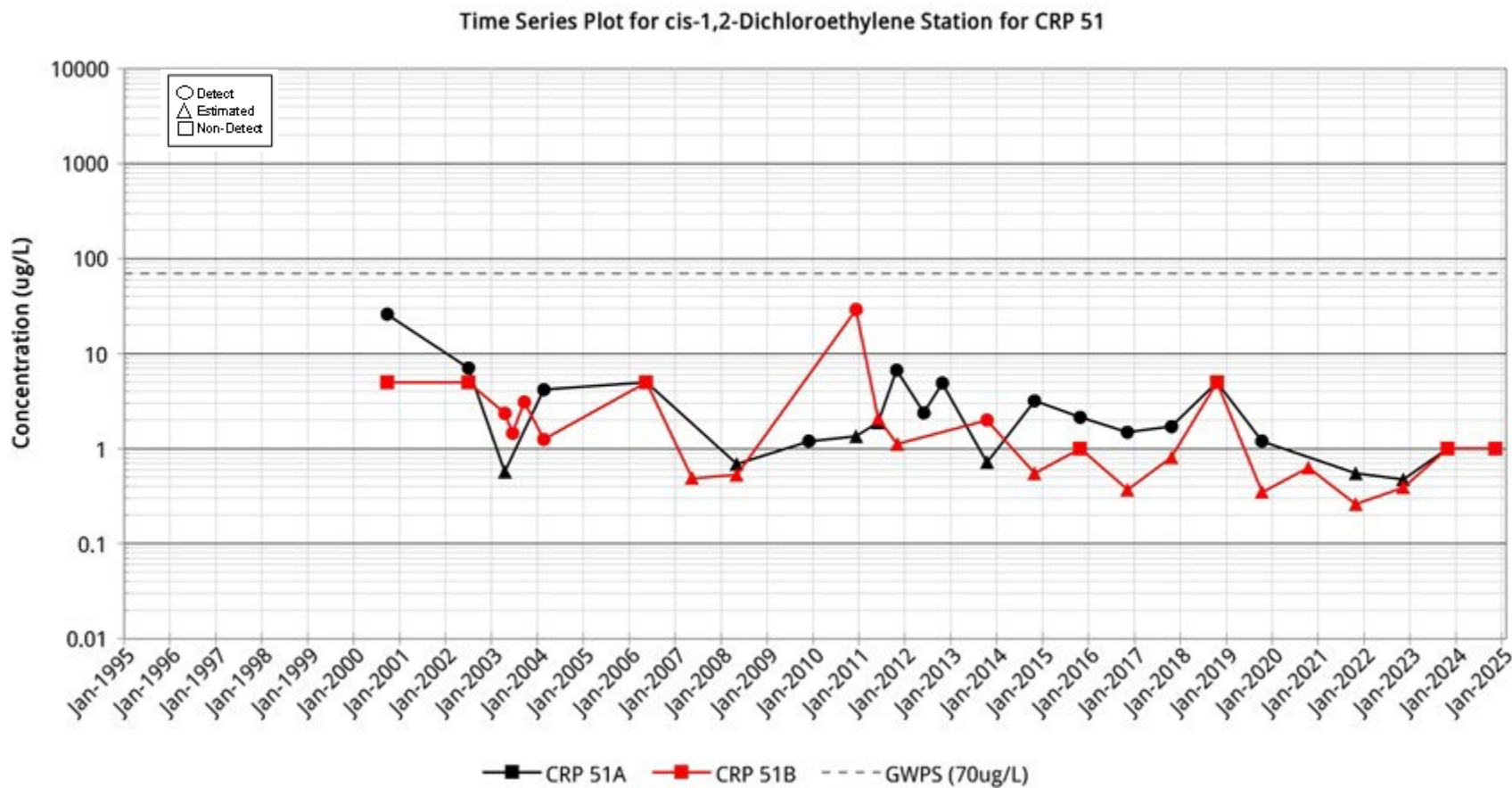


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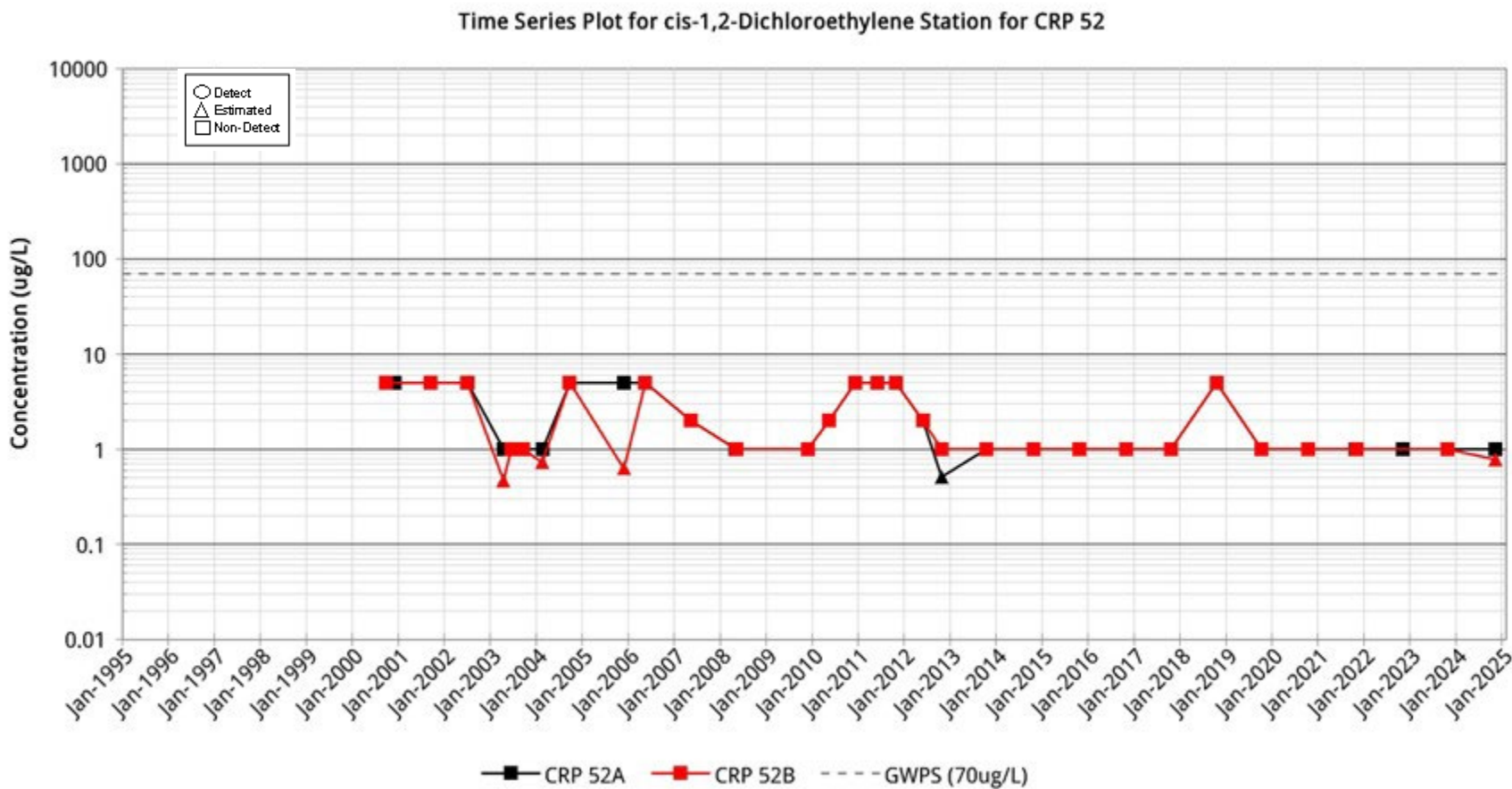


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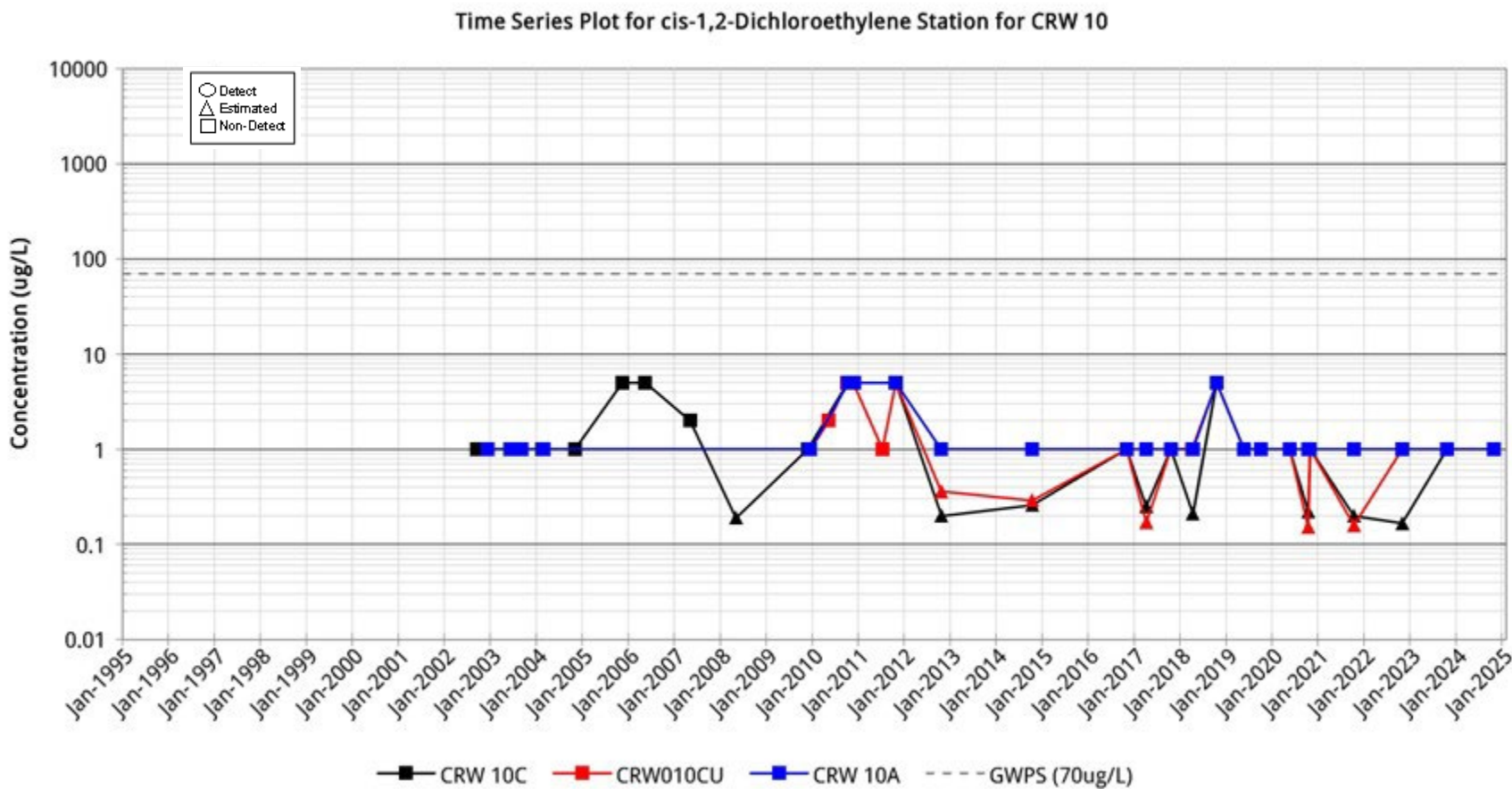


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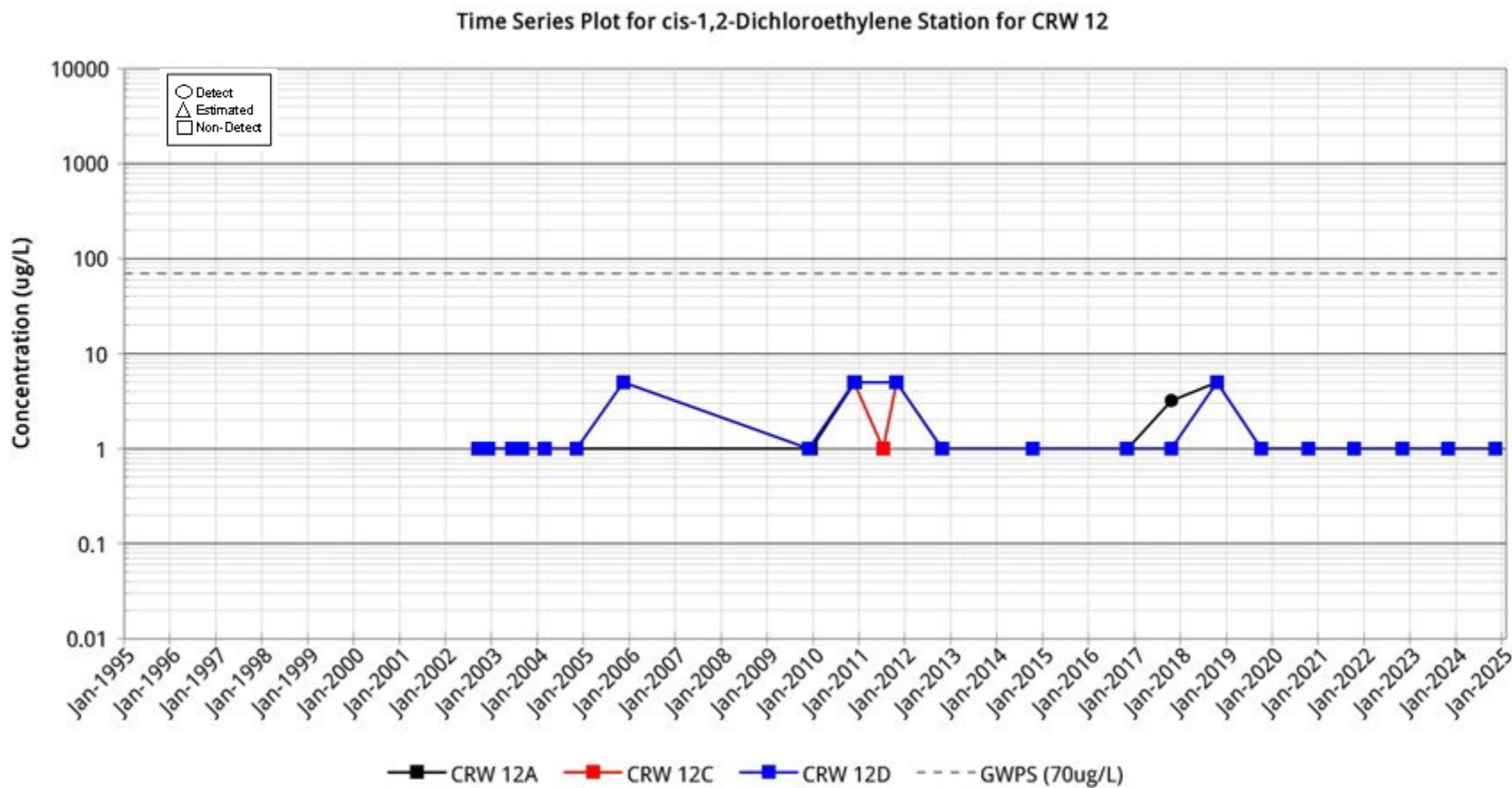


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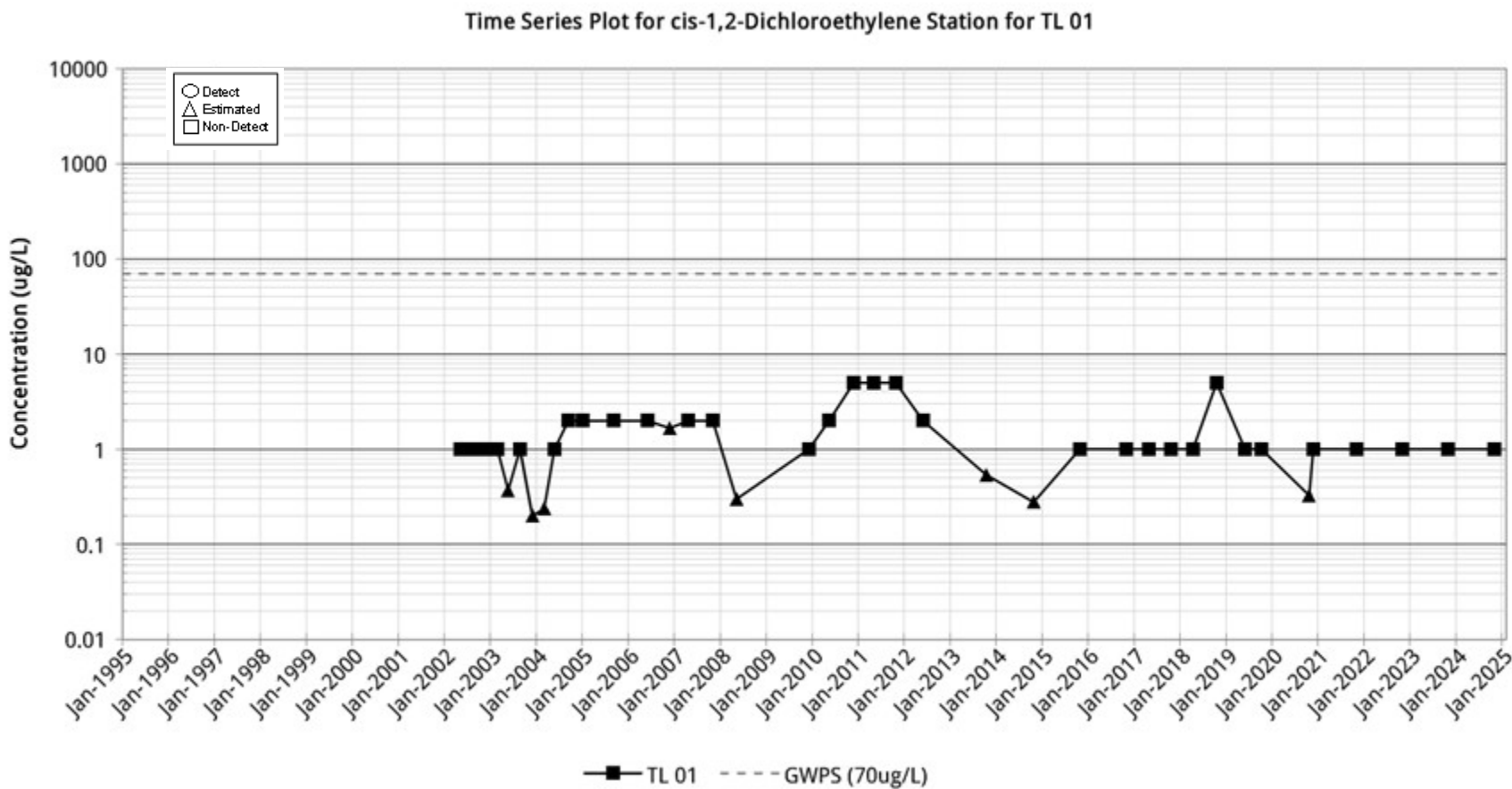


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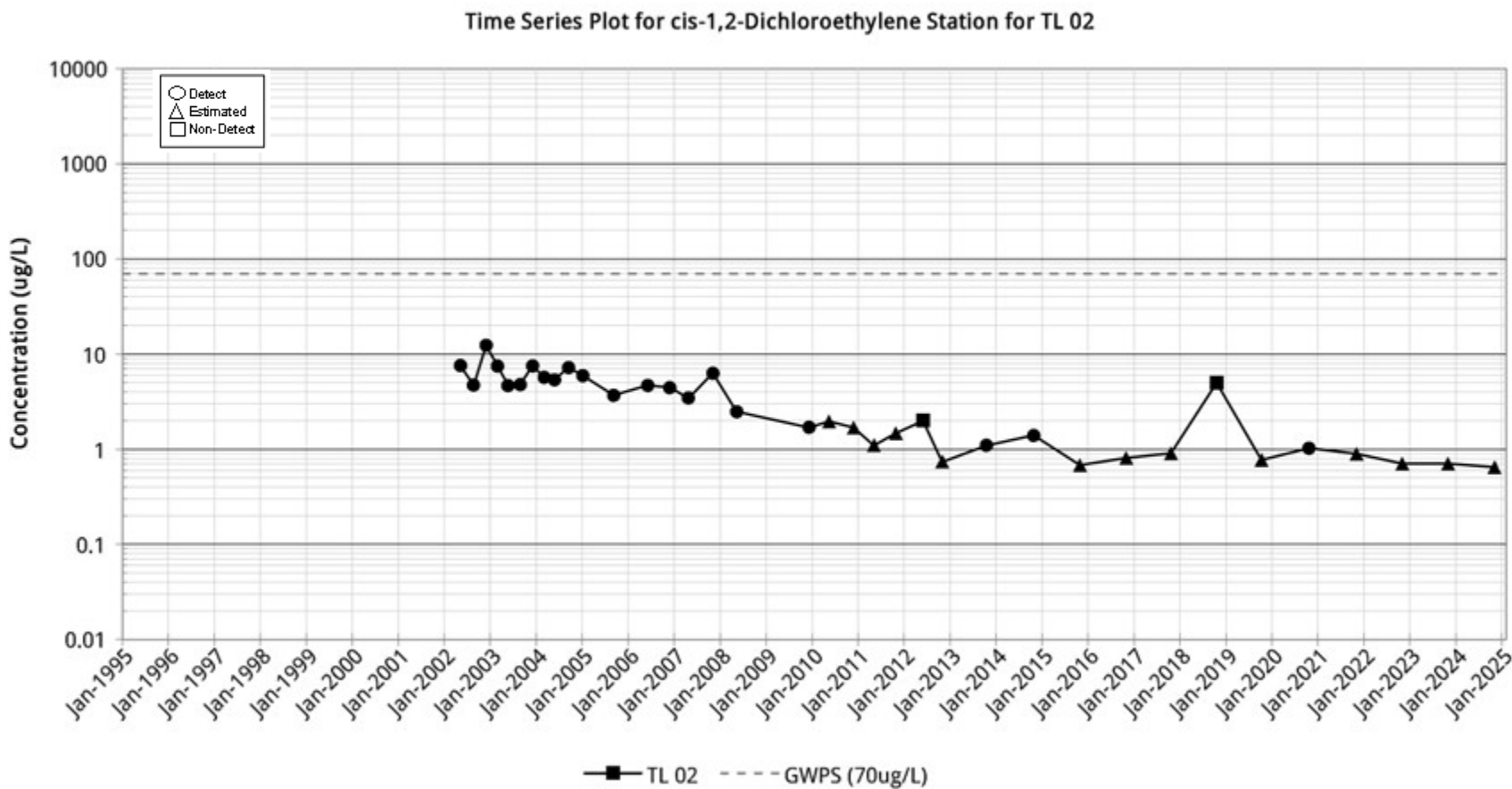


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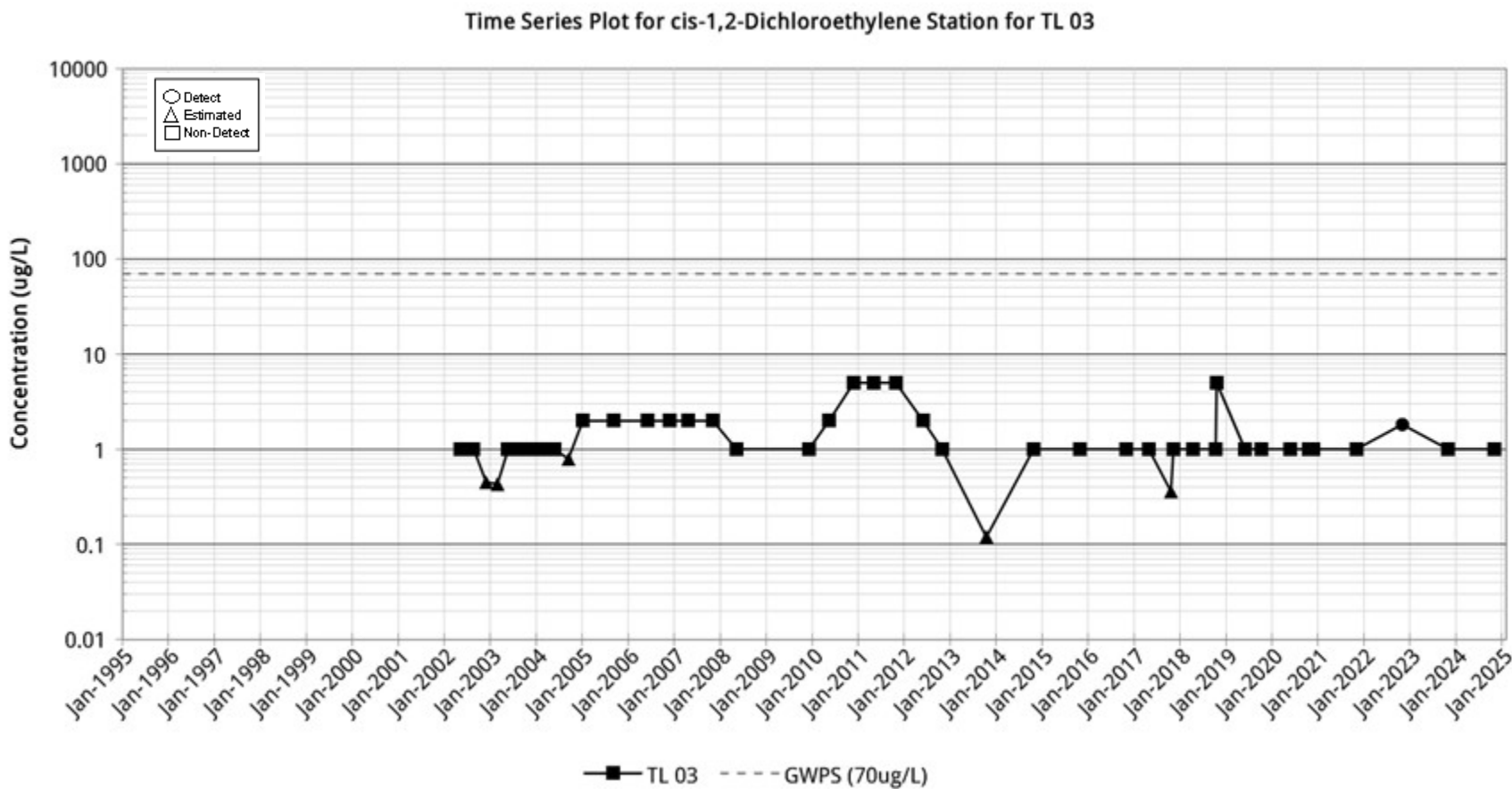


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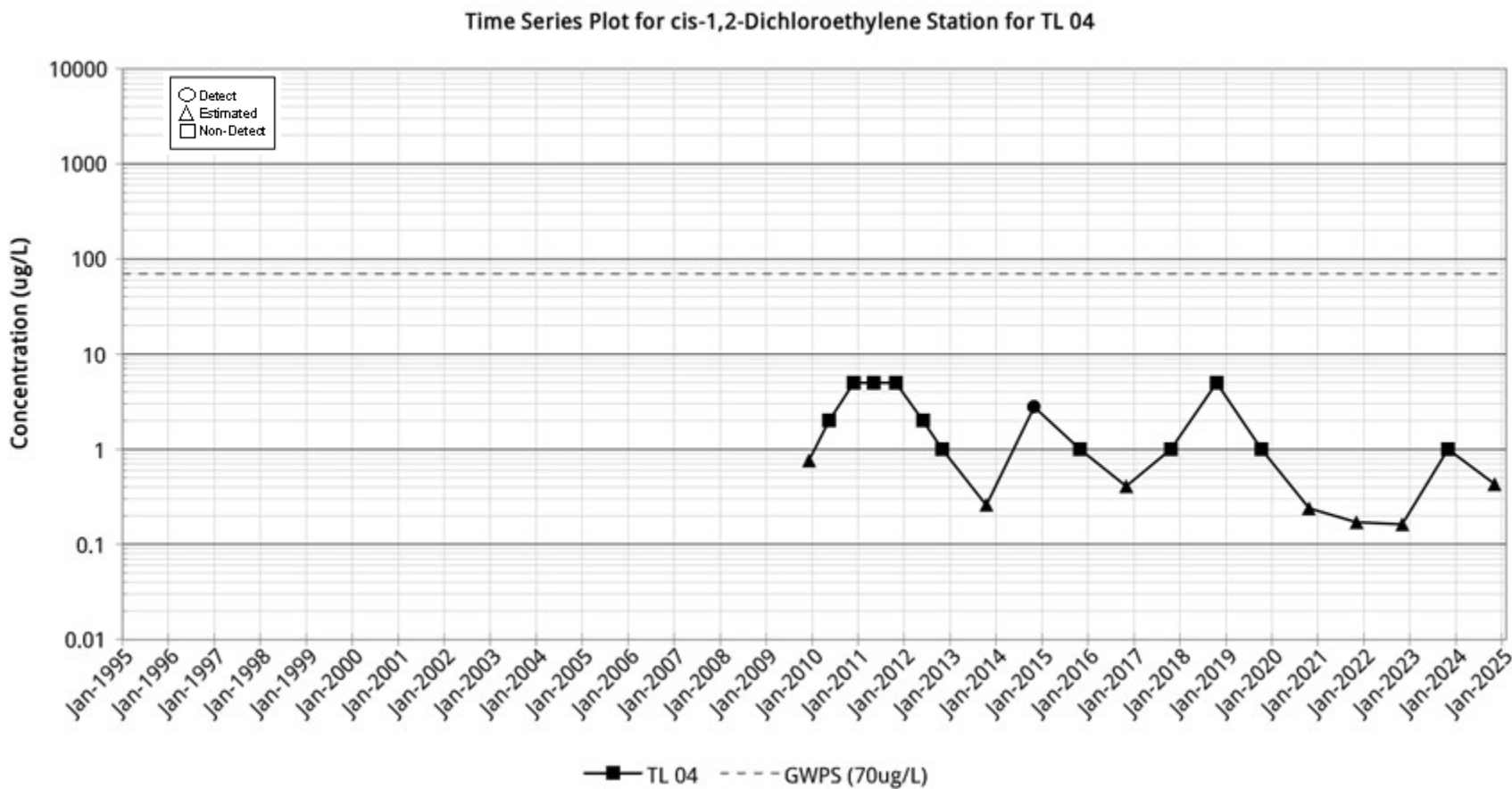


Figure C-60.

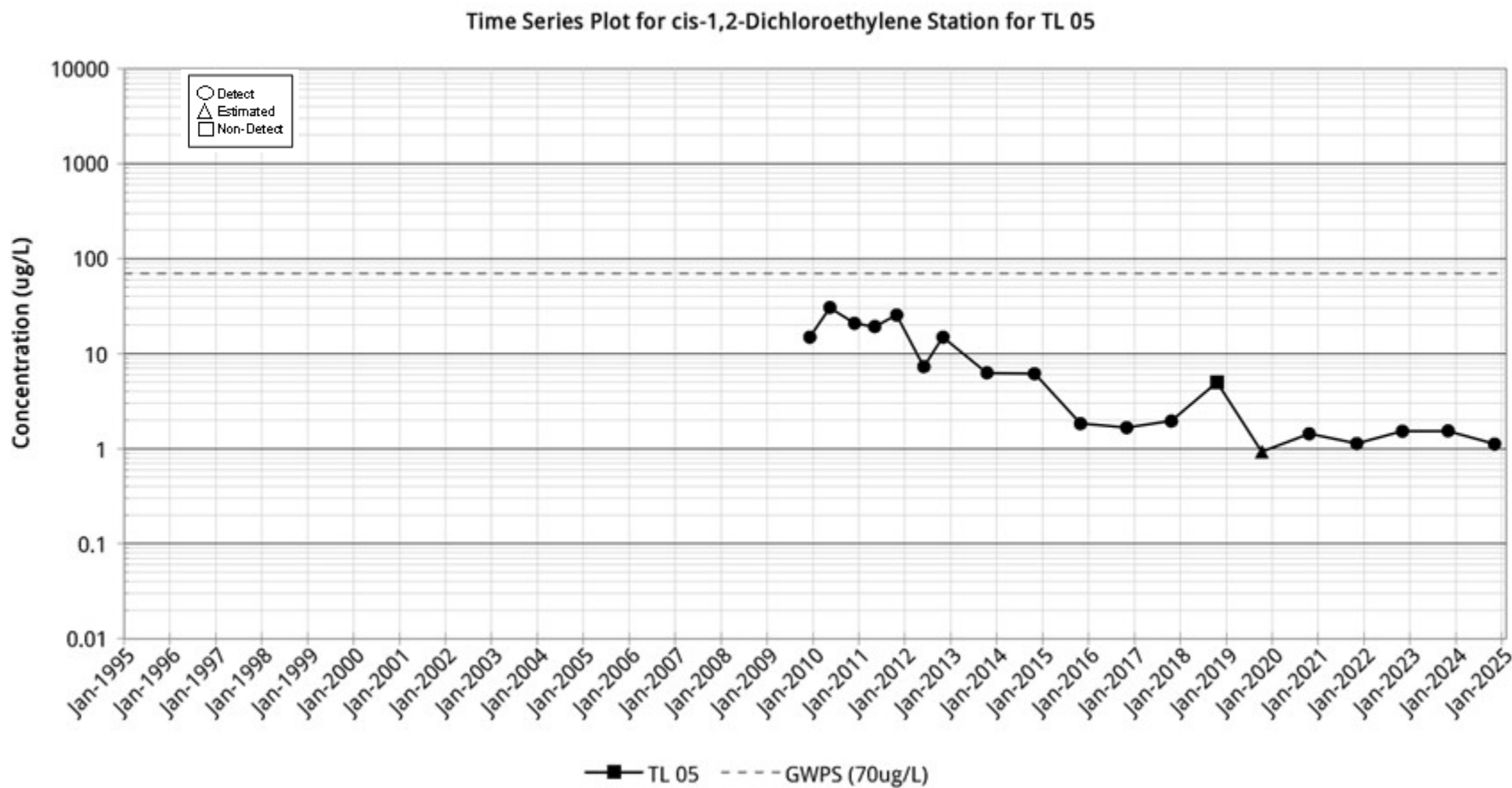


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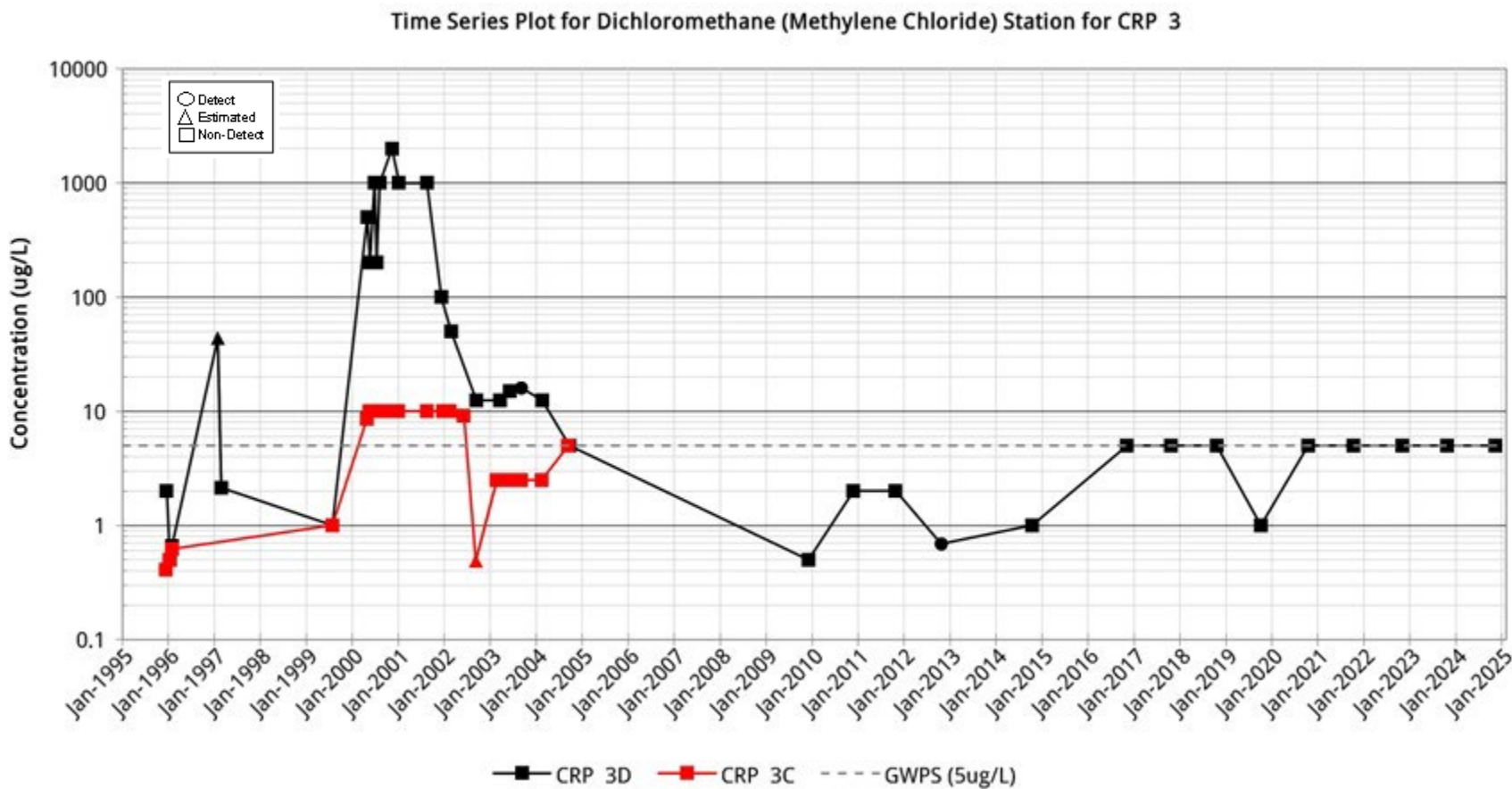


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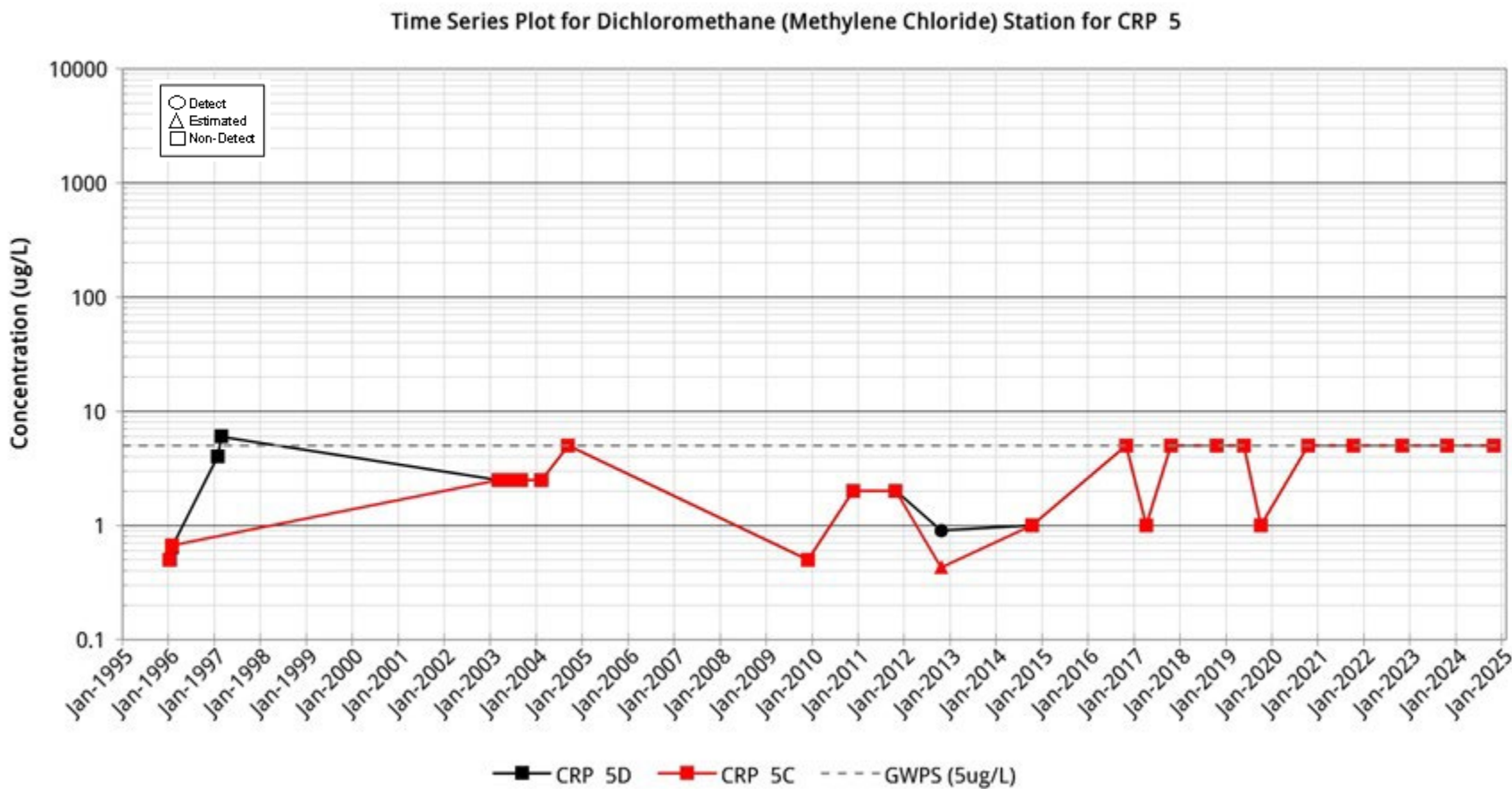


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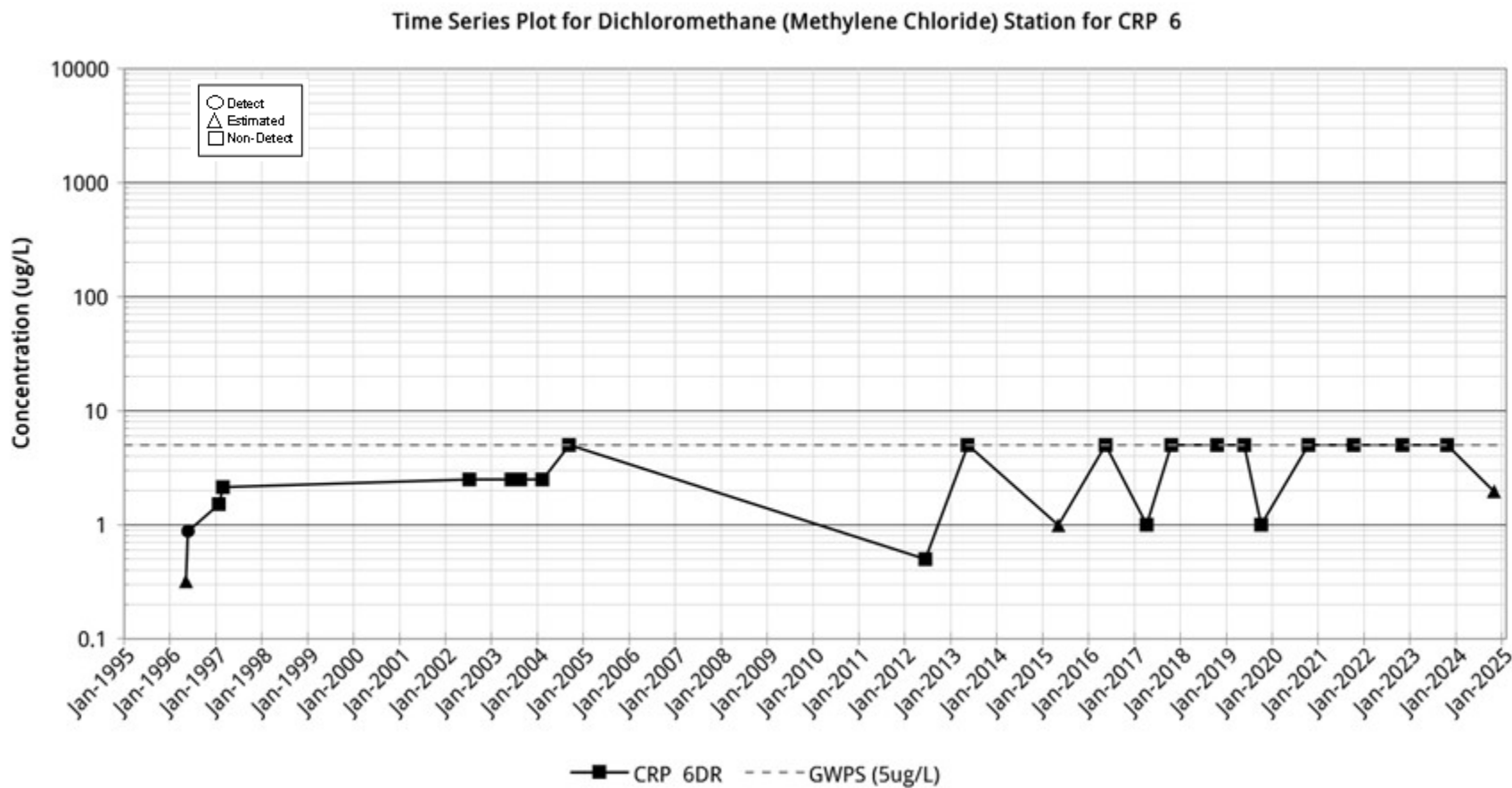


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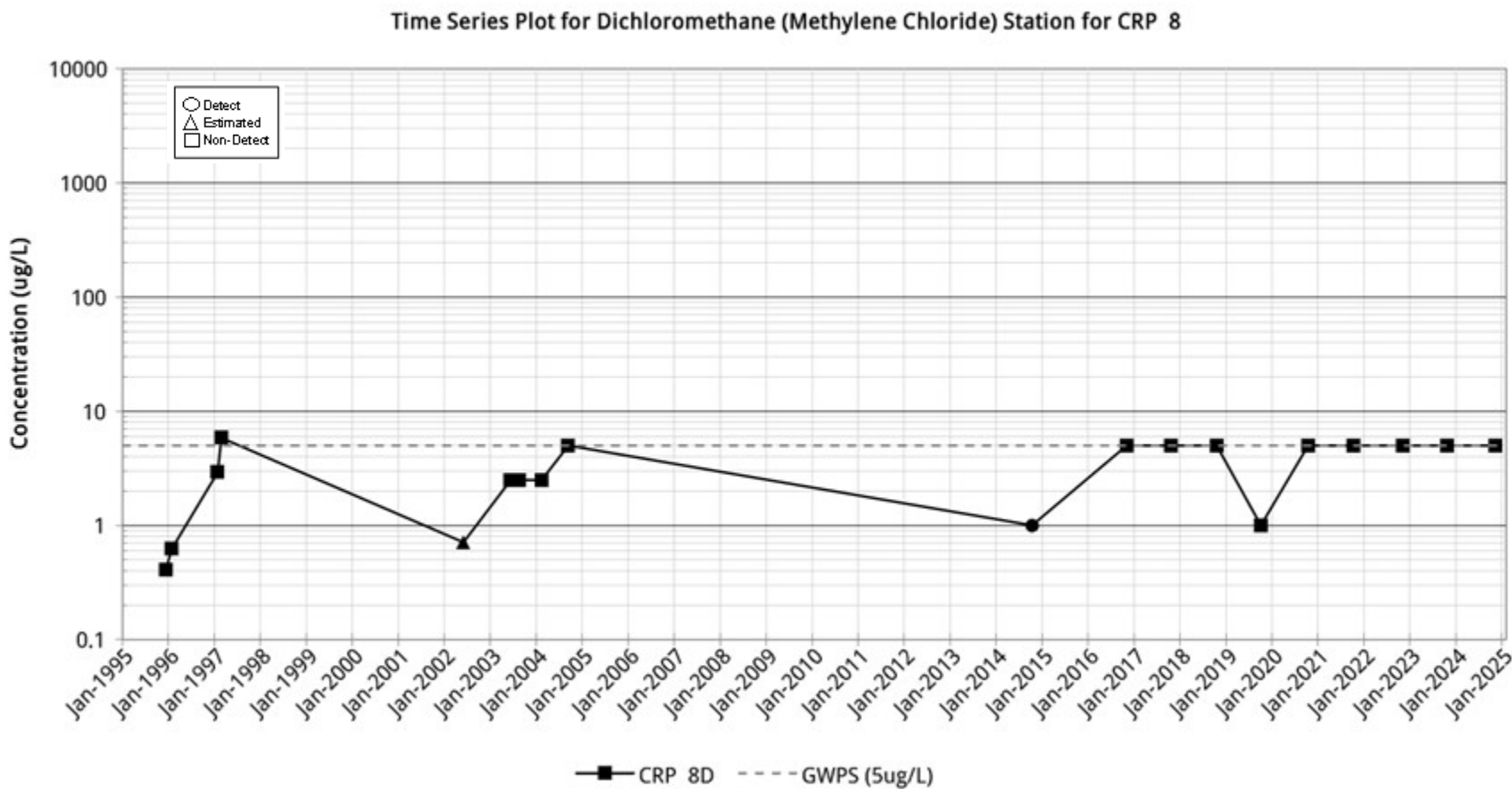


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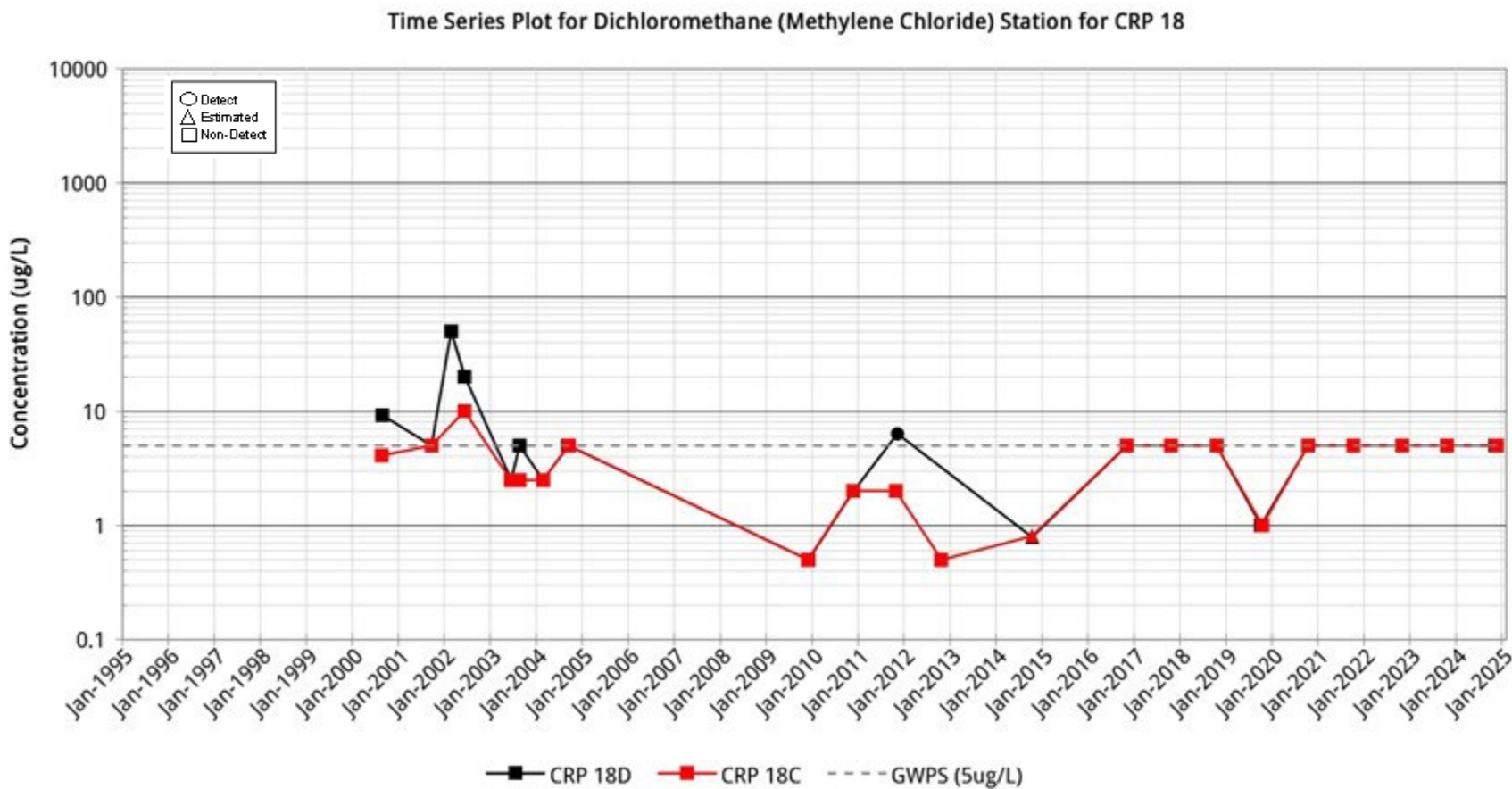


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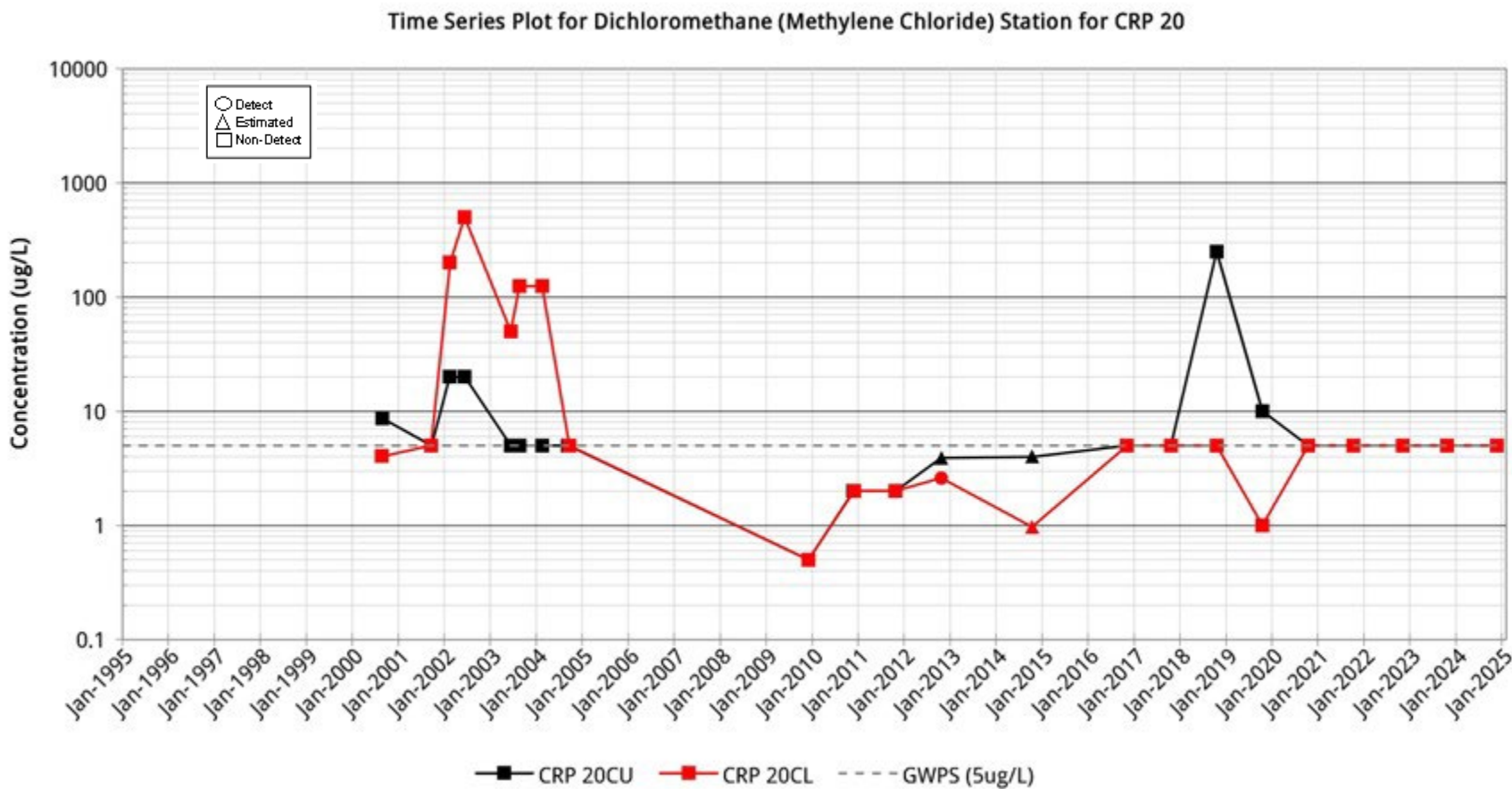


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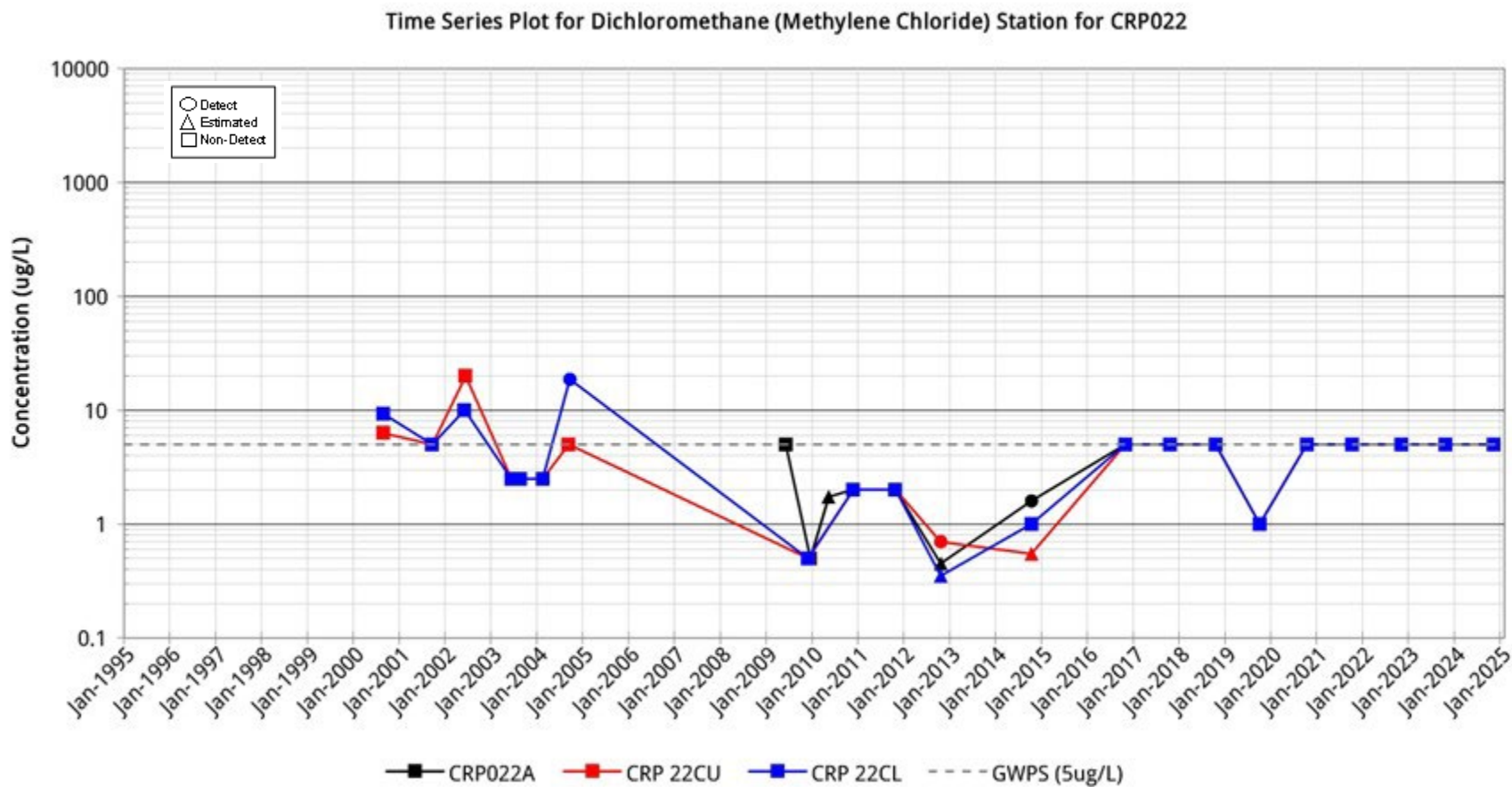


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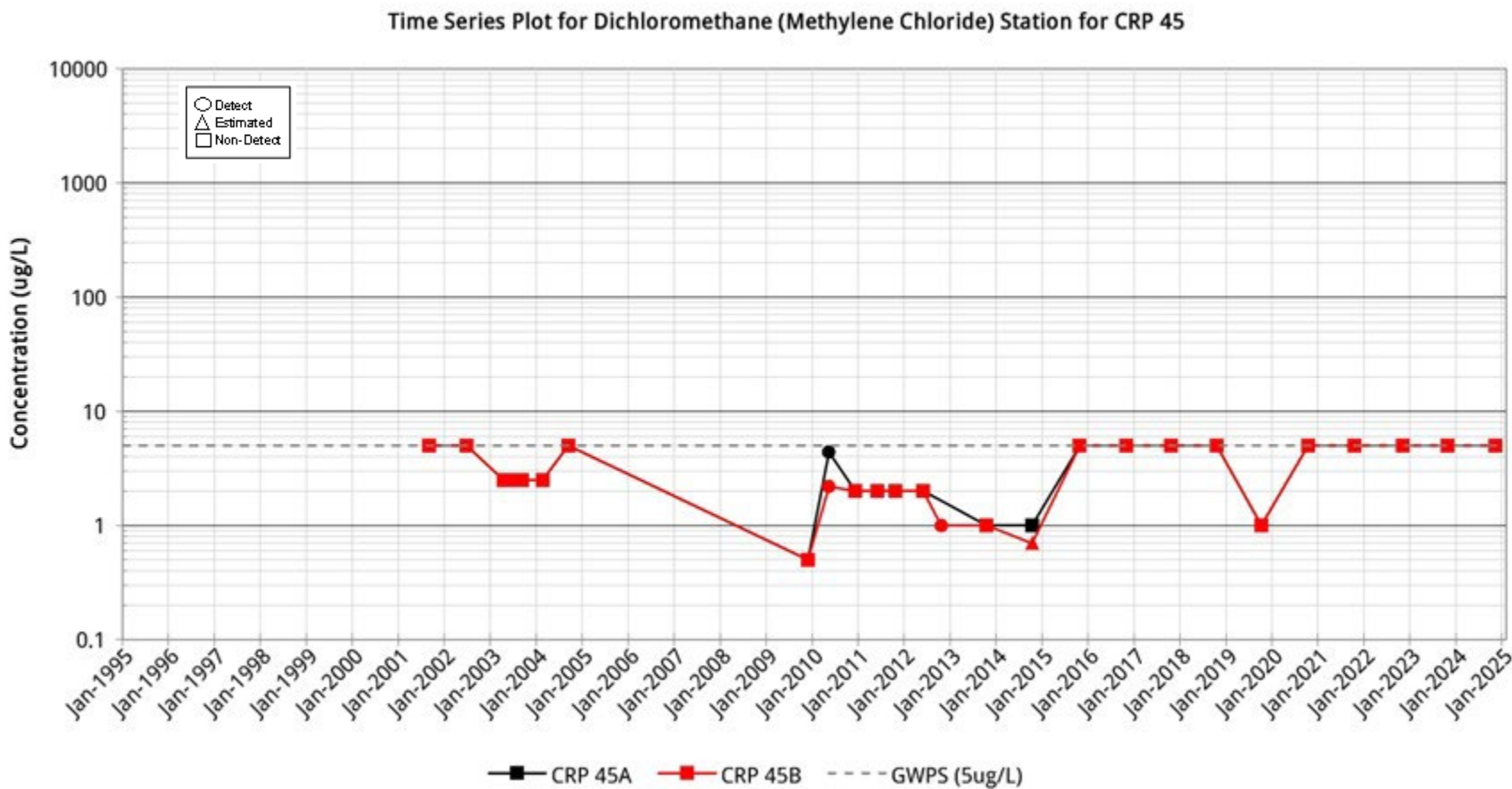


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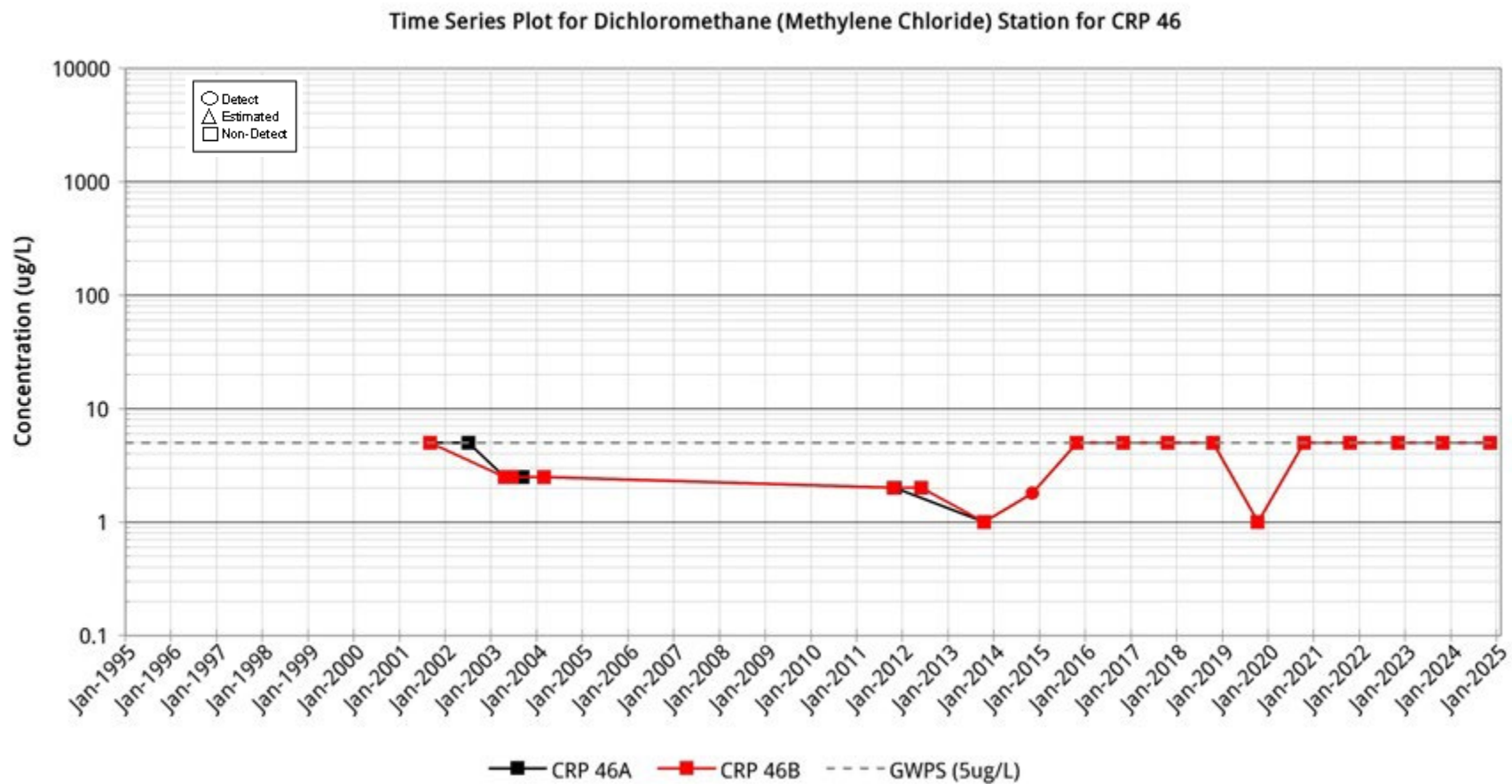


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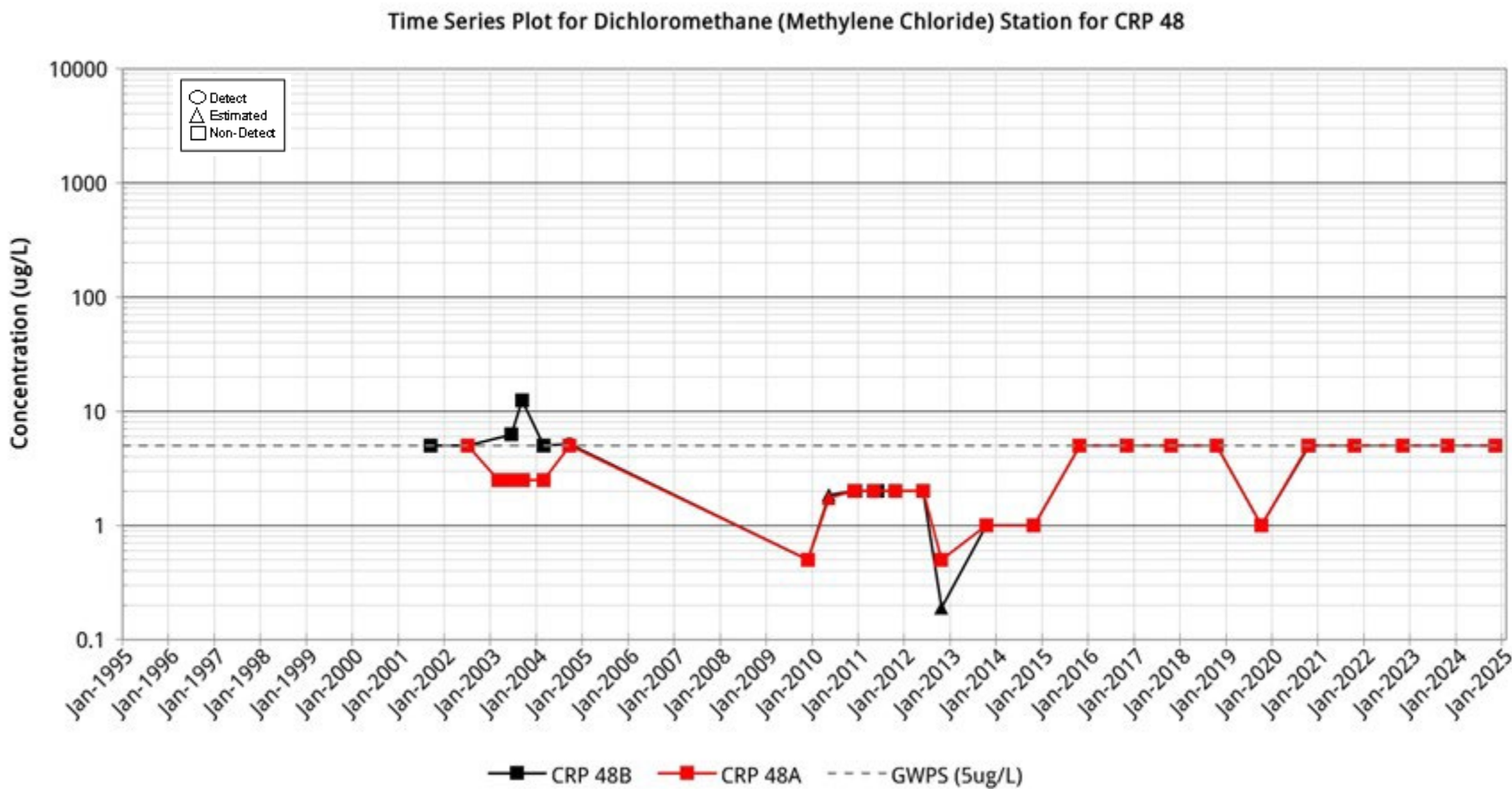


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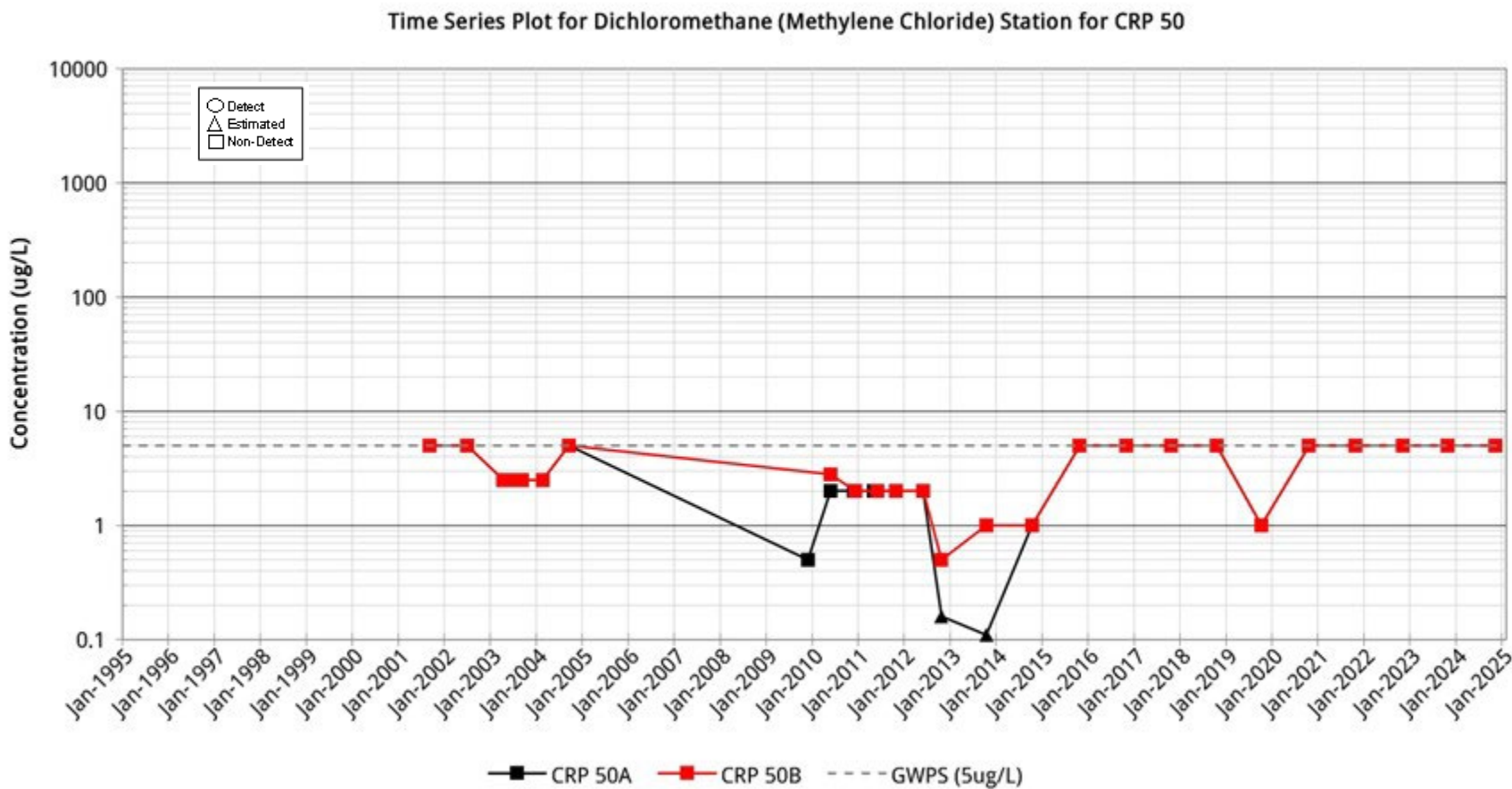


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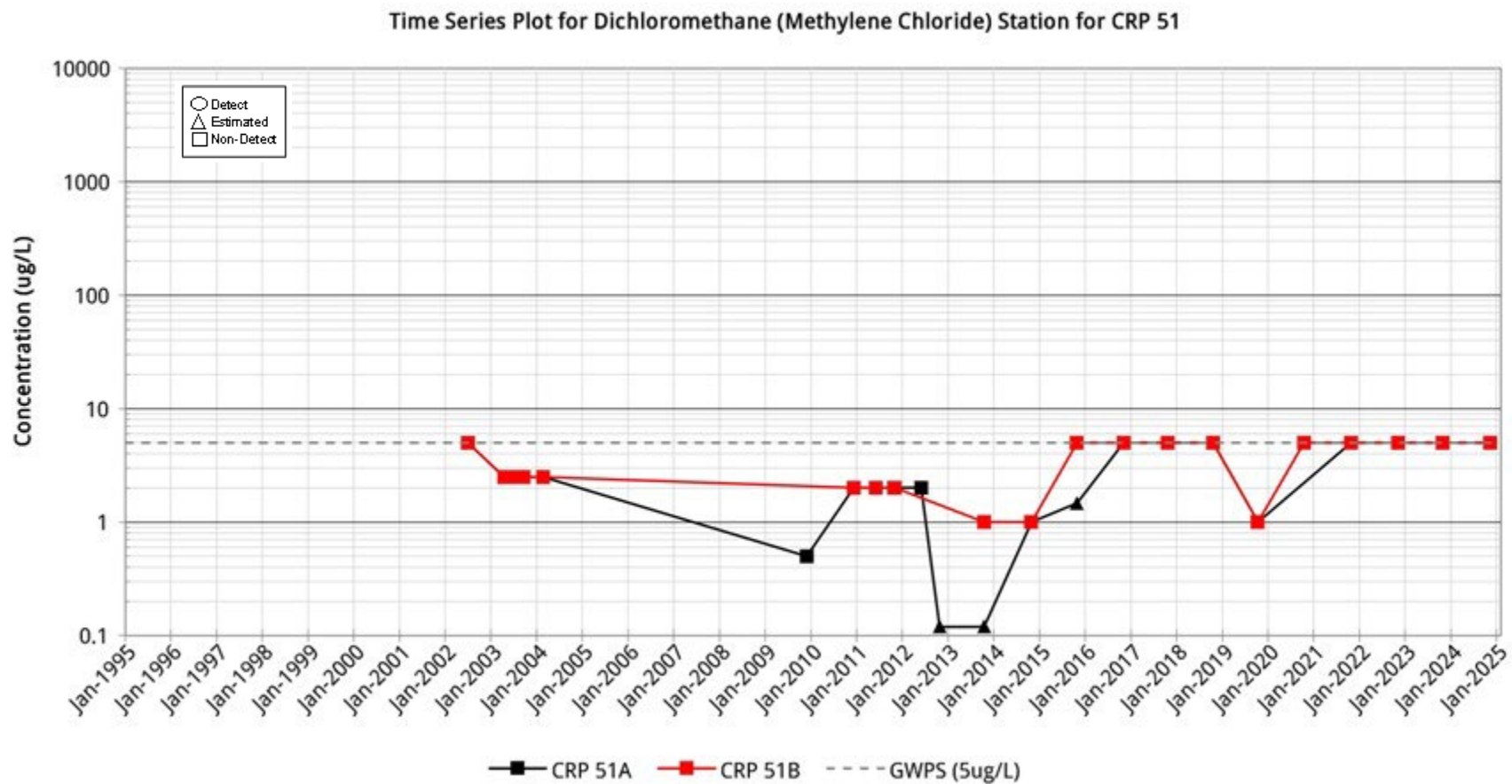


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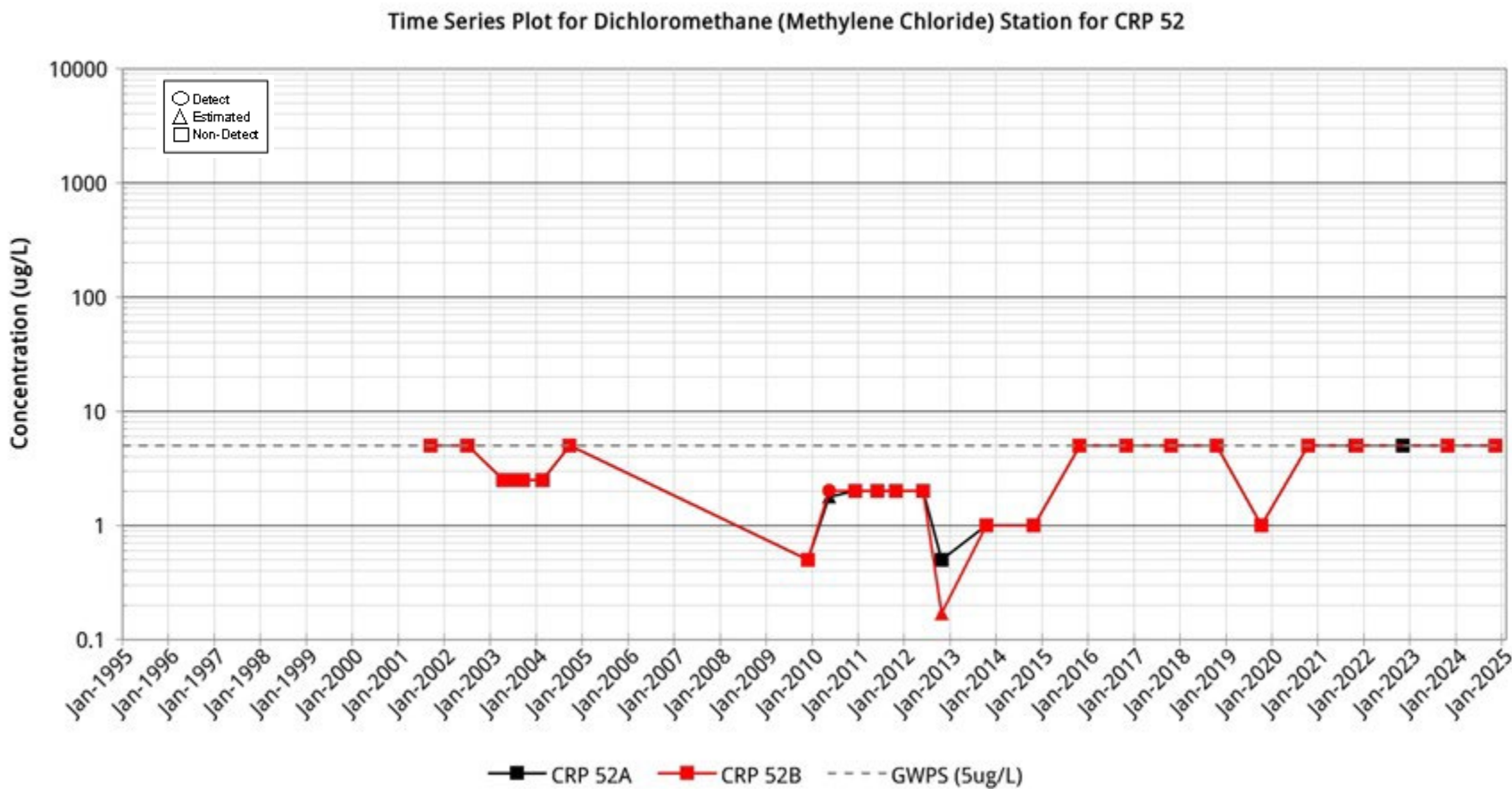


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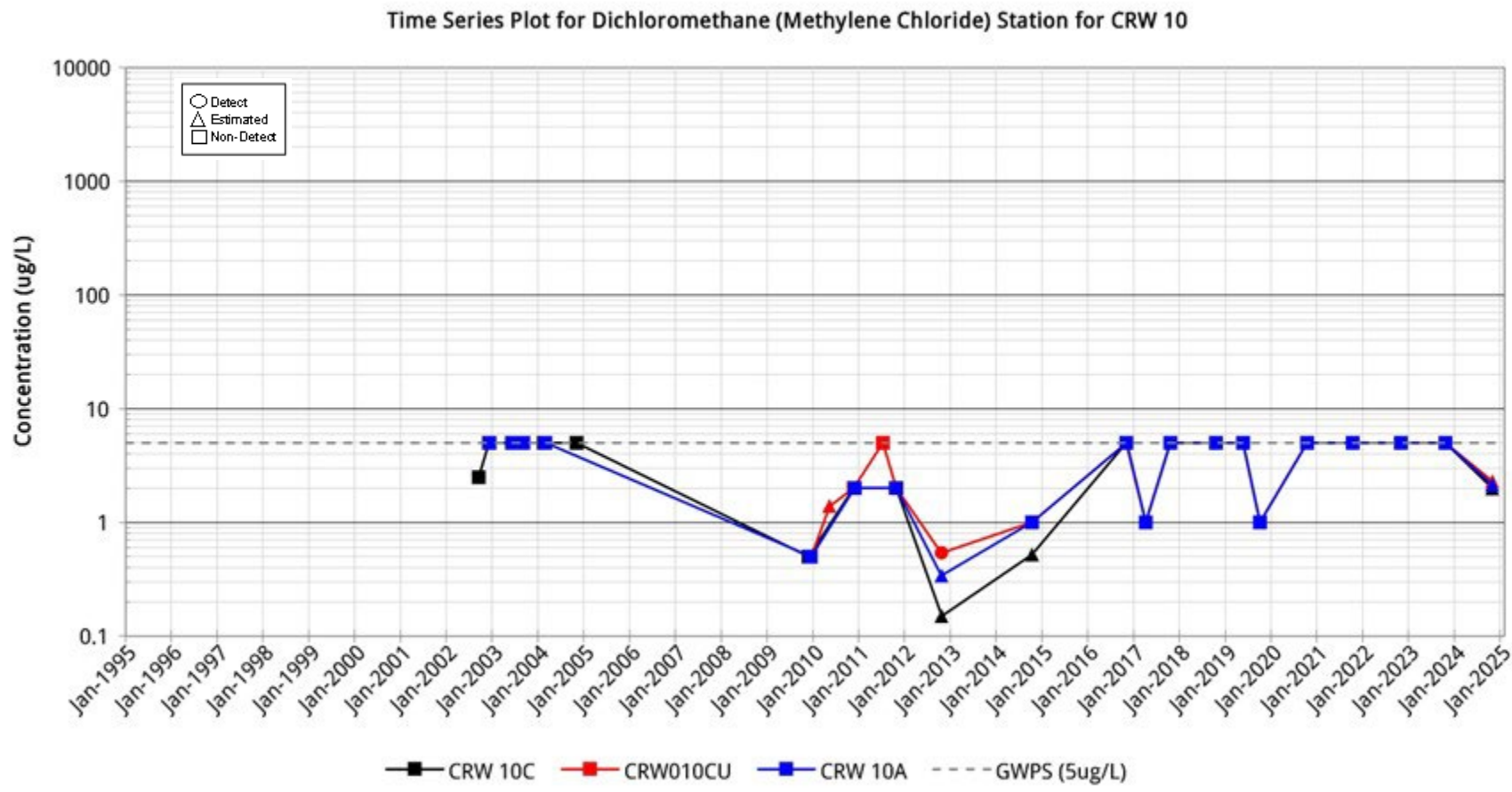


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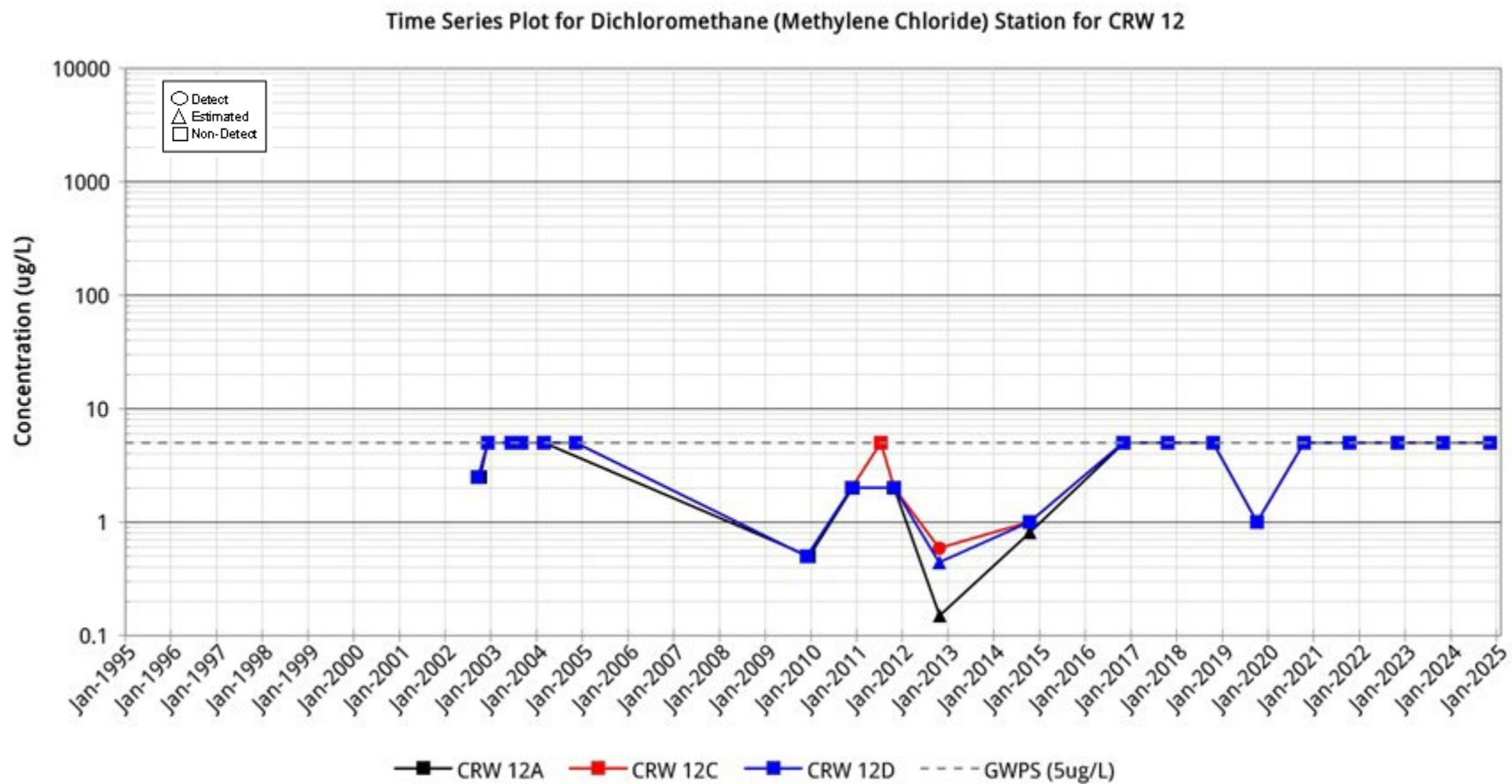


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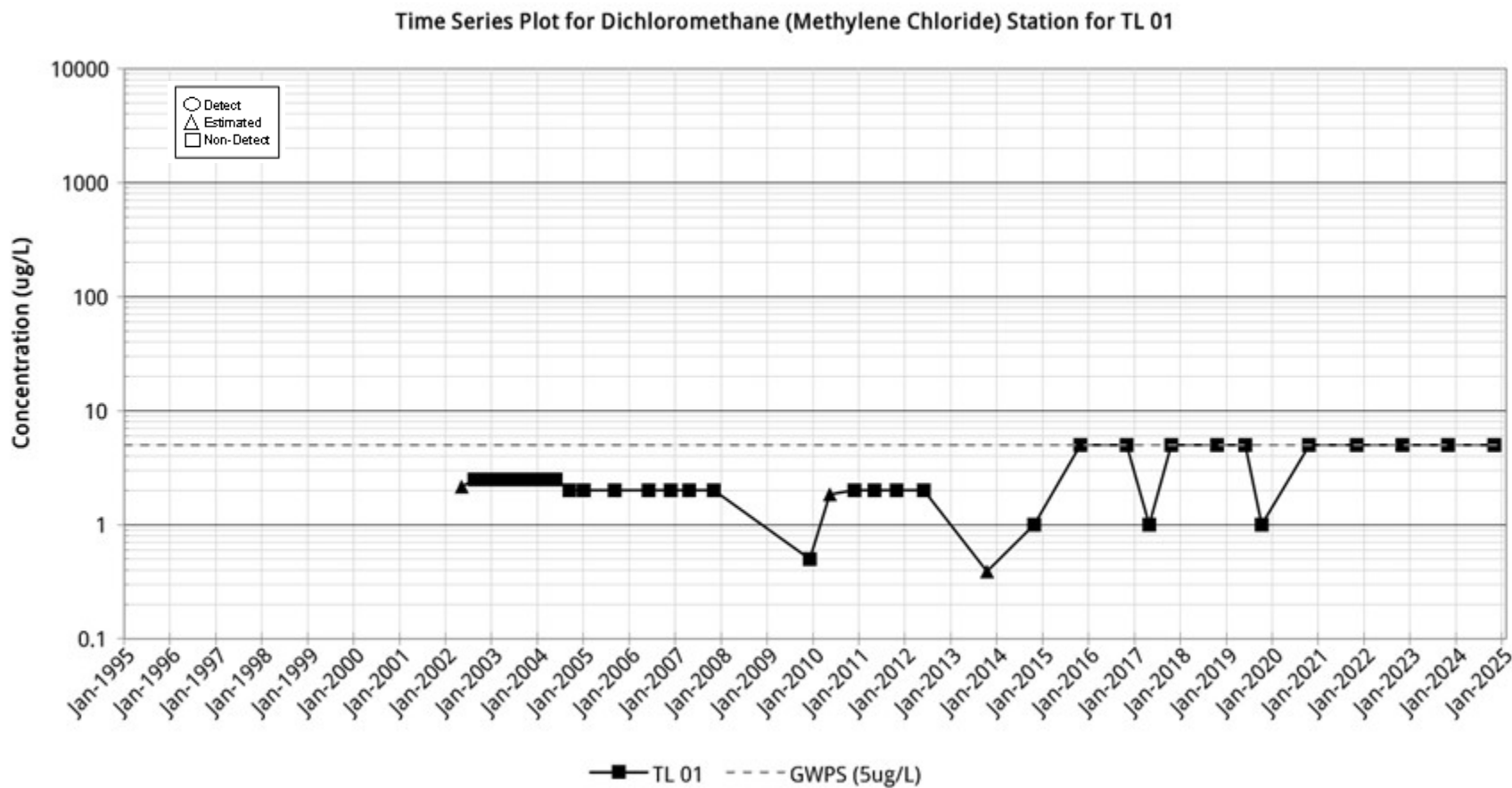


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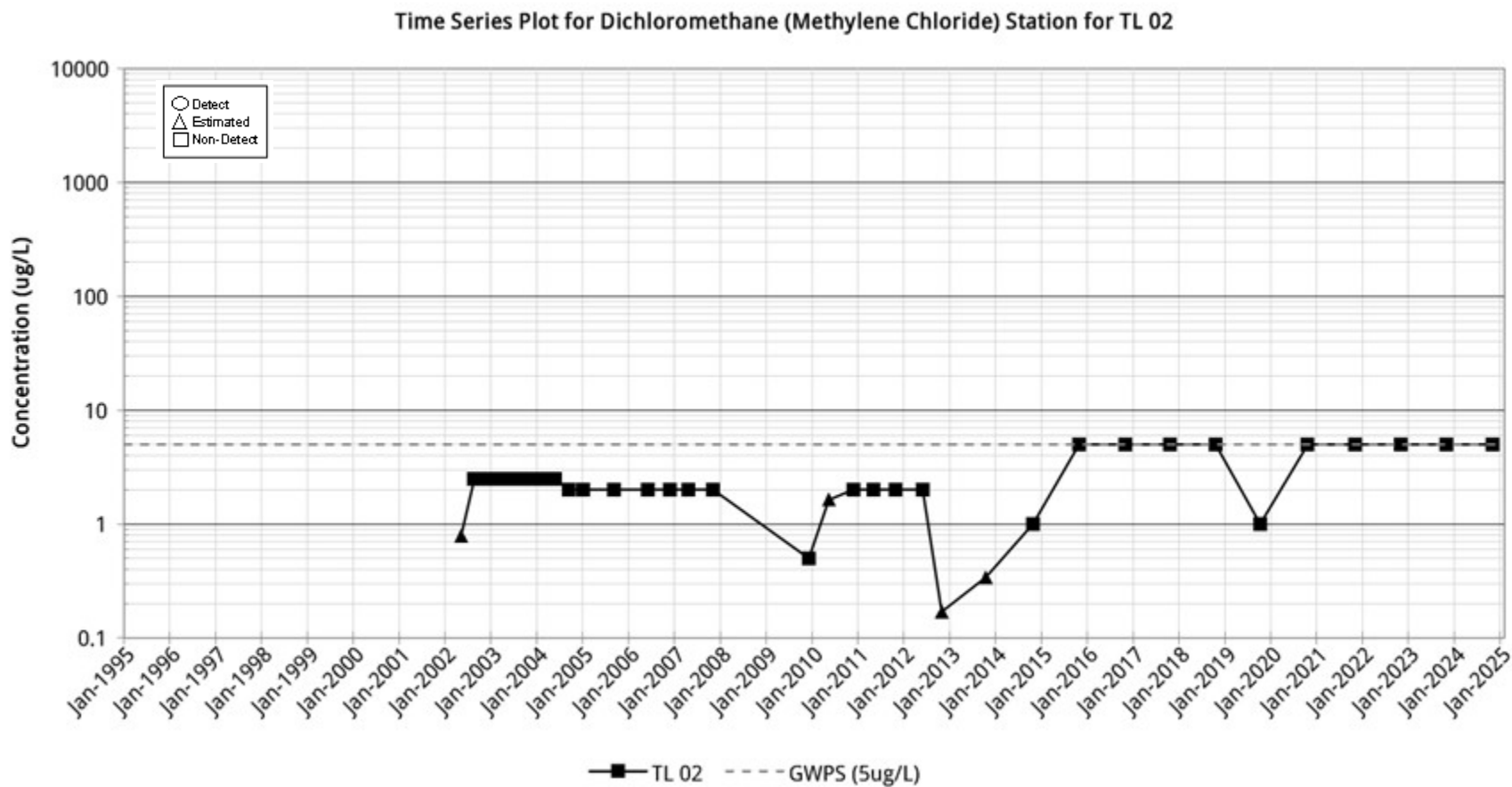


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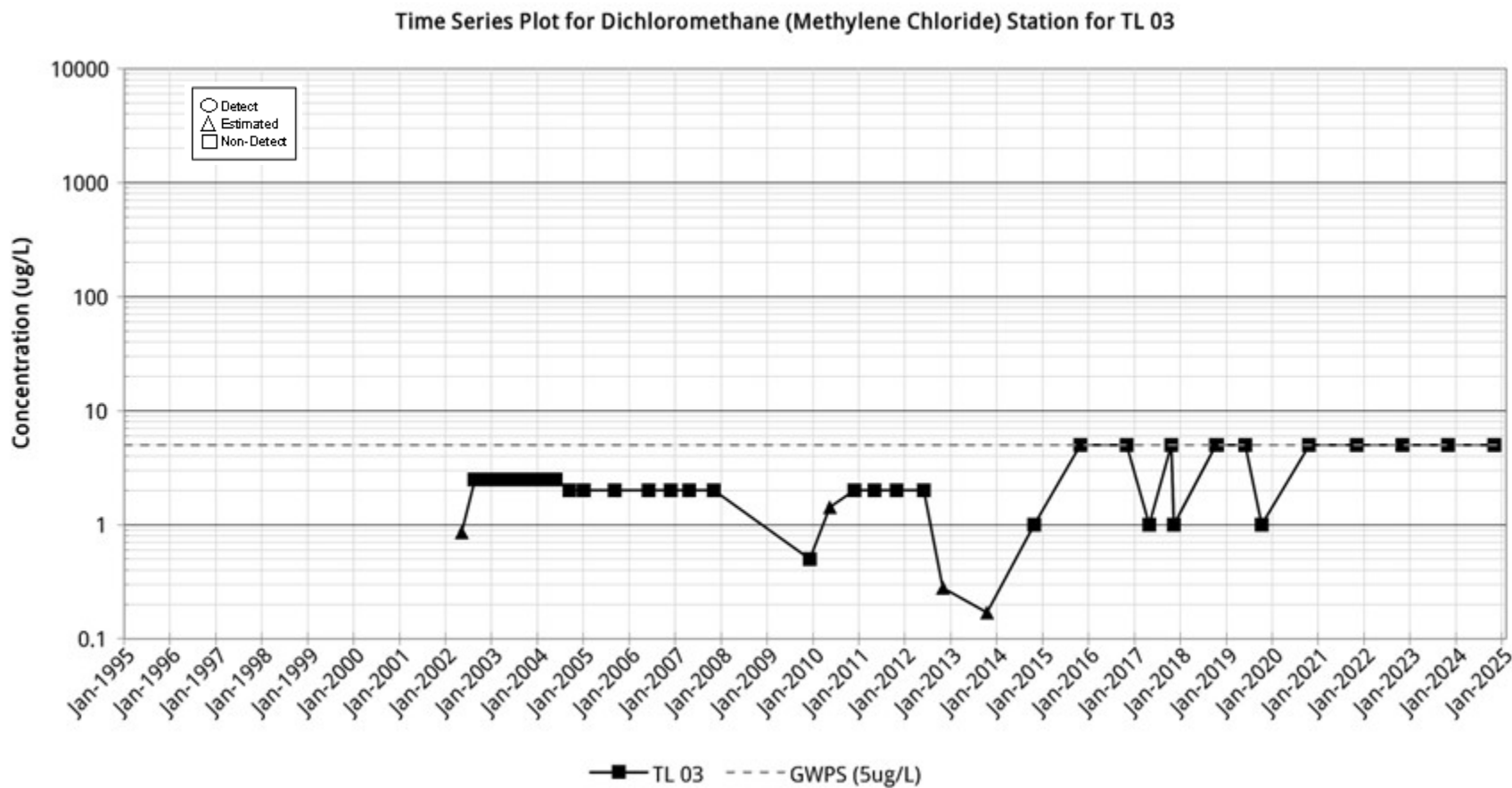


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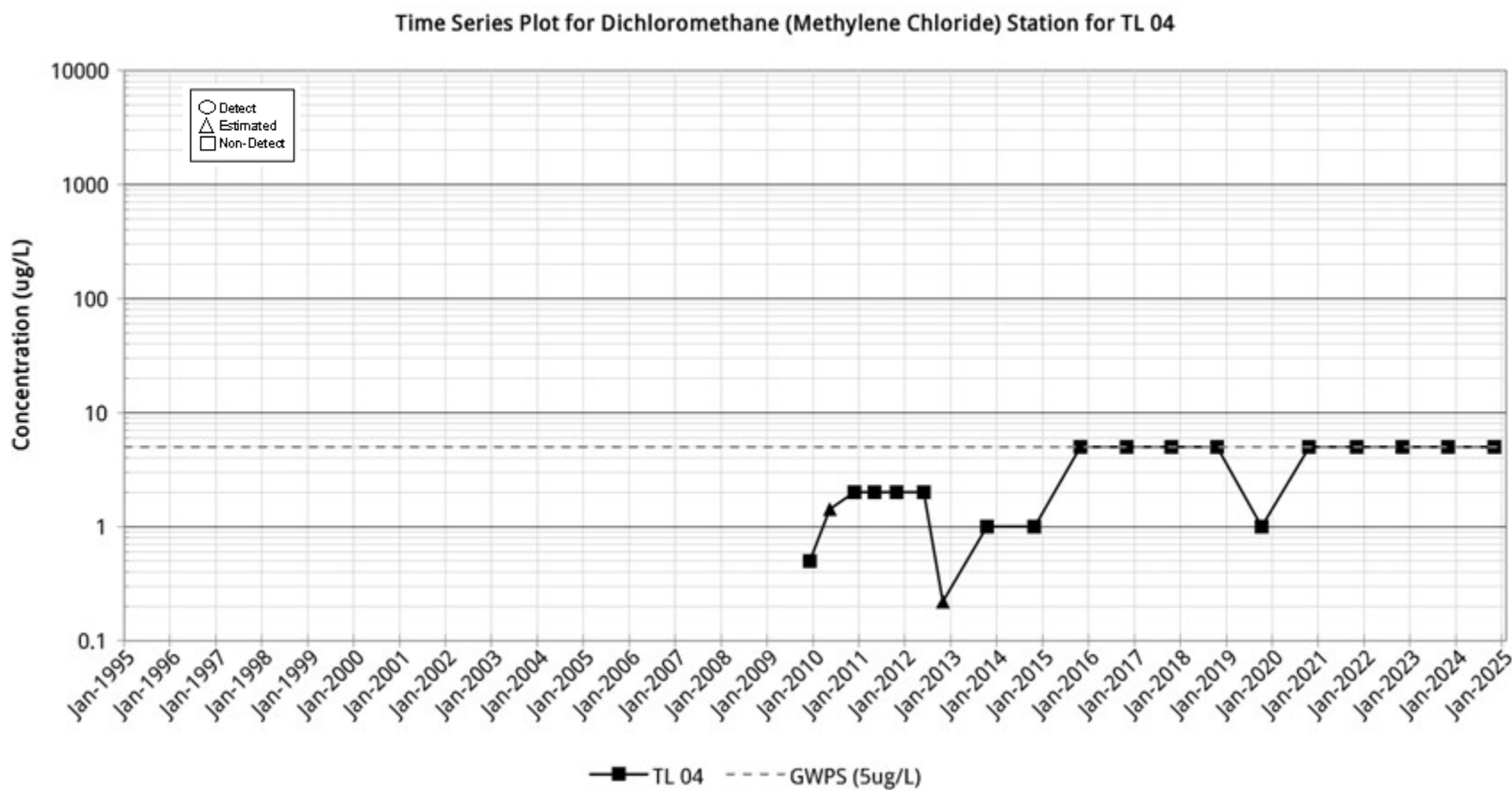


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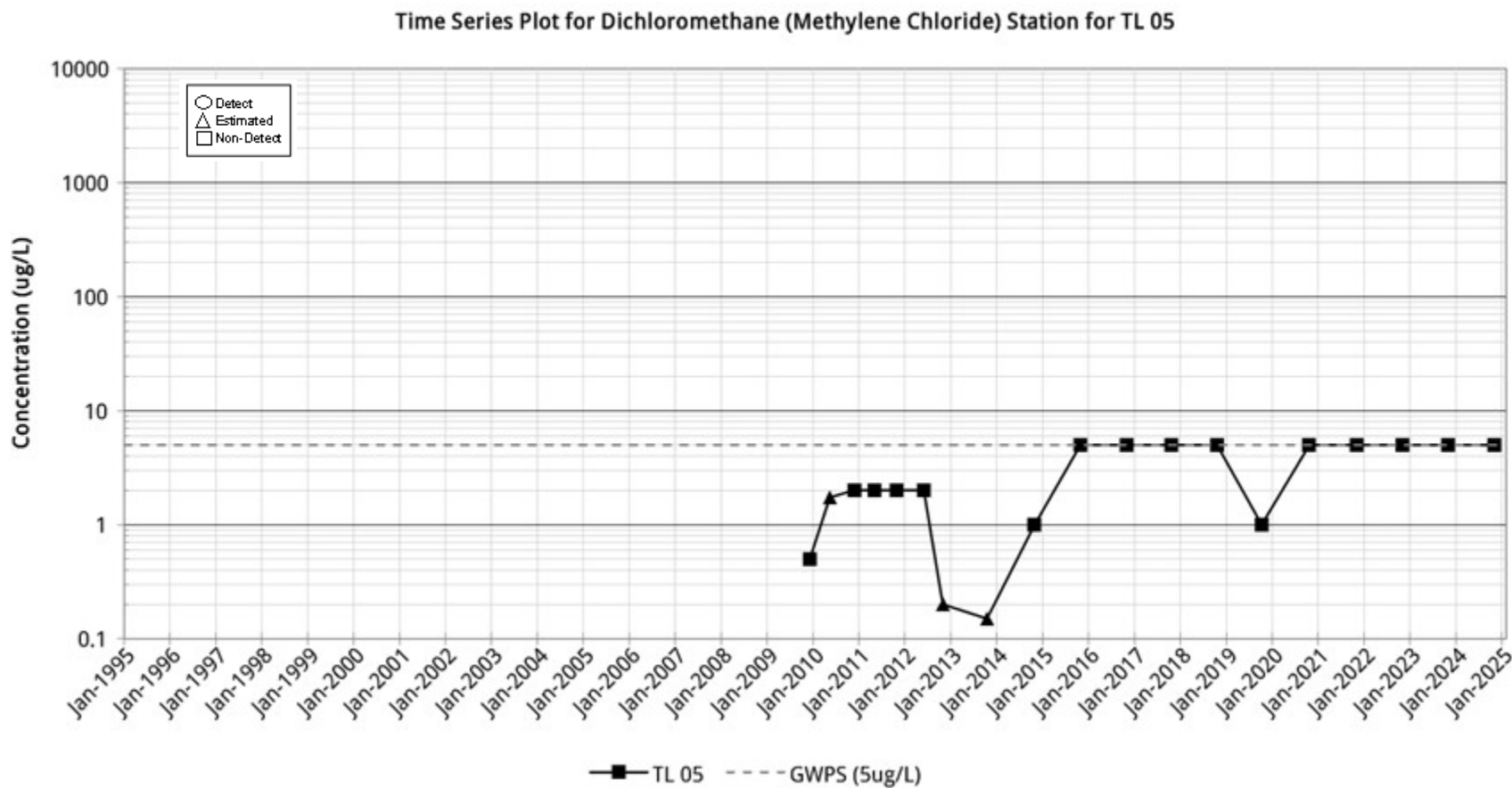


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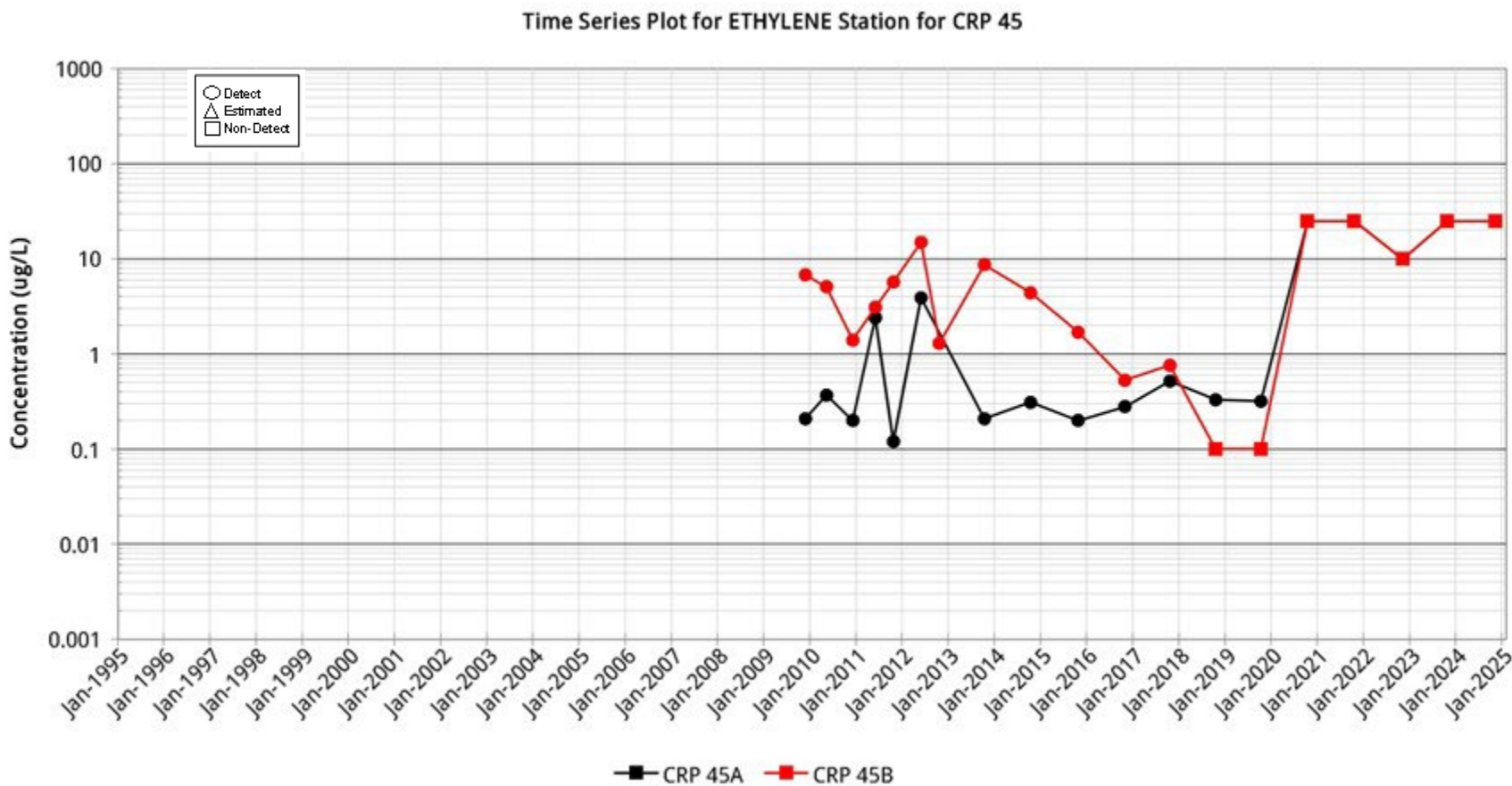


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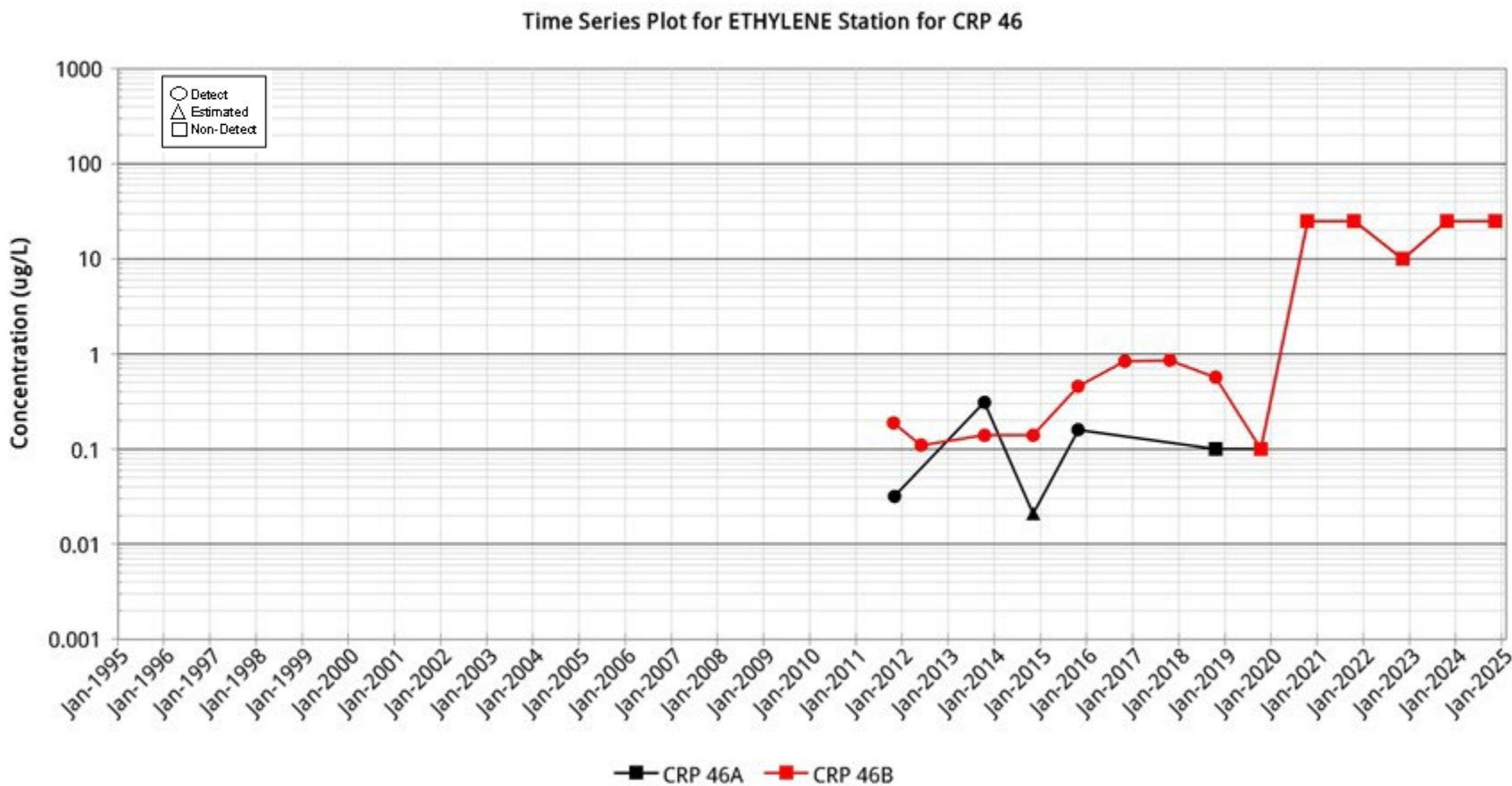


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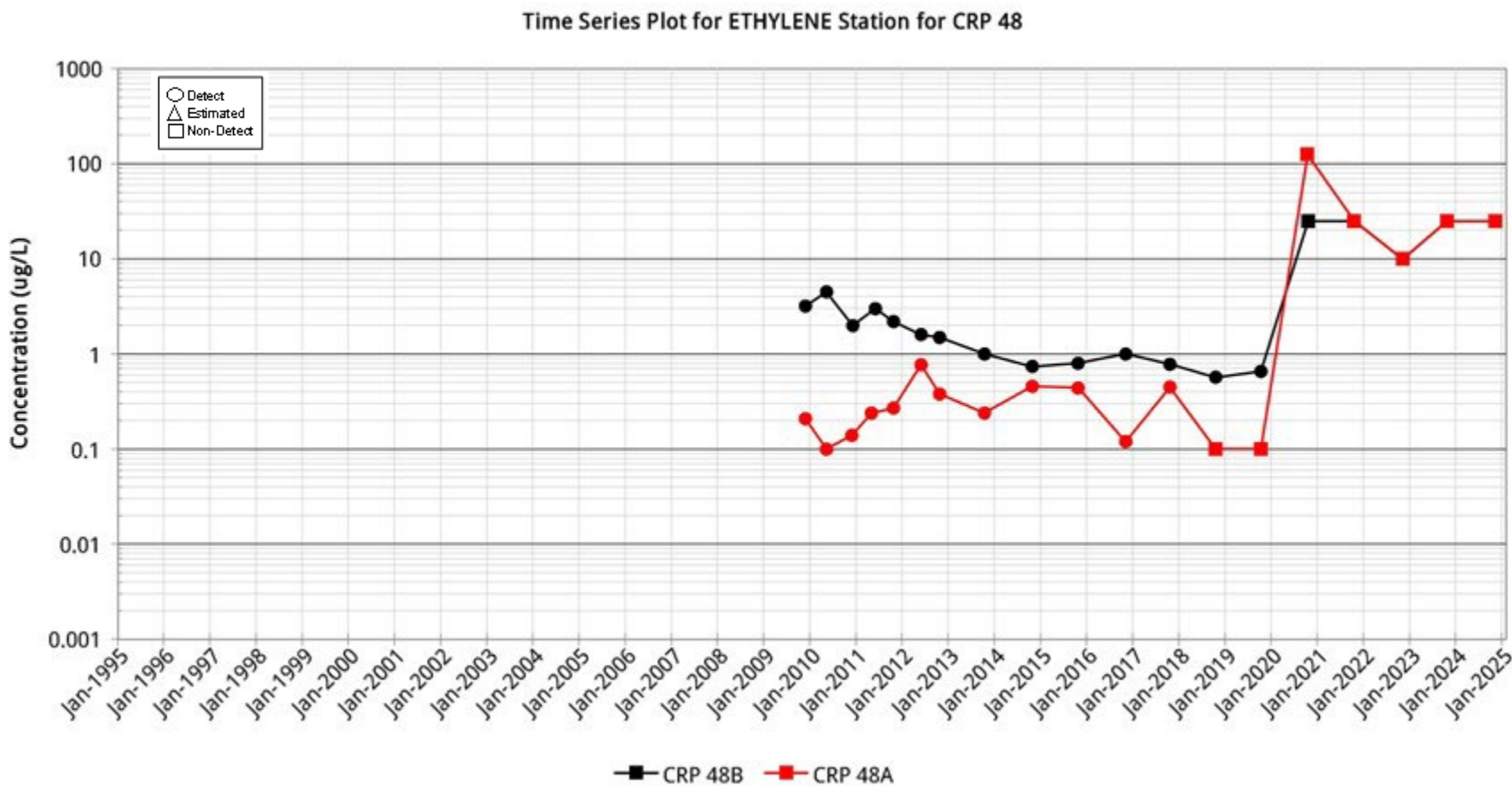


Figure C-84.

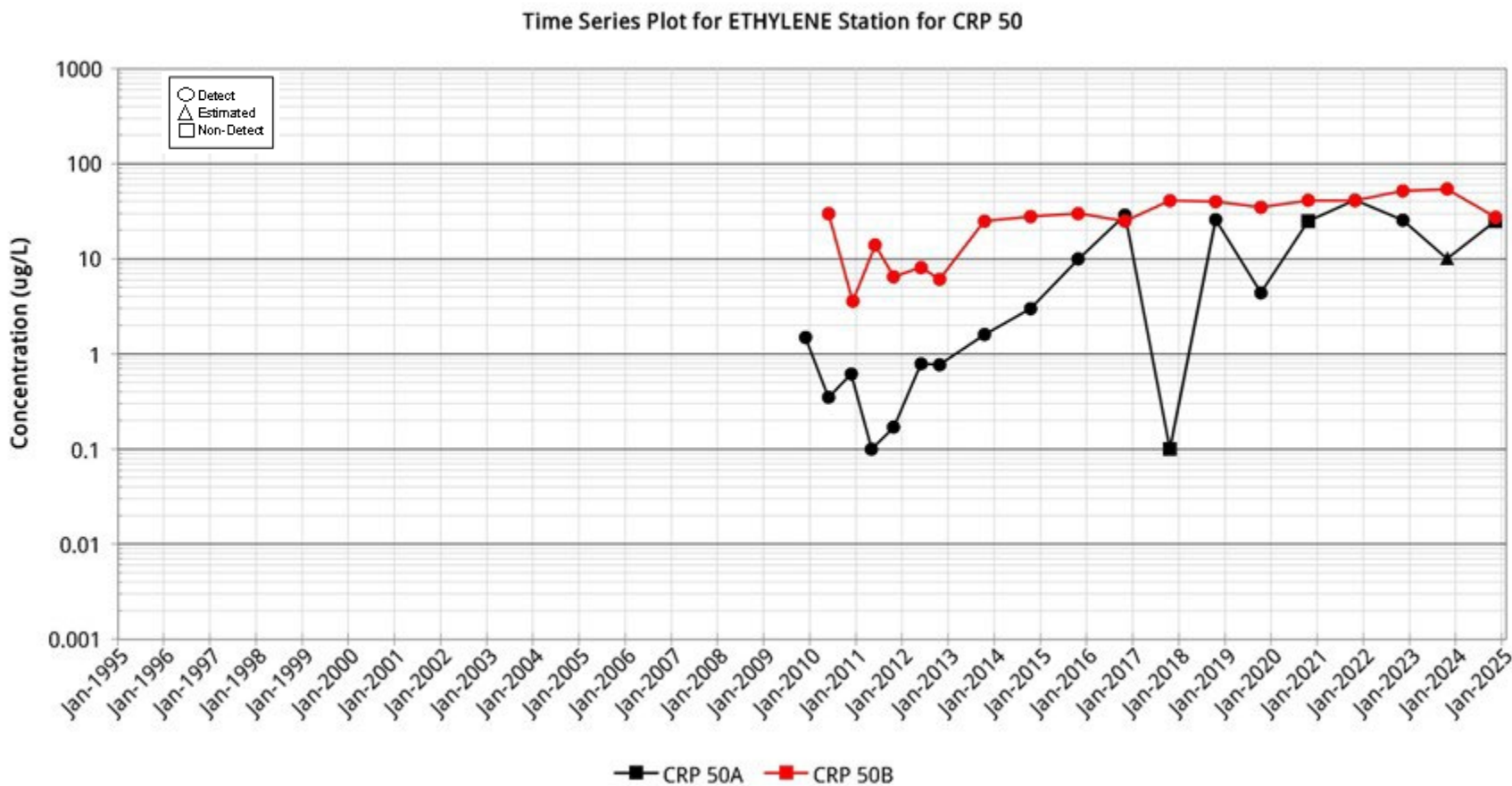


Figure C-85.

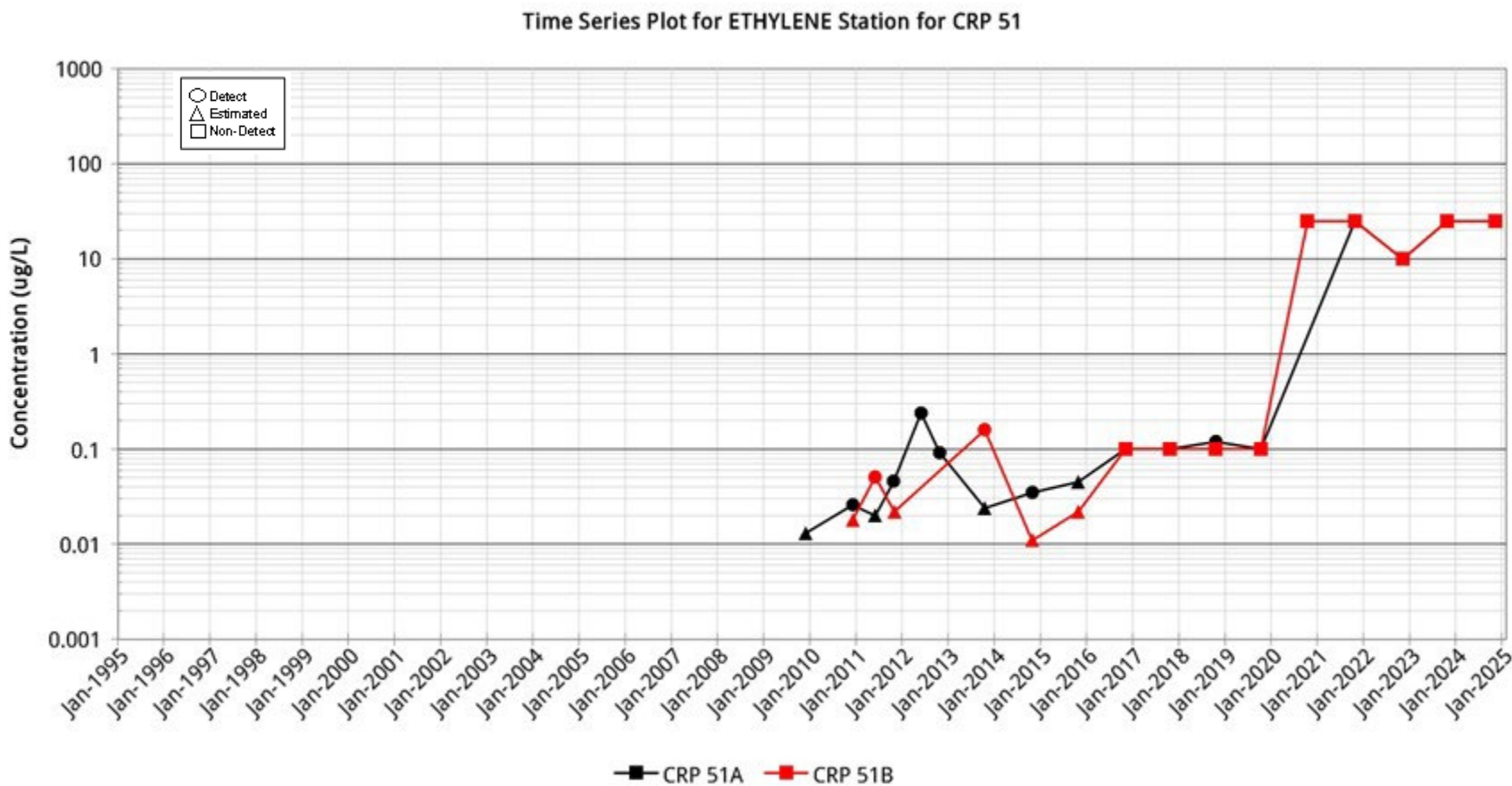


Figure C-86.

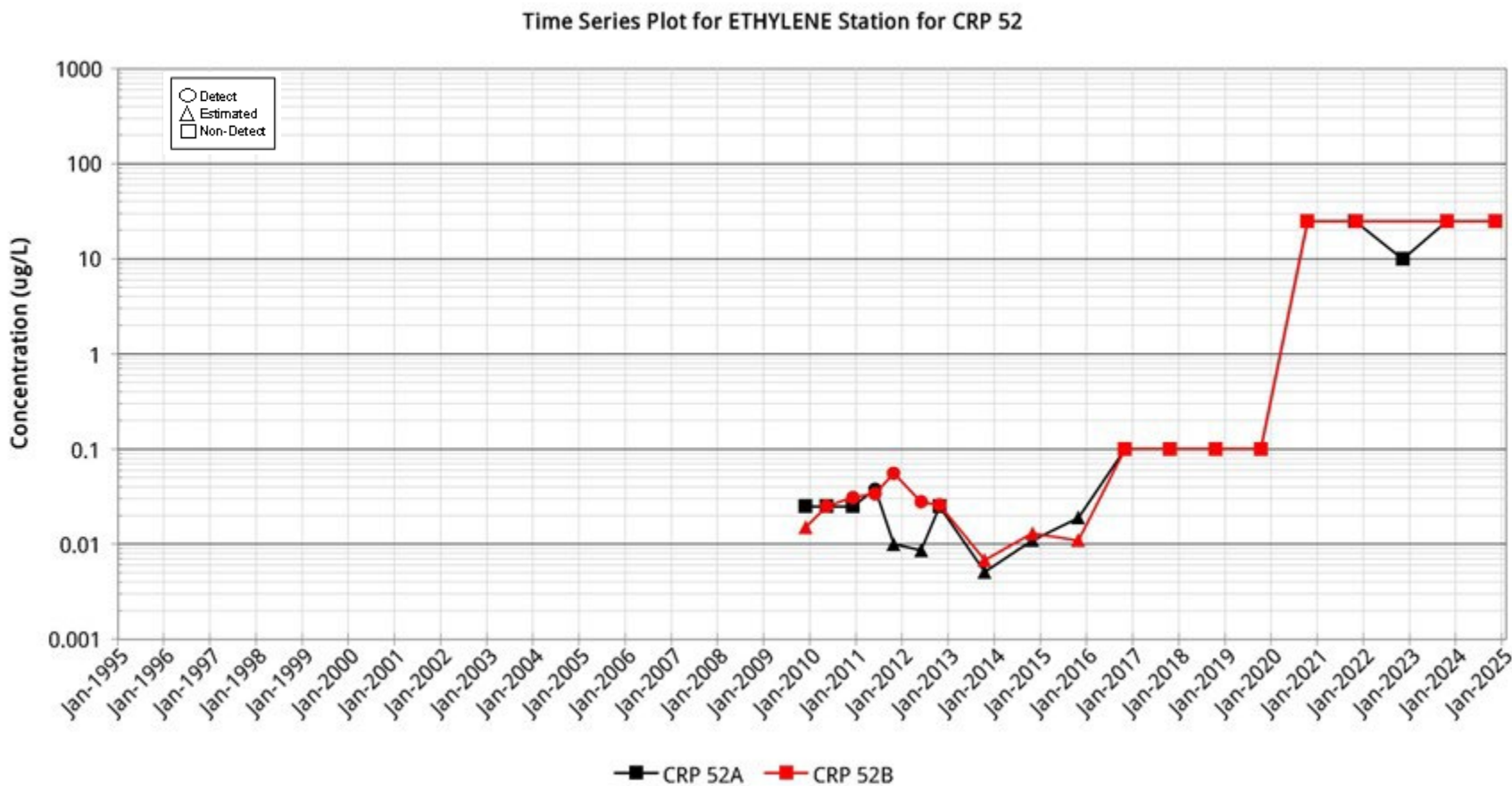


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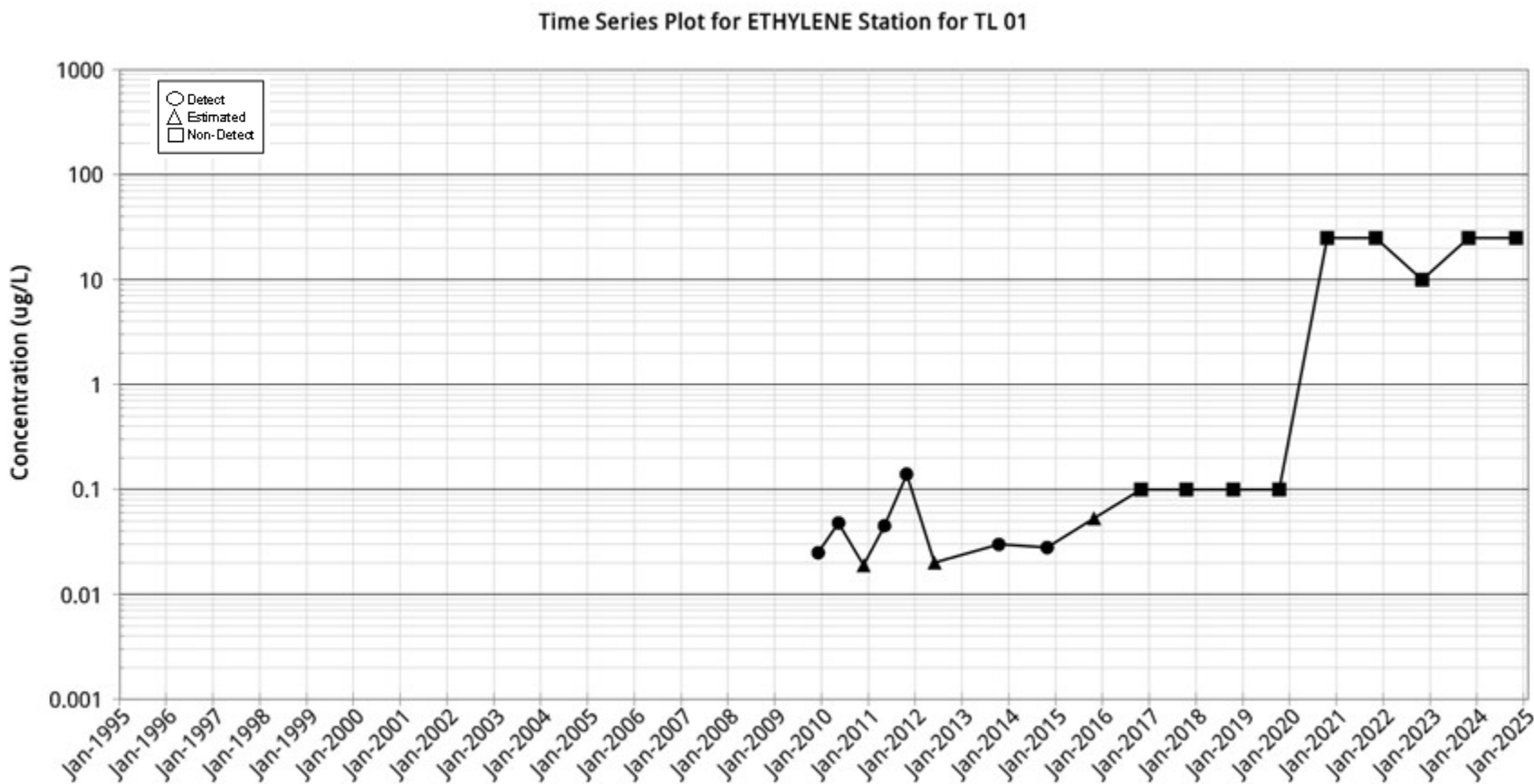


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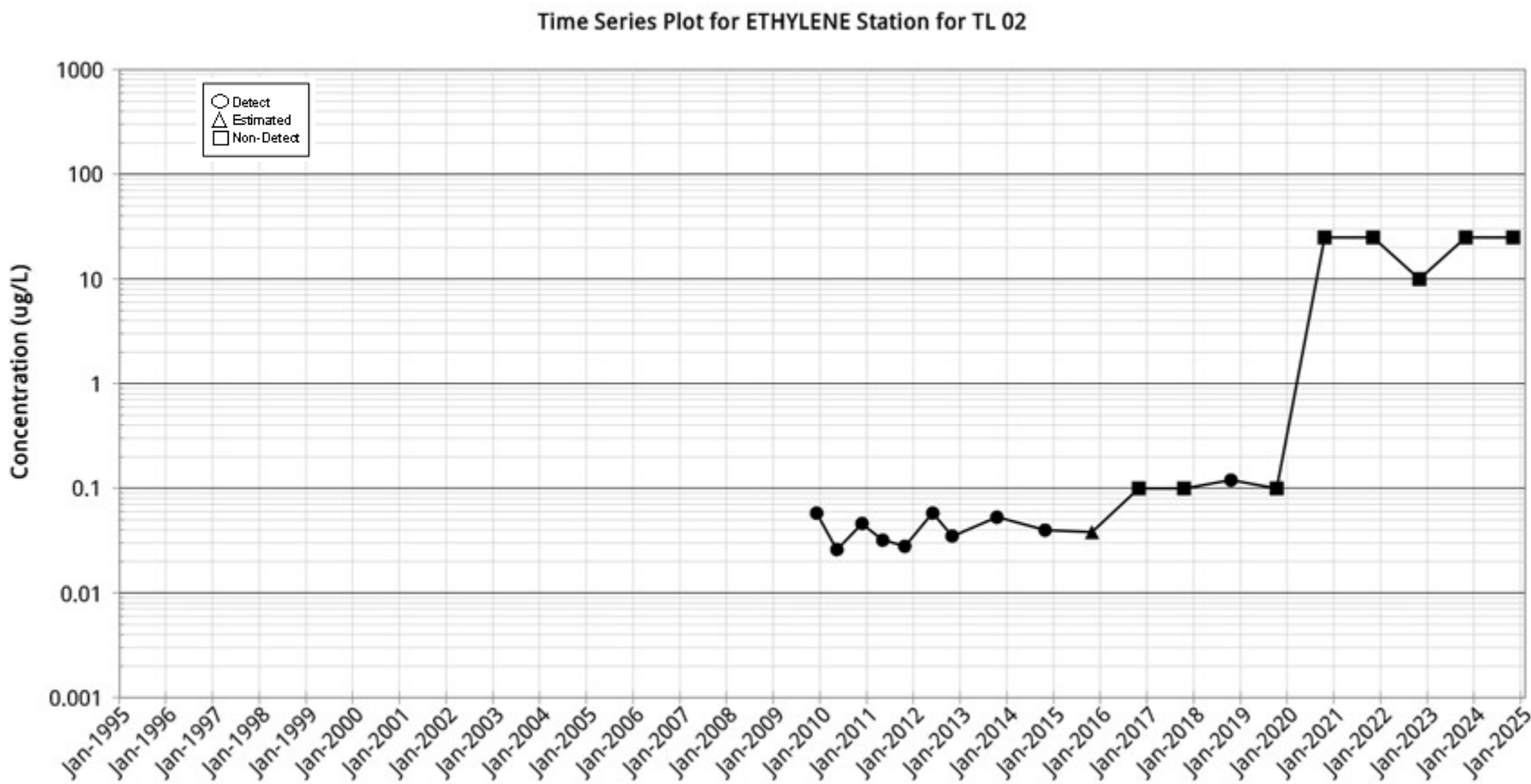


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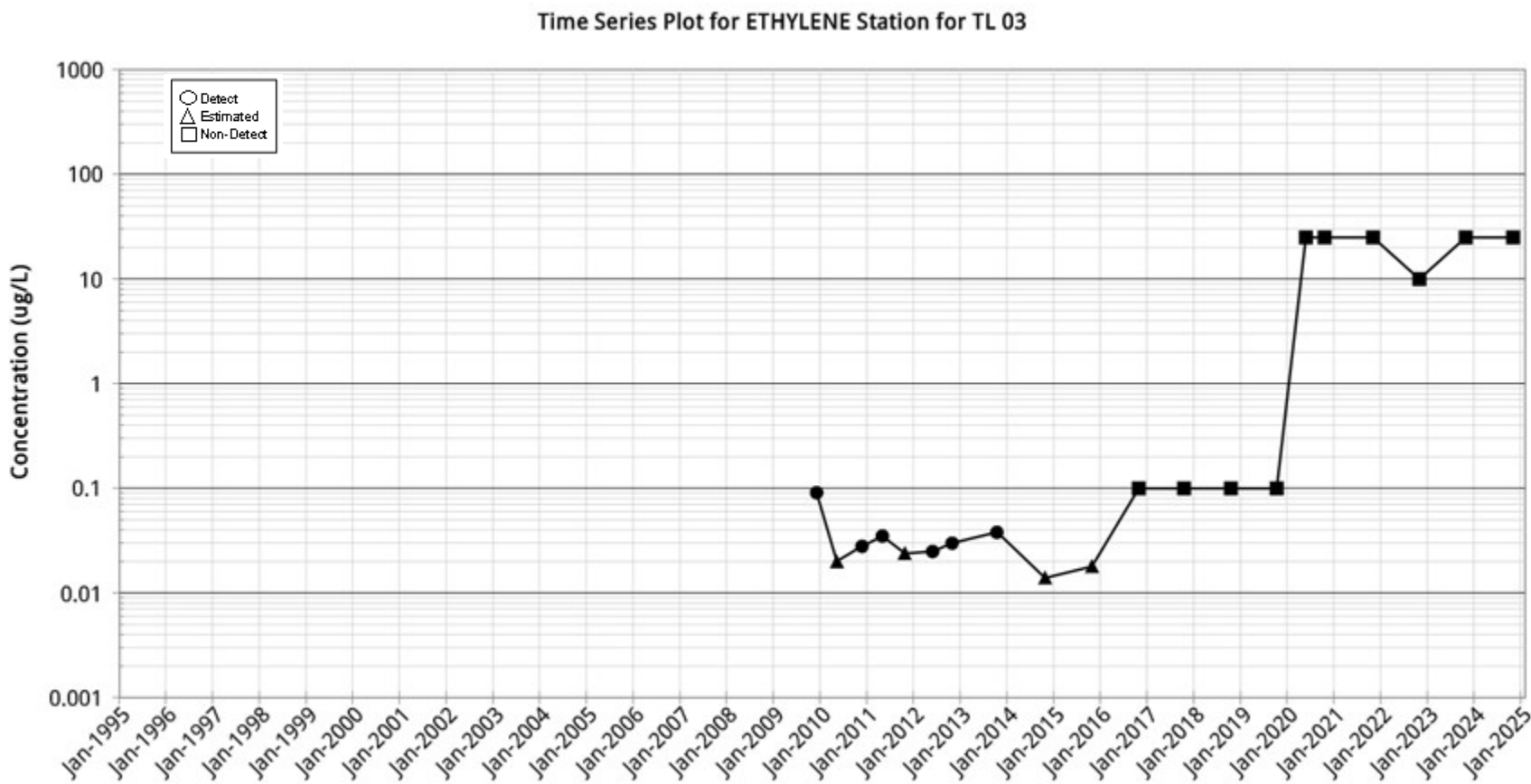


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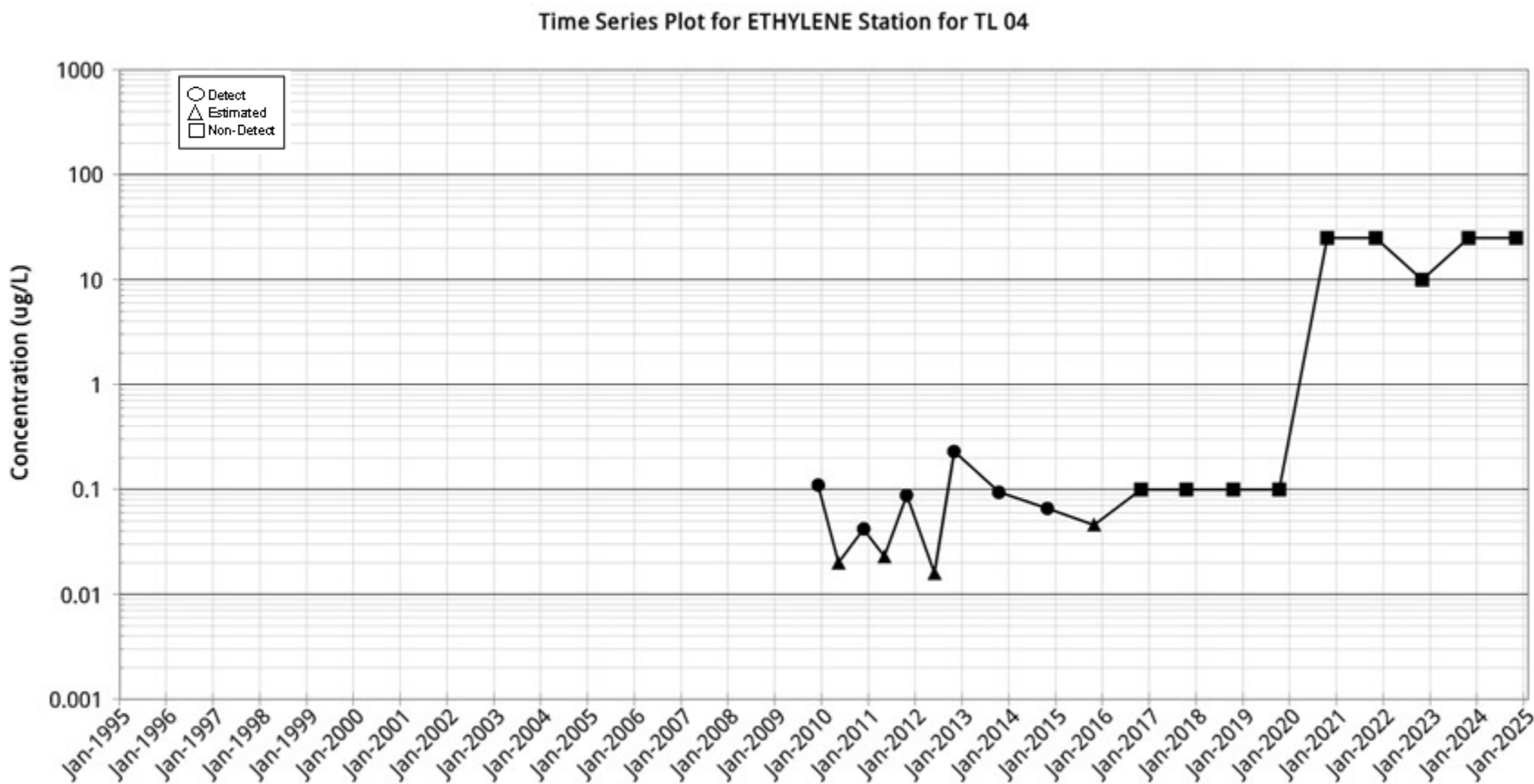


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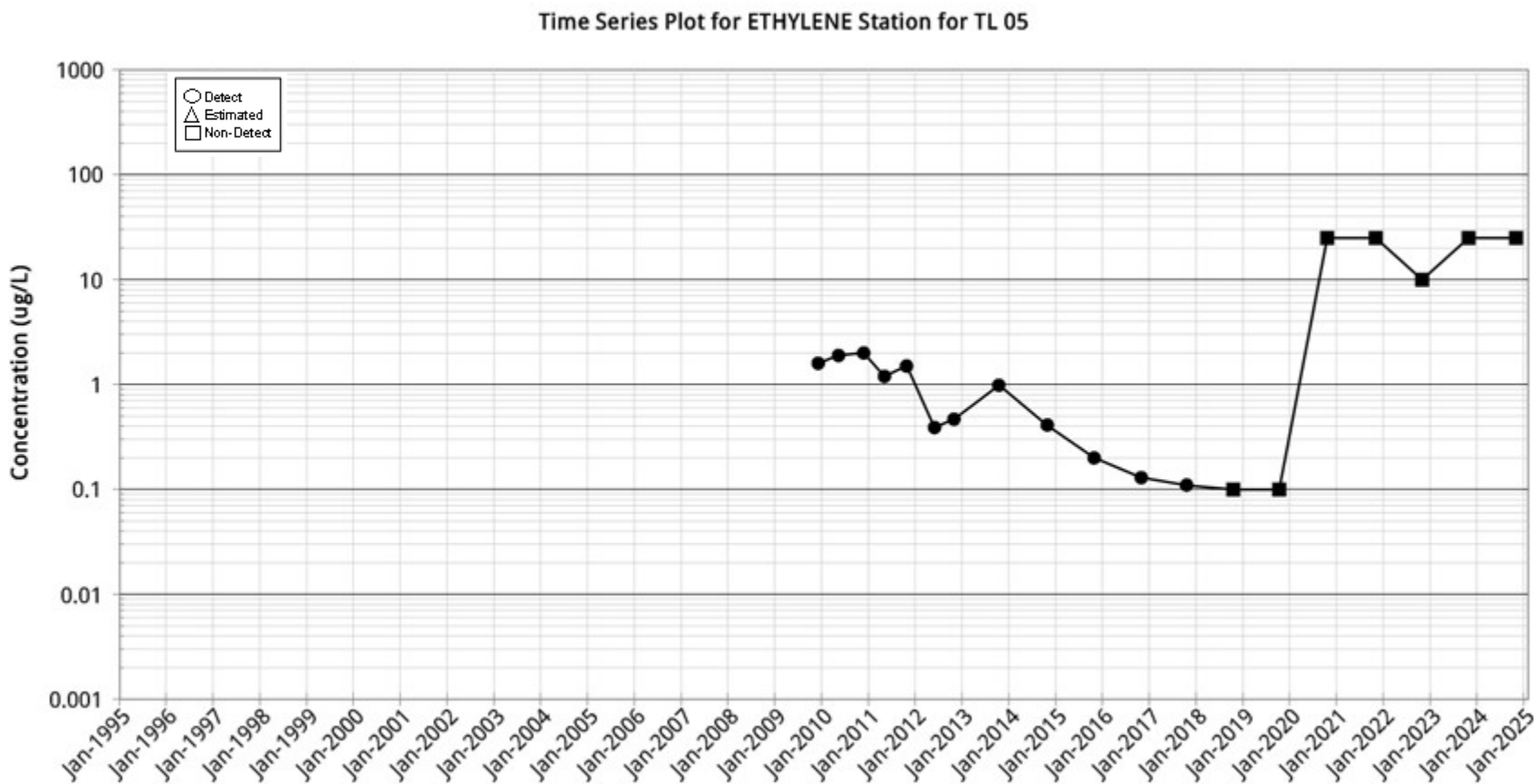


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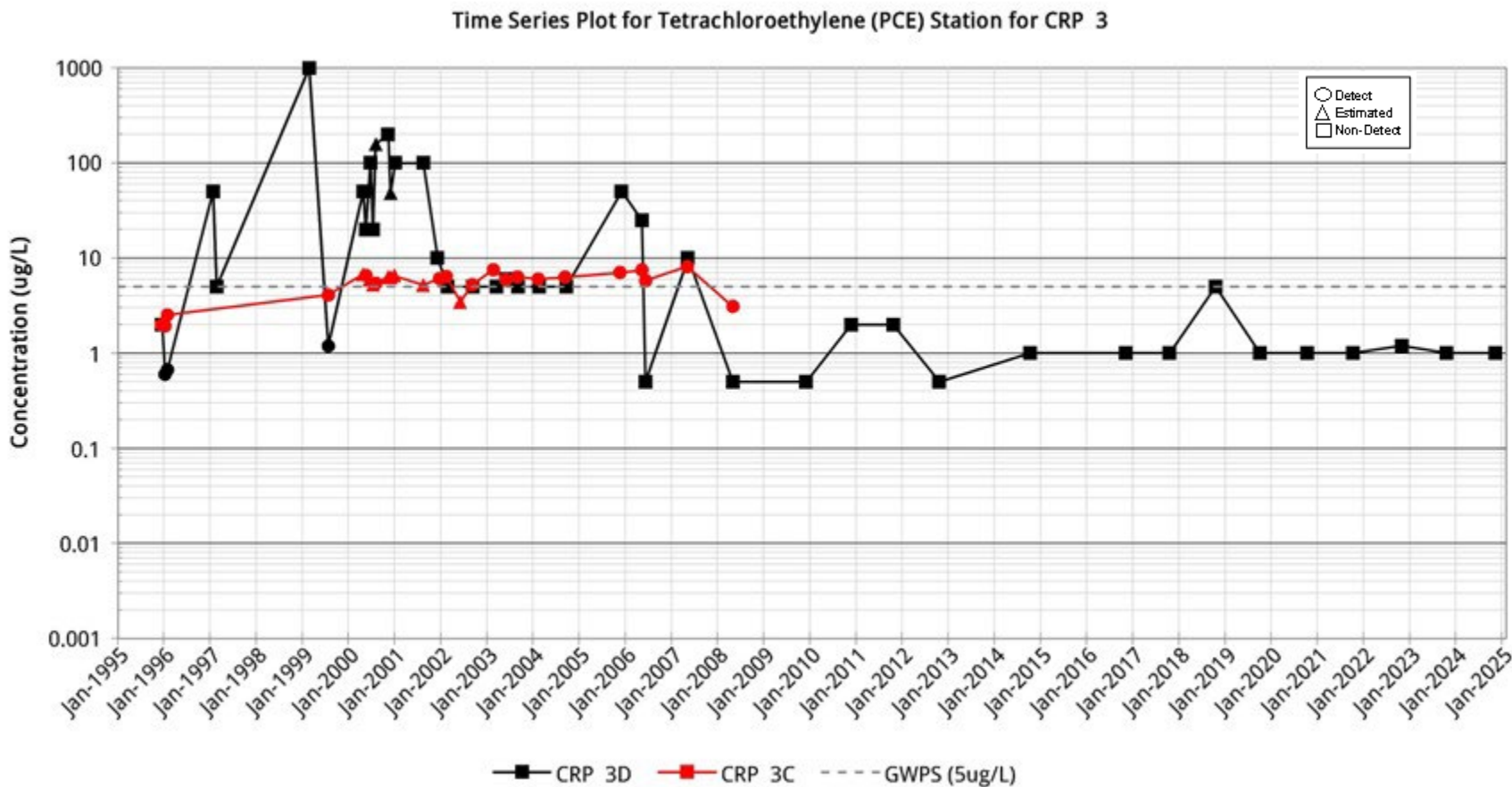


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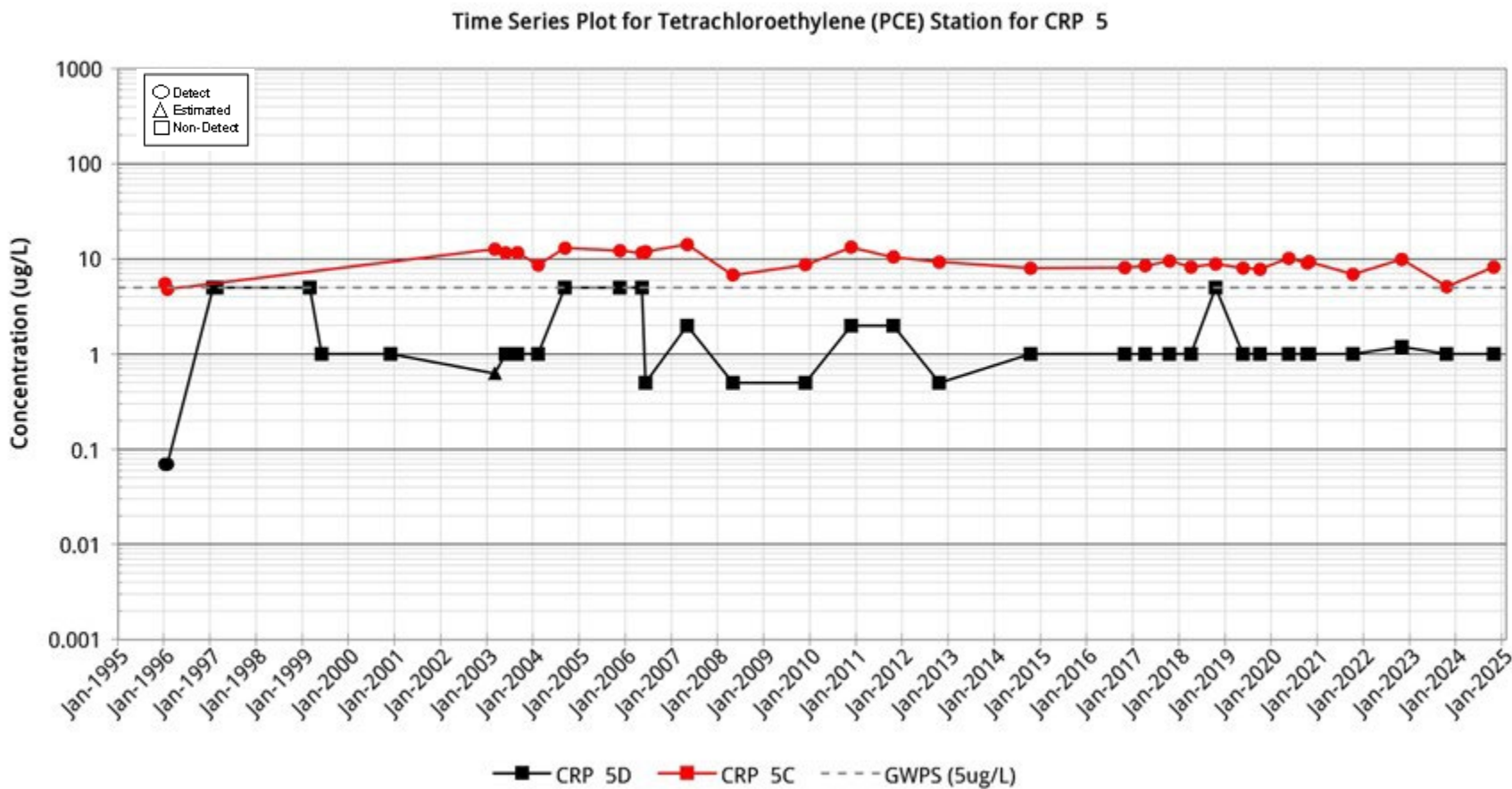


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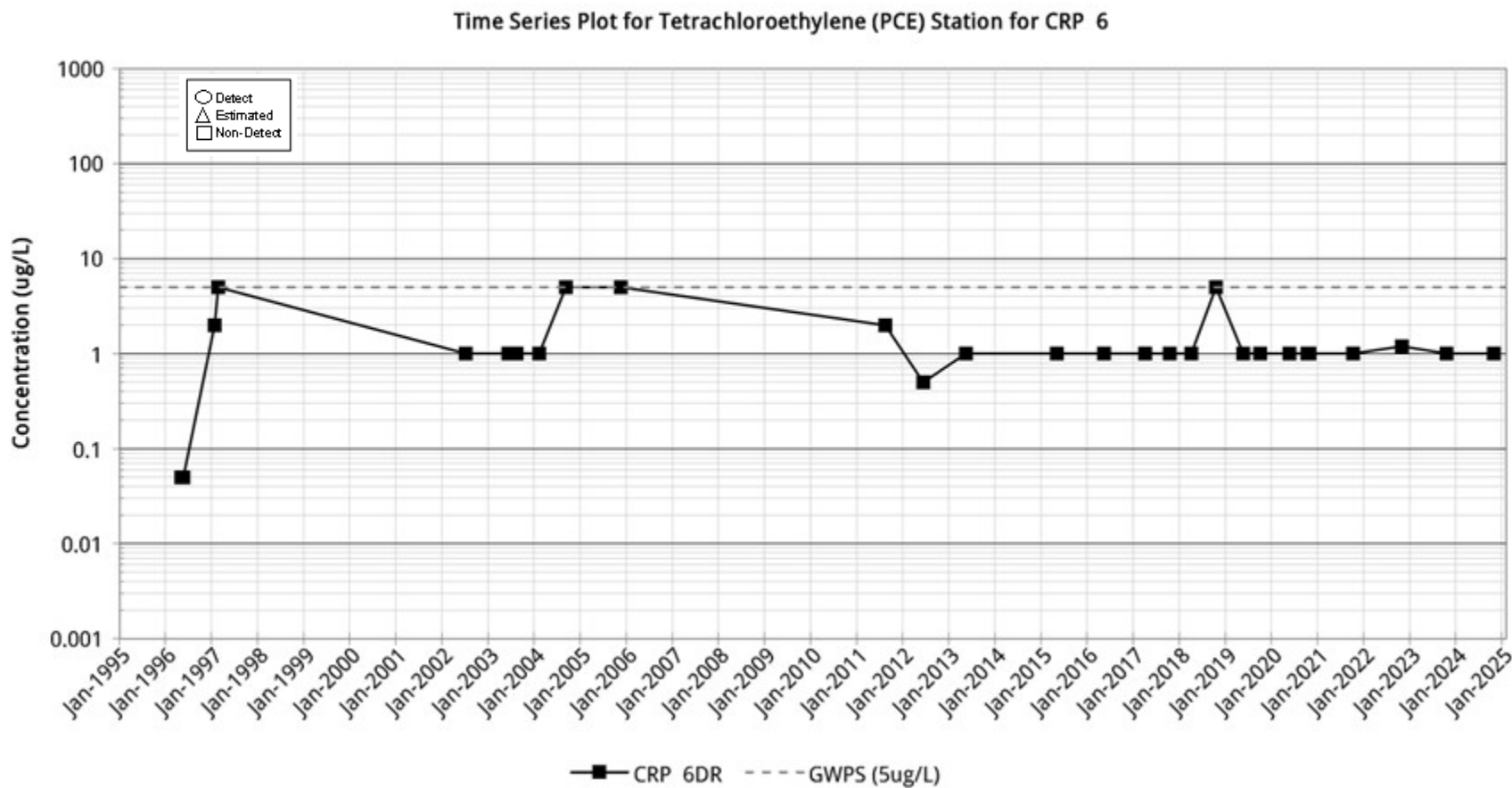


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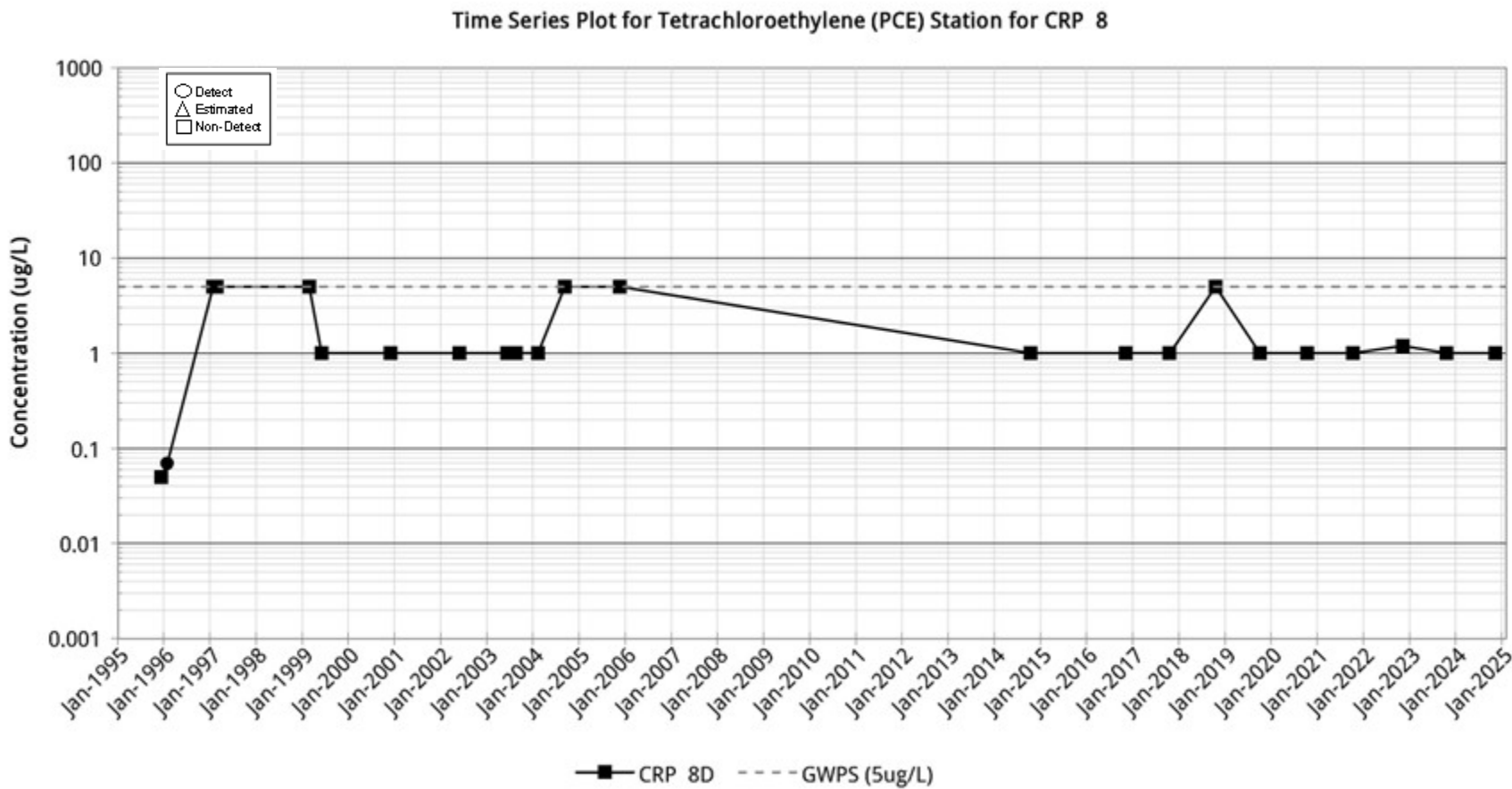


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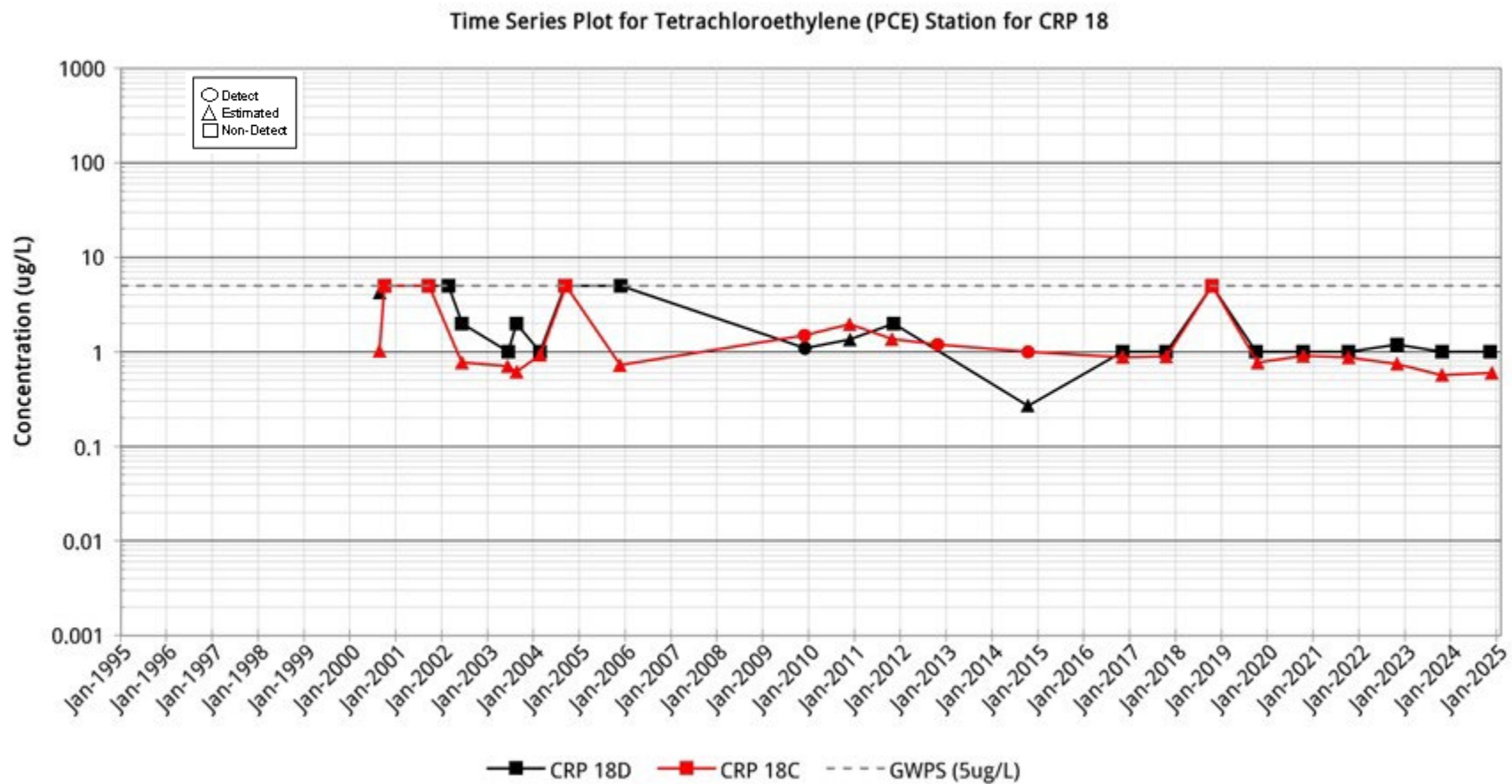


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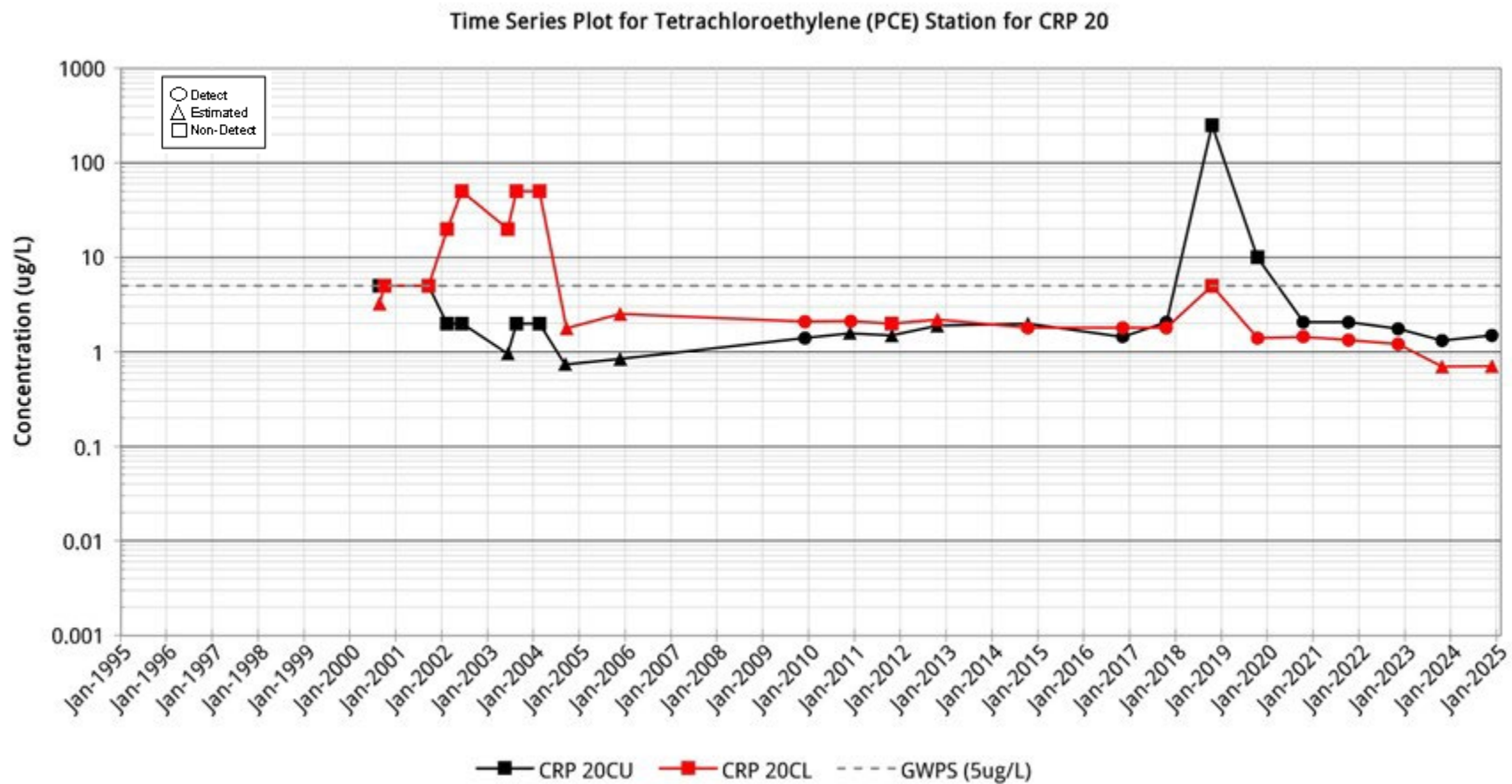


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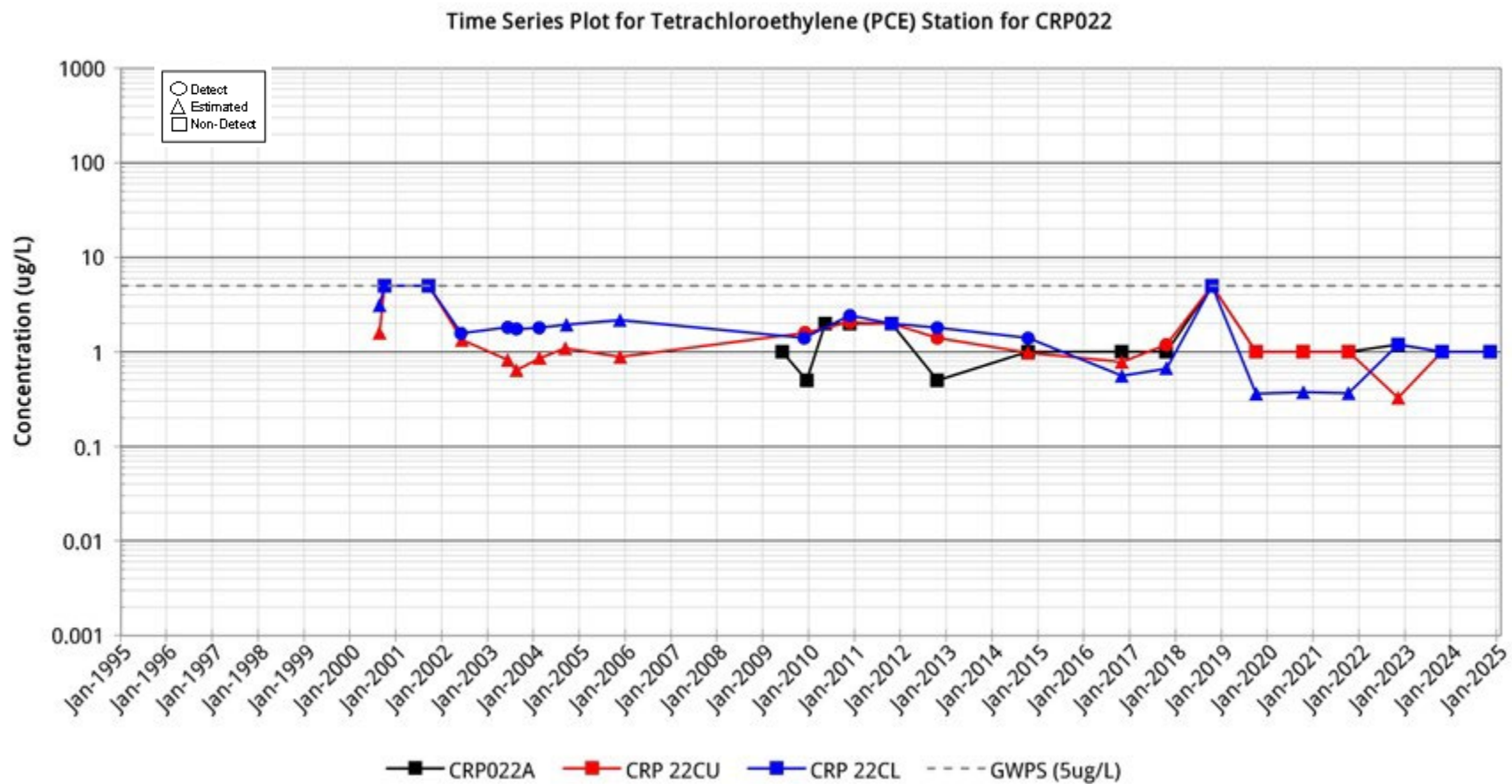


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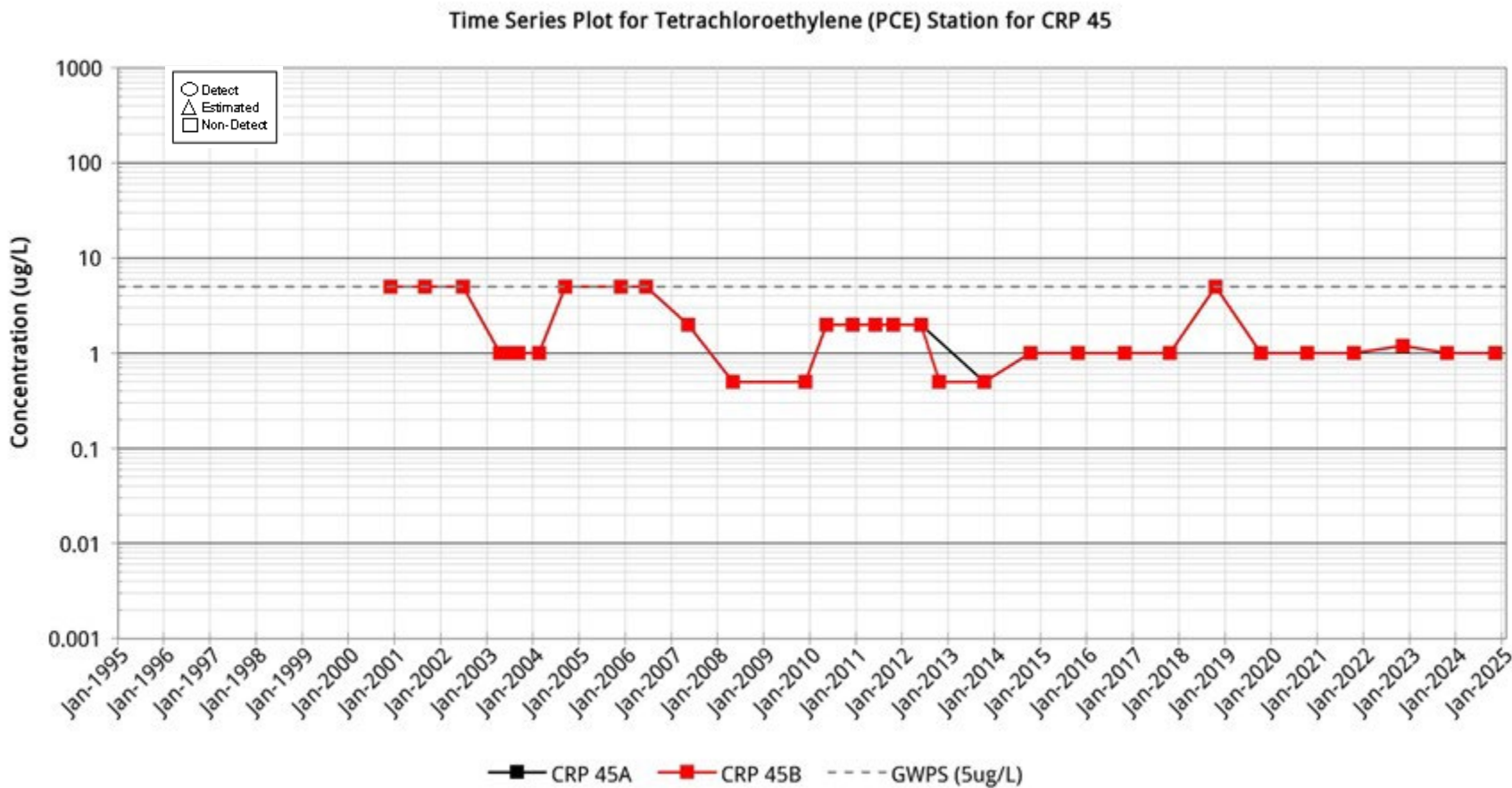


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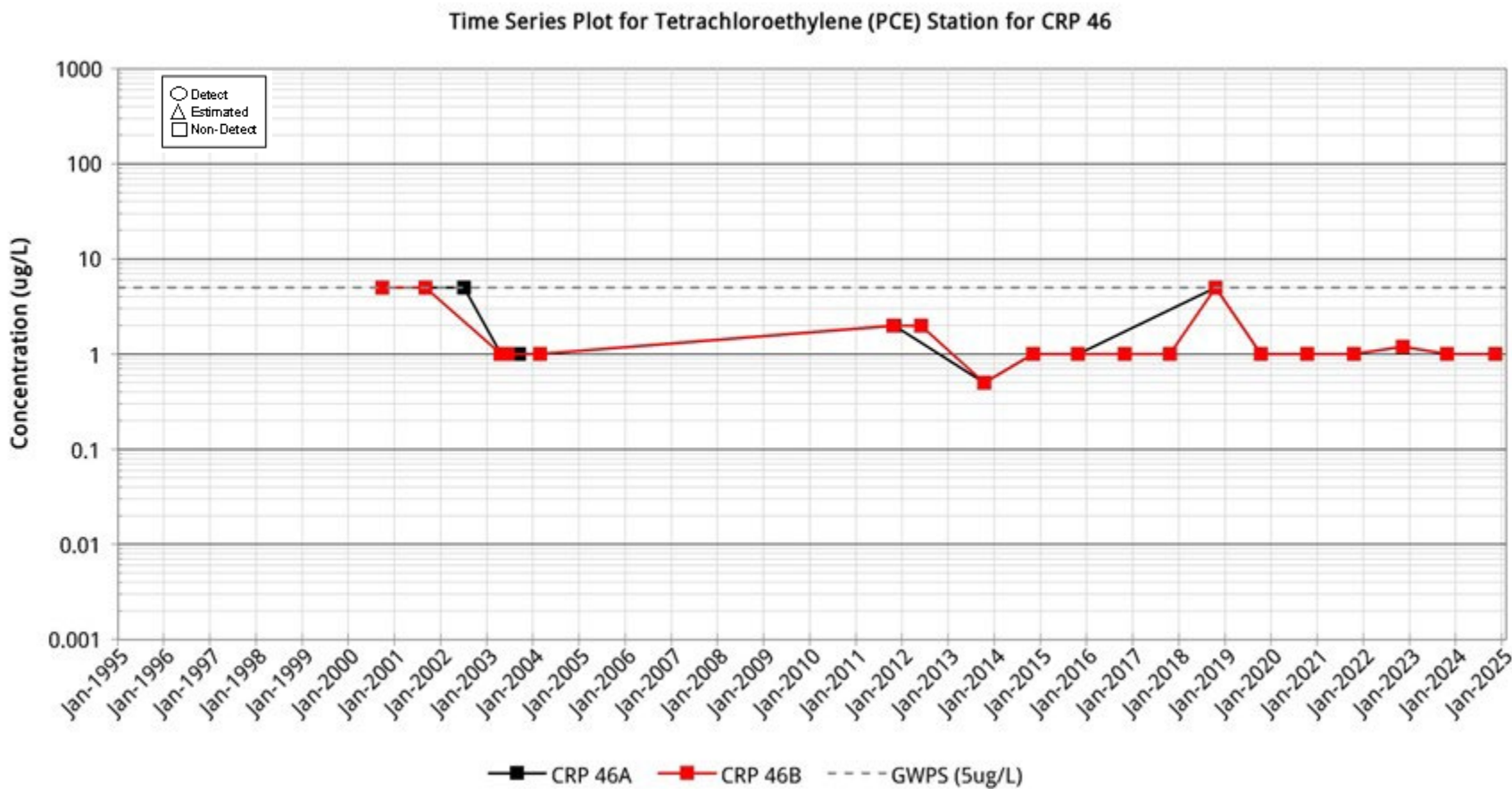


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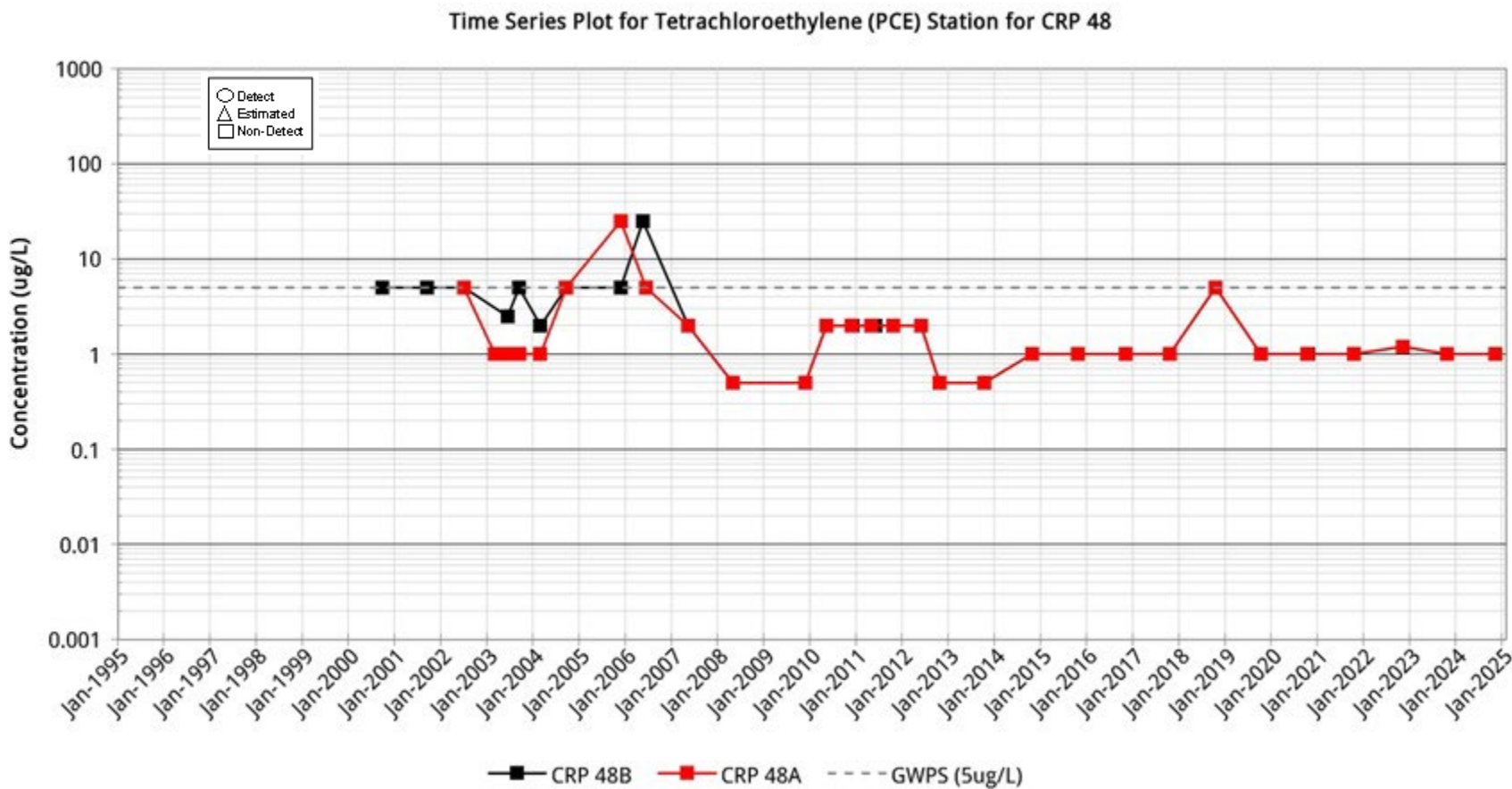


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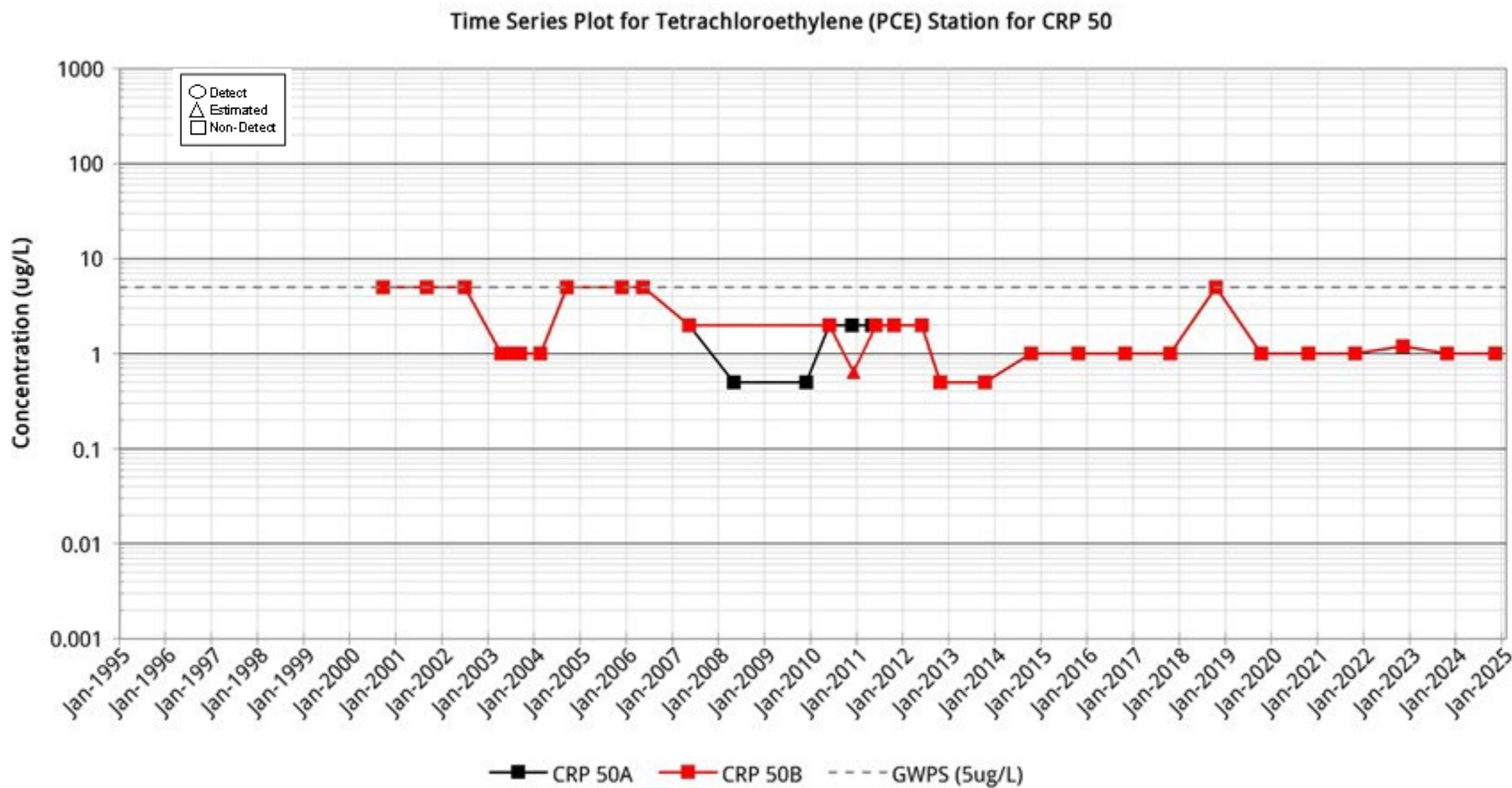


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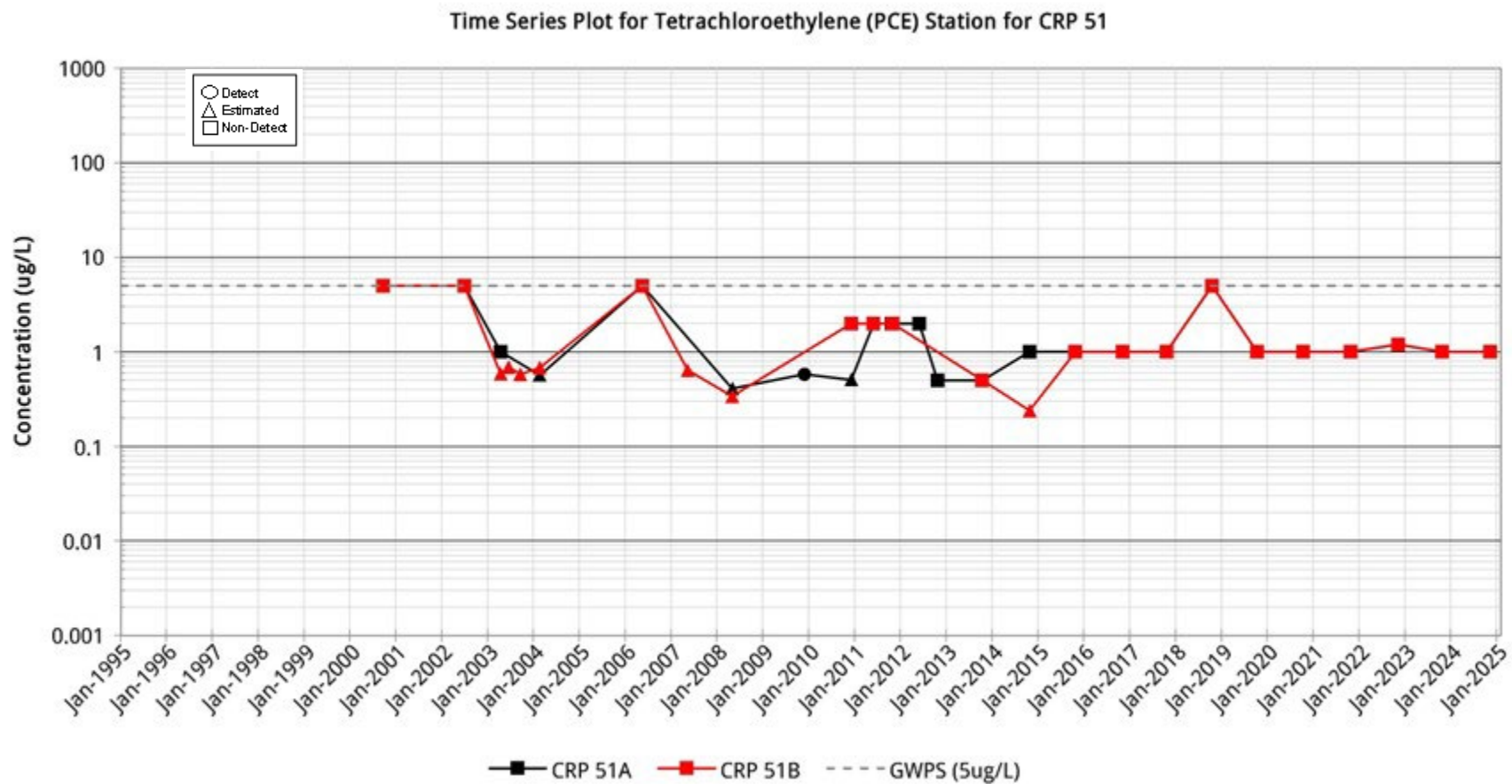


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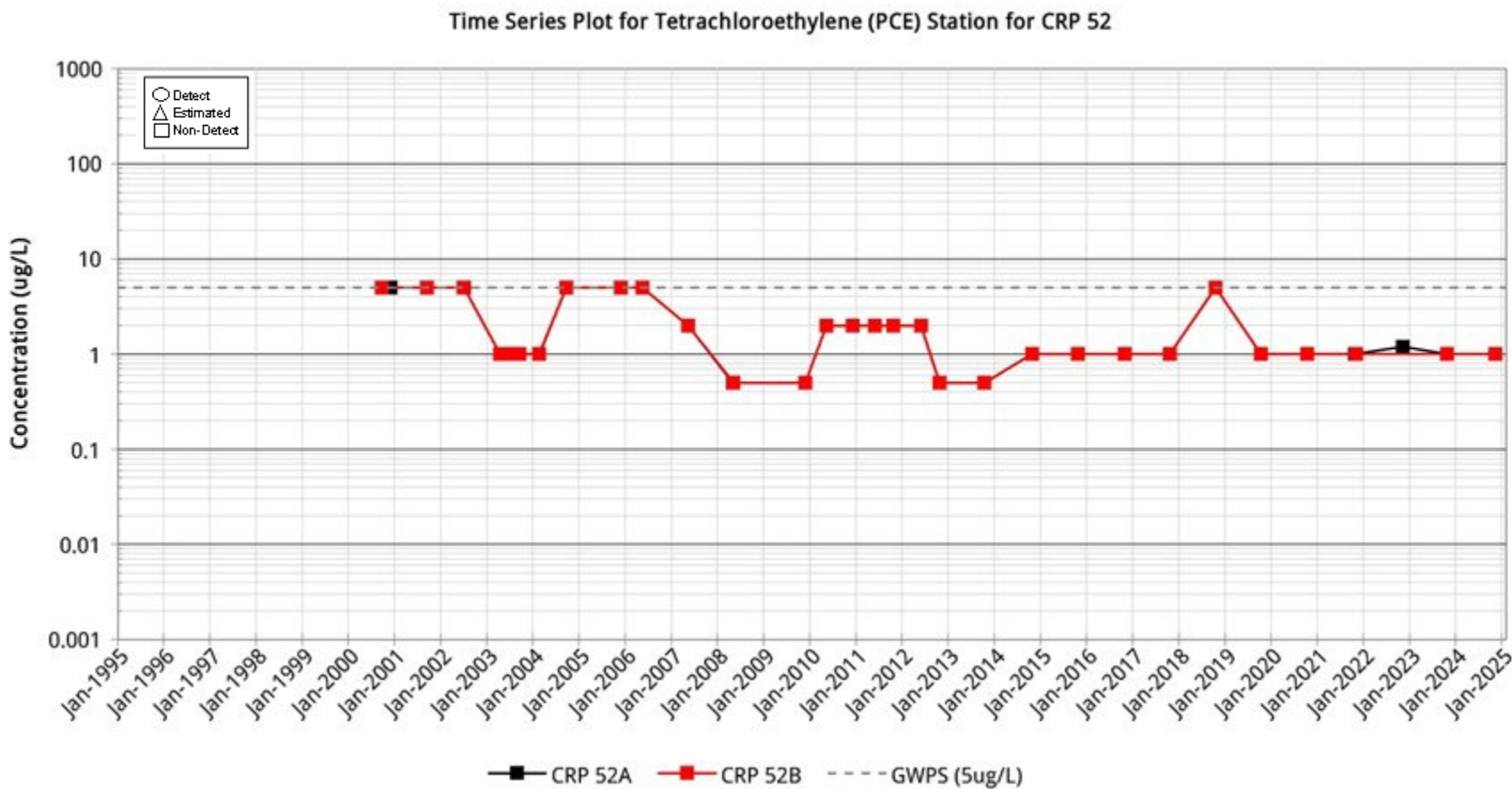


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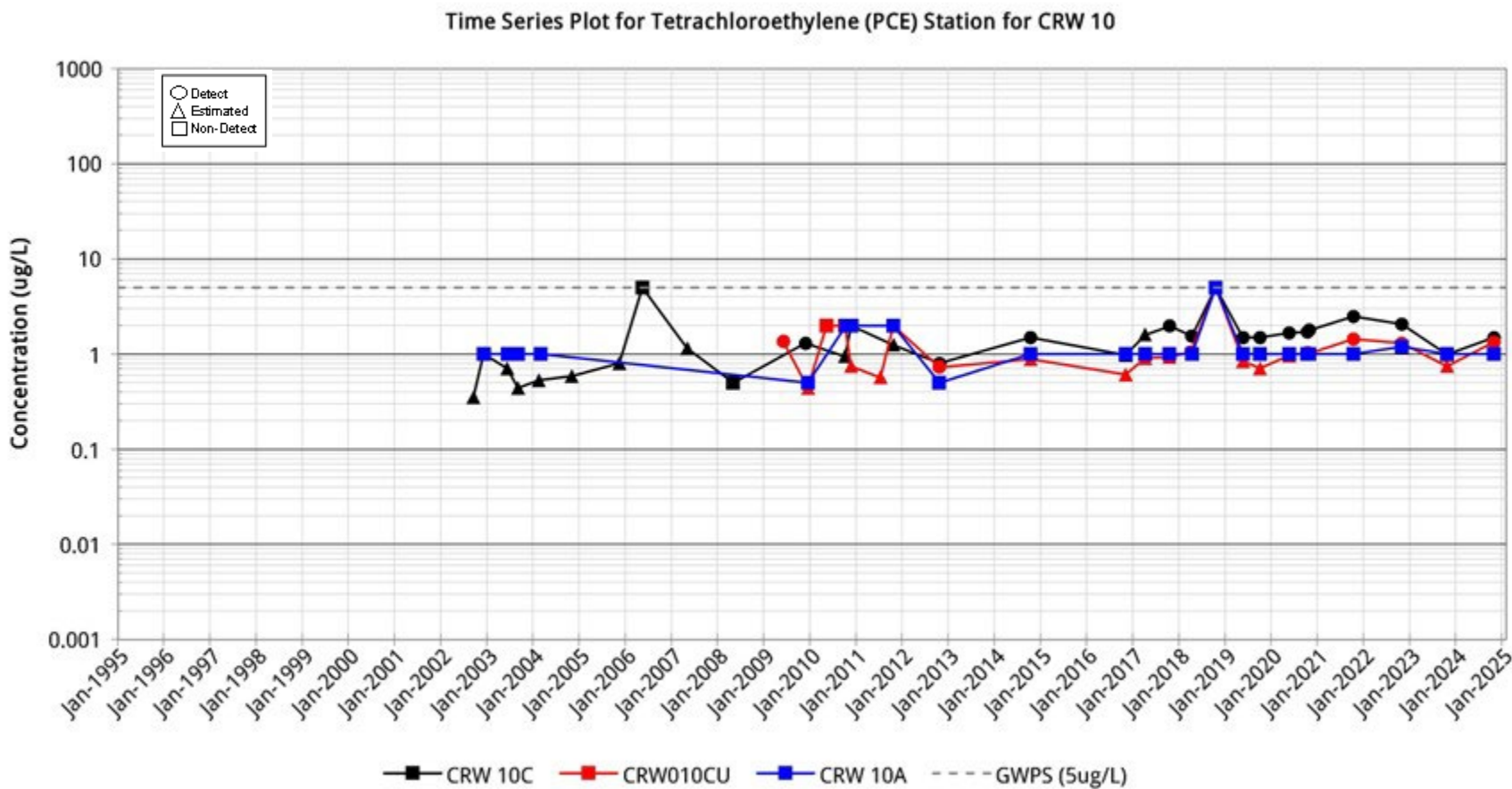


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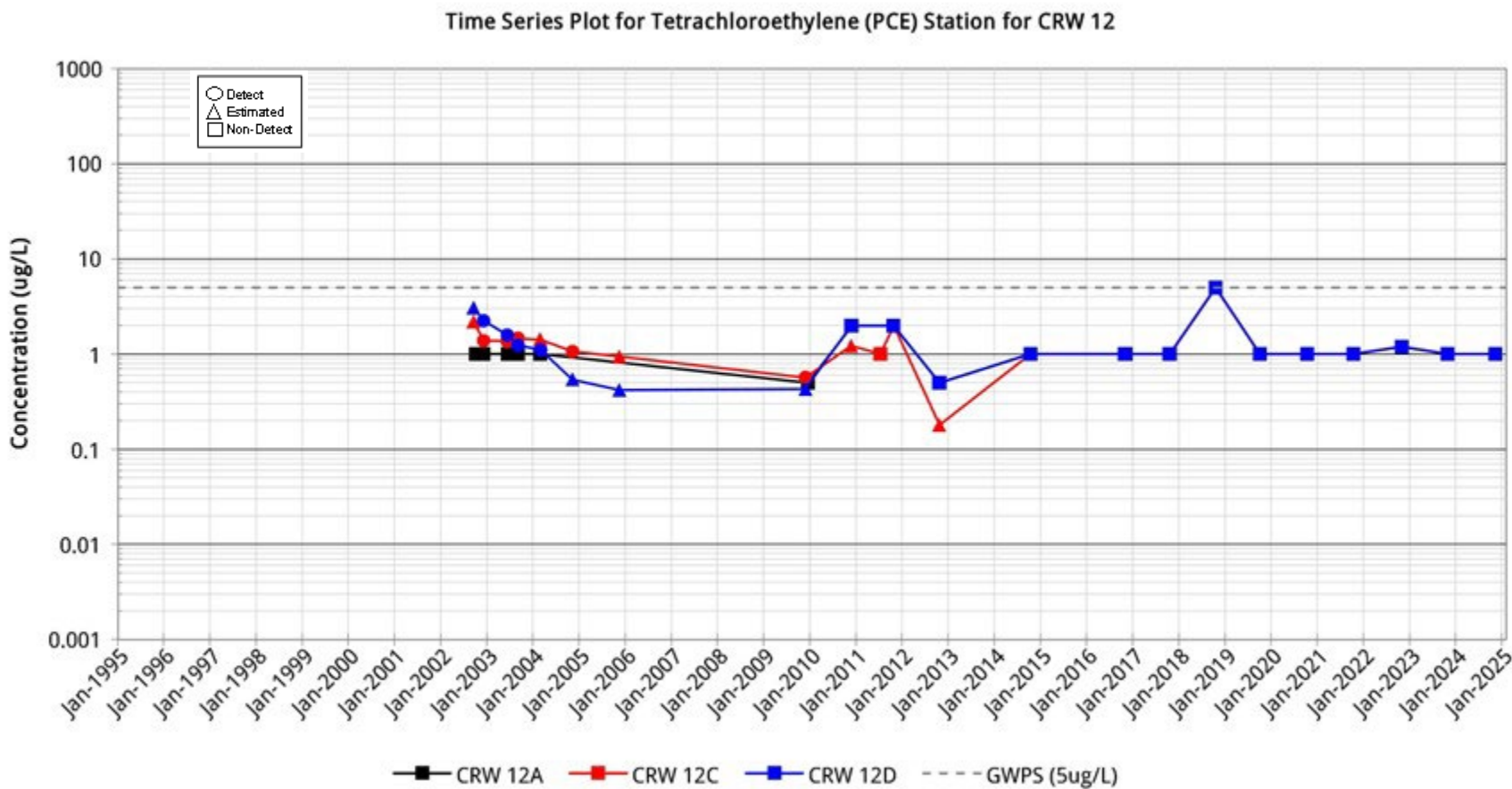


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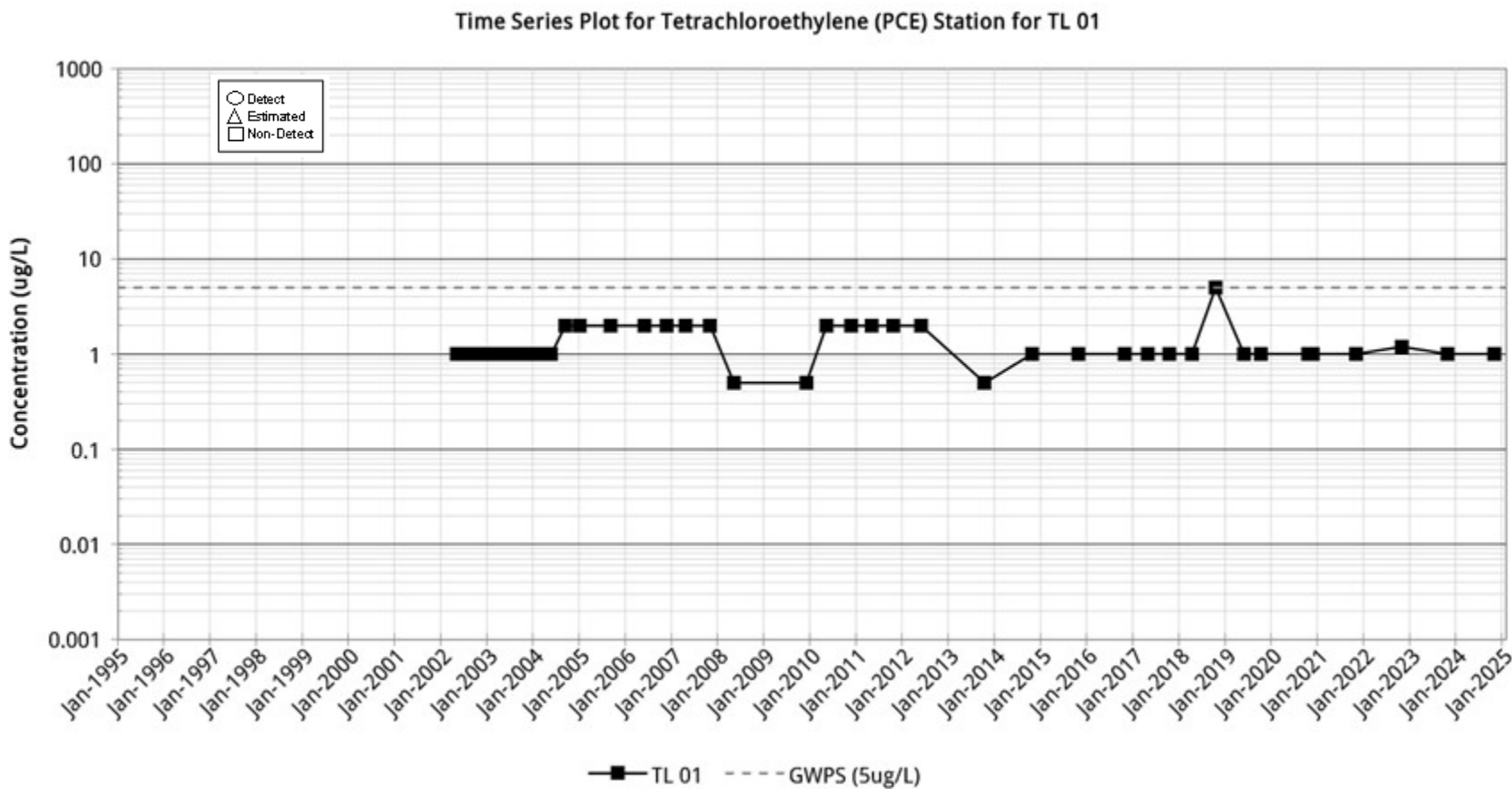


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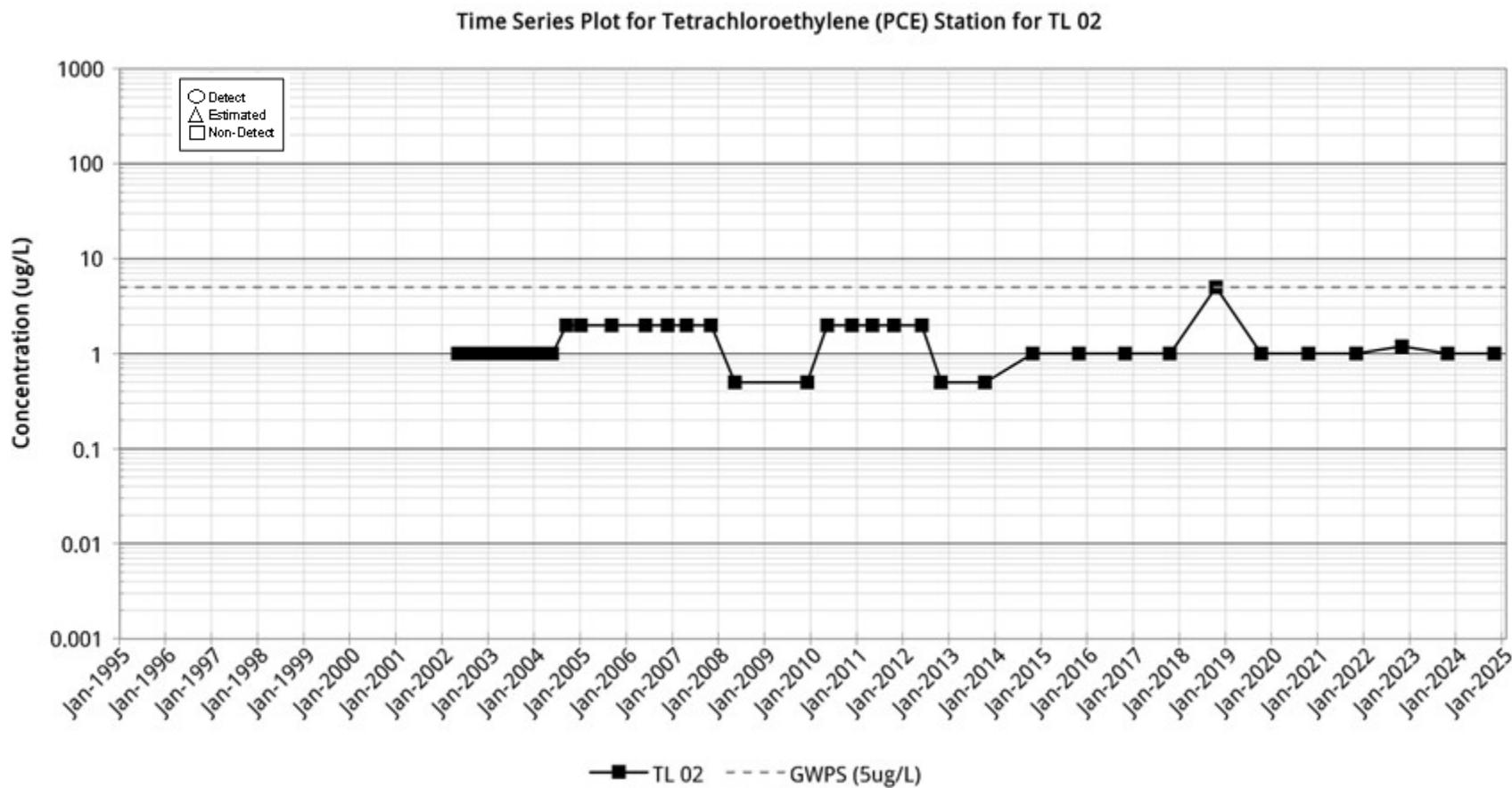


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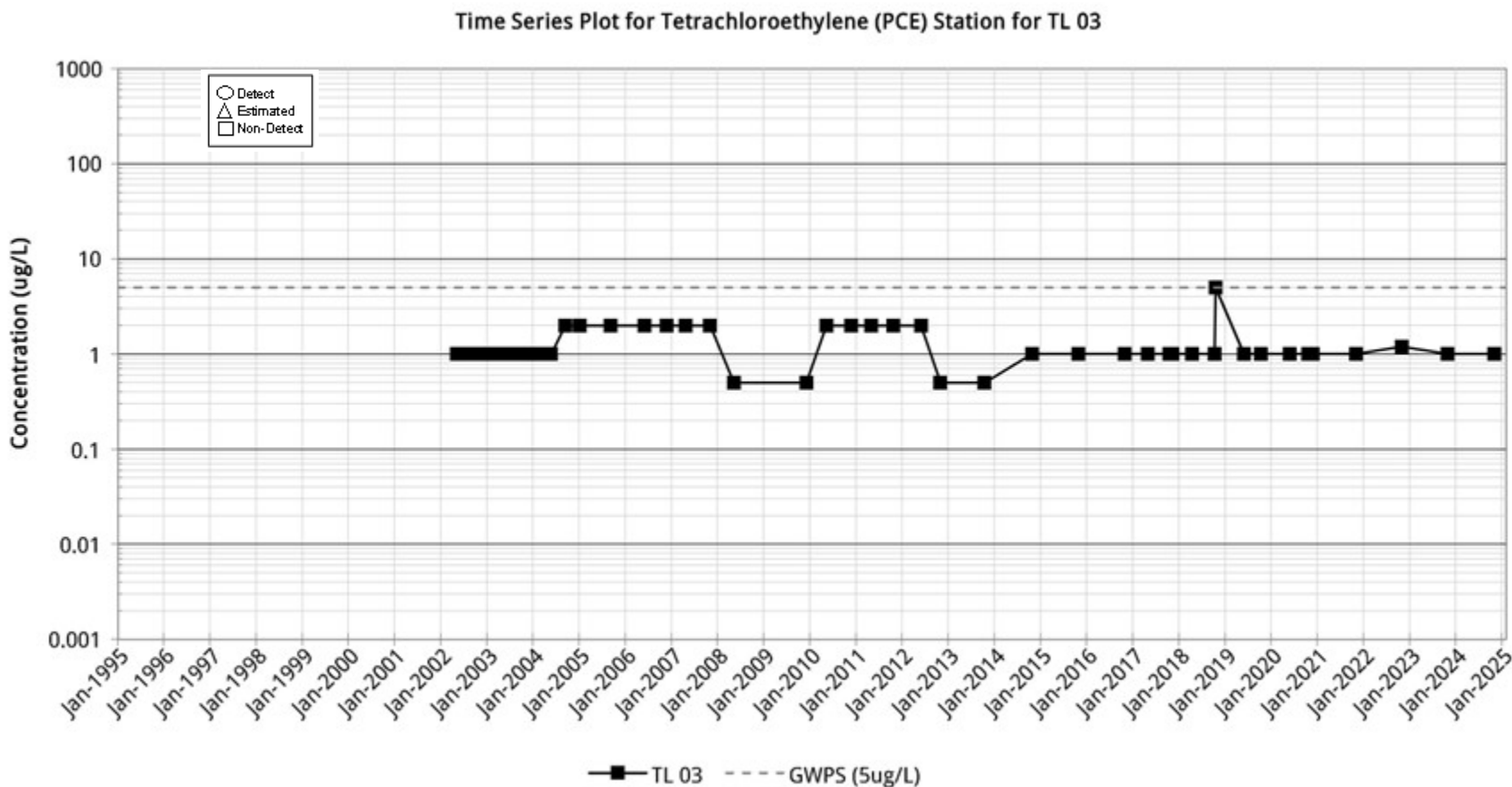


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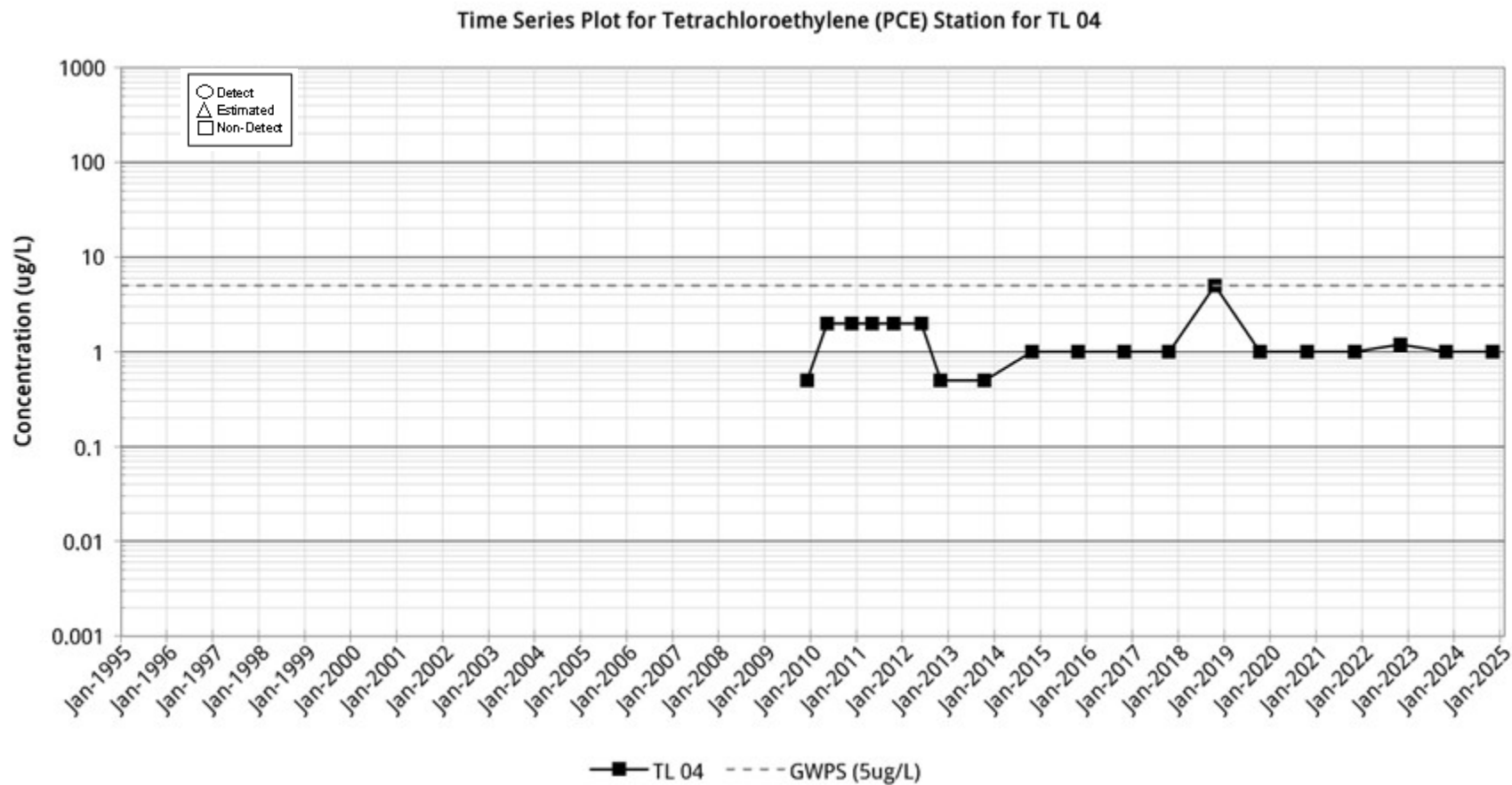


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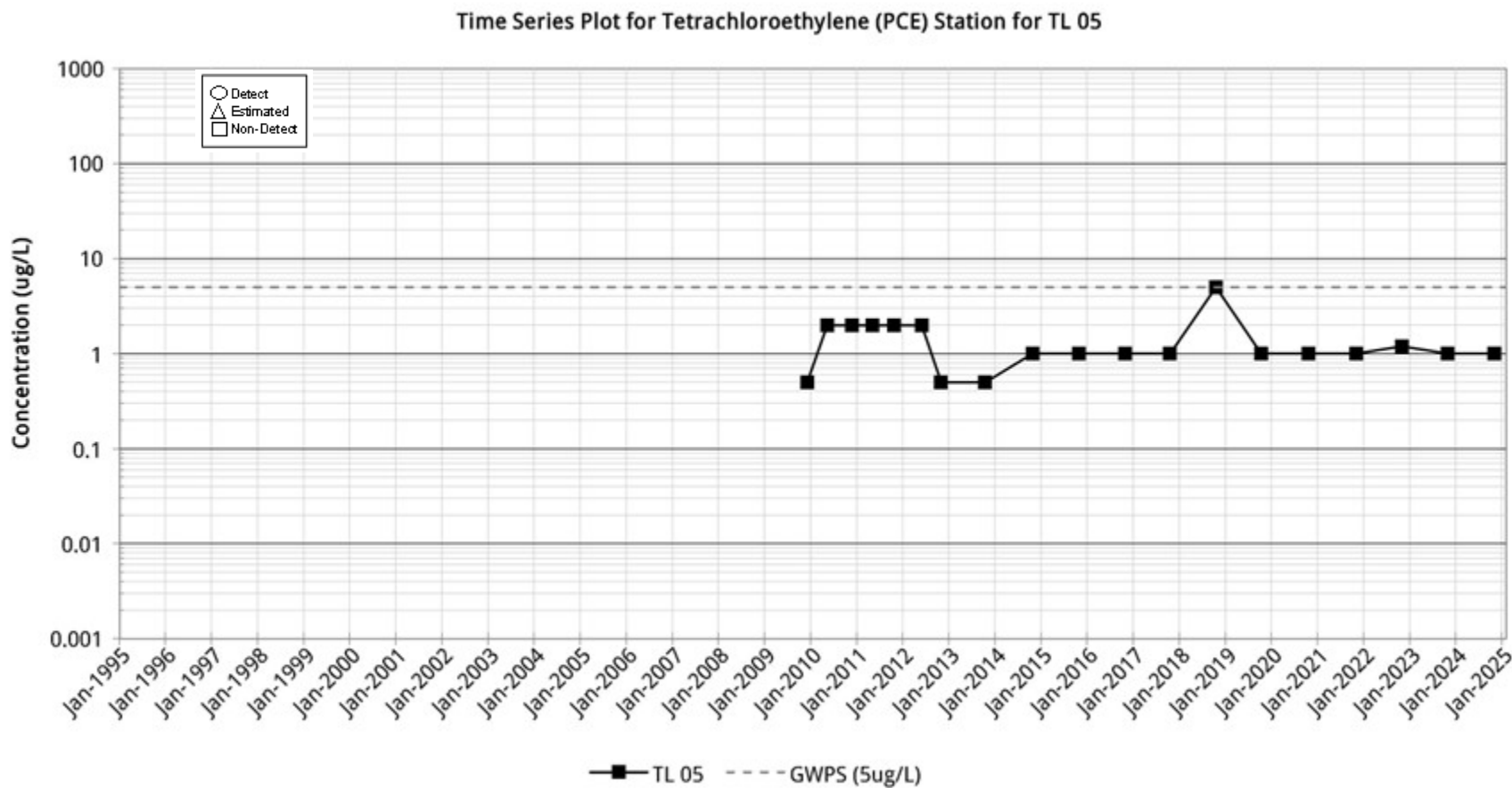


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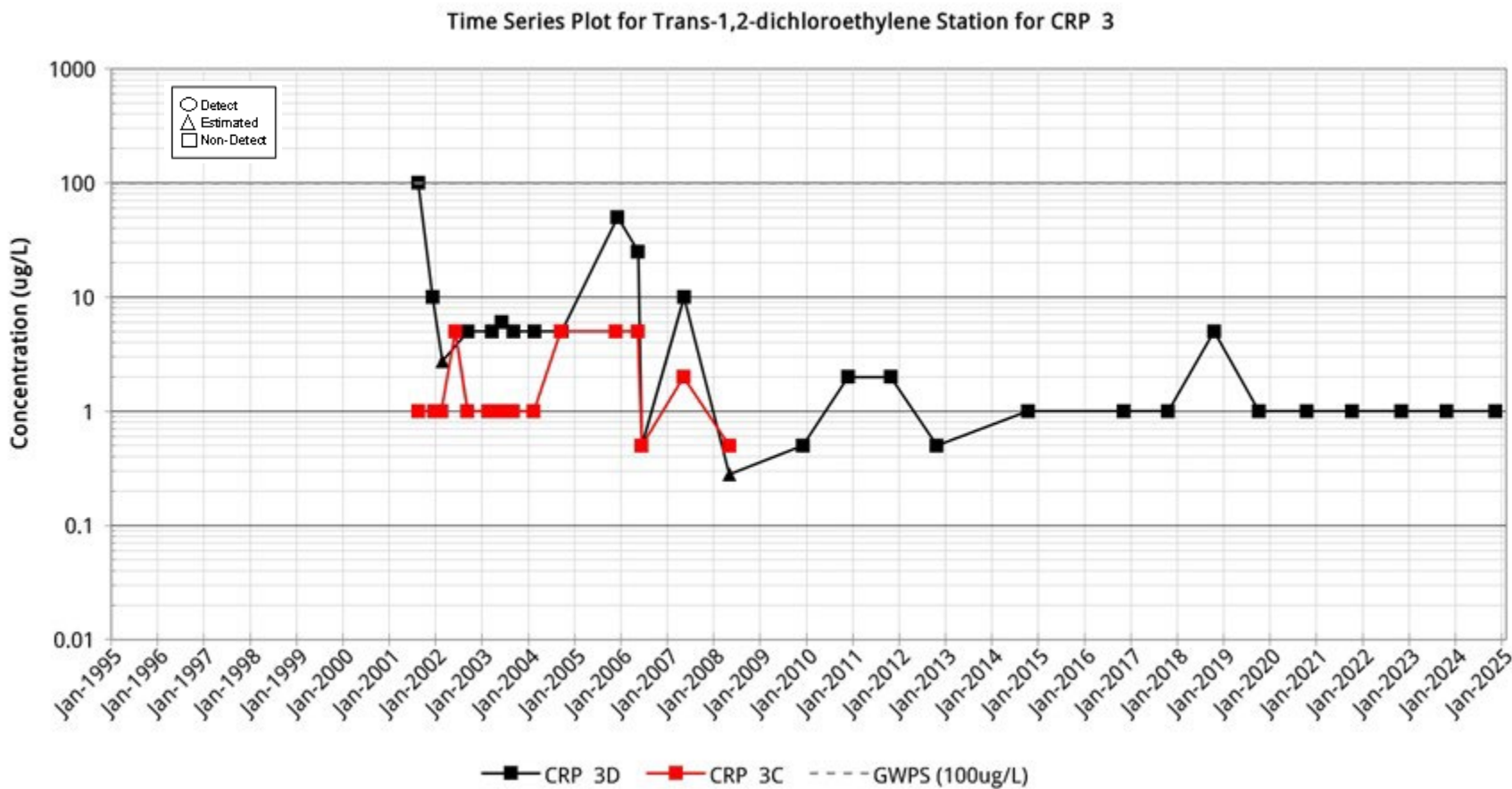


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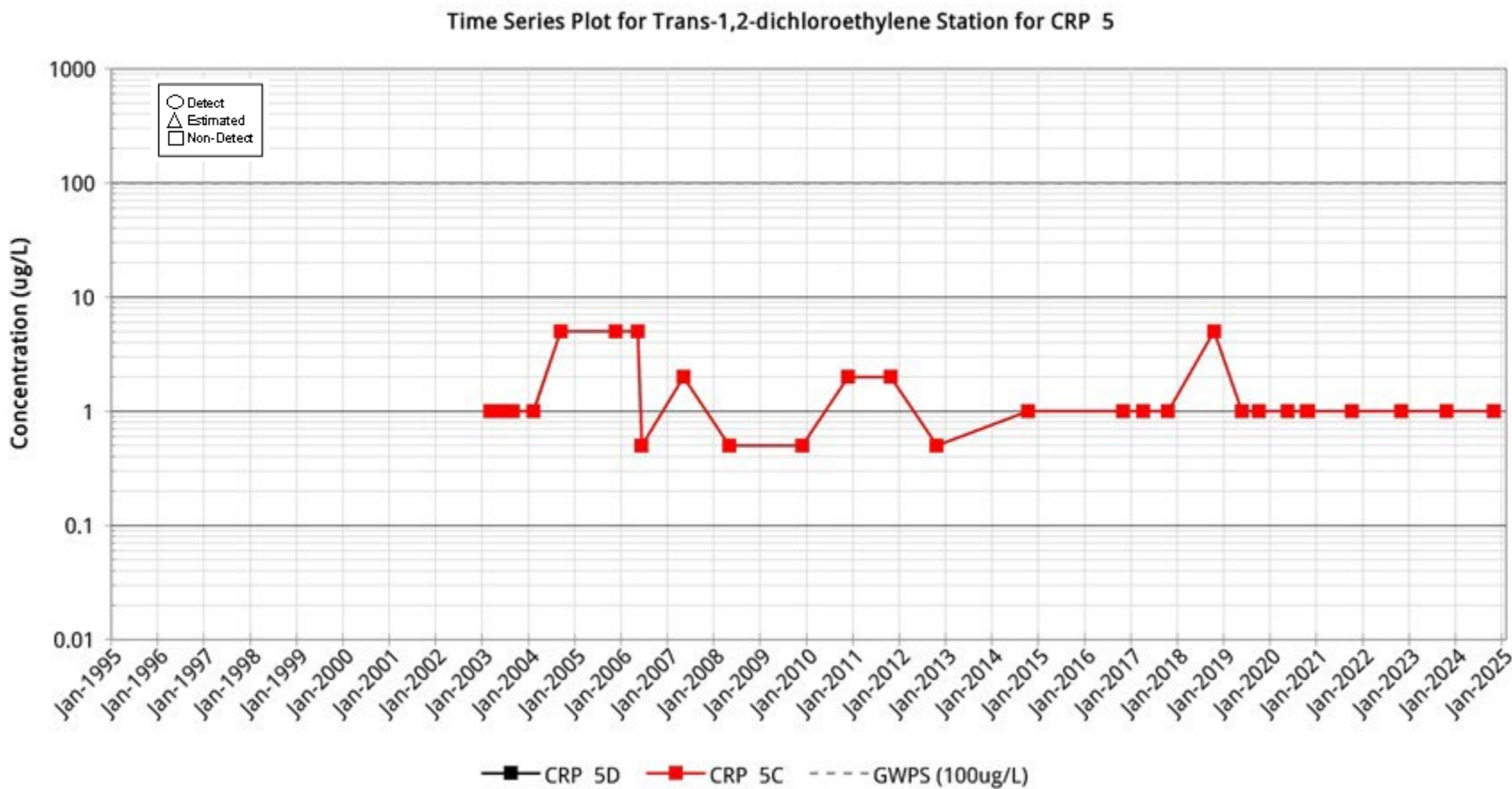


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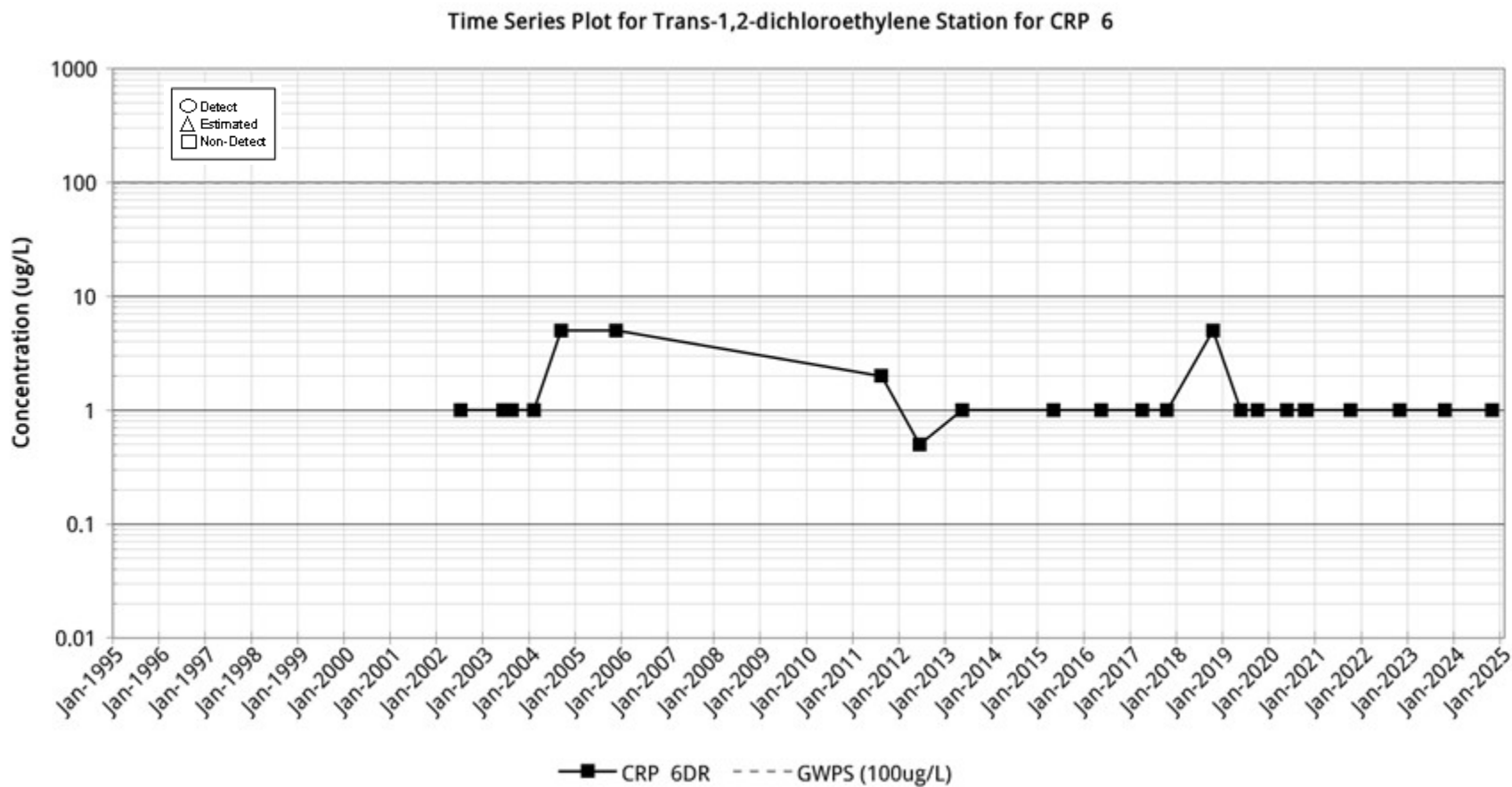


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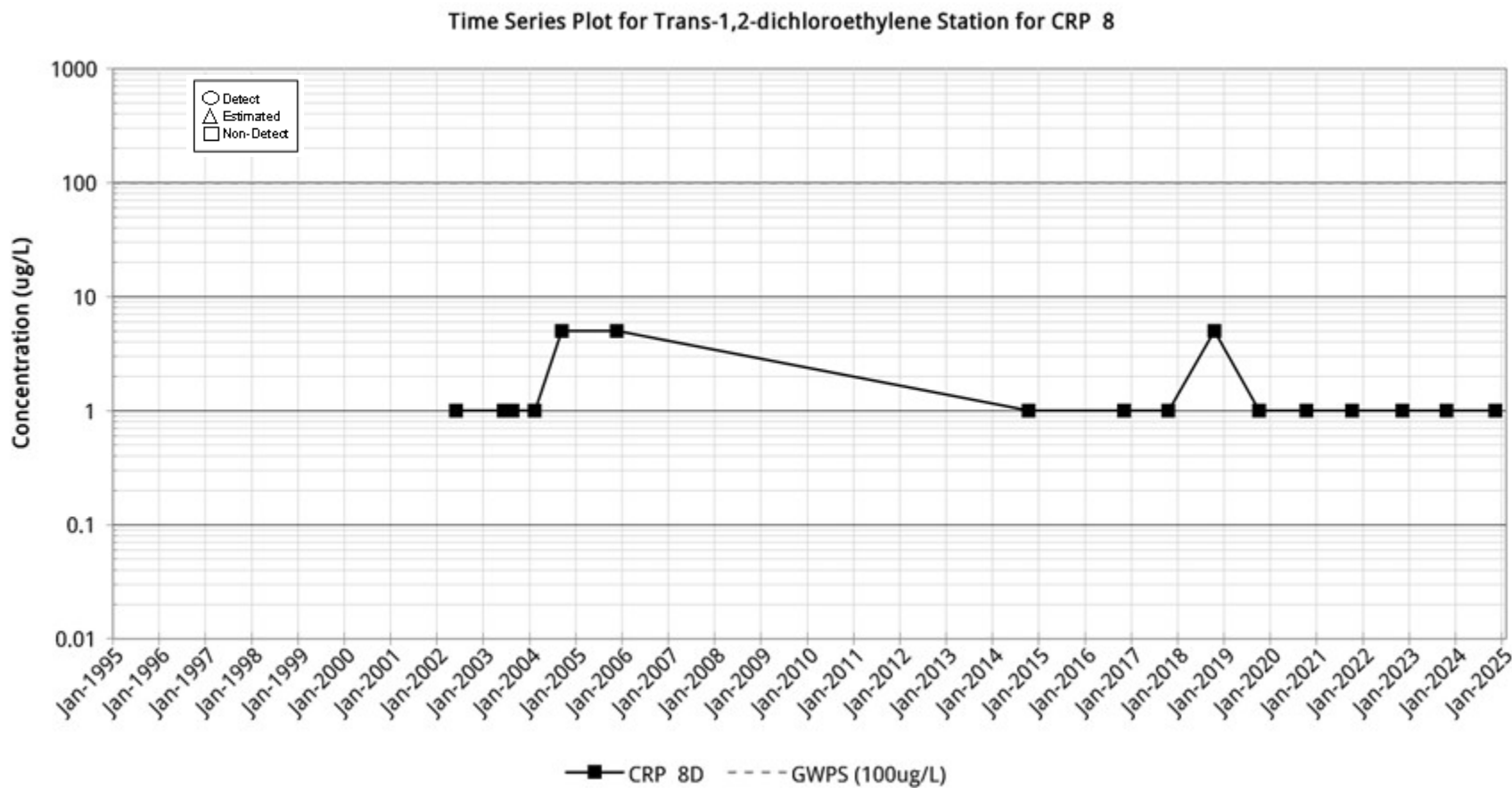


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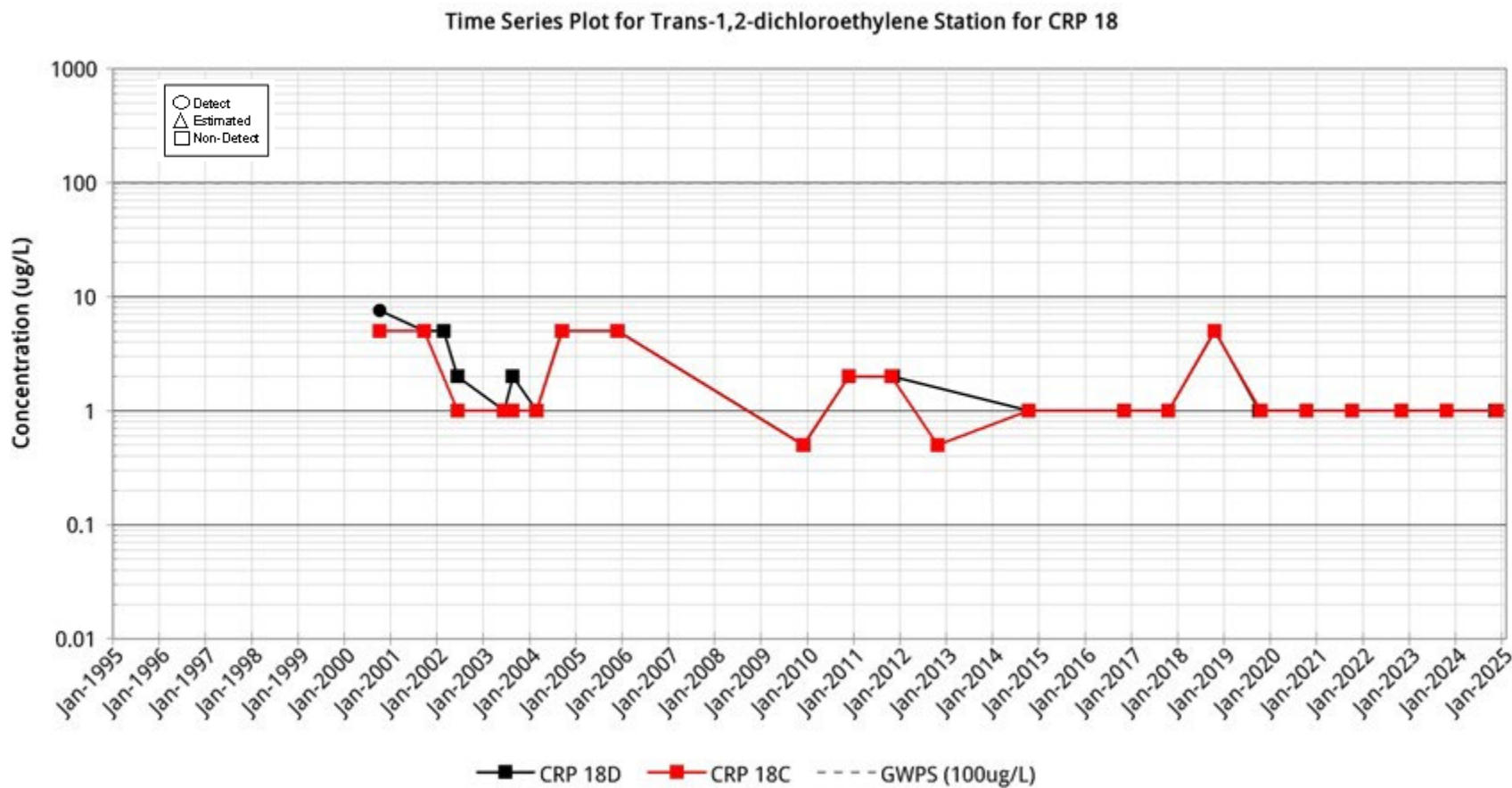


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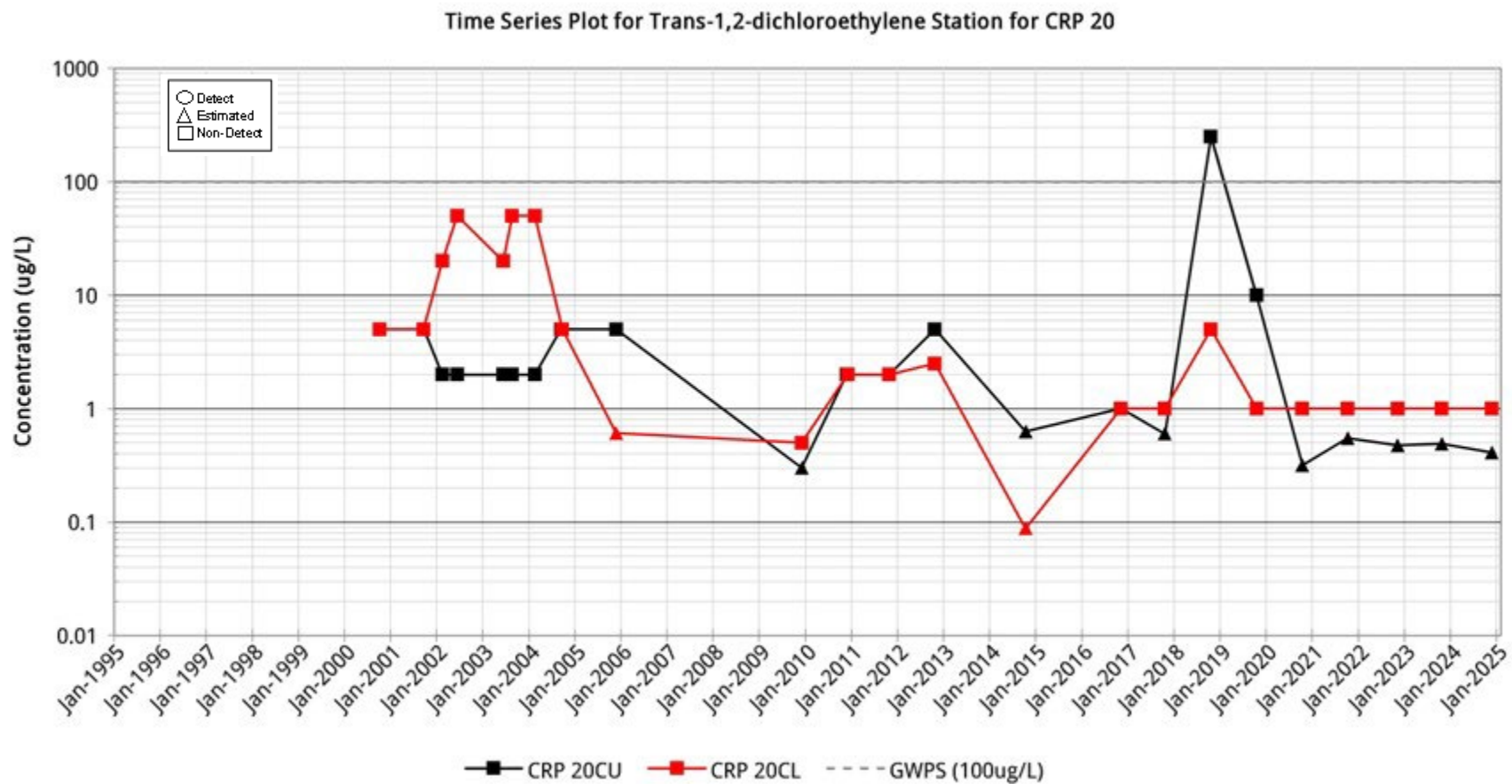


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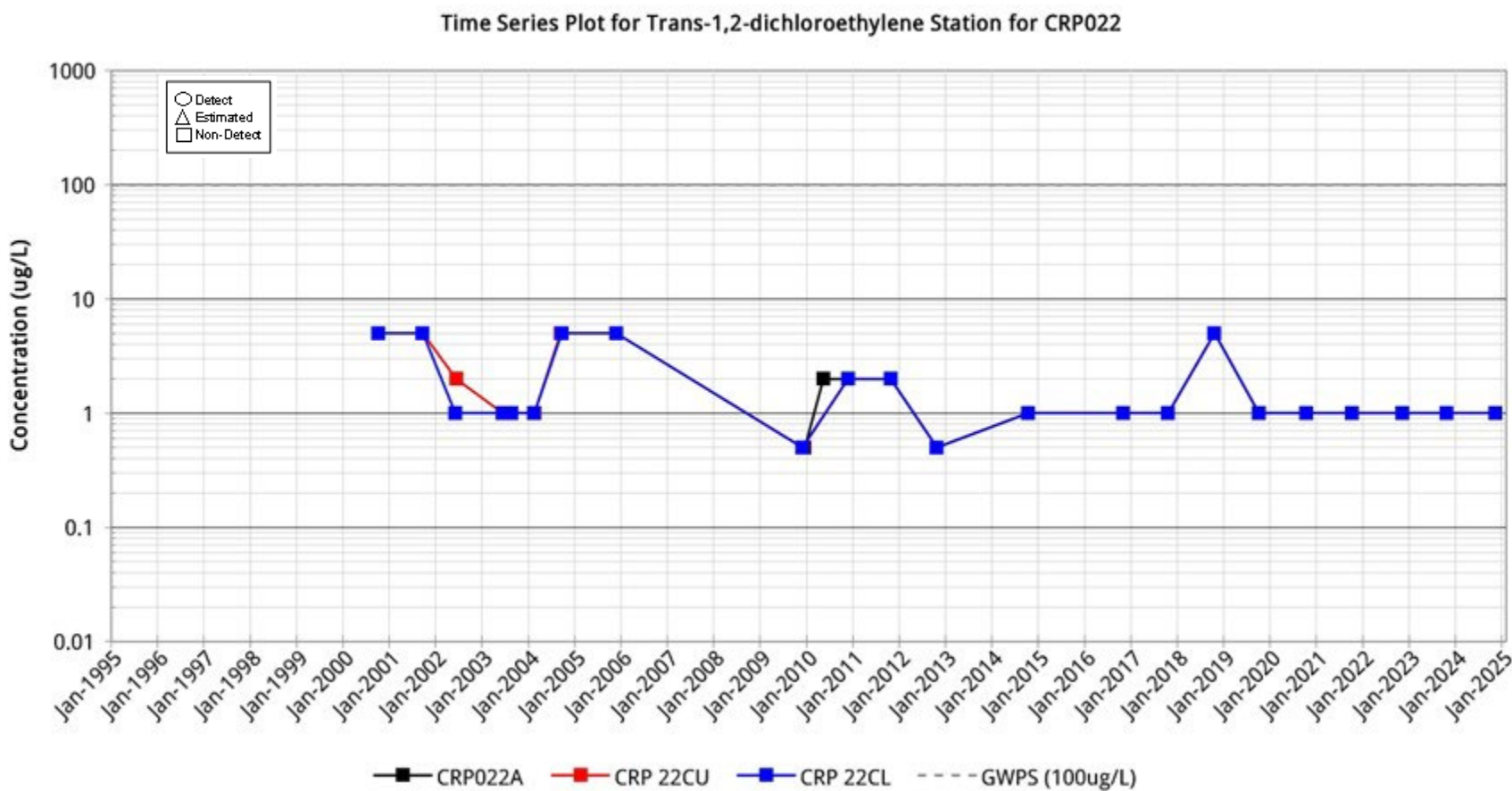


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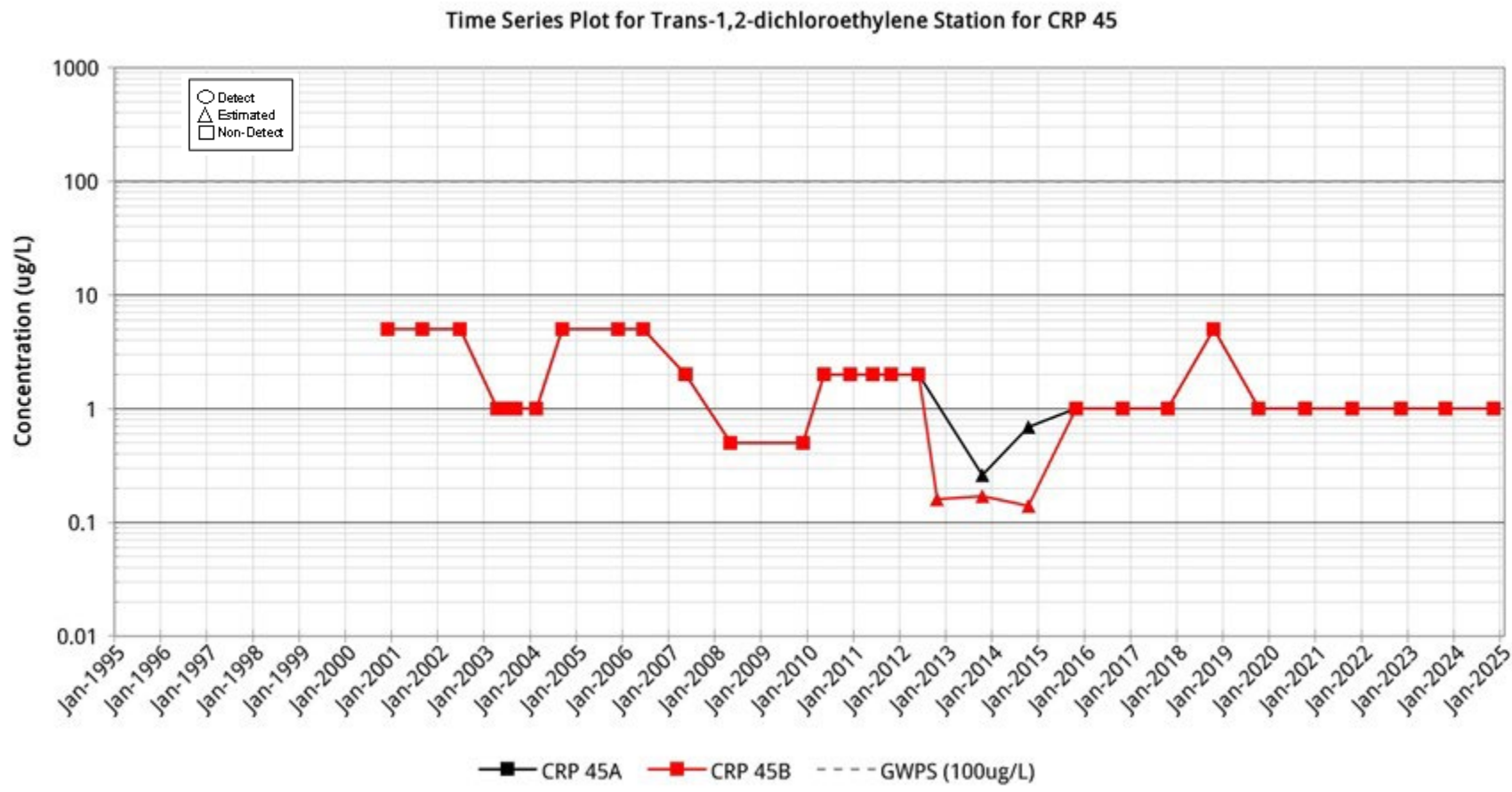


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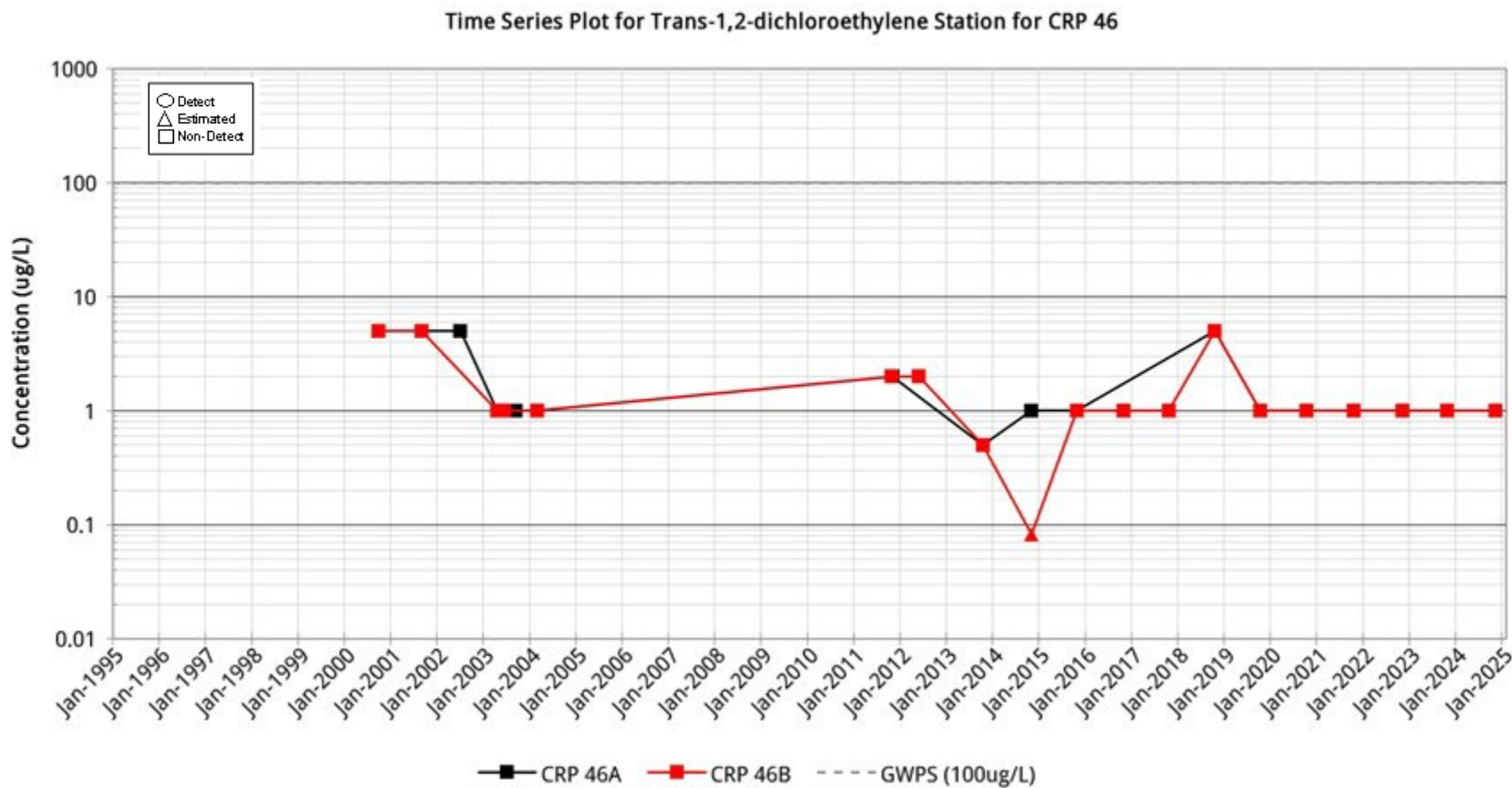


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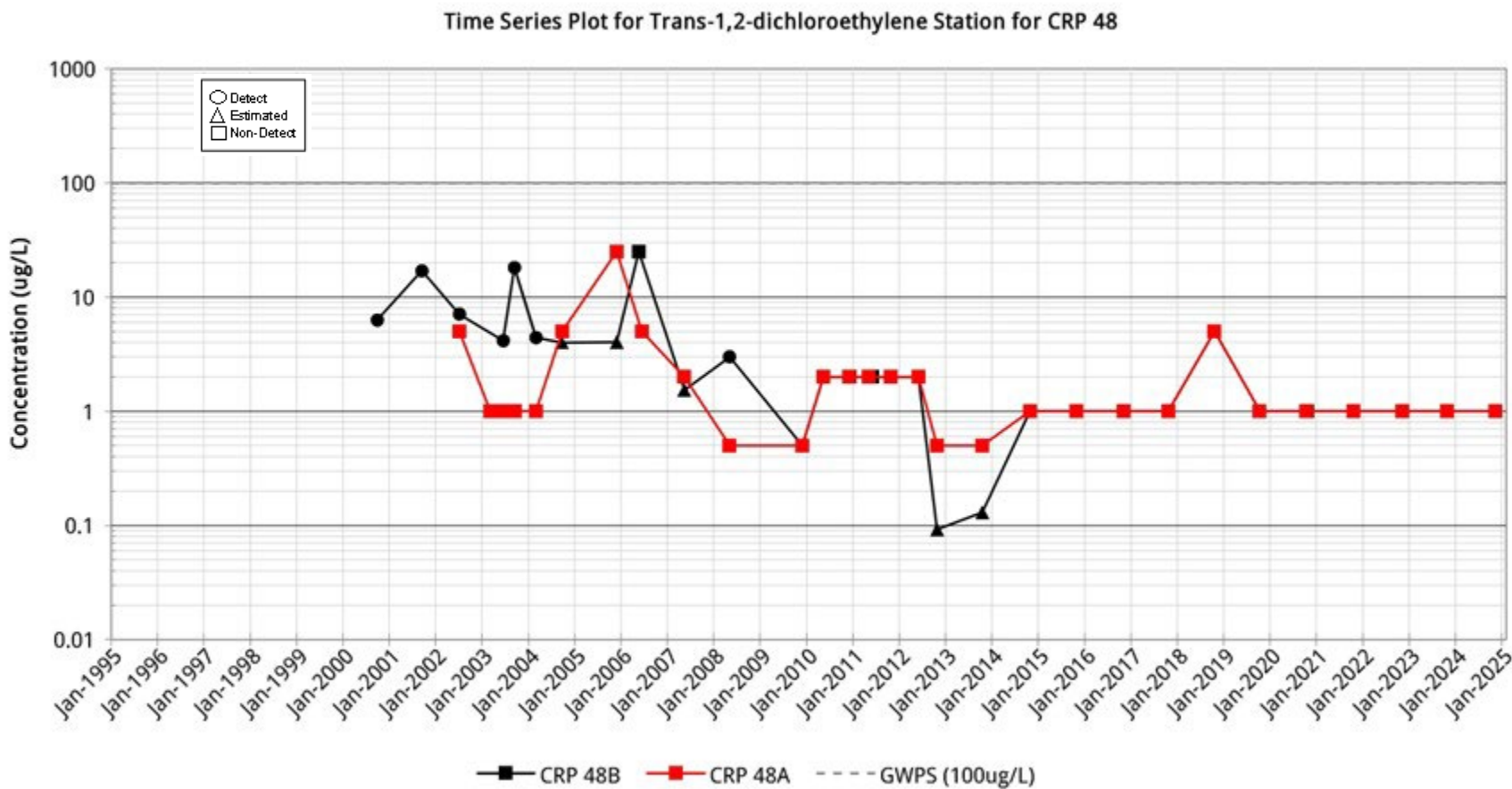


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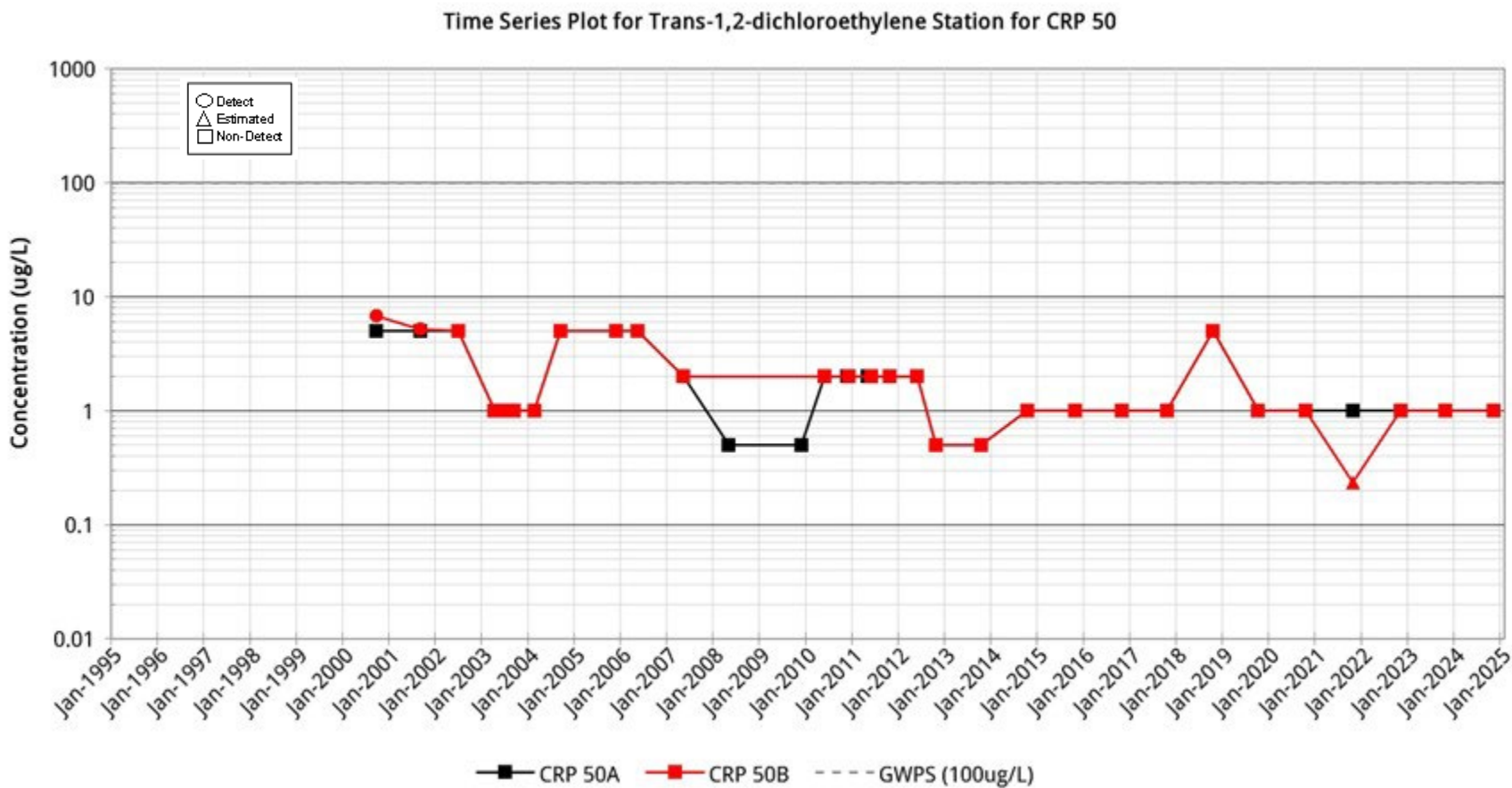


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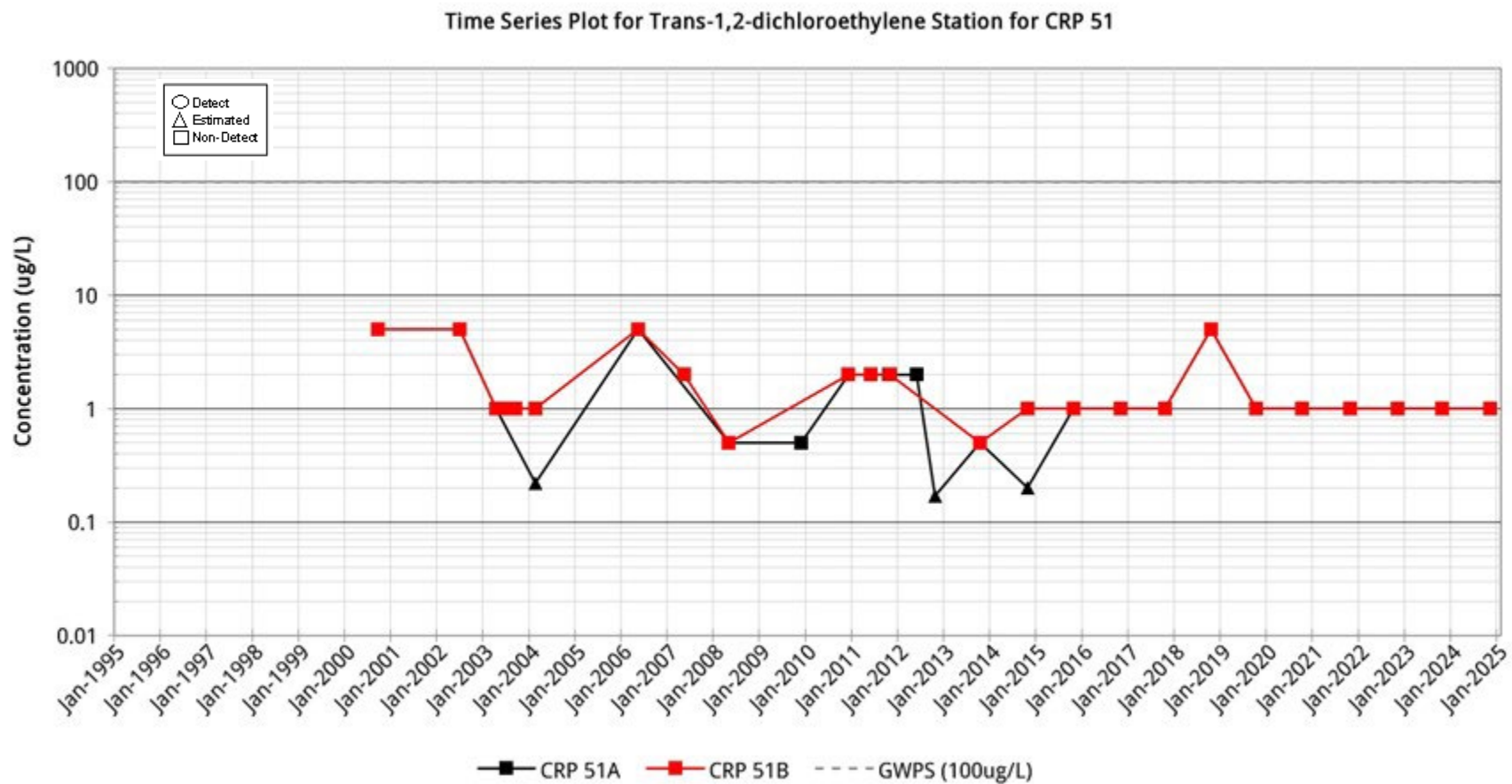


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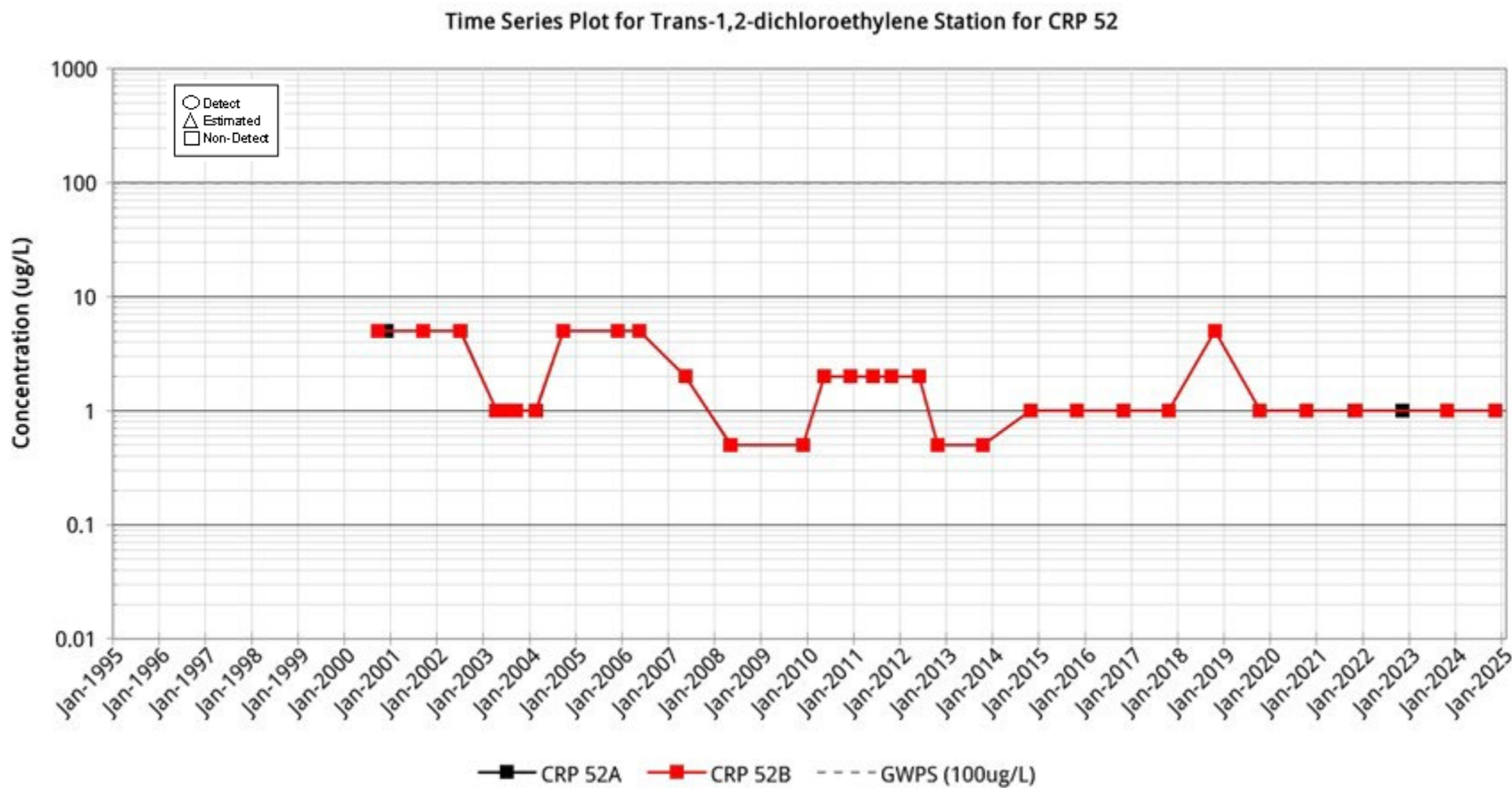


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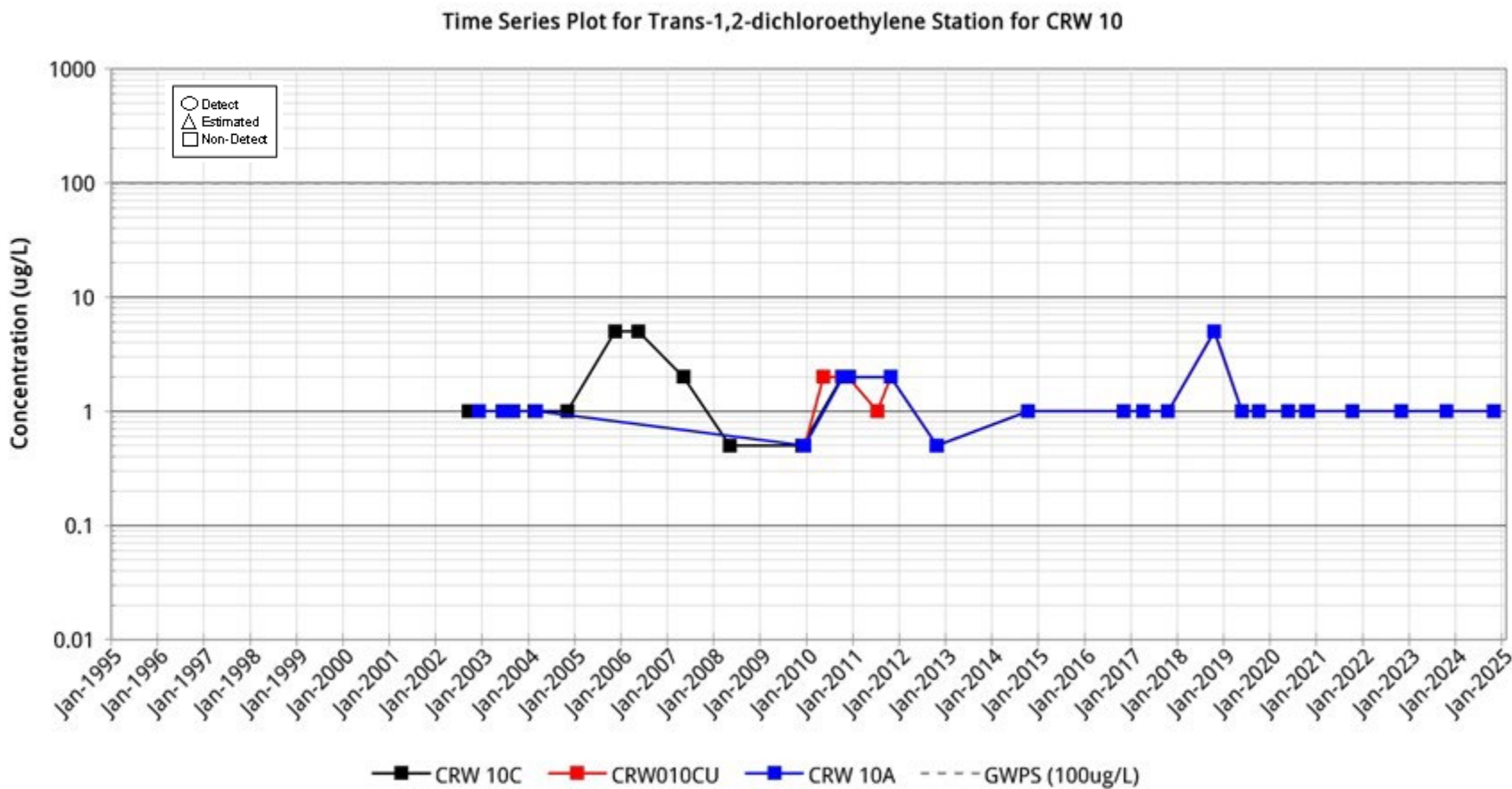


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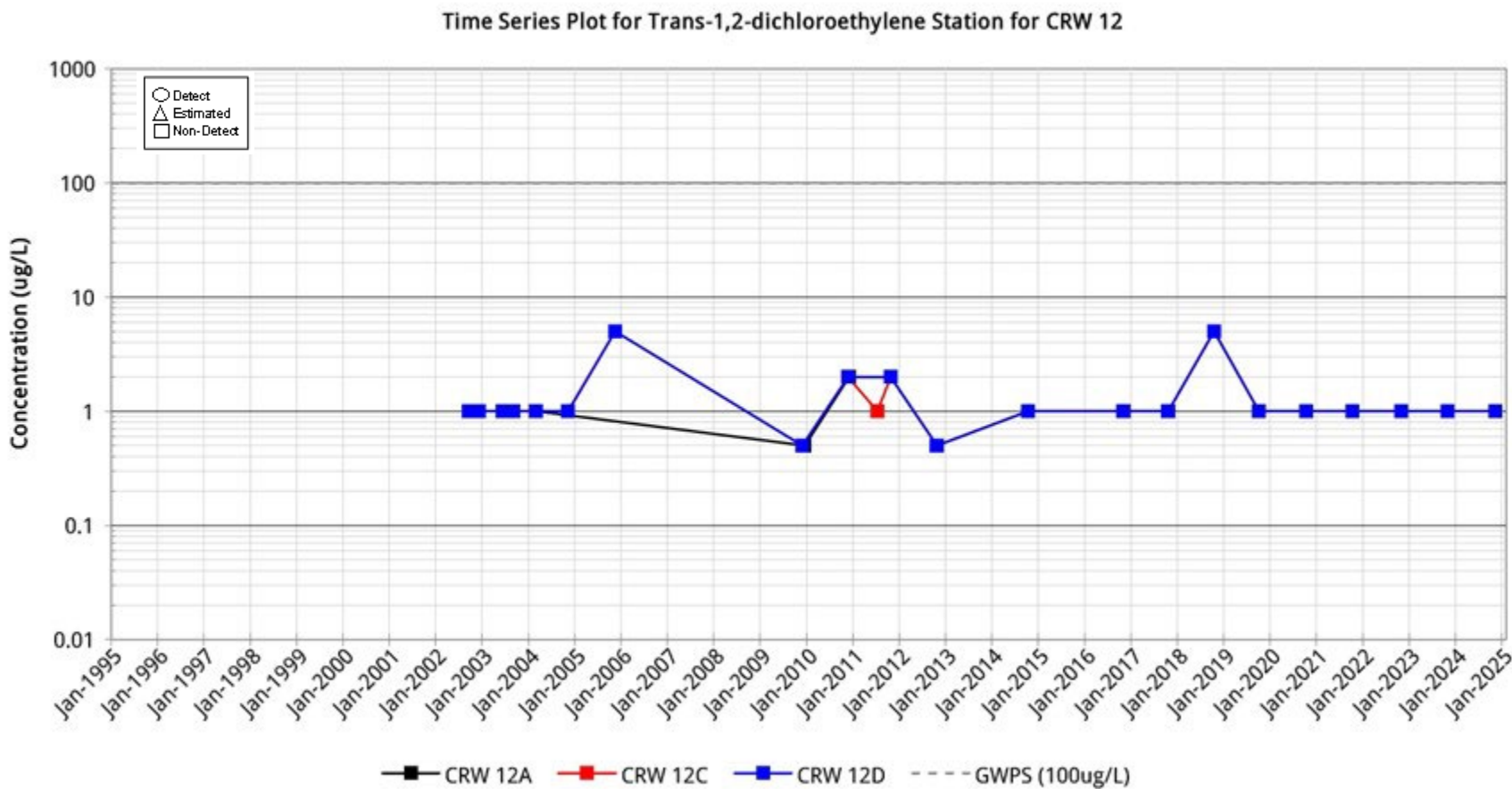


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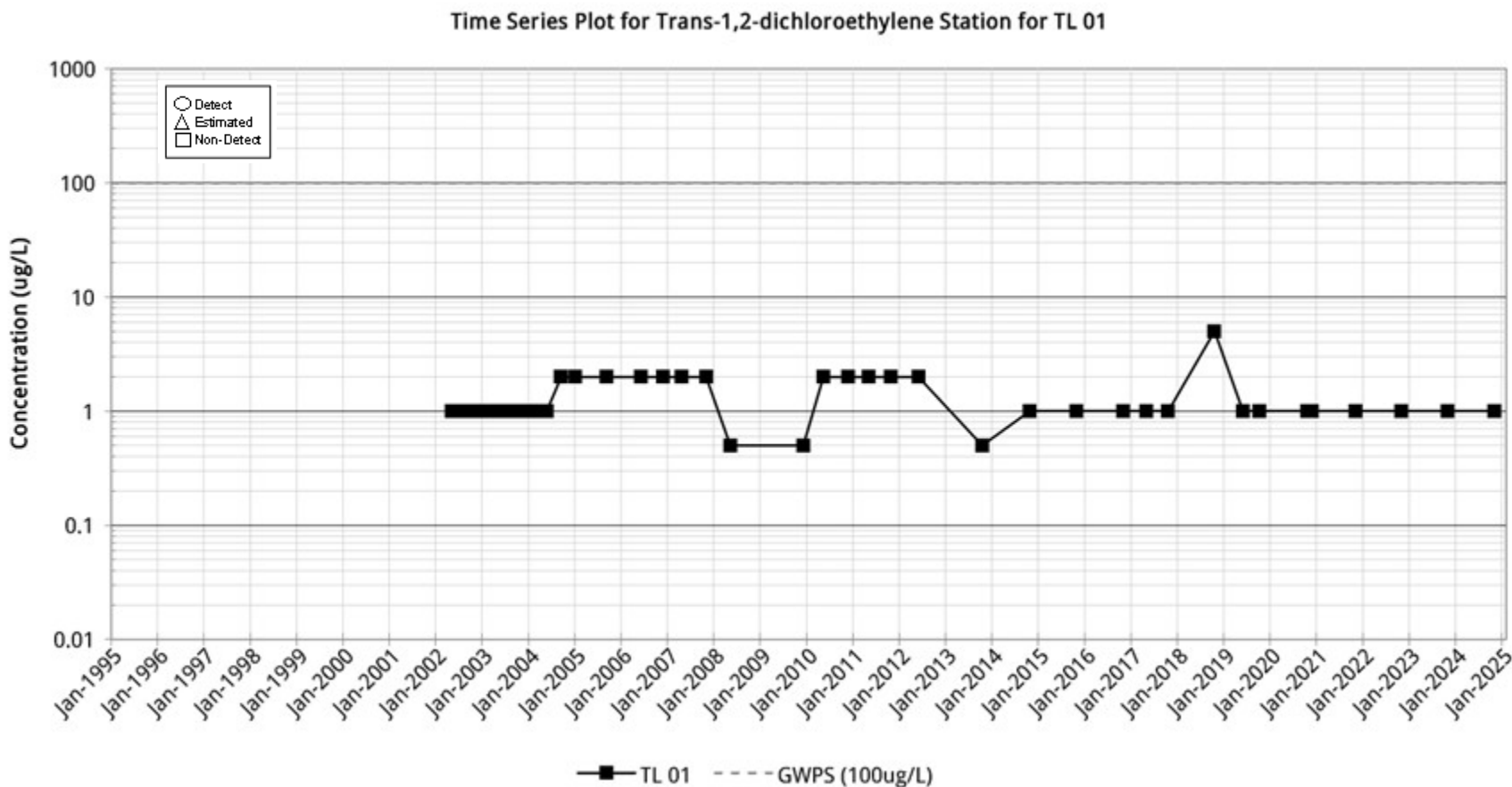


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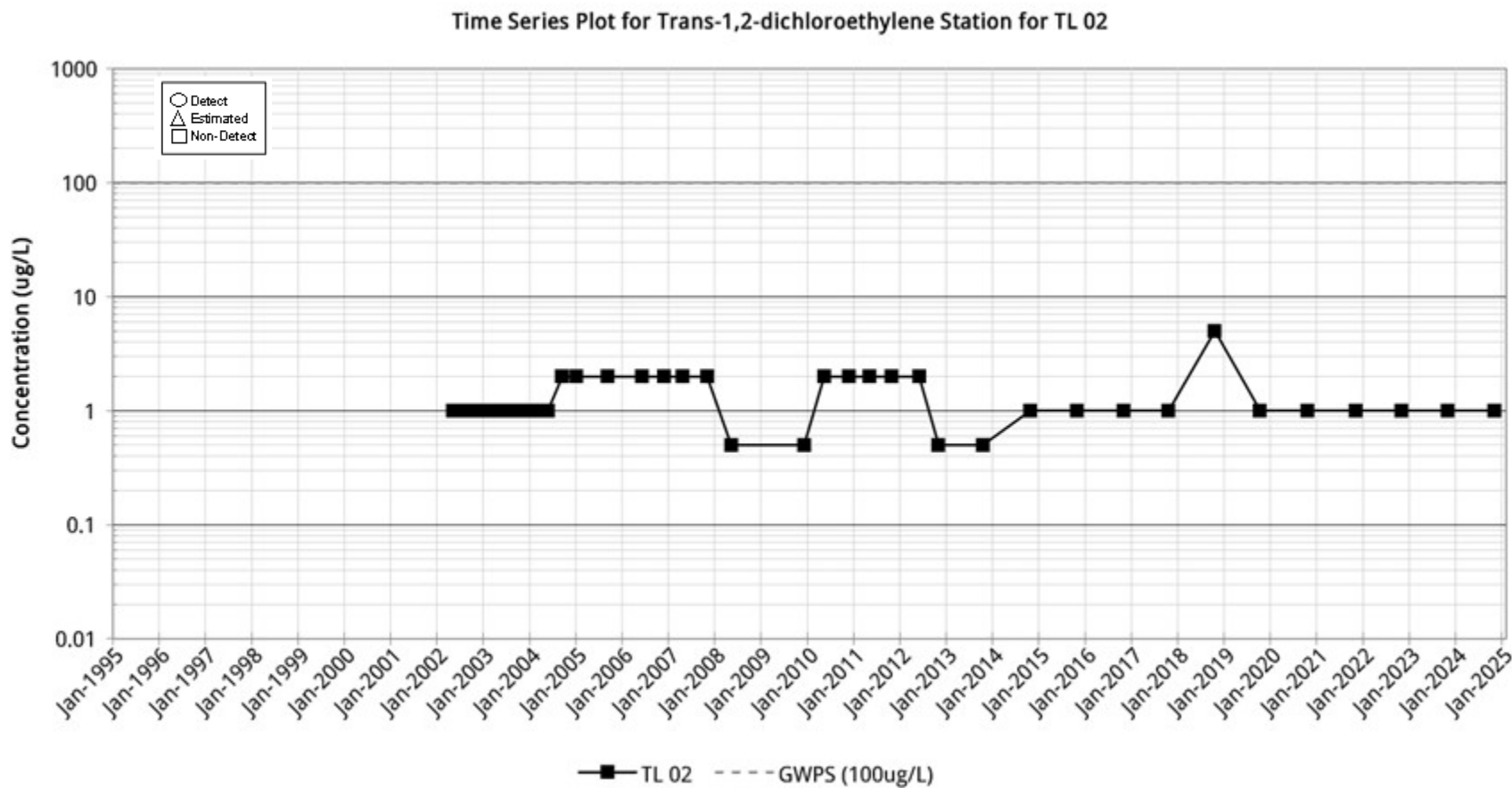


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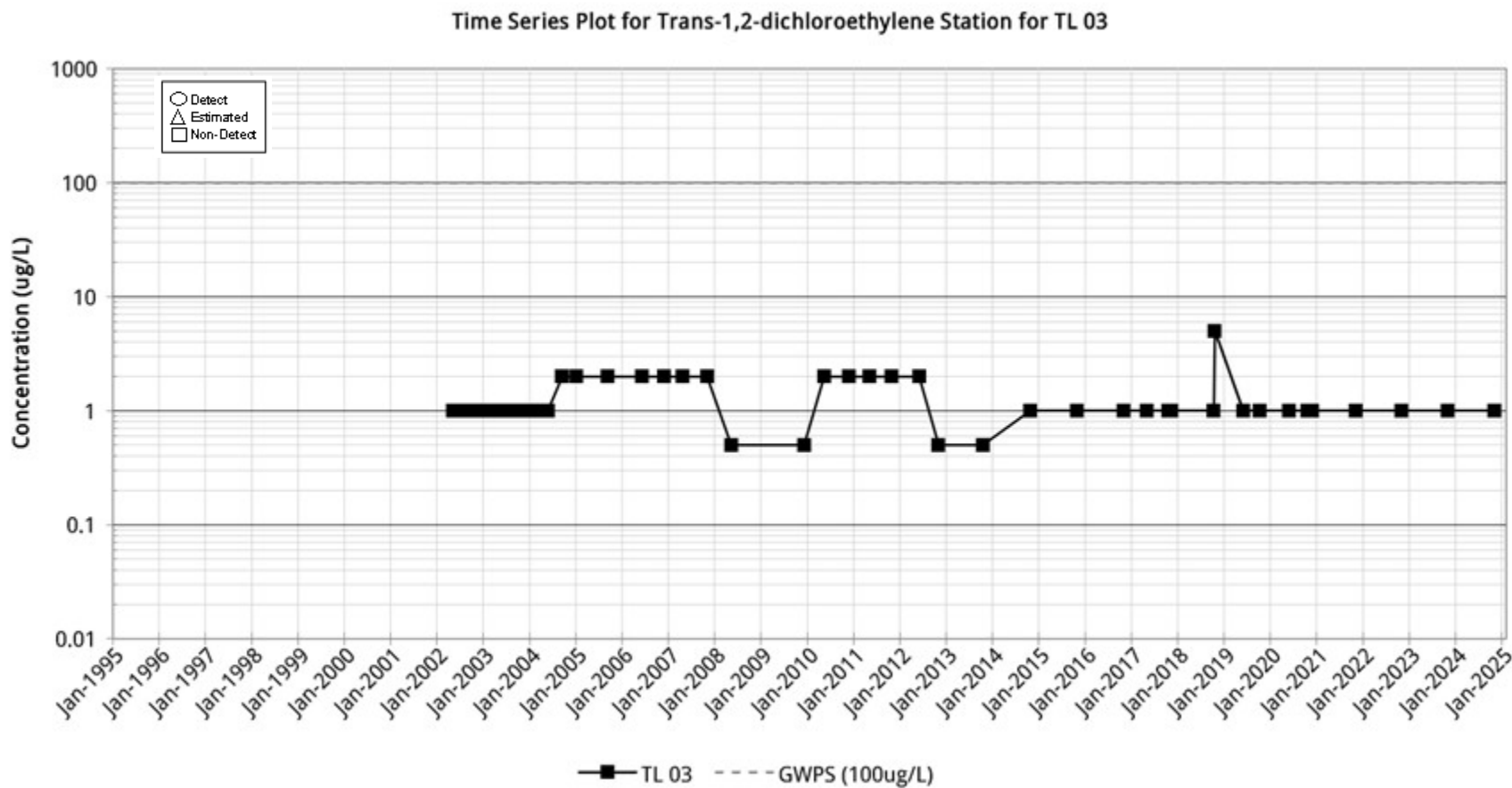


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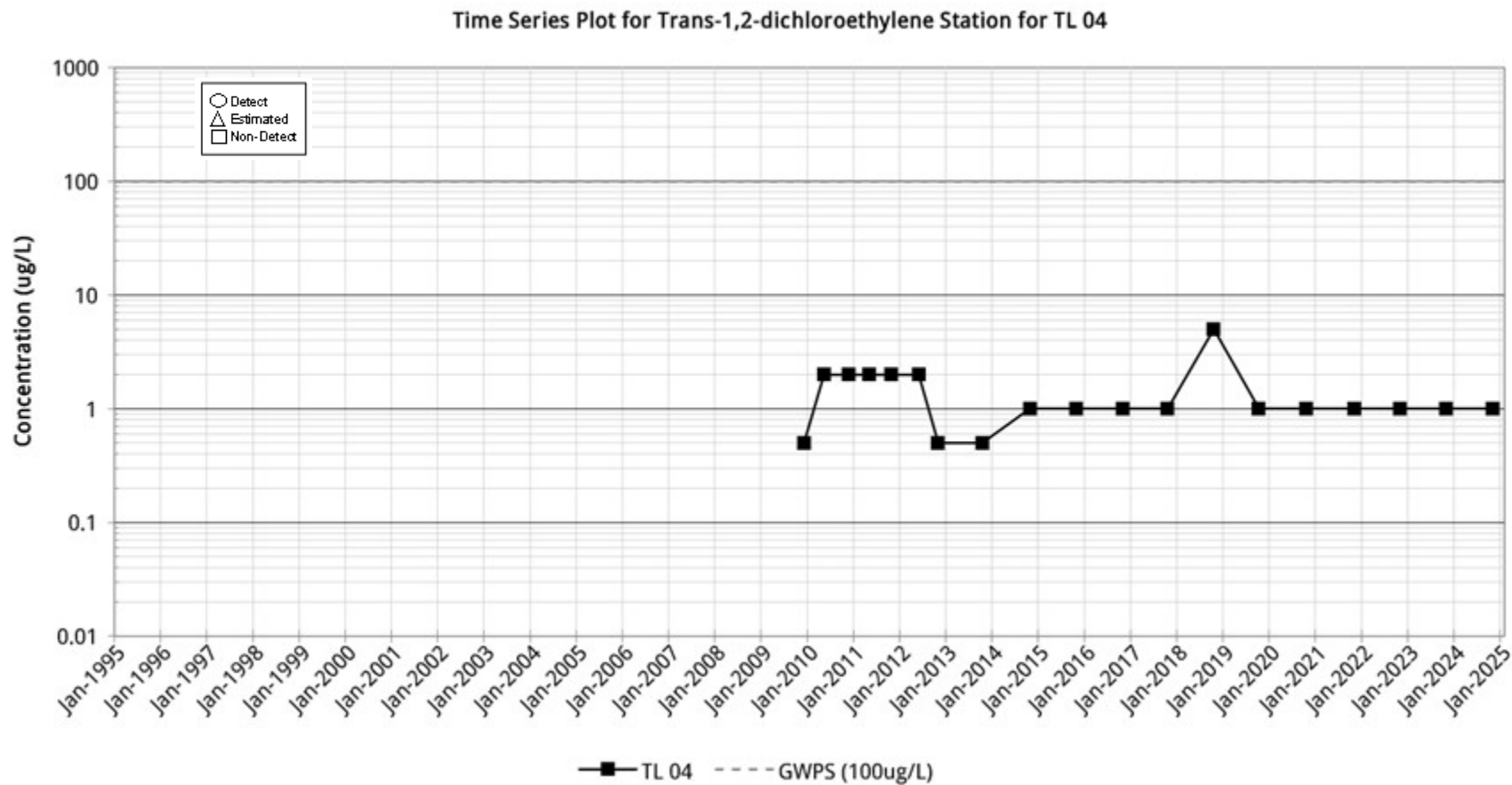


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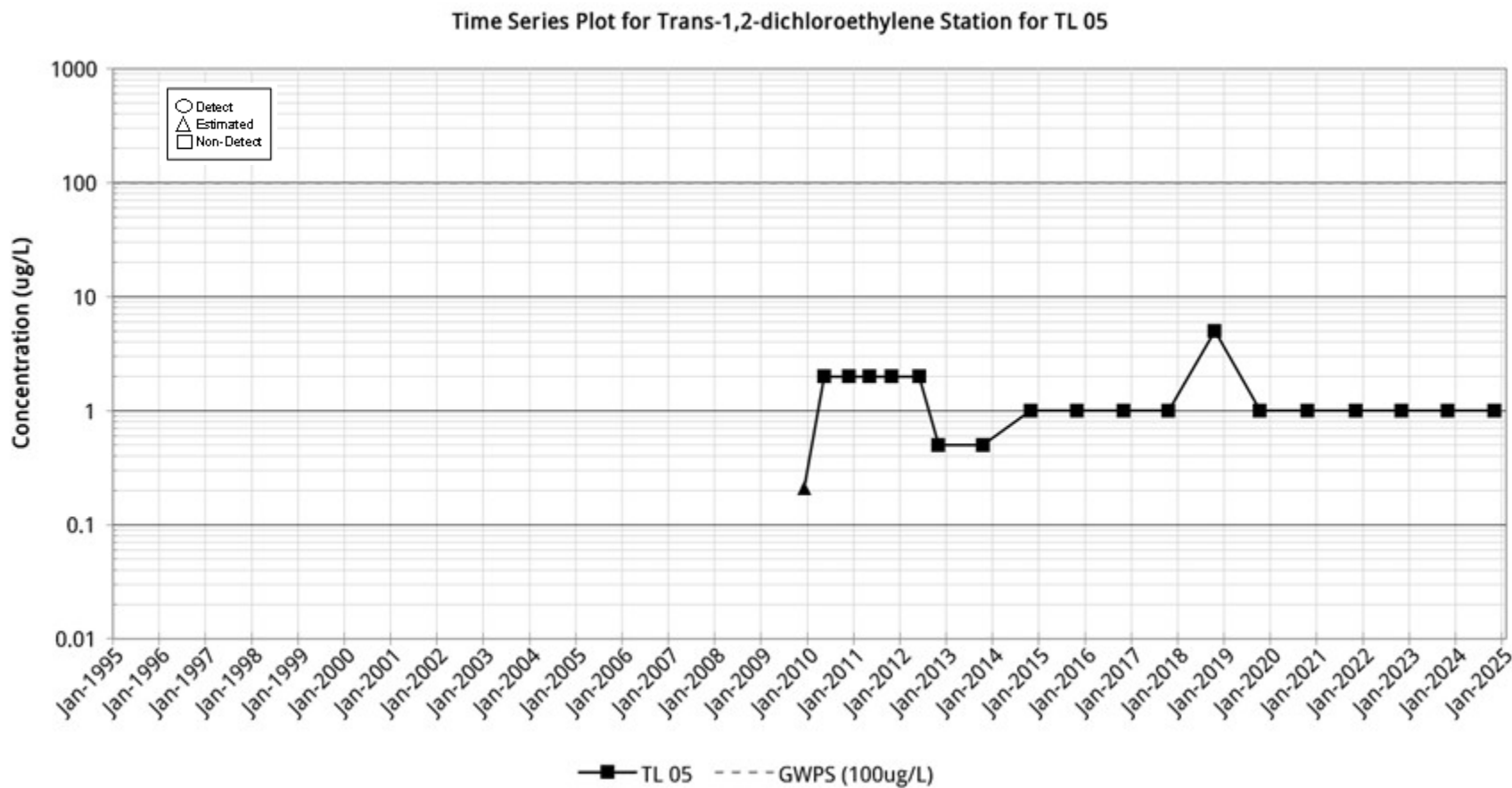


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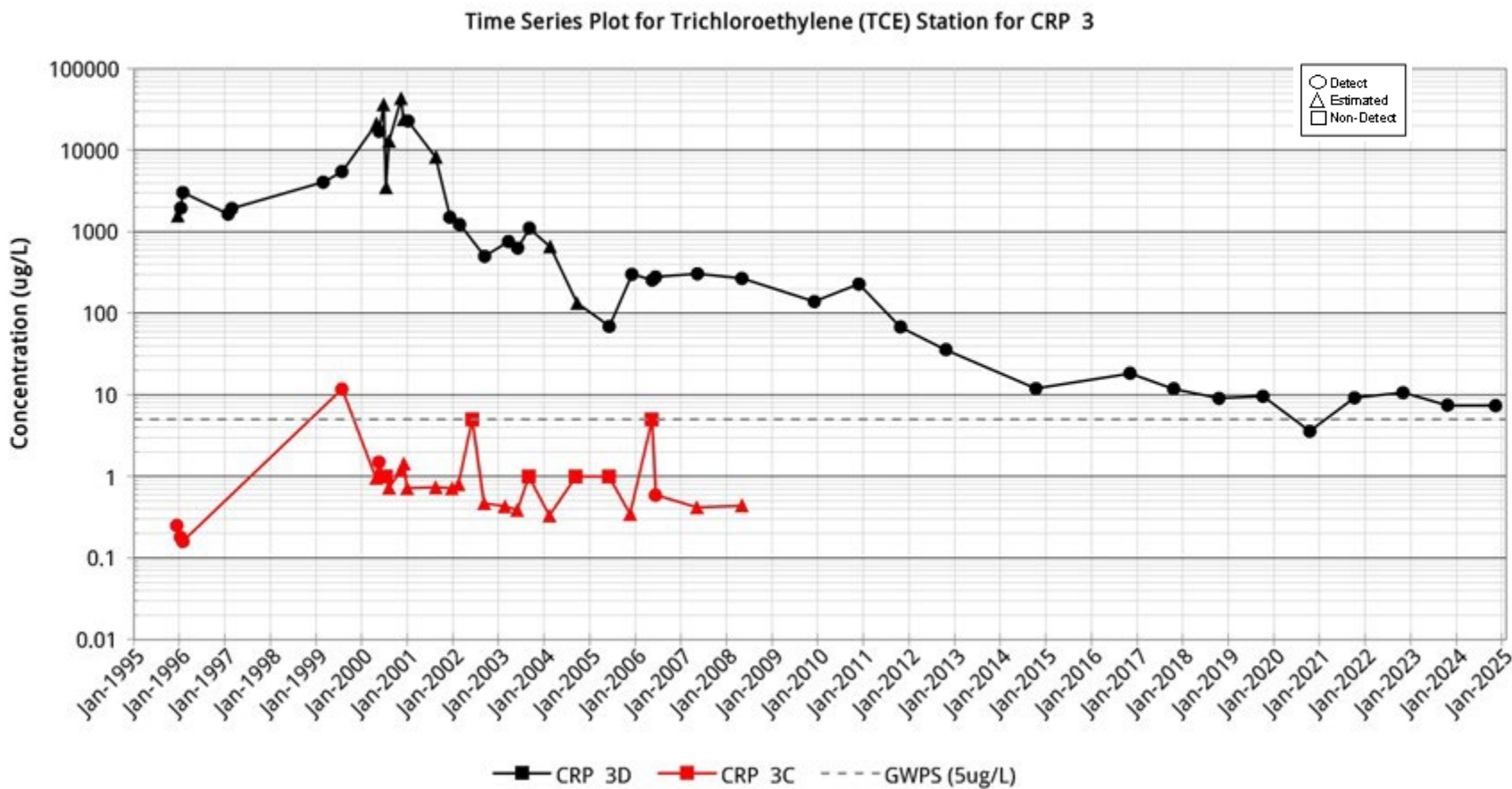


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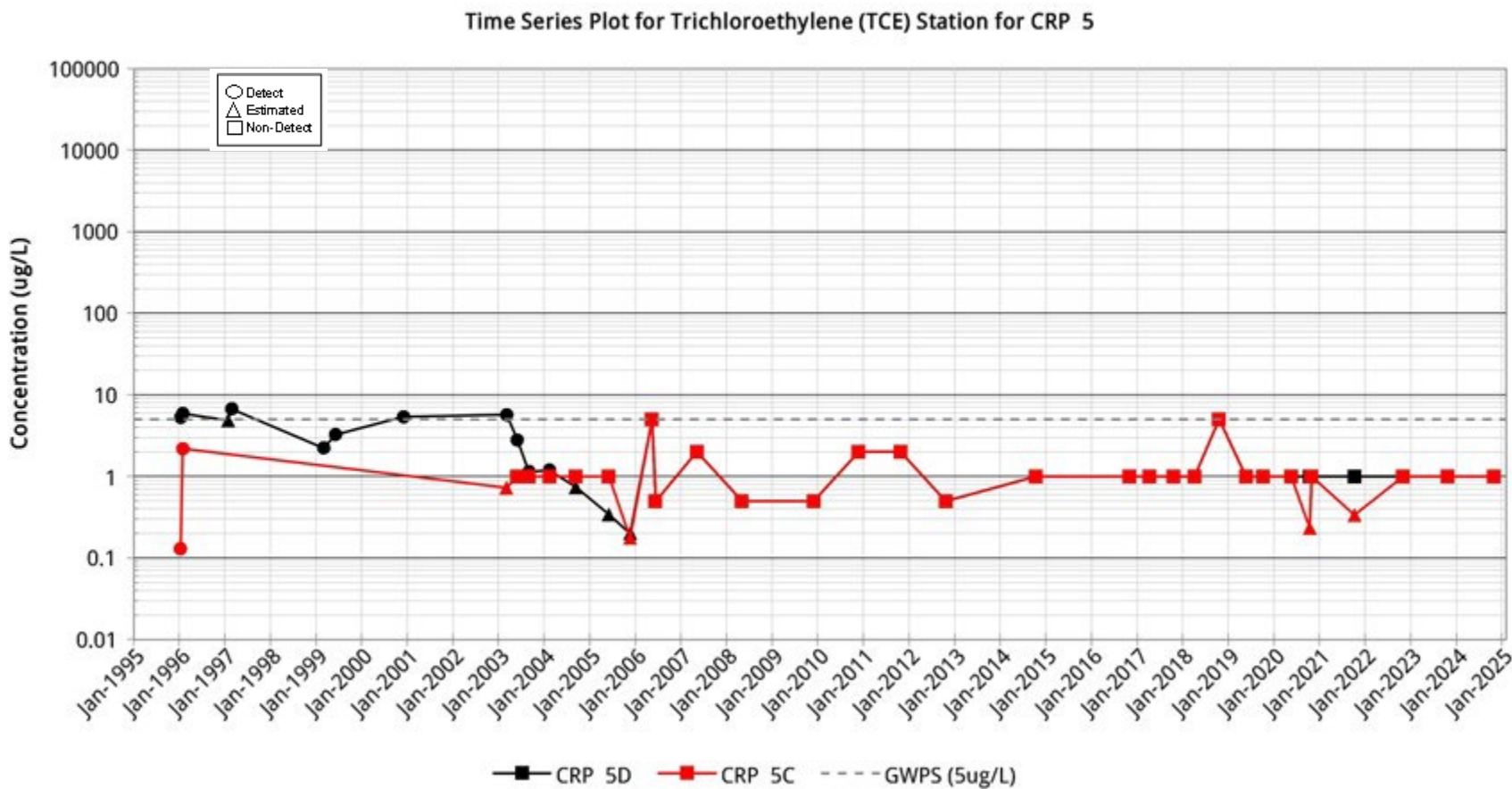


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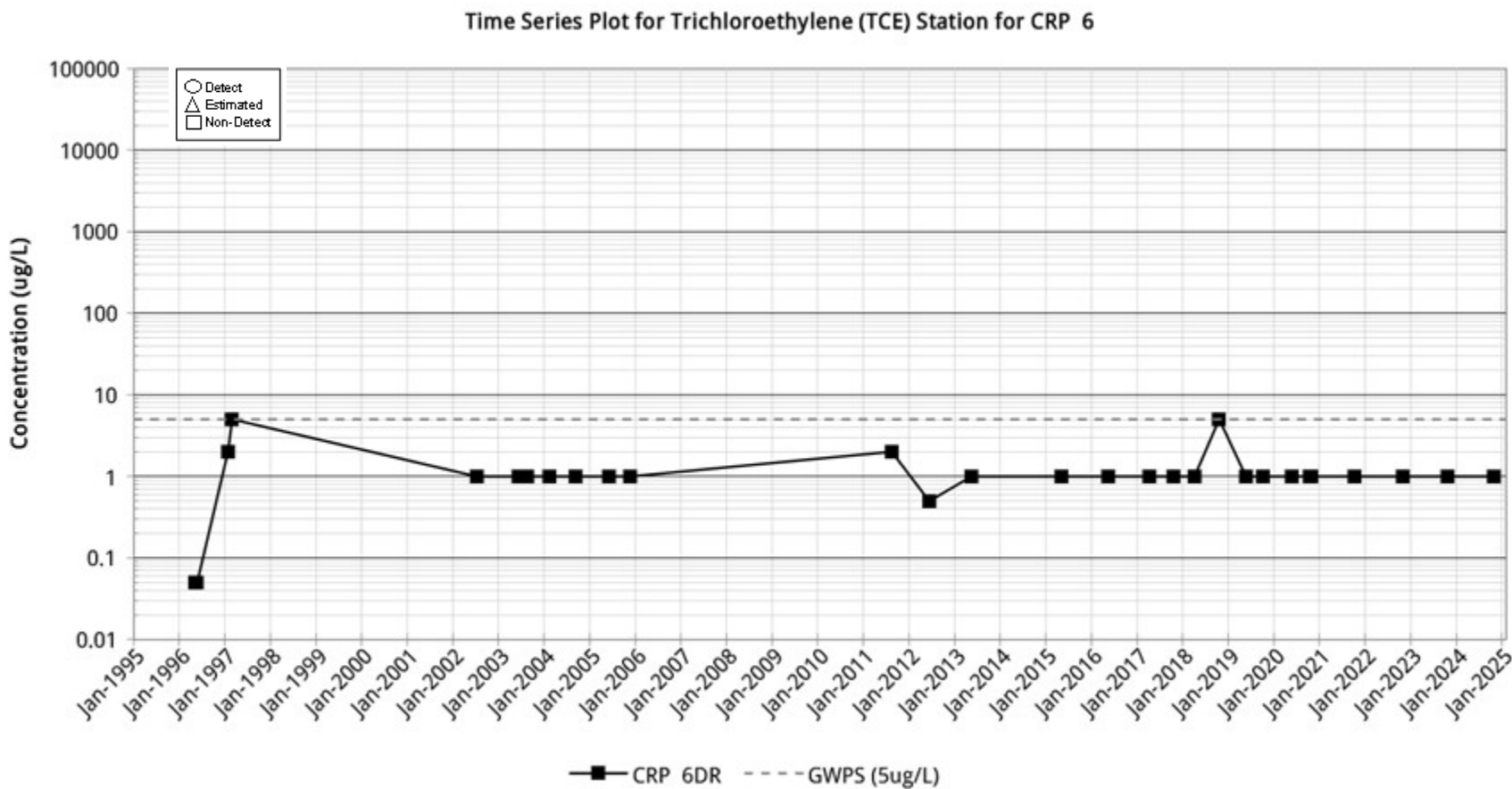


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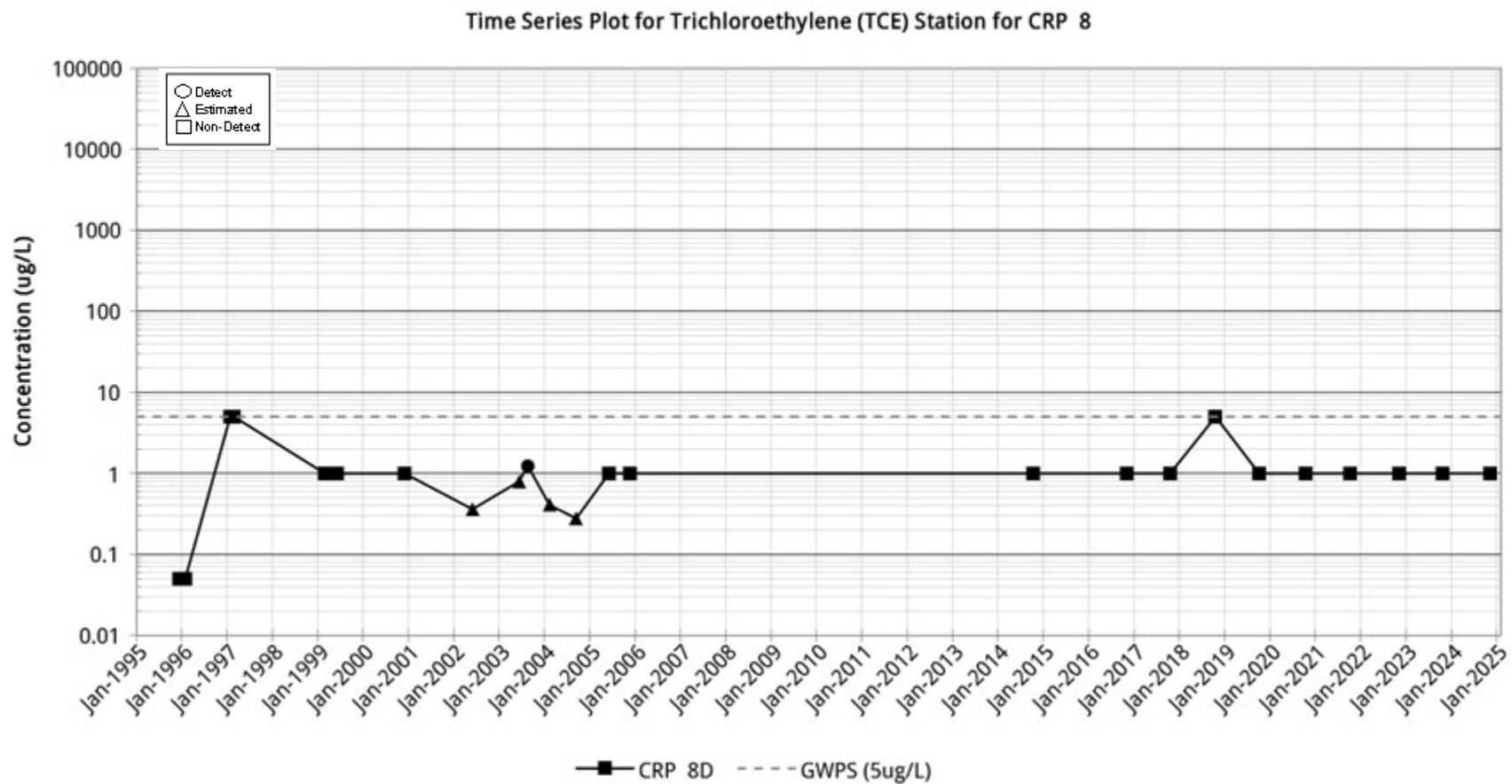


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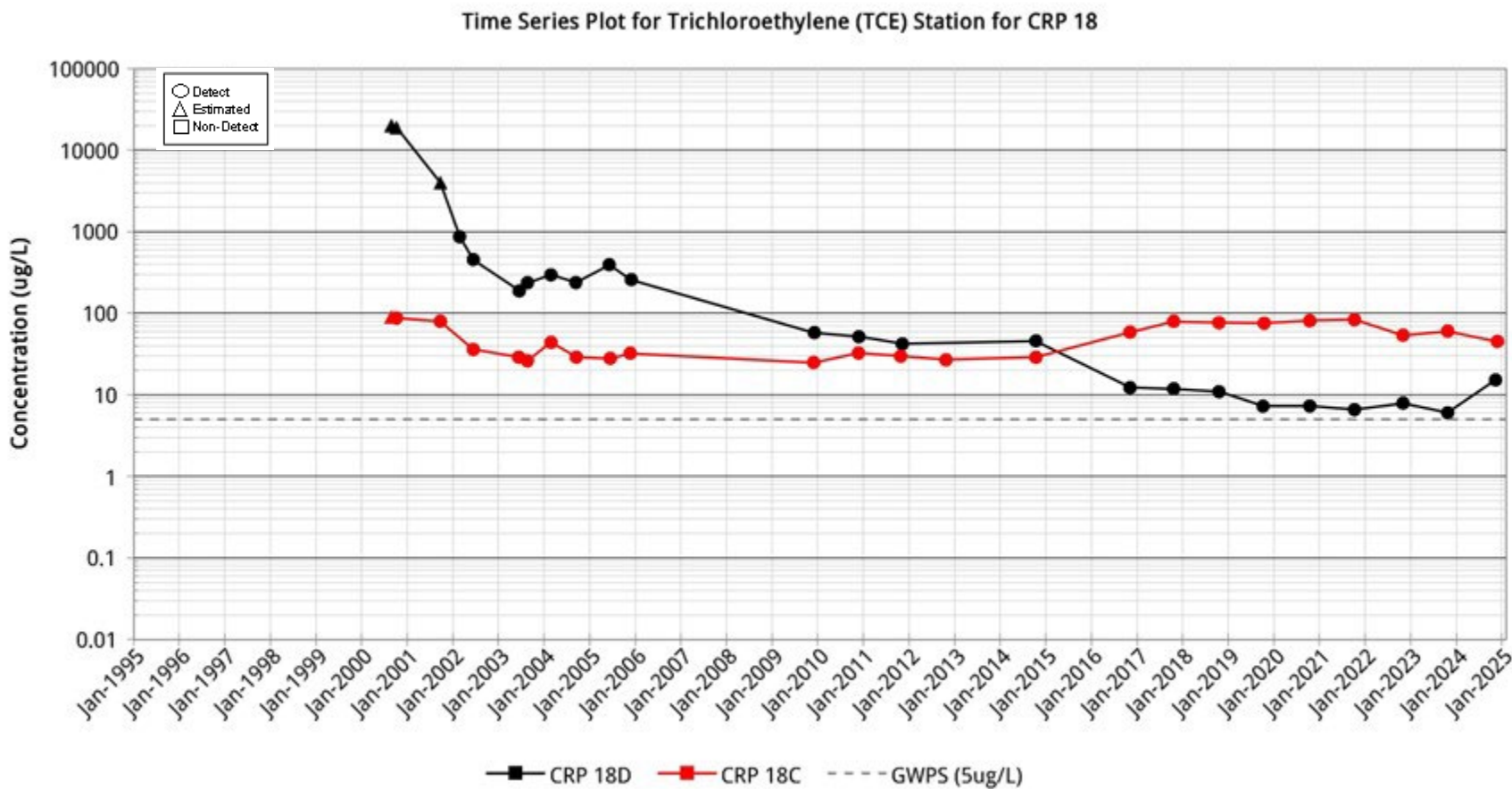


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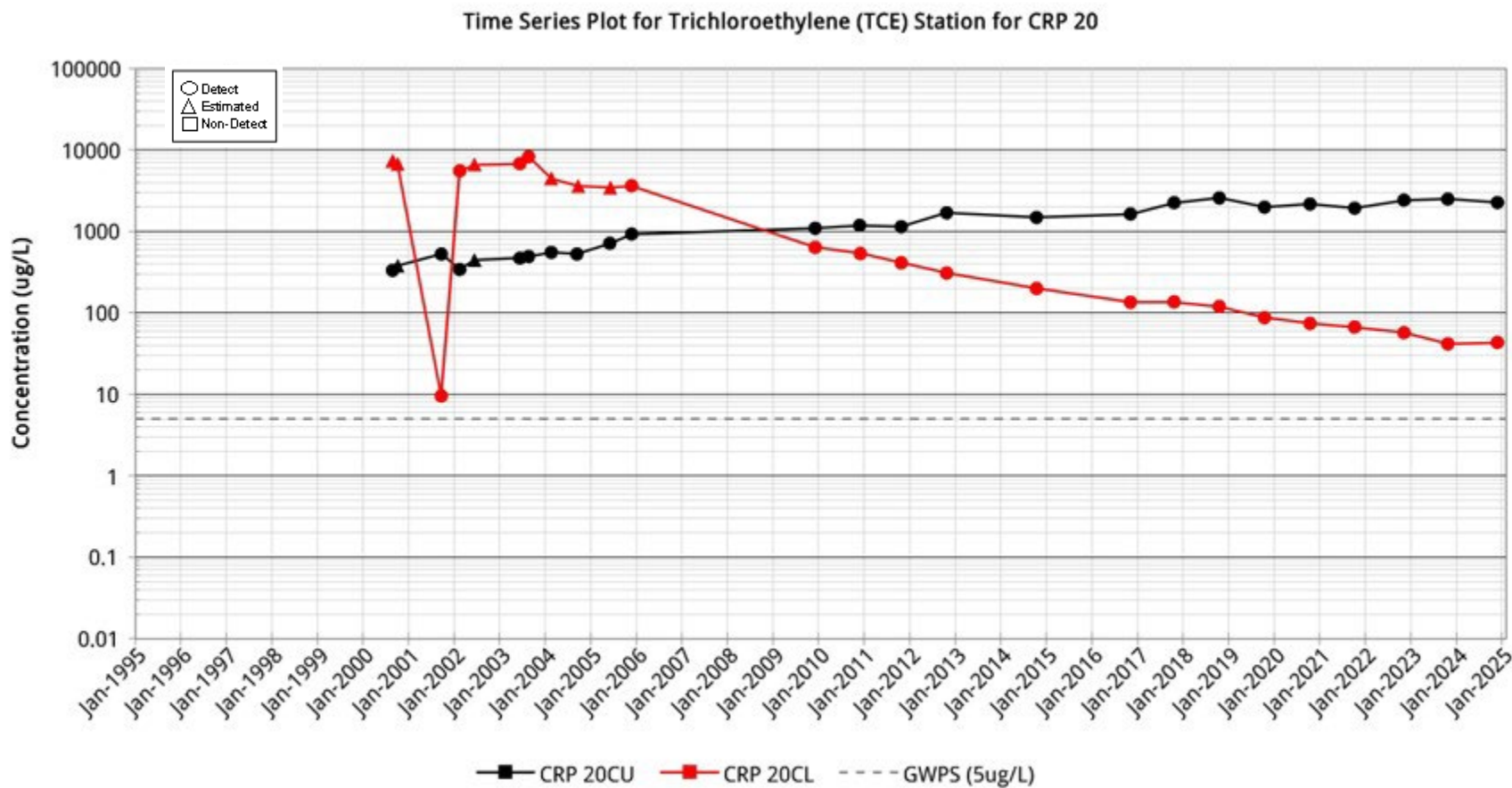


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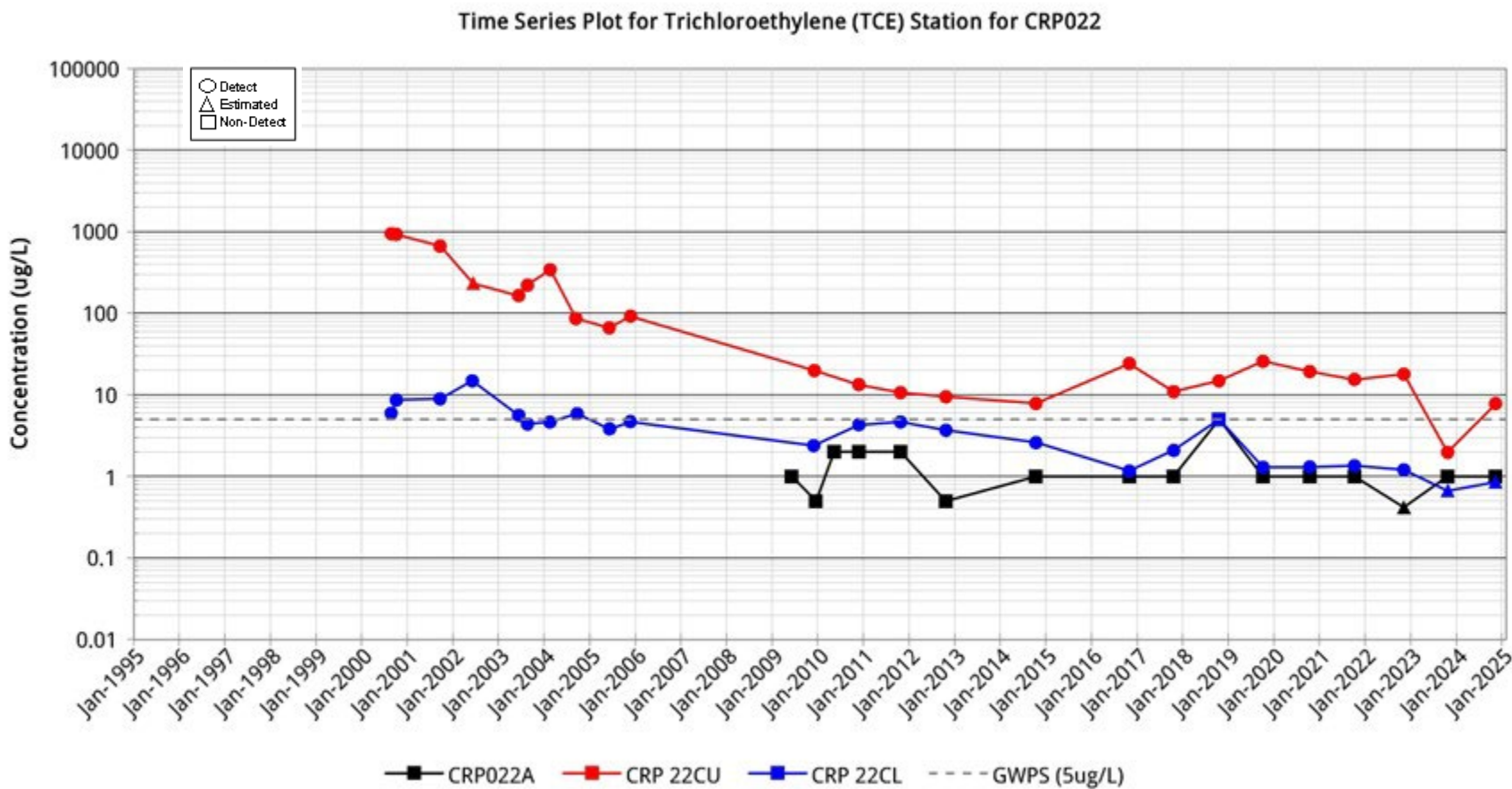


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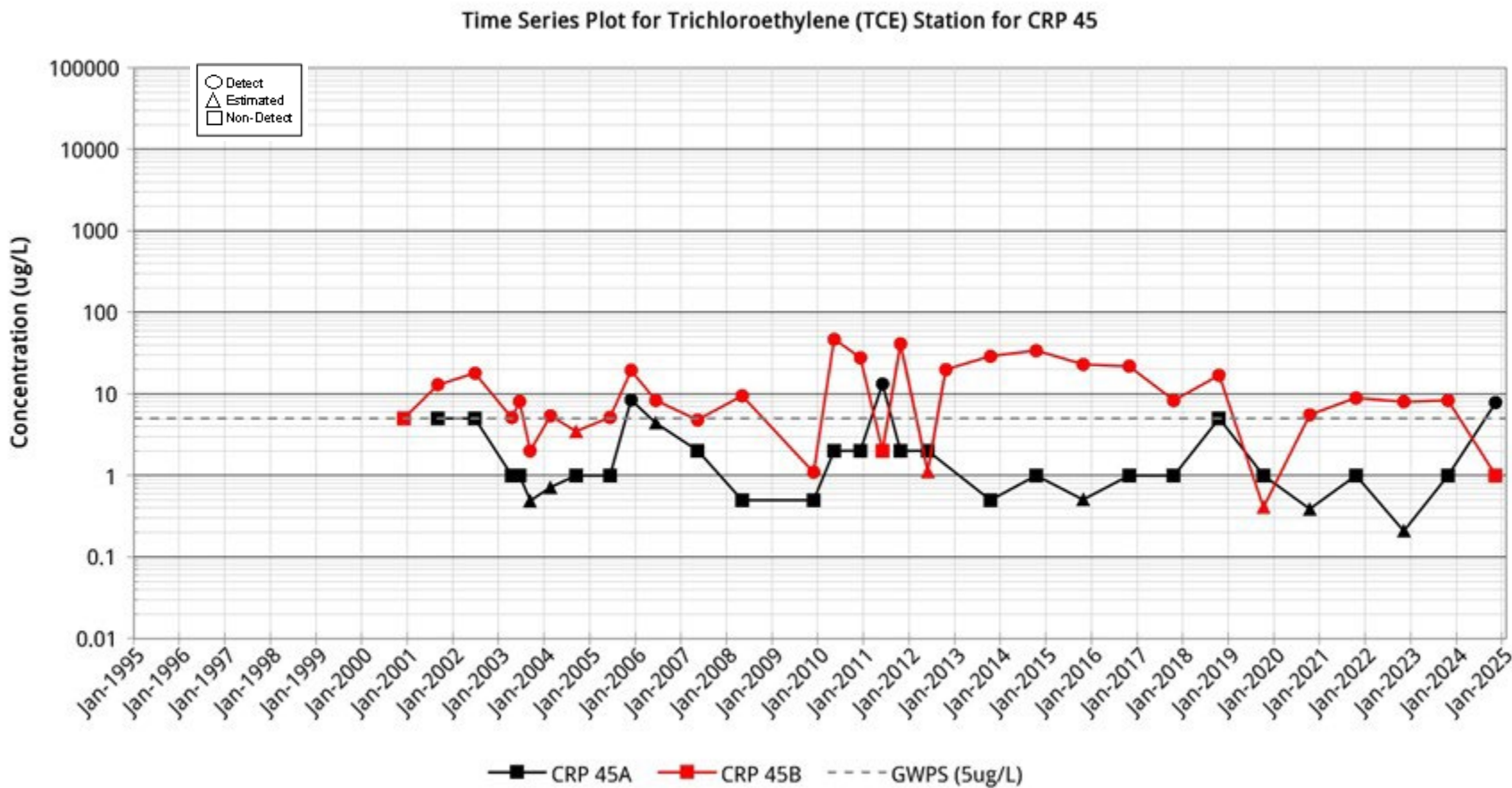


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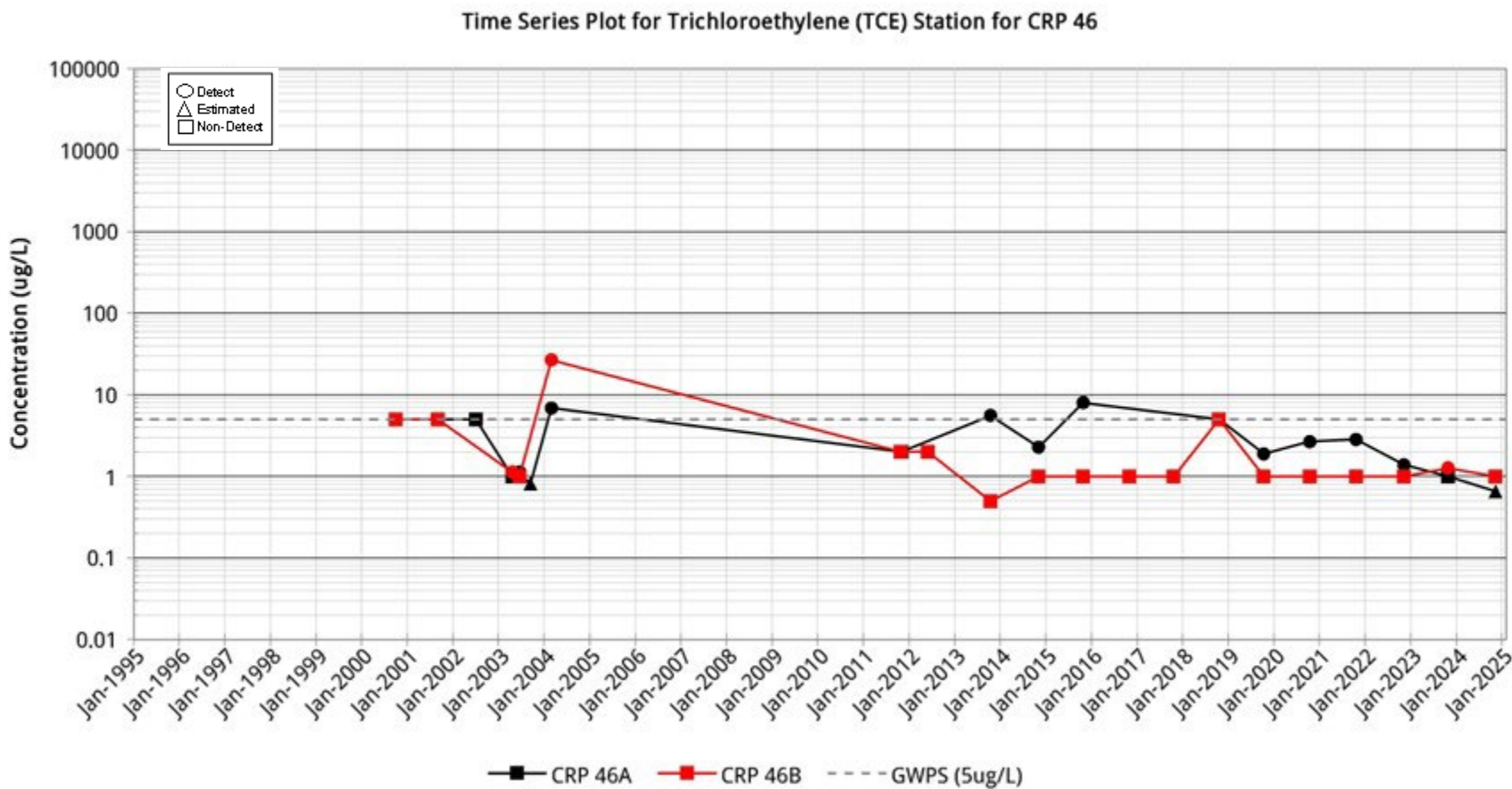


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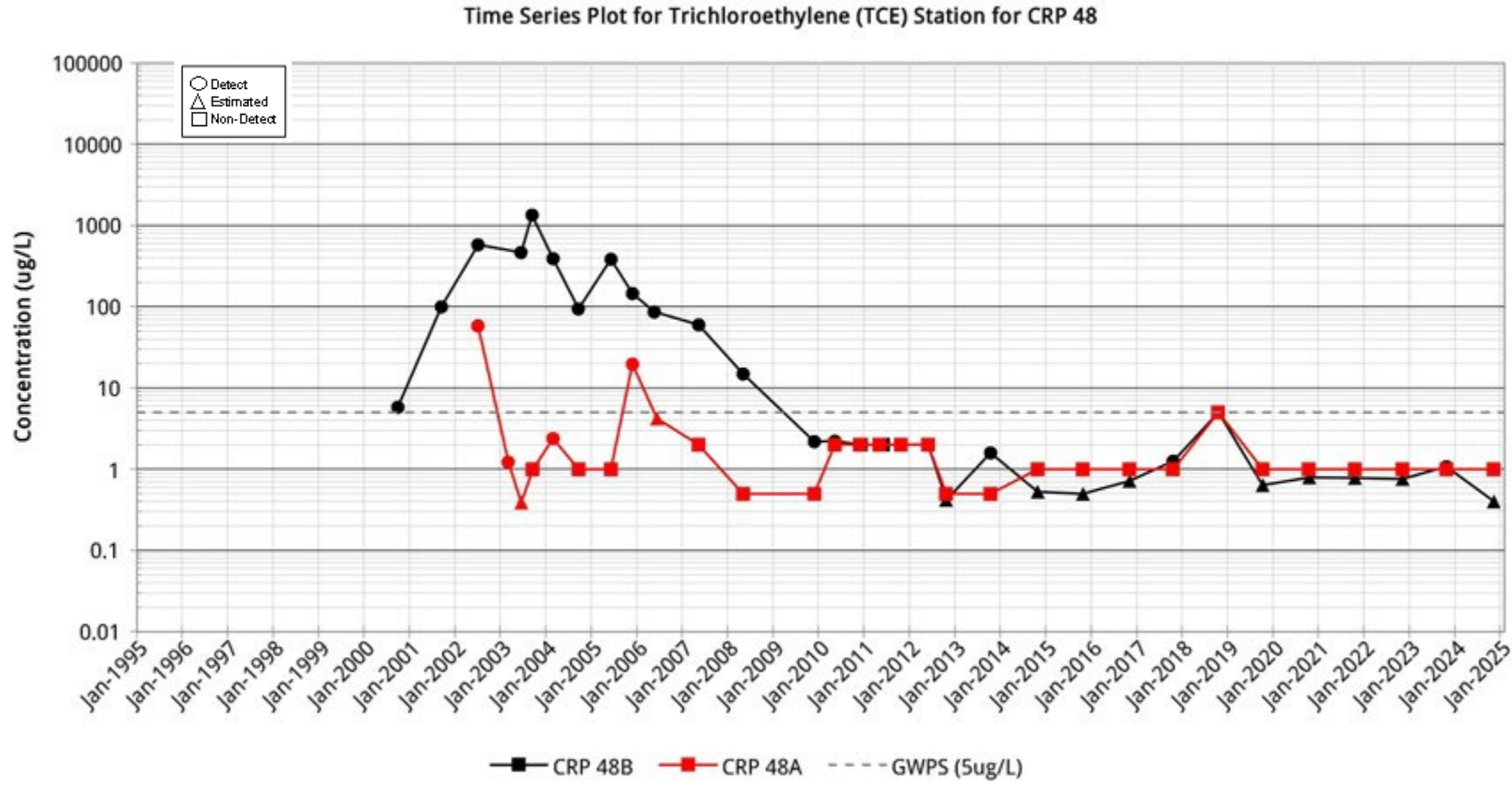


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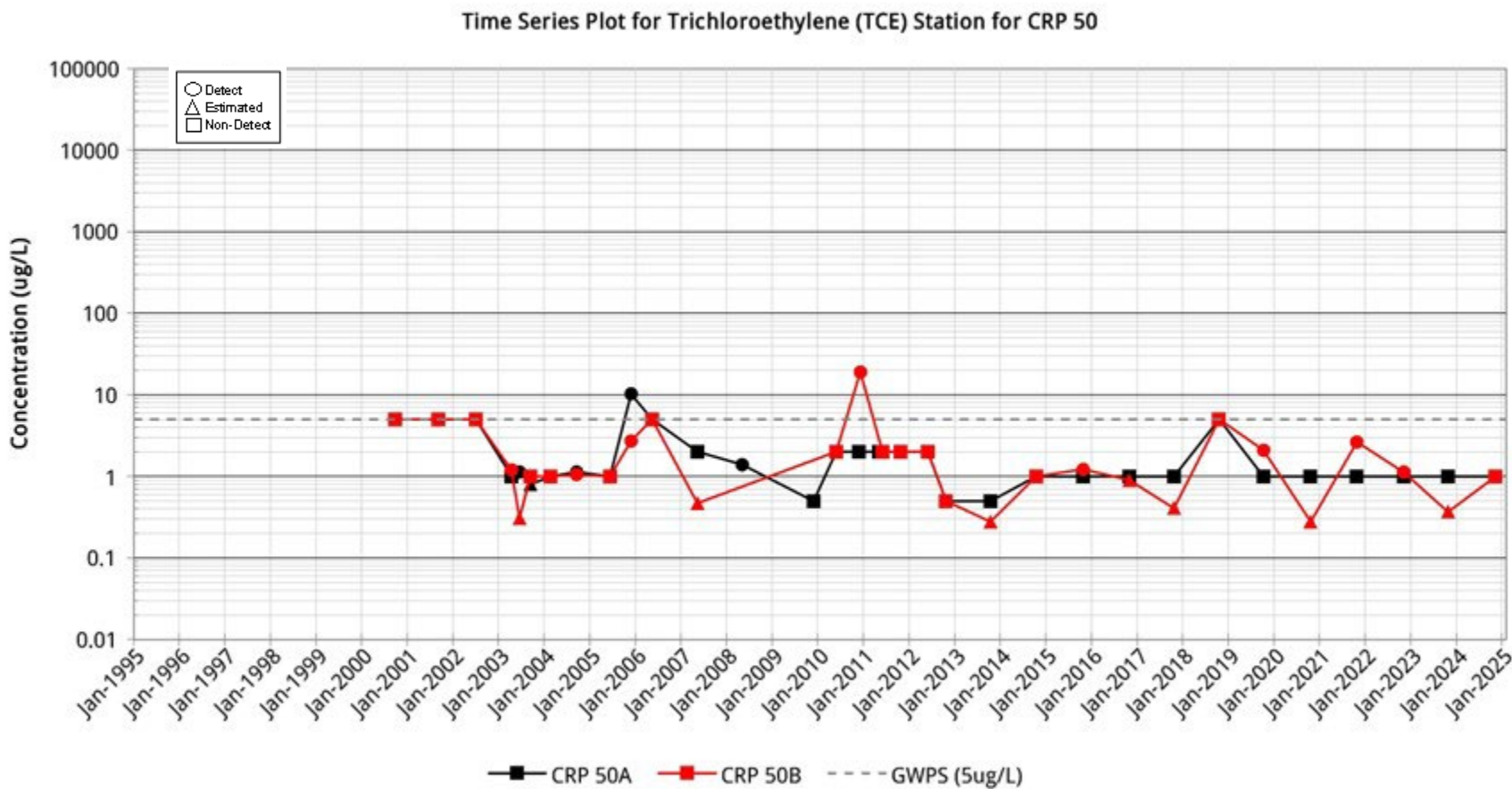


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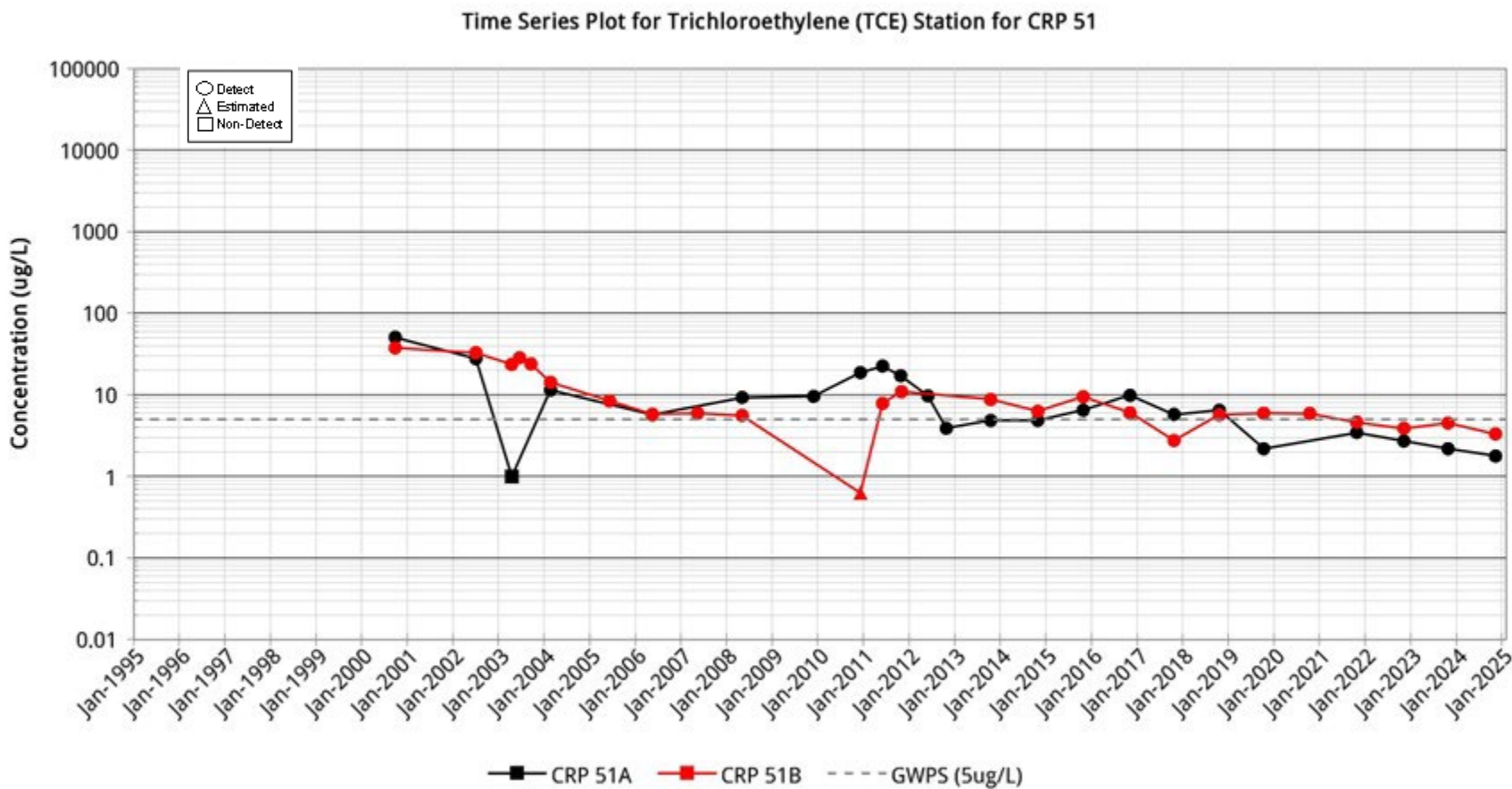


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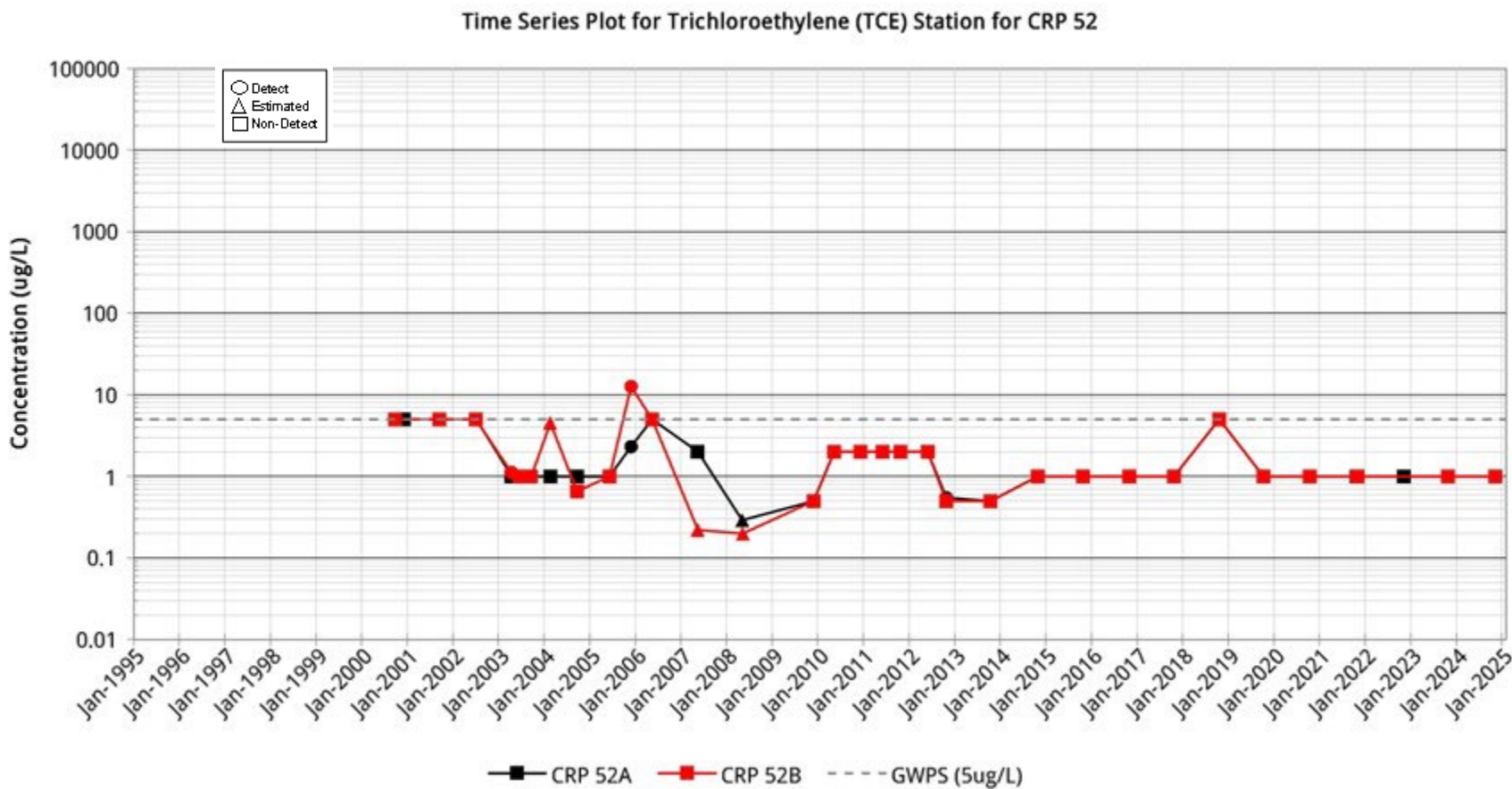


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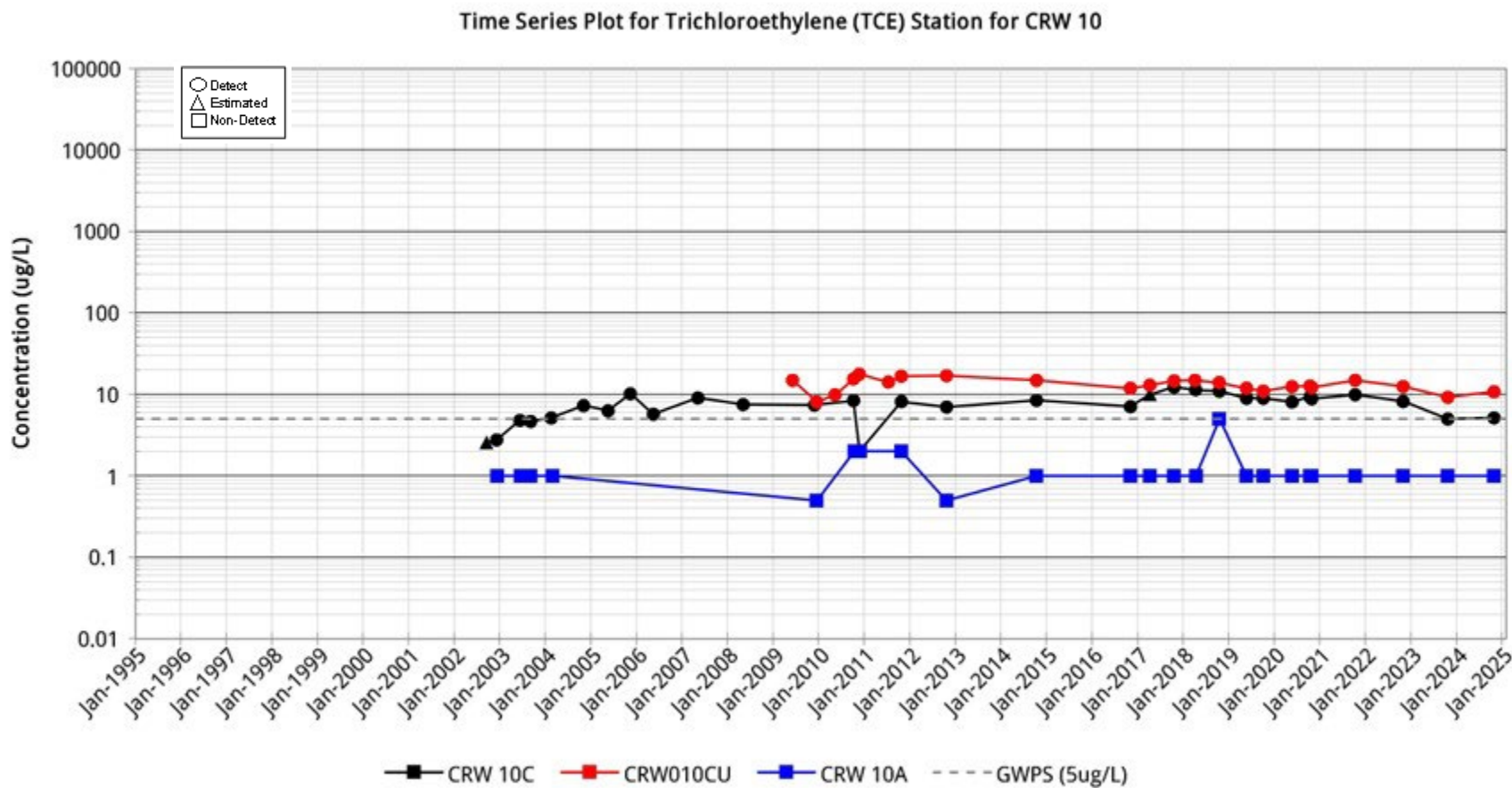


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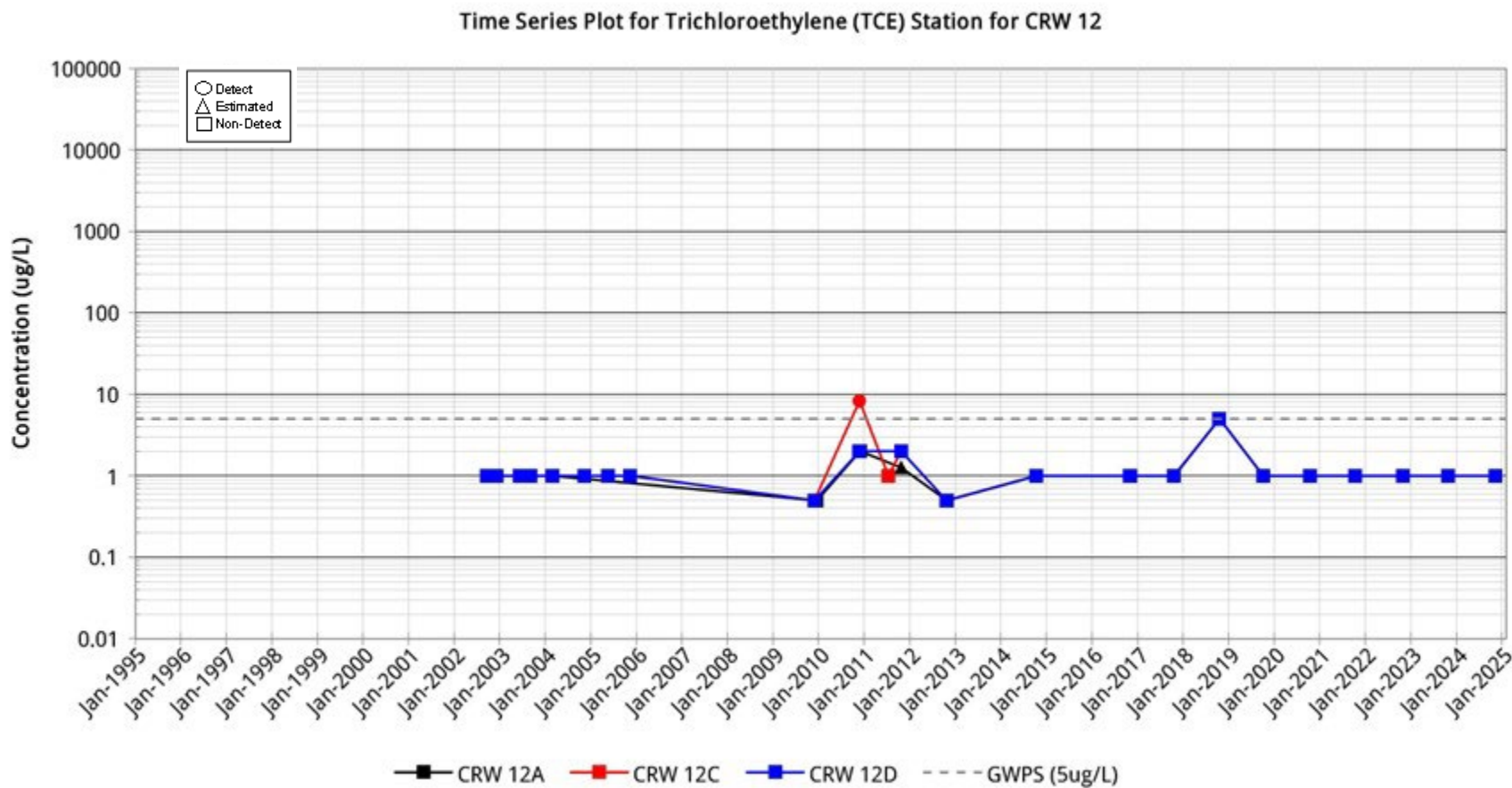


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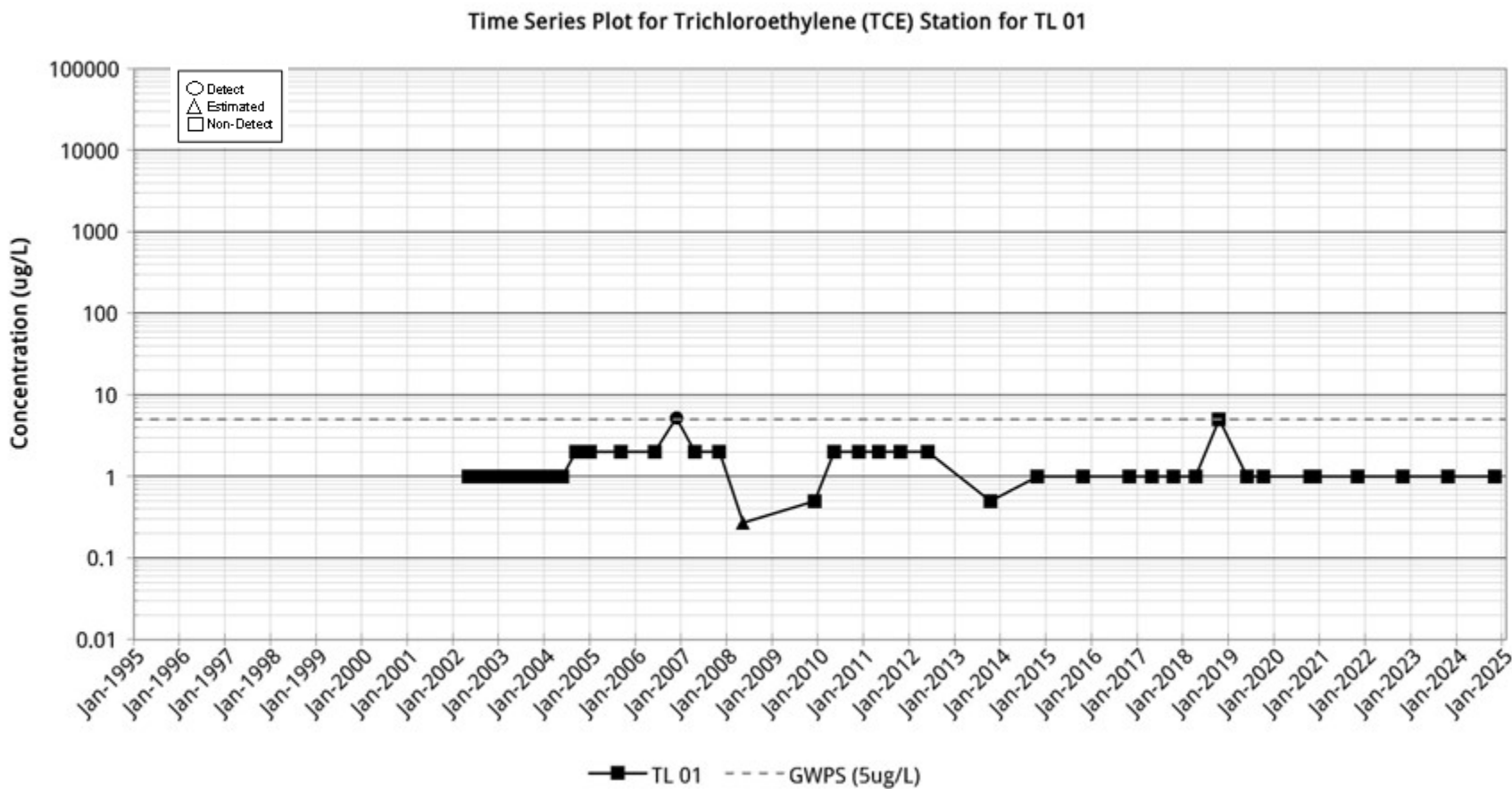


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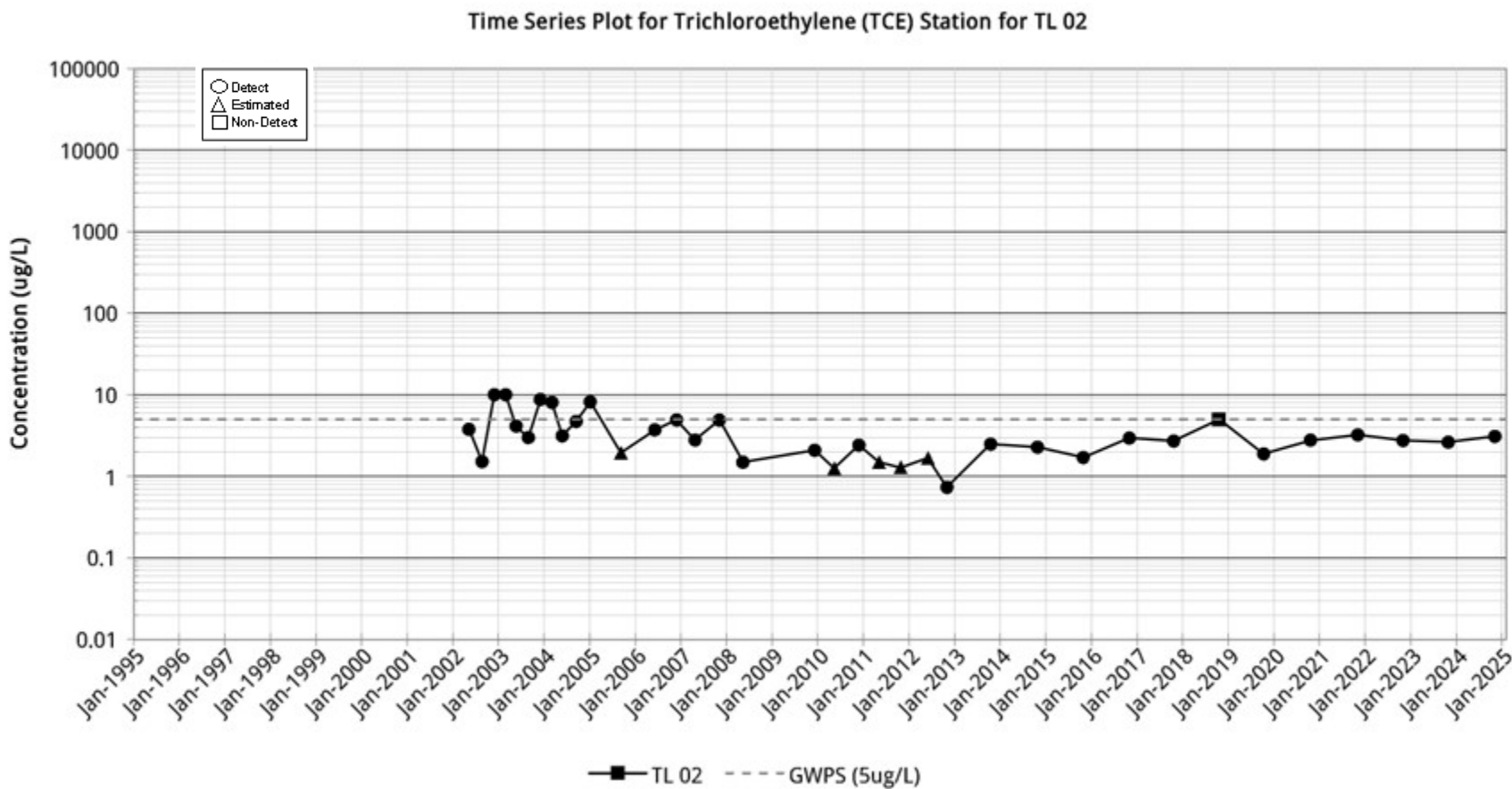


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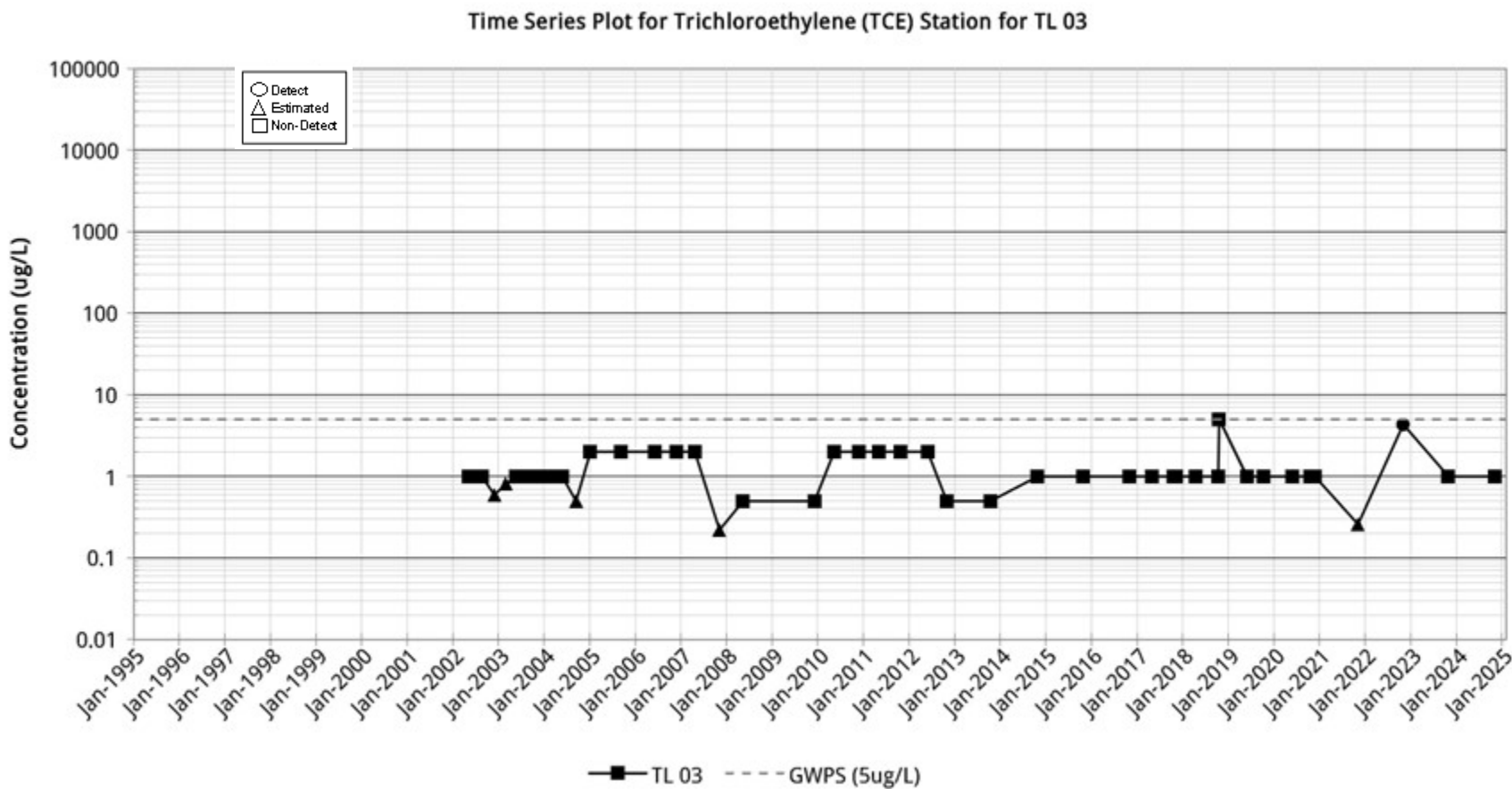


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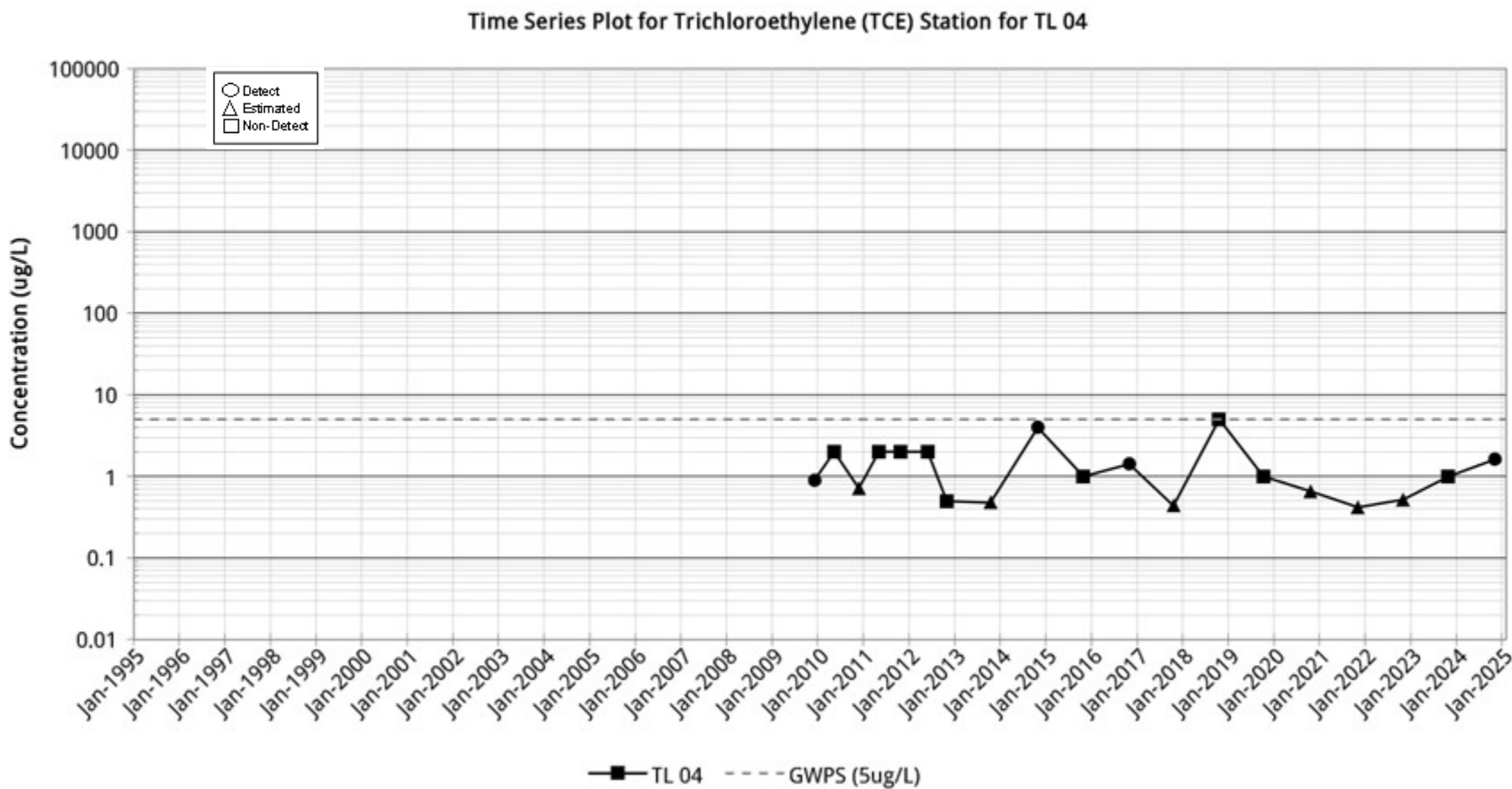
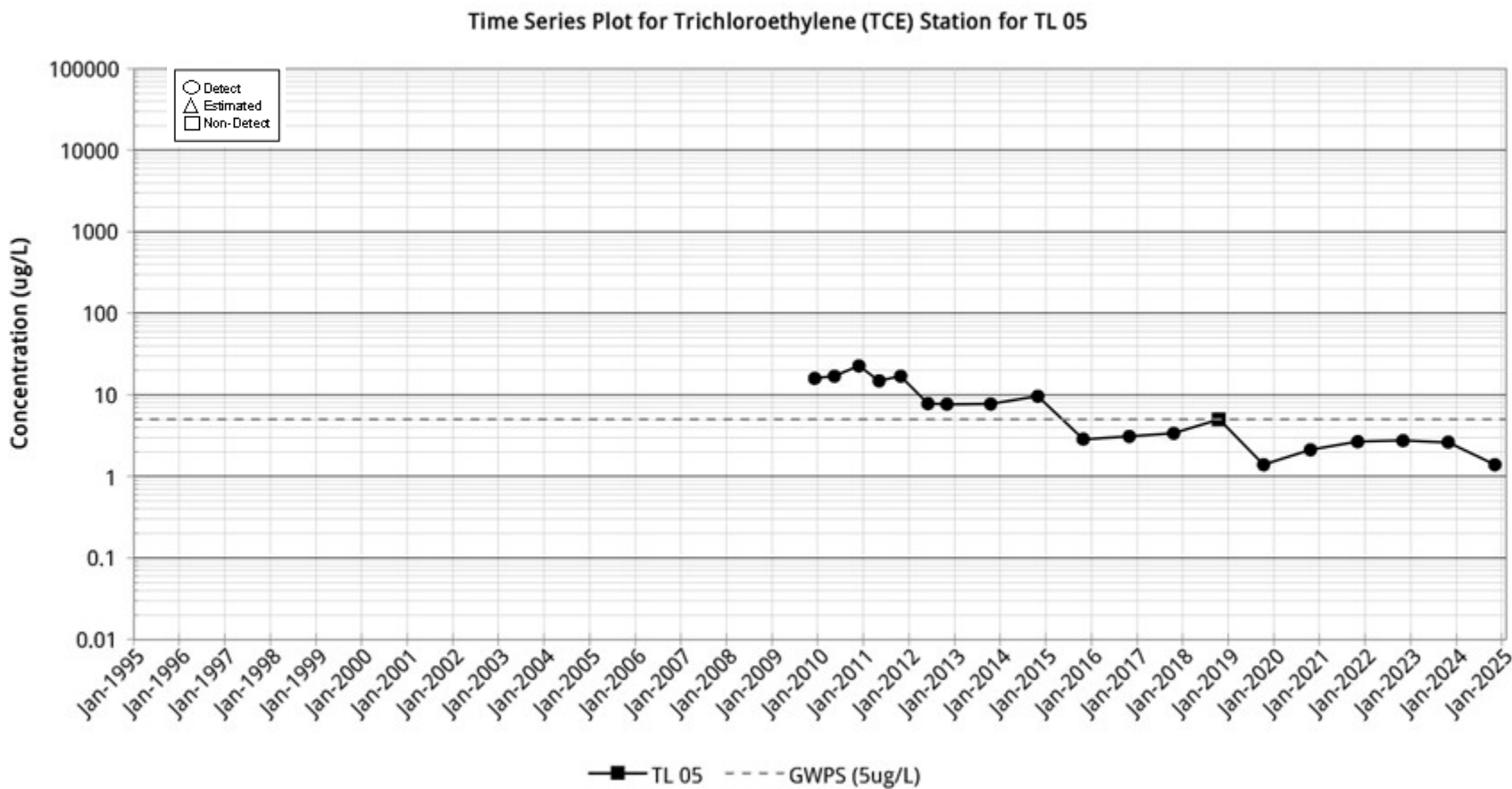


Figure C-151.



Appendix C Footnotes:

- 1) High concentrations of TCE (e.g., Figure C-137) in samples require them to be diluted prior to analysis, which results in elevated MDLs and EQLs for all VOCs in those samples (e.g., Figure C-6).

APPENDIX D

TCE Plume Maps

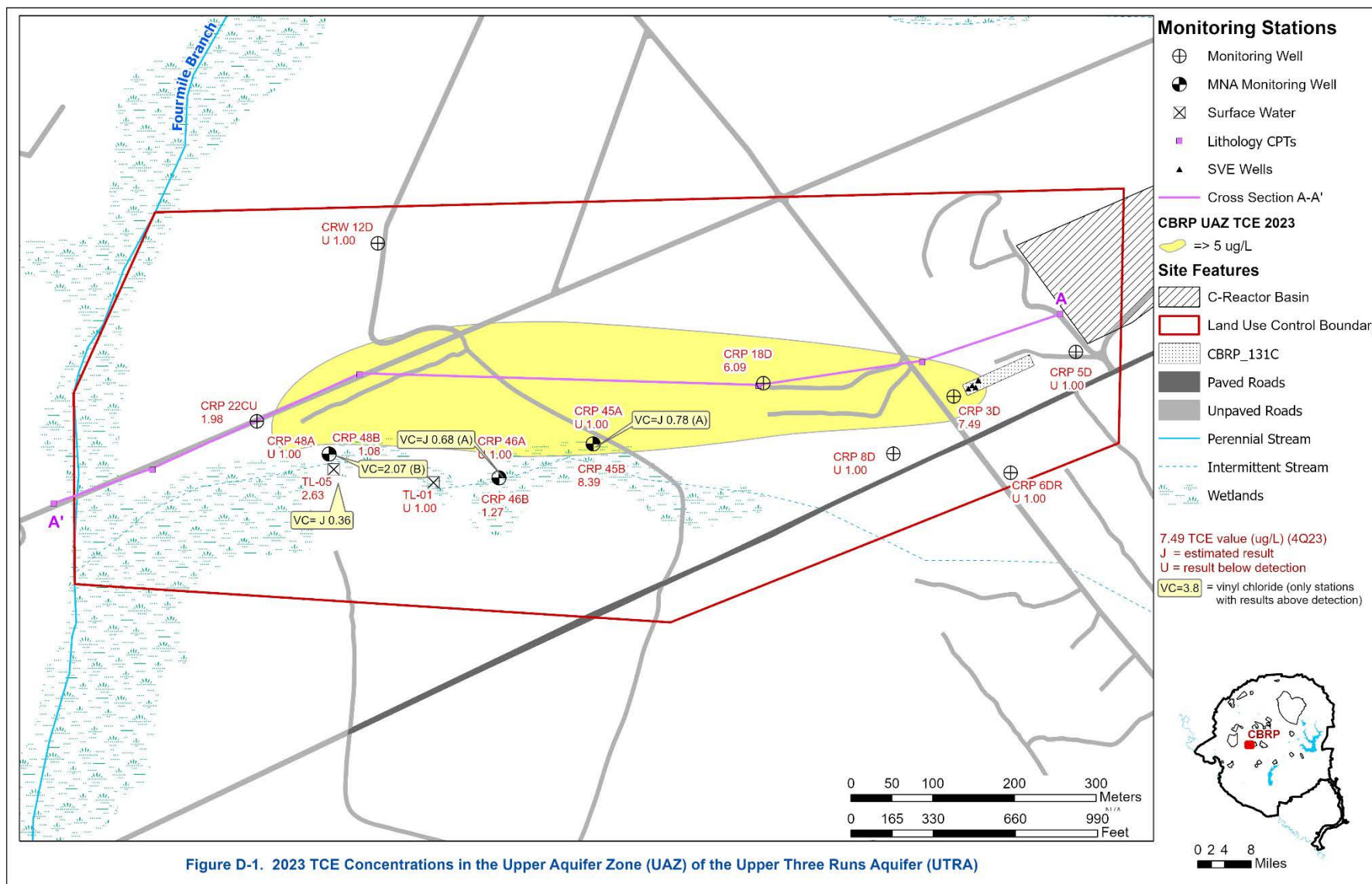
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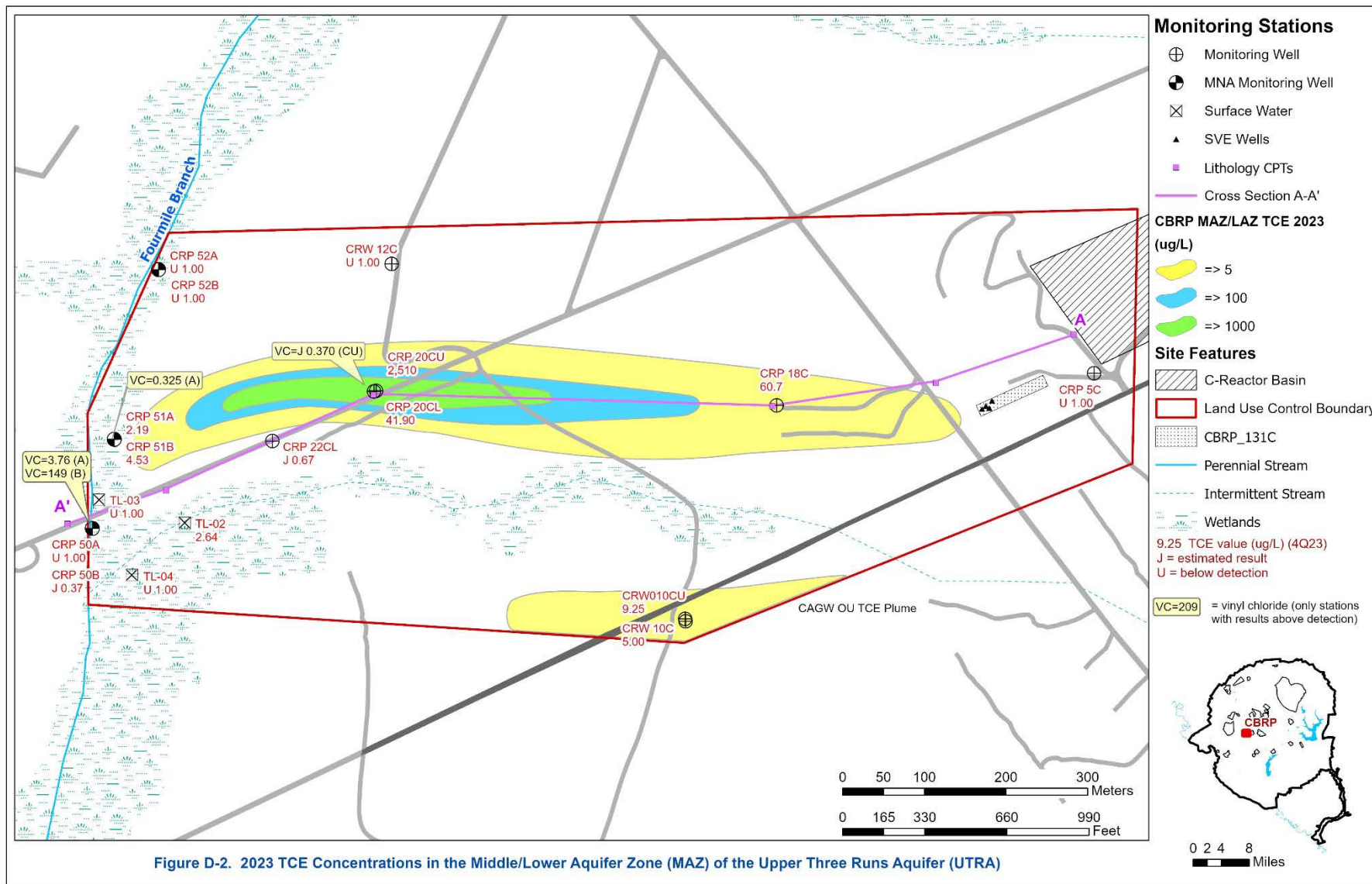
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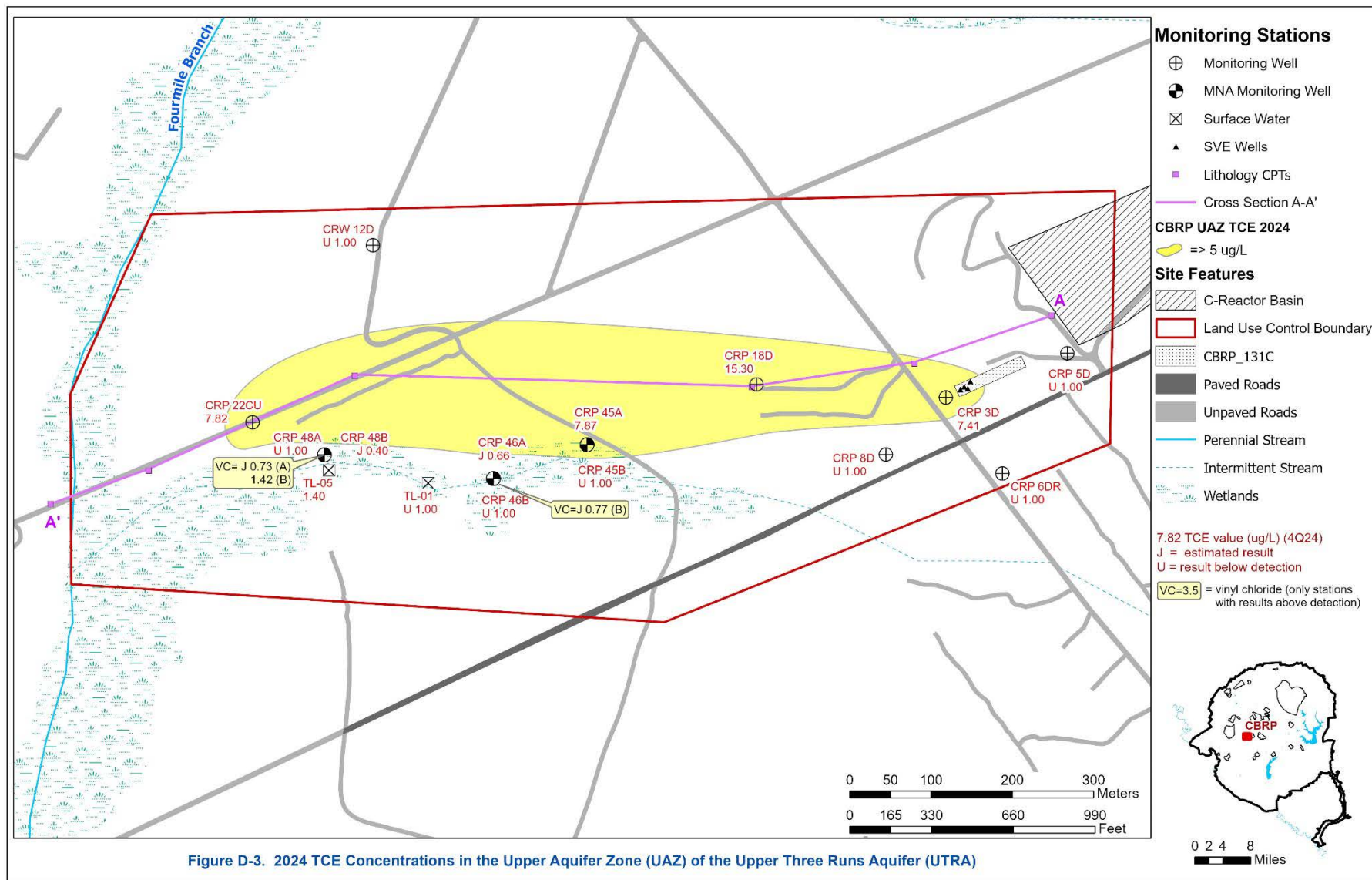
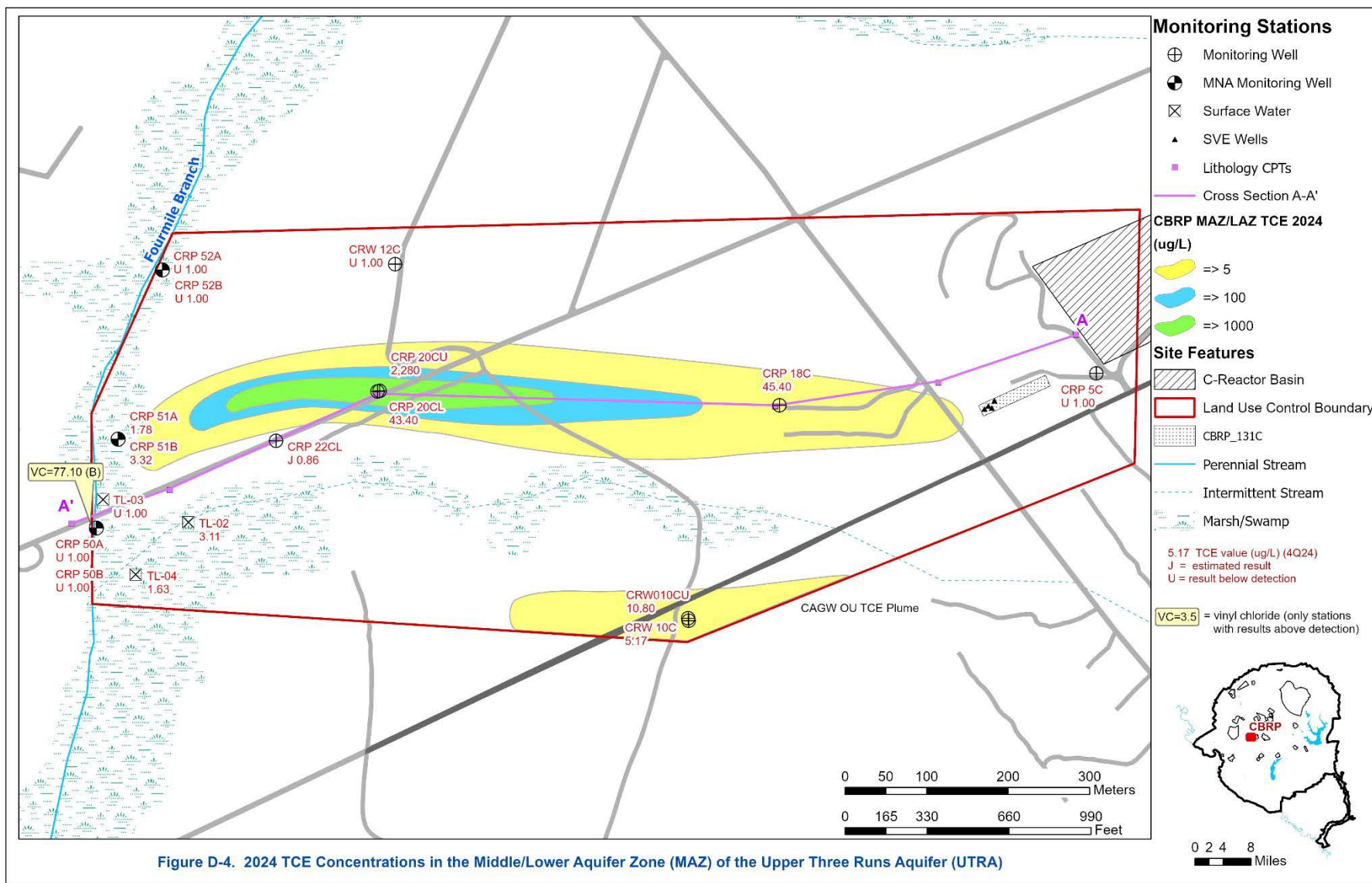
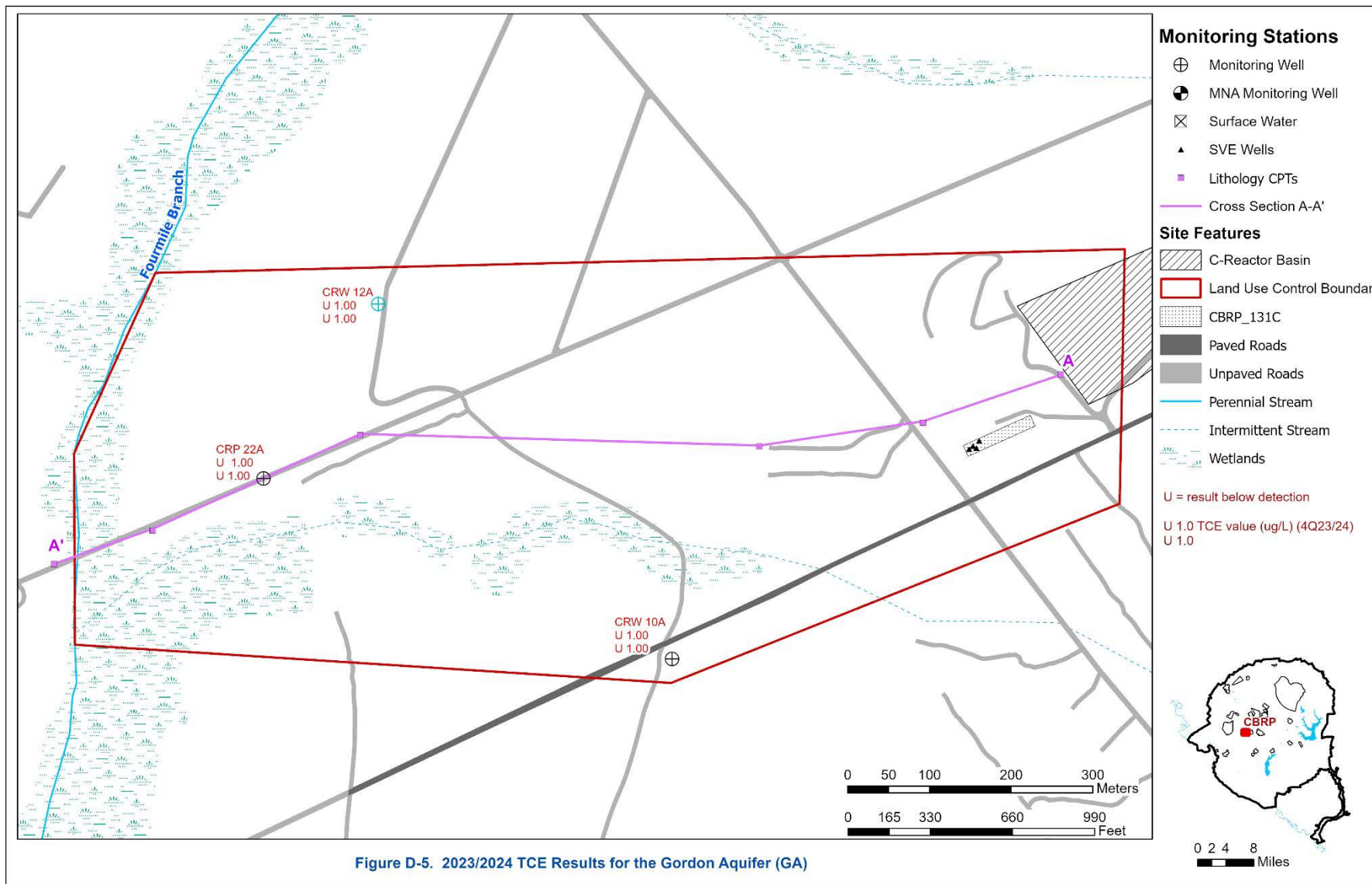


Figure D-3. 2024 TCE Concentrations in the Upper Aquifer Zone (UAZ) of the Upper Three Runs Aquifer (UTRA)

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APPENDIX E

Potentiometric Maps

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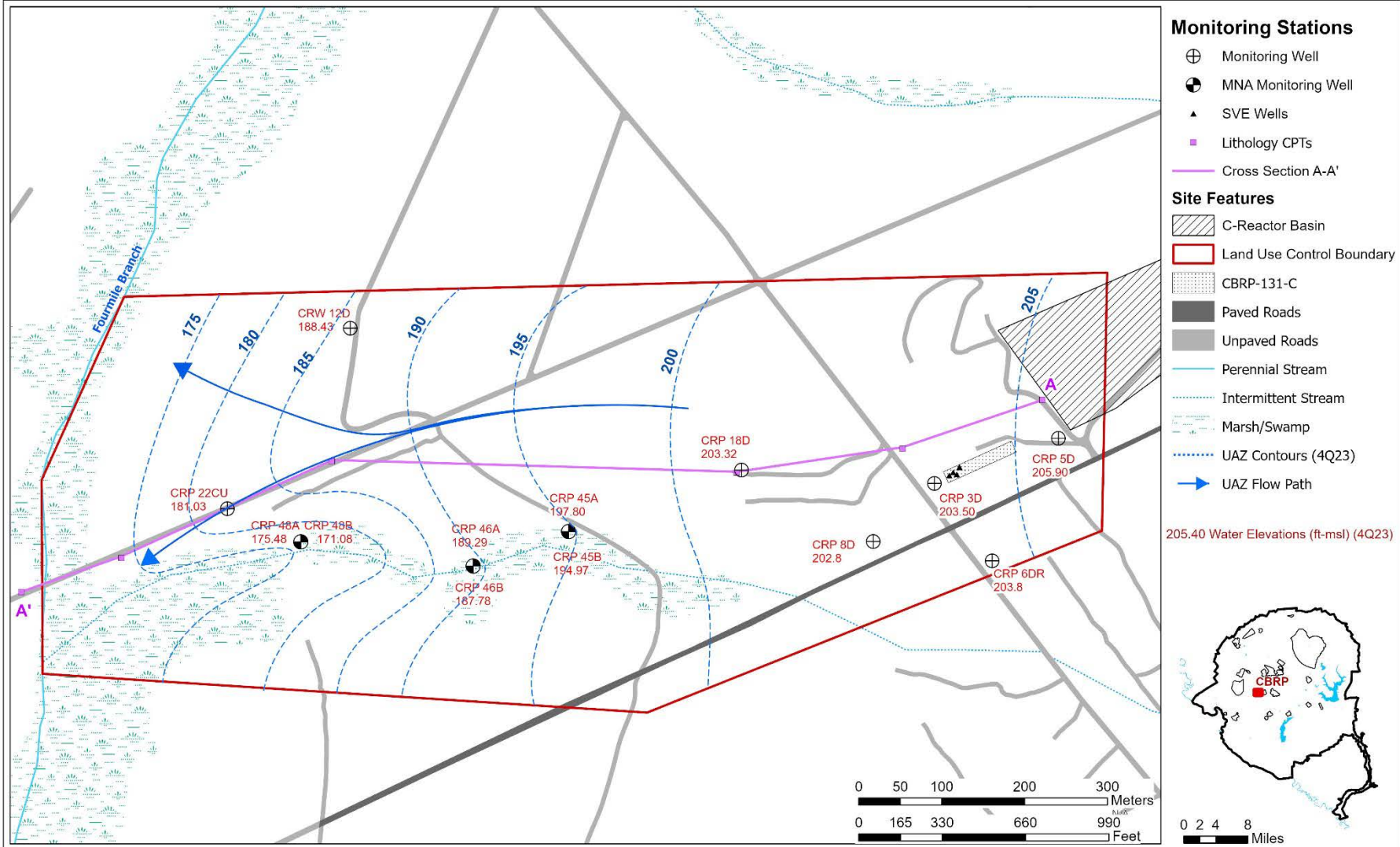
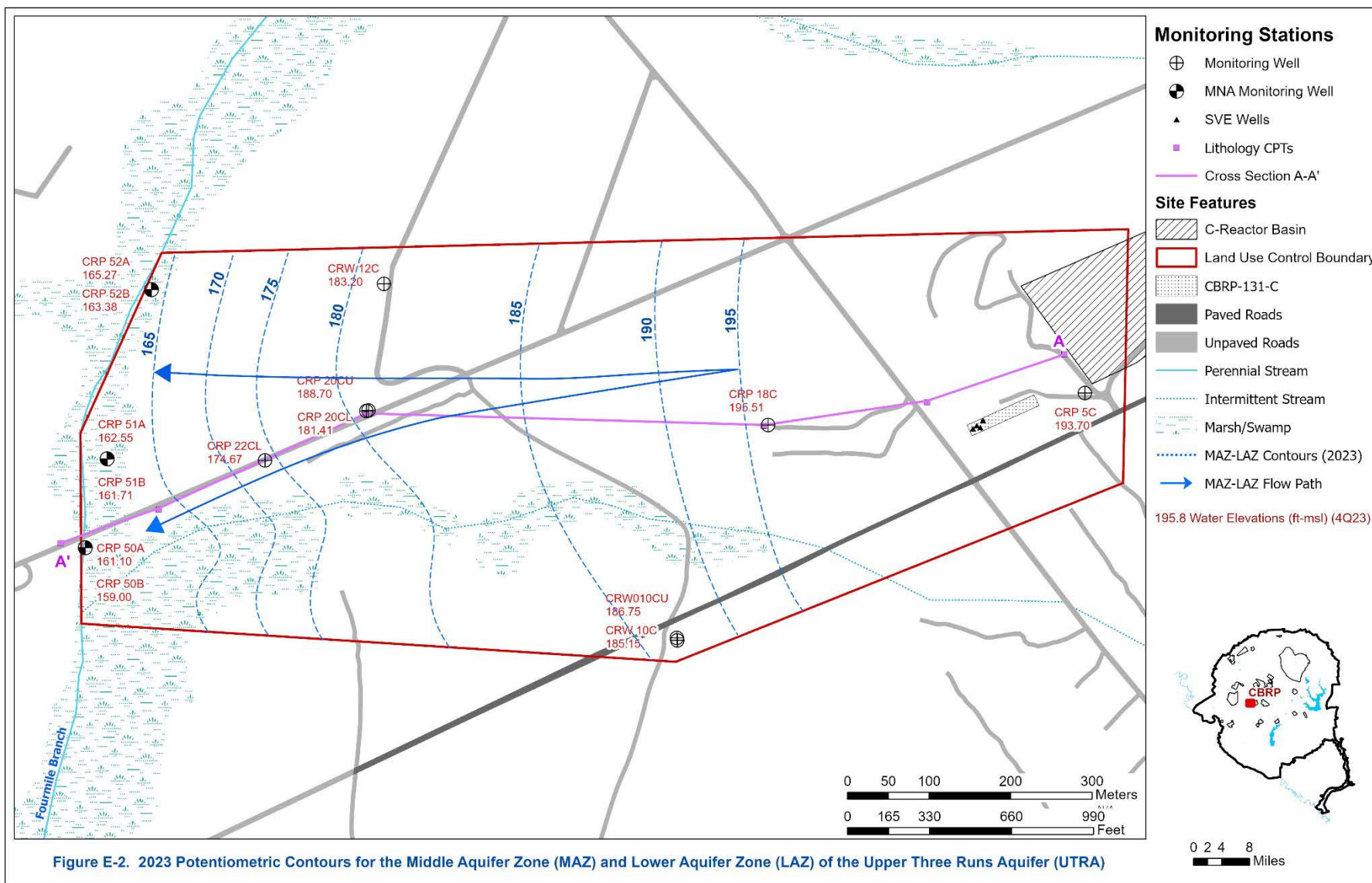
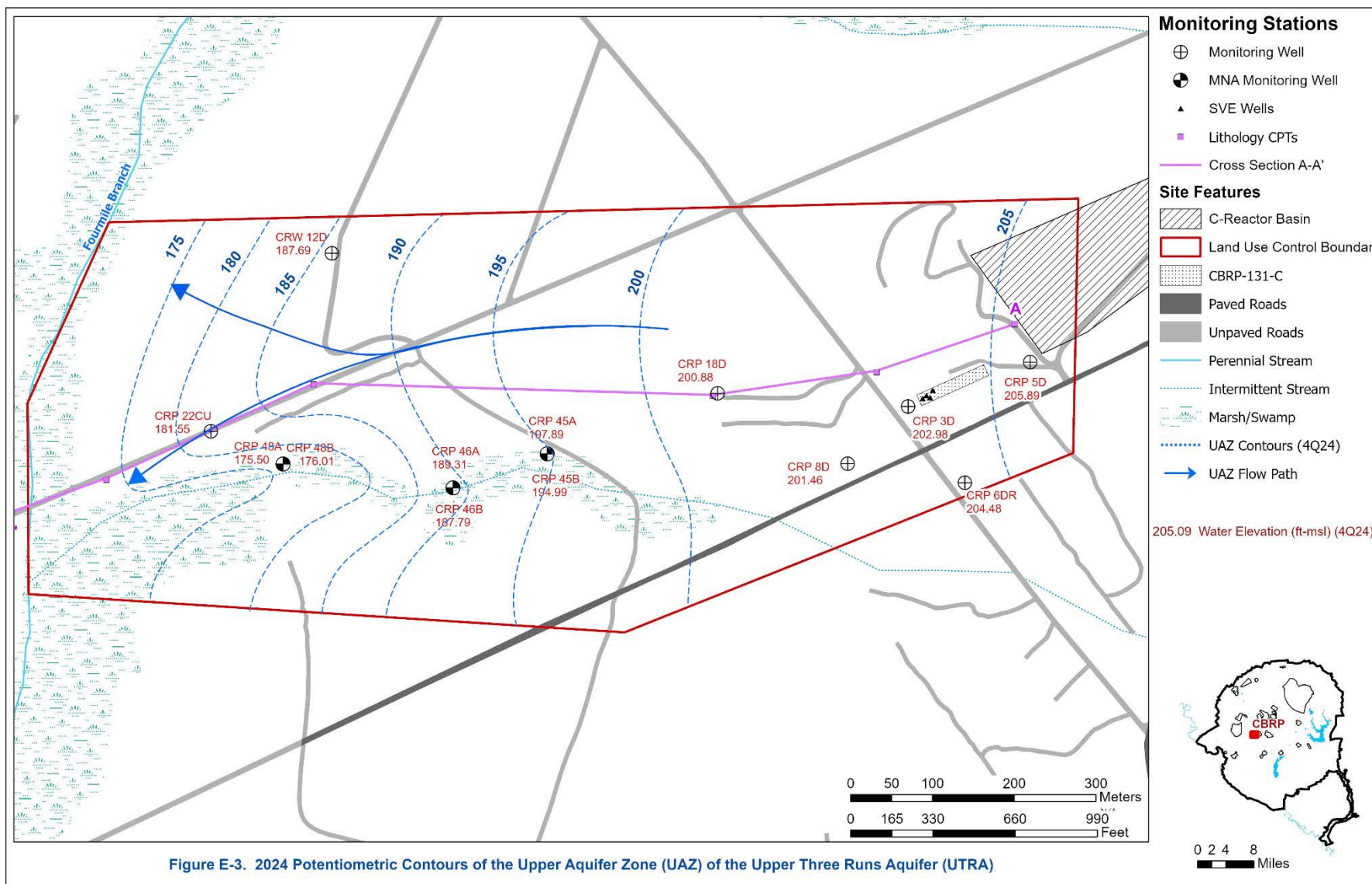


Figure E-1. 2023 Potentiometric Contours of the Upper Aquifer Zone (UAZ) of the Upper Three Runs Aquifer (UTRA)

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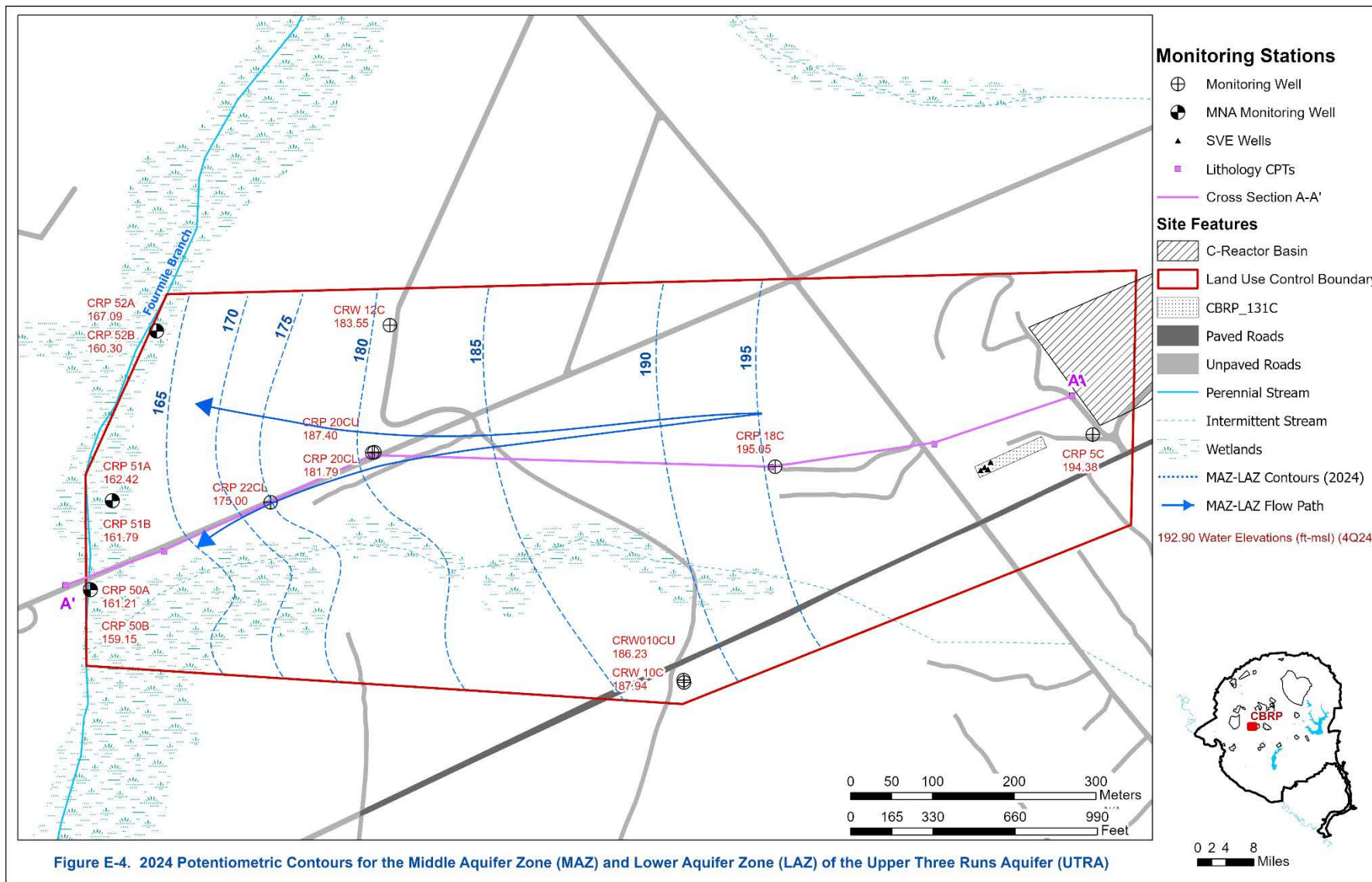


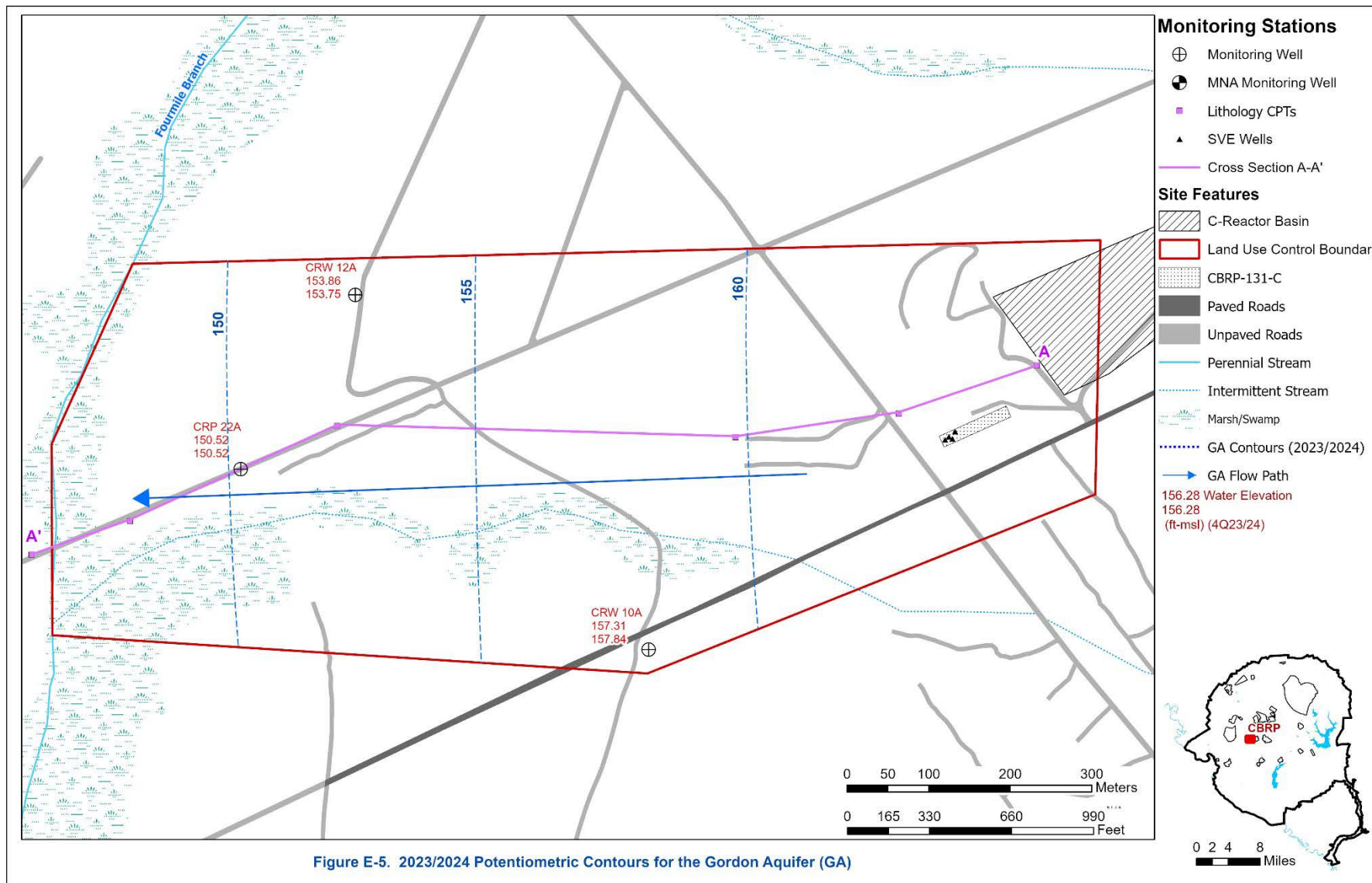
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APPENDIX F

2023 and 2024 MicroBlower Data Tables

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2023 and 2024 MicroBlower Data Tables									
Unit	TCE¹ (ppmv)²	PCE³ (ppmv)	Total Concentrated Solvent. (ppmv)	Flow Rate (cfm)⁴	Sample Date	Operating Hours	TCE (lbs)⁵	PCE (lbs)	Total⁶ (lbs)
Jan-23									
SVE-19B	0.33	0.00	0.33	2.42	Dec-22	744	0.01	0.00	0.01
SVE-22B	9.16	0.00	9.16	4.80	Dec-22	744	0.66	0.00	0.66
SVE-23B	6.80	0.00	6.80	1.29	Dec-22	744	0.13	0.00	0.13
SVE-27	27.10	0.02	27.12	5.63	Dec-22	744	2.28	0.00	2.28
Totals	10.85			3.54	100%		3.08	0.00	3.08
Feb-23									
SVE-19B	0.33	0.00	0.33	2.42	Dec-22	672	0.01	0.00	0.01
SVE-22B	9.16	0.00	9.16	4.80	Dec-22	672	0.59	0.00	0.59
SVE-23B	6.80	0.00	6.80	1.29	Dec-22	672	0.12	0.00	0.12
SVE-27	27.10	0.02	27.12	5.63	Dec-22	672	2.06	0.00	2.06
Totals	10.85			3.54	100%		2.78	0.00	2.79
Mar-23									
SVE-19B	0.33	0.00	0.33	2.42	Dec-22	744	0.01	0.00	0.01
SVE-22B	9.16	0.00	9.16	4.80	Dec-22	720	0.64	0.00	0.64
SVE-23B	6.80	0.00	6.80	1.29	Dec-22	744	0.13	0.00	0.13
SVE-27	27.10	0.02	27.12	5.63	Dec-22	720	2.21	0.00	2.21
Totals	10.85			3.54	98%		2.99	0.00	2.99

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2023 and 2024 MicroBlower Data Tables (continued)									
Unit	TCE (ppmv)	PCE (ppmv)	Total Concentrated Solvent. (ppmv)	Flow Rate (cfm)	Sample Date	Operating Hours	TCE (lbs)	PCE (lbs)	Total (lbs)
Apr-23									
SVE-19B	0.33	0.00	0.33	2.42	Dec-22	720	0.01	0.00	0.01
SVE-22B	9.16	0.00	9.16	4.80	Dec-22	720	0.64	0.00	0.64
SVE-23B	6.80	0.00	6.80	1.29	Dec-22	720	0.13	0.00	0.13
SVE-27	27.10	0.02	27.12	5.63	Dec-22	720	2.21	0.00	2.21
Totals	10.85			3.54	100%		2.98	0.00	2.98
May-23									
SVE-19B	0.33	0.00	0.33	2.42	Dec-22	744	0.01	0.00	0.01
SVE-22B	9.16	0.00	9.16	4.80	Dec-22	744	0.66	0.00	0.66
SVE-23B	6.80	0.00	6.80	1.29	Dec-22	744	0.13	0.00	0.13
SVE-27	27.10	0.02	27.12	5.63	Dec-22	744	2.28	0.00	2.28
Totals	10.85			3.54	100%		3.08	0.00	3.08
Jun-23									
SVE-19B	1.57	0.00	1.57	4.12	Jun-23	720	0.09	0.00	0.094
SVE-22B	9.14	0.00	9.14	7.39	Jun-23	720	0.98	0.00	0.977
SVE-23B	2.80	0.00	2.80	1.23	Jun-23	720	0.05	0.00	0.050
SVE-27	9.91	0.00	9.91	6.91	Jun-23	720	0.99	0.00	0.991
Totals	5.86			4.91	100%		2.11	0.00	2.111

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Unit	TCE (ppmv)	PCE (ppmv)	Total Concentrated Solvent. (ppmv)	Flow Rate (cfm)	Sample Date	Operating Hours	TCE (lbs)	PCE (lbs)	Total (lbs)
Jul-23									
SVE-19B	1.57	0.00	1.57	4.12	Jun-23	744	0.10	0.00	0.10
SVE-22B	9.14	0.00	9.14	7.39	Jun-23	744	1.01	0.00	1.01
SVE-23B	2.80	0.00	2.80	1.23	Jun-23	744	0.05	0.00	0.05
SVE-27	9.91	0.00	9.91	6.91	Jun-23	744	1.02	0.00	1.02
Totals	5.86			4.91	100%		2.18	0.00	2.18
Aug-23									
SVE-19B	1.57	0.00	1.57	4.12	Jun-23	744	0.10	0.00	0.10
SVE-22B	9.14	0.00	9.14	7.39	Jun-23	744	1.01	0.00	1.01
SVE-23B	2.80	0.00	2.80	1.23	Jun-23	744	0.05	0.00	0.05
SVE-27	9.91	0.00	9.91	6.91	Jun-23	744	1.02	0.00	1.02
Totals	5.86			4.91	100%		2.18	0.00	2.18
Sep-23									
SVE-19B	1.57	0.00	1.57	4.12	Jun-23	720	0.09	0.00	0.09
SVE-22B	9.14	0.00	9.14	7.39	Jun-23	720	0.98	0.00	0.98
SVE-23B	2.80	0.00	2.80	1.23	Jun-23	720	0.05	0.00	0.05
SVE-27	9.91	0.00	9.91	6.91	Jun-23	720	0.99	0.00	0.99
Totals	5.86			4.91	100%		2.11	0.00	2.11

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2023 and 2024 MicroBlower Data Tables (continued)									
Unit	TCE (ppmv)	PCE (ppmv)	Total Concentrated Solvent. (ppmv)	Flow Rate (cfm)	Sample Date	Operating Hours	TCE (lbs)	PCE (lbs)	Total (lbs)
Oct-23									
SVE-19B	1.57	0.00	1.57	4.12	Jun-23	744	0.10	0.00	0.10
SVE-22B	9.14	0.00	9.14	7.39	Jun-23	744	1.01	0.00	1.01
SVE-23B	2.80	0.00	2.80	1.23	Jun-23	744	0.05	0.00	0.05
SVE-27	9.91	0.00	9.91	6.91	Jun-23	744	1.02	0.00	1.02
Totals	5.86			4.91	100%		2.18	0.00	2.18
Nov-23									
SVE-19B	1.57	0.00	1.57	4.12	Jun-23	720	0.09	0.00	0.09
SVE-22B	9.14	0.00	9.14	7.39	Jun-23	720	0.98	0.00	0.98
SVE-23B	2.80	0.00	2.80	1.23	Jun-23	720	0.05	0.00	0.05
SVE-27	9.91	0.00	9.91	6.91	Jun-23	720	0.99	0.00	0.99
Totals	5.86			4.91	100%		2.11	0.00	2.11
Dec-23									
SVE-19B	0.74	0.00	0.74	2.83	Dec-23	744	0.03	0.00	0.03
SVE-22B	12.50	0.00	12.50	7.60	Dec-23	744	1.42	0.00	1.42
SVE-23B	6.54	0.00	6.54	2.93	Dec-23	744	0.29	0.00	0.29
SVE-27	18.50	0.00	18.50	5.65	Dec-23	744	1.56	0.00	1.56
Totals	9.57			4.75	100%		3.30	0.00	3.30

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2023 and 2024 MicroBlower Data Tables (continued)									
Unit	TCE (ppmv)	PCE (ppmv)	Total Concentrated Solvent. (ppmv)	Flow Rate (cfm)	Sample Date	Operating Hours	TCE (lbs)	PCE (lbs)	Total (lbs)
Jan-24									
SVE-19B	0.74	0.00	0.74	2.83	Dec-23	744	0.03	0.00	0.03
SVE-22B	12.50	0.00	12.50	7.60	Dec-23	744	1.42	0.00	1.42
SVE-23B	6.54	0.00	6.54	2.93	Dec-23	744	0.29	0.00	0.29
SVE-27	18.50	0.00	18.50	5.65	Dec-23	744	1.56	0.00	1.56
Totals	9.57			4.75	100%		3.30	0.00	3.30
Feb-24									
SVE-19B	0.74	0.00	0.74	2.83	Dec-23	696	0.03	0.00	0.03
SVE-22B	12.50	0.00	12.50	7.60	Dec-23	696	1.33	0.00	1.33
SVE-23B	6.54	0.00	6.54	2.93	Dec-23	696	0.27	0.00	0.27
SVE-27	18.50	0.00	18.50	5.65	Dec-23	696	1.46	0.00	1.46
Totals	9.57			4.75	100%		3.09	0.00	3.09
Mar-24									
SVE-19B	0.74	0.00	0.74	2.83	Dec-23	744	0.03	0.00	0.03
SVE-22B	12.50	0.00	12.50	7.60	Dec-23	744	1.42	0.00	1.42
SVE-23B	6.54	0.00	6.54	2.93	Dec-23	744	0.29	0.00	0.29
SVE-27	18.50	0.00	18.50	5.65	Dec-23	744	1.56	0.00	1.56
Totals	9.57			4.75	100%		3.30	0.00	3.30

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2023 and 2024 MicroBlower Data Tables (continued)									
Unit	TCE (ppmv)	PCE (ppmv)	Total Concentrated Solvent. (ppmv)	Flow Rate (cfm)	Sample Date	Operating Hours	TCE (lbs)	PCE (lbs)	Total (lbs)
Apr-24									
SVE-19B	0.74	0.00	0.74	2.83	Dec-23	720	0.03	0.00	0.03
SVE-22B	12.50	0.00	12.50	7.60	Dec-23	720	1.37	0.00	1.37
SVE-23B	6.54	0.00	6.54	2.93	Dec-23	720	0.28	0.00	0.28
SVE-27	18.50	0.00	18.50	5.65	Dec-23	720	1.51	0.00	1.51
Totals	9.57			4.75	100%		3.19	0.00	3.19
May-24									
SVE-19B	0.74	0.00	0.74	2.83	Dec-23	744	0.03	0.00	0.03
SVE-22B	12.50	0.00	12.50	7.60	Dec-23	744	1.42	0.00	1.42
SVE-23B	6.54	0.00	6.54	2.93	Dec-23	744	0.29	0.00	0.29
SVE-27	18.50	0.00	18.50	5.65	Dec-23	744	1.56	0.00	1.56
Totals	9.57			4.75	100%		3.30	0.00	3.30
Jun-24									
SVE-19B	2.54	0.00	2.54	4.53	Jun-24	720	0.17	0.00	0.17
SVE-22B	9.97	0.00	9.97	2.42	Jun-24	720	0.35	0.00	0.35
SVE-23B	4.64	0.00	4.64	1.05	Jun-24	720	0.07	0.00	0.07
SVE-27	15.70	0.00	15.70	6.70	Jun-24	720	1.52	0.00	1.52
Totals	8.21			3.68	100%		2.11	0.00	2.11

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Unit	TCE (ppmv)	PCE (ppmv)	Total Concentrated Solvent. (ppmv)	Flow Rate (cfm)	Sample Date	Operating Hours	TCE (lbs)	PCE (lbs)	Total (lbs)
Jul-24									
SVE-19B	2.54	0.00	2.54	4.53	Jun-24	744	0.17	0.00	0.17
SVE-22B	9.97	0.00	9.97	2.42	Jun-24	744	0.36	0.00	0.36
SVE-23B	4.64	0.00	4.64	1.05	Jun-24	744	0.07	0.00	0.07
SVE-27	15.70	0.00	15.70	6.70	Jun-24	744	1.57	0.00	1.57
Totals	8.21			3.68	100%		2.18	0.00	2.18
Aug-24									
SVE-19B	2.54	0.00	2.54	4.53	Jun-24	744	0.17	0.00	0.17
SVE-22B	9.97	0.00	9.97	2.42	Jun-24	744	0.36	0.00	0.36
SVE-23B	4.64	0.00	4.64	1.05	Jun-24	744	0.07	0.00	0.07
SVE-27	15.70	0.00	15.70	6.70	Jun-24	744	1.57	0.00	1.57
Totals	8.21			3.68	100%		2.18	0.00	2.18
Sep-24									
SVE-19B	2.54	0.00	2.54	4.53	Jun-24	720	0.17	0.00	0.17
SVE-22B	9.97	0.00	9.97	2.42	Jun-24	696	0.34	0.00	0.34
SVE-23B	4.64	0.00	4.64	1.05	Jun-24	720	0.07	0.00	0.07
SVE-27	15.70	0.00	15.70	6.70	Jun-24	720	1.52	0.00	1.52
Totals	8.21			3.68	99%		2.10	0.00	2.10

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2023 and 2024 MicroBlower Data Tables (end)									
Unit	TCE (ppmv)	PCE (ppmv)	Total Concentrated Solvent. (ppmv)	Flow Rate (cfm)	Sample Date	Operating Hours	TCE (lbs)	PCE (lbs)	Total (lbs)
Oct-24									
SVE-19B	2.54	0.00	2.54	4.53	Jun-24	744	0.17	0.00	0.17
SVE-22B	9.97	0.00	9.97	2.42	Jun-24	744	0.36	0.00	0.36
SVE-23B	4.64	0.00	4.64	1.05	Jun-24	744	0.07	0.00	0.07
SVE-27	15.70	0.00	15.70	6.70	Jun-24	744	1.57	0.00	1.57
Totals	8.21			3.68	100%		2.18	0.00	2.18
Nov-24									
SVE-19B	0.19	0.00	0.19	2.08	Nov-24	744	0.01	0.00	0.01
SVE-22B	5.05	0.00	5.05	4.48	Nov-24	744	0.34	0.00	0.34
SVE-23B	0.92	0.00	0.92	1.03	Nov-24	744	0.01	0.00	0.01
SVE-27	10.10	0.00	10.10	4.32	Nov-24	744	0.65	0.00	0.65
Totals	4.06			2.98	100%		1.01	0.00	1.01
Dec-24									
SVE-19B	0.19	0.00	0.19	2.08	Nov-24	744	0.01	0.00	0.01
SVE-22B	5.05	0.00	5.05	4.48	Nov-24	744	0.34	0.00	0.34
SVE-23B	0.92	0.00	0.92	1.03	Nov-24	744	0.01	0.00	0.01
SVE-27	10.10	0.00	10.10	4.32	Nov-24	744	0.65	0.00	0.65
Totals	4.06			2.98	100%		1.01	0.00	1.01
1. TCE = trichlorethylene 2. ppmV= parts per million vapor 3. PCE = tetrachlorethylene 4. cfm = cubic feet per minute				5. lbs = pounds 6. Total = Value reflects calculated totals using equation in Section 4.5. Reported values are 50% of this value (conservative estimate).					