Honeywell

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September 27, 2012

VIA EMAIL AND REGULAR MAIL

Mr. Galo Jackson
Remedial Project Manager
US EPA Region 4
61 Forsyth St. S.W.
Atlanta, Georgia 30303-8960

Re: PRP's Response to EPA's Letter Dated July 27, 2012
Remedial Investigation Report, Operable Unit #3 (Uplands)
LCP Chemical Company NPL Site, Brunswick, Glynn County, Georgia

Dear Mr. Jackson,

We are in receipt of EPA's letter dated July 27, 2012, regarding the EPA's and the Georgia Environmental Protection Division's ("EPDs") comments on the Remedial Investigation ("RI") report for Operable Unit 3 (Uplands) ("OU3") for the LCP Chemicals Site. As a follow-up to the meeting that we had with the EPA on August 28, 2012, the following are the response to comments from the Potentially Responsible Parties ("PRPs") – Honeywell, Atlantic Richfield Company, and Georgia Power:

General Comments

1) *The remedial investigation report (RI) has included figures to illustrate the sample locations that exceeded the preliminary remedial goals (PRGs) for both human health and ecological receptors. The figures use symbols to indicate where samples were available and where the concentrations detected in those samples exceeded the PRGs. Often samples having concentrations in excess of the PRGs are located adjacent to samples where concentrations are below PRGs. Interpolation of the data will better illustrate locations where spatially averaged concentrations are above or below the PRGs. Interpolation can be a useful tool to identify potential soil management areas. Please provide interpolation of the data which will better illustrate locations where spatially averaged concentrations are above or below the PRGs.*

Response:

See the Attachment, which provides the results of an area-averaging analysis of surficial soil conditions (upper 2 ft) in 1-acre grids across the site. We look forward to further discussion on this approach as was discussed during our meeting on August 28, 2012.

2) *The draft RI Report indicates that the Site's land use is zoned industrial and will be in the future. While data illustrated with figures in Appendix C show sample locations having concentrations above the PRGs for ecological protection, potential risks to wildlife receptors were considered by the draft RI Report as unlikely to warrant significant remedial measures. The rationale provided in the draft report is that the property is to be redeveloped for commercial or industrial use. However, future use of the property has not been determined. The areas of the Site that might be covered by buildings or parking lots are unknown. The risk to wildlife depends on the potential for exposure and not on property zoning. Please remove from the revised report use of institutional controls to pre-determine the remedy. Principally this involves, but may not be limited to, Sections 6.3.6 and 7.3.3*

Response:

The revised OU3 RI Report will be edited to remove the reference to the use of institutional controls ("ICs") for those sections relating to ecological risks. However, given that the Site will put in place ICs that restrict residential use, it is appropriate to retain the reference in those sections that pertain to human health risks.

3) *The uplands were the subject of extensive demolition and soils excavation between 1994 and 1997. Excavated areas were backfilled. A soil cover was placed over the former cell building area. The former facilities disposal area was removed and backfilled. Most of the remaining soil contamination is located in areas that were not removed in the late 1990s. The figures in Chapter 7 should show the outlines of the areas where removals took place.*

Response:

The figures in Chapter 7 of revised OU3 RI Report will be edited to include a depiction of areas excavated/backfilled or capped.

4) *A table should be included in Chapter 7 comparing the PRGs for human health and ecological receptors. Table 6-1 should show the PRGs for all receptors and chemicals regardless of whether the hazard or risks were above the thresholds. The risk assessment used only the 2008 data. It is possible that the ecological risk assessment may have reached slightly different conclusions if based on the more comprehensive data set used for the RI. The additional information included in Table 6-1 will allow the comprehensive data set for the RI to be used.*

Response:

Tables 6-1 and 6-3 of the RI Report replicate the information presented in Table 27 and Table 12 of the approved OU3 HHBRA and OU3 BERA Reports, respectively. Please note that although the BERA relied upon the 2008 sampling event (per the approved work plans), the more comprehensive data set for the site soils was used in all of the RI Report illustrations, comparing the comprehensive data to both human health and ecological PRGs. We are available to discuss this comment further with EPA and EPD if necessary.

5) *In general, OU-3 presents limited risk to ecological receptors. However, there appears to exist localized surface soil concentrations that deserve attention. Soil contaminant concentrations in some localized areas are high enough to elevate the average concentrations in these areas above the PRGs for wildlife.*

Response:

This comment is addressed by the area-averaging analysis presented in the Attachment.

6) The report should include a discussion of potential pathways for transport of chemical constituents within the upland areas.

Response:

The revised OU3 RI Report will be edited to include a discussion of potential pathways for transport of chemical constituents within the uplands.

7) *It should be made clear that leaching to groundwater was not evaluated as part of the risk assessment and that this evaluation will be conducted as part of the Feasibility Study.*

Response:

We would like to discuss this issue further with EPA and EPD.

8) *It should also be made clear that the soil (surface and subsurface) in the cell building area was not evaluated in OU3. This evaluation will be conducted as part of the groundwater OU (OU2).*

Response:

The revised OU3 RI Report will be edited as requested.

9) There are a significant number of grammatical errors in the document. For the sake of brevity, they will be pointed out only where they impact comprehension of the text.

Response:

The revised OU3 RI Report will be proofed and edited to correct typographical and grammatical errors.

10) Everywhere; Fuller-O'Brien, not O'Brian.

Response:

As agreed the revised OU3 RI Report will be edited to name the paint company as "Dixie-O'Brien."

Specific Comments

1) Page 1, Section 1.1, second paragraph – OU1 has always included the entire estuary, including channels and Purvis Creek, not just the "marsh sediments." Please clarify. The groundwater ***and cell building area*** *are designated as OU2. Please revise.*

Response:

The revised OU3 RI Report will be edited as requested.

2) Page 3, Section 2.1, first sentence – "...former Site Property..." Please clarify.

Response:

The word "former" will be deleted in this context in the revised OU3 RI Report.

3) Page 5, Section 3.1 – the closing ceremony for Glynn County's acquisition of most of Quadrant 1 took place on June 27, 2012. This section should be updated to reflect the fact that the amount of County-owned land will be different when the RI is finalized.

Response:

The revised OU3 RI Report will be edited as requested.

4) Page 5, Section 3.2 – Please add the word "in" between latest and late February.

Response:

The revised OU3 RI Report will be edited as requested.

5) Section 5.3 (Summary of Removal Response Actions) and 5.4 (Soil Investigations) – the discussion should include explicit listing of the emergency cleanup removal goals, and that those goals were not always met. The discussion, in fact, is misleading and states in several instances that all contamination was removed during the emergency action. For example, Section 5.3.3 states, "At the Mercury Retort Area, the above-ground concrete structures as well as the soil and retort waste that were contaminated with mercury were excavated and disposed of off-site... Complete removal of these contamination sources was accomplished by excavating and disposing a total of approximately 37,000 cubic yards of the process wastes from the North Disposal Area..."

Response:

The revised OU3 RI Report will be edited to remove the word "Complete" in the cited sentence. Further, the text will be modified to note that this work was approved by EPA.

6) Page 12, Section 5.3.3, third sentence – the cell building cap was not an engineered soil cover, as stated in the text; please revise.

Response:

The revised OU3 RI Report will be edited to delete the word "engineered" from the sentence.

7) Page 13, Section 5.4.1, last sentence – add "5.4.2 and" between "sections" and "5.4.3".

Response:

The revised OU3 RI Report will be edited as requested.

8) Page 16, Section 5.4.3, third paragraph, fourth sentence – the samples in the Phase II investigation were analyzed for the full suite of compounds, including metals, SVOCs, and PCBs, not just VOCs.

Response:

The revised OU3 RI Report will be edited as requested.

9) Page 16, Section 5.4.3, sixth paragraph, third sentence – PAH stands for polycyclic aromatic hydrocarbons, not polyatomic hydrocarbons.

Response:

The revised OU3 RI Report will be edited as requested.

10) Page 21, Section 6.2.3.2 – COPC Table. The listed COPCs do not agree with the final Human Health Risk Assessment (HHRA). The Quad 3 and 4 columns are lacking Dibenzofuran, and the Quad 4 column is lacking Manganese.

Response:

We acknowledge that manganese was mistakenly omitted from the Quad 4 column on the COPC table on page 21, which will be corrected in the resubmission. However, dibenzofuran was not identified as a COPC in any quadrant in the HHRA.

11) Page 23, Section 6.2.4.3 – Current/Future Worker. To more completely describe the future vs. current worker scenario, the following verbiage is recommended to be added at the end of the last sentence in the first paragraph: "...and a more realistic scenario for the future worker who is not aware of the presence of contaminants in the soil."

Response:

The text referenced in this comment was taken directly from the approved HHBRA. As agreed during our meeting on August 28, 2012, no change is necessary.

12) Page 26, Section 6.2.4 – Dioxins/Furans. Some brief discussion should be added regarding the recently verified reference dose (RfD) for 2,3,7,8-TCDD (IRIS 2010), such as: "Use of the RfDs recently verified by EPA would not alter the conclusions regarding acceptable risk/hazards for the onsite worker scenario." Also, it would seem that this discussion of risks from Dioxin/Furans might be better placed in the Risk Characterization discussion (Section 6.2.6).

Response:

The revised OU3 RI Report will be edited as requested.

13) Page 27, Section 6.2.6.2 – Non-Cancer Hazards. Verbiage in the last paragraph of this section should read "HQ/HI estimates" rather than "ELCR" for each of the receptors.

Response:

The revised OU3 RI Report will be edited as requested.

14) Page 29, Section 6.2.6.3 – ELCRs/HIs Shown in Tables. Shading is said to indicate HI estimates exceeding 1 (unity); however, HI values of 2 for the excavation worker RME scenario are not shaded. Some HI values do not quite agree with the HHRA document: Current/Future Industrial Worker RME, without TEG (high and low) shown here as 0.1; the HHRA list 0.08 for the HI (high) and 0.07 for the HI (low). Current Trespasser RME without TEG HI shown as 0.01; the HHRA lists 0.008 for this HI. Please recheck all risk and HI values.

Response:

The revised OU3 RI Report will be edited to provide the exact values (no rounding) from the HHRA. Tables will also be reviewed for appropriate shading.

15) Section 6.3.6, Ecological Preliminary Remedial Goals for Upland Soils, Page 44. The baseline ecological risk assessment (BERA) in Section 5.2.1 presented a PRG for antimony of 2.2 mg/kg in soil for protection of the terrestrial-feeding, grain-eating mammal (meadow vole). The BERA also presented a PRG for zinc in soil of 22 mg/kg for protection of the terrestrial-feeding insectivorous bird (Carolina wren). Antimony and zinc do not appear on Table 6.3. Appendix C does not include antimony and zinc. Please update the table to include the missing information. Appendix C does not need to include figures for antimony and zinc, because the update to the table requested will show that antimony and zinc are not of concern in the surface soil of OU-3.

Response:

Table 6-3 of the OU3 RI Report replicates the information presented in Table 12 of the approved OU3 BERA. Both of these tables present series of "nodal" PRGs for total mercury, Aroclor 1268, and lead. The PRGs for the secondary COPC antimony and zinc, were presented in the text of the OU3 BERA, not in Table 12. For this reason, we will include the PRGs in the text of Section 6.3.6 of the RI Report, but they will not be added to Table 6-3.

16) Page 22, Section 6.2.4.2 – revise as per Specific Comment #3 above.

Response:

The revised OU3 RI Report will be edited as requested.

17) Section 6.3.7, Uncertainty Section, Page 45. The estuarine ecological receptors were evaluated in the OU-3 BERA by evaluating exposure to the Dillon Duck, the on-site pond, and the creek running adjacent to the northern portion of OU-3. The RI should expand the discussion in 6.3.2.2 of the terrestrial and aquatic habitat in OU-3. The data collected within OU-1 as part of the OU-3 investigation was used for receptors that had exposure to a combination of estuarine and terrestrial lands. The data within the boundaries of OU-1, which was collected as part of the OU-3 investigation, was evaluated in conjunction with the OU-1 RI.

Response:

The revised OU3 RI Report will be edited as requested.

18) Page 48, Section 7.3.2, first sentence – should be Figures 7-19a through 7-21c; the document does not have any 30 or 40 figures.

Response:

This was a typographical error. The revised OU3 RI Report will be edited as requested.

19) Figure 4-1 – is upside down; north should not be oriented toward the top of the page. Further it is unclear if this figure includes the drainage feature that was installed to direct surface water to the marsh north of the causeway.

Response:

The north arrow has a correct orientation as drawn with respect to the site features orientation on this figure. The figure will be redrafted to provide greatest clarity of pertinent features.

20) Figures 5-2 through 5-7 show one of the raw brine enclosures as being capped. Please modify the figure to remove the caps.

Response:

During the removal response action a soil cap was placed over the raw brine enclosure area near Ross Road. Thus, no change to the text is necessary.

21) Section 6.3.4, page 37 – Please correct the text in the middle of the first full paragraph to read, "Similar assessments were conducted at referenced locations located..."

Response:

The revised OU3 RI Report will be edited as requested (note that the correct reference here is Section 6.3.3).

22) Section 6.3.6, page 44, second paragraph of the section – Correct the second sentence to read, "The entirety of the uplands..."

Response:

The revised OU3 RI Report will be edited as requested.

23) Appendix C shows Figure C-8, Comparison of Soil Aroclor-1268 PRGs for the short-tailed shrew. Short-tailed shrews and other insectivorous mammals are exposed to total PCBs in OU-3 soils. The figure should be improved by comparing total PCB concentrations to the PRGs. Of particular concern are risks to the short-tailed shrew and other mammalian wildlife exposed to total PCB concentrations in surface soils. The concentrations of total PCBs in four surface soil samples are much higher than elsewhere, suggesting that there are localized hot spots of contamination within Quadrant 4. Aroclor-1268 concentrations in the four samples were not exceptionally high relative to the PRGs, yet total PCB concentrations were over 100 mg/kg. None of these data were analyzed by the TEG laboratory. Total PCB contamination in surface soil at four locations within Zone 4 should be addressed.

Location	Sample ID	Date	Total PCB Concentration, mg/kg
Process South	B113036	10/18/1995	450
LC-204	LC-204-SLA	10/17/1994	122
96207-M76	96207-M76	7/25/1996	240
LC-639	LC-639-SLA	11/30/1994	214.4

Response:

See the Attachment, which provides the results of an area-averaging analysis of surficial soil conditions (upper 2 ft) in 1-acre grids across the site. This approach was discussed in our meeting on August 28, 2012.

24) The concentrations of mercury in surface soils of OU-3 are elevated above levels that are associated with risks to mammalian wildlife under the assumptions used in the baseline ecological risk assessment. The average concentrations of mercury in surface soils exceed the PRG for protection of the short-tailed shrew as shown in Figure C-6. This is particularly true for surface soils surrounding the former mercury cell building area. From an ecological perspective, division of the site into four quadrants dilutes contamination by lumping contaminated soils with less contaminated soils at the periphery of the Site. The cleanup decision should consider an exposure area in the west-central portion of the Site. The surface soils in the vicinity of the former mercury cell building have concentration of mercury high enough to present a risk to the broad-winged hawk, long-tailed weasel, and mourning dove. For instance, Sample 96207-M76 has 142 mg/kg of mercury in surface soil. Small local-area wildlife such as the meadow vole and short-tailed shrew are at risk from exposure to mercury in sols in the central portion of the Site. Concentration of total mercury in sol above 12 mg/kg are of concern for local-area wildlife, because when concentrations exceed 12 mg/kg the average concentration in a one acre area is typically greater than the LOAEL PRG for the short-tailed shrew of 2.8 mg/kg. The central area of OU-3 drains to the Main Canal (Figure 4-1). Another reason to clean up soils in the central portion of OU-3 is because it would reduce transport of mercury in surface soils to OU1 through surface water runoff and soil erosion.

Response:

See the Attachment, which provides the results of an area-averaging analysis of surficial soil conditions (upper 2 ft) in 1-acre grids across the site. This approach was discussed in our meeting on August 28, 2012.

25) The lead in the surface soils of OU-3 is rarely above the LOAEL PRG of 400 mg/kg for protection of the mourning dove. The mourning dove represents the granivorous bird. Typically it is the insectivorous bird that is most at risk from exposure to lead in soils, but in this case there was little lead accumulation observed in the insects collected from potentially impacted stations. The area of lead in surface soil that is of concern to the reproduction capacity of localized populations of granivorous birds is the lead at station

Response:

See the Attachment, which provides the results of an area-averaging analysis of surficial soil conditions (upper 2 ft) in 1-acre grids across the site. This approach was discussed in our meeting on August 28, 2012.

26) Figure C-1 – the values for <GMAEL, <LOAEL and >LOAEL are different than the values listed in Table 6-3 for the Broad-winged hawk, 50% MeHg/Hg ratio in small-mammal food. Please revise the figure.

Response:

Figure C-1 will be revised to reflect the values presented in Table 6-3.

Closing

Thank you for the opportunity to provide this information. We look forward to resolving these issues. To that end, please let me know when we can get together to discuss the area averaging analysis and any other remaining items so that we can finalize the OU3 RI report. As always, I can be reached at (973) 722-1656.

Sincerely,

Prashant K. Gupta

Attachment

cc: Brett Mitchell, Georgia Power
Paul Taylor, ARCO

EPS

Technical Memorandum

To: Prashant Gupta, Honeywell
Paul Taylor, Atlantic Richfield Company
W. Robert Mitchell, Georgia Power

From: Kirk Kessler, EPS

Date: September 28, 2012

Re: Soil Data Area-Averaging Analysis
LCP Chemical Site, Brunswick, Georgia, Operable Unit 3

Introduction

On August 28 2012, the Potentially Responsible Parties ("PRPs") – Honeywell, Atlantic Richfield Company, and Georgia Power – for the LCP Chemicals Site met the U.S. Environmental Protection Agency ("EPA") and the Georgia Environmental Protection Department ("EPD") to discuss EPA's comment letter on the Remedial Investigation ("RI") report for Operable Unit 3 ("OU3") dated July 27, 2012. Much of the discussion at that meeting related to EPA's comments regarding potential ecological risks associated with elevated concentrations of chemicals of potential concern ("COPC") in localized areas and requests for interpolation or averaging of soil concentration data, as a tool to compare the spatially averaged concentrations of COPC relative to the ecological preliminary remediation goals ("PRGs") derived in the OU3 Baseline Ecological Risk Assessment ("BERA"). At the conclusion of that meeting, the PRPs agreed to perform a series of soil data area-averaging analysis and share the results with EPA and EPD in order to facilitate further discussion.

At the meeting with EPA and EPD we reached agreement on the basic parameters for this analysis. As discussed, there are several factors that limit the application of conventional interpolation techniques (e.g., kriging, inverse distance weighting) for the OU3 RI data set. Primary among these is the fact that most of the soil samples in the OU3 data set were collected during the upland removal action in the late 1990s and were analyzed by on-site laboratories,[1] which generally did not achieve the same level of analytical sensitivity (i.e., detection limits) as off-site commercial laboratories. While the detection limits for the on-site laboratory samples were typically satisfactory for determining whether concentrations were above or below the removal action goals, they are often similar to, and sometimes exceed, the ecological PRGs for some of the receptors evaluated in the OU3 BERA. Because of these factors, EPA and EPD

[1] One of the on-site laboratories (TEG) was identified as having quality control issues and was replaced with another onsite laboratory (QAL) for the remainder of the upland removal action. The TEG data were excluded from the data evaluations presented in Appendix E of the OU3 BERA.

agreed that the interpolation exercise would be based on local area averaging of the soil data within one-acre grids. The one-acre grid size was selected because it corresponds to the approximate home range of a small mammal receptor, the short-tailed shrew, which was evaluated in the OU3 BERA.

Methods

ArcGIS was used to create a grid with one-acre cells covering the upland portion of the Site (Figure 1). Within these one-acre grid cells, central tendency (i.e., arithmetic mean or median) concentrations of the primary ecological COPC were computed using all of the soil samples collected from depths of 0 to ≤2 ft below ground surface ("bgs"). We evaluated several different data treatments approaches (scenarios) for the area-averaging of the OU3 soil data for ecological evaluation. The average (or median) concentration of each COPC was calculated in each grid cell and that concentration was compared with ecological PRGs from the OU3 BERA.

These scenarios are summarized in the following table and described in more detail below. An individual figure was generated for each of the scenarios and COPCs identified with an "x" in the table.

Scenario	TEG Data	DL Method	Statistic	Hg	Pb	Ar-1254	Ar-1260	Ar-1268	Total PCB*
1	Included	0.5X	Mean	x	x	x	x	x	x
2	Excluded	0.5X	Mean	x	x	x	x	x	x
3	Excluded	0.1X	Mean			x	x	x	x
4**	Excluded	0.5X (Hg) 0.1X (PCBs)	Mean	x		x	x	x	x
5**	Excluded	0.5X (Hg) 0.1X (PCBs)	Median	x		x	x	x	x

*A Total PCB result was calculated for each soil sample as the sum of all detected Aroclors in that sample. If no Aroclors were detected in a sample, one half of the detection limit for Aroclor-1268 was used as the Total PCB result for that sample.

**The following records were excluded for Scenarios 4 and 5: 96207-M76, 96289-CPS-06, 96303-CPS-14, 96303-CPS-15, LC-204-SLA, and LC-639-SLA.

As shown in this table, these data treatments focus on: (1) including or excluding data records from the TEG laboratory; (2) using two different methods for handling non-detect results for the PCBs; and (3) omitting certain data records in Scenarios 4 and 5 based on sample specific considerations. These considerations are discussed in more detail in the following bullets:

- 96207-M76 – This is a 3-point composite sample collected in 1996 from the 0-1 ft bgs interval at the northern sidewall of a removal area that abuts the southern boundary of the cell building cap (Figure 2). This sample was analyzed by the QAL on-site lab and had a detection of Aroclor-1268 at 253 mg/kg, which was the only detected PCB. The detected mercury concentration was also high at this location, 142 mg/kg. It is

appropriate to exclude this sample location from the area-averaging analysis given that it is a sidewall sample bordered to the south by clean backfill and to the north by the cell building cap.

- 96289-CPS-06 – This is a 3-point composite sample collected in 1996 from the 0-1 ft bgs interval at the northern sidewall of a removal area that abuts a warehouse building in Quadrant 4 (Figure 2). This sample was analyzed by the QAL on-site lab and had a detection of Aroclor-1268 at 34 mg/kg, which was the only detected PCB. This sample is bordered to the south by clean backfill and to the north by the building.
- 96303-CPS-14 – This is a second 3-point composite sample collected in 1996 from the 0-0.5 ft bgs interval at the northern sidewall of a removal area that abuts the same warehouse building in Quadrant 4 (Figure 2). This sample was analyzed by the QAL on-site lab and had a detection of Aroclor-1268 at 12 mg/kg, which was the only detected PCB. This sample is bordered to the south by clean backfill and to the north by the building.
- 96303-CPS-15 – This is a third 3-point composite sample collected in 1996 from the 0-0.5 ft bgs interval at the northern sidewall of a removal area that abuts the same warehouse building in Quadrant 4 (Figure 2). This sample was analyzed by the QAL on-site lab and had no PCB detections. However, it had a detection limit of 2.4 mg/kg for all PCBs. This sample is bordered to the south by clean backfill and to the north by the building.
- LC-204-SLA – This is a 5-point composite sample collected in 1994 from the 0-1 ft bgs interval in an area to the west of the cell cap in Quadrant 4 (Figure 2). This sample was analyzed by the ESD lab, which reported Aroclor-1260 at 110 mg/kg. No other Aroclors were detected. The very high concentration of Aroclor-1260 in this sample is inconsistent with numerous discrete samples subsequently collected in the same area. Given the sample in question was a multi-point composite, it is possible one or more portions of the composite sample had been obtained from an area addressed during the subsequent removal action.
- LC-639-SLA – This is a 5-point composite sample collected in 1994 from the 0-1 ft bgs interval in an area to the southwest of the cell cap in Quadrant 4 (Figure 2). This sample was analyzed by the ESD lab, which reported Aroclor-1260 at 160 mg/kg and Aroclor-1254 at 6.9 mg/kg. The very high concentration of Aroclor-1260 in this sample is inconsistent with numerous discrete samples subsequently collected in the same area. Given the sample in question was a multi-point composite, it is possible one or more portions of the composite sample had been obtained from an area addressed during the subsequent removal action.

Results

Figures illustrating the effects of the five data treatment scenarios are provided. The effects of these data treatment scenarios are discussed for each of the COPCs in the following paragraphs.

- Figures 3A through 3D illustrate Scenarios 1, 2, 4, and 5 for mercury.
- Figures 4A and 4B illustrate Scenarios 1 and 2 for lead.

- Figures 5A through 5E illustrate Scenarios 1 through 5 for Aroclor-1254.
- Figures 6A through 6E illustrate Scenarios 1 through 5 for Aroclor-1260.
- Figures 7A through 7E illustrate Scenarios 1 through 5 for Aroclor-1268.
- Figures 8A through 8E illustrate Scenarios 1 through 5 for Total PCBs.

Mercury

Figures 3A, 3B, 3C, and 3D illustrate the effects of the various data treatment scenarios for mercury. In these figures, the arithmetic average mercury concentration in each grid cell is compared with the lowest observed adverse effect level ("LOAEL") PRG for the short-tailed shrew and the broad-winged hawk[2] (assuming 100% and 50% methyl mercury in prey tissue). The differences between Scenarios 1, 2, and 4 are relatively minor – the number of grid cells exceeding the 3 mg/kg PRG ranges from 31 to 35 grid cells. Under Scenario 5 which uses the median concentration in each grid cell, the number of grid cells in excess of 3 mg/kg drops to 25. Under all of these scenarios, a much smaller number of grid cells exceed 50 mg/kg, the LOAEL PRG for the broad-winged hawk (assuming 50% methyl mercury in prey). As shown in these figures, most of the grids exceeding the PRG are located in the central portion of the site where low-quality habitat is present (numerous buildings and paved surfaces). Furthermore, many of these grid cells are partially characterized by clean backfill which was not accounted for in the area-averaging analysis and several are completely covered – a latter portion of this memo presents an areally-adjusted analysis to account for the presence of backfill in an area of Quadrant 4 where several contiguous grid cells exceeded the PRG.

Lead

In the comments on the OU3 RI report, EPA identified several locations where lead concentrations were above 400 mg/kg, which is the LOAEL PRG for mourning dove in the BERA. Figures 4A and 4B illustrate the arithmetic average lead concentration in each grid cell[3] under Scenarios 1 and 2, respectively, compared with the PRG for the mourning dove. It was found that in the more conservative-based Scenarios 1 and 2, very few grid cells exceed the 400 mg/kg PRG (4 cells in Scenario 1; 5 cells in Scenario 2) and that these exceeding grid cells are not continuous. Given the large size of the mourning dove's home range relative to these one-acre grid cells, these results indicate that "local populations" of mourning dove are not threatened by lead from the site.

Aroclor-1254

Figures 5A through 5E illustrate the effects of the various data treatment scenarios for Aroclor-1254. In these figures, the arithmetic average Aroclor-1254 concentration in each grid

[2] The one-acre grid size is overly conservative for the evaluation of the broad-winged hawk or other raptors, which have expansive home ranges.

[3] The one-acre grid size is overly conservative for the evaluation of the morning dove, which typically have home ranges that span 5-8 kilometers from a nesting site.

cell is compared with the PCB LOAEL PRG for the short-tailed shrew and long-tailed weasel.[4] As shown in these figures, there are only a limited number of grid cells exceeding the 2 mg/kg PRG for the short-tailed shrew, and each successive data treatment scenario results in fewer grid cells (the number of exceeding grid cells is between 3 and 6). Under Scenario 5, the use of the median concentration in each grid cell which resulted in only 1 individual grid cell exceeding 2 mg/kg. When compared to the long-tailed weasel PRG (6 mg/kg), only 1 grid cell exceeded this value under Scenario 1.

Aroclor-1260

Figures 6A through 6E illustrate the effects of the various data treatment scenarios for Aroclor-1260. In these figures, the arithmetic average Aroclor-1260 concentration in each grid cell is compared with the PCB LOAEL PRG for the short-tailed shrew and long-tailed weasel.[5] Even fewer grid cells exceed the 2 mg/kg PRG with Aroclor-1260 compared to Aroclor-1254 and, as is the case with Aroclor-1254, the exceeding cells are not contiguous.

Aroclor-1268

Figures 7A through 7E illustrate the effects of the various data treatment scenarios for Aroclor-1268. In these figures, the arithmetic average Aroclor-1268 concentration in each grid cell is compared with the PCB LOAEL PRG for the short-tailed shrew and long-tailed weasel.[6] As shown in these figures, each successive data treatment scenario results in fewer grid cells that exceed the 2 mg/kg PRG for the short-tailed shrew. The number of exceeding grid cells ranges from 24 cells under Scenario 1, to 14 cells under Scenario 4. Very few cells exceed the 6 mg/kg PRG for the long-tailed weasel. Under Scenario 5, which uses the median concentration in each grid cell, 11 individual grid cells exceed 2 mg/kg while only 1 grid cell exceeds 6 mg/kg. As shown in these figures, the grids exceeding the PCB PRG from the BERA are generally located in the central portion of the Site similar to mercury where significant parts of the area are characterized by poor quality habitat and other parts by clean backfill. Therefore, the analysis of the Aroclor-1268 is carried a step further (see below) to consider the effects of the clean backfill.

Total PCBs

Figures 8A through 8E illustrate the effects of the various data treatment scenarios for Total PCBs. These figures illustrate that the number of individual grid cells exceeding the PRG is similar to Aroclor-1268. The analysis of the Total PCBs is also carried a step further (see below) to consider the effects of the clean backfill.

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[4] The one-acre grid size is overly conservative for the evaluation of the long-tailed weasel, which can have a home range of 30-40 acres.

[5] A mammalian toxicity reference value ("TRV") for Aroclor-1254 was used as a surrogate to represent the toxicity of Aroclor-1260 in this exercise.

[6] A mammalian TRV for Aroclor-1254 was used as a surrogate to represent the toxicity of Aroclor-1268 in the OU3 BERA. As detailed in the uncertainty section of the OU3 BERA, use of this TRV in the derivation of the Aroclor-1268 PRG, results in a RGO value that is more conservative (i.e., potentially more than 10-times lower) than necessary.

Quantifying the Effect of Clean Fill

An important aspect of the Site conditions that is not addressed in the scenarios described above is the fact that there are large areas of the Site where clean backfill soil exists. However, this condition is not represented in the database in terms of location-specific data records with corresponding clean test results. Therefore, these large areas of clean fill are not accounted for in the grid averaging scenarios presented above. The true effect of the clean backfill would be to drive down the ecological exposure condition from what is represented in the grid averaging exercise presented above.

A "focus area" in Quadrant 4 of the Site was chosen to adjust the grid averaging to account for the clean backfill (Figure 9A). This area was selected because it is relatively free of hardscape features (i.e., buildings and pavement) and the PCB and mercury conditions were modeled to exceed the PRGs over a contiguous grouping of grid cells. In this area, ArcGIS tools were used to estimate the proportion of the surface area in each grid cell that contains clean fill. For each of the individual grid cells, the concentrations of COPC in the clean areas was calculated by multiplying the fractional area of the grid cell containing clean soil by the adjusted detection limit for each COPC.[7] For the remaining portions of each grid cell, the average concentration of each COPC calculated under Scenario 4 was multiplied by the fractional area of the grid cell not containing fill. The resulting concentrations in the areas of each grid cell were summed to yield a weighted concentration for each COPC. An example calculation is provided below for mercury in grid cell 5:

Calculated avg. Hg conc. in grid cell 5	5.5 mg/kg
Most common DL	0.5 mg/kg
Total area of grid cell	43,560 ft^2 (1 acre)
Area of backfill	33,042 ft^2
Proportion of un-remediated soil	24.1 % [(43,560-33,042)/43,560]
Proportion of clean backfill	75.9 % [33,042/43,560]

Adjusted avg. Hg conc. = (5.5 mg/kg x 0.241) + (0.25 mg/kg x 0.759) = **1.5 mg/kg**

[7] For mercury, 0.5-times the most common detection limit in the non-TEG OU3 data set (0.5 mg/kg) was used. For Aroclor-1268, 0.1-times the most common detection limit in the non-TEG OU3 data set (2 mg/kg) was used. This value was also used to represent Total PCB.

The table below provides the results of these calculations for the COPCs in the contiguous nine-cell area in Quadrant 4:

Grid Cell	Fill Area (ft^2)	% Clean Fill	Unadjusted Avg. Conc. (mg/kg)			Adjusted Avg. Conc. (mg/kg)		
			Mercury	Ar-1268	Total PCB	Mercury	Ar-1268	Total PCB
Quadrant 4								
1	42,061	96.6	4.4	0.32	0.32	0.4	0.98	0.98
2	31,878	73.2	0.23	3.2	3.5	0.25	1.6	1.7
3	16,328	37.5	7.8	6.2	8.9	5.0	4.3	5.9
4	14,195	32.6	7.0	0.93	0.93	4.8	0.95	0.95
5	33,042	75.9	5.5	1.2	1.2	1.5	1.0	1.0
6	23,211	53.3	8.3	4.5	5.7	4.0	2.7	3.2
7	31,115	71.3	7.2	1.2	1.2	2.2	1.1	1.1
8	24,331	55.8	5.5	4.1	4.1	2.6	2.4	2.4
9	15,273	35.1	8.5	0.75	0.75	5.6	0.84	0.84

It is evident that incorporating the clean backfill condition into the area-averaging analysis results in substantially lower area-averaged conditions for many of the grid cells, and less instances of grid cells exceeding an PRG (Figures 9B through 9D). This approach provides another layer of data interpretation to consider when evaluating the site data with respect to ecological-based PRGs.

Risk Management Considerations

When evaluating the OU3 soils data in the context of potential hazards to ecological receptors, it is important to recognize that the use of food web models in ecological risk assessment, including the ones that serve as the basis for the OU3 ecological PRGs, are laden with uncertainties inherent in both the estimates of exposure and the estimates of toxicity. The majority of these uncertainties are addressed through the use of intentionally conservative factors that ensure that risks are not underestimated. However, the cumulative effect of these conservative choices often results in grossly exaggerated estimates of potential harm to ecological receptors. Tannenbaum[8] has noted that the results of such models often do not comport with visible evidence of ecological productivity at sites where these tools have been used. This certainly seems to be the case at the LCP Chemicals Site, where a wide variety of mammalian and avian terrestrial wildlife are frequently observed.

[8] Tannenbaum LV. (2003). Can ecological receptors really be at risk? Human and Ecological Risk Assessment, 9(1): 5-13.
Tannenbaum LV. (2005). A critical assessment of the ecological risk assessment process: A review of misapplied concepts. Integrated Environmental Assessment and Management, 1(1): 66-72.

In addition, EPA guidance describes the importance of identifying ecological management goals for a site.[9] This is an acknowledgment that not all sites are equivalent in terms of the protection offered to various levels of ecological organization. Given the industrial history of the LCP Chemicals Site and the expected continued industrial use, the community structure of lower trophic level organisms that serve as a prey base for the upper trophic level birds and mammals (i.e., small mammals, small birds, reptiles, and amphibians) is different than what would be found in a more natural setting. Species that are particularly sensitive to physical or chemical stressors have likely been replaced by more tolerant species in certain areas. For the LCP Chemicals Site, it is appropriate that the overarching management goals focus on the protection of upper trophic level terrestrial wildlife at the population/community level. If lower trophic level receptors are considered in risk management decisions, it seems more appropriate that they be in the context of the ecological function they provide as a food source to the higher trophic level receptors. Very few of the grid cells evaluated herein exceed PRGs applicable to higher trophic level species, and in those few instances the condition is not contiguous.

[9] EPA. (1999). Ecological Risk Assessment and Risk Management Principles for Superfund Sites. Office of Solid Waste and Emergency Response, OSWER Directive 9285.7-28 P, October.

Grid for Area Averaging of OU3 Soil Concentrations

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Figure 1

OU3 Site Features and Soil Removal Areas

Scenario 1
Mercury

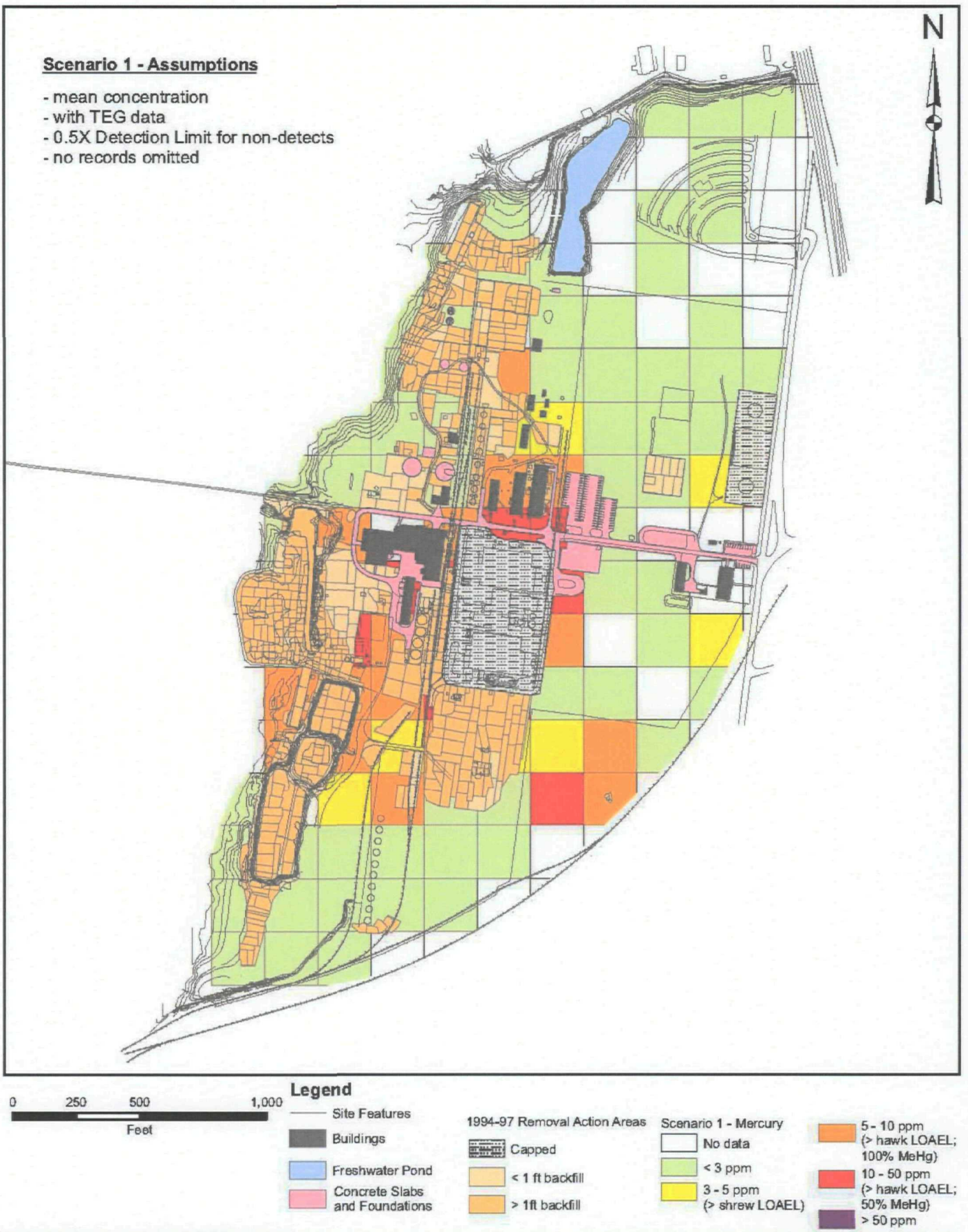

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Figure 3a

Scenario 2
Mercury

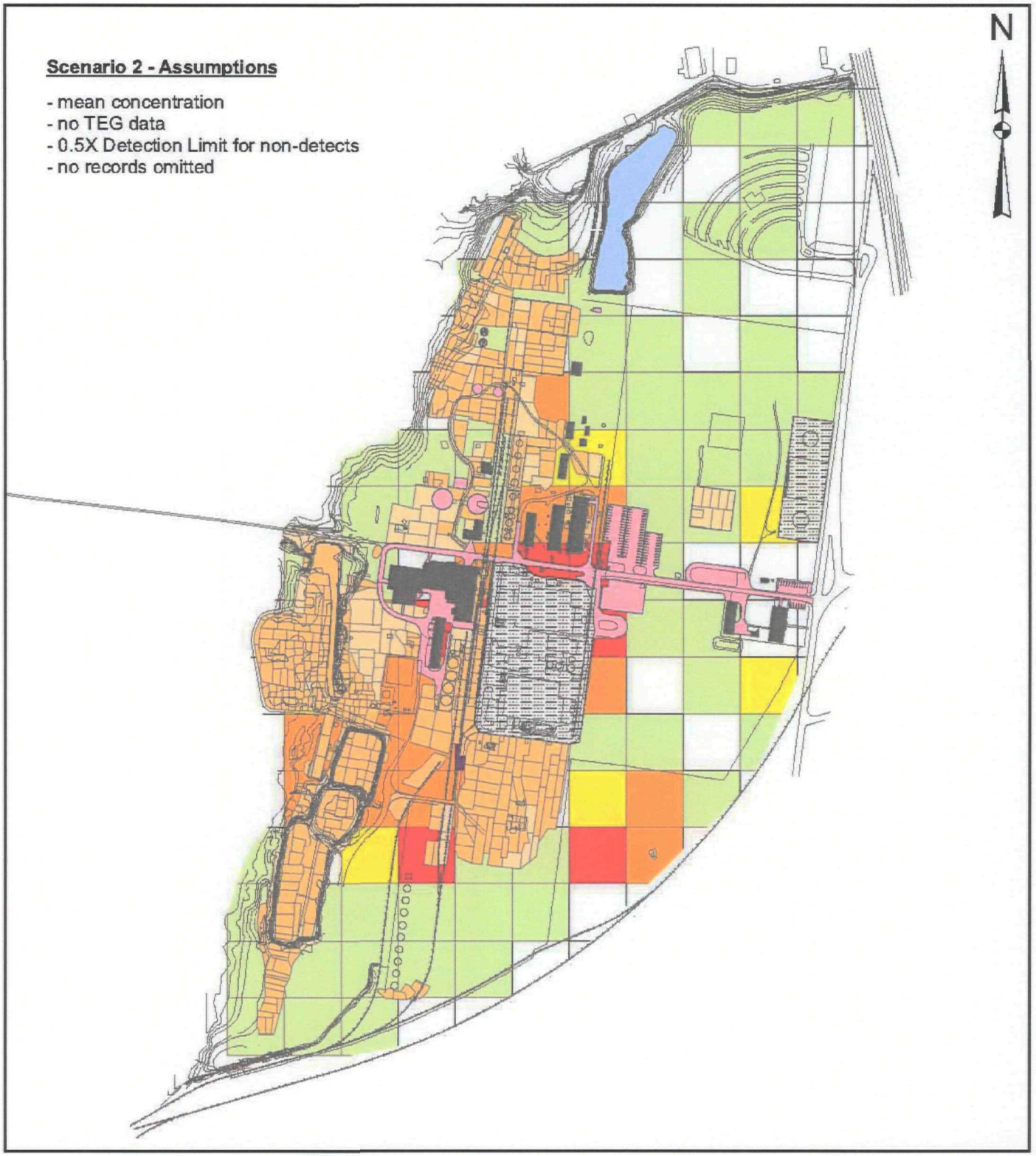

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Figure 3b

Scenario 4
Mercury

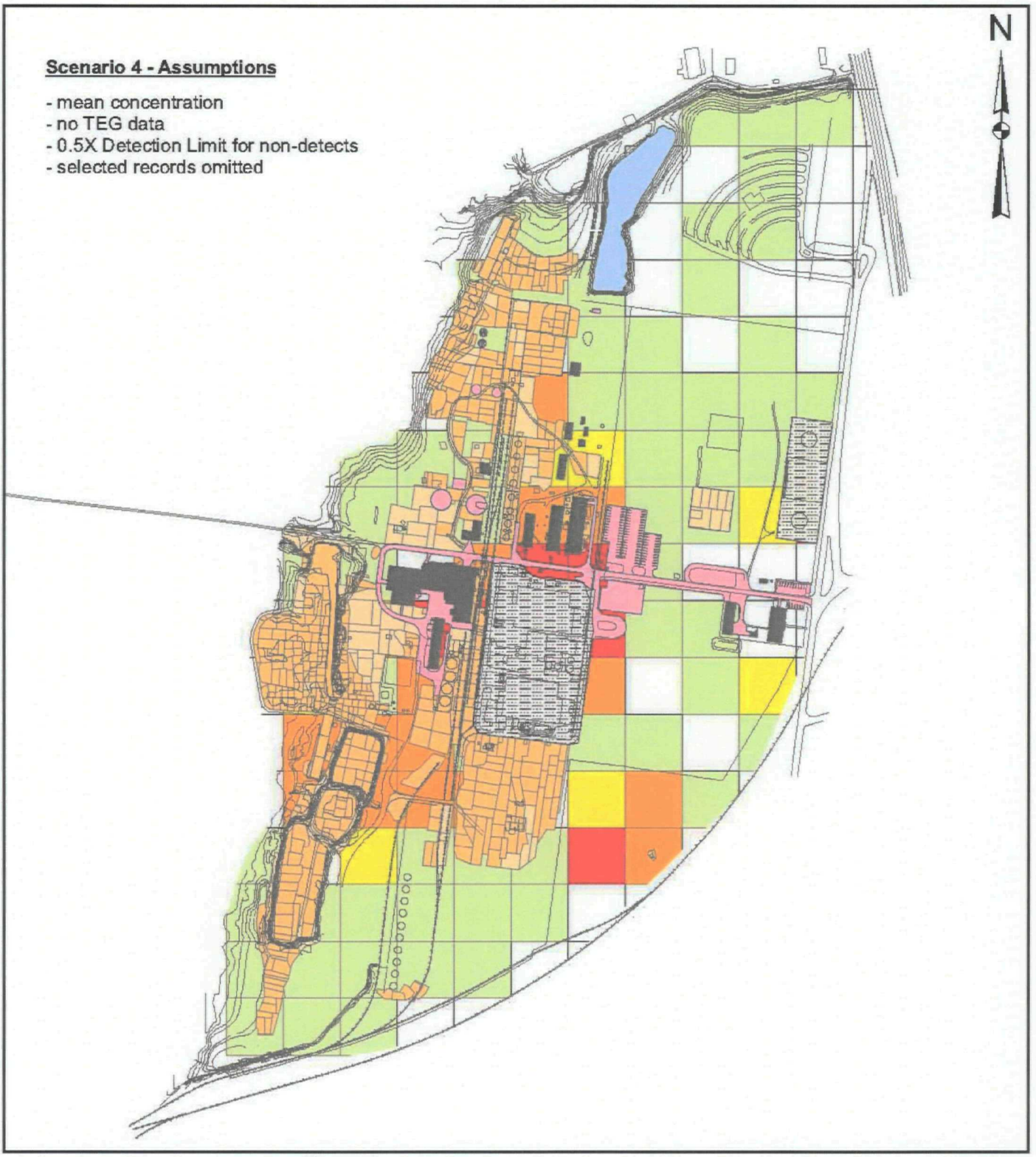

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Figure 3c

Scenario 5
Mercury

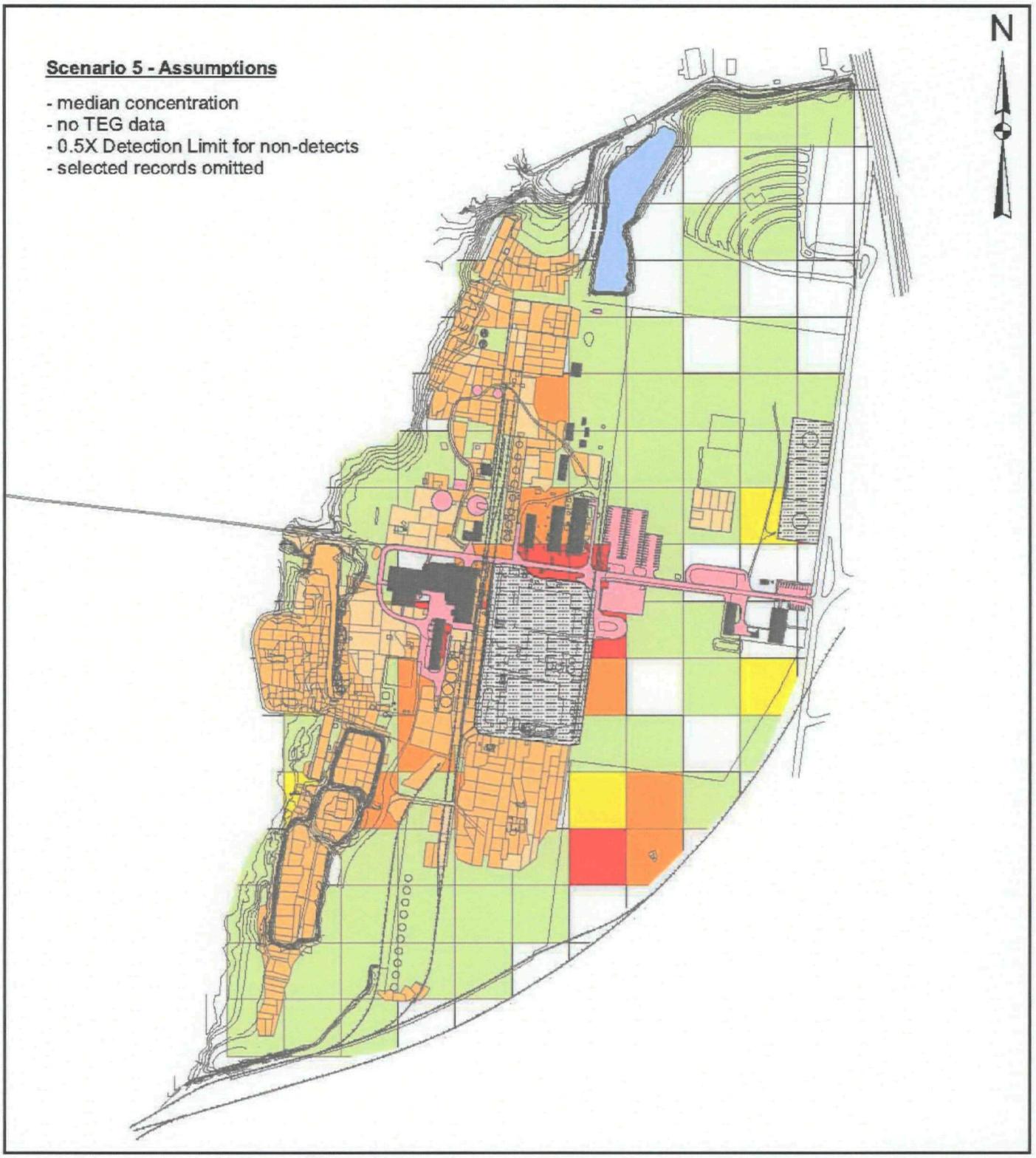

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Figure 3d

Scenario 1
Lead

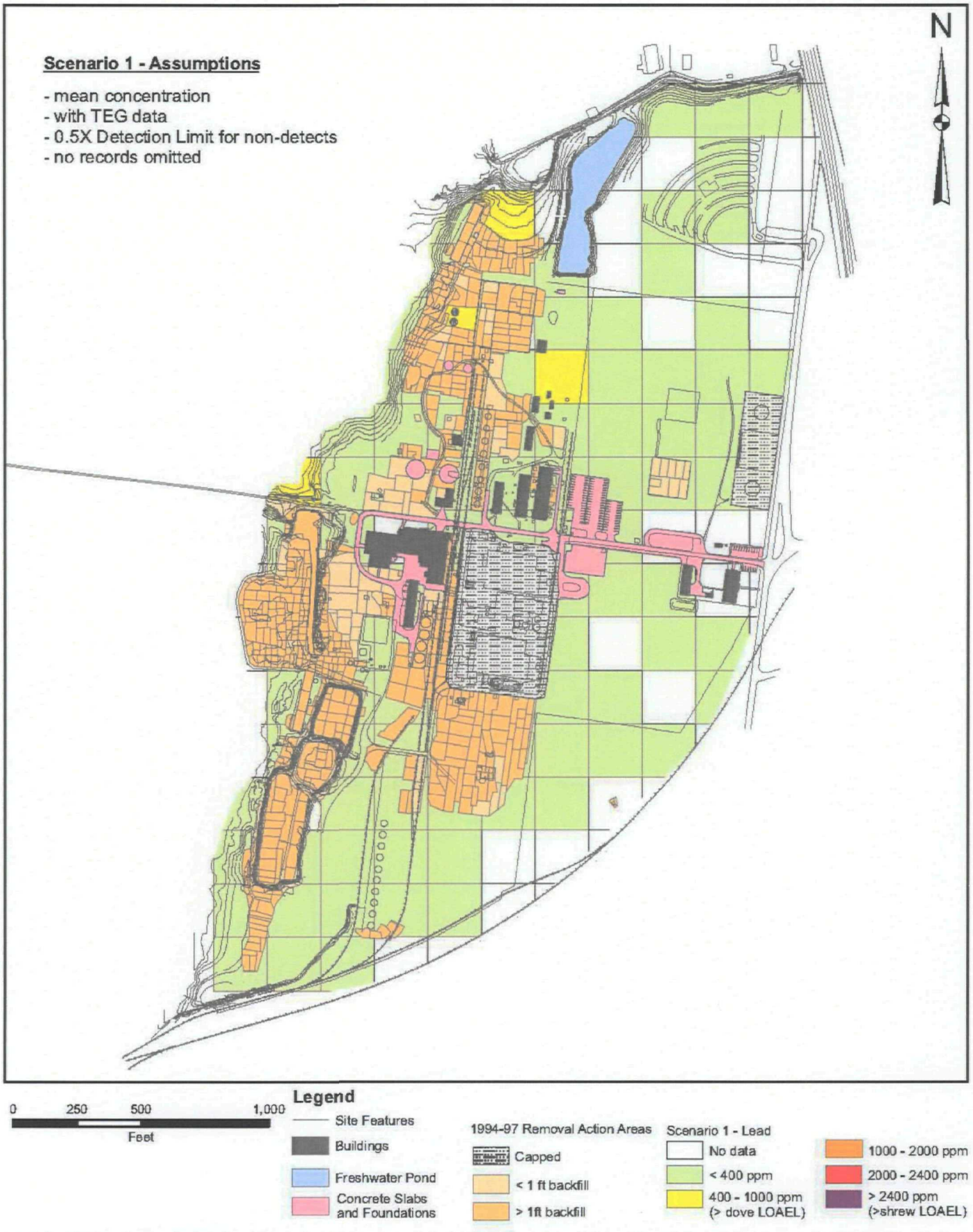

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Figure 4a

Scenario 2
Lead

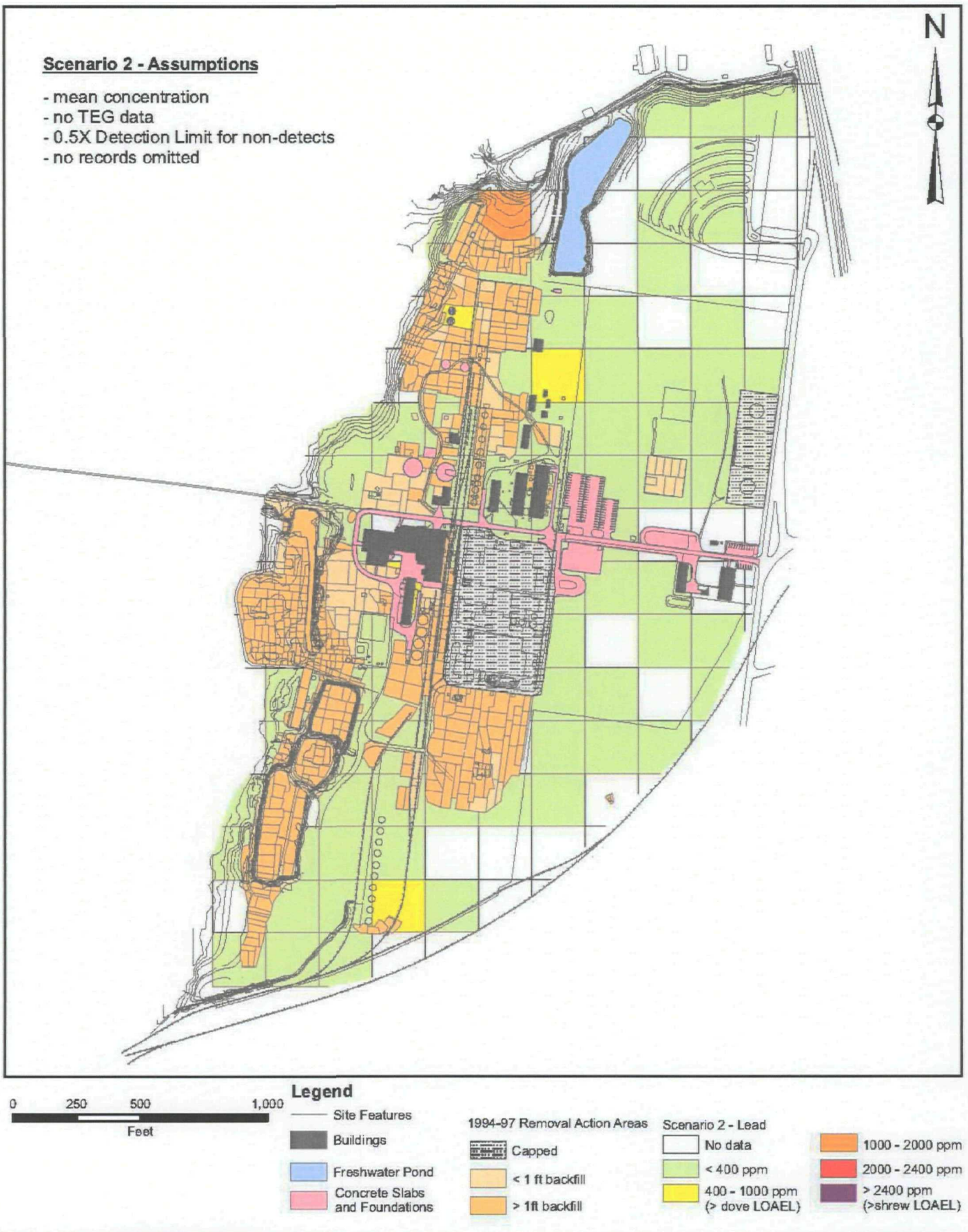
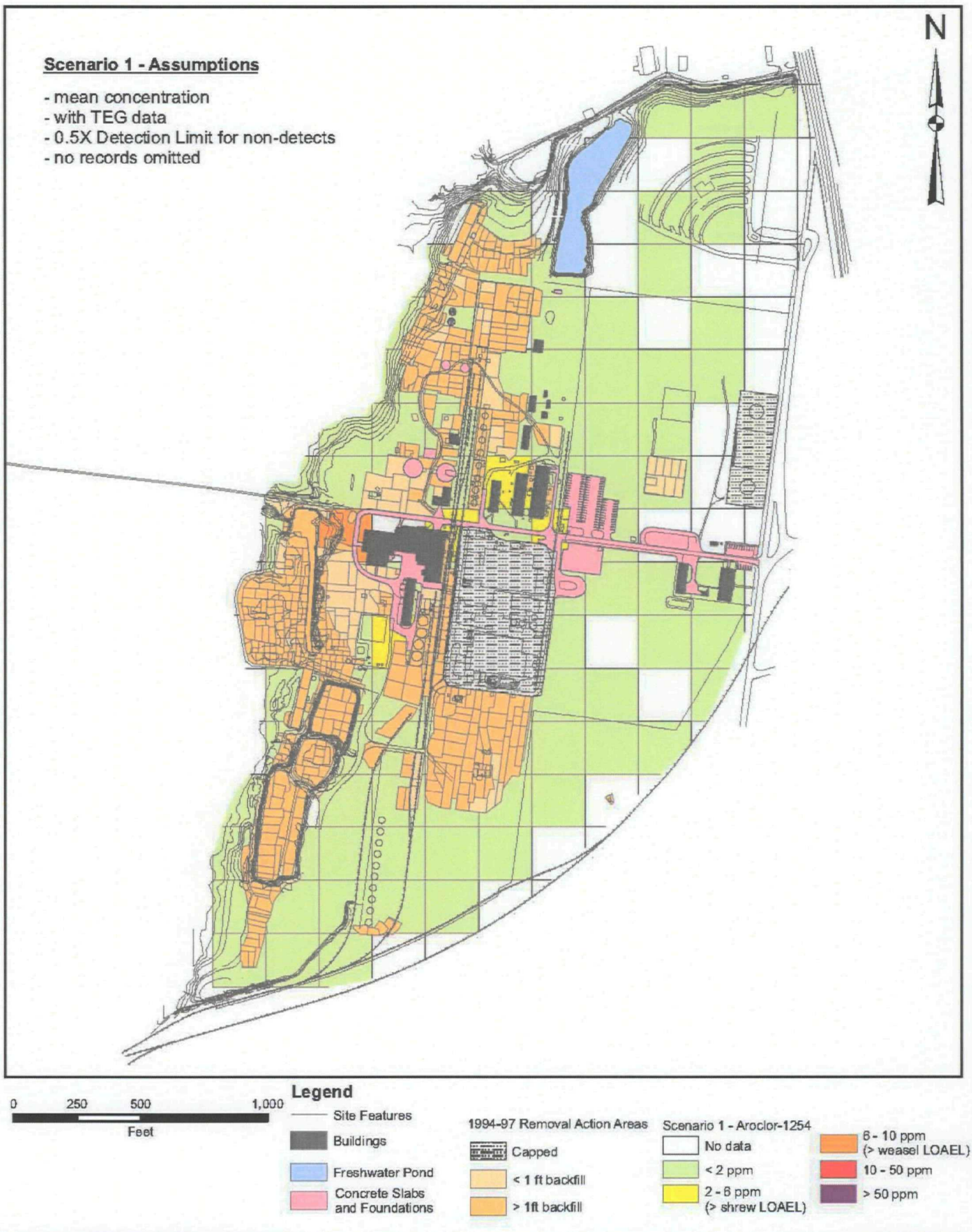


Figure 4b

Scenario 1
Aroclor-1254



Scenario 2
Aroclor-1254

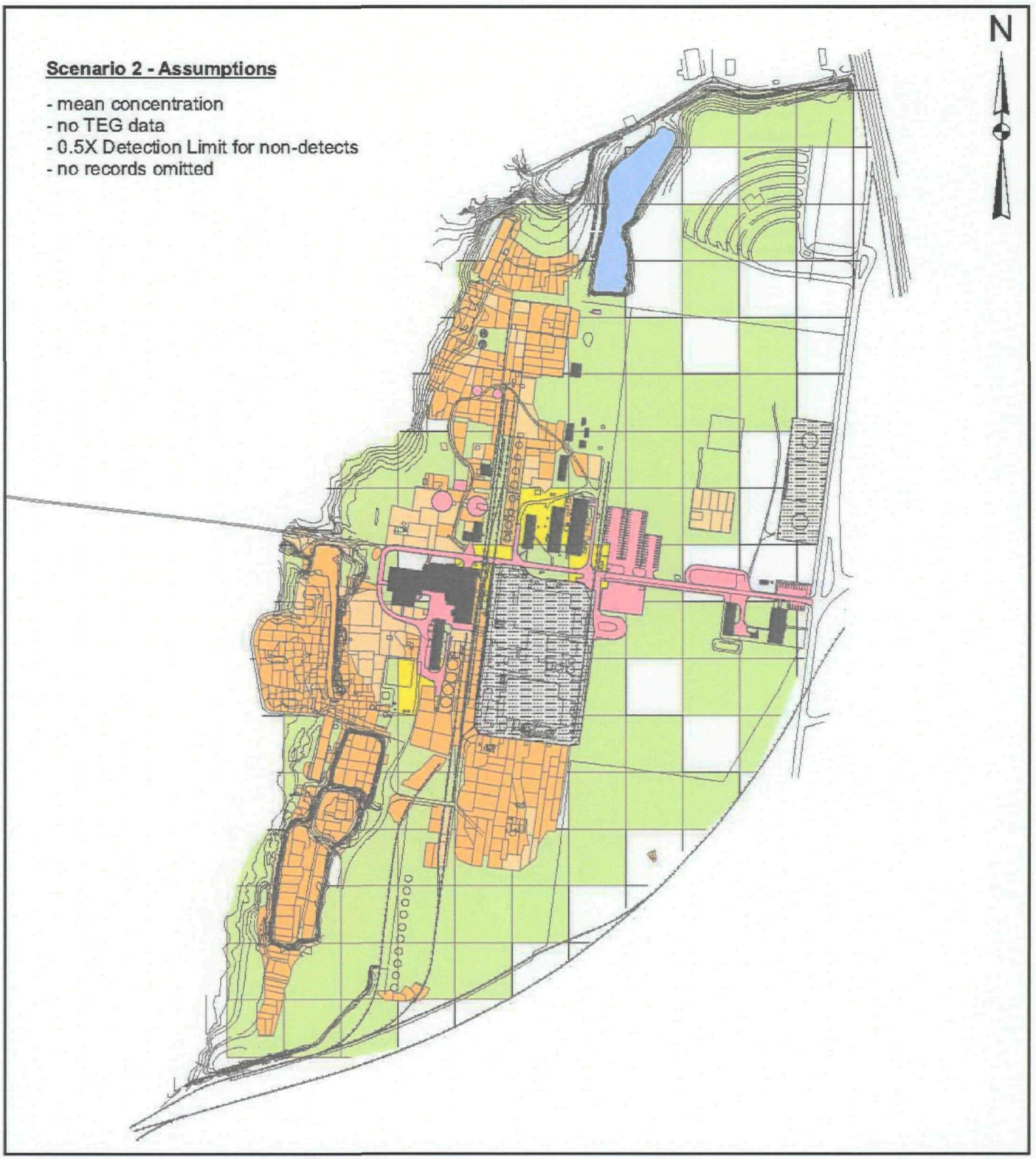


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Figure 5b

Scenario 3
Aroclor-1254

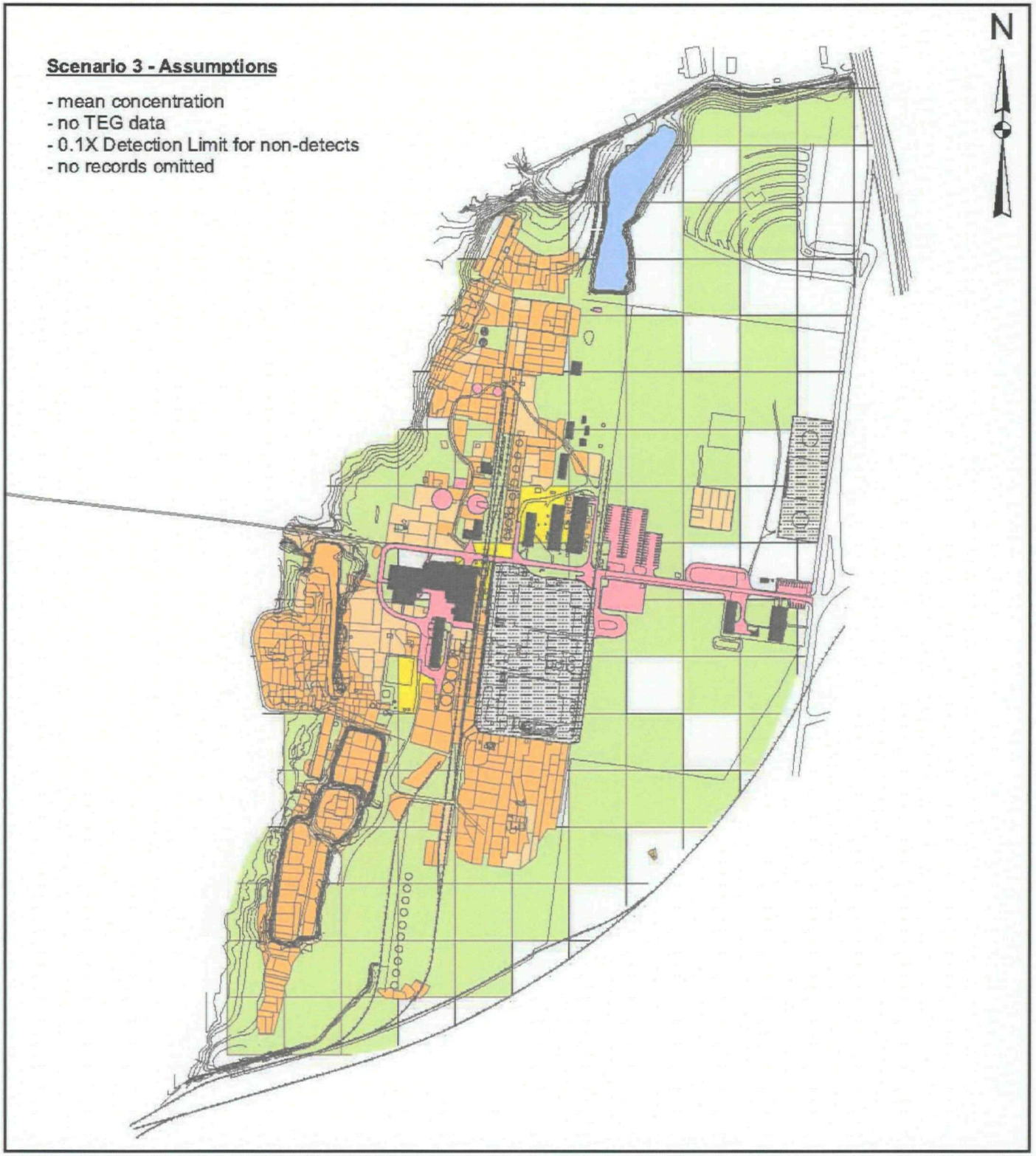

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Figure 5c

Scenario 4
Aroclor-1254

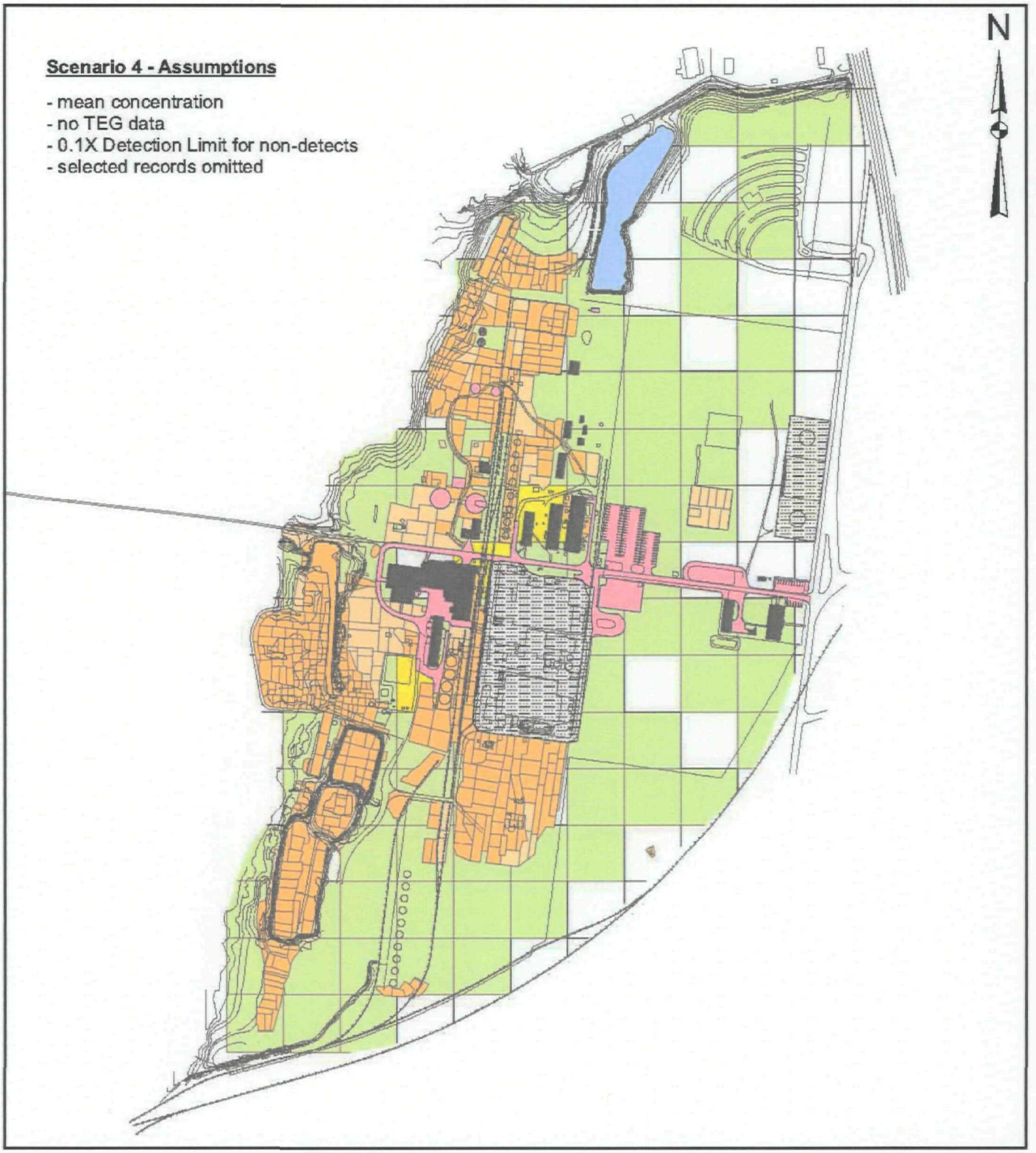

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Figure 5d

Scenario 5
Aroclor-1254

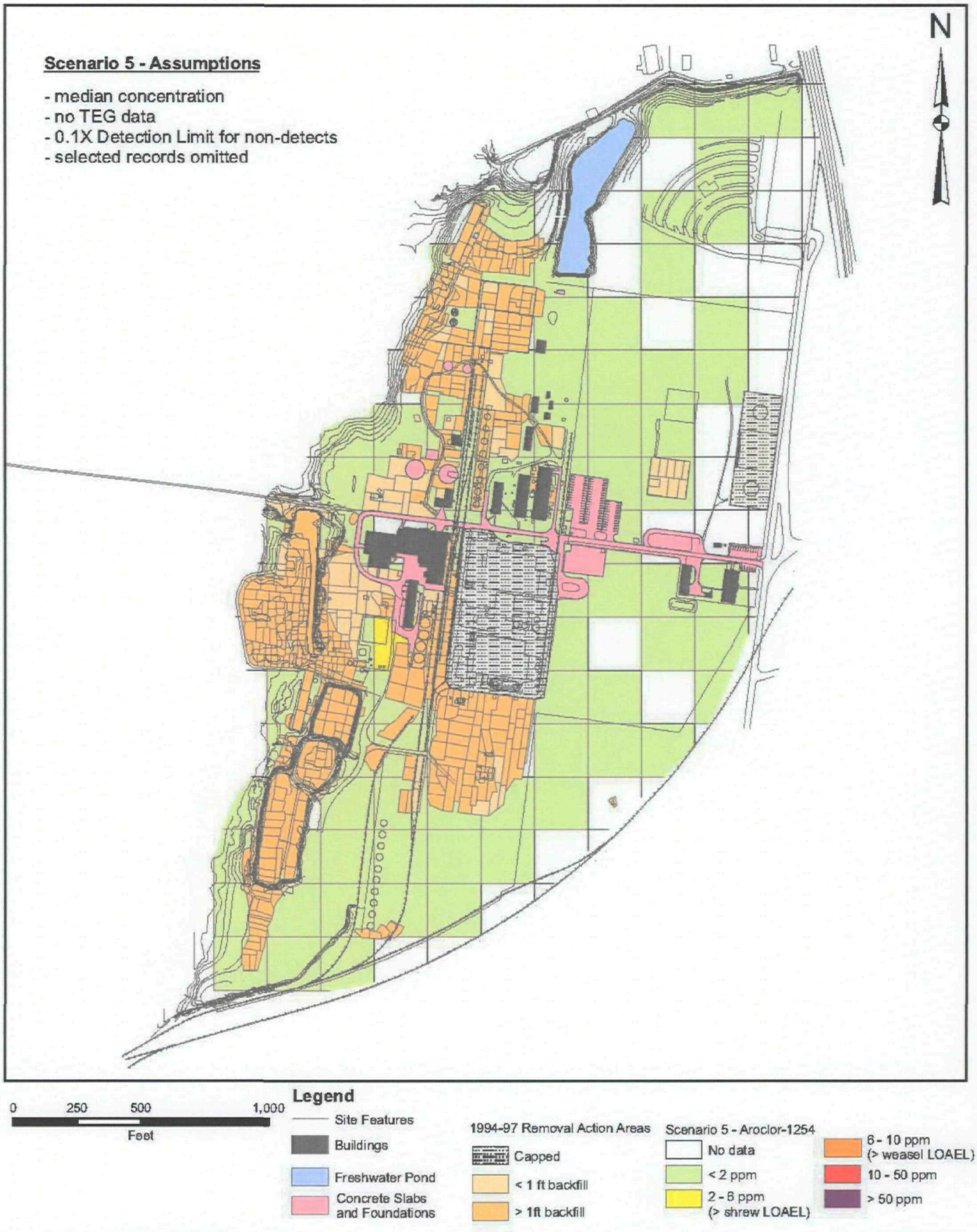

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Figure 5e

Scenario 1
Aroclor-1260

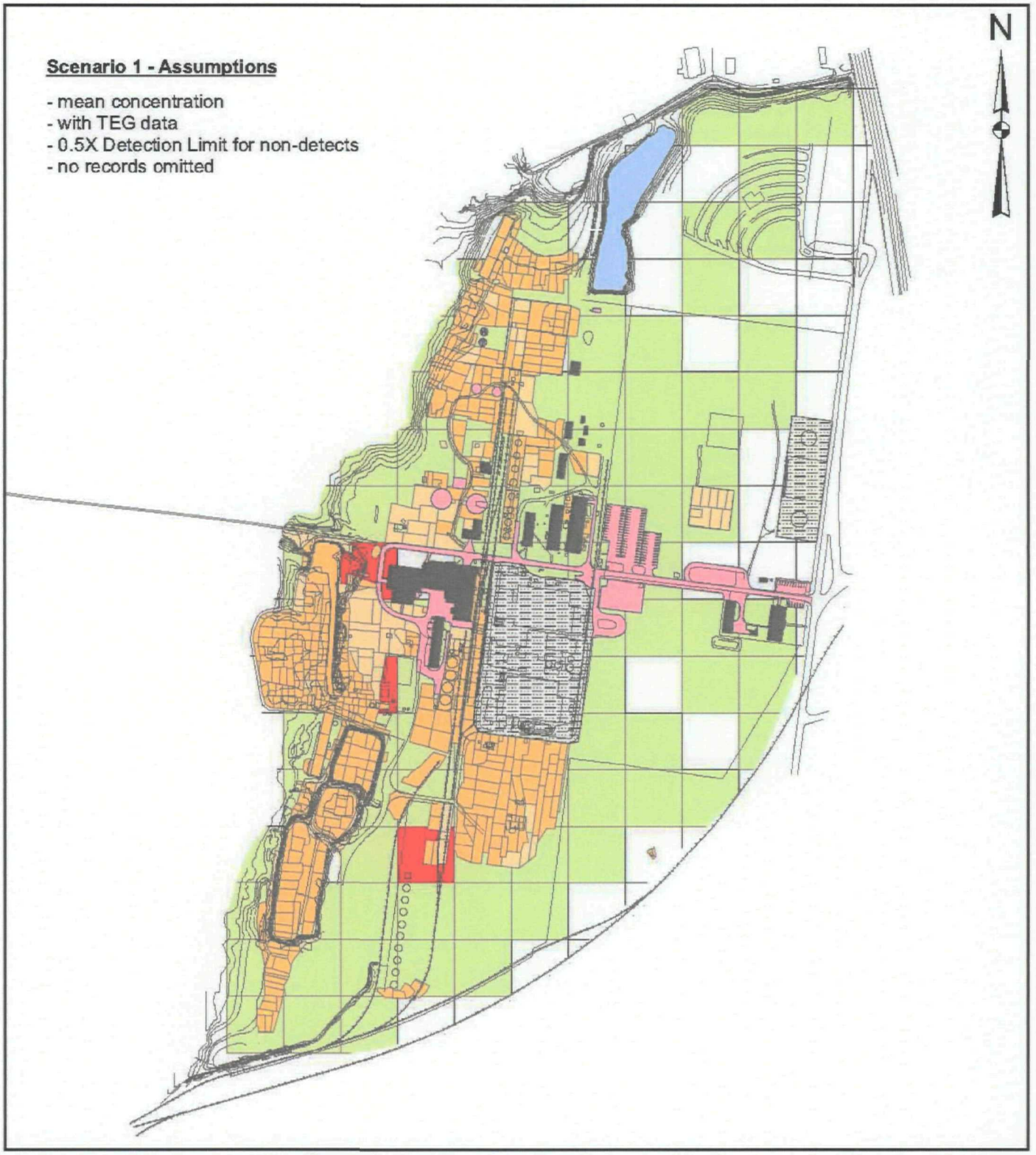

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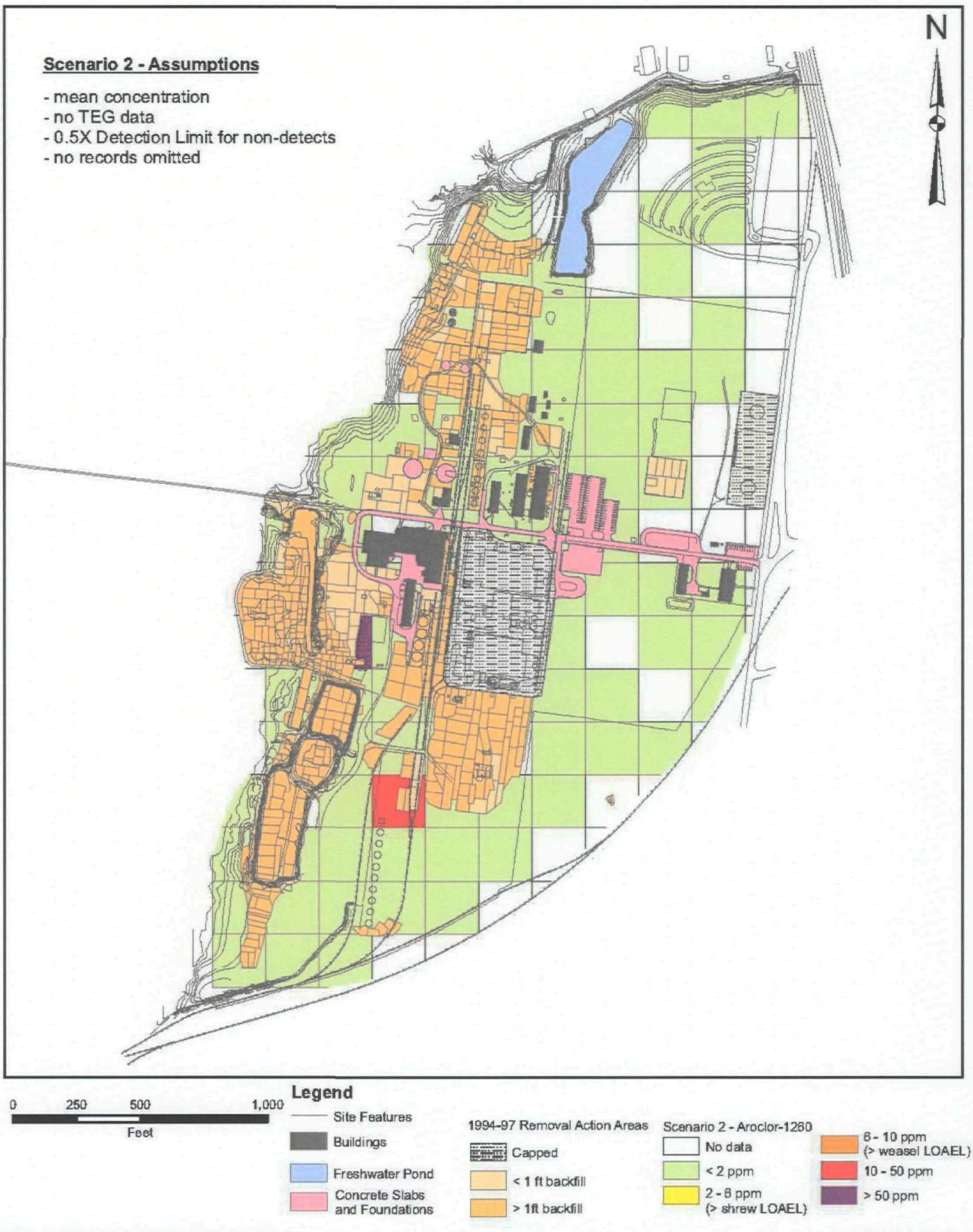
Figure 6a

Scenario 2
Aroclor-1260



Scenario 3
Aroclor-1260

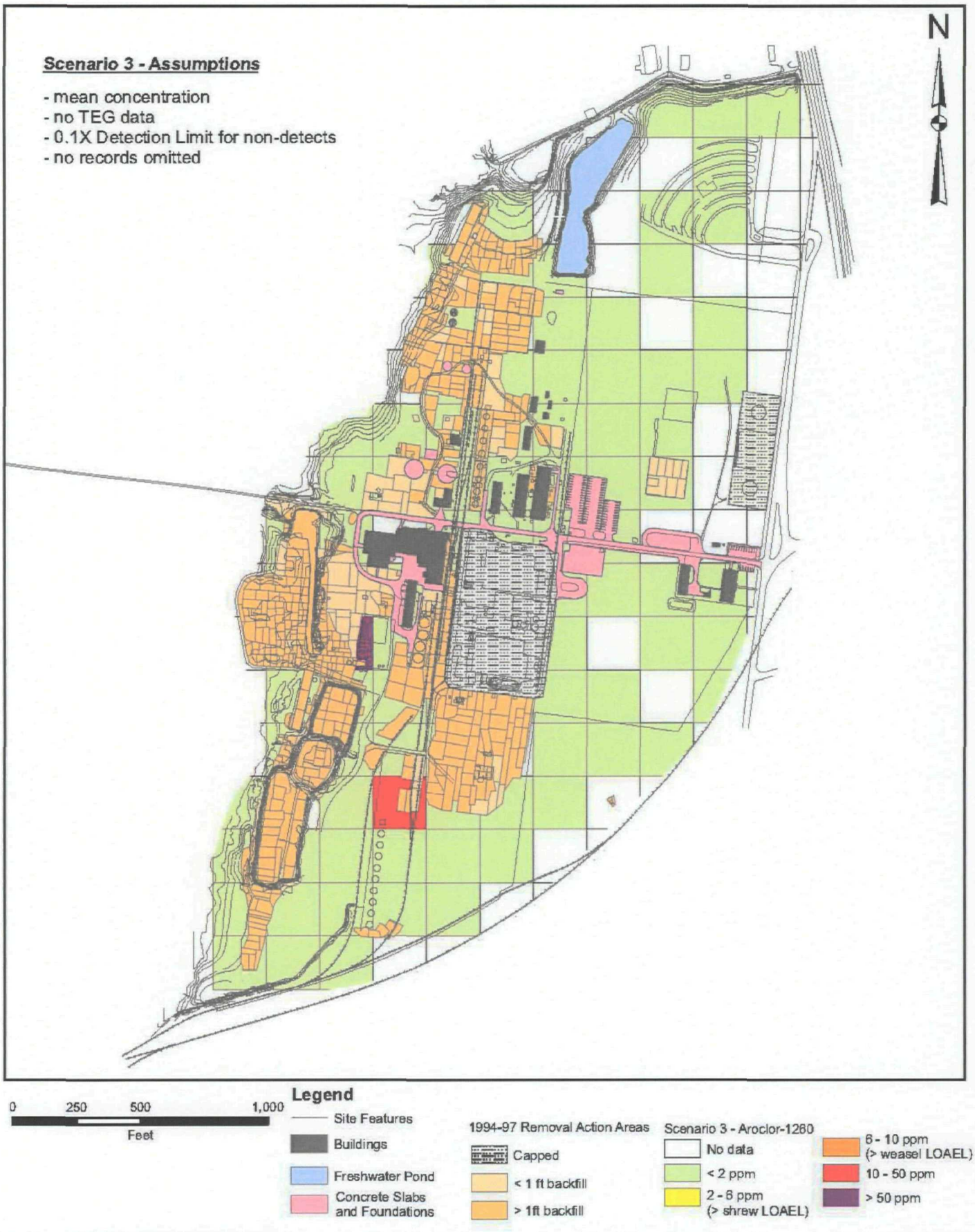


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Figure 6c

Scenario 4
Aroclor-1260

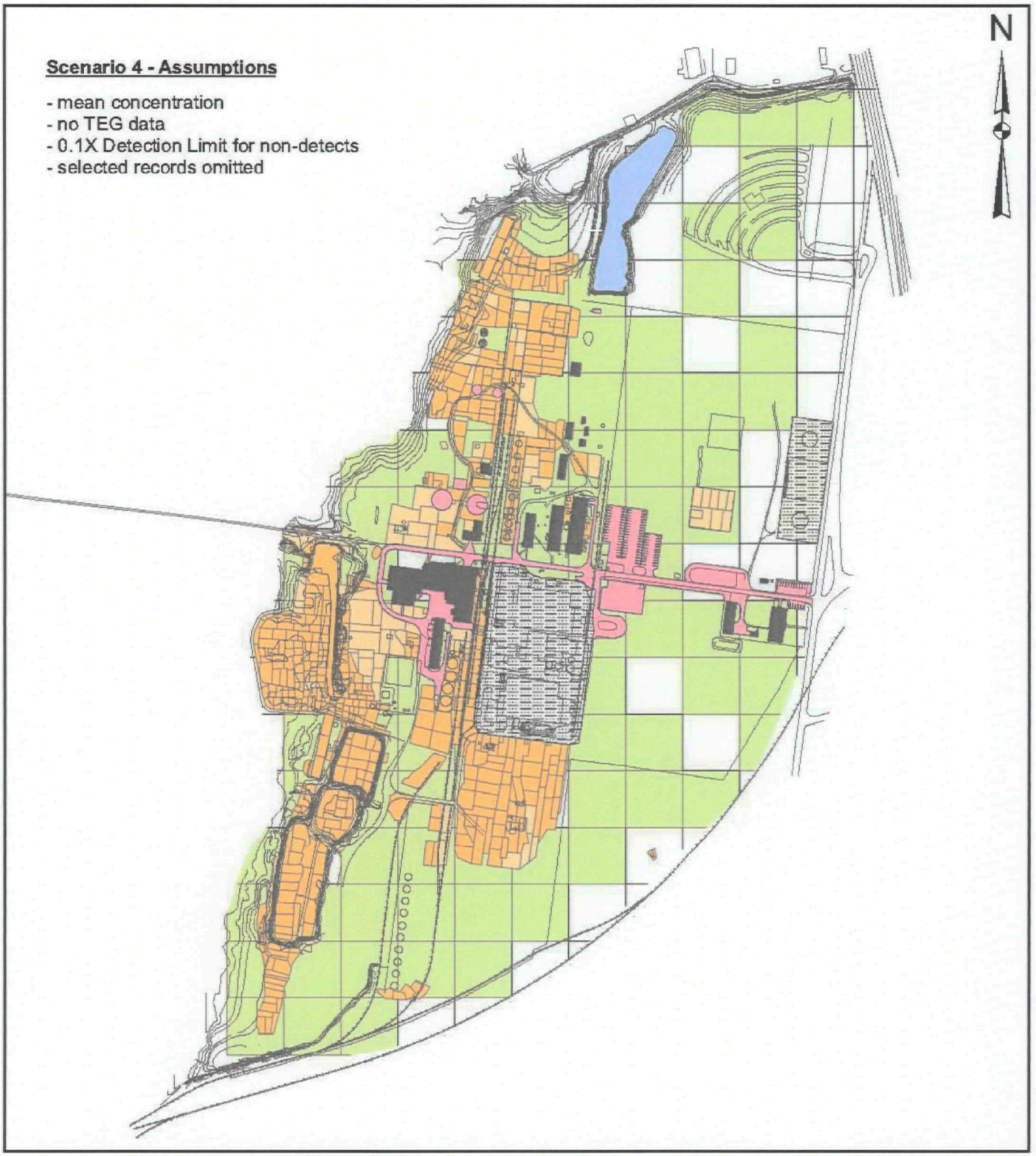

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Figure 6d

Scenario 5
Aroclor-1260

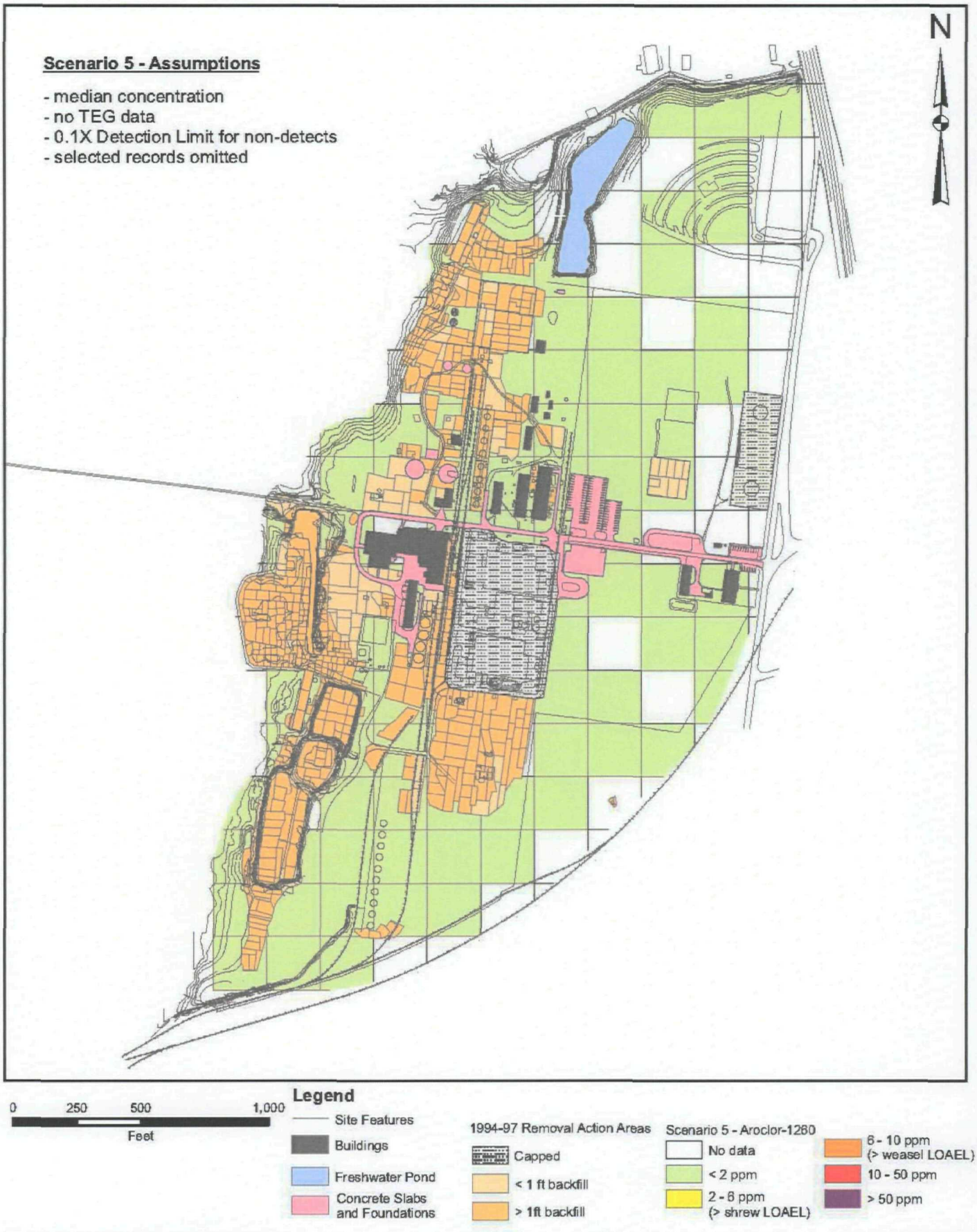

Figure 6e

Scenario 1
Aroclor-1268

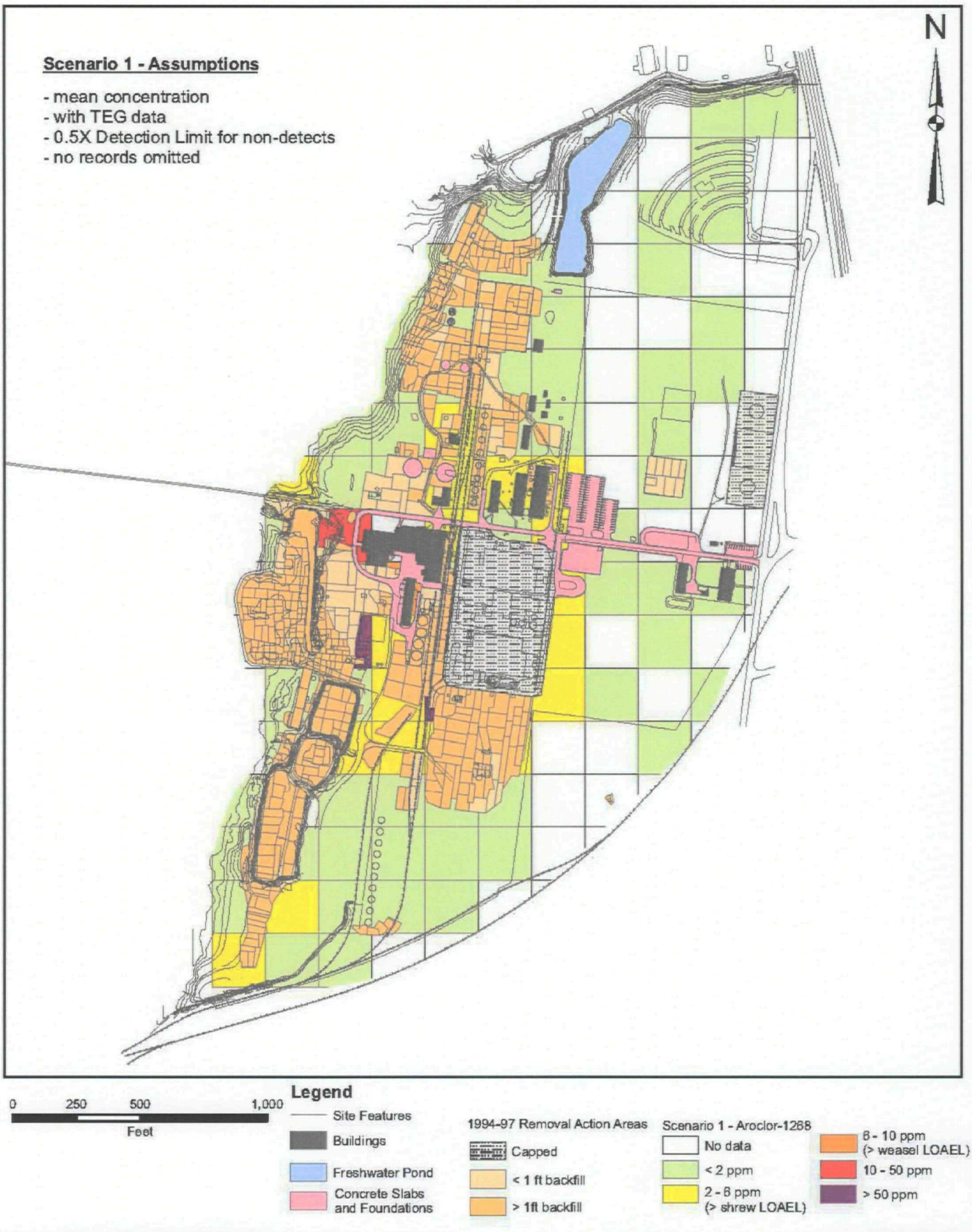

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Figure 7a

Scenario 2
Aroclor-1268

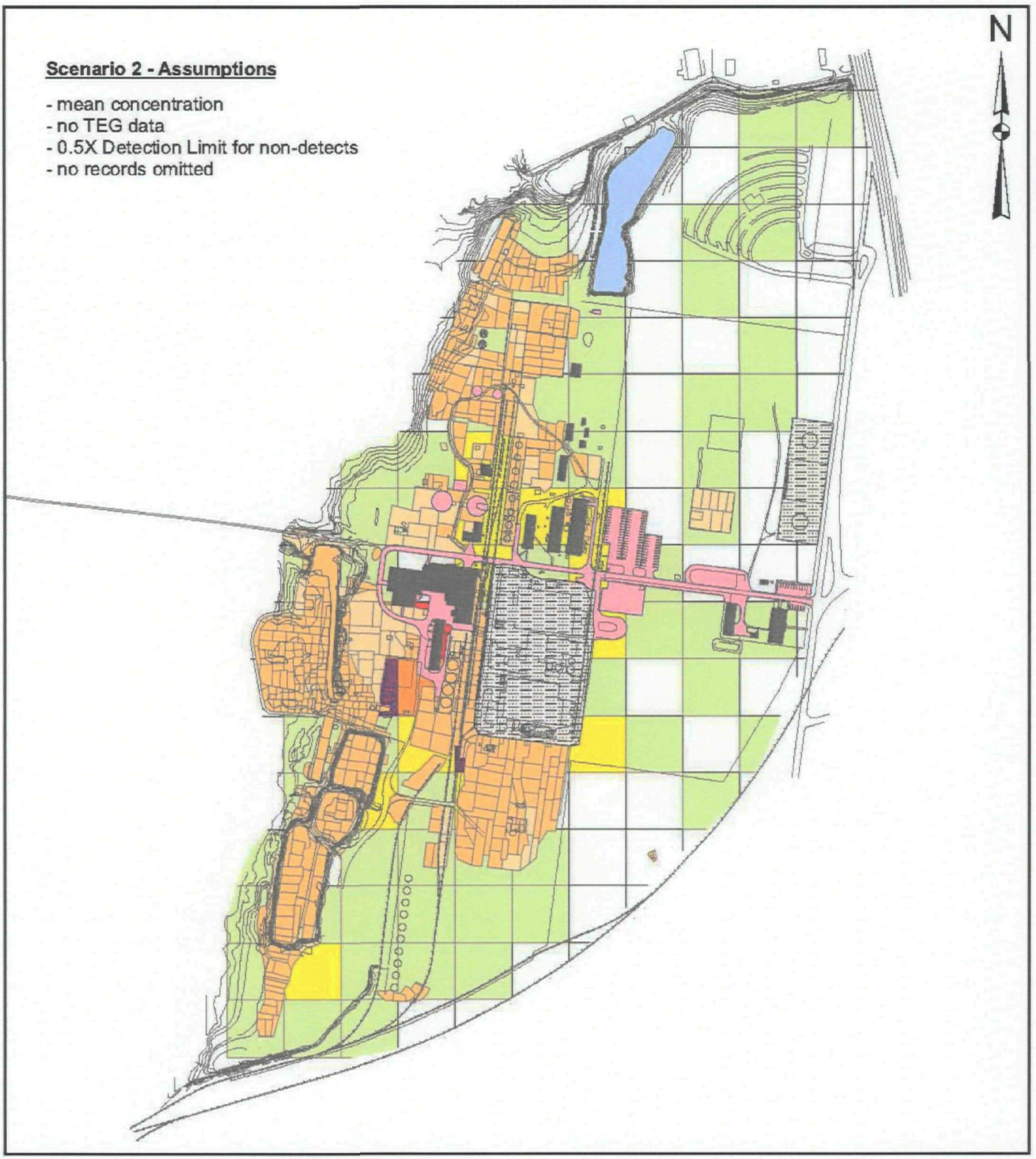

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Figure 7b

Scenario 3
Aroclor-1268

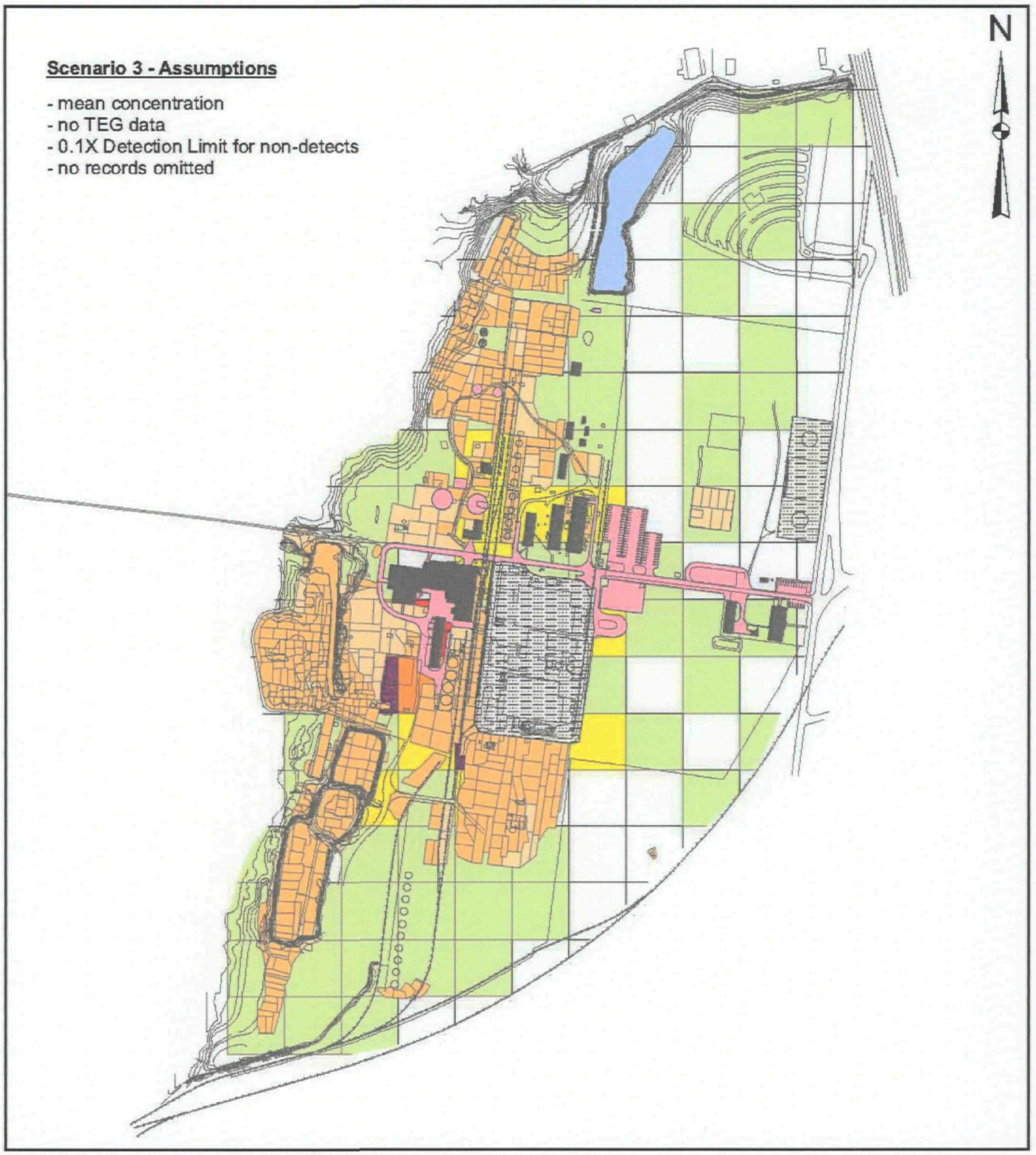

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Figure 7c

Scenario 4
Aroclor-1268

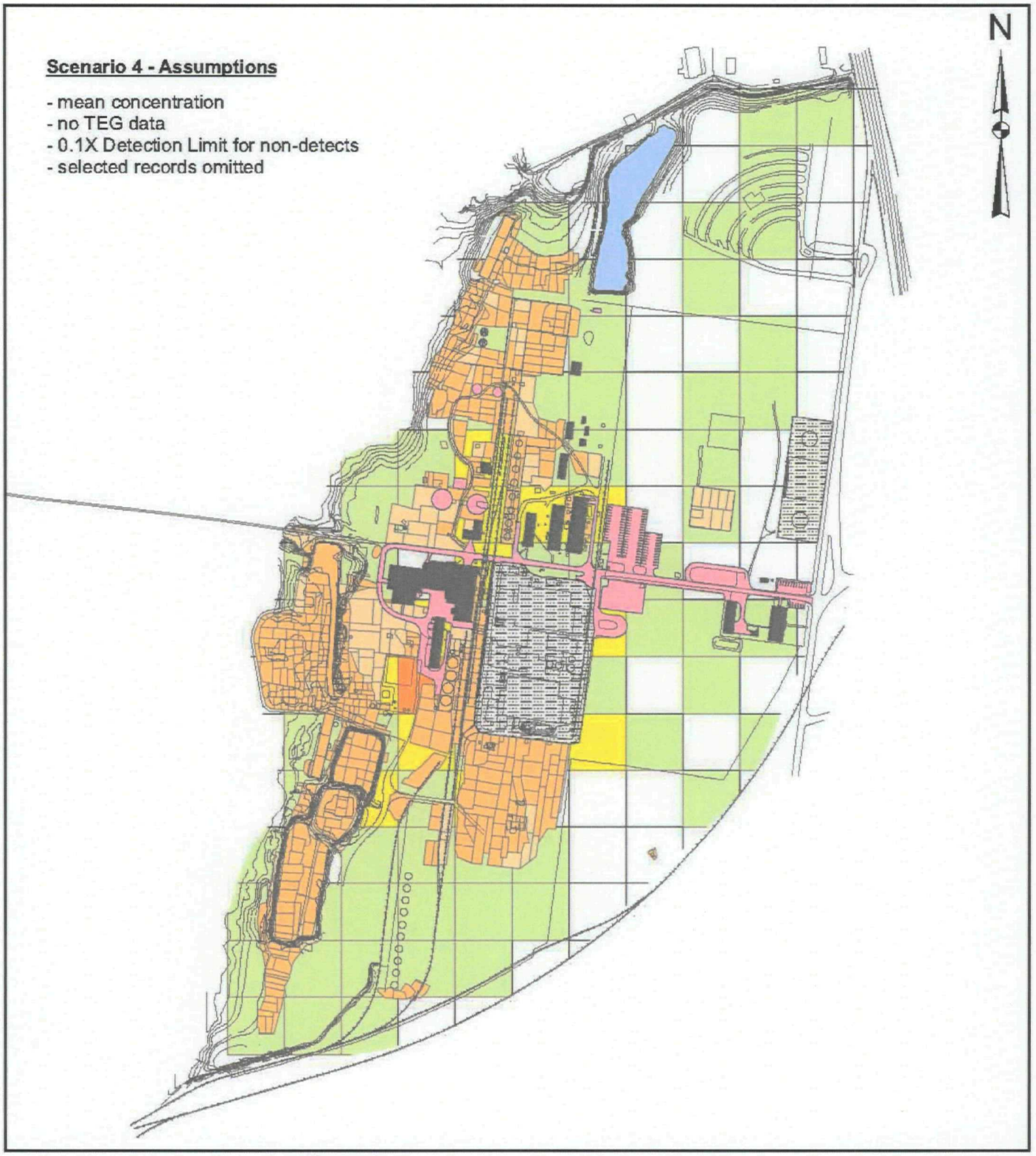

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Figure 7d

Scenario 5
Aroclor-1268

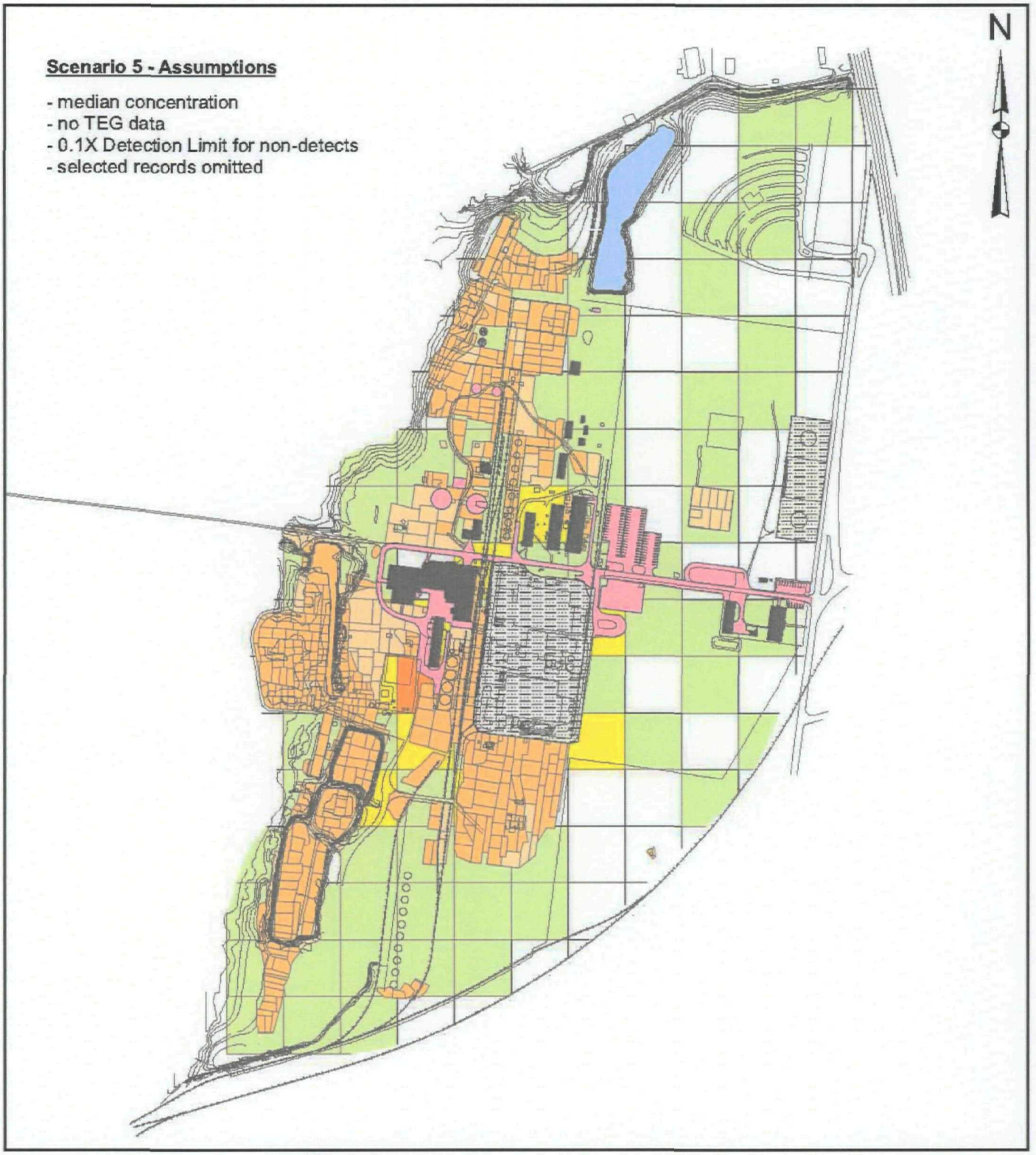

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Figure 7e

Scenario 1
Total PCBs

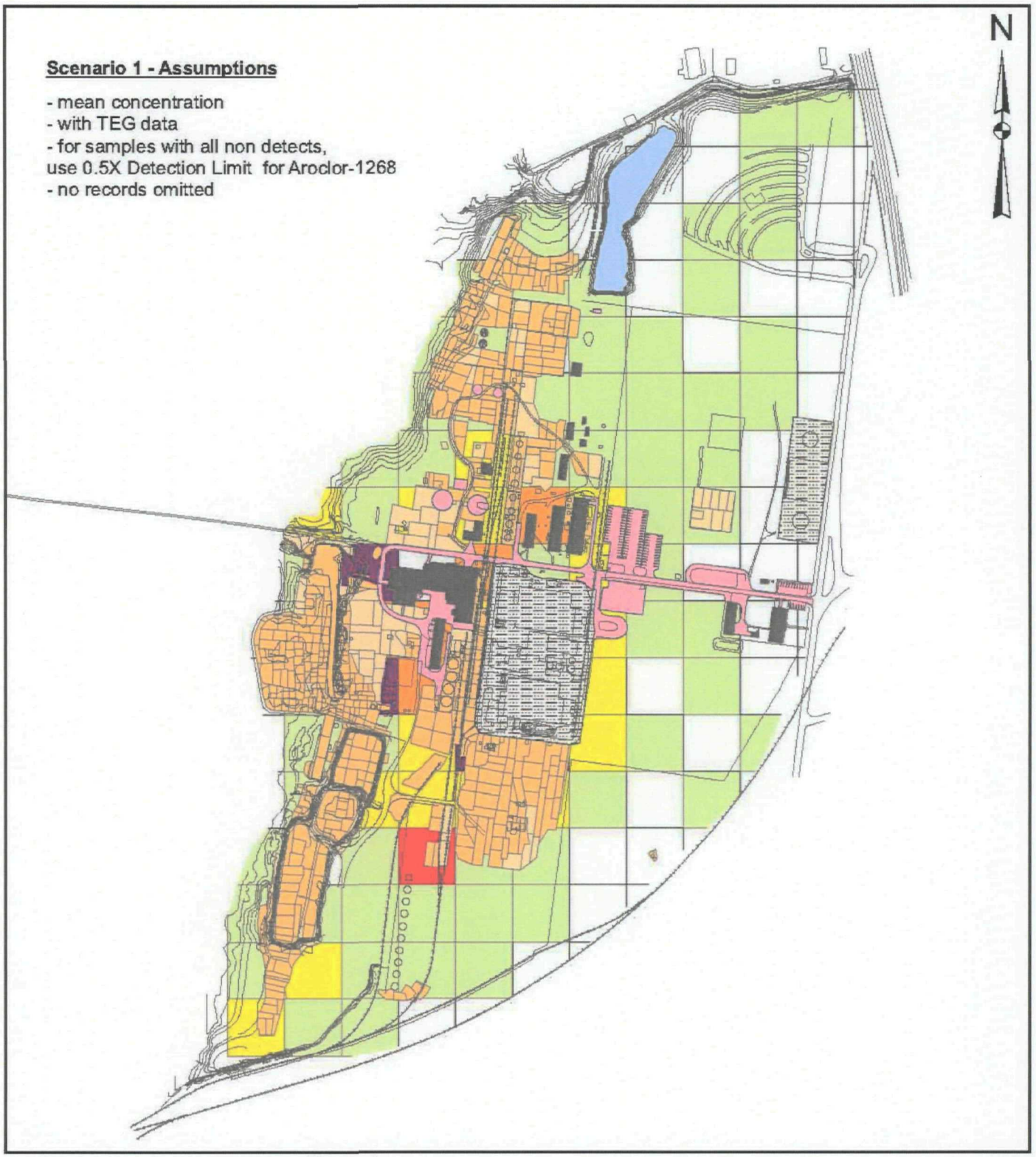

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Figure 8a

Scenario 2
Total PCBs

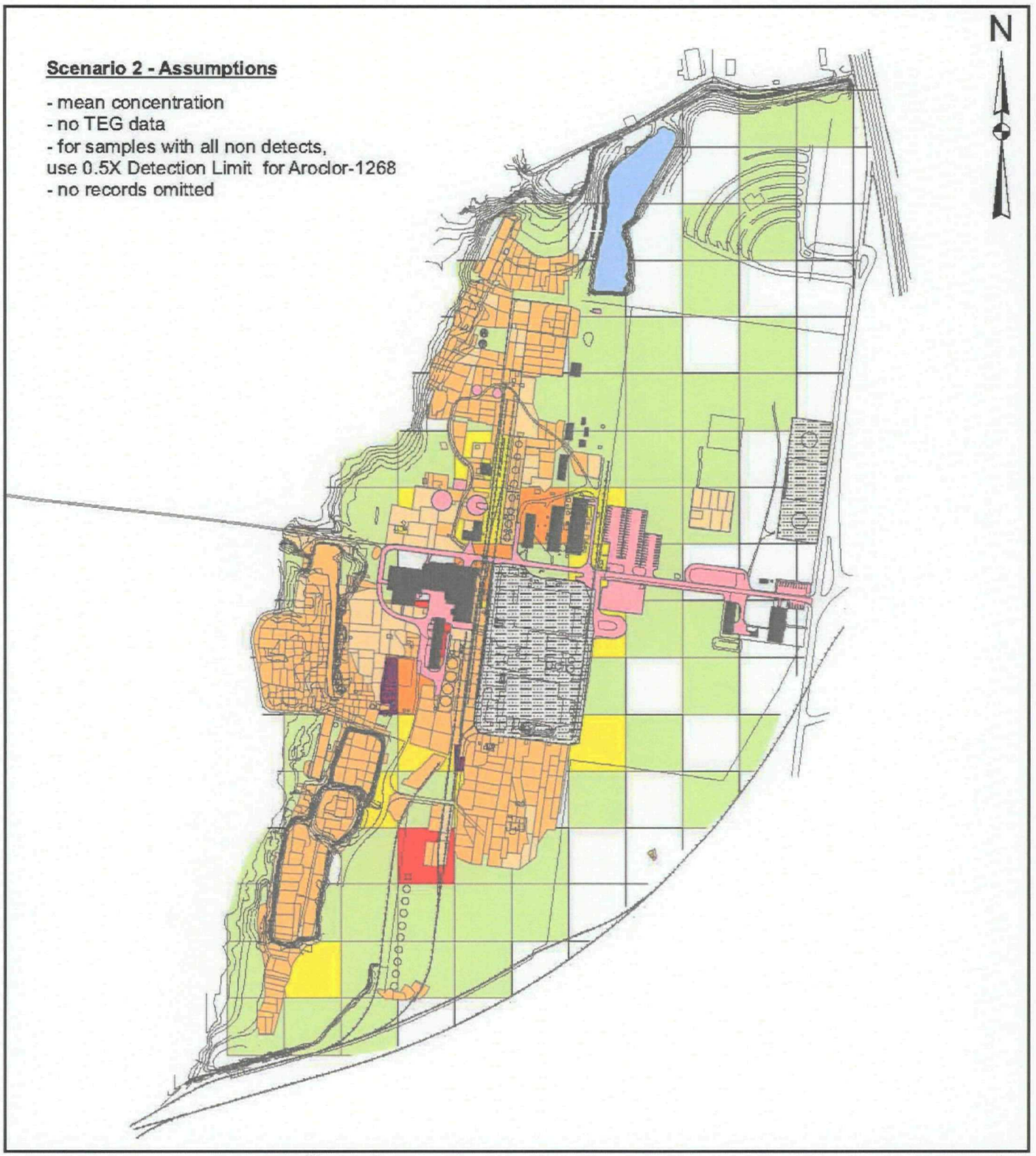

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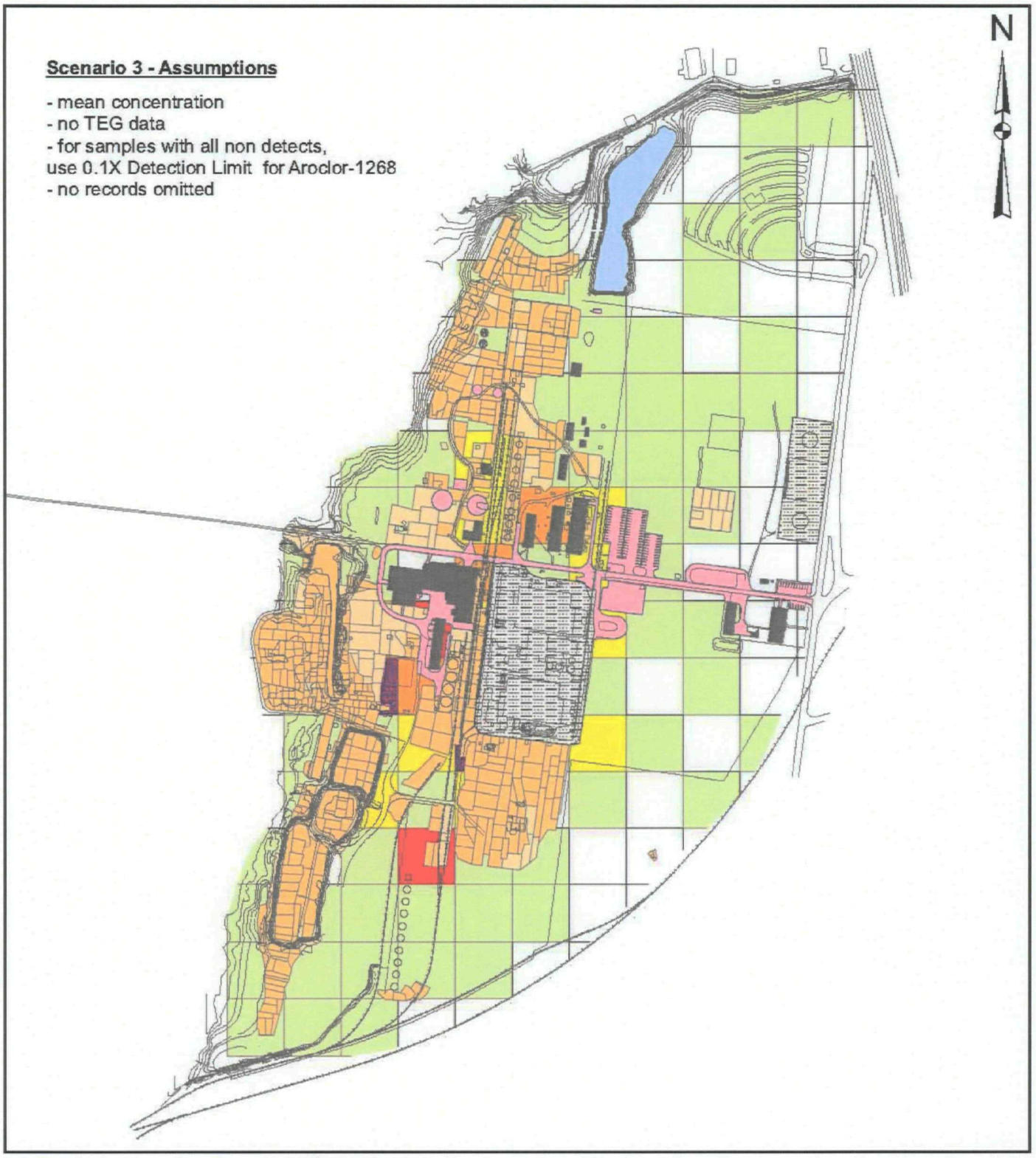
Figure 8b

Scenario 3
Total PCBs



Scenario 4
Total PCBs

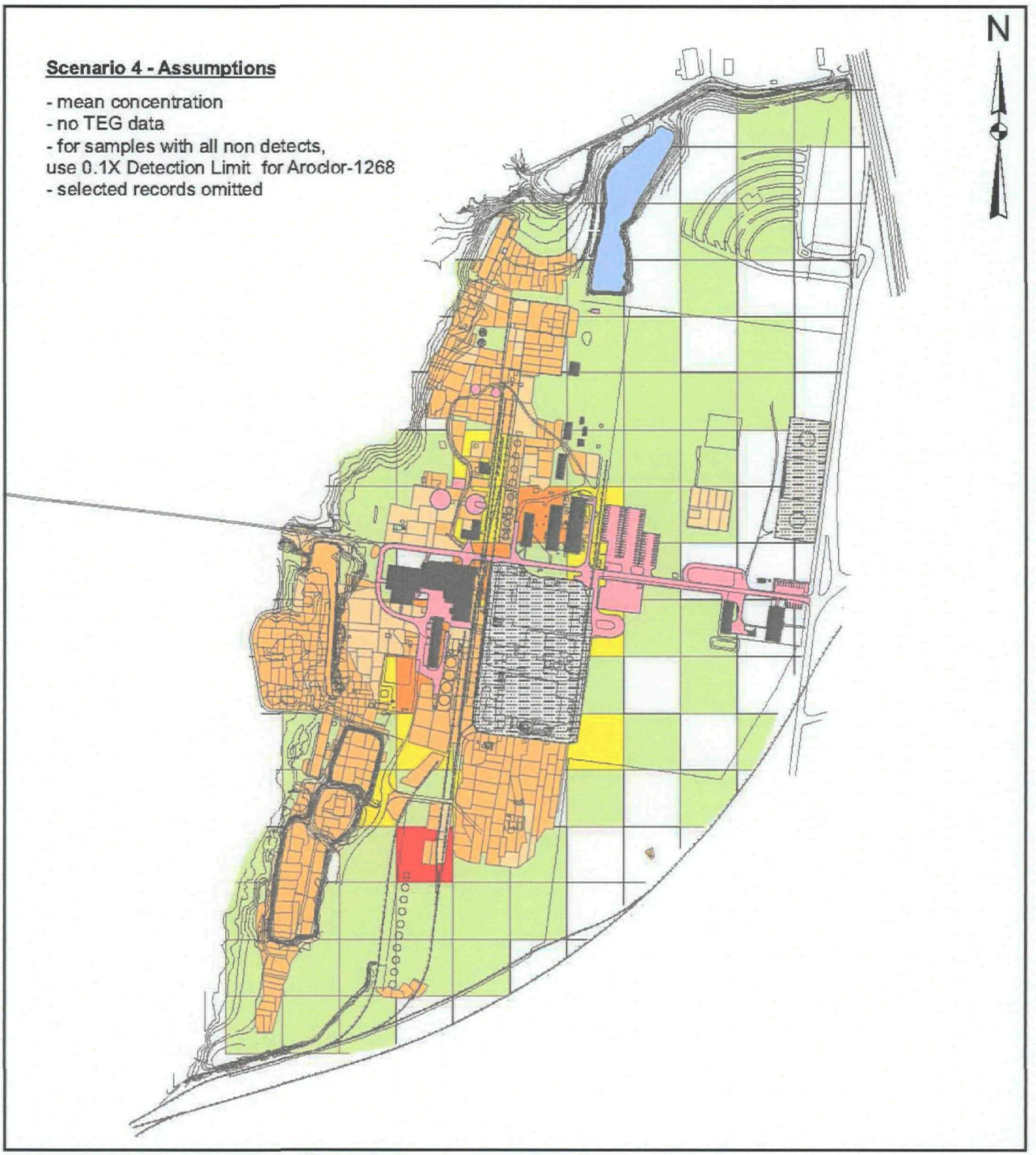


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Figure 8d

Scenario 5
Total PCBs

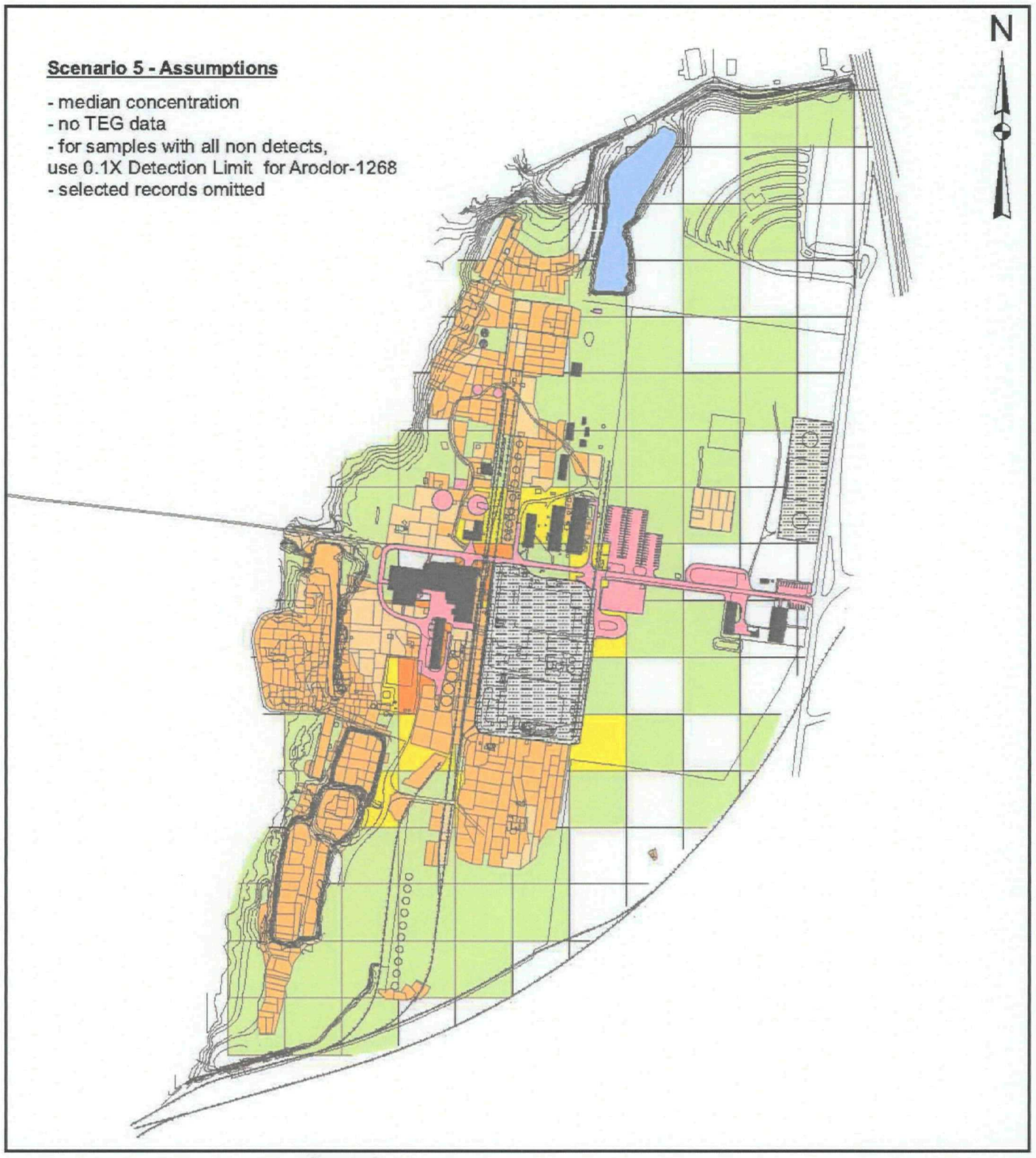

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Figure 8e

Grids for Quantitative Evaluation of Backfill Effects in the Quadrant 4 Focus Area

Quantitative Evaluation of Backfill Effects on Mercury Concentrations in the Quadrant 4 Focus Area

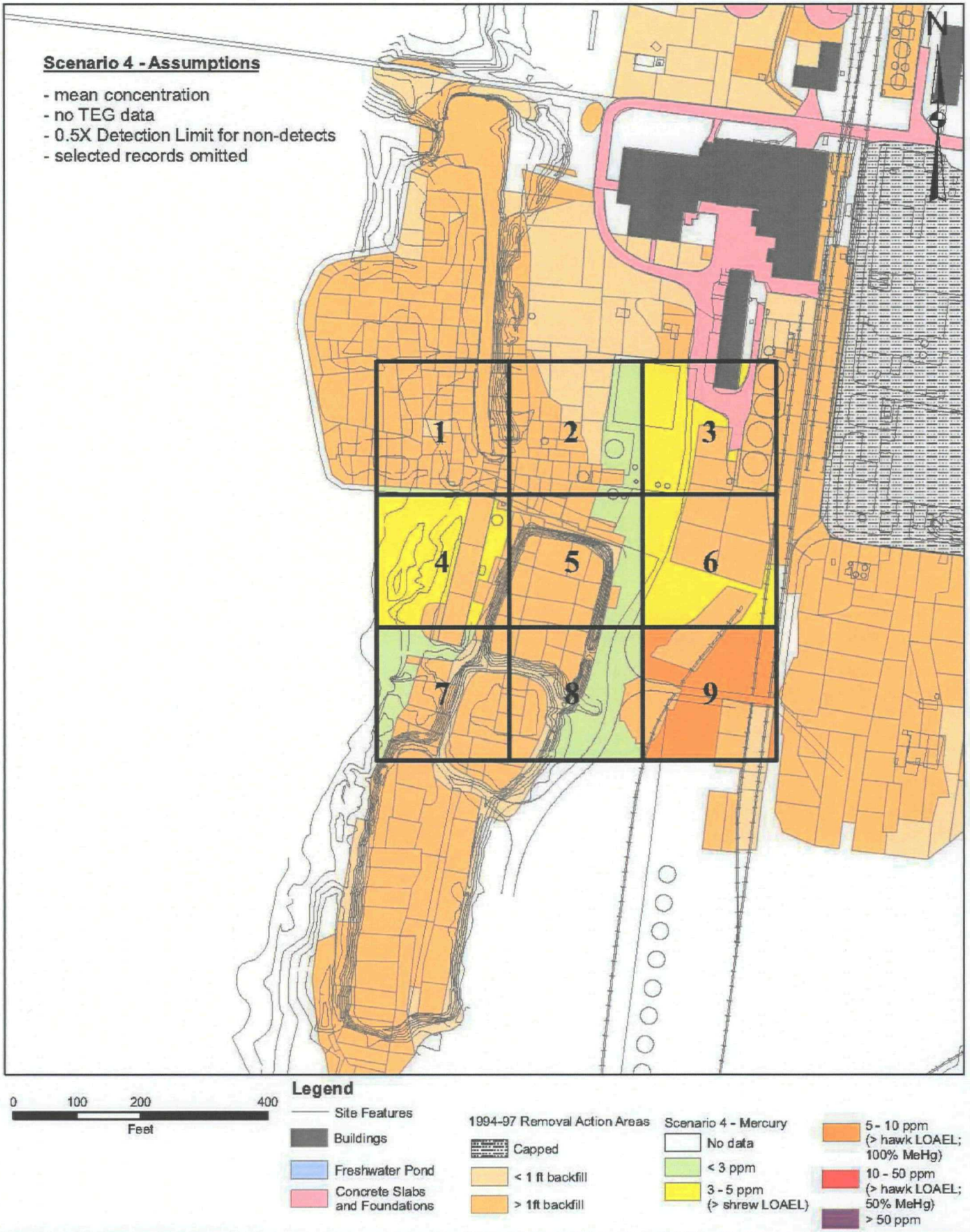

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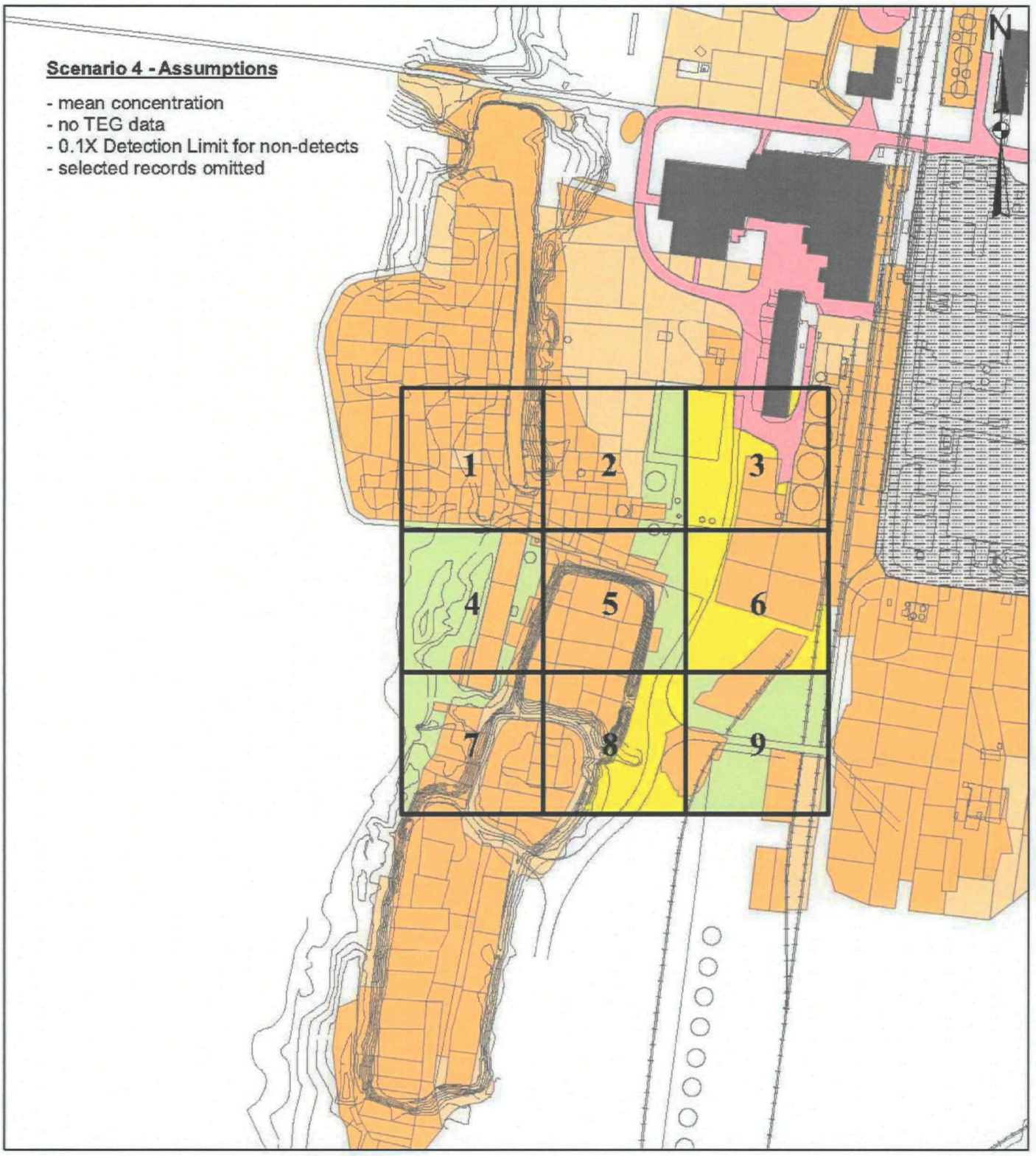
Figure 9b

Quantitative Evaluation of Backfill Effects on Aroclor-1268 Concentrations in the Quadrant 4 Focus Area



Quantitative Evaluation of Backfill Effects on Total PCB Concentrations in the Quadrant 4 Focus Area