SOURCE CONTROL AND MOBILE BUSINESSES: IDDE DATA ANALYSIS

Technical Memorandum

Prepared for: King County and Washington State Department of Ecology

Project No. 200212-A-04B • July 8, 2022 FINAL

Aspect CONSULTING

earth + water

SOURCE CONTROL AND MOBILE BUSINESSES: IDDE DATA ANALYSIS

Technical Memorandum

Prepared for: King County and Washington State Department of Ecology

Project No. 200212-A-04B • July 8, 2022 FINAL

Aspect Consulting, LLC

James Packman, PMP
Associate Hydrologist
jpackman@aspectconsulting.com

Brian Hite
Project Scientist
bhite@aspectconsulting.com

V:\200212 KC Mobile Businesses SAM Study\Deliverables\IDDE Data Analysis\Final\Memo_Final_IDDE-Mobile Businesses_070822.docx

Contents

List of Tables

List of Figures

List of Appendices

Acronyms

Aspect	Aspect Consulting, LLC
BMP	Best Management Practice
Ecology	Washington State Department of Ecology
IDDE	Illicit Discharge Detection and Elimination
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
PARIS	Ecology's Water Quality Permitting and Reporting Information System
QA	Quality Assurance
SAM	Stormwater Action Monitoring
Source ID	Source Identification
Study	This SAM study
UIC	Underground Injection Control

Executive Summary

This technical memorandum provides a summary of an illicit discharge detection and elimination (IDDE) data analysis performed as part of a Stormwater Action Monitoring (SAM) study (Study). The SAM program is a collaborative, regional stormwater monitoring program that is administered by the Washington State Department of Ecology (Ecology) and funded by more than 90 western Washington cities and counties, the ports of Seattle and Tacoma, and the Washington State Department of Transportation. Ecology's stated goal for the SAM program is to improve stormwater management to reduce pollution, improve water quality, and reduce flooding.

This Study is focused on stormwater source control and mobile businesses, and the IDDE analysis conducted here helps to identify what types and sources of pollution are associated with mobile businesses. In the context of stormwater, illicit discharges are non-stormwater discharges to municipal separate storm sewer systems (MS4) that are considered to be prohibited by the National Pollutant Discharge Elimination System (NPDES) permits (Ecology, 2019). Specifically, illicit discharges are those not on the "allowed" or "conditionally allowed" lists in the permits. Likewise, illicit connections are sewer connections to the MS4 that result in illicit discharges.

The data analyzed were from the first year (calendar year 2020) that IDDE data were required to be submitted using a new data entry template. The template is from an Appendix to the 2019-2024 permits that require this work, specifically section S5.C.5.G of the NPDES municipal stormwater permits. The Permit Appendix contains 12 questions for each IDDE investigation reported. Key findings are as follows:

- **Record Total:** The 2020 dataset was comprised of 542 records from Phase I permittees and 1,317 records from Phase II permittees (just over 1,800 total).
- **Template and Data Quality:** The current data entry template in the Permits is helping to improve the quality of the data and consistency of the records. A similar study on data from 2014 (Aspect Consulting, 2017) conducted under a different data entry template had 25 percent of records submitted (over 700) flagged as inconclusive or not an IDDE incident upon review. The 2020 data had no records flagged as inconclusive, though a few were adjusted based on text notes.
- **Noted data gap:** Consistent with other studies, this data analysis showed that the most common illicit discharges and their sources are automobile and equipment related first, followed by construction activity and discharges second, and sewage or pet/animal waste third. Notably, the second most common response to the Pollutant Identified question was *Unconfirmed, Unspecified, or Not Identified*.
- **Discharge to MS4:** Slightly less than half of incident reports resulted in discharge to the MS4.

- **Mobile business sources:** *Mobile businesses* are one of the standardized answer options for the source or cause of an incident (Permit Appendix question 9). Analysis was done on these records and showed the following key results:
    - Mobile businesses had a unique distribution of pollutants identified. These included fuel and vehicle-related pollutants as the most common (like the larger data set), but then emphasis on *Soap or Cleaning Chemicals* and *Other Wastewater*.
    - **Observation Dominant Approach:** Some records indicated additional pollutant sources or causes associated with mobile businesses, including *Construction Activity* and *Vehicle-Related Business*. This result sheds light on how permittees characterize and categorize mobile businesses.
    - The source tracing approaches used for mobile business incidents were almost all by *Observation*. Unlike the full dataset, in-pipe and field indicators were almost never used for mobile business incident source tracing.
    - Correction and elimination methods used for mobile business incidents had the same relative distribution as the full dataset. *Clean-Up* and *Education/Technical Assistance* were by far the two most common responses.
    - **Representativeness:** The analysis of mobile business IDDE sources was heavily influenced by the high proportion of records from one permittee who represented 49 out of 65 incident reports.
- **User-added notes:** In the IDDE records indicated additional pollutants, sources, source tracing approaches, and correction methods. Some of these could be potentially included` in the standardized answers in the Permit Appendix questions:
    - Other Pollutants Identified (Question 8)
        - Potable or irrigation water
        - Solvent
        - Landfill leachate
        - Construction wastes (concrete slurry, dewatering discharge, hydraulic oil spill)
        - Treated effluent
        - Algae or bacteria
        - Fertilizer chemicals, pesticides, or herbicides
        - Allowable discharges (per Permit)
    - Other Sources or Causes (Question 9)
        - Emergency response activity
        - Ground water
        - Pipe or pump issues
        - Erosion
        - Combined sewer overflow
        - Downspouts
        - Derelict, sunken, or grounded boat or vessel

- Other Source Tracing Methods (Question 10)
  - Pipe camera/video
  - Records from stormwater facility or POTW (e.g., vault, lift station, treatment facility)
  - Sediment deposition evidence
- Other Correction Methods (Question 11)
  - Unclog, pump-out, or flush system
  - Temporary facility closure
  - Natural attenuation
  - Clean-up/out homeless encampment
  - Pipe or BMP repair

This Executive Summary should only be used in the context of the full report.

1 INTRODUCTION

This technical memorandum provides a summary of data analysis performed for a Stormwater Action Monitoring (SAM) study. The SAM studies are administered by the Washington State Department of Ecology (Ecology) and support municipal permittees of the National Pollutant Discharge Elimination System (NPDES) in Washington State. Funding for the Study was provided by the permittees themselves via the SAM program.

1.1 Mobile Businesses and Source Control SAM Study

As part of the Source Identification (Source ID) subset of SAM studies, this SAM study (Study) is focused on how permittees are implementing or plan to implement stormwater source control activities in relation to mobile businesses. As a subset of commercial enterprises, mobile businesses have unique challenges related to stormwater and pollution prevention due to their mobile nature and working at dispersed sites in multiple jurisdictions. The overall Study goal is to provide insight and tools to help permittees identify, inspect, and coordinate in regard to mobile businesses and municipal source control activities. The Study also directly addresses two priority topics (numbers 17 and 23) identified by permittees and other stakeholders during the proposal and planning stages of the current round of SAM studies.[1]

1.2 Task 4: IDDE Data Analysis

Task 4 of the Study is to analyze data from permittee illicit discharge detection and elimination (IDDE) programs to understand how mobile businesses and associated pollutants are captured in municipal IDDE investigations and actual discharge incidents that occurred. Analysis of IDDE data is helpful to inform the design and implementation of source control programs since the programs are complementary and have some overlap, specifically with understanding and tracing the sources of stormwater pollution.

The purpose of the analysis is primarily to identify the types and sources of pollutants generated by mobile businesses. In addition, the goals include understanding other pollution incident factors related mobile businesses, including source tracing methods, clean-up timeframes, and the distribution of incidents among permittees. This analysis directly supports the other tasks of the Study, especially Task 3, which is evaluating and improving how mobile businesses are captured in site inventories. In addition, this analysis builds off a previous SAM study that evaluated IDDE data reported by Permittees in 2014.[2]

[1] Priority topic 17. What additional regional or statewide regulatory systems or approaches would likely support local government oversight of mobile businesses that discharge waste to the MS4?

17.1. How can the business licensure process and requirements support proper waste handling?

17.2. What are barriers to proper handling of waste?

Priority topic 23. Evaluate the IDDE data reported by permittees and gather additional information needed to identify mobile and other multi-jurisdictional business' violations, to support coordinated and effective multi-jurisdiction enforcement.

[2] 2017, City of Lakewood and Washington State Department of Ecology, IDDE Regional Data Evaluation for Western Washington, prepared by Aspect Consulting.

This memorandum is accompanied by a spreadsheet database of IDDE incidents reported by municipal permittees during calendar year 2020. The database was developed to support this analysis and is not intended for ongoing use.

2 DATA PREPARATION

This section describes the source and format of the IDDE data, and how the data were obtained, cleaned up and analyzed.

2.1 Data Source and Format

The IDDE records were obtained from Ecology's Water Quality Permitting and Reporting Information System (PARIS). The period of data analyzed is from calendar year 2020 and coincides with the first year that permittees were required to begin reporting their IDDE data using the updated reporting format in the current 2019-2024 permits (Appendix 14 of the Phase I permit and Appendix 12 of the Phase II permit). The IDDE annual questions, which are identical among the Phase I and Phase II permits, are provided in Appendix A of this memorandum.

The data were downloaded from PARIS as a spreadsheet file and includes both standardized and narrative answers to the 12 questions asked in the appendices, which are identical for both Phase I and Phase II permittees. Table 1 provides a summary of the number of IDDE incidents reported by permittee phase.

Table 1. IDDE Incidents Reported by Municipal Permittees in 2020

Permittee Phase	Number (and Percentage) of Permittees Who Reported IDDE Incidents	Number (and Percentage) of IDDE Incidents Reported
Phase Is	3 (50% of Phase Is)	542 (29%)
Phase IIs	37 (43% of Phase IIs)	1,317 (71%)
Total	40	1,859

Notes: Numbers represent Western Washington Permittees

2.2 Data Review, Clean-Up, and Identification of Mobile Business-Related Records

The IDDE incident data was cleaned-up before being analyzed to ensure quality and consistency. After an initial review of the database, it was discovered that some answers had errors or were not entered in a standardized format following the annual report Appendix questions. Multiple incidents reported did not provide answers to some required questions, and several instances were found with multiple records that contained responses for a single incident.

2.2.1 Data Review and Clean-Up

Based on review of the incident details (usually narrative text), we interpreted the incident data when it was reported with anomalies. The following steps were performed to review and clean-up the raw IDDE incident data.

- Combined Phase I and Phase II incident data into a single database for analysis and add field to indicate permittee Phase.
- Assigned sequential record numbers to the data, which is unique to each incident. The record numbers are occasionally referenced in the analysis.
- Reviewed records with blank information on any questions. Some data anomalies were found during review, which include the following.
    - Questions 2 through 4 and date issues:
        - 26 incidents with response date (Question 3) occurring earlier than incident discovery date (Question 2)
        - 16 incidents with resolved date (Question 4) earlier then incident discovery (Question 2)
        - Nine incidents with resolved date blank – these records were excluded in data analysis when determining time factors since one or more dates was missing
    - Question 6 "Discharged to MS4" was not answered in 77 incidents (76 of which were from one permittee, City of Kirkland).
    - Questions 7 - 12 had 162 incidents with no answers, which is expected due to the Question 6 response being "No" indicating nothing being discharged to the MS4.

Although standardized answers are provided in several Appendix questions, there were many records missing answers and many with narrative text added. These accounted for more than 2,000 text entries as *Other* for Questions 5-6 and 8-11 and/or as Field Notes for Question 12 (see Table 2).

Table 2. Other Answers to Appendix Questions 5-6 and Questions 8-12

Question	Records with *Other* Answers with User-Added Text
Q5: How Incident Was Discovered	108
Q6: Discharge to MS4?	89
Q8: Pollutants Identified	185
Q9: Pollutant Source	533
Q10: Source Tracing Approaches	10
Q11: Correction and Elimination Methods	105
Q12: Field Notes	1,129

Key words from the standardized answers for Questions 5 through 11 were used to search the text entries to help fill in blanks or revise answers. From this review, data in 13 records were adjusted to better reflect the incident among existing answer options. The interpreted results for those questions are documented in Table 3 and represent standardized answers added or revised based on user text.

Table 3. Interpreted IDDE Incidents

Interpreted Results
Record no.: 7 - Pollutant Identified – Other Wastewater
Record no.: 566 - Correction/Elimination Method – Clean-Up
Record no.: 1262 - Pollutant Identified – Fuel and/ or Vehicle Related Fluids
Record no.: 1272 - Source tracing approach(es) used – Observation (color/ sheen/ turbidity/ floatables/ odor)
Record no.: 1280 - Source tracing approach(es) used – Observation (color/ sheen/ turbidity/ floatables/ odor)
Record no.: 1286 - Pollutant Identified – Paint
Record no.: 1290 - Source tracing approach(es) used – Observation (color/ sheen/ turbidity/ floatables/ odor)
Record no.: 1316 - Pollutant Identified – Sediment/ Soil
Record no.: 1789 - Pollutant Identified – Other Wastewater
Record no.: 1791 - Pollutant Source/Cause – Other Accident/ Spill
Record no.: 1799 - Pollutant Identified – Other Wastewater
Record no.: 1801 - Pollutant Identified – Other Wastewater
Record no.: 1827 - Correction/Elimination Method – Clean-Up

Data analysis regarding the timing of incident response and resolution (Questions 2 through 4) included the following.

- Calculated average time to respond by subtracting the Begin Response (Question 3) from the Incident Discovery Date (Question 2) and grouped by: one to seven days, less than or equal to seven days, less than or equal to 15 days, or longer than 15 days.
- Calculated the time to resolve an incident by subtracting the End of Response Date (Question 4) from the Incident Discovery Date (Question 2) and grouped by: less than or equal to seven days, less than or equal to 15 days, less than or

equal to 30 days, less than or equal to six months (183 days), or longer than six months (183 days).

2.2.2 Identification of Mobile Business-Related Records

To identify mobile business-related incidents, records with *Mobile Business* selected as a source or cause (Question 9) were identified along with a search in the Other and Field Notes text fields. In total, this included 61 records with *Mobile Business* as a source or cause and four other records where a likely mobile business source is mentioned in notes.

No issues or data anomalies were discovered during the review and clean-up of the mobile business-related incidents. However, most of the records came from one jurisdiction (Kirkland), and none came from a Phase I permittee. Also, upon review of the records, it was discovered that several complaints were made by one person against a single mobile business.

3 DATA ANALYSIS AND GRAPHING

This section describes the data analysis itself, which is focused on graphing the distributions of the permittees' responses to the Permit Appendix questions (see Appendix A), which compose the data. The permit appendices—Phase I Appendix 14 and Phase II Appendix 12—are identical except in number.

A brief summary is provided below of the response data for each Permit Appendix question. This includes noting variously the minimum, maximum, and average number of records for a given question along with the percent of records the number represents. When an average is given, the first standard deviation is also provided following a plus-or-minus (±) sign.

The visual analysis of the distribution helps identify the relative occurrence of each answer option among the Appendix questions, which are grouped into pairs per subsection. The discussion below includes mention of the most and least occurrences for each topic and related question(s), and the visual data distributions are provided in Figures 1 through 11.

The last subsection covers data that represents mobile businesses. As one of the standardized answer options for Question 9 (Source or Cause of incident), the summary of data associated with *Mobile Businesses* is described with visual distributions in Figures 12 through 18.

In Figures 4-9 and 14-19 the responses (x-axis) are listed from most to least occurrence. In addition, those figures include responses that had multiple answers as well as no answer, and those data are always presented on the right end of the distribution.

3.1 Distribution by Permittee and Time of Year (Questions 1 and 2)

During the 2020 calendar year there were 1,859 IDDE incidents reported by municipal permittees and included in this analysis. As noted in Table 1, three Phase I permittees reported 542 (29%) IDDE incidents and 37 Phase II permittees submitted 1,317 (71%) IDDE incidents. See Figure 1 for a pie chart that shows the distribution of incidents reported among permittee types.

The Phase I permittees on average reported 181 ± 197 incidents with one city (Tacoma) reporting the most at 396 (21%). The Phase II permittees on average reported 36 ± 53 incidents with one city (Kirkland) reporting the most at 266 (14%). Figure 2 provides a summary of the incidents reported alphabetically by permittee.

For incident timing, the date of incident discovery (Question 2) was used. The average number of monthly incidents was 155 ±35 incidents. The maximum number of incidents reported in a single month occurred in January at 250 (13%), and the least occurred in May (121 (7%)). Figure 3 provides a distribution by the month of the year each incident was discovered by permittees (Question 2).

The timing of the average and most incidents per month held true among the Phase I and Phase II permittee types. For Phase Is, the average number of incidents per month was 45 ±12, the maximum was 77 (14%) per month in January; however, the minimum was 30 (6%) per month in September. For Phase IIs, the average number of incidents per month was 110 ±25, the maximum was 173 (13%) per month in January, and the minimum was 80 (6%) per month in May. See Figure 3.

3.2 Incident Notification and Discharge to MS4 (Questions 5 and 6)

Municipal permittees were notified of IDDE incidents through several methods. Question 5 of the Permit Appendix asks permittees to describe "How each incident was discovered and by which method permittees were notified." There are nine potential standardized answers to choose from, and permittees were asked to select all answers that apply. There were 120 incidents (6.5%) that had multiple responses.

The most common response to Question 5 was a *Pollution Hotline (phone, web, or app)* with 730 incidents (39%). The least number of incidents were discovered through *Business Inspections* with just 15 (0.8%). Figure 4 provides a summary of the responses to Question 5 about how the incident was discovered.

This pattern was also true among Phase I and Phase II permittee types. *Pollution Hotline (phone, web, or app)* was the most common response to identification method, with Phase Is having 295 incidents (54%) and Phase IIs having 435 (30%). For Phase Is, the least number of incidents were discovered through *Construction Inspections* with just 1 (0.2%), and the least for Phase IIs was through *Business Inspections* with 9 (0.6%). See Figure 4.

Question 6 of the Appendix asks permittees to report if the pollutant in question "Discharged to the MS4." There are nine potential standardized answers to choose from, and permittees were asked to select one answer. There were 77 incidents (4%) where question 6 was not answered and there were no incidents that had multiple responses.

Of the nine potential responses to "Discharged to the MS4," there are four answers which equate to *Yes*, three answers for *No* and two potential answers for *Other or Unknown*. When combining the responses of Yes, No, or Other, the most common result was *No* at 891 (48%) followed by *Yes* at 760 (41%) then *Other: Unknown* with 131 (7%) responses. However, if you look at a single answer to the question 6, the most common single response to Question 6 for all incidents was *Yes – Notified Ecology* with 565 (30%). The least common response was *No- Discharged to (UIC) Well* with 1 (0.1%) report. Figure 5 provides a summary of the responses to Question 6 regarding discharge to the MS4.

The most common response to Question 6 for Phase I permittees was *No – None Found* with 188 incidents (35%). The least common response was *Other, Unknown* and *No – Discharged to (UIC) Well* all with no incident reports. The most common response for Phase II permittees was *No- Cleaned Up* with 399 incidents (32%). The least common response was *No – Discharged to (UIC) Well* with 1 (0.1%). See Figure 5.

3.3 Types and Sources of Pollutants (Questions 8 and 9)

Question 8 of the Permit Appendix asks about the "Pollutant Identified" to report the type of pollutant discovered during the investigation. If the pollutant did not reach the MS4 and the answer to Question 6 is *No*, then permittees are not required to respond to Question 8.

There are 11 potential standardized answers to choose from, and permittees were asked to select all answers that apply. There were 140 incidents (8%) where Question 8 was not answered due to pollutant in question not reaching the MS4, and there were 96 incidents (5%) that had multiple pollutants identified.

The most common pollutant identified for all incidents was *Fuel and/or Vehicle Related Fluids* with 570 (31%), and the least common was *Firefighting Foam* with 16 (0.9%). Figure 6 provides a summary of the responses to Question 8.

The most common pollutant identified for Phase I permittees was *Unconfirmed, Unspecified, or Not Identified* with 294 incidents (52%). The least common pollutant identified was *Solid Waste/ Trash* with 5 incidents (0.9%). Among Phase IIs, the most common pollutant identified was also *Fuel and/or Vehicle Related Fluids* with 481 incidents (38%). The least common pollutant identified among Phase IIs was *Firefighting Foam* with 8 (0.6%). See Figure 6.

Question 9 of the IDDE form asks permittees to determine the "Source or Cause" of the pollutant discovered during investigation. If the pollutant did not reach the MS4 and the answer to Question 6 is *No*, then permittees are not required to respond to Question 9. There are 12 potential standardized answers to choose from in Question 9 and permittees were asked to select all answers that apply. Among the records, there were 134 incidents (7%) where Question 9 was not answered due to pollutant not reaching the MS4, and there were 89 incidents (5%) that had multiple sources or causes.

The most common pollutant source identified for all incidents was *Unconfirmed, Unspecified, or Not Identified* with 592 (32%). The least common pollutant source identified was *Landscape-Related Business* with 10 (0.5%). Figure 7 provides a summary of the responses to Question 9.

The most common pollutant source identified for both Phase Is and Phase IIs individually was *Unconfirmed, Unspecified, or Not Identified* with 302 (55%) and 290 (23%), respectively. The least common pollutant source for Phase Is was *Mobile Businesses* with no reports, and for Phase IIs it was *Landscape-Related Businesses* with 9 incidents (0.7%). See Figure 7.

3.4 Source Tracing and Correction Methods Used (Questions 10 and 11)

Question 10 of the Permit Appendix asks permittees about the "Source Tracing Approach(es)" to report the type of source tracing used during investigation. If the pollutant did not reach the MS4 and the answer to Question 6 is *No*, then permittees are not required to respond to Question 10. There are seven potential standardized answers to

choose from, and permittees are asked to select all answers that apply. There were 137 incidents (7%) where Question 10 was not answered due to pollutant in question not reaching the MS4, and there were 130 incidents (7%) that had multiple source tracing approaches used.

The most common source tracing approach used for all incidents was *Observation (color/sheen/turbidity/floatable/odor)* with 1,067 incidents (57%). The least common source tracing approach used was *Dye, Smoke, or Pressure Testing* with 7 incidents (0.4%). Figure 8 provides a summary of the responses to Question 10.

The most common source tracing approach used for Phase I permittees was *Not Applicable* with 419 incidents (77%). The least common source tracing approach used among Phase Is was *Field Indicator Measurements* with no reports. The most common source tracing approach used for Phase II permittees was *Observation (color/sheen/turbidity/floatable/odor)* with 961 incidents (73%). The least common source tracing approach used among Phase IIs was *Dye, Smoke, or Pressure Testing* with 6 incidents (0.5%). See Figure 8.

Question 11 of the Appendix asks permittees to report the "Correction/Elimination Methods" used during the investigation. If the pollutant did not reach the MS4 and the answer to Question 6 is No, then permittees are not required to respond to Question 11. There are eight potential standardized answers to choose from, and permittees are asked to select all answers that apply. There were 163 incidents (9%) where Question 11 was not answered, of which 140 were due to the pollutant in question not reaching the MS4. There were 395 (21%) incidents that had multiple correction and or elimination methods used.

The most common correction and or elimination method used for all incidents was *Clean-up* with 1,256 (68%). The least common correction and or elimination method used was *Add or Modify Treatment BMP* with 31 incidents (2%). Figure 9 provides a summary of the responses to Question 11.

The most common correction and or elimination method used among both Phase Is and Phase IIs was *Clean-up* with 473 (69%) and 783 (50%), respectively. The least common correction and or elimination method among Phase I's was *Add or Modify Treatment BMP* and *Referred to Other Agency or Department* both with no reports. The least common correction and or elimination method used among Phase IIs was *Add or Modify Treatment BMP* with 28 (2%) reports. See Figure 9.

3.5 Response and Resolution Times (Questions 2, 3, & 4)

After analysis of the IDDE incidents and their response times, the average **response** time to an incident was 0.28 ± 4.1 days. Nearly all incidents (1,823, 99.6%) were responded to within seven days, two incidents (0.1%) were responded to within 15 days, and six incidents (0.3%) took longer than 15 days to respond. There were 26 incidents that reported a response date earlier than the discovery date; those incidents were not included in the response analysis and it was assumed this was a user-entered error since an incident couldn't be responded to until after it was discovered. For records with a response date after the discovery date, the average response time for Phase I permittees

was 0.20 ± 2.0 days and the average response time for Phase II permittees was 0.31 ± 4.7 days. Figure 10 provides a summary of the response times grouped by permit phase.

After analysis of all IDDE incidents and their resolved times, the average **resolved** time for an incident was 6.4 ± 29 Days. The great majority of incidents (1,611, 89%) were resolved within seven days, 61 (3%) were resolved within fifteen days, 48 (2.7%) were resolved within thirty days, 71 (3.9%) were resolved within six months (183 days), and 14 incidents (0.8%) took longer than six months (183 days) to resolve. The average resolved time for Phase I permittees was 12 ± 39 days and for Phase II permittees was 4.1 ± 23 days. There were 16 incidents that reported a resolved date earlier than the discovery date; those incidents were not included in the response analysis. Another 9 incidents left the resolved date blank, and those incidents were also not included in the response analysis. Figure 11 provides a summary of the resolved times grouped by permit phase.

3.6 Mobile Businesses Represented in Data (within Question 9)

During the 2020 calendar year there were 65 IDDE incidents reported where the source of pollution was listed as *Mobile Businesses* and four other incidents with reference to mobile businesses in notes. No Phase I permittees reported mobile business IDDE incidents. Rather, the data came from seven Phase II permittees who submitted 61 reports with *Mobile Business* as the source plus five reports where it was clear from notes that it was a mobile business source. The number of incidents with a mobile business source were relatively few compared to the overall data set, which had 1,210 incidents that noted other types of sources.

Regarding response times among incidents involving mobile businesses, the average response time was 0.29 ± 1.7 days. A total of 63 incidents (97%) had responded to within seven days, 2 (3%) were responded to within 15 days, and none took longer than 15 days to respond.

Regarding resolution times among incidents involving mobile businesses, the average resolved time for an incident was 2.1 ± 9.6 days. A total of 62 incidents (95%) were resolved within seven days, 1 (1.5%) was resolved within 15 days, 2 (3.1%) were resolved within six months (183 days), and none took longer than six months (183 days) to resolve.

The timing of incident occurrence for just mobile business-related records was steady throughout the year with 3-5 records per month. But spikes up to 8 or 9 occurred in two months in the winter and two months in the summer. See Figure 12.

Figures 13 through 19 provide the distributions of data for just the subset of records where mobile businesses were the source. All of the data in this subset came from Phase IIs permittees; however, for completeness and consistency with the other figures in this memorandum, the Phase I numbers (all 0s) are still indicated in the figures for mobile businesses. Thus, the distributions represent just Phase II permittees.

Figure 13 provides an alphabetical summary of the permittees who reported IDDE data. Among the mobile business data subset, 49 incidents (75%) were submitted by one permittee (City of Kirkland), and this influences the results toward their program.

For Questions 5-6 and 8-11, below is a summary of the most and least common responses for the mobile business-related incidents.

Question 5 "How was the incident discovered or reported to you?" See Figure 14.

- Most common: *Pollution Hotline (phone, web, or app)* with 46 incidents (67%).
- Least common: *Business Inspections, Construction Inspections* and *Other Agency Referrals*, each with no reports.

Question 6 "Discharged to the MS4?" See Figure 15

- Most common: *No – Cleaned Up* with 31 incidents (48%).
- Least common: *No – Discharged to (UIC) Well, Unknown*, and *Yes – Notified DOH and Ecology*, both with no reports.

Question 8 "Pollutants Identified" See Figure 16

- Most common: *Fuel and/or Vehicle Related Fluids* with 30 incidents (42%)
- Least common: *Firefighting Foam*, *Sewage/Septage/Pet Waste or Human Waste,* and *Solid Waste/Trash*, each with no reports.

Question 9 "Source or Cause" See Figure 17

- All incidents summarized in this section indicated mobile business as a source or cause. In addition, there were 13 incidents (20%) that had multiple sources or causes, including *Unconfirmed*, *Construction*, *Vehicle-Related Business*, *Accident or Spill*, or *Other*.

Question 10 "Source Tracing Approach(es)" See Figure 18

- Most common: *Observation (color/sheen/turbidity/floatable/odor)* with 61 incidents (84%).
- Least common: *Map Analysis*, *Analytical Indicators*, *Dye, Smoke, or Pressure Testing*, and *Other* each had no reports.

Question 11 "Correction/Elimination Methods" See Figure 19

- Most common: *Clean-up* with 53 incidents (67%).
- Least common: *Add or Modify Structural or Treatment BMPs* with no reports.
- In addition, there was one incident (1.3%) among those where mobile businesses were indicated that was not answered, and there were 11 incidents (17%) that had multiple correction and or elimination methods used for mobile businesses.

3.7 Comparison to 2014 Data

For comparison, the 2020 IDDE data analyzed here is contrasted with the 2014 IDDE data analysis results (Aspect 2017).

- The 2020 dataset was smaller with 1,859 records compared to the 2014 dataset, which had 2,913 records.
- Among Phase Is, the greatest number of IDDE records was from the same jurisdictions in both years: Tacoma first, Seattle second. However, the 2020 data came from just three Phase Is, while the 2014 data came from seven Phase Is.
- Among Phase IIs, the distribution is different between the years. Among the top five Phase II jurisdictions represented in 2014, only one (City of Bothell) is also in the top five for 2020.
- The timing of when incidents were learned about was also similar among the years. Peak incidents occurred in winter, but also occurred steadily throughout the year.
- The types of pollutants found was similar among the years with Vehicle Fluids and Fuel/Hydrocarbons as the top pollutant and high numbers coming from Sediment/Soil and Sewage/Septage.
- The sources of pollutants found was also similar among the years with Construction Activity as the top source. However, the 2020 data had a much larger proportion of sources Unconfirmed or Not Identified than the 2014 data.
- The source tracing methods used in both years of data indicated that Visual or Empirical Observation was the most common with In-Pipe or Field Indicators used for a relatively small number of incidents.
- The correction and elimination methods were similar among the two years with Clean-Up or the use of BMPs representing the most methods. However, data from 2014 showed a higher proportion of Enforcement methods, whereas 2020 data showed a higher proportion of Technical Assistance.
- The analysis of 2020 data was much more straightforward than the 2014 data. The standardized answers available for the current Permit Appendix questions increased the efficiency of the data review and the quality of the data.

4 DISCUSSION

The results from this analysis informs us about the recent pattern of IDDE incidents across western Washington. In addition, a deeper analysis of data helped uncover stormwater pollution characteristics common with mobile businesses. The findings are similar to previous studies (Aspect 2017 and WSU 2020) with vehicle-related fluids being the most common type and source of illicit discharges. But a wide range of additional pollutants are recorded in these data and indicate that illicit discharges are still coming from many sources and being traced and corrected in a variety of ways.

4.1 Highlights of 2020 IDDE Data

The highlights of the analysis for the 2020 IDDE data include the following.

4.1.1 Top Pollutants and Sources

- The top pollutants included *Fuel and Vehicle-related Fluids* and *Sediment/Soil*, and some records (96) indicated more than one pollutant.
- The top pollutants track logically with the top sources, which were *Construction Activity* and *Vehicle-Relate*d sources. The Appendix questions about the Pollutant Identified and the Sources and Causes contained the most *Other* responses of user-added text, many with extended field notes.
- The source tracing approaches used were mostly by *Observation*. Some records (124) indicated more than one approach used, and just 72 records indicated the use of field or indicator tests to trace the source. Where correction or elimination was needed, most (1,256) used *Clean-Up* and some (358) used *Education/Technical Assistance* as the second most common method.
- About 41 percent of the records (760) indicated an investigation that resulted in a discharge incident to the MS4 (Appendix Question 6). The great majority of discharges were cleaned up and reported to Ecology.

4.1.2 Resolution Times and User-Added Entries

- Response and resolution times were almost entirely within permit requirements depending on the type of issue. Almost all records (1,611) were resolved within seven days, and only a very small number of records (7) indicated greater than six months to resolve.
- Numerous records contained user-added text entries in response to one or more questions. Those entries were searched for keywords to confirm the quality assurance (QA) of the data, and corrections were made to several records.

4.1.3 2020 versus 2014

- Similarities:
    - The greatest number of IDDE records per permittee was from the same two jurisdictions (both Phase Is).

  - The timing of incidents was similar with numbers occurring steadily throughout the year and peak numbers occurring in winter.
  - The most common type of pollutants found was *Vehicle Fluids* and *Fuel/Hydrocarbons* with high numbers also coming from *Sediment/Soil* and *Sewage/Septage*.
  - The sources of pollutants found was also similar among the years with *Construction Activity* as the top source.
  - *Visual or Empirical Observation* was the most common source tracing method.
  - *Clean-Up* or the use of *BMPs* represented the most correction and elimination methods.

- Differences:
  - The 2020 dataset was smaller with 1,859 records compared to the 2014 dataset, which had 2,913 records.
  - Fewer jurisdictions are represented in the 2020 data (40, compared to 78 in 2014).
  - The 2020 data had a much larger proportion of pollutant sources that were *Unconfirmed* or *Not Identified.*
  - 2020 data showed a higher proportion of *Technical Assistance* for correction and elimination methods and a lower proportion of *Enforcement* methods.

4.1.4 Data Distribution and Representativeness

- Data analyzed represent the 2020 calendar year, which is the first time municipal stormwater permittees in western Washington were required to submit IDDE data under the current permits effective 2019-2024.
- The data are from responses to 13 Permit Appendix questions about IDDE investigations and incidents that permittees recorded and submitted for 2020. In total 1,859 records available for analysis, with about two-thirds coming from Phase IIs (71%) and about one-third from Phase Is (29%).
- Half of the Phase I permittees (3) and a little less than half (37) of the Phase IIs submitted IDDE records in 2020.
- Among individual permittees, several submitted significantly more records than others, including several jurisdictions with more than 100 incident records each, including two Phase Is and four Phase IIs (and one Phase II with 92 records). The remaining records were from 3 Phase Is and 32 Phase IIs who submitted approximately 50 or fewer records each.
- One Phase II city (Kirkland) and one Phase I city (Tacoma) each had significantly more records than their counterparts, and those data do exhibit influence on the

results for some questions, especially the analysis of mobile business-related records. Given the limited representation of permittees among the data, the results from this analysis should be interpreted to represent just those jurisdictions who submitted IDD records for 2020.

- It is not known what programmatic factors caused the distribution of IDDE records in 2020 among permittees with some submitting significantly more records than others, and more than half of the Phase II permittees not submitting any IDDE records. Two ideas that may explain these disparities include:
    - Varying interpretations by permittees about what qualifies as an IDDE incident
    - Varying programmatic approaches about how much detail needs to be recorded during IDDE investigations and reported to Ecology (especially if the investigation is inconclusive or doesn't result in discharge to the MS4)

4.2 Comparison of All Data and Mobile Business Sources Data

The data analyzed in this section represents a comparison of the complete 2020 IDDE dataset with those data where *Mobile Business* was noted to be the source or cause.

4.2.1 Pollutants and Sources

- Concerning the pollutant identified, both datasets list *Fuel and/or Vehicle Fluids* as the most found pollutant during an IDDE incident. However, when looking at mobile businesses a higher percentage of *Fuel and/or Vehicle Fluids* was caused by a mobile business incident (42%) than all IDDE incidents (31%).
- During investigations of IDDE incidents a high percentage of investigations do not end up identifying an issue. Thirty-two percent of mobile business incident pollutants were *Unconfirmed* or *Not Identified*, while only 19% were *Unconfirmed* or *Not Identified*.
- While reviewing mobile business data, only 3 incidents (4%) listed *Accident* or *Spill* as a secondary cause of incident.

4.2.2 Source Tracing and Correction

- The most common source tracing method used to investigate mobile businesses incidents was by *Observation* (84%). This follows the same trend as all IDDE incidents (57%).
- The correction and elimination methods used during mobile business incident investigations follow the same trend as all IDDE incidents. The most common correction method is *Clean-Up* followed by *Education and Technical Assistance*.

4.2.3 Data Distribution and Representativeness

- Of the forty permittees who submitted IDDE records, only seven permittees had incidents listing a source or cause due to mobile businesses. The City of Kirkland

was the largest Phase II contributor of overall IDDE incidents (266 or 14%) and mobile business IDDE incidents (49 or 69%) among Phase II permittees. In this regard, the main trends of the data analysis for mobile business sources reflect bias toward Kirkland's methodologies.

- No Phase I permittees listed *Mobile Businesses* as a source or cause in the IDDE records they submitted. Thus, records analyzed here for mobile business-related incidents represent just Phase II permittees.
- Seasonally, when looking at all IDDE incidents there were relatively more incidents discovered in winter (32%). However, when only looking at mobile businesses, relatively more incidents were discovered in summer (18%) than winter (13%).

4.2.4 Other

- A large percentage of permittees were notified by *Pollution Hotline* for all IDDE incidents (39%) and for mobile business incidents (67%). The least common method of discovery for IDDE incidents is through *Inspection* of a mobile business.
- Almost half of all IDDE incidents (48%) and almost two-thirds of mobile business incidents (61%) do not reach the MS4 and no notification is required. Both datasets list notifying Ecology as the most common answer if a pollutant is discharged.

4.3 Conclusions

Noteworthy conclusions are summarized below based on the findings from the 2020 IDDE data analysis.

- The consistency of the most common pollutant types and sources among permittee types and between the years 2014 and 2020 indicates that vehicle-based spills and construction activity are ongoing leading sources of illicit discharges, among others.
- The 2020 dataset was represented by significantly fewer Phase I and Phase II permittees than the 2014 dataset. While this may indicate some year-to-year variability of IDDE incidents, it also likely indicates that the updated Appendix questions for the current permit are likely helping to prevent questionable records from being included (as was found with the 2014 analysis).
- Even with standardized answers available for many Permit Appendix questions, respondents still often chose to select the Other response and add text notes. This could be reduced with expanding the lists of standardized answer options.
- Mobile businesses are presently one of the standardized answer options for the source or cause of an incident (Permit Appendix question 9). Analysis was done on these records and was influenced by the high proportion of records from one permittee who represented 49 out of 65 incident reports indicating a mobile business source.

- Slightly less than half of all IDDE incident reports resulted in discharge to the MS4.
- The user-added notes indicated additional pollutants, sources, and correction methods than were captured in the standardized answers. These include the following, which can be considered by Ecology for expanding the standardized answer in the Permit Appendix:
    - Other Pollutants

      Potable or irrigation water; solvent; turbid liquid; landfill leachate; various construction wastes (concrete slurry, dewatering discharge, treated effluent); algae; fertilizer chemicals; allowable discharges (per Permit); iron oxide/bacteria
    - Other Sources

      Emergency response activity; ground water; pipe integrity and pump issues (e.g., broken water main); erosion; combined sewer overflow; downspouts; sunken boat or grounded vessel
    - Other Source Tracing Methods

      Pipe camera/video; lift station records; sediment deposition evidence
    - Other Correction Methods

      Unclog, pump-out, or flush system; temporary facility closure; natural attenuation; clear out homeless encampment; pipe or BMP repair

5 References

Aspect, 2017, Illicit Discharge Detection and Elimination (IDDE) 2014 Regional Data Evaluation for Western Washington, Prepared for City of Lakewood and Ecology.

Washington State Department of Ecology, 2019, Western Washington Phase I and Phase II Municipal Stormwater Permits, effective 2019-2024, Washington State Department of Ecology.

Washington Stormwater Center, 2020, Business Inspection Program Report.

6 Limitations

Work for this project was performed for the King County and the Department of Ecology (Clients), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

FIGURES

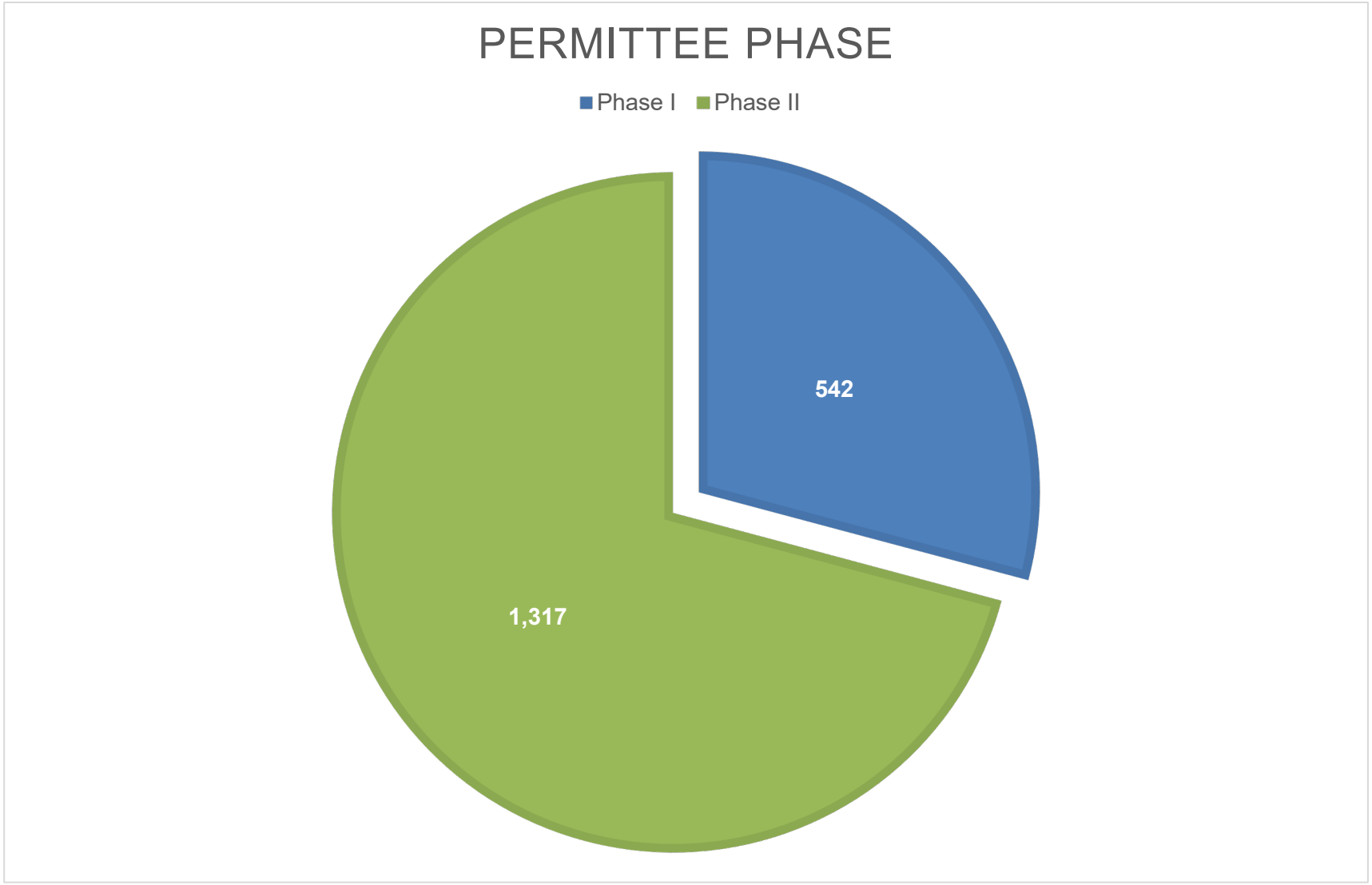

Figure 1
Records by Permittee Phase
IDDE Data Analysis Report
Project No. 200212-A-04B
Mobile Business SAM Study

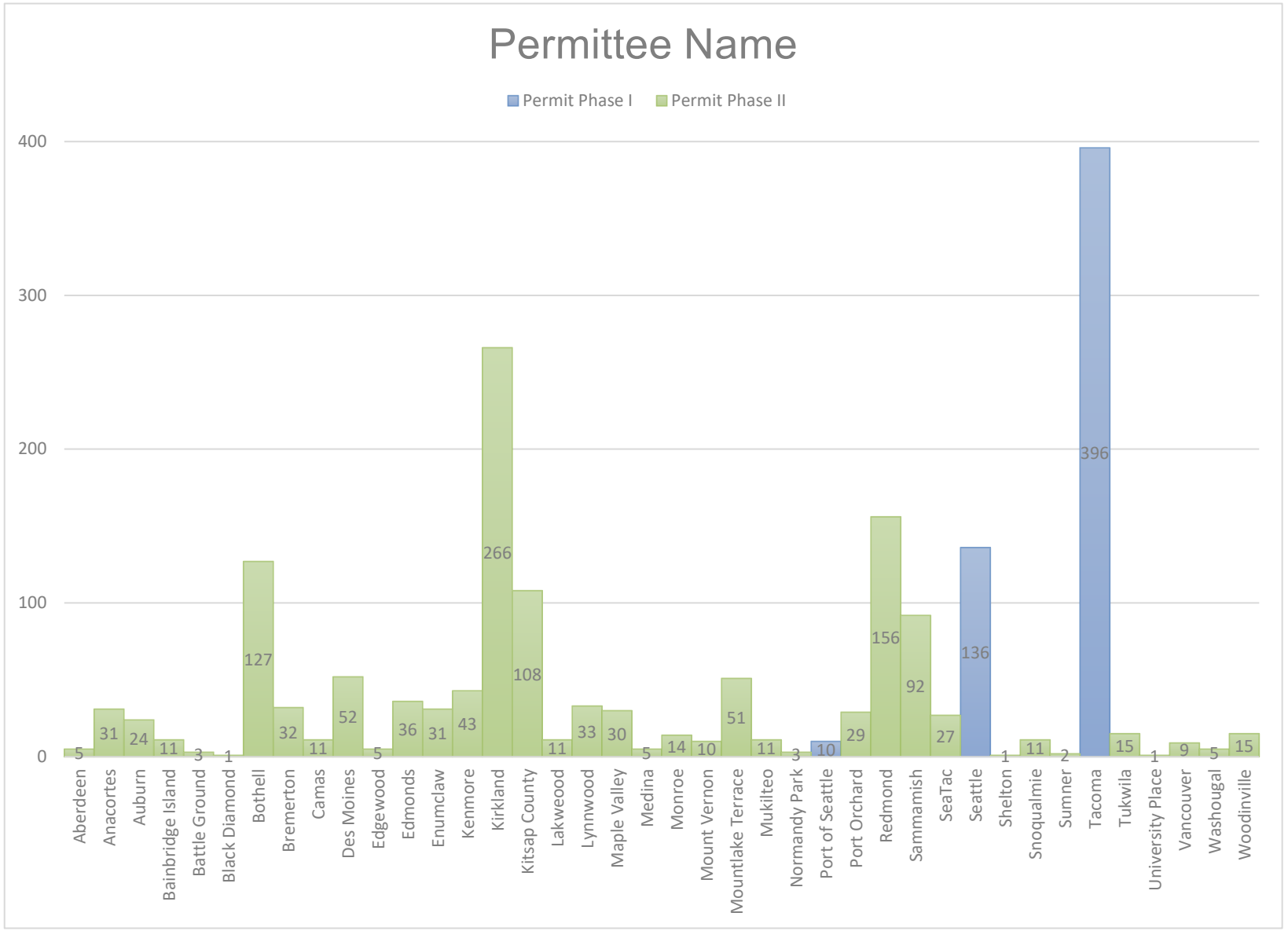

Figure 2
Records by Permittee Name

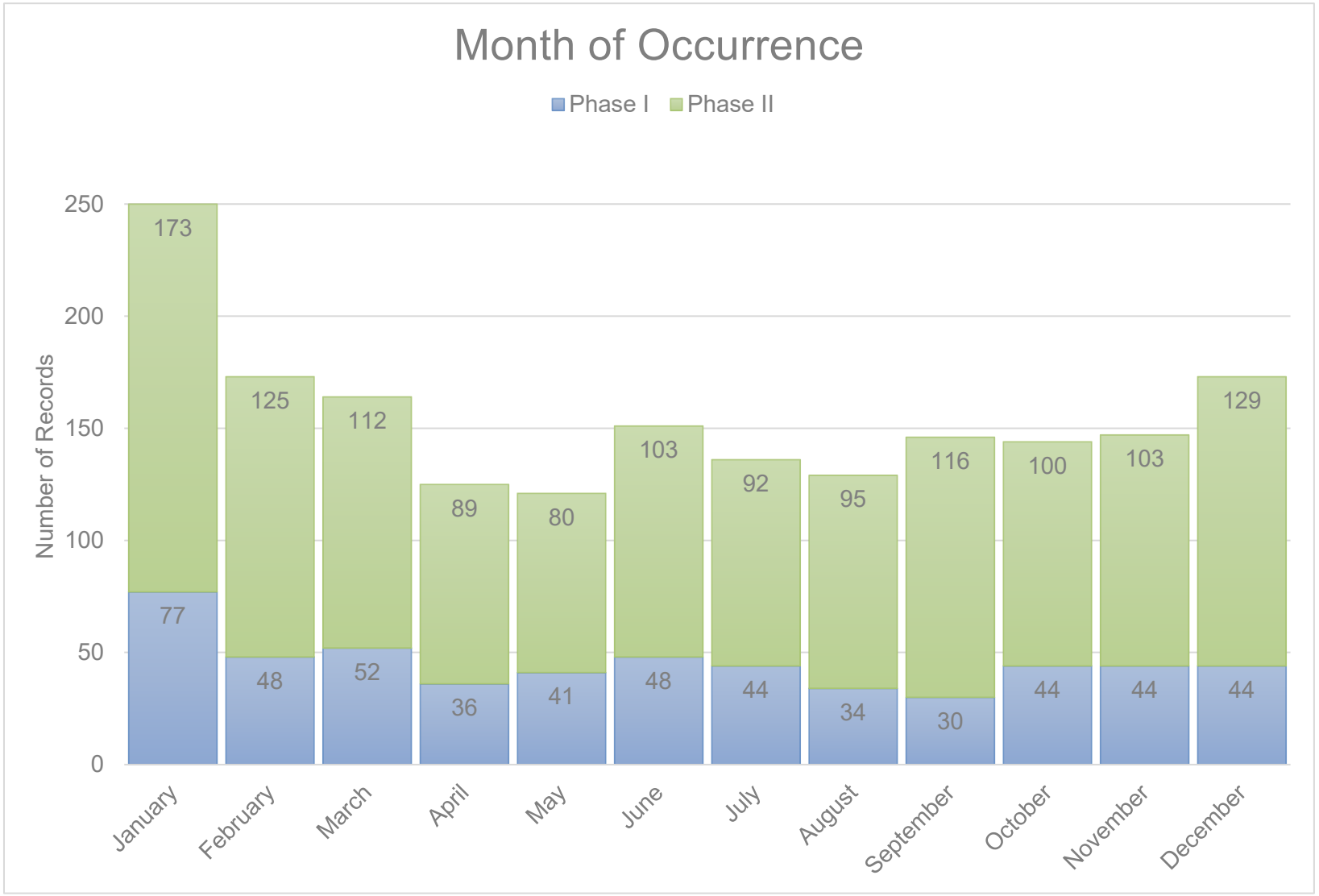

Figure 3
Month of Occurrence
IDDE Data Analysis Report
Project No. 200212-A-04B
Mobile Business SAM Study

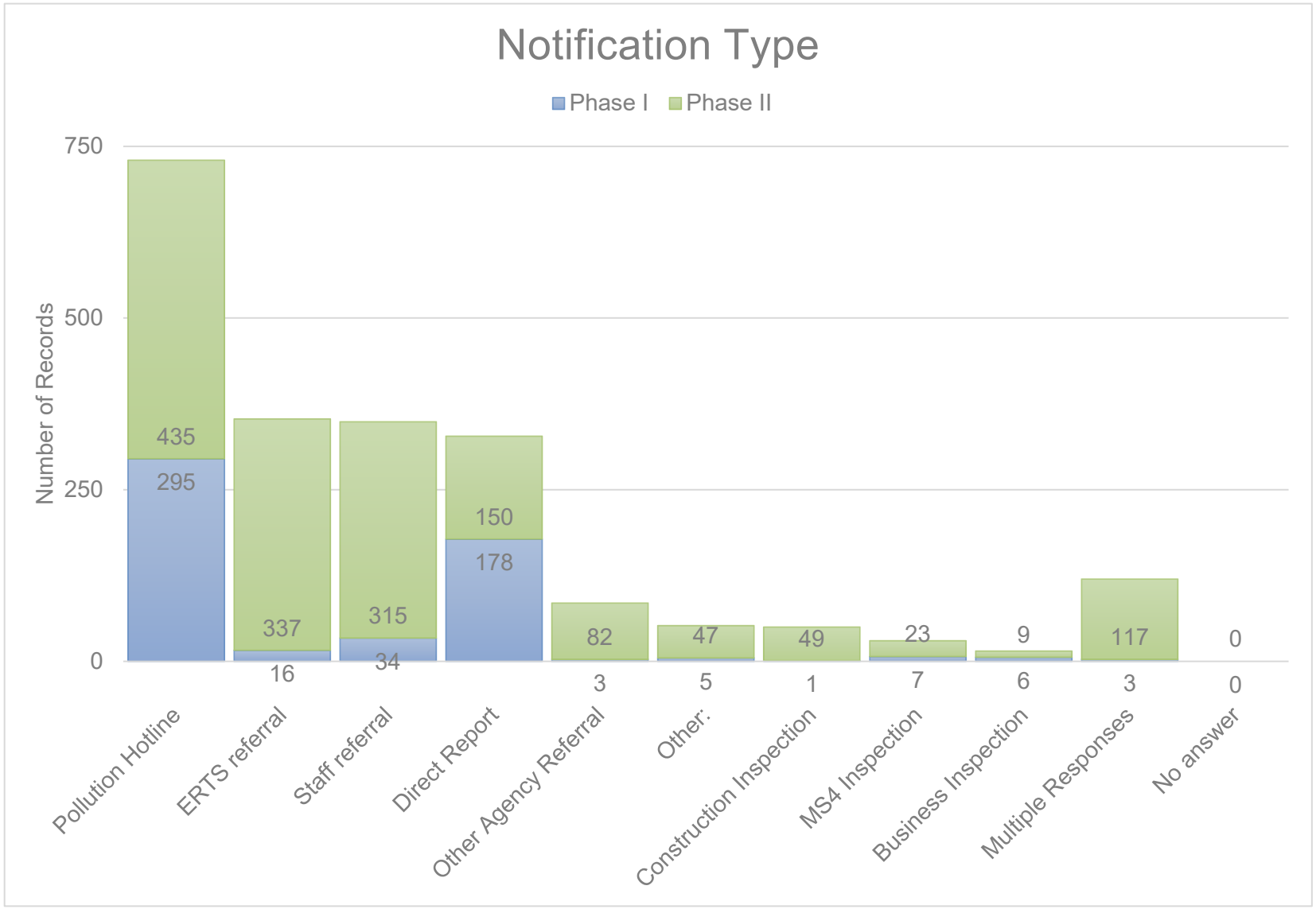

Figure 4
Notification Type
IDDE Data Analysis Report
Project No. 200212-A-04B
Mobile Business SAM Study

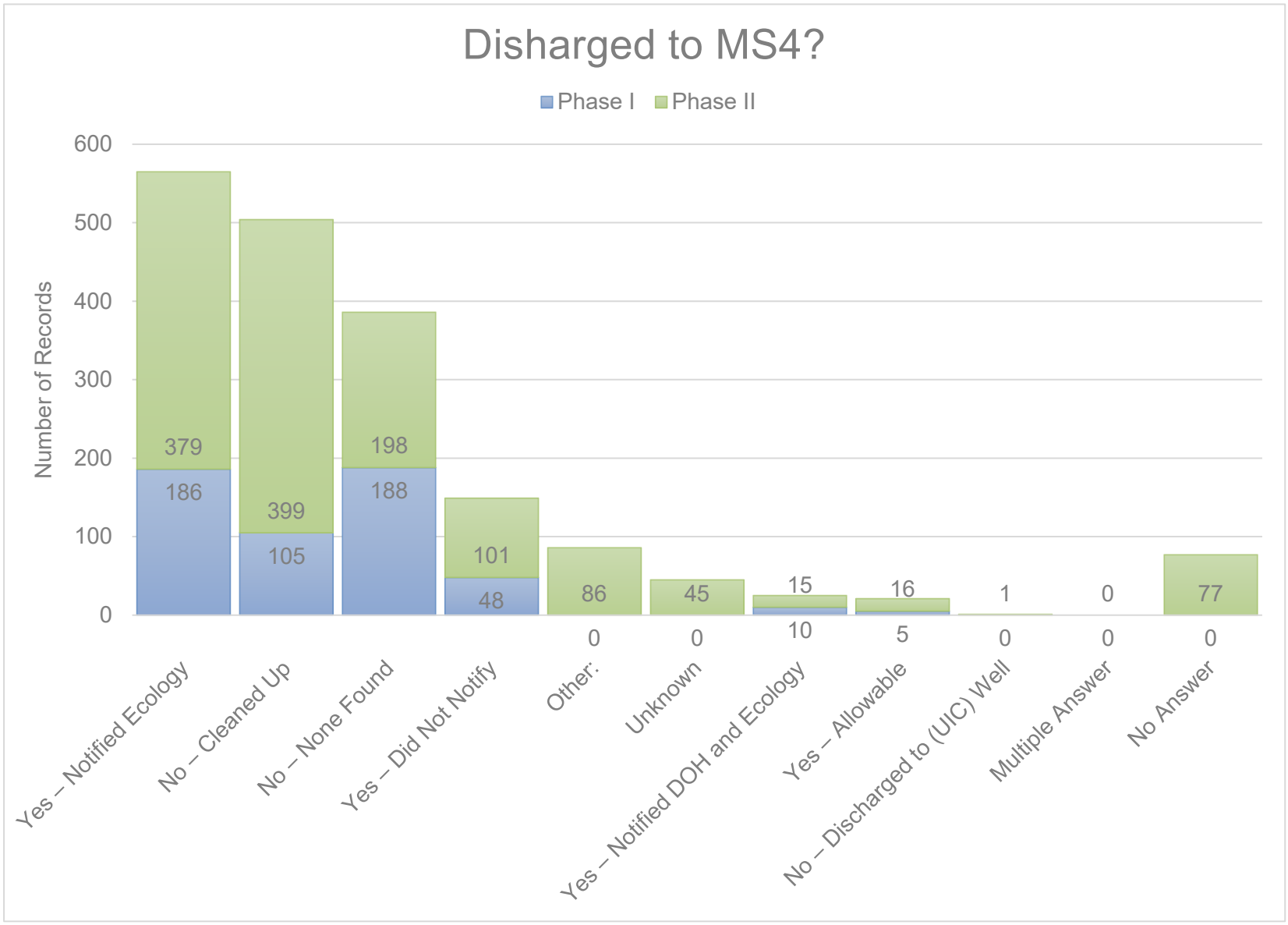

Figure 5
Discharged to MS4?
IDDE Data Analysis Report
Project No. 200212-A-04B
Mobile Business SAM Study

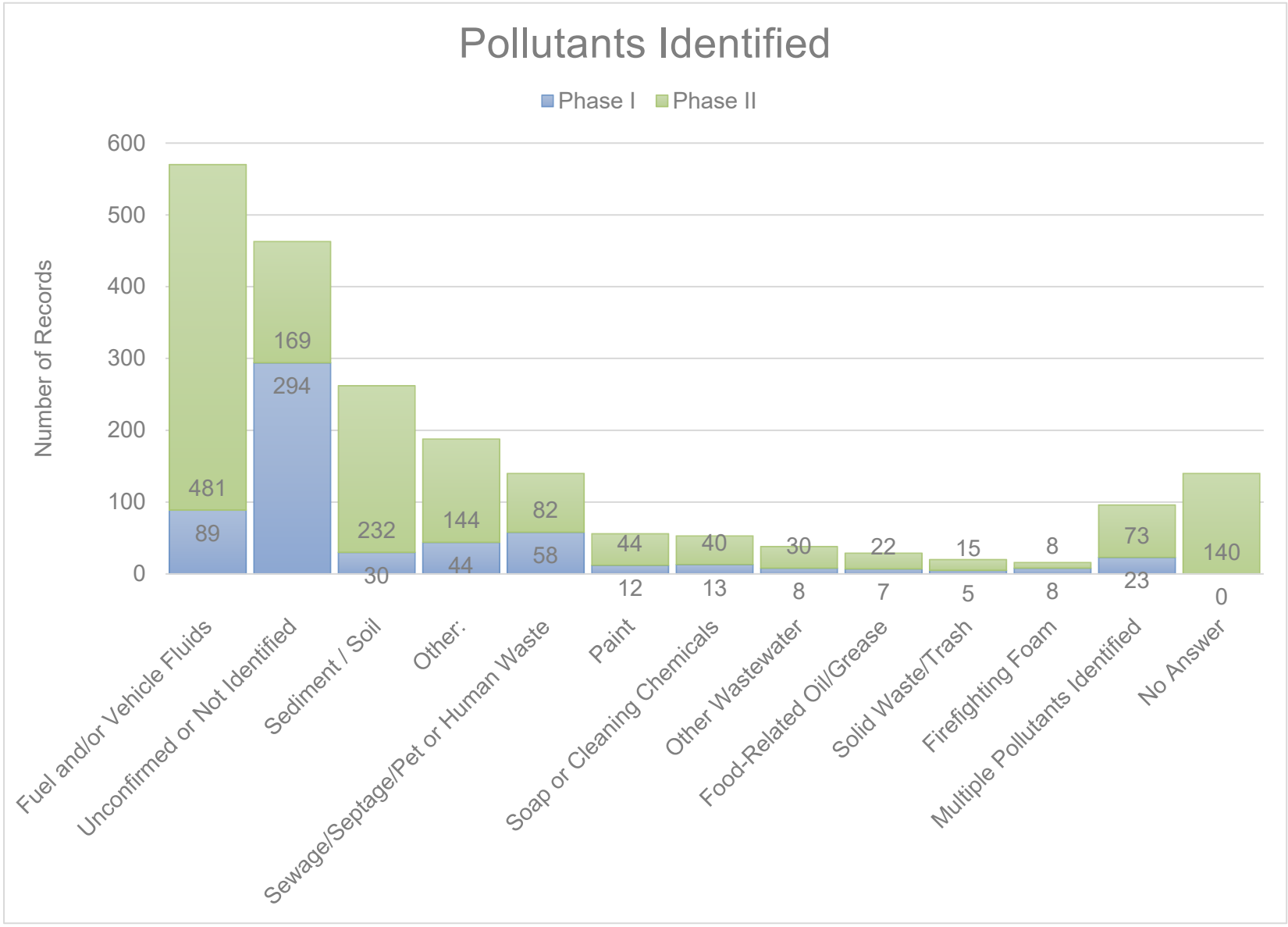

Figure 6
Pollutants Identified

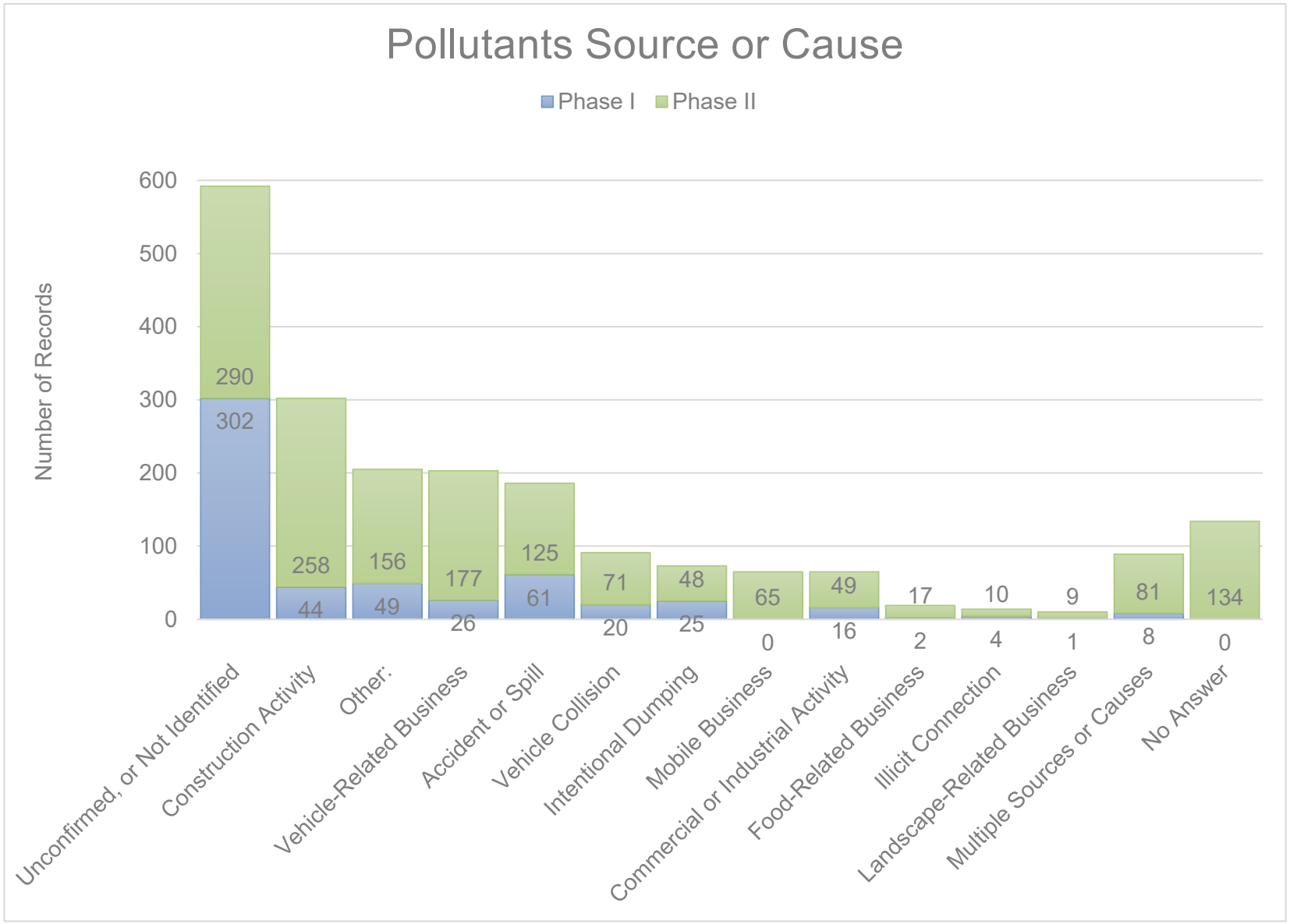

Figure 7
Pollutants Source or Cause

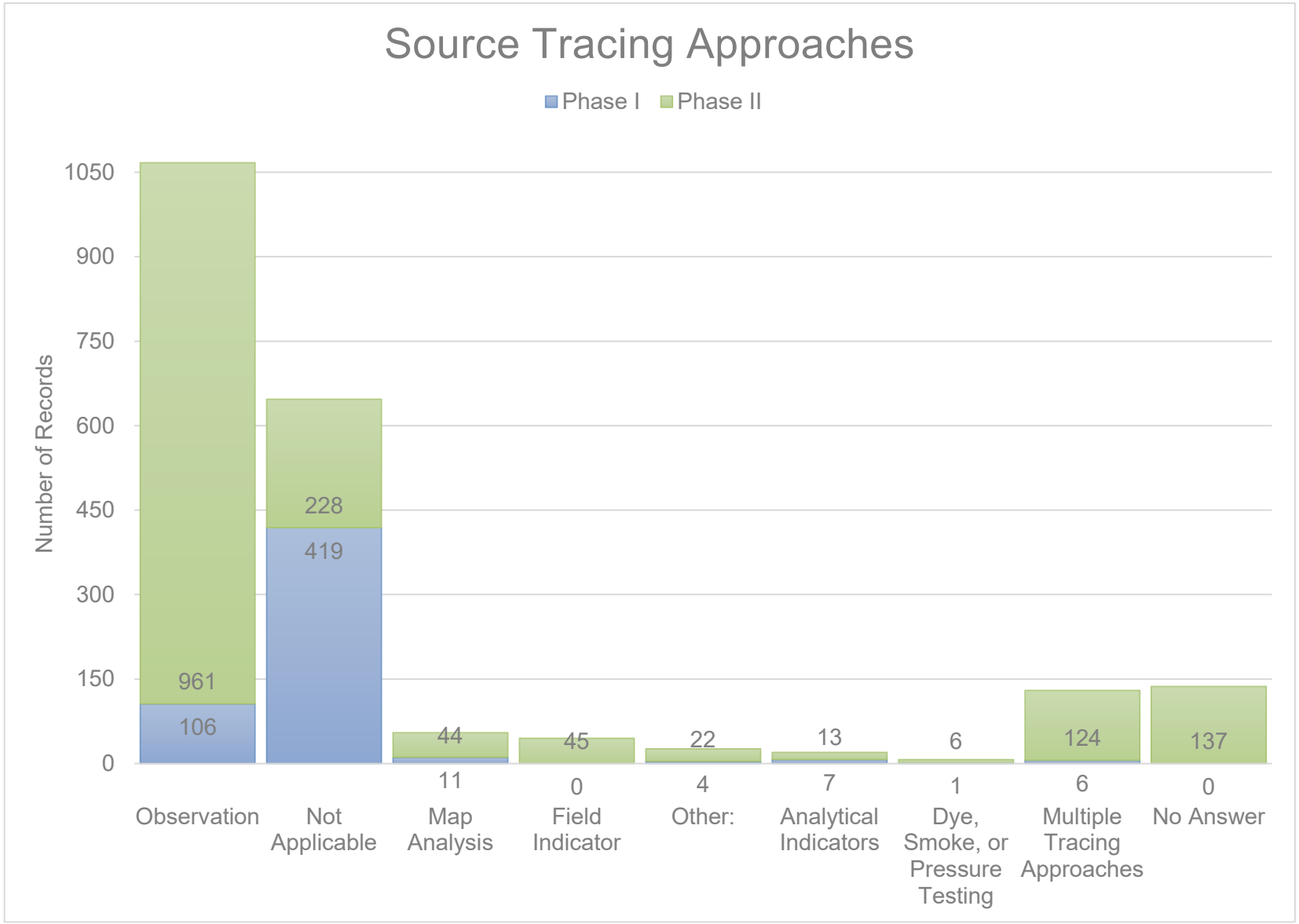

Figure 8
Source Tracing Approaches

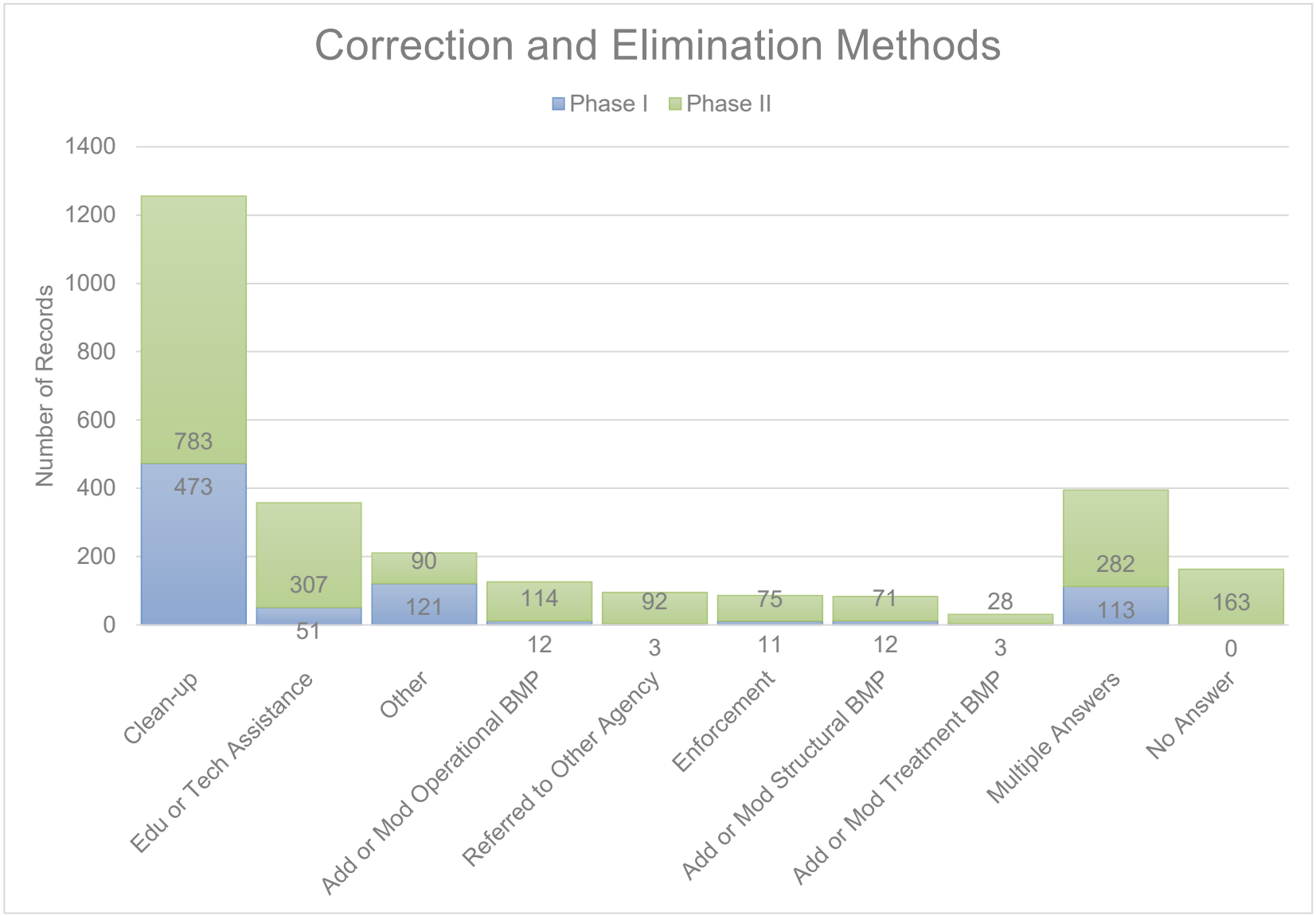

Figure 9
Correction and Elimination Methods Used

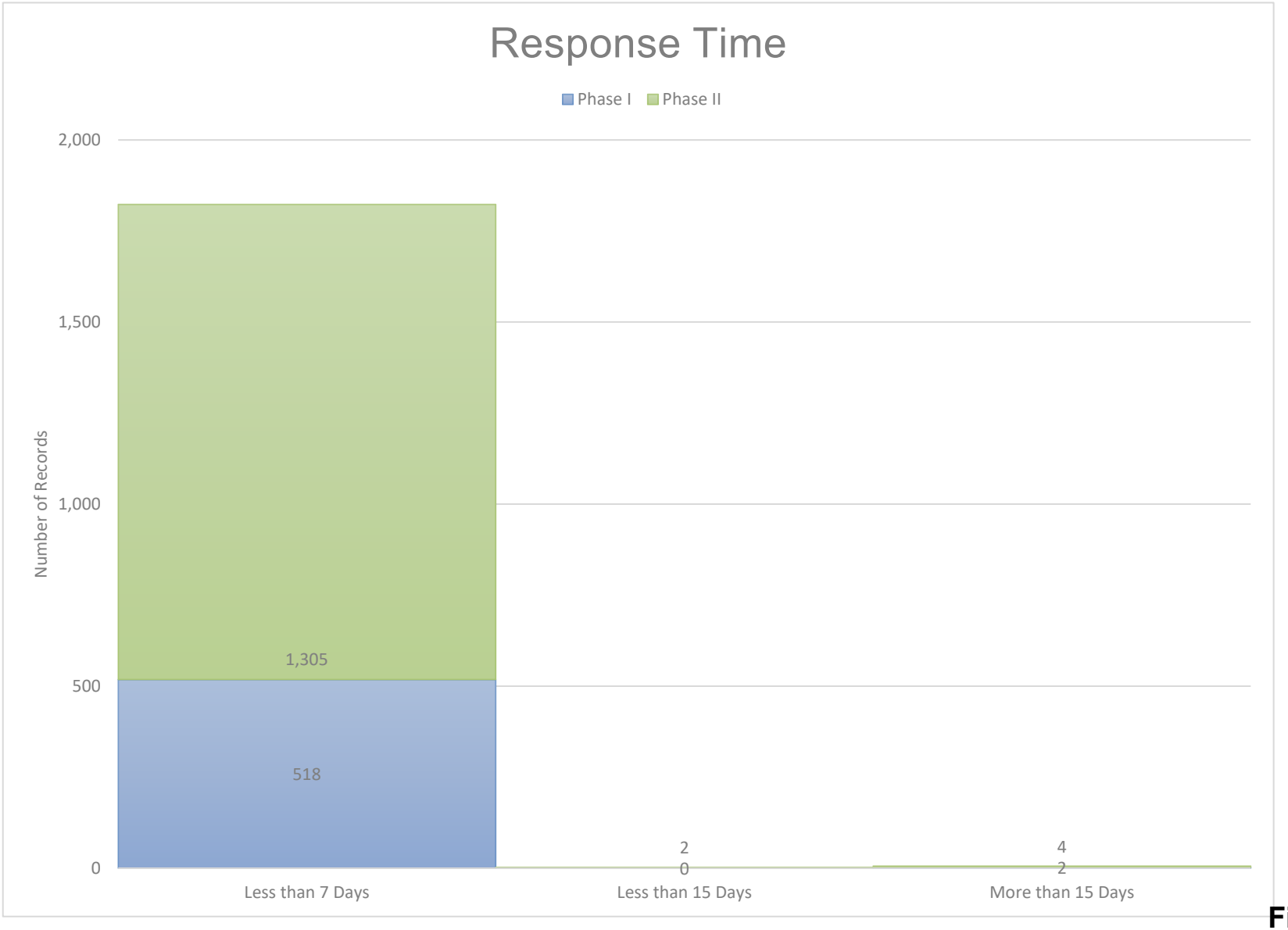

Figure 10
Response Time
IDDE Data Analysis Report
Project No. 200212-A-04B
Mobile Business SAM Study

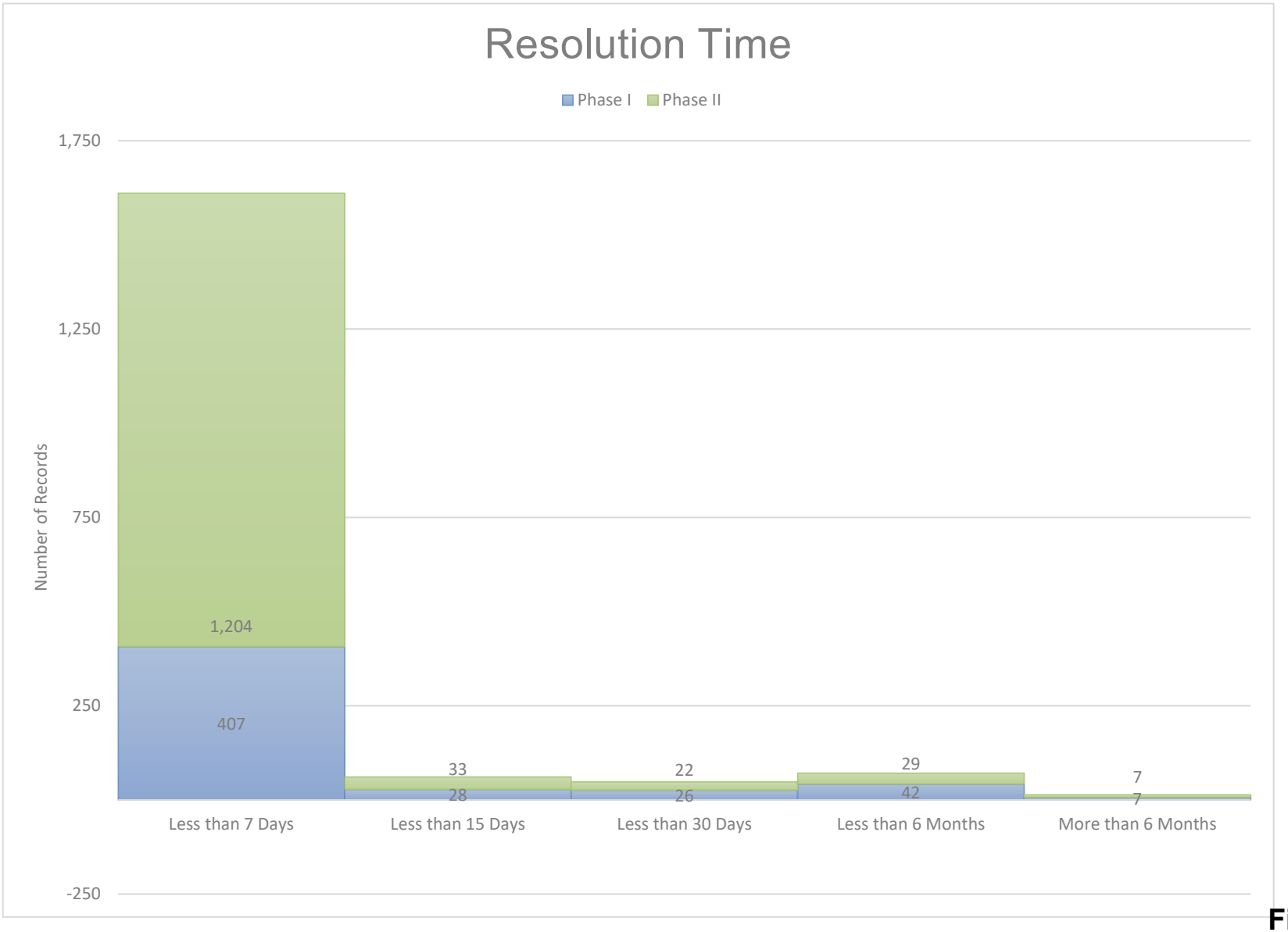

Figure 11
Resolution Time
IDDE Data Analysis Report
Project No. 200212-A-04B
Mobile Business SAM Study

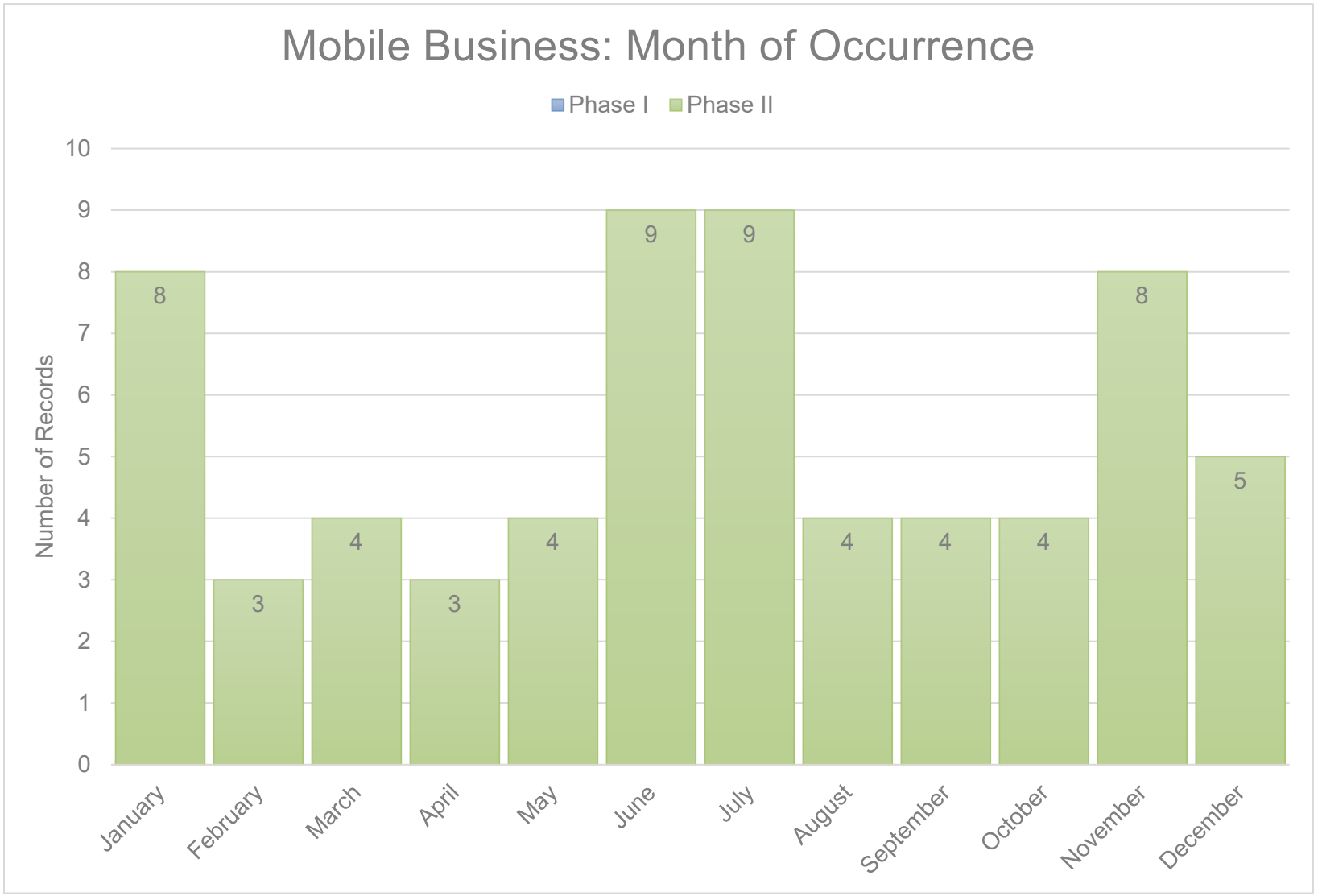

Figure 12
Mobile Business: Month of Occurrence

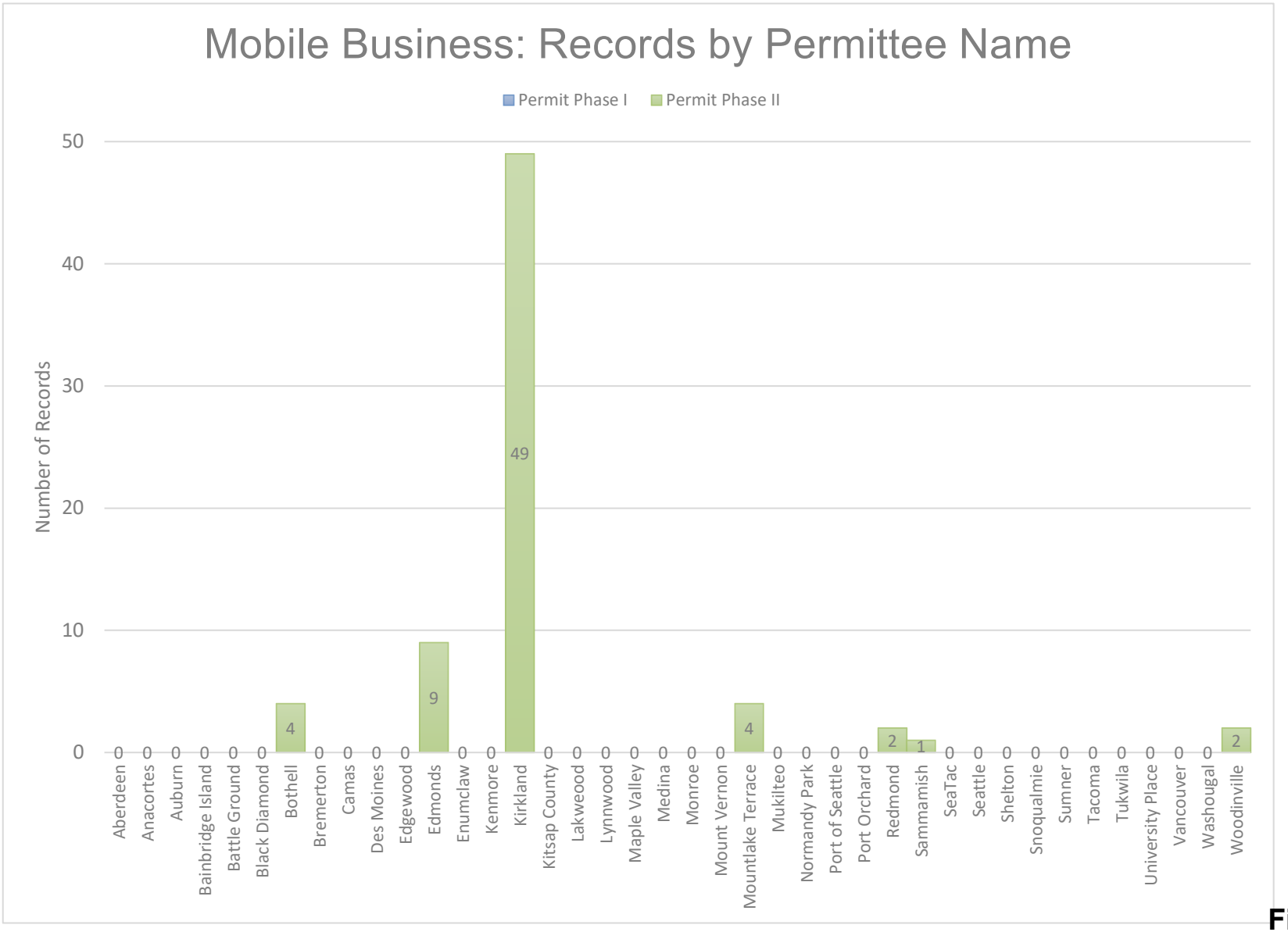

Figure 13
Mobile Business: Records by Permittee Name

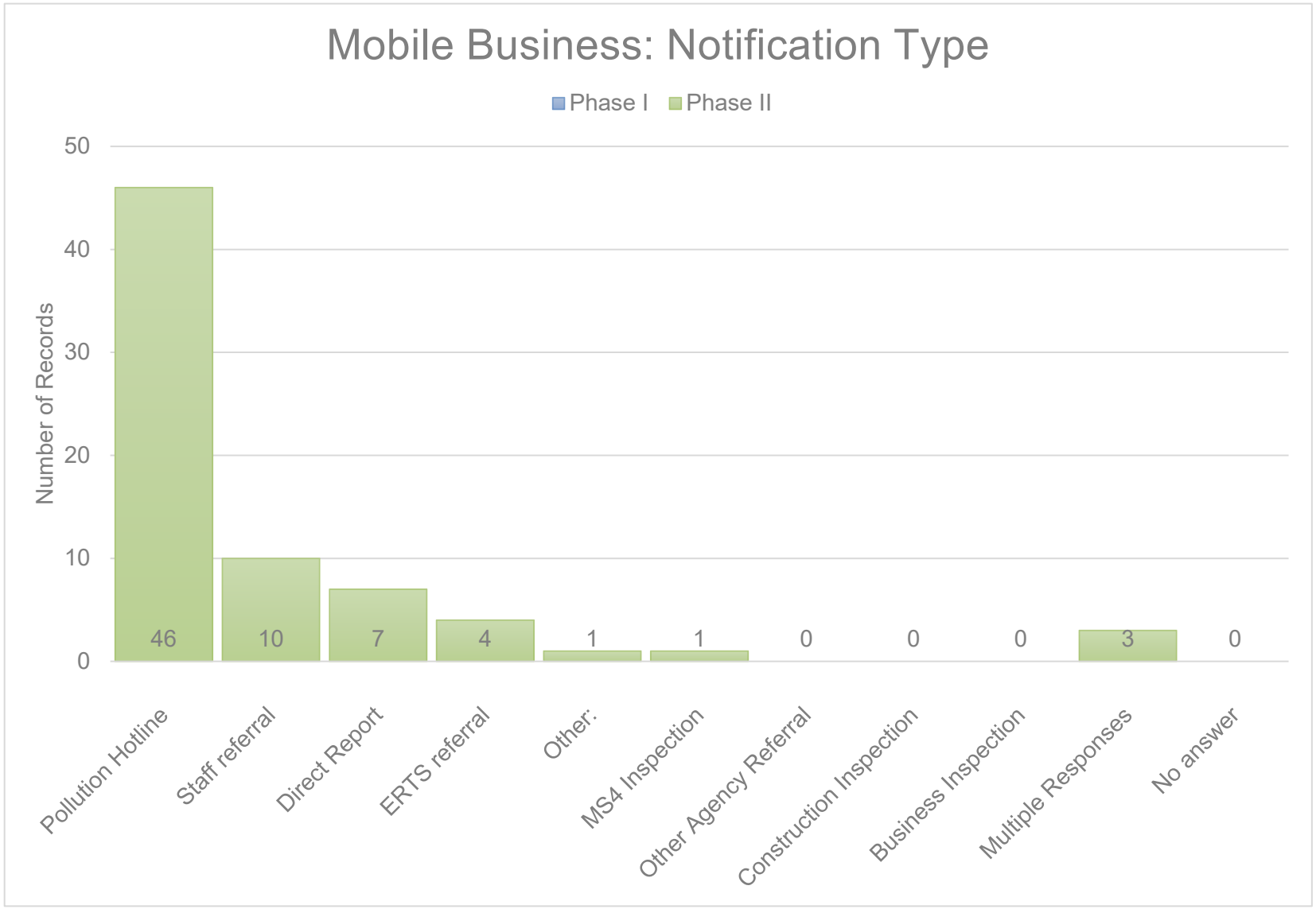

Figure 14
Mobile Business: Notification Type

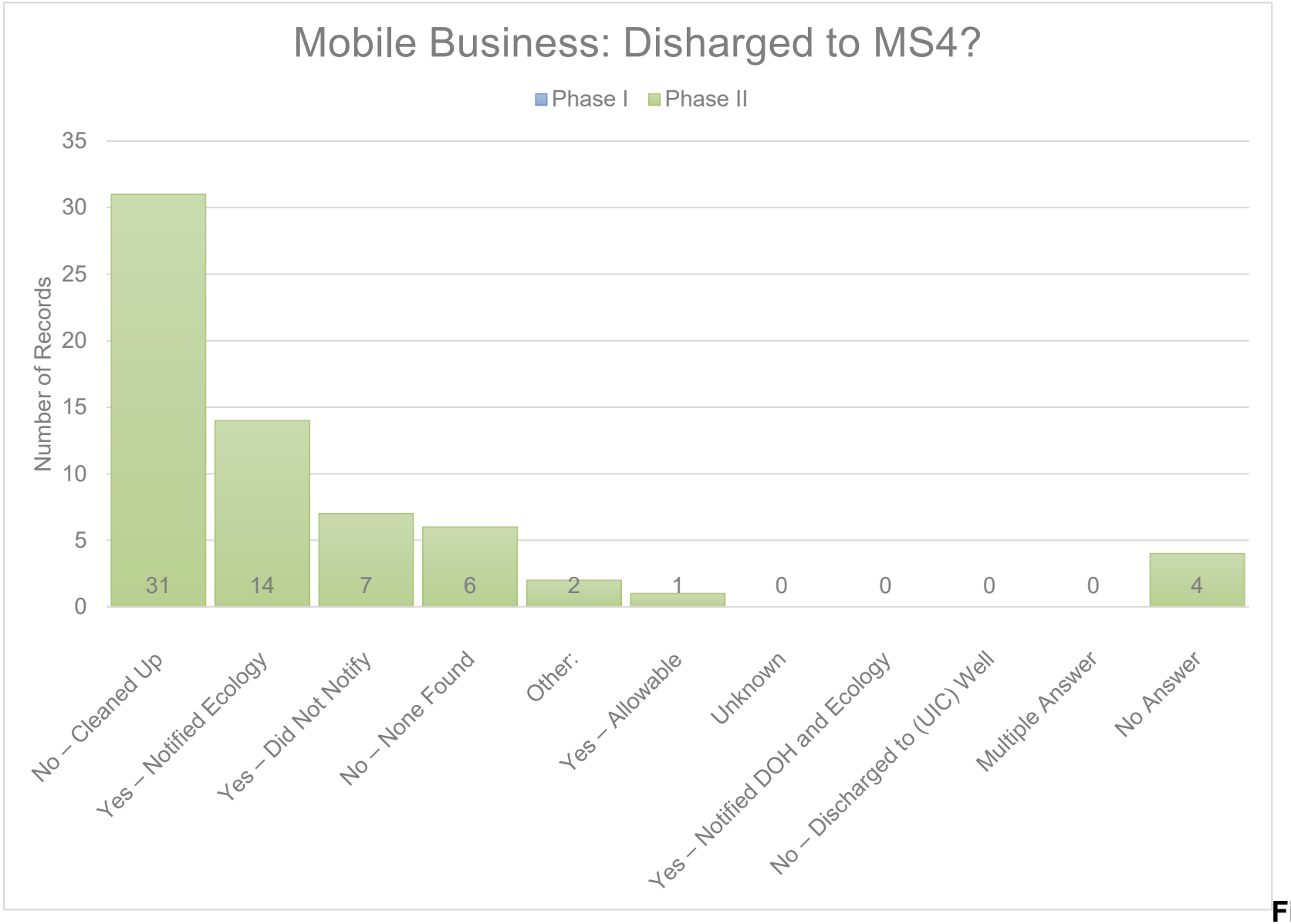

Figure 15
Mobile Business: Discharged to MS4?

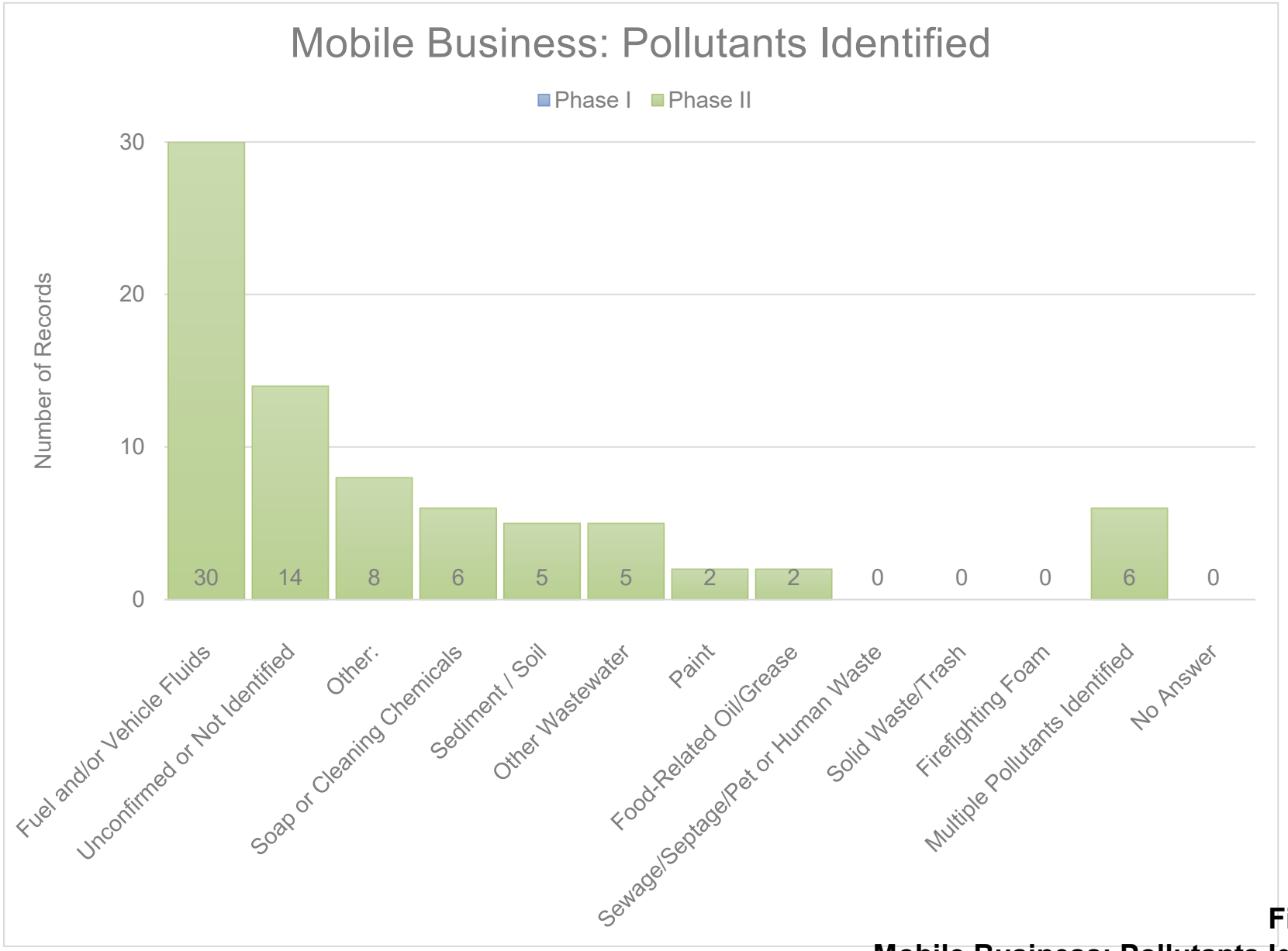

Figure 16
Mobile Business: Pollutants Identified

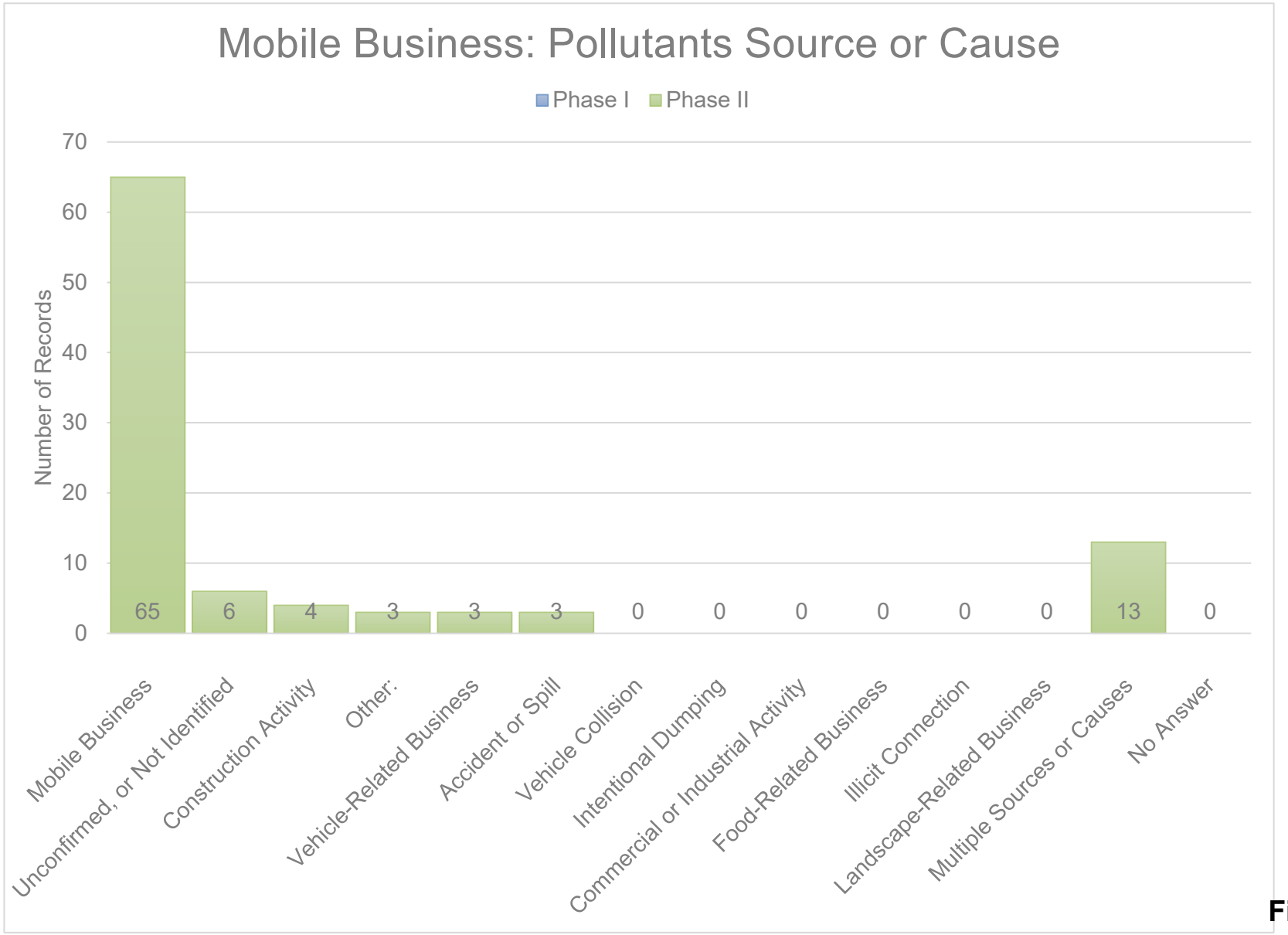

Figure 17
Mobile Business: Pollutants Source or Cause

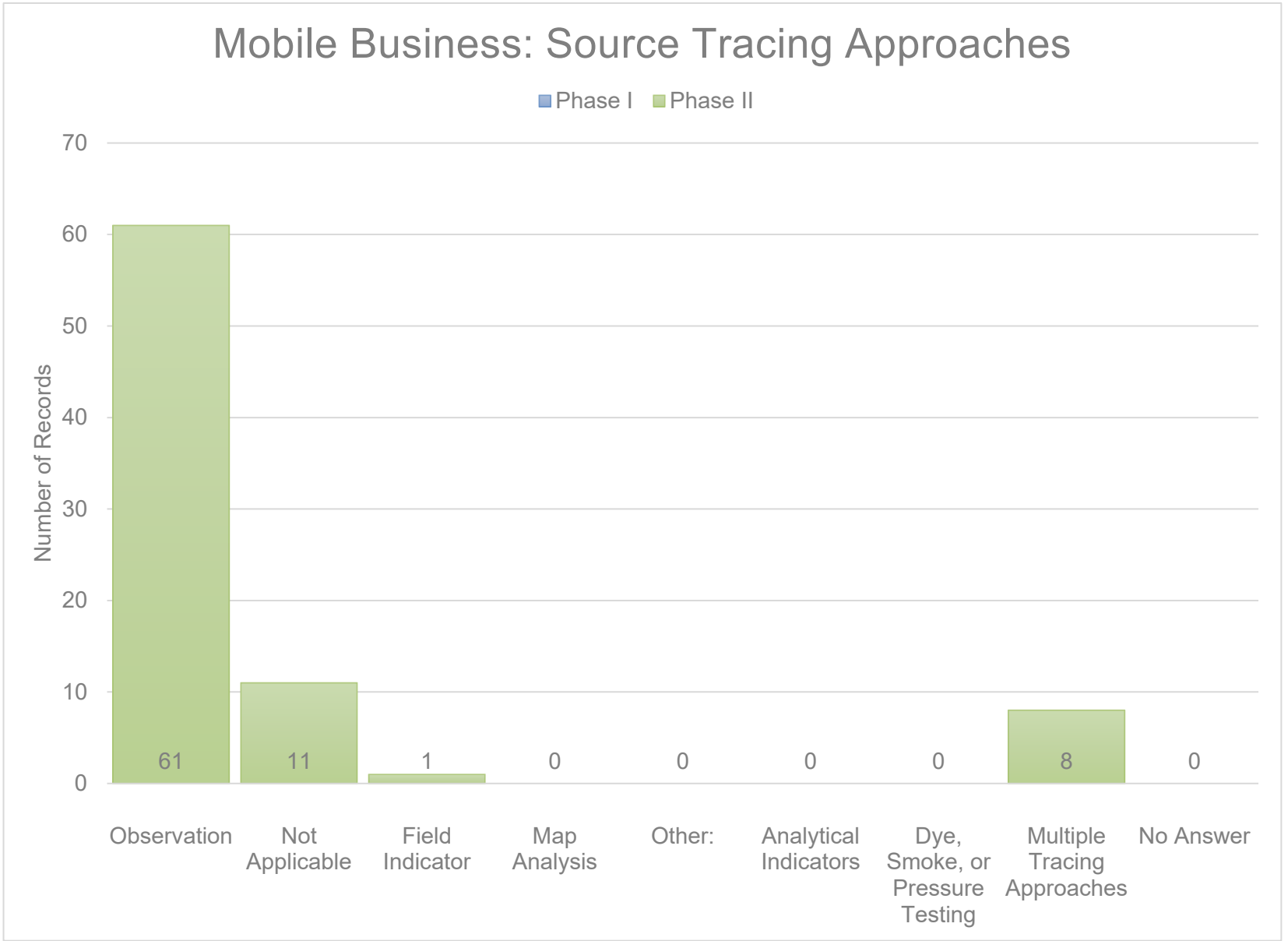

Figure 18
Mobile Business: Source Tracing Approaches

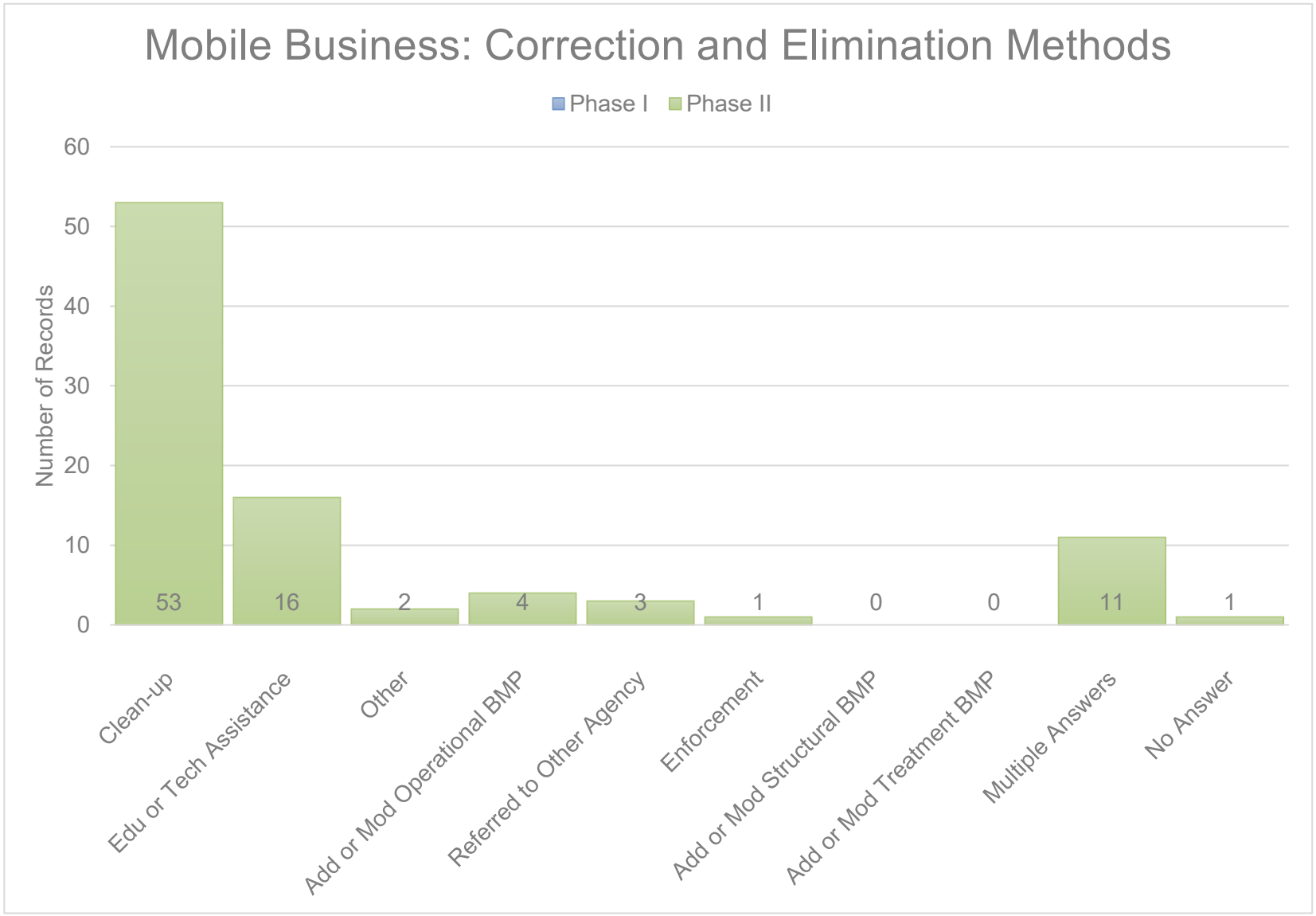

Figure 19
Mobile Business: Correction and Elimination Methods Used

APPENDIX A

IDDE Annual Report Questions from NPDES Permits

The questions are the same for Phase I (Appendix 14) and Phase II (Appendix 12) permittees

APPENDIX 12 – IDDE Reporting Data and Format

Permittees are required to submit the following information with the online annual report form, pursuant to Special Condition S9.A.

This is the complete list of information that all Permittees are required to report for each IDDE incident found, reported to, or investigated by the Permittee. Each Permittee may use either their own system or the WQWebIDDE form for recording this data.

Permittees may begin using the form to report as soon as March 31, 2020. The form is *required* for reporting by March 31, 2021, unless you are using your own tracking system. If using your own tracking system, this information must be provided in an electronic format that follows the data schema provided at the end of this document and is easily transferred to a database. For the March 31, 2020 annual report, permittees are required to submit as much of this information as possible, and in a format that is as close to this as feasible. For the March 31, 2021 annual report, Ecology would prefer a zipped .xml file that follows the schema, but it is acceptable to submit an Excel spreadsheet, .csv, or tab-delimited (.txt) file that includes all of this information. For annual reports due on March 31, 2022 and beyond, a zipped .xml that follows the schema is required.

A complete report will include a separate entry (even if left blank) for every line below and must use the precise verbiage and spelling below. For all incidents where the answer to #6 is no, #7-12 are not required. All dates are in MM/DD/YYYY format.

1. Jurisdiction name and permit number
2. Date incident discovered or reported to you
3. Date of beginning your response
4. Date of end of your response
5. How was the incident discovered or reported to you? *(select **all** that apply)*
    - Pollution hotline (phone, web, app)
    - Direct report to your staff
    - Staff referral
    - Other agency referral
    - ERTS referral
    - Business inspection
    - Construction inspection
    - MS4 inspection or screening
    - Other *(Explanation required)*
6. Discharge to MS4? *(select **one**)*
    - Yes – notified Ecology
    - Yes – notified DOH and Ecology

- Yes – did not notify
- Yes – allowable or conditionally allowable
- No – none found
- No – cleaned up before reached MS4
- No – discharge to Underground Injection Control (UIC) well
- Unknown
- Other *(Explanation required)*

7. Incident Location

- Address/Intersection
- City
- Zip *(optional)*

And/Or

- Latitude
- Longitude

8. Pollutants Identified *(select **all** that apply)*

- Unconfirmed, unspecified, or not identified
- Fuel and/or vehicle related fluids
- Food-related oil/grease
- Sediment/soil
- Solid waste/trash
- Sewage/septage/pet waste/human waste
- Other wastewater
- Paint
- Firefighting foam
- Soap or cleaning chemicals
- Other *(Explanation required)*

9. Source or Cause *(select **all** that apply)*

- Unconfirmed, unspecified, or not identified
- Vehicle-related business
- Food-related business
- Landscape-related business
- Mobile business
- Construction activity
- Other commercial/industrial activity
- Vehicle collision
- Other accident/spill
- Intentional dumping

- Illicit connection
- Other *(Explanation required)*

10. Source tracing approach(es) used *(select **all** that apply)*

- Not applicable
- Observation (color/sheen/turbidity/floatables/odor)
- Map analysis
- Dye, smoke, or pressure testing
- Field indicator measurements
- Analytical laboratory indicators
- Other *(Explanation required)*

11. Correction/elimination methods used *(select **all** that apply)*

- Clean-up
- Education/technical assistance
- Add or modify operational source control BMP
- Add or modify structural source control BMP
- Add or modify treatment BMP
- Enforcement
- Referred to other agency or department
- Other *(Explanation required)*

12. Field notes, explanations, and/or other comments