EVALUATION OF CONTACT-HANDLED TRANSURANIC WASTE ACCEPTABLE KNOWLEDGE CONFIRMATION USING HEADSPACE GAS SAMPLING AND ANALYSIS

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ABSTRACT

The Waste Isolation Pilot Plant (WIPP) Hazardous Waste Facility Permit (HWFP) limits the allowable emissions of volatile organic compounds (VOCs) from contact handled (CH) transuranic (TRU) waste. The environmental performance standard within the HWFP, Module IV, Table IV.D.1, prescribes the allowed VOC emissions from the waste to ensure protection of human health and the environment. Compliance with the performance standard to ensure control of VOC emissions is based on VOC concentrations and monitoring in the underground. One of the mechanisms used to ensure compliance with the emissions standards is measuring the VOC concentration in the headspace gas of waste containers prior to disposal.

Headspace gas sampling and analysis is the waste characterization activity used to determine the concentration of VOCs in the headspace of waste containers. In addition to being used to demonstrate compliance with the emissions standards of Module IV, Table IV.D.1, the results of the headspace gas sampling and analysis are used to confirm the hazardous wastes identified in the acceptable knowledge (AK) process. Headspace gas sampling and analysis has been an ongoing part of the CH TRU waste characterization program and therefore data are now available concerning its use and applicability.

The information from approved Waste Stream Profile Forms (WSPFs) and the headspace gas sampling and analysis results for over 16,000 containers of CH TRU waste were considered as part of this study. The headspace gas sampling and analysis results are based on data from the WIPP Waste Information System (WWIS). These results were evaluated to determine the usefulness of headspace gas sampling and analysis for confirming AK information.

The evaluation shows that the reliability of using the results of headspace gas sampling and analysis to confirm AK information can be grouped by mixed and non-mixed waste streams. In general, for mixed waste streams due to VOCs (i.e., carrying VOC-related hazardous waste numbers), there is no reliable comparison that can be made for the detection of a particular target analyte and its associated hazardous waste number(s) based on the AK information on a compound by compound basis. However, for non-mixed waste streams, the results of headspace gas sampling and analysis show a better correlation to the AK information.

INTRODUCTION

The WIPP HWFP (1) limits the allowable emissions of VOCs from CH TRU waste. The environmental performance standard within the HWFP, Module IV, Table IV.D.1, prescribes the allowed VOC emissions from the waste to ensure protection of human health and the environment. Compliance with the performance standard to ensure control of VOC emissions is based on VOC concentrations and monitoring in the underground. One of the mechanisms used to ensure compliance with the emissions standards is measuring the VOC concentration in the headspace gas of waste containers prior to disposal.

Headspace gas sampling and analysis is the waste characterization activity used to determine the concentration of VOCs in the headspace of waste containers. In addition to being used to demonstrate compliance with the emissions standards of Module IV, Table IV.D.1, the results of the headspace gas sampling and analysis are used to confirm the hazardous wastes identified in the acceptable knowledge (AK) process. Headspace gas sampling and analysis has been an ongoing part of the CH TRU waste characterization program and therefore data are now available concerning its use and applicability.

This report summarizes evaluations of the information from approved WSPFs and the headspace gas sampling and analysis results for over 16,000 containers of CH TRU waste. The headspace gas sampling and analysis results are based on data from the WWIS as of April 8, 2002. The results are analyzed to determine the usefulness of headspace gas sampling and analysis for confirming AK information.

ENVIRONMENTAL PERFORMANCE STANDARD

VOC emissions are gas emissions from VOCs that are present in waste containers. The source of the VOCs could be from any of the following three sources:

    1) VOCs in the waste,
    2) VOCs in the packaging materials, and
    3) VOCs produced through radiolysis.

All of these sources must be taken into account when considering compliance with the environmental performance standard. This is because the emission requirements are not based on the source of the VOCs. This is not the case, however, when considering confirmation of AK information, as discussed later.

The results of the headspace gas sampling and analysis are used to determine the overall emission rate from a room of CH TRU waste containers and to estimate an average concentration in active disposal rooms. The WWIS is used to track the emplacement of waste in the hazardous waste disposal units (HWDUs) and therefore ensure that the environmental performance standards are met based on the headspace gas concentrations reported for the individual waste containers.

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CONFIRMATION OF AK INFORMATION

The HWFP requires that the results of headspace gas sampling and analysis of CH TRU waste containers be used to confirm hazardous wastes identified and the corresponding hazardous waste numbers assigned during the AK process. All containers are sampled for headspace gases unless the waste stream warrants reduced sampling.

Headspace gas sampling and analysis data can be used to confirm some aspects of waste stream AK information, in that it identifies the VOCs actually present in the container headspace gas. However, the source of the VOCs cannot be directly determined during headspace gas sampling and analysis. This is important because the only VOCs that are relevant to the confirmation of AK information are those VOCs that are part of the waste (i.e., VOCs from radiolysis or packaging are not considered). The remainder of this report focuses on the use of headspace gas sampling and analysis results for the confirmation of AK information.

Criteria for Confirming AK Information

The HWFP requires that the CH TRU waste characterization program determine the headspace gas concentration for each of the VOCs on the target analyte list, including nine VOCs that constitute the environmental performance standard. The VOCs of concern are listed in the HWFP, Attachment B3, Table B3-10.

Headspace gas sampling and analysis data are used to determine if the VOCs in the headspace are consistent with expectation based on AK information (e.g., sampling may confirm the presence of VOCs, F-listed solvents, and toxicity characteristic solvents). Each of the VOCs has a program required detection limit (PRQL) that also serves as the regulatory threshold limit. The sites confirm the assignment of F-listed hazardous waste numbers by comparing the 90% upper confidence limit (UCL90) concentrations for each of the VOCs on the target analyte list for each waste stream or waste stream lot. If the UCL90 concentration for a target analyte is greater than the PRQL for that analyte and the AK information does not include that analyte, the AK information must be reevaluated. This is initially done at the time the WSPF is completed.

Hazardous constituents that are not on the target analyte list but are detected and tentatively identified using gas chromatography/mass spectrometry methods are also reported. These compounds are reported as tentatively identified compounds (TICs) in the analytical batch data report. A TIC is added to the target analyte list for a waste stream if:

- it is listed in the 20.4.1.200 NMAC, Appendix VIII, VOC list, and
- it is reported in 25% of the waste containers sampled from the waste stream.

After a TIC is added to the target analyte list, it is subject to the same requirements as other target analytes regarding the confirmation of AK information.

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EVALUATION

The results of this headspace gas sampling and analysis evaluation consists of two separate activities for each waste stream: 1) evaluating the WSPF information and 2) evaluating the actual headspace gas sampling and analysis results.

The waste stream information evaluated consisted of comparing the headspace gas summary tables to the AK summary reports used to complete the WSPF. The headspace gas summary tables summarize the results of the headspace gas sampling and analysis. The AK summary reports list the hazardous waste numbers assigned due to hazardous wastes identified during the AK process. The WSPF headspace gas sampling and analysis summary page has a check box to indicate "Did the data verify Acceptable Knowledge?" This check box is typically checked "yes" because no new compounds or hazardous wastes are identified using the headspace gas sampling and analysis results. However, this question has been interpreted in such a way that the answer does not take into consideration all of the compounds identified using the AK process whose UCL90 concentration does not indicate that the compound is "significant." If the question was being interpreted in this way, the majority of the answers be "no."

This is because there is not a direct correlation between the compounds measured and those identified during the AK process for the mixed waste streams. This could be due to the fact that a compound is a listed hazardous waste based on its use rather than its concentration. In such cases (i.e., when listed hazardous waste numbers are assigned) there should be no expectation that the headspace gas sampling and analysis results exactly match what is identified during the AK process.

For waste streams where the AK process shows that there are no hazardous constituents (i.e., non-mixed waste streams), the headspace gas sampling and analysis results indicate that there are no VOCs above the PRQLs in the container headspace. Therefore, for non-mixed waste streams, the headspace gas sampling and analysis does show a good correlation to the AK process results. The headspace gas sampling and analysis results may show the presence of some hazardous constituents due to the packaging; however, this does not indicate the presence of a hazardous waste because the waste itself is not the source of the hazardous constituent.

In addition to evaluating the WSPFs, the headspace gas sampling and analysis results for each of the waste streams were evaluated to determine the number of detections (i.e., results without a "U" flag) and the number of those results that exceeded the PRQL. These values were then expressed as a percentage of the sampled containers. The PRQL concentration is the level that the compound's UCL_{90} concentration is considered to be significant, independent of the detection rate.

In some cases, a waste stream qualified for statistical headspace gas sampling and analysis. For those waste streams, the actual number of containers sampled is less than the number of containers in the waste stream. The remainder of the waste stream containers (i.e., those not sampled) are assigned the UCL_{90} concentration calculated from the results of the sampled containers.

Although determining the UCL_{90} concentration is the only statistical reporting requirement for target analytes, the detection rate of the target analytes is of particular interest because it can be related to

the requirements for tentatively identified compounds (TICs). TICs are not considered to be significant unless they are present (i.e., detected) in greater than 25% of the samples. Although the 25% detection rate is not a HWFP requirement for the target analytes, it can be used to infer whether or not the presence of the target analyte is significant independent of the UCL_{90} concentration. This evaluation presents the data regarding the detection rate for target compounds regardless of the detected concentration to help address the "significance" of the detections on a waste stream basis.

The rate that compounds are detected at concentrations above the PRQL is also important because any detections below the PRQL are only estimates and carry the "J" flag. Calculating the detection rate above the PRQL shows how many of the actual containers are above the concentration level that is significant rather than just the UCL_{90} concentration being above the PRQL.

An example of where the detection rates would be of interest is where 41 containers have been sampled and analyzed. One container contains a carbon tetrachloride detection at 140 ppmv and the remainder of the containers have no detections (i.e., assigned one half the method detection limit [MDL], which is 5 ppmv for FTIRS). In this example, the AK process does not identify carbon tetrachloride as a hazardous constituent in the waste stream. The data results in a calculated UCL_{90} concentration of 10.22 ppmv, which is greater than the 10 ppmv PRQL requiring a reassessment of the AK information. In this case, both detection rates are significantly less than 25% (i.e., approximately 2.5%), but the UCL_{90} concentration causes the carbon tetrachloride to be "significant" because it drives a reassessment of the AK information. This is required even though the results are likely an anomalous occurrence not indicative of the waste stream contents as a whole.

The following sections evaluate the WSPF, AK summary report, and headspace gas sampling and analysis information for each of the waste streams that have all of this information as of April 8, 2002.

Waste Stream INW198.001

The INW198.001 waste stream is a debris waste stream from the INEEL with data from 29 containers in the WWIS as of April 8, 2002. The waste stream profile form indicates that the waste stream carries the F001, F002, F003, F005, F006, F007, F009, D006, D007, D008, D009, D011, and D022 hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that the UCL_{90} concentration is above the PRQL for 7 compounds. All of the other compounds that are associated with the hazardous waste numbers applied during the AK process are well below the PRQL. Therefore, the results of the headspace gas sampling and analysis indicate that although there is not a one-to-one correspondence between the compounds identified during the AK process and those identified through headspace gas sampling and analysis, there were no unexpected analytes found.

An evaluation of the WWIS data shows there are 8 compounds detected in greater than 25% of the containers. When the detections are compared to the PRQL, only 4 compounds show a detection rate greater than 25%. Again, the data indicate there is not a one-to-one correspondence between the AK process and headspace gas sampling and analysis results and there were no unexpected compounds found.

Waste Stream INW211.001

The INW211.001 waste stream is a debris waste stream from the INEEL with data from 553 containers in the WWIS as of April 8, 2002. The waste stream profile form indicates that the waste stream carries the F001, F002, F005, F006, F007, F009, D005, D007, D008, D009, D011, and D022 hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that the UCL_{90} concentration is only above the PRQL for 1,1,1-trichloroethane. All of the other compounds that are associated with the hazardous waste numbers applied during the AK process are well below the PRQL. The results from the remainder of the headspace gas sampling and analyses indicate that although there is not a one-to-one correspondence between the compounds identified during the AK process and those identified through headspace gas sampling and analysis, there were no unexpected analytes found.

An evaluation of the WWIS data shows that 17 compounds were detected in greater than 25% of the containers. When the detections are compared to the PRQL, only 2 compounds show a detection rate greater than 25%. Again, the data indicate there is not a one-to-one correspondence between the AK process and headspace gas sampling and analysis results and there were no unexpected compounds found.

Waste Stream INW216.001

The INW216.001 waste stream is a debris waste stream from the INEEL with data from 2612 containers in the WWIS as of April 8, 2002. The waste stream profile form indicates that the waste stream carries the F001, F002, F005, F006, F007, F009, D004, D005, D006, D007, D008, D009, D011, and D022 hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that the UCL_{90} concentration is above the PRQL for 3 compounds. All of the other compounds that are associated with the hazardous waste numbers applied during the AK process are well below the PRQL. Therefore, the results of the headspace gas sampling and analysis indicate that although there is not a one-to-one correspondence between the compounds identified during the AK process and those identified through headspace gas sampling and analysis, there were no unexpected analytes found.

An evaluation of the WWIS data shows that 18 compounds were detected in greater than 25% of the containers. When the detections are compared to the PRQL, only 2 compounds show a detection rate greater than 25%. Again, the data indicate there is not a one-to-one correspondence between the AK process and headspace gas sampling and analysis results and there were no unexpected compounds found.

Waste Stream INW218.001

The INW218.001 waste stream is a debris waste stream from the INEEL with data from 967 containers in the WWIS as of April 8, 2002. The waste stream profile form indicates that the waste stream carries the F001, F002, F005, F006, F007, F009, D006, D007, D008, D009, D010, D011, and D032 hazardous waste numbers. This determination was made based on the AK information. The

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UCL_{90} concentrations presented in the waste stream profile form show that the UCL_{90} concentration is only above the PRQL for 1,1,1-trichloroethane. All of the other compounds that are associated with the hazardous waste numbers applied during the AK process are well below the PRQL. Therefore, the results of the headspace gas sampling and analysis indicate that although there is not a one-to-one correspondence between the compounds identified during the AK process and those identified through headspace gas sampling and analysis, there were no unexpected analytes found.

An evaluation of the data shows that 15 compounds were detected in greater than 25% of the containers. When the detections are compared to the PRQL, only 3 compounds show a detection rate greater than 25%. Again, the data indicate there is not a one-to-one correspondence between the AK process and headspace gas sampling and analysis results and there were no unexpected compounds found.

Waste Stream INW243.001

The INW243.001 waste stream is a debris waste stream from the INEEL with data from 252 containers in the WWIS as of April 8, 2002. The waste stream profile form indicates that the waste stream carries the F001, F002, F005, D004, D005, D008, D009, and D022 hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that the UCL_{90} concentration is above the PRQL for 3 compounds. All of the other compounds that are associated with the hazardous waste numbers applied during the AK process are well below the PRQL, with the exception of toluene, which is slightly below its PRQL. Therefore, the results of the headspace gas sampling and analysis indicate that although there is not a one-to-one correspondence between the compounds identified during the AK process and those identified through headspace gas sampling and analysis, there were no unexpected analytes found.

An evaluation of the data shows that 15 compounds were detected in greater than 25% of the containers. When the detections are compared to the PRQL, only 2 compounds show a detection rate greater than 25%. Again, the data indicate there is not a one-to-one correspondence between the AK process and headspace gas sampling and analysis results and there were no unexpected compounds found.

Waste Stream INW247.001R1

The INW247.001R1 waste stream is a debris waste stream from the INEEL with data from 399 containers in the WWIS as of April 8, 2002. The waste stream profile form indicates that the waste stream carries the F001, F002, and D008 hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that the UCL_{90} concentration is only above the PRQL for 1,1,1-trichloroethane. All of the other compounds that are associated with the hazardous waste numbers applied during the AK process are well below the PRQL. Therefore, the results of the headspace gas sampling and analysis indicate that although there is not a one-to-one correspondence between the compounds identified during the AK process and those identified through headspace gas sampling and analysis, there were no unexpected analytes found.

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An evaluation of the data shows that 11 compounds were detected in greater than 25% of the containers. When the detections are compared to the PRQL, only 1 compound shows a detection rate greater than 25%. Again, the data indicate there is not a one-to-one correspondence between the AK process and headspace gas sampling and analysis results and there were no unexpected compounds found.

Waste Stream INW276.001

The INW296.001 waste stream is a debris waste stream from the INEEL with data from 282 containers in the WWIS as of April 8, 2002. The waste stream profile form indicates that the waste stream carries the F001, F002, F003, F005, F006, F009, D006, D007, D008, D009, D011, and D028 hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that some of the UCL_{90} concentrations for the compounds are above and others are below the PRQL for the compounds that are associated with the hazardous waste numbers applied during the AK process. Therefore, the results of the headspace gas sampling and analysis indicate that although there is not a one-to-one correspondence between the compounds identified during the AK process and those identified through headspace gas sampling and analysis, there were no unexpected analytes found.

An evaluation of the data shows that 15 compounds were detected in greater than 25% of the containers. When the detections are compared to the PRQL, only 3 compounds show a detection rate greater than 25%. Again, the data indicate there is not a one-to-one correspondence between the AK process and headspace gas sampling and analysis results and there were no unexpected compounds found.

Waste Stream INW276.003

The INW276.003 waste stream is a debris waste stream from the INEEL with data from 878 containers in the WWIS as of April 8, 2002. The waste stream profile form indicates that the waste stream does not carry any hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that the toluene UCL_{90} concentration exceeds the PRQL. Therefore, a reevaluation of the AK information for toluene was required. The reevaluation definitively shows that toluene was never used in the waste generating process. The reevaluation shows that the source of the toluene is either from the glue used in the waste packaging or was due to residuals present from glovebox cleaning operations and not the waste generating process. Therefore, no hazardous waste number was applied to the waste stream for toluene.

An evaluation of the data shows that 5 compounds were detected in greater than 25% of the containers, but toluene was not one of the compounds. When the detections are compared to the PRQL, only 1 compound shows a detection rate greater than 1%. Therefore, the data indicate that the headspace gas sampling and analysis results do not support or refute the information collected during the AK process.

Waste Stream INW276.004

The INW276.004 waste stream is a debris waste stream from the INEEL with data from 217 containers in the WWIS as of April 8, 2002. The waste stream profile form indicates that the waste stream carries the F001, F002, D008, D029, and D040 hazardous waste numbers. This determination was conservatively made based on results of headspace gas sampling and analysis. The UCL_{90} concentrations presented in the waste stream profile form shows that UCL_{90} concentration exceeds the PRQL for 1,1,1-trichloroethane, 1,1-dichloroethylene, and trichloroethylene. Therefore, a reevaluation of the AK information for these compounds was required. The reevaluation did not definitively conclude that these compound were never used in the waste generating process, even though the waste was generated in a manner similar to the other INW276 waste streams. Therefore, the hazardous waste numbers for the compounds were conservatively added to the waste stream rather than collecting additional AK information to allow a definitive conclusion regarding the use of the compounds to be reached. This is not a concern (i.e., adding an additional hazardous waste number indicating the presence of a hazardous constituent that is not actually present) because the waste is managed in the same fashion regardless of the hazardous waste numbers applied.

An evaluation of the data shows that 9 compounds were detected in greater than 25% of the containers, but 1,1-dichloroethylene was not one of the compounds. The detection rate for 1,1-dichloroethylene is only 11.52% (25 detections) with less than 1% (2 detection) above the PRQL. However, the UCL_{90} concentration provided with the WSPF shows that the 1,1-dichloroethylene UCL_{90} concentration is greater than the PRQL. This is an example of how a few high detections can skew the final UCL_{90} concentration making the usefulness of the headspace gas sampling and analysis results questionable for confirming AK information.

Waste Stream INW296.001

The INW296.001 waste stream is a debris waste stream from the INEEL with data from 282 containers in the WWIS as of April 8, 2002. The waste stream profile form indicates that the waste stream carries the F001, F002, F003, F005, F006, F009, D006, D007, D008, D009, D011, and D028 hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that some of the UCL_{90} concentrations for the compounds are above and others are below the PRQL for the compounds that are associated with the hazardous waste numbers applied during the AK process. Therefore, the results of the headspace gas sampling and analysis indicate that although there is not a one-to-one correspondence between the compounds identified during the AK process and those identified through headspace gas sampling and analysis, there were no unexpected analytes found.

An evaluation of the data shows that 15 compounds were detected in greater than 25% of the containers. When the detections are compared to the PRQL, only 3 compounds show a detection rate greater than 25%. Again, the data indicate there is not a one-to-one correspondence between the AK process and headspace gas sampling and analysis results and there were no unexpected compounds found.

Waste Stream LA-TA-55-19.01

The LA-TA-55-19.01 waste stream is a debris waste stream from the LANL with data from 68 containers in the WWIS as of April 8, 2002. The waste stream profile form indicates that the waste stream carries the F001, F002, F003, F005, D004, D005, D006, D007, D008, D009, D010, D011, D018, D019, D021, D022, D035, D038, D039, and D040 hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that the UCL_{90} concentration is above the PRQL for acetone and methylene chloride. All of the other compounds that are associated with the hazardous waste numbers applied during the AK process are well below the PRQL. Therefore, the results of the headspace gas sampling and analysis indicate that although there is not a one-to-one correspondence between the compounds identified during the AK process and those identified through headspace gas sampling and analysis, there were no unexpected analytes found.

An evaluation of the data shows that 4 compounds were detected in greater than 25% of the containers. When the detections are compared to the PRQL, only acetone shows a detection rate greater than 25%. Again, the data indicate there is not a one-to-one correspondence between the AK process and headspace gas sampling and analysis results and there were no unexpected compounds found.

Waste Stream RF001.01

The RF001.01 waste stream is a debris waste stream from the RFETS with data from 2619 containers in the WWIS as of April 8, 2002. The waste stream profile form indicates that the waste stream carries no hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that all of the UCL_{90} concentration are well below the PRQL. Therefore, the results of the headspace gas sampling and analysis support the conclusion made by the AK process that this is a non-mixed waste stream.

An evaluation of the data shows that only 2 compounds were detected in greater than 25% of the containers. When the detections are compared to the PRQL, no compounds show a detection rate greater than 25%. Again, the data indicate that the headspace gas sampling and analysis results support the information collected during the AK process that this is a non-mixed waste stream.

Waste Stream RF003.01

The RF003.01 waste stream is a debris waste stream from the RFETS with data from 345 containers in the WWIS as of April 8, 2002; however, only 40 of these containers were sampled using the statistical sampling approach for waste streams that are thermally processed or have no VOC hazardous waste numbers assigned to the waste stream. The remaining containers have the UCL_{90} concentration assigned to them.

The waste stream profile form indicates that the waste stream carries no hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that all of the UCL_{90} concentration are well below the PRQL.

Therefore, the results of the headspace gas sampling and analysis support the conclusion made by the AK process that this is a non-mixed waste stream.

An evaluation of the data shows that only 3 compounds were detected in greater than 25% of the containers. When the detections are compared to the PRQL, none of the compounds show a detection rate greater than 25%. Again, the data indicate that the headspace gas sampling and analysis results support the information collected during the AK process that this is a non-mixed waste stream.

Waste Stream RF005.02

The RF010.01 waste stream is a homogeneous solid waste stream from the RFETS with data from 368 containers in the WWIS as of April 8, 2002. The waste stream profile form indicates that the waste stream carries no hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that all of the UCL_{90} concentration are well below the PRQL. Therefore, the results of the headspace gas sampling and analysis support the conclusion made by the AK process that this is a non-mixed waste stream.

An evaluation of the data shows that no compounds were detected in greater than 25% of the containers either above or below the PRQL. Again, the data indicate that the headspace gas sampling and analysis results support the information collected during the AK process that this is a non-mixed waste stream.

Waste Stream RF006.01

The RF006.01 waste stream is a debris waste stream from the RFETS with data from 664 containers in the WWIS as of April 8, 2002; however, only 19 of these containers were sampled using the statistical sampling approach for waste streams that are thermally processed or have no VOC hazardous waste numbers assigned to the waste stream. The remaining containers have the UCL_{90} concentration assigned to them.

The waste stream profile form indicates that the waste stream carries no hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that all of the UCL_{90} concentration are well below the PRQL. Therefore, the results of the headspace gas sampling and analysis support the conclusion made by the AK process that this is a non-mixed waste stream.

An evaluation of the data shows only 5 compounds were detected in greater than 25% of the containers. When the detections are compared to the PRQL, none of the compounds show a detection rate greater than 25%. Again, the data indicate that the headspace gas sampling and analysis results support the information collected during the AK process that this is a non-mixed waste stream.

Waste Stream RF008.01

The RF008.01 waste stream is a debris waste stream from the RFETS with data from 378 containers in the WWIS as of April 8, 2002; however, only 18 of these containers were sampled using the

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statistical sampling approach for waste streams that are thermally processed or have no VOC hazardous waste numbers assigned to the waste stream. The remaining containers have the UCL_{90} concentration assigned to them.

The waste stream profile form indicates that the waste stream carries no hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that all of the UCL_{90} concentration are well below the PRQL. Therefore, the results of the headspace gas sampling and analysis support the conclusion made by the AK process indicating this is a non-mixed waste stream.

An evaluation of the data shows that only 1 compound was detected in greater than 25% of the containers. When the detections are compared to the PRQL, no compounds show a detection rate greater than 25%. Again, the data indicate that the headspace gas sampling and analysis results support the information collected during the AK process indicating this is a non-mixed waste stream.

Waste Stream RF009.01

The RF009.01 waste stream is a homogeneous solid waste stream from the RFETS with data from 3528 containers in the WWIS as of April 8, 2002; however, only 24 of these containers were sampled using the statistical sampling approach for waste streams that are thermally processed or have no VOC hazardous waste numbers assigned to the waste stream. The remaining containers have the UCL_{90} concentration assigned to them.

The waste stream profile form indicates that the waste stream carries no hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that all of the UCL_{90} concentration are well below the PRQL. Therefore, the results of the headspace gas sampling and analysis support the conclusion made by the AK process indicating this is a non-mixed waste stream.

An evaluation of the data shows that only 1 compound was detected in greater than 25% of the containers. When the detections are compared to the PRQL, no compounds show a detection rate greater than 25%, in fact there were no detections greater than the PRQL at all. Again, the data indicate that the headspace gas sampling and analysis results support the information collected during the AK process indicating this is a non-mixed waste stream.

Waste Stream RF010.01

The RF010.01 waste stream is a debris waste stream from the RFETS with data from 78 containers in the WWIS as of April 8, 2002. The waste stream profile form indicates that the waste stream carries no hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that all of the UCL_{90} concentration are well below the PRQL. Therefore, the results of the headspace gas sampling and analysis support the conclusion made by the AK process indicating this is a non-mixed waste stream.

An evaluation of the data shows that only 5 compound were detected in greater than 25% of the containers. When the detections are compared to the PRQL, no compounds show a detection rate greater than 25%. Again, the data indicate that the headspace gas sampling and analysis results support the information collected during the AK process indicating this is a non-mixed waste stream.

Waste Stream RF118.01

The RF118.01 waste stream is a homogeneous solid waste stream from the RFETS with data from 3724 containers in the WWIS as of April 8, 2002; however, only 20 of these containers were sampled using the statistical sampling approach for waste streams that are thermally processed or have no VOC hazardous waste numbers assigned to the waste stream. The remaining containers have the UCL_{90} concentration assigned to them.

The waste stream profile form indicates that the waste stream carries the F001, F002,F005, D004, D005, D006, D007, D008, D009, D010, D011, and D028 hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that all of the UCL_{90} concentration are well below the PRQL. Therefore, the results of the headspace gas sampling and analysis indicate that although there is not a one-to-one correspondence between the compounds identified during the AK process and those identified through headspace gas sampling and analysis, there were no unexpected analytes found.

An evaluation of the data shows that only 1 compound was detected in greater than 25% of the containers. When the detections are compared to the PRQL, no compounds show a detection rate greater than 25%, in fact there were no detections greater than the PRQL at all. Again, the data indicate there is not a one-to-one correspondence between the AK process and headspace gas sampling and analysis results and there were no unexpected compounds found.

Waste Stream RLNPDT.002

The RLNPDT.002 waste stream is a debris waste stream from Hanford with data from 383 containers in the WWIS as of April 8, 2002. The waste stream profile form indicates that the waste stream carries no hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that all of the UCL_{90} concentration are well below the PRQL. Therefore, the results of the headspace gas sampling and analysis support the conclusion made by the AK process indicating this is a non-mixed waste stream.

An evaluation of the data shows that only 1,1,1-trichloroethane was detected in greater than 25% of the containers. When the detections are compared to the PRQL, no compounds show a detection rate greater than 25%. Again, the data indicate that the headspace gas sampling and analysis results support the information collected during the AK process indicating this is a non-mixed waste stream.

Waste Stream SR2001.001.00

The SR2001.001.00 waste stream is a debris waste stream from the Savannah River Site with data from 294 containers in the WWIS as of April 8, 2002. The waste stream profile form indicates that

the waste stream does not carry any hazardous waste numbers. This determination was made based on the AK information. The UCL_{90} concentrations presented in the waste stream profile form show that 1,1,1-trichloroethane is the only constituent whose UCL_{90} concentration exceeds the PRQL. Therefore a reevaluation of the AK information for 1,1,1-trichloroethane was required. The reevaluation showed that the 1,1,1-trichloroethane is from the glue used in the waste packaging.

An evaluation of the data shows that there are 7 compounds that were detected in greater than 25% of the containers, but toluene was not one of the compounds. When the detections are compared to the PRQL, only 1,1,1-trichloroethane shows a detection rate of greater than 3%. The 1,1,1-trichloroethane in the headspace gas is from the glue used during the packaging. It was necessary to obtain additional AK information regarding the source of the 1,1,1-trichloroethane in order to demonstrate what the source of the 1,1,1-trichloroethane was. Therefore, the 1,1,1-trichloroethane headspace gas sampling and analysis results do not actually support the AK information about the waste contents.

CONCLUSIONS

The data show that the reliability of using the results of headspace gas sampling and analysis to confirm AK information can be grouped by mixed and non-mixed waste streams. In cases where the waste stream has already been identified as mixed waste carrying VOC-related hazardous waste numbers using the AK process, there is no reliable comparison that can be made for the headspace gas status of a particular target analyte and its associated hazardous waste number(s). The headspace gas sampling and analysis results for mixed waste streams do not show a trend when correlated to the AK information because sometimes there is agreement, but in most cases there is no agreement on a compound-by-compound basis.

In cases where the waste stream has been identified as a non-mixed waste streams using the AK process, the results of headspace gas sampling and analysis show a better correlation to the AK information than that for mixed waste streams. However, this correlation shows a negative trend: the headspace gas sampling and analysis results identify VOCs that do not carry a hazardous waste number because the waste itself is not the source of the VOCs (i.e., the VOC is from the packaging).

REFERNCES

1. New Mexico Environment Department. *Waste Isolation Pilot Plant Hazardous Waste Facility Permit.* NM4890139088-TSDF, Santa Fe, New Mexico.