UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

February 29, 2012

REPLY TO THE ATTENTION OF:

SR-6J

Via Electronic Mail and Certified Mail
Return Receipt Requested

Paul Kysel, President
PINES Group
[redacted]
Exemption 6

RE: Pines Site, Pines, Porter County, Indiana
Administrative Order on Consent Docket No. V-W-04-C-784

Dear Mr. Kysel:

Thank you for your response to comments dated October 12, 2011, and the risk assessment dated October 2009, provided via e-mail on December 6, 2011. The Environmental Protection Agency has reviewed this information and its comments are enclosed with this letter.

If you have any questions regarding this matter, please contact me at (312) 886-4442 or ohl.matthew@epa.gov.

Sincerely,

Matthew J. Ohl
Remedial Project Manager

Enclosures

cc via e-mail:

Chuck Norris
Mark Hutson
Kim Ferraro
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Janet Pope, EPA-CIC

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Enclosure 1

EPA reviewed a report titled, "Gamma Count Rate Survey in Pines, Indiana, Conducted October 10-15, 2009," submitted on behalf of the PINES community group and written by Larry Jensen. EPA provided its response on October 12, 2011. Larry Jensen provided EPA with comments in a document titled, "Comments on Review of PINES radiation survey," dated October 12, 2011. The following are responses to the document titled, "Comments on Review of Pines radiation survey." EPA responses in regular font follow the comments from "Comments on Review of Pines radiation survey," that are underlined and in quotes.

RESPONSE TO COMMENTS ON REVIEW OF PINES RADIATION SURVEY

For convenience each of the paragraphs in the Comments on Review of PINES Radiation Survey (Comments) is addressed separately. Where a paragraph has numbered statements, the response uses the same numbers as in the Comments. The response is limited to the Comments and the Survey and does not respond to documents not referenced in the Survey.

"I have read the review of the PINES radiation Survey sent by Matthew J. Ohl to Paul Kysel. My reaction is that (1) this review was not done by someone fluent with environmental radiation Surveys and (2) the reviewers did not read all the material submitted to Region 5 U.S. Environmental Protection Agency (USEPA5). There are numerous errors."

1. The comment is not correct. The reviewer has over thirty years of experience in environmental radiation health. The reviewer is a member of the Health Physics Society, whose goals include promoting the science and sound practice of radiation safety, and is certified by the American Board of Health Physics.

2. The reviewer carefully read the Survey and the review was limited to the contents of the Survey. The Comments state that there are numerous errors, but do not identify the documents in which the purported errors appear.

"Calibration of the instrument was done by Auxier and Associates, a long standing radiation Survey consulting company that is intimately familiar with environmental radiation measurements for naturally occurring radio nuclides. It is standard procedure to use cesium-137 for these calibrations. I am sure their work is court defensible."

The Comments state that the calibration was done by Auxier and Associates. The statement is not supported by the calibration certificate in Appendix B of the Survey. The calibration certificate was issued by Griffin Instruments and lists Auxier as the owner. Contrary to the statement that it is standard procedure to use Cs-137 for calibrations, calibration of instruments using the radionuclides of interest is an established practice.

EPA has in the past required measurements of naturally occurring radionuclides be made with instruments calibrated with standards containing the radionuclides of interest. For example at thorium cleanup sites, EPA and various contractors use Illinois Emergency Management Agency provided calibration standards blocks and barrels containing naturally occurring radionuclides, including Ra-226 and Ra-228. Calibration with these standards enables correlating instrument responses with radionuclide concentrations. Calibration with Cs-137 enables correlation with Cs-137, not a radionuclide of interest.

The work of Auxier and Associates may be court defensible. However, the calibration was performed by Griffin Instruments, not Auxier. Furthermore, the review was of the Survey, not the work of Auxier. The survey reports using an instrument for which the relationship between instrument reading and the concentration of radionuclides of interest is not demonstrated.

"The reviewer misses the point of this Survey - to determine if any radionuclides were present where coal combustion byproducts were present and to determine if these were distinct from background. This was done. Attached is an internet page from the U.S. Department of Health and Human Services stating that twice background is indicative of contamination. Materials in Pines are clearly distinct from background."

The Comments state that the reviewer misses the point of the Survey. This may be because the point of the Survey, stated in the Comments above, does not appear in the Survey and the Survey does not meet this objective. The survey does not include the type of analysis necessary to identify the radionuclides that might be present and the data presented in the Survey do not demonstrate that any specific radionuclides are present at concentrations distinct from background.

The Survey states that natural background gamma count rates were established at 3 sites believed to not have any deposits of flyash. The background radiation levels were reported to range between 3,052 and 11,684 counts per minute (cpm), possible due to normal variations in the concentrations of naturally occurring radionuclides on the background sites. Using a single number from a range biases results and ignores variations in natural background radiation. Radiation levels that are twice background may be indicative of contamination where background is a single uniform value. Analysis of samples is necessary to determine radionuclide identity and if concentrations are present above background concentrations.

The range of gamma count rate ranges measured at the 12 investigation sites where fly ash contamination was suspected, between 3,000 cpm and 14,000 cpm, are similar to the range of count rates at the three background sites. The conclusion that contamination is present on the investigation sites is not supported by the reported data. If the three background sites are considered investigation sites and the twelve investigation sites are considered background sites,

the lowest radiation level on a background site would be 3,000 cpm. The radiation levels on the three sites now considered investigation sites would all be above background and one would have radiation levels that are more than double background. Both groups of sites have similar radiation levels and could be either at background or not.

Additionally, glittering black material was reported on both unaffected background sites and the affected investigation sites. Elevated radiation levels are attributed to this material which is described, in the report, without explanation, as fly ash, a fine grained material, and as sand blasting grit.

"In the reviewer's Survey Methodology and Interpretation the procedure of this Survey was interpreted incorrectly. The first action by PINES was to locate radiologically elevated regions, giving the range of readings, and then to get a more exacting measurement through a two minute count where the readings appeared highest. This latter reading was the one used to make judgments."

The range of radiation levels in investigation areas never exceeded double the range of values observed in background areas, whether two minute or other durations of measurement were used. Collecting data for two minutes and dividing the result by two does not alter the observed count rate. Selection of data from a range of readings bias conclusions.

"The PINES group was not fiscally able to extend measurements beyond this Survey. That is why PINES made the five recommendations included in the Survey report. The intent was for USEPA5 to first confirm PINES readings and then to determine the radionuclides and their concentrations. Two years after PINES submitted this report, USEPA5 has only now responded to this Survey."

This is not accurate. EPA reviewed and discussed the Report with the PINES Group when it was first submitted. In response to PINES Group's request for further consideration of the report EPA provided a detailed, written response via e-mail on October 12, 2011.

"In the reviewer's Conclusions and Recommendations PINES is criticized for not exploring the human health pathways. This is wrong. PINES, subsequent to the radiation Survey, did a risk assessment for external exposure to X-rays and gamma radiation, concluding, for this single pathway that the 30-year risk could be as high as 1.2 E-03, well above the upper limit for Superfund. USEPAS has never acknowledged this risk assessment although it was submitted in 2010."

The Survey did not explore human health pathways. The calculation of risk in subsequent work does not negate a failure to include data in the Survey report.

"In trying to find sufficient data to perform this risk assessment, it appears that material buried in Yard 520 exceed the commonly used cleanup criterion for total radium used by USEPA5. The criterion is that in Title 10 Part 192 of the Code of Federal Regulations, namely 5 picocuries per gram total radium."

The Survey does not report the analysis of concentrations of any radionuclides. The standard that PINES is referring to is Title 40, Section 192.12 (Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites).

Sec. 192.12 Standards
Remedial actions shall be conducted so as to provide reasonable assurance that, as a result of residual radioactive materials from any designated processing site:
(a) The concentration of radium-226 in land averaged over any area of 100 square meters **shall not exceed the background level by more than**:

(1) 5 pCi/g, averaged over the first 15 cm of soil below the surface, and
(2) 15 pCi/g, averaged over 15 cm thick layers of soil more than 15cm below the surface.

Appendix J, Section J.5 (Standard Comparison) of the December 2011 HHRA states the following:

> "Only two of the Yard 520 sample results for the sum of radium-226 and radium-228 are above the highest "5 + BTV" value of 7 pCi/g (7.09 pCi/g and 7.26 pCi/g). The mean concentration of the sum of the radium is 5.49 pCi/g for the Yard 520 samples, which is below the lowest "5 + BTV" value of 5.9 pCi/g." Considering that only two Yard 520 samples exceed "5 + BTV", EPA would disagree with PINES statement that "*material buried in Yard 520 exceed the commonly used cleanup criterion for total radium.*" The single samples from the remedial investigation may exceed the 5+background level, but that doesn't mean the 192.12 Standard ("cleanup criterion") used for cleanup verification is exceeded. For example, the cleanup criteria for the West Chicago and Streeterville sites were 7.1 and 7.2 pCi/g for total radium (5pCi/g +background), confirmed with composite samples taken from 5 locations across an area of 100 square meters.

"Finally, PINES recommended that, if Pines drinking water is chemically contaminated, it should be investigated for radioactive contamination as well. PINES does not believe USEPA5 has done this."

EPA does not agree that such additional data collection is necessary at this time to complete the risk assessments.

Enclosure 2

I. Introduction

The document titled PINES Group Radiation Risk Estimate (PINES Report), along with other unreferenced documents that appear to be in support of the PINES Report, Data Necessary to Compute Radiological Risks from Flyash Associated with Yard 520 (Supporting), Cancer Risk Coefficients Worksheet (Coefficients), and Cancer Risks Worksheet 2 (Risks), is a flawed attempt to calculate Human Health Risk (HHR) from radionuclides in Pines, Indiana.

Supporting, contains data used as the foundation for the Report. Supporting does not cite the sources of the information it contains. The data appear to be from AECOM's Human Health Risk Assessment, Appendix A, Analytical Data, Attachment 4, Radionuclide Data, Table A-4-1, Validated Results of Yard 520 Sampling for Radionuclides. The sections of Supporting are evaluated separately.

Section: Available Data

Supporting contains multiple errors beginning with bad arithmetic. The section Available Data states that the ratio of 0.044 pCi/g to 14.5 pCi/g is 0.030. This simple calculation is in error by an order of magnitude. The correct ratio of these two numbers is 0.003. Even when the arithmetic is corrected, the ratio is not valid because the units used are not the units reported in Table A-4-1.

Several other errors are immediately apparent when the data are examined. Supporting states that the numbers used are the values for the peak concentrations of uranium 235 (U-235) and U-238 measured by ICP-MS in units of picocuries per gram (pCi/g). Table A-4-1 reports the concentrations of U-235 and U-238 by ICP-MS in units of milligrams per kilogram (mg/kg), not pCi/g. Using the wrong units with the reported numerical values introduces a gross overestimate in the assessment of risk.

This same section states that the numerical values are peak values. This statement is not true. The numerical value for the concentration of U-238 is the peak value, for the sample from Location GP008. The numerical value for the concentration of U-235 is not the peak value, but is, instead, the lowest concentration of U-235 found, in a different sample from Location GP004. Calculating a ratio in concentrations using data from different samples is a major error and is misleading about the quality of the data in Table A-4-1.

When the concentrations of U-238 and U-235 in mg/kg for the samples reported in Table A-4-1 are converted to specific activity in pCi/g, the ratios of U-235 to U-238 are between 0.045 and 0.047. These ratios are in excellent agreement with the expected ratio of 0.046, leading to the

conclusion that the data are of high quality, rather than as stated, of questionable quality.

Section: Background Determination

This section states that the observed background concentrations of three radionuclides in the uranium series average 0.291 pCi/g. This section further states that these data are of uncertain quality because the concentrations are not equal. Measured concentrations of radionuclides in a natural series rarely are equal. The reported values are all within 10% of the average value, a range that indicates that the data are high quality.

This section states that for the actinium decay series, the only measured values are for U-235 and that these measurements are by gamma spectroscopy, not by ICP-MS. This statement is false. Table A-4-1 contains measurements of the concentration of U-235 by ICP-MS for each sample location. These data are of excellent quality and could have been used.

Section: Projections for Unmeasured Data

This section states the radionuclides in the thorium decay series were unmeasured. The statement is false. Table A-4-1 contains measurements by gamma spectroscopy of thorium 232 (Th-232), Th-228, and radium 228 (Ra-228), all in the thorium series, for each sample location. The reported values indicate the results are of high quality and that the thorium series is in equilibrium in the samples.

The attempt to indirectly determine the activity of the thorium decay series in Yard 520 is seriously flawed. This section attempts to calculate the concentrations of the radionuclides in the thorium series using the ratio of thorium to uranium from an online report rather than using the measured concentrations reported in Table A-4-1 for samples collected from Yard 520.

The calculation starts with the numerical value derived from the highest concentration of U-238 measured by ICP-MS in Table A-4-1. The results of analyses by ICP-MS are in mg/kg (ppm). The calculation mistakenly multiplies the concentration by a factor intended to convert results in pCi/g to ppm and states that the concentration of radionuclides in the thorium series is 11.6 pCi/g.

The measured concentrations of the thorium series radionuclides in samples from Yard 520 range from 1.52 pCi/g to 3.11 pCi/g, with an average of 2.40 pCi/g. The incorrectly calculated concentration exceeds the measured average value by a factor of 4.83. When this erroneous result is used in a human health risk assessment, the error results in a gross overestimate of risk.

Even if the arithmetic errors, improper conversions, and false statements were corrected, the PINES report remains conceptually flawed. The PINES Report discusses data for Yard 520, implying that the PINES Report applies to Yard 520. However, the PINES Report does not explicitly state that the HHR estimate is for Yard 520 or for any other specific area. The penultimate paragraph of the PINES report states, "By this means, the external exposure risk from flyash in residential areas is on the order of 10^{-2}, 100 times the upper limit of the Superfund target risk range (10^{-6} to 10^{-4})". The PINES Report does not explain how risk from external exposure to an infinite slab in Yard 520 relates to residential areas.

The PINES Report discusses Federal Guidance Report number 13 Cancer Risk Coefficients for Environmental Exposure to Radionuclides (FGR 13). FGR 13 contains three scenarios for modeling risk from external exposure to Radionuclides, submersion in a semi-infinite cloud, exposure to ground surface contamination, and exposure to soil contaminated to an infinite depth.

The PINES Report is conceptually flawed because it uses a scenario for unshielded soil contaminated to an infinite depth, a condition that does not exist in Yard 520. The use of this scenario grossly exaggerates the human health risk from material in Yard 520. The PINES Report confuses self-shielding in an infinite depth of contaminated soil with shielding by an overburden of clean material.

When soil is contaminated to an infinite depth, the external exposure reaches an asymptotic value. Increasing the thickness of the contaminated soil does not increase the exposure because any increase in the exposure that could be due to additional material is offset by self-shielding by the additional material. This effect results in constant exposure for increasing thicknesses of contaminated soil in excess of several feet.

II. Details

The PINES Report correctly states that an infinite depth is actually 2-3 feet (of contaminated soil). In Yard 520, the contaminated layer is covered by 2-1/2 ft of clean clay and top soil, reducing the exposure to near background. The two supporting worksheets, Coefficients and Risks, appear to be identical and have the same risk factors as FGR 13 Table 2.3 for exposure to an infinite thickness of contaminated soil. The worksheets, without explanation, assign an occupancy factor of 16 hours per week for 50 weeks in a year.

The Supporting document compares analytical results for radioactive analysis in Yard 520 with data for natural occurrence. Unsupported conclusions about naturally occurring series being in equilibrium in flyash do not consider the burning off of or boiling off of some elements.

III. Conclusions and Recommendations

The PINES Report has a conceptual flaw that is fatal to assessing human health risk. No significant data are available for exposure in areas other than Yard 520 and no external exposure scenario from FGR 13 would be applicable in any identifiable area. The selection of an incorrect scenario is a flaw resulting in human health risk estimates that may be orders of magnitude higher than an appropriate model. The conceptual error is of even greater consequence than the correctness of data.