

**Comments on the Report
By Linda Downing
Titled
"Nine Mile Point Nuclear Surveillance
Program - A Summary"**

Comments Provided By: J. Furfaro
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Issued: May 31, 1991

**NEW YORK POWER AUTHORITY
JAMES A. FITZPATRICK NUCLEAR POWER PLANT**

COMMENTS ON REPORT BY L. DOWNING "NINE MILE POINT
NUCLEAR SURVEILLANCE PROGRAM - A SUMMARY"
SUBMITTED FOR REVIEW ON MAY 6, 1991 BY LINDA DOWNING.

GENERAL COMMENTS

- o Data from the James A. FitzPatrick Annual Radiological Environmental Operating Report are not presented in any of the tables or figures.
- o The author does not discuss the contribution from fallout from nuclear weapons tests to the data in Table 1. The contribution from Chernobyl is also not discussed in Table 1. The author also does not make any effort to present data from control locations.
- o The JAF Radiological Environmental Surveillance Reports presents a section entitled Historical Data Tables. Concentrations for indicator and control locations for the principal nuclides generated by the plant are presented. A net contribution could have been calculated by subtracting the indicator location value from the control location value and presenting a range for this net contribution. These ranges should have been used to describe Table 1.
- o To get an understanding of the environmental impact from the operation of the nuclear facilities at NMP, one should examine doses to the maximally exposed individual, not concentrations.
- o A lot of the author's questions and comments are addressed in the Environmental Reports issued by the utilities. Variations in historical data are discussed in detail in the Data Summaries and Conclusions Section of the JAF Radiological Environmental Surveillance Reports.
- o The radiological environmental monitoring program for JAF is a compliance program it is not a research program.

SPECIFIC COMMENTS

- o Title, the title should be changed to more accurately describe the intent of the report. This document appears to be a critique not a "summary". The word "Environmental" should be inserted after Nuclear and the word "Radiological" should be substituted for the word "Nuclear".
- o Page 1 - second sentence, the word "indicated" should be changed to "demonstrated".

SPECIFIC COMMENTS (Cont)

- o Page 1 - second sentence on page 5, the author makes an assessment that wide variation in results cannot be explained. It is not indicated which set of data was used to develop this opinion. It is the opinion of the reviewers that the referenced "wide variations" can be explained if the author were to review the data in context with historical events and appropriate control data. In addition, wide variations in analytical results are always discussed in detail in the appropriate NYPA Annual Radiological Environmental Surveillance Reports (ARESRS).
- o Page 1, second paragraph, third sentence. The word "host" should be changed to "utilize".
- o Page 2, first paragraph, The author uses the word "lobes" in reference to wind rose data, it is not clear as to the exact meaning of this term relative to meteorological data.
- o Page 2, first paragraph, last sentence, a reference should be noted for the precipitation values noted. This comment is also applicable to the plant physical data noted in paragraph three of this page.
- o Page 2, third paragraph, second sentence, the phrase "sometimes due to unusual events" is too casual. The author should be more specific and less arbitrary.
- o Page 3, second paragraph, the reference "Ellis" is incorrect. We believe that the author is referring to Mary Alice Koeneke who is the Program Director for EA Science and Technology.
- o Page 5, In the first sentence on page 5, the word "annually" should be changed to "continuously".
- o Page 5 - The presentation of meteorological data in the second paragraph is very confusing. We cannot reproduce the author's numbers from the wind rose (i.e., ...site was in the downwind shadow zone for 20 to 25% of the time... and... NRC/NYS data identified the site at the intersection of County Rt. 29 and Lake Road ... which is in the downwind shadow zone for 15 to 20% of the time).
- o Page 5 - The author should define downwind shadow zone.
- o Page 5, last paragraph, fifth sentence, "NYSDOH is noted twice in this sentence and as a result the sentence meaning is not clear.

SPECIFIC COMMENTS (Cont)

- o Page 6, first paragraph - The concentrations for Zr-Nb-95, Cs-134, Cs-137, and Sr-90 should have been presented in Table 1 on a yearly basis. The range reported for Zr-Nb-95 is misleading since it is based on indicator locations only. Data containing values from control locations should also have been presented. Any discrepancies between the indicator and control values should have been reported. In addition, the author fails to mention that the concentrations for the referenced radionuclides can be directly attributed to the Detonation of Atmospheric nuclear weapons. In many cases the fallout from these tests will result in widely varying analytical results dependent on large scale wind patterns and fission yields.
- o Page 6 - The fifth sentence in paragraph two is misleading.

"From the 3.5 mile to 5 mile radius around NMP there are four farms with milk animals but these are not sampled for radionuclides."

It should be explained why these four farms with milk animals are not sampled for radionuclides. The fifth sentence should read something like the following:

Based on the milk animal census there were no adequate milk sample locations within five miles of the site.
- o Page 7 - The third sentence in paragraph 1 states that, "The Scriba milk sample location was changed in 1982 which accounts for the decrease in Cs-137."
- o This does not appear to be a correct conclusion. A discussion of values from control locations should have been presented.
- o Page 7 - The fourth sentence in paragraph 1 implies that the NYSDOH is subject to the requirements of the RETS, this is incorrect.
- o Page 7 - The last four sentences in paragraph 1 are misleading. The 1989 Radiological Surveillance Report for JAF shows that for I-131 the maximum activity from 1978 to 1989 was 7.4 pCi/liter. This maximum activity was calculated by subtracting the indicator location value from the control location value.

SPECIFIC COMMENTS (Cont)

The author does not subtract the indicator location values for Cs-137, Sr, and I-131 from the control location values. It appears that control location values do not exist for the NYSDEC and NYSDOH data. The author is reporting values and ranges for indicator locations which make the data appear high. The control location values take into account Chernobyl and fallout from weapons testing. JAF data should have been used for Table 1.

The author should be aware that a large range of values is to be expected when the sample location is influenced by radionuclides from long range sources such as atmospheric weapons testing and Chernobyl fallout. These time related variations in radionuclide concentrations and outside historical influences are very clearly illustrated in graphs found in the NYPA Annual Radiological Environmental Surveillance Reports.

- o Page 8 - The last four sentences in paragraph 1 are misleading. The ranges for the radionuclides are misleading since the values are from indicator locations only. Data containing values from control locations should also have been presented. Any discrepancies between the indicator and control values should have been reported.
- o Page 8 - In the last sentence on page 8, we cannot reproduce the range of 20 to 25% from the ESEERCO wind rose.
- o Page 9, second paragraph - We suggest that NYPA reports be used to help analyze for trends. The author should look at the associated errors and determine if there is a statistical difference in the values quoted.
- o Page 10, first paragraph - The range for Strontium values presented is misleading. These values are from indicators locations only. Data containing values from control locations should also have been presented. Any discrepancies between the indicator and control values should have been reported. Again no time dependence is specified when referencing data ranges. When presenting data ranges it would be helpful and informative to include the standard deviation and the median value for the data set.
- o Page 10, third and fourth paragraphs - Thorium-232 and U-238, Thorium-234, and U-235 are natural occurring radionuclides found in the environment. A control location would have helped indicate this. As noted above some sample statistics would be helpful.
- o Page 11, second paragraph - The last sentence in paragraph 2 is misleading. The ranges for Co-60 and Cs-134 are based on indicator locations only. Data containing values from control locations should also have been presented. Any discrepancies between the indicator and control values should have been reported.

SPECIFIC COMMENTS (Cont)

- o Page 12, first paragraph - The last two sentences are not true. From this report it appears that control locations do not exist for the NYSDOH and NYSDCE data. Data for control locations should have been used. Data from indicator locations should have been compared with control locations and discrepancies noted. The JAF Radiological Environmental Surveillance Report contains data for control locations for the various medias sampled. The NYPA Annual Reports should be reviewed for discussion of trends and data evaluations.
- o Page 12, 3rd reason - One can check samples taken at control locations for increasing concentrations by performing statistical tests for increasing trends. It is the opinion of the reviewers that the likelihood of surface water samples becoming contaminated from fish or migrating fowl is highly unlikely.
- o Page 13, 5th reason - The RETS are concerned with pathways to man. The pathway to man from fish is ingestion of the fillet not the bones.
- o Page 13, Second bullet - this recommendation is irrelevant. Air sampling is not designed to determine instantaneous concentrations. The air sampling program is designed to measure weekly average concentrations and long term trends. The intent of the last sentence in this recommendation is unclear. Wind data is a meteorological condition.
- o Page 14, 3rd bullet - Do not understand why we should be monitoring for airborne releases north of NMP, Lake Ontario?
- o Page 14, 4th bullet - The reason for the broad ranges in measured concentrations in most cases can be found in the NYPA Annual Radiological Environmental Surveillance Reports.
- o Page 14, 5th bullet - TLDs are used to monitor noble gases.
- o Page 14, last paragraph - As discussed previously, ranges based on Table 1 of this report are misleading since no comparisons are made with data from control locations. Variations in historical data are discussed in detail in the Data Summaries and Conclusions Section of the JAF Radiological Environmental Surveillance Reports.
- o Page 15, 3rd bullet - ground water is not considered to be significant in the Nine Mile Point vicinity. The flow of ground water in the area is at a grade of approximately 37 feet per mile toward the lake. The subject of ground water is discussed in the FitzPatrick Nuclear Power Plant Final Safety Analysis Report (FSAR).
- o Page 15, water section, it is not clear to which program, the utility or NYSDOH, these recommendations are addressed.

SPECIFIC COMMENTS (Cont)

- o Page 17, Fish. Several of the recommendations in this section are based on the premise that the environmental program should be designed to measure the presence of radionuclides solely to qualify their existence. This approach is incorrect. The Environmental Program at Nine Mile Point is designed to assess the radiological impact to man. Therefore, the recommendation to sample and analyze a media such as Zebra mussels is inappropriate. This sample comment applies to the fact that migratory fish are not a suitable sample. These are the same species of fish that are most often consumed by man.
- o Figure 8 - We do not understand why the author is plotting U-238. It is a natural occurring radionuclide.
- o Table 2 - Do not understand the footnote on the bottom of the page.
- o "* Background sampling sites for the NYSDOH are established at various areas in New York State."

Why didn't the author present these sites? Could these sites be used as control locations?

STATE OF NEW YORK - DEPARTMENT OF HEALTH

INTEROFFICE MEMORANDUM

TO: Karim Rimawi, Ph.D.
Director

FROM: William Condon *WC*
James Huang *JH*
William Wigley *WW*

SUBJECT: Response to Report - Nine Mile Point
Nuclear Surveillance Program (SUNY - Oswego)

DATE: May 31, 1991

We recently received a draft of this report with a request for comments by June 1. The report reviewed DEC and DOH Annual Environmental Surveillance Reports for the period 1976 - 1988 for the Nine Mile Point nuclear reactor site. Numerous comments on data collection, analysis, and results were made with recommendations for changes in the DOH surveillance program. Our comments are basically in the same order the categories appear in the report.

OVERALL COMMENTS

The report does point out some problems in site descriptions and numbering which need to be addressed. Many comments are apparently based on unfamiliarity with: the purpose of our program, impact of weapons testing on radionuclides in the environment and factors which influence sample results.

INTRODUCTION

Contrary to what the SUNY report states, we did send copies of the 1987 and 1988 reports to Oswego County since all counties with monitored nuclear facilities are on the distribution list for annual reports. If reports are lost or misplaced we can send others. We recently mailed additional copies of the 1987 and 1988 reports to Natalie Jones of the Oswego County Health Department.

METHODS

The idea of spreadsheet analysis of the data is interesting but can lead to problems in data interpretation for the following reasons:

1. Many values reported are below the minimum detection level (MDL) and reported as less than values (i.e. < 10 pCi/l). Combining data of this type with measurable concentrations is not a straightforward process, and various methods to do so employ a variety of mathematical methods (see e.g. D.A. Waite et al, in Upgrading Environmental Radiation Data, USEPA Report No. EPA 520/1-80-012, 1980). This is particularly important when MDL results comprise more than half of a data set. For our data, MDL

results are often 80 to 100% of a data set. The SUNY report simply assigned the MDL numbers as being measured concentrations in order to combine them with actual measurable results. This leads to an upward bias for calculated averages and maxima.

2. Environmental samples of any type are more likely to be log normally distributed than to be normally distributed. This means a fairly wide range from lowest to highest values is not to be unexpected. This is easily seen by looking at other sites particularly Albany which is a good background comparison site.

AIR PARTICULATES

During the period 1976-1988 DEC/DOH operated air samplers at one of two different locations and for sometime during that period the two samplers operated simultaneously. We do need to show the present location on the site map in our Annual Report and will do so. One site was discontinued in 1980 but began operation again in 1988 (Lake Road and Route 29). The description of the sampling site was correct in the DOH reports, even if the map location was misplaced. The site is ESE of the Fitzpatrick and Niagara Mohawk reactors. The site is meant to be only a check on air samples made by the operators in the same general vicinity. The primary responsibility for monitoring the plant effluents and the surrounding environment lies with the operator, whose program includes more sampling points.

Using the Albany site as a comparison, similar results are seen as for the Nine Mile air sampler. Most data is of the MDL type. Several nuclear weapons were detonated by China in 1976, 1977 and 1978. Fallout from these tests was carried to the U.S. and was measurable at most air sample stations DOH maintains. A similar situation occurred in 1986 following the Chernobyl accident. The DEC annual reports of 1976-1978 mention the tests and note that measurable fission product activity was observed in air and milk samples. These tests need to be accounted for or else one can conclude that the nuclear plants were suddenly releasing much more radioactivity to the atmosphere. These results also produce most of the maximum values so that the range of high to low is also increased. The Albany data shows similar results at the same times, indicating a Statewide effect.

The 1978 DEC report shows a maximum Cs-137 level of 23×10^{-3} pCi/m³ which could be from the Chinese test.

Be-7 is a naturally occurring radionuclide which is a good indicator of the range of variability in air sample results. It also shows the wide range in maximum detectable concentrations which can occur in different samples.

MILK

Most of the comments on air particulates apply equally to milk samples in terms of variability of results, analysis for averages, maxima and minima and the effects of fallout. Milk is a particularly good medium for picking up fission product activity from fallout. Albany milk samples show similar results to samples obtained near the Nine Mile site.

Since participation in milk sampling is voluntary, some farms choose not to participate or decide to participate for a limited period of time. One of the two farms currently sampled by DOH has been the same for the entire period. We also perform split sample analysis with the utilities. The farms used for the split samples at any one time are determined by the utility.

WATER

While sample site numbers may have changed, the description of the site in the Annual Reports was accurate in the Nine Mile section. In the 1988 report the separate listing of all sites used the wrong number for 3767-003.

In 1989, all site locations were reviewed and site numbers were established in a more logical sequence. The 1989 report will reflect this new numbering system.

Albany water samples show similar ranges of activity for radionuclides as the Nine Mile Point sites. The author mentions a 500 pCi/l value for Zr-Nb 95, but for the 1976-1988 period the maximum value we could find in the reports was < 60 pCi/l. All Zr-Nb results were less than values and this was also the case for Cs 137, Ru 106, or other fission products. Measurable results were recorded for H3 and gross alpha and beta.

The gross alpha (GA) and beta (GB) tests are very sensitive with MDLs in the 1 - 2 pCi/l range versus MDLs of < 10 or more for many fission products. They serve as a good screening tool since if GA and GB levels are low there is no need for a detailed analysis. If a detailed gamma scan is done when GA and GB values are 1 - 2 pCi/l, the results are all at much higher minimum detection levels for fission products or other radionuclides. This results in no useful information and is much more costly to do in terms of time and effort. For this reason we often make quarterly composite samples where a number of weekly or monthly samples are combined and do a detailed analysis only on the composites. Routinely we only ask for a detailed gamma spectral analysis if the GA exceeds 15 pCi/l or the GB exceeds 50 pCi/l.

THERMOLUMINESCENT DOSIMETERS (p 8-9)

The DOH TLD monitors were placed at locations near the reactors and collocated with NRC dosimeters for comparison purposes. The TLD sites monitor normal background levels at each location, plus any additional exposure from atmospheric releases from the reactors. The normal background levels vary with season of the year at all sites Statewide as this is a natural phenomenon. The apparent decline in readings may be an artifact. If the error bars are shown on Figure 7 there is considerable overlap and it is quite easy to draw a flat line through the range of values. The two sigma error limits are typically $\pm 25\%$ for the quarterly readings. The NRC data for the same sites shows similar variability in readings, and has similar error limits.

One background reference site in Albany County shows a similar trend over the seasons and the background level is similar to those observed for the sites near Nine Mile Point. Any contribution to these readings from atmospheric activity released by the nuclear reactors is small. The main purpose of the NRC units is to record exposures from large accidental releases. The Chernobyl event, e.g., resulted in measurable radioactivity in our air and milk samples, but did not result in any measurable TLD readings.

The NRC publishes quarterly reports for TLD monitors at all nuclear sites in the country.

SEDIMENT

Sediment activity varies with the type of sample collected, depth of sample, location, etc. The samples DOH analyses are split samples that are collected by the utility. In 1985 the utility changed its indicator sample location. The decline in Cs 137 activity and the increase in the U238 activity could be caused by collecting samples at a different location. Cs 137 is normally found near the surface of normal soils or sediments (except when the contaminated layer is covered with freshly deposited soils or sediment). The concentration of natural radioactivity (Ra-226, U-238, Th-232) varies from sample to sample. The Th-232 concentration in the 1983 sample reported as 690,000 pCi/kg is a typographical error. It should read 690 pCi/kg.

We agree that core samples could provide a better historical record of radioactivity deposition.

FISH

We agree that fish migrate and collection of samples near Nine Mile does not guarantee that they spent most of their lives in the vicinity. Fish samples can be collected for three purposes, namely:

1. To monitor release of radioactivity to the environment.
2. To estimate the pathway to man via ingestion.
3. As quality assurance samples to check on results from another laboratory.

The DOH program collects samples for purposes 2 and 3 at a number of sites around the state. We recently asked DEC to collect some additional samples from Adirondack lakes to serve as good background comparisons. The first samples will be collected this year.

Since we are interested in the food pathway, analysis of edible portions provides the most representative analysis. Sr-90 accumulation in bone may be measured, but since the bone is not ingested it contributes nothing to human radiation exposure. Whole fish is used for measuring Sr-90 concentration when it is known that the dietary habits of the area residents include eating the fish bone.

VEGETATION

Our vegetation samples are for quality control purposes of the NRC contract and are obtained from the operators at Nine Mile.

Vegetation serves as a good environmental monitor, particularly broad leaved plants due to direct deposition on the leaves. Root uptake by vegetables and fruit is small under normal circumstances. The types of samples reflect the variety and volume of crops near the site.

ACCESSIBILITY OF INFORMATION

There are many ways to present environmental sample data. The DEC format of minimum, maximum and average was compact, but did not allow any detailed review of the data. DOH decided that it was better to present all the data. Our format is similar to that presented by most states and nuclear plants. Our annual reports present a table showing minimum detection levels for air, fallout, milk and water. We may add similar data for soil samples.

RECOMMENDATIONS

A large number of recommendations were made. Some are really for the nuclear utilities to respond to. Most of the others are addressed in the earlier sections of this response. The remaining ones are addressed below:

AIR

The utility has the primary responsibility for air monitoring. The DOH samples are not meant to determine compliance with the emission limits set by the NRC. They are independent samples and part of the NRC contract to provide an independent check on utility measurements. The utility has a meteorological tower to record various atmospheric parameters. This data is not routinely available to DOH but can be accessed in emergencies.

The lake does account for a large area, but remote monitoring there is difficult. There are no permanent residents in this area to warrant installing routine monitoring stations.

MILK

DOH does obtain split milk samples from the utility. Our other farm locations provide spot checks in the same manner as our air sampling site.

Sr-90 analysis is time consuming, requiring radiochemistry methods and allowing buildup of Y-90 activity for about three months prior to analysis. In any large release of fission products we can more easily measure I-130 and other radionuclides in air, water and milk. Quarterly monitoring of Sr-90 is considered sufficient when other fission product concentrations are minimal.

WATER

Monitoring of plutonium in water and sediment will only show very low levels consistent with deposition from atmospheric weapons tests. If reactor fuel rods are damaged, there will be a release of fission products as well, which will be more easily detected. Plutonium analysis is only warranted if fission product levels are significantly elevated.

TLDs

The DOH locations are spot checks only. The reference background location is Voorheesville, NY in the Albany area. Data for this location is given in Table 5 of the Annual Reports. Variations in TLD readings is consistent with variations in the natural background radiation as noted by data from other stations. The contribution from normal air emissions at NMP is not large enough to be directly measured. An accidental release of large quantities of radionuclides would be measurable.

SEDIMENT

Our sediment samples are supplied by the utility. The results of the analysis of these samples have been routinely consistent with the results obtained by the utility. We see no need to increase the number of samples collected unless a significant release of radioactivity occurs.

FISH

It may not be feasible to split each fish into two pieces for analysis by DOH and the utility laboratory. The mixed sample is split and should give comparable results as it is basically a composite sample.

Since most fish are migratory, it is difficult to determine where to sample or what fish to sample in order to obtain representative samples as "exposed" and "background" locations.

ACCESSIBILITY OF DATA

The DOH reports to NRC are done under contract. It is up to NRC to publish the data, not DOH. However, the results that DOH has are available upon request for interested parties.