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Aerial Radiation Survey and Soil Sampling at the WNYNSC and Cattaraugus Creek for the Quarterly Public Meeting

August 24, 2016

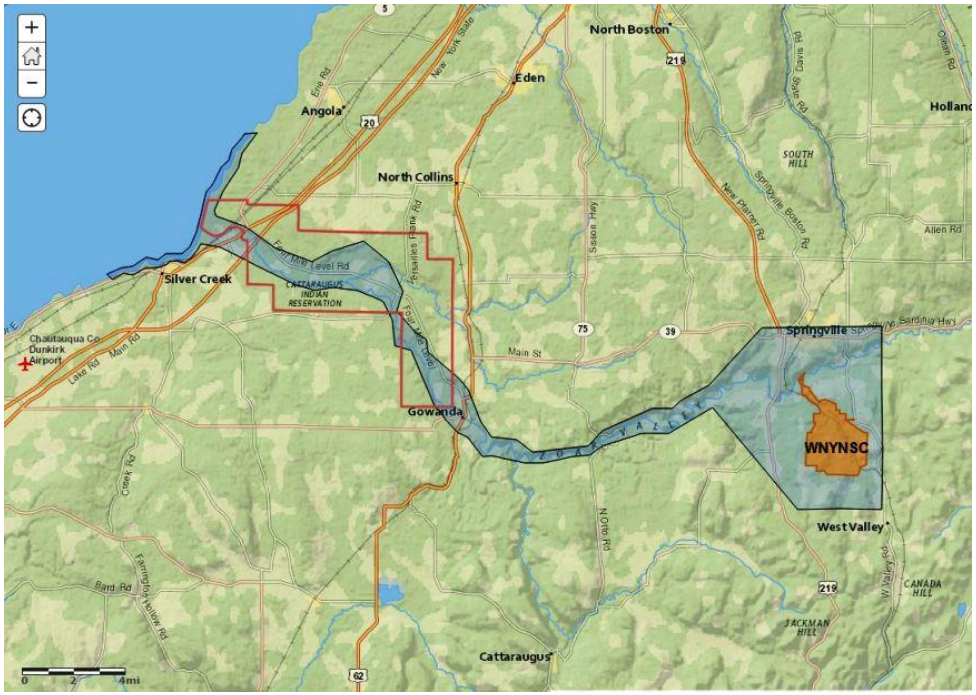
Aerial Survey to Measure Radiation

- In 2014, the U.S. Department of Energy (DOE) and the New York State Energy Research and Development Authority (NYSERDA) jointly conducted an aerial radiation survey of the Western New York Nuclear Service Center (Center) and Cattaraugus Creek from the Center to Lake Erie.
- The purpose of the survey was to provide an updated picture of radiation conditions at and near the Center in relation to previous aerial surveys that have been conducted.
- The agencies also included Cattaraugus Creek from the Center to Lake Erie in the aerial radiation survey.

Aerial Survey to Measure Radiation

The aerial radiation survey included:

- The entire 5.2 square mile Western New York Nuclear Service Center.
- Cattaraugus Creek from Springville to Lake Erie;
- Portions of several townships in Cattaraugus, Chautauqua and Erie Counties, and portions of the villages of Gowanda and Silver Creek;
- A portion of the Cattaraugus Territory of the Seneca Nation of Indians.



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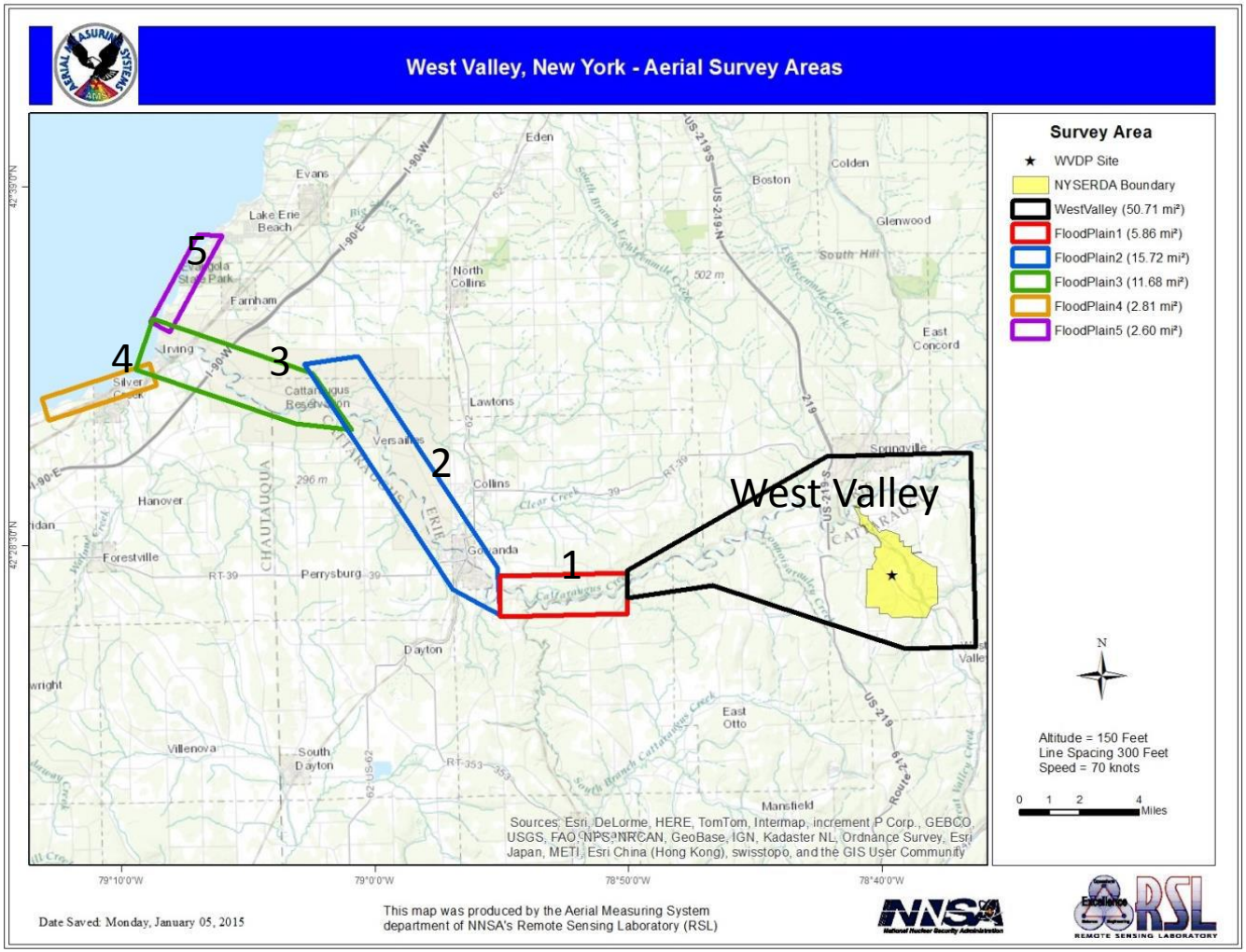
Aerial Survey to Measure Radiation



The survey area was divided into six boxes:

- "West Valley"
- Flood Plains 1 through 5.

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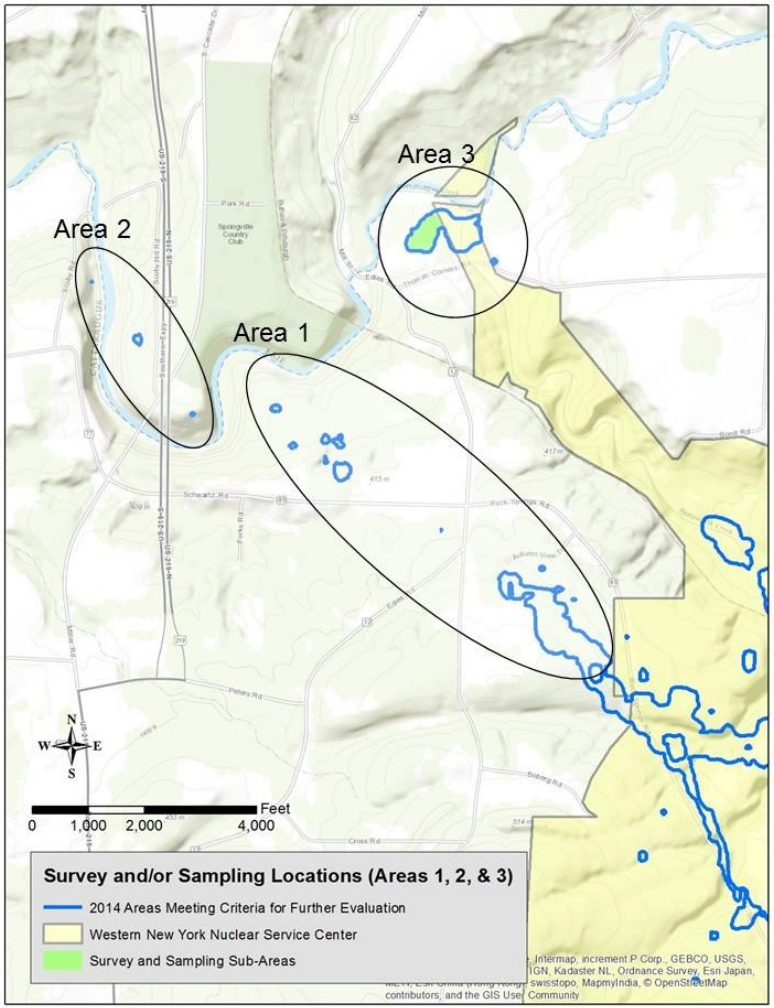
Aerial Survey Results

- The survey found that some areas outside the Center have radiation levels slightly above “background radiation” levels.
- What is background radiation?
    - Background radiation includes naturally occurring radiation from natural radioactive elements in rock, soil, air, water, and outer space.
    - Background radiation also includes some manmade contributions, including radiation from historic atomic testing.
- Similar above-background readings were seen in previous aerial surveys from 1979 and 1984.

Aerial Survey Results

- Three areas above background are adjacent to the Center.
- Two areas are on the Cattaraugus Territory of the Seneca Nation of Indians. These areas had levels that are “very small compared to background,” and the levels were “just above the sensitive detection thresholds inherent in these measurement and analysis methods.”
- The aerial radiation survey contractor provided NYSERDA with guidance in regard to identifying areas for follow-up soil sampling.

Aerial Survey Results



Sampling Locations 1, 2 and 3

Above background locations near the Western New York Nuclear Service Center.

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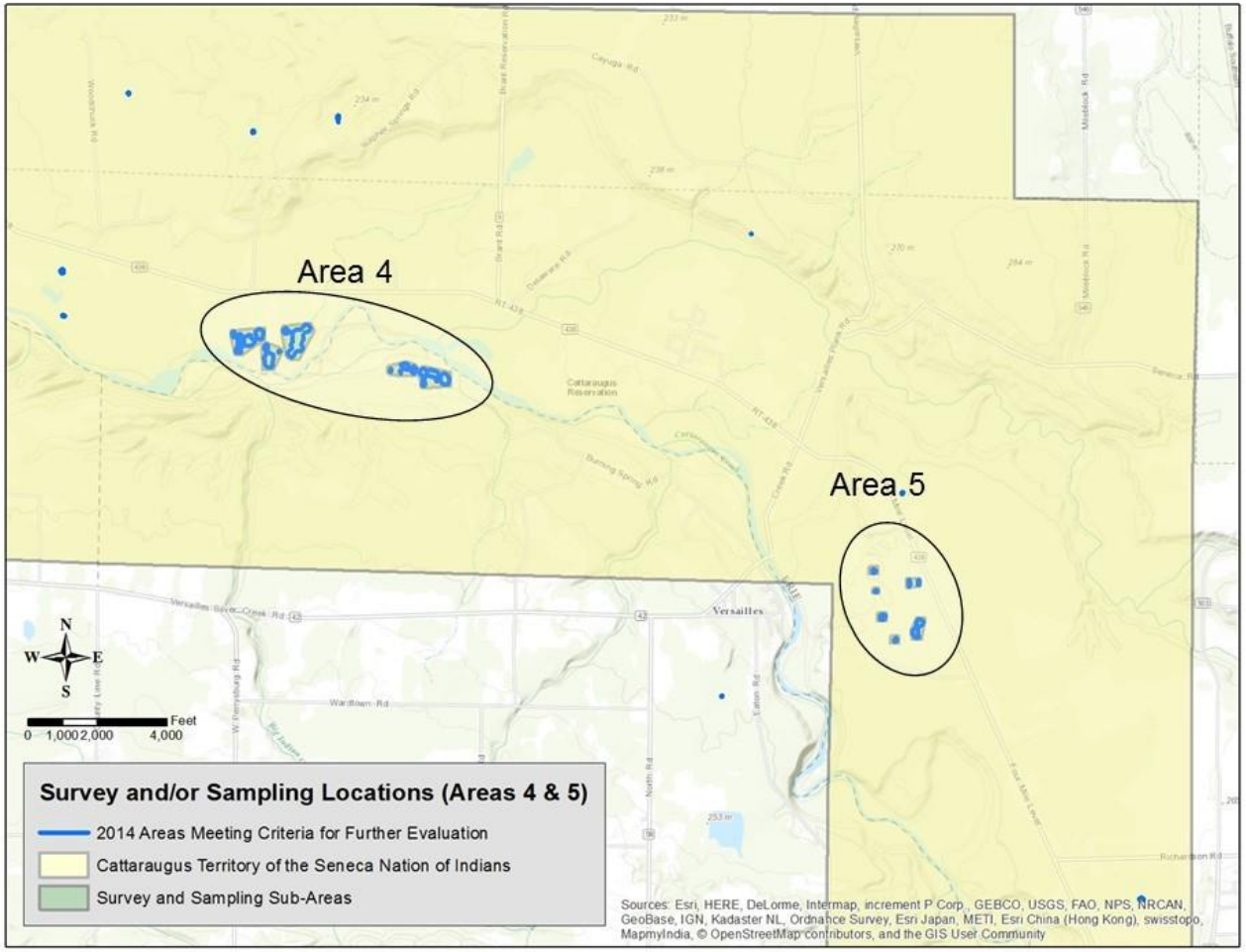
Aerial Survey Results



Sampling Locations 4 and 5

Above background locations on the Cattaraugus Territory of the Seneca Nation of Indians.

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Soil Sampling

- NYSERDA decided that a soil sampling program was warranted to provide a more complete picture of soil conditions.
- NYSERDA developed a Field Sampling and Dose Assessment Plan to evaluate each of the five areas identified in the aerial survey in greater detail.
- The objective was to confirm the results of the aerial survey, and to provide information needed to compare the results to regulatory requirements for public health and safety.

Soil Sampling

- NYSERDA submitted the draft Field Sampling and Dose Assessment Plan to NRC, EPA, NYSDEC, NYSDOH and the SNI in September 2015.
- NYSERDA submitted a revised plan on October 1, 2015 that addressed comments received.
- NYSERDA began the surveying and sampling activities on October 14, 2015.
- All field work was completed on December 18, 2015.

Field Survey and Sampling Approach

The process used for each area included the following:

- Conduct gamma walkover field surveys of each area to determine whether elevated locations were identified (except for Area 1).
- Conduct tissue equivalent dose rate surveys for each area.
- Collect soils at all sample locations. (The plan identified the number of samples and depth at each location.)
- Collect a number of “background” samples and dose rates.
- Collect current land use information.

Dose Assessment Approach – Areas 1, 2 and 3

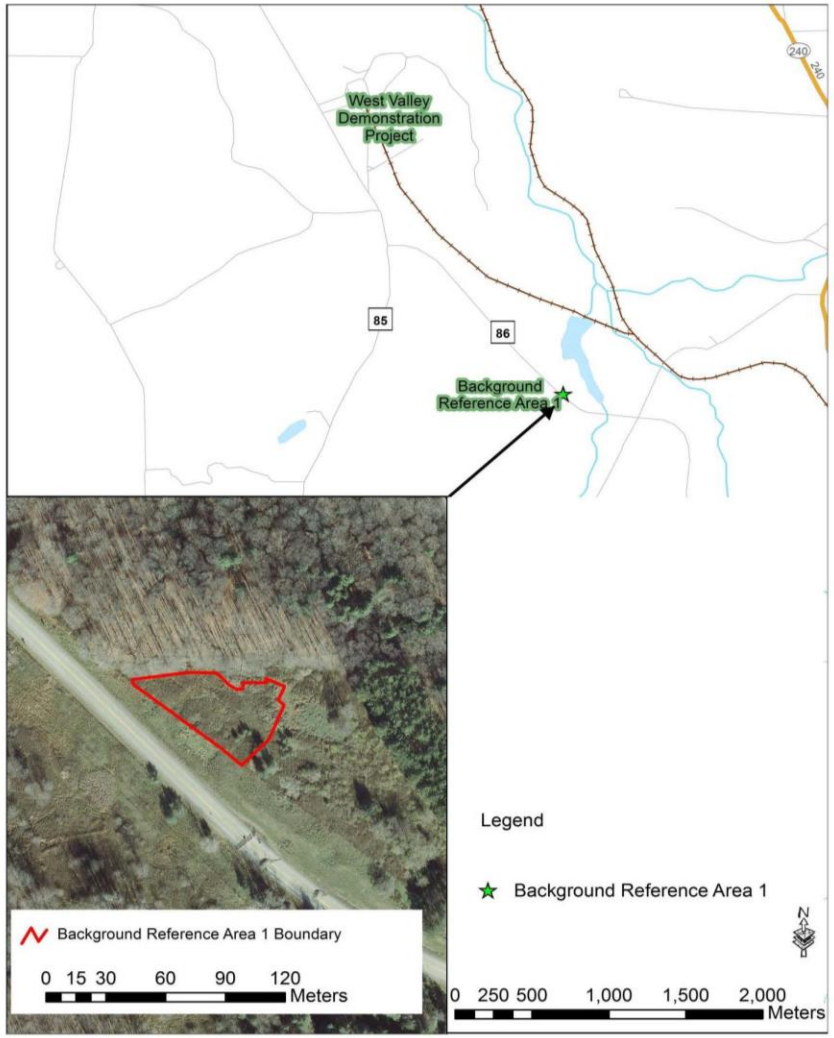
- Methods used to calculate dose:
  1. Develop an estimate of annual exposure using the 2014 Aerial Survey.
  2. Develop an estimate of annual exposure based upon the tissue equivalent meter readings.
  3. Calculate dose based on the current land use, measured soil concentrations and geological parameters.
  4. Compare the sample results to the Derived Concentration Guideline Levels ($DCGL_W$) values presented in the WVDP Phase 1 Decommissioning Plan.
  5. Calculate a maximum dose based upon the conservative resident farmer land use scenario, measured soil concentrations and geological parameters.
  6. Finally, perform an assessment to determine the exposure in excess of background from the consumption of fish, based on fish data in the Annual Site Environmental Report (2012).

Dose Assessment Approach – Areas 4 and 5

- NYSERDA is working with the Seneca Nation to develop land use scenarios that include culturally specific aspects of land use by the Seneca Nation. The report will be updated once the scenarios and dose calculations are finalized.

Background Soil Sampling

- All soil has naturally occurring radioactivity, the area results were compared to samples collected from “background areas.”
- For this evaluation, NYSERDA collected background samples at the locations used by the DOE.
- This is the background location for Areas 1, 2 and 3, and the On-Center locations.



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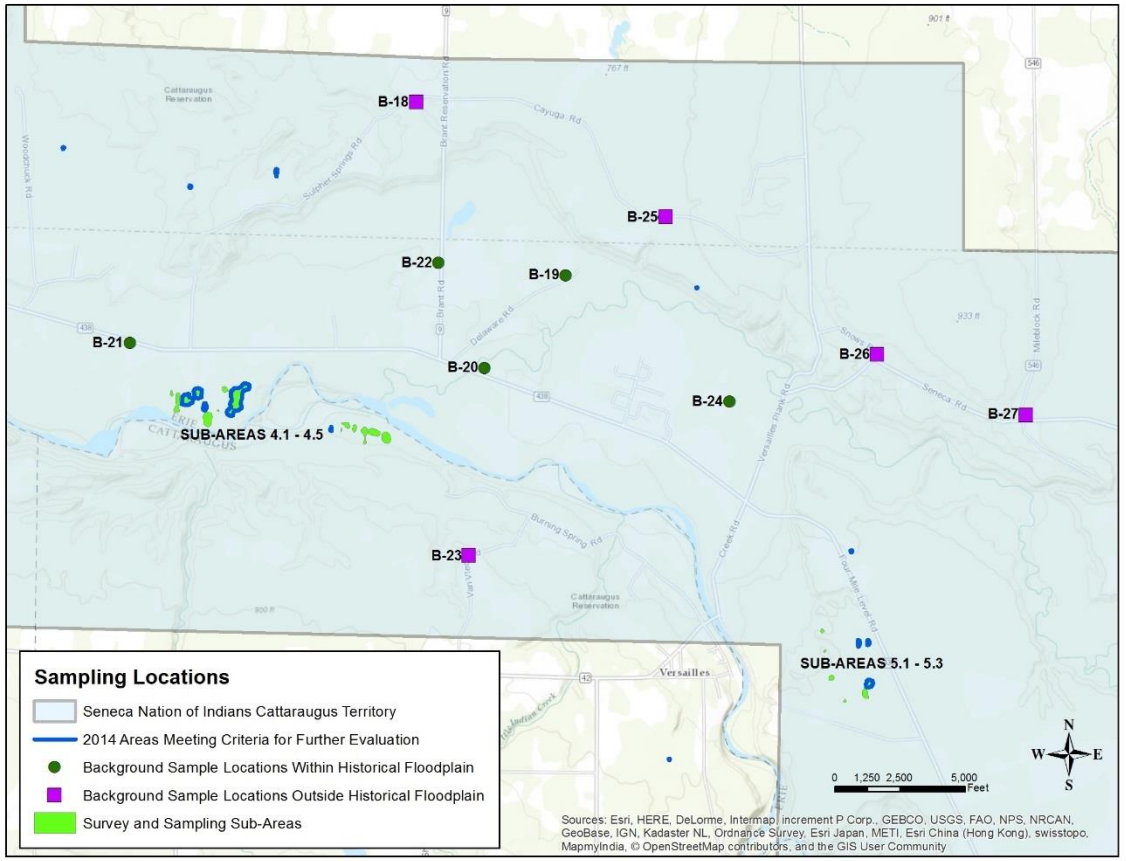
SNI Background Soil Sampling

- Five background locations within the Cattaraugus Creek floodplain.
- Five background locations outside of the Creek floodplain area.



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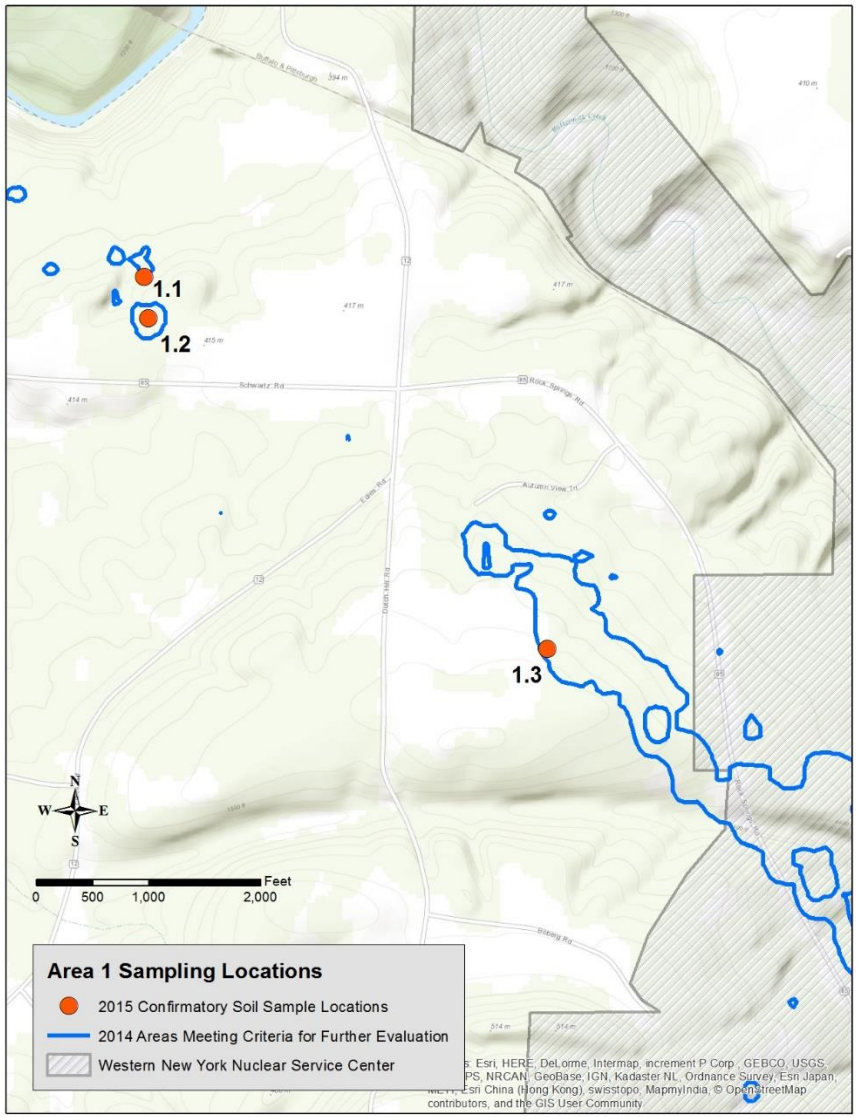
Area 1 Soil Sampling

- Area 1 is adjacent to the Center and is known as the “Cesium Prong.”
- The Cesium Prong is the result of unintentional airborne releases by NFS in 1968.
- Identified in previous aerial radiation surveys and was extensively characterized in the 1990s.



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Area 1 Soil Sampling Cont'd.

- Because of the prior characterization work, samples were collected here as close as possible to previous locations and compared to historical data.
- Dose rate readings and 12 samples collected from three locations at three soil depth intervals.
- Results were greater than the 1994 values plus 10 percent decay correction. So, dose assessments were completed.
- Land use information was collected and the current land use for Area 1 locations is a resident homemaker. RESRAD modeling was conducted where the individual is assumed to never leave the property and is inside for 20 hours with the remaining four hours spent outside.
- Also conducted a resident farmer analysis as a conservative land use scenario.

Area 1 - Summary of Results

Area	Area Dose Rate (µR/hour)	Background Dose Rate (µR/hour)	Annual Dose Rate (mrem/year)
2014 Aerial Survey Data			
1.1 and 1.2	7.8	8.3	0.0
1.3	8.3	8.3	0.0
Tissue Equivalent Survey Data			
1.1 and 1.2	4.4	3.7	2.4
1.3	6	3.7	8.0
Resident Homemaker			
1.1 and 1.2			1.0
1.3			0.2
WVDP Phase 1 Decommissioning Plan– below DP DCGL$_w$			
Resident Farmer			
1.1 and 1.2			1.7
1.3			0.4

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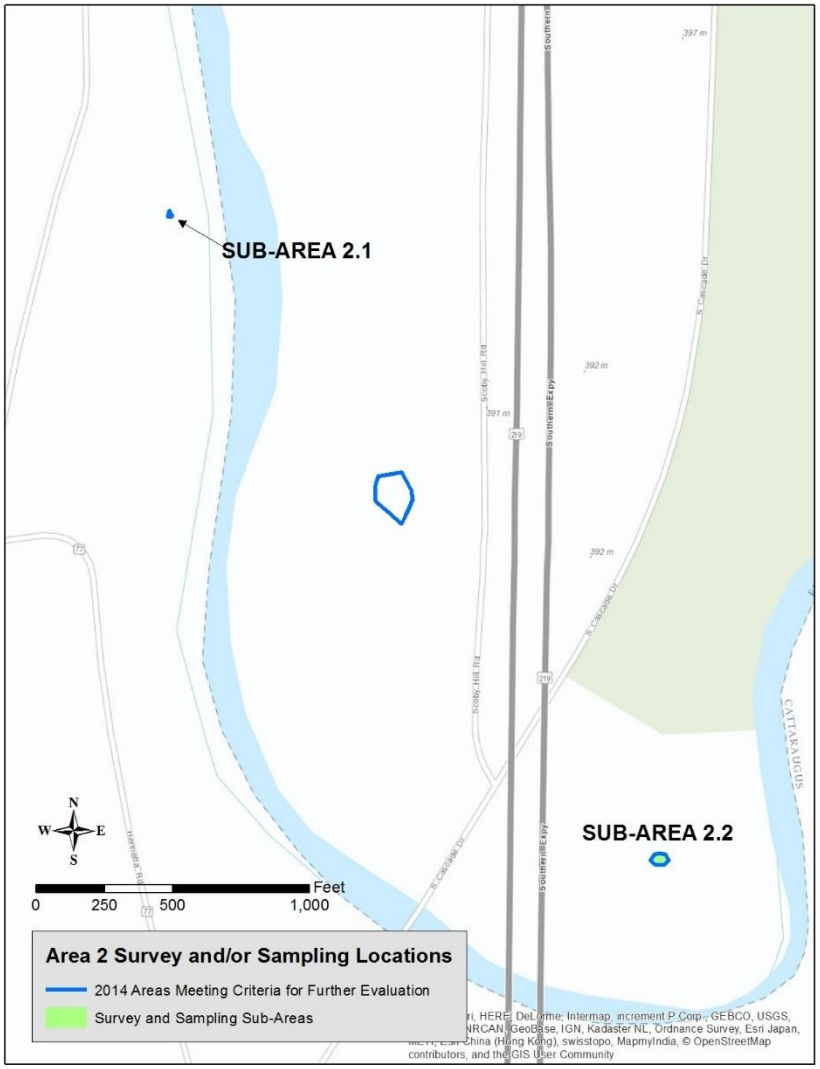
Area 2 Soil Sampling

- Area 2 believed to be a continuation of the Cesium Prong.
- Surveys and sampling were conducted in Sub-Areas 2.1 and 2.2.
- Both areas are sloped and tree covered.
- Area 2.1 extremely treacherous due to steep slope and difficult terrain.

The area near the center of the map was identified as meeting criteria for further evaluation; however, the landowner declined permission to survey and sample.



Area 2 Soil Sampling Cont'd.

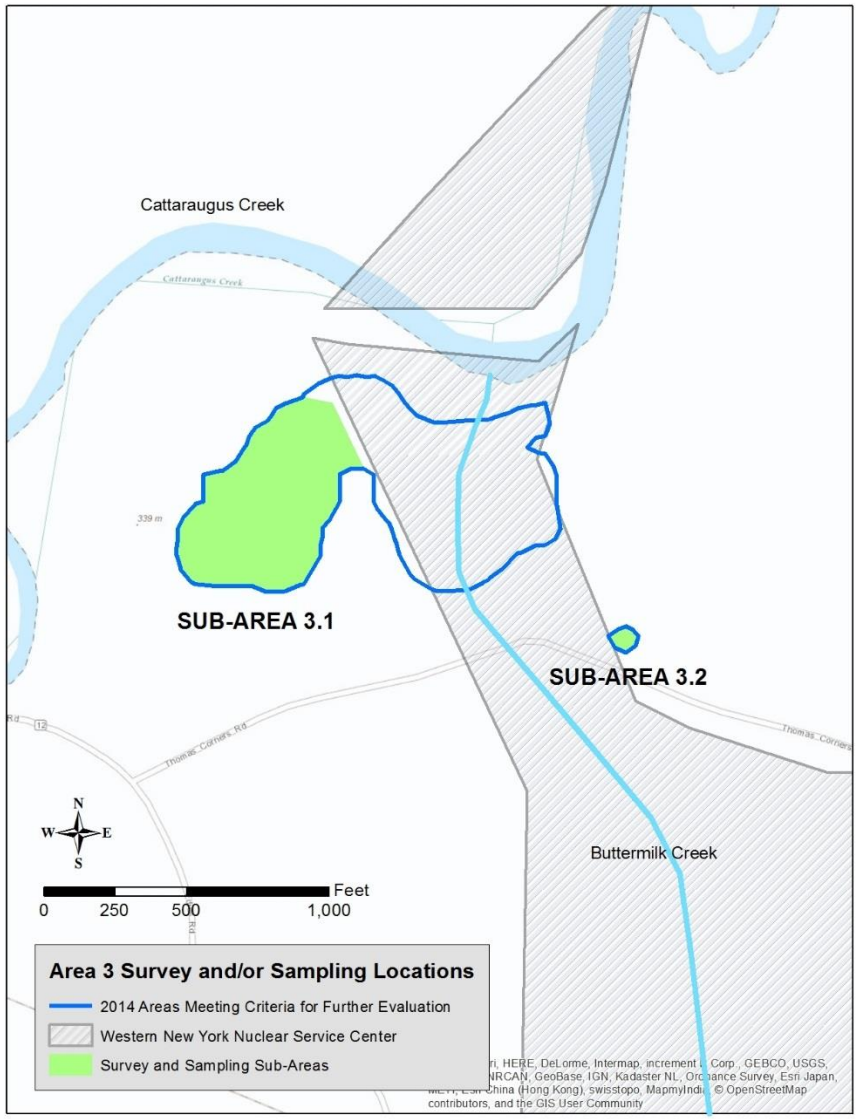
- Dose rates readings and a total of 28 samples were collected from eight locations and three soil depth intervals.
- Land use information was collected and the current land use for Area 2 locations is a recreational hiker/hunter. This individual is assumed to spend approximately 100 hours a year in the area and consumes animals taken from the area.
- Due to the small size of Area 2.1 and the extreme terrain, a conservative resident farmer land use scenario is not a reasonably foreseeable future land use for this property.

Area 2 - Summary of Results

Area	Area Dose Rate (µR/hour)	Background Dose Rate (µR/hour)	Annual Dose Rate (mrem/year)
2014 Aerial Survey Data			
2.1	9.3	8.3	0.1
2.2	9.3	8.3	0.1
Tissue Equivalent Survey Data			
2.1	7.6	3.7	0.4
2.2	3.7	3.7	0.0
Recreational Hiker/Hunter			
2.1			4.8E-03
2.2			2.2E-03
WVDP Phase 1 Decommissioning Plan– below DP DCGL$_w$			
Resident Farmer			
2.1			Not Reasonably Foreseeable
2.2			0.1

Area 3 Soil Sampling

- Area 3 is located in the floodplain of Cattaraugus Creek near the confluence of Buttermilk Creek.
- Identified in previous aerial radiation surveys.
- Surveys and samples were conducted in Sub-Areas 3.1 and 3.2.



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Area 3 Soil Sampling Cont'd.

- Dose rate readings and a total of 84 soil samples were collected from 28 locations at four soil depth intervals.
- Land use information was collected and the current land use for Area 3 locations is a resident farmer.
- This assumes an individual spends approximately 1,000 hours a year in the area tending crops and 1,000 hours a year tending to livestock. The farmer also consumes the meat from livestock and resides next to Area 3.2, with 100 hours a year spent traversing between the two locations.
- Also conducted an additional resident farmer analysis that assumes that the farmer's residence is in Area 3.1.

Area 3 - Summary of Results

Area	Area Dose Rate (µR/hour)	Background Dose Rate (µR/hour)	Annual Dose Rate (mrem/year)
2014 Aerial Survey Data			
3.1	10.3	8.3	1.8
3.2	10.3	8.3	0.2
Tissue Equivalent Survey Data			
3.1	7.6	3.7	3.9
3.2	<3.7	3.7	0.0
Resident Farmer (livestock only)			
3.1			0.8
3.2			4.2E-03
WVDP Phase 1 Decommissioning Plan– below DP $DCGL_w$			
Resident Farmer			
3.1			7.2
3.2			0.3

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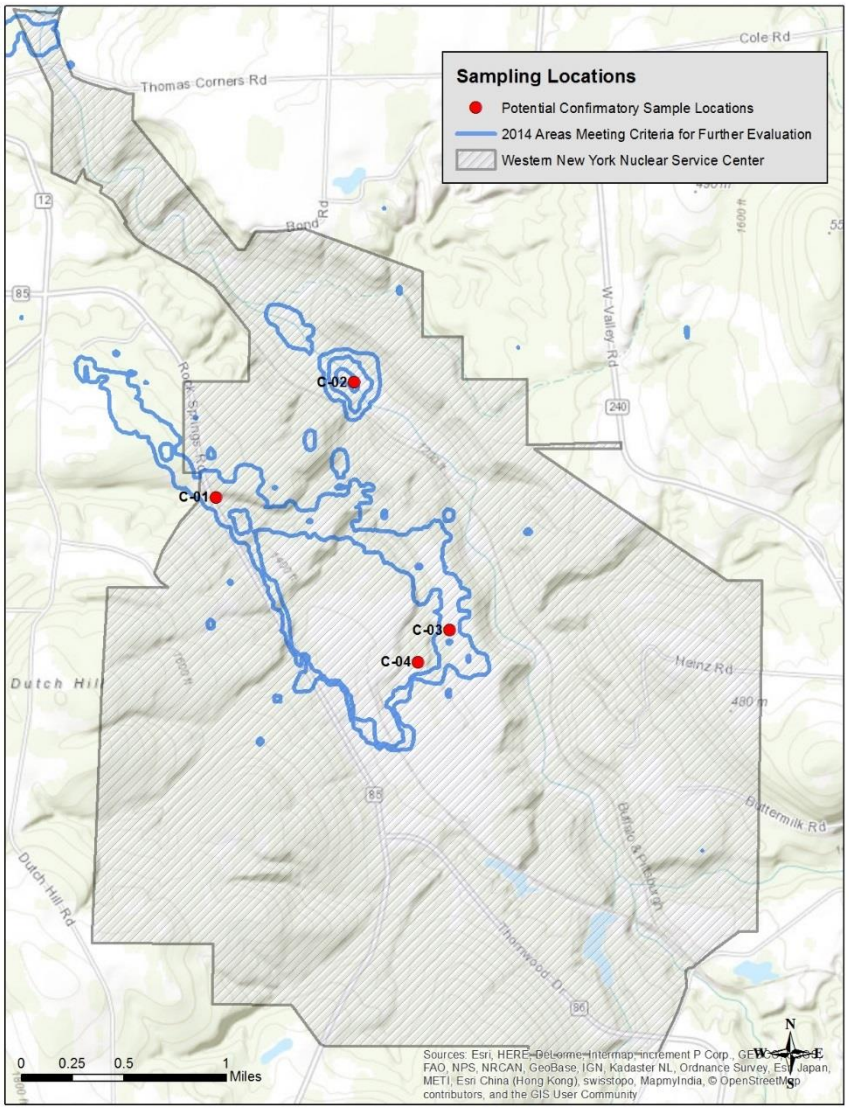
On Center Soil Sampling

- Four “On Center” locations were also sampled to compare aerial survey data and soil sample data.
- Locations are on the NRC-licensed Center property. No land use is authorized.
- No dose assessment was completed.



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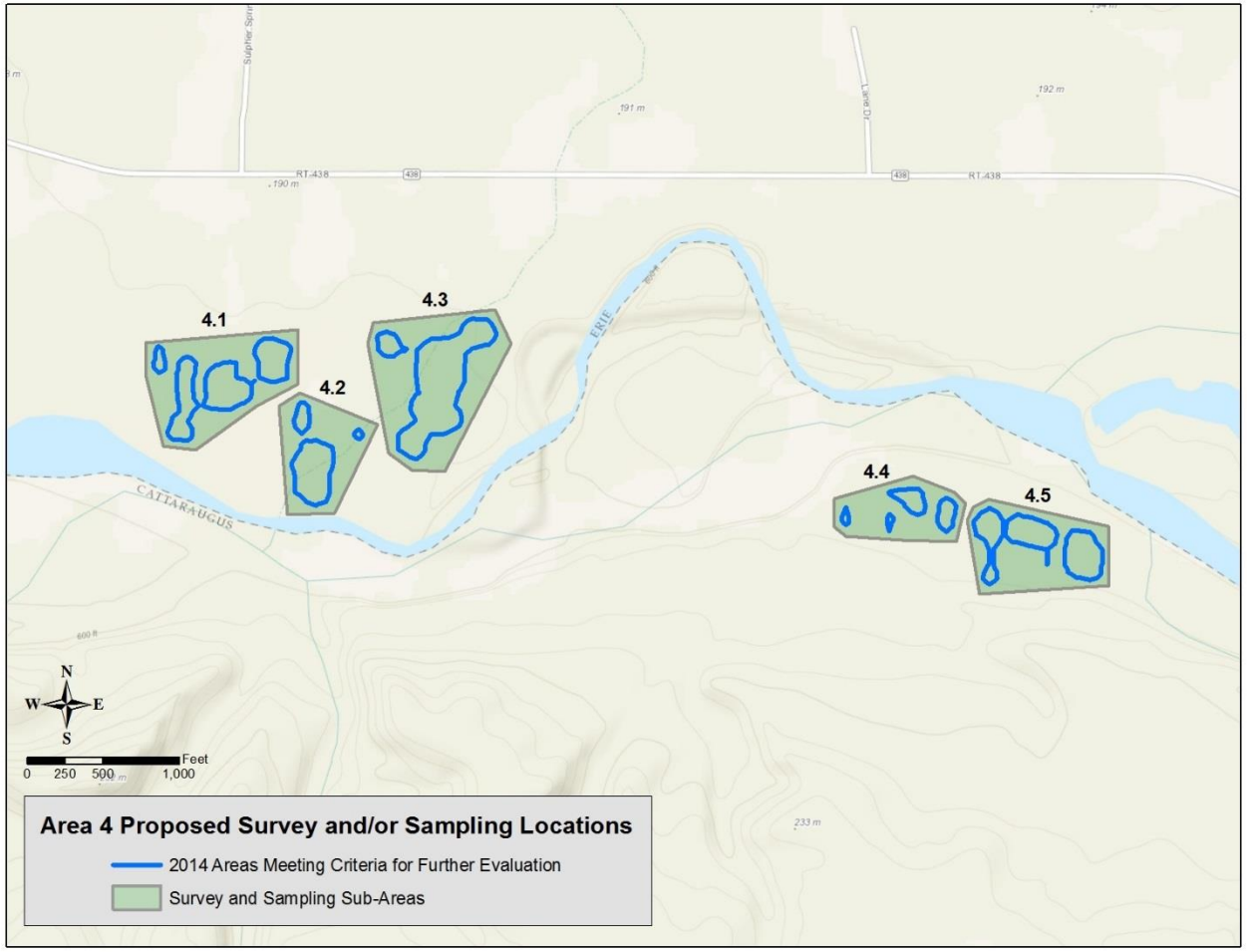
On Center - Summary of Results

Area	Area Dose Rate (µR/hour)	Background Dose Rate (µR/hour)
2014 Aerial Survey Data		
C.1	8.3	8.3
C.2	10.3	8.3
C.3	10.3	8.3
C.4	12.3	8.3
Tissue Equivalent Survey Data		
C.1	10	3.7
C.2	10	3.7
C.3	6	3.7
C.4	8	3.7

Area 4 Soil Sampling

- Area 4 is located on the Cattaraugus Territory of the Seneca Nation of Indians.
- This area is located within the floodplain of Cattaraugus Creek.
- Surveys and sampling were conducted in all five areas shown.



Area 4 Soil Sampling Cont'd.

- Dose rates readings and a total of 327 samples were collected from 111 locations at four soil depth intervals.
- NYSERDA is working with the Seneca Nation to allow preparation of dose assessments using culturally specific land use information.
- The results will be presented at a future Quarterly Public Meeting (QPM) when complete.

Area 4 - Summary of Results

Area	Area Dose Rate (µR/hour)	Background Dose Rate (µR/hour)	Annual Dose Rate (mrem/year)
2014 Aerial Survey Data			
4.1	10.3	8.9	TBD*
4.2	8.3	8.9	0.0
4.3	8.3	8.9	0.0
4.4	8.3	8.9	0.0
4.5	8.3	8.9	0.0
Tissue Equivalent Survey Data			
4.1	5.6	5.0	TBD*
4.2	4.9	5.0	0.0
4.3	4.4	5.0	0.0
4.4	4.5	5.0	0.0
4.5	4.5	5.0	0.0
***Culturally specific land uses are being developed**			

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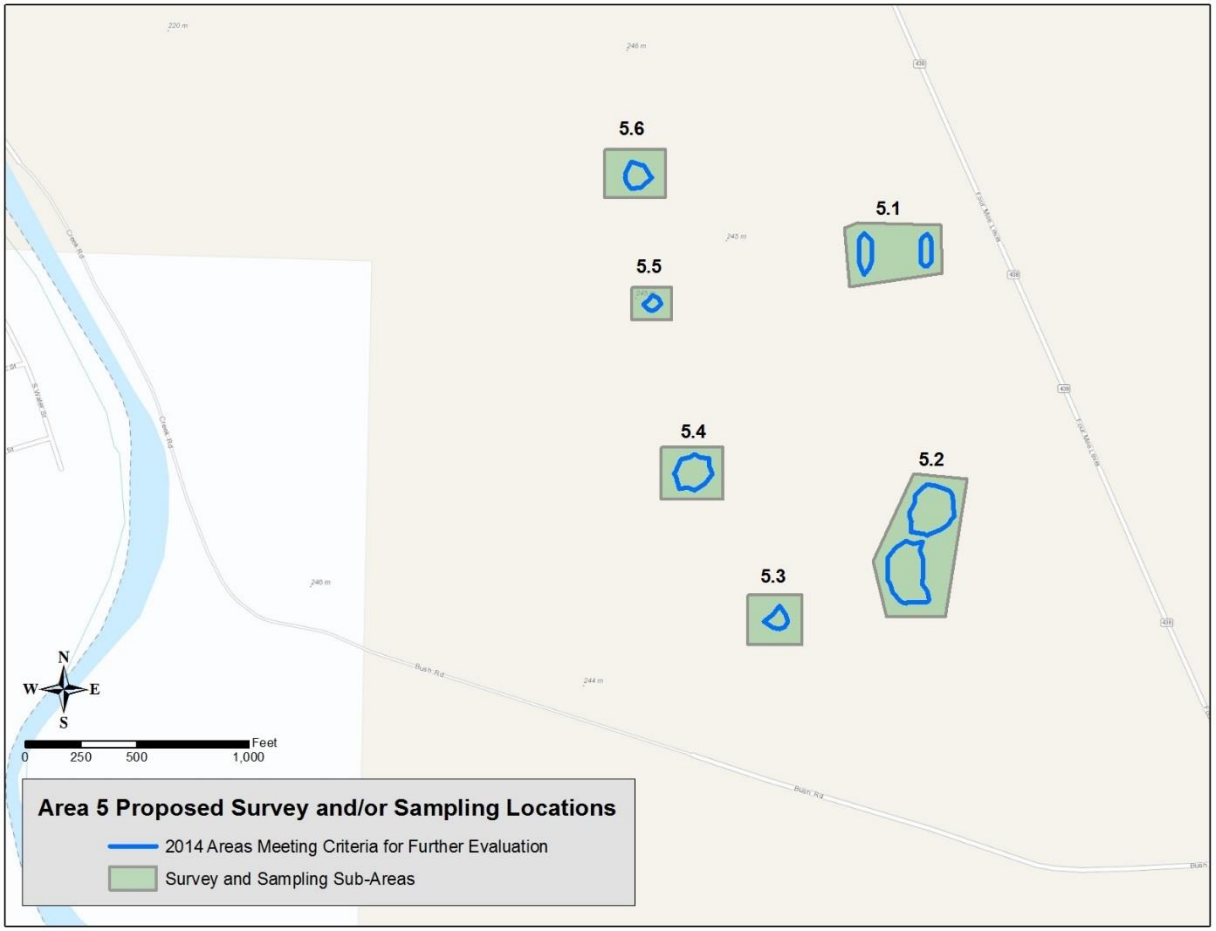
Area 5 Soil Sampling

- Area 5 is located on the Cattaraugus Territory of the Seneca Nation of Indians.
- Area is **not** within the floodplain of Cattaraugus Creek.
- Surveys and sampling were conducted in six areas shown.



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Area 5 Soil Sampling Cont'd.

- Dose rates readings and a total of 109 soil samples collected from 35 locations and four soil depth intervals.
- Land use information is being developed to prepare dose assessments using culturally appropriate land use information.
- Dose assessments to be completed using this land use scenario.
- The results will be presented at a future Quarterly Public Meeting (QPM) when complete.

Area 5 - Summary of Results

Location	Area Dose Rate (µR/hour)	Background Dose Rate (µR/hour)	Annual Dose Rate (mrem/year)
2014 Aerial Survey Data			
5.1	8.3	7.8	TBD*
5.2	8.3	7.8	TBD*
5.3	8.3	7.8	TBD*
5.4	8.3	7.8	TBD*
5.5	8.3	7.8	TBD*
5.6	8.3	7.8	TBD*
Tissue Equivalent Survey Data			
5.1	6.2	4.4	TBD*
5.2	4.6	4.4	TBD*
5.3	4.7	4.4	TBD*
5.4	5.0	4.4	TBD*
5.5	5.5	4.4	TBD*
5.6	4.5	4.4	TBD*
***Culturally specific land are being developed**			

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Fish Consumption - Summary of Results

- NRC requested a calculation of dose based on fish consumption.
- The 2012 WVDP Annual Site Environmental Report concentration data were used for background and downstream of Center property.
- Estimated fish consumption is 9 kg per year.
- This consumption information does not apply to Areas 4 and 5, which will have a different culturally specific fish consumption value.
- Estimated dose is 6.6E-03 mrem/year for fish consumption.

Summary

- No health or safety concerns were identified based on the aerial survey, field surveys and soil sampling data for the five areas evaluated.

- The assessed doses in Areas 1, 2, and 3 used multiple approaches and covered current and conservative potential use scenarios. All doses were calculated to be significantly less than the 25 mrem per year NRC regulatory release requirement (10 C.F.R. § 20.1402).

- For Areas 4 and 5, culturally specific aspects of the land use are being developed. This report will be revised once the culturally specific land use scenarios have been developed. Results will be presented at a future QPM.