Final Status Survey

Of

2 Morgan Drive Lot A

Mt. Kisco, NY

Prepared For:

Radio City Ventures, LLC

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Prepared by:

CoPhysics Corporation

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Site Work: August 2020

Report: December 2020

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TABLES

FIGURES

1.0 EXECUTIVE SUMMARY

The property known as 2 Morgan Drive Lot A, comprising 2.67 acres in Mt. Kisco, NY, is part of the former Mt. Kisco Waste Water Treatment Plant (WWTP). The former WWTP is known to be partially contaminated with the radioactive materials: radium-226 and thorium-230. However, an in-depth scoping survey conducted in 2019 showed that the area of the WWTP known as Lot A did not show any elevated radiation levels on the surface of the ground. To supplement the 2019 data, CoPhysics Corporation, in consultation with the NYS DEC, conducted additional measurements of Lot A in August, 2020 including sub-surface measurements. The results of these measurements show that the soil in Lot A does not contain elevated levels of radium-226 or thorium-230. Therefore, this Final Status Survey Report concludes that the property may be released from radiological controls and may be developed without the need for radiological precautions.

A small area of elevated radioactivity on the adjacent Lot-B has not affected the soil in Lot-A and does not pose a radiological safety problem for construction workers on Lot-A. However, for liability purposes, the property line between the two lots should be fenced.

2.0 INTRODUCTION

2.1 Background

Radioactive contamination has been detected on the property of the former Mt. Kisco Wastewater Treatment Plant (WWTP) located on Morgan Drive in Mt. Kisco, NY. From 1913 until 1964, the WWTP received sewage from the Village of Mt. Kisco including the Canadian Uranium and Radium Corporation facility located about 3 miles north of the plant. This led to elevated concentrations of radium-226 and thorium-230 being deposited in numerous spots across the property. To study the problem, in 2019, the New York City Department of Environmental Protection and CoPhysics Corporation performed gamma radiation measurements over the entire property. The results of the 2019 surface radiation survey (shown in Figure 2.1) showed that the parcel known as 2 Morgan Drive, Lot A had no detectable radioactive contamination.

2.2 Objective

Therefore, the objective of this project was to perform a final status survey (FSS) of Lot A so that it can be released from radiological safety controls and be developed. This final status survey extends the original surface survey by performing additional surface readings, collecting and analyzing sub-surface soil samples, and performing a more in-depth statistical analysis to prove that the lot is free of any residual radioactive contamination. The radiation measurements and the analysis of results for this FSS were performed per the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM, NUREG 1575, EPA 402-R-97-016).

2.3 Site Location

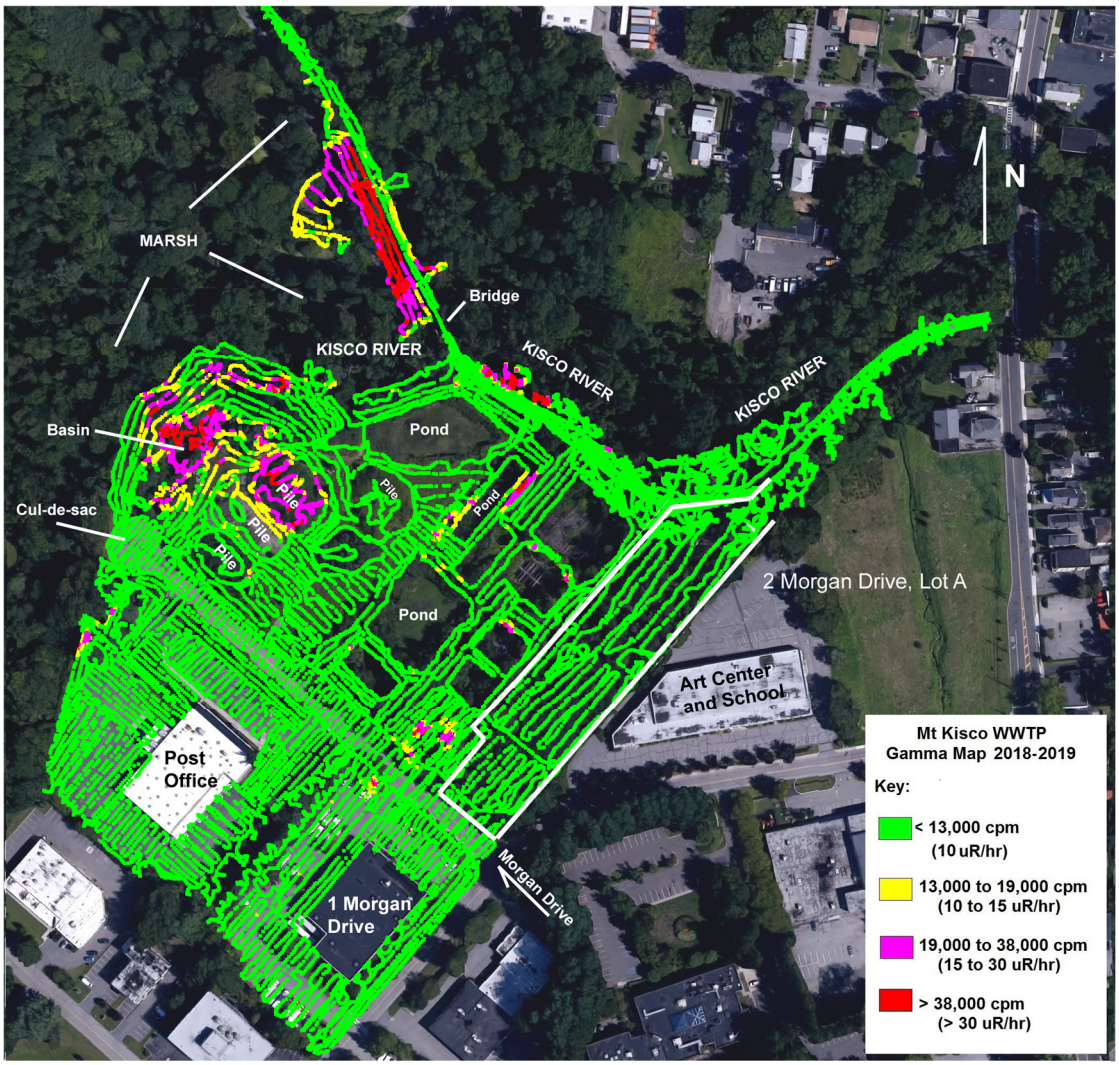
Lot A of 2 Morgan Drive comprises 2.67 acres and lays on the southern-most boundary of the WWTP site. The lot has no vehicle access and is heavily wooded with many large 100+ year-old trees.

The gamma map of the FWWTP with Lot A outlined in white is shown in Figure 2-1.

2.4 Expected Radiation Levels

Scoping gamma radiation measurements performed in 2019 showed only normal background radiation levels (6 to 10 uR/hr at the surface).

Figure 2-1– Gamma Map of FWWTP Site (2 Morgan Drive Lot-A Shown in White)



3.0 REGULATORY REQUIREMENTS AND GUIDELINES

While the NYSDEC has not specified an exact cleanup goal for the former WWTP site, a radium-226 concentration limit of 5 pCi/g and thorium-230 limit of 60 pCi/g is proposed here. (The WWTP Characterization Survey Report (August, 2019) indicated that Th-230 levels were approximately 12 times the radium-226 levels, therefore this ratio is maintained in the proposed limits.) 5 pCi/g of Ra-226 is a typical Derived Concentration Guideline Level (DCGL) used by the USEPA at its Superfund cleanup sites in Region 2 (NY and NJ).

In addition, the regulatory prescribed dose limits for decommissioned sites is 15 mrem/yr (USEPA) or 25 mrem/yr (USNRC). To determine if the above proposed DCGL's fall within these limits and are protective of health, a RESRAD analysis was performed (see results in Appendix A of the Lot A Survey Plan 07-2020). The radiation dose to future occupants living on soil containing 5 pCi/g Ra-226 and 60 pCi/g Th-230 was calculated. The results show a total radiation dose from all pathways of 14.2 mrem/yr (This occurred at the 300-year mark and assumed the entire property had radionuclide levels at the DCGL.) If only 1% of the property had radionuclide concentrations at the DCGL, the prospective annual dose would be only 0.14 mrem/yr. This prospective dose is quite insignificant considering a chest X-ray is about 10 mrem per shot and NY to LA airline flight passenger received about 5 mrem from cosmic-ray exposure.

In-field Guideline for Surface Gamma Measurements using a Ludlum 44-10 Detector

To convert the above DCGL's into gamma count rates from a Ludlum 44-10 detector, a count rate Investigation Level (IL) is defined as the count rate under which the surveyor would be 95% confident that the underlying radium or thorium concentrations are less than the cleanup criteria (DCGL). If count rates exceed the IL additional measurements would be performed to determine if the area would pass MARSSIM statistical tests. Per the WWTP Characterization Survey Report (August, 2019), gamma count rates less than 16,000 cpm are indicative of soil containing less than 5 pCi/g of radium-226. Therefore, the investigation level for gamma measurements at the site is specified as 16,000 cpm (on the Ludlum 44-10 detector). This level is consistent with the Investigation Level used at the WGGM Superfund Site, EPA Region 2.

In-field Guideline for Gamma Logging using a Ludlum 44-62 Detector

To convert the above DCGL's into gamma count rates from a Ludlum 44-62 downhole gamma logging detector, a count rate Investigation Level (IL) is defined as the count rate for which the surveyor would be 95% confident that the radionuclide concentrations in the soil surrounding the hole are less than the cleanup criteria (DCGL). If count rates exceed the IL additional measurements such as soil sampling would be performed to determine the exact concentration of specific radionuclides in the soil and if those concentrations

would pass the MARSSIM statistical tests. The downhole gamma logging technique is further discussed in an EPA Superfund site publication (WGGM Superfund Site, "The Use of Gamma Logging Measurements to Conduct Subsurface Release Surveys", T. Rahon, 2007). That document concludes that Ludlum Model 44-62 gamma count rates less than 1100 counts per 30 seconds are indicative of soil containing less than 5 pCi/g of radium-226. Therefore, the investigation level for downhole gamma logging measurements at the Mt Kisco site is also specified as 1100 counts per 30 seconds (on the Ludlum 44-62 detector).

4.0 METHODOLOGY

4.1 Data Quality Objectives

4.1.1 Step 1: State the Problem

Elevated concentrations of radioactivity in soil may reside on the property due to disposal of contaminated sewage sludge. The objective of the methodology is to obtain data of sufficient quality and quantity to prove that no residual contamination resides on the property that may exceed applicable guidelines.

4.1.2 Step 2: Identify the Decision

Principal Study Question

> *Does the survey area pass MARSSIM-specified analyses of scan, systematic, and biased measurement results?*

Decision Statements

The decision whether the property complies with the release criteria or not is described by MARSSIM as either the null hypothesis or the alternate hypothesis as follows:

a. Null hypothesis (H_0), which states "*the median concentration in the survey unit exceeds the median concentration in the background reference area by more than the DCGL.*"
b. Alternate hypothesis (H_a) which states "*the median concentration in the survey unit does not exceed the median concentration in the background reference area by more than the DCGL.*"

4.1.3 Step 3: Identify Inputs to the Decision

This section lists the data needed to resolve the applicable decision statements, including the means of obtaining the required data.

The main data inputs are:

1. Information regarding the locations and levels of radionuclide concentrations provided by historical / geotechnical information; and

2. Results of measurements of residual radioactivity by means of:

- Direct ground level measurements for gamma radiation (both scans and systematic, gridded readings)
- Laboratory analysis of soil samples
- Downhole gamma measurements to reveal sources of subsurface radioactivity not detected by surface scans.

4.1.4 Step 4: Define the Study Boundaries

The key area of interest is the Lot A with boundaries as specified by the land surveyor map of the property.

4.1.5 Step 5: State the Decision Rules

The results of this study will be used to determine the eventual fate of the property (release for unrestricted use or designated for cleanup).

4.1.6 Step 6: Define Acceptable Decision Errors

NRC guidance in MARSSIM provides a discussion regarding possible decision errors. The guidance discusses the concept of acceptable error rates, which balance the need to make appropriate decisions with the financial costs of achieving higher degrees of certainty for Final Status Surveys. As discussed in Section 3.0 above, the Investigation Level (IL) is the count rate under which the surveyor would be 95% confident that the underlying radium or thorium concentrations are less than the cleanup criteria (referred to as the DCGL).

4.2 Survey Design and Methodology

The survey design follows the guidance of the Multi Agency Radiation Survey and Site Investigation Manual (MARSSIM) (NRC 2000). A summary of this design is provided in the following subsections.

4.2.1 Determine Impacted or Non-Impacted

Lot A is considered to be potentially impacted due to its proximity to a known area of contamination (see Figure 2-1).

4.2.2 Survey Unit Breakdown

For this Survey, the entire property is considered to be one Class 2 survey unit. Per MARSSIM, survey units thought to be clean that adjoin Class 1 (potentially-contaminated) units shall be classified as Class 2.

4.2.3 Background Area

A nearby lawn area of a commercial building on the corner of Lexington Ave. and Radio Circle Drive was chosen to obtain background readings.

4.2.4 Scanning

Per MARSSIM, at least 50 % of the exterior of a Class 2 property must be scanned. For Lot-A, we estimate that 75% of the ground surface was scanned during the 2019 survey. The ground surface under a large pile of logs which was not scanned in 2019 with the GPS-based system was manually scanned during the 2020 Lot-A effort with a gamma probe attached to a long pole.

4.3 Gamma Scan

The gamma scan was performed by the collection of 1-second gamma counts using a Ludlum 44-10 (2x2-inch) scintillation detector coupled to a Model 2221 ratemeter and GPS-based localization and recording system. Additional readings were manually collected under the log pile during this recent effort. The surface gamma scan is useful in finding any areas of elevated soil radioactivity. (For this survey, none were found.)

4.4 Systematic Gamma Readings

To perform the regulatory-based MARSSIM statistical tests for residual contamination, one-minute gamma radiation counts using a Ludlum 44-10 (2x2-inch) scintillation detector coupled to a Model 2221 ratemeter were performed at each grid point shown in Appendix B of the Survey Plan.

Background Area

9 background points were collected in an area assumed to be unaffected by the WWTP, i.e., in a nearby commercial building lawn. These reference area data are necessary for comparison to the data collected in the survey area.

4.5 Downhole Gamma Logging and Soil Sampling

Boreholes were dug into the ground at 5 selected locations at the boundary of Lot A nearest an area of elevated radioactivity on the adjoining Lot-B (see Appendix C of the Survey Plan). This was done to determine if the elevated radioactivity levels could exist underground extending into Lot A.

To install the boreholes, a 4-inch diameter manual soil sampler was used. The soil collected at each 1-foot depth increment was staged on poly sheeting. The boreholes were

then gamma logged in 6-inch depth increments using a Ludlum 44-62 (1/2x3/4-inch) scintillation detector coupled to a Model 2221 ratemeter. The detector count rates provided a depth profile of radioactivity. After the gamma profile of each hole was obtained, the staged soil collected from the depth of maximum count rate was containerized for later shipment to Pace Laboratories (ELAP certified) for radioactivity analysis.

The laboratory analyzed the samples for radium-226, radium-228, thorium-230, gross alpha, and gross beta. While gross alpha and beta activities in soil are not specifically-regulated, such results are useful in detecting any other radionuclide that might be present other than the 3 main radionuclides of concern.

4.6 Instruments

Instrumentation used in this survey is shown below:

Table 4-1 Specific Instrumentation used in the Survey

Manufacture	Meter Model	Meter Serial	Probe Model	Probe Serial	Use	Calibration Date
Ludlum	3000	15307	44-10	373552	GPS Gamma Scan and Stationary Counts	5/5/20
Ludlum	2241	316729	44-62	273614	Downhole Gamma Logging	1/23/20

Calibration certificates are shown in Appendix B.

All instruments were calibrated with 1 year of use and were background- and source-check daily when in use.

5.0 RESULTS

5.1 Overland Gamma Scan

The gamma scan consisted of 7294 1-second counts continually collected by the field computer and mapped in real-time. The resultant color-coded gamma map is shown in Figure 5.1.

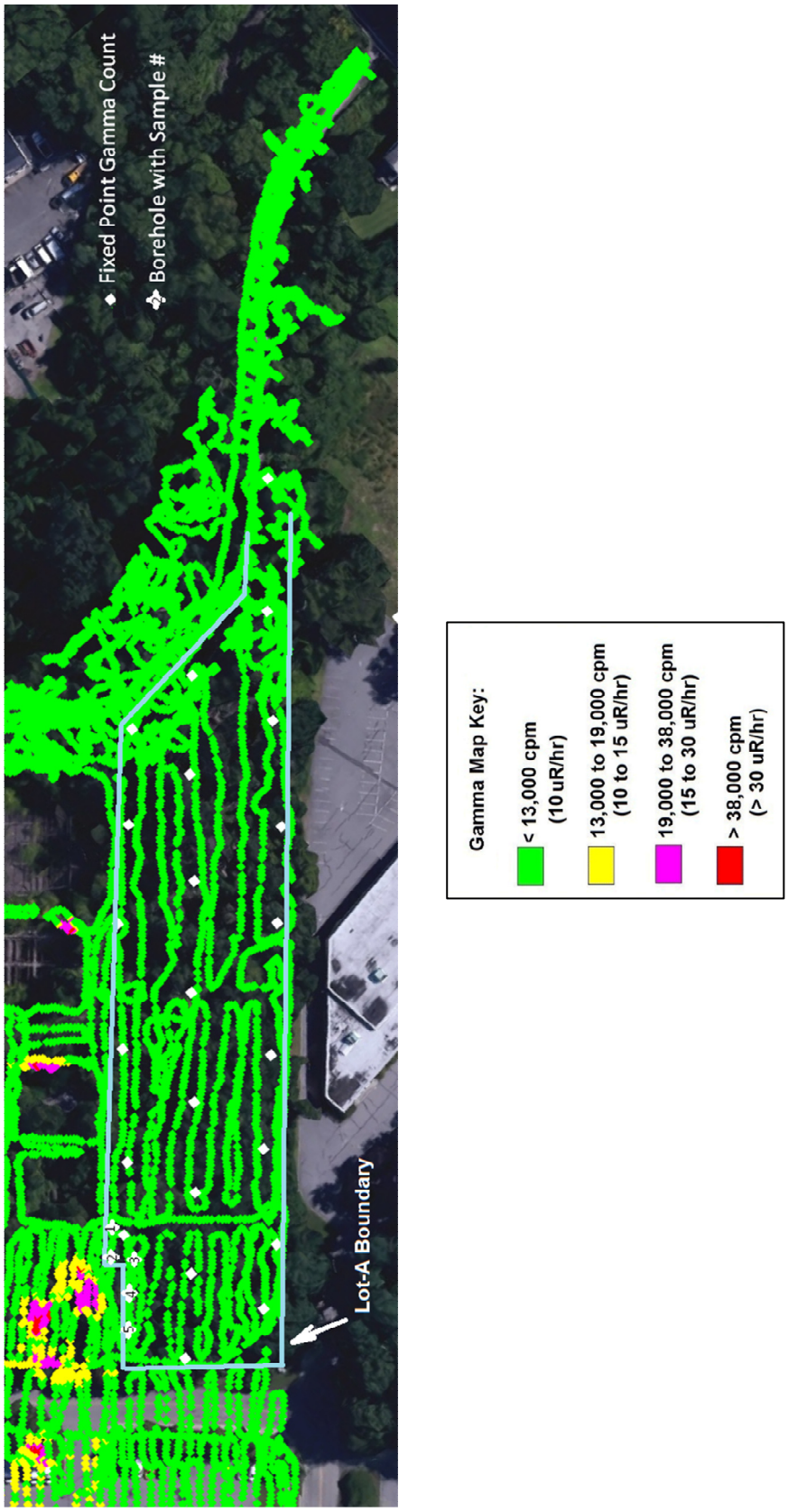
The summary statistics are shown in the following table:

Table 5-1 Summary of Surface Gamma Scan Results (Ludlum 44-10 Detector)

	cps	cpm	uR/hr
mean	113	6780	5.5
SD	15	875	0.7
min	67	4020	3.3
max	204	12240	10.0

The mean (average) radiation level is 5.5 uR/hr with a range of 3.3 to 10 uR/hr. This is consistent with normal, natural background radiation levels on the east coast US of 6 to 10 uR/hr (Ref: NRCP-45)

Figure 5-1 - Gamma Map and Sampling Locations - Lot-A 2 Morgan Dr.



5.2 Systematic Gamma Readings

The gridded, systematic gamma reading locations are shown in Figure 5.1 as white diamonds. The numeric results of these readings are shown in Appendix A. Typically, systematic readings of a survey area are statistically compared to readings obtained from a background, or reference, area using a Wilcoxon Rank Sum (WRS) Test per MARSSIM. However, MARSSIM also states that if the maximum reading from the survey minus the minimum reading from the background (reference) area is less than the DCGL (or IL), then the survey unit will certainly pass the WRS test and therefore performance of the WRS test is not necessary. This is the case for Lot-A – see calculation in Appendix A.

5.3 Downhole Gamma Logging Results

Downhole gamma logging readings were performed in 5 boreholes (locations shown in Figure 5.1 as numbered "plus" signs) located about 20 to 30 feet from the elevated radioactivity area of the adjoining lot. The results (shown in Table 5.2 below) are indicative of normal gamma levels in sub-surface soil. All sub-surface readings were well under the investigation level of 1100 cts/30 seconds indicating that none of the radioactivity on the adjoining lot is affecting soil in Lot-A.

Table 5-2 - Downhole Gamma Logging Results (Ludlum 44-62 Detector)

Biasd Boreholes to Investigate Possible Effect of Hotspot on Neighboring Lot

	Hole ID#s & Gamma Logging Count Rate (cts/30s) using Ludlum 44-62 Probe				
Depth (inches)	1	2	3	4	5
surface 44-10*	8.4 kcpm	8.1 kcpm	8.5 kcpm	8.0 kcpm	7.6 kcpm
0-6	278	268	304	258	249
`6-12	399	338	379	326	309
`12-18	491	412	431	388	380
18-24	512	433	527 sample	461 sample	463
24-30	533	508	523	508	505
30-36	591 sample	516	refusal	refusal	515 sample
36-42	547	540			496
42-48	558	575 sample			refusal
48-54	569	543			
54-60	511	533			
Ave (cts/30s)	499	467	433	388	417
Max (cts/30s)	591	575	527	508	515
Min (cts/30s)	278	268	304	258	249

Gamma Log Investigation Level: 1100 cts per 30-seconds

* Surface reading was performed with a Ludlum 44-10 probe - reading is in cpm (counts per minute)

5.4 Soil Sampling Results

A summary of the laboratory analysis results is shown in Table 5-3 below. These samples were collected along with the gamma logging subsurface investigation discussed in Section 5.3. The complete listing of results with uncertainty and Minimum Detectable Concentration is included in Appendix C.

Table 5-3 – Soil Analysis Results

		Radionuclide Concentration in Soil (pCi/g)				
Sample #	Depth (inches)	Ra-226	Ra-228	Th-230	Gross alpha	Gross beta
Lot A-1	30-36	0.785	1.402	0.339	12.7	16.3
Lot A-2	42-48	0.714	1.358	0.841	20.0	18.3
Lot A-3	18-24	1.267	0.841	0.924	17.7	12.7
Lot A-4	18-24	0.705	0.676	0.597	9.49	18.9
Lot A-5	30-36	0.624	0.714	0.263	8.86	13.4
Typical Natural BKG in Soil		0.5-1 pCi/g	0.5-1 pCi/g	0.5-1 pCi/g	10-20 pCi/g	10-20 pCi/g
Investigation Level:		5 pCi/g over BKG (sum of Ra-226 & Ra-228)		60 pCi/g	n/a	n/a

These results show that all samples contained normal, natural background concentrations of radionuclides.

5.5 Discussion of Elevated Readings on Lot-B

The area of elevated radiation readings on Lot-B near Morgan Drive is the closest elevated area to Lot-A. The Lot-B elevated area is not a pile but actually is a depression in the soil, about 2 to 3 feet lower than the surrounding ground. It is relatively small in size, about 20'x20'. It had been marked off during the 2019 survey, but the tape has degraded since then.

In preparation for this survey, CoPhysics and the NYSDEC discussed that in addition to performing a standard Final Status Survey of Lot-A, some additional special assessment of the soil near the Lot-B elevated area would be useful to determine if any radionuclide migration had occurred. Therefore, sub-surface measurements and soil sampling were performed on the Lot A-B boundary nearest to the Lot-B elevated area.

The results are shown in Sections 5.3 and 5.4 above. These results are all indicative of normal unaffected soil. The elevated area of radioactivity on Lot B (near Morgan Drive) has not affected the soil in Lot-A.

Furthermore, the levels of radiation emitted by the Lot-B elevated area are not immediately hazardous to health should anyone walk through it. The levels there are only considered to be "elevated" in the event of building a long-term residence, garden, etc. right on that spot. No special radiation safety precautions would be necessary for construction personnel working on Lot-A, although fencing off the area for liability purposes is recommended.

6.0 CONCLUSION

A radiological final status survey was conducted on Lot-A of 2 Morgan Drive, Mt. Kisco, NY per the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). The survey utilized an overland gamma radiation scan, systematic gamma counts, and subsurface investigation via gamma logging of boreholes along with soil sampling and laboratory analysis.

The results of these tests show that no elevated levels of radioactivity exist on the property. The elevated area of radioactivity on Lot B (near Morgan Drive) has not affected the soil in Lot-A. All readings throughout Lot-A are indicative of normal, natural background radiation levels. Therefore, the survey manager recommends that the NYSDEC release the property from any radiological controls.

APPENDIX A – MARSSIM ANALYSIS OF SYSTEMATIC GAMMA READINGS

Longitude	Latitude	1-MIN CNT (cpm)	Note	Type
-73.7359655	41.1926826	8397	hole1	biased
-73.73602	41.1926298	8091	hole2	biased
-73.735975	41.192593	8507	hole3	biased
-73.736059	41.192536	8001	hole4	biased
-73.736137	41.1924761	7629	hole5	biased
-73.7360463	41.1923426	8416		sys.
-73.735764	41.192316	7932		sys.
-73.7358679	41.1924839	8012		sys.
-73.735951	41.192651	8463		sys.
-73.735608	41.19241	8386		sys.
-73.735698	41.192622	8263		sys.
-73.7358	41.192775	8027		sys.
-73.73559	41.192982	7805		sys.
-73.735355	41.193212	6779		sys.
-73.73494	41.193536	7572		sys.
-73.73509	41.193176	7303		sys.
-73.73459	41.193344	7199		sys.
-73.734777	41.193144	6266		sys.
-73.734693	41.193542	6178		sys.
-73.735316	41.192982	7288		sys.
-73.734976	41.19298	7322		sys.
-73.735135	41.193371	7065		sys.
-73.735524	41.192784	7200		sys.
-73.73525	41.192755	7525		sys.
-73.735451	41.1926	7566		sys.
-73.734891	41.193371	7199		sys.
-73.734389	41.193547	7420		sys.
-73.734127	41.193781	6972		sys.
-73.732919	41.19248	5322	bk1	ref.
-73.732885	41.192446	5413	bk2	ref.
-73.732879	41.192418	6072	bk3	ref.
-73.732885	41.192385	6202	bk4	ref.
-73.732873	41.192298	5818	bk5	ref.
-73.732845	41.192258	5421	bk6	ref.
-73.732825	41.192198	5987	bk7	ref.
-73.732817	41.192103	6139	bk8	ref.
-73.732914	41.19251	6446	bk9	ref.

SURVEY AREA	
mean:	7485
min:	6178
max	8463
SD:	626
N:	23

REFERENCE AREA	
mean:	5869
min:	5322
max	6446
SD:	400
N:	9

Investigation Level corresponding to DCGL: 16000 cpm

Conclusion: Max count from Survey Area - Min Count from Ref. Area = 3141

3141 is < 16,000 cpm, therefore no WRS test necessary
Survey Unit passes

APPENDIX B – CALIBRATION CERTIFICATES

CoPhysics

CoPhysics Corporation
1 Commercial Drive, Unit 1, Florida, NY 10921
www.cophysics.com
845-783-4402

CERTIFICATE OF INSTRUMENT CALIBRATION

Co./Institute: CoPhysics Corporation **Calibration Date:** 05/05/20
Contact: BLUE **Phone:** **Due Date:** 05/05/21
Address: 1 Commercial Drive, Suite 1 Florida, NY 10921

Instrument Manufacturer: LUDLUM MEASUREMENTS, INC. **Detector Type:** SCINTILLATION
Meter Model: 3000 **Meter Serial #:** 15307 **Probe Model:** 44-10 **Probe Serial #:** 373552

Temperature (deg.C): 24 Relative Humidity (%): 31 Barometric Pressure (mbar): 1048
Mechanical Chk: OK Bat. Chk: OK Zero Chk: OK F/S Chk: OK Alarm Chk: NA Audio Chk: OK Plateau Chk: NA
Operating Voltage (V): 800 Input Sensitivity (mV): 10 Threshold Setting: - Window Setting: -
Repairs : BLUE SYSTEM, 4 AA BATTERIES

CALIBRATION DATA

	Source	Type or Attenuator	Dist.(cm)	Cal. Reference	Units	Scale	Net Reading	Units	Correction Factor	Efficiency
1	PULSE		0.0	300,000.00	CPM	RATE	299,000.00	CPM	1.0033	-
2	PULSE		0.0	30,000.00	CPM	RATE	29,600.00	CPM	1.0135	-
3	PULSE		0.0	3,000.00	CPM	RATE	2,970.00	CPM	1.0101	-
4	PULSE		0.0	300.00	CPM	RATE	300.00	CPM	1.0000	-
6	CS137A	100	207.0	499.79	uR/hr	RATE	421,000.00	CPM	0.0011 uR/hr/CPM	-
7	CS137A	100	293.0	249.46	uR/hr	RATE	211,000.00	CPM	0.0011 uR/hr/CPM	-
8	CS137D		41.0	99.21	uR/hr	RATE	82,000.00	CPM	0.0012 uR/hr/CPM	-
9	CS137D		82.0	24.80	uR/hr	RATE	20,400.00	CPM	0.0012 uR/hr/CPM	-

Usage Notes: 5 FOOT C TO C CABLE, APPROX. 834 CPM PER uR/hr

STANDARD DATA

Source/Nuclide	Manufacturer	Model#	Serial#	Type	Activity	As of	Geometry
CS137A Cs-137	JL Shepherd & Assoc, Inc.	28-6A	10287	Gamma	713.855 mCi	05/05/20	Parallel
CS137D Cs-137	DuPont-NEN	NES9017	083-01	Gamma	0.051 mCi	05/05/20	Parallel

Certification: This instrument has been calibrated to standards traceable to the National Institute of Standards and Technology and conforms to the requirements of ANSI N323-1978 and 10CFR35. The calibration is performed under New York State Radioactive Materials License # C2691.

Calibrated by: James Richard Date: 05/05/20
Quality Assurance: Theodore C Rahon

CoPhysics

CoPhysics Corporation
1 Commercial Drive, Unit 1, Florida, NY 10921
www.cophysics.com
845-783-4402

CERTIFICATE OF INSTRUMENT CALIBRATION

Co./Institute: CoPhysics Corporation **Calibration Date:** 01/23/20
Contact: **Phone:** **Due Date:** 01/22/21
Address: 1 Commercial Drive, Suite 1 Florida, NY 10921

Instrument Manufacturer: LUDLUM MEASUREMENTS, INC. **Detector Type:** 1/2x1 NaI Scint.
Meter Model: 2241 **Meter Serial #:** 316729 **Probe Model:** 44-62 **Probe Serial #:** 273614

Temperature (deg.C): 27 Relative Humidity (%): 22 Barometric Pressure (mbar): 1066
Mechanical Chk: OK Bat. Chk: OK Zero Chk: OK F/S Chk: NA Alarm Chk: NA Audio Chk: OK Plateau Chk: OK
Operating Voltage (V): 900 Input Sensitivity (mV): 10 Threshold Setting: 100 Window Setting: -
Repairs :

CALIBRATION DATA

	Source	Type or Attenuator	Dist.(cm)	Cal. Reference	Units	Scale	Net Reading	Units	Correction Factor	Efficiency
1	CS137D		127.0	10.41	uR/hr	dig	436.00	CPM	0.0238 uR/hr/CPM	-
2	CS137D		87.0	22.18	uR/hr	dig	954.00	CPM	0.0232 uR/hr/CPM	-
3	CS137D		52.0	62.08	uR/hr	dig	2,792.00	CPM	0.0222 uR/hr/CPM	-
4	CS137D		36.0	129.52	uR/hr	dig	5,310.00	CPM	0.0243 uR/hr/CPM	-
5	CS137A	100	329.0	199.14	uR/hr	dig	8,064.00	CPM	0.0246 uR/hr/CPM	-
6	CS137A	10	457.0	1,056.08	uR/hr	dig	51,702.00	CPM	0.0204 uR/hr/CPM	-

Usage Notes: CALIBRATION FOR USE WITH 20 FOOT CABLE ONLY. Approx. 43.4 CPM per uR/hr

STANDARD DATA

Source/Nuclide	Manufacturer	Model#	Serial#	Type	Activity	As of	Geometry
CS137A Cs-137	JL Shepherd & Assoc, Inc.	28-6A	10287	Gamma	718.454 mCi	01/23/20	Parallel
CS137D Cs-137	DuPont-NEN	NES9017	C83-01	Gamma	0.051 mCi	01/23/20	Parallel

Certification: This instrument has been calibrated to standards traceable to the National Institute of Standards and Technology and conforms to the requirements of ANSI N323-1978 and 10CFR35. The calibration is performed under New York State Radioactive Materials License # C2691.

Calibrated by: _____ Date: 01/23/20
Quality Assurance: Theodore C Rahon

APPENDIX C – SOIL ANALYSIS RESULTS

(Analytical Results pages only. Contact author for complete report)

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Lot-A
Pace Project No.: 30377832

Sample: Lot A-1 **Lab ID: 30377832001** Collected: 08/07/20 12:00 Received: 08/14/20 10:00 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical Services - Greensburg					
Radium-226	EPA 901.1	**0.785 ± 0.201 (0.155) C:NA T:NA**	pCi/g	09/10/20 15:24	13982-63-3	Ra
Radium-228	EPA 901.1	**1.402 ± 0.370 (0.241) C:NA T:NA**	pCi/g	09/10/20 15:24	15262-20-1	
	Pace Analytical Services - Greensburg					
Gross Alpha	EPA 9310	**12.7 ± 5.78 (5.38) C:NA T:NA**	pCi/g	08/21/20 07:29	12587-46-1	
Gross Beta	EPA 9310	**16.3 ± 4.11 (3.69) C:NA T:NA**	pCi/g	08/21/20 07:29	12587-47-2	
	Pace Analytical Services - Greensburg					
Thorium-230	HSL-300	**0.339 ± 0.221 (0.162) C:NA T:54%**	pCi/g	08/31/20 12:51	14269-63-7	N2

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Lot-A
Pace Project No.: 30377832

Sample: Lot A-2 **Lab ID: 30377832002** Collected: 08/07/20 12:00 Received: 08/14/20 10:00 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical Services - Greensburg					
Radium-226	EPA 901.1	**0.714 ± 0.256 (0.412) C:NA T:NA**	pCi/g	09/10/20 15:23	13982-63-3	Ra
Radium-228	EPA 901.1	**1.358 ± 0.439 (0.559) C:NA T:NA**	pCi/g	09/10/20 15:23	15262-20-1	
	Pace Analytical Services - Greensburg					
Gross Alpha	EPA 9310	**20.0 ± 8.68 (11.5) C:NA T:NA**	pCi/g	08/21/20 07:50	12587-46-1	
Gross Beta	EPA 9310	**18.3 ± 5.16 (5.10) C:NA T:NA**	pCi/g	08/21/20 07:50	12587-47-2	
	Pace Analytical Services - Greensburg					
Thorium-230	HSL-300	**0.841 ± 0.364 (0.165) C:NA T:52%**	pCi/g	08/31/20 12:51	14269-63-7	N2

REPORT OF LABORATORY ANALYSIS

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1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Lot-A
Pace Project No.: 30377832

Sample: Lot A-3 **Lab ID: 30377832003** Collected: 08/07/20 12:00 Received: 08/14/20 10:00 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical Services - Greensburg					
Radium-226	EPA 901.1	**1.267 ± 0.396 (0.305) C:NA T:NA**	pCi/g	09/09/20 09:19	13982-63-3	Ra
Radium-228	EPA 901.1	**0.841 ± 0.342 (0.306) C:NA T:NA**	pCi/g	09/09/20 09:19	15262-20-1	
	Pace Analytical Services - Greensburg					
Gross Alpha	EPA 9310	**17.7 ± 6.93 (6.40) C:NA T:NA**	pCi/g	08/21/20 07:30	12587-46-1	
Gross Beta	EPA 9310	**12.7 ± 3.61 (3.42) C:NA T:NA**	pCi/g	08/21/20 07:30	12587-47-2	
	Pace Analytical Services - Greensburg					
Thorium-230	HSL-300	**0.924 ± 0.347 (0.161) C:NA T:68%**	pCi/g	08/31/20 12:51	14269-63-7	N2

REPORT OF LABORATORY ANALYSIS

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1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Lot-A
Pace Project No.: 30377832

Sample: Lot A-4 **Lab ID: 30377832004** Collected: 08/07/20 12:00 Received: 08/14/20 10:00 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical Services - Greensburg					
Radium-226	EPA 901.1	**0.705 ± 0.200 (0.235) C:NA T:NA**	pCi/g	09/10/20 15:40	13982-63-3	Ra
Radium-228	EPA 901.1	**0.676 ± 0.560 (0.594) C:NA T:NA**	pCi/g	09/10/20 15:40	15262-20-1	
	Pace Analytical Services - Greensburg					
Gross Alpha	EPA 9310	**9.49 ± 5.09 (6.80) C:NA T:NA**	pCi/g	08/21/20 07:49	12587-46-1	
Gross Beta	EPA 9310	**18.9 ± 4.48 (3.03) C:NA T:NA**	pCi/g	08/21/20 07:49	12587-47-2	
	Pace Analytical Services - Greensburg					
Thorium-230	HSL-300	**0.597 ± 0.280 (0.141) C:NA T:58%**	pCi/g	08/31/20 12:51	14269-63-7	N2

REPORT OF LABORATORY ANALYSIS

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Greensburg, PA 15601
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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Lot-A
Pace Project No.: 30377832

Sample: Lot A-5 **Lab ID: 30377832005** Collected: 08/07/20 12:00 Received: 08/14/20 10:00 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical Services - Greensburg					
Radium-226	EPA 901.1	**0.624 ± 0.148 (0.202) C:NA T:NA**	pCi/g	09/10/20 15:41	13982-63-3	Ra
Radium-228	EPA 901.1	**0.714 ± 0.319 (0.239) C:NA T:NA**	pCi/g	09/10/20 15:41	15262-20-1	
	Pace Analytical Services - Greensburg					
Gross Alpha	EPA 9310	**8.86 ± 5.19 (7.40) C:NA T:NA**	pCi/g	08/21/20 07:30	12587-46-1	
Gross Beta	EPA 9310	**13.4 ± 4.17 (4.85) C:NA T:NA**	pCi/g	08/21/20 07:30	12587-47-2	
	Pace Analytical Services - Greensburg					
Thorium-230	HSL-300	**0.263 ± 0.175 (0.150) C:NA T:70%**	pCi/g	08/31/20 12:51	14269-63-7	N2

REPORT OF LABORATORY ANALYSIS