G5028006
June 30, 2022

Daniel A. Pennington, PE
Town Engineer/Manager of Physical Services
Town of Glastonbury
2155 Main Street
Glastonbury, CT 06033

Re: Peer Review Services – Uranium and Radionuclides
1199 Manchester Road, Glastonbury, CT

Dear Dan:

In accordance with our Proposal/Scope of Services dated June 22, 2022, Tighe & Bond has completed a peer review of documents you provided associated with a proposed 74-unit multi-family residential development at 1199 Manchester Road in Glastonbury (the Site).

This letter summaries our review of information pertaining to the presence of naturally occurring uranium and radon, as reported in the documents. In addition, we have reviewed information in State of Connecticut published documents and maps and documents published by the United States Environmental Protection Agency (USEPA). This letter summarizes our review of Site information and published information, specifically as it relates to the Site area, and our opinion and recommendations related to the presence or potential presence of uranium and other radionuclides in subsurface materials as they relate to the proposed residential development of the Site.

Documents Provided

Tighe & Bond was provided with documents from the Town including site plans, a traffic impact study, groundwater sampling, and a geotechnical evaluation. The following documents contain information used in our review and cited in this letter:

- Set (15 pages) of Site Development Plans by Wentworth Civil Engineers, LLC.
- Letter from Clarence Welti/Clarence Welti Associates, Inc. to Richard Hayes/Hayes Corporation dated September 20, 2005 containing a soil boring log of hole number B-2A completed on September 16, 2005.
- Memorandum to Glastonbury Town Plan and Zoning Commission from Hinkley Allen dated June 15, 2022 containing a letter report from Boston Environmental Corporation detailing their groundwater sampling event of May 23, 2022.

Site Description, Geology and Recent Sampling

The 2.4-acre, undeveloped, wooded Site is located immediately west of intersection of Manchester Road (Route 83) and Hebron Avenue (Route 94) in the northeast quadrant of Glastonbury. According to Site survey plans, elevation ranges from 354 feet at the north-northwest Site boundary to 408 feet in the central-southwest part of the Site.

State of Connecticut mapping indicates surficial materials on the Site consist of sand and gravel. Underlying bedrock is mapped Glastonbury Gneiss, described as a gray, medium- to coarse-grained, massive to well-foliated granitic gneiss. Mineralogy is reported as oligoclase, quartz, microcline, and biotite, as well as epidote and hornblende in many areas, commonly associated with layers of amphibolite. This bedrock unit trends northeast to southwest and underlies most of east Glastonbury. Figure 1 depicts surficial and bedrock geology on the Site.

The Connecticut surficial materials mapping appears consistent with the log of boring B-2A, which depicts a boring initiated at elevation 405 feet and extending 55 feet deep through fine- to coarse-grained sand overlying fine- to medium-grained sand and terminating in fine-grained sand. The presence of groundwater was not reported on the soil boring log.

Boston Environmental Corporation (BEC) reported that monitoring well B-3 was installed during subsurface explorations completed by Welti in 2005. The well is in the approximate center of the Site as shown in the figure (attached) provided in the BEC letter. Depth to water was reported at 62.24 feet below top of the well head riser, and the well was reported as 68.10 feet from top of well head riser. BEC collected groundwater samples from the well for analyses of a broad range of petroleum compounds, several metals (including uranium), and radon. Petroleum hydrocarbons and volatile organic compounds were not reported in the groundwater sample.

Uranium was reported at a concentration of 16.1 micrograms/Liter (ug/L), below the Groundwater Protection Criteria (GWPC) of 30 ug/L listed in the "Recommended Criteria Values for Common Additional Polluting Substances" published by the Connecticut Department of Energy & Environmental Protection (CTDEEP). Radon was reported at 560 picocuries/Liter (pCi/L), below the Connecticut Department of Public Health (CTDPH) recommended action level of 5,000 pCi/L for radon in drinking water.

Uranium and Radionuclides

Uranium and its intermediate decay elements (thorium, radium, and others) are naturally occurring radioactive elements found in unconsolidated surficial materials, bedrock, groundwater, and surface water. Radium decays to release the radioactive gas radon, which also occurs naturally in soil, bedrock, groundwater, and surface water. Radon is commonly found in soil vapor, the air in pore spaces in unconsolidated surficial materials and bedrock fractures. Since radon is a gas, it can move readily in unconsolidated surficial materials and bedrock fractures and dissolve into groundwater and surface water.

According to EPA sources, the half-life of uranium is 4.5 billion years, and the half-life of various radium isotopes range from 3.5 days for radium-224, to 6.7 years for radium-228 to 1,600 years for radium-226. Isotopes of radium decay to form radon. The half-life of radon is 3.8 days.

The CTDEEP developed the "Indoor Radon Potential Map of Connecticut" (1997) to depict the calculated radon potential rating for areas across the state based on radon measurements in buildings, radon in groundwater and radon measured in low level atmospheric air.

Figure 2 is an excerpt of this map that depicts the Site location and the area surrounding the Site. As shown, the Site area and surroundings are mapped as having moderate-high to high radon potential. The figure also depicts an area where the source map shows an area of naturally occurring radioactive minerals. Six other areas of naturally occurring radioactive minerals are shown to be in Glastonbury.

Recent research by the United States Geological Survey (USGS) and CTDPH estimates that groundwater at 4.7% of private wells in Connecticut contains uranium at concentrations higher than EPA standards (30 ug/L). According to their studies, groundwater in an estimated 11-20 percent of private wells located in a north-northeast to south-southwest trending swath over most of the eastern half of Glastonbury contains uranium at concentrations greater than 30 ug/L.

Opinion

Uranium and its intermediate decay elements (thorium, radium, and others) are naturally occurring radioactive elements found in soils, bedrock, groundwater, and surface water. Uranium (16.1 ug/L) was reported in a groundwater sample from an overburden well installed at 68 ftbg in overburden sand and gravel materials. Tighe & Bond has not reviewed any information related to analyses of soil and bedrock samples from the Site for uranium, radium, or arsenic. Naturally occurring concentrations of arsenic, uranium and other radionuclides are associated with bedrock and/or surficial materials underlying the Site.

The Site is undeveloped and does not appear to have been previously developed or used in a manner that caused a release of uranium, radium, or other radioactive substances. The CTDEEP does not mandate the remediation of naturally-occurring constituents in soil or groundwater on a site. Rather, CTDEEP recommends that site soils, groundwater, or soil vapor containing naturally occurring substances that could be harmful to humans or the environment, be effectively managed or that engineering controls, such as vapor barriers and sub-slab depressurization systems, be used to minimize risk to human health and the environment.

Based on our review of documents provided by the Town and information in State of Connecticut and United States Environmental Protection Agency mapping and literature, Tighe & Bond submits the following recommendations:

1) Given the high potential for radon exceeding 4 pCi/L in unconsolidated soils and/or bedrock on the Site, a sub-slab depressurization system or other radon control measure is recommended below the proposed residential building. Other radon control or mitigation measures could include an engineered control, such as a permanent vapor barrier or the combination a vapor barrier and sub-slab depressurization system. The granular nature of subsurface soils, while allowing for the migration of radon in the subsurface to overlying buildings, should also allow for successful radon mitigation via sub-slab depressurization.

2) The Site development plan should include provisions for proper management of excavated materials and airborne particulates created during site work. Generally, the airborne emissions performance standard requires no visible emissions of fine grained particulates. Subsurface materials that are mapped on the Site and identified in the soil boring log consist of sand and gravel, so visible emissions should be low. However, if materials encountered during site work include silts or very fine sand, possible visible emissions can be controlled by wetting or surface cover with coarser materials.

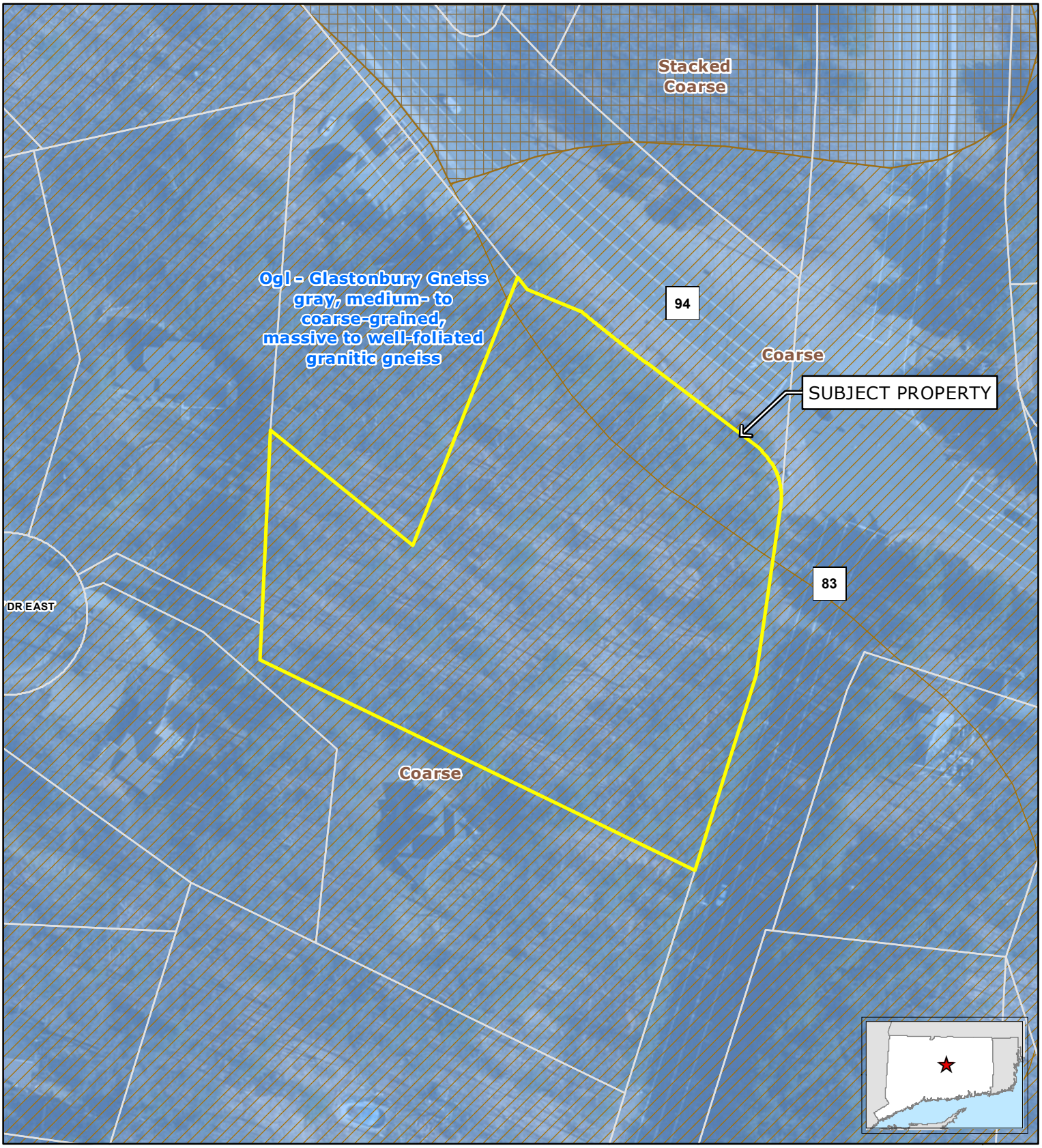
3) Site earthwork and soil grading may liberate radon from disturbed materials. Radon released from subsurface materials during construction will be lost to atmosphere and should not be harmful to Site workers based on short-term exposure rates.

Thank you for the opportunity to provide environmental services. If you have any questions or comments, please contact me at jbrown@tighebond.com or (860) 852-5210.

Sincerely,
Tighe & Bond, Inc.

Jeffrey Brown, LEP
Senior Project Manager

James T. Olsen, PG, LEP
Vice President



Surficial Materials

- Coarse
- Stacked Coarse

Bedrock Geology

- Glastonbury Gneiss

- Subject Property
- Approximate Parcel Boundary

1:1,200

0 50 100

Feet

N

Source:
GIS data layers displayed on this map were obtained from CTDEEP's data library (http://www.ct.gov/deep). Surficial Materials data was derived from the U.S Geological Survey Surficial Materials Map of Connecticut (Stone and others; 1992) and the Quaternary Geologic Map of Connecticut and Long Island Sound Basin (Stone and others;2005). Bedrock Geology data was derived from the Bedrock Geological Map of Connecticut (Rodgers; 1985). Based on 2019 Statewide Leaf-Off Orthophotography, Courtesty of CTECO.

FIGURE 1
SURFICIAL MATERIALS AND BEDROCK GEOLOGY MAP

1199 Manchester Road
Glastonbury, Connecticut

June 2022

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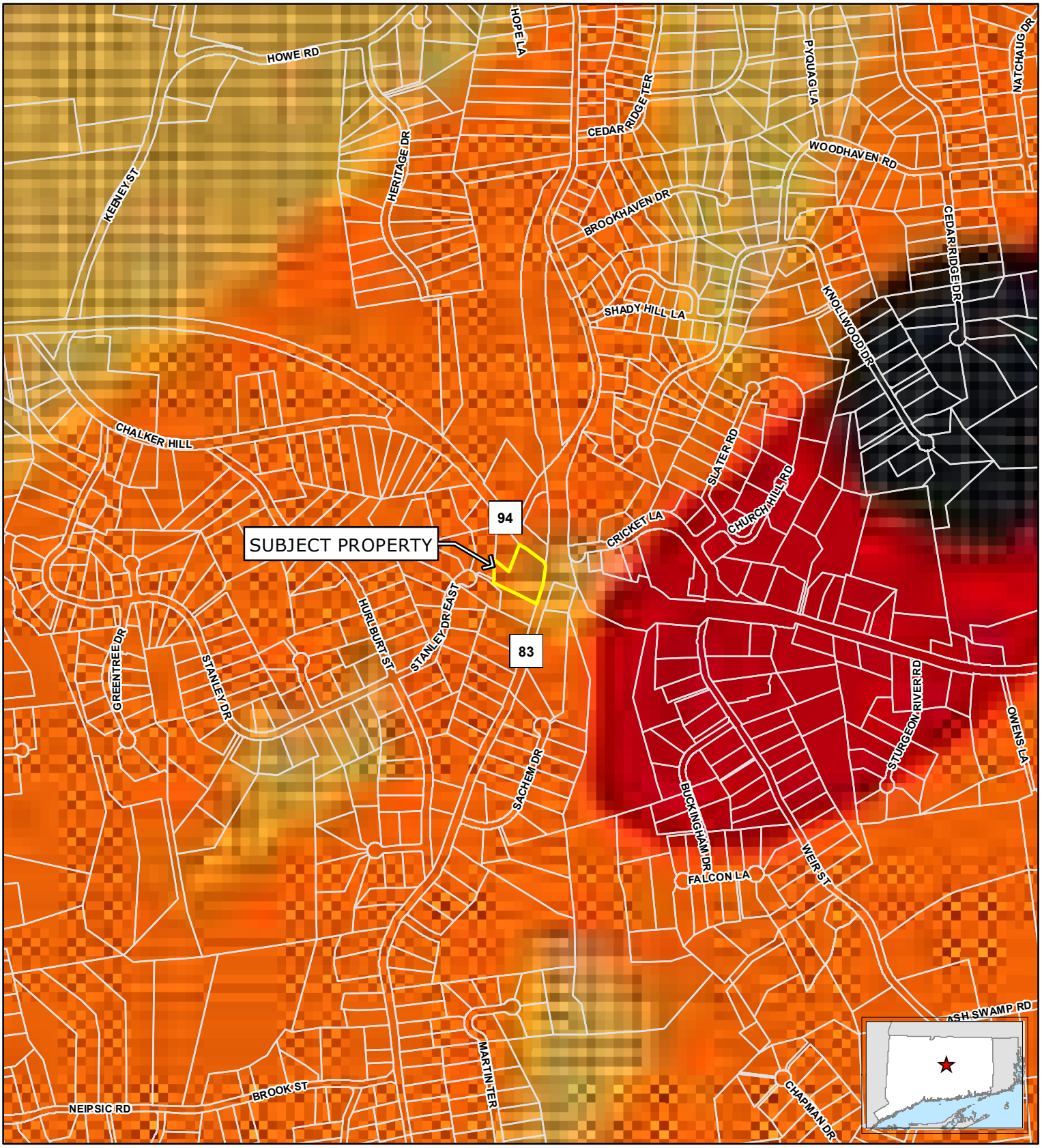

LEGEND

Radon Potential Rating*

- Low: 6%
- Low - Moderate: 16%
- Moderate: 22%
- Moderate - High: 33%
- High: 48%
- Naturally Occuring Radioactive Minerals
- Subject Property
- Approximate Parcel Boundary

1:12,000

0 500 1,000 Feet

N

*The radon potential rating indicates the percentage of tested homes in these areas with basement air radon greater than or eqal to 4.0 pCi/l. Radon data provided by the Department of Public Health. https://portal.ct.gov/-/media/DEEP/geology/radon/RadonPotentialpdf.pdf

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FIGURE 2
EXCERPT FROM
INDOOR RADON POTENTIAL MAP OF CONNECTICUT

1199 Manchester Road
Glastonbury, Connecticut

June 2022

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FIGURE 1 - SITE SKETCH

1199 MANCHESTER ROAD
GLASTONBURY, CONNECTICUT

BOSTON ENVIRONMENTAL CORPORATION

APPROXIMATE LOCATION OF GROUNDWATER MONITORING WELL B-3 SAMPLED BY BEC IN MAY 2022.

1199 Manchester Rd

Google Earth

300 ft

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