Appendix 24-2:

Glint and Glare Analysis

Excelsior Energy Center

Glint and Glare Analysis

1.0 GLARE

1.1 INTRODUCTION

The Project is not predicted to emit significant glare into the existing environment. Panels are designed to absorb sunlight and will be treated with anti-reflective coatings that will absorb and transmit light rather than reflect it. In general, solar panels are less reflective than the reflectivity of water (NYSERDA, 2020) and any reflected light from solar panels will have a significantly lower intensity than glare from direct sunlight (Mass. Department of Energy Resources, 2015).

The Applicant has prepared this Glint and Glare Analysis to identify any potential glint/glare impacts on nearby residences and roads and the need for any necessary mitigation. The analysis was prepared by Capitol Airspace Group utilizing the Solar Glare Hazard Analysis Tool (SGHAT). The results of the analysis conform to, and are in accordance with, the FAA's interim policy for Solar Energy System Projects on Federally Obligated Airports (78 FR 63271, October 2013), although this policy is only applicable for projects proposing to install solar panels at federally funded airports. SGHAT is a very conservative tool in that:

- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover, and geographic obstructions;
- The glare analysis assumes clear, sunny skies for 365 days of the year and does not take into account meteorological conditions that would nullify predicted glare such as clouds, rain or snow; and,
- Although only a portion of a modeled array may have the potential to produce glare, the results are provided as if the receptor has visibility of the entire array.

1.2 REGULATORY THRESHOLDS

There are no applicable quantitative standards for glare, but scientific literature suggests that doubling shadow flicker standards could be used as a benchmark (Pager Power, 2018). The New York State Siting Board has adopted a 30-hour shadow flicker standard; therefore, the benchmark for glare would be 60 hours per year. Additionally, if glint and glare is predicted for a surrounding dwelling for longer than 60 minutes per day, for three or more months of the year, then the impact should be considered significant with respect to residential amenity and, in this scenario, mitigation should be implemented (Pager Power, 2018).

1.3 GLARE ANALYSIS

Based on the viewshed analysis included as Figure 4 'Potential Visibility and Visual Resources' in the *Visual Impact Assessment* included as Appendix 24-1 of the Article 10 Application filing, non-participating residential receptors within 1,500 feet of the arrays (referred to herein as "observation points") identified as having visibility of the Project were assessed for glare. The proposed array was divided into 92 separate sub areas identified as arrays A1-A3, B1-B13, C1-C20, D1-D6, E1-E12, F1-F15, G1-G9, and H1-H14. An additional viewshed analysis was then performed to determine which of these separate 92 array areas are visible from each observation point with predicted visibility. In addition to the three factors that overestimate potential glare noted above, proposed landscaping was not accounted for in the viewshed analysis and, therefore, the predicted visibility is overestimated.

The analysis conservatively assumes that all residential receptors are from a second story height (16 feet) A total of 186 receptors were identified within 1,500 feet of a proposed array, of which 130 were determined to have potential visibility of an array. Therefore, 130 residential observation points were assessed in the analysis.

Figure 1 – Array Areas Assessed

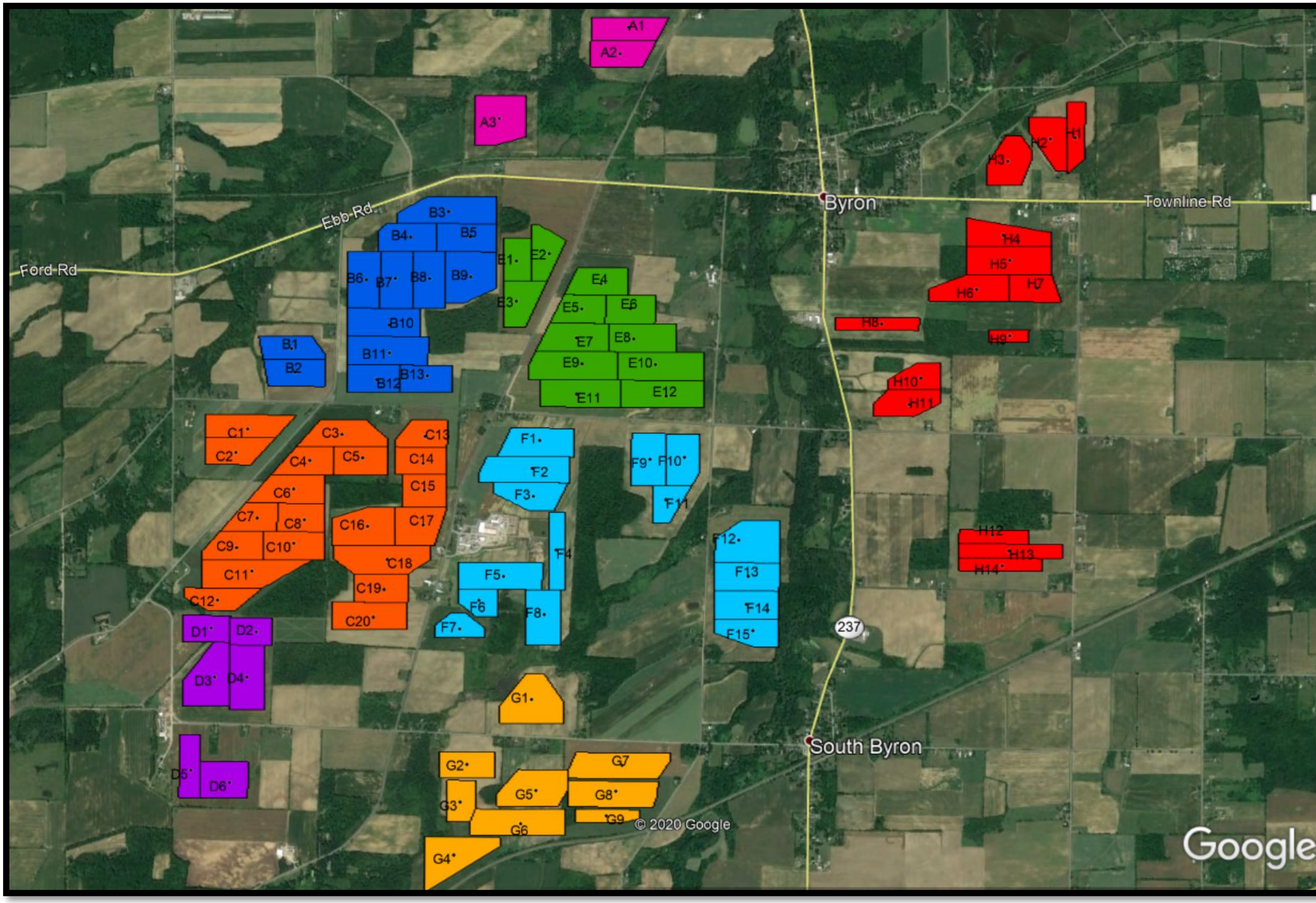
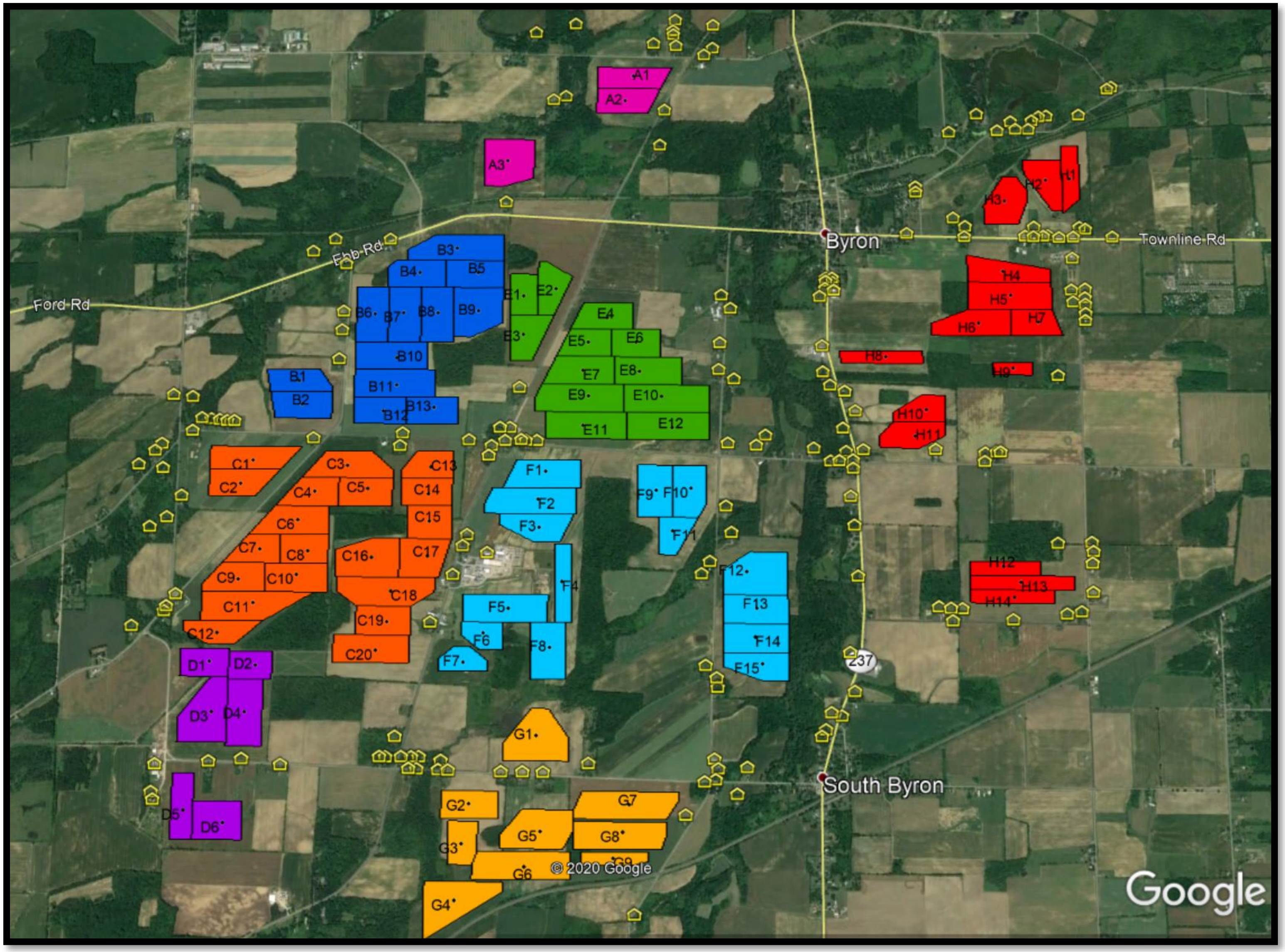


Figure 2 – Residential Observation Points



The glare analysis was then conducted to determine the potential duration of glare that could occur at each residential observation point and to determine the portion of each array area to have the potential to result in glare. The results of this analysis for the arrays are included in the attached glare report prepared by Capitol Airspace Group included as Appendix 1 and indicate that no glare is predicted at any residential observation point.

1.4 CONCLUSION

Based on the results of the analysis, no significant impacts from glare are expected as a result of the Project. No glare is predicted as a result of the Project. Refer to Appendix 1 to see the Glint and Glare report and associated SGHAT data sheets prepared by Capitol Airspace Group.

References:

Massachusetts Department of Energy Resources. "Clean Energy Results, Questions and Answers, Ground Mounted Solar Photovoltaic Systems." Energy Center, June 2015. https://www.masscec.com/clean-energy-results-questions-and-answers-ground-mounted-solar-photovoltaic-systems

NYSERDA. New York Solar Guidebook for Local Governments. January 2019. Available at: https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Communities-and-Local-Governments/Solar-Guidebook-for-Local-Governments

Pager Power, *Solar Photovoltaic Development – Glint Glare Guidance*, October, 2018 Second Edition

Appendix 1

Glint and Glare Report by Capitol Airspace Group

Excelsior Energy Center

Excelsior Energy Center, LLC

Genesee County, New York

Glint & Glare Analysis

September 11, 2020

Capitol Airspace Group

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Summary

Excelsior Energy Center, LLC is proposing to construct solar arrays near the town of Byron in Genesee County, New York (***Figure 1***). On behalf of Excelsior Energy Center, LLC, Capitol Airspace performed a Glint and Glare Analysis utilizing the Solar Glare Hazard Analysis Tool (SGHAT), in order to identify the potential for glare impacts. Specifically, this analysis considered the potential for glare impacts on the second story of nearby residences.

The results of this analysis indicate that there are no predicted glare occurrences for the second story of nearby residences as a result of the proposed single-axis tracking solar arrays. These results are based on the application of FAA glint and glare standards in the absence of non-aviation regulatory guidelines.

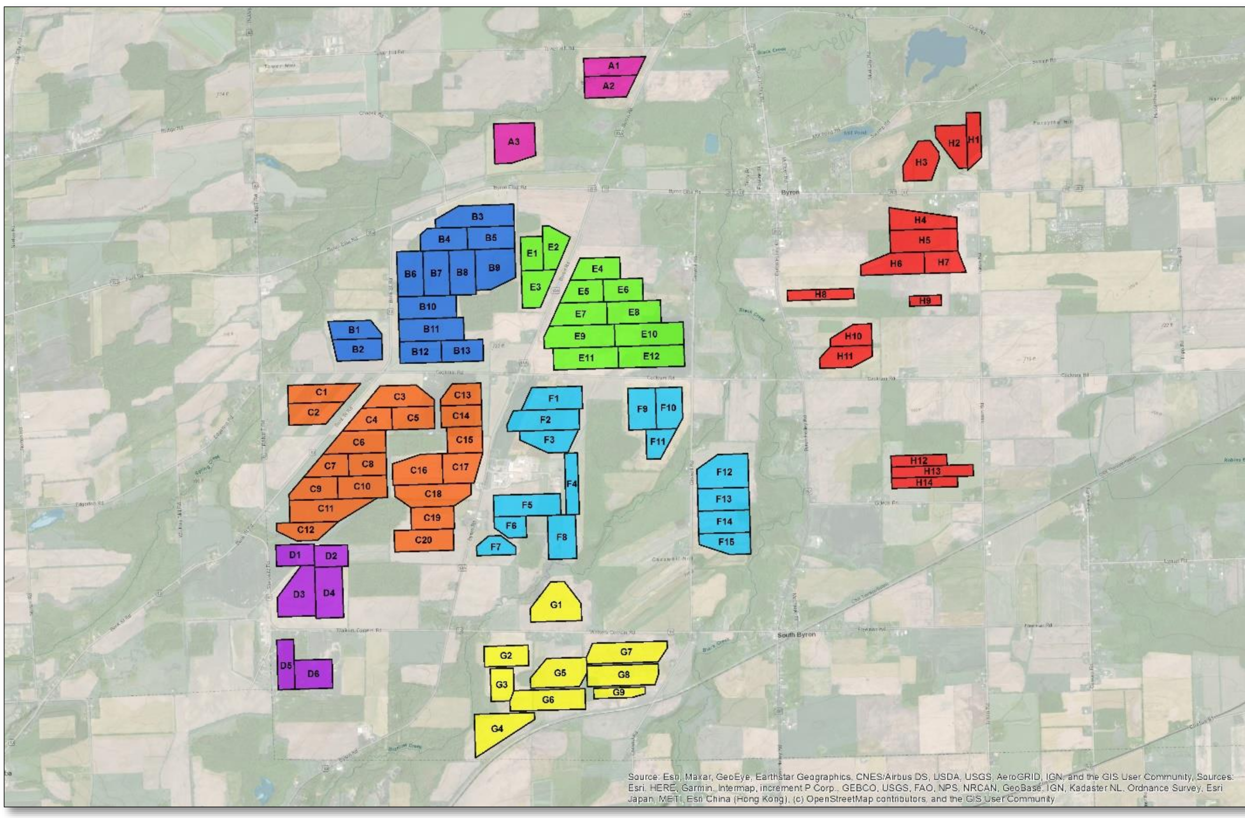

Figure 1: Location and identification of Excelsior Energy Center solar parcels

Methodology

In cooperation with the Department of Energy (DOE), the Federal Aviation Administration (FAA) developed and validated the Sandia National Laboratories Solar Glare Hazard Analysis Tool (SGHAT), now licensed through ForgeSolar. The FAA requires the use of the SGHAT in order to enhance safety by providing standards for measuring the ocular impact of proposed solar energy systems on pilots and air traffic controllers. ForgeSolar has enhanced the SGHAT for glare hazard analysis beyond the aviation environment. These enhancements include a route module for analyzing roadways as well as an observation point module for analyzing residences.

The SGHAT analyzes potential for glare over the entire calendar year, in one-minute intervals from when the sun rises above the horizon, until the sun sets below the horizon. The glare hazard determination relies on several approximations including; observer eye characteristics, angle of view, and typical blink response time. The SGHAT does not account for physical obstructions between reflectors and receptors. When glare is found, the SGHAT classifies the ocular impact into three categories:

Green: Low potential for temporary after-image
Yellow: Potential for temporary after-image
Red: Potential for permanent eye damage

The FAA interim policy for *Solar Energy System Projects on Federally Obligated Airports* requires the absence of red or yellow predicted glare occurrences in the cockpit. Currently, there are no defined standards for acceptable ocular impact on residences or roadways.

Data

Solar array specifications (***Table 1***) as well as location and height information were provided by Excelsior Energy Center, LLC. The SGHAT determines site elevations, unless entered manually.

Table 1: Excelsior Energy Center solar array specifications

Parameter	Value
Axis tracking:	Single-axis rotation
Tracking axis orientation:	180°
Tracking axis tilt:	0°
Max tracking angle:	52°
Resting angle:	10°
Panel material:	Smooth glass with AR coating
Reflectivity:	Vary with sun
Slope error:	Correlate with material

Results

Residences

The SGHAT assessed the potential for glare occurrences at 130 discrete observation point receptors (purple points, ***Figures 2 - 9***). Each observation point was assessed at a 16-foot second story viewing height. The SGHAT results do not predict glare occurrences at second story viewing heights for any of the 130 observation points as a result of single-axis tracking arrays.

Conclusion

The SGHAT does not predict any glare occurrences for the second story of nearby residences as a result of single-axis tracking arrays (***Table 2***). These results are based on the application of FAA glint and glare standards in the absence of non-aviation regulatory guidelines. As noted in the assumptions, this glint and glare analysis takes the most conservative approach and does not consider vegetation, fencing, or other natural obstructions.

Table 2: Annual glare occurrence summary

Receptor	Green Glare (Hours:Minutes)	Yellow Glare (Hours:Minutes)	Red Glare (Hours:Minutes)
Residences (Second Story)	0:00	0:00	0:00

If you have any questions regarding the findings in this analysis, please contact ***Rick Coles*** at (703) 256-2485.

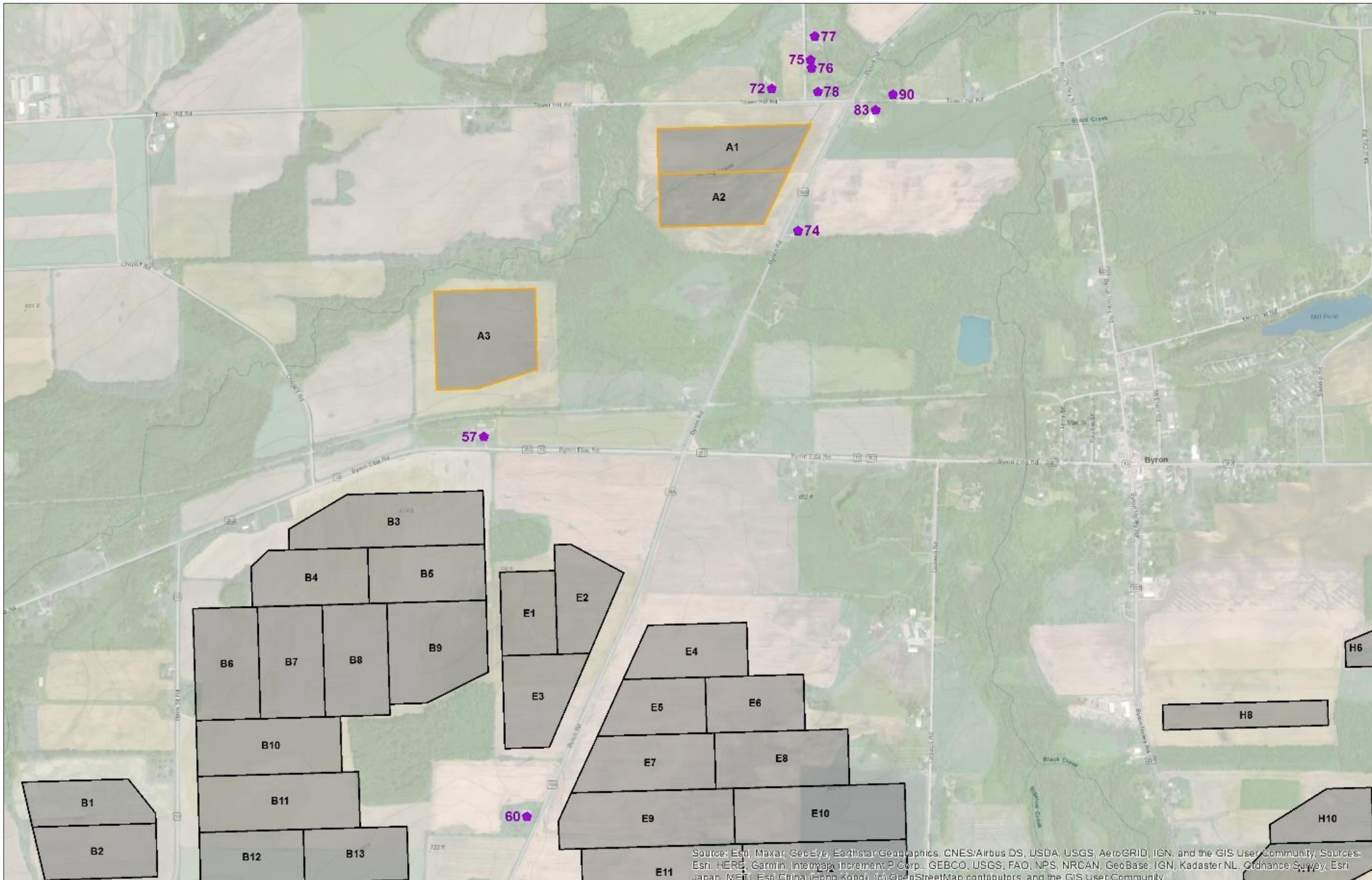

Figure 2: Array A parcels with surrounding discrete observation point receptors (purple points)

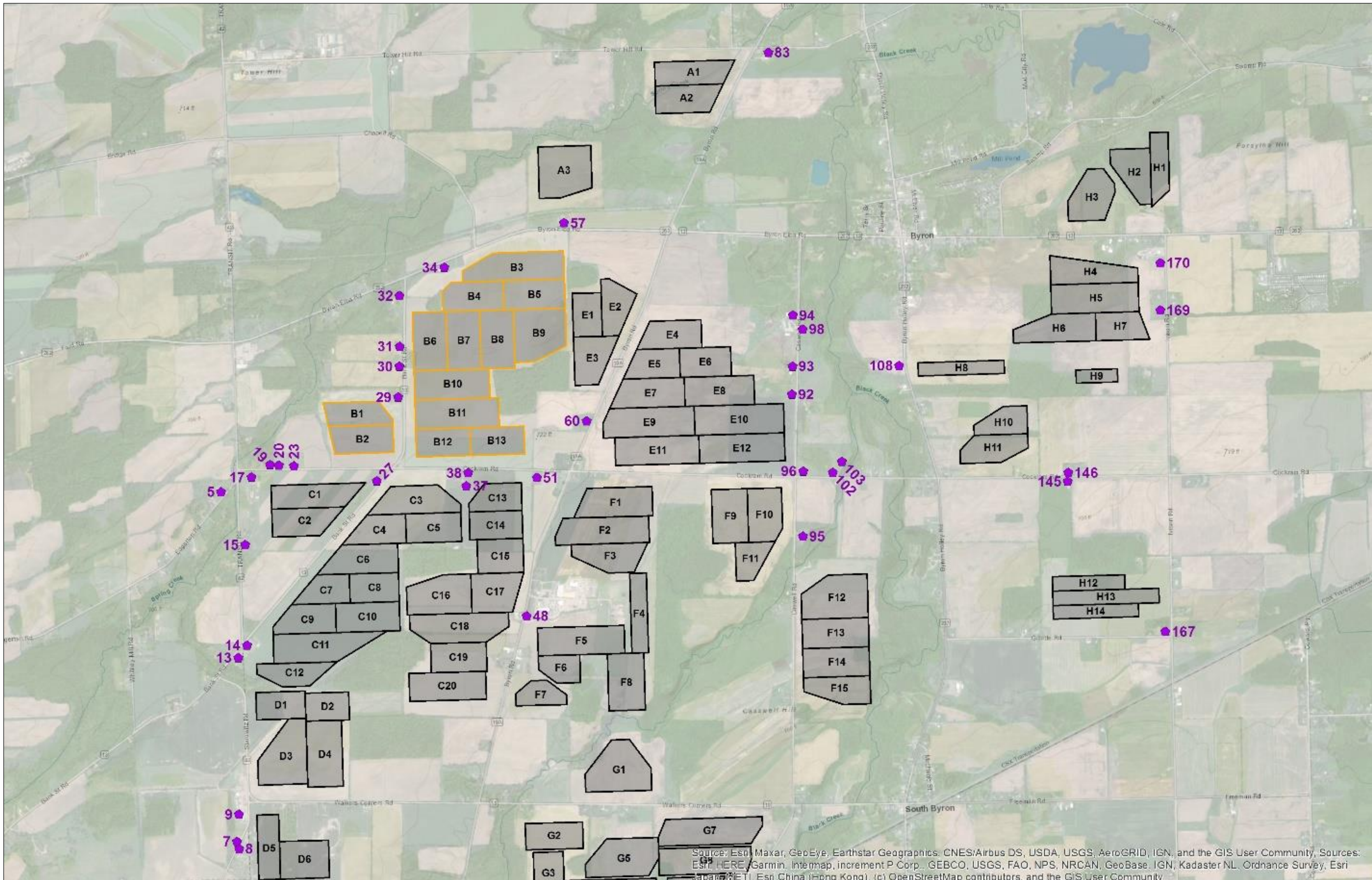

Figure3: Array B parcels with surrounding discrete observation point receptors (purple points)

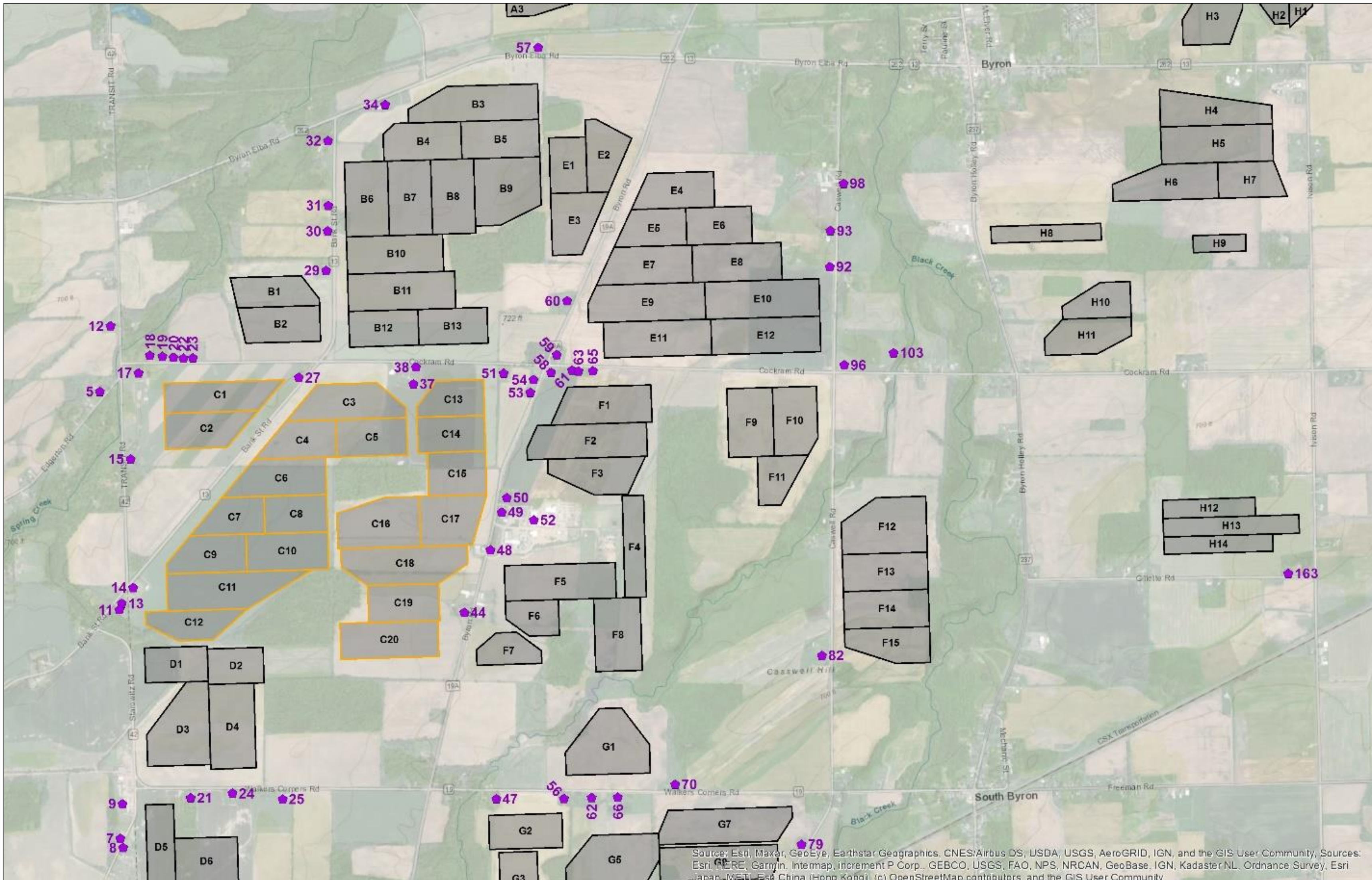

Figure 4: Array C parcels with surrounding discrete observation point receptors (purple points)

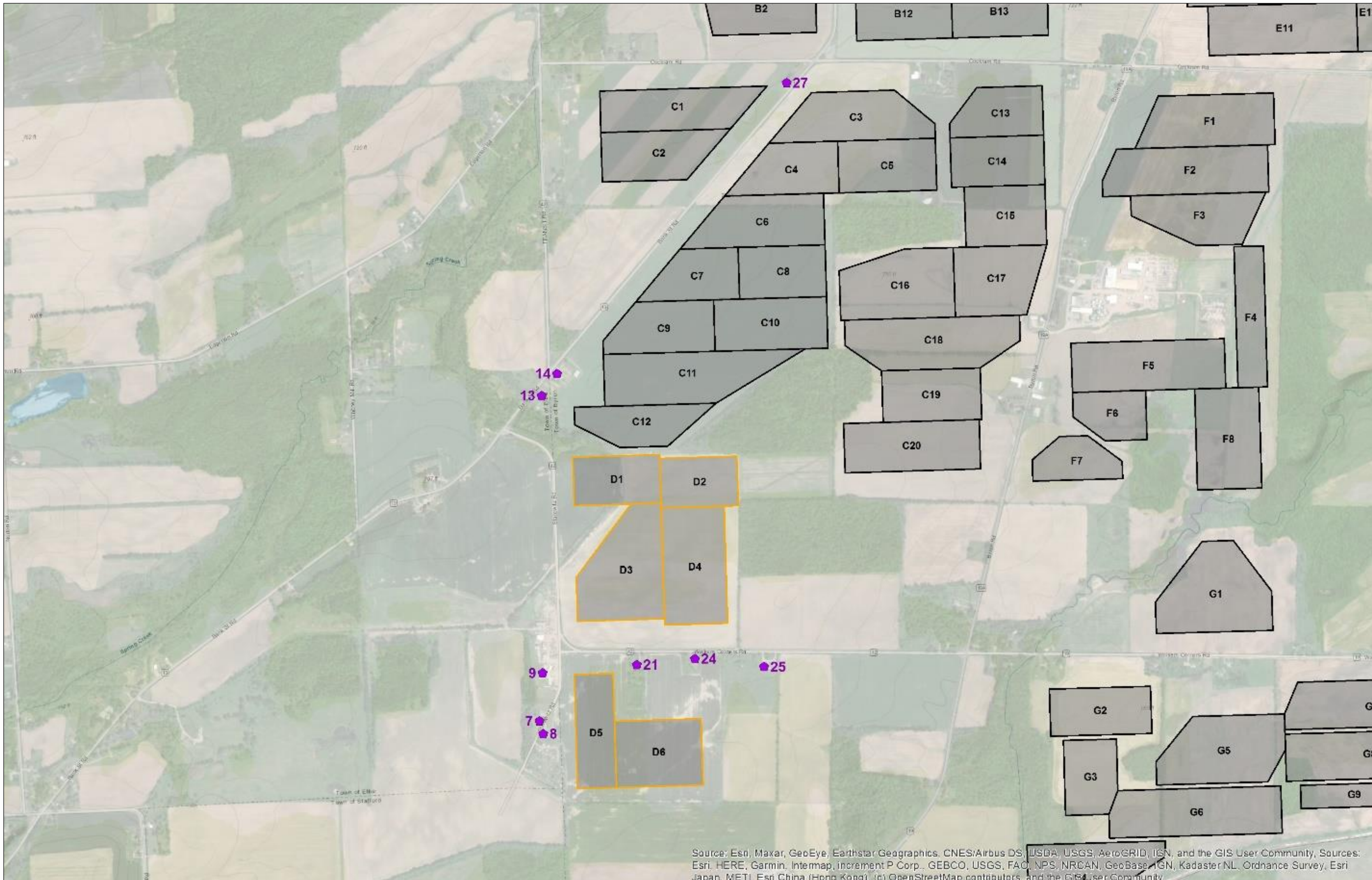

Figure 5: Array D parcels with surrounding discrete observation point receptors (purple points)

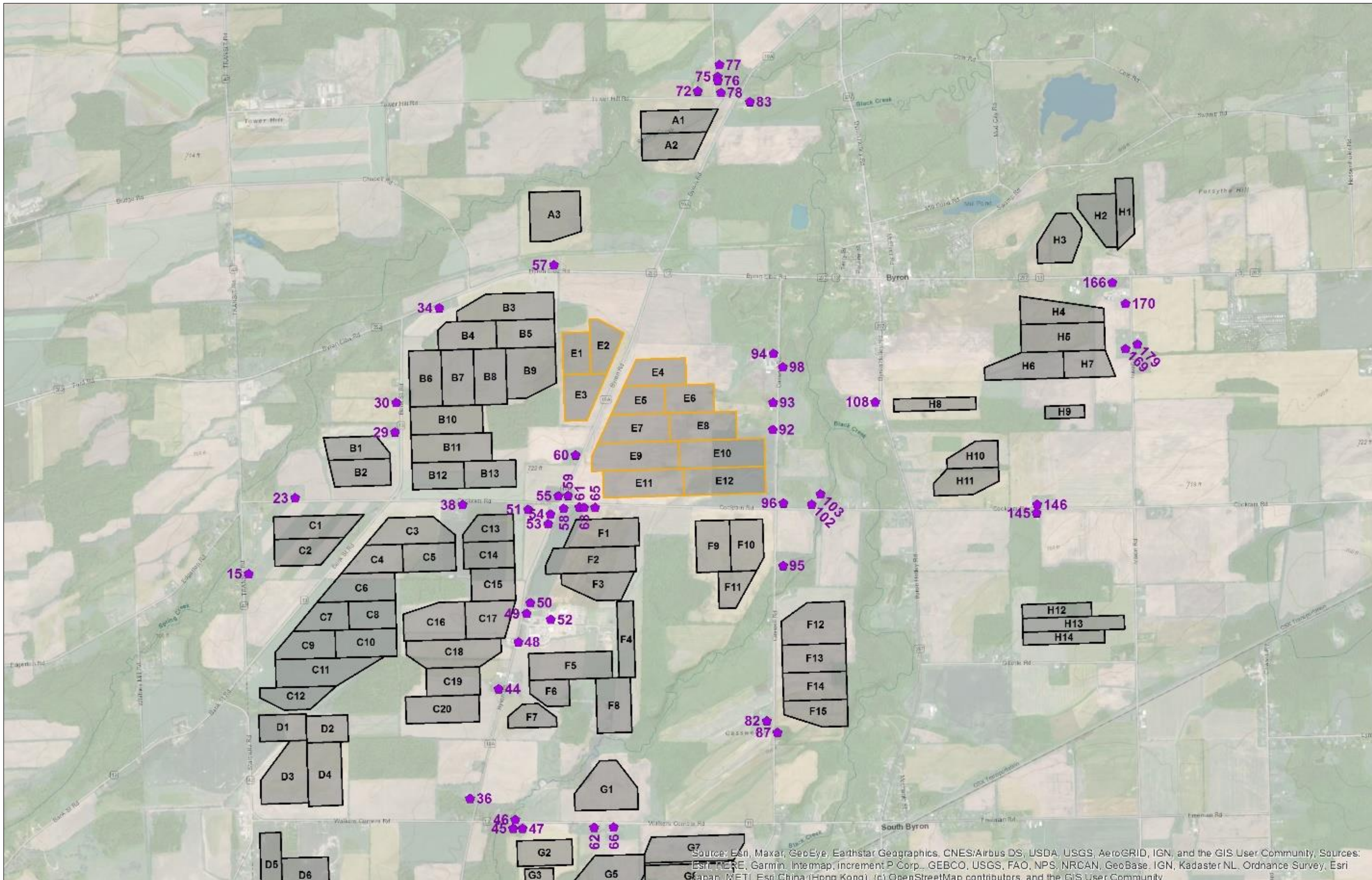

Figure 6: Array E parcels with surrounding discrete observation point receptors (purple points)

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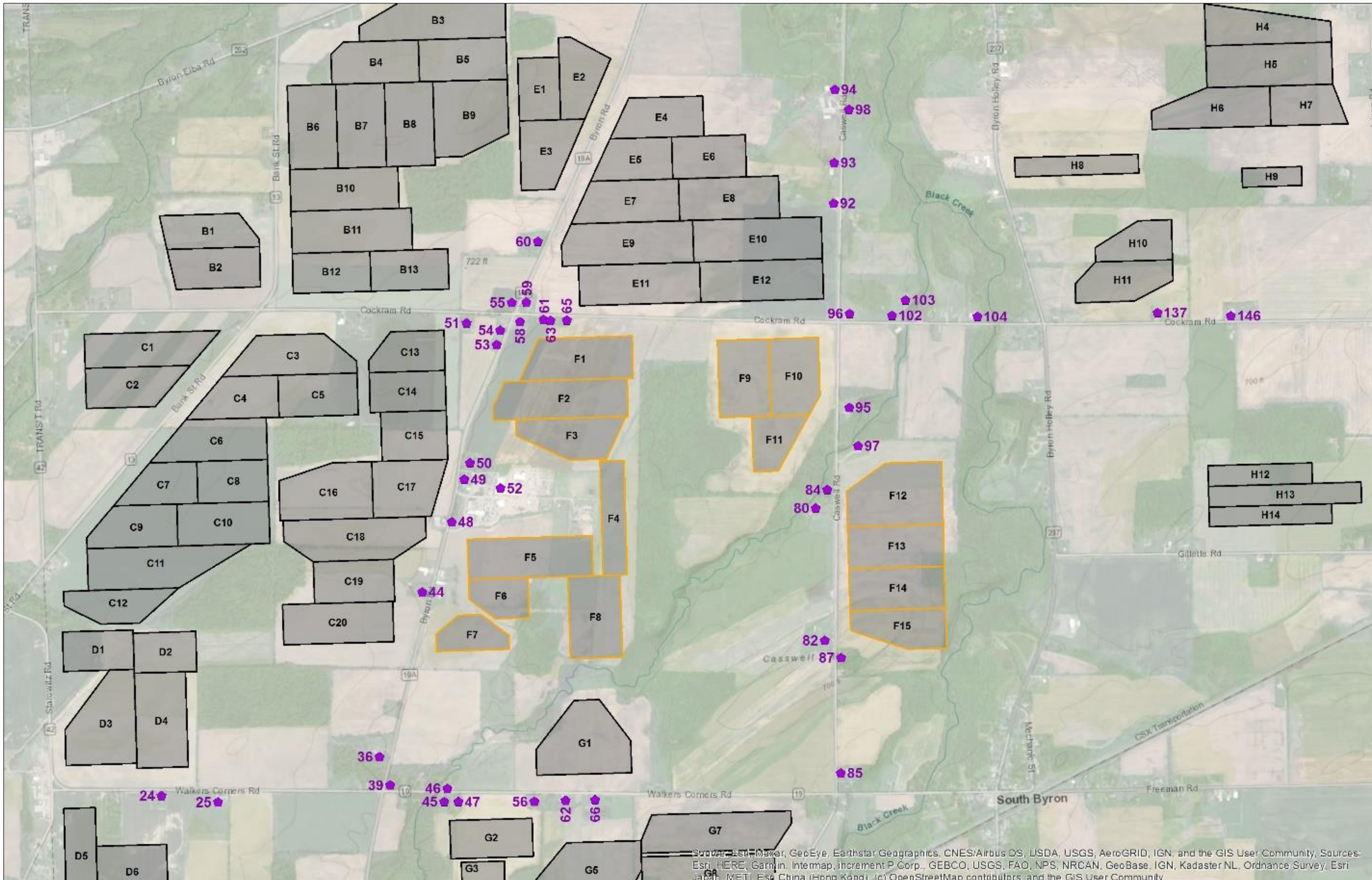

Figure 7: Array F parcels with surrounding discrete observation point receptors (purple points)

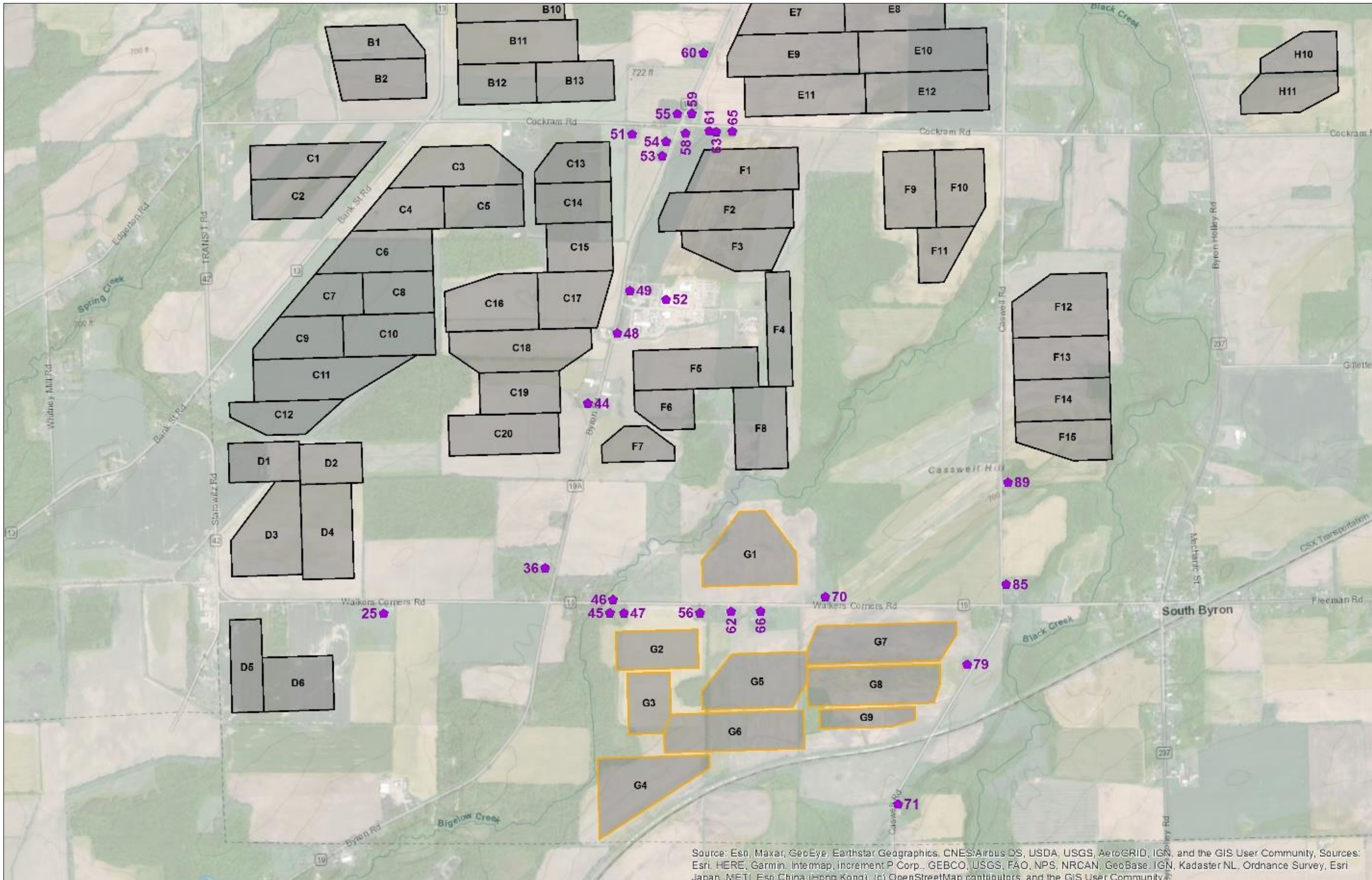

Figure 8: Array G parcels with surrounding discrete observation point receptors (purple points)

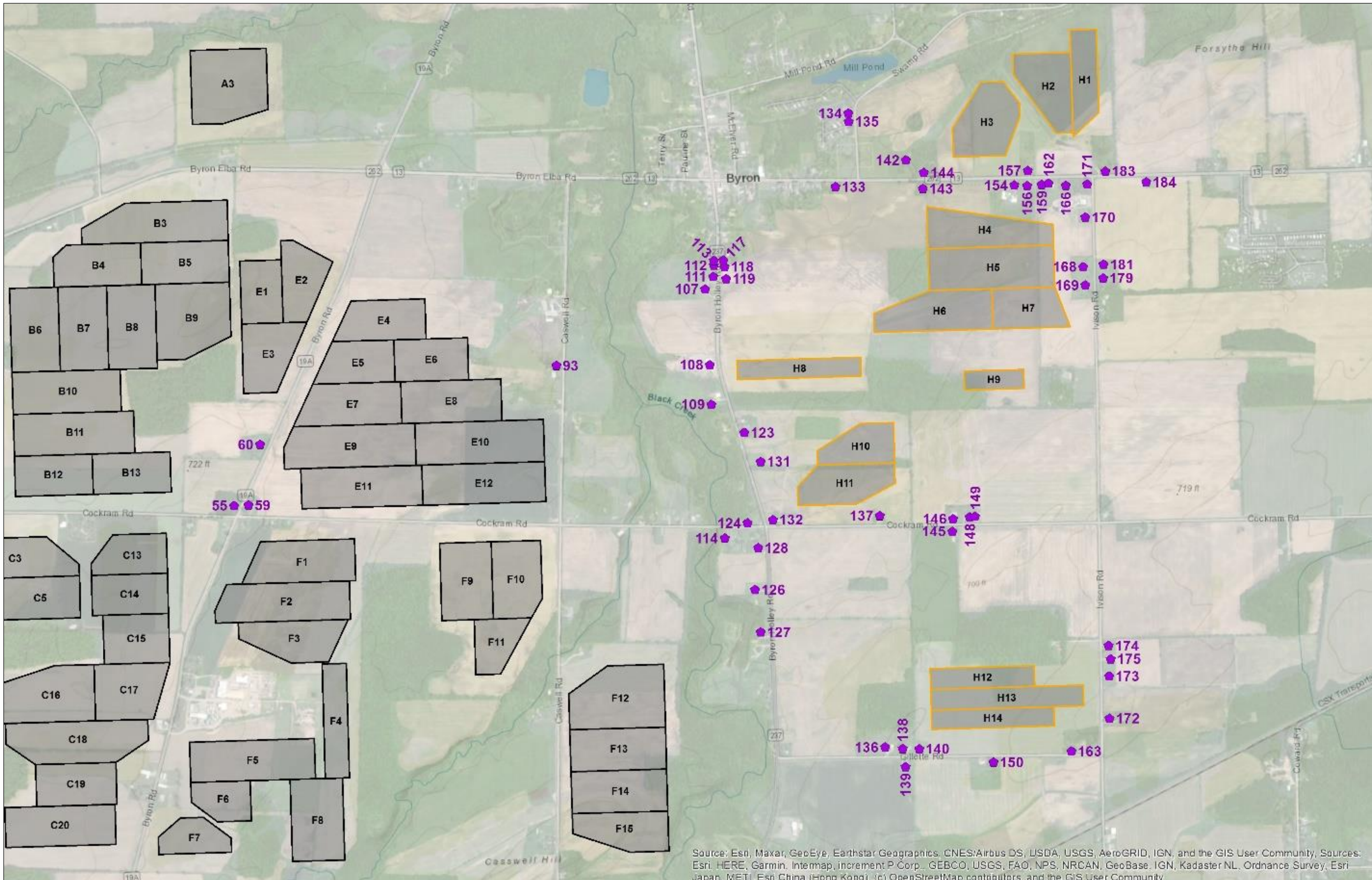

Figure ***9: Array H parcels with surrounding discrete observation point receptors (purple points)***