Thinking beyond the technology

How autonomous vehicles will change everything we know about cities

/Who are we?/

+ research team

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Founder, Principal
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Senior Planner
OHM Advisors

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Principal / Senior Planner
OHM Advisors

Urban Mobility Research Center (UMRC)

/what your day will be like/

Do any of these people sound familiar?

+ AV tech context

/young and urban/

Image source: www.investopia.com

/young and urban/

+ AV tech context

* No car needed
  * Shared mobility service
  * Huge cost savings
* Live anyplace
  * Mobility options make density even easier

/suburban families/

+ AV tech context

+ AV tech context

/*suburban families*/

* In the near term, may reduce cars per household
  * Two car to one
  * Better mobility for regular trips (work, school, etc.)
* Large potential change in development patterns

Image source: www..nbcnews.com

AV tech context

/older populations/

+ AV tech context

/older populations/

* Many living options
  * Stay in existing house
  * Location not limited by mobility choices
* Visit family and friends
  * Despite loss of vision or diminished physical mobility
* Remain active
  * Mental and physical

/today's message/

We're nearing the end of a 70-year experiment…

… with a new era about to begin:

*We need to be ready:

* There will be winners and losers
* Cities have a lots to gain
  * Must be prepared
  * Must embrace change
* Autonomous Vehicle technology is part of a global shift toward automation

/biggest impacts/

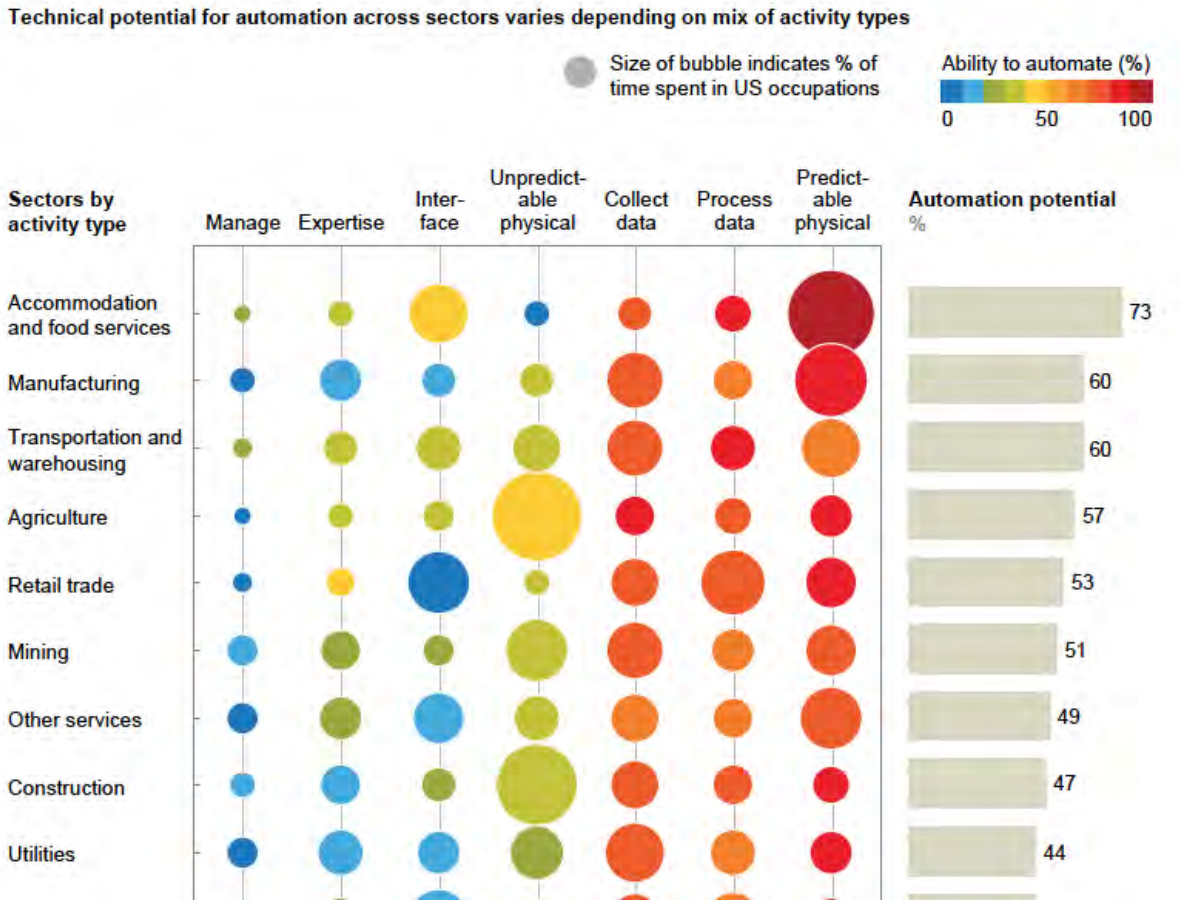
You're already in trouble if…

You have lots (pun intended) of retail

Image credit: www.strongtowns.org

* Typical "suburban-style" design
  * Over-parked
  * Large surface lots
  * Big Boxes and strip malls
* High quantity of per capita retail
* Sectors most sensitive to on-line sales competition

Job base with high automation factor



Source: McKinsey Global Institute

McKinsey Data: https://public.tableau.com/profile/mckinsey.analytics#!/vizhome/AutomationandUSjobs/Technicalpotentialforautomation
McKinsey Article: http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/where-machines-could-replace-humans-and-where-they-cant-yet

Un-adaptable public investments

Image source: http://www.meetusincolumbus.com

No worthy destinations or "sense of place"

* Ease of access less vital
  * Many legacy businesses to become obsolete
* Highway visibility far less important for many uses
* Wanting to be at a destination will be more vital than all other factors

/current trends/

What is going on now?

+ AV tech context

/safety/

* 2014 – 32,675 deaths (US)
* 2015 – 38,300 deaths (US)
* 2016 – 40,000+ deaths (US

* 94%+ caused by human error

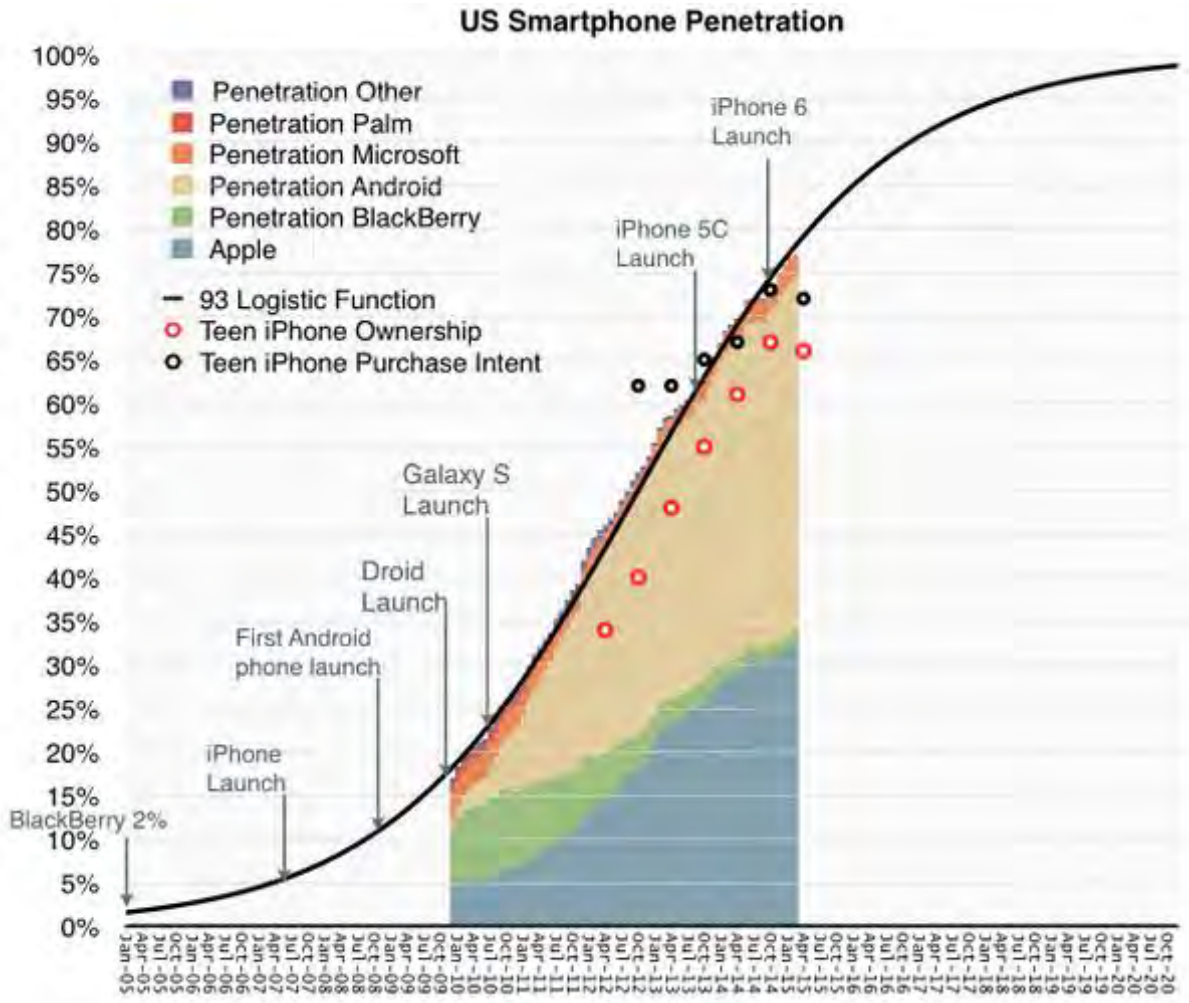
/safety/

+ AV tech context

* Driving is not the priority anymore…

/real-world implementation/

* Where have we seen this before?
  * Smartphone adoptions rates in US



Source: http://www.asymco.com

AV tech context

/real-world implementation/

/real-world implementation/

* Computing speed upgrades:
  * Intel chip 2014
    * 37.5m transistors per square mm
  * Intel chip 2017
    * 100m transistors per square mm

    Source: Intel Senior Fellow Mark Bohr interview comments
  * Will dramatically shrink the "brain" for AV

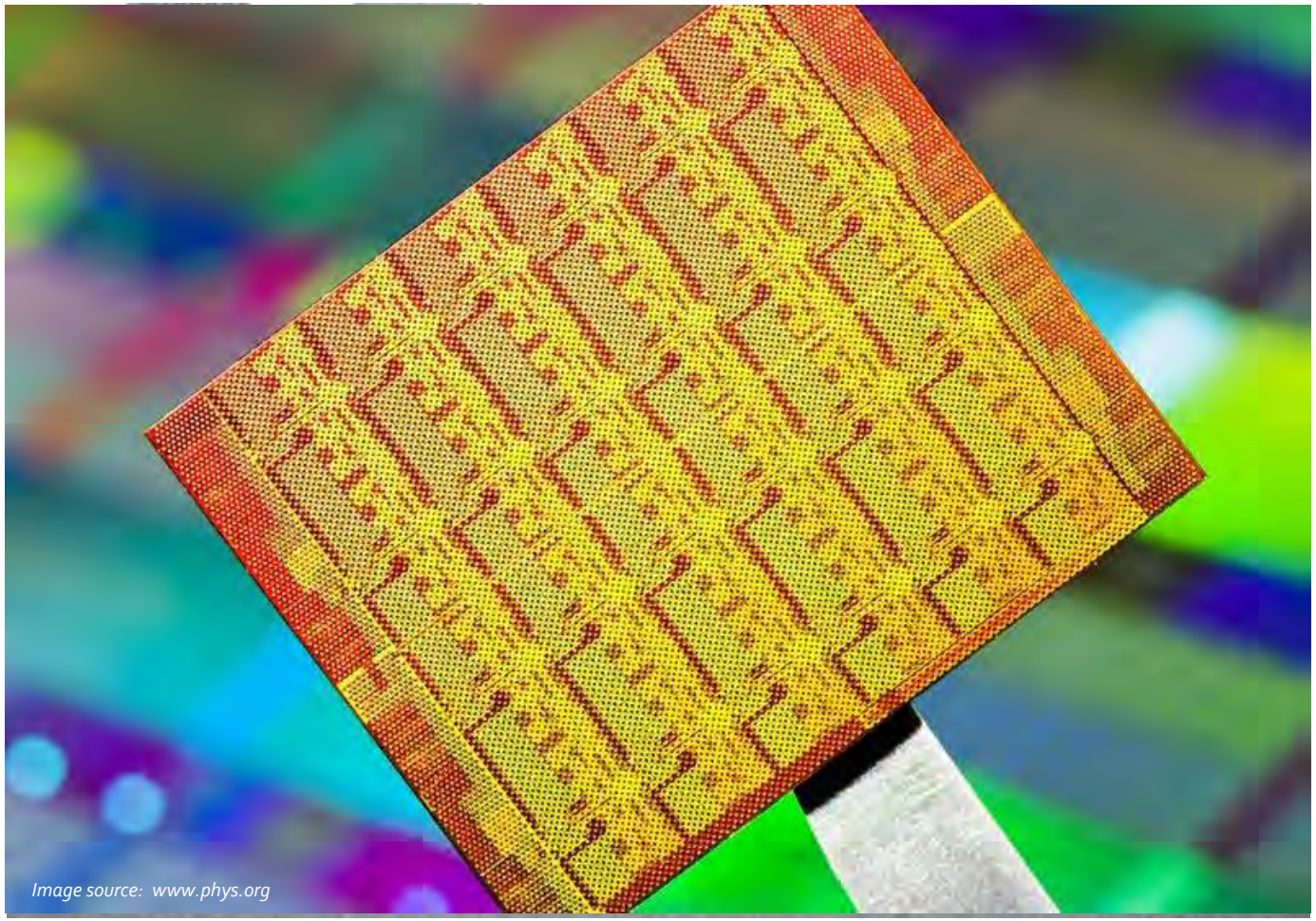


Image source: www.phys.org

/LEVEL 5 – full autonomy/

Video – View at link below:

https://www.tesla.com/videos/autopilot-self-driving-hardware-neighborhood-long

/how it's all gonna change/

Fundamental impacts for land use, development, infrastructure and life as we know it.

/planning refresher/

What is the size of a parking space?

9x18, 10x20

+/- 200 s.f.

/planning refresher/

How many parking spaces can you get per acre of land?

+/- 100 spaces

/planning refresher/

How many parking spaces would be needed for 1,000 square feet of retail?

3-4 spaces

-or- 1,740 square feet

/planning refresher/

How many square feet in an acre?

43,560 square feet

/planning refresher/

Given one acre of land, how much retail can be developed?

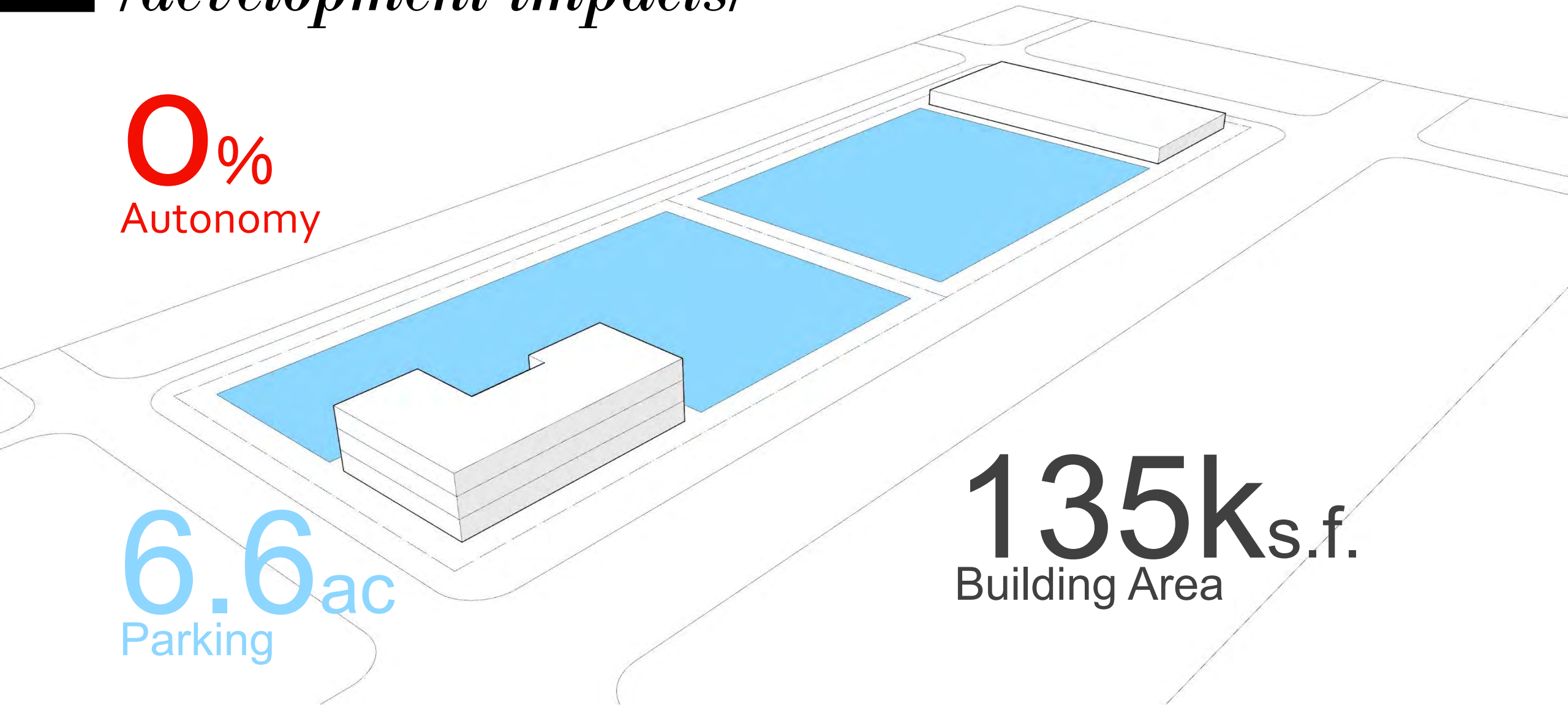
10,000 square feet

What does this mean?

Parking is THE #1 constraint for development in almost any context.

/development impacts/

+ 14 ac. site area



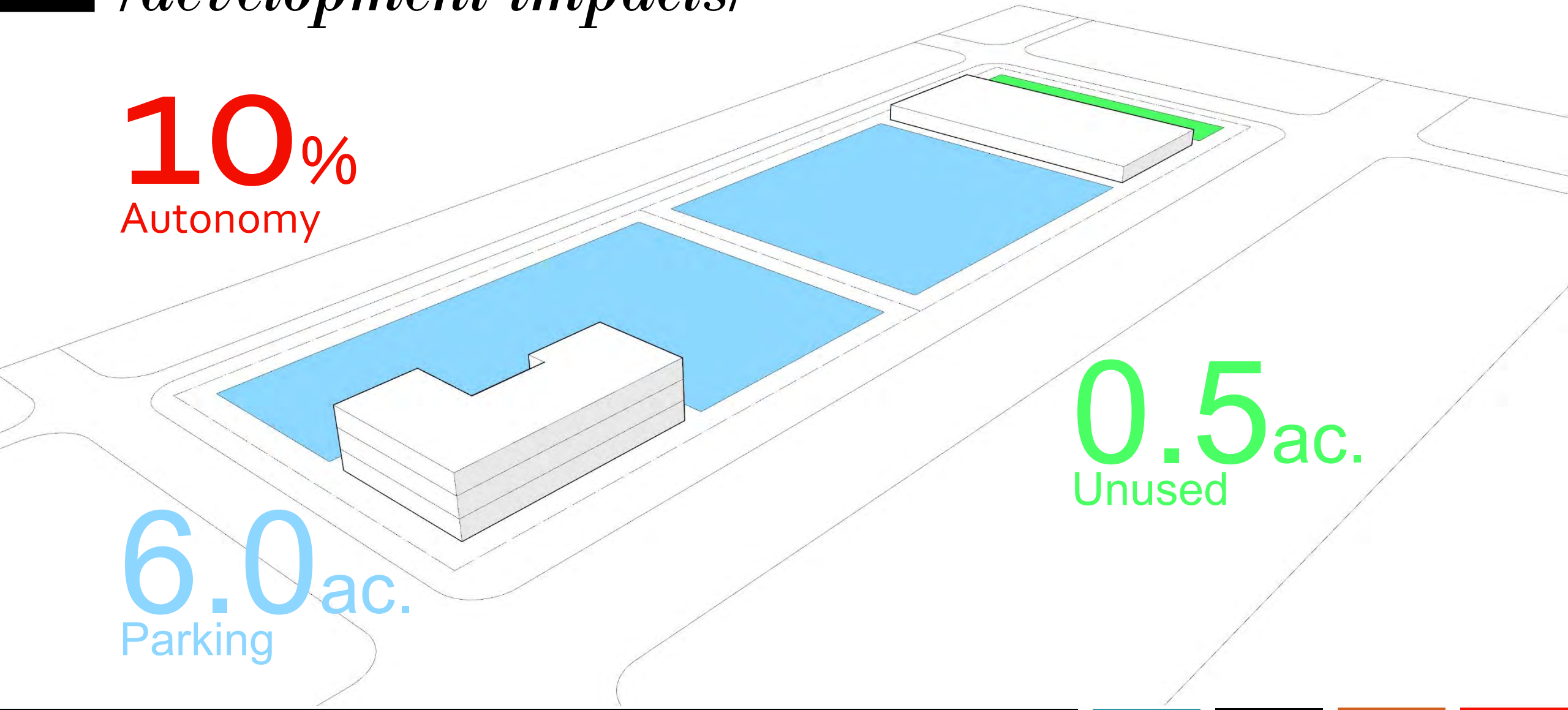
0%
Autonomy

6.6ac
Parking

135ks.f.
Building Area

/development impacts/

+ 14 ac. site area



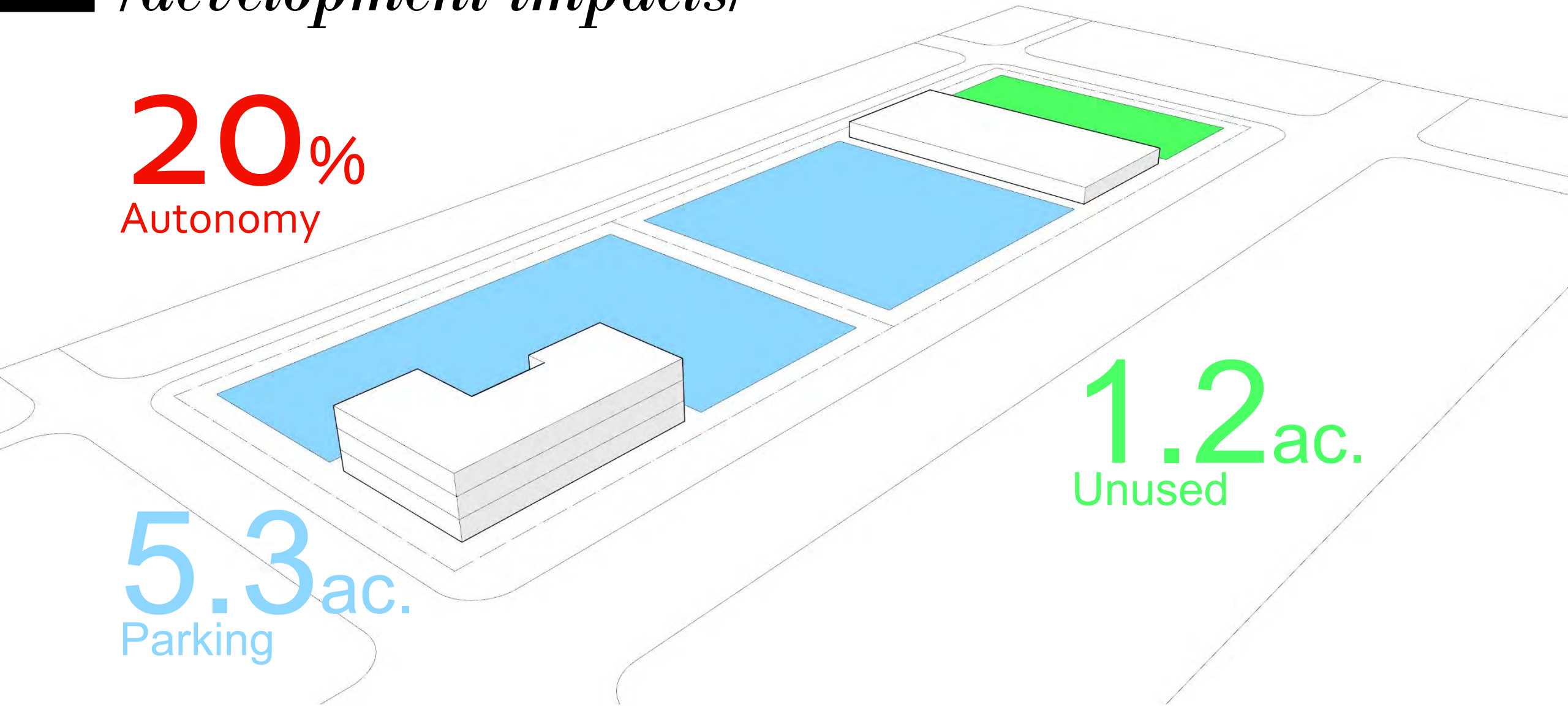
10%
Autonomy

0.5ac.
Unused

6.0ac.
Parking

/development impacts/

+ 14 ac. site area



20%
Autonomy

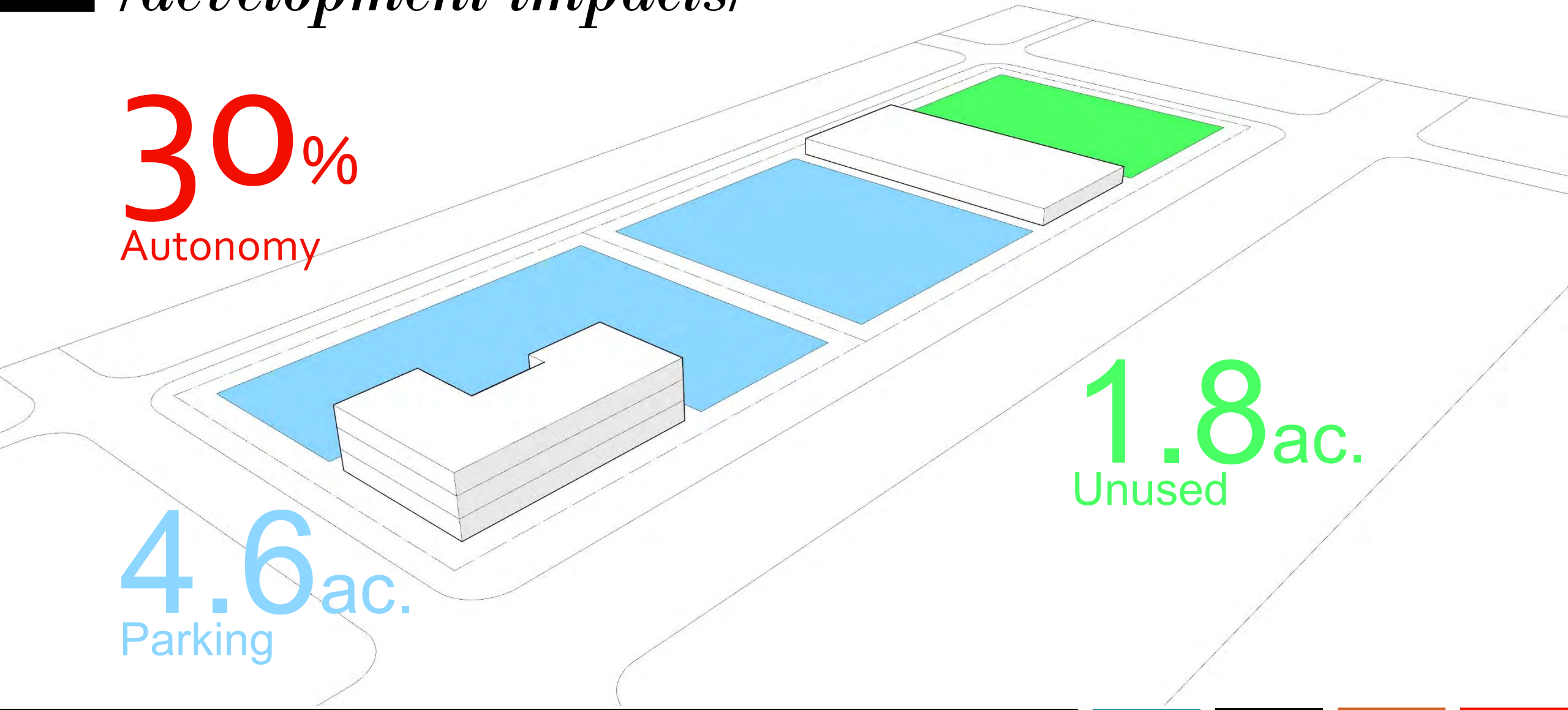
1.2ac.
Unused

5.3ac.
Parking

/development impacts/

+ 14 ac. site area

30%
Autonomy

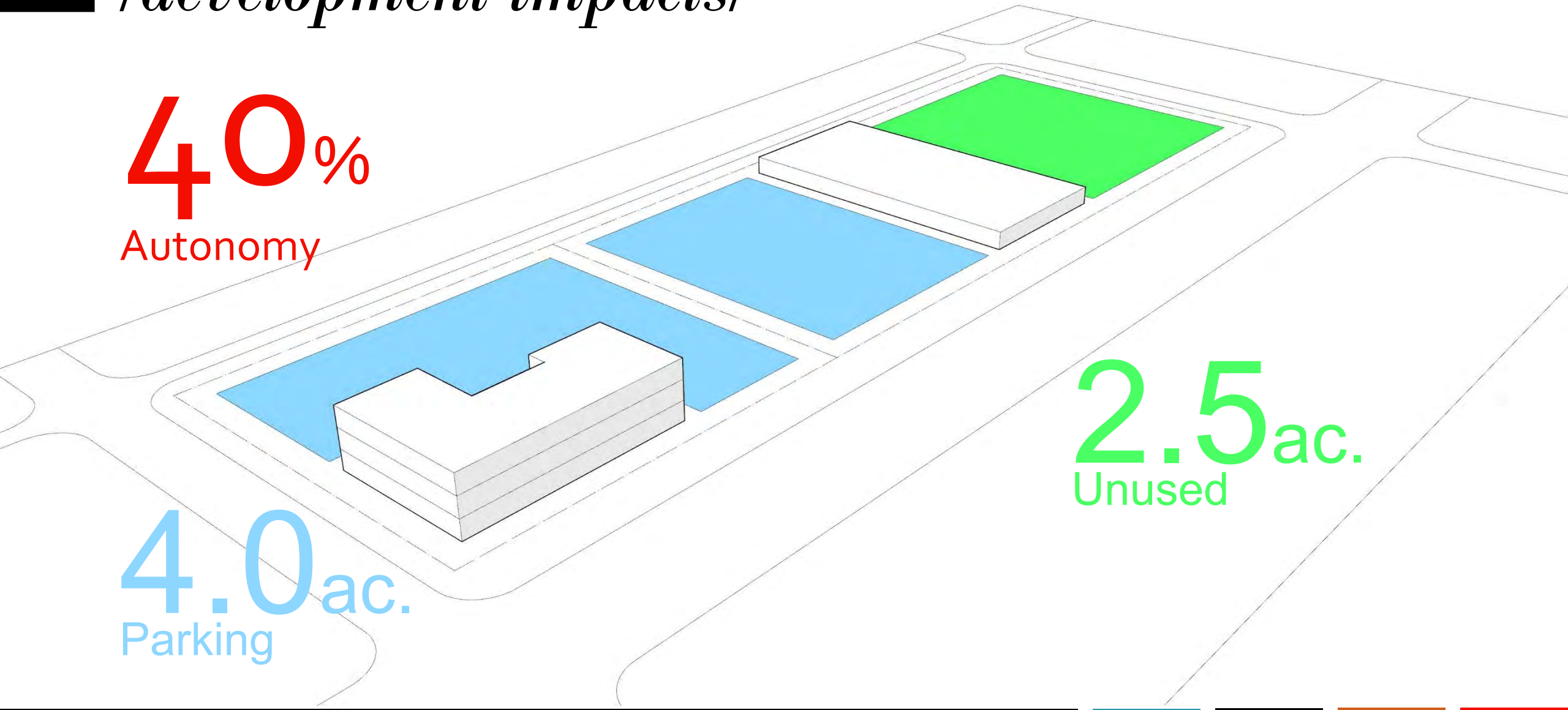


1.8ac.
Unused

4.6ac.
Parking

/development impacts/

+ 14 ac. site area



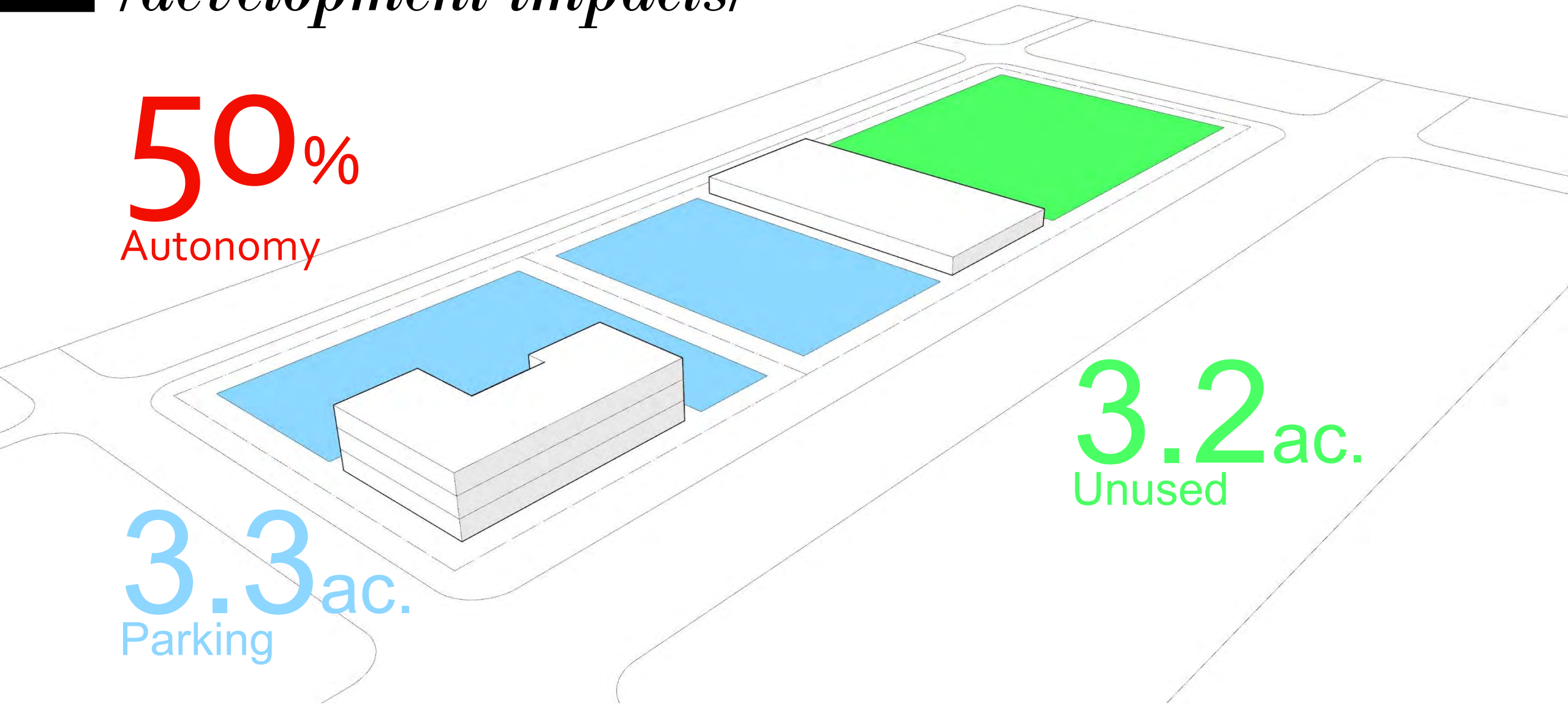
40%
Autonomy

2.5ac.
Unused

4.0ac.
Parking

/development impacts/

+ 14 ac. site area



50%
Autonomy

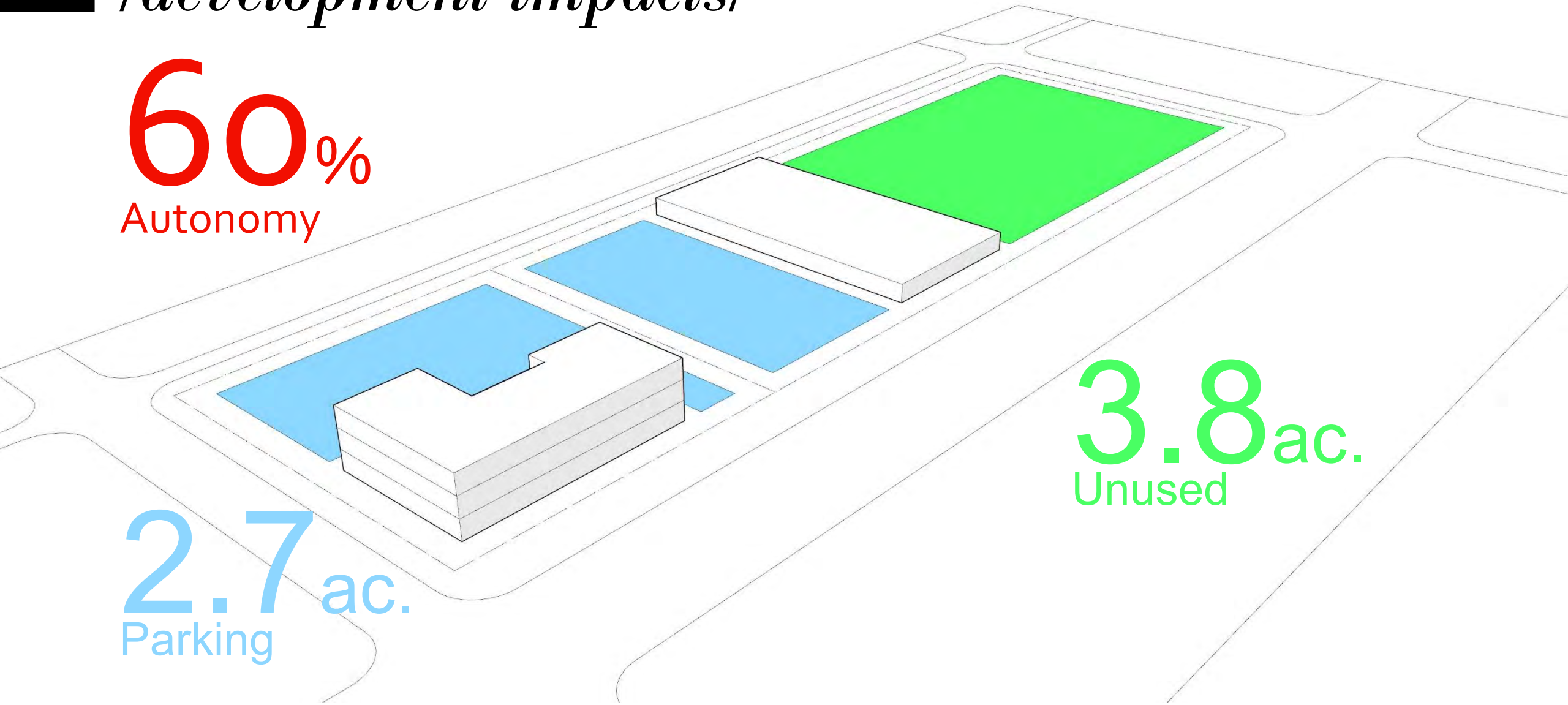
3.2ac.
Unused

3.3ac.
Parking

/development impacts/

+ 14 ac. site area

60%
Autonomy



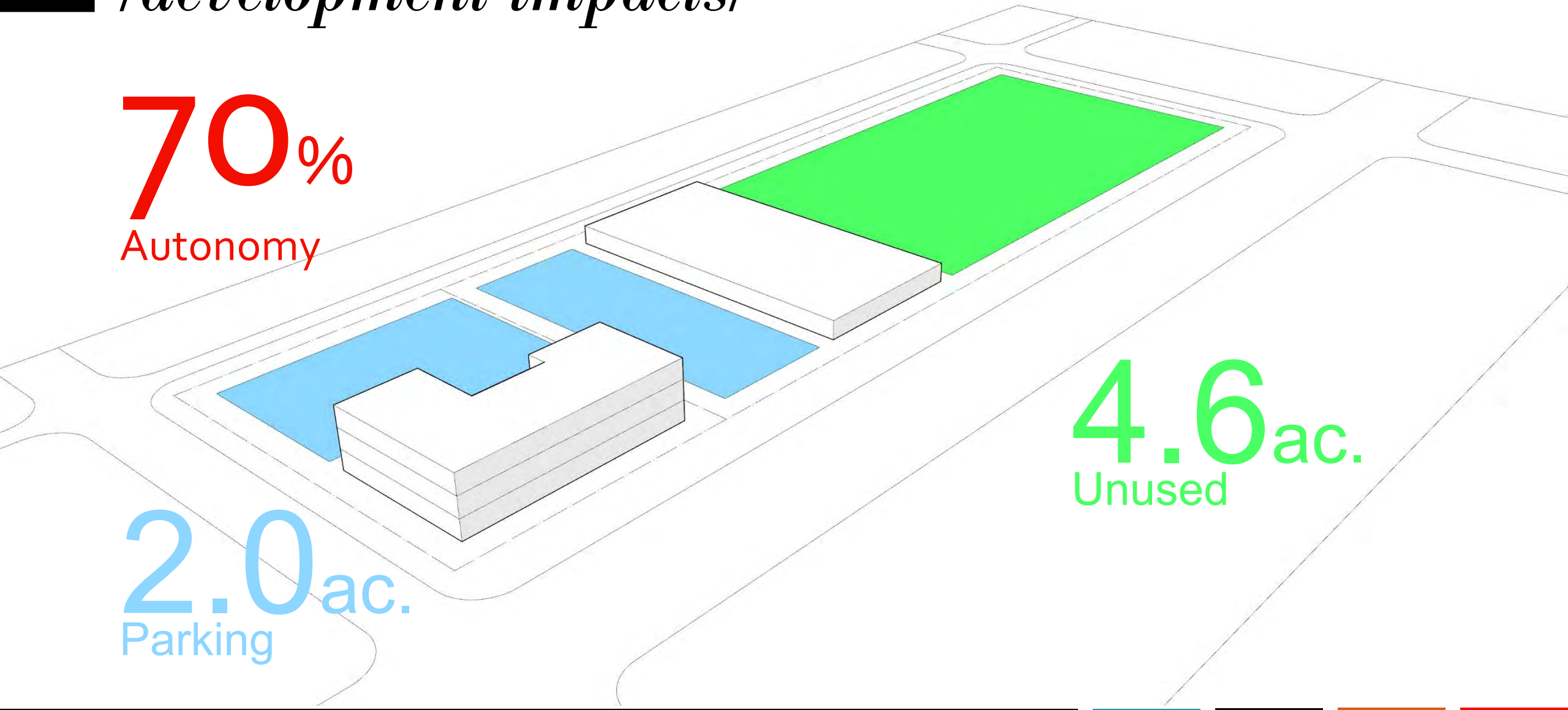
3.8ac.
Unused

2.7 ac.
Parking

/development impacts/

+ 14 ac. site area

70%
Autonomy



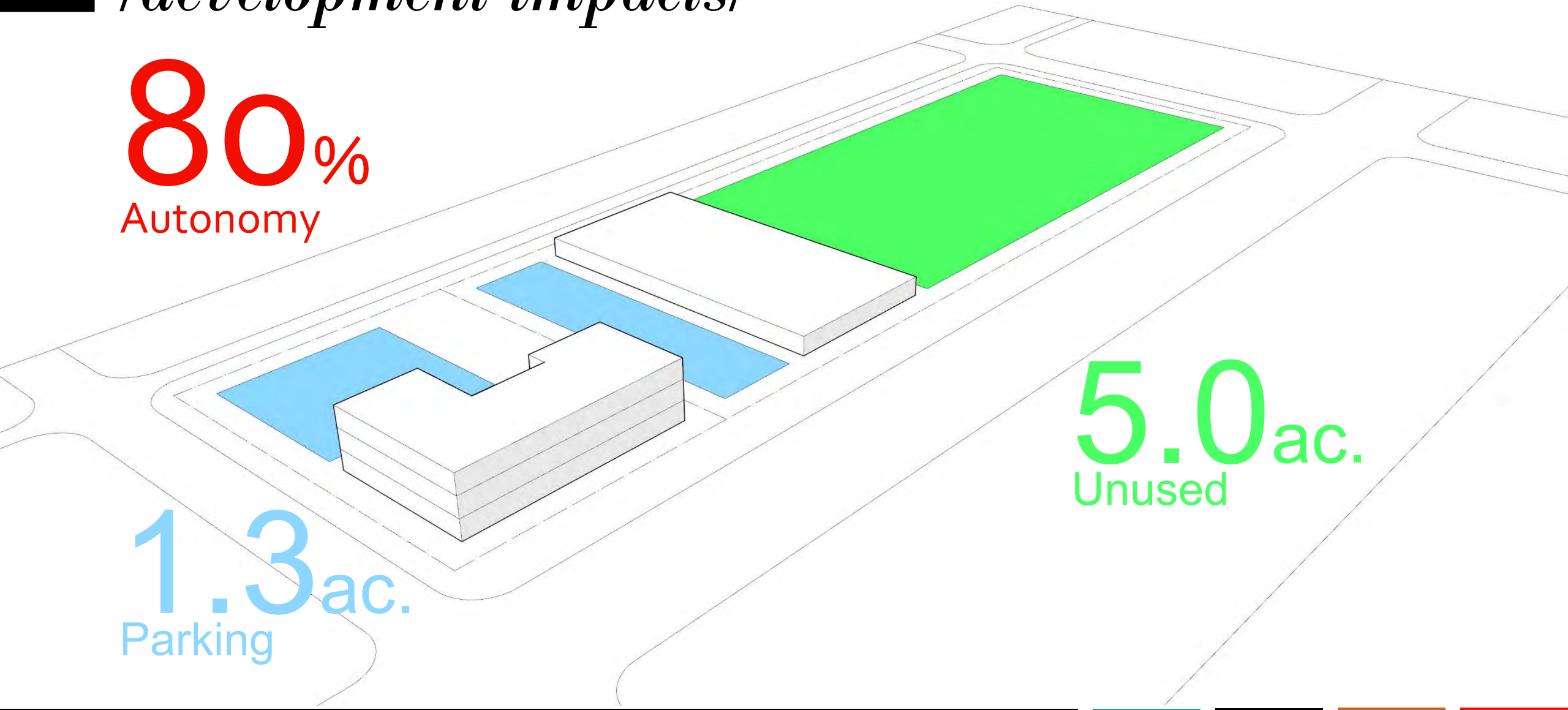
4.6ac.
Unused

2.0ac.
Parking

/development impacts/

+ 14 ac. site area

80%
Autonomy

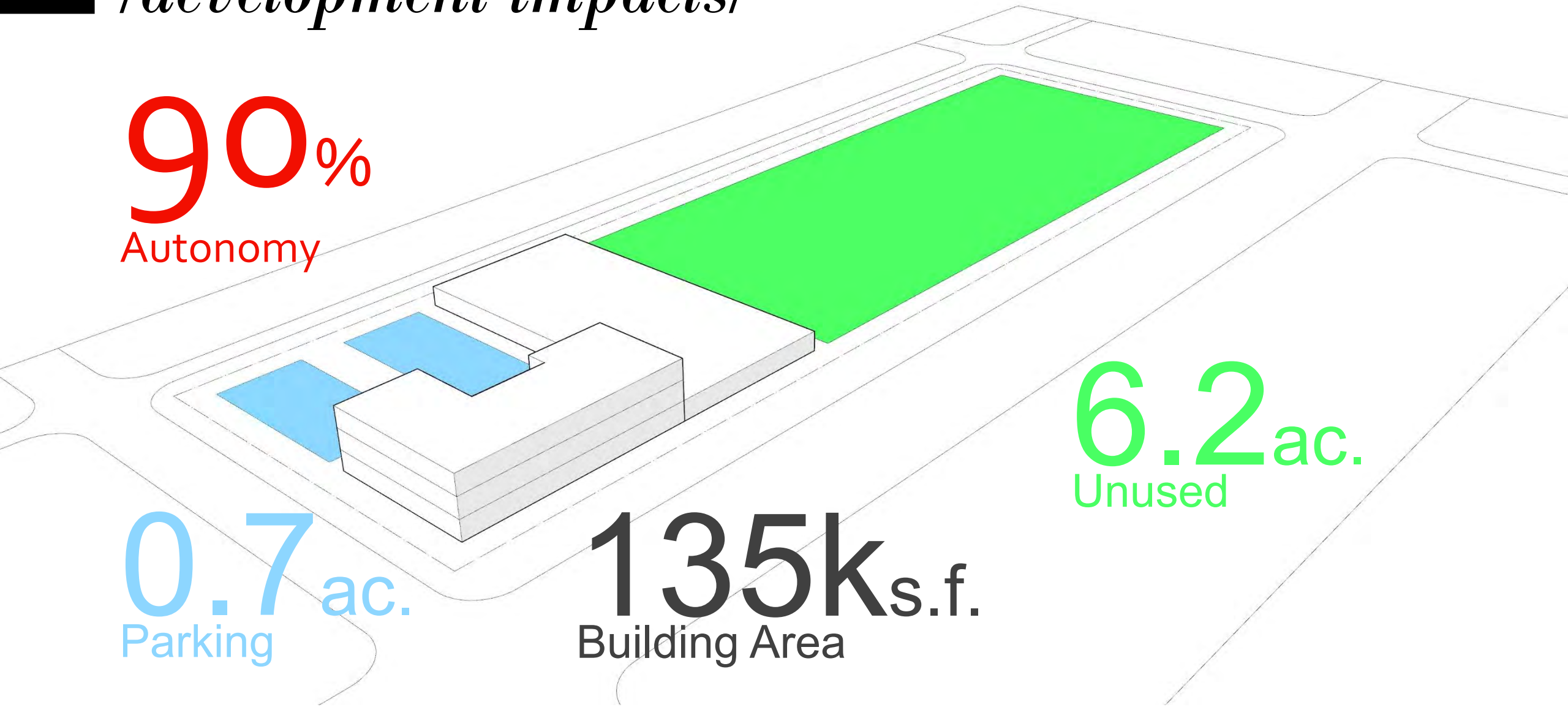


5.0ac.
Unused

1.3ac.
Parking

/development impacts/

+ 14 ac. site area



90%
Autonomy

6.2ac.
Unused

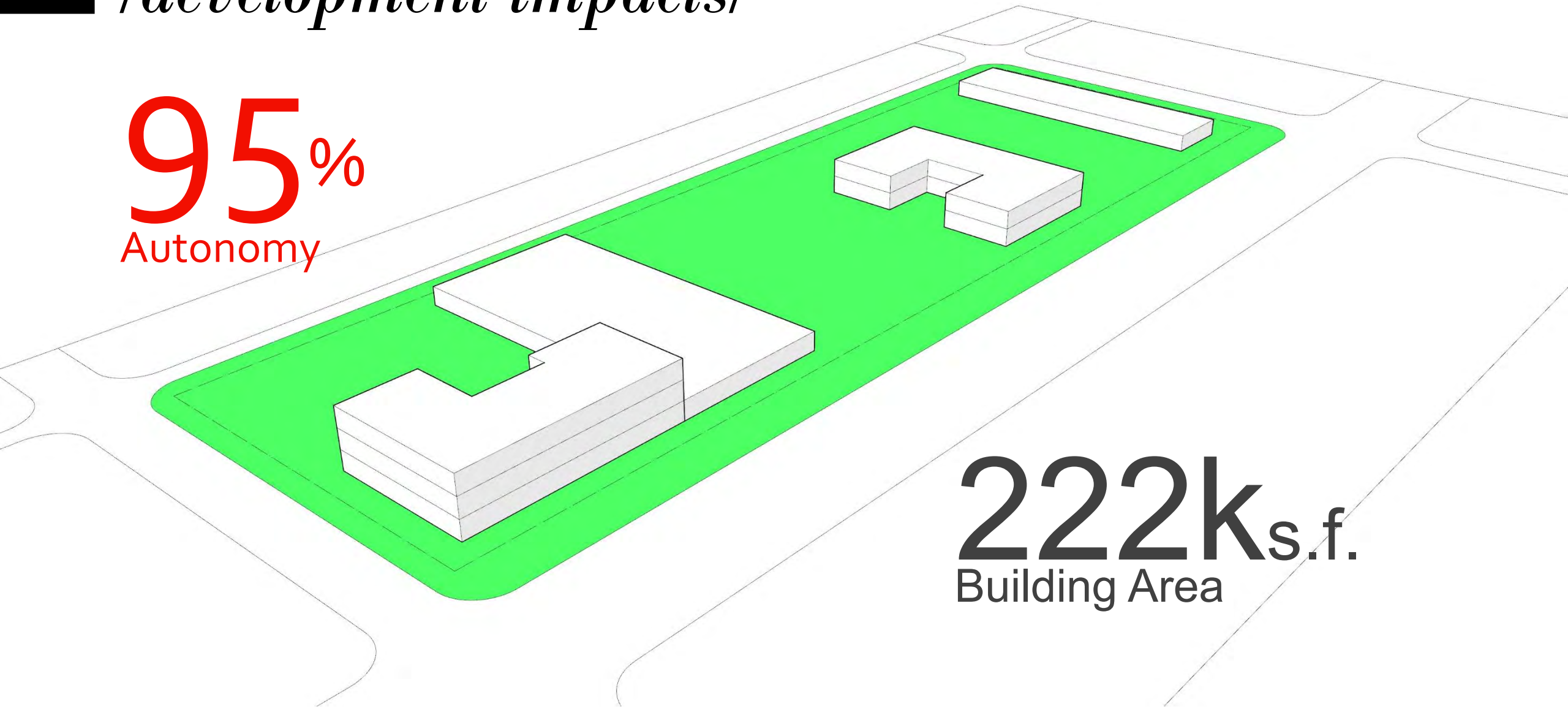
0.7 ac.
Parking

135ks.f.
Building Area

/development impacts/

+ 14 ac. site area

95%
Autonomy

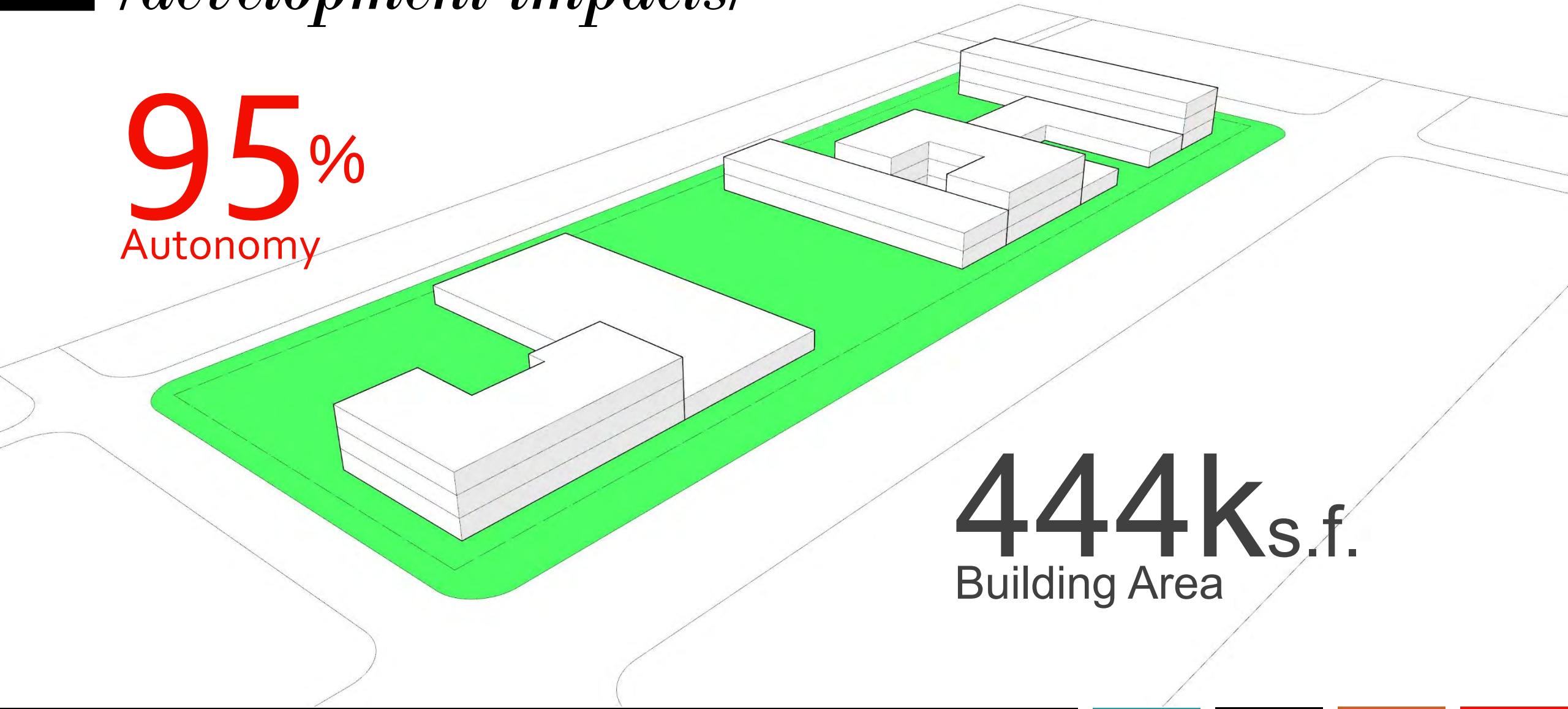


222k s.f.
Building Area

/development impacts/

+ 14 ac. site area

95%
Autonomy

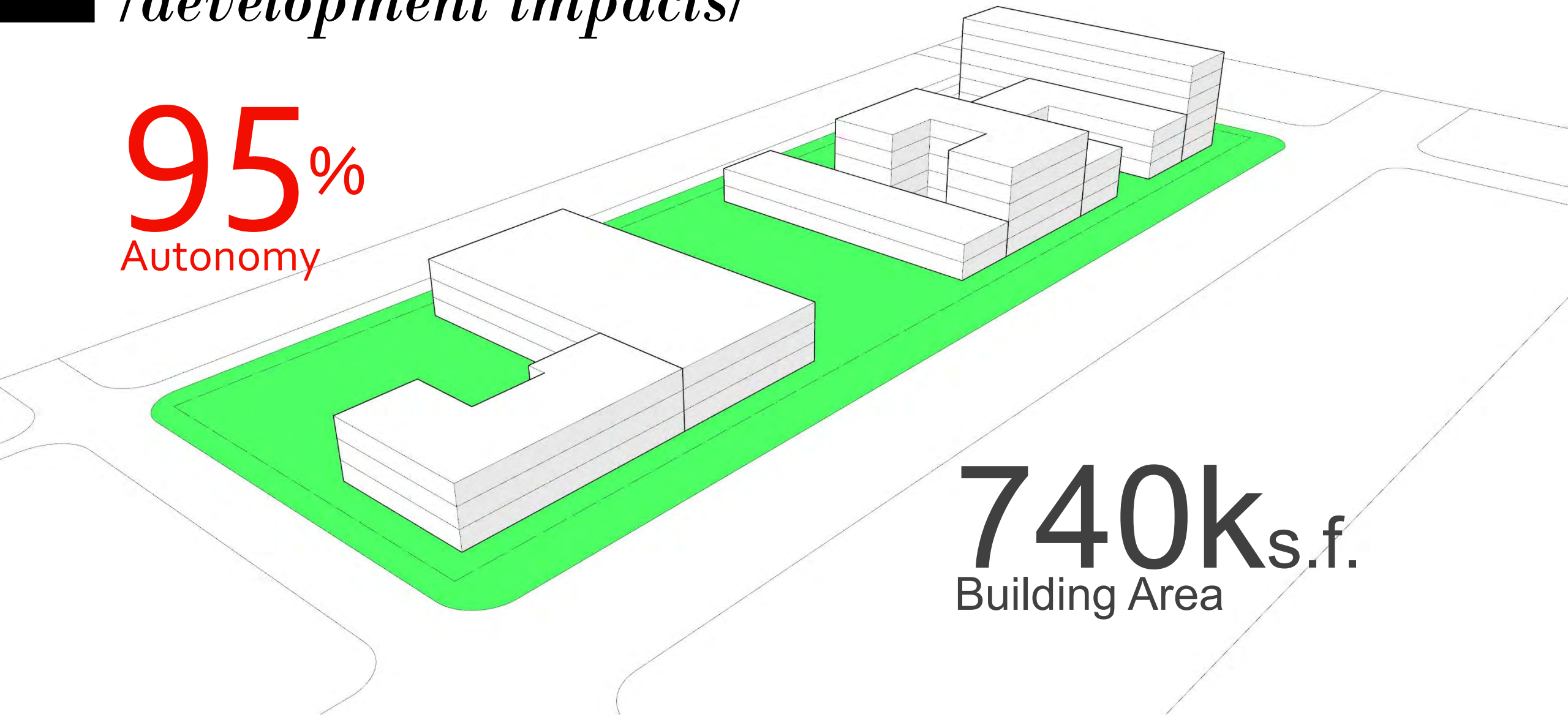


444k s.f.
Building Area

/development impacts/

+ 14 ac. site area

95%
Autonomy

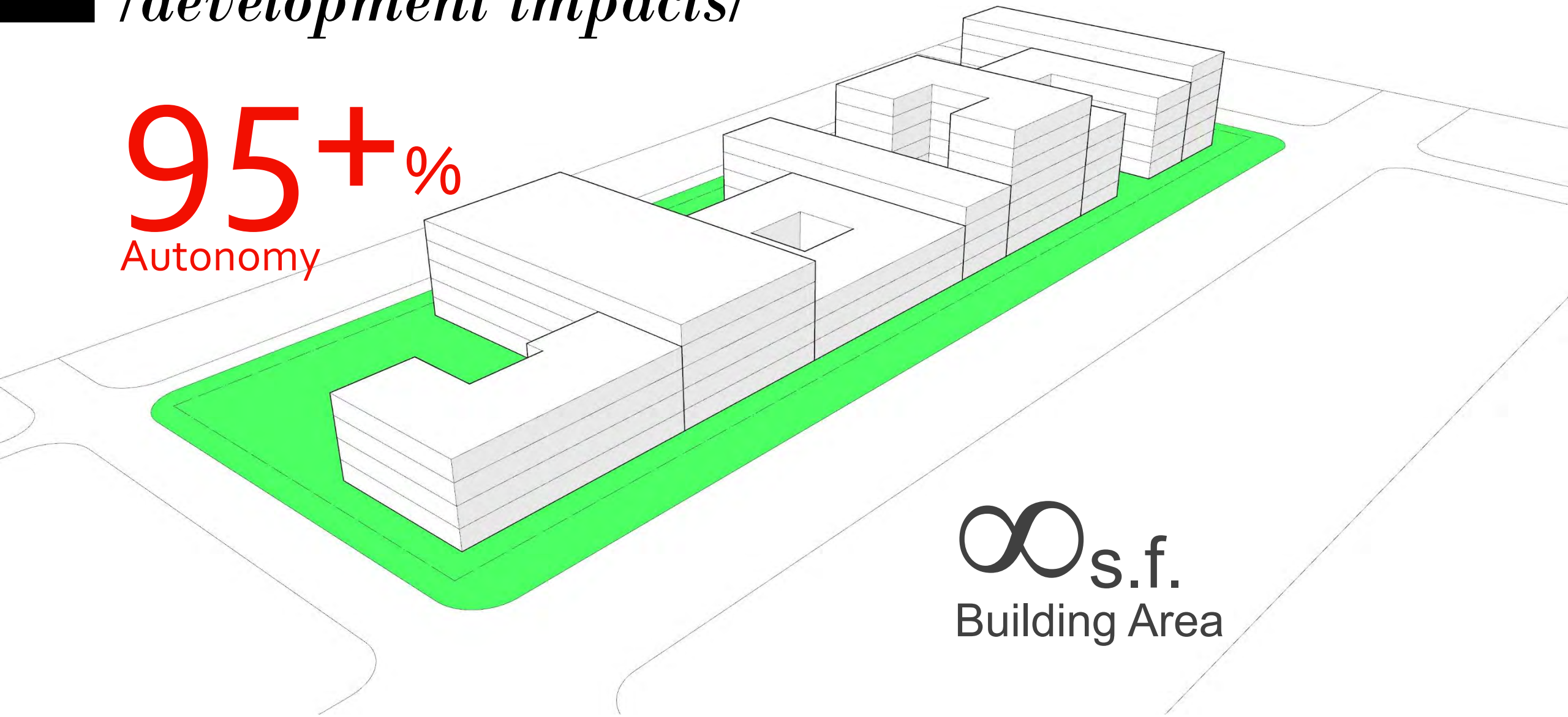


740k s.f.
Building Area

/development impacts/

14 ac. site area

95+%
Autonomy



∞ s.f.
Building Area

/development impacts/

350 acres

Uses:

* Office
* Residential
* Hotel
* Restaurant
* Theater

+ case study

/development impacts/

350 acres

Uses:

* Office
* Residential
* Hotel
* Restaurant
* Theater

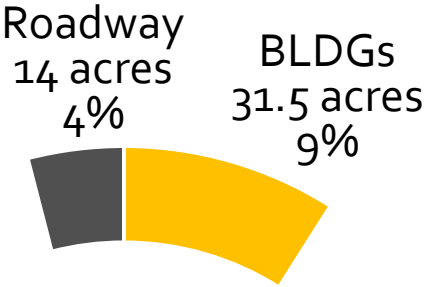
+ case study

/development impacts/

Roadway
14 acres
4%

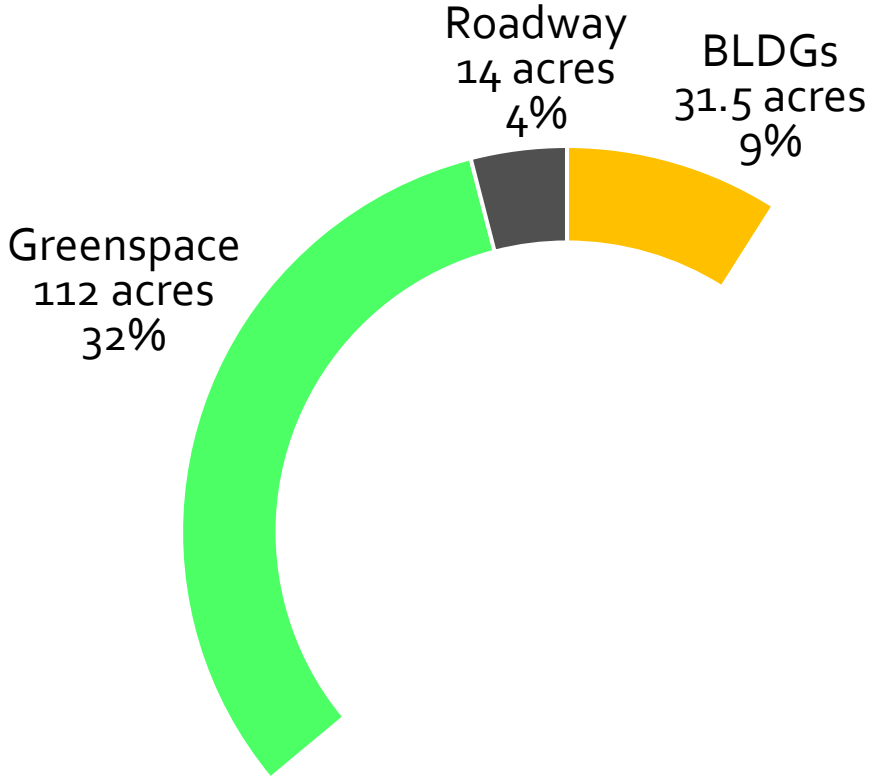
+ case study

/development impacts/



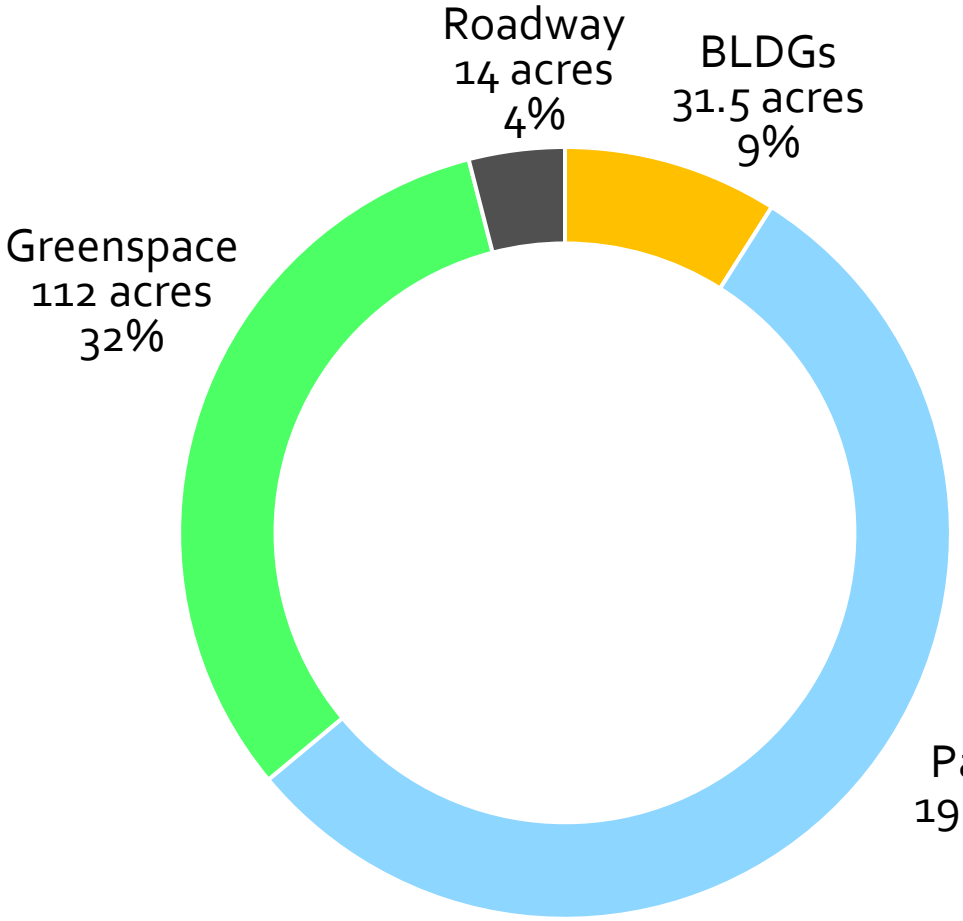
+ case study

/development impacts/



+ case study

/development impacts/

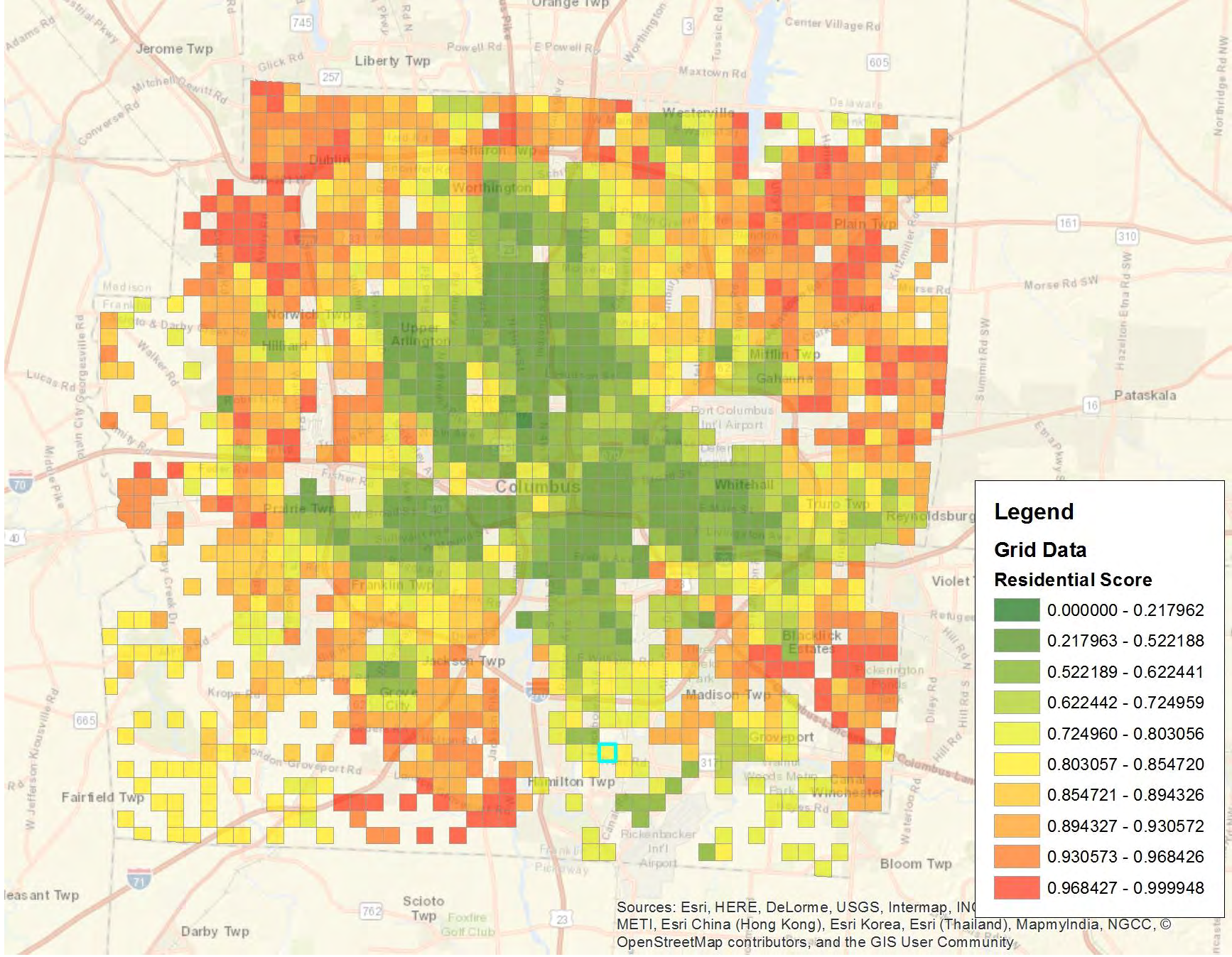


+ case study

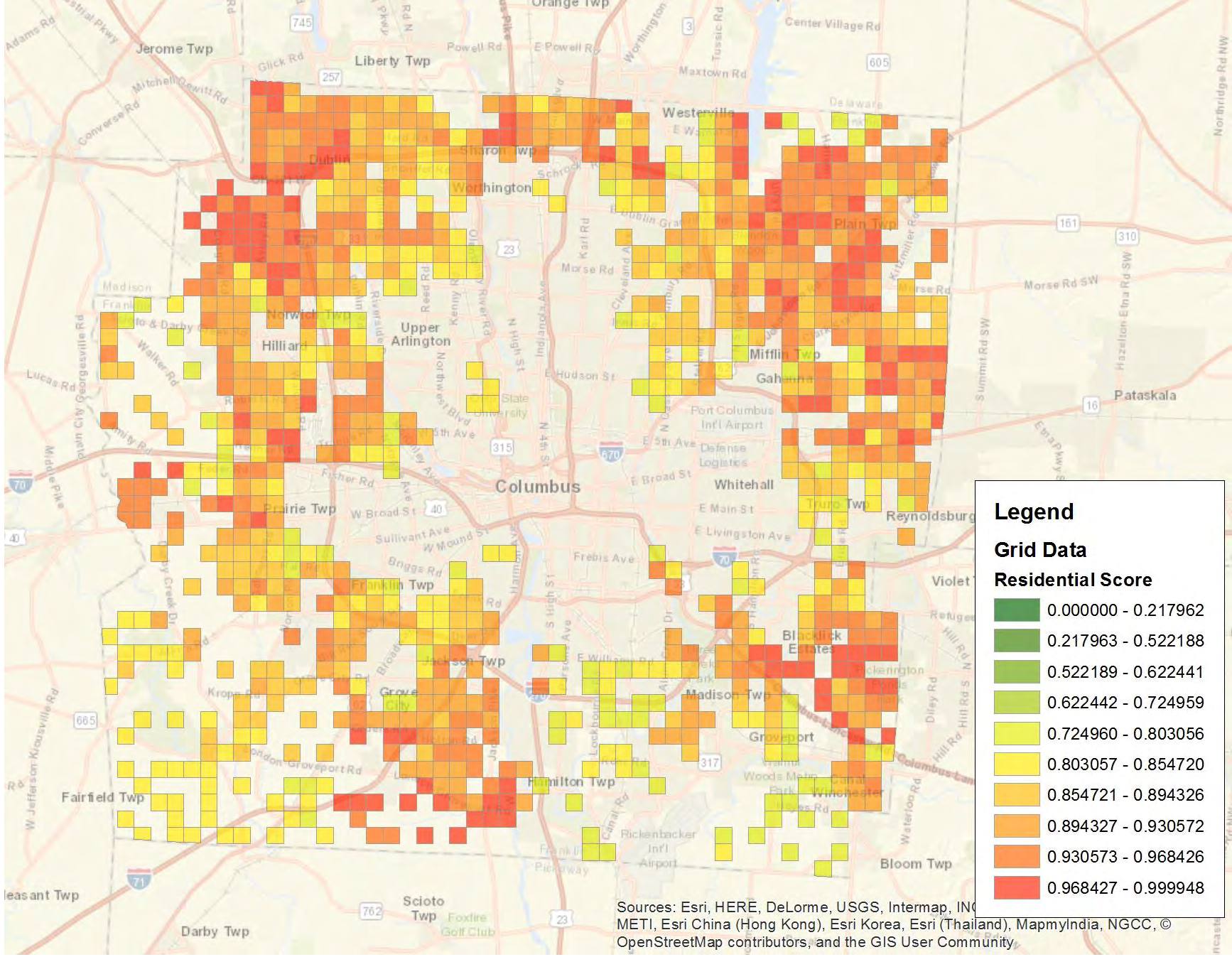
/case studies/

Locational characteristics that drive change

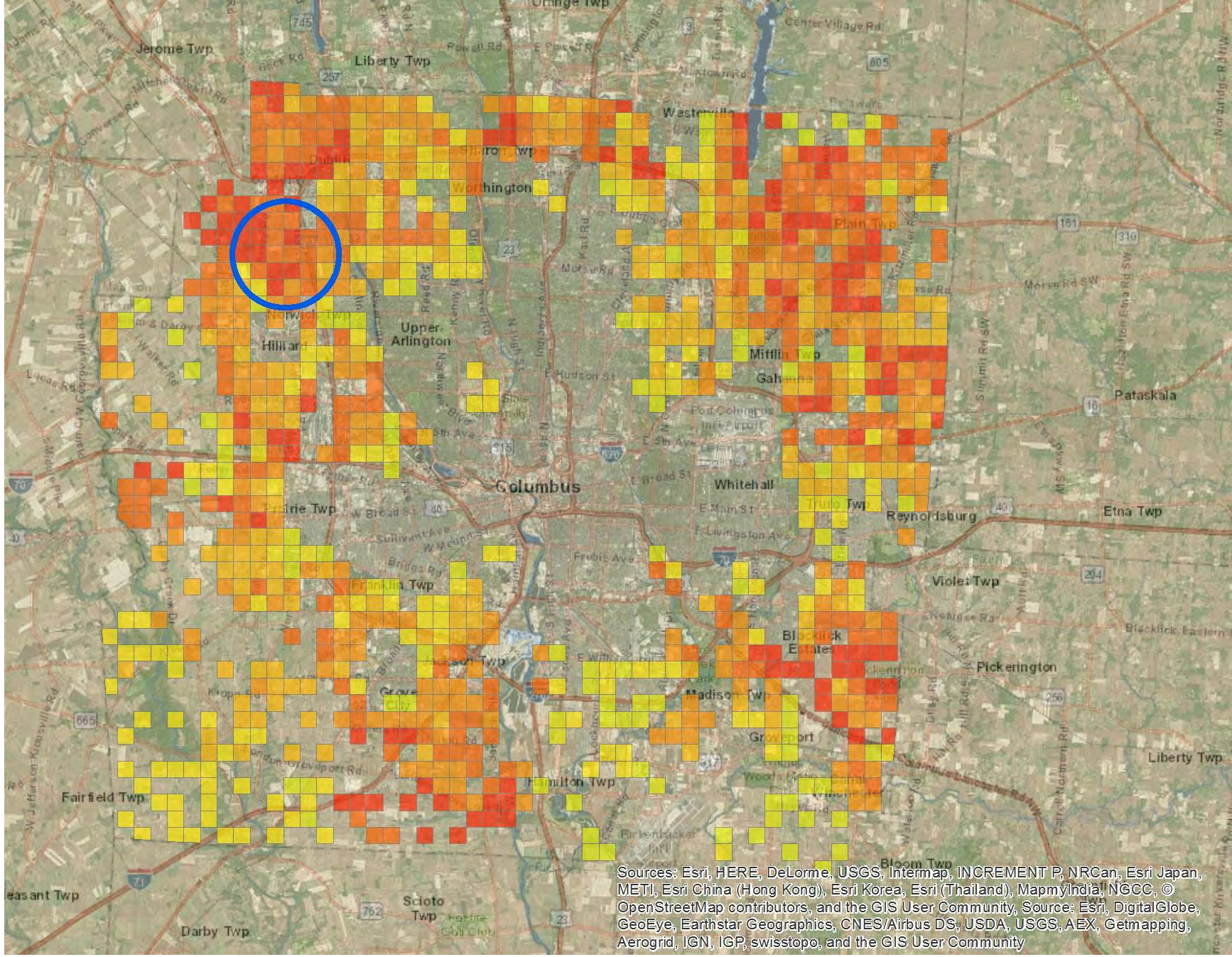
* Franklin County, OH
  * Residential vulnerability



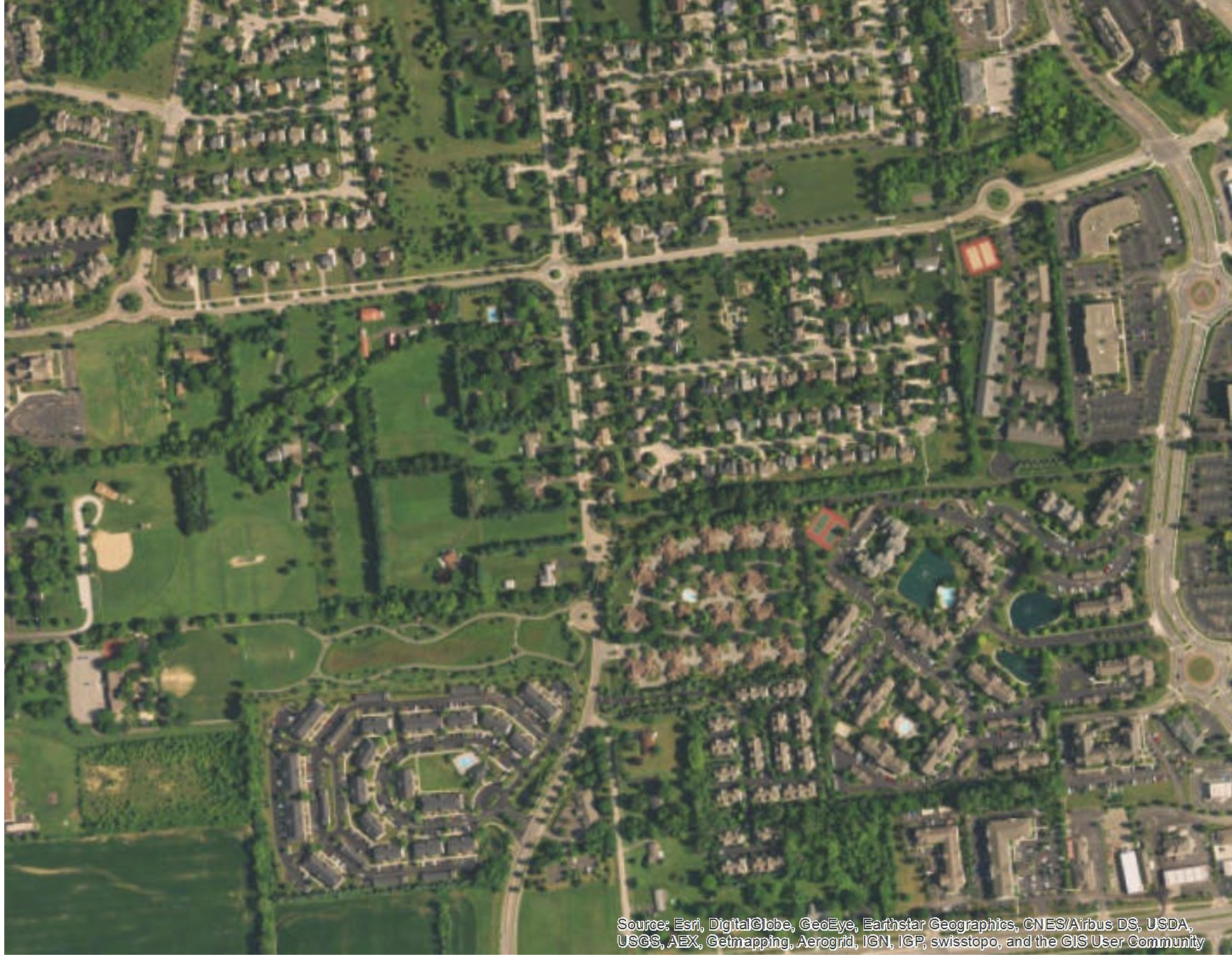
* Franklin County, OH
  * Residential most vulnerable



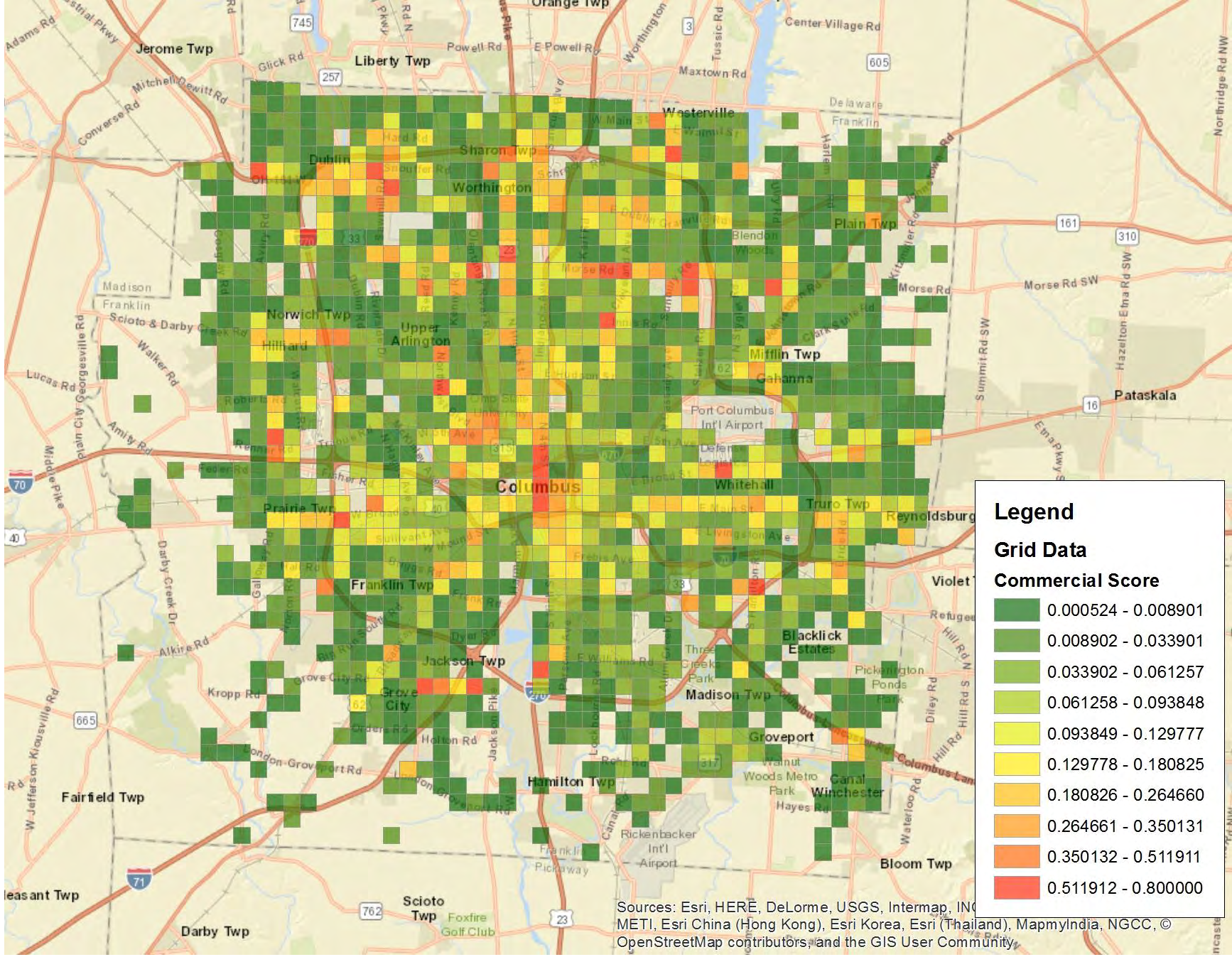
* Franklin County, OH
    * Example area



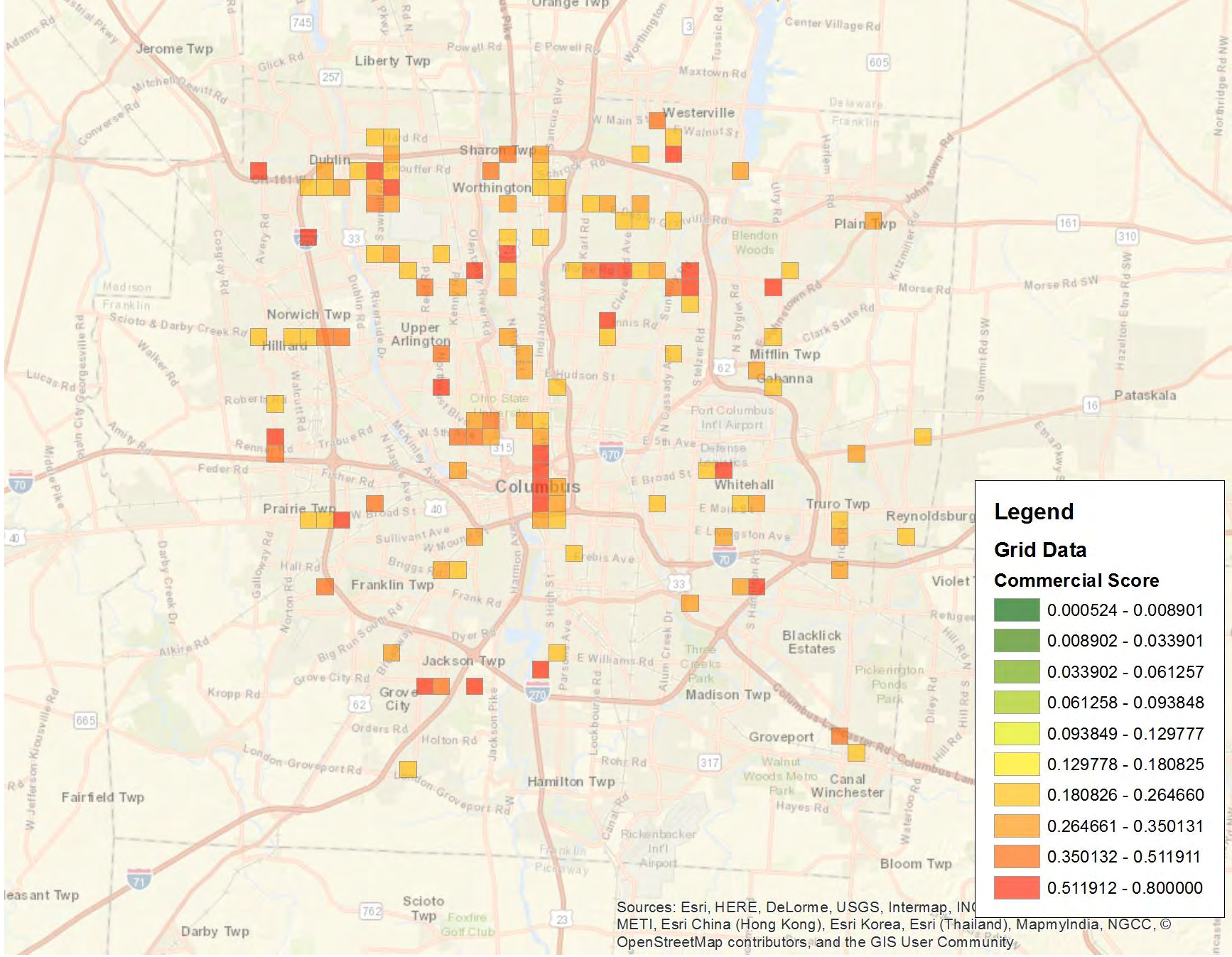
* Franklin County, OH
    * Example area



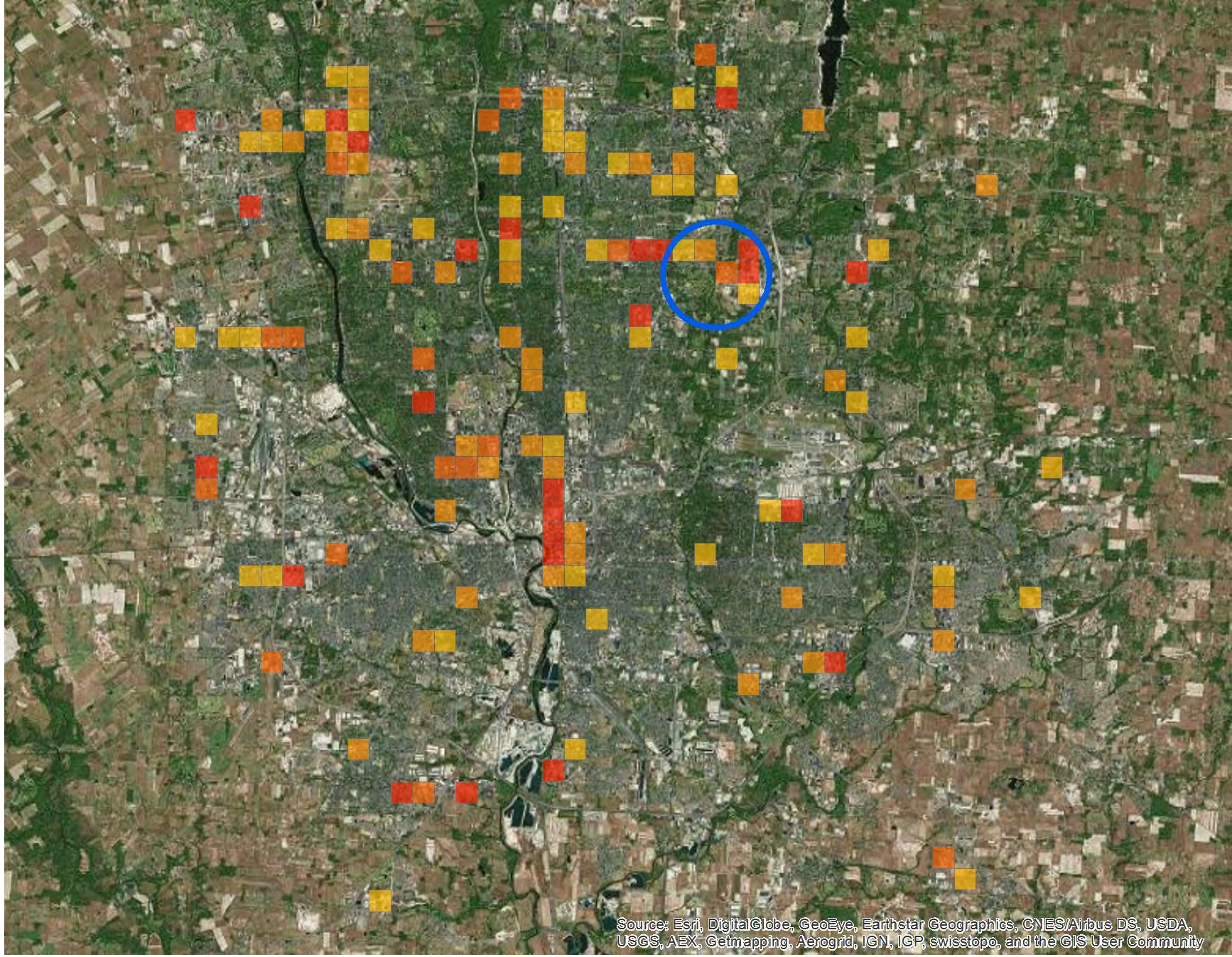
* Franklin County, OH
  * Commercial vulnerability



* Franklin County, OH
    * Commercial most vulnerable

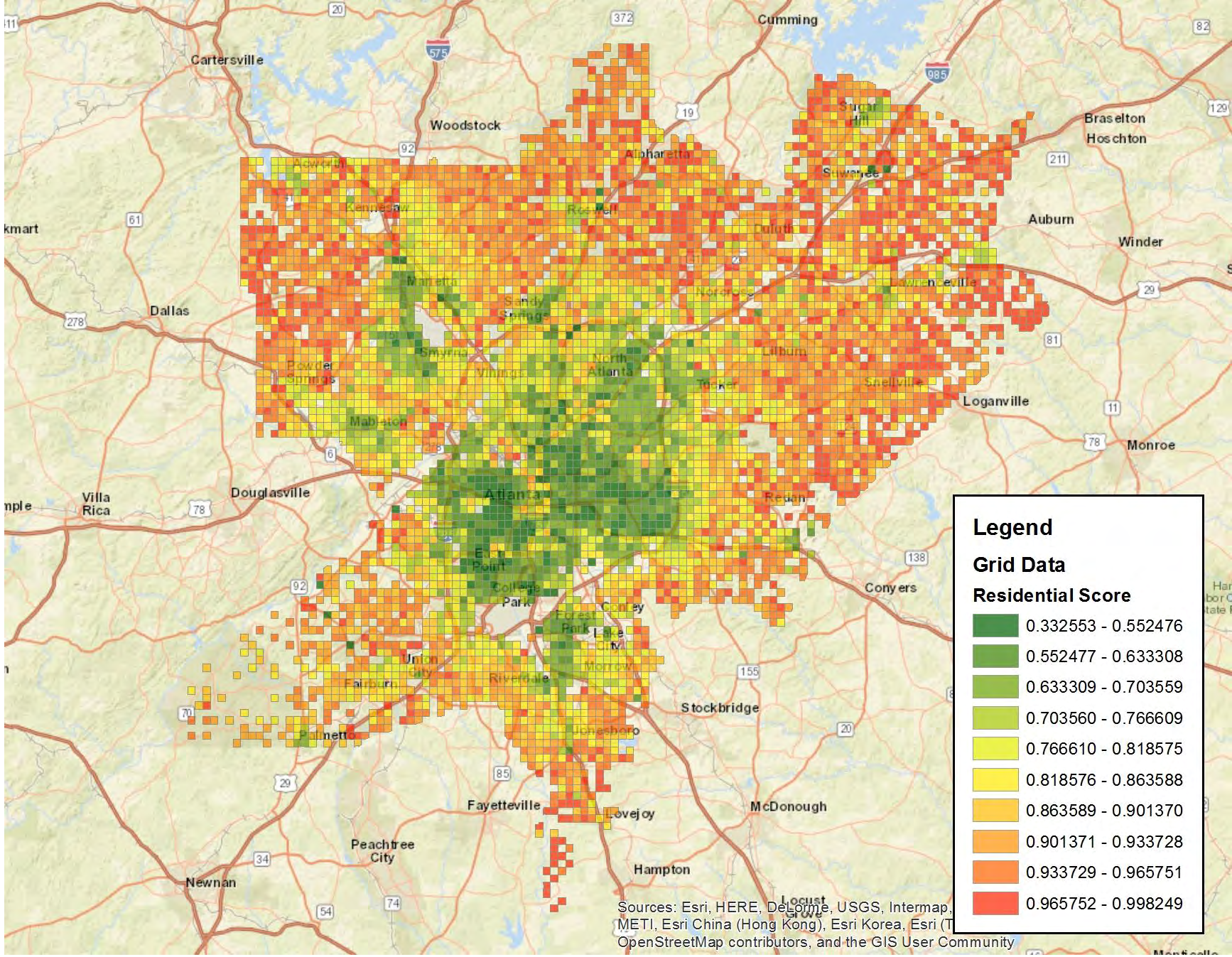


* Franklin County, OH
  * Example

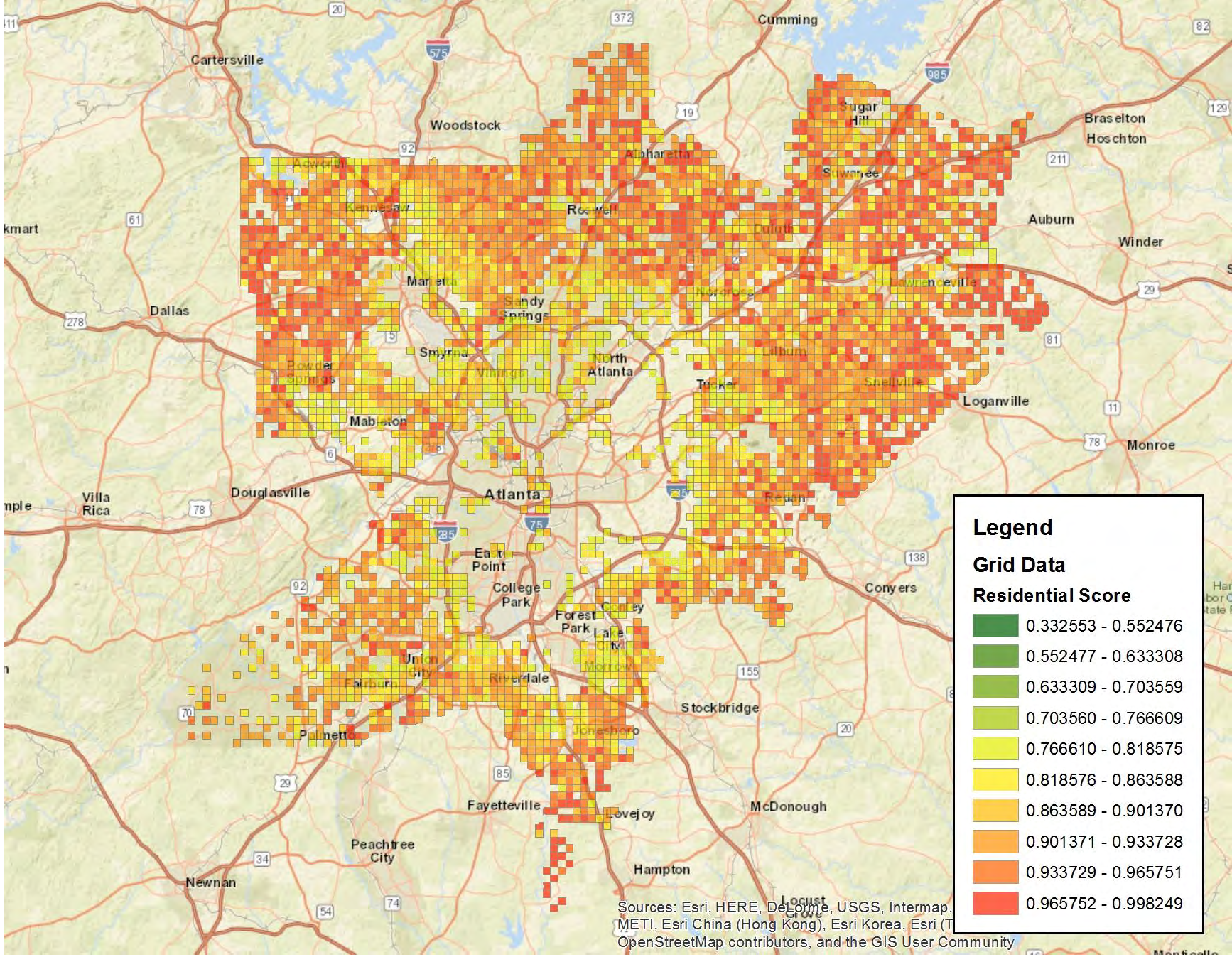


* Franklin County, OH
  * Example

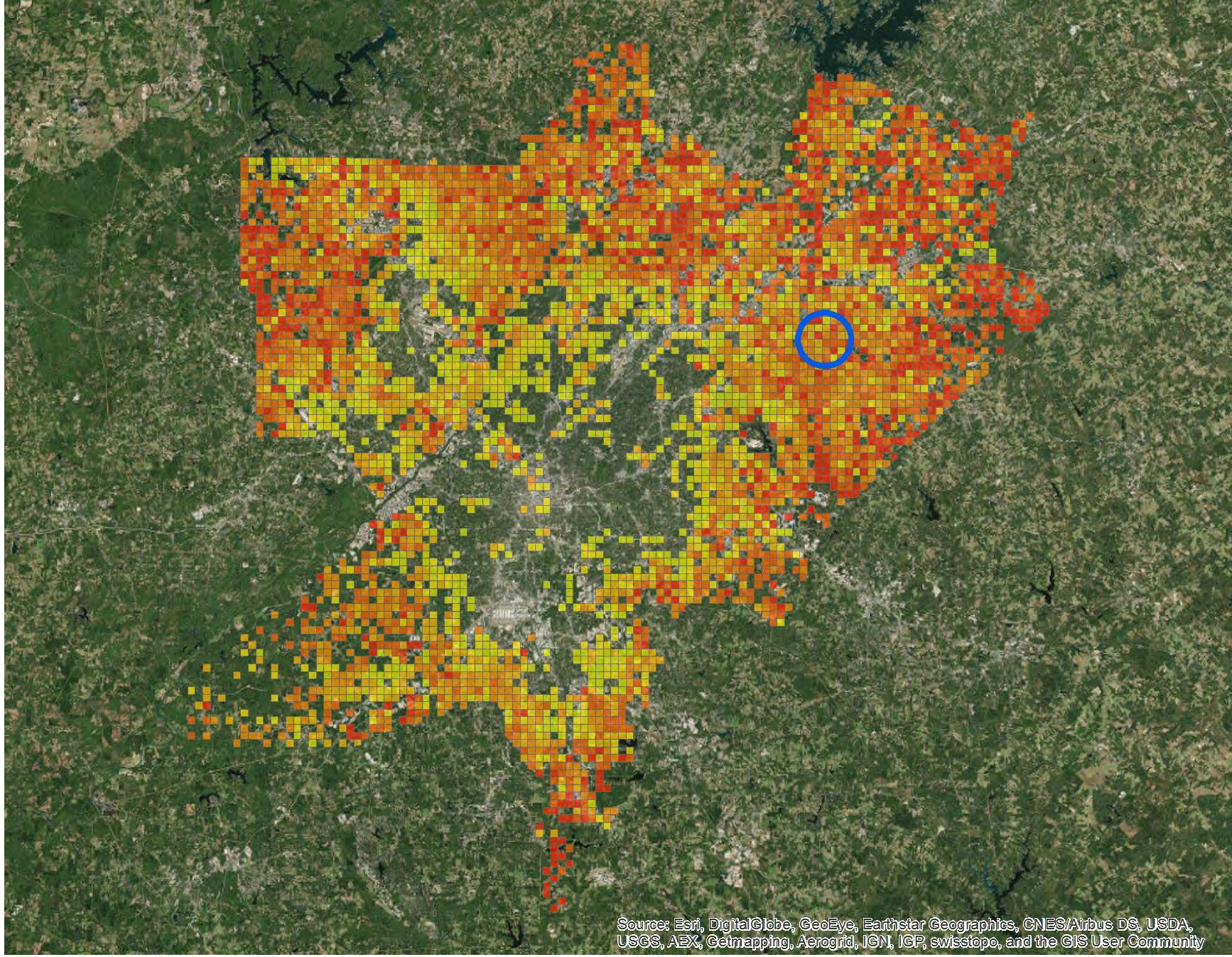
* Atlanta Region, GA
  * Residential Vulnerability



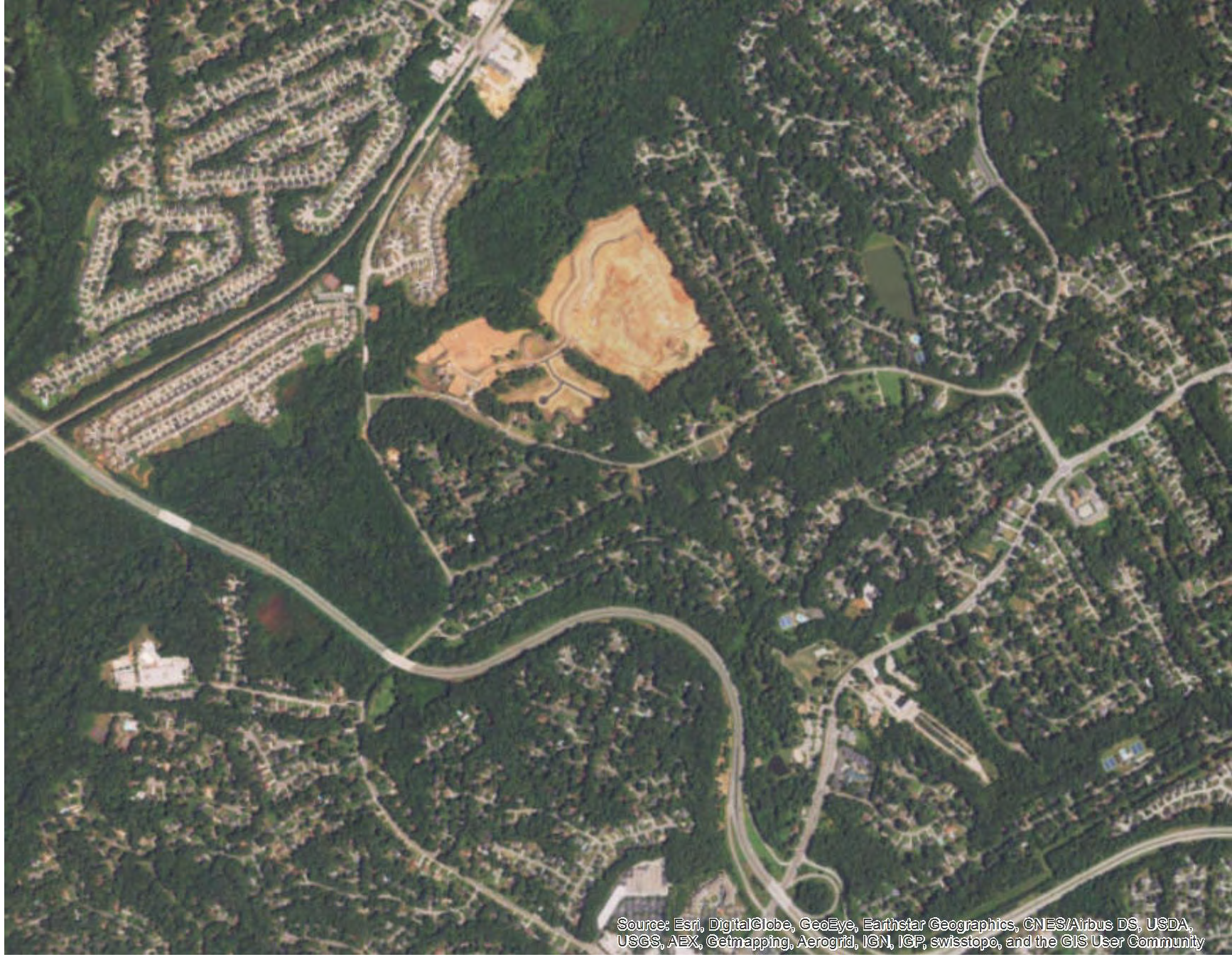
* Atlanta Region, GA
  * Residential most Vulnerable



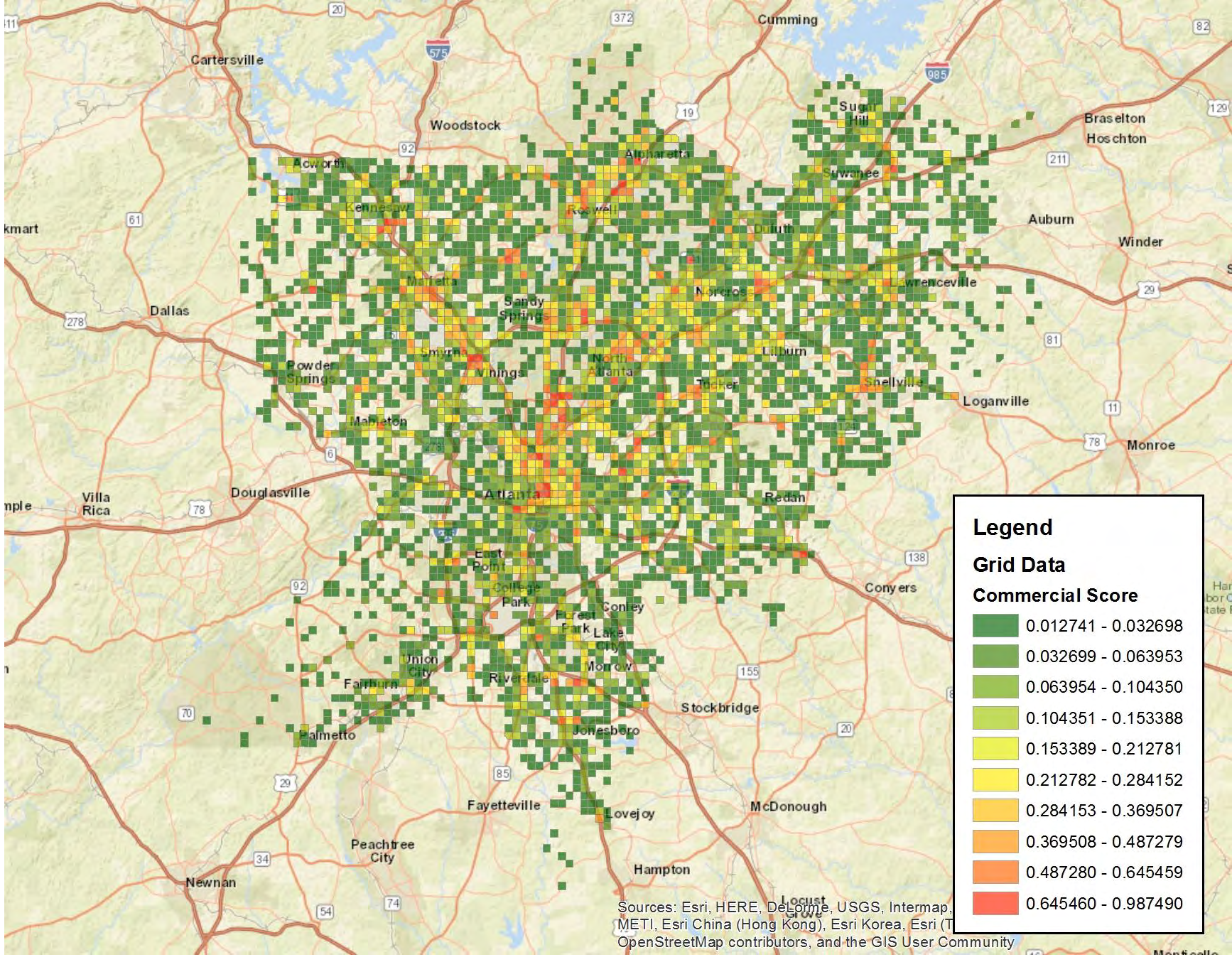
* Atlanta Region, GA
    * Example



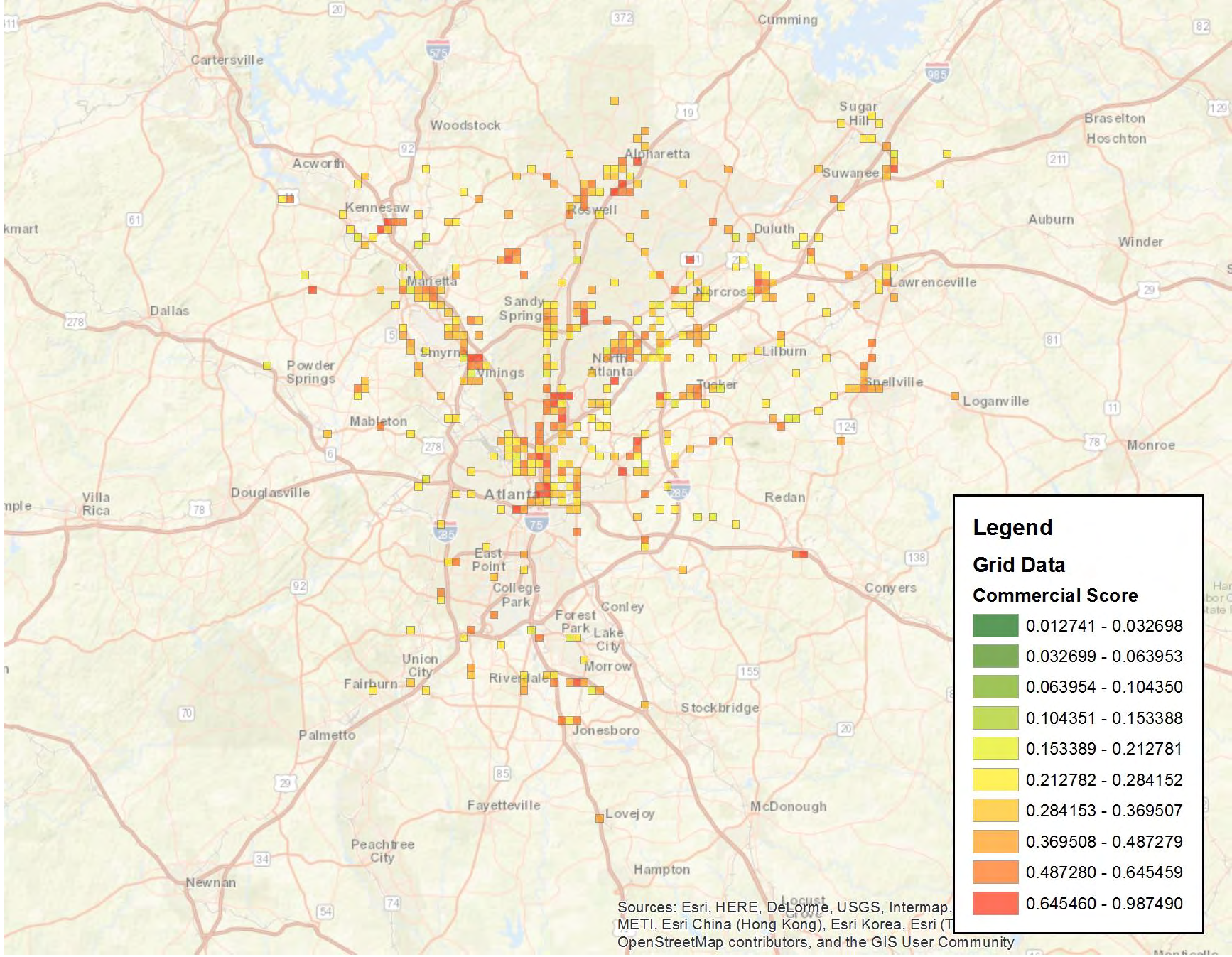
* Atlanta Region, GA
    * Example



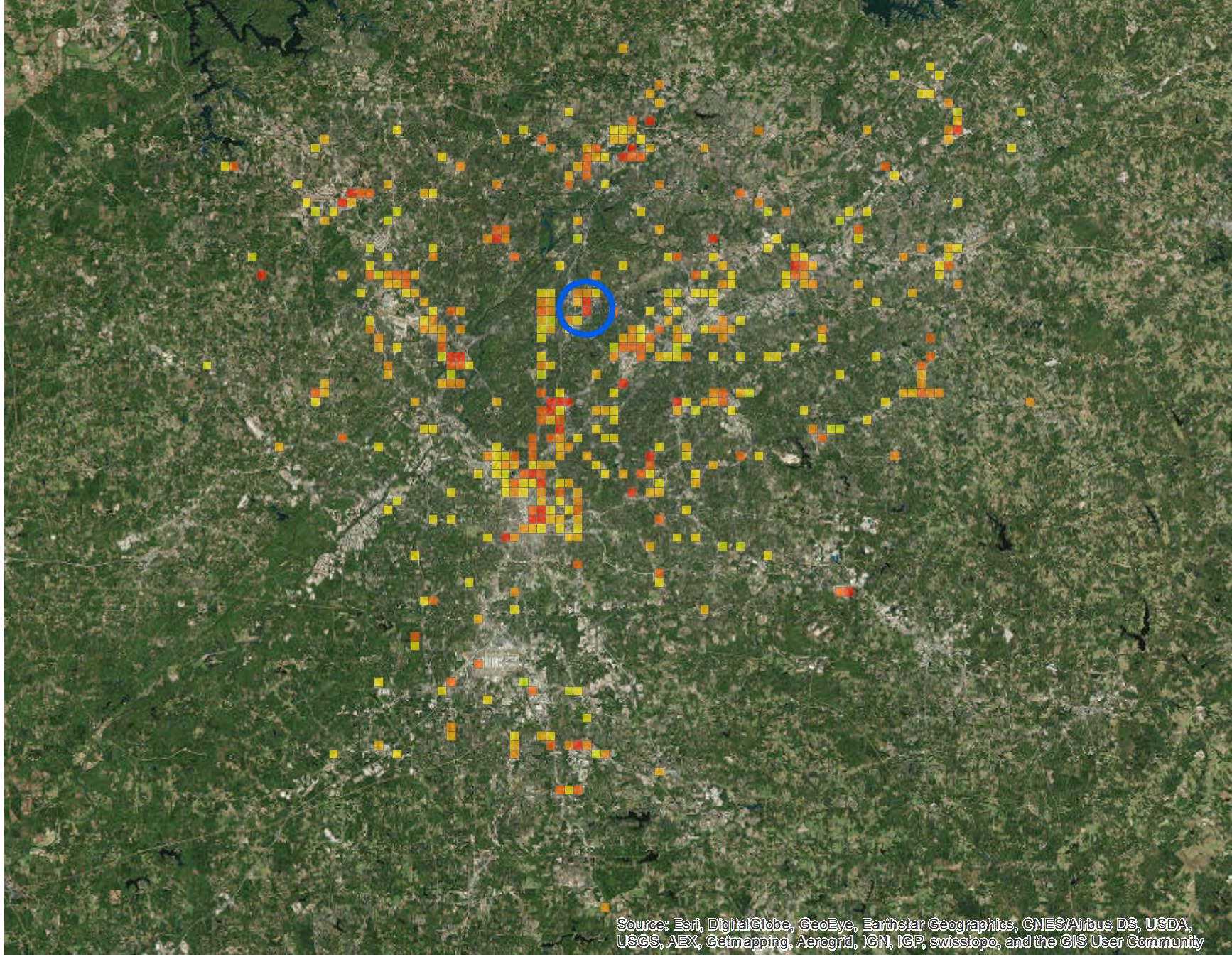
* Atlanta Region, GA
    * Commercial Vulnerability



* Atlanta Region, GA
    * Commercial most Vulnerable



* Atlanta Region, GA
    * Example



* Atlanta Region, GA
    * Example

/more questions/

What else is going to happen?

Image source: http://www.automobilemag.com/news/urban-mobility/

*What will "cars" look like?

* Vehicles will transform
  * Focus on mobility
  * Smaller for efficiency
  * Various shared vehicle forms

* Many factors of today's cars will not be needed
  * Crash safety aspects
  * Aspects related to ICE tech

Image source: https://localmotors.com/

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Reduction of Trips

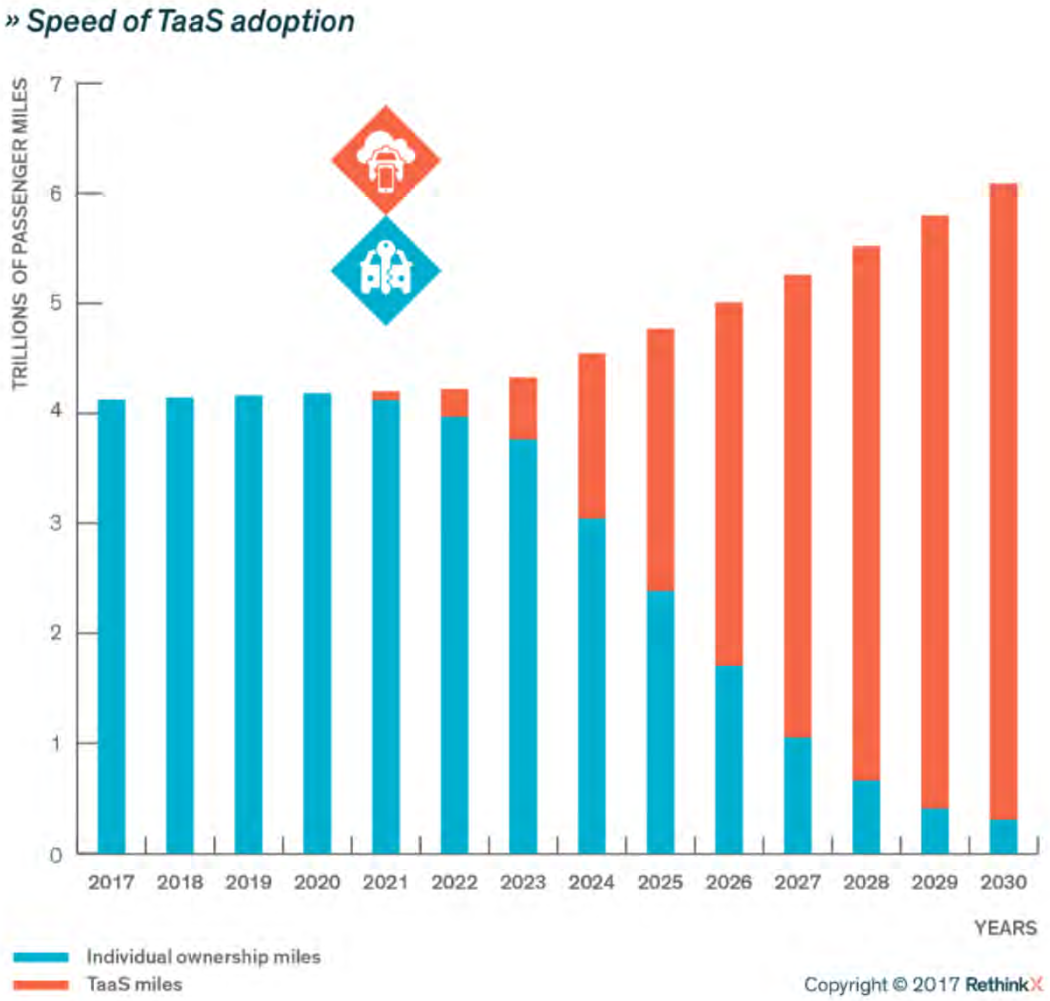
Video – View at link below:

MIT New York Cab Research:
https://www.csail.mit.edu/ridesharing_reduces_traffic_300_percent

MIT New York Cab Paper:
http://www.pnas.org/content/114/3/462.abstract

*Will we own our own cars in the future?

* Strong incentives toward shared model
  * Per mile cost
  * Liability
  * Urban opportunities



*Will we own our own cars in the future?

* Strong incentives toward shared model
  * Per mile cost
  * Liability
  * Urban opportunities

* Transition to shared model may be more rapid than previously expected

Rethink X Report:
https://static1.squarespace.com/static/585c3439be65942f022bbf9b/t/5912307e725e25a34efe5497/1494364316456/RethinkX+Report_050917+%281%29.pdf

Image source: Volvo

*What happens with trucking?

* Truck platooning
  * Controlled by front vehicle
  * Reduced fuel and labor costs
  * Safety increases

* Testing already underway throughout US and worldwide

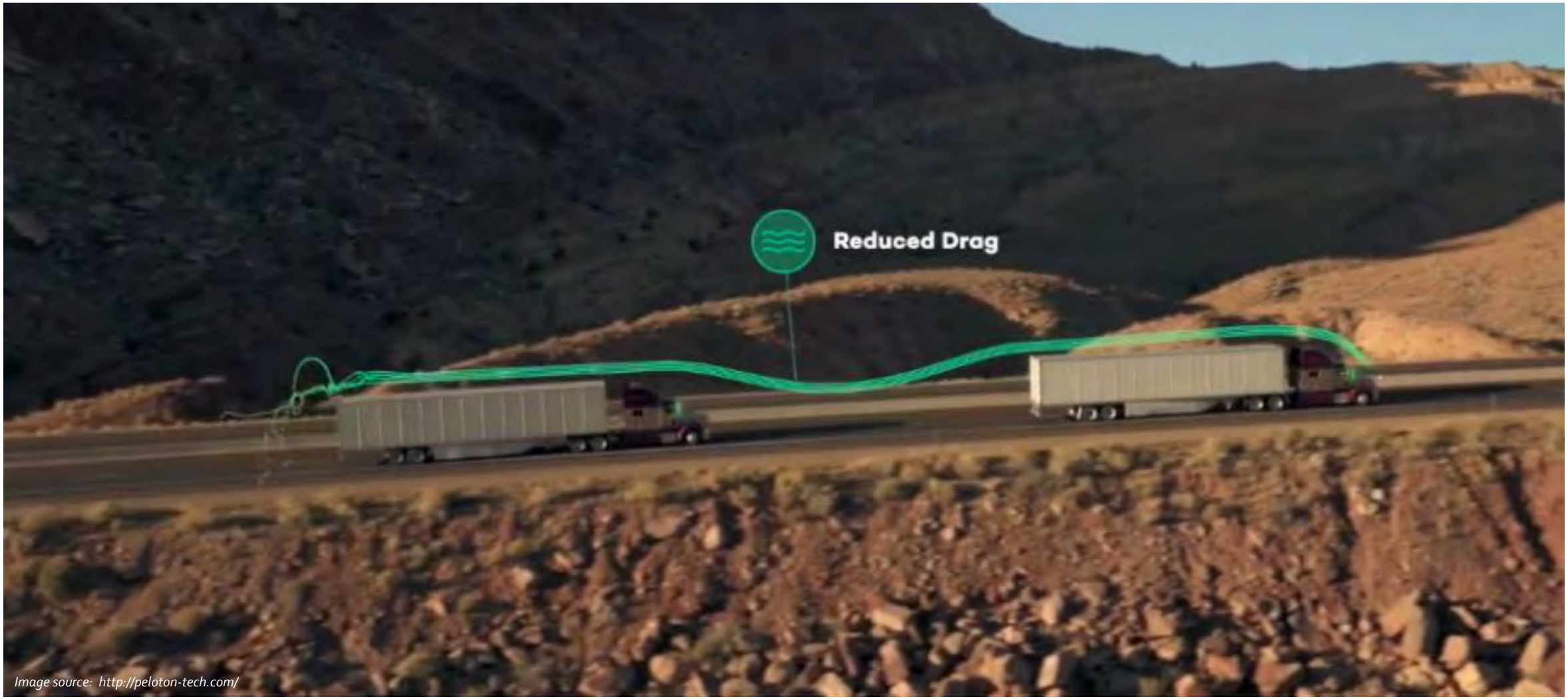


Image source: http://peloton-tech.com/

* What about sprawl?

* Will AV adoption encourage sprawl?

* How does AV tech change individual location decisions?
  * Where will people decide to live?
  * Where will developers decide to build?

* How/where do changes in density happen in each metro?

Image source: www.atlanta.curbed.com

*Will traffic get better or worse?

* Two schools of thought:
  * Better access will drive more trips
  * More ride sharing will lessen overall trips

Intersection Improvements

Video – View at link below:

MIT Intersection Paper:
http://senseable.mit.edu/papers/pdf/20160316_Tachet_etal_RevisitingStreet_PLOS.pdf

MIT Intersection Overview: http://senseable.mit.edu/light-traffic/

Image source:: www.idahostatesman.com

*What about bikers and pedestrians?

* Planners have need to help the conversation
  * Safe street crossings
  * Cyclist interactions
  * Signalization and system-wide automation

Image source:: www.mic.com

* What about transit?

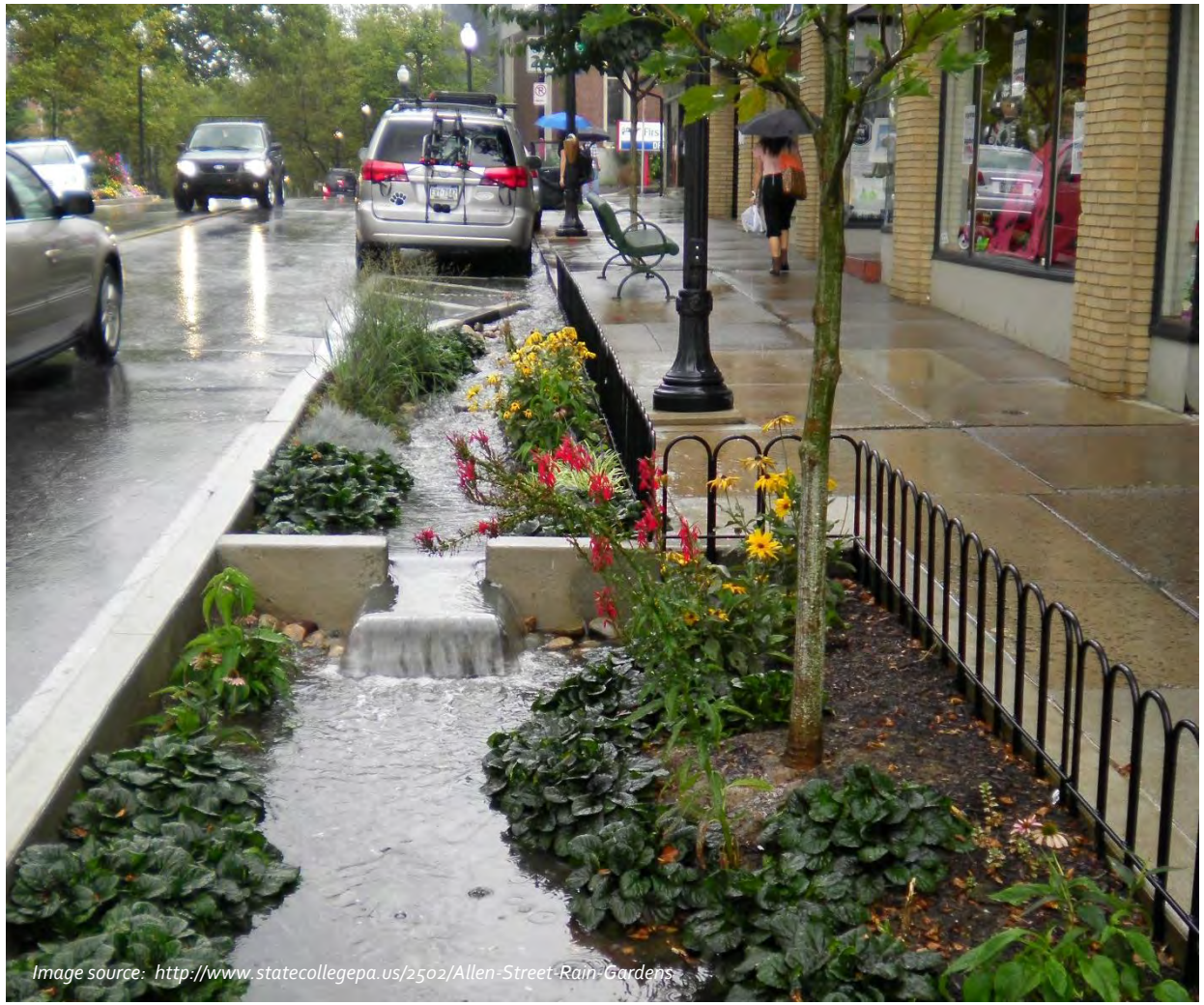
* How will different transit types interact?
* Will routes still exist for buses?
  * A total shift to on-demand?
  * How will the vehicles transform?
* How can all populations be served?

Image source:: Side Street Planning

*What else might change in our neighborhoods?

* Will our "Main Streets" get better?
  * No longer constrained by parking
  * Urban form and uses take precedence

* What if on-street parking goes away? Do cul-de-sacs make any sense?



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* Will our "Main Streets" get better?
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  * Urban form and uses take precedence

* What if on-street parking goes away? Do cul-de-sacs make any sense?

/what you must do/

Planners and planning must begin today

What to expect:

	1-3 years	3-7 years	7-15 years	15+ years
Driverless Car Adoption	Limited adoption • Higher cost vehicles • Regulations evolving • Limited supporting infrastructure	Moderate adoption • Average cost vehicles • Shared model emerging • Added infrastructure	High adoption • Vehicle fleet replacing • Shared model dominant • Infrastructure updates	Full adoption • All vehicles sold • Regulations set • Integrated systems
Site Design Impacts	Low • Most vehicles user-driven • Parking needs remain similar • Site and building access remain similar	Moderate • Most vehicles user-driven • Parking needs reduced • Site and building access – needed modifications	High • Most vehicles autonomous • Parking needs drop significantly • Site and building access – major modifications	Immense • All vehicles autonomous • Parking needs near zero • Site and building fundamentally changed

What planners must do (now!):

* Include AV technology in planning processes:
    * Comprehensive/master/strategic plan processes
* Mandate code changes:
    * Require that all parking garages be adaptable to other uses
        * Adequate floor-to-ceiling heights
        * No ramped floorplates
    * Reduce parking requirements
        * Anticipate triggers in AV adoption to lower and/or abandon parking minimums
* Focus on place
    * The impact on commercial development will be felt the earliest

What planners must do (now!):

* Create overlays
  * Corridors with "never gonna leave" uses like car lots, gas stations, etc..
    * THEY ARE GOING TO BE OBSOLETE
  * Requirements and strategies for redevelopment of corner lots
* Advocate to your elected boards and fellow staff
  * Provide information to City Council, Planning Commission
  * Advocate city engineering and transportation to consider coming AV

What planners must do soon (2-3 years):

* Identify areas of your community most susceptible to change
    * New opportunities for success
    * Potential areas for failure

* Define new land use strategy for your community
    * What to do with excess retail ground
    * What to do with excess parking areas
    * What to do with excess corner lots

/questions?/

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