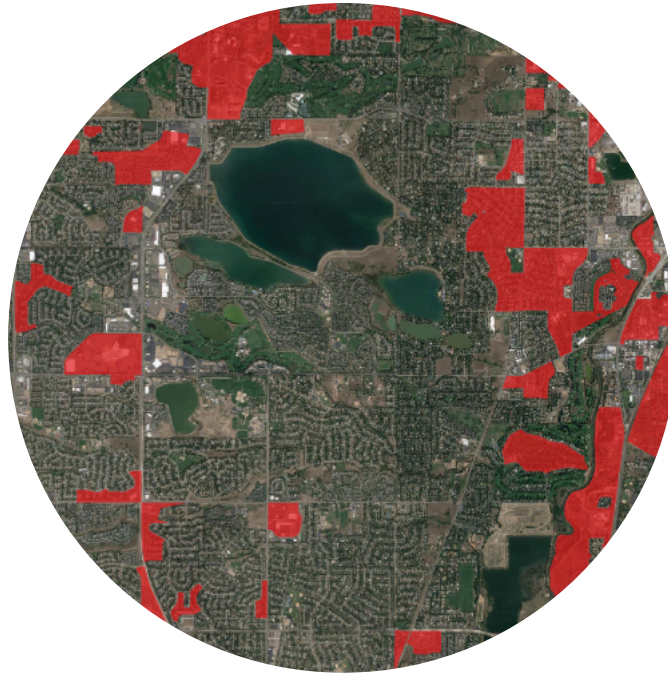


An aerial night view of a dense city, likely New York City, with numerous skyscrapers and buildings illuminated by city lights. The perspective is from a high angle, looking down on the city grid.

CBRS

Business
Analysis
Toolkit

Getting Started Guide



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SIGNALS
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Introduction

This guide describes how to install and launch the Toolkit. One can be up and running at a basic level in 15 minutes.

Users are encouraged to read “Introduction / User’s Guide” and to watch tutorial videos as they are released. These are valuable resources to help you understand the Toolkit. For additional documentation, new announcements, and training see:

<https://cbrstoolkit.com/pages/key-resources>

Quick Start

To getting started:

1. *Download the Toolkit.* You will receive an e-mail with a link immediately following your purchase.
2. *Unzip the File.* Unzip the contents and place the contents in a convenient location on your computer.

If you purchased the “Everything Analyzer” (the most comprehensive tool) you will receive a link to download the Block Group Analyzer and a USB drive in the mail, with each of the State Analyzer products.

3. *Download and Install QGIS.* The Visual Toolkit is an application built upon an open-source world class GIS tool. You need to download and install a copy. Its free and is available to support every major operating system (Windows, macOS, Linux, BSD).

Recommendation: download the “Long Term Release” standalone installer, 64-bit version. Long Term Release means that is extremely stable. Virtually every computer today runs a 64-bit operating system. It leverages the hardware capabilities of your computer.

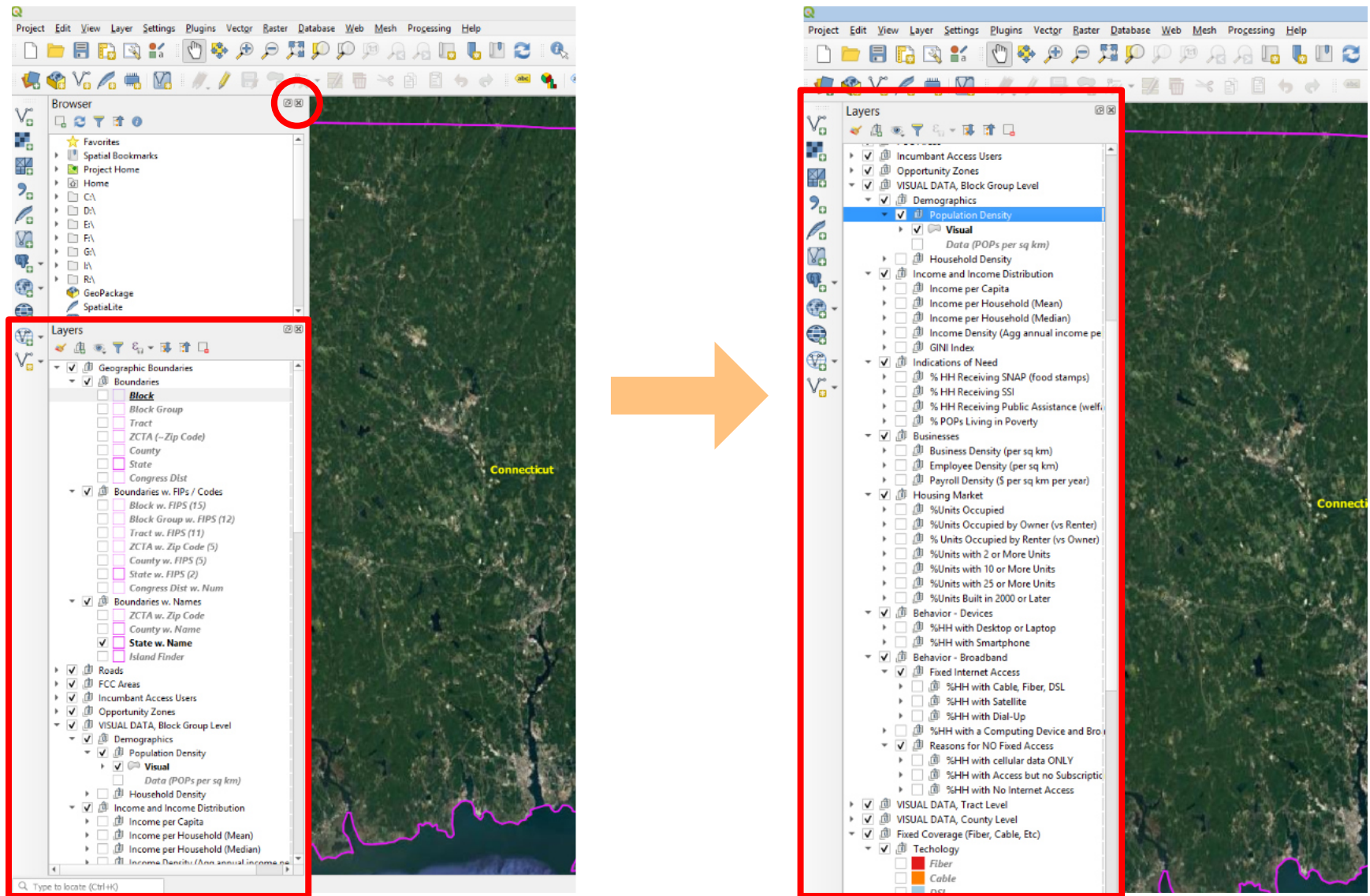
<https://www.qgis.org/en/site/forusers/download>

4. *Close Panels.* When you install QGIS it opens two panels by default, “Browser” and “Layers”. It is recommended that you close the “Browser” panel (see Figure 1). It is not needed and it consumes valuable screen real estate. If you want to see it again you can easily enable it from the “View” pull-down menu.
5. *Launch the Application.* Go to the Visual Toolkit folder within your unzipped Toolkit and double-click on any of the “qgz” icons to launch the Visual Toolkit.

State versions of the Toolkit include two or more icons. One is labeled “All of the data”. The other(s) are labeled “Limited”.

The “All of the data” version includes a lot of high resolution data. It may take a while to load (5 - 10 minutes in the most populous states). In contrast, the “Limited” version loads quickly - sometimes 5 times faster, but excludes the data sets that show the details of existing fixed and mobile broadband networks. In less populous states both versions are likely to load quickly.

Figure 1: Reducing Clutter by Closing Unnecessary Panels in QGIS



There's More

- *Spreadsheets.* The “Excel Spreadsheets” folder includes all of the economic, demographic, and behavior data displayed in the Visual Toolkit in spreadsheet format. Anyone developing a business case will eventually want to see this data.
- *Web Site Links.* The folder Web Site Links includes links to important updates. It is likely that the Toolkit documentation will be updated and that the Toolkit functionality will be enhanced over time.

Finally, those who have purchased a basic national version who wish to upgrade to a more comprehensive version will have the opportunity to do so via a special discount code (look for this within your zipped file).

- *Still Need Help?* The Toolkit team is happy to answer quick questions by e-mail (support@CBRSToolkit.com) or more complicated questions via a Zoom meeting.



Frequently Asked Questions

How do versions of the Toolkit differ?

The national versions (County Analyzer, Tract / ZIP Code Analyzer, and Block Group Analyzer, and the Everything Analyzer) display data for the entire United States. Each of the national toolkits includes the contents of the simpler national toolkits, plus more.

The Block Group Analyzer and the Everything Analyzer include data at the Block Group level, the highest resolution available for demographic data, and approximately 68 times the resolution of county-level data. Neighborhoods within a city can vary dramatically. The higher the resolution of the data the more precise the business analysis.

The State Analyzer is available for all 50 states plus the District of Columbia plus “Puerto Rico & Islands”. Puerto Rico and Islands includes a fairly complete data set for Puerto Rico (excluding business density, employee density, and payroll density) and limited data for American Samoa, Guam, Northern Mariana Islands, and the US Virgin Islands.

How does the Visual Toolkit relate to the Excel Spreadsheets?

A sophisticated user will eventually use both. The Visual Toolkit allows the user to zoom in and zoom out and navigate to different



geographies and turn on an off different data layers. Every area (county, tract, block group, etc.) has a unique numerical code.

A user can look loop up a single code and get a complete data set for that area (including information not displayed visually). Alternatively, the user can select an area using QGIS (that might include hundreds of tiny polygons) then save that list of areas to an Excel file then use the list to extract the corresponding data (by copying and pasting or via a lookup) from the Excel spreadsheet. Stay tuned for a video tutorial on this subject.

A business plan involving deployments in multiple cities might include selected geographies in each city and a corresponding P&L for each city.

Finally the Excel version aggregates most data sets for larger areas. In the national Toolkits these include the nation, regions (Northwest, Midwest, South, West), divisions (New England, Middle Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain, and Pacific), states, congressional districts, and counties. This aggregated data enables the user to ask “How does my area of interest compare with other geographic areas?”

What can I do with ZIP Code data?

Many versions of the Toolkit (State Analyzer, Tract/ZIP Code Analyzer, Block Group Analyzer, and the Everything Analyzer) include ZCTA (Zip Code Tabulation Areas) data. ZCTAs were

designed by the Census Bureau to approximate zip codes, with a few caveats. Unlike blocks and block groups and tracts, which all add up to counties, ZIP Codes and ZCTAs do not fit into a “clean” hierarchy. Some ZCTAs straddle two or even three states.

ZCTAs are more precise than counties but less precise than tracts or block groups. While the Excel spreadsheets of versions of the Toolkit that contain ZCTAs include an exhaustive set of ZCTA data, those Toolkits generally visualize data using a more precise polygon. The exception is business data (business density, employee density, and payroll density) which is available only at the ZCTA and county level.

Every version of the Toolkit contains ZCTA boundaries. One can therefore see how each data layer relates to each ZCTA and can save screenshots and / or select a group of ZCTAs to later analyze in a spreadsheet model.

If a marketing department wishes to purchase a third party customer list that relates to a specific geographic area it is easy to designate the areas of interest using ZIP Codes.

What else is included?

The Toolkit includes estimates / forecasts of population by county through the date of the CBRS auction (July 1, 2020). This is important because populations tend to change over time.

The vast majority of the economic and demographic data in the Toolkit comes from Census Bureau studies that were conducted over time, typically a five year period (2014 through 2018). A large number of samples (3.5 million per year x 5 years = 17.5

million samples) is necessary to get the exceptionally high precision of block group results. If one compares this to a political opinion survey of 2,000 responses, as an example, the Census data is 8,750 times more precise! A national survey with 2,000 responses would miss entire counties.

The trade-off in collecting a large sample over time is that the absolute counts will change slightly during the collection and analysis period. Ideally one would build a business case then “calibrate” the model using an up-to-the-minute population forecast (which is included) that seeks to capture rapid demographic changes. One can do that using this supplemental spreadsheet.

Troubleshooting

I launched the Visual Toolkit and everything looks green or pale white.

At a state level of zoom you are likely to see the most rural areas only. In urban areas the polygons are so tiny that all you see are the white lines that bound them.

Solution: zoom into an urban area (or a town in a rural area) with your mouse wheel and you will see an explosion of color! You will also discover as you change data layers that spectacular variety appears at a zoomed out level as well.

The tool produces lots of beautiful pictures but does not display any numbers.

If you click on the triangle icon next to each set of data you will see a check box that enables the data labels. If you check it each polygon will have an associated numerical value. You should enable data layers when you are zoomed into a small area. As you zoom out labels for small geographic areas are likely to become unreadable. Ideally one would turn on labels appropriate to the zoom level.

When I turn on additional layers of data it gets cluttered.

Each data layer includes 10 different colors, each with numerical significant. In addition, most users are likely to turn on some labels. Each layer is translucent, primarily to enable the user to

see hints of the map below the data layer. The Toolkit is designed to display a single layer at a time. The simple solution is to turn off any existing data layers when you turn on a new one.

When I click the checkbox next to a data layer nothing happens.

The data layers are contained in “groups” (a.k.a. folders) to help users find everything in the Toolkit. A data layer will display only if each of its parent “groups” is enabled. If nothing is happening check to make sure that each of the parent “groups” is enabled with a check mark.

I’m lost! How do I know what geography I’m viewing?

The Toolkit includes a number of features to provide context. These include state, county, tract, block group, and other polygons. Most of these can be displayed with numbers and/or names. You can also turn on roads or roads with labels. Finally, you can change the underlying map in the “Maps” section near the bottom to a map that includes local names and places of interest. Each map blocks the maps that are below it, so if you wish to try a different map make sure you turn off the default map, which just displays terrain.

The toolkit even has an “Island Finder” feature. If you turn off state lines and labels (on by default) and turn on the “Island Finder” it will show all Island territories plus Hawaii. Since the world is projected into a giant rectangle you may find that some islands in the Pacific Ocean appear on the extreme right of the



projection, to the east rather than the west. You may need to “fly” east, over Europe and Asia, to reach them. Also, In some cases, island communities are clustered together (e.g. Puerto Rico and the US Virgin Islands). From a global zoom level only one label will appear. As you zoom in the other island territory will appear.

I already had QGIS installed. Its not launching the Toolkit.

The Toolkit expects the current release of QGIS (Long Term Release version 3.10) or later.

Download and install the current “Long Term Release”. The Toolkit should then launch properly.

I downloaded the Toolkit and decided to rearrange all the file folders. Now I get a bunch of error messages when I launch the application.

It is critically important that “GIS Data” is in the same folder as the application icons and that the contents of “GIS Data” are not rearranged. The Toolkit needs to find and load each of these files.

I purchased a state-level Toolkit for a very populous state. I clicked on the icon two minutes ago and it is still loading.

This is a great opportunity to refresh your cup of coffee or have an unhurried water cooler conversation with a colleague. GIS applications process huge amounts of data. The data the Toolkit is loading may be 1,000 times or 100,000 greater than the size of the Word document you opened a couple minutes ago. GIS tools take a few minutes to load but are then very responsive once loaded.

The first time you enable a layer QGIS may pause for a couple of seconds. Afterwards, as you toggle the same layer on an off and as you zoom in and out the response should be almost instantaneous.

You might, optionally, choose to load a “Limited” version of the Toolkit for a particular session if you do not plan to study block-level competitive coverage and performance data during that particular session.