



SAP HANA Express/ArcGIS Pro Bundle Tutorial

Part of the ArcGIS Pro/HANA Express Bundle

July 14, 2017

Note: all copyrights and trademarks in this guide are property of their respective owners. SAP HANA, HANA Express, HANA Studio, S/4HANA are property of SAP SE. ArcGIS, ArcGIS Desktop, ArcGIS Pro, ArcGIS Online are property of Esri, Inc. All Rights Reserved.

Introduction

SAP HANA offers robust, native and high performance spatial and spatial analytic capabilities including its in-memory, columnar DBMS. With the introduction of SAP HANA Express, anyone can download or access in the cloud an up to 32GB HANA instance that has most of the capabilities of full use HANA for free. You can begin quickly exploring the combined capabilities of ArcGIS and HANA Express. This tutorial is designed to help you get started quickly.

Esri ArcGIS Platform and SAP HANA – Best of Breed Integration

Because SAP and Esri each focus on their respective platforms to ensure best in class capabilities, this integration offers more flexibility and capability than other single vendor solutions which try to be all things to all people. SAP and Esri have worked together for well over five years to ensure a high level of integration between the ArcGIS and the SAP HANA platforms. This provides our mutual customers with significant business value.

The Esri ArcGIS platform provides best-in-class advanced spatial analytic, spatial application and application development capabilities. There is quite a bit of overlap between SAP and Esri customers especially in asset intensive industries. Being able to meet the needs of these customers requires deep knowledge of how enterprises use spatial analysis and related GIS capabilities to gain strategic and operational benefits. Since 1969, Esri has been focused on understanding, meeting and anticipating these needs. On the other hand, SAP HANA provides a platform – including spatial, predictive, graph, text and other engines – which can be leveraged by ArcGIS to analyze and query large data volumes at very high speed. SAP HANA also provides advanced mash-up capabilities with various data sources – including SAP S/4HANA (ERP), IoT and non-SAP data. The results can then be consumed by the ArcGIS platform. ArcGIS's advanced spatial analytics and other capabilities are perfectly complemented by SAP HANA's capabilities.

Esri continues to increase the integration with SAP HANA particularly with Insights for ArcGIS. For instance, Insights connectivity to SAP HANA is highly optimized and will continue to leverage more native SAP HANA capabilities over time.

Get Started Building Innovative Solutions Today with HANA Express and ArcGIS Pro

This tutorial will help you quickly get started with the ArcGIS platform and HANA Express which will enable you to begin exploring the combined capabilities made possible by the tight integration. Please take the time to read the material referenced via the links in this document before starting installation. From there, you can create innovative solutions that meet your organization's and customer's needs or enable users to do things not previously possible. Consider an asset intensive scenario that a utility, DOT or municipality might encounter: you could implement a compelling solution that mashes up in SAP HANA work order history from SAP Plant Maintenance, IoT data for assets and ArcGIS data published to HANA to optimize asset repair and replacement. ArcGIS products like Business Analyst, ArcMap, Pro and others can then consume the results using query layers of the analysis done in HANA. This pushes down into HANA the compute and data intensive work and ArcGIS gets back only the data it needs. The result is greater insight faster or not previously possible because of HANA's unique capabilities. For an example of what HANA spatial makes possible, check out [this](#) video. There are plenty of other [videos](#) on YouTube that show what our customers are doing with SAP HANA spatial and Esri ArcGIS.

Prerequisites

Hardware and OS requirements

ArcGIS Desktop and Pro

A typical machine used to run ArcGIS Desktop would be Windows 7 Professional or greater, running on a 2.2GHz CPU (x86 or x64 with SSE2 extensions enabled), and have a recommended 8GB of memory. For the latest details on recommended hardware, OS and VM requirements, see the information here:

For ArcGIS Desktop 10.5: <http://desktop.arcgis.com/en/arcmap/latest/get-started/setup/arcgis-desktop-system-requirements.htm>

For ArcGIS Pro 2.0: http://pro.arcgis.com/en/pro-app/get-started/arcgis-pro-system-requirements.htm#ESRI_SECTION1_441BC14AD47145C1BF1ED8289CC238F2

You are encouraged to upgrade to ArcGIS Pro 2.0 – it is the version used in this tutorial.

SAP HANA Express

SAP HANA Express SPS12 is available for on premise use. HANA Express supports up to 32 GB at no charge, and if more memory capacity is needed, it can be purchased from the [SAP Store](#). For details on HANA Express including configuration, requirements and downloading, see [here](#). The free edition is supported for production use however only community based support is provided.

There is educational content for SAP HANA called SHINE (**SAP HANA I**nteractive **E**ducation) and it is available for HANA Express. It provides data and applications (in either XS Classic or XS Advanced) to help you learn the different facets of HANA including spatial. The SHINE schema and data is representative of SAP transactional data. It contains lat/long points for customers and suppliers and that data can be pulled into ArcGIS and combined with Living Atlas and Tapestry data. Installing and exploring SHINE will give you a feel for SAP applications and transactional data. It contains a demo application and a detailed tutorial so you can learn how to build native SAP HANA applications. It comes complete with sample data and design-time developer objects for the application's database tables, data views, stored procedures, OData, and user interface. You'll see how spatial data can be manipulated in SAP HANA using SQL Script and server-side JavaScript in stored procedures. For HANA Express 1.0 SPS12, you must have access to the SAP Support portal to download SHINE. As part of this tutorial, you'll install SHINE in your HANA Express instance.

Note: You must download HANA Express 1.0 SPS12 for this tutorial. When you click on the **Free Download** button, a page will display. When you enter your email address on the HANA Express registration page and click the **Register** button, you'll be taken to the download page. Scroll all the way to the bottom to obtain the SPS12 Download Manager:

with either a 32-bit or 64-bit JRE.

1B. CLOUD INSTALLATION:

Follow the respective tutorial links for getting started with SAP HANA, express edition on your chosen cloud platform:

[Google Cloud Platform](#)

[Amazon Web Services](#)

[Microsoft Azure Cloud](#)

2. Visit the SAP Community Network to get started on SAP HANA, express edition:

<https://www.sap.com/developer/topics/sap-hana-express.html>

Complete the installation of your chosen method from the **Try It Now** section. Then [configure and setup](#) your installation in order to proceed with the tutorials.

If you still require the previous release of SAP HANA, express edition (1.0 SPS 12), you may click on the applicable link below. For 1.0 SPS 12 documentation, consult the Getting Started guides available in the download manager.

[1.0 SPS 12 for Linux](#)

[1.0 SPS 12 for Windows](#)

[1.0 SPS 12 for Platform-independent](#)

[Cookie Preferences](#)

For SPS12, you have two options: Binary and VM.

[Binary](#)

The binary install can be installed on bare metal running:

1. For SAP HANA, express edition 1.0 SPS12: Suse Linux Enterprise for SAP Applications: 11.4, 12.0, or 12.1 or Red Hat Enterprise Linux 7.2

The minimum RAM is 16GB and the recommended amount is 24GB with a minimum of 2 cores (4 recommended).

[VM](#)

Alternatively, SAP HANA, express edition is available as a VM (ova file). The recommended memory and CPU cores is the same as the binary install. Supported hypervisors include:

1. VMWare Workstation: Player – 7.x and 12.x; and Pro 12.x.
2. VMWare Fusion (and Fusion Pro): 8.x.
3. Oracle VirtualBox

Download & Installation

[SAP Client](#)

You will need to download and install the SAP Client for the ArcGIS Desktop tools to connect to HANA Express:

SAP Client for Windows 32 bit (used by ArcGIS Desktop)

SAP Client for Windows 64 bit (used by ArcGIS Pro)

You can obtain the needed SAP Client installs in one of two ways:

1. A download from the SAP Store [here](#). Access does not require an SAP ID. To download, click on **Trial Version** on the SAP Store webpage. Fill out and submit the request and you will receive an email with a link. When you click on the link, a download webpage will display. Download both the 32 and 64-bit Windows Client packages.
2. Via the SAP Support portal. This requires an SAP ID (S#) to access.

See [here](#) for a step-by-step guide to download and install the SAP Client packages and configure the ODBC drivers – the blog shows how to download from the SAP Support portal. For installation instructions for the SAP Client, click [here](#) - make sure you pick your SAP HANA version in the upper right corner of the displayed help webpage.

ArcGIS Desktop and the SAP HANA Express bundle

To access this offer and submit your information, click [here](#). Once you submit your information, you will receive an email with the links to the HANA Express download and related files you'll need for this tutorial. See [here](#) for information on installing and configuring ArcGIS Desktop. If you want to download HANA Express separately that is a part of this offer, click [here](#).

For all Esri offers for SAP HANA customers, see [here](#). You can also check out what's going on with SAP and Esri at the 2017 Esri User Conference [here](#).

SAP HANA Express

You first need to determine which install type you want – Binary or VM. For details on HANA Express including configuration, requirements and downloading, see [here](#).

If you want to download SHINE for HANA 1.0 SPS12, you need access to the SAP Support portal ([here](#)). You must have a valid login to access this page. There's download, installation and how-to in these guides for the two versions:

1. For SPS 12 - the [XS Classic](#) and the [XS-Advanced](#) versions.

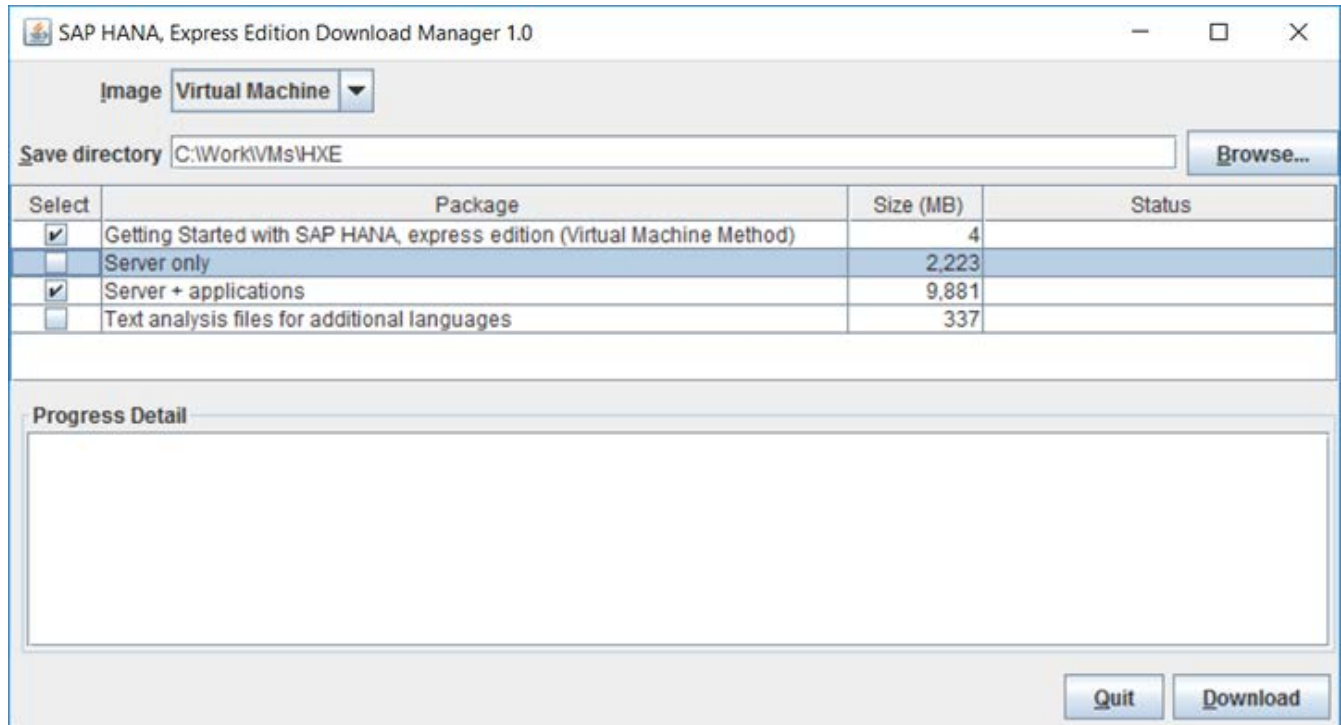
If you plan to use HANA Express as a personal sandbox, you might consider downloading the VM install and run it on your laptop along with tools like ArcGIS Desktop. You should always make sure you shut down the HANA database (issuing a `HDB stop` command at the command line prompt for the `hxeadm` user) and instance before shutting down your laptop. Make sure your laptop has enough RAM installed for the HANA Express VM and whatever tools (like ArcGIS Pro or ArcMap) you plan to run.

On the other hand, if a small group of people you work with want to explore and start building Esri apps that utilize SAP HANA, any option will work: you can run the VM version in your organization's VM farm or cloud, or run a binary instance on a bare metal machine.

With either the VM or binary install, you will need to complete a series of steps to configure the instance once it is installed. Installing and configuring HANA Express (either binary or VM) takes about an hour.

Remember that the default instance ID for an SPS12 version of HANA Express is 00. The instance ID affects the URLs and ports used to access the HANA Express instance. Keep this in mind when you configure HANA Studio and the ODBC connections when specifying the port numbers. See [here](#) for an explanation of all SAP software related TCP/IP ports including SAP HANA.

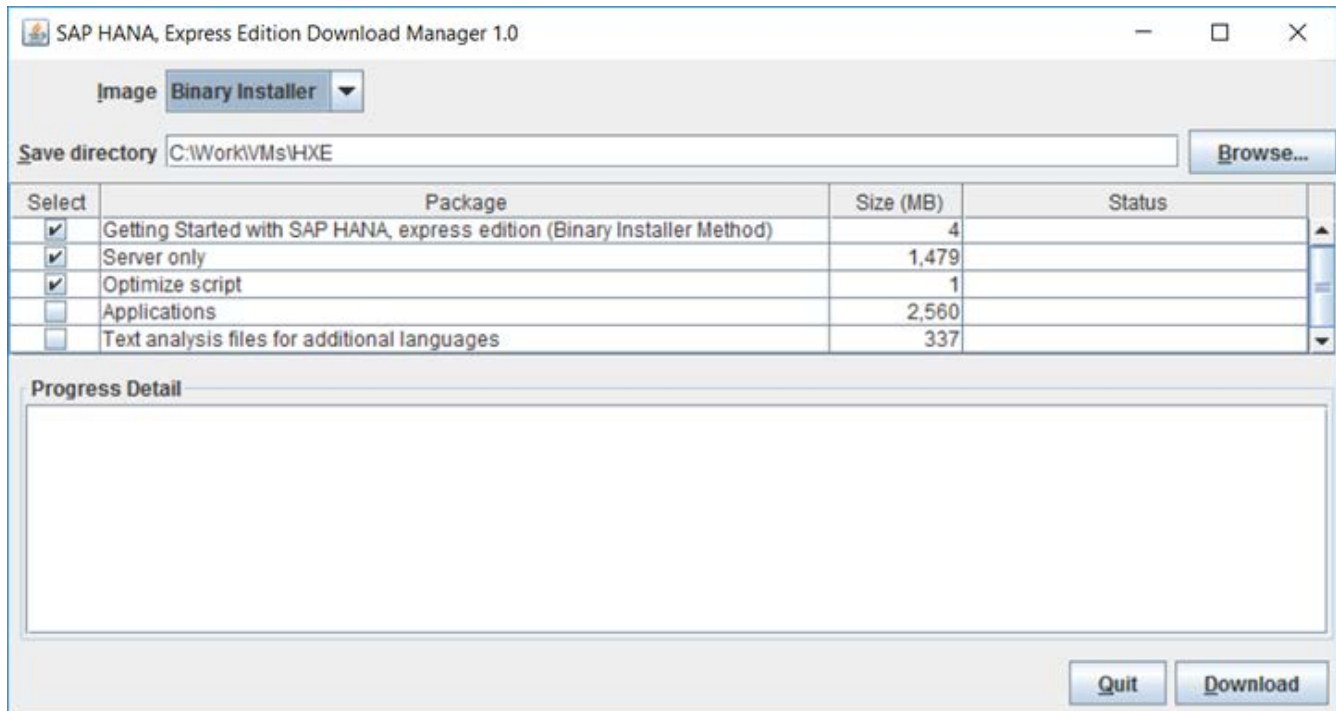
HANA Express VM Install



Please see [here](#) for information on how to install and configure the VM version. When downloading the VM version, make sure you download the server + applications package as shown here in the SAP HANA Express Download Manager. This includes XS and XSA which are needed to use SHINE (either the Classic XS or XS Advanced version).

If you downloaded SHINE for HANA Express SPS12, see the instructions for the version you want to install which can be the [XS Classic](#) or the [XS-Advanced](#) versions.

HANA Express Binary Install



HANA Express is available for install on bare metal. Please see [here](#) for information on how to install and configure the binary install. Make sure you download the applications package when using the SAP HANA Express Download Manager. That contains XS and XSA which is a requirement for SHINE to work.

If you've downloaded SHINE for HANA Express SPS12, see the instructions for the version you want to install which can be the [XS Classic](#) or the [XS-Advanced](#) versions.

Once your HANA Express instance is running and accessible, you're ready to proceed to downloading and installing SAP HANA Studio.

SAP HANA Studio

HANA Studio is an Eclipse based Java based app. It provides the ability to manage one or more SAP HANA instances, including HANA Express and to develop HANA based applications. You will need to install it on a Windows VM or machine.

If you have an SAP ID (S#), you can use the instructions [here](#) for full instructions on downloading, installing and configuring HANA Studio. HANA Studio is available for download [here](#). If you don't have an SAP ID, you can also download HANA Studio using the instructions in the Getting Started Guide that is part of the SAP HANA Express download. See Chapter 2.4 in the binary version guide and Chapter 4 in the VM version guide. There is a link in those instructions to a [tutorial](#) that will show you how to not only install HANA Studio but also configure it to connect to a HANA Express instance. Please read the tutorial before installing HANA Studio.

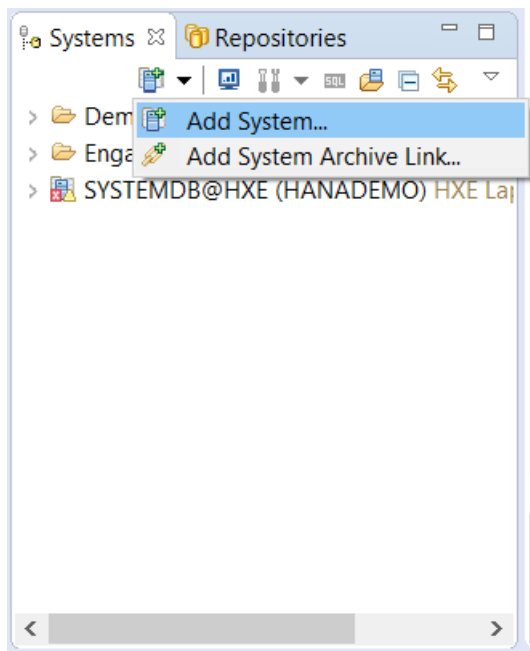
You can alternatively use the HANA Cockpit which is a web application that runs on the HANA instance. You can read more about the HANA Cockpit [here](#).

Setup

SAP HANA Express

As part of this tutorial, you'll create a HANA user called `HANADEMO`. You'll create an ODBC connection to SAP HANA for this user and load the ZIP Code data into the schema `HANADEMO` owned by the `HANADEMO` user. SAP HANA automatically creates the `HANADEMO` schema when the `HANADEMO` user first logs in. You'll first need to add the HANA Express system you created to HANA Studio. This [tutorial](#) also explains how to add a HANA Express system to HANA Studio. You'll use HANA Studio to administer your HANA Express instance.

Startup HANA Studio and in the **Systems** tab on the left-hand side, click on the System Icon with the down arrow next to it and select **Add System...**



The **Add System** dialog will appear.

System

Specify System

Specify the host name and instance number of the system.

Host Name: :39013

Instance Number: 90

Mode:

- ☐ Single container
- ☒ Multiple containers
- ☐ Tenant database

Name:

- ☒ System database

Description: HANA Express-ArcGIS Pro Demo System

Locale: English (United States)

Folder: / Browse...

< Back Next > Finish Cancel

In the Host Name field, enter the IP address or hostname of the HANA instance you're using for this tutorial. You'll also need the port and instance number. Make sure you check the **Mode** options as shown above. HANA Express is a multiple container HANA instance. *Remember that HANA Express SPS12 version has an instance of 00 as described earlier in this tutorial. This will affect the port number used in both HANA Studio and the ODBC driver configuration.* Enter a short description of your new HANA Express instance. When you're done, click **Next** and the following dialog box appears.

System

Connection Properties

Specify the properties for connecting to the system.

Authentication can be carried out using the current operating system user or a valid SAP HANA database user

☐ Authentication by current operating system user

☒ Authentication by database user

User Name:

Password:

☒ Store user name and password in [secure storage](#)

☐ Connect using SSL

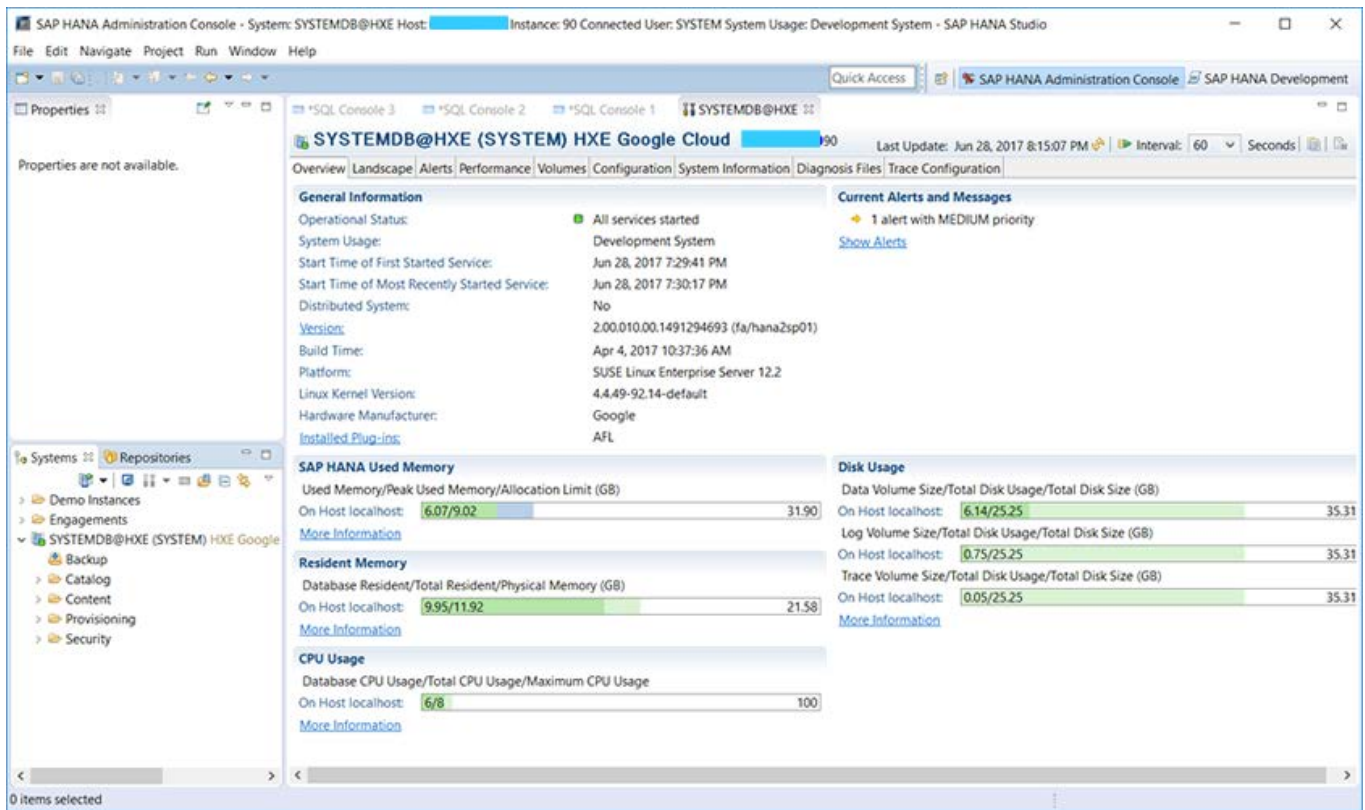
☒ Enable SAP start service connection

☐ Use HTTPS

? < Back Next > Finish Cancel

You'll enter the SYSTEM user and the password you entered for the SYSTEM user during the HANA Express install and configuration process.

Click Finish and, if everything was entered correctly, you should have a new system in the **System** pane.



You are now logged into HANA Express as the `SYSTEM` user. If you're installing SHINE as a Delivery Unit (i.e. for HANA SPS12), you should install SHINE before proceeding. You'll create a copy of your system entry in HANA Studio for the `HANADEMO` user later.

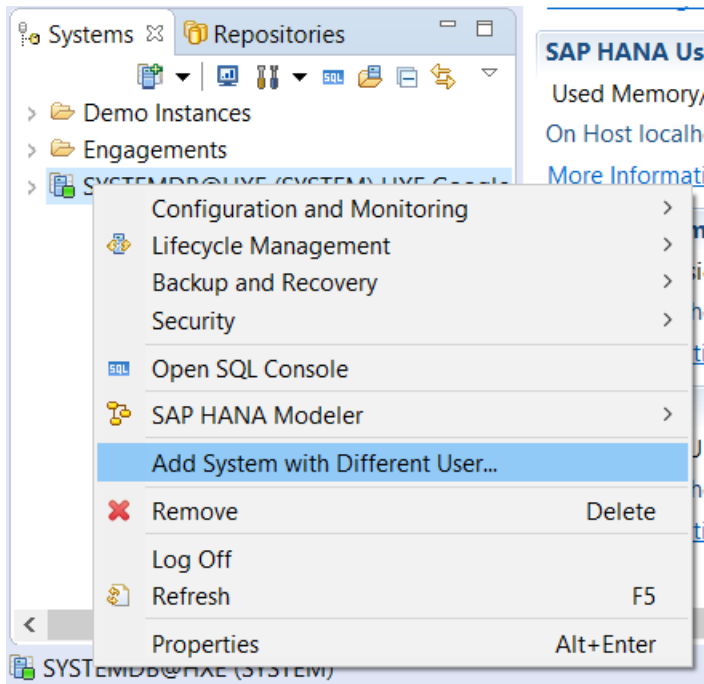
To create a new user (not restricted new) in HANA Studio, right click on the `Users` node in the left-hand pane. Simply provide the username `HANADEMO`, and enter a password. For more information on how to use HANA Studio, click [here](#). Keep in mind that the ArcGIS Project you import later uses a different password than you're picking here. You'll need to update that password with the one you've specified here so that ArcGIS Pro can access the imported data. Make sure you check "no" for the **Force password change on next logon** option as shown below:

The screenshot displays the 'New User' dialog box in the SAP HANA Administration Console. The left-hand pane shows the 'Systems' tree with 'SYSTEMDB@HXE (SYSTEM) HXE Laptops' selected. The main pane shows the 'New User' dialog box with the following fields and options:

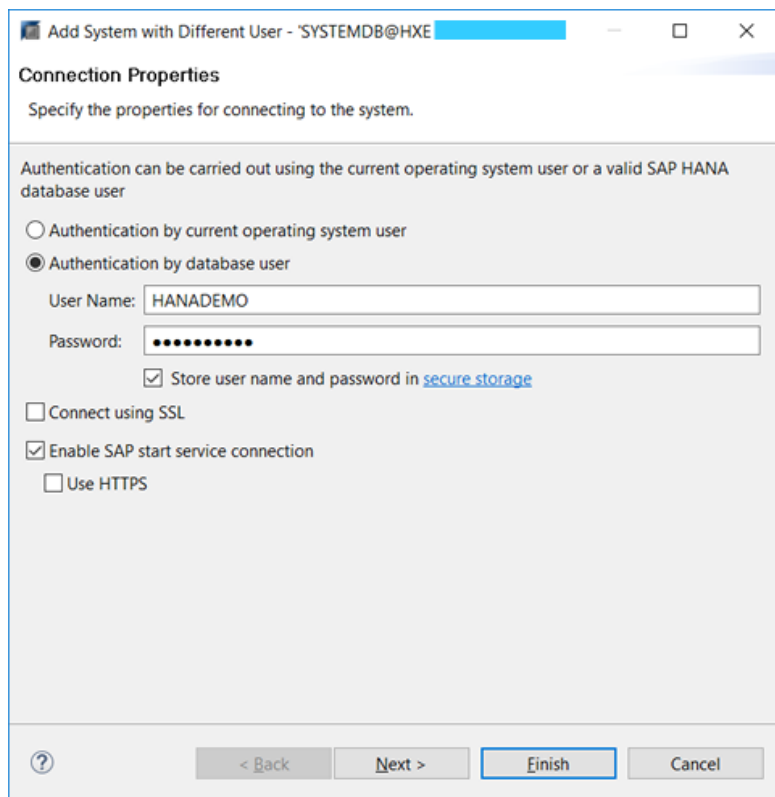
- User Name:** HANADEMO
- Authentication:**
 - ☒ Password
 - ☐ Kerberos
 - ☐ SAML
 - ☐ X509
 - ☐ SAP Logon Ticket
 - ☐ SAP Assertion Ticket
- Force password change on next logon:** ☐ Yes ☒ No
- Valid From:** [Date Picker]
- Valid Until:** [Date Picker]
- Session Client:** [Text Field]

At this point, HANA Express is ready to go including the SHINE data and apps. In the email you received from Esri as part of the registration process, there is a link to a HANA data export containing the ZIP Code data used for the workflow below. You should download and save the data before proceeding.

Now that you've created the HANADEMO user, you'll create a new system entry using the HANADEMO user credentials you just used. To do that, right click on the system you just added in the Systems pane and select **Add System with Different User....**

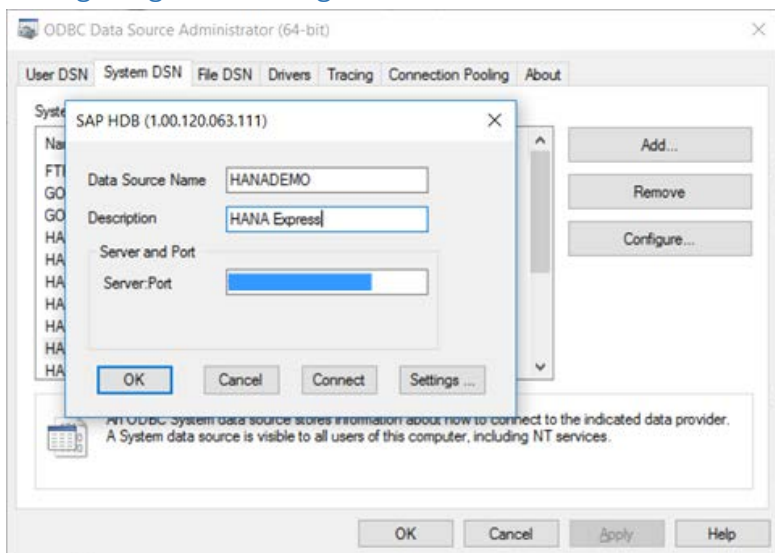


Enter the username and password you entered earlier for the HANADEMO user.



Later, you'll load the ZIP Code data into this new system as the HANADEMO user.

Configuring and Testing the ODBC connections



When setting up the ODBC connection to SAP HANA, you should use the name HANADEMO for the ODBC data source name as the ArcGIS Pro project you imported and its data connection reference that name. You must use this same name for your data source or else the connections specified in the project won't work. If the HANA entry doesn't show up in the System DSN list, you probably forgot to include the driver path (typically C:\Program Files\SAP\hdbclient) in your PATH variable. Enter the IP or hostname, and port for the HANA

Express instance you created. Make sure you test the ODBC connection. If you're connecting to a cloud instance of HANA Express, make sure your corporate firewall is not blocking the port you'll specify for the ODBC and the HANA Studio connection. Above is a screenshot of creating the ODBC connection. You should enter the IP address or hostname, and port for the HANA Express instance you created.

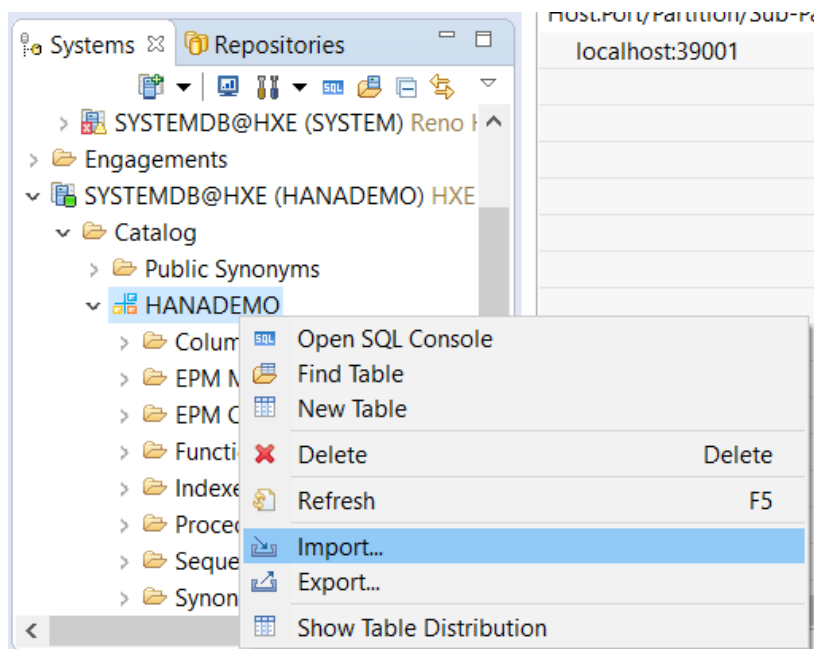
Of course, you'll need a 32-bit ODBC connection for ArcMap and a 64-bit ODBC connection for ArcGIS Pro. Make sure you use the same data source name for both and that the 32-bit driver path is before the 64-bit driver path in your PATH system variable. Additional information on how to configure the ODBC connection to HANA for ArcGIS Desktop and Pro can be found [here](#).

Loading Data

Esri ZIP Code dataset

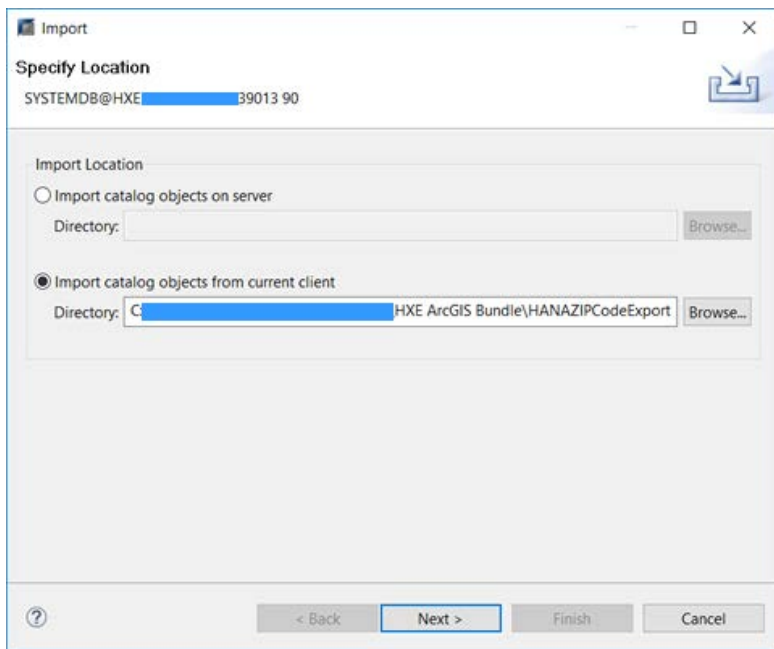
As part of the registration steps for this SAP HANA Express/ArcGIS Desktop bundle, you received an email from Esri. In that email, there is a link to this dataset which you will load into SAP HANA Express. You'll use this dataset in a workflow shown later in this tutorial. Download and extract this dataset in a directory for later use.

You should have already created the HANADEMO user and tested that ArcGIS Pro can connect to the HANA Express instance you created earlier. You also added a new system entry for your HANA Express instance for the HANADEMO user. Double click on this new entry in HANA Studio before proceeding.

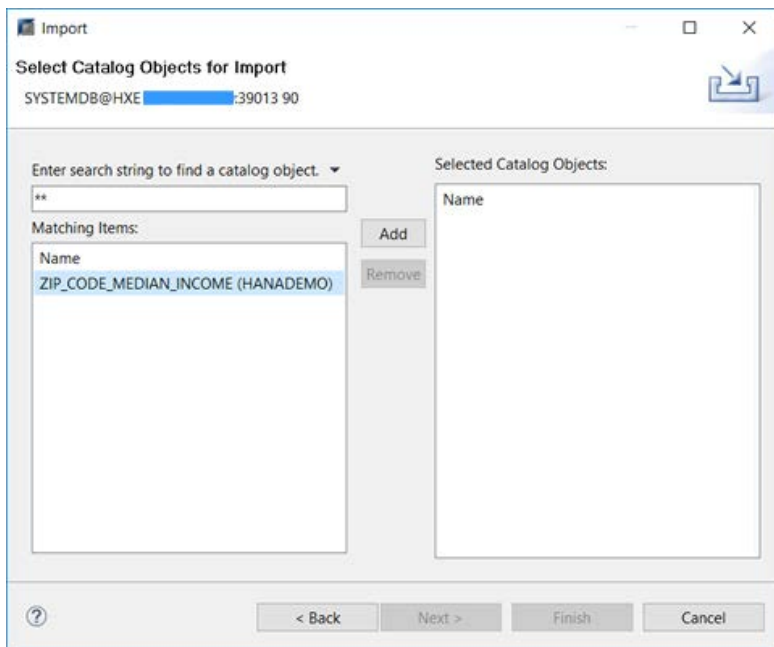


Now you're ready to import data. First, expand the **Catalog** folder by double clicking on it. Right click on the HANADEMO schema and select Import.

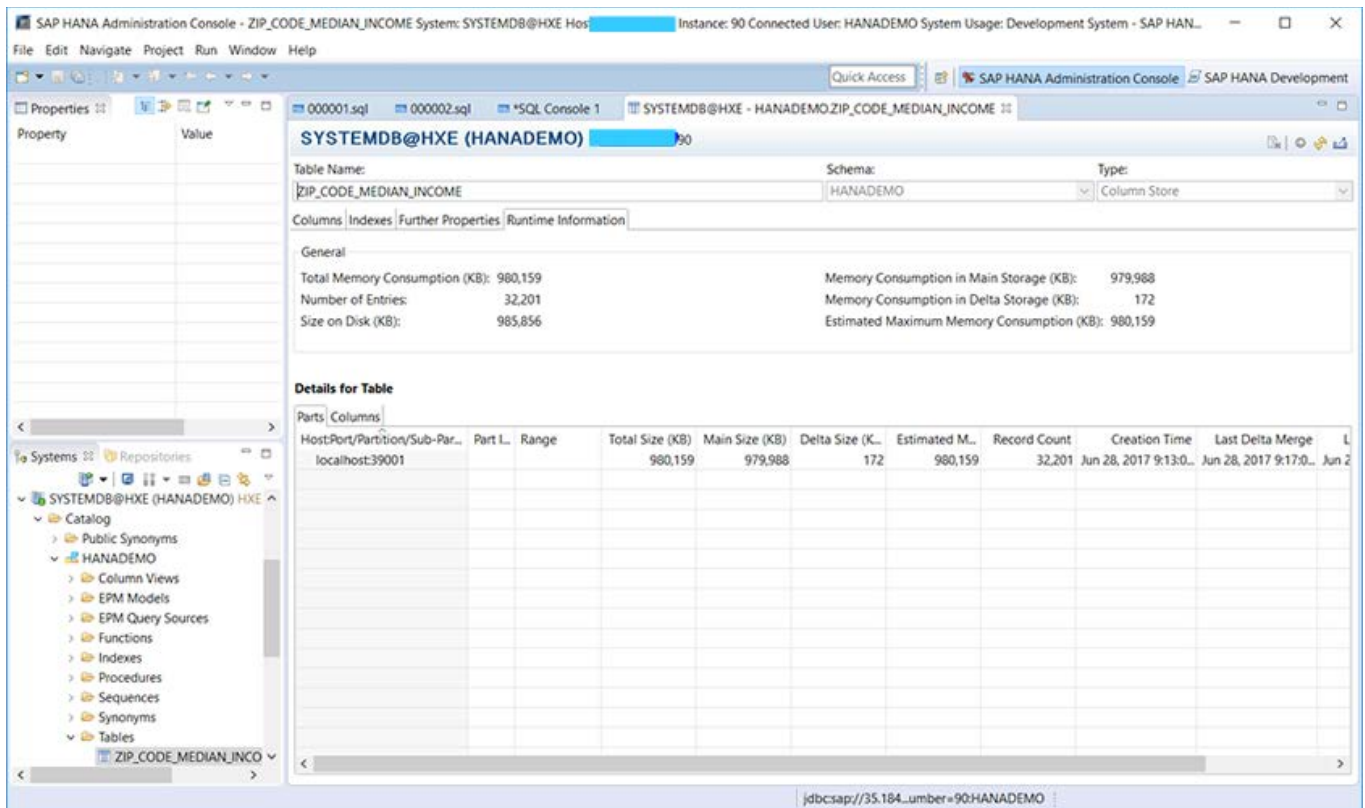
The **Import** dialog appears.



Navigate to the directory where you unpacked the downloaded ZIP file and select the directory it was unpacked to (it should be `HANAZIPCodeExport` unless you gave it a different name). Click Next.



Double click on the table name on the left to add it to the Selected Catalog Objects. Finally, click Finish. Depending upon network speeds, it may take up to 20 minutes to import the table. Keep in mind the polygons for ZIP Codes are quite complex (they can contain 100s of vertices) and the rows are quite large. When the import is done, here is what the table information looks like:



Now that the data is loaded in SAP HANA, you're ready to start exploring with ArcGIS Pro.

SHINE Data

If you downloaded and installed SHINE for HANA Express 1.0 SPS12, this data was loaded as part of the install section above. There is extensive documentation (referenced earlier in this tutorial) on what can be done with SHINE including spatial. It centers around procurement use cases – SHINE provides an excellent introduction to HANA and HANA Express capabilities. The SHINE data is representative of SAP transactional data and includes lat/long coordinates. You can explore consuming the SHINE data in ArcGIS and pulling in Living Atlas and Tapestry data to enrich it. Conversely, you can export a feature layer to SAP HANA and mash it up with the SHINE data. The key point is you'll get a feel for what SAP transactional data looks like and what you can do with it from a spatial and spatial analytics perspective.

Working with ArcGIS Pro and SAP HANA Express

Performing analytics with ArcGIS Pro

Workflows

The 2017 Median Family Income data and analysis

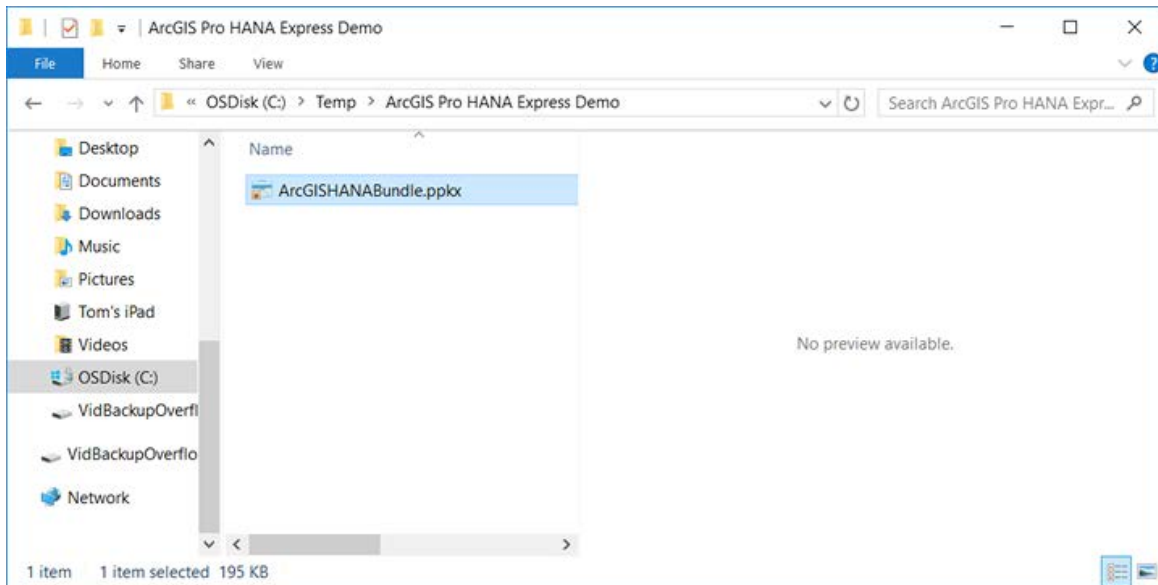
2D Map View

You'll be able to view the 2017 Median Income by ZIP Code and view the ZIP Codes' attributes for incomes greater than or equal to \$120,000.

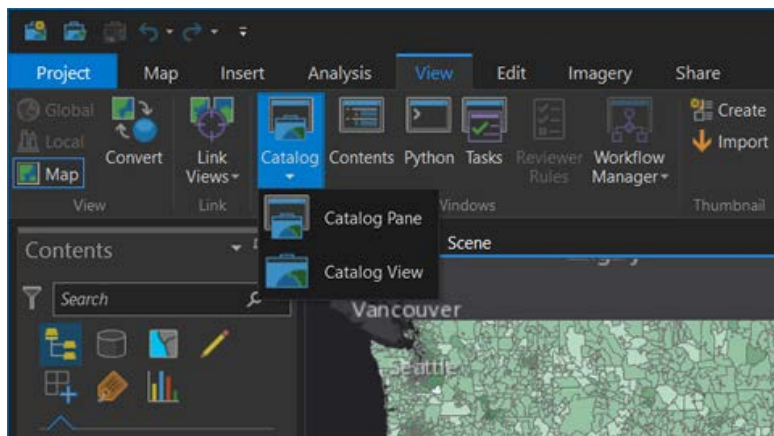
This workflow shows the graduated color symbology by 2017 Median Income family income. We will use the data loaded in a previous section of this document and fold in Demographic data from the Living Atlas data

accessible through ArcGIS Online. Keep in mind that accessing ArcGIS Online data may use ArcGIS Online credits. There's literally thousands of basemaps and layers covering demographics, spending, lifestyle and business data. You can browse through what's available [here](#).

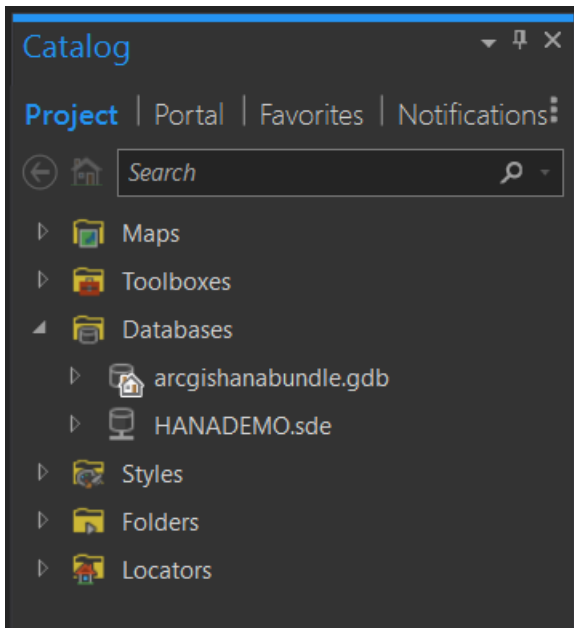
To open the ArcGIS Pro Project package, navigate to and double click on the ArcGIS Pro Project package file that you downloaded earlier.



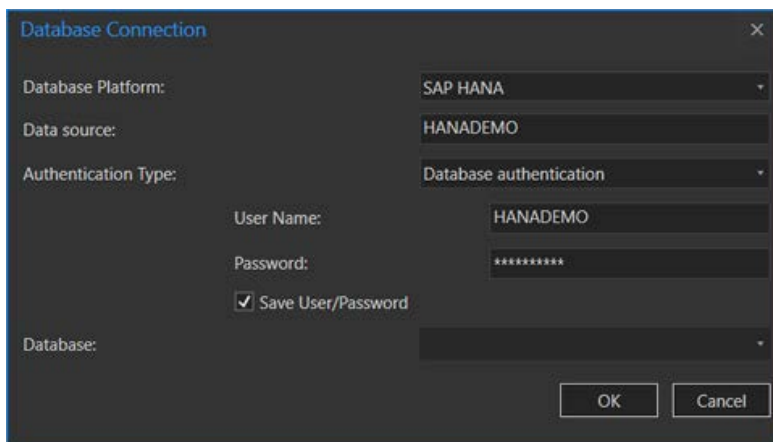
ArcGIS Pro will open and unpack the Project. The ZIP Code feature layer will not appear because the password used to setup the project is different than the one you specified for the HANADEMO user created earlier. You'll need to change the password by editing the layer's data source. If the **Catalog** pane on the right side of the ArcGIS Pro window isn't open, click on the View menu item above the ribbon and select **Catalog**, then **Catalog Pane** as shown below.



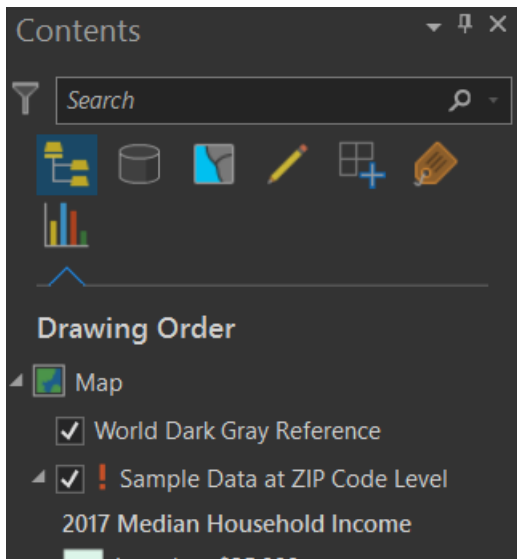
In the **Catalog** pane on the right side, expand the **Databases** folder.



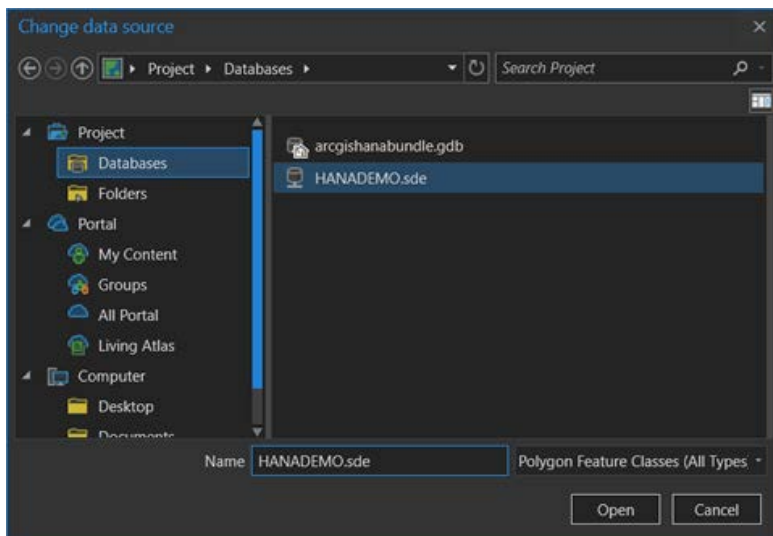
Right click on the `HANADEMO.sde` entry and select **Connection Properties**. The following screen will appear. Enter your password for the `HANADEMO` user and click OK.



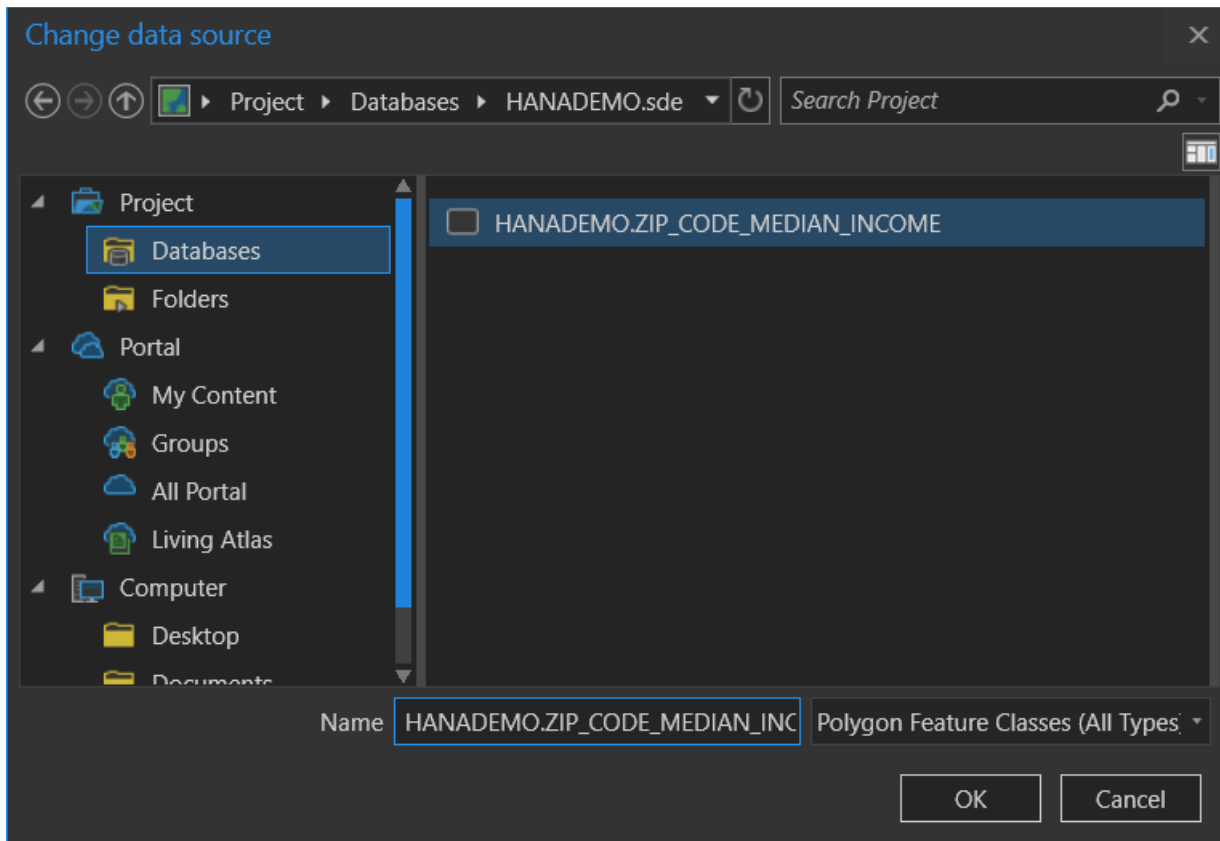
Next, you'll need to change the data source for the layer in the **Contents** pane on the left-hand side of the ArcGIS Pro window. Click on the exclamation point next to the **Sample Data at ZIP Code Level** layer.



This will bring up a **Change data source** dialog.

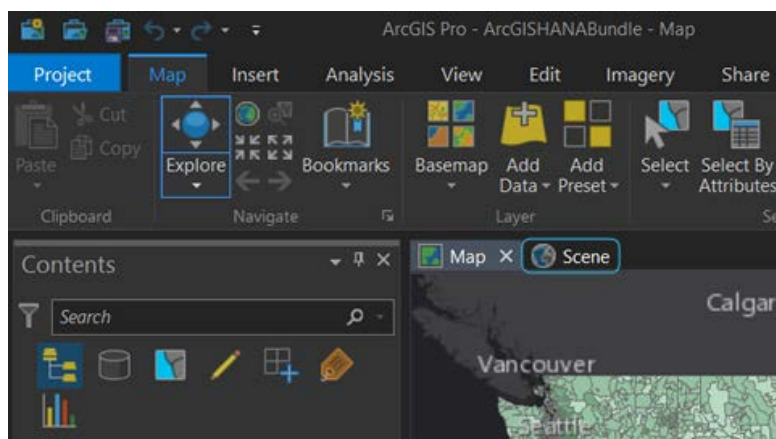


Double click on the HANADEMO.sde data source. The following dialog will appear.

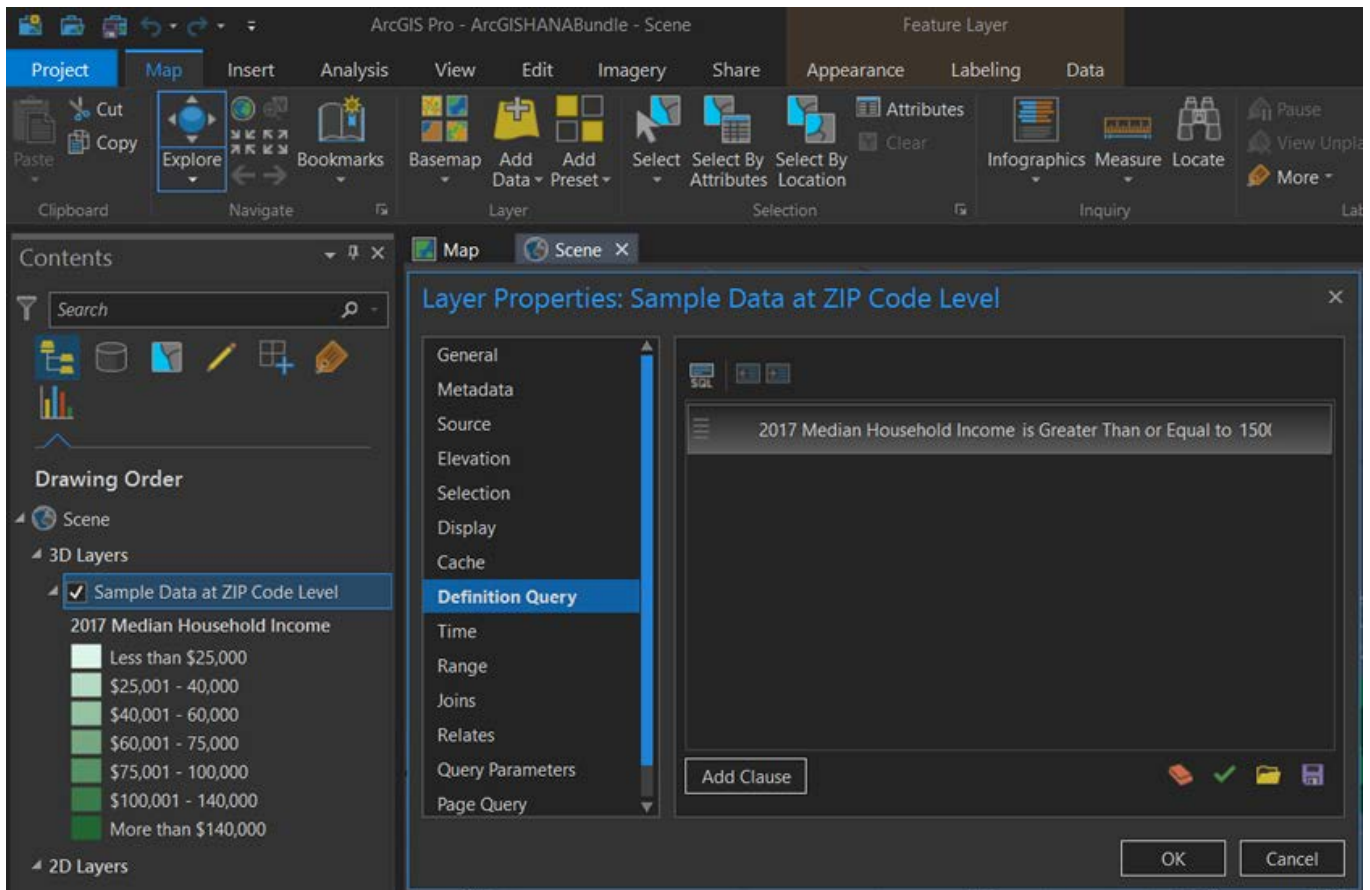


Double click on the HANADEMO.ZIP_CODE_MEDIAN_INCOME table. The layer should now render and appear on the map.

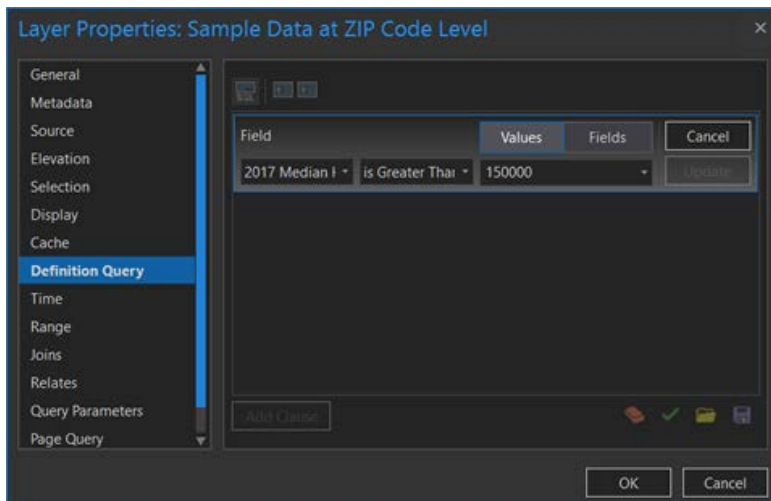
Next, we need to modify a filter to the 3D layer in the 3D Scene. Click on the **Scene** tab here:



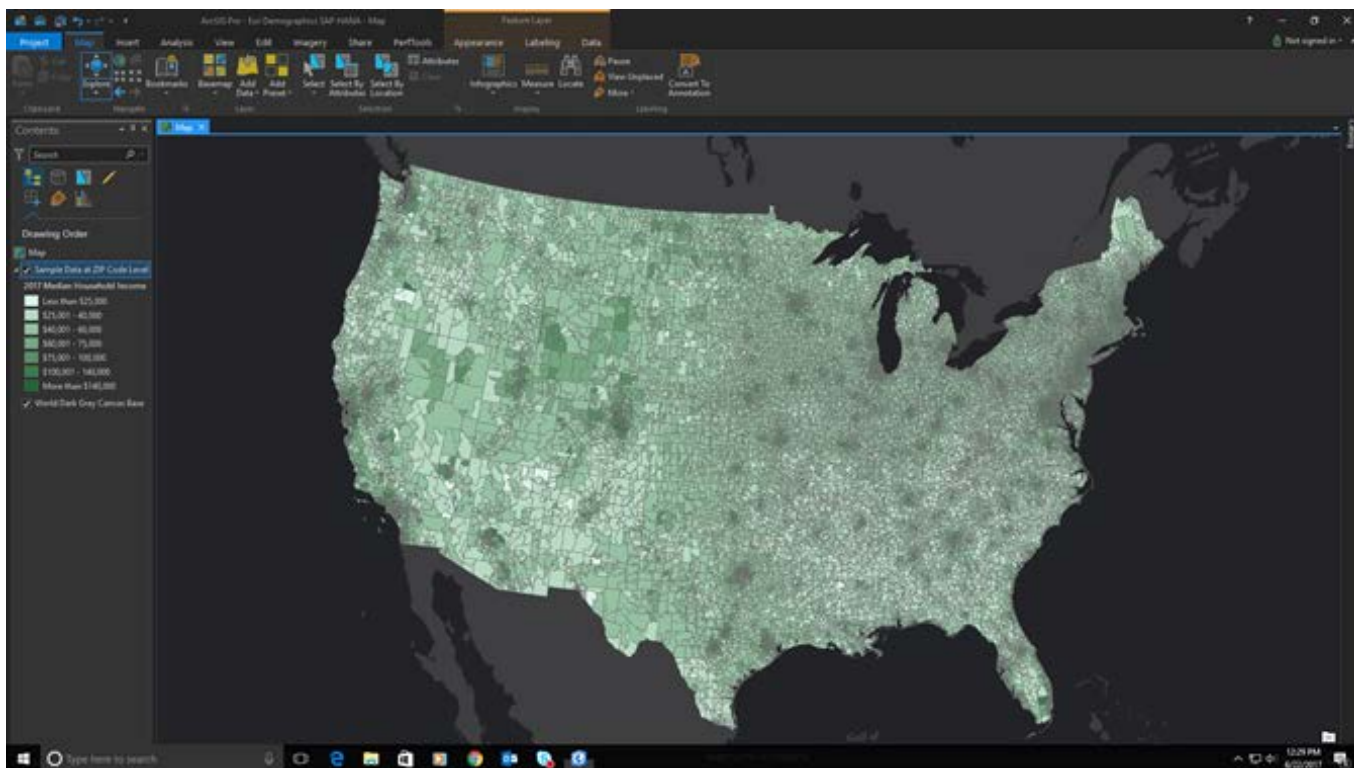
Let's change the filter to show ZIP Codes that have a median income greater than or equal to \$100,000. Right click on the *Sample Data at ZIP Code Level* layer, select **Properties** and the **Layer Properties** dialog will display.



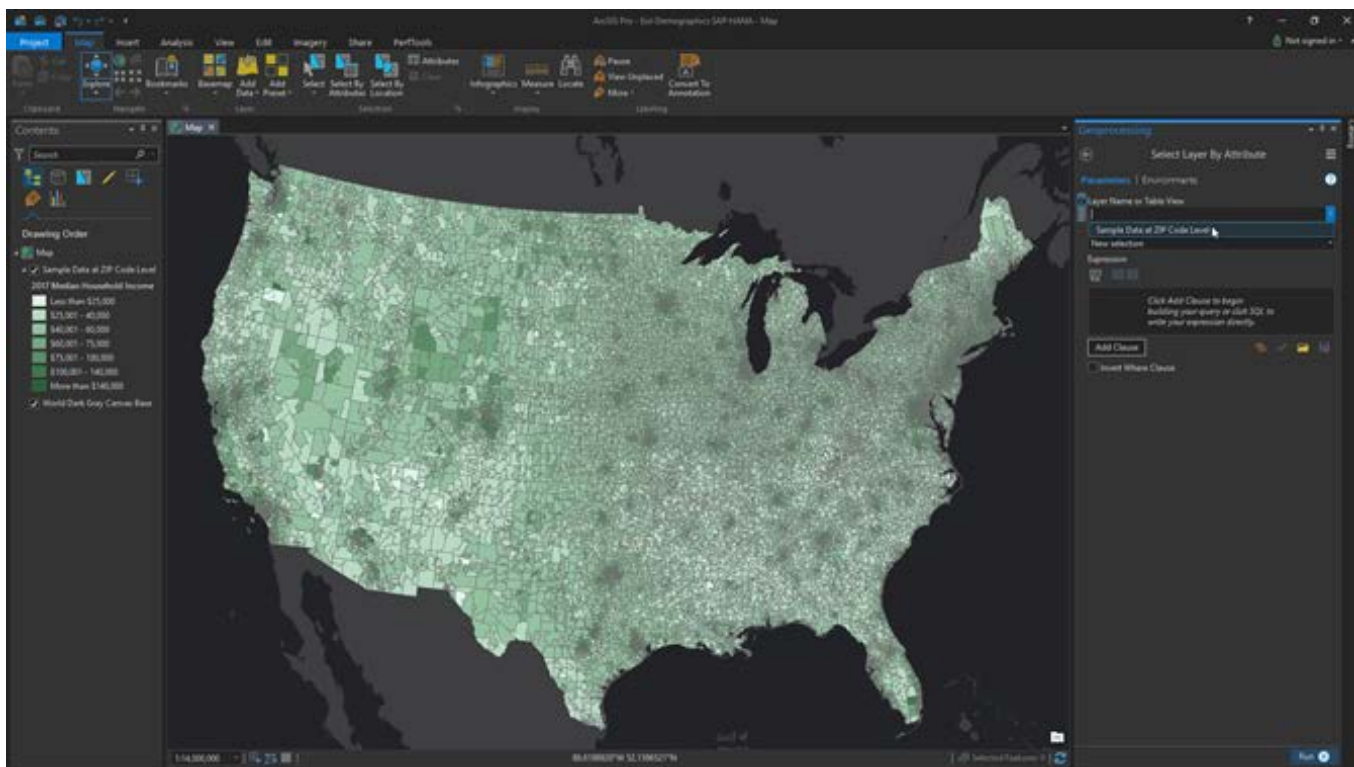
Click on **Definition Query** and hover over the query clause entry in the right pane. Click on the pencil.



Change the 150000 value to 100000. Click **Update**, then click **OK**. The layer will update and render.

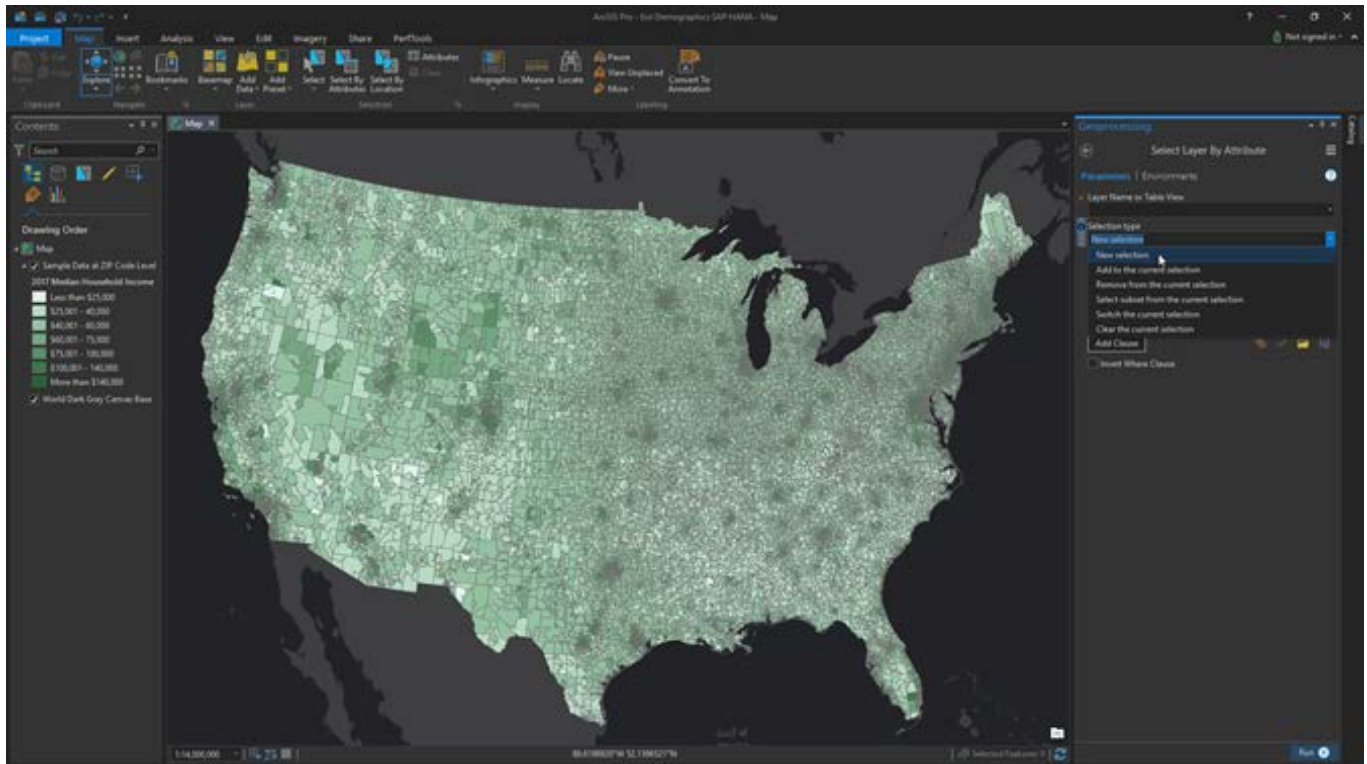


Once the 3D Scene refreshes, you can proceed with the tutorial. In this example, we are using ArcGIS Pro 2.0. Click on the **Map** tab then on the **Map** ribbon. Click on the **Select by Attributes** icon.

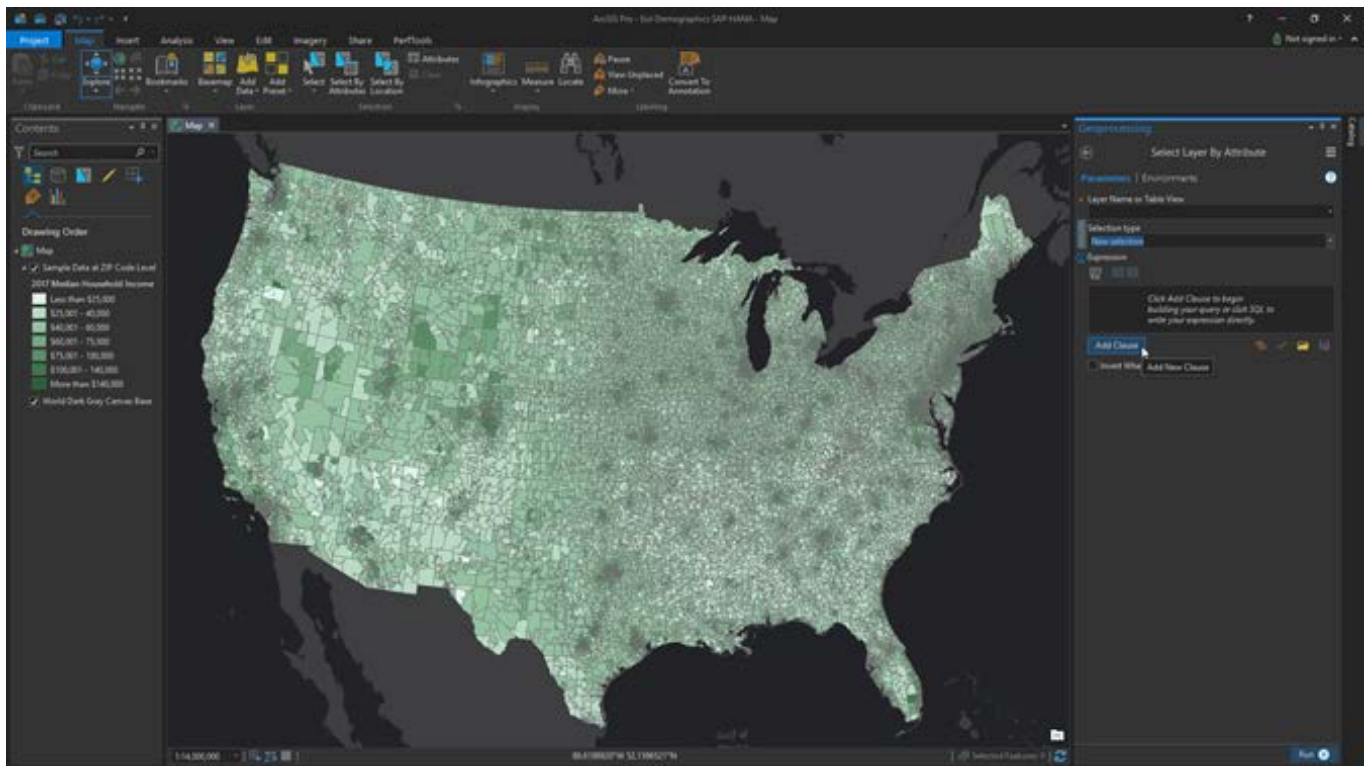


A **Geoprocessing** pane will appear, waiting for inputs for the **Select Layer by Attribute** command. From the **Layer Name or Table View**, select **Sample Data at ZIP Code level**.

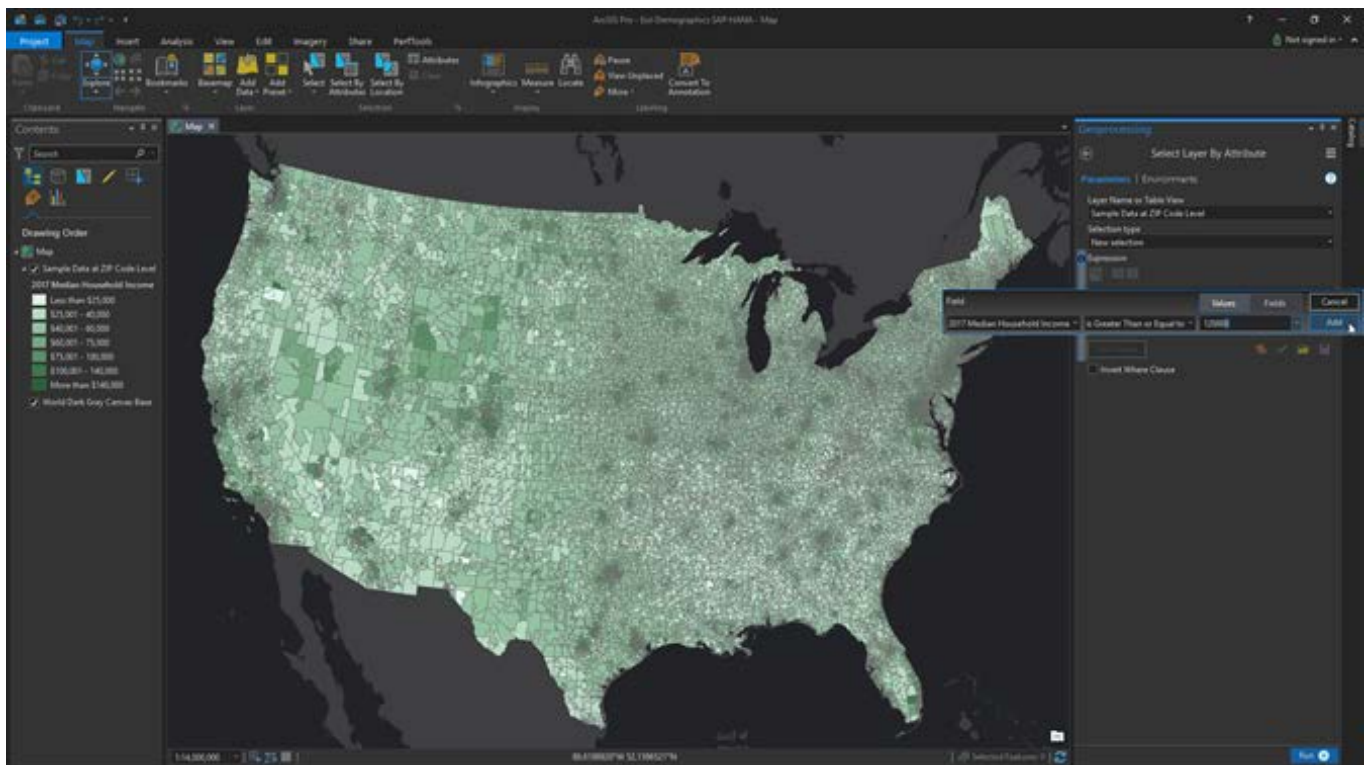
For the **Selection Type**, choose **New Selection**.



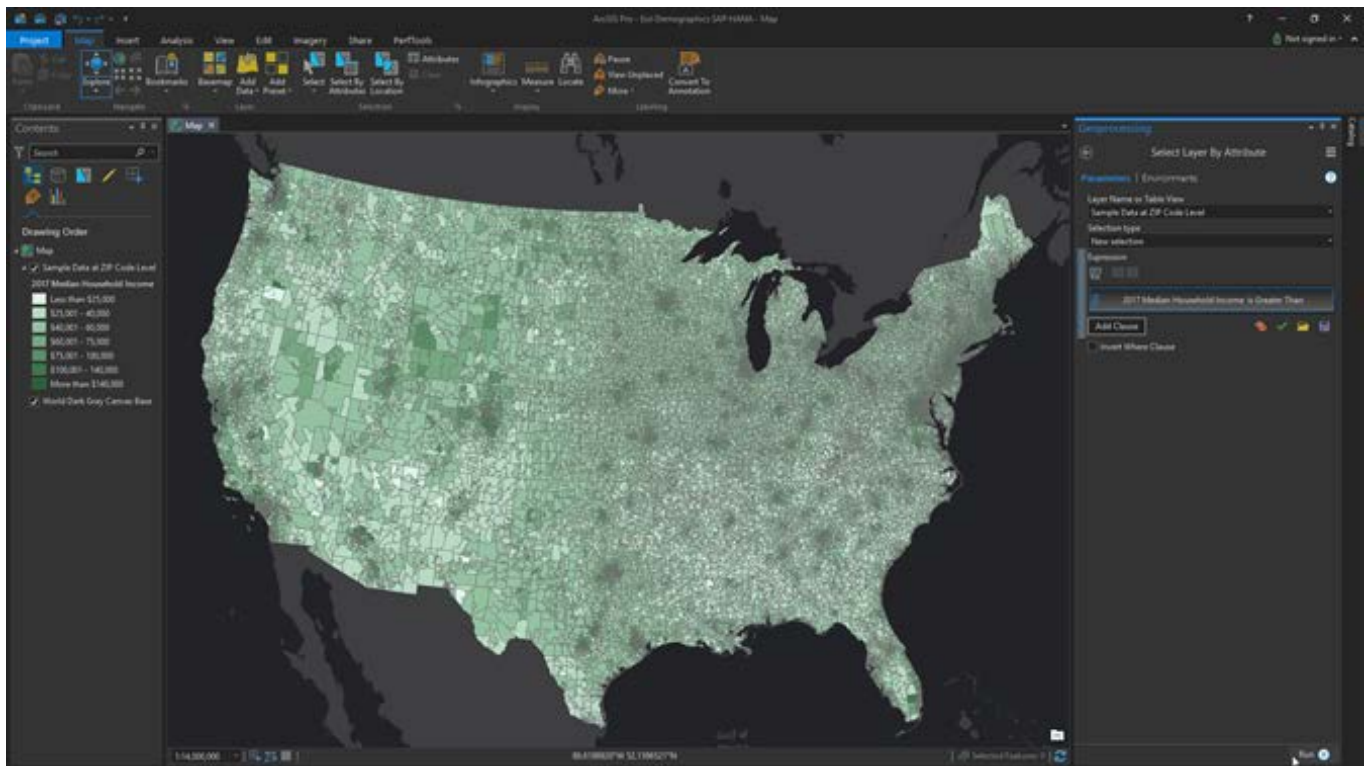
Select the **Add Clause** button.



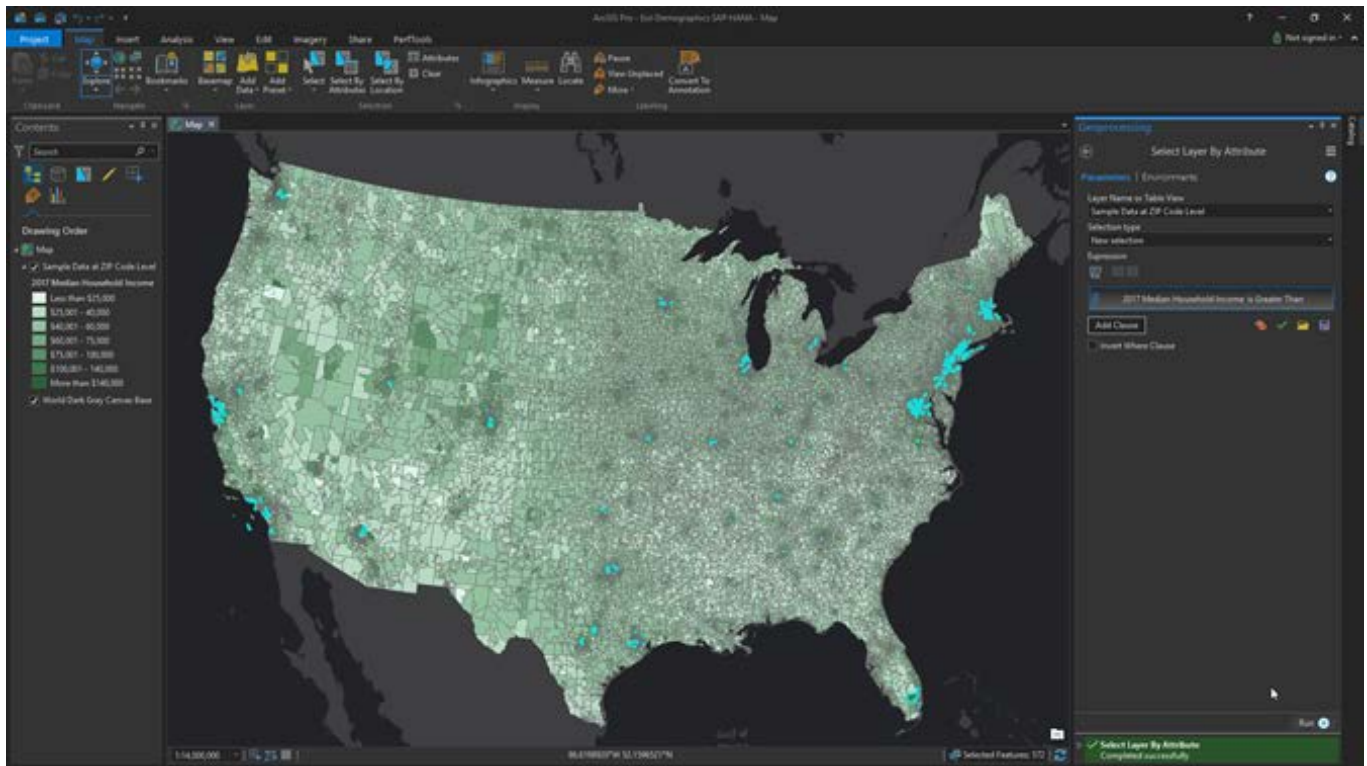
Using the dropdowns to select, choose Field **2017 Median Household Income** is **GREATER THAN OR EQUAL** to 120000. Click **Add** to add the clause.



The newly-edited clause will appear in a blue outlined box. In the lower right-hand-side of the ArcGIS Pro window, select the **Run** icon.



A green ribbon will appear to indicate the successful execution of the **Select Layer by Attribute** command.



At the same time, the map display will update to indicate those ZIP Codes that have been newly selected that meet the spatial selection criteria (in light blue).

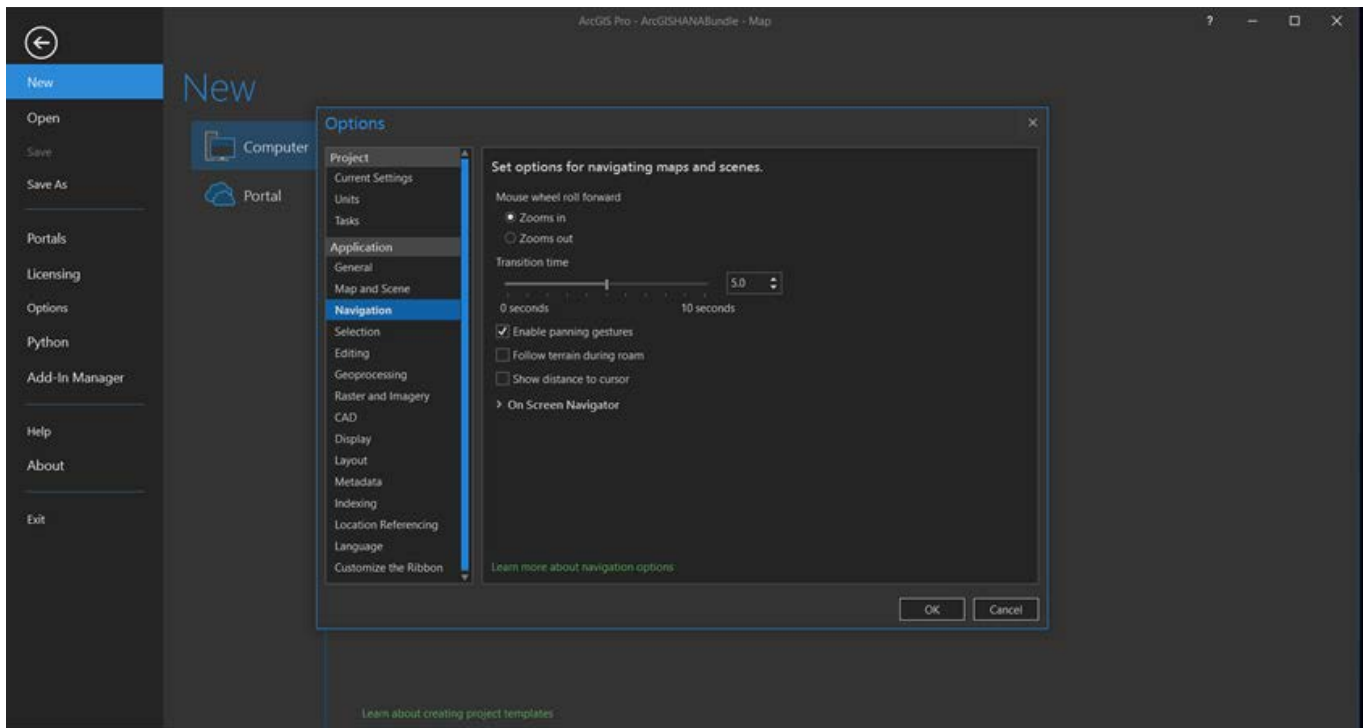
At this point, feel free to pan/zoom around the map, and left-click to identify and get further attribute information about a specific ZIP Code.

3D Scene View

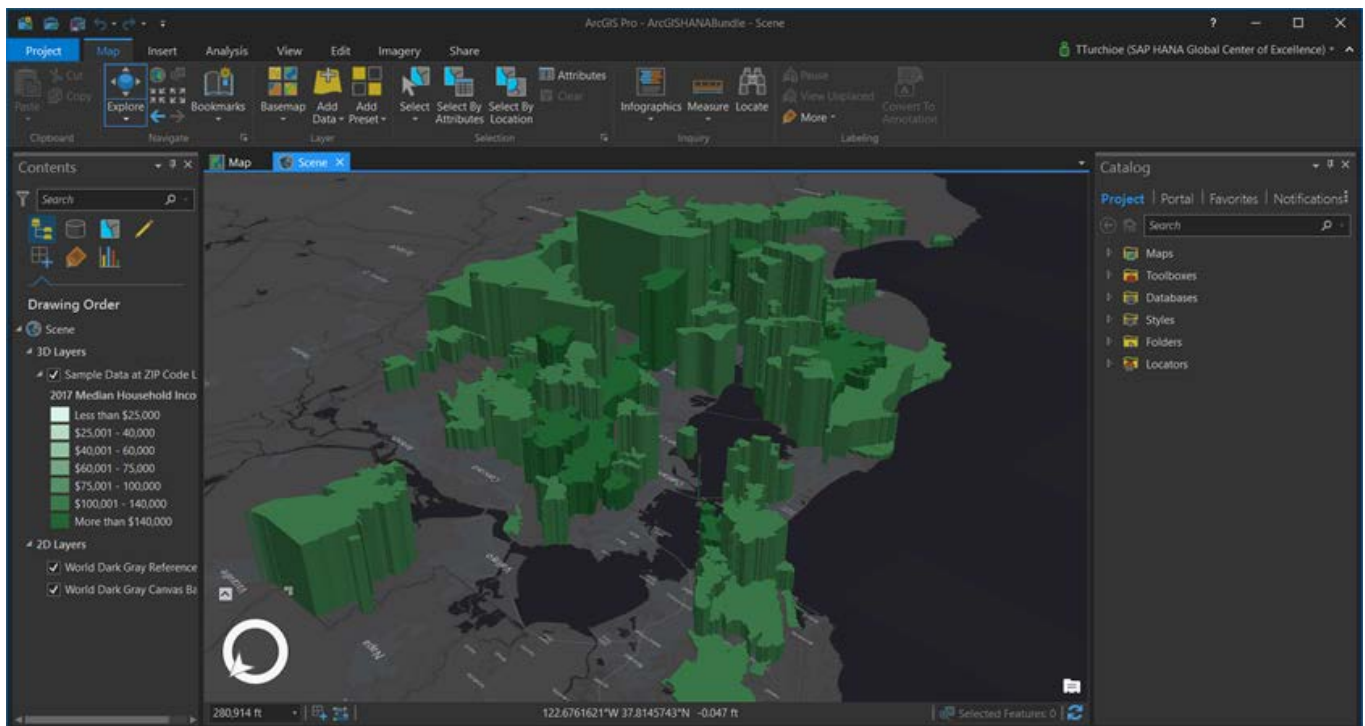
Next, we'll look at 3D scenes in ArcGIS Pro. The project you imported already has the scenes created using the HANA Express data and you can explore the scenes and use the bookmarks to fly around the map.

The 3D scenes are set to filter the displayed ZIP Codes whose median household income is greater than or equal to \$100,000US. We'll show how to change this value below. The height of the 3D extruded ZIP Codes can be based on any numeric value in the underlying HANA Express table. This means you can use values created by using advanced HANA analytics or as the result of streaming data being fed into HANA. In this case, we use the Total ZIP Code population to set the height.

ArcGIS Pro enables you to customize extensively including the base map type and the colors used for the ZIP Codes as shown below. You can also determine the speed of the map fly over when you select different bookmarks. To do this, click on **Project** in the ribbon, then the screen below should appear. Click on **Navigation** and adjust the slider to 5 seconds. Click **OK**.

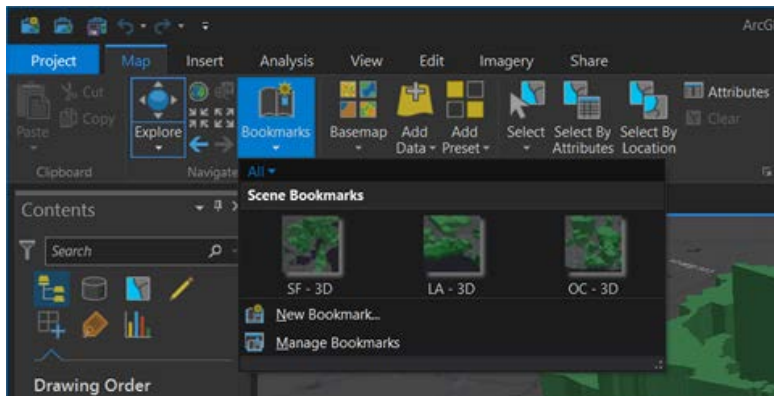


When you click on the **Scene** tab, you should see the following view of the San Francisco metro area. The 3D ZIP Codes displayed have median household income greater than or equal to \$100,000 USD:

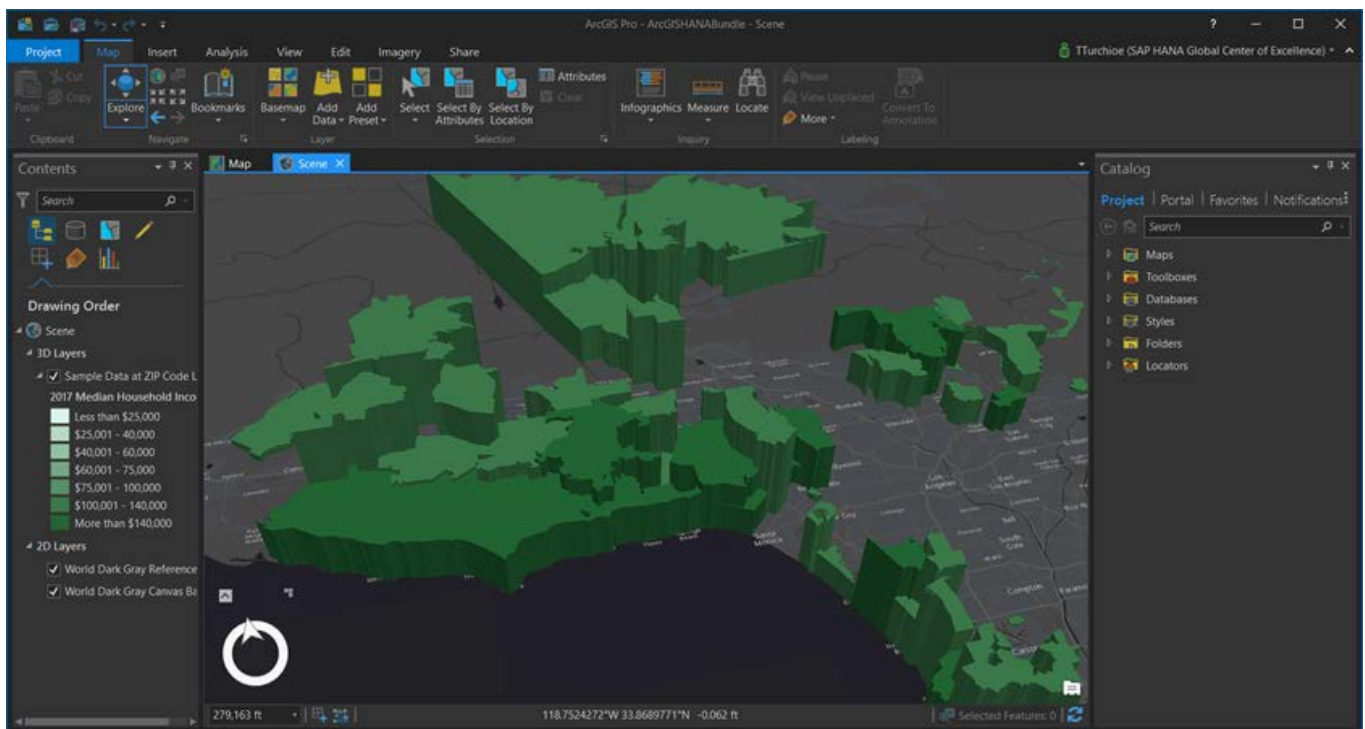


You can drag the cursor around to move around or if you click and hold the middle mouse button or wheel while moving the mouse around, you can change the perspective. If you have a mouse wheel, you can zoom in and

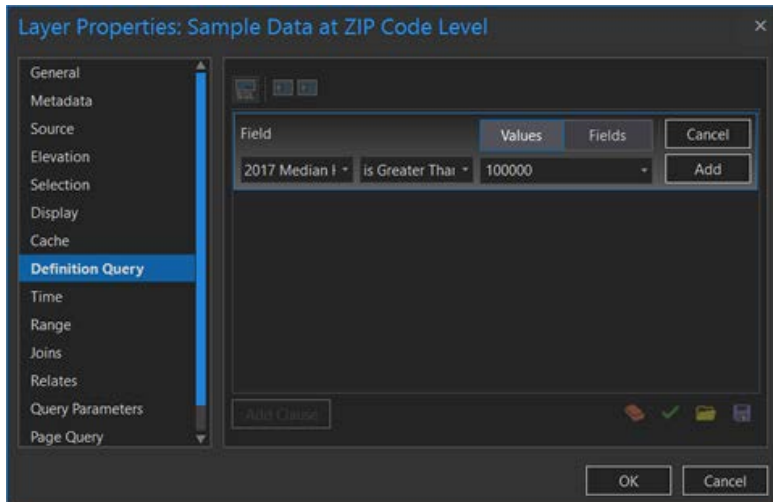
out. Try it and explore. You can use the Bookmarks feature in the ribbon to fly to other areas of California. You can create a new bookmark if you have a view that you want to save for easy reference.



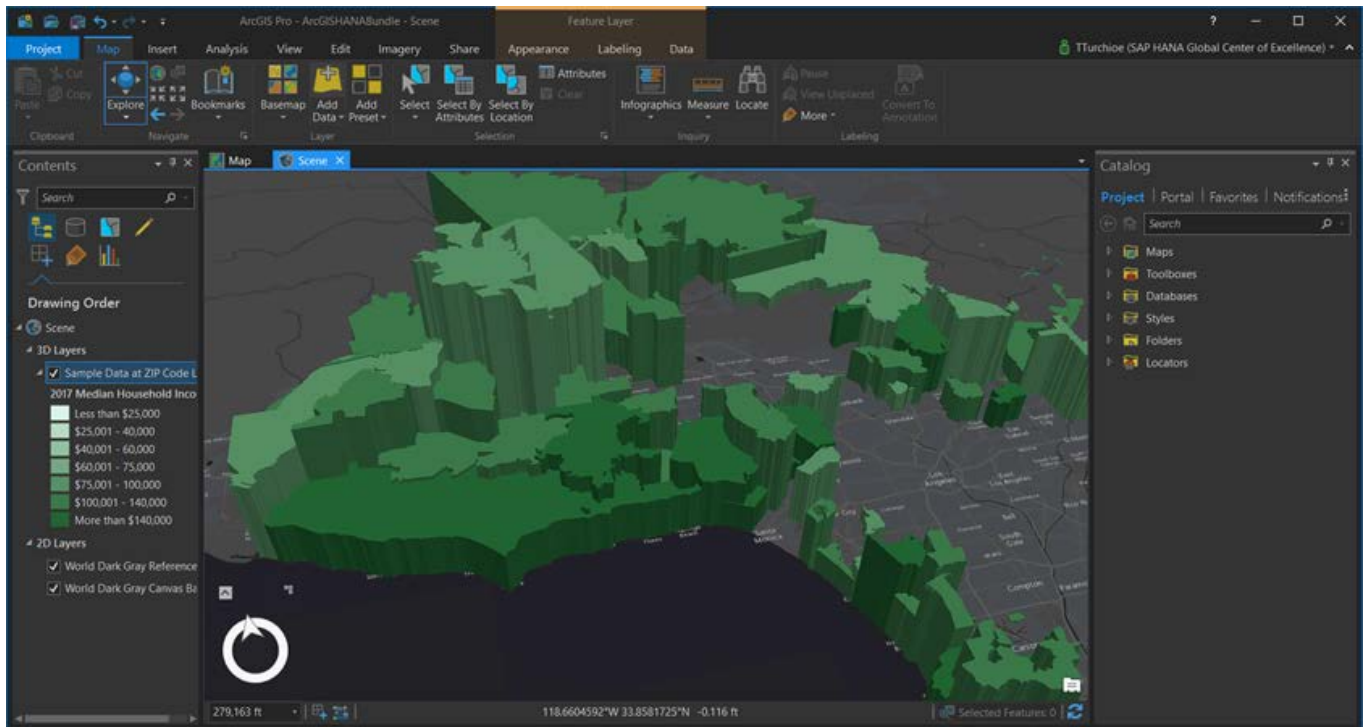
Select LA – 3D to display ZIP Codes in the LA metro area where the median income is equal to or greater than \$100,000.



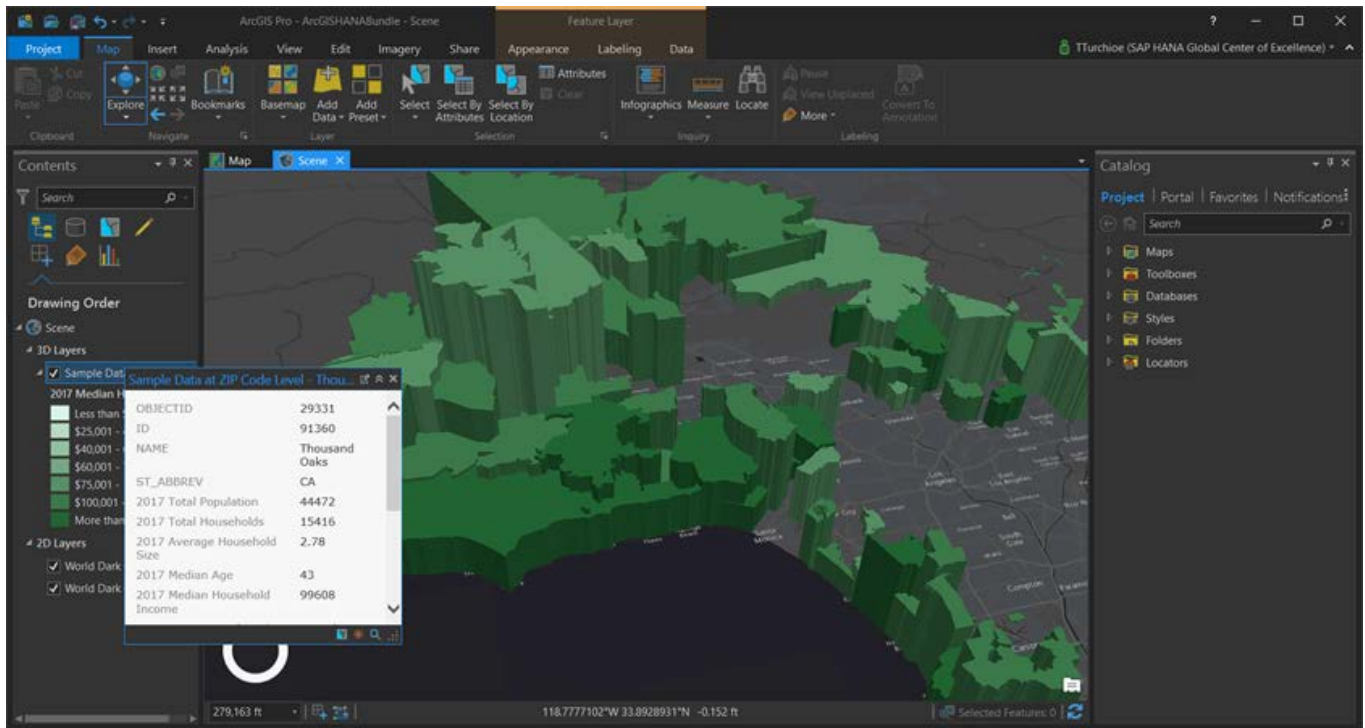
As you've seen previously, changing the filter value for the median income amount is easy. Right click the **Sample Data at ZIP Code** layer in the contents pane and select **Properties**. Pick the **Definition Query** option to display the filter query. You can edit the value. Change it to 90000. Remember, the lower the value, the more 3D ZIP Codes will be displayed.



Click **OK** and the map will redisplay showing the ZIP Codes whose Median Income is equal to or greater than 90000.



Note that more ZIP Codes are shown. You can left click on any of the ZIP Codes to view more information.

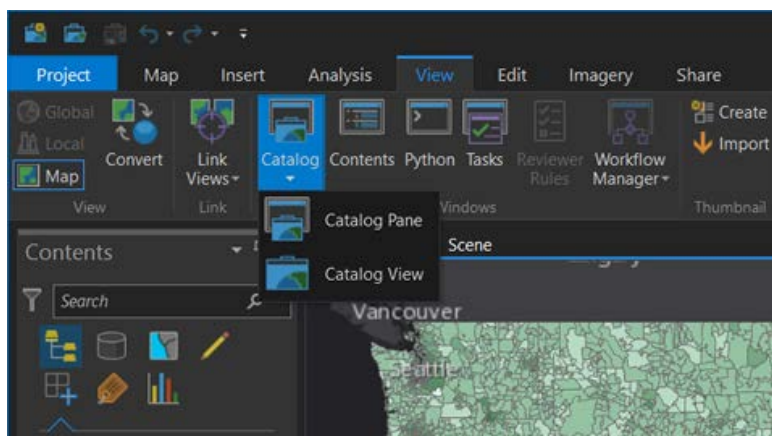


ArcGIS Pro offers quite a bit of flexibility to create visualizations of spatial data in HANA Express.

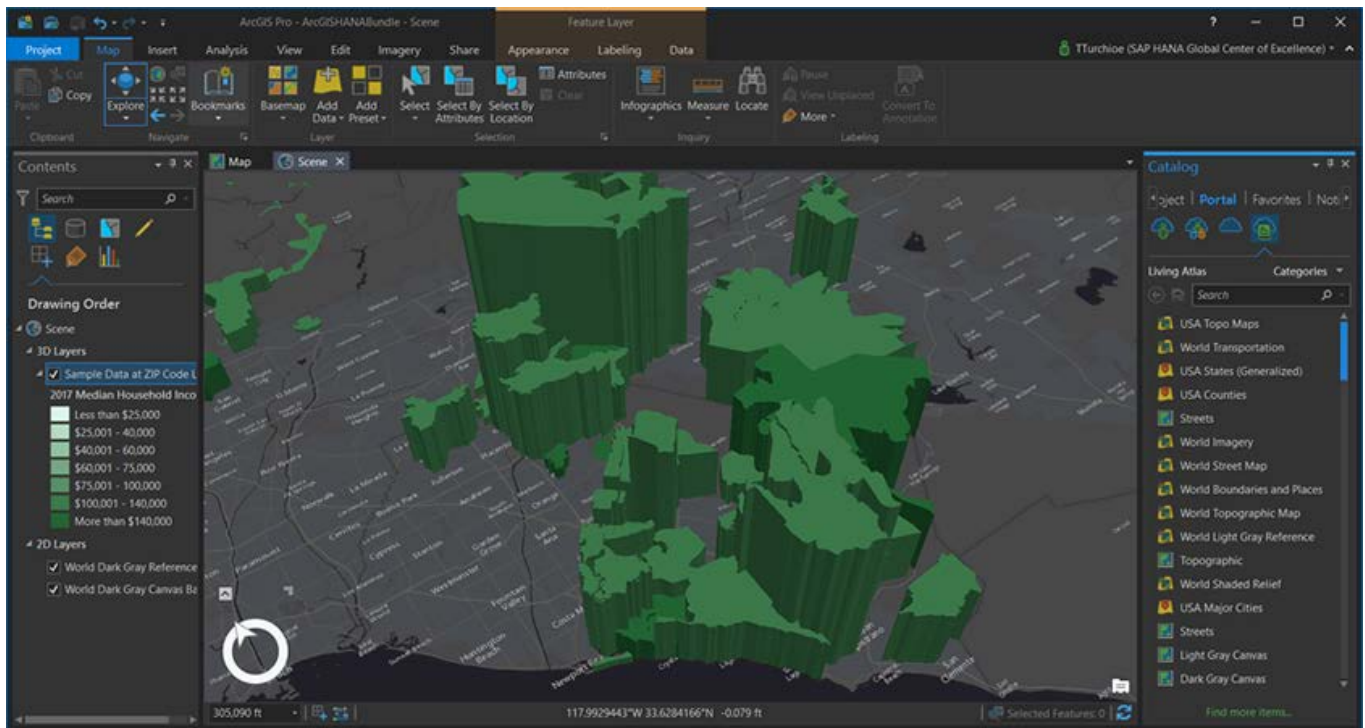
[Incorporating maps and layers from ArcGIS Online](#)

Another powerful feature is the ability to pull in demographic and other data on ArcGIS Pro as described earlier (see [here](#) for the types of data and maps available on ArcGIS Online). In this part of the tutorial, we will pull in 2016 Daytime and Nighttime population information into our ArcGIS Pro project. Note this will require ArcGIS Online credits to utilize this data.

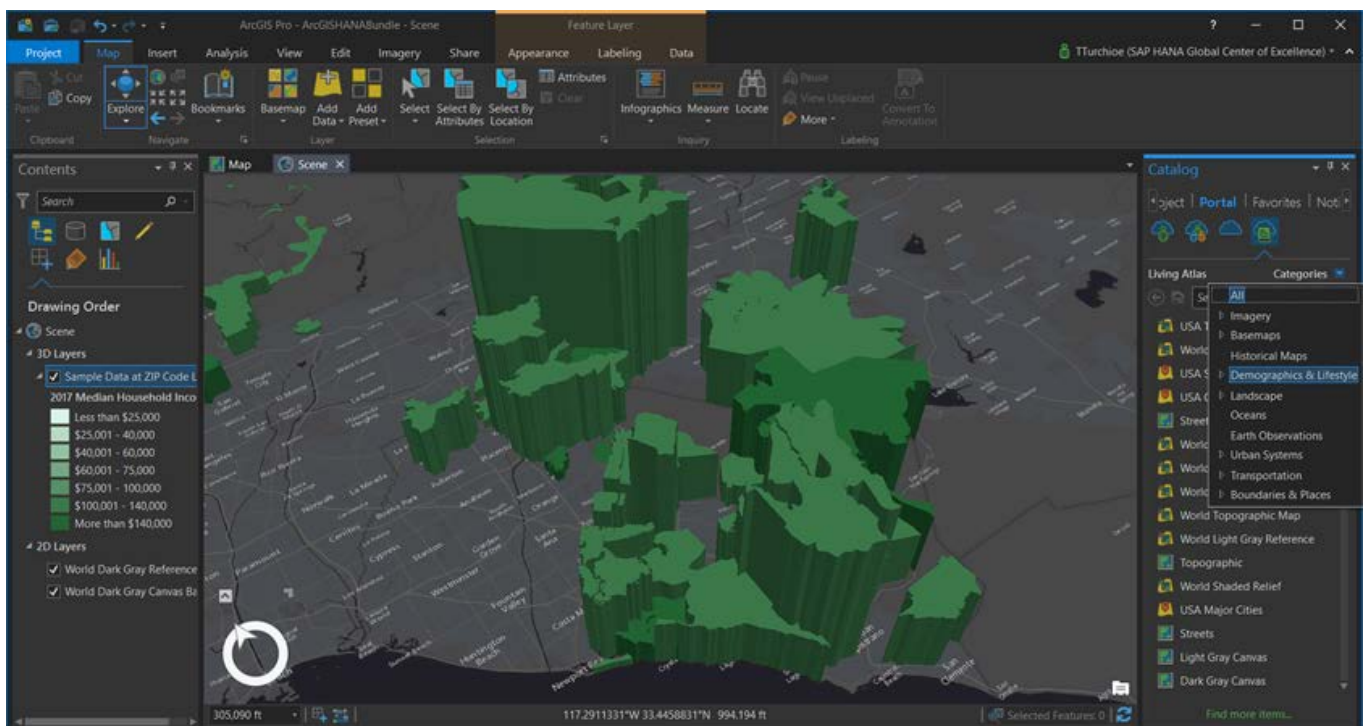
If the **Catalog** pane isn't visible on the right, follow the instructions provided earlier to display it. Here is a screenshot that was shown earlier:



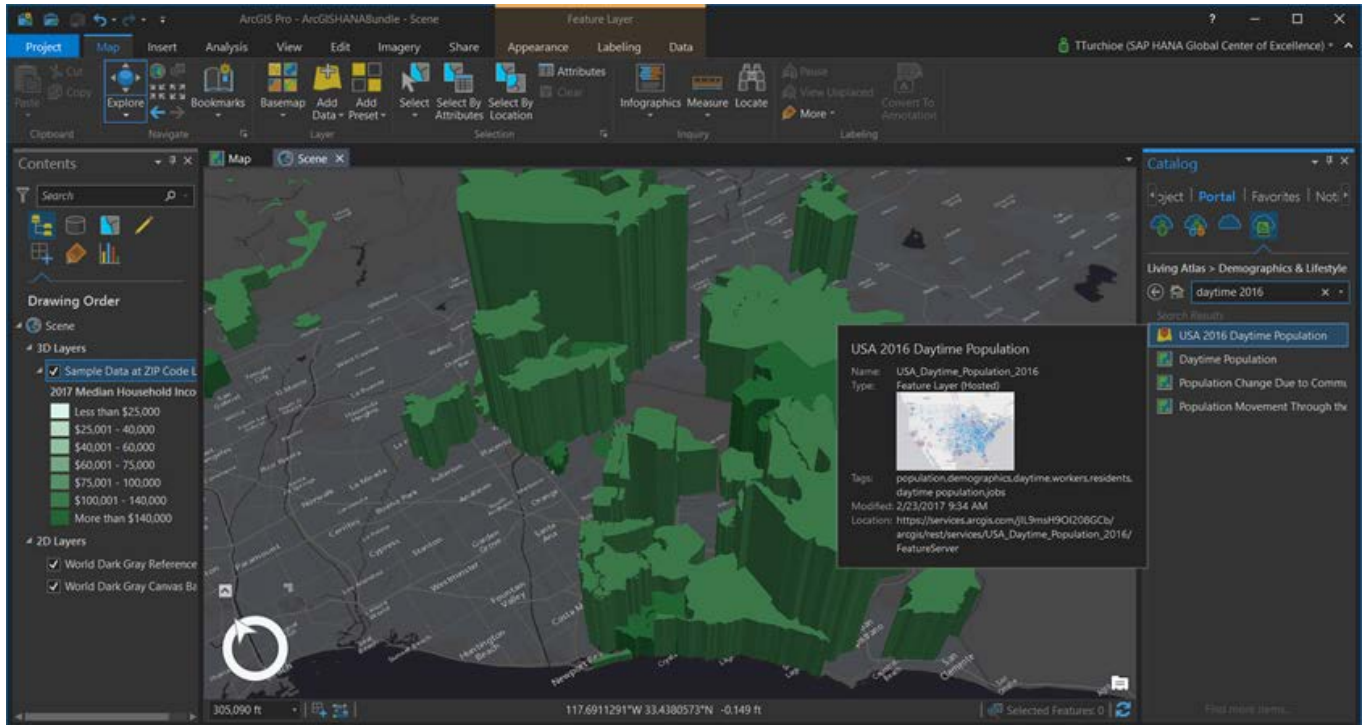
Once the **Catalog** pane appears, click on **Portal**. Then click on the Cloud with the Atlas (see below). You should see the following. Some of the maps and other Living Atlas data are shown.



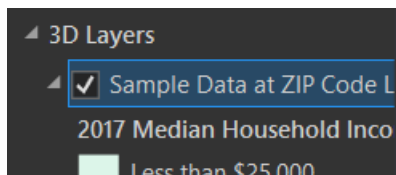
Left click on **Categories** and select **Demographics & Lifestyle**



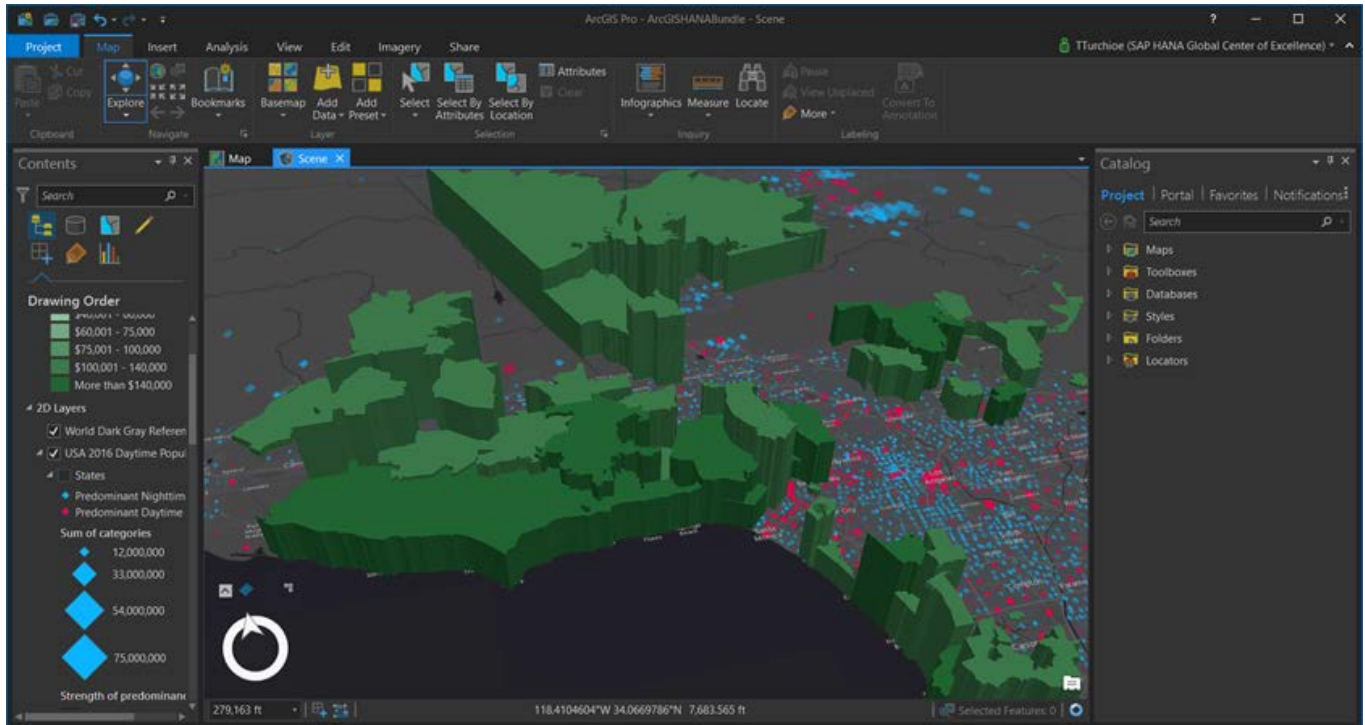
Finally, select the layer and drag it onto the map.



Remember, if you want to view this information that is under the displayed 3D Zip Codes, you can simply uncheck the check box next to the layer in the Contents pane. You can also uncheck the other layers as well.



ArcGIS Pro will draw the new information on the map. The red diamonds and their size indicates the daytime population (see the legend in the **Contents** pane). The blue diamonds and their size indicates the nighttime population.



Conclusion

This tutorial just scratches the surface of what you can do with SAP HANA and the ArcGIS Platform. ArcGIS simple feature services can be exported to SAP HANA and combined with data already in SAP HANA. HANA can be used to integrate and analyze many data sources, perform data mashups and process big data including IoT. Those results can be easily consumed by the ArcGIS Platform for advanced spatial analytics and used in any Esri or custom application that sits on top of the ArcGIS Platform. The ability to bridge silos between the enterprise back office ERP data and operational data in Enterprise GIS provide an almost limitless opportunity to gain insight that wasn't previously possible. We hope you will explore all that you can do with SAP HANA and the ArcGIS Platform. Have fun!