Toronto Police Service

Know Your Neighbourhood (KYN) Application

Implementation Guide: ESRI Dashboard

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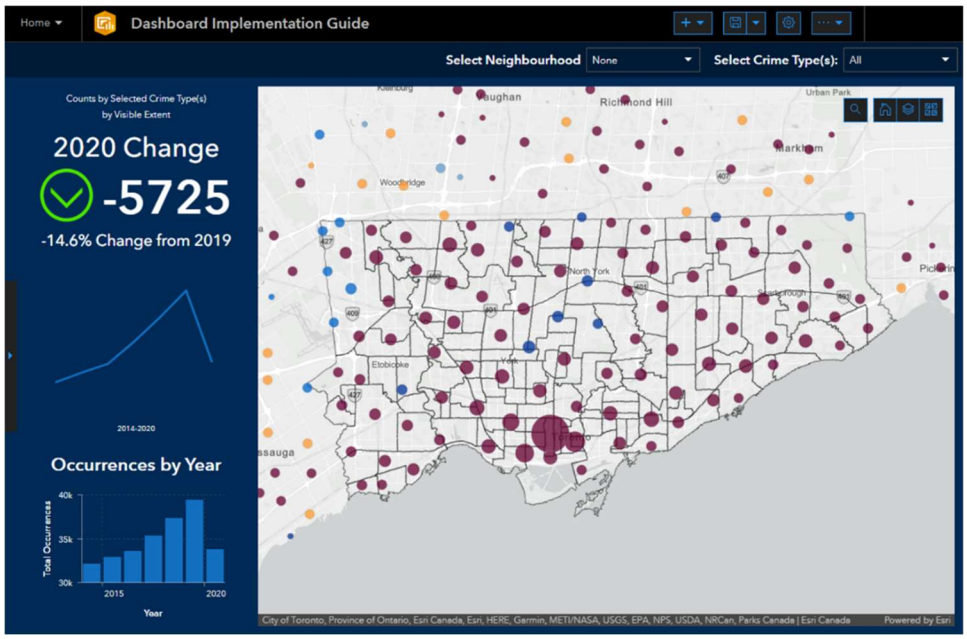
This guide was prepared by students at Fleming College in collaboration with the Toronto Police Service.

Dashboard Set-up and Configuration

This guide outlines how to set-up and configure ESRI Dashboard solutions for use in the Know Your Neighbourhood (KYN) web application. Dashboards act as the "landing page" of the KYN application and allow the user to quickly explore crime data using basic filters and dynamic counts by screen extent. The objective of this page is to provide this information is the quickest and easiest way possible.
These dashboards will be utilized in the final Experience Builder application using an embedded item widget. As such, the Dashboard application is meant to be formatted to blend into the existing Experience Builder. To allow for use on both desktop and mobile devices, all dashboards will be built twice with distinct set-up and configuration to capitalize on different screen sizes.



Completed example of desktop Dashboard configuration using Major Crime Indicators.

The set-up and configuration of the desktop Dashboard applications will be completed over the following sections:

a) Basic Dashboard Navigation and Widget Placement
b) Widget Set-up and Design Specifications
c) Actions and Filters

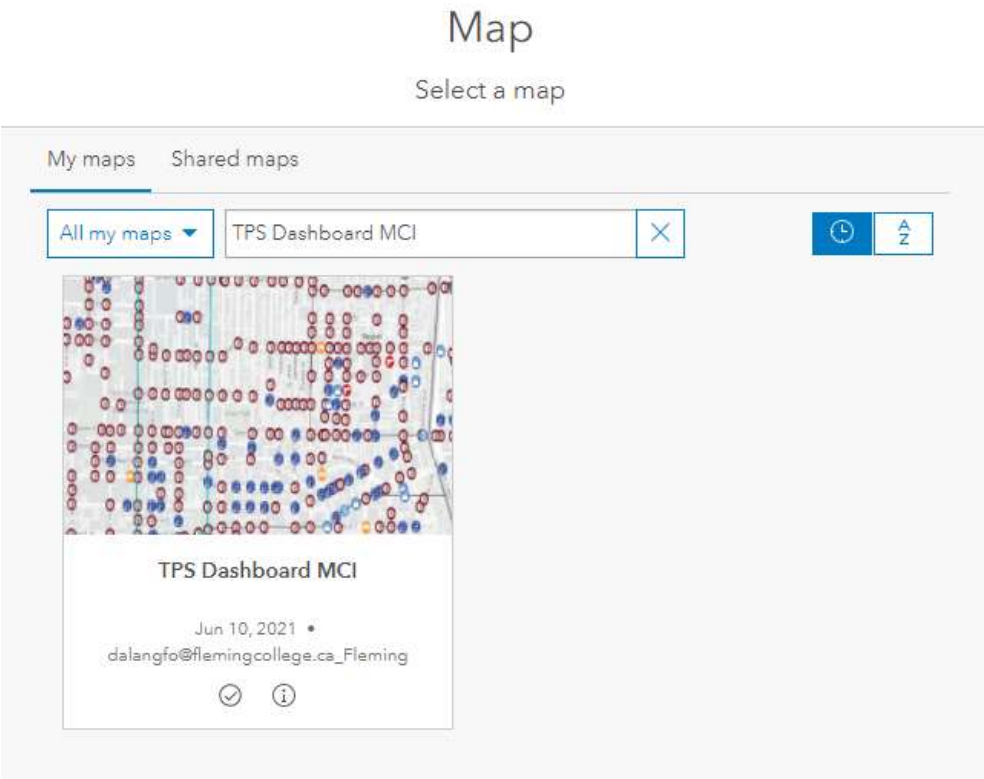
These sections will be further broken down to walk the user through the building of an example dashboard (as seen in the image above). Following this the steps required to modify the desktop dashboard for mobile use will be explained.

Once completed, additional Dashboards can be developed following these steps.

Basic Navigation and Widget Placement

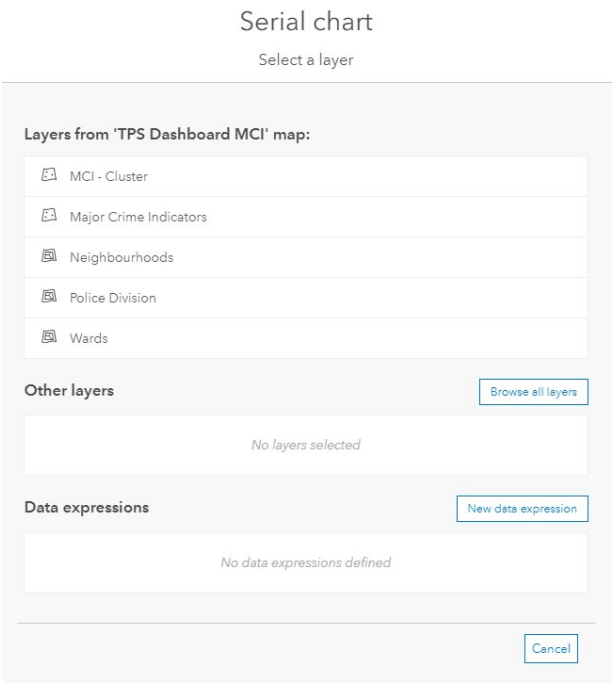
1) **Adding Widgets to your Workspace:** With your blank Dashboard canvas open, you can add widget by navigating to the + button at the top of the page. When this is clicked you can see the number of widget options available for use in Dashboards. For this application, we will be using the **Header, Side panel, Map, Serial chart, and 99! Indicator (Indicator)**.

   The first widget to add will be the **Map**. Once selected you will be asked to select a web map that you wish to use for the application. Navigate to your preferred map and press **SELECT**. Once you have selected your map you will be brought to the configuration window. For the time being, leave this section unconfigured and select **Done**.



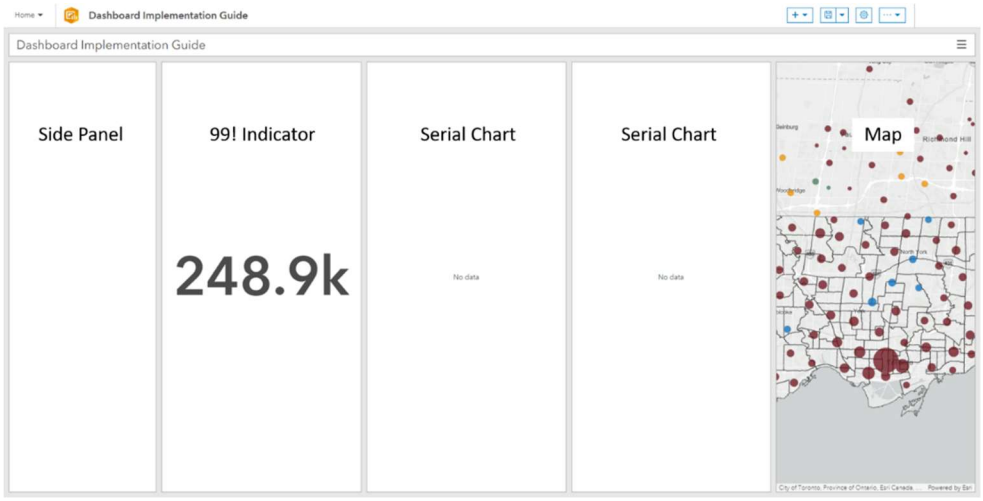
Selecting your web map for use in Dashboard application.

2) **Add two Serial charts and one Indicator:** When these widgets are added you will be asked to select a layer from your web map that you wish to display. For this example, the Major Crime Indicators layer was selected to allow for counts of crimes to be displayed by the widgets. Leave the configurations for the widgets as-is and select Done.



Selection of layer for use in Serial charts and 99! Indicator.

3) **Add the Header and Side panel and widgets**: Once selected you will be brought straight to the configuration screen. Once again, leave the widgets as-is and select Done. Once completed your Dashboard canvas will look like the figure below.

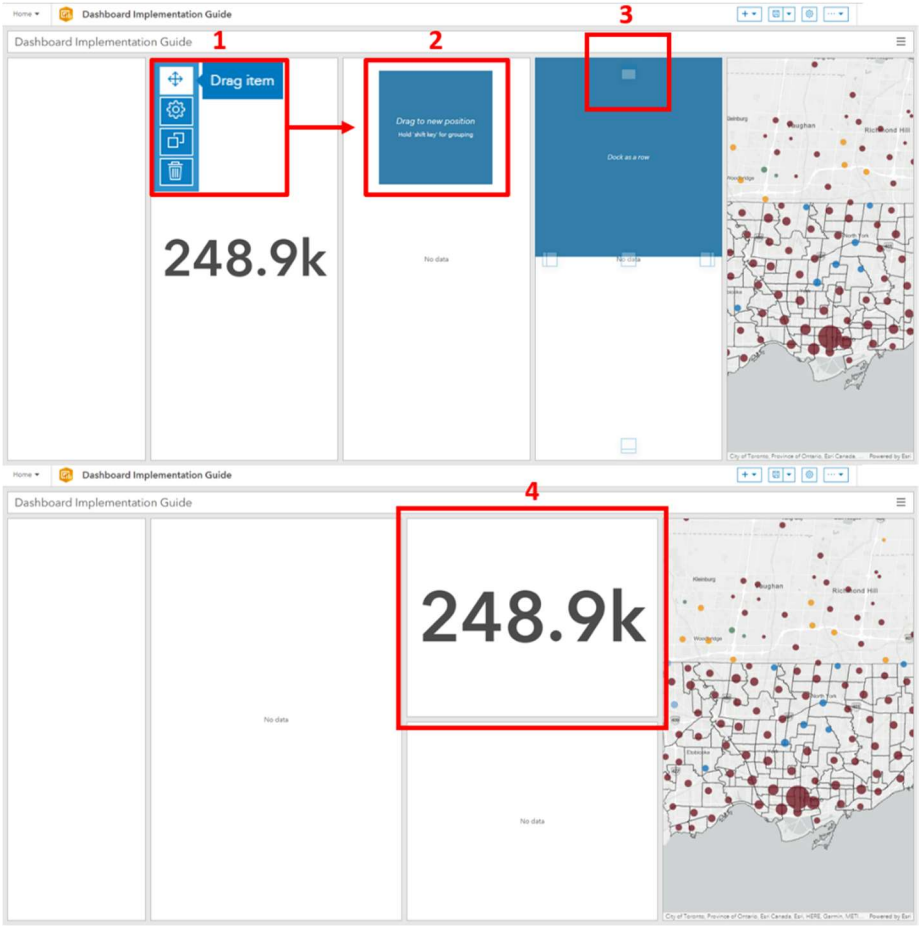


Dashboard canvas following addition of widgets (no configuration).

Setting up the Dashboard Canvas

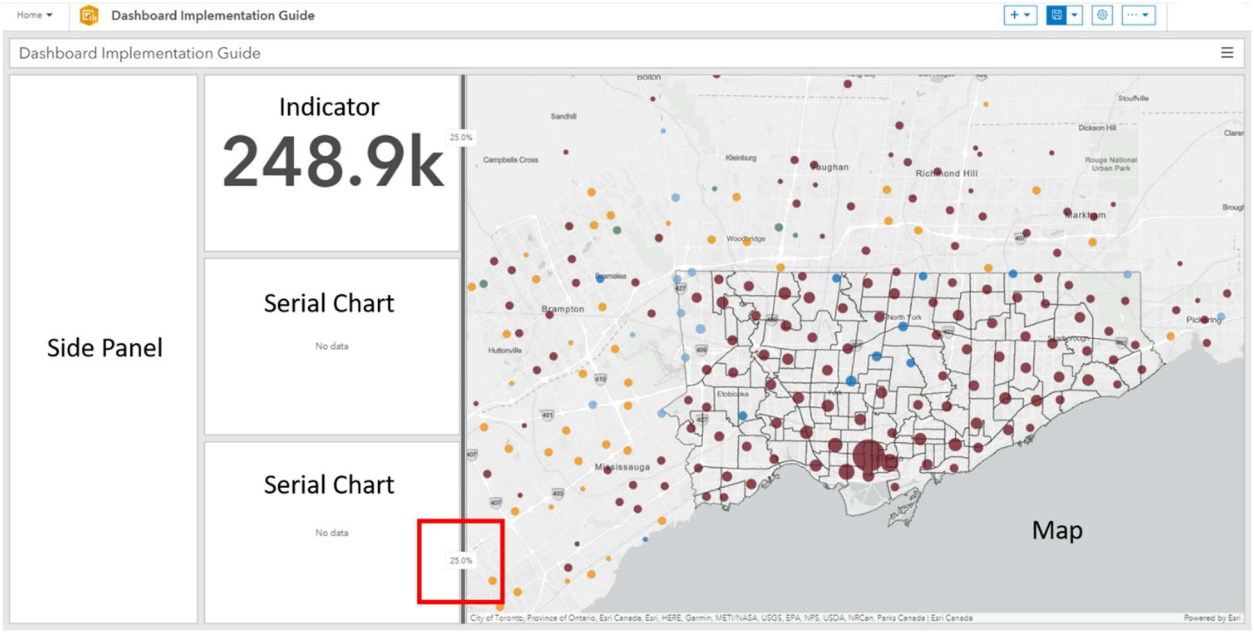
1) **Arrange Dashboard:** With all the necessary widgets added to the Dashboard canvas, the items can now be moved into position. To move widgets, hover over the upper left corner of the widget area until an options dropdown menu appears. From this menu select the Drag item option by clicking and holding the mouse. With Drag item selected, you will now see the Drag to new position box. Dragging the widget, you will now see options to dock the item as a column, a row, or to stack the widget on top of another. Additionally, you can how SHIFT to group widgets together.

   For this application, move to the **Indicator**, select Drag item, and drag the widget to the row on the right of your map. Bring the widget to the top until the Dock as a row option is visible and the blue box expands to cover the upper half of the row and release the widget. The **Indicator** widget will now be sitting above one of the **Serial Charts** as seen below.



Moving widgets in dashboard: 1) Click and hold Drag Item, 2) Drag item until blue box appears, 3) Move widget up upper portion of row until Dock as a row option appears, 4) Release widget to dock at top of row adjacent to map.

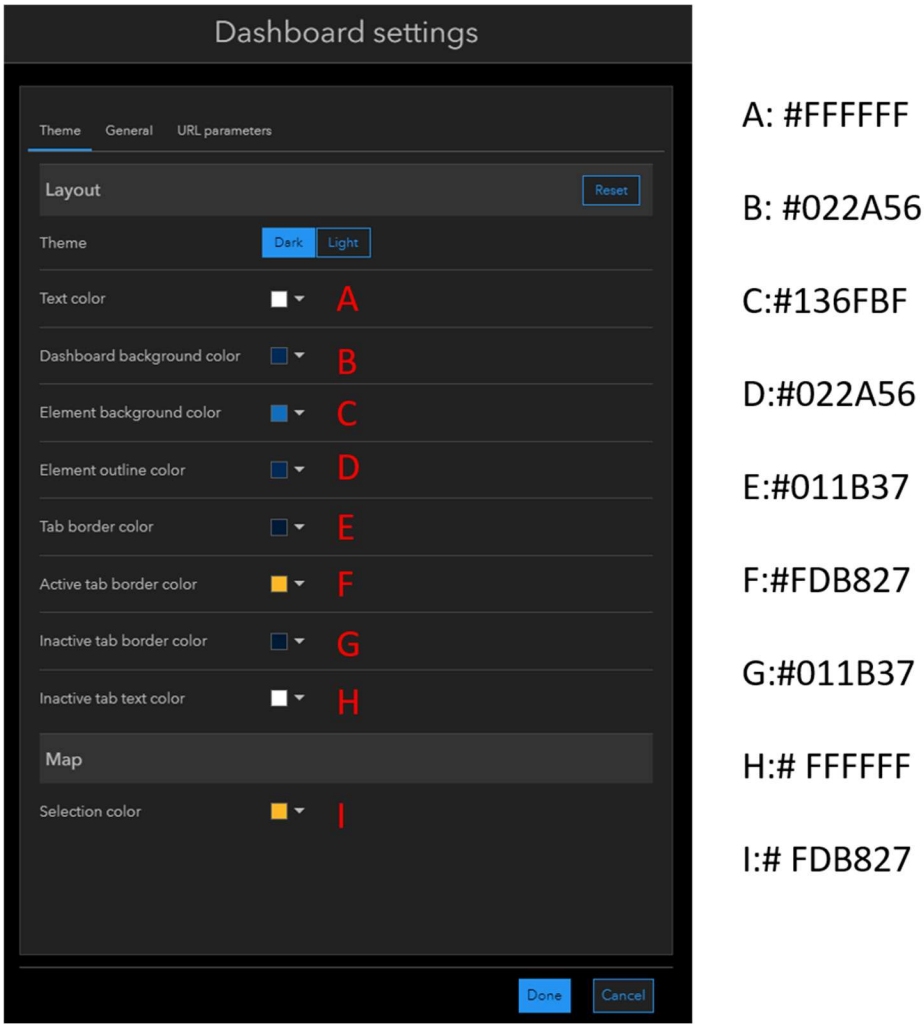
Repeat this process again with the second Serial chart, dragging the widget to the bottom of the stacked row and release. The widgets should now be organized as below. At this point you can use your cursor to select the areas between the various widgets to resize to best fit your current display.



Dashboard canvas following widget stacking and resizing.

Navigation and Widgets

1) **Configuring General Dashboard Settings:** Before beginning the process of configuring the various Dashboard widgets, you can set up the general Dashboard options. To do this, click on the ⚙ icon (Configure) to the left of save button. This will open the Dashboard settings. From the theme tab, select Dark mode. You can then select the colours for your Dashboard using the paint chips. For the KYN application, select the colours as shown below. From the General tab you can optionally select Allow element re-size which will give the users the option to re-size the widgets while using the application for optimal screen use.

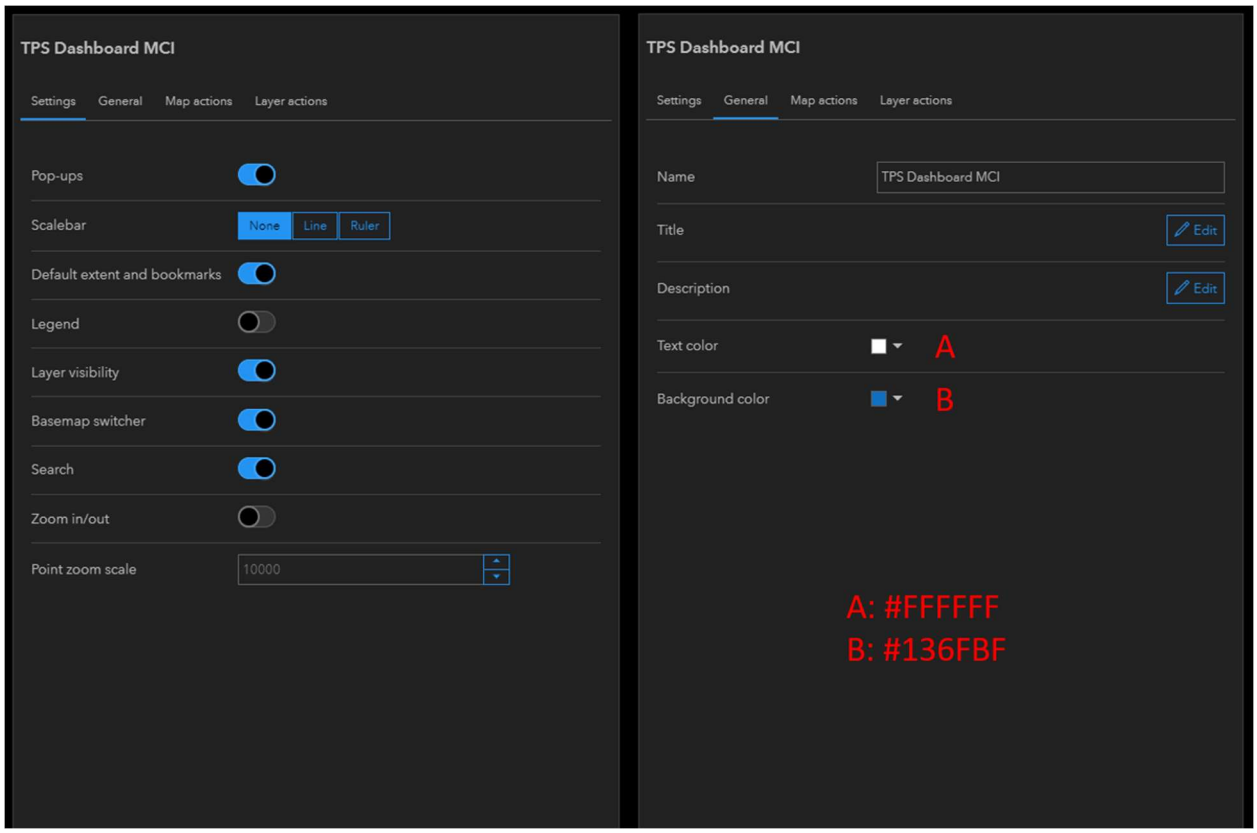


Basic set-up for general Dashboard settings with hex colour values.

2) **Configuring the Widgets:** To configure the Dashboard widgets, move your mouse to the upper left corner of the widget area until the dropdown icons appear. Select the Configure icon to open the widget settings.

3) **Map Widget:** After selecting the Configure button, the **Map** widget configuration page will open. In the Settings tab, select all map options that you wish the user to have access to in your dashboard application. For the KYN application, this will include **Pop-ups, Default extent and bookmarks, Layer visibility, Basemap switcher, and Search**. Under the General tab, re-name the Map and select colours as shown below. Leave the Map actions and Layer actions tabs as-is for now.

   One completed press **Done** to implement changes and **Save**.

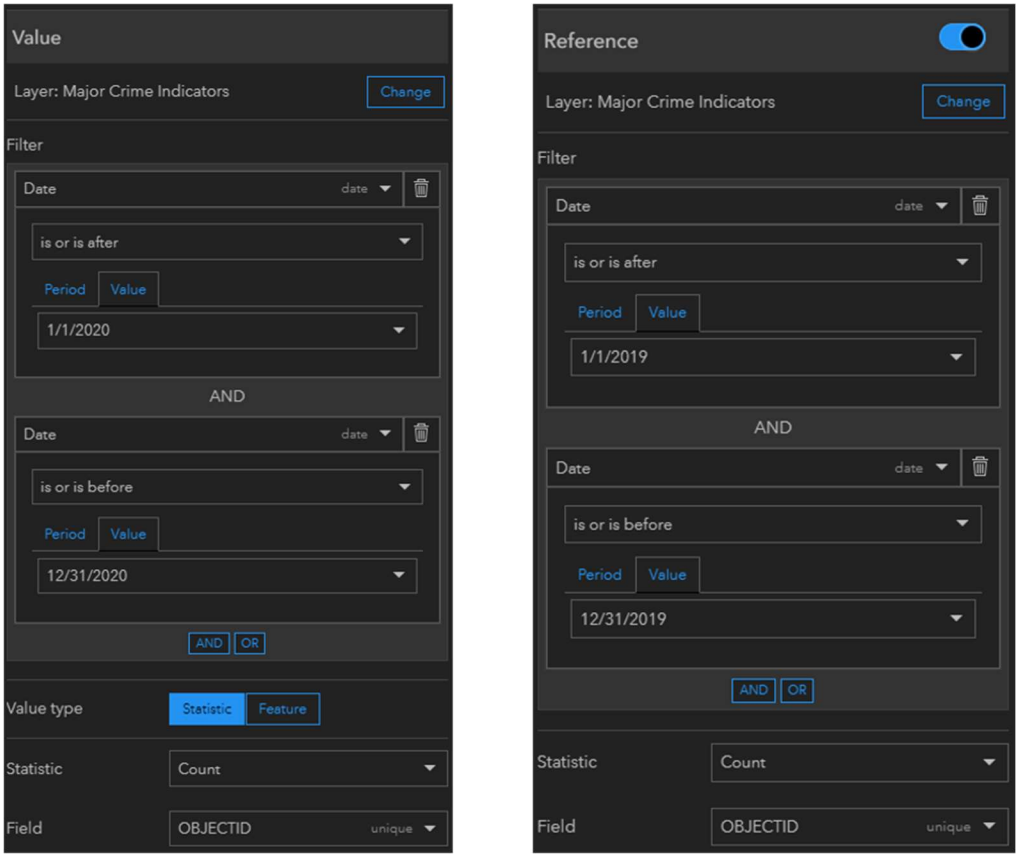


Settings for Map widget configuration including hex values.

4) **Indicator Widget:** Select the Configure button to open the **Indicator** widget configuration pages. From the Data Options tab, first ensure that the layer you want to show with the indicator is selected. Next, you will need to set any filters that are required to provide your primary data (referred to as the **datapoint**). For the KYN application we are interested in showing the difference and percent change between the most recent historic data and the year preceding it.

   For the first filter, select the Date field, and set the filter to select any features with a date **that is or is after** the first of January for the most recent year, and **is or is before** the 31st of December for that year. Set the **Value type** option to **Statistic**, the **Statistic** option to **Count**, and the **Field** to the unique field ID for your feature (Figure A).

   Next, turn on the **Reference** toggle. Select the same layer and field (e.g., Date) that you used above. Following the same procedure used for the first filter, select all features that are dated to the year preceding the one set in the first filter (Figure B).



A: Datapoint

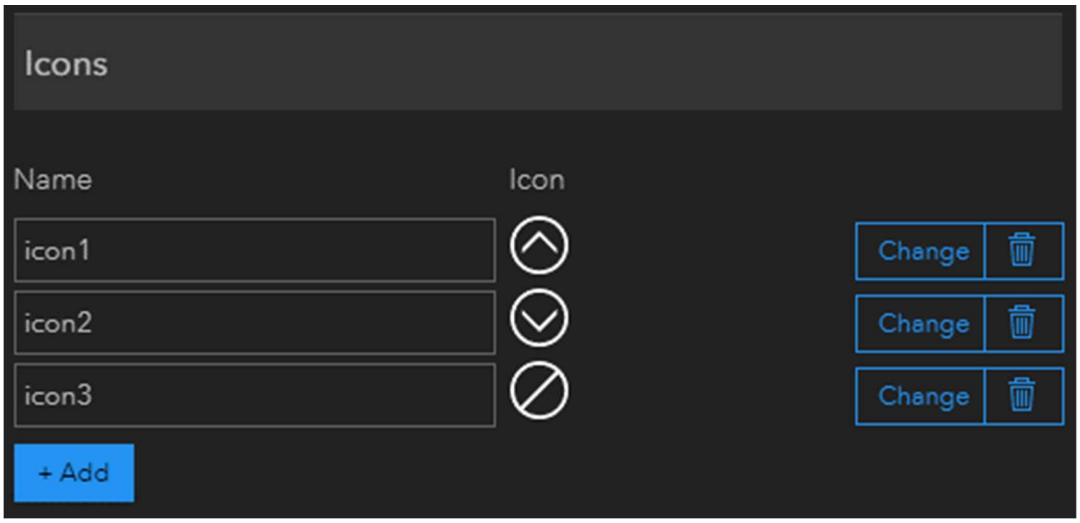
B: Reference

Data point and reference filter settings for use in Indicators.

5) **Set Indicator Options:** Next, you will set up the Indicator options using the Indicator tab. For this indicator, we want to show whether the selected crime types are increasing, decreasing, or staying the same when we compare the most recent two years. To accomplish this, enable the **Advanced formatting** option located at the top of the page. Enabling this will open the Advanced formatting window. Select the expand window option.

In the expanded window, copy and paste the Arcade expression provided in Appendix 1. This expression is used to add conditional formatting to the Indicator to allow for the symbology and lettering to change based on whether an increase, decrease, or no change is observed for crime data using the datapoint and reference filters set previously. The first section of this expression uses the datapoint.count (count of features within the first date range) and reference.count (count of features within the second date range) to determine the difference and percent change between the two years. the following section uses if/else if/ else statements to check the difference and determine what to display. In this section all style characteristics and text options for the Indicator are specified (See Appendix 1).

With the Arcade expression copied into the Advanced formatting window, click the collapse window option to return to the Indicator options page. Scroll to the bottom of this window to the Icons section. In the Arcade expression, the different conditional formatting options reference icon1, icon2, and icon3. To set these, click the +Add button to add three icons. Click the Change button to open the Select an icon page and navigate to the Miscellaneous tab and select an icon to close and return. Select icons as shown below for the three icon options.

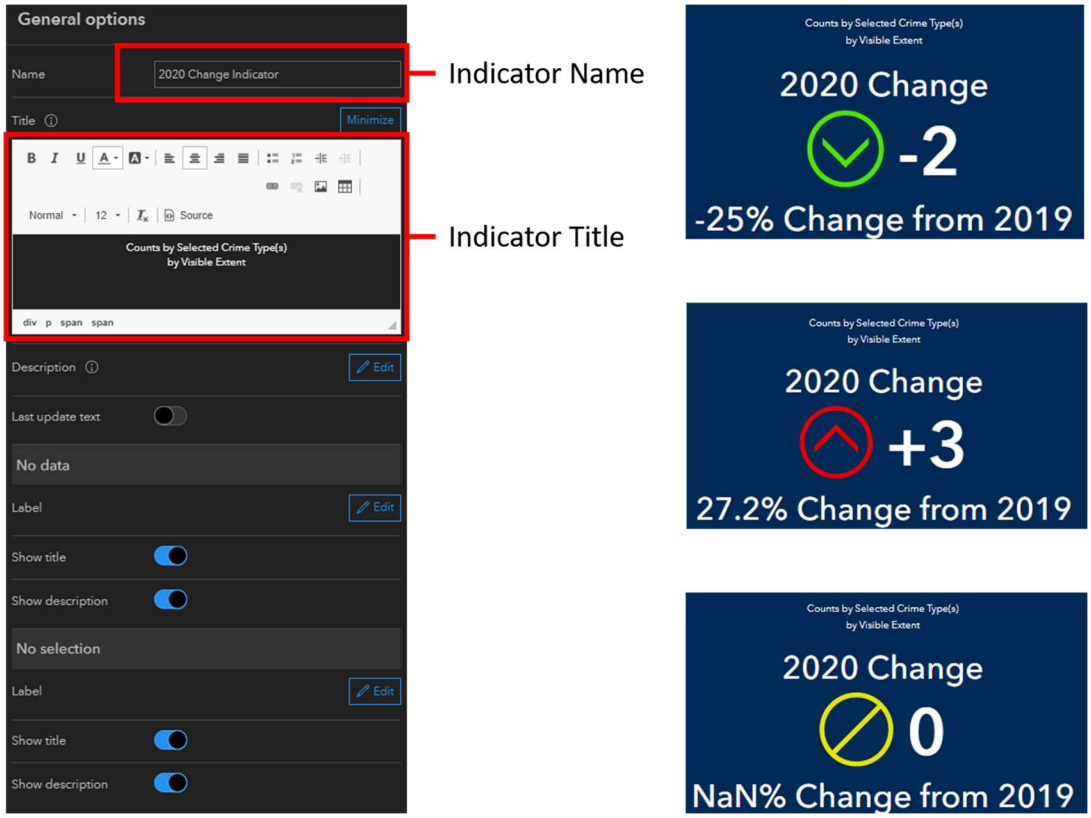


Icons used for conditional formatting of Indicator.

6) **Configure Indicators:** Navigating to the General options tab, give the Indicator widget a meaningful name that will allow you to easily understand what the widget is referencing. For the KYN application there will be only one indicator, but a meaningful name will allow for different indicators to be identified should more than one be required. Next, provide a title by clicking the Edit button and entering text as shown below.

Optional items that can be added from the General options window include descriptions, options to show when the data was last updated, and labels for when no data is available or no selection is made (not used in the KYN application).

One completed press **Done** to implement changes and **Save**.

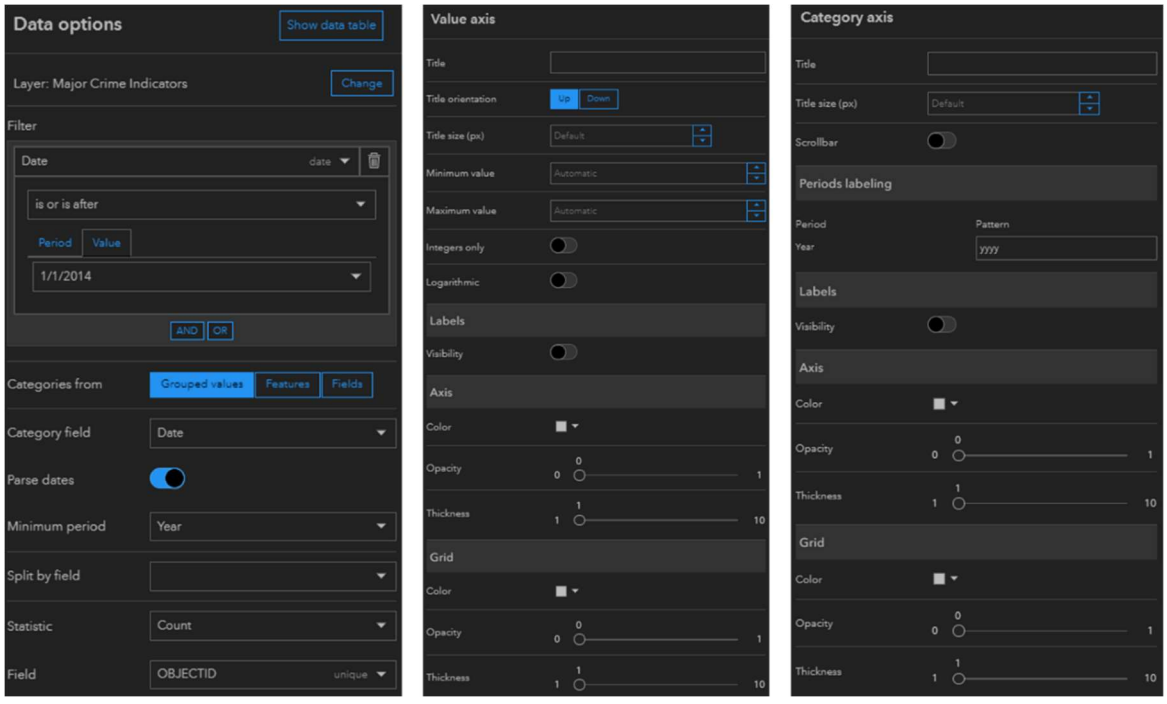


General options for indicator and final conditional Indicator examples.

7) **Serial Chart 1 Widget – Pulse Line:** The first of the two charts that will be used in the KYM dashboard is referred to as a **Pulse** line. This is a simple line graph with no additional features and is meant to show quickly and effectively how the selected data is changing over a selected period. For the KYM application this is between 2014 and the most recent year available for the historic dataset.

To begin the configuration of the Pulse chart, select the configure button of the middle **Serial chart** widget to open the **Serial chart** configuration page. Under the Data option tab, select the layer that you want to use for the Pulse chart. If required, set the filter option to ensure that only features from within the selected data range are used for the Pulse chart by selecting the Date field, and setting the filter to is or **is after** 1/1/2014. For the **Categories from** option select **Grouped values**, set the **Category field** to the **Date** field, turn on the Parse dates option, and set the **Minimum period** to Year. Lastly, set the **Statistic** to **Count**, and the **Field** to the features Object ID. These settings can be seen below.

Under Chart options tab, set the **Text color (colour**) to Hex #FFFFFF and set the **Orientation** to **Vertical**. For the Category axis and Vertical Axis tabs, ensure that all options are turned off, and all **Opacity** and **Thickness** values are set to 0 and 1 respectively.

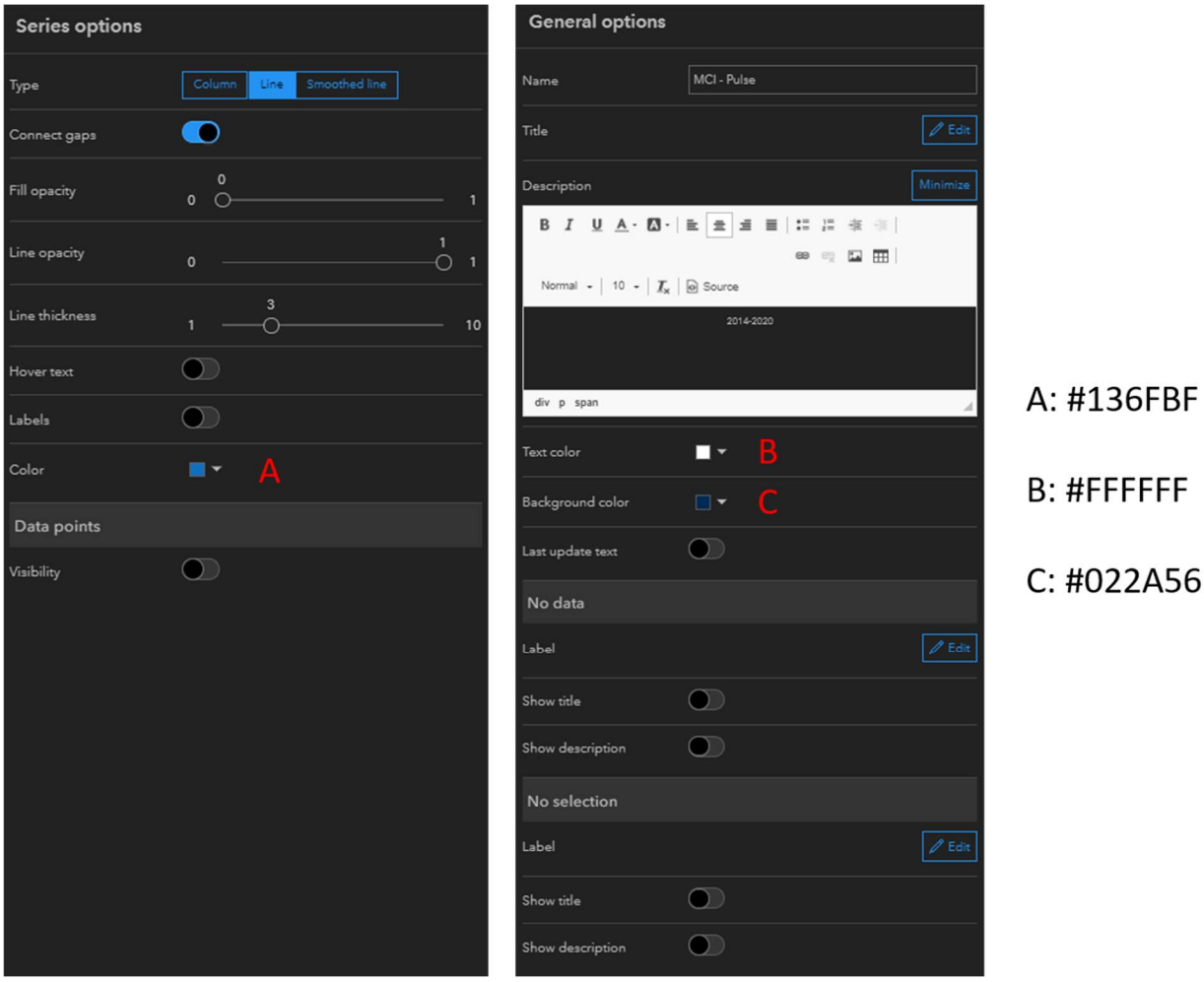


Data options, Category axis, and Value axis settings for Pulse chart.

From the Series tab, you can begin to format the characteristics of the chart to begin to make it look like a pulse. For the **Type** select the **Line** option and turn on the **Connect gaps** option. Set the **Fill opacity** to 0, the Line opacity to 1, and the **Line thickness** to 3. Turn off the **Hover** text, **Labels**, and **Visibility** options. Lastly, set the Color to Hex # 136FBF.

The final aspects to configure for the Pulse chart are found under the General options tab. Like the Indicator, give the Pulse chart a meaningful name so that it can be easily recognized. Under **Description** enter the date range that you will show in the chart, set the **Text colour** to Hex #FFFFFF and the **Background color** to Hex # 022A56.

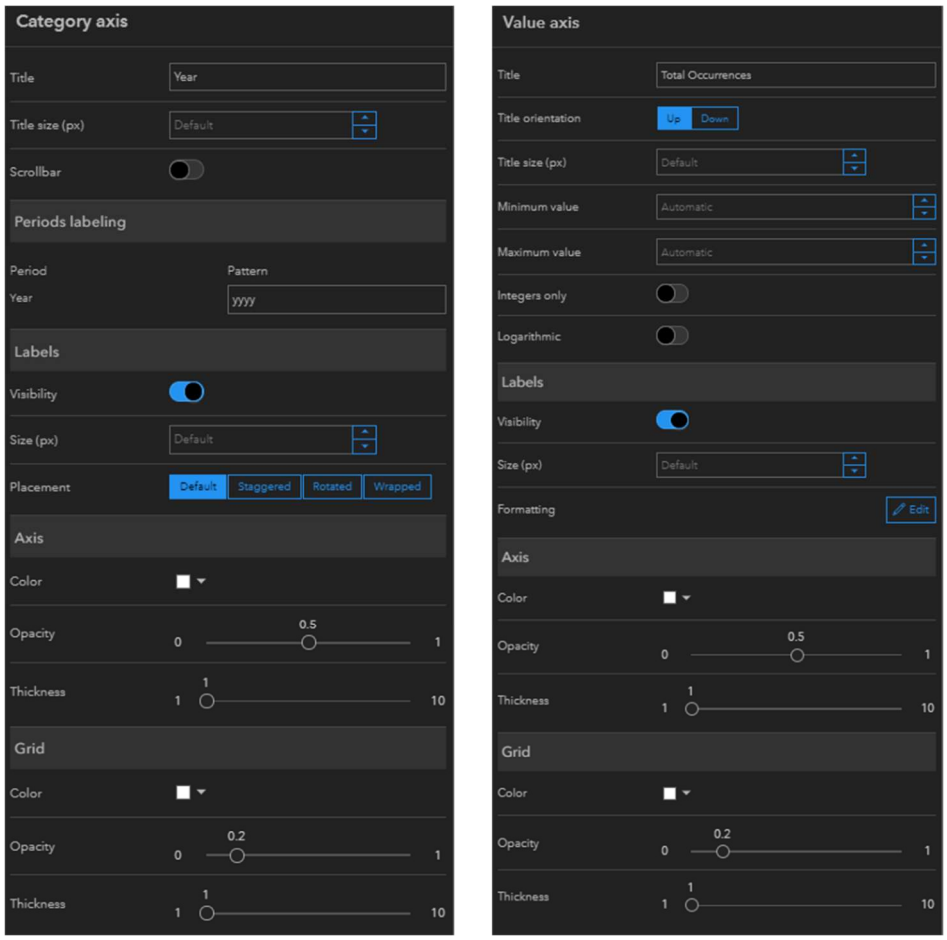
One completed press **Done** to implement changes and **Save**.



Pulse chart settings for Series options and General options including Hex colour values.

8) **Serial Chart 1 Widget – Bar Chart:** The second **Serial chart** for the KYN application is used to show the total occurrences by year, for all years after 2014, in the form of a bar chart. To begin the configuration of this widget, follow the same steps performed for the Data options and Chart options tabs as completed when creating the Pulse chart (Filter data, group values, categories by parsed date field, and count).

Format the Category axis and Value axis tabs as shown below, ensuring all Color options are set to Hex #FFFFFF.

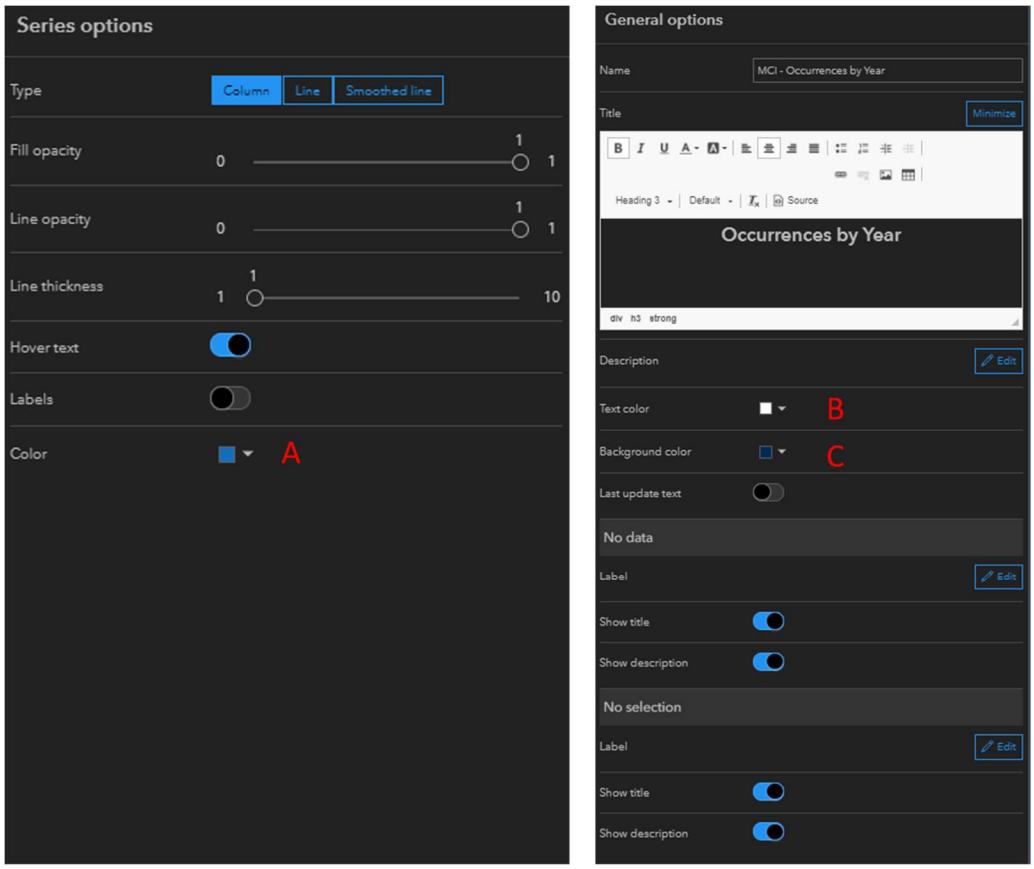


Category axis and Value axis settings for Bar Chart (All colours Hex #FFFFFF).

For the Series options, set the **Type** to **Column** and the **Fill opacity**, **Line opacity**, and **Line thickness** to **1**. Turn on the **Hover text** option and turn labels off (if desired). Lastly, set the Color to Hex #136FBF.

Under the General options tab, give the Serial chart a meaningful name. Under the **Title** section, enter your desired chart title using **Heading 3** and **Default** sizing. Set the **Text color** to Hex #FFFFFF and **Background color** to Hex # 022A56 (See below for Series and General options settings).

One completed press **Done** to implement changes and **Save**.



A: #136FBF

B: #FFFFFF

C: #022A56

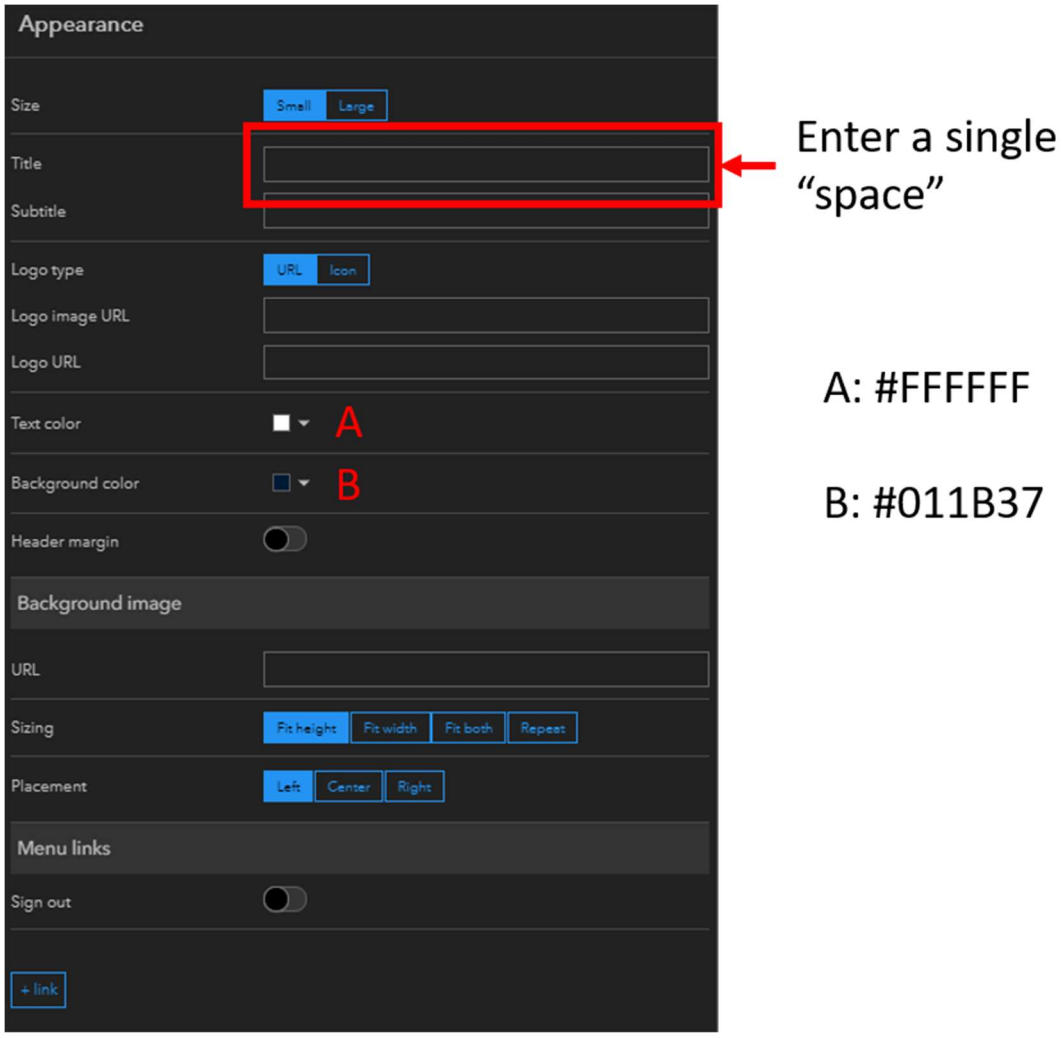
Bar chart settings for Series options and General options including Hex colour values.

9) **Header:** To configure the Header, move your mouse to the upper left corner of the header bar until the drop-down menu appears and select the Configure button. Unlike other widgets, the **Header** has a single Appearance page.

Leave the **Size** option as small and enter a single space into the **Title** section to remove the automatic default title. If no space is entered into the **Title** section, a default title will be used that will interfere with the integration of the Dashboard into the Experience Builder.

Set the **Text color** to Hex #FFFFFF and the **Background color** to Hex # 011B37. Uncheck both the **Header margin** and the **Sign out** toggles and leave the remaining defaults as-is.

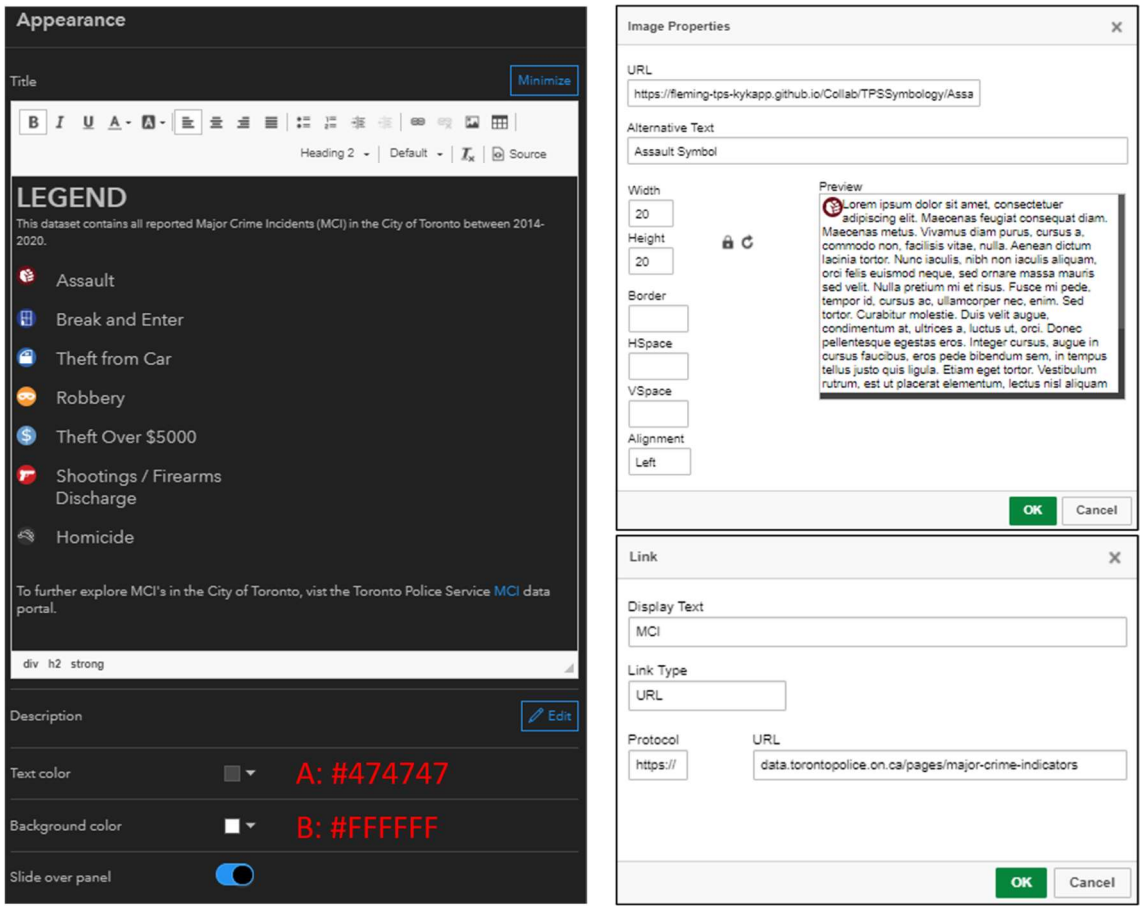
One completed press **Done** to implement changes and **Save**.



Settings for Header set up including Hex colour values.

10) **Side Panel:** The Side panel widget can be used to hold text information, links to external pages, images, and various data selectors (See below section). For the KYN application, the Side panel is used to display a basic map legend, description of the data set, and links to additional Toronto Police Service materials.

To configure the **Side panel**, navigate to the upper left corner and select the Configure button. Like the Header, the **Side panel** contains only one configuration page. With the Appearance page open, change the **Text color** to Hex # 474747, the **Background color** to Hex #FFFFFF, and turn on the **Slide over panel** toggle.



Side panel settings and example screenshots of adding images and linked pages.

The text of the Side panel can be placed into either the **Title** or **Description** sections. If placed in the **Title** section, the text will fille the Side panel from the top-to-bottom, while the **Description** section will fill the panel from bottom-to-top. For the KYN application all text was placed in the **Title** section.

The text can be added to the Side panel through the basic text options provided, or by using more advanced HTML source code. For this project the basic text options were used.

To add images to the text panel, select the  image icon. This will open the Image Properties window. In this window, enter the **URL** location for the photo you wish to use and provide an **Alternative Text** description. For the KYN application, image **Width** and **Height** were set at 20 and the Alignment set to left.

To add a link to your text descriptions, select the  link icon. Once selected, the Link properties window will open. In this window enter the text that you wish to hold the link in the **Display Text** box and provide the full **URL** of the desired link page in the URL section. Leave the **Link Type** section as URL and allow the **Protocol** section to autofill with your URL protocol.

Once desired text, images, and links have been added, select **Done** to confirm changes and **Save**.

Selectors and Map Actions

With the dashboard widgets configured and in place, it is now possible to add selectors and actions to allow the data displayed in the map and widgets to interact with one another in a dynamic way. **Selectors** allow for the user to zoom, flash, filter, show pop-ups, and pan to different map layers while **Map Actions** allow for widget results to be filtered automatically to reflect the features that are within the view extent.

1) **Adding a Selector:** The dashboard application allows for three different types of selectors: category, number, and date. The KYN application will use category selectors.

   Category selectors for **Neighbourhood** and **Crime Type** (optional) will be placed in the **Header** widget to keep them clearly visible to the user. A **Year** (optional) selector can also be placed in either the **Header** or **Side panel** dependent on preference and available space.

   To add a **Selector**, navigate to the upper left corner of the **Header** and click on the  **Add category selector** option. The same actions can be performed in the **Side panel** if you wish to add a selector to the **Side panel** widget.

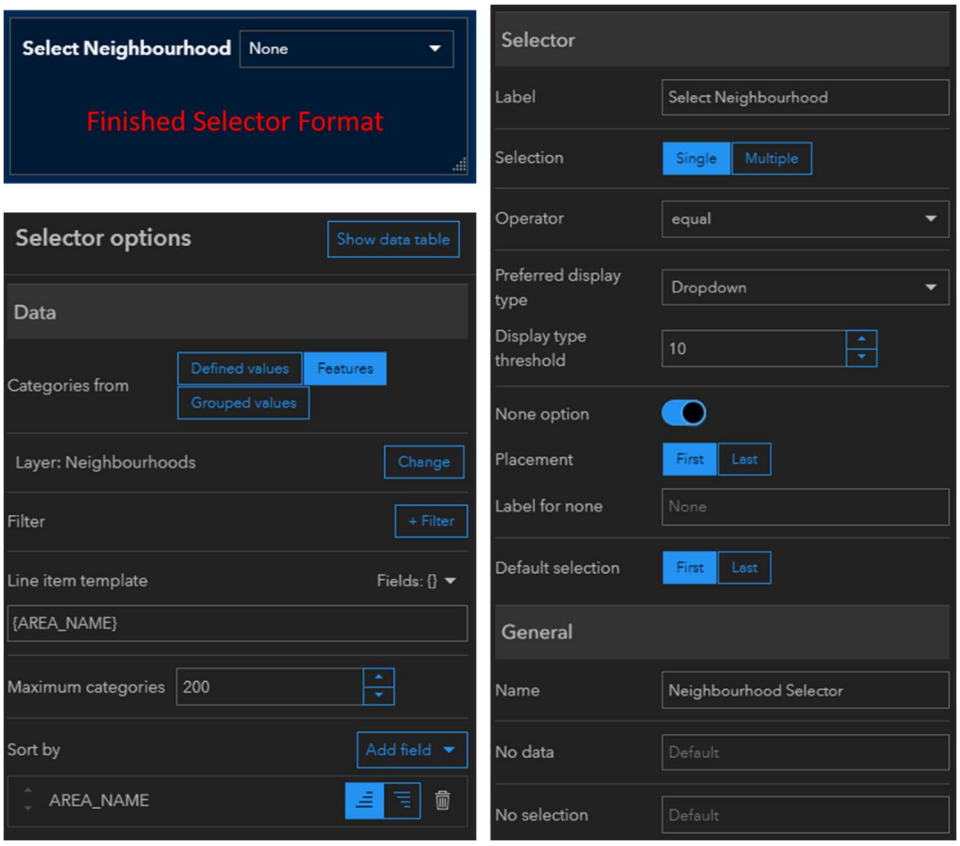
2) **Neighbourhood Selector:** After selecting the **Add category selector** option from the upper left of the **Header** widget, you will be brought to the Category selector configuration page. From the Selector tab you will be able to select the data that wish the Selector to interact with and how to display the data to the user in the application.

   In the **Data** section, select **Features** from the **Categories from** option. This will bring you to a new window where you will select which layer you want the Selector to use. For the KYN application select the **Neighbourhoods** layer.

   With the Neighbourhoods layer selected, you will be given the options on what data to be displayed in the selector. From the **Line item template option**, click on the **Fields:{}** dropdown menu and select the field that you wish the user to see when using the selector. For this application we want the user to be able to select by the name of the Neighbourhood, so select the field that contains this information. To ensure that all fields are available for selection the **Maximum categories** option will be increased to an arbitrary number above the total number of features in this layer (e.g., 200). The data can then be sorted alphabetically by selecting the neighbourhood name field from the **Sort by - Add field** dropdown menu and **Sort ascending**.

   In the **Selector** section of the Selector tab, provide a name that will clearly show the purpose of the selector to the user (e.g., Select Neighbourhood). For **Selection**, choose **Single**. Turn on the **None option**, provide a name for this option (e.g., None or All), and set the **Placement** to **First**.

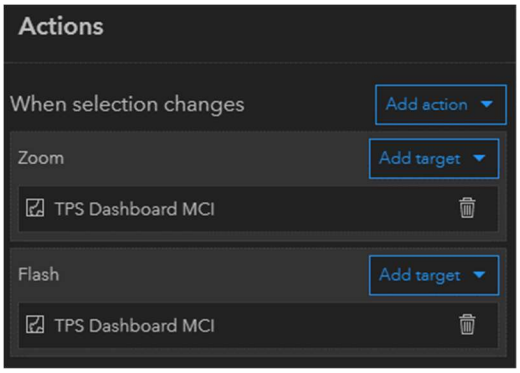
   You can now give the Selector a meaningful name in the General section.



Neighbourhood Selector settings.

With the Selector formatting completed, go to the **Actions** tab. From here you specify how the selector will interact with the different map layers. From the **Add action** dropdown, add the **Zoom** and **Flash** actions. With the actions added, click on the **Add target** dropdown for both actions and select your map (If you have chosen to add addition maps, you will be given options to select one or all maps).

With the Selector defined and actions added, select **Done** to confirm changes and **Save** your Dashboard.



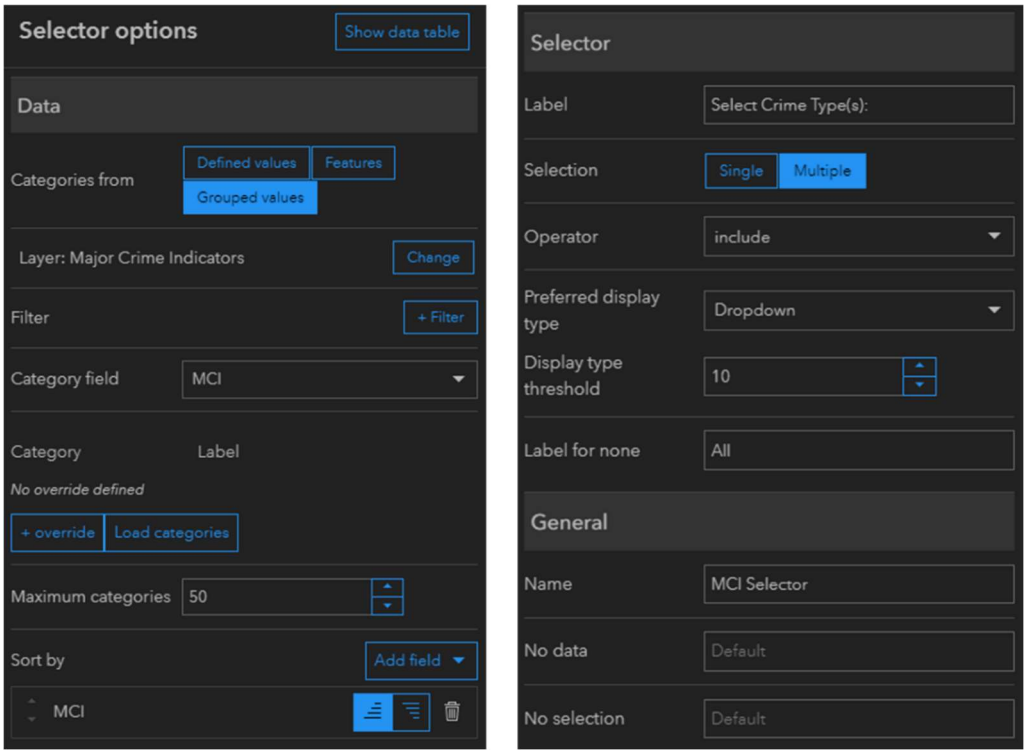
Neighbourhood Selector action settings.

3) **Crime Type / Year Selector (Optional):** The optional Crime Type or Year Selector differs from the previous selector as it will allow the user to change what features are visible in the map extents based on a one or more selections from a grouped list. This section will describe the process using Crime Type; however this type of selector can be adapted to work with any layer/field that you wish to allow the user to select distinct categories for display.

   First, select **Add category selector** from either the **Header** or **Side Panel** widget to open the Category selector configuration window.

   In **Categories** from section, select **Grouped values**. In the new window, select the layer that you want to use for this selector. For this application, select the Major Crime Indicators layer. By selecting **Grouped** values, you are given the option to select your field from the **Category field** dropdown menu – Select MCI. The remaining sections will auto-fill with **Maximum categories** at 50 and the **Sort by** option set to your selected layer, ascending. These options can be left as-is or adjusted as desired.

   Next, give the Selector a **Label** that will be used to direct the user (e.g., Select Crime Type(s)). For **Selection** choose multiple to allow the user to select one or more of the category options. The **Operator, Preferred display type, and Display type threshold** will remain as defaulted. For **Label for None**, type in All to reflect that all categories will be shown by default if no selection is made. Finally, give the Selector a meaningful **Name**.

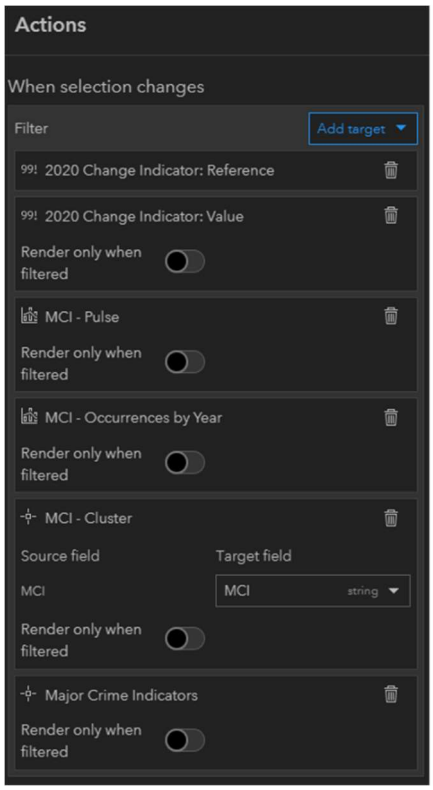


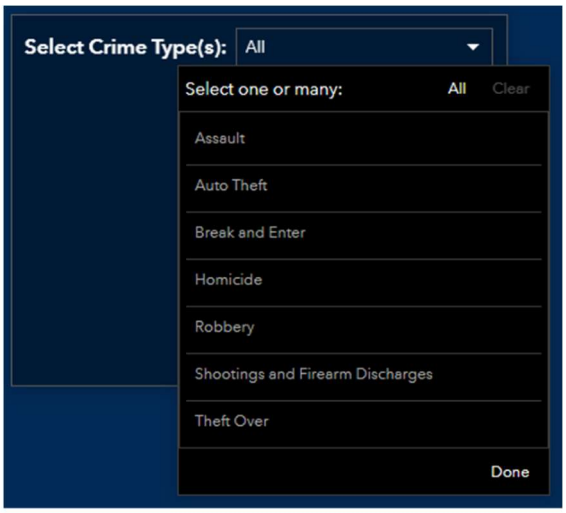
Major Crime Indicators Selector options settings.

From the Actions tab, it is now possible to define how the selector will interact with the Dashboard. As this Selector is meant to alter the visibility of the layers in the Dashboard based on user selection, choose the **Filter** option from the **Add action** dropdown menu (due to our earlier configuration settings, this will be the only option available).

From the **Add target** drop down, select all widgets with the Dashboard area that you want to reflect the results of filtering. For the MCI Selector, this will include the **Indicator Value** and **Reference**, and both **Serial charts**. Since these were given meaningful names earlier, they can be clearly differentiated from one another. Next, add any layers from the map that use the layer chosen for your Selector. If there is a second layer, you will be given the option to select the **Target field** from a dropdown list – select the same field used in the Selector.

With the Selector defined and actions added, select **Done** to confirm changes and **Save** your Dashboard.





Finished Selector Format

Major Crime Indicators Selector Actions settings and final Selector format.

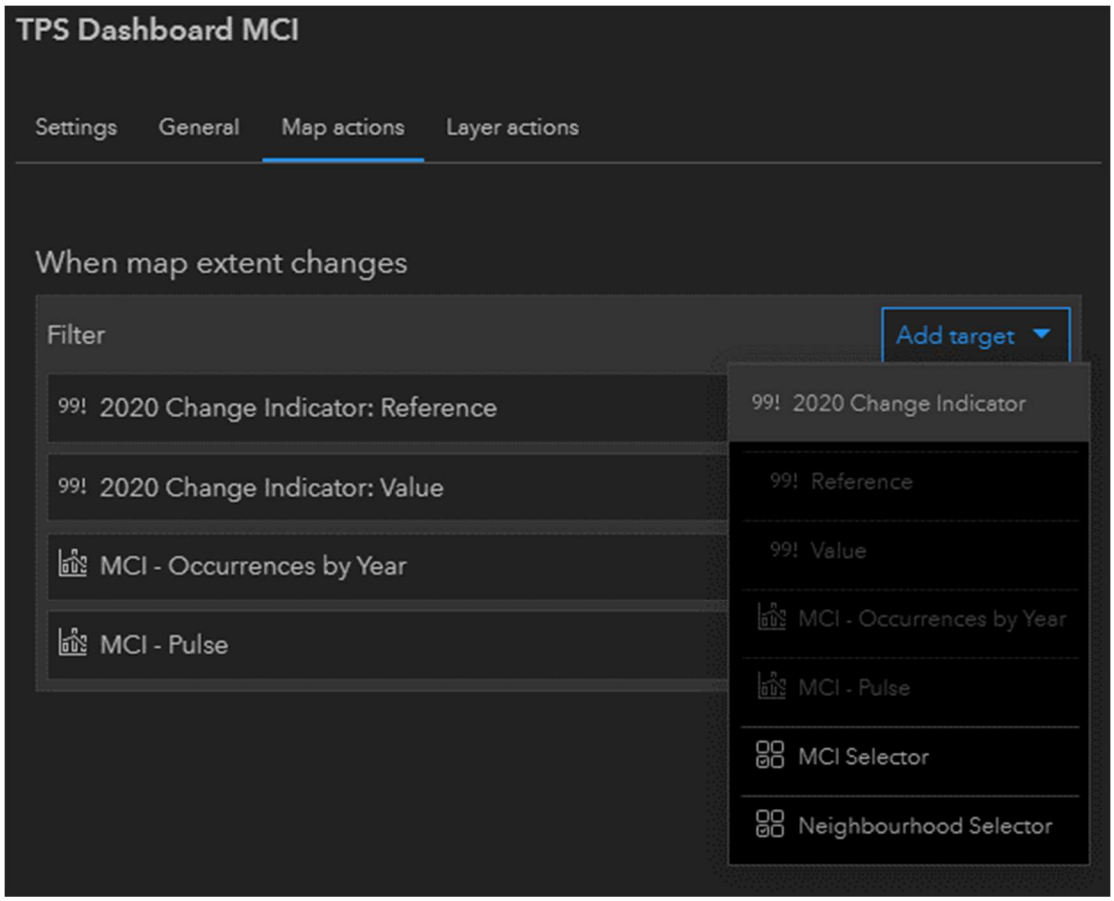
NOTE: If this Selector has been set up to filter for year, only select the map layers options. With the Indicator and Serial chart widgets set to show counts by specific years, filtering the results by year will not be effective and could lead to confusion for the user.

4) **Map Actions:** By defining a **Map action**, you can allow the map to automatically filter the results of widgets to only show results for features within the view extent. This provides an intuitive way to search for results by geographic area without requiring the user to select or define an input.

   To add a **Map action**, hover the mouse over the upper left corner of the **Map** widget and select the **Configure** option. Next, navigate to the **Map actions** tab. From **When map extent changes**, click the Add **action** dropdown menu and select **Filter**.

   With the **Filter** action added, click the **Add target** dropdown menu and select the widgets that you wish to filter by extent. Once again, providing meaningful names to the widgets simplifies this process.

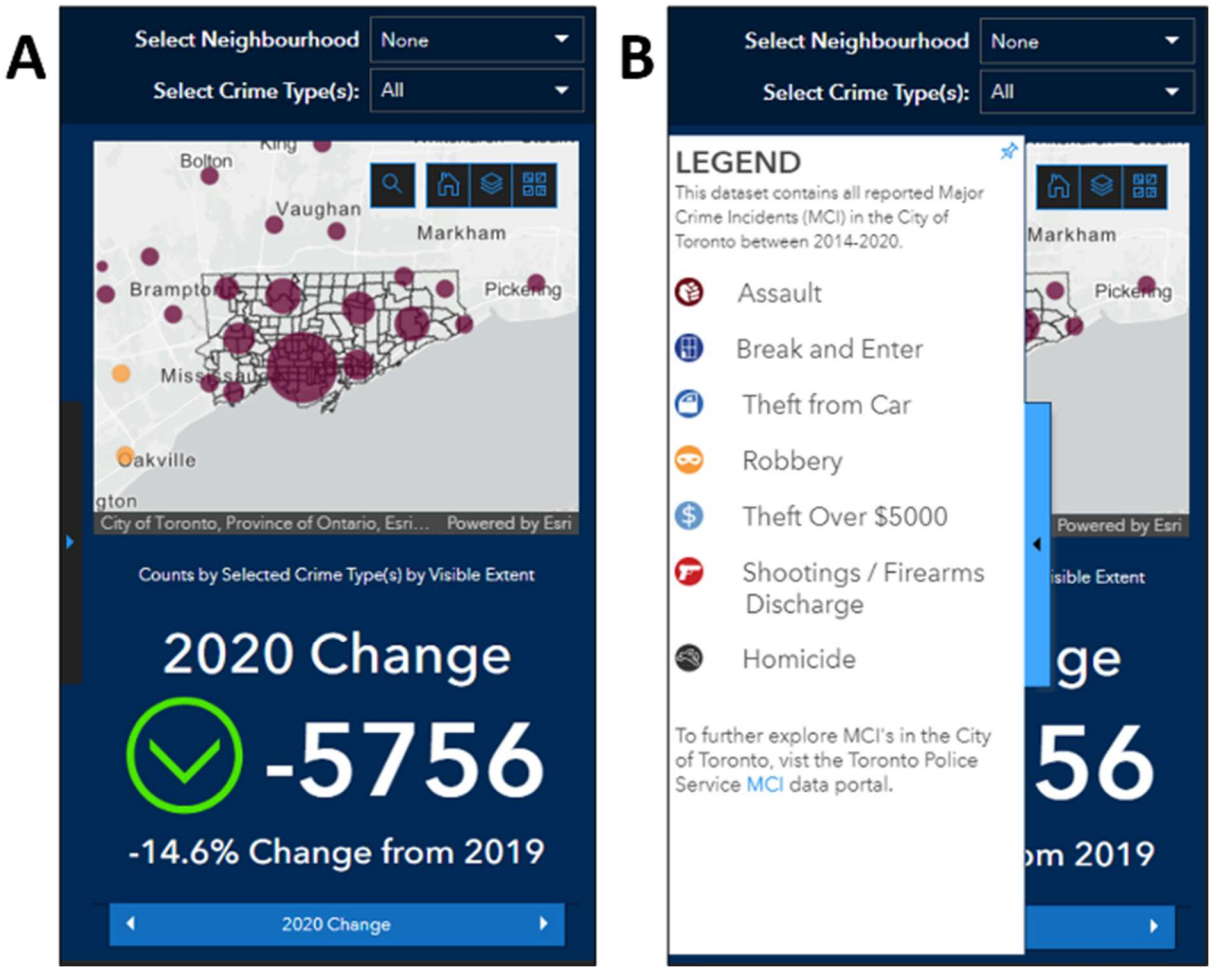
   With all desired widgets selected, click **Done** to exit the Map configuration window and **Save** your Dashboard.



Setting Map actions to allow for widget filtering by map view extent.

Adapting the Dashboard to Mobile

With the Desktop dashboard now complete, it is possible to use this as a base for configuring a new Dashboard optimized for mobile use. To allow for Dashboards to be used on mobile devices, it is necessary to organize the Dashboard items vertically and stack similar widgets on top of one another. By aligning vertically and stacking widgets, the user can cycle through various items at an effective screen size without losing relevant information.



Completed mobile Dashboard configuration as seen on iPhone 6/7/8:
A) Side panel closed B) Side panel extended.

To begin modifying the existing Dashboard for use on mobile devices, select the **Save as** option from the **Save** drop down menu and rename the Dashboard to identify it as a new mobile configuration.

1) **Aligning and Stacking Widgets:** To optimize screen use, it is necessary to stack the **Indicator** and **Serial chart** widgets underneath the **Map** widget.

   Starting with the Indicator widget, move your mouse to the upper left corner and select the **Drag item** option from the drop-down menu. Click and drag the widget to the bottom of the **Map** widget until the option to **Dock as row** appears.

Dragging widgets to arrange vertically (A) and stack (B) for use in mobile Dashboard configuration.

Next, select the **Drag item** option for the **Pulse – Serial chart widget**, click and drag it to the center of the Indicator Widget until the **Stack the items** option appears and release. By choosing this option**,** the widgets will "stack", allowing the user to cycle through the different widgets using tabs at the base of the stack. Select the  icon in the widget tabs to edit the label, giving the widgets meaningful names to guide the user.

With all the widgets now aligned vertically, stacks, and renamed in their respective tabs, review the various widgets to ensure that no additional descriptions or supplemental text is required to allow the user to clearly understand how the widgets function. This is important as the widgets will now be viewed independent of one another and do not benefit from descriptive text in other widgets. For the MCI mobile Dashboard, it will be necessary to add a statement to **the Bar chart – Serial chart** to inform the user that counts are being made by the visible map extent. At this tie it may be appropriate to change the font size for the **Indicator** and **Serial chart** titles, as well as to edit the **Category axis** and/or **Value axis** titles (for the KYN application **Title** fonts were set to 10pt and the **Title** was removed from the **Category axis**).

With the Dashboard now updated for use on mobile devices, **Save** your Dashboard.

Appendix 1: Arcade Code

This arcade code was used to create the dynamic indicators for the viewable extent of the main dashboard.

```
var difference = $datapoint["count"]-$reference["count"]
var percentChange = Floor(100*($datapoint.count - $reference.count) / $reference.count, 1);

if(difference > 0){
  return {
    backgroundColor:'#022A56',
    topText: '2020 Change',
    topTextColor: '#FFFFFF',
    topTextMaxSize: 'small',
    middleText: '+'+difference+' ',
    middleTextColor: '#FFFFFF',
    middleTextMaxSize: 'medium',
    bottomText: percentChange+'% Change from 2019',
    bottomTextColor: '#FFFFFF',
    bottomTextMaxSize: 'small',
    iconName:'icon1',
    iconAlign:'left',
    iconColor:'#e60000',
  }
}

else if(difference < 0){
    return {
        backgroundColor:'#022A56',
        topText: '2020 Change',
        topTextColor: '#FFFFFF',
        topTextMaxSize: 'small',
        middleText: ' '+difference+' ',
        middleTextColor: '#FFFFFF',
        middleTextMaxSize: 'medium',
        bottomText: percentChange+'% Change from 2019',
        bottomTextColor: '#FFFFFF',
        bottomTextMaxSize: 'small',
        iconName:'icon2',
        iconAlign:'left',
        iconColor:'#4ce600',
    }
}

else {
    return {
        backgroundColor:'#022A56',
        topText: '2020 Change',
        topTextColor: '#FFFFFF',
        topTextMaxSize: 'small',
        middleText: ' '+difference+' ',
        middleTextColor: '#FFFFFF',
        middleTextMaxSize: 'medium',
        bottomText: percentChange+'% Change from 2019',
        bottomTextColor: '#FFFFFF',
        bottomTextMaxSize: 'small',
        iconName:'icon3',
        iconAlign:'left',
        iconColor:'#e6e600',
    }
```