PI World 2019 Lab

Building Displays with PI Vision 2019

OSIsoft, LLC
1600 Alvarado Street
San Leandro, CA 94577 USA
Tel: (01) 510-297-5800
Web: http://www.osisoft.com

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Table of Contents

Contents

Introduction

In this session we will use the latest features of the PI Vision 2019 in order to build extensive, rich, and informative displays. We will be heavily leveraging PI Asset Framework throughout this lab in order to showcase the incredible strengths and abilities of the latest release of PI Vision. We will investigate new PI Vision features by building five main displays and by covering the basic display management and administration tasks.

Objectives

The following goals will be accomplished upon finishing the lab:

- Understand how to search for important Events, PI Tags, and AF Elements and Attributes using the PI Vision Search Pane
- Familiarization with all key features available in PI Vision 2019, especially the new Ad Hoc Trending and PI ProcessBook Display Migration
- Understand the importance and use of each of the eight main symbols. Understand how they can be used to work together in order to display data quickly, easily, and efficiently
- Utilize templates in AF to create one display that may be reused with many different assets
- Be able to perform simple PI Vision Administrator tasks

Your PI System

This lab uses a simplified PI system including the PI Data Archive, PI Asset Framework, and PI Vision all bundled together on one production server. Each student will have their own client machine to access PI Vision remotely. Each client machine is deployed using a Microsoft Azure environment so we will connect to them using Remote Desktop.

The servers of importance are:

- PISRV01
    - PI Data Archive 2018
    - PI AF Server 2018
    - PI AF Client 2018 SP2
    - PI Vision 2019
    - We will not have direct access to this machine
- PICLIENT##
    - Server to make client connections to PI Vision
    - Shortcut to open PI Vision is available on Desktop
    - PI ProcessBook 2015 SP2
    - PI Vision 2019 Display Utility
        - Note: Installation is only officially supported on a PI Vision server

Connecting to your PI System

Locate the slip of paper on your desk that indicates your client number.

Step by Step:

1. Open Remote Desktop on your PC
2. Enter the connection string you were provided for your Client machine ("PICLIENT##") and click OK
3. Log into the machine

    UserID: pischool\student##
    Password: TBD

Approach

TechCon Labs, LLC has had the PI System for years but has just recently starting using PI Vision. So far, they have only used PI Vision as a tool to view Imported PI ProcessBook Diplays.

You have been hired as a consultant by TechCon Labs, LLC to help them get the most value out of their PI System and visualize their data accordingly. TechCon Labs, LLC needs a quick and efficient way to monitor their 60 Wells, 27 Well Pads, and eight Production Areas. They estimate that you'll need to create around 100 displays, and they have allotted two full weeks for the job.

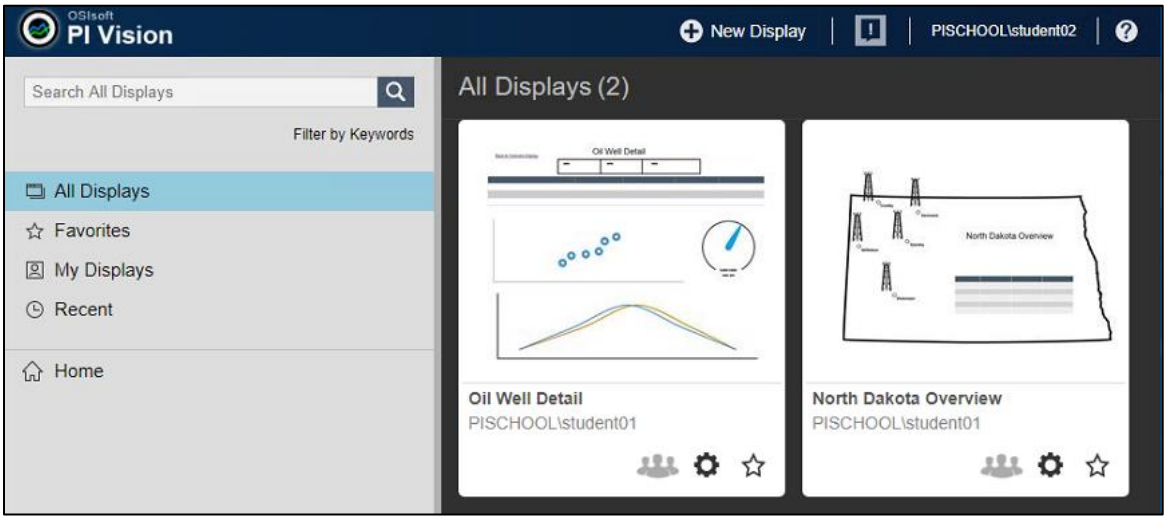
As an expert on PI Vision you will help TechCon Labs, LLC build displays that showcase important events and data within the company. With your in-depth knowledge of PI Vision as well as your comprehensive understanding of element and attribute templates within AF, you know that you'll only need to create 5 displays and that it should take just under three hours to complete.

PI Vision 2019 Introduction

TechCon Labs, LLC would like a quick PI Vision introduction before you build all of their displays. Once all of the content is created, they want to make sure that everyone has a general idea of how to navigate PI Vision and create simple ad-hoc displays.

This section is intended to be demoed quickly by the instructor. Students are not meant to follow along on their machines at this point. The interaction part of the lab begins in the next section with step-by-step instructions.

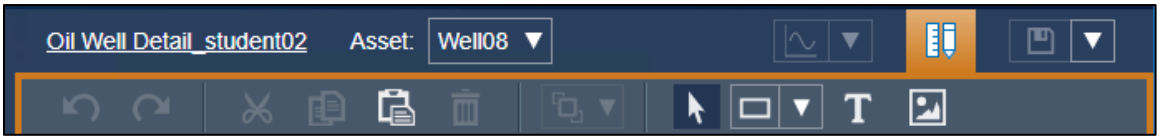
- **PI Vision 2019 Home Page**
  The home page is the starting point for PI Vision navigation. From here you can create displays as well as browse through your own and public displays



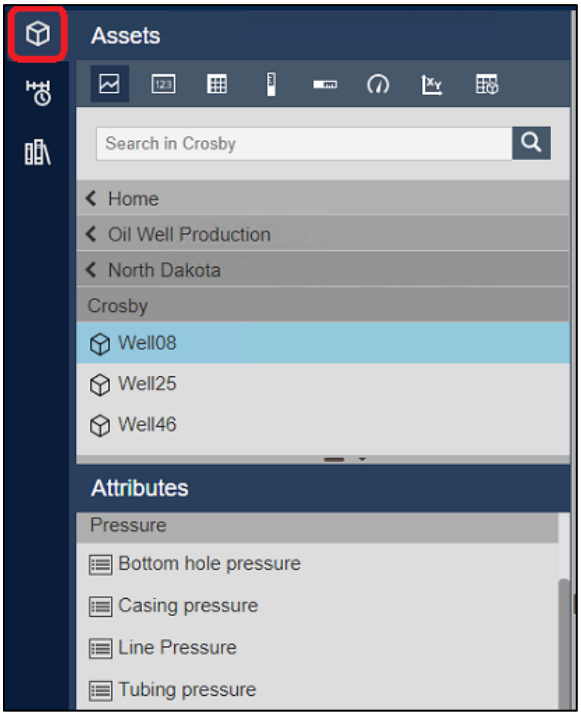
- **PI Vision Display Modes**
  There are two separate modes within PI Vision. You can only build and edit Displays while in Modify Mode.

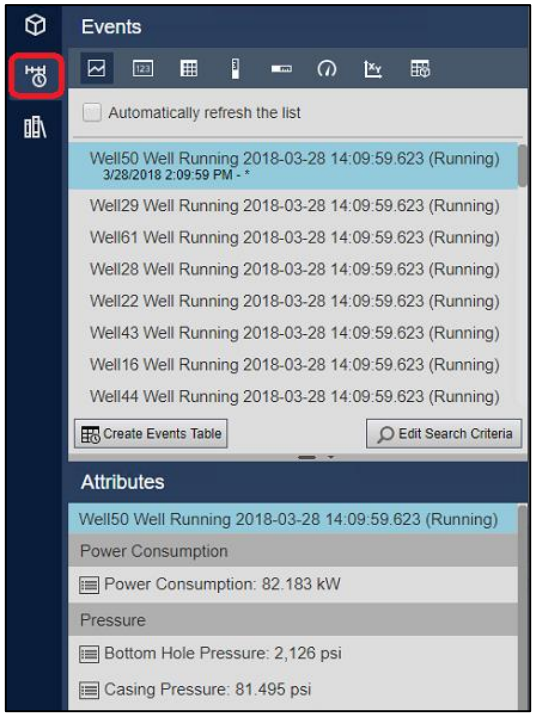
  Monitor Mode:

  Modify Mode:

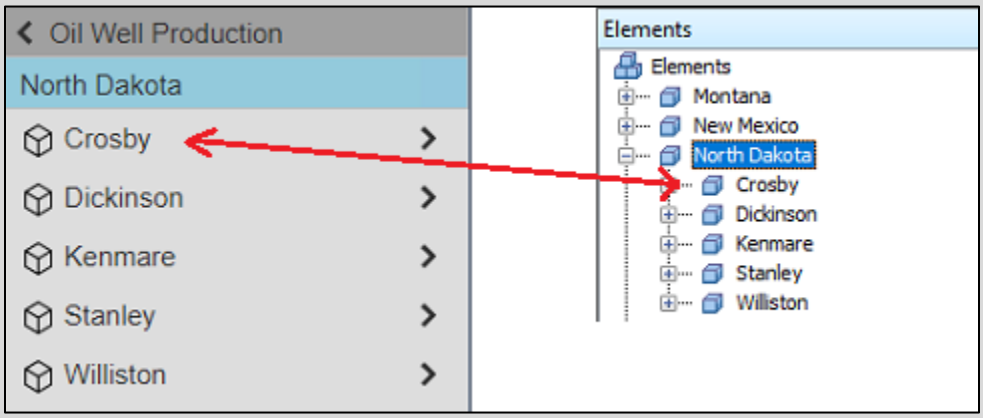


- **Search Pane & Events Pane**
  The Search Pane is used to find AF Elements and Assets as well as PI Points. AF Attributes can be found in the Attributes section. If the particular asset you are working with has related events they will be populated in the Events Pane





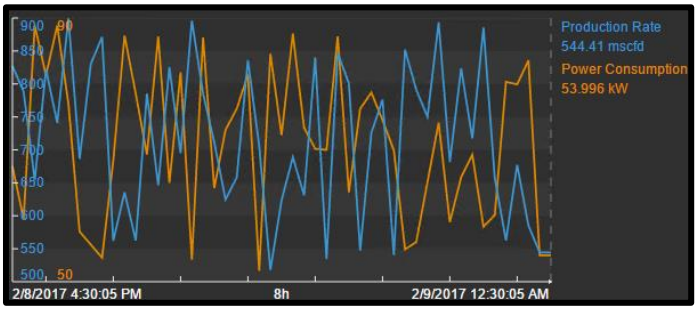
In this lab we will be working with the Oil Well Production AF Database on the PISRV01 AF Server. The Assets viewable in the PI Vision Search Pane are AF Elements created with PI System Explorer. The AF Structure has been built prior to beginning work on the PI Vision displays, which is recommended in order to take advantage of PI Vision's most powerful features.



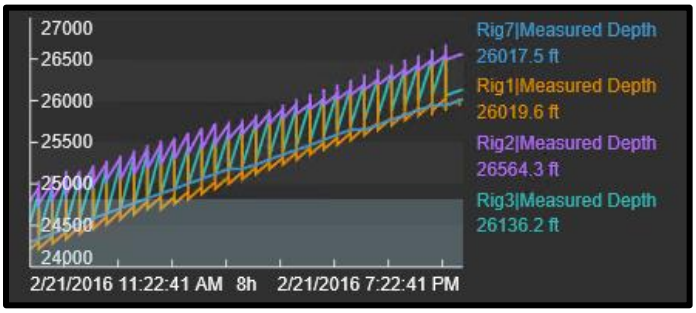
Each element can have its own set of permissions, which is also enforced within PI Vision.

- **Interacting with Data Symbols**

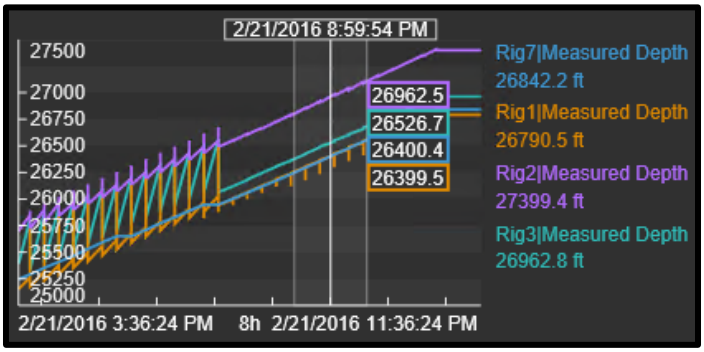
  - Trend



    - When in Modify Mode, right-click on the trend and select Format Trend in order to bring up the design options for the trend
      - Trend Options are used to change the Foreground and Background colors, choose between single or multiple scales, and set the scale range
      - Trace Options allows you to customize the color, weight, style, and scale range of individual traces. You can also delete traces from this section
      - The Use Default Settings button allows you to reset all trend options
    - In Monitor Mode, use the bottom third of the trend area to shift the time context of the trend



    - When in Monitor Mode you can add a cursor by simply clicking on the trend. A cursor automatically populates on all trends within that display. Drag the cursor to change positions, and drag it off of the trend in order to get rid of it.



    - In Monitor mode, click on the data item in order to highlight it on the trend

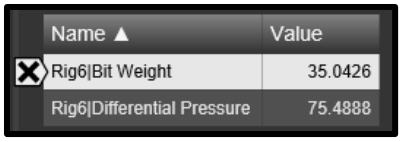
- Value
  - The Value Symbol populates with the asset name, timestamp, UOM, and value

  - Format the Value by right-clicking on the value and selecting Format Value
    - This allows you to change the Fill, Text, and Value color as well as changing what attributes are displayed within the Value symbol

- Table
  - The table symbol displays multiple attributes or PI Points concisely in a table format

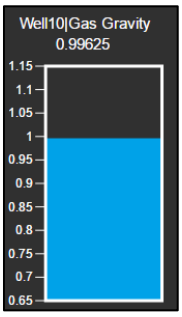
Name	Description	Value	Units	Trend	Minimum	Maximum
Well10|Power Consumptio		78.774	kW		51.656	88.861
Well10|Line Pressure		1,150.2	psia		1,000.3	1,495.3
Well10|Gas Gravity	Hydrocarbon gas density e	0.99625			0.65047	1.1484
Well10|Casing temperatur	The temperature in the dril	90.987	°F		40.94	96.279

  - Add data items to the table by dragging the data item onto the table
  - Get rid of data items by clicking on the row of your choice and then clicking the delete button



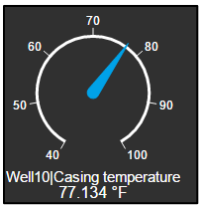
  - If you select a data item in a table you can then drag that data item onto a trend in order see historical values
  - Dragging a data item off of a table onto a blank space in the display will create a separate object for that data item while in display monitoring mode. The object type will depend on which symbol is selected above the search pane.
  - Right-click on the table and select 'Table Columns' to pick which columns to display

- Vertical and Horizontal Gauge
  - The Vertical and Horizontal Gauge display a singleton in a gauge format



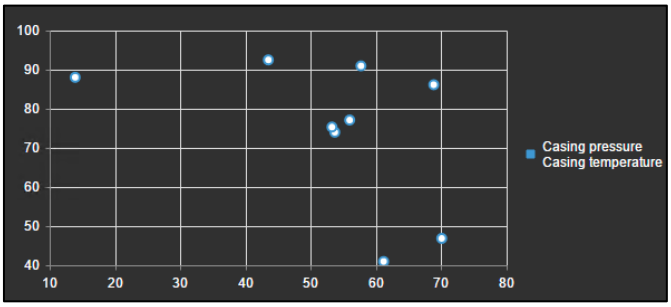
  - You can format the Bar, Fill, Outline, and Value color, Outline weight, and Visibility of the Vertical Gauge by right-clicking on the gauge and selecting Format Gauge

- Radial Gauge
  - The Radial Gauge symbol displays a singleton in a gauge format



  - Right-click on the gauge and click Format Gauge to bring up the possible format options. Here it is possible to change the stylings, visibility, and Scale start and end of the gauge

- XY Plot
  - The XY plot displays a graph of plotted points that helps to show if a relationship exists between sets of data



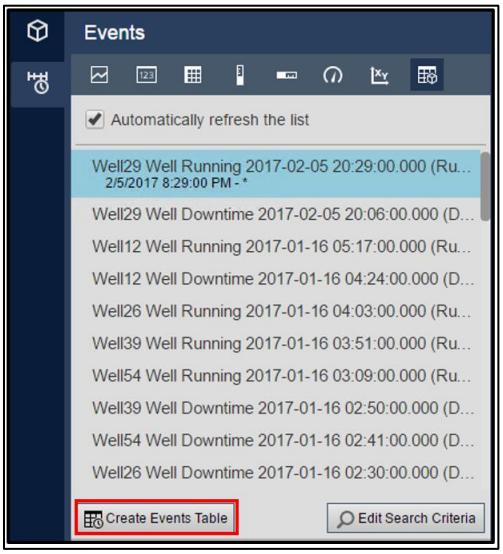
  - Right-clicking on the XY plot and selecting Format XY Plot allows for the customization of the Source data, associated X and Y scales, as well as general styling of the XY plot

- Asset Comparison Table
  - If the same attributes exist for multiple Elements, the Asset Comparison table allows us to display them all in a single table

Asset	Bottom hole pressure	Casing pressure	Casing temperatu...	Gas Gravity
Well06	2,450.6	42.19	68.595	1.0575
Well10	3,667.3	55.874	40.802	0.76351
Well23	6,718.9	50.124	51.177	0.72927

  - Right-click on the Asset Comparison table and select Format Table in order to select which attributes and assets to display in the table

- Events table
  - The Events Table button is available in the Events Search Pane

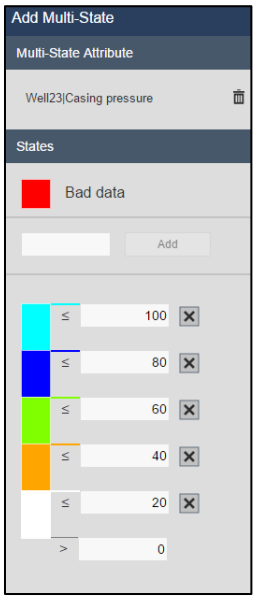


  - It creates a dynamically updating table of current events

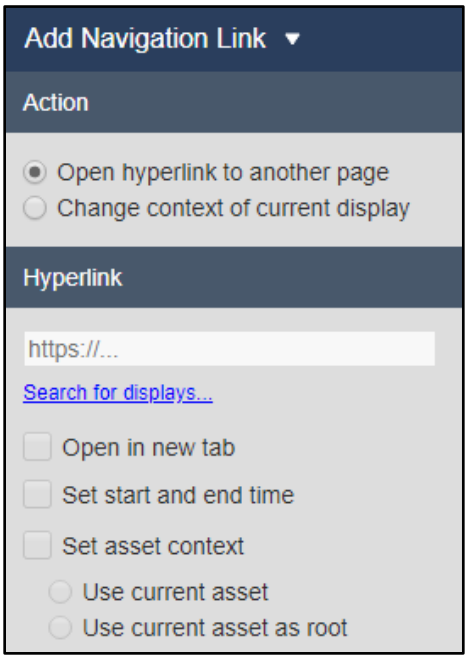
Event Name	Asset	Start Time	End Time
Well29 Well Running 2017-02-05 20:29:00.000	Well29	2/5/2017 8:29:00 PM	In Progress
Well29 Well Downtime 2017-02-05 20:06:00.000	Well29	2/5/2017 8:06:00 PM	2/5/2017 8:29:00 PM
Well12 Well Running 2017-01-16 05:17:00.000	Well12	1/16/2017 5:17:00 AM	2/3/2017 12:07:01 AM

  - Right-click on the Events Table and click on Table Configuration to edit the Table Columns and Dynamic Criteria that determine which events to show

- Multi-State menu option
  - Value symbols and all Gauge Symbols can be modified to become multi-state symbols
  - Right-click on the symbol and select Add Multi-State in order to configure the Multi-State symbol. The trigger tag and states can be configured here



- Navigation Link menu option
  - Every symbol has 'Add Navigation Link..' as a menu option
  - This allows a user to click on a symbol and redirected to a new link. This link could be a webpage, separate PI Vision display, or even a file or resource on a machine



- Collection menu option
  - Every symbol has the option to convert it to a collection
  - A collection is a dynamically updating group of symbols that leverages Element templates in AF

- Switch Symbol menu option
  - Each symbol has a menu option that allows a user to switch a symbol into a different type of symbol
  - This saves a user from having to recreate a symbol from scratch if they would like to change the symbol type

- **Ad Hoc Trend Workspace**
  - Selecting any number of symbols and/or data items and then the Ad Hoc Trend button will open a new window designed for Ad Hoc analysis
    - Optionally view a table with statistics for all data items
    - Toggle Trend options with single clicks without navigating a configuration menu
    - Add multiple cursors to the trend
    - Publish as a displays and share with other users

- **Asset Dropdown**
  - Opening the Asset dropdown menu gives a list of possible Assets to which the display context could be switched
  - If the list of Assets is very long, it is possible to enter a filter

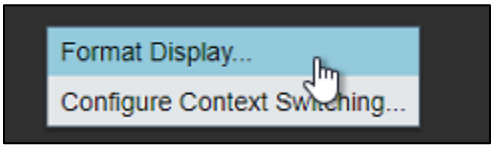
  - By default the menu will populate with similar Assets to the current context. If appropriate, click the gear button to customize the Asset search criteria

Challenge 1: Create an Overview display

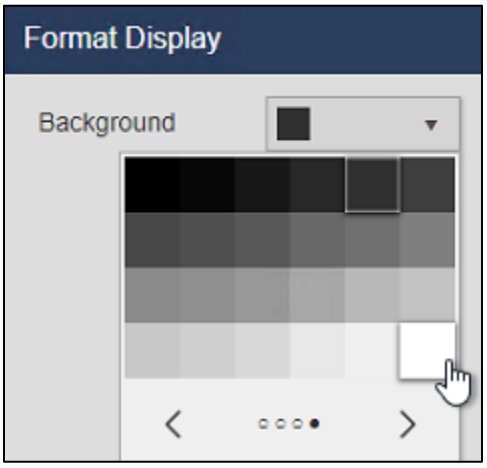
TechCon Labs has identified production within the state of North Dakota as a strategic area to monitor in the next several months. The TechCon Labs management team has requested a dashboard from which they can see any under-performing Well Pads or Oil Wells within the state at a single glance. If management is impressed by the resulting dashboard, they plan to approve additional project resources to continue the project.

Step by Step

1. On the PI Vision Homepage, click the **New Display** button at the top right-hand side of the screen
2. Right-click anywhere on the background of the display and select **Format Display…** to open up the configuration pane

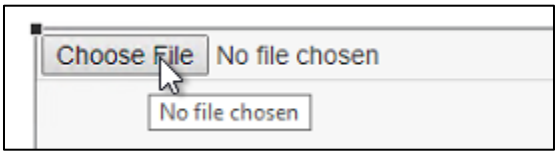


3. Open the **Background** drop-down color selector and choose the white background



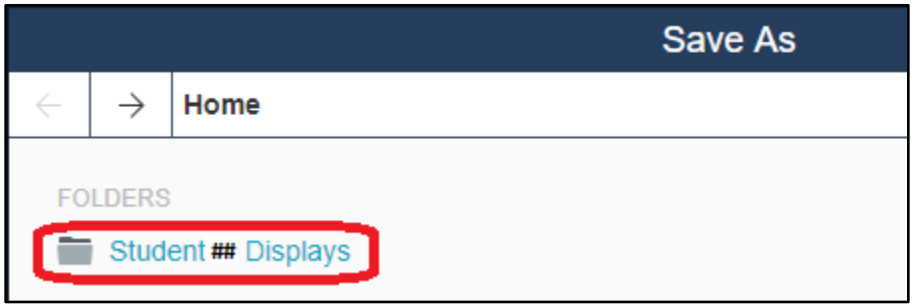
4. Click the **Image** button on the toolbar

5. Click and drag to outline most of the display area, and then click **Choose File**

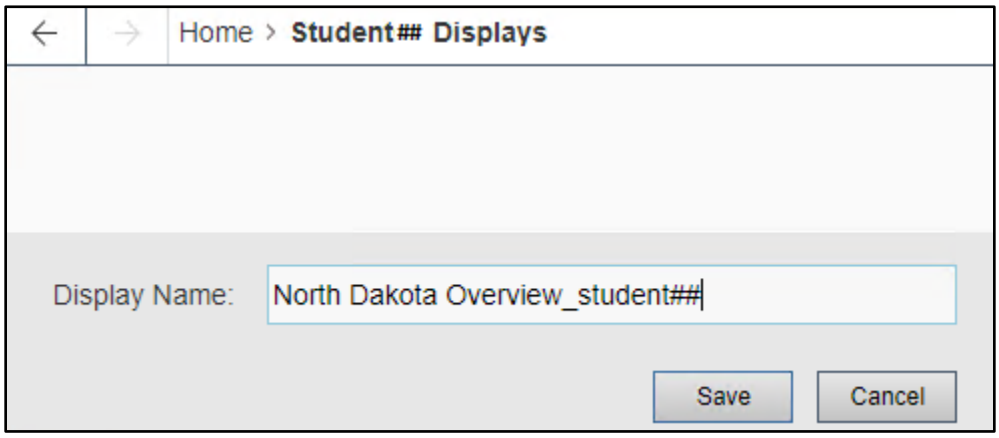


6. Select the file **C:\Class Files\north_dakota.gif**
7. Click on the **Save** button in the top right of the browser window

8. Select the Display Folder for your user account



9. Save the display with the name **North Dakota Overview** followed by your student number

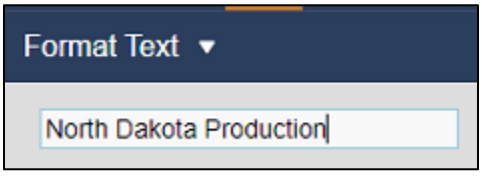


10. Click the **Modify** button to place the display back into Modify Mode

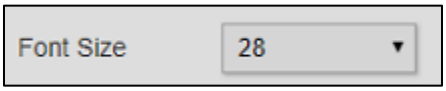
The workbook does not explicitly call for the display to be saved again until it is completely finished. However, it is a good idea to make incremental saves after every couple steps to make sure no work is ever lost. This can be done at any time by clicking the **Save** button again.

11. Click the **Text** button on the toolbar

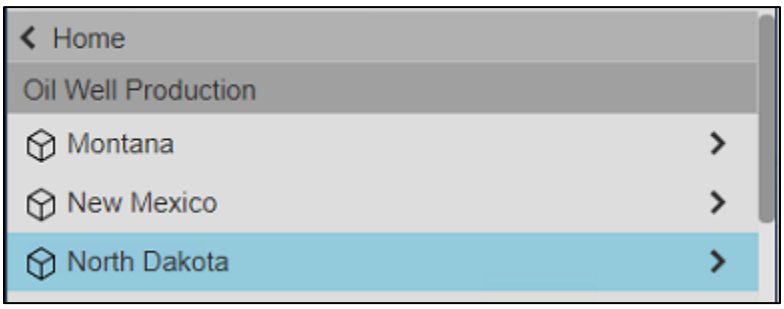
12. Click on the upper right area of the state image and type “North Dakota Production” in the **Format Text** field of Configuration Pane



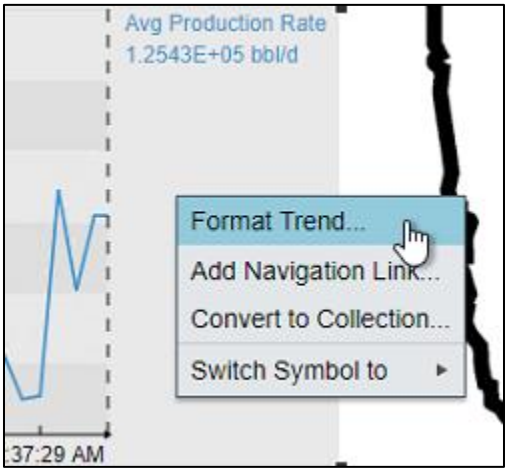
13. In the same Configuration Pane, change the **Font Size** to 28



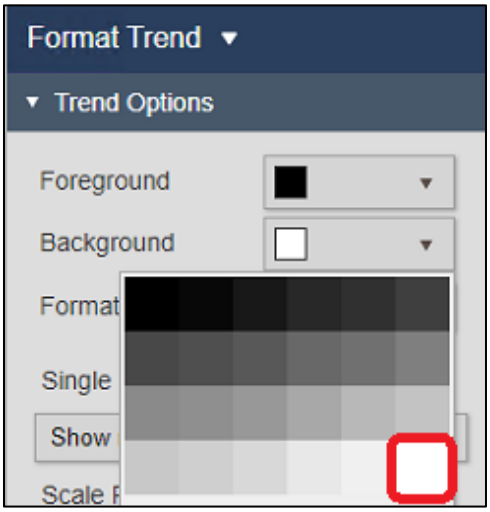
14. Browse to and highlight North Dakota in the Search Pane



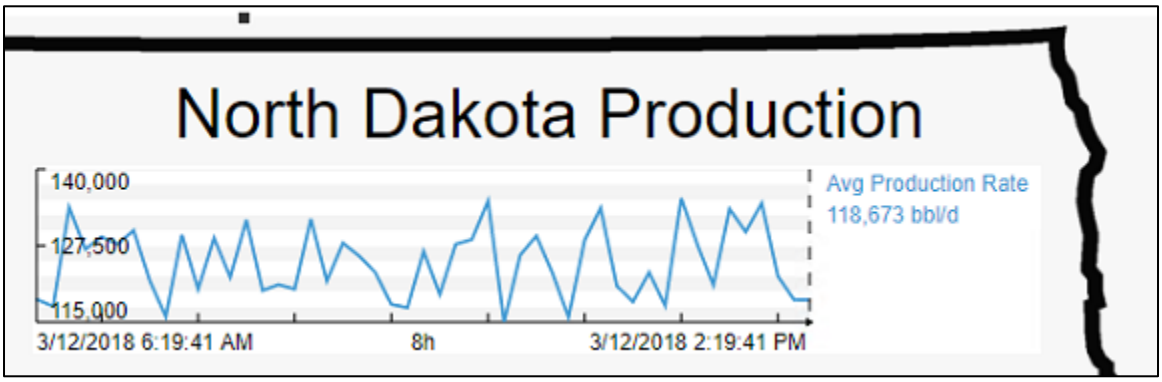
15. Verify the Trend symbol type is highlighted, and click and drag the **Avg Production Rate** attribute on the display to fill the area below the text symbol
16. Right-click on the symbol and select **Format Trend…**



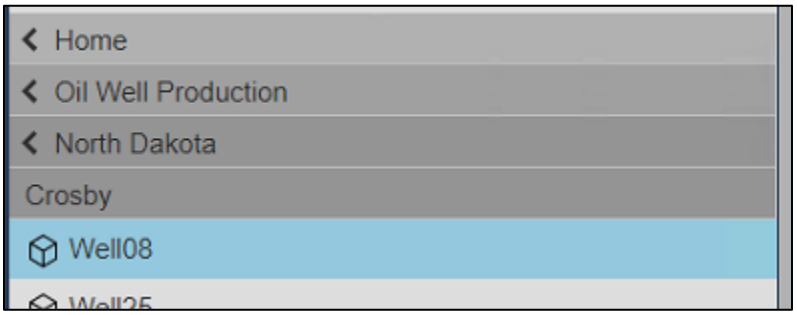
17. Change the **Background** from very light grey to white



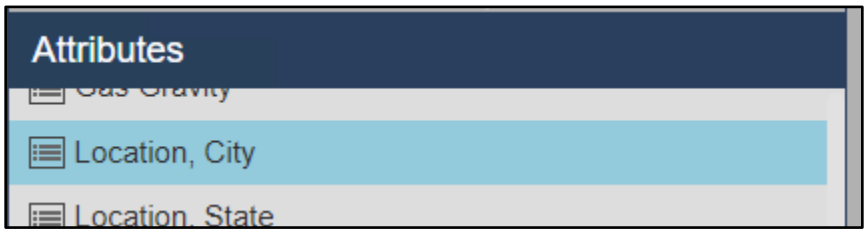
18. Resize the trend to only occupy a narrow band below the display title in the top right corner of the North Dakota outline



19. Browse to and highlight **Well08** in the Search Pane

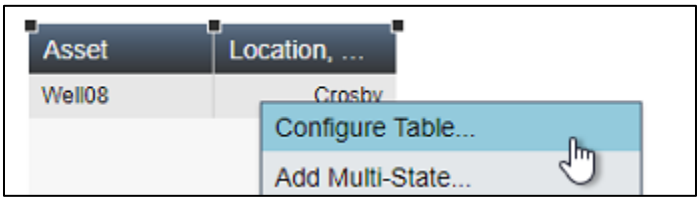


20. In the lower part of the Search Pane, find the **Location, City** attribute

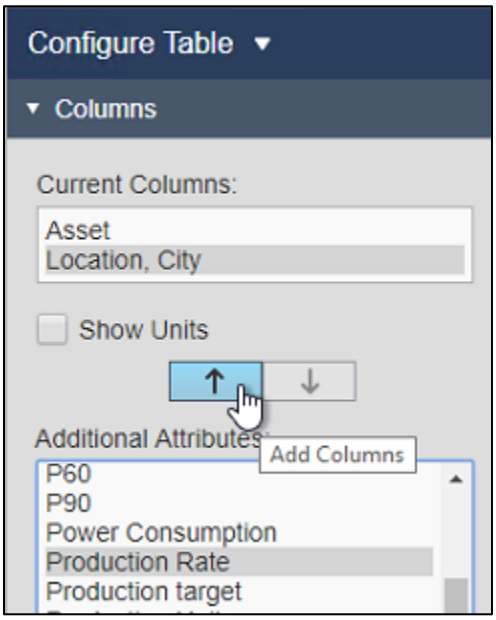


21. Select the **Asset Comparison Table** symbol and then click and drag the **Location, City** attribute onto the bottom right area within the North Dakota image

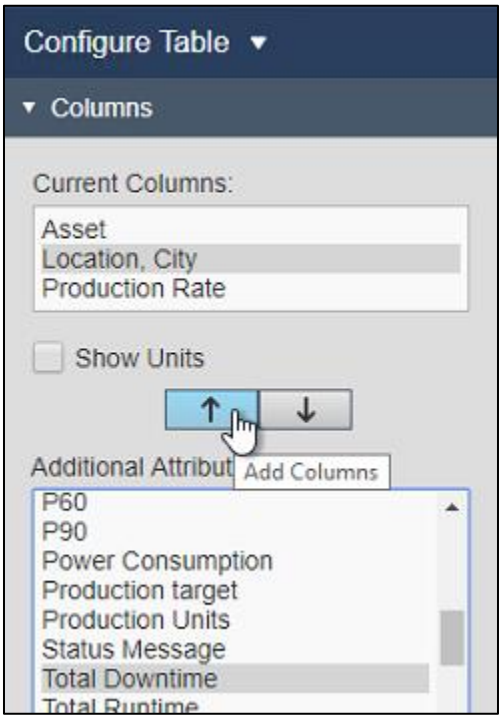
22. Right-click on the table symbol and select **Configure Table…**



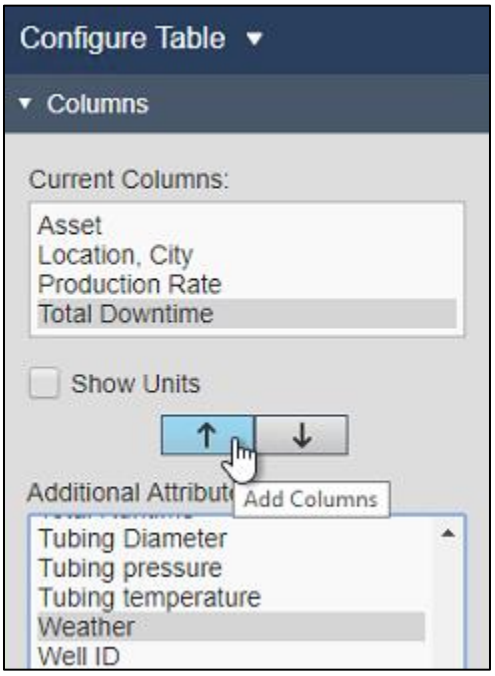
23. Under Additional Attributes, select **Production Rate** and click the upwards pointing arrow to add another column



24. Repeat the previous step for the **Total Downtime** attribute to add a fourth column to the table

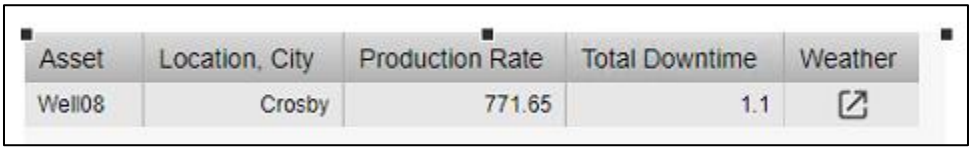


25. Repeat the previous state for the **Weather** attribute to add a fifth column to the table

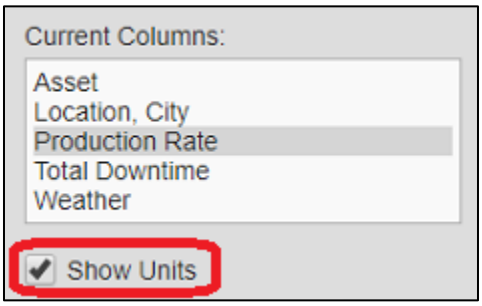


26. In the **Style** section of the configuration pane, select the middle option to use a light color scheme

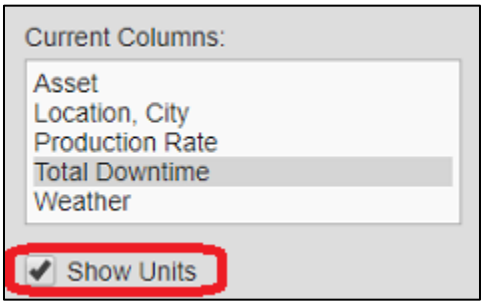
27. Resize the symbol area and the table columns so that nothing is cut off



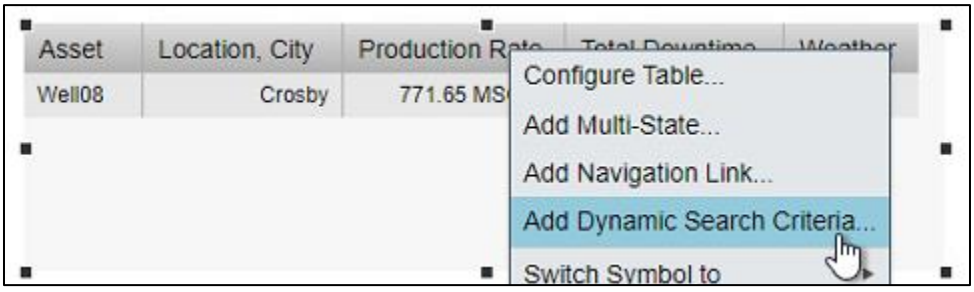
28. In the configuration pane, highlight the **Production Rate** column and click the **Show Units** checkbox



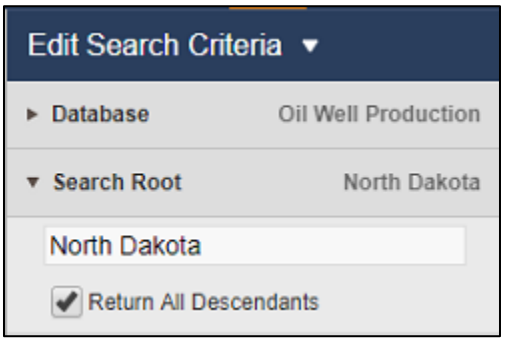
29. Repeat the previous step for the **Total Downtime** column



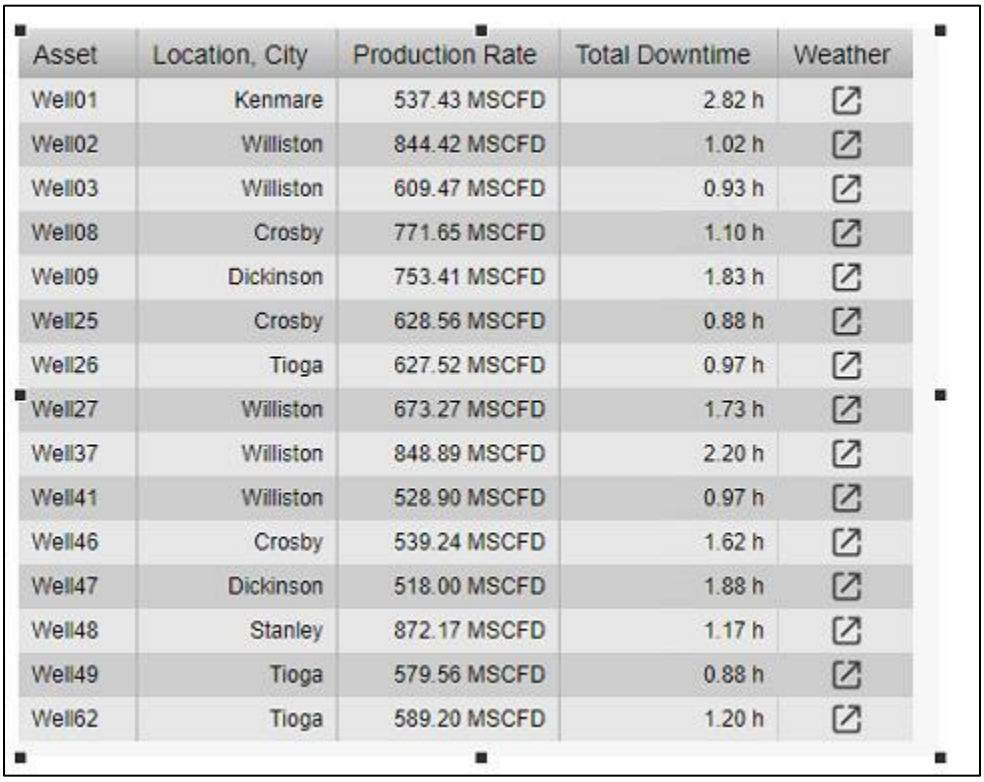
30. Right click on the Asset Comparison Table symbol and select **Add Dynamic Search Criteria…**



31. Modify the **Search Root** to include all of North Dakota, click the checkbox to **Return All Descendants**, and then click **Refresh**



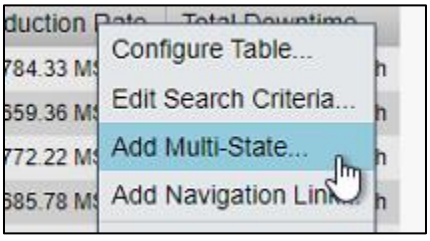
32. Resize the symbol again so that all rows are shown and there are no scroll bars



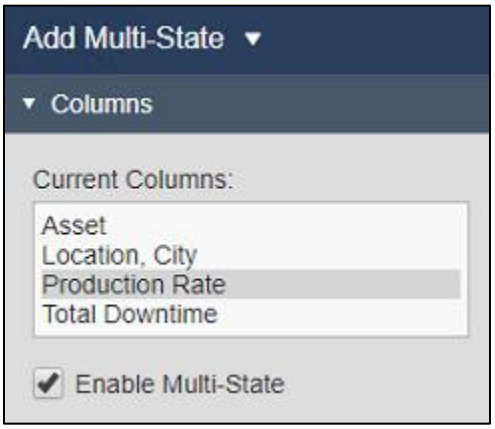
Asset	Location, City	Production Rate	Total Downtime	Weather
Well01	Kenmare	537.43 MSCFD	2.82 h	
Well02	Williston	844.42 MSCFD	1.02 h	
Well03	Williston	609.47 MSCFD	0.93 h	
Well08	Crosby	771.65 MSCFD	1.10 h	
Well09	Dickinson	753.41 MSCFD	1.83 h	
Well25	Crosby	628.56 MSCFD	0.88 h	
Well26	Tioga	627.52 MSCFD	0.97 h	
Well27	Williston	673.27 MSCFD	1.73 h	
Well37	Williston	848.89 MSCFD	2.20 h	
Well41	Williston	528.90 MSCFD	0.97 h	
Well46	Crosby	539.24 MSCFD	1.62 h	
Well47	Dickinson	518.00 MSCFD	1.88 h	
Well48	Stanley	872.17 MSCFD	1.17 h	
Well49	Tioga	579.56 MSCFD	0.88 h	
Well62	Tioga	589.20 MSCFD	1.20 h	

The icons in the **Weather** column can be clicked to open a link containing weather information for the appropriate city. Behind the scenes, this is an AF Attribute that contains a URL as its value.

33. Right-click on the Asset Comparison Table symbol and select **Add Multi-State…**

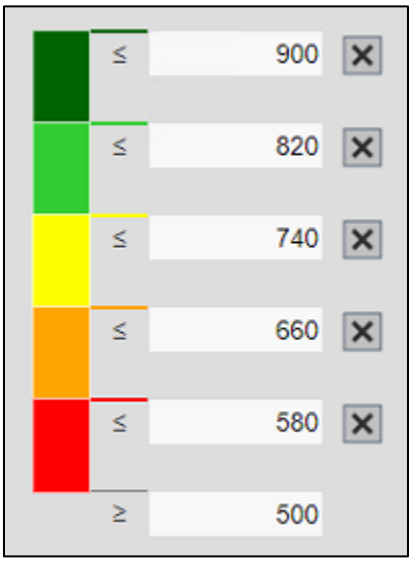


34. In the Configuration Pane, select **Production Rate** and select the **Enable Multi-State**

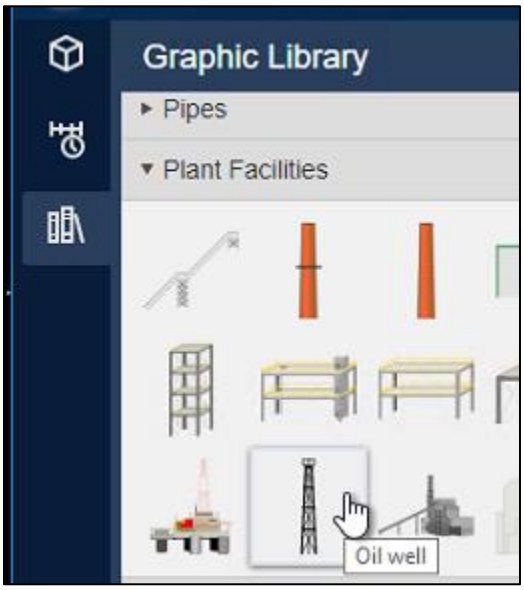


You may notice that some of the other columns have the checkbox greyed-out. This is because columns must contain numeric values in order to be eligible for Multi-Stating.

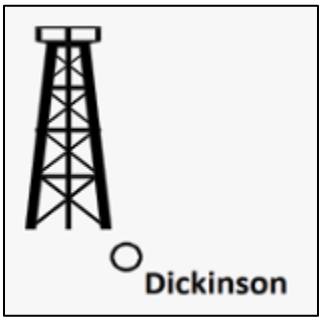
35. Modify the State colors so low values are shown in red and high values in green



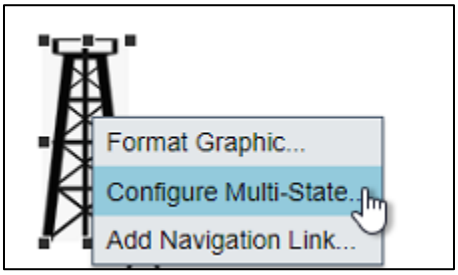
36. On the left-hand side of the display, open the Graphic Library, expand to the **Plant Facilities** section, and select the **Oil Well** graphic



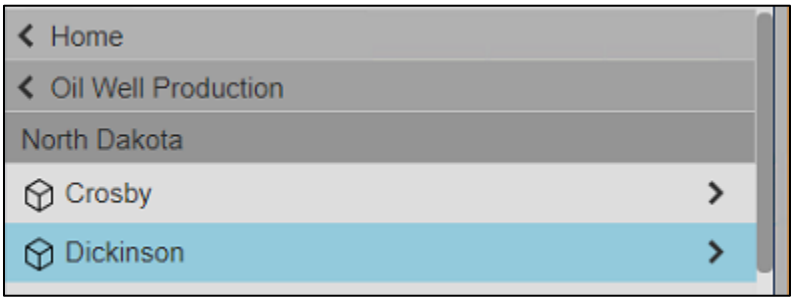
37. Draw the **Oil Well** graphic next to **Dickinson** on the map



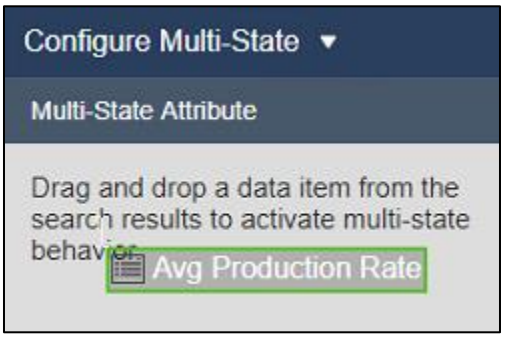
38. Right-click on the graphic and select **Configure Multi-State…**



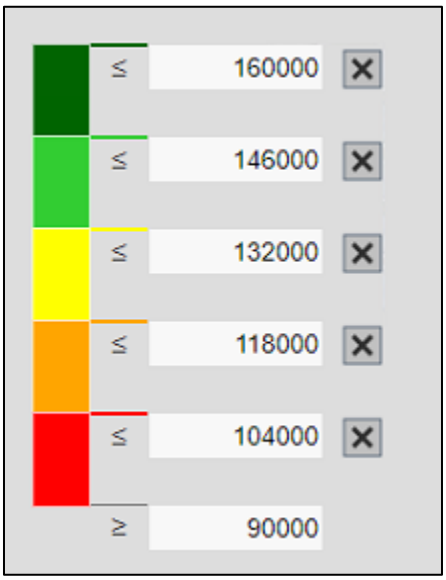
39. Browse to and highlight **Dickinson** in the Search Pane



40. Click and drag the **Avg Production Rate** attribute onto the **Multi-State Attribute** in the configuration pane



41. Modify the State colors so low values are shown in red and high values in green



42. Select the **Oil Rig** graphic on the display and click **Copy** on the toolbar

43. Click **Paste** four times

The keyboard shortcuts ***Ctrl + C*** and ***Ctrl + V*** can also be used to copy and paste, respectively.

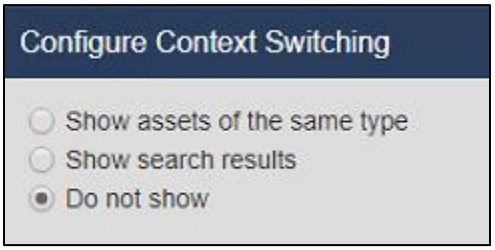
44. Click and drag the four new **Oil Well** graphics so there is one next to each production area

45. Repeat steps 38-40 to replace the Multi-state Attribute with the **Avg Production Rate** for the corresponding production area (Crosby|Avg Production Rate, Kenmare|Avg Production Rate, etc)

Be sure to replace the Multi-State data item rather than removing the existing item (using the trashcan graphic) and adding the new one. If the item is removed, the Multi-State colors will need to be re-configured each time.

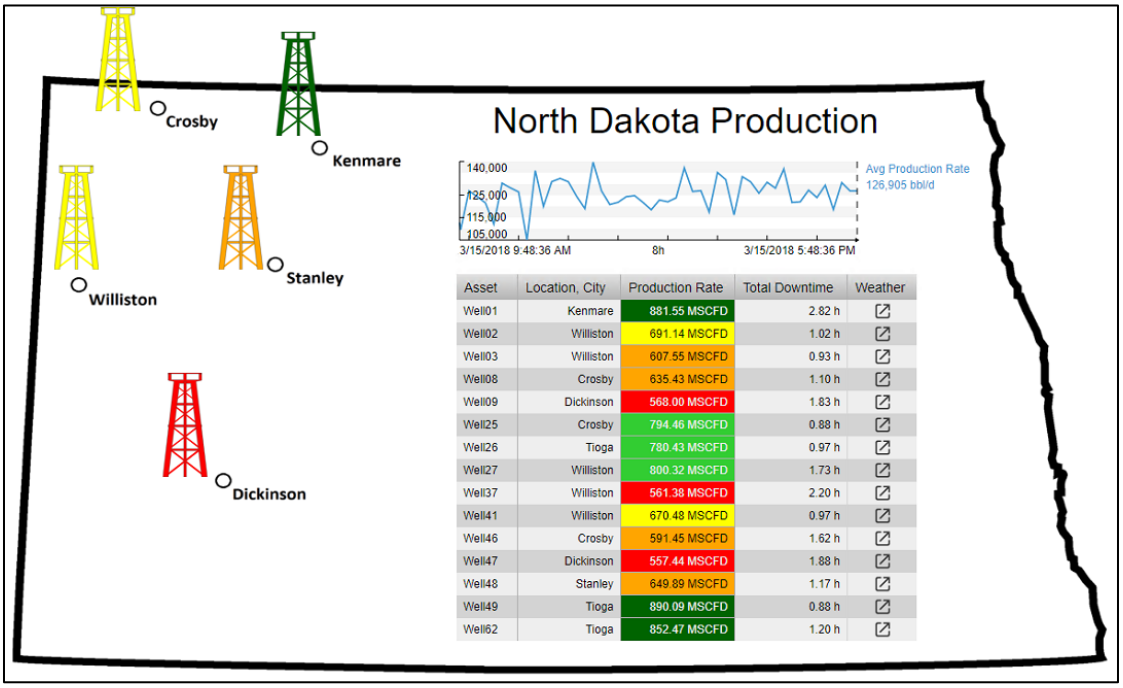
46. Open the Asset drop-down menu on the top of the display and then click the configure button

47. In the Configuration Pane, select **Do not show**



Since this is an overview display, we are hiding the context switching menu. This display is designed to always show the same data items. We will later be creating other displays that are meant to have a swappable asset context, and therefore will have the menu enabled.

48. In the top right corner, click the **Save** button



Asset	Location, City	Production Rate	Total Downtime	Weather
Well01	Kenmare	881.55 MSCFD	2.82 h	
Well02	Williston	691.14 MSCFD	1.02 h	
Well03	Williston	607.55 MSCFD	0.93 h	
Well08	Crosby	635.43 MSCFD	1.10 h	
Well09	Dickinson	568.00 MSCFD	1.83 h	
Well25	Crosby	794.46 MSCFD	0.88 h	
Well26	Tioga	780.43 MSCFD	0.97 h	
Well27	Williston	800.32 MSCFD	1.73 h	
Well37	Williston	561.38 MSCFD	2.20 h	
Well41	Williston	670.48 MSCFD	0.97 h	
Well46	Crosby	591.45 MSCFD	1.62 h	
Well47	Dickinson	557.44 MSCFD	1.88 h	
Well48	Stanley	649.89 MSCFD	1.17 h	
Well49	Tioga	890.09 MSCFD	0.88 h	
Well62	Tioga	852.47 MSCFD	1.20 h	

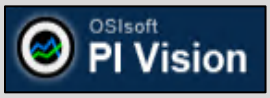
Challenge 2: Create a Well Pad drill-in display

The TechCon Labs management team has taken a look at the North Dakota dashboard and they think this PI Vision project has potential. However, they would also like to have a more detailed dashboard for each Well Pad.

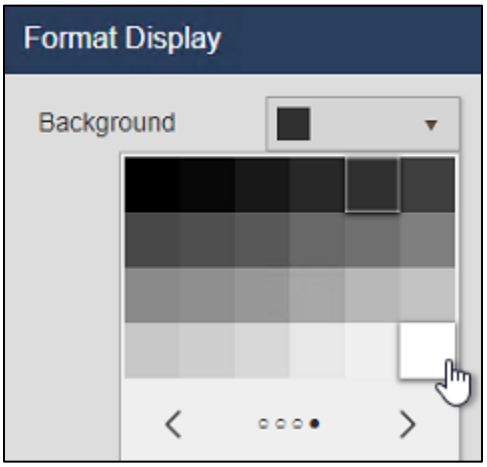
Since there are five different production areas and each one has a variable number of Oil Rigs, the executive team has allotted a week to build a specialized display for each area. However, since you are familiar with the latest Collection and asset-relative functionality in PI Vision, you believe you can satisfy the design requirements with a single display.

Step by Step

1. On the PI Vision Homepage, click the **New Display** button at the top right hand side of the screen

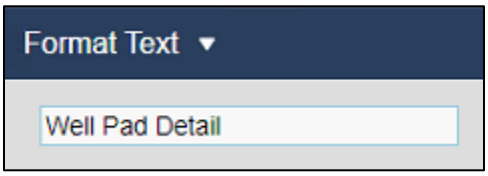
> The PI Vision Homepage can be reached at any time by clicking the PI Vision logo in the top left.
>
> 
>

2. Right-click anywhere on the background of the display and select **Format Display** to open up the configuration pane
3. Open the **Background** drop-down color selector and choose the white background

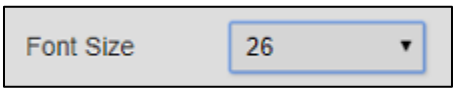


4. Click the **Text** button on the toolbar

5. Click on the top middle area of the display and type “Well Pad Detail” in the **Format Text** field in the Configuration Pane

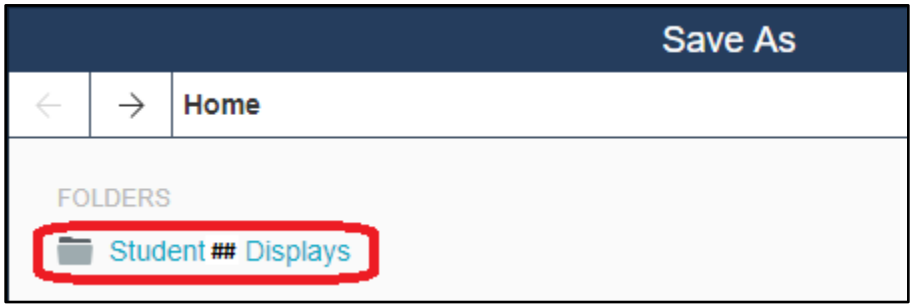


6. In the same Configuration Pane, change the **Font Size** to 26

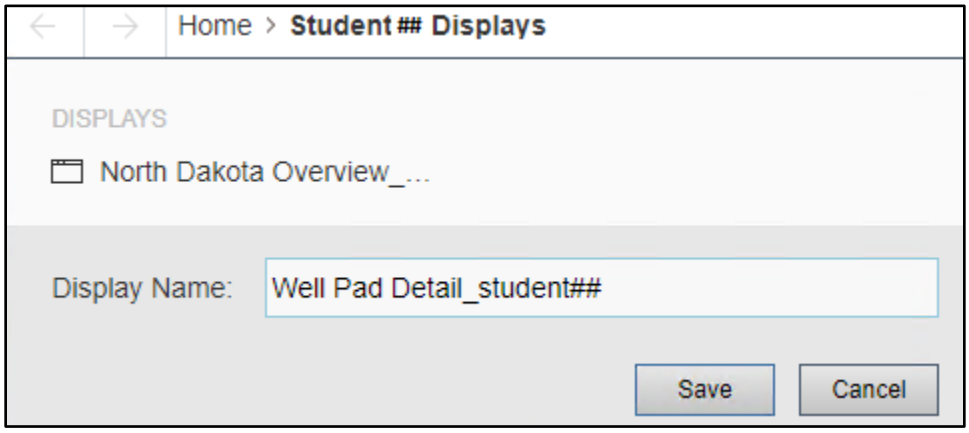


7. Click on the **Save** button in the top right of the browser window

8. If it is not already selected, click on the Display Folder for your user account

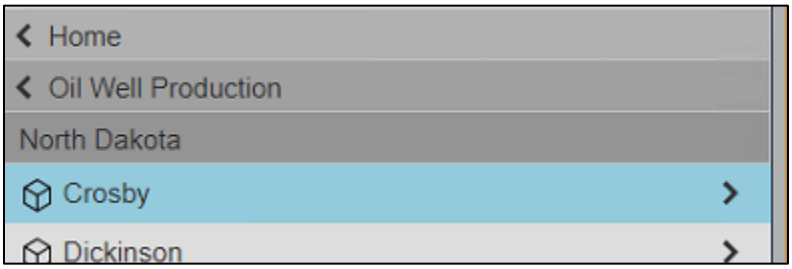


9. Save the display with the name **Well Pad Detail** followed by your student number



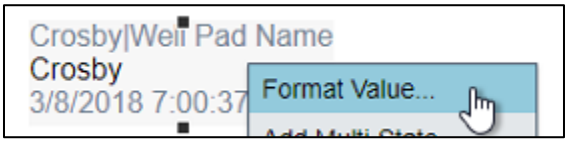
10. Click the **Modify** button to place the display back into Modify Mode

11. Browse to and highlight **Crosby** in the Search Pane

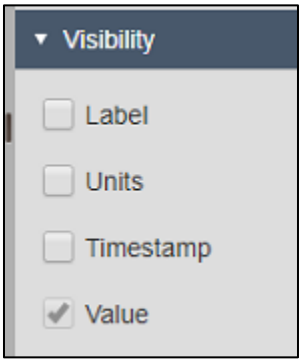


12. Select the **Value** symbol type at the top of the search pane

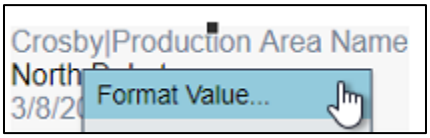
13. Click on the **Well Pad Name** attribute and drag it onto the display below the Well Pad Detail text
14. Right-click on the value symbol and select **Format Value…**



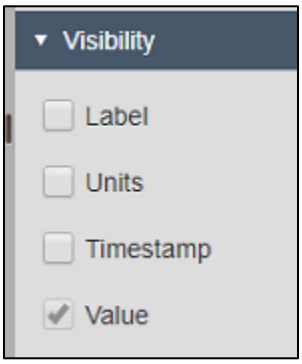
15. Expand the **Visibility** section of the Configuration Pane and deselect **Label**, **Units**, and **Timestamp**



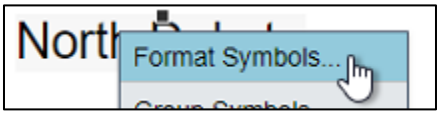
16. Click on the **Production Area Name** attribute and drag it onto the display below the Well Pad Detail text and to the right of the Well Pad Name
17. Right-click on the value symbol and select **Format Value…**



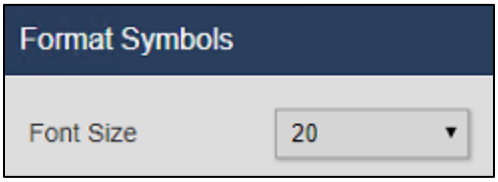
18. Expand the **Visibility** section of the Configuration Pane and deselect **Label**, **Units**, and **Timestamp**



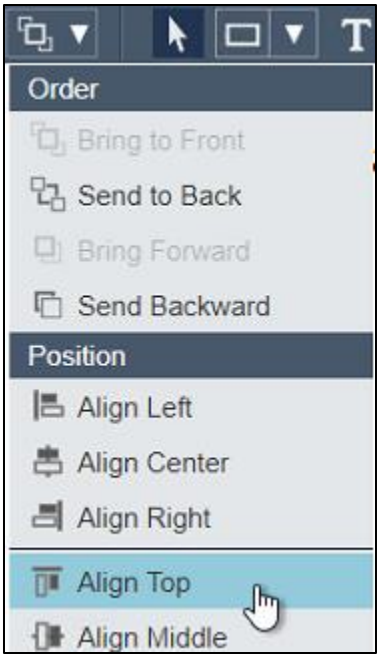
19. Select both Value symbols by clicking on both with the **Ctrl** key held down
20. Right-click on either of the symbols and select **Format Symbols…**



21. In the Configuration Pane, change the **Font Size** of both symbols to 20

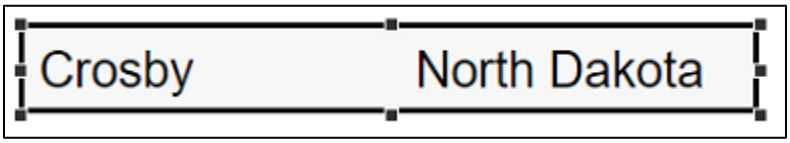


22. With both value symbols still selected, click the **Align Top** option in the **Arrange** dropdown menu on the toolbar

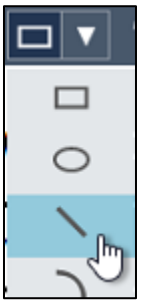


23. From the Shape dropdown menu on the toolbar, select **Rectangle**

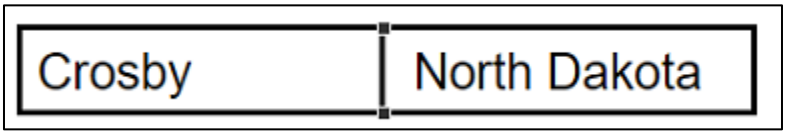
24. Draw a rectangle around the two value symbols by clicking and dragging
25. In the Arrange dropdown menu, select **Send to Back**



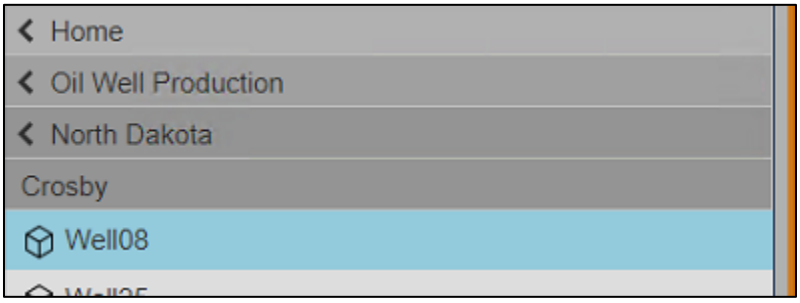
26. From the Shape dropdown menu on the toolbar, select **Line**



27. While holding down Shift, trace a line to divide the rectangle into two sections containing one value symbol each

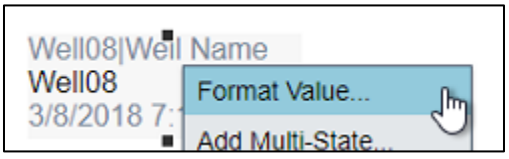


28. Browse to and highlight **Well08** in the Search Pane

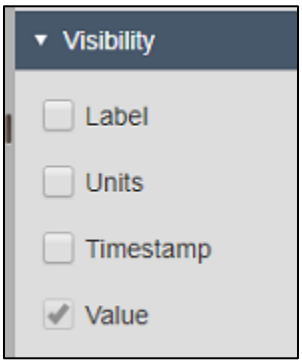


29. Verify the **Value** symbol is still selected

30. Click on the **Well Name** attribute and drag it onto the display
31. Right-click on the value symbol and select **Format Value…**



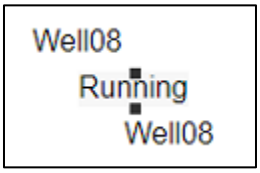
32. Expand the **Visibility** section of the Configuration Pane and deselect **Label**, **Units**, and **Timestamp**



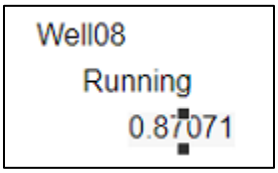
33. Highlight the Value symbol and select **Copy** on the toolbar

34. Click **Paste** two times

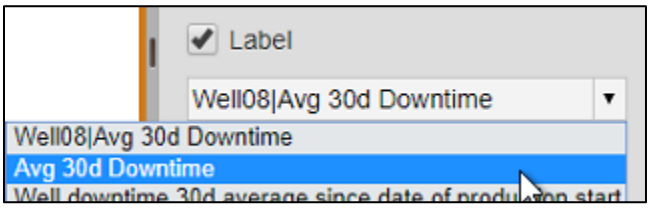
35. Find the **Status Message** attribute. Drag it onto the second **Well08** value symbol. The second value symbol should now read the status message rather than the well name



36. Find the **Avg 30d Downtime** attribute and drag it onto the third **Well08** value symbol



37. Right-click on the third value symbol, and select **Format Value**
38. In the **Visibility** section, check the box for Units and Label. Using the drop down menu, select the second label instance (where it only includes the name of the attribute, and not the name of the element)



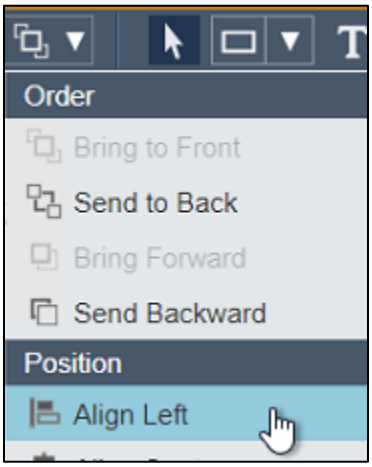
39. Select the **Avg 30d Downtime** value symbol and select Copy on the toolbar

40. Click **Paste** one time

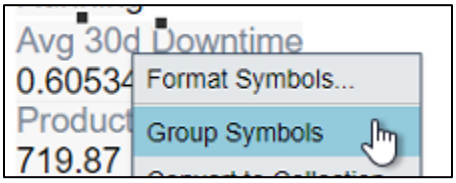
41. Click and drag the fourth value symbols so there is no overlap

42. Find the **Production Rate** attribute and drag it onto the fourth value symbol
43. Click and drag a box around the value symbols to select all four

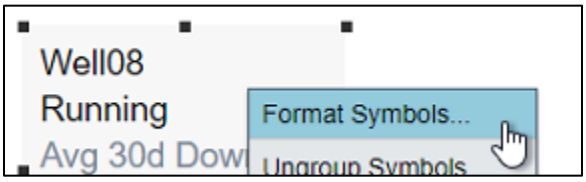
44. From the Arrange dropdown menu, select **Align Left**



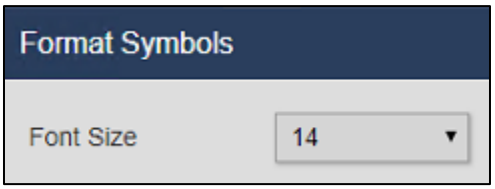
45. With all four of the symbols still selected, right-click and click **Group Symbols**



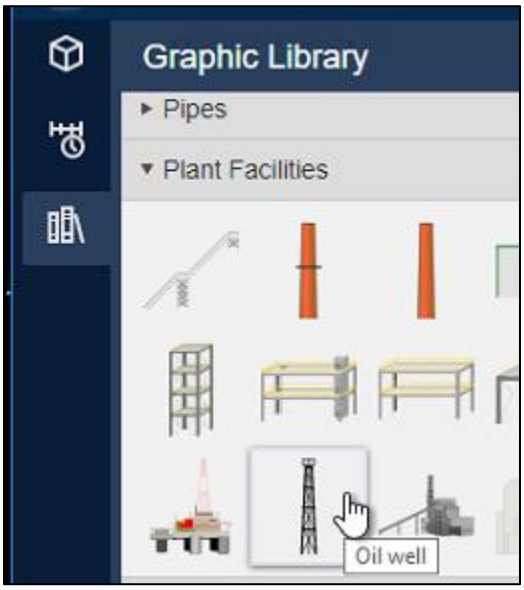
46. Right-click on any of the four symbols and select **Format Symbols…**



47. Change the **Font Size** to 14

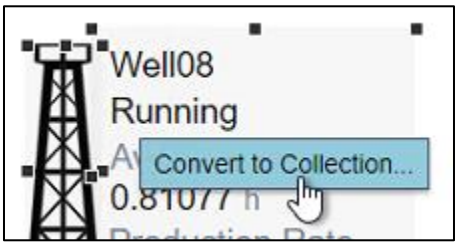


48. On the left-hand side of the display, open the Graphic Library, expand to the **Plant Facilities** section, and select the **Oil Well** graphic

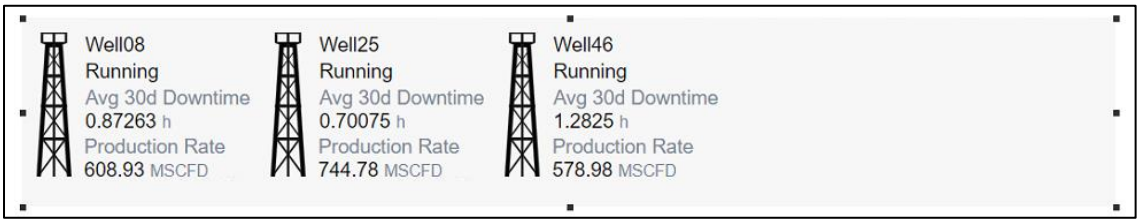


49. Draw the **Oil Well** graphic right next to the four values symbols that were most recently added

50. With the **Oil Well** graphic and the grouped value symbols selected, right-click and select **Convert to Collection…**

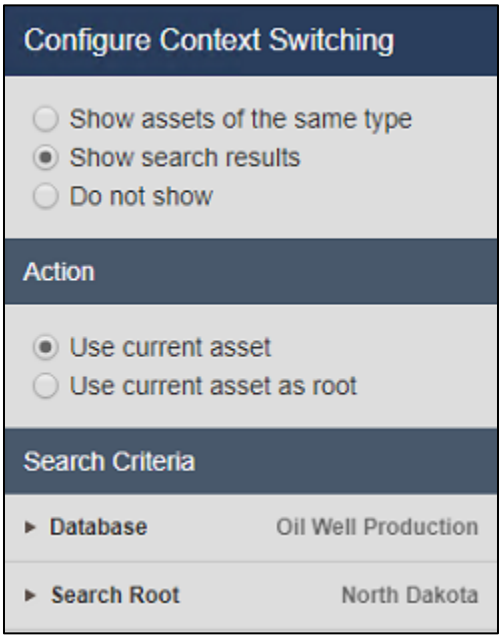


51. Resize the collection area so that all Oil Wells can be show in a horizontal row

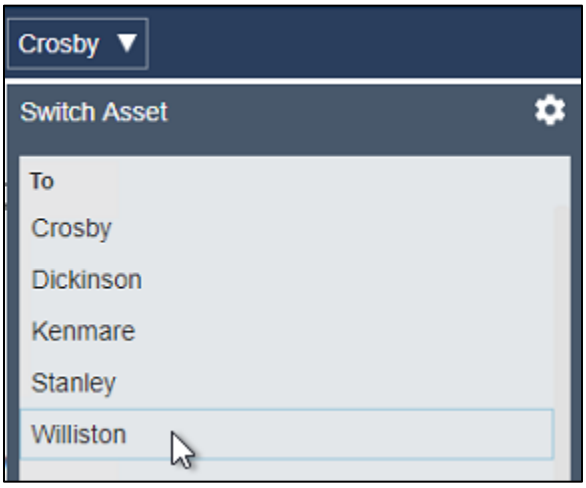


52. Open the Asset drop-down menu on the top of the display and then click the configure button

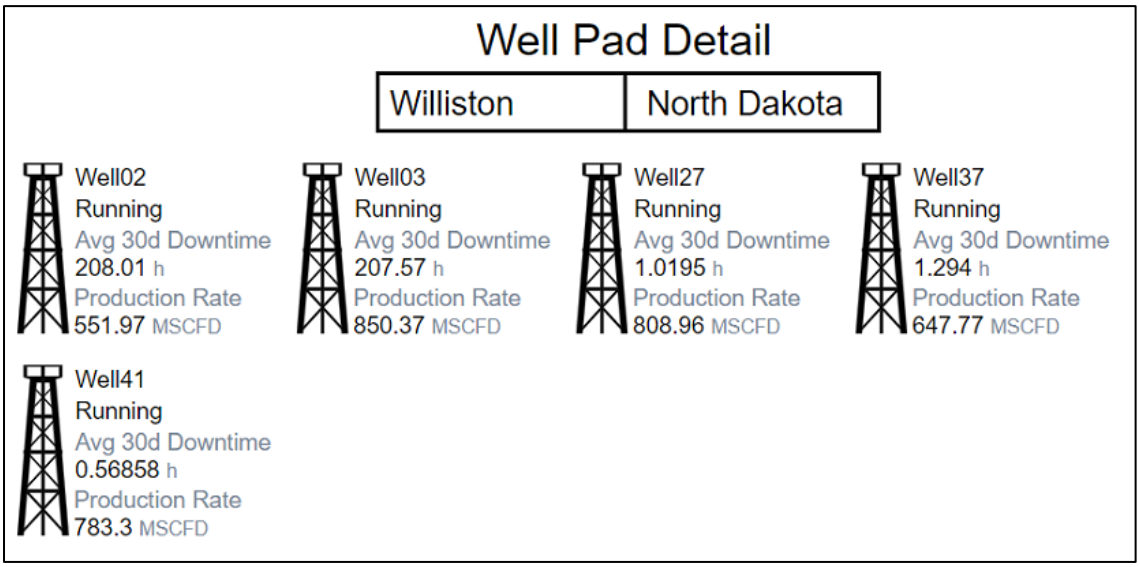
53. Toggle the Context Switching option to use **Show search results** and verify that North Dakota is set as the **Search Root**



54. Open the Asset dropdown menu and click **Williston** to change the display context



55. Save the display



Challenge 3: Create an Oil Well drill-in display

The Techcon Labs management team is again satisfied with what they see and would like to take this a step further. This time they have requested a dashboard for each Oil Well within North Dakota. There is an existing PI ProcessBook display that should be used as model. In addition to the items on the existing display, the dashboard also needs to be a way to view and classify recent downtime events for the Oil Rig.

Management was surprised by the quick turnaround on the last stage of the project, but they still figure so many displays will take at least a week to build. However, now you have some experience building displays and are confident only a single display is actually needed. Furthermore, you believe you can save time by migrating the PI ProcessBook display to use as a starting point.

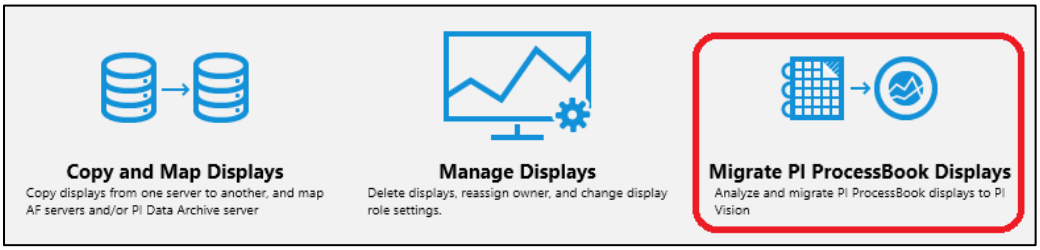
Step by Step

Optional: Open File Explorer and browse to **C:\Class Files**. Double click on **Oil Well Detail Well08.PDI** to open it in PI ProcessBook. This is the PI ProcessBook display we will be migrating to a native PI Vision display.

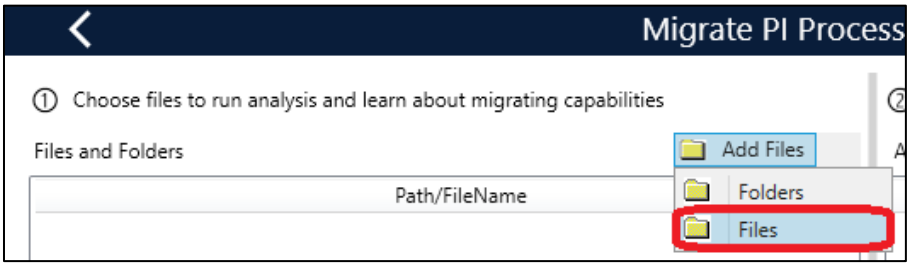
1. On the Windows taskbar, click the PI icon to open the **PI Vision Display Utility**

The lab environments should have the PI Vision Display Utility pinned to the taskbar as seen above. If it is missing, there is will also be a shortcut on the Desktop that is always placed there during installation.

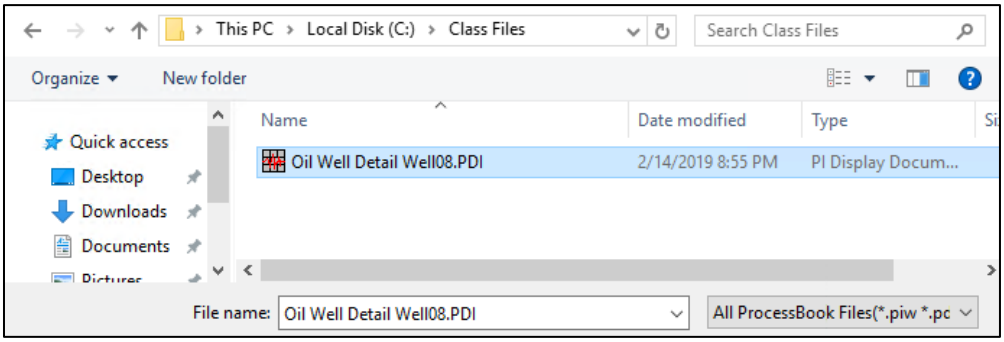
2. Select **Migrate PI ProcessBook Displays** add-in to open the



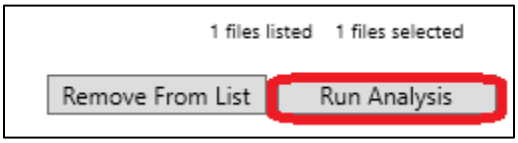
3. Open up the file selector by clicking **Add New** and then **Files**



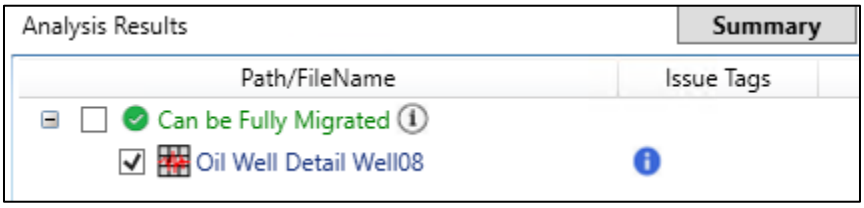
4. Browse to and select **C:\Class Files\Oil Well Detail Well08.PDI**.



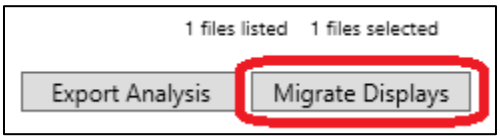
5. Click the checkbox next to the file and then click **Run Analysis**



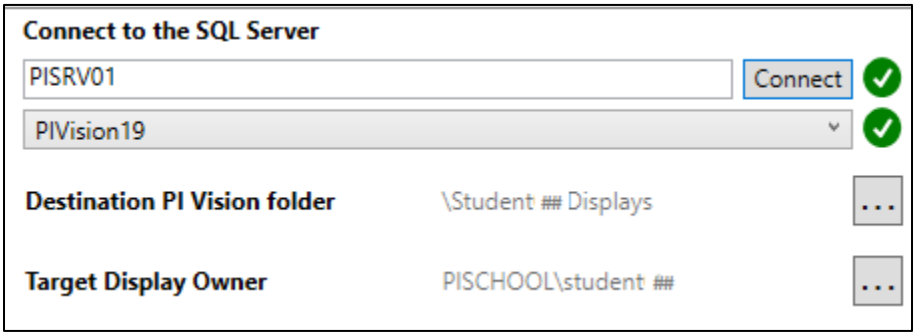
6. Expand the **Analysis Results** on the right side of the utility window and click the checkbox next to the display



7. Click **Migrate Displays** in the lower right corner

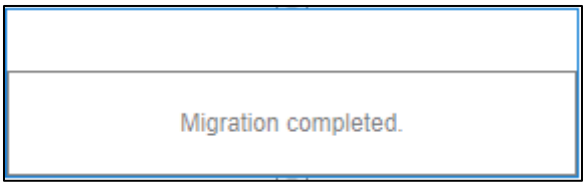


8. In the Migration Settings window, verify there is a good connection to the PI Vision SQL database and that the **Destination PI Vision folder** & **Target Display Owner** match your username

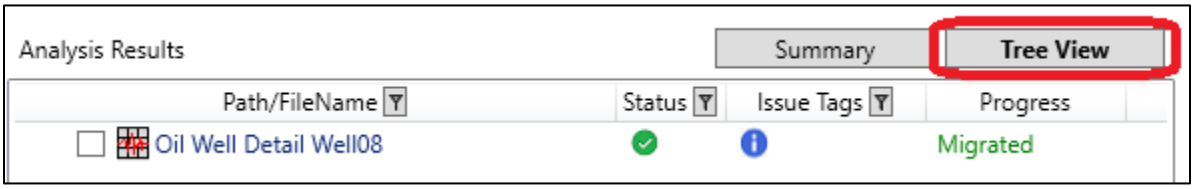


The **Persist folder structure from migrated items** option can be left unchanged. It does not matter in this case since we are only migrating a single display.

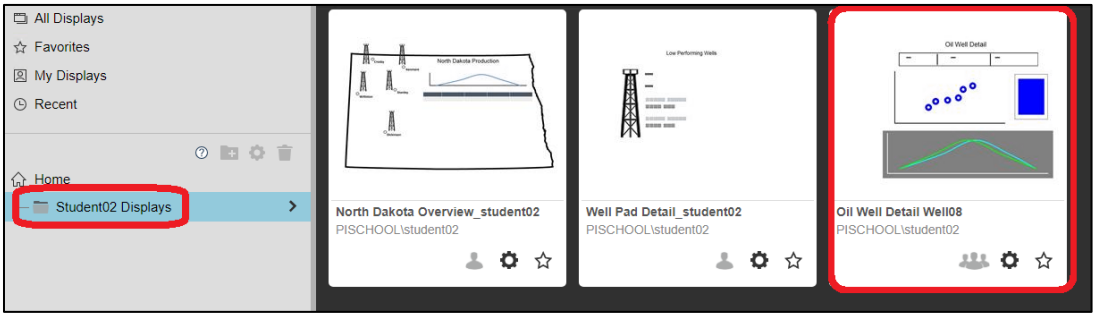
9. Click **OK** to initiate the migration
10. Once you see the **Migration completed** message, click any where else on the utility to close the dialog



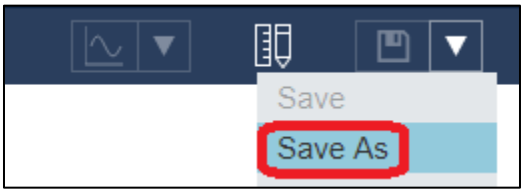
11. Click on the **Tree View** tab to verify that the display was successfully migrated



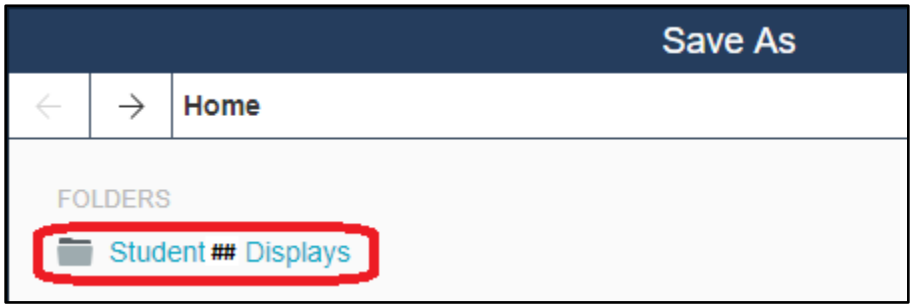
12. Open PI Vision, select your Display Folder and find & click on the migrated display



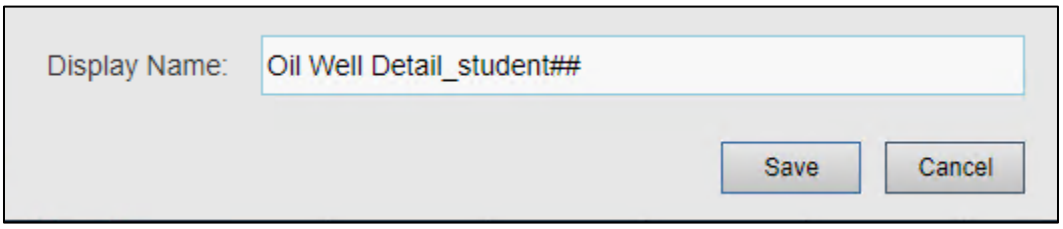
13. Open the save menu and select **Save As**



14. If it is not already selected, click on the Display Folder for your user account

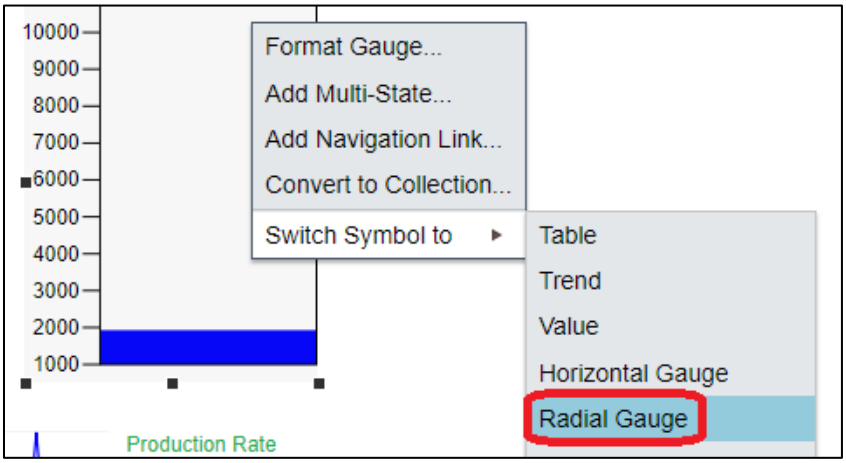


15. Save the display with the name **Oil Well Detail** followed by your student number

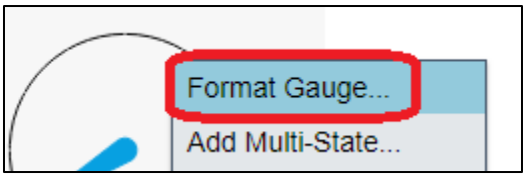


16. Click on the **Modify** button in the top right corner of the window to switch to Modify Mode

17. Right-click on the Vertical Gauge and select **Switch Symbol to Radial Gauge**



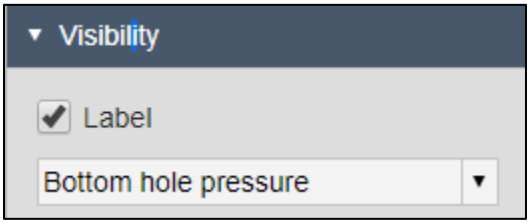
18. Right-click on the Radial Gauge and select **Format Gauge…** to open the Configuration Pane



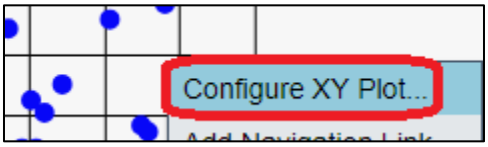
19. In the Style section, change the **Scale** and the **Value** color to black

The Scale and Value colors may have already been set to black. The last two steps were only necessary due to a bug in the background color detection for migrated displays. This will hopefully have been already fixed before the lab is held.

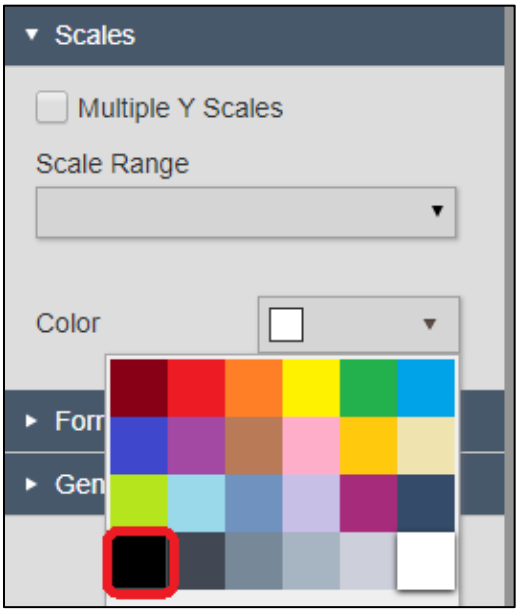
20. In the Visibility section, use the **Label** dropdown menu and select to show only the attribute name



21. Right-click on the XY Plot and select **Configure XY Plot…**

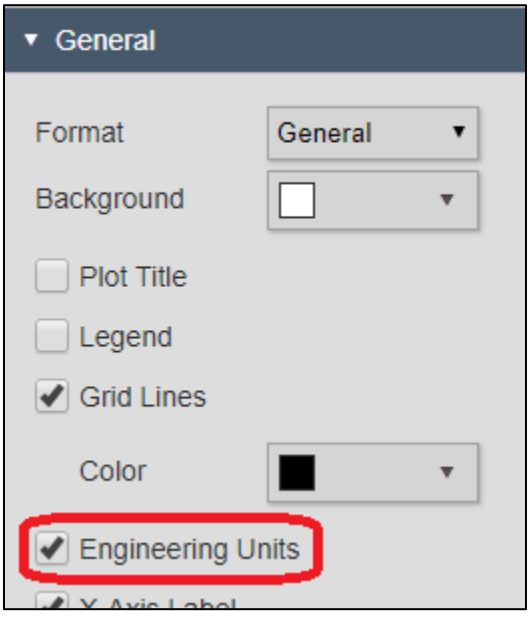


22. In the **Scales** section of the Configuration Pane, set the **Color** to black



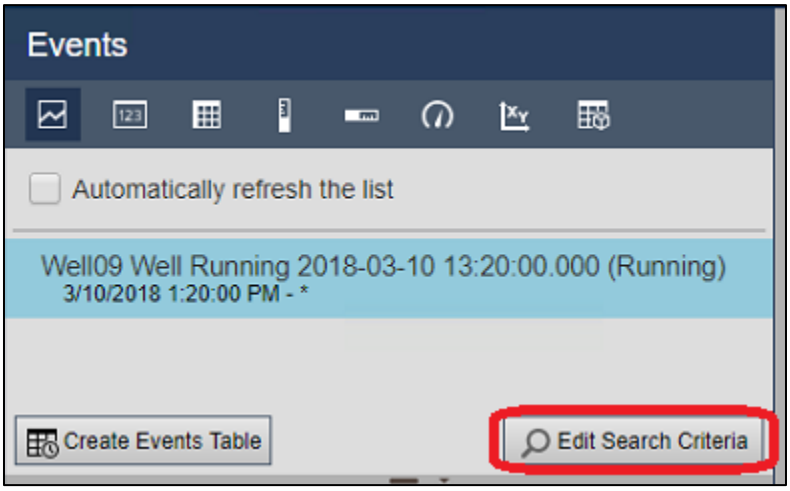
Again, the Scale color may have already been set to black. The last two steps were only necessary due to a bug in the migration of the XY Plot symbol. This will hopefully have been already fixed before the lab is held.

23. In the General section of the Configuration Pane, enable **Engineering Units**



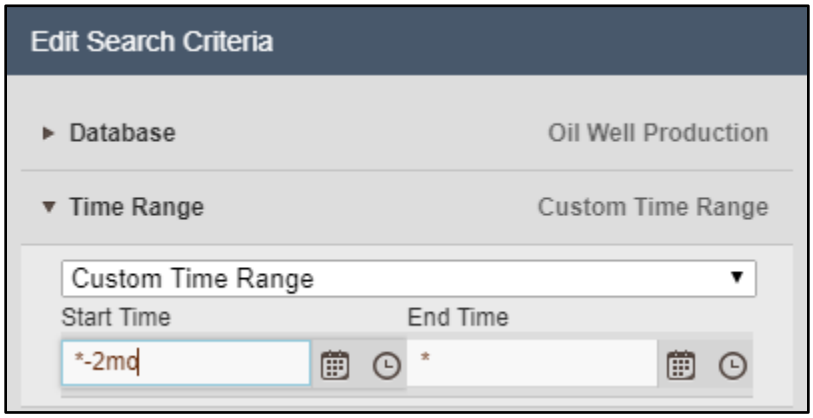
24. Open the Events Search Pane

25. Click **Edit Search Criteria**

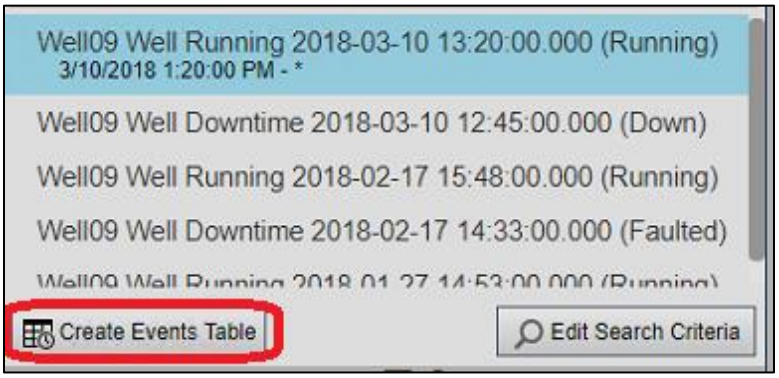


The Event Search pane initially returns Events that are related to on any assets represented by data items on the display, and were active at any point between the display Start Time and display End Time. By default, the display End Time is set to the current time and the display End Time is eight hours earlier.

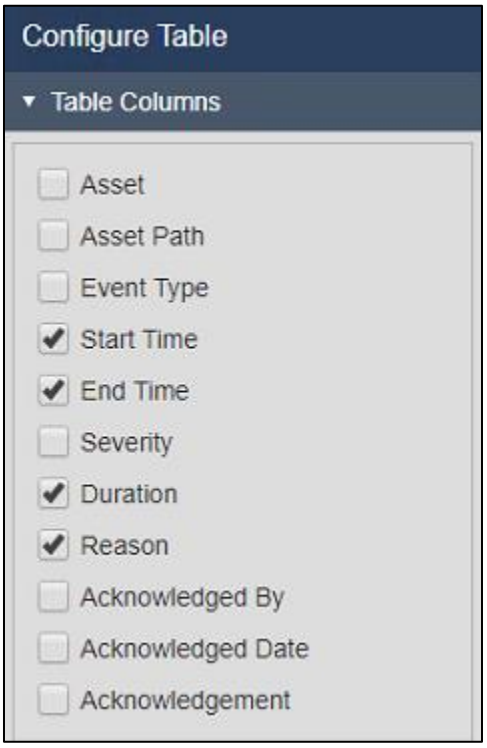
26. Select **Custom Time Range** from the Time Range dropdown list, enter "*-2mo" for the Start Time, and click Apply



27. Click **Create Events Table** and drag the symbol to the bottom of the display

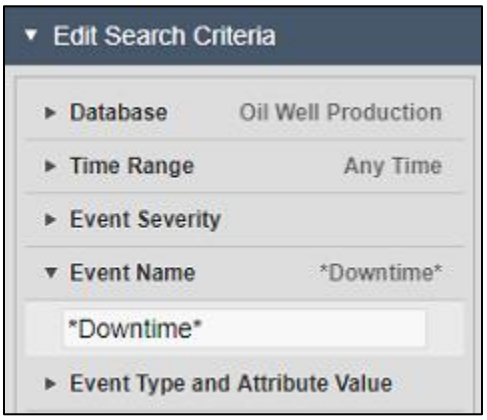


28. In the Configuration Pane, deselect the columns **Asset** and **Acknowledgement**
29. Select the columns **Duration** and **Reason**

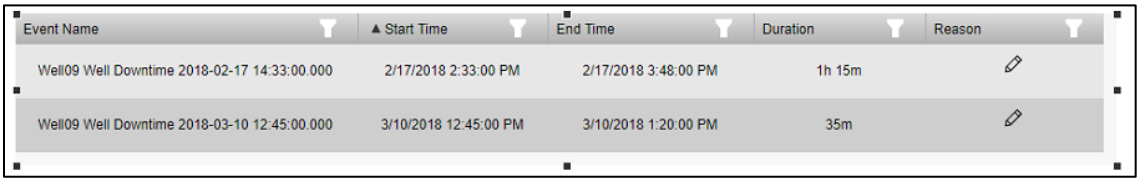


30. In the **Style** section of the Configuration Pane, Select the Light color scheme

31. In the **Edit Search Criteria** section of the Configuration Pane, add an **Event Name** search filter for "*Downtime*" and then click **Apply**



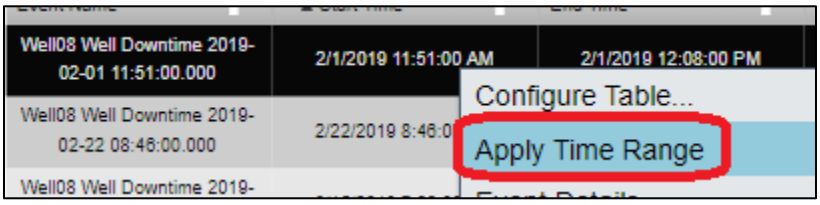
32. Resize the Events Table symbol outline and columns so that no nothing is cut off or wraps to the next line



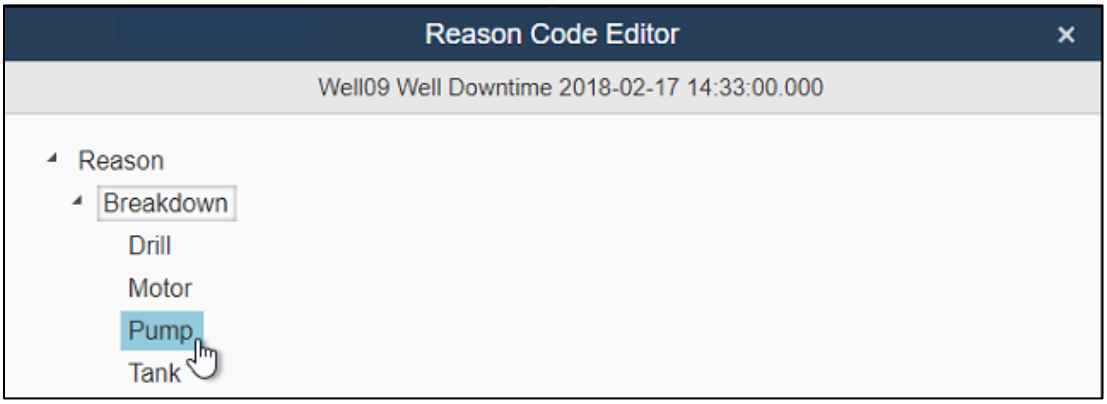
33. Place the Events Table symbol at the bottom of the display and adjust the position of other symbols if desired

If needed, the **Zoom Out** button is located in the bottom right of the display.

34. Right click on an Event in the table and select **Apply Time Range** to set the display Start Time and End Time to match the downtime event

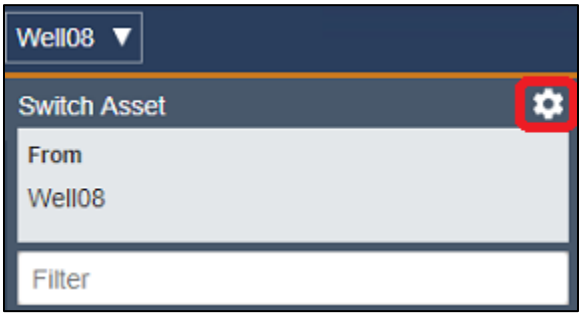


35. Click the Pencil graphic in the **Reason** column for the same Event in the table, and then expend the Reason hierarchy to select a Pump Breakdown as the reason for the downtime

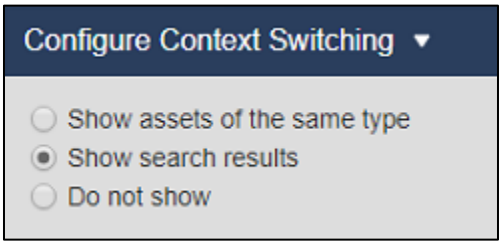


Setting the Reason Code in PI Vision saves the information on the underlying Event. Going forward anyone that views this particular Event, will see an explanation of what caused the downtime.

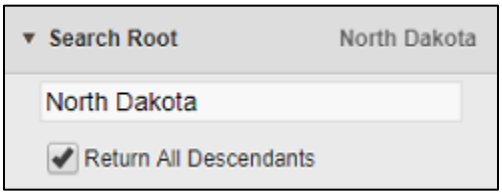
36. Open the Asset drop-down menu on the top of the display and then click the configure button



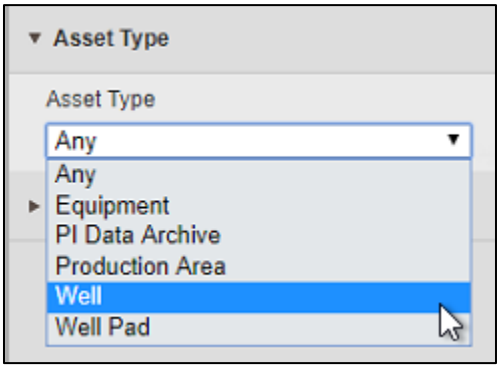
37. Toggle the Context Switching to **Show search results**



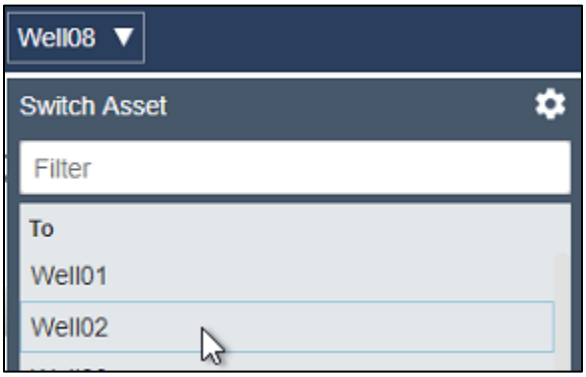
38. Adjust the search root to “North Dakota” and enable **Return All Descendants**



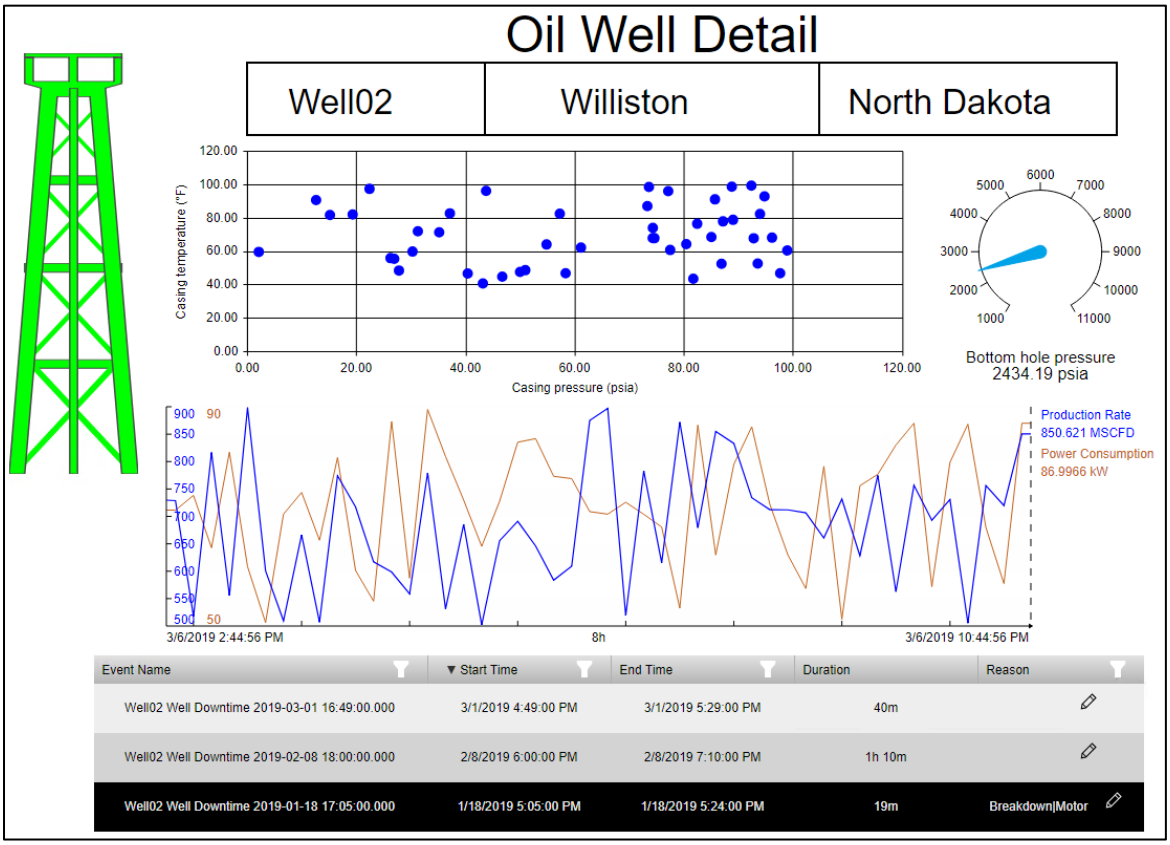
39. In the **Asset Type** dropdown menu, select Well



40. Open the Asset dropdown menu and click **Well02** to change the display context



41. Save the display



Challenge 4: Link displays together

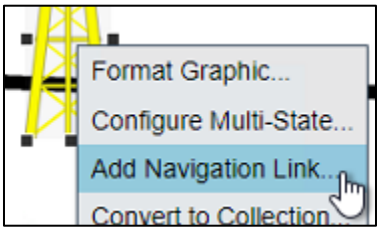
The Techcon Labs management team has been happy with all the content of the dashboards so far. However, now they are request the overview and detail displays be linked together in a way that is intuitive. For example, when a user wants to know more information about a particular Well Pad or Oil Well, they should be able to just click on it. As a side note, a director also mentions that they feel that the borders of the current dashboards are too cluttered with unneeded buttons and information.

Fortunately, you are familiar with all the latest PI Vision navigation and URL parameter functionality. You inform the management team that this can be implemented on the existing dashboards fairly easily.

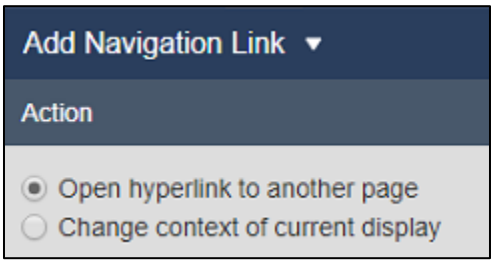
Step by Step

1. On the PI Vision Home page, open the **North Dakota Overview** display
2. Click on the **Modify** button in the top right of the window to enter Modify Mode

3. Right-click on the Crosby Oil Well graphic and select **Add Navigation Link…**

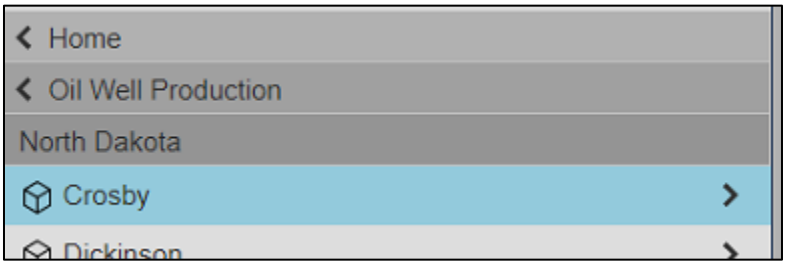


4. Verify that **Open hyperlink to another page** is selected

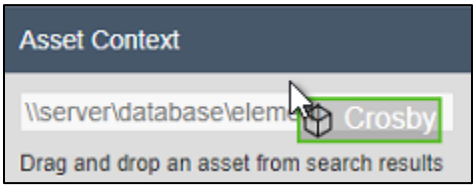


5. In the **Hyperlink** section, search for and select the **Well Pad Detail** display that was created in Challenge 2

6. In the Search Pane, browse to and select **Crosby**



7.
8. Click and drag the **Crosby** asset onto the **Asset Context** field in the Configuration Pane



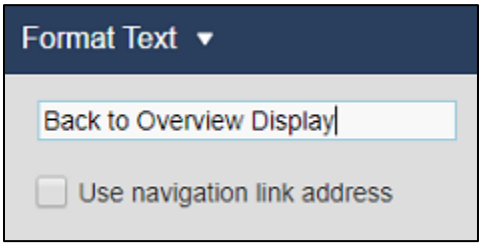
This Asset Context field determines which asset will be selected when the linked display is opened. In some other scenarios this does not always need to be explicitly specified. For example: When using links within Collections and Asset Comparison Tables, PI Vision is able to automatically determine the correct asset.

9. Repeat steps 3-8 for the **Kenmare**, **Williston**, **Stanley**, and **Dickinson** Oil Well graphics using the **Kenmare**, **Williston**, **Stanley**, and **Dickinson** assets from the Search pane
10. Click on Monitor button in the top right corner of the window to switch to Monitor Mode

11. Double-click on the Oil Well graphic next to **Crosby** to use the newly added Navigation Link to open the **Well Pad Detail** display
12. Click on the **Modify** button in the top right corner of the window to switch to Modify Mode

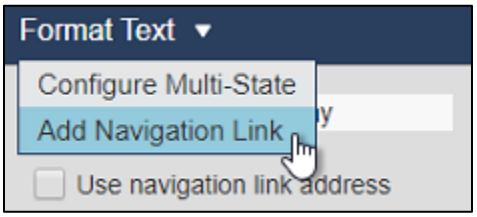
13. Click the **Text** button on the toolbar

14. Click on the top left corner of the display and type “Back to Overview Display” in the Format Text Configuration Pane

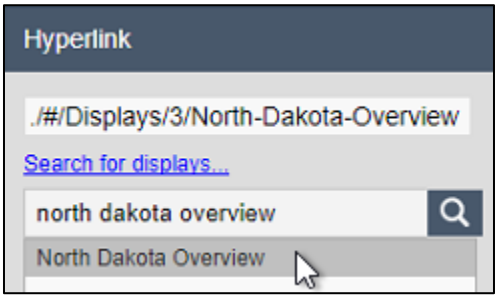


15. Change the **Font Size** to 12

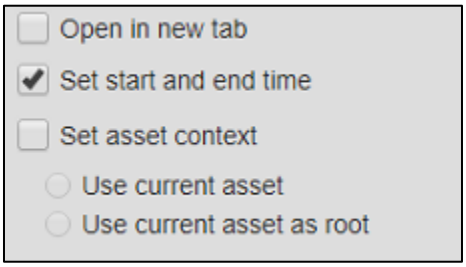
16. Click on the downwards arrow next to **Format Text** to open the configuration menu and select **Add Navigation Link**



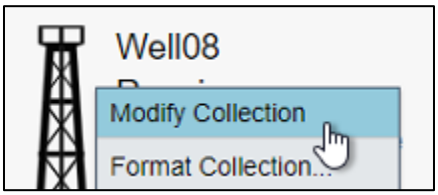
17. In the Hyperlink section, search for and select the **North Dakota Overview** display



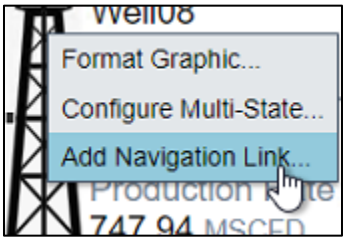
18. Unselect the **Set asset context** option



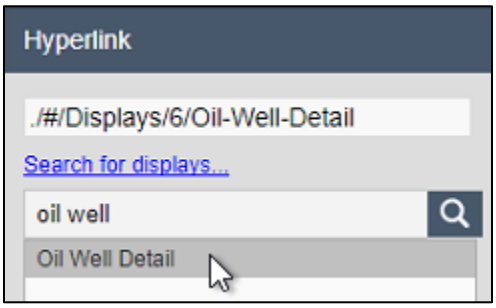
19. Right-click anywhere on the Oil Well collection and select **Modify Collection**



20. Right-click on the Oil Well graphic and select **Add Navigation Link…**



21. In the **Hyperlink** section of the Configuration Pane, search for and select the **Oil Well Detail** Display

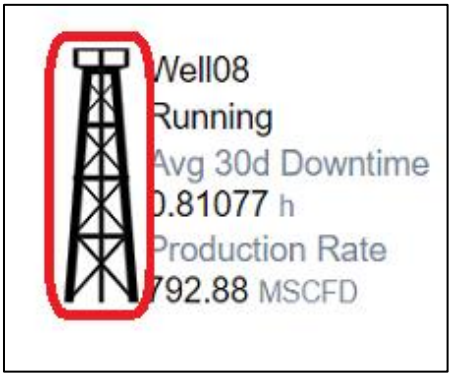


22. Save the display

23. Select the "Back to Overview Display" text symbol and click the **Copy** button on the toolbar

24. Click on **Monitor** button in the top right corner of the window to switch to Monitor Mode

25. Double-click on an Oil Well graphic within the collection to navigate to the **Oil Well Detail** display



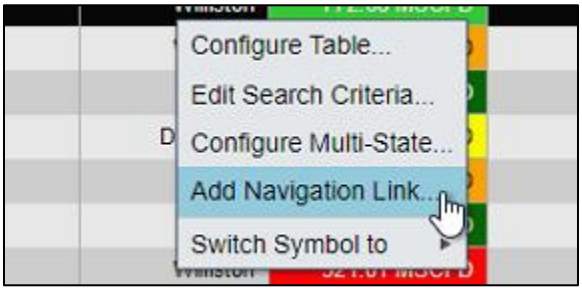
26. Click on the **Modify** button in the top right corner of the window to switch to Modify Mode

27. Click the **Paste** button on the toolbar

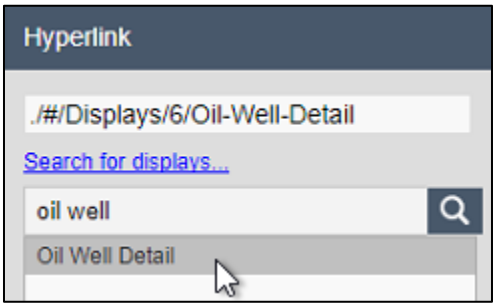
28. Click on **Monitor** button in the top right corner of the window to switch to Monitor Mode

29. Single-Click on the Text symbol to return to the **North Dakota Overview** display

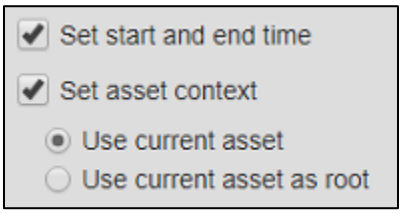
30. Right-click on the Asset Comparison Table symbol and select **Add Navigation Link…**



31. In the **Hyperlink** section, search for and select the **Oil Well Detail** display



32. Verify that **Set start and end time** and **Set asset context** are selected



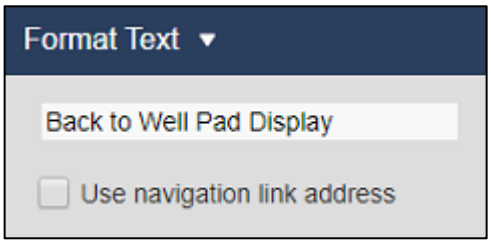
33. Save the display

34. Click on the first well under the **Asset** column of the Asset Comparison Table

35. Click on the **Modify** button in the top right corner of the window to switch to Modify Mode

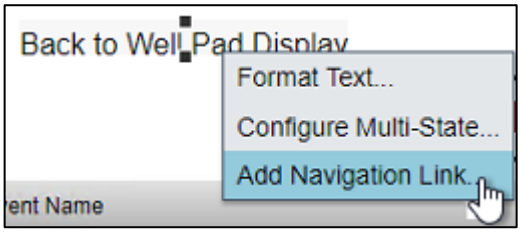
36. Click the **Text** button on the toolbar

37. Click on the top left corner of the display and type “Back to Well Pad Display” in the Format Text Configuration Pane

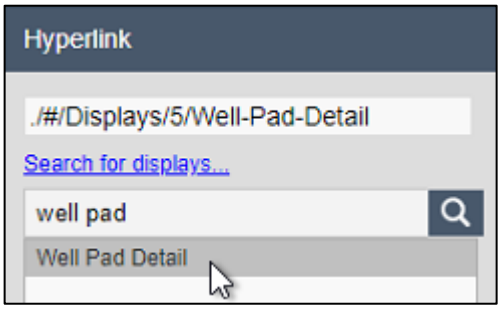


38. Change the **Font Size** to 12

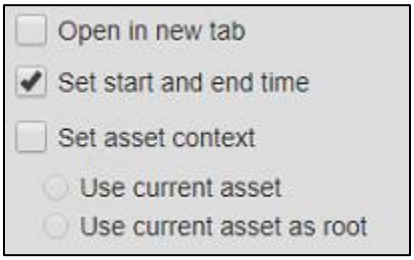
39. Right-click on the Text symbol and select **Add Navigation Link…**



40. In the **Hyperlink** section, search for and select the **Well Pad Detail** display



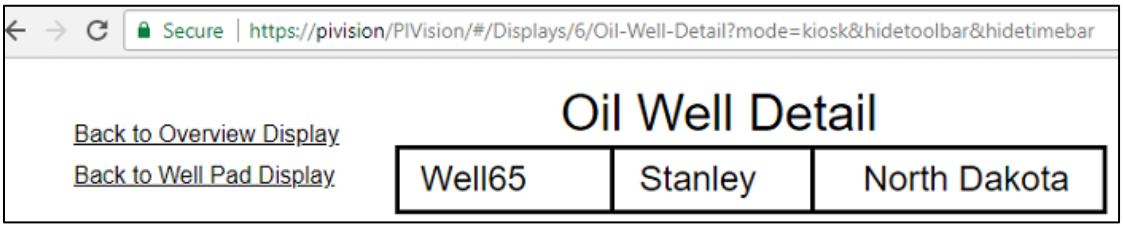
41. Deselect the **Set asset context** checkbox



It is expected that our link to the **Well Pad Detail** display from the **Oil Well Detail** display will not update the city context of the display. This would be possible to do if we get a bit creative, but it is outside the scope of this lab.

42. Save the display

43. In the browser address bar, add the string "?mode=kiosk&hidetoolbar&hidetimebar" to the URL and click refresh



Navigate through the three different displays while changing the asset and time context to verify all the displays link functionality is working. Once you are finished, you will need to manually remove the URL parameters from the URL in order to begin the next challenge.

Challenge 5: Collection search criteria

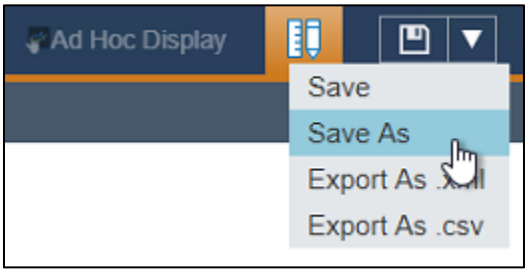
The PI Vision dashboards have become heavily used within the team monitoring North Dakota operations. Word has spread and there is interest from the executive management team in expanding the use to cover all of North American production. However, to begin, they request something that is a bit different that any existing dashboard. They would like to see the lowest performing Oil Wells in all of North American.

The management team know this sounds like a tricky request and have helpfully offered to bring in developers to create a programmatic solution if needed. Since you are familiar with the filtering options of collections in PI Vision, you are able to inform them that this will not be necessary.

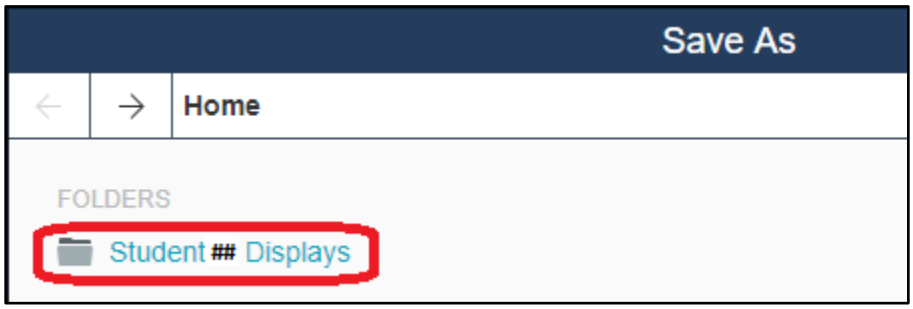
Step by Step

1. On the PI Vision Home page, open the **Well Pad Detail** display
2. Click the **Modify** Display button in the top right of the browser window

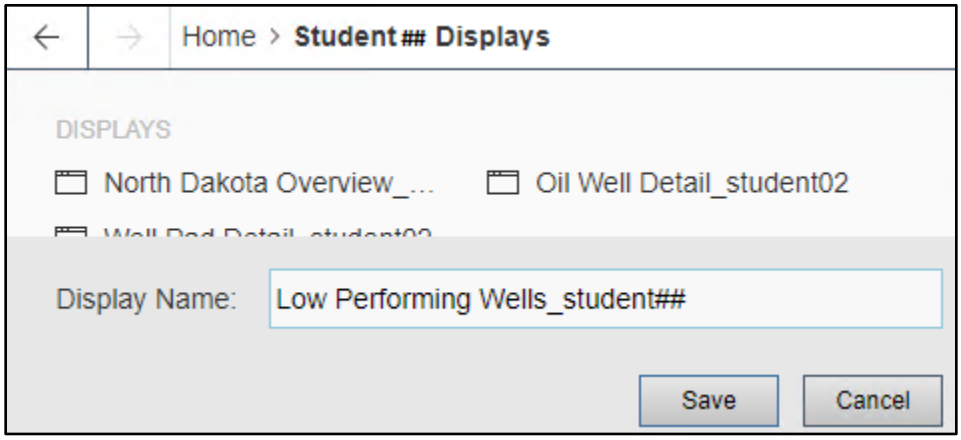
3. Click on the Save drop-down menu and select Save As



4. If it is not already selected, click on the Display Folder for your user account



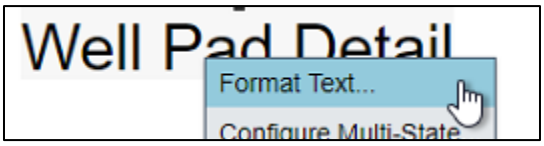
5. Name the display “Low Performing Wells” followed by your student number



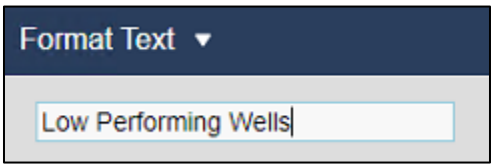
6. Click the **Modify** button to place the display back into Modify Mode

7. Delete the Text symbol navigating to the Overview display and the City & State value symbol

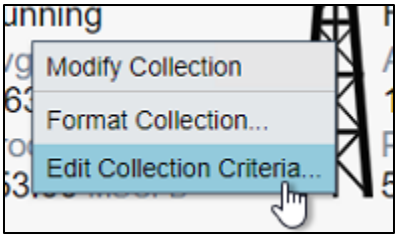
8. Right-click on the Well Pad Detail text symbol and select Format Text



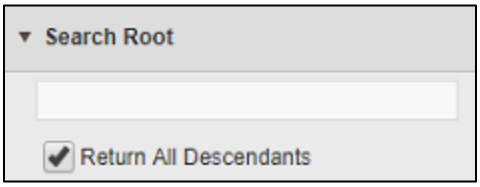
9. Change the text to “Low Performing Wells”



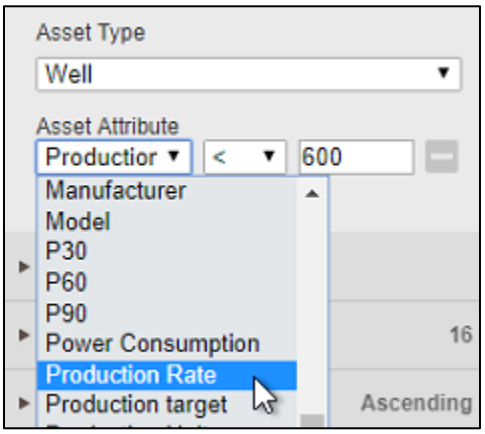
10. Right-click on the Oil Well collection and select **Edit Collection Criteria…**



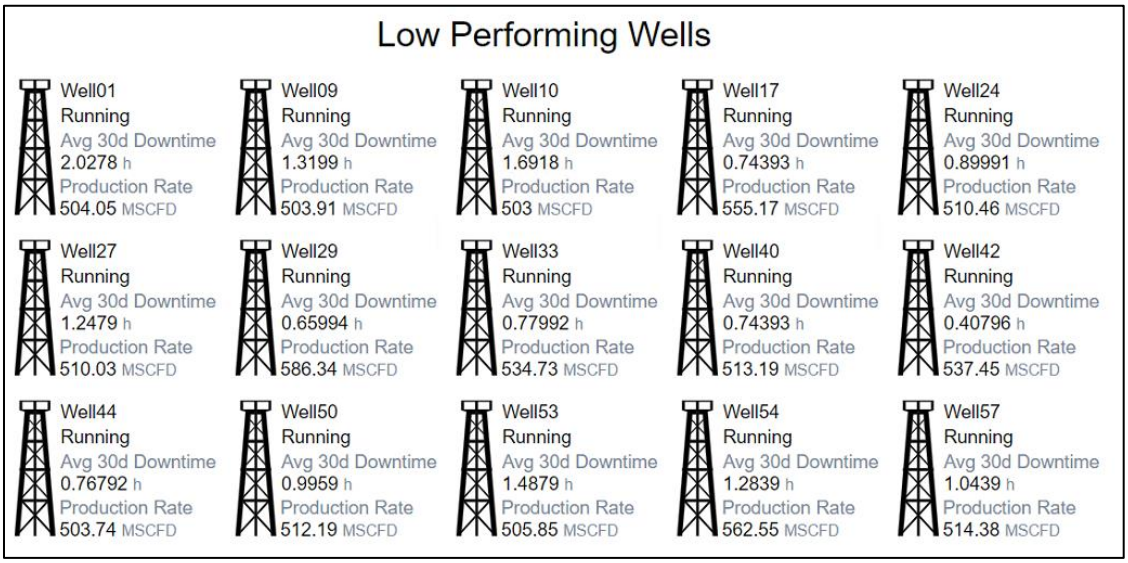
11. Remove the **Search Root** and select **Return All Descendants**



12. Verify that the **Asset Type** is set to **Well** and then set an attribute filter for **Production Rate** less than 600



13. Save the changes to the display



Challenge 6: Ad Hoc Analysis

Another request has come in from some members of the engineering team. For the most part, they are happy with the dashboards that have already been created. However, they would like to select a few different items from the displays and do some additional analysis when they investigate specific issues. If they identity something of interest, they would like to be able to share this ad hoc view with a colleague.

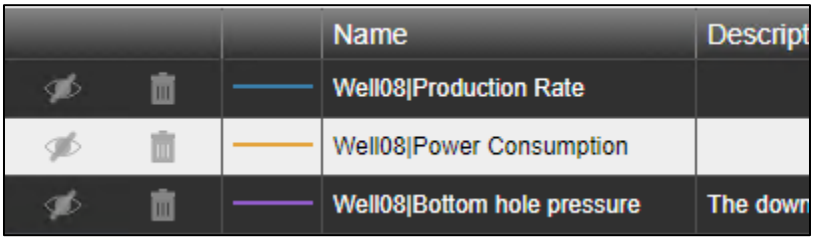
Fortunately, you remember that most recent release of PI Vision just revamped the ad hoc functionality with an enhanced workspace. You gather the team members for a quick demo.

Step by Step

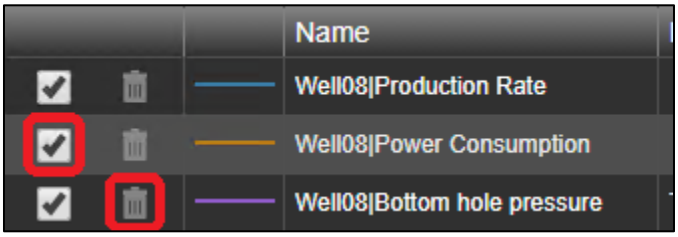
1. On the PI Vision Home Page, open the **Oil Well Detail** display
2. While holding the Ctrl key, click on the Trend and Radial Gauge symbols and then the **New Ad hoc Trend** button in the top right

3. Toggle between the different Scale and Range settings in the top left

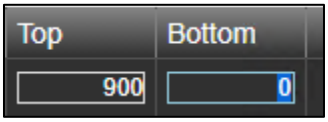
4. Highlight traces by selecting rows in the Summary Table at the bottom of the window



5. Toggle the visibility of the **Power Consumption** trace by clicking the checkbox and remove the **Bottom hole pressure** trace by clicking the trash can graphic



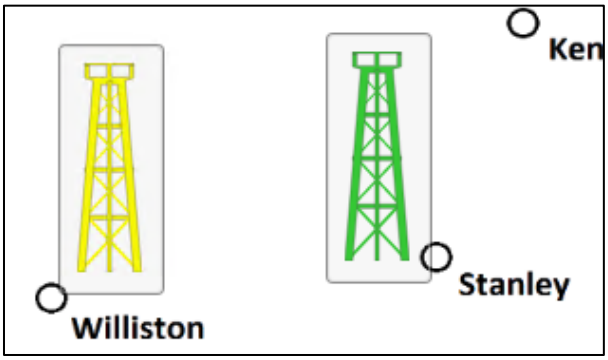
6. Set a custom scale by entering zero for the **Production Rate** trace's scale **Bottom**



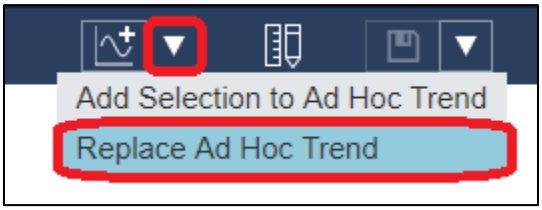
7. Close the Ad Hoc Workspace with the **Hide** button in the top right

8. Click the **Back to Overview Display** link to open the **North Dakota Overview** display

9. While holding the Ctrl key, click the oil rig graphics next to Williston and Stanley



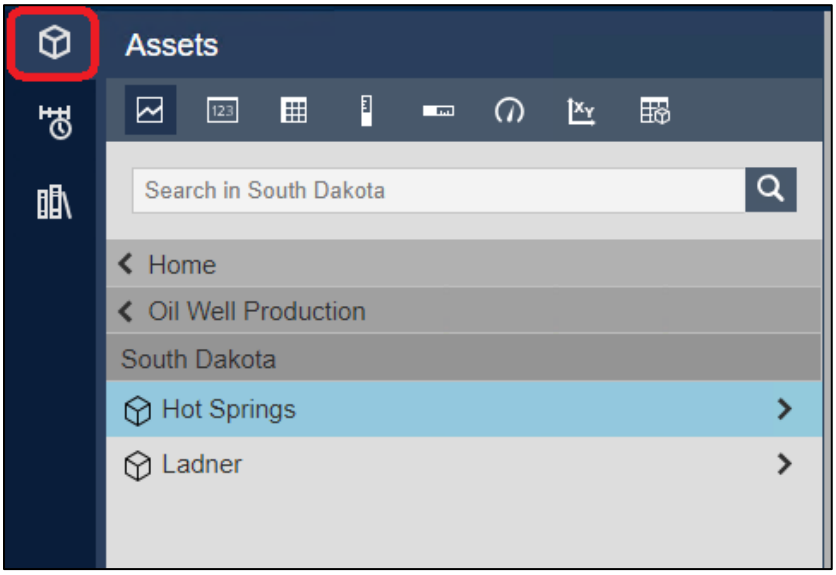
10. Open the Ad Hoc Trend dropdown menu in the top left and then select **Replace Ad Hoc Trend**



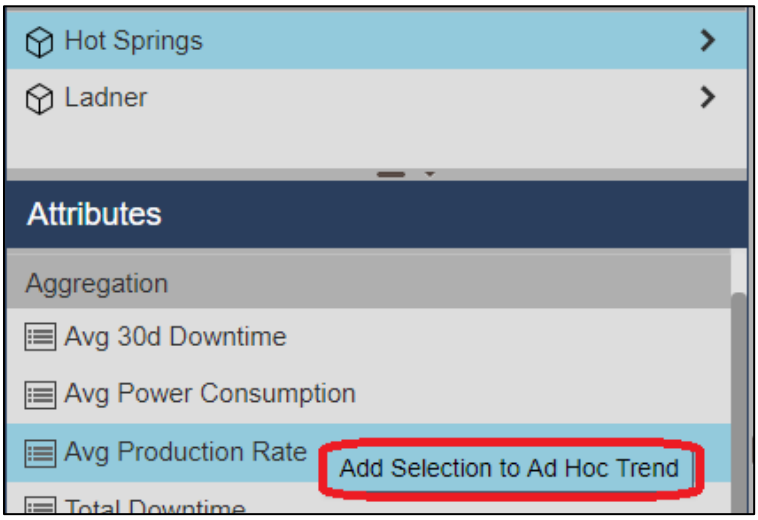
11. In the top right, toggle off the **Summary Table**

12. Close the Ad Hoc Workspace by clicking the **Hide** button

13. Open the Asset Search Pane and browse to & select **Hot Springs**, which is below South Dakota in the hierarchy

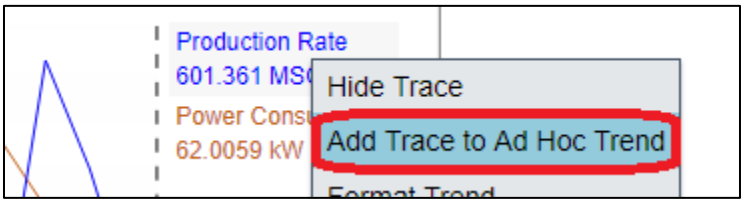


14. While Hot Strings is still selected, right-click the **Avg Production Rate** attribute in the bottom part of the pane and click **Add Selection to Ad Hoc Trend**



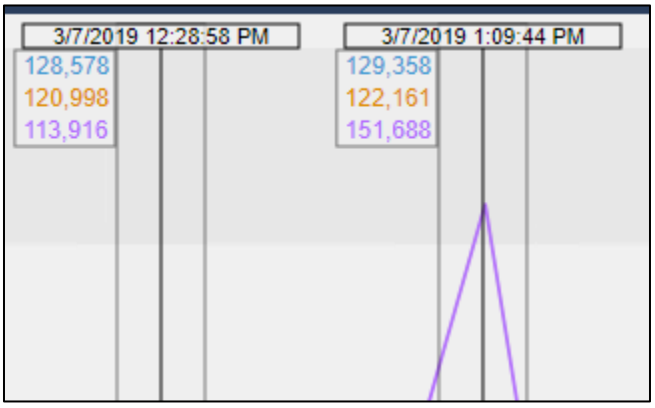
15. Click on **Well63** in the Asset Comparison Table to open the **Oil Well Detail** display

16. Right click directly on the **Production Rate** trace in the trend legend and select **Add Trace to Ad Hoc Trend**

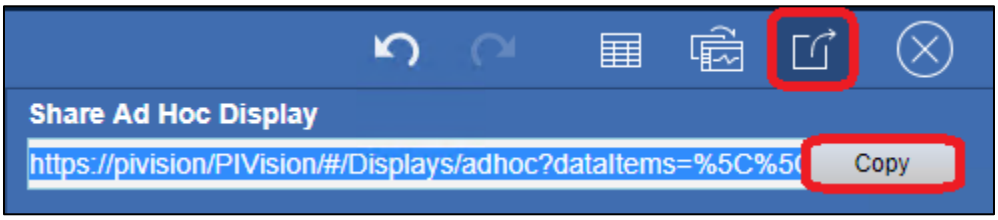


17. Reopen the Ad Hoc Workspace by clicking the **Ad Hoc Trend** button in the top right of the window

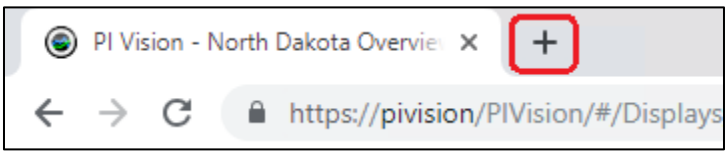
18. Click on the trend area to add cursors so the values at different times can be compared



19. Click the **Share** button and then the **Copy** button to place a link to reopen this view on the clipboard



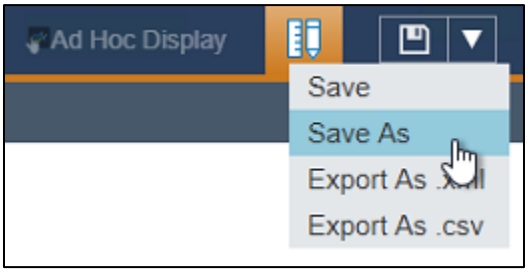
20. Open a new browser tab by clicking the plus icon on the top left, paste (**CTRL + V**) the URL from the clipboard, and hit the **Enter** key



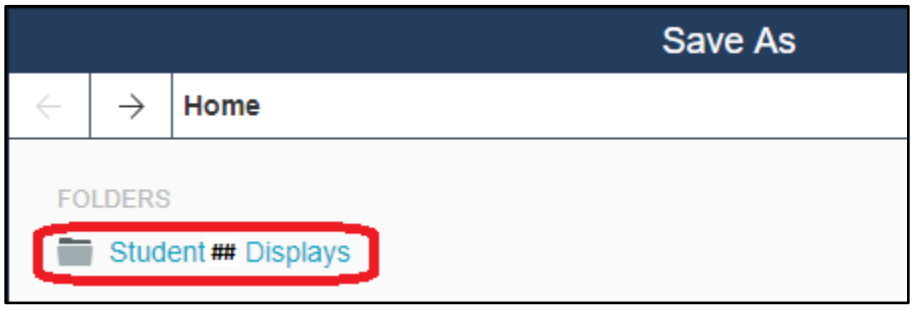
21. Close the new browser tab and return to the original tab with the Ad Hoc Workspace open
22. Click the **Summary Table** button to toggle the table back onto the Ad Hoc Workspace

23. Click on the **Convert** button to place the Ad Hoc Workspace contents into an Editor Display that can be permanently saved & shared

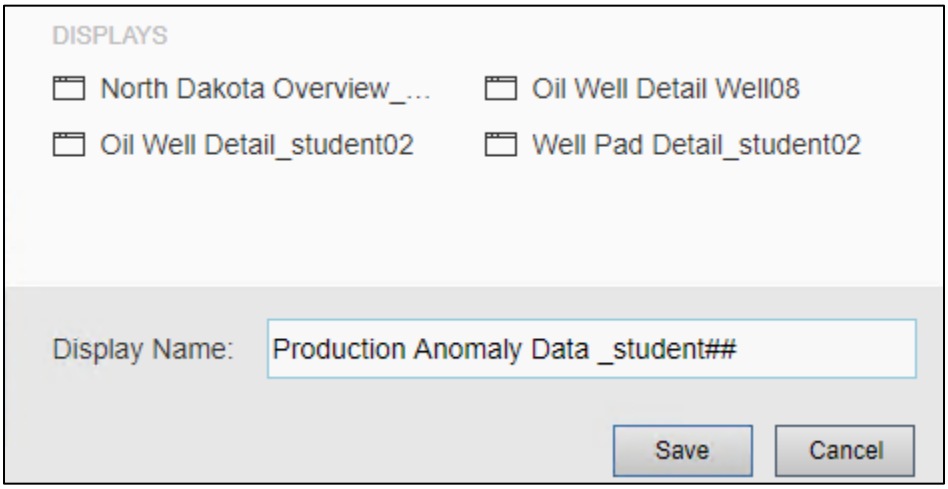
24. Click on the Save drop-down menu and select **Save As**



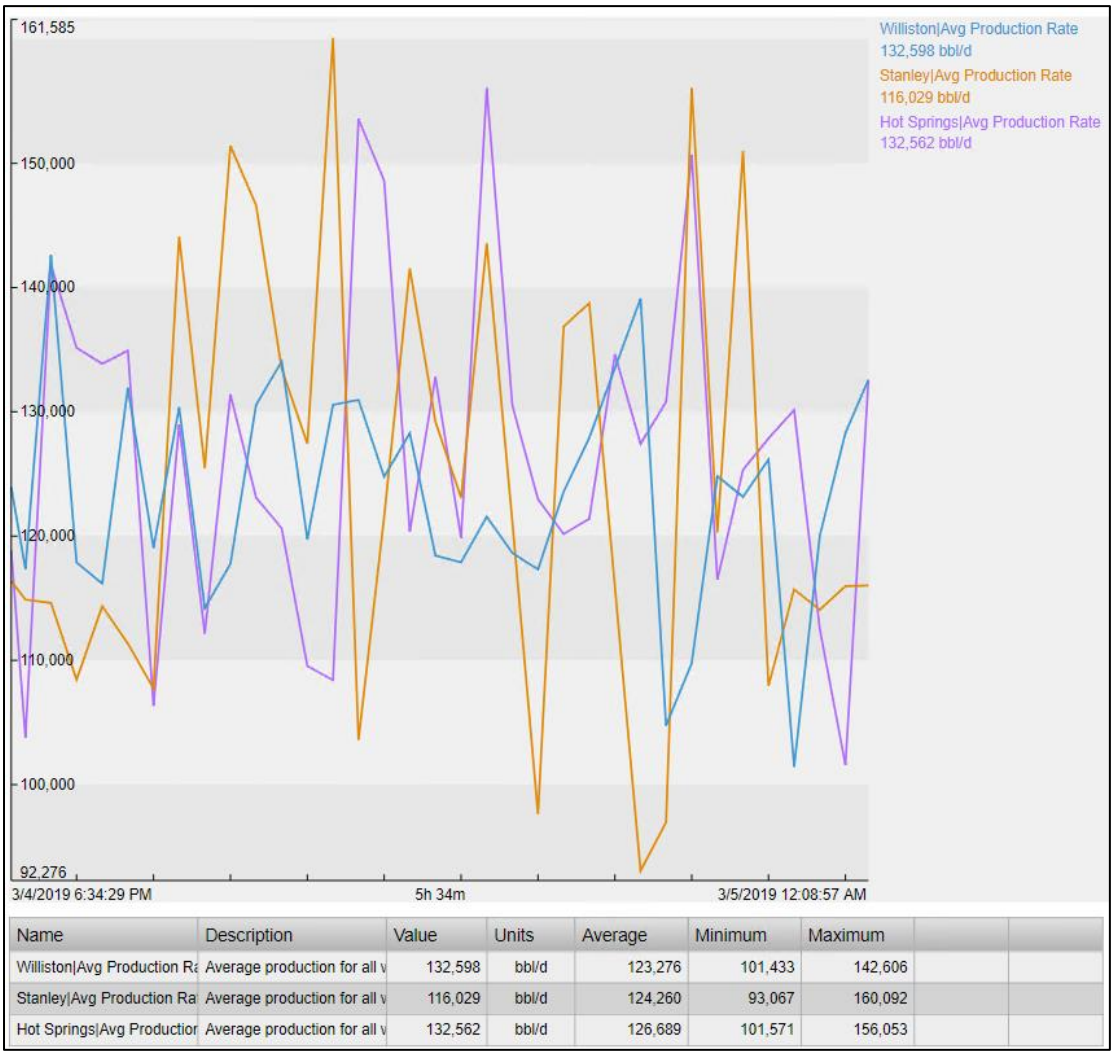
25. If it is not already selected, click on the Display Folder for your user account



26. Name the display “Production Anomaly Data” followed by your username



27. Adjust any formatting as needed and save the changes



Name	Description	Value	Units	Average	Minimum	Maximum
Williston|Avg Production Ra	Average production for all v	132,598	bbl/d	123,276	101,433	142,606
Stanley|Avg Production Ra	Average production for all v	116,029	bbl/d	124,260	93,067	160,092
Hot Springs|Avg Productior	Average production for all v	132,562	bbl/d	126,689	101,571	156,053

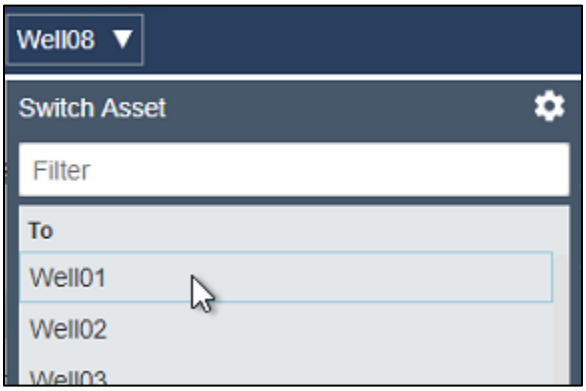
Challenge 7: Compare downtime events

A new type of request has come in from a member of the engineering team. They would like to compare the time series data that occurred during two different times that oil wells were down. Specifically there were events on Well01 and Well16 that seemed very similar and the team would like to take a closer look.

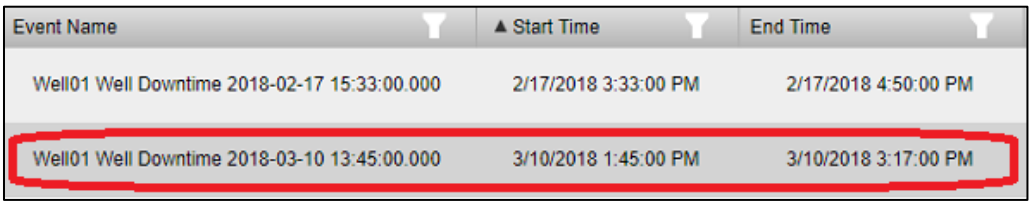
The engineering team has correctly noted that is not possible to overlay timeseries data on standard PI Vision dashboards and has asked if there are any workarounds. Luckily, you just can across the documentation of Event Comparison displays so you know how to do this.

Step by Step

1. On the PI Vision Home Page, open the "Oil Well Detail" display
2. Use the Asset drop-down menu to switch the context to Well01



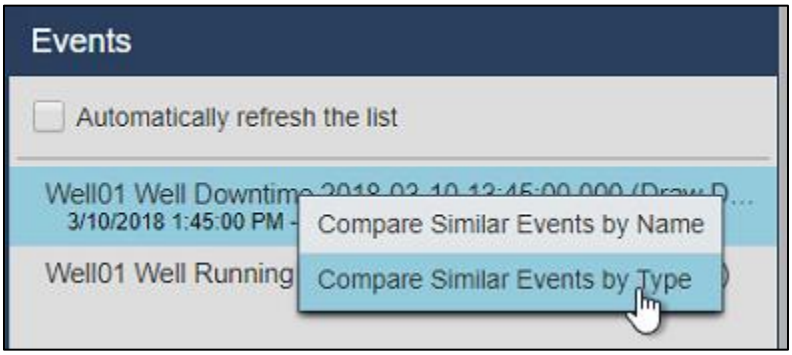
3. Double-click on the most recent Downtime event in the Events Table symbol to open the Event Detail window



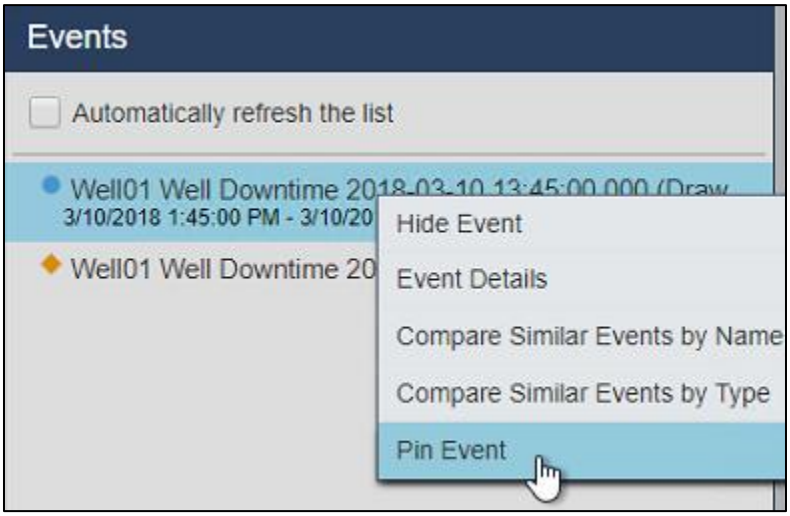
Alternately it is possible to open the Event Details by right-clicking on an Event in the Event Search Pane. Events will be automatically detected and added to this pane if they are active on any of the Assets represented on the display during the current display timespan. It is also possible to manually search for Events by modifying the Search Criteria.

4. Open the Event Search Pane

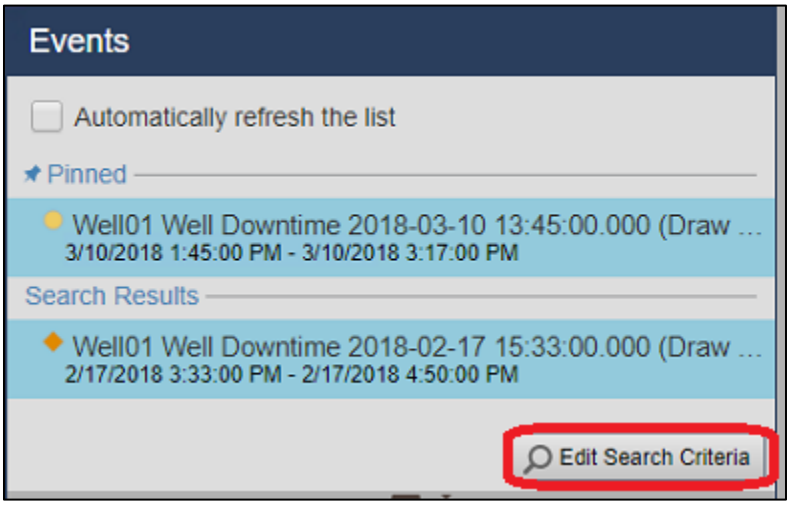
5. Right-click on the Downtime Event and select **Compare Similar Events by Type**



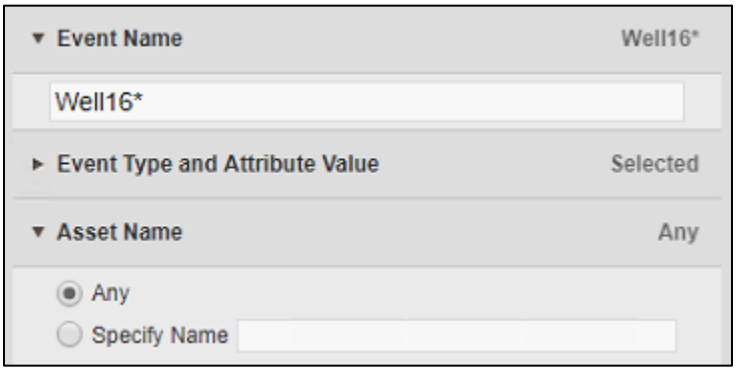
6. Right-click on the same Downtime event and select **Pin Event**



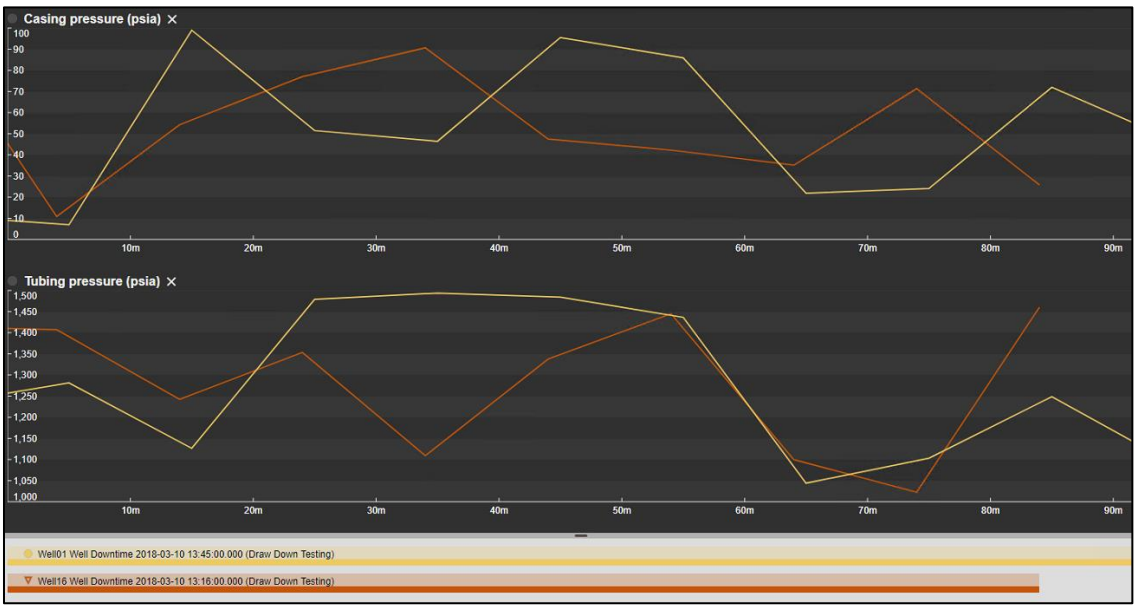
7. Click on **Edit Search Criteria** to open the search criteria



8. Set the Event Name filter to “Well16*”, set the Asset Name to **Any**, and then click **Apply**



9. Click and drag the **Casing pressure** and **Tubing pressure** attributes onto the display
10. Click the Save button in the top right of the window and save the display as “Downtime Event Comparison” followed by your student number



Challenge 8: Manage PI Vision Displays and User settings

Now that you have seen how to create displays within PI Vision, you may wonder how to keep track of and manage a large number of displays.

Before we begin, it is important to note that PI Vision allows two user types in order to aid in system manageability. The types are:

- Publisher
  - Designed for subject matter experts and content creators
  - Able to create and save new dashboards and analysis views
  - Equivalent to the traditional PI Vision user in previous versions
- Explorer
  - Can use the full power of existing displays, including context and time manipulation
  - Can create ad-hoc displays
  - Cannot save any new displays or changes to existing displays

These roles can be configured on an AF Identity basis from the PI Vision Admin page.

Another thing to note is that PI Vision allows the use of display folders to organize displays and to manage user access.

- Users can be set to have read permission to the displays contained within specific folders
- As appropriate, users can also be given write permission to edit the displays within a folder and/or to add new displays to folder

PI Vision administrators can manage these folders on an AF Identity basis from the PI Vision Home Page.

Step by Step:

1. PI Vision allows you to add keywords to displays so that they can be organized into one or more groups. To add a keyword to a display, go to the PI Vision Home Page and click the gear under a display.

   This will bring up the display settings dialog that you can use to manage displays you have created. This is where you can add keywords to help organize your displays. Simply type any text you like into the Keyword box. To add multiple labels, just use a semicolon to separate them.
2. Once you have added a few labels, click **Filter by Keywords** on the homepage.

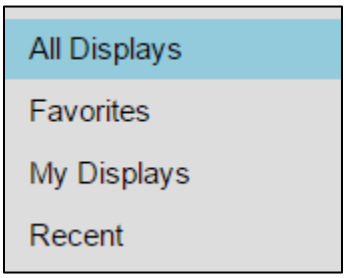
   This will bring up a tag cloud of the keywords that have been created on this server. The cloud is weighted so that labels that appear more in displays will be larger. Clicking a label from within the cloud will filter the list of displays to only those which have the selected label.

3. Another way to filter is by clicking the **Related Displays** button.

This will show all displays that contain any if the keywords associated with the selected display.

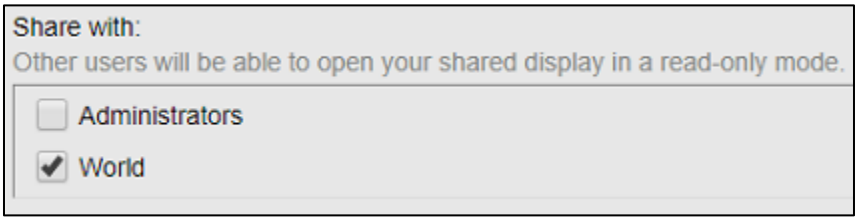
4. In addition to keywords, you can also mark a display as a favorite by clicking the star under a display.

5. Using the navigation pane you can filter displays to see only Favorites, displays that were created by you, or displays that you have recently viewed.



6. When you create a display, it will initially be set to Private, denoted by the single person icon on the PI Vision Home Page.

7. If you would like to share a display that you have created, click the gear graphic to open the Display Settings menu and then check the boxes next to the groups with which you would like to share your display.

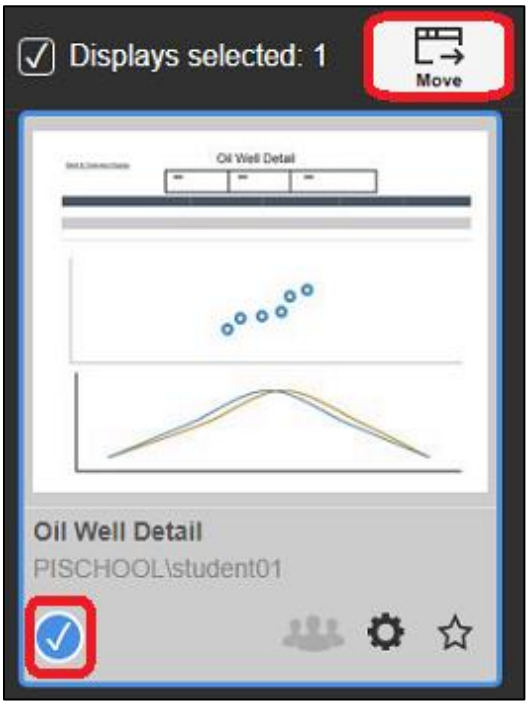


After at least one group is selected, the display will change to Public, denoted by the three person icon on the home page.

8. Also available is the option to make the display Read-only, which will prevent other users from making any modifications to the display.
9. The display owner is located below the display name. If needed, the display owner can be changed by PI Vision administrators

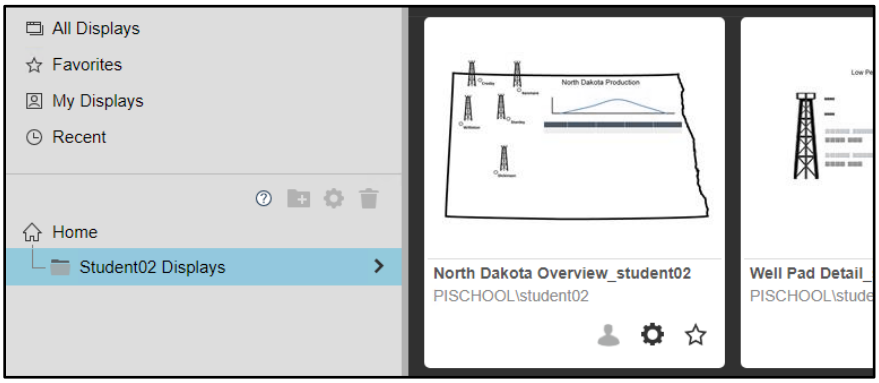
10. You can also delete your display using the **Delete display** button

11. To move a display to a folder, first hover over the display and click the checkmark. Then, click the Move button and select a destination folder

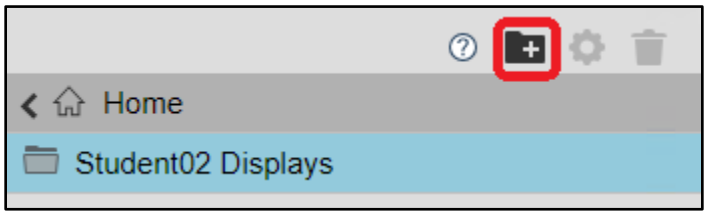


12. On the bottom left section of the home page, you will see the Display Folders for which you have permission. At the root level, the folder configuration buttons will be grayed out unless you are a PI Vision administrator

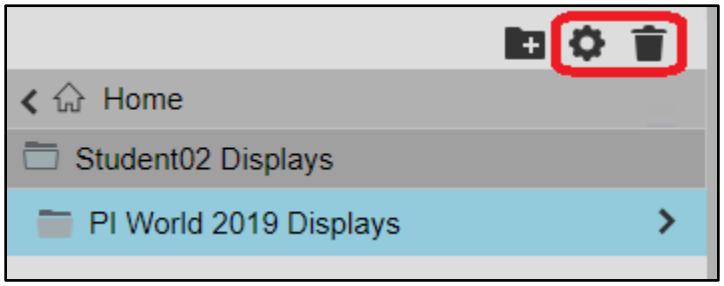
13. When you select a Folder, you will see the displays within it to which you have permission

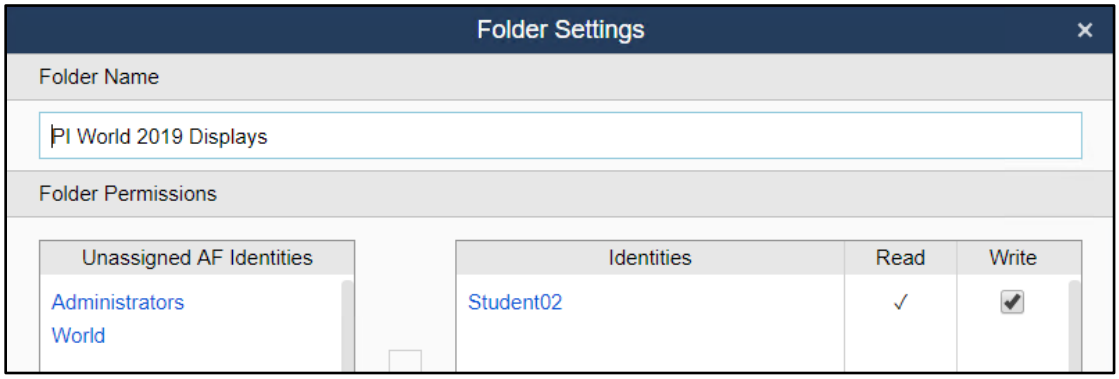


14. Since you have write permission within the Display Folder created for your user account, you may add child folders. Click on the **Student## Displays** folder and then click on the new folder graphic.



15. Since you have write permission at the parent level of this new child folder, you may manage the permissions on the folder or delete.





If you delete a Display Folder, any subfolders will also be deleted. Any displays in the selected folder or subfolders will be moved to **Home**, the root level above any display folders.

References

Consult these resources for assistance with PI Vision that can be found in https://my.osisoft.com and https://livelibrary.osisoft.com/

PI Server

- PI Data Archive 2016 R2 User Manuals
- AF Server 2017 R2 User Manuals

PI Vision

- PI Vision 2019 User Guide
- PI Vision 2019 Installation and Administration Guide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