

Ideation for Drug Discovery Projects

In this tutorial, you will learn how to create new LiveReport and add compounds through Basic and Advanced searching. Once compounds have been added to your LiveReport, we will add data then sort and filter the information. Coloring rules and plots will be explored to aid visualization. We will add a computational docking model to see a 3D view of ligands poses, as well as create a multi-parameter profile to evaluate several properties at once. Additionally, we will add and create some Free Form Columns to allow for annotations within the LiveReport. Finally, we will apply a Forms view to our LiveReport to be able to take a deeper dive into specific compounds.

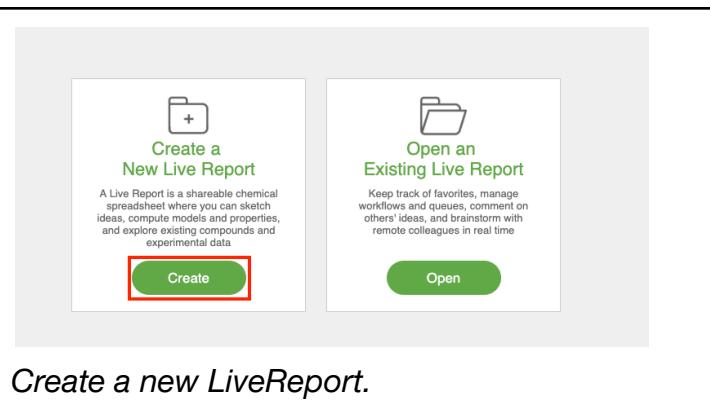
Items that you click or type are **bolded** or highlighted with a rectangle 

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1. Creating LiveReports and Adding Compounds

In this section, we'll create a new live report and add compounds to it by two different methods. First, we'll add compounds via a substructure search and then by assay activity.

	<ol style="list-style-type: none">1. In a browser, go to https://livedesign-courses.onschrodinger.com/ <p><i>Note:</i> While LiveDesign works well with most browsers, we would suggest using Chrome if you can</p> <ol style="list-style-type: none">2. Enter your username and password (same as your web-based Maestro credentials)3. Click Log in4. Choose the CDK2 project and click OK<ul style="list-style-type: none">○ Your project opens <p><i>Note:</i> This instance of LiveDesign is for training purposes within this course only.</p>
	<ol style="list-style-type: none">5. Click Create a New LiveReport <p><i>Optional:</i> Click Open an Existing LiveReport to browse existing LiveReports by folder, name, date, or author</p>

Create New Live Report

Live Report name: [Your name]_CDK2

Template: Blank

Place In Folder: Create New Folder

Default rationale (optional):
The default rationale will be added to all compounds in the live report which have not been given an explicit rationale.

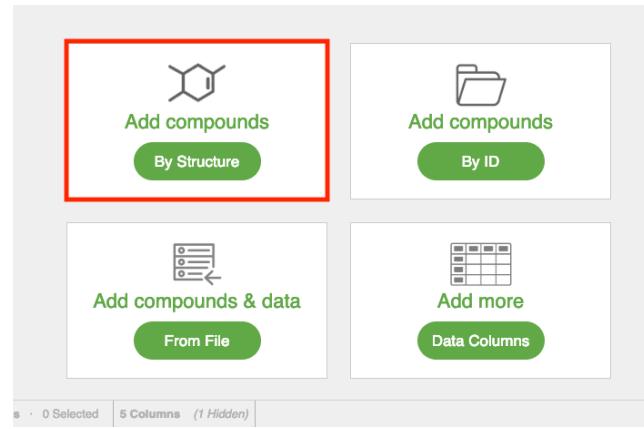
Cancel **OK**

Create a new folder for Live Reports

Folder name: user01

Cancel **OK**

Name LiveReport and Place in Folder.



Add compounds by structure.

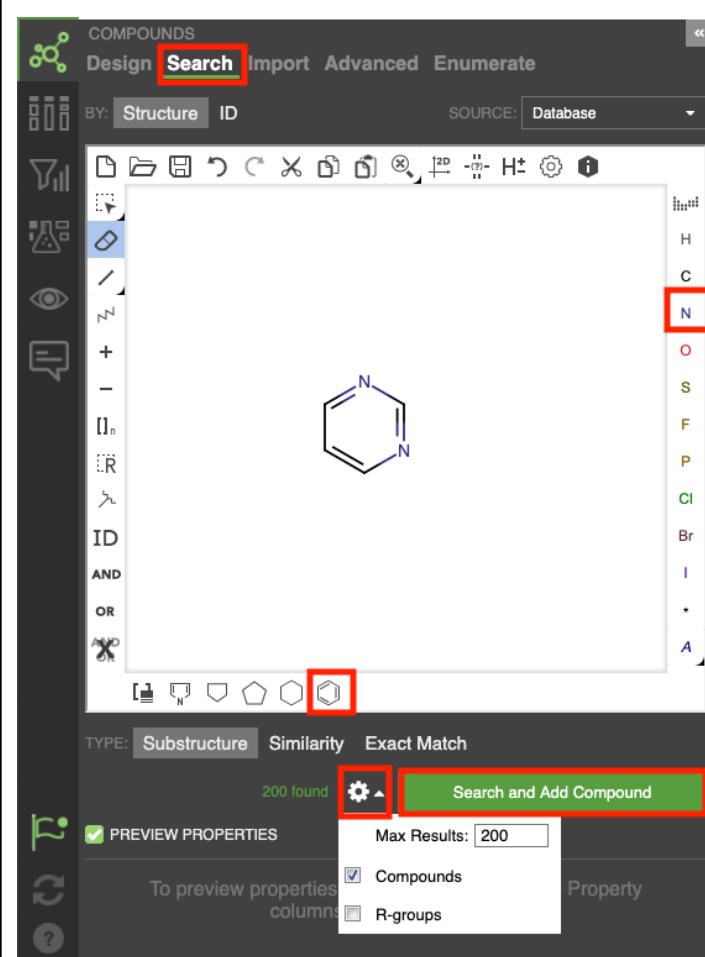
6. In LiveReport name, type **[Your name]_CDK2**
7. For Place in Folder, choose **Create a New Folder**
8. For Folder name, type **your username** and click **OK**
9. In Create New LiveReport, click **OK**
 - A new LiveReport tab named [Your name]_CDK2 is made
 - This LiveReport is in your folder

To begin, we will add compounds based on structure, irrespective of any assay data.

10. Click **Add compounds By Structure**
 - The Compounds menu opens

Note: You can also click the **Compounds** button in the top left of the LiveReport

Note: More LiveReport options are available in the **dropdown** to the right of the LiveReport name



Sketch a substructure search.

11. Switch to the **Search** tab

- The Design tab can be used to quickly sketch and add ideas to a LiveReport. The Search tab allows you to perform a search based on a structure (substructure, similarity or exact match) or ID in your database
- The default search is a Substructure Search

12. In the Sketcher, draw **pyrimidine**

13. Click the **cog**

14. Change Max Results to 200

15. Click **Search and Add Compounds**

- Compounds are added to the LiveReport
- The number of compounds is shown in the Compounds menu

The screenshot shows a context menu for column headers in a table. The menu items are: 'Rationale' (highlighted with a red box), 'Lot Scientist' (highlighted with a red box), 'Sort Ascending', 'Sort Descending', 'Add to Sort, Ascending', 'Add to Sort, Descending', 'Hide Columns' (highlighted with a red box), 'Remove Columns', 'Group Columns...', 'Columns' (with a dropdown arrow), and 'Reorder Columns...'. The background shows a green header row with columns for 'Rationale' and 'Lot Scientist'.

Hide columns that won't be used.

We will not be using the default columns Rationale and Lot Scientist in this tutorial, so let's hide them:

16. Use **shift-click** to select both columns

17. Right-click on the **column header**

- The multi-column menu is shown

18. Select **Hide Columns**

Add an Advanced search on real compounds only.

Now you will add compounds that have assay data that matches a certain query.

19. Click **Advanced**

- The Advanced Compound search menu opens

20. Toggle off **Virtual**

- Only real compounds will be added to the LiveReport

Add an advanced search on assay data.

21. Search **IC50**

22. Choose **Human CDK2 Inhibition (IC50)**

- This property is added to the LiveReport
- A search query on this assay is created

Set a range for the search condition.

23. In the range boxes type **0** and **500**

Search for compounds.

24. At the bottom of the menu, click **Search for Compounds**

- Compounds are added to the LiveReport
- The number of compounds is updated in the Compound menu

You have the option to clear the report on search instead of appending to the pre-existing compounds in the LiveReport

2. Adding, Sorting, Filtering, and Coloring Data

Now that we have many compounds in our LiveReport, we'll add computed properties and perform standard column operations - sorting, filtering, and coloring. This will allow us to focus on compounds that have optimal properties for our project.

The screenshot shows the ChEMBL LiveReport interface. On the left, there's a sidebar with various filters and a search bar. A red box highlights the 'Computed Properties' dropdown menu, which is expanded to show several options under 'Schrodinger Quick Properties': AlogP, HBA (maestro), HBD (maestro), MW, and PSA. These last four are also highlighted with red boxes. At the bottom of the sidebar, there's a green 'Add Columns' button. The main area displays four chemical structures labeled 1 through 4, each with a checkbox and a 'CHEMBL' ID. Below the structures, it says '294 Compounds · 0 Selected · 5 Columns (2)'.

Add Quick Properties data.

1. Click **Data & Columns**
2. Choose **Computed Properties**
3. Expand **Schrodinger Quick Properties**
4. Ctrl+Click (or Cmd+Click) to select **AlogP**, **HBA (maestro)**, **HBD (maestro)**, **MW**, and **PSA**
5. Click **Add Columns**
 - The properties are added to the LiveReport
 - Click and drag on column dividers to resize column width, if needed

We will use these computed properties, as well as rearranging our compounds by different data, to help guide our designs.

All IDs	¹ Human CDK2 Inhibition	Schrodinger Quick Properties (AlogP)	Schrodinger Quick Properties (HBA(maestro))
CHEMBL21038	1	0.22	4

Sort and move data columns.

First, let's order the compounds in our LiveReport by potency.

6. Double-click on the **Human CDK2 Inhibition (IC50)** column header
 - The data is sorted by ascending order
7. Click and drag the **column boxes**
 - The column is moved

Note: Hover over underlined data to see expanded information

Schrodinger Quick Properties (PSA)	Schrodinger Quick Properties	Schrodinger Quick Properties
93.15	<ul style="list-style-type: none"> Sort Ascending Sort Descending Add to Sort, Ascending Add to Sort, Descending Coloring Rules... Add filter... 	
82.28	<ul style="list-style-type: none"> Recalculate Model Hide Column Freeze Column Remove Column Reorder Columns... Show Column Details 	
108.72		

Add a filter from the column.

Now, let's remove compounds that fall outside of an optimal polar surface area (PSA) range.

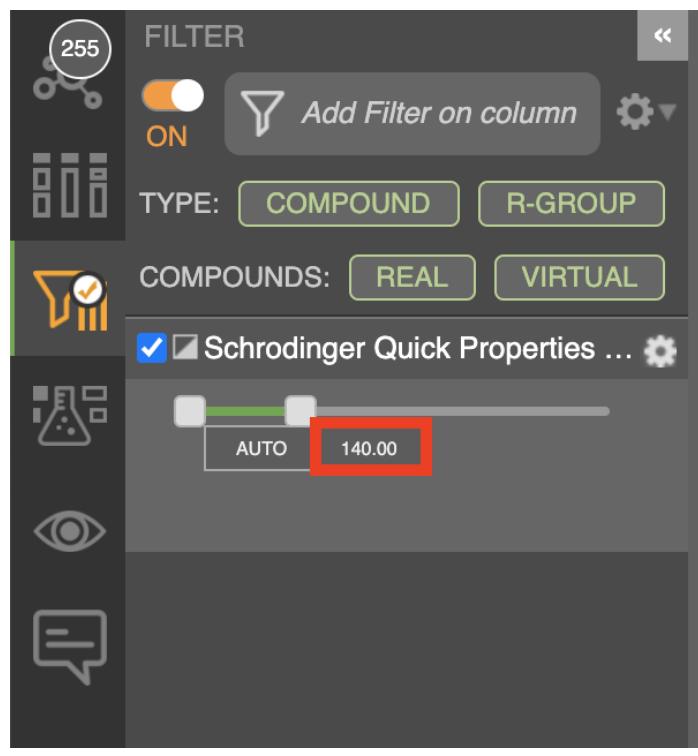
8. Right-click **Schrodinger Quick Properties (PSA)**

- Column options opens

9. Choose **Add Filter**

- The Filter menu opens on the left

Note: Shift-click to select **multiple column headers**, then right-click to see further actions



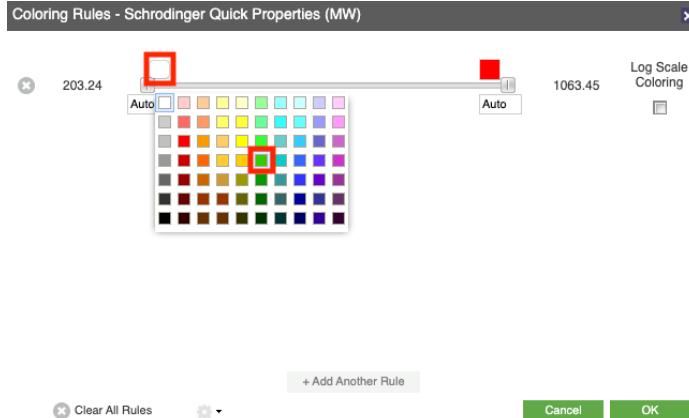
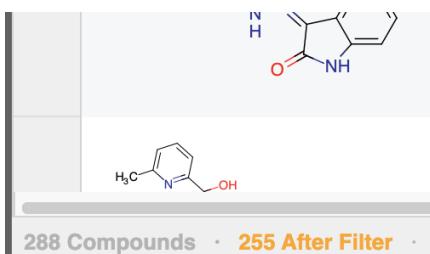
10. In the range boxes, set the maximum value to **140**

11. Type **enter** or click a **blank area** in the LiveReport

- The filter is applied
- The number of compounds filtered out is shown at the bottom of the LiveReport

Note: You can see how many compounds have been filtered out, along with additional information, at the bottom of the LiveReport. Please note that the numbers of compounds in your individual LiveReport may be different to what is shown below.

Set filter range.



Set a Coloring Rule.

Now we will use **Coloring Rules** to help highlight compounds in the molecular weight range we want.

12. Right-click **Schrodinger Quick Properties (MW) and choose **Coloring Rules****

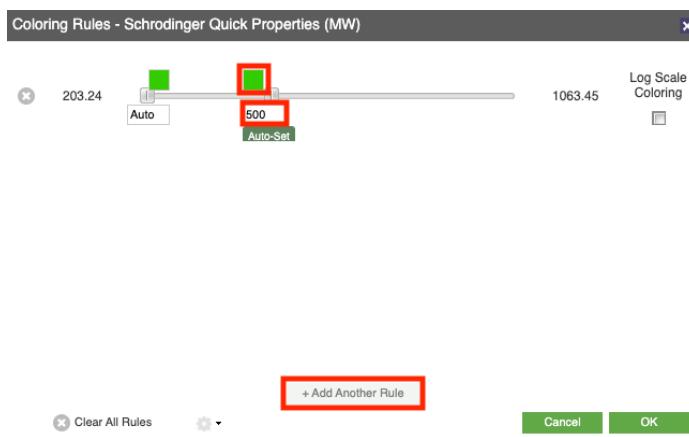
- The Coloring Rules panel opens

13. Click the **minimum value color box**

- The color selection opens

14. Click **green**

- The minimum value color is green



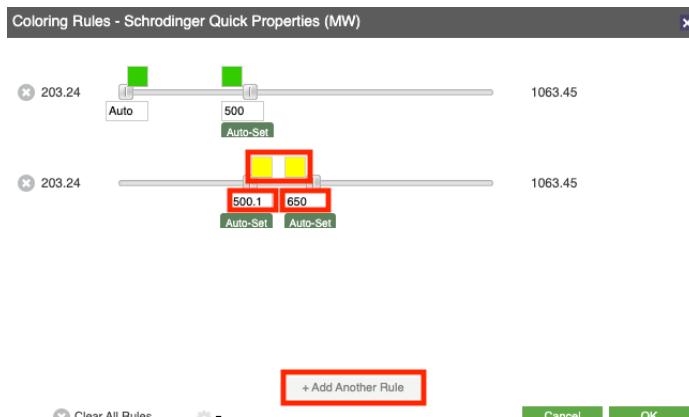
15. Repeat for the **maximum value color box**

16. Set the maximum value to **500**

17. Click **Add Another Rule**

- A new Coloring Rule is added

Note: Colors are applied as a gradient if the minimum and maximum value colors are different.



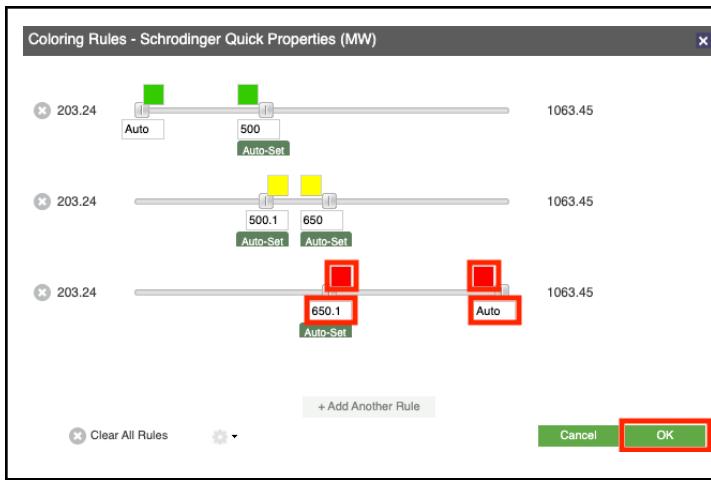
Add more Rules to make a stop-light Color Rule.

18. In the new coloring rule, set the minimum value to **500.1 and the maximum value to **650****

19. Change minimum and maximum value color boxes to **yellow**

20. Click **Add Another Rule**

- A new Coloring Rule is added



21. In the new coloring rule, set the minimum value to **650.1**

- Keep maximum value set to Auto

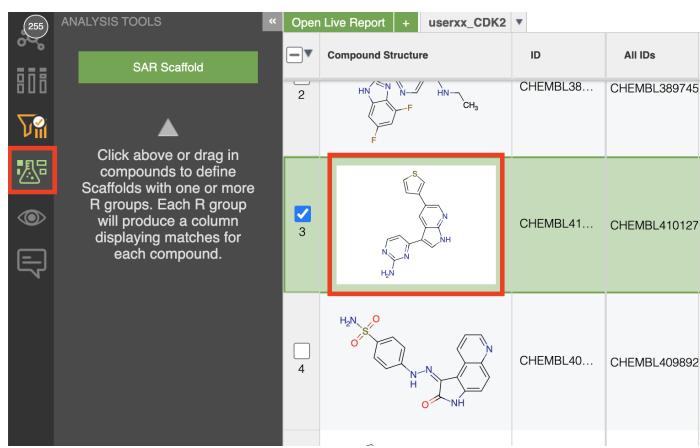
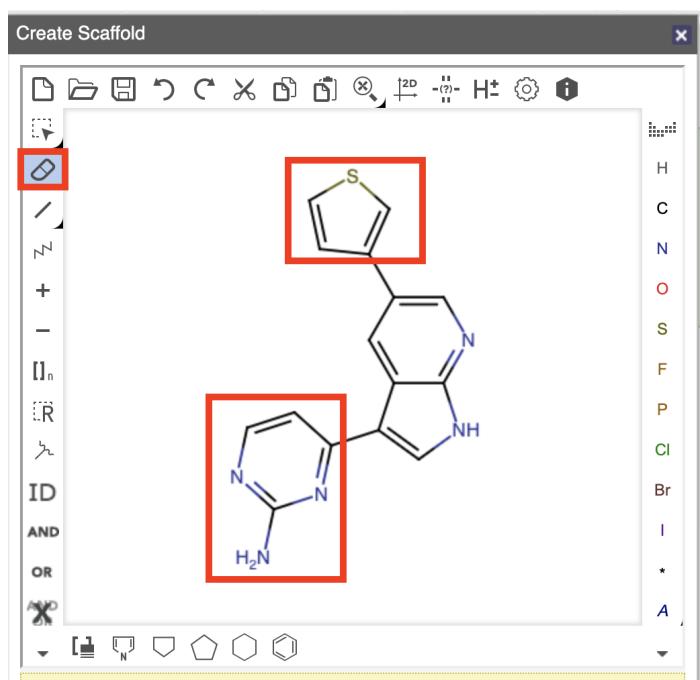
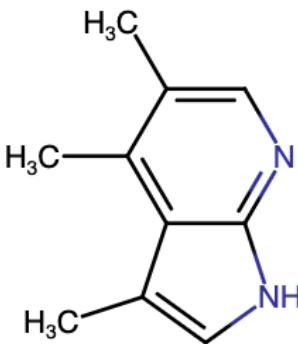
22. Change minimum and maximum value color boxes to **red**

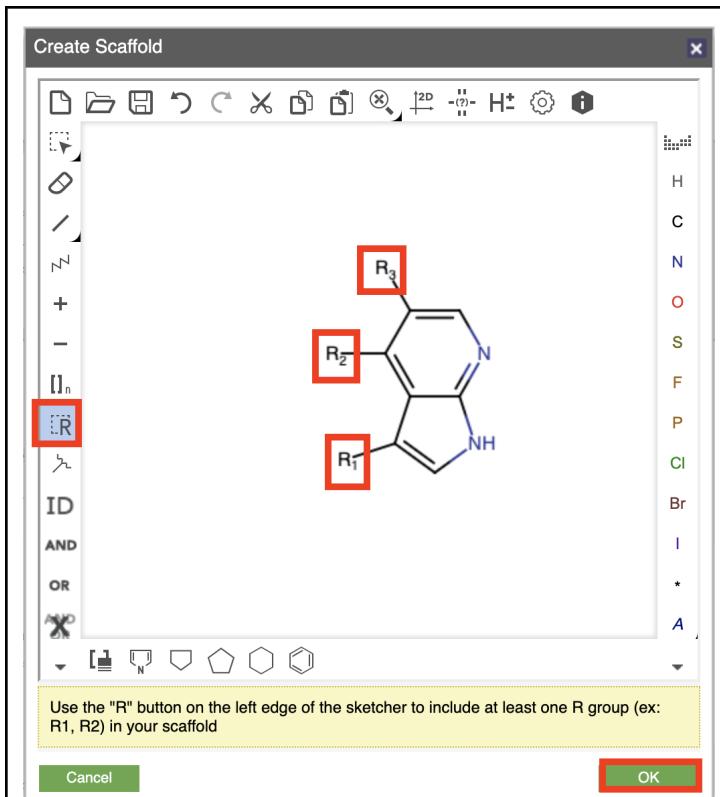
23. Click **OK**

A stop-light coloring rule has been added to the Molecular Weight column. Notice that all red compounds have been filtered out.

3. Adding a SAR Analysis

Structure Activity Relationship (SAR) analysis is a powerful tool to identify trends in activity and to identify gaps in the chemical space of your lead series. To perform a SAR analysis a scaffold (i.e. a minimal common substructure) and the location R-group substituents need to be defined. The LiveReport then populates with new columns, one for each R-group position, as well as one for the scaffold. We will use this information to see if we can identify different chemotypes within our compounds and how the various R-groups attached to them impact the IC₅₀ values.

 <p>Add a scaffold for SAR analysis.</p> <p>The screenshot shows the 'ANALYSIS TOOLS' section with 'SAR Scaffold' selected. A tooltip says: 'Click above or drag in compounds to define scaffolds with one or more R groups. Each R group will produce a column displaying matches for each compound.' The 'Compound Structure' table lists four compounds (CHEMBL389745, CHEMBL4101278, CHEMBL409892, CHEMBL409892). Compound 3 is highlighted with a red box. The 'Create Scaffold' panel shows a sketcher tool with a thiazole and a pyridine ring. A red box highlights the 'R' button on the left edge of the sketcher.</p>	<ol style="list-style-type: none">1. Click SAR Analysis<ul style="list-style-type: none">○ The SAR Analysis menu opens2. Click and drag the third compound (CHEMBL4101278) into the blue SAR Analysis menu area<ul style="list-style-type: none">○ The Create Scaffold panel opens <p><i>Optional:</i> You can click +Add SAR Scaffold and draw your own scaffold</p>
 <p>Delete atoms to make scaffold.</p> <p>The screenshot shows the 'Create Scaffold' panel with a sketcher tool. A thiazole ring and a pyridine ring are drawn. A red box highlights the 'R' button on the left edge of the sketcher. A note at the bottom says: 'Use the "R" button on the left edge of the sketcher to include at least one R group (ex: R1, R2) in your scaffold'.</p>	<ol style="list-style-type: none">3. In the Create Scaffold panel, click delete4. Click and drag to delete the R groups from the scaffold as shown to the left, leaving the connection points5. Add a methyl group ortho to where the thiazole was and para to the nitrogen on the pyridine<ul style="list-style-type: none">○ Scaffold should look like the structure below: 



6. Click **Smart R-group** and add R-groups as shown to the left

7. Click **OK**

- SAR analysis is run on the compounds in the LiveReport
- Columns with Matched Scaffold and R-groups are added

Note: R₁, R₂, and R₃ groups are denoted in the order of placement. To change the R-group number, click the R after it is placed to be prompted for the number.

Add R-groups.

ANALYSIS TOOLS

Define Scaffolds with one or more R groups. Each R group will produce a column displaying matches. ?

SAR Scaffold

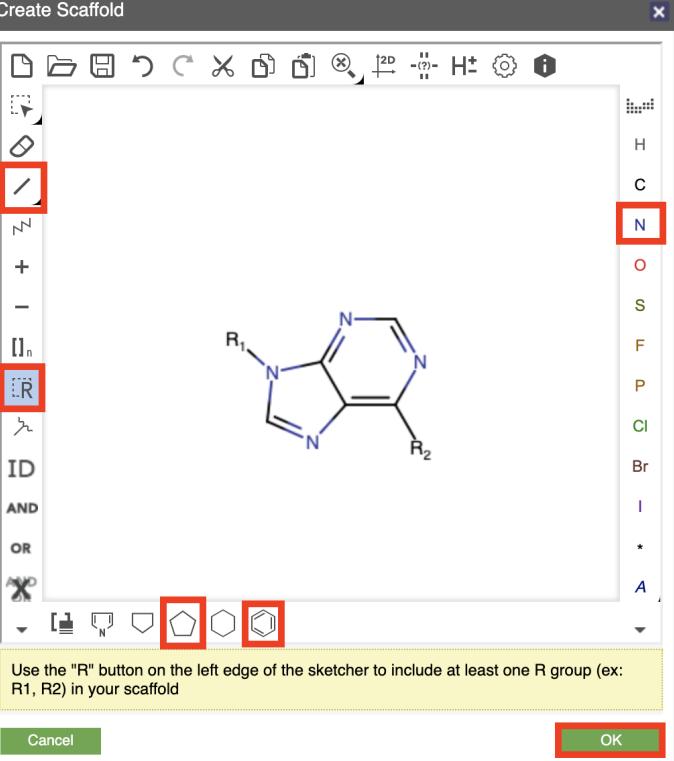
Scaffold 1

	Compound	
<input type="checkbox"/>	1	
<input type="checkbox"/>	2	

Add a new SAR Scaffold.

8. Click **SAR Scaffold**

- The Create Scaffold panel opens



9. In the Create Scaffold panel, **create the scaffold** to the left

10. Click **OK**

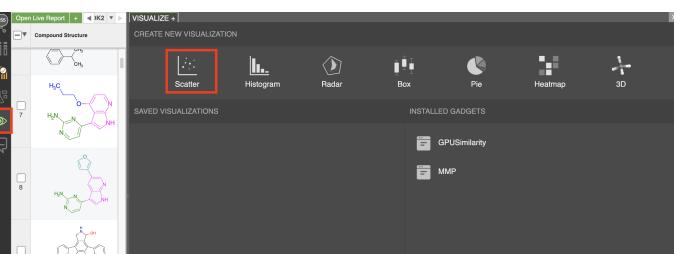
- SAR analysis is run on the compounds in the LiveReport
- Columns with Matched Scaffold and R-groups are added

Now that we have two SAR scaffolds in our LiveReport, let's visualize this information with some plots.

Sketch another SAR Scaffold.

4. Plotting and Visualizing Data

Data can be visualized by creating plots. Several types of plots are available for use in LiveDesign, and can be easily exported for use as figures.



1. Click **Visualize**

- The Visualize panel opens

2. Choose a **Scatter** plot

Open Visualize, and create a new Scatter Plot.



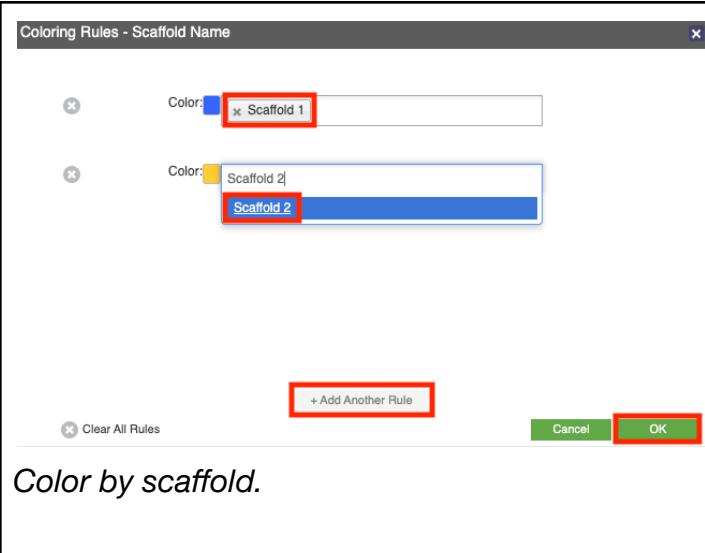
Create a SAR analysis scatter plot.

3. Under y-Axis, choose **R1 (SAR)**

4. Under x-Axis, choose **R2 (SAR)**

5. Under Color By, choose **Scaffold Name**

- As this property does not currently have a Coloring Rule defined, we have an option to add one
- The Coloring Rules panel opens

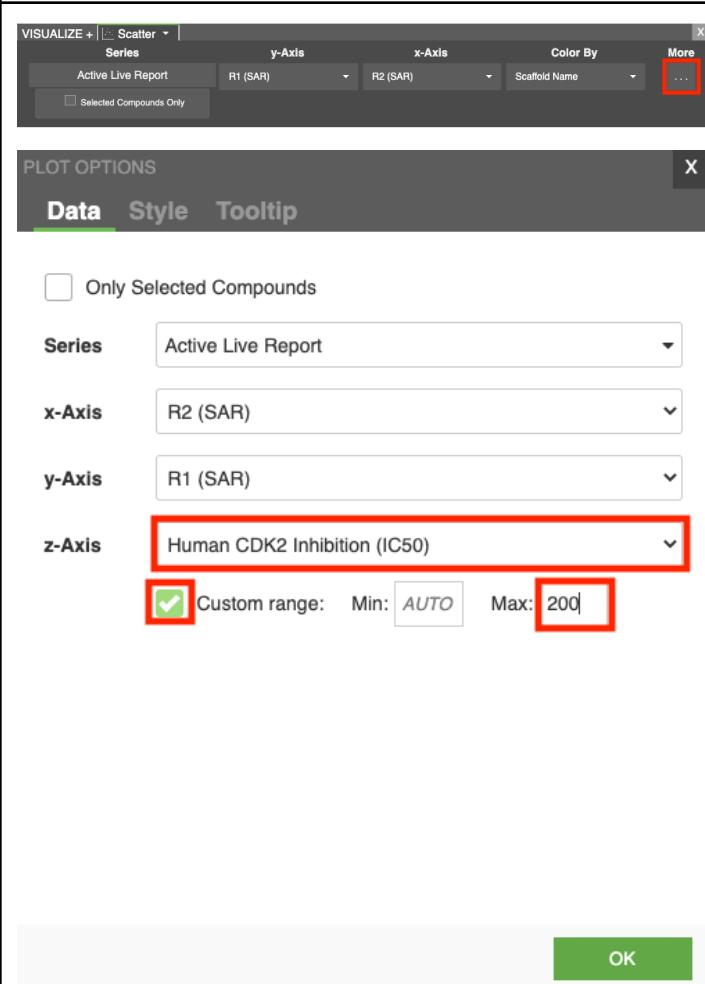


Color by scaffold.

6. Choose a **Color**, then type **Scaffold 1** and **click to select**
7. Click **Add Another Rule**
8. Choose another **Color**, then type **Scaffold 2** and **click to select**

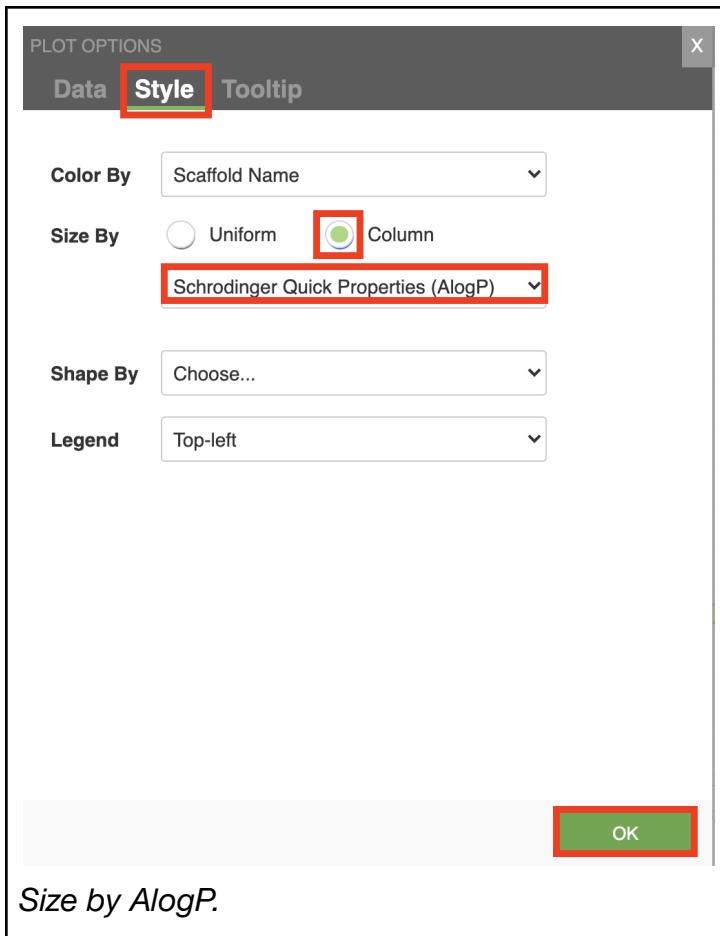
Note: Categorical coloring rules are case sensitive. Be sure to use the correct capitalization.

9. Click **OK**

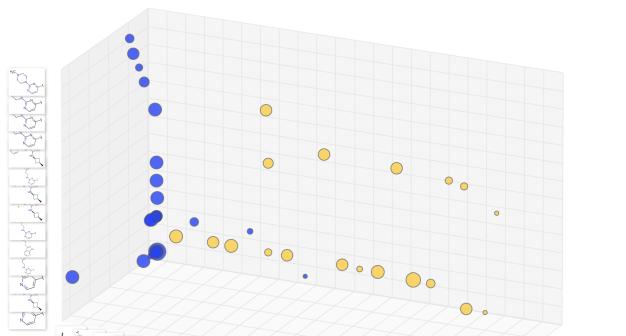


Add a z-Axis with a custom range.

10. In the Visualize panel, click **More**
 - The Plot Options panel opens
11. Next to z-Axis, choose **Human CDK2 Inhibition (IC50)**
12. Check **Custom range**
13. Set the z-Axis range to **Max: 200**



Size by AlogP.



Rotate the plot.

13. Go to the **Style** tab
14. Next to Size By, select column and then choose **Schrodinger Quick Properties (AlogP)**

15. Click **OK**

- o The Plot Options panel is closed

16. To the right of the scatter plot, click **Rotate**
17. **Click and drag** in the plot to rotate the plot

In the plot of SAR data, we can see that Scaffold 1 has more diversity at R1 while Scaffold 2 mostly has two cyclobutane-containing R-groups. Scaffold 1 typically has a hydrogen at the R2 position whereas Scaffold 2 has more diversity. Sizing by AlogP shows us that all compounds in the plot have reasonable AlogP values.

18. In the top right corner, click the **X** to close the plot

5. Adding Computed Models

LiveDesign is unique in the ability to deploy, execute, and visualize 2D and 3D models. Both structure-based (i.e. docking) and ligand-based (i.e. pharmacophore and shape screening) 3D models can be run in LiveDesign. In this example, we'll add a docking model to our report which

generates a 3D docked pose, a 2D ligand interaction diagram, and a 1D docking score as output. We can then use this model to evaluate new idea compounds that we design.

The screenshot shows the 'DATA & COLUMNS' interface for a project named 'LiveReport'. The left sidebar has several icons: a key icon with '255', a search icon, a star icon for 'Project Favorites', a flask icon for 'Computed Properties', and a folder icon for 'Computational Models'. A red box highlights the 'Computational Models' icon. Inside the 'Computational Models' section, there is a 'Docking' category with a red box highlighting the 'CDK2 (5IEY) Docking Model' entry. Below it are other docking models: '3D', 'Docking Score', 'LID', and 'Status'. A green '+' icon is located to the right of the docking models.

1. Click **Data & Columns**
2. Expand **Computational Models**
3. Select **Docking**
4. Click **CDK2 (5IEY) Docking Model** header and click the + icon
 - o CDK2 (5IEY) docking model columns are added to the LiveReport

These model results will pop up instantly as they are compounds that have been previously docked and the results are cached. Compounds which do not have information in them means the compound failed to dock with this model.

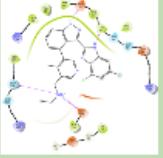
Add a Glide Docking model.

The screenshot shows the 'DISPLAY COLUMNS' section for the 'LiveReport' project. On the left, there is a list of checked items under 'All IDs' and 'Rationale'. A red box highlights the 'CDK2 (5IEY) Docking Model' group, which includes four items: '(Status)', '(3D)', '(LID)', and '(Docking Score)'. To the right, there is a table showing compound structures and IDs. The first row shows compound ID 3 with the structure: Nc1cc2c(cc1sc2)nc3cc4c(c(c3N)O)oc(=O)[nH]4. The second row shows compound ID 4 with the structure: CS(=O)(=O)c1ccc2c(c1)nc3cc4c(c(c3N)O)oc(=O)[nH]4. The third row shows compound ID 5 with the structure: CN1C=CC=C1c2cc3c(cc2C)c4c(c(c3N)O)oc(=O)[nH]4. The fourth row shows compound ID 6 with the structure: CC(C)c1cc2c(c1Cc3ccccc3O)S(=O)(=O)N2. At the bottom, there are buttons for 'Group...', 'Freeze', 'Hide', and 'Remove'.

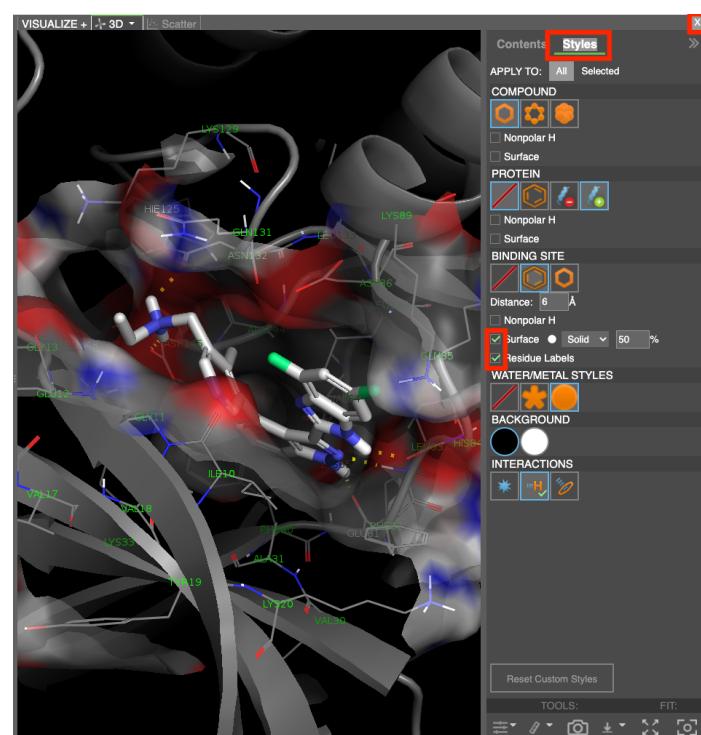
Group Glide Docking model columns.

For clarity, let's group the docking columns.

5. In Data and Columns, switch to the **LiveReport** tab
6. Shift-click to select all **four docking columns**
7. Click **Group**
8. Next to New Name, type **CDK2 Docking** and click **OK**
 - o Columns are grouped

CDK2 Docking			
CDK2 (5IEY) Docking Model (3D)	CDK2 (5IEY) Docking Model (Docking Score)	CDK2 (5IEY) Docking Model (LID)	CDK2 (5IEY) Docking Model (Status)
	-10.01		Completed (2018-2)

Click View 3D to visualize results of the model.



Add a binding site surface and residue labels.

9. For the second compound in the LiveReport click **View 3D**

- The 3D Visualizer opens
 - Explore the mouse functionality in the docking result:
- Left click and drag - Rotate
 - Left click - Select
 - Middle click and drag - Translate
 - Middle scroll - Adjust clipping planes
 - Right click and drag - Zoom

10. In the 3D Visualizer, click **Styles**

11. Under Binding Site Styles, check **Surface** and **Residue Labels**

- A binding site surface is shown
- Labels are added to binding site residues
- By default, hydrogen bond interactions are shown

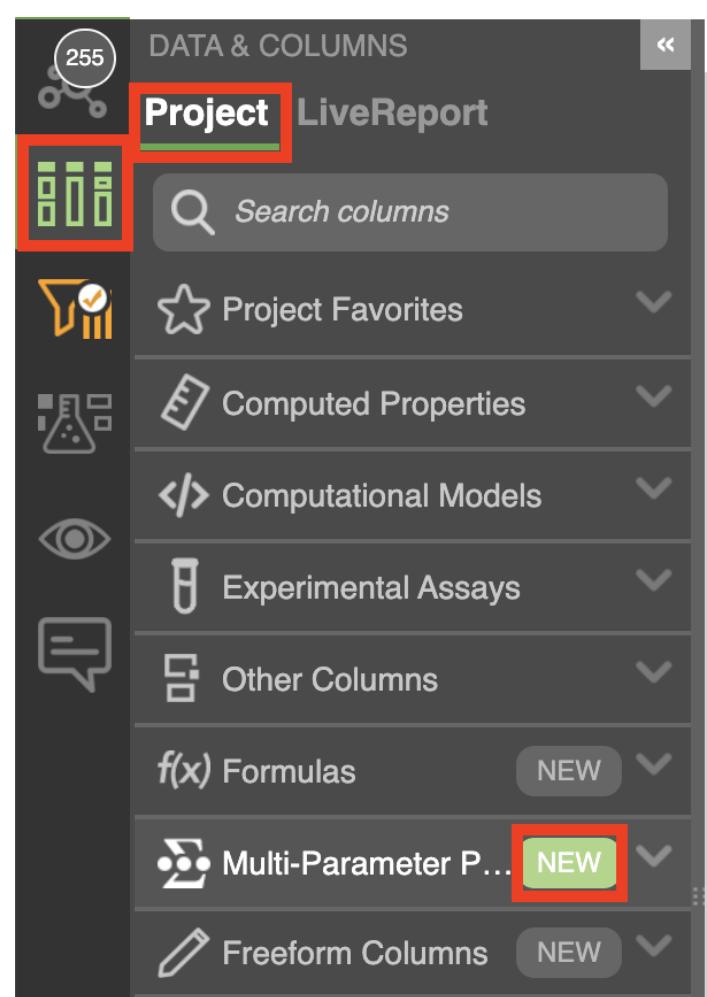
You can also adjust the rendering of the protein/ligand, add residue labels, change the background color, add measurements, export as an image, and export to .mae/.mol2/.pse

12. In the top right corner, click **X**

- The 3D Visualizer is closed

6. Creating a Multi-Parameter Profile (MPP)

At its heart, drug discovery is a multi-optimization problem that requires a balance among many parameters, such as potency, solubility, ADMET properties, etc. Multi-parameter profiles (**MPPs**) condense values for a collection of parameters into a **single numeric value**, i.e. the **MPP score**, allowing for rapid compound prioritization. The MPP score, which ranges from **0 (worst)** to **1 (best)**, is based on the geometric mean of the parameters that comprise the MPP profile. Parameters can be computed properties (such as predicted solubility, docking scores, etc.), assay values (such as *in vitro* or *in vivo* potency, solubility, etc.) or a combination of the two. To create an MPP, you must define the following: (1) the parameters, (2) the value distribution type for each parameter and (3) the range of acceptable values for each parameter. In this section, we will create a simple “drug-likeness” MPP based on three calculated properties. This can help quickly triage new ligand ideas and condense the amount of properties to look at for a compound.



The screenshot shows the QM9 Data & Columns interface. On the left is a sidebar with various icons: a key icon with '255' (highlighted with a red box), a project icon (highlighted with a red box), a search icon, a favorites icon, a computed properties icon, a computational models icon, an experimental assays icon, other columns icon, formulas icon, a multi-parameter profile icon (highlighted with a green box), and freeform columns icon. The main area has tabs 'Project' (highlighted with a red box) and 'LiveReport'. Below the tabs is a search bar labeled 'Search columns'. The main list includes 'Project Favorites', 'Computed Properties', 'Computational Models', 'Experimental Assays', 'Other Columns', 'Formulas' (with a 'NEW' button), 'Multi-Parameter P...' (with a 'NEW' button highlighted with a green box), and 'Freeform Columns' (with a 'NEW' button).

1. Click **Data & Columns**

Make sure you are in the Project tab in Data&Columns and not the LiveReport tab

2. Next to **Multi-Parameter Profiles** click **New**

Define a new Multi-Parameter Profile (MPP).

Define New Multi-Parameter Scoring Profile

1. General Settings	Name: [Your Name] Lipinski MPP
2. Choose Properties	Description: MPP on MW, HBD, HBA
+ Add Constituent	
3. Set Property Weights	Color Scheme: Bad (Red), Ok (Yellow), Good (Green)
	Scoring: Only score compounds that have values for every constituent
	<input type="checkbox"/> Cancel <input type="button" value="OK"/>

Add a name, description, and constituent.

Define New Multi-Parameter Scoring Profile

1. General Settings	In this Live Report	Other Columns
2. Choose Properties	Schrodinger Quick Properties (MW)	
+ Add Constituent	Schrodinger Quick Properties (AlogP)	
3. Set Property Weights	Schrodinger Quick Properties (HBD(maestro))	
	Schrodinger Quick Properties (HBA(maestro))	
	Schrodinger Quick Properties (PSA)	
	Human CDK2 Inhibition (IC50)	
	CDK2 (5IEY) Docking Model (Status)	
	CDK2 (5IEY) Docking Model (Docking Score)	

Define New Multi-Parameter Scoring Profile

1. General Settings	Constituent Property: Schrodinger Quick Properties (MW)
2. Choose Properties	Value Distribution: Categorical (Text)
+ Add Constituent	Higher Better
Schrodinger Quick Proper...	Lower Better
	Middle Good
	Middle Bad
	Categorical (Text)
	<input type="checkbox"/> Cancel <input type="button" value="OK"/>

Choose a value distribution for the property.

3. Next to Name, type **[Your Name] Lipinski MPP**

4. Next to Description, type **MPP on MW, HBD, HBA**

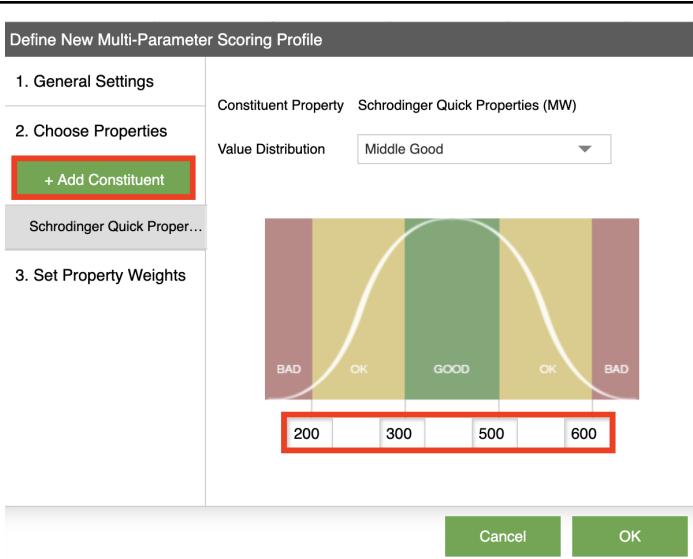
When you are including experimental data in an MPP, you should likely check **Only score compounds that have values for every constituent**

5. Click **Add Constituent**

- A list of properties is shown

6. Under Choose In this LiveReport, choose **Schrodinger Quick Properties (MW)**

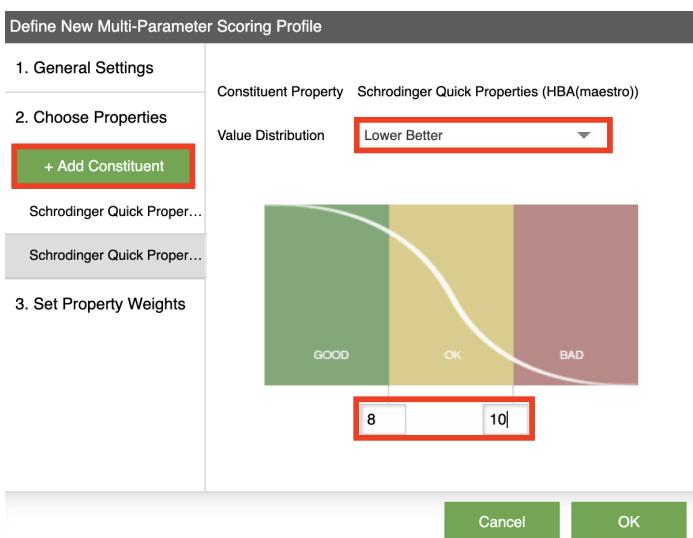
7. Next to Value Distribution, choose **Middle Good** from the dropdown



8. Set the cutoffs around the bell curve at **200, 300, 500, and 600**
9. Click **Add Constituent** to add the next property

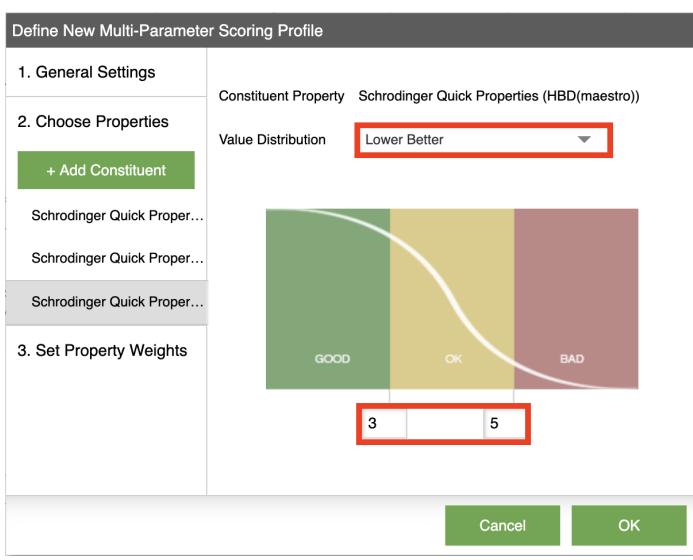
Note: If you accidentally click **OK** instead of **Add Constituent**, you can still edit your MPP. Hover over your MPP in the Data & Columns list on the left of the LiveReport and choose **Edit**.

Define the Mol. Wt. value distribution.



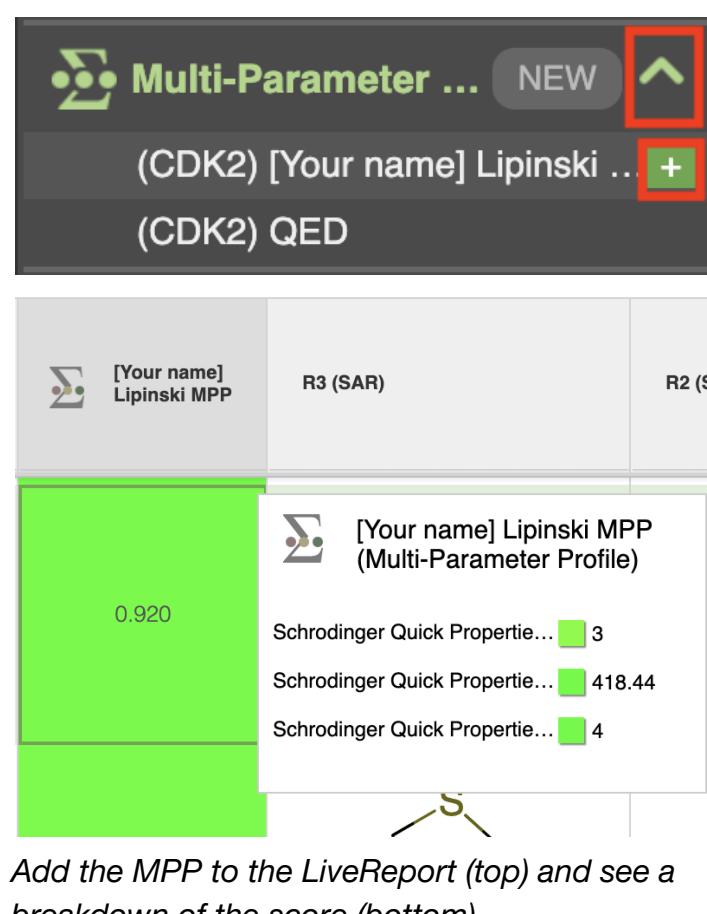
10. Choose **Schrodinger Quick Properties (HBA(maestro))**
11. Next to Value Distribution, choose **Lower Better** from the dropdown
12. Define the GOOD cutoff as **8**
13. Define the OK cutoff as **10**
14. Click **Add Constituent** to add next constituent

Define the HBA value distribution.



Define the HBD value distribution.

15. Choose **Schrodinger Quick Properties (HBD(maestro))**
16. Next to Value Distribution, choose **Lower Better** from the dropdown
17. Define the GOOD cutoff as **3**
18. Define the OK cutoff as **5**
- If you click **Set Property Weights** you can add weights to the different properties in the MPP
19. Click **OK**
 - The Define New Multi-Parameter Profile panel is closed



20. Click + to add your newly defined MPP from the menu

- Your MPP is added to the LiveReport
- Existing coloring rules for the MPP properties are overridden
- Constituents that don't exist in your LiveReport are added.
- A new column with an aggregated MPP score is added

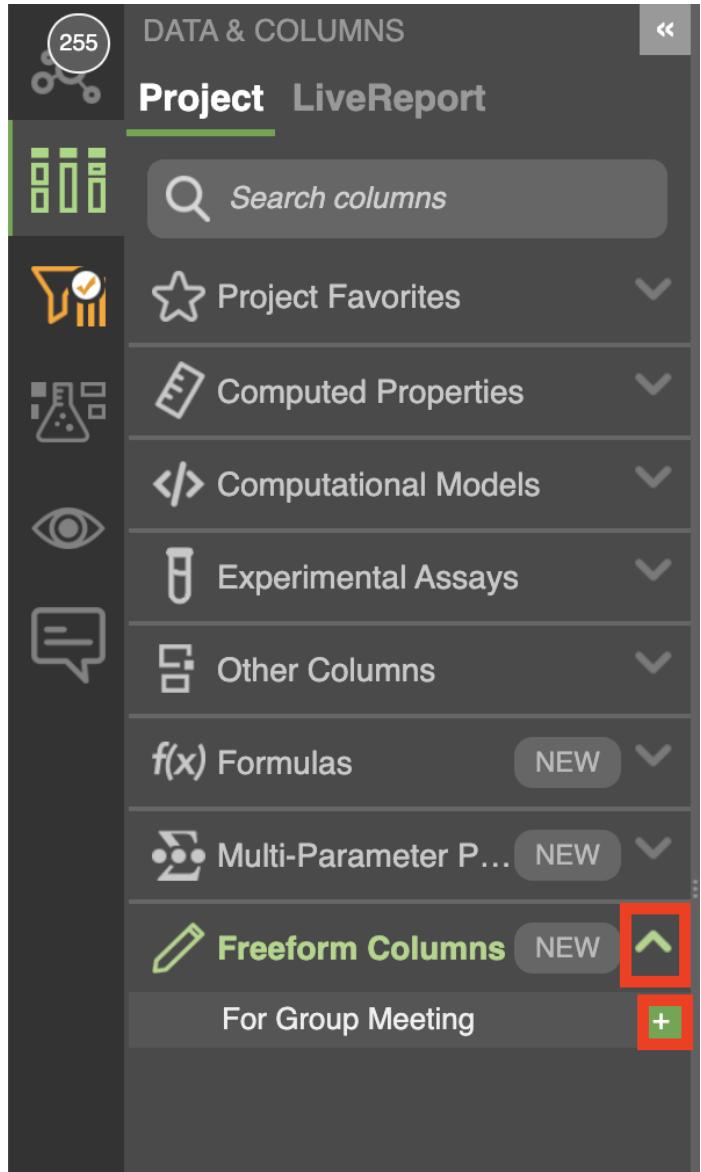
21. Click and drag to move the MPP column next to the Quick Property columns

22. Hover over the **MPP score**

- A breakdown of the value is shown in the tooltip

7. Using Freeform Columns (FFC) for Compound Progression

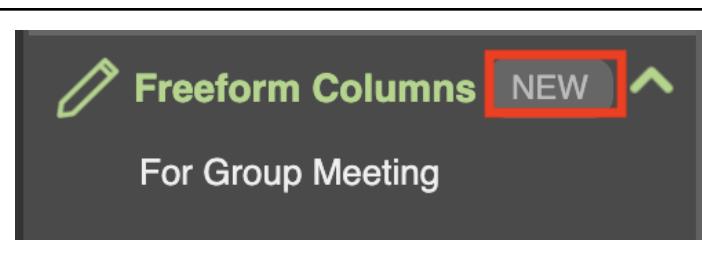
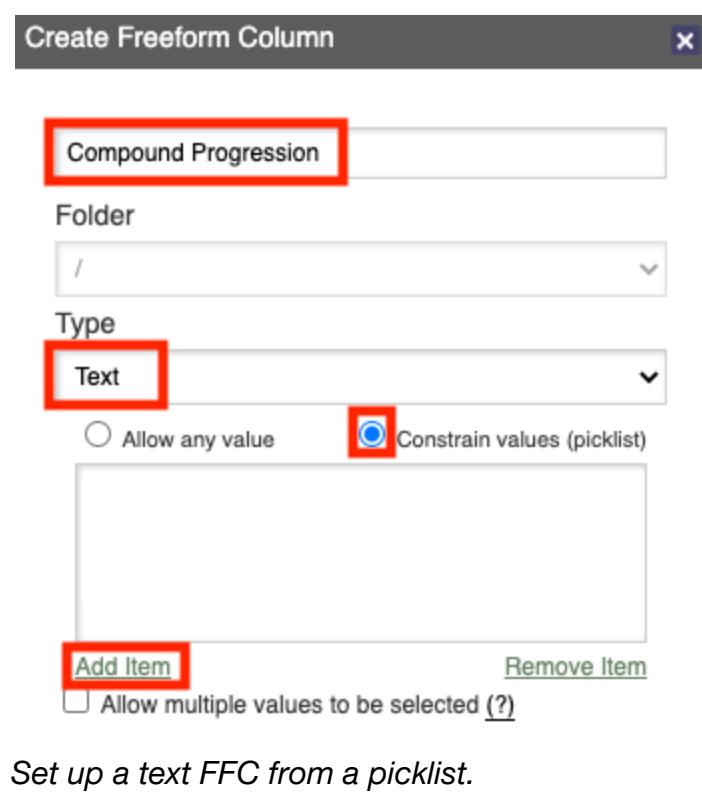
Freeform columns (FFCs) are a powerful tool for creating annotations, attaching files/images, assigning dates or picklists, and more. Used in combination, they are excellent for monitoring project progression. FFCs are user-editable and can be tracked across reports. In this exercise, we'll create an FFC that will allow collaborators to annotate compounds for follow-up discussion.

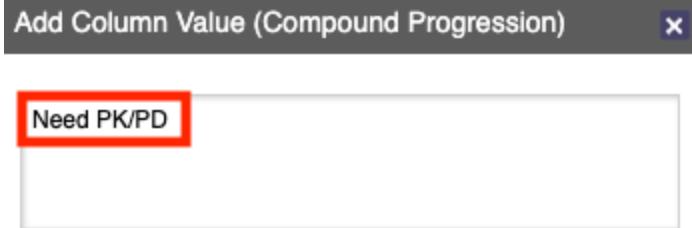


Add a Freeform Column (FFC).

Annotation is one of the most important uses for FFCs. Create a new FFC that you can use to add specific comments for compounds.

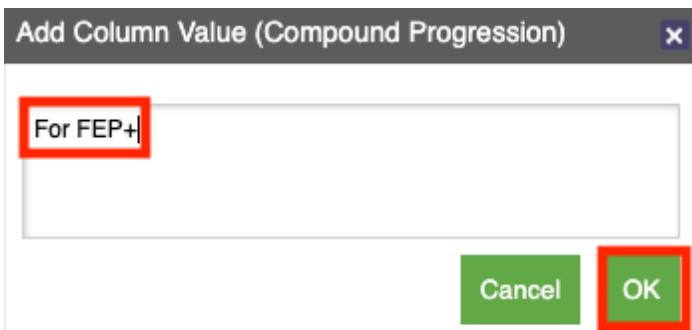
1. Click **Data & Columns**
2. Expand **Freeform Columns**
3. Add **For Group Meeting**
 - o The For Group Meeting FFC is added to your LiveReport

 <p><i>Create a published text FFC.</i></p>	<p>4. In the For Group Meeting Column, hover over a cell 5. Choose True (✓) or False (✗) for a compound</p> <p>As this FFC is available for all LiveReports in this project, we could use this to send a compound to a shared LiveReport that has an auto-update search active for compounds marked True. Just like in the video in Module 6B, this is how we could collaborate within a team to collect compounds for a group meeting.</p>
	<p>Now, we will create a new FFC that you can use to annotate compounds in your LiveReport.</p> <p>6. Go back to Freeform Columns and click New</p> <ul style="list-style-type: none"> ○ The Create Freeform Column panel opens
 <p><i>Set up a text FFC from a picklist.</i></p>	<p>7. For the Freeform Column name, type Compound Progression 8. Under Type, choose Text 9. Choose Constrain values (picklist) 10. Click Add Item</p>



11. Type **Need PK/PD** and click **OK**
12. Click **Add Item**
13. **Repeat steps 11 and 12** for the following annotations:

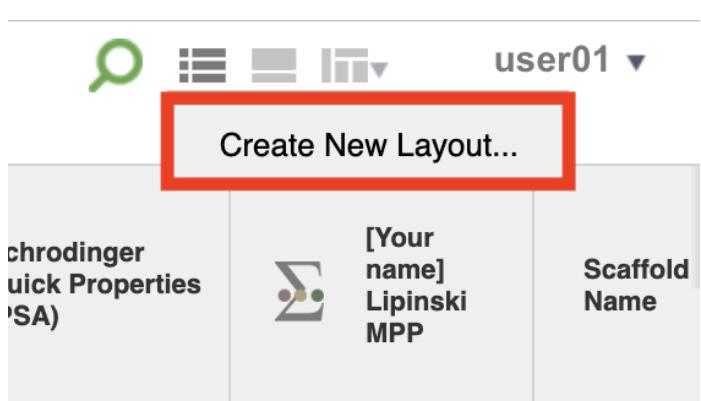
- For FEP+**
- For synthesis**
- No further action**



<p>Create Freeform Column</p> <p>Compound Progression</p> <p>Folder /</p> <p>Type Text</p> <p><input type="radio"/> Allow any value <input checked="" type="radio"/> Constrain values (picklist)</p> <p>Need PK/PD For FEP+ For synthesis No further actions</p> <p>Add Item Remove Item</p> <p><input type="checkbox"/> Allow multiple values to be selected (?)</p> <p>[Your name] compound progression for CDK2 project</p> <p><input type="checkbox"/> Publish (share data between Live Reports) (?)</p> <p>Cancel Add to LiveReport</p>	<p>If there is a scenario in which you might want to pick multiple values from the picklist at the same time, check Allow multiple values to be selected</p> <p>14. In the FFC description, type [Your name] compound progression for CDK2 project</p> <p>15. Click Add to LiveReport</p> <ul style="list-style-type: none"> ○ The Compound Progression FFC is added to your LiveReport <p>FFCs can be published (and thus available to all LiveReports in the project), or unpublished. Unpublished columns are only available in the current LiveReport, and can't be searched on across the database. Unpublished FFCs are an excellent way to have LiveReport only annotations that stay sandboxed from the rest of the project. In this module, we will leave our FFCs unpublished.</p>
	<p>16. In the Compound Progression FFC, hover over a compound cell and click the pencil</p> <p>17. Choose an annotation</p> <p>18. Click OK</p> <ul style="list-style-type: none"> ○ The annotation is added to your LiveReport

8. Creating a Form for Data Drilldown

In this section, we will create a Form. This will use the compounds we've populated our LiveReport with and change how we can view the associated data. Forms are useful for being able to focus on a single compound or smaller subset of compounds. For the final case study in this course, you will use a pre-built form to highlight properties of the compound you designed and submit for your final assignment.

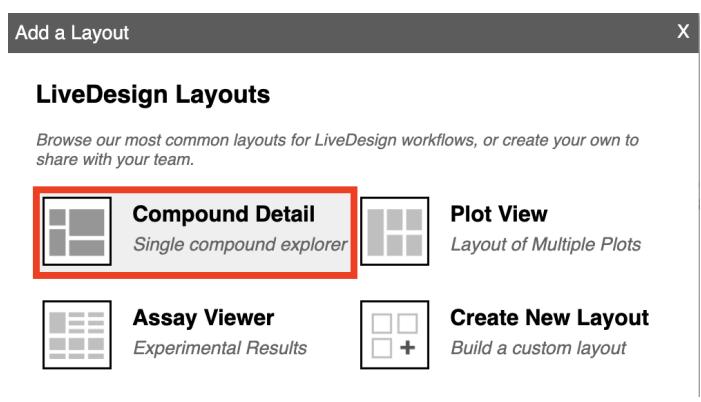


The screenshot shows the top navigation bar of a LiveReport. On the right side, there is a dropdown menu labeled "user01". Below it, a red box highlights the "Create New Layout..." button. To the left, there are several icons and sections: "chrodinger", "Quick Properties", "[Your name]", "Lipinski MPP", and "Scaffold Name".

Figure 2-1. Navigate to Forms.

1. In the upper right of the LiveReport, click the **Forms View navigation dropdown**
2. Select **Create New Layout**

- A dialog appears that permits creating a new layout

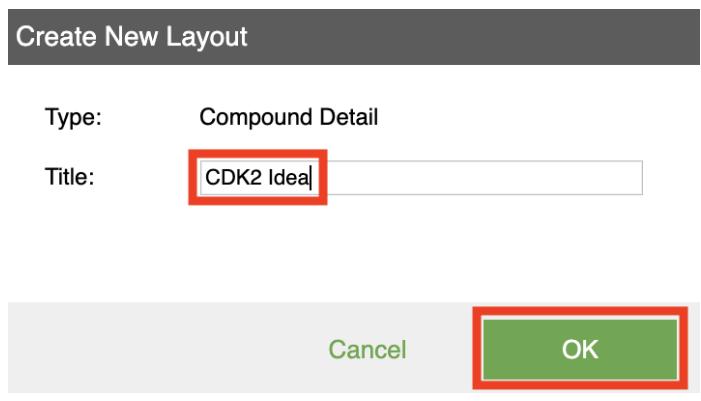


The screenshot shows the "Add a Layout" dialog. At the top, it says "Add a Layout" and has an "x" button. Below that is a heading "LiveDesign Layouts" with the sub-instruction "Browse our most common layouts for LiveDesign workflows, or create your own to share with your team.". There are four layout options shown in a grid:

- Compound Detail** (highlighted with a red box)
- Plot View** (Layout of Multiple Plots)
- Assay Viewer** (Experimental Results)
- Create New Layout** (Build a custom layout)

Figure 2-2. Select a default layout.

3. Select **Compound Detail**



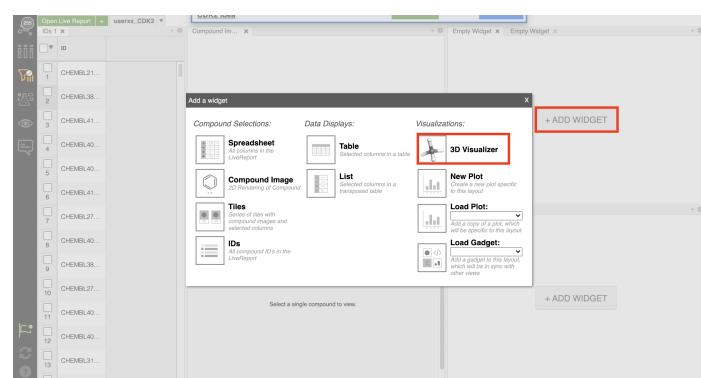
The screenshot shows the "Create New Layout" dialog. At the top, it says "Create New Layout".
Type: Compound Detail
Title: (highlighted with a red box)

At the bottom, there are two buttons: "Cancel" and "OK" (highlighted with a red box).

4. In Create New Layout, type **CDK2 Idea** as the Layout title
5. Click **OK**

- A layout appears that contains different view of data within the LiveReport
- Some Widgets (areas within the form) are empty

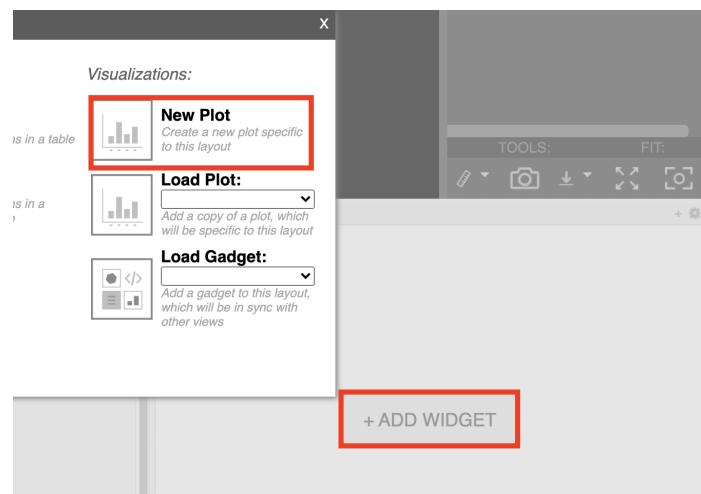
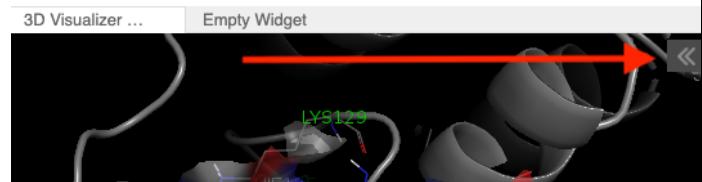
Figure 2-3. Give the form a title (top) and view the forms layout (bottom).



6. In the top right of the form, click **ADD WIDGET** and choose **3D Visualizer** and click **OK**

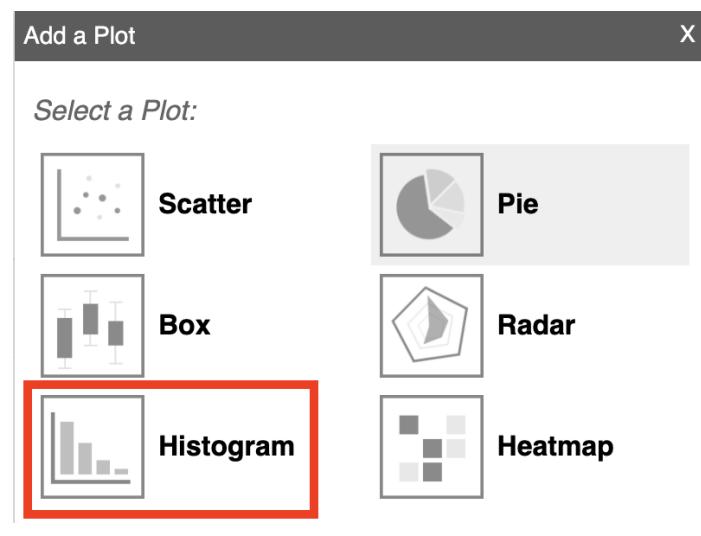
- The 3D Visualizer with the docked pose is now in the form

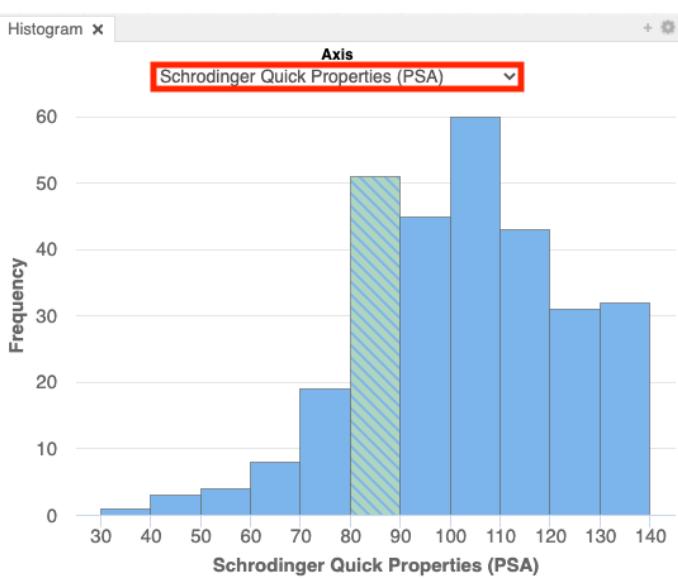
Note: Toggle on the **CDK2 (5IEY) Docking model**, if needed.



8. In the bottom right of the form, click **ADD WIDGET** and click **New Plot**

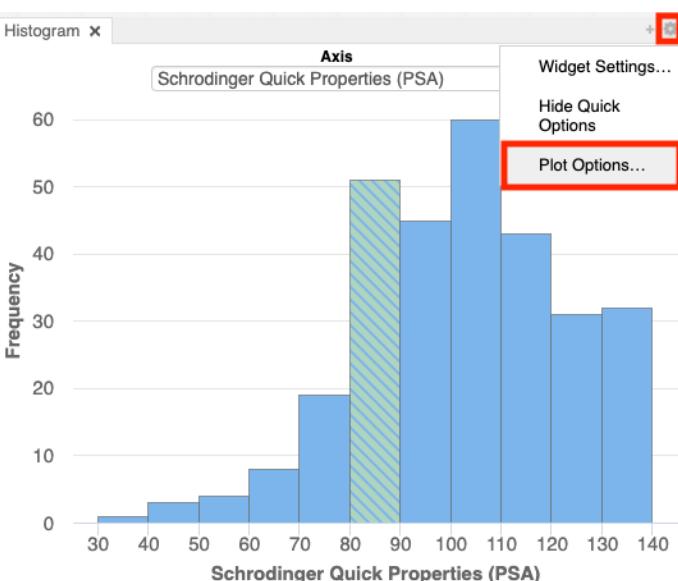
9. Click **Histogram**





10. Under Axis, choose **Schrodinger Quick Properties (PSA)**

Note: If you have a compound selected in your LiveReport, the bin it is in will be highlighted.



11. Click the **cog** in the Top right of the Histogram widget

12. Click **Plot Options**

ADVANCED OPTIONS

Data Style **Bin** Tooltip

Automatic
 5 equal bins
 Custom bins

OK

13. Go to the **Bin** tab

14. Set the Bin to **5 equal bins**

15. Click **OK**

- A histogram of PSA data is populated in the Widget

This form is looking great! As a last step, we will clean up the information in the table in the middle of the form.

ID: CHEMBL3897452 2 of 297

List 1 x

Schrodinger Quick Properties (MW)	418.44	Widget Settings...
Schrodinger Quick Properties (AlogP)	3.83	Choose Data...
Schrodinger Quick Properties (HBD(maestro))	3	
Schrodinger Quick Properties (HBA(maestro))	4	
Schrodinger Quick Properties (PSA)	82.28	
Human CDK2 Inhibition (IC50) [nM]	1	
CDK2 (5IEY) Docking Model (3D)		
CDK2 (5IEY) Docking Model (LID)		

16. Click the cog in top right of the **List 1** widget

17. Select **Choose Data...**

Choose Data...

Available columns

Select multiple using CMD & SHIFT keys.

- [Your name] Lipinski MPP
- All IDs
- CDK2 (5IEY) Docking Model (3D)
- CDK2 (5IEY) Docking Model (Docking Score)
- CDK2 (5IEY) Docking Model (LID)
- CDK2 (5IEY) Docking Model (Status)
- Compound Progression
- For Group Meeting
- Human CDK2 Inhibition (IC50)
- ID
- Lot Date Registered
- Lot Scientist
- Matched Scaffold
- R1 (SAR)
- R2 (SAR)
- R3 (SAR)
- Rationale
- Scaffold Name
- Scaffold SMARTS
- Schrodinger Quick Properties (AlogP)
- Schrodinger Quick Properties (HBA(maestro))

Displayed columns

Drag & drop columns to reorder them.
Select multiple using CMD & SHIFT keys.

- Schrodinger Quick Properties (MW)
- Schrodinger Quick Properties (AlogP)
- Schrodinger Quick Properties (HBD(maestro))
- Schrodinger Quick Properties (HBA(maestro))
- Schrodinger Quick Properties (PSA)
- Human CDK2 Inhibition (IC50)
- CDK2 (5IEY) Docking Model (Status)**
- CDK2 (5IEY) Docking Model (3D)**
- CDK2 (5IEY) Docking Model (LID)**
- CDK2 (5IEY) Docking Model (Docking Score)**

18. Under **Displayed columns**, choose **CDK2 (5IEY) Docking Model (Status)**

19. Click **Remove**

20. Repeat this for **CDK2 (5IEY) Docking Model (LID)**

Choose Data...

Available columns

Select multiple using CMD & SHIFT keys.

- [Your name] Lipinski MPP
- All IDs
- CDK2 (5IEY) Docking Model (3D)
- CDK2 (5IEY) Docking Model (Docking Score)
- CDK2 (5IEY) Docking Model (LID)
- CDK2 (5IEY) Docking Model (Status)
- Compound Progression
- For Group Meeting
- Human CDK2 Inhibition (IC50)
- ID
- Lot Date Registered
- Lot Scientist
- Matched Scaffold
- R1 (SAR)
- R2 (SAR)
- R3 (SAR)
- Rationale
- Scaffold Name
- Scaffold SMARTS
- Schrodinger Quick Properties (AlogP)
- Schrodinger Quick Properties (HBA(maestro))

Displayed columns

Drag & drop columns to reorder them.
Select multiple using CMD & SHIFT keys.

- Schrodinger Quick Properties (MW)
- Schrodinger Quick Properties (AlogP)
- Schrodinger Quick Properties (HBD(maestro))
- Schrodinger Quick Properties (HBA(maestro))
- Schrodinger Quick Properties (PSA)
- Human CDK2 Inhibition (IC50)
- CDK2 (5IEY) Docking Model (3D)

Cancel OK

21. Under **Available columns**, choose **[Your name] Lipinski MPP**

22. Click the **arrow** to move it to the **Displayed columns**

23. Click **OK**

- The List 1 widget has been updated

Editing Layout:
CDK2 Idea

+ Add Widget Cancel **Save Layout**

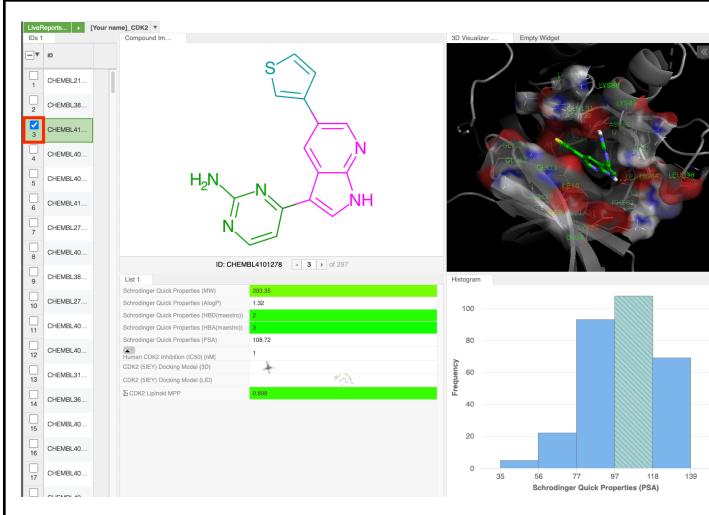
Open Compound Image Table 1 Histogram

ID List x + All IDs Human CDK2 Inhibition (IC50) 10

Open Compound Image Table 1 Histogram

All IDs Human CDK2 Inhibition (IC50) 10

22. In the top of the LiveReport, click **Save Layout**



23. In the ID List, **check** a compound

- The selected compound is shown as an image
- Properties are shown for the selected compound
- The histogram bins that contain this compound are highlighted

24. Use the **arrows** in the **Compound Image widget** to move through the compounds in the LiveReport

Well done! In this tutorial, you learned how to use LiveDesign to create a LiveReport populated with CDK2 binders. We evaluated these compounds for their physicochemical properties, computed ligand properties, and created a multi-parameter profile of several properties at once. We then annotated some compounds of interest and used a Form to be able to drill down into information for particular compounds of interest.