

SDHydroTools

User Information and Instructions

2026

General Notes About the SDHydroTools Package

- SDHydroTools is a computer program provided by the County of San Diego for use with the 2026 Hydrology Manual. It is provided free of charge to Hydrology Manual users.
- SDHydroTools performs certain hydrologic computations in accordance with Sections 3, 4, and 6 of the 2026 Hydrology Manual. Hydrologic computation procedures are based on rainfall depth data from NOAA Atlas 14.
- SDHydroTools includes embedded 100-year rainfall depth data for San Diego County from NOAA Atlas 14. Users may provide other rainfall depth data.
- SDHydroTools replaces both the San Diego Unit Hydrograph software and Rational Hydrograph (RATHYDRO) software that were provided with the June 2003 Hydrology Manual.

General Notes About the SDHydroTools Package

SDHydroTools includes modules to:

- Obtain NOAA Atlas 14 rainfall depth data for the 100-year storm event for locations within San Diego County;
- Interpolate rainfall depths and intensities using log-log interpolation;
- Prepare a rational method hydrograph using the procedure presented in Section 6 of the 2026 Hydrology Manual;
- Prepare a nested storm hyetograph for use with the NRCS hydrologic method presented in Section 4 of the 2026 Hydrology Manual;
- Calculate a peak flow rate and generate a hydrograph using the NRCS hydrologic method presented in Section 4 of the 2026 Hydrology Manual.

General Notes About the SDHydroTools Package

- The computation processes within SDHydroTools follow procedures described in the 2026 Hydrology Manual.
 - The Interpolation Module uses the formulas presented in Sections 3 and 4.
 - The RickRatHydro Module uses the procedures described in Section 6.
 - The Nested Storm Convolution Module and SD Unit Hydrograph Module use the procedures described in Section 4.
- Please refer to the 2026 Hydrology Manual for guidelines, definitions, parameters, equations, and descriptions of hydrologic computation processes.
- Please refer to the 2026 Hydrology Manual Workbook for example calculations.

Installing SDHydroTools

- Double-click the executable file “SDHydroToolsSetup.msi”.
- A Setup Wizard will guide you through the steps required to install SDHydroTools:
 - Review and accept the license agreement.
 - Select a location to install the software on the local computer.
- Once installed, open SDHydroTools using the desktop icon.
- SDHydroTools is now ready to use.

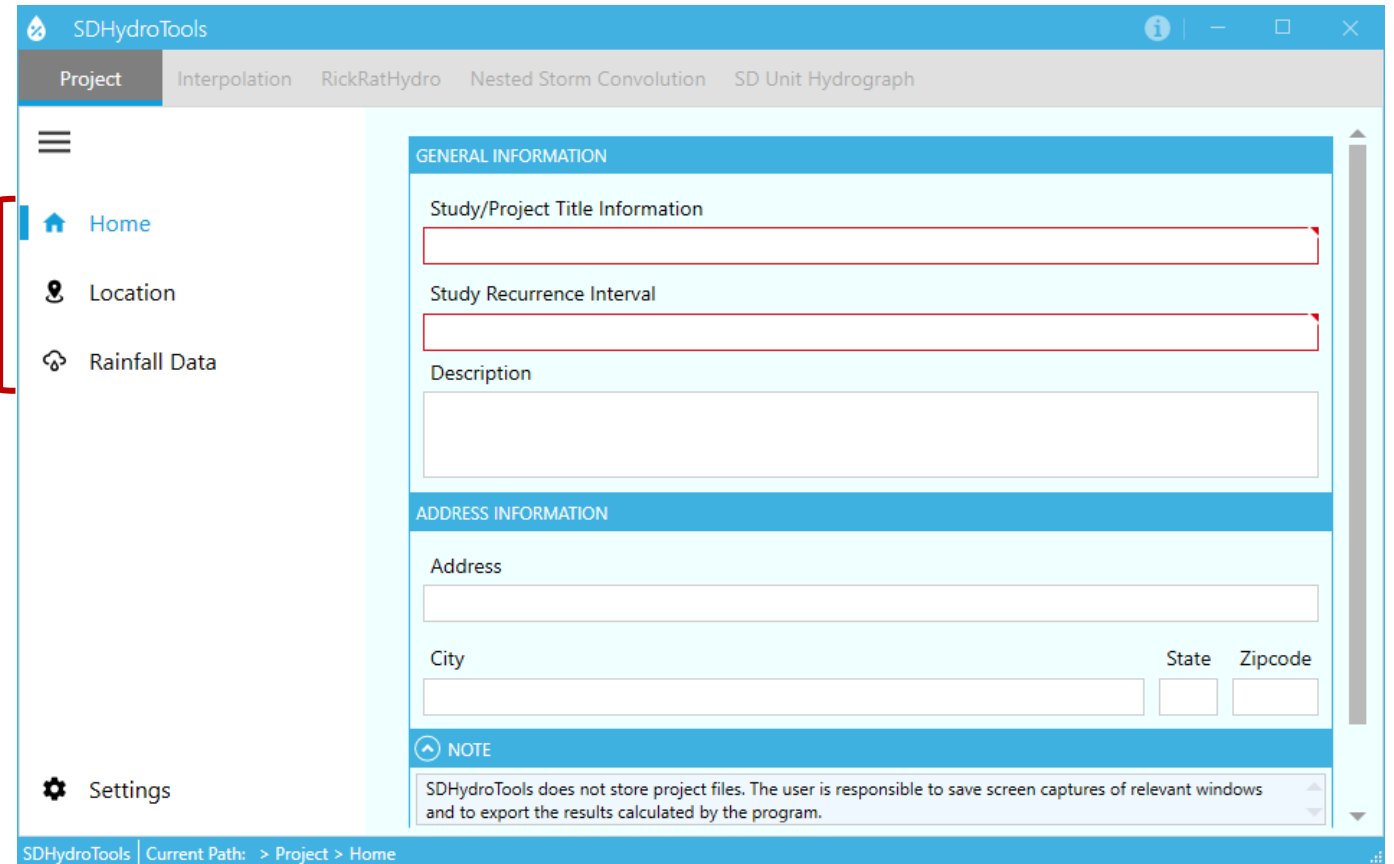
SDHydroTools Layout

- SDHydroTools includes 5 Modules shown in Tabs across the top.
- Each Module includes one or more Windows accessible along the left side.

Use Tabs on top to move between Modules. →

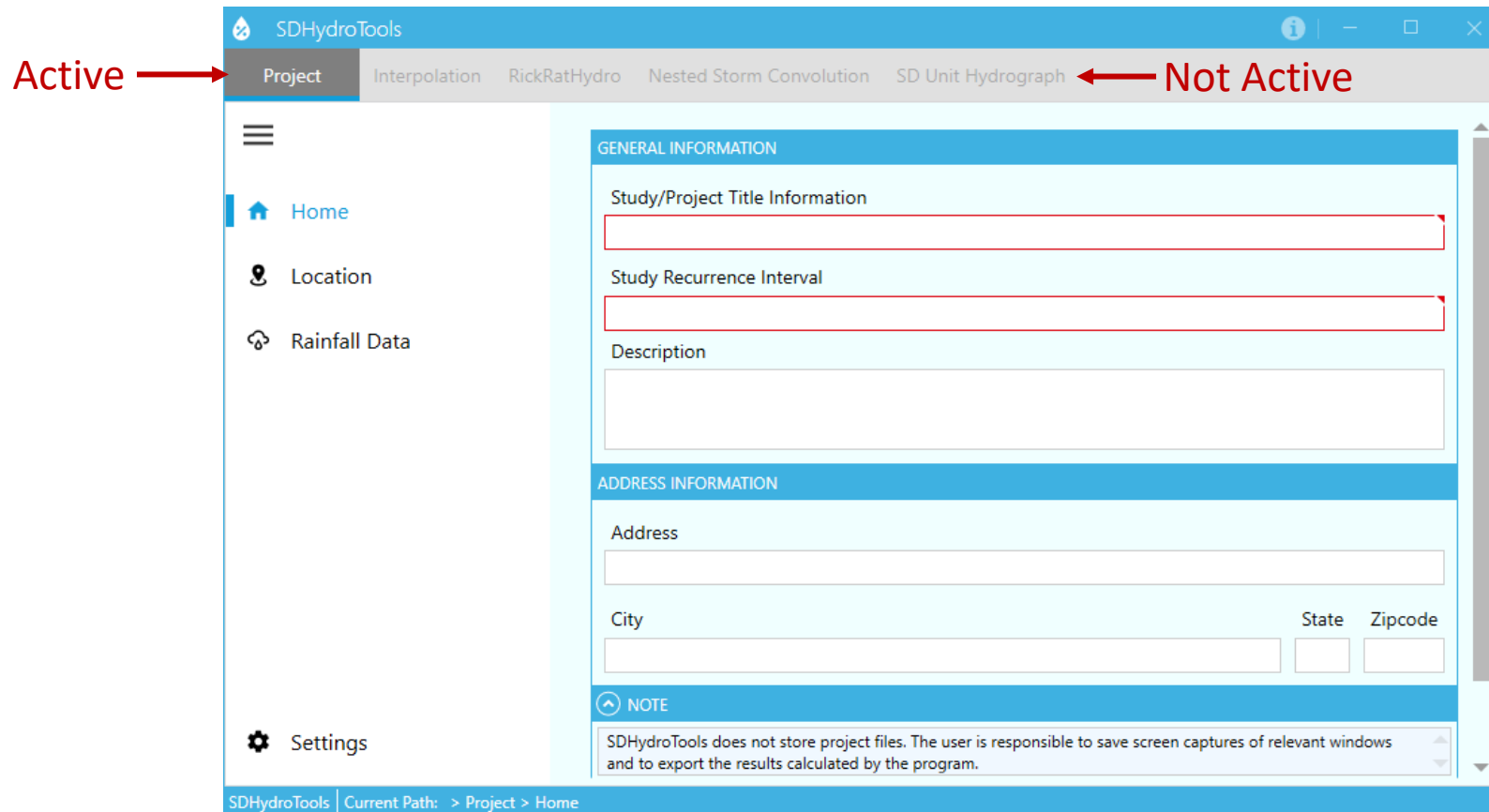
Available Windows within each Module/Tab – Windows vary depending on the Module. Select these to move between Windows within a Module. →

Settings (available in the Project Module) provides an option to access an offline map in the Location Window of the Project Module if no internet connection is available or if the online map does not load in the Location Window. →



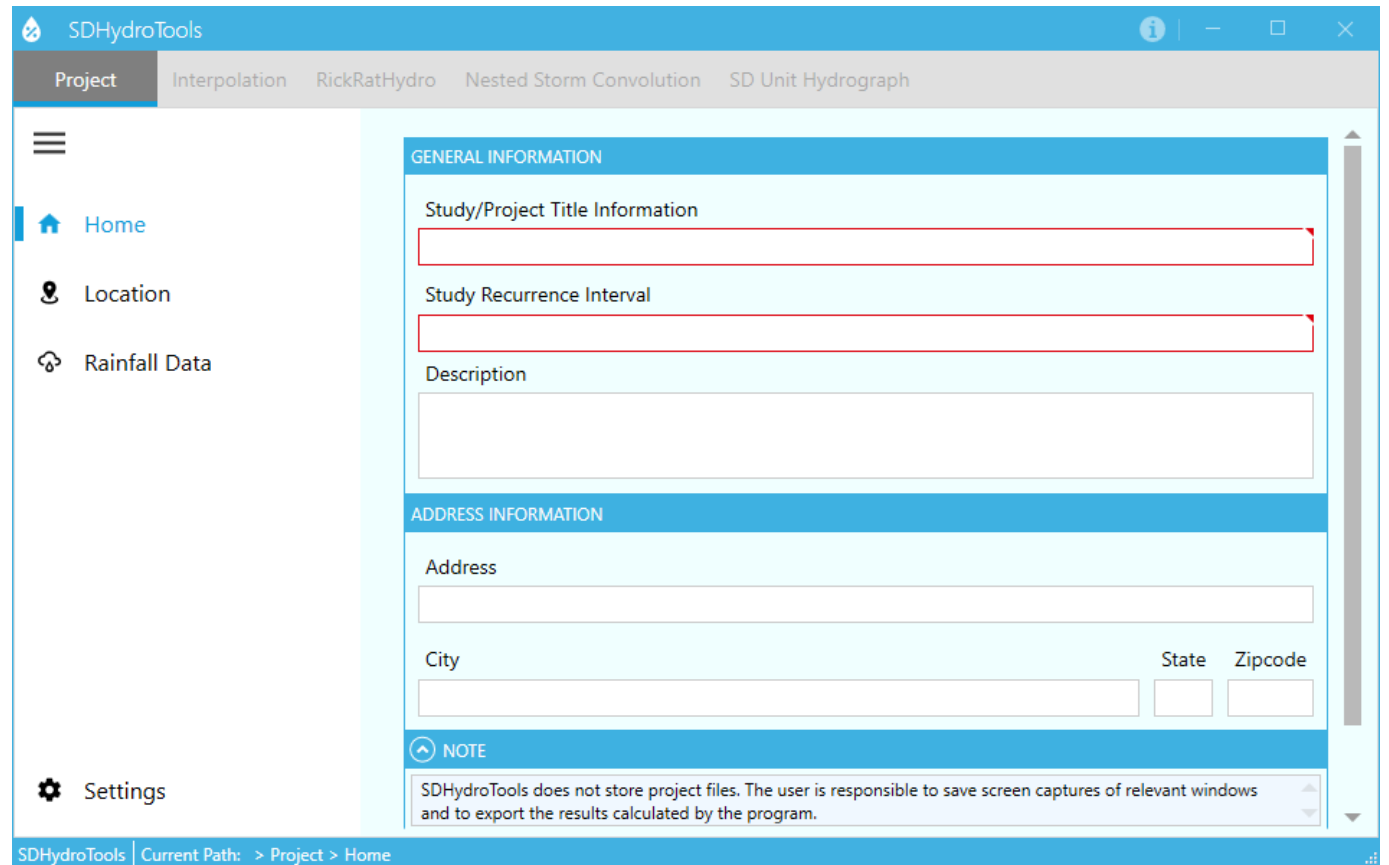
Starting SDHydroTools – Project Module

- When SDHydroTools is initially opened, only the Project Module is active.
- To activate the other modules, rainfall data must be populated in the Rainfall Data Window based on a location provided in the Location Window of the Project Module.



Starting SDHydroTools – Project Module (Continued)

- Complete the Home Window of the Project Tab, then move to the Location Window.
1. (Optional) Complete the General Information and Address Information for the project.
 2. (As Needed) Save a screen capture of the window for documentation (e.g., use ALT+Print Screen or your preferred method to take a copy of the SDHydroTools Window and save it to an external program).
 3. Click on “Location” to move to the next Window of the Project Tab.

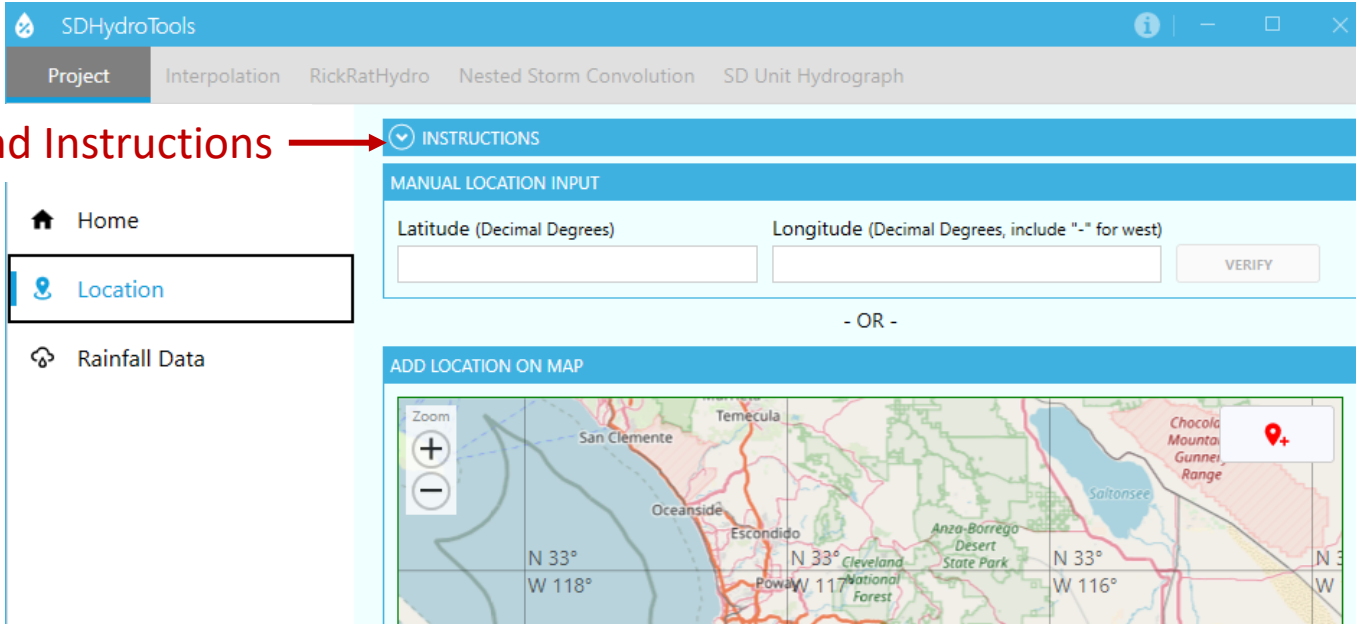


The screenshot displays the SDHydroTools software interface. The title bar shows 'SDHydroTools' with standard window controls. The main menu includes 'Project', 'Interpolation', 'RickRatHydro', 'Nested Storm Convolution', and 'SD Unit Hydrograph'. The 'Project' tab is active, showing a sidebar with 'Home', 'Location', 'Rainfall Data', and 'Settings'. The main content area is divided into sections: 'GENERAL INFORMATION' with fields for 'Study/Project Title Information', 'Study Recurrence Interval', and 'Description'; 'ADDRESS INFORMATION' with fields for 'Address', 'City', 'State', and 'Zipcode'; and a 'NOTE' section at the bottom stating: 'SDHydroTools does not store project files. The user is responsible to save screen captures of relevant windows and to export the results calculated by the program.'

Starting SDHydroTools – Project Module (Continued)

- A location must be provided for the program to get the embedded 100-year rainfall data. This step is mandatory to activate the computation modules, even when the user intends to substitute data from another source.
- If needed, expand the “Instructions” box to see instructions to select a location by entering a point or by entering latitude and longitude.

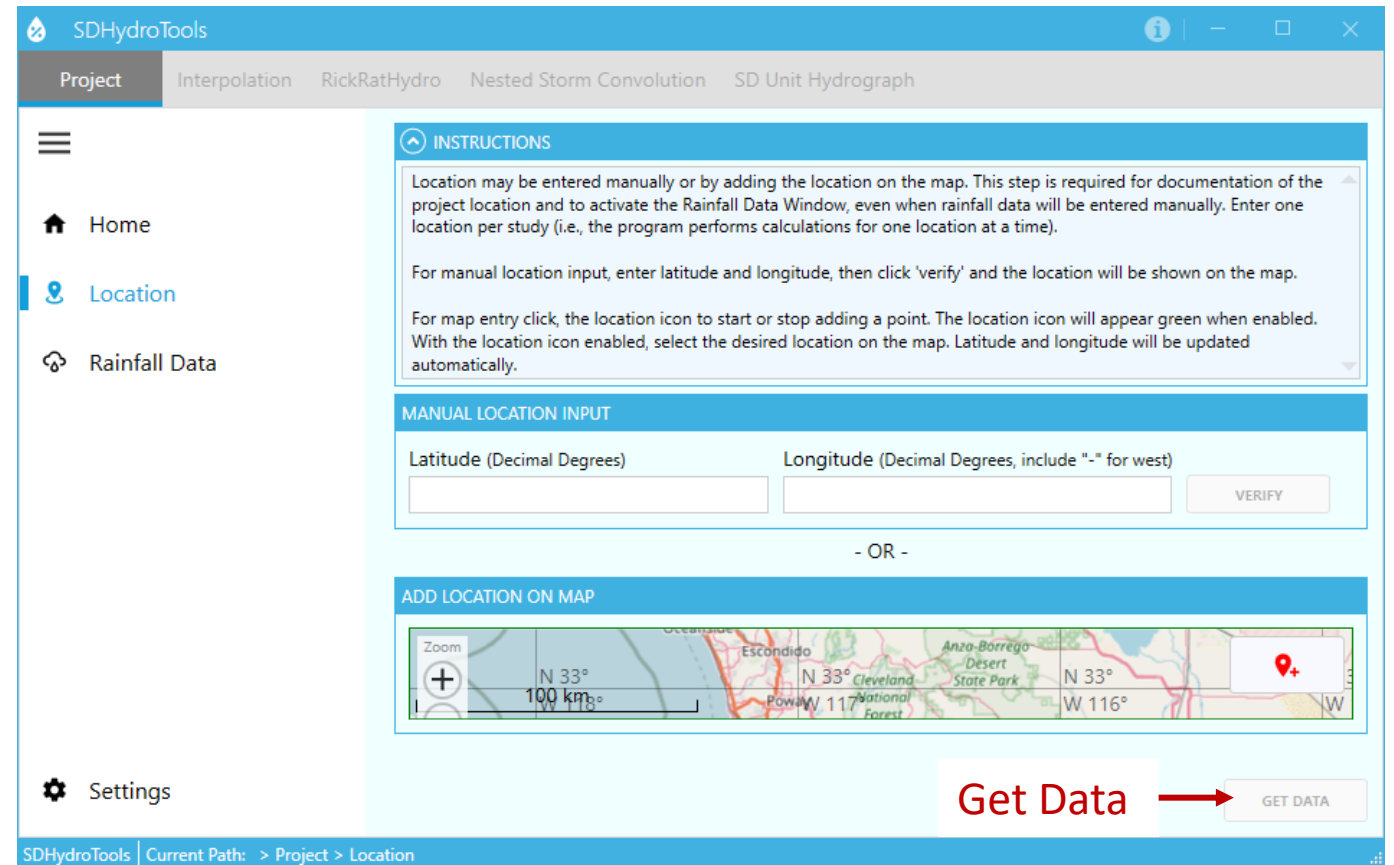
Click to Expand Instructions →



The screenshot shows the SDHydroTools application window with the 'Project' tab selected. The 'INSTRUCTIONS' section is expanded, revealing two options for location input: 'MANUAL LOCATION INPUT' and 'ADD LOCATION ON MAP'. The 'MANUAL LOCATION INPUT' section contains two text input fields for 'Latitude (Decimal Degrees)' and 'Longitude (Decimal Degrees, include "-" for west)', along with a 'VERIFY' button. The 'ADD LOCATION ON MAP' section features a map of the San Diego region with a red location pin icon. The map includes labels for various locations such as San Clemente, Temecula, Oceanside, Escondido, Cleveland National Forest, Anza-Borrego Desert State Park, Poway, and Saltonsee. The map also displays latitude and longitude coordinates (N 33° and W 118° to W 116°). A red arrow points to the 'INSTRUCTIONS' header, and a red box highlights the 'Location' option in the left sidebar.

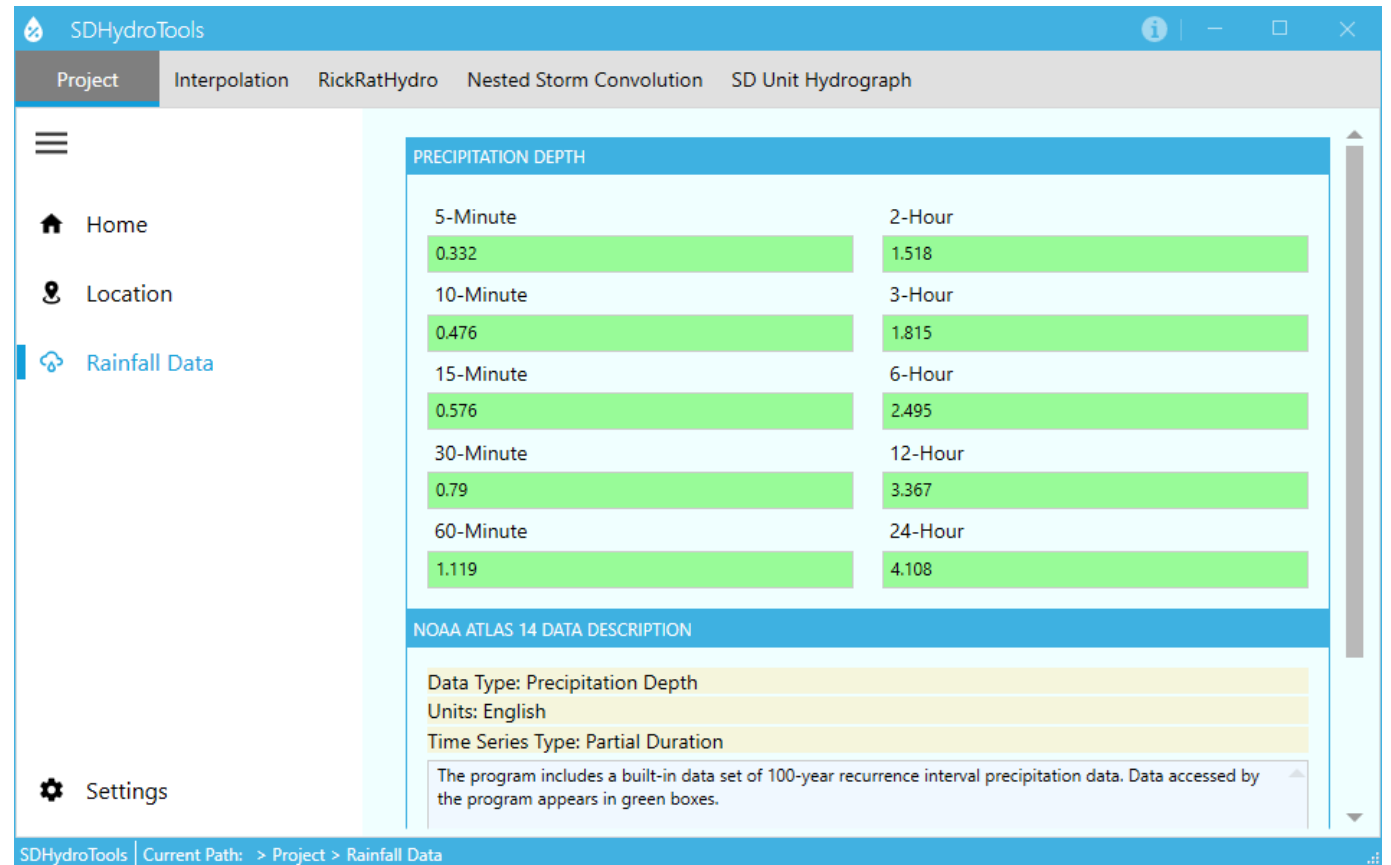
Starting SDHydroTools – Project Module (Continued)

- Enter the project location in the Location Window of the Project Tab to get the embedded 100-year rainfall data.
1. Provide the project location per the instructions.
 2. The “Get Data” button will be active after a valid (*i.e., within San Diego County*) project location has been entered.
 3. (As Needed) Save a screen capture of the window for documentation. Note the latitude and longitude. Data can be reproduced by entering the same latitude and longitude.
 4. Click on “Get Data” to move to the next Window.



Starting SDHydroTools – Project Module (Continued)

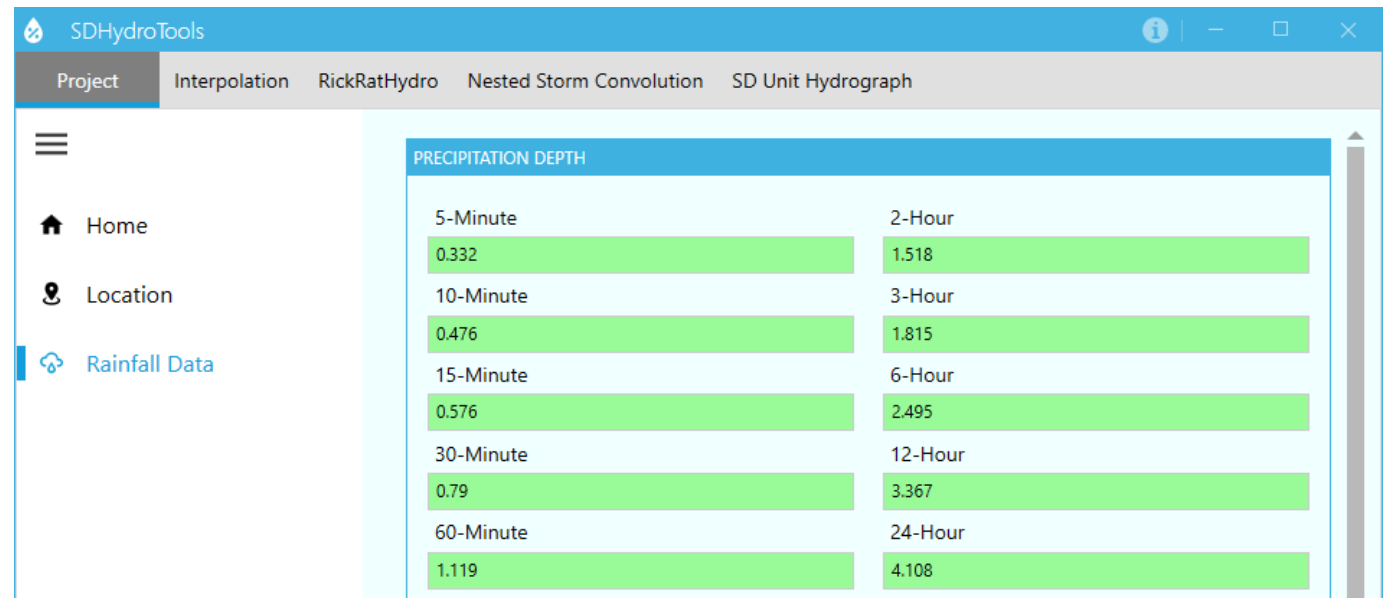
- After clicking on “Get Data” in the Location Window, the data are presented in the Rainfall Data Window of the Project Module.
- 100-year rainfall data is provided in units of inches.
- (As Needed) Save a screen capture of the rainfall data.
- (As Needed) Data can be reproduced by re-entering the latitude and longitude of the project location in the Location Window (e.g., after closing the program, upon opening a new session).



Starting SDHydroTools – Project Module (Continued)

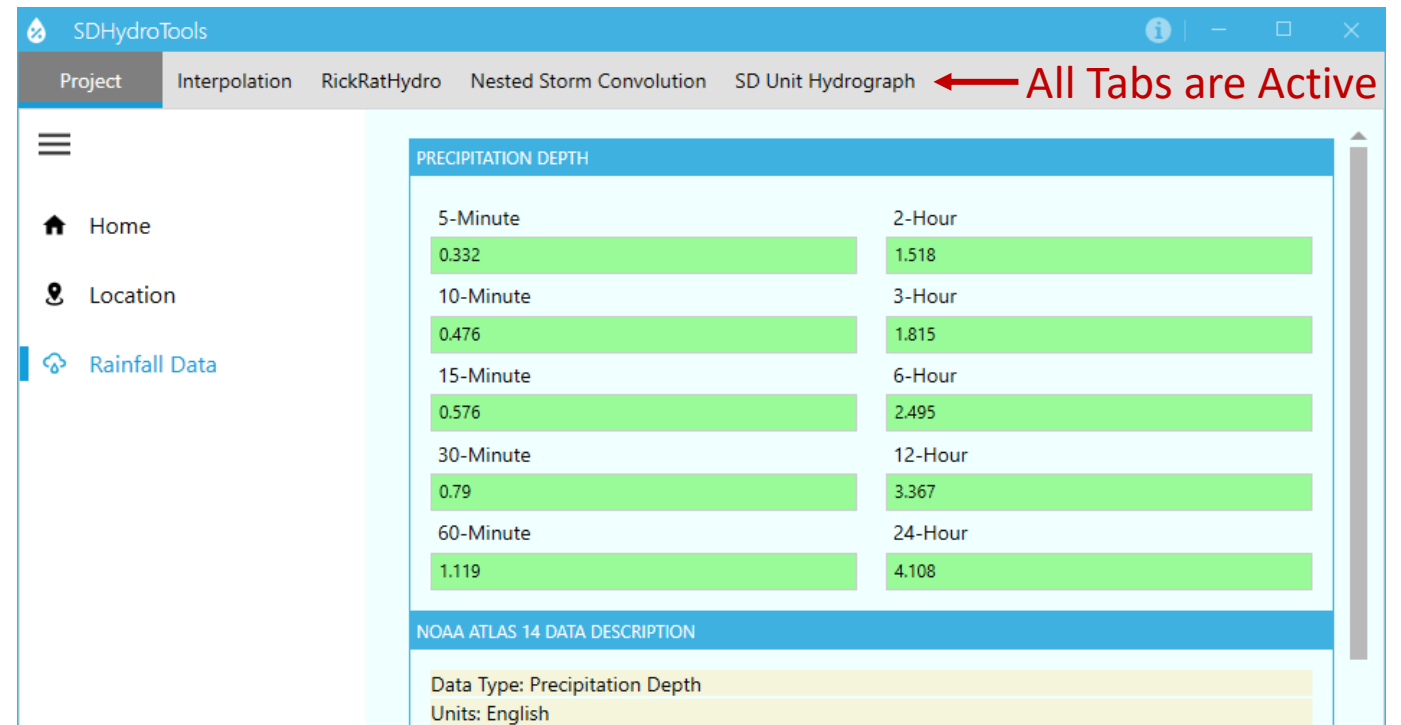
- Once the embedded 100-year rainfall data has been populated by the program, the data will appear in green boxes.
- In this Window, the user may overwrite the embedded 100-year rainfall data with data obtained for a different storm event (e.g., 10-year) from an outside source (e.g., from the NOAA Atlas 14 website) if desired (optional).

- If the user overwrites the embedded data, the boxes will change color.
- The user-entered data will appear in red boxes.



Starting SDHydroTools – Project Module (Continued)

- After rainfall data has been populated in the Project Tab, the Tabs for the computation Modules become active.
- Select the Tab for the desired Module.
- It is not necessary to move through all Tabs within the program. Go directly to the Tab for the desired Module.
- More than one Module may be used in the same session with the same rainfall data.



SDHydroTools Interpolation Module

- The **Interpolation Module** performs log-log interpolation between rainfall data points. For example, to obtain rainfall intensity for a given time of concentration for the purpose of rational method calculations.
1. Enter the desired time (e.g., your rational method time of concentration) in minutes or hours.
 2. Select the applicable units for the time that was entered (either minutes or hours).
 3. Click “Run”
 4. (As Needed) Repeat steps 1-3 for additional times.

The screenshot shows the SDHydroTools application window with the 'Interpolation' module selected. The interface includes a navigation menu on the left with 'Home' selected. The main content area is divided into several sections:

- NOTE:** A text box explaining that the module uses log-log interpolation between known precipitation ordinates to determine precipitation and intensity for a user-requested time, referencing Sections 3 and 4 of the San Diego County Hydrology Manual.
- INTERPOLATION INPUT:** A section with a text input field for 'Time', a dropdown menu for 'Units (min or hr)' set to 'Minutes', and two buttons: 'Interpolate' (labeled 'RUN') and 'Clear Table' (labeled 'CLEAR').
- RESULTS:** A section with an 'Export' button and a table with the following headers: 'TIME (MIN)', 'PRECIPITATION (IN)', 'AVG. INTENSITY (IN/HR)', and 'RAN'. The table body is currently empty.

A 'NEXT' button is located at the bottom right of the interface. The status bar at the bottom indicates the current path: 'SDHydroTools | Current Path: > Interpolation > Home'.

SDHydroTools Interpolation Module (Continued)

- Results from the Interpolation Module may be exported to a .csv file using the Export button and may be opened with an external program.
- (As Needed) Save a screen capture of SDHydroTools.

NOTE
This module uses log-log interpolation between the known precipitation ordinates to determine precipitation and intensity for a user-requested time. See Sections 3 and 4 of the San Diego County Hydrology Manual for equations for log-log interpolation.

INTERPOLATION INPUT

Time: 18.2
Units (min or hr): Minutes
Interpolate: RUN
Clear Table: CLEAR

RESULTS

TIME (MIN)	PRECIPITATION (IN)	AVG. INTENSITY (IN/HR)	RAN
7.5	0.410	3.279	3/23/2021 1:53:20 PM
9	0.451	3.004	3/23/2021 1:53:23 PM
12	0.519	2.593	3/23/2021 1:53:27 PM
15	0.576	2.304	3/23/2021 1:53:32 PM
18.2	0.629	2.074	3/23/2021 1:53:39 PM

Export

InterpolationResults_2021_0323 - Notepad

```
File Edit Format View Help
time (min),Precipitation (in),Avg. Intensity (in/hr),Ran
7.5,0.41,3.279,3/23/2021 1:53:20 PM
9,0.451,3.004,3/23/2021 1:53:23 PM
12,0.519,2.593,3/23/2021 1:53:27 PM
15,0.576,2.304,3/23/2021 1:53:32 PM
18.2,0.629,2.074,3/23/2021 1:53:39 PM
```

InterpolationResults_2021_0323 - Excel

Time (min)	Precipitation (in)	Avg. Intensity (in/hr)	Ran
7.5	0.41	3.279	3/23/2021 13:53
9	0.451	3.004	3/23/2021 13:53
12	0.519	2.593	3/23/2021 13:53
15	0.576	2.304	3/23/2021 13:53
18.2	0.629	2.074	3/23/2021 13:53

SDHydroTools RickRatHydro Module

- The **RickRatHydro Module** prepares a rational method hydrograph using the procedure presented in Section 6 of the 2026 Hydrology Manual.
- The RickRatHydro Module replaces the Rational Hydrograph (RATHYDRO) software that was provided with the June 2003 Hydrology Manual.
- The computation process in the RickRatHydro Module is based on NOAA Atlas 14 rainfall time-intensity pairs and log-log interpolation between pairs as presented in the 2026 Hydrology Manual; whereas the computation process in the RATHYDRO software was based on the County of San Diego's intensity equation presented in the June 2003 Hydrology Manual. Therefore, results from the RickRatHydro Module are not expected to match results from the RATHYDRO software.

SDHydroTools RickRatHydro Module (Continued)

- To prepare a rational method hydrograph using the RickRatHydro Module, first complete your rational method calculations (calculations external to SDHydroTools) in accordance with Section 3 of the 2026 Hydrology Manual.

1. Provide the required input data in the red boxes.
2. The “Calculate” button will be active after the required data has been entered.
3. (As Needed) Save a screen capture of the window for documentation.
4. Click on “Calculate” to obtain the rational method hydrograph.

SDHydroTools

Project Interpolation **RickRatHydro** Nested Storm Convolution SD Unit Hydrograph

NOTE

This module prepares a rational method hydrograph for user-provided rational method study results according to the procedure described in Section 6 of the San Diego County Hydrology Manual.

RATIONAL METHOD HYDROGRAPH INPUT

Time of Concentration (min) Watershed Area (ac)

Weighted Runoff Coefficient for Watershed Area Peak Flow Rate (Qp)

RESULTS SUMMARY

Export

ATTRIBUTE	VALUE	UNIT	RAN
-----------	-------	------	-----

CALCULATE

SDHydroTools | Current Path: > RickRatHydro > Home

SDHydroTools RickRatHydro Module (Continued)

Example Data for the RickRatHydro Module:

The screenshot displays the SDHydroTools application window with the 'RickRatHydro' module selected. The interface includes a navigation menu on the left with 'Home' and 'Table' options. The main content area is divided into sections: a 'NOTE' section, a 'RATIONAL METHOD HYDROGRAPH INPUT' section with four input fields, a 'RESULTS SUMMARY' section with an 'Export' button and a table header, and a 'CALCULATE' button at the bottom right. A red arrow points to the 'CALCULATE' button with the word 'Calculate' written in red text.

NOTE

This module prepares a rational method hydrograph for user-provided rational method study results according to the procedure described in Section 6 of the San Diego County Hydrology Manual.

RATIONAL METHOD HYDROGRAPH INPUT

Time of Concentration (min)	Watershed Area (ac)
<input type="text" value="10"/>	<input type="text" value="20"/>
Weighted Runoff Coefficient for Watershed Area	Peak Flow Rate (Qp)
<input type="text" value="0.6"/>	<input type="text" value="34.3"/>

RESULTS SUMMARY

Export

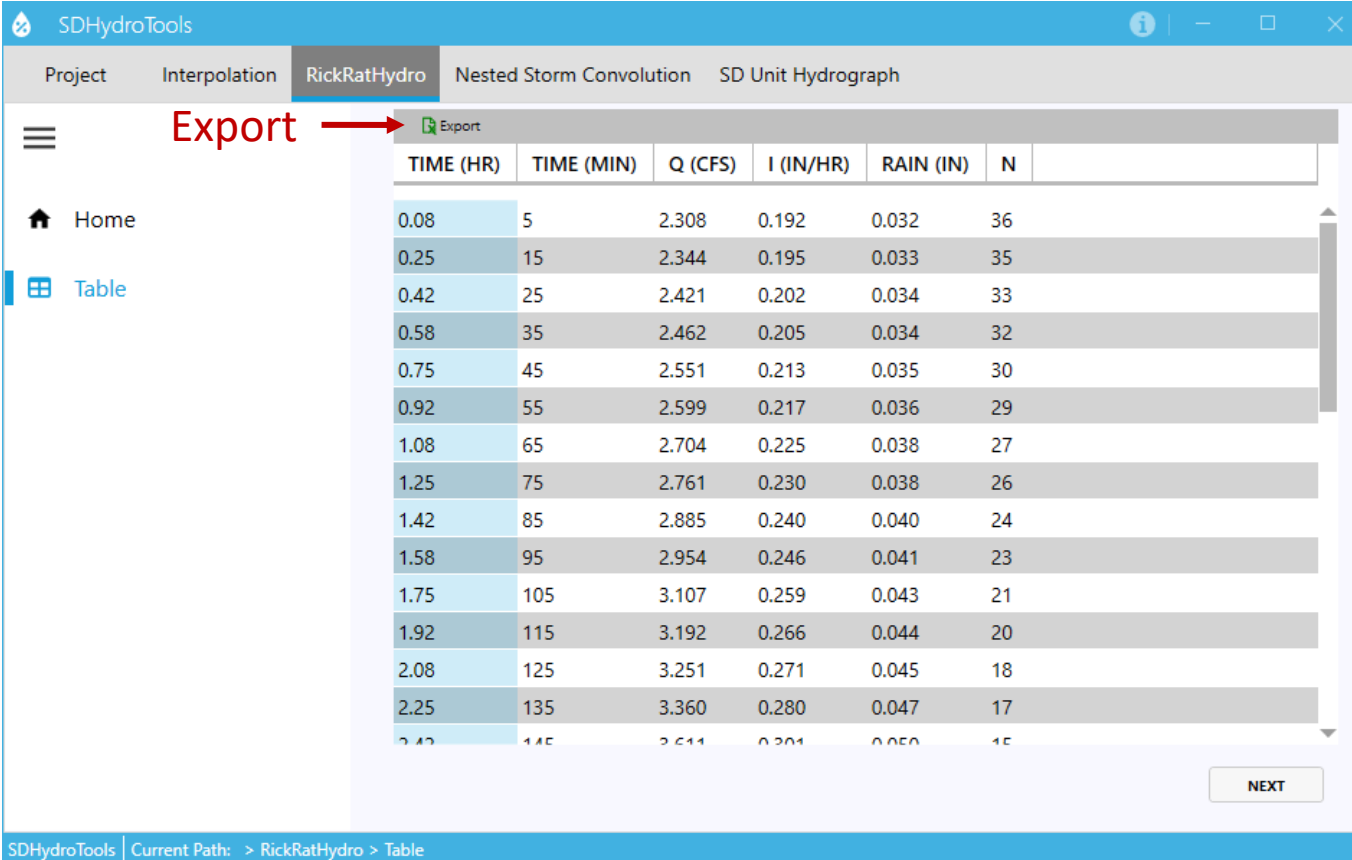
ATTRIBUTE	VALUE	UNIT	RAN
-----------	-------	------	-----

Calculate → **CALCULATE**

SDHydroTools | Current Path: > RickRatHydro > Home

SDHydroTools RickRatHydro Module (Continued)

- After clicking on “Calculate” to obtain the rational method hydrograph, the results are presented in the Table Window of the RickRatHydro Module.
- Results from the RickRatHydro Module may be exported to a .csv file using the Export button and may be opened with an external program.



The screenshot shows the SDHydroTools interface with the RickRatHydro module selected. The 'Table' window is active, displaying a table of hydrograph results. A red arrow labeled 'Export' points to the 'Export' button at the top of the table. Another red arrow labeled 'Table' points to the 'Table' icon in the left sidebar. The table contains the following data:

TIME (HR)	TIME (MIN)	Q (CFS)	I (IN/HR)	RAIN (IN)	N
0.08	5	2.308	0.192	0.032	36
0.25	15	2.344	0.195	0.033	35
0.42	25	2.421	0.202	0.034	33
0.58	35	2.462	0.205	0.034	32
0.75	45	2.551	0.213	0.035	30
0.92	55	2.599	0.217	0.036	29
1.08	65	2.704	0.225	0.038	27
1.25	75	2.761	0.230	0.038	26
1.42	85	2.885	0.240	0.040	24
1.58	95	2.954	0.246	0.041	23
1.75	105	3.107	0.259	0.043	21
1.92	115	3.192	0.266	0.044	20
2.08	125	3.251	0.271	0.045	18
2.25	135	3.360	0.280	0.047	17
2.42	145	3.511	0.291	0.050	15

SDHydroTools RickRatHydro Module (Continued)

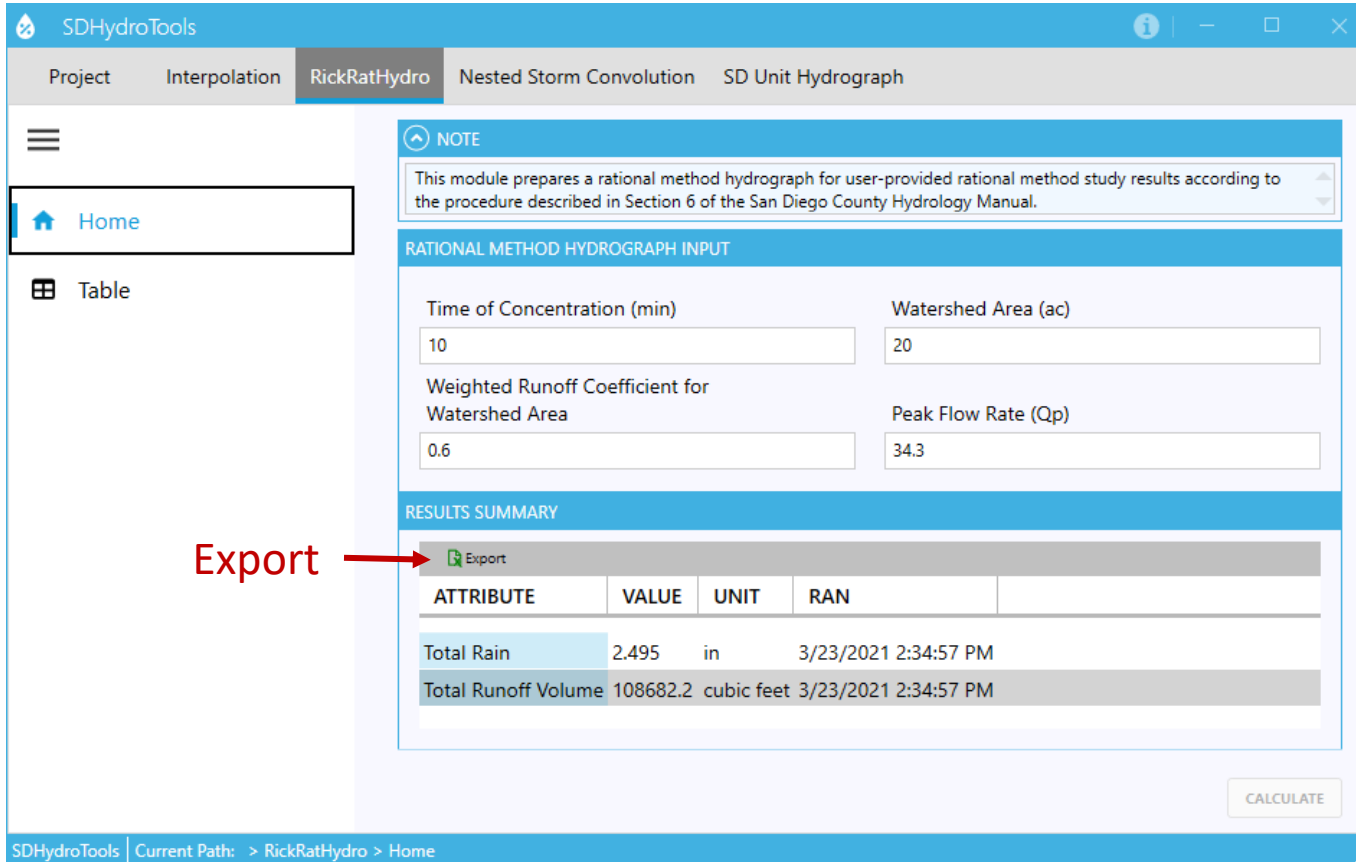
- Exported Results from the RickRatHydro Module may be opened with an external program.

Time (hr)	Time (min)	Q (cfs)	I (in/hr)	Rain (in)	N
0.08	5	2.308220893	0.192	0.032058624	36
0.25	15	2.344178122	0.195	0.032558029	35
0.42	25	2.421149607	0.202	0.033627078	33
0.58	35	2.462433338	0.205	0.034200463	32
0.75	45	2.551390363	0.213	0.035435977	30
0.92	55	2.599439642	0.217	0.036103328	29
1.08	65	2.703805694	0.225	0.037552857	27
1.25	75	2.760665594	0.23	0.038342578	26
1.42	85	2.885399498	0.24	0.040074993	24
1.58	95	2.954092423	0.246	0.041029061	23
1.75	105	3.106699453	0.259	0.043148604	21
1.92	115	3.191917121	0.266	0.044332182	20
2.08	125	3.250737546	0.271	0.045149133	18
2.25	135	3.359545666	0.28	0.046660356	17
2.42	145	3.611460285	0.301	0.050159171	15

```
File Edit Format View Help
Time (hr),Time (min),Q (cfs),I (in/hr),Rain (in),N
0.08,5,2.308220893,0.192,0.032058624,36
0.25,15,2.344178122,0.195,0.032558029,35
0.42,25,2.421149607,0.202,0.033627078,33
0.58,35,2.462433338,0.205,0.034200463,32
0.75,45,2.551390363,0.213,0.035435977,30
0.92,55,2.599439642,0.217,0.036103328,29
1.08,65,2.703805694,0.225,0.037552857,27
1.25,75,2.760665594,0.23,0.038342578,26
1.42,85,2.885399498,0.24,0.040074993,24
1.58,95,2.954092423,0.246,0.041029061,23
1.75,105,3.106699453,0.259,0.043148604,21
1.92,115,3.191917121,0.266,0.044332182,20
2.08,125,3.250737546,0.271,0.045149133,18
2.25,135,3.359545666,0.28,0.046660356,17
2.42,145,3.611460285,0.301,0.050159171,15
2.58,155,3.758820437,0.313,0.052205839,14
2.75,165,4.104960595,0.342,0.057013341,12
2.92,175,4.319755631,0.36,0.059996605,11
3.08,185,4.863284600,0.405,0.067545619,9
3.25,195,5.217163971,0.435,0.072460610,8
3.42,205,7.050455526,0.588,0.097922993,6
3.58,215,7.794980057,0.65,0.108263611,5
3.75,225,9.597542899,0.8,0.133299206,3
3.92,235,12.982457100,1.082,0.180311904,2
4.08,245,34.3,2.858,0.476388888,1
4.25,255,8.842564416,0.737,0.122813394,4
4.42,265,5.653705670,0.471,0.078523689,7
4.58,275,4.569129530,0.381,0.063460132,10
4.75,285,3.924276844,0.327,0.054503845,13
4.92,295,3.479159221,0.29,0.048321655,16
5.08,305,3.284151823,0.274,0.045613219,19
5.25,315,3.027659726,0.252,0.042050829,22
5.42,325,2.821070247,0.235,0.039181531,25
5.58,335,2.650160063,0.221,0.036807786,28
5.75,345,2.505787899,0.209,0.034802609,31
5.92,355,2.381778488,0.198,0.033080256,34
6.08,365,0,0.198,0,
```

SDHydroTools RickRatHydro Module (Continued)

- Return to the Home Window of the RickRatHydro Module to view the calculated volume of runoff.
- Total rain and total runoff volume results shown in the Home Window may also be exported.



Home →

Export →

SDHydroTools RickRatHydro

NOTE

This module prepares a rational method hydrograph for user-provided rational method study results according to the procedure described in Section 6 of the San Diego County Hydrology Manual.

RATIONAL METHOD HYDROGRAPH INPUT

Time of Concentration (min): 10
Watershed Area (ac): 20
Weighted Runoff Coefficient for Watershed Area: 0.6
Peak Flow Rate (Qp): 34.3

RESULTS SUMMARY

ATTRIBUTE	VALUE	UNIT	RAN
Total Rain	2.495	in	3/23/2021 2:34:57 PM
Total Runoff Volume	108682.2	cubic feet	3/23/2021 2:34:57 PM

CALCULATE

SDHydroTools | Current Path: > RickRatHydro > Home

Note: Total Runoff Volume = $C P_6 A$
 $(0.6)(2.495 \text{ in})(1 \text{ ft}/12 \text{ in})(20 \text{ ac})(43,560 \text{ ft}^2/\text{ac}) = 108,682 \text{ ft}^3$

SDHydroTools Nested Storm Convolution Module

- The **Nested Storm Convolution Module** prepares a nested storm hyetograph according to the procedure described in Section 4 of the 2026 Hydrology Manual.
- The program module will apply a rainfall depth-area adjustment to the rainfall based on the user-provided watershed area in accordance with Section 4 of the 2026 Hydrology Manual. If no rainfall depth-area adjustment is desired, the user may enter zero (0) for the watershed area.
 - See Table 4-1 of the Hydrology Manual for the Rainfall Depth-Area Adjustment Data Points.
- The nested storm hyetograph may be exported from SDHydroTools for use in other programs such as HEC-HMS or HEC-1.

SDHydroTools Nested Storm Convolution Module (Continued)

1. Provide the required input data in the red boxes.
2. The “Calculate” button will be active after the required data has been entered.
3. (As Needed) Save a screen capture of the window for documentation.
4. Click on “Calculate” to obtain the nested storm hyetograph.

The screenshot shows the SDHydroTools application window with the 'Nested Storm Convolution' module selected. The interface includes a navigation menu on the left with 'Home' and 'Table' options. The main content area features a 'NOTE' section, a 'NESTED STORM CONVOLUTION INPUT' section with two red-bordered input fields for 'Computation Interval (D) (min)' and 'Watershed Area (mi²) for Rainfall Depth-Area Adjustment', and a 'RESULTS SUMMARY' section with an 'Export' button and a table with columns 'ATTRIBUTE', 'VALUE', 'UNIT', and 'RAN'. A 'CALCULATE' button is located at the bottom right. The status bar at the bottom indicates the current path: 'SDHydroTools | Current Path: > Project > Rainfall Data'.

SDHydroTools

Project Interpolation RickRatHydro **Nested Storm Convolution** SD Unit Hydrograph

NOTE

This module prepares a nested storm hyetograph according to the procedure described in Section 4 of the San Diego County Hydrology Manual. See Section 4 of the Hydrology Manual for guidelines to select a computation interval. The program will apply a rainfall depth-area adjustment based on the user-provided watershed area. If no rainfall depth-area adjustment is desired, enter zero (0) for the watershed area.

NESTED STORM CONVOLUTION INPUT

Computation Interval (D) (min) Watershed Area (mi²) for Rainfall Depth-Area Adjustment

RESULTS SUMMARY

Export

ATTRIBUTE	VALUE	UNIT	RAN
-----------	-------	------	-----

CALCULATE

SDHydroTools | Current Path: > Project > Rainfall Data

SDHydroTools Nested Storm Convolution Module (Continued)

Example Data for the Nested Storm Convolution Module:

The screenshot shows the SDHydroTools software interface. The title bar reads "SDHydroTools" and includes standard window controls. The main menu bar contains "Project", "Interpolation", "RickRatHydro", "Nested Storm Convolution" (which is highlighted), and "SD Unit Hydrograph". On the left, there is a sidebar with a hamburger menu icon, a "Home" button with a house icon, and a "Table" button with a grid icon. The main content area is divided into several sections:

- NOTE:** A blue header section with a circular arrow icon. The text reads: "This module prepares a nested storm hyetograph according to the procedure described in Section 4 of the San Diego County Hydrology Manual. See Section 4 of the Hydrology Manual for guidelines to select a computation interval. The program will apply a rainfall depth-area adjustment based on the user-provided watershed area. If no rainfall depth-area adjustment is desired, enter zero (0) for the watershed area."
- NESTED STORM CONVOLUTION INPUT:** A section with two input fields. The first is labeled "Computation Interval (D) (min)" and contains the value "5". The second is labeled "Watershed Area (mi²) for Rainfall Depth-Area Adjustment" and contains the value "20".
- RESULTS SUMMARY:** A section with an "Export" button (with a document icon) and a table. The table has four columns: "ATTRIBUTE", "VALUE", "UNIT", and "RAN". The table body is currently empty.

At the bottom right of the interface, the word "Calculate" is written in red text, with a red arrow pointing to a button labeled "CALCULATE". The status bar at the very bottom shows "SDHydroTools | Current Path: > Project > Rainfall Data".

SDHydroTools Nested Storm Convolution Module (Continued)

- After clicking on “Calculate” to obtain the nested storm hyetograph, the results are presented in the Table Window of the Nested Storm Convolution Module.
- Results from the Nested Storm Convolution Module may be exported to a .csv file using the Export button and may be opened with an external program.

The screenshot shows the SDHydroTools interface with the 'Nested Storm Convolution' module active. The results are displayed in a table window. A red arrow labeled 'Export' points to the 'Export' button in the top right of the table area. Another red arrow labeled 'Table' points to the 'Table' icon in the left sidebar.

N	TIME (MIN)	DURATION (MIN)	PRECIPITATION FOR D	DEPTH-AREA ADJUSTMENT	D
288	5	1440	4.1080	0.9750	4.0
287	10	1435	4.1039	0.9749	4.0
285	15	1425	4.0957	0.9748	3.9
284	20	1420	4.0915	0.9748	3.9
282	25	1410	4.0833	0.9747	3.9
281	30	1405	4.0791	0.9746	3.9
279	35	1395	4.0707	0.9745	3.9
278	40	1390	4.0665	0.9744	3.9
276	45	1380	4.0581	0.9743	3.9
275	50	1375	4.0539	0.9743	3.9
273	55	1365	4.0454	0.9742	3.9
272	60	1360	4.0412	0.9741	3.9
270	65	1350	4.0326	0.9740	3.9
269	70	1345	4.0283	0.9739	3.9

SDHydroTools Nested Storm Convolution Module (Continued)

- Exported Results from the Nested Storm Convolution Module may be opened with an external program.

The screenshot displays a Microsoft Excel spreadsheet titled "HyetographTable_2021_0324". The spreadsheet contains a table with the following data:

	A	B	C	D	E	F	G	H	I	J
1	N	Time (min)	Duration (min)	Precipitation for D	Depth-Area Adjustment	Depth-Area Adjusted P (in)	Hyetograph Ordinate (in)	Cumulative Rainfall (in)		
2	288	5	1440	4.108	0.975	4.0053	0.004223955	0.004223955		
3	287	10	1435	4.10390158	0.974944444	4.001076045	0.004233438	0.008457393		
4	285	15	1425	4.095674093	0.974833333	3.992599628	0.004252579	0.012709972		
5	284	20	1420	4.091544904	0.974777778	3.988347049	0.004262238	0.01697221		
6	282	25	1410	4.083255322	0.974666667	3.979812854	0.004281735	0.021253945		
7	281	30	1405	4.079094804	0.974611111	3.975531119	0.004291575	0.025545519		
8	279	35	1395	4.07074199	0.9745	3.966938069	0.004311438	0.029856957		
9	278	40	1390	4.066549565	0.974444444	3.962626632	0.004321463	0.03417842		

Below the spreadsheet, the Excel status bar shows the file name "HyetographTable_2021_0324" and a zoom level of 100%.

Overlaid on top of the Excel window is a Notepad window titled "HyetographTable_2021_0324 - Notepad". The Notepad window displays the same data as the Excel spreadsheet, including the column headers and the first few rows of data.

SDHydroTools Nested Storm Convolution Module (Continued)

- Return to the Home Window of the Nested Storm Convolution Module to view the total rainfall and calculated area-adjusted rainfall.
- Total rain and area-adjusted depth results shown in the Home Window may also be exported.

Home →

Export →

SDHydroTools

Project Interpolation RickRatHydro **Nested Storm Convolution** SD Unit Hydrograph

NOTE

This module prepares a nested storm hyetograph according to the procedure described in Section 4 of the San Diego County Hydrology Manual. See Section 4 of the Hydrology Manual for guidelines to select a computation interval. The program will apply a rainfall depth-area adjustment based on the user-provided watershed area. If no rainfall depth-area adjustment is desired, enter zero (0) for the watershed area.

NESTED STORM CONVOLUTION INPUT

Computation Interval (D) (min) Watershed Area (mi²) for Rainfall Depth-Area Adjustment

5 20

RESULTS SUMMARY

Export

ATTRIBUTE	VALUE	UNIT	RAN
Total Rain	4.11	in	3/24/2021 3:47:08 PM
Area-Adjust Depth	4.01	in	3/24/2021 3:47:08 PM

CALCULATE

SDHydroTools | Current Path: > Nested Storm Convolution > Home

SDHydroTools SD Unit Hydrograph Module

- The **SD Unit Hydrograph Module** calculates a peak flow rate and generates a hydrograph using the NRCS hydrologic method.
- The SD Unit Hydrograph Module replaces the San Diego Unit Hydrograph software that was provided with the June 2003 Hydrology Manual.
- The computation process in the SD Unit Hydrograph Module is based on NOAA Atlas 14 rainfall time-intensity pairs and log-log interpolation between pairs as presented in the 2026 Hydrology Manual; whereas the computation process in the San Diego Unit Hydrograph software was based on the County of San Diego's intensity equation presented in the June 2003 Hydrology Manual. Therefore, results from the SD Unit Hydrograph Module are not expected to match results from the San Diego Unit Hydrograph software.
- The SD Unit Hydrograph Module is for single-basin analysis only. It does not combine hydrographs or perform hydrograph routing calculations.

SDHydroTools SD Unit Hydrograph Module (Continued)

1. Provide the required input data in the red boxes.
2. The “Calculate” button will be active after the required data has been entered.
3. (As Needed) Save a screen capture of the window for documentation.
4. Click on “Calculate” to obtain the hydrograph.

The screenshot shows the SDHydroTools application window with the 'SD Unit Hydrograph' module selected. The interface includes a navigation menu on the left with 'Home' and 'Table' options. A 'NOTE' section at the top right explains the module's purpose. Below it, the 'SDUH INPUT' section contains four red-bordered input fields: 'Computation Interval (D) (min)', 'Watershed Area (mi²)', 'Adjusted Curve Number for Watershed Area', and 'Watershed Corps Lag Time (hrs)'. The 'RESULTS SUMMARY' section features an 'Export' button and a table with columns for 'ATTRIBUTE', 'VALUE', and 'UNIT'. A 'CALCULATE' button is located at the bottom right of the main content area. The status bar at the bottom shows the current path: 'SDHydroTools | Current Path: > SD Unit Hydrograph > Home'.

SDHydroTools

Project Interpolation RickRatHydro Nested Storm Convolution **SD Unit Hydrograph**

NOTE

This module prepares a hydrograph according to the NRCS hydrologic method procedure described in Section 4 of the San Diego County Hydrology Manual. Preparation of a nested storm hyetograph occurs within this module and includes rainfall depth-areaadjustment based on the user-provided watershed area.

SDUH INPUT

Computation Interval (D) (min)
D should be $\leq 0.2T_p$

Watershed Area (mi²)

Adjusted Curve Number for
Watershed Area

Watershed Corps Lag Time (hrs)

RESULTS SUMMARY

Export

ATTRIBUTE	VALUE	UNIT
-----------	-------	------

CALCULATE

SDHydroTools | Current Path: > SD Unit Hydrograph > Home

SDHydroTools SD Unit Hydrograph Module (Continued)

Example Data for the SD Unit Hydrograph Module:

The screenshot displays the SDHydroTools application window with the 'SD Unit Hydrograph' module selected. The interface includes a navigation menu on the left with 'Home' and 'Table' options. A 'NOTE' section explains the module's function. The 'SDUH INPUT' section contains four input fields: 'Computation Interval (D) (min)' with value 5, 'Watershed Area (mi²)' with value 20, 'Adjusted Curve Number for Watershed Area' with value 81, and 'Watershed Corps Lag Time (hrs)' with value .551. Below this is a 'RESULTS SUMMARY' section with an 'Export' button and a table with columns 'ATTRIBUTE', 'VALUE', and 'UNIT'. A red arrow points to a 'CALCULATE' button at the bottom right.

NOTE

This module prepares a hydrograph according to the NRCS hydrologic method procedure described in Section 4 of the San Diego County Hydrology Manual. Preparation of a nested storm hyetograph occurs within this module and includes rainfall depth-area adjustment based on the user-provided watershed area.

SDUH INPUT

Computation Interval (D) (min)
D should be $\leq 0.2T_p$
5

Watershed Area (mi²)
20

Adjusted Curve Number for Watershed Area
81

Watershed Corps Lag Time (hrs)
.551

RESULTS SUMMARY

Export

ATTRIBUTE	VALUE	UNIT
-----------	-------	------

Calculate → CALCULATE

SDHydroTools | Current Path: > SD Unit Hydrograph > Home

SDHydroTools SD Unit Hydrograph Module (Continued)

- After clicking on “Calculate” to obtain the hydrograph, the results are presented in the Table Window of the SD Unit Hydrograph Module.
- Results from the SD Unit Hydrograph Module may be exported to a .csv file using the Export button and may be opened with an external program.

N	TIME (MIN)	DURATION (MIN)	PRECIPITATION FOR D	DEPTH-AREA ADJUSTMENT	I
288	5	1440	4.1080	0.9750	4.
287	10	1435	4.1039	0.9749	4.
285	15	1425	4.0957	0.9748	3.
284	20	1420	4.0915	0.9748	3.
282	25	1410	4.0833	0.9747	3.
281	30	1405	4.0791	0.9746	3.
279	35	1395	4.0707	0.9745	3.
278	40	1390	4.0665	0.9744	3.
276	45	1380	4.0581	0.9743	3.
275	50	1375	4.0539	0.9743	3.
273	55	1365	4.0454	0.9742	3.
272	60	1360	4.0412	0.9741	3.
270	65	1350	4.0326	0.9740	3.

Note:
 “SDUH Table” provides the hydrograph of direct runoff from the project area (the results).

“Unit Hydrograph” and “UH Time” provide the project unit hydrograph q ordinates based on the time to peak (T_p) and unit hydrograph q_p for the study area. These are provided for reference.

See Section 4 of the Hydrology Manual for discussion of the computation process, and see the Hydrology Manual Workbook for an example calculation.

SDHydroTools SD Unit Hydrograph Module (Continued)

- Exported Results from the SD Unit Hydrograph Module may be opened with an external program.

SDUHRResultsTable_2021_0326 - Notepad

File Edit Format View Help

N,Time (min),Duration (min),Precipitation for D,Depth-Area Adjustment,Depth-Area Adjusted P (in),Hyetograph Ordinate (in),Cumulative Rainfall (in),Cumulative Excess Rain (in),Incremental Excess Rain (in),Hydrograph Ordinate (cfs)

```

288,5,1440,4.108,0.975,4.0053,0.00422395451005197,0.00422395451005197,0,0,0
287,10,1435,4.10390157950989,0.974944444444444,4.00107604548995,0.00423343799591036,0.00845739250596234,0,0,0
285,15,1425,4.09567409277866,0.974833333333333,3.9925996281104,0.00425257922769484,0.0127099717336572,0,0,0
284,20,1420,4.0915449036754,0.974777777777778,3.9883470488827,0.00426223808981563,0.0169722098234728,0,0,0
282,25,1410,4.08325532242178,0.974666666666667,3.97981285425376,0.00428173515227481,0.0212539449757476,0,0,0
281,30,1405,4.07909480384351,0.974611111111111,3.97553111910149,0.00429157451355699,0.0255455194893046,0,0,0

```

Ln 1, Col 1 100% Windows (CRLF) UTF-8

SDUHRResultsTable_2021_0326 - Excel

File Home Insert Page Layout Formulas Data Review View Help Tell me what you want to do

Clipboard Font Alignment Number Styles Cells Editing

K7 0

	A	B	C	D	E	F	G	H	I	J	K
1	N	Time (min)	Duration (min)	Precipitation for D	Depth-Area Adjustment	Depth-Area Adjusted P (in)	Hyetograph Ordinate (in)	Cumulative Rainfall (in)	Cumulative Excess Rain (in)	Incremental Excess Rain (in)	Hydrograph Ordinate (cfs)
2	288	5	1440	4.108	0.975	4.0053	0.004223955	0.004223955	0	0	0
3	287	10	1435	4.10390158	0.974944444	4.001076045	0.004233438	0.008457393	0	0	0
4	285	15	1425	4.095674093	0.974833333	3.992599628	0.004252579	0.012709972	0	0	0
5	284	20	1420	4.091544904	0.974777778	3.988347049	0.004262238	0.01697221	0	0	0
6	282	25	1410	4.083255322	0.974666667	3.979812854	0.004281735	0.021253945	0	0	0
7	281	30	1405	4.079094804	0.974611111	3.975531119	0.004291575	0.025545519	0	0	0

SDUHRResultsTable_2021_0326

Ready 100%

SDHydroTools SD Unit Hydrograph Module (Continued)

- Return to the Home Window of the SD Unit Hydrograph Module to view summary output including the peak flow rate.
- The summary output shown in the Home Window may also be exported. The summary output will be a .txt file.

The screenshot shows the SDHydroTools interface with the 'SD Unit Hydrograph' module selected. The 'RESULTS SUMMARY' table is displayed, and the 'Export' button is highlighted. A Notepad window titled 'SDUHQuickResults_2021_0326 - Notepad' is open, showing the text content of the summary table.

ATTRIBUTE	VALUE	UNIT
Study/Project Title Information	Sample Project for User Instructions	
Latitude	32.8335	
Longitude	-117.1296	
Study Recurrence Interval	100	
Total Rainfall Depth (24-Hour Rainfall)	4.11	inch
Area Adjusted Rainfall Depth	4.01	inch
Watershed Area	20	mi2
Adjusted Curve Number for Watershed Area	81	
Watershed Corps Lag Time	.551	hours
Computation Interval (D)	5	min
Peak Flow Rate	10694.68	cfs
Time Ran	3/26/2021 11:14:28 AM	

```
San Diego Unit Hydrograph Output for:  
Study/Project Title Information: Sample Project for User Instructions  
Latitude: 32.8335  
Longitude: -117.1296  
Study Recurrence Interval: 100  
Total Rainfall Depth (24-Hour Rainfall) (inch): 4.11  
Area Adjusted Rainfall Depth (inch): 4.01  
Watershed Area (mi2): 20  
Adjusted Curve Number for Watershed Area: 81  
Watershed Corps Lag Time (hours): .551  
Computation Interval (D) (min): 5  
Peak Flow Rate (cfs): 10694.68  
Time Ran: 3/26/2021 11:14:28 AM
```