

SafeWater LCR User Guide and Description of Source Code

This memo describes how to install and use SafeWater LCR to 1) create a sample population of public water systems and 2) run the different cost models for the current rule and proposed rule. The memo describes the pdf versions of the source code used for SafeWater LCR, which is available in the LCRR docket (EPA-HQ-OW-2017-0300) and on the EPA website at <https://www.epa.gov/ground-water-and-drinking-water/proposed-revisions-lead-and-copper-rule>.

Installing and Using SafeWater LCR

The SafeWater LCR executable program and most of the associated data has been provided as a zip file titled *SafeWaterLCR_Executables&DataFiles* (available on the EPA website at the address above). In addition to material included in the zip file, a user must also save the high and low cost estimate access databases for the current rule and proposed rule option, as well as the cost equations spreadsheets for the current rule and the proposed rule option. These files are also available on the EPA website at the address above in the zip files *SafeWater LCR Additional Database Files* and *SafeWater LCR Cost Equation Files*, respectively.

The steps to install SafeWater LCR are as follows:

1. Extract the files from the zip file titled *SafeWaterLCR_Executables&DataFiles* and save in a folder named "SafeWaterLCR."
2. Save the database and cost equations for the current rule and the proposed rule options to the folder titled "Data" within the "SafeWaterLCR" parent folder. The databases are located in the zip file titled *SafeWater LCR Additional Database Files*. The cost equations can in the zip file titled *SafeWater LCR Cost Equation Files*.
 - a. Save the database for the current rule in the folder titled "Data" with the name:
 - i. *Baseline_DataRequest.accdb*
 - ii. *Baseline_DataRequest.xlsm*
 - b. Save the cost equations for the current rule in the folder titled "Data" with the name: *Baseline_costing_inputs.xlsx*
 - c. Save the database and cost equations for the desired proposed rule option with the existing file name in the folder titled "Data."

The steps to use SafeWater LCR are as follows:

1. Create the sample: This creates the CSV files of the public water system variables that SafeWater LCR reads based on SDWIS variables and the database variables. A sample must be created for each current rule and proposed rule option the user wishes to generate.
 - a. Open the executable *LCRSample* in the "SafeWaterLCR" folder; this will pull up a prompt that allows the user to tailor the sample.
 - b. In the "Excel Input" field, load the *SDWIS_CWS_2016_Q3* file saved in the "Data" folder.
 - c. In the "Baseline Variable Database" field, load the *Baseline_DataRequest.accdb* file.
 - d. In the "Option Name" field, select if the proposed rule option to be run is the existing tap sample protocol (OW) or the fifth liter tap sample alternative protocol (OW5L).
 - e. In the "Sample Name" field, give the sample a name.

- f. In the “Option Variable Database” field, load the proposed rule option variable database with the .accdb extension saved in the “Data” folder.
 - g. In the “Option Costing Logic Workbook” field, load the proposed rule costing logic excel file saved in the “Data” folder.
 - h. In the “Minimum # of PWS per Size/SW category” to run a replicated sample, which is necessary to capture the variability contained in the database variables, enter the minimum number of replicated systems desired and uncheck the “Do not replicate” field (the results presented in the proposed rule economic analysis relied on 5,000 as the minimum number of systems per size and source water category).
 - i. In the “Create Proxy PWS Records” field, check the box to create the proxy records necessary to examine the cost of the proposed small system and non-transient non-community water system (NTNCWS) flexibility proposed rule requirement.
 - j. In the “Small Proxy Cutoff Population” field, enter the appropriate desired population threshold below which the proposed small system flexibilities will be applied.
 - k. Ensure that the “Make Baseline” and “Make Option” fields are selected in order to generate a sample for the current rule and the proposed rule.
 - l. Ensure that the “PWS90Pct Bp1” and the “PWS90Pct Bp2” fields contain 10 and 15, respectively.
 - m. Ensure that the “Create Profile Sample” field is unchecked unless the user requires a sample of the sample output to be generated.
 - n. Click “Make Sample” to create PWS samples for the current and proposed rule.
 - i. The generated PWS samples for the current rule and the proposed rule option will be saved in the “Data” folder.
2. Generate the cost and benefit results:
- a. Open the executable *SafeWaterLCR* in the “SafeWaterLCR” folder; this will pull up a prompt that allows the user to tailor the SafeWater LCR run.
 - i. If a pop-up appears requesting confirmation that the user wants to load a saved configuration, select “No.”
 - b. In the “Run Name” field, give the run a name.
 - c. In the “Option Name” field, select if the proposed rule option to be run is the existing tap sample protocol (OW) or the 5L protocol (OW5L).
 - d. Ensure that the “CodeSite logging” field is unchecked. This field and the “Test Parser” button above are used for debugging.
 - e. In the “Run Description” field, provide an optional description, which will be saved in the log file generated by that run of the SafeWaterLCR program.
 - f. In the “CVDDR,” “IQVal,” “IQDR,” and “Child BL” fields enter the appropriate values for the desired benefit options, with 0 for normal.
 - g. Ensure that the “No BL Averaging” field is unchecked, unless the user requires a run with averaged blood levels.
 - h. In the “Baseline SDWIS Sample File” field, load the current rule sample file generated during the Sample Creation step.
 - i. In the “Option SDWIS Sample File” field, load the proposed rule sample file generated during the Sample Creation step.

- j. In the “Option Costing Logic Workbook” field, load the proposed rule costing logic excel file saved in the “Data” folder.
- k. In the “Option Variable Database” field, load the proposed rule option variable database with the .accdb extension saved in the “Data” folder.
- l. In the “Population” field, select the desired public water system option.
- m. In the “Discount” field, select the desired discount rate (i.e., 3% or 7%).
- n. In the “Small Proxy Cutoff Population” field, enter the appropriate desired population threshold below which the proposed small system flexibilities will be applied.
- o. Ensure that the “Means of Means Run” field is unchecked and that the “Variability Run Iterations” is selected.
- p. Ensure that the “PWS90Pct Bp1” and the “PWS90Pct Bp2” fields contain 10 and 15, respectively.
- q. In the “School option” field, select the desired school option.
- r. Ensure that the “No Random,” “Output Lead Bins,” “DebugOut,” and “CCT Partial to Full” fields are unchecked. These are used for debugging.
- s. Ensure that the “Small System Flexibility” field is selected in order to run the small system and NTNCWS flexibility program.
- t. In the “CCT Cost Equations” field, select the desired CCT cost equations.
- u. Select either “Full Run” to generate the results for the incremental run, “Baseline Only” to generate the results for the current rule, or “Option Only” to generate the results for the proposed rule.
- v. Click “Run Model” to begin the SafeWater LCR run.
 - i. The results will be saved in the “User” folder within the “SafeWaterLCR” parent folder.
 - ii. Multiple runs can occur at once. To do so, minimize the existing SafeWater LCR window and repeat the above steps.
 - iii. Any errors result in a nonzero being recorded in the files “ss_errors” for the proposed rule and “ss_errors_baseline” for the current rule saved in the main “SafeWaterLCR” folder.

SafeWater LCR Source Code

In addition to the SafeWater LCR executables and user guide, the EPA is providing pdfs of the Delphi code used for SafeWater LCR in the zip file titled *SafeWaterLCR_sourcecode*, which is available in the LCRR docket (EPA-HQ-OW-2017_0300) and on the EPA website at <https://www.epa.gov/ground-water-and-drinking-water/proposed-revisions-lead-and-copper-rule>. In addition to Delphi 10.1 source code, the following third party components are required to compile the code:

- DevExpress VCL
- TMS FlexCel
- MtxVec 2017
- MtxStatsMaster 2017
- Mathparser
- HtmlViewer-HtmlViewer-11.7
- CodeSite_5_Express_RX101

Links to the third party vendors are provided at the end of this memo.

The file structure for the zip drive *SafeWaterLCR_sourcecode* is as follows:

- The code used for the SafeWater LCR program is contained in the folders “Code,” “codeLCR,” and “uiLCR.”
- The code used for the SafeWater LCR sample creation is contained in the folders “LCRSample,” “Code,” and “codeLCR.”

Third Party Links

DevExpress VCL: <https://www.devexpress.com>

TMS FlexCel: <http://www.tmssoftware.com/site/>

MtxVec 2017: <http://www.dewresearch.com/delphi>

MtxStatsMaster 2017: <http://www.dewresearch.com/delphi>

Mathparser: <https://sourceforge.net/projects/parse-components/>

HtmlViewer-HtmlViewer-11.7: <https://github.com/BerndGabriel/HtmlViewer>

CodeSite_5_Express_RX101: <https://www.embarcadero.com/products/delphi>