

DEP Anti-Degradation Limits Spreadsheet Instructions

Final, April 3, 2024

Introduction

The Department of Environmental Protection (DEP) has developed the DEP Anti-Degradation Limits Spreadsheet to facilitate calculations to an anti-degradation analysis and determine non-degrading effluent limitations for discharges to special protection waters. This spreadsheet is a companion to the DEP Anti-degradation Policy (391-0300-002).

The spreadsheet was designed using Microsoft Excel® and is in macro-enabled worksheet (xlsm) format. Questions on the spreadsheet can be directed to the Bureau of Clean Water at RA-EPNPDES_Permits@pa.gov.

General Information

If prompted by Excel after opening the spreadsheet, enable editing and macros. Note that you may need to add additional Trusted Locations in the Trust Center Settings of Excel® in order to run the macros. These locations may include server drives and/or locations where you intend to save the file for use. The following steps may be taken:

1. Excel Options > Trust Center > Trust Center Settings > Trusted Locations
2. Check the box to “Allow Trusted Locations on my network”
3. Select “Add new location”
4. Browse to select the folder (or server) where the file will be saved, check the “Subfolders of this location are also trusted” box, and then OK.

If prompted by Excel to update the spreadsheet after opening the spreadsheet, do not update. Then, if prompted, set the spreadsheet to a trusted source.

All cells available for data entry or selection from a drop-down menu are highlighted. The user may use the mouse or the Tab key to move from cell to cell. The spreadsheet is protected.

Instructions on Using the Spreadsheet

Instructions Worksheet

This worksheet contains basic information regarding the Spreadsheet and contains a link to these Instructions.

Inputs Worksheet

Enter information into the cells that are shaded yellow. Cells that contain a * may not be left blank. The CLEAR FORM button will clear all inputs on the Inputs Worksheet. There will be a warning before the form data are cleared.

- Fill in the name of the Facility, the NPDES Permit No. and the Outfall No.
- Enter the Receiving Stream name. This should be the name of the stream into which the effluent is discharged.

- Use the drop-down menu to select the Evaluation Type for your project (see Figure 1):
 - **New Direct to SP Waters** should be selected for new discharges directly to a special protection water.
 - **New Upstream of SP Waters** should be selected when there is a new discharge to a water that is not special protection, but is upstream of a special protection water that may be influenced by the new discharge.
 - **Expanding Direct to SP Waters** should be selected when there is an existing discharge direct to a special protection water that will be adding additional or increased discharge.
 - **Expanding Upstream of SP Waters** should be selected when there is an existing discharge to a water that is not special protection, but is upstream of a special protection water that may be influenced by additional or increased discharge.
- If the Evaluation Type was New Upstream of SP Waters or Expanding Upstream of SP Waters, enter the name of the Special Protection water in the SP Stream cell and enter the distance from the discharge to the SP Stream in miles.
- Choose the Data Source by using the drop-down menu (see Figure 2). If site specific data is available for the stream segment, this data should be entered into the Site-Specific Data worksheet. Select 'Site-Specific Data' from the Data Source drop-down menu. Data from WQN reference stations is pre-loaded into the spreadsheet. Where site-specific data is not used, contact the Bureau of Clean Water's Data Management Division to determine the appropriate WQN reference station.

The screenshot shows a web form with a green header bar containing 'Instructions' and 'Inputs' tabs, and 'CLEAR FORM' and 'CALCULATE' buttons. Below the header are input fields for 'Facility:', 'NPDES Permit No.', and 'Outfall No.'. The 'Receiving Stream:' field is followed by an 'Evaluation Type*' dropdown menu with a list of options: 'Expanding Direct to SP Waters', 'New Direct to SP Waters', 'New Upstream of SP Waters', 'Expanding Direct to SP Waters' (highlighted in blue), and 'Expanding Upstream of SP Waters'. Below these is a 'Data Source*' field. A table titled 'Stream and Discharge Characteristics' is positioned below the 'Data Source' field.

| Stream and Discharge Characteristics | |
|---|--|
| Q ₇₋₁₀ of Receiving Stream (cfs)*: | |
| Q _n of Receiving Stream | |
| Discharge Flow (MGD)*: | |
| Additional Discharge Flow (MGD)*: | |
| No. of Samples*: | |

Figure 1: Evaluation Type

Facility: _____ NPDES Permit No. _____ Outfall No.: _____

Receiving Stream: _____ Evaluation Type*: Expanding Direct to SP Waters

Data Source*: Site-Specific Data

| Stream and Discharge Characteristics | |
|--------------------------------------|--|
| Flow of Receiving Stream | |
| Flow of Receiving Stream | |
| Discharge Flow (MGD)*: | |
| Additional Discharge Flow | |

Figure 2: Data Source

Stream and Discharge Characteristics

This table will be automatically modified based on the Evaluation Type (see Figure 1). Fill in the information that populates:

- **Q₇₋₁₀ of Receiving Stream (cfs)** – Enter the Q₇₋₁₀ of the receiving stream in cubic feet per second (cfs). The Q₇₋₁₀ will be used to calculate the harmonic mean flow of the stream.
- **Q_h of Receiving Stream (cfs)** – If known, enter the harmonic mean flow of the receiving stream in cfs. Where a Q_h is enter it will override the calculation of Q_h based on Q₇₋₁₀.
- **Q₇₋₁₀ of SP Water (cfs)** - Enter the Q₇₋₁₀ of the special protection stream in cfs. The Q₇₋₁₀ will be used to calculate the harmonic mean flow of the stream. This only populates for 'Upstream of SP Waters' evaluations.
- **Q_h of SP Water (cfs)** – If known enter the harmonic mean flow of the special protection stream in cfs. Where a Q_h is enter it will override the calculation of Q_h based on Q₇₋₁₀. This only populates for 'Upstream of SP Waters' evaluations.
- **Discharge Flow (MGD)** – Enter the discharge flow in million gallons per day (MGD). For expanding discharges, enter the existing discharge flow.
- **Additional Discharge Flow (MGD)** – Enter the amount of additional proposed discharge flow in MGD. This only populates for 'Expanding' evaluations.
- **No. of Samples** – Select the number of samples that will be collected per month (the minimum is 4).

Parameter Table

The contents of this table will be automatically modified dependent on the Evaluation Type chosen (see Figure 3):

- **Parameter** - parameters can be chosen by selecting a cell and using the dropdown menu to select a parameter. Only parameters available for the selected data source will

be selectable in the dropdown. Note that parameters will not be available until a Data Source is chosen.

NOTE: the parameters should be entered sequentially from the top to the bottom of the Parameter Table; if this is not done, the Parameter may not be visible on the Results worksheet.

- **Units** - the units will automatically populate after a Parameter is selected.
- **Existing AML or Concentration** – Enter the existing average monthly limit (AML) or, if there is no AML, enter the concentration in the existing discharge in the same units as the Parameter. This only populates for ‘Expanding’ evaluations and will be used to calculate the effluent limitations applied to the existing limits/concentrations to the existing discharge. If no value is entered, the value is set to 0 in the analysis.
- **Upstream Concentration** – Enter the concentration in the receiving stream upstream of the discharge (this is not the concentration in the SP water) in the same units as the Parameter. This only populates for ‘Upstream of SP Waters’ evaluations.
- **CV** – If known enter the Coefficient of Variation (CV) in the discharge. The CV will default to 0.5 unless a value is entered. The CV is used to determine the recommended AML.

| Parameter | Units | Existing AML or Concentration | Upstream Concentration | CV (0.5 if left blank) |
|-----------------------|-------|-------------------------------|------------------------|---------------------------|
| ▼ | | | | |
| Alkalinity (Lab) | ^ | | | |
| Aluminum Dissolved | | | | |
| Aluminum Total | | | | |
| Ammonia as N Total | | | | |
| Arsenic Dissolved | | | | |
| Barium Total | | | | |
| Biochemical Oxygen De | | | | |
| Boron Total | ▼ | | | |
| | | | | |
| | | | | |
| | | | | |

Figure 3: Parameters

Select the Calculate button (top of the page) and an Output worksheet will open (see Figure 4).

Inputs

Instructions
Inputs

CLEAR FORM
CALCULATE

Figure 4: Calculate Button

Results Worksheet

Mass Limits – The spreadsheet will recommend mass-based limits calculated using the concentration limits and the design flow, and additional flow, if applicable, entered in the Inputs Worksheet. Mass limits are calculated for pollutants with units of mg/L, µg/L or ng/L.

Concentration Limits – The AML, Maximum Daily Limit (MDL) and Instantaneous Maximum (IMAX) recommended by the model will be displayed.

In addition, a summary of the data will be available. The summary data can be hidden by unchecking the checkbox for Special Protection Summary Data. If the summary data does not show, check the checkbox (see Figure 5).

| Instructions | | Results | | RETURN TO INPUTS | PRINT TO PDF | PRINT |
|---|--------------------|---------------|----------------------|------------------|--------------|-------|
| Recommended Non-Degrading Limits | | | | | | |
| Pollutants | Mass Limits | | Concentration Limits | | | |
| | AML (lbs/day) | MDL (lbs/day) | AML | MDL | IMAX | Units |
| Ammonia as N Total | 41.8 | 65.3 | 3.34 | 5.22 | 8.36 | mg/l |
| <input checked="" type="checkbox"/> Special Protection Summary Data | | | | | | |
| Pollutants | Median of Upstream | WQ Objective | Units | | | |
| Ammonia as N Total | 0.02 | 0.02 | mg/l | | | |

Figure 5: Example Results

Site-Specific Data Worksheet

This worksheet must be completed if site-specific data is being used in the analysis. A list of naturally occurring parameters is included in the spreadsheet. If a parameter is not on the list, it can be manually entered at the bottom of the list of pre-loaded parameters.

- Enter the median value for the data set.
- Enter the 95% Upper Confidence Limit value of the data set.
- Enter the units.
- Enter the ND or < if the Parameter was not detected. This is for reference only. The calculations are conducted using the entered median and 95% Upper Confidence values.

Once data is entered, select Site-Specific Data on the Inputs worksheet using the dropdown menu for the Data Source and the entered data will be available for use in the calculations.

Supplemental Information

Equations can be found in the DEP Anti-degradation Policy (Document ID: 391-0300-002). In addition to direct equations in the Anti-degradation Policy, the following equations are used.

If there is an expanding discharge, the long-term average (LTA) and AML are calculated for only the expanded discharge flow using the same equations described in the Anti-Degradation Policy. A final AML for the blended discharge is determined using the following equation.

$$AML_{\text{Blended}} = \frac{(C_{\text{existing}} * Q_{\text{existing}}) + (C_{\text{AML}} * Q_{\text{expanded}})}{Q_{\text{existing}} + Q_{\text{expanded}}}$$

If a new or expanding discharge is upstream of a SP water, the same mass balance and LTA and AML equations previously described are used with the addition of a second stream to the mass balance.

$$(Q_{\text{discharge}} * C_{\text{discharge}}) + (Q_{\text{upstream}} * C_{\text{upstream}}) + (Q_{\text{SPwater}} * C_{\text{SPwater}}) = (Q_{\text{total}} * C_{\text{total}})$$

Where

Q_{SPwater} = the flow in the SP water upstream of the confluence with the stream/discharge combined flow

C_{SPwater} = the instream concentration upstream of the confluence with the stream/discharge combined flow (median concentration)

The Harmonic Flow, Q_{HM} , is calculated using the following equation:

$$Q_{\text{HM}} = 7.43 * Q_{7-10}^{0.874}$$

Revision History

| Date | Version | Revision Reason |
|----------|---------|-----------------|
| 4/3/2024 | 1.0 | Original |