DECISION SUPPORT TOOL USER INTERFACE TUTORIAL

The following images show the tool's user interface in Excel along with the steps for user inputs. The yellow highlighted cells indicate fields which require user inputs, and the green highlighted cells indicate option user inputs.

Step 1	Weighting Scheme	
Weighting Scheme	Equal	(Dropdown)

Selected Weighting Scheme:

Global Warming	**0.25**
Global Environmental and Human Health	**0.25**
Affordability	**0.25**
Facility Operation	**0.25**

Step 1

a. Select weighting scheme

If "User Defined" selected

b. Go to "Weighting Schemes" tab to input values

Step 2	General Design Info		
Flowrate Presets	0.03 MGD	2.2 MGD	
	0.12 MGD	7.4 MGD	
	0.31 MGD	23 MGD	
	0.74 MGD	75 MGD	
Region/Electrical Grid	SERC	(Dropdown)	
Include Building Structure?	No	(Dropdown)	
Influent TSS	2	mg/L	
Effluent TSS	0.5	mg/L	
Pump Efficiency	0.75		

Step 2

a. Select flowrate (8 options; see Step 5 if different value needed)

b. Select Region/Electrical Grid

For the following, you can update default values

c. Select if building structure is included

d. Input influent and effluent TSS

e. Input pump efficiency

Step 3	GAC and IX Info			
*Check to include			Media Usage Rate	
GAC Gravity Basin	☑	GAC Type 1	0.056	(lb/1000 gal)
	☐	No input required		
	☐	No input required		
GAC Pressure Vessel	☑	GAC Type 1	0.056	(lb/1000 gal)
	☐	No input required		
	☐	No input required		
IX Filter	☑	Resin Type 1	0.023	(lb/1000 gal)
	☐	No input required		
	☐	No input required		

GAC Disposal	RCRA Landfill	(Dropdown)
IX Disposal	RCRA Landfill	(Dropdown)
IX Founling Prevention	Cartridge Prefilter	(Dropdown)
Include GAC/IX Discharge Fees?	Yes	(Dropdown)

Step 3

a. Select if GAC Gravity Basin, GAC Pressure Vessel, and/or IX Filter are included for comparison (up to 3 media each)

b. Input media usage rate (lb/1000 gal) for each selected media; usage rate is based on media, water quality, and treatment objective

c. Select disposal options for spent GAC and IX filter media

d. Select fouling prevention for IX filter

e. Select if GAC/IX discharge fees for filter backwash water are included

Step 4	RO and NF Info	
*Check to include		
RO System	☑	
NF System	☑	

Source Water	Low Quality Groundwater	(Dropdown)
Influent pH	7.0	
Effluent pH Goal	7.5	
Water Temperature	55	°F
RO/NF Membrane Disposal	Incineration	(Dropdown)
RO/NF Concentrate Disposal	Haz Waste Disposal	(Dropdown)
Include RO/NF Discharge Fees	Yes	(Dropdown)

Step 4

a. Select if RO and/or NF are included for comparison
b. Select source water quality
c. Input influent and effluent pH
d. Input water temperature
e. Select RO/NF used membrane disposal method
f. Select RO/NF concentrate disposal method
g. Select if RO/NF discharge fees for membrane cleaning and concentrate are included

Select Regulation	EPA Health Advisory	(Dropdown)
Treatment Objective Type	Sum of Concentrations	(Dropdown)

PFAS	Treatment Objective	Influent Concentration (ng/L)	RO Percent Removal	NF Percent Removal
PFPeA	100000	0	98.5%	98.9%
PFHxA	100000	0	99.9%	98.7%
PFHpA	100000	0	96.9%	98.0%
PFOA	12	52	99.9%	96.7%
PFNA	11	24	99.9%	96.7%
PFPrS	100000	0	98.0%	84.1%
PFBS	100000	0	99.9%	94.9%
PFPeS	100000	0	99.3%	96.1%
PFHxS	18	47	99.9%	97.5%
PFHpS	100000	0	99.7%	87.0%
PFOS	15	88	99.4%	97.4%
Sum	70	211.0		

Step 4 (Continued)

h. Select Treatment Objective/Regulation

If "User Defined" is selected for treatment objective:

i. Select Treatment Objective Type
   i. If "Sum of Concentrations", then Input the "Sum" for the treatment objective
   ii. If "Individual Concentrations", then Input individual effluent concentrations for each relevant PFAS compound
j. Input relevant influent concentrations
k. Default percent removal values are included for RO and NF, user can adjust if desired

Step 5	Flowrate and Design Specifications	
Design Flowrate	2.152	MGD
GAC Gravity Basin		
Bed Depth	8	ft
Basin Width	12	ft
EBCT	10	min
GAC Pressure Vessel		
Vessel Geometry	Upright	(Dropdown)
Bed Depth	7	ft
Vessel Height/Length	11	ft
Vessel Diameter	8.5	ft
EBCT	10	min
IX Filter		
Vessel Geometry	Upright	(Dropdown)
Bed Depth	4	ft
Vessel Height/Length	7	ft
Vessel Diameter	5.5	ft
EBCT	2	min
RO System		
Membrane Element	8 inch Low Pressure RO	(Dropdown)
Recovery Rate	80%	
Design Flux	17	gfd
NF System		
Membrane Element	8 inch NF	(Dropdown)
Recovery Rate	85%	
Design Flux	17	gfd

Step 5

If Preset Flowrate not selected:

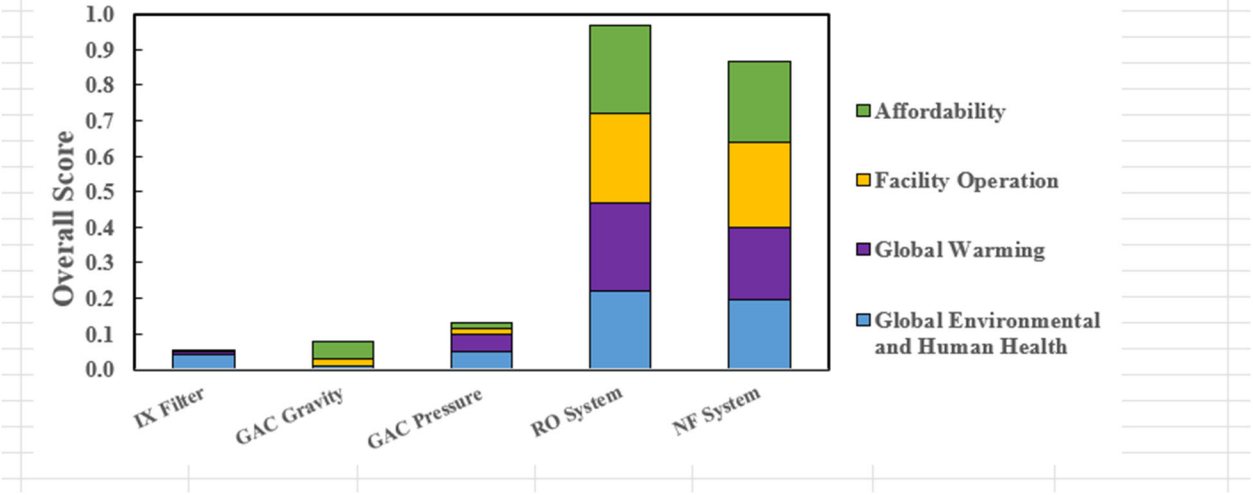
a. Input Design Flowrate
b. Input Bed Depth, Basin Width, and EBCT for GAC Gravity Basin
c. Select Vessel Geometry, Input Bed Depth, Vessel Height/Length, Vessel Diameter and EBCT for GAC Pressure Vessel
d. Select Vessel Geometry, Input Bed Depth, Vessel Height/Length, Vessel Diameter and EBCT for IX Filter
e. Select Membrane Element, Input Recovery Rate and Design Flux for RO System
f. Select Membrane Element, Input Recovery Rate and Design Flux for NF System

Output

Go to "OUTPUT" tab

- Only technologies that were selected for analysis are shown
  - If RO or NF system does not meet selected treatment objective, no output will be shown
- For each technology included in analysis, the tool displays:
  - Treatment system footprint in square feet
  - Bed lifetime (for GAC and IX processes) in months
  - Capital costs in present day value
  - Total operation and maintenance (O&M) costs in present day value
  - Lifetime costs (Capital + O&M costs) in present day value
  - Overall score (overall weighted score based on decision criteria)
- A bar graph of overall score, broken down by decision criteria category, is shown for each selected technology

Technology	Footprint (sq ft)	Bed Lifetime (mo)	Capital Costs ($)	O&M Costs ($/yr)	Lifetime Cost ($)	Overall Score
IX Filter	280	11	$ 106,349	$ 46,322	$ 1,959,216	0.051
IX Filter 2						
IX Filter 3						
GAC Gravity	650	48	$ 310,204	$ 41,662	$ 1,976,690	0.077
GAC Gravity 2						
GAC Gravity 3						
GAC Pressure	520	39	$ 188,174	$ 45,061	$ 1,990,607	0.132
GAC Pressure 2						
GAC Pressure 3						
RO System	2,010	N/A	$ 634,770	$ 26,525,406	$ 1,061,651,023	0.966
NF System	1,990	N/A	$ 646,443	$ 21,575,617	$ 863,671,129	0.867



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Kenan Ozekin and Alice Fulmer: Water Research Foundation

Chris Bellona and Chris Higgins: Colorado School of Mines

Charles Schaefer: CDM Smith

Detlef Knappe: North Carolina State University

Sherri Cook: University of Colorado, Boulder

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Water Research Foundation
6666 W. Quincy Ave.
Denver, CO 80235

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14. ABSTRACT

User Interface Tutorial for Decision Support Tool: The Decision Support Tool User Interface Tutorial is the accompanying user guide for the PFAS Decision Support Tool. It shows images for the tool's user interface in Excel along with the steps for user inputs.

PFAS Decision Support Tool: The PFAS Decision Support Tool is an Excel®-based decision support tool that provides a pathway to comprehensively evaluate PFAS treatment technology options consisting of GAC, IX, and high-pressure membrane systems for groundwater remediation. The tool quantifies each option's relative environmental impacts, costs, and facility requirements for a given scenario.

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