

NAE Sustainability Dashboard

The Sustainability PDT in collaboration with ERDC's Risk and Decision Sciences team (located on site in Concord Park) has developed an Excel-based tool to structure the evaluation of the level of sustainability at each of the thirty-five NAE Operations project sites. The tool accepts data inputs (Figure 3), organizes them under the set of sustainability goals laid out by USACE HQ, and displays a "dashboard" of the evaluations (Figure 1) according to their ranking (red, yellow, green). This dashboard can be used as the basis for visualizations of the current and future status of sustainability at each site.

USACE is tasked with complying with a number of executive orders and policies that aim to decrease the use of energy, water, facility energy intensity, fleet size and fuel consumption. The 2012 USACE Strategic Sustainability Performance Plan (SSPP) contains eight specific goals that encompass numerous metrics ranging from the overall assessment of site performance to the default settings on printers. Further, the SSPP goals are based on an even broader set of metrics outlined in the current USACE Campaign Plan that measures sustainability performance Corps-wide on an annual basis as well as establishes a set of guidelines for grading (red, yellow, green) the change in performance over time (through FY 20). NAE's decision tool is based on the performance objectives of these plans.

To date, NAE has made substantial progress in the measurement and evaluation of sustainability in compliance with several of these performance objectives, specifically with the incorporation of the CRAFT database into regular use. To further these efforts and facilitate a baseline sustainability assessment of the sites, each site submitted an extensive sustainability evaluation checklist (attached). The Sustainability PDT developed a weighted matrix for each of the eight SSPP sustainability goals and associated metrics that are reflected in the checklist. This matrix is used to generate an overall relative sustainability measure (red, yellow, green) for each project site and includes a score for each individual building and project and an overall score for each basin and the district as a whole.

The Excel-based tool is designed to allow the number, type, and importance of each of the sustainability metrics to be changed easily (Figure 2). Based on this structure, the model determines a color for each site based on the importance/weight of each metric and proportion of the metrics in the green, yellow and red zones. The model allows specification of the scale, the green, yellow and red ranges and a default value for each metric. If no green, yellow and red ranges are specified, the model assumes all values are "green." The dashboard output has two forms; one color shows which zone includes the highest/maximum value for that site (red, yellow green); the other value uses color mixing to show the color associated with the combination of the score across the three color zones (Figure 1). For example, if 51% (or 0.51) of the score is in the red zone and 49% of the score is in the yellow zone, the "max" color for the site is red and the "average" color for the site is orange.

The evaluation tool was designed to work in conjunction with GIS-based visualization. The value of the tool lies in its ability to consider different inputs and updates and display an easily interpretable three-color evaluation. It requires specification of data inputs, selection of metrics, and determination of both the relative importance of those metrics (weights) and their red-yellow-green color ranges. Next year's collection of data from the projects can be limited to annual updates (i.e. electricity usage) and to changes and improvements undertaken, such as the installation of solar panels or insulation that could improve the score of the site. Additional data is necessary to improve this year's assessment, namely the inclusion of water data for every site; a complete assessment this year provides baseline data needed to calculate changes in performance between years, which is integral for fulfilling the USACE Campaign Plan metrics. For example, the Campaign Plan requires a 30% change in building energy intensity between FY03 and FY15. At the end of FY 14, the change for the energy intensity goal can be calculated using the previous FY 13 year data and a new "delta" score will be generated. We anticipate the tool to become the backbone of NAE sustainability reporting.

Figure 1. Dashboard Site Evaluations reflecting current performance

Alternative Name	Max.	Avg.	R	Y	G	Score
Townshend			0.218	0.457	0.326	0.76782
Black Rock Lake			0.137	0.553	0.310	0.76063
Littleville			0.237	0.497	0.266	0.72687
MRB			0.270	0.477	0.253	0.72058
Tully Lake			0.317	0.377	0.306	0.71437
LCRB Office			0.370	0.377	0.253	0.70191
Surry			0.338	0.397	0.266	0.67966
Blackwater			0.338	0.380	0.282	0.67907
Buffumville Lake			0.191	0.577	0.233	0.67498
Hopkinton-Everett			0.347	0.380	0.273	0.65979
Franklin Falls			0.298	0.420	0.282	0.65766
Hodges Village			0.333	0.360	0.308	0.65425
NRB Office			0.370	0.377	0.253	0.65191
UCRB			0.370	0.377	0.253	0.65191
East Brimfield			0.322	0.437	0.242	0.65002
West Hill			0.350	0.497	0.153	0.63511
Barre Falls			0.412	0.320	0.268	0.63410
Birch Hill			0.373	0.397	0.231	0.63388
Hop Brook			0.363	0.459	0.178	0.63148
HNCK			0.445	0.377	0.178	0.62812
Thomaston			0.374	0.393	0.233	0.62015
Otter Brook			0.347	0.420	0.233	0.61464
Colebrook			0.463	0.397	0.141	0.60393
Mansfield Hollow			0.470	0.377	0.153	0.60191
TRB Office			0.470	0.377	0.153	0.60191
West Thompson			0.470	0.377	0.153	0.60191
Stamford			0.485	0.377	0.138	0.60155
Knightville			0.438	0.397	0.166	0.60151
Ball Mountain			0.322	0.477	0.201	0.58289
Westville			0.439	0.377	0.184	0.58135
Woonsocket			0.450	0.377	0.173	0.57796
North Hartland			0.482	0.337	0.181	0.57687
North Springfield			0.445	0.457	0.098	0.56872
Ed Mac			0.512	0.380	0.108	0.56848
Union Village			0.519	0.357	0.124	0.55270
Cape Cod Canal			0.442	0.377	0.181	0.31104

Figure 2. Decision Model in Excel as developed for the dashboard evaluation of sustainability

Goals	Criteria	Metrics	Hop Brook	Ball Mountain
20	Goal 1: Footprint	0	17.8	17.7
	Mobile Fuel MTCO2e	1	0.482543679	0
	Water Use MTCO2e	1	127.896	36.79
	MSW MTCO2e	1	26.3837574	44.3898
	Electricity Use	1	172.5623011	98.8818
	"Footprint" MTCO2e	1	0.76960392	0.388805
	Per Capita Footprint (MTCO2e/person)	1		
20	Goal 2: Buildings	90	5.65E-03	9.01E-03
	Building Efficiency	33	1.34E-02	2.55E-02
	"Office" Efficiency (MTCO2e/sq ft) - includes occupied, conditioned buildings	33		
	"Greenhouses & Garages" Efficiency (MTCO2e/sq ft) - included unoccupied, conditioned buildings	33		
	"Comfort Station" Efficiency (MTCO2e/sq ft) - included unoccupied, unconditioned buildings	33		
	Electricity Use (kWh)	0	46532	78285
	Electricity Cost (\$)	0	12437	15888
	Electricity Rate	0	0.27	0.20
	Percent Electricity from Renewable Energy Audit (Year)	1	0	0
	Percent Developed	1	2009	0
	Land	1	1.865671642	1.861427
	Fleet Size	1	6	4
	Fleet Annual Mileage	1	41000	33000
	Fleet MPG	1	3500	1659.7
	Percent Alternative Vehicles in Fleet	50	16.7	50
	%GGE for Fleet	1	0	10.32089

Figure 3. Input page in Excel for the dashboard evaluation of sustainability

Metric (Units)	Site	Hop Brook	Ball Mountain	Townshend	Barre Falls	Birch Hill	Blackwater	Ed Mac	Franklin Falls	Hopkinton-Everett	Knightville	Littleton
Mobile Fuel MTCO2e		17.8	17.7	9.1	3.8	5.9	4.8	2.7	8.9	7.5	9.1	10.2
Water Use MTCO2e		0.482543679	0	0	0	0	0	0	0.135693417	0	0	0
MSW MTCO2e		127.896	36.792	7.884	7.884	7.884	4.38	1.314	4.38	18.834	1.6425	1.64
Electricity Use MTCO2e		26.3837574	44.389863	23.501016	14.409171	9.12303	5.292945	8.601957	10.269504	45.36	8.463042	15.213
"Footprint" MTCO2e		172.5623011	98.881863	40.485016	26.093171	22.90703	14.472945	12.615957	23.68519742	71.694	19.205542	27.555
FTE		2	4.5	1.5	3	2	1	2.5	3	4	2	2
Visitation		40000	44968	42000	71000	25000	137000	155000	500000	58531	2824	2824
"Population"		224.2222222	254.3222222	234.8333333	397.4444444	2	139.8888889	763.6111111	864.1111111	2781.777778	327.1222222	158.916
Per Capita Footprint (MTCO2e/person)		0.76960392	0.388805438	0.172398933	0.065652373	11.453515	0.10346029	0.016521442	0.027409898	0.025772727	0.058701628	0.17339
"Office" Efficiency (MTCO2e/sq ft) - includes occupied, conditioned buildings		5.65E-03	9.01E-03	5.60E-03	6.27E-03	7.07E-03	9.50E-03	6.28E-03	8.48E-03	1.19E-02	2.25E-02	6.04E-02
"Greenhouses & Garages" Efficiency (MTCO2e/sq ft) - included unoccupied, conditioned buildings		1.34E-02	2.55E-02	1.47E-03	1.03E-03	1.09E-03	1.50E-03	5.38E-03		2.54E-03		2.27E-02
"Comfort Station" Efficiency (MTCO2e/sq ft) - included unconditioned, unoccupied buildings			5.37E-03	4.26E-05	1.58E-03	3.98E-04		2.67E-03		1.13E-03	7.90E-04	2.36E-02
Electricity Use (&W)		46532.2	78289	41448	614.035	871.287	569.62	400	942.42	911.6	1153.62	1176.
Electricity Cost (\$)		12437	15,888	4841	4435	2404	2330	2944	6621	11880	2954	465.
Electricity Rate		0.267272283	0.202940388	0.11676965	0.174516979	0.143409571	0.249598286	0.194054446	0.36558746	0.1485	0.197999688	0.17343
Percent Electricity from Renewable Energy Audit (Year)		0	0	0	2010	2011	0	0	0	0	0	1995
Acres adjacent		536	967	1008	0.25	1	5	10	12	18	2	1
Developed Land (Acres)		10	18	40	0.25	1	5	10	12	102	10	10
Percent Developed Land		1.865671642	1.861427094	3.968253968	100	100	100	100	100	566.6666667	500	1000
Fleet Size		6	4	3	4	2	1	2	3	3	1	2
Fleet Annual Mileage		41000	33000	27000	7000	11000	9000	8000	18000	14000	17000	2000
Fleet Gasoline Usage		3500	1659.74	1749.46	614.035	871.287	569.62	400	942.42	911.6	1153.62	1176.
Fleet MPG		11.71428571	19.88263222	15.43333371	11.40000163	12.62500187	15.80000702	20	19.09976444	15.35761299	14.73622163	17.000
Percent Alternative Vehicles in Fleet		16.7	50	100	50	0	100	0	66	66	0	100