

## Region 6 GIS Screening Tool (GISST) Methodology and User's Manual

Charge to the SAB Review Panel

### Background

U.S. EPA Region 6 has developed a Geographic Information System Screening Tool (GISST) for use in evaluating the potential *environmental impacts* of large complex Federal projects such as the construction of roads, the permitting of water treatment plants, and timber sales on Federal properties. The GISST can also be used to evaluate the potential *environmental vulnerability* of the proposed locations of such projects. The GISST is a descriptive tool used to facilitate decision-making by enabling visualization (in a geographic information system) of data layers that provide an initial level of representation of the potential impacts of projects, and the potential vulnerability of alternative project sites. The GISST is not a predictive model. It does not provide modeled outputs reflecting the ecological effects of proposed activities.

The GISST was developed by EPA Region 6 for use in preparing and reviewing environmental assessments and impact statements required under the National Environmental Policy Act (NEPA). NEPA requires that federal agencies prepare environmental assessments or impact statements for major actions (including the issuance of permits) affecting the environment. In addition to preparing assessments and impact statements for its own actions, EPA must also review the environmental assessments and impact statements of other federal agencies. The NEPA process requires the evaluation of potential direct, indirect, single and cumulative impacts associated with projects and project alternatives. The GISST has greatly enhanced the ability of EPA staff to systematically visualize potential project impacts and their cumulative effects on the environment. It has also provided a tool for evaluating and prioritizing project alternatives in order to make decisions.

GISST users can determine the potential environmental impacts of projects and the environmental vulnerabilities of project locations by evaluating sets of geographically referenced data. These data sets represent selected vulnerability and impact "criteria" in a number of different categories (e.g., ecological, socioeconomic, toxicity, water quality, air quality). For example, in the GISST, rainfall at a project location is evaluated as a vulnerability criterion because a greater amount of rainfall can be associated with greater infiltration to groundwater and runoff to surface water. The density of federally managed lands at a project location is evaluated as an impact criterion because greater project impacts are anticipated in areas with more federally managed lands. Some GISST criteria are both impact and vulnerability criteria. To facilitate decision-making, a scoring system with a scale of one to five is used in the GISST to evaluate the data sets associated with each criterion. A score of one equals a lower level of potential impact or vulnerability, and a score of five equals a higher level of potential impact or vulnerability. Values used to rate the data representing each criterion have been assigned by EPA using

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professional judgment (see Appendix A of the GISST User's Manual). In the GISST, the degree of potential vulnerability of a watershed subunit, project area, or other appropriate geographical unit is defined as the average or the sum of the vulnerability criteria scores. The degree of potential impact produced by a project is defined as the average or sum of the impact criteria scores within a geographic unit. A mathematical algorithm (in Chapter 3 of the GISST User's Manual) is also used in the GISST to derive the "potential for significant environmental risk" associated with projects. This algorithm considers the ratio of the cumulative area affected by a project to the total area evaluated, the degree of potential vulnerability of the area evaluated, and the degree of potential impact produced by the project. The results of GISST analyses can be displayed on maps that include data overlays generated using different criteria.

EPA Region 6 is seeking comment from the Science Advisory Board on: 1) whether the GISST methodology is reasonable and appropriate for use in conducting initial level assessments of potential environmental impacts and vulnerability, 2) the strengths and limitations of the GISST as a tool for use in prioritizing and comparing environmental vulnerabilities and impacts for decision-making, and 3) steps that can be taken to further develop the GISST User's manual and documentation. Specifically, EPA Region 6 is seeking advice regarding the following questions.

EPA Region 6 has provided the following material to the Panel for review:

- The GISST User's Manual

The GISST User's Manual contains: 1) An introduction in question and answer format that describes the uses of the GISST; 2) Background information on concepts underlying the GISST; 3) Information on development of the GISST algorithm and criteria; 4) A series of case studies where the GISST has been applied, including an illustrative case study describing the use of the GISST to assess the environmental impacts associated with the construction of Interstate Highway 69 in Texas; 5) The finalized GISST criteria; 6) Additional GISST criteria that are under development; 7) The GIS Programming language used in the GISST; and 8) a Peer Review History of GISST.

### Charge Questions to the Panel

#### Question 1. GISST Methodology

- 1.1 The GISST mathematical algorithm (presented in Chapter 3 of the GISST User's Manual) for determining the "potential for significant environmental risk" of projects is a multiplicative formula using the watershed as the base unit. Please comment on the reasonableness and appropriateness of using this algorithm for conducting screening level evaluations as described in the GISST User's Manual.

In the Interstate Highway 69 case study, the GISST algorithm was not used because it was not beneficial to obtain one cumulative vulnerability score for the

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- entire highway corridor. Instead, vulnerability within the corridor was evaluated by summing the scores of vulnerability criteria within 1 km<sup>2</sup> areas in a grid system. Please comment on the reasonableness and appropriateness of this method for conducting an initial screening level evaluation.
- 1.2 Appendix A of the GISST User's Manual identifies the impact and vulnerability criteria that are used in the GISST to evaluate environmental impact and vulnerability. A subset<sup>1</sup> of these criteria is frequently used by EPA Region 6 to conduct GISST evaluations. Are the criteria in this subset reasonable and appropriate for use in GISST evaluations of the potential degree of vulnerability of a project area and the potential degree of impact produced by a proposed project? Please provide similar comments for the other criteria in Appendix A. Are there additional categories of criteria that should be developed for use in GISST evaluations?
- 1.3 The GISST uses data sets (in Appendix A) with different coverages generated for different purposes (e.g., point sampling of water quality, census data, and land cover data gathered by satellite). Is the GISST 1 – 5 scoring scale on these coverages and datasets reasonable for developing an initial assessment of the potential cumulative impacts of proposed projects?

### Question 2. Application of the GISST to Environmental Decision-Making

- 2.1 EPA intends to use the GISST in the NEPA process as an initial screening tool to prioritize potential single, direct, and cumulative environmental impacts of projects for more detailed analyses. Please comment on the strengths and limitations of the GISST as it applies to this purpose.
- 2.2 EPA also intends to use the GISST in the NEPA process to evaluate environmental impacts of project alternatives to help inform decision-making. Please comment on the usefulness of the GISST as a tool for this use.

### Question 3. GISST Documentation

- 3.1 Please provide recommendations on steps that can be taken to enhance the usability of the GISST User's manual and documentation.

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<sup>1</sup> The subset of criteria most frequently used in GISST evaluations includes: Stream Density (surface water quantity), Population Density, Minority (environmental justice), Economic (environmental justice), Agricultural Lands, Density of Managed Lands, Hazardous Waste (Other Industries or Pollution Sources), Impaired Stream Segments (Clean Water Act 303(d) Segments), Wetlands, Floodplain, Ozone Nonattainment, Texas Ecological Assessment Protocol (TEAP) Diversity, TEAP Rarity, TEAP Sustainability, TEAP Composite, Wildlife Habitat, Federally-listed Species, and State-listed Species, and Ecologically Significant Stream Segments. The TEAP criteria were derived using a tool developed by EPA Region 5, the Critical Ecosystem Assessment Model (CREAM). The SAB has reviewed the CREAM. The SAB report on the CREAM is available at: [http://www.epa.gov/sab/pdf/cream\\_sab-05-011.pdf](http://www.epa.gov/sab/pdf/cream_sab-05-011.pdf)