### Sponsor

<table>
<thead>
<tr>
<th>Nomination of Technology Ready for Implementation</th>
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<tbody>
<tr>
<td><strong>1. Sponsoring State DOT:</strong> Maryland State Highway Administration</td>
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<td><strong>2. Name:</strong> Sandy Hertz</td>
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<tr>
<td><strong>Title:</strong> Deputy Director, Office of Environmental Design</td>
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<td><strong>Mailing Address:</strong> 707 North Calvert Street, MS C-303</td>
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<td><strong>Phone:</strong> 410-545-8609</td>
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<td><strong>3. Date Submitted:</strong> 09/14/2012</td>
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<td><strong>4. Is the Sponsoring State DOT willing to promote this technology to other states by participating on a Lead States Team supported by the AASHTO Technology Implementation Group?</strong></td>
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<td>Please check one: Yes</td>
<td>No</td>
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### Technology Description (10 points)

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<th>The term “technology” may include processes, products, techniques, procedures, and practices.</th>
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<td><strong>5. Name the technology:</strong> Watershed Resources Registry (WRR)</td>
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<td><strong>6. Please describe the technology:</strong> The WRR is a national pilot to integrate land-use planning, regulatory, and non-regulatory decision making using the watershed approach. A GIS-based pilot registry was developed out of the Green Highways Partnership through a project proposed by the Maryland State Highway Administration (MDSHA) for Route 301 in Prince George's and Charles Counties, Maryland. WRR Technical Advisory Team members sought to develop a framework for integrated watershed management that could be transferred nationally. The project team initially targeted southwest Maryland as a pilot region. Today, GIS-based WRR opportunity outputs have been compiled for the entire State of Maryland and are available through a web-based user interface. Using available data from various organizations the WRR reveals a comprehensive picture of watershed health and identifies opportunities for aquatic and terrestrial creation, restoration, enhancement and preservation.</td>
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<tr>
<td><strong>7. If appropriate, please attach photographs, diagrams, or other images illustrating the appearance or functionality of the technology.</strong> (If electronic, please provide a separate file.) Please check one: Yes, images are attached</td>
<td>No images are attached</td>
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8. Please describe the history of the technology’s development.


Summer-Fall 2007 – Research performed on EPA Region III data

Winter-Spring 2007-2008 – Initial executive summary and proposal developed

Summer 2008 – Watershed Resources Registry proposal agreed upon

Spring 2009 – Work plans developed, Technical Advisory Committee (TAC) formed

Summer 2009 – Initial data layers determined for each suitability analysis

Fall 2009 – GIS models developed using model builder for each suitability analysis

Winter 2009 – GIS models reviewed

Spring 2010 – GIS models outputs finished for the pilot area

Summer 2010 – Preliminary field testing of the outputs completed by an interagency group

Fall 2010 – Statewide data layers collected

Winter 2010 – GIS models reworked to run statewide

Spring 2011 – Web application developed statewide

Summer 2011 – Desktop testing performed for the statewide model outputs

Fall 2011 – GIS models reviewed (QA/QC)

Winter 2011 – GIS models corrected based on QA/QC report and desktop testing

Spring 2012 - MDSHA began using the WRR for project development

Summer 2012 - Beta version of Outreach Website developed in support of WRR

9. For how long and in approximately how many applications has your State DOT used this technology? The Maryland State Highway Administration (MDSHA) has used the WRR since Spring 2012. The WRR application has been valuable for gathering environmental inventory information, assessing watershed needs, and identifying potential mitigation sites. It can also be used to provide backup information for justifying mitigation site selection in support of various regulatory permitting processes. The web application also compliments initial field reconnaissance by providing the ability to export data about a location onto a print map including latitude / longitude coordinates which can be keyed into a GPS for navigation purposes.

10. What additional development is necessary to enable routine deployment of the technology? For 9-12 months beginning in October, 2012, end user testing will occur with key agencies within Maryland to gather feedback on the application. During this time coordination between the WRR Technical Advisory Committee (TAC) members will occur to review and address agency feedback. Web hosting and technical support geared to the web application and separate outreach website will be ongoing. Cyclical updates to WRR models in order to maintain an accurate depiction of potential restoration and preservation areas within the State will also be ongoing.

11. Have other organizations used this technology? Please check one: ☒ Yes ☐ No

If so, please list organizations and contacts.

<table>
<thead>
<tr>
<th>Organization</th>
<th>Name</th>
<th>Phone</th>
<th>E-mail</th>
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<tbody>
<tr>
<td>Maryland Department of the Environment</td>
<td>Kelly Neff</td>
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<tr>
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<td>410-260-8785</td>
<td><a href="mailto:CConn@dnr.state.md.us">CConn@dnr.state.md.us</a></td>
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| Payoff Potential (30 Points) | 12. How does the technology meet customer or stakeholder needs in your State DOT or other organizations that have used it? The WRR helps to:  
- Streamline information collection and preparation for permit processes  
- Prioritize watershed needs  
- Utilize limited resources to achieve multiple goals  
In addition the WRR aids in:  
- NEPA and State environmental review, Integrated transportation, energy and land use planning  
- Agency collaboration and program integration between: CWA 319, 401,402,404, 303(d)  
- Watershed planning, permit review, mitigation assessments  
- Total Maximum Daily Loads and Watershed Implementation Plan applications  
- Stormwater management  
- Resource conservation/ environmental resource planning including:  
  - GreenPrint and Rural Legacy priorities  
  - ESA Section 7 (Threatened and Endangered Species)  
  - Transportation and land use planning  
  - NEPA review |
| Payoff is defined as the combination of broad applicability and significant benefit or advantage over other currently available technologies. |
| Market Readiness (30 Points) | 13. What type and scale of benefits has your DOT realized from using this technology? Include cost savings, safety improvements, transportation efficiency or effectiveness, environmental benefits, or any other advantages over other existing technologies.  
- Reduces costs through more efficient administration of regulatory and non-regulatory programs and less review/site assessment/cooperation time  
- Improves environmental outcomes  
- Supports integrated decision making among multiple users  
- Uses a common watershed-based platform  
- Provides access to updated, consistent, and defensible data  
- Results in enhanced protection and targeted restoration of resources  
- Achieves multiple environmental objectives  
- Is a model approach for addressing potential new stormwater requirements (offsite mitigation, credits, offsets) on a watershed basis  
- Is transparent, predictable, and reliable  
- Promotes stakeholder and public involvement  
- Provides transferability to other states nationwide |
| 14. Please describe the potential extent of implementation in terms of geography, organization type (including other branches of government and private industry) and size, or other relevant factors. How broadly might the technology be deployed?  
The intent is to roll the WRR out nationally to private sector, local, state and federal governmental entities. As a result, the web application, modeling, and overall framework was developed in a manner that allows for the solution to be scaled with relative ease. This technology can be used for a variety of watershed-based land-use planning efforts. |
| The TIG selection process will favor technologies that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff |
| 15. What actions would another organization need to take to adopt this technology? Another organization would need to establish a Technical Advisory Committee (TAC), determine suitability analyses relevant to their jurisdiction, collect needed data (non-Federal), and develop the models specific to their state with the final model outputs represented on a ranked scale of 1-5 and -1 (not suitable). Upon it's completion, model outputs would then be uploaded to the WRR web application. Authorization from key agencies would be necessary to use, redistribute, and publish model outputs along with supplemental base mapping (for the web application) to fully implement the technology. |
16. What is the estimated cost, effort, and length of time required to deploy the technology in another organization? The estimated cost would depend on the number of suitability analyses desired, in addition to the types of GIS datasets that would be available for a given geography. Given the technology has already been implemented successfully, there would be a cost savings realized when following the Maryland example. Assumed costs for up to 6 models and a framework would be between $250,000 and $500,000. This would not account for any hardware (e.g. personal computers) or software (ESRI - ArcGIS software) procurement that may be necessary to implement within another organization/State. Factoring development and testing of the models along with updating the WRR web application to account for other States, the time required to deploy the technology would be 1-2 years. Timeframe would be dependent upon the number of stakeholders involved in the development process and availability of needed data. MDSHA anticipates that the WRR will likely save us over $100,000 and up to a year in agency coordination time per each large project mitigation site search effort.

17. What resources—such as technical specifications, training materials, and user guides—are already available to assist deployment?
   - Technical Documentation pertaining to technology stack used to run the Web Application.
   - WRR User Guide
   - WRR outreach website - Currently beta (http://watershedresourcesregistry.com/outreach/outreach/home.html)
   - WRR Web Application (http://watershedresourcesregistry.com/Default.aspx)
   - WRR Training Materials - How to use the WRR web application, How to conduct analysis using WRR data in ArcGIS.

18. What organizations currently supply and provide technical support for the technology?
   Environmental Protection Agency (EPA) Region 3; US Army Corps of Engineers (ACE); MD State Highway Administration (MDSHA); US Fish and Wildlife Service (FWS); Federal Highway Administration (FHWA); Maryland Department of the Environment (MDE); Maryland Department of Natural Resources (MDNR); Maryland Environmental Service (MES); and Interstate Commission on the Potomac River Basin (ICPRB)

19. Please describe any legal, environmental, social, intellectual property, or other barriers that might affect ease of implementation. There are no legal restrictions on using the source code associated with the web application, the intellectual property of the code belongs to the State. Models were developed by ACE based on criteria developed by the TAC. Ease of full implementation will require a commitment from TAC stakeholders to continue supporting the initiative over time. A key concept to the WRR is assuring the models themselves are updated on a cyclical basis which is a primary responsibility of the TAC. This assures stakeholders always have an accurate representation of potential restoration and preservation areas based on the best available data. This coupled with ongoing web hosting and regular maintenance needs to be acknowledged and embraced.

Submit Completed form to  

http://transportation1.org/tig_solicitation/Submit.aspx
Opening page of the WRR application
Using the Find Opportunities tool to locate potential projects for upland preservation
Adding resource data layers to customize your view

Revealing opportunity details
Opening page of WRR outreach website