

VILLANOVA UNIVERSITY
COLLEGE OF ENGINEERING



CENTER FOR RESILIENT
WATER SYSTEMS

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Advised By:

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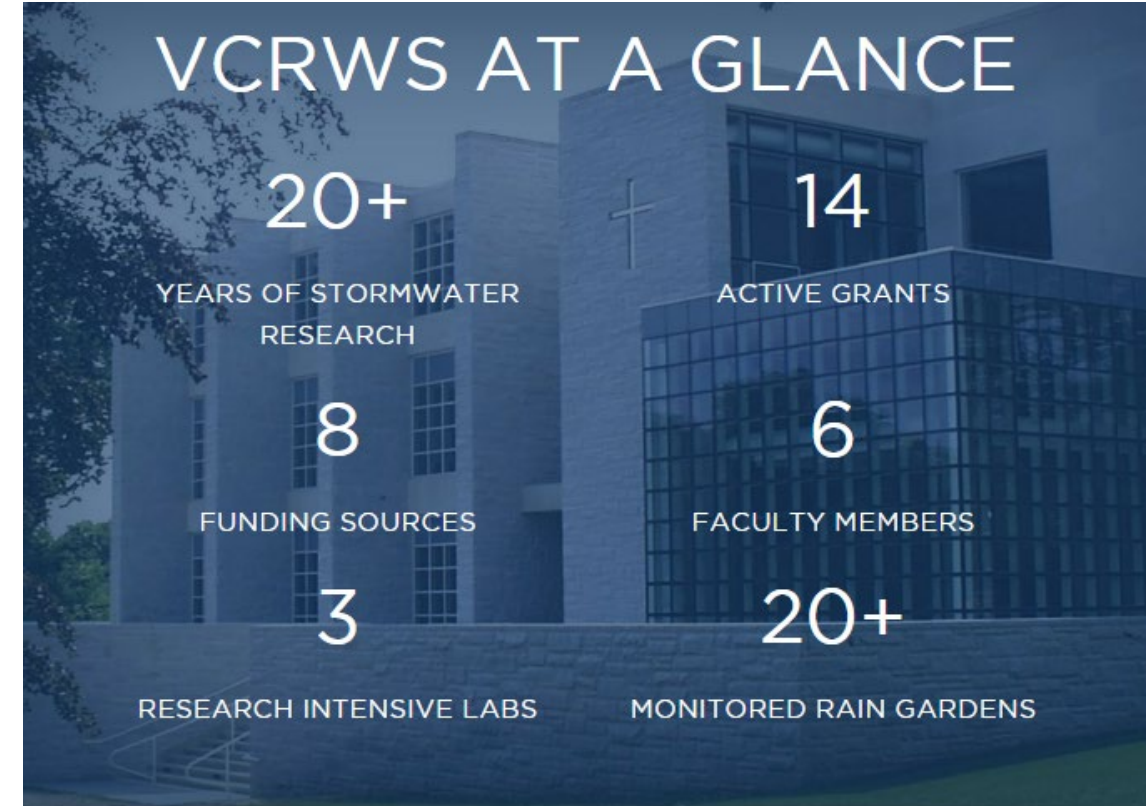
SAN Annual Meeting

November 5th, 2021

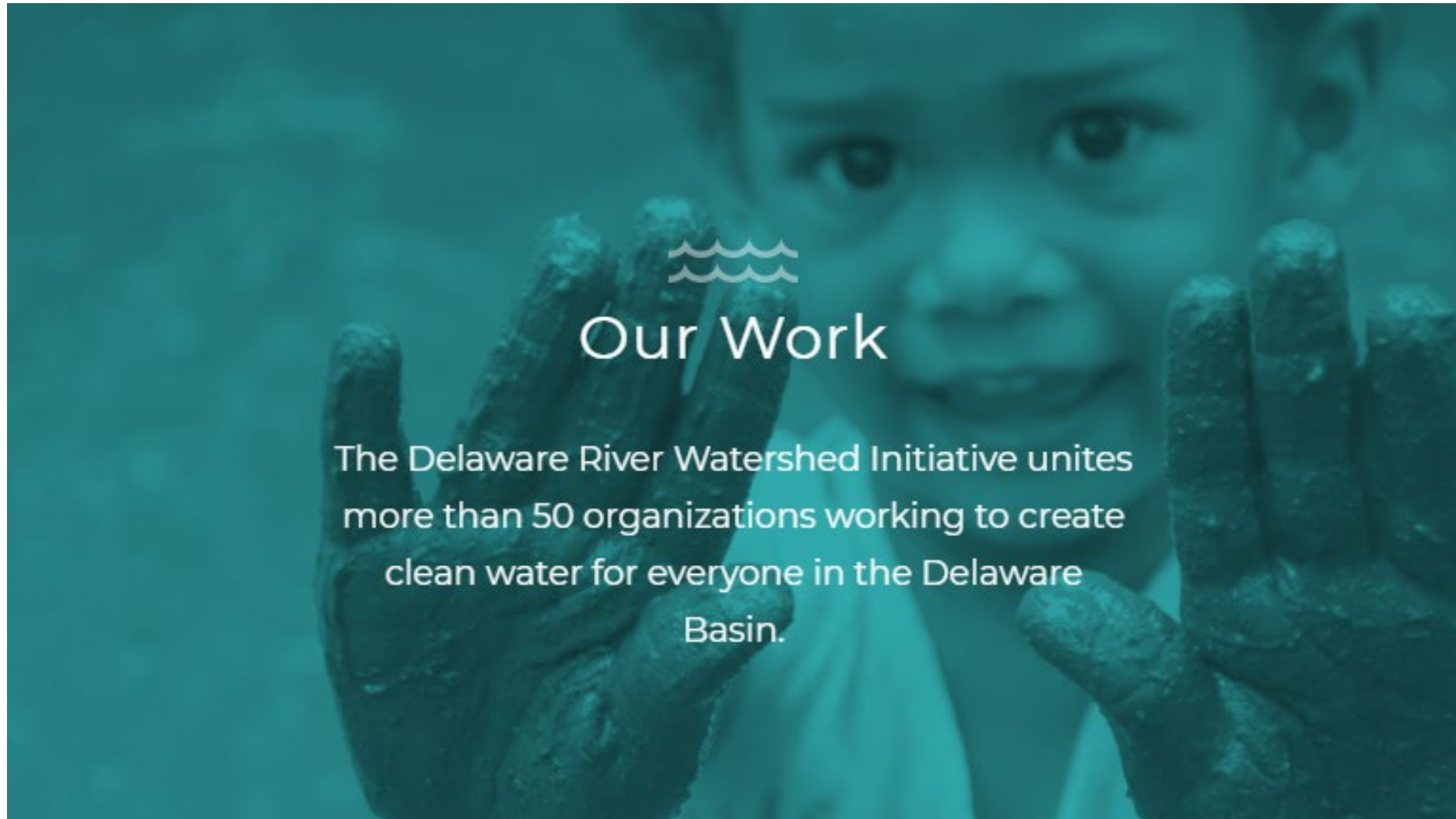
Green Stormwater Control Measures in the Delaware River Watershed Initiative

Villanova Center for Resilient Water Systems

- Mission is to evolve sustainable stormwater management and foster public/private partnerships through research
- Spans environmental, geotechnical, and water resource engineering topics
- Green Stormwater Infrastructure (GSI) or Stormwater Control Measures (SCM)
- Funders Include:
 - EPA
 - Philadelphia Water Department
 - William Penn Foundation
 - National Science Foundation
 - PDEP's Growing Greener Program



The Delaware River Watershed Initiative (DRWI)



Our Work

The Delaware River Watershed Initiative unites more than 50 organizations working to create clean water for everyone in the Delaware Basin.



Abington Friends School (AFS)

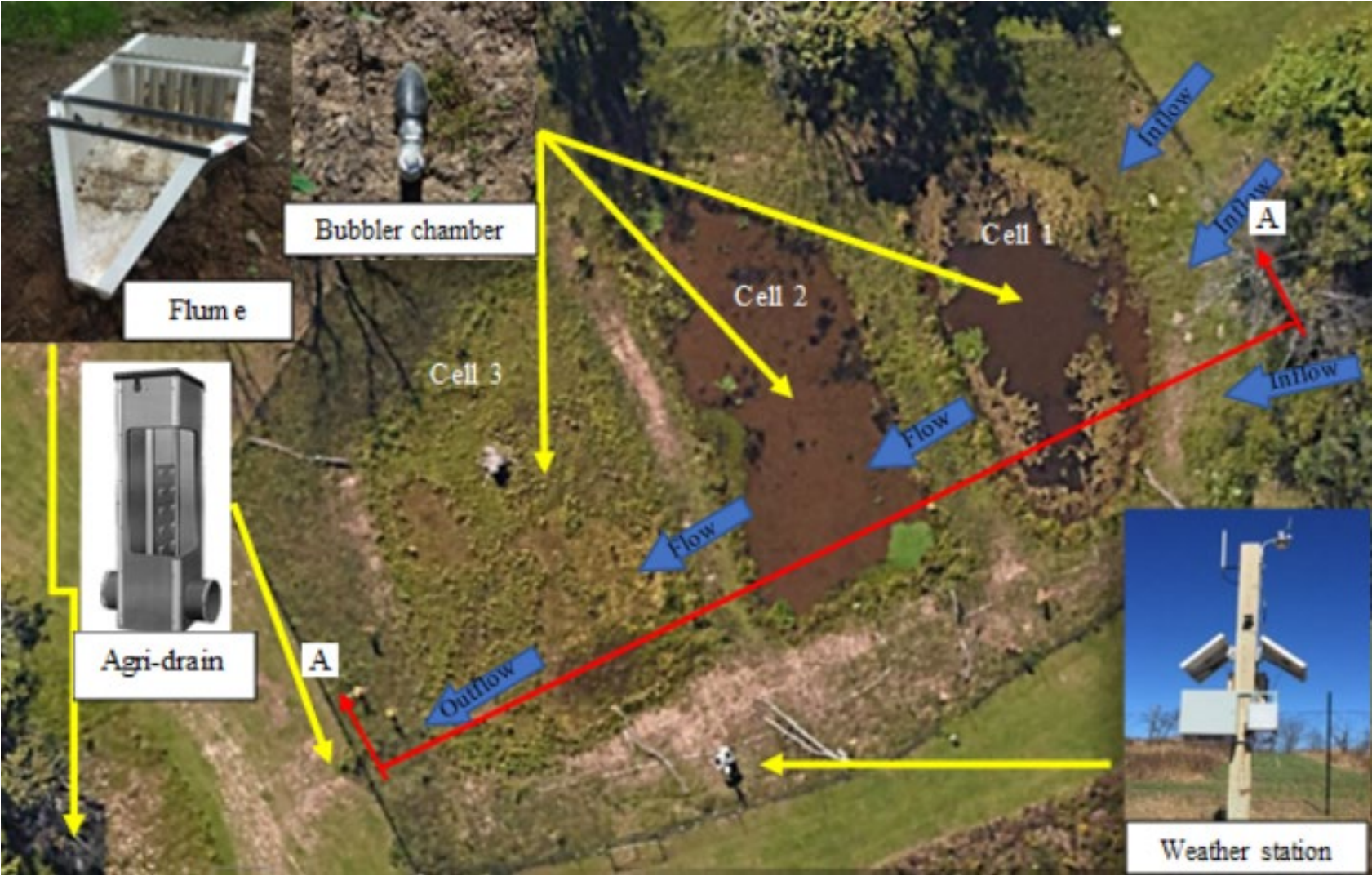


AFS Lessons Learned: Monitoring & Maintenance

- Monitoring helps inform on the performance of the system
 - Instrumentation throughout RG guides research insights & provides conclusions
 - Informs on how much water is moving through a system
 - Water quality improvements are quantified and tracked
- Problems with design are highlighted and adaptation is required
- Maintaining the rain garden helps performance and aids longevity



College Settlement (CS)



CS Lessons Learned: Adaptation & Outlook

- Site investigations before construction inform on future hydrologic conditions
 - Bedrock close to bottom of system, limits infiltration performance
 - Monitoring construction to limit compaction
- Modeling for future climate scenarios optimize SCM performance
 - Real-time controls implemented to maximize storm capacity
 - Machine learning algorithms improve system efficiency
- Bioassessment of system identifies patterns



Naylor's Run (NR)



NR Lessons Learned: Community Engagement & Vulnerability

- Local community members have interest in local stream dynamics
 - Inquisitive about our research
 - First-hand accounts of destructions during intense storms, such as Hurricane Isaias
 - Remarks on flooding reduction post-bioswale, citing Hurricane Ida
- Flash floods, erosion, streambed incision, and pollutant influx are all major issues stemming from impervious surfacing
 - Urban areas are highly vulnerable
 - Monitoring and green SCM implementation assist in these regions



The Future of Stormwater

- Climate change threatens local waterways, especially with more frequent, more intense storms
 - Flooding
 - Erosion
 - Pollutant loads
 - Property destruction
- Stormwater management designs should consider resiliency
- Site investigations, monitoring, visual inspection, and maintenance assist system performance and enhance longevity
- Native soils/plants are cost-effective materials that operate to mimic pre-development hydrology
- Modeling and machine learning engineering tools improve system efficiency and inform on successful designs

Acknowledgements



Questions, Recommendations, or Feedback?

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