



Verifier's Report

EXECUTIVE SUMMARY

ISSUER

Louisville and Jefferson County Metropolitan Sewer District

OPINION ON

Sewer and Drainage System Revenue Bonds, Series 2022A (Green Bonds - Climate Bond Certified)

STANDARD AND SECTOR CRITERIA

Climate Bonds Standard Version 3.0 ■ Water Infrastructure

PAR

\$225,000,000 (Preliminary, subject to change)

KEYWORDS

Integrated water resource management, Ohio River Basin, water quality, green infrastructure, pollution prevention, climate adaptation, Kentucky

EVALUATION DATE

December 27, 2021

SUMMARY OF FINDINGS

Kestrel Verifiers is of the opinion that the Louisville and Jefferson County Metropolitan Sewer District's (the "District") Sewer and Drainage System Revenue Bonds, Series 2022A ("Series 2022A Bonds") conform with the Climate Bonds Standard (Version 3.0) as follows:

■ Use of Proceeds

The Series 2022A Bonds will be used to pay at maturity, redeem, and refund Commercial Paper Notes and Direct Purchase Notes ("Program Notes") previously issued by the District to finance capital improvements to the wastewater, stormwater, and flood protection systems (collectively, "Projects"). The District demonstrates leadership in integrated water resource management by reducing combined sewer overflows and sanitary sewer overflows to meet Consent Decree obligations and by financing upgrades to the flood control, stormwater, and wastewater systems which integrate nature-based solutions. The bonds align with the *Water Infrastructure* eligible Sector Criteria under the Climate Bonds Standard.

■ Process for Evaluation and Selection of Projects & Assets

The District's compliance with the federal Consent Decree, internal risk mitigation criteria, value-based environmental benefit assessments, public and stakeholder input, and consideration of climate change adaptation all inform the prioritization of wastewater and stormwater capital projects. The District's primary planning documents are: the Consent Decree planning document, the Integrated Overflow Abatement Program ("IOAP"), and the 20-Year Critical Repair and Reinvestment Plan ("Facility Plan").

■ Management of Proceeds

Proceeds from Program Notes and the Series 2022A Bonds are managed by the District within separate accounts which are not comingled with other District funds. The District's Department of Finance is responsible for tracking and allocating proceeds to the outstanding Program Notes (comprised of Commercial Paper Notes and Direct Purchase Notes). Within 60 to 90 days of closing, Series 2022A Bond proceeds will be used to redeem or refund outstanding Program Notes or to pay certain outstanding Program Notes at maturity.

■ Reporting

The District commits to posting continuing disclosures to the Municipal Securities Rulemaking Board ("MSRB") annually through the Electronic Municipal Market Access ("EMMA") system. In accordance with the Climate Bonds Standard, Kestrel Verifiers will be engaged to provide one Post-Issuance Report within 24 months of issuance to confirm continued conformance of the Series 2022A Bonds with the

relevant Standards and Criteria. So long as the Series 2022A Bonds are outstanding, the District also expects to provide voluntary annual update reports on EMMA and BondLink. The District is required to report on completion of projects to reduce overflows of untreated wastewater into local waterways, and it also monitors and reports on water quality and stream health.

- **Impact and Alignment with United Nations Sustainable Development Goals**

By financing projects that improve wastewater, stormwater, flood protection systems, and mitigate overflows with green infrastructure, the Series 2022A Bonds advance Targets 6.3, 9.4, 12.2, 13.1. Funds and planning for water resource activities also support Target 6.5. The Series 2022A Bonds support the following UN Sustainable Development Goals: 6: *Clean Water and Sanitation*, 9. *Industry, Innovation, and Infrastructure*, 12. *Responsible Consumption and Production*, and 13. *Climate Action*.

- **Assurance Conclusion**

Based on the Reasonable Assurance procedures we have conducted, in our opinion, the Series 2022A Bonds conform, in all material respects, with the Climate Bonds Standard, and the bond-financed activities are aligned with the Climate Bonds Standard *Water Infrastructure* Sector Criteria (Version 3).



Verifier's Report

Legal Name of Issuer:	Louisville and Jefferson County Metropolitan Sewer District
Issue Description:	Sewer and Drainage System Revenue Bonds, Series 2022A (Green Bonds - Climate Bond Certified)
Project:	Capital Improvement Projects
Standard:	Climate Bonds Standard (Version 3.0)
Sector Criteria:	Water Infrastructure
Keywords:	Integrated water resource management, Ohio River Basin, water quality, green infrastructure, pollution prevention, climate adaptation, Kentucky
Par:	\$225,000,000*
Evaluation Date:	December 27, 2021

*Preliminary, subject to change

CLIMATE BONDS DESIGNATION

Louisville and Jefferson County Metropolitan Sewer District ("District") will issue Sewer and Drainage System Revenue Bonds, Series 2022A ("Series 2022A Bonds") to finance capital improvements to the wastewater, stormwater, and flood protection systems.

This Verifier's Report reflects Kestrel Verifiers' view of the District's projects and financing, allocation and oversight, and conformance of the Series 2022A Bonds with the Climate Bonds Standard (V3.0) and *Water Infrastructure* Sector Criteria. In our opinion, the Sewer and Drainage System Revenue Bonds, Series 2022A are fully aligned with the internationally accepted Climate Bonds Standard (Version 3.0) and the *Water Infrastructure* Sector Criteria (Version 3).

ABOUT THE ISSUER

The Louisville and Jefferson County Metropolitan Sewer District ("the District") was created in 1946 by the State of Kentucky Legislature to provide wastewater and stormwater infrastructure. The District serves all of Jefferson County and parts of Oldham County and Bullitt County, Kentucky. Located on the south bank of the Ohio River, the District serves approximately 750,000 people and treats 75 million gallons of wastewater per day ("MGD"). In 1987 the District's mission expanded to include flood control and stormwater management for Jefferson County. Flood control and drainage system infrastructure includes open channels, ditches, streams, ponds, pipes, culverts, conduits, bridges, detention basins, retention basins, pump stations, and other facilities. Infrastructure includes 600 miles of combined sewers; 2,700 miles of sanitary sewers; over 260 pumping stations; and 1,400 miles of lateral connections. The District maintains and operates five wastewater treatment plants with the following treatment capacities: Morris Forman (120 MGD), Derek R. Guthrie (60 MGD), Cedar Creek (7.5 MGD), Floyd's Fork (6.5 MGD), and Hite Creek (6 MGD). The Morris Forman facility provides biosolid processing for all five wastewater treatment plants in the District.

The District locates, builds and promotes green infrastructure projects to reduce stormwater runoff through its Green Infrastructure Program. Additionally, the District is part of the One Water Initiative, a partnership

with Louisville Water. The goal of the initiative is to share certain resources and promote efficiencies to deliver clean, safe water services to the community. In addition, the District participated in developing the *Prepare Louisville* Climate Adaptation Plan, a metro-wide plan to reduce greenhouse gas emissions 80% by 2050. Every two years the District releases *State of the Streams*, a water quality report that measures the health of surrounding streams through analysis of: fish, insects, algae, bacteria, suspended solids, water temperature and flow measurements from in-stream meters. Improvements in water quality and environmental progress can be attributed to projects going back to 2005.

In 2005, the District entered into a Consent Decree agreement with the federal government and State of Kentucky. The decree required the District to mitigate and manage combined sewer overflows and end sanitary sewer overflows. Following a 2009 amendment to the Consent Decree, the District created the Integrated Overflow Abatement Program (“IOAP”). Since 2010, the District has been fully compliant with the Consent Decree, completing projects on-time and under budget.¹

CONFORMANCE WITH CLIMATE BONDS STANDARD AND SECTOR CRITERIA

The District engaged Kestrel Verifiers to provide an independent verification on alignment of the Series 2022A Bonds with the Climate Bonds Standard (V3.0) and Certification Scheme, and the *Water Infrastructure* Sector Criteria. The Climate Bonds Initiative (“CBI”) administers the Standard and Sector Criteria. Additionally, Kestrel Verifiers examined alignment of the Series 2022A Bonds with the United Nations Sustainable Development Goals (“UN SDGs”).

Kestrel Verifiers is a Climate Bonds Initiative Approved Verifier. The Kestrel Verification Team included environmental scientists and financial professionals. We performed a Reasonable Assurance engagement to independently verify that the bonds meet relevant criteria, in all material respects.

For this engagement, Kestrel Verifiers reviewed the District’s bond disclosure documentation, Green Bond Framework, documentation on the allocation and uses of bond proceeds, as well as relevant planning documents and alignment to the District’s overarching climate objectives. We examined public and non-public information and interviewed key staff from the District. Our goal was to understand the planned use of proceeds, procedures for managing proceeds, and plans and practices for reporting in sufficient detail to verify the bonds.

Relevant Climate Bonds Sector Criteria and Other Standards

The Series 2022A Bonds align with the Climate Bonds Standard (V3.0) and *Water Infrastructure* Criteria (Version 3).

Assurance Approach

Kestrel Verifiers’ responsibility was to conduct a Reasonable Assurance engagement to determine whether the Series 2022A Bonds meet, in all material respects, the requirements of the Climate Bonds Standard. Our Reasonable Assurance was conducted in accordance with the Climate Bonds Standard (V3.0) and the *International Standard on Assurance Engagements (ISAE) 3000: Assurance Engagements Other than Audits or Reviews of Historical Financial Information*. Information relating to this engagement and the Verifier’s and Issuer’s Responsibilities, and Independence and Quality Control are available in Appendices B and C.

Kestrel Verifiers has relied on information provided by the District. There are inherent limitations in performing assurance, and fraud, error or non-compliance may occur and not be detected. Kestrel Verifiers is not responsible or liable for any opinions, findings or conclusions within the information provided by the District that are incorrect. Our assurance is limited to the District’s policies and procedures in place as of December 2021. The distribution and use of this verification report are at the sole discretion of the District. Kestrel Verifiers does not accept or assume any responsibility for distribution to any other person or organization.

¹ The Consent Decree project completion date was originally set at 2024, but priorities shifted when a series of system emergencies required immediate CIP funding. In late 2019, the District began negotiating with the EPA to defer Consent Decree work to focus on other CIP priorities. If approved by all parties, the updated Consent Decree project completion date is 2035.

Use of Proceeds

Proceeds of the Series 2022A Bonds will be used to pay at maturity, redeem, and refund Commercial Paper Notes and Direct Purchase Notes (“Program Notes”) previously issued by the District to finance capital improvements to the wastewater, stormwater, and flood protection systems (collectively, “Projects”).

Consent Decree Projects

A substantial portion of proceeds will refinance Program Notes which financed capital improvements to fulfill federal Consent Decree obligations, and complete construction and modernizations outlined in the Integrated Overflow Abatement Plan (“IOAP”). When a wastewater treatment plant has violated US Environmental Protection Agency (“EPA”) testing standards, or exceeded combined sewer overflow or sanitary sewer overflow rules, the permit holder typically enters into a consent decree with the EPA. The consent decree dictates certain improvements which must be made within a given timeframe. Kestrel views projects in response to a consent decree as generally having positive environmental impact, with the understanding that required infrastructure upgrades are an opportunity to improve sustainability and reliability of the system overall.

A significant portion of the District’s bond-financed Consent Decree projects relate to combined sewer overflows (“CSO”) and sanitary sewer overflows (“SSO”). Under certain conditions, systems that lack capacity can allow untreated sewage to spill, resulting in contamination of waterways. CSO to SSO conversion projects eliminate pollution-prone combined sewer systems by constructing separate stormwater infrastructure. The District’s CSO Long-Term Control Plan (“LTCP”), which is part of the IOAP, is expected to result in capture and treatment of approximately 98% of wet-weather combined flows in an average year. As a result, the volume of CSO discharges (spills) would be reduced 89% relative to baseline conditions in 2008. The District’s Sanitary Sewer Discharge Plan (“SSDP”), also part of IOAP, intends to eliminate all sanitary sewer overflows to project-specific levels of control. SSDP projects mitigate system capacity issues caused by wet weather inflow and infiltration. SSO projects are expected to eliminate 145 sewage spills per year (290 million gallons of untreated wastewater) relative to 2005 to 2007 data. The SSO projects are also expected to significantly improve water quality.

While a majority of the District’s Consent Decree projects are focused on CSOs, other types of wastewater, stormwater and flood protection projects are also required under the Consent Decree. A partial list of bond-financed Consent Decree projects include:

- Various CSO projects
- Ohio River Tunnel Project
- Emergency dewatering projects
- Sewer rehabilitation and repairs
- Interceptor projects
- Odor and corrosion control
- Collection system upgrades
- Green infrastructure upgrades
- Capacity Management Operations and Maintenance Program, Sewer Capacity Assurance Program, and Fats, Oils and Greases projects

Projects Separate from the Consent Decree

Multiple wastewater, stormwater and flood protection projects that are not part of the Consent Decree will be financed through the Series 2022A Bonds. Projects include upgrades to dewatering equipment, pump repairs, expansion of supervisory control and data acquisition system, stream monitoring and stormwater system data collection, and tree planting. Projects also include emergency preparedness planning, floodplain management, drainage projects for flood mitigation, and Ohio River flood protection system projects which include levees, floodwalls, gates, modernized pumping systems to improve resilience, and expanded capacity of pumping stations.

Table 1. Significant Consent Decree (“CD”) and Non-Consent Decree (“Non-CD”) projects with positive environmental impact

Project Description (CD / Non-CD)	Project Category	Environmental Impact	Approximate 2022A Bond Proceeds Allocated to Project ²
Ohio River Tunnel (CD)	IOAP – Long Term Control Plan	The Ohio River Tunnel, or the Waterway Protection Tunnel, is expected to capture water from 25 CSO locations and prevent release of 439 million gallons of wastewater and rainwater from entering waterways. The project expands greenspace and restoration at the Beargrass Creek Trailhead and includes a rain garden and wetland. The tunnel itself is 20 feet in diameter and four miles long, and is intended to capture and hold overflows until the Morris Forman Water Quality Treatment Center has treatment capacity available.	\$39,550,167
Morris Forman Water Quality Treatment Center LG Dryer Replacements FY21 (Non-CD)	Regulatory	Dryer replacements at the Morris Forman Water Quality Treatment Center will improve the efficiency of biosolids processing and replace older inefficient infrastructure. The project meets short-term needs and increases long-term resiliency for biosolids management process. The District will pursue a thermal hydrolysis pretreatment process to create usable biogas to ultimately produce approximately 4 MW of power.	\$26,240,758
Broadway INT Infrastructure Rehabilitation (CD)	Critical Sewer	Rehabilitation of the Broadway Interceptor is critical to maintaining reliability and sustainability of the system. Prevention of catastrophic failures significantly reduces the likelihood of resource-intensive and unnecessary comprehensive infrastructure replacements, and reduces public health and ecological risks.	\$24,824,283
Derek Guthrie Water Quality Treatment Center Dewatering Emergency Contract (Non-CD)	Regulatory	Dewatering system replacement at the Derek Guthrie Water Quality Treatment Center will increase efficiency of biosolids processing and allow for production of Grade A fertilizer for beneficial reuse. The upgrades are part of the long-term solution for biosolids management.	\$20,975,493

Environmental Benefits

The Louisville and Jefferson County Metropolitan Sewer District uses comprehensive planning tools to ensure that projects have significant environmental benefits. By reducing combined sewer overflows and sanitary sewer overflows to meet its obligations under the Consent Decree, and also incorporating green infrastructure in its flood control, stormwater, and wastewater systems, the District is demonstrating leadership in integrated water resource management. Multiple basin-scale assessments outline the significance of the Ohio River for water supply, navigation, hydroelectricity, agriculture, fish and wildlife habitat, and lay out the importance of good stewardship.³ The Ohio River runs through 15 states and over 25 million people reside in its watersheds, or approximately 10% of the US population. The Series 2022A projects address critical maintenance needs which directly protect water quality.

² Rounded to the nearest dollar. Preliminary budget, subject to change.

³ “Plan for the Ohio River Basin 2020-2025,” US Army Corps of Engineers, accessed December 17, 2021, https://www.lrh.usace.army.mil/Portals/38/docs/orba/Plan%20for%20the%20Ohio%20River%20Basin_FINAL.PDF?ver=s5zhd_NFTAZ7ao0bWhBLpA%3D%3D.

“Ohio River Basin Comprehensive Reconnaissance Report,” US Army Corps of Engineers, 2009, <https://www.lrh.usace.army.mil/Portals/38/docs/orba/Ohio%20River%20Basin%20Comp%20Recon%20Study%20-%20Dec%202009.pdf>.

“Ohio River Basin-Formulating Climate Change Mitigation/Adaptation Strategies through Regional Collaboration with the ORB Alliance,” US Army Corps of Engineers and Ohio River Basin Alliance, Institute for Water Resources, Responses to Climate Change Program, 2017, https://www.lrh.usace.army.mil/Portals/38/docs/orba/USACE%20Ohio%20River%20Basin%20CC%20Report_MAY%202017.pdf.

Green Infrastructure

Nature-based solutions, also called “green infrastructure” in the context of stormwater management, harness natural processes to protect habitat and improve water quality and flood protection. The District’s Design Manual integrates current science and research on design and best practices for green infrastructure and the District adds green infrastructure into many of its systems. Bioswales, rain gardens, green roofs, and permeable pavement and sidewalks are common features. MSD may directly fund and construct projects, but also provides incentives and education for green installations on private property.

Louisville Climate Adaptation Planning

Many of the bond-financed projects also advance goals set out in *Prepare Louisville*, a plan which outlines necessary actions for the City of Louisville to adapt to climate change. Primary strategies related to Healthy Residents, Natural Capital and Resilient Infrastructure have a strong intersection with Louisville MSD’s projects. The District’s Design Manual and Critical Repair and Reinvestment Plan are both aligned with the *Prepare Louisville* plan and projected changes in rainfall and other conditions as a result of climate change are accounted for in project planning.⁴

Sector Criteria for Water Infrastructure (Version 3)

The Series 2022A bond-financed activities align with CBI’s *Water Infrastructure* Sector Criteria and the associated Mitigation and/or Adaptation and Resilience requirements.

Mitigation Requirements: It is Kestrel Verifiers’ opinion that there will be no net increase in greenhouse gas (GHG) emissions as a result of financed projects. Financed activities primarily address wastewater and stormwater collection and conveyance which are not expected to have significant impacts on GHG emissions. The list of bond-financed projects includes multiple activities which will significantly increase operational efficiency, including replacement of aging or inefficient infrastructure; installation of variable frequency drive pumps; and real-time control technology, enabled by SCADA, which creates measurable increases in operational and energy efficiency. Stewardship of natural resources, including watershed management and the District’s green infrastructure program, will support preservation and enhancement of soil health and ecosystem functions to minimize emissions.

Adaptation and Resilience Requirements: A detailed vulnerability assessment including evaluation of Allocation, Governance, Diagnostics, Nature Based Solutions, and Adaptation Plan Assessment shows that the District has sufficient infrastructure and planning processes to meet the requirements of the Adaptation and Resilience component of the *Water Infrastructure* Criteria (Appendix D). In each area, the District achieved a score of at least 60%.

Process for Evaluation and Selection of Projects and Assets

Compliance with the federal Consent Decree, internal risk mitigation criteria, value-based environmental benefit assessments, public and stakeholder input, and consideration of climate change adaptation all inform the prioritization of wastewater and stormwater capital projects. The District’s primary planning documents are the Consent Decree planning document, the Integrated Overflow Abatement Program, and the 20-Year Critical Repair and Reinvestment Plan (“Facility Plan”).

Under the Consent Decree, the District is required to eliminate sanitary sewer overflows and unauthorized discharges from its sanitary sewer system, combined sewer system and wastewater treatment plants and address discharges from key locations identified in the Kentucky Pollutant Discharge Elimination System permit for MSD’s Morris Forman Water Quality Treatment Center. The District developed a Consent Decree planning document with detailed requirements to help select capital projects. To choose and prioritize capital projects that fulfill Consent Decree obligations, the District also relies on public input⁵ and guidance from

⁴ The District’s Design Manual (referenced in the Facility Plan) accounts for climate change by incorporating the Rainfall Analysis Update and the Atlas 14 update that are performed by the National Oceanic and Atmospheric Administration. Atlas 14 is an ongoing analysis of historical rainfall data which is used to provide projections of expected future rainfall volumes.

⁵ The District employs a multi-pronged approach to communicate the effects of capital projects on communities to the public and Metro City Council members. For example, the Waterway Protection Tunnel replaced four offline storage basins to mitigate CSOs. This change significantly reduced construction impacts, removed the need for any above-ground basins, and increased storage capacity. Additionally, structured engagement surveys are used to garner opinion on what is left behind after the project is completed.

the Wet Weather Team Stakeholder Group—a group of elected officials, Metro City Council Members, academic institutions, community groups, emergency services, and public health workers.

The Integrated Overflow Abatement Program (“IOAP”) also informs the process for evaluating and selecting capital projects. Essential projects in the IOAP are evaluated with the District’s value-based benefits which are: uphold the health and safety of the public, environmental protection, sustainability, economic vitality, and the goal to meet all regulatory standards within the Consent Decree on schedule. The District also uses the IOAP Cost Tool to assess the cost of improvements. The District aims to maintain affordability on behalf of its consumers and selects projects that will keep rates near regional averages.

Additionally, the District uses risk mitigation criteria to evaluate and prioritize projects. The District evaluated the benefits of proposed capital projects alongside the probability and consequence of certain events. Projects that address events with high probability and high consequence are considered “critical” and prioritized. In response to the increased frequency of extreme weather and other emergencies, the District reprioritizes projects as needed to ensure public health and safety and protect property.

The District also integrates climate change adaptation into planning processes. The Facility Plan sets clear goals to improve wastewater, stormwater, and drainage system efficiencies. Within the Facility Plan, the District cites the increased frequency of extreme storms (citing 2035 and 2065 forecasting) and the heightened need for reliable, sustainable stormwater management. Climate change has been considered in all applicable projects financed with the Series 2022A Bonds and this consideration has, for the most part, resulted in increased project size and impact.

Management of Proceeds

Proceeds from Program Notes are managed by the District within distinct accounts which are not comingled with other funds of the District. Similarly, proceeds of the Series 2022A Bonds will also be tracked separately from District funds. The District’s Department of Finance is responsible for tracking proceeds and allocating them to the outstanding Program Notes (comprised of Commercial Paper Notes and Direct Purchase Notes). Upon closing, Series 2022A Bond proceeds will be allocated to redeem or refund outstanding Program Notes within 60 to 90 days or will be used to pay certain outstanding Program Notes at maturity. Proceeds may be temporarily invested in money market accounts prior to spending.

Reporting

The District will submit annual continuing disclosures to the Municipal Securities Rulemaking Board (“MSRB”) through the Electronic Municipal Market Access (“EMMA”) system so long as the Series 2022A Bonds are outstanding. In accordance with the Climate Bonds Standard, Kestrel Verifiers will be engaged to provide one Post-Issuance Report within 24 months of issuance to confirm continued conformance of the Series 2022A Bonds with the relevant Standards and Criteria. So long as the Series 2022A Bonds are outstanding, the District also expects to provide voluntary annual update reports on EMMA and the District’s BondLink website. The content of these reports may include use of proceeds and impact reporting metrics. The District also has many other ongoing reporting requirements related to CSO compliance, water quality parameters and its NPDES⁶ permits.

IMPACT AND ALIGNMENT WITH UN SDGS

The Projects address UN SDGs 6, 9, 12 and 13. By financing projects with green infrastructure that improve wastewater, stormwater, flood protection systems, and mitigate overflows, the Series 2022A Bonds advance Targets 6.3, 9.4, 12.2, 13.1. Funds and planning for water resource activities also support Target 6.5. Full text of the Targets for Goals 6, 9, 12, and 13 is available in Appendix A, with additional information available on the United Nations website: www.un.org/sustainabledevelopment



⁶ National Pollution Discharge Elimination System



Clean Water and Sanitation (Target 6.3, 6.5)

Possible Indicators

- Increased storage capacity for influent
- Amount of treated wastewater
- Documentation of integrated water resource management
- Optimized operation of sustainably managed wastewater systems
- Proportion of stormwater captured
- Number of CSO or SSO events in dry or wet weather conditions



Industry, Innovation and Infrastructure (Target 9.4)

Possible Indicators

- Proportion of funds financing sustainable wastewater and stormwater infrastructure projects
- Increased resource use efficiency (energy or other)



Responsible Consumption and Production (Target 12.2)

Possible Indicators

- Increased energy efficiency
- Improved water quality as a result of financed activities
- Reduction in inflow and infiltration



Climate Action (Target 13.1)

Possible Indicators

- Number of flood risk reduction projects

ASSURANCE STATEMENT AND CONCLUSIONS

Based on the Reasonable Assurance procedures we have conducted, in our opinion, the Sewer and Drainage System Revenue Bonds, Series 2022A conform, in all material respects, with the current Climate Bonds Standard, and the bond-financed activities are completely aligned with the *Water Infrastructure* Sector Criteria. The District is demonstrating leadership in integrated water resource management by reducing CSOs and SSOs to comply with Consent Decree obligations and by integrating green infrastructure while financing upgrades to the flood control, stormwater, and wastewater systems.

Sincerely,

April Strid, Lead Verifier
 Kestrel Verifiers
 Hood River, Oregon, United States
 December 27, 2021

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ABOUT KESTREL VERIFIERS



For over 20 years Kestrel has been a trusted consultant in sustainable finance. Kestrel Verifiers, a division of Kestrel 360, Inc. is a Climate Bonds Initiative Approved Verifier qualified to verify transactions in all asset classes worldwide. Kestrel is a US-based certified Women’s Business Enterprise.

For more information, visit www.kestrelverifiers.com

DISCLAIMER

This Verifier's Report ("Opinion") aims to explain how and why the discussed financing meets the CBI Climate Bonds Standard based on the information which was available to us during the time of this engagement (December 2021) only. By providing this Opinion, Kestrel Verifiers is not certifying the materiality of the projects financed by the Climate Bonds. It was beyond Kestrel Verifiers' scope of work to review for regulatory compliance and no surveys or site visits were conducted. Furthermore, we are not responsible for surveillance on the project or use of proceeds. Kestrel Verifiers relied on information provided by the District and publicly available information. The Opinion delivered by Kestrel Verifiers does not address financial performance of the Climate Bonds or the effectiveness of allocation of its proceeds. This Opinion does not make any assessment of the creditworthiness of the District, or its ability to pay principal and interest when due. This is not a recommendation to buy, sell or hold the Bonds. Kestrel Verifiers is not liable for consequences when third parties use this Opinion either to make investment decisions or to undertake any other business transactions. This Opinion may not be altered without the written consent of Kestrel Verifiers. Kestrel Verifiers reserves the right to revoke or withdraw this Opinion at any time. Kestrel Verifiers certifies that there is no affiliation, involvement, financial or non-financial interest in the District or the projects discussed. We are 100% independent. Language in the offering disclosure supersedes any language included in this Verifier's Report.

Use of the United Nations Sustainable Development Goal (SDG) logo and icons does not imply United Nations endorsement of the products, services or bond-financed activities. The logo and icons are not being used for promotion or financial gain. Rather, use of the logo and icons is primarily illustrative, to communicate SDG-related activities.

Appendix A.

UN SDG TARGET DEFINITIONS

Target 6.3

By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing the proportion of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.

Target 6.5

By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.

Target 9.4

By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities.

Target 12.2

By 2030, achieve the sustainable management and efficient use of natural resources.

Target 13.1

Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries



Appendix B.

ASSURANCE PROCEDURES

REQUIREMENT	ASSURANCE PROCEDURES
1. Use of Proceeds	
1.1 Project Documentation	Review documentation of the Nominated Projects assessed as likely to be Eligible Projects, and list of Nominated Projects that Issuer will keep up-to-date during the term of the bond.
1.2 Valuation	Review net proceeds of the bond to ensure they are not greater than the value of the project.
1.3 Multiple Nominations for Certified Debt Instruments	Review Nominated Projects for previous nominations to other Certified Climate Debt Instruments, green bonds, or other designated instruments.
1.3.1 Nominations to Other Debt Instruments	Review Nominated Projects to determine whether certain portions are being financed by separately designated Certified Debt Instruments.
1.3.2 Refunding Existing Certified Climate Debt	Review and confirm whether Nominated Projects have been refinanced by other Certified Debt Instruments or bonds under assessment will refinance existing Certified Debt Instruments.
2. Process for Project Evaluation and Selection	
2.1 Environmental Statement & Process (2.1.1-2.1.4)	Review statement of the climate-related objectives of the bond. Review documentation of the process that the Issuer followed to identify projects and confirm eligibility requirements for inclusion of Nominated Projects in the bond. Review planning documents which establish goals, priorities and potential impact.
2.2 Eligibility (2.2.1-2.2.2)	Review additional documentation Issuer provided on further aspects of identification process including strategic directions and standards. Review the Issuer's environmental and social integrity policy, and/or Green Bond Framework, and confirm its coverage of the Nominated Projects.
2.3 Taxonomy & Technical Criteria	Test Nominated Projects to determine whether they meet the minimum technical requirements of the Climate Bonds Standard and relevant Sector Criteria (Part C: Eligibility of Projects and Assets).
3. Management of Proceeds	
3.1 Documentation of Processes & Procedures	Confirm that the policies, processes and procedures for tracking financial flows of the bond proceeds to the Nominated Projects are in place.
3.1.1 Tracking of Proceeds	Review the allocation of funds to ensure they can be tracked against Nominated Projects.
3.1.2 Managing of Unallocated Proceeds	Review documentation for the management of bond proceeds for funds that are not allocated to a Nominated Project and review eligible temporary investments for unallocated proceeds.
3.1.3 Earmarking Funds	Confirm that the policies, processes and procedures to identify flows of proceeds related to the Bond have been established.
4. Reporting	
4.1 Bond Disclosure Documentation	Review the Issuer's Green Bond Framework and confirm plans to make the document publicly available. Confirm inclusion of necessary information within the Green Bond Framework.
4.1.1 Confirmation of Alignment	In the Green Bond Framework, confirm documentation and review areas of investment align with the Climate Bonds Standard and review statements of alignment with other relevant standards.
4.1.2 Uses of Proceeds	In the Green Bond Framework, confirm documentation and review expected uses of proceeds and the amounts allocated to activities in relevant sectors and subsectors.

REQUIREMENT	ASSURANCE PROCEDURES
4.1.3 Decision-making Process	In the Green Bond Framework, confirm documentation of decision-making processes and positioning in the context of the Issuer’s overarching objectives.
4.1.4 Sector Criteria Assumptions and Methodologies	In the Green Bond Framework, confirm documentation of assumptions and methodologies to evaluate conformance with Sector Criteria.
4.1.5 Temporary Investment Instruments	In the Green Bond Framework, confirm documentation of allowable temporary investment instruments.
4.1.6 Reporting Approach	In the Green Bond Framework, confirm disclosure of intended approach to providing Update Reports and/or undertaking periodic Assurance Engagements during term of bond to reaffirm conformance with the Climate Bonds Standard.
4.1.7 List of Nominated Projects	In the Green Bond Framework, confirm disclosure of list of Nominated Projects likely to be eligible.
4.1.8 Refinancing	In the Green Bond Framework, confirm disclosure of proportion of proceeds for refinancing, if applicable.
4.2 Disclosure Documentation	Confirm incorporation of key information in Disclosure Documentation.
4.2.1 Sector Criteria Disclosure	Confirm “investment areas,” or alignment with the Climate Bonds Taxonomy and relevant Sector Criteria for Nominated Projects.
4.2.2 Temporary Investments	Confirm disclosure of eligible temporary investments for unallocated proceeds.
4.2.3 Verifier	Confirm disclosure of Verifier selected for Pre-Issuance and Post-Issuance Engagements.
4.2.4 Ongoing Reporting	Confirm disclosure of intended ongoing reporting on the Nominated Projects and allocation of proceeds.
4.2.5 CBI Disclaimer	Confirm incorporation of the CBI Disclaimer as provided in the Certification Agreement.



Appendix C.

RESPONSIBILITIES AND QUALITY CONTROL

Verifier's Responsibilities

Kestrel Verifiers' responsibilities for confirming alignment of the Series 2022A Bonds with the Climate Bonds Standard and *Water Infrastructure* Criteria include:

- assess and certify the District's internal processes and controls, including selection process for projects and assets, internal tracking of proceeds, and the allocation system for funds;
- assess policies and procedures established by the District for reporting;
- assess the readiness of the District to meet the Climate Bonds Standard (V3.0) and *Water Infrastructure* Sector Criteria; and
- express a Reasonable Assurance conclusion.

Issuer's Responsibilities

Issuer was responsible for providing detailed information and documents relating to:

- The details of the Nominated Projects and Assets and the project selection process;
- Maintaining adequate records and internal controls designed to support the Climate Bond Pre-Issuance Certification process; and
- The collection, preparation, and presentation of the subject matter in accordance with the Climate Bonds Standard and Criteria.

Independence and Quality Control

Kestrel Verifiers provides green bonds advisory services for corporate and public finance issuers. The Kestrel Verification Team is committed to providing robust, transparent, and accurate verifications. For over 20 years Kestrel has been a trusted advisor to state and local governments, nonprofits, and corporations. Kestrel certifies that there is no affiliation, involvement, financial or non-financial interest in the Issuer or the projects discussed. Accredited as an Approved Verifier by the Climate Bonds Initiative, Kestrel is qualified to evaluate bonds against the Climate Bonds Initiative Standards and Criteria.



Appendix D.

CLIMATE BONDS STANDARD WATER INFRASTRUCTURE ADAPTATION & RESILIENCE SCORECARD

CONTENTS

1. Allocation
2. Governance
3. Technical Diagnostics
4. Nature Based Solutions
 - 4.1. Site Inventory
 - 4.2. Ecological Baselines For Management
 - 4.3. Data Inventories of Localized & Indigenous Assets
 - 4.4. Broader Ecosystem Impacts
 - 4.5. Monitoring & Management Systems
5. Adaptation Plan

CRITERIA: The project must score at least 60% of the maximum potential score in all parts of the Scorecard. Section 4 only needs to be completed for “Nature Based and Hybrid Infrastructure” only (see Criteria for detail)

Vulnerability Assessment - Section 1: Allocation					
(To be completed for all Water Infrastructure assets)					
		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
1.1	Are there accountability mechanisms in place for the management of water allocation that are effective at a sub-basin and/or basin scale?	1	1	Disclosure	<p>Several plans outline management of water allocations both locally in Louisville and at the Ohio River Basin scale.</p> <p>Louisville Water Company is responsible for providing drinking water services in Louisville and surrounding areas. Water supply is sourced from the Ohio River upstream from downtown Louisville at the Zorn Avenue Pumping Station (which is part of Crescent Hill Water Treatment Plant). Water is also sourced from wells in the aquifer adjacent to the Ohio River at the B.E. Payne Water Treatment Plant. These wells use deep soils to filter water prior to conventional treatment in the B.E. Payne facility. Deep collector wells pull water through sands and gravel that naturally remove contaminants from the water.</p> <p>Louisville Water is permitted by the Kentucky Division of Water for Ohio River withdrawals. The daily draw from the river and the aquifer is less than 0.2% of the 75-billion-gallon average daily flow.</p> <p>Ohio River protection and monitoring are coordinated by the Ohio River Valley Water Sanitation Commission (ORSANCO), an interstate agency which manages and protects the Ohio River. Louisville Water Company is on the Water Users Advisory Committee.</p> <p>(Louisville Water Company, 2019 Official Statement https://emma.msrb.org/ER1391021.pdf; Kentucky Division of Water; Louisville Water Company Source Water Protection Program required through the Safe Drinking Water Act)</p>

Vulnerability Assessment - Section 1: Allocation

(To be completed for all Water Infrastructure assets)

		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
1.2	Are the following factors taken into account in the definition of the available resource pool?	7	4	Evidence	This factor reviewed at the basin-scale. The Ohio River is critical to inland transportation and connections to the Mississippi and Tennessee-Tombigbee rivers, municipal and industrial water supplies, recreation, and hydroelectric facilities.
	a. Non-consumptive uses (e.g., navigation, hydroelectricity)		Y		Yes, inland navigation systems are included in reconnaissance research and plans from the USACE. (USACE Ohio River Basin Comprehensive Reconnaissance Report)
	b. Environmental flow requirements		N		Not identified
	c. Dry season minimum flow requirements		N		Not identified
	d. Return flows (how much water should be returned to the resource pool, after use)		N		Not identified
	e. Inter-annual and inter-seasonal variability		Y		Variability is accounted for at basin-wide and sub-basin scales. It is considered in permitting through the state Department for Environmental Protection through supply assessments and infrastructure planning for the District (Critical Repair and Reinvestment Plan)
	f. Connectivity with other water bodies		Y		Watershed management plans and assessments of climate change impacts include considerations of connected water bodies.
	g. Climate change impacts		Y		Discussed and considered in Ohio River Basin - Climate Change Pilot Study Report (factors such as temperature, shifts in industry, and increased frequency of extreme weather events are considered) (USACE and ORBA Formulating Climate Change Mitigation/Adaptation Strategies). Also included in the District's Critical Repair and Reinvestment Plan.

Vulnerability Assessment - Section 1: Allocation

(To be completed for all Water Infrastructure assets)

		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
1.3	Are arrangements in place to accommodate the potentially adverse impacts of climate change on the resource pool? (E.g., using best available science to plan for future changes in availability, undertaking periodic monitoring and updating of plans as climate science improves.)	1	1	Evidence	<p>The Critical Repair and Reinvestment Plan accommodates projections of potential adverse impacts from climate change in areas related to wastewater, stormwater, and flood protection. The Prepare Louisville Plan outlines necessary activities to accommodate projected increased frequency of extreme weather events and potential for flooding.</p> <p>Efforts to reduce regional GHG emissions and plan for and mitigate extreme heat events, which can cause failure in electrical and water delivery systems, are also underway. High heat leads to significant increases in water demand and can increase stress on critical infrastructure (Louisville Urban Heat Management Study).</p> <p><i>“As climate change and regional development lengthen periods in excess of these temperature thresholds, water delivery systems may be increasingly stressed, resulting in potential water main breaks and increasing the cost of managing these systems. Mitigation of the urban heat island effect provides a set of management strategies that can extend the life and efficient performance of critical urban infrastructure.”</i></p>
1.4	Are arrangements in place to accommodate the potentially adverse impacts of climate change on the resource pool? (E.g., using best available science to plan for future changes in availability, undertaking periodic monitoring and updating of available pool.)	1	1	Evidence	<p>Louisville MSD is committed to an adaptive management approach to accommodate changing conditions and to respond to data collected through monitoring networks (IOAP). The 20-year Facility Plan includes projected rainfall intensity, duration, and frequency (IDF) curves for 2035 (reflecting and accounting for potential impacts from climate change” (Facility Plan p. 4)).</p>
1.5	Are there plans to define “exceptional” circumstances, such as an extended drought, that influence the allocation regime? (E.g., triggers water use restrictions, reduction in allocations according to pre-defined priority uses, suspension of the regime plan, etc.)	1	1	Evidence	<p>Water shortage response plans are required by the Kentucky Department for Environmental Protection. Louisville’s Hazard Mitigation Plan includes definitions and defines triggers related to hazards and “exceptional circumstances” such as flooding, storms, extreme heat, and drought. The Kentucky Division of Water monitors hydrologic conditions throughout the state, including drought indices across 15 Drought Management Regions. Flooding conditions are also a key determinant of operations</p> <p>(https://louisvillemsd.org/sites/default/files/inline-files/lm_hmp_2016_final.pdf and 2019 update: https://louisvillemsd.org/programs/programs-and-projects/floodplain-management/flood-related-documents)</p>
1.6	For international / trans boundary basins, is there a legal mechanism in place to define and enforce water basin allocation agreements?	1	0	Disclosure	Not identified
1.7	Are water delivery agreements defined on the basis of actual in situ seasonal / annual availability instead of volumetric or otherwise inflexible mechanisms?	1	1	Evidence	<p>Withdrawals from the Ohio River are permitted based on the rated treatment capacity. (Permits through the Kentucky Division of Water) (e.g., 2019 Louisville Water Company OS: https://emma.msrb.org/ER1391021.pdf)</p>

Vulnerability Assessment - Section 1: Allocation

(To be completed for all Water Infrastructure assets)

		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
1.8	Has a formal environmental flows (e- flows)/sustainable diversion limits or other environmental allocation been defined for the relevant sub-basin or basin? (If there is a pre-existing plan, then has the environmental flows program been updated to account for the new project?)	1	1	Evidence	Allowable discharges are permitted and monitored on a consistent basis. The Consent Decree required elimination of SSOs and control of CSOs. Additionally, reservoir storage and withdrawals must not “endanger other authorized purposes (e.g., flood control, recreation, low-flow augmentation, fish and wildlife habitat, etc.)” (USACE Ohio River Basin Comprehensive Reconnaissance Report, p. 49).
1.9	Have designated environmental flows / allocation programs been assured / implemented?	1	0	Evidence or Disclosure	Not identified
1.10	Has a mechanism been defined to update the environmental flows plan periodically (e.g., every 5 to 10 years) in order to account for changes in allocation, water timing, and water availability?	1	1	Evidence	Sanitary Surveys by the Kentucky Department of Environmental Protection are completed every three years for community water systems and includes an assessment of source water and infrastructure adequacy.
1.11	Is the amount of water available for consumptive use in the resource pool linked to a public planning document? (E.g., a river basin management plan or another planning document – please indicate)	1	1	Evidence	Defined by permitting regulations and supply adequacy assessments (Title 401 – Energy and Environment Cabinet – Department for Environmental Protection Chapter 4 – Water Resources and https://eec.ky.gov/Environmental-Protection/Water/Protection/Pages/WaterWithdrawal.aspx).
1.12	If present, is the river basin plan a statutory instrument that must be followed rather than a guiding document?	1	1	Disclosure	The consent decree is a federally enforceable agreement for the District (https://louisvillemsd.org/consent-decree).
Total Allocation Score		18	13/18		
Eligibility Criterion 1 passed/not passed			72%		Passed

Vulnerability Assessment - Section 2: Governance

(To be completed for all Water Infrastructure assets)

		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
2.1	<p>Have water entitlements been defined according to one of the following?</p> <ul style="list-style-type: none"> ▪ Purpose that water may be used for ▪ Maximum area that may be irrigated ▪ Maximum volume that may be taken in a nominated period ▪ Proportion of any water allocated to a defined resource pool 	1	1	Disclosure	<p>Entitlement is defined by the <i>proportion of any water allocated to a defined resource pool and maximum volume that may be taken in a nominated period</i> through the Kentucky Division of Water. Entitlements must disclose uses (domestic, industrial, commercial, municipal) and meet supply adequacy requirements to ensure base-level flows for any given water supply reservoir. Supply adequacy must also account for aquatic life, recreational uses, water conservation and demand management, quantity impacts as a result of the withdrawals, downstream or down-gradient impacts, and competing uses (Title 401 – Energy and Environment Cabinet – Department for Environmental Protection Chapter 4 – Water Resources).</p> <p>Also of note: “Due to the abundant supply in the River, the [Louisville Water Company] anticipates no volume restrictions on its licenses to withdraw water from the Ohio River or the aquifer in the future...The Company’s daily withdrawal from the Ohio River and its adjacent aquifer is less than 0.2% of the 75-billion-gallon average daily flow.” (Louisville Water Company 2019 Official Statement https://emma.msrb.org/ER1391021.pdf)</p>
	<p>Is the surface water system currently considered to be neither over allocated nor over-used?</p> <p>N.B. Over-allocated would be if e.g. current use is within sustainable limits but there would be a problem if all legally approved entitlements to abstract water were used.</p> <p>Over-used would be if existing abstractions exceed the estimated proportion of the resource that can be taken on a sustainable basis.</p>	1	1	Evidence	<p>The Ohio River Basin is not considered to be over-allocated. The primary concern for water management agencies is the potential for extreme weather events to become more common (USACE and ORBA Formulating Climate Change Mitigation/Adaptation Strategies, p. 19).</p>
2.3	<p>If monitored and the investment uses groundwater, is the groundwater water system currently considered to be neither over- allocated nor over-used?</p> <p>N.B. Over-allocated would be if e.g. current use is within sustainable limits but there would be a problem if all legally approved entitlements to abstract water were used.</p> <p>Over-used would be if existing abstractions exceed the estimated proportion of the resource that can be taken on a sustainable basis.</p>	1	1	Evidence	<p>The nominated assets do not directly involve groundwater resources. Nonetheless, groundwater in the Ohio River Basin originates from four primary aquifers: Pennsylvania/Mississippian, Glacial Aquifer, Mississippi Embayment, and Ozark Aquifers (USACE and ORBA Formulating Climate Change Mitigation/Adaptation Strategies, p. 20). The Mississippi Embayment is considered to be a depleted aquifer, but input from the (upstream) Ohio River is not commonly cited as a contributing factor (https://pubs.usgs.gov/sir/2013/5079/SIR2013-5079.pdf).</p>

Vulnerability Assessment - Section 2: Governance

(To be completed for all Water Infrastructure assets)

		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
2.4	Is there a limit to the proportion (e.g. percentage) of water that can be abstracted? How might this need to change if water supplies become more variable due to climate change? (e.g. will having sufficient amounts to meet basic human needs take precedence over others?)	1	1	Evidence	Permitted extraction must be followed
2.5	Are governance arrangements in place for dealing with exceptional circumstances (such as drought, floods, or severe pollution events), especially around coordinated infrastructure operations?	1	1	Disclosure	Louisville's Hazard Mitigation Plan defines triggers related to hazards and "exceptional circumstances" such as flooding, storms, extreme heat, and drought. The Kentucky Division of Water monitors hydrologic conditions throughout the state, including drought indices across 15 Drought Management Regions. Flooding conditions are also a key determinant of operations (Hazard Mitigation Plan and updates).
2.6	Is there a process for re-evaluating recent decadal trends in seasonal precipitation and flow OR recharge regime, in order to evaluate "normal" baseline conditions?	1	0	Evidence	Multi-decadal water resources assessments are required by the state environmental agency, and local stormwater modeling is updated to improve projections for changes in extreme weather events. The USACE has also completed an assessment of monitoring and projections for adaptation. Specific process or frequency of re-evaluations not identified.
2.7	Is there a formal process for dealing with new entrants?	1	1	Disclosure	New withdrawals in Kentucky are governed by Kentucky Energy and Environment Cabinet and require a specific set of procedures and assessments to comply, including supply evaluations and planning, water protection, and land-use evaluations affecting the resource pool (Title 401 - Energy and Environment Cabinet - Department for Environmental Protection Chapter 4 - Water Resources and https://eec.ky.gov/Environmental-Protection/Water/Protection/Pages/WaterWithdrawal.aspx).
2.8	For existing entitlements, is there a formal process for increasing, varying, or adjusted use(s)?	1	1	Disclosure	A formal process exists for updating the Consent Decree and the District's obligations under the agreement. Substantially adjusting operations, including withdrawal or discharges, requires permit adjustments. Adjustments or changes to drinking water supply sources or allocations requires notification and assessment through the KY permitting agency (Title 401 - Energy and Environment Cabinet - Department for Environmental Protection Chapter 4 - Water Resources).
2.9	Is there policy coherence across sectors (agriculture, energy, environment, urban) that affect water resources allocation, such as a regional, national, or basin-wide Integrated Water Resources Management (IWRM) plan?	1	1	Evidence	Multiple basin-wide cooperative planning and monitoring activities are in place. The Ohio River Valley Water Sanitation Commission, Ohio River Basin Alliance, and US Army Corps of Engineers are involved in IWRM planning (Plan for the Ohio River Basin 2020-2025).

Vulnerability Assessment - Section 2: Governance

(To be completed for all Water Infrastructure assets)

		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
2.10	Are obligations for return flows and discharges specified and enforced?	1	1	Disclosure	Obligations and requirements for discharge amount and potential negative impacts on water quality are specified and enforced through National Pollution Discharge Elimination System permitting through the Kentucky Department for Environmental Protection.
2.11	Is there a mechanism to address impacts from users who are not required to hold a water entitlement but can still take water from the resource pool?	1	0	Disclosure	Not identified
2.12	Is there a pre-defined set of priority uses within the resource pool? (E.g., according to or in addition to an allocation regime)	1	0	Disclosure	Not identified
2.13	If there are new entrants and/if entitlement holders want to increase the volume of water they use in the resource pool and the catchment is open, are these entitlements conditional on either assessment of third party impacts, an Environmental Impact Assessment (EIA) or an existing user(s) forgoing use?	1	1	Evidence	Depending upon the activity, activities affecting the Ohio River would be subject to a formal environmental review process (National Environmental Policy Act) and/or local environmental assessments. Submittal for permitting requires assessment of environmental impacts.
2.14	Are withdrawals monitored, with clear and legally robust sanctions?	1	1	Evidence	Withdrawals are recorded daily and reported monthly to the Kentucky Department for Environmental Protection through the Monitoring Results Submittal Form and Water Withdrawal Report Form. The District's NPDES permit also requires monitoring and reporting on discharges (General information from the Kentucky Energy and Environment Cabinet)
2.15	Are there conflict resolution mechanisms in place?	1	1	Disclosure	Formal processes for adjusting or requesting adjustments to a consent decree are in place. Additionally, procedures for conflict resolution related to water supply are outlined in Kentucky statues (Title 401 - Energy and Environment Cabinet - Department for Environmental Protection Chapter 4 - Water Resources).
Total Governance Score		15	12/15		
Eligibility Criterion 2 passed / not passed			80 %		Passed

Vulnerability Assessment - Section 3: Technical Diagnostics

(To be completed for all Water Infrastructure assets)

		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
3.1	Does a water resources model of the proposed investment and ecosystem (or proposed modifications to existing investment and ecosystem) exist? Specify model types, such as WEAP, SWAT, RIBASIM, USACE applications). Scale should be at least sub-basin.	1	1	Evidence	InfoWorks ICM is used for integrated water system and sanitary sewer system and combined sewer system modeling. HEC-RAS used for stormwater and watershed modeling.
3.2	Can the system model the response of the managed water system to varied hydrologic inputs and varied climate conditions?	1	1	Evidence	The model has dynamic inputs to address effects of varying conditions (such as addition/removal of structures, unique storm parameters and rainfall intensity-duration curves) on collection and treatment systems and other infrastructure in the District (MSD Design Manual).
3.3	Are environmental performance limits (ecosystem, species, ecological community) and/or ecosystem services specified?	1	1	Evidence	Environmental benefits analysis has set specific multi-year targets for projects (IOAP LTCP vol 2 p. ES-17). Projects also use ORSANCO data to tie directly into the impact they should have on the water quality.
3.4	Can these performance limits be defined and quantified using the water resources model?	1	1	Evidence	Yes, performance targets will be monitored and quantified through the model (IOAP LTCP vol 2 p. ES-17). ORSANCO data is not directly used to quantify impacts in the water resources model.
3.5	Have these limits been defined based on expert knowledge and/or scientific analysis?	1	1	Evidence	Environmental benefits and targets were set based on negotiations in the amended consent decree and involved parties.
3.6	Are these performance limits linked to infrastructure operating parameters?	1	1	Evidence	Yes, impacts of specific projects and their characteristics are tied to the modeled elimination of SSOs and other environmental benefits.
3.7	Are these limits linked to an environmental flows regime?	1	1	Evidence	The targets are related to certain storm scenarios and conditions which are likely to have adverse impacts on water quality (runoff, discharges, etc).
3.8	For new projects, is there an ecological baseline evaluation describing the pre-impact state?	1	1	Evidence	Yes, the Consent Decree is accompanied by baseline data/existing conditions and sets specific environmental targets to achieve through implementation of projects in the IOAP.
3.9	For rehabilitation / reoperation projects, is there an ecological baseline evaluation available before the projects was developed?	1	1	Evidence	Yes, the Consent Decree is accompanied by baseline data and sets specific environmental targets to achieve through implementation of projects in the IOAP.
3.10	Has there been an analysis that details impacts related to infrastructure construction and operation that has been provided?	1	1	Evidence	Hydraulic and hydrologic models are used to assess the impacts of construction or renovations. The District also requires evidence of no adverse downstream impacts as a result of new development in the Critical Repair and Reinvestment Plan.
3.11	Are lost species and/or lost or modified ecosystem functions specified for restoration in the environmental evaluation?	1	0		Not identified

Vulnerability Assessment - Section 3: Technical Diagnostics

(To be completed for all Water Infrastructure assets)

		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
3.12	Have regional protected areas / nature reserves been included in the analysis for impacts from the investment asset and future climate impacts?	1	1	Evidence	Yes, landscape inputs account for various land uses, including undeveloped areas or "nature reserves."
3.13	Does the model include analysis of regression relationships between climate parameters and flow conditions using time series of historical climate and stream flow data?	1	0	Evidence	Not identified
3.14	Does the model include climate information from a multi modal ensemble of climate projections (eg from the Climate Wizard or the World Bank's Climate Portal) to assess the likelihood of climate risks for the specified investment horizons (s)?	1	1	Evidence	Nine separate combinations of Atmospheric Ocean Global Climate Models and multiple emission scenarios were used for basin-wide model projections (USACE and ORBA Formulating Climate Change Mitigation/Adaptation Strategies, p. 12).
3.15	Are changes in the frequency and severity of rare weather events such as droughts and floods included?	1	1	Evidence	Yes, the District's protocols allow for modeling extreme weather events (e.g., 500-year floods) (For example, Critical Repair and Reinvestment Plan vol 3, p. 14).
3.16	Are sub-annual changes in precipitation seasonality included?	1	1	Evidence	Yes, the District's modeling protocols include seasonal dry and wet weather conditions.
3.17	Is GCM climate data complemented with an analysis of glacial melt water and sea level rise risks, where appropriate (e.g., high or coastal elevation sites)?	1	0	Evidence	N/A
3.18	Is paleo-climatic data (e.g., between 10,000 and >1000 years before present) included?	1	0	Evidence	Not identified
3.19	Is the number of model runs and duration of model runs disclosed?	1	0	Evidence	Not identified
3.20	Has a sensitivity analysis been performed to understand how the asset performance and environmental impacts may evolve under shifting future flow conditions?	1	0	Evidence	Not identified
3.21	Is directly measured climate data available for more than 30 years and incorporated into the water resources model?	1	1	Evidence	"For projects directly affected by precipitation events, the Facility Plan includes projected rainfall intensity, duration, and frequency (IDF) curves for year 2035. These projections consider both statistical trends going back 60 years, along with state-of-the art global circulation models that project future precipitation conditions" (http://louisvillemsd.org/sites/default/files/file_repository/CRRP%2020-Year/Volume_2_Wastewater-Collection-and-Treatment.pdf).

Vulnerability Assessment - Section 3: Technical Diagnostics

(To be completed for all Water Infrastructure assets)

		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
3.22	Has evidence demonstrated that climate change has already had an impact on operations and environmental targets? Are these impacts specified and, to the extent possible, quantified? These impacts should be responded to directly in the Adaptation Plan.	1	1	Evidence	Yes, climate change is viewed as already having impacts on operations and quantified impacts are available (USACE and ORBA Formulating Climate Change Mitigation/Adaptation Strategies; Critical Repair and Reinvestment Plan).
3.23	Does the evidence suggest that climate change will have an impact on operations and environmental targets over the operational lifespan? Are these impacts specified and, to the extent possible, quantified? These impacts should be responded to directly in the Adaptation Plan.	1	1	Evidence	Yes, climate change is expected to have an impact on the Ohio River Basin and on the Louisville region (Critical Repair and Reinvestment Plan).
3.24	Is there a discussion of the uncertainties associated with projected climate impacts on both operations and environmental impacts?	1	0	Evidence	District-specific discussion of uncertainties related to climate projections not identified.
Total Governance Score		24	17/24		
Eligibility Criterion passed / not passed			71%		Passed

Vulnerability Assessment - Section 4: Nature Based Solutions

(to be completed for nature-based solutions and hybrid water infrastructure only)

I.e. this section only needs to be completed if:

- A. As a nature based solution, the asset reflects the intentional use of natural and / or nature based features, processes, and functions, as an integral part of addressing a human need and doing so in a manner that protects, manages, restores, and / or enhances natural features, processes, and systems in a functioning and sustainable manner.
- B. Where feasible, the asset prioritizes natural features over nature – based features. Such features include the protection, restoration, expansion, and / or creation of natural systems and processes as an explicit component of the desired project outcomes.

Section 4.1: Site Inventory

How well do we understand the systems and processes at the project site?

		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
4.1.1	Is this a “greenfield site” (i.e., undeveloped land used for agriculture, landscape design, or left to evolve naturally)? If so, will existing ecosystem services be expanded / supported / maintained?	1	0	Evidence	Not yet identified
4.1.2	Has an eco-hydrological model been developed? Specify model type, such as WEAP, SWAT, RIBASIM, USACE. Is this a quantitative model? Has it been calibrated against site data? Does the model include water quantity?	4	4	Evidence	Modeling for stormwater management uses USACE HEC-HMS and HEC-RAS or HEC-1 and HEC-2. Models are quantitative and historic stream gauge data or regressions based on USGS data are used for calibration (Watershed Master Plan). Infoworks ICM used for wastewater system evaluations and includes variable inputs and site-specific factors, and provides quantified outputs.
4.1.3	Has the calibrated eco-hydrological model been reviewed by an independent expert?	1	1	Evidence	Yes, widely used and accepted modeling tools

Section 4.1: Site Inventory

How well do we understand the systems and processes at the project site?

		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
4.1.4	<p>Have sources of pollution been analyzed for the following (even if none have been found)?</p> <ul style="list-style-type: none"> ▪ Point source ▪ Nonpoint source 	2	2	Evidence	<p>A set of Source Water Protection Plans exists for the Ohio River Basin that outline, among other things, point source pollution detection.</p> <p>As summarized: "Required by the Safe Drinking Water Act Amendments to protect public drinking water supplies, the Source Water Assessment Program requires states to: delineate source water protection areas for public water systems; identify the origins of regulated and certain unregulated contaminants in the delineated area; determine the susceptibility of public water supplies to contamination by sources inventoried. States are also required to describe how they will attempt to coordinate assessments of interstate waterways with other states, tribes and nations" (ORSANCO SWAP).</p> <p>The Department operates the Municipal Separate Storm Sewer System (MS4) to address nonpoint source pollution associated with stormwater runoff (MS4 Program).</p> <p>Kentucky Department for Environmental Protection also has a nonpoint source pollution program and associated annual reports (e.g. 2020 Report).</p>
Total Site Inventory Score		8	7/8		
Eligibility Criterion passed / not passed			88 %		Passed

Section 4.2: Ecological Baselines For Management

Do we understand how the ecological characteristics of the site will evolve over time?

		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
4.2.1	Is there an inventory of species that can be used as a baseline for vegetation and animal species?	1	1	Evidence	Yes, at least one basin-wide inventory presented in USACE Ohio River Basin Comprehensive Reconnaissance Study (pp. 33 & 80).
4.2.2	If there is an inventory of species that can be used as a baseline for vegetation and animal species, does it specify or identify endangered / threatened species, ecological communities, or categories of species?	1	1	Evidence	Yes, USACE inventory includes threatened and endangered species by state (USACE Ohio River Basin Comprehensive Reconnaissance Report, p. 33).

Section 4.2: Ecological Baselines For Management

Do we understand how the ecological characteristics of the site will evolve over time?

		<i>Max Score</i>	<i>Actual Score</i>	<i>Requirement: Evidence and/or Disclosure</i>	<i>Comments</i>
4.2.3	Have studies on current or potential climate impacts on key species (e.g., endangered or threatened species) been included?	1	1	Evidence	Yes, potential impacts of climate change such as higher water temperatures and changes in water quality as a result of increased frequency of flooding events have been evaluated (e.g., USACE and ORBA Formulating Climate Change Mitigation/Adaptation Strategies, pp. 2 & 43; also Ohio River Basin Fish Habitat Partnership and species priority lists).
4.2.4	Is the flow regime used as a basis for ecological management?	1	0	Evidence	Not identified
4.2.5	Is there a climate trends analysis for the site or region based on at least 30 years of climate data?	1	1	Disclose	Forecasts are presented at the Hydrologic Unit Code-4 sub-basin level through three 30-year time periods between 2011 and 2099.
4.2.6	Is there an assessment of exotic invasive species?	1	1	Evidence	Yes, general assessments available in Ohio River Basin Comprehensive Reconnaissance Report (p. 82 & 144). Invasive Species List is also compiled in the District's Design Manual.
4.2.7	If there is an assessment of exotic invasive species, has a plan been developed to cope with exotic invasive species?	1	0	Evidence	Need for sub-basin adaptation plans for invasives identified, but comprehensive management plan not yet developed (USACE and ORBA Formulating Climate Change Mitigation/Adaptation Strategies; Design Manual).
4.2.8	Has there been an assessment of trade-offs between reliability vs environmental benefits to support decision making processes?	1	0	Evidence	Recognition of increased competition between human needs and ecological system functions is recognized, but a qualitative or quantitative assessment of trade-offs was not identified (USACE and ORBA Formulating Climate Change Mitigation/Adaptation Strategies).
Total Ecological Management Score		8	5 / 8		
Eligibility Criterion passed / not passed			63 %		Passed

Section 4.3: Data Inventories of Localized & Indigenous Assets

Do we have access to adequate, credible data about the project site?

		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
4.3.1	Is there an inventory of existing water-related ecosystem services based on 30 or more years of data?	1	1	Evidence	Yes, described and summarized (USACE and ORBA Formulating Climate Change Mitigation/Adaptation Strategies, p. 21) and in Critical Repair and Reinvestment Plan.
4.3.2	Does any existing inventory of water-related ecosystem services related to runoff / land-use include the following data? <ul style="list-style-type: none"> ▪ Fire regime ▪ Sediment / erosion load ▪ Nutrient load ▪ Land-use change 	3	3	Evidence	p. 26 land-use change p. 25 forest and fisheries production as related to nutrient load and sediment pollution p. 28 fire regime (USACE and ORBA Formulating Climate Change Mitigation/Adaptation Strategies)
4.3.3	Do inventories of water-related ecosystem services related to water <i>quality</i> include the following data: <ul style="list-style-type: none"> ▪ Water quality for environmental services (e.g., habitat, ecological communities, erosion) ▪ Water quality for human needs / services (e.g., drinking water, agriculture) 	2	1	Evidence	Data for water quality across the basin that directly affects both human needs and environmental services is tracked on a consistent basis (ORSANCO). Direct link and tracking of connections between water quality factors and environmental services not identified.
4.3.4	Is there an existing inventory of water-related ecosystem services related to water <i>quantity</i> ? <ul style="list-style-type: none"> ▪ Water quantity for environmental services (e.g., habitat, flow regime) ▪ Water quantity for human needs / services (e.g., service reliability) 	2	1	Evidence	Inventory of water quantity for human uses available in USACE Ohio River Basin Comprehensive Reconnaissance Report (e.g., Raw water intakes p. 50; land cover types p. 15).
Total Existing Inventories Score		8	6/8		
Eligibility Criterion passed / not passed			75%		Passed

Section 4.4: Broader Ecosystem Impacts

Do we understand how the project's impacts may extend beyond the site?

		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
4.4.1	Has there been a determination of proposed / estimated impacts from project construction and operations regarding local, upstream, and downstream species / ecological communities?	1	1	Evidence	Yes, projected impacts of capital projects are determined using modeling results. The MS4 team also completes a State of the Streams report which compiles water quality data around the District. It specifically reviews changes and trends in water quality (discussed in 4.4.4 in more detail).

Section 4.4: Broader Ecosystem Impacts

Do we understand how the project's impacts may extend beyond the site?

		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
4.4.2	<p>Has there been a determination of proposed / estimated impacts on existing local, upstream, and downstream eco-hydrological systems from modification regarding:</p> <ul style="list-style-type: none"> ▪ Pollution ▪ Downstream flow regime ▪ Groundwater impacts ▪ Land tenure (e.g., public vs private) 	4	3	Disclose	Estimated impacts on downstream flows, pollution, and land uses are available (IOAP LTCP vol 2, e.g., p. ES-25). For example, impact of certain pump station failures on business, homes and neighborhoods; pollution prevention as a result of treatment capacity expansion; and potential impacts on discharge volume into various creeks.
4.4.3	<p>Has there been a determination of proposed / estimated impacts and benefits on eco-hydrological systems from changes in allocation via the following?</p> <ul style="list-style-type: none"> ▪ Relevant environmental flows management plans ▪ Groundwater management plans 	2	0	Disclose	Not identified
4.4.4	<p>Has the monitoring system contributed to the development and goals of the basin management plan?</p>	1	1	Disclose	<p>Yes, identified and expected changes in air and water temperatures, shifts in industry, and increased frequency and duration of extreme weather events have impacted management plans (USACE Ohio River Basin Comprehensive Reconnaissance Report)</p> <p>The District's Design Manual has also adopted updates based on results from monitoring networks (e.g., Rainfall Analysis Update based on NOAA data; Design Manual)</p> <p>The MS4 team completes a State of the Streams report which compiles water quality data for all Jefferson County watersheds. Stream health parameters include fish, insect, and algae biological samples; habitat assessment; bacteria, nutrient, suspended solids, etc. in stream samples; and water temperature, dissolved oxygen, and flow parameters from in-stream meters. It specifically reviews changes and trends in water quality. Additionally, we've seen the benefits of completed projects through ORSANCO data and wet weather sampling data. The 2nd Amended Consent Decree acknowledges these water quality benefits and environmental progress made since consent decree projects started in 2005.</p>
Total Broader Impacts Systems Score		8	5/8		
Eligibility Criterion passed / not passed			63 %		Passed

Section 4.5: Monitoring & Management Systems

Do we have effective management processes and tools to maintain ecological integrity over time?

		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
4.5.1	Have target performance indicators been explicitly defined for: <ul style="list-style-type: none"> ▪ Infrastructure services ▪ Ecosystem services 	1	1	Evidence	Defined performance indicators are available in the Critical Repair and Reinvestment Plan and include factors such as CSO and SSO elimination or management and related water quality standards.
4.5.2	Is there a monitoring plan in place for infrastructure performance indicators?	2	2	Evidence	Discharge monitoring and annual MS4-related reporting will continue indefinitely. At a local scale, the District maintains a Long Term Monitoring Network throughout the 11 watersheds in Jefferson County https://www.louisvillemsd.org/sites/default/files/inline-files/Web_FINALcompiledAR%202017-11-7jab1.pdf .
4.5.3	Is there a monitoring plan in place for ecosystem performance indicators?	2	2	Evidence	Yes, ORSANCO operates monitoring programs for factors with significant effects on ecosystem functions (ORSANCO Data).
4.5.4	Are monitoring outcomes connected to the decision making and management / operations process?	1	1	Evidence	Adaptive management is integrated into decision-making and long-term planning.
4.5.5	Is there a multi-stakeholder basin management plan?	1	1	Disclose	ORSANCO operates a cooperative management approach and has multiple programs which allow for collaboration among federal and state agencies across member states (ORSANCO Programs).
Total Monitoring and Management Systems Score		6	6/6		
Eligibility Criterion passed / not passed			100 %		Passed

Section 5: Adaptation Plan

(To be completed for all Water Infrastructure assets)

		Max Score	Actual Score	Requirement: Evidence and/or Disclosure	Comments
AP.1	Is there a plan to restore or secure lost/modified ecosystem functions / species?	1	1	Evidence	The Prepare Louisville Plan (Adaptation Plan) includes preservation of natural capital as one of the seven primary Strategies to Prepare for Change. The Critical Repair and Reinvestment Plan also addresses adaptation.
AP.2	Is the adaptation plan for environmental targets / infrastructure robust across specified <u>observed</u> / recent climate conditions?	1	1	Evidence	The Adaptation Plan has specified goals in response to observed conditions, including expanded range of non-native vegetation, tree canopy and habitat loss, and increased frequency of extreme storms (p. 47). The District's Design Manual has also already been modified to account for shifting conditions.
AP.3	Is the adaptation plan for environmental targets / infrastructure robust across specified <u>projected</u> climate conditions?	1	1	Evidence	The Adaptation Plan has targets related to projected changes, including sewer and flood mitigation projects to address the most at-risk infrastructure. Certain roads, highways, and neighborhoods are particularly flood-prone (for example, p. 47). Sub-volumes of the Critical Repair and Reinvestment Plan address projected changes in rainfall, etc. and infrastructure design response. Larger-scale adaptation plans and projections are also available and used to inform the District's planning (USACE and ORBA Formulating Climate Change Mitigation/Adaptation Strategies).
AP.4	Is there a monitoring plan designed to track ongoing progress and impacts to inform future decisions?	1	0	Evidence	Discharge monitoring and annual MS4-related reporting will continue indefinitely and the District has an adaptive management policy. Formal District-specific monitoring plan to update adaptation priorities in response to climate change not identified.
AP.5	Is there a plan to reconsider on a periodic basis for operational parameters, governance and allocation shifts, and environmental performance targets?	1	0	Evidence	Not identified
Total Adaptation Plan Score:		5	3/5		
Eligibility Criterion passed / not passed			60%		Passed