Curriculum Vitae of Proposed Key Personnel

1. **Name:** Joel Samuel Rhine
2. **Proposed Position:** Remote Sensing Specialist
3. **Employer:** Development Monitors LLC
4. **Date of Birth:** 20 September 1994 **Nationality:** Indian (US LPR/Green Card)
5. **Education:**

College and/or university Attended	Degree/certificate or other specialized education obtained	Date Obtained
The George Washington University	Master of Science in Mechanical and Aerospace Engineering	2019
University of Mumbai	Bachelor of Science in Mechanical Engineering	2016

6. **Professional Certification or Membership in Professional Associations**: FAA Part 107 Remote Pilot Certification
7. **Other Relevant Training**: None
8. **Countries of Work Experience**: United States of America, India (Remote), Yemen (Remote), Afghanistan (Remote)
9. **Languages**: English (native), Hindi (native)
10. **Employment Record**:
    - **From:** July 2019 to present
    - **Employer:** Development Monitors LLC
    - **Position held**: Project Manager

11. Tasks Assigned	12. Work Undertaken that Best Illustrates Capability to Handle the Tasks Assigned
• Inception and background analysis • Desk review if international best practices in (i) Designing, developing, operating, maintaining and restoring water supply systems with cost effective resilience measures, and (ii) diagnostic and decision	**Name:** Quality Infrastructure Diagnostic & Planning Toolkits for Water Supply Systems in India. Development of a Diagnostic and Decision Support Toolkit (DDST) **Year:** April 2023 to June 2023 **Location:** India **Client:** The World Bank **Main project features:** **Positions held:** Software Project Manager **Activities performed**

support tools to inform planning and policymaking • Conceptualize a geo-referenced risk-based asset management system with a guidance note on data management of water supply systems in the two pilot cities • Develop a diagnostic tool and decision support tool for planning, designing, maintaining, monitoring, and restoring quality water supply systems and pilot it in the two identified cities • Conduct a gap analysis, assess vulnerabilities of water supply systems to the prevalent hazards and prepare recommendations on a contingency plan in pilot cities • Build Capacity to enhance the resilience of water supply systems	○ Prepared an inception concept satisfying all requirements of the project supported by technical algorithms ○ Cataloged all GIS data from Shimla and Aizawl. Meticulously analyzed all the data to identify gaps and shortcoming in the shape files as well as their associated attribute data ○ Researched and presented best practice tools for geo-referenced asset management systems and identified ESRI as the industry standard. Since keeping the costs low was a major criterion, drew parallels between ESRI and QGIS – which is open source ○ Developed the entire software development roadmap from design to handover, identified KPIs and set deliverables ○ Conducted periodic presentations and updated with all internal and external stake-holders including the World Bank Team and respective city representatives ○ Based on WNTR, EPANET and ESRI designed the entire Postgres schema to develop a standardized and scalable collected-data structure ○ Developed complex KoBoToolbox forms to be used as the open-source data collection tool ○ Integrated KoBoToolbox API with Postgres to get the data directly into the database ○ Designed and proposed a Criticality Score parameter to determine the operating status of each water supply asset based on probability and consequences of failure. ○ Developed a custom PyQGIS GUI plugin to visualize the data and interact with it. ○ Automated natural hazard risk intersection with the water supply system to identify water supply assets that are at risk. Sorted them based on Criticality Score to generate a priority list ○ Developed user and developer training manuals
• Work with Yemen partner organization and Yemen	**Name:** Yemen GBRBA SWM and Gender Assessment, Aden Climate Resilience Project, QIIP 7-City Project

University to receive and organize required data • Conduct watershed analysis using DEM data from USGS • Create channel (stream) networks utilizing Strahler Orders • Create Mapbox/Open Layers/Leaflet interactive 2D maps with QGIS-LTR 3.22 via QGIS2Web • Create 3D interactive maps with QGIS-LTR 3.22 via QGIS2ThreeJS • Prepare 2D PDF for soft and hard copy sharing	**Year:** February 2022 to February 2023 **Location:** Yemen **Client:** The World Bank **Main project features:** **Positions held:** GIS Specialist **Activities performed** o Collated and organized all data required in order to analyze and prepare maps using QGIS-LTR 3.2 o Conducted hydrology analysis in QGIS to calculate watershed areas/drainage basins, major and minor channel networks using Strahler Orders o Prepared interactive maps in QGIS-LTR 3.22 and Mapbox/Open Layers/Leaflet using QGIS2Web o Shared maps with stakeholders via interactive URL links (interactive maps deployed on Google Firebase) as well as PDF static maps and shared as soft and hard (printed) copies o Prepared 3D interactive maps in QGIS2ThreeJS and shared as soft (URL link) and hard copies
• In charge of the remote monitoring, management and verification (RMMV) lab for the Economic Infrastructure and Development of Afghanistan (EIDA) project • Developed remote sensing tools using open-source software which included freely available satellite imagery resources, KoBoToolbox, Google Firebase and Mapbox. • In charge of creating RMMV training material and conducting the training • Internal capacity building	**Name:** EIDA II **Year:** April 2020 to August 2021 **Location:** Afghanistan **Client:** German Bank for Reconstruction (KfW) **Main project features:** Rehabilitation of 30 canals in northern Afghanistan to improve the overall livelihood of people in the canal-associated command areas. **Positions held:** GIS and Remote Sensing Specialist **Activities performed** o Developed efficient KoBoToolbox surveys for data collection o Developed 2D and 3D canal command area maps and conducted farmland analysis geospatially o Utilized QGIS modelling tools to create flood models (pluvial and fluvial) and conduct respective analysis o Developed interactive individual canal-status maps with Mapbox o Overall management of the Remote Monitoring Management and Verification (RMMV) lab hardware and data storage and security

	○ Worked with TolaData as the EIDA Project Performance tool Prepared training material and conducted training sessions for the RMMV tools as required
• Automate creation of hazard maps based on modelled flood, earthquake and landslide zones • Estimate cascading effects of fall of electrical/water supply points during natural disasters like floods/earthquakes and landslides on the dependency of its respective built-up and public sector	**Name:** C2IAS Community Mapping System **Year:** November 2019 to Present **Location:** USA **Client:** Commonwealth of Virginia Center for Innovation and Technology (C2IAS) **Main project features:** Project is development of a web-based 2D and 3D Decision Support tool to identify flood/earthquake and landslide risk areas in the Commonwealth of Virginia and aid in mitigation measures **Positions held:** Project Manager/GIS Specialist **Activities performed** ○ Modelled flood and utilized earthquake and landslide risk data to overlay on areas of interest ○ Developed and supervised 3D visualization of water supply infrastructure, its dependencies and its supply network across the Commonwealth of Virginia ○ Currently developing module to identify areas of resilience introduction/improvement based on current risk of flood/earthquake and landslide hazard
• Research about community specific natural hazard • Create community features on Open Street Map • Analyze natural hazard GIS data • Develop flood data using QGIS modelling tools based on elevation data • Quality Control • Create risk profiles for said communities and compiled report.	**Name:** Community Based Disaster Risk Management and Early Warning (CBDRM/EW) **Year:** July 2019 to December 2020 **Location:** Afghanistan **Client:** World Bank **Main project features:** Project is the application of the entire CBDRM value chain to six selected Citizens Charter Afghanistan Project (CCAP) communities. Communities were selected for this pilot project due to their risk of drought, flooding, earthquakes, and/or landslides according to the World Bank's Afghanistan multi-hazard risk assessment **Positions held:** GIS Specialist **Activities performed**

	○ Create risk profiles and hazard maps for the six communities which were prone to natural hazards. Added OSM features

13. Do you currently or have you ever worked for the World Bank Group including any of the following types of appointments: Regular, term, ETC, ETT, STC, STT, JPA, or JPO? If yes, please provide details, including start/end dates of appointment. **No**

Certification

I, Joel Samuel Rhine, certify that (1) to the best of my knowledge and belief, this CV correctly describes me, my qualifications, and my experience; (2) that I am available for the assignment for which I am proposed; and (3) that I am proposed only by one Offeror and under one proposal. I understand that any willful misstatement or misrepresentation herein may lead to my disqualification or removal from the selected team undertaking the assignment.

March 21, 2024

Signature *Date*