

**Report on Multimodal Transportation Account—State Appropriation  
Sidewalk Inventory and Accessibility Mapping Project**

By

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The State of Washington  
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## PREAMBLE

**This report responds to direction within the 2023 ENGROSSED SUBSTITUTE HOUSE BILL 1125, Section 111 requesting a report due on December 1 of each year to the Transportation Committees of the Legislature detailing the specific expenditures made from the contingency funding provided in those sections. Proviso and Legislative Budget Notes**

2023 ENGROSSED SUBSTITUTE HOUSE BILL, ESHB 1125, Section 111 state that the appropriations are provided solely for:

*... the University of Washington's sidewalk inventory and accessibility mapping project to develop a public dataset under an open license and develop the tools needed to publish that data according to an open data specification. The project must include, but is not limited to, utilization of existing data sources, imagery, detailed surveys, and manually collected, detailed data for city streets, county rural and urban local access roads and collectors/arterials, state roads of all types, and roads owned by other entities. The project may draw on partially developed sidewalk data for all state facilities. To the extent practicable, the final product must be suitable for use by the department of transportation, local and regional agencies, tribal governments, and the general public. For the 2023-2025 fiscal biennium, the project will produce a base active transportation data layer for all counties, with priority given to counties with high proportions of overburdened communities. A project status report is due to the transportation committees of the legislature on December 1st of each year until the work is completed. The legislature intends that in the 2025-2027 fiscal biennium, \$5,000,000 of multimodal transportation account funds be provided to complete a second phase of work on the active transportation data.*

To maintain compliance with the Engrossed Substitute House Bill 1125 and for accountability and consistency with historical expenditure reporting of budget program structures, the University of Washington is providing this report for the 5 month period since the start of the biennium on July 1<sup>st</sup>, 2023. It must be noted, however, that on July 6, 2023, the University of Washington switched from a nearly 50-year-old finance system to a new one – Workday Finance. With this transition came a great deal of change that for the past 5 months (the reporting period of this report) has impeded the issuance of a Worktag to enable use of the funding provided by the proviso. Therefore, to date, no

expenditures or transactions have taken place against the proviso funding source. A worktag was finally issued on November 27<sup>th</sup>, 2023.

Apart from the challenges in obtaining financial transfers, the University of Washington Taskar Center for Accessible Technology has worked collaboratively with the Washington State Department of Transportation, the University of Washington's Legislative office to initiate planning and move the work forward. This report outlines the spending plan and the preparatory steps taken by the University of Washington and Partners in moving the work forward. The University of Washington welcomes the opportunity to discuss with the Legislature our approach to spending in order to best support our ability to meet legislative delivery expectations and performance goals.

### **ABSTRACT**

Most communities in Washington state lack a comprehensive inventory of their sidewalks, including their suitability for use by people with any type of disability. A 2019 report to the Joint Transportation Committee on city transportation funding needs noted the cost to local jurisdictions of self-evaluation for ADA Transition Plan requirements and the need for collaboration across agencies “to accelerate development of an integrated network of nonmotorized facilities.” Development of data systems that address both asset inventory and accessibility analysis supports an efficient and comprehensive approach to required ADA Transition Plans, active transportation planning, and provision of access to transit services that meet legal requirements. Without this information local jurisdictions and the state are hampered in their ability to direct investments for development, preservation, maintenance, and improvement of sidewalks to those locations where this is most needed. This is especially important for lower-income neighborhoods where more people rely on the use of active transportation and access to transit service for everyday transportation. The State Active Transportation Plan published in 2021 identified the need to address sidewalk data gaps comprehensively, and the challenge of non-standardized data systems in different regions. The Frequent Transit Service Study developed by WSDOT at legislative direction also finds the need for a sidewalk inventory to measure and enable access to transit. Availability of this information will support implementation of the Complete Streets directive to WSDOT and effective grantmaking from WSDOT's Active Transportation Division and Public Transportation Division.

## **EXECUTIVE SUMMARY**

The WA Statewide Sidewalk Inventory and Accessibility Analysis project is a comprehensive initiative that aims to enhance transportation infrastructure and accessibility for all Washington state residents. The project will create a detailed inventory of sidewalks across the state, assess their accessibility for individuals with disabilities, and develop advanced mapping tools to visualize sidewalk accessibility data. This valuable information will inform transportation planning, decision-making, and put

WA State on the path to having sidewalks meet the needs of all users.

The WA Statewide Sidewalk Inventory and Accessibility Analysis project is a crucial endeavor that will provide essential data for transportation planning and decision-making. By creating a comprehensive sidewalk inventory, assessing accessibility, and developing visualization tools, the project will significantly improve sidewalk accessibility and enhance mobility for all users. The project team is committed to overcoming any challenges and delivering a successful project that benefits communities across Washington state.

### **1.1 PROJECT STATUS:**

Currently in its fifth month of a 24-month timeframe, the project is progressing steadily towards its objectives. However, a delay in funding associated with a financial system transition at the University of Washington has slowed progress. A worktag was created on November 27<sup>th</sup>. The project team is actively collaborating with the University of Washington Legislative office to maintain project momentum. From July onward, the University of Washington team did proceed to work on the project objectives to the extent possible. These activities are discussed in this progress report.

### **1.2 PROJECT FUNDING:**

The project is funded by a WA State Proviso issued via the Washington State Transportation Committee at the State legislature. Because of the delay in establishing a UW worktag to charge against, we cannot provide a spending detail at this time. The UW and TCAT are committed to financial transparency and full reporting when those tools are available.

## **INTRODUCTION**

The WA Statewide Sidewalk Inventory and Accessibility Analysis project is a transformative initiative designed to elevate transportation infrastructure and enhance accessibility for all residents of Washington state. At its core, this project is driven by a commitment to inclusivity, recognizing the critical role sidewalks play in ensuring equal access and mobility for individuals of all abilities. The overarching purpose is to create a comprehensive consistently collected inventory of sidewalks, conduct a thorough accessibility analysis tailored to the needs of individuals with disabilities, and develop usable mapping tools to visualize the collected data. This initiative is poised to be transformative for jurisdictional operators in transportation planning, transition plan creation and execution as well as prioritization schemas for resource allocation and decision-making processes, guiding the state towards the establishment of sidewalks that are not only extensive but also responsive to the diverse needs of all users. The ensuing sections will delve into the refined goals that encapsulate the project's vision and its commitment to creating a more accessible and equitable built environment.

### **1.3 SCOPE**

The primary objective is to collect base network data on sidewalks, offering a detailed examination of their current state to inform strategic improvements. The scope encompasses the entire state, including individual counties, with a commitment to providing a nuanced understanding of the existing sidewalk infrastructure.

The project will encompass all jurisdictions, including cities, towns, and counties, acknowledging the diversity of urban, suburban, and rural landscapes. Additionally, tribal lands within the state will be integral to the scope, recognizing the unique considerations and collaboration required with tribal communities to ensure cultural sensitivity and inclusivity.

The work involves collecting data not only accounting for sidewalk and crossing assets within each region, but a routable transportation layer and conducting a detailed analysis to understand their current conditions. This quantitative focus will facilitate targeted interventions and improvements, recognizing that the sidewalk infrastructure needs may vary across the diverse geographical and demographic landscapes of Washington state.

### **1.4 PROJECT GOALS**

The project's refined goals are encapsulated in five key objectives:

**Develop a Comprehensive Inventory:** Create a detailed and exhaustive inventory of sidewalks throughout Washington state, laying the foundation for a comprehensive understanding of existing infrastructure.



**Analyze Accessibility:** Conduct an analysis of sidewalk accessibility, with a focus on addressing the specific needs of individuals with disabilities. This goal ensures that the project's outcomes contribute to fostering an inclusive pedestrian environment.

**Mapping Tools for Visualization:** Develop advanced mapping tools that leverage technology to visualize the collected sidewalk data. These tools will offer a user-friendly interface for stakeholders to interpret and utilize the information effectively.

**Data Management System:** Establish a robust data management system to facilitate the storage, regular updates, and maintenance of the statewide sidewalk inventory. This ensures the longevity and relevance of the information gathered throughout the project.

**Stakeholder Engagement:** Actively engage with stakeholders at various levels, including communities, local authorities, and advocacy groups, fostering collaboration, and ensuring that the project outcomes align with the diverse needs and aspirations of Washington state residents.

Together, these goals form a cohesive framework, guiding the WA Statewide Sidewalk Inventory and Accessibility Analysis project towards creating a more accessible, equitable, and interconnected transportation infrastructure for the benefit of all Washingtonians.

## **WORK PERFORMED TO DEVELOP A COMPREHENSIVE PEDESTRIAN GRAPH INVENTORY**

The first aim of the WA Statewide Sidewalk Inventory and Accessibility Analysis project is to create a comprehensive inventory of sidewalks across Washington state. At baseline, this statewide inventory will include information on the location, connectivity, and characteristics of sidewalks and crossings that can be visualized via satellite imagery. The information will be structured adhering to OpenSidewalks (OSW) data format, which is a schema that abstractly represents path centerline as line data and is a format which is OpenStreetMap compatible. Developing technology to support this goal requires streamlining and creating a production-level pipeline for OSW data prediction from satellite imagery and occupies most of the first year of development in the project's workplan.

### **1.5 HARDENING SOFTWARE TOOLS FOR AI/MACHINE LEARNING INFERENCE OF SIDEWALKS FROM SATELLITE IMAGERY**

The methodology for the WA Statewide Sidewalk Inventory and Accessibility Analysis project integrates advanced AI and machine learning approaches to extract valuable insights from satellite imagery. One of the key elements driving the success of this data

collection initiative is the application of artificial intelligence neural networks, specifically designed to infer sidewalks and their connections across the expansive landscape of Washington state. This work will build on prior work performed by the Taskar Center for Accessible Technologies (TCAT) (see [APE: An Open and Shared Annotated Dataset for Learning Urban Pedestrian Path Networks](#) at arxiv.org). This section outlines the process of hardening the software tools employed in the data inference phase to ensure accuracy, reliability, and ethical considerations.

In Figure 1, we show the workflow that was the original input to the pipeline hardening.

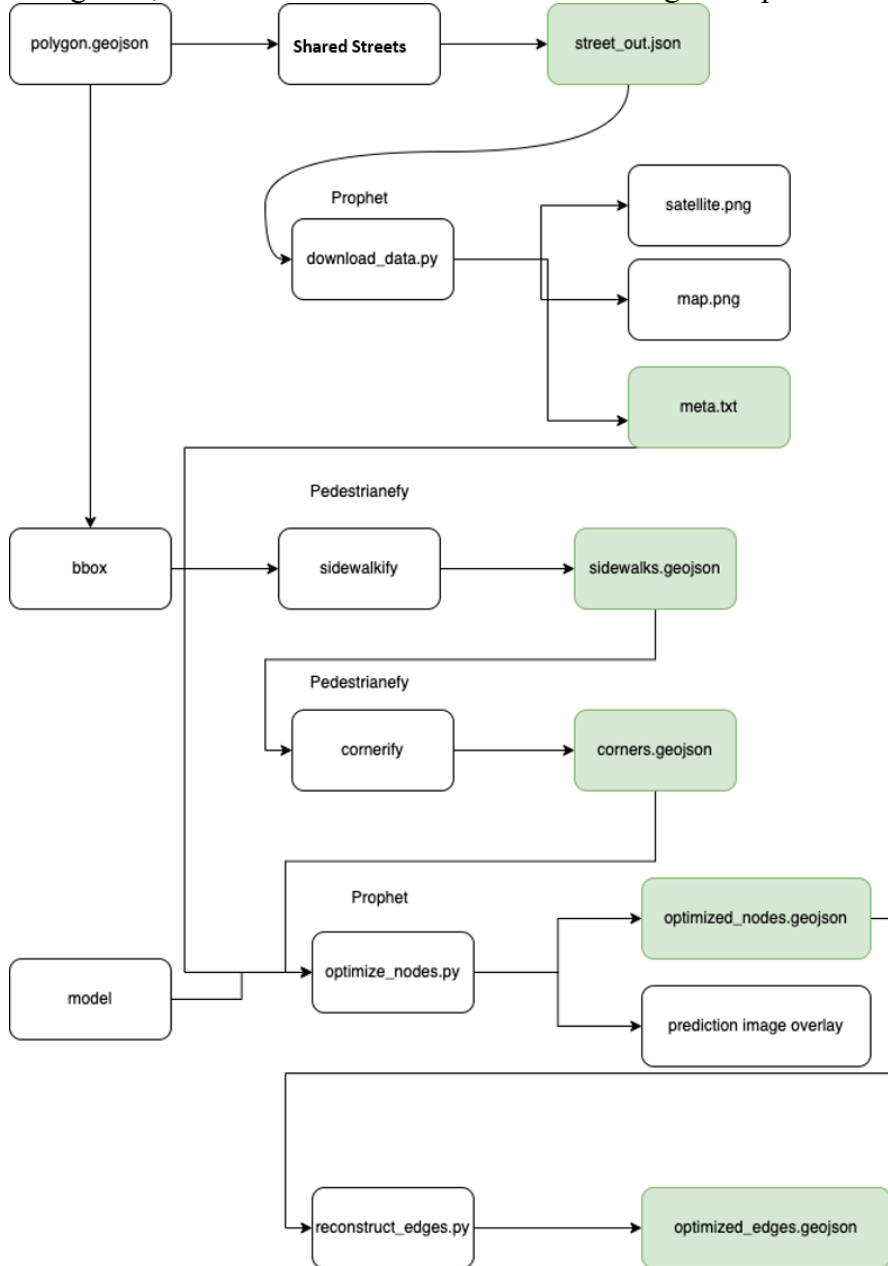


Figure 1. Original pipeline for sidewalks graph inference from satellite imagery

## **1.6 DATA COLLECTION AND PREPROCESSING**

The project leverages high-resolution satellite imagery covering the entire state, and this data is preprocessed from Bing Satellite imagery to create a standardized dataset suitable for AI and machine learning algorithms. The application of artificial intelligence neural networks significantly increases the efficiency and speed at which sidewalk data can be collected across Washington state. During the reporting period, the University of Washington met with the Bing Maps Microsoft team to identify favorable terms under which the team would be able to utilize the Bing Satellite imagery towards the collection of open, shareable sidewalk graph data for the state of Washington. An agreement is still pending and will be reported on in future communications from the team.

## **1.7 IMPROVEMENTS TO THE AI PIPELINE DURING REPORTING PERIOD**

Originally developed as a research project, the initial code prioritized exploration over scalability and manageability. However, as the scope expanded to encompass multiple cities, each with its unique requirements, the need arose for a standardized framework to effectively manage and scale the AI pipeline.

In response to this demand, we turned to OpenMMLab, a robust open-source research platform tailored for various computer vision and multimedia tasks. Offering a comprehensive suite of pre-trained models, datasets, and efficient codebases, OpenMMLab streamlines the development and experimentation of innovative algorithms in areas such as image and video analysis, object detection, and segmentation. Its dual emphasis on research and practical applications makes OpenMMLab a valuable asset to the computer vision community, catalyzing advancements in AI-driven multimedia research and development. The selection of OpenMMLab as our framework was driven by its open-source nature, cost-free availability, and strong support. Additionally, its foundation on PyTorch, the base AI open-source library from Facebook used in the original AI models, further solidified its suitability.

Key improvements implemented include the conversion of input images and segmentation masks into the COCO data format. This strategic adjustment facilitates the utilization of existing data loaders and visualization tools, eliminating the need to develop custom solutions. The representation of output segmentation masks in COCO format also translates to a significant reduction in storage requirements.

To further enhance scalability and experimentation, we established an OpenMMLab-based training and inference pipeline. This framework enables easy and scalable experimentation with various models. As a demonstration, we swapped the base model from TCAT's paper with an existing segmentation model from OpenMMLab based on DeepLabV3. The table below elucidates the notable distinctions between the baseline

model and DeepLabV3, highlighting the flexibility and adaptability achieved through the integration of OpenMMLab into our AI pipeline.

### **WORK PERFORMED TO ANALYZE ACCESSIBILITY**

During the reporting period, inquiries were made in the analysis of accessibility, with a focus on amplifying the perspectives of non-drivers in Washington state. A comprehensive literature review was undertaken to garner insights into existing research, methodologies, and best practices related to accessibility concerns. This foundational step aimed to inform and contextualize the subsequent analyses. Additionally, efforts were dedicated to the meticulous analysis of past participant data, shedding light on the unique accessibility challenges faced by non-drivers in the state. By leveraging this historical data, we sought to elevate the voices and experiences of individuals who rely on alternative modes of transportation. This dual approach, combining a thorough literature review with in-depth analyses of past participant data, lays the groundwork for a nuanced understanding of accessibility issues, guiding the development of targeted interventions and improvements in Washington state's transportation infrastructure.

### **WORK PERFORMED ON MAPPING TOOLS FOR VISUALIZATION**

During the current reporting period, substantial progress has been made in the development of mapping tools geared towards visualization, with a primary emphasis on enhancing accessibility data for sidewalks. A pivotal step in this process involved the instantiation of a private OpenStreetMap (OSM) instance, providing a secure environment for the manipulation and visualization of geospatial data specific to sidewalks. Additionally, an integrated approach was adopted, combining the functionalities of the iD editor and the RAPID editor to create a seamless mapping experience. These tools facilitate the collaborative mapping of sidewalks, ensuring accuracy and detail in capturing accessibility features.

Of significant note, the inferred sidewalk data generated through advanced AI and machine learning approaches has been seamlessly integrated into the developed mapping tools. This integration stands as a critical milestone, enabling stakeholders to visualize sidewalk accessibility data comprehensively. The visualization capabilities ensure that the insights gleaned from AI-driven analyses are effectively communicated, thereby contributing meaningfully to transportation planning and decision-making processes across Washington state.

Furthermore, the methodology employed in this phase draws valuable insights from previous AI pipeline work, with a keen consideration of the advancements made by the Taskar Center for Accessible Technologies (TCAT). This iterative approach ensures that the AI and machine learning tools deployed in this project are production-ready, but also

human readable and ready for manual vetting and validation. The alignment of these tools with the overarching project goals, centered on enhancing transportation infrastructure and accessibility throughout the state, underscores a commitment to quality control, reliability, and meaningful impact.

### **WORK PERFORMED ON DATA MANAGEMENT SYSTEM**

The OpenStreetMap Tasking Manager stands as a pivotal tool for facilitating collaborative mapping endeavors, efficiently coordinating contributors, and breaking down extensive mapping projects into manageable tasks. This tool not only provides clear instructions and validation processes but also offers essential collaboration and quality control tools for mappers.

In alignment with the unique requirements of our sidewalk mapping initiative, the Tasking Manager utilized by the Taskar Center for Accessible Technologies (TCAT) underwent significant enhancements. TCAT forked the Tasking Manager codebase and redeployed it at [insert link], tailoring customizations to suit the intricacies of sidewalk mapping. A key adaptation includes the integration of manual validation tools to assess the accuracy of sidewalk data generated by the AI pipeline.

Washington has been systematically divided into about 80 regions, each managed as a separate 'project' within the Tasking Manager. Each project is further subdivided into tasks specific to sidewalks and crossings. To streamline this division process, a Python script has been developed (referenced as [insert link to the script]), allowing for the creation of projects based on a GeoJSON input representing the area of interest. This script significantly reduces the manual effort required for project creation.

The Python script, invoked with the following command:

```
bash  
Copy code  
python src/gen_projects.py --credentials_file ./credentials.json --name  
{project_name} --geojson {geojson_of_area_of_interest}
```

The work facilitates the following tasks:

- Validation of GeoJSON Input: Ensures that the provided GeoJSON file adheres to the specified format.
- Task Area Splitting: Divides the area of interest into manageable 'task' areas, generating 'sidewalks\_tasks' and 'crossing\_tasks' for the designated region.
- Project Creation: Creates a project named {project\_name} and uploads the generated 'sidewalks\_tasks' and 'crossing\_tasks' to the newly established project.

Ongoing efforts are dedicated to uploading inferred data from the AI pipeline to the database, where the Tasking Manager retrieves sidewalk information to populate the front end for validation. This integration ensures a seamless flow of data from the AI pipeline to the Tasking Manager, enhancing the overall efficiency of the collaborative mapping initiative.

### **WORK PERFORMED ON STAKEHOLDER ENGAGEMENT**

In stakeholder engagement, a multifaceted approach was implemented, involving three distinct workstreams. The primary focus was on eliciting valuable insights from Washington State Department of Transportation (WSDOT) stakeholders. In October, a dedicated meeting was convened to gather pertinent information regarding the utilization of sidewalks data, stakeholders' awareness of existing datasets, the motivations behind seeking a consistent unified dataset for the state, and their envisioned uses and future use cases for their work. This engagement session fostered a collaborative atmosphere, enabling a comprehensive understanding of stakeholder needs and expectations.

Simultaneously, a separate workstream targeted the engagement of potential contractors for facilitating local data "deep dives" within communities. These endeavors sought to explore, in meticulous detail, the accessibility challenges faced by non-drivers, particularly in overburdened communities. By engaging contractors in this crucial aspect of the project, a foundation for localized, community-specific insights were established, contributing to a more nuanced understanding of accessibility issues.

The third engagement workstream involved reaching out to leaders within specifically identified overburdened communities. This outreach aimed to establish direct communication channels and understand collaboration opportunities. By connecting with community leaders, the project sought to ensure that the perspectives and needs of overburdened communities were integral to the project's trajectory. This comprehensive approach to stakeholder engagement aligns with the project's commitment to inclusivity, ensuring that the insights gained are reflective of diverse perspectives and experiences, thereby enhancing the project's impact and relevance.

### **CHALLENGES AND SOLUTIONS**

#### **1.8 REPORTING PERIOD AND SYSTEM TRANSITION**

The transition from the University of Washington's longstanding finance system to Workday Finance, while pivotal for long-term operational enhancements, has presented a series of challenges during the initial 5-month reporting period. These challenges have primarily impacted the issuance of a Worktag, hindering the execution of financial transactions against the proviso funding source. The following details are the challenges faced.

## **1.9 BACKGROUND ON SYSTEM TRANSITION**

On July 6, 2023, the University of Washington underwent a transformative change by transitioning from a finance system that had been in operation for 50 years to a modern and comprehensive system – Workday Finance. This strategic shift aimed to enhance efficiency, streamline financial processes, and align with evolving technological standards.

## **1.10 IMPACT ON EXPENDITURE REPORTING**

The transition to Workday Finance has been accompanied by a series of adjustments and implementations, resulting in a temporary obstacle to the issuance of a Worktag. A Worktag is essential for tracking and allocating funds to specific budgetary categories, enabling the University to effectively utilize the funding provided by the proviso. The following paragraph explains in greater detail the impact of not having a Worktag on the University of Washington’s ability to execute the work stipulated by the proviso:

In the context of financial operations within the University of Washington's new Workday Finance system, Worktags play a pivotal role in facilitating precise and comprehensive tracking of transactions. Worktags serve a multi-faceted function, functioning as critical identifiers that enhance the clarity and efficiency of financial processes. Primarily, they are instrumental in reporting transaction details, providing a granular view of financial activities. Moreover, Worktags play a crucial role in routing transactions to the appropriate fiscal officers and managers, streamlining the approval and oversight processes. Their significance extends to the identification of the organization responsible for expenses and revenues, fostering accountability and transparency. Transactions can be categorized with various Worktags, each serving a specific purpose. Notably, all transactions begin with a Driver Worktag, indicating the primary funding source.

## **1.11 RESOLUTION: ISSUANCE OF A WORKTAG**

The University of Washington acknowledges the critical importance of promptly resolving these challenges to ensure the seamless utilization of the proviso funding for its intended purposes. Efforts throughout the reporting period have been underway to expedite the issuance of the required Worktag and resume financial operations. A Worktag, crucial for unlocking the use of funding provided by the proviso, was successfully issued on November 27th, 2023. While there are still contractual agreements that need to be put in place, this development marks a significant milestone, enabling the University of Washington’s team to resume normal financial operations and effectively

allocate resources in accordance with the provisions of Engrossed Substitute House Bill 1125.

## **1.12 FUTURE REPORTING AND ACCOUNTABILITY**

The University remains steadfast in its commitment to transparency and now that the necessary systems and processes, including the issuance of the Worktag, are fully operational, we will be providing subsequent reports that detail the expenditure and allocation of funds. This commitment underscores our dedication to accountability, transparency, and adherence to legislative requirements, ensuring that the University's financial activities align with the stipulations of Engrossed Substitute House Bill 1125. Forthcoming reports will offer a comprehensive overview of the financial activities, reflecting the University's adherence to best practices and its ongoing pursuit of excellence in financial management.

### **CONCLUSION**

In this reporting period, our initiative to enhance transportation infrastructure and accessibility throughout Washington state has achieved some milestones across various key areas, despite funding challenges that are outside of our control. Our commitment to an inclusive approach is reflected in the emphasis on non-drivers' needs, especially in overburdened communities. Leveraging innovative AI and machine learning technologies, we have worked towards more robust, integrated sidewalk data inference pipeline, mapping tools, ensuring a comprehensive visualization of accessibility insights.

The adoption of OpenMMLab as a framework, informed by lessons from previous AI pipeline work and the expertise of the Taskar Center for Accessible Technologies (TCAT), highlights the commitment to innovation and production-ready solutions in this work. Our tools are state-of-the-art and aligned with the project's overarching goals of sustainable, maintainable data resources for the state of Washington.

Stakeholder engagement has been a focal point, with dynamic workstreams catering to WSDOT stakeholders, potential partners, and leaders within overburdened communities. These engagements have not only informed our project but have also set the stage for collaborative endeavors that recognize and address diverse accessibility needs.

The instantiation of a private OSM instance, integration of iD and RAPID editors, and the creation of mapping tools mark a stride in supplying a user-friendly platform for collaborative mapping. Furthermore, the division of the state into projects using scripts will streamline the management of tasks, ensuring efficiency in our statewide mapping endeavors.



As we move forward, the comprehensive sidewalk inventory, refined methodologies, and engaged stakeholders collectively position our project as a catalyst for positive change in Washington state's transportation landscape. The work performed during this reporting period laid a foundation for future enhancements, ensuring our steadfast commitment to accessibility.

#### **REFERENCES**

ESHB 1125 [EHSB 1125](#)

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<https://arxiv.org/pdf/2303.02323.pdf>