Oregon Department of Transportation

GIS Business Plan

Geographic Information Services Unit

April 2020

GIS Business Plan Project Team

Chris Wright – ODOT

Brett Juul - ODOT

Phil Smith - ODOT

Chad Brady - ODOT

Chad Crockett - ODOT

Andy Fox – Timmons Group

Tim Sheldon – Timmons Group

Sean Diehl – Timmons Group

Mike Sullivan – Timmons Group

Document prepared by Timmons Group.

Reviewed and endorsed by Oregon Department of Transportation (ODOT) Geographic Information Services Unit (GIS Unit) GIS Business Plan Project Team.

Approval by ODOT GIS Unit April 2020.

Contents

Executive Summary

Plan Purpose

The purpose of this GIS Business Plan is to provide the Geographic Information Services Unit (GIS Unit) of the Oregon Department of Transportation (ODOT) with common and communicated direction and guidance for the next five (5) years to improve the usage of technology and data as well as the practices of people.

Plan Background

This plan is built on the success of previous plans[1] and is informed by a series of stakeholder engagements, peer state examinations, literature reviews, present condition assessments, and outlooks on industry trends (see Approach section below).

GIS Unit Overview

The GIS Unit serves the Oregon Department of Transportation by effectively providing geographic information products and services through the development of spatially-enabled applications, databases, mapping products, analysis, education, consulting and technical support.

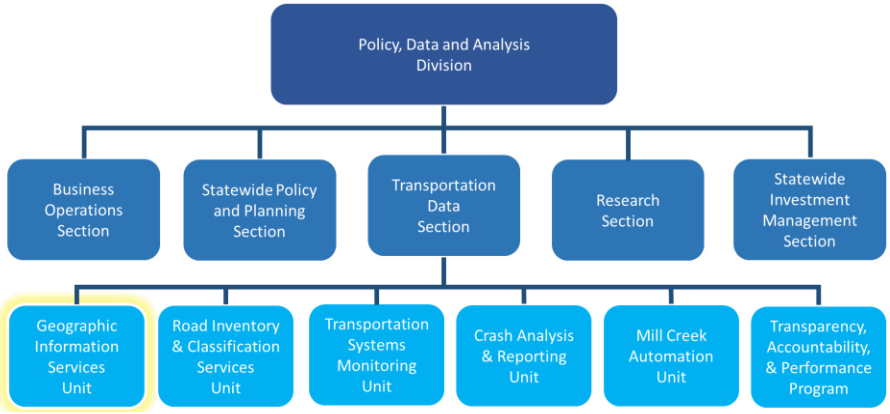


Figure 1: Policy, Data and Analysis Division Org Chart

Figure 2: GIS Unit Team Photo 2020

[1] See ODOT Strategic Plan, ODOT Strategic Data Business Plan, 2008 GIS Unit Strategic Plan.

Key Concepts of the Plan

The following are key concepts of this business plan. Each section represents multiple activities detailed in the plan which together constitute overall focus area designed to continue to grow the capabilities and services of the GIS Unit to meet stakeholder needs (see Recommendations section).

GIS Supports ODOT Strategic Priorities

The priorities of this business plan align with the strategic goals of ODOT. The goals and objectives of the ODOT Strategic Business Plan and ODOT Strategic Data Business Plan were considered throughout the planning process. Central to ODOT strategic goals is making informed decisions towards a common goal. As this business plan is implemented, the GIS Unit will help provide the technology, tools, data, and skills to develop the right information for ODOT staff and stakeholders to make informed decisions.

Performance Management of GIS

Performance management is rooted in the goals and objectives of an organization. When these goals and objectives are aligned with well-defined methodologies that are automated as much as possible, the opportunity for success is maximized. This plan both establishes and builds upon existing performance management practices in the areas of staff performance, stakeholder input & outreach, service requests, technical system performance, GIS production, GIS project effectiveness and benefit, and the continuing use of a capability maturity model (CMM). These recommendations were informed by a nation-wide questionnaire (with assistance from FHWA) of DOT GIS professionals about their GIS performance management practices.

GIS Outreach

Expressed time and time again throughout the development of this business plan via survey respondents and one-on-one interviews with ODOT GIS Unit staff, the need for outreach is a key component for increased success of the GIS Unit.

> Stakeholder Survey Respondent: "I am still not familiar with what types of maps and geographic data I have access to; if I were to know that then I would know whether any of the tools would benefit my work."

Survey respondents commented that the GIS Unit communicate and coordinate with them. However, many also reported a need for service offerings which are already offered by the GIS Unit, they simply aren't aware that the requested offerings already exist.

> Stakeholder Survey Respondent: "It[s] not for a lack of help with the GIS unit. They are very helpful. The limitations are with the tool and the source data."

GIS Needs Discovery

There are many examples of "needs discovery initiatives" in the plan that follows, ranging from evaluating the need for additional positions with new roles and responsibilities (such as GIS Business Analysts and Project Managers) to evaluating the implementation of new tools and technologies. A common theme with each initiative is that they are part of a critical path towards a higher functioning, more mature organizational GIS that continues to meet the needs of ODOT and its stakeholders. The GIS Unit will leverage existing frameworks and processes such as the Decisions and Information Needs Identification Tool for understanding and prioritizing data and tool needs in ways that align with other decision-making methods for data and technology across the agency.

GIS with Purpose

Two shifting paradigms are changing GIS fundamentally. The shifts are affecting GIS as a discipline and specifically are impacting GIS for transportation including at ODOT.

1) First, GIS is becoming application centric with business-driven workflows that leverage GIS to perform tasks in ways in which the user is often not fully even aware. Direct interfacing with a GIS is increasingly possible and requested with technology advances and data improvements typically in the form of best practice implementations in enterprise data stores.
2) Second, the adoption and use of GIS is becoming a core skill in education and the workplace. More and more workers have GIS skills and are bringing them to non-GIS positions. Additionally, GIS is more frequently being an included part of our expected ODOT workflows.

All these changes can be viewed as positive shifts. However, the challenge to the GIS Unit is to account for and provide the needed tools, technologies, and training related to these shifting paradigms. In short, GIS is becoming decentralized while the use is increasing significantly. This business plan specifically acknowledges these shifts and provides planned activities to guide GIS programs forward into these newer waters.

Introduction

Purpose

The Oregon Department of Transportation has a history of GIS planning, having created a GIS Strategic Plan in 2006, followed by a GIS Implementation Plan the same year. In 2008, the GIS Strategic Plan was updated based on activities of the GIS Implementation Plan and has served its purpose; however, as the needs and considerations have substantially changed, a new and fresh effort is practical and needed. The purpose of this GIS Business Plan is to provide a common and communicated direction and guidance for the next five (5) years to improve the usage of technology and data as well as the practice of ODOT staff and stakeholders.

Approach and Findings

The GIS Unit serves ODOT by providing geographic information products and services through the development of spatially enabled applications, databases, mapping products, analysis, education, consulting, and technical support.

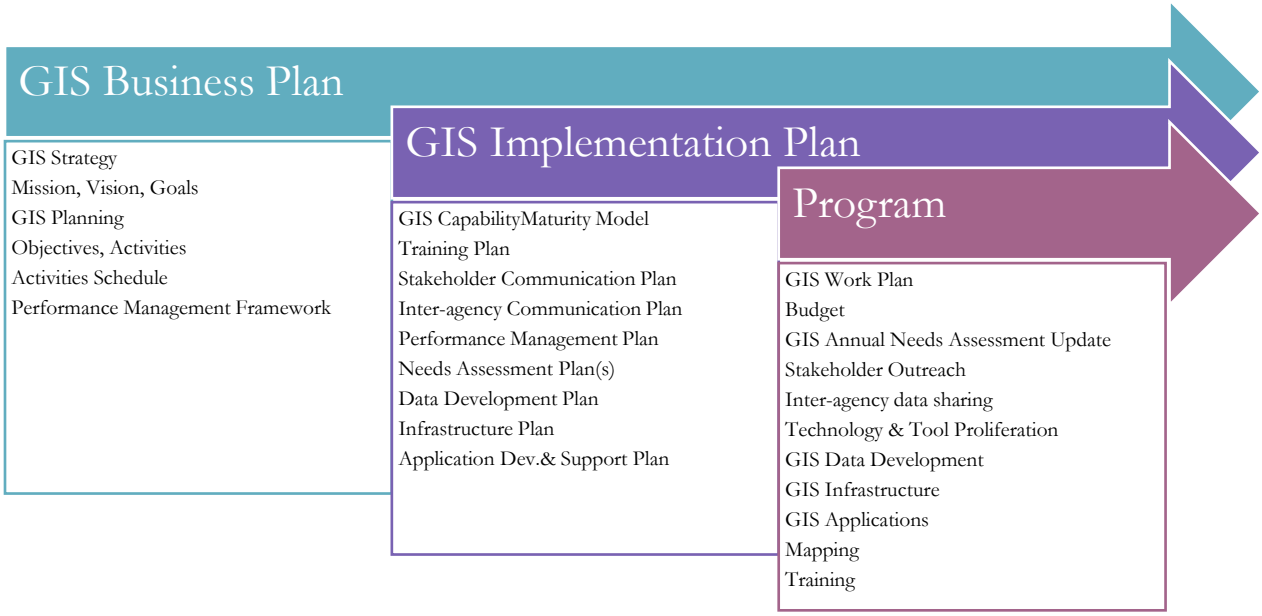
This plan is informed by a series of stakeholder engagements, peer state examinations, literature reviews, present condition assessments, and outlooks on industry trends (see Approach section) to gain an in-depth understanding of the needs and uses of geographic information products and services of the agency. Findings of these engagements were recorded in a series of support documents (see Findings section).

Recommendations

In the Recommendations section, top recommendations are organized by category to give the GIS Unit manageable and achievable areas to tackle in a five-year plan. Quick wins are identified where swift efforts could produce immediate tangible results. A comprehensive collection of all recommendations developed as a result of these planning efforts is provided in Appendix B Comprehensive Recommendations.

Implementation

This business plan provides the foundation for implementation planning for GIS programs of the GIS Unit (see GIS Strategy & Implementation) by identifying key needs and prioritizing recommendations toward addressing them.



Plan Framework

The ODOT Strategic Data Business Plan (SDBP) process led to the development of a strategic framework. The GIS Unit Business Plan largely follows this framework with a mission and vision followed by goals. Each goal has more specific sub-goals that relate to objectives. The activities in this GIS Unit plan are equivalent to strategies in this framework. Each activity has a specific objective and is aligned to GIS Unit goals.

Figure 3: SDBP Strategic Framework Elements adopted by GIS Business Plan

Document Terms and Acronyms

We have done our best to avoid using subject specific language (jargon) and acronyms in this document. We use jargon only when it is necessary to convey specific meaning and have defined terms in Appendix A and/or in context where appropriate. We have used acronyms sparingly, replacing words only when they are often repeated. Please reference Appendix D for further details on terms or acronyms.

Approach

This project engaged a significant cross-section of ODOT participants, stakeholders, and peers including GIS Unit staff, IT, executive leadership, stakeholder ODOT committees, GIS and geospatial data users ODOT-wide, and peer state GIS staff.

The result of this ODOT engagement generated several information gathering and review documents that inform this plan. Additionally, these documents provide more subject specific detail for the GIS Unit to implement identified needs and opportunities of this plan.

Project Kickoff and Background Review

An initial Project kickoff meeting (web-based) was held with ODOT key project leadership for first introductions, high-level project overview, discussion of how the project would be executed and conducted, to sync calendars and schedule recurring project meetings, and review the project schedule. A formal project kickoff (on-site) was also held with ODOT Project team and stakeholders identified by ODOT for a high-level overview of the project scope, schedule, and to conduct initial roundtable discussions about the plan.

ODOT possesses extensive background documentation about its current GIS organization, staffing, training, data, software, policies and procedures. Review of this background documentation provided a valuable information foundation for subsequent project tasks.

Literature Review of GIS Planning for Public Agencies

The purpose of the literature review is to examine other perspectives, topic areas, strategies, and/or methods for strategic and business planning for GIS by other public (specifically transportation) agencies/departments to provide ODOT with broader contexts from which to proceed for the GIS Unit Business Plan.

Key word searches executed in a variety of web search engines and on FHWA TRB[2] were used to find both anticipated and unanticipated documents for review. Documents for GIS/Geospatial Strategic and Business Plans were reviewed from state DOTs, other agencies (state and federal), as well as state-wide plans.

Operating Questions:

- What is the role and benefit of a GIS Business Plan for transportation agencies?
- How do transportation agencies plan for GIS?
- What are characteristics and examples of good and bad GIS planning?

Summary of Stakeholder Findings: Peer State Transportation Agency GIS Comparison & ODOT Stakeholder Engagement (Survey & Interviews)

Peer State Transportation Agency GIS Comparison

A comparative benchmarking was conducted by evaluating and interviewing three (3) pre-approved DOTs of similar size and complexity (Washington, Iowa, and Georgia). The goal of this comparative benchmarking was to gain an understanding of ODOT's relative state of system including such areas as technology stacks, organizational alignments, organizational structure and staffing, governance models, related scripting and programming tools/technologies, and data storage.

[2] Federal Highway Administration, Transportation Research Board. http://www.trb.org/Main/Home.aspx.

A gap analysis, as a qualitative study, between ODOT and the three (3) benchmarked DOTs was then conducted. Available published materials from the peer DOTs were used for the analysis with some materials furnished by DOT GIS managers by request for this study where additional information was needed. Interviews of enterprise GIS leadership from each peer state were then conducted (see summary of findings in next section).

ODOT Stakeholder Engagement (Survey & Interviews)

The purpose of the ODOT stakeholder surveys and interviews was to gather firsthand knowledge about ODOT's current GIS – what is working, and what could use enhancement. The purpose of the survey was to collect information from the participants that may take time to research and compile, and therefore cannot generally be collected conveniently (or completely) during on-site interviews. Following the review and analysis of the online survey results, meetings were held with ODOT staff representing the range of GIS users to collect information and provide a knowledge transfer opportunity to participants. The interviews provided a forum for information exchange between GIS stakeholders and Timmons Group. Stakeholders had a chance to expand on survey results and to learn more about how GIS is successfully implemented and used by their peers in other states. Group interview sessions were well attended, and attendee participation in the discussions was very good.

GIS Tools and Technology Audit

The purpose of the GIS Technology Audit was to develop an inventory of existing GIS tools and technologies across the agency to clearly understand and document existing maintenance responsibilities and identify any gaps.

Preliminary interviews were conducted on-site with ODOT GIS Unit staff July 16, 2019 and August 12-14, 2019 during which discovery on a variety of topics was conducted including GIS and related tools and technologies. An in-depth ODOT website review was subsequently conducted to review previously identified tools and technologies and note any newly discovered items for further discussions. An ODOT- wide survey captured a variety of off-the-cuff comments regarding tools and technology which were carefully noted and consolidated for follow up with the GIS Unit core team. In depth on-site stakeholder interviews were conducted September 23-25, 2019 during which time the identified tech and tools from previous discovery efforts were discussed with SMEs and other knowledgeable staff.

Workforce Development: Skill Competencies & Training Strategies

The purpose of the Workforce Development document was to provide additional and specific guidance in the pursuit of the investment in a critical organizational resource, its staff. The approach followed a logic stream of why and how workforce development is critical to success:

1. Organizations grow and improve on the abilities and engagement of their workforce.
2. Behind the best processes are the workforces that developed, implemented, and consistently follow them.
3. An organization can only bring in the best technology when their workforce can recognize it among the sea of options, understand its potential, deploy it to their colleagues, and maximize its potential.

In short, any business plan, particularly one involving information technologies, must pay critical attention to their workforce, both stewards and users. The approach to pay "critical attention" to workforce development involved:

- On-site interviews with fifteen (15) ODOT GIS Unit staff and management gained their perspectives on job tasks, competencies, and expectations of staffed positions.
- A review of organizational structure, job roles, and job skill levels for ODOT GIS Unit was conducted by reviewing staffing documentation: organizational charts, position descriptions, Performance Management Frameworks ("PMFs"), Capability Maturity Models, Oregon DOT business plans, and previous job announcements.
- Alignment of Workforce Development goals, objectives, and actions among business initiatives (providing a broader framework for the GIS Unit Business Plan) were mapped.
- Recommendations for developing a training plan, skill competency alignment, and organizational structure configuration were made.

GIS Performance Management

The purpose of the GIS Performance Management document was to provide additional, specific guidance in the pursuit of identifying performance measures for the agency along with the data, methods, tools by and with which to make assessments.

GIS leadership in twenty-three (23) state DOT's were identified and reached out to by way of the AASHTO identified DOT GIS-T contacts list via an emailed request for information. Responses were invited via email or phone interview, if preferred. A second email to all 50 states was sent on behalf of ODOT by FHWA with the same questions to encourage responses.

Responses were received from the DOTs of Connecticut, South Carolina, Pennsylvania, Ohio, Georgia, Alaska, New York, and Wisconsin. Their complete responses were captured in an appendix and summarized in the document. The GIS-related performance management concepts/measures they shared are discussed in reference to respective sections of the document.

Findings

This section briefly summarizes and highlights some of the findings from the supporting engagement activities, as outlined in the Approach section above, that inform this business plan.

Literature Review

The reviewed literature provided background, concepts, and ideas from a variety of GIS planning document sources to inform the GIS Unit Business Plan that were summarized into three (3) categories:

- Examination of the Current State
- Potential and Obstacles
- Strategy and Implementation

Examination of the Current State

A summary or examination of the current state of GIS as a part of a business plan (or in its preparation) is a common element of documents. Most plans provide history to give context for the direction and vision provided by the plan. In its absence, a reader (such as executive leadership or the public) would have nothing upon which to tether the logic or reasoning behind the direction.

Sections discussing history vary in length and detail; however, many focus on the successes and positives, spending little time or attention on areas of known deficiencies, concerns or struggles. The USDOT's GIS Strategic Plan[3] is a good example of a more dispassionate accounting of the GIS agency's responsibilities and it includes an interesting evaluation of full time employee (FTE) staffing levels (current vs optimal numbers) necessary to meet strategic goals (see Workforce Development section within this Findings section below).

In an update to their 2008 Strategic Plan, Maine DOT included updated appendices[4] from their 2002 GIS Strategic plan that included a list of "Pillars", their component parts, status, and comments. Though the content is now dated, this organizational/structure concept from a historical perspective is an effective and efficient way to provide context and status of programs, initiatives, and projects that is well organized and easily digestible. The GIS

[3] USDOT Strategic Plan for FY 2018-2022
https://www.transportation.gov/sites/dot.gov/files/docs/mission/administrations/office-policy/304866/dot-strategic-planfy2018-2022508.pdf

[4] Maine GeoLibrary Board 2008 Strategic Plan Update
https://www.maine.gov/geolib/publications/2009%20Strategic_Plan/ME%20Strategic%20Plan%20Appendices%20Final%2004-30-09.pdf

Unit Tools and Technology Portfolio section of this document benefited from concepts of the Maine "Pillars" concept.

Addressing various staffing challenges are a common theme among GIS planning documents including staffing levels (discussed in this section); attracting and retaining qualified staff (discussed in other sections of this document); and training (discussed in other sections of this document). Staffing levels and software needs are co-linear concepts: the amounts of GIS staff, their technical needs, and usage patterns drive software (and licensing) needs.

The USDOT GIS Plan summarizes by business area (what they call "Mode" and what are better known as the various composite administrations of the USDOT) the current number of GIS FTEs along with an evaluation of current staffing level and a corresponding "optimal staffing level" needed to meet strategic goals in a table (right). This table provides a very digestible assessment of current staffing capabilities, shortfalls, and position recruitment activities.

Mode	Current number of GIS FTEs	Evaluation of current staffing level	Optimal staffing level to meet strategic goals
FAA	137	Aeronautical Information Services requires six additional senior[4] GIS FTEs to serve as SME Project Managers. They will lead future geospatial implementation and modernization efforts.	143
FHWA	6	The Federal Lands department is understaffed with GIS FTEs; as a result, they cannot conduct requested training or organize geospatial data and metadata. No GIS positions are currently being advertised.	8
FMCSA	0	The sole GIS FTE position was eliminated. As a result, FMCSA has a need for geospatial analysis but no staff to perform it.	1
FRA	2	Additional junior FTEs with GIS skills are needed for database and server management and application development. No GIS positions are currently being advertised.	4
FTA	0	No geospatial work is currently performed given lack of GIS staff. Two FTEs (one junior and one senior) could support data visualization, process optimization, policy decisions, and regulatory activities.	2
MARAD	0	No requirements for a GIS FTE. MARAD's limited spatial data could be mapped by a contractor if desired.	0
NHTSA	1	Current staffing is sufficient.	1
OST	1	Two GIS FTEs are being advertised later this year.	3
OST-R	3	Current staffing level is not sufficient. One FTE is being advertised and one or two additional FTEs are needed to perform critical work.	6
PHMSA	2	One additional junior FTE is needed in order to perform critical work relating to risk assessment and geospatial data processing.	3
SLSDC	0	No need for GIS FTEs	0
Total existing FTEs 152			**Total needed to meet strategic goals 171**

Figure 4: GIS-FTE Staffing Evaluation Table (USDOT)

Though the purpose of this document was not to assess staffing shortfalls, this and the supplemental documents provide much of the critical background information for such as a next step activity.

Potential and Obstacles

This section examined obstacles to GIS program growth, unequal GIS development across agencies, and technology trends from reviewed plans of other agencies. Common obstacles to program growth and vision alignment for the GIS programs include dedicated and predictable funding and developing performance metrics to track geospatial Return on Investment (ROI). An inability to track geospatial ROI may hinder long term security of programmatic funding. Though funding and agency value is not a

current challenge for the GIS Unit, clearer ROI benefits of GIS programs help decision makers to continue to prioritize them during any challenging budget times.

Unequal GIS development across agencies was consistently attributed to development of GIS programs in "relative isolation" [5] from business unit to business unit causing disconnects between GIS budgets, standards, training, data, and capability. The GIS Unit being a unifying force for GIS at ODOT has a unique challenge to help coordinate, consolidate, economize, and standardize GIS for the agency. The GIS Unit has potential to provide the agency with increased ROI through understanding technology trends and therefore being better situated to implement the best GIS solutions and technology early in their lifecycles for the most longevity and value.

Strategy and Implementation

The purpose of this section was to provide an overview of a variety of GIS goals and implementation concepts, communication methods, and strategies. These were gathered from the agency and business unit level. The key concept here being that the critical step in between goals and implementation are planned actions which are the focus of a business plan. Also important is the link or connection between goals, actions, and objective. Without a clear connection to specific goals, it can become challenging for decision-makers to communicate the need for requirements, justify budget and actions, and measure success of those actions against goals.

The Idaho 2016 GIS Strategic Plan offers a good example of aligning goals with objectives and strategies.[6]

GOAL 1: Create/support a robust geospatial data clearinghouse for sharing current and historical TIM Framework and other authoritative data layers.
Objective: Seek and secure the funding and staffing needed for an official TIM geospatial data clearinghouse.
Strategy: Have a designated clearinghouse administrator who can reach out and support TIM/authoritative data stewards, review datasets and documentation and help keep them current, and maintain the clearinghouse website; acquire and maintain dedicated funding for this position.

Figure 5: Idaho 2016 GIS Strategic Plan: Goal, Objective, Strategy alignment example

The concept of alignment became a core project theme tethering the work of each engagement activity. Readers may note that all recommendations in this plan have an objective and are tethered to GIS Unit goals.

[6] 2016 Idaho GIS Strategic Plan, page 7.
https://gis.idaho.gov/pdf/Standards/_ISDI_StrategicPlan_APPROVED_20161206.pdf

The section of the literature review on implementation could be informative for the GIS Unit in drafting subsequent implementation documents to this business plan. Examples of projection costing tables, responsibly matrices, timeline Gantt charts, and prioritization matrices from a variety of sources are provided.

Summary of Stakeholder Findings

The Summary of Stakeholder Findings provides an overview of the findings of Stakeholder Engagement (Survey & Interviews) and a Peer State Transportation Agency Comparison.

ODOT Stakeholder Engagement (Survey & Interviews)

In order to help document and assess the current state of GIS at the Agency, input from was gathered from GIS stakeholders across the organization using an online survey and focused group interviews. In all, 226 ODOT staff members responded to the survey and almost 100 key stakeholders were interviewed to gather information about:

- Level, type and frequency of GIS use
- Access to maps and geographic data
- Access to GIS technology and tools
- Access to GIS technical support
- Access to GIS training
- GIS organizational structure and leadership
- GIS culture
- GIS process orientation
- GIS enterprise sustainability
- Thoughts in general about GIS at ODOT

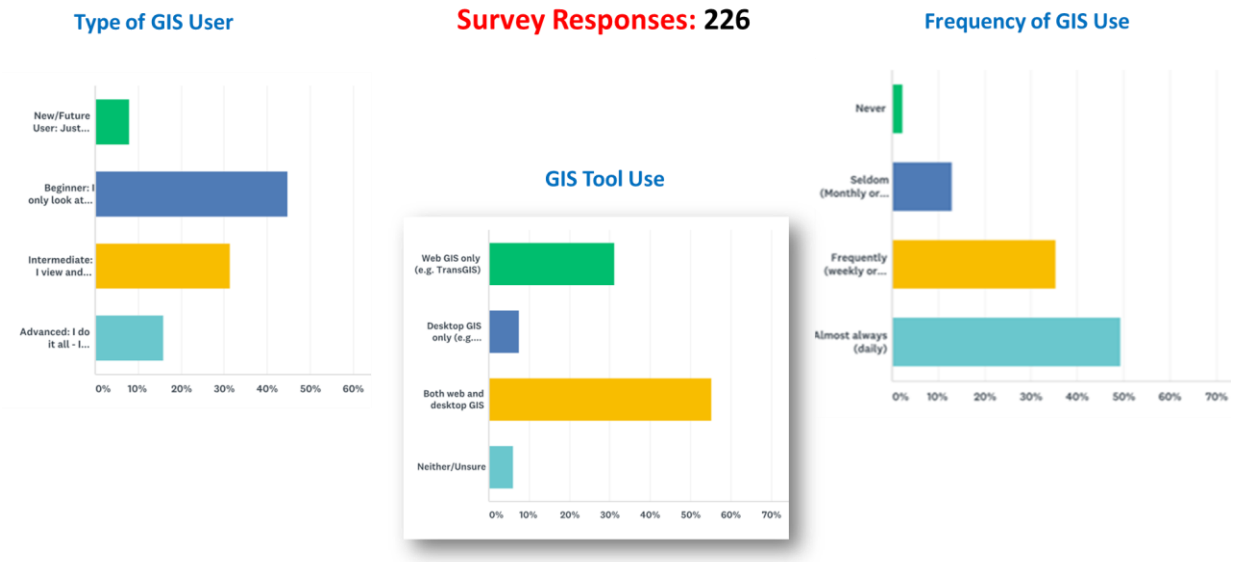


Figure 6 - Summary on GIS survey responses

Hundreds of stakeholder comments were documented and analyzed to identify common themes, GIS requirements and opportunities to enhance GIS at ODOT. Eighty-five (85) important findings were identified and summarized in the last section of the Summary of Initial Stakeholder Findings report and included:

1. Access to Information - Enhance Access to Location Based Information
2. Access to GIS Technology - Increase Information Availability
3. Access to GIS Technical Support - Engage and Strengthen Community
4. Access to GIS Training - Promote Use and Adoption of GIS through Establishing Training Practices for Lifetime Learners
5. GIS Organizational Structure and Leadership - Foster Community for Location-Based Decisions
6. GIS Organizational Structure and Leadership - Establish Plan for Stewardship and Administration to Improve Quality & Performance
7. GIS Culture - Refine Norms, Values, and Traditions
8. GIS Process Orientation – Establish Metrics to Evaluate and Monitor the Effectiveness of GIS
9. GIS Enterprise GIS Sustainability - Formulate Responsible Priorities and Principals to Guide Technology Change and Implementation

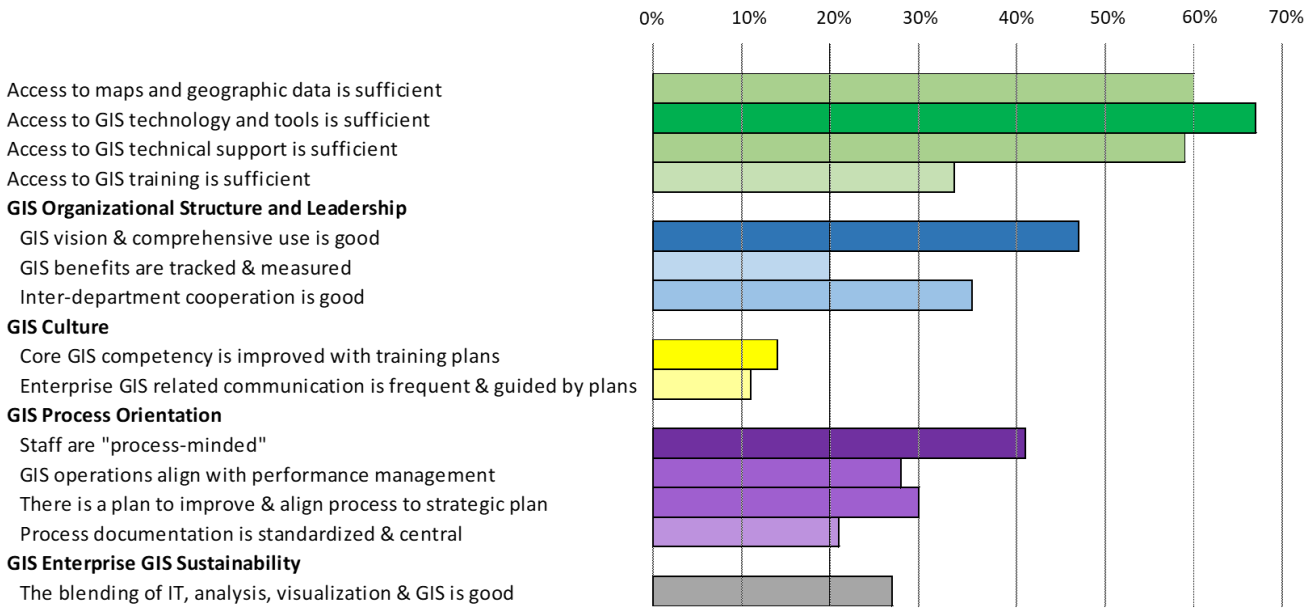


Figure 7 – The level of ODOT GIS stakeholder agreement (in % of survey respondents) with various characteristics of ODOT's current GIS.

Peer State Transportation Agency Comparison

The table below is a brief summary of findings from peer states, by discussed topic, with considerations for the GIS Unit.

Topic	Iowa DOT	Washington DOT	Georgia DOT	ODOT Considerations
GIS Strategic Planning	No GIS strategic plan. GIS policy with goals.	No GIS strategic plan.	Last GIS strategic plan from 1990s.	GIS Unit is a leader in this space.
GIS Assessments	Slimgim-T.	No GIS assessments in use.	No GIS assessments in use.	Continue using Slimgim-T
GIS Data Governance	Authoritative group owns the process to institutionalize governance, but not to dictate governance.	New effort to reinvigorate GIS governance. Formed GIS sub-committees for GIS resourcing and data governance.	Plan to leverage FHWA pooled fund study on GIS Data Governance final report.	Leverage ODOT robust use and trust of committees toward GIS governance goals.
GIS Capability and Investment	Investment self-characterized as "good." Novice to advanced users.	Funding for GIS directly from business units. Novice to advanced users.	Enterprise GIS is funded by IT Division (no bill back). Novice to advanced users.	Models for GIS investment vary. Need to support novice to advanced users is consistent.
Organizational Structure and Staff for GIS	Federated: Central GIS; IT Division; GIS Coordinators with central and district offices	Centralized: IT Division; GIS & Roadway Data Team; Planning Division	Centralized: Office of IT Applications; Office of Transportation Data	No structure is perfect. In the end, GIS will always traverse many business units.
GIS Data Stewards	Data publishers are de facto data stewards.	Business Units responsible. GIS & Roadway Data team gatekeepers to publication.	Data maintainer is the data steward. IT Division gatekeepers to publication.	Data stewards are neither a fix nor substitute for process, methods, and governance.
GIS Licensing and Software	Esri ELA – yes. Interagency Agreement via DAS-GEO	Esri ELA – no.	Esri ELA – yes.	Esri ELA – yes (no gap).
GIS Training	Esri Training Pass. Microsoft Stream. Internal video blog.	Ad hoc basis by GIS & Roadway Data team.	Desire for formal training program. Formerly a position for customer support and training with much success.	Esri Training Pass to normalize Esri course costs. Position to specifically coordinate training and customer support needs.
GIS Analytics	Esri Insights. Tableau. Power BI.	Not engaged in GIS analytics at this time. Exploring needs and options.	Power BI	Addition of Esri Insights.
Mobile GIS	Federated approach. Collector & Survey 123. Geocortex workflows.	Collector & Survey 123. In-house developed (HATS). Sunsetting ArcPad.	Collector & Survey 123	Connect with WashDOT on sunsetting ArcPad mobile (help sunset final 10 ODOT users).
Web GIS	Open Data Portal consistently organized with overview and metadata, downloads in multiple formats (spatial and tabular) and via APIs.	Impressive number of maps, apps, and data. But in disparate locations. 2020 plan to more federate the state geospatial open data portal.	No central source for GIS data in consistently available formats/methods.	Review Iowa and Washington DOT open data portals for aesthetic, organizational, and consistent data availability (spatial, tabular, API) ideas.

GIS Tools and Technology Audit

Through these techniques and industry experience, Timmons Group recommends that ODOT's GIS Unit investigate eleven new tools/technologies for their potential usefulness to the GIS Unit and ODOT as an organization. A short narrative about aspects of each suggestion that make it worth investigation follow. To review the full narratives, please see the GIS Tools and Technologies Audit document.

Data Offerings / Data Proliferation

ODOT GIS Unit offers users a rich dataset for viewing and reference in TransGIS and other web applications. With that said, there are other opportunities to provide data that were called out in survey responses and interviews.

TransGIS	**Purpose**	TransGIS is a web application existing both internally and externally to ODOT. The application allows viewing of *all* of ODOT's GIS data, and supports SQL queries allowing the user to more easily locate information. Data are not downloadable.
	Trustee	Transportation Data Section Manager
	Steward	GIS Unit Manager
	Stakeholders	ODOT and the general public
	Additional Details	1. Per the survey and on-site discussions, this seems to be the most widely used application at ODOT. 2. The external application differs in that it lacks tax parcel data.
	Redundant With	FACS-STIP
	Next Update	Scheduling needed for necessary update from 3.x to Web AppBuilder.
	Deprecation	Life cycle expected beyond 2025

Figure 8: Tools and Technology Audit Example

Current, High Resolution Imagery

Many survey responses and interviewees mentioned the need for additional reliable high-resolution imagery. The GIS Unit should investigate the extent of this need and investigate the update time of existing imagery to determine if improvements could be made there to mitigate the need for additional imagery.

Data Availability and Download

Users of ODOT's TransGIS tool have a wealth of data available for viewing and reference, but according to survey responses there are users who would also like to download the data from TransGIS. Given that the GIS Unit is an aggregator of data, it may not be within their purview to wholesale allow (and support technologically) the download of GIS data from TransGIS, it's worth investigating or refining current methodologies for connecting a TransGIS user with the data owner of interest to that a data sharing agreement could be reached.

Data Proliferation

Two large decisions face the GIS Unit that will drive the direction of the technology stack, ELA[7] needs, and focus/skillsets of many staff for the next 3-5 years: (1) Data proliferation in cloud (AGOL) or on ODOT servers OR a combination and (2) Data Warehouse integration – keeping the tabular and geospatial data worlds in sync (given the likelihood that the Data Warehouse will remain a tabular repository). In all cases, the goals should be that data is easy to find, in relatively few and consolidated locations, linked or referenced between locations, and consistent between them.

These efforts will most likely be based on guidance from the Data Catalog Work Group formed in November 2016 under the Strategic Data Business Plan (SDBP) Implementation Steering Committee (ISC) to develop recommendations for implementation of an agency-wide catalog of ODOT's data resources.

AGOL and ArcGIS Server Updates

The ODOT AGOL site currently contains only links to applications. This is possibly due to AGOL credit and space limitations under the current statewide agreement. It is worth considering proliferation of data with consistent metadata, download capabilities, and application program interfaces (APIs) via AGOL hosting (see Iowa open data model in State Comparison document).

Additional COTS Esri Technologies

Through staff interviews and meetings Timmons Group learned that there are a handful of existing COTS Esri applications and technologies either not in use, or not widely in use. Timmons Group encourages the GIS Unit to explore options for implementations or broadening the use of the following.

Workflow Manager (WMX)

Esri's Workflow Manager extension can help organize and streamline repetitive workflows and foster repeatability in product creation and output amongst multiple users. More specifically, several GIS Unit staff referenced annual or semi-annual products that must be created. Depending on determined ROI, the GIS Unit could implement WMX workflows to aid in these processes, likely by offering some automation or the ability to delegate the tasks to other users as necessary.

Spatial Database Engine (SDE)

Esri's Spatial Database Engine is a multi-user versioned editing environment used to manage spatial data. Over the course of meetings and staff interviews it was discovered that a significant amount of work is completed inside multiple file geodatabases across

[7] Esri software ELA is held by DAS-GEO. An interagency agreement (IGA) with DAS-GEO provides ODOT with access to Esri software.

the GIS Unit. Implementing (or broadening the use of) SDE could allow for easier database maintenance processes and a more structured and organized environment.

Data Reviewer (DR)

Esri's Data Reviewer extension is a powerful data quality control tool. The GIS Unit's role as a data aggregator may limit the uses of this tool, but in the situations where it could be applied it would likely allow for a major improvement in output data quality or at the least, make performing data quality control an easier task to navigate.

In addition to GIS Unit specific findings, the GIS Tools and Technology Audit also resulted in discussions and potential opportunities for dialogue with relevant business units in overlapping interests and responsibilities, such as:

Updated Enterprise Linear Referencing System (LRS)

ODOT's current LRS employs 3 linear referencing networks, commonly referenced by the Road Inventory and Classification Services (RICS) group as linear referencing methods. Among these three networks, representing; state-maintained highways, non-state-maintained highways, and local Functional Class highways, there are two different Linear Referencing Methods (LRMs); 1. Route/Measure, and 2. Segment ID.

The combination of multiple LRMs amongst multiple LRS networks presents challenges to data maintenance, data reporting, and data sharing. These challenges are compounded as ODOT is asked to store an inventory of all public roads in Oregon, which necessitates ingesting data from local governments into the LRS.

Project/Plan Sheet Disseminator

Not unlike many other DOTs, ODOT has struggles with getting roadway construction plan information into the myriad of hands that need it. Traditionally, construction plans were only used in support of the construction activities themselves but with existing technology and associated data demands by CAD and GIS operators this project plan information is requested by many more people than engineers who design the road way, and construction offices that build them.

This isn't currently a space where the GIS Unit has systems or expertise to leverage, but in the future ODOT might consider evaluating plan sharing technologies, or in their absence, looking into what technological methods or workflows are available to allow simple sharing and download.

Workforce Development

The review and findings of the workforce development document were organized into four main sections: Organizational Context; GIS Unit Staffing Summary; GIS Unit Staff Interviews; and Themes and Recommendations.

Organizational Context

Organizational context, in the case of the Geographic Information Services Unit (GIS Unit), refers to an understanding of the situated context of the Unit within the broader ODOT organization as well as the strategic initiatives with which the plans and goals of the GIS Unit should align.

An examination of other strategic initiatives with which the plans and goals of the GIS Unit should seek to align such as the ODOT Strategic Business Plan and the ODOT Strategic Data Business Plan highlighted guidance from other ODOT business and strategic plans. Themes of alignment, prioritization, strategic decision making, and workforce development emerged as common threads tying the documents reviewed to one another and to this GIS Business Plan.

Strategies and actions from the ODOT SDBP Status Report and Update, April 2018[8] were listed with recommendations for GIS Unit activities and suggested workforce development specific training and actions in alignment to SDBP strategies and actions. Those recommendations informed the broader recommendations of this plan.

An examination of the organizational context of GIS within ODOT, specifically, the organizational location and relation of the GIS Unit with the Department compared to other states was conducted. From this, an understanding of where various GIS services and operations are located, how they are staffed and resourced, and how (if at all) specific structural or staffing choices have played a part in successes of an organization's GIS. The conclusion was that there are several relatively common ways that GIS is organized within DOTs; however, there is little evidence to suggest that structural choices alone are attributable to successes. Rather, that structural and staffing choices relative to a specific agency, in context, are important.

GIS Unit Staffing Summary

The GIS Unit has 12 positions with guaranteed approved funding for 11.26 FTE positions plus a GIS Unit Manager. Fully funding the 12th position has to date not been an issue, nor has it caused recruitment hurdles. Additionally, the GIS Unit hosts two (2) additional GIS Systems Analysts (Application Developers) positions from the Transportation Application Development (TAD) Unit. GIS Unit is fully staffed as of October 2019:

[8] ODOT SDBP, pages 23-27

Table 1: GIS Unit Staffing Levels

Classification Title	Working Title	Number of Positions
PEMC-IS	GIS Unit Manager	1
ISS7	GIS Program Manager	1
ISS6	GIS Project Coordinator	2
ISS5	Senior GIS Analyst	2
ISS4	GIS Analyst	2
ISS3	GIS Data Analyst	3
ISS2	GIS Technician	2
ISS5/ISS6	GIS Systems Analyst*	2
TOTAL		15

Currently, there are no plans to increase the FTE staffing level of the GIS Unit. Any identified program/project needs beyond the capacity of the staff will need to be met either through supplemental staff via in-house contractors and/or project specific contracts.

GIS Unit Positional Authority

The ODOT Governance Standards inform us here regarding our agency commitment to upholding Positional Authority and maintaining its accountability. Part of that effort to improve governance structures and processes includes clarifying individual authority and accountability. We recognize ODOT's need to be 'nimble, focused and deliberate about how we make decisions.' Our keeping transparent positional authorities and accountabilities is key to that success. Through effective practice of positional authority in the context of designated roles, we recognize individuals are responsible and accountable for decision-making, progress of initiatives, and organizational performance under their direction. Positional Authority over the ODOT GIS Unit programs, data, products and services lies with the GIS Unit Manager and Transportation Data Section Manager.

GIS Unit Staff Project Categories

ODOT's GIS Unit staff perform tasks spread across nine major project categories, subdivided into many more granular GIS job duties, i.e., daily job tasks. This level of detail is captured, stored, analyzed, and reported on via an application called Hub

Planner. At any given time, the GIS Unit may create a report from Hub Planner detailing staff utilization based on any of the categorical information within the project categories and sub-categories. Hub Planner is and will continue to be a mission-critical work planning tool for the GIS Unit.

GIS Unit Staff Interviews

GIS Unit staff were interviewed in small groups for 45-minute time blocks and were provided questions in advance to better elicit thoughtful and robust answers. The mix of questions were chosen to collect information from staff on the skills, competencies, and knowledge that, from their point of view, are critical to their success and what additional training they feel they need. Also, questions were chosen to hear about the tasks, assignments, priorities, and workloads. Responses helped inform recommended training subject areas, task efficiency recommendations, and job duties / skills alignment improvements. The information gathered from these interviews highlighted common needs and interests across the unit leading to many easily implementable recommendations and actions.

What core skills are most critical to successfully accomplishing your job duties?

Summary Comments: Most positions utilize FME (either by creating or leveraging workbenches) to do some aspect of their work. This technology has become a critical component of the technology stack of the GIS Unit. Also notable is that given the consistent mentioning of the need for more training in business analysis, there wasn't more mention of business analysis activities such as process documentation and control. This isn't necessarily a reflection of those skills not being critical to success, but perhaps more a reflection of thinking about them in terms of needing more training in the next question and less about them in this context. Meaning, their omission in regard to this question could be a function of the information gathering tool (the questions and their order) in respect to this specific topic.

What additional or ongoing training would benefit you?

Summary Comments: The Esri trainings mentioned by staff were all in the context of either stand-alone specific classes or certifications.

It was noted that a number have taken the Oregon Project Management Associate (OPMA) accredited Project Management course and that the group takes an Agile approach to development. Do the OPMA methods and Agile align in ways that meet GIS Unit needs? If not, a consistent project management and delivery methodology should be adopted and trained to all staff. A light version of that training could also be offered to partners with whom GIS Unit works to deliver application and data products.

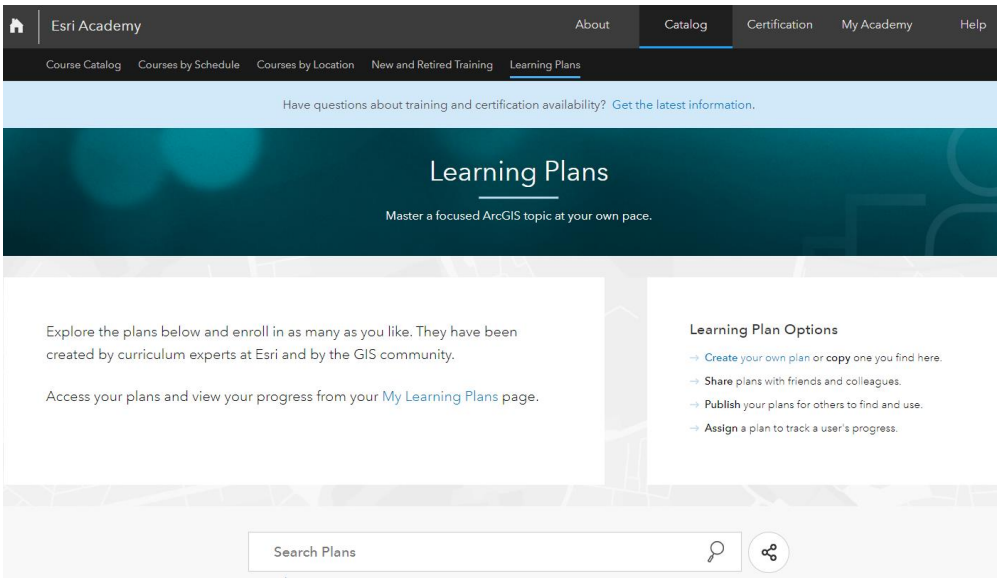


Figure 9: Esri Learning Plans

It was also noted that though training opportunities are available and time requirements for staff training are communicated from management to staff, there is some decision fatigue as to what classes to take, how to prioritize, how to find the right course, etc. Though staff might appreciate the flexibility and trust to seek out and access their own training to meet the needs being provided a buffet of options, a core curriculum for the GIS Unit to ratify training expectations, make for a formalized and consistent knowledge base across the Unit from which all positions proceed, and increase the speed with which new hires can achieve that uniform knowledge base.

A recommendation formed to consider using the learning plans available on the Esri training site, making use of free courses (free and free with maintenance in ELA). This could make selecting classes for a given topic or area of interest simpler, provide structure, and a completion goal. The GIS Unit can also create and save their own training modules.

The most requested training needs are for **FME** and **business analysis**.

Given the high use of FME across the GIS Unit and the dependence on business analysis skillset for daily operations, training plans in these areas are recommended.

Are there departmental/administrative/operational activities in which you feel a lack of understanding?

Summary Comments: There were general comments interested in learning more about the operational budgeting process for equipment procurement (such as for new and

updated office equipment) as well as for processes and forms for travel requests, purchase requests, and other related things.

What are your top 2-5 priority assignments?

Summary Comments: The group is responsible for a wide variety of tasks and duties. These tasks and duties span working with IT counterparts to manage the GIS technology stack to helping users with software, to developing applications to publishing data to making maps which cover a wide variety of skillsets and knowledge bases in GIS.

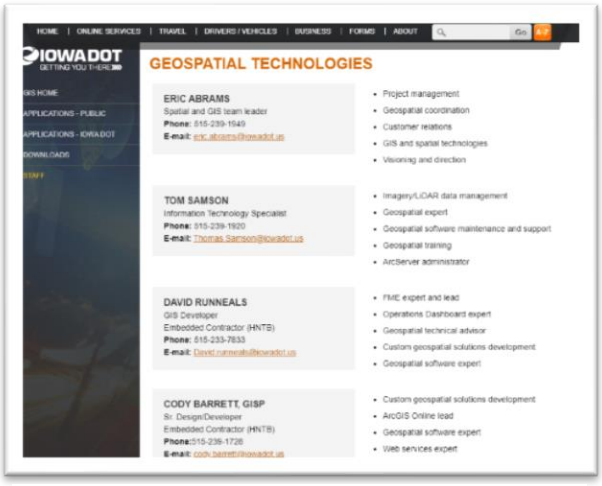


Figure 10: Iowa DOT example of posting GIS Unit roles

Posting staff with titles/roles/responsibilities on the intranet and/or ODOT website could provide clarity and transparency to stakeholders inside and outside of the organization.

On what 2-5 activities do you typically spend the most time?

Summary Comments: The GIS Unit has done a great job of streamlining and improving efficiencies in repetitive processes with technologies such as FME, for themselves and other business units. In doing so, greater amounts of work are accomplished than before by the GIS Unit on behalf of many agency business units. Meaning, more processes done by other methods (by GIS Unit staff and other business unit staff) are now being accomplished by FME. As would logically follow, maintaining the FME workbenches on the backend of the workload is now taking more and more of staff time as more and more processes are being managed. So, though these tools have led to great efficiencies, they need care and feeding themselves, a time requirement that cannot be overlooked. On-going training in FME is recommended to be added to workforce development.

Additionally, custom mapping occupies quite a lot of staff time and attention. The GIS Unit has a stated commitment and strategy of increasingly deploying web mapping solutions to meet mapping needs when possible. These will continue to reduce the need of and requests for custom maps. On-going training in web mapping technologies and platforms (such as AGOL) is recommended to be added to workforce development.

Finally, several staff comments revolved around time spent on data reviewing activities. This is an important role of the GIS Unit. The scope of this review did not ascertain or qualify the procedures and documentation for data reviewing processes of the GIS Unit; however, the need for improvements in methods and efficiencies in data reviewing methods was noted. The GIS Unit should investigate data reviewing technologies such

as Esri Data Reviewer extension for gains in efficiency, consistency, and quality of review processes. On-going training in selected technologies is recommended to be added to workforce development planning.

Are there activities that consistently take you longer than you think they should?

Summary Comments: Scope creep and underestimating time needed to complete projects were a common theme. These are not uncommon and plague many organizations. Though there was no formal assessment of procedures and controls, based on consistent feedback received, improved methodologies and skills in business analysis and project management could be a great start to addressing. Additionally, given the scale and number of projects, assignment of project management (PM) and/or business analyst (BA) roles to projects is not out of the realm of normalcy for a Unit such as GIS Unit and its business. For the variety, speed, and nimble nature of the typical GIS Unit project, a singular PM/BA role might be most effective.

Are there seasonal activities or deliverables that require significant amounts of your time (and potentially jeopardize your ability to deliver on other work)?

Summary Comments: Seasonal work does not seem to adversely affect ability to meet day to day work responsibilities. Regular data updates and map work are expected and can be planned. There were mentions of non-scheduled data updates and publishing schedules from various business units. Though some of these may not be helped given the nature of their business, those that can/should be encouraged to and coached in ways to get publications onto a normal schedule.

Projects such as SPIS, OR-Trans, and county/city map creation were discussed in terms of projects that either used to be more seasonal but have transitioned into more year-round activities or as ones that do not otherwise jeopardize the ability to meet daily work.

Are the expectations of you, in your opinion, reasonable?

Summary Comments: By and large, staff are very positive about expectations of them from management, colleagues, and customers. Most expectation discrepancies staff contend with come from customer deliverable and timeline requests that require consultation and education of the client whose requests typically are unknowingly and not purposefully unreasonable. These interactions are reported to generally be positive experiences with customer satisfaction and edification simultaneously achieved. However, the process and technology for handling customer service requests for the GIS Unit, though working well, is a source for potential improvement.

Additionally, the group is responsible for a wide variety of work and support. Given this, staff find themselves having to already know or learn on the fly about other business units and their data. A structured and organized continual education plan that rotates

subjects to teach and reinforce concepts pertinent to the GIS Unit and the Department at large (such as other business units and their data) will help reduce the knowledge gap.

A noted comment was that "occasionally support on production issues can bog us down and migration issues can be problematic." The scope of this review was not to assess whether adequate performance measures and procedures are in place to ensure production and migration issues are controlled. However, the comment does raise a question that is discussed in the performance management supporting documentation and in this final GIS Business Plan.

Themes and Recommendations

Throughout the course of the research and interviews for workforce development and the broader GIS Business Plan, noteworthy common themes revolving around workforce development became apparent.

The full list of recommendations from this section are included in the Comprehensive Recommendations of Appendix B. The most critical recommendations for this five-year business plan are called out in the Recommendations section below.

Business Analysis Training	
Recommendation	The most requested training needs are for FME and business analysis. Some requests for this training were direct while others were inferred by interviewers based on typical job duties and types of challenges they described. Given the dependence on business analysis skillset for daily operations, a training plan in business analysis is highly recommended.
Document References	4.2; *What additional or ongoing training would benefit you?* Summary Comments
Slimgim-T Success Factors	BCC, EFI, CCT, LTC, GLA, SPM
SDBP Strategy & Action	Dependent upon chosen core curriculum.

Figure 11: Workforce Development Theme & Recommendation Example

Performance Management

Responses were received from eight (8) states: Connecticut, South Carolina, Pennsylvania, Ohio, Georgia, Alaska, New York, and Wisconsin. Their complete responses are captured in Appendix A of this document. Though the number of responses were lower than hoped, the responses themselves represented a good cross section from those DOTS having no performance measures (beyond staff performance) to a quite comprehensive array of performance measures. This summary focusses on noteworthy concepts and ideas communicated in the state responses.

It should first be noted that three states reported little to no specific GIS performance measures beyond those related to staff performance reviews and GIS project management as part of the larger IT project management apparatus (and not GIS specific).

Also notable is that the use of a Capability Maturity Model (CMM), specifically Slimgim-T, as one performance measurement device was raised by three of the respondents – Pennsylvania and Connecticut are currently employing it, and New York is interested in its use.

For most respondents, there was no direct performance management for GIS. Performance related to personnel was the most common, though not as specific to GIS, but as a function of Department-wide policy/initiative. Additionally, two states reported GIS performance measuring relating to User Support, System Administration, Data Maintenance, and Applications Development.

The measures for GIS data and GIS staff were tied to relevant business units. Application development for GIS for one state was part of the larger GIS IT project management apparatus for performance measurement, which would imply its delivery would also reside within the larger apparatus as well in that case.

Most notable was that Connecticut is initially developing performance measures for geospatial and LRS data following the National Highway Transportation Safety Administration (NHTSA) prescribed Model Performance Measures for State Traffic Records Systems.[9] The NHTSA document provides performance measure suggestions for roadway data to meet Traffic Record Systems and associate activities needed; however, the concepts apply well in general to those needs of the enterprise. In this case, roadway data is defined as: The State repository that stores information about the roadways within the State. It should include information on all roadways within the State and is typically composed of discrete sub-files that include roadway centerline and geometric data, location reference data, geographical information system data, travel and exposure data, and more.

[9] https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/811441

Table 2: NHTSA Model Performance Measures for State Traffic Records Systems - Roadway Database Model Performance Measures

ROADWAY DATABASE MODEL PERFORMANCE MEASURES

ROADWAY DATABASE					
TIMELINESS	***ACCURACY***	***COMPLETENESS***	***UNIFORMITY***	***INTEGRATION***	***ACCESSIBILITY***
R-T-1: The *median* or *mean* number of days from (a) the date a periodic collection of a critical roadway data element is complete (e.g., Annual Average Daily Traffic) to (b) the date the updated critical roadway data element is entered into the database. R-T-2: The *median* or *mean* number of days from (a) the date a roadway project is completed to (b) the date the updated critical data elements are entered into the database.	R-A-1: The *percentage* of all road segment records with no errors in *critical* data elements. Example: Surface/Pavement	R-C-1: The *percentage* of road segment records with no missing *critical* data elements. R-C-2: The *percentage* of public road miles or jurisdictions identified on the State's basemap or roadway inventory file. R-C-3: The *percentage* of unknowns or blanks in *critical* data elements for which unknown is not an acceptable value. R-C-4: The *percentage* of total roadway segments that include location coordinates, using measurement frames such as a GIS basemap.	R-U-1: The *number* of Model Inventory of Roadway Elements (MIRE)-compliant data elements entered into a database or obtained via linkage to other databases.	R-I-1: The *percentage* of appropriate records in a specific file in the roadway database that are linked to another system or file. Example: Bridge inventory *linked to* roadway basemap	R-X-1: To measure accessibility of a specific file within the roadway database: • Identify the principal users of the roadway file • Query the principal users to assess (a) their ability to obtain the data or other services requested and (b) their satisfaction with the timeliness of the response to their request • Document the method of data collection and the principal users' responses

Of those states that do have active GIS performance measures, the most common focus areas are operational efficiency, constituent service levels and access, data integrity (confidence, accuracy, maintenance), and GIS project management (as a function of the "standard IT Governance process").

Notable was the description of a failed attempt at a department-wide effort to create and implement measures – "the measures for which quality input data was available weren't significant to the executives and the measures the executives desired weren't viable due to regional variations/discrepancies in the source data." A lesson from this being that the best performance measures are predestined to fail in implementation without quality metrics and data for them.

Three states responded that they have no formal or specific GIS performance measures and some report interest in them (see Alaska and Connecticut) with past failed attempts (see Alaska). Other states report that while performance measures are employed related to GIS, they are not GIS specific (such as IT project delivery which would include GIS IT projects, see New York). Internal quarterly and monthly reports were reported that largely revolve around quality of work product (data), staff performance (reviews), and trainee training plan completion. More specific data quality mandates were cited such as the FHWA Model Inventory of Roadway Elements (MIRE) Fundamental Data Elements (FDE[10]).

[10] https://safety.fhwa.dot.gov/fde/

Performance Management

Performance measure recommendations for ODOT GIS Unit are a result of outreach to states on their performance measures (see Approach), stakeholder engagement at ODOT (interviews with stakeholders and GIS Unit staff, ODOT-wide GIS survey), and subject matter expertise of the GIS Unit Business Plan team.

Though each of these performance measure concepts are applicable to the GIS Unit, it is not a realistic expectation to implement all or most of them immediately. First, each should be carefully considered and prioritized for implementation by the unit. Then, prioritized performance measures for implementation should have metrics and goals established.

The evaluation of existing and addition of new performance measures should be an annual GIS Unit operation.

Staff Performance

Staff Performance

Carry out annual staff performance reviews covering various job aspects by position level. Establish a clear review methodology including scale/rubric and criteria at the beginning of the review period. Reviews should be in part standardized across the business unit for generic areas such as customer service or teamwork and in part individualized to specific job duties and responsibilities.

Staff Training

Establish training goals (minimum number of training hours or activities) per year per employee, translate to a score and roll it up to the unit level. Have each employee establish training goals with a training plan for the year. The execution of the plan should be evaluated against plan goals while taking into consideration other priorities and operational tasks.

GIS Stakeholder Input & Outreach

Customer Survey

The GIS survey conducted by GIS Unit and Timmons Group in summer of 2019 could be used as a model for a consistently applied measurement device. Use of a consistent survey from year to year is important to track responses over time. Like the 2019 survey, respondent organizational information such as business unit, office, division, and district should be captured for summary and analysis purposes.

Changes to the survey change the ability to relate responses from year to year and make temporal assessments (meaning, assessing change over time). Inevitably, measurement

devices such as surveys must adjust to changes in technology, needs, and program focus shifts; however, careful attention should be paid to changes to ensure the usefulness of historic data gathered from past surveys for comparisons and analyses.

Surveys and outreach are also an excellent opportunity to gather technology, data, process, and training needs, such as in the question below from the 2019 ODOT-wide GIS survey.

GIS usage

Increasing GIS Unit evangelism has been discussed over the course of our interactions with the GIS Unit. GIS evangelism in this context means the continual efforts to communicate, educate about, and promote the benefits of GIS to the agency and GIS Unit stakeholders. This includes GIS training; geospatial data services; GIS technology(s) availability and capabilities; and infrastructure capacity.

The need to self-promote was evident in survey responses (see discussion below). A measure for determining successfulness of GIS Unit self-promotion could be evaluating the use of GIS technology across the enterprise. Consulting with ODOT IT on historic and current GIS software licensing and usage would allow the comparison of a baseline usage statistic to current and future trends in usage. As an example metric, a percentage increase goal for the unit for the year could be established.

The results of the survey showed a high number of self-reported beginner level users who use GIS daily. Usage measures could help validate survey results and point in the direction of useful training or informational outreach. Also, promotion can inform large numbers of beginner users who use GIS daily of training programs to utilize rather than relying on ad-hoc requests for assistance.

GIS Unit Service Requests

GIS Unit Service Requests and Projects

Differentiating between what could be deemed a request versus a project is important for performance management tracking and measurement. Requests could be considered activities such as a quick ten-minute tutorial on a web application or data request that takes less than a few hours to fulfill. Projects could be considered activities such as creating a mobile app for data collection, making a web map of consistently requested maps, or a training course.

To differentiate between requests and projects, the GIS Unit should establish standards and guidance. Though the lines might be somewhat grey in the middle, guidance helps the unit more consistently put work requested into one area or the other for tracking, as well as when the scope of a request has transitioned from a request to a project.

To track requests and projects, the GIS Project Request Page could be amended to track them as separate domains, allowing for separate tracking and performance measurement.

GIS Unit service request completion rate

Elapsed time between request submittal and first response to customer and/or request completion could be tracked and measured. Goals/targets for acknowledgement and completion timelines can be set such as all requests will be acknowledged within 2 business days and completed within 5.

GDOT: "All customer requests need to be addressed within 2 business days, whether that is a request for a custom map production or an off the shelf pre-printed map."
PennDOT: "Requests answered same day, completed by customer's stated due date or negotiated due date."
SCDOT: "We must get in contact with a customer within 24 hours after a request is received."
WisDOT: "Customer service surveys sent out randomly for Core GIS incident and service request tickets."

GIS Unit service request satisfaction survey

Each ticket submitted by a customer could generate a customer satisfaction survey that goes to the customer. Results could be compiled quarterly or annually.

Alternatively, service request surveys could be sent quarterly to all service request customers of the quarter for feedback on their request(s) experience.

WisDOT: "WisDOT GIS Core: Recently requested information from customers regarding GIS Core services, gaps, priorities, etc. and will continue this type of effort moving forward."

Technical System Performance

Capacity Planning, ArcGIS Service Monitoring, and Up-Time

We recommend performing a detailed performance capacity planning effort of the entire GIS architecture within ODOT. Once completed, other decisions on improvements can be recommended and baseline needs for performance measures can be established. These ArcGIS performance requirements and identified metrics could be sourced from ArcGIS Monitor (once implemented) and/or from Solar Winds for quantitative measurements. This would require the implementation of ArcGIS Monitor and possible additional configuration of ODOT's current deployment of Solar Winds.

PennDOT: "(Server performance monitoring, space, up-time), file backup cycle performance (time to complete, job success, optimal times to run). Database server performance, Application Query Performance, View performance, database space usage/availability/up-time, ETL batch cycle performance (time to complete, job success, optimal times to run), database backup cycle performance (time to complete, job success, optimal times to run). GIS Application Systems Development full SDLC with ITIL metrics and service improvement"

The next step to consider is determining acceptable failure rates for applications requesting GIS data or services served through the ArcGIS Enterprise components. If there are applications requesting GIS data and services that required to be running 24/7, then we recommend high availability configurations to support those applications. Metrics around the determination should be drafted for assisting in the decision on whether to configure an ArcGIS Enterprise high availability system. The metrics should be measured by the percentage of time that the system is available. The formula for measuring this percentage can be different for each IT department.

GIS Production (to include quantity and quality – accuracy, currency, availability)

GIS Production (Maps and Data)

The GIS Unit is responsible for some GIS production including specific annual maps (such as City/County series) and data (such as OR-Trans). Development of performance measures in these areas should revolve around quality, quantity, and timeliness. Program level performance measures can translate to staff level expectations/performance measures for those assigned.

For example, a simple performance measure could be to produce the required number of county maps, for our example we'll say 30 counties by June 30th for the program. That can translate to the assigned staff as:

City/County Map Series Production:
3 -> Produce 30 City/County series maps by June 30th
4 -> Produce 30 City/County series maps by April 30th
5 -> Produce 40 City/County series maps by April 30th

Where 3 is "meets expectations, job done"; 4 is "meets expectations in some areas and exceeds in some, great job"; and 5 is "exceeds all expectations, wow super performer." (with 2 being "did not meet in some area" and 1 means "did not perform").

> PennDOT: "We target updating and publishing all ~2,500 county/municipal maps annually, date change to current year by June 30, this applies to cartographic products. ARNOLD development performance (by county, conflating local data status and time to complete, incorporating non-liquid fuels tax eligible roads, network creation)"

Tiered environment

Movement of data through stages (DEV→TEST→ PROD) should be as efficient, consistent, and quick as possible. The configuration and promotion processes for SQL and GIS Server should follow industry best practices coupled with State of Oregon and ODOT agency best practices and/or requirements as much as possible/applicable to the environment.

We noted in interviews that work in SQL is mostly done in PROD environment and only copied down for DEV and TEST environments for specific needs. The best practice is that work should not be conducted in prod environment. Work should be done in DEV, pushed to TEST, and finally pushed to PROD. We also noted that the TEST and PROD environments of the GIS Server mostly mirror each other. The best practice is for them to mirror. This ensures that all work done in TEST will seamlessly transfer and work as expected in PROD. ODOT staff also noted that they would like to see improvements to data review and posting (such as from R1 jobs, FME, Data Reviewer, and other methods) as well as to the ArcGIS promotion workflow (to streamline and be faster).

We recommend accounting for and tracking improvements in this space over time through Slimgim-T success factors (SPM, GPM, SPD, DME, PPD, SAC). Additionally, specific measures could be assessed such as time through stages for data publications. Randomly conducted audits of TEST and PROD environments could assess consistency maintained between the two.

GIS Project Effectiveness, Efficiency, and Benefit

Internal Effectiveness (Scope)

Internal project effectiveness is the measurement of whether the execution of the project met its specific goals. Each project should have goals established and measured against for success. For example, a project to build a mobile app to collect culvert data in the field, should collect culvert information in the field successfully. An assessment of pre/post scope is an example of what could be measured. Measurement of these successes from project to project should be aggregated for the GIS Unit.

Efficiency (Schedule, Budget)

Project efficiency is the measurement of whether the execution of the project was within anticipated schedule and budget. Measurements should be aggregated for the GIS Unit.

Benefit

Project benefit is the measurement of anticipated vs. outcome benefits of the GIS project. Example GIS project benefits are avoidance of field time, increased safety, improved data quality, improved data access, systems integration, automation, reduction of costs, reduction of redundancy, and so on. Measurements should be aggregated for the GIS Unit. This aggregation will likely be in the form of qualitative assessments and narratives.

> WisDOT: "measures of improved business value we expect or receive after GIS technologies are implemented; examples: 30-60% reduction in staff effort after deploying mapping enhancements (items vi/x); 70%+ reduction in development and, over 50% reduction in IT maintenance and support, and elimination of 2 servers when replacing old public web map with AGO (item x)."

GIS Unit Project Closeouts

Track project closeout timelines against projected timelines at project outset. We recommend the additional capability to track customer lag or inactiveness in projects. For example, a project was supposed to take four weeks with one week for customer review, but review took 3 months.

We also recommend establishing guidelines for amending project timelines. It would be easy to simply amend all estimated project timelines to at or near actual timeline as a project nears closing, rendering the measurement device moot. Providing guidelines helps ensure GIS project managers know they can adjust timelines for activities such as agreed scope modifications but keeps adjustments from one project to the next more consistent. Additionally, it provides guidelines for when a request for quick help or simple map becomes the level of a project. For example, when a request for a quick 10-minute call to help with an ArcMap function or tool escalates to the need for a formal training session(s).

WisDOT: "WisDOT GIS Core: Measures close-out metrics for all IT projects, including GIS projects. This includes a variety of metrics such as project schedule on-time versus late, project staff time estimates versus actuals, project cost estimates versus actuals (e.g., licensing, infrastructure, etc.)"

Capability Maturity Model (CMM) – Slimgim-T

The GIS Unit has engaged with the Slimgim-T CMM. There is a baseline assessment from January 2019 from which to build. We recommend continuing to engage with the CMM on an annual basis. Use the Slimgim-T success factor related activities in the GIS Unit Business Plan completed in a given year to help assess maturity in specific areas. For each assessment, accompany success factors with narratives that help explain to future reviewers the rationale behind given scores (1-5) as shown in appendix C. A summary webbed chart (see also in Appendix C) plots maturity change by category over time, with each corner of the web corresponding to the six general areas of maturity based on a composite of success factors in each area:

PennDOT: "SLIMGIM completed by an on-site contractor and separately by internal staff, outcomes compared."

By utilizing the self-assessed maturity and likelihood by category, areas of the most potential for change (improvement) can be of highest priority and gap analysis focus for most likely positive results. A matrix (presented in Appendix C) can be employed for establishing a reviewing method and priority.

GIS Strategy & Implementation

The purpose of this section is to highlight guidance from other ODOT Business Plans to inform GIS Unit GIS Business Plan. Themes of alignment, prioritization, strategic decision-making, and workforce development are common threads tying all activities of this project together, culminating in this business plan.

One ODOT[11]

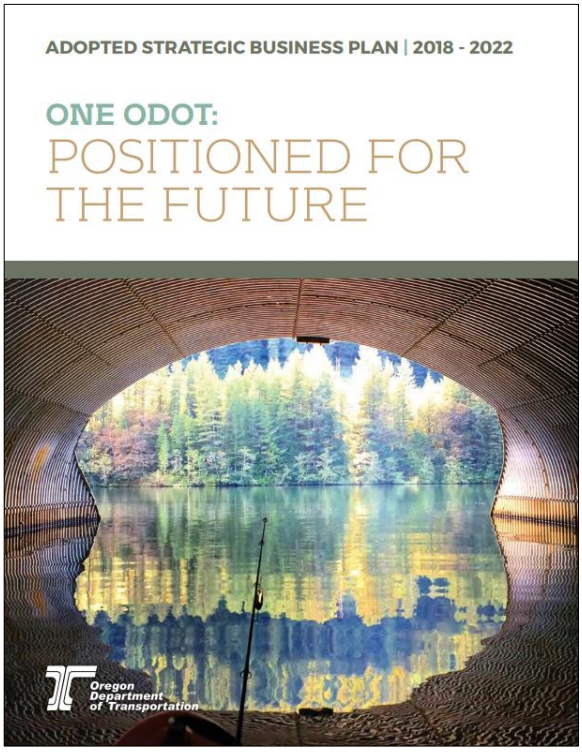
ODOT Mission

ODOT provides a safe and reliable multimodal transportation system that connects people and helps Oregon's communities and economy thrive.[12]

ODOT 5-Year Vision

ODOT works together to be a recognized leader in transportation, an employer of choice in our local communities, and well positioned to deliver transportation solutions for Oregon's future. Specifically, we have:

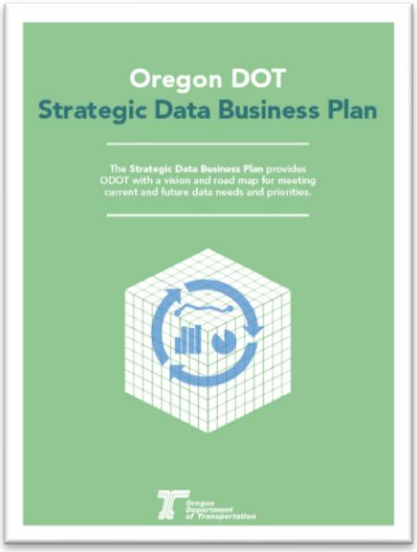
- A high-performing and collaborative workplace where staff at all levels are aligned in our shared mission.
- Flexible processes and mechanisms that adapt to changing needs and proactively respond to trends and opportunities.
- Modernized systems, technology and services to maximize resources and improve productivity and efficiency.
- Strong and informed governance for priority-setting, decision-making and evaluating progress on initiatives.



[11] ODOT Strategic Business Plan 2018-2022. https://www.oregon.gov/ODOT/About/Documents/SBP.pdf

ODOT Strategic Data Business Plan (SDBP)

SDBP Mission



ODOT makes effective use of data and information to support the department's mission. Our employees, partners and customers have access to the right data and information to enable them to make sound decisions.

This statement was intended to emphasize that investments in data should:

- Support the agency mission,
- Lead to improved decision making,
- Add value for not just for ODOT employees, but for partners and customers as well, and
- Be maximized through efficient and coordinated management practices

SDBP Goals and Objectives

Building on the vision statement, five goals were adopted to paint a more complete picture of the desired future state of data management at ODOT. This future state is one in which:

- Agency data are integrated in order to provide business insight,
- The agency has the agility needed to make use of emerging data sources and technologies,
- The agency focuses investments on data that will add the greatest value – and has the skills and tools needed to translate data into actionable information,
- The agency ensures that data are accessible for internal and external use, and
- The agency supports and encourages data sharing in order to maximize data utilization.

The SDBP process led to the development of a strategic framework. The GIS Unit Business Plan adopted this framework, the details for which are discussed in the GIS Plan section of this document.

Figure 12: SDBP Strategic Framework Elements

GIS Unit Strategy

GIS Unit Vision

Agency leader in delivering authoritative geospatial data services and support.

GIS Unit Mission

Provide ODOT with an integrated GIS platform that facilitates informed decision-making for a safe and efficient transportation system.

GIS Unit Values

The AREA Values provide direction ensuring that our vision and mission are met with technologically advanced solutions, transparent work practices, and excellent customer service.

Accountability
Reliability
Efficiency
Accuracy

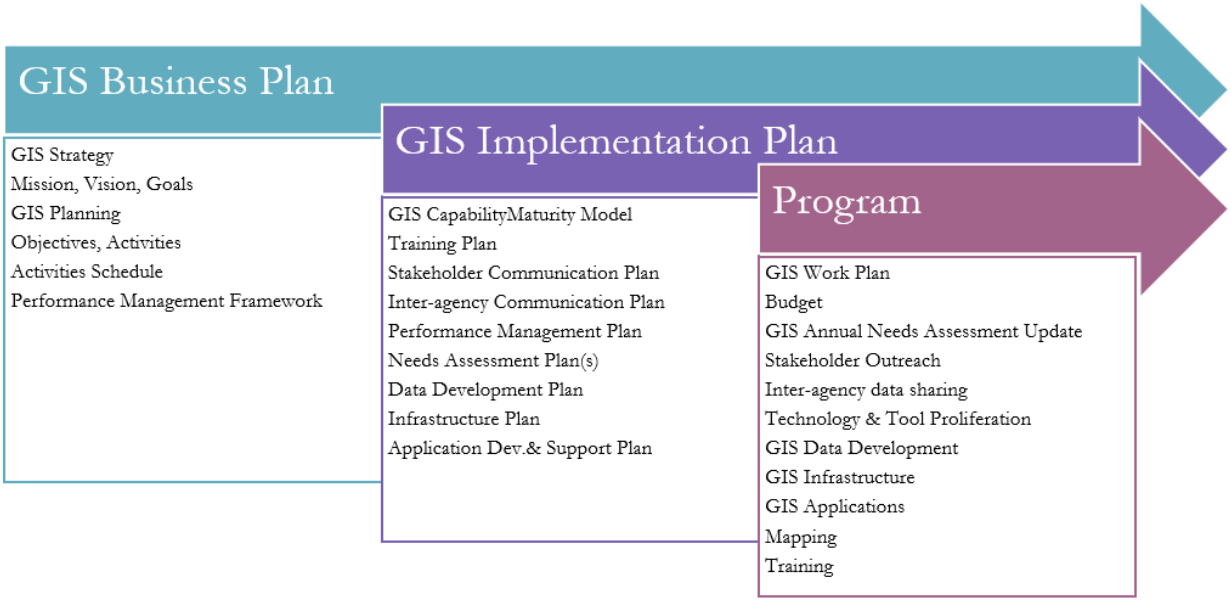
GIS Unit Goals and Objectives

To accomplish the GIS vision and mission, we must have a strong set of strategic goals that management, staff, and our stakeholders strive to achieve:

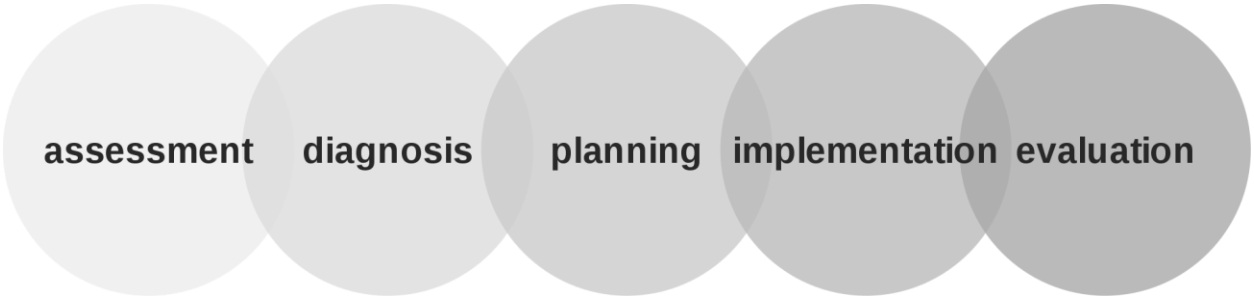
1. **Coordinate GIS Governance at ODOT**
   a) Develop, communicate and support spatial data standards
   b) Prioritize and develop GIS best practices
   c) Evaluate the costs, benefits and value of GIS data and projects
2. **Deliver efficient, reliable access to spatial data**
   a) Ensure the integrity and usability of spatial data through review and feedback
   b) Define GIS data specifications and maintenance
   c) Facilitate the collection and sharing of spatial data across business lines.
3. **Provide useful GIS tools, services and solutions**
   a) Develop and support spatial information tools.
   b) Provide GIS services and tools to support ODOT decision-making
4. **Strengthen GIS Activities Through Quality Support, Outreach and Training**
   a) Ensure effective training in GIS technology and tools
   b) Provide support and outreach for GIS technology
   c) Connect people to GIS resources to improve decision-making and workflow effectiveness
5. **Attract Develop and retain a skilled GIS Workforce**
   a) Attract through reputation, stability and compensation
   b) Develop through training and encouraged professional development,
   c) Retain through opportunities and advancement

Implementation

This business plan provides the foundation for implementation planning for GIS programs of the GIS Unit by identifying key needs and prioritizing recommendations toward addressing them.



Next steps for the GIS Unit are to further prioritize and refine the recommended activities of this business plan through implementation planning activities and begin actionable steps toward their realization into unit programs, projects, workflows, and engagements.



Primary Recommendations

Recommendations in this document are provided in two sections: (1) Primary Recommendations (here) and (2) Appendix B Comprehensive Recommendations.

This section, Primary Recommendations, provides the GIS Unit with a curated list of recommendations to tackle in a five-year plan. All primary recommendations are contained in the full comprehensive recommendations list. Recommendations are organized by logical categories the GIS Unit already use to catalog and track their business (see diagram below). The curation of the primary recommendations was a blending of consultant SME suggestions and ODOT GIS Unit staff preliminary prioritization of the comprehensive recommendations list. The primary recommendations may be used to develop a further prioritized list of project proposals when the GIS Unit is prepared to schedule their implementation.

Some recommendations are identified as "Quick Wins" (labeled in the table with an *) so that we may immediately recognize instances where swift efforts could produce immediate tangible results.

The Comprehensive Recommendations in Appendix B provide a complete list of recommendations resulting from the extensive supporting, coordination, and engagement efforts informing the business plan (as summarized above). The full scope of the comprehensive recommendations would extend beyond the implementation cycle of this five-year plan. Hence the need for a primary recommendations list to initially guide implementation.

Administration & Governance

The GIS Unit is faced with administrative overhead like other organizations or business units. The GIS Unit must and will continue to stay on top of administrative tasks to remain effective in its primary job duties. The GIS Unit will gain efficiency in administrative overhead by becoming more organized in its file cataloging and by creating formal communication plans to reduce time spent formulating daily communications. Additionally, the GIS Unit is hosting the 2022 GIS-T conference. The GIS-T is a national conference for GIS professionals in transportation and is the largest attended by peers in other state departments of transportation.

The GIS Unit participates with committees within ODOT and other state organizations for GIS. Participation with these committees is critical to ensure the GIS Unit can remain consistent with efforts and needs of ODOT and stakeholders. GIS is a growing sector of information technology with GIS professionals and GIS skills being in increasing demand.

Activity	Description	Objective	Plan Year	GIS Unit Goal(s)
Develop and Implement a GIS Outreach Program	The purpose would be to proactively communicate current GIS services and to hear/learn what gaps may exist and future needs that may be pending.	Expand the awareness of the GIS Unit's capabilities and service offerings.	1-5	4b, 4c
Provide balance in GIS support activities.	Implement guidelines on providing Business Units' with GIS technical and knowledge support as a service (i.e. GIS Unit staff completing tasks on behalf of business unit) vs. training and supporting Business Unit hired GIS SMEs to do the GIS work.	Efficiently distribute GIS capacity to agency. Reduce re-training requests.	3	2c, 3b, 4c
2022 GIS-T Planning	Prepare arrangements to host 2022 GIS-T national conference.	Host successful conference.	1-3	4b, 4c, 5a
Ensure GIS Standards in ODOT Procurements	Encourage GIS Unit involvement with enhanced coordination efforts when planning, procuring, and deploying relevant technology solutions. Ensure that best practices and standards can be enforced. Strengthen use of GIS information in ODOT project lifecycles.	To ensure ODOT contract include GIS best practice requirements and standards	1-5	1a, 1c

Workforce

Organizations grow and improve, based in large part, on the abilities and engagement of their workforce. Behind the best processes are the workforces that developed, implemented, and consistently follow them. An organization can only bring in the best technology when their workforce can recognize it among the sea of options, understand its potential, deploy it to their colleagues, and maximize its potential. In short, any business plan, particularly one involving information technologies, must pay critical attention to their workforce, both stewards and users.

Activity	Description	Objective	Plan Year	GIS Unit Goal(s)
Offer "GIS Boot Camp" and Intro to GIS for relevant ODOT staff.	Provide “GIS Boot Camp” style training for all relevant staff to help reduce the technical support request load. Provide an “Intro to GIS” class so that new/future/beginner users have a basic grasp of GIS Unit vocabulary and capabilities.	Increase GIS awareness and knowledge of new/relevant ODOT staff.	1-5	4
BA Training	Business Analysis training was one of the two top requested trainings from engagement efforts. Some requests for this training were direct while others were inferred by interviewers based on typical job duties and types of challenges they described. Given the dependence on business analysis skillset for daily operations, a training plan in business analysis is highly recommended.	Cultivate business analysis skill of the GIS Unit to improve project delivery outcomes such as clear and early requirements for a stable project scope.	1-5	5b
Create GIS Business Analyst Role	ODOT will benefit from adding a GIS staff member (FTE or contractor) whose role and expertise is in defining GIS project requirements and evaluating technical approach options in order to help in design of optimal solutions.	Ensure staff are properly equipped to handle project tasks other than the technical work involved.	1	5
Consistent Project Scoping, Management, and Delivery Practices	A consistent project scoping, management, and delivery methodology and practice should be developed/adopted and implemented (train all GIS Unit staff). A lite version of that training could also be offered to GIS Unit partners to whom data applications and products are often delivered.	Improve consistency, efficiency, and outcomes of GIS project deliveries.	1-5	1a, 1b, 4b

Infrastructure

Proper GIS-IT infrastructure maintenance and operational management is at the crux of any agency's GIS program(s). The GIS Unit is currently maintaining a diverse portfolio of GIS technologies and the infrastructure that supports them for enterprise use. The GIS Unit will continue to operate and maintain, in coordination with Information Services, the critical infrastructure that underpins GIS success at ODOT.

Activity	Description	Objective	Plan Year	GIS Unit Goal(s)
Implement Esri ArcGIS Monitor	Implement Esri ArcGIS Monitor to quantify and track utilization (typical & peak) for infrastructure and architecture planning.	Ensure GIS server technology is properly managed and scaled.	1*	2c, 3a, 3b
GeoMedia Replacement	Prepare to have discussion of moving out of GeoMedia. Most of the data management is a function of system (legacy) As-Is and not a function of planned, best case.	Fully understand LRS software options other than current situation.	1-2	2c, 3a
Mirror Custom Solutions with COTS Solutions	Use "out of the box" (COTS) web development technologies to re-create custom solution functions to (1) overcome any limitations of current custom solution (such as downloading data from TransGIS, a desired feature heard from many survey respondents) and/or (2) lower overhead of maintaining custom solutions with simpler COTS technologies.	Provide enhanced functionality of Web GIS solutions.	2-4	2c, 3a, 3b, 4b
Document access points and rules for enterprise GIS platform	The Enterprise application architecture must be well mapped and accessible. Guidelines and rules for new tethers (new applications or updates dependent on GIS data - locations, models, schemas, domains, etc.) to the architecture must be documented, known, and followed.	Improve documentation of architecture and security systems.	1-5	1b, 1c, 2c

Applications Support & Development

The GIS Unit implements, supports, creates, documents, and/or maintains dozens of tools and technologies for ODOT enterprise use (see GIS Unit Tools and Technology Portfolio section of this document for more details). Providing application support and development for GIS will continue to be a critical function of the GIS Unit. Moving forward, these roles will gain efficiency as processes continue to be documented, guidance continues to be offered, and as the use and proliferation of technology is tracked, analyzed, and its use is encouraged.

Activity	Description	Objective	Plan Year	GIS Unit Goal(s)
Provide more access to GPS-integrated mobile applications for field data collection	Mobile GIS is going to be a growing area of needed support. This will come with a desire for field data transactions with the enterprise.	Increase the understanding of creating spatial data from multiple devices.	1-5	2c, 3a
AGOL Cleanup and Governance	AGOL is heavily used with web servers for AGOL mostly being hosted in the DMZ ArcGIS Server. However, there remain some services published to cloud from prior to the existence of the DMZ ArcGIS Server. Need review and transition of remaining cloud services to ArcGIS Server; review of existing services on ArcGIS Server; and governance established for AGOL services.	Understand who, how, why, and where ArcGIS Online is being used.	2-5	1, 2b
Provide user guides for GIS tools	Create more/better documentation for commonly used ODOT tools and procedures to help reduce the technical support request load. Develop simple, “quick start” user guides for GIS-based tools commonly used at ODOT.	Ensure institutional knowledge retention and transferability.	1-5	1b, 4a
Leverage Data Analytics/Business Intelligence	Investigate best technologies and tools for GIS data analytics and business intelligence for use at ODOT.	Foster the growth of data analytics and business intelligence in the GIS Unit	1*	1c, 3b

Data Management Development

As data stewards and aggregators for the ODOT enterprise, the GIS Unit must remain vigilant in its handling of key aspects of data management, to include but not limited to: curating a data inventory; making data accessible (who can access, for what purpose(s), how to access); and helping the enterprise understand who is responsible for maintaining what data. In this role, the GIS Unit will focus on making sure correct data/datasets are used for appropriate purposes, are accessible, and are as centralized and organized as possible. Pertaining to GIS Unit internal datasets, time will be spent focusing on data quality, ensuring data editing is standardized and documented, and data are as complete as necessary.

Activity	Description	Objective	Plan Year	GIS Unit Goal(s)
Participate in Data Management/Data Warehouse Committee(s) / Group(s)	Consider establishing or participating in existing data management committees and/or groups at ODOT to help guide governance for how the Agency wants to manage all data (spatial and non-spatial) in a centralized and standardized way.	To manage all data (spatial and non-spatial) in a centralized and standardized way.	1-5	1, 2c
LRS Consolidation Evaluation	Evaluate potential gains from migrating to a single LRS with one LRM and one technology stack. If a new LRS/LRM technology stack is chosen, the implementation, migration, and training will be substantial activities that should be addendums to the business plan).	Evaluate benefit of single authoritative LRS/LRM allowing multi-user concurrent editing.	1	2c, 3a
AGOL and ArcGIS Server Updates	Proliferate data with consistent metadata, download capabilities, and APIs via AGOL hosting (see Iowa open data model in State Comparison document).	Ensure Server technology is properly managed and scaled.	1*	2b, 3
Provide easier access to data	Need an easy-to-use, centralized, authoritative data and shared services catalogue. Deploy a data discovery tool that provides easy access to GIS metadata for each layer. Communicate the availability and location of standard maps so that staff don't think they have to create them on their own.	Improve organization of, access to, and publication of the existing spatial data.	3-4	2

Mapping

Custom map requests in addition to many standard mapping products are a staple responsibility of the GIS Unit. Standard products include the Official Oregon State Map, Oregon City and County Atlas series, Maintenance District Map and Oregon Transportation Commission (OTC) Maps. Providing custom maps is also a large component of the customer service apparatus of the GIS Unit (see figure below).

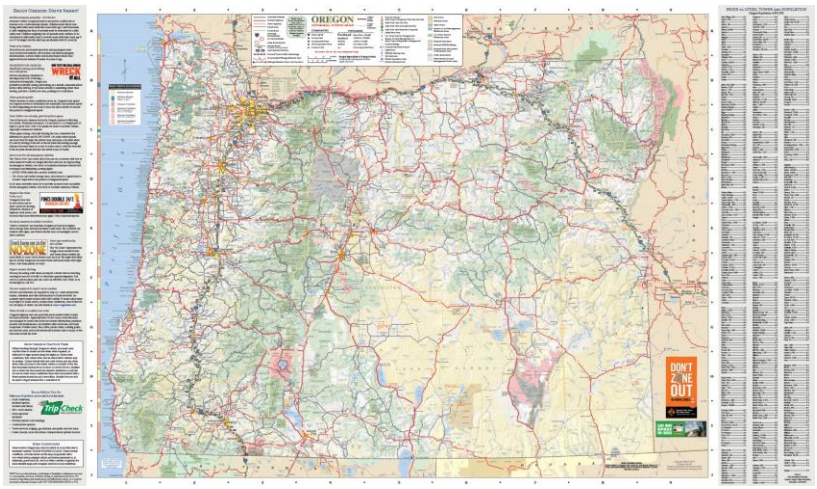


Figure 13: Official Oregon State Map

The GIS increasingly recognizes their services are requested by a community with increasing technical geospatial sophistication who express a need to develop their own maps and geospatial data across their disciplines. As GIS users continue to seek greater access to readily deployable geospatial tools that efficiently support their needs for automated map and geospatial data production the ODOT GIS Unit must be poised to respond effectively. Continuing to provide long-standing mission-critical services to ODOT will also become less of a burden on the GIS Unit as the requests for such services are tracked and analyzed to determine appropriate service requirements. Requests for service by the GIS Unit as a custom process may be more effectively, fulfilled with a templated process for interactive geospatial tools and consumer level mapping. The ODOT GIS Unit capability maturing in this area will help demonstrate in which situations it benefits the agency that the request can effectively be placed back on the requestor as the self-service web mapping tasks become more readily accessible and standardized.

Activity	Description	Objective	Plan Year	GIS Unit Goal(s)
Identify common map requests for web mapping and/or map template solutions	Continue to track custom map requests to identify common requests/themes that can be accommodated via web mapping solutions or formatted into templates for easier creation in the future.	Reduce custom mapping requests and increase customer service for mapping.	1-5	3a

Customer Service

The GIS Unit is committed to excellence in customer service of GIS services, technology, and geospatial data. Through responses to an ODOT-wide survey conducted for this planning effort, it is readily apparent that the GIS Unit is reaching a good number of ODOT enterprise customers with positive and meaningful impact to their work. Moving forward, the GIS Unit will continue the commitment to customer service with a goal for continual improvement. For example, the GIS Unit will increase communication efforts to current and potential customers of the GIS technologies, data, services, and available training. As another example, the GIS Unit will evaluate the benefits of having a specific role of Business Analyst whose role and expertise would be in defining GIS project requirements and evaluating technical approach options in order to design optimal solutions. Additionally, any outgoing communications that can be made to the enterprise about the offerings of the GIS Unit would likely be well received.

Activity	Description	Objective	Plan Year	GIS Unit Goal(s)
Documentation Catalog	The GIS Unit has a lot of documentation in a lot of places. An effort to catalog and centralize the documentation would make it easier to locate, and more likely to be used.	Improve ease of access to GIS Unit documentation	1-2	2c
GIS Project Request Portal Update	Suggest a new status for waiting on customer feedback to account for time lag due to customer inactivity. Suggest domained values and other mechanisms to control freeform content in form.	Keep active project list in check in support of customer service, staff utilization, and improved performance tracking.	1*	2a
Ensure GIS Standards in ODOT Procurements	Encourage GIS Unit involvement through enhanced coordination efforts when planning, procuring, and deploying relevant technology solutions. Ensure that best practices and standards can be enforced from the beginning.	To ensure ODOT contracts include GIS best practice requirements and standards. Strengthen the use of GIS information in ODOT project lifecycles.	2-5	1
Intra-Agency Communication Plan	The GIS Unit serves as a data aggregator; a communication plan formed collaboratively with the groups that they aggregate data from and for could be useful for better understanding data updates and schedule.	Document the GIS Unit's ODOT data handling roles to ensure shared understanding across the agency.	2-4	2c, 4b

Document Revision History

The GIS Business Plan is meant to be a living document that informs a common direction of GIS for ODOT. In pursuit of that direction, it is recognized that reflection and adjustment may be necessary over the course of the plan as needs, priorities, and even technologies shift in unforeseeable ways. The revision history provides a record of when updates or changes have been made to the plan along with a summary of the changes.

Document version numbers will consist of major numbers only (e.g., V2 is Version 2). Each revision should be accompanied by the primary revision author(s), the date the revisions are submitted, a summary of the changes that constitute the revision, and if appropriate an impetus for the revision (annual review/revision, administrative directive such as federal rule-making or legislation, substantive organizational structure change, etc.).

Version	Date	Revision Author(s)	Description of Version / Summary of Changes
V1	4/15/2020	ODOT GIS Unit / Timmons Group	2020 GIS Unit 5-Year Business Plan Final

Appendix A: GIS Unit Technology and Tools Portfolio

The GIS Unit provides and supports a vast collection of GIS tools and technologies for ODOT. Some are in-house developed, and some are COTS (custom-of-the-shelf), many of which are mission critical for business units across ODOT and necessary for them to meet state and federal statutory obligations. Two main purposes of this portfolio are to (1) be a communication tool to the agency and GIS Unit stakeholders of the portfolio supported and (2) be a planning tool for the GIS Unit for implementation and operational activities such as maintenance and operations planning, technology updates and migrations, and communications plans.

Reporting Applications and Platforms

The Reporting/Publishing section of the portfolio is understandably the largest given the role of the GIS Unit as a data aggregator and publisher. Tools and technologies in this section are used both internally by the GIS Unit and are made available to the Department, and in some cases the general public can also view the application/map.

Reporting Applications and Platforms			
Technology/Tool	GIS Steward	Next Update	Deprecation
FACS STIP	GIS Unit Manager	12/2019	Beyond 2025
FACS-STIP Suite	GIS Unit Manager	12/2019	Beyond 2025
ArcGIS Online	GIS Unit Manager	As Needed	Beyond 2025
TransGIS	GIS Unit Manager	Scheduling for necessary update from 3.x to Web AppBuilder	Beyond 2025

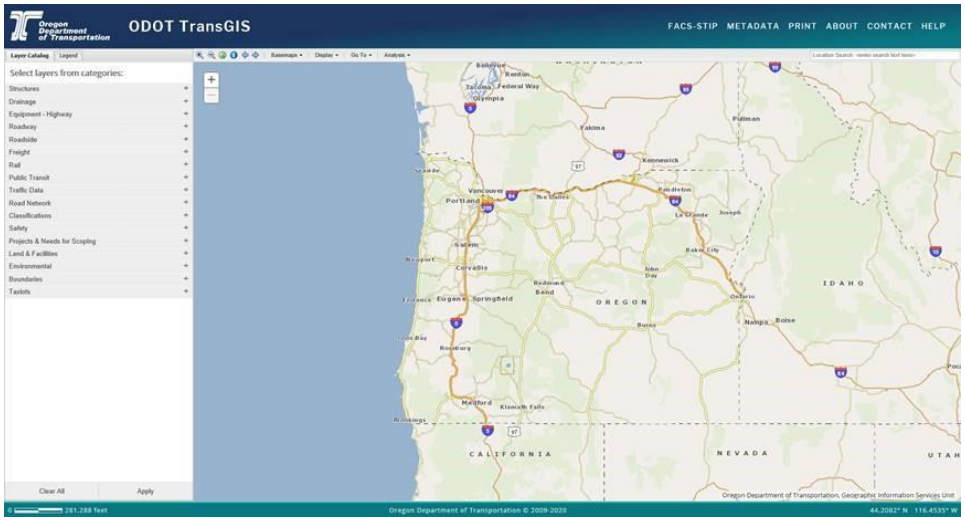


Figure 14: ODOT TransGIS

Reporting Applications and Platforms			
Technology/Tool	GIS Steward	Next Update	Deprecation
Tableau	Performance Management Program Manager	As Needed	Beyond 2025
ODOT Project Tracking	Transparency Accountability Performance Program Manager	As Needed	Beyond 2025
YouTube	GIS Unit Manager	N/A	N/A
ArcGIS Server	GIS Unit Manager	As Needed	Beyond 2025
Online Image Hosting	GIS Unit Manager	N/A	Beyond 2025
SPIS	GIS Unit Manager	N/A	Beyond 2025
TPOD	Transportation Planning Unit Manager	N/A	Beyond 2025
ASIS	Senior Region Engineering Geologist	N/A	Beyond 2025

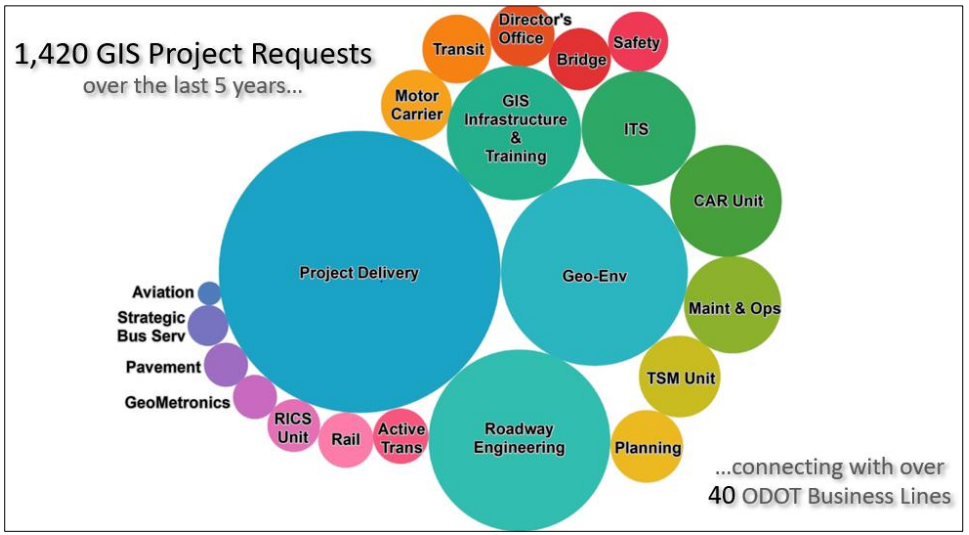


Figure 15: ODOT GIS Project Requests

Reporting Applications and Platforms			
Technology/Tool	GIS Steward	Next Update	Deprecation
FAHP	Environmental Program Coordinator	Migrate to AGOL	Beyond 2025
Virtual Highway Corridor	Engineering Automation Unit Manager	As Needed	Beyond 2025
Highway Report Tool	GIS Unit Manager	To be rebuilt after cold fusion is retired.	Before 2025
Unstable Slopes	N/A	N/A	Decommissioned 10/19
ODOT Owned	Deputy State Right of Way Manager	Migrate to AGOL	Beyond 2025
ROW GIS Tool	Right of Way Agent	N/A	Beyond 2025
CHAMPS	Access Management Specialist	To be Replaced by AMES	August 2020
OTSDE	GIS Unit Manager	N/A	Beyond 2025

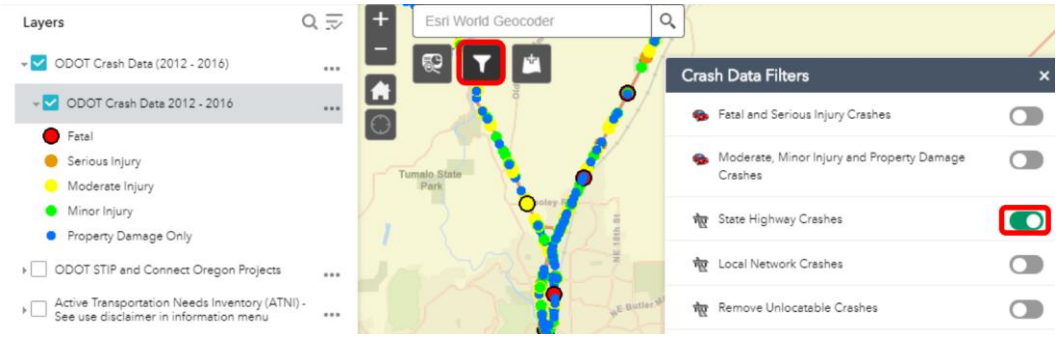


Figure 16: Oregon Transportation Safety Data Explorer (OTSDE)

Reporting Applications and Platforms			
Technology/Tool	GIS Steward	Next Update	Deprecation
Transportation Project Tracker (TPT)	GIS Unit Manager	N/A	Beyond 2025

Editing Applications

Editing and analysis tools span from tools that the GIS Unit uses internally for analysis to tools that the GIS Unit supports on behalf of other users for editing and/or analysis purposes.

Editing Applications			
Technology/Tool	GIS Steward	Next Update	Deprecation
ORTrans	GIS Unit Manager	As Needed	Under Review
ODOT Toolbar	GIS Unit Manager	As Needed	Beyond 2025
Crash Locator Tool	GIS Unit Manager	Pending	Beyond 2025
Vicinity Mapping Tool	GIS Unit Manager	N/A	Beyond 2025
Spatial Analyst	GIS Unit Manager	As Needed	Beyond 2025
ArcGIS Pro	GIS Unit Manager	As Needed	Beyond 2025

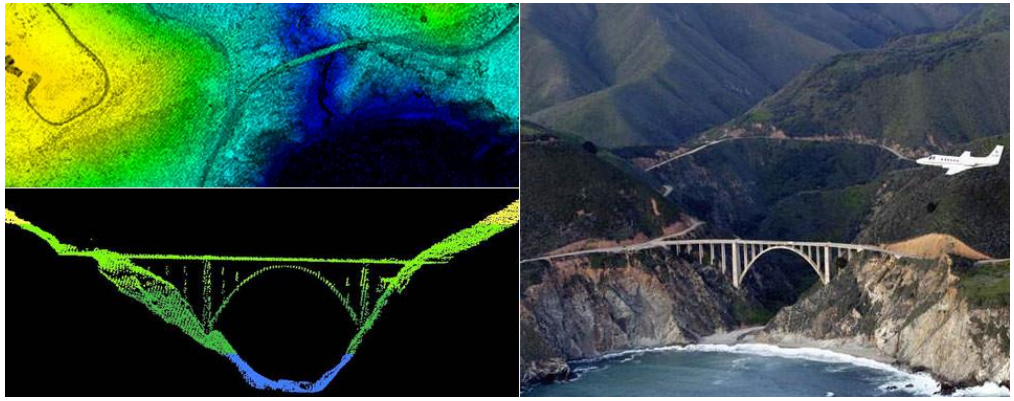


Figure 17: LiDAR at ODOT

Editing Applications			
Technology/Tool	GIS Steward	Next Update	Deprecation
ArcMap	GIS Unit Manager	N/A	Beyond 2025
Service Compare Tool	GIS Unit Manager	N/A	Beyond 2025
Geometronics Online Toolkit	Senior Surveyor - Geometronics	N/A	Beyond 2025
Roadkill GIS Tool	GIS Unit Manager	N/A	Beyond 2025
File Server FGDB	GIS Unit Manager	As Needed	Beyond 2025
LiDAR Lane Striping	GIS Unit Manager	N/A	Beyond 2025

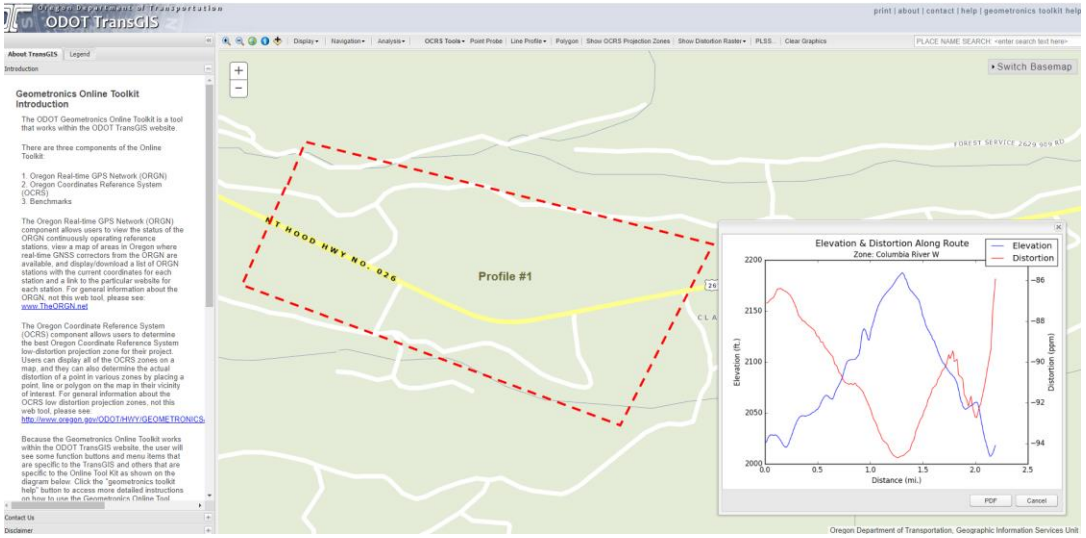


Figure 18: Geometronics Online Toolkit

Mobile Applications

Mobile applications supported by the GIS Unit include software provided through the Department. Not captured here are the hardware technologies such as the agency issued smart phones and tablets for mobile spatial data collection by ODOT staff.

Mobile Applications			
Technology/Tool	GIS Steward	Next Update	Deprecation
ArcPad	GIS Unit Manager	N/A	12/2019
ArcGIS Collector	GIS Unit Manager	As Needed	Beyond 2025

Mobile Applications			
Technology/Tool	GIS Steward	Next Update	Deprecation
Esri Survey 123	GIS Unit Manager	As Needed	Beyond 2025
Inspection Tablets	GIS Unit Manager	N/A	Beyond 2025
Trimble Units	Engineering Automation Section Manager	N/A	Beyond 2025
ODOT Rail Safety Inspection	TAD Project Delivery Manager	N/A	Beyond 2025

Figure 19: Esri Survey 123

CAD Applications

Computer Aided Design software is not widely used by the GIS Unit, but a license and install remain available to GIS Unit staff.

CAD Applications			
Technology/Tool	GIS Steward	Next Update	Deprecation
Microstation	ODOT Deputy Director	N/A	Beyond 2025

Programming and Scripting Tools and Technology

The GIS Unit employs a wide variety of programming and scripting tools for both in-house use to automate workflows and provide efficiencies, and in support of applications that are made available to ODOT and the general public.

Programming and Scripting Tools and Technology			
Technology/Tool	GIS Steward	Next Update	Deprecation
FME	GIS Unit Manager	As Needed	Beyond 2025
Python	GIS Unit Manager	As Needed	Beyond 2025
JS API	GIS Unit Manager	As Needed	Beyond 2025
Web AppBuilder	GIS Unit Manager	As Needed	Beyond 2025
Visual Basic	GIS Unit Manager	N/A	Beyond 2025
AppStudio	GIS Unit Manager	As Needed	Beyond 2025
Team Foundation Server	GIS Unit Manager	As Needed	Beyond 2025

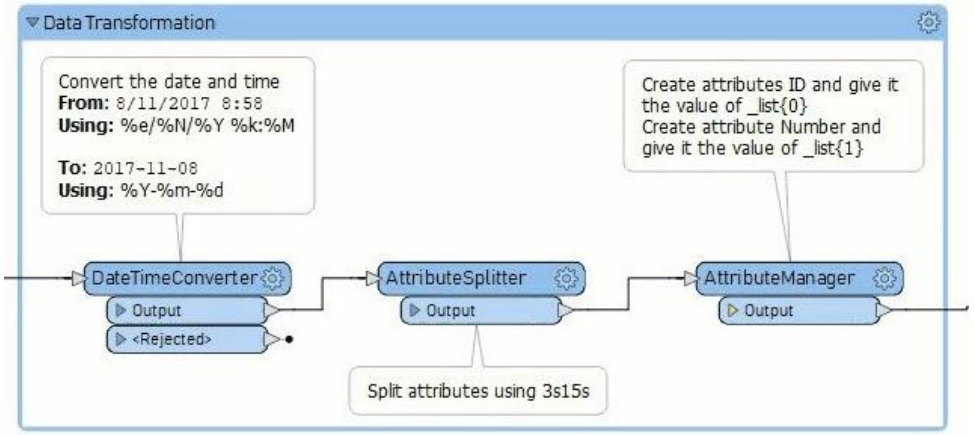


Figure 20: FME Data Transformation Workflow

Data Storage

The GIS Unit maintains a wealth of GIS metadata and access to the Department's Enterprise Content Management system as two separate tools.

Data Storage			
Technology/Tool	GIS Steward	Next Update	Deprecation
ODOT Geoportal	GIS Unit Manager	N/A	Beyond 2025
FileNet	GIS Unit Manager	N/A	Beyond 2025

Figure 21: ODOT Geoportal

Work Tracking Tools

Work tracking tools assist the GIS Unit (used internally) in service delivery, task orchestration, and performance management.

Work Tracking Tools			
Technology/Tool	GIS Steward	Next Update	Deprecation
GIS Project Tracker	GIS Unit Manager	N/A	Beyond 2025
GIS Project Request Form	GIS Unit Manager	N/A	Beyond 2025
HUB Planner	GIS Unit Manager	As Needed	Beyond 2025
SharePoint	GIS Unit Manager	As Needed	Beyond 2025
Remedy	ODOT Deputy Director	As Needed	Beyond 2025

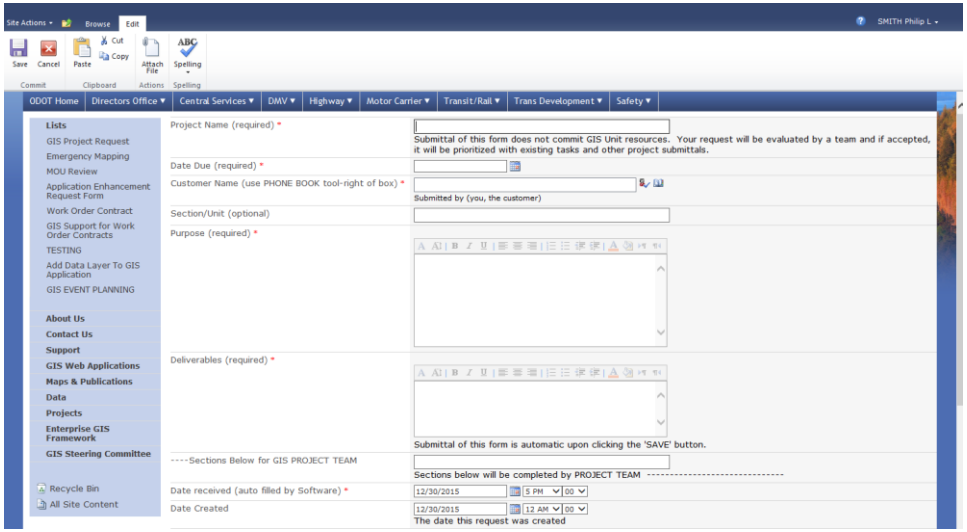


Figure 22: GIS Project Request Form

Appendix B: Comprehensive Recommendations

Appendix B is a comprehensive collection of all recommendations developed as a result of these planning efforts. The main audience for this appendix is GIS Unit staff for use in implementation planning. Activities in this appendix have been mapped to Hub Planner for workforce planning, Slimgim-T success factors to facilitate performance management, and ODOT Goals to facilitate strategic alignment.

Administrative Operations

The GIS Unit is faced with administrative overhead like other organizations or business units. The GIS Unit must and will continue to stay on top of administrative tasks to remain effective in its primary job duties. The GIS Unit will gain efficiency in administrative overhead by becoming more organized in its file cataloging and by creating a formal communication plan to reduce time spent formulating daily communications. Additionally, the GIS Unit is hosting the 2022 GIS-T conference. The GIS-T is a national conference for GIS professionals in transportation and is the largest attended by peers in other state departments of transportation.

Additionally, the GIS Unit participates with several committees within ODOT and with other state organizations for GIS. Participation with these committees is critical to ensure the GIS Unit can remain consistent with efforts and needs of ODOT and stakeholders. GIS is a growing sector of information technology with GIS professionals and GIS skills being in increasing demand.

GIS Job Duty	HubPlanner Booking Category	HubPlanner Project	EA
Performance Appraisals	Indirect Personnel	0 - Indirect	IN6211 000 010
Recruitment			
FIT	Indirect Committee Support		
GPL			
OGIC			
GISSC			
Safety Committee, Diversity Committee, Etc.			
Non-Project Related (Staff) Meetings, Other	Indirect Other Support		

GIS Job Duty	HubPlanner Booking Category	HubPlanner Project	EA
Supervisory Duties	Supervisory Duties	1 - Administrative	21PF060 000 P58
General Administrative	General Administrative		
Timesheets/HubPlanner	Personnel		
Tracking/Planning	Budgeting		
Purchasing			
Payments			
SPR			
WOCs & Contract Expenditures Review			
Performance Measures	Reporting		
Project Updates			

Administrative Opportunities

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
Indirect Committee Support	Clearly Define Purview of GIS Unit and of other Business Units with respect to GIS and geospatial data at ODOT	Need clearly defined and understood responsibilities of GIS Unit programs and of those of other business units as they relate to GIS and geospatial data.	Define GIS Unit and ODOT business units/stakeholders' roles and responsibilities for GIS and geospatial data.	1		BUP, EEU, CSC	1a
Indirect Committee Support	Develop a GIS Outreach program	The purpose would be to proactively communicate current GIS services and to hear/learn what gaps may exist and future needs that may be pending.	Expand the awareness of the GIS Unit's capabilities and service offerings.	1		VCU, GCF	4b
Indirect Committee Support	Formulate Responsible Priorities and Principals to Guide Technology Change and Implementation.	Collaborate with IT to document the responsibilities, services, and resources of both units to identify synergies, redundancies and gaps. Develop a plan to reduce redundancies, fill gaps, and jointly communicate to ODOT staff what the combined GIS-IT services are and proper request processes.	To ensure Enterprise GIS Sustainability.	1		IDC	1
Indirect Committee Support	Clarify GIS responsibilities, when possible, in formal job descriptions for support forecasting	To estimate training needs (amount and level - particularly advanced), the GIS Unit needs clear positions that state GIS expertise and responsibilities rather than position happening to be filled with GIS capable folks as much as possible. Having positions that define required GIS expertise, responsibilities and training rather than position happening to be filled with GIS capable folks provides clearer insights for support needs of the agency (training, licensing, user support, application development, data requests, etc.).	Ensure GIS Unit can maintain level of support needed to meet needs of the agency.	2		CCT, GLA, NCF	5b

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
Indirect Committee Support	Identify and fix any disconnects between ODOT IT and GIS units.	Need org charts with roles and responsibilities to accompany communication process (single or integrated requests for work system) that properly captures work requirements, reports and documents actions/status. The solution could be part of a joint IT-GIS PMO.	Clarify roles of and communication between GIS Unit and IT.	2		VCU, FGG	1
Indirect Committee Support	Provide balance in GIS support activities.	Implement guidelines on providing Business Units' with GIS technical and knowledge support as a service (i.e. GIS Unit staff completing tasks on behalf of business unit) vs. training and supporting Business Unit hired GIS SMEs who do the GIS work themselves.	Efficiently distribute GIS capacity to agency. Reduce re-training requests.	3		BUP	2c, 4a
General Administrative	File Server Catalog Organization and Maintenance	Create file folder organizational structure. Move all documents into structure. Agree to maintenance plan for folder/file structure. Include an organizational control document in the root folder that explains organizational structure, sets expectations, and outlines mechanisms for maintenance. Reach out to GDOT Office of Transportation Data for ideas.	Improve ease of access to GIS Unit electronic file storage.	1	✓	BDC, PW3	2b, 2c
General Administrative	Prepare for and host GIS-T Conference in 2022	Conduct all coordination and preparation for 2022 GIS-T conference to be hosted by GIS Unit.	Host a successful national GIS conference.	1-3		SLB, BCC	2c, 5a
Reporting	Develop a communication plan for the GIS Unit.	Develop a communication plan for the GIS Unit that includes the collection and tracking of metrics that can be used to assess the effectiveness of communications about the unit's mission, services, project, capabilities, availability, access, accomplishments, failures, plans, follow-up procedures and strategic vision.	To ensure that enterprise GIS related communication is frequent & guided by plans.	1		GCF	2b, 2c

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
Reporting	Improve & align GIS Unit processes to support ODOT's overall strategic plan.	Align the GIS Unit's Business Plan with the Agency's overall strategic plan and develop a plan for the collection and tracking of measures that can be used to assess the success of this alignment.	To ensure the success and optimize the value of the GIS Unit.	1	✓	PAS	1
Reporting	Establish an objective way to assess the effectiveness of the GIS unit's activities.	Develop a plan for the collection and tracking of measures that can be used to assess the effectiveness of the unit's activities.	Align GIS operations with performance management.	3		GPM	1
Reporting	Deploy dashboards to communicate ODOT GIS performance	Develop dashboards (such as using Esri Operations Dashboard for ArcGIS) to communicate GIS Unit performance to stakeholders. (GIS Customer Support, System Performance, Project Success)	Ensure transparency in performance measures.	4		BIG, GPM	2a

Customer Service Operations

The GIS Unit is committed to excellence in customer service of GIS services, technology, and geospatial data. Through responses to an ODOT-wide survey conducted for this planning effort, it is readily apparent that the GIS Unit is reaching a good number of ODOT enterprise customers with positive and meaningful impact to their work at ODOT. Moving forward, the GIS Unit will continue the commitment to customer service with a goal for continual improvement. For example, the GIS Unit will increase communication efforts to current and potential customers of the GIS technologies, data, services, and available training. As another example, the GIS Unit will evaluate the benefits of having a specific role of Business Analyst whose role and expertise would be in defining GIS project requirements and evaluating technical approach options in order to design optimal solutions. Additionally, any outgoing communications that can be made to the enterprise about the offerings of the GIS Unit would likely be well received by the enterprise.

GIS Job Duty	HubPlanner Booking Category	HubPlanner Project	EA
Customer Help	Help Desk/Remedy	2 - Customer Service	21PF060 000 P58
Coordinate with IS			
Demonstrations	Communication		
Support Page			
Documentation			
GIS Consultation	GIS Consultation		
Web Help Page	GNSS		
Courses			
Unit Email	Map Orders		
Unit Phone			
Fill Map Orders			

Customer Service Opportunities

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
Communication	Promote the value of GIS Unit services	Better communicate ("Market") the services, resources, capabilities and vision of the GIS Unit to agency (especially with business lines with the biggest anticipated ROI). Need to clearly define the core operational functions of the GIS Unit - delineating the bounds of which with respect to overlaps with other business units. Update the charter/mission of the GIS Unit so that other ODOT units know what its mission is and what services and resources it offers. This will help remove uncertainty and redundancies, where they exist, to strengthen collaboration and cooperation.	Ensure that ODOT understands the valuable role the GIS Unit plays in meeting ODOT's strategic goals and mandates.	1-5		USS, GCF, SPD	1a, 3, 4b
Communication	Promote the value of spatial information for new ODOT initiatives	Promote the value of spatial information for new ODOT initiatives that involve data analytics, performance metrics, business intelligence, or accomplishment tracking.	To ensure that ODOT fully leverages the value of GIS.	1-5		GPA, VCU	1c, 4c

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
Communication	Provide easier access to data	Need an easy-to-use, centralized, authoritative data and shared services catalogue. Deploy a data discovery tool that provides easy access to GIS metadata for each layer. Communicate the availability and location of standard maps so that staff don't think they have to create them on their own.	Improve organization of, access to, and publication of the existence of spatial data.	3-4		PPD, DAI	2, 3
Documentation	Documentation Catalog	The GIS Unit has a lot of documentation in a lot of places. An effort to catalog and centralize the documentation would make it easier to locate, and more likely to be used.	Improve ease of access to GIS Unit documentation.	1-2	✓	SPD	2
GIS Consultation	Create a "GIS Business Analyst" role	ODOT will benefit from adding a GIS staff member (FTE or contractor) whose role and expertise is in defining GIS project requirements and evaluating technical approach options in order to design an optimal solution.	Ensure staff are properly equipped to handle project tasks other than the technical work involved.	1	✓	AHR	5b
GIS Consultation	Evaluate need for the creation of a Project Management Office (PMO) or team	Evaluate potential need for GIS Project Management roles in GIS Unit or a PMO that contains GIS PM specialists to support GIS Unit in addition to other PM needs of the agency (not related to Preconstruction and Construction DOT projects).	Determine the necessity of a Project Management Office or GIS Project Management role.	1-2		GPA, FGG	1
GIS Consultation	Discover ODOT GIS needs and identify tools to simplify duplicative processes.	Balance training activities: provide AGOL easy tools vs. training in ArcMap.	Ensure GIS technology are right sized with staff needs. Better align GIS tools with staff needs to reduce training & support demand.	1-3		EUS, USS	3

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
GIS Consultation	Business Analysis of Tools	Build upon inventory of GIS Tools and Technology Audit document to conduct a business analysis of tools - enough tools, right tools, do they need to be more integrated, have more consistent look and feel, are there gaps?	Round-out the understanding of status of technology and tools collection.	2-5		PW1, TBD	3a
GIS Consultation	Include GIS standards in ODOT procurements	ODOT should involve GIS unit when planning, procuring and deploying relevant technology solutions so that best practices and standards can be enforced from the beginning. Strengthen the use of GIS information in ODOT project lifecycles – from planning, through design and construction, to ongoing operations and maintenance.	To ensure ODOT contract include GIS best practice requirements and standards.	3-5		GPA	1
Help Desk / Remedy	Enhance GIS awareness of help desk staff	Work with help desk to educate them on the GIS products, processes, capabilities, and responsibilities to better assist help desk with triage of questions, issues, requests, and tickets.	Ensure that Staff are "process-minded."	1	✓	EEU, SPM	3
Help Desk / Remedy	GIS Project Request Portal revamp	Suggest a new status for waiting on customer feedback to account for time lag due to customer inactivity. Suggest domained values and other mechanisms to control freeform content in form.	Keep active project list in check.	1-2	✓	SPD, GPM, EUS	2a, 3
GIS Consultation	Consistent Project Sopping, Management, and Delivery Practices	A consistent project scoping, management, and delivery methodology and practice should be developed/adopted and implemented (trained to all staff). A lite version of that training could also be offered to GIS Unit partners to whom data applications and products are often delivered.	Improve consistency, efficiency, and outcomes of GIS project deliveries.	1-5		GPA	1a, 1b, 4b

Infrastructure Operations

Proper GIS-IT infrastructure maintenance and operational management is at the crux of any GIS group. The GIS Unit is no different in this regard, currently monitoring and maintaining a diverse portfolio of GIS technologies and the infrastructure that supports them for ODOT enterprise use. The GIS Unit will continue to operate and maintain, in coordination with Information Services, the critical infrastructure that underpins GIS success at ODOT. Over time, the GIS Unit can achieve an increasingly robust GIS technology infrastructure by employing additional software packages to assist in the maintenance and operation of this environment. Additional software can specifically help with editing and licensing within the environment and will assist in the rightsizing of technologies to enterprise needs.

GIS Job Duty	HubPlanner Booking Category	HubPlanner Project	EA
Data Agreements	Administration	3 - Infrastructure	21PF060 000 P58
Data Sharing (External)			
MOU's	Documentation		
Process Documentation			
Standards			
Servers	Security		
Databases			
User Access			
Change Management			
Esri ELA	Software Management		
iCARE			
Purchase Approval			
License Acquisition/Tracking			
Restricted Use Licenses			
Review Install Documentation			
PC's/Laptops/Monitors	Hardware		
Emergency Laptops			
Plotters			
Mobile Storage			
GIS Web Pages	GIS Web Pages		

Infrastructure Opportunities

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
Hardware	Implement Esri ArcGIS Monitor	Implement Esri ArcGIS Monitor to quantify and track utilization (typical and peak) for infrastructure and architecture planning.	Ensure GIS Server technology is properly managed and scaled.	1	✓	BTM, BCC, PW3	3

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
Security	Document access points and rules for enterprise GIS platform	The Enterprise application architecture must be well mapped and accessible. Also, guidelines and rules for new tethers (new applications or updates dependent on GIS data - locations, models, schemas, domains, etc.) to the application architecture must be well documented, known, and followed.	Improve documentation of architecture and security systems.	1-5		SAC, DAI	1b, 1c, 2c
Software Management	Geomedia Replacement	Ready to have discussion around moving out of GeoMedia. Most of the data management is a function of system (legacy) As-Is and not a function of planned, best case.	Fully understand LRS software options other than current situation.	1-2		BDC	3
Software Management	Licensing Level Determination Workflow	Currently, ODOT staff can change their own licensing levels once installed. But in future (when?) will have to justify both the install and the level. (With goal to provide AGOL apps and solutions where appropriate.) Ensure staff have access to software licenses needed to do work via role-based toolbox.	Improve software licensing level process and ensure software licensing availability and right-sizing.	1-2		CBC, GRA	1b
Software Management	Sunset ArcPad in favor of Collector	ArcPad licenses are down from 55 to 10. Good opportunity to work with remaining users to replace with updated technology and phase out its use.	Migrate mobile platform to more modern and less client-intensive products.	2		PW3, USS	3a, 4c
Software Management	ArcGIS Pro licensing needs assessment	Asses Pro licensing needs by reviewing those of similar agencies (such as NVDOT) who have migrated to Enterprise and Portal.	Ensure that ArcGIS Pro licensing is correctly distributed and utilized.	2-3		USS	2b, 4b
Software Management	Mirror Custom Solutions with COTS Solutions	Use “out of the box” (COTS) web development technologies to re-create custom solution functions to (1) overcome any limitations of current custom solution (such as downloading data from TransGIS, a desired feature heard from many survey respondents) and/or (2) lower overhead of maintaining custom solutions with simpler COTS technologies.	Provide enhanced functionality of Web GIS solutions.	2-4		PW3, USS	2b, 3a

Data Management & Development Operations

As data stewards and aggregators for the ODOT enterprise, the GIS Unit must remain vigilant in its handling of key aspects of data management, to include but not limited to: curating a data inventory; making data accessible (who can access, for what purpose(s), how to access); and helping the enterprise understand who is responsible for maintaining what data. As the GIS Unit continues a role of data steward and aggregator for the ODOT enterprise, it will focus on making sure correct data/datasets are used for appropriate purposes, are accessible, and are as centralized and organized as possible. Pertaining to GIS Unit internal datasets, time will be spent focusing on data quality, ensuring data editing is standardized and documented, and data are as complete as necessary.

GIS Job Duty	HubPlanner Booking Category	HubPlanner Project	EA
Data Agreements	Administration	4 - Data Management & Development	21PF060 000 P58
Data Sharing (External)			
Process Documentation	Documentation		
Standards			
Layer Development	Updates / Postings		
Scheduling			
Communication/Notify			
Review/Approve			
Posting			
Testing			
Update Desktop Toolbar			
TransGIS Data Catalog Updates			
Service Updates/Restarts			
Distribution			
Develop/Acquire	Metadata		
Review			
Approve/Publish			
GeoPortal			
Process Deliverables	LiDAR		
Distribution			
Update Footprint (index)			
Storage			
Notification			
Receive Imagery	Imagery		
Mosaic			
Post			

Data Management & Development Business Opportunities

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
Administration	AGOL and ArcGIS Server Updates	It is worth considering proliferation of data with consistent metadata, download capabilities, and APIs via AGOL hosting (see Iowa open data model in State Comparison document).	Ensure Server technology is properly managed and scaled.	3		SAC	4b
Administration	Participate in Data Management/Data Warehouse Committee(s) / Group(s)	Consider establishing or participating in existing data management committees and/or groups at ODOT to help guide governance for how the Agency wants to manage all data (spatial and non-spatial) in a centralized and standardized way.	To manage all data (spatial and non-spatial) in a centralized and standardized way.	1-5		FGG	1
Administration	Data Governance	Need a holistic data governance, integration & reporting strategy to manage data better.	Understand who, how, why, and where data are viewed and maintained.	3-5		DOC, IBS	1
Documentation	Create SOP's for common GIS tasks	Develop standard operating procedures (SOPs) for common GIS-based ODOT workflows to guide training.	Document the GIS Unit's ODOT data handling roles.	2-4		SPM, SPD	1b, 4b
Documentation	Inter-Agency Communication Plan	The GIS Unit serves as a data aggregator; a communication plan formed collaboratively with the groups that they aggregate data from and for could be useful for better understanding data updates and schedule.	Document the GIS Unit's ODOT data handling roles.	2-4		IDC	2c, 4b
Imagery	Current, High Resolution Imagery	Many survey responses and interviewees mentioned the need for additional reliable high resolution imagery. The GIS Unit will investigate the extent of this need and investigate the up time of existing imagery to determine if improvements could be made there to mitigate the need for additional imagery.	Provide reliable access to current, high quality basemap data.	2-5		PW4, BDC	3b, 4b

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
Updates / Postings	LRS Consolidation Evaluation	Evaluate potential gains from migrating to a single LRS with one LRM and one technology stack. A single LRS will likely facilitate access by multiple users editing simultaneously via SDE.	Evaluate benefit of single authoritative LRS/LRM allowing multi-user concurrent editing.	1		BDC	1b, 2b, 2c
Updates / Postings	Add missing/desired data to internal GIS Unit catalog and enterprise	Continue to add spatial data layers (new and historic content). Reduce the need for staff to access external information sources. Leverage existing frameworks and processes (such as Decision and Information Needs Identification Tool from SDBP) to conduct decision-making consistently with enterprise.	Increase quantity and quality of internal GIS Unit data.	1-5		PW4	2
Updates / Postings	Enhance priority data sets	Enhance some data layers (update, accuracy, resolution, more content/attributes)	Increase quality and completeness of internal GIS Unit data.	1-5		BDC	2
Updates / Postings	Provide data automation tools	Deploy more tools that automate data flow within the organization.	Improve efficiency of data flow through the enterprise.	1-5		NCF, DME	2
Updates / Postings	Implement Esri Data Reviewer (DR)	Esri's Data Reviewer extension is a powerful data quality control tool. The GIS Unit's role as a data aggregator may limit the uses of this tool, but in the situations where it could be applied it would likely allow for a major improvement in output data quality or at the least, make performing data quality control an easier task to navigate.	Improve data quality or data quality reporting capabilities.	2		FQC	2, 3a
Updates / Postings	Establish a GIS Portal	Establish a centralized, internal portal for all things GIS where frequent news and updates are available for those who want (or need) to know. As part of governance, establish high-level process documentation standards and leverage them to create SOPs and maintain them in a centralized and accessible network location (Internal GIS User Portal).	Ensure that process documentation is standardized and easy-to-find (centralized).	3		DAI, BDC	2

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
Updates / Postings	Implement Esri Workflow Manager (WMX)	Esri's Workflow Manager extension can help organize and streamline repetitive workflows and foster repeatability in product creation and output amongst multiple users. More specifically, several GIS Unit staff referenced annual or semi-annual products that must be created. Depending on determined ROI, the GIS Unit could implement WMX workflows to aid in these processes, likely by offering some automation or the ability to delegate the tasks to other users as necessary. These automated processes	Add automation and consistency to workflows and processes, particularly for stakeholders.	2		DME, SPD	2b, 2c, 4c
Updates / Postings	Automating Promotion Sequence	Develop more efficient methods to conduct promotion sequence using R1 jobs or other technology.	Improve efficiency of data and software promotion among environments.	3		SAC, RIM	1b, 2b
Updates / Postings	Centralize/consolidate data locations	Establish a singular GIS Data Warehouse (one that can window into other repositories as needed as a single view for data)	Centralize data repositories.	3-5		BDC	2
Updates / Postings	Improve integration between GIS and documents	Easier access to documents (plans, as-builts, permits, ROW docs) – link to GIS location	Improve efficiency of accessing non-spatial supporting documents in a spatial system.	4-5		DIE	2c
Updates / Postings	Project/Plan Sheet Disseminator	This isn't currently a space where the GIS Unit has systems or expertise to leverage, but in the future ODOT might consider evaluating plan sharing technologies, or in their absence, looking into what technological methods or workflows are available to allow simple sharing and download.	Increase access to construction plans.	5		GCS, SPD	2c

Application Support & Development Operations

The GIS Unit implements, supports, creates, documents, and/or maintains dozens of tools and technologies for ODOT enterprise use (see GIS Unit Tools and Technology Portfolio section of this document for more details). Providing Application Support and Development for GIS will continue to be a critical function of the GIS Unit. Moving forward, these roles will gain efficiency as processes continue to be documented, guidance continues to be offered, and as the use and proliferation of technology is tracked, analyzed, and its use is encouraged.

GIS Job Duty	HubPlanner Booking Category	HubPlanner Project	EA
Data Agreements	Administration	5 - Application Support & Development	21PF060 000 P58
Data Sharing (External)			
Process Documentation	Documentation		
Standards			
Coordination	Internally Developed & Hosted Applications		
Layer Development			
Publishing			
Standards			
WMS Basemaps			
Symbology/Display			
Design			
Programming/Tools			
Update Map Documents			
Administer Accounts	ArcGIS On-Line (AGOL)		
Monitor Credits			
Administer Restricted Use Groups			
Publish			
Coordinate	Caching		
Preparation/Update Map Documents			
Start/Monitor Processes			
Review Products			

Application Support & Development Opportunities

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
Administration	Improve Data Proliferation, Interoperability, and Integration	Two large decisions face GIS Unit that will drive the direction of the technology stack, ELA needs, and focus/skillsets of many staff for the next 3-5 years: (1) Data proliferation in cloud (AGOL) or on ODOT servers OR combination and (2) Data Warehouse integration – keeping the tabular and geospatial data worlds in sync (given the likelihood that the Data Warehouse will remain a tabular repository).	Provide reliable access to current, high quality data that is easy to find, in relatively few and consolidated locations, linked or referenced between locations, and consistent.	1-5		BDC, DAI, PW4	1b, 3
AGOL	AGOL Cleanup and Governance	AGOL is heavily used with web servers for AGOL mostly being hosted in the DMZ ArcGIS Server. However, there remain some services published to cloud from prior to the existence of the DMZ ArcGIS Server. Need review and transition of remaining cloud services to ArcGIS Server; review of existing services on ArcGIS Server; and governance established for AGOL.	Understand who, how, why, and where ArcGIS Online is being used.	2-5		RIM	1, 4b
Documentation	Provide user guides for GIS tools	Create more/better documentation for commonly used ODOT tools and procedures to help reduce the technical support request load. Develop simple, “quick start” user guides for GIS-based tools commonly used at ODOT.	Ensure institutional knowledge retention and transferability.	2-5		SPD	2b, 3a
Internally Developed & Hosted Applications	Leverage Data Analytics/Business Intelligence	Investigate best technologies and tools for GIS data analytics and business intelligence for use at ODOT.	Foster the growth of data analytics and business intelligence in the GIS Unit.	1-2		BIG	3

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
Internally Developed & Hosted Applications	Provide more access to GPS-integrated mobile applications for field data collection	Mobile GIS is going to be a growing area of needed support. This will come with a desire for field data transactions with the enterprise.	Increase the understanding of creating spatial data from multiple devices.	1-5		USS, EUS	3a, 4b

Mapping Operations

Custom map requests in addition to many standard mapping products are a staple responsibility of the GIS Unit. Standard products include the Official Oregon State Map, Oregon City and County Atlas series, Maintenance District Map and Oregon Transportation Commission (OTC) Maps. Providing custom maps is also a large component of the customer service apparatus of the GIS Unit (see figure below). Continuing to provide these mission-critical services to ODOT will become less of a burden on the GIS Unit as the requests for such services are tracked and analyzed to determine which requests for service fall on the GIS Unit as a custom process, which requests can be fulfilled with a templated process, and which request onus can be placed back on the requestor as a self-service web mapping task.

GIS Job Duty	HubPlanner Booking Category	HubPlanner Project	EA
Official State Map	Major Publications	6 - Mapping	21PF060 000 P58
Motorcycle Map			
Bicycle Map			
Maintenance Map			
OTC/STIP			
Traffic Volume Series			
Pavement Conditions			
City/County Series			
RES/RAZ			
Custom Mapping	Custom Mapping		
Emergency Mapping Support	Emergency Mapping Support		

Mapping Opportunities

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
Custom Mapping	Identify common map requests for web mapping and/or map template solutions	Track custom map requests to identify common requests/themes that can be accommodated via web mapping solutions or formatted into templates for easier creation in future.	Reduce custom mapping requests and increase customer service for mapping.	1-5		SPM, NCF, USS	3a

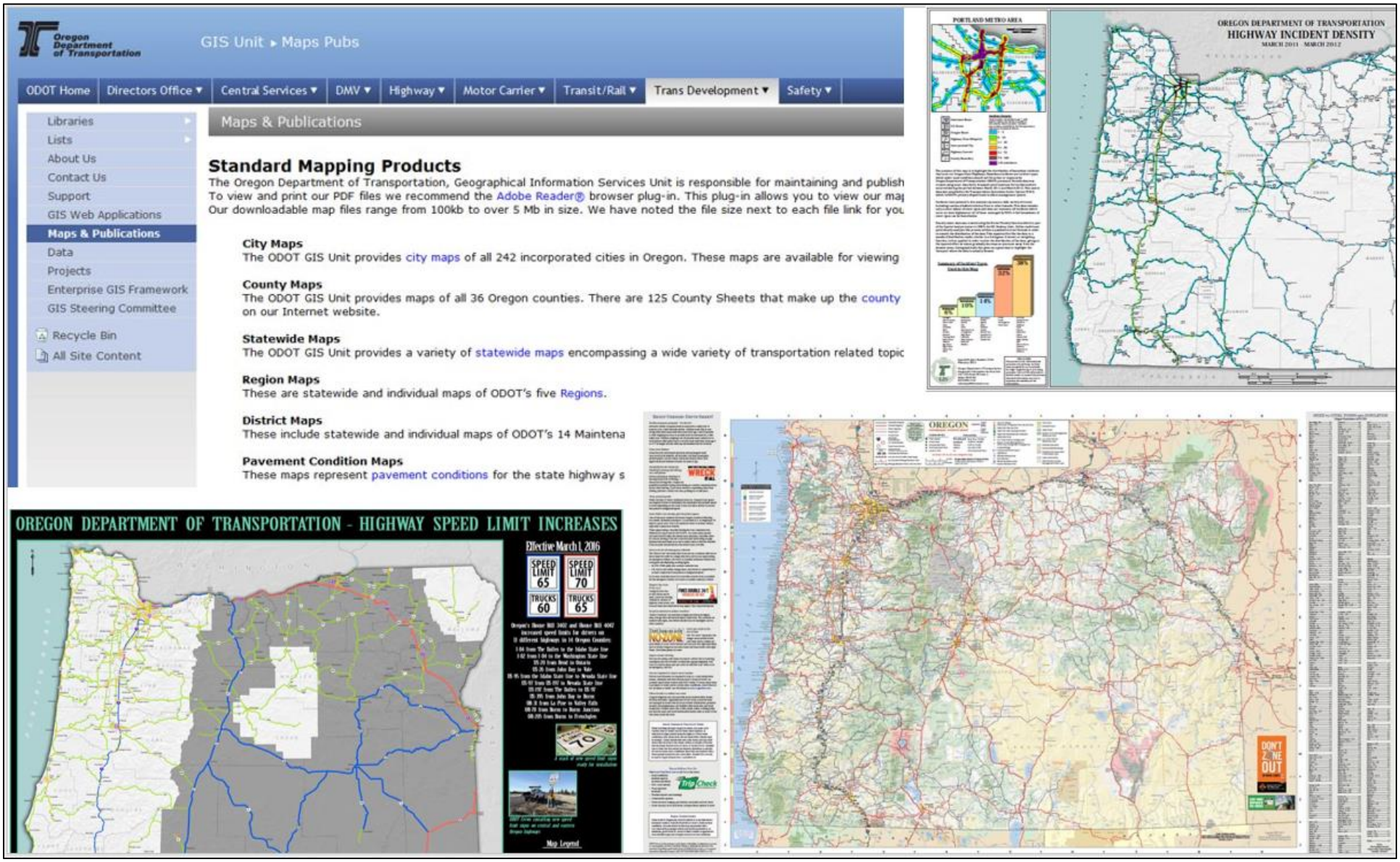


Figure 23: GIS Unit Map Products

Training Operations

The GIS Unit currently offers training to both GIS Unit staff and other ODOT staff throughout other division offices and Districts. All training offered are viewed as a good opportunity to bolster the strengths of the GIS Unit (internal) and for outreach (external). Adding additional, focused training for new and existing internal GIS Unit staff and creating training offerings for external ODOT divisions highlighting the availability of GIS tools and data will foster a stronger GIS community throughout ODOT.

GIS Job Duty	HubPlanner Booking Category	HubPlanner Project	EA
In-Person/Online Training, Conferences, Workshops, Policy Reviews	7 - Training Received		IN6211 000 020
iLearn Administration	8 - Training Given		IN6211 000 023
Coordination			
Develop Materials			
Conduct Classes			

Training Opportunities

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
Training Given	Better communicate training available for GIS technology and tools.	Easy to find and take basic training on the tools we have (Tool-related training catalogue).	Ensure ODOT staff are aware of training opportunities.	1-2		CCT, EUS, LTC	4a
Training Given	Establish and promote monthly GIS "lunch & learn" meetings.	Establish a regular (monthly?) brown bag “lunch and learn” for GIS users to share knowledge and ask questions.	Expand ODOT staff training opportunities.	1-2	✓	CCT, LTC	4a, 5c
Training Given	New Employee Orientation Package and Training Plan.	Create standard new employee orientation package to get employees up to speed consistently with less stress on current staff.	Improve the new employee onboarding process.	1-2		EUS, LTC, AHR	4a, 5a
Training Given	Cross-training.	Cross-train GIS support staff and establish a knowledge base so that there is not only one person who knows something.	Ensure institutional knowledge retention and transferability.	1-5		GRA, BCC, CSC	4a, 5c

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
Training Given	Offer "GIS Unit Boot Camp" for new ODOT staff.	Provide “GIS Unit Boot Camp” training for all new relevant staff to help reduce the technical support request load. Provide an “Intro to GIS” class so that new/future/beginner users have a basic grasp of GIS Unit vocabulary and capabilities.	Improve the new employee onboarding process.	2		AHR, CCT	4a, 5b
Training Given	Clearly define GIS training service offerings.	Need to clearly delineate what areas of training the GIS Unit is responsible for (Esri tools and apps, working with geospatial data, etc.) vs. FME or other related topics, applications, and tools.	Expand ODOT staff training opportunities.	2-3		LTC, CCT	4a, 4b
Training Given	Establish a role-based training plan.	Establish a comprehensive, role-based training plan for ODOT staff based on job duties and the GIS tools they need to use.	Ensure new and current staff can quickly identify, access, and take GIS training for their specific job role/duties.	2-3		AHR, CCT, LTC	4a, 4b, 5c
Training Given	Provide basic training/tutorials for. how to locate and use GIS data	Provide training on how to search for and use ODOT’s data. Integrate GIS into daily workflow, not just GIS Data.	Increase the understanding of how to access and use spatial data.	2-3		LTC, EUS	4a, 3a
Training Given	Deploy more “self-service” technical support options.	Deploy “self-service” technical support and training resource options that include a GIS FAQ page, library of training videos, user guides, knowledge base, SME contact list, etc. Offer regular “refresher” classes/online videos for the most commonly used GIS-based tools at ODOT.	Allow users to help themselves first, before contacting GIS Unit for assistance.	3-4		USS	4a, 2c
Training Given	Establish a GIS User Certification program at ODOT.	Establish a GIS User Certification program at ODOT to ensure that required GIS user skills are confirmed/validated in a standardized way.	To ensure that Core GIS competency is improved with training plans.	4-5		CWC, LTC, BCC	4a, 5c

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
Training Received	Risk Management for Data-Related Business	Identify appropriate risk management representatives within GIS Unit to liaise with broader enterprise data risk management activities (committee discussions, plans, etc.). Identify and engage in on-going training in risk management for data-related business.	Engage enterprise data apparatus in risk management activities.	1-5		IDC, GCF	5b
Training Received	BA Training	Business Analysis training was one of the two top requested trainings from engagement efforts. Some requests for this training were direct while others were inferred by interviewers based on typical job duties and types of challenges they described. Given the dependence on business analysis skillset for daily operations, a training plan in business analysis is highly recommended.	Cultivate business analysis skill of the GIS Unit to improve project delivery outcomes such as clear and early requirements for a stable project scope.	1-5		BCC, EFI, CCT, LTC, GLA, SPM	5b
Training Received	FME Training	Given the high use of FME across the GIS Unit and saturation in GIS Unit workflows and business, a training plan for FME is highly recommended.	Cultivate GIS automation skills and improve efficiency.	1-5		BCC, EFI, CCT, LTC, SPM	5b
Training Received	Web GIS Training	Develop standard onboarding and ongoing training curriculum for relevant staff to ratify training of Web GIS at ODOT (architecture, infrastructure, publishing services, AGOL, etc.).	Improve Web GIS standardization and efficiencies through consistent training and education.	1-5		BCC, CCT, LTC, GLA	5b
Training Received	Data Governance Engagement Training	Engage in on-going training in data governance concepts. Engage in on-going enterprise-level data literacy training anticipated from activities of the SDBP.	Be trained, capable, and ready to engage in agency data governance initiatives.	1-5		FGG, ARD, GCS, DOC, LTC, GLA	1,5b

GIS Unit Category	GIS Unit Activity	Description	Objective	Plan Year	Quick Win	Slimgim Success Factors	GIS Unit Goals
Training Received	Data Review Technologies Review and Training	Investigate data reviewing technologies such as Esri Data Reviewer extension for gains in efficiency, consistency, and quality of review processes. On-going training in selected technologies is recommended to be added to workforce development planning.	Improve data review technologies and practices.	2-5		GCF, LTC, SPM, FQC	2a, 5b
Training Received	Normal Data Publication Cycle Training	Review GIS data publication cycles in data catalog noting non-scheduled and ad-hoc publishing cycles. Identify those that could be on a regular schedule and work with business units toward normalized and scheduled publication cycle. Normalization (consistent process) and scheduling could occur over several iterations of engagement. An example could be a completely ad-hoc process that happens whenever could first get into a quarterly publication expectation (agreement between business unit and GIS Unit). Though the timing within the given quarterly month might not be set, now only 4 of 12 months are open to the publication process.	Normalize publication processes and cycles (schedules) for GIS data improving consistency and predictability of data availability, workloads, and methods.	1-5		GCF, LTC, FQC, DAI, DME	2, 5b
Training Received	Master Data Management (MDM)	Identify GIS master data elements, prioritize management improvement needs, and develop and pursue MDM Initiatives. These all would begin with GIS Unit staff engaging in MDM training.	Establish processes and methods to establish authoritative sources for “master data” beginning with training in MDM.	1-2		GCF, LTC, FQC, DAI, DME	2, 5b

Appendix C: Slimgim-T Reference

This appendix provides reference information for the Slimgim-T Capability Maturity Model (CMM).[13] Below is the template summary web chat of the Slimgim-T CMM assessment results. Each of the corners of the web correspond to the six general areas of maturity. The six general maturity score values are based on a composite of success factors (as shown in the tables that follow) in each area that are scored along five levels:

1. Ad Hoc (think, act, work locally)
2. Planned / Early Stage
3. Partially Implemented
4. Enterprise
5. Optimized (think, work, act globally)

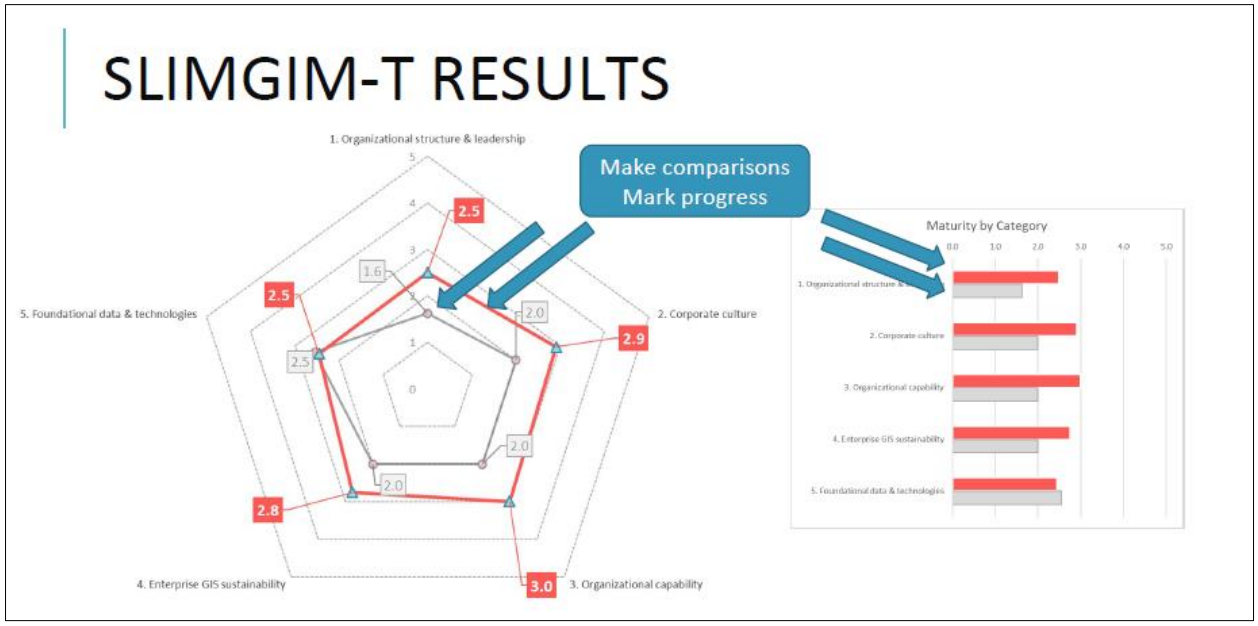


Figure 24: Slimgim-T CMM Summary Web Chat Comparison

[13] https://www.slimgim.info/the-method.html

By utilizing the self-assessed maturity and likelihood by category, areas of the most potential for change (improvement) can be of highest priority and gap analysis focus for most likely positive results. The matrix presented below is employed for establishing a reviewing method and priority.

Table 3: Capability Maturity Model Matrix

<table>
<tr><td colspan="2" rowspan="2"></td><td colspan="5">Likelihood</td></tr>
<tr><td>Extremely Unlikely</td><td>Unlikely</td><td>Neutral</td><td>Likely</td><td>Extremely Likely</td></tr>
<tr><td rowspan="5">Maturity</td><td>Ad-Hoc (individual or none)</td><td rowspan="4">Maturity gains in this space are very unlikely. Not explored in this study; however, gaps noted through other review activities will be noted.</td><td colspan="2" rowspan="2">Maturity gains in this space can come easily, and even despite unlikely engagement or support, can find success. Gaps found through other review activities will be noted.</td><td colspan="2" rowspan="2">Maturity gains in this space can come easily, especially with engagement anticipated by a likely self-assessment. Gaps will be sought and explored.</td></tr>
<tr><td>Planned / Early Stage (departmental)</td></tr>
<tr><td>Partially Implemented (corporately but not consistently)</td><td colspan="2" rowspan="2">Maturity in this space requires high levels of consistent engagement of SMEs (unlikely/neutral). Of less focus in this study; however, gaps that are noted through other review activities will be noted.</td><td colspan="2" rowspan="2">Maturity in this space requires high levels of engagement of SMEs which is likely given self-assessment. Gaps will be sought and explored in this space.</td></tr>
<tr><td>Enterprise (corporately and consistently)</td></tr>
<tr><td>Optimized (corporately and optimized)</td><td colspan="5">Agency is fully mature! Innovative differences will be noted. Not of specific focus of this study.</td></tr>
</table>

Following are the six general maturity areas with their component success factors and descriptions.

1.	Organizational Structure and Leadership
GIO	**1.1 GIS manager or coordinator** The organization has a permanent Enterprise GIS management function and position.
GIA	**1.2 GIS is authoritative** GIS has been established by upper management as the authoritative source of spatial data and recognized as a critical component of business systems.
FGG	**1.3 Formal GIS governance** Formal GIS governance is established which may include committee structures, user groups and working groups. Some structure is in place to coordinate long range planning, stakeholder satisfaction and ability to leverage enterprise gis (EGIS) are in place in some organized manner.
GRA	**1.4 GIS resource allocation** Management has in place policies, procedures, and sufficient resource allocation to maintain GIS related services.
VCU	**1.5 GIS vision, comprehensive use & innovation** Management is committed to EGIS and are fostering participation of users in EGIS activities. They have a vision and foster awareness of the benefits and encourage innovation. Strategic plans are in place that directs comprehensive use of spatial data. Enterprise planning processes align with EGIS strategic goals and vision.
BTM	**1.6 Benefits are tracked & measured** Management measure tangible benefits of EGIS in order to track success and guide decisions and planning.
SLB	**1.7 Senior management learning** One or more representatives from top management are interested in learning how EGIS opportunities can help realize improvements to their core business.
BCC	**1.8 Enterprise GIS competency & capacity** Committed to competence and capacity building at all levels as it relates to EGIS.
IDC	**1.9 Inter-department cooperation** An emphasis is placed on integration and coordination of inter-departmental activities. There are processes and procedures in place for inter-departmental conflict management and to prevent duplicative efforts.
AHC	**1.10 Adaptable hierarchy to align with change** The organization is able to adapt to evolution and change by creating a new hierarchy to align with the changes.
GPA	**1.11 GIS Projects align with enterprise vision** GIS projects undertaken work seamlessly within the enterprise framework and aim to help the organization work smarter and more efficiently.

2.	Corporate Culture
BUP	**2.1 Business units have active EGIS participation**There is active participation and involvement of business units in EGIS activities, implementation, planning, etc.
EFI	**2.2 Environment of the organization fosters innovation** Learning, change and continuous improvement is an accepted and practiced philosophy.
ARD	**2.3 Staff accept EGIS as a reliable data source** It is generally accepted that EGIS is the authoritative, reliable source of spatial data for the organization (system of record).
CSC	**2.4 Open cross-unit cooperation & information sharing** Interaction amongst employees is open and cross-unit cooperation and sharing of information, ideas, best practices, and inquiry is common.
AHR	**2.5 Adaptable hiring practices ensure modern skills** The level of adaptability regarding the organization's ability to change hiring practices to ensure those with both the requisite modern spatial skill set, up-to-date training and an innovation mindset are prioritized.
CCT	**2.6 Core competency improved with training plans** The corporation encourages improvement of core competency which is supported by a comprehensive training plan.
GCF	**2.7 Enterprise GIS related communication is frequent & guided by plans** A strong communication and employee engagement plan is in place & align to strategic goals. Enterprise GIS related communication is frequent at all levels and is tailored to staff and partners with follow up procedures to evaluate effectiveness of communication.
EEU	**2.8 Employees at all levels encouraged to use GIS** Employees at all levels think spatially and are encouraged to explore and improve their practices by incorporating spatial data. This aligns people and process to the corporate vision.

3.	Process Orientation
SPM	**3.1 Staff are "process-minded"** Business process is valued by the organization. Staff are "process-minded" and often are involved in business process mapping and other exercises and are capable of interpreting and following the results.
GCS	**3.2 EGIS process & goals shared across silos** Enterprise process and goals are shared among functional areas.
GPM	**3.3 GIS operation align with performance management** GIS operations align with performance management.
PAS	**3.4 Plan to improve & align process to strategic plan** Processes are in place for improving and aligning business to strategic plan. There is a management commitment to improve their section to improve process.
SPD	**3.5 Process documentation standardized & central** High level process documentation and task responsibilities are centralized and accessible and the organization follows a standard methodology for business process mapping.
DME	**3.6 Data maintenance embedded in business workflow** Data maintenance procedures, including editing roles, are embedded in business workflow and either consistently pushed out to data custodians or automated using workflow tools or automation.

4.	Organizational Capacity and Capability
GLA	**4.1 EGIS led by appropriate and sufficient staff** Enterprise GIS staff are led by a qualified manager with the appropriate GIS education, experience, and credentials. There is sufficient staff with the appropriate training for GIS viability. This position is within or tightly aligned with I.T. requiring competencies with EGIS architecture, business process, relationship building, stakeholder engagement and project management.
DIE	**4.2 GIS data interoperability exists** GIS data-interoperability exists to enable integration of spatial data from various sources within and external to the organization.
CWC	**4.3 Corporate-wide spatial competency** Appropriate employees have a competency in using spatial data and applications/systems supplied by EGIS.
NCF	**4.4 GIS 'operators' no longer have a cartography/map making focus** A GIS / IT team has evolved and is focused on more complex automation and data management services. Cartography, map making (includes story maps) and basic analysis has become the common task of the end-user.

5.	Enterprise GIS Sustainability
CBC	**5.1 Long term corporate budget commitment** There is a budget for long term commitments for support, licensing, etc. such as an Enterprise License Agreement (ELA). GIS software acquisition is a coordinated effort across departments and the EGIS budget is seen as a cost of doing business.
TBD	**5.2 Balance of tech resources & data admin** Planning and controls are in place to balance technological resources with organizational needs as well as administration of data resources and automations.
EUS	**5.3 End-users well supported** End-users are well supported with online guides, training material, technical support including service quality practices. IT staff are used for infrastructure support.
BIG	**5.4 Blending of IT, analysis, visualization & GIS** There is an active partnership or blending between GIS and IT technical staff as well as a specialization of analytical & visualization staff.
MBP	**5.5 Mechanism to maintain business unit participation** Mechanisms are in place to maintain continued participation of the business units.
ESU	**5.6 External support utilized** External support such as consultants and specialized contract employees can be utilized when required to assist with activities.
LTC	**5.7 Long term competency & training plans** Long term competency and training plans are in place and continue to be followed.
SDC	**5.8 Spatial data is core / mission-critical** Spatial data is core to business applications and is centralized and an essential part of work and e-services.
USS	**5.9 Ubiquitous access to web self-service maps** Web based self-service GIS/Mapping tools with ubiquitous access are in place with the list of applications continuing to grow.
PW1	**5.10 Data and application backups** Data backup and security for GIS data and applications is defined, reliable, controlled and consistent.

6.	Foundational Data and Technologies
DOC	**6.1 Business unit data owners & data stewards defined** Data stewards are defined for each dataset. Business unit end-user data owners have been identified and are involved in data maintenance, quality procedures and decisions regarding their related datasets.
PPD	**6.2 Production & published database of reliable data** There is both a centralized managed production database as well as a published environment for consumption and distribution. The data is accessible and reliable. A development environment exists.
SAC	**6.3 System architecture current** The system architecture design is current with plans in place for future enhancements, expansion and upgrades.
FQC	**6.4 Formal QA/QC process** There is a formal QA/QC for each business process. Quality control and data accuracy are built into editing to reduce human error.
DAI	**6.5 Data common & available for integration** Spatial data is published in the organization's common data warehouse. Spatial data is readily available for integration and interoperability.
RIM	**6.6 Redundancy of information management reduced** Data duplication is minimized across the organization.
BDC	**6.7 All foundation datasets modeled & centralized** The organization's enterprise data have all undergone data modeling, are centralized, loaded, and maintained.
IBS	**6.8 Direct integration to business systems** Spatial data is an integral part of business systems and direct integration has been established.
PW2	**6.9 Metadata** Metadata available and maintained for all foundational and business data layers.
PW3	**6.10 Technical Infrastructure** Technical infrastructure in place to maintain and operate the GIS and to meet organizations' needs.
PW4	**6.11 Foundational Data** Adequate foundational data and secondary data exists to meet business requirements.

Appendix D: Terms and Acronyms

The following terms may be found in this document, for additional ODOT terms and acronym information consult the ODOT online Acronyms and Glossary.

Terms

Business Steward – A data subject matter expert who manages data in conformance with agency policy and guidelines

Business Intelligence - A set of techniques and tools for accessing raw data from various agency systems and transforming it into meaningful and useful information forbusiness purposes.

Capability Maturity Model – A methodology used to define, measure, develop, and refine an organization's level of maturity within a particular field.

Coordinating Data Steward – A staff person that coordinates and facilitates implementation and data governance practices

Data Analytics - Techniques for transforming data into information to provide insights into current conditions and/or likely implications of potential future actions.

Data Governance - The formal orchestration of people, processes, and technology to enable the organization to leverage data as an enterprise asset.

Data Management - The set of activities carried out to manage data across its life cycle – it includes: planning, collecting/acquiring, documenting, organizing, storing, controlling, disseminating, using and disposing of data.

Data Program - A business unit whose primary responsibilities include collection, processing, reporting and/or distribution of a particular class of data.

Data Quality - The degree to which data is accurate, complete, timely and consistent with requirements and business rules and relevant for a given use.

Data Set - A collection of data made available for access or download in one or more formats. Examples: a state's crash records for a single year; a database with roughness measures for pavement segments on the state highway system.

Data Standard - An adopted agency requirement related to data content, structure, format, naming conventions, definitions, accuracy levels or collection methods.

Data Trustee – A manager with decision making authority and responsibility for a data asset

Data Visualization - Techniques for graphical representation of trends, patterns and other information.

Enterprise Data - Data may be designated "of agency-wide or enterprise significance" if (1)it is statewide in scope, (2)is pertinent to business needs of multiple divisions, (3)is required to meet legal or regulatory requirements, and/or (4)is considered critical for carrying out agency core functions or minimizing risks.

Findability - The degree to which relevant information is easy to find when needed; findability is improved through application of metadata, taxonomies and other organizing tools, and search technologies.

Guideline - A recommended practice to be considered for application in a given situation.

Interoperability – The ability of computer systems of software to exchange and make use of information.

Master Data - Data about entities such as customers, projects, facilities, organizational units, etc. that is shared across different information systems.

Metadata - Data describing context, content, and structure of documents and records and the management of such documents and records through time. Literally, data about data.

Sensitive Data - Data that is confidential, privileged, or proprietary that should be protected from unauthorized disclosure, loss, misuse, or corruption in order to avoid serious consequences to the organization that owns it.

Shared Data - Data that serves the decision making needs of more than one ODOT business unit and/or is made available for external agency use.

System Steward – A person (staff or manager) that acts as the primary administrator for a system, platform or application asset

System Trustee – A manager with decision making authority and responsibility for a system, platform, or application asset

Technical Data Steward – A technical staff person (typically but not always within the information systems branch) who understands and manages how data is physically structured and stored

GIS Unit Acronyms

AASHTO – American Association of State Highway Transportation Officials

AGOL – ArcGIS Online (Esri)

ALB – Agency Leadership Board

API – Application Programming Interface

ARNOLD – All Roads Network of Linear Referenced Data

ASIS – Aggregate Site Index System

BA – Business Analyst

CAD – Computer Aided Design

CHAMPS – Central Highway Approach Maintenance Permit System

CMM – Capability Maturity Model

COTS – Commercial Off the Shelf

DMZ – IT "demilitarized zone" (also referred to as perimeter network or screened subnet)

DOT – Department of Transportation

DR – Data Reviewer (Esri)

EGIS – Enterprise Geographic Information System

ELA – Enterprise Licensing Agreement

ETL – Extract Translate Load

FACS – Features Attributes and Conditions Survey

FAHP – Federal Aid Highway Program

FAQ – Frequently Asked Question

FGDB – File GeoDatabase

FIT – Framework Implementation Team

FME – Feature Manipulation Engine

FTE – Full Time Employee

GDOT – Georgia Department of Transportation

GIS – Geographic Information System

GISSC – GIS Steering Committee (ODOT)

GIS-T – Geographic Information System for Transportation

GPL –GIS Program Leaders (State of Oregon)

GPS – Global Positioning System

ISC – Implementation Steering Committee

IT – Information Technology

LiDAR – Light Detection and Ranging

LRM – Linear Referencing Method

LRS – Linear Referencing System

MIRE – Model Inventory of Roadway Elements

ODOT – Oregon Department of Transportation

ODS – Open Data Standard (ORS 276A.350-374)

OGIC – Oregon Geographic Information Council

OPMA – Oregon Project Management Associate

OTC – Oregon Transportation Commission

OTSDE – Oregon Transportation Safety Data Explorer

PM – Project Management

PMF – Performance Management Frameworks

PMO – Project Management Office

QA/QC – Quality Assurance & Quality Control

RES/RAZ Map – Resource & Restricted Activity Zones (ODOT)

RICS – Road Inventory and Classification Services

ROI – Return on Investment

ROW – Right of Way

SDBP – Strategic Data Business Plan

SDE – Spatial Database Engine (Esri)

SDLC – Software Development Life Cycle

SME – Subject Matter Expert

SOP – Standard Operating Procedure

SPIS – Safety Priority Index System

SQL – Structured Query Language

STIP – Statewide Transportation Improvement Program

TAD - Transportation Application Development

TDSC – Transportation Data Steering Committee

TPOD – Transportation Planning Online Database

TRB – Transportation Research Board

USDOT – United States Department of Transportation

WashDOT – Washington State Department of Transportation

WMX – Workflow Manager (Esri)

Appendix E: Tables and Figures