PBOT

PORTLAND BUREAU OF TRANSPORTATION

Utility Coordination Scoping Project

City of Portland – Portland Bureau of Transportation

Portland, OR

Final Recommendation

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Acronym List

AD	Assistant Director
AHP	Analytical Hierarchy Process
AML	Asset Management Lead
AMT	Asset Management Team
BTS	Bureau of Transportation Services
CMMI	Capability Maturity Model Integration
COP	Common Operating Picture
CIP	Capital Improvement Plan
EAM	Enterprise Asset Management
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
GIS	Geographic Information System
KPI	Key Performance Indicator
LOS	Level of Service
PBOT	Portland Bureau of Transportation
PCI	Pavement Condition Index
PDCA	Plan, Do, Check, Act
ROI	Return-on-Investment
ROW	Right-of-Way
SAMP	Strategic Asset Management Plan
TAC	Technical Advisory Committee
TCO	Total Cost of Ownership

1 Executive Summary

1.1 Overview

It's said that what gets measured, gets done. Those measurements include a mandate to lay new pavement on 100 miles of streets each year. At the same time the City had 23 miles of pavement cuts that shortened the overall lifespan of those streets[1]. The fees charged as part of that work don't begin to recoup the value of the Right of Way (ROW) investments.

The Portland Bureau of Transportation (PBOT) made a public commitment to Asset Management in 2013 "… to be a community partner in shaping a livable city. We plan, build, manage and maintain an effective and safe transportation system that provides people and businesses access and mobility…" The infrastructure and environment to truly support its mission has not been put in place. So finds this report, after an in-depth study of PBOT practices in comparison to peer cities' best practices.

PBOT uses an asset management framework recommended by the International Infrastructure Management Manual, which is also used by the Federal Highway Administration (FHWA) and Environmental Protection Agency (EPA). Focusing on the concept of "continuous improvement"[2], the approach identifies which assets are most critical to meeting the City's needs, comparing the current state with key performance indicators (KPI) that indicate progress, and then actively managing the system to meet those needs while improving long-term funding options. While PBOT has put in place some of the elements needed to enable this process, the core components to successfully enact and sustain Asset Management are still missing. More fundamental, agency-wide changes are needed.

Attempts have been made to improve processes, primarily through the addition of new information technologies. While information technology is a highly prominent component of any asset management plan, any new introduction at this point would meet with minimal return on investment due to the flawed underlying processes. Vendor demonstrations are attractive, but they mask the fact that they are done off demonstration data with implied mature asset management practices. PBOT has already invested significantly in enterprise information technology, but has continued to develop other areas. IT is being seen as a "silver bullet[3]," despite a history of implementing software that doesn't align with people or processes.

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[1] Source PBOT, 2015. Data is not collected in a manner that allows PBOT to determine the linear feet of cuts against the PCI, or which cuts were made on moratorium streets.

[2] W. Edwards Deming in the 1950's proposed that business processes should be analyzed and measured to identify sources of variations that cause products to fail to meet expectations. He developed a *continuous* feedback loop that examines business processes, allowing managers to identify and change the parts of the process that need improvements. The basic illustration of this process is the PDCA cycle, so named for the four basic elements – Plan, Do, Check, Act.

[3] From Fred Brooks' *Mythical Man Month*, a seminal work on software engineering. Brooks argues that "there is no single development, in either technology or management technique, which by itself promises

What are missing from these attempts are changes to the workflows and organizational structure that will allow the information technology to fully yield the promises of improvement. Until then, PBOT will continue to struggle to meet its performance, and suffer from diminishing funding with an increasing mandate, while continuing to lose operating to funds to underutilized technology. In short, they will not be *able* to operate at peak effectiveness.

1.2 Approach

This paper approaches asset management with the idea that better value is achieved through accountability. **Accountability** is a basic tenet of most organizations. The simplicity of being responsible for decisions made, actions taken, and assignments completed can be difficult to move organizations toward. Indeed, a Harvard Business Review[4] identified peoples', often unconscious, desire to avoid accountability as the most significant barrier in organizational effectiveness.

However difficult to implement, it is critical to rework the current PBOT organization towards this goal. Additional policies and procedures are not enough. Instead, a **true Asset Management structure is needed**. Significant adjustments are needed to the three levers within PBOT. When in effect, these levers will provide the framework, definition, and accountability, not just with the coordination of the ROW, but with the management of all PBOT assets. This affects a shift from a departmental performance standard to an **agency-wide performance standard**[5], and provides the predictability of the delivery of PBOT services needed for continuous improvement.

1.2.1 Process & Scope

This study began as a way to improve utility coordination in the PBOT ROW, primarily through the development of additional information technology. As the process progressed, however, it became clear that the same actions to correct utility coordination applied to greater PBOT operations. At the direction of the Project Manager, Assistant Director, and the PBOT team, the scope was adjusted. Rather than creating yet another set of processes and reporting within an already-complex structure, PBOT decided to address the root of the problem and look at correcting the organization.

This project developed over several phases, with the results of each feeding into the other. It is designed to filter alternatives down to a focus data-supported conclusion. Phase 1 of this process was two-fold. First, was an **evaluation** of current PBOT practices, using a functional assessment, including eight primary categories of measurement. Each primary category contained sub-areas, resulting in a total of 36 areas

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even one order of magnitude improvement within a decade in productivity, in reliability, in simplicity." There is no "silver bullet".

[4] "Why Accountability Is So Muddled, and How to Un-Muddle It" by Ron Ashkenas. Harvard Business Review November 26, 2012.

[5] This study used a model based on the Capability Maturity Model Integration (CMMI), a process improvement and appraisal program that was developed by Carnegie Mellon University. Specifically, the predictability of services is a Managed Process (level 4 of 5).

of measurement. Concurrently, the best practices of peer cities were also evaluated, creating a **benchmark** against which alternatives could be developed.

As part of a structured moderated process, several key factors were identified. These were included in the development of three alternatives that would work within the City of Portland environment. By consensus, the Director's Team selected the alternative that was:

- Predictive, risk-based project coordination
- Aligned best with documented City goals
- Most effective with resources and a clear line of authority
- Project developed based on asset management principles
- In line with City of Portland Bureaus; BES and Water asset management programs

While this approach is longer and more complicated to implement, it is more sustainable and provides the needed components for accountability. Most important is that the elements align with the other City Bureaus, making **interagency coordination** possible. Additionally, this alternative provided an option to **incorporate the public**, keeping with the City's Vision.

As the final part of this study, the Project Team developed an Action Plan that would immediately address critical PBOT needs, and allow the full implementation of the preferred alternative in as few as 36 months.

1.3 Recommendations

Implementing a true Asset Management strategy involves actions across all three categories of criteria - or "levers" – organizational, policy, and information technology. The review of peer cities, that are maximizing effectiveness and yielding the greatest value from their assets, showed a key balance between all three of these factors. While City's success has been tailored to fit their uniqueness, we have adjusted and developed a **Portland solution**.

1.3.1 Organization

Before any success can be realized, there must be significant organizational transformation. Specifically, realignment within the bureau includes the **formation of an asset management group.** Tasked with a single mission and ultimate authority for all asset managements decisions, this group will review, approve, prioritize, and direct the execution of projects. Without this entity, additional technology expenditures will be wasted, adding greater overhead for the City, while not yielding measurable benefit.

Rather than the expansion of authority within an existing department, we recommend the formation of a new unit within PBOT. This keeps each department's mission focused. More importantly, it sends a clear statement about the importance of managing activities. This is a key component in the decision-making structure, and is completely absent as a single point of authority at PBOT. Moreover, it is in line with the other City agencies,

facilitating interagency coordination. The current practice results in an ineffective "muddling through" with diffused and abstracted authority and decision-making.

This group will be charged with redefining and reporting out new KPIs. Instead of mandates to pave a certain amount of mileage each year, they must identify those factors that **emphasize the preservation of the City's investments**.

1.3.2 Policy

The City is constantly losing money through the lack of formalized and enforced **policies that protect and recoup the value of the City's assets**. As the ultimate authority on the transportation system, PBOT must require that all agencies and utilities get permit approval prior to the commencement of any work. Even those entities with "blanket permits" will have to coordinate well in advance with the new Asset Management Team, allowing PBOT to coordinate activities and look for cost saving opportunities.

Most important is the enactment of a "loss of life" policy – adjusting fees for all stakeholders to ensure that remediation returns the pavement to its prior condition, instead of the standard flat-fee that is now in place. Without this, PBOT will continue to subsidize others' work in the ROW at its own detriment and to the detriment of City taxpayers.

1.3.3 Information Technology

Lastly, the process is favoring the development of **strong and mandated information technologies** that will create the tools by which the decisions can be made.

Rather than making additional investments in technology, we recommend building out the underutilized capabilities in PBOT's existing Enterprise Asset Management (EAM) software.

Incomplete information exacerbates the poor decision-making. To this effect, **formalized information and decision making pathways** (i.e., workflows) have to be established, maintained, and enforced at the City. Simply, there is no easy way to access, let alone reproduce, information upon which decisions are being made daily. Aside from the operational inefficiencies, this is a public awareness nightmare. Civic inefficiencies of this magnitude are unacceptable in the information era.

Another important task is the development of a common operating picture (COP), critical for both **internal and external communication**. A COP provides an instantaneous look at all activities – planned, pending, and current – so that operational efficiencies can be gained. More importantly, this information needs to be shared amongst shareholders and the public. That level of transparency alone will yield results in both the immediate and long-term future. That said, however, the City is rich in information technology resources. The recommendation is to better leverage the existing capital systems, and supplement them with a focused set of applications, databases, and processes that can maximize the effectiveness of specific tasks. This will minimize the information technology capital outlays, yet still provide the functionality that the organization needs.

1.4 Action Going Forward: Realize Immediate Benefit

The City has immediate needs, and cannot wait 2-3 years for a costly enterprise information implementation. What is needed is a triage effort in order to start realizing greater value from existing assets, to start meeting PBOT's most immediate needs through interim steps. This will begin developing the culture of accountability while concurrently, the more comprehensive and sustainable elements for true Asset Management are implemented. The action plan – or scope – is included at the end of this document and represents the conclusion of this study.

This scope presents a 3-phase plan to implement Asset Management at PBOT. With almost 30 key actions to be implemented in the next few years, the goals can be distilled down to:

- Managing to the **true value** of PBOT's assets.
- Effecting **true coordination** – within PBOT, between bureaus, and even with the public.
- Making everyone working in the ROW truly **accountable** for their actions.

Phase 1 begins to put a framework in place upon which to build. The focal "levers" in this phase are organizational and policy. First, PBOT must hire an Asset Manager at the Principal level. Prior attempts to fill this position have not had the positional authority nor been in the critical path for decision making. By establishing this position, it signals to the entire Bureau the criticality of this plan. Once in place, the Asset Manager can begin filling in the organizational structure, as well as assuming the oversight of this plan. The second lever that needs to be addressed is policy. Fees and permits must immediately begin to reflect the true cost of restoring the pavement to its previous life expectancy, prior to the work being done to Portland streets. Overall, the move toward pavement preservation is needed, as opposed to the costs of other stakeholders' work simply being transferred to PBOT. Information systems in Phase 1 are focused on using the capabilities of existing software more effectively.

Phase 2 builds upon the gains created in Phase 1. Completion of staffing the Asset Management team allows the implementation – and verification – of workflows needed to ensure that the plan stays on track. As part of this, PBOT can move from its questionable 1-year work plan to a dependable 5-year work plan. This level of maturity allows the information to be shared with sister bureaus, where coordination and true financial gains can be seen. Indicative of this is a true COP, a map-based portal that allows users to see the authoritative project list.

Phase 3 reflects the maturity of this plan. With the early policy changes firmly in place, PBOT can now require that all activities in the ROW require a permit prior to the commencement of work, and that remediation fees are wholly recouping the true cost of remediation. With a solid Asset Management foundation, PBOT can develop the internal steering committee to continue oversight of the program while also extending more services to external partners. As a mature process, PBOT Asset Management can refine its processes while reporting out on how it is meeting its goals.

The lack of prominence of information systems in this plan should not downplay their importance. This reflects the considerable investment that PBOT has already made in enterprise systems to date. The addition of more technology will not yield substantive benefits until the underlying processes have been defined. What is more important is to build out the unused capabilities of the existing information systems with the changes in policy. Information technology will be critical in the success of this plan, but it is the targeted use of it to provide interim capabilities, its consolidation, and – most importantly – its ability to report on the accountability of Asset Management activities, where technology is most effective.

While this plan is designed to be implemented on a flexible timescale, it should not be assumed that the plan is modular. The majority of the changes will be implemented in Phases 1 & 2, but this needs to be seen through to its maturity to truly be effective. Accordingly, the buy-in from Executive Management will be critical throughout. Support and emphasis of Asset Management is needed to begin changing organizational processes that will be resistant. Education and reinforcement is needed to continue to nurture the program to maturity. And the celebration of the successes achieved through Phase 3 will move this from being a "plan" and into everyday thinking.

1.5 The Future

PBOT is well-positioned - with both the capabilities and the leadership in place - to affect the changes that will move them from being behind the budgetary curve - where the current funding cannot even maintain its maintenance cycle – to one where it can take control and not only have its financial successes, but report out on them and demonstrate continuous improvement. That level of organizational maturity is reflected in our peer cities, where implementation of similar changes in Chicago netted $13 Million in savings. In short, it is not technology, but better processes that will allow PBOT to see the best return-on-investment (ROI).

2 Document Overview

This document is the product of Phase One of the Utility Coordination Scoping Project that is examining the coordination of projects in the City of Portland transportation ROW. Phase 1 is, itself, comprised of two elements; both will be summarized in this document, and will cover goals, process, and results.

To assist the reader in navigating this document, it is broken down into the following sections:

Chapter 1 – The **Executive Summary** of the Project and its findings.

Chapter 2 – The **Project Overview**, explaining the drivers of the project, its sponsors, and the participants.

Chapter 3 – A brief **summary of Phase One** of the Utility Coordination Project. The findings provide some context for the development of the Recommended Alternative.

Chapter 4 – The development of the **Alternatives.** This includes a summary of the process, key findings from the stakeholder survey, and the guiding policies that were included in all of proposed alternatives.

Chapter 5 – The **Evaluation & Selection** process.

Chapter 6 – A presentation of the **Selected Alternative**.

Chapter 7 – A high level **Action Plan** for implementing the Selected Alternative within 36-48 months.

3 Re-cap of First Paper

This is the second part of a Two-Phase[6] review of the City's utility coordination efforts. Funded by a $250,000 grant from the Innovation Fund, improved utility coordination was identified as an area where City government could be more effective, responsive, and accountable to the public.

Phase 1 of the project was focused on benchmarking Portland against five cities that have a reputation for innovative practices in coordinating work in ROW. PBOT was measured against these "peer cities" in seven major areas with thirty-six sub-areas with the goal of capturing those best practices that Portland could most effectively adopt to improve the delivery of its services.

Information systems alone were preliminarily favored to be the recommended solution. However, after a comprehensive survey and capability rating, the Project Team identified the following three major themes that most contribute to the success of ROW management programs:

1. **Authority & Policy** to incentivize project coordination
2. **Organizational Structure** designed for project coordination
3. Leveraging **Information Systems** & Asset Management Best Practices

These inputs became the central organizing framework for developing alternatives in Phase 2 of this study. This allowed the Project Team to develop alternatives that had different combinations of these themes – or "levers[7]" – with the overall goal of improving PBOT's delivery of its services.

At the conclusion of Phase 1, the Project Team found that the largest efficiencies could be gained within PBOT by focusing its improvement efforts in the following areas:

1. Strategically leveraging the paving program
2. Optimizing time and location-based coordination

[6] Originally a Four-Phase project, PBOT accelerated the original timetable based on the consensus of the stakeholders in the Alternatives phase of the study. The project is now comprised of two phases, but allowed the development of an Action Plan to expedite changes accepted by the Director's office.

[7] These "levers" became a pervasive organizational framework, and were used to describe and compare the different alternatives in the selection process. They are also used as categories for the actions in the recommended alternative presented later in this document.

3. Implementing intelligent information systems.

Phase 2 was intended to develop three alternatives that address these areas, and that would be evaluated for a solution that would both improve utility coordination and that would be sustainable within the City of Portland's unique bureau structure.

4 Alternatives Overview

Developing a viable solution for utility coordination with 14 disparate stakeholders can be a complicated process. Good solutions are not possible without good alternatives. Alternatives should reflect substantially different approaches to the problem or different priorities across objectives, and should present decision makers with real options and choices. The HDR team's primary objective was to propose three workable solutions that stakeholders endorsed and met the scope of the project.

In this phase, the Project Team's primary objective was to develop three viable solutions that stakeholders endorsed and met the goal of improving PBOT utility coordination.

Developing good alternatives is an iterative task. The Project Team sought to collaborate with the people most affected in the ROW process Our team understood that difficult trade-offs are easier to make when people believe that their input was sought in developing alternatives that would effect their day-to-day work. Using a structured process that maximized input from the ROW stakeholders, the Project Team sought to develop alternatives that were:

- **Value-Focused:** The right solution would align with the values of Portland.
- **Technically Sound:** the Project Team has drawn on the best available information about cause and effect relationships, and has designed creative and diverse alternatives based on sound analysis.
- **Comprehensive:** All potential alternatives were considered and refined,

In order to capture the values of the stakeholders, the Project Team leveraged Thomas Saaty's Analytical Hierarchy Process[8] (AHP). The AHP is a structured technique for organizing complex decisions. The approach the Project Team took was also collaborative and they started by holding a series of workshops in order to share their objectives, and to seek input on the values of the organization. By using this process, HDR feels it accurately addressed the challenges, shortcomings, and values that were discovered in the inventory, benchmarking, and analysis phase of the Project with the proposed alternative.

4.1 Methodology Analytical Hierarchy Process

The AHP is a rigorous, structured technique for organizing and analyzing complex decisions. It has particular application in group decision-making and is used around the world in a wide variety of decisive situations. Rather than prescribing decision, the AHP

[8] http://www.colorado.edu/geography/leyk/geog_5113/readings/saaty_2008.pdf

helps decision makers find one path that best suits their goals and understanding of the problem by using a combination of weighted mathematics and psychology. By making head-to-head comparisons and weighing the priorities at each level and for each element, the bifurcation naturally leads to a single decision. The AHP provides a comprehensive and rational framework for structuring a problem and relating elements to an overall goal, and for evaluating alternative solutions.

The AHP uses the following steps in systematically evaluating problems [9]

1. Decompose decisions into a hierarchy on sub problems
2. Evaluate the sub problems by comparing them to each other
3. Convert evaluations to numerical values
4. Prioritize and weight each area of the problem
5. Calculate priorities for each of the alternatives

In making comparisons of elements of the problem, decision makers can use concrete data about the variables of the problem. However, personal judgment about a variable's relative meaning and importance to the overall problem is subjective. Numbers represent the alternatives' relative ability to achieve a decision goal; they allow a straightforward consideration of the various courses of action, but ultimately one must use professional expertise in choosing the correct alternative to match the problem at hand.

The transparency of the AHP lends itself well to issues with multiple stakeholders who may have different agendas. The simplified decision process, and the guidance by a moderator, expedites the process and moves toward consensus.[10]

4.2 Developing Alternatives

During the benchmarking exercise, the Project Team discovered that the best organizations leveraged an organizational structure designed for coordination, policies, and fees that enforced street preservation and information technology that was aligned with business processes. The right alternative would require a mix of each of these elements. In order to select the right alternative, the Project Team held a total of eight meetings that presented the goals of each "lever".

Meeting one was focused on developing a complete understanding of the findings in Phase 1 of this project. The Project Team used this effort to set the goals of potential alternatives with the stakeholders. The team worked at defining the sub goals and areas of evaluation that would be set for the AHP in subsequent meetings. The result of the first meeting was a complete AHP hierarchy with rankings to be defined and or confirmed in future steps. The primary goals were defined by the Project Team as:

- **Organization Structure:** Organize across the bureaus for quantified outcomes

[9] http://www.studygs.net/problem/problemsolvingv2.htm

[10] Saaty and Dong. An Analytic Hierarchy Process Model of Group Consensus. Journal of Systems Science and Systems Engineering September 2014, Volume 23, Issue 3, pp 362-374

- **Organizational Structure**: Formally define the business processes
- **Policy:** Protect PBOT assets collaboratively and opportunistically
- **Policy:** Track performance with metrics
- **Information Technology:** Better leverage technology for data driven decision support

Following the AHP methodology, the Project Team had a series of meetings in which the sub goals for each of the above were defined, weighed, evaluated, and voted upon. In order to prioritize using the AHP, the Project Team held a series of meetings to ensure that their goals and priorities were aligned with the greater Technical Action Committee (TAC).

Each meeting had a specific purpose in scoring priorities that would inform the possible alternatives under the AHP. Workshops leveraged a Turning Point polling system[11] to facilitate the ranking sessions. The technology allowed real-time polling of the TAC members on issues that were central to the development of viable Asset Management solutions. With results being immediately visible, the Project Team could follow up on key issues. This system also formally documented the values of members of the TAC so they could be compared the overall goals established by the Project Team.

4.3 Majority Conclusions

In the May 28, 2015, 72 percent of ROW stakeholders felt that current pavement preservation policies were not effective.[12] The Project Team solicited ideas and feelings from the stakeholders during these meetings. This allowed the Project Team to generate an acceptable range of actions that could be incorporated into proposed alternatives. Those alternatives are summarized below.

4.3.1 Stricter Policies to Preserve the Pavement Value

Policies, or the rules to govern the way PBOT manages the ROW, are identical in each alternative. The Project Team had sufficient evidence to determine that policies and procedures need to be stricter in- order to better preserve the pavement asset. Tighter policies and procedures should be focused on accountability and managing to the value of the asset. By accomplishing these two major themes, PBOT will greatly enhance the value of the pavement asset.

4.3.2 Accountability

Without accountability you can not have coordination. Currently, responsibility for the ROW is under the purview of no single entity. Instead, the roles and responsibilities are mixed amongst different groups. Individuals have taken it upon themselves to work in the City's best interests. And while those information pathways have become known, they are not followed ubiquitously and are not codified. What is needed is the structure to

[11] https://www.turningtechnologies.com/

[12] The moderated survey yielded that 18% of stakeholders agreed that current policies were effective. 9% were neutral.

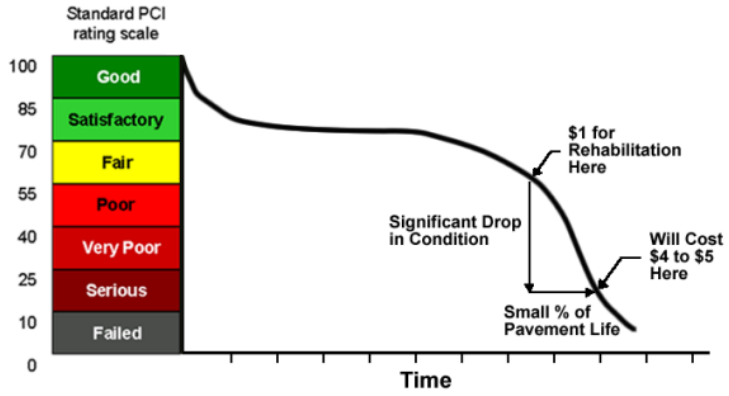
ensure follow-through and consistency throughout the entire organization. This enables senior leadership to prioritize resource allocation. Accountability is achieved by clearly identifying those responsible for tasks, and then verifying their completion and accuracy. In Phase 1 we identified this as Level 3 in the Capability Maturity Model.

4.3.3 Manage to the Value of the Asset

PBOT effectively subsidizes the work of the stakeholders in the ROW. The policies are not designed to protect the value of the asset, and fees do not begin to the cover the remediation of the damage done to the pavement by those holding "blanket cut" authority[13]. Moreover, fees are standardized, with cuts to pavement at "end of life" being the same as cuts to moratorium streets. With over 23 miles of cuts made to City pavement in FY 2014/2015[14], this equates to substantial losses to the City.

The stakeholders felt that policies and standards for work in ROW should consider the asset value when determining restoration techniques and fees. As Figure 4-1 shows below, the timing of maintenance can have tremendous impacts to its overall cost. Preserving existing pavement or rehabilitating it to a higher Pavement Condition Index (PCI) will save money over the extended life of the pavement asset. Fees and policies should reflect the "loss of [pavement] life."

Figure 4-1. Monitoring value over the life of the asset allows the City to appropriately assess "loss of life" fees to save money and improve the overall system.



4.3.4 Greater Organization is Needed to Manage the "System"

The Project Team saw three effective ways[15] to organize across organizational silos. Since it was apparent that organizational structure would be the most important lever in coordination and better asset management, "Organization" became an alternatives

[13] "Blanket cut" authority refers to those stakeholders who have negotiated the right to make pavement cuts anywhere in the system in order to extend utility service or conduct sewer maintenance.

[14] Source PBOT, 2015. Data is not collected in a manner that allows PBOT to determine the linear feet of cuts against the PCI, or which cuts were made on moratorium streets.

[15] See Utility Scoping Project Phase 1 White Paper for more information on the organizational models of the benchmarked peer cities.

exercise in itself. The Project Team, along with the group managers at PBOT, took three meetings to discuss and evaluate the following organizational alternatives:

- Board and Coordination Manager (i.e., the Baltimore Model)
- Coordination Group (i.e., the Chicago Model)
- Strong Asset Management practices (similar to City's Sister Bureaus)

Each organizational alternative has it merits and was considered to be effective in improving PBOT utility coordination. The process next focused on developing a solution that would be both effective and sustainable in the Portland City environment.

4.3.5 It's not about the Technology

While it was significant in the polling process that the stakeholder emphasis was put onto both process and policy, it was overwhelmingly recognized that information systems alone would fail if they were implemented without solid policy and accountability of staff in completing their actions. This was a major departure from PBOT's history, and even in the initial premise of this study where a technology solution was originally envisioned.

As a group, technological innovation is sometimes perceived as a "silver bullet[16]", a panacea that will solve all problems and realize all potential benefits shortly after deployment.

Failure of an innovation project to achieve its expected benefits can quickly result in disappointment and a backlash against not only the project at hand, but other future initiatives. Other critical comments from the group session included:

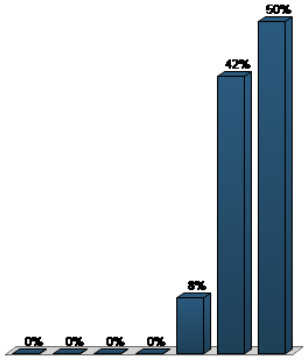
- The lack of standards and process awareness as major risks. Since complex information systems will magnify and expedite processes, more technology would be problematic.
- Sufficient resources were not available to implement and staff new systems.
- Prior IT implementations that have not met their goals or expectations.
- Constant budget shortfalls.

[16] Brooks, Frederick, 1975. The Mythical Man-Month . "The Silver Bullet Theory" – following the myth that a single silver bullet is sufficient to solve all the problems. As Brooks put it ""there is no single development, in either technology or management technique, which by itself promises even one order of magnitude [tenfold] improvement within a decade in productivity, in reliability, in simplicity."

Figure 4-2. A survey of TAC members unanimously identified the need for processes to be solidified before major IT solutions were implemented.

8. The right Information Technology solution will solve R-O-W coordination issues in Portland. (Multiple Choice)

	Responses	
	Percent	Count
Strongly Agree	0%	0
Agree	0%	0
Somewhat Agree	0%	0
Neutral	0%	0
Somewhat Disagree	8.33%	1
Disagree	41.67%	5
Strongly Disagree	50%	6
Totals	**100%**	**12**



4.3.1 Data-driven Decisions

Ninety one percent of stakeholders felt that ROW coordination is more effective when it is data driven. The Gap Analysis conducted in Phase 1 found that processes were lacking. Informal negotiations are often made to get around moratorium streets, with no calculation of precedent or financial impacts. Moreover, it was also noted that bureaus didn't fully respect the moratorium list when planning projects.

4.4 Guiding Policies

4.4.1 Universal Permitting

First and foremost, PBOT must require that all agencies and utilities get permit approval prior to the commencement of any work. This has a two-fold effect:

- It allows PBOT to have a current operational understanding of all work going on in its streets.
- It allows the proper fees to be assessed with regard to remediation.

This policy must be required of – and enforced with – all agencies seeking to work within the ROW. This study found that many of the utilities feel that any delay in the connection to their services jeopardizes their customer base. As a result, cuts are frequently made, but not reported back to PBOT until months after the work.

4.4.2 Value-based Fee Structure

Currently, there is a permit fee associated with ROW. However, this does not approach the value of the City's investment in time or, especially, in the utility of the asset. A key part of this approach is to put in place strong policies and cost-recovery mechanisms that cover the true costs to the City resulting in excavations to the public ROW. Going

forward, the requirements will be to restore the pavement to its original value prior to the work commencing.

4.4.3 Increased Paving Planning

Two factors significantly impede PBOT's ability to coordinate ROW activities with other agencies; the currency and duration of the pavement list (i.e., the list of upcoming projects). PBOT's current list only extends for a year at a time. This is out of alignment with other city bureaus that plan 5 years out. Extending the breadth of the planning would allow PBOT to work effectively with other bureaus; coordinating resources, avoiding conflicts, and assisting in capital planning. Major projects that require multi-agency coordination would cause less disruption both logistically and financially.

A longer paving list, however, is ineffective if not kept up-to-date. In fact, the outdated information can actually impede project delivery, tying up staff resources on dealing with erroneous or out-of-date information, and with no review process in place to ensure that new projects make it onto the paving list, or to ensure the quality of the data.

Both issues must be addressed through policy in order for the situation to change.

4.4.4 Leveraging Projects

While PBOT has a wealth of information systems, they are not connected to provide comprehensive, tactical decision-making, nor are the processes in place to ensure that the data contained within is complete or current. This prevents PBOT from leveraging parallel projects – the timing and the budgets – to manage cost avoidance. In other words, without the correct information available, opportunities to combine projects together are missed. For example, if there were multiple cuts along a half-mile of street, the ability to combine multiple projects together to create a better overall pavement, instead of treating each cut individually. Combining all of the cuts into a single remediation project creates a longer, continuous surface with greater quality and longer lifespan (i.e., value) than the total value of the individual projects.

4.4.5 More Stringent Reconstruction Standards

Current moratorium standards (17.24.100[17]) allow the City Engineer to grant exceptions to the prohibition, allowing development on adjacent pavement for emergency repairs, underground service connections, or the full upgrade of underground facilities. The City Engineer determines the conditions "appropriate to insure [sic] the rapid and complete restoration of the street and surface paving." The City Engineer "may require a larger pavement restoration area on each side of the trench, a full-lane-width pavement replacement or a full curb-to-curb replacement."

The current language is not stringent enough to ensure that the work actually restores the roadway to its preconstruction condition. Nor does it detail the conditions for restoration.

[17] "5-Year Moratorium Street Cut Replacement Guidelines", City of Portland Office of Transportation (Ordinance No. 176408).

In practice, there is too much room for interpretation, and no defined goal that Project Managers must attain for the remediation of streets.

4.5 Alternatives Summary

Following the AHP, the input received from PBOT and the ROW stakeholders limited the criteria acceptable in developing viable alternatives. With the Peer Cities' options, the Gap Analysis, and the Emergent Concepts, the Project Team developed three solutions to present to the TAC. This section gives a brief overview of the three solutions and their impacts along the three levers.

The Project Team would also support the preferred solution with an Action Plan that would outline successful implementation over the subsequent 24-36 months.

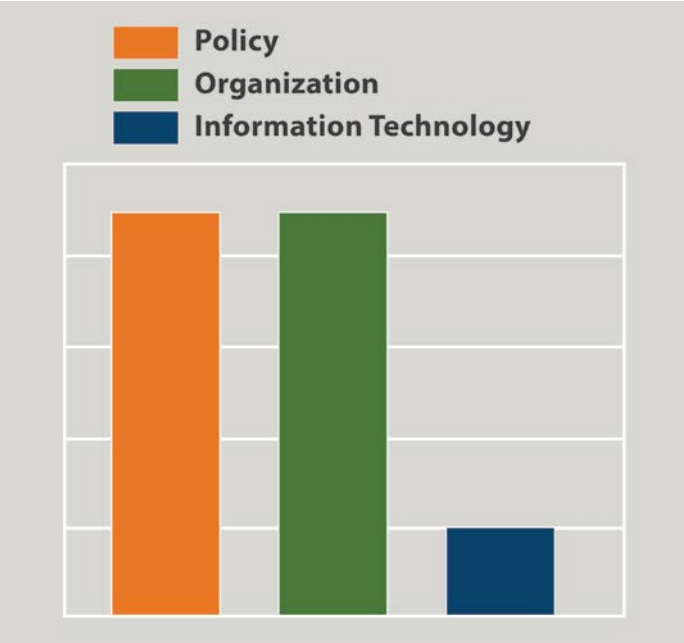
4.5.1 Alternative 1: Passive Coordination

As can be seen in Figure 4-3 (below) Alternative 1 was an effort focused on formalizing business processes and strengthening the organizational structure around Asset Management. These would be required in all of the proposed alternatives. However, there was little emphasis on the technology inputs.

Alternative 1 was considered a viable solution for utility coordination, since the solution focused on formalizing business processes and established policies. This requirement would be a first step regardless of the chosen alternative. The key characteristics of this alternative include:

- Developing business processes that are actionable and have accountability
- Establishing a coordination group that can cut across organizational silos
- Leveraging existing technology so that it aligns with business processes

Figure 4-3. Alternative 1 Emphasized Policy and Organizational Changes

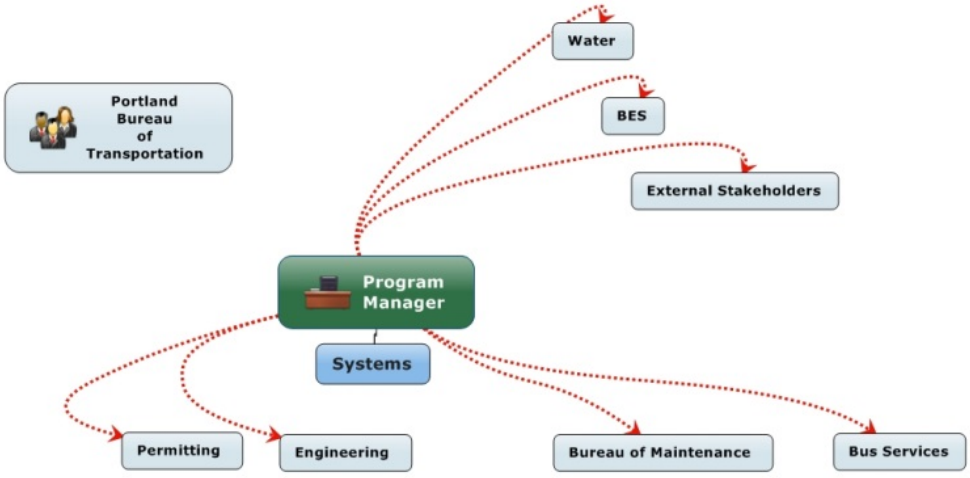


Organizational Impacts

Organizationally, Alternative 1 relied on the formation of a group to coordinate activities (Figure 4-4). This alternative was identified as the easiest to implement at PBOT, but also as the most likely to fail, as it relied upon participation in loosely defined groups to be successful. Similar prior attempts at this type of approach had failed as the coordination mandate was added to the missions of the participating units, blurring the priorities of the respective groups.

Coordination was channeled through a single individual – a “meta-systems” manager – who was to ensure compliance. However, with a loosely defined organizational structure, there was no measure of accountability. Compliance could not be guaranteed.

Figure 4-4. Alternative 1 Set Up Many Processes to Allow for Coordination



Policy Impacts

Alternative 1 forced PBOT to formalize and document its processes. Phase 1 efforts identified PBOT as having "ad hoc" (Level 1) or "basic standards" (Level 2); peer cities were working on Levels 3 and 4 in the Capability Maturity Model[18]. Alternative 1 emphasized policy documentation – and enforcement – as a means to achieve more consistent delivery of services.

In addition to pavement valuation and moratorium standards, Alternative 1 would require managers from each City department meet with the Mayor's office every 2 weeks to answer questions about their results and the overall progress toward their goals. Analogous to the Baltimore model, this represented a level of verification and accountability that had not been formalized at PBOT.

Information Technology Impacts

No New Technology: Alternative 1 emphasized minimizing or even precluding the implementation of any new information technology solutions. After the TAC polling workshop, HDR met with the Bureau of Technology Services (BTS) regarding the viability of the technical alternatives. It was clear to BTS that PBOT does not have the organizational maturity to see a significant ROI in implementing more technology.

4.5.2 Alternative 2: Integrated Systems & Workflows

Alternative 2 most closely resembles enterprise asset management, and loses some of the strict focus on utility coordination. However, it represents the alternative that most closely follows the City's goal to effectively and efficiently allocate resources, measure

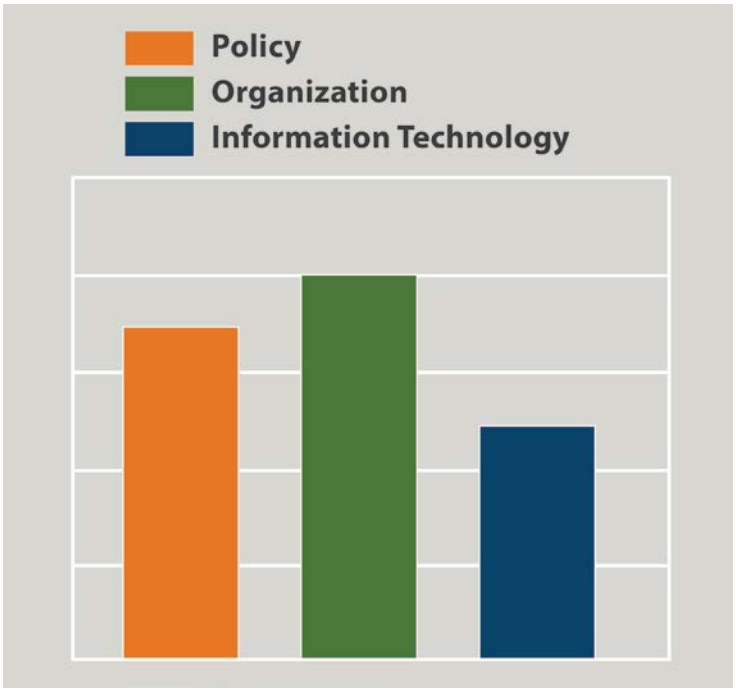
[18] See Phase 1 Utility Coordination White Paper for the PBOT Gap Analysis and a discussion of the Capability Maturity Model.

performance, and track infrastructure needs. It treats the ROW as another City asset – arguably its most valuable – and manages its true value.

Functionally, this approach is clearer and easier for all parties to navigate than other solutions. This is primarily due to the organizational structure that is built around the Asset Management decision-making that needs to be implemented to make timely decisions and monitor key metrics.

As Figure 4-5 shows, it has the greatest balance between the levers. But while it has this distribution of effort, operationally it is the most complex to implement. This is countered by its sustainability – it is PBOT-wide, and becomes self-sustaining once it is up and running. Most important, it is in line with other city bureaus and provides the most opportunity to collaborate and leverage each others' work.

Figure 4-5. Alternative 2 Offered a Greater Balance of Effort

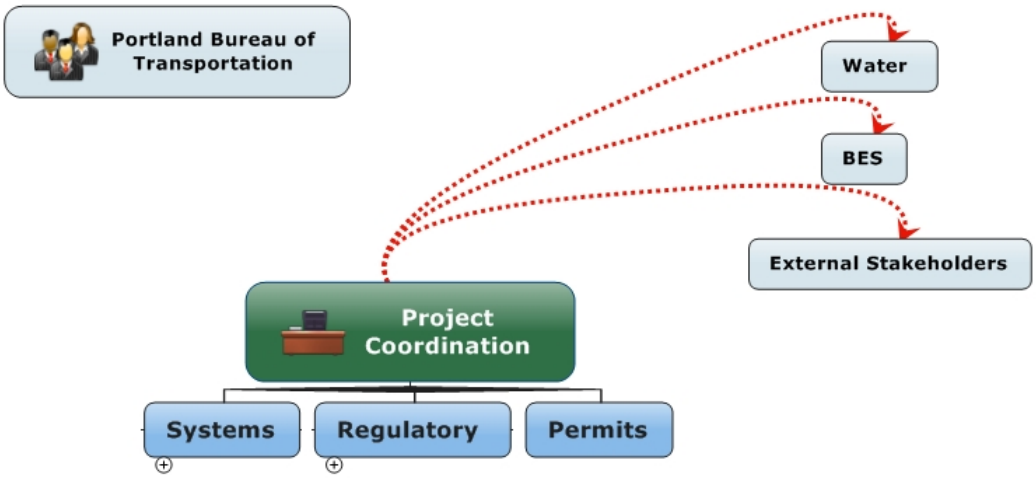


Organizational Impacts

Alternative 2 makes the most significant impacts to the current PBOT organizational structure. It proposed the establishment of a new office within PBOT – the Office of Asset Management, which would have authority on par with the other departments, and would have the sole role and authority over Asset Management decisions at PBOT. This would move the functions of asset management and ROW coordination from their diffused and distributed roles in other departments.

This alternative would have an assigned Asset Management Lead that reports directly to the Assistant Director, and additional staff to analyze, coordinate, and enforce asset management decisions.

Figure 4-6. Alternative 2 Established a Project Coordination Office to Control ROW Coordination



Policy Impacts

Like Alternative 1, Alternative 2 forced PBOT to formalize and document its processes. In addition to pavement valuation and moratorium standards, Alternative 2 would require the new department to:

- Be **responsible** for the protection of the City's surface and subsurface infrastructure from damage due to planned and programmed construction, installation and maintenance projects.
- **Review and approve** all proposed projects for new construction and installation work.
- **Schedule** infrastructure improvement projects of City departments and electric, gas, and telecommunication utilities in an effort to eliminate duplicative work.

This represented the most structured of the implementations.

Information Technology Impacts

Alternative 2 emphasized leveraging current technology and integrating systems in an operating portal. This alternative looks to leverage PBOT's current investment in information technology systems by integrating systems and developing both web tools and an administrative portal. The technology investments to date have been sizeable and are capable of handling the bureau-wide demands that would be required. What is needed is commitment to building out, administering, and ensuring compliance in the proper use of the systems.

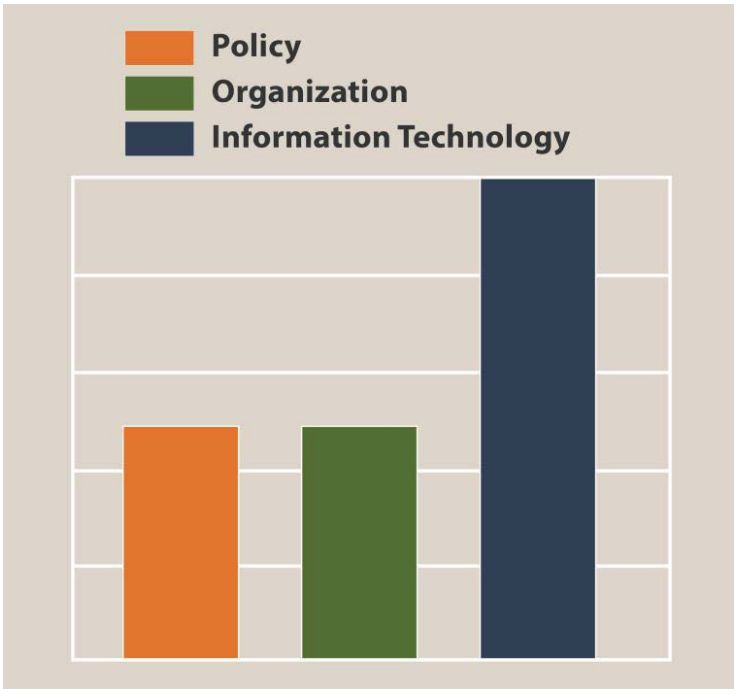
4.5.3 Alternative 3: Streamline Commercial Solution

Alternative 3 was the most technology-centric of the alternatives (see Figure 4-7), and the one that most closely aligned with the PBOT preliminary conclusions. It emphasized a technology solution that would address multiple problems:

- The lack of a single source to provide a COP of all projects in the City
- Unorganized and incomplete data
- Lack of connectivity
- Non-standard reporting
- Lack of data for Capital Improvement Plan (CIP) development

These all remain critical elements in an effective solution, but are not the only problems that need to be addressed. Technology magnifies work process; inefficient workflows and incomplete or untrustworthy data make a technology solution unviable.

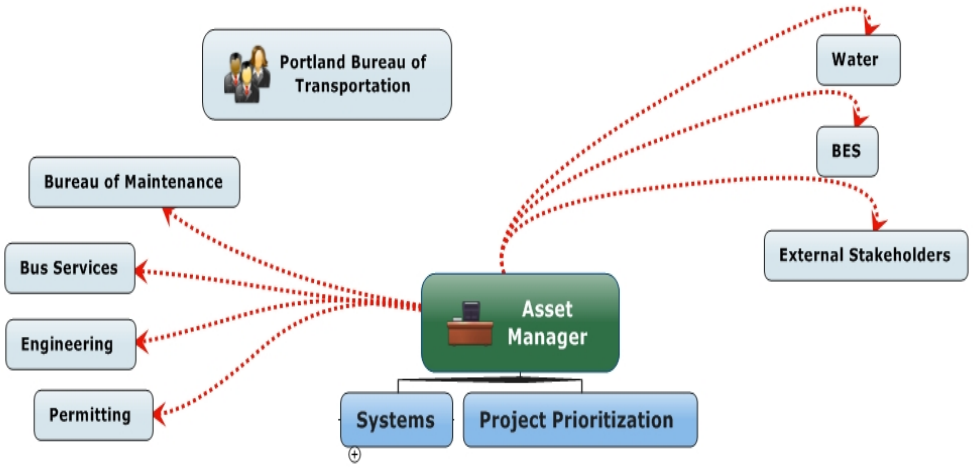
Figure 4-7. Alternative 3 Emphasized a Technology Platform



Organizational

Organizationally, Alternative 3 emphasized an Asset Management Group that would organize direct, coordinate, and control asset management activities. Like Alternative 1, however, this group (Figure 4-8) was loosely organized and lacked the authority to ensure compliance.

Figure 4-8. Alternative 3 Formed a Group for Coordination



Policy Impacts

Alternative 1 forced PBOT to formalize and document its processes. Alternative 3 emphasized policy documentation – and enforcement – as a means to achieve more consistent delivery of services. With a technology-centric solution, this was even more critical – though the absence of a strong organizational structure was seen to hinder this effort.

Information Technology Impacts

Alternative 3 was the most technology-centric of the alternatives. The goal was to consolidate the multiple platforms with a single vendor. In the face of multiple, concurrent IT projects, this was seen as disruptive and premature, given the immature workflows, incomplete data, and lack of accountability.

5 Evaluation & Selection

The three alternatives were presented directly to PBOT's Director's Team in a series of meetings, the first of which was on August 6, 2015. Each alternative was explored, on its merits. Discussions centered upon the following topics:

Viability – Verification that the process to date had yielded valid options for utility coordination.

Impacts – What would the impacts of a given alternative be on current PBOT structure?

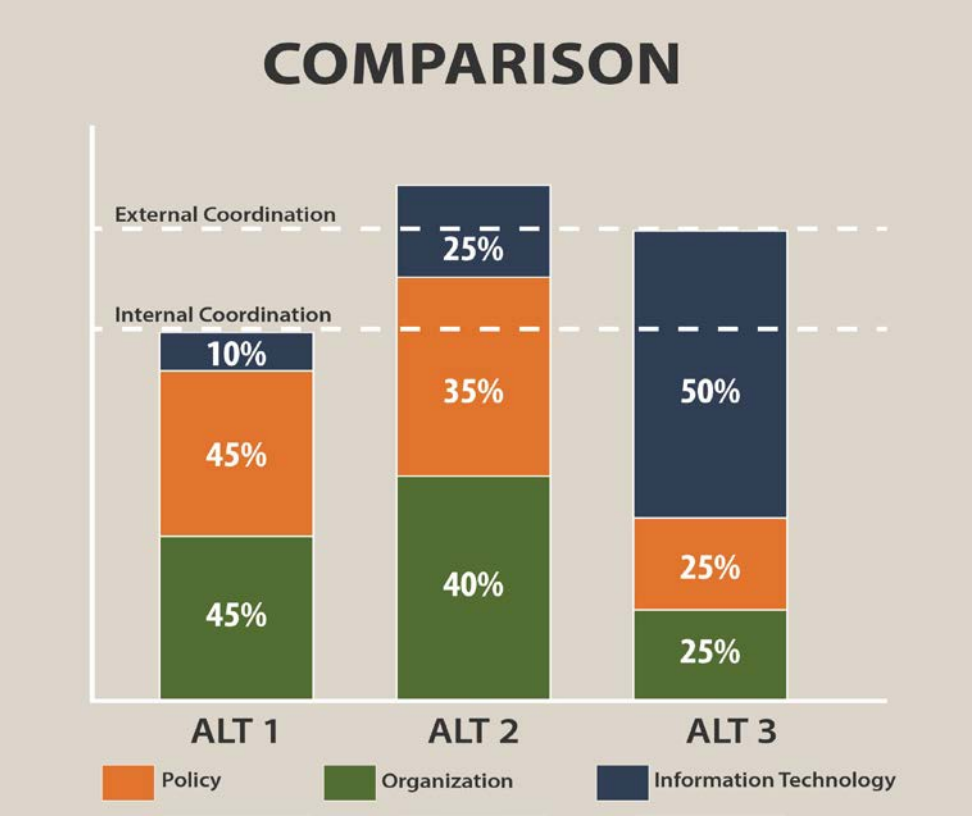
Effectiveness – How would a proposed alternative work within the City, especially related to the Bureau structure (which was unlike any of the peer cities upon which the alternatives were based) and with budget projection?

Pitfalls – What may not have been considered in developing the alternatives?

Figure 5-1 below compared the three alternatives. The columns themselves are proportional and are indicative of the overall level of effort each alternative would take to implement. Each column shows the composition of that effort, relative to each of the Project's "levers". Finally, levels of service (LOS) were delineated on the chart, indicating the level of coordination that each alternative would yield.

Passive Coordination (Alternative 1) represented the easiest to implement. It focused almost exclusively on Policy and Organizational changes, but only met the minimum standard of coordination internal to PBOT. This would improve the delivery and dependability of services within PBOT, but would still leave many key elements unaddressed, such as effective Capital Projects planning and cooperation with other city bureaus working in the ROW. Integrated Systems & Workflows (Alternative 2) was the most expansive and difficult to implement. While the percentage of effort in each of the levers was smaller, implementation represented a far larger effort overall. This alternative was more in line with other city bureaus and would allow PBOT to collaborate on projects as a peer – a role that they have not assumed. This alternative also aligned best with stated City goals for predictive, risk-based project selection. Most notably, though, the LOS offered in Alternative 2 exceeded external coordination with ROW stakeholders, and had the ability to extend services and reporting directly to the public.

Figure 5-1: A comparison of the breakdown of effort and the benefits of the 3 Alternatives.



Alternative 3 yielded immediate impacts. In investing in a centralized information technology resource, it created the forum for collaboration from all internal departments and external stakeholders. The data presented would allow users to have access to the data needed for tracking CIP and executing project and maintenance plans. With a solid IT system, PBOT could collaborate with other bureaus and even the public. The Director's Team felt, however, that problems with the underlying workflows still remained. And while data would be accessible through a new system, its authoritativeness would remain in question. The emphasis was put on improving process before implementing new technology.

The Director's Team unanimously endorsed Alternative 2 as the recommended approach.

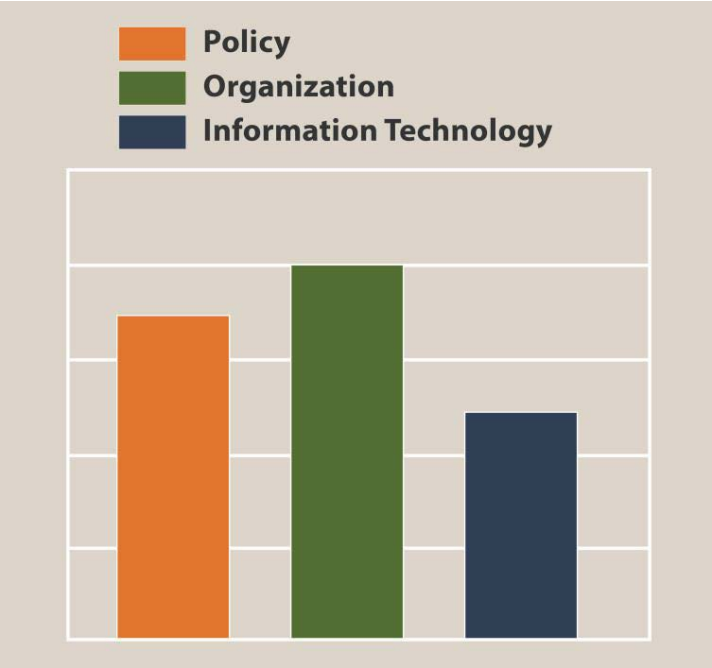
6 Selected Option: Overview

"Alternative 2" represents a move towards strong and structured Asset Management at PBOT. While this effort requires more work than the other options that were considered, this provides the most definitive move towards predictive, risk-based project coordination and will yield PBOT the greatest ongoing savings.

It represents a redesign of the current PBOT way of doing business, but balances that effort more evenly across the three "levers" – organizational change, policy, and information technology (see Figure 6-1). Moreover, it incorporates many of the best practices identified in the Peer City evaluation, and delivers improvements across the entire spectrum of PBOT operations:

- Internal coordination
- External (partner agency, utility) coordination
- Extending services to the public

Figure 6-1. The selected Option Introduces Formal Asset Management

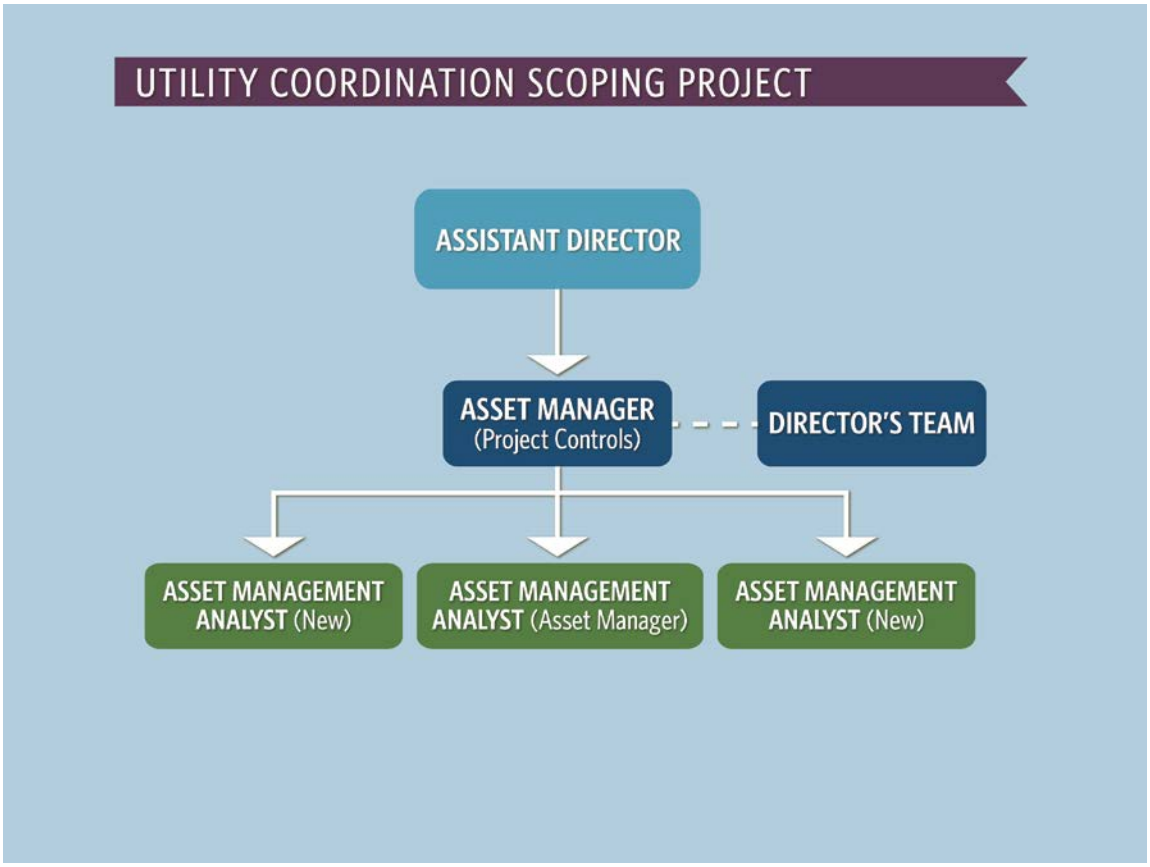


The single most distinguishing element of Alternative 2 is the change in organizational structure: the reorganization of departments and authority, and the creation of a single decision-making authority within the agency. Rather than distributed management, this single department will become responsible for managing PBOT's assets – primarily its streets – to their greatest value.

6.1 Organizational

Alternative 2 mandates the establishment of a new office within PBOT – the Office of Asset Management (see Figure 6-2). This is not an office that currently exists. The establishment of this office – on par with the other departments – signals the importance of this initiative. The new office will have a clearly defined role to have authority over asset management decisions at PBOT. In its creation, the new office signifies the mandate and PBOT's new emphasis on managing to the maximum value of its assets.

Figure 6-2. Proposed New Organizational Structure for PBOT Asset Management



Functionally, this approach is clearer and easier for all parties to navigate than other solutions. This is primarily due to the organizational structure that is built around the asset management decision-making that needs to be put in place to make timely decisions and monitor key metrics.

Putting decision-making amongst other departments can too often create conflicts by forcing managers to choose between the decision that would be best for the City's assets, and that by which they are being measured in job performance. For example, a pavement manager who is charged with paving a certain number of miles of road per year is in direct conflict with a mandate to preserve pavement quality. By streamlining the organization, it allows that manager to continue to improve the work that he's doing, and transfers monitoring of the pavement quality to another department.

6.2 Policy

With more than 5,000 miles of road in the City of Portland, and a process and budget to support repaving of only about 100, value-based decision-making must be implemented. Otherwise, the quality of roads will continue to deteriorate with no means to remedy the situation. Other PBOT assets face similar lifecycle issues. This option forces PBOT to instill more holistic and stringent policies to begin to manage the resources to their maximum value.

Central to success is the recognition – and defense – of moratorium streets. Developed in 2002, the City of Portland enacted a 5-year moratorium on cuts to the replacement pavement through Title 17.24.100. However, saw cuts are allowed, and additional cuts can be applied for using an application process. Currently, such exceptions are routinely granted, and utility cuts are not tracked in real-time. Additionally, the permit process and remediation is a fraction of the life of the cut pavement. This translates to millions of dollars of additional liability for the City.

Alternative 2 incorporated all of the guiding policies captured in Section 4.4. These are targeted at recovering the true cost of the City's investments and managing to the value of the investments:

- All work in the ROW must have a permit issued in advance of the commencement of work.
- Owners of open permits must provide sufficient notice (2 week minimum) to PBOT of intent to exercise the permit.
- PBOT will enact a "loss of [pavement] life" policy; pricing all cuts to remediate to the value of the pavement prior to commencement of work.
- PBOT will ensure data in all of its systems is kept current, and reviewed for accuracy.
- The window of projects will be extended to 5 years (from its current 1 year).

6.3 Information Technology

PBOT has a wealth of enterprise IT systems already deployed. A December 2014 software scan yielded 83[19] different software applications currently installed. However, the investments in technology have not yielded the proper returns for a number of reasons[20].

Alternative 2 emphasizes leveraging current technology and integrating systems in an operating portal. The technology investments to date have been sizeable and are capable of handling the Bureau-wide demands that would be required. While the technology component of Alternative 2 is less of the overall project composition, it is more intricate and time-consuming to implement. More than another capital system, this approach emphasizes aligning the technology with defined workflows, and where the workflows can take advantage of the benefits the technology provides, such as data sharing, error checking, automated reporting, etc. Alternative 2 emphasizes:

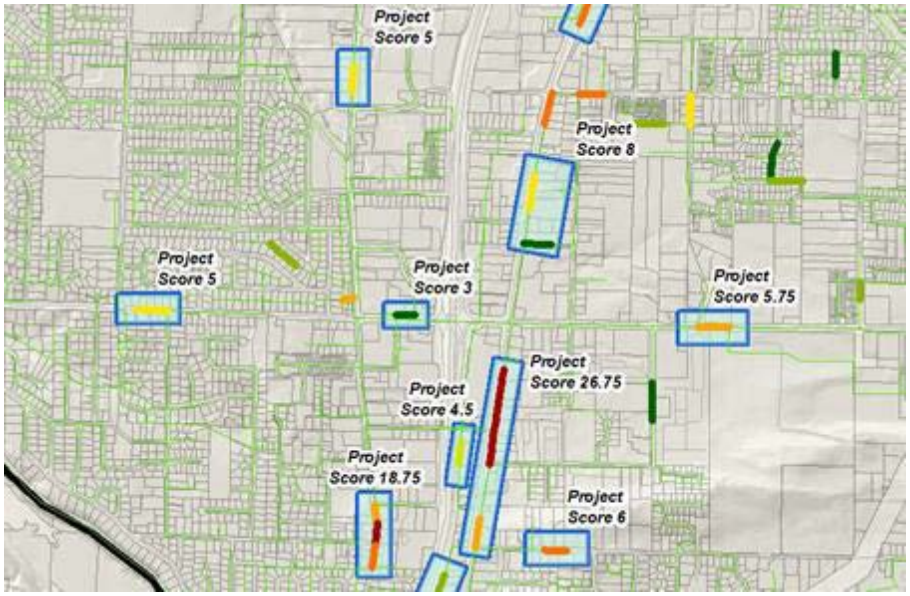
- defined workflows assigned to specific individuals.
- removal of "air gaps" – information pathways where data is physically transferred between systems.

[19] Innotas Export, December 23, 2014, PBOT.

[20] For a more detailed discussion, see the Phase 1 White Paper.

- building out the capabilities of one of PBOT's existing Enterprise Asset Management (EAM) platforms to fully support the AMG in work orders, labor and expense tracking, and procurement and reporting.
- development of a GIS-Centric ROW coordination portal for internal users (see Figure 6-3).
- deployment of an interim geospatial COP to support coordination while the longer-term Asset Management Tactical Plan is implemented.
- progressively extending services – first to internal users, then to stakeholders, and finally to the public.
- publication and automatic updating of PBOT KPIs through electronic dashboards.

Figure 6-3: EAM with a GIS-centric COP Allows for More Effective Planning by grouping projects near each other.



The Project Team believes that this will make the overall IT more effective and minimize the Total Cost of Ownership (TCO). TCO is a metric that quantifies the financial impact of deploying an IT product over its lifecycle. These technologies include hardware, software, maintenance, and training. Frequently, a higher entry fee into a technology can be justified with a lower TCO, yielding a shorter time to recoup the initial investment (also known as the "Breakeven Point").

6.4 Keys to Success

For these policies to be effective, they must be enforced consistently and in a timely manner. Currently, many of the stakeholders – specifically area utilities – have their workflows aligned with a more permissive policy environment. Changes will be disruptive and will undoubtedly meet with resistance. It is recommended that PBOT begin working with the utilities on integrating these changes immediately to lessen the impact to the

stakeholders' workflows, minimize the financial impacts, and build the goodwill needed for the policies to be effective.

Additionally, such major changes to both guidance and standard operating procedures will require executive buy-in and ongoing support:

- Public Kickoff – A public kickoff by prominent City leaders that prioritizes Asset Management as a City benefit.
- Education – A Communications Plan that provides the stakeholders – including the public – with information that supports the shift. Education should provide hard data to support the:
    - Need – specifically the problem statement, and why Portland is adopting this approach
    - Impact – how the shift will be implemented, in timeline, action plans, and measurable goals
    - Actions – what specific actions are going to be implemented and who they will affect.
- Ongoing support – Consistent and public reinforcement of PBOT policies, especially in early stages when resistance to the changes will be the greatest.
- Celebrate Wins – Public celebration of the wins that the new policies will yield, especially the financial realities and the services being extended to the public.

7 Action Plan

7.1 Overview

This Project provides an Action Plan to affect the needed changes at PBOT and begin better and more active management of the ROW. Under true "Asset Management", it steers away from project-based – or "worst first" – management, and moves towards value-based or "strategic" management. This is in line with the City's 2010 PBOT policy on asset management, and is designed to provide a more consistent level of service for the entire transportation network. The sections below break out the necessary actions into manageable timeframes to effect the needed changes within 3 years. The triage approach has been developed to capture:

- Contingencies – prioritized steps that build upon each other throughout the course of the plan
- Best practices – those practices identified from the peer cities that are needed to meet the City's goals
- Functional areas – addressing the "3 levers" of asset management: policy, organizational, and information technology
- Portland – reached through consensus with the stakeholders, the level that is most likely to be successful at PBOT

The main body presented an analysis of the business process flows that identifies inefficiencies and issues related to process data and information flows. This section identifies major systems, applications, and databases being utilized and opportunities for improvement. The report provides summaries for general findings, achievements, issues and challenges, and operational requirements. This section provides greater context for the recommendations presented throughout.

7.1.1 Action Plan Approach

A tactical plan, by definition, is a short-term plan designed to make immediate gains, ostensibly in alignment with a longer-term strategic plan. PBOT currently lacks the existing analysis or central asset management on which to develop a tactical plan. To jump start this, the Project Team developed an Action Plan. It presents a critical path with actions that can be implemented over 36+ months. It is set up with interim actions that allow PBOT to make immediate gains on their asset management investments while building out the long-term capabilities. This plan captures successful best practices in the formalization of formal asset management at PBOT. The Project Team recognizes that this is an aggressive implementation timeline, but it is predicated on several key factors:

- Aligning with the City's existing Asset Management Vision
- The value that is being lost to City streets through ongoing current practices
- The existence of a core group of individuals at PBOT who are already ushering parts of Asset Management technology
- The presence of a suite of enterprise technologies already at PBOT that can be better engaged for centralized Asset Management

7.1.2 Reading the Action Plan tables

Action Plan contains two types of tables to assist PBOT. The first is the Resource Table, which provides a summary of the actions required in each phase and identifies the participants - or staff resources – that will be required to implement that action. The Resources Table (Table 7-1) indicate key actions that need to be taken, individual(s) with primary responsibility for the action (denoted by ● in the table), and participants in the same action (denoted by ✪ in the table). Additionally, the type of change – the lever – is indicated. Finally, the priority of the action is indicated by the RYG (**Red**/**Yellow**/**Green**) box, though as critical path, most have been identified as red.

Table 7-1. Resource Table Example

				● Primary ⊙ Participant					
Lever	RYG	Action	Staff Resource 1	Staff Resource 2	Staff Resource 3	Staff Resource 4	Staff Resource 5	Staff Resource 6
O		General description of the action	⊙	●		●	●	

The Tactical Tables detail those summary actions from the Resource Tables, providing more detail on the action and giving an assessment of both the risk and reward of the action. They appear in single action tables such as this:

Table 7-2. Tactical Table Example

ACTION	The action name as presented in the Summary Table.
DESCRIPTION	A description of the activities around this action, including: The process – general steps needed to execute this action Goal – what is the desired outcome Impacts – approximate impacts, including financial (if they can be assessed) Roles – building on the primary and participants, describing the needed level of effort
RISK	The risk of not taking or failing to enact this action.
REWARD	The benefit that this provides to the 36-month plan.

7.2 Phase 1 Tactical Plan: Triage & Jumpstart

7.2.1 Summary

The actions of the first phase set the tone for the subsequent phases. This time is marked by a number of immediate changes across all three levers – organizational, policy, and information technology. However, it is the tone that is set with this kickoff that signals to all of the stakeholders that significant changes are not only coming, but have the full consent and backing of the Director's Office.

Organizational

The first and most important actions are that of the Assistant Director (AD). The AD must effect the most drastic and visible organizational changes in this plan. First, there is the establishment of a new office within PBOT – the Office of Asset Management. This is not an office that currently exists. The establishment of this office – on par with the other departments – signals the importance of this initiative. The new office will have a clearly defined role to have authority over asset management decisions at PBOT. In its creation,

the new office signifies the mandate and PBOT's new emphasis on managing to the maximum value of its assets.

Second, there is the appointment of an Asset Management Lead (AML) for the new office. In naming an AML that reports directly to the AD this relieves the existing staff from the burden of taking the lead on a major PBOT initiative. More importantly, these actions make a statement to the rest of PBOT about the strategic importance of asset management and the need for future and ongoing cooperation in the effort. The AML's focus will be on building the necessary support both internally and externally and coordinating the development of a formal roadmap for multiyear implementation. Given the unique nature of this work, the new Asset Management Office is likely to need formal outside assistance; this plan calls for at least one subordinate hire for the AML in the first year.

Policy

Changes in PBOT policies in Phase 1 will signal the major changes to all of the ROW stakeholders, and are likely to draw the greatest attention. These are new mandates on remediation standards and fees, and reporting.

PBOT will move toward increasing remediation standards to match that of the pavement prior to the commencement of work and aligning fees to match. Title 17.24.100[21] outlines the rules regarding the 5-year moratorium. However, this language does not define those standards, and still gives the engineer leeway to reduce the standards and no PCI guidelines to guide any negotiations. The effect is that new pavement can have its lifespan – measured in millions of dollars – halved with a single project. Standards need to be revised to ensure that the City maintains the value of its investment. ROW stakeholders need to be able to conduct their business, but not at the City's expense.

New policies will begin revising its fee structure to enforce preservation of its streets and maintaining that investment. Similarly, remediation can be incentivized by reducing or even eliminating fees on low PCI streets, or those that are at the end of their lifespan. This would guide improvement of the overall system.

In Phase 1, PBOT will also start requiring that its crews provide sufficient advance notice prior to the commencement of any work. Currently, work can happen at any time with work orders being entered into PBOT systems after the projects themselves have been completed. Aside from safety issues, this precludes PBOT's ability to coordinate opportunities and look for cost savings.

The roadmap that captures this Action Plan and related actions will be codified in a Strategic Asset Management Plan (SAMP). This document will provide guidance for the AMT and asset management for PBOT for the first five years.

Information Technology

As the organizational reorientation begins to be communicated formally to the agency as a whole, immediate gains will be made by better utilizing existing software investments.

[21] The language adopted by the City Council effective July 1, 2002 (Ordinance No.176408).

Another critical element of this stage is the definition of KPIs through the Capability Maturity Model Index (CMMI). This is a baseline assessment of the CMMI capabilities compared to the Vision goals. This ensures the resulting strategy is measurable. A cause and effect relationship in KPIs is essential is understanding whether a strategy is effective.

Phase 1 begins to put a framework in place upon which to build. The focal "levers" in this phase are organizational and policy. First, PBOT must hire an Asset Manager at the Principal level. Prior attempts to fill this position have not had the positional authority nor been in the critical path for decision making. By establishing this position, it signals to the entire Bureau the criticality of this plan. Once in place, the Asset Manager can begin filling in the organizational structure, as well as assuming the oversight of this plan. The second lever that needs to be addressed is policy. Simply, fees and permits must immediately begin to reflect the true cost of restoring the pavement to its previous life expectancy prior to the work being done to Portland streets. Overall, the move toward pavement preservation is needed, as opposed to the costs of other stakeholders' work simply being transferred to PBOT. Information systems in Phase 1 are focused on using the capabilities of existing software more effectively.

Table 7-3. Phase 1 Tactical Plan Resources

			● Primary ◎ Participant						
Lever	RYG	Action	Senior Management	Asset Manager	Business Group Manager	Asset Management Staff	IT Department	PBOT Business Groups	ROW Stakeholders
O		Establishment of Asset Management Department with ultimate authority on project approval	◎						
O		Hire an Asset Management Lead at the "principal" level to lead further activities in this action plan	◎					●	
O		Hire one (1) of three (3) asset management support positions		◎				●	●
P		Increase fees and reconstruction standards for cutting moratorium streets to align with asset values	●	◎		●		●	●
P		Revise "open permits" to emphasize pavement preservation	◎	●		●	●	●	●
I		Develop business requirements to streamline the process of obtaining permits for ROW activity	◎	●		●	●	●	●
I		Release mobile permit software internal to PBOT to track all ROW activity	●	●	●	●	◎	●	●
I		Develop a service level agreement (SLA) that requires that all projects across the Bureau will be added to the GIS in a timely manner		●			◎	●	●
P		Develop a Strategic Asset Management Plan	●	◎		●		●	

7.2.2 Tactical Plan Actions

Highlights:

- Creates interim solution for the City – inexpensive, but high ROI; don't wait for long IT project
- Puts in new Asset Management Office/Lead – starts the organizational change that will take time to adjust; creates single point of contact
- Immediate changes in policies

Table 7-4. Tactical Plan Action Tables

ACTION	Establishment of Asset Management Department with the charge to organize and priorities projects across management groups.
DESCRIPTION	Creation of a new department within PBOT that is responsible for the coordination and prioritization of projects across management groups at the Bureau.
RISK	The Asset Management Department will be marginalized by group leaders.
REWARD	The Asset Management Department will sit outside of a management group and will be able to organize and prioritize projects across siloed management groups.

ACTION	Hire an Asset Management Lead at the "principal" level to lead further activities in this action plan.
DESCRIPTION	The appointment of an Asset Manager reporting to the Assistant Director, that will own the processes and procedures of project prioritization in the Portland Bureau of Transportation.
RISK	There is a very high risk of program failure in the first year of this project. The Asset Manager must build consensus across management groups within PBOT. If the asset management position is marginalized and / or can't receive the information they need, the position will not be effective.
REWARD	A strong Asset Management Lead will enable the Bureau to prioritize and coordinate projects with its partners; this will make the City and the Bureau more efficient and will drive the Action Plan.

ACTION	Hire one (1) of the three (3) recommended asset management support positions along with the open, and recently reclassified "asset manager" position.
DESCRIPTION	Asset Management Department and the Asset Manager will need support in writing and maintaining the Bureau's Asset Management Plan (AMP);
RISK	The ability to build consensus will be a critical success factor with the asset management office. All asset Management Department staff should be assertive, yet cooperative, in establishing initial protocols.
REWARD	A support position will help the Asset Manager in project coordination and prioritization, as well as establishing asset management best practices throughout PBOT. This will enable asset management best practices and PBOT priorities to be realized in a more timely and efficient manner.

ACTION	Increase fees and reconstruction standards for cutting moratorium streets to align with asset value
DESCRIPTION	Street permit fees don't correlate with the value of the pavement asset. HDR recommends "managing to the value of the asset" so that permit fees for cutting the ROW reflect the value of the street.
RISK	Developers, stakeholders, and sister Bureaus might object to this action.
REWARD	PBOT will be able to fully recoup the value of the asset.

ACTION	Revise "blanket permits" to emphasize pavement preservation
DESCRIPTION	Several stakeholders and sister Bureaus have blanket permits that allow them to cut the ROW. HDR recommends considering revision of blanket permits to allow ROW cuts to be tracked.
RISK	Developers, stakeholders, and sister Bureaus might object to this action.
REWARD	Tracking all ROW activity is the only way to ensure that PBOT staff has an understanding of work performed in the ROW. PBOT will be able to better manage the pavement asset to it value.

ACTION	Develop business requirements to streamline the process of obtaining permits and / or notification for ROW activity
DESCRIPTION	Efficiencies can be realized by aligning people and process with information systems.
RISK	Group managers could see technology as not aiding in the mission of its workers.
REWARD	Aligning business processes with information technology, especially mobile technology, has proven results on return on investment. Currently systems at PBOT are not being fully leveraged because of poor business processes.

ACTION	Release mobile permit software internally to PBOT to track all ROW activity.
DESCRIPTION	In order to obtain a Common Operating Picture and accountability for actions that take place in the public ROW
RISK	Group managers could see technology as not aiding in the mission of its workers.
REWARD	The reward for using mobile technology would be a real-time Common Operating Picture that also tracks historic information for reporting.

ACTION	Develop an SLA that requires all projects across the Bureau be added to the GIS in a timely manner
DESCRIPTION	SLAs allow for a common understanding of usage and requirements of current systems, while allowing owners of the systems to manage the day-to-day operations.
RISK	SLA becomes another “paper policy” without enforcement
REWARD	Update and maintenance cycles to keep them current, and end users will have a level of confidence in their data.

ACTION	Develop a Strategic Asset Management Plan.
DESCRIPTION	A Strategic Asset Management Plan (SAMP) should be agreed upon by the group managers, which outlines the priorities of the organization
RISK	A plan will become another “paper policy” without enforcement
REWARD	A SAMP will give the Asset Management Department both authority and direction based on the direction of management.

7.3 Phase 2 Tactical Plan: Foundational

7.3.1 Summary

With some immediate gains in the implementation of existing technologies, the first 6 months provided a jump start to the longer-term plan. The actions of the next phase take place over the course of the subsequent 6-18 months. PBOT needs to assess the progress of the actions of the first phase, address the feedback of the fee increases,

solidify the department through additional hires, and most importantly, improve and standardize workflows.

Organization

Organizationally, the AML hired in Phase 1 becomes the Champion. With the support of the Assistant Director, it is now the AML that must drive the actions going forward, as well as advance the additional actions identified in the SAMP.

This is a critical time for the AML. Overextending the goals while simultaneously introducing significant change into an established organization can jeopardize the Action Plan by taxing new staff, confusing the new structure, and overall diluting the focus of the first few years. The Asset Management Lead must make sure that the program stays focused during this nascent period, with oversight and regular reviews from the AD.

At this point the Asset Management Lead must solidify their staff. Despite trends toward smaller government and delaying hires for budgetary reasons, this group must be prioritized. First, they need to be able to handle the challenges of developing and simultaneously implementing new workflows. Second, they need to be able to handle the surges in permits – something that PBOT has never experienced. And third, their success will be a demonstrable model to changes implemented by the AD. All told, they need to be able to handle this transition period successfully. Staffing shortfalls should not prevent PBOT from being able to recoup the value to Portland streets.

With the definition of the appropriate rates, PBOT begins to address the updating and formalizing of its workflows. As established and repeatable – and therefore auditable – processes, implementing defined steps with responsible parties provides the mechanisms to ensure different groups working in the ROW can be held accountable. In turn, these workflows become KPIs, upon which PBOT can monitor improvement and report out upon the benefits that are being produced for the City under the new plan.

KPI – An Overview

KPI selection itself is a critical decision. The KPIs – essential to building organizational improvements – must drive strategic improvements (i.e., progress), and not simply be a measurement of work completed. For example, the current directive (KPI) to “pave 100 miles of Portland streets each year” is not a proper KPI. This does not say whether the right 100 miles of road is paved, nor does it reflect the monetary impact to the City. KPIs that reflect the actions of managing to maximum value need to be defined. Starting with the outcome and working backward will keep the KPIs focused.

To support accountability, these KPIs need to be implemented and verified at all levels. The KPI for a street crew is different than that of the Asset Management Team, but the levels are interrelated and reflect the actions of the levels below. It’s critical to ensure that each level is accurately tracking its work.

Simplicity is vital in KPIs. The measurements themselves must be reflective of progress, but must be simple to calculate. Similarly, the number of KPIs must be a critical few. Since this must happen at each level of delivery, it underlies the principle that KPIs must

be selected carefully, and introduced so that the measurement works in to the workflows without distracting from the work itself.

Finally, PBOT Asset Management staff will have to regularly revisit the KPIs. While there is the desire to be able to monitor progress year over year, it's more important to maintain the validity of the KPIs. The desire to "set it and forget it" is not appropriate here – these are measurements of the success in the delivery and accountability of PBOT services. As that delivery improves and the underlying processes change, so should the KPIs.

Policy

Beginning in Phase 2, will expand the policy that a permit in advance of the commencement of all work. This is the change that is most prominent in the transition. Until this point, utilities and other city bureaus have not needed to obtain permits in advance of their work. Instead, the work has progressed at the discretion and convenience of those stakeholders, with the work reported after its completion. This has led to new pavement being cut within months of its completion. While this has allowed the stakeholders to maintain delivery of their services, it has come at a cost for PBOT. Those streetcuts degrade the overall lifespan – or value. Since the ROW stakeholders account for approximately 20 miles of streetcuts per year (Figure 7-1), extending early notification and a fee-based policies will have a significant effect on the overall value of Portland streets.

Table 7-5. Miles of Trench Cuts from PBOT Stakeholders, by Fiscal Year[22]

Fiscal Year	Miles in cuts
2015/2016	21[23]
2014/2015	23
2013/2014	17
2012/2013	21

Completion of staffing the AMT allows the implementation – and verification – of workflows needed to ensure that the plan stays on track. As part of this, PBOT can move from its questionable 1-year work plan to a dependable 5-year work plan[24]. This level of maturity allows the information to be shared with sister bureaus, where coordination and true financial gains can be seen. Indicative of this is development and implementation of a true COP, a map-based portal that allows users to see the authoritative project list. This falls under the Information Technology category in the Resource Plan, but the integrity of the data presented in any IT system takes precedence over the development of that system.

[22] Numbers rounded to nearest whole. Source PBOT.

[23] Projected numbers derived from mid-year inventory. Source PBOT.

[24] Phase 1 of this project found that the CIP had only a one-year projection and much of the information that it contained was not kept current.

Table 7-6. Phase 2 Tactical Plan Resources

			● Primary ⊙ Participant						
Lever	RYG	Action	Senior Management	Asset Manager	Business Group Manager	Asset Management Staff	IT Department	PBOT Business Groups	ROW Stakeholders
O		Hire remaining asset management positions in order to build the remainder of the asset management team in-line with sister Bureaus (2 of 4 positions)	●	⊙					
O		Establish an asset management culture focused on continual improvement, driven by goals and measurable results		⊙		●		⊙	⊙
P		Require a "permit/notification" for all activity in the ROW with sister Bureaus	⊙	●		●		●	●
P		Implement a 5 year outlook for all projects across the Bureau	●	⊙		●	●		●
P		Educate users of goals, measures, and initiatives related to asset management and project coordination	●	⊙	●			●	●
I		Develop GIS-Centric ROW coordination portal for internal users		●	●	●	⊙	●	●

7.3.2 Actions

Highlights:

- Stabilize the early changes; begin work on the substantive/process changes
- Take cue from guidance of the new Asset Management Lead

Table 7-7. Phase 2 Tactical Plan Action Tables

ACTION	Hire remaining asset management positions in order to build the remainder of the asset management team in-line with sister bureaus (2 of 4 positions)
DESCRIPTION	Completion of the Asset Management Team, reporting directly to the Asset Management Lead. These 2-3 Analyst positions would develop and maintain the KPIs, manage the status of projects, and ensure compliance with reporting timelines. They would seek opportunities for coordination in the ROW and would look for ways to engage and improve service to the stakeholders.
RISK	Without additional staff, the Asset Management lead will not be able enact the Asset Management Program. Hires must be timely or initial backlog will cause the initiative to fail. High risk in selecting staff that don't have strong project delivery and asset valuation knowledge. Budget impacts for positions will not be popular. Increased authority for new positions may not be popular with PBOT staff.
REWARD	Immediate impact on implementing Asset Management plan. Rapid definition of KPIs. Quality reviews and enforcement of project data entry builds trust in the new initiative. Capacity ensures that transition is smoother and backlog is kept to a minimum.

ACTION	Establish an asset management culture focused on continual improvement driven by goals and measurable results
DESCRIPTION	Move PBOT toward a culture of continuous improvement – where the emphasis shifts away from individual (departmental) goals to one that is Bureau-wide. This approach is more accepting of failure, but emphasizes an ever-raising standard of delivery, albeit incremental changes.
RISK	Metrics-driven culture will meet with initial resistance as PBOT increases its delivery maturity. Influencing organizational is imprecise and time-consuming, and requires constant reinforcement from management.
REWARD	An organization that is always searching for ways to improve delivery of its services. Public impression that the City is both innovative and good stewards of the public's money.

ACTION	Require a "permit" for all activity in the ROW with sister Bureaus
DESCRIPTION	PBOT must require that all agencies and utilities get permit approval prior to the commencement of any work.
RISK	Backlash from stakeholders resistant to loss of flexibility in commencement of work from permits that are open for a year of issuance.
REWARD	It allows PBOT to have a current operational understanding of all work going on in its streets. It allows the proper fees to be assessed with regard to remediation.

ACTION	Implement a 5 year look ahead for all projects across the Bureau
DESCRIPTION	Development of a master list of projects that extends outward for 5 years.
RISK	Initial effort to develop list will be time-consuming for the Agency. Minimal risk in maintaining list as it will fall under the new Asset Management Department, but will require regular review and updates by PBOT departments.
REWARD	Puts PBOT on par with other City Bureaus and increases ability to collaborate (both financially and with schedule) on major projects. Capital planning is easier as list is maintained. Ability to rapidly flex to changes in budget.

ACTION	Educate users on goals, measures and initiatives related to asset management and project coordination.
DESCRIPTION	Educate users on relationship between business process and KPIs, and its effect on PBOT service delivery.
RISK	Difference in KPIs at different levels of organization may cause confusion.
REWARD	An organization that is always searching for ways to improve delivery of its services. Public impression that the City is both innovative and good stewards of the public's money.

ACTION	Develop GIS-centric ROW coordination portal for internal users
DESCRIPTION	Develop a geospatial common operating picture that enables all staff to input, view, and update projects in the ROW.
RISK	Information technology staffing will have to accommodate the maintenance of custom code.
REWARD	Better coordination starts with an understanding of actions in the ROW. A geospatial common operating picture allows the identification of conflicts and potential opportunities. Will give all stakeholders an opportunity for time/space coordination.

7.4 Phase 3 Tactical Plan: Operational Consolidation

7.4.1 Summary

With Phases 1 and 2 introducing significant changes, Phase 3 will focus on maturing and refining the new processes that surround project selection. Full accountability is achieved as asset classes and standard operating procedures are defined, there is uniform enforcement, and the development of KPIs at all levels is both defined and published.

Organization

With the AMT in place and a functional SAMP, the next level of maturity is to develop the internal Steering Committee to continue oversight of the program. An ongoing Steering Committee makes formal asset management sustainable – it can provide the subtle guidance to continue to improve service delivery.

Policy

With the early policy changes firmly in place, PBOT can now continue with their expansion and refinement. Now PBOT will require that its sister Bureaus' activities in the ROW require a permit prior to the commencement of work, and that remediation fees wholly recoup the true value of the damage.

Set asset classes developed by the AMT allow for new standard operational procedures to be identified prior to the commencement of work. This eliminates informal negotiations conducted in the field and allows PBOT to maintain value projections.

Information Technology & Policy

Information Technology and Policy combine in Phase 3. The KPIs defined in Phase 2 are now published out to the public. As a reflection of current operational maturity and indicative of the direction of PBOT the organization should be monitoring and working to improve them. Their publication, in real-time, pushes accountability.

As the EAM buildout continues, PBOT can also begin extending more services - like online permitting - to external partners and to the public. Direct data entry and the abilities to verify, process and report now moves PBOT into the third and fourth levels in CMMMI. Future actions are now guided by the Steering Committee as part of ongoing operations.

Table 7-8. Phase 3 Tactical Plan Resources

			● Primary ⊙ Participant						
Lever	RYG	Action	Senior Management	Asset Manager	Business Group Manager	Asset Management Staff	IT Department	PBOT Business Groups	ROW Stakeholders
O		The asset management team should establish a steering committee	●	⊙				●	
O		Continuing education for current users		⊙		●			
P		Refine project prioritization procedures	●	⊙				●	●
P		Assurance that appropriate procedures, intervals, and rating methodology for new assets are determined at or prior to delivery and allow for consistency in condition assessments across asset classes		⊙	●			●	
P		Require that all activity in the ROW require a "permit/notification" with external stakeholders	●	●	⊙				
P		Increase fees and reconstruction standards for cutting moratorium streets to both sister bureaus and external stakeholders	●	●	⊙				
P		Begin looking 5 years ahead at developing pavement projects and needs		⊙	●	●			
I/P		Begin to publish goals KPI's to citizens and stakeholders in real-time		⊙		●		●	
I/P		Fix current integrations and visualize the GIS with a complete portal application		●		●	⊙		

7.4.2 Actions

Highlights:

- Formation of Steering Committee
- Implementation of KPIs
- Extension of services to the public

Table 7-9. Phase 3 Tactical Plan Action Tables

ACTION	The Asset Management Team should establish a Steering Committee.
DESCRIPTION	An Asset Management Steering Committee (AMSC) will add legitimacy to the efforts of the Asset Management Department. Efforts behind the Asset Management Department's initiatives will be vetted by the steering committee for approval. Direction of the department will also come from the steering committee.
RISK	There is a risk that members of the AMSC will not be committed and the committee will dissolve.
REWARD	A steering committee will by default give credibility to the Asset Management Department. Members of the committee will by proxy, be speaking for each management group.

ACTION	Assurance that appropriate procedures, intervals, and rating methodology for new assets are determined at or prior to delivery and allow for consistency in condition assessments across asset classes.
DESCRIPTION	A rating system that allows for the priorities of the Bureau will be essential in comparing asset classes against each other. Non-quantifiable risks and cultural priorities must also be considered in project prioritization.
RISK	Cultural initiatives and risks will be left out of project prioritization procedures leaving some groups out of the process.
REWARD	A process that compares projects across asset classes will result in an apple to apple comparison of projects.

ACTION	Require that all activity in the ROW require a “permit/notification” with external stakeholders.
DESCRIPTION	Broaden the scope of permitting applications to include all stakeholders in the ROW. This will allow for a complete picture of work performed in the ROW.
RISK	Small construction firms and organizations that have establish procedures and may resist change.
REWARD	Full understanding of ROW activities will allow the Bureau to make informed, data-driven decisions on activities in the ROW.

ACTION	Increase fees and reconstruction standards for cutting moratorium streets to both sister bureaus and external stakeholders.
DESCRIPTION	Allow reconstruction of the pavement asset to aid in the improvement of the pavement asset as a whole by increasing fees and reconstruction standards; Align fees to the value of the asset.
RISK	Political pressure and resistance from sister Bureaus will test the leadership at PBOT.
REWARD	Aligning fees to the value of the asset is a step in the right direction in managing and under funded asset at the City of Portland.

ACTION	Begin looking 5 years ahead in developing pavement projects and needs.
DESCRIPTION	Align project look-ahead to sister Bureaus with the understanding that PBOT takes advantage of opportunistic funding and that will affect the reliability of project past the second year.
RISK	Data will be seen as very unreliable.
REWARD	Planning can begin to align across Bureaus.

ACTION	Begin to publish goals KPIs to citizens and stakeholders in real-time
DESCRIPTION	Integrated systems will allow for key performance indicators and situational awareness tools to be pushed to citizens real-time.
RISK	Integrated systems require management of systems; staffing could be an issue here.
REWARD	Citizens will feel as though they are part of the process; making citizens aware of road closures will also help with potential traffic frustrations.

ACTION	Fix current integrations and visualize the GIS with a complete portal application
DESCRIPTION	Current integrations with the GIS are manual; automating these processes will allow for more reliable and current data. Service level agreements will outline update requirements
RISK	Integrations are hard to maintain; BTS will need to assign resources to maintaining a code base.
REWARD	Integrations make for a single version of the truth for users of the systems