

# Public Works Denver Moves Plan Performance Audit

July 2015

Office of the Auditor  
Audit Services Division  
City and County of Denver



Dennis J. Gallagher  
Auditor

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*Dennis J. Gallagher*  
Auditor

July 16, 2015

Mr. Jose Cornejo, Executive Director  
Department of Public Works  
City and County of Denver

Dear Mr. Cornejo:

Attached is the Auditor's Office Audit Services Division's report of their audit of the implementation of *Denver Moves: Making Bicycle and Multi-Use Connections*. The purpose of the audit was to examine Denver Moves network development and project prioritization, funding, and procedures in place for evaluating the plan's effectiveness and assessing risk. We reviewed Denver Moves implementation activities for a period spanning 2011 through 2015.

Our audit found that while both the Mayor and City Council have identified Denver Moves as one of the City's foremost priorities for establish a multi-modal network, insufficient funding has distorted decisions about plan implementation—resulting in a network that does not adequately address the City's goal of establishing an easy to use transportation network for bicycle and pedestrian transportation.

As Denver continues to grow and thrive as a City, it is my hope that we continue to invest in our bicycle and pedestrian infrastructure and provide citizens of Denver with a multi-use transportation network that they deserve.

If you have any questions, please call Kip Memmott, Director of Audit Services, at 720-913-5000.

Sincerely,

Dennis J. Gallagher  
Auditor

DJG/cw

cc: Honorable Michael Hancock, Mayor  
Honorable Members of City Council  
Members of Audit Committee

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*Dennis J. Gallagher*  
Auditor

## AUDITOR'S REPORT

We have completed an audit of *Denver Moves: Making Bicycle and Multi-Use Connections* plan implementation. The purpose of the audit was to examine the effectiveness of Public Works' efforts to select and fund projects on an annual basis, to evaluate plan outcomes, and to assess risk.

This performance audit is authorized pursuant to the City and County of Denver Charter, Article V, Part 2, Section 1, *General Powers and Duties of Auditor*, and was conducted in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

The audit determined that the Department of Public Works is not implementing the plan in a manner that addresses the City's long-term goals for non-motorized transportation. We identified three primary factors that are hindering progress towards realizing the plan's goals. First, we found that resource allocation decisions for Denver Moves are not aligned with plan goals. Second, the City has not fully funded Denver Moves implementation and does not commit sufficient funds to meet program goals. Finally, we found that Public Works has not developed an effective framework for evaluating Denver Moves performance as it relates to program goals and objectives. Public Works does not identify and prepare for potentially adverse outcomes related to Denver Moves implementation.

We extend our appreciation to Jose Cornejo, Crissy Fanganello, and Emily Snyder and other City personnel who assisted and cooperated with us during the audit.

Audit Services Division

Kip Memmott, MA, CGAP, CRMA  
Director of Audit Services

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## REPORT HIGHLIGHTS



### Public Works Denver Moves Plan July 2015

The audit determined that insufficient funding has led to the selection of projects that do not meet program goals.

#### Background

*Denver Moves: Making Bicycle and Multi-Use Connections* is a \$119 million plan for expanding the City's non-motorized transportation network. Denver Moves builds on previous City planning efforts and seeks to link destinations in all parts of the City by creating safe, comfortable multi-use corridors for bicycle and pedestrian transit. The Department of Public Works is primarily responsible for Denver Moves implementation, with support from the Department of Parks & Recreation in the development of regional trails and related infrastructure.

#### Purpose

This audit examined Public Works' implementation of the Denver Moves plan. Specifically, we examined the effectiveness of Public Works' efforts to select and fund projects on an annual basis, to evaluate plan outcomes, and to assess risk. As part of our analysis, we analyzed data and related information for projects implemented between 2011 and 2015.

#### Highlights

Since 2011, both the Mayor and City Council have stated that Denver Moves is the City's foremost priority for establishing a comprehensive bicycle and pedestrian transportation network. Despite Denver Moves' high-priority designation, the City's fragmented execution of the plan has resulted in the prioritization of projects that will not fulfill plan's established goals. We identified three areas in which the City needs to make improvements related to Denver Moves implementation.

First, we found that Public Works resource allocation decisions for Denver Moves are not aligned with plan goals. Specifically, resource constraints led to a disproportionate prioritization of lower cost, less user-friendly infrastructure, as opposed to easier to use infrastructure as is consistent with plan goals. Second, the City has not fully funded Denver Moves and may not have a complete understanding of commitments implied in budgetary decisions. We also found that data that could be used to inform resource allocations decisions is either unclear or incomplete. Finally, we found that Public Works has not developed an effective framework for evaluating Denver Moves performance or assessing risk, making it difficult to determine whether the plan is achieving expected outcomes and whether additional steps can be taken to mitigate risk.

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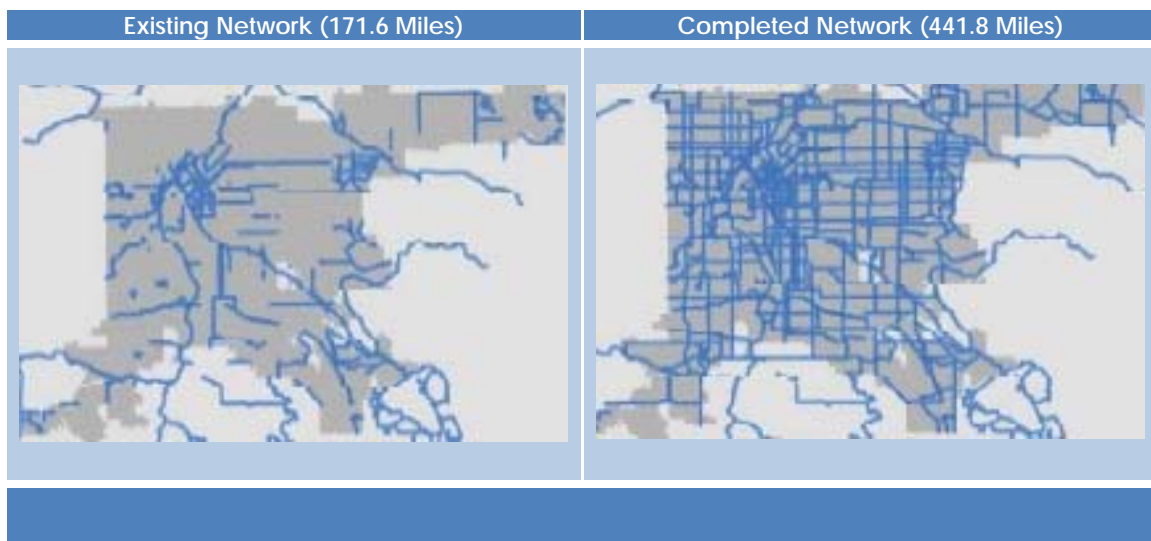
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# INTRODUCTION & BACKGROUND

## Denver Moves is the City's Plan to Expand its Non-Motorized Transportation Network

Released in 2011 by the Department of Public Works (Public Works), *Denver Moves: Making Bicycle and Multi-Use Connections* (Denver Moves) is a plan to expand the City's multi-use network for non-motorized transportation by creating safe, comfortable routes for bicycle and pedestrian transit—referred to in the plan as *corridors*. As shown in Figure 1, the Denver Moves plan identifies 270 miles to add to the City's existing 172-mile multi-use network to create a 442-mile network that connects locations in all parts of the City.

**Figure 1: Map of Existing and Final Denver Moves Network**

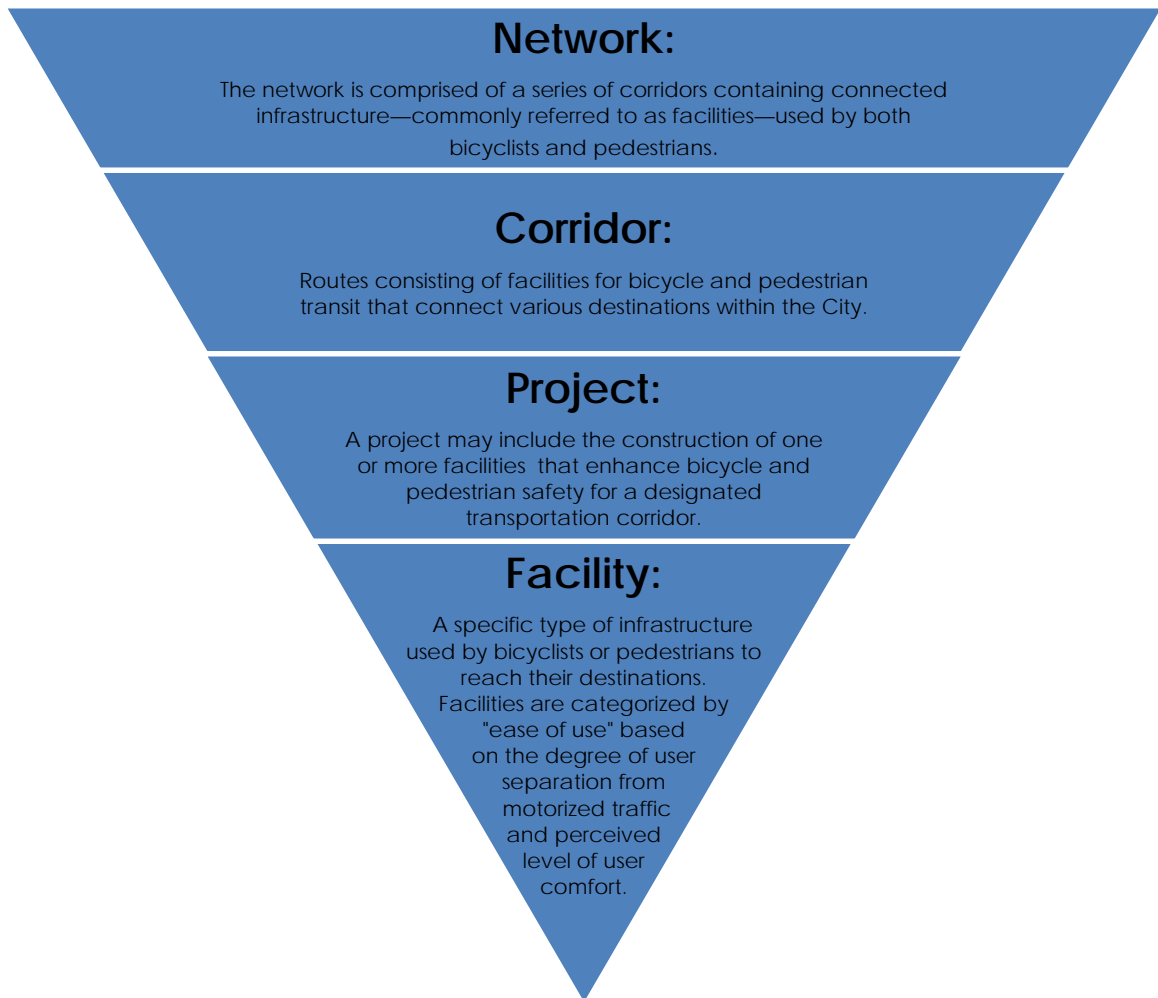


Source: Denver Moves: Making Bicycle and Multi-Use Connections

The network is comprised of a series of connected infrastructure—commonly referred to as *facilities*—used by both bicyclists and pedestrians. Examples of facilities include pavement markings such as sharrows, buffered bicycle lanes, and regional trails. Facilities can also be categorized as low, moderate and high “ease of use” based on the degree of user separation from motorized traffic and perceived level of user comfort. See Appendix A for a summary of the facility types described in Denver Moves, as well as, the corresponding ease of use designation. Public Works installs facilities through projects, which may contain multiple facility types. See Figure 2 for an illustration of the relationship between the network, corridors, projects, and facilities.



**Figure 2: Relationship between the Denver Moves Network, Corridors, Projects, and Facilities**



Source: Auditors Summary of Information Provided by Public Works

Denver Moves establishes an implementation strategy for engineering or building physical infrastructure that supports the development of a comprehensive multi-use network. It is important to note that Denver Moves is not a bicycle master plan. Master plans are long-term planning documents that reflect civic goals and establish a framework for implementation. According to the League of American Bicyclists, bicycle master plans typically address the "5 E's" of bicycling—Engineering, Education, Encouragement, Enforcement, and Evaluation. Denver Moves is distinguished from the City's current 2001 Bicycle Master Plan in that its primary focus is "Engineering," namely the design and implementation of bicycle and pedestrian infrastructure. Although the Denver Moves plan states that the City will move forward with other elements of bicycle planning (i.e., Education, Encouragement, and Enforcement), the plan does not outline a specific strategy for doing so.

## The Development of the Denver Moves Network

Denver Moves is the current citywide bicycle network plan that was completed in 2011 as a joint effort between Denver Public Works and Denver Parks and Recreation. Originally intended to include all bicycle, pedestrian, and trail elements, the final plan primarily focused on the on-street bicycle system. Denver Moves (Bicycles) has proven to be a useful framework for identifying, prioritizing, and implementing the on-street bicycle projects in a systematic manner.

Building on the success of the current Denver Moves *Bicycles* plan and fulfilling the original intent to develop a more comprehensive plan and program for all active transportation modes, the Denver Moves Pedestrian and Trails planning effort will complete the missing plan components. The final result will be a Denver Moves plan with a fully incorporated pedestrian and trail component that will allow the vision, implementation and completed infrastructure to work together in a complementary manner.

Denver Moves builds on previous planning efforts and existing bicycle and pedestrian infrastructure. Public Works developed the network by identifying primary corridors that that connect neighborhoods, parks, employment centers, business districts, transit centers (e.g., Union Station), and other destinations in all parts of the City. The Department relied on a four-step process that included mapping recommendations from previous city plans, gathering community input, assessing conditions of existing bicycling and pedestrian transportation infrastructure, and a final review by City staff.

**Mapping Recommendations from Previous City Plans**—There are seven previous City planning efforts that Public Works used to identify 1,330 miles of existing and planned bicycle and pedestrian infrastructure.<sup>1</sup> See Table 1 for a description of the City’s previous planning efforts.

**Table 1: Previous Planning Efforts to Develop the Denver Moves Network**

Previous Planning Effort	Description
Bicycle Master Plan Update 2001	The 2001 Bicycle Master Plan Update sought to develop and implement a comprehensive bicycling program by developing a framework for a physical bicycle system as well as education, promotion, enforcement, public policy, and information distribution programs.
Pedestrian Master Plan 2005	The Pedestrian Master Plan 2005 created a citywide pedestrian network, recommended pedestrian friendly policies, and identified pedestrian projects.
Game Plan 2005	The Game Plan 2005 is a master plan for the Denver Parks System that provided a framework for values to guide planning and development decisions.

<sup>1</sup> Denver Moves is the current citywide bicycle network plan that was completed in 2011 as a joint effort between Denver Public Works and Denver Parks and Recreation. Originally intended to include all bicycle, pedestrian, and trail elements, the final plan primarily focused on the on-street bicycle system. Denver Moves (Bicycles) has proven to be a useful framework for identifying, prioritizing, and implementing the on-street bicycle projects in a systematic manner.

<p>Gulch Master Plan 2010</p>	<p>The Gulch Master Plan 2010 created a vision for Denver’s Gulch park systems to unify the park system, create neighborhood and trail connectivity, prepare estimation and prioritization of future costs for park and channel improvements, and identify policy issues that will strengthen and maintain proposed enhancements for all gulch parks.</p>
<p>Denver Downtown Multimodal Access Plan 2005</p>	<p>The Denver Downtown Multimodal Access Plan 2005 is a planning document that includes and overview of Downtown land use and transportation, a summary of existing conditions for various modes of transportation, principles guiding downtown decisions, recommendations, and implementation priorities.</p>
<p>Station Area Plans</p>	<p>The Station Area Plans are a collection of plans that provide high-level policy recommendations and an action plan to foster implementation of transit oriented development in specific areas of Denver.</p>
<p>Denver Eastside Mobility Plan 2010</p>	<p>The Denver Eastside Mobility Plan 2010 is the first step to implementing the Strategic Transportation Plan. It is a plan that offers multimodal solutions to improve overall mobility within the system of transportation facilities throughout the East Side travel shed. The travel shed is a designated area containing a network of multimodal transportation facilities that work together as a system. The East Side travel shed was identified in the Strategic Transportation Plan.</p>

Source: City and County of Denver

**Gathering Community Input**—Public Works and other stakeholders, such as the Department of Parks & Recreation (Parks & Recreation), held public outreach events to obtain recommendations for potential improvements to the Denver Moves network.<sup>2</sup> At these events, they received guidance for community priorities from approximately 375 people, and received an additional 75 comments on the Denver Moves project website. Public input accounted for about 110 miles of suggested network improvements.

**Conducting Field Evaluations**—Two evaluation teams which included a transportation planner and engineer, conducted a field evaluation of 200 miles to assess the feasibility of constructing the proposed network improvements.

**Conducting Final Reviews**—Staff from Public Works, Parks & Recreation, and other City departments reviewed draft maps of the network to ensure consistency with other City planning efforts. This resulted in a defined network of 250 miles. An additional twenty miles were added following comments from a final public review, resulting in a total of 270 miles to be added to the existing network.

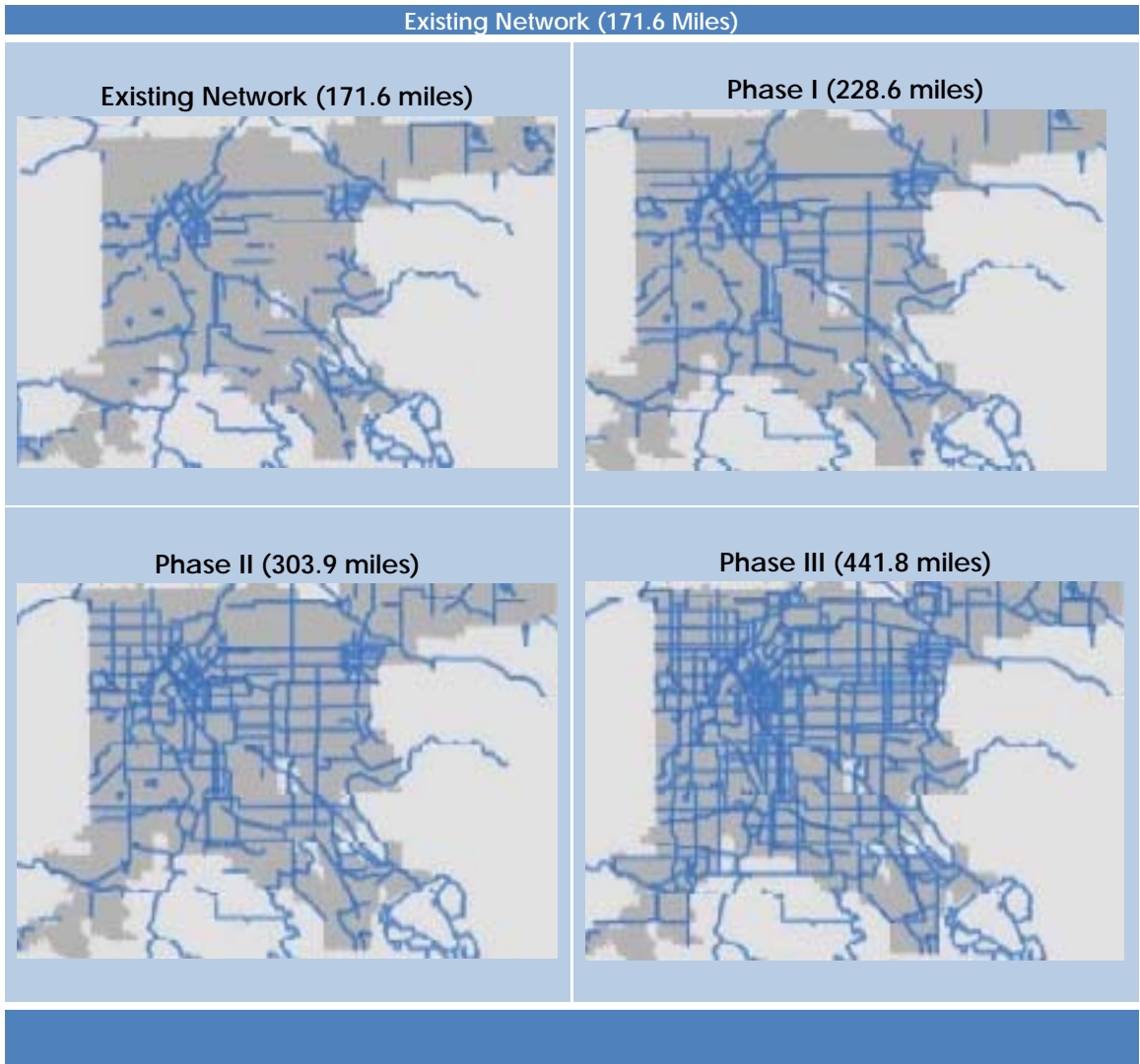
In addition to defining the City’s proposed bicycle and pedestrian transportation network, Denver Moves includes an implementation approach that details the intended prioritization and order of projects required to complete the network. This phasing plan

<sup>2</sup> Other stakeholders include the Denver Moves Citizens’ Taskforce, City Council, and other City departments, such as Parks & Recreation, Community Planning & Development, Public Health, and Environmental Health.

categorizes projects into three chronological phases. The phasing plan’s prioritization approach is based on criteria that scored projects based on their: ability to mitigate conflict with other modes of transportation, inclusion in past plans, proximity to key destinations within the City, and overall implementation feasibility—as measured by community support, tradeoffs required for completion, and project costs. See Appendix B for a listing of the scoring criteria used to create the Denver Moves phasing plan.

As illustrated in Figure 3, Phase I, projects were prioritized to connect different areas of the City through main routes, while Phase II and III projects expand coverage and density of the Denver Moves network.

**Figure 3: Denver Moves Phasing Plan Map**



Source: Denver Moves: Making Bicycle and Multi-Use Connections

## Public Works' Transportation Division is Primarily Responsible for Implementing the Denver Moves Plan

The Transportation Division (Division) within Public Works is primarily responsible for implementing the Denver Moves plan. The Division develops, reviews, evaluates, implements, and supports the design of transportation system improvements. Additionally, the Division provides review services for both private and public transportation projects to help ensure conformity with transportation system standards and the Denver Comprehensive Plan. The Division is also responsible for the operation, maintenance, installation, and emergency repair of traffic control devices including, traffic signals, sign installation, and pavement markings.

To implement Denver Moves, the Division frequently collaborates with other Public Works divisions, such as the Capital Projects Management Division, to plan, program and construct network facilities. Public Works also coordinates with Parks & Recreation to develop select network facilities. While Public Works is primarily responsible for developing "on-street" facilities (i.e., facilities that share the roadway) such as bike lanes and sharrows, Parks and Recreation is responsible for developing "off-street" facilities such as regional trails. Public Works and Parks & Recreation both share responsibility for infrastructure that connects off-street and on-street facilities.

The Division reviews the Denver Moves phasing plan when establishing its Annual Work Program. The Annual Work Program is a plan that identifies the projects to be completed within a given year. While the Division does not have documented procedures for developing the Annual Work Program, particularly as it relates to the inclusion of Denver Moves projects, officials stated that they consider the following factors:

- **Outstanding Phase I Projects** – The Division reviews the Denver Moves phasing plan to identify outstanding projects from Phase I that are targeted toward closing gaps in the existing network.
- **Opportunities to Expedite Phase II and Phase III Projects** – The Division reviews maps for repairs and improvements to public streets to identify opportunities to expedite Phases II and III projects.
- **Input from External Stakeholders** – Public Works also consults with external stakeholders, such as the Mayor's Bicycle Advisory Committee; to obtain community perspectives on final project design.<sup>3</sup>
- **Trade-offs Required for Completion** – Finally, the Department considers key trade-offs, such as the cost of facilities or policy related decisions, in developing its Annual Work Program. For example, the implementation of higher-cost facilities such as bicycle boulevards may be delayed in favor of lower-cost facilities such as sharrows.

See Table 2 for a summary of the number of miles implemented, by phase.

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<sup>3</sup> The Mayor's Bicycle Advisory Committee (MBAC) advises the Mayor and City Council, and all Departments of and consultants to the City, on all matters relating to the use of bicycles as means of transportation and recreation. MBAC reviews and makes recommendations on planning, design, and development of projects prepared by developers, City Departments, and consultants affecting the use of bicycles.

**Table 2: Denver Moves Miles Completed, by Phase**

Phases	2011	2012	2013	2014	2015 <sup>a</sup>
Phase I miles	9	13	8	1	1
Phase II miles	2	6	0	10	0
Phase III miles	2	2	0	15	0
<b>TOTAL <sup>b, c</sup></b>	<b>13</b>	<b>20</b>	<b>8</b>	<b>26</b>	<b>1</b>

Source: Auditor’s Office analysis of Public Works data.

<sup>a</sup> Completed miles are the number of Denver Moves network miles completed as of March 31, 2015.

<sup>b</sup> The numbers in the table are rounded, but the total miles were calculated using exact values. Therefore, in some cases, calculations are slightly different than they would be if they were calculated using the rounded values in the table.

<sup>c</sup> The numbers in this table do not include approximately 1 mile of completed trails. According to Public Works officials, trails were not assigned a Denver Moves phase due to their capital-intensive nature.

## Denver Moves Funding

The estimated total cost of Denver Moves implementation is \$119 million, including \$66 million for projects and \$54 million for bridges and other improvements at street crossings that enhance safety for users by enabling them to avoid interactions with motorized vehicles.<sup>4</sup> Although Denver Moves is funded through multiple sources, it is primarily funded with annual and discretionary monies obtained through the City’s Capital Improvement Program (CIP).<sup>5</sup> Public Works generally funds smaller-scale, “less intrusive” projects through annual CIP funding, while leveraging available discretionary funding to support larger capital projects.<sup>6</sup>

In addition to CIP investments, Denver Moves has been funded by other revenue sources, including contributions from the City’s General Fund. Denver Moves also cites other potential revenue sources, such as Denver Urban Renewal Authority (DURA) Tax Incremental Financing and grants from the Colorado Department of Transportation. However, Public Works has only received about \$3 million in DURA funding as of April 2015 to support Denver Moves and other transportation needs.<sup>7</sup>

Finally, Public Works leverages funding from other street maintenance (e.g., resurfacing projects, utility work, etc.) to implement Denver Moves.<sup>8</sup>

<sup>4</sup> The estimated cost of Denver Moves is in 2011 U.S. dollars and does not include sidewalk repair or maintenance costs.

<sup>5</sup> *City and County of Denver, Colorado Mayor’s 2015 Budget*. Capital Improvement Program funding is used to acquire and maintain major capital assets other than those financed through special assessment or enterprise funds. The primary source of revenue for the Capital Improvement Program is the Capital Improvement Fund which is primarily funded through property taxes.

<sup>6</sup> According to Denver Moves, less intrusive projects generally require minimal design, property impacts, and constructions. These projects could include routine trail maintenance, signage, pavement markings for sharrows or bike lanes, curb ramp upgrades, signal improvements, or small intersection improvements. Larger capital projects can include construction of trails, cycle tracks, sidewalks and major grade-separated projects.

<sup>7</sup> According to Public Works, the DURA funds of \$3 million were received as of April 2015.

<sup>8</sup> Street maintenance projects receive funding from the City CIP budget and allocations from a mill levy assessment. These funds are primarily expended on paving materials used by Public Works internal crews, contract costs, and some ancillary expenses such as traffic control and surveys. Additionally, the Waste Water Enterprise Fund pays for certain street maintenance, such as paving unimproved alleys.

# Denver Moves Performance Management

As shown in Table 3, the Denver Moves plan includes goals, objectives, and performance measures to monitor and evaluate plan implementation. The effectiveness of these measures is discussed in greater detail in the performance evaluation audit finding.

**Table 3: Denver Moves Goals, Objectives and Performance Measures**

Denver Moves Goals, Objectives and Performance Measures
<p><b>Goals</b></p> <ul style="list-style-type: none"> <li>• A biking and walking network where every household is within a quarter mile (5-minute walk or 2-minute bicycle ride of a high ease of use facility."</li> <li>• Achieve a 15 percent bicycling and walking commute mode share by 2020.</li> </ul>
<p><b>Objectives</b></p> <ul style="list-style-type: none"> <li>• <i>Create a new identity:</i> Find new ways to communicate how to use the current system, identify innovative treatments for new trails and existing streets, and educate a large audience using social media.</li> <li>• <i>Build a simpler system:</i> Eliminate barriers for new and regular users, and integrate existing trails and streets.</li> <li>• <i>Embrace innovation, practical ideas:</i> Identify potential citywide demonstration projects and near term improvement, and increase safety, visibility and usability.</li> <li>• <i>Include all users:</i> Balance the needs and skill level of all user groups, and develop strategies to increase usage and interest from a wide range of users.</li> </ul>
<p><b>Performance measures</b></p> <ul style="list-style-type: none"> <li>• <i>Amount of bicycling:</i> Percent increase per year in locational counts</li> <li>• <i>Bike/walk share of commute trips:</i> Percent bicycle and walking mode share of all "to work" trips</li> <li>• <i>Bike/walk share of all trips:</i> Percent bicycle and walking mode share of all trips</li> <li>• <i>Pedestrian and bicycle infrastructure spending:</i> Amount secured for all bicycle/pedestrian projects</li> <li>• <i>Network completion:</i> Percent of Denver Moves network completed</li> <li>• <i>Geographic equity of network:</i> Percent of Denver Moves network miles per City Council district</li> </ul>

Source: Denver Moves: Making Bicycle and Multi-Use Connections

# SCOPE

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This audit examined the implementation status of the Denver Moves plan; including an assessment of plan funding, projects prioritization and execution, and performance measurement activities.

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

# OBJECTIVE

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This audit evaluated the efforts of Public Works to implement the Denver Moves plan. To accomplish this objective we evaluated

- Denver Moves plan funding;
- Processes and procedures for developing, managing, and evaluating program costs;
- Project prioritization and execution processes;
- Efforts to assess and monitor Denver Moves performance, including assessing the extent to which actual performance aligns with plan goals and objectives; and
- Public Work strategies to assess and mitigate risk to plan implementation.

# METHODOLOGY

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We used several methodologies to address the audit objectives. These evidence-gathering and analytical techniques included, but were not limited to:

- Reviewing other City-wide planning documents such as the Bicycle Master Plan Update (2001), Pedestrian Master Plan (2005), the Game Plan (2005), Strategic Transportation Plan (2008), and the Gulch Master Plan (2010) to identify the relationship between Denver Moves and prior planning efforts.
- Reviewing the Denver Moves plan to identify the network development process, implementation strategy, and the plan's performance goals, objectives, and measures.
- Analyzing data contained in Public Works' annual work programs and other available sources to identify the number of Denver Moves projects completed



between 2011 and March 31, 2015, as well as key project characteristics such as the length and miles and ease of use.

- Reviewing the City's Six-Year Capital Improvement Plan (2013 through 2018) to determine the funding structure of capital projects, such as those identified in Denver Moves.
- Analyzing data contained in the Mayor's annual budget to determine the amount of funding allocated to the Denver Moves program between 2011 and 2015.
- Analyzing performance data provided by Public Works to determine the extent to which the department is effectively addressing Denver Moves goals, objectives, and performance measures.
- Comparing Denver Moves implementation to U.S. Government Accountability Office (GAO) guidance on leading capital project management practices to identify opportunities for improving Denver Moves capital project management.
- Comparing Public Works' processes for evaluating Denver Moves performance to GAO guidance on designing program evaluations to identify opportunities for improvement.
- Comparing Denver Moves network development, funding structure, cost estimation and management procedures, and program evaluation framework to leading practices established by the Cities of Portland and Seattle.
- Interviewing Public Works officials and others to obtain contextual information, otherwise not documented, about Denver Moves implementation.

# FINDING

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## The Department of Public Works is Not Implementing the Denver Moves Plan in a Manner that Addresses the City's Long-Term Goals for Non-Motorized Transportation

Since 2011, both the Mayor and City Council have identified Denver Moves as one of the City's foremost priorities for expanding the existing multi-use network for bicycle and pedestrian transportation. Despite citing Denver Moves as a high-priority in the Mayor's Budget and Denver City Council Priorities for 2016, the historical lack of adequate funding demonstrates that the Denver Moves initiative has not been a city priority.

Public Work's fragmented execution of the plan has resulted in the development of a network that will not address the City's long-term goals for non-motorized transportation. This audit identified three areas in which Public Works needs to make improvements related to implementing the remaining components of the Denver Moves plan.

First, we found that resource allocation decisions for Denver Moves are not well integrated with plan goals—namely, the development of a network where every household is within a quarter mile of a high ease of use facility. We found that resource constraints led to a disproportionate prioritization of lower cost facilities that are less user-friendly, as opposed to more costly facilities that are easier to use. Also, Public Works has not established clear timeframes for completing the final network.

Second, while the total cost of Denver Moves was initially estimated to be \$119 million, the City did not fully fund the plan at its inception—opting instead to rely on inconsistent incremental funding.<sup>9</sup> However, there is no reliable, dedicated incremental funding plan in place. As a result, a gap exists between the stated priority of completing this plan made by City officials, and the actual funding decisions required to complete the network envisioned by the plan. Furthermore, during the course of this audit, we found that data that could be useful in formulating funding requests was either incomplete or unclear. The lack of quality data, particularly as it relates to tracking individual project costs, prevents policy-makers and others stakeholders from having the best possible information on which to base resource allocation decisions and to have readily available and accurate project costs.

Third, despite efforts to define plan outcomes, we found that Public Works has not developed an effective approach for evaluating the effectiveness of the execution of Denver Moves. For example, the Department has not identified specific measures for assessing whether program objectives that help address plan goals. Also, the relationship

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<sup>9</sup> Fully funded capital projects are those for which budget authority is or appears to be provided for the full estimated cost of a capital project or a stand-alone stage if the project is divisible into stages. Incrementally funded capital projects are projects for which budget authority is or appears to be provided for only part of the estimated cost of a capital acquisition or part of a usable asset.

between some performance measures and plan goals is unclear. Furthermore, effective performance evaluation is hampered by incomplete data. Without measureable goals and complete performance data, Public Works management is unable to determine and report to key stakeholders and citizens, whether the plan is being implemented as intended and achieving expected outcomes. Additionally, Public Works does not assess risk related to Denver Moves implementation making it difficult to identify threats to project completion or quality, and steps that could be taken to mitigate them.

## Key Goals of Denver Moves Remain Elusive Some Four Years After the Development of the Plan

According to data provided by Public Works and Parks & Recreation, Denver Moves has added nearly sixty-nine miles of pedestrian and bicycle infrastructure to the City’s existing multi-use network. These additions have increased the total number of network miles from 172 in 2011 to just over 240 miles as of March 31, 2015, and account for about fifty-four percent of the cumulative 442 miles required to complete the network.

Despite adding miles to the City’s multi-use network, the Denver Moves projects and activities undertaken to date have not resulted in the actualization of key program goals though some progress has been made. Specifically, the plan sets a goal of creating a “biking and walking network where every household is within a quarter mile (a 5-minute walk or 2-minute bicycle ride) of a high ease of use facility.” As shown in Table 4, Public Works data shows that about fifty percent of households (just over 130,000) were located within a quarter mile of a high ease of use facility, as compared to forty-eight percent in 2011, meaning there has only been about a four percent increase related to this important goal since the adoption of Denver Moves.

**Table 4: Households within a Quarter Mile of a High Ease of Use Facility, 2011 through 2014**

Performance Goal	2011	2012	2013	2014
Number of households within a quarter mile of a high ease of use facility	125,838	128,603	128,603	130,326
Percentage of households within a quarter mile of a high ease of use facility <sup>a, b</sup>	48%	49%	49%	50%

Source: Department of Public Works data based on U.S. Census Bureau’s American Community Survey.

<sup>a</sup> Data are from January 1, 2011 through December 31, 2014. The numbers in the table are rounded, but the percentages were calculated using exact values. Therefore, in some cases, calculations may be slightly different than they would be if they were calculated using the rounded values in the table.

<sup>b</sup> The percentage of households within a quarter mile of a high ease of use facility was calculated using the U.S. Census Bureau’s 2010 American Community Survey (ACS) data for the City and County of Denver. ACS is an ongoing survey that provides communities with information to plan investments and services on an annual basis. According to ACS data, in 2010, the total number of households in Denver was 263,107.

Another stated outcome of the Denver Moves plan is that high to moderate ease of use facilities will comprise eighty percent of the final network. However, although approximately thirty-four percent (ninety-two miles) of the planned network miles include

high ease of use facilities, only about two percent (two miles) of the miles completed since the adoption of Denver Moves include high ease of use facilities. Table 5 summarizes the total number of planned and completed miles by ease of use designation. See also Appendix A for planned and completed miles by facility type.

**Table 5: Planned and Completed Miles, by Ease of Use**

Ease of use <sup>a</sup>	Miles planned	Miles completed <sup>b</sup>	Percent of planned miles completed <sup>c</sup>
High	90	2	2%
High to Moderate	2	0	0%
Moderate	106	39	37%
Moderate to Low	28	5	18%
Low	41	23	56%
No designation specified	1	0	0%
<b>TOTAL</b>	<b>268</b>	<b>69</b>	<b>26%</b>

Source: Auditor's Office analysis of Public Works and Parks & Recreation data.

<sup>a</sup> Ease of use is determined both by the degree of user separation from motorized traffic and perceived level of user comfort.

<sup>b</sup> Completed miles are the number of Denver Moves network miles completed as of March 31, 2015.

<sup>c</sup> The numbers in the table are rounded, but the total miles and percentages were calculated using exact values. Therefore, in some cases, calculations are slightly different than they would be if they were calculated using the rounded values in the table.

Public Works has not established clear timeframes for completing the Denver Moves phasing plan, nor does it have a date for final network completion. We also found that the lack of alignment between Denver Moves implementation and plan goals could be attributed to frequent deviations from the phasing plan. According to Public Works officials such deviations can stem from variety of factors, including:

- Limited staffing levels for project management;
- Opportunities to expedite Phases II and III projects in conjunction with larger capital projects; and
- Design changes stemming from conditions on the ground or input from key stakeholders such as City Council and neighborhood organizations.

In addition, Public Works may delay the implementation of projects in transportation corridors that it has identified as requiring further study. Such studies help Public Works determine the feasibility of implementing new innovations in facility design.

Although all of the aforementioned management decisions can cause deviations from the phasing plan, Public Works officials confirmed that limited funding is a primary driver for decisions about project prioritization. Projects that incorporate low to moderate ease of use facilities tend to be less expensive than those that include higher ease of use facilities. For example, low ease of use facilities such as sharrows, can cost between \$23,000 and \$31,000 per mile; whereas, higher ease of use facilities such as a bike boulevard or a buffered bike lane can cost up to \$133,000 per mile. Funding constraints

have resulted in Public Works selecting less expensive, low to moderate ease of use facilities over more expensive, higher ease of use facilities. While more cost effective in the near-term, the prioritization of low to moderate ease of use facilities does not align with the long-term goals of Denver Moves.

U.S. Government Accountability Office (GAO) guidance states that decision-making for capital projects, such as those identified in Denver Moves, should include the definition of results-oriented goals and objectives. Decision-making should also include an assessment of the resources needed to satisfy those goals and objectives. Specifically, such needs assessments can help organizations identify the resources needed to fulfill both immediate requirements and anticipated future needs based on the results-oriented goals and objectives.<sup>10</sup>

## The Historical Lack of Adequate Funding Demonstrates that the Denver Moves Initiative is Not a City Priority

Public Works does not have a dedicated revenue source to fund the \$119 million estimated cost of Denver Moves implementation, opting to fund the program incrementally. Moreover, the funding provided for Denver Moves has not been maintained at levels that would adequately support the estimated cost. In fact, the City only recently begun to specify funding for Denver Moves in the Mayor’s annual budget. Since 2013, the City has appropriated a total of \$2.8 million in funding for Denver Moves through CIP annual maintenance and discretionary funds—representing slightly over two percent of the original plan cost estimate. Table 6 summarizes CIP annual maintenance and discretionary investments for Denver Moves since 2013.

**Table 6: Denver Moves Capital Improvement Program Investments, 2013 through 2015**

Investment type	2013	2014	2015	Sub-total
Annual maintenance <sup>a</sup>	\$400,000	\$400,000	\$400,000	\$1,200,000
Discretionary <sup>b</sup>	\$200,000	\$500,000	\$900,000	\$1,600,000
<b>TOTAL</b>	<b>\$600,000</b>	<b>\$900,000</b>	<b>\$1,300,000</b>	<b>\$2,800,000</b>

Source: City and County of Denver, Mayor’s Budget, 2013 through 2015, confirmed by Public Works.

<sup>a</sup> Annual maintenance includes investments to support the maintenance or improvement of City capital assets.

<sup>b</sup> The discretionary investment for 2015 includes a General Fund capital one-time transfer of \$500,000 to support specific projects, including deferred capital maintenance and projects identified in the City’s Six-Year Capital Improvement Plan.

While incremental funding may be appropriate for some capital projects, it does not ensure that the costs of decisions are recognized at the time the commitment is made.<sup>11</sup> Furthermore, incremental funding that is not based upon a defined and dedicated funding plan creates uncertainty about when future funding will be available to

<sup>10</sup> GAO. *Executive Guide: Leading Practices in Capital Decision-Making*, GAO/AIMD-99-32 (Washington, D.C.: December 1998).

<sup>11</sup> GAO. *Budget Issues: Incremental Funding of Capital Asset Acquisitions*, GAO-01-432. (Washington, D.C.: February 26, 2001). According to GAO, incremental funding can be justified for technology-based capital projects because such projects are often closer in nature to research and development, and funding provided on an incremental basis can provide useful knowledge even if no additional funding is provided.

complete capital projects, which can result in poor planning, higher costs, delays, cancellations, or insufficient resources to maintain and operate assets.<sup>12</sup>

Some cities with highly rated bicycle transportation networks have opted for a more reliable incremental funding approach. For example, the City of Seattle, Washington recently adopted a six-year capital improvement program that includes \$35.5 million and \$45.1 million for bicycle and pedestrian master plan implementation, respectively.<sup>13</sup> According to Seattle officials, the dedicated capital improvement funds with incremental revenue provides a reliable source for bicycle infrastructure while retaining the flexibility to cover other planned investments.

In addition to the absence of strategic and consistent funding, we found that Denver Moves project cost data was unclear or incomplete. For example, Public Works was unable to provide complete data on estimated and actual costs for Denver Moves projects implemented prior to 2014. Public Works officials acknowledged that the Department has not consistently tracked project-level budget data for Denver Moves making it difficult to provide accurate, comprehensive data on estimated and actual plan costs.

Despite the limitations previously cited, Public Works did provide estimated and actual cost data for some Denver Moves projects implemented before 2013. Through our analysis, we observed significant variations between estimated and actual project costs. In some instances, we identified projects with actual costs that were nearly three times above the estimated cost of the project—ranging from about \$700 to \$76,000 above estimated costs. Conversely, we identified projects with actual costs that were grossly underestimated, ranging from \$2,700 to just over \$39,000. Table 7 compares estimated and actual costs for projects implemented.

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<sup>12</sup> U.S. Office of Management and Budget. *Capital Programming Guide*, V. 2.0 (Washington, D.C.: June 2006).

<sup>13</sup> For more information on the City of Seattle, Washington's Capital Improvement Program, see *City of Seattle, Washington, 2014-2019 Adopted Capital Improvement Program*.

<http://www.seattle.gov/financedepartment/1419adoptedcip/documents/2014-2019AdoptedCIPFinalBook.pdf>

**Table 7: Comparison of Estimated and Actual Denver Moves Project Costs**

Project	Facility Type	Estimated Costs <sup>a</sup>	Actual Costs	Difference
Steele St. - Expo-Bucktel	Sharrows	\$2,000.00	\$13,333.84	\$11,333.84
26th Colorado - Quebec	Bike Lane	\$50,000.00	\$24,566.08	(\$25,433.92)
26 <sup>th</sup> St. - York - Colorado	Bike Lane	\$15,000.00	\$30,510.00	\$15,510.00
15th St. - Cleveland – Larimer <sup>b</sup>	Vertical protection	\$50,000.00	\$126,158.05	\$76,158.05
1st Ave. - Knox Ct- Sheridan Blvd.	Bike Lane	\$8,000.00	\$32,043.90	\$24,043.90
Tennyson - 26th-52nd	Sharrows	\$16,000.00	\$648.69	(\$15,351.31)
23 <sup>rd</sup> Ave - Colorado - Kerney	Bike Lane	\$50,000.00	\$10,693.54	(\$39,306.46)
47th Ave. - Washington-Lincoln	Bike Lane	\$8,000.00	\$8,711.45	\$711.45
Perry - 6th-17th Ave	Sharrows	\$8,000.00	\$1,332.97	(\$6,667.03)
Crown	Bike Lane	\$20,000	\$15,899.54	(\$4,100.46)
MLK - Quebec - CPB	Buffered Bike Lane	\$50,000	\$47,300.00	(\$2,700.00)

Source: Auditor’s Office analysis of Public Works data.

Note: The table does not represent all completed projects for Denver Moves, it represents only projects where both estimated and actual cost data was readily available for the auditor’s office to review.

<sup>a</sup> The estimated costs are the original 2011 Denver Moves high level estimate and not an engineering level estimate which is a detailed cost estimate for a project, computed by estimating the cost of every activity in a work breakdown structure, summing these estimates, and adding appropriate overhead.

<sup>b</sup> 15<sup>th</sup> Street contained multiple projects, the data represents the contractor costs for vertical separation only and not the entire cost of the 15<sup>th</sup> street corridor.

The Department has not conducted a formal, comprehensive assessment of Denver Moves implementation costs since the City developed the original estimate in 2011. However, officials attributed differences between estimated and actual costs to a variety of factors including, pricing fluctuations in the construction industry, environmental factors or changes in project design. For example, officials stated that the poor quality of existing concrete drove design changes that increased the cost of bicycle improvements on the 15<sup>th</sup> Street corridor, installation of a Protected Bike Lane, from \$150,000 to over \$400,000.<sup>14</sup>

Whether funding capital projects in full or incrementally, decision-makers should have access to complete, comprehensive, and clear information for all proposed projects including, information on the total cost. GAO guidance on capital and cost management highlights the importance of complete and accurate data to support sound capital planning and decision-making. Specifically, the guidance states that decision-making based on good, firm estimates of the full cost of a project helps agencies fully fund projects up front by providing the information necessary to allocate

<sup>14</sup> Data was not readily available for the Auditors office to confirm the estimated costs of this portion construction on the 15<sup>th</sup> street corridor, which is a different project from the data in table 7. Both projects are part of the same 15<sup>th</sup> Street corridor.

resources more accurately and effectively.<sup>15</sup> Without such information, it is difficult for decision-makers and other stakeholders to determine future costs and whether the funding provided will contribute to the development of a usable asset.<sup>16</sup>

## Public Works Lacks an Effective Performance Evaluation and Risk Assessment Framework for the Denver Moves Plan

Denver Moves outlines goals, objectives, and performance measures that define the desired result of the plan—also referred to as outcomes. Denver Moves also identifies an approach for achieving established goals, including a phasing plan that informs how and when projects will be undertaken to complete the network. Despite efforts to define Denver Moves outcomes, Public Works has not developed an evaluation framework that sufficiently aligns plan goals, objectives, and performance measures to assess the effectiveness of plan. Specifically, the current framework does not:

- **Include outcome measures to assess expected program benefits**—Although Denver Moves identifies four program objectives, Public Works officials report that the Department has not developed specific measures or methods for determining the extent to which program objectives are helping address program goals.

Also, the relationship between some performance measures and the overall program goals has not been established. For example, it is unclear how measures such as “bicycle/pedestrian crashes,” “geographic equity of network,” or “pedestrian and bicycle infrastructure spending” monitor progress toward program goals of achieving better access to high ease of use facilities for all households, or achieving a fifteen percent bicycling and walking commute mode share by 2020.

- **Include plans to track and analyze data in ways that allow valid conclusions to be drawn**—The current evaluation approach is hampered by incomplete or insufficient data. For three of the seven performance measures identified in Denver Moves (“amount of bicycling,” “bike/walk share of all trips,” and “pedestrian and bicycle infrastructure spending”), Public Works officials reported that data was either unavailable or difficult to isolate for specific program operations. However, we found that other cities with similar goals for increasing the amount bicycling used alternative data sources for such information. For example, the City of Portland Auditor’s survey of city residents includes a question about primary and secondary means of travel to work.

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<sup>15</sup> GAO/AIMD-99-32

<sup>16</sup> GAO. *BUDGET ISSUES: Agency Data Supporting Capital Project Funding Requests Could Be Improved*, GAO-01-770 (Washington, D.C. June 8, 2001).



*The Department of Public Works does not publish an annual report on Denver Moves, even though such a report is required by the plan.*

According to Public Works officials, the goals, objectives, and performance measures identified in Denver Moves were established during the development of the overall plan, and have not been comprehensively evaluated since 2011. Officials also confirmed that the Department does not publish an annual report on Denver Moves, even though such a report is required by the plan.

GAO guidance on designing evaluations states that to appropriately assess program effectiveness, outcome measures must represent the nature of the expected program benefits.<sup>17</sup> Outcome measures should also address key aspects of desired performance and should not be unduly influenced by factors beyond the program's control. Additionally, evaluations should include plans to track and analyze data in such a way that program administrators and other stakeholders may draw causal connections and develop valid conclusions about program effectiveness.

Without measurable goals and adequate data for analysis, Public Works and other decision-makers are unable to ascertain whether (1) the plan is being implemented as intended; (2) feasibility or management challenges have emerged; (3) the program is achieving expected outcomes; and (4) whether opportunities exist to improve plan effectiveness, accountability and service delivery.

Finally, Public Works officials acknowledged that the Department does not conduct risk analysis specific to Denver Moves projects. As reported in our 2012 report on Public Works capital project management, effective project management should include an assessment of the potential risks to the project. Formal, ongoing assessment of various risks to the successful completion of the project, including potential threats to the project schedule and quality, could allow Public Works to identify and mitigate risks as they occur.<sup>18</sup>

## **Without Substantive Program Management Enhancements, the Goals of the Denver Moves Plan Will Not Be Realized**

Denver Moves has not been implemented as envisioned. Public Works has employed a disjointed and financially inefficient approach, resulting in a fragmented system that includes less user-friendly bicycle and pedestrian infrastructure that does not further the goals of the Denver Moves Plan. The lack of concrete implementation milestones, coupled with inconsistent and inadequate funding, creates ambiguity about when, and if, the final network will be completed. Also, an outdated overall cost estimate

<sup>17</sup> GAO, Designing Evaluations: 2012 Revision, GAO-12-208G (Washington, D.C.: Jan. 31, 2012). There is not a standard government definition of "program." However, the term can be defined in various ways for budgeting or policy-making purposes, and may include activities, projects, functions or policies.

<sup>18</sup> For more information on our findings specific to Public Works capital project management, see Denver Office of the Auditor, *Public Works Capital Construction Project Management Performance Audit*, November 2012, <http://www.denvergov.org/auditor>.

exacerbated by poor data on tracking individual project costs, means that Public Works and the citizens of Denver do not know what the actual cost of the completed network will be. Furthermore, inaccurate cost data does not lend credibility to resource requests, specifically for large capital improvements. Finally, ineffective performance measurement, compromises Public Works ability to assess Denver Moves progress against plan goals and to make any needed adjustments and corrections —making it difficult to meet the goals of the plan as well as to justify the costs of implementing the plan to date.

# RECOMMENDATIONS

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We offer the following recommendations to assist the Department of Public Works with improving Denver Moves implementation:

- 1.1 **Project Prioritization**—To the extent that Denver Moves remains a high priority for the City, Public Works should establish timeframes for completing each phase of the Denver Moves plan.
  
- 2.1 **Funding**—Public Works should also develop a realistic and strategic funding approach for implementation that would enable the Department to compare the long-term costs of spending and understand the budgetary and programmatic impact of resource allocation decisions. The approach should include both dedicated long-term funding, as well as, flexible strategies for mitigating the effects of a budget-constrained environment – including budgeting for standalone stages that will result in usable assets.
  
- 2.2 **Cost Data**—To ensure decision-makers have sound information for resource allocation, we recommend that Public Works establish a more effective, efficient and transparent system for tracking Denver Moves project costs either by using child project identification numbers or separating the specific costs in spreadsheet.
  
- 3.1 **Annual Reporting and Performance Evaluation**—As stated in Denver Moves, Public Works should publish annual reports that evaluate the effectiveness of plan implementation. The evaluations should, at a minimum, evaluate whether Denver Moves is being implemented as intended, and assess the extent to which the plan is achieving expected outcomes. To ensure that the evaluation provides quality, creditable, and useful information, the Department should identify outcomes that are measurable, and design an evaluation approach that analyzes data in ways that allow valid conclusions to be drawn about implementation effectiveness.
  
- 3.2 **Risk Assessment**—Public Works should conduct formal, ongoing assessments of risks related to Denver Moves implementation to identify potential threats to completion timeframes and quality, and to identify strategies to reduce or eliminate the risk identified.

# APPENDIX A

## Denver Moves Multi-Use Facilities

The Denver Moves plan identifies seventeen types of multi-use facilities that could be implemented to enhance bicycle and pedestrian safety. Facilities may be categorized as low, moderate, or high “ease of use,” based on the degree of separation from motorized traffic and perceived level of user comfort. Table 8 summarizes the facility types identified in Denver Moves, as well as, the corresponding ease of use designation.

Table 8: Denver Moves Multi-Use Facilities, by type

Facility	Ease of Use	Description
Bike Boulevard	High	<p>Bike boulevards are streets designed to give priority to non-motorized users and discourage through-traffic by motorized vehicles. A separated space in the street is not necessary because non-motorized users’ preference is communicated through the roadway design, signage, and traffic calming measures.</p> <p>Bike boulevards should provide connectivity between neighborhoods and common destinations via low volume streets. Bike boulevards are typically best accomplished in neighborhoods with a gridded street network where one street is chosen as the bicycle boulevard. They can also be created by combining a series of road and trail segments to form one continuous route. They are most effective on streets that currently have a high volume of bicycle and pedestrian use, documented crash history, or excessive motor vehicle speeds based on field studies</p>
Regional Trail	High	<p>Regional trails are off-street facilities that are shared use for non-motorized users and provide connectivity within and beyond the city limit. They are typically located near a watercourse or greenway. Examples include the Cherry Creek Trail, S. Platte River Trail, Bear Creek Trail, Highline Canal Trail, and Clear Creek Trail.</p> <p>The regional trails provide recreational opportunities and supplement the transportation emphasis of the grid bicycle route system. Regional trails are multi-purpose trails serving a variety of trail users.</p>
Heels and Wheels Trail	High	<p>Heel &amp; Wheel trails are designed to minimize conflicts between different speed users to reduce conflicts in highly used segments of trail corridors. There are several construction, signage, and striping techniques available to reduce conflicts between different users.</p> <p>Heel &amp; Wheels trails should provide additional capacity to trail segments that have poor Levels of Service (LOS) based on the Federal Highway Administration LOS calculations. Heels &amp; Wheels trails are typically best accomplished by adding a parallel trail, adding to the current trail, or reconstructing the trail. Parallel trails can be</p>

		constructed in hard or soft surfaces depending on the user types and demands.
Minor Trail	High	<p>Minor &amp; neighborhood trails are off-street facilities that are shared use for non-motorized users and provide connectivity to a regional trail or neighborhood destination. They are typically located in a park, open space, or near a low volume roadway.</p> <p>The off-street trails provide recreational opportunities and supplement the transportation emphasis of the grid bicycle route system.</p>
Cycle Track	High	<p>Cycle tracks provide an exclusive bikeway separated from motor vehicle and pedestrian traffic by a median, planter strip, and/or a parking lane. The cycle track may be designed at street level, sidewalk level or a height in-between the two to accentuate the separation.</p> <p>Cycle tracks are typically installed on streets with higher traffic volumes and/or speeds with long blocks and few intersections. Cycle tracks can be either one-directional, or two-directional, and can be provided on one or both sides of the street. They are useful on streets that connect to off-street trails since riders using trails often prefer to be separated from traffic.</p>
Shared Use Sidewalk	High	<p>Sidewalks designed for bicycle usage to avoid conflicts between single direction motor vehicle traffic.</p> <p>The facilities are designated on maps and have special signage to warn pedestrians and bicycles of the shared use.</p> <p>Pedestrians and bicyclists can legally share the space on the sidewalks to make connections between green facilities.</p>
Shared Roadways/ Signed Routes	Moderate to High	<p>Shared streets are roads that have been designated as part of the bicycle system. Bicyclists operate with motor vehicles without any designated bicycle facility. There are no bicycle-specific designs or dimensions for shared lanes or roadways, but various design features can make shared lanes more compatible with bicycling, such as signage, good pavement quality, adequate sight distances, lower speeds and volumes, bicycle compatible drainage grates, bridge expansion joints, and railroad crossings.</p> <p>Shared streets are signed routes that make short connections between facility types or two destinations. They are normally used where investment in a specific facility type may not be cost effective.</p>
Buffered Bike Lane	Moderate	<p>Buffered bike lanes are created by painting a flush buffer zone between a bike lane and the adjacent travel lane. Buffers may also be provided between bike lanes and parking lanes to demarcate the door zone to discourage bicyclists from riding closely next to parked vehicles.</p> <p>Buffered bicycle lanes should be considered at locations where there is excess pavement width or where increased separation is desired.</p>

		The buffer provides a warning for motorists and bicyclists that the street is multi-purpose.
Bicycle Lanes	Moderate	<p>Bicycle lanes are a portion of the roadway designated for preferential use by bicyclists. They are one-way facilities that typically carry bicycle traffic in the same direction as adjacent motor vehicle traffic on the right side of the roadway.</p> <p>Bike lanes provide the minimum standard for separate on-street bicycle accommodation. They are desirable on collectors and some arterials to improve rider comfort and safety where traffic volumes and speeds are higher.</p> <p>Bicyclists are not required to ride exclusively in a bicycle lane when traveling on a street and may leave the lane as necessary to make turns, pass other bicyclists, or to position themselves for other necessary movements. Motor vehicles may temporarily use bicycle lanes to access parking spaces, enter and exit driveways and alleys, or move into turning lanes. Parking is prohibited within bicycle lanes.</p>
Climbing Lane	Moderate	<p>Climbing lanes are hybrid bicycle facilities on roadways with steep grades. Typically, bicycle lanes are marked in the uphill direction and shared-lane markings are painted in the downhill direction.</p> <p>Climbing lanes are used on streets with steep and/or sustained grades. The bicycle lane should be placed on the side of the street that is gaining elevation (uphill), with a shared lane marking placed in the opposite direction (downhill).</p>
Bike/Bus Lane	Moderate to Low	<p>Bike/bus lanes provide guidance to bicyclists and buses in situations where separate bicycle facilities are not possible. The marking is intended to alert bicyclists and bus drivers that both uses occupy the traveled way. The designs encouraging safer passing practices (including changing lanes, if necessary).</p> <p>Bike/bus lanes are typically located in arterial corridors where there are designed RTD routes and the need for on-street bicycle connections between destinations.</p>
Party Parking Lane	Moderate to Low	<p>Party parking lanes are marked parking lanes that have a very low weekday utilization rate and/or few street facing residences. The parking lanes provide overflow parking for adjacent perpendicular residential streets or adjacent land uses such as churches, schools, or recreation facilities that have limited, but intense on-street parking needs. During periods of low parking, use or restricted parking, use the parking lane can operate as a de-facto bicycle lane or shoulder for bicycle use.</p> <p>Party parking lanes should be considered as bikeways under unique circumstances where the removal of parking lanes is not feasible due to high parking demands during specific times. Typically, party parking lanes are located on streets in residential neighborhoods with limited commercial activity. Streets with party parking lanes generally use</p>

		about 5-10% of the block length for parking during off peak times.
Sharrows	Low	<p>Shared lane markings or “sharrows” are designed to provide guidance in situations where space is too narrow for a motor vehicle and a bicycle to travel side by side. It assists bicyclists with positioning in a shared lane with on-street parallel parking in order to reduce the chance of a bicyclist’s impacting the open door of a parked vehicle, as well as alerts road users of the location bicyclists are likely to occupy within the traveled way. Sharrows also encourage safe passing practices and reduce the incidence of wrong-way bicycling.</p> <p>Sharrows are installed where there is insufficient space to allocate to a dedicated bicycle facility in the through travel lane. Sharrows are generally used on collector streets where dedicated space for a bicycle facility cannot be provided due to right-of-way constraints. They should generally not be used on streets with speed limits in excess of 35 MPH.</p>
Paved Shoulder	Low	Paved shoulders are hybrid bicycle facilities on roadways where there is additional space between the outer travel lanes and the edge of the right of way. Typically, paved shoulders are marked with a solid white line.
<b>Roadway Crossings</b>		
Grade Separation	High	<p>Grade separations provide connection across streets and do not require pedestrians or wheeled users to interface with motor vehicles. Grade separations can include underpasses or bridges that are shared use.</p> <p>Grade separations should be considered at locations where there are high traffic volumes, motor vehicle speeds, or where increased separation is desired based on accident history. Locations that have existing culverts or drainage channels that travel under the roadway, or are scheduled for improvements should be considered for grade separations.</p>
Mid-Block	Moderate to Low	<p>Mid-block crossings provide connection between trails that are separated by a roadway. A mid-block crossing is located on a roadway between intersections. They can be located on local, collector, and arterial streets. They provide an enhanced crossing for pedestrians and wheeled users by employing several motor vehicle warning devices.</p> <p>Mid-block crossings should be considered at locations where there are moderate traffic volumes, motor vehicle speeds, and where increased visibility is desired based on accident history. They can also be located on roadways where two adjacent land uses require a mid-block connection.</p>
<b>Intersections</b>		
Bicycle Treatments	Moderate	Intersection bicycle treatments are a portion of the roadway

		<p>designated for preferential use by bicyclists. They are designated facilities that allow bicycle traffic to make turning and thru movements at motor vehicle intersections.</p> <p>Intersection bicycle treatments are an enhanced standard to existing on-street bicycle facilities. They are desirable on collectors and some arterials to improve rider comfort and safety where traffic volumes and speeds are higher. Bicyclists are not required to ride exclusively in the intersection bicycle treatment when traveling on a street.</p>
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Source: Denver Moves: Making Bicycle and Multi-Use Connections (2011)



# APPENDIX B

## Denver Moves Phasing Plan Scoring Criteria

The prioritization of projects as outlined in the Denver Moves phasing plan was based on criteria that scored projects based on key qualities, such as the ability to mitigate conflicts between multiple modes of transportation or implementation feasibility. Table 9 provides a listing of the scoring criteria used to develop the Denver Moves phasing plan.

**Table 9: Denver Moves Phasing Plan Scoring Criteria**

Criteria	Score
Mitigates pedestrian/bicycle/vehicle conflicts	High = 2 Medium = 1 Low = 0
Connects off-street to on-street bike facilities or sidewalks	Yes = 1 No = 0
Directly adjacent to a school	Yes = 1 No = 0
Within a ¼ mile of a park recreation center, or library	Yes = 1 No = 0
Within a ¼ mile of a neighborhood destination	Yes = 1 No = 0
With ½ mile of a Denver TOD	Yes = 1 No = 0
Fulfills recommendations in the Bicycle Master Plan	Yes = 1 No = 0
Fulfills recommendation in the Pedestrian Master Plan	Yes = 1 No = 0
Fulfills recommendations in the Gulch Master Plan	Yes = 1 No = 0
Implementation Feasibility	
Community Support	High = 2 Low = 1 None = 0
Action (Trade-off)	None = 2 Medium = 1 High = 0
Cost	Low = 2 Medium = 1 High = 0
Opportunity Driven	Yes = 1 No = 0

Source: Denver Moves: Making Bicycle and Multi-Use Connections (2011)

# APPENDIX C

## Denver Moves Completed Miles, by Facility Type

Table 10 summarizes the total number of planned and completed in the Denver Moves network, by facility type.

**Table 10: Planned and Completed Miles, by Facility Type**

Facility Type	Ease of Use <sup>a</sup>	Planned Miles	Completed Miles <sup>b</sup>
Trails	High	22	1
Bike Boulevard	High	55	0
Cycle Track/ Buffered Bike Lanes	High	8	1
Shared Use Path	High	3	0
Sidewalk – Bikes Permitted	High	3	0
Bike Boulevard/ Bike Lane	High to Moderate	2	0
Climbing Lane	Moderate	2	1
Bike Lane	Moderate	104	38
Bike Lane/Sharrow	Moderate to Low	7	2
Shared Parking/ Bike Lane	Moderate to Low	21	3
Paved Shoulder	Low	4	0
Sharrow	Low	37	23
No Facility Recommended	n/a	1	0
<b>Totals <sup>c</sup></b>		<b>268</b>	<b>69</b>

Source: Auditor's Office analysis of Public Works and Parks & Recreation data.

<sup>a</sup> Ease of use is determined both by the degree of user separation from motorized traffic and perceived level of user comfort.

<sup>b</sup> Completed miles are the number of Denver Moves network miles completed as of March 31, 2015.

<sup>c</sup> The numbers in the table are rounded, but the total miles were calculated using exact values. Therefore, in some cases, the total is slightly different than it would be if it were calculated using the rounded values in the table.

# AGENCY RESPONSE

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July 6, 2015

Mr. Kip R. Memmott, MA, CGAP, CRMA
Director of Audit Services
Office of the Auditor
City and County of Denver
201 West Colfax Avenue, Dept. 705
Denver, Colorado 80202

Dear Mr. Memmott:

The Office of the Auditor has conducted a performance audit of Public Works Denver Moves Plan.

This memorandum provides a written response for each reportable condition noted in the Auditor's Report final draft that was sent to us on June 17, 2015. This response complies with Section 20-276 (c) of the Denver Revised Municipal Code (D.R.M.C.).

AUDIT FINDING 1

The Department of Public Works is Not Implementing the Denver Moves Plan in a Manner that Addresses the City's Long-Term Goals for Non-Motorized Transportation

Table with 3 columns: Agree or Disagree with Recommendation, Target date to complete implementation activities, Name and phone number of specific point of contact for implementation. Row 1: Agree, October 31, 2015, Emily Snyder 720-913-4562

Narrative for Recommendation 1.1

Denver Public Works agrees with the recommendation to set a timeframe for the completion of each phase of Denver Moves. Establishing a schedule is associated to funding and costs (Recommendation 2.2 and 2.1) as it relates to the number of network miles per phase, the facility type of these miles, and the costs per mile of facility type. The current Denver Moves Plan is

currently being updated with additional network miles, new facility types, relevant costs, and revised prioritization. Based on this new baseline, Public Works will create different scenarios for completing each phase of Denver Moves.

<b>RECOMMENDATION 2.1</b>		
<b>Funding</b> —Public Works should also develop a realistic and strategic funding approach for implementation that would enable the Department to compare the long-term costs of spending and understand the budgetary and programmatic impact of resource allocation decisions. The approach should include both dedicated long-term funding, as well as, flexible strategies for mitigating the effects of a budget-constrained environment – including budgeting for standalone stages that will result in usable assets.		
<b>Agree or Disagree with Recommendation</b>	<b>Target date to complete implementation activities (Generally expected within 60 to 90 days)</b>	<b>Name and phone number of specific point of contact for implementation</b>
Agree	October 31, 2015	Emily Snyder 720-913-4562

**Narrative for Recommendation 2.1**

Denver Public Works recognizes the need to create a funding approach for Denver Moves, which will also help achieve clear implementation timelines (Recommendation 1.1). Denver Public Works will develop different funding scenarios with various levels of flexibility, including timeframe. Public Works will work with the Budget and Management Office on a sustainable and realistic approach.

<b>RECOMMENDATION 2.2</b>		
<b>Cost Data</b> —To ensure decision-makers have sound information for resource allocation, we recommend that Public Works establish a more effective, efficient and transparent system for tracking Denver Moves project costs either by using child project identification numbers or separating the specific costs in spreadsheet.		
<b>Agree or Disagree with Recommendation</b>	<b>Target date to complete implementation activities (Generally expected within 60 to 90 days)</b>	<b>Name and phone number of specific point of contact for implementation</b>
Agree	November 30, 2015	Emily Snyder 720-913-4562  Lisa Edington 720-865-3146

**Narrative for Recommendation 2.2**

Denver Public Works agrees to establish a more effective and transparent method for tracking estimated and actual cost data. This includes establishing a standard template with contractors (design and construction) to track actual costs per project even if part of a larger work effort. It also includes documenting the process for accurately capturing time and materials for projects completed by City staff. Public Works will improve on current Denver Moves program spreadsheet to track all estimated and actual costs for each phase of project development—study, design, and installation.

<b>RECOMMENDATION 3.1</b>		
<b>Annual Reporting and Performance Evaluation</b> —As stated in Denver Moves, Public Works should publish annual reports that evaluate the effectiveness of plan implementation. The evaluations should, at a minimum, evaluate whether Denver Moves is being implemented as intended, and assess the extent to which the plan is achieving expected outcomes. To ensure that the evaluation provides quality, credible, and useful information, the Department should identify outcomes that are measurable, and design an evaluation approach that analyzes data in ways that allow valid conclusions to be drawn about implementation effectiveness.		
<b>Agree or Disagree with Recommendation</b>	<b>Target date to complete implementation activities (Generally expected within 60 to 90 days)</b>	<b>Name and phone number of specific point of contact for implementation</b>
Agree	October 31, 2015	Emily Snyder 720-913-4562

**Narrative for Recommendation 3.1**

Denver Public Works acknowledges the need to formalize the annual reporting process and clarify performance evaluation. Currently, reports on the Denver Moves Plan progress and project status are provided upon request and usually address the high-level plan outcomes. As part of the current effort to update the Denver Moves Plan, Denver Public Works will identify and incorporate measureable outcomes, as well as state an accountable method to evaluate the effectiveness of implementation.

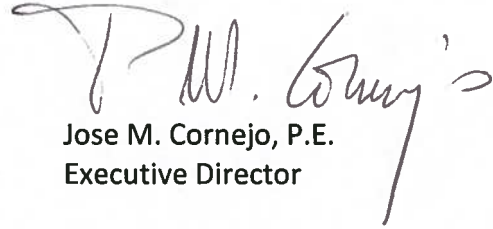
<b>RECOMMENDATION 3.2</b>		
<b>Risk Assessment</b> —Public Works should conduct formal, ongoing assessments of risks related to Denver Moves implementation to identify potential threats to completion timeframes and quality, and to identify strategies to reduce or eliminate the risk identified.		
<b>Agree or Disagree with Recommendation</b>	<b>Target date to complete implementation activities (Generally expected within 60 to 90 days)</b>	<b>Name and phone number of specific point of contact for implementation</b>
Agree	Ongoing	Emily Snyder 720-913-4562

**Narrative for Recommendation 3.2**

Public Works agrees to perform formal, on-going risk assessments related to Denver Moves implementation. This may include both risks to program management, or knowledge transfer, as well as project implementation. Opportunities to mitigate risks regarding program management include regular staff meetings to discuss the Denver Moves Plan and implementation strategies and documentation of standard work processes. Opportunities to mitigate project implementation risks include early trade-off identification and defined public input process. Denver Public Works will continue to develop these ideas and others and document into a risk assessment for the Denver Moves Plan.

Please contact Emily Snyder at 720-913-4562 with any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "J.M. Cornejo", with a stylized flourish at the end.

Jose M. Cornejo, P.E.  
Executive Director

cc: Crissy Fanganello, Lesley Thomas, George Delaney, Emily Snyder