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NATIONAL WESTERN CENTER PARKING & TRANSPORTATION DEMAND MANAGEMENT PLAN FINAL REPORT

DECEMBER 2017



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EXECUTIVE SUMMARY

BACKGROUND

The National Western Center (NWC) campus in north Denver is best known as the home of the National Western Stock Show and Rodeo, which has been held at the venue every January since 1906. The campus is also used for several hundred additional events ranging from smaller meetings and banquets, to larger music festivals, consumer trade shows, sporting events, rodeos, and other livestock and animal events.

In 2011, the Mayor's office began to study options to keep the National Western Center at its current location—requiring a major investment to improve aging infrastructure—as opposed to relocating the venue to an alternative site. In 2015, a site-wide Master Plan was completed, focused on expanding and reorganizing the site and rebuilding many of the facilities to modernize the campus. The goal of the Master Plan is to establish a year-round destination showcase for North Denver, while creating a best-in-class experience for the Stock Show, and promoting Western Heritage and agricultural-business investment and education. One of the ancillary goals of the Master Plan is to improve long-standing issues with access, parking, and circulation systems. In evaluating solutions for these issues, the Master Plan places a particular emphasis on sustainability, including “right-sizing” the parking system, and incorporating effective transportation demand management strategies to promote modes of arrival beyond the single-occupancy vehicle.

Because the Master Plan did not go into extensive detail in terms of the parking and access systems, a follow-up analysis was needed. To this end, the City of Denver (and the Mayor's Office of the National Western Center) have commissioned the following *Parking and Transportation Demand Management Plan* (the Plan). The key objectives of this plan are to address the following questions:

1. How much parking is needed for the site for various events and activities?
2. How can the management authority leverage other local and regional transportation infrastructure investments?
3. How will phasing of the Master Plan be addressed?
4. How can parking and transportation demand management help to promote efficiency campus-wide?
5. How can parking and transportation demand management be used to maintain and bolster the success of events on the NWC site?

INPUT AND GUIDING PRINCIPLES

No plan can be successful without buy-in from key stakeholders and the community. To this end, this Plan incorporated multiple avenues to solicit feedback and ideas from those directly impacted by the Plan. This outreach strategy is described in detail on pages 1.8 – 1.11.

One of the major avenues of this input was the Project Management Team (PMT), which included over 30 representatives from various stakeholder groups and campus development partners. One of the first objectives of the PMT was to establish a set of guiding principles for this Plan that would be reflected throughout, and would be supported by key recommendations.

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The following guiding principles were established:

Summary Figure 1: Guiding Principles

Site Access	Parking Infrastructure, Management, and Policy	Transportation Demand Management
•Accommodate current and future needs for access to, from, and through the site. •Promote pedestrian, bicycle, and light vehicle connections as the primary means to circulate within the site. •Create multiple entry portals or "doorways" to distribute site access and promote a welcoming campus environment.	•Enable growth in attendance, number, and type of events by right-sizing parking infrastructure. •Establish policies, technologies, and strategies that promote a high level of service. •Recommend design standards for parking infrastructure that allow for future flexibility. •Enable year-round efficient use of existing and new infrastructure.	•Develop multi-faceted TDM strategies that maximize person trips. •Encourage multimodal transportation usage through a combination of proven strategies. •Ensure success of TDM strategies through active management and monitoring.

See Page 1.7 for additional discussion

At several meetings throughout the planning process, the PMT discussed how important it was to "plan for the future site," to make the NWC highly successful as a best-in-class venue. This means transitioning from a business-as-usual model of parking and access into a model that incorporates primarily structured rather than surface parking assets, leverages technology such as real-time signage and wayfinding to improve access and the customer experience, and actively promotes multimodal forms of arrival (and circulation) through effective transportation demand management.

TDM RECOMMENDATIONS

Early in the Plan development, the consultant team determined that transportation demand management (TDM) programs and policies would have a direct impact on other elements of the Plan, including how much on-site and off-site parking was needed, and where and how internal circulation could be handled. For this reason, TDM has been addressed as an early chapter in this Plan (See Chapter 3).

Based on feedback from the PMT and case studies from other similar venues, the consultant team developed a series of TDM recommendations that could realistically be incorporated at each stage of build-out and for various sizes of events and activities on the site. The various TDM interventions were tested using an analytical model called TDM+ to determine their potential range of impact on single-occupancy vehicle (SOV) arrivals, total regional vehicle miles traveled (VMT), and total demand for parking spaces. An effective combination of programs was then suggested for implementation at each stage; these are discussed on pages 3.13 – 3.30.



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The following are the other key recommendations from the TDM portion of the Plan. Please see pages 3.30-3.32 for a more detailed discussion of these recommendations.

Summary Figure 2: TDM Recommendations

PLAN RECOMMENDATIONS: TRANSPORTATION DEMAND MANAGEMENT

To be implemented by the Management Authority and Partners:

1. Create a Parking and Transportation Management Authority for the campus.
2. Hire a campus mobility coordinator.
3. Develop and implement TDM interventions by stage.
4. Consider the complete trip (origin to destination).
5. Capitalize on current branding and marketing.
6. Develop an active TDM monitoring program, and adjust programs as necessary.
7. Pursue regional TDM support from prospective partners.
8. Pursue regional TDM funding reflective of the stage of construction and the interventions pursued.
9. Begin collecting end user parking fees, separate from the ticket price, for all events including the Stock Show, once Phases 1 and 2 are operational.

See Pages 3.30—3.32 for additional discussion

SPECIALIZED VEHICLE RECOMENDATIONS

Specialized vehicles, such as trucks and trailers, have always been an essential part of operations at the NWC. They make many different types of programming and events possible—from rodeos and stock shows to concerts and festivals. As the NWC site expands, in both land area and faculties, the need for specialized vehicle staging and queuing and overnight parking is also projected to increase.

To determine the land area needed for specialized vehicle operations, the consulting team used analysis of existing conditions, plus an intensive evaluation of projected future needs—based on variables such as requirements by event type, projected livestock totals and breeds, typical vehicle size, and arrival and departure schedules. Many of the assumptions related to future growth were vetted with NWSS and with other technical advisory groups representing vendors, exhibitors, and rodeo operations. For non-NWSS events, the type of event, frequency of events, probability of overlap, and typical truck-trailer dimensions were analyzed.

In addition to the above, the consultant team also looked at whether the land area for specialized vehicles could be used more efficiently by consolidating staging, queuing, and storage activities into a few designated locations and by improving these locations with permanent infrastructure such as lighting, security, services, striping, and lane



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delineations (appropriate for oversized vehicles). In total, the consultant team calculated the following needs for specialized vehicle operations after Phases 1 and 2 are complete and at full build-out:

Summary Figure 3: Projected Spatial Needs for Specialized Vehicles

Timeframe	Type	NWSS	Large/Concurrent Event
Phase 1&2 Operational	Staging	6.7 acres	3.3 acres
	Storage	26.9 acres	6.6 acres
	Total	33.6 acres	9.9 acres
Full Buildout	Staging	6.7 acres	3.8 acres
	Storage	28.1 acres	7.5 acres
	Total	34.8 acres	11.3 acres

Note that the space needed at individual buildings for load- and unload activities (loading animals in pens at the stock yards for example), is not reflected in this calculation but would be handled as part of the programing effort for the internal site.

Based on the consultant team's analysis the following recommendations are made related to Specialized Vehicles.

Summary Figure 4: Specialized Vehicles Recommendations

PLAN RECOMMENDATIONS: SPECIALIZED VEHICLES

1. Plan for the future site. *(Management Authority and Partners)*
2. As part of Placemaking, evaluate core site access and load-in/load-out needs for various venues. *(Placemaking Team)*
3. Identify 11.3 acres, on-site or near-site, for full-time improved specialized vehicle storage, staging, and queuing. *(Placemaking Team)*
4. Consider improving Lot F, or similar near-site alternative, for full-time specialized vehicle operations and add a smaller lot (or lots) closer to the core campus to address remaining acreage. *(Placemaking Team/ WSSA)*
5. Re-evaluate use of the Coliseum North Lot for Rodeo functions to free up space for passenger vehicle parking. *(Placemaking Team/ WSSA)*
6. Identify off-site locations (up to 23.5 additional acres) for temporary specialized vehicle storage needs during the NWSS event. *(Management Authority and WSSA)*

See Pages 4.13-4.14 for additional discussion



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PARKING RECOMENDATIONS

Parking is a central issue for the NWC because it directly impacts users' ability to access the site. The campus, and the Stock Show specifically, have traditionally generated a large need for parking, as many attendees arrive from out-of-state locations and a large proportion arrive by personal vehicle.

To determine a "right-sized" recommendation for parking facilities on the site, the Consultant team developed a research-driven parking model which incorporated statistics collected during the 2015 and 2016 Stock Shows, plus attendance and other metrics provided by team partners including NWSS, the Coliseum, and the City. The following variables were analyzed in the model:

- Current and future event schedules and the potential increase in the number of events on the future site,
- Projected facilities and event capacity at different stages of the Master Plan,
- Typical arrival and length of stay patterns for NWSS attendees and other groups such as vendors, employees, volunteers, and exhibitors,
- Projected persons per car for different types of events and different user groups,
- The potential impact of transportation demand management programs to reduce (some percentage) of parking demand, and
- Design day considerations, including how many dates per year were expected to generate parking needs at a given level.

In keeping with other sections in the Plan, results from the parking demand model were organized by both build-out stage and by projected activity level. These levels range from a Stock Show weekend (as the largest event type) to a typical day. Since parking capacity is cited as a common issue on the NWC campus, the existing inventory of spaces was not factored into the demand analysis. This approach ensured that the demand model was calibrated to project actual parking demand at future stages of build-out, assuming that 100% of demand could potentially be accommodated in some combination of on-site and off-site resources. The following table provides results from our analysis:

Summary Figure 5: Parking Demand Projections by Scenario

	Stock Show Weekend	Large Event / Festival / Concurrent Event	Typical Day
Baseline	9,600	N/A	N/A
Pre-Construction	9,500	3,600	260
Phase 1-2 Construction	9,800	3,700	260
Phase 1-2 Operational	10,700	5,500	400
Full Build Out	12,200	7,500	1,100



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After careful consideration of the number of dates generating parking demand at each level of activity, the tradeoffs between parking infrastructure and other building infrastructure, and various parking design and service considerations, the consultant team arrived at the following recommendations:

Summary Figure 6: Parking Infrastructure Recommendations

PLAN RECOMMENDATIONS: PARKING INFRASTRUCTURE

1. Plan for the success of the future site. *(Management Authority and Partners)*
2. Accommodate 100% of parking demand for all activity levels with a combination of on- and off-site parking resources, after accounting for TDM reductions and other key factors. *(Management Authority and Partners)*
3. Build 7,500 parking stalls on- or near-site, including 6,000 permanent parking stalls and 1,500 flexible or semi-permanent parking stalls. *(Placemaking Team)*
4. Accommodate remaining parking demand for the nine busiest NWSS events using a combination of off-site parking resources. *(Management Authority and Partners)*
5. Reevaluate parking infrastructure needs based on the success of TDM interventions and resulting parking demand reductions over the course of construction. *(Management Authority and Partners)*

For Programming Consideration:

1. In later phases, provide one-for-one replacement of the entire Coliseum surface lot. *(Placemaking Team)*
2. Add a parking garage specialist to the Placemaking team prior to finalizing garage programming. *(Placemaking Team)*
3. Design any structured parking to accommodate event volume egress in 30 minutes or less. *(Placemaking Team)*
4. Provide (where possible) above-grade structures due to service level, efficiency, and cost. *(Placemaking Team)*
5. Provide higher floor-to-floor heights in structures (on the ground level) to allow for future flexibility for adaptive re-use and/or to accommodate specialized vehicles. *(Placemaking Team).*

See Page 5.22 for additional discussion

A preliminary parking infrastructure phasing strategy for the site is depicted in the Plan on pages 5.12 – 5.16. Conceptually, three parking garages are programed on the site of between 1,000 and 1,500 space each to address the recommended total of 6,000 permanent parking stalls on the site.



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ACCESS AND OFF-SITE RECOMMENDATIONS

At present, the NWC access system focuses primarily on people arriving to the site using personal vehicles, as well as roadway access for specialized vehicles. As the site develops into a year-round center of activity and broadens its programming, a more integrated access plan is envisioned. Planned transportation system infrastructure improvements in areas surrounding the site—from key arterials like Brighton Boulevard to the RTD light and commuter rail network—will bolster this approach.

To analyze ideal access conditions for NWC, the consultant team reviewed best practices from similar large event venues and reviewed the analysis provided in earlier sections of the Plan to help quantify the projected need for access infrastructure. For example, the earlier recommendation in Chapter 3 envisions an extensive need for infrastructure to support TDM programs – including pick-up/drop-off locations for RTD shuttles and for rideshare services such as Uber and Lyft. For the largest events, such as a Stock Show weekend, the site must also accommodate an extensive shuttle program to bring employees and visitors from off-site parking facilities. These off-site lots are intended as intercept points for vehicular arrivals from the north, south, east, and west of the site. Parking shuttle operations are discussed in more detail on pages 6.15-6.16 and in the report appendix for this chapter.

To enable these access systems to function effectively, the consultant team developed the following recommendations:



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Summary Figure 7: Site Access Recommendations

PLAN RECOMMENDATIONS: SITE ACCESS AND OFF-SITE SOLUTIONS

1. Around the Site:

- a. Develop Mobility Hubs closely linked to facilities, internal circulation, and external access routes. *(Placemaking Team)*
- b. Utilize Mobility Hubs as “doorways” to the NWC site, complete with amenities and branding in keeping with the NWC vision. *(Placemaking Team)*

2. On-Site:

- a. Develop permanent infrastructure to accommodate TNC (uber/lyft) pick-up and drop-off locations, back-of-house/specialized vehicle entry, bicycle, and pedestrian connections. *(Placemaking Team)*
- b. Develop temporary infrastructure to accommodate shuttle queuing on days when the shuttle operation is in use. *(Placemaking Team/WSSA)*
- c. Identify and implement controlled access points for specialized vehicles and NWC-managed or owned passenger carriers, such as shuttles. *(Placemaking Team/WSSA)*

3. Off-Site:

- a. Identify off-site parking locations for up to 7,000 stalls—4,000 stalls at Phase 1 and 2 Operational (estimated 7 locations) and 7,000 stalls at Full Buildout (estimated 9 locations). *(Placemaking Team)*
- b. Plan for a shuttle operation increasing in magnitude over the course of campus implementation. *(Placemaking Team)*
- c. Identify funding to implement the shuttle operation by stage. Adjust funding based on the Authority's usage of off-site parking resources. *(Management Authority and Partners)*
- d. Utilize customer service interventions to encourage and simplify usage of off-site parking resources. *(Management Authority and Partners)*

See Page 6.18 for additional discussion

PARKING MANAGEMENT AND TECHNOLOGY RECOMMENDATIONS

As the NWC campus undergoes a major transformation, it is likely that the traditional methods of operating parking on-and near the site must change along with it. Though the Master Plan for the site is unique, particularly in terms of scope and scale, major transformations in parking management approaches are not uncommon for similar event venues around the country. In most cases, an upgrade to the parking system is a way to refresh and/or expand the



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venue, improve perceptions of the space, and enhance the overall experience for all user groups. The vision for this transformation for NWC emphasizes increased efficiency in how space is used on the campus (with increased density and design flexibility). When paired with projected future growth in attendance, it is imperative that the campus adapt to how user groups gain access to the site, and how access options and routes are best to communicated.

The following are the consultant team's key recommendations regarding parking management and technology:

Summary Figure 8: Parking Management and Technology Recommendations

PLAN RECOMMENDATIONS: PARKING MANAGEMENT & TECHNOLOGY

1. Maximize customer service and satisfaction for on- and off-site parking locations, utilizing information, technology, and parking management interventions. *(Management Authority and Partners)*
2. Use technology tools to communicate off-site and internal shuttle routes and arrival times. *(Management Authority and Partners)*
3. Begin applying parking fees/generating revenue once Phase 1 and 2 are operational; use improved technology to allow for integration of revenue controls and parking availability. *(Management Authority and Partners)*
4. Restripe/improve the coliseum lot and add parking guidance systems and/or occupancy sensors to this location. *(Placemaking Team)*
5. Add parking guidance systems and real-time availability signage to any new parking facilities developed on the campus. (over 100 spaces) *(Placemaking Team)*
6. Consider hiring additional full-time parking staff and/or contracting with a professional 3rd party operator to reduce the reliance on seasonal hires. *(Management Authority and Partners)*
7. Conduct regular system-wide financial and operational audits; track customer satisfaction using survey techniques. *(Management Authority and Partners)*
8. Consider best practices to limit impacts on parking infrastructure in surrounding neighborhoods. *(Management Authority and Partners, with significant participation specifically from CCD)*

See Pages 7.20-7.21 for additional discussion

FINAL COMMENTS ON THE RECOMMENDATIONS

We encourage the reader to review the rest of this Plan in its entirety to get a better sense of the rigor that went into developing these recommendations. The Plan also includes important details on how the various recommendations might be implemented to ensure the success of the future site.



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LIST OF TECHNICAL TERMS AND ABBREVIATIONS

- **ADAAG:** Americans with Disabilities Act Accessibility Guidelines. Originally published in 1991 but superseded by more recent publications including the DOJ's 2010 ADA Standards for Accessible Design. Generally, these publications define the required number of, location, and design standards for accessible (ADA) parking spaces and many other related items including pedestrian/wheelchair path of travel.
- **Adaptive Reuse:** The ability of a building to be re-commissioned for another purpose, such as a parking garage being converted to retail or residential uses in the future.
- **Baseline Conditions:** For the purposes of this Plan, references in the document to "baseline" or "existing" conditions refer to the 2015 and 2016 Stock Shows and 2016 events calendar; this is when most of the data was collected for this analysis. Changes that impacted the 2017 stock show or calendar year are noted in some instances, but are not considered to be part of the baseline.
- **CCD:** City and County of Denver.
- **Design Day:** An industry-standard concept (used by many in the planning, design, and engineering disciplines) that generally means the maximum set of conditions, or "day," that a system is designed to handle on a regular basis. For example, a parking system planned for the 95th percentile design day would accommodate the peak needs for the vast majority of dates, though a small number of days may generate parking demand exceeding system capacity. These atypical days may require special accommodations such as off-site or temporary parking resources, valet accommodations, and/or increased reliance on multi-modal alternatives.
- **EV:** Electric Vehicle.
- **GLO:** Globeville Landing Outfall. A project impacting the southern portion of the Coliseum parking lot.
- **ITS:** Intelligent Transportation System. A broad term that generally refers to technologies that allow end users to make better informed and safer decisions regarding the use of transport networks. These systems often include real-time roadway signage to inform drivers of upcoming traffic issues, and provide information as to parking locations, pricing, and/or availability.
- **Management Authority or "Authority":** An entity, created by the City and its partners, responsible for management of the National Western Center.
- **Multi-modal Access:** Refers to the range of non-driving alternatives to access the site including rail, walking, biking, drop-off, shuttle, bus, TNC (Uber/Lyft), and other options.
- **NDCC:** North Denver Cornerstone Collaborative.
- **NWC:** National Western Center (the site).
- **NWCCAC:** National Western Center Citizens' Advisory Committee.
- **NWCO:** The Mayor's Office of the National Western Center.
- **NWSS:** National Western Stock Show and Rodeo (the major 16-day event).



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- **PARCS:** Parking Access and Revenue Control Systems. Includes various elements that are critical to the management of an integrated parking system including gates, payment kiosks, mobile phone payment applications, space sensors, in-lane vehicle detectors, and hand-held units used by parking attendants during events.
- **Parking Efficiency:** Generally, the average square footage per parking space in a given facility, which is calculated as total area divided by total spaces; this calculation includes circulation such as ramping and drive aisles.
- **Parking Ratio:** The number of parking spaces required per population, such as attendees (usually less than 1.0), or per 1,000 square feet of new building programming. For example, if most attendees for a given event arrive by car, with 3-4 people per car, the demand ratio would be expected to be between 0.25 and 0.33 /attendee.
- **SOV:** Single-occupancy vehicle.
- **Stock Show:** Short-hand for the National Western Stock Show.
- **The Plan:** This document, the *Parking & Transportation Demand Management Plan*.
- **TAG:** Technical Advisory Group.
- **TDM:** Transportation Demand Management. A grouping of programs and policies, including both incentives and disincentives, aimed to reduce reliance on single occupancy vehicles, promote use of multi-model alternatives, and/or reduce vehicle miles traveled.
- **TNC:** Transportation Network Company; the technical term for most ride-hailing services, including Uber and Lyft.
- **VMT:** Vehicle miles traveled; a key outcome of the TDM section of this Plan is to promote VMT reductions within the region.
- **WALKER / Fehr&Peers / OV:** Members of the planning team.
- **WSSA:** Western Stock Show Association.

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CHAPTER 1: CONTEXT AND VISION



WHAT'S IN THIS SECTION?

- Plan Organization
- Plan Introduction
- Guiding Principles
- Agency, Stakeholder, and Community Involvement
- Plan Scenarios

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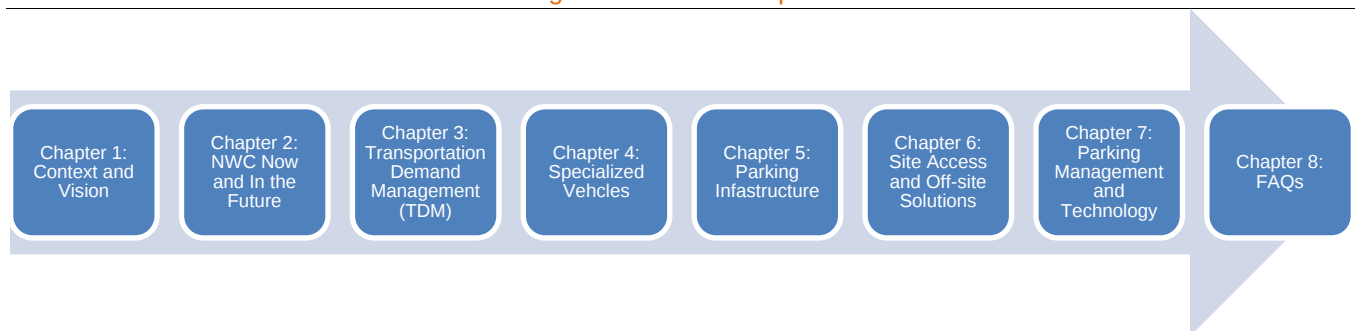
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PLAN ORGANIZATION

This Plan is structured to provide context in Chapters 1 and 2, and then to delve into technical analysis and recommendations in Chapters 3 through 7. Chapter 8 provides answers to frequently asked questions about the Plan. The chapters are organized as shown in Figure 1.1 below:

Figure 1.1: Plan Chapters



**Additional information and backup material is included in the Appendices section at the end of the Plan and is also organized by related Chapter*

The next chapter, “NWC Now and in the Future,” identifies baseline conditions and context on the NWC site and outlines future development, as conceptualized by the 2015 Master Plan and more recent updates for Phases 1-2 (as of July 2017).¹ Following, this document is divided into five distinctive yet interrelated chapters that encompass analysis and recommendations: TDM, Specialized Vehicles, On-Site Parking, Access and Off-Site Solutions, and Management and Technology. Each of these sections includes:

- Objective
- Relationship to the National Western Center
- Analysis
- Key Findings
- Recommendations

WHAT IF I DON'T HAVE MUCH TIME?

This Plan is organized in a manner to provide both detailed analysis and a “plan within the plan” summary so that the document can be absorbed on a quick pass rather than a detailed read-through. For example, the first page of each Chapter provides an outline of the contents, while key recommendations are presented in a summary text box toward the end of the chapter, beginning in Chapter 3. For even quicker reads, we would recommend a review of the Executive Summary, which summarizes the plan scope and recommendations, as well as Chapter 8: Frequently Asked Questions (FAQs), which answers a series of questions about the Plan.

¹ Build-out plans for the site will continue to change as various funding, phasing, and programming elements are refined. In many instances, this Plan makes recommendations based on the best assumptions of future conditions that were available as of mid-2017 when this analysis was being developed. Much of the baseline information for this Plan was collected during the 2015 and 2016 Stock Shows. Parking and transportation operations (including the locations available for parking) tend to vary from year to year, as discussed in Chapter 2.



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PLAN INTRODUCTION

The National Western Center (NWC) campus in north Denver is best known as the home of the National Western Stock Show and Rodeo (NWSS or "Stock Show"), which has been held at the venue every January since 1906. The 16-day event, which attracts more than 600,000 attendees per year, is one of the most heralded western and livestock shows of its kind in North America, and a point of nostalgia and pride for many Denverites.

In addition to the Stock Show, the NWC campus is used year-round for several hundred additional events ranging from smaller meetings and banquets, to larger music festivals, consumer trade shows, sporting events, rodeos, and other livestock and animal events. Over the years, the campus has begun to feel the effects of its aging building infrastructure with major limitations related to access and circulation. These, and other constraints, have limited the campus's ability to expand or to fund the upgrades to facilities that are needed to successfully compete for shows and events on a national level.

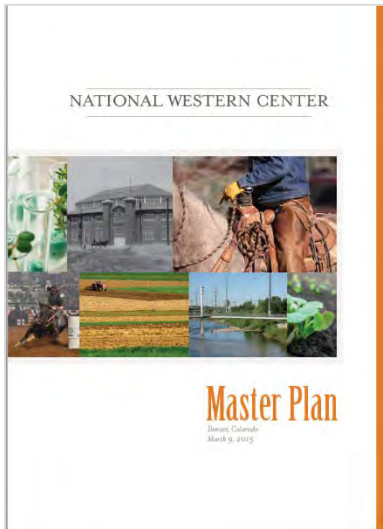
In 2011, then mayor-elect Michael Hancock began to tackle the question of how to best support the NWC campus. The mayor requested that NWSS provide a business plan, facilities plan, and financing plan to determine if the venue could be significantly upgraded at its current location, or if NWSS would need to relocate to an alternative site. Based on the findings of these plans, it was determined that a considerable effort should be made to keep the NWSS in north Denver by investing significantly in the needed infrastructure upgrades. To this end, the Mayor's Office of the National Western Center (NWCO) was founded and a Master Plan was commissioned to help set the vision for the site. The Master Plan was completed in 2015 by a team of consultants headed by Parsons-Brinkerhoff (now WSP). A major effort was also put in place to identify and secure funding for the ambitious project.

Then, in November of 2015, City of Denver voters passed ballot measure 2C. This measure extended an existing tourism tax on hotels and rental cars and allocated a portion of the funding (via a Regional Tourism Act grant) to redevelopment efforts at the NWC campus. This measure, along with State support and key partnerships with the WSSA, CSU, the Museum of Nature and Science, and History Colorado, have helped to kick-start redevelopment efforts and provided funding for the first two phases of the overall development plan. Though they are not yet funded, six additional phases are envisioned for full buildout of the NWC site.

The initial redevelopment effort is expected to exceed \$1.1 billion in public and private investment over the next ten years. The project will fundamentally reshape the landscape of the venue and dramatically improve connectivity to, from, and between surrounding north Denver neighborhoods including River North (RiNo), Globeville, and Elyria-Swansea. As one of five major re-development efforts of the North Denver Cornerstone Collaborative (NDCC), the NWC project is tremendously important in terms of both cultural impact and Citywide mobility. The redeveloped NWC, coupled with improvements to Brighton Boulevard, is expected to create a new "gateway" into downtown and showcase the site for both visitors and locals.

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The 2015 Master Plan contains an expansive vision for the campus, including the Denver Coliseum site, to turn this venue into a year-round destination and regional asset. At full build-out, the roughly 250-acres (as proposed) are envisioned to include the following future land uses:

- A new Equestrian Center, Livestock Center, Trade Show and Exhibition Hall, Stadium Arena, and removable stockyard pens to support the stock show and other livestock events;
- A new CSU Center which is envisioned as a hub for agricultural research, education, and agro-business investment;
- A new water resource center for research and education, plus new park and open spaces along the river;
- Proposed (longer-term) redevelopment of the Coliseum, which may serve as a regional marketplace;
- A new transit hub focused around the RTD "N" Line which will provide direct access to the site; and,
- New vehicular, pedestrian, and cycle connections to the surrounding neighborhoods.

Major themes highlighted in the Master Plan include preservation of western heritage (which has long been a part of the NWSS), the ability of the Stock Show and other events to operate successfully, expanded educational opportunities, and sustainability of the design and infrastructure. The plan includes phasing that will allow the venue to conduct existing operations while the redevelopment efforts take place.

To help facilitate this vision for the NWC campus, the City, and specifically NWCO, has initiated several projects to prepare the site for initial redevelopment efforts and long-term outside investment. Recent and ongoing City projects include rail consolidation, land acquisition, and infrastructure planning—said infrastructure planning, spearheaded by NWCO, lead to the creation of the NWC *Parking & Transportation Demand Management (TDM) Plan*. This plan (referred to as the "Plan" for purposes of this document) will be used by the City to

establish a set of technical findings and recommendations for the site related specifically to access. This Plan addresses questions such as how much parking demand the site will generate over time, and what transportation infrastructure initiatives and programs should be pursued.

As shown in Figure 1.2 below, this Plan will be incorporated into the next step of Master Plan implementation which is the Placemaking Study. The Placemaking team, headed by the consulting firm MIG, is tasked with creating the final site plan which will assign implementation priorities for the parking and transportation systems, along with other elements including building infrastructure and site utilities. The overall Program Manager (CH2M) is tasked with completing the necessary steps to get the site ready for construction of Phases 1 and 2 of the long-term build-out, and to oversee the construction of these phases on behalf of NWCO.

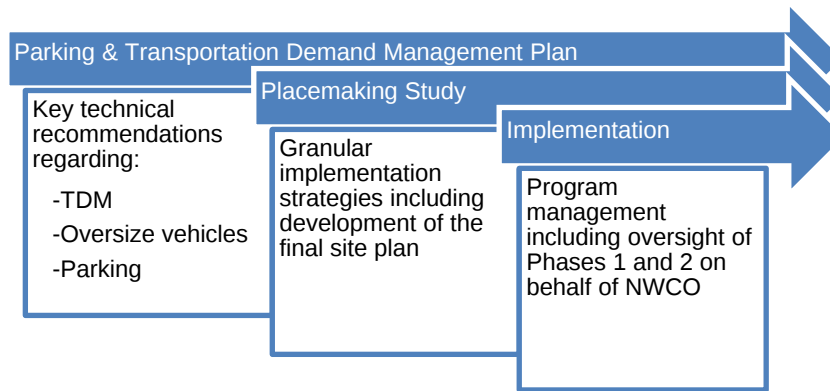
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Figure 1.2: Parking and TDM Plan Scope and Next Steps



KEY CHALLENGES TO BE ADRESSED BY THIS PLAN

There are several key challenges that the *Parking & Transportation Demand Management Plan* will seek to address; these key questions are outlined below. Some of these challenges are unique to this site, given the types of uses and events that are envisioned and the site's location in relationship to the rest of the City.

Aerial view of the NWC site from I-70 East



1. How much parking is needed for the site for various events and activities? The site is envisioned as a mixed-use, year-round venue with various elements that will need different amounts of parking at different times. This includes accommodations for the National Western Stock Show, which attracts many types of vehicles including trucks, trailers, and larger passenger vehicles. Additionally, many Stock Show patrons drive to the venue from surrounding states. At the same time, the site is located in a relatively urban context and cannot spare the space needed to build out with large fields of surface parking. Right-sizing the parking system for this venue is one of the most important outcomes of this Plan.

2. How can the management authority leverage other transportation infrastructure investments? Significant investments have already been made in developing many of the City's access systems including cyclist and pedestrian infrastructure, the RTD A Line to the Denver International Airport, and the RTD N line, which will be constructed through the NWC site. Additionally, there are several major venues in the region that have significant parking available that could be leveraged (as they have in the past) to help support



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the larger events at NWC. The City envisions a highly multi-modal solution for the NWC campus. Solutions in this Plan will address vehicular access and parking needs, but will also address planning for pedestrians, bicycle, rail, shuttle, Uber/Lyft/taxi, and off-site parking connectivity, and will incorporate a wide variety of TDM programs and strategies to encourage usage of options outside of the passenger vehicle.

3. How will phasing of the Master Plan be addressed? Phasing of the parking and transportation systems will be a key element of this Plan, as the NWC will need to continue to function successfully during all construction phases. Additionally, full build-out of the site is anticipated to take place over ten-plus years, which is a significant period of time over which transitions in parking and access infrastructure, and even patron behaviors, may occur. Future chapters of this Plan address both phasing and how the system may adapt over time to changing transportation behaviors.
4. How can parking and transportation demand management help to promote efficiency campus-wide? The planning team for this engagement has thought carefully about the future of parking, and how parking and transportation assets can be leveraged to support efficiency of the NWC campus and surrounding assets. This Plan addresses topics such as transportation planning, parking sustainability, and adaptive reuse (i.e., what can be done with the infrastructure if the driving landscape changes radically over the next ten to twenty years). TDM is a key chapter within this plan and addresses how policy changes can be leveraged to reduce single occupancy vehicle trips to the site and also reduce overall vehicle miles travelled within the regional context.
5. How can parking and transportation demand management be used to maintain and bolster the success of events on the NWC site? This Plan has set forth recommendations that embrace the ambitious increases in programming and attendance expected for the NWC campus. The planning team understands the importance of parking and transportation assets to the success of all NWC events, and has been sensitive to the needs of particular users—such as exhibitors and vendors—when evaluating parking supply and making assumptions about how TDM will influence parking needs. Ultimately, this Plan sets forth specific accommodations for every user, whether they drive, take public transit, bicycle, or use any of the many other transportation options available to them.

SCOPE OF WORK

The consulting team for this effort is led by the City's project manager, supported by a consultant team including WALKER Consultants, with sub-consultants Fehr & Peers, and OV Consulting. The consultant team scope of work was divided into nine tasks as follows:

- Task 1: Project Management
- Task 2: Define Plan Goals and Objectives
- Task 3: Public Involvement
- Task 4: Document Existing Conditions
- Task 5: Identify Parking User Group Requirements
- Task 6: Evaluate Parking Demand and Identify Transportation Demand Management (TDM) Strategies
- Task 7: Identify Parking (and Oversize Vehicles) Infrastructure Needs
- Task 8: Develop Access and Circulation Plans
- Task 9: Identify Public-Private Opportunities, Parking Management, and Technology Opportunities

Many of the specific tasks, such as Project Management, Goals, and Objectives, and Public Involvement have informed all aspects of this plan and therefore do not have a specific chapter devoted to them. Instead, this document is organized around the key outcomes and recommendations from this Plan.

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GUIDING PRINCIPLES

Every plan needs a guide. The guiding principles for the National Western Center *Parking & Transportation Demand Management Plan* was developed through a combination of:

- Direction from previous planning documents related to the site, such as the Campus Master Plan Vision, Values, and Goals statement, as well as vision and mission statements from site partners (including the North Denver Cornerstone Collaborative, the City, the WSSA, and others);
- Input from partners and stakeholders; and,
- Industry best practices.

The result is an achievable set of goals, referred to as the Guiding Principles, meant to shape the NWC parking and transportation system, and ensure that the system embodies larger social, economic, and environmental goals.

As components of the various Chapters were developed, the Guiding Principles (Figure 1.3) shaped methodology, recommendations, and guidelines for implementation. Each section of this Plan strives to address the underlying intent of these guiding principles, and they will be referenced throughout the document.

Figure 1.3: Guiding Principles

Site Access	Parking Infrastructure, Management, and Policy	Transportation Demand Management
•Accommodate current and future needs for access to, from, and through the site. •Promote pedestrian, bicycle, and light vehicle connections as the primary means to circulate within the site. •Create multiple entry portals or "doorways" to distribute site access and promote a welcoming campus environment.	•Enable growth in attendance, number, and type of events by right-sizing parking infrastructure. •Establish policies, technologies, and strategies that promote a high level of service. •Recommend design standards for parking infrastructure that allow for future flexibility. •Enable year-round efficient use of existing and new infrastructure.	•Develop multi-faceted TDM strategies that maximize person trips. •Encourage multimodal transportation usage through a combination of proven strategies. •Ensure success of TDM strategies through active management and monitoring.



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AGENCY, STAKEHOLDER AND COMMUNITY INVOLVEMENT

OVERVIEW

The involvement strategy was a coordinated effort to establish communication methods and practices that work cohesively for the City and the project team, and used to directly inform the technical planning process. Engagement and input were rooted in a broadly representative PMT that demonstrated the interests and concerns of many community organizations and agencies. The focused dialogue with the PMT was enhanced through engagement with the NWCCAC, comprised of area businesses and residents.

The goals of the engagement strategy for the *Parking & Transportation Demand Management Plan* included the following:

- Enable conversation, input, and guidance from the Project Management Team
- Ensure the concerns of area businesses and community members are reflected in the development of strategies/solutions
- Establish opportunities to provide clear and consistent communication on project progress

THE PROJECT MANAGEMENT TEAM

The PMT provided project leadership, guidance, and input to the technical process. The group was composed of City staff, consultant staff, and representatives from key partners and Stakeholders, including the WSSA, Denver Coliseum, the RiNo BID/GID, CSU, RTD, DRCOG, and CDOT. The group acted as a sounding board for project progress and decision points, and the PMT meetings served as a forum for discussion and review, and coordination with other ongoing and related projects, departments, and studies.

PMT members actively represented their associated organizations, agencies or departments and were responsible for sharing project progress or updates with the constituents they represented.

PMT Members included:

- o Eric Anderson, NWCO/CH2M
- o Elizabeth Ashby, Public Works
- o Lenore Bates, CDOT
- o Kyle Baun, NWSS
- o Lacy Bell, RTD
- o Tad Bowman, Denver Coliseum
- o Scott Burton, Public Works
- o W. Celeste Davis Stragand, DRCOG
- o Aaron Fodge, CSU
- o Emily Gloeckner, Public Works
- o Fred Haberecht, CSU
- o Ann Hayes, NWCCAC
- o Danny Herrmann, CDOT
- o John Hersey, RTD
- o Jocelyn Hittle, CSU

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- o Gretchen Hollrah, NWCO
- o Kye Holtan-Brown, NWSS
- o John Karner, Finance
- o Elizabeth Kemp, CDOT
- o John LaSalla, Public Works
- o Kelly Leid, NWCO
- o Jamie Licko, RiNo BID/GID
- o Erika Martinez, NWCO
- o Steve Nalley, Community Planning and Development
- o Patrick O'Keefe, NWCO/CH2M
- o Cindy Patton, Public Works
- o Stephanie Reed, NWCO
- o Jay Renkens, MIG
- o Steven Rijo, Public Works
- o Ron Rohr, NWSS
- o Shawn Ropp, CSU/Icon
- o Melissa Rosas, NDCC
- o Michael Sapp, NDCC/NWCO
- o Sam Stevens, NWCO/CH2M
- o Lisa Streisfeld, CDOT
- o John Toebbe, NWSS
- o Todd Wenskoski, NDCC
- o Jason Whitlock, Community Planning and Development

Project Manager (City and County of Denver):

- o Chris Proud, NDCC

Consulting Staff:

- | | |
|---|------------------------------------|
| o Jeremiah Simpson – WALKER Consultants | Mallory Baker – WALKER Consultants |
| o Chris Vogelsang – OV Consulting | Beth Vogelsang – OV Consulting |
| o Ann Bowers – Fehr & Peers | Allison Crump – Fehr & Peers |

The PMT met four times during the project with each meeting addressing key project milestones.



PMT Meeting #1 took place February 2, 2017 with over 30 attendees participating. The purpose of PMT#1 was to introduce the project team, define the role of the PMT, recap the NWC Master Plan, and review the project purpose and process. Following, the group worked in rotating breakout sessions, covering such topics as user group access needs, TDM/mode split, and parking/transit management best practices.

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PMT Meeting #2 took place March 23, 2017 with 27 attendees present. The purpose of PMT#2 was to finalize the guiding principles; review the team's analysis of the event data, existing conditions, and field interviews, describe the data's relevance and direction, review the team's proposed structure to build solutions based on balancing parking and TDM opportunities, discuss what TDM is and what it is not, discuss the TDM effectiveness tool, and conduct a TDM preferences exercise.



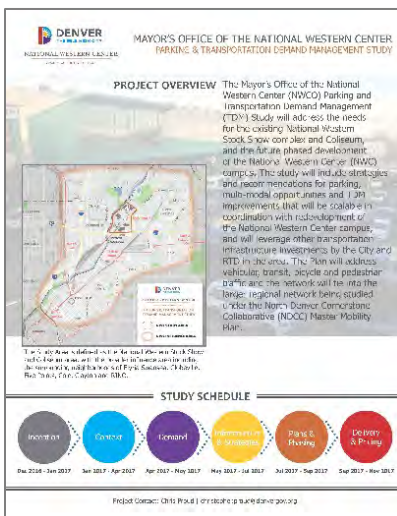
PMT Meeting #3 took place on May 18, 2017 with 19 attendees. The purpose of PMT#3 was to describe the parking demand modeling process including research and development and sources of input for the model, discuss demand calculations and assumptions (formula for determining demand outputs) and parking demand by scenario (taking into account parking demand reductions as a result of TDM strategies and interventions), discuss TDM influences including TDM factors and strategies considered, and expand on research conducted and TDM's influence on trips and parking.

PMT Meeting #4 took place on November 9, 2017. Findings and recommendations from the Plan were presented to the group. The full report will be made available to PMT members in early 2018, after a review and comment period with equity partners.

TAG MEETINGS

At various times throughout the project, the team (together and on an individual basis) met with representatives of the WSSA, RTD, NDCC, CCD Public Works, and NWCO for technical coordination of this study. A total of over 10 technical advisory group (TAG) meetings were conducted over the course of this analysis.

PUBLIC INFORMATION AND CITIZENS ADVISORY COMMITTEE PARTICIPATION



Public communication and input was designed to ensure inclusivity and community awareness of the overall progress, timeline, and scope of this technical study. The project team created opportunities to maintain clear and consistent communication and project updates through NWCO and NDCC Newsletter updates and community fact sheets. The project website was housed at the Office of the National Western Center website:

<https://www.denvergov.org/content/denvergov/en/north-denver-cornerstone-collaborative/national-western-center/NWCParkingTDMStudy.html>.

Additionally, the project team utilized the CAC as a forum for sharing information and to receiving critical input. The team presented to the CAC at the onset of the project to share the study purpose and schedule and to gather initial input on community parking concerns related to the NWC site. A second presentation took place on March 30, 2017 to share the parking demand methodology and results. Findings were presented to the CAC on October 26th,

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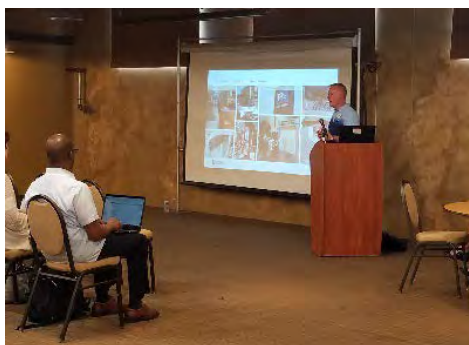
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and a final meeting is scheduled in January 2018 to present recommendations of the study for feedback. The CAC provided extensive input on process and findings at key milestones.

PUBLIC OPEN HOUSE

Public input for the study was informed by the community development processes for various recent planning efforts, including the Elyria and Swansea Neighborhoods Plan, the Globeville Neighborhood Plan, and the Master Plan. These plans identified the community's and stakeholder's interests and concerns regarding future parking supply and location.



The team conducted a project public meeting / open house on June 21, 2017 at the NWSS campus. The objective was to discuss the project process, potential demand for parking, and the role of TDM today and in future phases. The project team presented information on future parking demand and key strategies and listened to community member feedback

on findings. The team answered questions and engaged community members at information stations, including: Plan Context and Overview, Existing Conditions, Parking Demand Modeling, and TDM Influence. Many residents and stakeholders discussed parking concerns and operational needs over an aerial map of the area. There was also a TDM polling station where the public gave input to specific questions about the preferences in TDM approaches. Approximately 40 people attended the open house and translation or interpretation services were available.

Public input was integral to the planning process, and was used in a variety of ways to inform process, findings, and recommendations.

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PLAN SCENARIOS

Due to the complexity of the site and its proposed programming, this Plan uses a scenario matrix to assess findings and recommendations. This scenario matrix, shown below and discussed briefly below the table, provides a framework for analysis by stage of construction (Baseline, Pre-Construction, Phase 1 and 2 Under Construction, Phase 1 and 2 Operational, and Full Buildout) and activity level (Typical Day, Large/Concurrent Event, and Stock Show Weekend).

Figure 1.4: Plan Scenarios – Organized by Stage and Activity Level

		Activity Levels		
		Stock Show Weekend	Large Event / Festival / Concurrent Event	Typical Day
Development Stages	Baseline	Scenario 1	N/A	N/A
	Pre-Construction	Scenario 2	Scenario 3	Scenario 4
	Phase 1-2 Construction	Scenario 5	Scenario 6	Scenario 7
	Phase 1-2 Operational	Scenario 8	Scenario 9	Scenario 10
	Full Build Out	Scenario 11	Scenario 12	Scenario 13
				

Stages: The final site plan and schedule are still being developed; therefore, this Plan uses broader stages (such as Pre-Construction and Phases 1-2 Under Construction) to define certain periods of time when site conditions related to parking and access will be generally similar. Each stage is expected to cover between 1 and 5 years. The exception is the Final Buildout stage, which represents the site as fully developed pursuant to the Master Plan; this stage may be 10+ years into the future, depending on the speed at which future phases become funded.

Activity Levels: Based on our assessment of current and future conditions, it is assumed that the Stock Show Weekend represents the largest single-day level of activity that the site will likely experience. All other event types would fall between the Stock Show Weekend and the Typical Day. Therefore, parking and transportation programs recommended for Scenarios 2, 3, and 4 (for example) should cover most of the situations that would arise during the Pre-Construction stage of buildout.

More detail on these stages and activity levels will be discussed under future chapters of the Plan.

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CHAPTER 2: NWC NOW AND IN THE FUTURE



WHAT'S IN THIS SECTION?

- Existing Site and Access Conditions
- Campus Master Plan Phasing



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EXISTING SITE AND ACCESS CONDITIONS

At present, the National Western Center site is primarily used as the event venue for the National Western Stock Show—a 16-day event held annually in January and drawing between roughly 35,000+ and 65,000+ attendees per day in recent years. The site is also used for several hundred additional events throughout the year, such as home shows, rodeos, equestrian events, and concerts. These events vary in attendance, with the larger events drawing up to roughly 10,000+ per day. Most events utilize one or more of the major venues on the site including the Denver Coliseum, Events Center, Expo Hall, Hall of Education, and/or Stadium Arena. It should be noted that the Denver Coliseum is currently a separate event venue, owned and operated by the City; with the exception of Stock Show, this venue operates its own calendar of events, staffing, and associated parking. For the purposes of this Plan, the Denver Coliseum is considered as a part of the overall NWC site, as it is identified as part of a unified site under the 2015 Master Plan. This chapter discusses current access conditions on the site and discusses implementation of the various phases of the Master Plan.

EXISTING PARKING CONDITIONS

The parking inventory available for the Stock Show tends to vary from year to year, as NWSS typically negotiates several temporary lease agreements to augment the parking system with various near-site and off-site locations. Examples in recent years have included the Coors Field parking garage, F Lot Annex, Crystal Packaging, Pepsi Bottling Overflow Lot, Dick's Sporting Goods Park (in 2015), and others. Additionally, most parking lots on the site are unpaved and un-striped, meaning that the inventory can vary depending on how the lot is configured, or how efficiently it is used. Operations staff at NWSS also make adjustments each year in how the parking lots are used to help improve the customer experience. However, the congested street network, limited technology, signage, and parking information tools, and lack of close-in parking have been problems in recent years, especially on peak days when the demand for parking exceeds the available on-site and near-site capacity.

Based on the most recent estimates from the consultant team, as detailed below, parking options for Stock Show attendees and visitors, employees, exhibitors and vendors, and others, include a total usable inventory of roughly 9,300 stalls. The estimated available inventory includes roughly 4,800 spaces in on-site lots, 1,900 spaces in near-site lots, and 1,300 spaces in off-site lots, all either owned or temporarily leased by the Stock Show, WSSA, and/or City partners. Privately owned and operated lots in the immediate vicinity and on-street parking accounts for roughly 1,200 additional stalls.

The following figures (Figures 2.1 and 2.2) include graphical depictions and tables showing the “Baseline” parking inventory for NWSS events by type and location. Note that several variables complicate the parking inventory figures, leading to multiple discussions during the Plan development process as to the true capacity and what exactly should be considered part of the “baseline” parking inventory for the site. The consultant team performed extensive due diligence for this analysis to provide the most accurate estimates possible for this Plan. The following research was conducted to arrive at the totals below:

- Conducted two site visits, guided by NWSS staff, during Stock Show 2017 to glean a general understanding of parking conditions and operations on the site
- Conducted on-site counts to verify parking inventory at striped locations such as the Coliseum lot and reviewed prior inventory counts for other locations collected by OV Consulting for the 2015 and 2016 stock Shows
- Conducted 2 TAG meetings with NWSS staff to discuss parking inventory, uses of parking facilities, and existing and projected changes to parking inventory

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- Surveyed project managers of various projects impacting parking inventory in the near future (e.g. Pepsi Bottling, GLO, Adams County, and CDOT I-70)
- Conducted aerial surveys of parking facilities to estimate square footage and inventory based on NWSS-provided parking dimensions (stalls and drive aisles)
- Provided conceptual lot layouts for lots were estimated inventories varied significantly from historical records and confirmed these findings with NWSS staff during a focused work session

Figure 2.1: Parking Inventory Snapshot

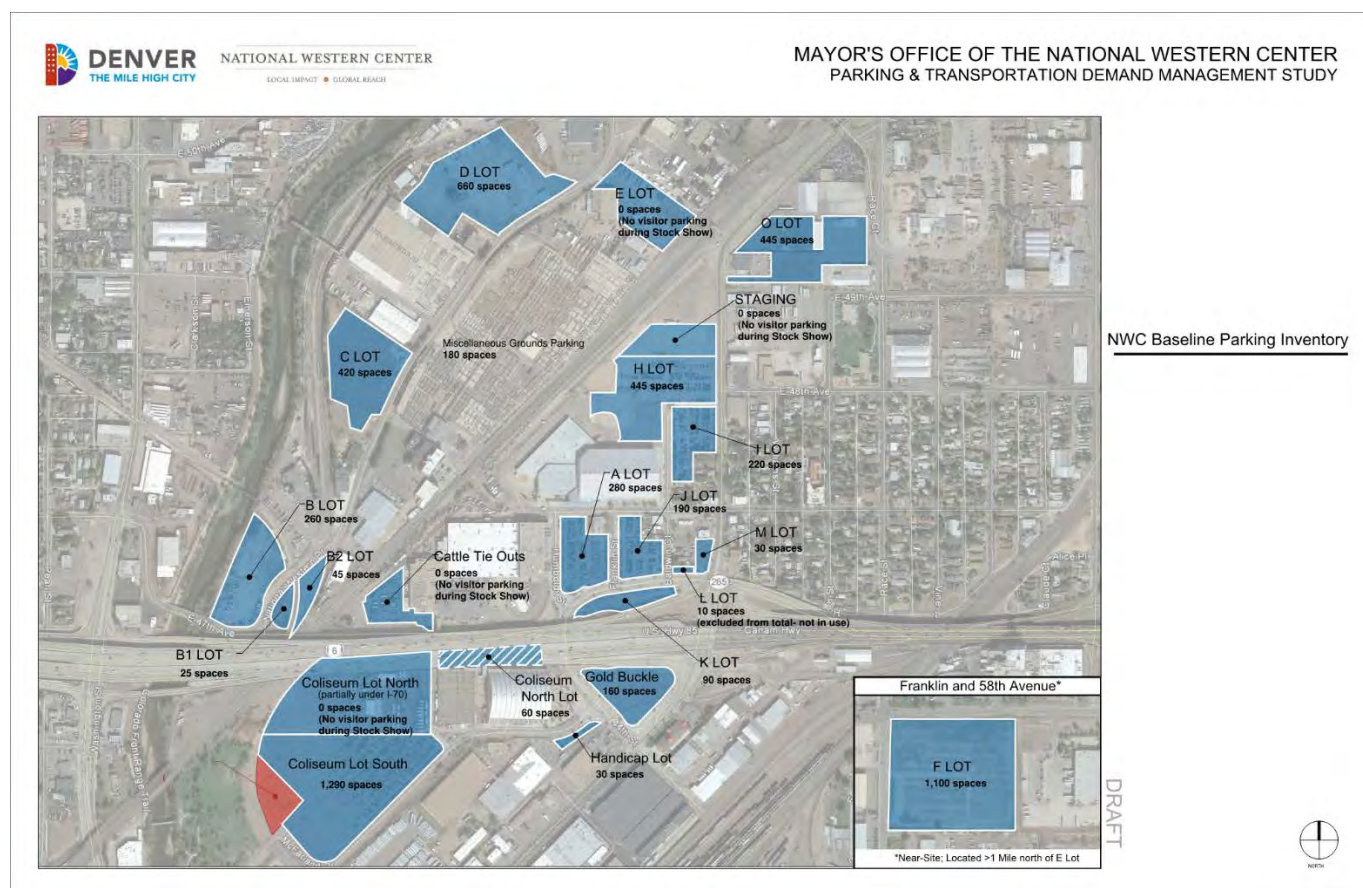


Figure 2.2: Parking Inventory by Location—Stock Show

Location	Usable/Available Inventory (Rounded Count)
On-Site	4,850
Near-Site	1,900
Off-Site	1,300
Private/On-Street	1,250
Total	9,300



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Additionally, the following notes are in response to comments received from equity partners and are listed here to help clarify the information presented above:

- Figure 2.2 (above) includes F Lot as a near site asset, with other lots depicted on the map included as on-site assets. Other temporary leased and private lots available for the Stock Show (for the baseline conditions) are not shown on the map but are listed in more detail in the Chapter 2 Appendix. Inventory figures on the map and table are rounded to the nearest significant digit and may not sum exactly; please keep in mind that most of these facilities are unstriped and unimproved and the exact inventory will vary significantly depending on the size of the vehicles and how efficiently drivers park or are directed to park.
- Several locations including Coliseum Lot, Gold Buckle Lot, F Lot, and O Lot are owned by separate entities such as the City of Denver, CDOT, and NWSS. We understand that O Lot and F Lot are identified by the WSSA as possible development sites and may not be available for parking in future years. These lots are included in the baseline as these facilities were used for Stock Show parking during the 2015 and/or 2016 events. The future conditions analysis does include the displacement of O Lot and Gold Buckle as a near term assumption. The Coliseum Lot is assumed to be operated as part of the on-site parking system for the near future until this lot is displaced in later phases of the Master Plan.
- The Coliseum South Lot has been adjusted to reflect spaces permanently displaced by GLO, though we understand that the number of spaces displaced temporarily during construction (impacting the 2017 Stock Show) was much more significant. Recent changes in the inventory due to improvements along Brighton Blvd. are not reflected in the baseline parking inventory figures, but are included in our calculations for the Phases 1 and 2 Under Construction.
- As noted on the map and in the Appendix, some portions of on-site lots are used for expanded staging/queuing during Stock Show, and as such are not available for parking. Those areas that are primarily used for trucks/trailers and animal staging are excluded from the baseline parking inventory count, but are added back in to the inventory for non-stock show events as discussed below.

The following figure (Figure 2.3) shows the available parking inventory during non-Stock Show events. The on-site count does include the Coliseum Lot as this lot is used for many Coliseum events and for some larger site-wide events such as the Home Show. It is our understanding the Coliseum Lot will be treated as part of the site-wide parking system for future build-out.

Figure 2.3: Parking Inventory by Location—Non-Stock Show

Location	Usable/Available Inventory (Rounded Count)
On-Site	6,500
Near-Site	1,100
Off-Site	0
Private/On-Street	150
Total	7,750

The difference in inventory between Stock Show and non-Stock Show is due to several factors, including:

- Stock Show's operational decision to use some on-site inventory for truck and trailer staging, storage, and queuing plus rodeo operations (in the Coliseum North Lot)
- Stock Show temporary leases of near-site and off-site inventory to meet demand
- Private "pop-up" lots on on-street overflow available during Stock Show but generally not used extensively for the remainder of the year

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In addition to passenger vehicle parking, a significant portion of square footage, both on- and off-site, is dedicated to truck and trailer storage, staging, and queuing. These figures, along with the parking inventories, are provided in the Chapter 2 Appendix section in more detail.

As noted previously, the 2016 and 2017 Stock Show events were adversely impacted by construction related to the Globeville Landing Outfall (GLO) project, which temporarily cordoned off up to 750 stalls from the Coliseum South Lot. Long-term impacts from this project are reflected in the parking inventory numbers. Likewise, some additional truck and trailer queuing space was also lost permanently to site preparations at RTD's new commuter rail stop at 48th Ave. and Brighton Boulevard (a future N Line station).

The cost of parking at the NWSS event is bundled into ticket prices for Stock Show attendees, and therefore is advertised as free to end users. Other events occurring on the complex throughout the year—for example, home shows or concerts in the Coliseum—often charge for parking, with a typical fee ranging from \$10 to \$15 per vehicle.

Parking for all events on the site is managed on a per-lot basis using various low-cost methods, including poles, bollards, and roping to identify parking areas and roughly delineate spaces, and lot attendants to direct vehicles into parking facilities. Parking staff are primarily utilized to show attendees where lots are located, rather than for speed parking, space efficiency, or other interventions. Though NWC does have full-time operations staff to oversee the parking system, parking lot attendants working during the events are typically hired on a seasonal or per-event basis.

Example of a typical event lot with ropes and signage



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EXISTING PEDESTRIAN CONDITIONS

The majority of usable sidewalks surrounding the NWC campus are located in neighborhoods, parks, and retail/industrial areas. The campus itself is generally missing sidewalks. Brighton Boulevard, presently used primarily as a major access point for I-70 and an arterial for large trucks and trailers, will be converted to a complete, multimodal street fitting for the density and nature of development being built out in the vicinity. Brighton will have sidewalks and a protected cycle track incorporated between 29th to 44th Avenues during the current Brighton Boulevard Construction Project.

Figures 2.4 and 2.5 depict the pedestrian conditions within and surrounding the NWC site. Note that for this section of the Plan, and the sections that follow, analysis of multimodal conditions was conducted for two planning areas—the North Planning Area, encompassing the site and surrounding areas north of I-70, and the South Planning Area, encompassing areas south of I-70. Note that “obstructions” refer to areas of the sidewalk where some condition, such as a break in the sidewalk or other issue, impede pedestrian travel.

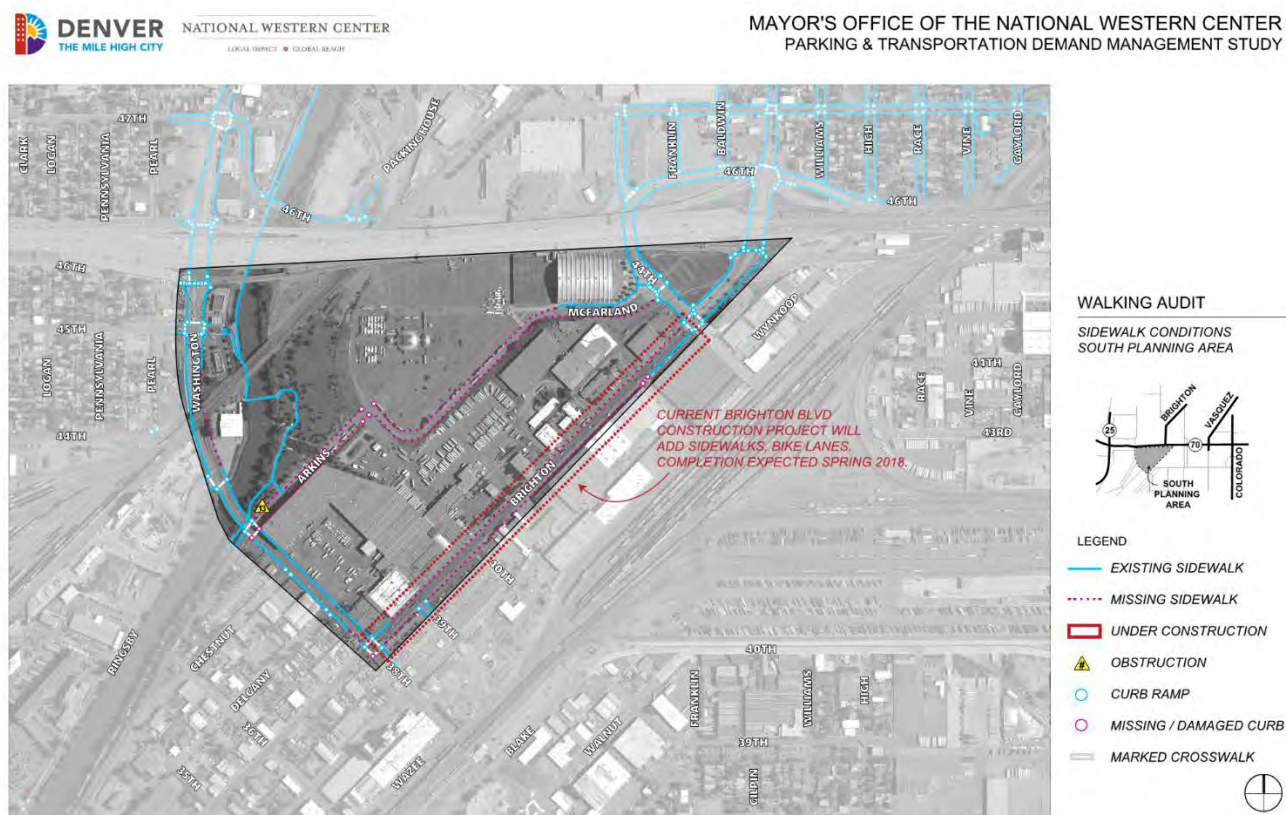
Figure 2.4: Existing Pedestrian Conditions—North Planning Area



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Figure 2.5: Existing Pedestrian Conditions—South Planning Area



EXISTING BICYCLE CONDITIONS

A regional bike trail runs along the South Platte River throughout the study area. A signed bike route runs along the northeastern edge of the study area. Along 47th Avenue there is approximately a quarter mile of bike lane and a quarter mile of signed bike route. Along 38th Avenue, there is approximately a half mile of a signed bike route. There are no designated bike routes within the campus itself. In the study area, there were seven locations in which bikes were counted, but there are not any officially-designated bicycle parking areas or corrals identified. Recently, the WSSA has built and utilized a bicycle corral for some events on the NWC campus.

Figures 2.6 and 2.7 depict bicycle conditions by planning area.

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Figure 2.6: Existing Bicycle Conditions—North Planning Area



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Figure 2.7: Existing Bicycle Conditions—South Planning Area



EXISTING TRANSIT CONDITIONS

There are currently four transit routes that serve the entire study area. Bus route 12 runs along the western edge of the study area along Washington Street. Routes 48, AB, and FF service the lower right quadrant of the study area, primarily along Brighton Boulevard and through the neighborhood on the southeast of the study area. On route 48 there are nine stops and two of them have benches. Routes AB/FF run along the same route, there are three stops—none of which have benches. There are no shelters at any of these stops.

Figures 2.8 and 2.9 depict transit conditions by planning area.

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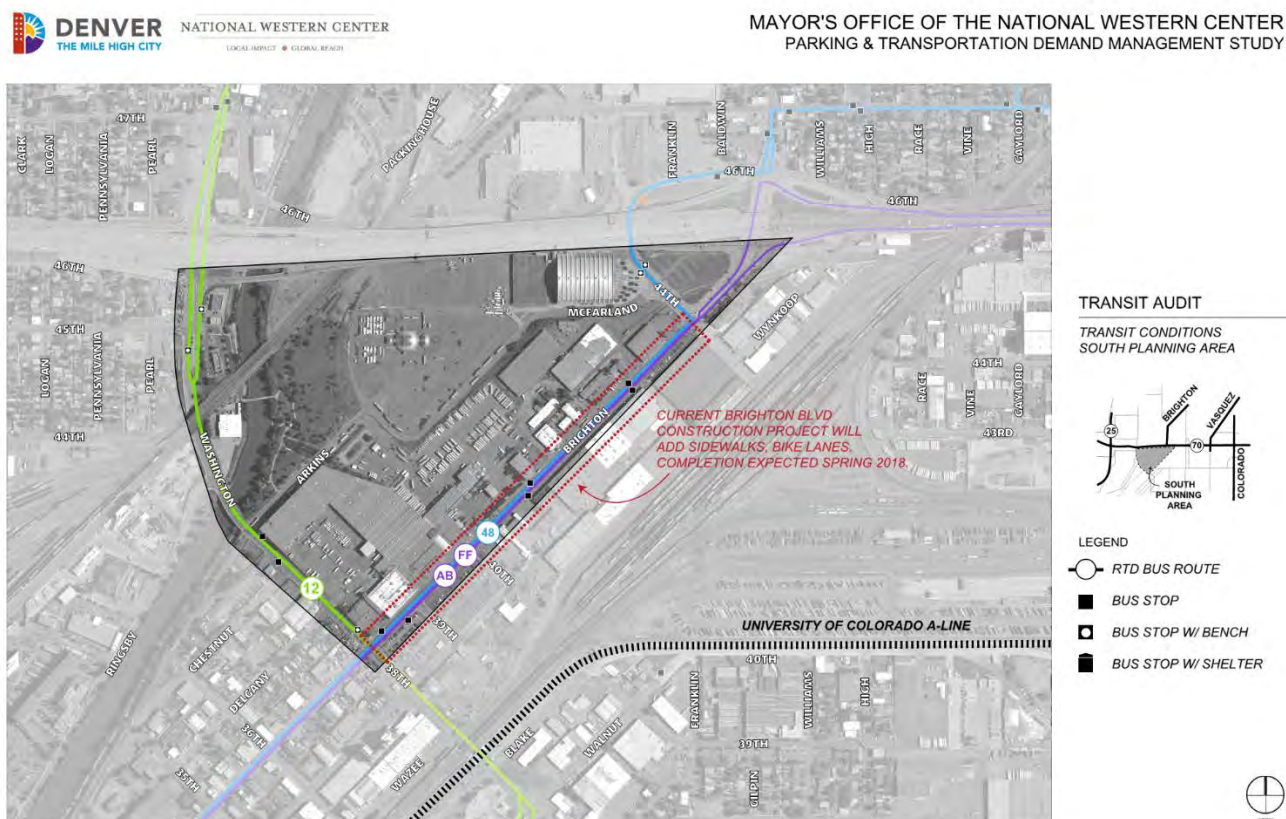
Figure 2.8: Existing Transit Conditions—North Planning Area



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Figure 2.9: Existing Transit Conditions—South Planning Area



Additional information on existing conditions, including traffic volume data by intersection, is provided in the Chapter 2 appendix.

CAMPUS MASTER PLAN PHASING

Since the Campus Master Plan was completed in 2015, construction and implementation phasing has been further refined, particularly for Phases 1 and 2 for which an RTA grant was procured. Figure 2.10 shows projected buildings and venues, uses, square footages, and seating capacity added or maintained on the site by phase, pursuant to either the 2015 Master Plan or RTA grant application.

Note that many aspects of the Master Plan including square footages, exact building locations, etc. are subject to change as the site develops. For example, the planning team is in the process of releasing a new “baseline” program for Phases 1-2. This revised program was not released in time to be incorporated into this is Plan; however, our understanding is that most of the changes will not have a major impact on projected site-wide attendance of event venue capacity. (Other changes may be noted in this Plan where they have an impact on the size or location of proposed future parking facilities). More details on the calculated correlation between facilities’ capacities and projected growth in parking needs is discussed in Chapter 5 of this Plan.



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Figure 2.10: Buildings and Venues by Phase

Phase 1: completion 1.5-2 years after construction start date				
Use/Facility	Use Description	Sq. Ft	# Seats	Other Metric
Stockyard Show Arena	Livestock shows and sales during NWSS; year-round events	20,000	1,000	
Stockyard/Events Pavilion	800-pen stockyard (NWSS)- large performance/event space year-round	871,200		
		891,200	1,000	
Phase 2: completion 4-4.5 years after construction start date				
Use/Facility	Use Description	Sq. Ft	# Seats	Other Metric
Livestock Stadium Arena	Event/performance space- livestock shows, family shows, conventions, lectures, sporting/entertainment	130,000	5,000	
Livestock Hall	Events space/livestock facility- livestock sales, animal shows, trade shows, markets, overflow stalls	230,000		
Livestock Hall Auction Arena	Livestock sales and lecture space (attached to Livestock Hall)	9,500	700	
Livestock Center Auction Arena	Livestock sales, lecture space, performances	15,000	1,000	
Equestrian Events Center	Multi-use arena for equine, livestock, and other events year-round	109,000	4,500	
Equestrian Arena	Multi-use arena for smaller-scale equine, livestock, and other events year-round	86,500	500	
Horse Barn	Horse stalls	220,000		1,000 Stalls
Maintenance and Operations Facility	Operations and service space for NWCC/ storage	44,000		
CSU Equine Sports Medicine Facility	Equine sports medicine and education, outreach clinic	78,600		
Practice Areas	Staging/pre-function for activities in the Equestrian arena and events center	88,000		
Livestock Exchange Plaza	Park/Open gathering space (small events, outdoor markets, displays and exhibits)	17,424		
Equestrian Plaza	Park/Open gathering space (small events, exhibits, vendors/markets)	113,256		
		1,141,280	11,700	
Phase 3:				
Use/Facility	Use Description	Sq. Ft.	# Seats	Other Metric
1909 Stadium Arena	Repurposed space- conceptualized as a public market, commercial kitchen, events space	90,000		
		90,000	0	
Phase 4:				
Use/Facility	Use Description	Sq. Ft.	# Seats	Other Metric
NWCC Station Plaza	Park/Open gathering space	152,460		
Trade Show/ Expo Hall	Exhibit hall and event space for major local events (e.g. trade shows, etc.)	350,000		
Elyria Plaza	Park/Open gathering space	100,190		
Water Resources Center	Public education, meetings/small events space	15,000		
		617,650	0	



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Figure 2.10: Buildings and Venues by Phase (Continued)

Phase 5:				
Use/Facility	Use Description	Sq. Ft.	# Seats	Other Metric
NWCC Arena	Flagship building- replacing Denver Coliseum. Major events (rodeos, concerts, etc.)	300,000	10,000	
Arena Square	Primary outdoor exhibit plaza	100,190		
		400,190	10,000	
Phase 6:				
Use/Facility	Use Description	Sq. Ft.	# Seats	Other Metric
CSU Building	Classrooms/labs, event spaces, exhibit hall, admin offices/business center, performance space	100,000		
Colorado Commons	Park/Open gathering space (urban farming, mid-size events, outdoor markets and exhibits, etc.)	217,800		
		317,800	0	
Phase 7:				
Use/Facility	Use Description	Sq. Ft.	# Seats	Other Metric
None-all infrastructural				
		0	0	
Phase 8:				
Use/Facility	Use Description	Sq. Ft.	# Seats	Other Metric
Denver Coliseum	Rehab/repurposing of existing Denver Coliseum	170,400		
Globeville Landing Park	Possible rehab of existing park/recreational trails			
		170,400	0	
	TOTAL	3,628,520	22,700	
Remaining Existing Facilities				
Use/Facility	Use Description	Sq. Ft.	# Seats	Other Metric
1917 Armory& Co Meat Packing Plant Office	Current private residence- slated for potential reuse with offices, business center and conference rooms			
Livestock Exchange Building	Administrative offices and Stockyard Bar and Restaurant	54,000		
Livestock Center Plaza	Park/Open gathering space (outdoor displays, vendor booths, exhibits, small events, etc.)	165,528		
		219,528	0	

Figure 2.11 graphically depicts the proposed on-site and near-site improvements for Phase 1 and 2 of the campus Master Plan, as shown in the RTA grant application.

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Figure 2.11: Phase 1 and 2 Construction



Beyond Phases 1 and 2, six additional phases are planned, as outlined in Figure 2.10. These phases are highly conceptual in nature and are not presently funded. As such, future build-out dates for Phases beyond Phase 2 are not specifically included in this Plan.



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In addition to construction on the NWC site, a significant number of transportation improvements associated with the Master Plan and with other City of Denver and partner projects are planned in the surrounding area. These projects have been evaluated as part of Chapter 3: TDM.

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CHAPTER 3: TRANSPORTATION DEMAND MANAGEMENT (TDM)



OBJECTIVE: *USE BEST PRACTICE SOLUTIONS TO REDUCE VEHICLE MILES TRAVELED, SINGLE OCCUPANCY VEHICLE ARRIVALS, AND RATE OF GROWTH IN PARKING DEMAND ON THE NWC SITE.*

WHAT'S IN THIS SECTION?

- TDM & The National Western Center
- Analysis
- Key Findings
- Recommendations



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TDM & THE NATIONAL WESTERN CENTER

The redeveloped NWC campus will be a popular, year-round destination for employees and visitors. Significant growth is anticipated over the next few years and, at full build-out, the site is projected to accommodate more than 90,000 people during a Stock Show Saturday, more than 20,000 people during large or concurrent events, and up to 2,000 people on an average weekday. Planned enhancements to the transportation network include new roadway, pedestrian, and bicycle facilities that will increase connectivity to and through the site. In addition, the N Line commuter rail (Denver Union Station through Denver, Commerce City, Thornton, Northglenn, and, eventually, Adams County) will provide access to NWC with a station at 48th Avenue and Brighton Boulevard. However, the existing and planned roadway and transit network alone cannot accommodate the projected growth of the campus. Additional strategies to manage the travel and parking demands are necessary. A proven, successful solution to manage travel and parking demand is leveraging a range of policy and programmatic options, commonly referred to as TDM.

This chapter introduces the concept of TDM, identifies how TDM is successful, outlines the benefits of TDM, and recommends TDM strategies for the various development scenarios of the campus. The TDM recommendations aim to accommodate growth of the site, minimize the demand for on-site parking, and enhance the transportation experience of all users. The TDM terms used throughout the document are defined in the Chapter 3 Appendix section, with several of the most common terms also referenced in Chapter 1.

WHAT IS TDM?

TDM is a collection of complimentary strategies and behavioral incentives that emphasize the movement of people and goods rather than the motor vehicle. It focuses on assisting people to make transportation decisions that include transit, ridesharing, shuttles, walking, biking, and other solutions or improvements and to reduce SOV trips and the parking infrastructure required to accommodate those trips. TDM's focus is on the people that will be accessing the site and the alternative ways in which they could do so. Often, substantial subsidies, in the form of free parking and Federal and local investments in roadways, allow driving to be the most convenient option. To counterbalance these subsidies, TDM strategies propose a range of possible transportation incentives for the site that could optimize several different modes. This methodology is intended to create a more balanced transportation system that provides the best access and mobility for all users.

Simply providing options within the transportation system is the start of the TDM process; developing a desire by travelers to use the services is the logical next step to managing traffic. TDM is a much more cost-effective strategy than trying to build a system to meet peak travel or parking demands, and it creates significantly fewer community and environmental impacts. TDM strategies often require some tradeoffs between personal travel freedom and greater network efficiency or utilization.

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WHAT BENEFITS DOES TDM PROVIDE?

There are many important, interrelated benefits of reducing the number of cars on the roadway and the number of miles driven. There are transportation system benefits, social benefits, environmental benefits, health and safety benefits, and financial benefits.

Transportation System Benefits

- Reduced congestion and resultant time savings
- Multiple options for getting around





You want to travel freely

TODAY, LESS THAN 35% of vehicle seats are filled on urban freeways during peak hours even though demand overwhelms available capacity. As public infrastructure, this level of efficiency raises questions about whether the road space is being wisely used. It also raises questions about how performance is traditionally measured.



But so does everyone else

FREEWAYS ARE OFTEN DESCRIBED as having problems when they are congested due to slow speeds instead of having too many unfilled seats. To some degree, this outcome is a result of cultural preferences for driving personal vehicles. This preference rates high on personal freedom, comfort, and convenience, but low on efficient use of the limited public road supply. If greater efficiency of the road network is desirable (i.e., more seats occupied) to improve travel reliability and reduce adverse travel effects such as delay, wasted fuel and air pollution, then demand management is essential.



Managing travel demand can help

DEMAND MANAGEMENT can include a range of strategies from how roads are operated and controlled to behavioral incentives that influence when and how much people travel and by what modes. These strategies often require some tradeoffs between personal travel freedom and greater network efficiency or utilization. How to balance these tradeoffs is the essential question facing the public agencies that operate our roads.

FEHR & PEERS



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Social Benefits

- Reduced dependence on fossil fuels
- Enhanced quality of life in walkable, bikeable communities with many transportation options
- Reduced community fragmentation caused by wide, high-speed roads

Environmental Benefits

- Improved air quality
- Reduced greenhouse gas emissions
- Improved water quality
 - reduced polluting emissions and fluid leaks
 - reduced need for paved surfaces

Health and Safety Benefits

- Fitness benefits of active transportation (biking and walking)
- Health benefits of improved air quality
- Stress reduction

Financial Benefits

- Reduced costs of car ownership and maintenance
- Reduced cost of parking

TDM provides a multitude of options for users to access a site and promotes a mode shift away from the SOV. In providing these options, roadways can be used more efficiently and impacts to these networks can be lessened. TDM strategies that offer transportation choices are often considered a site amenity by users and visitors. Walkability, proximity to transit, bicycle facilities, and carshare enhance convenience and provide several transportation options to those that don't have to drive.

HOW DOES TDM WORK?

TDM is most effective when supported and implemented by both the public and private sector through a coordinated effort to reduce vehicle trips to a specific area or to a high-intensity activity center like the National Western Center Campus. A shift from automobile trips to other transportation modes may result in the reduction of vehicle miles traveled by employees, visitors, and residents. TDM is also most effective when multiple strategies are implemented together as part of a package of transportation options for end users.

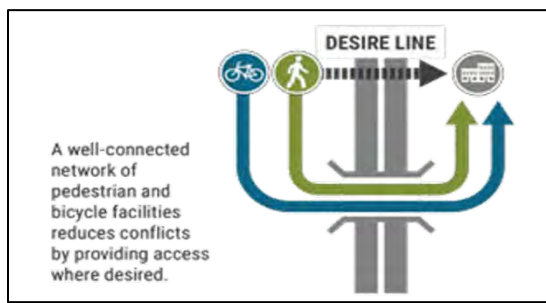
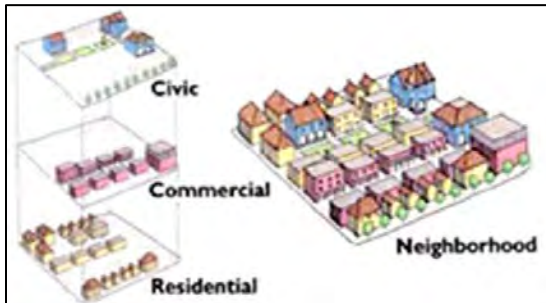
Ongoing monitoring is also a key element in the success of a TDM plan. Depending upon the goals of the project, the TDM Plan can be focused to encourage lower VMT, reduce greenhouse gas emissions (GHG), lower rates of SOVs, and reduce parking demand.

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TDM strategies are often classified into six different categories:

- **Land Use/Location** - sites located in urban environments with higher densities and a mix of uses (see examples on the left), with grid roadway systems, in proximity to local attractions, and with access to transit are more successful when implementing TDM programs.
- **Neighborhood Site Enhancements** – physical and/or programmatic improvements can enhance pedestrian, bicyclist, and carshare experiences.
- **Parking Pricing** – use of management strategies that correlate parking supply and cost.
- **Transit System** – improvements can increase accessibility of transit: expansion, frequency, and proximity.
- **Commute Trips** – incentives offered by employers may reduce SOV commute trips: transit fare subsidies, alternative work schedules, employer-sponsored vanpools/shuttles, and ride-share programs.
- **Marketing/Promotions** – education provides real-time information regarding transportation options

Depending on the project, a TDM plan can incorporate elements from one, several, or all of these categories. Most of the strategies are considered incentives rather than disincentives, and the responsibility for implementation is often a collaboration between the private and public sectors.

HOW DO WE KNOW TDM WORKS?

TDM has been proven to reduce the impacts on the physical transportation infrastructure, air quality, energy use, and travel costs, while still preserving mobility. There is extensive peer-reviewed research related to TDM strategies. The California Air Pollution Control Officers Association (CAPCOA) *Quantifying Greenhouse Gas Mitigation Measures* report provides a comprehensive overview of most of the available literature and identifies TDM strategies and their effectiveness in VMT reduction.

Based on years of research, some of the most effective TDM strategies are related to Parking Pricing/ Policy, Commute Trips, and Land Use/Location. Limiting the parking supply typically results in a 5% to 12.5% reduction in VMT; unbundling parking results in a 3% to 13% reduction in VMT. Mandatory commute-trip reductions can result in a VMT reduction of 21%, and pricing workplace parking can reduce VMT by 20%. When a site provides a mix of land uses, good transit accessibility, and increased density, VMT reductions can reach 30%.





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In addition, several cities and large projects in the United States have implemented successful TDM programs with measurable success.

Aspen, Colorado – Aspen implemented transit as a TDM strategy in the 1970s and launched a more formal program with paid parking in the mid-1990s. Traffic volumes across the Cripple Creek Bridge into town have remained below 1998 volumes, largely due to the city's TDM program. This is true even during the multiple events throughout the year that draw hundreds of out-of-town visitors. New development projects in Aspen are required to implement TDM strategies that result in zero net new vehicle trips.

Boulder, Colorado – The City of Boulder requires a TDM plan be completed and implemented for every development within the city. The City currently realizes approximately 20-percent fewer vehicle trips due to their TDM program and the multimodal transportation options available. Increases in the demand for transit and an increase in transit service create a positive-feedback loop.

Stanford University, Palo Alto, California - Stanford University employs several services and incentives that have successfully replaced student, faculty, and staff trips by private vehicle with transit, biking, and walking commute trips. The main ingredients for success at Stanford are charging for parking, making other modes free and easy to use, changes to the built environment, and helping people to understand their options.

Seattle Children's Hospital, Seattle, Washington – Seattle Children's Hospital is a strong model for promoting alternative transportation modes, with the mode split to prove it. The 2008 Master Plan laid out a target to reduce the share of commuters who arrive in an SOV to 30 percent by 2028. The hospital is working to achieve this goal through a carrots-and-sticks approach to travel behavior—making it less attractive to drive while also making other modes more attractive. The hospital attributes their mode splits to a comprehensive program that includes paid parking, free bicycles, shuttles, education, branding, and marketing to create a compelling package.

Park City, Utah - Park City adopted a TDM plan in March 2016. The City has begun to implement several TDM strategies from this plan, in addition to existing programs. This includes the phased implementation of paid parking, beginning with evening-only paid parking downtown. Other TDM strategies include discounted ski lift tickets for those that take transit, preferred ski parking for carpoolers, shifting travel demand to off-peak hours, and increasing education through lodging venues and the Chamber that visitors don't need a car when they visit Park City.

Burlingame Point, San Francisco, California - In 2011, Burlingame Point developed a TDM program to encourage future employees of Burlingame Point to walk, bicycle, use public transportation, carpool, or use other alternatives to driving alone when traveling to and from the proposed campus. The program identified 16 different TDM strategies that have a combined effectiveness of a more than ten-percent reduction in peak hour trips; this justifies the reduction in parking from the City's 3.33 spaces/1,000 sf to 3.0/1,000 sf. Methods documented in Quantifying Greenhouse Gas Mitigation Measures, a report recently released by the California Air Pollution Control Officers Association (CAPCOA), estimate a 13 percent reduction in peak hour trips, three percentage points higher than the ten percent goal.

Facebook Campus, Menlo Park, California - At its headquarters in Menlo Park, California, Facebook has developed a comprehensive TDM program, including long-distance employee commute shuttles, a vanpool program, and bicycling amenities and incentives. This program has been consistently successful in diverting over 45 percent of trips.

Barclays Center, Brooklyn, New York. In 2012, the Barclays Center, both an active year-round event center and home to the Brooklyn Nets, implemented a holistic TDM program. This program reduced overall auto mode share by 8%, and resulted in a 20% reduction in peak hour auto trips. Initiatives included enhanced transit service on New

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York City Transit (NYCT) and the Long Island Rail Road (LIRR), preferred parking for carpools, parking supply limits, and targeted marketing programs.

Prudential Center, Newark, New Jersey. The Prudential Center in Newark hosts about 200 events per year, and is also home to the New Jersey Devils. After years of car-centric transportation planning, the Center implemented a TDM program in 2010 which doubled transit ridership. Interventions included dedicated transit ambassadors, special discounts and passes for event attendees, and signage and wayfinding to park-and-ride locations.

CenturyLink Field, Seattle, Washington. Home to the Seattle Seahawks, the CenturyLink Field complex also serves as a concert and multipurpose event venue. In 2002, the complex implemented a Transportation Management Program (TMP) that ultimately reduced auto mode share from over 80% to 57%. Interventions included hiring a transportation manager to implement TMP strategies, a shuttle program to park-and-ride lots, and improvements to pedestrian and bicycle amenities.

WHY IS TDM IMPORTANT FOR THE NATIONAL WESTERN CENTER?

During the stakeholder process, TDM was identified as a very important component of the *Parking & Transportation Demand Management Plan* to the extent that three TDM-specific goals (shown in Figure 3.1) were included with the Guiding Principles (see Chapter 1 for additional discussion). A key outcome from the third PMT Meeting was that the NWC site could not afford to meet growth and sustainability targets by investing solely in parking and vehicular-focused infrastructure.

Figure 3.1: TDM Goals from the Guiding Principles

<i>Develop multi-faceted TDM plans that maximize person trips</i>	<i>Encourage multi-modal transportation usage through a combination of proven strategies</i>	<i>Ensure success of TDM strategies through active management and monitoring</i>
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Some of the key points from the PMT meetings and other discussions are shown below. These points highlight the importance of pursuing an active TDM strategy for NWC as the site develops:

- An investment in TDM programs and policies is an effective way to leverage prior and on-going investments that have already been made into RTD's rail system, bike and pedestrian improvements to Brighton Boulevard, and other local and regional multi-modal systems. The eTuk circulator program in RiNo, pictured to the right, is a good example of a local program that might be leveraged to reduce infrastructure needs on the future NWC site.
- TDM policies are proven to be generally effective in encouraging multi-modal transportation choices at other major event venues across the country, especially those located near an urban core, such as NWC.
- The cost to implement moderate TDM policies is much lower than the cost to develop and operate a comparable amount of on-site parking and access infrastructure.





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- TDM requires only a small amount of physical land area (mostly for pick-up and drop-off queuing) as compared to parking, and therefore allows for a greater amount of the future site to be devoted to event venues, livestock and agricultural uses, pedestrian circulation and green space, and other desirable choices.
- A TDM program helps to fulfill the NWC's mission of sustainability by reducing SOV trips and overall VMT, thereby reducing fossil fuel consumption.
- TDM programs encourage a range of transportation options, many of which are well positioned to respond to changes in demand as the transportation industry evolves. Major industry disruptors such as the impact of TNCs (e.g., Uber and Lyft) and possible future changes due the autonomous vehicles are two possible evolutionary factors to consider.
- Though not an option for all patrons, multi-model options are appealing to some percentage of existing event attendees. Intercept surveys collected during the 2015 Stock Show indicated that nearly 2/3 of respondents said they would be willing to use rail transit or a shuttle system to come to the event in the future.
- Even a modest investment in TDM programs for past Stock Shows, such as the recent partnership with Lyft, have had an impact on the site-wide parking needs. (For example, intercept surveys collected by OV Consulting during the 2015 Stock Show indicate an estimated parking demand reduction of roughly 2%, based on increased Uber and Lyft ridership).

In summary, developments like the NWC can help manage demand on the transportation network, and be designed to make it easier for new residents, tenants, employees, and visitors to get around by sustainable travel modes such as transit, walking, and biking, by implementing and supporting TDM strategies. Without TDM strategies, mobility options would be limited, a less efficient transportation system would be realized, the demand for parking could not be accommodated, and the NWC's sustainability goals would not be met.

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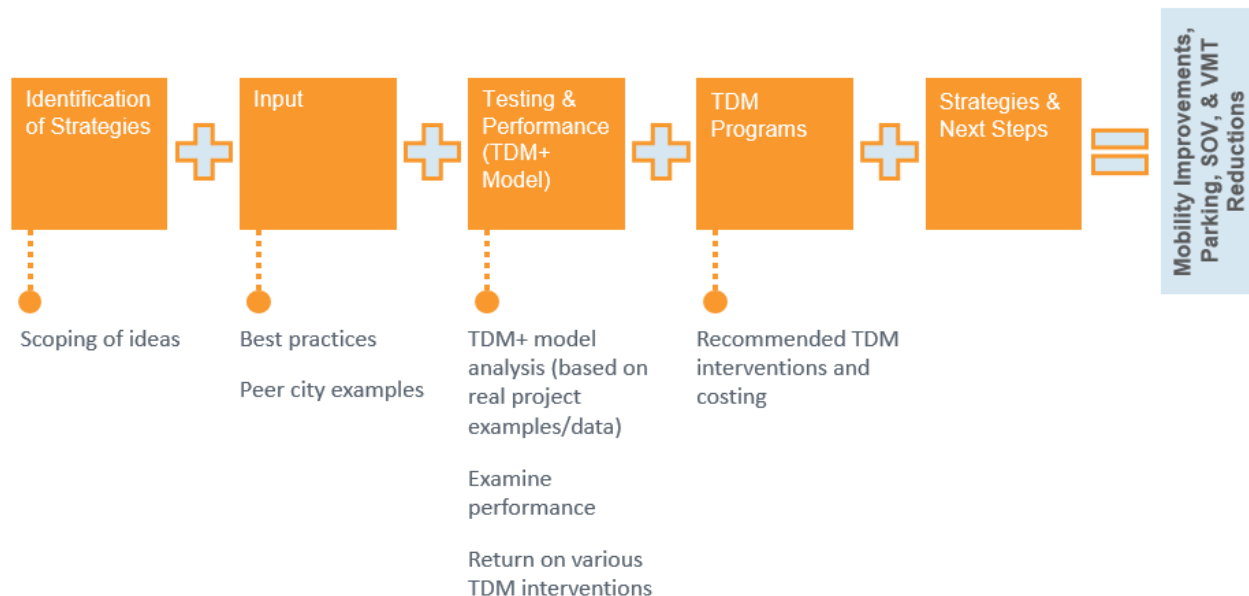
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ANALYSIS

To develop TDM plans for the National Western Center campus, the team used feedback from the PMT, the Campus Master Plan, the analysis of existing conditions, national research, peer community review, and market and opportunity information. The general workflow for the TDM analysis portion of this Plan is summarized below.

Figure 3.2: TDM Analysis Calculation



STRATEGY DEVELOPMENT AND TESTING

The strategies deemed to be most effective for the National Western Campus were put into an Excel-based tool that quantifies TDM effects on VMT, called the TDM+ model (sample inputs and outputs of this model are shown in Figure 3.3). Based on peer-reviewed research, this tool estimates percentage VMT reductions for individual TDM strategies and combinations of strategies, accounting for interaction among different measures. In applying the recommended TDM strategies, estimates for reduction in VMT and SOV were produced for each scenario.

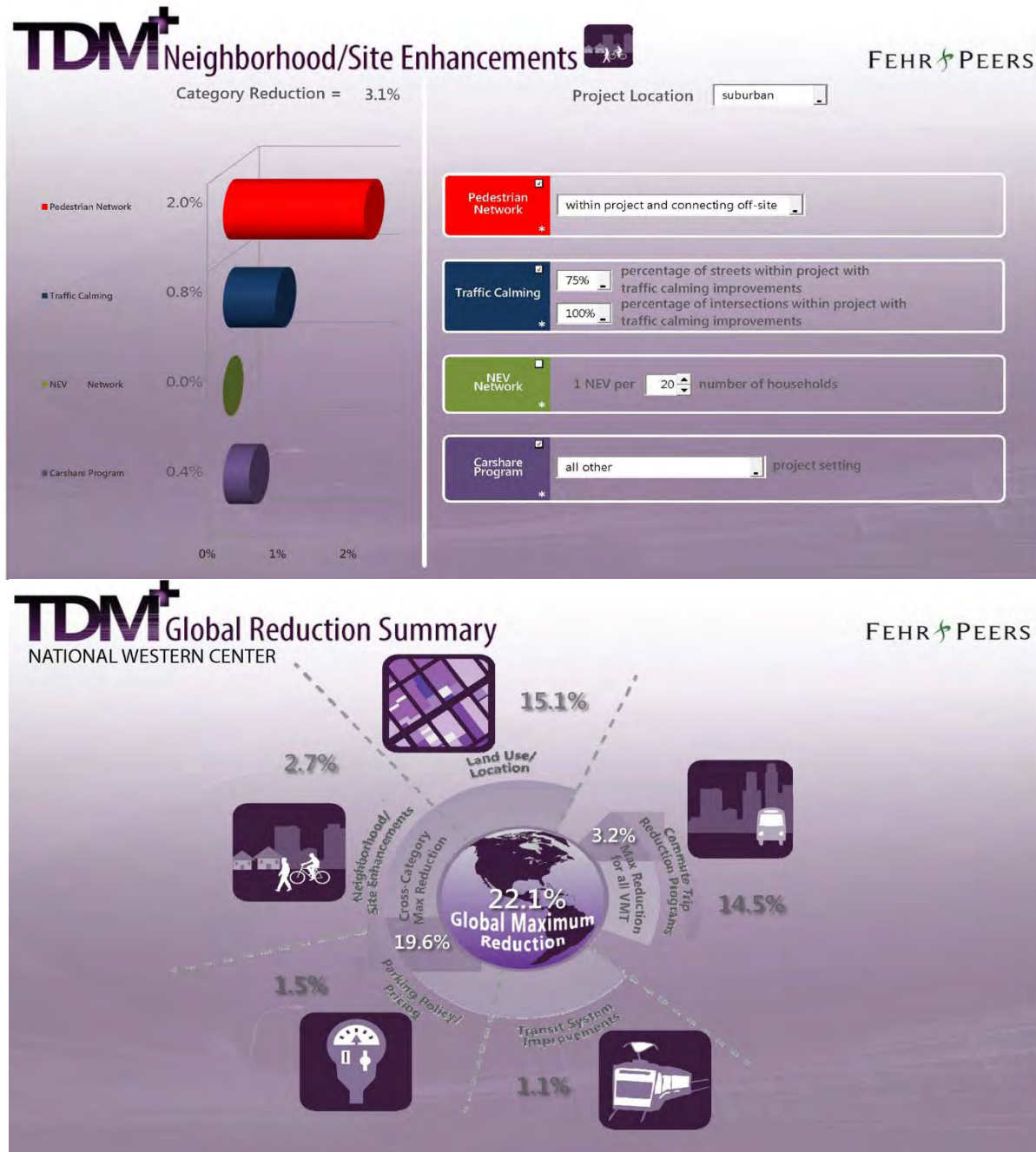
The estimates of TDM-strategy effectiveness are based on a literature review prepared by CAPCOA in 2010. The strategy list and effectiveness estimates on VMT reduction, SOV reduction, and parking reduction were updated based on recent work conducted by the consultant team for other clients, including the City of San Francisco and major employers in the San Francisco Bay Area. The estimates were further refined using planning judgment and local knowledge.

The estimates for parking demand reductions were calculated (by strategy and by combination of strategies) based on TDM case studies compiled by planning team members Fehr & Peers and WALKER Consultants. The percentage reduction in parking taken for each strategy is discussed further in Chapter 5 of this Plan.

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Figure 3.3: Examples of Inputs and Outputs from the TDM+ Tool





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After evaluating and testing the outputs from the TDM+ tool, the consulting team prepared a preliminary list of strategies for each scenario and presented them to the PMT for review and comment, as noted in the Public Input section. The PMT recommended the addition of several TDM strategies to each scenario. These strategies were vetted by the consultant team based on applicability. For example, several PMT members suggested adding transit fare subsidies, transit frequency/speed enhancements, and a built pedestrian network for the Pre-Construction phases. However, due to the timing of the Pre-Construction phase, there would not be adequate time to implement these changes, and therefore this strategy did not make the final list.

Several of the strategies suggested by the PMT were added to the TDM plans and the VMT and SOV reductions updated. Two levels of TDM plans were applied to each scenario—an aggressive plan and a moderate plan. Both plans would require expenditure of funds and a commitment to manage the program. For the most part, the moderate plans include TDM strategies that cost less to provide than the aggressive plans. The aggressive plans include all the strategies in the moderate plans, plus additional strategies that would require additional expenditure of funds either through infrastructure improvements, capital costs (shuttles, wayfinding, etc.), and/or personnel costs (TDM coordinator). Planning-level cost estimates are provided for each scenario for both the moderate and aggressive plans. Expanded cost estimates and assumptions are included in the Chapter 3 Appendix. However, for the purposes of this Plan, only the moderate set of TDM programs have been included for our final projections of parking and access needs for the site. This is to ensure that initial parking infrastructure and funding needs are projected conservatively; the Plan assumes that the success of TDM programs and initiatives will be monitored and assessed on an annual basis, so as to reevaluate parking infrastructure and funding needs as necessary over the course of the site's buildout.

The following table outlines the scenarios per stage of campus implementation. Costs shown in the Chapter 3 Appendix are by stage and activity level, and include both one-time capital and ongoing-annual costs, based on the programming included.

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Figure 3.4: Scenario Matrix (review from prior Chapters)

	Stock Show Weekend	Large Event / Festival / Concurrent Event	Typical Day
Baseline	Scenario 1	N/A	N/A
Pre-Construction	Scenario 2	Scenario 3	Scenario 4
Phase 1-2 Construction	Scenario 5	Scenario 6	Scenario 7
Phase 1-2 Operational	Scenario 8	Scenario 9	Scenario 10
Full Build Out	Scenario 11	Scenario 12	Scenario 13





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KEY FINDINGS

This section discussed the TDM programs recommended by scenario, based on the consultant team's rigorous analysis. The figure below (Figure 3.5) provides a general overview of all the strategies the campus is recommended to employ at Full Buildout. A detailed look at strategies employed by scenario is included in the sections that follow.

Figure 3.5: TDM Strategies Recommended at Full Buildout



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Figure 3.5: TDM Strategies Recommended - continued

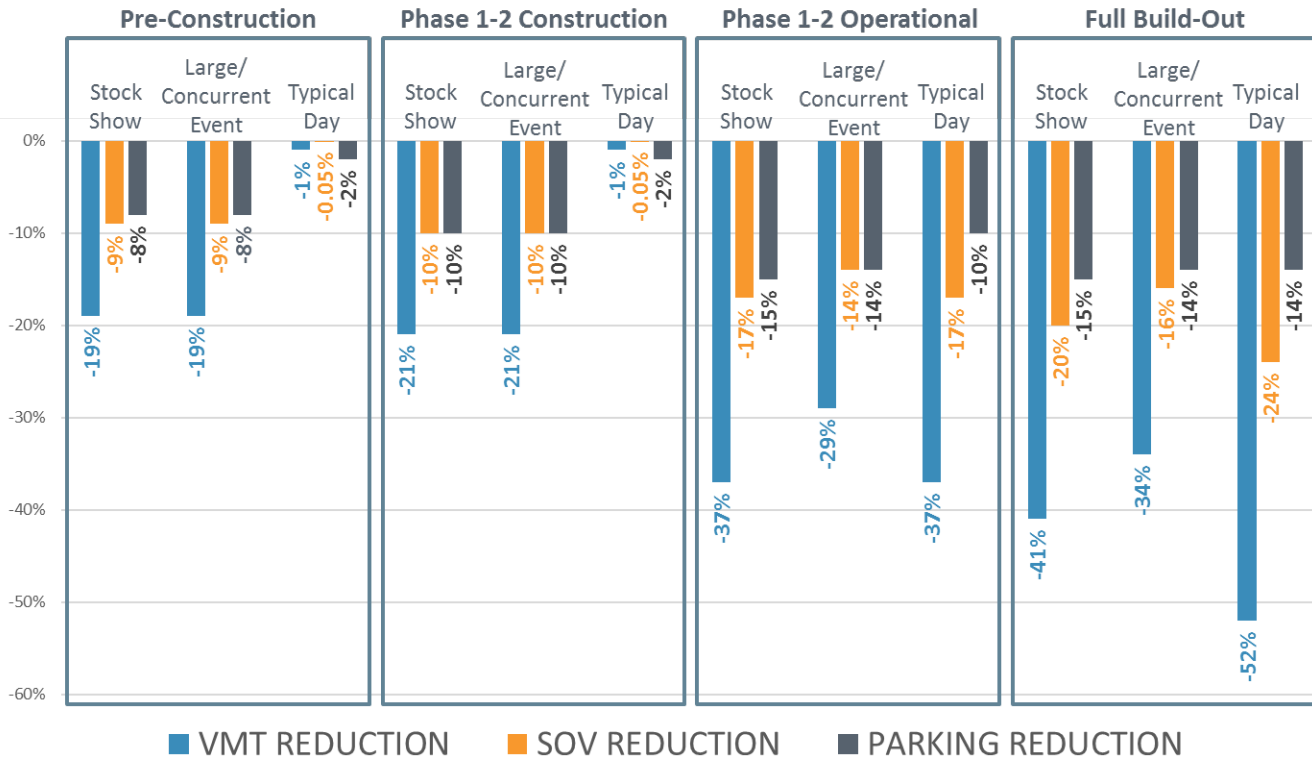
Infrastructure & Operations 	Transit Network Expansion
	Transit Frequency/Speed
	Local Shuttles
	Real Time Transit Displays
	Carshare Parking
	Preferential Parking for 4+ Carpool
	Dedicated Carpool Pick-up/Drop-off
Pricing & Incentives 	Secure Bicycle Parking
	Transit Fare Subsidy
	Unbundle Parking Costs
	On-Street Market Pricing
	Subsidized Carshare Membership
	Employee Parking Cash-Out
	Workplace Parking Pricing

The overall numerical outcomes, showing the projected impact to parking, VMT, and SOV's related to the above programs are shown in Figure 3.6. This graphic represents the real upside of TDM implementation—as TDM interventions are scaled from Pre-Construction to Full Buildout, reductions in VMT, SOV, and parking demand increase. The most dramatic jumps are seen in VMT reduction, which is projected to increase from -19% to -41% for the Stock Show, -19% to -34% for a Large/Concurrent Event, and -1% to -52% for a typical day.

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Figure 3.6: Projected Outcomes of TDM Programs



Varying levels of investment in each TDM program are assumed at interim phases of development, with further refinement likely by scenario and event type.

Additional details are provided below and on the following pages to describe the assumed programs that are utilized at each stage of campus development. The Guiding Principles call for “active management and monitoring” of TDM programs so that adjustments can be made at future stages of build-out, to ensure the program is effective.

BASELINE

Based on surveys conducted during the Stock Show in 2015 and 2016, an estimated 11% of users use multimodal transportation options—including transit, biking, walking, drop-off, and TNCs (Transportation Network Companies) like Uber and Lyft—resulting in an overall 6% reduction in parking demand. This function of user choice occurs with relatively minimal formalized TDM programming or strategies.

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PRE-CONSTRUCTION

Under the Pre-Construction Scenario, a range of strategies that would be reasonable, prior to the National Western Center undergoing major physical changes, are listed below. While daily employees and typical-day activities will remain minimal under this scenario, the Stock Show will continue to operate and, as such, TDM will become essential to the circulation and functionality of the site.

Some recommended strategies for Scenarios Two through Four include unbundling the parking cost from the cost of Stock Show and large/concurrent event tickets, so that visitors recognize the cost of parking. This strategy should be combined with providing preferential parking for carpools, providing bicycle parking, and a dedicated pick-up/drop-off location for carpools.

Figure 3.7: TDM Strategies—Pre-Construction Stock Show Weekend

Pre-Construction	Stock Show Weekend (Scenario 2)	
	Moderate	Aggressive
Transit Accessibility	+	+
Commute Trip Reduction Marketing		+
Destination Accessibility	+	+
Transit Fare Subsidy		+
Unbundle Parking Costs		+
Local Shuttles		+
Carshare Parking	+	+
Secure Bicycle Parking	+	+
Preferential parking for 4+ carpools	+	+
Dedicated Carpool Pick-Up/Drop-Off	+	+
Multi-modal Wayfinding	+	+
Estimated Annual Cost:	\$84,000	\$878,000

Estimated Costs: Note that TDM estimated annual costs program are shown on the table above (and subsequent build-out phases) and are generally the ongoing costs associated with the TDM programs themselves, the costs of incentives, operational costs, and staffing. Major capital costs associate with each stage are broken out and shown separately in the appendix, and may in some cases be items already funded for Phases 1 and 2 of construction. Additional details on costs can be found in the Chapter 3 Appendix.

In the case of Preferential Parking for Carpools and similar programs, the cost is generally the income that might be lost if that space were otherwise available for general special event parking at full market value. For Phase 1-2 Operational and beyond all costs do assume that parking prices are unbundled (i.e., charged separately from the ticket price) for the Stock Show event and therefore carry an income value.

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Many campuses opt to recoup the cost of TDM programs through end-user parking fees. For this reason, we continue to stress the importance of unbundled parking fees after Phase 1-2 Operational for all events (including NWSS) as both a strong incentive to use TDM programs, and a revenue stream to help fund the programs.

The TDM strategies included for Scenario 2 are projected to reduce VMT, SOV trips, and parking as outlined in Figure 3.8.

Figure 3.8: Pre-Construction Stock Show Weekend VMT, SOV, and Parking Reduction

Moderate			Aggressive		
VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION	VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION
19%	9%	8%	21%	10%	12%

The TDM strategies included for Scenario 3 (Figure 3.9) are similar to those included for Scenario 2, with the addition of Valet Bicycle Parking in the aggressive scenario.

Figure 3.9: TDM Strategies—Pre-Construction Large/Concurrent Event

Pre-Construction	Large / Concurrent Event (Scenario 3)	
	Moderate	Aggressive
Transit Accessibility	+	+
Commute Trip Reduction Marketing		+
Destination Accessibility	+	+
Transit Fare Subsidy		+
Unbundle Parking Costs	+	+
Local Shuttles		+
Carshare Parking	+	+
Secure Bicycle Parking	+	+
Valet Bicycle Parking		+
Preferential parking for 4+ carpools	+	+
Dedicated Carpool Pick-Up/Drop-Off	+	+
Multi-modal Wayfinding	+	+
Estimated Annual Cost:	\$74,000	\$278,000

The TDM strategies for Scenario 3 are projected to reduce VMT, SOV trips, and parking similar to Scenario 2. The additional strategy of Valet Bicycle Parking in the aggressive plan does not alter the reductions enough to change the overall reduction (see Figure 3.10).

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Figure 3.10: Pre-Construction Large/Concurrent Event VMT, SOV, and Parking Reduction

Moderate			Aggressive		
VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION	VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION
19%	9%	8%	21%	10%	13%

The TDM strategies included for Scenario 4 (shown in Figure 3.11) are minimal given the small number of visitors and employees to the site during a Pre-Construction typical day. The strategies are focused on providing wayfinding and secure parking for those that desire to arrive via bicycle, and the promotion of using a carshare vehicle if trips must be taken off-site during the work day.

Figure 3.11: TDM Strategies—Pre-Construction Typical Day

Pre-Construction	Typical Day (Scenario 4)	
	Moderate	Aggressive
Carshare Parking	+	+
Secure Bicycle Parking	+	+
Multi-modal Wayfinding	+	+
Estimated Annual Cost:	\$54,000	\$108,000

The resulting VMT and SOV trip reductions are outlined in Figure 3.12.

Figure 3.12: Pre-Construction Typical Day VMT, SOV, and Parking Reduction

Moderate			Aggressive		
VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION	VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION
1%	< 1%	2%	1%	1%	2%

PHASE 1 AND 2 CONSTRUCTION

Under the Construction Scenario, a range of strategies that would be reasonable while the National Western Center undergoes major physical changes are listed below. While daily employees and typical day activities will remain minimal under this scenario, the Stock Show and Large/Concurrent events will continue to operate and, as such, Transportation Demand Management will become essential to the circulation, functionality, and parking of the site.

Additional strategies for Scenarios 5 and 6, beyond the Pre-Construction phase, include trip reduction marketing and transit fare subsidies under the moderate plan, and limiting the parking supply for the aggressive plan. These strategies are highlighted in the following tables.

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The addition of these strategies results in a slightly higher reduction in VMT and SOV trips over the Pre-Construction scenarios.

Figure 3.13: TDM Strategies—Phase 1 and 2 Construction Stock Show Weekend

Construction	Stock Show Weekend (Scenario 5)	
	Moderate	Aggressive
Transit Accessibility	+	+
Commute Trip Reduction Marketing	+	+
Destination Accessibility	+	+
Transit Fare Subsidy	+	+
Unbundle Parking Costs	+	+
Parking Supply Limits		+
Local Shuttles		+
Carshare Parking	+	+
Secure Bicycle Parking	+	+
Preferential parking for 4+ carpools	+	+
Dedicated Carpool Pick-Up/Drop-Off	+	+
Multi-modal Wayfinding	+	+
Estimated Annual Cost:	\$764,000	\$878,000

Figure 3.14: Phase 1 and 2 Construction VMT, SOV, and Parking Reduction

Moderate			Aggressive		
VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION	VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION
21%	10%	10%	31%	15%	14%

Figure 3.15: TDM Strategies—Phase 1 and 2 Construction Large/Concurrent Event

Construction	Large / Concurrent Event (Scenario 6)	
	Moderate	Aggressive
Transit Accessibility	+	+
Commute Trip Reduction Marketing	+	+

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Destination Accessibility	+	+
Transit Fare Subsidy	+	+
Unbundle Parking Costs	+	+
Parking Supply Limits		+
Local Shuttles		+
Carshare Parking	+	+
Secure Bicycle Parking	+	+
Valet Bicycle Parking		+
Preferential parking for 4+ carpools	+	+
Dedicated Carpool Pick-Up/Drop-Off	+	+
Multi-modal Wayfinding	+	+
Estimated Annual Cost:	\$174,000	\$278,000

The TDM strategies included for Scenario 6 are projected to reduce VMT, SOV trips, and parking similar to Scenario 5 and are outlined in Figure 3.16.

Figure 3.16: Phase 1 and 2 Construction Large/Concurrent Event VMT, SOV, and Parking Reduction

Moderate			Aggressive		
VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION	VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION
21%	10%	10%	31%	15%	15%

The TDM strategies included for Scenario 7 are minimal given the small number of visitors and employees to the site during a typical day. The strategies are focused on providing wayfinding and secure parking for those that desire to arrive via a bicycle, and the promotion of using a carshare vehicle if trips must be taken off-site during the work day.

Figure 3.17: TDM Strategies—Phase 1 and 2 Construction Typical Day

Construction	Typical Day (Scenario 7)	
	Moderate	Aggressive
Carshare Parking	+	+
Secure Bicycle Parking	+	+
Multi-modal Wayfinding	+	+
Estimated Annual Cost:	\$54,000	\$108,000

The resulting reductions are outlined below, and are the same as the Pre-Construction typical day.

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Figure 3.18: Phase 1 and 2 Construction Typical Day VMT, SOV, and Parking Reduction

Moderate			Aggressive		
VTM REDUCTION	SOV REDUCTION	PARKING REDUCTION	VTM REDUCTION	SOV REDUCTION	PARKING REDUCTION
1%	<1%	2%	1%	1%	2%

PHASE 1 AND 2 OPERATIONAL

The moderate and aggressive TDM plans for Phase 1 and 2 Operational include several additional TDM strategies and represent the largest jump in implementation between stages. As the mix of land uses increases and the infrastructure within the campus and surrounding the campus evolves, the ability to utilize various modes of transportation increases. Some of the additional strategies, beyond those included in the Construction phase, include a complete pedestrian network, transit expansion and frequency, a carshare program, traffic calming, real-time transit displays, bikeshare stations, an internal fleet of bicycles for on-site trips, and an online mobility platform that provides real-time data for multiple mobility options (bus, rail, shuttles, TNC (Uber and Lyft), etc.), and a TDM coordinator.

Figure 3.19: TDM Strategies—Phase 1 and 2 Operational Stock Show Weekend

Operational	Stock Show Weekend (Scenario 8)	
	Moderate	Aggressive
Carshare Program		+
Land Use Diversity	+	+
Transit Network Expansion	+	+
Pedestrian Network	+	+
Transit Frequency/Speed	+	+
Transit Accessibility	+	+
Commute Trip Reduction Marketing	+	+
Destination Accessibility	+	+
Transit Fare Subsidy	+	+
Unbundle Parking Costs	+	+
Parking Supply Limits	+	+
Traffic Calming	+	+
Local Shuttles	+	+
Carshare Parking	+	+
Secure Bicycle Parking	+	+
Valet Bicycle Parking	+	+
Preferential parking for 4+ carpools	+	+
Dedicated Carpool Pick-Up/Drop-Off	+	+

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Multi-modal Wayfinding	+	+
Real time transit displays	+	+
Bikeshare Station	+	+
Internal Fleet of bicycles	+	+
Online Mobility platform	+	+
Estimated Annual Cost:	\$1.2M	\$1.6M

The resulting VMT, SOV trip, and parking reductions are shown in Figure 3.20 for Scenario 8. As is shown, the additional strategies result in significant increases in trip and parking reductions.

Figure 3.20: Phase 1 and 2 Operational Stock Show Weekend

Moderate			Aggressive		
VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION	VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION
37%	17%	15%	46%	22%	19%

Scenario 9 includes the same TDM strategies as Scenario 8, with the exception of parking supply limits for a large/concurrent event in the moderate plan.

Figure 3.21: TDM Strategies—Phase 1 and 2 Operational Large/Concurrent Event

Operational	Large / Concurrent Event (Scenario 9)	
	Moderate	Aggressive
Carshare Program		+
Land Use Diversity	+	+
Transit Network Expansion	+	+
Pedestrian Network	+	+
Transit Frequency/Speed	+	+
Transit Accessibility	+	+
Commute Trip Reduction Marketing	+	+
Destination Accessibility	+	+
Transit Fare Subsidy	+	+
Unbundle Parking Costs	+	+
Parking Supply Limits		+
Traffic Calming	+	+
Local Shuttles	+	+



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Carshare Parking	+	+
Secure Bicycle Parking	+	+
Valet Bicycle Parking	+	+
Preferential parking for 4+ carpools	+	+
Dedicated Carpool Pick-Up/Drop-Off	+	+
Multi-modal Wayfinding	+	+
Real time transit displays	+	+
Bikeshare Station	+	+
Internal Fleet of bicycles	+	+
TDM Coordinator	+	+
Online Mobility Platform	+	+
Estimated Annual Cost:	\$415,000	\$627,000

The resulting VMT, SOV trip, and parking reductions are shown below. The moderate plan results in lower VMT and SOV reductions, because a parking-supply limit for large/concurrent events was not included.

Figure 3.22: Phase 1 and 2 Operational Large Concurrent Event VMT, SOV, and Parking Reduction

Moderate			Aggressive		
VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION	VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION
29%	14%	14%	46%	22%	19%

Scenario 10 includes additional employee-based TDM strategies, because the number of employees during the typical weekday is projected to be higher than previous scenarios.

Figure 3.23: TDM Strategies—Phase 1 and 2 Operational Typical Day

Operational	Typical Day (Scenario 10)	
	Moderate	Aggressive
Carshare Program		+
Land Use Diversity	+	+
Transit Network Expansion	+	+
Pedestrian Network	+	+
Rideshare Program		+
Transit Frequency/Speed	+	+
Transit Accessibility	+	+



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Commute Trip Reduction Marketing	+	+
Destination Accessibility	+	+
Employee Parking Cash-Out	+	+
Employer Sponsored Vanpool/Shuttle		+
Transit Fare Subsidy	+	+
Unbundle Parking Costs	+	+
Workplace Parking Pricing	+	+
Parking Supply Limits	+	+
Traffic Calming	+	+
Local Shuttles	+	+
Carshare Parking	+	+
Secure Bicycle Parking	+	+
Multi-modal Wayfinding	+	+
Real time transit displays	+	+
Bikeshare Station	+	+
Internal Fleet of bicycles	+	+
Estimated Annual Cost:	\$936,000	\$1.7M

The resulting VMT, SOV trip, and parking reductions are shown in Figure 3.24, and represent a significant reduction in VMT, SOV, and parking over the Pre-Construction and Construction typical weekdays.

Figure 3.24: Phase 1 and 2 Operational Typical Day VMT, SOV, and Parking Reduction

Moderate			Aggressive		
VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION	VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION
37%	17%	10%	45%	21%	17%

FULL BUILDOUT

The moderate and aggressive TDM plans for Full Build-Out include additional TDM strategies. As the site is completely built out per the Master Plan, the pedestrian, roadway, transit, and bicycle infrastructure within, and surrounding, the site is completed allowing a shift in mode share from the private vehicle. Some of the additional strategies include a mobility hub, on-street market pricing, and end-of-trip facilities (showers, bike repairs) for regular commuters.

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Figure 3.25: TDM Strategies—Full Buildout Stock Show Weekend

Full Build	Stock Show Weekend (Scenario 11)	
	Moderate	Aggressive
Carshare Program		+
Land Use Diversity	+	+
Transit Network Expansion	+	+
Pedestrian Network	+	+
Transit Frequency/Speed	+	+
Transit Accessibility	+	+
Commute Trip Reduction Marketing	+	+
Destination Accessibility	+	+
Transit Fare Subsidy	+	+
Unbundle Parking Costs	+	+
On-Street Market Pricing		+
Parking Supply Limits	+	+
Traffic Calming	+	+
Local Shuttles	+	+
Carshare Parking	+	+
Secure Bicycle Parking	+	+
Valet Bicycle Parking	+	+
Preferential parking for 4+ carpools	+	+
Dedicated Carpool Pick-Up/Drop-Off	+	+
Multi-modal Wayfinding	+	+
Real time transit displays	+	+
Bikeshare Station	+	+
Internal Fleet of bicycles	+	+
TDM Coordinator	+	+
Online Mobility Platform	+	+
Mobility Hub		+
Estimated Annual Cost:	\$1.2M	\$1.4M

The resulting VMT, SOV, and parking reductions for Scenario 11 are shown in Figure 3.26.

Figure 3.26 Full Buildout Stock Show Weekend VMT, SOV, and Parking Reduction

Moderate			Aggressive		
VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION	VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION
41%	20%	15%	50%	24%	20%



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For Scenario 12, the aggressive TDM plans are the same. The difference in moderate plans is the parking supply limits included for stock show weekend, but not for large/concurrent events.

Figure 3.27: TDM Strategies—Full Buildout Large/Concurrent Event

Full Build	Large / Concurrent Event (Scenario 12)	
	Moderate	Aggressive
Carshare Program		+
Land Use Diversity	+	+
Transit Network Expansion	+	+
Pedestrian Network	+	+
Transit Frequency/Speed	+	+
Transit Accessibility	+	+
Commute Trip Reduction Marketing	+	+
Destination Accessibility	+	+
Transit Fare Subsidy	+	+
Unbundle Parking Costs	+	+
On-Street Market Pricing		+
Parking Supply Limits		+
Traffic Calming	+	+
Local Shuttles	+	+
Carshare Parking	+	+
Secure Bicycle Parking	+	+
Valet Bicycle Parking	+	+
Preferential parking for 4+ carpools	+	+
Dedicated Carpool Pick-Up/Drop-Off	+	+
Multi-modal Wayfinding	+	+
Real time transit displays	+	+
Bikeshare Station	+	+
Internal Fleet of bicycles	+	+
TDM Coordinator	+	+
Online Mobility Platform	+	+
Mobility Hub		+
Estimated Annual Cost:	\$416,000	\$628,000



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The resulting VMT, SOV trip, and parking reductions for Scenario 12 are shown in Figure 3.28.

Figure 3.28: Full Buildout Large/Concurrent Event VMT, SOV, and Parking Reduction

VMT, SOV and Parking Reduction (Scenario 12)					
Moderate			Agressive		
VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION	VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION
34%	16%	14%	50%	24%	20%

The full-build scenario for a typical weekday includes strategies targeted at the weekday employees: alternative schedules and telecommuting, neighborhood (NWC campus) electric vehicles, guaranteed ride home, subsidized carshare memberships for trips during the day, and an electric bikeshare program for internal trips.

Figure 3.29: TDM Strategies—Full Buildout Typical Day

Full Build	Typical Day (Scenario 13)	
	Moderate	Aggressive
Carshare Program		+
Land Use Diversity	+	+
Transit Network Expansion	+	+
Pedestrian Network	+	+
Rideshare Program		+
Transit Frequency/Speed	+	+
Transit Accessibility	+	+
Alternative Schedules & Telecommute		+
Commute Trip Reduction Marketing	+	+
Destination Accessibility	+	+
Employee Parking Cash-Out	+	+
Employer Sponsored Vanpool/Shuttle		+
Transit Fare Subsidy	+	+
Unbundle Parking Costs	+	+
On-Street Market Pricing	+	+
Workplace Parking Pricing	+	+
Parking Supply Limits	+	+
Neighborhood Electric Vehicle Network		+
Traffic Calming	+	+
Local Shuttles	+	+
Guaranteed Ride Home	+	+
Subsidized Carshare Membership	+	+



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Carshare Parking	+	+
Secure Bicycle Parking	+	+
Preferential parking for 4+ carpools	+	+
Dedicated Carpool Pick-Up/Drop-Off	+	+
Multi-modal Wayfinding	+	+
Real time transit displays	+	+
Bikeshare Station	+	+
Electric Bikeshare Program		+
Bikeshare Membership	+	+
End of trip facilities (showers, lockers, repair station)	+	+
Internal Fleet of bicycles	+	+
TDM Coordinator	+	+
Online Mobility Platform	+	+
Mobility Hub		+
Estimated Annual Cost:	\$1.8M	\$3.0M

Scenario 13 represents the highest reduction in VMT, SOV trips, and parking as shown in Figure 3.30.

Figure 3.30: Full Buildout Typical Day VMT, SOV, and Parking Reduction

VMT, SOV and Parking Reduction (Scenario 13)					
Moderate			Aggressive		
VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION	VMT REDUCTION	SOV REDUCTION	PARKING REDUCTION
52%	24%	14%	59%	28%	24%



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RECOMMENDATIONS

As a major event center and multi-use campus poised for significant growth, the NWC is likely to have a substantial influence on the local and regional transportation network. TDM will play an essential role in reducing the number of vehicle trips generated by the campus, as well as campus parking infrastructure needs, while still providing a high-quality transportation experience for all users and visitors.

TDM is most effective when supported and implemented by both the public and private sector through a coordinated effort to reduce vehicle trips to an area, or to a high-intensity activity center like the NWC campus. TDM is also most effective when multiple strategies are implemented together as part of a package of transportation options for end users.

This study analyzed 13 TDM scenarios (each with a moderate and aggressive version), and modeled the potential trip and parking reductions. Although the planning-level cost estimates to implement these plans are substantial under certain scenarios, each is projected to result in significant trip and parking reductions. (Note that for parking and access needs, the moderate scenario is assumed). Without regard to which scenarios or strategies are ultimately selected, NWC should consider the following enabling actions to effectively introduce TDM programming:

PLAN RECOMMENDATIONS: TRANSPORTATION DEMAND MANAGEMENT

To be implemented by the Management Authority and Partners:

1. Create a Parking and Transportation Management Authority (TMA) for the campus.
2. Hire a campus mobility coordinator.
3. Develop and implement TDM interventions by stage.
4. Consider the complete trip (origin to destination).
5. Capitalize on current branding and marketing.
6. Develop an active TDM monitoring program, and adjust programs as necessary.
7. Pursue regional TDM support from prospective partners.
8. Pursue regional TDM funding reflective of the stage of construction and the interventions pursued.
9. Begin collecting end user parking fees, separate from the ticket price, for all events including the Stock Show, once Phases 1 and 2 are operational.



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RECOMMENDATION DETAIL

The following section provides detail on certain recommendations discussed above.

- **Create a Parking and Transportation Management Authority (TMA).** The Management Authority, comprised of partner leadership, should include a department or management arm specifically dedicated to managing parking and transportation for the NWC campus, year-round (including during Stock Show). Duties for the transportation component would include implementing, managing, and collecting data on the success of TDM initiatives. The Parking and Transportation Authority would be expected to form partnerships and maintain agreements with the surrounding neighborhoods and other entities, including the City, RiNo Business District, CDOT, and RTD, to leverage other parking and transportation infrastructure critical to the campus.
- **Hire a campus mobility coordinator.** This Plan recommends that the Parking and Transportation Management Authority prioritize hiring of a campus mobility coordinator to spearhead said implementation of TDM initiatives and strategies, as discussed herein. This position should be created and filled during the Pre-Construction stage; all partners should participate in the hiring process.
- **Develop and implement TDM interventions by stage; pursue regional funding support from prospective partners; pursue regional TDM funding reflective of the stage of construction and the interventions pursued.** As discussed in the Key Findings section above, TDM strategies should be developed and implemented by the Parking and Transportation Management Authority (led by the campus mobility coordinator). The Authority should utilize the scaled strategies by stage to evaluate funding needs and approach prospective regional partners (e.g. RTD, DRCOG, CDOT, etc.) to contribute resources.
- **Consider the complete trip (origin to destination).** The Plan recommends that any TDM strategy, at each stage, employ interventions from each user's origin of travel to their final destination. This includes strategies to improve circulation in and around the site, as well as first and last mile options and trip planning for users from all locations.
- **Capitalize on current branding and marketing.** Active promotion of multimodal transportation options is essential to ensuring their success. This Plan recommends that the Authority leverage NWC branding and marketing to identify options for campus visitors—for example, campus history or other informational audio on internal shuttle systems, NWC banners on the RTD N-line, and branded bike lanes and signage.
- **Develop an active TDM monitoring program, and adjust programs as necessary.** The effectiveness of individual TDM strategies should be monitored by a third party and reported on annually in order to determine whether certain strategies should be expanded upon, maintained, or replaced. The moderate VMT, SOV, and parking reduction percentages by stage should be used as a benchmark for success.
- **Unbundled Parking Fees (once Phases 1 and 2 are operational):** Unbundling the price of parking is a critical TDM element and is recommended in this Chapter and again in Chapter 7 under parking management. This strategy is considered one of the most important enabling mechanisms for TDM programs to be successful for the following reasons:
 - Charging a modest amount for parking is enough to incentivize some patrons to choose an alternative mode of arrival – such as carpool, public transit, uber/lyft, or a less expensive remote or off-site parking location



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- o Demand-based parking pricing is a proven strategy for the vast majority of major event venues across the nation as an effective strategy to manage the demand for parking resources as opposed to alternatives
- o Conversely, when parking charges are buried in the cost of the ticket, the option to influence consumer choice based on price is lost
- o Once parking fees are unbundled, parking pricing can then be used to influence where patrons park and created added value for programs such as preferential carpool parking
- o In many systems, parking fees are a logical way to help fund programs such as TDM incentives, and cover TDM operational costs
- o Finally, bundling the price of parking into the ticket price implicitly suggests that all ticket holders will also be provided equal accommodations within the parking system; this is not currently the case on the site and will likely not be the case under future phases of build-out. Additionally, there is some evidence to suggest that by bundling parking fees a venue may increase the frustration among end-users when they arrive to the site and find that most of the close-in "free" parking is already full and they are re-directed to a remote lot.

We understand that the NWS does collect parking fees for many large events throughout the year but moved away from pay parking for the NWSS event to help address traffic issues, safety, and customer satisfaction. The consultant team feels that redesign of the parking and access systems (in future phases) and the implementation of newer pay parking technologies (and management practices) can help to address the traffic and safety issues. Many of the parking operations recommendations in Chapter 7 are aimed at improving pay parking operations for the site so that fees can be collected in manner that is secure, efficient, and customer-friendly. We strongly recommend that these operational changes be adopted in addition to collecting fees from all parking patrons.

In terms of customer satisfaction, we feel that the right combination of market-base parking pricing, discounted remote parking options, and viable TDM alternatives will ultimately allow for a better end-user experience when attending events at NWS (including the Stock Show).

TDM programs and strategies should be implemented by stage by the established parking and transportation management authority. The authority should also be responsible for identifying funding for programs, hiring the campus mobility coordinator and associated support staff, and identifying a third party to continuously monitor program success and recommend changes as necessary.

Risk is always a factor when planning for a transportation solution that will work for a diverse range of activities and user groups. To account for risk in building the above-mentioned recommendations, the planning team did the following:

- Accounted for differences among user groups (e.g., exhibitors vs. employees) and event types (e.g., the National Western Stock Show vs. a summer music concert) in assessing the potential success of various TDM strategies.
- Assumed "moderate" reductions in parking demand when determining parking infrastructure needs.
- Recommended regular monitoring of TDM program success in order to continually adapt to the changing landscape and anticipate potential shortfalls.

The planning team recommends that the following steps be taken to account for risk in TDM programming and effectiveness moving forward:



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- Implement the recommendation to regularly monitor TDM program success. Assign this task to an independent third party unassociated with the team responsible for managing the programs. Establish a benchmark for success (identified as the “moderate” parking demand-reduction percentages by scenario, as set forth in this document).
- If the benchmark for success is unmet, perform the following:
 - o Increase usage of high-performing TDM strategies and replace low-performing TDM strategies. For example, if preferential parking for carpools of 4+ persons has proven especially impactful for Large/Concurrent Event VMT, SOV, and parking reductions, increase the number of preferred parking spaces dedicated to such carpools. Conversely, if valet bike parking is infrequently used and has no measured impacts on VMT, SOV, and parking reduction, eliminate the program and replace with an alternative program or increased focus on another TDM program.
 - o Scale up marketing and incentive packages as funding allows.
 - o If the benchmark is still unmet, consider increasing off-site parking lease capacity and corresponding shuttle operations (as discussed in Chapter 6 of this document) to meet increases in demand.

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CHAPTER 4: SPECIALIZED VEHICLES



OBJECTIVES: *PRIORITIZE SPACE FOR EXHIBITOR AND VENDOR SPECIALIZED VEHICLE OPERATIONS TO ALLOW FOR EVENT SUCCESS AND EXPANSION.*

WHAT'S IN THIS SECTION?

- Specialized Vehicles & The National Western Center
- Analysis
- Key Findings
- Recommendations

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SPECIALIZED VEHICLES & THE NATIONAL WESTERN CENTER

Specialized vehicles, such as trucks and trailers, have always been an essential part of operations at the NWC. They make many different types of programming and events possible—from rodeos to concerts. As such, an integral objective of this plan is to prioritize space for those users that require specialized vehicles, such as exhibitors and vendors. This focus ensures that limitations on that space is not an obstacle to event success and expansion. At the same time, this Plan seeks to balance other on-site needs and leverage opportunities to use off-site solutions for certain specialized vehicle activity, such as storage.

EXISTING CONDITIONS

Presently, specialized vehicles are primarily used to bring in livestock and other animals, tack and equipment, and vendor materials to the NWC site. Types of specialized vehicles include stock trailers, semi haulers, tack and support trailers, and others—each differing in size and configuration. The Stock Show especially places great importance on these vehicles and their proximity to the buildings and to outdoor areas where events involving livestock and other equipment occur.

The Figures 4.1 and 4.2 depict the on-site space presently dedicated to specialized vehicle staging and storage (load-in and load-out activities are handled internally to the site itself, at each individual venue). A significant percentage of specialized vehicle operations, especially queuing for the Stockyards and for truck and trailer storage, currently occurs off-site, along Brighton Boulevard (queuing) and in the roughly 500,000 sq. ft. surface lot adjacent to Coors Field (storage). Some exhibitors for the NWSS opt to store their animal trailers at alternative off-site locations, including private residences or off I-70 (at the Denver Mattress Factory Lot, for example). The current needs for off-site storage currently accommodated by off-site, independent locations are factored into this Plan's analysis of future needs for the site.

Figure 4.1: Truck and Trailer Operations – Existing Square Footage (Rounded)

	On-Site	Off-Site	Total
Truck/Trailer Staging and Storage (in Acres)	12.8	11.1	23.9

Notes:

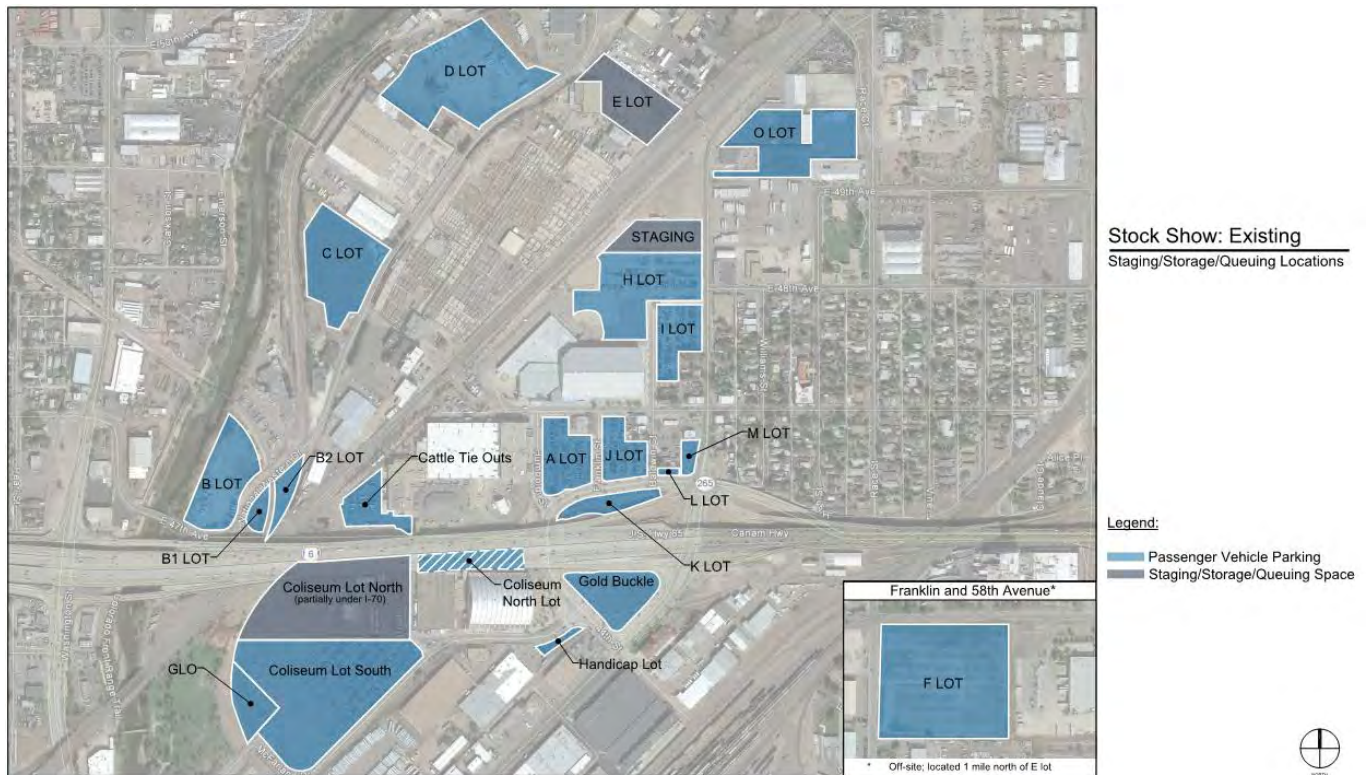
- On-Site acreage includes: Lot E, Lot G, and the Coliseum North Lot
- Off-Site acreage includes: Coors Field surface lot, which is used for storage after trucks and trailers unload at the yards
- The existing totals above do not reflect any staging that occurs along Brighton Blvd.
- Truck/trailer load-in and load-out areas located internally to the site (such as immediately adjacent to the yards or the Expo Hall) are excluded; these areas will be factored in to building-specific programming, which is being finalized by the Placemaking team

During non-stock show periods, some of the areas used for truck and trailer storage and queuing are available for event parking. A good example is the Coliseum North lot, which is devoted to truck/trailer and rodeo staging during the Stock Show, and during other regular Rodeo events. For other events, such as the Home Show, this lot is open for attendee parking and contains roughly 1,000 spaces, as of the 2015 and 2016 stock shows. (There are currently plans in place to expand this lot into a dirt area under I-70).

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Figure 4.2: Truck and Trailer Operations – Existing Locations Map



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WHAT KINDS OF SPACE DO SPECIALIZED VEHICLES NEED?

Specialized vehicle users typically require the following types of spaces:

- **Staging and Queuing:** Space where specialized vehicles can be held short-term while waiting for load-in and load-out at the yards or other venues. Many exhibitors for the Stock Show may arrive overnight, or many hours prior to their actual load-in timeslot.
- **Storage:** Space where specialized vehicles can be held for long periods of time, generally several days or a full week or more, during NWSS. Most storage currently occurs at off-site locations.



Examples of truck/trailer staging, queuing, and storage at the Stock Show

- **Load-In / Load-Out:** The area needed for loading and unloading of animals and/or equipment, veterinary or administrative check-ins, and other activities. These activities occur immediately adjacent to the buildings and/or yards.

The objective of this Plan is to provide analysis and recommendations related to staging/queuing and to storage for specialized vehicles. These are all activities that can occur either on-site or in near-site or remote parking lots.

The spatial needs for load-in / load-out activities (number of docks, etc.) is not addressed in this Plan, as it is a function of the size and activity level for each venue and would be handled primarily internally to the site. The Placemaking team will be addressing load-in / load-out analysis as part of the next phase of programming.

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SPECIALIZED VEHICLES AND EFFICIENCY

Over many years, the NWSS has developed a generally efficient in handling truck and trailer staging, storage, and queuing needs in terms of customer experience. This has been done through trial and error, and repeating and improving on the methods that work. However, many of the lots that are currently used for truck and trailer storage and/or staging are unimproved and unstriped, as shown in Figure 4.3. This means that, though the procedures in place for truck and trailer movements provide a strong level of service overall, the geometric efficiency (i.e., the land area devoted per vehicle) is relatively low. This is more a function of the skill and precision of individual drivers, rather than a reflection on the procedures put in place by the NWSS.

The planning team has devoted significant energy in determining the future needs related to trucks and trailers for the future site, and have also considered whether the spatial needs could be improved upon by providing permanent (striped and improved) lots that are dedicated to specialized vehicle use. Providing for striped and allocated stalls for specialized vehicles is one option to help improve the overall efficiency of the future site. Services, such as trash, water, power, lighting, communications, and extra covered storage could also be provided if certain lots were improved for full-time usage by specialized vehicles.

Figure 4.3: Truck and Trailer Operations – Unimproved v. Striped and Improved



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SPECIALIZED VEHICLES AND SITE ACCESS

One of the site's primary challenges is that many of the roadways into and around the NWC campus are smaller surface streets, which are more difficult for trucks and trailers to navigate, yet are often used as staging, queuing, and storage spaces for trucks and trailers. To maximize efficiency, reliability, and predictability of truck and trailer space in the future, this Plan incorporated methodology to determine appropriate sizing of permanent, dedicated infrastructure for specialized vehicles. One benefit would be that such infrastructure could be designed in a way that access and turning movements from major roadways would be improved over current conditions.

Another important benefit in designing for dedicated, and outfitted, space for specialized vehicles is avoiding usage and subsequent congestion of the adjacent roadways. At present, Brighton Boulevard is used as a primary staging and queuing space for specialized vehicles during the Stock Show. If permanent infrastructure both on- and off-site is dedicated for such activities in the future, Brighton Boulevard, and other streets surrounding the campus, can be prioritized for passenger vehicles, pedestrians, bicycle, and light vehicle travel.

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PROCESS & ANALYSIS

To develop our projections of specialized vehicle needs for the future NWC campus, the team used analysis of existing conditions, plus an intensive evaluation of projected future needs—based on variables such as requirements by event type, projected livestock totals and breeds, typical vehicle size, and arrival and departure schedules. Many of the assumptions related to future growth were vetted with NWSS and with other technical advisory groups representing vendors, exhibitors, and rodeo operations.

Efforts to ascertain appropriate spatial needs for the myriad of trucks, trailers, and other specialized vehicles that frequent the NWC campus were a combination of meetings with NWSS staff and representatives from individual livestock and vendor groups, on-the-ground data collection and observation, and incorporation of industry standards for specialized vehicle infrastructure design. A major focus of this effort was the significant level of intensification in programming for events that will drive spatial demand for specialized vehicles over the course of Master Plan implementation. The planning team heavily weighted this projected intensification in programming, based on its importance in the overall health and success of the NWC.

A more detailed list of all assumptions that went into the analysis for this Plan section is included in the Appendix related to this Chapter; however, Figure 4.4 below provides an overview of the assumptions and their scope. The general workflow for this portion of the Plan is summarized in Figure 4.5.

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Figure 4.4: Specialized Vehicle Needs Assumptions Overview



Figure 4.5: Specialized Vehicles Analysis Workflow



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As previously stated, industry standard publications regarding permanent infrastructure design for specialized vehicles were also consulted. Figure 4.6 on the following page, for example, depicts the range of vehicular movement ideally accommodated in permanent infrastructure, derived from the Walker Consultants Standard Detail in AutoTURN. AutoTURN is a software used to determine vehicle turn radii and other metrics.

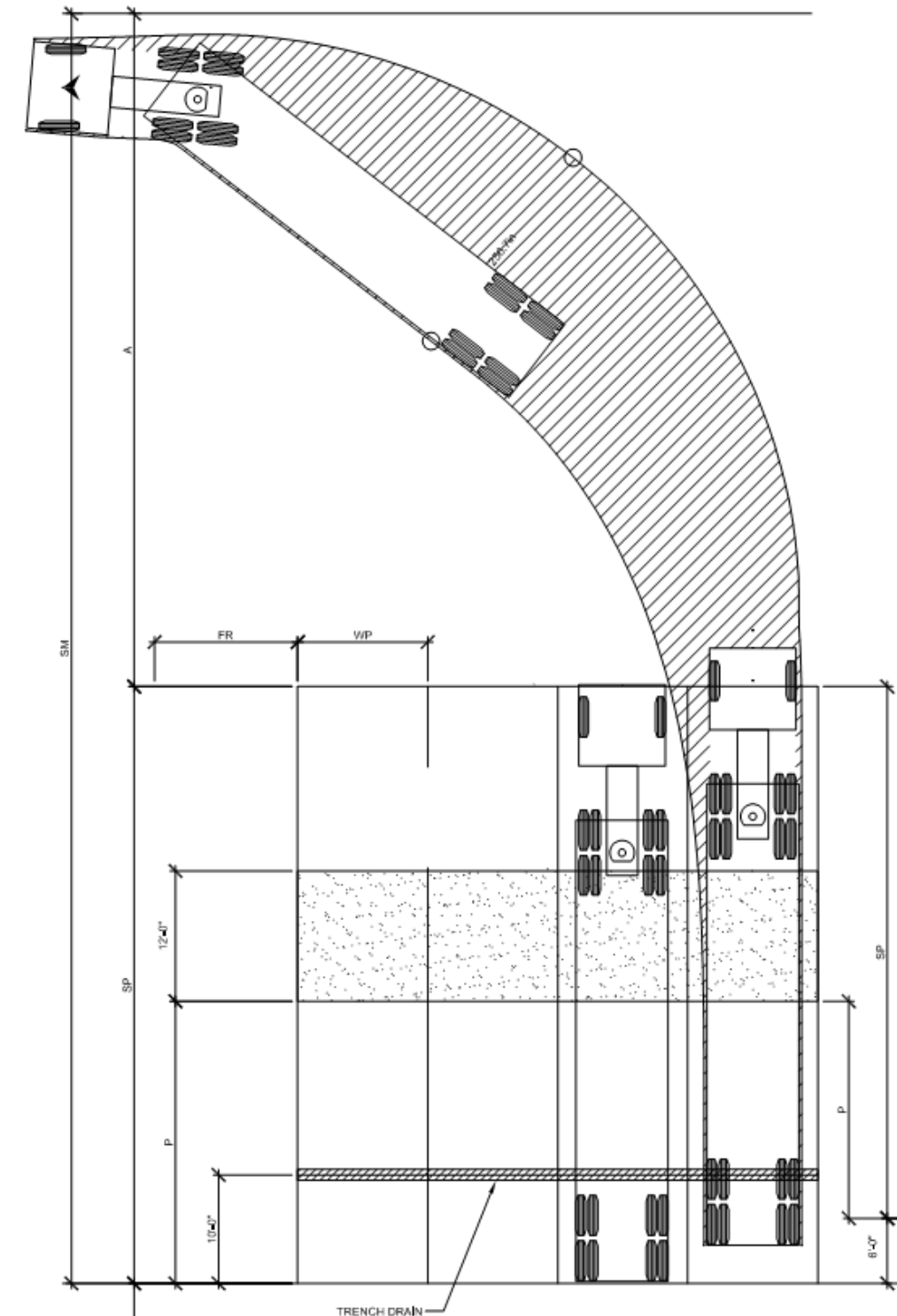
Note that, for the purposes of this Plan, specialized vehicles are expected to include any vehicles over roughly 20' in length and/or 8' in width. This generally includes buses and RVs, livestock trailers, truck and trailer combinations, "big rigs", and other vehicle types in between. The most typical dimensions and vehicle types include:

- Single-Unit (SU) Trucks: 30' in length
- Intermediate (WB40 and WB50) Semitrailers: 45' to 55' in length
- Interstate (WB62, WB65, and WB67) Semitrailers: 68.5' to 73.5' in length

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Figure 4.6: Typical Truck/Trailer Design Sample for Parking and Turning Movements



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KEY FINDINGS

Based on our analysis of Specialized Vehicle needs for the future site, the consultant team is recommending that the following square footages be devoted for staging/queuing and storage. A full breakdown of the projected needs by event level of activity, and by animal event type (or other event type) is provided in the appendix.

Figure 4.7: Projected Spatial Needs for Specialized Vehicles*

Timeframe	Type	NWSS	Large/Concurrent Event
Phase 1&2 Operational	Staging	6.7 acres	3.3 acres
	Storage	26.9 acres	6.6 acres
	Total	33.6 acres	9.9 acres
Full Buildout	Staging	6.7 acres	3.8 acres
	Storage	28.1 acres	7.5 acres
	Total	34.8 acres	11.3 acres

**One acre is equal to 43,560 sq.ft.; the equivalent amount of parking would be roughly 130 to 150 spaces in an improved lot, or roughly 100 spaces in an unimproved dirt lot (as currently configured on the site).*

WHERE SHOULD SPECIALIZED VEHICLE OPERATIONS BE HANDLED FOR NWSS?

For Typical Day and Large/Concurrent event scenarios, this Plan recommends that specialized vehicle operations have the space to occur entirely near- or on-site—meaning that for a projected 90% of the calendar year, off-site staging, queuing, and storage space will not be needed. This will help save on operating expenses over the long-term, and help to promote the growth in number (and size) of events that may require specialized vehicles.

For the largest events that draw a higher demand for specialized vehicle space, like the National Western Stock Show, this Plan recommends that off-site space be identified, and that the space be specifically dedicated to specialized vehicle operations for the 16-day event. This solution begs the question—why, during the Stock Show, should some specialized vehicle operations occur off-site rather than devoting more full-time infrastructure to this purpose?

The first reason is space. Many specialized vehicles, such as semi-haulers and truck and stock trailer combinations, require upwards of 1,300 sq. ft. of space for staging, queuing, and storage activities. In other words, an area the size of a football field could only accommodate 44 specialized vehicles at any one time. As such, housing all specialized vehicle operations on- or near-site for the Stock Show would require sacrificing buildings or other programming currently conceived for the NWC site.

The second reason is efficiency. With projected programming, the only event expected to draw more specialized vehicle activity than a Large/Concurrent Event is the Stock Show, which occurs on fewer than 10% of calendar days. Building new on- or near-site infrastructure to support this level of activity would mean that that space would sit empty and underutilized, even during Large/Concurrent events when a significant amount of specialized vehicle space is needed.

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LOT F

One key finding of the Plan, as shown in Figure 4.7, is that roughly 9.9 acres are projected to be needed for Phase 1 and 2 Operational for the large or concurrent event activity level, and up to 11.3 acres will be needed at Full Buildout. The planning team has found that Lot F, an unimproved area at Franklin St. and E 58th Ave owned by the NWSS and used for passenger parking, is a potential location for full-time specialized vehicle storage and queuing, in addition to several smaller locations in close proximity to the core campus. Lot F currently contains just over 10 acres and is projected to contain 8.6 acres after Adams County makes improvements to 58th Ave. In evaluating Lot F as a possible permanent location for specialized vehicle operations, the planning team also identified essential improvements to the lot, including:

- Improved drainage and sub-surface conditions
- Asphalt and striping (per large vehicle dimensions shown in the prior figure)
- Lighting, power, security, and communications infrastructure
- Signage
- Buildings to allow for animal check-in and additional storage, and a shuttle waiting area
- Restrooms and other services
- Queuing lanes internal to the property

NORTH COLISEUM LOT

The assumption of this Plan is that during NWSS (and other rodeo events), a portion of the Coliseum North Lot would still be used for rodeo needs, such as contestant and livestock staging, until the time that the Coliseum is replaced or redeveloped. At that time, appropriate rodeo staging and storage acres would need to be accommodated into the programing for this portion of the site. (Please reference the Chapter 3 appendix for spatial projections for rodeo usage, by development stage).

However, it is the finding of this Plan that the rodeo function could still be accommodated sufficiently using 2/3 of the Coliseum North Lot, by condensing essential functions at this location and relocating other specialized vehicles to the full-time location (such as Lot F). This plan assumes that up to 440 additional parking spaces could be made available for event attendees and/or exhibitors within the Coliseum North Lot.

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RECOMMENDATIONS AND IMPLEMENTATION

Specialized Vehicles are critical to the success of the future site, as many of the largest and most high profile events, including the NWSS, will require varying degrees of space for staging, storage, and queuing for non-passenger vehicles. Planning appropriately for these vehicles will help the site to grow in terms of the number and diversity of the events that can be accommodated. Specialized vehicle types will vary in size but, at minimum, will include vehicles such as service trucks, truck and trailer combinations, other livestock trailers, big rigs, buses, RVs, and others. The following are the recommended steps to help plan for and accommodate these vehicle types.

PLAN RECOMMENDATIONS: SPECIALIZED VEHICLES

1. Plan for the future site. *(Management Authority and Partners)*
2. As part of Placemaking, evaluate core site access and load-in/load-out needs for various venues. *(Placemaking Team)*
3. Identify 11.3 acres, on-site or near-site, for full-time improved specialized vehicle storage, staging, and queuing. *(Placemaking Team)*
4. Consider improving Lot F, or similar near-site alternative, for full-time specialized vehicle operations and add a smaller lot (or lots) closer to the core campus to address remaining acreage. *(Placemaking Team/ WSSA)*
5. Re-evaluate use of the Coliseum North Lot for Rodeo functions to free up space for passenger vehicle parking. *(Placemaking Team/ WSSA)*
6. Identify off-site locations (up to 23.5 additional acres) for temporary specialized vehicle storage needs during the NWSS event. *(Management Authority and WSSA)*

RECOMMENDATION DETAIL

The following section provides detail on certain recommendations discussed above.

- **Plan for the future site.** The recommendations set forth by this Plan assume a vibrant, active NWC akin to the vision described in the Campus Master Plan. The specialized vehicle demand projections and resulting specialized vehicle infrastructure recommendations assume that the Campus grows programming scope and intensity as projected by the Master Plan.
- **Evaluate core site access and load-in/load-out needs for various venues.** Needs for specific buildings, and circulation needs internal to the site, have not been evaluated as part of this process. The Placemaking

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team should determine what spatial needs are required for loading of individual buildings, such as the new arena.

- **Consider improving Lot F or similar alternative for full-time specialized vehicle operations.** The consultant team recommends that Lot F, located at Franklin St. and E. 58th Ave., should be considered as a possible location for full-time, improved, specialized vehicle storage and queuing. Lot F current contains just over 10 acres and is projected to contain 8.6 acres after Adams County makes improvements to 58th Ave. Several smaller locations in closer proximity to the core campus should be considered to address the remaining acreage needs. Recommended improvements to Lot F, or alternative location(s), are mentioned previously and would include:
 - o Improved drainage and sub-surface conditions
 - o Asphalt and striping (per large vehicle dimensions shown in the prior figure)
 - o Lighting, power, security, and communications infrastructure
 - o Signage
 - o Buildings to allow for animal check-in and additional storage, and a shuttle waiting area
 - o Restrooms and other services
 - o Queuing lanes internal to the property

We understand that F Lot is privately owned by NWSS and may be later zoned or redeveloped for a use other than parking. If Lot F is not a viable long-term location for the recommended improvements, then this Plan recommends that an alternative location be identified for full-time specialized vehicle usage. A total of up to 11.3 acres is recommended for full build-out of the site.

- **Reevaluate use of the Coliseum North Lot for rodeo functions to free up space for passenger vehicle parking.** This Plan recommends that the Placemaking team work with the WSSA to evaluate options that will reduce usage of the Coliseum North Lot as a staging and storage area for rodeo functions, particularly during interim stages of development during which passenger vehicle parking inventory will be impacted by construction activity around the site.

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CHAPTER 5: PARKING INFRASTRUCTURE



OBJECTIVES: *ENSURE THAT PARKING INFRASTRUCTURE IS RESPONSIVE TO GROWING ATTENDANCE AND PROGRAMMING.*

WHAT'S IN THIS SECTION?

- Parking & The National Western Center
- Analysis
- Key Findings
- Recommendations

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PARKING & THE NATIONAL WESTERN CENTER

Parking is a central issue for the National Western Center because it directly correlates with users' ability to access the site. The campus, and the Stock Show specifically, have traditionally generated a large need for parking, as many attendees tend to arrive from out of state and a large proportion arrive by personal vehicle. Recent survey data from the 2016 Stock Show indicates an uptick in patrons' desire to access the site by non-driving options (with 11% arriving by some other mode, resulting in a 6% parking demand reduction). However, even as reductions in parking demand grow alongside a strong suite of TDM initiatives, a significant percentage of NWSS attendees will arrive either by passenger vehicle or, in the case of some vendors and exhibitors, by larger trucks/trailers. As such, the way in which parking infrastructure is provided on-site and off-site, in concert with TDM and other access initiatives, is vital to strengthen the NWC's ability to grow and become a year-round center of activity.

The vision for this Plan for parking infrastructure at the NWC is not to assign a number of parking stalls arbitrarily; rather, it was to "right-size" parking based on the following factors:

- Projected parking demand by user group, during each activity level and stage of development
- Projected reductions in parking demand correlated with TDM interventions
- The frequency and volume of activity on the site during each stage of development

Note that this Plan also does not rely heavily on the existing inventory of parking on the campus as a starting point because: A) the "baseline" inventory is relatively fluid and tends to vary from year-to-year and from event-to-event, and B) NWSS representatives have frequently mentioned that the current parking infrastructure is insufficient and a limiting factor on the current and ongoing success of the Stock Show and other events.

The consultants working on this Plan are very cognizant of the fact that there are several varied (and sometimes competing) opinions and priorities related to on-site and off-site parking capacity. Therefore, this Plan seeks to provide our best professional evaluation of actual need for parking, based on projected attendance, and to make sound recommendations, based on best practices, related to the massing and phasing of both on-site and off-site solutions. This chapter is closely related to the subsequent chapters, Access & Off-Site Solutions, and Management & Technology, which touch upon the Plan's recommendations for alternatives to on-site parking and for managing the parking inventory.



WHAT IS A DESIGN DAY?

As discussed in Chapter 3, this Plan recommends taking significant steps to incentivize people to use multimodal options to access the site. However, even with extensive TDM interventions, such as unbundled parking, transit subsidies, or improved bicycle infrastructure, a significant number of users will still choose to drive.

The Plan recommends that such users are accommodated using a combination of on-site and off-site solutions. Both the construction of on-site parking and the usage of off-site parking (including leasing costs, shuttling costs,

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concession costs, and other associated fees) are expensive endeavors; due to these and other factors unrelated to cost—such as spatial needs—many event centers choose to undersupply parking and rely on the private market to accommodate demand. As stated above, the Plan recommends that all users driving to the site are accommodated using both on-site and off-site infrastructure. However, the team understands that the Management Authority and its decision-makers may ultimately decide not to procure all of the off-site parking supply needed to accommodate 100% of the parking demand that certain events are expected to generate. The pros of such an approach are as follows:

- Reduction or elimination of leasing costs, shuttle costs, concession costs, and other costs associated with off-site parking managed by the NWC/NWC Management Authority
- Potential to bolster success of TDM strategies by further limiting parking supply

The cons of such an approach are as follows:

- Potential hit to event attendance due to lack of direct or “guaranteed” parking associated with NWC
- Potential increases to area paid parking rates in response to increases in demand
- Potential increases in “spillover” on neighborhood streets and other on-street parking areas near the campus

“Design Day” is an important concept in parking infrastructure planning. For most large-scale venues (along with many other land-use types), design day is calibrated to accommodate a certain percentile of absolute peak activity that is reasonable to address, based on limited amounts of capital and the trade-offs between parking and other land uses.

“Percentile” is different from “percentage”. Percentile refers to the value at or below which a given percentage of observations in a group of observations fall. For example, the 95th percentile of activity means that 95% of activity falls below that level.

For many campuses—from hospitals, to universities, to sporting event venues—the concept of design day applies. Most campus environments choose to accommodate between the 85th percentile and 95th percentile of absolute peak conditions as their design day, meaning that on 85% to 95% of calendar days, conditions are at or below the level the infrastructure can accommodate. For many locations, such as a typical university, the campus generally makes little or no effort to accommodate demand on the absolute busiest days of each semester (generally the first two weeks), as many students opt to drop classes and move to alternative modes of arrival after the first few days. In other locations, such as hospitals, a third-party shuttle service or valet attendants may be contracted to address unusual spikes in activity due to large meetings, conferences, and atypical increases in patient activity (or the conversion of close-in parking to additional medical facilities). For venues located near or within an urban core, the design day calculation is less relevant, as there are typically many commercial or municipal parking facilities in the immediate market area that are happy to take on the excess demand generated by large and atypical special events.

The concept of design day is especially important for a place like the National Western Center—meant to be a hub for many different types of activities, some drawing tens of thousands, others drawing only hundreds. The consideration is even more important because of the vast difference in attendance between the largest events each year (the nine weekend days, including MLK, during the Stock Show), and the next busiest level of activity which might be a large concert or a weekday NWSS event. The Plan recommends that demand for design day conditions be accommodated entirely by the on-site parking infrastructure, while demand for conditions that exceed “design day” (an estimated nine days per calendar year) be accommodated by both on- and off-site infrastructure.

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To determine the appropriate design day recommendation for the NWC, the following factors were considered:

- Current event schedule at the NWC campus
- Anticipated increases in programming intensity and activity scope, size, and type
- Metrics from comparable event facilities, as shown in Figure 5.1. In selecting comparable facilities, the Planning Team focused on event centers with a wide scope and range of event types (animal, trade show, convention, sport, performance, etc.) generating a minimum of 10,000-15,000 guests for large events—commensurate with programming plans for the future NWC.

Figure 5.1: Comparable Event Facility Metrics

Venue	Event Types	Typical Attendance (Large/Concurrent Event)	# Large/Concurrent Events per year
Denver Coliseum	Animal, Trade Show, Convention, Performance, Sport	6,000 – 11,000	15 – 20 (4% to 5%)
Las Vegas Convention Center	Trade Show, Convention, Performance	17,000 – 45,000	45 – 55 (13% to 15%)
Pepsi Center	Sport, Performance	15,000 – 18,000	60 – 84 (16% to 23%)
Los Angeles Convention Center	Convention, Trade Show, Sport, Performance	10,000 – 18,000	48 – 52 (13% to 14%)
Calgary Stampede	Animal, Trade Show, Convention, Performance, Sport	10,000 – 25,000	60 – 84 (16% to 23%)
Staples Center	Sport, Performance	16,000 – 20,000	60 – 84 (16% to 23%)

Based on these factors, the planning team determined that a Large/Concurrent Event, generating attendance of roughly 21,000 people at Full Build-out, is the design day. Based on programming assumptions provided by the NWCO team, such events are expected to occur on between 12% and 20% of calendar days (between 44 and 73 days per year). Of course, these projections are commensurate on the assumed level of success of programming at the NWC; below-expected or above-expected performance may change the number/percentage of days on which Large/Concurrent Events occur.

Based on our assessment of both current and future site uses, we determined that six to nine days (all NWSS weekends, plus the MLK holiday) will generate attendance levels in excess of the Large/Concurrent Event activity level. These six to nine days represent 2.5% of site-wide activity levels based on daily activity for the entire year. However, these dates are critical to the Stock Show from an attendance and economic impact perspective and therefore, user experience should be carefully considered when setting up an off-site parking management plan for these dates.

Note that this range of dates—six to nine—reflects the progressive growth of attendance for the Stock Show as the campus is built out.

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WHY CAN'T ON-SITE PARKING BE PROVIDED FOR EVERYONE FOR ALL EVENTS?

Roughly 90 to 95% of the year, the on-site parking infrastructure recommended in this Plan will accommodate everyone who chooses to drive to the site. But roughly 5 to 10% of the year, some users will be required to use parking provided off-site. Why is this the case?

The first reason is space. Parking, particularly surface parking, requires a significant amount of space—even in the most efficient lots, every parking stall can consume up to 350 square feet. 200 spaces of surface parking cover more area a football field. Even if all the parking required to meet the highest levels of demand were provided in parking structures, which benefit from the ability to build capacity vertically, some of the buildings and programming conceived in the Campus Master Plan would need to be sacrificed. Figure 5.2, below, shows how much of the NWC would be required to build the amount of surface parking needed to accommodate all of the parking demand expected at Full Buildout onsite. As shown, it's essentially the entire campus.

Figure 5.2: Surface Parking Spatial Needs for Future Parking Demand



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The second reason is cost. Parking is expensive. Tens of thousands of dollars are required to build one stall of structured parking, with below-grade parking representing double or triple the base cost. Infrastructure spending on parking means that fewer dollars can be used for other NWC goals. Even surface parking spaces can cost \$5,000 to \$8,000 each. Therefore, “right-sizing” the amount provided on-site is critical to the Plan.

The text box to the right summarizes “industry standard” costs per stall for general informational purposes. However, these costs do not include a number of key factors for parking infrastructure construction on the NWC site. Namely, site preparation (including demolition, site remediation, and other tasks), soft costs (design, entitlements, etc.), and architectural, aesthetic, or other special elements (ground floor retail, flexible or adaptive reuse components, etc.) are not included. For NWC, these omissions are particularly consequential. A number of the sites slated or recommended for parking infrastructure improvements, such as the former Denver Public Schools site (planned for Parking Structure #1) and the Coliseum site (recommended for paving and restriping) require extensive site preparation prior to facility construction.

The third reason is efficiency. When parking infrastructure is designed to meet design day conditions, that parking is used on a regular basis, rather than remaining underutilized for the overwhelming majority of calendar days.

Typical Costs Per Parking Stall

SURFACE: \$2,000--\$3,000
ABOVE-GRADE: \$20,000—\$30,000
BELOW GRADE: \$30,000+

Notes:

1. Only hard costs included.
2. Site preparation (including remediation, demolition, and other activities) excluded
3. Architectural, aesthetic, or other special elements excluded
4. Costs can vary greatly based on site constraints and other factors

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HOW DOES THE PLAN ACCOMMODATE EVERYONE WHO CHOOSES TO DRIVE?

Event and activity centers like the NWC deal with parking in many ways. A common method is to rely on the private market to park vehicles that cannot fit in the infrastructure provided by the center itself. This Plan recommends that the NWC accommodate people who drive to the site using both on- and off-site solutions. Off-site solutions, based on current programming, will only be needed on 5% to 10% of days each year.

Chapter 6 of this Plan provides additional information on how an off-site shuttle operation can be implemented successfully for the 6-9 calendar days during which the NWSS event is expected to generate more demand for parking than is recommended for on-site capacity.

Off-site bus/shuttle queuing example from Stampede Park, Calgary



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ANALYSIS

The consultant team's analysis to determine recommended parking supply included three key components: parking demand, design day supply needs, and parking system impacts. Each component was analyzed using the Scenario Matrix as a framework (Figure 5.3).

Figure 5.3: Scenario Matrix

Development Stages	Activity Levels		
	Stock Show Weekend	Large Event / Festival / Concurrent Event	Typical Day
	Scenario 1	N/A	N/A
	Scenario 2	Scenario 3	Scenario 4
	Scenario 5	Scenario 6	Scenario 7
	Scenario 8	Scenario 9	Scenario 10
Baseline	Scenario 11	Scenario 12	Scenario 13
Pre-Construction			
Phase 1-2 Construction			
Phase 1-2 Operational			
Full Build Out			





COMPONENT 1: PARKING DEMAND BY SCENARIO

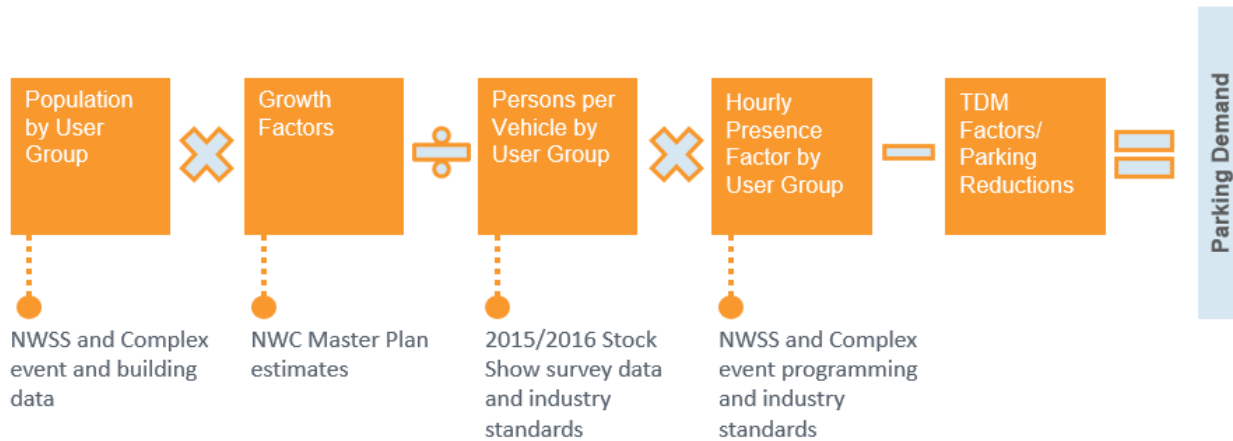
This component entails projected parking demand by user group for each scenario. Figure 5.4 summarizes the calculation steps for this component. Additional description is provided below the figure.

Note that tables detailing the process used to determine parking demand by scenario are included in the Chapter 5 Appendix section at the end of this Plan.

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Figure 5.4: Parking Demand Calculation



Population by User Group: This factor refers to the total number of people expected to come to the site during any of the given scenarios—including a Typical Day, a Large/Concurrent Event, or on a Stock Show Weekend day. User groups included visitors/attendees, daily (non-event) visitors, employees and volunteers, and exhibitors/concessions. Baseline populations were derived from:

Activity Level	Source
Typical Day	From roughly 300 during Pre-Construction to 1,700 at Full Buildout. Based on the type of buildings currently on-site and the daily populations they draw—such as restaurant workers or office employees.
Large/Concurrent Event	From 10,000 during Pre-Construction to 21,000 at Full Buildout. Based on the highest-attended non-Stock Show event.
Stock Show Weekend	From 60,000 during Pre-Construction to 84,000 at Full Buildout. Based on attendance figures provided by the WSSA.

- **Growth Factors:** This factor refers to the percentage growth expected for each type of activity, at each different stage of campus implementation.

Activity Level	Source
Typical Day	Roughly 500% growth from Pre-Construction to Full Buildout. Based on the construction and intensification of buildings drawing daily activity.

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Large/Concurrent Event	Roughly 120% at Full Buildout. Based on the seating and occupancy capacities of the buildings and spaces available to house such events, and the anticipated increases of programming.
Stock Show Weekend	Roughly 40% at Full Buildout. Based on growth projections in the campus Master Plan, prorated to reflect the stage of construction.

- **Persons per Vehicle by User Group:** This factor refers to the typical number of people expected to arrive to the site together in a single vehicle.

Activity Level	Source
Typical Day	Urban Land Institute/Institute of Transportation Engineers standards.
Large/Concurrent Event	WALKER research studies plus Urban Land Institute/Institute of Transportation Engineers standards.
Stock Show Weekend	Urban Land Institute/Institute of Transportation Engineers standards and 2015/2016 Intercept Survey data from OV.

- **Hourly Presence Factor by User Group:** This factor takes into account that not all people come to the site at the same time of day. It refers to the percentage of total vehicle demand on the site at each particular hour.

Activity Level	Source
Typical Day	Urban Land Institute/Institute of Transportation Engineers standards.
Large/Concurrent Event	WALKER research studies plus Urban Land Institute/Institute of Transportation Engineers standards.
Stock Show Weekend	Urban Land Institute/Institute of Transportation Engineers standards and attendance data provided by the WSSA.

- **TDM Factors/Parking Reductions:** This factor refers to the parking reductions calculated based on TDM interventions, as discussed in Chapter 3: Transportation Demand Management. While both Moderate and Aggressive TDM programming were explored, only parking reductions derived from Moderate programming were used to assess parking demand and recommended supply, to mitigate the potential risk associated with assuming a success level commensurate with an Aggressive program.

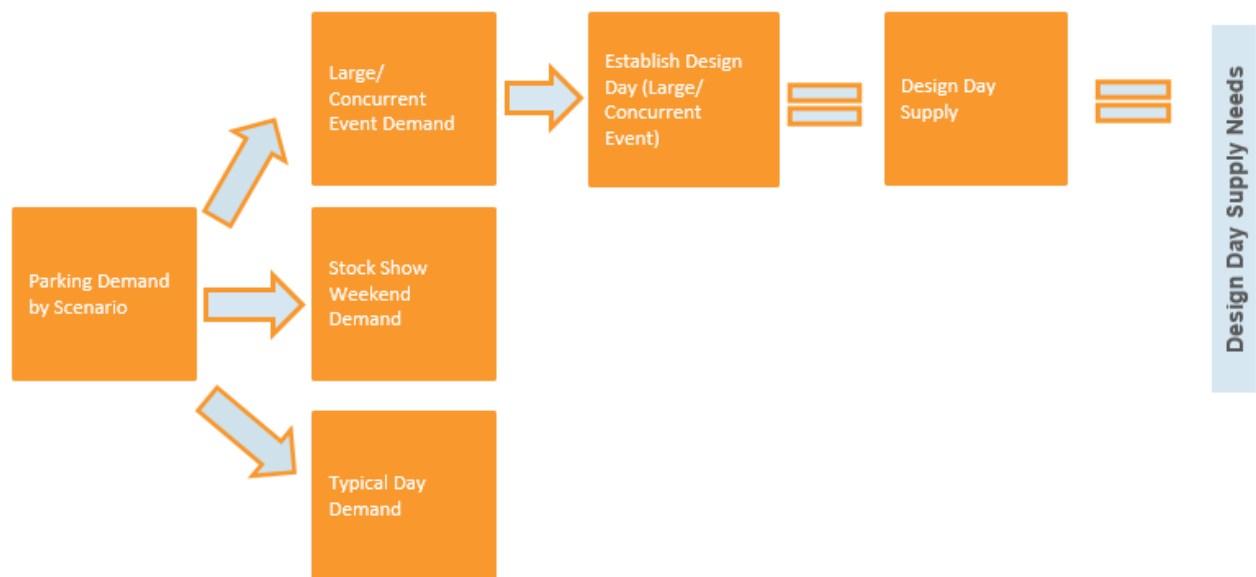
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COMPONENT 2: DESIGN DAY SUPPLY NEEDS

This component entails determining design day parking supply needs for each stage of construction. Figure 5.5 summarizes the calculation steps for this component. Additional description is provided below.

Figure 5.5: Design Day Supply Needs Calculation



- **Parking Demand by Scenario:** Determining design day supply needs first required projecting parking demand by scenario, using the steps and factors shown above. Based on these steps and factors, we determined parking demand by scenario (for each activity level during each stage of construction).
- **Establishing Design Day:** Using the design day calculations and factors described earlier in this Chapter, the planning team determined that Large/Concurrent Event conditions represented design day conditions, and therefore should drive parking infrastructure recommendations.

COMPONENT 3: PARKING SYSTEM IMPACTS

The planning team also evaluated projected parking system gains, losses, temporary removals, and temporary additions by scenario, based on the anticipated build-out of future phases. Figures 5.6—5.10 and the accompanying descriptions depict these anticipated gains and losses on the following pages.

Parking Phasing Diagrams and Future Program Changes

Note that the build-out plan for the NWC site is highly conceptual, especially for later phases of the Master Plan. Many elements on the site, including parking, may end up being modified depending on funding, timing, and site

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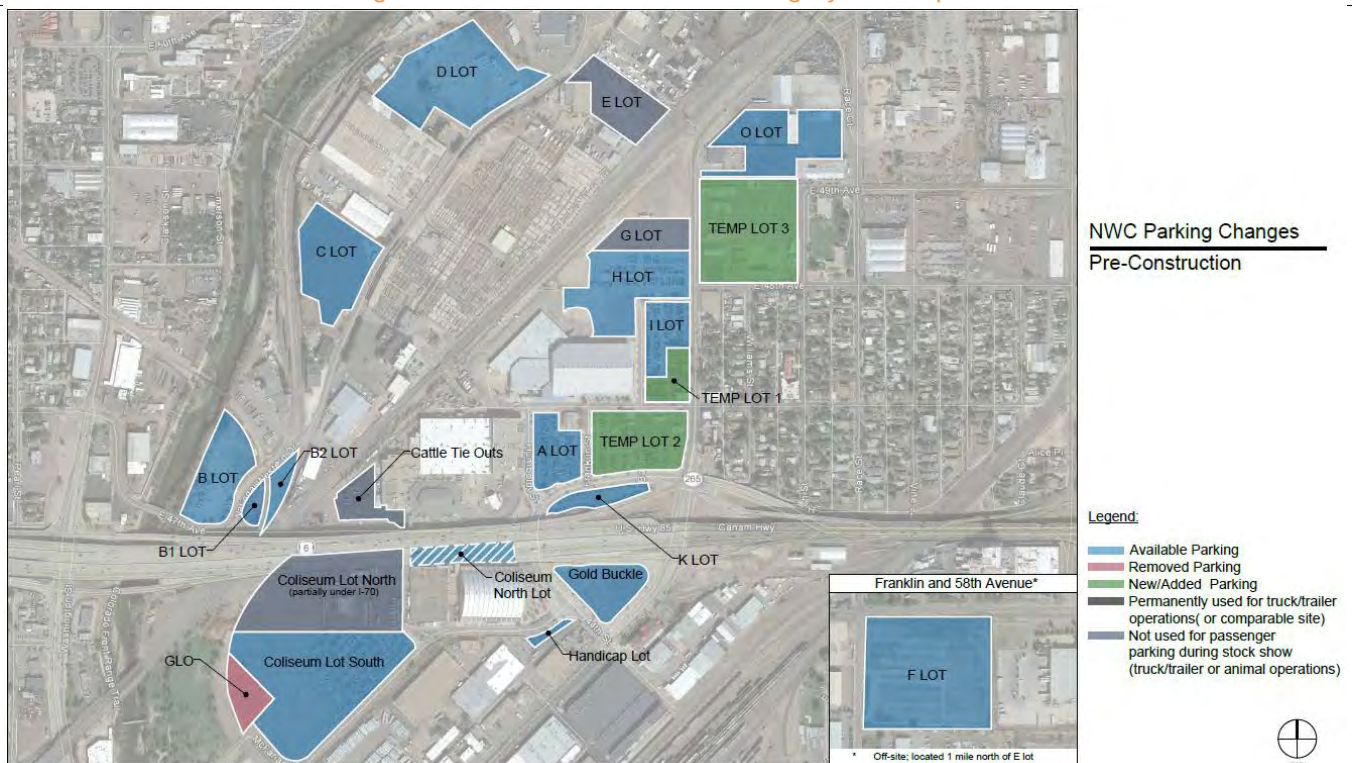
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constraints, which include remediation on several sites. The phasing diagrams shown below are based in part on the RTA grant application for Phases 1 and 2 on the original Master Plan for later phases. These diagrams have been updated based on the most available information provided to the consulting team as of mid-summer 2017. However, we understand that certain phases (including Phases 1 and 2) are still being refined by the planning team which may mean that alternative parking locations are developed. Possible changes to the phasing plan are noted below each diagram.

Pre-Construction

Figure 5.6: Pre-Construction—Parking System Impacts



Anticipated Gains: Several temporary parking lots are expected to be added along Brighton Boulevard, pending the removal of existing buildings, and vacating one roadway. Lot J will be reconfigured into Temporary Lot 2 (which is slightly larger) and Lot I will be expanded into Temporary Lot 1. The net gain is calculated to be roughly 400 spaces combined if these lots are improved with temporary striping and used efficiently. The City is also currently in the process of purchasing the Denver Public School (DPS) site, or Temporary Lot 3, which is expected to be cleared and available for parking in time for the 2019 Stock Show.

Permanent Losses: Construction associated with the GLO project has impacted parking inventory in the Coliseum Lot for several years. A small permanent loss on the southwest corner of Coliseum Lot South is anticipated for this stage.

Specialized Vehicle Lots: The Plan assumes that during the Stock Show, most of the lots that were previous used for specialized vehicles (and animal staging) are still used for this purpose. This includes E Lot, G Lot, the Cattle Tie Outs, and a portion of Coliseum Lot North.

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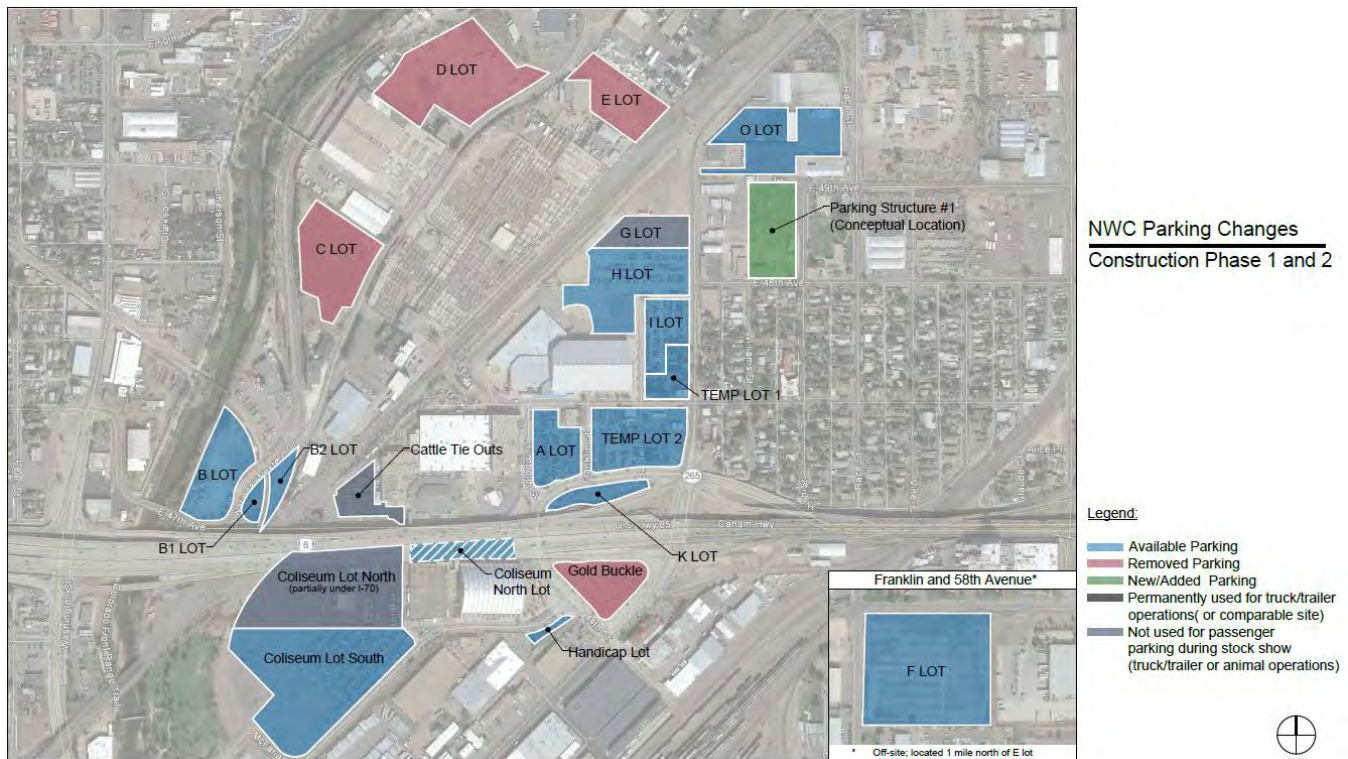
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Phase 1 and 2 Under Construction

Figure 5.7: Phase 1 and 2 Construction—Parking System Impacts



Projected Gains: In addition to the temporary parking added in the Pre-Construction stage, the first parking structure (Parking Structure #1) is projected to be completed by the end of this stage. The original Phase 1 & 2 program had this garage located on the DPS site. However, due to the cost of remediation on this property, the planning team is now considering an alternative location for PS #1 which would be located below the Yards on the western side of the site. If this alternative is adopted, then the DPS site would remain as temporary parking for the next several years, until this site was eventually redeveloped.

Permanent Losses: Pursuant to campus Master Plan phasing, C Lot, D Lot, and E Lot will be permanently removed during this stage after PS #1 is completed—an estimated inventory loss of 1,100 stalls along with E Lot which was previously used primarily for trucks and trailers during the Stock Show. Gold Buckle Lot has been identified by CDOT as part of the I-70 lid project and is also expected to go away in the next several years, though the exact timing is unknown.

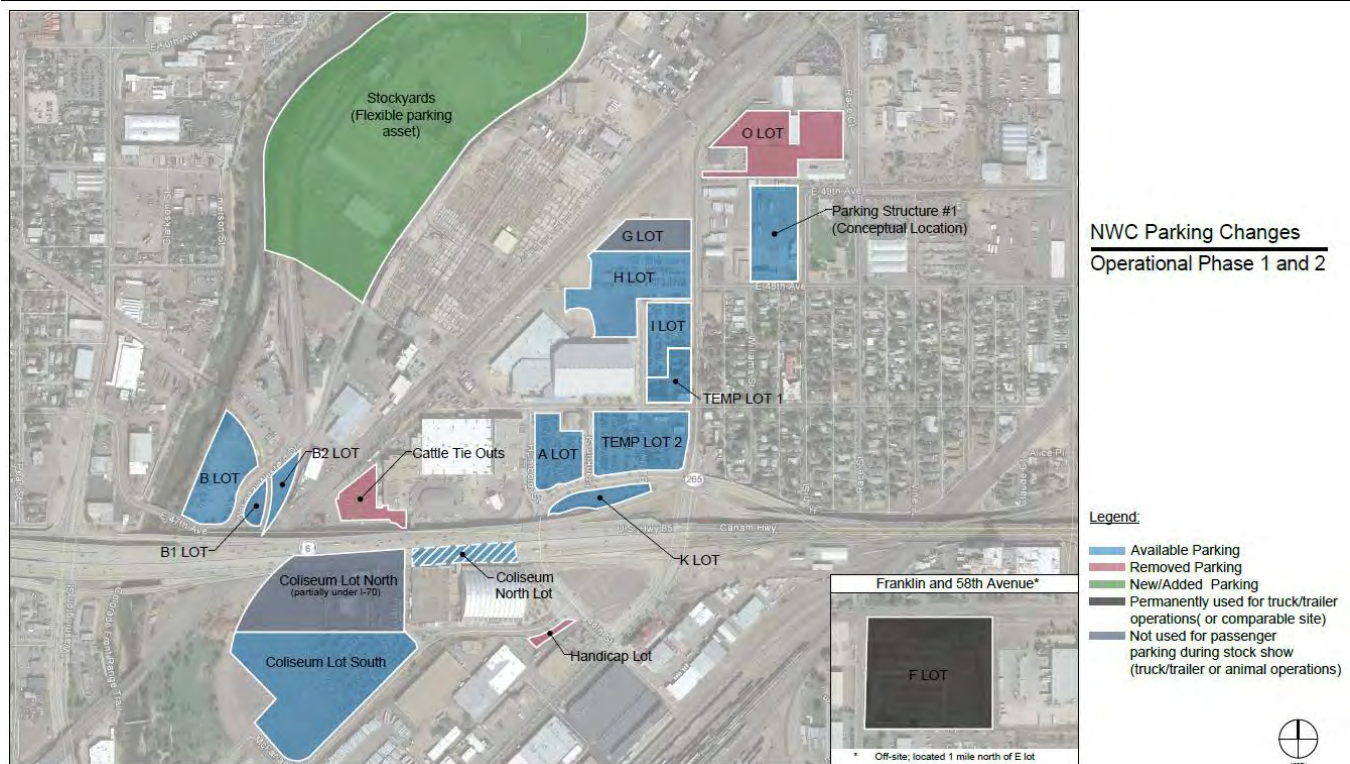
Specialized Vehicle Lots: The Plan assumes that during the Stock Show G Lot, some of the internal site, and the Coliseum Lot North will continue to be used for specialized vehicle operations. Some temporary facilities may need to be identified to replace E Lot.

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Phase 1 and 2 Operational

Figure 5.8: Phase 1 and 2 Operational—Parking System Impacts



Anticipated Gains: The Plan assumes that a significant portion of the Stockyards will become available as a flexible parking asset for Large/Concurrent events during this stage (but not available during the Stock Show). Please see the prior note related to Parking Garage #1, as the location of this garage might move to the western side of the site.

Permanent Losses: The Cattle Tie Outs will likely be displaced due to construction activities and the extension of Betty Cram Drive. The NWSS has also identified O Lot as a likely redevelopment opportunity, which we assume would be unavailable during this stage.

Specialized Vehicle Lots: The Plan assumes additional special vehicle staging and storage capacity will be needed at by this stage. Therefore, for Phase 1-2 Operational, we assume that much of the queuing and staging will be shifted over to a newdedicated near-site permanent location (such as Lot F or similar). If Lot F is not used for this purposes, NWSS has also identified this lot as a possible redevelopment location, which would still make it unavailable for parking in later phases of the Plan.

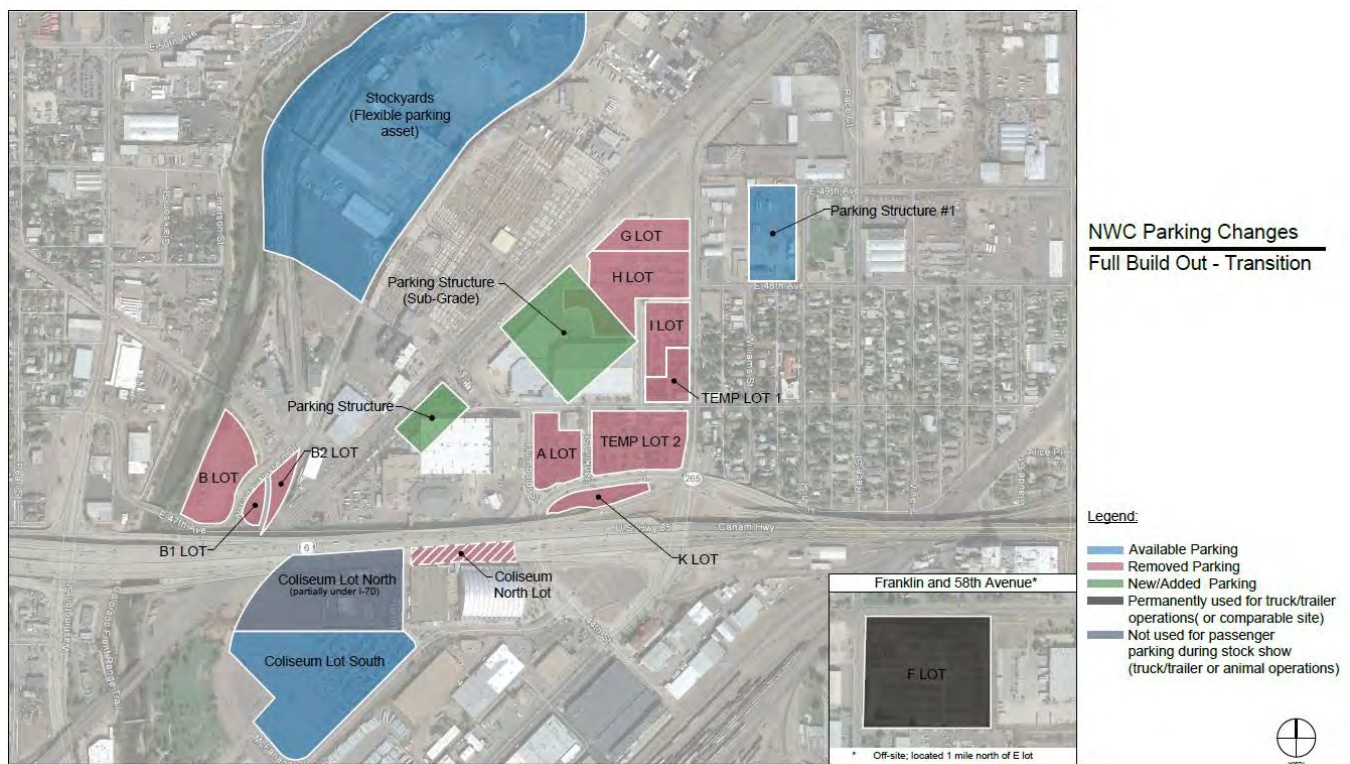
Stockyards: Note that the Stockyards will not be available for parking during the NWSS event but may be available to help support other (non-livestock) large events at other times of the the year. This is listed as a “flexible” parking asset as discussed in the Plan.

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Full Buildout

Figure 5.9: Full Buildout—Parking System Impacts (Transition)



Anticipated Gains: The Plan assumes that a significant portion of the Stockyards will continue to be used as a flexible parking asset for Large/Concurrent events during this stage (not available during the Stock Show). Pursuant to Campus Master Plan phasing, two additional parking structures, the CSU/CO Commons Structure, and the Trade Show/Expo Hall Parking Structure, are expected to be completed during this stage. As with Garage #1, these two garages are highly conceptual as to their exact placement and sizing. From a cost-benefit standpoint, the consultant team has recommended that alternative above-grade options be considered (such as a larger garage on the Coliseum site) as a less-costly and more flexible alternative to sub-grade parking as shown on the Master Plan.

Permanent Losses: Pursuant to Campus Master Plan phasing, all surface lots except for the Coliseum Lot will be removed during this stage. Additionally, temporary parking added during the Pre-Construction stage will become unavailable.

Specialized Vehicle Lots: The Plan assumes that during the Stock Show, a portion of the Coliseum Lot North will continue to be used for specialized vehicle operations.

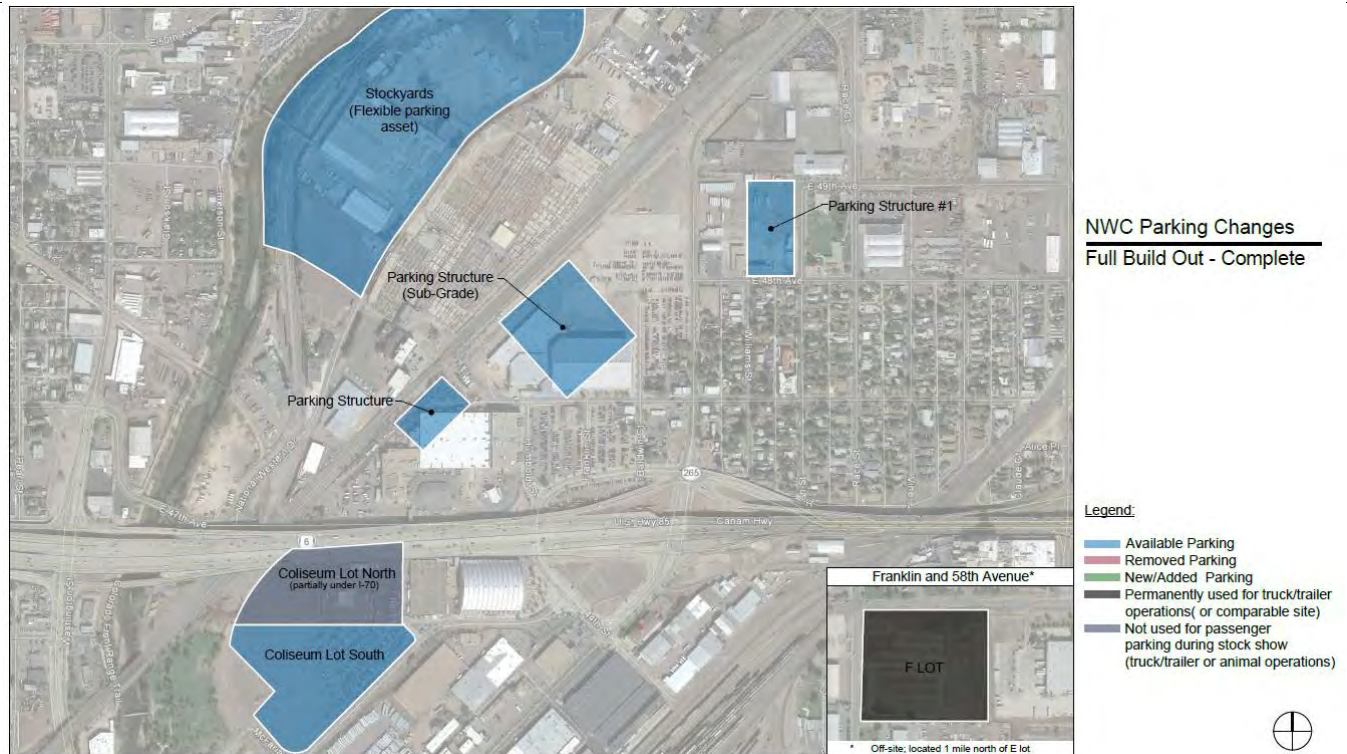
The final projected parking system for the campus is depicted in Figure 5.10. Note that the locations and configurations of the final parking facilities are conceptual and will be finalized during the Placemaking process.

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Stockyards: Note that the Stockyards will not be available for parking during the NWSS event but may be available to help support other (non-livestock) large events at other times of the the year. This is listed as a “flexible” parking asset as discussed in the Plan.

Figure 5.10: Full Buildout—Parking System Impacts (Complete)



Coliseum Lots: For the time being, this Plan shows the Coliseum Lots as remaining surface parking for the immediate future under Full Buildout. If these lots are displaced by future redevelopment of this site, this Plan recommends one-for-one replacement of any displaced parking, plus accommodations for necessary staging for Rodeo events.

This Plan does not delve significantly into the option of building a large above-grade event parking garage on the Coliseum site, though this might be worth considering if the option to develop the sub-grade parking option proves to be cost-prohibitive.

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KEY FINDINGS

PARKING DEMAND BY SCENARIO

The following figure shows the projected parking demand by scenario, based on the process previously described.

As shown in Figure 5.11, parking demand ranges dramatically based on the activity level—from 260 to 9,500 during the Pre-Construction stage, to 1,100 to 12,200 at Full Buildout. As TDM interventions increase in both intensity and success level, parking reduction percentages increase, therefore diminishing potential growth in parking demand, as a result of growth in attendance and programming intensity.

Figure 5.11: Parking Demand by Scenario

	Stock Show Weekend	Large Event / Festival / Concurrent Event	Typical Day
Baseline	9,600	N/A	N/A
Pre-Construction	9,500	3,600	260
Phase 1-2 Construction	9,800	3,700	260
Phase 1-2 Operational	10,700	5,500	400
Full Build Out	12,200	7,500	1,100



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INVENTORY BY SCENARIO

Figures 5.12 and 5.13 below shows the projected parking inventory on- and near-site by scenario, as compared to parking demand by scenario (as shown in Figure 5.11) and by user group. These figures also show the projected Inventory with off-site, which includes parking spaces in off-site locations (i.e., leased locations). Inventory by stage was developed using the Design Day supply needs, calibrated the parking system impacts previously discussed.

While this chapter sets forth recommendations for parking infrastructure, the following chapter (Chapter 6: Access and Off-Site Solutions) provides analysis, findings, and recommendations related to prospective locations and shuttling needs for off-site users.

Figure 5.12: Inventory and Projected Demand by Scenario

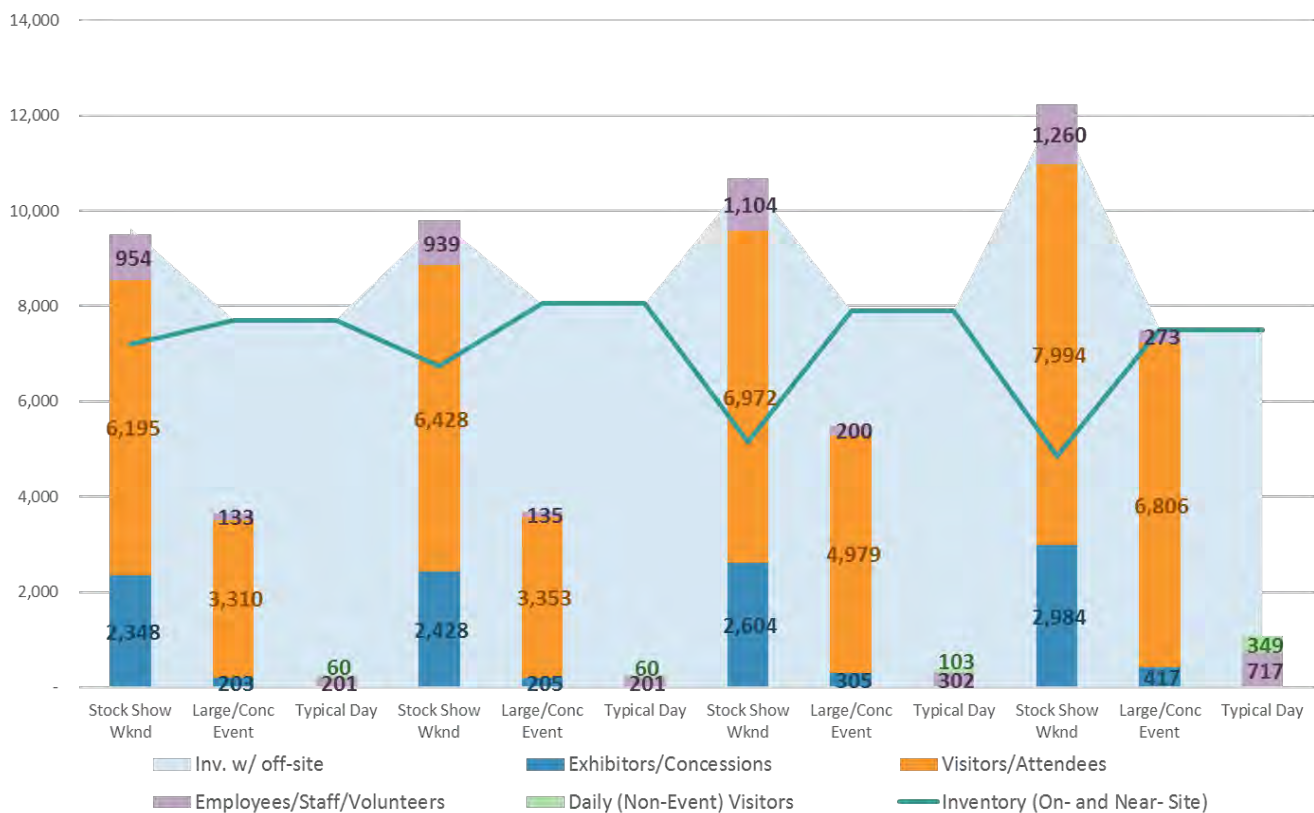
	Pre-Construction			Construction Phase 1 & 2			Phase 1 & 2 Operational			Full Build-Out		
	Stock Show Wknd	Large/ Conc Event	Typical Day	Stock Show Wknd	Large/ Conc Event	Typical Day	Stock Show Wknd	Large/ Conc Event	Typical Day	Stock Show Wknd	Large/ Conc Event	Typical Day
Onsite and near site – permanent spaces	7,350	7,700	7,700	6,750	7,400	7,400	4,700	5,800	5,800	4,850	5,850	5,850
Onsite – flexible spaces								1,650	1,650		1,650	1,650
Offsite – existing off-site private + agreements	2,420			2,310			1,480			1,480		
Offsite – future space agreements				740			4,520			5,870		
Total	9,770	7,700	7,700	9,800	7,400	7,400	10,700	7,450	7,450	12,200	7,500	7,500
Demand	9,500	3,600	300	9,800	3,700	300	10,700	5,500	400	12,200	7,500	1,100

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Figure 5.13: Continued—Inventory and Projected Demand by Scenario



As shown in Figures 5.12 and 5.13, the Plan assumes that parking demand above the permanent and semi-permanent infrastructure provided on- and near-site (as depicted by the teal line in Figure 5.13) can be accommodated in off-site locations. Detailed off-site needs by stage, identified by the planning team, are shown in Figure 5.14 below. Note that this analysis assumes that the existing off-site parking operation will be continued for the Pre-Construction stage, which is reflected in this figure. Based on current programming, off-site parking and corresponding shuttle operations will only be needed on 6-9 days out of the calendar year (during Stock Show).

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Figure 5.14: Off-Site Parking Needs by Stage

Stage of Construction	Vehicles Parked Off-Site	People Parked Off-Site
Pre-Construction	800	2,100
Phase 1 and 2 Construction	1,700	3,200
Phase 1 and 2 Operational	5,000	11,700
Full Buildout	7,000	17,400

PARKING DESIGN

The topic of parking design was discussed at several stakeholder and PMT meetings—specifically, the importance of parking design in improving the customer experience on the NWC campus and to promote future site flexibility. Several key components were brought forward into the Guiding Principles including:

- *Recommend design standards for parking infrastructure that allow for future flexibility.*
- *Enable year-round efficient use of existing and new infrastructure.*

Through these discussions and a survey of industry best practices related to the design of parking infrastructure for event complexes, the team developed a number of key findings on this topic.

Design criteria that incorporates future flexibility, efficiency, and appropriate ramping, queuing, and flow capacity for special events are highly technical topics. Several general guidelines for designing parking for special event uses are presented in the Recommendations Detail section.

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RECOMMENDATIONS

The National Western Center is poised for extensive changes to scope of programming, attendance volume, and frequency of events. A healthy, well-utilized, and efficient parking system is an essential component in providing access to all user groups—from a rodeo contestant, to a family of four attending a concert, to an office employee. This Plan sets forth recommendations for a parking system that will meet demand in permanent, on- and near-site infrastructure on the vast majority of calendar days, while meeting excess demand in off-site infrastructure. In this way, the parking system will be an asset—rather than a barrier—to growing attendance and programming on the NWC site.

PLAN RECOMMENDATIONS: PARKING INFRASTRUCTURE

1. Plan for the success of the future site. *(Management Authority and Partners)*
2. Accommodate 100% of parking demand for all activity levels with a combination of on- and off-site parking resources, after accounting for TDM reductions and other key factors. *(Management Authority and Partners)*
3. Build 7,500 parking stalls on- or near-site, including 6,000 permanent parking stalls and 1,500 flexible or semi-permanent parking stalls. *(Placemaking Team)*
4. Accommodate remaining parking demand for the nine busiest NWSS events using a combination of off-site parking resources. *(Management Authority and Partners)*
5. Reevaluate parking infrastructure needs based on the success of TDM interventions and resulting parking demand reductions over the course of construction. *(Management Authority and Partners)*

For Programming Consideration:

1. In later phases, provide one-for-one replacement of the entire Coliseum surface lot. *(Placemaking Team)*
2. Add a parking garage specialist to the Placemaking team prior to finalizing garage programming. *(Placemaking Team)*
3. Design any structured parking to accommodate event volume egress in 30 minutes or less. *(Placemaking Team)*
4. Provide (where possible) above-grade structures due to service level, efficiency, and cost. *(Placemaking Team)*
5. Provide higher floor-to-floor heights in structures (on the ground level) to allow for future flexibility for adaptive re-use and/or to accommodate specialized vehicles. *(Placemaking Team)*

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RECOMMENDATION DETAIL

The following section provides detail on certain recommendations discussed above.

- **Plan for the success of the future site.** The recommendations set forth by this Plan assume a vibrant, active NWC akin to the vision described in the Campus Master Plan. The parking demand projections and resulting parking infrastructure recommendations assume that the campus grows attendance and programming as projected by the Master Plan.
- **Accommodate 100% of parking demand for all activity levels with a combination of on- and off-site resources, after accounting for TDM reductions and other key factors.** The planning team believes that parking infrastructure is an essential asset in growing and expanding Campus activity year-round. Even with the extensive TDM interventions proposed in this Plan, a significant number of users will continue to choose to drive to the site. To ensure that parking supports, rather than hinders, the ambitious growth goals for the campus, this Plan recommends that the Management Authority seek to accommodate all parking demand, year-round, using a combination of on-site and off-site supply. The magnitude of this accommodation should also account for the site's ability to leverage private parking resources in the surrounding market to accommodate some demand, particularly during the Stock Show.
- **Reevaluate parking infrastructure needs based on the success of TDM interventions and resulting parking demand reductions over the course of construction.** The parking infrastructure recommended by this Plan is phased, with one structure proposed for construction early in the project (prior to completion of Phases 1 and 2) and two structures proposed for construction later in the project (prior to Full Buildout). This allows a significant amount of time to continually monitor the success of TDM interventions and the resulting parking reductions based on hard data, and to adjust parking infrastructure needs accordingly. For example, if TDM interventions consistently result in parking reductions substantially less than projected, parking infrastructure could be scaled to accommodate additional demand. Conversely, if TDM interventions consistently result in parking reductions substantially greater than projected, parking infrastructure could be reduced in size. Extensive vetting of the reporting on TDM interventions' success should be conducted by an objective third party, and parking infrastructure decisions should be based on an overall longitudinal trend, rather than on one- or two-year results.
- **Add a parking garage specialist to the Placemaking team prior to finalizing garage programming.** NWC and its partners have expressed complex ambitions in regards to parking infrastructure, such as strong customer service for attendees and future flexibility in design. These elements can be costly and complicated, particularly on a site such as NWC that requires extensive planning and preparation (and, at times, demolition, and remediation) prior to construction. To incorporate the level of sophistication needed to reach NWC's transportation, mobility, and sustainability goals, the Plan recommends that a parking garage specialist, well-versed in parking design and planning, be added to the Placemaking team before structures are planned, placed, and designed. Some general guidelines for designing parking facilities for special event uses include:
 - Delineate secure space within facilities for VIPs/Teams/Media and other key groups.
 - Consider using a stadium ramp—an ADA accessible ramp—for pedestrians rather than elevators.
 - Plan to accommodate accessible parking (beyond the supply required by ADAG) closest to ground-level access points to event facilities.
 - Prohibit "tailgating" and other similar activities in parking structures.
 - Wherever possible, incorporate pay-on-entry or pay-on-foot options for parkers to ensure a quick exit (i.e. no paying in lane upon exit).

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CHAPTER 6: SITE ACCESS AND OFF-SITE SOLUTIONS



OBJECTIVE: MAKE THE NWC SITE ACCESSIBLE FROM A WIDE VARIETY OF LOCATIONS AND TRANSPORTATION MODES, REFLECTIVE OF VISITORS' GEOGRAPHIC AND SOCIAL DIVERSITY.

WHAT'S IN THIS SECTION?

- Access & The National Western Center
- Analysis
- Key Findings
- Recommendations

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ACCESS & THE NATIONAL WESTERN CENTER

The National Western Center complex is envisioned as a year-round center of activity, drawing users not only from a wide range of locations, but from a wide range of socioeconomic backgrounds, familiarity with multimodal transportation, and motivations for visiting the site. It is essential that this diversity is reflected in the NWC access system. Spanning over ½ mile from its northernmost point to the southernmost point, the NWC complex must be served by multiple “doorways,” offering ease of ingress and egress to its many existing and planned buildings, venues, parks, and attractions.



WHAT IS EQUITABLE ACCESS?

This Plan envisions an equitable access system—a system from which all users, regardless of transportation mode, familiarity with the site, or origin location, can use and benefit. Equitable access should also take into account the unique needs of seniors, families with small children, and patrons with disability (for which design and access guidelines are established by ADAG).

- **Transportation Mode:** An equitable access system offers opportunities for people using all different transportation methods, from walking and biking, to driving or using public transit. This requires usable, inviting, and modern infrastructure and amenities for all modes.
- **Familiarity with the Site:** An equitable access system is straightforward, logical, and clearly delineated—meaning that it is easy to use for every person, whether that person comes to the site every day or is visiting for the first time.
- **Origin Location:** An equitable access system offers the same level of accessibility to a Globeville resident, a Highlands Ranch family, a rancher from Montana, or a couple from outside the country. This comes through the integration of on-site, around site, and off-site solutions that expand the access system beyond the boundaries of the NWC campus.

HOW WILL THE NWC DEAL WITH ACCESSIBILITY?

The access plan for NWC includes three different components: Access Around the Site, Access On-Site, and Access Off-Site.

- **Access Around the Site:** How different modes of arrival and departure—including transit, walking, cycling, driving, and other mobility options—intersect and interact around the site.
- **Access On-Site:** How access infrastructure is configured on-site to maximize equity and usability.
- **Access Off-Site:** How off-site solutions are leveraged to serve patrons who are driving to the site, but can't or don't want to be accommodated in on-site infrastructure.

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ANALYSIS

At present, the NWC access system primarily focuses on people arriving to the site using personal vehicles, with significant emphasis placed on the specialized vehicles that bring the many animals and types of equipment needed to run the Stock Show and other events. As the site develops into a year-round center of activity, and broadens its programming scope and its target markets, a more integrated access plan is envisioned. Planned transportation system infrastructure improvements in areas surrounding the site—from key arterials like Brighton Boulevard to major interstate highways like I-70—will bolster this approach.

ACCESS AROUND THE SITE

To analyze how the access system should function around the site, the planning team incorporated the following factors:

- **Multiple Ways of Entry:** A key guiding principle for site access was to create multiple entry portals or “doorways” to distribute site ingress and egress and create a welcoming campus for all users. This was the central idea behind developing various “hubs” of access around the site—where modes of transportation would converge, and users could find NWC branding (signage, wayfinding, etc.) and various amenities, such as charging stations and bicycle repair kits. Of course, the Placemaking process and subsequent efforts will ultimately determine the precise location and nature of each “doorway”.
- **Best Practice Examples:** Mobility hubs will be an integral part of a first-mile, last-mile solutions strategy for the NWC site. The ability of these hubs to function successfully will depend on the organization of land uses, placemaking, the proximity of transit services and a strong network of bike and pedestrian connections to and through the site. It is anticipated that the primary, permanent hub locations will not only be operationally effective, but will serve as a vital aspect of the vibrant, mixed-use environment on site. Their eventual sizing and layout will be tied to overall placemaking, site conditions and relationship to the surrounding community. There are many hubs recently constructed or underway that are linking site development and mobility components and transforming transportation options for communities.

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Figure 6.1: Mobility Hub Examples



North Hollywood Station, California – Mixing zone for mobility and placemaking.

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University Station, Denver, Colorado – Visual image depicting an integrated mobility hub and community activity zone



Downtown Fort Lauderdale Mobility Hub – multi-block hub connecting street car circulator, regional bus service stop, and Tri-Rail station access.

- **Key Components of Mobility Hubs:** The physical elements required to serve a multiplicity of user groups and transportation network services, including public transportation, taxis, and TNCs (e.g., Lyft and Uber).

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- **Locational Requirements:** Locational needs based on the size of the NWC site, the elements of the site, and the phasing of those elements (e.g., the locations of certain buildings, venues, and attractions).

ACCESS ON THE SITE



To analyze access on the site, the planning team incorporated the following elements:

- **Modes of Arrival and Departure:** Quantification of the different potential modes of arrival and departure, including TNC, pick-up/drop-off, specialized vehicle, passenger vehicle, transit, bicycling, walking, and others.
- **Spatial Needs:** Square- and linear-footage needs on-site for each transportation element.

ACCESS OFF-SITE

Analysis of off-site solutions focused on shuttle operations needed to shuttle people parked in off-site parking locations to and from the NWC site, and potential locations and parameters for remote parking options.

SHUTTLE OPERATIONS

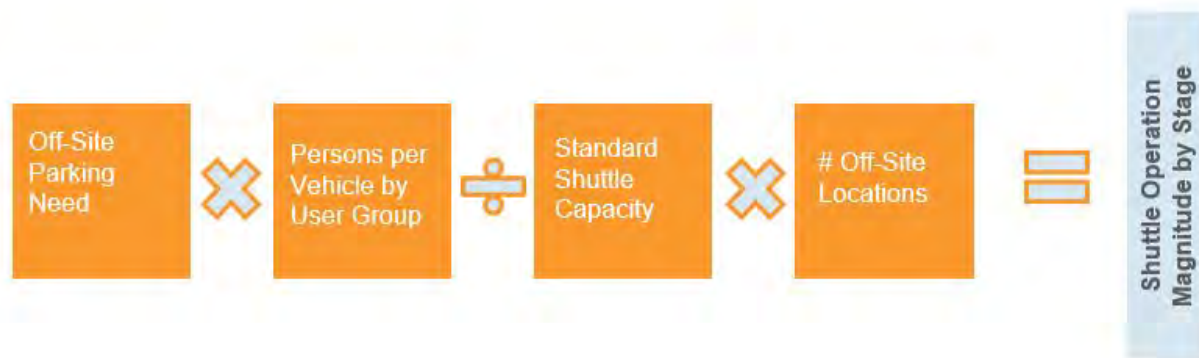
While the detailed scope and size of shuttle operations for the NWC site will ultimately be determined during the Placemaking process, the planning team did undergo an order-of-magnitude analysis to evaluate potential shuttle operations based on the off-site parking needs discussed in Chapter 5. The Figure 6.2 depicts the calculation

used to determine the magnitude of the shuttle operation for the four stages of campus implementation (Pre-Construction, Construction of Phase 1 and 2, Phase 1 and 2 Operational, and Full Buildout).

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Figure 6.2: Shuttle Operation Calculation



- **Off-Site Parking Need:** As discussed in Chapter 5.
- **Persons per Vehicle by User Group (including those arriving by truck/trailer):** The typical number of people expected to arrive in each vehicle, which differs by user group (attendees/visitors, employees/volunteers, daily (non-event) visitors, and exhibitors/concessions). For more information on this factor, see Chapter 5.
- **Standard Shuttle Capacity:** Based on industry standards for full-size shuttles.
- **# Off-Site Locations:** Determined based on the number of vehicles expected to park at off-site locations at each stage of construction.

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KEY FINDINGS

The following section discusses key findings from the three main components of Site Access and Off-Site Solutions.

ACCESS AROUND THE SITE

Mobility hubs are a key component of the future transportation access to the NWC site. Several hub locations will act as “doorways” to the site, enabling a range of modal operations and dispersing arrivals and departures for daily commuters and event attendees.

The planning team has identified the following menu of options for the NWC mobility hubs. Note that individual mobility hubs will include different amenities—these amenities will be determined during the Placemaking process.

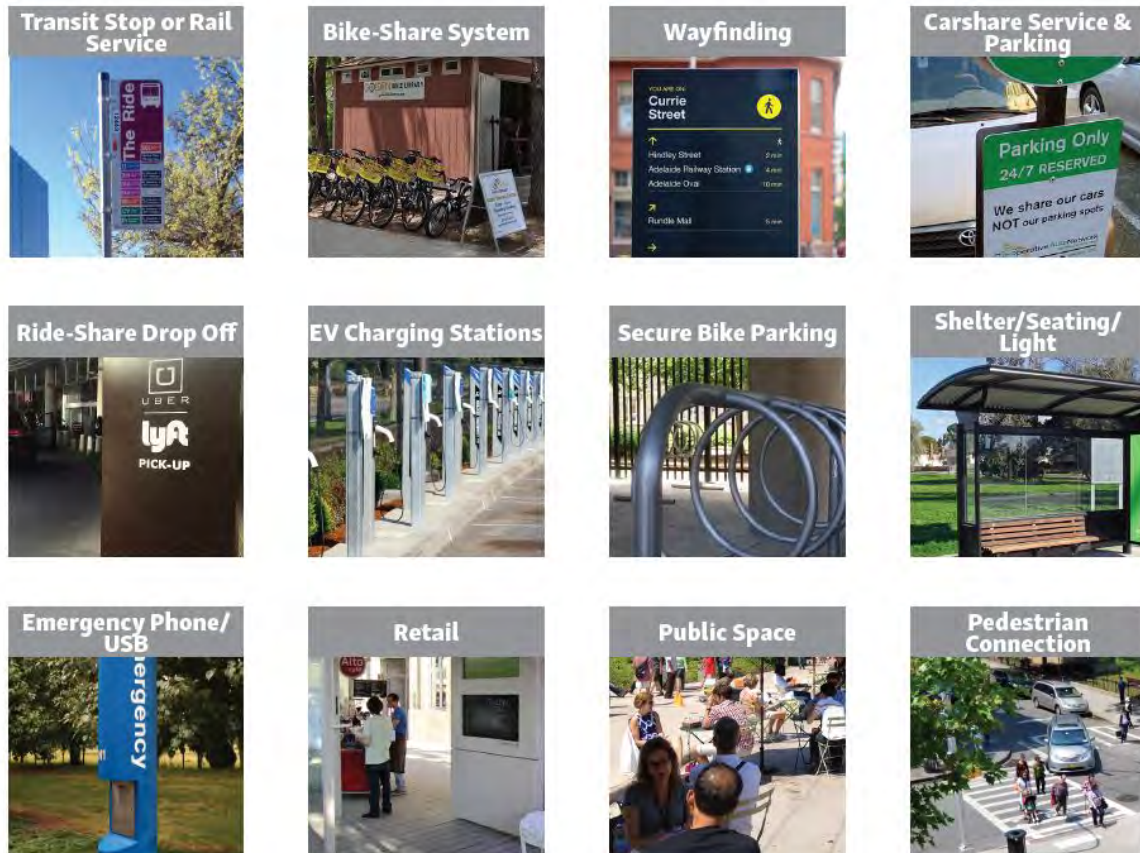
- **Transit Service Stop:** A transit stop typically includes shelter, seating, and lighting located curbside with a concrete pad for loading. At NWC hubs, any transit stop element should be designed to accommodate an appropriate number of transit buses at one time, as well as additional micro-transit services.
- **Bike-Share Racks and Storage:** Many bike share racks hold up to 5 bikes and can easily be accommodated at multiple hub locations (24 inches is the industry-recommended minimum distance between the racks for spacing purposes). Bike cages or bike station facilities should be considered for the primary hub locations and active during events. Many new bike shares are being developed as dockless and self-locking, which can be a great feature in a (geo-fenced) campus environment.
- **Hub Signage:** Hub signage and way-finding signage serve to create visibility and awareness for attendees onsite. Additionally, signage should explain how to access bike-share and other related micro mobility services related to NWC events and activities.
- **Carshare Parking:** Locating a carshare space in your mobility hub requires the reservation of at least one parking space. This space may be marked with painted curb indicating reserved parking, or by company sign. The campus might also consider one-way carsharing programs like Car2Go.
- **TNC/Pick-Up and Drop-Off Zone:** A zone for ride services or future autonomous vehicles--a length of roughly two parking spaces may be marked to indicate a pick-up/drop-off zone. (approximately 40' in length or longer depending on demand levels)
- **Charging Stations and Other Amenities:** As EVs become more prevalent, providing charging stations at mobility hub locations may be a positive amenity. These charging stations would require the use of one parking space (9' x 18') and the necessary equipment for charging. Other hub amenities that would be helpful to attendees include a USB charging station for personal electronics, Wi-Fi, emergency phones, a bike fix-it station, and integrated or pop-up coffee kiosks.

Figure 6.3 below depicts these and other common elements found in mobility hubs.

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Figure 6.3: Mobility Hub Elements



At NWC, hub operations should work in conjunction with local parking management strategies, fixed-route rail or bus services in the vicinity, and bike and pedestrian facilities that comprise the connectivity network serving the area. The hub locations should serve as the seam between the connectivity network and the events/destination locations onsite.

The NWC Commuter Rail Station is poised to be one hub location that can circulate employees and visitors throughout the site. However, one central hub is not recommended to serve such a large site. The NWC site is expansive, making travel through the site challenging and time consuming without internal mobility options. The distance further suggests that hubs will need to be dispersed throughout the site, acting as “doorways,” and emphasizing the multiple access points to the site.

For the mobility hubs to function effectively, and in order to maximize their utility, they need to be located around the site in areas with good ties to proposed facilities and internal circulation, as well as with ties to external access routes for both vehicular and non-motorized access. Note that specific internal circulation routes and means will be determined during the Placemaking process. Today, vehicular access routes to the NWC site are Washington Street and Brighton Boulevard. These are supplemented by vehicular access routes that penetrate the site including National Western Center Drive, 47th Avenue/Betty Cram Drive/44th Avenue, 51st Avenue, and Race Court. Major non-motorized facilities in the area that are important to non-vehicular access to the site include Brighton Boulevard

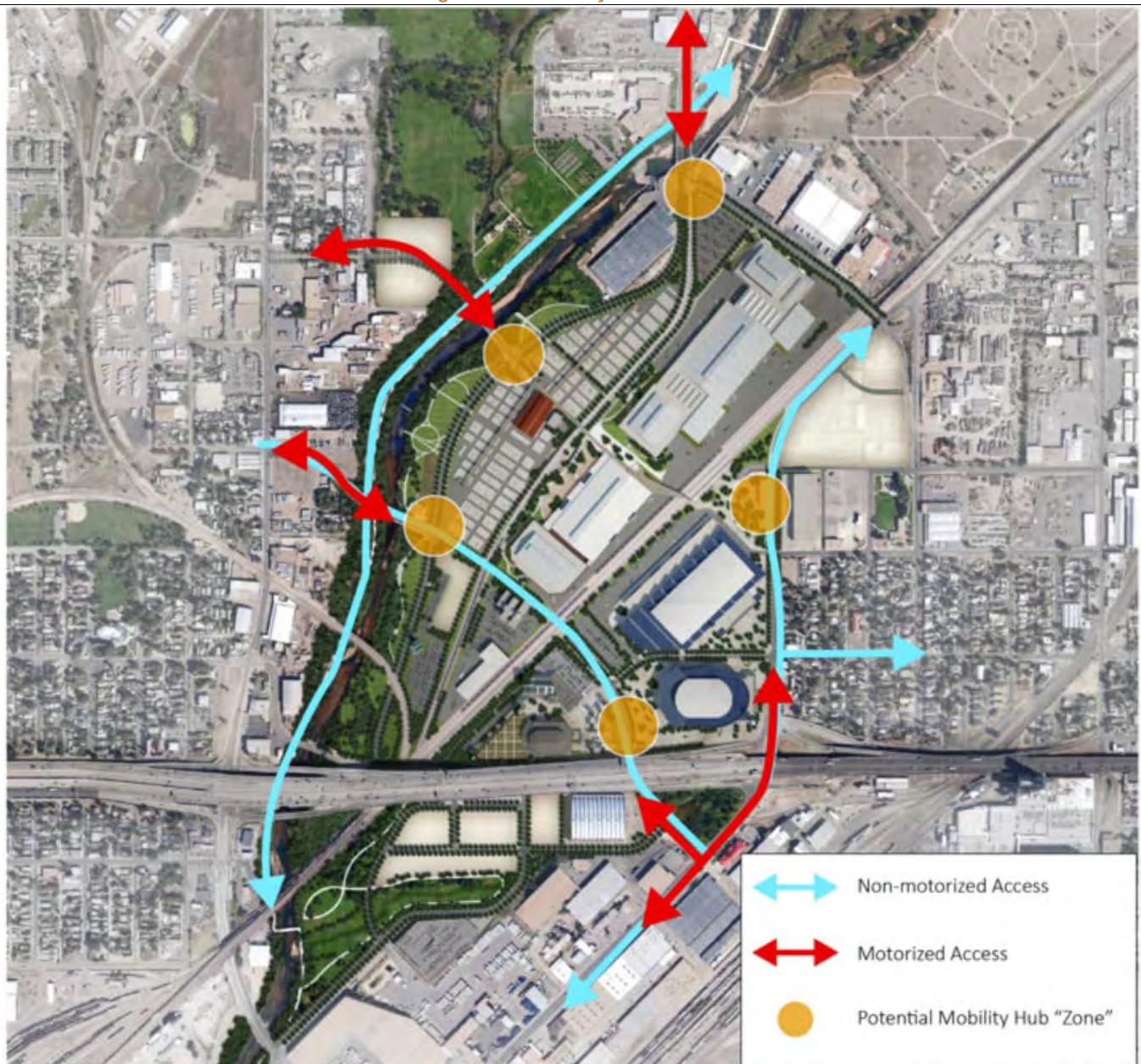
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Cycle Track, the Platte River Trail, Betty Cram Drive, and 47th Avenue bike lanes. The multitude of access points to the site indicates the need for multiple mobility hub locations.

Potential mobility hub “zones” were identified based on the NWC Master Plan configuration. These “zones” indicate areas where mobility hubs should be considered, as the site design and placemaking process moves forward. Figure 6.4 illustrates motorized and non-motorized access points as well as potential mobility hub “zones.”

Figure 6.4: Mobility Hub Zones



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ACCESS ON THE SITE

The following section describes access methodology by stage. These plans identify to-scale on-site locations and spatial needs, in terms of temporary and permanent infrastructure, for different modes of arrival and departure from the NWC site. The findings discussed below are based on data and observations collected to-date by the planning team; more detailed on-site access plans will be established during the Placemaking process.



CONTROLLED ACCESS SYSTEMS

Controlled access systems regulate, standardize, and improve security for bustling campuses like NWC. This Plan envisions gated access points for both "back of house" vehicles (trucks and trailers) and NWC-owned passenger carriers (shuttles and buses). These gated access points would use RFID (Radio-Frequency Identification), proximity cards, or a similar technology to identify vehicles allowed in. These RFIDs or proximity cards could be permanently assigned to NWC-owned passenger carriers, and given to truck/trailer operators upon check-in, and could correspond with assigned time windows, particular areas of access, and other factors. This controlled access system would allow for tracking of vehicles, reporting of violations, and eventually enforcement of access standards and regulations. It could also prevent potential security breaches.

PRE-CONSTRUCTION

Access to the NWSS during the Pre-Construction stage will primarily reflect existing conditions, with only minor changes to infrastructure occurring until construction begins on Phase 1 and 2. The Brighton Boulevard reconstruction project will impact access to/from the north on Brighton Boulevard when it begins, but access to the site for the general public, including exhibitors and vendors, will essentially remain the same.

PHASE 1 AND 2 CONSTRUCTION

Access for attendees and exhibitors will likely be impacted during this stage of

the project; the nature of such impacts are dependent on the final construction phasing for Phase 1 and 2 facilities, as determined by the Program Management and Placemaking teams. In general, access should be maintained to both sides of the railroad tracks as much as possible to allow for utilization of both Brighton Boulevard and Washington Street to distribute attendee/visitor traffic loads. For exhibitors, it is crucial that access from Brighton Boulevard into the areas of campus where trade show and rodeo activities occur must be maintained, and that access to the existing Stockyards be maintained for load in and load out livestock, until such time that the new Stockyards opens. The exact configuration of the access will depend on the construction phasing plan and the available infrastructure during each step of the Phase 1 and 2 construction activities.

PHASE 1 AND 2 OPERATIONAL

Once construction of Phase 1 and 2 is completed, all livestock and equine facilities will be located on the west side of the railroad tracks. The Trade Show and the Rodeo will occur in the current locations. Access for attendees should be distributed between Washington Street and Brighton Boulevard, and access should be made available on both sides of the railroad tracks to allow for efficient utilization of the available transportation infrastructure

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capacity. Access for livestock and equine exhibitors will need to occur primarily to the west side of the railroad tracks and should be provided on the north, south, and west sides of the site to allow for distributed access and staging opportunities. A more detailed staging and access plan will need to be developed that allows for capturing the different livestock and equine users and directing them efficiently to their loading destination. These details depend on the on-site roadway configurations and connections and are not able to be determined in detail today.

FULL BUILDOUT

Access needs for Full Buildout are similar to Phase 1 and 2 Operational, with livestock and equine activities occurring on the west side of the railroad tracks and trade show and rodeo activities occurring on the east side of the railroad tracks. The east side of the railroad tracks will see a significant growth in activity as the new Expo Hall and Arena are completed. Attendee access should be distributed between Washington Street and Brighton Boulevard and access points should be designed to share the traffic load between them and to have enough capacity to allow for efficient loading and dumping of those facilities.

ACCESS OFF-SITE

The findings for Off-Site access are separated into two main components: Off-Site Parking Locations and Shuttle Operations.

OFF-SITE PARKING LOCATIONS

The planning team assembled a prospective area for locating off-site parking facilities to accommodate off-site demand, shown in the figure below. The maximum travel distance for these off-site facilities was a 20-minute shuttle (drive) time from the conceptual pick-up and drop-off location at the NWC site—the average for the prospective off-site facilities was 15 minutes. All shuttle time considerations included a 10% cushion for traffic and weather conditions.

Prospective locations for off-site facilities were categorized by three tiers:

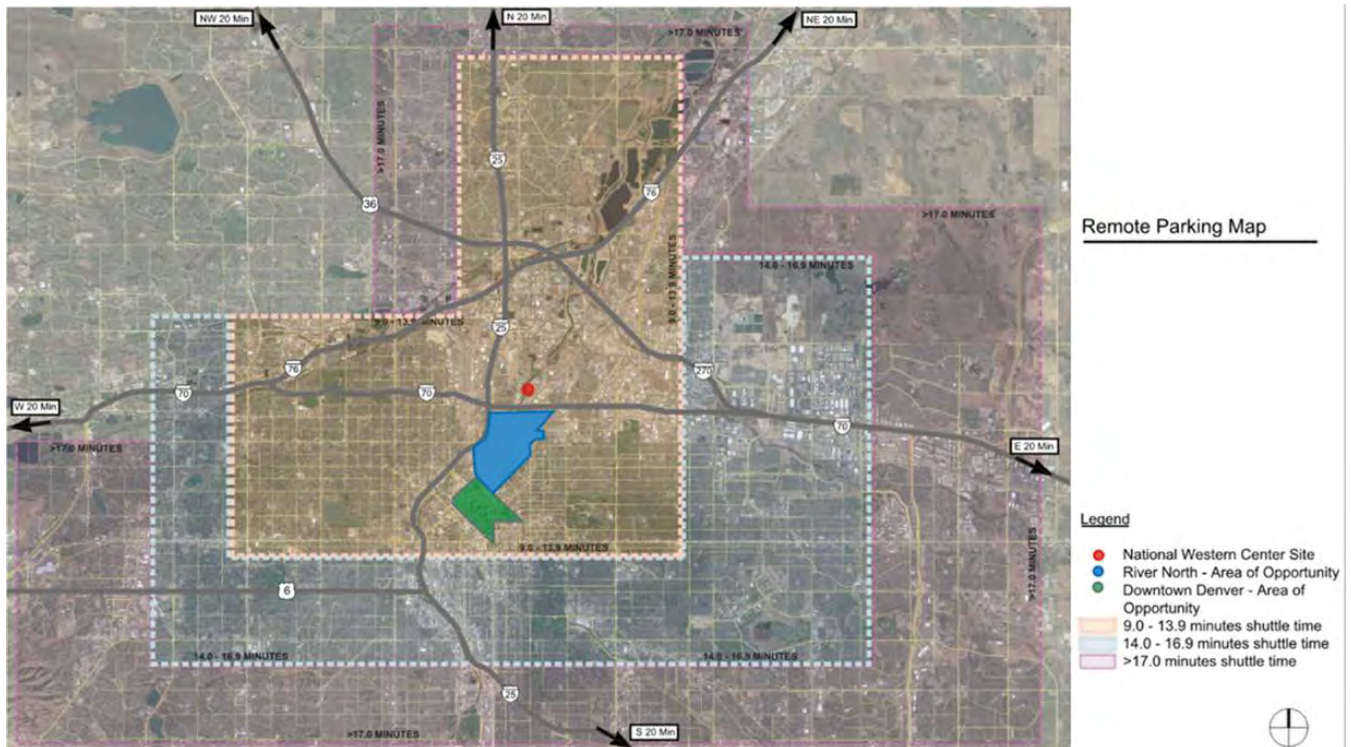
- Tier 1: 9.0 to 13.9-minute shuttle time
- Tier 2: 14.0 to 16.9-minute shuttle time
- Tier 3: 17.0 to 20-minute shuttle time

These tiers are depicted in Figure 6.5.

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Figure 6.5: Off-Site Parking Map



As part of this discussion, several opportunity areas have been identified, as shown in Figure 6.5. These include RiNo and Downtown Denver.

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Is RiNo a strong parking asset for NWC? Given the amount of development slated in RiNo, this neighborhood is often seen as a mecca for potential parking resources. However, this Plan recognizes several limiting factors with counting on RiNo as a key asset for the NWC, including:

- The extent to which anticipated development will come to fruition is currently unknown.
- Parking assets provided by developers may or may not be available to the public, or may already be restricted by existing shared or exclusive arrangements with other parties.
- Parking assets provided by private developers may be restricted by controlled access systems.
- Parking needs generated by the land uses for which parking assets are primarily built may conflict with parking needs for the NWC (for example, a boutique hotel, market, or restaurant that generates parking demand primarily on weekends).

As such, this Plan has chosen not to focus on RiNo, and instead identify potential off-site parking locations within the tiers discussed in this section.

The RiNo neighborhood has been identified as an Opportunity Area based on its existing and projected parking infrastructure capacity. The Central Business District ("Downtown Denver"), which houses roughly 15,000 publicly available (but primarily privately owned) parking spaces, has also been identified. The ability to leverage these areas as parking assets for the NWC will depend on several factors, including the general public's ability to access associated parking facilities, the times of day, week, and year that the parking facilities have capacity available, and connectivity from these Opportunity Areas to the NWC site.

Figure 6.6 shows prospective new parking locations within the tiers described that meet certain guidelines, including:

- The parking facility has an inventory of 400 stalls or greater.
- The parking facility is easily accessible from major highways.
- The parking facility is a surface lot that could serve both as a passenger vehicle parking or truck/trailer storage asset.

Note that no prospective leases or other arrangements have been discussed; Figure 6.9 is intended to be conceptual in purpose.

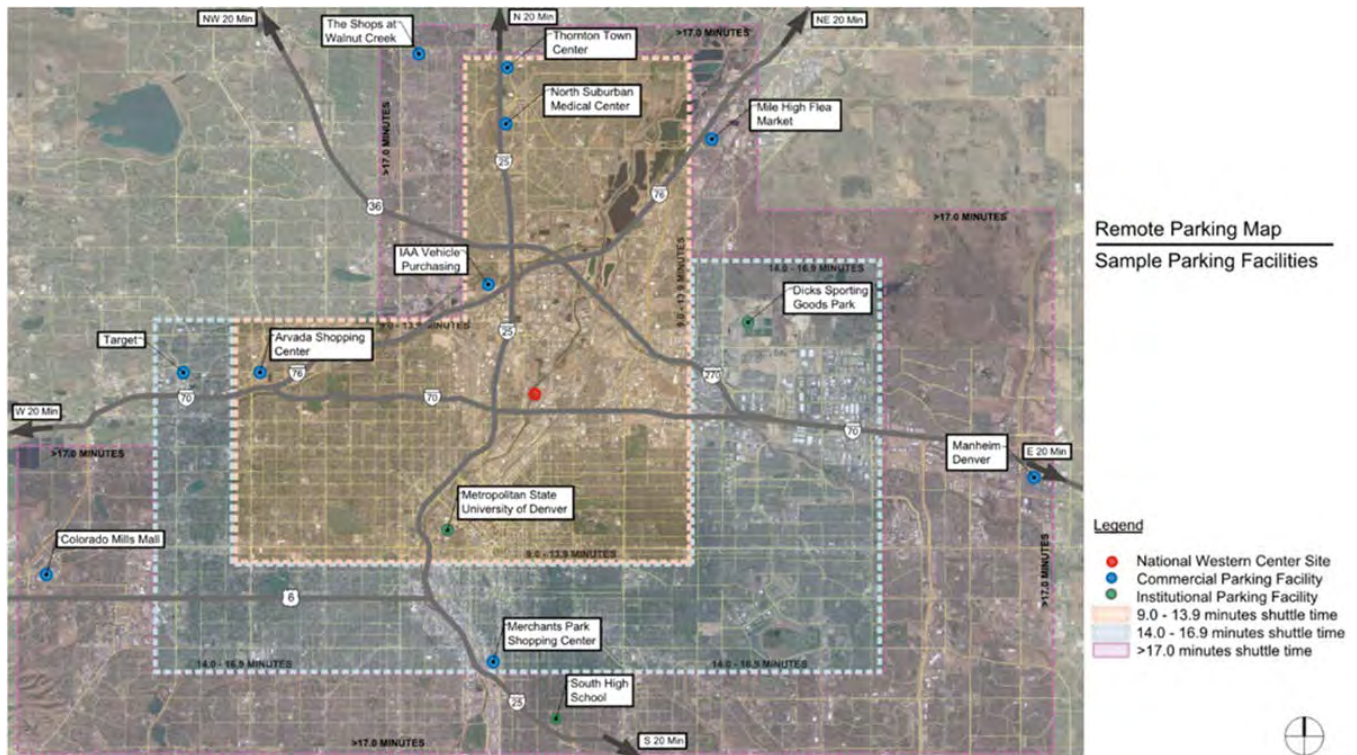
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Figure 6.6: Off-Site Parking Map Detail



Seven off-site parking locations at Phase 1 and 2 Operational and 9 off-site parking locations at Full Buildout would be needed to support the off-site parking needs discussed in Chapter 5. The location of these off-site parking resources, reliance on the private market to serve off-site needs, and other complementary initiatives will be further evaluated during the Placemaking process and implemented by the Authority.

SHUTTLE OPERATIONS

Shuttle operations—preferably managed by and branded for the NWC campus—will be needed to move people to and from off-site parking locations managed by the Authority. Based on off-site parking needs as discussed in Chapter 5, the fleet and number of off-site locations needed to serve customers who choose to drive would increase over time as the campus is built out. Customer service improvements such as concessions, ticket price reductions, or other financial incentives, signage and wayfinding to off-site parking locations, informational audio or visuals on shuttle buses, and others should be included at each stage.

- **Pre-Construction:** Maintenance (with some customer service improvements) of existing off-site parking program.
- **Phase 1 and 2 Construction:** Expansion of the off-site parking program, to include additional locations for visitors/attendees and employees and a larger fleet.
- **Phase 1 and 2 Operational:** Further expansion of the off-site parking program, to include additional parking locations for visitors/attendees, as well as locations for exhibitors, and a robust shuttle fleet.

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- **Full Buildout:** Further expansion of the off-site parking program, to include additional locations for visitors/attendees, employees, and exhibitors, and a robust shuttle fleet.

Shuttle operations and off-site parking leases should be scalable to reflect actual demand on any given day on which these solutions are leveraged.

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RECOMMENDATIONS

Access is a key asset in expanding the National Western Center's programming, attendance, and ability to attract users from around Denver, across the state, around the country—even around the world. This Plan envisions access as an integrated system comprised of around-the-site mobility hubs where different modes of travel intersect, dedicated space on-site for multimodal arrival and departure, and off-site assets to accommodate needs outside the scope of the on-site infrastructure.

PLAN RECOMMENDATIONS: SITE ACCESS AND OFF-SITE SOLUTIONS

1. Around the Site:

- a. Develop Mobility Hubs closely linked to facilities, internal circulation, and external access routes. (*Placemaking Team*)
- b. Utilize Mobility Hubs as "doorways" to the NWC site, complete with amenities and branding in keeping with the NWC vision. (*Placemaking Team*)

2. On-Site:

- a. Develop permanent infrastructure to accommodate TNC (uber/lyft) pick-up and drop-off locations, back-of-house/specialized vehicle entry, bicycle, and pedestrian connections. (*Placemaking Team*)
- b. Develop temporary infrastructure to accommodate shuttle queuing on days when the shuttle operation is in use. (*Placemaking Team/WSSA*)
- c. Identify and implement controlled access points for specialized vehicles and NWC-managed or owned passenger carriers, such as shuttles. (*Placemaking Team/WSSA*)

3. Off-Site:

- a. Identify off-site parking locations for up to 7,000 stalls—4,000 stalls at Phase 1 and 2 Operational (estimated 7 locations) and 7,000 stalls at Full Buildout (estimated 9 locations). (*Placemaking Team*)
- b. Plan for a shuttle operation increasing in magnitude over the course of campus implementation. (*Placemaking Team*)
- c. Identify funding to implement the shuttle operation by stage. Adjust funding based on the Authority's usage of off-site parking resources. (*Management Authority and Partners*)
- d. Utilize customer service interventions to encourage and simplify usage of off-site parking resources. (*Management Authority and Partners*)

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RECOMMENDATION DETAIL

The following section provides detail on certain recommendations discussed above.

- **Develop permanent infrastructure to accommodate TNC/pick-up and drop-off locations, back-of-house/specialized vehicle entry, bicycle, and pedestrian connections.** The vision for NWC involves many different modes of ingress and egress converging on the site. As such, this Plan recommends that permanent infrastructure—including dedicated and signed curb lengths for TNCs, taxis, pick-up, and drop off, designated access points for specific vehicle types, and active transportation connections (sidewalks, crosswalks, and bike paths) be permanently installed throughout the site.
- **Develop temporary infrastructure to accommodate shuttle queuing on days when the shuttle operation is in use.** This Plan recommends that curb length be dedicated to accommodate shuttle queuing needs when the shuttle program is in operation. The location of the curb length should correspond with the event(s) for which attendees/visitors are arriving.
- **Identify and implement controlled access points for specialized vehicles and NWC-managed or owned passenger carriers, such as shuttles.** This Plan recommends that gated, controlled access be provided for specialized vehicles (such as trucks and trailers) and NWC-managed or owned passenger carriers, like the shuttle buses. These controlled access areas should utilize Radio Frequency Identification (RFID), proximity cards, or a similar technology to grant or bar access for particular users, track access, and ultimately track violations and enforce access rules and regulations.
- **Identify locations, plan for, and fund an off-site parking and shuttle program.** Precise off-site parking needs, shuttle fleet, and required funding will be dependent on the intensity of off-site parking programming desired by the Authority and its partners. However, this Plan recommends that the Authority prioritize, prior to the Pre-Construction stage, identifying locations, shuttle operation needs, and funding for each stage of Master Plan implementation.
- **Utilize customer service interventions to encourage and simplify usage of off-site parking resources.** The success of the off-site parking program will be dependent on the strength of customer service interventions and incentives, such as signage and wayfinding, concessions, ticket price reductions or other financial incentives, and NWC branding and marketing (e.g. informational audio on shuttle buses, knowledgeable drivers, NWC banners and signage at off-site parking facilities and on buses) to encourage and simplify usage of off-site parking resources.

CHAPTER 7: PARKING MANAGEMENT AND TECHNOLOGY



OBJECTIVE: LEVERAGE THE BEST IN PARKING/MOBILITY TECHNOLOGY AND MANAGEMENT PRACTICES TO FACILITATE A HIGH LEVEL OF SERVICE AND EFFICIENCY.

WHAT'S IN THIS SECTION?

- Parking Management, Technology, & The NWC
- Analysis
- Key Findings
- Recommendations

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PARKING MANAGEMENT, TECHNOLOGY, & THE NATIONAL WESTERN CENTER

Historically, the NWC campus has provided parking for most of its user groups—visitors, exhibitors, competitors, employees, and volunteers-- in either on-site or near-site locations. Providing parking near to the campus was seen as the best way to ensure access for those user groups and provide a high level service. The residential neighborhoods and low-density, industrial land uses surrounding the site have also absorbed some percentage of the overflow parking demand, without relying too heavily on alternative access or remote parking locations. In more recent years, the NWSS has formalized usage of several off-site locations, such as the Coors Field parking garage, to handle some of the overflow demand for Stock Show. This change has occurred but without the benefit of several newer technologies that might serve to warn visitors ahead of time that on-site parking locations are already filled.

The current parking supply on the campus is flexible in that most of the parking lots are unimproved (dirt/gravel) and unstriped. This has allowed for many of the parking lots to serve double-duty for both parking and for truck and trailer staging and storage. For typical days and small events, some lots are used for trucks and trailers of exhibitors and competitors, while other lots are used for passenger vehicles (employees, volunteers, and visitors). During large events, and during Stock Show, the system may be used differently. Also, during peak conditions (namely NWSS) the parking supply is expanded with additional off-site parking lots being utilized, though the locations may vary depending on the year and where the NWSS can secure leases.



As the NWC campus undergoes a major transformation, it is likely the traditional methods of operating parking on- and near the site will also need to change. Though the Master Plan for the site is unique, particularly in terms of scope and scale, major transformations in parking management approach are not uncommon for similar event venues around the country. Many times, an upgrade to the parking system is a way to refresh and/or expand the venue, improve perceptions of the space, and enhance the overall experience for all user groups. The vision for this transformation for NWC has called for increased efficiency in how space is used on the campus (with increased density and design flexibility). When paired with projected future growth in attendance, it is imperative that the campus adapt to how user groups gain access to the site, and how access options and routes are best to communicated.

This chapter provides insights into:

- How to support and encourage alternative modes (TDM strategies) through technology;
- How industry best practice and use of technology can be used to manage parking and the parking approach for increased parking system efficiency and a better user experience; and,
- How creating flexible and dynamic management and technology solutions can be scaled and adjusted to various events and stages of development.

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ANALYSIS

The analysis for this chapter is more qualitative as we address technology and parking management needs of the NWC campus. Within this analysis section we discuss typical needs of event venues, unique needs for the NWC campus, identify applicable technologies, and identify applicable parking management practices.

USES OF TECHNOLOGY AT EVENT VENUES

Typically, the first and last experience a driver has with any land use is dealing with access and parking. Therefore, it is important to implement plans that are intended to improve this first and last impression. In this section, we discuss some of the typical needs of an event venue to help mitigate the high peak hour arrival volumes.

ONLINE INFORMATION

It is important to provide online information regarding site access and movement within the event venue. Given the increasing tendency to access information via mobile devices, the information should also be in a format that is easy to view/interact with via mobile device. Some venues provide directions and site maps as part of their webpage while other provide a PDF download that can be viewed using a mobile device without incurring data fees. Currently, NWSS provides a PDF download of their parking map, and Google Maps-linked driving directions to the site and overflow parking locations.



The online information should provide text and/or a map identifying the event venue(s), and parking supply(s), each with a key or label. The information should also include text regarding various modes of transportation that may be used to access the site, and some basic directions. A link to an outside website for directions/navigation is also important, as these are used with increasing frequency.

To support a shift to multimodal transportation options, parking pricing information should also be prominent posted on the same webpage/PDF document providing driving directions and alternative mode options. Several of the earlier sections of this Plan discussed the importance of unbundling parking fees to provide consumer incentive to use alternative modes and/or utilize off-site parking locations.

Online information may also differ by user group. Visitors or event attendees may be directed to different parking lots versus exhibitors and competitors. It is important that the right information is provided to each user group, as potentially creating cross-traffic for large events (especially once on-site) can create significant additional traffic congestion. By creating separate routing for various user groups, there is less cross-traffic and some driver frustrations may be avoided.

To help mitigate the issue of cross-traffic between user groups or for those who may have reserved parking in a specific lot, it is important to work with online and real-time navigation companies to create separate "pin" locations for the various parking lots and venues. A single pin location for an event venue will direct all those using online and real-time navigation to the same point, potentially creating unneeded cross-traffic. The "pinning" of front doors to the venue is also important when routing TNC (Uber/Lyft), taxis, and similar service providers to the correct pick-up and drop-off locations.

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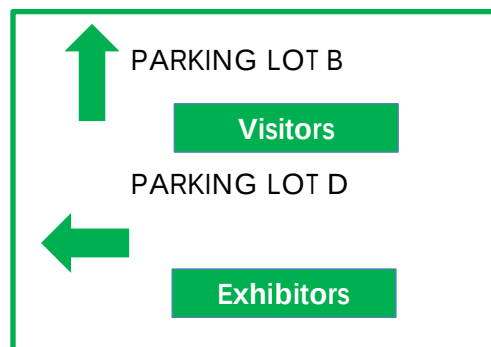
For some events, the information described above is sent via email. Therefore, it is imperative to make this information available to those coordinating events.

INFORMATIONAL/DIRECTIONAL SIGNAGE

Another important element for event parking and access is informational/directional signage. Because attendees, exhibitors, and competitors may not be at the site regularly, signage is needed to direct those driving. Signage must first direct them toward the venue, and then possibly more importantly, to parking. Signage should be provided along the approach to the venue, and if necessary separate different user groups to mitigate cross-traffic and congestion.

Signage may be static or dynamic. Static signage would be used to locate infrastructure that is not moving, and relate information that is not changing. Dynamic signage is used to provide additional information, which if changed may alter a driver's decision. Some dynamic signage can be basic and not require technology. For these signs portions of the sign may be blocked, or changed out. Figure 7.1 depicts a simple dynamic sign where "Visitors" and "Exhibitors" may be changed out manually based on the event.

Figure 7.1: Example of Dynamic Signage with and w/o Technology



On the opposite extreme, dynamic signage may be part of an intelligent transport system (ITS). ITS is an advanced application that aims to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks. These systems are in use in most major cities and integrate road, weather, and traffic conditions, and provide construction information and Amber Alerts. These signs are also, at times, tied into information for event venues to help alleviate traffic conditions on major roadways and highways.

PRE-PAID PARKING AND RESERVATIONS

Many event venues now provide for online pre-paid parking. Pre-payment has many merits, which include:

- Reduced transactions on the day of the event (reducing cash handling, and time required at the facility entry),
- Ability to direct parkers to specific lots/structures and either balance these transaction types to balance arrivals or group to ease arrivals for those who pre-pay.
- Ability to staff accordingly for parking management and directing to available supply.

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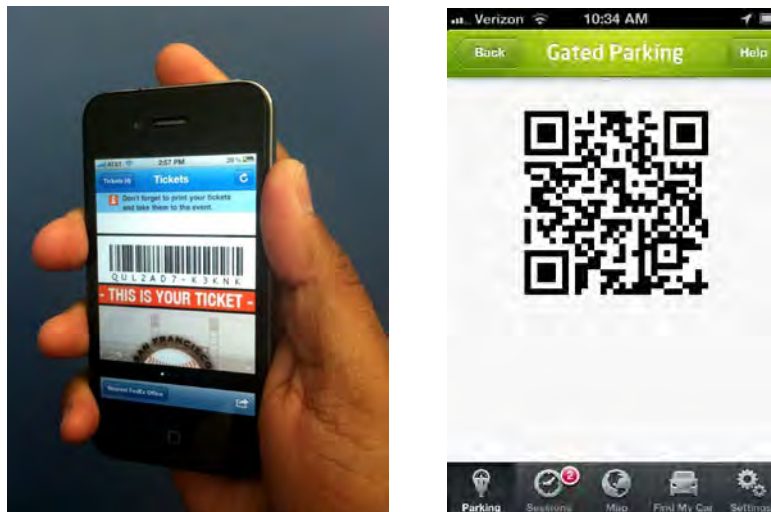
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Typically parking pre-payment is an option when purchasing tickets for the actual event, as an add-on to the transaction. If event tickets are purchased online to be printed at home, an additional ticket for parking is included with a bar code or QR code that will be used at the parking facility entrance. Other applications allow for the barcode or QR code to be read directly from a mobile device (typical a PDF sent via email). Examples of these options are provided in Figure 7.2.

Figure 7.2: Examples of Barcodes & QR Codes for Pre-Paid Parking Access



Parking pre-payment requires a technology component as well as a management, infrastructure, and equipment component.

In some event venue applications, there is only a single parking facility, so a check-box is all that is needed to reserve parking within the online/app interface. In larger settings where multiple facilities are involved, parking may need to be reserved with an approximate arrival and departure time and identify the facility to use. The technology component must be adapted for the specific site application.

Parking rates may also vary by event or by facility, which would require input from parking management staff. Some online parking management software allows location managers to make these changes directly, while others may require requests to be submitted and entered by a hosting service.

Finally, infrastructure and access equipment must be in place to ensure compliance. Infrastructure such as fencing, bollards, chains, or ropes is needed to limit access to the parking facility. Only locations where access equipment is provided to process the transaction should provide access to the facility. Access equipment is required to limit access to those drivers who have a right to park (due to payment or valid parking permit). For this application, equipment used to read the barcodes or QR codes is required. The infrastructure and equipment would be required for most paid parking scenarios.

Infrastructure and Striping

Some event venues have formal infrastructure in place that is permanent and is best suited for the needs of the event venue. Other venues have informal parking and access infrastructure, possibly due to the site having a dual use. Due to the dual use, the site cannot provide infrastructure that best suits the venue from a parking and access standpoint.

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Parking and access infrastructure includes elements that create an entry/exit point within an area, limit access to the site outside of those defined points, and help to orient vehicle circulation and storage. Elements that limit access or define an entry/exit may include fencing, bollards, chains, ropes, and sometimes landscaping. To help define circulation, so venues have striped parking facilities while those with less formal parking areas may use cones, or poles and ropes to differentiate circulation areas from parking areas.

If understanding parking capacity and availability is important, a parking stall count is needed. This would require that parking stalls be delineated via striping. Striping can be painted on a paved parking surface, or even sprayed onto a temporary parking surface similar to lines painted on sports fields. Figure 7.3 depicts how informal parking infrastructure can be improved to provide defined parking spaces. With this improvement, parking availability information can be provided in real-time.

Figure 7.3: Example of Temporary Parking Striping Plan



If the items listed above are provided, drivers will be directed toward the event venue, then to an appropriate parking facility, and the facility will have a defined entry and exit. What happens at that defined entry (and exit) is determined by whether the entrance is access controlled (gated), and whether parking is paid, permitted, or free.

PARCS

Most event venues with formal parking infrastructure have parking facilities that are access-controlled. This means that access to the facility limited by a gate or other means until a credential is either issued (for payment at exit) or a credential is provided (for pre-paid) or payment made (for pay at entry). The equipment systems used to perform these tasks are called PARCS.

There are numerous forms of operation and types of equipment (dependent upon form of operation) that may be part of these systems. Figure 7.4 provides some examples of PARCS applications at various venues and with different types of operation-each depicts an access controlled parking facility. To provide audit control of revenue, it is important to have access control and a separate vehicle count from access control to cross-check with transaction information. The example on the left shows an application that has a booth for manned cashiering, while the example on the right shows an unmanned application where drivers would process their own transaction.

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Figure 7.4: Examples of PARCS Equipment



PARCS equipment is also necessary to provide real-time parking occupancy and availability information. Striping of the parking facility is the first piece of the availability puzzle. The next piece is the net of vehicle entries and exits. All of these data points are required to provide real-time availability; a missing piece would render the others useless. Real-time availability helps to direct drivers to parking facilities that can accommodate them, either using dynamic signage or parking/traffic staff directing drivers. Figure 7.5 on the following page provides examples of dynamic signage that provides availability information to drivers. Some event venues have different pricing for different parking facilities, and this information can also be included on dynamic signage.

Figure 7.5: Examples of Dynamic Availability and Directional Availability Signage





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KEY FINDINGS

UNIQUE NEEDS FOR THE NWC CAMPUS

The NWC campus is large and has several event venues spread throughout the site. The venues host truly unique events (stock show, rodeos, etc.) as well as more typical events (concerts, awards and charity events, etc.). These factors contribute to access needs that are also unique to the campus. Within this section we describe some of the unique access needs that are created by nuances at the NWC campus.

The parking supply at the NWC has historically been a flexible parking supply in which some lots are used for visitors (passenger vehicles) one weekend, and used for exhibitors/competitors (trucks & trailers) the next weekend. A flexible parking supply is useful for an event venue like the NWC campus because of the wide array of events and event needs. But this flexibility creates a situation where a driver may plan to use a specific parking facility, drive to it, but it is not available for their use. On busy days, this can create unwanted cross-traffic and increase congestion (and driver frustration). In earlier chapters, we recommended that some of these flexible use lots be physically segregated to create two separate areas—one for passenger vehicles, and the other for trucks & trailers. Still, some parking facilities will be required to have flexibility to serve the varied events at the NWC campus for the foreseeable future. Ensuring some lots are still able to serve double-duty is important. Directing drivers based on changing uses of these lots is also important.

The NWC campus has several distinct venues, and several distinct parking facilities serving those venues. Somewhat related to the flexible parking supply, is the fact that different user groups may be assigned to a parking facility for different events. Directing drivers to appropriate parking facilities for various events is a significant task for an event campus like NWC. For less busy days, some signage is provided. For more busy days, signage and staffing are required to direct drivers. This nuance can be confusing to drivers. It may also require a significant (and dynamic) pool of staff to handle signage changes and traffic direction duties for slow days and the busiest days. Dynamic staffing needs can be very difficult to manage.

Providing relief and solutions for these unique needs will be considered as we review technologies and parking management best practices.

APPLICABLE TECHNOLOGIES

Within this section we provide some of the technologies that are available in the market at-large and/or are specific to Denver. There is a significant amount of technology used to enhance the user experience and improve parking management, but not all would be applicable to this site. We have taken time to consider which technologies would best suit the NWC campus now and into the foreseeable future.

INTEGRATED TRIP PLANNING

Real-time trip planning via Integrated Trip Planning (ITP) is becoming available in more and more cities. These websites and apps typically run with one of the dynamic mapping/navigation interfaces described above as the base, then layers and functions are added. One example is the Go Denver app, which provides users with myriad information regarding access by several means as well as timing and cost. The same information is available via the website. Some venues, where ITP is available, have shifted from providing a link to Google Maps, to providing a link to the ITP site as it provides additional information for local users. Figure 7.6 on the following page shows a screenshot of the mobile app.

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Although trip cost is provided, it does not include the cost of parking for those who wish to drive. This may be the next integration within these types of apps to further inform the choice in transportation. Parking rates (and reservations) are available online for most urban centers and include most public parking supply (on-street and off-street) and some privately-owned facilities. If the entire trip (including reserving parking) can be coordinated within one app, the total cost of the trip could be weighed against other options. For now, that information may be shared by the venues instead to encourage use of alternative modes, if desired.

Figure 7.6: Go Denver ITP App



ONLINE PARKING RESERVATIONS

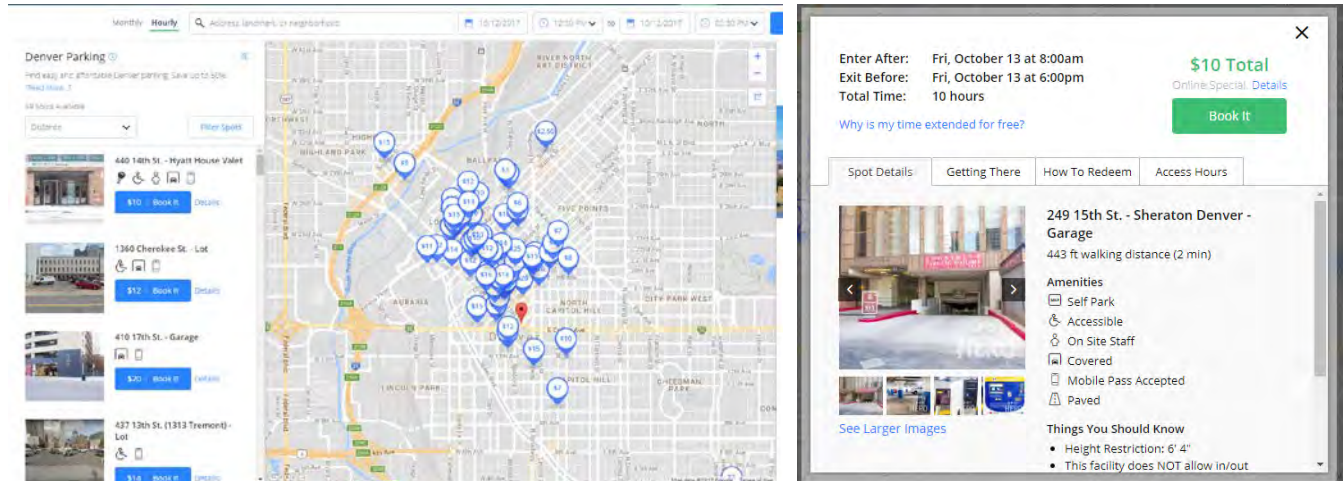
Another technological advance that has become more prevalent in recent years is online parking reservations. Some online reservations are provided by the venue itself, especially for venues that have a single parking facility. In other applications, separate companies have set out to consolidate information from area parking operators to create an online parking market and allow for choice based on location and pricing options (see figure 7.7). Some event venues have brought these third-parties in to manage their own online reservations and make their excess spaces available to the public in general.

One company that provides the ability to reserve parking online is Spot Hero. Reservations may be made within surrounding parking facilities (or downtown settings) or at event venues. As their business has matured, their technology and product offering has also expanded to include platforms (software and equipment) that manage event parking conditions via handhelds, online valet reservation/management, and validated parking. Event parking reservations generate an email that provides a printed (or mobile) bar code to be used for access. Handhelds used by parking staff for the event accept cash and credit payments, as well as validate bar codes for pre-paid reserved parking. For other lots that may have access control added, handhelds could be used to process payments and issue printed bar codes. These printed bar codes and those from online reservations may be used to gain access to the parking supply.

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Figure 7.7: Spot Hero Online Parking Reservation Interface - Denver



WAYFINDING

Wayfinding is the set of cues and information used to direct someone from their current location to their desired location. This may include navigation (discussed above), but historically has been signage. Signage can be static or dynamic. Static signage does not change, and would need to be replaced entirely if a route is altered or information on the sign is no longer valid. Dynamic signage is intended to change, knowing that the information presented on it may impact route choice if/when altered. For either application, placement of signage and message should be carefully considered to guide travelers to their intended destination at key decision points without presenting too much information that cannot be processed effectively by drivers.

For most trips, wayfinding for travelers is provided in general terms by state and local agencies. It is not until a traveler is approaching their destination that wayfinding specific to their desired route is needed. Depending on the specifics of the destination (e.g. venue/campus size, or desired user separation) site-specific wayfinding signage may be provided several miles away or simply beginning that the entrance to the destination. Various user groups may require different directions as they approach the site and within the campus; parking for attendees, marshalling for truck & trailer, and drop-off/pick-up for Uber/Lyft.

ITS

ITS have been developing in the U.S. for roughly 30 years, with various facets added as technology allows. ITS is an advanced application that aims to provide innovative services relating to different modes of transportation and traffic management. The goal of these systems is to enable various users to be better informed and make safer, more coordinated, and smarter use of transportation networks. These systems are in use in most major cities and collect process and disseminate information related to road, weather and traffic conditions; they also provide construction information and Amber Alerts.

ITS uses various tools to collect and disseminate information. One such tool to disseminate information is dynamic signage. Depending on how the state or local government chooses to use the signage, they may display travel times, weather and road conditions. These signs are also, at times, tied into information for event venues to help alleviate traffic conditions on major roadways and highways near the venue.

CDOT maintains the ITS in and around the Denver area. The system includes dynamic signage to provide information to drivers along area highways. Dynamic ITS signs are found along I-70E and I-70W near the NMC

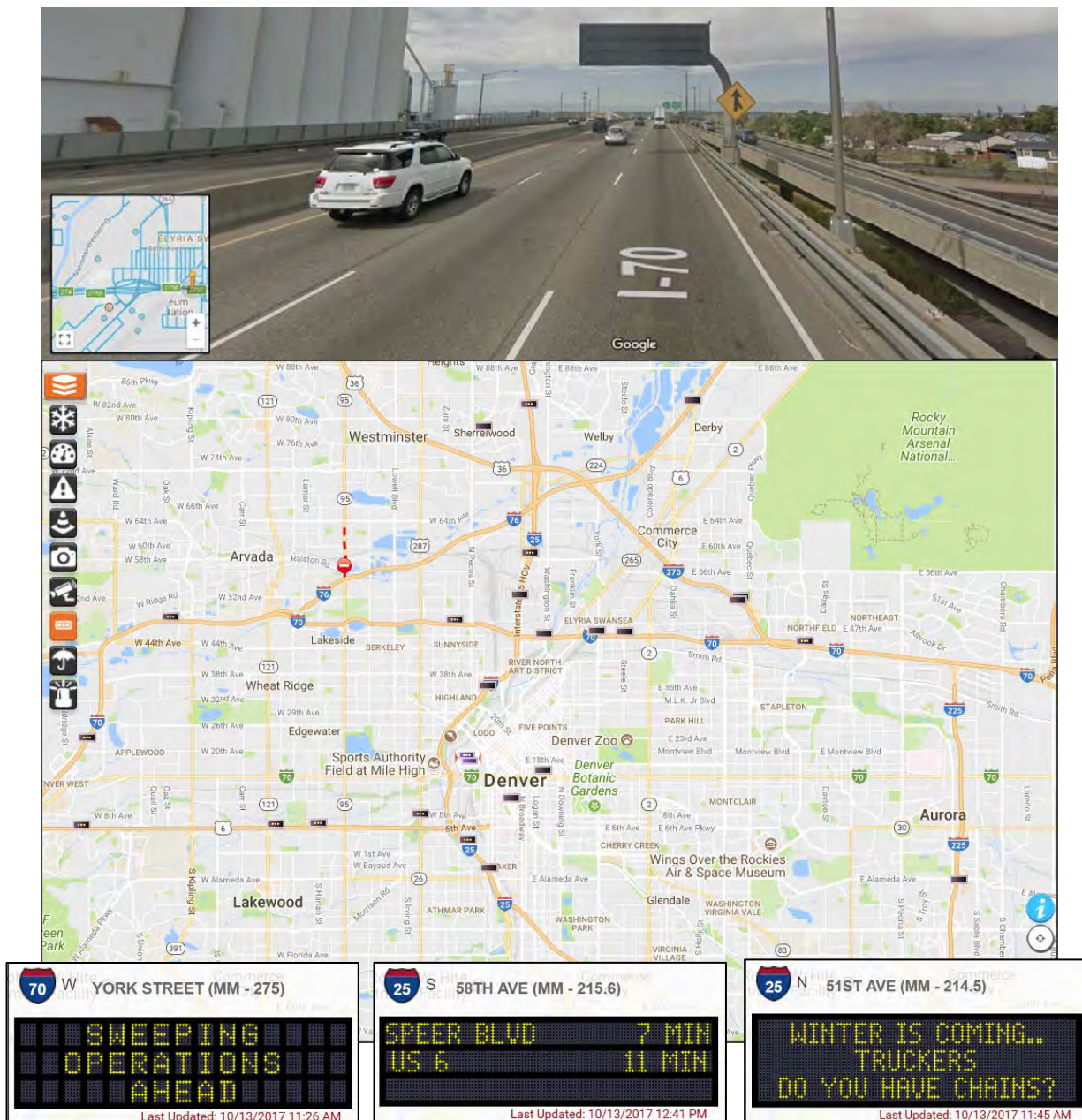
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campus. This network of signs could be used to separate user groups for large events, and direct drivers to the most appropriate parking supply.

Figure 7.11 shows the dynamic sign along I-70W near the NWC campus, a map of the dynamic signage in the area, and some current messages found on nearby sign. More information on the ITS system can be found at: <http://www.cotrip.org/map.htm>

Figure 7.8: CDOT ITS Dynamic Signage – Denver Area





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DYNAMIC SIGNAGE

Aside from the CDOT ITS signage, dynamic signage specific to a venue is helpful in relating site-specific information to guide drivers. As discussed within the Typical Needs of Event Venues section above, dynamic signage is helpful in this type of a setting to avoid creating cross-traffic and congestion. Signage placement is important, and signage should be located in a way to ensure enough time/distance is provided for a driver to understand the information provided and make an informed decision.

Messaging on venue-specific signage can be more tailored to the site than the ITS signage. Dynamic signage on the approach nearby and on-site should direct drivers to appropriate supply. If desired the signage should provide drivers with availability and pricing information if a few facility options exist. Messages for these signs should be clear and concise. The messages should be developed in advance and approved for use, then implemented as a package for each specific event scenario. Each event scenario should consider the informational needs of each user group and be placed along their approach accordingly.

Another consideration is timing for this signage. Because this campus is undergoing such a significant transformation, with new roadways and linkages, it would be unwise to spend on the infrastructure needed to place dynamic signage if the roadways will be significantly altered. A wayfinding plan should be developed in advance of each stage of development to ensure customer satisfaction during transitional times, and for full buildout. Required infrastructure should be provided as part of the staged redevelopment of the NWC campus.

PARCS

PARCS are both a technology item and a parking management item. These systems are used to grant access (for ingress and egress) and to track transactions and revenue. Due to the significant variance in activity levels at the NWC campus for different events, a base system should be considered that can be scaled up for large events. Infrastructure (number of entry lanes and circulation) should be provided to meet a busy event condition, but staffing can be scaled based on need.

PARCS equipment should be implemented to reduce staffing during typical non-busy days (staffing is typically the costliest operating expense for parking facilities). This may mean PARCS equipment is provided at the entry and exit to control access. Payment could be handled as a separate function Pay-On-Foot pay station, via mobile app, or online in advance.

Typically, event parking is paid at entry or in advance to speed up vehicle exits once the event ends. Therefore, the payment transaction would occur during entry. Payment transactions take more time than non-payment transactions, so entering traffic can be delayed if the extra time needed for these transactions is not accounted for and operations are not scaled appropriately. For large events, the in-lane equipment could be supplemented using handheld devices issued to additional staff. Multiple payment transactions could occur simultaneously in the same lane, and paid tickets could be scanned at entry gate equipment to increase throughput. This would help to maximize vehicle processing times at entry.

Another reason to add PARCS to the campus is that information from installed PARCS equipment and from handhelds can be pushed to dynamic signage to reflect real-time availability for each facility. This information can also be used by traffic and parking management staff to supplement the dynamic signage and direct drivers accordingly. Prior to full buildout the information would help traffic and parking staff direct drivers (assuming no dynamic signage until full buildout).

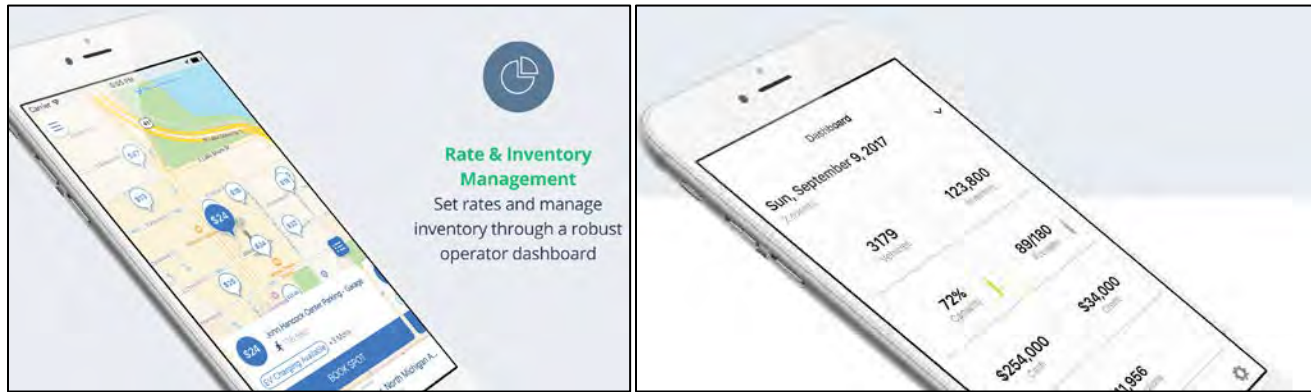
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Figure 7.9: Management Options & Information Available on Handhelds



APPLICABLE PARKING OPERATIONS PRACTICES

Within this section, we discuss some of the basic and more advanced parking operations practices that could be applied at the NWC campus. Some are simply helping to define the parking supply by creating boundaries and organizing circulation and vehicle storage. Others are more advanced, and require technology to implement best practice for a venue like the NWC campus.

LOT STRIPING

Parking is provided most efficiently for events when it has been laid out in advance. This ensures proper stall size and circulation is provided. Parking layouts are typically striped (painted) on the surface of the area to define where vehicles can drive, and where they park. Having a striped parking area also provides a pre-defined parking inventory for each facility, which is needed to understand real-time availability. This information is required to help direct drivers either through dynamic signage, or traffic and parking staff.

Striping for event parking could be done through typical means for permanent parking facilities (painted lines on asphalt), cones and chalk/paint on gravel/dirt/grass (similar to sports fields), or by creating a centerline for parking using ropes and poles. An example of such a layout plan was provided in Figure 7.3.

The majority of on-site lots at the NWC are either dirt or gravel, presenting challenges when trying to achieve efficiency within the lot. To increase utilization and prevent users from over-parking as the campus transitions, the NWSS could consider installing a spray-painted temporary (or semi-temporary) striping plan that could be refreshed prior to each large event.

To achieve this, NWSS can enlist a vendor that can temporarily spray paint a parking grid onto the dirt or gravel lots for large event days. The vendor will paint the grid using a machine like those used to paint lines on a football field. Walker has developed functional layouts and striping plans like this in the past, executing a make-shift striping plan on grass fields or gravel or dirt lots for event parking. Implementing an effective striping plan can enhance both traffic flow and parking management for the venue.

Walker recommends that the visitor/attendee (passenger vehicle) lots with the lowest level of efficiency (# of square feet per stall) be considered for this measure. The following figure (Figure 7.13) lists lots recommended for a striping plan, their current inventory, and current efficiency. Note that the number of stalls gained as a result of implementing



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a striping plan will vary based on the physical constraints of each lots; however, WALKER estimates that total stall gain will be between 300 and 390 stalls.

Figure 7.10: Visitor/Attendee Lots Suitable for Striping Plan

Lot	Sq. Ft.	Inventory	Efficiency (1)
D	306,400	660	465 sf/ stall
K	48,150	95	505 sf/stall
M	15,900	30	530 sf/stall
O	194,300	460	420 sf/stall
Gold Buckle	114,700	160	715 sf/stall

(1) An efficient surface lot ranges from 350 to 380 sq. ft. per stall. Based on unique standard stall requirements of the NWSS due to a higher percentage of large passenger vehicles, WALKER has expanded this range from 380 sq. ft. to 400 sq. ft. per stall to project estimated total stall gain if a striping plan is pursued.

As the Stock Show occurs in January, weather patterns are unpredictable and can include snowfall. Walker recommends using a pole and rope system (poles or stakes along a center line, with ropes between, to indicate stall widths) as a back-up if striping is impacted by snow or snow removal—a practice that the Stock Show has already adopted for many of its lots. This measure, combined with the use of directed parking, will maximize the space in each parking lot.

Again, ultimately, the campus implementation process will result in permanent parking infrastructure largely located in structured parking. As such, this practice would largely be incorporated during transitional stages, such as the Pre-Construction stage and the Phase 1 and 2 Under Construction stage.

CONTROLLING LOT ACCESS

Like lot striping, it is important to control access to the parking area. Controlled access means creating a boundary that defines the parking area, and ensures access to the parking area is limited to specific, and intended locations.

Parking layouts (striping) are prepared to consider the site location and best access points. Circulation layouts would be prepared to ensure efficient loading of the parking area for an event with access from those points, so ensuring access is limited to the intended entry/exit is important. Entries and exits are also oriented to ensure good visibility and to limit pedestrian and vehicular interaction. If access to the parking area is possible elsewhere, these considerations may not be considered and could result in injury.

Another reason to control lot access is that vehicles entering from other places (beside the intended entry) would impact the validity of the parking availability information. If access is not controlled, a driver may enter at the correct location and pay for parking, but no space may be available as it was taken by someone entering illegally. A refund would be needed, and the driver who followed the rules would then need to drive elsewhere to find a place to park. This situation should be avoided and requires access control to ensure it does not happen.

Controlled lot access also assists with potential security concerns.

SEGREGATING LOTS

Some of the parking areas currently serve double-duty depending on the day and needs of different events. These areas serve as parking for passenger vehicles, and as truck and trailer marshalling and storage. To simplify the



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operation, and send a clear message to drivers, it may be best to separate these areas, and create a designated parking area, and a designated truck and trailer area, with separate entries.

Trucks and trailers require a different turning radius and therefore different entry/exit configurations compared to those for typical passenger vehicles. Instead of creating a second entry into a lot, providing a permanent space for trucks & trailers is recommended. For small events, when these areas are unneeded, they may be used as parking for employees and volunteers.

Segregating these uses, would allow for parking areas to be controlled as parking areas all the time. The parking inventory would be a set number, which would simplify availability and directing drivers. Entry/exit would be designed for passenger vehicles specifically, with appropriate access control. Efficient parking layouts (striping) would be prepared based on the site dimensions to maximize the amount of parking offered within the area.

DYNAMIC GUIDANCE

Historically, guidance for large events has been provided through staffing and signage. For smaller events, signage has been provided along with staffing on an as-needed basis. For event venues, it is important to help guide drivers to available parking supply as quickly as possible. Although many venues have enough spaces to meet the needs of event-goers, getting them from their origination point and into a parking space can be a cause for frustration. Dynamic guidance is intended to provide needed information or direction for drivers along their approach – more defined as they approach their destination.

Dynamic guidance is provided either through event staff, or through dynamic signage. If performed by staffing alone, a site may require significant staffing for larger areas, especially if there are several roadways within the campus, and more than one parking facility. Staff would direct drivers to available parking facilities, and as facilities fill change how drivers are directed. Sometimes availability information is delayed when performed by staff alone, which impacts how drivers are directed and may require some drivers to be turned away and redirected to another parking facility.

Dynamic guidance through dynamic signage helps to reduce the staffing needs to direct drivers to their destination. Directing traffic on-site is truly a cost of operating parking. Reducing staff for this function reduces the cost to operate parking. The information used to guide drivers may direct those attending a specific event to a specific facility; or may note availability and location of various facilities and allow drivers to choose their parking destination based on that information; or inform drivers of location, parking rates and availability, and allow for drivers to choose their parking destination based on that information.

PAY-AT-ENTRY

For many event venues, parking is paid in advance and tickets (to be displayed on the dashboard) are issued to paid vehicles. Payment may occur as pay-at-entry, or pre-payment (online). Parking rates are typically a fixed amount for the event, which allows for this type of payment.

Prepayment ensures that exiting after an event is easy for drivers. No transactions are necessary, which means no transaction problems. Prepayment is also helpful to guarantee that each vehicle pays for parking. If prepayment does not occur, a driver may say that they cannot pay. In more typical (non-event) settings, this transaction may have a low dollar value and/or not create an exit problem for others if delayed to figure out another form of payment, etc. But, in an event setting most attendees are hoping to leave at the same time, and exits are not configured to account for exception transactions which would clog an exit lane.

Pay-at-entry transactions can be performed by staff with handhelds, automated via PARCS equipment, or both. Staff with handhelds could be deployed in locations where typical PARCS equipment cannot (or should not, based

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on future changes) be installed (lots slated for redevelopment, etc.). PARCS should be added where it can be to help with informing real-time parking availability and to allow for parking revenue audits (ensure the venue received money to offset staffing costs, etc.). For large events, the PARCS equipment can be supplemented through handheld devices to allow for multiple transactions concurrently per lane of vehicles. Because payment is typically the slowest part of the transaction, payment for several vehicles at the same time is preferable to reduce average wait times at entry.

DIRECTED PARKING

Many event venues use directed parking to increase the efficiency of parking mass volumes of vehicles in a short period of time. Given that the public is accustomed to parking liberally at NWC, providing direction and guidance as customers enter the lot should minimize misperception, maximize parking capacity within each lot, and enhance the overall parking experience of the user.

To implement directed parking, the parking manager must rope off the lot, and provide one entry point (as described within Control Lot Access). From that entry point, each car will follow a single path to the next attendant ("flagger"), who will direct them to pull forward into a parking space, with a second vehicle pulling in directly behind the previous vehicle. This action will continue through the lot, filling up each row quickly. Eventually, all ropes will be removed and the lot will be parked similarly to a conventional striped parking lot.

Figure 7.11: Example of Directed Parking



This option could require a team of skilled parking attendants able to effectively execute a directed parking system. A possible alternative to training existing staff or hiring new staff would be to consider retaining an outside parking management company (SP+, Towne Park, Ace Parking, etc.) to assist with vehicle load-in and load-out. These companies typically have well-trained staff and mobile technology available to help expedite the parking process and improve the visitor experience.



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PARKING SYSTEM AUDITS AND FINANCIAL CONTROLS

Though NWSS does not currently charge for parking for the Stock Show, there are a number of events throughout the year that do charge for parking. As the Stock Show and other events on the NWC site continue to grow and parking policies change, parking revenues for the complex might be much more significant than they are today.

The volume and scope of parking revenues may necessitate increased financial controls beyond what the NWSS currently requires. Such controls may include engaging a 3rd party management company to assist the NWSS in its annual audits, or the inclusion of appropriate short-range and mid-range technologies that could be adopted to assist in the control of cash transactions and handle options for credit cards, pre-paid parking transactions, and parking reservations.

DIRECTIONS AND PARKING INFORMATION

The website for the NWC provides information to direct and orient users to the campus. This information is found under the "Attend an Event" menu by selecting "Map" "The page provides the address, a link to google maps to provide driving directions, and a map noting roadways, tram and shuttle stops, parking lots, ticket windows and gate locations for exhibitors.

An RTD bus line, Route 48, also services the site; that information is noted under the "Contact Us" page. The Route 48 bus provides service to the nearby 38th and Blake RTD A Line Station.

There are a number of key focus areas for providing parking and directional information to users. Several examples include:

- Information on alternative modes of transportation
- Parking rates for events, where applicable
- Payment options for parking, where applicable
- Options to reserve/prepay for event parking, where applicable
- Directions for specific users to parking lots/facilities designated for those users (e.g. exhibitors to exhibitor lots and visitors to visitor lots)
- Consistent wayfinding signage for all parking facilities, able to be read easily from a moving vehicle

These factors, along with options to improve overall parking operations are carried forward into the next section of this chapter containing the consultant team's recommendations.

PARKING SYSTEM MANAGEMENT AND BUDGETING

We understand that the management agreement between the City and NWC allows for some type of centralized entity to be formed to help administer the site-wide the parking system. As an industry best practice, the consultant team recommends that this entity be charged with both parking and transportation oversight; this is so that resources such as on- and off-site parking locations, the shuttle system, and TDM programs can be coordinated and potentially funded by the parking system itself. Similar large and complex campus often organize these functions as a "Parking and Transportation Authority" or as a self-sustaining business auxiliary unit. Parking-specific business enterprises are also sometimes used if the organization is large enough and expected to have the responsibility to help retire debt service on parking garage assets and/or other infrastructure.



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Under any governance structure, another general best practice is that the parking and transportation budget be kept separate from "general fund." This allows the parking department to maintain and fund programs that promote site access and customer service rather than being expected to back-fill operations expenses that should be associated with the venues themselves and paid for out of attendee fees, concessions, exhibitor fees, etc. The Parking and Transportation Authority (or similar) responsibilities would include, but not be limited to, the following:

- Implementation and management of TDM initiatives and strategies by stage
- Management of the on- and near-site parking system, including:
 - o Staffing
 - o Operations and maintenance of parking assets, as discussed in this section
 - o Collection and management of revenues associated with the parking system
 - o Regularized data collection on parking system performance, specifically supply/demand analysis
- Implementation and management of transportation- and parking-related signage and wayfinding
- Implementation and management of off-site parking leases and arrangements
- Implementation and management of off-site and internal shuttle programs
- Coordination with City and others regarding usage of off-site resources not managed by NWSS

Success of the Parking and Transportation Authority will necessitate that it be active throughout the year, with a cohesive strategy for all stages and activity levels. The equity partners should set performance benchmarks to ensure that the Authority has responsibility to maintain assets with a high level of care and to provide exceptional customer service.

PARKING SYSTEM REVENUE POTENTIAL

At present, the Authority has yet to determine the precise nature of paid parking on the NWC campus. However, for the purposes of this Plan, the planning team has assumed that paid and "unbundled" parking will be fully utilized at Phase 1 and 2 Operational and at Full Buildout, for all activity levels. This means that the parking fee will be separate from and in addition to event ticket prices.

The revenue and income potential will vary greatly depending on the rate schedule adopted by the campus and the amount of staffing required to load and unload parking facilities after larger events, including the NWSS. Adopting a modern PARCS (parking access and revenue control system) as discussed earlier in this Plan, along with real-time signage and information systems, will help to reduce the overall labor needed to handle parking and traffic management for almost all event types.

At some future point in time the Parking and Transportation Authority, NWCO, and/or the Placemaking team may want to undertake a more detailed financial analysis for the NWC parking and transportation system. This study would help to determine how much parking net revenues might be generated by future facilities and how much this revenue might be able to offset programs such as the shuttle service, TDM, etc. This type of analysis will be especially important should public-private partnerships (PPP's) be considered to help develop some of the parking assets in future phases.



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RECOMMENDATIONS

Based on the industry best practices discussed in this section, and the existing conditions observed on the site, the following are several key recommendations of this Plan. Most of these recommendations would be the responsibility of the new parking management entity to implement. However, existing operations staff at NWC should also review the list and determine which items would be appropriate to move forward with for earlier phases of the Master Plan (such as during Pre-Construction or Phase 1-2 Under Construction).

PLAN RECOMMENDATIONS: PARKING MANAGEMENT & TECHNOLOGY

1. Maximize customer service and satisfaction for on- and off-site parking locations, utilizing information, technology, and parking management interventions. *(Management Authority and Partners)*
2. Use technology tools to communicate off-site and internal shuttle routes and arrival times. *(Management Authority and Partners)*
3. Begin applying parking fees/generating revenue once Phase 1 and 2 are operational; use improved technology to allow for integration of revenue controls and parking availability. *(Management Authority and Partners)*
4. Restripe/improve the coliseum lot and add parking guidance systems and/or occupancy sensors to this location. *(Placemaking Team)*
5. Add parking guidance systems and real-time availability signage to any new parking facilities developed on the campus. (over 100 spaces) *(Placemaking Team)*
6. Consider hiring additional full-time parking staff and/or contracting with a professional 3rd party operator to reduce the reliance on seasonal hires. *(Management Authority and Partners)*
7. Conduct regular system-wide financial and operational audits; track customer satisfaction using survey techniques. *(Management Authority and Partners)*
8. Consider best practices to limit impacts on parking infrastructure in surrounding neighborhoods. *(Management Authority and Partners, with significant participation specifically from CCD)*



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RECOMMENDATION DETAIL

- **Manage customer service and satisfaction for on- and off-site parking locations, including:**
 - o **Information:**
 - Existing ITP apps, such as “Go Denver” can be leveraged more effectively with strategic partnerships. For example, webpages for NWC, NWSS, and other events should provide a link to godenverapp.com in addition to Google Maps.
 - Parking pricing should be included on NWC, NWSS, and other event websites within the “Directions” section to provide trip cost comparisons for an informed decision prior to the trip commencing.
 - For larger events, where parking and staging for exhibitors/competitors is located separately from the general public, this information, including routing should be provided on a separate webpage specific to these user groups.
 - Directions, road, and lot closures must be kept up to date on the NWC website. Changes must be communicated (map and text) to those parties with upcoming events to ensure those coming to the site for the event are aware of recent changes.
 - o **Technology:**
 - As more people connect to online resources via mobile devices, scale the NWC website appropriately for mobile devices as well as normal computers.
 - Partner with CDOT regarding messaging for events on ITS dynamic signage on nearby highways; signs will display information and the messaging needed to best inform/direct eventgoers.
 - Implement dynamic signage at the campus where/when possible as redevelopment infrastructure is in place. A wayfinding plan should be developed to ensure ease of access for each stage of development. Dynamic signage should direct groups to appropriate parking locations, and provide availability, or pricing and availability for each option (if appropriate).
 - Include PARCS where/when possible as redevelopment infrastructure is in place. The Coliseum Lot(s) could have PARCS installed now. New parking supply should be designed with PARCS in mind with adequate number of lanes to serve typical busy days. PARCS may be used with or without staffing. Some venues reallocate former cashier staff to help with vehicle and pedestrian guidance to ensure the “human touch” is not lost. Some venues assign 1 staff to 2-3 lanes to quickly resolve problems at the entry, if they arise.
 - Handheld devices to perform transactions should be used in lots that do not have PARCS. Handheld devices should also be used for busiest days where PARCS is in place to increase the number of transactions that can occur in a short period of time before an event begins.
 - o **Parking Management Practices:**



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- A parking management plan should be developed for each event at the site to document what practices and procedures were used, and how effective they were. This allows for development of best practices for the site under various scenarios for a consistent user experience. The parking management entity may want to establish a baseline in terms of customer service expectations, revenue handling procedures, and use of technology for these event-specific management plans.
 - The boundaries of each parking facility should be demarcated (roped/fenced off) and striped (painted/chalked) to quantify the parking inventory available within each lot. This allows dynamic signage and/or traffic and parking staff to direct drivers accordingly based on parking availability.
 - Parking supply currently serving double-duty as truck & trailer marshalling or storage should be divided permanently. This would reduce confusion on-site and allow for efficient parking layouts and access control lanes/equipment to be added as appropriate.
 - Dynamic guidance should be provided via traffic and parking staff until infrastructure is in place for dynamic signage. Managers would identify when parking facilities are filling and have staff route drivers to the next available lot. Once dynamic signage is in place, this would be automated and signage would guide drivers accordingly.
 - Best practice for event parking is to collect fees in advance of granting access to the parking area. This ensures payment and avoids back-ups at the end of the event. Payment may be made through handheld devices, or for less busy days at PARCS equipment, or via online pre-payment
 - Many event venues use staff within the parking lot to direct drivers to their parking space. This speeds the process and ensures that all spaces in the inventory are used; drivers are also not required to search for a space potentially left vacant by others.
- **Consider best practices to limit impacts on parking infrastructure in surrounding neighborhoods, such as:**
 - o Parking area management plans
 - o Clear delineation and signage for all on-street parking stalls surrounding the campus
 - o An expanded Residential Parking Permit program to protect on-street neighborhood parking resources from extensive usage by NWC event attendees, employees, and other users
 - o Time limits for on-street parking supply (e.g. 2-hour parking)
 - o Delineated NWC-managed facilities for employee parking and incentives to use said facilities
 - o A license plate database of employee vehicles to assist in enforcement
 - o Clear signage and wayfinding to NWC parking facilities
 - o Coordination with CCD Public Works to establish times and routes of on-street enforcement, particularly when events are scheduled

(Note that ultimately the strategy for managing on-street parking resources will be dependent on the desired interventions of CCD Public Works).

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CHAPTER 8: FREQUENTLY ASKED QUESTIONS



WHAT'S IN THIS SECTION?

- Frequently Asked Questions (FAQ)

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FREQUENTLY ASKED QUESTIONS (FAQ)

THE BASICS

Q: What is the purpose of this project?

A: The purpose of the Parking and TDM study is to provide a set of technical recommendations related specifically to site access at the National Western Center as it is developed. This includes such components as passenger vehicle parking, multimodal transportation infrastructure and integration, and specialized vehicles operations.

Q: Who was involved in this project?

A: This project is an effort of the CCD—and specifically NWCO and the NDCC. Key partners included in this effort include the WSSA, RTD, DRCOG, and CSU.

A number of other organizations, institutions, and community partners were engaged in this effort, including the NWCCAC, various CCD department staff, neighborhood organizations like the RiNo BID/GID, and others.

The general public also played a role in this effort by engaging with the planning team in an open house held in June 2017, and various online and print publications circulated throughout the planning process.

Q: What do all these acronyms mean?

A: Confused about TDM, VMT, SOV, or some other acronym? Visit the List of Technical Terms and Abbreviations section in Chapter 1 for a comprehensive list of definitions.

Q: What are the next steps for implementing the National Western Center Master Plan?

A: The City and County of Denver has initiated a number of projects to facilitate implementation of the NWC Master Plan. The next step in this ongoing process is the Placemaking Study, which kicked off in mid-2017. The Placemaking team will take recommendations set forth in this and other studies and determine how they are physically articulated on the NWC campus.

TECHNICAL QUESTIONS

Q: What is the incentive for the TDM programs to work if we are providing parking for peak demand?

A: The plan recommends several TDM strategies such as: unbundled parking pricing for all events (including NWSS at Phase 1 and 2 Operational and Full Buildout), service enhancement for multi-modal access, direct incentives, and active promotion of TDM options. The goal of the plan is to make TDM a consumer choice where patrons are “opting in” because of price, convenience, and flexibility. Parking will still be provided (and scaled) for those that wish to drive. It should be noted that parking and TDM are not mutually exclusives; for example, increasing the number of patrons per car and decreasing SOV's are two very positive outcomes of TDM that still rely on parking as a primary means to access the site.

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Note that the parking supply recommendation for each stage already takes into account a reduction based on "Moderate" TDM programming. The ultimate parking supply recommendation of 7,500 stalls for a Large/Concurrent Event is for the Full Buildout stage; based on performance of TDM strategies and programs, this figure could be adjusted downward at future phases if warranted.

Q: Why would we not accommodate all demand generated by the Stock Show with on-site infrastructure?

A: The plan recommends that stock show parking demand be met through a combination of on-site and off-site facilities (after accounting for TDM and patron choice). The plan does not recommend meeting 100% of the demand generated on peak days, using on-site assets, as the cost to do so would mean sacrifices in other areas such as building programming, livestock operations, and/or space devoted to truck and trailer operations. The plan recommends that up to 6,000 spaces be provided off-site at full build-out. However, this excess inventory is only needed for the busiest 6-8 stock show days each year. No other event days (including NWSS) generate similar demand. Building the last 6,000 stalls on-site to address the proverbial 'church on Easter Sunday' event would not be financially viable from either a capital or operational cost perspective. If administered correctly, an off-site parking program can be accomplished without impacting a consumer's willingness to visit the stock show, and in many cases might be seen as a more desirable option than parking on-site (especially if parking fees are unbundled, and off-site parking locations are set up as a highly convenient alternative.)

Q: What's the cost of TDM?

A: TDM program costs are scaled depending on phase of the project and program effectiveness. Depending on which programming options are selected, recurring annual and capital costs could range from approximately \$100,000 to \$2M. Regardless of which strategies are employed, the plan recommends that the TDM program be set up as (at minimum) a revenue neutral business auxiliary so that any TDM programs costs would be offset by parking revenues generated events on-site, including the Stock Show.

Q: What's the cost of the shuttle services?

A: Shuttle service costs are scaled depending on phase of the project and to-be-determined choices about the phasing of on-site parking infrastructure and the locations of off-site lots. To meet the objectives of the plan, the team is recommending a budget of up to \$700,000 per year in shuttle costs (7 locations) at Phase 1-2 operational and up to \$1.1 Million per year (9 locations) at full build-out. Shuttles are projected to be needed for the 9 largest NWSS dates per year (weekends, including Thursday-Sunday, as well as the MLK holiday) and generally not required for design day and smaller events, assuming the recommended parking supply is met. Costs may be less than budgeted if off-site locations are located closer to the site and/or shuttle routes can be combined. As with TDM programs, the plan recommends that the NWC parking and transportation program be set up as (at minimum) a revenue neutral business auxiliary so that any shuttle and associated costs would be offset by parking revenues generated from events on-site (including the Stock Show).

Shuttles costs above assume that the system primarily services off-site park-and-ride locations (i.e. lots used by employees, volunteers, vendors, and patrons) and locations where specialized vehicle are stored overnight. Shuttle costs to and from nearby transit locations, along with regular RTD bus routes are not included. Additionally, the operations plan assumes that an internal site circulation network is also established using "light vehicles" and that this circulator would service the location where large and specialized vehicles are being queued.

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Q: How do we address parking demand if TDM fails?

A: Step 1 will be to continuously monitor TDM programs and modify the overall plan to focus on the TDM programs that are most effective, and/or incorporate alternatives. If TDM is moderately or severely ineffective in accomplishing the plan's goals, then additional off-site parking assets and auxiliary programs, such as the shuttle operation, may be scaled to accommodate additional demand.

Q: Are there really 10,000 existing parking spaces on-site at the National Western Complex?

A: The 10,000 stall inventory figure has been widely circulated in several documents including the 2011 existing conditions memorandum included with the Master Plan document. Unfortunately, this figure has frequently been quoted as "on site inventory," which is inaccurate. The base documents also reflect some degree of overstatement in the potential efficiency of unimproved dirt lots used for NWSS events, as they calculate stall count as a standard figure per acre without taking into account various physical constraints of individual lots.

The actual inventory of parking on the NWC site as of the 2016 stock show is roughly 2,900 striped parking spaces including the coliseum lots. Approximately 5,900 total spaces are provided on site (and in Lot F) for stock show including unimproved dirt lots and subtracting out spaces used for truck, trailer, and rodeo staging and operations.

The stock show generally secures several leased and temporary locations used for overflow parking, which in recent years have included the DPS lot, F Annex, Crystal Packaging, IPW, and more remote locations such as the Pepsi Bottling employee lot and the Coors field parking garage. The total inventory available for NWSS patrons and employees as of 2016, including the above locations, was roughly 8,000 spaces.

Nearby neighborhoods and uncontrolled on-street parking assets are estimated to accommodate between 1,000 and 1,500 additional parking spaces for the very largest events. This resource is not expected to be significantly impacted by any changes proposed as part of the Master Plan unless the City and neighborhoods wish to take additional steps to limit these alternative facilities in future years.

Q: Why would the Stockyards be considered part of the future parking inventory when it can't be used during Stock Show events?

A: The plan recommends 6,000 permanent parking spaces be provided on site with an additional 1,500 flexible spaces available for large/concurrent events (for a total of 7,500 spaces).

The Stockyards are being discussed as one possible location for these 1,600 flex stalls, which would make them unavailable during stock show. However, if programming decisions dictate regular usage of the yards for another purpose during non-stock show (other than parking), then an alternative location might be needed.

If this is the case, the 1,600 flex spaces might be available for NWSS usage for parking or for another purpose like truck/trailer operations, depending on the desired prioritization of the Stock Show

Based on feedback from the Master Plan programming team, the off-site parking plan and shuttle operations assume the former, and therefore that 5,900 spaces will be available on-site for NWSS at Full Buildout.

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Q: Where do Stock Show weekdays fall in terms of demand and supply deficit?

A: The typical weekday event during NWSS is projected to generate a need for roughly 5,100 parking spaces at Phase 1 and 2 operational and 5,800 parking spaces at full build-out. This demand would be accommodated within the plan-recommended permanent parking infrastructure.

Q: Why are the demand figures lower than what was projected in the Master Plan?

A: The Master Plan-based projections were based on high-level population figures that did not account for certain nuances (such as badge-holding vendors, exhibitors, and rodeo contestants also being historically reported in overall attendance figures). The Master Plan also used somewhat different assumptions relating to TDM impacts, persons per car, and distribution of demand by user group at the peak hour.

Q: How does this recommended supply compare to the supply shown in the Master Plan?

A: The Master Plan does not designate precise figures or locations for any parking assets on the site; rather, it was the intent of the Parking and TDM Plan to take the general parking conclusions set forth in the Master Plan and bring them to a higher level of specificity). However, if compared to preliminary discussions, the parking plan does recommend more spaces both in Phase 1+2 (an additional 450 stalls recommended) and at Full Buildout (an additional 720 spaces). The parking plan also recommends certain strategic operational changes, such as the usage of Lot F as full-time truck/trailer operations, that are different than or not addressed by the Master Plan.

Q: Explain the staging and storage procedures for specialty vehicles that will maximize efficiency beyond where it is today.

A: The plan recommends that permanent infrastructure improvements be made to Lot F (or comparable) to support truck and trailer staging for NWSS and for staging and storage for smaller and mid-size events. The improvements recommended would include permanent lane delineation for ingress/egress, efficient striping for large vehicles of various sizes, and other infrastructure such as lighting, security, communications, utilities and animal check-in support. Vehicles would essentially arrive at this lot at various times of day and would stage or hold at this location before being sent down to the yards at assigned times for load-in/load-out. For NWSS events, the trucks and trailers would be sent to an off-site location (such as the Coors field surface lot) for overnight parking after they have unloaded.

Q: NWSS has tried a payment system for its parking lots before. Why would it work now?

A: All new permanent parking infrastructure will be designed with appropriate internal or ancillary queuing capacity so that pay-on-entry transactions are not causing back-ups onto the roadways, or significantly impacting the speed at which patrons are able to enter and exit facilities. Service rates must be addressed by applying a combination of technologies (such as options for pre-pay or pre-reservations, and pay by plate for day-to-day) along with the appropriate number of staff. Finally, the plan recommends that full-time parking staff be hired (and/or contracted with a regular 3rd party operator) so that any employees used for stock show events are appropriately trained with the technology, service expectations, and accounting procedures. This strategy is intended to limit employee turnover, and improve both customer service and revenue loss prevention.

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Q: How did you differentiate between TDM strategies that will work for the Stock Show and strategies that will work for other events on the site?

A: The TDM portion of the plan was carefully developed taking into account the needs and preferences of different user groups, patron types, and the likely point of origin (i.e., how convenient it would be to arrive via a passenger vehicle compared to other modes). The team also took into account the % of arrivals that would need access to a vehicle to transport equipment, supplies, vendor products, and livestock support.

Q: How will this Plan address local parking issues?

A: The plan recommends a number of strategies for the neighborhoods that would need to be discussed with the community and implemented by the City of Denver and/or the event organizer to mitigate negative impacts on residential streets. Continuation and expansion of the existing Residential Parking Permit Program, currently enforced during the Stock Show, is a strong possibility.

The plan also recommends allowing for private parking lot operators to continue offering off-site / near-site parking alternatives for large events. This strategy is intended to help support an existing sector of the neighborhood economy, and enhance pedestrian, bicycle, and light vehicle connections to and from restaurant/retail/and entertainment districts in adjacent areas (particularly RiNo, Globeville, and downtown). The plan envisions the National Western Center expanding to become a city-wide celebration.

A toolbox of possible options to support parking in the neighborhoods surrounding NWC is included in Chapter 7.



APPENDICES



APPENDICES

CHAPTER 2: Current Parking Inventory Data

CHAPTER 2: Existing Traffic Volume

CHAPTER 3: TDM Terms and Program Cost Estimates

CHAPTER 4: Specialized Vehicle Assumptions

CHAPTER 4: Specialized Vehicle Calculations

CHAPTER 5: Parking Demand Model

Chapter 2 - NWC Parking Inventory Summary Estimates



NWC Baseline Parking Inventory Estimates- 2017 Stock Show and Non-Stock Show
By Type

PASSENGER VEHICLE PARKING

Type	Usable/Available Inventory (Stock Show)	Usable/Available Inventory (Non Stock-Show)
On Site	4,834	6,482
Near Site	1,874	1,104
Off Site	1,324	-
Private/On-Street	1,226	126
Total	9,258	7,712

TRUCK/TRAILER STAGING, STORAGE, & OPERATIONS

	On-Site	Off-Site	Total
Truck/Trailer Staging/Storage (in Sq. Ft)	562,236	483,554	1,045,790

Chapter 2 - NWC Parking Inventory Summary Estimates



Attachment 1: NWC Baseline On-Site Parking Inventory Estimates- 2017 Stock Show and Non-Stock Show
By Lot

Lot	Sq. Ft (1)	Usable/Available Inventory (Stock Show)	Usable/Available Inventory (Non Stock-Show)	Efficiency (SF/Stall)	Lot Description	Notes (from NWSS and WALKER research) (5)	Notes (from OV 2015/2016 Data Collection)	DURA Estimate (2)
A	94,216	282	282	334	Gravel lot with wheel stops; access off Franklin St and Humboldt St; designated for Special Event parking			242
B (B, B1, B2)	193,977	332	332	584	Unimproved dirt lots with access off National Western Drive; designated for Livestock Exhibitors		Lot B1 and B2 not used in 2015/16	483
C	191,973	423	423	454	Unimproved gravel lot with access off National Western Drive; designated for Livestock Exhibitors		Primarily large vehicles and trailers	844
D	306,418	658	658	466	Unimproved dirt lot (northwest of Stockyards) with access off of National Western Drive		Available for visitor parking, but underutilized because of difficult access	1,242
E	125,138	-	221	566	Unimproved dirt lot (northeast of Stockyards) with access off National Western Drive; designated for Livestock overflow and attendees	Used for trailer staging during Stock Show.	Primarily exhibitors	342
G (Staging)	81,458	-	212	384	Unimproved dirt lot with access off of Brighton Blvd; used as commercial exhibitor pick-up and delivery area, livestock/horse exhibitor entry point	Formerly staging in area now taken over by RTD, as well as parking. Since RTD has taken over northern portion, remainder has become staging area.	Used primarily for staging in 2016	896
H	216,294	449	449	482	Paved and striped lot with access off Baldwin Ct; significant portion used for horse trailer staging; designated for horse exhibitor parking	Currently used primarily for horse trailer staging with some portion used for visitor parking.	Used at least partially for trailer staging	342
I	78,399	219	219	358	Unimproved dirt lot; access off Brighton Blvd			372
J	67,078	189	189	355	Unimproved dirt lot with access off Franklin St and Baldwin Ct; designated for Members parking			226
K	48,145	95	95	507	Unimproved dirt lot with access off 46th Ave; designated for will call and press parking			148
L	4,485	-	-	N/A	Unimproved grass lot; no longer used (11 stall loss)	City of Denver has confirmed that this area is not large enough to use for parking and cannot be used	Not used in 2015/16	24
M	15,859	28	28	566	Unimproved grass/dirt lot; access off alley on 46th between Baldwin Ct and Brighton Blvd		Not used in 2015/16	59
O	194,273	456	456	426	Unimproved dirt lot with access off Brighton Blvd	Used primarily for bus storage during weekday Stock Show; parking during weekend Stock Show	Used for parking on weekends	542
Coliseum Lot South	438,159	1,289	1,289	340	Paved and striped portion of Coliseum Lot; not up to code; severe sprawling and slope issues	Includes permanent GLO deduction of 156 stalls; temporary GLO deduction is roughly 450 stalls		1,561
Coliseum Lot North	355,640	-	1,025	347	Paved and striped portion of Coliseum Lot; not up to code; severe sprawling and slope issues	This area used for rodeo contestant staging/parking as confirmed by on-site observations. Area is fully utilized during non-stock show events (such as the Home Show on March 17, confirmed on-site)		679
Gold Buckle	114,666	160	160	717	Unimproved dirt lot with access off McFarland Dr.; designated for parkers with special pass			325
North Lot (under I-70) (6)	57,672	65	103	560	Paved and striped lot under I-70 north of the Coliseum; ADA stalls not in compliance	Non-Stock Show inventory based on on-site stall count. Per Denver Coliseum, space for 65 employees plus vendor staging and storage (Aramark beer tent, 3-4 food trailers, roughly 38 stalls impeded by refrigerated trailers to supply concession stands).		N/A
Cattle Tie Outs	61,979	-	152	408	Used as a cattle tie out area during Stock Show			N/A
Miscellaneous On-Grounds Parking	N/A	189	189					
Total	2,645,829	4,834	6,482	408				8,327

Assumptions

- (1) Square footage calculated by WALKER based on aerial of NWC site.
- (2) DURA estimates used for NWC Master Plan 2015 and are based on a standard # of stalls per acre; last updated in 2012. Estimates do not account for physical changes on NWC site since that date.
- (3)"Usable/Available" primarily based on assumed deductions from potential total inventory based on physical impediments and industry standards of efficiency losses due to self-parking in unmanaged/unstriped environments; calibrated with actual vehicle counts from 2015 and 2016 data collection during peak Saturday at NWSS
- (4)"Usable/Available" counts for the Stock Show exclude lots currently used for storage
- (5) Certain information about the lots, including staging/storage locations and use restrictions were derived from notes provided by NWSS on March 7, 2017
- (6) An "efficient" surface lot ranges from 350-380 sq. ft. per stall.

Chapter 2 - NWC Parking Inventory Summary Estimates



NWC Baseline Near-Site Parking Inventory Estimates- 2017 Stock Show and Non-Stock Show
By Lot

Lot	Sq. Ft (1)	Usable/Available Inventory (Stock Show)	Usable/Available Inventory (Non Stock-Show)	Efficiency (SF/Stall)	Lot Description
DPS (2)	181,645	450	-	404	Unimproved dirt lot
F (1)	438,616	1,104	1,104	397	Unimproved dirt lot with access off of Franklin St; space designated for employees and volunteers, and overflow visitors as needed
F Annex (2)	217,800	320	-	681	Unimproved dirt lot
Total	838,061	1,874	1,104	447	

F (Preconstruction) - Acres: 10.06923783
Loss from Adams County - SF: 375,251
Remaining Acres: 8.614577594

Assumptions

- (1) Square footage calculated by WALKER based on aerial of NWC site.
- (2) Square footage estimated based on information provided by NWSS.

Chapter 2 - NWC Parking Inventory Summary Estimates



NWC Baseline Off-Site Parking Inventory Estimates- 2017 Stock Show and Non-Stock Show
By Lot

Lot	Usable/Available Inventory (Stock Show)	Usable/Available Inventory (Non Stock-Show)	Sq. Ft.	Lot Description
Coors Field (Surface)	-	-	474,804	Surface lots north of Coors Field used for truck/trailer storage, staging, etc.
Coors Field (2)	931	-		Coors Field parking structure- leased by NWSS
Pepsi Bottling	283	-		North Pepsi Bottling lot at 39th and Brighton leased by NWSS primarily for employees. Paved/striped lot.
Crystal Packaging (Passenger)	50	-		Crystal Packaging lot on NWD- paved lot.
Crystal Packing (Truck/Trailer)			8,750	
IPW	60			
Total	1,324	-		

Assumptions

- (1) No accurate square footage available.
- (2) Count for passenger vehicles only--does not include area dedicated for truck/trailer staging

Chapter 2 - NWC Parking Inventory Summary Estimates



NWC Baseline Private/On-Street Parking Inventory Estimates- 2017 Stock Show and Non-Stock Show By Lot

Lot	Usable/Available Inventory (Stock Show)	Usable/Available Inventory (Non Stock-Show)	Lot Description
Private Lots	1,100	-	Privately managed and operated lots.
On-Street Parking	126	126	Usable on-street parking with reasonable access to subject site (Race Ct., NWD, etc.
Total	1,226	126	

Assumptions

(1) No accurate square footage estimate available.

1. Introduction

The purpose of this report is to describe procedures, methodology, and the initial findings of the 2016 National Western Stock Show (NWSS) parking data collection and initial analysis results. The data collection program was conducted between January 13 and January 19, 2016 during NWSS events.

Study Goal

The goal of the study was to collect additional data related to transportation to supplement the data collected during the 2015 NWSS. Since construction on Brighton Blvd is expected to commence prior to the 2017 NWSS, it was important to collect as much data as feasible to fill in gaps left from the 2015 data collection program. The data collected this year will be combined with the data collected in 2015 and other sources to support future transportation and parking decisions and investments as the National Western Center redevelopment project moves forward.

Study Components

The data collection program was conducted during three specific time periods in order to gather the most relevant data. These dates and times were chosen based on the types of activities that were occurring at the National Western Stock show. The data collection time periods and the main activities occurring during those periods included:

- Wednesday January 13, 2016 from 5 – 7:30pm
 - PBR Bull Riding Finals at 7pm
- Saturday January 16, 2016 from 9:30am – 5pm
 - Pro Rodeo at 11am and 3:30pm
 - Many other shows and activities throughout the day
- Tuesday January 19, 2016 from 4:30 – 7:30pm
 - Super Dogs at 6:30pm
 - Pro Rodeo at 7pm

The type of data collected consisted of seven specific components plus general observations of back of house and internal operations of the NWSS. These components were:

Traffic Volume Counts: Peak hour turning movement counts and 24-hour volume counts were conducted on Saturday January 16, 2016 and Tuesday January 19, 2016 in order to capture traffic volume trends and patterns.

Vehicle occupancy counts: The number of passengers in each vehicle entering NWSS parking areas was recorded.

NWSS Shuttle Boardings and Alightings: The number of passengers getting on and off the free NWSS shuttle buses was recorded at several locations. On Saturday the same information was also recorded for the Pepsi Parking lot shuttle and the Coors Field parking structure shuttle.

RTD Route 48 Boardings and Alightings: The number of passengers getting on and off the public RTD bus at the intersection of 47th Ave/Brighton Blvd was recorded during the data collection periods.

Private Parking Lot Usage and Fees: Private parking lots near the NWSS were surveyed during the data collection periods to determine how full they were and the parking fee being charged.

Bicycle Parking: A survey was performed during each data collection period of the areas adjacent to the NWSS to record the number and location of parked bicycles.

Intercept Survey: A one-page questionnaire was developed and administered in an interview style format by data collection staff at various locations in the Expo Hall during busy time periods.

On-site and Back of House Operational Observations: During the data collection periods and a few other times during the NWSS, observations of animal load in/load out, trade show operations, truck and trailer movements for deliveries and animal movements, and other NWSS logistical aspects were performed.

Methodologies, results, and conclusions for each data category are included in the following sections of this report. The results and conclusions are relatively high level based on the scope of this report. The main data conclusions are detailed with supporting charts and tables.

Although beyond the scope of this report, there is a tremendous amount of data available from both the 2016 NWSS data collection effort and the previous 2015 NWSS data collection effort that can be sorted and parsed in many interesting ways. The raw data from this 2016 effort is included in a separate “Complete Technical Data” appendix for others perusal and use.

2. Traffic Counts

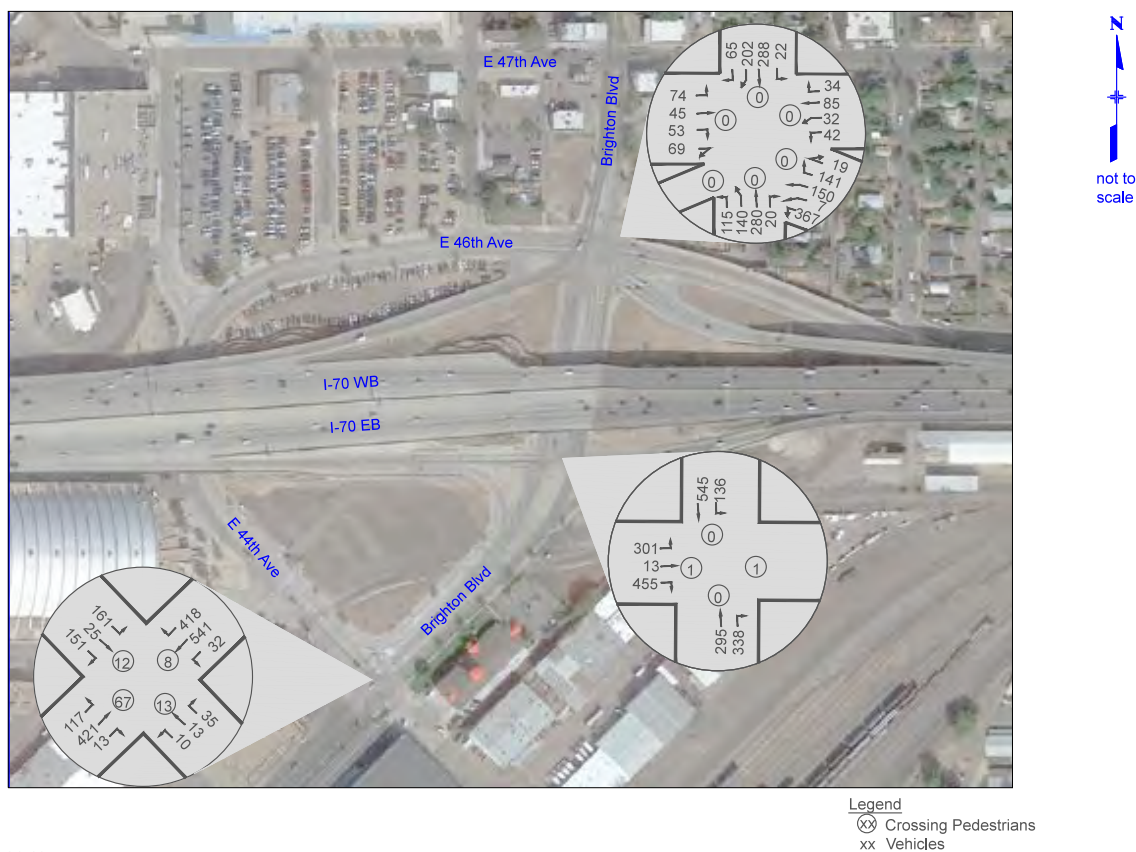
Methodology

Peak hour turning movement counts and 24-hour volume counts were conducted on Saturday, January 16, 2016 and Tuesday, January 19, 2016 in order to capture traffic volume trends and patterns on both a busy weekend day for the NWSS and during a weekday period when background traffic unrelated to the NWSS was likely to be significantly higher.

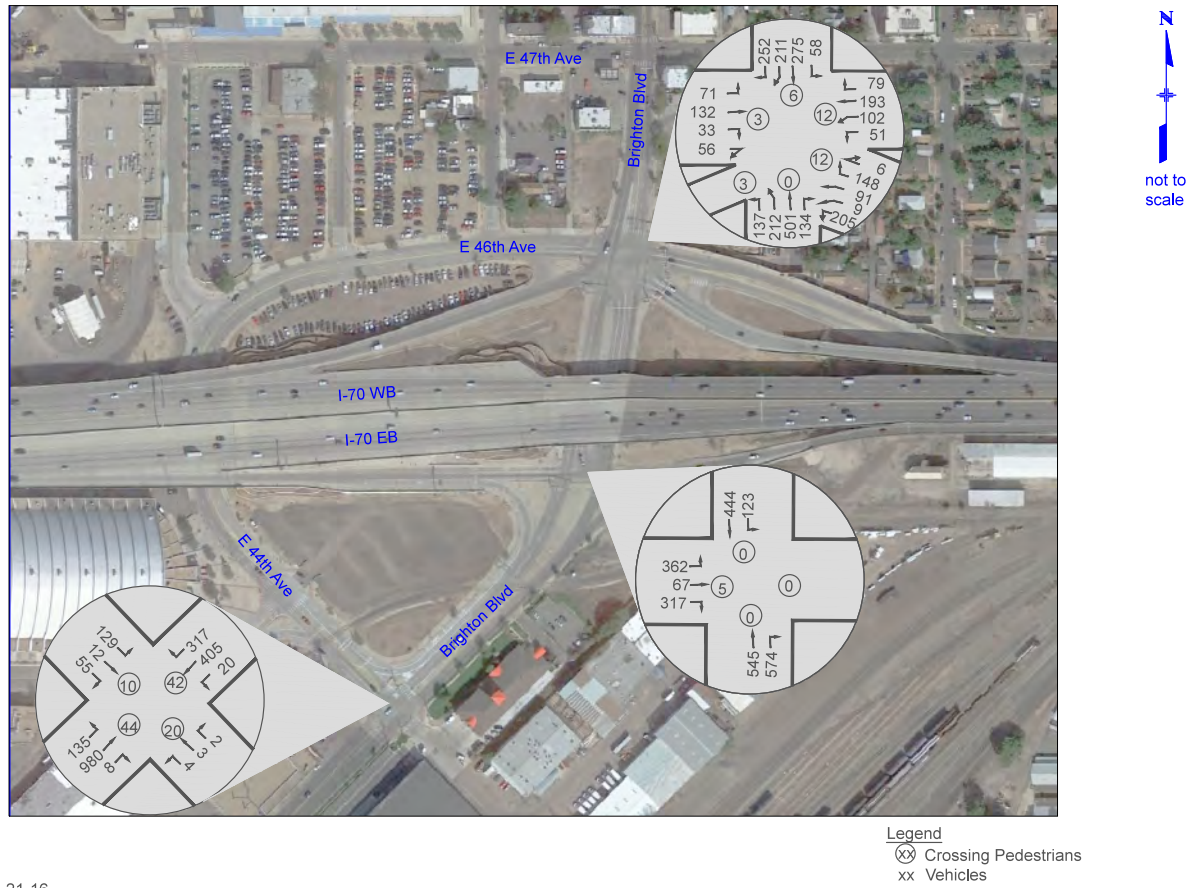
Results

The figures below show the turning movement count traffic data that also includes pedestrian crossing volumes at each intersection counted.

Peak Hour Turning Movement Volumes: Noon on Saturday January 16, 2016



Peak Hour Turning Movement Volumes: 5PM on Tuesday January 19, 2016



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The figures below show the 24-hour traffic volume count traffic data.

Daily Traffic Volumes: Saturday January 16, 2016



N
not to scale

Legend
 xx/xx/xx NB/ SB/ Total Vehicles in Peak Hour
 EB/ WB/ Total Vehicles in Peak Hour
 xx/xx/xx NB/ SB/ Total Vehicles per Day
 EB/ WB/ Total Vehicles per Day

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Daily Traffic Volumes: Tuesday January 19, 2016

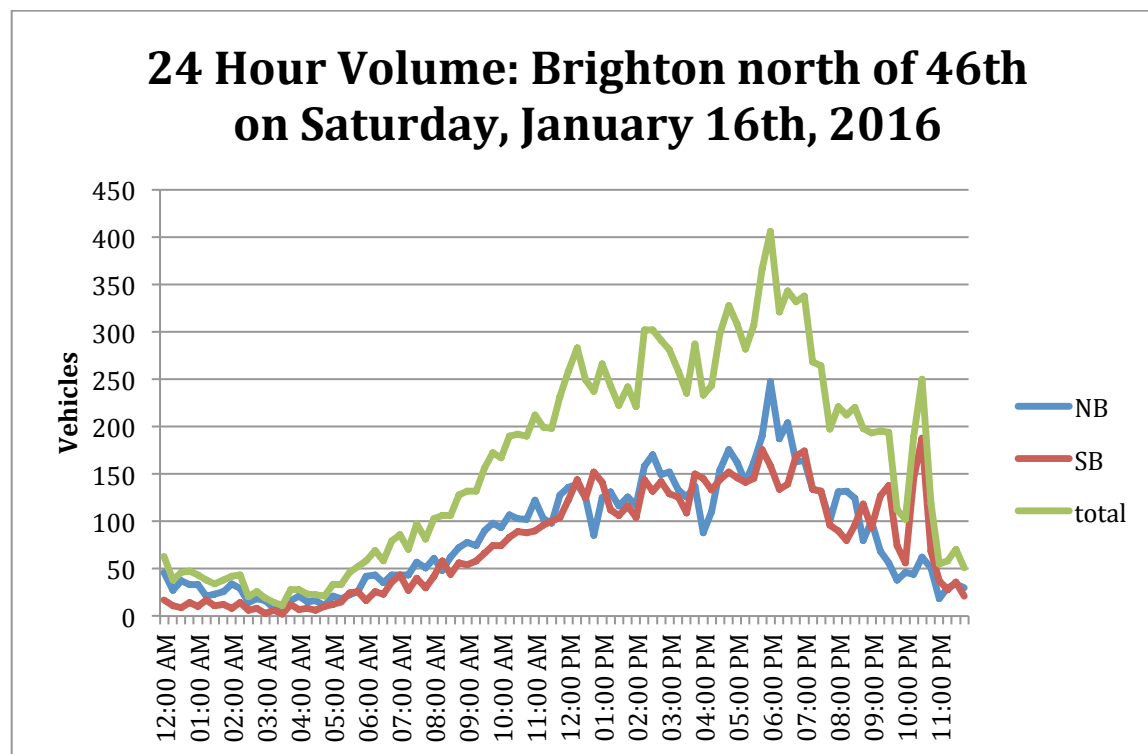
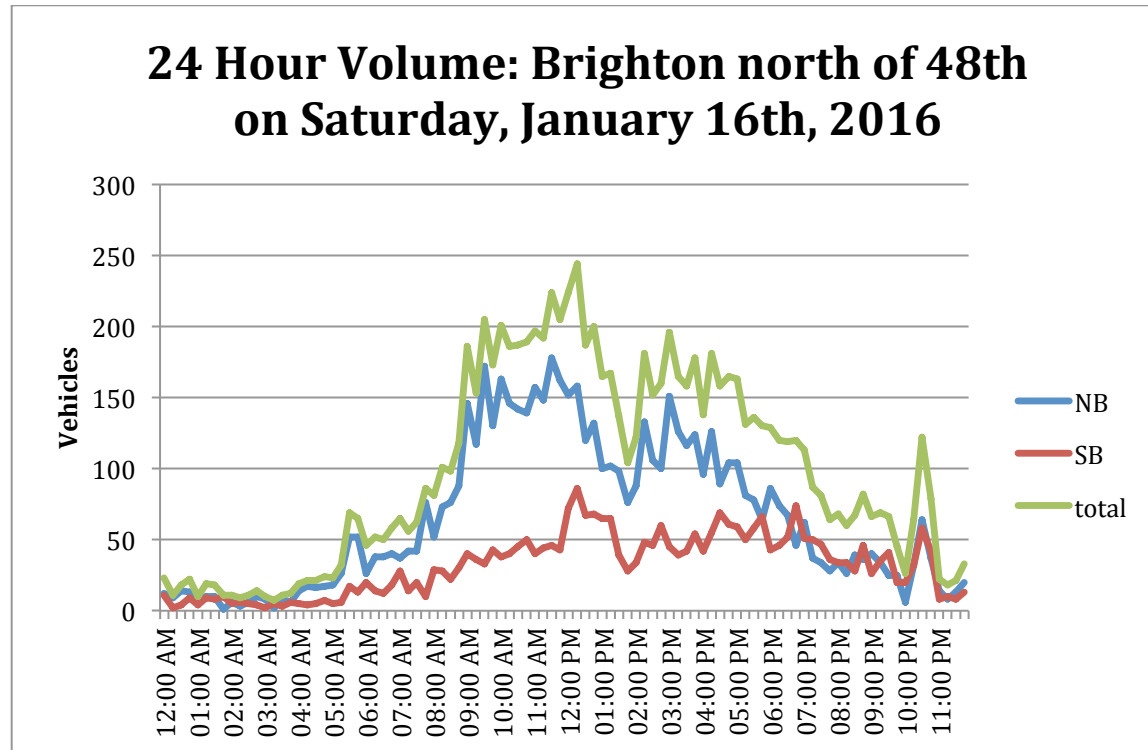


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not to scale

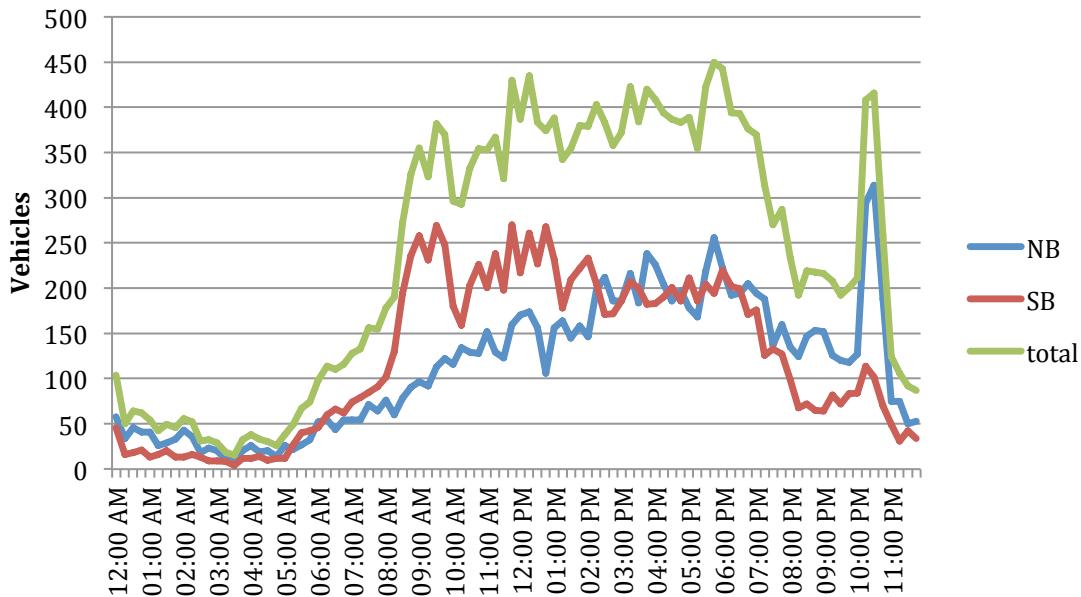
Legend
xx/xx/xx NB/ SB/ Total Vehicles in Peak Hour
EB/ WB/ Total Vehicles in Peak Hour
xx/xx/xx NB/ SB/ Total Vehicles per Day
EB/ WB/ Total Vehicles per Day

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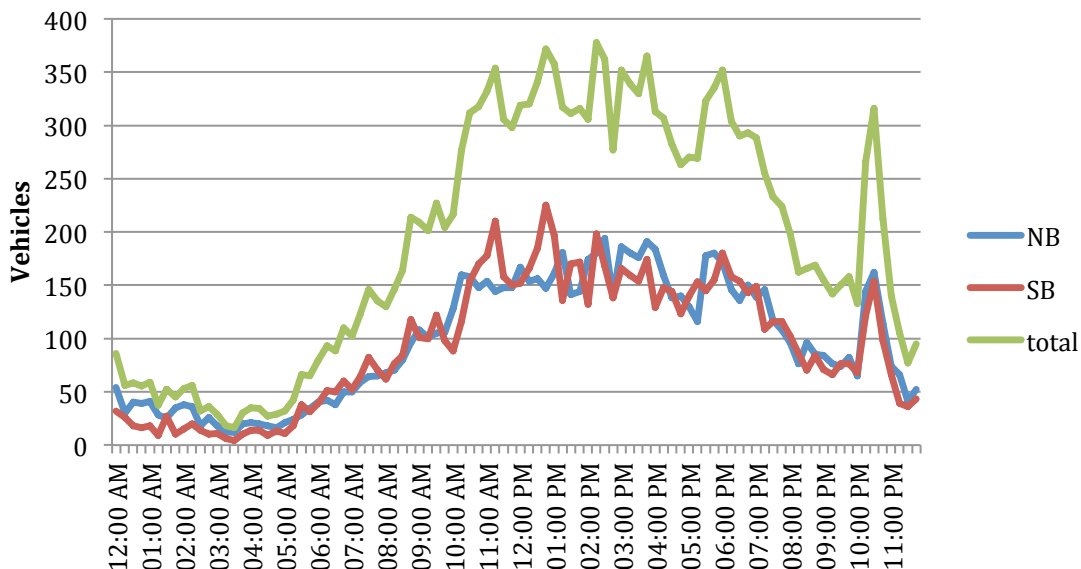
The following charts show the distribution of traffic throughout each day at the five 24 hour volume data collection sites on Saturday, January 16th, 2016.



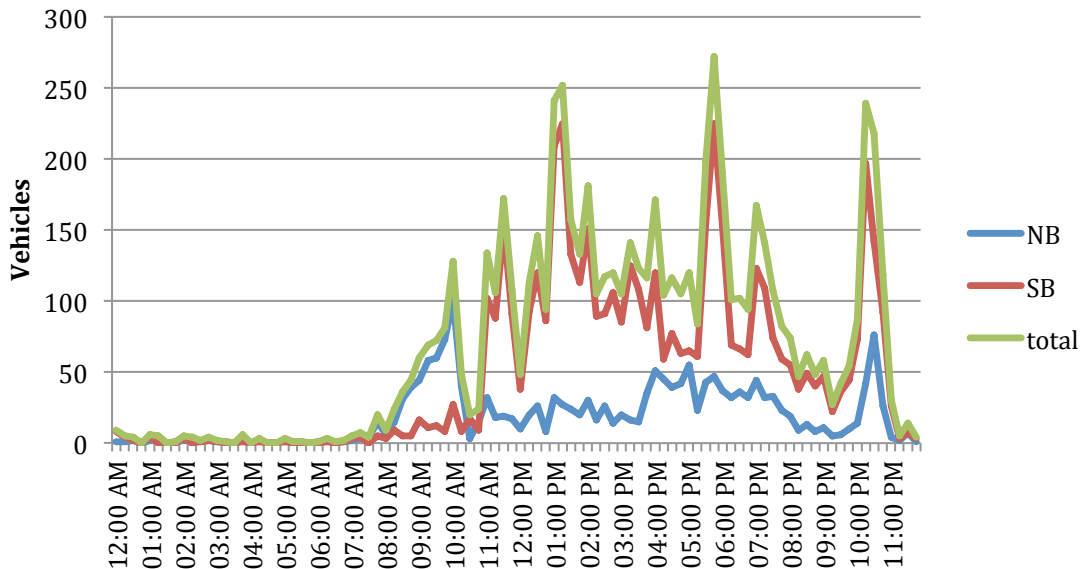
24 Hour Volume: Brighton north of 44th on Saturday, January 16th, 2016



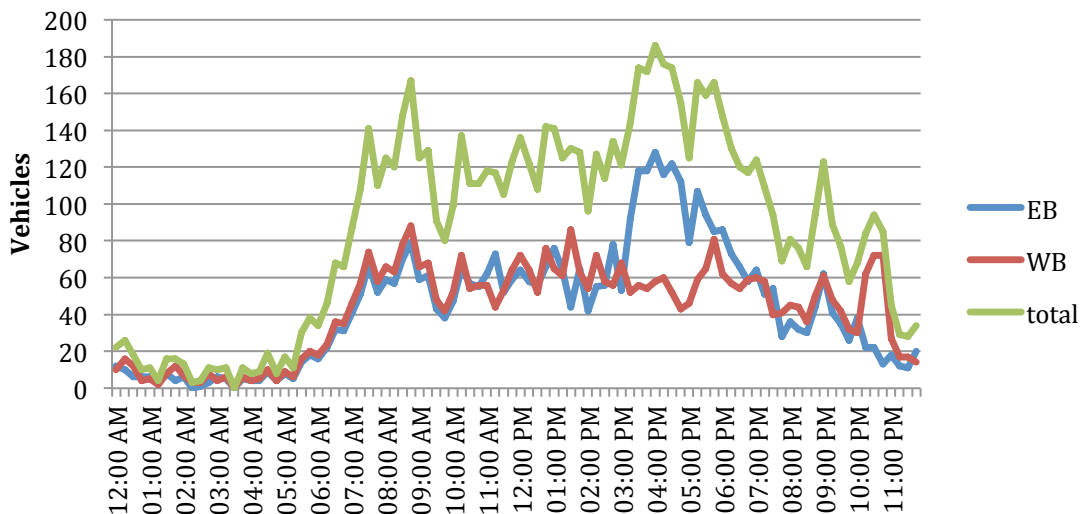
24 Hour Volume: Brighton south of 44th on Saturday, January 16th, 2016



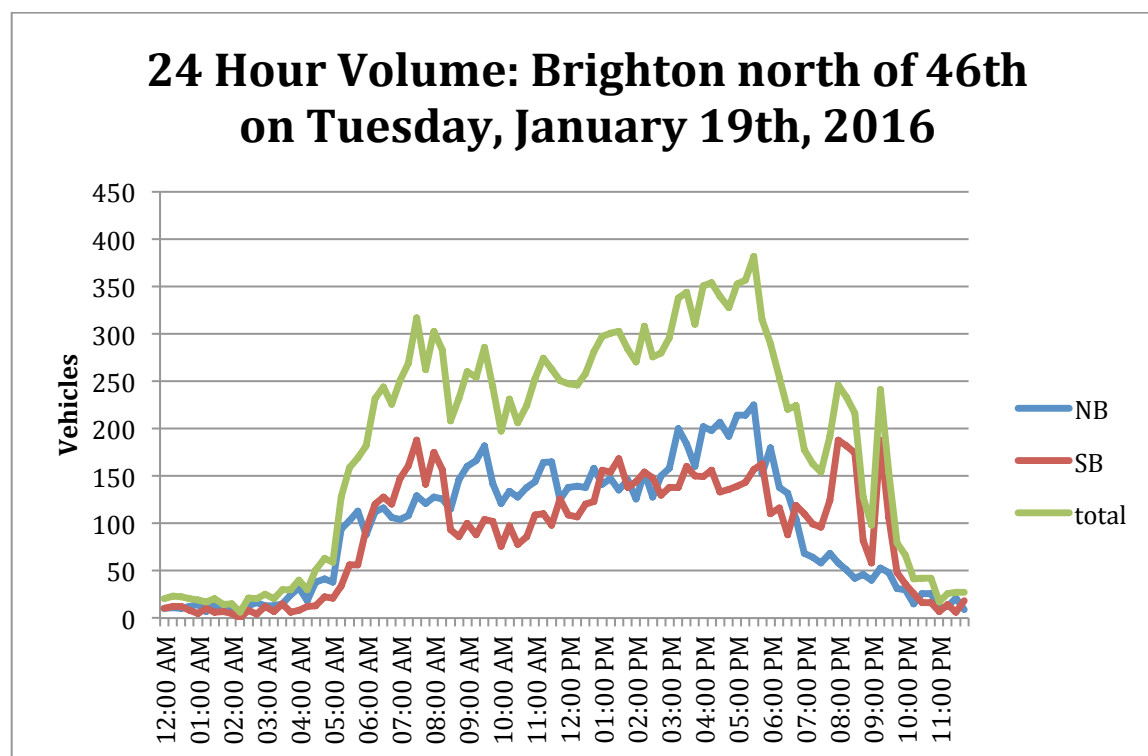
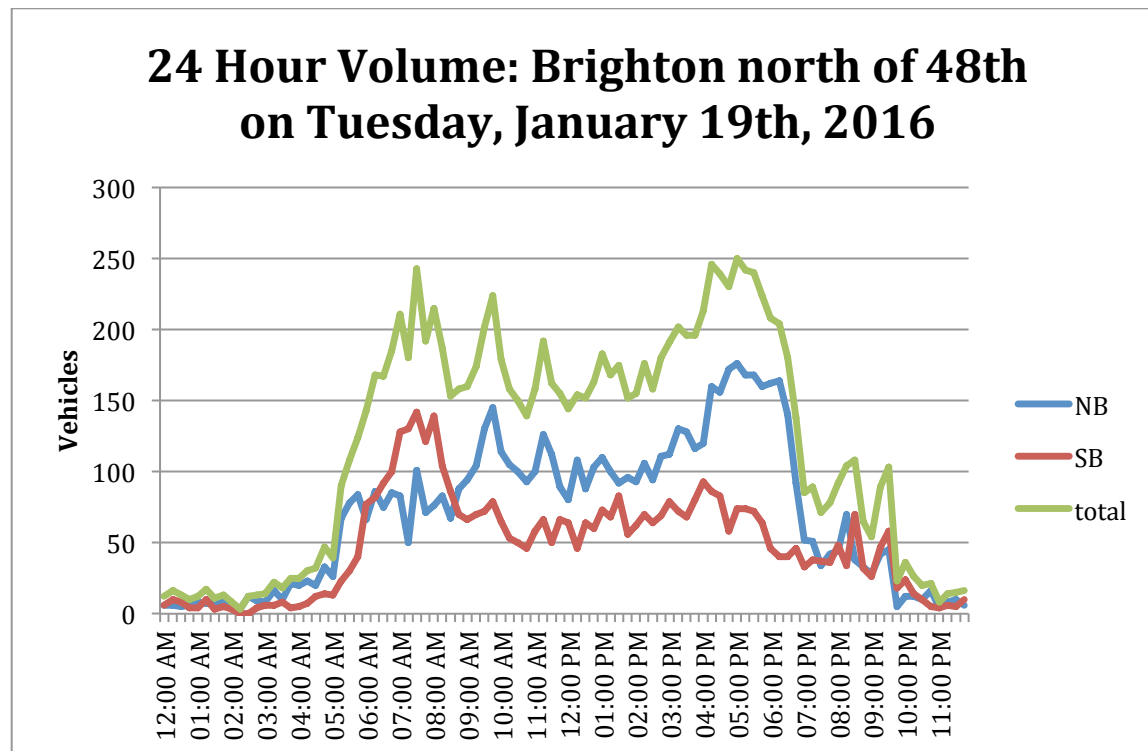
24 Hour Volume: Arkins north of 38th on Saturday, January 16th, 2016



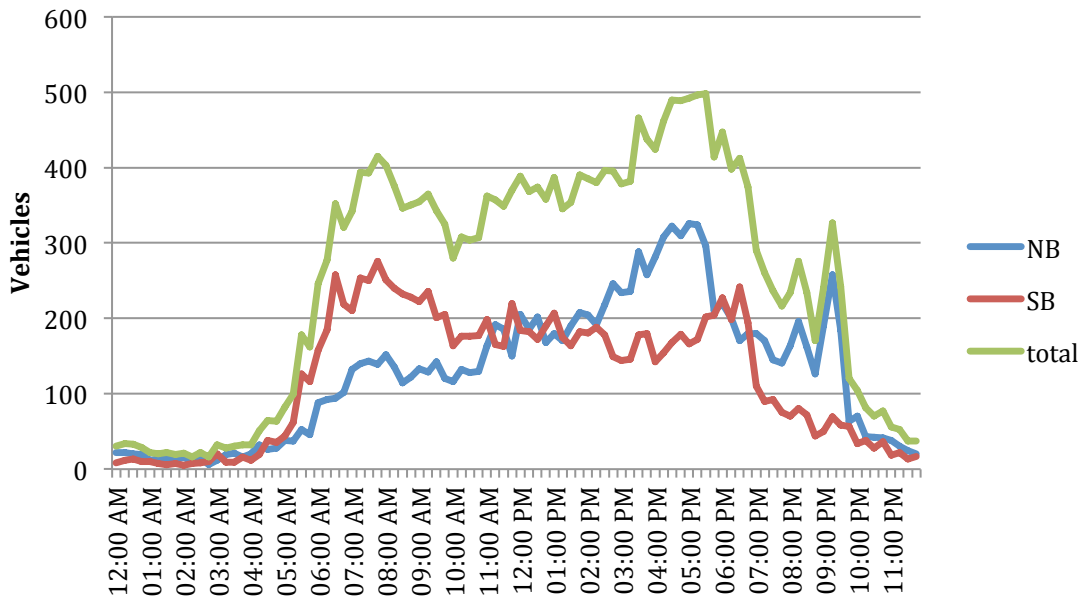
24 Hour Volume: 46th Ave east of National Western Drive on Saturday, January 16th, 2016



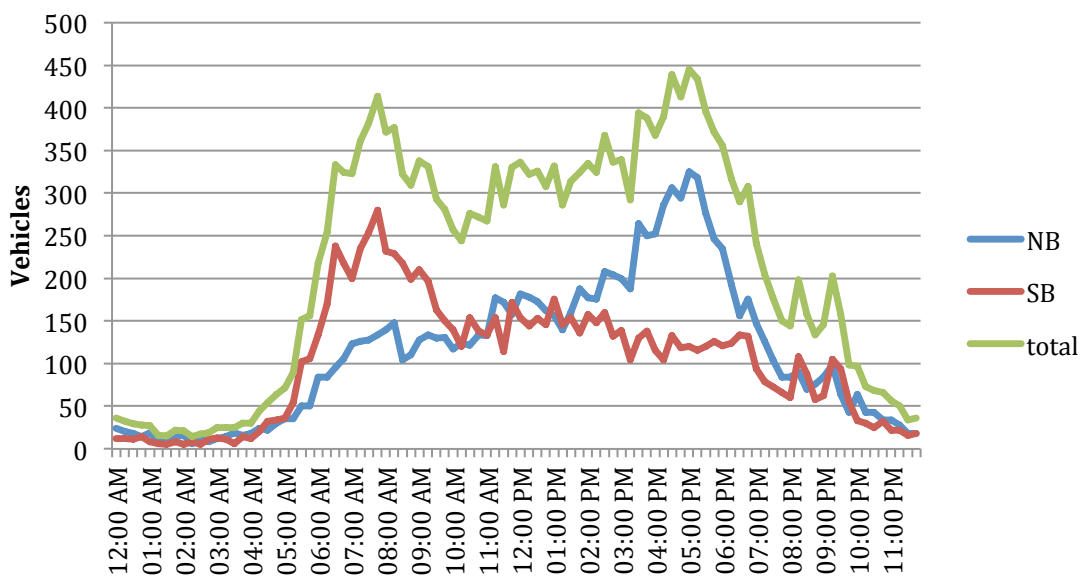
The following charts show the distribution of traffic throughout each day at the five 24 hour volume data collection sites on Tuesday, January 19th, 2016.



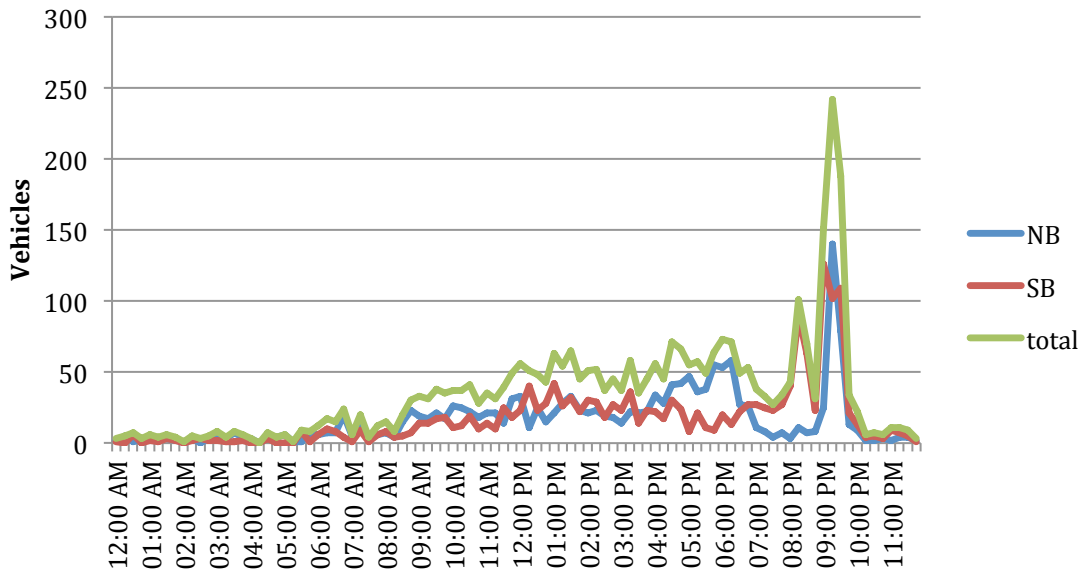
24 Hour Volume: Brighton north of 44th on Tuesday, January 19th, 2016



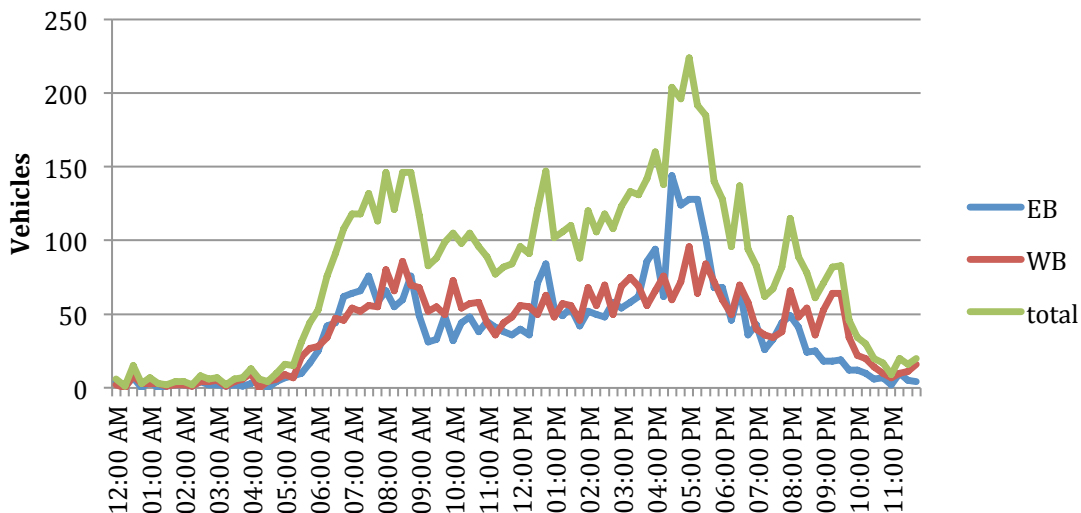
24 Hour Volume: Brighton south of 44th on Tuesday, January 19th, 2016



24 Hour Volume: Arkins north of 38th on Tuesday, January 19th, 2016



24 Hour Volume: 46th Ave east of National Western Drive on Tuesday, January 19th, 2016



Conclusions

- Overall traffic volumes on Brighton Blvd were approximately 10% higher on Tuesday than on Saturday likely due to non-NWSS related background traffic.
- Traffic volumes on Saturday tended to be more evenly directionally distributed in each hour and the volumes were relatively steady for a large portion of the day.
- Traffic volumes on Tuesday were more directionally distributed on Brighton Blvd with a SB peak in the early morning and a NB peak in the early evening, mirroring an expected weekday-commuting pattern.
- Arkins Court saw higher overall volumes and more even volumes throughout the day on Saturday as compared to Tuesday. On Tuesday its volume peaked near the expected event starting time at the coliseum. This reflects its primary function as the Coliseum parking lot entrance.
- Peak hour pedestrian volumes were relatively low with the exception of the intersection of 44th Ave/Brighton Blvd. Crossings of the intersection by pedestrians were high, especially across Brighton Blvd on the southwest side of the intersection.
- Based on the Arkins Court volumes, NWSS event attendee arrival patterns appear to be more concentrated on weekdays than weekend days.

3. Vehicle Occupancy Counts

Methodology

Staff members were positioned at various NWSS Free Parking Lot entrances during the data collection periods. They observed the number of people in each vehicle entering the lot and recorded that information on a data collection sheet. Data was collected in 15-minute increments and each entering vehicle was recorded as matching one of the following categories:

- 1 person in vehicle
- 2 people in vehicle
- 3 people in vehicle
- 4 people in vehicle
- 5 or more people in vehicle

The data was then entered into a spreadsheet for analysis.

The map on the following page shows the locations where vehicle occupancy data was collected. The letter labels for the lots correspond to the NWSS parking lot designations shown on maps produced for the event and signage present at the entrance to each lot during the event. Some lots were observed during all time periods and others were only observed during a portion of the data collection periods based on lot usage, whether the lot was available for parking on that day, and staff availability.

- Lots F, D, and Coliseum lots were observed during all data collection periods.
- The Coors Field Lot and Lot O were only observed on Saturday January 16, 2016.
- Lot G was observed on Wednesday January 13 and Tuesday January 19, 2016.
- Lot I was observed on Wednesday January 13, 2016.
- The DPS lot was observed on Tuesday January 19, 2016.

Vehicle Occupancy Count Locations



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Data Collection Results

The tables below show the vehicle occupancy data results.

NWSS Average Vehicle Occupancy

Wednesday January 13, 2016; 5:30-7:30pm

Lot ID	Total Vehicles	Total People	Avg Occupancy (people/vehicle)
Coliseum	1055	2250	2.13
Lot D	30	54	1.80
Lot F	56	123	2.20
Lot G	103	207	2.01
Lot I	58	106	1.83
Total All Lots	1302	2740	2.10

NWSS Average Vehicle Occupancy

Tuesday January 19, 2016; 4:15-7:00pm

Lot ID	Total Vehicles	Total People	Avg Occupancy (people/vehicle)
Coliseum	1036	2269	2.19
Lot D	45	110	2.44
Lot F	172	371	2.16
Lot G	115	273	2.37
DPS Lot	233	507	2.18
Average All Lots	1601	3530	2.20

NWSS Average Vehicle Occupancy

Saturday January 16, 2016; 9:30am - 3:00pm

Lot ID	Total Vehicles	Total People	Avg Occupancy (people/vehicle)
Coliseum	1983	5357	2.70
Lot D	345	713	2.07
Lot F	153	406	2.65
Lot O	514	1385	2.69
Coors Field Structure	529	1335	2.52
Total All Lots	3524	9196	2.61

Conclusions

- There were no consistent trends recognized that related the location of the parking facility to the average vehicular occupancy. This data set does not show a correlation between the distance between the Expo Hall and the parking facility and a higher or lower vehicular occupancy.
- There was a significant difference between the weekdays and Saturday that were counted with the average vehicular occupancy for all lots approximately 20% higher on Saturday than on the weekdays counted.
- The Coliseum lot filled by 11:15am. Lot F filled by 12:30pm. The Coors Field Structure opened at 10:45am. Lot O (the new one near DPS lots on Brighton at 48th Ave) opened at 10:45am and was full at 12:15pm.
- There were a total of 6,427 entering vehicles to all counted lots with 3,524 of those occurring on Saturday.
- 45-50% of vehicles has 2 people in them during all count periods. On Saturday 24% of vehicles had 4 or more people in them.

4. NWSS Shuttle Boardings and Alightings

Methodology

The NWSS operates a private shuttle operation around the event site to carry people from MWSS Free Parking Lots to the Expo Hall during all days of the Show. The data collection team counted all people getting on and off each arriving shuttle bus at several locations and days including:

- Lot D: all data collection periods (Wednesday, January 13; Saturday, January 16; Tuesday, January 19)
- Lot F: all data collection periods
- Expo Hall: all data collection periods
- Coors Field Parking Structure: Saturday, January 16
- Pepsi Center Shuttle Drop off location on 46th Ave: Saturday, January 16

These locations are shown in the figure on the following page. The time the shuttle bus arrived; the number of people getting off the shuttle bus (“Alightings”), and the number of people getting on the shuttle bus (“Boardings”) were recorded for each shuttle bus.

NWSS Shuttle Boarding and Alighting Count Locations



CDV 3-30-16

Data Collection Results

The tables below show detailed information that was collected about the use and operation of the NWSS Free Parking Lot shuttle system.

National Western Stock Show 2016 Shuttle System Boardings and Alightings

Date: Tuesday, January 13, 2016

Total All Lots

Weather: Dry/Mild

	Number of Passengers			Buses	Avg Boardings + Alightings Per Bus	Total Minutes	Avg Bus Frequency (Minutes/Bus)
	Alighting	Boarding	Total				
Lot D	3	8	11	24	0.46	104	4.33
Lot F	77	160	237	31	7.65	135	4.35
Expo Hall	181	85	266	28	9.50	104	3.71
Total	261	253	514	83	6.19	343	4.13

National Western Stock Show 2016 Shuttle System Boardings and Alightings

Date: Wednesday, January 19, 2016

Total All Lots

Weather: Dry/Mild

	Number of Passengers			Buses	Avg Boardings + Alightings Per Bus	Total Minutes	Avg Bus Frequency (Minutes/Bus)
	Alighting	Boarding	Total				
Lot D	8	59	67	11	6.09	59	5.36
Lot F	194	408	602	28	21.50	146	5.21
Expo Hall	609	207	816	55	14.84	317	5.76
Total	811	674	1485	94	15.80	522	5.55

National Western Stock Show 2016 Shuttle System Boardings and Alightings

Date: Saturday, January 16, 2016

Total All Lots

Weather: Dry/Mild

	Number of Passengers			Buses	Avg Boardings + Alightings Per Bus	Total Minutes	Avg Bus Frequency (Minutes/Bus)
	Alighting	Boarding	Total				
Lot D	30	32	62	30	2.07	280	9.33
Lot F	676	2466	3142	56	56.11	318	5.68
Expo Hall	2785	997	3782	55	68.76	317	5.76
Coors Garage	273	1393	1666	30	55.53	246	8.20
Pepsi Shuttle	730	181	911	19	47.95	253	13.32
Total	4494	5069	9563	190	50.33	915	4.82

Conclusions

- There was a significant difference in the average boardings and alightings per bus between the two weekday count periods. The event types being held on the evening of Wednesday, June 19th might have attracted an attendee demographic more attracted to riding the shuttle bus system.
- The shuttle system is highly utilized on weekend days as illustrated by the much higher total usage and average boardings and alightings per bus recorded on Saturday as compared to the weekdays.
- The average bus frequency was quite variable on Saturday. This was likely due to traffic congestion delaying shuttle buses.
- The Coors Field shuttle carried almost 1,400 attendees from the Coors Garage to the Expo Hall during the data collection period. This closely matches the number of people counted entering the Coors Field Garage in the vehicular occupancy section of this report.

5. RTD Route 48 Boardings and Alighting

Methodology

Denver's Regional Transportation District operates public bus service that provides access to the NWSS site. Route 48 has stops at the intersection of 47th Ave/Brighton Blvd. The time of each bus arrival, the direction of travel of the bus, and the number of passengers that got on and off each bus were recorded by the data collection team. The figure below shows the bus stop locations.

RTD Route 48 NWSS Stop Map



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Data Collection Results

The table below summarizes passenger activity on the RTD Route 48 during the data collection periods.

National Western Stock Show 2016

RTD Route 48 Activity

Time	Number of Buses			Number of Passengers			Average Activity/Bus		
	EB	WB	Total	Alighting	Boarding	Total	Alighting	Boarding	Total
Wednesday 1/13/16 (5:30-7:30PM)	3	5	8	5	12	17	0.63	1.50	2.13
Saturday 1/16/16 (10:30AM-3:30PM)	5	8	13	10	16	26	0.77	1.23	2.00
Tuesday 1/19/16 (4:30-5:30PM)	2	2	4	3	8	11	0.75	2.00	2.75
Total	10	15	25	18	36	54			

Conclusions

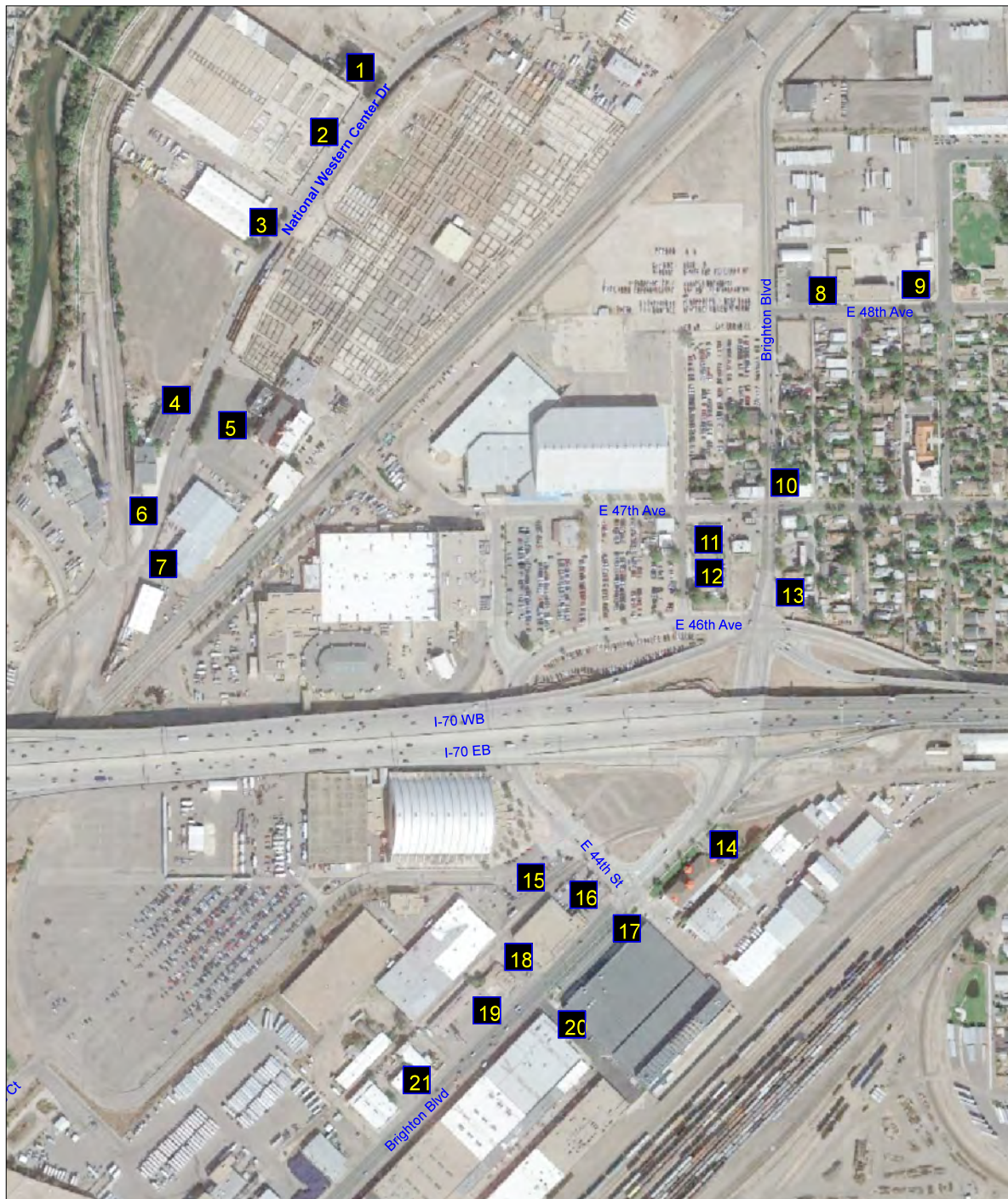
- It is difficult to draw any conclusions from this small data set however it is clear that the RTD Route 48 is not a significant draw for NWSS attendees. Most passengers observed getting on and off the Route 48 appeared to be local residents using the bus as a transportation option.

6. Private Parking Lot Survey

Methodology

There are numerous private parking lots surrounding the National Western Center that offer paid parking on NWSS event days. The location of the private lots that were clearly open and available for paid parking during the data collection periods were noted as well as the parking fee being advertised for each lot. The location of each lot identified during all data collection periods is shown in the figure on the following page. In this figure the private lots are labeled with numbers used to identify the location of each lot and correlate to the data that will be presented later in this report. These lot identification numbers were created for comparison and identification purposes by the study organizers and were not physically displayed at any of the lot locations.

Private Parking Lot Location and ID Map



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Data Collection Results

Insert text here

2016 National Western Center Stock Show

Private Lot Characteristics

Map Lot ID	Capacity	Wednesday 1/13/16		Saturday 1/16/16		Tuesday 1/19/16	
		Price	Spaces Occupied	Price	Spaces Occupied	Price	Spaces Occupied
1	50	\$ 5.00	14	\$ 20.00	50	\$ 5.00	5
2	80			\$ 40.00	80		
3	35	\$ 10.00	26	\$ 40.00	35	\$ 10.00	28
4	40			\$ 30.00	40	\$ 5.00	6
5	179	\$ 15.00	134	\$ 50.00	179	\$ 15.00	107
6	35			\$ 30.00	35	\$ 5.00	18
7	40	\$ 20.00	24	\$ 30.00	40	\$ 10.00	6
8	15			\$ 10.00	12		
9	15			\$ 10.00	15		
10	10			\$ 20.00	10		
11	26	\$ 20.00	21			\$ 20.00	26
12	32	\$ 20.00	29			\$ 20.00	32
13	25	\$ 10.00	18	\$ 20.00	30	\$ 10.00	1
14	30			\$ 25.00	30	\$ 10.00	6
15	60	\$ 20.00	58				
16	60	\$ 20.00	60				
17	100	\$ 15.00	100				
18	120	\$ 15.00	72	\$ 30.00	120	\$ 10.00	18
19	68	\$ 5.00	30	\$ 20.00	51		
20	40			\$ 25.00	40		
21	40			\$ 25.00	36		
Average Price/Space		\$ 14.20		\$ 32.42		\$ 11.39	
Average % Occupied			70%		97%		41%

Conclusions

- Private lot prices were significantly higher on Saturday than on weekdays.
- More private parking lots with more capacity were available on Saturday than on weekdays.
- The average percent occupancy of 97% on Saturday is similar to the overall percent parking occupancy that was determined for the 2015 NWSS event.
- Lots that are closer to the Expo Hall had generally higher prices than those further away. Lot size was also a factor in pricing as shown in the higher pricing for Lot 5 that is relatively close to the Expo Hall and has a large capacity.
- Pricing is demand sensitive. Average price per space on Wednesday vs. Tuesday was \$14.16 vs. \$11.21 and occupancy on those days was 70% and 45% respectively.
- On Saturday occupancy was 97% and average price per space was \$32.48.
- Total available private spaces on Saturday were 867 spaces. Total revenue generated by private parking on Saturday exceeded \$28,000.
- Total available private spaces on a Wednesday were 800 and on Tuesday were 600. Total parking revenue exceeded \$8,500 on Wednesday and \$3,600 on Tuesday.

7. Bicycle Parking

Methodology

Data collection staff roamed around the core area of the NWSS looking for parked bicycles. There were not any officially designated bicycle parking areas or corrals identified. The location and number of bicycles identified was recorded during all the data collection periods.

Results

The figure below shows locations where parked bicycles were identified and the total number for all data collection periods combined.

Bicycle Parking Survey Locations and Number of Bicycles: All Count Periods Combined



CDV 3-21-16

Conclusions

- There were relatively few bicycles counted. Conversations with riders indicated that they were either coming from Elyria-Swansea to visit the NWSS or they were working on-site and using their bicycle to commute and avoid traffic.
- There were no discernible differences between weekdays and weekend days in terms of bicycles counted.

8. Intercept Survey

Methodology

The data collection team conducted a short survey and interviews of people in the main Expo Hall on:

- Wednesday, January 13;
- Saturday, January 16; and
- Tuesday, January 19, 2016.

The data collection team spread out to multiple locations in the Expo Hall and randomly intercepted people to answer a short set of questions intended to gather basic information about the person, some parking related information, their experiences parking that day and a variety of other questions. The data collection staff asked the questions and recorded the answers. The survey form that was used in the interviews is shown on the following page.

NWSS Parking and Transportation Survey: 2016

Today's Date: _____

Age:

30 and younger

31 – 50

51 or older

Category: Attendee

Vendor

Volunteer

Approximate Arrival Time: _____

How long do you plan to stay: <2 hours 2 hr - ½ day ½ day to all day

How did you get here:

Drive

Transit

Walk

Bike

Other: _____

Did you carpool today: Yes No

If yes, how many people were in your car? 1 2 3 4 5+

If you drove:

1. Did you park close by, or offsite? NWSS Offsite Not Sure

2. If close by, did you park in one of the free lots? Yes No

3. If yes, which lot (use map if necessary): _____

4. If private lot, what was the cost: _____

How long did it take you to find parking:

Not long

Some time but was expected

Longer than expected

Would you be willing to Bike, Bus, use Rail or a Shuttle in Future: Yes No

If no, why not? _____

Would valet parking be attractive to you: Yes No

Would Uber or Lyft be attractive to you: Yes No

Any other comments on parking today (use back side)

Drop survey off at National Western Center North Denver Cornerstone Collaborative Booth of email to Emily.gloeckner@denvergov.org or mail to Emily Gloeckner, City and County of Denver, 201 W Colfax Ave, Dept 508, Denver, CO 80202



NATIONAL
WESTERN



DENVER
THE MILE HIGH CITY

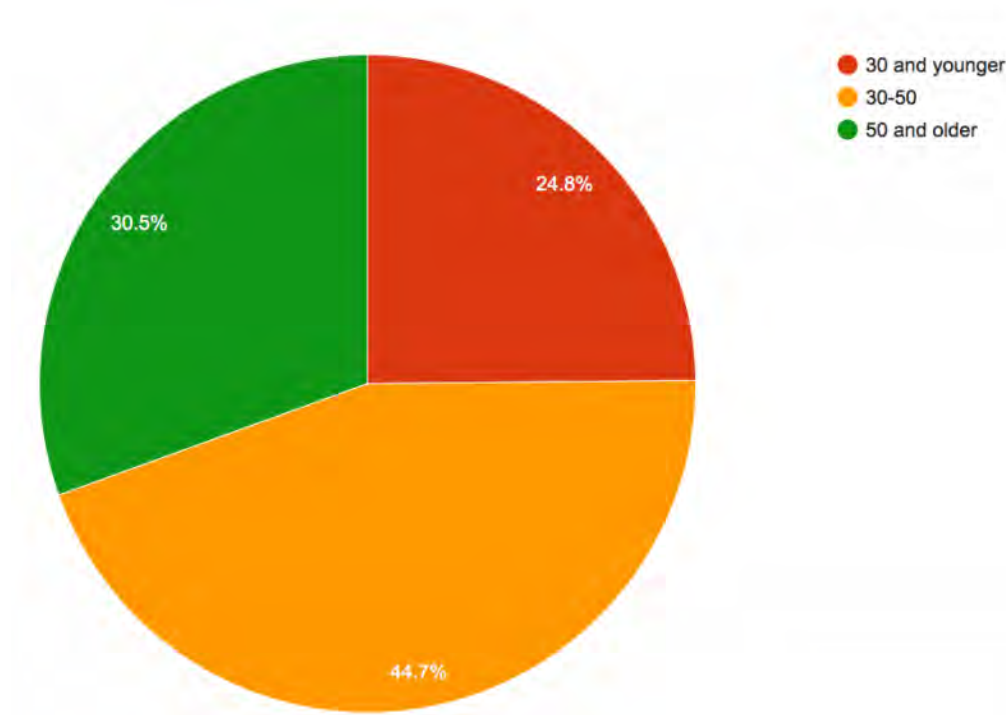
HISTORY Colorado



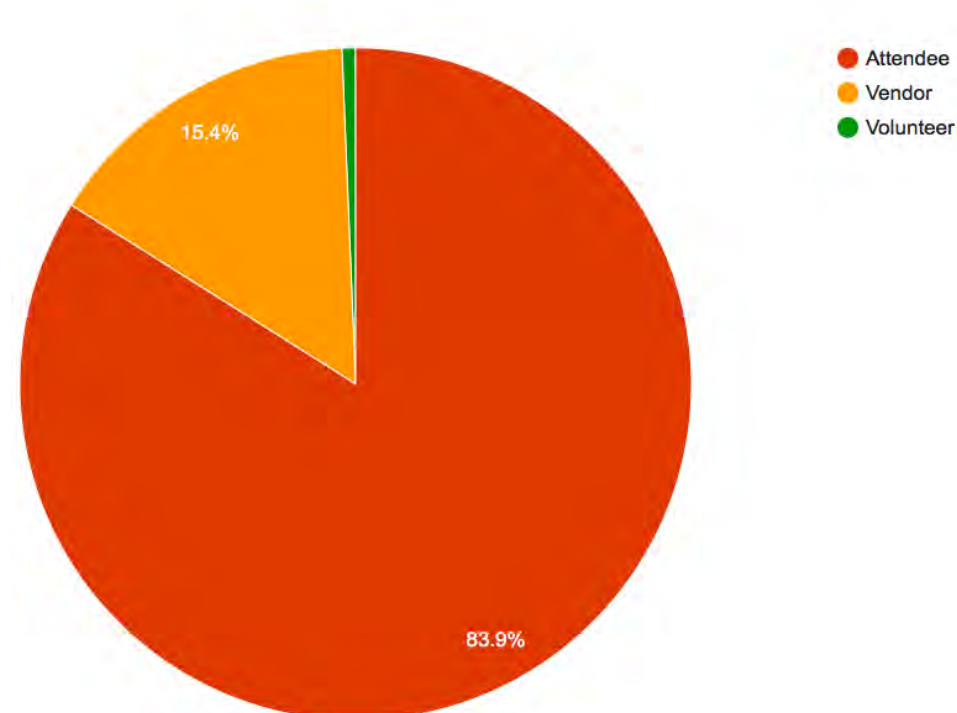
Results

There were a total of 326 survey responses collected during the data collection period of which 211 were collected on Saturday and a combined 115 were collected on Tuesday or Wednesday evening. Below is a summary of basic information on the demographics of the respondents.

Age

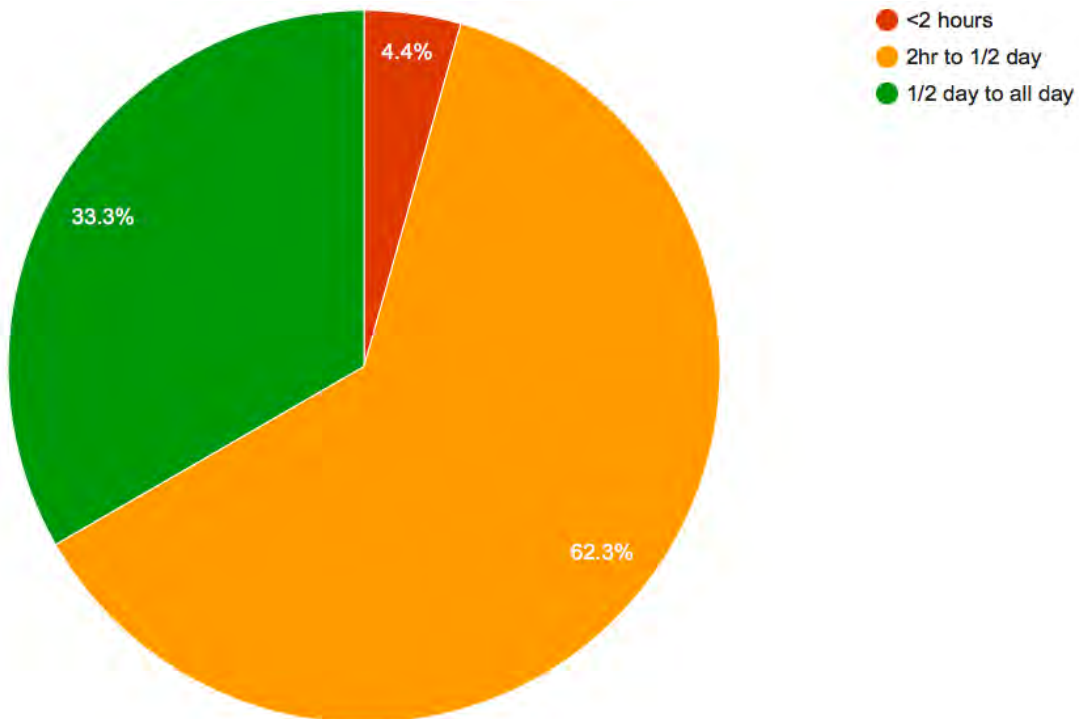


Role in NWSS

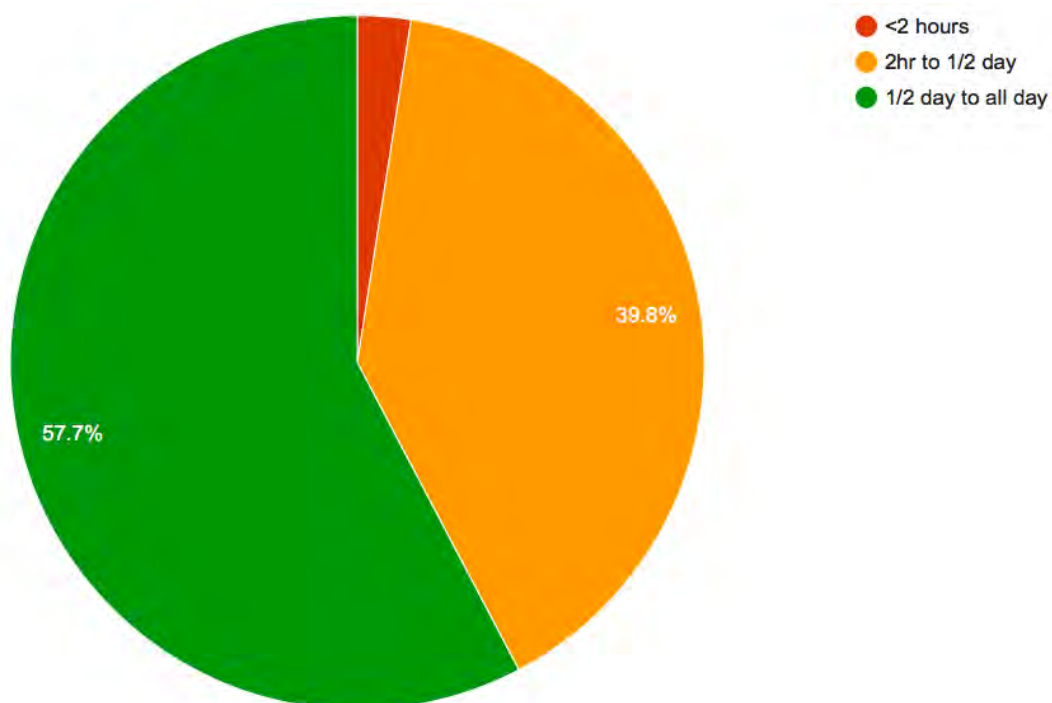


There was a significant difference in the length of stay for attendees depending on whether they answered the survey on Saturday or on a weeknight. The charts below highlight those differences.

Length of Stay for Weeknight Survey Respondents

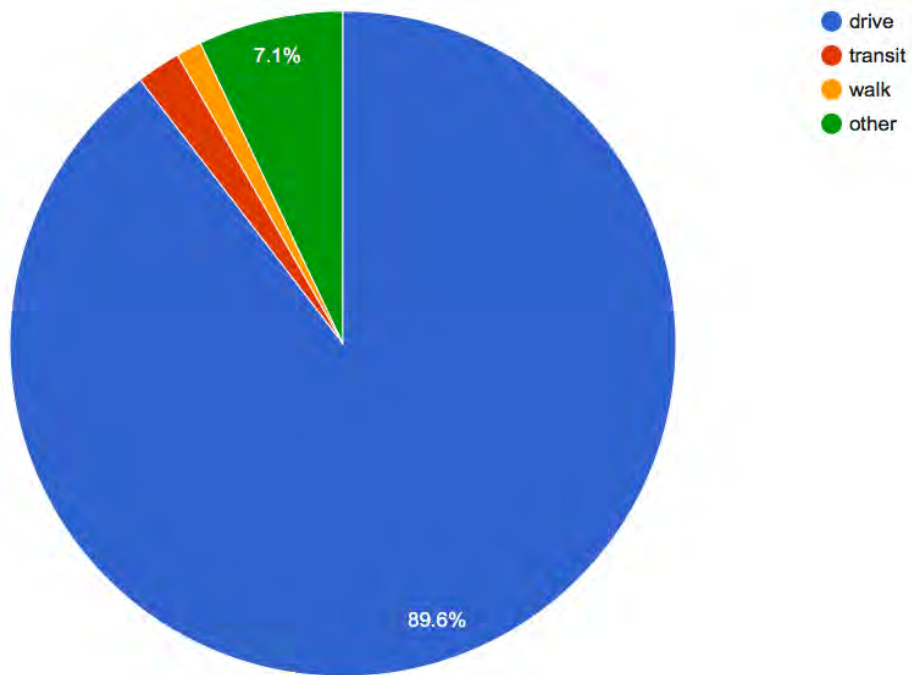


Length of Stay for Saturday Survey Respondents



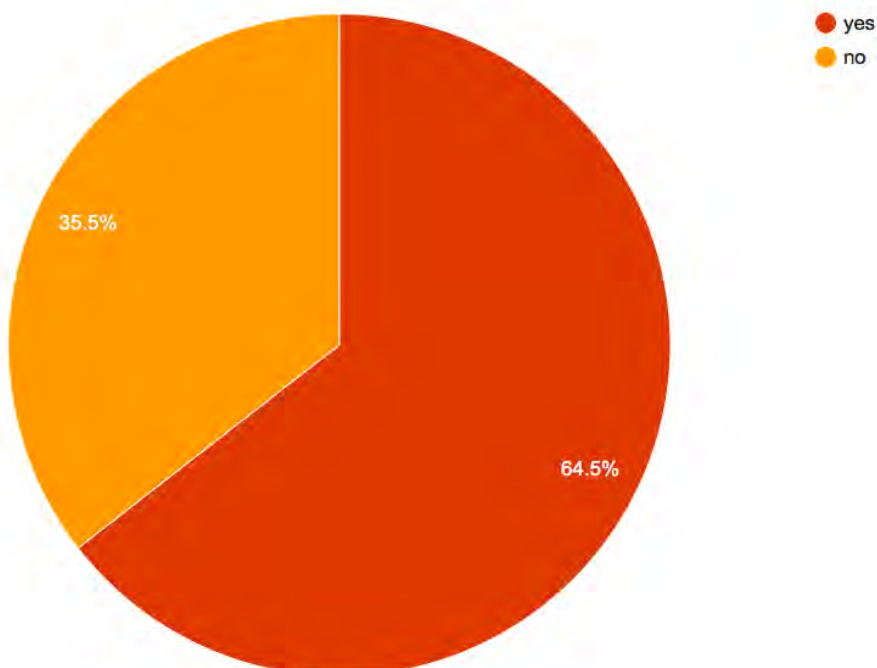
Nearly 90% of respondents chose to drive to the NWSS. For the “other” category the most common answers were Uber, Taxi, Shuttle, or Dropped Off. Only 7 respondents said they took transit and 4 said they walked.

Arrival Mode



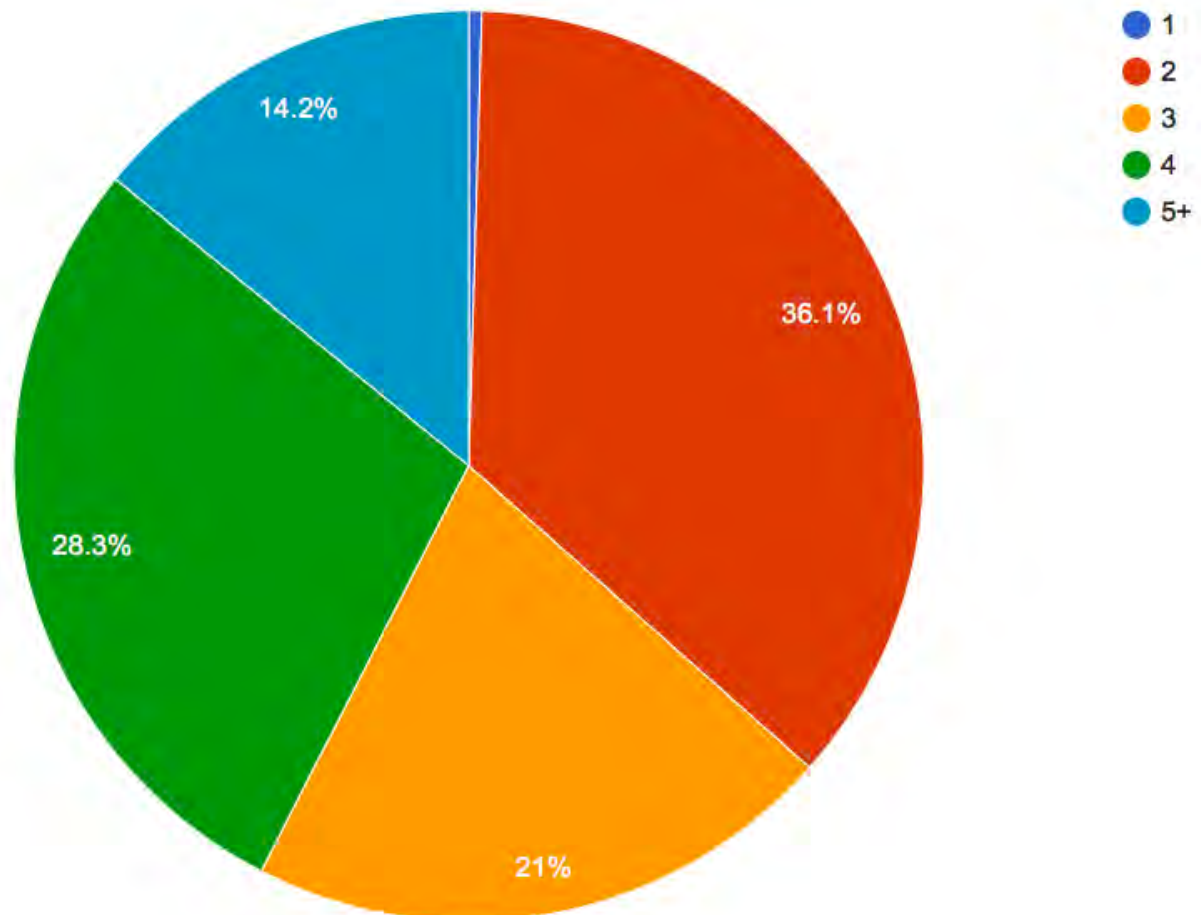
However nearly 65% of respondents said they carpooled to the NWSS.

Did you Carpool?



The respondents that carpooled were asked a follow up question of how many people did they carpool with. 42% of respondents that carpooled said they came with 4 or more people in their car. This is quite a bit higher than our visual survey of parking lots showed (up to 25% of vehicles on Saturday had 4 or more people in their car) so it isn't clear if the respondents were inaccurate in their response or if there was some bias in the interview process that led to the higher number.

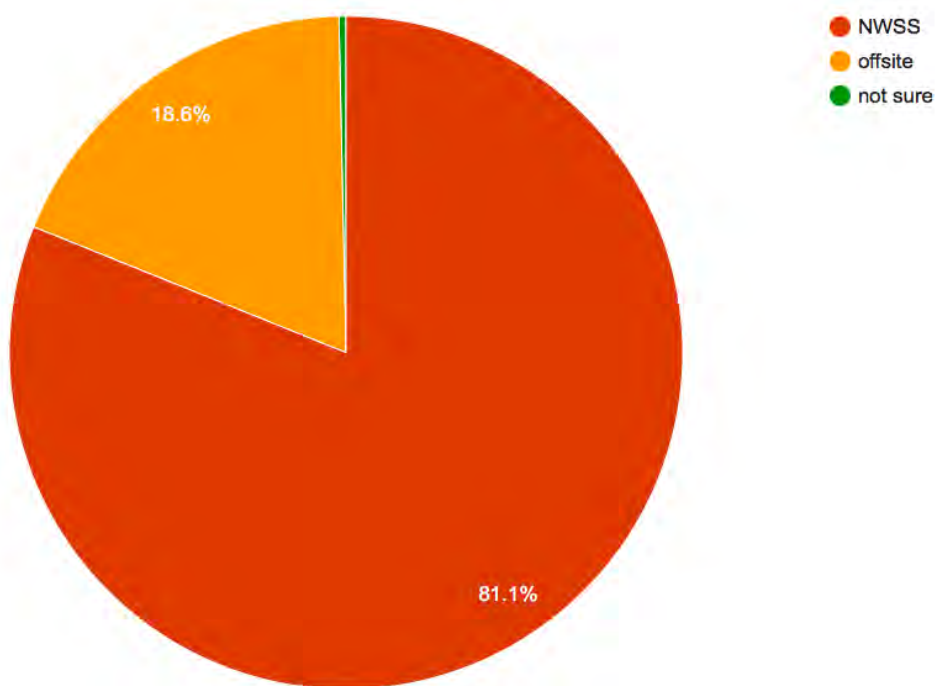
Number of People in Carpool Cars



Respondents that said they drove were asked several follow-up questions; Did you park close by?; Did you park in one of the free lots?; which free lot?; if you parked in a private lot, what was the parking fee?

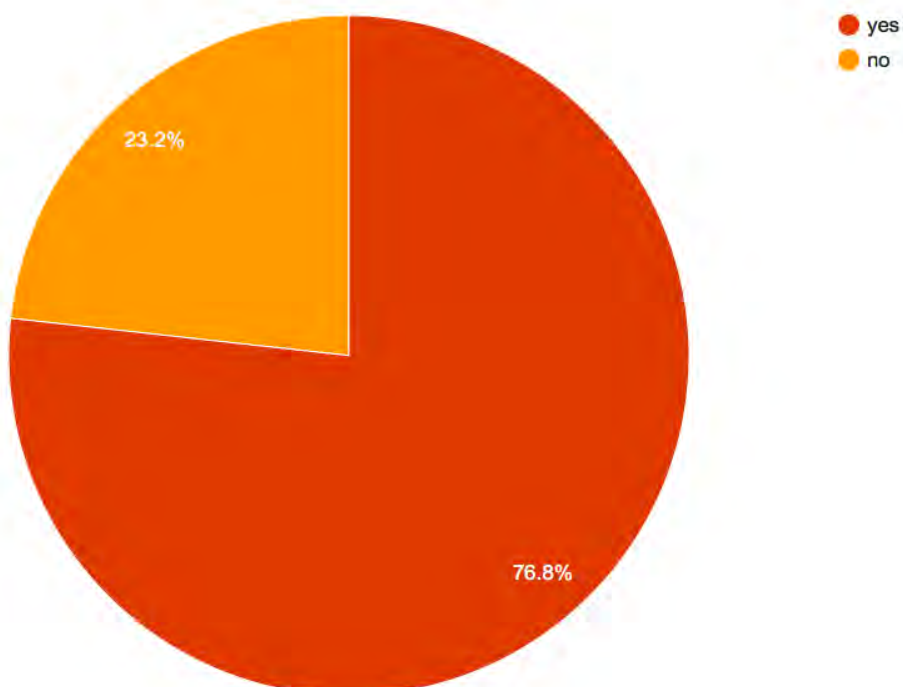
81% of respondents that drove said they parked close by

Parking Location

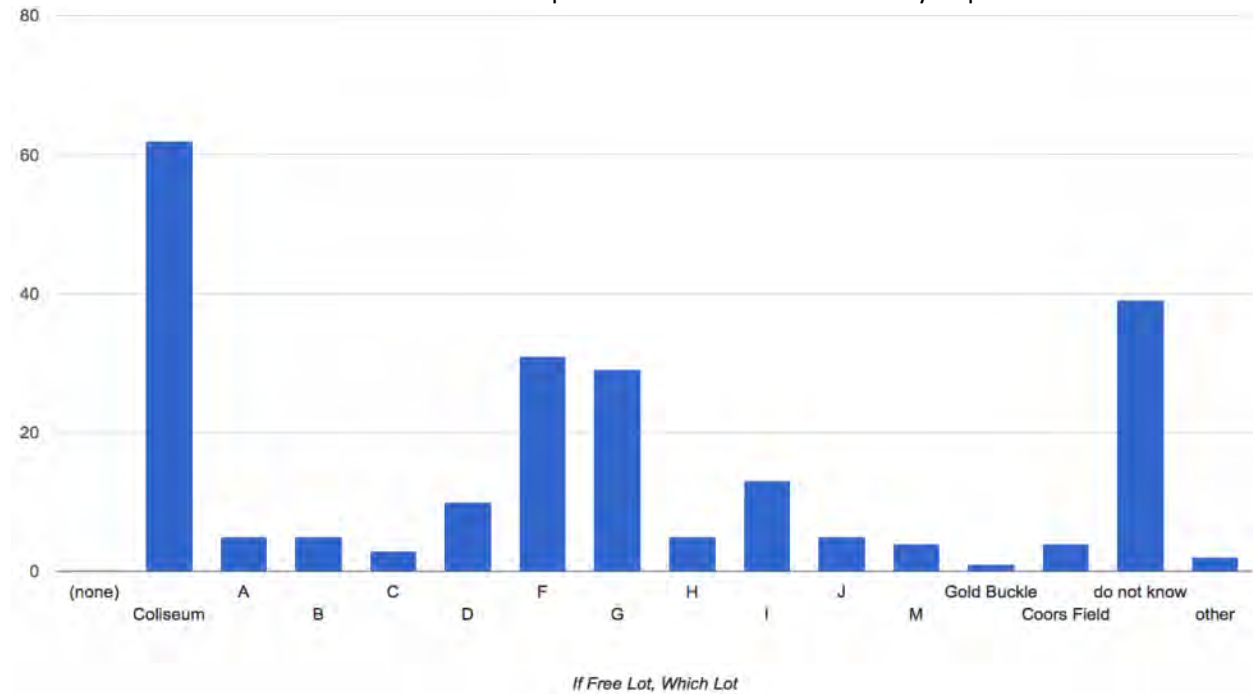


of those, more than ¾ of respondents said they parked in a NWSS Free Lot

Did you park in a NWSS free lot?

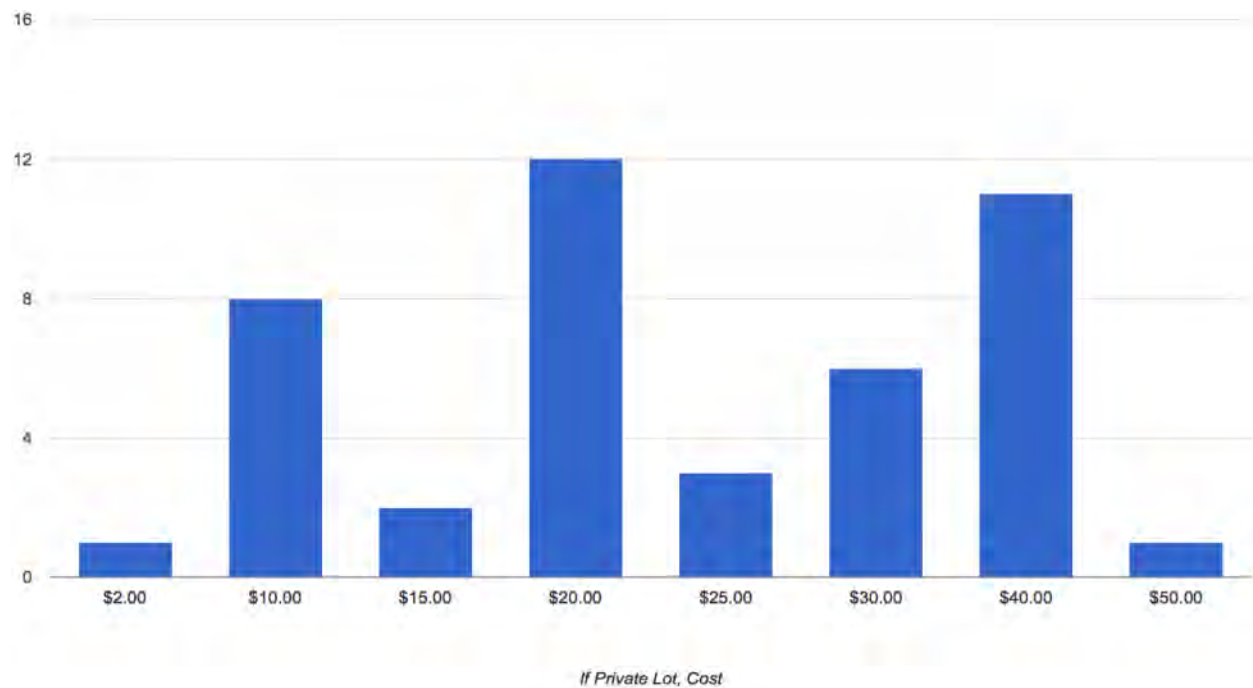


The chart below shows the distribution of responses to “Which Free Lot did you park in?”



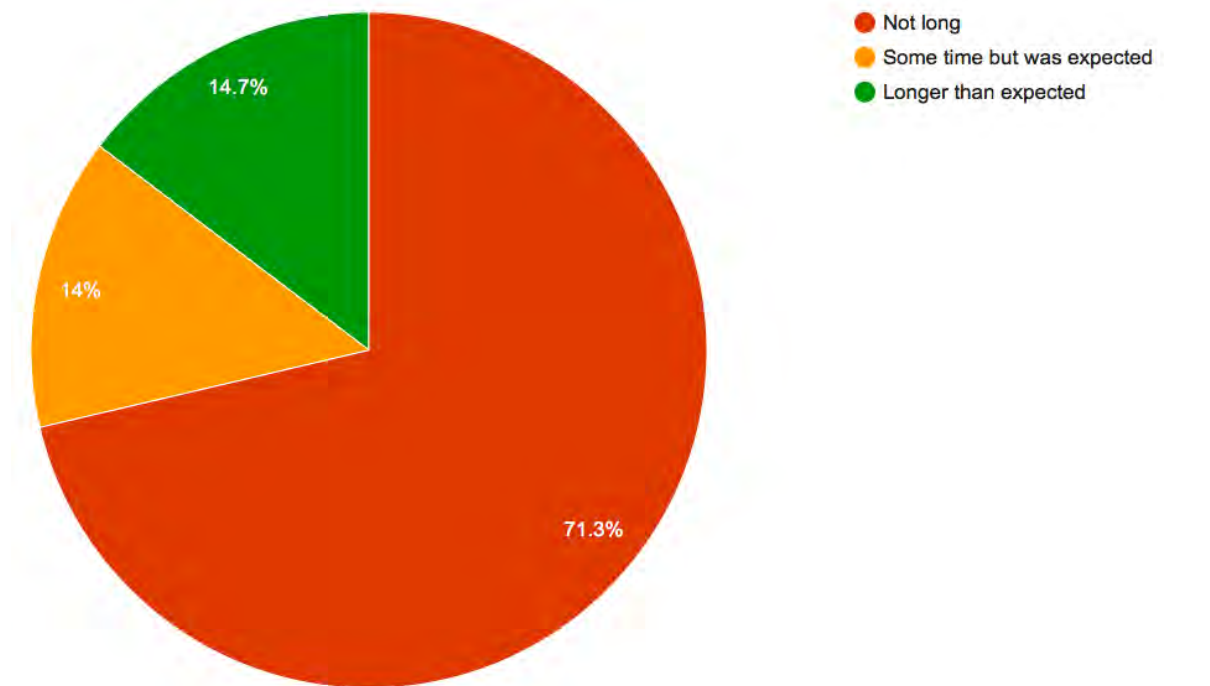
The Coliseum lot was the most common answer, which matches our field observations of parking distribution. Of note is that nearly 40 respondents were not sure which Free Lot they had parked in.

People that drove and parked in a private lot paid a wide range of fees depending on the lot location and day of attendance. Their responses support our private lot survey detailed earlier in this report.



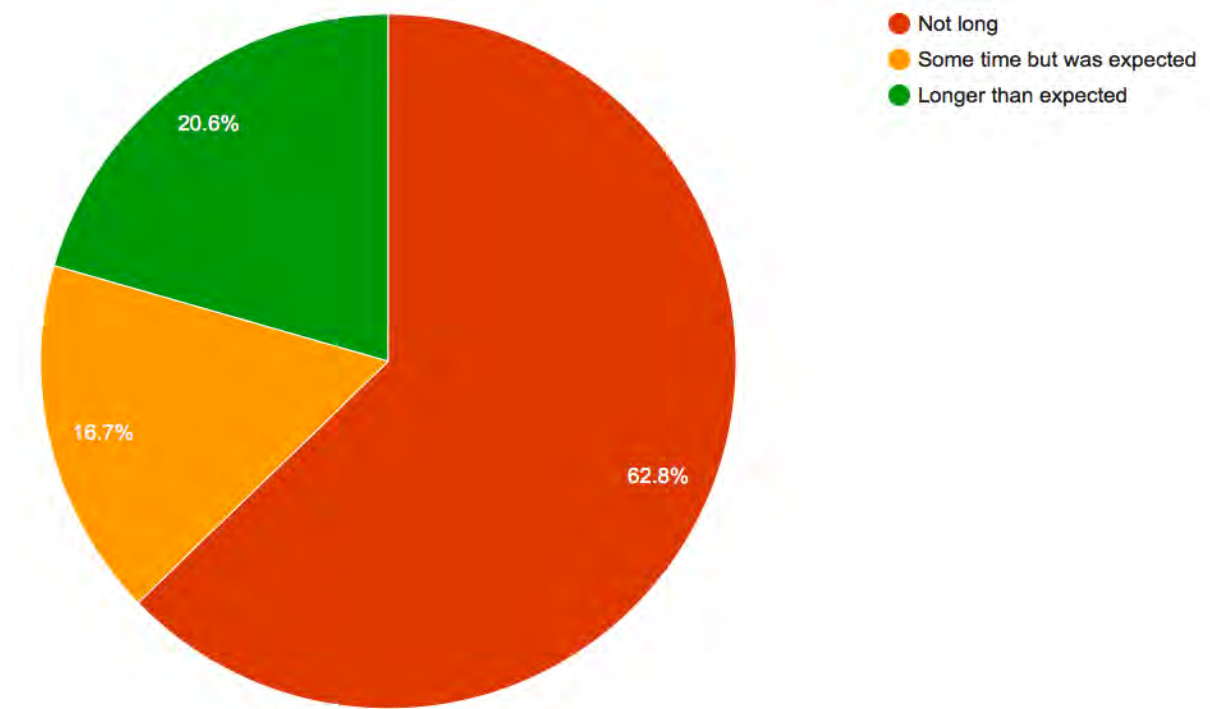
Another factor we were interested in was how long it took attendees to find parking. Almost 75% of respondents said it did not take them long to find parking.

How long did it take you to find parking (All Respondents)?



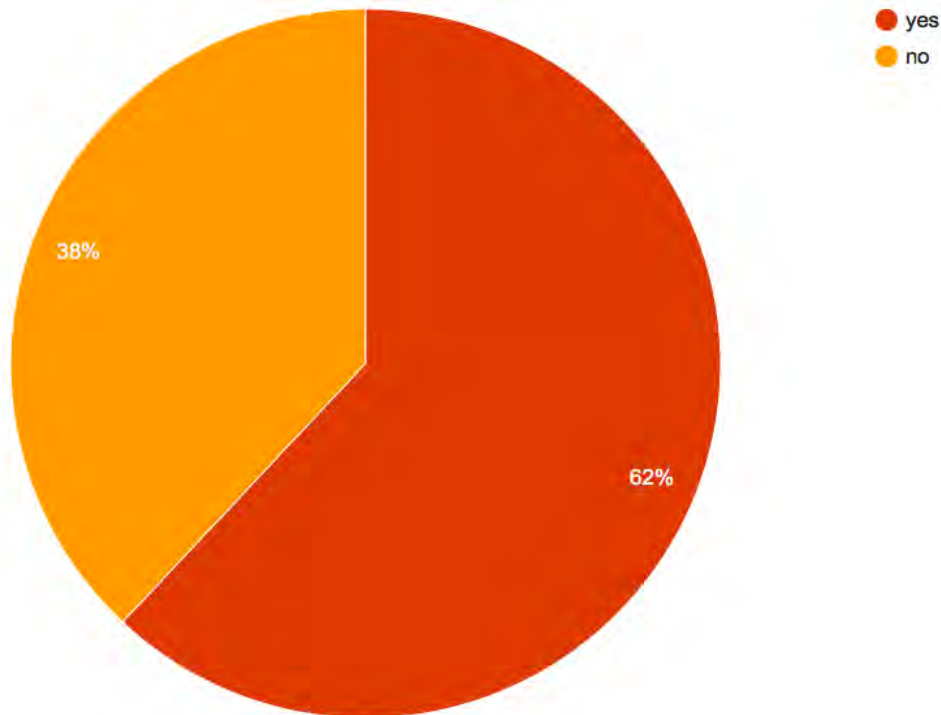
Saturday responses reflected slightly more difficulty in finding parking than weekday respondents.

How long did it take you to find parking (Saturday Respondents Only)?



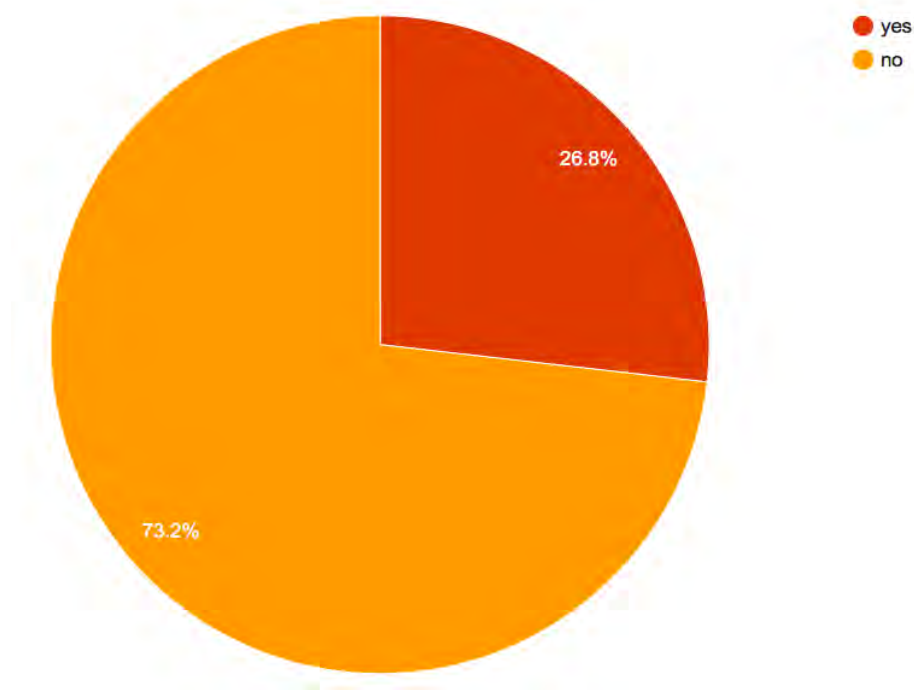
We also asked if respondents would be willing to Bike, Bus, use Rail or a Shuttle in the future. 62% of respondents said they would be willing to try one of these modes. This result is similar to the 2015 survey responses where 65% of respondents said they would be willing to use rail or a shuttle. For respondents that said they would not be willing to try one of these modes, the most common answers as to why they would not were convenience and time and availability/distance from NWSS.

Would you be willing to Bike Bus, use Rail or a Shuttle in the Future?



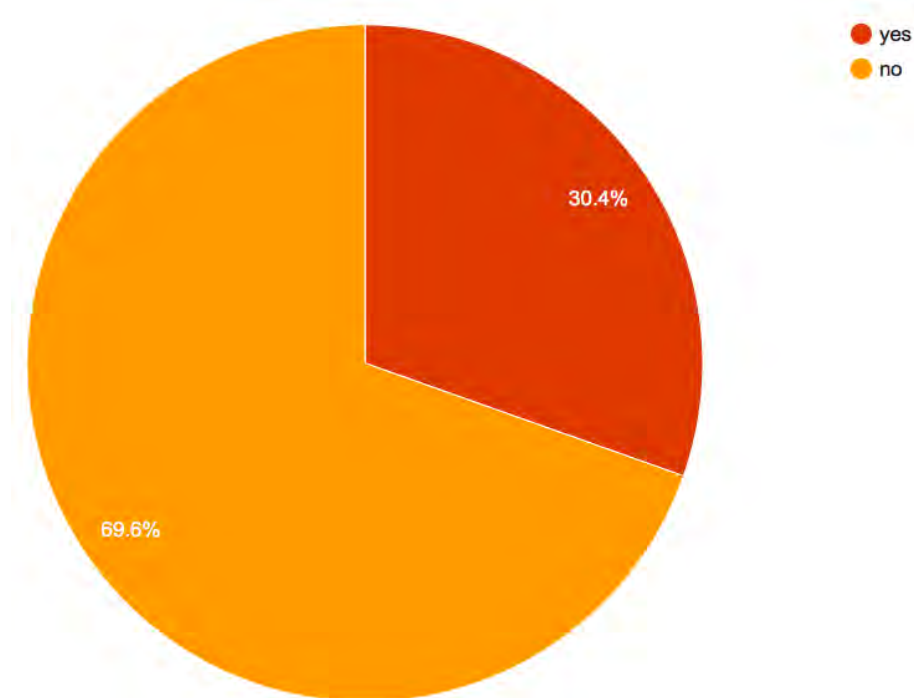
Only ¼ of respondents said that valet parking would be attractive to them. This is a similar result to our 2015 survey where approximately 32% of respondents said valet parking would be attractive to them.

Would Valet Parking be Attractive to you?



A similar percentage of respondents said taking Uber or Lyft to the NWSS would be attractive.

Would Uber or Lyft be attractive to you?



We also collected other general comments from respondents if they chose to provide them. 61 respondents did provide other general comments. The main themes with those comments were that wayfinding signage and directions from staff on how to get to parking could be improved and that vendor parking was not adequate to meet the demand.

Conclusions

- A total of 326 survey responses were collected during all survey periods which included two weeknights and a Saturday
- 65% of respondents carpooled with 42% of those having 4 or more people in their car
- For arrival mode almost 90% of respondents arrived via personal vehicle. 4 people walked. 7 took transit. 6 survey respondents took Uber and 3 took a taxi. The rest were either dropped off or took a hotel shuttle.
- 30% of respondents said they would consider taking Uber or Lyft.
- 62% of respondents said they would consider other modes than private vehicle (bus, bike, rail, or shuttle). In 2015, 65% of respondents said they would consider rail or shuttle.
- 25% of respondents said that valet parking would be attractive. Many added that it would depend on pricing. In 2015, 32% of respondents said valet parking would be attractive.
- 77% of respondents said they parked in a free lot. Of those that parked in a paid lot the average lot price was just under \$25. In 2015, 68% of respondents parked in a free lot.
- Just over 70% of respondents said it took “not long” to park. About 15% said it took longer than expected. In 2015, over 65% said parking was easy or average.

9. Other Observations

As part of our data collection efforts, we spent time walking around the NWSS talking to vendors and exhibitors, watched some animal load in and out activities, and talked to NWSS operations staff about logistics details for back of house operations. What became clear is that there are really many different stock shows occurring over the three-week event, each with its own set of requirements and logistical needs. With activities occurring in the Yard and on the Hill at almost all times of the day during the NWSS, it is a herculean task to organize it all and to keep everyone happy. The NWSS depends not only on attendees to make it a success. If exhibitors and vendors are not satisfied with the operations or if there is too much burden placed on them to modify their transportation, feeding, cleaning, and daily routine then they will not be inclined to continue participating in the NWSS. It is clearly impossible to detail the complexity and nuances of these operations in a short report so the following sections will give an overview of activities to demonstrate their magnitude and general location and operations.

Animal Load in/Out and Changeover Periods

There are almost too many types and varieties of stock coming in and out of the facility to count. Each stock animal must be transported to the NWSS, unloaded near their assigned area, and moved to that area safely and efficiently. Then they must be fed, watered, and cleaned up after. A main activity area is the Yards where National Western Center Drive is used as a staging area for trucks, trailers, and animals during key move in/move out days. This operation requires significant involvement from City and County of Denver Police as well as detailed, clear, and concise directions and information to exhibitors so they know where to be and when to be there. Exhibitors are checked in by NWSS staff to ensure they are in the right place at the right time and have all the required animal and feed documentation. These activities are usually performed overnight. The Yards are almost their own independent stock show with animals, tents, parties, client functions, food and beverages, and animal sales all occurring in that area.

The other main activity area is the loading bays on the bottom floor of the Expo Hall. Trucks and trailers are staged in a dirt area on the west side of Brighton Blvd north of 48th Ave. Exhibitors are checked in by NWSS staff to ensure they are in the right place at the right time and have all the required animal and feed documentation. They are allowed to proceed to the Expo Hall along the railroad track alignment and assigned a loading bay. The trucks and trailers need significant room to perform turning and backing movements to access the loading bays. Once their business is complete they exit the Expo Hall area to 46th Ave to the south.

A detailed understanding of the logistics of keeping the NWSS running and exhibitors needs and desires should be developed in order to keep the NWSS operating successfully in new facilities.

Vendor Expo

The vendor expo is held on several levels of the Expo Hall and also in the main outside area on the south side of the Expo hall. This is a huge show with vendors coming from all over the country to display and sell their wares to exhibitors and attendees. Because other activities outside the Expo Hall prevent large-scale vendor move in our out during the three weeks of the show, vendors must arrive early and leave after the show is complete. Coordinating this massive move in requires careful planning. The largest vendors arrive up to a week prior to the show starting to get their large booths set up and all their inventory moved in to the Expo Hall. Then vendors are allowed into the Expo Hall for set up based on the location of their booths and the size of their operations. Most vendor set up activity has been completed up to three days prior to the NWSS opening to the public. Vendors move out of the Expo Hall

at the end of the NWSS generally in a reverse order for how they arrived with the largest vendors leaving last.

The Vendor Expo is an event in itself and the transportation and logistics needs of the vendors for the three-week show have to be carefully planned for in order for them to be satisfied with their experience. Further facility planning activities need to take into account these needs in order for the NWSS to be successful in new facilities.

Chapter 3 - TDM Definitions and Cost Estimates

NWC TDM - Cost Estimates: Pre-Construction

Pre-Construction - Stock Show Weekend (Scenario 2)			
Strategy	Summary	Moderate Cost Estimate	Aggressive Cost Estimate
Transit Accessibility	With the addition of the N Line commuter rail, including a station on the National Western Center Campus, accessibility to high quality transit is assumed to improve and would result in a mode shift. The cost is not included as the new transit station is dependent upon RTD's future planned improvements.	N/A	N/A
Commute Trip Reduction Marketing ¹	Information sharing and marketing are important components to successful commute trip reduction strategies. Marketing strategies may include new employee orientation of trip reduction and alternative mode options, event promotions, and distributing publications. The TDM Coordinator would take on these marketing responsibilities.	---	\$16,200
Destination Accessibility	Destination accessibility is measured in terms of the number of jobs or other attractions reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones. The location of the project also increases the potential for pedestrians to walk and bike to these destinations and therefore reduces the VMT. As the cost is more realistically embedded in the cost of the land, the cost would be reflected in the land development around the NWC site.	N/A	N/A
Transit Fare Subsidy ²	Provide discount daily or monthly passes for on-site employees or long-term visitors at the National Western Center.	---	\$675,000
Unbundle Parking Costs	Unbundling separates parking from property costs, requiring those employees who wish to purchase parking spaces to do so at an additional cost from the property cost. This removes the burden from those who do not wish to utilize a parking space. Parking will be priced separately from office leases. An assumption is made that the parking costs are passed through to the vehicle owners/drivers utilizing the parking spaces.	TBD -Adminstrative cost could be subsidized by parking revneues	TBD -Adminstrative cost could be subsidized by parking revneues
Local Shuttles ³	Operation of shuttle service to nearby transportation hubs and major destinations.	---	\$5,800

Carshare Parking ⁴	Designating parking spaces for carshare vehicles near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$55,000	\$110,000
Secure Bicycle Parking ⁵	Short-term and long-term bicycle parking; may include a combination of bike racks, bike lockers, or secure bike stations	\$12,500	\$25,000
Preferential parking for 4+ carpools ⁶	Designating parking spaces for carpools and vanpools near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$22,000	\$66,000
Dedicated Carpool Pick-Up/Drop-Off ⁷	Designating carpool pick-up and drop-off locations clarifies where these activities occur and can prioritize their use by being provided at preferential curb locations. Designating the area using signage and/or paint can also serve as a marketing component to get others to consider carpooling as an option.	\$1,250	\$2,500
Multi-modal Wayfinding ⁸	Wayfinding allows users of all modes to quickly and easily navigate through the development to their destination. Transit wayfinding can help users find transit stops and can also provide information on routes, schedules, and instructions for using the system. Bicycle, pedestrian and automobile wayfinding can guide users to parking areas, walking and biking routes, and development amenities.	\$13,500	\$27,000
	Subtotal of Estimated One-time Capital Costs	\$26,000	\$52,000
	Subtotal of Estimated Annual Costs	\$84,000	\$878,000
	Total Estimated Cost (excluding TBD or N/A strategies; rounded to the nearest ten thousand)	\$110,000	\$930,000

Please note, the above costs are estimates and should be further studied and refined to accurately illustrate real projected costs. An estimated 1,350 employees are projected for this scenario.

¹Estimated \$8 per employee under moderate scenario and \$12 per employee under aggressive scenario.

²Estimated \$500 per employee

³Shuttle service based upon an estimated annual operating cost of \$140,000. Cost illustrated for a two week period.

⁴Parking space estimate is \$11,000 per stall (\$9,000 forgone parking revenue + \$2,000 stall O&M). Five stalls projected for moderate intervention and ten stalls for aggressive intervention.

⁵Estimated cost of approximately \$2,090 per bike locker and \$660 per bike rack. Five bike lockers and three bike racks for moderate intervention and ten bike lockers and six bike racks for aggressive intervention.

⁶Parking space estimate is \$22,000 per stall (\$18,000 in forgone parking revenue + \$4,000 in stall O&M). One stall estimated for moderate intervention and three stalls for aggressive intervention.

⁷Estimate of \$250 per stall for curb space repurposing. Six stalls estimated for moderate intervention and 12 stalls for aggressive intervention.

⁸Approximate costs per sign range from \$530 to \$2,150. An average cost of \$1,340 was used in the above table. Ten signs of various sizes estimated for moderate intervention and 20 for aggressive intervention.

Chapter 3 - TDM Definitions and Cost Estimates

NWC TDM - Cost Estimates: Pre-Construction

Pre-Construction - Large / Concurrent Event (Scenario 3)			
Strategy	Summary	Moderate Cost Estimate	Aggressive Cost Estimate
Transit Accessibility	With the addition of the N Line commuter rail, including a station on the National Western Center Campus, accessibility to high quality transit is assumed to improve and would result in a mode shift. The cost is not included as the new transit station is dependent upon RTD's future planned improvements.	N/A	N/A
Commute Trip Reduction Marketing ¹	Information sharing and marketing are important components to successful commute trip reduction strategies. Marketing strategies may include new employee orientation of trip reduction and alternative mode options, event promotions, and distributing publications. The TDM Coordinator would take on these marketing responsibilities.	---	\$2,300
Destination Accessibility	Destination accessibility is measured in terms of the number of jobs or other attractions reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones. The location of the project also increases the potential for pedestrians to walk and bike to these destinations and therefore reduces the VMT. As the cost is more realistically embedded in the cost of the land, the cost would be reflected in the land development around the NWC site.	N/A	N/A
Transit Fare Subsidy ²	Provide discount daily or monthly passes for on-site employees or long-term visitors at the National Western Center.	---	\$94,000
Unbundle Parking Costs	Unbundling separates parking from property costs, requiring those employees who wish to purchase parking spaces to do so at an additional cost from the property cost. This removes the burden from those who do not wish to utilize a parking space. Parking will be priced separately from office leases. An assumption is made that the parking costs are passed through to the vehicle owners/drivers utilizing the parking spaces.	TBD -Administrative cost could be subsidized by parking revneues	TBD -Administrative cost could be subsidized by parking revneues
Local Shuttles ³	Operation of shuttle service to nearby transportation hubs and major destinations.	---	\$2,900

Carshare Parking ⁴	Designating parking spaces for carshare vehicles near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$55,000	\$110,000
Secure Bicycle Parking ⁵	Short-term and long-term bicycle parking; may include a combination of bike racks, bike lockers, or secure bike stations	\$12,500	\$25,000
Valet Bicycle Parking ⁶	Similar to valets for automobiles, valet bike parking allows users to drop off bikes at a central location near an event entrance. Users receive a claim ticket and can also leave helmets and other bike accessories. By providing a secure and convenient parking area, users no longer need to worry about where to lock their bike, reducing anxiety. If provided in a highly visible location valet bike parking can also demonstrate to non-users that they can use the service during future events.	---	\$1,000
Preferential parking for 4+ carpools ⁷	Designating parking spaces for carpools and vanpools near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$22,000	\$66,000
Dedicated Carpool Pick-Up/Drop-Off ⁸	Designating carpool pick-up and drop-off locations clarifies where these activities occur and can prioritize their use by being provided at preferential curb locations. Designating the area using signage and/or paint can also serve as a marketing component to get others to consider carpooling as an option.	\$1,250	\$2,500
Multi-modal Wayfinding ⁹	Wayfinding allows users of all modes to quickly and easily navigate through the development to their destination. Transit wayfinding can help users find transit stops and can also provide information on routes, schedules, and instructions for using the system. Bicycle, pedestrian and automobile wayfinding can guide users to parking areas, walking and biking routes, and development amenities.	\$13,500	\$27,000
	Subtotal of Estimated One-time Capital Costs	\$26,000	\$52,000
	Subtotal of Estimated Annual Costs	\$74,000	\$278,000
	Total Estimated Cost (excluding TBD or N/A strategies; rounded to the nearest ten thousand)	\$100,000	\$330,000

Please note, the above costs are estimates and should be further studied and refined to accurately illustrate real projected costs. An estimated 188 employees are projected for this scenario.

¹Estimated \$8 per employee under moderate scenario and \$12 per employee under aggressive scenario.

²Estimated \$500 per employee

³Shuttle service based upon an estimated annual operating cost of \$140,000. Cost illustrated for a one week period.

⁴Parking space estimate is \$11,000 per stall (\$9,000 forgone parking revenue + \$2,000 stall O&M). Five stalls projected for moderate intervention and ten stalls for aggressive intervention.

⁵Estimated cost of approximately \$2,090 per bike locker and \$660 per bike rack. Five bike lockers and three bike racks for moderate intervention and ten bike lockers and six bike racks for aggressive intervention.

⁶Estimated cost of \$1,000 per large event for staffing and other associated costs.

⁷Parking space estimate is \$22,000 per stall (\$18,000 in forgone parking revenue + \$4,000 in stall O&M). One stall estimated for moderate intervention and three stalls for aggressive intervention.

⁸Estimate of \$250 per stall for curb space repurposing. Six stalls estimated for moderate intervention and 12 stalls for aggressive intervention.

⁹Approximate costs per sign range from \$530 to \$2,150. An average cost of \$1,340 was used in the above table. Ten signs of various sizes estimated for moderate intervention and 20 for aggressive intervention.

Chapter 3 - TDM Definitions and Cost Estimates

NWC TDM - Cost Estimates: Pre-Construction

Pre-Construction - Typical Day (Scenario 4)			
Strategy	Summary	Moderate Cost Estimate	Aggressive Cost Estimate
Carshare Parking ¹	Designating parking spaces for carshare vehicles near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$55,000	\$110,000
Secure Bicycle Parking ²	Short-term and long-term bicycle parking; may include a combination of bike racks, bike lockers, or secure bike stations	\$12,500	\$25,000
Multi-modal Wayfinding ³	Wayfinding allows users of all modes to quickly and easily navigate through the development to their destination. Transit wayfinding can help users find transit stops and can also provide information on routes, schedules, and instructions for using the system. Bicycle, pedestrian and automobile wayfinding can guide users to parking areas, walking and biking routes, and development amenities.	\$13,500	\$27,000
	Subtotal of Estimated One-time Capital Costs	\$26,000	\$52,000
	Subtotal of Estimated Annual Costs	\$54,000	\$108,000
	Total Estimated Cost (excluding TBD or N/A strategies; rounded to the nearest ten thousand)	\$80,000	\$160,000

Please note, the above costs are estimates and should be further studied and refined to accurately illustrate real projected costs. An estimated 224 employees are projected for this scenario.

¹Parking space estimate is \$11,000 per stall (\$9,000 forgone parking revenue + \$2,000 stall O&M). Five stalls projected for moderate intervention and ten stalls for aggressive intervention.

²Estimated cost of approximately \$2,090 per bike locker and \$660 per bike rack. Five bike lockers and three bike racks for moderate intervention and ten bike lockers and six bike racks for aggressive intervention.

³Approximate costs per sign range from \$530 to \$2,150. An average cost of \$1,340 was used in the above table. Ten signs of various sizes estimated for moderate intervention and 20 for aggressive intervention.

Chapter 3 - TDM Definitions and Cost Estimates

NWC TDM - Cost Estimates: Construction

To be copied over from Full Build (once confirmed)

Construction - Stock Show Weekend (Scenario 5)			
Strategy	Summary	Moderate Cost Estimate	Aggressive Cost Estimate
Transit Accessibility	With the addition of the N Line commuter rail, including a station on the National Western Center Campus, accessibility to high quality transit is assumed to improve and would result in a mode shift. The cost is not included as the new transit station is dependent upon RTD's future planned improvements.	N/A	N/A
Commute Trip Reduction Marketing ¹	Information sharing and marketing are important components to successful commute trip reduction strategies. Marketing strategies may include new employee orientation of trip reduction and alternative mode options, event promotions, and distributing publications. The TDM Coordinator would take on these marketing responsibilities.	\$10,800	\$16,200
Destination Accessibility	Destination accessibility is measured in terms of the number of jobs or other attractions reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones. The location of the project also increases the potential for pedestrians to walk and bike to these destinations and therefore reduces the VMT. As the cost is more realistically embedded in the cost of the land, the cost would be reflected in the land development around the NWC site.	N/A	N/A
Transit Fare Subsidy ²	Provide discount daily or monthly passes for on-site employees or long-term visitors at the National Western Center.	\$675,000	\$675,000
Unbundle Parking Costs	Unbundling separates parking from property costs, requiring those employees who wish to purchase parking spaces to do so at an additional cost from the property cost. This removes the burden from those who do not wish to utilize a parking space. Parking will be priced separately from office leases. An assumption is made that the parking costs are passed through to the vehicle owners/drivers utilizing the parking spaces.	TBD -Administrative cost could be subsidized by parking revneues	TBD -Administrative cost could be subsidized by parking revneues
Parking Supply Limits	The project will change parking requirements and types of supply within the project site to encourage "smart growth" development and alternative transportation choices by project residents and employees. This will be accomplished through the elimination (or reduction) of minimum parking requirements, creation of maximum parking requirements, and the provision of shared parking.	N/A	N/A

Local Shuttles ³	Operation of shuttle service to nearby transportation hubs and major destinations.	---	\$5,800
Carshare Parking ⁴	Designating parking spaces for carshare vehicles near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$55,000	\$110,000
Secure Bicycle Parking ⁵	Short-term and long-term bicycle parking; may include a combination of bike racks, bike lockers, or secure bike stations	\$12,500	\$25,000
Preferential parking for 4+ carpools ⁶	Designating parking spaces for carpools and vanpools near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$22,000	\$66,000
Dedicated Carpool Pick-Up/Drop-Off ⁷	Designating carpool pick-up and drop-off locations clarifies where these activities occur and can prioritize their use by being provided at preferential curb locations. Designating the area using signage and/or paint can also serve as a marketing component to get others to consider carpooling as an option.	\$1,250	\$2,500
Multi-modal Wayfinding ⁸	Wayfinding allows users of all modes to quickly and easily navigate through the development to their destination. Transit wayfinding can help users find transit stops and can also provide information on routes, schedules, and instructions for using the system. Bicycle, pedestrian and automobile wayfinding can guide users to parking areas, walking and biking routes, and development amenities.	\$13,500	\$27,000
	Subtotal of Estimated One-time Capital Costs	\$26,000	\$52,000
	Subtotal of Estimated Annual Costs	\$764,000	\$878,000
	Total Estimated Cost (excluding TBD or N/A strategies; rounded to the nearest ten thousand)	\$790,000	\$930,000

Please note, the above costs are estimates and should be further studied and refined to accurately illustrate real projected costs. An estimated 1,350 employees are projected for this scenario.

¹Estimated \$8 per employee under moderate scenario and \$12 per employee under aggressive scenario.

²Estimated \$500 per employee

³Shuttle service based upon an estimated annual operating cost of \$140,000. Cost illustrated for a two week period.

⁴Parking space estimate is \$11,000 per stall (\$9,000 forgone parking revenue + \$2,000 stall O&M). Five stalls projected for moderate intervention and ten stalls for aggressive intervention.

⁵Estimated cost of approximately \$2,090 per bike locker and \$660 per bike rack. Five bike lockers and three bike racks for moderate intervention and ten bike lockers and six bike racks for aggressive intervention.

⁶Parking space estimate is \$22,000 per stall (\$18,000 in forgone parking revenue + \$4,000 in stall O&M). One stall estimated for moderate intervention and three stalls for aggressive intervention.

⁷Estimate of \$250 per stall for curb space repurposing. Six stalls estimated for moderate intervention and 12 stalls for aggressive intervention.

⁸Approximate costs per sign range from \$530 to \$2,150. An average cost of \$1,340 was used in the above table. Ten signs of various sizes estimated for moderate intervention and 20 for aggressive intervention.

Chapter 3 - TDM Definitions and Cost Estimates

NWC TDM - Cost Estimates: Construction

To be copied over from Full Build (once confirmed)

Construction - Large / Concurrent Event (Scenario 6)			
Strategy	Summary	Moderate Cost Estimate	Aggressive Cost Estimate
Transit Accessibility	With the addition of the N Line commuter rail, including a station on the National Western Center Campus, accessibility to high quality transit is assumed to improve and would result in a mode shift. The cost is not included as the new transit station is dependent upon RTD's future planned improvements.	N/A	N/A
Commute Trip Reduction Marketing ¹	Information sharing and marketing are important components to successful commute trip reduction strategies. Marketing strategies may include new employee orientation of trip reduction and alternative mode options, event promotions, and distributing publications. The TDM Coordinator would take on these marketing responsibilities.	\$1,550	\$2,300
Destination Accessibility	Destination accessibility is measured in terms of the number of jobs or other attractions reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones. The location of the project also increases the potential for pedestrians to walk and bike to these destinations and therefore reduces the VMT. As the cost is more realistically embedded in the cost of the land, the cost would be reflected in the land development around the NWC site.	N/A	N/A
Transit Fare Subsidy ²	Provide discount daily or monthly passes for on-site employees or long-term visitors at the National Western Center.	\$97,000	\$97,000
Unbundle Parking Costs	Unbundling separates parking from property costs, requiring those employees who wish to purchase parking spaces to do so at an additional cost from the property cost. This removes the burden from those who do not wish to utilize a parking space. Parking will be priced separately from office leases. An assumption is made that the parking costs are passed through to the vehicle owners/drivers utilizing the parking spaces.	TBD -Administrative cost could be subsidized by parking revneues	TBD -Administrative cost could be subsidized by parking revneues
Parking Supply Limits	The project will change parking requirements and types of supply within the project site to encourage "smart growth" development and alternative transportation choices by project residents and employees. This will be accomplished through the elimination (or reduction) of minimum parking requirements, creation of maximum parking requirements, and the provision of shared parking.	N/A	N/A

Local Shuttles ³	Operation of shuttle service to nearby transportation hubs and major destinations.	---	\$2,900
Carshare Parking ⁴	Designating parking spaces for carshare vehicles near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$55,000	\$110,000
Secure Bicycle Parking ⁵	Short-term and long-term bicycle parking; may include a combination of bike racks, bike lockers, or secure bike stations	\$12,500	\$25,000
Valet Bicycle Parking ⁶	Similar to valets for automobiles, valet bike parking allows users to drop off bikes at a central location near an event entrance. Users receive a claim ticket and can also leave helmets and other bike accessories. By providing a secure and convenient parking area, users no longer need to worry about where to lock their bike, reducing anxiety. If provided in a highly visible location valet bike parking can also demonstrate to non-users that they can use the service during future events.	---	\$1,000
Preferential parking for 4+ carpools ⁷	Designating parking spaces for carpools and vanpools near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$22,000	\$66,000
Dedicated Carpool Pick-Up/Drop-Off ⁸	Designating carpool pick-up and drop-off locations clarifies where these activities occur and can prioritize their use by being provided at preferential curb locations. Designating the area using signage and/or paint can also serve as a marketing component to get others to consider carpooling as an option.	\$1,250	\$2,500
Multi-modal Wayfinding ⁹	Wayfinding allows users of all modes to quickly and easily navigate through the development to their destination. Transit wayfinding can help users find transit stops and can also provide information on routes, schedules, and instructions for using the system. Bicycle, pedestrian and automobile wayfinding can guide users to parking areas, walking and biking routes, and development amenities.	\$13,500	\$27,000
	Subtotal of Estimated One-time Capital Costs	\$26,000	\$52,000
	Subtotal of Estimated Annual Costs	\$174,000	\$278,000
	Total Estimated Cost (excluding TBD or N/A strategies; rounded to the nearest ten thousand)	\$200,000	\$330,000

Please note, the above costs are estimates and should be further studied and refined to accurately illustrate real projected costs. An estimated 194 employees are projected for this scenario.

¹Estimated \$8 per employee under moderate scenario and \$12 per employee under aggressive scenario.

²Estimated \$500 per employee

³Shuttle service based upon an estimated annual operating cost of \$140,000. Cost illustrated for a one week period.

⁴Parking space estimate is \$11,000 per stall (\$9,000 forgone parking revenue + \$2,000 stall O&M). Five stalls projected for moderate intervention and ten stalls for aggressive intervention.

⁵Estimated cost of approximately \$2,090 per bike locker and \$660 per bike rack. Five bike lockers and three bike racks for moderate intervention and ten bike lockers and six bike racks for aggressive intervention.

⁶Estimated cost of \$1,000 per large event for staffing and other associated costs.

⁷Parking space estimate is \$22,000 per stall (\$18,000 in forgone parking revenue + \$4,000 in stall O&M). One stall estimated for moderate intervention and three stalls for aggressive intervention.

⁸Estimate of \$250 per stall for curb space repurposing. Six stalls estimated for moderate intervention and 12 stalls for aggressive intervention.

⁹Approximate costs per sign range from \$530 to \$2,150. An average cost of \$1,340 was used in the above table. Ten signs of various sizes estimated for moderate intervention and 20 for aggressive intervention.

Chapter 3 - TDM Definitions and Cost Estimates

NWC TDM - Cost Estimates: Construction

To be copied over from Full Build (once confirmed)

Construction - Typical Day (Scenario 7)			
Strategy	Summary	Moderate Cost Estimate	Aggressive Cost Estimate
Carshare Parking ¹	Designating parking spaces for carshare vehicles near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$55,000	\$110,000
Secure Bicycle Parking ²	Short-term and long-term bicycle parking; may include a combination of bike racks, bike lockers, or secure bike stations	\$12,500	\$25,000
Multi-modal Wayfinding ³	Wayfinding allows users of all modes to quickly and easily navigate through the development to their destination. Transit wayfinding can help users find transit stops and can also provide information on routes, schedules, and instructions for using the system. Bicycle, pedestrian and automobile wayfinding can guide users to parking areas, walking and biking routes, and development amenities.	\$13,500	\$27,000
	Subtotal of Estimated One-time Capital Costs	\$26,000	\$52,000
	Subtotal of Estimated Annual Costs	\$54,000	\$108,000
	Total Estimated Cost (excluding TBD or N/A strategies; rounded to the nearest ten thousand)	\$80,000	\$160,000

Please note, the above costs are estimates and should be further studied and refined to accurately illustrate real projected costs. An estimated 224 employees are projected for this scenario.

¹Parking space estimate is \$11,000 per stall (\$9,000 forgone parking revenue + \$2,000 stall O&M). Five stalls projected for moderate intervention and ten stalls for aggressive intervention.

²Estimated cost of approximately \$2,090 per bike locker and \$660 per bike rack. Five bike lockers and three bike racks for moderate intervention and ten bike lockers and six bike racks for aggressive intervention.

³Approximate costs per sign range from \$530 to \$2,150. An average cost of \$1,340 was used in the above table. Ten signs of various sizes estimated for moderate intervention and 20 for aggressive intervention.

Chapter 3 - TDM Definitions and Cost Estimates

NWC TDM - Cost Estimates: Operational

To be copied over from Full Build (once confirmed)

Operational - Stock Show Weekend (Scenario 8)			
Strategy	Summary	Moderate Cost Estimate	Aggressive Cost Estimate
Carshare Program ¹	On-demand access to a fleet of shared vehicles; User fees are typically collected through annual membership, mileage and hourly rates.	---	\$69,000
Land Use Diversity	Having different types of land uses near one another can decrease VMT since trips between land use types are shorter and may be accommodated by non-auto modes of transport. For example when residential areas are in the same neighborhood as retail and office buildings, a resident does not need to travel outside of the neighborhood to meet his/her trip needs. The cost estimate is not included here as the land use development will be determined by future plans and development.	N/A	N/A
Transit Network Expansion ²	Expanding the bus and rail network on and near the National Western Site affords employees and visitors a wider range of transportation options. The cost is not included as the transit network expansion is dependent upon RTD's future planned improvements.	\$10,400	\$20,800
Pedestrian Network ³	This would require coordination with local jurisdictions to expand and improve pedestrian networks around the National Western Center. There would be a cost to NWC for on site improvements. There would be a cost to local land owners for off site improvements.	\$650,000	\$700,000
Transit Frequency/Speed ⁴	Work with RTD to reduce headways during peak travel times, increase reliability, create express bus lines with limited stop service, and implement feasible operational improvements such as transit signal priority and queue jumping.	\$4,200	\$8,400
Transit Accessibility	With the addition of the N Line commuter rail, including a station on the National Western Center Campus, accessibility to high quality transit is assumed to improve and would result in a mode shift. The cost is not included as the new transit station is dependent upon RTD's future planned improvements.	N/A	N/A

Commute Trip Reduction Marketing ⁵	Information sharing and marketing are important components to successful commute trip reduction strategies. Marketing strategies may include new employee orientation of trip reduction and alternative mode options, event promotions, and distributing publications.	13,500	\$20,200
The TDM Coordinator would take on these marketing responsibilities.			
Destination Accessibility	Destination accessibility is measured in terms of the number of jobs or other attractions reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones. The location of the project also increases the potential for pedestrians to walk and bike to these destinations and therefore reduces the VMT. As the cost is more realistically embedded in the cost of the land, the cost would be reflected in the land development around the NWC site.	N/A	N/A
Transit Fare Subsidy ⁶	Provide discount daily or monthly passes for on-site employees or long-term visitors at the National Western Center.	\$840,500	\$840,500
Unbundle Parking Costs	Unbundling separates parking from property costs, requiring those employees who wish to purchase parking spaces to do so at an additional cost from the property cost. This removes the burden from those who do not wish to utilize a parking space. Parking will be priced separately from office leases. An assumption is made that the parking costs are passed through to the vehicle owners/drivers utilizing the parking spaces.	TBD -Administrative cost could be subsidized by parking revneues	TBD -Administrative cost could be subsidized by parking revneues
Parking Supply Limits	The project will change parking requirements and types of supply within the project site to encourage "smart growth" development and alternative transportation choices by project residents and employees. This will be accomplished through the elimination (or reduction) of minimum parking requirements, creation of maximum parking requirements, and the provision of shared parking.	N/A	N/A
Traffic Calming ⁷	Providing traffic calming measures encourages people to walk or bike instead of using a vehicle. This mode shift will result in a decrease in VMT. Project design will include pedestrian/bicycle safety and traffic calming measures in excess of jurisdiction requirements. Both internal roadways within the development as well as external roadways leading to the development will be designed to reduce motor vehicle speeds and encourage pedestrian and bicycle trips with traffic calming features. Traffic calming features may include: marked crosswalks, count-down signal timers, curb extensions, speed tables, raised crosswalks, raised intersections, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, and others.	\$50,000	\$100,000
Local Shuttles ⁸	Operation of shuttle service to nearby transportation hubs and major destinations.	\$5,800	\$5,800

Guaranteed Ride Home	Guaranteed Ride Home is a benefit to EcoPass Holders. As such, this strategy would be complimentary to Transit Fare Subsidy and would require minimal additional fees for EcoPass holders. Additional fees would be incurred for non-EcoPass holders.	---	N/A
Subsidized Carshare Membership ⁹	A carshare system membership allows users to pay a monthly or yearly fee to use the carshare program. This fee could be subsidized by employers to further incentivize use.	---	\$185,000
Carshare Parking ¹⁰	Designating parking spaces for carshare vehicles near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$55,000	\$110,000
Secure Bicycle Parking ¹¹	Short-term and long-term bicycle parking; may include a combination of bike racks, bike lockers, or secure bike stations	\$12,500	\$25,000
Valet Bicycle Parking ¹²	Similar to valets for automobiles, valet bike parking allows users to drop off bikes at a central location near an event entrance. Users receive a claim ticket and can also leave helmets and other bike accessories. By providing a secure and convenient parking area, users no longer need to worry about where to lock their bike, reducing anxiety. If provided in a highly visible location valet bike parking can also demonstrate to non-users that they can use the service during future events.	\$800	\$1,000
Preferential parking for 4+ carpools ¹³	Designating parking spaces for carpools and vanpools near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$22,000	\$66,000
Dedicated Carpool Pick-Up/Drop-Off ¹⁴	Designating carpool pick-up and drop-off locations clarifies where these activities occur and can prioritize their use by being provided at preferential curb locations. Designating the area using signage and/or paint can also serve as a marketing component to get others to consider carpooling as an option.	\$1,250	\$2,500

Multi-modal Wayfinding ¹⁵	Wayfinding allows users of all modes to quickly and easily navigate through the development to their destination. Transit wayfinding can help users find transit stops and can also provide information on routes, schedules, and instructions for using the system. Bicycle, pedestrian and automobile wayfinding can guide users to parking areas, walking and biking routes, and development amenities.	<i>\$13,500</i>	<i>\$27,000</i>
Real time transit displays ¹⁶	Real time information about travel conditions simplifies transportation choices and removes anxiety about using transit.	<i>\$4,000</i>	<i>\$12,000</i>
Bikeshare Station ¹⁷	On-demand access to a fleet of shared bicycles. Provide convenient locations on National Western Center site and near site for users. Work with Denver Bcycle to coordinate convenient station locations.	<i>\$50,000</i>	<i>\$100,000</i>
Electric Bikeshare Program ¹⁸	On-demand access to a fleet of shared electric bicycles.	<i>\$100,000</i>	<i>\$200,000</i>
Bikeshare Membership ¹⁹	A bike share system membership allows users to pay a monthly or yearly fee to use the electric bike share program. This fee could be subsidized by employers to further incentivize use.	<i>\$160,000</i>	<i>\$160,000</i>
End of trip facilities (showers, lockers, repair station) ²⁰	End-of-trip cycling facilities are an important component of encouraging cycling to and from the work place. This includes bicycle repair stands and pumps and showers and changing facilities. These amenities allow cyclists to arrive to work and be more comfortable throughout their workday.	<i>\$1,000</i>	<i>\$1,000</i>
Internal Fleet of bicycles ²¹	An internal fleet of bicycles offers free bicycles to employees to use during the day for short trips. Unlike a formal bike share, there are no membership fees or hourly rates. This allows users to use other modes like carpools or transit to commute, but provides them with a mobility option during the day.	<i>\$4,000</i>	<i>\$8,000</i>

TDM Coordinator ²²	A full-time employee of the National Western Center who works with the various tenants to implement TDM strategies and build tenant relationships. This role would include marketing, outreach, a strong understanding of TDM, general understanding of transportation planning and engineering, and a regional context.	\$100,000	\$100,000
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Online Mobility Platform ²³	A comprehensive commute planning, on-demand ride-share matching, real-time transit arrival times, bicycle route mapping, traffic information and parking availability	\$12,000	\$48,000
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	<i>Subtotal of Estimated One-time Capital Costs</i>	<i>\$885,000</i>	<i>\$1,173,000</i>
	<i>Subtotal of Estimated Annual Costs</i>	<i>\$1,225,000</i>	<i>\$1,637,000</i>
	Total Estimated Cost <i>(excluding TBD or N/A strategies; rounded to the nearest ten thousand)</i>	\$2,110,000	\$2,810,000

Please note, the above costs are estimates and should be further studied and refined to accurately illustrate real projected costs. An estimated 1,681 employees are projected for this scenario.

¹Estimated per stall cost of \$13,700 (approximately \$2,700 carshare fees + \$9,000 forgone parking revenue + \$2,000 stall O&M). Five parking stalls estimated under aggressive intervention.

²Estimated annual cost of \$250,000 for expansion of bus routes with RTD. Cost illustrated for two week period. Source: CU-Boulder Transportation Master Plan (2011)

³Costs illustrate an estimate for additional pedestrian infrastructure supporting connections around the site. Estimated cost of \$650,000 for moderate intervention and \$700,000 for aggressive intervention.

⁴Estimated annual cost of \$100,000 for increase in bus frequency per route in partnership with RTD. Illustrated cost is for a two week period. Source: CU-Boulder Transportation Master Plan (2011)

⁵Estimated \$8 per employee under moderate scenario and \$12 per employee under aggressive scenario.

⁶Estimated \$500 per employee

⁷Estimate based upon approximate cost of \$10,000 per small scale traffic calming project. Moderate and aggressive intervention costs estimated on a per project basis, five and ten respectively. Source: City of Boulder Neighborhood Speed Management Program Guidelines (2017)

⁸Shuttle service based upon an estimated annual operating cost of \$140,000. Cost illustrated for a two week period.

⁹Estimated cost of \$110 per employee

¹⁰Parking space estimate is \$11,000 per stall (\$9,000 forgone parking revenue + \$2,000 stall O&M). Five stalls projected for moderate intervention and ten stalls for aggressive intervention.

¹¹Estimated cost of approximately \$2,090 per bike locker and \$660 per bike rack. Five bike lockers and three bike racks for moderate intervention and ten bike lockers and six bike racks for aggressive intervention.

¹²Estimated cost of \$800 for moderate intervention and \$1,000 for aggressive intervention per large event for staffing and other associated costs.

¹³Parking space estimate is \$22,000 per stall (\$18,000 in forgone parking revenue + \$4,000 in stall O&M). One stall estimated for moderate intervention and three stalls for aggressive intervention.

¹⁴Estimate of \$250 per stall for curb space repurposing. Six stalls estimated for moderate intervention and 12 stalls for aggressive intervention.

¹⁵Approximate costs per sign range from \$530 to \$2,150. An average cost of \$1,340 was used in the above table. Ten signs of various sizes estimated for moderate intervention and 20 for aggressive intervention.

¹⁶Estimated cost of \$2,000 per unit. Two displays proposed for moderate intervention and six displays proposed for aggressive intervention.

¹⁷Approximate cost of \$50,000 per B-Cycle station with current technology. One station estimated for moderate intervention and two stations estimated for aggressive intervention.

¹⁸According to study, electric bicycle stations cost approximately twice as much as traditional. An estimated cost of \$100,000 per stations was used reflecting twice the cost of a traditional B-Cycle station. One station estimated for moderate intervention and two stations for aggressive intervention. Source: City of Wilmington Bike Share Feasibility Analysis

¹⁹Estimated \$95 per employee

²⁰Approximate cost per repair station is \$1,000. other facilities could be provided offsite. One facility estimated for both interventions.

²¹Estimated cost of \$300-\$500 per bike. Above estimate reflects an average of \$400 per bike. Ten bikes estimated for moderate intervention and 20 for aggressive intervention.

²²Estimated cost of \$100,000 for employment of a TDM Coordinator.

²³Estimated cost of \$12,000 annually for moderate intervention and \$48,000 annually for aggressive intervention.

Chapter 3 - TDM Definitions and Cost Estimates

NWC TDM - Cost Estimates: Operational

To be copied over from Full Build (once confirmed)

Operational - Large / Concurrent Event (Scenario 9)			
Strategy	Summary	Moderate Cost Estimate	Aggressive Cost Estimate
Carshare Program ¹	On-demand access to a fleet of shared vehicles; User fees are typically collected through annual membership, mileage and hourly rates.	---	\$69,000
Land Use Diversity	Having different types of land uses near one another can decrease VMT since trips between land use types are shorter and may be accommodated by non-auto modes of transport. For example when residential areas are in the same neighborhood as retail and office buildings, a resident does not need to travel outside of the neighborhood to meet his/her trip needs. The cost estimate is not included here as the land use development will be determined by future plans and development.	N/A	N/A
Transit Network Expansion ²	Expanding the bus and rail network on and near the National Western Site affords employees and visitors a wider range of transportation options. The cost is not included as the transit network expansion is dependent upon RTD's future planned improvements.	\$5,200	\$10,400
Pedestrian Network ³	This would require coordination with local jurisdictions to expand and improve pedestrian networks around the National Western Center. There would be a cost to NWC for on site improvements. There would be a cost to local land owners for off site improvements.	\$650,000	\$700,000
Transit Frequency/Speed ⁴	Work with RTD to reduce headways during peak travel times, increase reliability, create express bus lines with limited stop service, and implement feasible operational improvements such as transit signal priority and queue jumping.	\$2,100	\$4,200
Transit Accessibility	With the addition of the N Line commuter rail, including a station on the National Western Center Campus, accessibility to high quality transit is assumed to improve and would result in a mode shift. The cost is not included as the new transit station is dependent upon RTD's future planned improvements.	N/A	N/A

Commute Trip Reduction Marketing ⁵	Information sharing and marketing are important components to successful commute trip reduction strategies. Marketing strategies may include new employee orientation of trip reduction and alternative mode options, event promotions, and distributing publications.	\$2,400	\$3,600
The TDM Coordinator would take on these marketing responsibilities.			
Destination Accessibility	Destination accessibility is measured in terms of the number of jobs or other attractions reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones. The location of the project also increases the potential for pedestrians to walk and bike to these destinations and therefore reduces the VMT. As the cost is more realistically embedded in the cost of the land, the cost would be reflected in the land development around the NWC site.	N/A	N/A
Transit Fare Subsidy ⁶	Provide discount daily or monthly passes for on-site employees or long-term visitors at the National Western Center.	\$150,500	\$150,500
Unbundle Parking Costs	Unbundling separates parking from property costs, requiring those employees who wish to purchase parking spaces to do so at an additional cost from the property cost. This removes the burden from those who do not wish to utilize a parking space. Parking will be priced separately from office leases. An assumption is made that the parking costs are passed through to the vehicle owners/drivers utilizing the parking spaces.	TBD -Administrative cost could be subsidized by parking revneues	TBD -Administrative cost could be subsidized by parking revneues
Parking Supply Limits	The project will change parking requirements and types of supply within the project site to encourage "smart growth" development and alternative transportation choices by project residents and employees. This will be accomplished through the elimination (or reduction) of minimum parking requirements, creation of maximum parking requirements, and the provision of shared parking.	---	N/A
Traffic Calming ⁷	Providing traffic calming measures encourages people to walk or bike instead of using a vehicle. This mode shift will result in a decrease in VMT. Project design will include pedestrian/bicycle safety and traffic calming measures in excess of jurisdiction requirements. Both internal roadways within the development as well as external roadways leading to the development will be designed to reduce motor vehicle speeds and encourage pedestrian and bicycle trips with traffic calming features. Traffic calming features may include: marked crosswalks, count-down signal timers, curb extensions, speed tables, raised crosswalks, raised intersections, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, and others.	\$50,000	\$100,000
Local Shuttles ⁸	Operation of shuttle service to nearby transportation hubs and major destinations.	\$2,900	\$2,900

Guaranteed Ride Home	Guaranteed Ride Home is a benefit to EcoPass Holders. As such, this strategy would be complimentary to Transit Fare Subsidy and would require minimal additional fees for EcoPass holders. Additional fees would be incurred for non-EcoPass holders.	N/A	N/A
Subsidized Carshare Membership ⁹	A carshare system membership allows users to pay a monthly or yearly fee to use the carshare program. This fee could be subsidized by employers to further incentivize use.	\$33,100	\$33,100
Carshare Parking ¹⁰	Designating parking spaces for carshare vehicles near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$55,000	\$110,000
Secure Bicycle Parking ¹¹	Short-term and long-term bicycle parking; may include a combination of bike racks, bike lockers, or secure bike stations	<i>\$12,500</i>	<i>\$25,000</i>
Valet Bicycle Parking ¹²	Similar to valets for automobiles, valet bike parking allows users to drop off bikes at a central location near an event entrance. Users receive a claim ticket and can also leave helmets and other bike accessories. By providing a secure and convenient parking area, users no longer need to worry about where to lock their bike, reducing anxiety. If provided in a highly visible location valet bike parking can also demonstrate to non-users that they can use the service during future events.	\$800	\$1,000
Preferential parking for 4+ carpools ¹³	Designating parking spaces for carpools and vanpools near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$22,000	\$66,000
Dedicated Carpool Pick-Up/Drop-Off ¹⁴	Designating carpool pick-up and drop-off locations clarifies where these activities occur and can prioritize their use by being provided at preferential curb locations. Designating the area using signage and/or paint can also serve as a marketing component to get others to consider carpooling as an option.	\$1,250	\$2,500

Multi-modal Wayfinding ¹⁵	Wayfinding allows users of all modes to quickly and easily navigate through the development to their destination. Transit wayfinding can help users find transit stops and can also provide information on routes, schedules, and instructions for using the system. Bicycle, pedestrian and automobile wayfinding can guide users to parking areas, walking and biking routes, and development amenities.	<i>\$13,500</i>	<i>\$27,000</i>
Real time transit displays ¹⁶	Real time information about travel conditions simplifies transportation choices and removes anxiety about using transit.	<i>\$4,000</i>	<i>\$12,000</i>
Bikeshare Station ¹⁷	On-demand access to a fleet of shared bicycles. Provide convenient locations on National Western Center site and near site for users. Work with Denver Bcycle to coordinate convenient station locations.	<i>\$50,000</i>	<i>\$100,000</i>
Electric Bikeshare Program ¹⁸	On-demand access to a fleet of shared electric bicycles.	<i>\$100,000</i>	<i>\$200,000</i>
Bikeshare Membership ¹⁹	A bike share system membership allows users to pay a monthly or yearly fee to use the electric bike share program. This fee could be subsidized by employers to further incentivize use.	<i>\$28,600</i>	<i>\$28,600</i>
End of trip facilities (showers, lockers, repair station) ²⁰	End-of-trip cycling facilities are an important component of encouraging cycling to and from the work place. This includes bicycle repair stands and pumps and showers and changing facilities. These amenities allow cyclists to arrive to work and be more comfortable throughout their workday.	<i>\$1,000</i>	<i>\$1,000</i>
Internal Fleet of bicycles ²¹	An internal fleet of bicycles offers free bicycles to employees to use during the day for short trips. Unlike a formal bike share, there are no membership fees or hourly rates. This allows users to use other modes like carpools or transit to commute, but provides them with a mobility option during the day.	<i>\$4,000</i>	<i>\$8,000</i>

TDM Coordinator ²²	A full-time employee of the National Western Center who works with the various tenants to implement TDM strategies and build tenant relationships. This role would include marketing, outreach, a strong understanding of TDM, general understanding of transportation planning and engineering, and a regional context.	\$100,000	\$100,000
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Online Mobility Platform ²³	A comprehensive commute planning, on-demand ride-share matching, real-time transit arrival times, bicycle route mapping, traffic information and parking availability	\$12,000	\$48,000
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	<i>Subtotal of Estimated One-time Capital Costs</i>	<i>\$885,000</i>	<i>\$1,173,000</i>
	<i>Subtotal of Estimated Annual Costs</i>	<i>\$415,000</i>	<i>\$627,000</i>
	Total Estimated Cost <i>(excluding TBD or N/A strategies; rounded to the nearest ten thousand)</i>	\$1,300,000	\$1,800,000

Please note, the above costs are estimates and should be further studied and refined to accurately illustrate real projected costs. An estimated 301 employees are projected for this scenario.

¹Estimated per stall cost of \$13,700 (approximately \$2,700 carshare fees + \$9,000 forgone parking revenue + \$2,000 stall O&M). Five parking stalls estimated under aggressive intervention.

²Estimated annual cost of \$250,000 per bus route expansion with RTD. Cost illustrated for one week period with one route under moderate intervention and two routes for aggressive intervention. Source: CU-Boulder Transportation Master Plan (2011)

³Costs illustrate an estimate for additional pedestrian infrastructure supporting connections around the site. Estimated cost of \$650,000 for moderate intervention and \$700,000 for aggressive intervention.

⁴Estimated annual cost of \$100,000 for increase in bus frequency per route in partnership with RTD. Illustrated cost is for a one week period with one route under moderate intervention and two routes for aggressive intervention. Source: CU-Boulder Transportation Master Plan (2011)

⁵Estimated \$8 per employee under moderate scenario and \$12 per employee under aggressive scenario.

⁶Estimated \$500 per employee

⁷Estimate based upon approximate cost of \$10,000 per small scale traffic calming project. Moderate and aggressive intervention costs estimated on a per project basis, five and ten respectively. Source: City of Boulder Neighborhood Speed Management Program Guidelines (2017)

⁸Shuttle service based upon an estimated annual operating cost of \$140,000. Cost illustrated for a one week period.

⁹Estimated cost of \$110 per employee

¹⁰Parking space estimate is \$11,000 per stall (\$9,000 forgone parking revenue + \$2,000 stall O&M). Five stalls projected for moderate intervention and ten stalls for aggressive intervention.

¹¹Estimated cost of approximately \$2,090 per bike locker and \$660 per bike rack. Five bike lockers and three bike racks for moderate intervention and ten bike lockers and six bike racks for aggressive intervention.

¹²Estimated cost of \$800 for moderate intervention and \$1,000 for aggressive intervention per large event for staffing and other associated costs.

¹³Parking space estimate is \$22,000 per stall (\$18,000 in forgone parking revenue + \$4,000 in stall O&M). One stall estimated for moderate intervention and three stalls for aggressive intervention.

¹⁴Estimate of \$250 per stall for curb space repurposing. Six stalls estimated for moderate intervention and 12 stalls for aggressive intervention.

¹⁵Approximate costs per sign range from \$530 to \$2,150. An average cost of \$1,340 was used in the above table. Ten signs of various sizes estimated for moderate intervention and 20 for aggressive intervention.

¹⁶Estimated cost of \$2,000 per unit. Two displays proposed for moderate intervention and six displays proposed for aggressive intervention.

¹⁷Approximate cost of \$50,000 per B-Cycle station with current technology. One station estimated for moderate intervention and two stations estimated for aggressive intervention.

¹⁸According to study, electric bicycle stations cost approximately twice as much as traditional. An estimated cost of \$100,000 per stations was used reflecting twice the cost of a traditional B-Cycle station. One station estimated for moderate intervention and two stations for aggressive intervention. Source: City of Wilmington Bike Share Feasibility Analysis

¹⁹Estimated \$95 per employee

²⁰Approximate cost per repair station is \$1,000. other facilities could be provided offsite. One facility estimated for both interventions.

²¹Estimated cost of \$300-\$500 per bike. Above estimate reflects an average of \$400 per bike. Ten bikes estimated for moderate intervention and 20 for aggressive intervention.

²²Estimated cost of \$100,000 for employment of a TDM Coordinator.

²³Estimated cost of \$12,000 annually for moderate intervention and \$48,000 annually for aggressive intervention.

Chapter 3 - TDM Definitions and Cost Estimates

NWC TDM - Cost Estimates: Operational

To be copied over from Full Build (once confirmed)

Operation - Typical Day (Scenario 10)			
Strategy	Summary	Moderate Cost Estimate	Aggressive Cost Estimate
Carshare Program ¹	On-demand access to a fleet of shared vehicles; User fees are typically collected through annual membership, mileage and hourly rates.	---	\$69,000
Land Use Diversity	Having different types of land uses near one another can decrease VMT since trips between land use types are shorter and may be accommodated by non-auto modes of transport. For example when residential areas are in the same neighborhood as retail and office buildings, a resident does not need to travel outside of the neighborhood to meet his/her trip needs. The cost estimate is not included here as the land use development will be determined by future plans and development.	N/A	N/A
Transit Network Expansion ²	Expanding the bus and rail network on and near the National Western Site affords employees and visitors a wider range of transportation options. The cost is not included as the transit network expansion is dependent upon RTD's future planned improvements.	\$250,000	\$500,000
Pedestrian Network ³	This would require coordination with local jurisdictions to expand and improve pedestrian networks around the National Western Center. There would be a cost to NWC for on site improvements. There would be a cost to local land owners for off site improvements.	\$650,000	\$700,000
Rideshare Program ⁴	Increasing vehicle occupancy rates by promoting ridesharing options would result in fewer cars driving the same trip to/from the NWC. This would include designation specific parking stalls for ridesharing vehicles, designating unloading/loading areas, and providing messaging for coordinating rides.	---	\$66,000
Transit Frequency/Speed ⁵	Work with RTD to reduce headways during peak travel times, increase reliability, create express bus lines with limited stop service, and implement feasible operational improvements such as transit signal priority and queue jumping.	\$100,000	\$200,000

Transit Accessibility	With the addition of the N Line commuter rail, including a station on the National Western Center Campus, accessibility to high quality transit is assumed to improve and would result in a mode shift. The cost is not included as the new transit station is dependent upon RTD's future planned improvements.	N/A	N/A
Commute Trip Reduction Marketing ⁶	Information sharing and marketing are important components to successful commute trip reduction strategies. Marketing strategies may include new employee orientation of trip reduction and alternative mode options, event promotions, and distributing publications. The TDM Coordinator would take on these marketing responsibilities.	\$3,000	\$4,400
Destination Accessibility	Destination accessibility is measured in terms of the number of jobs or other attractions reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones. The location of the project also increases the potential for pedestrians to walk and bike to these destinations and therefore reduces the VMT. As the cost is more realistically embedded in the cost of the land, the cost would be reflected in the land development around the NWC site.	N/A	N/A
Employee Parking Cash-Out ⁷	The NWC would allow employer to provide employees with a choice of forgoing their current subsidized/free parking for a cash payment equivalent to the cost of the parking space to the employer.	\$202,000	\$407,000
Employer Sponsored Vanpool/Shuttle ⁸	Purchased or leased vans for commute use and the formation of vanpools; Shuttles providing employees direct access to transit stations and other primary destinations.	---	\$24,000
Transit Fare Subsidy ⁹	Provide discount daily or monthly passes for on-site employees or long-term visitors at the National Western Center.	\$185,000	\$185,000
Unbundle Parking Costs	Unbundling separates parking from property costs, requiring those employees who wish to purchase parking spaces to do so at an additional cost from the property cost. This removes the burden from those who do not wish to utilize a parking space. Parking will be priced separately from office leases. An assumption is made that the parking costs are passed through to the vehicle owners/drivers utilizing the parking spaces.	TBD -Administrative cost could be subsidized by parking revneues	TBD -Administrative cost could be subsidized by parking revneues

Workplace Parking Pricing	Parking disincentives may include charging employees for parking, above market rate pricing, or not providing employee parking.	TBD -Administrative cost could be subsidized by parking revneues	TBD -Administrative cost could be subsidized by parking revneues
Parking Supply Limits	The project will change parking requirements and types of supply within the project site to encourage "smart growth" development and alternative transportation choices by project residents and employees. This will be accomplished through the elimination (or reduction) of minimum parking requirements, creation of maximum parking requirements, and the provision of shared parking.	N/A	N/A
Traffic Calming ¹⁰	Providing traffic calming measures encourages people to walk or bike instead of using a vehicle. This mode shift will result in a decrease in VMT. Project design will include pedestrian/bicycle safety and traffic calming measures in excess of jurisdiction requirements. Both internal roadways within the development as well as external roadways leading to the development will be designed to reduce motor vehicle speeds and encourage pedestrian and bicycle trips with traffic calming features. Traffic calming features may include: marked crosswalks, count-down signal timers, curb extensions, speed tables, raised crosswalks, raised intersections, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, and others.	\$50,000	\$100,000
Local Shuttles ¹¹	Operation of shuttle service to nearby transportation hubs and major destinations.	\$140,000	\$140,000
Carshare Parking ¹²	Designating parking spaces for carshare vehicles near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$55,000	\$110,000
Secure Bicycle Parking ¹³	Short-term and long-term bicycle parking; may include a combination of bike racks, bike lockers, or secure bike stations	\$12,500	\$25,000
Multi-modal Wayfinding ¹⁴	Wayfinding allows users of all modes to quickly and easily navigate through the development to their destination. Transit wayfinding can help users find transit stops and can also provide information on routes, schedules, and instructions for using the system. Bicycle, pedestrian and automobile wayfinding can guide users to parking areas, walking and biking routes, and development amenities.	\$13,500	\$27,000

Real time transit displays ¹⁵	Real time information about travel conditions simplifies transportation choices and removes anxiety about using transit.	\$4,000	\$12,000
Bikeshare Station ¹⁶	On-demand access to a fleet of shared bicycles. Provide convenient locations on National Western Center site and near site for users. Work with Denver Bcycle to coordinate convenient station locations.	\$50,000	\$100,000
Internal Fleet of Bicycles ¹⁷	An internal fleet of bicycles offers free bicycles to employees to use during the day for short trips. Unlike a formal bike share, there are no membership fees or hourly rates. This allows users to use other modes like carpools or transit to commute, but provides them with a mobility option during the day.	\$4,000	\$8,000
	Subtotal of Estimated One-time Capital Costs	\$784,000	\$972,000
	Subtotal of Estimated Annual Costs	\$936,000	\$1,708,000
	Total Estimated Cost <i>(excluding TBD or N/A strategies; rounded to the nearest ten thousand)</i>	\$1,720,000	\$2,680,000

Please note, the above costs are estimates and should be further studied and refined to accurately illustrate real projected costs. An estimated 370 employees are projected for this scenario.

¹Estimated per stall cost of \$13,700 (approximately \$2,700 carshare fees + \$9,000 forgone parking revenue + \$2,000 stall O&M). Five parking stalls estimated under aggressive intervention.

²Estimated annual cost of \$250,000 per bus route expansion with RTD. Cost illustrated annually with one route under moderate intervention and two routes for aggressive intervention. Source: CU-Boulder Transportation Master Plan (2011)

³Costs illustrate an estimate for additional pedestrian infrastructure supporting connections around the site. Estimated cost of \$650,000 for moderate intervention and \$700,000 for aggressive intervention.

⁴Estimated per parking stall cost of \$22,000 (\$18,000 in forgone parking revenue + \$4,000 in stall O&M). Three parking stalls estimated for aggressive intervention.

⁵Estimated annual cost of \$100,000 for increase in bus frequency per route in partnership with RTD. Cost illustrated annually with one route under moderate intervention and two routes for aggressive intervention. Source: CU-Boulder Transportation Master Plan (2011)

⁶Estimated \$8 per employee under moderate scenario and \$12 per employee under aggressive scenario.

⁷Total estimated cost per employee of \$2,200 (\$1,800 in forgone parking revenue + \$400 per stall O&M). A 1:1 ratio of employees to parking stalls was used. Under the moderate scenario and estimated 25% of all employees cashed out and 50% in the aggressive scenario.

⁸Estimated cost of \$65 per employee

⁹Estimated \$500 per employee

¹⁰Estimate based upon approximate cost of \$10,000 per small scale traffic calming project. Moderate and aggressive intervention costs estimated on a per project basis, five and ten respectively. Source: City of Boulder Neighborhood Speed Management Program Guidelines (2017)

¹¹Shuttle service based upon an estimated annual operating cost of \$140,000.

¹²Parking space estimate is \$11,000 per stall (\$9,000 forgone parking revenue + \$2,000 stall O&M). Five stalls projected for moderate intervention and ten stalls for aggressive intervention.

¹³Estimated cost of approximately \$2,090 per bike locker and \$660 per bike rack. Five bike lockers and three bike racks for moderate intervention and ten bike lockers and six bike racks for aggressive intervention.

¹⁴Approximate costs per sign range from \$530 to \$2,150. An average cost of \$1,340 was used in the above table. Ten signs of various sizes estimated for moderate intervention and 20 for aggressive intervention.

¹⁵Estimated cost of \$2,000 per unit. Two displays proposed for moderate intervention and six displays proposed for aggressive intervention.

¹⁶Approximate cost of \$50,000 per B-Cycle station with current technology. One station estimated for moderate intervention and two stations estimated for aggressive intervention.

¹⁷Estimated cost of \$300-\$500 per bike. Above estimate reflects an average of \$400 per bike. Ten bikes estimated for moderate intervention and 20 for aggressive intervention.

Chapter 3 - TDM Definitions and Cost Estimates

NWC TDM - Cost Estimates: Full Build

Full Build - Stock Show Weekend (Scenario 11)			
Strategy	Summary	Moderate Cost Estimate	Aggressive Cost Estimate
Carshare Program ¹	On-demand access to a fleet of shared vehicles; User fees are typically collected through annual membership, mileage and hourly rates.	---	\$69,000
Land Use Diversity	Having different types of land uses near one another can decrease VMT since trips between land use types are shorter and may be accommodated by non-auto modes of transport. For example when residential areas are in the same neighborhood as retail and office buildings, a resident does not need to travel outside of the neighborhood to meet his/her trip needs. The cost estimate is not included here as the land use development will be determined by future plans and development.	N/A	N/A
Transit Network Expansion ²	Expanding the bus and rail network on and near the National Western Site affords employees and visitors a wider range of transportation options. The cost is not included as the transit network expansion is dependent upon RTD's future planned improvements.	\$10,400	\$20,800
Pedestrian Network ³	This would require coordination with local jurisdictions to expand and improve pedestrian networks around the National Western Center. There would be a cost to NWC for on site improvements. There would be a cost to local land owners for off site improvements.	\$650,000	\$700,000
Transit Frequency/Speed ⁴	Work with RTD to reduce headways during peak travel times, increase reliability, create express bus lines with limited stop service, and implement feasible operational improvements such as transit signal priority and queue jumping.	\$4,200	\$8,400
Transit Accessibility	With the addition of the N Line commuter rail, including a station on the National Western Center Campus, accessibility to high quality transit is assumed to improve and would result in a mode shift. The cost is not included as the new transit station is dependent upon RTD's future planned improvements.	N/A	N/A

Commute Trip Reduction Marketing ⁵	Information sharing and marketing are important components to successful commute trip reduction strategies. Marketing strategies may include new employee orientation of trip reduction and alternative mode options, event promotions, and distributing publications.	\$15,400	\$23,100
The TDM Coordinator would take on these marketing responsibilities.			
Destination Accessibility	Destination accessibility is measured in terms of the number of jobs or other attractions reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones. The location of the project also increases the potential for pedestrians to walk and bike to these destinations and therefore reduces the VMT. As the cost is more realistically embedded in the cost of the land, the cost would be reflected in the land development around the NWC site.	N/A	N/A
Transit Fare Subsidy ⁶	Provide discount daily or monthly passes for on-site employees or long-term visitors at the National Western Center.	\$965,000	\$965,000
Unbundle Parking Costs	Unbundling separates parking from property costs, requiring those employees who wish to purchase parking spaces to do so at an additional cost from the property cost. This removes the burden from those who do not wish to utilize a parking space. Parking will be priced separately from office leases. An assumption is made that the parking costs are passed through to the vehicle owners/drivers utilizing the parking spaces.	TBD -Administrative cost could be subsidized by parking revneues	TBD -Administrative cost could be subsidized by parking revneues
On-Street Market Pricing	The NWC would implement a pricing strategy for parking by pricing all central business district/employment center/retail center on-street parking. It will be priced to encourage" park once" behavior. The benefit of this measure above that of paid parking at the project only is that it deters parking spillover from projects supplied parking to other public parking nearby, which undermine the vehicle miles traveled (VMT) benefits of project pricing. It may also generate sufficient area-wide mode shifts to justify increased transit service to the area.	---	N/A
Parking Supply Limits	The project will change parking requirements and types of supply within the project site to encourage "smart growth" development and alternative transportation choices by project residents and employees. This will be accomplished through the elimination (or reduction) of minimum parking requirements, creation of maximum parking requirements, and the provision of shared parking.	N/A	N/A

Traffic Calming ⁷	Providing traffic calming measures encourages people to walk or bike instead of using a vehicle. This mode shift will result in a decrease in VMT. Project design will include pedestrian/bicycle safety and traffic calming measures in excess of jurisdiction requirements. Both internal roadways within the development as well as external roadways leading to the development will be designed to reduce motor vehicle speeds and encourage pedestrian and bicycle trips with traffic calming features. Traffic calming features may include: marked crosswalks, count-down signal timers, curb extensions, speed tables, raised crosswalks, raised intersections, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, and others.	\$50,000	\$100,000
Local Shuttles ⁸	Operation of shuttle service to nearby transportation hubs and major destinations.	\$5,800	\$5,800
Carshare Parking ⁹	Designating parking spaces for carshare vehicles near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$55,000	\$110,000
Secure Bicycle Parking ¹⁰	Short-term and long-term bicycle parking; may include a combination of bike racks, bike lockers, or secure bike stations	\$12,500	\$25,000
Valet Bicycle Parking ¹¹	Similar to valets for automobiles, valet bike parking allows users to drop off bikes at a central location near an event entrance. Users receive a claim ticket and can also leave helmets and other bike accessories. By providing a secure and convenient parking area, users no longer need to worry about where to lock their bike, reducing anxiety. If provided in a highly visible location valet bike parking can also demonstrate to non-users that they can use the service during future events.	\$800	\$1,000
Preferential parking for 4+ carpools ¹²	Designating parking spaces for carpools and vanpools near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$22,000	\$66,000
Dedicated Carpool Pick-Up/Drop-Off ¹³	Designating carpool pick-up and drop-off locations clarifies where these activities occur and can prioritize their use by being provided at preferential curb locations. Designating the area using signage and/or paint can also serve as a marketing component to get others to consider carpooling as an option.	\$1,250	\$2,500

Multi-modal Wayfinding ¹⁴	Wayfinding allows users of all modes to quickly and easily navigate through the development to their destination. Transit wayfinding can help users find transit stops and can also provide information on routes, schedules, and instructions for using the system. Bicycle, pedestrian and automobile wayfinding can guide users to parking areas, walking and biking routes, and development amenities.	\$13,500	\$27,000
Real time transit displays ¹⁵	Real time information about travel conditions simplifies transportation choices and removes anxiety about using transit.	\$4,000	\$12,000
Bikeshare Station ¹⁶	On-demand access to a fleet of shared bicycles. Provide convenient locations on National Western Center site and near site for users. Work with Denver Bcycle to coordinate convenient station locations.	\$50,000	\$100,000
Internal Fleet of bicycles ¹⁷	An internal fleet of bicycles offers free bicycles to employees to use during the day for short trips. Unlike a formal bike share, there are no membership fees or hourly rates. This allows users to use other modes like carpools or transit to commute, but provides them with a mobility option during the day.	\$4,000	\$8,000
TDM Coordinator ¹⁸	A full-time employee of the National Western Center who works with the various tenants to implement TDM strategies and build tenant relationships. This role would include marketing, outreach, a strong understanding of TDM, general understanding of transportation planning and engineering, and a regional context.	\$100,000	\$100,000
Online Mobility Platform ¹⁹	A comprehensive commute planning, on-demand ride-share matching, real-time transit arrival times, bicycle route mapping, traffic information and parking availability	\$12,000	\$48,000
Mobility Hub ²⁰	A major transit station that provides seamless connectivity between mutiple modes of transportation, including transit, walking, biking and driving,	---	\$3,500,000
	Subtotal of Estimated One-time Capital Costs	\$784,000	\$4,472,000
	Subtotal of Estimated Annual Costs	\$1,196,000	\$1,418,000
	Total Estimated Cost (excluding TBD or N/A strategies; rounded to the nearest ten thousand)	\$1,980,000	\$5,890,000

Please note, the above costs are estimates and should be further studied and refined to accurately illustrate real projected costs. An estimated 1,929 employees are projected for this scenario.

¹Estimated per stall cost of \$13,700 (approximately \$2,700 carshare fees + \$9,000 forgone parking revenue + \$2,000 stall O&M). Five parking stalls estimated under aggressive intervention.

²Estimated annual cost of \$250,000 per bus route expansion with RTD. Cost illustrated for two week period with one route under moderate intervention and two routes for aggressive intervention. Source: CU-Boulder Transportation Master Plan (2011)

³Costs illustrate an estimate for additional pedestrian infrastructure supporting connections around the site. Estimated cost of \$650,000 for moderate intervention and \$700,000 for aggressive intervention.

⁴Estimated annual cost of \$100,000 for increase in bus frequency per route in partnership with RTD. Illustrated cost is for a two week period with one route under moderate intervention and two routes for aggressive intervention. Source: CU-Boulder Transportation Master Plan (2011)

⁵Estimated \$8 per employee under moderate scenario and \$12 per employee under aggressive scenario.

⁶Estimated \$500 per employee

⁷Estimate based upon approximate cost of \$10,000 per small scale traffic calming project. Moderate and aggressive intervention costs estimated on a per project basis, five and ten respectively. Source: City of Boulder Neighborhood Speed Management Program Guidelines (2017)

⁸Shuttle service based upon an estimated annual operating cost of \$140,000. Cost illustrated for a two week period.

⁹Parking space estimate is \$11,000 per stall (\$9,000 forgone parking revenue + \$2,000 stall O&M). Five stalls projected for moderate intervention and ten stalls for aggressive intervention.

¹⁰Estimated cost of approximately \$2,090 per bike locker and \$660 per bike rack. Five bike lockers and three bike racks for moderate intervention and ten bike lockers and six bike racks for aggressive intervention.

¹¹Estimated cost of \$800 for moderate intervention and \$1,000 for aggressive intervention per large event for staffing and other associated costs.

¹²Parking space estimate is \$22,000 per stall (\$18,000 in forgone parking revenue + \$4,000 in stall O&M). One stall estimated for moderate intervention and three stalls for aggressive intervention.

¹³Estimate of \$250 per stall for curb space repurposing. Six stalls estimated for moderate intervention and 12 stalls for aggressive intervention.

¹⁴Approximate costs per sign range from \$530 to \$2,150. An average cost of \$1,340 was used in the above table. Ten signs of various sizes estimated for moderate intervention and 20 for aggressive intervention.

¹⁵Estimated cost of \$2,000 per unit. Two displays proposed for moderate intervention and six displays proposed for aggressive intervention.

¹⁶Approximate cost of \$50,000 per B-Cycle station with current technology. One station estimated for moderate intervention and two stations estimated for aggressive intervention.

¹⁷Estimated cost of \$300-\$500 per bike. Above estimate reflects an average of \$400 per bike. Ten bikes estimated for moderate intervention and 20 for aggressive intervention.

¹⁸Estimated cost of \$100,000 for employment of a TDM Coordinator.

¹⁹Estimated cost of \$12,000 annually for moderate intervention and \$48,000 annually for aggressive intervention.

²⁰Estimated cost of \$3.5 million for the construction of a mobility hub and associated infrastructure (carshare parking, bicycle parking, real time transit displays, and bikeshare station). Source for base cost: Proposed North Boulder mobility hub.

Chapter 3 - TDM Definitions and Cost Estimates

NWC TDM - Cost Estimates: Full Build

Full Build - Large / Concurrent Event (Scenario 12)			
Strategy	Summary	Moderate Cost Estimate	Aggressive Cost Estimate
Carshare Program ¹	On-demand access to a fleet of shared vehicles; User fees are typically collected through annual membership, mileage and hourly rates.	---	\$69,000
Land Use Diversity	Having different types of land uses near one another can decrease VMT since trips between land use types are shorter and may be accommodated by non-auto modes of transport. For example when residential areas are in the same neighborhood as retail and office buildings, a resident does not need to travel outside of the neighborhood to meet his/her trip needs. The cost estimate is not included here as the land use development will be determined by future plans and development.	N/A	N/A
Transit Network Expansion ²	Expanding the bus and rail network on and near the National Western Site affords employees and visitors a wider range of transportation options. The cost is not included as the transit network expansion is dependent upon RTD's future planned improvements.	\$5,200	\$10,400
Pedestrian Network ³	This would require coordination with local jurisdictions to expand and improve pedestrian networks around the National Western Center. There would be a cost to NWC for on site improvements. There would be a cost to local land owners for off site improvements.	\$650,000	\$700,000
Transit Frequency/Speed ⁴	Work with RTD to reduce headways during peak travel times, increase reliability, create express bus lines with limited stop service, and implement feasible operational improvements such as transit signal priority and queue jumping.	\$2,100	\$4,200
Transit Accessibility	With the addition of the N Line commuter rail, including a station on the National Western Center Campus, accessibility to high quality transit is assumed to improve and would result in a mode shift. The cost is not included as the new transit station is dependent upon RTD's future planned improvements.	N/A	N/A

Commute Trip Reduction Marketing ⁵	Information sharing and marketing are important components to successful commute trip reduction strategies. Marketing strategies may include new employee orientation of trip reduction and alternative mode options, event promotions, and distributing publications.	\$3,300	\$5,000
The TDM Coordinator would take on these marketing responsibilities.			
Destination Accessibility	Destination accessibility is measured in terms of the number of jobs or other attractions reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones. The location of the project also increases the potential for pedestrians to walk and bike to these destinations and therefore reduces the VMT. As the cost is more realistically embedded in the cost of the land, the cost would be reflected in the land development around the NWC site.	N/A	N/A
Transit Fare Subsidy ⁶	Provide discount daily or monthly passes for on-site employees or long-term visitors at the National Western Center.	\$207,000	\$207,000
Unbundle Parking Costs	Unbundling separates parking from property costs, requiring those employees who wish to purchase parking spaces to do so at an additional cost from the property cost. This removes the burden from those who do not wish to utilize a parking space. Parking will be priced separately from office leases. An assumption is made that the parking costs are passed through to the vehicle owners/drivers utilizing the parking spaces.	TBD -Administrative cost could be subsidized by parking revneues	TBD -Administrative cost could be subsidized by parking revneues
On-Street Market Pricing	The NWC would implement a pricing strategy for parking by pricing all central business district/employment center/retail center on-street parking. It will be priced to encourage" park once" behavior. The benefit of this measure above that of paid parking at the project only is that it deters parking spillover from projects supplied parking to other public parking nearby, which undermine the vehicle miles traveled (VMT) benefits of project pricing. It may also generate sufficient area-wide mode shifts to justify increased transit service to the area.	---	N/A
Parking Supply Limits	The project will change parking requirements and types of supply within the project site to encourage "smart growth" development and alternative transportation choices by project residents and employees. This will be accomplished through the elimination (or reduction) of minimum parking requirements, creation of maximum parking requirements, and the provision of shared parking.	---	N/A

Traffic Calming ⁷	Providing traffic calming measures encourages people to walk or bike instead of using a vehicle. This mode shift will result in a decrease in VMT. Project design will include pedestrian/bicycle safety and traffic calming measures in excess of jurisdiction requirements. Both internal roadways within the development as well as external roadways leading to the development will be designed to reduce motor vehicle speeds and encourage pedestrian and bicycle trips with traffic calming features. Traffic calming features may include: marked crosswalks, count-down signal timers, curb extensions, speed tables, raised crosswalks, raised intersections, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, and others.	\$50,000	\$100,000
Local Shuttles ⁸	Operation of shuttle service to nearby transportation hubs and major destinations.	\$2,900	\$2,900
Carshare Parking ⁹	Designating parking spaces for carshare vehicles near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$55,000	\$110,000
Secure Bicycle Parking ¹⁰	Short-term and long-term bicycle parking; may include a combination of bike racks, bike lockers, or secure bike stations	\$12,500	\$25,000
Valet Bicycle Parking ¹¹	Similar to valets for automobiles, valet bike parking allows users to drop off bikes at a central location near an event entrance. Users receive a claim ticket and can also leave helmets and other bike accessories. By providing a secure and convenient parking area, users no longer need to worry about where to lock their bike, reducing anxiety. If provided in a highly visible location valet bike parking can also demonstrate to non-users that they can use the service during future events.	\$800	\$1,000
Preferential parking for 4+ carpools ¹²	Designating parking spaces for carpools and vanpools near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$22,000	\$66,000
Dedicated Carpool Pick-Up/Drop-Off ¹³	Designating carpool pick-up and drop-off locations clarifies where these activities occur and can prioritize their use by being provided at preferential curb locations. Designating the area using signage and/or paint can also serve as a marketing component to get others to consider carpooling as an option.	\$1,250	\$2,500

Multi-modal Wayfinding ¹⁴	Wayfinding allows users of all modes to quickly and easily navigate through the development to their destination. Transit wayfinding can help users find transit stops and can also provide information on routes, schedules, and instructions for using the system. Bicycle, pedestrian and automobile wayfinding can guide users to parking areas, walking and biking routes, and development amenities.	\$13,500	\$27,000
Real time transit displays ¹⁵	Real time information about travel conditions simplifies transportation choices and removes anxiety about using transit.	\$4,000	\$12,000
Bikeshare Station ¹⁶	On-demand access to a fleet of shared bicycles. Provide convenient locations on National Western Center site and near site for users. Work with Denver Bcycle to coordinate convenient station locations.	\$50,000	\$100,000
Internal Fleet of bicycles ¹⁷	An internal fleet of bicycles offers free bicycles to employees to use during the day for short trips. Unlike a formal bike share, there are no membership fees or hourly rates. This allows users to use other modes like carpools or transit to commute, but provides them with a mobility option during the day.	\$4,000	\$8,000
TDM Coordinator ¹⁸	A full-time employee of the National Western Center who works with the various tenants to implement TDM strategies and build tenant relationships. This role would include marketing, outreach, a strong understanding of TDM, general understanding of transportation planning and engineering, and a regional context.	\$100,000	\$100,000
Online Mobility Platform ¹⁹	A comprehensive commute planning, on-demand ride-share matching, real-time transit arrival times, bicycle route mapping, traffic information and parking availability	\$12,000	\$48,000
Mobility Hub ²⁰	A major transit station that provides seamless connectivity between multiple modes of transportation, including transit, walking, biking and driving,	---	\$3,500,000
	Subtotal of Estimated One-time Capital Costs	\$784,000	\$4,472,000
	Subtotal of Estimated Annual Costs	\$416,000	\$628,000
	Total Estimated Cost (excluding TBD or N/A strategies; rounded to the nearest ten thousand)	\$1,200,000	\$5,100,000

Please note, the above costs are estimates and should be further studied and refined to accurately illustrate real projected costs. An estimated 414 employees are projected for this scenario.

¹Estimated per stall cost of \$13,700 (approximately \$2,700 carshare fees + \$9,000 forgone parking revenue + \$2,000 stall O&M). Five parking stalls estimated under aggressive intervention.

²Estimated annual cost of \$250,000 per bus route expansion with RTD. Cost illustrated for two week period with one route under moderate intervention and two routes for aggressive intervention. Source: CU-Boulder Transportation Master Plan (2011)

³Costs illustrate an estimate for additional pedestrian infrastructure supporting connections around the site. Estimated cost of \$650,000 for moderate intervention and \$700,000 for aggressive intervention.

⁴Estimated annual cost of \$100,000 for increase in bus frequency per route in partnership with RTD. Illustrated cost is for a one week period with one route under moderate intervention and two routes for aggressive intervention. Source: CU-Boulder Transportation Master Plan (2011)

⁵Estimated \$8 per employee under moderate scenario and \$12 per employee under aggressive scenario.

⁶Estimated \$500 per employee

⁷Estimate based upon approximate cost of \$10,000 per small scale traffic calming project. Moderate and aggressive intervention costs estimated on a per project basis, five and ten respectively. Source: City of Boulder Neighborhood Speed Management Program Guidelines (2017)

⁸Shuttle service based upon an estimated annual operating cost of \$140,000. Cost illustrated for a one week period.

⁹Parking space estimate is \$11,000 per stall (\$9,000 forgone parking revenue + \$2,000 stall O&M). Five stalls projected for moderate intervention and ten stalls for aggressive intervention.

¹⁰Estimated cost of approximately \$2,090 per bike locker and \$660 per bike rack. Five bike lockers and three bike racks for moderate intervention and ten bike lockers and six bike racks for aggressive intervention.

¹¹Estimated cost of \$800 for moderate intervention and \$1,000 for aggressive intervention per large event for staffing and other associated costs.

¹²Parking space estimate is \$22,000 per stall (\$18,000 in forgone parking revenue + \$4,000 in stall O&M). One stall estimated for moderate intervention and three stalls for aggressive intervention.

¹³Estimate of \$250 per stall for curb space repurposing. Six stalls estimated for moderate intervention and 12 stalls for aggressive intervention.

¹⁴Approximate costs per sign range from \$530 to \$2,150. An average cost of \$1,340 was used in the above table. Ten signs of various sizes estimated for moderate intervention and 20 for aggressive intervention.

¹⁵Estimated cost of \$2,000 per unit. Two displays proposed for moderate intervention and six displays proposed for aggressive intervention.

¹⁶Approximate cost of \$50,000 per B-Cycle station with current technology. One station estimated for moderate intervention and two stations estimated for aggressive intervention.

¹⁷Estimated cost of \$300-\$500 per bike. Above estimate reflects an average of \$400 per bike. Ten bikes estimated for moderate intervention and 20 for aggressive intervention.

¹⁸Estimated cost of \$100,000 for employment of a TDM Coordinator.

¹⁹Estimated cost of \$12,000 annually for moderate intervention and \$48,000 annually for aggressive intervention.

²⁰Estimated cost of \$3.5 million for the construction of a mobility hub and associated infrastructure (carshare parking, bicycle parking, real time transit displays, and bikeshare station). Source for base cost: Proposed North Boulder mobility hub.

Chapter 3 - TDM Definitions and Cost Estimates

NWC TDM - Cost Estimates: Full Build

Full Build - Typical Day (Scenario 13)			
Strategy	Summary	Moderate Cost Estimate	Aggressive Cost Estimate
Carshare Program ¹	On-demand access to a fleet of shared vehicles; User fees are typically collected through annual membership, mileage and hourly rates.	---	\$69,000
Land Use Diversity	Having different types of land uses near one another can decrease VMT since trips between land use types are shorter and may be accommodated by non-auto modes of transport. For example when residential areas are in the same neighborhood as retail and office buildings, a resident does not need to travel outside of the neighborhood to meet his/her trip needs. The cost estimate is not included here as the land use development will be determined by future plans and development.	N/A	N/A
Transit Network Expansion ²	Expanding the bus and rail network on and near the National Western Site affords employees and visitors a wider range of transportation options. The cost is not included as the transit network expansion is dependent upon RTD's future planned improvements.	\$250,000	\$500,000
Pedestrian Network ³	This would require coordination with local jurisdictions to expand and improve pedestrian networks around the National Western Center. There would be a cost to NWC for on site improvements. There would be a cost to local land owners for off site improvements.	\$650,000	\$700,000
Rideshare Program ⁴	Increasing vehicle occupancy rates by promoting ridesharing options would result in fewer cars driving the same trip to/from the NWC. This would include designation specific parking stalls for ridesharing vehicles, designating unloading/loading areas, and providing messaging for coordinating rides.	---	\$66,000
Transit Frequency/Speed ⁵	Work with RTD to reduce headways during peak travel times, increase reliability, create express bus lines with limited stop service, and implement feasible operational improvements such as transit signal priority and queue jumping.	\$100,000	\$200,000

Transit Accessibility	With the addition of the N Line commuter rail, including a station on the National Western Center Campus, accessibility to high quality transit is assumed to improve and would result in a mode shift. The cost is not included as the new transit station is dependent upon RTD's future planned improvements.	N/A	N/A
Alternative Schedules & Telecommute	Telecommuting and alternative work schedules reduce the number of commuters and thus, the number of VMT traveled by employees. Alternative work schedules could take the form of staggered starting times, flexible schedules, or compressed work weeks. Given that the employer is likely paying for the infrastructure for these schedules (i.e. laptops), there would be minimal additional cost.	---	N/A
Commute Trip Reduction Marketing ⁶	Information sharing and marketing are important components to successful commute trip reduction strategies. Marketing strategies may include new employee orientation of trip reduction and alternative mode options, event promotions, and distributing publications. The TDM Coordinator would take on these marketing responsibilities.	\$7,300	\$11,000
Destination Accessibility	Destination accessibility is measured in terms of the number of jobs or other attractions reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones. The location of the project also increases the potential for pedestrians to walk and bike to these destinations and therefore reduces the VMT. As the cost is more realistically embedded in the cost of the land, the cost would be reflected in the land development around the NWC site.	N/A	N/A
Employee Parking Cash-Out ⁷	The NWC would allow employer to provide employees with a choice of forgoing their current subsidized/free parking for a cash payment equivalent to the cost of the parking space to the employer.	\$501,600	\$1,003,200
Employer Sponsored Vanpool/Shuttle ⁸	Purchased or leased vans for commute use and the formation of vanpools; Shuttles providing employees direct access to transit stations and other primary destinations.	---	\$59,300
Transit Fare Subsidy ⁹	Provide discount daily or monthly passes for on-site employees or long-term visitors at the National Western Center.	\$456,500	\$456,500

Unbundle Parking Costs	Unbundling separates parking from property costs, requiring those employees who wish to purchase parking spaces to do so at an additional cost from the property cost. This removes the burden from those who do not wish to utilize a parking space. Parking will be priced separately from office leases. An assumption is made that the parking costs are passed through to the vehicle owners/drivers utilizing the parking spaces.	TBD -Administrative cost could be subsidized by parking revneues	TBD -Administrative cost could be subsidized by parking revneues
On-Street Market Pricing	The NWC would implement a pricing strategy for parking by pricing all central business district/employment center/retail center on-street parking. It will be priced to encourage "park once" behavior. The benefit of this measure above that of paid parking at the project only is that it deters parking spillover from projects supplied parking to other public parking nearby, which undermine the vehicle miles traveled (VMT) benefits of project pricing. It may also generate sufficient area-wide mode shifts to justify increased transit service to the area.	N/A	N/A
Workplace Parking Pricing	Parking disincentives may include charging employees for parking, above market rate pricing, or not providing employee parking.	TBD -Administrative cost could be subsidized by parking revneues	TBD -Administrative cost could be subsidized by parking revneues
Parking Supply Limits	The project will change parking requirements and types of supply within the project site to encourage "smart growth" development and alternative transportation choices by project residents and employees. This will be accomplished through the elimination (or reduction) of minimum parking requirements, creation of maximum parking requirements, and the provision of shared parking.	N/A	N/A
Neighborhood Electric Vehicle Network ¹⁰	The project will create local "light" vehicle networks, such as NEV networks. They are electric powered and must conform to applicable federal automobile safety standards. NEVs offer an alternative to traditional vehicle trips and can legally be used on roadways with speed limits of 35 MPH or less (unless specifically restricted). They are ideal for short trips up to 30 miles in length. To create an NEV network, the project will implement the necessary infrastructure, including NEV parking, charging facilities, striping, signage, and educational tools. NEV routes will be implemented throughout the project and will double as bicycle routes.	---	\$300,000
Traffic Calming ¹¹	Providing traffic calming measures encourages people to walk or bike instead of using a vehicle. This mode shift will result in a decrease in VMT. Project design will include pedestrian/bicycle safety and traffic calming measures in excess of jurisdiction requirements. Both internal roadways within the development as well as external roadways leading to the development will be designed to reduce motor vehicle speeds and encourage pedestrian and bicycle trips with traffic calming features. Traffic calming features may include: marked crosswalks, count-down signal timers, curb extensions, speed tables, raised crosswalks, raised intersections, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, and others.	\$50,000	\$100,000

Local Shuttles ¹²	Operation of shuttle service to nearby transportation hubs and major destinations.	\$140,000	\$140,000
Guaranteed Ride Home	Guaranteed Ride Home is a benefit to EcoPass Holders. As such, this strategy would be complimentary to Transit Fare Subsidy and would require minimal additional fees for EcoPass holders. Additional fees would be incurred for non-EcoPass holders.	N/A	N/A
Subsidized Carshare Membership ¹³	A carshare system membership allows users to pay a monthly or yearly fee to use the carshare program. This fee could be subsidized by employers to further incentivize use.	\$100,400	\$100,400
Carshare Parking ¹⁴	Designating parking spaces for carshare vehicles near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$55,000	\$110,000
Secure Bicycle Parking ¹⁵	Short-term and long-term bicycle parking; may include a combination of bike racks, bike lockers, or secure bike stations	\$12,500	\$25,000
Preferential parking for 4+ carpools ¹⁶	Designating parking spaces for carpools and vanpools near building entrances prioritizes non-drive-alone modes, incentivizing their use.	\$22,000	\$66,000
Dedicated Carpool Pick-Up/Drop-Off ¹⁷	Designating carpool pick-up and drop-off locations clarifies where these activities occur and can prioritize their use by being provided at preferential curb locations. Designating the area using signage and/or paint can also serve as a marketing component to get others to consider carpooling as an option.	\$1,250	\$2,500

Multi-modal Wayfinding ¹⁸	Wayfinding allows users of all modes to quickly and easily navigate through the development to their destination. Transit wayfinding can help users find transit stops and can also provide information on routes, schedules, and instructions for using the system. Bicycle, pedestrian and automobile wayfinding can guide users to parking areas, walking and biking routes, and development amenities.	\$13,500	\$27,000
Real time transit displays ¹⁹	Real time information about travel conditions simplifies transportation choices and removes anxiety about using transit.	\$4,000	\$12,000
Bikeshare Station ²⁰	On-demand access to a fleet of shared bicycles. Provide convenient locations on National Western Center site and near site for users. Work with Denver Bcycle to coordinate convenient station locations.	\$50,000	\$100,000
Electric Bikeshare Program ²¹	On-demand access to a fleet of shared electric bicycles.	---	\$200,000
Bikeshare Membership ²²	A bike share system membership allows users to pay a monthly or yearly fee to use the electric bike share program. This fee could be subsidized by employers to further incentivize use.	\$86,700	\$86,700
End of trip facilities (showers, lockers, repair station) ²³	End-of-trip cycling facilities are an important component of encouraging cycling to and from the work place. This includes bicycle repair stands and pumps and showers and changing facilities. These amenities allow cyclists to arrive to work and be more comfortable throughout their workday.	\$1,000	\$1,000
Internal Fleet of bicycles ²⁴	An internal fleet of bicycles offers free bicycles to employees to use during the day for short trips. Unlike a formal bike share, there are no membership fees or hourly rates. This allows users to use other modes like carpools or transit to commute, but provides them with a mobility option during the day.	\$4,000	\$8,000

TDM Coordinator ²⁵	A full-time employee of the National Western Center who works with the various tenants to implement TDM strategies and build tenant relationships. This role would include marketing, outreach, a strong understanding of TDM, general understanding of transportation planning and engineering, and a regional context.	\$100,000	\$100,000
Online Mobility Platform ²⁶	A comprehensive commute planning, on-demand ride-share matching, real-time transit arrival times, bicycle route mapping, traffic information and parking availability	\$12,000	\$48,000
Mobility Hub ²⁷	A major transit station that provides seamless connectivity between mutiple modes of transportation, including transit, walking, biking and driving,	---	\$3,500,000
	Subtotal of Estimated One-time Capital Costs	\$785,000	\$4,973,000
	Subtotal of Estimated Annual Costs	\$1,835,000	\$3,027,000
	Total Estimated Cost (excluding TBD or N/A strategies; rounded to the nearest ten thousand)	\$2,620,000	\$8,000,000

Please note, the above costs are estimates and should be further studied and refined to accurately illustrate real projected costs. An estimated 913 employees are projected for this scenario.

¹Estimated per stall cost of \$13,700 (approximately \$2,700 carshare fees + \$9,000 forgone parking revenue + \$2,000 stall O&M). Five parking stalls estimated under aggressive intervention.

²Estimated annual cost of \$250,000 per bus route expansion with RTD. Cost illustrated annually with one route under moderate intervention and two routes for aggressive intervention. Source: CU-Boulder Transportation Master Plan (2011)

³Costs illustrate an estimate for additional pedestrian infrastructure supporting connections around the site. Estimated cost of \$650,000 for moderate intervention and \$700,000 for aggressive intervention.

⁴Estimated per parking stall cost of \$22,000 (\$18,000 in forgone parking revenue + \$4,000 in stall O&M). Three parking stalls estimated for aggressive intervention.

⁵Estimated annual cost of \$100,000 for increase in bus frequency per route in partnership with RTD. Cost illustrated annually with one route under moderate intervention and two routes for aggressive intervention. Source: CU-Boulder Transportation Master Plan (2011)

⁶Estimated \$8 per employee under moderate scenario and \$12 per employee under aggressive scenario.

⁷Total estimated cost per employee of \$2,200 (\$1,800 in forgone parking revenue + \$400 per stall O&M). A 1:1 ratio of employees to parking stalls was used. Under the moderate scenario and estimated 25% of all employees cashed out and 50% in the aggressive scenario.

⁸Estimated cost of \$65 per employee

⁹Estimated \$500 per employee

¹⁰Charging station costs are estimated to be \$45,000 - \$100,000 per station. Estimate based upon three to six stations depending upon overall cost. Source: Plug-In Electric Vehicle Handbook - US Dept of Energy

¹¹Estimate based upon approximate cost of \$10,000 per small scale traffic calming project. Moderate and aggressive intervention costs estimated on a per project basis, five and ten respectively. Source: City of Boulder Neighborhood Speed Management Program Guidelines (2017)

¹²Shuttle service based upon an estimated annual operating cost of \$140,000.

¹³Estimated cost of \$110 per employee

¹⁴Parking space estimate is \$11,000 per stall (\$9,000 forgone parking revenue + \$2,000 stall O&M). Five stalls projected for moderate intervention and ten stalls for aggressive intervention.

¹⁵Estimated cost of approximately \$2,090 per bike locker and \$660 per bike rack. Five bike lockers and three bike racks for moderate intervention and ten bike lockers and six bike racks for aggressive intervention.

¹⁶Parking space estimate is \$22,000 per stall (\$18,000 in forgone parking revenue + \$4,000 in stall O&M). One stall estimated for moderate intervention and three stalls for aggressive intervention.

¹⁷Estimate of \$250 per stall for curb space repurposing. Six stalls estimated for moderate intervention and 12 stalls for aggressive intervention.

¹⁸Approximate costs per sign range from \$530 to \$2,150. An average cost of \$1,340 was used in the above table. Ten signs of various sizes estimated for moderate intervention and 20 for aggressive intervention.

¹⁹Estimated cost of \$2,000 per unit. Two displays proposed for moderate intervention and six displays proposed for aggressive intervention.

²⁰Approximate cost of \$50,000 per B-Cycle station with current technology. One station estimated for moderate intervention and two stations estimated for aggressive intervention.

²¹According to study, electric bicycle stations cost approximately twice as much as traditional. An estimated cost of \$100,000 per stations was used reflecting twice the cost of a traditional B-Cycle station. One station estimated for moderate intervention and two stations for aggressive intervention. Source: City of Wilmington Bike Share Feasibility Analysis

²²Estimated \$95 per employee

²³Approximate cost per repair station is \$1,000. other facilities could be provided offsite. One facility estimated for both interventions.

²⁴Estimated cost of \$300-\$500 per bike. Above estimate reflects an average of \$400 per bike. Ten bikes estimated for moderate intervention and 20 for aggressive intervention.

²⁵Estimated cost of \$100,000 for implementation of TDM Coordinator

²⁶Estimated cost of \$12,000 annually for moderate intervention and \$48,000 annually for aggressive intervention.

²⁷Estimated cost of \$3.5 million for the construction of a mobility hub and associated infrastructure (carshare parking, bicycle parking, real time transit displays, and bikeshare station). Source for base cost: Proposed North Boulder mobility hub.

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Back of House Truck/Trailer Space Needs Analysis

Overall Assumptions

- NWSS Baseline sets the stage for calculating the time/event scenario numbers.
- Acres of space needed at maximum demand (calculated from analysis) is being used to determine area required for staging and storage
- New facilities can be fully utilized/no outside constraints applied
- RTA Application, NWC Master Plan, and NWC Economic Study facility descriptions remain valid
- NWSS Baseline calculated demand is not constrained by available space
- All trucks/trailers that come to the NWC are accommodated through designated NWC facilities
- Data provided by NWC on arrival/departure days, head of stock, equine numbers, vendors, and rodeo were used as a basis for this analysis along with input gathered at the public meeting and various stakeholder meetings
- Truck/trailer numbers for Livestock were calculated on a per breed/animal type basis, not by dividing the total animals by a head/trailer ratio
- Truck/trailer numbers for Equine Competitions were calculated on a per competition type basis, not by dividing total animals by a head/trailer ratio

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NWSS Baseline Scenario Assumptions

Livestock (Marshall's Team has Reviewed)

Yards General Assumptions

- 11 head/trailer for cattle (based on 15% semi hauler carrying 25 head/trailer and 85% 30' stock trailer carrying 6 head/trailer)
- 4 head per trailer for yak and bison
- one support/tack trailer per two livestock trailers
- all trailers require storage in designated NWC facilities
- 2/3 of truck/trailers go through staging (for example for a 10-head exhibitor with three trailers, only two of these trailers go through staging and the other one drops stock at tie outs and does not need to access the building directly)

Hill General Assumptions

- 8 head/trailer for cattle (non-junior) (based on 5% semi hauler with 25 head/trailer and 95% 30' stock trailer with 6 head/trailer)
- 4 head/trailer for cattle (junior)
- 4 head/trailer for market swine (junior)
- 4 head/trailer for market lamb (junior)
- 3 head /trailer for market goats (junior)
- 6 head/trailer for specialty shows sheep
- 2 head/trailer for junior ewe lambs
- 4 head/trailer for Boer Goats
- 2 head/trailer for llama and alpaca
- 16 head/trailer for poultry
- 2% semi haulers to the Hill
- one support/tack trailer per two livestock trailers
- all trailers require storage in designated NWC facilities
- 2/3 of truck/trailers go through staging (for example for a 10-head exhibitor with three trailers, only two of these trailers go through staging and the other one drops stock at tie outs and does not need to access the building directly)

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Staging

Yards

- three load in/load out windows per day
- 10% semi hauler, 90% 26' truck/30' stock trailer combo;
- semi hauler area required = 1,350 SF (based on WB 65); 26'truck/30' trailer combo area required = 1,060 SF (based on WB 50)

Hill

- three load in/load out windows per day
- 2% semi hauler, 98% 26' truck/30' stock trailer combo
- semi hauler area required = 1,350 SF (based on WB 65); 26'truck/30' trailer combo area required = 1,060 SF (based on WB 50)

Storage

Yards

- 10% semi hauler, 90% 26' truck/30' stock trailer combo
- semi hauler area required = 1,350 SF (based on WB 65); 26'truck/30' trailer combo area required = 1,060 SF (based on WB 50)

Hill

- 2% semi hauler, 98% 26' truck/30' stock trailer combo
- semi hauler area required = 1,350 SF (based on WB 65); 26'truck/30' trailer combo area required = 1,060 SF (based on WB 50)

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Equine Competition Assumptions

General Assumptions

- 2.5-3 horses per truck/trailer except for drafts which is assumed to be 4 animals/truck-trailer.
- All trucks/trailers go through staging

Staging

- 2 load in/load out windows per day- actually more like constant arrivals and departures
- 50% 26' truck/33'8" trailer and 50% 26' truck/38' stock trailer combo
- 26' truck/33'8" trailer area required is 1,340 SF (based on WB 62)
- 26' truck/30' stock trailer combo area required is 1,060 SF (based on WB 50)

Storage

- 50% 26' truck/33'8" trailer and 50% 26' truck/38' stock trailer combo
- 26' truck/33'8" trailer area required is 1,340 SF (based on WB 62)
- 26' truck/30' stock trailer combo area required is 1,060 SF (based on WB 50)
- 70% of trailers require storage in designated NWC facilities

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Rodeo Assumptions

Staging

- 1.5 competitors/truck and trailer (3 horses)
- 50% 26' truck/33'8" trailer- 50% 26' truck/36' stock trailer combo
- 26' truck/33'8" trailer area required is 1,340 SF (based on WB 62)
- 26' truck/30' stock trailer combo area required is 1,060 SF (based on WB 50)
- 70 competitors per performance and each competitor competes in 2 shows
- dispersed arrivals- maximum one half of competitors for the next shows arrive at one time

Storage

- 1.5 competitors/truck and trailer (3 horses)
- 50% 26' truck/33'8" trailer and 50% 26' truck/36' stock trailer combo
- 26' truck/33'8" trailer area required is 1,340 SF (based on WB 62)
- 26' truck/30' stock trailer combo area required is 1,060 SF (based on WB 50)
- 70 competitors per show with 70% of trucks/trailers being stored on site

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Vendor Assumptions

Staging

- Staging for load in occurs over many days so space requirements are accommodated through the facility design and not additional space. Staging for load out occurs at the end of the NWSS when there is lower levels of livestock and equine load out activity occurring so adequate space is available at that time.

Storage

- 2017 totals; 276 vendors using 630 vendor display spaces
- 1 truck/trailer per vendor
- 5% semi hauler, 95% 26' truck/30' stock trailer combo;
- semi hauler area required = 1,350 SF (based on WB 65); 26'truck/30' trailer combo area required = 1,060 SF (based on WB 50)
- all vendors are on-site by Thursday January 5th, 2017 and remain on-site until Monday January 23rd, 2017
- all trailers require storage in designated NWC facilities

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Additional Timeframe Assumptions

NWSS Pre-Construction and Construction Period Assumptions

- all current activities and events that occur at the NWSS today continue to occur at the same levels as NWSS Baseline activity

NWSS Phase 1 and 2 Operational Period Assumptions

- New Yards have 800 pens.
- all Livestock numbers grow by 30% per NWC Staff Input
- Equine competitions grow by 100% from NWSS Baseline utilizing the new 700 stall equine center. The existing facility has 346 stalls.
- The number of Rodeo events, competitors, stock, and support vehicles remains the same as NWSS Baseline numbers
- Vendor activity grows by 25% over NWSS Baseline. This is based on the fact that the new Expo Hall is not constructed yet and it is assumed that there will be some space dedicated to vendors in the Phase 1 and 2 facilities but that is not their primary function. This growth is in line with attendance growth projections of 24%. Even though much more space is available for vendors in this phase due to stock animals being moved to the new facility, it does not seem reasonable to increase the number of vendors more than 25% given the poor access to and visibility of the newly available space.
- Basic operational parameters of loading and unloading animals and the vehicles and vehicle mix used to transport animals remains the same as NWSS Baseline

NWSS Full Build Out Period Assumptions

- All categories remain the same as NWSS Phase 1 and 2 Operational except Vendors. This is because all livestock and equine facilities are constructed and operational in Phase 1 and 2 (there are no new livestock or equine facilities).
- Rodeo relocates to the new Event Center. It is assumed that the number of events, competitors, stock, and support vehicles would remain the same.
- Rodeo staging and storage requirements should be added to the total staging and storage needed in this scenario.
- Vendor activity grows by 50% over NWSS Baseline. This is based on the fact that the new Expo Hall is constructed in this phase and it is assumed to be 460,000 sf as compared to 300,000 sf available today.
- Basic operational parameters of loading and unloading animals and the vehicles and vehicle mix used to transport animals remains the same as NWSS Baseline

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Large/Concurrent Event Period Assumptions

- The Large/Concurrent event analyzed was developed based on maximizing the need to stage and store trucks and trailers, not maximizing attendance. The events contained in the Large/Concurrent Event for this analysis include:
 - Livestock show ½ the size of NWSS of the comparable phase
 - Equine Competitions ½ the size of NWSS of the comparable phase
 - Trade Show ½ the size of NWSS of the comparable phase
 - A motorsports event at the Coliseum with 20 semi-trailer haulers and support vehicles
 - The Yards are not programmed with an event and are available for parking, staging, or storage
- No outside constraints were placed on this scenario in terms of available space or capacity. It was assumed that all of these events could occur at the same time.
- all trailers require storage in designated NWC facilities

Typical Day Assumptions

- It is assumed that all storage and operational requirements for typical day are determined through the individual facility design process and are contained on site near the facility footprint. There is no macro analysis of storage and staging space requirements required

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Equine Breed Show Assumptions (if introduced to NWSS/NWC)

Large Equine Breed Shows Utilizing Entire Equine Center

- Due to the increase in equine competition participants assumed for NWSS, it is assumed that all new stall capacity is utilized by equine competitors. This leaves no stalls available for equine breed shows during the NWSS. However, if a standalone equine breed show were held that utilized the entire facility, these are the assumptions to calculate staging and storage space:

Staging

- 700 total stalls available with average 3 stalls/exhibitor
- Assumes a two day load in up front, two load in/load out overlap in middle, a two day load out at end
- two load in/load out windows per day
- 25% semi hauler, 75% 26' truck/33'8" trailer combo
- semi hauler area needed is 1,350 SF (based on WB 65); 26' truck/33'8" trailer combo area needed is 1,340 SF (based on WB 62)
- 2 truck/trailers per exhibitor (1 equine transport and 1 tack/support)
- All trucks/trailers go through staging

Storage

- 25% semi hauler, 75% 26' truck/33'8" trailer combo
- semi hauler area needed is 1,350 SF (based on WB 65); 26' truck/33'8" trailer combo area needed is 1,340 SF (based on WB 62)
- 700 total stalls with average 3 stalls/exhibitor
- Assumes a two day load in up front, two load in/load out overlap in middle, a two day load out at end
- 2 truck/trailers per exhibitor (1 equine transport and 1 tack/support)
- all trailers require storage in designated NWC facilities

Equine Breed Show Utilizing ½ of the Equine Center Capacity

- This scenario is investigated because it may be possible to hold an equine breed show at the same time as an equine competition in the equine center.

Staging

- 350 total stalls available with average 3 stalls/exhibitor
- Assumes a two day load in up front, two load in/load out overlap in middle, a two day load out at end
- two load in/load out windows per day
- 25% semi hauler, 75% 26' truck/33'8" trailer combo

Chapter 4 - Specialized Vehicle Assumptions



October 5, 2017

- semi hauler area needed is 1,350 SF (based on WB 65); 26' truck/33'8" trailer combo area needed is 1,340 SF (based on WB 62)
- 2 truck/trailers per exhibitor (1 equine transport and 1 tack/support)
- All trucks/trailers go through staging

Storage

- 25% semi hauler, 75% 26' truck/33'8" trailer combo
- semi hauler area needed is 1,350 SF (based on WB 65); 26' truck/33'8" trailer combo area needed is 1,340 SF (based on WB 62)
- 350 total stalls with average 3 stalls/exhibitor
- Assumes a two day load in up front, two load in/load out overlap in middle, a two day load out at end
- 2 truck/trailers per exhibitor (1 equine transport and 1 tack/support)
- all trailers require storage in designated NWC facilities

Chapter 4 - Specialized Vehicle Staging and Storage

NWC Back of House Assessment
Summary Table- NWSS Event
DRAFT- assumptions being reviewed
8/31/2017

		NWSS	
Project Phase	Area/Type	Acres	Notes
Baseline	Staging Area		
	Livestock	3.2	Largest total peak of Hill and Yards. Maximum Hill need is 3.0 acres, Maximum Yard need is 0.8 acres. Middle of First Week.
	Equine Competition	1.0	Middle of Second Week.
	Maximum Total of Livestock and Equine Competition	3.7	Middle of Second Week.
	Vendor	N/A	Vendors have dispersed arrival times at NWSS. Staging areas that work for equine and livestock are adequate for vendors. Vendors are not released until NWSS is over and by this time most Livestock/Equine have left.
	Rodeo	1.1	Staging needs are based on dispersed arrivals/departures and turnover of competitors and stock over the Show.
	Trailer Storage Area		
	Livestock	13.0	Middle of first week
	Equine Competition	2.6	Middle of second week
	Vendor	3.8	Based on 276 vendors
	Maximum Total of Livestock, Equine Competition, and Vendor	17.7	Peak day of all three user groups
	Rodeo	3.6	based on 70 competitors per performance arriving 1-2 shows prior and departing immediately after their show + production support space
Pre-Construction	Staging Area		
	Livestock	3.2	Largest total peak of Hill and Yards. Maximum Hill need is 3.0 acres, Maximum Yard need is 0.8 acres.
	Equine Competition	1.0	No Breed Shows
	Maximum Total of Livestock and Equine Competition	3.7	Middle of Second Week.
	Vendor	N/A	Vendors have dispersed arrival times at NWSS. Staging areas that work for equine and livestock are adequate for vendors. Vendors are not released until NWSS is over and by this time most Livestock/Equine have left.
	Rodeo	1.1	Staging needs are based on dispersed arrivals/departures and turnover of competitors and stock over the Show.
	Trailer Storage Area		
	Livestock	13	Middle of first week
	Equine Competition	2.6	Middle of second week
	Vendor	3.8	Based on 276 vendors
	Maximum Total of Livestock, Equine Competition, and Vendor	17.7	Peak day of all three user groups
	Rodeo	3.6	based on 70 competitors per performance arriving 1-2 shows prior and departing immediately after their show + production support space
Construction	Staging Area		
	Livestock	3.2	Largest total peak of Hill and Yards. Maximum Hill need is 3.0 acres, Maximum Yard need is 0.8 acres. New Yards have 800 pens compared to 800 pens in existing Yards
	Equine Competition	1.0	No Breed Shows
	Maximum Total of Livestock and Equine Competition	3.7	Middle of Second Week.
	Vendor	N/A	Vendors have dispersed arrival times at NWSS. Staging areas that work for equine and livestock are adequate for vendors. Vendors are not released until NWSS is over and by this time most Livestock/Equine have left.
	Rodeo	1.1	Staging needs are based on dispersed arrivals/departures and turnover of competitors and stock over the Show.
	Trailer Storage Area		
	Livestock	13	Middle of second week
	Equine Competition	2.6	Middle of first and second week
	Vendor	3.8	Assumes 276 vendors with one trailer each
	Maximum Total of Livestock, Equine Competition, and Vendor	17.7	Peak day of all three user groups
	Rodeo	3.6	based on 70 competitors per show arriving 1-2 shows prior and departing immediately after their show + production support space
Phase 1 and 2 Operational	Staging Area		
	Livestock	4.2	New facility allows for 30% growth in animals exhibited.
	Equine Competition	2.0	number of available stalls doubles from 346 to 700
	Maximum Total of Livestock, Equine Competition, and Vendor	5.6	Middle of Second Week
	Vendor	N/A	Assume 25% vendor growth to 345 vendors
	Rodeo	1.1	Staging needs are based on dispersed arrivals/departures and turnover of competitors and stock over the Show.
	Trailer Storage Area		
	Livestock	16.9	30% growth
	Equine Competition	5.2	Stalls double from 346 to 700
	Vendor	4.8	Assume 25% vendor growth to 345 vendors
	Maximum Total of Livestock, Equine Competition, and Vendor	23.3	Peak day of all three user groups
	Rodeo	3.6	Rodeo remains in Coilseum. Based on existing Rodeo event data. Assumes # of rodeo shows, competitors, stock, and support remains the same as today.
Full Build Out	Staging Area		
	Yard Livestock	4.2	Same as Phase 1 and 2 Operational
	Equine Competition	2.0	Same as Phase 1 and 2 Operational
	Maximum Total of Livestock, Equine Competition, and Vendor	5.6	Same as Phase 1 and 2 Operational
	Vendor	N/A	Assume 50% vendor growth to 414 vendors.
	Rodeo	1.1	Staging needs are based on dispersed arrivals/departures and turnover of competitors and stock over the Show.
	Trailer Storage Area		
	Livestock	16.9	Same as Phase 1 and 2 Operational
	Equine Competition	5.2	Same as Phase 1 and 2 Operational
	Vendor	5.7	Assume 50% vendor growth to 414 vendors.
	Maximum Total of Livestock, Equine Competition, and Vendor	24.5	Peak day of all three user groups
	Rodeo	3.6	Assumes # of rodeo shows, competitors, stock, and support remains the same as today. Rodeo moves to new Event Center
Equine Breed Shows			Maximum Equine Breed Show- utilizes 700 Stalls
	Staging	7.2	proposed equine center has 700 stall capacity
	Storage	7.2	All trailers stored in NWC facilities

Chapter 4 - Specialized Vehicle Staging and Storage

NWC Back of House Assessment
Summary Table- Large Livestock/Equine Concurrent Event
DRAFT- assumptions being reviewed
8/31/2017

		Large/Concurrent Livestock/Equine Event*	
Project Phase	Area/Type	Acres	Notes
Baseline	Staging Area	Staging Area	
	Livestock	1.0	1/3 of NWSS Hill
	Equine Competition	0.3	1/3 of NWSS Equine Competition
	Maximum Total of Livestock and Equine Competition	1.3	Livestock and Equine arrive together
	Vendor	N/A	Vendors are staged prior to livestock and equine arrival and leave after most Livestock/Equine trailers have left staging
	Rodeo	N/A	Assume motorsports show at Coliseum with 20 team and support semi haulers. No staging, only storage.
	Trailer Storage Area	Trailer Storage Area	
	Livestock	3.3	1/3 of Hill Livestock Trailer Storage
	Equine Competition	0.9	1/3 of NWSS Equine Competition
	Vendor	1.3	1/3 of NWSS Expo
	Maximum Total of Livestock, Equine Competition, and Vendor	5.5	All on-site at same time
	Rodeo	0.6	Assume motorsports show at Coliseum with 20 team and support semi haulers. No staging, only storage.
Pre-Construction	Staging Area	Staging Area	
	Livestock	1.0	1/3 of NWSS Hill
	Equine Competition	0.3	1/3 of NWSS Equine Competition
	Maximum Total of Livestock and Equine Competition	1.3	Livestock and Equine arrive together
	Vendor	N/A	Vendors are staged prior to livestock and equine arrival and leave after most Livestock/Equine trailers have left staging
	Rodeo	N/A	Assume motorsports show at Coliseum with 20 team and support semi haulers. No staging, only storage.
	Trailer Storage Area	Trailer Storage Area	
	Livestock	3.3	1/3 of Hill Livestock Trailer Storage
	Equine Competition	0.9	1/3 of NWSS Equine Competition
	Vendor	1.3	1/3 of NWSS Expo
	Maximum Total of Livestock, Equine Competition, and Vendor	5.5	All on-site at same time
	Rodeo	0.6	Assume motorsports show at Coliseum with 20 team and support semi haulers. No staging, only storage.
Construction	Staging Area	Staging Area	
	Livestock	1.0	1/3 of NWSS Hill
	Equine Competition	0.3	1/3 of NWSS Equine Competition
	Maximum Total of Livestock and Equine Competition	1.3	Livestock and Equine arrive together
	Vendor	N/A	Vendors are staged prior to livestock and equine arrival and leave after most Livestock/Equine trailers have left staging
	Rodeo	N/A	Assume motorsports show at Coliseum with 20 team and support semi haulers. No staging, only storage.
	Trailer Storage Area	Trailer Storage Area	
	Livestock	3.3	1/3 of Hill Livestock Trailer Storage
	Equine Competition	0.9	1/3 of NWSS Equine Competition
	Vendor	1.3	1/3 of NWSS Expo
	Maximum Total of Livestock, Equine Competition, and Vendor	5.5	All on-site at same time
	Rodeo	0.6	Assume motorsports show at Coliseum with 20 team and support semi haulers. No staging, only storage.
and 2 Operational	Staging Area	Staging Area	
	Livestock	1.4	1/3 of NWSS Livestock
	Equine Competition	0.7	1/3 of NWSS Equine Competition
	Maximum Total of Livestock, Equine Competition, and Vendor	2.1	Livestock and Equine Arrive together
	Vendor	N/A	Vendors are staged prior to livestock and equine arrival and leave after most Livestock/Equine trailers have left staging
	Rodeo	N/A	Assume motorsports show at Coliseum with 20 team and support trucks. No staging, only storage.
	Trailer Storage Area	Trailer Storage Area	

Phase 1	Livestock	5.6	Assumes 1/3 of Max NWSS Livestock in new facility
	Equine Competition	1.7	Assumes 1/3 of Max NWSS Equine in new facility
	Vendor	1.6	Assumes 1/3 of Max NWSS Vendor in current 300,000 sf facility
	Maximum Total of Livestock, Equine Competition, and Vendor	9.0	All on-site at same time
	Rodeo	0.6	Assume motorsports show at Coliseum with 20 team and support semi haulers. No staging, only storage.
Full Build Out	Staging Area	Staging Area	
	Yard Livestock	1.4	1/3 of NWSS Livestock
	Equine Competition	0.7	1/3 of NWSS Equine Competition
	Maximum Total of Livestock, Equine Competition, and Vendor	2.1	Livestock and Equine Arrive together
	Vendor	N/A	Vendors are staged prior to livestock and equine arrival and leave after most Livestock/Equine trailers have left staging
	Rodeo	N/A	Assume motorsports show at Coliseum with 20 team and support trucks. No staging, only storage.
	Trailer Storage Area	Trailer Storage Area	
	Livestock	5.6	Assumes 1/3 of Max NWSS Livestock in new facility
	Equine Competition	1.7	Assumes 1/3 of Max NWSS Equine in new facility
	Vendor	1.9	Assumes 1/3 of Max NWSS Vendor in new 450,000 sf facility
	Maximum Total of Livestock, Equine Competition, and Vendor	9.3	All on-site at same time
	Rodeo	0.6	Assume motorsports show at Coliseum with 20 team and support semi haulers. No staging, only storage.
Equine Breed Shows		Smaller Equine Breed Show - Utilizes 350 Stalls	
	Staging	3.6	1/2 size of maximum equine breed show
	Storage	3.6	1/2 size of maximum equine breed show

* **Large/Concurrent Event** assumes livestock show in Livestock Center (1/3 size NWSS), Horse Competitions (1/3 size NWSS), Trade Show in Trade Show/Exhibition Hall (1/3 size NWSS), and a motorsports event at the Coliseum. The Yards are not programmed with activities.

Chapter 4 - Specialized Vehicle Staging and Storage

NWC Back of House Assessment
Summary Table- Large Attendee Event / DESIGN DAY CONDITIONS
DRAFT- assumptions being reviewed
8/31/2017

		Large Attendee Event*	
Project Phase	Area/Type	Acres	Notes
Baseline	Staging Area	Staging Area	
	Concert	N/A	in Coliseum. 3 Semi truck haulers for equipment and one bus for performers. No staging required other than space available next to the venue.
	Expo Show	1.0	In Expo Hall. Assumes 80 vendors. Assumes half stage at once.
	Horse Show	1.2	In Event Center. Assumes 75 competitors. Assumes half stage at once.
	Sporting Event	N/A	In Stadium Arena. Assumes 3 semi truck haulers for equipment. No additional staging space required.
	Trailer Storage Area	Trailer Storage Area	
	Concert	N/A	in Coliseum. 3 Semi truck haulers for equipment and one bus for performers. No storage required other than space available next to the venue.
	Expo Show	1.95	In Expo Hall. Assumes 80 vendors.
	Horse Show	2.3	In Event Center. Assumes 75 competitors.
	Sports Show	N/A	In Stadium Arena. Assumes 3 semi truck haulers for equipment. No additional storage space required.
Pre-Construction	Staging Area	Staging Area	
	Concert	N/A	in Coliseum. 3 Semi truck haulers for equipment and one bus for performers. No staging required other than space available next to the venue.
	Expo Show	1.0	In Expo Hall. Assumes 80 vendors. Assumes half stage at once.
	Horse Show	1.2	In Event Center. Assumes 75 competitors. Assumes half stage at once.
	Sporting Event	N/A	In Stadium Arena. Assumes 3 semi truck haulers for equipment. No additional staging space required.
	Trailer Storage Area	Trailer Storage Area	
	Concert	N/A	in Coliseum. 3 Semi truck haulers for equipment and one bus for performers. No storage required other than space available next to the venue.
	Expo Show	1.95	In Expo Hall. Assumes 80 vendors.
	Horse Show	2.3	In Event Center. Assumes 75 competitors.
	Sports Show	N/A	In Stadium Arena. Assumes 3 semi truck haulers for equipment. No additional storage space required.
Construction	Staging Area	Staging Area	
	Concert	N/A	in Coliseum. 3 Semi truck haulers for equipment and one bus for performers. No staging required other than space available next to the venue.
	Expo Show	1.0	In Expo Hall. Assumes 80 vendors. Assumes half stage at once.
	Horse Show	1.2	In Event Center. Assumes 75 competitors. Assumes half stage at once.
	Sporting Event	N/A	In Stadium Arena. Assumes 3 semi truck haulers for equipment. No additional staging space required.
	Trailer Storage Area	Trailer Storage Area	
	Concert	N/A	in Coliseum. 3 Semi truck haulers for equipment and one bus for performers. No storage required other than space available next to the venue.
	Expo Show	1.95	In Expo Hall. Assumes 80 vendors.
	Horse Show	2.3	In Event Center. Assumes 75 competitors.
	Sports Show	N/A	In Stadium Arena. Assumes 3 semi truck haulers for equipment. No additional storage space required.
Phase 1 and 2 Operational	Staging Area	Staging Area	
	Concert	N/A	in Coliseum. 3 Semi truck haulers for equipment and one bus for performers. No staging required other than space available next to the venue.
	Expo Show	1.0	In Expo Hall. Assumes 80 vendors. Assumes half stage at once.
	Horse Show	2.3	In Event Center. Assumes 150 competitors (facility doubles in size). Assumes half stage at once.
	Sporting Event	N/A	In Livestock Center. Assumes 3 semi truck haulers for equipment. No additional staging space required.
	Trailer Storage Area	Trailer Storage Area	
	Concert	N/A	in Coliseum. 3 Semi truck haulers for equipment and one bus for performers. No storage required other than space available next to the venue.
	Expo Show	1.95	In Expo Hall. Assumes 80 vendors.
	Horse Show	4.6	In Event Center. Assumes 150 competitors (facility doubles in size)
	Sports Show	N/A	In Livestock Center. Assumes 3 semi truck haulers for equipment. No additional storage space required.
Full Build Out	Staging Area	Staging Area	
	Concert	N/A	In new arena. 3 Semi truck haulers for equipment and one bus for performers. No staging required other than space available next to the venue.
	Expo Show	1.5	In Expo Hall. Assumes 120 vendors (50% increase over Baseline). Assumes half stage at once.
	Horse Show	2.3	In Event Center. Assumes 150 competitors (facility doubles in size). Assumes half stage at once.
	Sporting Event	N/A	In Livestock Center. Assumes 3 semi truck haulers for equipment. No additional staging space required.
	Trailer Storage Area	Trailer Storage Area	
	Concert	N/A	In new arena. 3 Semi truck haulers for equipment and one bus for performers. No staging required other than space available next to the venue.
	Expo Show	2.9	In Expo Hall. Assumes 120 vendors (50% increase over Baseline).
	Horse Show	4.6	In Event Center. Assumes 150 competitors (facility doubles in size over Baseline)
	Sports Show	N/A	In Livestock Center. Assumes 3 semi truck haulers for equipment. No additional storage space required.

* Large Attendee Event design day assumes concert (3,500 attendees), expo show (3,000 attendees), horse show (1,000 attendees), sporting event (2,000 attendees)
The Yards are not programmed with activities.

Chapter 5 - Parking Demand Model



Projected Parking Demand with TDM and Mode-Split Reductions

Active TDM Scenario = Moderate

	Scenarios	Scenario Description	Unadjusted	Projected Demand	% Mode Reduction
Baseline	1	Baseline conditions, Design Day (2nd Saturday of National Western Stock Show)	10,213	9,600	6%
Pre-Construction	2	Pre-Construction: Stock Show Weekend	10,334	9,500	8%
	3	Pre-Construction: Large/Concurrent Event	3,967	3,600	8%
	4	Pre-Construction: Typical Day	265	260	2%
Phase 1-2 Under Construction	5	Phase 1-2 Under Construction: Stock Show Weekend	10,835	9,800	10%
	6	Phase 1-2 Under Construction: Large/Concurrent Event	4,086	3,700	10%
	7	Phase 1-2 Under Construction: Typical Day	265	260	2%
Phase 1-2 Operational	8	Phase 1-2 Operational: Stock Show Weekend	12,506	10,700	15%
	9	Phase 1-2 Operational: Large/Concurrent Event	6,346	5,500	14%
	10	Phase 1-2 Operational: Typical Day	451	400	10%
Full Build-out	11	Full Build-out: Stock Show Weekend	14,414	12,200	15%
	12	Full Build-out: Large/Concurrent Event	8,726	7,500	14%
	13	Full Build-out: Typical Day	1,235	1,100	14%

Chapter 5 - Parking Demand Model



	Scenarios	Scenario Description
Baseline	1	Baseline conditions, Design Day (2nd Saturday of National Western Stock Show)
Pre-Construction	2	Pre-Construction: Stock Show Weekend
	3	Pre-Construction: Large/Concurrent Event
	4	Pre-Construction: Typical Day
Phase 1-2 Under Construction	5	Phase 1-2 Under Construction: Stock Show Weekend
	6	Phase 1-2 Under Construction: Large/Concurrent Event
	7	Phase 1-2 Under Construction: Typical Day
Phase 1-2 Operational	8	Phase 1-2 Operational: Stock Show Weekend
	9	Phase 1-2 Operational: Large/Concurrent Event
	10	Phase 1-2 Operational: Typical Day
Full Build-out	11	Full Build-out: Stock Show Weekend
	12	Full Build-out: Large/Concurrent Event
	13	Full Build-out: Typical Day

Chapter 5 - Parking Demand Model



Population Growth Factors			
	Stock Show (1,2)	Large/Concurrent Event (3)	Typical Day (4)
Pre-Construction	3%	3%	0%
Phase 1-2 Under Construction	8%	8%	0%
Phase 1-2 Operational	24%	60%	110%
Full Build-out	43%	120%	518%

Assumptions

- (1) Stock Show growth factor estimates based on projections from Parsons Brinkerhoff's Parking Demand Technical Memorandum (dated Sept. 22 2011) and Master Plan construction phasing as conceptualized to date. Growth factors may vary as phases become further defined. See "Additional Information" tab.
- (2) Modest growth is assumed for Pre-Development and Under Construction stages based on historical attendance data trends provided by NWSS.
- (3) WALKER has assumed a much higher percentage growth expectation for large/concurrent events on the NWC site due to the impacts of drastically improved facilities, access, infrastructure, and marketing, as well as the availability of previously unavailable areas, such as the yards, for large event hosting.
- (4) WALKER has estimated growth based on square footage of facilities in the Master Plan conceptualized for daily use. Typical daily demand and growth factors will change as the year-round site uses are more fully defined. Note that the site currently experiences minimal typical daily demand.

Chapter 5 - Parking Demand Model



Active Scenario8Phase 1-2 Operational: Stock Show Weekend

Active Hourly Factors

	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Event Visitors/Attendees	5%	10%	15%	30%	30%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	35%	15%	5%
Daily (Non-Event) Visitors	50%	60%	75%	75%	100%	100%	100%	100%	100%	100%	100%	100%	80%	60%	60%	40%	40%	30%	20%	10%
Employees/Staff/Volunteers	50%	60%	75%	75%	100%	100%	100%	100%	100%	100%	100%	100%	80%	60%	60%	40%	40%	30%	20%	10%
Exhibitors/Concession/Vendors	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	40%	40%	40%	30%	30%	30%	20%	10%

1 Baseline conditions, Design Day (2nd Saturday of National Western Stock Show)

	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Event Visitors/Attendees	5%	10%	15%	30%	30%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	35%	15%	5%
Daily (Non-Event) Visitors	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Employees/Staff/Volunteers	50%	60%	75%	75%	100%	100%	100%	100%	100%	100%	100%	100%	80%	60%	60%	40%	40%	30%	20%	10%
Exhibitors/Concession/Vendors	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	40%	40%	40%	30%	30%	30%	20%	10%

2 Pre-Construction: Stock Show Weekend

	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Event Visitors/Attendees	5%	10%	15%	30%	30%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	35%	15%	5%
Daily (Non-Event) Visitors	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Employees/Staff/Volunteers	50%	60%	75%	75%	100%	100%	100%	100%	100%	100%	100%	100%	80%	60%	60%	40%	40%	30%	20%	10%
Exhibitors/Concession/Vendors	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	40%	40%	40%	30%	30%	30%	20%	10%

3 Pre-Construction: Large/Concurrent Event

	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Event Visitors/Attendees	0%	0%	0%	1%	1%	1%	1%	1%	17%	67%	67%	1%	1%	1%	25%	100%	100%	0%	0%	0%
Daily (Non-Event) Visitors	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Employees/Staff/Volunteers	0%	0%	10%	10%	20%	20%	20%	30%	100%	100%	100%	30%	30%	100%	100%	100%	100%	30%	10%	5%
Exhibitors/Concession/Vendors	0%	0%	0%	0%	20%	20%	20%	30%	60%	60%	60%	30%	30%	80%	80%	80%	80%	30%	10%	5%

4 Pre-Construction: Typical Day

	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Event Visitors/Attendees	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Daily (Non-Event) Visitors	0%	1%	5%	10%	30%	50%	65%	80%	90%	100%	100%	95%	90%	80%	75%	65%	50%	35%	15%	0%
Employees/Staff/Volunteers	0%	10%	15%	40%	75%	85%	95%	100%	100%	100%	100%	100%	95%	85%	80%	75%	65%	45%	15%	0%
Exhibitors/Concession/Vendors	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

5 Phase 1-2 Under Construction: Stock Show Weekend

	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Event Visitors/Attendees	5%	10%	15%	30%	30%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	35%	15%	5%
Daily (Non-Event) Visitors	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Employees/Staff/Volunteers	50%	60%	75%	75%	100%	100%	100%	100%	100%	100%	100%	100%	80%	60%	60%	40%	40%	30%	20%	10%
Exhibitors/Concession/Vendors	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	40%	40%	40%	30%	30%	30%	20%	10%

6 Phase 1-2 Under Construction: Large/Concurrent Event																				
	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Event Visitors/Attendees	0%	0%	0%	1%	1%	1%	1%	1%	17%	67%	67%	1%	1%	1%	25%	100%	100%	0%	0%	0%
Daily (Non-Event) Visitors	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Employees/Staff/Volunteers	0%	0%	10%	10%	20%	20%	20%	30%	100%	100%	100%	30%	30%	100%	100%	100%	100%	30%	10%	5%
Exhibitors/Concession/Vendors	0%	0%	0%	0%	20%	20%	20%	30%	60%	60%	60%	30%	30%	80%	80%	80%	80%	30%	10%	5%

7 Phase 1-2 Under Construction: Typical Day																				
	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Event Visitors/Attendees	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Daily (Non-Event) Visitors	0%	1%	5%	10%	30%	50%	65%	80%	90%	100%	100%	95%	90%	80%	75%	65%	50%	35%	15%	0%
Employees/Staff/Volunteers	0%	10%	15%	40%	75%	85%	95%	100%	100%	100%	100%	100%	95%	85%	80%	75%	65%	45%	15%	0%
Exhibitors/Concession/Vendors	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

8 Phase 1-2 Operational: Stock Show Weekend																				
	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Event Visitors/Attendees	5%	10%	15%	30%	30%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	35%	15%	5%
Daily (Non-Event) Visitors	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Employees/Staff/Volunteers	50%	60%	75%	75%	100%	100%	100%	100%	100%	100%	100%	100%	80%	60%	60%	40%	40%	30%	20%	10%
Exhibitors/Concession/Vendors	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	40%	40%	40%	30%	30%	30%	20%	10%

9 Phase 1-2 Operational: Large/Concurrent Event																				
	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Event Visitors/Attendees	0%	0%	0%	1%	1%	1%	1%	1%	17%	67%	67%	1%	1%	1%	25%	100%	100%	0%	0%	0%
Daily (Non-Event) Visitors	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Employees/Staff/Volunteers	0%	0%	10%	10%	20%	20%	20%	30%	100%	100%	100%	30%	30%	100%	100%	100%	100%	30%	10%	5%
Exhibitors/Concession/Vendors	0%	0%	0%	0%	20%	20%	20%	30%	60%	60%	60%	30%	30%	80%	80%	80%	80%	30%	10%	5%

10 Phase 1-2 Operational: Typical Day																				
	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Event Visitors/Attendees	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Daily (Non-Event) Visitors	0%	1%	5%	10%	30%	50%	65%	80%	90%	100%	100%	95%	90%	80%	75%	65%	50%	35%	15%	0%
Employees/Staff/Volunteers	0%	10%	15%	40%	75%	85%	95%	100%	100%	100%	100%	100%	95%	85%	80%	75%	65%	45%	15%	0%
Exhibitors/Concession/Vendors	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

11 Full Build-out: Stock Show Weekend																				
	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Event Visitors/Attendees	5%	10%	15%	30%	30%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	35%	15%	5%
Daily (Non-Event) Visitors	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Employees/Staff/Volunteers	50%	60%	75%	75%	100%	100%	100%	100%	100%	100%	100%	100%	80%	60%	60%	40%	40%	30%	20%	10%
Exhibitors/Concession/Vendors	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	40%	40%	40%	30%	30%	30%	20%	10%

12 Full Build-out: Large/Concurrent Event																				
	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Event Visitors/Attendees	0%	0%	0%	1%	1%	1%	1%	1%	17%	67%	67%	1%	1%	1%	25%	100%	100%	0%	0%	0%

Daily (Non-Event) Visitors	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Employees/Staff/Volunteers	0%	0%	10%	10%	20%	20%	20%	30%	100%	100%	100%	30%	30%	100%	100%	100%	100%	30%	10%	5%
Exhibitors/Concession/Vendors	0%	0%	0%	0%	20%	20%	20%	30%	60%	60%	60%	30%	30%	80%	80%	80%	80%	30%	10%	5%

13 Full Build-out: Typical Day

	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	12:00 AM
Event Visitors/Attendees	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Daily (Non-Event) Visitors	0%	1%	5%	10%	30%	50%	65%	80%	90%	100%	100%	95%	90%	80%	75%	65%	50%	35%	15%	0%
Employees/Staff/Volunteers	0%	10%	15%	40%	75%	85%	95%	100%	100%	100%	100%	100%	95%	85%	80%	75%	65%	45%	15%	0%
Exhibitors/Concession/Vendors	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Assumptions

- (1) Stock Show Events: Hourly demand distribution based on 2015, 2016, and 2017 events schedules; 2015 and 2016 intercept survey data including time of arrival and length of stay; and information provided by NWSS staff.
- (2) Large Concurrent Events: Hourly demand distribution based on ULI Shared Parking Model Performing Arts Center use.
- (3) Daily Conditions: Hourly demand distribution based on ULI Shared Parking Model Mixed Community Retail use. This will be adjusted based on further refinement of build-out scenarios based on information provided by CH2M.

Chapter 5 - Parking Demand Model



TDM Program	Measure of Effectiveness in Reducing Parking	
	Low	High*
Carshare Program	0.5%	0.5%
Land Use Diversity	0.0%	0.0%
Network Expansion	0.0%	0.0%
Pedestrian Network	0.5%	0.5%
Rideshare Program	0.5%	0.8%
Service Frequency/Speed	0.5%	0.8%
Transit Accessibility	0.0%	0.0%
Alternative Work Schedules & Telecommute Program	1.0%	2.0%
Commute Trip Reduction (CTR) Marketing	1.0%	2.0%
Destination Accessibility	0.0%	0.0%
Employee Parking Cash-Out	0.5%	0.8%
Employer Sponsored Vanpool/Shuttle	0.5%	0.5%
Transit Fare Subsidy	0.5%	0.8%
Unbundle Parking Costs	1.0%	2.0%
On-Street Market Pricing	0.0%	0.0%
Workplace Parking Pricing	1.2%	2.2%
Parking Supply Limits	1.0%	2.0%
NEV Network	N/A	N/A
Traffic Calming	N/A	N/A
Local Shuttles	0.5%	0.5%
Guaranteed Ride Home	0.5%	0.5%
Subsidized Carshare Membership	0.5%	0.5%
Carshare Parking	0.5%	0.5%
Secure Bicycle Parking	0.5%	0.5%
Valet Bicycle Parking	0.5%	0.5%
Preferential Parking for 4+ Carpools	0.5%	0.5%
Dedicated Carpool Pick-Up/Drop-Off	0.5%	0.5%
Multi-Modal Wayfinding	0.5%	0.5%
Real-Time Transit Displays	0.5%	0.5%
Bikeshare Station	0.5%	0.5%
Electric Bikeshare Program	0.5%	0.5%
Bikeshare Membership	0.5%	0.5%
End-of-Trip Facilities (Showers, lockers, repair station)	0.5%	0.5%
Internal Fleet of Bicycles	0.5%	0.5%
TDM Coordinator	0.5%	0.8%
Online Mobility Platform	0.5%	0.5%
Mobility Hub	0.5%	0.5%

