Proposed improvements to the transportation system are discussed in more detail below. In addition, the open space and street section design discusses proposed transportation improvements from a design perspective.

**Public Transportation**

The South Lincoln district is currently served by multiple lines of public transportation including commuter/local bus and light rail. The light rail station at 10th Avenue and Osage Street is likely to see the greatest amount of growth among the public transportation options that currently serve the area. In 2007, 2,744 transit patrons were observed getting on and off the light rail at the 10th and Osage station. By 2030, this number has been projected to grow to 14,837 boardings and alightings. This ridership projection was developed prior to proposed redevelopment of the South Lincoln Homes site, so future transit ridership will likely be higher.

There are several transit improvements that could be made to provide better regional mobility for existing residents, as well as to provide transportation choices to new residents in order to preserve the existing “low traffic character of the neighborhood. The existing and proposed transit priority network is shown in this Existing and Proposed Bus and Pedestrians Priority Network figure, with specific recommendations discussed in more detail below.

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1 Lee Cryer, RTD. Telephone conversation on October 9, 2009
Frequency
As redevelopment of the South Lincoln Homes site occurs and the surrounding neighborhood continues to grow, RTD will continue to update its ridership projections and Short-Range Transit Plan to accommodate necessary service frequency increases to existing fixed-route bus and rail transit.

Connectivity
One of the primary transportation needs identified during community outreach was the need to improve transit connections to the light rail station and retail and community services. Despite the high level of transit service to the rail station and the surrounding neighborhood, the need to improve transit connections to the light rail station identified during community outreach was the early-action recommendation of this Master Plan.

As the South Lincoln Homes site redevelops and the surrounding neighborhood continues to grow, the Master Plan recommends that this existing shuttle could be expanded or a new shuttle system be developed to serve more destinations in the plan area, have higher frequency service, and/or have expanded hours of operation that the current shuttle. Such a shuttle system would need to be developed in coordination with Denver Health, RTD, and the Housing Authority. The shuttle should be low-cost or free with an RTD pass or transfer. If a new shuttle were to be implemented, there may be cost efficiencies in coordinating with the existing Denver Health shuttle such as stop sharing or shared marketing/branding.

Additionally, the Santa Fe Arts District operates a shuttle from the light rail station to the District on First Fridays. Efficiencies may also be realized by coordinating with the Arts District.

To further enhance transit connectivity and access to the light rail station, shuttle buses should directly serve the station so that the light rail station is in place one or more of its ridership projections. Currently Denver Health runs a free shuttle between their facilities located in the southwestern edge of the plan area and the light rail station at 10th Avenue and Osage Street. Since many neighborhood residents stated during community outreach meetings that they were not aware of this shuttle, an early-action recommendation of the Master Plan is to better advertise this shuttle to neighborhood residents.

Amenity
An important way to encourage transit ridership in the plan area is to increase passenger convenience and the perceived safety of waiting for the bus. To accomplish this goal, street-side bus stops should be upgraded to bus shelters with the following features:

- Seating/leaning rails
- Trash receptacles (if desired)
- Shelter from inclement weather while maintaining some transparency
- Maps and schedules
- Real-time arrival information
- Lighting at night
- Emergency call boxes (if desired by the community)

Bus shelter design should be coordinated with existing RTD shelter standards, but potentially consider a special shelter design for the plan area that visually references the neighborhood history and character and complements the design palette for other proposed street furniture in the neighborhood (benches, lighting, etc.).

Pedestrian Network
Although the area adjacent to the 10th and Osage light rail station has good pedestrian conditions, much of the rest of the South Lincoln plan area does not. In its present condition, the South Lincoln Homes site and surrounding neighborhood provides challenging conditions for pedestrians for a variety of reasons including poor roadway crossing locations, inadequate sidewalks, and poor wayfinding signage.

The existing and proposed pedestrian priority network is shown in Existing and Proposed Bus and Pedestrians Priority Network figure on the preceding page, with specific recommendations discussed in more detail below. Based on site observations, community outreach, and collision data, the Master Plan project team identified several locations in the plan area as pedestrian improvements. These include:

- Pedestrian crossings at Kalamath Street (Santa Fe Drive (this couplet of one-way streets serves as a high-speed arterial for traffic coming/leaving downtown)).
- Mariposa Street corridor between Colfax and 6th Avenues.
- The intersections of Osage and Mariposa Streets, 10th and 11th Avenues.
- Mid-block crossings of Mariposa, Navajo and Osage Streets between 9th and 11th Avenues.

In the summer of 2009, a group from the local La Alma Boys and Girls Club surveyed pedestrian conditions in the neighborhood. Using San Francisco’s Pedestrian Quality Index (PEQI), the students surveyed intersections and blocks near Lincoln Park to measure the quality of the pedestrian environment. Even though the survey did not encompass the entirety of the South Lincoln plan area, it does provide a snapshot of how certain places within the site perform. Based on a sample of ten intersections, only one provided “reasonable pedestrian conditions” while the remainder scored as “basic” or “poor.” The full PEQI assessment can be found in the Appendix.
This Master Plan recommends four primary strategies for improving the pedestrian network in the plan area:

- Incorporating corner and mid-block curb bulb-outs to narrow crossing distances and increase pedestrian visibility.
- Implementing tighter turn radii at intersections (less than the current City standard of 25') to slow turning vehicles as they cross the pedestrian realm would be a non-site specific strategy.
- Installing raised crosswalks and or raised intersections to slow vehicles and reduce conflicts with crossing pedestrians.
- Establishing back-in angled parking on the north side of 11th Avenue adjacent to Lincoln Park and other bike priority streets to improve pedestrian safety of motorists exiting parked cars and entering the pedestrian realm.

Some of these improvements do not meet current City street design standards and will require either changes to these standards or approval of a variance from these standards. See the diagram below and refer to the following sections, Open Space Plan & Character, and Proposed Street Sections, for additional information on street character.

Beyond these traffic calming improvements, additional improvements would be to develop pedestrian wayfinding signage to direct pedestrians to and from the 10th and Osage light rail station and major destinations in the plan area. Currently, little information is provided to pedestrians beyond the station area to local destinations. Likewise, individuals at local destinations may be completely unaware that an RTD station is located just a few blocks away. For example, simple directional signs near the station and at key points in the Santa Fe Arts District would significantly improve the pedestrian experience by directing pedestrians to the best walking routes. This Master Plan recommends that a pedestrian wayfinding system be developed, with an emphasis on the streets that comprise the pedestrian priority network connecting major pedestrian attractions (as shown in the Existing and Proposed Bus and Pedestrians Priority Network figure).

**Bicycle Network**

The current bicycle network in the South Lincoln district has the beginnings of a comprehensive bicycle network, including a number of signed bicycle routes and off-street bicycle paths. However, in its current status, the bicycle network is disjointed and does not fully support convenient cross-town or even local bicycle travel. The current bicycle network provides an adequate north-south means of bicycle to traverse within and through the district. However, bicycle connectivity east-west through the site and specifically to access the 10th and Osage light rail station is limited.

In recent months, federal stimulus funds, in conjunction with local city funds, has allowed for the expansion of the bicycle network within the South Lincoln district. The City’s current proposals for these funds include striping bicycle lanes on Mariposa Street between 8th and Coffax Avenues, and designating several roadways around the 10th and Osage light rail station as bicycle routes with signs and sharrows.

In order to improve bicycle connectivity and convenience for existing and new residents who wish to bicycle, this Master Plan proposes to expand on the current bicycle network as follows:

**New bicycle routes:**
- W 8th and W 13th Avenues between Mariposa Street and Speer Boulevard;
- W 10th Avenue between the 10th and Osage RTD Station and Speer Boulevard;
- Continuation of bike route on Osage Street between 10th and Coffax Avenues;
- Continuation of bike route on Galapago Street between 10th and 13th Avenues

**Proposed bicycle paths:**
- Potential use of rail right-of-way for off-street bike path. Design of this facility would follow several successful “rails-with-trails” facilities that have been implemented across the country. This recommendation would be pursued in coordination with RTD and Union Pacific to address all safety and liability concerns.

The existing and proposed bicycle priority network is shown in the Existing Neighborhood Character figure on the following page. Bicycle facilities, including storage, should be provided to meet LEED-ND NPD Credit 1. These can be incorporated in the South Lincoln Redevelopment as well as considered at the 10th and Osage RTD station. Also, refer to street sections in the following sections, Open Space Plan & Character, and Proposed Street Sections.

These improvements will complete several
critical gaps in the existing bicycle network in the plan area and will improve the convenience of bicycling between the 10th and Osage light rail station and important pedestrian attractors including employment and community facilities.

In addition to improvements to the bicycle network, additional bicycle parking should be provided throughout the district, with a priority on locations that have significant potential for increasing bike travel such as schools and community facilities. As with bus shelters, the design of bike parking racks should be coordinated with current City standards but could also emphasize a consistent design that is both attractive and secure and incorporates art or other elements that reference the neighborhood history and character. Bike parking should be located in areas that are visible from the street, near building entrances, sheltered from the elements, and well-lit at night.
Vehicular Network
With the exception of extending Osage through to 9th Avenue to promote better access to the light rail station and improved vehicle and transit circulation, no significant changes to the existing street grid pattern or directionality of traffic are recommended in this Master Plan. While no traffic modeling was conducted as part of this Master Plan, the roadway widths would appear to be adequate to accommodate future traffic volumes generated by current and future development anticipated in the plan area under any potential build-out scenario. Likewise, it would appear that all the proposed changes to the street widths for the purpose of improving pedestrian conditions would not impact automobile levels of service since the existing number of traffic lanes is being maintained. It is important to note that this recommendation assumes that the multimodal transportation recommendations in this section and the transportation demand management strategies recommended in the Parking Demand and Estimate Management Plan section (following) are implemented in order to maintain the existing “low traffic” character of the neighborhood.

Parking Design Principles
The manner in which on- and off-street parking is designed and operated will play a critical role in the success of the project, from the perspective of economic feasibility, sustainability, but also urban design. To ensure that the project provides the right amount of parking, a parking demand model and parking management plan are included in the following section. Below are some parking design principles that will be incorporated into future development projects (for on-street parking) and street improvements (for on-street parking) in order to promote the most efficient use of the parking supply while ensuring that parking does not dominate and detract from the public realm:

On-street Parking
- Wherever feasible and especially on commercial streets, on-street parking lanes will be designed with special paving materials to promote flexible use of the parking lane and potentially stormwater mitigation (if pervious materials are used).
- On-street parallel parking lanes shall be designed to the minimum width feasible; on bike priority streets, parallel parking lanes shall include a buffer space (in addition to the space needed for vehicle storage) in order to ensure that bicycles can safely ride outside of the “door zone” (the area in the travel lane taken up when the driver-side door of a parked car is open).
- Wherever angled parking is used and especially on bike-priority streets, back-in angled parking shall be prioritized in order to reduce conflicts between bikes and cars during parking maneuvers.

Off-street Parking
- The widths of driveway curb cuts shall be minimized to the narrowest feasible dimension. Driveways shall be consolidated/shared to the maximum extent feasible.
- Surface parking lots shall be screened with landscaping providing some buffer between the sidewalk while still allowing for visibility.
- Structured parking shall be provided below ground wherever feasible. Any ground-floor parking shall be wrapped with either a) active uses (“liner buildings”) or b) screened with art, landscaping, etc.
Introduction
In order for the South Lincoln Homes redevelopment project to succeed both today and in the future, careful attention must be paid to parking. Enough parking must be supplied to meet the reasonable amount of demand from residents, visitors, and employees.

At the same time providing too much parking in this transit-oriented project will facilitate excessive vehicle travel that compromises the sustainability and public health goals of this Master Plan and undermines the existing low-traffic character of the neighborhood. Because parking is expensive to build and maintain—and takes up a tremendous amount of space that could be developed to a higher and better uses (such as housing or neighborhood-serving retail or community services)—the economic viability of the proposed redevelopment is contingent on providing the least amount of parking that is required to meet the estimated demand.

For these reasons, this Master Plan recommends a number of proven strategies to both reduce parking demand and promote the most efficient use of the parking supply. In addition, this Master Plan proposes a phased approach to building parking facilities in order to provide maximum flexibility to adjust parking supply to meet changing demand over time.

Existing city parking requirements
The consultant team has reviewed the existing City of Denver parking requirements for the proposed program and has determined that the project will meet the existing City requirements under any scenario. The parking analysis has been preliminarily reviewed by City of Denver Community Development staff who have affirmed its conclusions in concept. In addition, the City of Denver is currently undergoing a planning initiative to revise its zoning code and parking requirements to require less parking (and greater flexibility in parking provision) for mixed-use, transit-oriented projects like the South Lincoln Homes redevelopment project.

Conventional requirements
Based on our research, the city’s conventional parking requirements for “stand-alone” uses would require 1,048 parking spaces for this project with the proposed development program.

Allowable reductions to requirements
The City of Denver’s parking requirements recognize that developments in different contexts perform uniquely, and that parking requirements cannot be applied in a one-size-fits-all manner. Instead, local planners have taken a progressive approach to parking and have outlined parking requirements that reflect not only a specific type of land use, but the interaction of land uses. This has been codified through the designation of off-street parking requirements for mixed-use districts. In this section, parking requirements have been set at a level that reflects the findings of recent parking research, including the example cited above. Further detail of these requirements can be found in the Appendix.

In addition to setting parking standards that are more appropriate for particular types of land uses, the City of Denver has also recognized the value of districts that have close proximity to public transportation and demonstrate other factors that may reduce the need for parking spaces. These standards may reduce the total number of required spaces by up to 50% in select districts. The factors that contribute to these additional reductions include:

• Access to transit mixed use-zones within 1/4 mile of the outer boundary of a rail station are subject to a parking space reduction of up to 25%.  
• Shared Parking Analysis/Trip Reduction Strategy. Upon the submission of a formal transportation/trip reduction plan among other requirements, parking spaces are subject to reductions of 26-50%. This will be discussed in greater detail below.  
• Affordable Housing Parking requirements associated with affordable housing may be reduced up to 20%.

These reductions are subject to analysis of project location, shared parking opportunities, mode shift and travel demand reduction plans. Yet, based on the nature and the location of the South Lincoln Homes site, we estimate that the proposed project would be eligible for the current maximum of a 50% reduction from City parking for a total of 524 spaces required under current code.

1 Additional information on proposed mobility improvements to reduce parking demand is provided in the Access and Connectivity section. Appendix contains the full parking demand analysis including assumptions and findings.
Difference between parking requirements and parking demand

Actual parking demand for this project will differ from conventional parking requirements for several reasons. First, the site’s close proximity to bus and light rail public transportation will enable many of its residents and users to access the site without the need for a private automobile. Second, the site’s unique characteristics and environs are appropriate for trip reduction programs and other strategies that could be implemented which could further reduce the number of parking spaces needed. Additional characteristics include good roadway connectivity, affordability, and land-use mixes that are appropriate for shared parking.

The following sections will describe in greater detail the types of strategies that will help reduce parking demand that are proposed for implementation in the South Lincoln Homes redevelopment project.

Captive Market Effects

The city’s parking requirements already reflect a wide range of potential parking reductions but do not explicitly address the impact of captive market effects. Mixed-use districts such as the South Lincoln Redevelopment allow for parking efficiencies through “captive market effects” (sometimes called “internal trip capture”). Captive market effects refers to trips that are made by patrons who, having already parked, travel on foot between different uses on the project site without moving their vehicle or requiring an additional parking space. For example, restaurants and retail services are common sources of captive market parking reductions in mixed-use developments that also include office and residential components, as the restaurants/retail components serve both employees and residents of the same development. In cases where residents of the project also work on-site, captive market effects in a mixed-use project can eliminate multiple parking spaces compared to single use development by allowing residents to live, work, and play without moving their car. Not only does this proximiy of mixed uses present an opportunity to conserve land area from parking uses, but it reduces localized traffic congestion as local employees and residents are presented with daily goods and services within walking distance.

Based on the mixture of uses for this project and the project’s target market demographics, we believe that a large number of visitors to the project’s dining and retail destinations are expected to be composed of local employees and residents. In addition, some trips to the project by residents and employees in the immediate project vicinity are expected to be made on foot or other non-motorized modes. Captive market effects are largely the result of density and mixed uses, and the South Lincoln Redevelopment will therefore realize a significant reduction in its parking demand due to the captive market effects. Even though city parking requirements do not explicitly call for analysis of these type of effects, we proceeded to calculate their potential impact on parking demand.

Trip Reduction Strategies

The trip reduction strategies discussed in this section have been shown to reduce vehicle trips and parking demand in comparable development contexts. In addition, this section discusses programs that are recommended for their impact on improving the efficiency of the parking supply provided by helping visitors find available parking quickly and preventing parking spillover problems in adjacent neighborhoods.
This Master Plan proposes that the South Lincoln district develop a comprehensive package of parking demand management and trip reduction tools. While the specific mix of strategies has not been finalized, the package of measures will be developed to provide a reduction in parking demand that meets or exceeds the reduction in parking requirements granted by the City. The parking demand reduction measures under consideration include:

- Parking cash-out to allowing employees the option of “cashing out” the value of employer-provided free parking space.
- Unbundling prices charged for residential parking from the sales prices charged for residential units.
- Providing free or subsidized “Universal Transit Passes” to project residents and employees.
- Establishing a car-sharing service for project residents, guests, and employees.
- Coordinating a carpool ridematching service.
- Offering Guaranteed Ride Home service to employees.
- Providing enhanced transit, bicycle, and pedestrian facilities.

Parking Operations Efficiencies
In addition to the policies and incentives discussed above that reduce parking demand, the project could also implement several recommended programs that improve the efficiency of the parking supply already provided. While these programs do not necessarily reduce vehicle trips or parking demand, they do improve the efficiency of parking supply by helping visitors find available parking and prevent parking spillover problems in adjacent neighborhoods. These strategies may specifically come into play for the phasing of the South Lincoln project. As the project comes to fruition, parking demands at any point of time can be fully met using some of the strategies below to temporarily alleviate any parking constraints.

These strategies include:
- Coordinated parking wayfinding and real-time occupancy signage systems.
- Use of tandem, parking stackers or parking operations to add capacity as needed as shown earlier in this section.
- Use of undeveloped parcels for additional surface parking (“parking reservoir”) as needed.

We estimate that implementation of parking management, trip reduction, and operational efficiency measures will result conservatively in an estimated parking demand reduction of 10% for residential uses and 15% for all other uses.

Peak Load Parking Demand Estimate
Combining the reasonable reductions for captive market effects and demand reduction measures, we estimate a peak parking demand for 597 cars. This estimate assumes peak loads for all uses and doesn’t take into account shared parking opportunities to reduce the stand-alone parking supply as discussed in the next section. In the next section, parking demand is analyzed with the assumption of some shared parking in order to make the most efficient use of the project area’s parking supply and allow for a reduction in the physical “footprint” of and new parking facilities.

Shared parking demand analysis
This section estimates the parking efficiency gains made possible by implementing a shared parking arrangement among different project uses with different parking demand peaks. The section then estimates actual parking demand for the project assuming implementation of the shared parking arrangements and the parking management and trip reduction strategies recommended. All assumptions and methodology for the parking demand reduction and shared parking analysis are provided in full in the Appendix.

Overview of shared parking
Mixed-use districts such as South Lincoln offer the opportunity to share parking spaces between various project uses, thereby reducing the total number of spaces required compared to the same uses in stand-alone developments. This is a primary benefit in mixed-use development contexts of moderate-to-high density. Shared parking operations also offer many localized benefits to the surrounding community, including a more efficient use of land resources and reduced traffic congestion. Shared parking opportunities for the South Lincoln project and comparable mixed-use plans are the result of the staggered demand peaks associated with each different use. Different land uses generate unique levels and patterns of parking demand. Parking supplies at mixed-use locations accommodate these demand fluctuations more efficiently than segregated supplies, by accommodating peaking uses with spaces left vacant by other uses. Thus, the same parking facility that was full of office workers’ vehicles during the day can be used for restaurant patrons at night.

Mechanical parking stackers reduce parking footprint and can be operated by the motorist.
Shared Parking Analysis for South Lincoln

In recognition of the fact that parking demand for each land use fluctuates throughout the day, each land use (condominiums, office, restaurant and retail) for this project has a variable parking demand rate by time of day. This varying demand is expressed as “occupancy rates” a percentage of spaces allocated for a particular land use that are likely to be occupied at any given time. If parking is shared, then the total demand for parking is the sum of the number of parking spaces occupied for all land uses at the busiest hour. Sharing does not reduce parking demand; instead it reduces the amount of square footage that is needed to meet the parking demand. For example, during the evening, parking spaces used by office workers during the day can be “shared” or filled with visitors of a nearby restaurant, or even better, by residents. However, if residents have dedicated parking, these spaces will become unavailable to other users at all times, which may cause underutilization of parking. These efficiencies allow for a much smaller “parking footprint” allowing for a) land to be used for more productive uses and b) greater flexibility in site planning and project design.

The consultant team analyzed how a shared parking arrangement can reduce the parking footprint for the South Lincoln District. The table further on in this section shows the main input parameters used in this shared parking analysis:

- **Land Use**: The first column shows all the land uses for the project.

- **Time Period**: The second column lists the applicable time period covered. The analysis has been conducted for a Friday and Saturday – the days with peak parking demand for the land uses relevant to this study. Following industry practice, it is assumed that the South Lincoln development can accommodate typical Sunday through Thursday parking demand if the Friday and Saturday peak demand are met.

- **Parking Rates**: The third column shows the consultant team’s estimates for parking demand rates, expressed as parking spaces per commercial 1,000 sq. ft. or per condo unit; these have been obtained from the Urban Land Institute (ULI) Shared Parking Manual (2005) and the Institute of Transportation Engineers (ITE) Parking Generation (3rd Edition, 2004). These manuals provide parking demand data observed at comparable land uses throughout the country. It should be noted, however, that the parking generation rates in Parking Generation and in the Shared Parking Manual were measured at stand-alone, single-use, relatively low-density suburban sites. Consequently, estimates of parking demand using these methods will be higher than what is experienced in denser, mixed-use settings like in the South Lincoln district.

As shown in the parking generation rates table on the following page, the shared parking analysis has been conducted for two “seasons”, a summer scenario and a Christmas holiday scenario. The “peak of the peak” typically occurs during the Christmas shopping season, which is why 100% of both retail and restaurant parking demand can be expected to be used at that time. During the summer, parking demand is typically less than 70% of the Christmas peak parking demand. During the rest of the year, parking demand is normally similar to or lower than the summer peak parking demand.

We have also assumed that there will be a parking and transportation demand management (TDM) program in place. One of the proposed strategies is to “unbundle” or separate the cost of parking from the cost of owning a condo or leasing office space in the development. If this parking and TDM program is implemented with a minimal parking cost (in the range of $1 to $5 per day or equivalent “avoided costs” incentive through parking cash-out) it can be assumed that employee parking demand will drop by at least 15% and residential demand by at least 10% (more robust reductions in parking demand and auto trips could be achieved if employee parking charges were priced to cover the capital and operating costs of building and maintaining parking).

The hourly parking demand ratios shown in the peak parking table further on in this section represent the percent of peak hour demand present throughout the day in the following analysis, are based on the ITE Parking Generation Manual, 3rd Edition. We have used the Weekday parking occupancy to calculate the parking demand for Friday from 6AM to 5PM and the weekend occupancy to calculate the parking demand for Friday from 3PM until Midnight and all of Saturday, as recommended by the Manual.

As a result of the fluctuations of hourly parking demand patterns among different uses, the seasonal shared/not shared parking charts illustrate the parking efficiencies the project will be able to take advantage of by mixing different uses with different peak parking demands. As illustrated in the peak parking chart showing the hour-by-hour variable parking demand, the shared parking demand estimate resulted in the following findings:

- With no shared parking between residential and non-residential uses, the peak parking demand is for 597 cars.
- If 60% of the residential parking is shared with non-residential uses, the peak parking demand is for 524 cars. The project team would recommend that as much parking as possible be shared in order to maximize the efficiency (and shrink the footprint) of the parking facilities. One way to accomplish this goal would be to establish for all development projects in the project area a very low parking maximum for on-site stand-alone parking but allow a higher parking maximum for shared parking in off-site shared parking facilities (such as the proposed community garage centrally-located in the project area). A number of other effective strategies exist for encouraging shared parking amongst commercial uses as well as between commercial uses and residential uses.

- The peak parking demand hour for both scenarios is Friday at 3pm during the Winter season.

In addition to reducing the total amount of parking spaces needed, the distribution of parking demand is much more balanced throughout the course of the day as opposed to having a distinct peak. This parking demand estimate is conservative in all assumptions related to the parking reduction factors. For example, for all the community services (like job training and computer lab) we assumed a 50% captive market effect. The actual captive market effect is likely closer to 90% or more since most of these uses are almost entirely locally-serving with a user base that is both site-specific and population-specific. In addition, TDM reductions of 10% to 15% were assumed when research suggests vehicle trip reductions of 20% to 60% percent are achievable for a development of this type (compared to stand-alone suburban development) with resulting reductions in parking demand.2

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2 This analysis assumes that the 10th and Osage light rail station continues to operate as a “walk-up” station and that there is no commuter parking needed for the light rail station.
MASTER PLAN  
PARKING DEMAND ESTIMATE & MANAGEMENT PLAN

Summary of Findings
The analysis conducted for South Lincoln shows the potential significant parking reductions that are possible for this district. Based on our analysis, it is possible to reduce parking spaces required under current City code for single-use, conventional development from 1,048 spaces to 524 spaces based on captive market effects, various TDM strategies, and shared parking program. It should be emphasized that extremely conservative estimates and assumptions were used in this parking demand analysis, and that the actual parking for individual projects and the project area as a whole is likely be less for reasons stated previously.

Parking demand studies should be conducted for each individual project at time of development entitlements to account for any variability between the development program for the project area as a whole (e.g. uses, intensities, etc.) that was assumed for this analysis and the specific program of individual projects.

In addition, this Master Plan recommends several parking efficiency strategies to provide flexibility in meeting the changing parking demand at different redevelopment phases. This flexible approach will help avoid “over parking” the site in early phases in a manner that would undermine the goals of this Master Plan, while still ensuring that the project’s entire parking demand can be accommodated as redevelopment occurs and new development is added over time.

By following the recommended parking management plan, this analysis suggests that the South Lincoln Redevelopment site can accommodate adequate parking supply to meet:

a. The City’s current parking requirements with existing parking reduction factors available per City code and

b. The estimated peak-hour (e.g. “worst case”) parking demand for all build-out scenarios under even the most conservative assumptions.

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Friday, Winter Season, Dedicated Residential Parking

Winter Season with no Shared Parking

Friday, Winter Peak, 60% Shared Rental

Winter Season with 60% Shared Rental Parking
**BLOCK BY BLOCK PARKING COUNT**

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**SUMMARY BY BLOCK**

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**NOTE:** Each TH provides one parking space in garage.
The project’s proximity to light rail, major employment and educational destinations, and the proposed density establishes an ideal setting to promote walking and cycling as alternatives to the car. Most of the streets in the La Alma/Lincoln Park neighborhood have generous sidewalks which contribute to a walking environment. Conversely, the neighborhood has excessively wide streets given current traffic volumes, such as Mariposa Street, that contribute to speeding vehicles making unsafe conditions for pedestrians crossing the street.

As previously mentioned, to promote a more walkable and bikeable environment, existing city street standards and street widths should be reevaluated and modified. Our proposal for the South Lincoln project would propose the following amendments to current street design standards:

- Narrow street widths and provide with green infrastructure that may include consolidated storm water facilities or pedestrian use areas.
- Mid-block pedestrian crossings at Mariposa, Navajo, and Osage Streets.
- Vertical traffic calming that works with emergency response vehicles and snowplows.
- Smaller turning radii at street and alley intersections.
- Slow streets (10th Avenue Promenade and other residential streets designed for 15 mph).

Navajo Street

The Site Master Plan calls for varied building setbacks along Navajo Street along with a series of mid-block parks. The proposed section proposes a 36’ width curb to curb dimension, with 11’ wide travel lanes in each direction, along with on-street parking on both sides of the street. Bulb out planters are located mid-block and are used as traffic calming measures for pedestrian crossings and provide planting areas for additional street trees.

The plan utilizes right-of-way area, outside of the curb line, for stormwater infiltration gardens. Stormwater runoff will be channeled from the street and roof tops to infiltration areas located along the street edge. See the Infrastructure Section of this document for more detailed information on stormwater strategies.

<table>
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<th>Proposed Navajo Street</th>
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<td>Street</td>
</tr>
<tr>
<td>7'</td>
</tr>
<tr>
<td>Parking Lane</td>
</tr>
<tr>
<td>Right of Way</td>
</tr>
</tbody>
</table>

Mariposa Street

Mariposa Street is currently 48’ wide curb to curb, with one travel lane in each direction, and on-street parking on both sides of the street. Mariposa Street is excessively wide given current traffic volumes, and therefore contributes to speeding vehicles making unsafe conditions for pedestrians crossing the street. The proposed plan for Mariposa Street includes a center median planter and a shared vehicle/bike lane in each direction to reduce the street’s travel lane widths. The proposed plan maintains on-street parking on each side of the street, and will include bulb-outs for additional street tree planting and stormwater infiltration planters. These improvements accomplish street calming while maintaining the existing curb to curb dimensions, such that proposed improvements can be made without completely rebuilding the street.

The proposed plan for Mariposa Street includes utilizing the right-of-way, outside the curb line, for stormwater infiltration gardens. Stormwater runoff will be channeled from the street and roof tops to infiltration areas located along the street edge, currently the tree lawn (area between the curb and sidewalk). The tree lawn will be re-purposed to include porous soils and native planting, while maintaining existing street trees. This strategy of utilizing the right-of-way promotes a denser development, beautifies the street, and makes visible the sustainable concepts of this project. See the Infrastructure Section of this document for more detailed information on stormwater strategies.
11th Avenue
The Master Plan proposes buildings along 11th Avenue to be mixed-use with residential and non-residential uses. 11th Avenue fronts Lincoln Park to the north providing an active street scene. The sidewalk on the south side of the street will be generous, providing gathering spaces as well as places to sit, relax, and take in views of the park. The proposed street section calls for 12' wide travel lanes in each direction, along with on-street parking on the south side of the street. Back-in angled parking stalls will be provided on the north side of the street and will be used by residents of the community in addition to supplementing the Park's parking needs. Bulb-out planters are located between parking stalls, on both sides of the street, and are used as traffic calming measures while providing planting areas for street trees.

Osage Street
The Master Plan proposes buildings along Osage Street to be mixed-use with residential and non-residential uses. The character along Osage will primarily be an urban streetscape, consisting of paved sidewalks from the back of curb to building face, with street trees in tree grates, and small planters. The proposed street section calls for a 40' width curb to curb dimension, with 12' wide travel lanes in each direction, along with on-street parking on both sides of the street. Bulb out planters are located mid-block and are used as traffic calming measures for pedestrian crossings and provide planting areas for street trees.

On the east side of the street, the plan utilizes right-of-way area, outside of the curb line, for stormwater infiltration gardens. Stormwater runoff will be channeled from the street and rooftops to infiltration areas. See the Infrastructure Section of this document for more detailed information on stormwater strategies.
10th Avenue Promenade

The 10th Avenue Promenade will be the “Main Street” for the South Lincoln Redevelopment. The Master Plan calls for buildings along 10th Avenue to be mixed-use with commercial and non-residential uses on the ground floor with residential flats above. 10th Avenue will be an active street with café’s, plaza spaces, and event spaces. The streetscape will consist of paved sidewalks from the back of curb to building face, with street trees in tree grates, paver areas and/or small planters.

The street section calls for a 40’ curb to curb dimension, with 10’ wide travel lanes in each direction, along with 8’ wide on-street parking spaces on both sides of the street. A 4’ wide decorative band along the centerline will visually reduce travel lane widths, producing reduced speeds while providing relief area for pedestrians crossing the street. Bulb-outs and planting areas near the intersection of 10th Avenue and Navajo Street reduce street widths and provide generous sidewalk spaces for café’s, plazas and other street activity. See the Open Space Section of this document for more detailed information on street character.
Stormwater Plan

The goals of the South Lincoln Redevelopment are to create a dense, walkable urban community. In order to accomplish the plan’s proposed densities, the stormwater management strategy for the project proposes the use of consolidated stormwater facilities, rather than on individual development parcels. A consolidated approach yields up to a 10% reduction in the land area required for stormwater treatment compared to detention on each individual development site. The stormwater plan proposes utilizing the street’s right-of-way, outside of the curb line, to manage stormwater quality. These areas, called stormwater infiltration gardens, will have shallow ponding depths (12’ maximum) and will be located within the existing tree lawn between the curb and sidewalk. These areas will be planted with native plants, flowering perennials, and plants that are well adapted to the wet, and dry conditions. Large trees within the tree lawn will be maintained, and new street trees will be planted.

To manage the 100-year flood volumes within the project area, the plan proposes consolidating stormwater detention on the west side of the project area, next to the light rail tracks. This area will have an average ponding depth of 3 feet, and can be planted to create a natural buffer between the rail tracks and proposed buildings. Safety considerations will also need to be addressed.

Additional benefits to this consolidated approach could accrue, resulting in an overall reduction in the City’s requirement to invest in expensive upgrades to the existing underground storm sewer system. Additionally, consolidated systems are often easier to maintain, resulting in reduced maintenance costs, and better long-term performance. Finally, stormwater, infiltrated on-site in compliance with state water law, can serve to passively irrigate the site’s landscape, reducing demands on potable water supplies for landscape irrigation.

To fully realize the vision for the South Lincoln Redevelopment, current City standards for infrastructure design should be updated to consider contemporary policies. Updated standards for infrastructure will support concepts for the South Lincoln Redevelopment that are outlined in this project, as well as described in Blueprint Denver. The following elements should be evaluated and considered with regard to a contemporary approach to urban infill development.

- Construction of consolidated water quality treatment and detention facilities in existing street rights-of-way, as well as on private development sites. All water quality and storm water detention facilities within the right of way would remain in City ownership. A long-term, revocable permit, that could be valid for up to 50 years and issued by the City that specifically defines responsibilities and conditions for ongoing maintenance and use of the facilities.
MASTER PLAN
INFRASTRUCTURE: STORMWATER STRATEGY

- Maintenance of all water quality facilities would be apportioned between RTD, the City of Denver (if applicable) and DHA based on benefits realized. Maintenance could be assured by an independent entity or agreement, as required by the City.
- Accommodation of existing and proposed wet and dry utilities according to current standards, or according to modifications in existing street standards.
- Improvement standards for safety and vector (mosquito) control based on national precedents, and local conditions as required.

- Implementation of flow reduction techniques (such as bioswales, disconnected impervious areas, green roofs) credited toward reduction of storm water detention and treatment volumes required.

Proposed Stormwater Treatment (within R.O.W)
1. Stormwater collects on rooftops of new buildings
2. Stormwater is conveyed, via internal and/or external downspouts.
3. Stormwater is daylighted to landscape planters adjacent to buildings.
4. Stormwater is conveyed to infiltration gardens, via sidewalk chases. Alternatively stormwater can be piped from downspouts directly to infiltration garden, underneath sidewalk.
5. Rainwater falls on streets and is conveyed in curb and gutter
6. Stormwater runoff enters planter area through curb opening.
7. Stormwater surface flows through planter, or conveyed via chase, to stormwater infiltration garden.
8. The infiltration garden, also known as a porous landscape detention area, filters stormwater through plant uptake and infiltrates through a special soil medium. Infiltration gardens should be designed to pond no more than 12’ deep.
9. Storm underdrains (required for soils with low permeability) and overflow devices convey stormwater to existing storm pipes located in the street.

Curb openings allow stormwater to be conveyed from the street’s gutter to stormwater infiltration planters.

Stormwater infiltration planters along the street provide treatment and storage of street runoff. The infiltration planters narrow vehicular street widths to provide traffic calming and safer streets.

A stormwater infiltration garden located along this residential street treats runoff from the street and roofs of adjacent buildings.
The current South Lincoln project area provides little to no water quality and detention. The proposed South Lincoln project is laid out and designed to conform to the City and County of Denver (CCD) rules and regulations for stormwater discharge. The existing outfall (21-inch) located at 10th and Osage is currently under-capacity to serve even the minor design storm. Proposed as a sustainable community, this Master Plan understands the importance of using an extensive array of best management practices such as:

- Porous Pavement
- Porous Landscape detention
- Detention/Sedimentation facilities
- Sand Filtration

The project will be evaluated on a comprehensive site wide basis with extensive consideration to providing safe conveyance of stormwater, to include sequencing for phased construction. This Master Plan Concept will challenge standard engineering practices to meet the CCD criteria, establishing a stormwater strategy that uses right-of-way, alleys and common open areas to mitigate storm runoff and provide water quality. The revised roadway network will provide alternative flow paths for the conveyance of stormwater, with additional inlets proposed to accommodate the proposed grading and roadway alignment.
The South Lincoln Redevelopment Master Plan has developed a guide to upgrade the utilities serving the development. The layout is intended to serve as a principal planning document to support the future growth of the project. Existing infrastructure was examined to look for opportunities to re-use the facilities where practical or to augment phasing of construction. Measures include utility rehabilitation and to mitigate potential impacts to down-stream facilities.

The layouts took the following into consideration:
- Promote designs that will create a sustainable environment.
- Provide designs that satisfy build-out conditions, but that can be phased in a manner whereby infrastructure construction coincides with phased development.
- Resolve existing historic issues of the surrounding area for flooding and non-compliance to new stormwater standards and guidelines.
- Understanding an integrated approach to land use, transportation elements and utility systems to facilitate a high density urban infill development.

This layout is not to take the place of the extensive technical analysis to be submitted at a later date, but does establish the framework for the conceptualization of the facilities, determined by engineering fundamentals and future land use.

**LEGEND**

- SS: Existing sanitary sewer
- PS: Proposed sanitary sewer
- PS: Proposed sanitary manhole
- AL: Alternative sanitary sewer
- AL: Alternative sanitary manhole
- ST: Existing storm sewer
- PS: Proposed storm sewer
- PS: Proposed storm manhole
- PS: Proposed storm inlet
- PS: Proposed 4" subgrade drain
- W: Existing water main
- PS: Proposed water main
- PS: Proposed fire hydrant
- PS: Proposed gate valve
- PS: Proposed butterfly valve

**SOUTH LINCOLN REDEVELOPMENT MASTER PLAN**

January 2010 Final Master Plan Report
Sanitary sewage collection will be provided by several newly constructed service lines. The existing sanitary system is located in areas that are difficult to maintain, providing no means to access the system by mechanical equipment. The entire service basin is served by a 24-inch CCD Wastewater conduit located at 11th Avenue and Osage Street. Without a complete analysis for this Master Plan (detailed analysis forthcoming and not included in this document or Master Plan) we have laid-out the proposed system to meet Wastewater Managements rules and regulations.

The proposed system is designed to be located in alleys and streets as to promote the most efficient layout to minimize any redundancy in the pipe system. It is not anticipated that any additional earthwork or pumping will be required to serve the South Lincoln project.
The existing potable water system will require extensive upgrades to facilitate fire demands and increased consumption, to support the new infill development.

The proposed development has a similar layout of street right-of-way, as the current residential area. The conceptual distribution system has been laid-out to meet the standards and guidelines of the Denver Water Department. The existing system of 6, 8 and 10-inch lines, will be replaced with 8 and 12-inch lines, providing additional capacity to address increased demand.

The redevelopment site has adequate static pressure and is served by existing large diameter pipes in Mariposa and Osage Streets. This Master Plan has significantly increased the number of Fire Hydrants serving the site, to provided adequate fire flow delivery, in conjunction with maximum day conditions.

This plan encourages the conservation principals adopted by the Denver Water Department. Utilization of these principals throughout this development will provide ecological stable landscapes and efficient use of potable water. A priority for the South Lincoln Redevelopment will be in compliance with conservation guidelines, and encouraging public awareness and participation in water management.
Existing Conditions
This graphic describes the current, existing conditions at South Lincoln Homes. The resource flow diagram measures the baseline energy used on site, including utilities and transportation, and the resulting amount of greenhouse gas (GHG) emissions annually.

Energy Inputs

Electrical Energy
20% of the Site energy is Electrical – mostly summer cooling load

Natural Gas
80% of the site energy consumption is Natural Gas – which correlates to the Heating Degree Days area under the curve for late Fall through early Spring

Transportation
Census data shows that this area of Denver has fewer cars and travels less per trip than surrounding Denver & Greater Denver suburbs

Solar Input
>300 sunny days a year contribute to a large solar resource available to the site. Only 25% of the existing roof area is needed today for photovoltaics to supply the site electrical demand.

Greenhouse Gas Emissions
Despite Natural Gas supplying 80% of the energy demand, only 25% of the emissions are attributed to Natural Gas. This can be seen by the breakdown of the electrical supply fuel mix – over 57% is supplied by burning coal.

The redevelopment of South Lincoln homes represents a significant opportunity to improve the energy performance of the homes and neighborhood, particularly with the solar resources available. In addition, the location adjacent to the 10th and Osage light rail station and potential for improved walkability and transit connections can significantly reduce auto usage, creating a walkable, low traffic neighborhood. The reduction of energy usage and vehicle miles traveled (VMT) can have a positive impact on future GHG emissions of this community.

Redevelopment Master Plan
Energy & GHG Analysis
Energy flows through the site in many forms: produced electricity, Natural Gas, heat and light from the sun and earth. Understanding these energy systems can help a site reduce its dependence on off-site energy production and reduce its impact on the planet measured by carbon footprint.

Energy Inputs

- Electrical Energy
- Natural Gas
- Transportation
- Solar Input

Annual Greenhouse Gas (GHG) Emissions

(3635 metric tons CO₂ equivalent per year)

by Sector

- Electrical Energy
- Natural Gas
- Petroleum Fuel
- Transportation

by Fuel

- Coal
- Natural Gas
- Petroleum
- Solar
- Wind
- Biomass

Areas shaded in RED are not recommended for PV System due to the lack of direct sunlight throughout the day.

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EnviroHealth Consulting

SOUTH LINCOLN REDEVELOPMENT MASTER PLAN
January 2010 Final Master Plan Report
MASTER PLAN
INFRASTRUCTURE: COST-TO-BENEFIT

System Components:

Electrical PV:
- A 2MW PV system covers approximately 85% of each building's load, up to a maximum of 75% of the roof area (non-obstructed), totaling 75% of the electrical demand for the site.

Electrical:
- Energy Star appliances.

Controls:
- Building Management Controls for lighting and HVAC.

Building Envelope:
- High Performance (double or even triple pane) windows - Low-e glazing, U-value = 0.21, SHGC (Solar Heat Gain Coefficient) = 0.48, VT (Visible Transmittance) = 0.63
- Increased Wall Insulation to R-36
- Increased Roof Insulation to R-60
- Cool Roofs
- Trombe Walls
- Solar Chimneys and Downdraft Cooling Towers

Hvac:
- Ground Source Heat Pumps
- Radiant Floor Heating
- Offices – Under floor air distribution with Indirect-Direct Evaporative Cooling
- Energy Recovery Ventilators on high outside air systems.
- Residential - Ceiling Fans
- Summertime Night Purge Cycle (i.e. residential whole house fans and commercial economizer building purge). Most effective when building envelope has mass and insulation is on exterior of mass.
- Solar Water Heating (can be coupled with Solar Domestic Water Heating)
- High Efficiency Condensing Boilers (serves as backup to solar and/or geothermal systems).

Plumbing:
- Solar Domestic Water Heating coupled with semi-instantaneous (“tankless”) water heaters.
- Low Flow Fixtures
- Drain Water Heat Recovery
- Grocery – Refrigeration equipment heat rejection to serve as domestic water preheat.

Lighting:
- LED Lighting - Fluorescent Lighting
- Electrical controls (photocells, time clocks, power switches, motion sensors, etc.)
- Day lighting – Daylight harvesting, skylights and solar tubes.

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### Cost-to-Benefit Energy Strategies

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<tr>
<th>Strategy</th>
<th>Cost</th>
<th>Benefit</th>
<th>Notes</th>
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<td>Electrical - PV</td>
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<td>Electrical - Energy Star Appliances</td>
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<tr>
<td>Lighting - Daylight Harvesting</td>
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Cost $10,000/kWatt - Produces ~800 Wh/yr

Cost = 10% premium reduces Energy Consumption ~10%

Helps control energy usage automatically

Small improvements in Envelope can Dramatically increase efficiency

Helps reduce dependence on Natural Gas. A good partner with PV

A large portion of our energy is consumed heating water

Let the Architecture help regulate heat flow

Using the sun reduces our dependence on electricity