

## AMENDED LAND STUDY

## NORTHEAST MASTER PLAN

August 12, 2008

El Paso, Texas

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## 1. GENERAL PURPOSE AND INTENT

The purpose of this land study is to amend the Northeast Land Study dated October 2006, submitted by the El Paso Water Utilities-Public Service Board (EPWU-PSB), prepared by URS Corporation, and approved on January $9^{\text {th }}$, 2007. The intent of this land study amendment request is to provide the necessary information for the City Planning Commission (CPC) to approve the amendment request. This amendment request is based on the requirements established per the City of El Paso, Texas, Title 19 Subdivision Regulations, Section 19.2.

Additionally, this land study amendment submittal intends to provide additional guidelines for development of the approximately 4,835-acre tract and provide the means for the developer to follow the Smart Growth Plan for the Northeast.

## 2. OVERVIEW

## Site Location

The site is approximately 4,835 acres located in the Northeast district of the City of El Paso, north of U.S. Highway 54 (Patriot Freeway) and east of the Franklin Mountains, within El Paso city limits. Reference Exhibit 1 for site location details.

## Site Description

The project site is a portion of the approximately 16,000 acres of vacant land currently owned by the El Paso Water Utilities-Public Service Board (EPWU-PSB). The site is mostly vegetated by native desert vegetation and no endangered species have been found according to the Geologic Investigation report prepared by Mark Peterson and Associates, dated March 2007. The terrain is part of the alluvial fan from the Franklin Mountains which drains towards the east of the property. Although the effective Flood Emergency Management Agency (FEMA) map shows three flow paths within the project site, no defined channels or arroyos are found within the project site (see Master Drainage Plan attached). The average east-west slope of the terrain is $2 \%$, while the north-south slope is generally flat. Two major roads exist within the project site, Martin Luther King Jr. Boulevard and McCombs Road. Both of these roads are under the jurisdiction of the Texas Department of Transportation (TxDOT). The Painted Dunes Golf Course is situated within the project site but is not included in the acreage described for the project. EPWU-PSB water wells and water reservoirs exist within the project site.

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## Existing Conditions

The project site is within El Paso city limits. The current zoning is R-F (Ranch-Farm). The adjacent properties to the south are zoned R3 and R3A. The area west of the project site is within the PMD zone and is mostly state park under the jurisdiction of Texas Parks and Wild Life.

## Existing Future Land Use Plan

The projected land use plan for the project site is found on the current City of El Paso comprehensive plan (Plan for El Paso) illustrated in Exhibit 2. The Existing Future Land Use Plan is based on the land study submitted by the EWPU-PSB as prepared by URS Corporation and approved on January $9^{\text {th }}, 2007$.

## Existing Thoroughfare Plan

The Existing Future Land Use Plan is based on the land study approved on January $9^{\text {th }}, 2007$ referenced above. This land study did not include a traffic study that justified the requirements to amend the thoroughfare plan in the current Plan for El Paso. The Existing Thoroughfare Plan is based on a land use map that has been amended. Therefore, no relationship exists between land uses and thoroughfares in the current Plan for El Paso. Exhibit 3 depicts the existing thoroughfare plan which this amendment request intends to modify. Existing traffic and thoroughfare conditions are discussed in more detail in the attached Traffic Impact Analysis.

## Existing Infrastructure

The project site is vacant. Infrastructure capable of satisfying the minimum requirements for development is not available. There are future plans by the PSB to extend the facilities to the site to support the development as part of the agreement between the Buyer, the Seller, and the PSB to purchase the property. Three major infrastructure categories are described in this study: traffic, drainage and utilities (water and sanitary sewer).

- Traffic

Martin Luther King Jr. Boulevard is a TxDOT road with two lanes on its current condition and six lanes divided on its ultimate condition. The road was recently expanded through the North-Hills subdivision and transitioned to its current two lanes just north of the subdivision. McCombs Road is a two lane road on its current condition and possible six lanes divided in its ultimate condition. As part of the purchasing agreement, the PSB will expand the existing road to four lanes to the northern extent of the 4,835 acre site. McCombs Road runs on a north-south direction through the site adjacent to the Painted Dunes Golf Course. Detailed existing conditions and future road extension and additions are discussed in the Traffic Impact Analysis (TIA) attached.

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- Drainage

According to the current effective FEMA maps, there are 4 defined flow paths within the subject site. Three flow paths flow in the east-west direction. All flow paths combine at the downstream end (southeast of the site), forming one flow path which ultimately discharges into the regional levee system located south of U.S. Highway 54. Based on detailed inspections of the flow paths and on-site observations, it is determined that arroyos do not exist within the project site. The only defined arroyos can be found west of the property within the Franklin Mountain State Park. Detailed information regarding the existing conditions is included as part of the Northeast Master Drainage Plan presented with this amendment request.

- Utilities (Water and Sanitary Sewer)

According to record drawings and information provided by the EPWU-PSB, the site does not have the necessary infrastructure required to provide water and wastewater services to the projected development. A 16" water main exists west of McCombs Road that serves the Painted Dunes Golf Course. The nearest wastewater point of discharge is a sewer main extension through the development south of the project site. It is understood this sewer main extension is under construction at the time of this report.

A 16-inch reclaimed water main (purple water) exists within the project site. The purpose of this water main is to provide water to the existing El Paso Electric Company power plant located north of the project site. This purple water main runs in the east-west direction starting at the "Fred Harvey" treatment plant and turning north along the future extension of Sean Haggerty Road.

## 3. PROPOSED LAND USE PLAN

The proposed land use plan is presented in Exhibit 4.

The development is organized as a community consisting of neighborhood centers and town centers serving pedestrian-friendly neighborhoods. Mixed use areas are used to anchor residential uses and provide goods and services within walking distance of residential neighborhoods. Single use commercial zones may exist within mixed-use areas. Development intensity generally increases toward neighborhood and town centers and decreases toward the perimeter of the development, thus providing for a gradient of lessening development from mixed-use and non-residential core areas.

The Master Land Use Plan shows four categories of residential development intensity, each expressed as an average density and range of housing types. Neighborhoods are arranged to support walkability and minimize pedestrian/vehicular conflicts wherever practical.

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A regional town center is located to prevent isolation from the perimeter of the development and the City, increase the support of the region by providing access to more people, and discourage offsite traffic from passing through residential neighborhoods.

Open space within the project site provides for a pedestrian linkage system, thus uniting rather than dividing the community. The open space provided in the land use plan is in addition to the required open space that will be required per the City of El Paso, Texas, Title 19 Subdivision Regulations.

## Proposed Land Uses

Open Space. Open space is distributed throughout the District in a manner intended to unite the community. Homes and neighborhoods, the more personal parts of the district, are linked to gathering places (e.g., schools, parks, retail/office) through the pedestrian circulation system, itself being a space for social interaction.

Schools. Four elementary schools, one middle school and one high school have been reserved throughout the project site. Final location of the elementary school and the middle school will be negotiated between developer and EPISD. The location of the high school tract has been negotiated between EPISD and property owner.

Low Density Residential (3.5 du/ac). This residential type includes single-family detached homes and two-family homes, distributed in a manner that follows the intent of Section 1.3.3 and does not exceed 3.5 dwelling units per gross acre (du/ac) within the acreage allocated to it within its Subdistrict, as shown on the Master Land Use Plan. Four-family homes may be included at the edges of these areas in order to blend with adjacent higher-density areas, provided the density maximum is not exceeded.

Low Density Residential ( $5.5 \mathrm{du} / a \mathrm{c}$ ). This residential type consists primarily of single-family detached homes and two- and four-family homes, distributed in a manner that follows the intent of Section 1.3.3 and does not exceed 5.5 dwelling units per gross acre (du/ac) within the acreage allocated to it within its Subdistrict, as shown on the Master Land Use Plan. Townhomes may be included at the edges of these areas in order to blend with adjacent higher-density areas, provided the density maximum is not exceeded.

Medium Density Residential (7.2 du/ac). This residential type consists primarily of multifamily housing, with single-family detached homes, two- and four-family homes, and townhomes, distributed in a manner that follows the intent of Section 1.3.3 and does not exceed 7.2 dwelling units per gross acre (du/ac) within the acreage allocated to it within its Subdistrict, as shown on the Master Land Use Plan.

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Medium Density Residential ( $12.0 \mathrm{du} / \mathrm{ac}$ ). This residential type consists primarily of multifamily development, with four-family homes, townhomes, and apartment buildings, distributed in a manner that follows the intent of Section 1.3.3 and does not exceed 12.0 dwelling units per gross acre (du/ac) within the acreage allocated to it within its Subdistrict, as shown on the Master Land Use Plan. Twofamily homes may be included at the edges of these areas in order to blend with adjacent lower-density areas.

Mixed-Use Low Intensity. This land use type consists of neighborhood-serving retail and/or commercial uses, providing goods and services for the day-to-day needs of the nearby neighborhoods and/or multifamily dwellings. Single-use retail, commercial and residential development is allowed in mixed-use, low intensity areas.

Mixed-Use High Intensity. This land use type consists of community-serving retail and/or commercial uses, providing goods and services for several neighborhoods and/or multi-family dwellings. Single-use retail, commercial and residential development is allowed in mixed-use, high intensity areas.

Regional Retail. Regional retail consists of high-intensity retail development that is intended to serve the northeast El Paso region and beyond.

## Demographics

The projected land uses are not determined based on income or projected type of housing (luxury, medium income, etc). The objective of the land use plan presented is to achieve a mix of residential densities and types. The population projections are based on the calculated average per-house density from the El Paso census data obtained from the 2006 El Paso Development Services database. Table 1 below provides the population projection per the maximum densities allowed per this land study.

Demographic Summary

| Residential Use | Phase One: Years 1 to 4 |  |  | Phase Two: Years 5 to 8 |  |  | Phase Three Years 9 to 12 |  |  | Total |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Acres | Projected Units | Projected Population | Acres | Projected Units | Projected Population | Acres | Projected Units | Projected Population | Acres | Projected Units | Projected Population |
| Low Density Residential | 0 | 0 | 0 | 247.68 | 867 | 2514 | 482.26 | 1688 | 4895 | 729.94 | 2555 | 7409 |
| Medium Density Residential | 511.40 | 2813 | 8157 | 709.93 | 395 | 11323 | 535.11 | 2943 | 8535 | 1756.44 | 9660 | 28015 |
| Medium/High Density Residential | 123.90 | 892 | 2587 | 103.65 | 746 | 2164 | 173.04 | 1246 | 3613 | 400.59 | 2884 | 8364 |
| High Density Residential | 134.17 | 1610 | 4669 | 118.81 | 1426 | 4135 | 38.41 | 461 | 1337 | 291.39 | 3497 | 10140 |
| Mixed Use Low Intensity | 34.56 | 207 | 601 | 96.00 | 576 | 1670 | 97.28 | 584 | 1693 | 227.84 | 1367 | 3964 |
| Mixed Use High Intensity | 66.37 | 239 | 693 | 77.70 | 280 | 811 | 12.10 | 44 | 126 | 156.17 | 562 | 1630 |
| Subtotal | 870.40 | 5761 | 16707 | 1353.77 | 7799 | 22618 | 1338.20 | 6965 | 20199 | 3562.37 | 20525 | 59524 |

Table 1. Northeast Master Plan Demographic Projections.

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## 4. PROPOSED THOROUGHFARE PLAN

The thoroughfare plan is developed with the objective of distributing projected trips in an orderly and organized fashion. The trip generation depends on the land use distribution and projected attraction and generation zones. Although the objective of the land use distribution and the overall master plan is to provide a pedestrian friendly community and additional alternatives for transportation, the developer is required to provide the road infrastructure necessary to satisfy the level of service (LOS) required by the city ordinance.

The proposed thoroughfare plan will utilize three typical road cross-sections, Major Arterial Street, Minor Arterial Street and Minor Arterial Street with Bike/Hike. The sections are standards represented on pages 3-1,2 of the City of El Paso, Texas, Title 19-Subdivision Ordinance Design Standards for Construction (DSC). The minor arterials contain four lanes while the major arterial consists of six lanes. Furthermore, the bike/hike arterial calls for a ten foot hike and bike trail on either side of the roadway as opposed to the sidewalk that is utilized in the regular arterials. See Figure 1 for the cross-section schematic.

A Traffic Impact Analysis has been developed as part of this amendment request. Reference the Northeast Master Plan Traffic Impact Analysis attached with this land study for specific details on existing conditions, demographic projections, modeling assumptions and results.

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## 5. PROPOSED MASTER DRAINAGE PLAN

A master drainage plan has been developed as part of this amendment request. Reference the Northeast Master Drainage Plan attached with this land study for specific details on existing conditions, modeling methodology, assumptions and proposed conditions model, and results.

## 6. PROPOSED DEVELOPMENT PLAN

The objective of the developer is to complete development of the approximately 4,835 acres based on a projected twelve year phasing schedule. The development is divided into three major phases. Each major phase is projected to be developed in four year intervals. Yearly development areas will vary depending on market conditions, housing demand and availability of infrastructure such as water, sewer and drainage.

The retail use area located at the intersection of McCombs and U.S. Hwy 54 is projected to be the initial development area along with residential use areas near the retail area and near existing/available infrastructure along Loma Real and Sean Haggerty. It is projected that the bulk of the last area to develop will be residential use area located in the north and northwest portion of the subject site. Market conditions at the time of development will dictate the speed of development and the ultimate schedule. Table 2 depicts the development plan per major phase.

Land Use Development Plan

| Land Use | Phase One: <br> Years 1 to 4 <br> (Acres) | Phase Two: <br> Years 5 to 8 <br> (Acres) | Phase Three <br> Years 9 to 12 <br> (Acres) | Total <br> (Acres) |
| :--- | ---: | ---: | ---: | ---: |
| Low Density Residential | 0.00 | 247.68 | 482.26 | 729.94 |
| Medium Density <br> Residential | 511.40 | 709.93 | 535.11 | 1756.44 |
| Medium/High Density <br> Residential | 123.90 | 103.65 | 173.04 | 400.59 |
| High Density Residential | 134.17 | 118.81 | 38.41 | 291.39 |
| Regional Retail | 86.17 | 0.00 | 0.00 | 84.86 |
| Mixed Use Low Intensity | 34.56 | 96.00 | 97.28 | 227.84 |
| Mixed Use High Intensity | 66.37 | 77.70 | 12.10 | 156.16 |
| Open Space | 88.95 | 342.28 | 411.48 | 842.71 |
| Park | 25.01 | 0.00 | 0.00 | 25.01 |
| School | 15.00 | 39.99 | 30.00 | 84.99 |
| R.O.W. | 81.01 | 76.85 | 76.26 | 234.12 |
| Subtotal | 1166.57 | 1815.13 | 1855.94 | 4835.35 |

Table 2. Northeast Master Plan Development Phasing Schedule.
(50.69-acre high school not included in this table)

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## 7. PROPOSED ZONING

A re-zoning request is being submitted simultaneously with this amendment request. The zoning proposed for the project site is General Mixed-Use (GMU). The zoning request will be in conformance with the City of El Paso, Texas, Title 20 Zoning.

## 8. UTILITIES

The project site is vacant land; therefore, infrastructure capable of satisfying the minimum projected demand is not available. The EPWU-PSB plan to satisfy the minimum demand was presented in the original land study prepared by URS Corp., submitted by the EPWU-PSB. Generally, the plan is to extend existing water transmission lines to a total of 3 reservoirs located within the project site, which in turn distribute water to the project site through major distribution lines (12, 16, 18 and 24 inch). Sanitary sewer mains will be extended as necessary to serve the project site. It is understood the EPWU-PSB will be required to upgrade their lift stations. Although a purple water main is available to the site, plans for the extension of this system are not projected at the time of this amendment request.

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## 9. PROPOSED ALTERNATIVE SUBDIVISION IMPROVEMENT DESIGN GUIDELINES

## Purpose and Applicability

The purpose of the alternative subdivision improvements design guidelines presented in this land study is to provide alternative design parameters that will allow the developer to achieve specific goals as established by the proposed Master Zoning Plan, the Request for Bidders as prepared by the EPWU-PSB, and the Smart Growth Plan for the Northeast Master Plan.

Approval of the alternative subdivision improvements presented herein shall grant the developer the right to utilize such guidelines throughout the proposed development.

### 9.1 STREET STANDARDS

In addition to the regulations of Section 19.15 the following regulations shall apply:

Residential Lots Fronting Arterial Streets. Where a single family lot fronts an arterial street, it shall be required to provide a 20 ' drive (slip road) parallel to the adjacent arterial to provide direct access to the single family lot. Access to slip roads shall meet the minimum driveway standards per the DSC. The separation between curb openings for slip roads shall follow the minimum driveway guidelines per the DSC, Section 6-15 and minimum street offsets per Section 19.15.12.

Construction of Streets. Intersection of major arterials only shall be constructed with concrete in accordance with the Figure 2.

Street Grades and Horizontal Curves. Minimum and maximum street grades shall conform to the standards set forth in the DSC. Horizontal curves shall be calculated based on the AASHTO design manual applying design speed limit applicable to the road classification per Section 3-40 of the DSC. The design speed limit for minor residential access shall be 25 mph under the criteria established in Section $3-41$ of the DSC.

FIGURE 2: INTERSECTION PAVING GUIDELINES

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### 9.2 STREET LIGHTING

In addition to the regulations of Section 19.16 the following regulations shall apply:

Exceptions. In addition to the exceptions referenced in Section 19.16.1-d, street light spacing requirements for local streets may be authorized by the City Plan Commission at the request of the developer at the time of plat approval on all streets within the Northeast Master Plan.

Custom lighting. The City of El Paso and the developer shall agree on a type of custom lighting that will be incorporated as part of the standard street lighting throughout the development. Thus, Section 19.16.3 shall not apply to the Northeast Master Plan. The custom lighting has to comply with the lumen level required in the DSC and meet or exceed the coverage requirements. A Private Improvement District shall not be required. Due to the number of acres that will be developed under one street lighting standard, the cost of maintenance shall not be perpetually conveyed to the developer or any Public Improvement District.

### 9.3 STORM WATER MANAGEMENT REQUIREMENTS

In addition to the regulations of section 19.19 the following regulations shall apply:

Applicability. The developer shall have the option to apply the engineering methods and standards proposed herein. The City will apply the Drainage Design Manual (DDM) standards, methods, criteria and administrative policies and procedures except for instances for which an alternative design standard is presented herein.

Time of Concentration. Alternatively to Section 4.3.1.3 of the DDM, the developer shall use the methodology described in the Natural Resource Conservation Service Technical Release 55 (NRCS, 1986) for time of concentration calculations in developed areas. This methodology calculates time of concentration based on three flow regimes - overland flow, shallow concentrated flow, and channelized flow. The same methodology shall be applicable to future iterations of the master drainage plan and drainage design for this project.

Energy Losses. Alternatively to Section 6.1.3 of the DDM, the developer may utilize Table 3 for the calculation of minor head loses. The values of $K$ shown in the table shall be used in the design of storm sewer systems. The head losses which occur at the points of turbulence shall be computed and reflected in the profile of the hydraulic gradient.

TABLE 3.1: MINOR LOSS COEFFICIENTS

TABLE 3.2: MINOR LOSS COEFFICIENTS

TABLE 3.3: MINOR LOSS COEFFICIENTS

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Pipe Materials. In addition to section 6.2.8 of the DDM, the developer shall have the right to utilize thermoplastic HDPE smooth interior wall pipe for storm drain applications. The developer shall provide technical specifications and fabricator's certification that the type of HDPE pipe proposed can withstand soil corrosion and design loading.

Drop Inlet Design Discharge. Alternatively to Section 7.6 of the DDM, the design discharge for a drop inlet should be determined based on the Rational Method.

Inlet Depth Calculations. Alternatively to Section 7.6 .3 of the DDM, a standard pre-fabricated concrete box with a minimum depth of 4.5 feet, measured from the interior bottom of the box to the top of curb, shall be allowed throughout this development. The hydraulic gradient shall not be less than 1.5 feet below the top of curb profile.

Open Channel Maximum Velocity. Alternatively to Section 8.2.4 of the DDM, the maximum permissible velocity shall be determined by a geotechnical study that determines the maximum velocities the soils in the channel can sustain without creating hazardous erosion condition. In no instance shall the velocities exceed 8 feet per second.

Open Channel Freeboard. Alternatively to Section 8.2.5 of the DDM, the freeboard on a subcritical flow condition shall be a minimum of 1 foot above the 100 -year water surface elevation (WSEL). For supercritical conditions, the minimum freeboard shall be 2 feet above the $100-y r$ WSEL. For levees the minimum freeboard shall be 3 feet above the 100-yr WSEL.

Open Channel Safety. In addition to Section 8.2.9 of the DDM, a fence shall not be required for the channels adjacent to linear parks or for channels that provide a hike and bike trail within the $100-\mathrm{yr}$ WSEL. In no instance shall the hike and bike trail be at an elevation lower than the 50-yr WSEL.

Detention Facilities. Alternatively to Section 11.4.1.2 of the DDM, the basin is to be designed utilizing engineering practices and accepted methods whereby $100 \%$ of the runoff volume is to be properly managed through the use of channels and basins. Note: HEC-1 and other computer methods generally accepted by industry standards shall be approved for use in the detention basin design.

Detention/Retention Standards. Ponds with side slopes of 5 horizontal to 1 vertical or lesser slope will not require a fence. An access ramp will not be necessary since the slopes are suitable for vehicle use. A vehicular access (for maintenance) route shall be designated meeting compaction of $90 \%$ per ASTM D1557.

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Detention/Retention Fence. When a fence is required a combination of stone wall and wrought iron fence shall be allowed. The fence shall meet the minimum dimensions as established in the City of El Paso, Texas, Title 19-Subdivision Ordinance Design Standards for Construction.

### 9.4 PARK DESIGN AND CONSTRUCTION STANDARDS

For trails located within the $\pm 843$ acre open space area:

Trail Structure. The trail shall be of any width that contains a minimum of 8 -feet of pavement surface with two $6 " x 12 "$ concrete header curbs. Decomposed granite compacted shall be allowed for pavement surface. Header concrete curbs shall meet the concrete specifications per the City of El Paso, Texas, Park Design and Construction Standards (PDCS). The open space areas adjacent to the paved surface may be left in a natural state or may be landscaped under the Parks Facility Standards, referenced in Section 19.20.5.

Trail Landscaping. For the area immediately adjacent to the pavement surface, the developer shall have the option to leave in a natural state or landscape with natural non-irrigated landscape treatment under the Parks Facility Standards referenced in Section 19.20.5. Shrubs shall not be required. A minimum of one park bench shall be provided, spaced at a minimum distance of 1,350 feet ( $\pm 1 / 4$ mile). A cluster of no less than 5 shade trees and 3 ornamental trees shall be located at intervals of 1,350 feet. They shall have a drip irrigation system provided as specified in PDCS.

Trail Access and Signage. Trails adjacent to street right-of-way shall comply with the standard street section and the minimum sidewalk width shall be increased to 8 feet. Sidewalk depth shall be 4 " thick concrete, minimum 3,000 psi strength, with 6 "x6" wire mesh. Sub-grade is to meet minimum standards per PDCS. Trail signage shall be consistent in theme and form throughout the development.

Park Trail Lighting Standards. Because the intent of the development is to have a natural-like hike and bike trail system, the lighting standards shall not apply to the development. Standard illuminated bollards shall be installed at trail/street intersections, underpasses and tunnels. The developer may choose to provide additional lighting along the trails in a manner the developer considers to be necessary.

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Trail Heads Standards. The trail heads may have a minimum of the following:

- 10 parking spaces
- 1 van accessible parking space meeting minimum ADA standards.
- A perimeter sidewalk meeting the Trail abutting right-of-way standards
- Information kiosk
- One or more points of access to state park or hike and bike trails
- A landscaped area of no less than 100 square feet.
- A cluster of no less than 2 shade trees
- Information signs required for traffic management and warning notices

Traffic Impact Analysis

# Northeast Master Plan <br> El Paso, Texas 

Prepared for:<br>Hunt Communities LLC

July 2008

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## EXECUTIVE SUMMARY

This report documents a traffic impact analysis performed for the proposed Northeast Master Plan mixed use development, located generally north of US 54 (Patriot Freeway), between Martin Luther King, Jr. Boulevard and McCombs Street in the City of El Paso, Texas. Based on information provided by Hunt Communities LLC, the Northeast Master Plan will ultimately consist of approximately $6,615,000$ square feet of shopping center / retail land use, 953,000 square feet of office land use, 16,373 single-family homes, apartments with 2,397 dwelling units, 1,398 townhomes, 4 elementary schools, a middle school, and a high school.

This traffic impact analysis was performed as a planning exercise, to determine the feasibility of developing the parcel and to size the internal thoroughfare network. As the site is developed, more detailed traffic impact analyses will need to be performed for each phase to ensure the proper mitigation measures and capacity improvements are provided with each proposed phase.

The traffic evaluation was comprised of three (3) scenarios for which both AM and PM peak hour level of service analyses were performed. For both signalized and unsignalized intersections, analysis was accomplished via the Synchro $6^{\mathrm{TM}}$ software. The scenarios are detailed in the table below.

| Analysis Scenario Summary |  |  |  |
| :---: | :---: | :---: | :---: |
| Scenario | Roadway Conditions | Development <br> Assumptions | Traffic Volumes |
| Existing | Existing | Existing | Existing |
| Build Out <br> Background <br> (2035) | Existing | Development <br> intensity modeled by <br> El Paso MPO in <br> 2035 | Volumes modeled by El Paso <br> MPO + Existing Background <br> Traffic |
| Build Out |  |  |  |
| (2035) | Patriot Freeway expansion + <br> Haggerty Dr. extension + <br> MLK Blvd. expansion + <br> McCombs St. expansion + <br> Loma Real Ave. extension/ <br> expansion + Ring Rd. <br> construction + Painted <br> Dunes Dr. construction | Existing + Build Out <br> of Northeast Master <br> Plan | Background volumes based on <br> projected El Paso MPO 2035 <br> volumes + Build Out of <br> Northeast Master Plan |

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Based on the analyses performed during this traffic impact study, we offer the following conclusions and recommendations:

## Existing Conditions (2008):

Based on the analysis of existing conditions, all study area intersections currently operate at an acceptable level of service during the AM and PM peak hours.

## Build Out Background (2035):

Based on the analysis of the 2035 background scenario conditions, all study area intersections are projected to operate at an acceptable level of service during the AM and PM peak hours.

## Build Out Year (2035) Recommendations:

- Martin Luther King, Jr. Boulevard is recommended to be expanded to a six (6) lane divided arterial both through the site and between Loma Real Avenue and Patriot Freeway. While this requires a change to the City of El Paso Master Thoroughfare Plan (this roadway was previously listed as a super arterial -8 lanes); a major arterial should adequately serve the study area.
- McCombs Street is recommended to be expanded to a six (6) lane divided arterial through the site. While this requires a change to the City of El Paso Master Thoroughfare Plan (this roadway was previously listed as a super arterial - 8 lanes); a major arterial should adequately serve the study area.
- Sean Haggerty Drive is recommended to be extended through the site as a four (4) lane divided minor arterial, as per the City of El Paso Master Thoroughfare Plan.
- Painted Dunes Road is recommended to be constructed as a four (4) lane divided connector.
- Loma Real Avenue is recommended to be constructed as a four (4) lane undivided connector.
- Ring Road is recommended to be constructed as a four (4) lane undivided connector.
- Ring Road is recommended to intersect McCombs Street, south of Painted Dunes Road and north of Loma Real Avenue.
- All major intersections (those analyzed in the report) are projected to require signalization (or some other treatment to increase capacity) by 2035. During each phase of development, the study area's intersections will be further analyzed to determine during which phase the capacity improvement is needed.
- Left and right-turn lanes are recommended at each intersection in the study. This recommendation is based on upon projected traffic volumes at the intersections. Exhibit 14 shows the recommended lane uses and traffic control devices. It is recommended that the length of these turn lanes be designed in accordance with TxDOT and City of El Paso standards, respectively.
- Turn lanes on Martin Luther King, Jr. Boulevard through the site are recommended to be designed to with the same criteria as the existing turn lanes on Martin Luther King, Jr. Boulevard from US 54 to Loma Real Avenue.
- Dual left turn lanes are recommended at the intersections of:
- McCombs Street and Painted Dunes Road (northbound only)
- McCombs Street and Ring Road South (northbound only)
- Martin Luther King, Jr. Boulevard and Loma Real Avenue (northbound and southbound)
- Sean Haggerty Drive and Loma Real Avenue (northbound and southbound)
- Painted Dunes Road and Patriot Freeway Westbound Frontage Road (westbound)
- At the intersection of Patriot Freeway Westbound Frontage Road and Martin Luther King, Jr. Boulevard, the lane configuration under the bridge could be modified to increase the capacity at this intersection. Due to the unbalanced volumes anticipated at this interchange, we recommend three northbound lanes with an additional dedicated northbound left lane and one dedicated southbound thru lane and one shared-left southbound lane.
- We recommend restriping the Patriot Freeway Eastbound Frontage Road at both McCombs Street and Sean Haggerty Drive to include dual lefts as indicated in Exhibit 14.

Exhibit 14 (next page) displays the recommendations made, based on the intersection level of service and link capacity analysis results.


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## I. INTRODUCTION

## A. Purpose

Kimley-Horn and Associates, Inc. was retained by Hunt Communities LLC to perform a traffic impact analysis as part of an amended land study for the proposed mixed use development, the Northeast Master Plan, located generally north of US 54 (Patriot Freeway), between Martin Luther King, Jr. Boulevard and McCombs Street in the City of El Paso, Texas.

The purpose of this study is to address the traffic and transportation impacts of the proposed development on surrounding streets and intersections, and to determine the necessary sizing of the network inside the development boundaries. This traffic impact study was prepared based on criteria set forth by the City of El Paso. The specific objectives of this study are to perform both mid-block and intersection capacity analyses, and to recommend any amendments or modifications to the City of El Paso Master Thoroughfare Plan within the study area to accommodate build out of the proposed development.

This traffic impact analysis was performed as a planning exercise, to determine the feasibility of developing the parcel and to size the internal thoroughfare network. As the site is developed, more detailed traffic impact analyses will need to be performed for each phase to ensure the proper mitigation measures and capacity improvements are provided with each proposed phase.

## B. Methodology

The traffic evaluation was comprised of the existing traffic conditions, background conditions in the build out year of 2035, and the build out scenario for which both AM and PM weekday peak hour level of service analyses were performed. For both signalized and unsignalized intersections, analysis was accomplished via the Synchro $6^{\mathrm{TM}}$ software. Table 1 provides a summary of the assumptions used in each scenario.

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|  | Table 1 - Analysis Scenarios |  |  |
| :---: | :---: | :---: | :---: |
| Scenario | Roadway Conditions | Development <br> Assumptions | Traffic Volumes |
| Existing | Existing | Existing | Existing |
| Build Out <br> Background <br> (2035) | Existing | Development <br> intensity modeled <br> by El Paso MPO in <br> 2035 | Volumes modeled by El Paso <br> MPO + Existing Background <br> Traffic |
| Build Out |  |  |  |
| (2035) | Patriot Freeway expansion + <br> Haggerty Dr. extension + <br> MLK Blvd. expansion + <br> McCombs St. expansion + <br> Loma Real Ave. extension/ <br> expansion + Ring Rd. <br> construction + Painted <br> Dunes Dr. construction | Existing + Build <br> Out of Northeast <br> Master Plan | Background volumes based on <br> projected El Paso MPO 2035 <br> volumes + Build Out of Northeast <br> Master Plan |

A list of the intersections analyzed within the study area and their existing and proposed traffic control can be seen below.

## Existing (2008) Conditions:

Existing Unsignalized Intersections (not analyzed):

- Martin Luther King, Jr. Boulevard \& Loma Real Avenue
- McCombs Street \& Painted Dunes Golf Course

Existing Signalized Intersections:

- Patriot Freeway WBFR \& Martin Luther King, Jr. Boulevard
- Patriot Freeway EBFR \& Kenworthy Street
- Patriot Freeway WBFR \& Sean Haggerty Drive
- Patriot Freeway EBFR \& Sean Haggerty Drive
- Patriot Freeway WBFR \& McCombs Street
- Patriot Freeway EBFR \& McCombs Street


## Build Out (2035) Conditions:

This scenario includes the intersections in the existing traffic scenario, plus the following proposed intersections:

Proposed Signalized Intersections:

- Martin Luther King, Jr. Boulevard \& Ring Road North
- Martin Luther King, Jr. Boulevard \& Painted Dunes Road
- Martin Luther King, Jr. Boulevard \& Ring Road South
- Martin Luther King, Jr. Boulevard \& Loma Real Avenue
- Ring Road West \& Painted Dunes Road
- Sean Haggerty Drive \& Ring Road North
- Sean Haggerty Drive Boulevard \& Painted Dunes Road
- Sean Haggerty Drive \& Ring Road South
- Sean Haggerty Drive \& Loma Real Avenue
- McCombs Street \& Ring Road North
- McCombs Street \& Painted Dunes Road
- McCombs Street \& Ring Road South
- McCombs Street \& Loma Real Avenue
- Painted Dunes Road \& Patriot Freeway WBFR
- Painted Dunes Road \& Patriot Freeway EBFR


## II. EXISTING AND PROPOSED LAND USE

## A. Site Location / Study Area

The proposed development is located generally north of US 54 (Patriot Freeway), between Martin Luther King, Jr. Boulevard and McCombs Street in the City of El Paso, Texas. A vicinity map can be seen in Exhibit 1.

## B. Existing Development

Currently, the only development within the site is the Painted Dunes Desert Golf Course. The focus of this study was the Amended Land Study and the ultimate build out of the proposed site; therefore, the impact of any development proposed to be in place by 2035 was considered through the background volumes obtained from the El Paso MPO's 2035 TransBorder projections.

## C. Proposed Development

Based on information provided by Hunt Communities LLC, the Northeast Master Plan will ultimately consist of approximately $6,615,000$ square feet of shopping center / retail land use, 953,000 square feet of office land use, 16,373 single-family homes, apartments with 2,397 dwelling units, 1,398 townhomes, 4 elementary schools, a middle school, and a high school. The current site plan can be seen in Exhibit 2.


EXHIBIT 1 - Vicinity Map



Master Land Use Plan

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## III. EXISTING (2008) ROADWAY SYSTEM

## A. Thoroughfare System

The existing roadway network within the study area consists of Martin Luther King, Jr. Boulevard, Sean Haggerty Drive, McCombs Street, Loma Real Avenue, and Patriot Freeway. This network composes six (6) signalized intersections and two (2) unsignalized intersections. Exhibit 3 displays the existing thoroughfares, lane assignments, and traffic control devices within the study area. The following is a general description of the major thoroughfares within the study area as they exist today, along with their planned cross-sections and alignments.

US 54 (Patriot Freeway) Frontage Roads are adjacent to the US 54 main lanes, which end at Sean Haggerty Drive. The existing posted speed on the frontage roads is 45 mph . US 54 runs generally north-south through El Paso, connecting Alamogordo, New Mexico to the north and Ciudad Juarez, Chihuahua, Mexico to the south. The frontage roads are typically two (2) lanes in each direction, with dedicated turn lanes at intersections.

Martin Luther King, Jr. Boulevard is a two (2) lane divided arterial running generally in a north-south direction with a posted speed of 65 mph through the site. A direct connection allows southbound motorists to access to Patriot Freeway. South of the study area, at the intersection with Patriot Freeway, Martin Luther King, Jr. Boulevard becomes Kenworthy Street. Martin Luther King, Jr. Boulevard extends north through the study area, eventually becoming State Highway 213 north of the state line between Texas and New Mexico. In the study area, Martin Luther King, Jr. Boulevard is a TxDOT facility, designated as FM 3255. The City of El Paso Master Thoroughfare Plan identifies Martin Luther King, Jr. Boulevard as ultimately becoming a six (6) lane divided arterial facility. Both left and right turn lanes are provided at every intersection within the study area.

McCombs Street is a six (6) lane north-south arterial facility south of Patriot Freeway, and a two (2) lane facility north of the frontage roads. The posted speed is 55 mph . McCombs Street extends through the study area into New Mexico. In the study area, McCombs Street is also a TxDOT facility, designated FM 2529. Like Martin Luther King, Jr. Boulevard, the Master Thoroughfare Plan identifies McCombs Street as a future six (6) lane divided arterial facility.

Sean Haggerty Drive is currently a four (4) lane north-south minor arterial terminating at the southbound Patriot Freeway frontage road. The posted speed limit is 35 miles per hour. The City of El Paso Master Thoroughfare Plan identifies Sean Haggerty Drive as ultimately becoming a minor arterial street.

Loma Real Avenue is a two (2) lane residential collector with a 30 mph posted speed limit. Loma Real Avenue begins at Martin Luther King, Jr. Boulevard and terminates approximately one half mile to the east. The City of El Paso Master Thoroughfare Plan identifies Loma Real Avenue as a proposed collector.

## B. Existing Traffic Volumes

Exhibit 4 presents the existing AM and PM peak hour traffic volumes collected on Thursday, May 15, 2008 at the intersections listed below. In addition, 24-hour bi-directional recording machine counts were collected on Martin Luther King, Jr. Boulevard (north of the direct connector to US 54) and McCombs Street (north of US 54). The raw count sheets are provided in the Appendix.

Turning Movement Count Locations:

- US 54 WBFR \& Martin Luther King, Jr. Boulevard
- US 54 EBFR \& Kenworthy Street
- US 54 WBFR \& Sean Haggerty Drive
- US 54 EBFR \& Sean Haggerty Drive
- US 54 WBFR \& McCombs Street
- US 54 EBFR \& McCombs Street



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## IV. EXISTING CONDITIONS (2008) TRAFFIC ANALYSIS

## A. Level of Service Evaluations

The evaluation of the existing roadway system was comprised of both AM and PM peak hour level of service analyses. For both the signalized intersections, analysis was accomplished via the Synchro $6{ }^{\mathrm{TM}}$ software. The previously referenced Exhibit 3 details the lane assignments and traffic control devices for the existing roadway network that were used for analysis. The purpose of this analysis was to determine if any deficiencies exist within the network and to establish a baseline condition.

Capacity defines the volume of traffic that can be accommodated by a roadway at a specified "level-of-service." Capacity is affected by various geometric factors including roadway type (e.g. divided or undivided), number of lanes, lane widths, and grades. Level-of-service (LOS), which is a measure of the degree of congestion, ranges from LOS A (free flowing) to LOS F (a congested, forced flow condition). LOS C is considered to be the minimum acceptable level of service for design and evaluation purposes, while LOS D is considered acceptable for longterm planning due to the uncertainty of study assumptions. Due to increasing congestion in many cities, LOS D is gaining acceptance as a level of service for design and evaluation. LOS E is commonly being accepted for long term planning due to the uncertainty of assumptions in many long term projects. A description of each operational state for signalized intersections is presented in Table 2.

| Table 2 - Definition of Level of Service for Signalized Intersections |  |  |
| :---: | :---: | :---: |
| Level of Service | Average Control Delay per Vehicle (sec/veh) | Description |
| A and B | $\begin{gathered} \leq 10(\mathrm{~A}) \\ >10 \text { and } \leq 20 \text { (B) } \end{gathered}$ | No delays at intersections with continuous flow traffic. Uncongested operations; high frequency of long gaps available for all left and right-turning traffic; no observable queues. |
| C | $>20$ and $\leq 35$ | Moderate delays at intersections with satisfactory to good traffic flow. Light congestion; infrequent backups on critical approaches. |
| D | $>35$ and $\leq 55$ | Increased probability of delays along every approach. Significant congestion on critical approaches, but intersection functional. No long standing lines formed. |
| E | $>55$ and $\leq 80$ | Heavy traffic flow condition. Heavy delays probable. No available gaps for cross-street traffic or main street turning traffic. Limit of stable flow. |
| F | > 80 | Unstable traffic flow. Heavy congestion. Traffic moves in forced flow condition. Average delays greater than one minute highly probable. Total breakdown. |

The following tables detail the results of the analysis for the study area. Table $\mathbf{3}$ compiles the results of the controlled movements at the signalized intersections. Synchro $6^{T M}$ output sheets are provided in the Appendix.

Based on the analysis of existing conditions, all study area intersections currently operate at an acceptable level of service during the AM and PM peak hours.

Table 3 - Existing (2008) Signalized Intersection Analysis

| Intersection | AM Peak |  | PM Peak |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Existing |  | Existing |  |
|  | Delay $^{1}$ | LOS | Delay $^{1}$ | LOS |
| McCombs @ Patriot Freeway WBFR | 14.9 | B | 13.8 | B |
| McCombs @ Patriot Freeway EBFR | 19.3 | B | 18.8 | B |
| MLK @ Patriot Freeway WBFR | 7.5 | A | 7.2 | A |
| MLK@ Patriot Freeway EBFR | 17.4 | B | 16.7 | B |
| Haggerty @ Patriot Freeway WBFR | 16.4 | B | 15.7 | B |
| Haggerty @ Patriot Freeway EBFR | 18.2 | B | 21.0 | C |

${ }^{1}$ Delay is reported as HCM delay in sec/veh

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## V. BUILD OUT (2035) BACKGROUND TRAFFIC

## A. Build Out Background Thoroughfare Roadway System

The background thoroughfare roadway system used in the analysis was based on the proposed amended land study. Exhibit 5 shows the thoroughfare roadway system for the background build out scenario.

## B. Background Traffic Volumes

In order to determine the projected background traffic volumes, projected 2035 weekday traffic volumes along the study area thoroughfare facilities were obtained from thoroughfare planning work conducted by the El Paso Metropolitan Planning Organization. Based upon characteristics of the model, the volumes provided by the El Paso MPO were adjusted to reflect the differences between the modeled land uses and the land uses proposed by Hunt Communities LLC. The traffic generated by the site in the model was removed from the background volumes, since this volume would be accounted for through trip generation of the proposed land uses. The resulting projected 2035 daily traffic volumes from the El Paso MPO's TransBorder 2035 plan are summarized below.

Projected 2035 Background Daily Traffic Volumes:

- McCombs Street:

$$
\begin{aligned}
& 10,395 \mathrm{vpd} \\
& \mathbf{2 0 , 6 8 1} \mathrm{vpd}
\end{aligned}
$$

- Martin Luther King, Jr. Boulevard

El Paso MPO's model volumes were used to calculate the north and southbound background traffic on Martin Luther King, Jr. Boulevard, Sean Haggerty Drive, McCombs Street, and at their existing intersections along US 54. The volumes generated by the MPO model are presented as total daily volumes. These daily volumes were translated into AM and PM peak period trips by analyzing the existing daily traffic counts (see Appendix). Below is an example of the PM Peak background volume calculation.

Example Calculation: McCombs Street PM Peak Background Calculation.

Projected Daily Volume from TransBorder 2035:
PM Peak as a percentage of daily traffic:
Total PM Peak Hour Volume
Directional Split
Resulting Background PM Peak Volumes:

10,395 vehicles per day
$8.77 \%$ of the daily volume.
912 vehicles
$\sim 60 \%(\mathrm{NB}) / \sim 40 \%$ (SB)
546 (NB) / 366 (SB)

A similar methodology was applied to Martin Luther King, Jr. Boulevard; however some of the background traffic (30\%) was shifted to Sean Haggerty Drive through the site due to the fact that Sean Haggerty was not included in the MPO's model. At existing intersections, the model trips were distributed among each movement, based on percentages determined from the existing count volumes. It should be noted that the MPO's model assumes the construction of the Patriot Freeway mainlines between MLK and McCombs to occur by 2015; therefore the lack of inclusion of these main lanes in this analysis results in a conservative estimate of the level of service.

Exhibit 6 displays the projected build out year (2035) background traffic volumes, which combines the background traffic projected by the El Paso MPO's 2035 model and the existing turning movement counts.



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## VI. BUILD OUT BACKGROUND (2035) TRAFFIC ANALYSIS

## A. Level of Service Evaluations

The evaluation of the build out background roadway system was comprised of both AM and PM peak hour level of service analyses. For the signalized intersections, analysis was accomplished via the Synchro $6^{\mathrm{TM}}$ software. The previously referenced Exhibit 5 details the lane assignments and traffic control devices for the build out background roadway network that were used for analysis. The purpose of this analysis was to determine if any deficiencies exist within the network and to establish a baseline condition.

The following tables detail the results of the analysis for the study area. Table 4 compiles the results of the controlled movements at the signalized intersections. Synchro $6^{T M}$ output sheets are provided in the Appendix.

Based on the analysis of build out background conditions, all of the existing intersections are expected to operate at an acceptable level of service under background conditions in the 2035 build out year.

Table 4 - Build Out Background (2035) Signalized Intersection Analysis

| Intersection | Controlled | AM Peak |  | PM Peak |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $\mathbf{2 0 3 5}$ Background |  | 2035 Background |  |
|  |  | LOS | Delay $^{\mathbf{1}}$ | LOS |  |
| McCombs @ Patriot Freeway WBFR | Intersection | 16.5 | B | 14.1 | B |
| McCombs @ Patriot Freeway EBFR | Intersection | 19.6 | B | 20.2 | C |
| MLK@ Patriot Freeway WBFR | Intersection | 8.7 | A | 10.0 | A |
| MLK@ Patriot Freeway EBFR | Intersection | 17.2 | B | 20.2 | C |
| Haggerty @ Patriot Freeway WBFR | Intersection | 12.5 | B | 11.0 | B |
| Haggerty @ Patriot Freeway EBFR | Intersection | 16.8 | B | 18.4 | B |

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## VII. BUILD OUT (2035) TRAFFIC CHARACTERISTICS

## A. Proposed Site Trip Generation

Traffic projections were prepared for the proposed development based on the trip generation rates found in the Institute of Transportation Engineers (ITE) publication entitled Trip Generation, 7th Edition. This recognized standard for trip generation is based on actual surveys (traffic counts) of existing types of development.

Based on information provided by Hunt Communities LLC, the Northeast Master Plan will ultimately consist of approximately $6,615,000$ square feet of shopping center / retail land use, 953,000 square feet of office land use, 16,373 single-family homes, apartments with 2,397 dwelling units, 1,398 townhomes, 4 elementary schools, a middle school, and a high school. The site was split into fourteen (14) separate traffic generation zones, each with a unique trip generation and distribution, as shown in Exhibit 7. The land use characteristics of the site are shown in Table 5, and the land uses in each traffic generation zone are shown in Table 6.

The ITE trip generation rates assumed for the proposed development are given in Table 7. The calculated number of trips from these rates represents vehicle trips. Table 8 summarizes the net total number of trips that are expected to be generated by the proposed development during the AM and PM peak periods and on a daily basis. Due to the large amount of retail and office space, the fitted curve equation was used for trip generation after a certain square-footage threshold was exceeded ( 300,000 square feet of office, 400,000 square feet of retail). Extrapolating the linear rates past this threshold produced an excessive number of trips. The fitted curve equations offer a more realistic prediction for high intensity land uses. The calculated results from these rates and equations are the predicted vehicle trips. The number of trips generated represents the number of vehicles entering and exiting the proposed development to and from the adjacent street system.

Appropriate internal capture rates were applied to each trip generation zone, based on the methodology illustrated in the ITE Trip Generation Handbook (See Appendix). This internal capture rate was applied to those trips generated within each zone that would remain within the zone, and not access the site's internal thoroughfare network. In addition, a 40\% adjustment was applied to the residential trips for to account for trips that entered the internal thoroughfare network, yet never left the boundaries of the Northeast Master Plan. Based on the size and characteristics of the development within the site, $40 \%$ of the trips generated by residential traffic were assumed to be generated by the retail space within the development. In order to avoid counting these trips twice (once as a residential trip and once as a retail trip), the $40 \%$ reduction was applied. No adjustments were made to the non-residential trips, or for pass-by trips.


Table 5 - Land Use for Entire Northeast Master Plan

| Land Use Description | Intensity | Units | ITE Land Use Code |
| :---: | :---: | :---: | :---: |
| Single Family-Detached Housing | 16,373 | DU | 210 |
| Apartment | 2,397 | DU | 220 |
| Residential Condominium/Townhouse | 1,398 | DU | 230 |
| Elementary School | 3,200 | Students | 520 |
| Middle School/Junior High | 1,200 | Students | 522 |
| High School | 2,500 | Students | 530 |
| General Office Building | 953 | 1000 SF | 710 |
| Shopping Center/Retail | 6,615 | 1000 SF | 820 |

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Table 6 - Land Use by Trip Generation Zone

| TGZ Number | Land Use Description | Intensity | Units | ITE Land Use Code |
| :---: | :---: | :---: | :---: | :---: |
| 1 | Single Family-Detached Housing | 1,516 | DU | 210 |
|  | General Office Building | 45 | 1000 SF | 710 |
|  | Shopping Center/Retail | 409 | 1000 SF | 820 |
| 2 | Single Family-Detached Housing | 1,187 | DU | 210 |
|  | Apartment | 432 | DU | 220 |
|  | Residential Condominium/Townhouse | 132 | DU | 230 |
|  | Elementary School | 800 | Students | 520 |
|  | General Office Building | 63 | 1000 SF | 710 |
|  | Shopping Center/Retail | 150 | 1000 SF | 820 |
| 3 | Single Family-Detached Housing | 1,075 | DU | 210 |
|  | General Office Building | 15 | 1000 SF | 710 |
|  | Shopping Center/Retail | 134 | 1000 SF | 820 |
| 4 | Single Family-Detached Housing | 2,214 | DU | 210 |
|  | Apartment | 300 | DU | 220 |
|  | Residential Condominium/Townhouse | 65 | DU | 230 |
|  | General Office Building | 96 | 1000 SF | 710 |
|  | Shopping Center/Retail | 534 | 1000 SF | 820 |
| 5 | Single Family-Detached Housing | 329 | DU | 210 |
|  | Elementary School | 800 | Students | 520 |
| 6 | Single Family-Detached Housing | 1,310 | DU | 210 |
|  | Middle School/Junior High | 1,200 | Students | 522 |
|  | General Office Building | 76 | 1000 SF | 710 |
|  | Shopping Center/Retail | 682 | 1000 SF | 820 |
| 7 | Single Family-Detached Housing | 1,646 | DU | 210 |
|  | Apartment | 146 | DU | 220 |
|  | Residential Condominium/Townhouse | 230 | DU | 230 |
|  | General Office Building | 50 | 1000 SF | 710 |
|  | Shopping Center/Retail | 451 | 1000 SF | 820 |
| 8 | Single Family-Detached Housing | 1,259 | DU | 210 |
|  | General Office Building | 26 | 1000 SF | 710 |
|  | Shopping Center/Retail | 237 | 1000 SF | 820 |
| 9 | Single Family-Detached Housing | 1,019 | DU | 210 |
|  | Apartment | 284 | DU | 220 |
|  | Residential Condominium/Townhouse | 133 | DU | 230 |
|  | Elementary School | 800 | Students | 520 |
|  | General Office Building | 63 | 1000 SF | 710 |
|  | Shopping Center/Retail | 348 | 1000 SF | 820 |
| 10 | Single Family-Detached Housing | 409 | DU | 210 |
|  | High School | 2,500 | Students | 530 |
|  | General Office Building | 13 | 1000 SF | 710 |
|  | Shopping Center/Retail | 116 | 1000 SF | 820 |
| 11 | Single Family-Detached Housing | 1,963 | DU | 210 |
|  | Apartment | 635 | DU | 220 |
|  | General Office Building | 14 | 1000 SF | 710 |
|  | Shopping Center/Retail | 126 | 1000 SF | 820 |
| 12 | Single Family-Detached Housing | 62 | DU | 210 |
|  | Apartment | 300 | DU | 220 |
|  | Residential Condominium/Townhouse | 495 | DU | 230 |
|  | General Office Building | 354 | 1000 SF | 710 |
|  | Shopping Center/Retail | 2,000 | 1000 SF | 820 |
| 13 | Single Family-Detached Housing | 1,631 | DU | 210 |
|  | Apartment | 300 | DU | 220 |
|  | Residential Condominium/Townhouse | 153 | DU | 230 |
|  | Elementary School | 800 | Students | 520 |
|  | General Office Building | 48 | 1000 SF | 710 |
|  | Shopping Center/Retail | 428 | 1000 SF | 820 |
| 14 | Single Family-Detached Housing | 753 | DU | 210 |
|  | Residential Condominium/Townhouse | 190 | DU | 230 |
|  | General Office Building | 90 | 1000 SF | 710 |
|  | Shopping Center/Retail | 1,000 | 1000 SF | 820 |

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Table 7 - Estimated Trip Generation Rates

| Land Use Description | ITE Code | Weekday |  | AM Peak Hour |  | PM Peak Hour |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Rate | In/Out Split (\%) | Rate | $\begin{array}{\|c} \text { In/Out } \\ \text { Split (\%) } \\ \hline \end{array}$ | Rate | $\begin{gathered} \text { In/Out } \\ \text { Split (\%) } \\ \hline \end{gathered}$ |
| Single Family-Detached Housing | 210 | 9.57 (X) | 50:50 | 0.75 (X) | 25:75 | 1.01 (X) | 63:37 |
| Apartment | 220 | 6.72 (X) | 50:50 | 0.51 (X) | 20:80 | 0.62 (X) | 65:35 |
| Residential Condominium/Townhouse | 230 | 5.86 (X) | 50:50 | 0.44 (X) | 17:83 | 0.52 (X) | 67:33 |
| Elementary School | 520 | 1.29 (Y) | 50:50 | 0.42 (Y) | 55:45 | $0.28(\mathrm{Y})$ | 45:55 |
| Middle School/Junior High | 522 | 1.62 (Y) | 50:50 | 0.53 (Y) | 55:45 | 0.15 (Y) | 52:48 |
| High School | 530 | 1.71 (Y) | 50:50 | 0.41 (Y) | 69:31 | 0.14 (Y) | 47:53 |
| General Office Building | 710 | $11.01(\mathrm{Z})$ | 50:50 | 1.55 (Z) | 88:12 | 1.49 (Z) | 17:83 |
| Shopping Center/Retail | 820 | 42.94 (Z) | 50:50 | 1.03 (Z) | 61:39 | 3.75 (Z) | 48:52 |
| Number of Trips Generated = Trip Rate (Development Unit) |  |  |  |  |  |  |  |
| $\mathrm{X}=$ Number of Dwelling Units (ITE Codes 210, 220, 230), $\mathrm{Y}=$ Number of Students (ITE Codes 520, 522, 530), $\mathrm{Z}=1000 \mathrm{sq}$. ft. of Gross Leasable Floor Area (ITE Codes 710, 820) |  |  |  |  |  |  |  |
| For ITE Code 710 , if $\mathrm{Z}>300$, equation $\operatorname{Ln}(\mathrm{T})=0.77 \mathrm{Ln}(\mathrm{Z})+3.65$ used for Weekday trip generation (where $\mathrm{T}=$ Trips Generated) |  |  |  |  |  |  |  |
| For ITE Code 820 , if $\mathrm{Z}>400$, equation $\operatorname{Ln}(\mathrm{T})=0.65 \mathrm{Ln}(\mathrm{Z})+5.83$ used for Weekday trip generation (where $\mathrm{T}=$ Trips Generated) |  |  |  |  |  |  |  |
| For ITE Code 710 , if $\mathrm{Z}>300$, equation $\operatorname{Ln}(\mathrm{T})=0.80 \mathrm{Ln}(\mathrm{Z})+1.55$ used for AM Peak trip generation (where $\mathrm{T}=$ Trips Generated) |  |  |  |  |  |  |  |
| For ITE Code 820, if $\mathrm{Z}>400$, equation $\operatorname{Ln}(\mathrm{T})=0.60 \mathrm{Ln}(\mathrm{Z})+2.29$ used for AM Peak trip generation (where T = Trips Generated) |  |  |  |  |  |  |  |
| For ITE Code 710 , if $\mathrm{Z}>300$, equation $\mathrm{T}=1.12(\mathrm{Z})+78.81$ used for PM Peak trip generation (where $\mathrm{T}=$ Trips Generated) |  |  |  |  |  |  |  |
| For ITE Code 820 , if $\mathrm{Z}>400$, equation $\mathrm{Ln}(\mathrm{T})=0.66 \mathrm{Ln}(\mathrm{Z})+3.40$ used for PM Peak trip generation (where $\mathrm{T}=$ Trips Generated) |  |  |  |  |  |  |  |

Table 8 - Total Estimated Trip Generation

| Land Use | Intensity | Unit | ITE <br> Code | Daily Total | AM Peak |  |  | PM Peak |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  | In | Out | Total | In | Out | Total |
| Single FamilyDetached Housing | 16,373 | DU | 210 | 156,691 | 3,072 | 9,209 | 12,281 | 10,417 | 6,120 | 16,537 |
| Apartment | 2,397 | DU | 220 | 16,107 | 246 | 976 | 1,222 | 966 | 521 | 1,487 |
| Residential Condominium/ Townhouse | 1,398 | DU | 230 | 8,193 | 104 | 512 | 616 | 487 | 241 | 728 |
| Total Residential Trips |  |  |  | 180,991 | 3,422 | 10,697 | 14,119 | 11,870 | 6,882 | 18,752 |
| Internally Captured Residential Trips |  |  |  | 18,280 | 345 | 1,085 | 1,431 | 1,202 | 695 | 1,897 |
| Internally Assigned Residential Trips |  |  |  | 65,084 | 1,231 | 3,845 | 5,075 | 4,267 | 2,475 | 6,742 |
| Net External Residential Trips |  |  |  | 97,627 | 1,846 | 5,767 | 7,613 | 6,401 | 3,712 | 10,113 |
| Elementary School | 3,200 | Students | 520 | 4,128 | 740 | 604 | 1,344 | 404 | 492 | 896 |
| Middle <br> School/Junior <br> High | 1,200 | Students | 522 | 1,944 | 350 | 286 | 636 | 94 | 86 | 180 |
| High School | 2,500 | Students | 530 | 4,275 | 707 | 318 | 1,025 | 165 | 185 | 350 |
| General Office Building | 953 | 1000 SF | 710 | 10,126 | 1,272 | 174 | 1,446 | 233 | 1,135 | 1,368 |
| Shopping Center/Retail | 6,615 | 1000 SF | 820 | 221,986 | 2,902 | 1,856 | 4,758 | 9,876 | 10,701 | 20,577 |
| Total Non-Residential Trips |  |  |  | 242,459 | 5,971 | 3,238 | 9,209 | 10,772 | 12,599 | 23,371 |
| Internally Captured Non-Residential Trips |  |  |  | 26,913 | 2,260 | 1,433 | 3,693 | 1,786 | 2,079 | 3,865 |
| Net External Non-Residential Trips |  |  |  | 215,546 | 3,711 | 1,805 | 5,516 | 8,986 | 10,520 | 19,506 |
| Net Total External Site Generated Trips |  |  |  | 313,173 | 5,557 | 7,572 | 13,129 | 15,387 | 14,232 | 29,619 |

## B. Net Change in Trip Generation

The existing, vacant property generates no traffic on the study area roadway network, which has not yet been constructed. The only existing development in the study area is the Painted Dunes Golf Course. The course does not generate a significant amount of traffic in the peak periods; therefore, it was excluded from this study.

## C. Trip Distribution and Traffic Assignment

The distribution and assignment of the build out site-generated traffic to the study area roadway network was performed to reflect the anticipated local traffic patterns. The distribution and assignment was determined based upon anticipated future land use and existing traffic characteristics. Based on the proposed land use plan, a majority of the retail sites are located at the intersections of McCombs Street and Patriot Freeway, in the southeast corner of the site, and Painted Dunes Drive and Martin Luther King, Jr. Boulevard, in the western part of the development. These two locations were designated as internal attractors for trip distribution purposes.

Due to the distinct trip patterns of residential and non-residential land uses, two trip distributions were established. Separate residential and non-residential trip distributions were developed for each traffic generation zone. Individual distributions were necessary to provide the level of detail needed to size the internal roadways. In each residential distribution, 40\% of the generated traffic was assigned to the internal network, specifically toward the internal attractors (Zones 2, 9, 12, and 14, where retail space was concentrated within the development). Trips leaving the boundaries of the site were assigned as follows:

- $45 \%$ to/from the South
- $5 \%$ to/from the East
- $10 \%$ to/from the North.

These distributions were based on the traffic characteristics derived from the MPO's model. For each non-residential trip distribution, $60 \%$ of the traffic was assigned to the internal network. External trips were assigned with:

- $30 \%$ to/from the South
- $5 \%$ to/from the East
- $5 \%$ to/from the North.

The fourteen (14) residential distributions were then aggregated into an overall residential trip distribution. Traffic was assigned to the network by applying this aggregated residential trip distribution to the net total residential trips generated by the site. The non-residential trip distribution and assignment were performed in the same manner. To determine the total number of trips on the network, the residential, non-residential, and background trips were combined.

Exhibit 8 presents the inbound and outbound directional distributions for build out of residential developments. These trips were distributed within the development, in order to size the internal road network, based on capacity values provided by the El Paso MPO. Exhibit 9 presents the projected AM and PM weekday peak hour site trips for the residential developments.

Exhibit 10 presents the inbound and outbound directional distributions for build out of the proposed non-residential development. Exhibit 11 presents the projected AM and PM weekday peak hour site trips for non-residential development.

These volumes for each of the land uses were computed based on the trip generation information and directional distribution assumptions.





## VIII. BUILD OUT (2035) ROADWAY SYSTEM

## A. Programmed Improvements

This TIA will make recommendations to the types of facilities that are ultimately necessary to support the development. As part of the El Paso MPO TransBorder 2035 plan, they make assumptions regarding the timing and sizing of various improvements. Based on a review of this 2035 plan, the following improvements were indicated:

## 2015 Model:

Martin Luther King Jr. Boulevard:
Sean Haggerty Drive:
McCombs Street:
Painted Dunes Drive
US 54 Main Lanes:
2025 Model:
Martin Luther King Jr. Boulevard:
Sean Haggerty Drive:
McCombs Street:
Painted Dunes Drive
US 54 Main Lanes:

Four (4) lanes from US 54 to Loma Real Avenue Two (2) lanes north of Loma Real Avenue Six (6) lanes from US 54 to Painted Dunes Drive Four (4) lanes from US 54 to North of Property
Two (2) lanes from MLK to McCombs Street Main Lanes built to just east of McCombs

Four (4) lanes from US 54 to Stan Roberts
Same as 2015
Same as 2015
Four (4) lanes from MLK to McCombs Street
Same as 2015

## 2035 Model:

Martin Luther King Jr. Boulevard:
Sean Haggerty Drive:
McCombs Street:
Painted Dunes Drive
US 54 Main Lanes:

Same as 2025
Same as 2025 , however roadway is not shown north of Painted Dunes in the model
Same as 2025
Same as 2025
Main Lanes built to just west of proposed NE Pkwy

The 2025 and 2035 model indicates Martin Luther King Jr. Boulevard and McCombs Street are four (4) lane facilities; however both are indicated in the model as a having a severe level of service (LOS F). It should be noted that the 2015 model indicates Martin Luther King Jr. Boulevard as a severe level of service while McCombs is tolerable (e.g. LOS D or better) level of service.

## B. Total Traffic Volumes

Exhibit 12 presents the total traffic volumes for the site, which combine background, residential, and non-residential traffic projections. These total volumes were used to analyze intersection and link capacities. The total build out traffic volumes presented in Exhibit 13 combines the build out background traffic (Exhibit 6) with the residential (Exhibit 9), and non-residential traffic (Exhibit 11).

## C. Build Out Thoroughfare Capacity Analysis

The roadways in the site network were sized according to the agreement between Hunt and KHA, as well as the City of El Paso Master Thoroughfare Plan. Martin Luther King, Jr. Boulevard and McCombs Street were analyzed as six (6) lane divided arterials. Sean Haggerty Drive was analyzed as a four (4) lane divided minor arterial. Painted Dunes Drive as analyzed as a four (4) lane divided collector. The other roadways (Ring Road and Loma Real Avenue) were analyzed as four (4) lane undivided collectors. The capacity values given by the El Paso MPO are shown below in Table 9.

Table 9 - Capacity Values Used for Analysis

| Roadway | Lane Capacity |
| :---: | :---: |
| Martin Luther King, Jr. Boulevard | 900 vph |
| Sean Haggerty Drive | 715 vph |
| McCombs Street | 900 vph |
| Ring Road | 715 vph |
| Painted Dunes Drive | 715 vph |
| Loma Real Avenue | 625 vph |

The TransBorder 2035 Metropolitan Transportation Plan examines regionally significant projects based on the volume-to-capacity ratio, an operating condition they define as level of mobility (LOM). An "Acceptable" operating condition means the facility is underutilized, while a "Severe" operating condition indicates the carrying capacity has been met. Table 10 illustrates the level of mobility criteria.

Table 10 - Level of Mobility Criteria

| Level of Mobility | V/C Ratio |
| :---: | :---: |
| Tolerable | $<0.85$ |
| Moderate | $>=0.85<1.00$ |
| Serious | $>=1.00<1.25$ |
| Severe | $>=1.25$ |

The mid-block capacity analysis for the internal thoroughfare network is shown in Table 11. Based on the capacity analysis, some of the facilities show an unacceptable level of service ("Severe") during the PM peak hour. It should be noted that the intersections in the study area still operate at an acceptable level of service (as shown in the following section). The intersections have a far larger influence on the operations of the traffic network. In addition, the network used in the analysis was somewhat simplified in that only the major thoroughfare roadways in the development were analyzed. In the actual build out scenario (as shown in Exhibit 2), more facilities will be available to shift some of the excess demand predicted in this analysis, further improving operations.

Table 11 - Mid-Block Capacity Analysis

| Martin Luther King, Jr. Boulevard |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Scenario | Road | Segment | Dir | \# of lanes | AM |  |  | PM |  |  |
|  |  |  |  |  | V | V/C | LOM | V | V/C | LOM |
| Build Out (2035) | MLK | N of Ring Rd N | NB | 3 | 870 | 0.32 | Tolerable | 1487 | 0.55 | Tolerable |
|  |  |  | SB | 3 | 1309 | 0.48 | Tolerable | 1456 | 0.54 | Tolerable |
| Build Out (2035) | MLK | Between Ring RdN and Painted Dunes Dr | NB | 3 | 868 | 0.32 | Tolerable | 1528 | 0.57 | Tolerable |
|  |  |  | SB | 3 | 1584 | 0.59 | Tolerable | 1802 | 0.67 | Tolerable |
| Build Out (2035) | MLK | Between Painted Dunes Dr and Ring Rd S | NB | 3 | 917 | 0.34 | Tolerable | 1925 | 0.71 | Tolerable |
|  |  |  | SB | 3 | 1982 | 0.73 | Tolerable | 2255 | 0.84 | Tolerable |
| Build Out (2035) | MLK | Between Ring Rd S and Loma Real Ave | NB | 3 | 1071 | 0.40 | Tolerable | 2487 | 0.92 | Moderate |
|  |  |  | SB | 3 | 2138 | 0.79 | Tolerable | 2373 | 0.88 | Moderate |
| Build Out (2035) | MLK | Between Loma Real Ave and Patriot Frwy | NB | 3 | 1111 | 0.41 | Tolerable | 2665 | 0.99 | Moderate |
|  |  |  | SB | 3 | 646 | 0.24 | Tolerable | 683 | 0.25 | Tolerable |


| Sean Haggerty Drive |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Scenario | Road | Segment | Dir | \# of lanes | AM |  |  | PM |  |  |
|  |  |  |  |  | V | V/C | LOM | V | V/C | LOM |
| Build Out (2035) | Haggerty | N of Ring Rd N | NB | 2 | 419 | 0.29 | Tolerable | 717 | 0.50 | Tolerable |
|  |  |  | SB | 2 | 605 | 0.42 | Tolerable | 699 | 0.49 | Tolerable |
| Build Out (2035) | Haggerty | Between Ring RdN and Painted Dunes Dr | NB | 2 | 463 | 0.26 | Tolerable | 930 | 0.65 | Tolerable |
|  |  |  | SB | 2 | 905 | 0.50 | Tolerable | 1231 | 0.86 | Moderate |
| Build Out (2035) | Haggerty | Between Painted Dunes Dr and Ring Rd S | NB | 2 | 761 | 0.42 | Tolerable | 1652 | 1.16 | Serious |
|  |  |  | SB | 2 | 1294 | 0.72 | Tolerable | 1714 | 1.20 | Serious |
| Build Out (2035) | Haggerty | Between Ring Rd S and Loma Real Ave | NB | 2 | 846 | 0.47 | Tolerable | 2322 | 1.62 | Severe |
|  |  |  | SB | 2 | 1499 | 0.83 | Tolerable | 1951 | 1.36 | Severe |
| Build Out (2035) | Haggerty | Between Loma Real Ave and Patriot Frwy | NB | 2 | 804 | 0.45 | Tolerable | 2032 | 1.42 | Severe |
|  |  |  | SB | 2 | 1559 | 0.87 | Moderate | 1874 | 1.31 | Severe |


| McCombs Street |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Scenario | Road | Segment | Dir | \# of lanes | AM |  |  | PM |  |  |
|  |  |  |  |  | V | V/C | LOM | V | V/C | LOM |
| Build Out (2035) | McCombs | N of Ring RdN | NB | 3 | 398 | 0.15 | Tolerable | 729 | 0.27 | Tolerable |
|  |  |  | SB | 3 | 514 | 0.19 | Tolerable | 628 | 0.23 | Tolerable |
| Build Out (2035) | McCombs | Between Ring Rd N and Painted Dunes Dr | NB | 3 | 541 | 0.20 | Tolerable | 1179 | 0.44 | Tolerable |
|  |  |  | SB | 3 | 968 | 0.36 | Tolerable | 1348 | 0.50 | Tolerable |
| Build Out (2035) | McCombs | Between Painted Dunes Dr and Ring Rd S | NB | 3 | 930 | 0.34 | Tolerable | 2393 | 0.89 | Moderate |
|  |  |  | SB | 3 | 1496 | 0.55 | Tolerable | 2213 | 0.82 | Tolerable |
| Build Out (2035) | McCombs | Between Ring Rd S and Loma Real Ave | NB | 3 | 1222 | 0.45 | Tolerable | 3271 | 1.21 | Serious |
|  |  |  | SB | 3 | 1975 | 0.73 | Tolerable | 2758 | 1.02 | Serious |
| Build Out (2035) | McCombs | Between Loma Real Ave and Patriot Frwy | NB | 3 | 1227 | 0.45 | Tolerable | 3302 | 1.22 | Serious |
|  |  |  | SB | 3 | 1504 | 0.56 | Tolerable | 1901 | 0.70 | Tolerable |


| Ring Road North |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Scenario | Road | Segment | Dir | \# of lanes | AM |  |  | PM |  |  |
| Scenario | Road |  |  |  | V | V/C | LOM | V | V/C | LOM |
| Build Out (2035) | Ring RdN | W of MLK | EB | 2 | 152 | 0.11 | Tolerable | 246 | 0.17 | Tolerable |
|  |  |  | WB | 2 | 81 | 0.06 | Tolerable | 298 | 0.21 | Tolerable |
| Build Out (2035) | Ring RdN | Between MLK and Haggerty | EB | 2 | 309 | 0.22 | Tolerable | 571 | 0.40 | Tolerable |
|  |  |  | WB | 2 | 219 | 0.15 | Tolerable | 617 | 0.43 | Tolerable |
| Build Out (2035) | Ring RdN | Between Haggerty and McCombs | EB | 2 | 238 | 0.17 | Tolerable | 387 | 0.27 | Tolerable |
|  |  |  | WB | 2 | 151 | 0.11 | Tolerable | 429 | 0.30 | Tolerable |


| Painted Dunes Drive |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Scenario | Road | Segment | Dir | \# of lanes | AM |  |  | PM |  |  |
|  |  |  |  |  | V | V/C | LOM | V | V/C | LOM |
| Build Out (2035) | Painted Dunes | W of Ring Rd W | EB | 2 | 272 | 0.19 | Tolerable | 450 | 0.31 | Tolerable |
|  |  |  | WB | 2 | 180 | 0.13 | Tolerable | 508 | 0.28 | Tolerable |
| Build Out (2035) | Painted Dunes | Between Ring Rd W and MLK | EB | 2 | 588 | 0.41 | Tolerable | 1152 | 0.81 | Tolerable |
|  |  |  | WB | 2 | 35 | 0.02 | Tolerable | 99 | 0.06 | Tolerable |
| Build Out (2035) | Painted Dunes | Between MLK and Haggerty | EB | 2 | 800 | 0.56 | Tolerable | 1560 | 1.09 | Serious |
|  |  |  | WB | 2 | 817 | 0.57 | Tolerable | 1502 | 0.83 | Tolerable |
| Build Out (2035) | Painted Dunes | Between Haggerty and McCombs | EB | 2 | 734 | 0.51 | Tolerable | 1471 | 1.03 | Serious |
|  |  |  | WB | 2 | 682 | 0.48 | Tolerable | 1508 | 0.84 | Tolerable |
| Build Out (2035) | Painted Dunes | Between McCombs and Patriot Frwy | EB | 2 | 501 | 0.35 | Tolerable | 923 | 0.65 | Tolerable |
|  |  |  | WB | 2 | 452 | 0.32 | Tolerable | 972 | 0.54 | Tolerable |


| Ring Road South |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Scenario | Road | Segment | Dir | \# of lanes | AM |  |  | PM |  |  |
|  |  |  |  |  | V | V/C | LOM | V | V/C | LOM |
| Build Out (2035) | Ring Rd S | W of MLK | EB | 2 | 553 | 0.39 | Tolerable | 1032 | 0.72 | Tolerable |
|  |  |  | WB | 2 | 384 | 0.27 | Tolerable | 1167 | 0.82 | Tolerable |
| Build Out (2035) | Ring RdS | Between MLK and Haggerty | EB | 2 | 733 | 0.51 | Tolerable | 1303 | 0.91 | Moderate |
|  |  |  | WB | 2 | 420 | 0.29 | Tolerable | 1368 | 0.96 | Moderate |
| Build Out (2035) | Ring RdS | Between Haggerty and McCombs | EB | 2 | 563 | 0.39 | Tolerable | 972 | 0.68 | Tolerable |
|  |  |  | WB | 2 | 411 | 0.29 | Tolerable | 1204 | 0.84 | Tolerable |


| Loma Real Avenue |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Scenario | Road | Segment | Dir | \# of lanes | AM |  |  | PM |  |  |
|  |  |  |  |  | V | V/C | LOM | V | V/C | LOM |
| Build Out (2035) | Loma Real | W of MLK | EB | 2 | 116 | 0.09 | Tolerable | 170 | 0.14 | Tolerable |
|  |  |  | WB | 2 | 68 | 0.05 | Tolerable | 200 | 0.16 | Tolerable |
| Build Out (2035) | Loma Real | Between MLK and Haggerty | EB | 2 | 94 | 0.08 | Tolerable | 246 | 0.20 | Tolerable |
|  |  |  | WB | 2 | 78 | 0.06 | Tolerable | 198 | 0.16 | Tolerable |
| Build Out (2035) | Loma Real | Between Haggerty and McCombs | EB | 2 | 57 | 0.05 | Tolerable | 113 | 0.09 | Tolerable |
|  |  |  | WB | 2 | 227 | 0.18 | Tolerable | 653 | 0.52 | Tolerable |




## IX. BUILD OUT (2035) TOTAL TRAFFIC ANALYSIS

## A. Level of Service Evaluations

The evaluation of the build out year system was comprised of both AM and PM peak hour level of service analyses. Exhibit 12 details the lane assignments and traffic control devices for the proposed roadway network that were utilized in the analysis. The purpose of this analysis was to identify any deficiencies within the network as a result of the traffic generated by the proposed development.

The following tables detail the results of the analysis for the study area. Table $\mathbf{1 2}$ compiles the results of the controlled movements at the signalized intersections. Synchro $6^{T M}$ output sheets are provided in the Appendix.

Table 12 - Build Out (2035) Intersection Capacity Analysis

| Intersection | Controlled Approach | AM Peak |  | PM Peak |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 2035 Total |  | 2035 Total |  |
|  |  | Delay ${ }^{1}$ | LOS | Delay ${ }^{1}$ | LOS |
| MLK @ Ring Rd North | Intersection | 10.4 | B | 23.8 | C |
| Haggerty @ Ring Rd North | Intersection | 22.9 | C | 34.1 | C |
| McCombs @ Ring Rd North | Intersection | 14.0 | B | 17.1 | B |
| Ring Rd West @ Painted Dunes | Intersection | 23.2 | C | 16.7 | B |
| MLK @ Painted Dunes | Intersection | 31.3 | C | 69.9 | E |
| Haggerty@ Painted Dunes | Intersection | 29.1 | C | 72.5 | E |
| McCombs @ Painted Dunes | Intersection | 40.0 | D | 56.9 | E |
| Patriot Freeway WBFR @ Painted Dunes | Intersection | 16.7 | B | 30.2 | C |
| Patriot Freeway EBFR @ Painted Dunes | Intersection | 18.4 | B | 16.9 | B |
| MLK @ Ring Rd South | Intersection | 21.3 | C | 52.4 | D |
| Haggerty @ Ring Rd South | Intersection | 20.1 | C | 53.4 | D |
| McCombs @ Ring Rd South | Intersection | 25.2 | C | 54.7 | D |
| MLK @ Loma Real | Intersection | 11.6 | B | 17.3 | B |
| Haggerty @ Loma Real | Intersection | 18.4 | B | 26.5 | C |
| McCombs @ Loma Real | Intersection | 3.2 | A | 10.6 | B |
| McCombs @ Patriot Freeway WBFR | Intersection | 17.9 | B | 41.4 | D |
| McCombs @ Patriot Freeway EBFR | Intersection | 24.8 | C | 48.9 | D |
| MLK @ Patriot Freeway WBFR | Intersection | 12.2 | B | 80.0 | E |
| MLK @ Patriot Freeway EBFR | Intersection | 24.7 | C | 78.7 | $E$ |
| Haggerty @ Patriot Freeway WBFR | Intersection | 18.4 | B | 48.0 | D |
| Haggerty @ Patriot Freeway EBFR | Intersection | 23.9 | C | 75.8 | E |
| Delay is reported as HCM delay in sec/veh |  |  |  |  |  |

Based on the analysis of build out conditions, all of the intersections in the study area will operate at an acceptable level of service in the AM peak hour, provided the recommended lane configurations are utilized. Some of the intersections operate at LOS E during the PM peak hour. While this LOS is not desirable for actual operations, LOS E is may be considered acceptable for long-term planning. This analysis is also very conservative, because all of the traffic generated by the site was distributed through the major thoroughfare facilities and their intersections. The intersections showing LOS E will likely operate at a higher level of service, due to the diversion of traffic to other roadways within the overall network.

The Northeast Master Plan's internal thoroughfare network was analyzed using the following assumptions:

- Martin Luther King, Jr. Boulevard and McCombs Street were 6 lane divided major arterials.
- Sean Haggerty Drive was a 4 lane divided minor arterial.
- Painted Dunes Drive was a 4 lane divided collector.
- Loma Real Avenue and Ring Road were 4 lane undivided connectors.
- All intersections were signalized.
- Every approach had both left turn lanes and right turn lanes.
- All left-turn movements within the site were assumed to be protected-only (with the exception being the intersection of Painted Dunes Drive with the Ring Road on the far western edge of the site).
- Dual left turns were assumed at the following intersections:
- McCombs Street and Painted Dunes Road (northbound only).
- McCombs Street and Ring Road South (northbound only).
- Martin Luther King, Jr. Boulevard and Loma Real Avenue (northbound and southbound).
- Sean Haggerty Drive and Loma Real Avenue (northbound and southbound).
- Painted Dunes Road and Patriot Freeway Westbound Frontage Road (westbound).

Using these assumptions, the levels of service shown in Table 12 were achieved. Exhibit 14 displays the recommendations made, based on the intersection LOS and capacity analyses.

It should also be noted that there may be opportunities for alternative, higher capacity improvements to be installed at future intersections of the major arterials (MLK and McCombs) at their intersections with Patriot Freeway. For example, a significant volume is projected to exit NB Patriot Freeway and proceed NB on MLK. All of this traffic is forced through the signalized intersection. The installation of a direct connection (as is present for SB traffic) at this interchange (which may be needed near build out of the development) is something that should be considered by the City, MPO, and TxDOT.


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## X. CONCLUSIONS AND RECOMMENDATIONS

Based on the analyses performed during this traffic impact study, we offer the following conclusions and recommendations:

## Existing Conditions (2008):

Based on the analysis of existing conditions, all study area intersections currently operate at an acceptable level of service during the AM and PM peak hours.

## Build Out Background (2035):

Based on the analysis of the 2035 background scenario conditions, all study area intersections are projected to operate at an acceptable level of service during the AM and PM peak hours.

## Build Out Year (2035) Recommendations:

- Martin Luther King, Jr. Boulevard is recommended to be expanded to a six (6) lane divided arterial both through the site and between Loma Real Avenue and Patriot Freeway. While this requires a change to the City of El Paso Master Thoroughfare Plan (this roadway was previously listed as a super arterial - 8 lanes); a major arterial should adequately serve the study area.
- McCombs Street is recommended to be expanded to a six (6) lane divided arterial through the site. While this requires a change to the City of El Paso Master Thoroughfare Plan (this roadway was previously listed as a super arterial - 8 lanes); a major arterial should adequately serve the study area.
- Sean Haggerty Drive is recommended to be extended through the site as a four (4) lane divided minor arterial, as per the City of El Paso Master Thoroughfare Plan.
- Painted Dunes Road is recommended to be constructed as a four (4) lane divided connector.
- Loma Real Avenue is recommended to be constructed as a four (4) lane undivided connector.
- Ring Road is recommended to be constructed as a four (4) lane undivided connector.
- Ring Road is recommended to intersect McCombs Street, south of Painted Dunes Road and north of Loma Real Avenue.
- All major intersections (those analyzed in the report) are projected to require signalization (or some other treatment to increase capacity) by 2035. During each phase of development, the study area's intersections will be further analyzed to determine during which phase the capacity improvement is needed.
- Left and right-turn lanes are recommended at each intersection in the study. This recommendation is based on upon projected traffic volumes at the intersections. Exhibit 14 shows the recommended lane uses and traffic control devices. It is recommended that the length of these turn lanes be designed in accordance with TxDOT and City of El Paso standards, respectively.
- Turn lanes on Martin Luther King, Jr. Boulevard through the site are recommended to be designed to with the same criteria as the existing turn lanes on Martin Luther King, Jr. Boulevard from US 54 to Loma Real Avenue.
- Dual left turn lanes are recommended at the intersections of:
- McCombs Street and Painted Dunes Road (northbound only)
- McCombs Street and Ring Road South (northbound only)
- Martin Luther King, Jr. Boulevard and Loma Real Avenue (northbound and southbound)
- Sean Haggerty Drive and Loma Real Avenue (northbound and southbound)
- Painted Dunes Road and Patriot Freeway Westbound Frontage Road (westbound)
- At the intersection of Patriot Freeway Westbound Frontage Road and Martin Luther King, Jr. Boulevard, the lane configuration under the bridge could be modified to increase the capacity at this intersection. Due to the unbalanced volumes anticipated at this interchange, we recommend three northbound lanes with an additional dedicated northbound left lane and one dedicated southbound thru lane and one shared-left southbound lane.
- We recommend restriping the Patriot Freeway Eastbound Frontage Road at both McCombs Street and Sean Haggerty Drive to include dual lefts as indicated in Exhibit 14.


## Appendix Sections

1 Raw Traffic Count Sheets
2 Existing (2008) Traffic Peak Hour Analysis
3 Build Out (2035) Year Background Traffic Analysis
4 Build Out (2035) Year Total Traffic Analysis
5 Internal Capture Worksheet

## 1. Raw Traffic Count Sheets





## Kimley-Horn and Associates, Inc

801 Cherry Street, Unit 11, Suite 950
Fort Worth, Texas 76012

Peak Hour 7:15 AM - 8:15 AM
Peak Interchange


| Peak Hour Approach Traffic Volume and Percentage |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{gathered} 0 \% \\ 0 \\ 8 \end{gathered}$ | $\begin{gathered} 100 \% \\ 302 \\ \boxed{\eta} \end{gathered}$ | $\begin{gathered} 0 \% \\ 0 \\ \square \end{gathered}$ | $\begin{aligned} & \sqrt[6]{2} \\ & \sqrt[2]{5} \end{aligned}$ | $65$ $59$ $48$ <br> US 5 | $34 \%$ $31 \%$ $25 \%$ <br> BFR |
| 0\% 0\% $0 \%$ | 0 0 0 | $\underset{\sim}{\square}$ | $6$ <br> 132 <br> 17\% | $\begin{gathered} \widehat{661} \\ 83 \% \end{gathered}$ | $\begin{gathered} \vec{\Gamma} \\ 0 \\ 0 \% \end{gathered}$ |


| Location: | El Paso 4,900 Acre Site |  |
| :---: | :---: | :---: |
| Project \#: | 68200.010 |  |
| North-South street: | MLK |  |
| East-West street: | US 54 EBFR |  |
| Time Period: |  | 3 4:00-6:00 PM |
| Date recorded: | Thursday May 15, 2008 |  |
| Traffic Count Sub | GRAM |  |
| Comments: |  |  |

## Kimley-Horn and Associates, Inc.

801 Cherry Street, Unit 11, Suite 950
Fort Worth, Texas 76012

Peak Hour 5:00 PM - 6:00 PM

| Time | U-Turns |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Approach: |  |  |  |  |
| Vehicle Type | C | T | C | T |
| 4:00 PM 4:15 PM |  |  |  |  |
| 4:15 PM 4:30 PM |  |  |  |  |
| 4:30 PM 4:45 PM |  |  |  |  |
| 4:45 PM 5:00 PM |  |  |  |  |
| 5:00 PM 5:15 PM |  |  |  |  |
| 5:15 PM 5:30 PM |  |  |  |  |
| 5:30 PM 5:45 PM |  |  |  |  |
| 5:45 PM 6:00 PM |  |  |  |  |
| Total | 0 | 0 | 0 | 0 |
| Peak Total | 0 | 0 | 0 | 0 |
| Peak Movement Total |  |  |  |  |
| Peak Turn Percent |  |  |  |  |



| Location: | El Paso 4,900 Acre Site |  |
| :---: | :---: | :---: |
| Project \#: | 68200.010 |  |
| North-South street: | Kentworth |  |
| East-West street: | US 54 EBFR |  |
| Time Period: |  | 1 7:00-9:00 AM |
| Date recorded: | Thursday | May 15, 2008 |
| Traffic Count Sub | GRAM |  |
| Comments: |  |  |

## Kimley-Horn and Associates, Inc

801 Cherry Street, Unit 11, Suite 950
Fort Worth, Texas 76012

| Time | Northbound |  |  |  |  |  | Southbound |  |  |  |  |  | Eastbound |  |  |  |  |  | Westbound |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | left |  | thru |  | right |  | left |  | thru |  | right |  | left |  | thru |  | right |  | left |  | thru |  | right |  |
| Vehicle Type | C | T | C | T | C | T | C | T | C | T | C | T | C | U-turn | C | T | C | T | C | T | C | T | C | T |
| 7:00 AM 7:15 AM |  |  | 76 |  | 8 |  | 18 |  | 39 |  |  |  | 118 | 24 | 19 |  | 12 |  |  |  |  |  |  |  |
| 7:15 AM 7:30 AM |  |  | 85 |  | 9 |  | 21 |  | 40 |  |  |  | 141 | 22 | 16 |  | 20 |  |  |  |  |  |  |  |
| 7:30 AM 7:45 AM |  |  | 96 |  | 7 |  | 22 |  | 65 |  |  |  | 130 | 21 | 21 |  | 15 |  |  |  |  |  |  |  |
| 7:45 AM 8:00 AM |  |  | 74 |  | 14 |  | 38 |  | 72 |  |  |  | 118 | 14 | 21 |  | 27 |  |  |  |  |  |  |  |
| 8:00 AM 8:15 AM |  |  | 68 |  | 11 |  | 16 |  | 78 |  |  |  | 94 | 7 | 25 |  | 14 |  |  |  |  |  |  |  |
| 8:15 AM 8:30 AM |  |  | 57 |  | 9 |  | 19 |  | 69 |  |  |  | 105 | 13 | 17 |  | 14 |  |  |  |  |  |  |  |
| 8:30 AM 8:45 AM |  |  | 59 |  | 7 |  | 11 |  | 55 |  |  |  | 138 | 10 | 23 |  | 15 |  |  |  |  |  |  |  |
| 8:45 AM 9:00 AM |  |  | 47 |  | 8 |  | 11 |  | 29 |  |  |  | 127 | 11 | 17 |  | 23 |  |  |  |  |  |  |  |
| Total |  |  | 562 | 0 | 73 | 0 | 156 | 0 | 447 | 0 |  |  | 971 | 122 | 159 | 0 | 140 | 0 |  |  |  |  |  |  |
| Peak Total |  |  | 323 | 0 | 41 | 0 | 97 |  | 255 | 0 |  |  | 483 | 64 | 83 | 0 | 76 | 0 |  |  |  |  |  |  |
| Peak Movement Total |  |  | 323 |  | 41 |  | 97 |  | 255 |  |  |  | 483 |  | 83 |  | 76 |  |  |  |  |  |  |  |
| Peak Turn Percent |  |  | 89\% |  | 11\% |  | 28\% |  | 72\% |  |  |  | 68\% |  | 12\% |  | 11\% |  |  |  |  |  |  |  |
| Peak Approach Total |  |  | 364 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 |  |  |  |  |  |
| Peak Hour Factor (PHF) |  |  | 0.84 |  | 0.73 |  | 0.00 |  | 0.82 |  | 0.00 |  | 0.84 |  | 0.83 |  | 0.70 |  |  |  |  |  |  |  |


| Peak Hour | 7:15 AM |  |  | 8:15 AM |
| :---: | :---: | :---: | :---: | :---: |
|  | Peak Interchange |  |  |  |
| Time | U-Turns |  |  |  |
| Approach: |  |  |  |  |
| Vehicle Type | C | T | C | T |
| 7:00 AM 7:15 AM <br> 7:15 AM $7: 30 \mathrm{AM}$ <br> 7:30 AM $7: 45 \mathrm{AM}$ <br> 7:45 AM $8: 00 \mathrm{AM}$ <br> 8:00 AM 8:15 AM <br> 8:15 AM $8: 30 \mathrm{AM}$ <br> 8:30 AM $8: 45 \mathrm{AM}$ <br> 8:45 AM 9:00 AM <br> Total  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | 0 | 0 | 0 | 0 |
| Peak Total | 0 | 0 | 0 | 0 |
| Peak Movement Total | 0 |  | 0 |  |
| Peak Turn Percent |  |  |  |  |



| Location: | El Paso 4,900 Acre Site |  |
| :---: | :---: | :---: |
| Project \#: | 68200.010 |  |
| North-South street: | Kentworth |  |
| East-West street: | US 54 EBFR |  |
| Time Period: |  | 3 14:00-6:00 PM |
| Date recorded: | Thursday | May 15, 2008 |
| Traffic Count Sub | GRAM |  |
| Comments: |  |  |

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Fort Worth, Texas 76012

| Time | Northbound |  |  |  |  |  | Southbound |  |  |  |  |  |  | Eastbound |  |  |  |  |  | Westbound |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | left |  | thru |  | right |  | left |  | thru |  |  | right |  | left |  | thru |  | right |  | left |  | thru |  | right |  |
| Vehicle Type | C | T | C | T | C | T | C | T | C |  | T | C | T | C | U-turn | C | T | C | T | C | T | C | T | C | T |
| 4:00 PM 4:15 PM |  |  | 101 |  | 22 |  | 24 |  | 47 |  |  |  |  | 212 | 2 | 39 |  | 43 |  |  |  |  |  |  |  |
| 4:15 PM 4:30 PM |  |  | 74 |  | 13 |  | 23 |  | 59 |  |  |  |  | 214 | 5 | 52 |  | 35 |  |  |  |  |  |  |  |
| 4:30 PM 4:45 PM |  |  | 86 |  | 16 |  | 28 |  | 59 |  |  |  |  | 214 | 7 | 36 |  | 41 |  |  |  |  |  |  |  |
| 4:45 PM 5:00 PM |  |  | 89 |  | 8 |  | 17 |  | 66 |  |  |  |  | 213 | 16 | 45 |  | 54 |  |  |  |  |  |  |  |
| 5:00 PM 5:15 PM |  |  | 81 |  | 12 |  | 27 |  | 73 |  |  |  |  | 206 | 11 | 45 |  | 59 |  |  |  |  |  |  |  |
| 5:15 PM 5:30 PM |  |  | 81 |  | 13 |  | 27 |  | 73 |  |  |  |  | 228 | 14 | 50 |  | 63 |  |  |  |  |  |  |  |
| 5:30 PM 5:45 PM |  |  | 112 |  | 16 |  | 22 |  | 81 |  |  |  |  | 234 | 4 | 33 |  | 57 |  |  |  |  |  |  |  |
| 5:45 PM 6:00 PM |  |  | 101 |  | 14 |  | 14 |  | 103 |  |  |  |  | 193 | 12 | 49 |  | 60 |  |  |  |  |  |  |  |
| Total |  |  | 725 | 0 | 114 | 0 | 182 | 0 | 561 |  | 0 |  |  | 1714 | 71 | 349 | 0 | 412 | 0 |  |  |  |  |  |  |
| Peak Total |  |  | 375 | 0 | 55 | 0 | 90 |  | 330 |  | 0 |  |  | 861 | 41 | 177 | 0 | 239 | 0 |  |  |  |  |  |  |
| Peak Movement Total |  |  | 375 |  | 55 |  | 90 |  | 330 |  |  |  |  | 861 |  | 177 |  | 239 |  |  |  |  |  |  |  |
| Peak Turn Percent |  |  | 87\% |  | 13\% |  | 21\% |  | 79\% |  |  |  |  | 65\% |  | 13\% |  | 18\% |  |  |  |  |  |  |  |
| Peak Approach Total |  |  | 430 |  |  |  | 0.00 |  |  |  |  |  |  |  |  |  |  |  |  | 0 |  |  |  |  |  |
| Peak Hour Factor (PHF) |  |  | 0.84 |  | 0.86 |  |  |  | 0.80 |  |  | 0.00 |  | 0.93 |  | 0.89 |  | 0.95 |  |  |  |  |  |  |  |


| Peak Hour |  |  | erc |  |
| :---: | :---: | :---: | :---: | :---: |
| Time |  |  |  |  |
| Approach: |  |  |  |  |
| Vehicle Type | C | T | C | T |
| 4:00 PM 4:15 PM |  |  |  |  |
| 4:15 PM 4:30 PM |  |  |  |  |
| 4:30 PM 4:45 PM |  |  |  |  |
| 4:45 PM 5:00 PM |  |  |  |  |
| 5:00 PM 5:15 PM |  |  |  |  |
| 5:15 PM 5:30 PM |  |  |  |  |
| 5:30 PM 5:45 PM |  |  |  |  |
| 5:45 PM 6:00 PM |  |  |  |  |
| Total | 0 | 0 | 0 | 0 |
| Peak Total | 0 | 0 | 0 | 0 |
| Peak Movement Total | 0 |  | 0 |  |
| Peak Turn Percent | 0\% |  | 0\% |  |




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801 Cherry Street, Unit 11, Suite 950
Fort Worth, Texas 76012

Peak Hour 7:00 AM - 8:00 AM
Peak Interchange

| Time | U-Turns |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Approach: |  |  |  |  |
| Vehicle Type | C | T | C | T |
| 7:00 AM 7:15 AM |  |  |  |  |
| 7:15 AM 7:30 AM |  |  |  |  |
| 7:30 AM 7:45 AM |  |  |  |  |
| 7:45 AM 8:00 AM |  |  |  |  |
| 8:00 AM 8:15 AM |  |  |  |  |
| 8:15 AM 8:30 AM |  |  |  |  |
| 8:30 AM 8:45 AM |  |  |  |  |
| 8:45 AM 9:00 AM |  |  |  |  |
| Total | 0 | 0 | 0 | 0 |
| Peak Total | 0 | 0 | 0 | 0 |
| Peak Movement Total |  |  |  |  |
| Peak Turn Percent |  |  |  |  |




## Kimley-Horn and Associates, Inc

801 Cherry Street, Unit 11, Suite 950
Fort Worth, Texas 76012

Peak Hour 5:00 PM - 6:00 PM

| Time | U-Turns |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Approach: |  |  |  |  |
| Vehicle Type | C | T | C | T |
| 4:00 PM 4:15 PM |  |  |  |  |
| 4:15 PM $4: 30 \mathrm{PM}$ |  |  |  |  |
| 4:30 PM $4: 45 \mathrm{PM}$ |  |  |  |  |
| 4:45 PM 5:00 PM |  |  |  |  |
| 5:00 PM 5:15 PM |  |  |  |  |
| 5:15 PM 5:30 PM |  |  |  |  |
| 5:30 PM 5:45 PM |  |  |  |  |
| 5:45 PM 6:00 PM |  |  |  |  |
| Total | 0 | 0 | 0 | 0 |
| Peak Total | 0 | 0 | 0 | 0 |
| Peak Movement Total |  |  |  |  |
| Peak Turn Percent |  |  |  |  |


| Peak Hour Approach Traffic Volume and Percentage |  |
| :---: | :---: |
| $\begin{array}{ccc} 58 \% & 42 \% & 0 \% \\ 50 & 36 & 0 \\ 5 & \square & \square \end{array}$ | er <br> US 54 WBFR |
|  | $\begin{array}{ccc} \natural & \uparrow & \vec{\Gamma} \\ 172 & 82 & 0 \\ 68 \% & 32 \% & 0 \% \end{array}$ |



## Kimley-Horn and Associates, Inc

801 Cherry Street, Unit 11, Suite 950
Fort Worth, Texas 76012

| Time | Northbound |  |  |  |  |  | Southbound |  |  |  |  |  | Eastbound |  |  |  |  |  | Westbound |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | left |  | thru |  | right |  | left |  | thru |  | right |  | left |  | thru |  | right |  | left |  | thru |  |  | right |  |
| Vehicle Type | C | T | C | T | C | T | C | T | C | T | C | T | C | U-turn | C | T | C | T | C | T | C |  | T | C | T |
| 7:00 AM 7:15 AM |  |  | 69 |  | 0 |  | 1 |  | 11 |  |  |  | 26 | 30 | 103 |  | 46 |  |  |  |  |  |  |  |  |
| 7:15 AM 7:30 AM |  |  | 86 |  | 0 |  | 10 |  | 13 |  |  |  | 30 | 47 | 142 |  | 58 |  |  |  |  |  |  |  |  |
| 7:30 AM 7:45 AM |  |  | 110 |  | 0 |  | 8 |  | 25 |  |  |  | 24 | 38 | 122 |  | 56 |  |  |  |  |  |  |  |  |
| 7:45 AM 8:00 AM |  |  | 85 |  | 0 |  | 3 |  | 18 |  |  |  | 20 | 36 | 111 |  | 7 |  |  |  |  |  |  |  |  |
| 8:00 AM 8:15 AM |  |  | 91 |  | 0 |  | 0 |  | 10 |  |  |  | 12 | 41 | 82 |  | 63 |  |  |  |  |  |  |  |  |
| 8:15 AM 8:30 AM |  |  | 75 |  | 0 |  | 0 |  | 13 |  |  |  | 15 | 22 | 110 |  | 46 |  |  |  |  |  |  |  |  |
| 8:30 AM 8:45 AM |  |  | 64 |  | 0 |  | 0 |  | 10 |  |  |  | 15 | 14 | 82 |  | 45 |  |  |  |  |  |  |  |  |
| 8:45 AM 9:00 AM |  |  | 41 |  | 0 |  | 0 |  | 5 |  |  |  | 17 | 23 | 83 |  | 33 |  |  |  |  |  |  |  |  |
| Total |  |  | 621 | 0 | 0 | 0 | 22 | 0 | 105 | 0 |  |  | 159 | 251 | 835 | 0 | 354 | 0 |  |  |  |  |  |  |  |
| Peak Total |  |  | 350 | 0 | 0 | 0 | 22 |  | 67 | 0 |  |  | 100 | 151 | 478 | 0 | 167 | 0 |  |  |  |  |  |  |  |
| Peak Movement Total |  |  | $\begin{gathered} \hline 350 \\ \hline 100 \% \\ \hline \end{gathered}$ |  | 0 |  | 22 |  | 67 |  |  |  | 100 |  | 478 |  | 167 |  |  |  |  |  |  |  |  |
| Peak Turn Percent |  |  |  |  |  |  |  |  |  |  |  |  |  | \% | 53\% |  | 19\% |  |  |  |  |  |  |  |  |
| Peak Approach Total |  |  | 350 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Peak Hour Factor (PHF) |  |  | 0.80 |  | \#DIV/0! |  | 0.00 |  | 0.67 |  | 0.00 |  | 0.81 |  | 0.84 |  | 0.72 |  |  |  |  |  |  |  |  |


| Peak Hour | 7:00 AM |  |  | 8:00 AM |
| :---: | :---: | :---: | :---: | :---: |
|  | Peak Interchange |  |  |  |
| Time | U-Turns |  |  |  |
| Approach: |  |  |  |  |
| Vehicle Type | C | T | C | T |
| 7:00 AM 7:15 AM |  |  |  |  |
| 7:15 AM 7:30 AM |  |  |  |  |
| 7:30 AM 7:45 AM |  |  |  |  |
| 7:45 AM 8:00 AM |  |  |  |  |
| 8:00 AM 8:15 AM |  |  |  |  |
| 8:15 AM 8:30 AM |  |  |  |  |
| 8:30 AM 8:45 AM |  |  |  |  |
| 8:45 AM 9:00 AM |  |  |  |  |
| Total | 0 | 0 | 0 | 0 |
| Peak Total | 0 | 0 | 0 | 0 |
| Peak Movement Total |  |  |  |  |
| Peak Turn Percent |  |  |  |  |


| Peak Hour Approach Traffic Volume and Percentage |  |  |
| :---: | :---: | :---: |
| $\begin{array}{ccc} 0 \% & 75 \% & 25 \% \\ 0 & 67 & 22 \\ \sim & \square & \square \end{array}$ |  | $\begin{array}{ll} 0 & 0 \% \\ 0 & 0 \% \\ 0 & 0 \% \end{array}$ <br> US 54 EBFR |
|  | $\begin{gathered} 6 \\ 0 \\ 0 \% \end{gathered}$ | $\begin{array}{cc} \underset{\jmath}{350} & 0 \\ 100 \% & 0 \% \end{array}$ |



## Kimley-Horn and Associates, Inc

801 Cherry Street, Unit 11, Suite 950
Fort Worth, Texas 76012


| Peak Hour |  |  |  | Peak Interchange |
| :---: | :---: | :---: | :---: | :---: |
| Time | U-Turns |  |  |  |
| Approach: |  |  |  |  |
| Vehicle Type | C | T | C | T |
| 4:00 PM 4:15 PM |  |  |  |  |
| 4:15 PM 4:30 PM |  |  |  |  |
| 4:30 PM $4: 45$ PM |  |  |  |  |
| 4:45 PM 5:00 PM |  |  |  |  |
| 5:00 PM 5:15 PM |  |  |  |  |
| 5:15 PM 5:30 PM |  |  |  |  |
| 5:30 PM 5:45 PM |  |  |  |  |
| 5:45 PM 6:00 PM |  |  |  |  |
| Total | 0 | 0 | 0 | 0 |
| Peak Total | 0 | 0 | 0 | 0 |
| Peak Movement Total | 0 |  | 0 |  |
| Peak Turn Percent | 0\% |  | 0\% |  |


| Peak Hour Approach Traffic Volume and Percentage |  |  |
| :---: | :---: | :---: |
| $\begin{array}{ccc} 0 \% & 100 \% & 0 \% \\ 0 & 43 & 0 \\ \sim & \square & \square \end{array}$ |  | $\begin{array}{ll} 0 & 0 \% \\ 0 & 0 \% \\ 0 & 0 \% \end{array}$ <br> US 54 EBFR |
|  | $\begin{gathered} 6 \\ 0 \\ 0 \% \end{gathered}$ | $\begin{array}{cc} \hat{\bigoplus} & \vec{~} \\ 192 & 7 \\ 96 \% & 4 \% \end{array}$ |



## Kimley-Horn and Associates, Inc

801 Cherry Street, Unit 11, Suite 950
Fort Worth, Texas 76012

Peak Hour 7:00 AM - 8:00 AM

> Peak Interchange

| Time | U-Turns |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Approach: |  |  |  |  |
| Vehicle Type | C | T | C | T |
| 7:00 AM 7:15 AM |  |  |  |  |
| 7:15 AM 7:30 AM |  |  |  |  |
| 7:30 AM 7:45 AM |  |  |  |  |
| 7:45 AM 8:00 AM |  |  |  |  |
| 8:00 AM 8:15 AM |  |  |  |  |
| 8:15 AM 8:30 AM |  |  |  |  |
| 8:30 AM 8:45 AM |  |  |  |  |
| 8:45 AM 9:00 AM |  |  |  |  |
| Total | 0 | 0 | 0 | 0 |
| Peak Total | 0 | 0 | 0 | 0 |
| Peak Movement Total |  |  |  |  |
| Peak Turn Percent |  |  |  |  |


| Peak Hour Approach Tra | Volume and Percentage |
| :---: | :---: |
| $\begin{array}{ccc} 63 \% & 37 \% & 0 \% \\ 250 & 146 & 0 \\ \sim & \square & \square \end{array}$ |  |
| $\begin{array}{llll} 0 \% & 0 & \text { 勺 } & \\ 0 \% & 0 & \square & \begin{array}{c} 0 \\ E \\ 0 \% \end{array} \\ 0 & \text { S } \\ \hline \end{array}$ |  |


| Location: | El Paso 4,900 Acre Site |  |  |  |
| :--- | :--- | :---: | :---: | :---: |
| Project \#: | 68200.010 |  |  |  |
| North-South street: | McCombs |  |  |  |
| East-West street: | US 54 WBFR |  |  |  |
| Time Period: |  |  |  |  |
| Date recorded: | Thursday |  | May 15, 2008 | 7:00 PM |
| Traffic Count Sub | GRAM |  |  |  |
| Comments: |  |  |  |  |

## Kimley-Horn and Associates, Inc

801 Cherry Street, Unit 11, Suite 950
Fort Worth, Texas 76012

| Time | U-Turns |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Approach: |  |  |  |  |
| Vehicle Type | C | T | C | T |
| 4:00 PM 4:15 PM |  |  |  |  |
| 4:15 PM 4:30 PM |  |  |  |  |
| 4:30 PM 4:45 PM |  |  |  |  |
| 4:45 PM 5:00 PM |  |  |  |  |
| 5:00 PM 5:15 PM |  |  |  |  |
| 5:15 PM 5:30 PM |  |  |  |  |
| 5:30 PM 5:45 PM |  |  |  |  |
| 5:45 PM 6:00 PM |  |  |  |  |
| Total | 0 | 0 | 0 | 0 |
| Peak Total | 0 | 0 | 0 | 0 |
| Peak Movement Total |  |  |  |  |
| Peak Turn Percent |  |  |  |  |


| Peak Hour Approach Tra | lume and Percentage |
| :---: | :---: |
| $\begin{array}{ccc} 47 \% & 53 \% & 0 \% \\ 129 & 148 & 0 \\ \sim & \square & \square \end{array}$ | US 54 WBFR |
|  | $$ |


| Location: | El Paso 4,900 Acre Site |  |
| :---: | :---: | :---: |
| Project \#: | 68200.010 |  |
| North-South street: | McCombs |  |
| East-West street: | US 54 EBFR |  |
| Time Period: |  | 1 17:00-9:00 AM |
| Date recorded: | Thursday | May 15, 2008 |
| Traffic Count Sub | GRAM |  |
| Comments: |  |  |

## Kimley-Horn and Associates, Inc

801 Cherry Street, Unit 11, Suite 950
Fort Worth, Texas 76012


| Peak Hour | 7:00 AM |  |  | 8:00 A |
| :---: | :---: | :---: | :---: | :---: |
|  | Peak Interchange |  |  |  |
| Time | U-Turns |  |  |  |
| Approach: |  |  |  |  |
| Vehicle Type | C | T | C | T |
| 7:00 AM 7:15 AM |  |  |  |  |
| 7:15 AM 7:30 AM |  |  |  |  |
| 7:30 AM 7:45 AM |  |  |  |  |
| 7:45 AM 8:00 AM |  |  |  |  |
| 8:00 AM 8:15 AM |  |  |  |  |
| 8:15 AM 8:30 AM |  |  |  |  |
| 8:30 AM 8:45 AM |  |  |  |  |
| 8:45 AM 9:00 AM |  |  |  |  |
| Total | 0 | 0 | 0 | 0 |
| Peak Total | 0 | 0 | 0 | 0 |
| Peak Movement Total | 0 |  | 0 |  |
| Peak Turn Percent | 0\% |  | 0\% |  |


| Peak Hour Approach Tr | olume and Percentage |
| :---: | :---: |
| $\begin{array}{ccc} 0 \% & 100 \% & 0 \% \\ 0 & 157 & 0 \\ \sim & \square & \square \end{array}$ | $\begin{array}{lll} 饣 & 0 & 0 \% \\ \sqrt{6} & 0 & 0 \% \\ 0 & 0 \% \end{array}$ <br> US 54 EBFR |
|  | $\begin{array}{ccc} \curvearrowleft & \overparen{\int} & \vec{\Gamma} \\ 0 & 385 & 43 \\ 0 \% & 90 \% & 10 \% \end{array}$ |


| Location: | El Paso 4,900 Acre Site |  |
| :---: | :---: | :---: |
| Project \#: | 68200.010 |  |
| North-South street: | McCombs |  |
| East-West street: | US 54 EBFR |  |
| Time Period: |  | 3 14:00-6:00 PM |
| Date recorded: | Thursday | May 15, 2008 |
| Traffic Count Sub | GRAM |  |
| Comments: |  |  |

## Kimley-Horn and Associates, Inc

801 Cherry Street, Unit 11, Suite 950
Fort Worth, Texas 76012

| Time | Northbound |  |  |  |  |  | Southbound |  |  |  |  |  | Eastbound |  |  |  |  |  | Westbound |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | left |  |  |  |  |  |  |  |  |  |  |  |  | ft |  |  |  |  |  |  | thru |  | right |  |
| Vehicle Type | C | T | C | T | C | T | C | T | C | T | C | T | C | U-turn | C | T | C | T | C | T | C | T | C | T |
| 4:00 PM 4:15 PM |  |  | 41 |  | 3 |  | 0 |  | 46 |  |  |  | 69 | 14 | 44 |  | 12 |  |  |  |  |  |  |  |
| 4:15 PM 4:30 PM |  |  | 48 |  | 8 |  | 0 |  | 51 |  |  |  | 52 | 8 | 37 |  | 20 |  |  |  |  |  |  |  |
| 4:30 PM $\quad 4: 45$ PM |  |  | 66 |  | 4 |  | 0 |  | 44 |  |  |  | 58 | 7 | 32 |  | 27 |  |  |  |  |  |  |  |
| 4:45 PM 5:00 PM |  |  | 58 |  | 1 |  | 0 |  | 44 |  |  |  | 62 | 9 | 31 |  | 24 |  |  |  |  |  |  |  |
| 5:00 PM 5:15 PM |  |  | 68 |  | 8 |  | 0 |  | 67 |  |  |  | 68 | 19 | 48 |  | 30 |  |  |  |  |  |  |  |
| 5:15 PM 5:30 PM |  |  | 59 |  | 9 |  | 0 |  | 52 |  |  |  | 75 | 12 | 39 |  | 25 |  |  |  |  |  |  |  |
| 5:30 PM 5:45 PM |  |  | 67 |  | 7 |  | 0 |  | 49 |  |  |  | 56 | 12 | 36 |  | 39 |  |  |  |  |  |  |  |
| 5:45 PM 6:00 PM |  |  | 76 |  | 4 |  | 0 |  | 38 |  |  |  | 45 | 11 | 43 |  | 31 |  |  |  |  |  |  |  |
| Total |  |  | 483 | 0 | 44 | 0 | 0 | 0 | 391 | 0 |  |  | 485 | 92 | 310 |  | 208 | 0 |  |  |  |  |  |  |
| Peak Total |  |  | 270 | 0 | 28 | 0 | 0 |  | 206 | 0 |  |  | 244 | 54 | 166 | 0 | 125 | 0 |  |  |  |  |  |  |
| Peak Movement Total |  |  | 270 |  |  |  | 0 |  | 206 |  |  |  | 244 |  | 166 |  | 125 |  |  |  |  |  |  |  |
| Peak Turn Percent |  |  |  |  | 9\% |  |  |  |  |  |  |  | 41\% |  | 28\% |  | 21\% |  |  |  |  |  |  |  |
| Peak Approach Total | 298 |  |  |  |  |  | 206 |  |  |  |  |  |  |  |  |  |  |  | 0 |  |  |  |  |  |
| Peak Hour Factor (PHF) |  |  | 0.89 |  | 0.78 |  | 0.00 |  | 0.77 |  | 0.00 |  | 0.86 |  | 0.86 |  | 0.80 |  |  |  |  |  |  |  |


| Peak Hour |  | Peak Interchange |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Time | U-Turns |  |  |  |
| Approach: |  |  |  |  |
| Vehicle Type | C | T | C | T |
| 4:00 PM 4:15 PM |  |  |  |  |
| 4:15 PM 4:30 PM |  |  |  |  |
| 4:30 PM 4:45 PM |  |  |  |  |
| 4:45 PM 5:00 PM |  |  |  |  |
| 5:00 PM 5:15 PM |  |  |  |  |
| 5:15 PM 5:30 PM |  |  |  |  |
| 5:30 PM 5:45 PM |  |  |  |  |
| 5:45 PM 6:00 PM |  |  |  |  |
| Total | 0 | 0 | 0 | 0 |
| Peak Total | 0 | 0 | 0 | 0 |
| Peak Movement Total | 0 |  | 0 |  |
| Peak Turn Percent | 0\% |  | 0\% |  |



## 2. Existing (2008) Peak Hour Traffic Analysis








|  | $\stackrel{ }{*}$ |  |  | 7 |  |  | 4 | $\uparrow$ | 1 | $\checkmark$ | $\downarrow$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations |  |  |  | \％${ }^{1 / 4}$ | 个4 | ${ }^{7}$ | \％ | 个个4 |  |  | 椎 | F |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） |  |  |  | 4.0 | 4.0 |  | 4.0 | 4.0 |  |  | 4.0 | 4.0 |
| Lane Util．Factor |  |  |  | 0.97 | 0.95 |  | 1.00 | 0.91 |  |  | 0.91 | 1.00 |
| Frt |  |  |  | 1.00 | 1.00 |  | 1.00 | 1.00 |  |  | 1.00 | 0.85 |
| Flt Protected |  |  |  | 0.95 | 1.00 |  | 0.95 | 1.00 |  |  | 1.00 | 1.00 |
| Satd．Flow（prot） |  |  |  | 3433 | 3539 |  | 1770 | 5085 |  |  | 5085 | 1583 |
| Flt Permitted |  |  |  | 0.95 | 1.00 |  | 0.65 | 1.00 |  |  | 1.00 | 1.00 |
| Satd．Flow（perm） |  |  |  | 3433 | 3539 |  | 1209 | 5085 |  |  | 5085 | 1583 |
| Volume（vph） | 0 | 0 | 0 | 60 | 242 | 0 | 102 | 412 | 0 | 0 | 148 | 129 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 0 | 0 | 0 | 63 | 255 | 0 | 107 | 434 | 0 | 0 | 156 | 136 |
| RTOR Reduction（vph） | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 97 |
| Lane Group Flow（vph） | 0 | 0 | 0 | 63 | 255 | 0 | 107 | 434 | 0 | 0 | 156 | 39 |
| Turn Type |  |  |  | custom |  | Perm | m＋pt |  |  |  |  | Perm |
| Protected Phases |  |  |  | 816 | 816 |  | 5 | 56 |  |  | 6 |  |
| Permitted Phases |  |  |  | 816 |  | 816 | 56 | 56 |  |  |  | 6 |
| Actuated Green，G（s） |  |  |  | 21.2 | 21.2 |  | 48.8 | 53.8 |  |  | 23.4 | 23.4 |
| Effective Green，g（s） |  |  |  | 22.2 | 22.2 |  | 50.8 | 54.8 |  |  | 24.4 | 24.4 |
| Actuated g／C Ratio |  |  |  | 0.26 | 0.26 |  | 0.60 | 0.64 |  |  | 0.29 | 0.29 |
| Clearance Time（s） |  |  |  |  |  |  | 5.0 |  |  |  | 5.0 | 5.0 |
| Vehicle Extension（s） |  |  |  |  |  |  | 3.0 |  |  |  | 3.0 | 3.0 |
| Lane Grp Cap（vph） |  |  |  | 897 | 924 |  | 897 | 3278 |  |  | 1460 | 454 |
| v／s Ratio Prot |  |  |  | 0.02 | c0．07 |  | 0.04 | c0．09 |  |  | 0.03 |  |
| v／s Ratio Perm |  |  |  |  |  |  | 0.03 |  |  |  |  | 0.02 |
| v／c Ratio |  |  |  | 0.07 | 0.28 |  | 0.12 | 0.13 |  |  | 0.11 | 0.09 |
| Uniform Delay，d1 |  |  |  | 23.6 | 25.0 |  | 7.3 | 5.9 |  |  | 22.3 | 22.1 |
| Progression Factor |  |  |  | 1.00 | 1.00 |  | 0.38 | 0.41 |  |  | 1.00 | 1.00 |
| Incremental Delay，d2 |  |  |  | 0.0 | 0.2 |  | 0.1 | 0.0 |  |  | 0.1 | 0.4 |
| Delay（s） |  |  |  | 23.7 | 25.2 |  | 2.9 | 2.4 |  |  | 22.4 | 22.5 |
| Level of Service |  |  |  | C | C |  | A | A |  |  | C | C |
| Approach Delay（s） |  | 0.0 |  |  | 24.9 |  |  | 2.5 |  |  | 22.5 |  |
| Approach LOS |  | A |  |  | C |  |  | A |  |  | C |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
| HCM Average Control Delay |  |  | 13.8 |  | HCM Lev | vel of Sersider | rvice |  | B |  |  |  |
| HCM Volume to Capacity ratio |  |  | 0.17 |  |  |  |  |  |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 85.0 |  | Sum of | ost time |  |  | 8.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 30．3\％ |  | ICU Leve | el of Servis | vice |  | A |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |


|  | 4 |  |  | 7 |  |  | 4 | $\dagger$ | $p$ |  | $\downarrow$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | \％${ }^{1 *}$ | ¢ 4 | F＇ |  |  |  |  | 个个4 | 「 | \％ | 坐个中 |  |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） | 4.0 | 4.0 | 4.0 |  |  |  |  | 4.0 | 4.0 |  | 4.0 |  |
| Lane Util．Factor | 0.97 | 0.95 | 1.00 |  |  |  |  | 0.91 | 1.00 |  | 0.91 |  |
| Frt | 1.00 | 1.00 | 0.85 |  |  |  |  | 1.00 | 0.85 |  | 1.00 |  |
| Flt Protected | 0.95 | 1.00 | 1.00 |  |  |  |  | 1.00 | 1.00 |  | 1.00 |  |
| Satd．Flow（prot） | 3433 | 3539 | 1583 |  |  |  |  | 5085 | 1583 |  | 5085 |  |
| FIt Permitted | 0.95 | 1.00 | 1.00 |  |  |  |  | 1.00 | 1.00 |  | 1.00 |  |
| Satd．Flow（perm） | 3433 | 3539 | 1583 |  |  |  |  | 5085 | 1583 |  | 5085 |  |
| Volume（vph） | 244 | 166 | 125 | 0 | 0 | 0 | 0 | 270 | 28 | 0 | 206 | 0 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 257 | 175 | 132 | 0 | 0 | 0 | 0 | 284 | 29 | 0 | 217 | 0 |
| RTOR Reduction（vph） | 0 | 0 | 87 | 0 | 0 | 0 | 0 | 0 | 22 | 0 | 0 | 0 |
| Lane Group Flow（vph） | 257 | 175 | 45 | 0 | 0 | 0 | 0 | 284 | 7 | 0 | 217 | 0 |
| Turn Type | Split |  | Perm |  |  |  |  |  | Perm | pm＋pt |  |  |
| Protected Phases | 412 | 412 |  |  |  |  |  | 2 |  | 1 | 12 |  |
| Permitted Phases |  |  | 412 |  |  |  |  |  | 2 | 12 | 12 |  |
| Actuated Green，G（s） | 27.7 | 27.7 | 27.7 |  |  |  |  | 20.6 | 20.6 |  | 47.3 |  |
| Effective Green，g（s） | 28.7 | 28.7 | 28.7 |  |  |  |  | 21.6 | 21.6 |  | 48.3 |  |
| Actuated g／C Ratio | 0.34 | 0.34 | 0.34 |  |  |  |  | 0.25 | 0.25 |  | 0.57 |  |
| Clearance Time（s） |  |  |  |  |  |  |  | 5.0 | 5.0 |  |  |  |
| Vehicle Extension（s） |  |  |  |  |  |  |  | 3.0 | 3.0 |  |  |  |
| Lane Grp Cap（vph） | 1159 | 1195 | 534 |  |  |  |  | 1292 | 402 |  | 2889 |  |
| v／s Ratio Prot | c0．07 | 0.05 |  |  |  |  |  | c0．06 |  |  | c0．04 |  |
| v／s Ratio Perm |  |  | 0.03 |  |  |  |  |  | 0.00 |  |  |  |
| v／c Ratio | 0.22 | 0.15 | 0.08 |  |  |  |  | 0.22 | 0.02 |  | 0.08 |  |
| Uniform Delay，d1 | 20.2 | 19.6 | 19.2 |  |  |  |  | 25.0 | 23.8 |  | 8.3 |  |
| Progression Factor | 1.00 | 1.00 | 1.00 |  |  |  |  | 1.00 | 1.00 |  | 0.84 |  |
| Incremental Delay，d2 | 0.1 | 0.1 | 0.1 |  |  |  |  | 0.4 | 0.1 |  | 0.0 |  |
| Delay（s） | 20.3 | 19.7 | 19.3 |  |  |  |  | 25.4 | 23.8 |  | 7.0 |  |
| Level of Service | C | B | B |  |  |  |  | C | C |  | A |  |
| Approach Delay（s） |  | 19.8 |  |  | 0.0 |  |  | 25.3 |  |  | 7.0 |  |
| Approach LOS |  | B |  |  | A |  |  | C |  |  | A |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
| HCM Average Control Delay |  |  | 18.8 |  | HCM Lev | el of S | rvice |  | B |  |  |  |
| HCM Volume to Capacity ratio |  |  | 0.18 |  |  |  |  |  |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 85.0 |  | Sum of los | ost time |  |  | 12.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 30．3\％ |  | ICU Leve | of Se | vice |  | A |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |





|  | $\stackrel{ }{ }$ |  |  |  |  |  | 4 | $\dagger$ |  |  | $\downarrow$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | \％ | 个 $\uparrow$ | 「 |  |  |  |  | 个个 | 「 | ${ }^{7}$ | 个4 |  |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） | 4.0 | 4.0 | 4.0 |  |  |  |  | 4.0 | 4.0 |  | 4.0 |  |
| Lane Util．Factor | 1.00 | 0.95 | 1.00 |  |  |  |  | 0.95 | 1.00 |  | 0.95 |  |
| Frt | 1.00 | 1.00 | 0.85 |  |  |  |  | 1.00 | 0.85 |  | 1.00 |  |
| Flt Protected | 0.95 | 1.00 | 1.00 |  |  |  |  | 1.00 | 1.00 |  | 1.00 |  |
| Satd．Flow（prot） | 1770 | 3539 | 1583 |  |  |  |  | 3539 | 1583 |  | 3539 |  |
| Flt Permitted | 0.95 | 1.00 | 1.00 |  |  |  |  | 1.00 | 1.00 |  | 1.00 |  |
| Satd．Flow（perm） | 1770 | 3539 | 1583 |  |  |  |  | 3539 | 1583 |  | 3539 |  |
| Volume（vph） | 57 | 610 | 450 | 0 | 0 | 0 | 0 | 192 | 7 | 0 | 43 | 0 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 60 | 642 | 474 | 0 | 0 | 0 | 0 | 202 | 7 | 0 | 45 | 0 |
| RTOR Reduction（vph） | 0 | 0 | 347 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 |
| Lane Group Flow（vph） | 60 | 642 | 127 | 0 | 0 | 0 | 0 | 202 | 2 | 0 | 45 | 0 |
| Turn Type | Perm |  | Perm |  |  |  |  |  | Perm | pm＋pt |  |  |
| Protected Phases |  | 3 |  |  |  |  |  | 2 |  | 1 | 12 |  |
| Permitted Phases | 3 |  | 3 |  |  |  |  |  | 2 | 12 |  |  |
| Actuated Green，G（s） | 17.8 | 17.8 | 17.8 |  |  |  |  | 23.2 | 23.2 |  | 42.2 |  |
| Effective Green，g（s） | 18.8 | 18.8 | 18.8 |  |  |  |  | 24.2 | 24.2 |  | 43.2 |  |
| Actuated g／C Ratio | 0.27 | 0.27 | 0.27 |  |  |  |  | 0.35 | 0.35 |  | 0.62 |  |
| Clearance Time（s） | 5.0 | 5.0 | 5.0 |  |  |  |  | 5.0 | 5.0 |  |  |  |
| Vehicle Extension（s） | 2.0 | 2.0 | 2.0 |  |  |  |  | 2.0 | 2.0 |  |  |  |
| Lane Grp Cap（vph） | 475 | 950 | 425 |  |  |  |  | 1223 | 547 |  | 2184 |  |
| v／s Ratio Prot |  | c0．18 |  |  |  |  |  | c0．06 |  |  | c0．01 |  |
| v／s Ratio Perm | 0.03 |  | 0.08 |  |  |  |  |  | 0.00 |  |  |  |
| v／c Ratio | 0.13 | 0.68 | 0.30 |  |  |  |  | 0.17 | 0.00 |  | 0.02 |  |
| Uniform Delay，d1 | 19.4 | 22.9 | 20.4 |  |  |  |  | 15.9 | 15.0 |  | 5.2 |  |
| Progression Factor | 1.00 | 1.00 | 1.00 |  |  |  |  | 1.00 | 1.00 |  | 0.35 |  |
| Incremental Delay，d2 | 0.0 | 1.5 | 0.1 |  |  |  |  | 0.3 | 0.0 |  | 0.0 |  |
| Delay（s） | 19.4 | 24.4 | 20.5 |  |  |  |  | 16.2 | 15.0 |  | 1.8 |  |
| Level of Service | B | C | C |  |  |  |  | B | B |  | A |  |
| Approach Delay（s） |  | 22.6 |  |  | 0.0 |  |  | 16.1 |  |  | 1.8 |  |
| Approach LOS |  | C |  |  | A |  |  | B |  |  | A |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
| HCM Average Control Delay |  |  | 21.0 |  | HCM Lev | vel of Sern | rvice |  | C |  |  |  |
| HCM Volume to Capacity ratio |  |  | 0.28 |  |  |  |  |  |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 70.0 |  | Sum of los | ost time |  |  | 8.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 37．9\％ |  | ICU Leve | el of Servis | vice |  | A |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |

## 3. Build Out (2035) Year Background Traffic Analysis

|  |  |  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |




|  | $\rangle$ |  |  |  |  |  | 4 | $\dagger$ |  |  | $\downarrow$ | $\checkmark$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | ＊＊ | 个个 | $\stackrel{7}{7}$ |  |  |  |  | 恌 | F | \％ | 个 4 |  |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） | 4.0 | 4.0 | 4.0 |  |  |  |  | 4.0 | 4.0 | 4.0 | 4.0 |  |
| Lane Util．Factor | 0.97 | 0.95 | 1.00 |  |  |  |  | 0.91 | 1.00 | 1.00 | 0.95 |  |
| Frt | 1.00 | 1.00 | 0.85 |  |  |  |  | 1.00 | 0.85 | 1.00 | 1.00 |  |
| Flt Protected | 0.95 | 1.00 | 1.00 |  |  |  |  | 1.00 | 1.00 | 0.95 | 1.00 |  |
| Satd．Flow（prot） | 3433 | 3539 | 1583 |  |  |  |  | 5085 | 1583 | 1770 | 3539 |  |
| Flt Permitted | 0.95 | 1.00 | 1.00 |  |  |  |  | 1.00 | 1.00 | 0.40 | 1.00 |  |
| Satd．Flow（perm） | 3433 | 3539 | 1583 |  |  |  |  | 5085 | 1583 | 738 | 3539 |  |
| Volume（vph） | 585 | 83 | 76 | 0 | 0 | 0 | 0 | 391 | 41 | 147 | 310 | 0 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 616 | 87 | 80 | 0 | 0 | 0 | 0 | 412 | 43 | 155 | 326 | 0 |
| RTOR Reduction（vph） | 0 | 0 | 44 | 0 | 0 | 0 | 0 | 0 | 37 | 0 | 0 | 0 |
| Lane Group Flow（vph） | 616 | 87 | 37 | 0 | 0 | 0 | 0 | 412 | 6 | 155 | 326 | 0 |
| Turn Type | Split |  | Perm |  |  |  |  |  | Perm | pm＋pt |  |  |
| Protected Phases | 412 | 412 |  |  |  |  |  | 2 |  | 1 | 12 |  |
| Permitted Phases |  |  | 412 |  |  |  |  |  | 2 | 12 | 12 |  |
| Actuated Green，G（s） | 35.5 | 35.5 | 35.5 |  |  |  |  | 10.0 | 10.0 | 29.5 | 34.5 |  |
| Effective Green，g（s） | 36.5 | 36.5 | 36.5 |  |  |  |  | 11.0 | 11.0 | 31.5 | 35.5 |  |
| Actuated g／C Ratio | 0.46 | 0.46 | 0.46 |  |  |  |  | 0.14 | 0.14 | 0.39 | 0.44 |  |
| Clearance Time（s） |  |  |  |  |  |  |  | 5.0 | 5.0 | 5.0 |  |  |
| Vehicle Extension（s） |  |  |  |  |  |  |  | 2.0 | 2.0 | 1.0 |  |  |
| Lane Grp Cap（vph） | 1566 | 1615 | 722 |  |  |  |  | 699 | 218 | 555 | 1570 |  |
| v／s Ratio Prot | c0．18 | 0.02 |  |  |  |  |  | c0．08 |  | c0．07 | 0.09 |  |
| v／s Ratio Perm |  |  | 0.02 |  |  |  |  |  | 0.00 | 0.04 |  |  |
| v／c Ratio | 0.39 | 0.05 | 0.05 |  |  |  |  | 0.59 | 0.03 | 0.28 | 0.21 |  |
| Uniform Delay，d1 | 14.4 | 12.1 | 12.1 |  |  |  |  | 32.4 | 29.9 | 16.2 | 13.6 |  |
| Progression Factor | 1.00 | 1.00 | 1.00 |  |  |  |  | 1.00 | 1.00 | 0.56 | 0.58 |  |
| Incremental Delay，d2 | 0.1 | 0.0 | 0.0 |  |  |  |  | 0.8 | 0.0 | 0.1 | 0.0 |  |
| Delay（s） | 14.5 | 12.1 | 12.1 |  |  |  |  | 33.2 | 29.9 | 9.1 | 8.0 |  |
| Level of Service | B | B | B |  |  |  |  | C | C | A | A |  |
| Approach Delay（s） |  | 14.0 |  |  | 0.0 |  |  | 32.9 |  |  | 8.3 |  |
| Approach LOS |  | B |  |  | A |  |  | C |  |  | A |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
| HCM Average Control Delay |  |  | 17.4 |  | HCM Lev | el of S | rvice |  | B |  |  |  |
| HCM Volume to Capacity ratio |  |  | 0.39 |  |  |  |  |  |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 80.0 |  | Sum of los | ost time |  |  | 12.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 41．8\％ |  | ICU Leve | of Se | vice |  | A |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |


|  | 4 |  |  |  |  |  | 4 | $\uparrow$ | 7 | $\checkmark$ | $\downarrow$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations |  |  |  | \％ | 个个 | 「 | \％ | 个个 |  |  | 个个 | F |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） |  |  |  | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |  |  | 4.0 | 4.0 |
| Lane Util．Factor |  |  |  | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 |  |  | 0.95 | 1.00 |
| Frt |  |  |  | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 |  |  | 1.00 | 0.85 |
| Flt Protected |  |  |  | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 |  |  | 1.00 | 1.00 |
| Satd．Flow（prot） |  |  |  | 1770 | 3539 | 1583 | 1770 | 3539 |  |  | 3539 | 1583 |
| Flt Permitted |  |  |  | 0.95 | 1.00 | 1.00 | 0.49 | 1.00 |  |  | 1.00 | 1.00 |
| Satd．Flow（perm） |  |  |  | 1770 | 3539 | 1583 | 906 | 3539 |  |  | 3539 | 1583 |
| Volume（vph） | 0 | 0 | 0 | 7 | 684 | 2 | 317 | 535 | 0 | 0 | 404 | 223 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 0 | 0 | 0 | 7 | 720 | 2 | 334 | 563 | 0 | 0 | 425 | 235 |
| RTOR Reduction（vph） | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 67 |
| Lane Group Flow（vph） | 0 | 0 | 0 | 7 | 720 | 1 | 334 | 563 | 0 | 0 | 425 | 168 |
| Turn Type |  |  |  | pm＋pt |  | Perm | pm＋pt |  |  |  |  | Perm |
| Protected Phases |  |  |  | 3 | 7 |  | 5 | 56 |  |  | 6 |  |
| Permitted Phases |  |  |  | 7 |  | 7 | 56 | 56 |  |  |  | 6 |
| Actuated Green，G（s） |  |  |  | 17.6 | 17.6 | 17.6 | 37.4 | 42.4 |  |  | 32.5 | 32.5 |
| Effective Green，g（s） |  |  |  | 18.6 | 18.6 | 18.6 | 39.4 | 43.4 |  |  | 33.5 | 33.5 |
| Actuated g／C Ratio |  |  |  | 0.27 | 0.27 | 0.27 | 0.56 | 0.62 |  |  | 0.48 | 0.48 |
| Clearance Time（s） |  |  |  | 5.0 | 5.0 | 5.0 | 5.0 |  |  |  | 5.0 | 5.0 |
| Vehicle Extension（s） |  |  |  | 2.0 | 2.0 | 2.0 | 1.0 |  |  |  | 2.0 | 2.0 |
| Lane Grp Cap（vph） |  |  |  | 470 | 940 | 421 | 583 | 2194 |  |  | 1694 | 758 |
| v／s Ratio Prot |  |  |  | 0.00 | c0．20 |  | c0． 05 | 0.16 |  |  | 0.12 |  |
| v／s Ratio Perm |  |  |  |  |  | 0.00 | c0．27 |  |  |  |  | 0.11 |
| $\mathrm{v} / \mathrm{c}$ Ratio |  |  |  | 0.01 | 0.77 | 0.00 | 0.57 | 0.26 |  |  | 0.25 | 0.22 |
| Uniform Delay，d1 |  |  |  | 18.9 | 23.7 | 18.9 | 11.2 | 6.0 |  |  | 10.8 | 10.6 |
| Progression Factor |  |  |  | 1.00 | 1.00 | 1.00 | 0.87 | 0.57 |  |  | 1.00 | 1.00 |
| Incremental Delay，d2 |  |  |  | 0.0 | 3.4 | 0.0 | 0.7 | 0.0 |  |  | 0.4 | 0.7 |
| Delay（s） |  |  |  | 19.0 | 27.1 | 18.9 | 10.5 | 3.5 |  |  | 11.2 | 11.3 |
| Level of Service |  |  |  | B | C | B | B | A |  |  | B | B |
| Approach Delay（s） |  | 0.0 |  |  | 27.0 |  |  | 6.1 |  |  | 11.2 |  |
| Approach LOS |  | A |  |  | C |  |  | A |  |  | B |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
| HCM Average Control Delay |  |  | 14.2 |  | HCM Le | el of S | ervice |  | B |  |  |  |
| HCM Volume to Capacity ratioActuated Cycle Length（s） |  |  | 0.63 |  |  |  |  |  |  |  |  |  |
|  |  |  | 70.0 |  | Sum of | st time | （s） |  | 12.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 60．3\％ |  | ICU Lev | of Se | vice |  | B |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |



|  |  |  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |


|  | 4 |  |  |  |  |  | 4 | $\uparrow$ | $p$ |  | $\downarrow$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations |  | ＊个个 | 「 |  |  |  |  | 个个个 | 「 | \％ | 个4 |  |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） |  | 4.0 | 4.0 |  |  |  |  | 4.0 | 4.0 |  | 4.0 |  |
| Lane Util．Factor |  | 0.91 | 1.00 |  |  |  |  | 0.91 | 1.00 |  | 0.95 |  |
| Frt |  | 1.00 | 0.85 |  |  |  |  | 1.00 | 0.85 |  | 1.00 |  |
| Flt Protected |  | 0.98 | 1.00 |  |  |  |  | 1.00 | 1.00 |  | 1.00 |  |
| Satd．Flow（prot） |  | 4995 | 1583 |  |  |  |  | 5085 | 1583 |  | 3539 |  |
| Flt Permitted |  | 0.98 | 1.00 |  |  |  |  | 1.00 | 1.00 |  | 1.00 |  |
| Satd．Flow（perm） |  | 4995 | 1583 |  |  |  |  | 5085 | 1583 |  | 3539 |  |
| Volume（vph） | 149 | 265 | 53 | 0 | 0 | 0 | 0 | 546 | 43 | 0 | 292 | 0 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 157 | 279 | 56 | 0 | 0 | 0 | 0 | 575 | 45 | 0 | 307 | 0 |
| RTOR Reduction（vph） | 0 | 0 | 38 | 0 | 0 | 0 | 0 | 0 | 31 | 0 | 0 | 0 |
| Lane Group Flow（vph） | 0 | 436 | 18 | 0 | 0 | 0 | 0 | 575 | 14 | 0 | 307 | 0 |
| Turn Type | Split |  | Perm |  |  |  |  |  | Perm | pm＋pt |  |  |
| Protected Phases | 412 | 412 |  |  |  |  |  | 2 |  | 1 | 12 |  |
| Permitted Phases |  |  | 412 |  |  |  |  |  | 2 | 12 | 12 |  |
| Actuated Green，G（s） |  | 26.4 | 26.4 |  |  |  |  | 25.4 | 25.4 |  | 48.6 |  |
| Effective Green，g（s） |  | 27.4 | 27.4 |  |  |  |  | 26.4 | 26.4 |  | 49.6 |  |
| Actuated g／C Ratio |  | 0.32 | 0.32 |  |  |  |  | 0.31 | 0.31 |  | 0.58 |  |
| Clearance Time（s） |  |  |  |  |  |  |  | 5.0 | 5.0 |  |  |  |
| Vehicle Extension（s） |  |  |  |  |  |  |  | 3.0 | 3.0 |  |  |  |
| Lane Grp Cap（vph） |  | 1610 | 510 |  |  |  |  | 1579 | 492 |  | 2065 |  |
| v／s Ratio Prot |  | c0．09 |  |  |  |  |  | c0．11 |  |  | c0．09 |  |
| v／s Ratio Perm |  |  | 0.01 |  |  |  |  |  | 0.01 |  |  |  |
| $\mathrm{v} / \mathrm{c}$ Ratio |  | 0.27 | 0.04 |  |  |  |  | 0.36 | 0.03 |  | 0.15 |  |
| Uniform Delay，d1 |  | 21.4 | 19.7 |  |  |  |  | 22.8 | 20.4 |  | 8.1 |  |
| Progression Factor |  | 1.00 | 1.00 |  |  |  |  | 1.00 | 1.00 |  | 1.17 |  |
| Incremental Delay，d2 |  | 0.1 | 0.0 |  |  |  |  | 0.7 | 0.1 |  | 0.0 |  |
| Delay（s） |  | 21.5 | 19.8 |  |  |  |  | 23.4 | 20.5 |  | 9.5 |  |
| Level of Service |  | C | B |  |  |  |  | C | C |  | A |  |
| Approach Delay（s） |  | 21.3 |  |  | 0.0 |  |  | 23.2 |  |  | 9.5 |  |
| Approach LOS |  | C |  |  | A |  |  | C |  |  | A |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
| HCM Average Control Delay |  |  | 19.6 |  | HCM Lev | el of S | rvice |  | B |  |  |  |
| HCM Volume to Capacity ratio |  |  | 0.28 |  |  |  |  |  |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 85.0 |  | Sum of los | st time |  |  | 12.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 58．4\％ |  | ICU Leve | of Se | vice |  | B |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |


|  | 4 | $\rightarrow$ | $\checkmark$ | 4 |  |  | 4 | $\dagger$ | $p$ |  | $\dagger$ | 4 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations |  |  |  |  | $\uparrow \uparrow$ | 「 | ${ }^{*}$ | 44 |  |  | 44 |  |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) |  |  |  |  | 4.0 | 4.0 | 4.0 | 4.0 |  |  | 4.0 |  |
| Lane Util. Factor |  |  |  |  | 0.95 | 1.00 | 1.00 | 0.95 |  |  | 0.95 |  |
| Frt |  |  |  |  | 1.00 | 0.85 | 1.00 | 1.00 |  |  | 1.00 |  |
| Flt Protected |  |  |  |  | 0.98 | 1.00 | 0.95 | 1.00 |  |  | 1.00 |  |
| Satd. Flow (prot) |  |  |  |  | 3461 | 1583 | 1770 | 3539 |  |  | 3539 |  |
| Flt Permitted |  |  |  |  | 0.98 | 1.00 | 0.46 | 1.00 |  |  | 1.00 |  |
| Satd. Flow (perm) |  |  |  |  | 3461 | 1583 | 851 | 3539 |  |  | 3539 |  |
| Volume (vph) | 0 | 0 | 0 | 48 | 59 | 105 | 132 | 875 | 0 | 0 | 392 | 0 |
| Peak-hour factor, PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj. Flow (vph) | 0 | 0 | 0 | 51 | 62 | 111 | 139 | 921 | 0 | 0 | 413 | 0 |
| RTOR Reduction (vph) | 0 | 0 | 0 | 0 | 0 | 86 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 0 | 0 | 0 | 0 | 113 | 25 | 139 | 921 | 0 | 0 | 413 | 0 |
| Turn Type |  |  |  | Perm |  | Perm | m+pt |  |  |  |  |  |
| Protected Phases |  |  |  |  | 816 |  | 5 | 56 |  |  | 6 |  |
| Permitted Phases |  |  |  | 816 |  | 816 | 56 | 56 |  |  |  |  |
| Actuated Green, G (s) |  |  |  |  | 17.2 | 17.2 | 47.8 | 52.8 |  |  | 27.9 |  |
| Effective Green, g (s) |  |  |  |  | 18.2 | 18.2 | 49.8 | 53.8 |  |  | 28.9 |  |
| Actuated g/C Ratio |  |  |  |  | 0.23 | 0.23 | 0.62 | 0.67 |  |  | 0.36 |  |
| Clearance Time (s) |  |  |  |  |  |  | 5.0 |  |  |  | 5.0 |  |
| Vehicle Extension (s) |  |  |  |  |  |  | 1.0 |  |  |  | 2.0 |  |
| Lane Grp Cap (vph) |  |  |  |  | 787 | 360 | 770 | 2380 |  |  | 1278 |  |
| v/s Ratio Prot |  |  |  |  |  |  | 0.05 | c0.26 |  |  | 0.12 |  |
| v/s Ratio Perm |  |  |  |  | 0.03 | 0.02 | 0.07 |  |  |  |  |  |
| v/c Ratio |  |  |  |  | 0.14 | 0.07 | 0.18 | 0.39 |  |  | 0.32 |  |
| Uniform Delay, d1 |  |  |  |  | 24.7 | 24.3 | 6.3 | 5.8 |  |  | 18.5 |  |
| Progression Factor |  |  |  |  | 1.00 | 1.00 | 0.14 | 0.24 |  |  | 1.00 |  |
| Incremental Delay, d2 |  |  |  |  | 0.0 | 0.0 | 0.0 | 0.0 |  |  | 0.7 |  |
| Delay (s) |  |  |  |  | 24.7 | 24.3 | 0.9 | 1.4 |  |  | 19.1 |  |
| Level of Service |  |  |  |  | C | C | A | A |  |  | B |  |
| Approach Delay (s) |  | 0.0 |  |  | 24.5 |  |  | 1.4 |  |  | 19.1 |  |
| Approach LOS |  | A |  |  | C |  |  | A |  |  | B |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
| HCM Average Control Delay |  |  | 8.7 |  | HCM Lev | vel of S | rvice |  | A |  |  |  |
| HCM Volume to Capacity ratio |  |  | 0.33 |  |  |  |  |  |  |  |  |  |
| Actuated Cycle Length (s) |  |  | 80.0 |  | Sum of los | ost time |  |  | 8.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 42.2\% |  | ICU Leve | of Se | vice |  | A |  |  |  |
| Analysis Period (min) |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |



|  | 4 |  |  |  |  |  | 4 | $\dagger$ | $p$ |  | $\downarrow$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations |  |  |  |  | ＊个守 |  | \％ | ¢ 4 |  |  | 个性 | F |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） |  |  |  |  | 4.0 |  | 4.0 | 4.0 |  |  | 4.0 | 4.0 |
| Lane Util．Factor |  |  |  |  | 0.91 |  | 1.00 | 0.95 |  |  | 0.91 | 1.00 |
| Frt |  |  |  |  | 1.00 |  | 1.00 | 1.00 |  |  | 1.00 | 0.85 |
| Flt Protected |  |  |  |  | 1.00 |  | 0.95 | 1.00 |  |  | 1.00 | 1.00 |
| Satd．Flow（prot） |  |  |  |  | 5081 |  | 1770 | 3539 |  |  | 5085 | 1583 |
| Flt Permitted |  |  |  |  | 1.00 |  | 0.49 | 1.00 |  |  | 1.00 | 1.00 |
| Satd．Flow（perm） |  |  |  |  | 5081 |  | 922 | 3539 |  |  | 5085 | 1583 |
| Volume（vph） | 0 | 0 | 0 | 7 | 684 | 2 | 317 | 535 | 0 | 0 | 404 | 223 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 0 | 0 | 0 | 7 | 720 | 2 | 334 | 563 | 0 | 0 | 425 | 235 |
| RTOR Reduction（vph） | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 65 |
| Lane Group Flow（vph） | 0 | 0 | 0 | 0 | 728 | 0 | 334 | 563 | 0 | 0 | 425 | 170 |
| Turn Type |  |  |  | pm＋pt |  |  | pm＋pt |  |  |  |  | Perm |
| Protected Phases |  |  |  | 3 | 7 |  | 5 | 56 |  |  | 6 |  |
| Permitted Phases |  |  |  | 7 |  |  | 56 | 56 |  |  |  | 6 |
| Actuated Green，G（s） |  |  |  |  | 15.9 |  | 39.1 | 44.1 |  |  | 34.4 | 34.4 |
| Effective Green，g（s） |  |  |  |  | 16.9 |  | 41.1 | 45.1 |  |  | 35.4 | 35.4 |
| Actuated g／C Ratio |  |  |  |  | 0.24 |  | 0.59 | 0.64 |  |  | 0.51 | 0.51 |
| Clearance Time（s） |  |  |  |  | 5.0 |  | 5.0 |  |  |  | 5.0 | 5.0 |
| Vehicle Extension（s） |  |  |  |  | 2.0 |  | 1.0 |  |  |  | 2.0 | 2.0 |
| Lane Grp Cap（vph） |  |  |  |  | 1227 |  | 610 | 2280 |  |  | 2572 | 801 |
| v／s Ratio Prot |  |  |  |  | c0．14 |  | c0．04 | 0.16 |  |  | 0.08 |  |
| v／s Ratio Perm |  |  |  |  |  |  | c0． 28 |  |  |  |  | 0.11 |
| v／c Ratio |  |  |  |  | 0.59 |  | 0.55 | 0.25 |  |  | 0.17 | 0.21 |
| Uniform Delay，d1 |  |  |  |  | 23.5 |  | 9.4 | 5.3 |  |  | 9.3 | 9.6 |
| Progression Factor |  |  |  |  | 1.00 |  | 0.89 | 0.59 |  |  | 1.00 | 1.00 |
| Incremental Delay，d2 |  |  |  |  | 0.5 |  | 0.5 | 0.0 |  |  | 0.1 | 0.6 |
| Delay（s） |  |  |  |  | 24.0 |  | 8.8 | 3.1 |  |  | 9.5 | 10.2 |
| Level of Service |  |  |  |  | C |  | A | A |  |  | A | B |
| Approach Delay（s） |  | 0.0 |  |  | 24.0 |  |  | 5.3 |  |  | 9.7 |  |
| Approach LOS |  | A |  |  | C |  |  | A |  |  | A |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 12.5 |  | HCM Lev | el of S | ervice |  | B |  |  |  |
| HCM Average Control Delay HCM Volume to Capacity ratio |  |  | 0.56 |  |  |  |  |  |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 70.0 |  | Sum of | ost time | （s） |  | 12.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 54．8\％ |  | ICU Leve | of Se | rvice |  | A |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |



## 4. Build Out (2035) Year Total Traffic Analysis

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | \％ | 个4 | 「 | \％ | 个4 | 「 | \％ | 种个 | 「 | ${ }_{1}$ | 种个 | 「 |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） | 4.0 | 4.0 |  | 4.0 | 4.0 | 4.0 |  | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Lane Util．Factor | 1.00 | 0.95 |  | 1.00 | 0.95 | 1.00 |  | 0.91 | 1.00 | 1.00 | 0.91 | 1.00 |
| Frt | 1.00 | 1.00 |  | 1.00 | 1.00 | 0.85 |  | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 |  | 0.95 | 1.00 | 1.00 |  | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（prot） | 1770 | 3539 |  | 1770 | 3539 | 1583 |  | 5085 | 1583 | 1770 | 5085 | 1583 |
| Flt Permitted | 0.95 | 1.00 |  | 0.95 | 1.00 | 1.00 |  | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（perm） | 1770 | 3539 |  | 1770 | 3539 | 1583 |  | 5085 | 1583 | 1770 | 5085 | 1583 |
| Volume（vph） | 39 | 113 | 0 | 101 | 63 | 55 | 0 | 776 | 92 | 65 | 1225 | 18 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 41 | 119 | 0 | 106 | 66 | 58 | 0 | 817 | 97 | 68 | 1289 | 19 |
| RTOR Reduction（vph） | 0 | 0 | 0 | 0 | 0 | 51 | 0 | 0 | 45 | 0 | 0 | 6 |
| Lane Group Flow（vph） | 41 | 119 | 0 | 106 | 66 | 7 | 0 | 817 | 52 | 68 | 1289 | 13 |
| Turn Type | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm |
| Protected Phases | 7 | 4 |  | 3 | 8 |  | 5 | 2 |  | 1 | 6 |  |
| Permitted Phases |  |  | 4 |  |  | 8 |  |  | 2 |  |  | 6 |
| Actuated Green，G（s） | 8.1 | 9.3 |  | 10.0 | 11.2 | 11.2 |  | 52.8 | 52.8 | 7.9 | 65.7 | 65.7 |
| Effective Green，g（s） | 9.1 | 10.3 |  | 11.0 | 12.2 | 12.2 |  | 53.8 | 53.8 | 8.9 | 66.7 | 66.7 |
| Actuated g／C Ratio | 0.09 | 0.10 |  | 0.11 | 0.12 | 0.12 |  | 0.54 | 0.54 | 0.09 | 0.67 | 0.67 |
| Clearance Time（s） | 5.0 | 5.0 |  | 5.0 | 5.0 | 5.0 |  | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Vehicle Extension（s） | 3.0 | 3.0 |  | 3.0 | 3.0 | 3.0 |  | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Lane Grp Cap（vph） | 161 | 365 |  | 195 | 432 | 193 |  | 2736 | 852 | 158 | 3392 | 1056 |
| v／s Ratio Prot | 0.02 | c0．03 |  | c0．06 | 0.02 |  |  | 0.16 |  | 0.04 | c0．25 |  |
| v／s Ratio Perm |  |  |  |  |  | 0.00 |  |  | 0.03 |  |  | 0.01 |
| v／c Ratio | 0.25 | 0.33 |  | 0.54 | 0.15 | 0.04 |  | 0.30 | 0.06 | 0.43 | 0.38 | 0.01 |
| Uniform Delay，d1 | 42.3 | 41.6 |  | 42.1 | 39.3 | 38.7 |  | 12.7 | 11.0 | 43.1 | 7.4 | 5.6 |
| Progression Factor | 1.14 | 1.12 |  | 0.49 | 0.43 | 0.68 |  | 0.17 | 0.02 | 1.00 | 1.00 | 1.00 |
| Incremental Delay，d2 | 0.8 | 0.5 |  | 3.0 | 0.2 | 0.1 |  | 0.2 | 0.1 | 1.9 | 0.3 | 0.0 |
| Delay（s） | 49.1 | 47.3 |  | 23.7 | 17.1 | 26.4 |  | 2.4 | 0.3 | 45.0 | 7.8 | 5.6 |
| Level of Service | D | D |  | C | B | C |  | A | A | D | A | A |
| Approach Delay（s） |  | 47.8 |  |  | 22.5 |  |  | 2.1 |  |  | 9.6 |  |
| Approach LOS |  | D |  |  | C |  |  | A |  |  | A |  |


| Intersection Summary |  |  |  |
| :--- | ---: | :--- | ---: |
| HCM Average Control Delay | 10.4 | HCM Level of Service | B |
| HCM Volume to Capacity ratio | 0.38 | Sum of lost time（s） | 8.0 |
| Actuated Cycle Length（s） | 100.0 | ICU Level of Service | A |
| Intersection Capacity Utilization | $49.3 \%$ |  |  |

Analysis Period（min） 15
c Critical Lane Group

|  | $\star$ |  |  | $\dagger$ |  |  | 4 | $\dagger$ | $p$ |  | $\downarrow$ | $\checkmark$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | ${ }^{7}$ | 性 | 「 | \％ | 性 | 「 | \％ | 性 | F | ${ }^{7}$ | 个4 | 7 |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Lane Util．Factor | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（prot） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 |
| Flt Permitted | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（perm） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 |
| Volume（vph） | 4 | 203 | 102 | 10 | 129 | 12 | 57 | 403 | 3 | 12 | 582 | 11 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 4 | 214 | 107 | 11 | 136 | 13 | 60 | 424 | 3 | 13 | 613 | 12 |
| RTOR Reduction（vph） | 0 | 0 | 93 | 0 | 0 | 11 | 0 | 0 | 1 | 0 | 0 | 6 |
| Lane Group Flow（vph） | 4 | 214 | 14 | 11 | 136 | 2 | 60 | 424 | 2 | 13 | 613 | 6 |
| Turn Type | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm |
| Protected Phases | 7 | 4 |  | 3 | 8 |  | 5 | 2 |  | 1 | 6 |  |
| Permitted Phases |  |  | 4 |  |  | 8 |  |  | 2 |  |  | 6 |
| Actuated Green，G（s） | 1.5 | 12.4 | 12.4 | 1.5 | 12.4 | 12.4 | 17.4 | 64.6 | 64.6 | 1.5 | 48.7 | 48.7 |
| Effective Green，g（s） | 2.5 | 13.4 | 13.4 | 2.5 | 13.4 | 13.4 | 18.4 | 65.6 | 65.6 | 2.5 | 49.7 | 49.7 |
| Actuated g／C Ratio | 0.02 | 0.13 | 0.13 | 0.02 | 0.13 | 0.13 | 0.18 | 0.66 | 0.66 | 0.02 | 0.50 | 0.50 |
| Clearance Time（s） | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Vehicle Extension（s） | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Lane Grp Cap（vph） | 44 | 474 | 212 | 44 | 474 | 212 | 326 | 2322 | 1038 | 44 | 1759 | 787 |
| v／s Ratio Prot | 0.00 | c0．06 |  | c0．01 | 0.04 |  | 0.03 | c0．12 |  | 0.01 | c0．17 |  |
| v／s Ratio Perm |  |  | 0.01 |  |  | 0.00 |  |  | 0.00 |  |  | 0.00 |
| v／c Ratio | 0.09 | 0.45 | 0.07 | 0.25 | 0.29 | 0.01 | 0.18 | 0.18 | 0.00 | 0.30 | 0.35 | 0.01 |
| Uniform Delay，d1 | 47.6 | 39.9 | 37.8 | 47.8 | 39.0 | 37.5 | 34.5 | 6.7 | 5.9 | 47.9 | 15.3 | 12.7 |
| Progression Factor | 0.99 | 1.04 | 1.91 | 0.49 | 1.05 | 2.24 | 0.64 | 0.33 | 0.31 | 1.00 | 1.00 | 1.00 |
| Incremental Delay，d2 | 0.9 | 0.7 | 0.1 | 2.7 | 0.3 | 0.0 | 0.3 | 0.2 | 0.0 | 3.7 | 0.5 | 0.0 |
| Delay（s） | 47.8 | 42.0 | 72.6 | 26.2 | 41.1 | 84.0 | 22.3 | 2.4 | 1.8 | 51.6 | 15.8 | 12.7 |
| Level of Service | D | D | E | C | D | F | C | A | A | D | B | B |
| Approach Delay（s） |  | 52.2 |  |  | 43.5 |  |  | 4.8 |  |  | 16.5 |  |
| Approach LOS |  | D |  |  | D |  |  | A |  |  | B |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
| HCM Average Control Delay |  |  | 22.9 |  | HCM Le | el of S | rvice |  | C |  |  |  |
| HCM Volume to Capacity ratio |  |  | 0.32 |  |  |  |  |  |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 100.0 |  | Sum of | st time |  |  | 12.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 37．7\％ |  | CU Lev | of Se | vice |  | A |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |



|  | 4 |  |  |  |  |  | 4 | 4 |  |  | $\downarrow$ | $\checkmark$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | \％ | 个4 | F | \％ | 个 4 | 「 | \％ | 个个 | F | \％ | 个 4 | 7 |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） |  | 4.0 | 4.0 |  | 4.0 |  | 4.0 | 4.0 |  |  | 4.0 |  |
| Lane Util．Factor |  | 0.95 | 1.00 |  | 0.95 |  | 1.00 | 0.95 |  |  | 0.95 |  |
| Frt |  | 1.00 | 0.85 |  | 1.00 |  | 1.00 | 1.00 |  |  | 1.00 |  |
| Flt Protected |  | 1.00 | 1.00 |  | 1.00 |  | 0.95 | 1.00 |  |  | 1.00 |  |
| Satd．Flow（prot） |  | 3539 | 1583 |  | 3539 |  | 1770 | 3539 |  |  | 3539 |  |
| Flt Permitted |  | 1.00 | 1.00 |  | 1.00 |  | 0.73 | 1.00 |  |  | 1.00 |  |
| Satd．Flow（perm） |  | 3539 | 1583 |  | 3539 |  | 1358 | 3539 |  |  | 3539 |  |
| Volume（vph） | 0 | 52 | 220 | 0 | 35 | 0 | 145 | 52 | 0 | 0 | 39 | 0 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 0 | 55 | 232 | 0 | 37 | 0 | 153 | 55 | 0 | 0 | 41 | 0 |
| RTOR Reduction（vph） | 0 | 0 | 211 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow（vph） | 0 | 55 | 21 | 0 | 37 | 0 | 153 | 55 | 0 | 0 | 41 | 0 |
| Turn Type | pm＋pt |  | Perm | pm＋pt |  | Perm | pm＋pt |  | Perm | pm＋pt |  | Perm |
| Protected Phases | 7 | 4 |  | 3 | 8 |  | 5 | 2 |  | 1 | 6 |  |
| Permitted Phases | 4 |  | 4 | 8 |  | 8 | 2 |  | 2 | 6 |  | 6 |
| Actuated Green，G（s） |  | 8.1 | 8.1 |  | 8.1 |  | 81.9 | 81.9 |  |  | 71.4 |  |
| Effective Green，g（s） |  | 9.1 | 9.1 |  | 9.1 |  | 82.9 | 82.9 |  |  | 72.4 |  |
| Actuated g／C Ratio |  | 0.09 | 0.09 |  | 0.09 |  | 0.83 | 0.83 |  |  | 0.72 |  |
| Clearance Time（s） |  | 5.0 | 5.0 |  | 5.0 |  | 5.0 | 5.0 |  |  | 5.0 |  |
| Vehicle Extension（s） |  | 3.0 | 3.0 |  | 3.0 |  | 3.0 | 3.0 |  |  | 3.0 |  |
| Lane Grp Cap（vph） |  | 322 | 144 |  | 322 |  | 1153 | 2934 |  |  | 2562 |  |
| v／s Ratio Prot |  | c0．02 |  |  | 0.01 |  | c0．01 | 0.02 |  |  | 0.01 |  |
| v／s Ratio Perm |  |  | 0.01 |  |  |  | c0．10 |  |  |  |  |  |
| v／c Ratio |  | 0.17 | 0.15 |  | 0.11 |  | 0.13 | 0.02 |  |  | 0.02 |  |
| Uniform Delay，d1 |  | 42.0 | 41.9 |  | 41.8 |  | 1.6 | 1.5 |  |  | 3.9 |  |
| Progression Factor |  | 1.00 | 1.00 |  | 0.41 |  | 1.52 | 1.19 |  |  | 0.31 |  |
| Incremental Delay，d2 |  | 0.3 | 0.5 |  | 0.1 |  | 0.1 | 0.0 |  |  | 0.0 |  |
| Delay（s） |  | 42.2 | 42.3 |  | 17.2 |  | 2.6 | 1.8 |  |  | 1.2 |  |
| Level of Service |  | D | D |  | B |  | A | A |  |  | A |  |
| Approach Delay（s） |  | 42.3 |  |  | 17.2 |  |  | 2.4 |  |  | 1.2 |  |
| Approach LOS |  | D |  |  | B |  |  | A |  |  | A |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 23.2 |  | HCM Lev | vel of S | ervice |  | C |  |  |  |
| HCM Average Control Delay HCM Volume to Capacity ratio |  |  | 0.14 |  |  |  |  |  |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 100.0 |  | Sum of los | st time |  |  | 8.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 24．7\％ |  | ICU Leve | of Se | vice |  | A |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |


|  | $\dagger$ |  |  |  |  | 4 | 4 | $\uparrow$ | 7 |  | $\downarrow$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | \％ | 个4 | 「 | \％ | 个4 | $\stackrel{7}{ }$ | \％ | 种中 | 「 | \％ | 恘 | F |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Lane Util．Factor | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.91 | 1.00 | 1.00 | 0.91 | 1.00 |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（prot） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 5085 | 1583 | 1770 | 5085 | 1583 |
| Flt Permitted | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（perm） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 5085 | 1583 | 1770 | 5085 | 1583 |
| Volume（vph） | 48 | 424 | 116 | 180 | 470 | 167 | 51 | 785 | 81 | 158 | 1363 | 63 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 51 | 446 | 122 | 189 | 495 | 176 | 54 | 826 | 85 | 166 | 1435 | 66 |
| RTOR Reduction（vph） | 0 | 0 | 98 | 0 | 0 | 134 | 0 | 0 | 61 | 0 | 0 | 39 |
| Lane Group Flow（vph） | 51 | 446 | 24 | 189 | 495 | 42 | 54 | 826 | 24 | 166 | 1435 | 27 |
| Turn Type | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm |
| Protected Phases | 7 | 4 |  | 3 | 8 |  | 5 | 2 |  | 1 | 6 |  |
| Permitted Phases |  |  | 4 |  |  | 8 |  |  | 2 |  |  | 6 |
| Actuated Green，G（s） | 10.4 | 18.3 | 18.3 | 14.9 | 22.8 | 22.8 | 6.8 | 27.8 | 27.8 | 19.0 | 40.0 | 40.0 |
| Effective Green，g（s） | 11.4 | 19.3 | 19.3 | 15.9 | 23.8 | 23.8 | 7.8 | 28.8 | 28.8 | 20.0 | 41.0 | 41.0 |
| Actuated g／C Ratio | 0.11 | 0.19 | 0.19 | 0.16 | 0.24 | 0.24 | 0.08 | 0.29 | 0.29 | 0.20 | 0.41 | 0.41 |
| Clearance Time（s） | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Vehicle Extension（s） | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Lane Grp Cap（vph） | 202 | 683 | 306 | 281 | 842 | 377 | 138 | 1464 | 456 | 354 | 2085 | 649 |
| v／s Ratio Prot | 0.03 | c0．13 |  | c0．11 | c0．14 |  | 0.03 | c0．16 |  | 0.09 | c0．28 |  |
| v／s Ratio Perm |  |  | 0.01 |  |  | 0.03 |  |  | 0.02 |  |  | 0.02 |
| v／c Ratio | 0.25 | 0.65 | 0.08 | 0.67 | 0.59 | 0.11 | 0.39 | 0.56 | 0.05 | 0.47 | 0.69 | 0.04 |
| Uniform Delay，d1 | 40.4 | 37.3 | 33.1 | 39.6 | 33.8 | 29.8 | 43.8 | 30.3 | 25.7 | 35.3 | 24.2 | 17.7 |
| Progression Factor | 0.95 | 0.95 | 0.84 | 1.19 | 1.35 | 3.79 | 0.56 | 0.48 | 0.58 | 0.86 | 0.83 | 0.89 |
| Incremental Delay，d2 | 0.7 | 2.2 | 0.1 | 5.5 | 0.9 | 0.1 | 1.7 | 1.5 | 0.2 | 0.9 | 1.8 | 0.1 |
| Delay（s） | 38.9 | 37.7 | 28.0 | 52.7 | 46.5 | 113.1 | 26.1 | 16.0 | 15.1 | 31.2 | 21.9 | 15.9 |
| Level of Service | D | D | C | D | D | F | C | B | B | C | C | B |
| Approach Delay（s） |  | 35.9 |  |  | 61.5 |  |  | 16.5 |  |  | 22.6 |  |
| Approach LOS |  | D |  |  | E |  |  | B |  |  | C |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
| HCM Average Control Delay |  |  | 31.3 |  | HCM Le | vel of Se | rvice |  | C |  |  |  |
| HCM Volume to Capacity ratio |  |  | 0.65 |  |  |  |  |  |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 100.0 |  | Sum of | st time |  |  | 12.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 64．7\％ |  | CU Lev | of Ser | vice |  | C |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |


|  | $\rangle$ |  |  |  |  |  | 4 | 4 | 7 |  | $\downarrow$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | ${ }^{*}$ | 性 | 「 | \％ | 性 | 「 | 7 | 性 | 「 | \％ | 性 | 「 |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Lane Util．Factor | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（prot） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 |
| Flt Permitted | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（perm） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 |
| Volume（vph） | 38 | 499 | 263 | 32 | 503 | 147 | 175 | 508 | 78 | 133 | 737 | 35 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 40 | 525 | 277 | 34 | 529 | 155 | 184 | 535 | 82 | 140 | 776 | 37 |
| RTOR Reduction（vph） | 0 | 0 | 207 | 0 | 0 | 120 | 0 | 0 | 50 | 0 | 0 | 26 |
| Lane Group Flow（vph） | 40 | 525 | 70 | 34 | 529 | 35 | 184 | 535 | 32 | 140 | 776 | 11 |
| Turn Type | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm |
| Protected Phases | 7 | 4 |  | 3 | 8 |  | 5 | 2 |  |  | 6 |  |
| Permitted Phases |  |  | 4 |  |  | 8 |  |  | 2 |  |  | 6 |
| Actuated Green，G（s） | 7.4 | 24.2 | 24.2 | 5.1 | 21.9 | 21.9 | 23.0 | 38.2 | 38.2 | 12.5 | 27.7 | 27.7 |
| Effective Green，g（s） | 8.4 | 25.2 | 25.2 | 6.1 | 22.9 | 22.9 | 24.0 | 39.2 | 39.2 | 13.5 | 28.7 | 28.7 |
| Actuated g／C Ratio | 0.08 | 0.25 | 0.25 | 0.06 | 0.23 | 0.23 | 0.24 | 0.39 | 0.39 | 0.14 | 0.29 | 0.29 |
| Clearance Time（s） | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Vehicle Extension（s） | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Lane Grp Cap（vph） | 149 | 892 | 399 | 108 | 810 | 363 | 425 | 1387 | 621 | 239 | 1016 | 454 |
| v／s Ratio Prot | 0.02 | c0．15 |  | 0.02 | c0．15 |  | c0．10 | 0.15 |  | 0.08 | c0．22 |  |
| v／s Ratio Perm |  |  | 0.04 |  |  | 0.02 |  |  | 0.02 |  |  | 0.01 |
| v／c Ratio | 0.27 | 0.59 | 0.17 | 0.31 | 0.65 | 0.10 | 0.43 | 0.39 | 0.05 | 0.59 | 0.76 | 0.02 |
| Uniform Delay，d1 | 42.9 | 32.8 | 29.3 | 44.9 | 34.9 | 30.4 | 32.2 | 21.8 | 18.9 | 40.6 | 32.6 | 25.6 |
| Progression Factor | 0.63 | 0.83 | 1.00 | 1.41 | 0.93 | 1.76 | 0.47 | 0.39 | 0.21 | 1.10 | 0.93 | 1.25 |
| Incremental Delay，d2 | 0.9 | 0.9 | 0.2 | 1.6 | 1.8 | 0.1 | 0.7 | 0.8 | 0.1 | 3.6 | 5.4 | 0.1 |
| Delay（s） | 27.7 | 28.0 | 29.5 | 64.9 | 34.4 | 53.6 | 15.8 | 9.4 | 4.1 | 48.1 | 35.7 | 32.0 |
| Level of Service | C | C | C | E | C | D | B | A | A | D | D | C |
| Approach Delay（s） |  | 28.5 |  |  | 40.0 |  |  | 10.3 |  |  | 37.3 |  |
| Approach LOS |  | C |  |  | D |  |  | B |  |  | D |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 29.1 |  | HCM Le | el of S | rvice |  | C |  |  |  |
| HCM Volume to Capacity ratio |  |  | 0.61 |  |  |  |  |  |  |  |  |  |
|  |  |  | 100.0 |  | Sum of | ost time |  |  | 12.0 |  |  |  |
| Actuated Cycle Length（s） <br> Intersection Capacity Utilization |  |  | 60．6\％ |  | ICU Leve | of Se | vice |  | B |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |


|  | $\dagger$ |  |  |  |  | 4 | 4 | $\dagger$ | 7 |  | $\downarrow$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | \％ | 个4 | 「 | \％ | 个4 | $\stackrel{7}{ }$ | ＊＊ | 惟 | 「 | \％ | 种中 | F |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Lane Util．Factor | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 0.97 | 0.91 | 1.00 | 1.00 | 0.91 | 1.00 |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（prot） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 3433 | 5085 | 1583 | 1770 | 5085 | 1583 |
| Flt Permitted | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（perm） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 3433 | 5085 | 1583 | 1770 | 5085 | 1583 |
| Volume（vph） | 29 | 356 | 349 | 107 | 326 | 19 | 267 | 603 | 60 | 14 | 940 | 14 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 31 | 375 | 367 | 113 | 343 | 20 | 281 | 635 | 63 | 15 | 989 | 15 |
| RTOR Reduction（vph） | 0 | 0 | 294 | 0 | 0 | 14 | 0 | 0 | 36 | 0 | 0 | 10 |
| Lane Group Flow（vph） | 31 | 375 | 73 | 113 | 343 | 6 | 281 | 635 | 27 | 15 | 989 | 5 |
| Turn Type | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm |
| Protected Phases | 7 | 4 |  | 3 | 8 |  | 5 | 2 |  | ， | 6 |  |
| Permitted Phases |  |  | 4 |  |  | 8 |  |  | 2 |  |  | 6 |
| Actuated Green，G（s） | 4.6 | 19.0 | 19.0 | 13.1 | 27.5 | 27.5 | 12.8 | 42.3 | 42.3 | 5.6 | 35.1 | 35.1 |
| Effective Green，g（s） | 5.6 | 20.0 | 20.0 | 14.1 | 28.5 | 28.5 | 13.8 | 43.3 | 43.3 | 6.6 | 36.1 | 36.1 |
| Actuated g／C Ratio | 0.06 | 0.20 | 0.20 | 0.14 | 0.28 | 0.28 | 0.14 | 0.43 | 0.43 | 0.07 | 0.36 | 0.36 |
| Clearance Time（s） | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Vehicle Extension（s） | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Lane Grp Cap（vph） | 99 | 708 | 317 | 250 | 1009 | 451 | 474 | 2202 | 685 | 117 | 1836 | 571 |
| v／s Ratio Prot | 0.02 | c0．11 |  | c0．06 | 0.10 |  | c0．08 | 0.12 |  | 0.01 | c0．19 |  |
| v／s Ratio Perm |  |  | 0.05 |  |  | 0.00 |  |  | 0.02 |  |  | 0.00 |
| v／c Ratio | 0.31 | 0.53 | 0.23 | 0.45 | 0.34 | 0.01 | 0.59 | 0.29 | 0.04 | 0.13 | 0.54 | 0.01 |
| Uniform Delay，d1 | 45.4 | 35.8 | 33.6 | 39.4 | 28.3 | 25.7 | 40.5 | 18.4 | 16.4 | 44.0 | 25.3 | 20.5 |
| Progression Factor | 0.69 | 0.80 | 4.54 | 1.00 | 1.00 | 1.00 | 1.15 | 0.99 | 1.48 | 0.76 | 0.72 | 0.60 |
| Incremental Delay，d2 | 1.6 | 0.6 | 0.3 | 1.3 | 0.2 | 0.0 | 1.9 | 0.3 | 0.1 | 0.5 | 1.1 | 0.0 |
| Delay（s） | 32.9 | 29.1 | 152.6 | 40.7 | 28.5 | 25.7 | 48.5 | 18.6 | 24.3 | 34.0 | 19.5 | 12.3 |
| Level of Service | C | C | F | D | C | C | D | B | C | C | B | B |
| Approach Delay（s） |  | 87.9 |  |  | 31.3 |  |  | 27.5 |  |  | 19.6 |  |
| Approach LOS |  | F |  |  | C |  |  | C |  |  | B |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
| HCM Average Control Delay |  |  | 40.0 |  | HCM Le | vel of Se | rvice |  | D |  |  |  |
| HCM Volume to Capacity ratio |  |  | 0.53 |  |  |  |  |  |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 100.0 |  | Sum of | st time |  |  | 16.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 55．7\％ |  | CU Lev | of Ser | vice |  | B |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |


|  | $\rangle$ |  |  |  |  |  |  | 4 |  |  | $\dagger$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations |  | 个 $\uparrow$ | 「 | \％ | 个个 |  |  |  |  | \％ | 性 | F |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） |  | 4.0 | 4.0 | 4.0 | 4.0 |  |  |  |  |  | 4.0 | 4.0 |
| Lane Util．Factor |  | 0.95 | 1.00 | 1.00 | 0.95 |  |  |  |  |  | 0.95 | 1.00 |
| Frt |  | 1.00 | 0.85 | 1.00 | 1.00 |  |  |  |  |  | 1.00 | 0.85 |
| Flt Protected |  | 1.00 | 1.00 | 0.95 | 1.00 |  |  |  |  |  | 1.00 | 1.00 |
| Satd．Flow（prot） |  | 3539 | 1583 | 1770 | 3539 |  |  |  |  |  | 3539 | 1583 |
| Flt Permitted |  | 1.00 | 1.00 | 0.48 | 1.00 |  |  |  |  |  | 1.00 | 1.00 |
| Satd．Flow（perm） |  | 3539 | 1583 | 890 | 3539 |  |  |  |  |  | 3539 | 1583 |
| Volume（vph） | 0 | 378 | 123 | 120 | 103 | 0 | 0 | 0 | 0 | 0 | 37 | 277 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 0 | 398 | 129 | 126 | 108 | 0 | 0 | 0 | 0 | 0 | 39 | 292 |
| RTOR Reduction（vph） | 0 | 0 | 77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 225 |
| Lane Group Flow（vph） | 0 | 398 | 52 | 126 | 108 | 0 | 0 | 0 | 0 | 0 | 39 | 67 |
| Turn Type |  |  | Perm | pm＋pt |  |  |  |  |  | Split |  | Perm |
| Protected Phases |  | 6 |  | 5 | 56 |  |  |  |  | 816 | 816 |  |
| Permitted Phases |  | 6 | 6 | 56 | 56 |  |  |  |  |  |  | 816 |
| Actuated Green，G（s） |  | 33.5 | 33.5 | 51.5 | 56.5 |  |  |  |  |  | 18.5 | 18.5 |
| Effective Green，g（s） |  | 34.5 | 34.5 | 53.5 | 57.5 |  |  |  |  |  | 19.5 | 19.5 |
| Actuated g／C Ratio |  | 0.41 | 0.41 | 0.63 | 0.68 |  |  |  |  |  | 0.23 | 0.23 |
| Clearance Time（s） |  | 5.0 | 5.0 | 5.0 |  |  |  |  |  |  |  |  |
| Vehicle Extension（s） |  | 3.0 | 3.0 | 3.0 |  |  |  |  |  |  |  |  |
| Lane Grp Cap（vph） |  | 1436 | 643 | 757 | 2394 |  |  |  |  |  | 812 | 363 |
| v／s Ratio Prot |  | c0．11 |  | c0．04 | 0.03 |  |  |  |  |  | 0.01 |  |
| v／s Ratio Perm |  |  | 0.03 | 0.07 |  |  |  |  |  |  |  | c0．04 |
| v／c Ratio |  | 0.28 | 0.08 | 0.17 | 0.05 |  |  |  |  |  | 0.05 | 0.18 |
| Uniform Delay，d1 |  | 16.9 | 15.5 | 6.3 | 4.6 |  |  |  |  |  | 25.5 | 26.4 |
| Progression Factor |  | 1.00 | 1.00 | 0.38 | 0.31 |  |  |  |  |  | 1.00 | 1.00 |
| Incremental Delay，d2 |  | 0.5 | 0.2 | 0.1 | 0.0 |  |  |  |  |  | 0.0 | 0.2 |
| Delay（s） |  | 17.4 | 15.8 | 2.5 | 1.4 |  |  |  |  |  | 25.5 | 26.6 |
| Level of Service |  | B | B | A | A |  |  |  |  |  | C | C |
| Approach Delay（s） |  | 17.0 |  |  | 2.0 |  |  | 0.0 |  |  | 26.5 |  |
| Approach LOS |  | B |  |  | A |  |  | A |  |  | C |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 16.7 |  | HCM Lev | vel of S | rvice |  | B |  |  |  |
| HCM Average Control Delay HCM Volume to Capacity ratio |  |  | 0.22 |  |  |  |  |  |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 85.0 |  | Sum of los | st time |  |  | 12.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 51．3\％ |  | ICU Leve | of Ser | vice |  | A |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | \％ | 性 | F | \％ | 个 $\uparrow$ | 「 | ${ }^{7 *}$ | 快 | F | \％＊ | 坐虫 | F |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Lane Util．Factor | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 0.97 | 0.91 | 1.00 | 0.97 | 0.91 | 1.00 |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（prot） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 3433 | 5085 | 1583 | 3433 | 5085 | 1583 |
| Flt Permitted | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（perm） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 3433 | 5085 | 1583 | 3433 | 5085 | 1583 |
| Volume（vph） | 23 | 314 | 216 | 76 | 215 | 129 | 131 | 911 | 29 | 211 | 1733 | 38 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 24 | 331 | 227 | 80 | 226 | 136 | 138 | 959 | 31 | 222 | 1824 | 40 |
| RTOR Reduction（vph） | 0 | 0 | 192 | 0 | 0 | 105 | 0 | 0 | 17 | 0 | 0 | 21 |
| Lane Group Flow（vph） | 24 | 331 | 35 | 80 | 226 | 31 | 138 | 959 | 14 | 222 | 1824 | 19 |
| Turn Type | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm |
| Protected Phases | 7 | 4 |  | 3 | 8 |  | 5 | 2 |  | 1 | 6 |  |
| Permitted Phases |  |  | 4 |  |  | 8 |  |  | 2 |  |  | 6 |
| Actuated Green，G（s） | 2.8 | 14.2 | 14.2 | 10.6 | 22.0 | 22.0 | 8.9 | 43.3 | 43.3 | 11.9 | 46.3 | 46.3 |
| Effective Green，g（s） | 3.8 | 15.2 | 15.2 | 11.6 | 23.0 | 23.0 | 9.9 | 44.3 | 44.3 | 12.9 | 47.3 | 47.3 |
| Actuated g／C Ratio | 0.04 | 0.15 | 0.15 | 0.12 | 0.23 | 0.23 | 0.10 | 0.44 | 0.44 | 0.13 | 0.47 | 0.47 |
| Clearance Time（s） | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Vehicle Extension（s） | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Lane Grp Cap（vph） | 67 | 538 | 241 | 205 | 814 | 364 | 340 | 2253 | 701 | 443 | 2405 | 749 |
| v／s Ratio Prot | 0.01 | c0．09 |  | c0．05 | 0.06 |  | 0.04 | 0.19 |  | c0．06 | c0．36 |  |
| v／s Ratio Perm |  |  | 0.02 |  |  | 0.02 |  |  | 0.01 |  |  | 0.01 |
| v／c Ratio | 0.36 | 0.62 | 0.14 | 0.39 | 0.28 | 0.09 | 0.41 | 0.43 | 0.02 | 0.50 | 0.76 | 0.03 |
| Uniform Delay，d1 | 46.9 | 39.7 | 36.8 | 40.9 | 31.7 | 30.2 | 42.3 | 19.1 | 15.6 | 40.6 | 21.7 | 14.1 |
| Progression Factor | 1.07 | 0.96 | 0.80 | 0.77 | 0.86 | 1.82 | 1.00 | 1.00 | 1.00 | 0.74 | 0.42 | 0.11 |
| Incremental Delay，d2 | 3.2 | 2.0 | 0.3 | 1.2 | 0.2 | 0.1 | 0.8 | 0.6 | 0.1 | 0.8 | 2.0 | 0.1 |
| Delay（s） | 53.6 | 40.1 | 29.7 | 32.8 | 27.4 | 55.2 | 43.1 | 19.7 | 15.7 | 30.7 | 11.1 | 1.5 |
| Level of Service | D | D | C | C | C | E | D | B | B | C | B | A |
| Approach Delay（s） |  | 36.6 |  |  | 37.0 |  |  | 22.5 |  |  | 13.0 |  |
| Approach LOS |  | D |  |  | D |  |  | C |  |  | B |  |


| Intersection Summary |  |  |  |
| :--- | ---: | :--- | ---: |
| HCM Average Control Delay | 21.3 | HCM Level of Service | C |
| HCM Volume to Capacity ratio | 0.66 | Sum of lost time（s） | 16.0 |
| Actuated Cycle Length（s） | 100.0 | SU |  |
| Intersection Capacity Utilization | $63.4 \%$ | Level of Service | B |

Analysis Period（min） 15
c Critical Lane Group





|  | 4 |  | 4 |  |  | $\downarrow$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBR | NBL | NBT | SBT | SBR |  |
| Lane Configurations | ${ }^{7}$ | 「 | ${ }^{7}$ | 來乐 | 來革 | 「 |  |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |  |
| Total Lost time（s） | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |  |  |
| Lane Util．Factor | 1.00 | 1.00 | 1.00 | 0.91 | 0.91 |  |  |
| Frt | 1.00 | 0.85 | 1.00 | 1.00 | 1.00 |  |  |
| Flt Protected | 0.95 | 1.00 | 0.95 | 1.00 | 1.00 |  |  |
| Satd．Flow（prot） | 1770 | 1583 | 1770 | 5085 | 5085 |  |  |
| Flt Permitted | 0.95 | 1.00 | 0.95 | 1.00 | 1.00 |  |  |
| Satd．Flow（perm） | 1770 | 1583 | 1770 | 5085 | 5085 |  |  |
| Volume（vph） | 12 | 45 | 28 | 1199 | 1975 | 0 |  |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |  |
| Adj．Flow（vph） | 13 | 47 | 29 | 1262 | 2079 | 0 |  |
| RTOR Reduction（vph） | 0 | 44 | 0 | 0 | 0 | 0 |  |
| Lane Group Flow（vph） | 13 | 3 | 29 | 1262 | 2079 | 0 |  |
| Turn Type |  | Perm | Prot |  |  | Perm |  |
| Protected Phases | 4 |  | 5 | 2 | 6 |  |  |
| Permitted Phases |  | 4 |  |  |  | 6 |  |
| Actuated Green，G（s） | 4.6 | 4.6 | 6.6 | 85.4 | 73.8 |  |  |
| Effective Green，g（s） | 5.6 | 5.6 | 7.6 | 86.4 | 74.8 |  |  |
| Actuated g／C Ratio | 0.06 | 0.06 | 0.08 | 0.86 | 0.75 |  |  |
| Clearance Time（s） | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |  |  |
| Vehicle Extension（s） | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |  |  |
| Lane Grp Cap（vph） | 99 | 89 | 135 | 4393 | 3804 |  |  |
| v／s Ratio Prot | c0．01 |  | 0.02 | c0．25 | c0．41 |  |  |
| v／s Ratio Perm |  | 0.00 |  |  |  |  |  |
| v／c Ratio | 0.13 | 0.03 | 0.21 | 0.29 | 0.55 |  |  |
| Uniform Delay，d1 | 44.9 | 44.6 | 43.4 | 1.2 | 5.4 |  |  |
| Progression Factor | 1.22 | 2.09 | 1.06 | 0.30 | 0.26 |  |  |
| Incremental Delay，d2 | 0.5 | 0.1 | 0.8 | 0.2 | 0.4 |  |  |
| Delay（s） | 55.4 | 93.2 | 46.9 | 0.5 | 1.8 |  |  |
| Level of Service | E | F | D | A | A |  |  |
| Approach Delay（s） | 85.0 |  |  | 1.6 | 1.8 |  |  |
| Approach LOS | F |  |  | A | A |  |  |
| Intersection Summary |  |  |  |  |  |  |  |
| HCM Average Control DelayHCM Volume to Capacity ratio |  |  | 3.2 |  | HCM Le | el of Service | A |
|  |  | HCM Volume to Capacity ratio | 0.48 |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 100.0 |  | Sum of | st time（s） | 8.0 |
| Intersection Capacity Utilization |  |  | 48．2\％ |  | ICU Lev | of Service | A |
| Analysis Period（min） |  |  | 15 |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |



|  | $\rangle$ |  |  | 7 |  |  | 4 | $\uparrow$ | 7 |  | $\downarrow$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | ${ }^{4}$ | ＊$\uparrow$ | 「 |  |  |  |  | 个种 | 「 | ${ }^{7}$ | 体个 |  |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） | 4.0 | 4.0 | 4.0 |  |  |  |  | 4.0 | 4.0 |  | 4.0 |  |
| Lane Util．Factor | 0.91 | 0.91 | 1.00 |  |  |  |  | 0.91 | 1.00 |  | 0.91 |  |
| Frt | 1.00 | 1.00 | 0.85 |  |  |  |  | 1.00 | 0.85 |  | 1.00 |  |
| Flt Protected | 0.95 | 0.99 | 1.00 |  |  |  |  | 1.00 | 1.00 |  | 1.00 |  |
| Satd．Flow（prot） | 1610 | 3351 | 1583 |  |  |  |  | 5085 | 1583 |  | 5085 |  |
| Flt Permitted | 0.95 | 0.99 | 1.00 |  |  |  |  | 1.00 | 1.00 |  | 1.00 |  |
| Satd．Flow（perm） | 1610 | 3351 | 1583 |  |  |  |  | 5085 | 1583 |  | 5085 |  |
| Volume（vph） | 244 | 265 | 53 | 0 | 0 | 0 | 0 | 904 | 266 | 0 | 1121 | 0 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 257 | 279 | 56 | 0 | 0 | 0 | 0 | 952 | 280 | 0 | 1180 | 0 |
| RTOR Reduction（vph） | 0 | 0 | 47 | 0 | 0 | 0 | 0 | 0 | 210 | 0 | 0 | 0 |
| Lane Group Flow（vph） | 173 | 363 | 9 | 0 | 0 | 0 | 0 | 952 | 70 | 0 | 1180 | 0 |


| Turn Type | Perm | Perm |  |  | Perm pm＋pt |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Protected Phases |  | 4 |  |  | 2 |  | 1 | 12 |
| Permitted Phases | 4 |  | 4 |  |  | 2 | 12 | 12 |
| Actuated Green，G（s） | 15.6 | 15.6 | 15.6 |  | 24.0 | 24.0 |  | 63.5 |
| Effective Green，g（s） | 16.6 | 16.6 | 16.6 |  | 25.0 | 25.0 |  | 64.5 |
| Actuated g／C Ratio | 0.17 | 0.17 | 0.17 |  | 0.25 | 0.25 |  | 0.64 |
| Clearance Time（s） | 5.0 | 5.0 | 5.0 |  | 5.0 | 5.0 |  |  |
| Vehicle Extension（s） | 3.0 | 3.0 | 3.0 |  | 3.0 | 3.0 |  |  |
| Lane Grp Cap（vph） | 267 | 556 | 263 |  | 1271 | 396 |  | 3280 |
| v／s Ratio Prot |  |  |  |  | c0．19 |  |  | c0．23 |
| v／s Ratio Perm | 0.11 | 0.11 | 0.01 |  |  | 0.04 |  |  |
| v／c Ratio | 0.65 | 0.65 | 0.04 |  | 0.75 | 0.18 |  | 0.36 |
| Uniform Delay，d1 | 39.0 | 39.0 | 35.0 |  | 34.6 | 29.4 |  | 8.2 |
| Progression Factor | 0.77 | 0.78 | 0.95 |  | 1.00 | 1.00 |  | 0.98 |
| Incremental Delay，d2 | 4.0 | 2.1 | 0.0 |  | 4.1 | 1.0 |  | 0.0 |
| Delay（s） | 34.2 | 32.4 | 33.2 |  | 38.7 | 30.4 |  | 8.1 |
| Level of Service | C | C | C |  | D | C |  | A |
| Approach Delay（s） |  | 33.0 |  | 0.0 | 36.8 |  |  | 8.1 |
| Approach LOS |  | C |  | A | D |  |  | A |


| Intersection Summary |  |  |  |
| :--- | ---: | :--- | ---: |
| HCM Average Control Delay | 24.8 | HCM Level of Service | C |
| HCM Volume to Capacity ratio | 0.56 |  | 22.9 |
| Actuated Cycle Length（s） | 100.0 | Sum of lost time（s） | B |
| Intersection Capacity Utilization | $60.3 \%$ | ICU Level of Service |  |
| Analysis Period（min） | 15 |  |  |
| C Critical Lane Group |  |  |  |


|  | $\rangle$ |  |  |  |  |  | 4 | $\dagger$ |  |  | $\dagger$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations |  |  |  | \％ | 个 $\uparrow$ | 「 | \％ | 个虫 |  |  | 性 |  |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） |  |  |  | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |  |  | 4.0 |  |
| Lane Util．Factor |  |  |  | 1.00 | 0.95 | 1.00 | 1.00 | 0.91 |  |  | 0.95 |  |
| Frt |  |  |  | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 |  |  | 1.00 |  |
| Flt Protected |  |  |  | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 |  |  | 1.00 |  |
| Satd．Flow（prot） |  |  |  | 1770 | 3539 | 1583 | 1770 | 5085 |  |  | 3539 |  |
| Flt Permitted |  |  |  | 0.95 | 1.00 | 1.00 | 0.22 | 1.00 |  |  | 1.00 |  |
| Satd．Flow（perm） |  |  |  | 1770 | 3539 | 1583 | 413 | 5085 |  |  | 3539 |  |
| Volume（vph） | 0 | 0 | 0 | 48 | 59 | 164 | 154 | 1475 | 0 | 0 | 646 | 0 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 0 | 0 | 0 | 51 | 62 | 173 | 162 | 1553 | 0 | 0 | 680 | 0 |
| RTOR Reduction（vph） | 0 | 0 | 0 | 0 | 0 | 49 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow（vph） | 0 | 0 | 0 | 51 | 62 | 124 | 162 | 1553 | 0 | 0 | 680 | 0 |
| Turn Type |  |  |  | Split |  | Perm | pm＋pt |  |  |  |  |  |
| Protected Phases |  |  |  | 816 | 816 |  | 5 | 56 |  |  | 6 |  |
| Permitted Phases |  |  |  |  |  | 816 | 56 | 56 |  |  |  |  |
| Actuated Green，G（s） |  |  |  | 18.5 | 18.5 | 18.5 | 66.5 | 71.5 |  |  | 29.4 |  |
| Effective Green，g（s） |  |  |  | 19.5 | 19.5 | 19.5 | 68.5 | 72.5 |  |  | 30.4 |  |
| Actuated g／C Ratio |  |  |  | 0.20 | 0.20 | 0.20 | 0.68 | 0.72 |  |  | 0.30 |  |
| Clearance Time（s） |  |  |  |  |  |  | 5.0 |  |  |  | 5.0 |  |
| Vehicle Extension（s） |  |  |  |  |  |  | 1.0 |  |  |  | 2.0 |  |
| Lane Grp Cap（vph） |  |  |  | 345 | 690 | 309 | 800 | 3687 |  |  | 1076 |  |
| v／s Ratio Prot |  |  |  | 0.03 | 0.02 |  | 0.08 | c0．31 |  |  | c0．19 |  |
| v／s Ratio Perm |  |  |  |  |  | c0．08 | 0.06 |  |  |  |  |  |
| v／c Ratio |  |  |  | 0.15 | 0.09 | 0.40 | 0.20 | 0.42 |  |  | 0.63 |  |
| Uniform Delay，d1 |  |  |  | 33.4 | 33.0 | 35.1 | 6.6 | 5.4 |  |  | 30.0 |  |
| Progression Factor |  |  |  | 0.93 | 0.93 | 0.91 | 0.19 | 0.14 |  |  | 1.00 |  |
| Incremental Delay，d2 |  |  |  | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 |  |  | 2.8 |  |
| Delay（s） |  |  |  | 31.2 | 30.7 | 32.2 | 1.3 | 0.8 |  |  | 32.8 |  |
| Level of Service |  |  |  | C | C | C | A | A |  |  | C |  |
| Approach Delay（s） |  | 0.0 |  |  | 31.7 |  |  | 0.8 |  |  | 32.8 |  |
| Approach LOS |  | A |  |  | C |  |  | A |  |  | C |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 12.2 |  | HCM Lev | el of S | rvice |  | B |  |  |  |
| HCM Average Control Delay HCM Volume to Capacity ratio |  |  | 0.50 |  |  |  |  |  |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 100.0 |  | Sum of los | st time |  |  | 12.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 45．3\％ |  | ICU Leve | of Se | vice |  | A |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |


|  | $\rangle$ |  |  |  |  |  |  | $\dagger$ |  |  | $\downarrow$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | \％${ }^{1 *}$ | 个4 | $\stackrel{\square}{*}$ |  |  |  |  | 个个4 | 「 |  | $\uparrow \uparrow$ |  |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） | 4.0 | 4.0 | 4.0 |  |  |  |  | 4.0 | 4.0 |  | 4.0 |  |
| Lane Util．Factor | 0.97 | 0.95 | 1.00 |  |  |  |  | 0.91 | 1.00 |  | 0.95 |  |
| Frt | 1.00 | 1.00 | 0.85 |  |  |  |  | 1.00 | 0.85 |  | 1.00 |  |
| Flt Protected | 0.95 | 1.00 | 1.00 |  |  |  |  | 1.00 | 1.00 |  | 0.99 |  |
| Satd．Flow（prot） | 3433 | 3539 | 1583 |  |  |  |  | 5085 | 1583 |  | 3503 |  |
| Flt Permitted | 0.95 | 1.00 | 1.00 |  |  |  |  | 1.00 | 1.00 |  | 0.55 |  |
| Satd．Flow（perm） | 3433 | 3539 | 1583 |  |  |  |  | 5085 | 1583 |  | 1947 |  |
| Volume（vph） | 896 | 83 | 76 | 0 | 0 | 0 | 0 | 702 | 57 | 147 | 564 | 0 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 943 | 87 | 80 | 0 | 0 | 0 | 0 | 739 | 60 | 155 | 594 | 0 |
| RTOR Reduction（vph） | 0 | 0 | 47 | 0 | 0 | 0 | 0 | 0 | 49 | 0 | 0 | 0 |
| Lane Group Flow（vph） | 943 | 87 | 33 | 0 | 0 | 0 | 0 | 739 | 11 | 0 | 749 | 0 |
| Turn Type | Split |  | Perm |  |  |  |  |  | Perm | pm＋pt |  |  |
| Protected Phases | 412 | 412 |  |  |  |  |  | 2 |  | 1 | 12 |  |
| Permitted Phases |  |  | 412 |  |  |  |  |  | 2 | 12 | 12 |  |
| Actuated Green，G（s） | 40.2 | 40.2 | 40.2 |  |  |  |  | 17.6 | 17.6 |  | 44.8 |  |
| Effective Green，g（s） | 41.2 | 41.2 | 41.2 |  |  |  |  | 18.6 | 18.6 |  | 46.8 |  |
| Actuated g／C Ratio | 0.41 | 0.41 | 0.41 |  |  |  |  | 0.19 | 0.19 |  | 0.47 |  |
| Clearance Time（s） |  |  |  |  |  |  |  | 5.0 | 5.0 |  |  |  |
| Vehicle Extension（s） |  |  |  |  |  |  |  | 2.0 | 2.0 |  |  |  |
| Lane Grp Cap（vph） | 1414 | 1458 | 652 |  |  |  |  | 946 | 294 |  | 1350 |  |
| v／s Ratio Prot | c0．27 | 0.02 |  |  |  |  |  | c0．15 |  |  | c0．16 |  |
| v／s Ratio Perm |  |  | 0.02 |  |  |  |  |  | 0.01 |  | 0.10 |  |
| v／c Ratio | 0.67 | 0.06 | 0.05 |  |  |  |  | 0.78 | 0.04 |  | 0.55 |  |
| Uniform Delay，d1 | 23.8 | 17.7 | 17.7 |  |  |  |  | 38.8 | 33.4 |  | 19.1 |  |
| Progression Factor | 1.00 | 1.00 | 1.00 |  |  |  |  | 1.00 | 1.00 |  | 0.39 |  |
| Incremental Delay，d2 | 0.9 | 0.0 | 0.0 |  |  |  |  | 3.9 | 0.0 |  | 0.2 |  |
| Delay（s） | 24.8 | 17.7 | 17.7 |  |  |  |  | 42.7 | 33.4 |  | 7.6 |  |
| Level of Service | C | B | B |  |  |  |  | D | C |  | A |  |
| Approach Delay（s） |  | 23.7 |  |  | 0.0 |  |  | 42.0 |  |  | 7.6 |  |
| Approach LOS |  | C |  |  | A |  |  | D |  |  | A |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
| HCM Average Control Delay |  |  | 24.7 |  | HCM Le | el of S | rvice |  | C |  |  |  |
| HCM Volume to Capacity ratio |  |  | 0.66 |  |  |  |  |  |  |  |  |  |
|  |  |  | 100.0 |  | Sum of | st time |  |  | 12.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 69．0\％ |  | CU Lev | of Ser | vice |  | C |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |




| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | \％ | 性 | 「 | \％ | 个 $\uparrow$ | 「 | ${ }^{7}$ | 快 | 「 | ${ }^{7}$ | 快 | 「 |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） | 4.0 | 4.0 |  | 4.0 | 4.0 | 4.0 |  | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Lane Util．Factor | 1.00 | 0.95 |  | 1.00 | 0.95 | 1.00 |  | 0.91 | 1.00 | 1.00 | 0.91 | 1.00 |
| Frt | 1.00 | 1.00 |  | 1.00 | 1.00 | 0.85 |  | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 |  | 0.95 | 1.00 | 1.00 |  | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（prot） | 1770 | 3539 |  | 1770 | 3539 | 1583 |  | 5085 | 1583 | 1770 | 5085 | 1583 |
| Flt Permitted | 0.95 | 1.00 |  | 0.95 | 1.00 | 1.00 |  | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（perm） | 1770 | 3539 |  | 1770 | 3539 | 1583 |  | 5085 | 1583 | 1770 | 5085 | 1583 |
| Volume（vph） | 57 | 189 | 0 | 244 | 225 | 148 | 0 | 1282 | 246 | 144 | 1239 | 73 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 60 | 199 | 0 | 257 | 237 | 156 | 0 | 1349 | 259 | 152 | 1304 | 77 |
| RTOR Reduction（vph） | 0 | 0 | 0 | 0 | 0 | 121 | 0 | 0 | 131 | 0 | 0 | 28 |
| Lane Group Flow（vph） | 60 | 199 | 0 | 257 | 237 | 35 | 0 | 1349 | 128 | 152 | 1304 | 49 |
| Turn Type | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm |
| Protected Phases | 7 | 4 |  | 3 | 8 |  | 5 | 2 |  | 1 | 6 |  |
| Permitted Phases |  |  | 4 |  |  | 8 |  |  | 2 |  |  | 6 |
| Actuated Green，G（s） | 7.9 | 14.4 |  | 25.7 | 32.2 | 32.2 |  | 73.3 | 73.3 | 16.6 | 94.9 | 94.9 |
| Effective Green，g（s） | 8.9 | 15.4 |  | 26.7 | 33.2 | 33.2 |  | 74.3 | 74.3 | 17.6 | 95.9 | 95.9 |
| Actuated g／C Ratio | 0.06 | 0.10 |  | 0.18 | 0.22 | 0.22 |  | 0.50 | 0.50 | 0.12 | 0.64 | 0.64 |
| Clearance Time（s） | 5.0 | 5.0 |  | 5.0 | 5.0 | 5.0 |  | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Vehicle Extension（s） | 3.0 | 3.0 |  | 3.0 | 3.0 | 3.0 |  | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Lane Grp Cap（vph） | 105 | 363 |  | 315 | 783 | 350 |  | 2519 | 784 | 208 | 3251 | 1012 |
| v／s Ratio Prot | 0.03 | c0．06 |  | c0．15 | 0.07 |  |  | c0．27 |  | c0．09 | 0.26 |  |
| v／s Ratio Perm |  |  |  |  |  | 0.02 |  |  | 0.08 |  |  | 0.03 |
| v／c Ratio | 0.57 | 0.55 |  | 0.82 | 0.30 | 0.10 |  | 0.54 | 0.16 | 0.73 | 0.40 | 0.05 |
| Uniform Delay，d1 | 68.7 | 64.0 |  | 59.3 | 48.7 | 46.5 |  | 26.0 | 20.8 | 63.9 | 13.1 | 10.1 |
| Progression Factor | 1.04 | 0.82 |  | 1.00 | 1.00 | 1.00 |  | 0.32 | 0.18 | 1.00 | 1.00 | 1.00 |
| Incremental Delay，d2 | 7.3 | 1.7 |  | 14.9 | 0.2 | 0.1 |  | 0.5 | 0.3 | 12.4 | 0.4 | 0.1 |
| Delay（s） | 78.5 | 53.9 |  | 74.2 | 49.0 | 46.6 |  | 8.9 | 4.1 | 76.3 | 13.5 | 10.2 |
| Level of Service | E | D |  | E | D | D |  | A | A | E | B | B |
| Approach Delay（s） |  | 59.6 |  |  | 58.4 |  |  | 8.1 |  |  | 19.6 |  |
| Approach LOS |  | E |  |  | E |  |  | A |  |  | B |  |


| Intersection Summary |  |  |  |
| :--- | ---: | :--- | ---: |
| HCM Average Control Delay | 23.8 | HCM Level of Service | C |
| HCM Volume to Capacity ratio | 0.62 |  | 16.0 |
| Actuated Cycle Length（s） | 150.0 | Sum of lost time（s） | C |
| Intersection Capacity Utilization | $64.8 \%$ | ICU Level of Service |  |
| Analysis Period（min） | 15 |  |  |
| c Critical Lane Group |  |  |  |


|  | $\rangle$ |  |  |  |  |  | 4 | $\dagger$ | P |  | $\dagger$ | $\checkmark$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | ${ }^{7}$ | 个4 | $\stackrel{7}{ }$ | \％ |  | $\stackrel{7}{ }$ | \％ | 性 | F | \％ | 个4 | 7 |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Lane Util．Factor | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（prot） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 |
| Flt Permitted | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（perm） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 |
| Volume（vph） | 15 | 343 | 213 | 6 | 392 | 31 | 248 | 671 | 11 | 30 | 659 | 10 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 16 | 361 | 224 | 6 | 413 | 33 | 261 | 706 | 12 | 32 | 694 | 11 |
| RTOR Reduction（vph） | 0 | 0 | 182 | 0 | 0 | 27 | 0 | 0 | 5 | 0 | 0 | 6 |
| Lane Group Flow（vph） | 16 | 361 | 42 | 6 | 413 | 6 | 261 | 706 | 7 | 32 | 694 | 5 |
| Turn Type | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm |
| Protected Phases | 7 | 4 |  | 3 | 8 |  | 5 | 2 |  | 1 | 6 |  |
| Permitted Phases |  |  | 4 |  |  | 8 |  |  | 2 |  |  | 6 |
| Actuated Green，G（s） | 3.1 | 21.7 | 21.7 | 1.4 | 20.0 | 20.0 | 22.4 | 70.9 | 70.9 | 6.0 | 54.5 | 54.5 |
| Effective Green，g（s） | 4.1 | 22.7 | 22.7 | 2.4 | 21.0 | 21.0 | 23.4 | 71.9 | 71.9 | 7.0 | 55.5 | 55.5 |
| Actuated g／C Ratio | 0.03 | 0.19 | 0.19 | 0.02 | 0.18 | 0.18 | 0.19 | 0.60 | 0.60 | 0.06 | 0.46 | 0.46 |
| Clearance Time（s） | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Vehicle Extension（s） | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Lane Grp Cap（vph） | 60 | 669 | 299 | 35 | 619 | 277 | 345 | 2120 | 948 | 103 | 1637 | 732 |
| v／s Ratio Prot | c0．01 | 0.10 |  | 0.00 | c0．12 |  | c0．15 | 0.20 |  | 0.02 | c0．20 |  |
| v／s Ratio Perm |  |  | 0.03 |  |  | 0.00 |  |  | 0.00 |  |  | 0.00 |
| v／c Ratio | 0.27 | 0.54 | 0.14 | 0.17 | 0.67 | 0.02 | 0.76 | 0.33 | 0.01 | 0.31 | 0.42 | 0.01 |
| Uniform Delay，d1 | 56.5 | 43.9 | 40.5 | 57.8 | 46.2 | 41.0 | 45.6 | 12.0 | 9.7 | 54.2 | 21.6 | 17.4 |
| Progression Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.09 | 1.64 | 2.44 | 1.00 | 1.00 | 1.00 |
| Incremental Delay，d2 | 2.4 | 0.8 | 0.2 | 2.3 | 2.7 | 0.0 | 5.6 | 0.3 | 0.0 | 1.7 | 0.8 | 0.0 |
| Delay（s） | 58.9 | 44.8 | 40.8 | 60.1 | 49.0 | 41.0 | 55.5 | 20.0 | 23.7 | 55.9 | 22.4 | 17.4 |
| Level of Service | E | D | D | E | D | D | E | B | C | E | C | B |
| Approach Delay（s） |  | 43.6 |  |  | 48.5 |  |  | 29.5 |  |  | 23.8 |  |
| Approach LOS |  | D |  |  | D |  |  | C |  |  | C |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
| HCM Average Control Delay |  |  | 34.1 |  | HCM Le | vel of Servir | ervice |  | C |  |  |  |
| HCM Volume to Capacity ratio |  |  | 0.54 |  |  |  |  |  |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 120.0 |  | Sum of | ost time |  |  | 16.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 54．4\％ |  | CU Leve | ef Ser | vice |  | A |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |


|  | 4 |  | 4 |  |  | $\downarrow$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBR | NBL | NBT | SBT | SBR |  |
| Lane Configurations | ${ }^{7}$ | F＇ | ${ }^{7}$ | 夹午 | 來革 | 「 |  |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |  |
| Total Lost time（s） |  | 4.0 | 4.0 | 4.0 | 4.0 |  |  |
| Lane Util．Factor |  | 1.00 | 1.00 | 0.91 | 0.91 |  |  |
| Frt |  | 0.85 | 1.00 | 1.00 | 1.00 |  |  |
| Flt Protected |  | 1.00 | 0.95 | 1.00 | 1.00 |  |  |
| Satd．Flow（prot） |  | 1583 | 1770 | 5085 | 5085 |  |  |
| Flt Permitted |  | 1.00 | 0.95 | 1.00 | 1.00 |  |  |
| Satd．Flow（perm） |  | 1583 | 1770 | 5085 | 5085 |  |  |
| Volume（vph） | 0 | 387 | 450 | 729 | 628 | 0 |  |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |  |
| Adj．Flow（vph） | 0 | 407 | 474 | 767 | 661 | 0 |  |
| RTOR Reduction（vph） | 0 | 29 | 0 | 0 | 0 | 0 |  |
| Lane Group Flow（vph） | 0 | 378 | 474 | 767 | 661 | 0 |  |
| Turn Type |  | m＋ov | Prot |  |  | m＋ov |  |
| Protected Phases | 4 | 5 | 5 | 2 | 6 | 4 |  |
| Permitted Phases |  | 4 |  |  |  | 6 |  |
| Actuated Green，G（s） |  | 54.4 | 54.4 | 150.0 | 85.6 |  |  |
| Effective Green，g（s） |  | 55.4 | 55.4 | 150.0 | 86.6 |  |  |
| Actuated g／C Ratio |  | 0.37 | 0.37 | 1.00 | 0.58 |  |  |
| Clearance Time（s） |  | 5.0 | 5.0 | 5.0 | 5.0 |  |  |
| Vehicle Extension（s） |  | 3.0 | 3.0 | 3.0 | 3.0 |  |  |
| Lane Grp Cap（vph） |  | 585 | 654 | 5085 | 2936 |  |  |
| v／s Ratio Prot |  | 0.24 | c0．27 | 0.15 | c0．13 |  |  |
| v／s Ratio Perm |  |  |  |  |  |  |  |
| v／c Ratio |  | 0.65 | 0.72 | 0.15 | 0.23 |  |  |
| Uniform Delay，d1 |  | 39.2 | 40.7 | 0.0 | 15.4 |  |  |
| Progression Factor |  | 1.00 | 0.55 | 1.00 | 1.00 |  |  |
| Incremental Delay，d2 |  | 2.5 | 3.4 | 0.1 | 0.2 |  |  |
| Delay（s） |  | 41.6 | 25.8 | 0.1 | 15.6 |  |  |
| Level of Service |  | D | C | A | B |  |  |
| Approach Delay（s） | 41.6 |  |  | 9.9 | 15.6 |  |  |
| Approach LOS | D |  |  | A | B |  |  |
| Intersection Summary |  |  |  |  |  |  |  |
| HCM Average Control Delay |  |  | 17.1 |  | HCM Le | l of Service | B |
| HCM Volume to Capacity ratio |  |  | 0.42 |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 150.0 |  | Sum of | st time（s） | 8.0 |
| Intersection Capacity Utilization |  |  | 43．7\％ |  | ICU Lev | of Service | A |
| Analysis Period（min） |  |  | 15 |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |



|  | $\dagger$ |  |  |  |  | 4 | 4 | $\uparrow$ | $p$ |  | $\downarrow$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | \％ |  | 「 | \％ | 个4 | $\stackrel{7}{ }$ | \％ | 种中 | 「 | \％ | 恘 | F |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Lane Util．Factor | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.91 | 1.00 | 1.00 | 0.91 | 1.00 |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（prot） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 5085 | 1583 | 1770 | 5085 | 1583 |
| Flt Permitted | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（perm） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 5085 | 1583 | 1770 | 5085 | 1583 |
| Volume（vph） | 95 | 944 | 113 | 222 | 942 | 338 | 158 | 1478 | 289 | 300 | 1351 | 151 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 100 | 994 | 119 | 234 | 992 | 356 | 166 | 1556 | 304 | 316 | 1422 | 159 |
| RTOR Reduction（vph） | 0 | 0 | 89 | 0 | 0 | 218 | 0 | 0 | 162 | 0 | 0 | 92 |
| Lane Group Flow（vph） | 100 | 994 | 30 | 234 | 992 | 138 | 166 | 1556 | 142 | 316 | 1422 | 67 |
| Turn Type | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm |
| Protected Phases | 7 | 4 |  | 3 | 8 |  | 5 | 2 |  | ， | 6 |  |
| Permitted Phases |  |  | 4 |  |  | 8 |  |  | 2 |  |  | 6 |
| Actuated Green，G（s） | 8.3 | 37.0 | 37.0 | 15.0 | 43.7 | 43.7 | 16.0 | 56.0 | 56.0 | 22.0 | 62.0 | 62.0 |
| Effective Green，g（s） | 9.3 | 38.0 | 38.0 | 16.0 | 44.7 | 44.7 | 17.0 | 57.0 | 57.0 | 23.0 | 63.0 | 63.0 |
| Actuated g／C Ratio | 0.06 | 0.25 | 0.25 | 0.11 | 0.30 | 0.30 | 0.11 | 0.38 | 0.38 | 0.15 | 0.42 | 0.42 |
| Clearance Time（s） | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Vehicle Extension（s） | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Lane Grp Cap（vph） | 110 | 897 | 401 | 189 | 1055 | 472 | 201 | 1932 | 602 | 271 | 2136 | 665 |
| v／s Ratio Prot | 0.06 | c0．28 |  | c0．13 | 0.28 |  | 0.09 | c0．31 |  | c0．18 | 0.28 |  |
| v／s Ratio Perm |  |  | 0.02 |  |  | 0.09 |  |  | 0.09 |  |  | 0.04 |
| v／c Ratio | 0.91 | 1.11 | 0.08 | 1.24 | 0.94 | 0.29 | 0.83 | 0.81 | 0.24 | 1.17 | 0.67 | 0.10 |
| Uniform Delay，d1 | 69.9 | 56.0 | 42.6 | 67.0 | 51.3 | 40.5 | 65.1 | 41.5 | 31.7 | 63.5 | 35.0 | 26.3 |
| Progression Factor | 0.97 | 0.96 | 0.94 | 1.00 | 1.00 | 1.00 | 0.93 | 0.91 | 1.50 | 0.94 | 1.04 | 2.56 |
| Incremental Delay，d2 | 57.3 | 64.2 | 0.1 | 144.0 | 15.4 | 0.3 | 11.4 | 1.6 | 0.4 | 105.7 | 1.6 | 0.3 |
| Delay（s） | 125.0 | 118.1 | 40.3 | 211.0 | 66.8 | 40.8 | 71.9 | 39.4 | 47.8 | 165.7 | 37.8 | 67.6 |
| Level of Service | F | F | D | F | E | D | E | D | D | F | D | E |
| Approach Delay（s） |  | 111.0 |  |  | 82.3 |  |  | 43.3 |  |  | 61.6 |  |
| Approach LOS |  | F |  |  | F |  |  | D |  |  | E |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 69.9 |  | HCM Le | vel of Se | rvice |  | E |  |  |  |
| HCM Average Control Delay HCM Volume to Capacity ratio |  |  | 1.00 |  |  |  |  |  |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 150.0 |  | Sum of | st time |  |  | 16.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 96．9\％ |  | CU Lev | of Ser | vice |  | F |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |


|  | $\dagger$ |  |  |  |  |  | 4 | $\dagger$ | \％ |  | $\dagger$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | ${ }^{7}$ | 性 | 「 | \％ | 个 $\uparrow$ | 「 | \％ | 个4 | 「 | \％ | 性 | F |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Lane Util．Factor | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（prot） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 |
| Flt Permitted | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（perm） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 |
| Volume（vph） | 103 | 1067 | 390 | 160 | 1063 | 285 | 445 | 994 | 213 | 216 | 916 | 99 |
| Peak－hour factor，PHF | 0.95 | 0.96 | 0.95 | 0.95 | 0.96 | 0.95 | 0.95 | 0.96 | 0.95 | 0.95 | 0.96 | 0.95 |
| Adj．Flow（vph） | 108 | 1111 | 411 | 168 | 1107 | 300 | 468 | 1035 | 224 | 227 | 954 | 104 |
| RTOR Reduction（vph） | 0 | 0 | 295 | 0 | 0 | 208 | 0 | 0 | 124 | 0 | 0 | 78 |
| Lane Group Flow（vph） | 108 | 1111 | 116 | 168 | 1107 | 93 | 468 | 1035 | 100 | 227 | 954 | 26 |
| Turn Type | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm |
| Protected Phases | 7 | 4 |  | 3 | 8 |  | 5 | 2 |  | 1 | 6 |  |
| Permitted Phases |  |  | 4 |  |  | 8 |  |  | 2 |  |  | 6 |
| Actuated Green，G（s） | 7.0 | 33.0 | 33.0 | 10.0 | 36.0 | 36.0 | 28.0 | 39.0 | 39.0 | 18.0 | 29.0 | 29.0 |
| Effective Green，g（s） | 8.0 | 34.0 | 34.0 | 11.0 | 37.0 | 37.0 | 29.0 | 40.0 | 40.0 | 19.0 | 30.0 | 30.0 |
| Actuated g／C Ratio | 0.07 | 0.28 | 0.28 | 0.09 | 0.31 | 0.31 | 0.24 | 0.33 | 0.33 | 0.16 | 0.25 | 0.25 |
| Clearance Time（s） | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Vehicle Extension（s） | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Lane Grp Cap（vph） | 118 | 1003 | 449 | 162 | 1091 | 488 | 428 | 1180 | 528 | 280 | 885 | 396 |
| v／s Ratio Prot | 0.06 | c0．31 |  | c0．09 | c0．31 |  | c0．26 | 0.29 |  | 0.13 | c0．27 |  |
| v／s Ratio Perm |  |  | 0.07 |  |  | 0.06 |  |  | 0.06 |  |  | 0.02 |
| v／c Ratio | 0.92 | 1.11 | 0.26 | 1.04 | 1.01 | 0.19 | 1.09 | 0.88 | 0.19 | 0.81 | 1.08 | 0.07 |
| Uniform Delay，d1 | 55.7 | 43.0 | 33.3 | 54.5 | 41.5 | 30.5 | 45.5 | 37.7 | 28.5 | 48.8 | 45.0 | 34.3 |
| Progression Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.58 | 0.60 | 0.59 | 1.10 | 1.14 | 1.92 |
| Incremental Delay，d2 | 56.7 | 62.7 | 0.3 | 80.8 | 30.9 | 0.2 | 59.7 | 5.1 | 0.4 | 15.7 | 53.1 | 0.3 |
| Delay（s） | 112.4 | 105.7 | 33.6 | 135.3 | 72.4 | 30.7 | 86.1 | 27.7 | 17.2 | 69.4 | 104.6 | 66.2 |
| Level of Service | F | F | C | F | E | C | F | C | B | E | F | E |
| Approach Delay（s） |  | 88.0 |  |  | 71.2 |  |  | 42.2 |  |  | 95.2 |  |
| Approach LOS |  | F |  |  | E |  |  | D |  |  | F |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
| HCM Average Control DelayHCM Volume to Capacity ratio |  |  | 72.5 |  | HCM Le | el of S | rvice |  | E |  |  |  |
|  |  |  | 1.12 |  |  |  |  |  |  |  |  |  |
| HCM Volume to Capacity ratioActuated Cycle Length（s） |  |  | 120.0 |  | Sum of | st time |  |  | 20.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 01．7\％ |  | ICU Lev | of Se | vice |  | G |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |


|  | $\dagger$ |  |  |  |  | 4 | 4 | $\uparrow$ | 7 |  | $\downarrow$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | \％ | 个4 | 「 | \％ | 个4 | $\stackrel{7}{ }$ | \％${ }^{1+1}$ | 惟 | 「 | \％ | 恘 | F |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Lane Util．Factor | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 0.97 | 0.91 | 1.00 | 1.00 | 0.91 | 1.00 |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（prot） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 3433 | 5085 | 1583 | 1770 | 5085 | 1583 |
| Flt Permitted | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（perm） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 3433 | 5085 | 1583 | 1770 | 5085 | 1583 |
| Volume（vph） | 69 | 683 | 719 | 181 | 701 | 90 | 766 | 1413 | 214 | 17 | 1250 | 81 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 73 | 719 | 757 | 191 | 738 | 95 | 806 | 1487 | 225 | 18 | 1316 | 85 |
| RTOR Reduction（vph） | 0 | 0 | 341 | 0 | 0 | 67 | 0 | 0 | 112 | 0 | 0 | 62 |
| Lane Group Flow（vph） | 73 | 719 | 416 | 191 | 738 | 28 | 806 | 1487 | 113 | 18 | 1316 | 23 |
| Turn Type | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm |
| Protected Phases | 7 | 4 |  | 3 | 8 |  | 5 | 2 |  | 1 | 6 |  |
| Permitted Phases |  |  | 4 |  |  | 8 |  |  | 2 |  |  | 6 |
| Actuated Green，G（s） | 9.9 | 38.0 | 38.0 | 15.0 | 43.1 | 43.1 | 37.1 | 74.6 | 74.6 | 2.4 | 39.9 | 39.9 |
| Effective Green，g（s） | 10.9 | 39.0 | 39.0 | 16.0 | 44.1 | 44.1 | 38.1 | 75.6 | 75.6 | 3.4 | 40.9 | 40.9 |
| Actuated g／C Ratio | 0.07 | 0.26 | 0.26 | 0.11 | 0.29 | 0.29 | 0.25 | 0.50 | 0.50 | 0.02 | 0.27 | 0.27 |
| Clearance Time（s） | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Vehicle Extension（s） | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Lane Grp Cap（vph） | 129 | 920 | 412 | 189 | 1040 | 465 | 872 | 2563 | 798 | 40 | 1387 | 432 |
| v／s Ratio Prot | 0.04 | 0.20 |  | c0．11 | 0.21 |  | c0．23 | 0.29 |  | 0.01 | c0．26 |  |
| v／s Ratio Perm |  |  | c0．26 |  |  | 0.02 |  |  | 0.07 |  |  | 0.01 |
| v／c Ratio | 0.57 | 0.78 | 1.01 | 1.01 | 0.71 | 0.06 | 0.92 | 0.58 | 0.14 | 0.45 | 0.95 | 0.05 |
| Uniform Delay，d1 | 67.3 | 51.5 | 55.5 | 67.0 | 47.2 | 38.1 | 54.5 | 26.1 | 19.9 | 72.4 | 53.5 | 40.3 |
| Progression Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.93 | 0.90 | 0.98 | 0.88 | 0.97 | 0.76 |
| Incremental Delay，d2 | 5.6 | 4.4 | 46.7 | 68.2 | 2.2 | 0.1 | 11.7 | 0.7 | 0.3 | 7.6 | 14.4 | 0.2 |
| Delay（s） | 72.8 | 55.9 | 102.2 | 135.2 | 49.5 | 38.1 | 62.6 | 24.2 | 19.8 | 71.6 | 66.1 | 30.7 |
| Level of Service | E | E | F | F | D | D | E | C | B | E | E | C |
| Approach Delay（s） |  | 79.3 |  |  | 64.4 |  |  | 36.1 |  |  | 64.1 |  |
| Approach LOS |  | E |  |  | E |  |  | D |  |  | E |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 56.9 |  | HCM Le | vel of Se | rvice |  | E |  |  |  |
| HCM Average Control Delay HCM Volume to Capacity ratio |  |  | 0.97 |  |  |  |  |  |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 150.0 |  | Sum of | st time |  |  | 16.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 88．7\％ |  | CU Lev | of Ser | vice |  | E |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |


|  | $\rangle$ |  |  |  |  |  |  | 4 |  |  | $\dagger$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations |  | 个 $\uparrow$ | 「 | \％ | 个个 |  |  |  |  | \％ | 性 | F |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） |  | 4.0 | 4.0 | 4.0 | 4.0 |  |  |  |  |  | 4.0 | 4.0 |
| Lane Util．Factor |  | 0.95 | 1.00 | 1.00 | 0.95 |  |  |  |  |  | 0.95 | 1.00 |
| Frt |  | 1.00 | 0.85 | 1.00 | 1.00 |  |  |  |  |  | 1.00 | 0.85 |
| Flt Protected |  | 1.00 | 1.00 | 0.95 | 1.00 |  |  |  |  |  | 1.00 | 1.00 |
| Satd．Flow（prot） |  | 3539 | 1583 | 1770 | 3539 |  |  |  |  |  | 3539 | 1583 |
| Flt Permitted |  | 1.00 | 1.00 | 0.18 | 1.00 |  |  |  |  |  | 1.00 | 1.00 |
| Satd．Flow（perm） |  | 3539 | 1583 | 339 | 3539 |  |  |  |  |  | 3539 | 1583 |
| Volume（vph） | 0 | 711 | 212 | 302 | 278 | 0 | 0 | 0 | 0 | 0 | 133 | 768 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 0 | 748 | 223 | 318 | 293 | 0 | 0 | 0 | 0 | 0 | 140 | 808 |
| RTOR Reduction（vph） | 0 | 0 | 168 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 387 |
| Lane Group Flow（vph） | 0 | 748 | 55 | 318 | 293 | 0 | 0 | 0 | 0 | 0 | 140 | 421 |
| Turn Type |  |  | Perm | pm＋pt |  |  |  |  |  | Split |  | Perm |
| Protected Phases |  | 6 |  | 5 | 56 |  |  |  |  | 816 | 816 |  |
| Permitted Phases |  | 6 | 6 | 56 | 56 |  |  |  |  |  |  | 816 |
| Actuated Green，G（s） |  | 21.0 | 21.0 | 47.1 | 52.1 |  |  |  |  |  | 27.9 | 27.9 |
| Effective Green，g（s） |  | 22.0 | 22.0 | 49.1 | 53.1 |  |  |  |  |  | 28.9 | 28.9 |
| Actuated g／C Ratio |  | 0.24 | 0.24 | 0.55 | 0.59 |  |  |  |  |  | 0.32 | 0.32 |
| Clearance Time（s） |  | 5.0 | 5.0 | 5.0 |  |  |  |  |  |  |  |  |
| Vehicle Extension（s） |  | 3.0 | 3.0 | 3.0 |  |  |  |  |  |  |  |  |
| Lane Grp Cap（vph） |  | 865 | 387 | 616 | 2088 |  |  |  |  |  | 1136 | 508 |
| v／s Ratio Prot |  | c0． 21 |  | c0．16 | 0.08 |  |  |  |  |  | 0.04 |  |
| v／s Ratio Perm |  |  | 0.03 | 0.13 |  |  |  |  |  |  |  | c0．27 |
| v／c Ratio |  | 0.86 | 0.14 | 0.52 | 0.14 |  |  |  |  |  | 0.12 | 0.83 |
| Uniform Delay，d1 |  | 32.6 | 26.6 | 13.1 | 8.2 |  |  |  |  |  | 21.6 | 28.3 |
| Progression Factor |  | 1.00 | 1.00 | 0.67 | 0.02 |  |  |  |  |  | 1.00 | 1.00 |
| Incremental Delay，d2 |  | 11.2 | 0.8 | 0.4 | 0.0 |  |  |  |  |  | 0.0 | 10.7 |
| Delay（s） |  | 43.8 | 27.4 | 9.2 | 0.2 |  |  |  |  |  | 21.6 | 39.0 |
| Level of Service |  | D | C | A | A |  |  |  |  |  | C | D |
| Approach Delay（s） |  | 40.0 |  |  | 4.9 |  |  | 0.0 |  |  | 36.4 |  |
| Approach LOS |  | D |  |  | A |  |  | A |  |  | D |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 30.2 |  | HCM Lev | el of S | rvice |  | C |  |  |  |
| HCM Average Control Delay HCM Volume to Capacity ratio |  |  | 0.69 |  |  |  |  |  |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 90.0 |  | Sum of los | ost time |  |  | 8.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 06．8\％ |  | ICU Level of Service |  |  |  | G |  |  |  |
| Analysis Period（min） |  | 15 |  |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SB |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | ＊ | 个 $\uparrow$ | 「 | \％ | 个个 | F＇ | ${ }^{7 \times 1}$ | 个个4 | 「 | \％${ }^{1+1}$ | 个性 | 「 |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Lane Util．Factor | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 0.97 | 0.91 | 1.00 | 0.97 | 0.91 | 1.00 |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（prot） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 3433 | 5085 | 1583 | 3433 | 5085 | 1583 |
| Flt Permitted | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd．Flow（perm） | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 3433 | 5085 | 1583 | 3433 | 5085 | 1583 |
| Volume（vph） | 35 | 670 | 327 | 65 | 728 | 575 | 382 | 2009 | 96 | 488 | 1710 | 57 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 37 | 705 | 344 | 68 | 766 | 605 | 402 | 2115 | 101 | 514 | 1800 | 60 |
| RTOR Reduction（vph） | 0 | 0 | 182 | 0 | 0 | 182 | 0 | 0 | 52 | 0 | 0 | 31 |
| Lane Group Flow（vph） | 37 | 705 | 162 | 68 | 766 | 423 | 402 | 2115 | 49 | 514 | 1800 | 29 |
| Turn Type | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm |
| Protected Phases | 7 | 4 |  | 3 | 8 |  | 5 | 2 |  | 1 | 6 |  |
| Permitted Phases |  |  | 4 |  |  | 8 |  |  | 2 |  |  | 6 |
| Actuated Green，G（s） | 3.2 | 32.5 | 32.5 | 5.0 | 34.3 | 34.3 | 20.0 | 72.5 | 72.5 | 20.0 | 72.5 | 72.5 |
| Effective Green，g（s） | 4.2 | 33.5 | 33.5 | 6.0 | 35.3 | 35.3 | 21.0 | 73.5 | 73.5 | 21.0 | 73.5 | 73.5 |
| Actuated g／C Ratio | 0.03 | 0.22 | 0.22 | 0.04 | 0.24 | 0.24 | 0.14 | 0.49 | 0.49 | 0.14 | 0.49 | 0.49 |
| Clearance Time（s） | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Vehicle Extension（s） | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Lane Grp Cap（vph） | 50 | 790 | 354 | 71 | 833 | 373 | 481 | 2492 | 776 | 481 | 2492 | 776 |
| v／s Ratio Prot | 0.02 | c0．20 |  | 0.04 | 0.22 |  | 0.12 | c0．42 |  | c0．15 | 0.35 |  |
| v／s Ratio Perm |  |  | 0.10 |  |  | c0．27 |  |  | 0.03 |  |  | 0.02 |
| v／c Ratio | 0.74 | 0.89 | 0.46 | 0.96 | 0.92 | 1.13 | 0.84 | 0.85 | 0.06 | 1.07 | 0.72 | 0.04 |
| Uniform Delay，d1 | 72.4 | 56.5 | 50.4 | 71.9 | 56.0 | 57.4 | 62.8 | 33.4 | 20.1 | 64.5 | 30.2 | 19.9 |
| Progression Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.79 | 0.70 | 1.04 | 0.84 | 0.52 | 0.24 |
| Incremental Delay，d2 | 42.8 | 12.2 | 0.9 | 91.2 | 15.0 | 88.2 | 8.5 | 2.7 | 0.1 | 57.6 | 1.6 | 0.1 |
| Delay（s） | 114.8 | 68.5 | 51.6 | 163.1 | 70.9 | 145.6 | 58.2 | 26.2 | 21.0 | 111.6 | 17.4 | 4.8 |
| Level of Service | F | E | D | F | E | F | E | C | C | F | B | A |
| Approach Delay（s） |  | 64.7 |  |  | 106.7 |  |  | 30.9 |  |  | 37.5 |  |
| Approach LOS |  | E |  |  | F |  |  | C |  |  | D |  |


| Intersection Summary |  |  |  |
| :--- | ---: | :--- | ---: |
| HCM Average Control Delay | 52.4 | HCM Level of Service | D |
| HCM Volume to Capacity ratio | 0.95 |  | 12.0 |
| Actuated Cycle Length（s） | 150.0 | Sum of lost time（s） | E |
| Intersection Capacity Utilization | $89.5 \%$ | ICU Level of Service |  |
| Analysis Period（min） | 15 |  |  |
| c Critical Lane Group |  |  |  |





|  | $\rangle$ |  |  | 1 |  |  | 4 | $\dagger$ | 7 | － | $\dagger$ | $\downarrow$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | \％ | 个 4 | 「 | \％ | 个 $\uparrow$ | F＇ | \％ | 个4 | 「 | \％ | 个 $\uparrow$ | 「 |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time（s） |  | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |  |
| Lane Util．Factor |  | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 |  |
| Frt |  | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 |  |
| Flt Protected |  | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 |  |
| Satd．Flow（prot） |  | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 |  |
| Flt Permitted |  | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 |  |
| Satd．Flow（perm） |  | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 | 1583 | 1770 | 3539 |  |
| Volume（vph） | 0 | 184 | 62 | 56 | 182 | 415 | 60 | 1534 | 142 | 379 | 1295 | 0 |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Adj．Flow（vph） | 0 | 194 | 65 | 59 | 192 | 437 | 63 | 1615 | 149 | 399 | 1363 | 0 |
| RTOR Reduction（vph） | 0 | 0 | 58 | 0 | 0 | 316 | 0 | 0 | 79 | 0 | 0 | 0 |
| Lane Group Flow（vph） | 0 | 194 | 7 | 59 | 192 | 121 | 63 | 1615 | 70 | 399 | 1363 | 0 |
| Turn Type | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm | Prot |  | Perm |
| Protected Phases | 7 | 4 |  | 3 | 8 |  | 5 | 2 |  | 1 | 6 |  |
| Permitted Phases |  |  | 4 |  |  | 8 |  |  | 2 |  |  | 6 |
| Actuated Green，G（s） |  | 11.7 | 11.7 | 5.9 | 22.6 | 22.6 | 4.0 | 55.0 | 55.0 | 27.4 | 78.4 |  |
| Effective Green，g（s） |  | 12.7 | 12.7 | 6.9 | 23.6 | 23.6 | 5.0 | 56.0 | 56.0 | 28.4 | 79.4 |  |
| Actuated g／C Ratio |  | 0.11 | 0.11 | 0.06 | 0.20 | 0.20 | 0.04 | 0.47 | 0.47 | 0.24 | 0.66 |  |
| Clearance Time（s） |  | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |  |
| Vehicle Extension（s） |  | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |  |
| Lane Grp Cap（vph） |  | 375 | 168 | 102 | 696 | 311 | 74 | 1652 | 739 | 419 | 2342 |  |
| v／s Ratio Prot |  | c0．05 |  | c0．03 | 0.05 |  | 0.04 | c0．46 |  | c0．23 | 0.39 |  |
| v／s Ratio Perm |  |  | 0.00 |  |  | 0.08 |  |  | 0.04 |  |  |  |
| v／c Ratio |  | 0.52 | 0.04 | 0.58 | 0.28 | 0.39 | 0.85 | 0.98 | 0.09 | 0.95 | 0.58 |  |
| Uniform Delay，d1 |  | 50.8 | 48.2 | 55.1 | 40.9 | 41.9 | 57.1 | 31.4 | 17.9 | 45.1 | 11.2 |  |
| Progression Factor |  | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.77 | 0.59 | 0.43 | 1.14 | 0.94 |  |
| Incremental Delay，d2 |  | 1.2 | 0.1 | 7.7 | 0.2 | 0.8 | 8.5 | 3.2 | 0.0 | 5.6 | 0.1 |  |
| Delay（s） |  | 52.0 | 48.3 | 62.9 | 41.2 | 42.7 | 52.6 | 21.8 | 7.8 | 57.1 | 10.6 |  |
| Level of Service |  | D | D | E | D | D | D | C | A | E | B |  |
| Approach Delay（s） |  | 51.0 |  |  | 44.0 |  |  | 21.7 |  |  | 21.1 |  |
| Approach LOS |  | D |  |  | D |  |  | C |  |  | C |  |
| Intersection Summary |  |  |  |  |  |  |  |  |  |  |  |  |
| HCM Average Control Delay |  |  | 26.5 |  | HCM Le | el of S | rvice |  | C |  |  |  |
| HCM Volume to Capacity ratioActuated Cycle Length（s） |  |  | 0.89 |  |  |  |  |  |  |  |  |  |
|  |  |  | 120.0 |  | Sum of | st time |  |  | 16.0 |  |  |  |
| Intersection Capacity Utilization |  |  | 85．2\％ |  | CU Lev | of Se | vice |  | E |  |  |  |
| Analysis Period（min） |  |  | 15 |  |  |  |  |  |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |  |  |  |  |  |


|  | 4 |  | 4 |  | $\frac{1}{\square}$ | 4 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Movement | EBL | EBR | NBL | NBT | SBT | SBR |  |
| Lane Configurations | ${ }^{7}$ | F＇ | ${ }^{7}$ | 种4 | 性缶 | 「 |  |
| Ideal Flow（vphpl） | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |  |
| Total Lost time（s） | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |  |  |
| Lane Util．Factor | 1.00 | 1.00 | 1.00 | 0.91 | 0.91 |  |  |
| Frt | 1.00 | 0.85 | 1.00 | 1.00 | 1.00 |  |  |
| Flt Protected | 0.95 | 1.00 | 0.95 | 1.00 | 1.00 |  |  |
| Satd．Flow（prot） | 1770 | 1583 | 1770 | 5085 | 5085 |  |  |
| Flt Permitted | 0.95 | 1.00 | 0.95 | 1.00 | 1.00 |  |  |
| Satd．Flow（perm） | 1770 | 1583 | 1770 | 5085 | 5085 |  |  |
| Volume（vph） | 43 | 70 | 82 | 3427 | 2911 | 0 |  |
| Peak－hour factor，PHF | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |  |
| Adj．Flow（vph） | 45 | 74 | 86 | 3607 | 3064 | 0 |  |
| RTOR Reduction（vph） | 0 | 69 | 0 | 0 | 0 | 0 |  |
| Lane Group Flow（vph） | 45 | 5 | 86 | 3607 | 3064 | 0 |  |
| Turn Type |  | Perm | Prot |  |  | Perm |  |
| Protected Phases | 4 |  | 5 | 2 | 6 |  |  |
| Permitted Phases |  | 4 |  |  |  | 6 |  |
| Actuated Green，G（s） | 9.1 | 9.1 | 12.6 | 130.9 | 113.3 |  |  |
| Effective Green，g（s） | 10.1 | 10.1 | 13.6 | 131.9 | 114.3 |  |  |
| Actuated g／C Ratio | 0.07 | 0.07 | 0.09 | 0.88 | 0.76 |  |  |
| Clearance Time（s） | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |  |  |
| Vehicle Extension（s） | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |  |  |
| Lane Grp Cap（vph） | 119 | 107 | 160 | 4471 | 3875 |  |  |
| v／s Ratio Prot | c0．03 |  | 0.05 | c0．71 | 0.60 |  |  |
| v／s Ratio Perm |  | 0.00 |  |  |  |  |  |
| v／c Ratio | 0.38 | 0.05 | 0.54 | 0.81 | 0.79 |  |  |
| Uniform Delay，d1 | 66.9 | 65.4 | 65.2 | 3.8 | 10.7 |  |  |
| Progression Factor | 1.00 | 1.00 | 1.33 | 1.54 | 0.92 |  |  |
| Incremental Delay，d2 | 2.0 | 0.2 | 3.2 | 1.6 | 0.2 |  |  |
| Delay（s） | 69.0 | 65.6 | 89.9 | 7.3 | 10.0 |  |  |
| Level of Service | E | E | F | A | A |  |  |
| Approach Delay（s） | 66.9 |  |  | 9.2 | 10.0 |  |  |
| Approach LOS | E |  |  | A | A |  |  |
| Intersection Summary |  |  |  |  |  |  |  |
| HCM Average Control Delay |  |  | 10.6 |  | HCM Lev | el of Service | B |
| HCM Volume to Capacity ratio |  |  | 0.78 |  |  |  |  |
| Actuated Cycle Length（s） |  |  | 150.0 |  | Sum of lo | st time（s） | 8.0 |
| Intersection Capacity Utilization |  |  | 76．2\％ |  | ICU Leve | of Service | D |
| Analysis Period（min） |  |  | 15 |  |  |  |  |
| c Critical Lane Group |  |  |  |  |  |  |  |


|  |  |  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |







## 5. Internal Capture Worksheet

## ITE MULTI-USE PROJECT INTERNAL CAPTURE WORKSHEET

## (Source: Chapter 7, ITE Trip Generation Handbook, June 2004

Project Number: 068200009
Project Name: Hunt Communities LLC TIA
Scenario: TGZ 1


NET EXTERNAL TRIPS FOR MULTI-USE DEVELOPMENT

| Category | Land Use |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | A | B | C | D |  |
| Enter | 6,316 | 211 | 7,665 | 0 | 14,192 |
| Exit | 6,491 | 188 | 7,513 | 0 | 14,192 |
| Total | 12,807 | 399 | 15,178 | 0 | 28,384 |
| Single Use |  |  |  |  |  |
| Trip Gen Estimate | 14,508 | 496 | 16,966 | 0 | 31,970 |
| Overall Internal Capture $=$ |  |  |  | 11.22\% |  |

ITE MULTI-USE PROJECT INTERNAL CAPTURE WORKSHEET

## (Source: Chapter 7, ITE Trip Generation Handbook, June 2004)

ject Number: 068200009
roject Name: Hunt Communities LLC TIA
Scenario: TGZ 2


| NET EXTERNAL TRIPS FOR MULTI-USE DEVELOPMENT |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Category | Land Use |  |  |  | Total |
|  | A | B | C | D |  |
| Enter Exit | 580 | 295 | 2,854 | 0 | 3,729 |
|  | 586 | 264 | 2,879 | 0 | 3,729 |
| Total | 1,166 | 559 | 5,733 | 0 | 7,458 |
| Single Use <br> Trip Gen Estimate |  |  |  |  |  |
|  | 1,752 | 694 | 6,440 | 0 | 8,886 |
| Overall Internal Capture $=$ |  |  |  | 16.07\% |  |

## ITE MULTI-USE PROJECT INTERNAL CAPTURE WORKSHEET

## (Source: Chapter 7, ITE Trip Generation Handbook, June 2004

Project Number: 068200009
Project Name: Hunt Communities LLC TIA Scenario: TGZ 3


NET EXTERNAL TRIPS FOR MULTI-USE DEVELOPMENT

| Category | Land Use |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | A | B | C | D |  |
| Enter | 4,827 | 58 | 2,603 | 0 | 7,488 |
| Exit | 4,885 | 52 | 2,551 | 0 | 7,488 |
| Total | 9,712 | 110 | 5,154 | 0 | 14,976 |
| Single Use |  |  |  |  |  |
| Trip Gen Estimate | 10,288 | 136 | 5,754 | 0 | 16,178 |
| Overall Internal Capture $=$ |  |  |  | 7.43\% |  |

## ITE MULTI-USE PROJECT INTERNAL CAPTURE WORKSHEET

## (Source: Chapter 7, ITE Trip Generation Handbook, June 2004)

Project Number: 068200009
Project Name: Hunt Communities LLC TIA
Scenario: TGZ 4


| NET EXTERNAL TRIPS FOR MULTI-USE DEVELOPMENT |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Category | Land Use |  |  |  | Total |
|  | A | B | C | D |  |
| Enter | 10,672 | 449 | 9,064 | 0 | 20,185 |
| Exit | 10,885 | 401 | 8,899 | 0 | 20,185 |
| Total | 21,557 | 850 | 17,963 | 0 | 40,370 |
| Single Use <br> Trip Gen Estimate | 23,586 | 1,056 | 20,176 | 0 | 44,818 |
|  | verall In | rnal | ture $=$ |  |  |

## ITE MULTI-USE PROJECT INTERNAL CAPTURE WORKSHEET

## (Source: Chapter 7, ITE Trip Generation Handbook, June 2004)

roject Number: 068200009
Project Name: Hunt Communities LLC TIA
Scenario: TGZ 6


NET EXTERNAL TRIPS FOR MULTI-USE DEVELOPMENT

| Category | Land Use |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | A | B | C | D | Total |
|  | 4,960 | 355 | 10,671 | 0 | 15,986 |
| Exit | 5,205 | 318 | 10,463 | 0 | 15,986 |
| Total | 10,165 | 673 | 21,134 | 0 | 31,972 |
| Single Use <br> Trip Gen Estimate | 12,538 | 836 | 23,654 | 0 |  |
| 37,028 |  |  |  |  |  |

## ITE MULTI-USE PROJECT INTERNAL CAPTURE WORKSHEET

## (Source: Chapter 7, ITE Trip Generation Handbook, June 2004

roject Number: 068200009
Project Name: Hunt Communities LLC TIA Scenario: TGZ 7


| NET EXTERNAL TRIPS FOR MULTI-USE DEVELOPMENT |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Category | Land Use |  |  |  | Total |
|  | A | B | C | D |  |
| Enter | 8,040 | 234 | 8,165 | 0 | 16,439 |
| Exit | 8,226 | 208 | 8,005 | 0 | 16,439 |
| Total | 16,266 | 442 | 16,170 | 0 | 32,878 |
| Single Use |  |  |  |  |  |
| Trip Gen Estimate | 18,080 | 550 | 18,080 | 0 | 36,710 |
| Overall Internal Capture $=$ |  |  |  | 10.44\% |  |

## ITE MULTI-USE PROJECT INTERNAL CAPTURE WORKSHEET

## (Source: Chapter 7, ITE Trip Generation Handbook, June 2004

roject Number: 068200009
Project Name: Hunt Communities LLC TIA
Scenario: TGZ 8


NET EXTERNAL TRIPS FOR MULTI-USE DEVELOPMENT

| Category | Land Use |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | A | B | C | D | Total |
|  | 5,462 | 122 | 4,600 | 0 | 10,184 |
|  | 5,567 | 109 | 4,508 | 0 | 10,184 |
|  | 11,029 | 231 | 9,108 | 0 | $\mathbf{2 0 , 3 6 8}$ |
|  | 12,050 | 286 |  |  |  |
|  |  |  |  |  |  |

## ITE MULTI-USE PROJECT INTERNAL CAPTURE WORKSHEET

## (Source: Chapter 7, ITE Trip Generation Handbook, June 2004

Project Number: 068200009
Project Name: Hunt Communities LLC TIA


| NET EXTERNAL TRIPS FOR MULTI-USE DEVELOPMENT |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Category | Land Use |  |  |  | Total |
|  | A | B | C | D |  |
| Enter | 5,391 | 295 | 6,724 | 0 | 12,410 |
| Exit | 5,548 | 264 | 6,598 | 0 | 12,410 |
| Total | 10,939 | 559 | 13,322 | 0 | 24,820 |
| Single Use <br> Trip Gen Estimate | 12,440 | 694 | 14,944 | 0 | 28,078 |
| Overall Internal Capture $=$ |  |  |  |  |  |
|  |  |  |  | 11.60\% |  |

ITE MULTI-USE PROJECT INTERNAL CAPTURE WORKSHEET

## (Source: Chapter 7, ITE Trip Generation Handbook, June 2004)

Project Number: 068200009
Project Name: Hunt Communities LLC TIA
Scenario: TGZ 10


| NET EXTERNAL TRIPS FOR MULTI-USE DEVELOPMENT |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Category | Land Use |  |  |  | Total |
|  | A | B | C | D |  |
| Enter Exit | 1,682 | 61 | 2,251 | 0 | 3,994 |
|  | 1,733 | 55 | 2,206 | 0 | 3,994 |
| Total | 3,415 | 116 | 4,457 | 0 | 7,988 |
| Single Use <br> Trip Gen Estimate |  |  |  |  |  |
|  | 3,914 | 144 | 4,982 | 0 | 9,040 |
| Overall Internal Capture $=$ |  |  |  | 11.64\% |  |

## ITE MULTI-USE PROJECT INTERNAL CAPTURE WORKSHEET

## (Source: Chapter 7, ITE Trip Generation Handbook, June 2004

Project Number: 068200009
Project Name: Hunt Communities LLC TIA
Scenario: TGZ 11


| NET EXTERNAL TRIPS FOR MULTI-USE DEVELOPMENT |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Category | Land Use |  |  |  | Total |
|  | A | B | C | D |  |
| Enter | 11,227 | 65 | 2,445 | 0 | 13,737 |
| Exit | 11,284 | 58 | 2,395 | 0 | 13,737 |
| Total | 22,511 | 123 | 4,840 | 0 | 27,474 |
| Single Use |  |  |  |  |  |
| Trip Gen Estimate | 23,054 | 154 | 5,410 | 0 | 28,618 |
| Overall Internal Capture $=$ |  |  |  | 4.00\% |  |

## ITE MULTI-USE PROJECT INTERNAL CAPTURE WORKSHEET

## (Source: Chapter 7, ITE Trip Generation Handbook, June 2004

Project Number: 068200009
Project Name: Hunt Communities LLC TIA
Scenario: TGZ 12


NET EXTERNAL TRIPS FOR MULTI-USE DEVELOPMENT

| Category | Land Use |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | A | B | C | D |  |
| Enter | 1,811 | 1,501 | 22,364 | 0 | 25,676 |
| Exit | 1,708 | 1,342 | 22,626 | 0 | 25,676 |
| Total | 3,519 | 2,843 | 44,990 | 0 | 51,352 |
| Single Use <br> Trip Gen Estimate | 5,510 | 3,532 | 47,600 | 0 | 56,642 |
| Overall Internal Capture = 9.34\% |  |  |  |  |  |

ITE MULTI-USE PROJECT INTERNAL CAPTURE WORKSHEET

## (Source: Chapter 7, ITE Trip Generation Handbook, June 2004)

Project Number: 068200009
Project Name: Hunt Communities LLC TIA
Scenario: TGZ 13


| NET EXTERNAL TRIPS FOR MULTI-USE DEVELOPMENT |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Category | Land Use |  |  |  | Total |
|  | A | B | C | D |  |
| Enter | 8,295 | 224 | 7,893 | 0 | 16,412 |
| Exit | 8,475 | 201 | 7,736 | 0 | 16,412 |
| Total | 16,770 | 425 | 15,629 | 0 | 32,824 |
| Single Use |  |  |  | 0 |  |
| Trip Gen Estimate | 18,522 | 528 | 17,474 | 0 | 36,524 |
| Overall Internal Capture $=$ |  |  |  | 10.13\% |  |

## ITE MULTI-USE PROJECT INTERNAL CAPTURE WORKSHEET

## (Source: Chapter 7, ITE Trip Generation Handbook, June 2004

Project Number: 068200009
Project Name: Hunt Communities LLC TIA
Scenario: TGZ 14


| NET EXTERNAL TRIPS FOR MULTI-USE DEVELOPMENT |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Category | Land Use |  |  |  | Total |
|  | A | B | C | D |  |
| Enter | 2,777 | 421 | 13,693 | 0 | 16,891 |
| Exit | 2,795 | 376 | 13,720 | 0 | 16,891 |
| Total | 5,572 | 797 | 27,413 | 0 | 33,782 |
| Single Use <br> Trip Gen Estimate | 8,320 | 990 | 30,334 | 0 | 39,644 |
|  | verall I | rnal | pture $=$ |  |  |

# CONCEPTUAL DRAINAGE PLAN 

## FOR $\pm 4,900$ ACRE MASTER PLAN COMMUNITY

City of El Paso, Texas

Prepared for:
Hunt Communities GP, LLC
4401 North Mesa
El Paso, Texas 79902-1107

Prepared by:
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## 1. Introduction

Kimley-Horn and Associates, Inc. (KHA) has prepared a Conceptual Drainage Plan for Hunt Communities GP, LLC (Hunt) Master Plan Community (Development). The subject tract encompasses approximately 4,900 acres in northeast El Paso, Texas. The subject tract is bound on the west by the Franklin Mountains, on the south by the North Hills and Sandstone Ranch subdivisions, on the southeast by the Patriot Freeway, and on the north and east by undeveloped land owned by the Public Service Board (PSB).

Typical drainage patterns route flow in a southeasterly manner. Runoff from the Franklin Mountains crosses the western property boundary and travels southeast across the property. Runoff from northern offsite areas flows across the northern property boundary where it combines with the runoff from the Franklin Mountains. Runoff from offsite areas located to the south and east of the property flow through the Western and Eastern Freeway Channels to the outfall of the subject tract. The outfall of the subject tract is located at the Patriot Freeway approximately 2,800 feet northeast of the Patriot Freeway intersection with McCombs Street. The outfall is the upstream extent of the Greenbelt Levee System (GLS).

An existing condition analysis of the subject tract and the surrounding watershed was prepared by CEA Engineering Group in October 2006. KHA reviewed the available information and was unable to verify the watershed mapping, modeling assumptions, and hydrologic parameters in the CEA study. In addition, the City of El Paso has established new drainage criteria for the region. Therefore, KHA performed a new existing condition drainage analysis.

The purpose of this study is to propose a conceptual drainage plan for the Development. The proposed improvements meet the criteria set in the City of El Paso Drainage Design Manual (DDM), dated June 2008, and additional criteria established specifically for this site. The improvements have been designed to not increase the 100-year peak flow and volume at the GLS from its existing condition.

## 2. Methodology

Two Drainage Area Maps were created for the watershed draining to the GLS: an existing condition map and a proposed condition map. The watershed was delineated using 1-foot aerial topography of the subject tract and USGS topography for offsite areas. The available topography was supplemented with construction plans for the Sandstone Ranch subdivision, Eastern Freeway Channel, and Western Freeway Channel to create a drainage area map for the entire watershed. The proposed drainage area boundaries have been modified from the existing condition based on the location of proposed land uses, roadways, and improvements. The proposed boundaries are conceptual and assume a full build-out of the subject tract.

Hydrologic modeling was performed using PondPack v. 10.0 (Bentley Systems, Inc.). PondPack was selected in anticipation of interconnected ponds in the proposed condition. Peak flows were calculated using TR-55 methodology developed by the Natural Resources Conservation Service (NRCS). Soil types within the watershed were evaluated based on the NRCS Web Soil Survey and were found to consist of Type B, Type C, and Type D soils. Curve Number (CN) values for existing land uses were based on field observations and aerial photography. CN values for proposed land uses are based on maximum amount of allowable impervious cover for each land use. All CN values have been calculated using methodology described in the DDM. CN values for the drainage areas included in this study are shown in Appendix A of this report.

The times of concentration for undeveloped basins were calculated using the Kirpich Method in accordance with the DDM. The Kirpich Method is recommended for mountainous areas (Maidment, 1993) and for determining times of concentration for areas in which flow regimes are difficult to classify. The Kirpich formula is used for perennial, intermittent, and disappearing streams as described in the DDM.
Methodology described in TR-55 was used to calculate the time of concentration for developed areas within the watershed. The development of property in this watershed significantly aligns the characteristics of runoff across the property. The TR-55 methodology breaks the time of concentration into three flow regimes: overland flow, shallow concentrated flow, and concentrated flow. Based on these flow regimes, the TR-55 methodology provides additional precision for time of concentration calculations. Times of concentration for each drainage area are shown in Appendix A of this report.

Open channels and flow paths were modeled in the hydrologic model using the Muskingum method. Physical parameters of existing channels and flow paths were established based on field observations and aerial topography. Physical parameters of proposed channels were established based on conceptual channel design.

Existing and proposed condition peak flows and runoff volumes were evaluated for the 100-year storm event. An NRCS Type II-75 rainfall distribution and 24 -hour rainfall depth of 3.34 inches were used as required by the DDM. Existing and proposed condition peak flows for the 100 -year storm event for drainage areas and hydrologic model junction points included in the study are shown on sheet two of the drainage area maps in Appendix C. Hydrologic parameters used for the hydrologic models are included in Appendix A.

## 3. Existing Drainage Patterns

The Franklin Mountains are located immediately west of the subject tract. Runoff from the mountains is concentrated in well defined channels and flows towards the western property boundary. In the vicinity of the western property boundary the channels lose definition and runoff spreads across an alluvial fan before it is concentrated in several small defined flow paths. The flow paths convey flow across the site in an easterly direction towards Martin Luther King, Jr. Boulevard (MLK). Fourteen sets of existing box culverts route flow across MLK on the subject property.

Downstream of the MLK culverts, runoff continues to flow in an easterly direction towards McCombs Street. The defined flow paths dissipate through the middle of the site. At McCombs Street, five existing corrugated metal pipe culverts convey flow across the road. Historical evidence indicates that McCombs Street overtops during large storm events.

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Runoff from areas north of the subject tract and west of McCombs Street enters the subject tract at various locations along the northern property boundary. This offsite runoff is routed through the subject tract to McCombs Street by flow paths near the northern property boundary.

Runoff from areas north of the subject tract and east of McCombs Street enters the subject tract at various locations along the northeast property boundary. This offsite runoff is conveyed through the Painted Dunes Golf Course to the GLS. A portion of the offsite runoff is also conveyed through the Eastern Freeway Channel.

No offsite runoff from areas south of the subject tract enters the property. Runoff from the North Hills and Sandstone Ranch subdivisions is routed to the Western Freeway Channel.

Runoff generally flows in a southerly direction downstream of McCombs Street. Runoff from the subject tract and the Eastern and Western Freeway Channels combine at the GLS.
Portions of the Federal Emergency Management Agency (FEMA) floodplains for Flow Paths 11, 11b, 12, 53 , and 54 are located within the property. Flow Paths 11, 54, and 53 travel from west to east across the northern, central, and southern portions of the subject tract respectively. Flow Path 11 turns south at McCombs Street and combines with Flow Path 54 before it turns east and continues to the GLS. Flow Path 53 travels along the southern property boundary and combines with the Western Freeway Channel west of McCombs Street. Flow Path 53 continues east through the Western Freeway Channel to the GLS. Flow Path 12 crosses the northeastern property boundary and flows south to the Eastern Freeway Channel where it continues on to the GLS. Flow Path 11b travels from north to south through the Painted Dunes golf course until it combines with Flow Path 11 north of the GLS.

## 4. Proposed Drainage Design

The conceptual drainage plan is proposed to meet several objectives:

- Reduce proposed 100-year peak flow and runoff volume at the GLS to its existing condition
- Reduce proposed 100-year peak flow at the McCombs Street crossing of the Western Freeway Channel to its existing condition
- Control debris entering the Development from the Franklin Mountains
- Convey runoff across the site as concentrated flow
- Capture offsite runoff and convey it to the GLS

The following conceptual infrastructure will accomplish the above objectives.

## Detention and Retention Ponds

Proposed condition 100-year peak flow and runoff volume at the outfall of the site must be less than or equal to existing condition 100-year peak flow and runoff volume to meet the requirements in the DDM. Detention ponds have been proposed to decrease the peak flow rate and retention areas have been proposed to facilitate infiltration and decrease the runoff volume. A composite detention/retention pond concept was used for the conceptual drainage design for the Development. See the Conceptual Infrastructure Exhibit in Appendix C for a figure illustrating the detention/retention pond concept.

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Preliminary geotechnical information shows the soils within the Development west of MLK have an infiltration rate range of 1-15 inches per hour and soils east of MLK have an infiltration rate range of 215 inches per hour. For conceptual design purposes, minimum infiltration rates were used in designing retention areas for the site. To meet the criteria in the DDM, detention and retention ponds must drain within 72 hours. Based on the minimum infiltration rates provided in the geotechnical information, retention depths can reach a maximum of 6 feet in areas west of MLK and 12 feet throughout the remainder of the Development. More detailed geotechnical information is anticipated for final design.

Table 1 shows the conceptual storage volumes throughout the Development. Final pond locations and sizes will be determined during final design.

Table 1: 100-Year Detention and Retention Conceptual Storage Volumes

| General Location | Retention <br> Storage (ac-ft) | Detention <br> Storage (ac-ft) |
| :---: | :---: | :---: |
| Western Property Boundary to MLK | 4.9 | 63.0 |
| MLK to Sean Haggarty | 9.1 | 54.8 |
| Sean Haggarty to McCombs | 229.5 | 357.1 |

## Dams

Two dams are proposed to be located west of the subject tract to capture runoff from the Franklin Mountains. The dams will serve the following purposes:

- Capture debris from the mountains to protect onsite drainage infrastructure
- Concentrate runoff from the mountains into two onsite channels
- Provide detention for the Development to reduce proposed peak flow

The conceptual primary spillway locations of the dams are set at the proposed channel locations. Conceptual emergency spillway locations of the dams are located adjacent to proposed open space areas. Conceptual dam sizes assume $3: 1$ side slopes and a top of dam elevation equal to approximately 10 feet above the adjacent downstream existing ground. The conceptual design assumptions will be verified during final design of the structures.

Table 2 shows conceptual sizing information for the proposed dams.
Table 2: Conceptual Dam Design

| Dam Name | Provided Storage <br> (ac-ft) | Peak 100- <br> Year Inflow <br> (cfs) | Peak 100-Year <br> Outflow (cfs) |
| :---: | :---: | :---: | :---: |
| Dam 1 | 314 | 4,130 | 130 |
| Dam 2 | 410 | 5,805 | 150 |

The conceptual dams will be designed to meet the Texas Commission on Environmental Quality (TCEQ) design criteria. The dams will need to be sized for a Probable Maximum Precipitation (PMP) storm event. A PMP analysis has not yet been performed. The conceptual dam storage shown above is approximately double the storage required to convey the 100 -year storm event. Additional storage will be provided if a PMP analysis shows it is required.

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Due to the proposed dams' proximity to residential development and a potential loss of life and property during a dam breach, the dams will be classified as high hazard dams by TCEQ. The dams will require a dam breach analysis and an Emergency Action Plan (EAP) per TCEQ requirements for high hazard dams.

## Channels

Four main channels are proposed to convey flow across the Development. Conceptual channel locations are shown on the proposed Infrastructure Exhibit. The North, Central, and South Channels will convey flow across the Development from west to east. The McCombs Channel will convey flow from north to south parallel to McCombs Street. The North Channel will convey the outflow of Dam 2, offsite runoff entering the site from the north, and onsite runoff from the northern portion of the Development. The Central Channel will convey the outflow of Dam 1 and onsite runoff from the central portion of the Development. The South Channel will convey onsite runoff from the southern portion of the Development. The North and Central Channels will convey flow to the McCombs Channel. The South Channel will convey runoff to the existing Western Freeway Channel. Onsite flow on the eastern portion of the Development will be routed to the existing Eastern Freeway Channel. The McCombs Channel, Western Freeway Channel, and Eastern Freeway Channel all converge at the outfall of the Development at the Greenbelt Levee System.

Conceptual channel cross sectional geometry is designed to allow the 10 -year storm flows to pass through the main channel. The 50- and 100-year flows will inundate channel shelves sloped towards the main channel. The channel shelves will be open to the public as park areas. Typical cross sections were designed using Bentley's Flowmaster computer program. Flowmaster output can be seen as electronic PDF documents on the CD with this report. Typical cross sections of the proposed channels can be seen on the Conceptual Infrastructure Exhibit in Appendix C. The conceptual channels are proposed to be naturally lined where feasible. The final channels will be designed in conjunction with a geotechnical study to determine a channel geometry and slope stabilization design that is appropriate for the soil conditions within the Development.

Existing ground slopes range from approximately $0.5 \%$ to approximately $3.0 \%$ within the development. Drop structures are anticipated to be placed at intervals along the length of the conceptual channels to maintain channel slopes and velocities appropriate for natural channels. The exact locations and dimensions of the drop structures will be determined during final design of the channels.

FEMA Flow Paths 11, 11b, 54, 53, and 12 will be impacted by the Development. Flow Paths 11, 54, and 53 will be associated with the North, Central, and South Channels respectively. Flow Paths 11 b and 12 are not associated with a specific proposed channel. Per currently published City criteria, FEMA approval of Conditional Letter of Map Revision (CLOMR) applications for each of these FEMA flow paths will be required before construction can occur within the effective floodplain boundary. Letter of Map Revision (LOMR) applications for the affected flow paths will need to be approved by FEMA before final approval by the City of El Paso is granted for building occupancy.

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## Crossings

Culvert and bridge crossings will be required for all vehicle and pedestrian crossings over open channels. Conceptual crossing sizes for anticipated roadway crossings over main channels have been designed using the 100 -year storm. Bentley's PondPack and Culvertmaster computer programs were used to determine culvert sizes. Table 3 shows crossing sizes and locations of the conceptually designed crossings.

Table 3: Conceptual Crossing Sizes

| Crossing Name | Conceptual Size | Anticipated 100-Year <br> Peak Flow (cfs) |
| :---: | :---: | :---: |
| Crossing 1 | $3-7^{\prime} \times 6^{\prime} \mathrm{RBC}$ | 1,350 |
| Crossing 2 | $3-8^{\prime} \times 8^{\prime} \mathrm{RBC}$ | 1,705 |
| Crossing 3 | $1-24^{\prime \prime} \mathrm{RCP}$ | 40 |
| Crossing 4 | $7-8^{\prime} \times 8^{\prime} \mathrm{RBC}$ | 4,035 |
| Crossing 5 | $4-8^{\prime} \times 8^{\prime} \mathrm{RBC}$ | 2,700 |
| Crossing 6 | $1-7^{\prime} \times 6^{\prime} \mathrm{RBC}$ | 510 |
| Crossing 7 | $3-6^{\prime} \times 3^{\prime} \mathrm{RBC}$ | 755 |
| Crossing 8 | $11-8^{\prime} \times 8^{\prime} \mathrm{RBC}$ | 6,380 |
| Crossing 9 | $13-8^{\prime} \times 8^{\prime} \mathrm{RBC}$ | 6,195 |
| Crossing 10 | $10-8^{\prime} \times 8^{\prime} \mathrm{RBC}$ | 6,545 |
| Crossing 11 | $5-6^{\prime} \times 6^{\prime} \mathrm{RBC}$ | 1,375 |
| Crossing 12 | $4-48^{\prime \prime} \mathrm{RCP}$ | 295 |
| Crossing 13 | $3-6^{\prime} \times 3^{\prime} \mathrm{RBC}$ | 755 |
| Crossing 14 | $3-6^{\prime} \times 3^{\prime} \mathrm{RBC}$ | 755 |

Sizes of additional crossings are anticipated to be similar to the crossings listed above. See the Conceptual Infrastructure Exhibit in Appendix C for locations of the proposed crossings.

## 5. Results

The 100-year existing and proposed condition peak flow and runoff volume for the channels combining at the GLS are shown in Table 4.

Table 4: 100 -Year Peak Flow and Volume

| Existing Condition |  |  |  | Proposed Condition |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Notes |  |  |  |  |  |  |
|  | Peak <br> Flow <br> (cfs) | Runoff <br> Volume <br> (ac-ft) | Hydrologic <br> Modeling <br> Point | Peak <br> Flow <br> (cfs) | Runoff <br> Volume <br> (ac-ft) |  |
| J-E19 | 5,193 | 1,159 | J-H12c | 5,157 | 1,231 | Western Freeway Channel |
| J-F5 | 9,742 | 2,123 | J-H15a | 6,534 | 1,980 | FEMA Flow Path \#11 <br> (McCombs Channel) |
| J-G2 | 760 | 83 | J-H15d | 1,282 | 123 | Eastern Freeway Channel |
| GLS | $\mathbf{1 0 , 2 2 3}$ | $\mathbf{3 , 3 6 5}$ | GLS | $\mathbf{9 , 0 7 7}$ | $\mathbf{3 , 3 5 9}$ | Greenbelt Levee System; <br> outfall of Development |

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Preliminary results indicate an increase in peak flow for the Eastern Freeway Channel as seen in Table 4. Preliminary FlowMaster calculations show the Eastern Freeway Channel has capacity to convey the increased flow.

## 6. Conclusion

The conceptual drainage improvements reduce the proposed condition peak flow and runoff volume at the outfall of the site to less than existing condition. A combination of dams, channels and culvert crossings, and detention/retention ponds are proposed to meet the requirements of the DDM. The final location and design of the conceptual drainage infrastructure will be determined during the final design of the Development.

This Conceptual Drainage Plan is being submitted as part of an Amended Land Study. Due to the preliminary nature of this study, there is potential that the design presented in this study will change during final design and construction.

Upon approval of this Conceptual Drainage Plan, KHA will start work on a construction phasing plan to ensure that the requirements detailed in this report are maintained throughout the construction of the development, detailed dam design, and CLOMR submittals to FEMA.

Kimley-Horn
and Associates, Inc.

## Appendix A:

## Hydrologic Parameters

Existing Condition
Proposed Condition

## Existing Condition

| Curve Number Table |  |  |  |
| :---: | :---: | :---: | :---: |
| EXISTING WATERSHED CONDITIONS |  |  |  |
| CN Description | Soil Type B | Soil Type C | Soil Type D |
| Desert Shrub - Poor Condition | 77 | 85 | 88 |
| Paved parking lots, roofs, driveways, etc. | 98 | 98 | 98 |
| Natural Desert Landscaping | 77 | 85 | 88 |
| Industrial | 92 | 94 | 95 |
| Open Space (Good Condition) | 61 | 74 | 80 |
| Existing Single Family | 90 | 93 | 94 |
| Commercial | 92 | 94 | 95 |
| Mountainous Terrain | 92 | 94 | 95 |

## Notes:

1. Curve Numbers for areas designated as industrial were computed using $72 \%$ impervious area and $28 \%$ desert shrub in poor condition.
2. Curve Numbers for areas designated as existing single family were computed using $60 \%$ impervious area and $40 \%$ natural desert landscaping
3. Per currently published City of El Paso Drainage Criteria, Rational Method "c" factors for Mountainous Terrain and Commercial land uses are generally consistent. KHA assumes that Curve Numbers for Mountainous Terrain and Commercial land uses will also be consistent.
4. Curve Numbers were obtained from Tables 2-2a through 2-2d of Technical Resource 55 (TR-55) by the National Resource Conservation Service (NRCS).

| WATERSHED PHYSICAL CONDITIONS: AREA AND CURVE NUMBER |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| EXISTING WATERSHED CONDITIONS |  |  |  |  |
| Basin | Area | Soil Group \% | Weighted CN | CN Description |
|  | Acres |  |  |  |
| A1 | 2879 | 100\% D | 95 | 99\% Mountainous Terrain 1\% Streets and Roads |
| A2 | 759 | 85\% D + 15\% B | 93 | 85\% Mountainous Terrain 14\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| A3 | 55 | 100\% D | 95 | Mountainous Terrain |
| A4 | 20 | 100\% D | 95 | Mountainous Terrain |
| A5 | 4 | 100\% D | 95 | Mountainous Terrain |
| A6 | 194 | 95\% D + 5\% C | 89 | 10\% Mountainous Terrain 89\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| A7 | 56 | 65\% D + 35\% B | 85 | 5\% Mountainous Terrain <br> 94\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| A8 | 96 | $35 \%$ D + $65 \%$ B | 84 | 35\% Mountainous Terrain <br> 62\% Desert Shrub - Poor Condition 3\% Streets and Roads |
| A9 | 181 | 60\% D +40\% B | 88 | 60\% Mountainous Terrain 39\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| A10 | 121 | $35 \%$ D + 65\% B | 84 | 35\% Mountainous Terrain <br> 63\% Desert Shrub - Poor Condition 2\% Streets and Roads |
| A11 | 303 | 15\% D + 85\% B | 79 | 99\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| A12 | 27 | 100\% B | 77 | 99\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| A13 | 143 | 5\% D + 95\% B | 78 | 99\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| A14 | 528 | 15\% D + 85\% B | 83 | 71\% Desert Shrub - Poor Condition 19\% Industrial <br> 9\% Ponded Water Surface 1\% Streets and Roads |
| A15 | 147 | 100\% B | 77 | Desert Shrub - Poor Condition |
| A16 | 241 | 5\% C + 95\% B | 78 | 99\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| A17 | 165 | 100\% B | 77 | 100\% Desert Shrub - Poor Condition |
| A18 | 33 | 100\% B | 77 | 100\% Desert Shrub - Poor Condition |
| A19 | 81 | 100\% B | 78 | 97\% Desert Shrub - Poor Condition 3\% Streets and Roads |
| A20 | 126 | 100\% B | 77 | $\qquad$ |

Notes:

1. Areas designated as streets and roads reflect the impervious cover of MLK, McCombs, and Stan Roberts Sr .

| WATERSHED PHYSICAL CONDITIONS: AREA AND CURVE NUMBER |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| EXISTING WATERSHED CONDITIONS |  |  |  |  |
| Basin | Area | Soil Group \% | Weighted CN | CN Description |
|  | Acres |  |  |  |
| B1 | 1085 | 100\% D | 95 | Mountainous Terrain |
| B2 | 11 | 100\% D | 95 | Mountainous Terrain |
| B3 | 79 | 100\% D | 95 | Mountainous Terrain |
| B4 | 35 | 100\% D | 95 | Mountainous Terrain |
| B5 | 345 | 100\% D | 95 | Mountainous Terrain |
| B6 | 23 | 60\% D + 40\% B | 88 | 60\% Mountainous Terrain 40\% Desert Shrub - Poor Condition |
| B7 | 86 | 70\% D + 30\% B | 90 | 70\% Mountainous Terrain 30\% Desert Shrub - Poor Condition |
| B8 | 95 | 65\% D + 35\% B | 89 | 65\% Mountainous Terrain 35\% Desert Shrub - Poor Condition |
| B9 | 75 | $35 \%$ D + 65\% B | 84 | 35\% Mountainous Terrain <br> 61\% Desert Shrub - Poor Condition 4\% Streets and Roads |
| B10 | 71 | 100\% D | 95 | Mountainous Terrain |
| B11 | 83 | 10\% D + 90\% B | 80 | 10\% Mountainous Terrain 86\% Desert Shrub - Poor Condition 4\% Streets and Roads |
| B12 | 72 | 75\% D + 25\% B | 91 | 75\% Mountainous Terrain <br> 25\% Desert Shrub - Poor Condition |
| B13 | 7 | 25\% D + 75\% B | 82 | 25\% Mountainous Terrain <br> 75\% Desert Shrub - Poor Condition |
| B14 | 107 | 5\% D + 95\% B | 79 | 5\% Mountainous Terrain <br> 92\% Desert Shrub - Poor Condition 3\% Streets and Roads |
| B15 | 132 | 5\% D + 95\% B | 78 | 5\% Mountainous Terrain <br> 94\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| B16 | 277 | 100\% B | 77 | 100\% Desert Shrub - Poor Condition |
| B17 | 173 | 100\% B | 77 | 100\% Desert Shrub - Poor Condition |
| B18 | 193 | 100\% B | 77 | 100\% Desert Shrub - Poor Condition |
| B19 | 249 | 100\% B | 77 | 99\% Desert Shrub - Poor Condition 1\% Streets and Roads |
|  |  |  |  |  |
| C1 | 290 | 100\% B | 77 | 98\% Desert Shrub - Poor Condition 2\% Streets and Roads |
| C2 | 12 | 100\% B | 80 | 85\% Desert Shrub - Poor Condition 15\% Streets and Roads |
| C3 | 137 | 100\% B | 77 | 100\% Desert Shrub - Poor Condition |
| C4 | 209 | 100\% B | 77 | 98\% Desert Shrub - Poor Condition 2\% Streets and Roads |
|  |  |  |  |  |
| D1 | 83 | 100\% B | 77 | 98\% Desert Shrub - Poor Condition 2\% Streets and Roads |
| D2 | 74 | 100\% B | 77 | 100\% Desert Shrub - Poor Condition |
| D3 | 161 | 100\% B | 78 | 97\% Desert Shrub - Poor Condition 3\% Streets and Roads |
| D4 | 275 | 100\% B | 78 | 97\% Desert Shrub - Poor Condition 3\% Streets and Roads |

Notes:

1. Areas designated as streets and roads reflect the impervious cover of MLK, McCombs, and Stan Roberts Sr .

WATERSHED PHYSICAL CONDITIONS: AREA AND CURVE NUMBER

| EXISTING WATERSHED CONDITIONS |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Basin | Area | Soil Group \% | Weighted CN | CN Description |
|  | Acres |  |  |  |
| E1 | 1470 | 85\% D + 15\% B | 92 | 85\% Mountainous Terrain 15\% Desert Shrub - Poor Condition |
| E2 | 875 | 80\% D + 20\% B | 91 | 80\% Mountainous Terrain 20\% Desert Shrub - Poor Condition |
| E3 | 912 | 100\% D | 95 | Mountainous Terrain |
| E4 | 228 | 80\% D + 20\% B | 91 | 80\% Mountainous Terrain 20\% Desert Shrub - Poor Condition |
| E5 | 382 | 85\% D + 15\% B | 93 | 85\% Mountainous Terrain <br> 14\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| E6 | 67 | 100\% B | 77 | 98\% Desert Shrub - Poor Condition 2\% Streets and Roads |
| E7 | 59 | 100\% B | 77 | 98\% Desert Shrub - Poor Condition 2\% Streets and Roads |
| E8 | 42 | 100\% B | 77 | 98\% Desert Shrub - Poor Condition 2\% Streets and Roads |
| E9 | 23 | 100\% B | 77 | 99\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| E10 | 7 | 100\% B | 78 | 93\% Desert Shrub - Poor Condition 7\% Streets and Roads |
| E11 | 9 | 100\% B | 79 | 90\% Desert Shrub - Poor Condition 10\% Streets and Roads |
| E12 | 143 | 100\% B | 90 | 95\% Existing Single Family 3\% Ponded Water Surface 2\% Streets and Roads |
| E13 | 183 | 5\% D + 95\% B | 89 | 87\% Existing Single Family 6\% Open Space - Good Condition 4\% Ponded Water Surface 3\% Streets and Roads |
| E14 | 103 | 100\% B | 77 | 100\% Desert Shrub - Poor Condition |
| E15 | 50 | 100\% B | 77 | 100\% Desert Shrub - Poor Condition |
| E16 | 104 | 100\% B | 77 | 100\% Desert Shrub - Poor Condition |
| E17 | 98 | 100\% B | 77 | Desert Shrub - Poor Condition |
| E18 | 116 | 100\% B | 77 | Desert Shrub - Poor Condition |
| E19 | 186 | 100\% B | 77 | 98\% Desert Shrub - Poor Condition 2\% Ponded Water Surface |
| E20 | 302 | 100\% B | 90 | Existing Single Family |
| E21 | 76 | 100\% B | 78 | 94\% Desert Shrub - Poor Condition 4\% Commercial 2\% Streets and Roads |
| E22 | 71 | 100\% B | 90 | Existing Single Family |
| E23 | 137 | 100\% B | 90 | 96\% Existing Single Family 4\% Ponded Water Surface |
| E24 | 86 | 100\% B | 91 | 87\% Existing Single Family 13\% Ponded Water Surface |
| E25 | 93 | 100\% B | 90 | 91\% Existing Single Family 9\% Ponded Water Surface |
| E26 | 52 | 100\% B | 90 | 91\% Existing Single Family 9\% Ponded Water Surface |
| E27 | 84 | 100\% B | 90 | 93\% Existing Single Family 7\% Ponded Water Surface |
| E28 | 11 | 100\% B | 91 | 82\% Existing Single Family 18\% Ponded Water Surface |
| E29 | 34 | 100\% B | 90 | 94\% Existing Single Family 6\% Ponded Water Surface |
| NHB1 | 22 | 100\% B | 98 | Ponded Water Surface |
| NHB2 | 29 | 10\% D + 90\% B | 98 | Ponded Water Surface |

## Notes:

1. Areas designated as streets and roads reflect the impervious cover of MLK, McCombs, and Stan Roberts Sr .

| WATERSHED PHYSICAL CONDITIONS: AREA AND CURVE NUMBER |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| EXISTING WATERSHED CONDITIONS |  |  |  |  |
| Basin | Area | Soil Group \% | Weighted CN | CN Description |
|  | Acres |  |  |  |
| F1 | 812 | $5 \%$ C + 95\% B | 78 | 96\% Desert Shrub - Poor Condition 3\% Industrial 1\% Streets and Roads |
| F2 | 26 | 100\% B | 78 | 91\% Desert Shrub - Poor Condition 8\% Industrial <br> 1\% Streets and Roads |
| F3 | 167 | 100\% B | 75 | 74\% Desert Shrub - Poor Condition 18\% Open Space - Good Condition 7\% Industrial 1\% Streets and Roads |
| F4 | 427 | 100\% B | 77 | 85\% Desert Shrub - Poor Condition 9\% Open Space - Good Condition 5\% Industrial 1\% Streets and Roads |
| F5 | 122 | 100\% B | 77 | 98\% Desert Shrub - Poor Condition 1\% Open Space - Good Condition $1 \%$ Streets and Roads |
| F6 | 466 | 100\% B | 79 | 85\% Desert Shrub - Poor Condition 14\% Industrial <br> 1\% Streets and Roads |
|  |  |  |  |  |
| G1 | 310 | 100\% B | 77 | 99\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| G2 | 109 | 100\% B | 77 | 93\% Desert Shrub - Poor Condition 4\% Ponded Water Surface <br> 3\% Open Space - Good Condition |
| G3 | 56 | 100\% B | 78 | 95\% Desert Shrub - Poor Condition 5\% Ponded Water Surface |
| G4 | 42 | 100\% B | 78 | 95\% Desert Shrub - Poor Condition 5\% Ponded Water Surface |
| G5 | 123 | 100\% B | 77 | 98\% Desert Shrub - Poor Condition 2\% Ponded Water Surface |
| G6 | 118 | 100\% B | 77 | Desert Shrub - Poor Condition |

Notes:

1. Areas designated as streets and roads reflect the impervious cover of MLK, McCombs, and Stan Roberts Sr .
2. Areas F3, F4, F5, and G2 include an existing golf course with sections considered grass cover in good condition.

HYDROLOGIC MODEL ROUTES


Notes:

1. Open channel flow was modeled using Muskingum methodology. The " $K$ " parameter represents the travel time within the channel based on a measured channel length and an assumed channel velocity determined in time of concentration calculations. The "X" parameter represents the level of attenuation experienced in the reach on a scale of 0.1 to 0.5 with 0.5 having little to no attenuation and 0.1 having a large amount of attenuation.
2. Enclosed storm sewer flow was modeled using a standard lag methodology that does not account for attenuation.

HYDROLOGIC MODEL ROUTES

| Route ID | Upstream Junction | Downstream Junction | Length | $\mathrm{V}_{\text {avg }}$ | K | X |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | (ft) | (fps) | (hr) |  |
| REACH D1 | J-D1 | J-D2 | 3831 | 2.9 | 0.36 | 0.1 |
| REACH D2 | J-D2 | J-D3 | 3573 | 2.9 | 0.35 | 0.1 |
| REACH D3 | J-D3 | J-D4 | 3234 | 2.6 | 0.35 | 0.1 |
| REACH D4 | J-D4 | J-F5 | 2621 | 2.1 | 0.34 | 0.1 |
|  |  |  |  |  |  |  |
| REACH E5 | J-E5 | J-E20 | 2491 | 24.6 | 0.03 | 0.4 |
| REACH E6 | J-E6 | J-E14 | 5126 | 3.2 | 0.45 | 0.1 |
| REACH E7 | J-E7 | J-E15 | 2902 | 3.0 | 0.27 | 0.1 |
| REACH E8a | J-E8a | J-E15 | 2973 | 3.0 | 0.28 | 0.1 |
| REACH E9 | J-E9 | J-E12 | 2294 | 24.6 | 0.03 | 0.4 |
| REACH E11 | J-E11 | J-E16 | 5329 | 3.4 | 0.44 | 0.1 |
| REACH E12 | J-E12 | J-E13 | 2287 | 24.6 | 0.03 | 0.4 |
| REACH E13 | J-E13 | J-E5 | 781 | 24.6 | 0.01 | 0.4 |
| REACH E14 | J-E14 | J-E19 | 7347 | 2.8 | 0.73 | 0.1 |
| REACH E15 | J-E15 | J-E16 | 2909 | 3.4 | 0.24 | 0.1 |
| REACH E16 | J-E16 | J-E17 | 2854 | 3.2 | 0.25 | 0.1 |
| REACH E17 | J-E17 | J-E18 | 1061 | 3.0 | 0.10 | 0.1 |
| REACH E18 | J-E18 | J-E19 | 1558 | 2.8 | 0.15 | 0.1 |
| REACH E19 | J-E19 | GLS | 2982 | 1.9 | 0.44 | 0.1 |
| REACH E20 | J-E20 | J-E21 | 432 | 5.5 | 0.02 | 0.4 |
| REACH E21 | J-E21 | J-E24 | 1809 | 5.5 | 0.09 | 0.4 |
| REACH E22 | J-E22 | J-E23 | 2364 | 5.5 | 0.12 | 0.1 |
| REACH E23 | J-E23 | J-E25 | 1640 | 5.5 | 0.08 | 0.4 |
| REACH E24 | J-E24 | J-E23 | 893 | 5.5 | 0.05 | 0.4 |
| REACH E25 | J-E25 | J-E26 | 978 | 5.5 | 0.05 | 0.4 |
| REACH E26 | J-E26 | J-E27 | 1282 | 5.5 | 0.06 | 0.4 |
| REACH E27 | J-E27 | J-E28 | 479 | 5.5 | 0.02 | 0.4 |
| REACH E28 | J-E28 | J-E29 | 633 | 5.5 | 0.03 | 0.4 |
| REACH E29 | J-E29 | J-E19 | 1075 | 2.8 | 0.11 | 0.4 |
| REACH NHB2 | Basin NHB 2 | J-E13 | 2844 | 36-inch RCP Culvert Pond Outfall |  |  |
|  |  |  |  |  |  |  |
| REACH F1a | J-F1a | J-F2a | 620 | 2.0 | 0.08 | 0.1 |
| REACH F2a | J-F2a | J-F3 | 2786 | 2.2 | 0.35 | 0.1 |
| REACH F3a | J-F3a | J-F4 | 4176 | 2.7 | 0.43 | 0.1 |
| REACH F4 | J-F4 | J-F5 | 729 | 2.1 | 0.10 | 0.1 |
| REACH F6 | J-F6 | J-F4 | 6734 | 2.7 | 0.70 | 0.1 |
|  |  |  |  |  |  |  |
| REACH G1 | J-G1 | J-G5 | 2310 | 5.3 | 0.12 | 0.1 |
| REACH G2 | J-G2 | GLS | 407 | 1.9 | 0.06 | 0.4 |
| REACH G3 | J-G3 | J-G2 | 2359 | 5.3 | 0.12 | 0.4 |
| REACH G4 | J-G4 | J-G3 | 1193 | 5.3 | 0.06 | 0.4 |
| REACH G5 | J-G5 | J-G4 | 1403 | 5.3 | 0.07 | 0.4 |
| REACH G6 | J-G6 | J-G5 | 931 | 5.3 | 0.05 | 0.4 |

Notes:

1. Open channel flow was modeled using Muskingum methodology. The " $K$ " parameter represents the travel time within the channel based on a measured channel length and an assumed channel velocity determined in time of concentration calculations.
The "X" parameter represents the level of attenuation experienced in the reach on a scale of 0.1 to 0.5 with 0.5 having little to no attenuation and 0.1 having a large amount of attenuation
2. Enclosed storm sewer flow was modeled using a standard lag methodology that does not account for attenuation.

Existing Basin Time of Concentrations

| Existing Basin Time of Concentrations |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Basin | Methodology | Upstream Elevation | Downstream Elevation | Length | Slope | Time Of Concentration |
|  |  |  |  | (ft) | (ft/ft) | (min) |
| A1 | Kirpich | 5377 | 4135 | 26861 | 0.046 | 66 |
| A2 | Kirpich | 4820 | 4110 | 13001 | 0.055 | 35 |
| A3 | Kirpich | 4720 | 4285 | 3935 | 0.111 | 11 |
| A4 | Kirpich | 4372 | 4268 | 1696 | 0.061 | 10 |
| A5 | Kirpich | 4320 | 4280 | 891 | 0.045 | 10 |
| A6 | Kirpich | 4362 | 4112 | 7292 | 0.034 | 27 |
| A7 | Kirpich | 4315 | 4112 | 5565 | 0.036 | 21 |
| A8 | Kirpich | 4300 | 4105 | 5786 | 0.034 | 23 |
| A9 | Kirpich | 4277 | 4097 | 6416 | 0.028 | 26 |
| A10 | Kirpich | 4277 | 4095 | 5422 | 0.034 | 22 |
| A11 | Kirpich | 4135 | 4050 | 6820 | 0.012 | 38 |
| A12 | Kirpich | 4110 | 4072 | 2064 | 0.018 | 13 |
| A13 | Kirpich | 4110 | 4040 | 5490 | 0.013 | 31 |
| A14 | Kirpich | 4130 | 4035 | 9258 | 0.010 | 52 |
| A15 | Kirpich | 4055 | 4021 | 6256 | 0.005 | 50 |
| A16 | Kirpich | 4062 | 4003 | 5969 | 0.010 | 37 |
| A17 | Kirpich | 4101 | 4024 | 6676 | 0.012 | 38 |
| A18 | Kirpich | 4040 | 4016 | 2968 | 0.008 | 24 |
| A19 | Kirpich | 4025 | 4002 | 4008 | 0.006 | 33 |
| A20 | Kirpich | 4029 | 4000 | 5212 | 0.006 | 41 |
|  |  |  |  |  |  |  |
| B1 | Kirpich | 6927 | 4251 | 16176 | 0.165 | 27 |
| B2 | Kirpich | 4316 | 4272 | 908 | 0.048 | 10 |
| B3 | Kirpich | 4800 | 4248 | 6271 | 0.088 | 17 |
| B4 | Kirpich | 4490 | 4250 | 3467 | 0.069 | 12 |
| B5 | Kirpich | 5700 | 4256 | 8482 | 0.170 | 16 |
| B6 | Kirpich | 4399 | 4245 | 2018 | 0.076 | 10 |
| B7 | Kirpich | 4580 | 4250 | 5048 | 0.065 | 16 |
| B8 | Kirpich | 4700 | 4253 | 6659 | 0.067 | 19 |
| B9 | Kirpich | 4281 | 4099 | 5601 | 0.032 | 23 |
| B10 | Kirpich | 4281 | 4164 | 2758 | 0.042 | 12 |
| B11 | Kirpich | 4200 | 4103 | 4117 | 0.024 | 20 |
| B12 | Kirpich | 4255 | 4162 | 3207 | 0.029 | 15 |
| B13 | Kirpich | 4254 | 4225 | 994 | 0.029 | 10 |
| B14 | Kirpich | 4234 | 4110 | 4781 | 0.026 | 22 |
| B15 | Kirpich | 4256 | 4114 | 5759 | 0.025 | 25 |
| B16 | Kirpich | 4104 | 4008 | 8353 | 0.011 | 46 |
| B17 | Kirpich | 4115 | 4033 | 5626 | 0.015 | 31 |
| B18 | Kirpich | 4120 | 4023 | 6633 | 0.015 | 34 |
| B19 | Kirpich | 4083 | 3999 | 9072 | 0.009 | 53 |
|  |  |  |  |  |  |  |
| C1 | Kirpich | 4485 | 4122 | 9458 | 0.038 | 32 |
| C2 | Kirpich | 4155 | 4119 | 1797 | 0.020 | 10 |
| C3 | Kirpich | 4122 | 4038 | 5290 | 0.016 | 28 |
| C4 | Kirpich | 4059 | 3990 | 7304 | 0.009 | 45 |

Existing Basin Time of Concentrations

| Existing Basin Time of Concentrations |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Basin | Methodology | Upstream Elevation | Downstream Elevation | Length | Slope | Time Of Concentration |
|  |  |  |  | (ft) | (ft/ft) | (min) |
| D1 | Kirpich | 4333 | 4123 | 6967 | 0.030 | 27 |
| D2 | Kirpich | 4123 | 4059 | 3907 | 0.016 | 22 |
| D3 | Kirpich | 4080 | 4013 | 5174 | 0.013 | 30 |
| D4 | Kirpich | 4036 | 3982 | 5897 | 0.009 | 38 |
|  |  |  |  |  |  |  |
| E1 | Kirpich | 6927 | 4212 | 16255 | 0.167 | 27 |
| E2 | Kirpich | 6440 | 4204 | 17717 | 0.126 | 32 |
| E3 | Kirpich | 6200 | 4200 | 18681 | 0.107 | 36 |
| E4 | Kirpich | 4650 | 4220 | 8094 | 0.053 | 25 |
| E5 | Kirpich | 4900 | 4100 | 14235 | 0.056 | 37 |
| E6 | Kirpich | 4272 | 4121 | 5241 | 0.029 | 22 |
| E7 | Kirpich | 4277 | 4128 | 5390 | 0.028 | 23 |
| E8 | Kirpich | 4224 | 4130 | 3270 | 0.029 | 15 |
| E9 | Kirpich | 4224 | 4133 | 2976 | 0.031 | 14 |
| E10 | Kirpich | 4173 | 4130 | 1391 | 0.031 | 10 |
| E11 | Kirpich | 4159 | 4133 | 1015 | 0.026 | 10 |
| E12 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 24 |
| E13 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 26 |
| E14 | Kirpich | 4128 | 4040 | 5148 | 0.017 | 27 |
| E15 | Kirpich | 4128 | 4068 | 2975 | 0.020 | 17 |
| E16 | Kirpich | 4131 | 4025 | 5430 | 0.020 | 26 |
| E17 | Kirpich | 4101 | 4000 | 7426 | 0.014 | 39 |
| E18 | Kirpich | 4074 | 3989 | 6952 | 0.012 | 39 |
| E19 | Kirpich | 4040 | 3966 | 7475 | 0.010 | 44 |
| E20 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 32 |
| E21 | Kirpich | 4088 | 4020 | 3320 | 0.020 | 18 |
| E22 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 22 |
| E23 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 27 |
| E24 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 19 |
| E25 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 25 |
| E26 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 20 |
| E27 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 20 |
| E28 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 15 |
| E29 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 17 |
| NHB 1 | Kirpich | 4227 | 4198 | 1883 | 0.015 | 13 |
| NHB 2 | Kirpich | 4225 | 4175 | 3114 | 0.016 | 19 |


| Existing Basin Time of Concentrations |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Basin | Methodology | Upstream Elevation | Downstream Elevation | Length | Slope | Time Of Concentration |
|  |  |  |  | (ft) | (ft/ft) | (min) |
| F1 | Kirpich | 4075 | 4000 | 11274 | 0.007 | 69 |
| F2 | Kirpich | 4022 | 3999 | 3186 | 0.007 | 26 |
| F3 | Kirpich | 4022 | 3986 | 5557 | 0.006 | 43 |
| F4 | Kirpich | 4037 | 3967 | 9078 | 0.008 | 56 |
| F5 | Kirpich | 3983 | 3964 | 3084 | 0.006 | 27 |
| F6 | Kirpich | 4075 | 4010 | 10711 | 0.006 | 71 |
|  |  |  |  |  |  |  |
| G1 | Kirpich | 4075 | 4007 | 10502 | 0.006 | 70 |
| G2 | Kirpich | 4022 | 3965 | 8157 | 0.007 | 54 |
| G3 | Kirpich | 4016 | 3969 | 4999 | 0.009 | 34 |
| G4 | Kirpich | 4016 | 3980 | 4176 | 0.009 | 29 |
| G5 | Kirpich | 4021 | 3994 | 4683 | 0.006 | 37 |
| G6 | Kirpich | 4037 | 3999 | 4057 | 0.009 | 29 |



Note:

1. An average length of 135 feet was measured from back of lot to street frontage in existing single family developments. 40 of these 135 feet are assumed to convey runoff in shee flow with the rest in shallow concentrated flow.

The remaining length of the time of concentration path in roadways and storm facilities is considered open channel fiow.

## Proposed Condition

| Curve Number Table |  |  |  |
| :---: | :---: | :---: | :---: |
| PROPOSED WATERSHED CONDITIONS |  |  |  |
| CN Description | Soil Type B | Soil Type C | Soil Type D |
| Desert Shrub - Poor Condition | 77 | 85 | 88 |
| Paved parking lots, roofs, driveways, etc. | 98 | 98 | 98 |
| Natural Desert Landscaping | 77 | 85 | 88 |
| Industrial | 92 | 94 | 95 |
| Open Space (Good Condition) | 61 | 74 | 80 |
| Existing Single Family | 90 | 93 | 94 |
| Mixed Use/Retail | 92 | 94 | 95 |
| Paved; open ditches (including right-of-way) | 89 | 92 | 93 |
| Mountainous Terrain | 95 | 95 | 95 |
| School | 89 | 93 | 94 |
| Proposed Open Space | 78 | 86 | 89 |
| Wells | 77 | 85 | 88 |
| Type A Residential (3.5 lots per acre) | 84 | 89 | 91 |
| Type B Residential ( 5.5 lots per acre) | 87 | 91 | 93 |
| Type C Residential (7.2 lots per acre) | 89 | 93 | 94 |
| Type D Residential (12.0 lots per acre) | 92 | 94 | 95 |

Notes:

1. Curve Numbers for areas designated as industrial were computed using $72 \%$ impervious area and $28 \%$ desert shrub in poor condition.
2. Curve Numbers for areas designated as existing single family were computed using $60 \%$ impervious area and $40 \%$ natural desert landscaping.
3. Curve Numbers for areas designated as Residential Types A, B, C, and D were computed using densities of $3.5,5.5,7.2$, and 12.0 units per acre respectively. Each density corresponds to ratio of natural desert landscaping to impervious area for a specific land use. There is potential for these densities to change during final design.
4. Curve Numbers for proposed areas designated as open space assume $5 \%$ impervious area to account for potential ponded water in channels and ponds.
5. Land cover for existing wells is similar to Desert Shrub-Poor Condition; therefore, Curve Numbers for the existing wells are set equal to Curve Numbers for Desert Shrub-Poor Condition.
6. Land uses designated as Retail and all densites of Mixed Use have Curve Numbers set equal to Commercial land uses as specified in TR-55.
7. Curve Numbers were obtained from Tables 2-2a through 2-2d of Technical Resource 55 (TR-55) by the National Resource Conservation Service (NRCS).

| WATERSHED PHYSICAL CONDITIONS: AREA AND CURVE NUMBER |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| PROPOSED WATERSHED CONDITIONS |  |  |  |  |
| Basin | Area | Soil Group \% | Weighted CN | CN Description |
|  | Acres |  |  |  |
| A1 | 2879 | 100\% D | 95 | 99\% Mountainous Terrain 1\% Streets and Roads |
| A2 | 759 | 85\% D + 15\% B | 93 | 85\% Mountainous Terrain 14\% Desert Shrub - Poor Condition $1 \%$ Streets and Roads |
| A3 | 44 | 100\% D | 95 | Mountainous Terrain |
| A6 | 194 | 95\% D + 5\% C | 89 | 10\% Mountainous Terrain 89\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| A7 | 56 | 65\% D + 35\% B | 85 | 5\% Mountainous Terrain <br> 94\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| A8 | 90 | 40\% D + 60\% B | 84 | 40\% Mountainous Terrain 59\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| A9 | 49 | 80\% D +20\% B | 92 | 80\% Mountainous Terrain 19\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| A11 | 303 | 15\% D + 85\% B | 79 | 99\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| A12 | 27 | 100\% B | 77 | 99\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| A13 | 143 | $5 \%$ D $+95 \%$ B | 78 | 99\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| A14 | 528 | 15\% D + 85\% B | 83 | 71\% Desert Shrub - Poor Condition 19\% Industrial <br> 9\% Ponded Water Surface <br> 1\% Streets and Roads |
| A15 | 147 | 100\% B | 77 | Desert Shrub - Poor Condition |
| A16 | 241 | 5\% C + 95\% B | 78 | 99\% Desert Shrub - Poor Condition 1\% Streets and Roads |
|  |  |  |  |  |
| B1 | 1039 | 100\% D | 95 | Mountainous Terrain |
| B3 | 72 | 100\% D | 95 | Mountainous Terrain |
| B4 | 26 | 100\% D | 95 | Mountainous Terrain |
| B5 | 328 | 100\% D | 95 | Mountainous Terrain |
| B7 | 69 | $85 \%$ + 15\% B | 92 | 85\% Mountainous Terrain 15\% Desert Shrub - Poor Condition |
| B8 | 84 | 75\% D + 25\% B | 91 | 75\% Mountainous Terrain 25\% Desert Shrub - Poor Condition |
| DAM 1 | 25 | 45\% D + 55\% B | 98 | Ponded Water Surface |
| DAM 2 | 24 | 100\% D | 98 | Ponded Water Surface |
|  |  |  |  |  |
| C1 | 65 | 5\% D + 95\% B | 78 | Desert Shrub - Poor Condition |

Notes:

1. Areas designated as streets and roads reflect the impervious cover of MLK, McCombs, and Stan Roberts Sr .

| WATERSHED PHYSICAL CONDITIONS: AREA AND CURVE NUMBER |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| PROPOSED WATERSHED CONDITIONS |  |  |  |  |
| Basin | Area | Soil Group \% | Weighted CN | CN Description |
|  | Acres |  |  |  |
| E1 | 1470 | $85 \%$ + 15\% B | 92 | 85\% Mountainous Terrain 15\% Desert Shrub - Poor Condition |
| E2 | 875 | 80\% D + 20\% B | 91 | 80\% Mountainous Terrain 20\% Desert Shrub - Poor Condition |
| E3 | 912 | 100\% D | 95 | Mountainous Terrain |
| E4 | 228 | 80\% D + 20\% B | 91 | 80\% Mountainous Terrain 20\% Desert Shrub - Poor Condition |
| E5 | 382 | 85\% D + 15\% B | 93 | 85\% Mountainous Terrain <br> 14\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| E12 | 143 | 100\% B | 90 | 95\% Existing Single Family 3\% Ponded Water Surface 2\% Streets and Roads |
| E13 | 183 | 5\% D + 95\% B | 89 | 87\% Existing Single Family 6\% Open Space - Good Condition 4\% Ponded Water Surface 3\% Streets and Roads |
| E20 | 302 | 100\% B | 90 | Existing Single Family |
| E21 | 76 | 100\% B | 78 | 94\% Desert Shrub - Poor Condition 4\% Commercial 2\% Streets and Roads |
| E22 | 71 | 100\% B | 90 | Existing Single Family |
| E23 | 137 | 100\% B | 90 | 96\% Existing Single Family 4\% Ponded Water Surface |
| E24 | 86 | 100\% B | 91 | 87\% Existing Single Family 13\% Ponded Water Surface |
| E25 | 93 | 100\% B | 90 | 91\% Existing Single Family 9\% Ponded Water Surface |
| E26 | 52 | 100\% B | 90 | 91\% Existing Single Family 9\% Ponded Water Surface |
| E27 | 84 | 100\% B | 90 | 93\% Existing Single Family 7\% Ponded Water Surface |
| E28 | 11 | 100\% B | 91 | 82\% Existing Single Family 18\% Ponded Water Surface |
| E29 | 34 | 100\% B | 90 | 94\% Existing Single Family 6\% Ponded Water Surface |
| NHB1 | 22 | 100\% B | 98 | Ponded Water Surface |
| NHB2 | 29 | 10\% D + 90\% B | 98 | Ponded Water Surface |
|  |  |  |  |  |
| F1 | 739 | 5\% C + 95\% B | 78 | 95\% Desert Shrub - Poor Condition 4\% Industrial 1\% Streets and Roads |
| F6 | 527 | 100\% B | 80 | 81\% Desert Shrub - Poor Condition 18\% Industrial 1\% Streets and Roads |
|  |  |  |  |  |
| G1 | 352 | 100\% B | 77 | 99\% Desert Shrub - Poor Condition 1\% Streets and Roads |
| G6 | 110 | 100\% B | 77 | Desert Shrub - Poor Condition |

Notes:

1. Areas designated as streets and roads reflect the impervious cover of MLK, McCombs, and Stan Roberts Sr.

| WATERSHED PHYSICAL CONDITIONS: AREA AND CURVE NUMBER |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| PROPOSED WATERSHED CONDITIONS |  |  |  |  |
| Basin | Area | Soil Group \% | Weighted CN | CN Description |
|  | Acres |  |  |  |
| H1 | 103 | 85\% D + 15\% B | 87 | ```91% Open Space - Poor Condition 6% Wells 1% Road and ROW 2% Desert Shrub - Poor Condition``` |
| H2a | 367 | 35\% D + 65\% B | 88 | 5\% Mixed Use <br> 9\% Open Space - Poor Condition 39\% Type A Residential 26\% Type B Residential 7\% Type C Residential 5\% Type D Residential 3\% Road and ROW 4\% School <br> 2\% Desert Shrub - Poor Condition |
| H2b | 328 | 100\% B | 85 | 3\% Mixed Use <br> 9\% Open Space - Poor Condition 42\% Type A Residential 29\% Type B Residential 6\% Type C Residential 3\% Type D Residential 6\% Road and ROW <br> 2\% Desert Shrub - Poor Condition |
| H3 | 270 | 35\% D + 65\% B | 88 | 2\% Mixed Use 36\% Type A Residential 46\% Type B Residential 10\% Type C Residential 6\% Road and ROW |
| H4a | 88 | 100\% B | 89 | 22\% Mixed Use 44\% Type B Residential 24\% Type D Residential 10\% Road and ROW |
| H4b | 91 | 100\% B | 89 | 24\% Mixed Use 50\% Type B Residential 15\% Type D Residential 11\% Road and ROW |
| H5 | 216 | 100\% B | 86 | 2\% Mixed Use <br> 13\% Open Space - Poor Condition 56\% Type B Residential 12\% Type C Residential 7\% Road and ROW 7\% School 3\% Wells |
| H6 | 365 | 100\% B | 86 | 5\% Mixed Use <br> 12\% Open Space - Poor Condition 66\% Type B Residential 12\% Type C Residential 5\% Road and ROW |

## Notes:

1. Internal roads are encompassed in the zoning designations.

| WATERSHED PHYSICAL CONDITIONS: AREA AND CURVE NUMBER |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| PROPOSED WATERSHED CONDITIONS |  |  |  |  |
| Basin | Area | Soil Group \% | Weighted CN | CN Description |
|  | Acres |  |  |  |
| H7a | 345 | 100\% B | 88 | 5\% Mixed Use <br> 3\% Open Space - Poor Condition 69\% Type B Residential 15\% Type D Residential 8\% Road and ROW |
| H7b | 341 | 100\% B | 86 | 2\% Mixed Use <br> 15\% Open Space - Poor Condition 66\% Type B Residential 12\% Type D Residential 5\% Road and ROW |
| H8 | 355 | 100\% B | 86 | 1\% Mixed Use <br> 22\% Open Space - Poor Condition 40\% Type B Residential 7\% Type C Residential 8\% Type D Residential 6\% Road and ROW 14\% School 2\% Wells |
| H9 | 379 | 100\% B | 84 | 4\% Mixed Use <br> 37\% Open Space - Poor Condition 25\% Type A Residential 21\% Type C Residential 6\% Road and ROW 4\% School 3\% Wells |
| H10 | 305 | 100\% B | 84 | 4\% Mixed Use 29\% Open Space - Poor Condition 29\% Type A Residential 22\% Type B Residential 8\% Road and ROW 8\% School |
| H11a | 172 | 100\% B | 86 | 3\% Mixed Use <br> 22\% Open Space - Poor Condition 33\% Type B Residential 29\% Type C Residential 4\% Road and ROW 9\% School |
| H11b | 164 | 100\% B | 85 | 5\% Mixed Use <br> 26\% Open Space - Poor Condition 28\% Type B Residential 30\% Type C Residential 8\% Road and ROW 3\% Wells |

Notes:

1. Internal roads are encompassed in the zoning designations.

| WATERSHED PHYSICAL CONDITIONS: AREA AND CURVE NUMBER |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| PROPOSED WATERSHED CONDITIONS |  |  |  |  |
| Basin | Area | Soil Group \% | Weighted CN | CN Description |
|  | Acres |  |  |  |
| H12a | 309 | 100\% B | 90 | 45\% Mixed Use 8\% Open Space - Poor Condition 14.\% Type B Residential 22\% Type D Residential 10\% Road and ROW 1\% Wells |
| H12b | 74 | 100\% B | 89 | 74\% Retail 15\% Open Space - Poor Condition 9\% Road and ROW 2\% Wells |
| H13 | 98 | 100\% B | 85 | 12\% Mixed Use 10\% Open Space - Poor Condition 67\% Type A Residential 11\% Road and ROW |
| H14a | 43 | 100\% B | 83 | 32\% Open Space - Poor Condition 48\% Type A Residential 20\% Road and ROW |
| H14b | 121 | 100\% B | 74 | 36\% Open Space - Good Condition $33 \%$ Open Space - Poor Condition 28\% Type A Residential 3\% Road and ROW |
| H15a | 104 | 100\% B | 83 | 33\% Mixed Use <br> 4\% Open Space - Good Condition 50\% Open Space - Poor Condition 9\% Road and ROW 4\% Wells |
| H15b | 44 | 100\% B | 89 | 72\% Retail 18\% Open Space - Poor Condition 10\% Road and ROW |
| H15c | 193 | 100\% B | 72 | 1\% Mixed Use <br> 38\% Open Space - Good Condition 60\% Open Space - Poor Condition 1\% Wells |
| H15d | 36 | 100\% B | 74 | 25\% Open Space - Good Condition 72\% Open Space - Poor Condition 3\% Wells |
| H16 | 410 | 100\% B | 87 | 7\% Mixed Use <br> 9\% Open Space - Poor Condition 11\% Type A Residential 43\% Type B Residential 14\% Type C Residential 10\% Type D Residential 5\% Road and ROW $1 \%$ Wells |

## Notes:

1. Internal roads are encompassed in the zoning designations.
2. Areas H 14 b and H 15 include an existing golf course with sections considered grass cover in good condition.

| Route ID | Upstream Junction | HYDROLOG <br> Downstream Junction | EL ROU Length | Vavg | K | X |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | (ft) | (fps) | (hr) |  |
| REACH A1 | J-A1 | J-A11 | 6472 | 3.0 | 0.60 | 0.1 |
| REACH A2 | J-A2 | J-A13 | 4697 | 2.9 | 0.45 | 0.1 |
| REACH A3 | J-A3 | J-A8 | 5373 | 4.2 | 0.35 | 0.2 |
| REACH A6 | J-A6 | J-A14 | 7837 | 3.0 | 0.73 | 0.1 |
| REACH A7 | J-A7 | J-A13 | 5093 | 2.9 | 0.49 | 0.1 |
| REACH A8 | J-A8 | J-A12 | 1858 | 2.7 | 0.19 | 0.1 |
| REACH A11 | J-A11 | J-A14 | 5451 | 3.0 | 0.51 | 0.1 |
|  |  |  |  |  |  |  |
| REACH E5 | J-E5 | J-E20 | 2491 | 24.6 | 0.03 | 0.4 |
| REACH E12 | J-E12 | J-E13 | 2287 | 24.6 | 0.03 | 0.4 |
| REACH E13 | J-E13 | J-E5 | 781 | 24.6 | 0.01 | 0.4 |
| REACH E20 | J-E20 | J-E21 | 432 | 5.5 | 0.02 | 0.4 |
| REACH E21 | J-E21 | J-E24 | 1809 | 5.5 | 0.09 | 0.4 |
| REACH E22 | J-E22 | J-E23 | 2364 | 5.5 | 0.12 | 0.1 |
| REACH E23 | J-E23 | J-E25 | 1640 | 5.5 | 0.08 | 0.4 |
| REACH E24 | J-E24 | J-E23 | 893 | 5.5 | 0.05 | 0.4 |
| REACH E25 | J-E25 | J-E26 | 978 | 5.5 | 0.05 | 0.4 |
| REACH E26 | J-E26 | J-E27 | 1282 | 5.5 | 0.06 | 0.4 |
| REACH E27 | J-E27 | J-E28 | 479 | 5.5 | 0.02 | 0.4 |
| REACH E28 | J-E28 | J-E29 | 633 | 5.5 | 0.03 | 0.4 |
| REACH NHB2 | Basin NHB 2 | J-E13 | 2844 | 36-inch RCP Culvert Pond Outfall |  |  |

## Notes:

1. Open channel flow was modeled using Muskingum methodology. The "K" parameter represents the travel time within the channel based on a measured channel length and an assumed channel velocity determined in time of concentration calculations.

The " X " parameter represents the level of attenuation experienced in the reach on a scale of 0.1 to 0.5 with 0.5 having little to no attenuation and 0.1 having a large amount of attenuation.

| Route ID | Upstream Junction | HYDROLOG <br> Downstream Junction | EL ROUT Length | $\mathrm{V}_{\text {avg }}$ | K | X |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | (ft) | (fps) | (hr) |  |
| NORTH REACH 1 | DAM 1 | J-H1a | 5831 | 6.0 | 0.27 | 0.3 |
| NORTH REACH 2 | J-H1a | J-H1 | 1250 | 6.0 | 0.06 | 0.3 |
| NORTH REACH 3 | J-H1b | J-H6a | 1779 | 6.0 | 0.08 | 0.3 |
| NORTH REACH 4 | J-H6a | J-H6b | 2582 | 6.0 | 0.12 | 0.3 |
| NORTH REACH 5 | J-H6b | J-H6 | 1003 | 6.0 | 0.05 | 0.3 |
| NORTH REACH 6 | J-H6 | J-H9a | 1395 | 6.0 | 0.06 | 0.3 |
| NORTH REACH 7 | J-H9a | J-H9b | 1160 | 6.0 | 0.05 | 0.3 |
| NORTH REACH 8 | J-H9b | J-H9 | 3921 | 6.0 | 0.18 | 0.3 |
| NORTH REACH 9 | J-A16 | J-H9 | 2935 | 6.0 | 0.14 | 0.3 |
| NORTH REACH 10 | J-F1 | J-H13 | 2751 | 6.0 | 0.13 | 0.3 |
| NORTH REACH 11 | J-F6 | J-H13 | 2952 | 6.0 | 0.14 | 0.3 |
| CENTRAL REACH 1 | DAM 2 | J-H2c | 3143 | 6.0 | 0.15 | --- |
| CENTRAL REACH 2 | J-H2c | J-H2 | 3821 | 6.0 | 0.18 | 0.3 |
| CENTRAL REACH 3 | J-H2 | J-H4 | 837 | 6.0 | 0.04 | 0.3 |
| CENTRAL REACH 4 | J-H4 | J-H7 | 5396 | 6.0 | 0.25 | 0.3 |
| CENTRAL REACH 5 | J-H7 | J-H11a | 5411 | 6.0 | 0.25 | 0.3 |
| CENTRAL REACH 6 | J-H14b | J-H14a | 600 | 6.0 | 0.03 | 0.3 |
| SOUTH REACH 1 | J-H5 | J-H8 | 5290 | 6.0 | 0.24 | 0.3 |
| SOUTH REACH 2 | J-H8 | J-H12a | 4187 | 6.0 | 0.19 | 0.3 |
| SOUTH REACH 3 | J-H12a | J-H12b | 1027 | 6.0 | 0.05 | 0.3 |
| MCCOMBS REACH 4 | J-H11b | J-H15a | 3232 | 6.0 | 0.15 | 0.1 |
| EFC REACH 1 | J-G6 | J-H16 | 4200 | 5.3 | 0.22 | 0.4 |
| EFC REACH 2 | J-H16 | J-H15d | 2830 | 5.3 | 0.15 | 0.4 |
| EFC REACH 3 | J-G1 | J-G6 | 1793 | 6.0 | 0.08 | 0.4 |
| WFC REACH 1 | J-E29 | $J-H 12 b$ | 258 | 2.8 | 0.03 | 0.4 |
| WFC REACH 2 | J-H12b | J-H12c | 817 | 2.8 | 0.08 | 0.4 |
| WFC REACH 3 | J-H12c | J-H15b | 2207 | 2.8 | 0.22 | 0.4 |
| WFC REACH 4 | J-H15b | GLS | 775 | 1.9 | 0.11 | 0.1 |

## Notes:

1. Open channel flow was modeled using Muskingum methodology. The "K" parameter represents the travel time within the channel based on a measured channel length and an assumed channel velocity determined in time of concentration calculations. The " X " parameter represents the level of attenuation experienced in the reach on a scale of 0.1 to 0.5 with 0.5 having little to no attenuation and 0.1 having a large amount of attenuation.
2. Enclosed storm sewer flow was modeled using a standard lag methodology that does not account for attenuation.
3. McCombs Reaches 1-3 have are modeled as reservoirs in PondPack.

Proposed Basin Times of Concentration

| Proposed Basin Times of Concentration |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Basin | Methodology | Upstream Elevation | Downstream Elevation | Length | Slope | Time Of Concentration |
|  |  |  |  | (ft) | (ft/ft) | (min) |
| A 1 | Kirpich | 5377 | 4135 | 26861 | 0.046 | 66 |
| A 2 | Kirpich | 4820 | 4110 | 13001 | 0.055 | 35 |
| A 3 | Kirpich | 4720 | 4285 | 3935 | 0.111 | 11 |
| A 6 | Kirpich | 4362 | 4112 | 7292 | 0.034 | 27 |
| A 7 | Kirpich | 4315 | 4112 | 5565 | 0.036 | 21 |
| A 8 | Kirpich | 4300 | 4105 | 5786 | 0.034 | 23 |
| A 9 | Kirpich | 4290 | 4124 | 4084 | 0.041 | 16 |
| A 11 | Kirpich | 4135 | 4050 | 6820 | 0.012 | 38 |
| A 12 | Kirpich | 4110 | 4072 | 2064 | 0.018 | 13 |
| A 13 | Kirpich | 4110 | 4040 | 5490 | 0.013 | 31 |
| A 14 | Kirpich | 4130 | 4035 | 9258 | 0.010 | 52 |
| A 15 | Kirpich | 4055 | 4021 | 6256 | 0.005 | 50 |
| A 16 | Kirpich | 4062 | 4003 | 5969 | 0.010 | 37 |
|  |  |  |  |  |  |  |
| B 1 | Kirpich | 6927 | 4374 | 12591 | 0.203 | 21 |
| B 3 | Kirpich | 4800 | 4282 | 5542 | 0.093 | 15 |
| B 4 | Kirpich | 4490 | 4293 | 2411 | 0.082 | 10 |
| B 5 | Kirpich | 5700 | 4311 | 7029 | 0.198 | 13 |
| B 7 | Kirpich | 4580 | 4294 | 3847 | 0.074 | 12 |
| B 8 | Kirpich | 4700 | 4306 | 5525 | 0.071 | 16 |
| Dam 1 | Kirpich | 4313 | 4272 | 6180 | 0.007 | 44 |
| Dam 2 | Kirpich | 4377 | 4296 | 2046 | 0.040 | 10 |
|  |  |  |  |  |  |  |
| C 1 | Kirpich | 4485 | 4303 | 3039 | 0.060 | 11 |
|  |  |  |  |  |  |  |
| E 1 | Kirpich | 6927 | 4212 | 16255 | 0.167 | 27 |
| E 2 | Kirpich | 6440 | 4204 | 17717 | 0.126 | 32 |
| E 3 | Kirpich | 6200 | 4200 | 18681 | 0.107 | 36 |
| E 4 | Kirpich | 4650 | 4220 | 8094 | 0.053 | 25 |
| E 5 | Kirpich | 4900 | 4100 | 14235 | 0.056 | 37 |
| E 12 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 24 |
| E 13 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 26 |
| E 20 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 32 |
| E 21 | Kirpich | 4088 | 4020 | 3320 | 0.020 | 18 |
| E 22 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 22 |
| E 23 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 27 |
| E 24 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 19 |
| E 25 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 25 |
| E 26 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 20 |
| E 27 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 20 |
| E 28 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 15 |
| E 29 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 17 |
| NHB 1 | Kirpich | 4227 | 4198 | 1883 | 0.015 | 13 |
| NHB 2 | Kirpich | 4225 | 4175 | 3114 | 0.016 | 19 |

Proposed Basin Times of Concentration

| Proposed Basin Times of Concentration |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Basin | Methodology | Upstream Elevation | Downstream Elevation | Length | Slope | Time Of Concentration |
|  |  |  |  | (ft) | (ft/ft) | (min) |
| F 1 | Kirpich | 4075 | 4003 | 8682 | 0.008 | 54 |
| F 6 | Kirpich | 4075 | 4011 | 10693 | 0.006 | 71 |
|  |  |  |  |  |  |  |
| G 1 | Kirpich | 4075 | 4006 | 10567 | 0.007 | 66 |
| G 6 | Kirpich | 4037 | 4003 | 3259 | 0.010 | 23 |
|  |  |  |  |  |  |  |
| H1 | Kirpich | 4301 | 4100 | 7254 | 0.028 | 29 |
| H 2 a | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 30 |
| H 2 b | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 28 |
| H 3 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 21 |
| H4a | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 17 |
| H 4b | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 16 |
| H 5 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 24 |
| H6 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 31 |
| H7a | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 33 |
| H7b | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 32 |
| H 8 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 32 |
| H 9 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 21 |
| H 10 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 33 |
| H 11a | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 21 |
| H 11b | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 21 |
| H 12a | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 29 |
| H 12b | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 11 |
| H 13 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 15 |
| H 14a | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 23 |
| H 14b | Kirpich | 4012 | 3986 | 3870 | 0.007 | 30 |
| H15a | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 19 |
| H15b | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 15 |
| H15c | Kirpich | 3990 | 3965 | 4203 | 0.006 | 34 |
| H15d | Kirpich | 3981 | 3965 | 2921 | 0.005 | 28 |
| H16 | TR-55 | See Times of Concentration for Developed Areas |  |  |  | 40 |


| BASIN INFOR | Condition | sheEt flow:$\begin{aligned} & \mathrm{T}^{\mathrm{Tc}=\left(0.007(\mathrm{~nL})^{0.8}\right)\left(\mathrm{P}^{0.5}\right) /\left(\mathrm{s}^{0.4}\right)} \\ & \text { Slope }=1.0 \% \text { assumed for overland flow } \end{aligned}$ |  |  |  |  | $\begin{array}{\|\|l} \text { SHALLOW CONCENTRATED FLOW: } \\ \text { Slope }=1.0 \% \text { assumed for overland flow } \\ \mathrm{V}_{\text {avg }}=16.1345^{*} \text { sqrt(Slope) [unpaved] } \\ \mathrm{V}_{\mathrm{avg}}=20.3282^{*} \text { sqrt(Slope) [paved] } \\ \mathrm{T}_{\mathrm{c}}=\mathrm{L} / 60^{*} \mathrm{~V} \end{array}$ |  |  |  |  | OPEN CHANNEL FLOW: <br> Hydraulic Radius $=$ Cross-Sectional $/$ Wetted Perimeter <br> Slope $=1.0 \%$ assumed for flow within street $V=1.49 R^{2 / 3} S^{1 / 2} / n$ <br> $\mathrm{Tc}=\mathrm{L} / 60^{*} \mathrm{~V}$ |  |  |  |  |  |  |  | TOTAL $T_{\text {CTOTAL }}=\mathrm{T}_{\mathrm{c} 1}+\mathrm{T}_{\mathrm{c} 2}+\mathrm{T}_{\mathrm{c} 3}$ <br> $\mathrm{T}_{\text {ctotal }}$ <br> (min) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Length <br> (ft) | $\begin{aligned} & \text { Slope } \\ & (\mathrm{ft} / \mathrm{ft}) \end{aligned}$ | $\begin{gathered} \text { Rainfall Depth } \\ \text { TP-40 (in) } \end{gathered}$ | Manning's "n" (Table 3 -1) | $\left.\begin{array}{c} \boldsymbol{T}_{\mathrm{c} 1} \\ (\text { min } \end{array}\right)$ | Length <br> (ft) | $\begin{gathered} \text { Slope } \\ (\mathrm{ft} / \mathrm{ft}) \end{gathered}$ | Condition <br> TR-55 <br> (Fig. 3-1) | $\begin{gathered} \begin{array}{c} \mathrm{v}_{\text {veg }} \\ (\mathrm{fps}) \\ (\mathrm{Fig} .3-1) \end{array} \end{gathered}$ | $\begin{gathered} \mathrm{T}_{\mathrm{c} 2} \\ (\min ) \end{gathered}$ | Cross Sectional Flow Area ( $\mathrm{ft}^{2}$ ) | Wetted Perimeter <br> (ft) | Hydraulic Radius <br> (ft) | Length (ft) | Slope <br> (ftfit) | Manning's "n" | $\underset{(f p s)}{v}$ | $\begin{gathered} \mathrm{T}_{\mathrm{C} 3} \\ (\text { min }) \end{gathered}$ |  |
| E12 | Developed | 40 | 0.010 | 1.50 | 0.150 | 9.07 | 95 | 0.010 | Unpaved | 1.61 | 0.98 | 19.0 | 39.0 | 0.5 | 4707.0 | 0.010 | 0.016 | 5.8 | 13.61 | 23.66 |
| E 13 | Developed | 40 | 0.010 | 1.50 | 0.150 | 9.07 | 95 | 0.010 | Unpaved | 1.61 | 0.98 | 19.0 | 39.0 | 0.5 | 5443.0 | 0.010 | 0.016 | 5.8 | 15.73 | 25.79 |
| E 20 | Developed | 40 | 0.010 | 1.50 | 0.150 | 9.07 | 95 | 0.010 | Unpaved | 1.61 | 0.98 | 19.0 | 39.0 | 0.5 | 7548.0 | 0.010 | 0.016 | 5.8 | 21.82 | 31.87 |
| E 22 | Developed | 40 | 0.010 | 1.50 | 0.150 | 9.07 | 95 | 0.010 | Unpaved | 1.61 | 0.98 | 19.0 | 39.0 | 0.5 | 4004.0 | 0.010 | 0.016 | 5.8 | 11.57 | 21.63 |
| E 23 | Developed | 40 | 0.010 | 1.50 | 0.150 | 9.07 | 95 | 0.010 | Unpaved | 1.61 | 0.98 | 19.0 | 39.0 | 0.5 | 5733.0 | 0.010 | 0.016 | 5.8 | 16.57 | 26.63 |
| E 24 | Developed | 40 | 0.010 | 1.50 | 0.150 | 9.07 | 95 | 0.010 | Unpaved | 1.61 | 0.98 | 19.0 | 39.0 | 0.5 | 3128.0 | 0.010 | 0.016 | 5.8 | 9.04 | 19.10 |
| E 25 | Developed | 40 | 0.010 | 1.50 | 0.150 | 9.07 | 95 | 0.010 | Unpaved | 1.61 | 0.98 | 19.0 | 39.0 | 0.5 | 5320.0 | 0.010 | 0.016 | 5.8 | 15.38 | 25.43 |
| E 26 | Developed | 40 | 0.010 | 1.50 | 0.150 | 9.07 | 95 | 0.010 | Unpaved | 1.61 | 0.98 | 19.0 | 39.0 | 0.5 | 3448.0 | 0.010 | 0.016 | 5.8 | 9.97 | 20.02 |
| E 27 | Developed | 40 | 0.010 | 1.50 | 0.150 | 9.07 | 95 | 0.010 | Unpaved | 1.61 | 0.98 | 19.0 | 39.0 | 0.5 | 3330.0 | 0.010 | 0.016 | 5.8 | 9.63 | 19.68 |
| E 28 | Developed | 40 | 0.010 | 1.50 | 0.150 | 9.07 | 95 | 0.010 | Unpaved | 1.61 | 0.98 | 19.0 | 39.0 | 0.5 | 1656.0 | 0.010 | 0.016 | 5.8 | 4.79 | 14.84 |
| E 29 | Developed | 40 | 0.010 | 1.50 | 0.150 | 9.07 | 95 | 0.010 | Unpaved | 1.61 | 0.98 | 19.0 | 39.0 | 0.5 | 2381.0 | 0.010 | 0.016 | 5.8 | 6.88 | 16.94 |
| H2a | Developed | 40 | 0.030 | 1.50 | 0.150 | 5.85 | 95 | 0.030 | Unpaved | 2.79 | 0.57 | --- | -- | $\cdots$ | 8471.0 | ---- | --- | 6.0 | 23.53 | 29.94 |
| $\mathrm{H}^{2 \mathrm{~b}}$ | Developed | 40 | 0.030 | 1.50 | 0.150 | ${ }_{5} 5.85$ | 95 | 0.030 | Unpaved | 2.79 | 0.57 | - | -- | -- | 7885.0 | --- | $\cdots$ | ${ }^{6.0}$ | 21.90 | 28.32 |
| н3 | Developed | 40 | 0.030 | 1.50 | 0.150 | 5.85 | 95 | 0.030 | Unpaved | 2.79 | 0.57 | --- | --- | --- | 5253.0 | --- | --- | ${ }^{6.0}$ | 14.59 | 21.00 |
| H4a | Developed | 40 | 0.030 | 1.50 | 0.150 | 5.85 | 95 | 0.030 | Unpaved | 2.79 | 0.57 | --- | --- | --- | 3737.0 | --- | --- | 6.0 | 10.38 | 16.79 |
| H4b | Developed | 40 | 0.030 | 1.50 | 0.150 | 5.85 | 95 | 0.030 | Unpaved | 2.79 | 0.57 | --- | --- | --- | 3345.0 | --- | --- | 6.0 | 9.29 | 15.70 |
| H5 | Developed | 40 | 0.030 | 1.50 | 0.150 | 5.85 | 95 | 0.030 | Unpaved | 2.79 | 0.57 | --- | -- | -- | 6264.0 | -- | -- | 6.0 | 17.40 | 23.81 |
| H6 | Developed | 40 | 0.010 | 1.50 | 0.150 | 9.07 | 95 | 0.010 | Unpaved | 1.61 | 0.98 | -- | --- | --- | 7512.0 | $\cdots$ | $\cdots$ | 6.0 | 20.87 | 30.92 |
| H7a | Developed | 40 | 0.010 | 1.50 | 0.150 | 9.07 | 95 | 0.010 | Unpaved | 1.61 | 0.98 | -- | -- | $\cdots$ | 8415.0 | $\cdots$ | - | 6.0 | 23.38 | 33.43 |
| н7b | Developed | 40 | 0.010 | 1.50 | 0.150 | 9.07 | 95 | 0.010 | Unpaved | 1.61 | 0.98 | $\cdots$ | -- | -- | 7860.0 | -- | $\cdots$ | 6.0 | 21.83 | 31.89 |
| H 8 | Developed | 40 | 0.010 | 1.50 | 0.150 | ${ }^{9.07}$ | 95 | 0.010 | Unpaved | 1.61 | 0.98 | --- | --- | -- | 7791.0 | --- | --- | 6.0 | 21.64 | 31.70 |
| ня | Developed | 10 | 0.010 | 1.50 | 0.150 | 2.99 | 50 | 0.010 | Paved | 2.03 | 0.41 | --- | --- | --- | 6510.0 | --- | --- | 6.0 | 18.08 | 21.49 |
| H 10 | Developed | 40 | 0.010 | 1.50 | 0.150 | 9.07 | 95 | 0.010 | Unpaved | 1.61 | 0.98 | --- | --- | --- | 8356.0 | --- | --- | 6.0 | 23.21 | 33.26 |
| H11a | Developed | 10 | 0.010 | 1.50 | 0.150 | 2.99 | 50 | 0.010 | Paved | 2.03 | 0.41 | -- | --- | --- | 6294.0 | --- | --- | 6.0 | 17.48 | 20.89 |
| H11b | Developed | 40 | 0.010 | 1.50 | 0.150 | 9.07 | 95 | 0.010 | Unpaved | 1.61 | 0.98 | $\cdots$ | --- | --- | 3993.0 | --- | --- | 6.0 | 11.09 | 21.15 |
| H 12 a | Developed | 40 | 0.010 | 1.50 | 0.150 | 9.07 | 95 | 0.010 | Paved | 2.03 | 0.78 | -- | -- | --- | 6768.0 | -- | -- | 6.0 | 18.80 | 28.65 |
| H 12 b | Developed | 10 | 0.010 | 1.50 | 0.150 | 2.99 | 50 | 0.010 | Paved | 2.03 | 0.41 | --- | --- | --- | 2646.0 | --- | --- | 6.0 | 7.35 | 10.75 |
| H 13 | Developed | 10 | 0.005 | 1.50 | 0.150 | 3.95 | 50 | 0.005 | Paved | 1.44 | 0.58 | --- | --- | --- | 3692.0 | --- | --- | 6.0 | 10.26 | 14.78 |
| H 14 a | Developed | 40 | 0.005 | 1.50 | 0.150 | 11.97 | 95 | 0.005 | Unpaved | 1.14 | 1.39 | --- | --- | --- | 3352.0 | --- | --- | 6.0 | 9.31 | 22.67 |
| H 15 a | Developed | 10 | 0.005 | 1.50 | 0.150 | 3.95 | 50 | 0.005 | Unpaved | 1.44 | 0.58 | --- | --- | --- | 5130.0 | --- | --- | 6.0 | 14.25 | 18.78 |
| H 15 b | Developed | 10 | 0.005 | 1.50 | 0.150 | 3.95 | 50 | 0.005 | Unpaved | 1.44 | 0.58 | --- | --- | --- | 3732.0 | --- | --- | 6.0 | 10.37 | 14.90 |
| H 16 | Developed | 40 | 0.005 | 1.50 | 0.150 | 11.97 | 95 | 0.005 | Unpaved | 1.14 | 1.39 | $\cdots$ | $\cdots$ | --- | 9557.0 | $\cdots$ | $\cdots$ | 6.0 | 26.55 | 39.91 |

Notes:
Anvage lengt of 135 feet was measured from back of fot to street fronlage in existing single famiy developments. 40 of these 135 feet are assumed to convey runoff in sheet flow with the rest in shallow concentrated flow.
The remaining length of the time of concentration path is considered open channel flow. Proposed single family developments are assumed to have similar time of concentration paths as existing single family developments.
2. Times of concentration for proposed retail and mixed use developments assume 10 feet of sheet flow and 40 feet of shallow concentrated flow. The remaining length of the time of concentration path is assumed to occur
enclosed storm sewer pipe and/or open channel flow with velocities equal to approximately 6 feet per second
Open channel flow includes portions of the time of concentration path contained within enclosed storm sewer pipe as well as open channel flow. Velocities for open channel flow and enclosed storm sewer are set at 6 feet per second in proposed conditions.

Kimley-Horn and Associates, Inc.

## Appendix B:

## Hydrologic Results

Existing Condition
Proposed Condition

## Existing Condition

Type.... Master Network Summary
Page 2.01
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Existing Conditions \PondPack\Hunt Property Existing C

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Type II-75-24

|  | Total |  |  |
| :---: | :---: | :---: | :---: |
|  | Depth | Rainfall |  |
| Return Event | in | Type | RNF ID |
| Pre100 | 3.3400 | Synthetic Curve | TypeII-75 24 hr : |



MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt)

| Node ID | Type | Return <br> Event | $\begin{gathered} \text { HYG Vol } \\ \text { ac-ft } \end{gathered}$ | Trun | Qpeak <br> hrs | Qpeak <br> cfs | $\begin{gathered} \text { Max WSEL } \\ \text { ft } \end{gathered}$ | Max <br> Pond Storage ac-ft |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| A1 | AREA | 100 | 667.433 |  | 6.5500 | 6243.82 |  |  |
| A10 | AREA | 100 | 18.141 |  | 6.1500 | 409.77 |  |  |
| A11 | AREA | 100 | 36.417 |  | 6.3000 | 505.23 |  |  |
| A12 | AREA | 100 | 2.921 |  | 6.0500 | 87.69 |  |  |
| A13 | AREA | 100 | 16.374 |  | 6.2500 | 265.97 |  |  |
| A14 | AREA | 100 | 75.930 |  | 6.4500 | 832.82 |  |  |

Type.... Master Network Summary
Page 2.01
Name.... Watershed
File.... G: \CIVIL\68200005\Hydrology\Existing Conditions \PondPack\Hunt Property Existing C


Type.... Master Network Summary
Page 2.02
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Existing Conditions \PondPack\Hunt Property Existing C

| ICPM CALCULATION TOLERANCES |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Target Convergence $=$ $.001 \mathrm{cfs} \mathrm{+/-}$ <br> Max. Iterations $=$ 35 loops <br> ICPM Time Step $=$ .0500 hrs <br> Output Time Step .0500 hrs  <br> ICPM Ending Time $=141.5000 \mathrm{hrs}$  |  |  |  |  |  |  |  |  |
| MASTER NETWORK SUMMARY <br> SCS Unit Hydrograph Method <br> (*Node=Outfall; +Node=Diversion;) <br> (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt) |  |  |  |  |  |  |  |  |
| Node ID | Type | Return <br> Event | HYG Vol $a c-f t$ | Trun | Qpeak hrs | Qpeak <br> cfs | Max WSEL ft | Max <br> Pond Storage ac-ft |
| B1 | AREA | 100 | 251.560 |  | 6.1500 | 4882.17 |  |  |
| B10 | AREA | 100 | 16.451 |  | 6.0500 | 514.89 |  |  |
| B11 | AREA | 100 | 10.493 |  | 6.1500 | 245.60 |  |  |
| B12 | AREA | 100 | 14.408 |  | 6.0500 | 407.90 |  |  |
| B13 | AREA | 100 | . 918 |  | 6.0500 | 32.34 |  |  |
| B14 | AREA | 100 | 12.902 |  | 6.1500 | 284.95 |  |  |
| B15 | AREA | 100 | 15.199 |  | 6.2000 | 294.83 |  |  |
| B16 | AREA | 100 | 30.319 |  | 6.4000 | 351.11 |  |  |
| B17 | AREA | 100 | 18.888 |  | 6.2500 | 306.79 |  |  |
| B18 | AREA | 100 | 21.149 |  | 6.3000 | 309.06 |  |  |
| B19 | AREA | 100 | 27.273 |  | 6.5000 | 279.16 |  |  |
| B2 | AREA | 100 | 2.457 |  | 6.0000 | 80.20 |  |  |
| B3 | AREA | 100 | 18.366 |  | 6.0500 | 488.01 |  |  |
| B4 | AREA | 100 | 8.155 |  | 6.0500 | 253.33 |  |  |

Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Existing Conditions \PondPack\Hunt Property Existing C


Type.... Master Network Summary
Page 2.04
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Existing Conditions \PondPack\Hunt Property Existing C


Type.... Master Network Summary
Page 2.05
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Existing Conditions \PondPack\Hunt Property Existing C


Type.... Master Network Summary
Page 2.06
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Existing Conditions \PondPack\Hunt Property Existing C


Type.... Master Network Summary
Page 2.07
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Existing Conditions \PondPack\Hunt Property Existing C

| Target Convergen |  | . 001 | cfs +/- |
| :---: | :---: | :---: | :---: |
| Max. Iterations | $=$ | 35 | loops |
| ICPM Time Step | = | . 0500 | hrs |
| Output Time Step | = | . 0500 | hrs |
| ICPM Ending Time |  | . 5000 | hrs |

> MASTER NETWORK SUMMARY SCS Unit Hydrograph Method
> (*Node=Outfall; +Node=Diversion;)
> (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt)

| Node ID | Type | Return <br> Event | $\begin{gathered} \text { HYG Vol } \\ \text { ac-ft } \end{gathered}$ | Trun | Qpeak hrs | Qpeak <br> cfs | $\begin{gathered} \text { Max WSEL } \\ \mathrm{ft} \end{gathered}$ | Max <br> Pond Storage ac-ft |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| J-A10 | JCT | 100 | 18.956 |  | 6.1500 | 416.16 |  |  |
| J-A10A | JCT | 100 | 55.585 |  | 6.1500 | 1053.24 |  |  |
| J-A11 | JCT | 100 | 703.849 |  | 7.1500 | 5850.06 |  |  |
| J-A12 | JCT | 100 | 30.093 |  | 6.4500 | 471.58 |  |  |
| J-A13 | JCT | 100 | 188.457 |  | 6.7000 | 2452.65 |  |  |
| J-A14 | JCT | 100 | 815.506 |  | 7.7000 | 5720.26 |  |  |
| J-A15 | JCT | 100 | 16.041 |  | 6.4500 | 173.12 |  |  |
| J-A16 | JCT | 100 | 43.720 |  | 6.3500 | 451.87 |  |  |
| J-A17 | JCT | 100 | 292.215 |  | 6.9000 | 3527.86 |  |  |
| J-A18 | JCT | 100 | 1111.372 |  | 7.7500 | 6183.74 |  |  |
| J-A19 | JCT | 100 | 1164.361 |  | 8.1500 | 6073.93 |  |  |
| J-A2 | JCT | 100 | 163.260 |  | 6.2500 | 2639.76 |  |  |
| J-A20 | JCT | 100 | 1178.089 |  | 8.3000 | 6045.92 |  |  |
| J-A3 | JCT | 100 | 12.815 |  | 6.0000 | 406.52 |  |  |

Type.... Master Network Summary
Page 2.08
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Existing Conditions \PondPack\Hunt Property Existing C

| Target Convergen |  | . 001 | cfs +/- |
| :---: | :---: | :---: | :---: |
| Max. Iterations | $=$ | 35 | loops |
| ICPM Time Step | $=$ | . 0500 | hrs |
| Output Time Step | $=$ | . 0500 | hrs |
| ICPM Ending Time | = | . 5000 | hrs |

MASTER NETWORK SUMMARY SCS Unit Hydrograph Method
(*Node=Outfall; +Node=Diversion;) (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt)

| Node ID | Type | Return <br> Event | HYG Vol ac-ft | Trun | Qpeak <br> hrs | Qpeak <br> cfs | $\begin{gathered} \text { Max WSEL } \\ f t \end{gathered}$ | Max <br> Pond Storage ac-ft |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| J-A4 | JCT | 100 | 4.645 |  | 6.0000 | 151.62 |  |  |
| J-A5 | JCT | 100 | .816 |  | 6.0000 | 26.63 |  |  |
| J-A6 | JCT | 100 | 35.734 |  | 6.2000 | 700.83 |  |  |
| J-A7 | JCT | 100 | 8.826 |  | 6.1500 | 201.75 |  |  |
| J-A 8 | JCT | 100 | 27.172 |  | 6.3000 | 496.06 |  |  |
| J-A9 | JCT | 100 | 36.629 |  | 6.2000 | 642.73 |  |  |
| J-B1 | JCT | 100 | 251.560 |  | 6.1500 | 4882.17 |  |  |
| J-B10 | JCT | 100 | 286.377 |  | 6.3500 | 4979.76 |  |  |
| J-B11 | JCT | 100 | 296.870 |  | 6.6000 | 4609.74 |  |  |
| J-B12 | JCT | 100 | 124.035 |  | 6.3000 | 2535.92 |  |  |
| J-B13 | JCT | 100 | 21.382 |  | 6.2000 | 529.00 |  |  |
| J-B14 | JCT | 100 | 136.932 |  | 6.5000 | 2381.83 |  |  |
| J-B15 | JCT | 100 | 32.756 |  | 6.5000 | 439.93 |  |  |
| J-B16 | JCT | 100 | 550.486 |  | 7.2500 | 6149.03 |  |  |

Type.... Master Network Summary
Page 2.09
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Existing Conditions \PondPack\Hunt Property Existing C

| Target Convergen |  | . 001 | cfs +/- |
| :---: | :---: | :---: | :---: |
| Max. Iterations | $=$ | 35 | loops |
| ICPM Time Step | = | . 0500 | hrs |
| Output Time Step | = | . 0500 | hrs |
| ICPM Ending Time |  | . 5000 | hrs |

> MASTER NETWORK SUMMARY SCS Unit Hydrograph Method
> (*Node=Outfall; +Node=Diversion;) (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt)

| Node ID | Type | Return <br> Event | $\begin{gathered} \text { HYG Vol } \\ \text { ac-ft } \end{gathered}$ | Trun | Qpeak <br> hrs | Qpeak cfs | $\begin{gathered} \text { Max WSEL } \\ \text { ft } \end{gathered}$ | Max <br> Pond Storage ac-ft |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| J-B17 | JCT | 100 | 452.623 |  | 7.0500 | 5857.84 |  |  |
| J-B18 | JCT | 100 | 506.518 |  | 7.1000 | 6187.43 |  |  |
| J-B19 | JCT | 100 | 577.759 |  | 7.4000 | 6006.99 |  |  |
| J-B2 | JCT | 100 | 2.457 |  | 6.0000 | 80.20 |  |  |
| J-B3 | JCT | 100 | 18.366 |  | 6.0500 | 488.01 |  |  |
| J-B4 | JCT | 100 | 8.155 |  | 6.0500 | 253.33 |  |  |
| J-B5 | JCT | 100 | 80.090 |  | 6.0500 | 2147.81 |  |  |
| J-B5A | JCT | 100 | 88.245 |  | 6.0500 | 2401.14 |  |  |
| J-B6 | JCT | 100 | 3.998 |  | 6.0500 | 137.01 |  |  |
| J-B7 | JCT | 100 | 16.466 |  | 6.1000 | 455.73 |  |  |
| J-B8 | JCT | 100 | 17.557 |  | 6.1000 | 436.65 |  |  |
| J-B9 | JCT | 100 | 13.660 |  | 6.1500 | 260.99 |  |  |
| J-C1 | JCT | 100 | 31.767 |  | 6.2500 | 510.88 |  |  |
| J-C2 | JCT | 100 | 1.506 |  | 6.0500 | 53.31 |  |  |

Type.... Master Network Summary
Page 2.10
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Existing Conditions \PondPack\Hunt Property Existing C

| Target Convergen |  | . 001 | cfs +/- |
| :---: | :---: | :---: | :---: |
| Max. Iterations | $=$ | 35 | loops |
| ICPM Time Step | = | . 0500 | hrs |
| Output Time Step | = | . 0500 | hrs |
| ICPM Ending Time |  | . 5000 | hrs |

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt)

| Node ID | Type | Return <br> Event | HYG Vol ac-ft | Trun | Qpeak hrs | Qpeak <br> cfs | $\begin{gathered} \text { Max WSEL } \\ f t \end{gathered}$ | Max <br> Pond Storage ac-ft |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| J-C3 | JCT | 100 | 48.296 |  | 6.7500 | 475.89 |  |  |
| J-C 4 | JCT | 100 | 71.100 |  | 7.2500 | 476.67 |  |  |
| J-D1 | JCT | 100 | 9.102 |  | 6.2000 | 167.45 |  |  |
| J-D2 | JCT | 100 | 17.230 |  | 6.2000 | 181.06 |  |  |
| J-D3 | JCT | 100 | 35.709 |  | 6.3000 | 359.73 |  |  |
| J-D 4 | JCT | 100 | 67.304 |  | 6.5000 | 609.91 |  |  |
| J-E1 | JCT | 100 | 304.255 |  | 6.1500 | 5918.49 |  |  |
| J-E10 | JCT | 100 | . 761 |  | 6.0500 | 27.03 |  |  |
| J-E11 | JCT | 100 | 1.097 |  | 6.0500 | 38.90 |  |  |
| J-E12 | JCT | 100 | 30.060 |  | 6.1500 | 671.58 |  |  |
| J-E13 | JCT | 100 | 808.787 |  | 6.1500 | 1449.82 |  |  |
| J-E14 | JCT | 100 | 18.576 |  | 6.2500 | 213.84 |  |  |
| J-E15 | JCT | 100 | 17.312 |  | 6.3500 | 249.13 |  |  |
| J-E16 | JCT | 100 | 29.776 |  | 6.3500 | 333.98 |  |  |

Type.... Master Network Summary
Page 2.11
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Existing Conditions \PondPack\Hunt Property Existing C

| Target Convergen |  | . 001 | cfs +/- |
| :---: | :---: | :---: | :---: |
| Max. Iterations | $=$ | 35 | loops |
| ICPM Time Step | = | . 0500 | hrs |
| Output Time Step | = | . 0500 | hrs |
| ICPM Ending Time |  | . 5000 | hrs |

MASTER NETWORK SUMMARY SCS Unit Hydrograph Method
(*Node=Outfall; +Node=Diversion;) (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt)

| Node ID | Type | Return <br> Event | $\begin{gathered} \text { HYG Vol } \\ \text { ac-ft } \end{gathered}$ | Trun | Qpeak <br> hrs | Qpeak <br> cfs | $\begin{gathered} \text { Max WSEL } \\ f t \end{gathered}$ | Max <br> Pond Storage ac-ft |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| J-E17 | JCT | 100 | 40.446 |  | 6.5500 | 411.67 |  |  |
| J-E18 | JCT | 100 | 53.148 |  | 6.5500 | 510.35 |  |  |
| J-E19 | JCT | 100 | 1159.166 |  | 6.7000 | 5192.57 |  |  |
| J-E2 | JCT | 100 | 174.345 |  | 6.2500 | 2997.77 |  |  |
| J-E20 | JCT | 100 | 948.828 |  | 6.2500 | 3615.37 |  |  |
| J-E21 | JCT | 100 | 957.494 |  | 6.2500 | 3741.16 |  |  |
| J-E22 | JCT | 100 | 13.691 |  | 6.1500 | 315.32 |  |  |
| J-E23 | JCT | 100 | 1014.488 |  | 6.3500 | 4364.90 |  |  |
| J-E24 | JCT | 100 | 974.508 |  | 6.3500 | 3845.86 |  |  |
| J-E25 | JCT | 100 | 1032.374 |  | 6.4500 | 4448.29 |  |  |
| J-E26 | JCT | 100 | 1042.373 |  | 6.5000 | 4468.02 |  |  |
| J-E27 | JCT | 100 | 1058.376 |  | 6.5500 | 4498.32 |  |  |
| J-E28 | JCT | 100 | 1060.604 |  | 6.5500 | 4500.71 |  |  |
| J-E29 | JCT | 100 | 1067.148 |  | 6.6000 | 4505.47 |  |  |

Type.... Master Network Summary
Page 2.12
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Existing Conditions \PondPack\Hunt Property Existing C

| Target Convergen |  | . 00 | cfs +/- |
| :---: | :---: | :---: | :---: |
| Max. Iterations | $=$ |  | loops |
| ICPM Time Step | $=$ | . 0500 | hrs |
| Output Time Step | $=$ | . 0500 | hrs |
| ICPM Ending Time |  | . 5000 | hrs |

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt)

| Node ID | Type | Return <br> Event | HYG Vol ac-ft | Trun | Qpeak hrs | Qpeak cfs | $\begin{gathered} \text { Max WSEL } \\ f t \end{gathered}$ | Max <br> Pond Storage ac-ft |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| J-E3 | JCT | 100 | 211.498 |  | 6.2500 | 3305.41 |  |  |
| J-E 4 | JCT | 100 | 45.592 |  | 6.1500 | 964.23 |  |  |
| J-E5 | JCT | 100 | 890.949 |  | 6.2000 | 2623.59 |  |  |
| J-E 6 | JCT | 100 | 7.315 |  | 6.1500 | 156.47 |  |  |
| J-E7 | JCT | 100 | 6.481 |  | 6.1500 | 135.72 |  |  |
| J-E8 | JCT | 100 | 4.587 |  | 6.1000 | 126.98 |  |  |
| J-E8A | JCT | 100 | 5.347 |  | 6.1000 | 147.80 |  |  |
| J-E9 | JCT | 100 | 2.565 |  | 6.1000 | 73.43 |  |  |
| J-F1 | JCT | 100 | 93.154 |  | 6.6500 | 764.82 |  |  |
| $J-F 1 A$ | JCT | 100 | 1271.235 |  | 8.3500 | 6113.20 |  |  |
| $J-F 2$ | JCT | 100 | 3.028 |  | 6.2000 | 57.32 |  |  |
| $J-F 2 A$ | JCT | 100 | 1852.007 |  | 7.5000 | 10111.38 |  |  |
| $J-F 3$ | JCT | 100 | 16.559 |  | 6.3500 | 201.55 |  |  |
| $J-F 3 A$ | JCT | 100 | 1939.575 |  | 7.8500 | 9915.09 |  |  |

Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Existing Conditions \PondPack\Hunt Property Existing C


Type... Master Network Summary Page 2.14
Name.... Watershed
File.... G: \CIVIL\68200005\Hydrology\Existing Conditions $\backslash$ PondPack $\backslash$ Hunt Property Existing C

| ICPM CALCULATION TOLERANCES |  |  |
| :--- | ---: | ---: |
| ------------------------------- |  |  |
| Target Convergence | $.001 \mathrm{cfs}+/-$ |  |
| Max. Iterations | $=$ | 35 |
| Ioops |  |  |
| ICPM Time Step | $=$ | .0500 |
| Output Time Step | $=$ | .0500 |
| ICPM Ending Time | $=$ | 141.5000 |
| hrs |  |  |

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt)


## Proposed Condition

Type.... Master Network Summary
Page 2.01
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Proposed Conditions $\backslash$ PondPack $\backslash$ Hunt Property Proposed C

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Type II-75-24

|  | Total |  |  |
| :---: | :---: | :---: | :---: |
|  | Depth | Rainfall |  |
| Return Event | in | Type | RNF ID |
| Dev100 | 3.3400 | Synthetic Curve | TypeII-75 24hr: |

```
-------------------------------
ICPM CALCULATION TOLERANCES
---------------------------------
Target Convergence= .001 cfs +/-
Max. Iterations = 35 loops
ICPM Time Step = .0500 hrs
Output Time Step = .0500 hrs
ICPM Ending Time = 141.5000 hrs
----------------------------------
    MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)
```

| Node ID | Type | Return <br> Event | HYG Vol ac-ft | Trun | Qpeak hrs | $\begin{gathered} \text { Qpeak } \\ \text { cfs } \end{gathered}$ | $\begin{gathered} \text { Max WSEL } \\ f t \end{gathered}$ | Max <br> Pond Storage ac-ft |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| A1 | AREA | 100 | 667.433 |  | 6.5500 | 6243.82 |  |  |
| A11 | AREA | 100 | 36.417 |  | 6.3000 | 505.23 |  |  |
| A12 | AREA | 100 | 2.921 |  | 6.0500 | 87.69 |  |  |
| A13 | AREA | 100 | 16.374 |  | 6.2500 | 265.97 |  |  |
| A14 | AREA | 100 | 75.930 |  | 6.4500 | 832.82 |  |  |
| A15 | AREA | 100 | 16.041 |  | 6.4500 | 173.12 |  |  |

Type.... Master Network Summary
Page 2.01
Name.... Watershed
File.... G: \CIVIL\68200005\Hydrology\Proposed Conditions $\backslash$ PondPack $\backslash$ Hunt Property Proposed C

| ICPM CALCULATION TOLERANCES |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Target Convergence $=$ $.001 \mathrm{cfs} \mathrm{+/-}$ <br> Max. Iterations $=$ 35 loops <br> ICPM Time Step $=$ .0500 hrs <br> Output Time Step .0500 hrs  <br> ICPM Ending Time $=141.5000 \mathrm{hrs}$  |  |  |  |  |  |  |  |  |
| MASTER NETWORK SUMMARY <br> SCS Unit Hydrograph Method <br> (*Node=Outfall; +Node=Diversion;) <br> (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt) |  |  |  |  |  |  |  |  |
| Node ID | Type | Return <br> Event | $\begin{gathered} \text { HYG Vol } \\ \text { ac-ft } \end{gathered}$ | Trun | Qpeak hrs | Qpeak <br> cfs | Max WSEL ft | Max <br> Pond Storage ac-ft |
| A16 | AREA | 100 | 27.679 |  | 6.3000 | 390.29 |  |  |
| A2 | AREA | 100 | 163.260 |  | 6.2500 | 2639.76 |  |  |
| A3 | AREA | 100 | 10.141 |  | 6.0000 | 321.69 |  |  |
| A 6 | AREA | 100 | 35.734 |  | 6.2000 | 700.83 |  |  |
| A 7 | AREA | 100 | 8.826 |  | 6.1500 | 201.75 |  |  |
| A 8 | AREA | 100 | 13.489 |  | 6.1500 | 295.08 |  |  |
| A9 | AREA | 100 | 10.148 |  | 6.0500 | 277.44 |  |  |
| B1 | AREA | 100 | 240.558 |  | 6.1000 | 5677.59 |  |  |
| B3 | AREA | 100 | 16.721 |  | 6.0500 | 475.84 |  |  |
| B4 | AREA | 100 | 5.952 |  | 6.0000 | 194.29 |  |  |
| B5 | AREA | 100 | 75.963 |  | 6.0500 | 2273.48 |  |  |
| B7 | AREA | 100 | 14.326 |  | 6.0500 | 451.17 |  |  |
| B8 | AREA | 100 | 16.680 |  | 6.1000 | 453.85 |  |  |
| C1 | AREA | 100 | 7.468 |  | 6.0500 | 253.88 |  |  |

Type.... Master Network Summary
Page 2.02
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Proposed Conditions $\backslash$ PondPack $\backslash$ Hunt Property Proposed C


Type.... Master Network Summary
Page 2.03
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Proposed Conditions $\backslash$ PondPack $\backslash$ Hunt Property Proposed C


Type.... Master Network Summary
Page 2.04
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Proposed Conditions $\backslash$ PondPack $\backslash$ Hunt Property Proposed C

| ICPM CALCULATION TOLERANCES |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Target Convergence $=$ $.001 \mathrm{cfs} \mathrm{+/-}$ <br> Max. Iterations $=$ 35 loops <br> ICPM Time Step $=$ .0500 hrs <br> Output Time Step $=$ .0500 hrs <br> ICPM Ending Time $=141.5000$ hrs |  |  |  |  |  |  |  |  |
| MASTER NETWORK SUMMARY <br> SCS Unit Hydrograph Method $\begin{gathered} \text { (*Node=Outfall; +Node=Diversion;) } \\ \text { (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt) } \end{gathered}$ |  |  |  |  |  |  |  |  |
| Node ID | Type | Return <br> Event | HYG Vol ac-ft | Trun | Qpeak hrs | Qpeak <br> cfs | Max WSEL ft | Max <br> Pond Storage ac-ft |
| G 6 | AREA | 100 | 11.993 |  | 6.1500 | 247.78 |  |  |
| * GLS | JCT | 100 | 3358.744 |  | 7.2000 | 9076.51 |  |  |
| H1 | AREA | 100 | 17.569 |  | 6.2000 | 325.70 |  |  |
| H10 | AREA | 100 | 45.823 |  | 6.2500 | 738.52 |  |  |
| H11A | AREA | 100 | 27.922 |  | 6.1500 | 645.83 |  |  |
| H11B | AREA | 100 | 25.730 |  | 6.1500 | 592.34 |  |  |
| H12A | AREA | 100 | 59.232 |  | 6.2000 | 1107.43 |  |  |
| H12B | AREA | 100 | 13.621 |  | 6.0500 | 456.13 |  |  |
| H13 | AREA | 100 | 15.340 |  | 6.0500 | 441.42 |  |  |
| H14A | AREA | 100 | 6.237 |  | 6.1500 | 137.64 |  |  |
| H14B | AREA | 100 | 11.402 |  | 6.2500 | 183.81 |  |  |
| H15A | AREA | 100 | 14.991 |  | 6.1000 | 374.18 |  |  |
| H15B | AREA | 100 | 8.110 |  | 6.0500 | 233.43 |  |  |
| H15C | AREA | 100 | 16.400 |  | 6.3000 | 233.92 |  |  |

Name... . Watershed
File... G: \CIVIL\68200005\Hydrology $\backslash$ Proposed Conditions $\backslash$ PondPack $\backslash$ Hunt Property Proposed C


Type.... Master Network Summary
Page 2.06
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Proposed Conditions $\backslash$ PondPack $\backslash$ Hunt Property Proposed C
ICPM CALCULATION TOLERANCES

> MASTER NETWORK SUMMARY SCS Unit Hydrograph Method
> (*Node=Outfall; +Node=Diversion;) (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt)

| Node ID | Type | Return <br> Event | $\begin{gathered} \text { HYG Vol } \\ \text { ac-ft } \end{gathered}$ | Trun | Qpeak <br> hrs | Qpeak <br> cfs | $\begin{gathered} \text { Max WSEL } \\ f t \end{gathered}$ | Max <br> Pond Storage ac-ft |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| J-A11 | JCT | 100 | 703.849 |  | 7.1500 | 5850.06 |  |  |
| J-A16 | JCT | 100 | 27.679 |  | 6.3000 | 390.29 |  |  |
| J-A2 | JCT | 100 | 163.260 |  | 6.2500 | 2639.76 |  |  |
| J-A3 | JCT | 100 | 10.141 |  | 6.0000 | 321.69 |  |  |
| J-A 6 | JCT | 100 | 35.734 |  | 6.2000 | 700.83 |  |  |
| J-A7 | JCT | 100 | 8.826 |  | 6.1500 | 201.75 |  |  |
| J-A 8 | JCT | 100 | 23.629 |  | 6.2500 | 428.49 |  |  |
| J-E1 | JCT | 100 | 304.255 |  | 6.1500 | 5918.49 |  |  |
| J-E12 | JCT | 100 | 27.495 |  | 6.1500 | 602.62 |  |  |
| J-E13 | JCT | 100 | 806.225 |  | 6.2000 | 1376.02 |  |  |
| J-E2 | JCT | 100 | 174.345 |  | 6.2500 | 2997.77 |  |  |
| J-E20 | JCT | 100 | 946.266 |  | 6.2500 | 3555.10 |  |  |
| J-E21 | JCT | 100 | 954.933 |  | 6.2500 | 3674.48 |  |  |
| J-E22 | JCT | 100 | 13.691 |  | 6.1500 | 315.32 |  |  |

Type.... Master Network Summary
Page 2.07
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Proposed Conditions $\backslash$ PondPack $\backslash$ Hunt Property Proposed C

| Target Convergen |  | . 00 | cfs +/- |
| :---: | :---: | :---: | :---: |
| Max. Iterations | $=$ |  | loops |
| ICPM Time Step | $=$ | . 0500 | hrs |
| Output Time Step | $=$ | . 0500 | hrs |
| ICPM Ending Time |  | . 5000 | hrs |

MASTER NETWORK SUMMARY SCS Unit Hydrograph Method
(*Node=Outfall; +Node=Diversion;) (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt)

| Node ID | Type | Return <br> Event | HYG Vol ac-ft | Trun | Qpeak <br> hrs | $\begin{gathered} \text { Qpeak } \\ \text { cfs } \end{gathered}$ | Max WSEL <br> ft | Max <br> Pond Storage $a c-f t$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| J-E23 | JCT | 100 | 1011.926 |  | 6.3500 | 4295.55 |  |  |
| J-E24 | JCT | 100 | 971.946 |  | 6.3500 | 3783.23 |  |  |
| J-E25 | JCT | 100 | 1029.812 |  | 6.4500 | 4383.84 |  |  |
| J-E26 | JCT | 100 | 1039.811 |  | 6.5000 | 4404.54 |  |  |
| J-E27 | JCT | 100 | 1055.814 |  | 6.5500 | 4435.25 |  |  |
| J-E28 | JCT | 100 | 1058.044 |  | 6.5500 | 4436.89 |  |  |
| J-E29 | JCT | 100 | 1064.587 |  | 6.6000 | 4442.71 |  |  |
| J-E3 | JCT | 100 | 211.498 |  | 6.2500 | 3305.41 |  |  |
| J-E 4 | JCT | 100 | 45.592 |  | 6.1500 | 964.23 |  |  |
| $J-E 5$ | JCT | 100 | 888.389 |  | 6.2000 | 2557.07 |  |  |
| $J-F 1$ | JCT | 100 | 84.839 |  | 6.5000 | 868.14 |  |  |
| $J-F 6$ | JCT | 100 | 66.393 |  | 6.6000 | 538.53 |  |  |
| J-G1 | JCT | 100 | 38.468 |  | 6.6000 | 327.38 |  |  |
| J-G6 | JCT | 100 | 50.461 |  | 6.6500 | 361.92 |  |  |
| J-G 6 | JCT | 100 | -. 000 |  | . 0000 | . 00 | (-Q) |  |

Type.... Master Network Summary
Page 2.08
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Proposed Conditions $\backslash$ PondPack $\backslash$ Hunt Property Proposed C

| ICPM CALCULATION TOLERANCES |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Target Convergence $=$ $.001 \mathrm{cfs} \mathrm{+/-}$  <br> Max. Iterations $=$ 35 loops <br> ICPM Time Step $=$ .0500 hrs <br> Output Time Step $=$ .0500 hrs <br> ICPM Ending Time $=141.5000$ hrs  |  |  |  |  |  |  |  |  |
| ```MASTER NETWORK SUMMARY \\ SCS Unit Hydrograph Method \\ (*Node=Outfall; +Node=Diversion;) \\ (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt)``` |  |  |  |  |  |  |  |  |
| Node ID | Type | Return <br> Event | HYG Vol ac-ft | Trun | Qpeak <br> hrs | Qpeak <br> cfs | Max WSEL ft | Max <br> Pond Storage ac-ft |
| J-H1 | JCT | 100 | 272.266 |  | 6.1500 | 580.30 |  |  |
| $J-H 11 A$ | JCT | 100 | 424.235 |  | 6.8000 | 2706.08 |  |  |
| J-H11B | JCT | 100 | 1965.239 |  | 7.6000 | 6543.27 |  |  |
| J-H12A | JCT | 100 | 152.374 |  | 6.2500 | 1214.56 |  |  |
| J-H12B | JCT | 100 | 1216.960 |  | 6.6000 | 5175.60 |  |  |
| J-H12C | JCT | 100 | 1230.574 |  | 6.7000 | 5157.21 |  |  |
| J-H13 | JCT | 100 | 166.572 |  | 6.6500 | 1377.06 |  |  |
| J-H14A | JCT | 100 | 17.639 |  | 6.2000 | 294.31 |  |  |
| J-H14B | JCT | 100 | 11.402 |  | 6.2500 | 183.81 |  |  |
| J-H15A | JCT | 100 | 1980.219 |  | 7.8000 | 6533.78 |  |  |
| J-H15B | JCT | 100 | 1238.673 |  | 6.9000 | 5079.43 |  |  |
| J-H15C | JCT | 100 | 16.400 |  | 6.3000 | 233.92 |  |  |
| J-H15D | JCT | 100 | 123.495 |  | 6.5000 | 1282.36 |  |  |
| J-H16 | JCT | 100 | 120.108 |  | 6.4000 | 1269.74 |  |  |

Type.... Master Network Summary
Page 2.09
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Proposed Conditions $\backslash$ PondPack $\backslash$ Hunt Property Proposed C

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt)

| Node ID | Type | Return <br> Event | $\begin{gathered} \text { HYG Vol } \\ \text { ac-ft } \end{gathered}$ | Trun | Qpeak <br> hrs | Qpeak <br> cfs | $\begin{gathered} \text { Max WSEL } \\ f t \end{gathered}$ | Max <br> Pond Storage ac-ft |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| J-H1A | JCT | 100 | 254.701 |  | 6.0500 | 281.21 |  |  |
| J-H1B | JCT | 100 | 318.825 |  | 6.2500 | 1351.21 |  |  |
| J-H2 | JCT | 100 | 259.505 |  | 6.2000 | 2126.14 |  |  |
| J-H2A | JCT | 100 | 64.936 |  | 6.2000 | 1170.20 |  |  |
| J-H2B | JCT | 100 | 51.268 |  | 6.2000 | 944.71 |  |  |
| J-H2C | JCT | 100 | 143.303 |  | 7.0000 | 129.34 |  |  |
| J-H3 | JCT | 100 | 47.770 |  | 6.1500 | 1103.80 |  |  |
| J-H4 | JCT | 100 | 288.687 |  | 6.3500 | 1870.49 |  |  |
| J-H4A | JCT | 100 | 16.115 |  | 6.1000 | 434.02 |  |  |
| J-H4B | JCT | 100 | 16.728 |  | 6.1000 | 464.63 |  |  |
| J-H5 | JCT | 100 | 35.216 |  | 6.1500 | 750.16 |  |  |
| J-H6 | JCT | 100 | 593.446 |  | 6.6500 | 4036.37 |  |  |
| $J-H 6 A$ | JCT | 100 | 345.376 |  | 6.3500 | 1705.74 |  |  |
| J-H6B | JCT | 100 | 533.834 |  | 6.6000 | 3758.91 |  |  |

Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Proposed Conditions $\backslash$ PondPack $\backslash$ Hunt Property Proposed C

| ICPM CALCULATION TOLERANCES |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Target Convergence $=$ $.001 \mathrm{cfs} \mathrm{+/-}$  <br> Max. Iterations $=$ 35 loops <br> ICPM Time Step $=$ .0500 hrs <br> Output Time Step $=$ .0500 hrs <br> ICPM Ending Time $=141.5000$ hrs  |  |  |  |  |  |  |  |  |  |
| ```MASTER NETWORK SUMMARY \\ SCS Unit Hydrograph Method \\ (*Node=Outfall; +Node=Diversion;) \\ (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt)``` |  |  |  |  |  |  |  |  |  |
| Node ID |  | Type | Return <br> Event | HYG Vol ac-ft | Trun | Qpeak <br> hrs | Qpeak cfs | Max WSEL ft | Max <br> Pond Storage ac-ft |
| J-H7 |  | JCT | 100 | 405.414 |  | 6.3500 | 3028.91 |  |  |
| J-H7A |  | JCT | 100 | 61.036 |  | 6.2500 | 1010.73 |  |  |
| J-H7B |  | JCT | 100 | 55.690 |  | 6.2500 | 944.58 |  |  |
| J-H8 |  | JCT | 100 | 93.142 |  | 6.2500 | 1001.87 |  |  |
| J-H9 |  | JCT | 100 | 1676.067 |  | 6.9500 | 6928.33 |  |  |
| J-H9A |  | JCT | 100 | 1408.954 |  | 7.6500 | 6257.54 |  |  |
| J-H9B |  | JCT | 100 | 1424.994 |  | 7.7000 | 6263.93 |  |  |
| NHB 1 |  | AREA | 100 | 5.808 |  | 6.0500 | 167.37 |  |  |
| NHB 2 |  | AREA | 100 | 7.579 |  | 6.1000 | 184.77 |  |  |
| NHB1 |  | POND | 100 | 310.062 |  | 6.1500 | 6022.67 |  |  |
| NHB1 | OUT | POND | 100 | 307.029 |  | 6.8000 | 84.10 | 4213.98 | 253.968 |
| NHB2 |  | POND | 100 | 746.044 |  | 6.2500 | 7291.92 |  |  |
| NHB2 | OUT | POND | 100 | 745.083 |  | 15.6500 | 112.52 | 4201.59 | 389.679 |
| POND 1 | IN | POND | 100 | 320.035 |  | 6.1500 | 1684.10 |  |  |

Name.... Watershed
File.... G: \CIVIL\68200005\Hydrology\Proposed Conditions $\backslash$ PondPack $\backslash$ Hunt Property Proposed C
ICPM CALCULATION TOLERANCES

MASTER NETWORK SUMMARY SCS Unit Hydrograph Method
(*Node=Outfall; +Node=Diversion;) (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt)

| Node |  |  | Type | Return <br> Event | $\begin{gathered} \text { HYG Vol } \\ \text { ac-ft } \end{gathered}$ | Trun | Qpeak hrs | Qpeak <br> cfs | $\begin{gathered} \text { Max WSEL } \\ \mathrm{ft} \end{gathered}$ | Max <br> Pond Storage ac-ft |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| POND | 1 | OUT | POND | 100 | 318.825 |  | 6.2500 | 1351.21 | 4100.52 | 13.503 |
| POND | 2 |  | JCT | 100 | 255.845 |  | 6.3500 | 1706.96 |  |  |
| POND | 2 | IN | POND | 100 | 259.505 |  | 6.2000 | 2126.14 |  |  |
| POND | 2 | OUT | POND | 100 | 255.845 |  | 6.3500 | 1706.96 | 4129.63 | 26.743 |
| POND | 3 |  | JCT | 100 | 35.215 |  | 6.9500 | 41.25 |  |  |
| POND | 3 | IN | POND | 100 | 35.216 |  | 6.1500 | 750.16 |  |  |
| POND | 3 | OUT | POND | 100 | 35.215 |  | 6.9500 | 41.25 | 4134.92 | 24.686 |
| POND | 4 |  | JCT | 100 | 396.313 |  | 6.5500 | 2702.04 |  |  |
| POND | 4 | IN | POND | 100 | 405.414 |  | 6.3500 | 3028.91 |  |  |
| POND | 4 | OUT | POND | 100 | 396.313 |  | 6.5500 | 2702.04 | 4035.84 | 40.877 |
| POND | 5 |  | JCT | 100 | 93.142 |  | 6.5500 | 510.17 |  |  |
| POND | 5 | IN | POND | 100 | 93.142 |  | 6.2500 | 1001.87 |  |  |
| POND | 5 | OUT | POND | 100 | 93.142 |  | 6.5500 | 510.17 | 4025.54 | 20.598 |
| POND | 6 |  | JCT | 100 | 152.374 |  | 6.6500 | 755.71 |  |  |

Type.... Master Network Summary
Page 2.12
Name... . Watershed
File.... G: \CIVIL\68200005\Hydrology\Proposed Conditions $\backslash$ PondPack $\backslash$ Hunt Property Proposed C

| Target Convergen |  | . 001 | cfs +/- |
| :---: | :---: | :---: | :---: |
| Max. Iterations | $=$ | 35 | loops |
| ICPM Time Step | = | . 0500 | hrs |
| Output Time Step | $=$ | . 0500 | hrs |
| ICPM Ending Time | $=$ | . 5000 | hrs |

MASTER NETWORK SUMMARY SCS Unit Hydrograph Method
(*Node=Outfall; +Node=Diversion;) (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left\&Rt)

| Node ID |  | Type | Return <br> Event | HYG Vol ac-ft | Trun | Qpeak <br> hrs | Qpeak <br> cfs | $\begin{gathered} \text { Max WSEL } \\ f t \end{gathered}$ | Max <br> Pond Storage $a c-f t$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| POND 6 | IN | POND | 100 | 152.374 |  | 6.2500 | 1214.56 |  |  |
| POND 6 | OUT | POND | 100 | 152.374 |  | 6.6500 | 755.71 | 3985.60 | 22.409 |
| POND 7 |  | POND | 100 | 1676.068 |  | 6.9500 | 6928.33 |  |  |
| POND 7 | OUT | POND | 100 | 1578.297 |  | 7.1000 | 6382.42 | 3998.74 | 193.975 |
| POND 8 |  | POND | 100 | 1641.759 |  | 7.1000 | 6475.72 |  |  |
| POND 8 | OUT | POND | 100 | 1559.760 |  | 8.1500 | 6194.87 | 3988.67 | 196.115 |
| POND 9 |  | POND | 100 | 2009.732 |  | 7.3000 | 7089.04 |  |  |
| POND 9 | OUT | POND | 100 | 1965.239 |  | 7.6000 | 6543.27 | 3982.58 | 156.492 |

## Appendix C:

## Workmaps

$11 \times 17$ Workmaps
Existing Drainage Area Map
Existing Hydrologic Results
Proposed Drainage Area Map
Proposed Hydrologic Results
Conceptual Infrastructure Exhibit

## Full-Size Workmaps

Existing Drainage Area Map
Existing Hydrologic Results
Proposed Drainage Area Map
Proposed Hydrologic Results
Conceptual Infrastructure Exhibit



- DRAINAGE AREAS FOR NORTH HILLS BASINS 1 AND 2 WERE DELINEATED USING USGS TOPOGRAPHY
- ELEVATION-Storage information for north hills basin 1 WAs determined using lidar topography of the basin.
- ELEVATION-STORAGE INFORMATION FOR NORTH HILLS BASIN 2 WAS OBTAINED FROM THE CONCEPTUAL DRAINAGE PLAN PERFORMED BY EL PASO WATER UTILITIES SERVICE BOARD IN OCTOBER 2006.
- MEASUREMENTS FOR THE OUTFALL STRUCTURES FOR NORTH HILLS BASINS 1 AND 2 WERE PERFORMED BY KHA DURING A SITE VISIT IN JANUARY 2008.
- ELEVATION-DISCHARGE INFORMATION FOR THE BASINS WAS COMPUTED USING PONDPACK'S OUTLET STRUCTURE MANAGER

SAMPLE CURVE NUMBER CALCULATIONS:
INDUSTRIAL AREAS: 72\% IMPERVIOUS (CN=98) AND 28\% DESERT SHRUB IN POOR CONDITION (CN=77)
$0.72^{*} 98+0.28^{*} 77=92.1$

SINGLE FAMILY AREAS: 60\% IMPERVIOUS (CN=98) AND 40\% NATURAL DESERT LANDSCAPING (CN=77)
$0.60 * 98+0.40 * 77=89.6$





| DRAINAGE AREA | AREA (AC.) | WEIGHTED | Tc (MIN) | FLOW (CFS) |
| :---: | :---: | :---: | :---: | :---: |
| A1 | 2879 | ${ }_{95}$ | 66 | 6244 |
| ${ }^{\text {A2 }}$ | 759 | 93 | 35 | 2640 |
| ${ }^{\text {A }}$ | 55 | 95 | 11 | 407 |
| ${ }^{\text {A4 }}$ | 20 | 95 | 10 | 152 |
| A5 | 4 | 95 | 10 | 27 |
| ${ }^{\text {A6 }}$ | 194 | 89 | 27 | 701 |
| A7 | 56 | 85 | 21 | 202 |
| A8 | 96 | 84 | 23 | 314 |
| A9 | 181 | 88 | 26 | 638 |
| A10 | 121 | 84 | 22 | 410 |
| A11 | 303 | 79 | 38 | 505 |
| A12 | 27 | 77 | 13 | 88 |
| A13 | 143 | 78 | 31 | 266 |
| ${ }^{\text {A14 }}$ | 528 | 83 | 52 | ${ }_{83} 8$ |
| A15 | 147 | 77 | 50 | 173 |
| A16 | ${ }^{241}$ | 78 | 37 | 390 |
| A17 | 165 | 77 | 38 | 250 |
| A18 | 33 | 77 | 24 | 74 |
| A19 | 81 | 78 | 33 | 143 |
| A20 | 126 | 77 | 41 | 178 |
| ${ }^{1} 1$ | 1085 | 95 | 27 | 4882 |
| B2 | 11 | 95 | 10 | 80 |
| B3 | 79 | 95 | 17 | 488 |
| B4 | 35 | 95 | 12 | 253 |
| B5 | 345 | 95 | 16 | 2148 |
| ${ }^{\text {B6 }}$ | ${ }^{23}$ | 88 | 10 | 137 |
| ${ }^{87}$ | 86 | 90 | 16 | 456 |
| ${ }^{88}$ | 95 | 89 | 19 | 437 |
| B9 | 75 | 84 | ${ }^{23}$ | 245 |
| ${ }^{810}$ | 71 | 95 | 12 | 515 |
| ${ }^{111}$ | 83 | 80 | 20 | 246 |
| ${ }^{12}$ | 72 | 91 | 15 | 408 |
| B13 | 7 | 82 | 10 | 32 |
| ${ }^{14}$ | 107 | 79 | 22 | 285 |
| B15 | 132 | 78 | 25 | 295 |
| ${ }^{816}$ | 277 | 77 | 46 | 351 |
| ${ }^{17}$ | 173 | 77 | 31 | 307 |
| B18 | 193 | 77 | 34 | 309 |
| B19 | 249 | 77 | 53 | 279 |
| C1 | 290 | 77 | 32 | 511 |
| C2 | 12 | 80 | 10 | 53 |
| c3 | 137 | 77 | 28 | 265 |
| C4 | 209 | 77 | 45 | 271 |
| D1 | 83 | 77 | 27 | 167 |
| D2 | 74 | 77 | 22 | 174 |
| D3 | 161 | 78 | 30 | 311 |
| D4 | 275 | 78 | 38 | 436 |
| E1 | 1470 | 92 | 27 | 5918 |
| E2 | 875 | 91 | 32 | 2998 |
| E3 | 912 | 95 | 36 | 3305 |
| E4 | 228 | 91 | 25 | 964 |
| E5 | 382 | 93 | 37 | 1251 |
| E6 | 67 | 77 | 22 | 156 |
| E7 | 59 | 77 | ${ }^{23}$ | 136 |
| E8 | 42 | 77 | 15 | 127 |
| E9 | ${ }^{23}$ | 77 | 14 | 73 |
| E10 | 7 | 78 | 10 | 27 |
| E11 | 9 | 79 | 10 | 39 |
| E12 | 143 | 90 | 24 | 603 |
| E13 | 183 | 89 | 26 | 677 |
| E14 | 103 | 77 | 27 | 207 |
| E15 | 50 | 77 | 17 | 145 |
| E16 | 104 | 77 | 26 | 207 |
| E17 | 98 | 77 | 39 | 145 |
| E18 | 116 | 77 | 39 | 170 |
| E19 | 186 | 77 | 44 | 245 |
| E20 | 302 | 90 | 32 | ${ }^{995}$ |
| E21 | 76 | 78 | 18 | 215 |
| E22 | 71 | 90 | 22 | 315 |
| E23 | 137 | ${ }_{90}^{90}$ | ${ }^{27}$ | 519 |
| E24 | 86 | 91 | 19 | 427 |
| E25 | 93 | 90 | 25 | 368 |
| ${ }_{\text {E26 }}^{\text {E27 }}$ | ${ }_{5}^{52}$ | 90 | 20 | ${ }_{3}^{245}$ |
| E27 | 84 | 90 | 20 | 394 |
| ${ }_{\text {E28 }}$ | 11 | 91 | 15 | 64 |
| E29 | 34 22 | 90 98 | 17 | ${ }_{176}^{167}$ |
| NHB1 | ${ }_{2}^{22}$ | ${ }_{98}^{98}$ | 13 19 | 167 185 |
| F1 | 812 | 78 | 69 | ${ }_{765}$ |
| F2 | 26 | 78 | 26 | 57 |
| F3 | 167 | 75 | 43 | 202 |
| F4 | ${ }^{427}$ | 77 | 56 | 455 |
| ${ }^{\text {F }}$ | 122 | 77 | ${ }^{27}$ | 242 |
| F6 | 466 310 | 79 | 71 | 452 |
| 61 | 109 | 77 | 54 | ${ }_{122}^{27}$ |
| 63 | 56 | 78 | ${ }^{34}$ | 98 |
| 64 | 42 | 78 | 29 | 83 |
| 65 | 123 | 77 | 37 | 187 |
| 66 | 118 | 77 | 29 | 225 |

- drainage areas for north hills basins 1 And 2 were delineated using usgs topography.
- ELEVATIONSTORAGE INFORMATION FOR NORTH HILLS BASIN 1 WAS dETERMINED USING LIDAR TOPOGRAPHY OF THE BASII
- ELEVATION-STORAGE INFORMATION FOR NORTH HLLLS BASIN 2 WAS OBTAINED FROM THE CONCEPTUAL DRAINAGE PLAN PERFORMED B

MEASUREMENTS FOR THE OUTFALL STRUCTURES FOR NORTH HILLS BASINS 1 AND 2 WERE PERFORMED BY KHA DURING A SITE VIITTIN
elevatondischarge nformaton or the basins was compute using pondpacks outlet structure manager

SAMPLE CURVE NUMBER CALCULATIONS:
INDUSTRIAL AREAS: 72\% IMPERVIOUS (CN=98) AND 28\% DESERT SHRUB IN POOR NDITION (CN=77)
$0.72^{*} 98+0.28^{* 77}=92.1$

SINGLE FAMILY AREAS: $60 \%$ IMPERVIOUS (CN=98) AND 40\% NATURAL DESERT $0.60^{* 98}+0.40^{*} 77=89.6$



| DRAINAGE AREA | AREA (AC.) | $\underset{\substack{\text { WEIGHTED } \\ \text { CN }}}{ }$ | Tc ( MIN) | FLOw (CFS) |
| :---: | :---: | :---: | :---: | :---: |
| ${ }^{\text {A1 }}$ | 2879 | 95 | 66 | 6244 |
| $\mathrm{A}^{2}$ | 759 | 93 | 35 | 2640 |
| A3 | 44 | 95 | 11 | 322 |
| ${ }^{\text {A6 }}$ | 194 | 89 | 27 | 701 |
| A7 | 56 | 85 | 21 | 202 |
| A8 | 90 | 84 | 23 | 295 |
| A9 | 49 | 92 | 16 | 277 |
| A11 | 303 | 79 | 38 | 505 |
| A12 | 27 | 77 | 13 | 88 |
| A13 | 143 | 78 | 31 | 266 |
| A14 | 528 | 83 | 52 | 833 |
| A15 | 147 | 77 | 50 | 173 |
| A16 | 241 | 78 | 37 | 390 |
| B1 | 1039 | 95 | 21 | 5678 |
| B3 | 72 | 95 | 15 | 476 |
| ${ }^{84}$ | 26 | 95 | 10 | 194 |
| ${ }^{85}$ | 328 | 95 | 13 | 2273 |
| B7 | 69 | 92 | 12 | 451 |
| B8 | 84 | 91 | 16 | 454 |
| DAM 1 | 25 | 98 | 44 | 84 |
| DAM 2 | 24 | 98 | 10 | 194 |
| C1 | 65 | 78 | 11 | 254 |
| E1 | 1470 | 92 | 27 | 5918 |
| E2 | 875 | 91 | 32 | 2998 |
| E3 | 912 | 95 | 36 | 3305 |
| E4 | 228 | 91 | 25 | 964 |
| E5 | 382 | 93 | 37 | 1251 |
| E12 | 143 | 90 | 24 | 603 |
| E13 | 183 | 89 | 26 | 677 |
| E20 | 302 | 90 | 32 | 995 |
| E21 | 76 | 78 | 18 | 215 |
| E22 | 71 | 90 | 22 | 315 |
| E23 | 137 | 90 | 27 | 519 |
| E24 | 86 | 91 | 19 | 427 |
| E25 | 93 | 90 | 25 | 368 |
| E26 | 52 | 90 | 20 | 245 |
| E27 | 84 | 90 | 20 | 394 |
| E28 | 11 | 91 | 15 | 64 |
| E29 | 34 | 90 | 17 | 176 |
| NHB1 | 22 | 98 | 13 | 167 |
| NHB2 | 29 | 98 | 19 | 185 |
| F1 | 739 | 78 | 54 | 868 |
| F6 | 527 | 80 | 71 | 539 |
| 61 | 352 | 77 | 66 | 327 |
| 66 | 110 | 77 | 23 | 248 |
| H1 | 103 | 87 | 29 | 326 |
| H2a | 367 | 88 | 30 | 1170 |
| H2b | 328 | 85 | 28 | 945 |
| H3 | 270 | 88 | 21 | 1104 |
| H4a | 88 | 89 | 17 | 434 |
| H4b | 91 | 89 | 16 | 465 |
| H5 | 216 | 86 | 24 | 750 |
| H6 | 365 | 86 | 31 | 1037 |
| H7a | 345 | 88 | 33 | 1011 |
| H7b | 341 | 86 | 32 | 945 |
| H8 | 355 | 86 | 32 | 983 |
| н9 | 379 | 84 | 21 | 1289 |
| H10 | 305 | 84 | 33 | 739 |
| H11a | 172 | 86 | 21 | 646 |
| H11b | 164 | 85 | 21 | 592 |
| H12a | 309 | 90 | 29 | 1107 |
| H12b | 74 | 89 | 11 | 456 |
| H13 | 98 | 85 | 15 | 441 |
| H14a | 43 | 83 | 23 | 138 |
| H14b | 121 | 74 | 30 | 184 |
| H15a | 104 | 83 | 19 | 374 |
| H15b | 44 | 89 | 15 | 233 |
| ${ }^{\text {H15 }}$ | 193 | 72 | 34 | 234 |
| ${ }_{\text {H15d }}$ | 36 410 | 74 87 | 28 40 | 58 990 |


| MODELING UNCTION POINT | fLow (CFS) |
| :---: | :---: |
| J-A1 | 6244 |
| J-A2 | 2640 |
| J-A3 | 322 |
| J-A6 | 701 |
| J-A7 | 202 |
| J-A8 | 428 |
| J-A11 | 5850 |
| J-A16 | 390 |
| J-E1 | 5918 |
| J-E2 | 2998 |
| J-E3 | 3305 |
| J-E4 | 964 |
| J-E5 | 2557 |
| J-E12 | 603 |
| J-E13 | 1376 |
| J-E20 | 3555 |
| J-E21 | 3674 |
| J-E22 | 315 |
| J-E23 | 4296 |
| J-E24 | 3783 |
| J-E25 | 4384 |
| J-E26 | 4405 |
| J-E27 | 4435 |
| J-E28 | 4437 |
| J-E29 | 4443 |
| J-F1 | 868 |
| J-F6 | 539 |
| J-G1 | 327 |
| J-G6 | 362 |
| J-H1 | 580 |
| J-H1a | 281 |
| J-H1b | 1351 |
| J-H2 | 2126 |
| J-H2a | 1170 |
| J-H2b | 945 |
| J-H2C | 129 |
| J-H3 | 1104 |
| J-H4 | 1870 |
| J-H4a | 434 |
| J-H4b | 465 |
| J-H5 | 41 |
| J-H6 | 4036 |
| J-H6a | 1706 |
| J-H6b | 3759 |
| J-H7 | 2702 |
| J.-H7a | 1011 |
| J-Н7b | 945 |
| J-H8 | 510 |
| J-H9 | 6382 |
| J.H9a | 6258 |
| J-H9b | 6264 |
| JH10 | 6195 |
| J-H11a | 2706 |
| J-H11b | 6543 |
| J-H12a | 756 |
| J-H12b | 5176 |
| J-H12c | 5157 |
| J-H13 | 1377 |
| J-H14a | 294 |
| J-H14b | 184 |
| J-H15a | 6534 |
| J-H15b | 5079 |
| J-H15c | 234 |
| J-H15d | 1282 |
| J-H16 | 1270 |
| GLS | 9077 |

- DRAINAGE AREAS FOR NORTH HILLS BASINS 1 AND 2 WERE DELINEATED USING USGS TOPOGRAPHY
- ELEVATION-Storage information for north hills basin 1 Was determined using lidar topography of the basin
- ELEVATION-STORAGE INFORMATION FOR NORTHHLLLS BASIN 2 WAS OBTAINED FROM THE CONCEPTUAL DRAINAGE PLAN PERFORMED B
- MEASUREMENTS FOR THE OUTFALL STRUCTURES FOR NORTHHILSS BASINS TAND 2 WERE PERFORMED BY KHA DURING A SITE VISTIN
elevation-discharge information for the basins was computed using pondpacks outlet structure mana


## SAMPLE CURVE NUMBER CALCULATIONS:

INDUSTRIAL AREAS: 72\% IMPERVIOUS (CN=98) AND 28\% DESERT SHRUB IN POOR
$0.72^{*} 98+0.28^{*} 77=92.1$
SINGLE FAMILY AREAS: $60 \%$ IMPERVIOUS (CN=98) AND 40\% NATURAL DESERT NDSCAPING (CN=77)
$0.60^{\circ} 98+0.40^{\circ} 77=89.6$



TYPICAL SECTION A-A


TYPICAL SECTION B-B



TYPICAL SECTION D-D


# Master Zoning Plan for the Northeast Property <br> in El Paso, Texas 

Prepared for:


Prepared by:


Kimley-Horn and Associates, Inc.

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12700 Park Central Drive
Suite 1800
Dallas, Texas 75251
Tel: (972) 770-1300

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## Section 1: Introduction

This Master Zoning Plan (MZP) is a required component of the documentation necessary for development in a Mixed-Use Zoning District. The provisions for the preparation of this Plan are found under Title 20, Chapter 20.04, Section IV, which states: "For any use authorized in a Mixed-Use District (RMU, GMU, and IMU), a master zoning plan shall be required...." It is intended that the property that is the subject of this MZP be zoned as a General Mixed-Use District in coordination with the Land Study for the District (submitted concurrently) and to be subject to the requirements established herein.

### 1.1 Scope

The scope of this document is to describe the purpose, characteristics, components, and timing of the proposed mix of land use within the District. The District contemplated under this MZP is intended to develop into a unified, comprehensively planned community that conforms with, enhances and furthers the City's adopted Comprehensive Plan and Smart Growth Objectives.

### 1.2 Purpose and Intent

The purposes of this Master Zoning Plan are to provide details about the proposed land use and proposed structures to convey compatibility within the District and with adjacent properties. Some of the objectives of this development are to accomplish the following:

- Coordinate appropriate transportation corridors with specific land use patterns;
- Interconnect open space and parks within the GMU district via pedestrian and bicycle pathways;
- Provide for neighborhoods that are compact and pedestrian-friendly;
- Provide for streets that disperse and reduce the length of vehicular trips;
- Provide for a range of open spaces including pocket parks, squares and playgrounds distributed throughout a GMU district;
- Provide for street designs that reinforce safety;
- Provide for dual use park-pond opportunities; and
- Allow for the use of drainageways for open space amenities.

In some instances alternative design standards are warranted and are found in the Land Study submitted concurrently with this document.

### 1.3 General Guidelines

The Master Zoning Plan establishes the desired development form for this District. The components of this development form are buildings, streets, and spaces; the distribution of which is governed by this Master Zoning Plan and also described in the Amended Land Study. These documents provide standards for the distribution, placement and appearance of forms, linkages, and spaces within the District.

It is not the intent of these Guidelines to mandate or imply that a design reference to each item be included in each submittal; rather that when there is a practical opportunity for an item to be included as part of the development plan such item shall be considered.

### 1.3.1 The District

The intent of the design and function of the District as a whole is as follows:

- Development intensity generally increases toward mixed-use area(s) and generally adjusts as appropriate to integrate with adjacent development.
- The District and its Subdistricts and Neighborhoods are structured with respect to walkability and minimization of pedestrian/vehicular conflicts wherever practicable.
- The District is organized as a community incorporating mixed-use areas ("Neighborhood Centers", "Town Centers") serving, pedestrian-friendly neighborhoods.
- The District supports pedestrian and bicycle systems and is agreeable to a framework of future transit.
- Civic, institutional and commercial activity is integrated with residential areas.
- A range of open space types, such as trails, parks, squares, plazas and playgrounds are distributed within and throughout the District.


Commercial uses provide for the needs of the neighborhood.

- Various land uses, housing types and densities are distributed throughout the District.


### 1.3.2 The Subdistrict

The intent of the design and function of the Subdistricts that comprise the District is as follows:

- Subdistricts are regulated as to development type, character, and intensity.
- Appropriate building densities and land uses are provided within walking distance of transit stops in coordination with transit providers.


### 1.3.3 <br> The Neighborhoods

Neighborhoods are distinct areas where the residents and/or non-residential uses share a school, park, or community business center generally within walking distance of the homes or businesses; architecture; or other features; and/or having boundaries that may include roadways or natural features. The neighborhood character is deemed to be the prevailing character of the streets, structures, and open spaces. The intent of the general design and function of the Neighborhoods within the Subdistricts is as follows:

- Neighborhoods are compact, pedestrian-friendly, and composed of diverse housing types.
- There is opportunity to obtain goods and services and enjoy social interaction and recreation within walking distance of most dwellings.
- A one-quarter mile radius shall determine the approximate boundary and center of a Neighborhood.
- The classic model of a "Neighborhood Unit" is shown for illustrative purposes only.
- The relevant points are as described above.


## Buildings and Open Spaces

The intent of buildings and open spaces within a Neighborhood is as follows:

- Well-configured squares, plazas, greens, streets, preserves, greenbelts, and parks are devoted to the collective social activity, recreation, and visual enjoyment of the Neighborhood.
- Buildings and landscaping contribute to the physical definition of streets as public places.
- Public gathering spaces are provided in a manner that reinforces community identity.
- Principal buildings and facades, where possible, relate to and are oriented toward the street to encourage a neighborhood-friendly environment.
- Buildings, open spaces, and other features act as landmarks, symbols, and focal points.


Prototypical "Neighborhood Unit" (Clarence Perry, 1929)

### 1.3.5 Circulation

The intent of the design and function of the circulation systems is as follows:

- Transportation corridors are planned and reserved in coordination with proposed land use patterns.
- Natural or man-made green corridors and open space areas are used to define and connect Neighborhoods to other facilities within the District.
- The street network offers multiple travel choices.


Structures and landscaping work together to frame views and define streets.


## Section 2: Master Land Use Plan

The Master Zoning Plan for the District shall be as described herein and as depicted on the Master Land Use Plan. Key components of the Master Land Use Plan are described below.

### 2.1 Development Context

The District is bounded by the Franklin Mountains State Park to the west, US 54 and vacant land to the east, the EPECO power plant and El Paso natural gas facility and vacant land to the north, and single-family residential development to the south. The District is currently zoned as R-F (Ranch \& Farm), M-2 (Heavy Manufacturing), and PMD (Planned Mountain Development) Districts, and is planned for residential and supporting non-residential and civic land uses.
2.2 Topography

The land comprising the District slopes gently downhill at an approximate $2 \%$ gradient eastward from the Franklin Mountains.
2.3 Proposed Land Use Types

Each of the following proposed land use types are shown distributed throughout the Master Land Use Plan and are described in Section 3.
2.3.1 Open Space

Open space that has been set aside to provide for site drainage and for the recreational needs of the community.

### 2.3.2 Community Uses

Community uses, including schools, public safety uses, governmental uses, and bus terminals.
2.3.3 Low Density Residential 3.5

Low Density Residential 3.5, consisting primarily of single-family detached dwellings and two-family dwellings composing an average density of no greater than 3.5 dwelling units per gross acre (du/ac).

```
2.3.4 Low Density Residential 5.5
Low Density Residential 5.5, consisting primarily of single-family detached dwellings, two-and four-family dwellings and townhouses composing an average
density of no greater than 5.5 du/ac.
2.3.5 Medium Density Residential 7.2
Medium Density Residential 7.2, consisting primarily of multifamily dwellings, with single-family detached dwellings, two- and four-family dwellings and
    townhouses composing an average density of no greater than 7.2 du/ac.
2.3.6 Medium Density Residential 12.0
    Medium Density Residential 12.0, consisting primarily of multifamily dwellings, with two- and four-family dwellings, townhouses and apartments
    composing an average density of no greater than 12.0 du/ac.
2.3.7 Mixed-Use Low Intensity
    Mixed-Use Low Intensity, consisting of neighborhood-serving retail and/or commercial uses and/or multi-family dwellings.
2.3.8 Mixed-Use High Intensity
    Mixed-Use High Intensity, consisting of community-serving retail and/or commercial uses and multi-family dwellings.
2.3.9 Regional Retail
    Regional Retail, consisting of a high concentration of retail, commercial and entertainment opportunities serving the Northeast El Paso region.
```


### 2.4 Development Intensity

### 2.4.1 Organization

The development is organized as a community consisting of neighborhood centers and town centers serving pedestrian-friendly neighborhoods.
Mixed-use, town center development is used to anchor residential areas and to provide goods and services within walking distance of housing.
Single use commercial areas may be used in coordination with mixed-use development.


### 2.4.2 Intensity

Development intensity generally increases toward neighborhood centers and town centers and generally decreases toward the perimeter of the development thus providing for a gradient of lessening development from mixed-use and non-residential core areas.

## Distribution

Land uses, housing types and densities are distributed throughout the development. Neighborhood commercial nodes provide for the ordinary needs of daily living of the residents of the adjacent neighborhoods.

## Densities

Densities are capable of supporting mixed-use development. Per the recommendation of The Plan for El Paso, Low Density Residential shall contain less than seven dwelling units per acre (du/ac), Medium Density Residential shall contain 7.1-20 du/ac, High Density Residential shall contain greater than twenty $\mathrm{du} / \mathrm{ac}$. This Master Land Use Plan shows four categories of residential development intensity each expressed as an average density and a range of housing types.

### 2.4.5

Walkability
Neighborhoods are arranged to support walkability and to minimize pedestrian/vehicular conflicts wherever practicable. The Plan for El Paso encourages residential development to be located within "walking distance" (one-quarter mile) of retail and service centers, community facilities, medical facilities, and/or transportation facilities. Companion maps to the Master Land Use Plan show lines delimiting the area within one-quarter mile of the proposed retail,


Mixed-use neighborhoods promote walkability. commercial and community facilities. (See Appendices ' $\mathbf{B}$ ' and ' $\mathbf{C}$ '.)

## Town Centers

Town Centers are located so as not to be isolated from the perimeter of the development and from the City; so as to increase the support of the region by providing access to more people; and to discourage offsite traffic from passing through residential neighborhoods. (See Appendix ' $A$ '.)

### 2.5 Specific Land Use Provisions

### 2.5.1 Access

Residential neighborhoods are located so as to have access to goods and services, provide for a variety of dwelling types, and call for densities appropriate to the needs of the neighborhood and community retail that serve them.

### 2.5.2 Open Space

Open space within the District provides for a pedestrian linkage system, thus uniting rather than dividing the community.

### 2.5.3 Schools

School sites are well distributed and buffered as necessary. Final location of school sites will be coordinated with the El Paso Independent School District (EPISD) or Socorro Independent School District (SISD) at the appropriate time during the development process.
2.5.4 Coordination

The roadway network is coordinated with land use needs and includes concentric ring roads that capitalize on views westward to the mountains.

### 2.6 Roadways

Roadways vary depending on the proposed function, anticipated land uses, and anticipated traffic load. This District contains a variety of roadway types in anticipation of demand for a number of housing opportunities, each with distinct access needs. Details and explanatory text in the Land Study for this proposed District (submitted concurrently) describe the design and supposed function of each roadway not contemplated by the Design Standards for Construction.

In general, Martin Luther King, Jr. Boulevard, McCombs Street and proposed Sean Haggerty Drive are the major north-south thoroughfares. An inner loop and an outer loop are proposed as well as an east-west thoroughfare (Painted Dunes Avenue) in the center of the development. Various additional thoroughfares connect all corners of the development. (See Appendix ' $A$ '.)


### 2.7 Phasing

Per the Development Agreement, the District is proposed to be developed as three Phase Parcels, within which are twelve development phases. Construction and development of Phase 1 is expected to begin in 2009, with twelve phases of development expected to be completed by 2020. The Phasing schedule is described below and is shown graphically on the Phasing Key Map in Appendix ' $D$ '.
2.7.1 $\quad$ Phase Parcel 1
$\quad$ Phase Parcel 1 is approximately 1,167 net acres ( $4.94 \mathrm{du} / \mathrm{ac}$ ) with four development phases.
2.7.1.1 Phase 1 (2009)

Phase 1 (2009) is approximately 301 acres within Subdistricts 14-16, and containing approximately $1,201 \mathrm{du}(4.00 \mathrm{du} / \mathrm{ac})$.
2.7.1.2 Phase 2 (2010)

Phase 2 (2010) is approximately 245 acres within Subdistricts 9 and 14, and containing approximately $1,161 \mathrm{du}(4.73 \mathrm{du} / \mathrm{ac})$.
2.7.1.3 Phase 3 (2011)

Phase 3 (2011) is approximately 256 acres within Subdistricts $13-15$ and 19, and containing approximately $1,229 \mathrm{du}(4.80 \mathrm{du} / \mathrm{ac})$.
2.7.1.4 Phase 4 (2012)

Phase 4 (2012) is approximately 364 acres within Subdistricts 4-6, 9,15 and 19, and containing approximately 2,170 du (5.96 du/ac).

### 2.7.2 Phase Parcel 2

Phase Parcel 2 is approximately 1,813 net acres ( $4.30 \mathrm{du} / \mathrm{ac}$ ) with four development phases.
2.7.2.1 Phase 5 (2013)

Phase 5 (2013) is approximately 442 acres within Subdistricts 4, 8,12 and 15, and containing approximately 1,903 du (4.30 du/ac).
2.7.2.2 Phase 6 (2014)

Phase 6 (2014) is approximately 491 acres within Subdistricts 3-7 and 15, and containing approximately 2,060 du (4.20 du/ac).

| 2.7.2.3 | Phase $7(2015)$ |
| :--- | :--- |
| Phase $7(2015)$ is approximately 418 acres within Subdistricts $2,4-7,11,18$ and 19 , and containing approximately $1,805 \mathrm{du}$ ( $4.31 \mathrm{du} / \mathrm{ac}$ ). |  |
| 2.7.2.4 | Phase $8(2016)$ <br> Phase $8(2016)$ is approximately 461 acres within Subdistricts 6,15 and $18-21$, and containing approximately $2,031 \mathrm{du}(4.41 \mathrm{du} / \mathrm{ac})$. |

### 2.7.3 Phase Parcel 3

Phase Parcel 3 is approximately 1,856 net acres ( $3.75 \mathrm{du} / \mathrm{ac}$ ) with four development phases.
2.7.3.1 Phase 9 (2017)

Phase 9 (2017) is approximately 615 acres within Subdistricts 2-4, 12, 18, 20 and 21, and containing approximately 2,344 du (3.81 du/ac).
2.7.3.2 Phase 10 (2018)

Phase 10 (2018) is approximately 561 acres within Subdistricts $3,4,7,11$ and 12 , and containing approximately $1,954 \mathrm{du}(3.48 \mathrm{du} / \mathrm{ac})$.
2.7.3.3 Phase 11 (2019)

Phase 11 (2019) is approximately 563 acres within Subdistricts $1-3$ and 17, and containing approximately 2,132 du ( $3.79 \mathrm{du} / \mathrm{ac}$ ).
2.7.3.4 Phase 12 (2020)

Phase 12 (2020) is approximately 117 acres within Subdistricts 1,2 and 17 , and containing approximately 535 du ( $4.57 \mathrm{du} / \mathrm{ac}$ ).

The total area of the three Phase Parcels, not including the high school, the golf course and utilities is 4,835 acres containing a maximum of 20,000 units. This equates to a maximum density of $4.14 \mathrm{du} / \mathrm{ac}$.

The total area for the District per this Master Zoning Plan, which excludes the golf course and the TxDOT drainage easement (i.e., includes the high school site and the water well sites), is 4,943 acres according to the survey, with an maximum dwelling count of 20,000 units. This equates to a maximum density of 4.05 du/ac.

The total area for the District per the Comprehensive Plan amendment (including the high school, the golf course, utilities and open space) is 5,201 acres, with an maximum dwelling count of 20,000 units. This equates to a maximum density of $3.85 \mathrm{du} / \mathrm{ac}$.


### 2.8 Relation to The Plan for El Paso

The Plan for El Paso puts forth Goals and Policies that define the desired form and function of the City: how El Paso looks and how it works. What is created through development in this District is balanced with what is conserved of the native environment. Land development provides homes, stores, offices and civic buildings to the citizens of El Paso; land that is not developed provides recreation space, habitat and floodwater conveyance. The appropriate utility of the native environment is achieved when its functional and aesthetic qualities are maximized in the service of land development needs. The appropriate development form is achieved when its functional and aesthetic qualities are maximized in the service of human needs. This Master Zoning Plan is in accordance with the goals and policies of The Plan for El Paso.

This Master Zoning Plan and the Land Study (submitted concurrently) provide specificity to the Goals and Policies of The Plan for El Paso. Primary points of agreement with these Goals and Policies are as follows:

## Environment

- Policy: Emphasize infill and higher density developments located in areas served by public transit to reduce dependency on automobiles.
- Policy: Allow high-density land uses and cluster developments that protect ecologically sensitive areas.
- Reduce dependence on the automobile.


## Transportation

- Policy: Increase bicycle, pedestrian and transit access in land development ordinances and conceptual plans.

Note: While some right-of-way widths allowed by Title 19 are greater than those suggested by The Plan for El Paso, a goal of this District is to provide a circulation system whereby the streets are as narrow as possible and no more than four travel lanes.

## Community Facilities

- Policy: Expand park acreage and recreational facilities to meet the needs of the expanding population within the community through several methods including, but not limited to park / ponding facilities.
- Public and quasi-public facilities should be located in commercial or office zoning districts
- Facilities should be located on shared sites with other facilities.

Note: This District promotes locating community facilities on shared sites (see Master Land Use Plan) with mixed-use areas.

## Land Use \& City Form

- Goal: Develop a balanced and complete community that contains a mix of land uses and densities, housing types and styles, economic development, job opportunities, educational opportunities, and outlets for social and cultural expression.
- Policy: Community facilities should be equitably distributed to the extent feasible throughout the City.
- Goal: Encourage the provision of neighborhood commercial services that are compatible with a neighborhood's residential character.
- Policy: Promote mixed uses within designated neighborhoods.
- Policy: Locate neighborhood commercial centers within walking distance of residences and on mass transit routes.
- Policy: Community facilities should be equitably distributed to the extent feasible throughout the City.
- Policy: Encourage neighborhood amenities that include places for interaction among residents such as parks, community centers, schools, commercial areas, churches, and other gathering points throughout the City.
- Low Density Residential is primarily for single family dwellings ranging up to $7 \mathrm{du} / \mathrm{ac}$.
- Medium Density Residential is intended for dwellings ranging from 7.1-20 du/ac, allowing for a mixture of housing types,
 including single-family, two-family, and multi-family dwellings.
- High Density Residential. is intended for very dense residential development of 20.1 or more units per acre, allowing for a mixture of housing types and intensity.
- Neighborhood Commercial contributes to neighborhood identity. Residential, office and light commercial uses are considered complementary uses.
- Community Commercial permits miscellaneous commercial land uses serving several neighborhoods within a planning area.
- Regional Commercial serves the City and adjacent communities. Such land uses are high traffic generators, and are encouraged along major or higher order arterial streets.


## Urban Design

- Linking different neighborhoods together through a quality spatial experience
- Consistency from one neighborhood to the next
- Master-planned communities


## Section 3: Property Development Regulations of The Master Zoning Plan

### 3.1 General

### 3.1.1 Existing Zoning

The existing zoning for the property is Ranch-Farm (R-F), Heavy Manufacturing (M-2), and Planned Mountain Development (PMD). The existing zoning for the adjoining land is R-F, M-2 and Light Manufacturing ( $M-1$ ) to the north; $R-F$ to the east; PMD to the west; and Residential ( $R-1$ and $R-3 A$ ), Commercial ( $\mathrm{C}-1$ and $\mathrm{C}-2$ ) to the south.
3.1.2 Proposed Zoning

The proposed zoning for the property is General Mixed-Use (GMU).

### 3.2 Purpose and Intent

The purpose of the Development regulations for the District is to provide for the housing, educational, recreational, shopping and business needs of the population of the District and to promote compatible buildings and uses that are appropriate in area, location and overall planning for this purpose. The proposed mix of land uses supports this purpose by offering a broad range of development possibilities to meet the needs of a variety of market sectors.

It is the intent of these Development regulations to support this purpose, offering development requirements that may be evaluated uniformly over time while at the same time being flexible enough to change with the needs of the dynamic population of El Paso, all within a physically, socially and economically unified master-planned community. El Paso's Smart Growth Objectives will play an important role in meeting this intent.

### 3.3 Land Use Types, Densities, and Dimensional Standards

### 3.3.1 The District

The intent of the design and function of the District shall be as described under Section 1.3.1 and regulated by the requirements of this Section.
The distribution of these land use types is shown on the Master Land Use Plan in Appendix ' $\mathbf{A}$ '.

### 3.3.1.1 $\quad$ Proposed Mix of Land Use Types

3.3.1.1.1 Open Space

Open space is distributed throughout the District in a manner intended to unite the community. Homes and neighborhoods, the more personal parts of the District are linked to gathering places (e.g., schools, parks, retail/ office); the pedestrian circulation system itself being a space for social interaction as well.

### 3.3.1.1.2 Schools

### 3.3.1.1.2.1 Elementary School

Four elementary schools are shown, each in one of the quadrants of the District west of McCombs Street. The eventual locations of these institutions will be coordinated with the EPISD or SISD as appropriate. Access to elementary schools shall not be from a major arterial.

### 3.3.1.1.2.2 Middle School

One middle school site has been reserved. As this is the only middle school planned for the District it is likely that its location will change based on the desire to best serve the needs of the students. The eventual location of the middle school will be coordinated with the EPISD. Access to the middle school shall not be from a major arterial.

### 3.3.1.1.2.3 High School

One high school site has been reserved. This is the only high school planned for the District, the eventual location of which will be coordinated with the EPISD. Its location has taken the following criteria (provided by the EPISD) into account:

- street frontage and access;
- student capture (two-mile walking distance);
- site shape and potential for expansion;
- open space buffer adjacent to neighborhoods; and
- proximity to retail.


### 3.3.1.1.3 Low Density Residential 3.5

This residential type includes single-family detached homes and two-family homes, distributed in a manner that follows the intent of Section 1.3.3 and does not exceed 3.5 dwelling units per gross acre within the acreage allocated to it within its Subdistrict, as shown on the Master Land Use Plan. Duplexes may be included at the edges of these areas in order to articulate with adjacent higher-density areas, provided the density maximum is not exceeded.

### 3.3.1.1.4 Low Density Residential 5.5

This residential type includes single-family detached homes, two-family homes, and three- and four-family homes, distributed in a manner that follows the intent of Section 1.3.3 and does not exceed 5.5 dwelling units per gross acre within the acreage allocated to it within its Subdistrict, as shown on the Master Land Use Plan. Townhouses may be included at the edges of these areas in order to articulate with adjacent higher-density areas, provided the density maximum is not exceeded.
3.3.1.1.5

Medium Density Residential 7.2
This residential type includes single-family detached homes, two-family homes, three- and four-family homes, and residential cluster development, distributed in a manner that follows the intent of Section 1.3.3 and does not exceed 7.2 dwelling units per gross acre within the acreage allocated to it within


Cluster development is encouraged.
its Subdistrict, as shown on the Master Land Use Plan. Townhouses may be included at the edges of these areas in order to articulate with adjacent higher-density areas, provided the density maximum is not exceeded. Cluster development is encouraged.

### 3.3.1.1.6

3.3.1.1.7
3.3.1.1.9

## Medium Density Residential 12.0

This residential type includes three- and four-family homes, residential cluster development, townhouses, and apartment buildings, distributed in a manner that follows the intent of Section 1.3.3 and does not exceed 12.0 dwelling units per gross acre within the acreage allocated to it within its Subdistrict, as shown on the Master Land Use Plan. Two-family homes may be included at the edges of these areas in order to articulate with adjacent lower-density areas, provided the density maximum is not exceeded. Cluster development is encouraged.

## Mixed-Use Low Intensity

This land use type consists of neighborhood-serving retail and/or commercial uses, such uses providing goods and services for the day-to-day needs of the nearby neighborhoods, and/or multi-family dwellings. Single-use retail, commercial or residential development is allowed in Mixed-Use Low Intensity areas.

### 3.3.1.1.8 Mixed-Use High Intensity

This land use type consists of community-serving retail and/or commercial uses, such uses providing goods and services for several neighborhoods, and/or multi-family dwellings. Single-use retail, commercial or residential development is allowed in Mixed-Use High Intensity areas.

Regional Retail
Regional retail consists of a full-range of high concentration retail, commercial and entertainment opportunities serving the needs of the Northeast El Paso region and nearby communities. This component of the District benefits from the high visibility and access afforded it by its location at the intersection of two high-capacity arterials and thus should be designed and developed as a unit in a manner that maximizes its potential to act as a catalyst for development of the District. This planning of this area should be done in coordination with the adjoining mixed-use areas to produce an integrated development.

Development within this land use may consist of a single large anchor store or have multiple anchor retail tenants (e.g., department stores, supermarkets, home improvement stores, sporting goods stores, variety, or specialty), office tenants or entertainment uses (such as movie theatres), along with pad sites developed within the area. Secondary uses may include restaurants, banks and service stations; however, these uses must be integrated into the larger primary use. The Regional Retail area should have direct access to Patriot freeway and to McCombs Street and should allow access from the District in a manner that does not promote cut-through traffic from outside the District. Also, development within the Regional Retail land use category must adhere to specific design guidelines. (see Section 7).


Well-planned retail centers and lower-intensity retail uses can be integrated into the neighborhood fabric.

Stand-alone apartment buildings are allowed throughout the District, with the following restrictions, together with any other requirements described herein:

- Such development shall have an area of no greater than sixteen acres;
- Such development shall be adjacent to and access an arterial or collector street;
- Such development shall not directly access streets or alleys from which single-family detached homes are directly accessed.


| 3.3.1.2 | Proposed Density |  |
| :---: | :---: | :---: |
|  | The gross residential density of the District shall be the sum of the dwelling units within each Subdistrict, as may be approved, divided by the gross area of the development. The number of dwelling units for the District shall not exceed 20,000 units, which equates to a gross density of $4.05 \mathrm{du} / \mathrm{ac}$. |  |
| 3.3.1.3 | Proposed Non-Residential Floor Area |  |
|  | The maximum proposed total floor area for all non-residential land uses is 8,805,000 square feet, approximately 4\% of the District. |  |
| 3.3.1.4 | Property Development Regulations for Subdistricts |  |
|  | 3.3.1.4.1 | Maximum Building Heights |
|  |  | Maximum building heights. (See Appendix 'E'.) |
|  | 3.3.1.4.2 | Minimum Dimensions of Lots |
|  |  | Minimum dimensions of lots. (See Appendix 'E'.) |
|  | 3.3.1.4.3 | Yard Setbacks |
|  |  | Yard setbacks are shown in Appendix 'E'. Properties within the District shall be allowed zero setbacks for all uses unless otherwise indicated. |
|  | 3.3.1.5 | Buffers |
|  |  | A side/rear yard buffer six feet wide (minimum) shall be maintained between parking areas and adjacent lots, regardless of site size. A buffer fifteen feet wide (minimum) shall be maintained between residential and nonresidential uses. |

### 3.3.1.6

3.3.1.7

Park Land Dedication
Park land dedication within each Subdistrict shall be in accordance with the requirements of Title 19 Subdivisions and in accordance with the Land Study.


### 3.3.2 <br> The Subdistricts

The intent of the design and function of Subdistricts shall be as described under Section 1.3.2 and further described in this section. The proposed mix of land uses for each Subdistrict, their relative locations and dimensional standards are included on the following pages. (The Subdistrict Key Map can be found in Appendix ' $F$ '.)

### 3.3.2.1 $\quad$ Subdistrict 1

### 3.3.2.1.1 Characteristics

Subdistrict 1, which is in the far northwest corner of the District north of the outer loop road and bounded by the EPECO right-of-way and the northern property line of the District, is planned as residential with nodes of supporting mixed-use, as indicated in the figure below. The purpose of the Subdistrict is to provide for a range of housing opportunities including relatively large lots. Adjacency to the Franklin Mountains, open space and the outer loop will buffer this Subdistrict from adjacent development while providing a strong vehicular linkage via Martin Luther King Boulevard and strong pedestrian opportunities via the northern linear open space, including a trailhead to the Franklin Mountains.
3.3.2.1.2 Components and Timing

The components of the Subdistrict and the timing of development are as follows:

|  | Approximate | Estimated Non- <br> Estimated Residential <br> Dwelling Units | Residential Floor Area <br> $\left(\mathrm{ft}^{2}\right)$ |
| :--- | :---: | :---: | :---: |
| Open Space: | 114 acres | - | - |
| Residential $3.5 \mathrm{du} / \mathrm{ac}:$ | 103 acres | 361 | - |
| Residential $5.5 \mathrm{du} / \mathrm{ac}:$ | 125 acres | 688 | - |
| Residential $7.2 \mathrm{du} / \mathrm{ac}:$ | 79 acres | 569 | - |
| Mixed-Use Low Intensity: | 17 acres | - | 222,200 |
| TOTAL | 438 acres | 1,618 | 222,200 |

The mixed-use areas are allowed residential units up to 12.0 du /ac as long as the total number of residential units for the Subdistrict does not exceed 1,618. The estimated number of units for Subdistrict 1 accounts for $8 \%$ of the estimated District units. Development of Subdistrict 1 is expected to occur within years eleven and twelve.

### 3.3.2.1.3 Proposed Density

The maximum proposed residential density for the Subdistrict shall be $5.27 \mathrm{du} / \mathrm{ac}$.
3.3.2.1.4 Proposed Non-Residential Floor Area

The maximum proposed total floor area for all non-residential land uses in the Subdistrict is 222,200 square feet.

### 3.3.2.1.5 Proposed Intensity

The gross non-residential intensity of the Subdistrict shall be the sum of the non-residential floor area divided by the sum of the land area of non-residential land uses, expressed as a floor to area ratio (FAR). The maximum proposed non-residential intensity for Subdistrict 1 shall be 0.3:1.



### 3.3.2.2 <br> Subdistrict 2

### 3.3.2.2.1

3.3.2.2.3
3.3.2.2.4

## Characteristics

Almost all of Subdistrict 2, which occupies the western edge of the District between the Franklin Mountains and the outer loop road, is low-density residential with one node of supporting mixed-use, as indicated in the table below. This area adjoins the three linear open spaces and will contain a trailhead to the Franklin Mountains State Park in conjunction with the central linear park. The purpose of the Subdistrict is to provide for a range of housing opportunities including relatively large lots. With access to a single thoroughfare, Subdistrict 2 provides for a housing segment that prefers relatively secluded neighborhoods.

### 3.3.2.2.2 Components and Timing

The components of the Subdistrict and the timing of development are as follows:

|  | Approximate | Estimated Residential | Estimated Non- <br> Residential Floor Area |
| :--- | :---: | :---: | :---: |
| Land Use | Acreage | Dwelling Units | - |
| Open Space: | 25 acres | - | - |
| Residential 3.5 du/ac: | 290 acres | 1,015 | - |
| Mixed-Use Low Intensity: | 7 acres | - | 91,500 |
| TOTAL | 322 acres | 1,015 | 91,500 |

The mixed-use area is allowed residential units up to $12.0 \mathrm{du} / \mathrm{ac}$ as long as the total number of residential units for the Subdistrict does not exceed 1,015 . The estimated number of units for Subdistrict 2 accounts for $5 \%$ of the estimated District units. Development of Subdistrict 2 is expected to occur in years seven, nine and twelve.

Proposed Density
The maximum proposed residential density for the Subdistrict shall be $3.50 \mathrm{du} / \mathrm{ac}$.
Proposed Non-Residential Floor Area
The maximum proposed total floor area for all non-residential land uses in the Subdistrict is 91,500 square feet.


### 3.3.2.2.5 Proposed Intensity

The gross non-residential intensity of the Subdistrict shall be the sum of the non-residential floor area divided by the sum of the land area of non-residential land uses, expressed as a floor to area ratio (FAR). The maximum proposed nonresidential intensity for Subdistrict 2 shall be 0.3:1.


### 3.3.2.3 <br> Subdistrict 3

### 3.3.2.3.1 Characteristics

Subdistrict 3 in the northwest quadrant of the District, and bounded by the outer and inner loop roads, proposed
Painted Dunes Avenue and the EPECO right-of-way, will function primarily as a residential area and contains an elementary school. As a buffer area, Subdistrict 3 serves to decrease the gradient of development intensity between the primarily residential Subdistricts 1 and 2 and the western Town Center in Subdistrict 4.
3.3.2.3.2 Components and Timing

The components of the Subdistrict and the timing of development are as follows:

|  | Approximate | Estimated Residential | Estimated Non- <br> Residential Floor Area |
| :--- | :---: | :---: | :---: |
| Land Use | Acreage | Dwelling Units | - |
| Elementary School: | 15 acres | - | - |
| Open Space: | 10 acres | - | - |
| Residential $5.5 \mathrm{du} / \mathrm{ac}:$ | 335 acres | 1,843 | - |
| TOTAL | 360 acres | 1,843 |  |

The estimated number of units for Subdistrict 3 accounts for $9 \%$ of the estimated District units. Development of Subdistrict 3 is expected to begin in year six with development continuing in years nine, ten and eleven.
3.3.2.3.3 Proposed Density

The maximum proposed residential density for the Subdistrict shall be $5.50 \mathrm{du} / \mathrm{ac}$.
3.3.2.3.4 Mixed-Use Development

In order to meet potential market demand for additional mixed-use development within the District, up to ten acres of Mixed-Use Low Intensity uses shall be allowed within Subdistrict 3 east of Martin Luther King, Jr. Boulevard.



### 3.3.2.4 <br> Subdistrict 4

### 3.3.2.4.1 Characteristics

Subdistrict 4, bounded by the proposed inner loop road and the EPECO right-of-way, contains the western Town Center and the residential uses that surround it. The intent of this Subdistrict is to serve as a highly visible activity node at the western end of the linear park that also has strong links to the northeast and northwest corners of the District and to neighborhoods south of the District.
3.3.2.4.2 Components and Timing

The components of the Subdistrict and the timing of development are as follows:

|  | Approximate | Estimated Non- <br> Estimated Residential <br> Dwelling Units | Residential Floor Area <br> $\left(\mathrm{ft}^{2}\right)$ |
| :--- | :---: | :---: | :---: |
| Land Use | Acreage | - | - |
| Residential $12.0 \mathrm{du} / \mathrm{ac}:$ | 19 acres | 167 acres | 2,004 |
| Mixed-Use Low Intensity: | 30 acres | - | - |
| Mixed-Use High Intensity: | 45 acres | - | 392,000 |
| TOTAL | 261 acres | $\mathbf{2 , 0 0 4}$ | 823,200 |

The mixed-use areas are allowed residential units up to $12.0 \mathrm{du} / \mathrm{ac}$ and $24.0 \mathrm{du} / \mathrm{ac}$ respectively as long as the total number of residential units for the Subdistrict does not exceed 2,004 . The estimated number of units for Subdistrict 4 accounts for $10 \%$ of the estimated District units. Development of Subdistrict 4 is expected to begin in year four with development continuing in years five, six, seven, nine and ten.

### 3.3.2.4.3 Proposed Density

The maximum proposed residential density for the Subdistrict shall be $12.0 \mathrm{du} / \mathrm{ac}$.
3.3.2.4.4 Proposed Non-Residential Floor Area

The maximum proposed total floor area for all non-residential land uses in the Subdistrict is 1,215,200 square feet.

### 3.3.2.4.5 Proposed Intensity

The gross non-residential intensity of the Subdistrict shall be the sum of the non-residential floor area divided by the sum of the land area of non-residential land uses, expressed as a floor to area ratio (FAR). The maximum proposed non-residential intensity for Subdistrict 4 shall be 0.37:1.

Linear Park
Pedestrian access via the Linear Park and view corridor shall be maintained through Subdistrict 4.



### 3.3.2.5 <br> Subdistrict 5

### 3.3.2.5.1

3.3.2.5.2
3.3.2.5.3
3.3.2.5.4

## Characteristics

Subdistrict 5 in the southwest quadrant of the District, and bounded by the outer and inner loop roads, proposed
Painted Dunes Avenue and the EPECO right-of-way, will function primarily as a residential area containing an elementary school. As a buffer area, Subdistrict 5 serves to decrease the gradient of development intensity between the primarily residential Subdistricts 2 and 6 and the western Town Center in Subdistrict 4.

Components and Timing
The components of the Subdistrict and the timing of development are as follows:

|  | Approximate |  |  |
| :--- | :---: | :---: | :---: |
| Acreage | Estimated Residential <br> Dwelling Units | Estimated Non- <br> Residential Floor Area <br> $\left(\mathrm{ft}^{2}\right)$ |  |
| Land Use | 15 acres | - |  |
| Elementary School: | 10 acres | - | - |
| Open Space: | 308 acres | 1,694 | - |
| Residential $5.5 \mathrm{du} / \mathrm{ac}:$ | 333 acres | 1,694 | - |
| TOTAL |  |  |  |

The estimated number of units for Subdistrict 5 accounts for $8 \%$ of the estimated District units. Development of Subdistrict 5 is expected to occur within years six and seven.

Proposed Density
The maximum proposed residential density for the Subdistrict shall be $5.50 \mathrm{du} / \mathrm{ac}$.
Mixed-Use Development
In order to meet potential market demand for additional mixed-use development within the District, up to ten acres of Mixed-Use Low Intensity uses shall be allowed within Subdistrict 5 east of Martin Luther King, Jr. Boulevard.



### 3.3.2.6 <br> Subdistrict 6

### 3.3.2.6.1

3.3.2.6.2
3.3.2.6.3

## Characteristics

Subdistrict 6, which is in the far southwest corner of the District south of the outer loop road and bounded by the EPECO right-of-way and the southern boundary line of the District, is planned as residential with nodes of supporting mixed-use, as indicated in the figure below. The purpose of the Subdistrict is to provide for a range of housing opportunities in keeping with adjacent development to the south. Open space and the outer loop will buffer this Subdistrict from adjacent development while providing a strong vehicular linkage via Martin Luther King Boulevard and strong pedestrian opportunities via the southern linear open space, including a trailhead to the Franklin Mountains.

Components and Timing
The components of the Subdistrict and the timing of development are as follows:

|  | Approximate | Estimated Residential <br> Dwelling Units | Estimated Non- <br> Residential Floor Area <br> $\left(\mathrm{ft}^{2}\right)$ |
| :--- | :---: | :---: | :---: |
| Land Use | 121 acres | - | - |
| Open Space: | 137 acres | 754 | - |
| Residential $5.5 \mathrm{du} / \mathrm{ac}:$ | 77 acres | 555 | - |
| Residential $7.2 \mathrm{du} / \mathrm{ac}:$ | 16 acres | - | 209,100 |
| Mixed-Use Low Intensity: | 351 acres | $\mathbf{1 , 3 0 9}$ | $\mathbf{2 0 9 , 1 0 0}$ |

The mixed-use areas are allowed residential units up to $12.0 \mathrm{du} / \mathrm{ac}$ as long as the total number of residential units for the Subdistrict does not exceed 1,309. The estimated number of units for Subdistrict 6 accounts for $7 \%$ of the estimated District units. Development of Subdistrict 6 is expected to begin in year four with development continuing in years six, seven and eight.

Proposed Density
The maximum proposed residential density for the Subdistrict shall be $6.12 \mathrm{du} / \mathrm{ac}$.

### 3.3.2.6.4 Proposed Non-Residential Floor Area

The maximum proposed total floor area for all non-residential land uses in the Subdistrict is 209,100 square feet.
3.3.2.6.5 Proposed Intensity

The gross non-residential intensity of the Subdistrict shall be the sum of the non-residential floor area divided by the sum of the land area of non-residential land uses, expressed as a floor to area ratio (FAR). The maximum proposed non-residential intensity for Subdistrict 6 shall be 0.3:1.



### 3.3.2.7

## Subdistrict 7

### 3.3.2.7.1

3.3.2.7.2
3.3.2.7.3
3.3.2.7. $\quad$ Proposed Non-Residential Floor Area

The maximum proposed total floor area for all non-residential land uses in the Subdistrict is 169,900 square feet.

### 3.3.2.7.5 Proposed Intensity

The gross non-residential intensity of the Subdistrict shall be the sum of the non-residential floor area divided by the sum of the land area of non-residential land uses, expressed as a floor to area ratio (FAR). The maximum proposed non-residential intensity for Subdistrict 7 shall be 0.3:1.



### 3.3.2.8

## Subdistrict 8

### 3.3.2.8.1

3.3.2.8.2
3.3.2.8.3

## Characteristics

Subdistrict 8, bounded by the proposed inner loop road and proposed Painted Dunes Avenue, is planned as a primarily residential subdistrict with supporting neighborhood commercial/retail uses. Adjacency to the central linear open space and the EPECO right-of-way provides exceptional access to the community hike/bike circulation system.

Components and Timing
The components of the Subdistrict and the timing of development are as follows:

|  | Approximate | Estimated Residential | Estimated Non- <br> Residential Floor Area |
| :--- | :---: | :---: | :---: |
| Land Use | Acreage | Dwelling Units | $\left(\mathrm{ft}^{2}\right)$ |
| Middle School: | 25 acres | - | - |
| Residential 5.5 du/ac: | 159 acres | 875 | - |
| Mixed-Use Low Intensity: | 8 acres | - | 104,500 |
| TOTAL | 192 acres | 875 | 104,500 |

The mixed-use areas are allowed residential units up to 12.0 du/ac as long as the total number of residential units for the Subdistrict does not exceed 875. The estimated number of units for Subdistrict 8 accounts for $4 \%$ of the estimated District units. Development of Subdistrict 8 is expected to occur within years five and six.

### 3.3.2.8.4 Proposed Non-Residential Floor Area

The maximum proposed total floor area for all non-residential land uses in the Subdistrict is 104,500 square feet.

### 3.3.2.8.5 Proposed Intensity

The gross non-residential intensity of the Subdistrict shall be the sum of the non-residential floor area divided by the sum of the land area of non-residential land uses, expressed as a floor to area ratio (FAR). The maximum proposed non-residential intensity for Subdistrict 8 shall be 0.3:1.



### 3.3.2.9

## Subdistrict 9

### 3.3.2.9.1 Characteristics

Subdistrict 9, bounded by proposed Painted Dunes Avenue, proposed Sean Haggerty Drive, the proposed outer loop roar and the EPECO right-of-way, is planned as a primarily residential subdistrict with supporting neighborhood commercial/retail uses. Adjacency to the central linear open space and the EPECO right-of-way provides exceptional access to the community hike/bike circulation system.
3.3.2.9.2 Components and Timing

The components of the Subdistrict and the timing of development are as follows:

|  | Approximate | Estimated Residential | Estimated Non- <br> Residential Floor Area |
| :--- | :---: | :---: | :---: |
| Land Use | Acreage | Dwelling Units | - |
| Open Space: | 30 acres | - | - |
| Residential 5.5 du/ac: | 227 acres | 1,249 | - |
| Mixed-Use Low Intensity: | 6 acres | - | 78,400 |
| TOTAL | 263 acres | 1,249 | 78,400 |

The mixed-use areas are allowed residential units up to $12.0 \mathrm{du} / \mathrm{ac}$ as long as the total number of residential units for the Subdistrict does not exceed 1,249. The estimated number of units for Subdistrict 9 accounts for $6 \%$ of the estimated District units. Development of Subdistrict 9 is expected to occur in years two, three and four.
3.3.2.9.3 Proposed Density

The maximum proposed residential density for the Subdistrict shall be $5.50 \mathrm{du} / \mathrm{ac}$.
3.3.2.9.4 Proposed Non-Residential Floor Area

The maximum proposed total floor area for all non-residential land uses in the Subdistrict is 78,400 square feet.

### 3.3.2.9.5 Proposed Intensity

The gross non-residential intensity of the Subdistrict shall be the sum of the non-residential floor area divided by the sum of the land area of non-residential land uses, expressed as a floor to area ratio (FAR). The maximum proposed non-residential intensity for Subdistrict 9 shall be 0.3:1.



### 3.3.2.10 <br> Subdistrict 10

### 3.3.2.10.1 Characteristics

Subdistrict 10 , which consists of a 25 -acre community park and a 50 -acre high school site, is planned as a community service area for the District and for neighborhoods to the south. Sean Haggerty Drive, Lomo Real Avenue and the EPECO right-of-way provide excellent access for the District and for the neighborhoods to the south.

Subdistrict 10 is bounded by the proposed outer loop road to the north, proposed Sean Haggerty Drive to the east, the southern boundary of the District to the south and the EPECO right-of-way to the west.
3.3.2.10.2 Components and Timing

The components of the Subdistrict and the timing of development are as follows:

## Estimated Non-

Land Use
Open Space:
High School:
TOTAL

Approximate
Acreage
45 acres
51 acres
96 acres

Estimated Residential Dwelling Units

Residential Floor Area
(ft ${ }^{2}$ )
-
-
-

Development of the Community Park is expected to begin in year one and to be completed no later than year three.



### 3.3.2.11 <br> Subdistrict 11

3.3.2.11.2 Components and Timing

### 3.3.2.11.1

3.3.2.11.3
3.3.2.11.4

## Characteristics

Subdistrict 11, bounded by the northern District boundary, proposed Sean Haggerty Drive and the proposed inner loop roar is planned as a primarily residential subdistrict with supporting neighborhood commercial/retail uses.

The components of the Subdistrict and the timing of development are as follows:

|  | Approximate <br> Acreage | Estimated Residential <br> Dwelling Units | Estimated Non- <br> Residential Floor Area <br> $\left(\mathrm{ft}^{2}\right)$ |
| :--- | :---: | :---: | :---: |
| Land Use | 55 acres | - | - |
| Open Space: | 108 acres | 378 | - |
| Residential $3.5 \mathrm{du} / \mathrm{ac}:$ | 48 acres | 264 | - |
| Residential $5.5 \mathrm{du} / \mathrm{ac}:$ | 45 acres | 324 | - |
| Residential $7.2 \mathrm{du} / \mathrm{ac}:$ | 15 acres | - | 196,000 |
| Mixed-Use Low Intensity: | 271 acres | 966 | 196,000 |

The mixed-use areas are allowed residential units up to $12.0 \mathrm{du} / \mathrm{ac}$ as long as the total number of residential units for the Subdistrict does not exceed 966. The estimated number of units for Subdistrict 11 accounts for $5 \%$ of the estimated District units. Development of Subdistrict 11 is expected to occur within years seven and ten.
3.3.2.11.3 Proposed Density

The maximum proposed residential density for the Subdistrict shall be $4.81 \mathrm{du} / \mathrm{ac}$.
Proposed Non-Residential Floor Area
The maximum proposed total floor area for all non-residential land uses in the Subdistrict is 196,000 square feet.

### 3.3.2.11.5 Proposed Intensity

The gross non-residential intensity of the Subdistrict shall be the sum of the non-residential floor area divided by the sum of the land area of non-residential land uses, expressed as a floor to area ratio (FAR). The maximum proposed non-residential intensity for Subdistrict 11 shall be 0.3:1.



### 3.3.2.12.1

3.3.2.12.4
3.3.2.12.2
3.3.2.12.3
3.3.2.12.3

## Characteristics

Subdistrict 12 is bounded by McCombs Street, proposed Painted Dunes Avenue and the proposed inner loop road. Almost half of the Subdistrict is open space, which will serve a dual function of stormwater detention and recreational open space. One of the four proposed elementary schools is located in this Subdistrict.

Components and Timing
The components of the Subdistrict and the timing of development are as follows:

|  | Approximate <br> Acreage | Estimated Residential <br> Dwelling Units | Estimated Non- <br> Residential Floor Area <br> $\left(\mathrm{ft}^{2}\right)$ |
| :--- | :---: | :---: | :---: |
| Land Use | 170 acres | - | - |
| Open Space: | 15 acres | - | - |
| Elementary School: | 95 acres | 333 | - |
| Residential $3.5 \mathrm{du} / \mathrm{ac}:$ | 47 acres | 338 | - |
| Residential $7.2 \mathrm{du} / \mathrm{ac}:$ | 16 acres | - | 209,100 |
| Mixed-Use Low Intensity: | 343 acres | 671 | $\mathbf{2 0 9 , 1 0 0}$ |

The mixed-use areas are allowed residential units up to $12.0 \mathrm{du} / \mathrm{ac}$ as long as the total number of residential units for the Subdistrict does not exceed 671. The estimated number of units for Subdistrict 12 accounts for $3 \%$ of the estimated District units. Development of Subdistrict 12 is expected to occur within years five and nine.

Proposed Density
The maximum proposed residential density for the Subdistrict shall be $4.73 \mathrm{du} / \mathrm{ac}$.

Proposed Non-Residential Floor Area
The maximum proposed total floor area for all non-residential land uses in the Subdistrict is 209,100 square feet.

### 3.3.2.12.5 Proposed Intensity

The gross non-residential intensity of the Subdistrict shall be the sum of the non-residential floor area divided by the sum of the land area of non-residential land uses, expressed as a floor to area ratio (FAR). The maximum proposed non-residential intensity for Subdistrict 12 shall be 0.3:1.


### 3.3.2.13 Subdistrict 13

### 3.3.2.13.1

3.3.2.13.2
3.3.2.13.3 Proposed Density

The maximum proposed residential density for the Subdistrict shall be $7.20 \mathrm{du} / \mathrm{ac}$.



### 3.3.2.14 <br> Subdistrict 14

### 3.3.2.14.1

3.3.2.14.2
3.3.2.14.3 Proposed Density

The maximum proposed residential density for the Subdistrict shall be $5.50 \mathrm{du} / \mathrm{ac}$.
3.3.2.14.4 Proposed Non-Residential Floor Area

The maximum proposed total floor area for all non-residential land uses in the Subdistrict is 104,500 square feet.

### 3.3.2.14.5 Proposed Intensity

The gross non-residential intensity of the Subdistrict shall be the sum of the non-residential floor area divided by the sum of the land area of non-residential land uses, expressed as a floor to area ratio (FAR). The maximum proposed non-residential intensity for Subdistrict 14 shall be 0.3:1.



### 3.3.2.15 <br> Subdistrict 15

### 3.3.2.15.1

3.3.2.15.2
3.3.2.15.3 Proposed Density

The maximum proposed residential density for the Subdistrict shall be $12.0 \mathrm{du} / \mathrm{ac}$.
3.3.2.15.4 Proposed Non-Residential Floor Area

The maximum proposed total floor area for all non-residential land uses in the Subdistrict is $2,697,200$ square feet.

### 3.3.2.15.5 Proposed Intensity

The gross non-residential intensity of the Subdistrict shall be the sum of the non-residential floor area divided by the sum of the land area of non-residential land uses, expressed as a floor to area ratio (FAR). The maximum proposed non-residential intensity for Subdistrict 15 shall be 0.37:1.



### 3.3.2.16 <br> Subdistrict 16

### 3.3.2.16.1 Characteristics

Subdistrict 16 , together with Subdistrict 15 shall serve as a strong mixed-use urban center for Northeast El Paso.
The location of this Subdistrict (the intersection of a proposed six-lane thoroughfare and U.S. Highway 54)
provides an ideal location for meeting the retail and commercial needs of the Northeast region as well as providing momentum for the development of the District as a whole.
3.3.2.16.2 Components and Timing

The components of the Subdistrict and the timing of development are as follows:

|  | Approximate | Estimated Non- <br> Estimated Residential <br> Residential Floor Area |  |
| :--- | :---: | :---: | :---: |
| Land Use | Acreage | Dwelling Units | $\left(\mathrm{ft}^{2}\right)$ | | Open Space: |
| :--- |
| Regional Retail: |

Development of Subdistrict 16 is expected to occur in year one.
3.3.2.16.3 Proposed Non-Residential Floor Area

The maximum proposed total floor area for all non-residential land uses in the Subdistrict is $2,430,600$ square feet.
3.3.2.16.4 Proposed Intensity

The gross non-residential intensity of the Subdistrict shall be the sum of the non-residential floor area divided by the sum of the land area of non-residential land uses, expressed as a floor to area ratio (FAR). The maximum proposed non-residential intensity for Subdistrict 16 shall be 0.6:1.



### 3.3.2.17 Subdistrict 17



### 3.3.2.17.5 Proposed Intensity

The gross non-residential intensity of the Subdistrict shall be the sum of the non-residential floor area divided by the sum of the land area of non-residential land uses, expressed as a floor to area ratio (FAR). The maximum proposed non-residential intensity for Subdistrict 17 shall be 0.3:1.



### 3.3.2.18 <br> Subdistrict 18

3.3.2.18.1 Characteristics

Subdistrict 18 wraps around the northern end of Painted Dunes Golf Course providing an additional opportunity for enclave development with enclosure by the District boundary, the golf course boundary and McCombs Street, and little or no opportunity for cut-through traffic.
3.3.2.18.2 Components and Timing

The components of the Subdistrict and the timing of development are as follows:

|  | Approximate | Estimated Non- <br> Estimated Residential <br> Desidential Floor Area |  |
| :--- | :---: | :---: | :---: |
| Land Use | Acreage | Dwelling Units | $\left(\mathrm{ft}^{2}\right)$ | Open Space: $^{14 \text { acres }}$

The estimated number of units for Subdistrict 18 accounts for $2 \%$ of the estimated District units. Development of Subdistrict 18 is expected to occur within years seven and nine.
3.3.2.18.3 Proposed Density

The maximum proposed residential density for the Subdistrict shall be $4.22 \mathrm{du} / \mathrm{ac}$.


### 3.3.2.19.1

3.3.2.19.2
3.3.2.19.3
3.3.2.19.4

## Characteristics

Subdistrict 19 consists of two mixed-use areas adjacent to McCombs Street and open space. The southern mixeduse area is adjacent to the regional retail area as well and is planned to be complementary to it. Pedestrian access to the regional park south of U.S. 54 is an amenity to the Subdistrict.

Components and Timing
The components of the Subdistrict and the timing of development are as follows:

|  | Approximate | Estimated Residential | Estimated Non- <br> Residential Floor Area <br> $\left(\mathrm{ft}^{2}\right)$ |
| :--- | :---: | :---: | :---: |
| Land Use | Acreage | Dwelling Units | 183,000 |
| Mixed-Use Low Intensity: | 14 acres | - | 439,100 |
| Mixed-Use High Intensity: | 24 acres | - | 622,100 |

The mixed-use areas are allowed residential units up to $12.0 \mathrm{du} / \mathrm{ac}$ and $24.0 \mathrm{du} / \mathrm{ac}$ respectively as long as the total number of residential units for the Subdistrict does not exceed 96 . The estimated number of units for Subdistrict 19 accounts for $1 \%$ of the estimated District units. Development of Subdistrict 19 is expected to begin in year three with development continuing in years four, seven and eight.

Proposed Density
The maximum proposed residential density for the Subdistrict shall be $12.0 \mathrm{du} / \mathrm{ac}$.
Proposed Non-Residential Floor Area
The maximum proposed total floor area for all non-residential land uses in the Subdistrict is 622,100 square feet.

### 3.3.2.19.5 Proposed Intensity

The gross non-residential intensity of the Subdistrict shall be the sum of the non-residential floor area divided by the sum of the land area of non-residential land uses, expressed as a floor to area ratio (FAR). The maximum proposed non-residential intensity for Subdistrict 19 shall be 0.4:1



### 3.3.2.20.1

3.3.2.20.2
3.3.2.20.4

## Characteristics

Subdistrict 20 contains the eastern Town Center and the residential development planned to support it, contributing to a compact, walkable development. Adjacency to Painted Dunes Golf Course provides a unique amenity to the Subdistrict.

Components and Timing
The components of the Subdistrict and the timing of development are as follows:

|  | Approximate | Estimated Residential | Estimated Non- <br> Residential Floor Area <br> $\left(\mathrm{ft}^{2}\right)$ |
| :--- | :---: | :---: | :---: |
| Land Use | Acreage | Dwelling Units | - |
| Residential $5.5 \mathrm{du} / \mathrm{ac}:$ | 44 acres | 242 | - |
| Residential $7.2 \mathrm{du} / \mathrm{ac}:$ | 37 acres | 266 | - |
| Residential $12.0 \mathrm{du} / \mathrm{ac}:$ | 45 acres | 540 | 405,100 |
| Mixed-Use Low Intensity: | 31 acres | - | 405,100 |

The mixed-use areas are allowed residential units up to $12.0 \mathrm{du} / \mathrm{ac}$ as long as the total number of residential units for the Subdistrict does not exceed 1,048 . The estimated number of units for Subdistrict 20 accounts for $6 \%$ of the estimated District units. Development of Subdistrict 20 is expected to occur within years eight and nine.

### 3.3.2.20.3 <br> 3.3.2.20.3 Proposed Density

The maximum proposed residential density for the Subdistrict shall be $8.32 \mathrm{du} / \mathrm{ac}$.

Proposed Non-Residential Floor Area
The maximum proposed total floor area for all non-residential land uses in the Subdistrict is 405,100 square feet.

### 3.3.2.20.5 Proposed Intensity

The gross non-residential intensity of the Subdistrict shall be the sum of the non-residential floor area divided by the sum of the land area of non-residential land uses, expressed as a floor to area ratio (FAR). The maximum proposed non-residential intensity for Subdistrict 20 shall be 0.3:1.



### 3.3.2.21 <br> Subdistrict 21

### 3.3.2.21.1 Characteristics

Subdistrict 21 at the far eastern edge of the District is planned as a residential Subdistrict with adjacencies to the eastern Town Center and Painted Dunes Golf Course. The District boundary serves as the Subdistrict's eastern edge with U.S. 54 acting as the southern boundary. Pedestrian access to the regional park south of U.S. 54 is an amenity to the Subdistrict.
3.3.2.21.2 Components and Timing

The components of the Subdistrict and the timing of development are as follows:

|  | Approximate | Estimated Non- <br> Estimated Residential <br> Residential Floor Area |  |
| :--- | :---: | :---: | :---: |
| Land Use | Acreage | Dwelling Units | - |
| Open Space: | 146 acres | - | - |
| Residential $5.5 \mathrm{du} / \mathrm{ac}:$ | 140 acres | 770 |  |
| TOTAL | 286 acres | 770 |  |

The estimated population for Subdistrict 21 accounts for $4 \%$ of the estimated District population. Development of Subdistrict 21 is expected to occur in year eight.

### 3.3.2.21.3 Proposed Density

The maximum proposed residential density for the Subdistrict shall be $5.50 \mathrm{du} / \mathrm{ac}$.


3.3.2.22 Summary

An acreage summary of the Subdistricts is shown below. All acreages are approximate and rounded to the nearest whole acre.

| SUBD. | RES 3.5 | RES 5.5 | RES 7.2 | RES 12.0 | MU-LI | MU-HI | RR | OS | SCH | TOT |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 103 | 125 | 79 |  | 17 |  |  | 114 |  | 438 |
| 2 | 290 |  |  |  | 7 |  |  | 25 |  | 322 |
| 3 |  | 335 |  |  |  |  |  | 10 | 15 | 360 |
| 4 |  |  |  | 167 | 30 | 45 |  | 19 |  | 261 |
| 5 |  | 308 |  |  |  |  |  | 10 | 15 | 333 |
| 6 |  | 137 | 77 |  | 16 |  |  | 121 |  | 351 |
| 7 |  | 184 | 19 |  | 13 |  |  | 15 |  | 231 |
| 8 |  | 159 |  |  | 8 |  |  |  | 25 | 192 |
| 9 |  | 227 |  |  | 6 |  |  | 30 |  | 263 |
| 10 |  |  |  |  |  |  |  | 45 | 51 | 96 |
| 11 | 108 | 48 | 45 |  | 15 |  |  | 55 |  | 271 |
| 12 | 95 |  | 47 |  | 16 |  |  | 170 | 15 | 343 |
| 13 |  |  | 107 |  |  |  |  | 33 |  | 140 |
| 14 |  | 163 |  |  | 8 |  |  | 48 | 15 | 234 |
| 15 |  |  |  | 108 | 65 | 101 |  | 18 |  | 292 |
| 16 |  |  |  |  |  |  | 93 | 8 |  | 101 |
| 17 | 69 |  |  |  | 14 |  |  | 8 |  | 91 |
| 18 | 103 |  | 25 |  |  |  |  | 14 |  | 142 |
| 19 |  |  |  |  | 14 | 24 |  |  |  | 38 |
| 20 |  | 44 | 37 | 45 | 31 |  |  |  |  | 157 |
| 21 |  | 140 |  |  |  |  |  | 146 |  | 286 |
| TOTAL | 768 | 1,870 | 436 | 320 | 260 | 170 | 93 | 889 | 136 | 4,942 |

### 3.4 Allowable Land Uses

Appendix ' $G$ ' contains the table of allowable land uses for the District. The District supports the Smart Growth goal of providing a diverse mix of housing and is planned to include a variety of housing types within each phase of development. The District has been planned with a balanced mix of residential, commercial and public uses.

## Section 4: Stormwater Management Plan

### 4.1 General

The location of the District at the foot of the Franklin Mountains ensures the need for a system capable of directing large volumes of stormwater in a safe and efficient manner. This system should be planned, designed and constructed in a manner that not only provides for the safe conveyance of stormwater but also serves the District as useable open space during dry times.
4.2 Relationship Between Stormwater Management and Recreational Open Space

### 4.2.1 Park-ponds

4.2.1.1 $\quad$ Strategy Envisioned for Detention Facilities The strategy envisioned for the detention facilities is the use of park-ponds, which can be developed into parks or athletic fields.
4.2.1.2

Park Ponding Utilized
As part of a regional detention strategy, park-ponds should be utilized throughout the District to the extent practicable.

### 4.2.2 Linear Park and Perimeter Buffers

The linear park and perimeter buffers will serve not only as parks but as a significant part of the drainage and storm water infrastructure for the District, and therefore should be improved consistent with these dual functions, including landscaping and configuration.


Linear parks offer dual-use opportunities.

## Section 5: Circulation

### 5.1 General

Within the District - or any development — one of the most important elements affecting how it will look and how well it will work is the space between the façade of a building and the façade of another building across a street. Wide streets encourage drivers to speed, are less safe for pedestrians, cost more, increase runoff and decrease opportunities for social interaction. Narrower streets do the opposite.

The trail system within the District should be designed as a unifying element; thus it should connect as many uses and/or neighborhoods as practicable. The trail system may follow public right-of-way, may follow permanent open space, and/or may be placed within an easement across land owned by a Homeowner's Association (HOA).

### 5.2 Relationship Between Circulation and Land Use

- Opportunity for goods and services should be within one-half mile of most dwellings.
- Distribute development densities so as to support potential future transit stops.
- Locate higher density developments within walking distance of town centers and transit nodes.


### 5.3 Roadway Design Intent and Principles

The intent of the design and function of the circulation systems shall be as described under Section 1.3.5 and further described as follows:

- The street network should be designed with multiple connections and direct routes.
- Thoroughfares should be spaced no more than one half-mile apart.
- Align streets to give buildings energy-efficient orientations.
- Provide networks for pedestrians and bicyclists.
- Provide alternatives to travel along high-volume streets.


### 5.4 Standards

Standards for streets and trails within the District correspond to the unique needs of neighborhoods; however, in all cases circulation patterns should be designed to encourage pedestrian movement and to limit vehicular through traffic. These street standards are proposed to coordinate with circulation needs and development intensities. Necessary street standards not included in the DSC are described in the Alternative Design Standards submitted with the Land Study for the District.

### 5.4.1 Transit

While the success of transit (e.g., light rail, bus rapid transit) within the District depends upon mass transit planning by others, transit-oriented design features should be included in town centers and transit nodes when and where appropriate. Transit-oriented design features may be provided in town centers and transit nodes; however, such land may be reallocated within such town centers and transit nodes from time to time should mass transit not become available to the area, and may be eliminated altogether within ten years after the submittal of a final plat should transit not become available to the area within that time
5.4.2 Hike and Bike Trails

Hike and bike trails should consist of an eight-foot wide path with a minimum of four feet of native landscaping on each side, as described in the Alternative Design Standards. Paths of concrete, asphalt, decomposed granite or similar material, or natural material should be used depending on the user need. Landscaping with native vegetation reduces water requirement. Decomposed granite trails should require permanent edging. Park bench(es) should be installed at a minimum of one every $1 / 2$-mile along public trails, coordinated with shade trees as provided for in the Alternative Design Standards. The general location of hike and bike trails is shown on the General Park Service Areas Map in Appendix ' H '.

### 5.5 Alternative Design Standards

Reference the Alternative Design Standards in the Land Study submitted concurrently with this Master Zoning Plan for requirements relating to Circulation Standards.


The diversity of mixed-use development provides opportunities for unique street design.


Master Zoning Plan for the Northeast Property

## Section 6: Parks and Open Space Plan

### 6.1 Purpose and Intent

The purpose of the Parks and Open Space Plan for the District is to provide for the health, safety, general welfare, and recreational and social needs of El Paso generally and the community specifically. It is the intent of this Plan to work in concert with El Paso's Open Space Plan ("Towards a Bright Future: A Green Infrastructure Plan for El Paso, Texas") to accomplish this purpose. Nothing herein shall permit parkland credit or bonus reductions to be granted for parkland, open space or amenities that are required as a condition of the sale of the land by EPWU and reflected in the bid documents.

### 6.2 General Principles

The following principles guide the placement and use of parks, open space and trail linkages within the District.

- Green corridors and open space define and interconnect neighborhoods, schools and other uses within the District.
- Public spaces establish focal points within neighborhoods and mixed-use areas.
- A variety of open space features distributed equally across the development, including parks, squares, plazas, landscaped streets, and greenbelts, and dedicate them for the collective social, visual and recreational use and enjoyment of the neighborhoods.
- Meet or exceed City requirements for park land dedication, currently as follows:
- Mini-neighborhood parks of less than two acres
- Neighborhood parks of two to ten acres
- Community parks of greater than ten acres
- Proposed provision and configuration of park and open space facilities are adequate and meet City standards except as provided for herein.


Neighborhood gathering spaces contribute to shared identify and promote interaction.

## Adjacencies

Where physically feasible, parks should be bounded by streets or by other public uses. Where residential lots must directly abut a park, lots should be oriented so as to side to and not back to the park. Residential lots should back to a park only when the site's physical character does not reasonably permit an alternative design.

Where a non-residential use must directly abut a park, the use shall be separated by a screening wall or fence and landscaping. Access points to the park may be permitted if a public benefit is established.

The elements described below are shown on the General Park Service Areas Map in Appendix ' H '.

### 6.3 Design Requirements

### 6.3.1 Community Open Space

### 6.3.1.1 Area

Approximately 820 acres have been reserved to serve the dual function of providing for the recreational needs of the community while managing stormwater runoff. These areas shall be provided as generally shown in Appendix ' $\mathbf{H}$ '. Such area is in addition to the parkland dedication requirements of Title 19, Chapter 19.20.
6.3.1.2 Trailheads to the Franklin Mountains State Park

This District includes three trailhead areas adjacent to the Franklin Mountains State Park, which includes 1,640 acres contiguous to the District. These areas shall be provided as generally shown in Appendix ' H '.
6.3.2 Neighborhood Parks
6.3.2.1 Neighborhood Parks

The neighborhoods within each Subdistrict may include neighborhood parks and neighborhood pocket parks in accordance with Title 19 Subdivisions and in accordance with the Land Study.

### 6.3.2.2 Pocket Parks

In order to provide for an urban form that includes a variety of open space opportunities, and to meet the goal of having a park within walking distance of every home, pocket parks may be provided in accordance with Title 19 Subdivision and shall be credited toward the parkland dedication requirement provided they meet the following criteria:


### 6.3.2.2.1 Pocket Parks Shall be No Smaller than 10,000 Square Feet

Pocket parks shall be no smaller than 10,000 square feet and shall have a width of no less than eighty feet.
6.3.2.2.2 Pocket Parks Shall Have Frontage

Pocket parks shall have frontage on at least one Residential street and shall not have frontage on streets other than Residential streets.
6.3.2.2.3 Pocket Parks Should Contain the Following Elements

Pocket parks should contain, at a minimum, the following elements, as provided for in the Alternative Design Standards:

- bench(es)
- pedestrian access from street to bench(es)
- two shade trees
- native low-water landscaping


### 6.3.2.3 Residential Units

Every residential unit shall be within one-quarter mile of a designated park, plaza or useable open space.
6.3.2.4 Trail Heads

Facilities within the District provided in conjunction with Trail Heads shall be credited toward the parkland requirement for adjacent neighborhood(s) if such facilities are available for the recreational needs of those neighborhood(s).
6.3.3.1 Public Trail System Provided

A public trail system shall be provided within and throughout the development and shall be credited toward the parkland dedication requirement unless it replaces a required sidewalk. It is the intent of such a trail system to provide an alternative to automobile travel. The trail system shall include, at a minimum, the following components:

| 6.3.3.1.1 | Connections to any Adjacent Trail System |
| :---: | :---: |
|  | Connections to any adjacent trail system existing at the time of platting; |
| 6.3.3.1.2 | Trailhead Connections |
|  | Trailhead connections to the Franklin Mountain State Park and a linkage to the City's regional park to the south; |
| 6.3.3.1.3 | Connections Between Neighborhoods |
|  | Connections between neighborhoods; |
| 6.3.3.1.4 | Connections to Schools, Parks, and Mixed-Use Areas |
|  | Connections to schools, parks, and mixed-use areas within the District; |
| 6.3.3.1.5 | Connections to Neighborhood Centers |
|  | Connections to neighborhood centers and to Town Centers; |
| 6.3.3.1.6 | Linkage Along the Southern Perimeter |
|  | A linkage along the southern perimeter of the site; and |
| 6.3.3.1.7 | Pedestrian and Trail Access |
|  | Pedestrian and trail access improvements at the following key locations: |
|  | an underpass at Patriot Freeway connecting to the regional park; |
|  | an underpass at McCombs Street to provide access between the linear park and the golf course; and |
|  | - an underpass at Martin Luther King, Jr. Boulevard connecting to the linear park. |
| Trail System Within the District |  |
| The trail system within the District is intended to be a unifying element; thus it should connect as many uses and/or neighborhoods |  |
| as practicable. The trail system may follow public right-of-way, may follow permanent open space, and/or may be placed within an |  |
| easement across land owned by the HOA of the District, Subdistrict, Neighborhood or tract as applicable. Trails should be integrated |  |
| into the community rather than separated by fences, barriers or poor land use planning. Pedestrian amenities such as landscaping and |  |

benches should be strategically located at nodes rather than along the entire length of the hike and bike trail system to create a positive impact while minimizing the overall costs.
6.3.3.3 Public Trail Routing and Type

Public Trail routing and type shall be as generally shown in Appendix ' H '.
6.3.3.4 Trail Types
6.3.3.4.1 Trail Type ' $A$ '

Trail type ' $A$ ' is predominant in the District and is intended to be the standard for the development as described herein.
6.3.3.4.2 Trail Type 'B'

Trail type ' $B$ ' is intended for use within the more urban areas of the District. Design components may include more formal street furniture and a planting pattern that contributes to an urban character.
6.3.3.4.3 Trail Type ' $C$ '

Trail type ' $C$ ' is intended for the eastern side of the development in accordance with a golf-related community. Design components may include furnishings and plantings that contribute to a more manicured design approach.
6.3.3.5 "Useable" Open Space

To be considered "useable" open space, thus eligible for parkland dedication credit, Public Trail linkages shall be no less than sixteen feet in width.

### 6.3.4 Community Park

Approximately twenty-five acres adjacent to the proposed high school is required to be set aside for a community park.
6.3.4.1 Community Park Plans

Community park plans shall be submitted to the City within six months of adoption of this ordinance.

### 6.3.4.2 Community Park Construction

The Community park shall be constructed within two years of adoption of this ordinance.

Off-Site Dedication
Parkland required to be dedicated within a particular phase of development within the District may be dedicated "off-site" to another phase of development within the District provided all other requirements of this section have been met. Such dedication will not require a metes and bounds description prior to the development of that phase. For the purposes of parkland deeded as part of an offsite dedication, a District shall be considered a single park zone.

### 6.3.7 Relationship with Drainage

Park and ponding areas shall be designed for dual purposes whenever possible. Such dual us requires support and recommendation from the Director of Parks and the Deputy Director. of Building Services


A linear park's form compliments the drainage function.

## Section 7: Community Form

### 7.1 Purpose and Intent

The purpose and intent of this Section is to provide for the placement and design of forms and spaces within the District.

### 7.2 General Design Principles

7.2.1 $\left.\begin{array}{l}\text { Buildings Express Architectural Compatibility } \\ \text { Buildings express architectural compatibility, with coordinated } \\ \text { architectural features that contribute to community identity. }\end{array}\right\}$
7.2.3 Architectural and Landscape Design Architectural and landscape design are appropriate to physical, historical and economic conditions.
7.2.4 Landmark Buildings, Entry Statements, Public Spaces, and Art
Landmark buildings, entry statements, public spaces, and art establish focal points at appropriate locations within and throughout the development.


Buildings define streets as public places.
7.2.5 Design and Function of Buildings and Open Spaces

The design and function of buildings and open spaces respects and is influenced by local climate, topography, history, and building practice.


### 7.2.6 Buildings and Other Improvements <br> Buildings and other improvements are compatible in their arrangement, bulk, form, character, and landscaping.

### 7.3 Design Elements

7.3.1 Community Theme

The Community theme is desert southwest in keeping with the vernacular aesthetic.

### 7.3.2 General Form

The general form shall be one of interconnected neighborhoods with traditional rectangular architectural forms, narrow streets and grid pattern; less yard space (reduced setbacks) balanced by more neighborhood open space (oases) as per Code, but strategically placed and integrated into a community-wide system); and gateways.
7.3.3 Neighborhood Form

### 7.3.3.1 Homes

Multiple product types per neighborhood; traditional components: porches and patios, fountains and pools, portals/gateways and paths, vibrant color, native building materials.

### 7.3.3.2 Open Space

Enhanced views to the mountains; central park / plaza civic space; open space corridors for long views and for pedestrian circulation; native landscape materials, with focused landscaping for impact.

### 7.3.3.3 Circulation

"All paths lead to the park" concept; the neighborhood boulevard; narrow streets; strategically placed alley product (e.g., across from civic space, along collectors and boulevards, across from dissimilar land use category or sub-category), to eliminate clutter from the street scene.

[^1]
## Appendices



El Paso, Texas


Appendix 'A' - Master Land Use Plan


Proximity to Mixed Use
El Paso, Texas
人ETM Kimer-Horn

Appendix 'B' - Proximity to Mixed-Use


Proximity to Community Facilities El Paso, Texas

Appendix 'C' - Proximity to Community Facilities


Phasing Key Map
El Paso, Texas
ELPASO DATEB UTLITES

Kimley-Horn
Appendix 'D' - Phasing Plan

| Land Use Type | Minimum Lot Area | LOT COVERAGE |  | Minimum <br> Lot Width | Minimum <br> Lot Depth | MAX BLDG HEIGHT (1) |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Minimum | Maximum |  |  | Structure | Structure |
| Low Density Residential 3.5 |  |  |  |  |  |  |  |
| Single-Family Detached (large lot) | 9,600 | 0\% | 50\% | $70^{\prime}$ | 100' | 35' | $25^{\prime}$ |
| Single-Family Detached (standard lot-1) | 6,500 | 0\% | 50\% | $60^{\prime}$ | 100 | $35^{\prime}$ | $25^{\prime}$ |
| Single-Family Detached (standard lot-2) | 5,000 | 0\% | 50\% | $50^{\prime}$ | $90^{\prime}$ | $35^{\prime}$ | $25^{\prime}$ |
| Patio/ZLL | 4,000 | 0\% | 50\% | $40^{\prime}$ | $90^{\prime}$ | $35^{\prime}$ | $25^{\prime}$ |
| Low Density Residential 5.5 |  |  |  |  |  |  |  |
| Single-Family Detached (large lot) | 9,600 | 0\% | 50\% | $70^{\prime}$ | 100' | $35^{\prime}$ | $25^{\prime}$ |
| Single-Family Detached (standard lot-1) | 6,500 | 0\% | 50\% | $60^{\prime}$ | $10{ }^{\prime}$ | $35^{\prime}$ | $25^{\prime}$ |
| Single-Family Detached (standard lot-2) | 5,000 | 0\% | 50\% | $50^{\prime}$ | $90^{\prime}$ | $35^{\prime}$ | $25^{\prime}$ |
| Patio/ZLL | 4,000 | 0\% | 50\% | 40' | $90^{\prime}$ | $35^{\prime}$ | $25^{\prime}$ |
| Duplex | 3,500 | 0\% | 50\% | $35^{\prime}$ | $90^{\prime}$ | $35^{\prime}$ | $25^{\prime}$ |
| Townhome | 3,000 | 0\% | 100\% | $25^{\prime}$ | $10{ }^{\prime}$ | $35^{\prime}$ | $15^{\prime}$ |
| Medium Density Residential 7.2 |  |  |  |  |  |  |  |
| Single-Family Detached (large lot) | 9,600 | 0\% | 50\% | $70^{\prime}$ | 100' | 35' | $25^{\prime}$ |
| Single-Family Detached (standard lot-1) | 6,500 | 0\% | 50\% | 60' | 100 | $35^{\prime}$ | $25^{\prime}$ |
| Single-Family Detached (standard lot-2) | 5,000 | 0\% | 50\% | $50^{\prime}$ | $90^{\prime}$ | $35^{\prime}$ | $25^{\prime}$ |
| Patio/ZLL | 4,000 | 0\% | 50\% | $40^{\prime}$ | $90^{\prime}$ | $35^{\prime}$ | $25^{\prime}$ |
| Duplex | 3,500 | 0\% | 50\% | $35^{\prime}$ | $90^{\prime}$ | $35^{\prime}$ | $25^{\prime}$ |
| Townhome | 1,800 | 0\% | 100\% | $15^{\prime}$ | $90^{\prime}$ | $40^{\prime}$ | $15^{\prime}$ |
| Multifamily | 6,000 | 0\% | 60\% | $50^{\prime}$ | $10{ }^{\prime}$ | $40^{\prime}$ | $25^{\prime}$ |
| Medium Density Residential 12.0 |  |  |  |  |  |  |  |
| Patio/ZLL | 4,000 | 0\% | 50\% | 40' | $90^{\prime}$ | $35^{\prime}$ | $25^{\prime}$ |
| Duplex | 3,500 | 0\% | 50\% | $35^{\prime}$ | $90^{\prime}$ | $35^{\prime}$ | $25^{\prime}$ |
| Townhome | 1,800 | 0\% | 100\% | $15^{\prime}$ | $90^{\prime}$ | $40^{\prime}$ | $15^{\prime}$ |
| Multifamily | 6,000 | 0\% | 60\% | $50^{\prime}$ | $10{ }^{\prime}$ | $40^{\prime}$ | $25^{\prime}$ |

Notes

1. Building Height shall be 20 feet minimum in the Mixed Use High Intensity Land Use Type.

> Appendix 'E' - Property Development Regulations

| Land Use Type | Front | Rear | Cumulative <br> Front \& Rear | SETBACKS (1) <br> Side Interior | Side Street | Cumulative <br> Sides (4) | Garage <br> Setbacks | Maximum <br> Density <br> (du/ac) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Low Density Residential 3.5 |  |  |  |  |  |  |  |  |
| Single-Family Detached (large lot) | 15' - 20' | $20^{\prime}$ | $35^{\prime}$ | $10^{\prime}$ | $10^{\prime}$ | 20'/20' | (5) | 3.5 |
| Single-Family Detached (standard lot-1) | 10' - 15' | $15^{\prime}$ | $25^{\prime}$ | $5{ }^{\prime}$ | $10^{\prime}$ | 10'/15' | (5) |  |
| Single-Family Detached (standard lot-2) | 10' - 15' | $15^{\prime}$ | $25^{\prime}$ | 5' | $10^{\prime}$ | 10'/15' | (5) |  |
| Patio/ZLL | 10' - 15' | $15^{\prime}$ | $25^{\prime}$ | $0^{\prime}(2)$ | $10^{\prime}$ | 0'/10' | (5) |  |
| Low Density Residential 5.5 |  |  |  |  |  |  |  |  |
| Single-Family Detached (large lot) | 15' - 20' | $20^{\prime}$ | 35' | $10^{\prime}$ | $10^{\prime}$ | 20'/20' | (5) | 5.5 |
| Single-Family Detached (standard lot-1) | 10' - 15' | $15^{\prime}$ | $25^{\prime}$ | $5{ }^{\prime}$ | $10^{\prime}$ | 10'/15' | (5) |  |
| Single-Family Detached (standard lot-2) | 10'-15' | $15^{\prime}$ | $25^{\prime}$ | $5{ }^{\prime}$ | $10^{\prime}$ | 10'/15' | (5) |  |
| Patio/ZLL | 10'-15' | $15^{\prime}$ | $25^{\prime}$ | $0^{\prime}$ (2) | $10^{\prime}$ | 0'/10' | (5) |  |
| Duplex | $10^{\prime}-15^{\prime}$ | $15^{\prime}$ | $25^{\prime}$ | 5' | $10^{\prime}$ | 10'/15' | (5) |  |
| Townhome | $5^{\prime}-10^{\prime}$ | $10^{\prime}$ | $15^{\prime}$ | $0^{\prime}(3)$ | $10^{\prime}$ | 0'/10' | (5) |  |
| Medium Density Residential 7.2 |  |  |  |  |  |  |  |  |
| Single-Family Detached (large lot) | 15' - 20' | $20^{\prime}$ | $35^{\prime}$ | $10^{\prime}$ | $10^{\prime}$ | 20'/20' | (5) | 7.2 |
| Single-Family Detached (standard lot-1) | 10' - 15' | $15^{\prime}$ | $25^{\prime}$ | $5{ }^{\prime}$ | $10^{\prime}$ | 10'/15' | (5) |  |
| Single-Family Detached (standard lot-2) | 10'-15' | $15^{\prime}$ | $25^{\prime}$ | $5 '$ | $10^{\prime}$ | 10'/15' | (5) |  |
| Patio/ZLL | 10' - 15' | $15^{\prime}$ | $25^{\prime}$ | $0^{\prime}(2)$ | $10^{\prime}$ | 0'/10' | (5) |  |
| Duplex | 10' - 15' | $15^{\prime}$ | $25^{\prime}$ | 5' | $10^{\prime}$ | 10'/15' | (5) |  |
| Townhome | $5^{\prime}-10^{\prime}$ | $10^{\prime}$ | $15^{\prime}$ | $0^{\prime}(3)$ | $10^{\prime}$ | 0'/10' | (5) |  |
| Multifamily | 10' - 15' | $15^{\prime}$ | $25^{\prime}$ | $10^{\prime}$ | $10^{\prime}$ | 20'/20' | (5) |  |

## Notes

1. Setbacks shown with a range represent a minimum and maximum setback requirement.
2. Minimum 10 ' building separation
3. Minimum 20' building separation
4. Cumulative Side Setbacks shall be dependent upon whether the lot is an interior lot or corner lot. (interior lot / corner lot)
5. Refer to Section 3.3.1.6 of the Master Zoning Plan for Garage Setbacks

> Appendix 'E' - Property Development Regulations

| Land Use Type | Minimum LOT COVERAGE |  |  | Minimum Lot Width | Minimum Lot Depth | MAX BLDG HEIGHT (1) |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Primary |  | Accessory |
|  | Lot Area | Minimum | Maximum |  |  | Structure | Structure |
| Mixed Use Low Intensity |  |  |  |  |  |  |  |
| Patio/ZLL | 4,000 | 0\% | 50\% |  | 40' | $90^{\prime}$ | $35^{\prime}$ | $25^{\prime}$ |
| Duplex | 3,500 | 0\% | 50\% | $35^{\prime}$ | $90^{\prime}$ | $35^{\prime}$ | $25^{\prime}$ |
| Townhome | 1,800 | 0\% | 100\% | $15^{\prime}$ | $90^{\prime}$ | 35' | $15^{\prime}$ |
| Multifamily | 6,000 | 0\% | 60\% | $50^{\prime}$ | $10{ }^{\prime}$ | $35^{\prime}$ | 25' |
| Neighborhood Office | 21,780 | 0\% | 50\% | $10{ }^{\prime}$ | $100^{\prime}$ | $35^{\prime}$ | n/a |
| Neighborhood Retail | 21,780 | 0\% | 50\% | $100{ }^{\prime}$ | $100{ }^{\prime}$ | 35' | n/a |
| Vertically Integrated Mixed Use | 21,780 | 0\% | 50\% | 100' | $100{ }^{\prime}$ | $35^{\prime}$ | n/a |
| Mixed Use High Intensity |  |  |  |  |  |  |  |
| Townhome | 1,800 | 0\% | 100\% | 15' | 90' | 40' | $15^{\prime}$ |
| Multifamily | 6,000 | 0\% | 60\% | $50^{\prime}$ | $10{ }^{\prime}$ | $40^{\prime}$ | 25' |
| General Office | 21,780 | 0\% | 50\% | $10{ }^{\prime}$ | 100 | $40^{\prime}$ | n/a |
| General Retail | 21,780 | 0\% | 50\% | $100{ }^{\prime}$ | 100' | $40^{\prime}$ | n/a |
| General Commercial | 43,560 | 0\% | 50\% | 100' | 200' | $40^{\prime}$ | n/a |
| Vertically Integrated Mixed Use | 21,780 | 0\% | 50\% | 100 | 100' | $40^{\prime}$ | n/a |
| Regional Retail |  |  |  |  |  |  |  |
| General Office | 43,560 | 0\% | 50\% | 100' | 200' | $50^{\prime}$ | n/a |
| General Retail | 43,560 | 0\% | 50\% | $100{ }^{\prime}$ | 200 | $40^{\prime}$ | n/a |
| General Commercial | 43,560 | 0\% | 50\% | $100{ }^{\prime}$ | 200' | $40^{\prime}$ | n/a |

## Notes

1. Building Height shall be 20 feet minimum in the Mixed Use High Intensity Land Use Type.
Appendix 'E' - Property Development Regulations

| Land Use Type | SETBACKS (1) |  |  |  |  |  |  | Maximum Density (du/ac) | Maximum Intensity (FAR) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Front | Rear | Cumulative <br> Front \& Rear | Side Interior | Side <br> Street | Cumulative <br> Sides (4) | Garage <br> Setbacks |  |  |
| Mixed Use Low Intensity |  |  |  |  |  |  |  |  |  |
| Patio/ZLL | 10' - 15' | $15^{\prime}$ | $25^{\prime}$ | 0' (2) | 10' | 0'/10' | (5) |  |  |
| Duplex | 10' - 15' | $15^{\prime}$ | $25^{\prime}$ | 5' | $10^{\prime}$ | 10'/15' | (5) |  |  |
| Townhome | $5^{\prime}-10^{\prime}$ | $10^{\prime}$ | $15^{\prime}$ | $0{ }^{\prime}$ (3) | $10^{\prime}$ | 0'/10' | (5) |  |  |
| Multifamily | 10' - 15' | $20^{\prime}$ | $30^{\prime}$ | $10^{\prime}$ | $10^{\prime}$ | 20'/20' | n/a | 6.0 | 30\% (6) |
| Neighborhood Office | $10^{\prime}$ | $20^{\prime}$ | $30^{\prime}$ | $20^{\prime}$ | $10^{\prime}$ | 40'/30' | n/a |  |  |
| Neighborhood Retail | $10^{\prime}$ | $20^{\prime}$ | $30^{\prime}$ | $20^{\prime}$ | $10^{\prime}$ | 40'30' | n/a |  |  |
| Vertically Integrated Mixed Use | $10^{\prime}$ | $20^{\prime}$ | $30^{\prime}$ | $20^{\prime}$ | $10^{\prime}$ | 40/30' | n/a |  |  |
| Mixed Use High Intensity |  |  |  |  |  |  |  |  |  |
| Townhome | 5' - 10' | $0^{\prime}$ | 5' | 0' (3) | 10' | 0'/10' | (5) |  |  |
| Multifamily | 10' - 15' | $0{ }^{\prime}$ | $10^{\prime}$ | 10' | 10' | 20'/20' | n/a |  |  |
| General Office | 0' - 5' | $5{ }^{\prime}$ | $5{ }^{\prime}$ | $0^{\prime}-10^{\prime}$ | $0^{\prime}-10^{\prime}$ | 0' - 20' | n/a | 3.6 | 42\% |
| General Retail | 0' $5^{\prime}$ | $5{ }^{\prime}$ | $5{ }^{\prime}$ | $0^{\prime}-10^{\prime}$ | $0^{\prime}-10^{\prime}$ | $0^{\prime}-20^{\prime}$ | n/a | 3.6 | 42\% |
| General Commercial | 0' - 5' | $5^{\prime}$ | 5' | $0^{\prime}-10^{\prime}$ | $0^{\prime}-10^{\prime}$ | $0^{\prime}-20^{\prime}$ | n/a |  |  |
| Vertically Integrated Mixed Use | 0' ${ }^{\prime}$ ' | 5' | $5 '$ | $0^{\prime}-10^{\prime}$ | $0^{\prime}-10^{\prime}$ | $0^{\prime}-20^{\prime}$ | n/a |  |  |
| Regional Retail |  |  |  |  |  |  |  |  |  |
| General Office | $25^{\prime}$ | $20^{\prime}$ | $45^{\prime}$ | 15' | $25^{\prime}$ | 30'/45' | n/a |  |  |
| General Retail | $25^{\prime}$ | $20^{\prime}$ | $45^{\prime}$ | $15^{\prime}$ | $25^{\prime}$ | 30'/45' | n/a | n/a | 60\% |
| General Commercial | $25^{\prime}$ | $20^{\prime}$ | $45^{\prime}$ | $15^{\prime}$ | $25^{\prime}$ | 30'/45' | n/a |  |  |

## Notes

1. Setbacks shown with a range represent a minimum and maximum setback requirement.
2. Minimum 10 ' building separation
3. Minimum 20 ' building separation
4. Cumulative Side Setbacks shall be dependent upon whether the lot is an interior lot or corner lot. (interior lot / corner lot)
5. Refer to Section 3.3.1.6 of the Master Zoning Plan for Garage Setbacks
6. The maximum non-residential intensity may be increased to $60 \%$, provided a reduction of one dwelling unit per acre is provide for each $5 \%$ increase in FAR
Appendix 'E' - Property Development Regulations


El Paso, Texas
EL PASO
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Appendix 'F' - Subdistrict Key Map

## AGRICULTURAL \& RELATED OPERATIONS

| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Animal cemetery | X | X | X | X | X | P | P |
| Animal crematory | P | P | P | P | X | P | P |
| Animal kennel | X | X | X | X | X | P | P |
| Animal pound, shelter | X | X | X | X | X | P | P |
| Animal training facility (school) | X | X | X | X | X | P | P |
| Barn | A | A | A | A | X | X | X |
| Composting facility | X | X | X | X | X | P | P |
| Farm | P | P | P | P | P | P | P |
| Farmer's market | X | X | X | X | P | P | P |
| Greenhouse (industrial-scale) | X | X | X | X | X | X | P |
| Harvesting (field, tree, bush crops) | P | P | P | P | P | P | P |
| Nursery (industrial scale) | X | X | X | X | X | X | P |
| Raising (field, tree, bush crops) | P | P | P | P | P | P | P |
| Veterinary treatment center (small animals) | X | X | X | X | P | P | P |


| COMMERCIAL, STORAGE \& PROCESSING |  |  |  |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| Boutique bottling | X | X | X | X |  |  |  |
| Contractor yard (large) | X | X | X | X | P | P | P |
| Contractor yard (sall) | X | X | X | X | X | X | P |
| General Warehouse | X | X | X | X | X | P | P |
| Office warehouse | X | X | X | P | P | P |  |
| Self storage warehouse | X | X | X | P | P | P | P |
| Storage of supplies, equipment, goods | X | X | X | X | P | P | P |


| EDUCATIONAL, INSTITUTIONAL \& SOCIAL USES |  |  |  |  |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |  |
| Adult day care center | $X$ | $X$ | $X$ | $X$ | P | P | P | P |
| Art gallery | P | P | P | P | P | P | P | P |

## X-Use Not Allowed: P-Permitted Use; A-Permitted Accessory Use

Appendix 'G' - Allowable Land Uses

EDUCATIONAL, INSTITUTIONAL \& SOCIAL USES (continued)

| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Child care facility, Type 3 | P | P | P | P | P | P | X |
| Child care facility, Type 4 | X | X | X | X | P | P | P |
| Child care facility, Type 5 | X | X | X | X | P | P | P |
| Child care facility, Type 6 | P | P | P | P | P | P | P |
| Child care institution | X | X | X | X | P | P | P |
| Church | P | P | P | P | P | P | P |
| Community center | P | P | P | P | P | P | P |
| Convent | P | P | P | P | P | P | P |
| Library | P | P | P | P | P | P | P |
| Lodge | P | P | P | P | P | P | P |
| Monastery | P | P | P | P | P | P | P |
| Museum | P | P | P | P | P | P | P |
| Orphanage, shelter | P | P | P | P | P | P | P |
| School, public, private or parochial (9 through 12) | P | P | P | P | P | P | P |
| School, public, private or parochial (Pre-K through 8) | P | P | P | P | P | P | P |
| School, trade | X | X | X | X | P | P | P |
| School, vocational | X | X | X | X | P | P | P |
| Social, fraternal club | P | P | P | P | P | P | P |
| Synagogue | P | P | P | P | P | P | P |
| Temple | P | P | P | P | P | P | P |
| Union hall | P | P | P | P | P | P | P |
| University, college | P | P | P | P | P | P | P |
| Youth organization (with/without living facility) | P | P | P | P | P | P | P |

OFFICE \& RESEARCH SERVICES

| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Automated Teller Machine (ATM) | X | X | X | X | A | P | P |
| Bank | X | X | X | X | P | P | P |
| Courier \& message service | X | X | X | X | X | P | P |
| Credit union | X | X | X | X | P | P | P |
| Data processing center | X | X | X | X | P | P | P |

X-Use Not Allowed: P-Permitted Use; A-Permitted Accessory Use
Appendix 'G' - Allowable Land Uses

OFFICE \& RESEARCH SERVICES (continued)

| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Employment agency | X | X | X | X | P | P | P |
| Financial institution | X | X | X | X | P | P | P |
| Office, administrative \& manager's | X | X | X | X | P | P | P |
| Office, business | X | X | X | X | P | P | P |
| Office, medical | X | X | X | X | P | P | P |
| Office, professional | X | X | X | X | P | P | P |
| Radio broadcasting studio | X | X | X | X | X | P | P |
| Research laboratory | X | X | X | X | P | P | P |
| School, arts \& crafts | X | X | X | X | P | P | P |
| Studio, dance | X | X | X | X | P | P | P |
| Studio, music | X | X | X | X | P | P | P |
| Studio, photography | X | X | X | X | P | P | P |
| Telemarketing agency | X | X | X | X | P | P | P |
| Television broadcasting studio | X | X | X | X | X | P | P |

MANUFACTURING, PROCESSING \& ASSEMBLING

| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Apparel manufacturing | X | X | X | X | X |  |  |
| Bread \& bakery product manufacturing | X | X | X | X | X | X |  |
| Computer electronic product assembly | X | X | X | X | X |  |  |
| Recycling collection facility (large) | X | X | X | X | P |  |  |
| Recycling collection facility (small) | X | X | X | X | P |  |  |
| Reverse vending machines | X | X | X | X | X |  |  |


| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Assisted living facility (elderly) | P | P | P | P | P | P | P |
| Clinic | X | X | P | P | P | P | P |
| Convalescent home | P | P | P | P | P | P | P |
| Drug store | X | X | X | X | P | P | P |

## X-Use Not Allowed: P-Permitted Use; A-Permitted Accessory Use

Appendix 'G' - Allowable Land Uses

MEDICAL \& RELATED USES

| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Hospital | P | P | P | P | P | P | P |
| Intermediate care facility (elderly) | P | P | P | P | P | P | P |
| Medical lab | X | X | P | P | P | P | P |
| Medical treatment facility | X | X | P | P | P | P | P |
| Nursing home | P | P | P | P | P | P | P |
| Optical dispensary | X | X | X | X | P | P | P |
| Pharmacy | X | X | X | X | P | P | P |
| Rest home | P | P | P | P | P | P | P |
| Sanitarium | P | P | P | P | P | P | P |


| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Ambulance service | X | X | X | X | X | P | P |
| Automobile (sales, service, storage \& rental) | X | X | X | X | X | P | P |
| Automobile part sales | X | X | X | X | P | P | P |
| Automotive rental location (satellite) | X | X | X | X | P | P | P |
| Automotive repair garage | X | X | X | X | X | P | P |
| Automotive service station | X | X | X | X | P | P | P |
| Boat, boat-trailer (sales, service, storage \& rental) | X | X | X | X | X | P | P |
| Carwash, fullservice | X | X | X | X | P | P | P |
| Carwash, selfservice | X | X | X | X | P | P | P |
| Commercial fueling station | X | X | X | X | X | P | P |
| Contractor equipment (sales, storage, repair \& rental) | X | X | X | X | X | P | P |
| Light truck (sales, service, storage \& rental) | X | X | X | X | X | P | P |
| Light truck part sales | X | X | X | X | P | P | P |
| Manufactured home (sales, display \& repair) | X | X | X | X | X | P | P |
| Motor vehicle repair, major | X | X | X | X | X | P | P |
| Motor vehicle repair, minor | X | X | X | X | P | P | P |
| Motorcycle (sales, service, storage \& rental) | X | X | X | X | X | P | P |

X-Use Not Allowed: P-Permitted Use; A-Permitted Accessory Use
Appendix 'G' - Allowable Land Uses

PARKING \& LOADING

| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Garage or lot, parking (commercial) | X | X | X | X | P | P | P |
| Garage or lot, parking (community) | X | X | X | P | P | P | P |
| Garage or lot, parking (private) | A | A | A | A | P | P | P |
| Loading spaces (serving another property) | P | P | P | P | P | P | P |
| On-site loading | A | A | A | A | A | A | A |
| On-site parking | A | A | A | A | A | A | A |
| Parking spaces (serving another property) | P | P | P | P | P | P | P |
| Unenclosed parking space shelter | X | X | A | A | A | A | A |

PERSONAL SERVICES

| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Barber shop | X | X | X | X | P | P | P |
| Beauty salon | X | X | X | X | P | P | P |
| Cemetery | P | P | P | P | P | P | X |
| Dry cleaning shop (<2,500 square feet) | X | X | X | X | P | P | P |
| Dry cleaning shop ( $>2,500$ square feet) | X | X | X | X | P | P | P |
| Dry-cleaners (commercial) | X | X | X | X | X | P | P |
| Extermination service | X | X | X | X | X | P | P |
| Funeral home | X | X | X | X | X | P | P |
| Laundromat, laundry (<5,000 square feet) | X | X | P | P | P | P | P |
| Laundromat, laundry ( $>5,000$ square feet) | X | X | X | X | P | P | P |
| Laundry (commercial) | X | X | X | X | X | P | P |
| Locksmith | X | X | X | X | P | P | P |
| Massage parlor | X | X | X | X | P | P | P |
| Mausoleum | P | P | P | P | P | P | X |
| Mortuary | X | X | X | X | X | P | P |
| Photofinishing lab | X | X | X | P | P | P | P |
| Shoe repair shop | X | X | X | X | P | P | P |
| Tattoo parlor | X | X | X | X | P | P | P |
| Taxidermist | X | X | X | X | P | P | P |

Taxidermist
Appendix ' $G$ ' - Allowable Land Uses

RECREATION, AMUSEMENT \& ENTERTAINMENT

| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Amusement game complex | X | X | X | X | P | P | P |
| Amusement park | X | X | X | X | X | X | P |
| Athletic facility (indoor) | X | X | X | A | A | P | P |
| Athletic facility (outdoor) | X | X | X | X | X | P | P |
| Ballroom | X | X | X | X | X | P | P |
| Billiard \& pool hall | X | X | X | X | X | P | P |
| Bingo hall | X | X | X | X | X | P | P |
| Bowling alley | X | X | X | X | P | P | P |
| Coliseum | X | X | X | X | X | X | P |
| Community recreational facility | P | P | P | P | P | P | X |
| Dancehall | X | X | X | X | X | P | P |
| Exercise facility (indoor) | X | X | X | A | A | P | P |
| Gambling casino | X | X | X | X | X | X | P |
| Golf course < 75 acres (with/without restaurant \& bar) | P | P | P | P | P | P | P |
| Golf course > 75 acres (with/without restaurant \& bar) | P | P | P | P | P | P | P |
| Golf driving range | P | P | P | P | P | P | P |
| Ice skating facility | X | X | X | X | P | P | P |
| Laser games center | X | X | X | X | P | P | P |
| Miniature golf course | X | X | X | X | X | P | P |
| Movie theatre (indoor) | X | X | X | X | X | P | P |
| Movie theatre, drivein (outdoor) | X | X | X | X | X | X | P |
| Nightclub, bar, cocktail lounge | X | X | X | X | P | P | P |
| Open space (common, public or private) | P | P | P | P | P | P | P |
| Paint ball center (indoor) | X | X | X | X | X | P | P |
| Park, playground | P | P | P | P | P | P | P |
| Racquetball club, indoor (with/without restaurant \& bar) | X | X | X | A | A | P | P |
| Racquetball club, outdoor (with/without restaurant \& bar) | X | X | X | X | P | P | P |
| Roller skating facility | X | X | X | X | X | P | P |
| Sauna, exercise room | A | A | A | A | A | A | A |
| Skateboarding facility (indoor) | X | X | X | X | X | P | P |
| Skateboarding facility (outdoor) | X | X | X | X | X | P | P |

X-Use Not Allowed: P-Permitted Use; A-Permitted Accessory Use

Appendix 'G' - Allowable Land Uses

| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Sports arena | X | X | X | X | X | X | P |
| Stadium | X | X | X | X | X | X | P |
| Swimming pool (commercial) | X | X | X | X | P | P | P |
| Tennis club, indoor (with/without restaurant \& bar) | P | P | P | P | P | P | P |
| Tennis club, outdoor (with/without restaurant \& bar) | P | P | P | P | P | P | P |
| Theatre, performing | X | X | X | X | P | P | P |

## REPAIR SERVICES

| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Commercial equipment repair | X | X | X | X | X | P | P |
| Electronic equipment repair | X | X | X | X | P | P | P |
| Household goods repair | X | X | X | X | P | P | P |
| Industrial equipment repair | X | X | X | X | X | P | P |
| Personal goods repair | X | X | X | X | P | P | P |
| Precision equipment repair | X | X | X | X | P | P | P |


| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Animals, keeping for enjoyment purposes | A | A | A | A | A | A | A |
| Apartment ( 5 or more units) | X | X | P | P | P | P | X |
| Bed and Breakfast (residence) | P | P | P | P | P | P | X |
| Bed and Breakfast Inn | X | X | X | X | P | P | P |
| Congregate home | A | A | A | A | A | A | X |
| Domestic garden house, toolhouse, playhouse | A | A | A | A | A | A | A |
| Domestic storage | A | A | A | A | A | A | A |
| Duplex (two-family dwelling) | P | P | P | P | P | X | X |
| Dwelling, resident watchman or property caretaker | X | X | A | A | A | A | X |
| Home occupation uses | A | A | A | A | A | A | X |
| Hotel | X | X | X | X | P | P | P |
| HUD-code manufactured home park | X | X | X | P | P | P | X |

HUD-code manufactured home park
Appendix ' $G$ ' - Allowable Land Uses

RESIDENTIAL (continued)

| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Laundry room | A | A | A | A | A | A | X |
| Live-work flex unit | X | X | P | P | P | P | X |
| Motel | X | X | X | X | P | P | P |
| Quadraplex | X | X | P | P | P | P | X |
| Ranchette ( $>1$ acre \& < 5 acres) | P | X | X | X | X | X | X |
| Single-family attached dwelling (atrium, patio, townhouse, condominium) | X | P | P | P | P | P | X |
| Single-family detached dwelling | P | P | P | P | P | P | X |
| Swimming pool, game court (noncommercial) | A | A | A | A | A | A | X |
| Triplex | X | X | P | P | P | P | X |

SALES, RETAIL \& WHOLESALE

| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Bakery | X | X | X | X | P | P | P |
| Book store | X | X | X | X | P | P | P |
| Boutique | X | X | X | X | P | P | P |
| Cafeteria | X | X | X | X | P | P | P |
| Cafeteria, school | A | A | A | A | A | A | A |
| Coin-operated vending machines (inside a building) | A | A | A | A | A | A | A |
| Convenience store | X | X | X | X | P | P | P |
| Convenience store with gas pumps | X | X | X | X | P | P | P |
| Delicatessen | X | X | X | P | P | P | P |
| Drug store | X | X | X | P | P | P | P |
| Flea market (indoor) | X | X | X | X | P | P | P |
| Flea market (outdoor) | X | X | X | X | X | P | P |
| Flower shop, florist | X | X | X | P | P | P | P |
| Grocery | X | X | X | P | P | P | P |
| Hobby store | X | X | X | X | P | P | P |
| Home improvement center | X | X | X | X | P | P | P |
| Ice cream parlor | X | X | X | P | P | P | P |
| Material sales (building \& construction) | X | X | X | X | X | P | P |

X-Use Not Allowed: P-Permitted Use; A-Permitted Accessory Use
Appendix 'G' - Allowable Land Uses

| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Music store | X | X | X | X | P | P | P |
| Newspaper printing facility | X | X | X | X | X | P | P |
| Nursery, greenhouse | P | P | P | P | P | P | P |
| Other retail establishment (high-volume) | X | X | X | X | X | P | P |
| Other retail establishment (low-volume) | X | X | X | X | P | P | P |
| Package liquor store | X | X | X | X | X | P | P |
| Pet shop (including grooming) | X | X | X | X | P | P | P |
| Print \& copy shop | X | X | X | X | P | P | P |
| Produce stand | A | A | X | X | P | P | P |
| Restaurant (drive-in or walk up) | X | X | X | X | P | P | P |
| Restaurant (sit down) | X | X | X | X | P | P | P |
| Shopping center, community | X | X | X | X | P | P | P |
| Shopping center, regional | X | X | X | X | X | P | P |
| Snow cone, shaved ice stand or trailer | X | X | X | X | P | P | P |
| Specialty shop | X | X | X | X | P | P | P |
| Sporting goods store | X | X | X | X | P | P | P |
| Supermarket | X | X | X | X | P | P | P |
| Superstore | X | X | X | X | P | P | P |
| Warehouse club | X | X | X | X | P | P | P |


| SIGNS |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| On-premise advertising | A | A | A | A | A | A | A |
| TEMPORARY USES |  |  |  |  |  |  |  |
| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| Amusement rides (commercial) | X | X | X | X | X | X | P |
| Borrow pit (related to construction operations) | P | P | P | P | P | P | P |
| Christmas tree stand | X | X | X | X | P | P | P |
| Circus | X | X | X | X | X | X | P |

X-Use Not Allowed: P-Permitted Use; A-Permitted Accessory Use

Appendix 'G' - Allowable Land Uses

TEMPORARY USES (continued)

| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Concrete mixing or batching plant | P | P | P | P | P | P | P |
| Firewood sales | X | X | X | P | P | P | P |
| Garage sale | A | A | A | A | A | A | X |
| Mobile office/storage unit (related to construction operations) | A | A | A | A | A | A | A |
| Mobile office/storage unit (related to sales or rental) | A | A | A | A | A | A | A |
| Model dwelling | P | P | P | P | P | P | P |
| Neighborhood fair, carnival | A | A | A | A | A | P | P |
| Pumpkin patch | X | X | X | X | P | P | P |
| Recycling collection facility (small) | A | A | A | A | A | A | A |
| Rummage sale | A | A | A | A | A | A | X |
| Sales stands (ranch \& farm products) | A | A | A | A | P | P | P |
| Temporary events on public rights-of-way | A | A | A | A | A | A | A |
| Tents (special events) | P | P | P | P | P | P | P |
| Yard sale | A | A | A | A | A | A | X |


| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Amateur \& CB radio stations (federally licensed) | A | A | A | A | A | A | A |
| Personal Wireless Service Facility (PWSF), facility-mounted | P | P | P | P | P | P | P |
| PWSF, ground-mounted | X | X | X | X | P | P | P |
| PWSF, roof-mounted | P | P | P | P | P | P | P |
| Radio broadcasting antenna | X | X | X | X | P | P | P |
| Radio receiving station (residential-type) | A | A | A | A | A | A | A |
| Satellite receiving dish, antenna | A | A | A | A | A | A | A |
| Solar conversion system | A | A | A | A | A | A | A |
| Television broadcasting antenna | X | X | X | X | P | P | P |
| Television receiving station (residential-type) | A | A | A | A | A | A | A |
| Wind-driven electrical generator, pump | A | A | A | A | P | P | P |

X-Use Not Allowed: P-Permitted Use; A-Permitted Accessory Use
Appendix 'G' - Allowable Land Uses

| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Airpad | P | P | P | P | P | P | P |
| Helistop | P | P | P | P | P | P | P |
| Passenger station | X | X | X | X | P | P | P |
| Railroad R.O.W. | P | P | P | P | P | P | P |
| Transportation terminal, Type A | X | X | X | X | P | P | P |
| Transportation terminal, Type B | X | X | X | X | P | P | P |
| UTILITY \& MISCELLANEOUS GOVERNMENTAL FACILITIES |  |  |  |  |  |  |  |
| USE | LDR-3.5 | LDR-5.5 | MDR-7.2 | MDR-12.0 | MXD-L | MXD-H | RR |
| Communication utility facility | P | P | P | P | P | P | P |
| Detention basin (public/private) | P | P | P | P | P | P | P |
| Governmental use, building | P | P | P | P | P | P | P |
| Major utility facility | P | P | P | P | P | P | P |
| Minor utility facility | P | P | P | P | P | P | P |
| Streets and ROW (public or private) | P | P | P | P | P | P | P |
| Stormwater retention pond (public/private) | P | P | P | P | P | P | P |
| Utility storage yard | P | P | P | P | P | P | P |
| Water \& wastewater utility facility | P | P | P | P | P | P | P |

X-Use Not Allowed: P-Permitted Use; A-Permitted Accessory Use

Appendix 'G’ - Allowable Land Uses


Appendix 'H' - General Park Service Areas


Zoning Map Sheet
El Paso, Texas

Appendix 'I' - Zoning Map










TABLE 3.1
JUNCTION OR STRUCTURE COEFFICIENT OF LOSS

| Case No. | Reference Figures | Description of Condition | Coefficient $k_{j}$ | Equation $h_{j}=$ |
| :---: | :---: | :---: | :---: | :---: |
| 1 | TABLE 1 | Inlet on Main Line | 0.50 | $\underline{V_{2}{ }^{2}}-\underline{K_{j} V^{2}}$ |
|  | Sheet 2 |  |  | $\frac{2 g}{2 g}$ |
| 11 | TABLE 1 | Inlet on Main Line with Branch Lateral | 0.25 |  |
|  | Sheet 2 |  |  |  |
| III | TABLE 1 <br> Sheet 2 | Manhole on Main Line with |  |  |
|  |  | $90^{\circ}$ | 0.25 |  |
|  |  | $60^{\circ}$ | 0.35 |  |
|  |  | $45^{\circ}$ | 0.50 |  |
|  |  | $22.5{ }^{\circ}$ | 0.75 |  |
| IV | Wye Connection or Cut In |  |  |  |
|  | TABLE 1 | $60^{\circ}$ | 0.60 |  |
|  | Sheet 2 | $45^{\circ}$ | 0.75 |  |
|  |  | $22.5{ }^{\circ}$ | 0.95 |  |
| V | TABLE 1 | Inlet or Manhole at Beginning of Line | 1.25 | $\underline{K_{j} V_{2}{ }^{2}}$ |
|  | Sheet 3 |  |  | $2 g$ |
| VI | Conduit Curves for 90** |  |  |  |
|  | TABLE 1 | Curve Radius: 2 to 8D** | 0.40 |  |
|  | Sheet 3 | 8 to 20D | 0.25 |  |
|  |  | $>20 \mathrm{D}$ | 0.00 |  |
| VII | Bend Where Radius is Equal to Diameter |  |  |  |
|  |  | $90^{\circ}$ | 0.50 |  |
|  | Sheet 3 | $60^{\circ}$ | 0.43 |  |
|  |  | $45^{\circ}$ | 0.35 |  |
|  |  | $22.5{ }^{\circ}$ | 0.20 |  |

The values of the coefficient $k_{j}$ for determining the loss of head due to obstructions in pipes are shown in TABLE 1-A and the coefficients are used in the following Equation to calculate the head loss at the obstruction:

$$
h_{j}=K_{j} \frac{V_{2}^{2}}{2 g}
$$

* Where deflection other than $90^{\circ}$ are used, the $90^{\circ}$ deflection coefficient can be used with the following percentage factors: $60^{\circ}$ Bend $-85 \%$; $45^{\circ}$ Bend $-70 \%$; $221 / 2^{\circ}$ Bend $-40 \%$.


## **D - Inside Diameter of Pipe

Note: $\quad 90^{\circ}$ Bends are not to be used in Storm Sewer System unless specifically approved by City Engineer.



TABLE 3.3

## FIGURE 1 TYPICAL THOROUGHFARE CROSS-SECTIONS

N.T.S.

MAJOR ARTERIAL STREET


MINOR ARTERIAL STREET


MINOR ARTERIAL STREET WITH BIKE/HIKE


TYPICN MEDIAN



[^0]:    Delay is reported as HCM delay in $\mathrm{sec} / \mathrm{veh}$

[^1]:    7.3.4 Landscaping

    Native plant materials, irrigation systems favor reclaimed water, greywater, roof water and surface stormwater as appropriate and practicable.

