APPENDIX N. TRANSPORTATION IMPACT ANALYSIS

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KITTELSON & ASSOCIATES

OAKLAND INTERNATIONAL AIRPORT - TERMINAL MODERNIZATION AND DEVELOPMENT

TRANSPORTATION IMPACT ANALYSIS

July 14, 2023



Inside front cover

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Oakland International Airport - Terminal Modernization and Development – Transportation Impact Analysis

Oakland, CA

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July 14, 2023

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Section 1
Introduction

INTRODUCTION

This report presents the findings of the transportation impact analysis conducted in support of the Environmental Impact Report (EIR) for the proposed Terminal Modernization and Development Project (Proposed Project) at Oakland International Airport (OAK or Airport) in Oakland, California. The report follows the California Environmental Quality Act (CEQA) Checklist and analyzes the transportation effects of the Proposed Project, including:

- Trip generation and distribution
- Traffic operations analysis for seven intersections near the Proposed Project
- Impacts in relation to CEQA regulations, including Vehicle Miles Traveled (VMT)

PROJECT SUMMARY

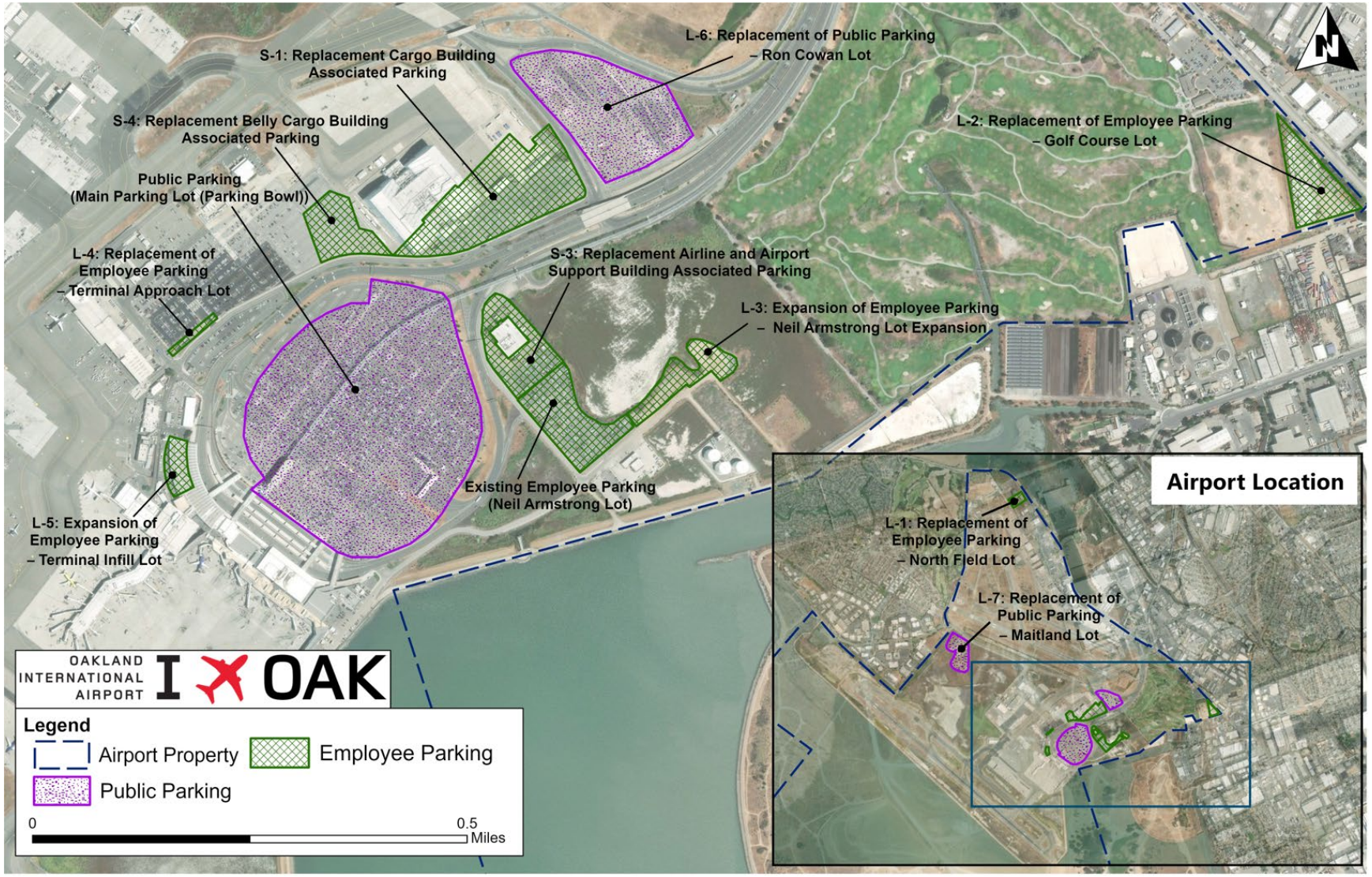
The Proposed Project at OAK includes:

- modernizing Terminals 1 and 2;
- consolidating passenger processing functions (e.g., ticketing, baggage check-in, security screening);
- constructing an expansion of the international arrival facilities;
- constructing a new terminal;
- relocating existing cargo and support facilities; and
- improving the terminal area roadway, parking areas, and support facilities.

The Proposed Project would not change the number of aircraft operations or the number of passenger enplanements[1] at OAK but would cause rerouting of vehicles accessing the area as parking facilities are relocated within Airport property. The proposed parking areas with the construction of the Proposed Project are shown in Exhibit 1.

[1] The act or process of boarding an aircraft.

Exhibit 1: Parking Areas with Proposed Project



Source: Port of Oakland 2022



Section 2 Regulatory Setting

REGULATORY SETTING

Because the Proposed Project is within the city of Oakland (Oakland), Oakland's adopted plans and policies shape the transportation analysis framework. The overall goal of these policies is to achieve an effective, sustainable, multi-modal transportation system for Oakland. Additionally, there are state and regional policies that provide a regulatory setting that further shapes the transportation infrastructure. This section discusses the Proposed Project's conformance with applicable plans and policies.

STATE PLAN, POLICIES, AND REGULATIONS

California Senate Bill 743

State Senate Bill (SB) 743[2] was signed into law in September 2013. SB 743 required changes to the CEQA Guidelines regarding the analysis of transportation impacts. Historically, CEQA transportation analyses of individual projects determined impacts in the circulation system in terms of roadway delay and/or capacity at specific locations. SB 743 changes include the elimination of auto delay, Level of Service (LOS), and other similar measures of vehicular capacity or traffic congestion as a basis for determining significant impacts. Instead, SB 743 identifies vehicle miles traveled (VMT)[3] as the most appropriate metric to evaluate a project's transportation impacts. Since the bill has gone into effect, automobile delay, as measured by LOS and other similar metrics, no longer constitutes a significant environmental impact under CEQA. LOS may continue to be a measure for planning purposes only.

In December 2018, the California Governor's Office of Planning and Research (OPR) and the State Natural Resources Agency submitted updated CEQA Guidelines to the Office of Administrative Law for final approval to implement SB 743. The Office of Administrative Law approved the updated CEQA Guidelines, thus implementing SB 743 and making VMT the primary metric used to analyze transportation impacts for all projects starting July 1, 2020.

REGIONAL PLANS, POLICIES, AND REGULATIONS

Alameda County Transportation Commission Goods Movement Plan

The Alameda CTC Goods Movement Plan, prepared in February 2016, explores opportunities and strategies Alameda County may pursue to reach goals related to goods movement, including economic prosperity, quality of life, interconnectedness and multimodal

[2] Senate Bill 743 (Steinberg, Chapter 386, Statutes of 2013)
[3] VMT is a measure of total vehicular travel that accounts for the number of vehicle trips and the length of those trips (SB 743).

operations, safety and reliability, and innovation. The Goods Movement Plan outlines a long-range strategy for how to move goods efficiently, reliably, and sustainably within, to, from, and through Alameda County by roads, rail, air, and water.

Plan Bay Area 2050

The Metropolitan Transportation Commission (MTC) and Association of Bay Area Governments (ABAG) adopted the Bay Area's long-range Regional Transportation Plan (RTP) and Sustainable Communities Strategy (SCS) in October 2021. The document describes growth and development in the region over a 20-year horizon and identifies transportation and land use strategies to enable a more sustainable, equitable, and economically vibrant future.

Plan Bay Area 2050 recommends increasing non-auto travel mode share and reducing VMT per capita and per employee by promoting transit-oriented development, transit improvements, and active transportation modes including walking and bicycling.

San Francisco Bay Plan

The San Francisco Bay Plan was completed and adopted by the San Francisco Bay Conservation and Development Commission (BCDC) in 1968 and was transmitted to the California Legislature and the Governor in 1969. Since its adoption, several amendments to the policies have been adopted and incorporated into the plan. Policies pertinent to the transportation analysis for this Proposed Project include:

- **Transportation Policy 4:** Transportation projects on the Bay shoreline and bridges over the Bay or certain waterways should include pedestrian and bicycle paths that will either be a part of the Bay Trail or connect the Bay Trail with other regional and community trails. Transportation projects should be designed to maintain and enhance visual and physical access to the Bay and along the Bay shoreline.
- **Public Access Policy 2:** In addition to the public access to the Bay provided by waterfront parks, beaches, marinas, and fishing piers, maximum feasible access to and along the waterfront and on any permitted fills should be provided in and through every new development in the Bay or on the shoreline, whether it be for housing, industry, port, airport, public facility, wildlife area, or other use, except in cases where public access would be clearly inconsistent with the project because of public safety considerations or significant use conflicts, including unavoidable, significant adverse effects on Bay natural resources. In these cases, in lieu of access at another location, preferably near the project, should be provided. If in lieu public access is required and cannot be provided near the project site, the required access should be located preferably near identified vulnerable or disadvantaged communities lacking well-maintained and convenient public access to foster more equitable public access around the Bay Area.
- **Public Access Policy 10:** Access to and along the waterfront should be provided by walkways, trails, or other appropriate means and connect to the nearest public thoroughfare where convenient parking or public transportation may be available. Diverse and interesting public access experiences should be provided which would encourage users to remain in the designated access areas to avoid or minimize potential adverse effects on wildlife and their habitat.

LOCAL PLANS, POLICIES, AND REGULATIONS

City of Oakland General Plan

Oakland's General Plan (General Plan) is a comprehensive plan for growth and development of the city. The General Plan includes policies related to land use and transportation; open space, conservation, and recreation; housing; historic resources; noise; and bikes and pedestrians. These topics are addressed within individual elements of the General Plan.

The General Plan contains many policies, which may in some cases address different goals; thus, some policies may compete or conflict with each other.

City of Oakland Land Use and Transportation Element (1998)

The Land Use and Transportation Element (LUTE) was adopted by the City of Oakland in March 1998 and addresses land use and transportation issues. In order to accomplish a more integrated planning process that incorporates city-wide infrastructural needs with neighborhood decision-making, the LUTE includes general development policies for Oakland, in addition to district-specific policies. The overriding vision for Oakland that is outlined in the LUTE involves creating "clean and attractive neighborhoods rich in character and diversity, each with its own distinctive identity, yet well-integrated into a cohesive urban fabric" in addition to "a diverse and vibrant downtown with around-the-clock activity." The LUTE includes land use designations for all land within Oakland. Policies in the LUTE applicable to this Proposed Project include:

- **Policy T3.5, Including Bikeways and Pedestrian Walks**: The City should include bikeways and pedestrian walks in the planning of new, reconstructed, or realized streets, wherever possible.
- **Policy T3.6, Encouraging Transit**: The City should encourage and promote use of public transit in Oakland by expediting the movement of and access to transit vehicles on designated "transit streets" as shown on the Transportation Plan. (Policies T3.6 and T3.7 are based on the City Council's passage of a "Transit First" policy in October 1996.)
- **Policy T3.7, Resolving Transportation Conflicts**: The City, in constructing and maintaining its transportation infrastructure, should resolve any conflicts between public transit and single occupant vehicles in favor of the transportation mode that has the potential to provide the greatest mobility and access for people, rather than vehicles, giving due consideration to the environmental, public safety, economic development, health and social equity impacts.
- **Policy T4.1, Incorporating Design Features for Alternative Travel**: The City will require new development, rebuilding, or retrofit to incorporate design features in their projects that encourage use of alternative modes of transportation such as transit, bicycling, and walking.
- **Policy W6.3, Enhancing Intermodal Transportation**: Transportation corridors which serve the harbor/airport terminals should be preserved and enhanced to accommodate higher capacities, service, and safety levels, and intermodal connections.

Bicycle Master Plan (2019)

The current Bicycle Master Plan, *Let's Bike Oakland!,* was adopted by the Oakland City Council in June 2019 as an update to the 2007 plan. The Bicycle Master Plan is the official policy document addressing the development of facilities and programs to enhance the role of bicycling as a viable transportation choice in Oakland. The Bicycle Master Plan is part of the LUTE of the General Plan and defines new Oakland policies and recommends actions that would encourage and support bicycle travel improvements. The goals of the Bicycle Master Plan include the following:

- *Access*: Support increased access to neighborhood destinations such as grocery stores, libraries, schools, recreation centers, bus stops, and BART.
- *Health and Safety*: Empower Oaklanders to live a more active lifestyle by providing a network of safe and comfortable bikeways for everyone to enjoy.
- *Affordability*: Work to reduce the burden of housing and transportation costs on households.
- *Collaboration*: Foster an increased role for the community in the planning process and impressed trust that the city will fulfill its promises.

Pedestrian Master Plan (2017)

The Pedestrian Master Plan (PMP), *Oakland Walks!*, was adopted by the Oakland City Council in June 2017. The vision of the PMP is to make Oakland "a place where vibrant, safe and attractive streets give everyone the opportunity to walk to their destinations and to enjoy the convenience and health benefits of walking." The four goals identified in the PMP are:

- *Equity*: Recognizing a historical pattern of disinvestment, focus investment and resources to create equitable, accessible walking conditions to meet the needs of Oakland's diverse communities.
- *Holistic Community Safety*: Make Oakland's pedestrian environment safe and welcoming.
- *Vitality*: Ensure that Oakland's pedestrian environment is welcoming and well connected, supports the local economy, and sustains healthy communities.
- *Responsiveness*: Develop and provide tools to ensure that Oakland creates and maintains a vibrant pedestrian environment.

The PMP outlines an action plan to invest in and improve safety in the high injury network[4] and to implement the key policy and programmatic improvements that will make streets safer and more inviting for walking throughout the city. The PMP identifies a targeted set of improvements (38 recommended actions) that can be accomplished in five years.

City of Oakland Complete Streets Policy

The Complete Streets Policy (Resolution No. 84204 C.M.S.), adopted by the City of Oakland in February 2013, recognizes the necessity of providing safe and convenient pedestrian,

[4] The high injury network identifies the most dangerous streets in the city. The network was identified was identified by analyzing seven years of pedestrian crashes (2008-2014) as well as the physical characteristics of the roadway. This analysis identified 34 high-injury corridors and 37 high-injury intersections.

bicycle, and public transportation travel options. As such, the City of Oakland will plan, design, construct, operate, and maintain appropriate facilities for pedestrians, bicyclists, transit users of all abilities, children, elderly, and people with disabilities as a routine component of new construction, reconstruction, retrofit, and maintenance projects (subject to some exceptions).



Section 3 Methodology

METHODOLOGY

This section documents the methodology for the analyses of VMT for the Proposed Project. VMT for an airport is not a simple calculation based on a published rate. It is determined using a combination of metrics (vehicle trip generation, alternative mode trip generation [transit, bicycle, and pedestrians], passenger enplanements, potential mode shift, and average trip lengths) to appropriately represent the overall trip generation and VMT for OAK. These inputs were used to calculate VMT for the existing conditions (2019) and two future years (2028 and 2038) with the Proposed Project and, for comparison purposes, without the Proposed Project.

VEHICLE TRIP GENERATION

Vehicle trip generation was estimated for all areas at OAK accessible by vehicle (passenger terminal, public and employee parking, North Field, rental car center, etc.). Details of how the trip generation was estimated, the data sources used, and how the underlying data were collected are discussed in this section. The following section describes how data collected in 2021 were adjusted to represent 2019 existing conditions.

DATA COLLECTION

Data were collected from a variety of sources, including pneumatic tube counts, parking activity data from the Port, StreetLight Data,[5] and video camera data. The first step in determining the vehicle trip generation of OAK was the collection of vehicle counts for all areas of OAK that are accessed by vehicle. These data were collected over either a seven-day period between December 3 and December 9, 2021, or a three-day period between December 7 and December 9, 2021, and differentiated between automobiles, trucks (including cargo trucks), and buses. OAK vehicle trip generation comes from passenger and employee activity, as well as tenant and support activities. These activities and how they generate vehicle trips were collected and split into six categories of trip types. These types include:

- Vehicle Trip Generation Category A: Non-Parking Vehicle Trips (Airport pick-up, drop-off, cargo trucks and service/deliveries)
- Vehicle Trip Generation Category B: Employee Parking (employees)
- Vehicle Trip Generation Category C: On-Airport Passenger Parking (passengers)
- Vehicle Trip Generation Category D: Off-Airport Passenger Parking (passengers)
- Vehicle Trip Generation Category E: Rental Car Center (passengers)
- Vehicle Trip Generation Category F: North Field (passengers and employees)

Vehicle Trip Generation Category A: Non-Parking Vehicle Trips

The primary source of vehicle trip generation with about 50 percent of total trip generation is vehicles that do not park at OAK. These vehicle trips are primarily passengers or employees being picked up or dropped off at the terminals via personal vehicle, taxicab,

[5] StreetLight Data indexes and processes transportation location data from connected devices. This information is used to assess origin-destination data and relative vehicle volumes.

bus, or transportation network company (e.g., Uber/Lyft) vehicle. This trip type also includes cargo truck trips and service/deliveries.

Vehicle trip generation and vehicle class (e.g., personal vehicle, bus, truck) for non-parking trips was determined using seven-day pneumatic tube counts placed on John Glenn Drive, Airport Drive inbound/outbound, and on Neil Armstrong Way (the access road between Airport Drive and Ron Cowan Parkway) which are roadways or "screen lines" that all vehicles accessing OAK use. However, these screen lines also contain vehicle trip generation associated with employee parking lots and on-Airport passenger parking lots. Therefore, the collected data was adjusted to remove the vehicles that were parking in either the employee or passenger parking lots since trip generation for these parking areas was collected separately as described in the next sections.

Vehicle Trip Generation Category B: Employee Parking

There are several parking lots for Airport and tenant employees located throughout OAK. To understand employee parking activity, data were collected to capture inbound and outbound employee trips at the various parking facilities in early December 2021. These employee parking facilities and how the inbound and outbound trips were calculated are described below:

- **FedEx, Airport Traffic Control Tower, and Oakland Fire Station No. 22** – These facilities are accessed from Air Cargo Way. A pneumatic tube counter that can differentiate between trucks and passenger vehicles (two-axle cars and pickup trucks) was placed on Air Cargo Way near Ron Cowan Parkway over a seven-day period. Any passenger vehicles passing over this tube counter were assumed to be associated with an employee of one of these facilities.
- **Southwest, SwissPort, and Edward White Way parking near Terminal 2** – These parking facilities are accessed using Neil Armstrong Way. A pneumatic tube counter was set up on Neil Armstrong Way near Edward White Way to capture trucks and passenger vehicles. Any passenger vehicles passing over these counters were assumed to be either employee vehicles or OAK service vehicles accessing the gate at the end of Edward White Way near Terminal 2, which separates public areas of OAK from airside operations. Using counts from this gate's entries and exits supplied by the Port, which are assumed to represent only OAK service vehicles, OAK service vehicles were removed from the tube count data leaving just counts of Southwest or SwissPort employee vehicles or Port service vehicles parking in the three parking lots noted.
- **UPS and Southwest Provisioning** – Employee parking for these two facilities is located north of Air Cargo Road, which is accessed via Alan Shepard Way. A pneumatic tube counter was placed on Air Cargo Road near Alan Shepard Way to capture both trucks and passenger vehicles over a seven-day period. All passenger vehicles passing over the tube counter during this time were assumed to be employees entering or leaving a parking facility. The employee parking for UPS and Southwest Provisioning were further separated in the analysis by splitting them between UPS and Southwest Provisioning proportional to the number of parking spaces in each facility's parking lot.[6]
- **Non-Secure Airport Employee** – Located between John Glenn Drive and Airport Drive, the non-secure employee parking was captured using pneumatic tube counters

[6] Southwest Provisioning has 40 parking spaces and UPS has 206.

placed at parking lot driveways over a seven-day period. All vehicles entering and departing this facility were assumed to be employee trips.

- **Secure Airport Employee** – These parking facilities are accessed via John Glenn Drive through a security gate. A camera was placed to observe the security gate over a three-day period. The data were reduced to differentiate between personal vehicles and other vehicles such as trucks. All personal vehicles were assumed to be employees parking over the three-day period. These three-day counts were adjusted to seven-day counts by using data from the nearby non-secure employee parking facility, which had seven-day tube counts. These seven-day counts were used to develop a factor to account for the four days not collected via video. This assumes the vehicles for the missing four days are in the same relative proportion to the other parking facilities as the three days of collected data.
- **Other Airport Tenant Employee** – Parking for most non-Southwest Airline employees occurs in the lot referred to as the Oakland Maintenance Center (OMC) lot, located near the intersection of John Glenn Drive and Ron Cowan Parkway. This parking lot was observed via video over a three-day period to capture entering and leaving vehicles. These counts were used to determine the trip generation of this parking lot. The three-day counts were adjusted to seven-day counts as described for the secure employee parking.

Vehicle Trip Generation Category C: On-Airport Passenger Parking

On-airport parking is for passengers who wish to park their vehicles in the premier, hourly, daily, or economy parking lots that are owned and operated by the Port. To determine vehicle trip generation of these facilities, parking activity data were requested from the Port for the early December 2021 data collection period when tube counts were collected. These data were provided as hourly counts differentiating between the economy parking lot and the premier/hour/daily lot as well as entering versus exiting vehicles.

Vehicle Trip Generation Category D: Off-Airport Passenger Parking

In addition to the on-Airport parking, there are several off-Airport lots that provide public parking for OAK passengers. These off-Airport lots include the following:

- Park 'N Fly (82 98th Avenue, Oakland, CA 94603)
- Park 'N Travel (10001 Doolittle Drive, Oakland, CA 94603)
- VIP Airport Parking (50 Airport Access Road, Oakland, CA 94603)
- Airpark Oakland Airport Parking (111 98th Avenue, Oakland, CA 94603)
- FastTrack Airport Parking (195 98th Avenue, Oakland, CA 94603)
- Fly N Save OAK Airport Parking (250 Hegenberger Road, Oakland, CA 94621)

StreetLight Data was used to estimate the vehicle trip generation of these lots. StreetLight Data tracks mobile device information and allows for a determination of relative vehicle trip activity between different geographic areas. An analysis "zone" for each of these off-Airport lots and the on-Airport economy lot was created. StreetLight Data provided the relative vehicle trip activity for each of these off-Airport parking facilities and the on-Airport economy lot. Since the trip generation for the on-Airport parking lot is known from parking data from 2019 provided by the Port, it can be used in combination with the relative trip generation metrics from StreetLight to estimate the amount of vehicle trip generation for the off-Airport parking facilities. For example, if the vehicle activity at the Fly N Save OAK

Parking lot in 2019 had a relative difference of 80 percent compared to the economy parking lot, then the vehicle trip generation of that off-Airport parking lot was assumed to be 80 percent of the economy lot.

Vehicle Trip Generation Category E: Rental Car Center

The rental car center (RAC) is in North Field and provides a shuttle service to and from the OAK terminals. Vehicle trip generation for the RAC was collected using a combination of pneumatic tube counts and video camera data. Pneumatic tube counts were collected over a seven-day period on Cessna Street and Sikorsky Street to capture most of the vehicles entering and leaving the RAC. In addition to the two pneumatic tube count locations, there are two additional driveways serving rental cars at the RAC. These driveways, one on Earhart Road and one on Langley Street, were surveyed using a video camera over a three-day period. The three-day counts were adjusted to seven-day counts by assuming the traffic on the remaining four days was proportional to the pneumatic tube counts collected over the seven-day period.

Vehicle Trip Generation Category F: North Field

North Field is accessed primarily via Doolittle Drive and includes uses such as general/corporate aviation, Airport maintenance facilities, aviation support facilities, and hangars. Vehicle trip generation was collected using pneumatic tube counters placed to capture inbound vehicles at Langley Street and Swan Way off Doolittle Drive and inbound vehicles on Earhart Road off Hegenberger Road over a seven-day period. Outbound trips from North Field were estimated using StreetLight Data and the collected inbound traffic count data. StreetLight Data provides the proportion of inbound versus outbound trips by each hour of the day. This proportion was used to estimate the outbound volumes based on the inbound volumes collected using pneumatic tube counts so that both inbound and outbound volumes by time of day are known. These volumes were further adjusted to remove the trips accessing the RAC so that vehicle trips are not double counted.

VEHICLE TRIP GENERATION ADJUSTMENT

Data collection for OAK vehicle trip generation elements occurred in December 2021. The base year for existing conditions in the EIR is 2019. Therefore, an adjustment was made to the 2021 data collection to represent 2019 conditions. The adjustment was based on using 2019 and 2021 StreetLight Data to compare 2019 versus 2021 volumes. The relative volumes from late 2021 (consistent with the time period for traffic counts) for each type of vehicle trip generation were compared to typical day conditions in 2019. The typical day conditions are defined as the 50th percentile day for overall trip generation at OAK among all days of calendar year 2019. The trip generation estimates were then adjusted based on the relative volume changes between 2019 and 2021. For example, if the on-Airport parking facilities were found to be 30 percent higher in terms of vehicle trip generation in 2019 compared to December 2021 conditions, the 2021 data were increased by 30 percent. This provided a trip generation baseline representative of existing conditions in 2019. On average, the typical day 2019 traffic volumes were 17.5 percent higher than the December 2021 traffic volumes.

Typical conditions (i.e., 50th percentile from 2019) were used for the impact assessment rather than a peak day.

EXISTING CONDITIONS 2019 TRIP GENERATION

Based on the collected vehicle count data from December 2021, on-Airport parking data provided by the OAK for December 2021, and the adjustment using StreetLight to compare December 2021 data to a typical day in 2019, the resulting trip generation for OAK on a typical day in 2019 is shown in Exhibit 2. As shown, trip generation is broken down into trucks, buses, cars, and total for each hour of a typical day. The resulting total trip generation is about 46,315 vehicle trips per day.

Exhibit 2: Existing Conditions (2019) Trip Generation

Time	2019 Total Trips			
	Trucks	Buses	Cars	Total
0:00	47	22	617	686
1:00	49	24	405	478
2:00	66	28	455	549
3:00	105	28	441	574
4:00	186	41	1,024	1,251
5:00	187	52	1,514	1,753
6:00	207	50	1,906	2,163
7:00	171	46	2,354	2,571
8:00	148	48	2,038	2,234
9:00	166	48	2,024	2,238
10:00	181	48	2,140	2,369
11:00	183	47	2,262	2,492
12:00	153	47	2,717	2,917
13:00	149	50	2,555	2,754
14:00	120	46	2,375	2,541
15:00	140	47	2,038	2,225
16:00	152	52	2,151	2,355
17:00	211	51	1,982	2,244
18:00	190	41	2,679	2,910
19:00	178	40	2,149	2,367
20:00	146	37	2,342	2,525
21:00	134	29	1,974	2,137
22:00	98	26	1,238	1,362
23:00	34	0	586	620
Total	**3,401**	**948**	**41,966**	**46,315**

Source: Kittelson & Associates, Inc. 2022

FORECAST OAK TRIP GENERATION

Vehicle trip generation was calculated for the two future years 2028 and 2038. The resulting calculations for these future years was based on the market-based demand for OAK including passenger activity, cargo tonnage, and aircraft operations. Exhibit 3 shows the anticipated annual demand for these elements of OAK.

Exhibit 3: Aviation Activity Forecast Demand for OAK between 2019 and 2038

	Forecast in Calendar Years		
	2019 (Base Year)	**2028 (Planning Activity Level 1)**	**2038 (Planning Activity Level 2)**
Passenger Activity			
Passenger Enplanements	6,689,457	8,792,855	12,342,518
Million Annual Passengers (MAP)	*13.4*	*17.6*	*24.7*
Cargo Tonnage			
Belly Cargo (US Tons)	9,678	16,905	24,650
Freighter Cargo (US Tons)	632,727	757,987	859,437
Total Air Cargo Tonnage (US Tons)	*642,405*	*774,892*	*884,087*
Aircraft Operations			
Passenger Airline Operations	113,272	132,830	181,270
Cargo Airline Operations	20,698	23,200	24,800
Business/General Aviation	107,861	110,758	116,431
Military	926	1,000	1,000
Total Aircraft Operation	*242,757*	*267,788*	*323,501*

Source: Port of Oakland, Oakland International Airport Comprehensive Aviation Activity Forecast Report (2019-2038), July 28, 2020, updated June 2021

Vehicle trip generation for OAK in 2019 was divided into 18 distinct zones. Each one of these zones was tied to one element of the aviation activity forecast demand shown in Exhibit 3. Exhibit 4 shows the 18 zones for OAK and the element of the aviation activity forecast its demand was associated with. The reasoning behind the various aviation activity forecast associations with the various zones includes:

- Freighter Cargo (US Tons)
    - The Freighter Cargo forecast is used to estimate the growth in demand for both FedEx and UPS since freighter cargo is the primary operation in the future at those facilities.
- Passenger Airline Operations

- The Neil Armstrong parking lot, Southwest Provisioning, and the Oakland Maintenance Center (OMC) Employee parking lot are primarily used by employees of the various airlines, Transportation Security Administration (TSA) staff, and concessions at OAK. It was assumed that the demand in these areas relates to the number of passenger airline operations.

- Total Aircraft Operations
  - Both the non-secure and secure employee parking lots are used by Port management staff at OAK. Therefore, it was assumed that demand for these positions relates to the total number of aircraft operations at OAK.
- Corporate/General Aviation Aircraft Operations
  - The corporate/general aviation area of OAK is in North Field and is separate from the passenger terminal in South Field. It was assumed that the growth in demand for this area could be represented by the growth in the total number of general aviation aircraft operations, although there are some activities at North Field that are not specifically general aviation.
- Passenger Enplanements
  - This metric captures the total number of commercial aviation passengers that will board an aircraft. It was assumed that all passenger parking areas, both on-Airport and off-Airport, as well as the rental car center and non-parking (pick-up/drop-off/other trips) will have a demand level associated with passenger enplanements.

Exhibit 4: Zone and Aviation Activity Forecast Element Used for Future Trip Generation Estimates

Zone	Description	Aviation Activity Forecast Element
1	FedEx	Freighter Cargo
2	Neil Armstrong	Passenger Aircraft Operations
3	UPS (Employee)	Freighter Cargo
4	SW Provisioning	Passenger Aircraft Operations
5	Non-secure Employee	Total Aircraft Operations
6	Secure Employee	Total Aircraft Operations
7	OMC Employee Parking	Passenger Aircraft Operations
8	Rental Car Center	Passenger Enplanements
9	North Field/Corporate/General Aviation	General Aviation Aircraft Operations
10	Parking Bowl	Passenger Enplanements
11	Economy	Passenger Enplanements
12	Park 'N Fly	Passenger Enplanements
13	Park 'N Travel	Passenger Enplanements
14	VIP Airport Parking	Passenger Enplanements
15	Airpark Oakland	Passenger Enplanements
16	FastTrack	Passenger Enplanements
17	Fly N Save	Passenger Enplanements

18	Non-Parking	Passenger Enplanements

Source: Kittelson & Associates, Inc. 2022

The forecast demand in Exhibit 3 can be used directly to increase or decrease the 2019 vehicle trip generation to future years. However, this would assume that travel behavior and mode choice (transit and vehicle) would not change between 2019 and future conditions meaning passengers taking transit or taking a vehicle to OAK would remain in the same relative proportion in the future as it occurs today.

To determine whether mode choice may change in the future, the Alameda County Transportation Commission's countywide travel demand model was used. This model relies on land use growth assumptions and future transportation network improvements for both transit and vehicles to determine mode choice. Based on analysis of the travel demand model, the mode choice for passengers taking transit would grow by about 2.9 percent between 2019 and 2038. Employee mode choice for transit is anticipated to increase by 0.8 percent over the same period. Mode shifts for 2028 were estimated based on a linear interpolation between 2019 and 2038. These increases in transit mode share correspond to an equivalent reduction in vehicle mode share. Therefore, the demand levels from Exhibit 3 were adjusted to account for the forecast mode shift from vehicles to transit.

For example, the passenger enplanements shown in Exhibit 3 are projected to grow by about 3.1 percent between 2019 and 2028. However, there is a slight shift to more transit usage among passengers. Accounting for this mode shift results in a compound annual growth rate of about 2.9 percent for passengers between 2019 and 2028 as shown in Exhibit 5.

Exhibit 5 provides the compound annual growth rate between 2019 and both 2028 and 2038 for each of the 18 zones used to define the OAK trip generation based on the aviation activity forecasts (Exhibit 3) and the adjustments based on mode choice.

Exhibit 5: Calculated Compound Annual Growth Rate for Each Analysis Zone at OAK

Zone	Description	Compound Annual Growth Rate	
		2019 to 2028	2019 to 2038
1	FedEx	2.0%	1.6%
2	Neil Armstrong & SwissPort	1.7%	2.5%
3	UPS (Employee)	2.0%	1.6%
4	SW Provisioning	1.7%	2.5%
5	Non-secure Employee	1.1%	1.5%
6	Secure Employee	1.1%	1.5%
7	OMC Employee Parking	1.7%	2.5%
8	Rental Car Center	2.9%	3.1%
9	Corporate/General Aviation	0.3%	0.4%
10	Parking Bowl	2.9%	3.1%
11	Economy	2.9%	3.1%
12	Park 'N Fly	2.9%	3.1%
13	Park 'N Travel	2.9%	3.1%
14	VIP Airport Parking	2.9%	3.1%
15	Airpark Oakland	2.9%	3.1%
16	FastTrack	2.9%	3.1%
17	Fly N Save	2.9%	3.1%
18	Non-Parking	2.9%	3.1%

Source: Kittelson & Associates, Inc. 2022

The growth rates shown in Exhibit 5 were applied to the 2019 vehicle trip generation to determine the estimated trip generation of OAK in both 2028 and 2038. The resulting daily trip generation for cars, buses, and trucks on a typical day is shown in Exhibit 6.

Exhibit 6: OAK Trip Generation in 2019, 2028, and 2038

Time	2019 Total Vehicle Trips				2028 Total Vehicle Trips				2038 Total Vehicle Trips			
	Trucks	Buses	Cars	Total	Trucks	Buses	Cars	Total	Trucks	Buses	Cars	Total
0:00	47	22	617	686	56	28	775	859	69	40	1,034	1,143
1:00	49	24	405	478	58	31	488	577	72	44	610	726
2:00	66	28	455	549	78	37	539	654	96	52	664	812
3:00	105	28	441	574	123	37	527	687	162	52	669	883
4:00	186	41	1,024	1,251	218	54	1,254	1,526	281	75	1,647	2,003
5:00	187	52	1,514	1,753	217	68	1,888	2,173	281	95	2,524	2,900
6:00	207	50	1,906	2,163	239	65	2,377	2,681	305	92	3,166	3,563
7:00	171	46	2,354	2,571	196	61	2,926	3,183	249	85	3,866	4,200
8:00	148	48	2,038	2,234	170	64	2,524	2,758	216	88	3,341	3,645
9:00	166	48	2,024	2,238	190	63	2,529	2,782	238	89	3,379	3,706
10:00	181	48	2,140	2,369	209	63	2,677	2,949	264	89	3,593	3,946
11:00	183	47	2,262	2,492	210	62	2,837	3,109	263	86	3,814	4,163
12:00	153	47	2,717	2,917	174	62	3,403	3,639	221	86	4,569	4,876
13:00	149	50	2,555	2,754	169	66	3,183	3,418	215	92	4,253	4,560
14:00	120	46	2,375	2,541	136	61	2,963	3,160	171	85	3,955	4,211
15:00	140	47	2,038	2,225	160	62	2,543	2,765	205	86	3,401	3,692
16:00	152	52	2,151	2,355	173	68	2,708	2,949	220	95	3,632	3,947
17:00	211	51	1,982	2,244	242	67	2,504	2,813	313	93	3,377	3,783
18:00	190	41	2,679	2,910	220	54	3,401	3,675	278	76	4,616	4,970
19:00	178	40	2,149	2,367	205	53	2,731	2,989	265	74	3,705	4,044
20:00	146	37	2,342	2,525	167	49	2,954	3,170	211	68	3,976	4,255
21:00	134	29	1,974	2,137	154	38	2,488	2,680	193	54	3,328	3,575
22:00	98	26	1,238	1,362	113	34	1,558	1,705	139	48	2,107	2,294
23:00	34	0	586	620	40	0	723	763	44	0	956	1,000
Total	3,401	948	41,966	46,315	3,917	1,247	52,500	57,664	4,971	1,744	70,182	76,897

Source: Kittelson & Associates, Inc. 2022

PASSENGER ENPLANEMENTS

For environmental analyses, VMT is typically evaluated as an efficiency metric such as VMT per capita (residential) or VMT per employee (office). There is no official VMT metric for airport operations and it is up to individual agencies to determine one. Since airport VMT is primarily a function of passenger volume, using a per capita or per employee metric does not capture most of the travel to an airport. To be consistent with recent VMT studies of airports such as Norman Y. Mineta San Jose International Airport, a VMT per passenger enplanement efficiency metric was used for OAK for this analysis. This requires that the number of passengers boarding airplanes be identified for existing conditions (2019) and future years (2028 and 2038).

2019 PASSENGER ENPLANEMENTS

To determine the number of enplanements at OAK for a typical day in 2019, data on the number of people transiting security at OAK in early December 2019 was used. The 2019 data were adjusted from the December 2019 data collection period to a typical day in 2019 using StreetLight Data which indicated December has about 93 percent of the total trip generation compared to a typical day in 2019. Therefore, the data collected in December increased by about 7 percent to represent the 50th percentile day in 2019. The total number of enplanements with this adjustment in 2019 on a typical day was 16,516.

FORECAST PASSENGER ENPLANEMENTS

Forecast passenger enplanements were based on the aviation activity forecasts (Exhibit 3). These forecasts show that air carrier passenger enplanements are anticipated to grow by a compound annual growth rate of 3.1 percent between 2019 and 2028 and 3.3 percent between 2019 and 2038 resulting in the passenger enplanements on a typical day shown in Exhibit 7.

Exhibit 7: Estimated Passenger Enplanements on a Typical Day in 2019, 2028, and 2038

Year	Typical Day Enplanements
2019	16,516
2028	21,709
2038	30,473

Source: Kittelson & Associates, Inc. 2022

AVERAGE TRIP LENGTH

A key component in the calculation of VMT is to determine the average trip length for vehicles accessing OAK for the existing conditions (2019) and future years (2028 and 2038).

2019 AVERAGE TRIP LENGTH

To determine the average trip length in 2019, StreetLight Data, which provides average trip length for various zones, was used. StreetLight Data is one of the best available tools for estimating actual trip length between zones and has been used on other environmental documents in the area such as the Oakland Waterfront Ballpark District at Howard Terminal. Many of the zones described in Exhibit 5 were consolidated into the following six groups to ensure a large enough sample size for an accurate estimation of average trip length:

- Trip Length Group 1: FedEx:
    - FedEx, Airport Traffic Control Tower, and Oakland Fire Station No. 22
- Trip Length Group 2: Employee Parking:
    - Neil Armstrong and Nearby Parking (Southwest, SwissPort, and Edward White Way parking near Terminal 2)
    - UPS
    - Southwest Provisioning
    - Non-Secure Airport Employee
    - Secure Airport Employee
    - General Airport Employee Parking (OMC)
- Trip Length Group 3: Rental Car Center
- Trip Length Group 4: Corporate/General Aviation
- Trip Length Group 5: Passenger Parking (On- and Off-Airport):
    - Hourly, Premier, and Daily Parking
    - Economy Lot
    - Park 'N Fly (82 98th Ave, Oakland, CA 94603)
    - Park 'N Travel (10001 Doolittle Dr, Oakland, CA 94603)
    - VIP Airport Parking (50 Airport Access Rd, Oakland, CA 94603)
    - Airpark Oakland Airport Parking (111 98th Ave, Oakland, CA 94603)
    - FastTrack Airport Parking (195 98th Ave, Oakland, CA 94603)
    - Fly N Save OAK Airport Parking (250 Hegenberger Rd, Oakland, CA 94621)
- Trip Length Group 6: Non-Parking
    - Private auto pickup/drop off, TNC[7] vehicles, taxis, cargo, service/deliveries, etc.

Exhibit 8 shows the average trip length in and out of OAK for each of these trip length groups in 2019. As shown, the average trip length ranges from about 14.4 miles to 23.2 miles.

[7] Transportation Network Companies (Uber, Lyft, etc.)

Exhibit 8: Average Trip Length in 2019 to Each OAK Group

Group	Description	2019 Average Trip Length (miles)
1	FedEx	16.2
2	Employee Parking	19.9
3	Rental Car Center	14.7
4	Corporate/General Aviation	14.4
5	Passenger Parking	23.2
6	Non-Parking	17.3

Source: Kittelson & Associates, Inc. Based on StreetLight Data from 2019

FORECAST AVERAGE TRIP LENGTH

Average trip length in the future can be affected by land use and other changes. For example, densification in nearby cities may lead to a decrease in average trip length as customers of OAK do not have to travel as far to access OAK. There is also continued development on the periphery of the urban area, which can cause an increase in average trip length. To estimate how average trip length may change between 2019 and future years, Kittelson used the Alameda County Transportation Commission's countywide travel demand model similar to how the mode choice adjustment was made.

The travel demand model estimates that the average passenger trip length for OAK is anticipated to decrease by 0.5 percent while the average employee trip length is anticipated to increase by 2.5 percent between 2019 and 2038. These factors were applied to estimate the average trip length in 2038 for each of the 18 zones used to represent OAK. Average trip length for 2028 was determined as an interpolation between 2019 and 2038. Applying these factors results in the estimated average inbound and outbound trip lengths in Exhibit 9 for each of the six trip length groups. As shown, there is a mix with some trip lengths increasing and others decreasing.[8]

Exhibit 9: Average Inbound and Outbound Trip Length by Zone and Year

Group	Description	Average Trip Length (Miles)		
		2019	2028	2038
1	FedEx	16.2	16.3	16.6
2	Employee Parking	19.9	20.1	20.4
3	Rental Car Center	14.7	14.7	14.6
4	North Field	14.4	14.6	14.8
5	Passenger Parking	23.2	23.1	23.0
6	Non-Parking	17.3	17.3	17.3

Source: Kittelson & Associates, Inc. 2022

[8] The "Pick-Up and Drop-Off" trip lengths decrease between 2019 and 2038 but not by more than one decimal place.

BACKGROUND TRAFFIC FORECAST

In addition to the growth estimated for the Airport in 2028 and 2038, there will also be growth and transportation network changes in the surrounding community. To determine how this background traffic may change in the study area, the Alameda Countywide travel model was used. This model includes all reasonably foreseeable changes to land use and the transportation infrastructure between today and 2038.

The model forecasts weekday daily traffic and weekday a.m. and p.m. peak hour traffic for roadways and intersections based on a standard trip-based travel demand model method. A detailed description of the forecasting process is provided below:

Estimate background traffic growth: The model was used to forecast peak hour traffic conditions at the study intersections by generating data files that represent traffic movements in 2019 and the future background conditions in 2038 without the Proposed Project. A straight line interpolation between 2019 and 2038 volumes was used to estimate traffic volumes in 2028.

Adjust future intersection volumes: To minimize model calibration error, future background model volumes were post-processed to correlate model results with actual traffic counts. An incremental adjustment method was applied as the difference between future and base year model road segment volumes added to observed traffic counts. The future intersection turn movements were then factored to match the adjusted road segment volumes entering and leaving each intersection, using the "Furness" factoring method. This method is consistent with methods described in the Transportation Research Board National Cooperative Highway Research Program Report (NCHRP) 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design (2014), the update to NCHRP 255.

Reasonableness check: Since the model employs congestion as a measure to assign traffic to the network, it may not add additional traffic to overloaded links if the roadways are too congested. Instead, it will redistribute some traffic to other routes. This process can sometimes lead to minor fluctuations or anomalies due to traffic redistribution. The final model outputs for future traffic projections were reviewed to ensure these minor fluctuations and anomalies would not change the overall results of the analysis.

TRIP DISTRIBUTION

Trip distribution determines how the trips generated by OAK will arrive and depart the study area in order to assess how these movements will affect intersection operations at the seven study intersections. It was determined that there were six primary origin and destination locations for OAK vehicle trips within the study area including:

1. Hegenberger Road just south of I-880
2. 98th Avenue just south of I-880
3. Davis Street south of I-880
4. Doolittle Drive south of Davis Street
5. Doolittle Drive west of Harbor Bay Parkway

6. Harbor Bay Parkway west of Ron Cowan Parkway

StreetLight data, which tracks origins and destinations of vehicle trips, was used to determine the distribution of vehicle trips between these six groups and the 18 zones (Exhibit 4) of OAK for 2019. This allowed for a detailed understanding of trip distribution based on data from 2019. The trip distribution for OAK vehicle trip generation in 2028 and 2038 was assumed to follow the same general distribution patterns as 2019. The resulting vehicle traffic volumes in 2028 and 2038 at the seven study intersections are shown in Appendix C. This appendix also contains a summary of 2019.

PROJECT TRIP REDISTRIBUTION

While the Proposed Project would not result in an increase in passenger enplanements, there would be a redistribution of trips as some parking facilities at OAK are relocated to other parts of the Airport property (see Exhibit 1). Based on the description of the Proposed Project and in coordination with the Port, the following redistribution of OAK vehicle trips was assumed with the Proposed Project:

- 40 percent of the 2019 employee trips parking in the Neil Armstrong Lot would be relocated to the new North Field Lot (L-1)
- The UPS parking lot located on Air Cargo Road would be relocated to S-1: Replacement Cargo Building Associated Parking.
- SW Provisioning parking which is currently located on Air Cargo Road would be relocated to S-3: Replacement Airline and Airport Support Building Associated Parking.
- Management non-secure parking, currently located between Airport Drive and John Glenn Drive, would be relocated to L-3: Neil Armstrong Lot Expansion.
- Management secure parking and Customs and Border Patrol parking currently located south of Alan Shepard Way would be relocated to L-4: Terminal Approach Lot and L-5: Terminal Infill Lot
- The existing OMC lot located near the intersection of John Glenn Drive and Ron Cowan Parkway would be relocated to L-1: North Field Lot (49 percent) and L-2: Golf Course Lot (51 percent)
- Seven percent of parking located in the Parking Bowl (passenger hourly, premiere, daily) would be relocated to L-6: Ron Cowan Lot.
- The current passenger economy lot located off John Glenn Drive would be relocated to both L-6 Ron Cowan Lot (38 percent) and L-7 Maitland Lot (62 percent)
- Existing belly cargo parking located off Alan Shepard Way would be relocated to S-4: Replacement Belly Cargo Building Associated Parking

How this redistribution affects traffic volumes at the study intersections is shown in Appendix D for 2019, 2028, and 2038 conditions.



Section 4
Existing Conditions

EXISTING CONDITIONS

ROADWAY NETWORK

The roadway network surrounding the Proposed Project consists of freeways, arterials, and collector roadways. The following describes the major roads within the transportation study area as shown in Exhibit 10. The transportation study area was chosen to encompass the local street network that provides vehicle access along arterial and collectors between OAK and the freeway. Therefore, the area extends to just past the I-880 freeway to the east, San Leandro Bay (between Alameda and Bay Farm Island) to the north, San Francisco Bay to the west, and Davis Street to the south.

FREEWAYS

Interstate 880 (I-880), also known as the Nimitz Freeway, is a major north-south freeway that runs for approximately 46 miles from I-280 and SR-17 in San Jose to I-80 and I-580 in Oakland. The interchanges at Hegenberger Road, 98th Avenue, and Davis Street serve OAK.

ARTERIALS

98th Avenue is a four- to six-lane arterial roadway with a posted speed limit of 35 miles per hour (mph). 98th Avenue features ramps in both directions to I-880 and is one of the three primary roadways connecting I-880 with the Airport. There are generally sidewalks on both sides of the street between Airport Access Road and I-880 and to the east of the I-880 overcrossing. However, the I-880 / 98th Avenue interchange overcrossing only has sidewalk facilities along the north side of the road. There are no designated bicycle facilities along 98th Avenue in the vicinity of the Proposed Project. 98th Avenue becomes Bessie Coleman Drive just west of Doolittle Drive. 98th Avenue is served by Alameda-Contra Costa Transit District (AC Transit) Route 98 (Eastmont-98th Avenue-Edgewater) and Route 1T (International-East 14th Street).

Hegenberger Road is a six-lane arterial roadway with a posted speed limit of 35 mph. Hegenberger Road features a full access interchange to I-880 and is one of the three primary roadways connecting I-880 with the Airport. There are sidewalks on both sides of the street between I-880 and Doolittle Drive but no marked bicycle facilities. Hegenberger Road is served by AC Transit Route 73 (73rd Avenue-Coliseum-Airport) and Route 805 (MacArthur-Airport All Nighter).

Doolittle Drive/State Route (SR) 61 is a four-lane arterial with a posted speed limit of between 35 and 45 mph. Doolittle Drive runs north-south and connects Bay Farm Island to San Leandro. There are sidewalks on both sides of Doolittle Drive between Davis Street and Airport Access Road. West of Airport Access Road, the sidewalk is only present along the north side of Doolittle Drive to about Swan Way. North of Swan Way, there are no sidewalks until after Harbor Bay Parkway. Doolittle Drive has bicycle lanes in both directions between Davis Street and Swan Way which contains a section of the Bay Trail, but bicycle lanes are not present elsewhere on the arterial. Doolittle Drive close to the

Airport is served by AC Transit Route 73 (73rd Avenue-Coliseum-Airport) and Route 805 (MacArthur-Airport All Nighter).

Davis Street/SR 61 is a four-lane arterial with a posted speed limit of 35 mph. Davis Street serves as the connection of SR 61 between the I-880 interchange and Doolittle Drive and is one of the three primary roadways connecting I-880 with the Airport. There are sidewalks on both sides of Davis Street between Doolittle Drive and I-880.

Bessie Coleman Drive is a six- to nine-lane arterial roadway with a posted speed limit of 45 mph. Bessie Coleman Drive is a continuation of 98th Avenue and provides direct access to the Airport. There are no sidewalks on either side of the street and no designated bicycle facilities.

Airport Access Road is a five-lane divided arterial with a speed limit of 35 mph. It serves as a connecting roadway between Hegenberger Road, 98th Avenue, and Doolittle Drive. Sidewalks are present on both sides of the road but marked bicycle facilities are not provided.

Ron Cowan Parkway is a four-lane arterial roadway with a posted speed limit of 45 mph. Ron Cowan Parkway provides a connection through the Airport's North and South Fields to connect Bessie Coleman Drive and Harbor Bay Parkway on Bay Farm Island. There is a Class 1 Bicycle Path along the south side of Ron Cowan Parkway serving both pedestrians and bicyclists between Harbor Bay Parkway and Bessie Coleman Drive.

Harbor Bay Parkway is a four-lane divided arterial roadway with a posted speed limit of between 35 and 45 mph. Harbor Bay Parkway is a continuation of Ron Cowan Parkway and connects to the northwest portion of Bay Farm Island in the city of Alameda. It also provides a connection between Ron Cowan Parkway and Doolittle Drive between the Corica Park Golf Course and the Airport. Sidewalks are generally present on both sides of the street west of Ron Cowan Parkway and only on the west side for the part of Harbor Bay Parkway that connects Ron Cowan Parkway to Doolittle Drive. There are no marked bicycle facilities on Harbor Bay Parkway but there is an off-street path along the west side of the road.

COLLECTORS

John Glenn Drive is a two-lane roadway that provides a connection between Ron Cowan Parkway and the air cargo facilities at the Airport. It also serves the economy parking lot and a park and call lot. The speed limit is set at 25 mph. A sidewalk is present along the north side of the street and the street is striped as a Class 3 bicycle facility.

Airport Drive is a one-way loop roadway of four lanes that connects Bessie Coleman Drive with the parking facilities at the Airport and the pick-up/drop-off area for the Airport terminals. Sidewalks are not present along this roadway except near the Airport terminals. No bicycle facilities are provided.

LOCAL STREETS

Local streets serving vehicle movements within OAK include Air Cargo Way, Alan Shepard Way, Edward White Way, Neil Armstrong Way in the main terminal area, and Cessna Street,

Earhart Road, Hiller Street, Langley Street, Old Earhart Road and Sikorsky Street in the North Field area.

TRANSIT FACILITIES

The Airport is served by two public transportation agencies: AC Transit and Bay Area Rapid Transit (BART). Exhibit 11 provides the locations of routes serving the transportation study area.

BAY AREA RAPID TRANSIT (BART)

BART is a heavy-rail rapid public transit system that connects the San Francisco Peninsula with cities across the East Bay and South Bay. BART operates 131 miles of track and averaged approximately 418,000 trips per weekday in 2019. BART operations are similar today as before the pandemic operating between 5 a.m. and midnight on weekdays, 6 a.m. and midnight on Saturdays, and 8 a.m. and 9 p.m. on Sundays.

The BART station that directly serves the Airport is the Coliseum Station (located on San Leandro Street at 73rd Avenue). This BART station provides direct access to three BART lines. These lines include: the Blue Line, which operates between Dublin/Pleasanton and Daly City; the Orange Line, which operates between Berryessa/North San José and Richmond; and the Green Line, which operates between Berryessa/North San José and Daly City. Service frequency on each of these lines is 30 minutes or less.

The Coliseum Station features a pedestrian bridge to the Oakland Coliseum and Oakland Arena, and it also serves as the transfer point from BART to the Airport via a people mover connection, which opened in November 2014. The people mover is known as the Oakland Airport / Beige Line and provides a connection to the Airport, taking about eight minutes. The people mover departs every six minutes and has service hours between 5 a.m. to midnight on weekdays, 6 a.m. to midnight on Saturday, and 8 a.m. to 9 p.m. on Sunday.[9]

ALAMEDA-CONTRA COSTA TRANSIT DISTRICT (AC TRANSIT)

AC Transit provides local fixed-route service, bus rapid transit, regional "transbay" service, and school service for the East Bay and greater Bay Area. AC Transit operates 158 bus lines and maintains approximately 5,400 bus stops. Seven routes serve the transportation study area, including six local lines and one all-nighter. Exhibit 12 provides a description of these routes. Three of these seven routes directly serve OAK including Route 21, Route 73, and the All Nighter Route 805.

BICYCLE AND PEDESTRIAN FACILITIES

Bicycle and pedestrian facilities are a component of the transportation network surrounding the Airport. These facilities offer non-vehicular options for commuting and recreational uses, as well as connections to local and regional transit.

[9] Service hours based on BART website data accessed on September 22, 2021

Bicycle facilities are classified as one of the following types consistent with Oakland's Bikeway Network:[10]

Class 1 Bicycle Paths (bike paths) are paved rights-of-way completely separated from streets. Bike paths are often located where there are a limited number of cross streets and driveways along waterfronts, creeks, railroad rights-of-way, or freeways. These paths are typically shared with pedestrians and often called mixed-use paths.

Class 2 Bicycle Lanes (bike lanes) are on-street facilities designated for bicyclists using stripes and stencils. Bike lanes are a preferred treatment for all arterial and collector streets on the bikeway network and are not typically installed on low-volume, low-speed residential streets.

Class 2B Buffered Bicycle Lanes are bike lanes that include buffer striping to provide greater separation between bicyclists and parked or moving vehicles.

Class 3 Bicycle Routes (bike routes) are streets designated for bicycle travel and are shared with motor vehicles. Streets are designated as bike routes because they are suitable for sharing with motor vehicles and/or provide better (or needed) connectivity compared to other streets. Routes are marked with signs and/or pavement markings.

Class 3B Neighborhood Bicycle Routes, also known as Bike Boulevards, are bike routes on residential streets that prioritize through trips for bicyclists. Traffic calming is included as needed to discourage drivers from using the street as a through route and to keep streets comfortable for bicyclists. Oakland's Bike Boulevards are marked with shared lane bicycle markings (i.e., "sharrows") and signage.

Class 4 Protected Bicycle Lanes, also known as cycle tracks, provide space that is for bicyclists and physically separated from motor vehicle travel lanes, parking lanes, and sidewalks. Parked cars, curbs, bollards, or planter boxes provide physical separation between bicyclists and moving cars. Where on-street parking is allowed, it is placed between the bikeway and the travel lanes (rather than between the bikeway and the sidewalk, as is typical for Class 2 bike lanes).

EXISTING BICYCLE FACILITIES

The following bicycle facilities are within the transportation study area:

- Class 1 bike path along Ron Cowan Parkway from Harbor Bay Parkway to Bessie Coleman Drive.
- Class 1 bike path connecting Bessie Coleman Drive near Ron Cowan Parkway with the city of San Leandro through the Oyster Bay Regional Shoreline and Bay Trail.
- Class 1 bike path connecting Ron Cowan Way with Doolittle Drive.
- Class 2 bike lanes on Doolittle Drive from Swan Way to Davis Street.

[10] https://www.oaklandca.gov/resources/bikeway-types

- Class 3 bike lanes on John Glenn Drive from the Airport to Ron Cowan Parkway.

PROPOSED BICYCLE FACILITIES

Oakland's 2019 Bike Plan, *Let's Bike Oakland!*, proposes the following bicycle facilities near the Airport:

- Class 1 bike path along San Leandro Creek from Hegenberger Road to I-880 near 105th Avenue.
- Class 4 protected bike lane on Doolittle Drive from Davis Street to Harbor Bay Parkway.
- Class 4 protected bike lane on Hegenberger Road from Airport Drive to the Coliseum BART Station.

Exhibit 13 provides the locations of existing and proposed bicycle facilities in the transportation study area.

EXISTING PEDESTRIAN FACILITIES

Sidewalks are not provided along roadways in the immediate vicinity of the Airport. However, the Airport is connected to the area around Hegenberger Road and 98th Avenue via a multiuse path along Bessie Coleman Drive between Doolittle Drive and Ron Cowan Parkway and a sidewalk along John Glenn Drive between Ron Cowan Parkway and the Airport. A Class 1 Bicycle Path along Ron Cowan Parkway also connects John Glenn Drive to Harbor Bay Parkway. Consistent sidewalks become present on major roadways between Doolittle Drive and I-880 and along Harbor Bay Parkway on Bay Farm Island.

PROPOSED PEDESTRIAN FACILITIES

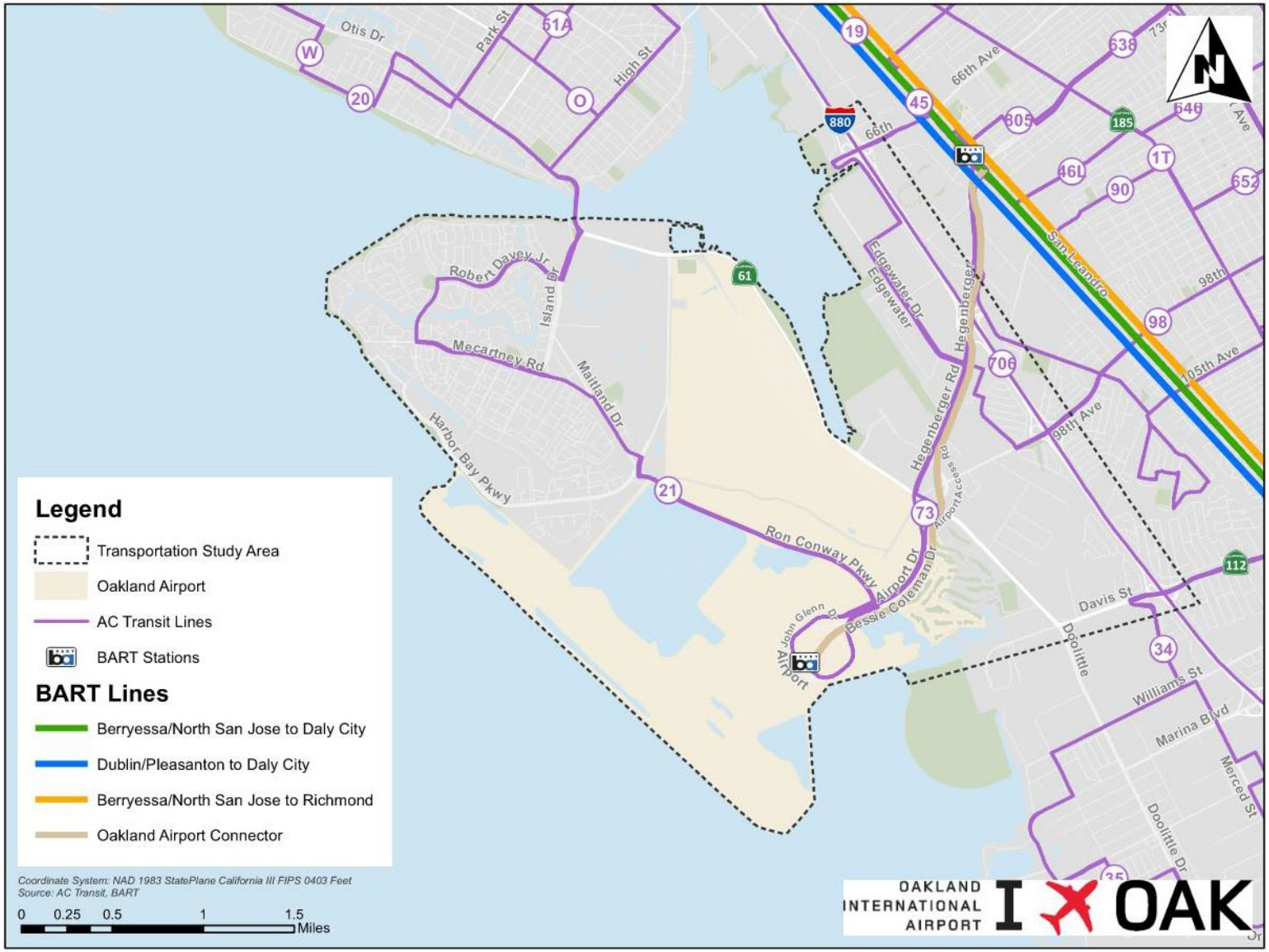
Oakland Walks!, Oakland's pedestrian master plan, identifies Hegenberger Road from Hegenberger Loop to Hegenberger Plan (approximately 1,000 feet) as a high injury corridor in the vicinity of the Airport.

Exhibit 10: Transportation Study Area



Source: Kittelson & Associates, Inc. 2022

Exhibit 11: Existing Transit Facilities



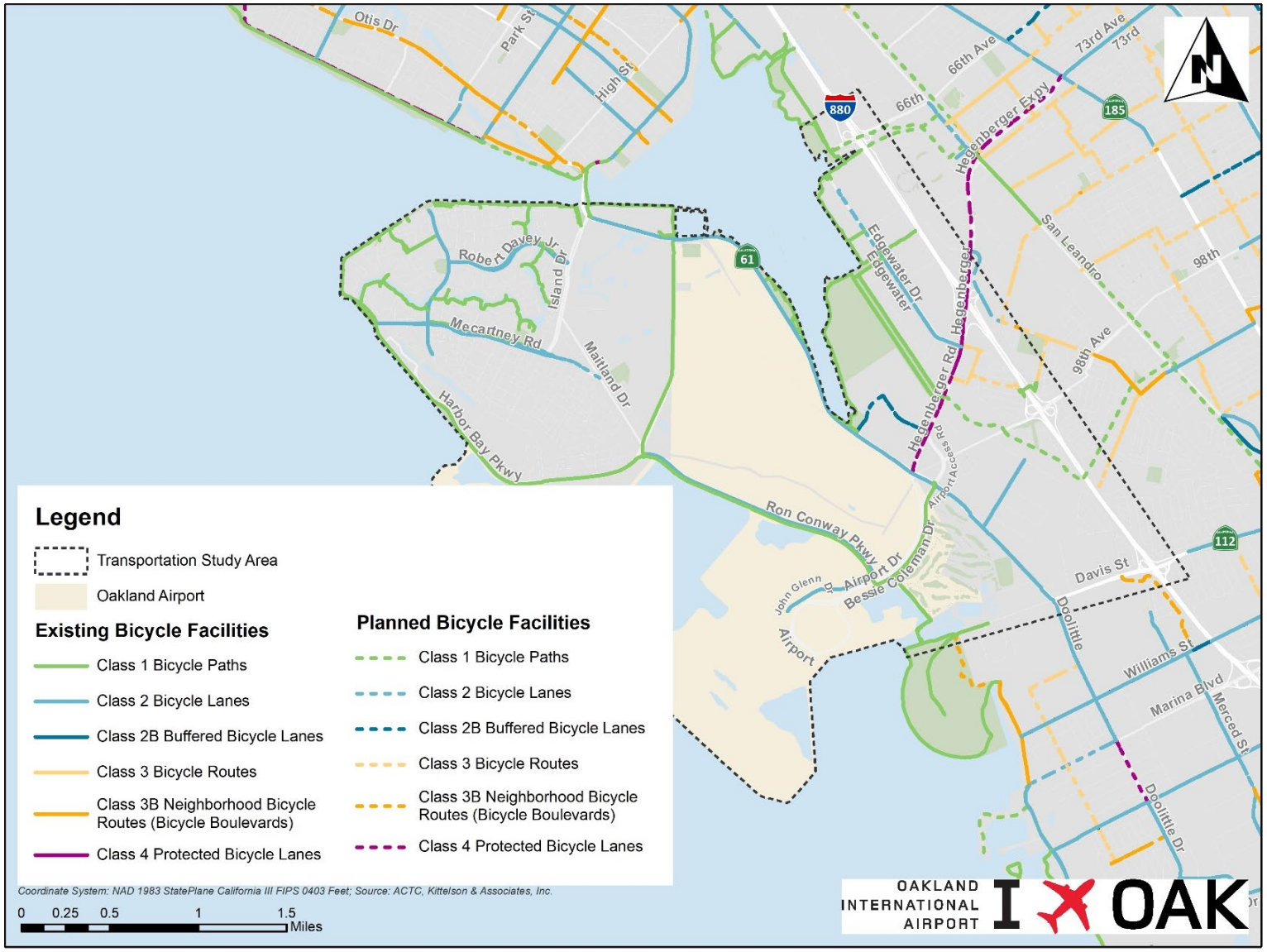
Source: AC Transit, BART, Kittelson & Associates, Inc. 2022

Exhibit 12: AC Transit Routes

Route	Route Type	Serving	Day	Times		Frequency
21	Local Line	Runs between Oakland International Airport and the Dimond District via Fruitvale Avenue	Weekday	6:30 a.m.	10:00 p.m.	Every 30 minutes
			Weekend	6:30 a.m.	10:00 p.m.	Every 30 minutes
45	Local Line	Eastmont Transit Center to Foothill Square via Hillmont Avenue, Seminary Avenue, and Edes Avenue	Weekday	6:00 a.m.	11:00 p.m.	Every 20 minutes
			Weekend	6:00 a.m.	11:00 p.m.	Every 40 minutes
46L	Local Line	Coliseum BART to Grass Valley via 81st Avenue, Fontaine Street, Mountain Boulevard, and Golf Links Road	Weekday	6:45 a.m.	7:30 p.m.	Hourly
73	Local Line	Eastmont Transit Center to Oakland International Airport via 73rd Avenue, Coliseum BART, and Hegenberger Road	Weekday	1:45 a.m.	12:15 a.m.	Every 15 minutes
			Weekend	1:45 a.m.	12:15 a.m.	Every 15 minutes
90	Local Line	Coliseum BART to Foothill Square via San Leandro Street, 85th Avenue, International Boulevard, 90th Avenue, and MacArthur Boulevard	Weekday	6:00 a.m.	11:15 p.m.	Every 20 minutes
			Weekend	6:00 a.m.	10:15 p.m.	Every 30 minutes
98	Local Line	Coliseum BART to Eastmont Transit Center via Oakport Street, Edgewater Drive, 98th Avenue, and MacArthur Boulevard	Weekday	6:00 a.m.	11:20 p.m.	Every 20 minutes
			Weekend	6:00 a.m.	10:20 p.m.	Every 30 minutes
805	All Nighter Line	Downtown Oakland to Oakland International Airport via Grand Avenue, MacArthur Boulevard, and Coliseum BART	Weekday	12:40 a.m.	6:30 a.m.	Every hour
			Weekend	12:40 a.m.	6:30 a.m.	Every hour

Source: actransit.org, 2019

Exhibit 13: Existing and Proposed Bicycle Facilities



Source: Oakland Pedestrian Plan (Oakland Walks!) and Bicycle Plan (Let's Bike Oakland!), Kittelson & Associates, Inc. 2022

2019 TRAFFIC CONDITIONS

2019 traffic conditions were assessed using vehicle miles traveled (VMT), which is a performance measure consistent with environmental analysis requirements under CEQA.

VEHICLE MILES TRAVELED

The total VMT generated by the Airport (passengers, employees, deliveries, etc.) in 2019 was calculated using a combination of traffic counts at key vehicle access points and total trip length tracking information from mobile sources such as cell phones (see discussion of 2019 trip generation on page 14 and 2019 trip lengths on page 21). The total VMT is divided by the total number of passenger enplanements to determine the VMT per passenger enplanement, which is 46.4 miles for the base year 2019. A summary of these calculations is shown in Exhibit 14.

Exhibit 14: Total VMT and VMT Per Enplanement in 2019

	2019
Car VMT	749,445
Bus VMT	16,437
Total VMT	765,882
Enplanements	16,516
VMT/Enplanement	46.4

Source: Kittelson & Associates, Inc. 2022



Section 5 CEQA Analysis

CEQA ANALYSIS

CEQA section 21099(b)(1) requires that OPR develop revisions to the CEQA Guidelines establishing criteria for determining the significance of transportation impacts of projects that "promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses." CEQA section 21099(b)(2) states that upon certification of the revised guidelines for determining transportation impacts pursuant to CEQA section 21099(b)(1), automobile delay, as described solely by level of service or similar measures of vehicular capacity or traffic congestion, shall not be considered a significant impact on the environment under CEQA.

In December 2018, the California Natural Resources Agency certified and adopted the CEQA Guidelines update package, including the section implementing SB 743 (section 15064.3). TOPR developed a *Technical Advisory on Evaluating Transportation Impacts in CEQA*, which contains OPR's technical recommendations regarding assessment of VMT, thresholds of significance, and mitigation measures.[11]

This section identifies the CEQA significance criteria, thresholds of significance, the project's consistency with adopted plans, and presents the findings of the VMT analysis.

CEQA SIGNIFICANCE CRITERIA

The following are the CEQA significance criteria used for the determination of impacts associated with a project. A project would have a significant effect on the environment if it would:[12]

- Conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities; or
- Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b) (VMT); or
- Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment); or
- Result in inadequate emergency access.

THRESHOLDS OF SIGNIFICANCE

The Port has not established thresholds of significance for VMT. Guidance on VMT thresholds can be found in documents published by the State of California Office of Planning and Research (OPR) and the adopted guidelines of other jurisdictions in the Bay Area. These guidelines adopt thresholds for retail, residential, and commercial development. These guidelines for other types of land uses, such as airports, do not have a specific threshold for VMT. This requires a customized VMT metric to be developed for

[11] California Office of Planning and Research, Technical Advisory on Evaluating Transportation Impacts in CEQA, December 18, 2018, http://opr.ca.gov/docs/20190122-743_Technical_Advisory.pdf, accessed February 5, 2021.

[12] The project is subject to Senate Bill (SB) 743, which provides that "aesthetics and parking impacts of a residential, mixed-use residential, or employment center project on an infill site within a transit priority area shall not be considered significant impacts on the environment". (CEQA Update: Senate Bill 743 Summary – Aesthetics, Parking and Traffic [November 26, 2013])

environmental documents such as EIRs that study land uses that are not explicitly retail, residential, or commercial.

A review of other relevant EIRs was conducted to identify the metrics being applied at airports. The Norman Y. Mineta San José International Airport Master Plan, adopted in 2020, provides a recent example of an EIR for an airport project. The significance threshold for VMT in the San José analysis was defined as no net increase in VMT per passenger compared to existing conditions. A similar metric has been applied to the Proposed Project, but it has been adjusted to specifically focus on enplanements. Therefore, for this EIR the Proposed Project's impact would be considered significant if VMT per enplanement increases compared to the existing conditions (2019).

VEHICLE-MILES TRAVELED ANALYSIS

2019 VEHICLE MILES TRAVELED WITHOUT THE PROPOSED PROJECT

VMT is calculated as the product of the average trip length and trip generation. Kittelson used the average trip length and vehicle trip generation in 2019 to develop VMT by multiplying the inbound trip generation by the inbound average trip length and adding the outbound trip generation times the outbound average trip length to obtain No Project VMT for cars, buses, and trucks.

Using the data on vehicle trip length and vehicle trip generation for 2019, Exhibit 15 shows the VMT by vehicle classification on a typical day.

Exhibit 15: 2019 VMT for Cars, Trucks, and Buses on a Typical Day

	2019 Total VMT
Cars	749,445
Trucks	56,476
Buses	16,437

Source: Kittelson & Associates, Inc. 2022

CEQA Section 15064.3, subdivision (a), states, *"For the purposes of this section, 'vehicle miles traveled' refers to the amount and distance of automobile travel attributable to a project." Here, the term "automobile" refers to on-road passenger vehicles, specifically cars and light trucks.* Based on this, the cargo truck VMT from Exhibit 15 will not be used in the calculation of VMT for the Proposed Project and only car (which includes light trucks). For conservative analysis purposes, given that buses are utilized primarily for transport of passengers and employees, bus VMT will be included in the calculation of VMT. However, cargo truck trips were included in the air quality analysis.

Combining the car and bus VMT results in a total VMT for a typical day in 2019 of 765,882 miles. Dividing this number by the typical daily number of passenger enplanements in 2019 of 16,516 results in a VMT per enplanement of 46.4 miles in 2019 as shown in Exhibit 16.

Exhibit 16: VMT Per Enplanement in 2019 without the Proposed Project

	2019
Car VMT	749,445
Bus VMT	16,437
Total VMT	765,882
Enplanements	16,516
VMT/Enplanement	46.4

Source: Kittelson & Associates, Inc. 2022

PROPOSED PROJECT EFFECTS ON VMT

The Proposed Project would affect two components of the VMT calculation including trip generation and average trip length.

Proposed Project Trip Generation

OAK trip generation is not anticipated to change significantly because of the Proposed Project since the passenger forecasts shown in Exhibit 3 would occur whether the Proposed Project is constructed or not. Based on discussions with the Port, the potential change to vehicle trip generation would be from two sources:

- Estimated additional employees needed to operate and maintain the new facilities that would not be needed if the new terminal were not constructed; and
- additional buses which are needed to service the relocated parking areas.

In addition to estimated employee growth from market-based demand, the Port has estimated the potential need for approximately 70 additional employees on a typical day. These new employees are expected to park in both the secure parking lot (management positions) and the equivalent of the OMC parking lot (terminal services and maintenance positions). The resulting additional trip generation (approximately 70 inbound and 70 outbound trips or about 140 total trips) is anticipated to correspond to the increase in new employees beyond the market-based growth.

As a result of the Proposed Project, the existing economy lot for passengers and OMC parking lot for employees would be relocated. The OMC parking lot would be relocated to two lots including the North Field lot located off old Earhart Road north of the RAC and the Golf Course lot located at the intersection of Doolittle Drive and Eden Road. The economy parking lot would be relocated to two lots including the Maitland lot located north of FedEx on Ron Cowan Parkway and the Ron Cowan lot located near the intersection of Ron Cowan Parkway and John Glenn Drive. These new parking facilities are shown in Exhibit 19.

The relocation of the parking areas as part of the Proposed Project would affect the vehicle trips associated with each parking lot and the buses that serve them since these new parking lots would require additional buses to maintain the same bus frequencies for passengers as the current economy lot bus and for employees similar to the existing OMC bus. Data provided by the Port showing the route and number of bus trips per day that serviced the three parking lots in 2019 (passenger economy lot, employee OMC lot, and

employee Neil Armstrong lot) was used to estimate that buses at OAK generate 558 VMT on a typical day under 2019 conditions (Exhibit 17).

Based on the location of the proposed replacement parking lots for the passenger economy lot and the employee OMC lot, the roundtrip loop distance a bus would travel for each trip between these parking lots and OAK was estimated. After assuming the same number of bus trips would be performed each day, Exhibit 18 shows the VMT for buses with the Proposed Project. As shown, the Proposed Project would add 237 additional bus trips per day (570 – 333_resulting in an increased VMT of 1,430 miles (1,988 – 558).

Exhibit 17: 2019 OAK Shuttle Bus VMT

2019 Shuttle Bus VMT			
Bus Route	**Loop Distance (Miles)**	**Trips Per Day**	**VMT**
Economy Lot	2.13	117	249
OMC Lot	1.86	120	223
Neil Armstrong Lot	0.89	96	86
	Total:	333	558

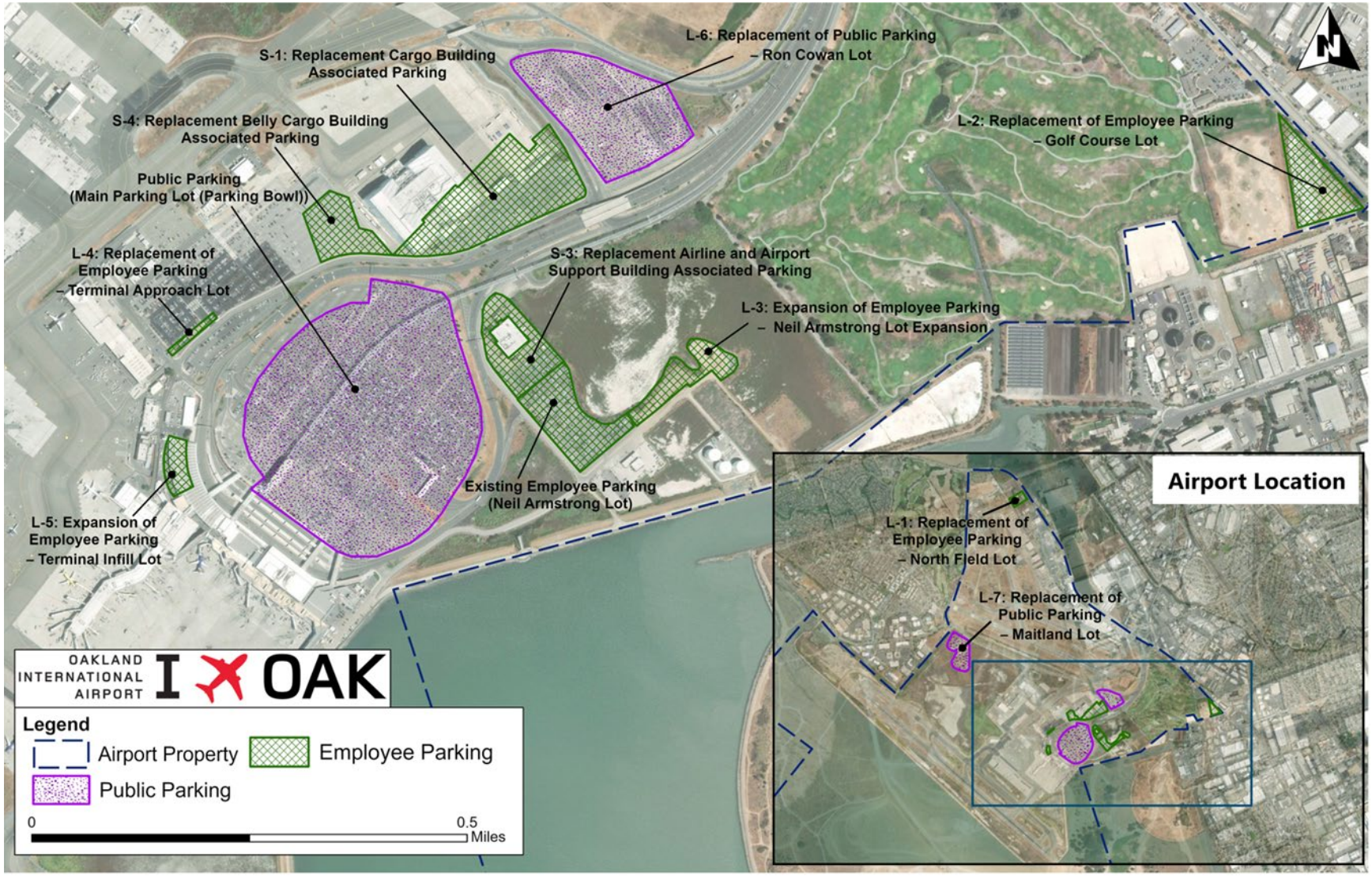
Source: Kittelson & Associates, Inc. 2022

Exhibit 18: Proposed Project OAK Shuttle Bus VMT

Proposed Project Shuttle Bus VMT			
	Loop Distance	**Trips Per Day**	**VMT**
Neil Armstrong Lot	0.89	96	85
North Field Lot (OMC)	5.9	120	708
Golf Course Lot (OMC)	4.4	120	528
Maitland Lot (Economy)	4.1	117	480
Ron Cowan Lot (Economy)	1.6	117	187
	Total:	570	1,988

Source: Kittelson & Associates, Inc. 2022

Exhibit 19: Parking Areas with Proposed Project



Source: Port of Oakland, 2022

Proposed Project Average Trip Length

As a result of the relocation of certain parking areas, the average trip length for certain zones would change as vehicles accessing the new parking areas (Exhibit 1) travel either more or less distance. Parking area changes include the following based on the description of the Proposed Project:

- Approximately 40 percent of the employees parking in the Neil Armstrong lot in 2019 would be relocated to the North Field parking area.
- The management secure parking area would be relocated to two new parking areas with about 54 percent being relocated to the secure infill lot and 46 percent relocated to the secure approach lot.
- The OMC employee parking lot would have about 49 percent of its parking relocated to the North Field lot and 51 percent relocated to the golf course lot.
- Approximately 7 percent of the parking bowl (daily, hourly, premier parking) would be relocated to the Ron Cowan lot.
- The economy parking lot would be relocated to both the Maitland lot (62 percent) and the Ron Cowan lot (38 percent).

A total of five origin/destination locations for how vehicle trips would arrive to and depart from OAK within the transportation study area were identified and the average trip length from each origin/destination location may change because of the relocation of the parking areas was calculated. These five origin/destination locations included:

1. Harbor Bay Parkway at Ron Cowan Parkway
2. Doolittle Drive at Harbor Bay Parkway
3. Hegenberger Road at Doolittle Drive
4. 98th Avenue at Airport Access Road
5. Doolittle Drive at Davis Street

The difference in distance between each of these origin/destination locations and the parking areas to be relocated was determined using Google Maps. For example, a vehicle traveling between Harbor Bay Parkway at Ron Cowan Parkway and the UPS parking area would travel 0.7 miles less with the Proposed Project compared to 2019 conditions because the UPS parking lot is moving closer to the entrance to OAK. Conversely, an employee traveling to the Neil Armstrong parking lot with the Proposed Project from Harbor Bay Parkway and Ron Cowan Parkway would travel 1.3 miles farther to access the relocated parking in the North Field area compared to 2019 conditions.

Based on the changes in distance to each parking area from the five origin/destinations, the change to average trip length for each of the 18 zones was calculated and is shown in Exhibit 19. The resulting changes to average trip length for the Proposed Project is compared to 2019 conditions average trip length in Exhibit 20

Exhibit 20: Trip Length Adjustment Applied to 2019 Condition Average Trip Length for Each Zone

Zones	Proposed Project Trip Length Adjustment (miles)	
1	FedEx	0.00
2	Neil Armstrong	0.12
3	UPS (Employee)	-0.70
4	SW Provisioning	-0.60
5	Non-Secure	0.00
6	Secure	-0.05
7	OMC	0.26
8	Rental Car Center	0.00
9	North Field	0.00
10	Parking Bowl	-0.02
11	Economy	0.25
12	Park 'N Fly	0.00
13	Park 'N Travel	0.00
14	VIP	0.00
15	Airpark Oakland	0.00
16	FastTrack	0.00
17	Fly N Save	0.00
18	Non-Parking	0.00

Source: Kittelson & Associates, Inc. 2022

Exhibit 21: Average Trip Length Comparison by Zone

Zone	Description	Average Trip Length			Proposed Project Average Trip Length		
		2019	2028	2038	2019	2028	2038
1	FedEx	16.2	16.3	16.6	16.2	16.3	16.6
2	Neil Armstrong	19.9	20.1	20.4	20.0	20.2	20.5
3	UPS (Employee)	19.9	20.1	20.4	19.2	19.4	19.7
4	SW Provisioning	19.9	20.1	20.4	19.3	19.5	19.8
5	Non-Secure	19.9	20.1	20.4	19.9	20.1	20.4
6	Secure	19.9	20.1	20.4	19.9	20.1	20.4
7	OMC	19.9	20.1	20.4	20.2	20.4	20.7
8	Rental Car Center	14.7	14.7	14.6	14.7	14.7	14.6

Zone	Description	Average Trip Length			Proposed Project Average Trip Length		
		2019	2028	2038	2019	2028	2038
9	North Field	14.4	14.6	14.8	14.4	14.6	14.8
10	Parking Bowl	23.2	23.1	23.0	23.1	23.1	23.0
11	Economy	23.2	23.1	23.0	23.4	23.4	23.3
12	Park 'N Fly	23.2	23.1	23.0	23.2	23.1	23.0
13	Park 'N Travel	23.2	23.1	23.0	23.2	23.1	23.0
14	VIP	23.2	23.1	23.0	23.2	23.1	23.0
15	Airpark Oakland	23.2	23.1	23.0	23.2	23.1	23.0
16	FastTrack	23.2	23.1	23.0	23.2	23.1	23.0
17	Fly N Save	23.2	23.1	23.0	23.2	23.1	23.0
18	Non-Parking	17.3	17.3	17.3	17.3	17.3	17.3

Source: Kittelson & Associates, Inc. 2022

Proposed Project VMT

The changes to trip generation for the new employees and additional buses along with the adjustments to average trip length[13] were used to calculate the VMT with the addition of the Proposed Project. A comparison between the Proposed Project VMT and 2019 condition VMT is shown in Exhibit 21. As shown, the VMT per enplanement with the Proposed Project in 2028 and 2038 would be less than the VMT per enplanement under 2019 conditions. Since the 2028 and 2038 VMT with the Proposed Project is less than 2019 condition VMT, no significant VMT impacts are anticipated based on the significance criteria.

Exhibit 22: VMT Per Enplanement for 2019, 2028, and 2038 with the Proposed Project

	2019	2028	2038
Car VMT	749,445	943,094	1,264,780
Bus VMT	16,437	23,011	31,533
VMT	765,882	966,105	1,296,314
Enplanements	16,516	21,709	30,473
VMT/Enplanement	**46.4**	**44.5**	**42.5**

Source: Kittelson & Associates, Inc. 2022

[13] Trip length estimation for the new shuttle bus routes was estimated using Google Maps as the roundtrip distance between the terminal boarding/alighting area and the proposed parking lot location.

CEQA PROJECT IMPACTS AND PROPOSED MITIGATIONS

TRAF-1	**The Proposed Project would not conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities. This would be considered a less than significant impact with mitigation.**

The Proposed Project and its effects were compared against local, regional, and state programs, plans, ordinances, and policies addressing the circulation system, as described previously. The ordinances and policies addressing the circulation system in the area and a discussion of whether the Proposed Project would conflict with them include:

- Alameda County Transportation Commission Goods Movement Plan
    - The Goods Movement Plan outlines a long-range strategy for how to move goods efficiently, reliably, and sustainably within, to, from, and through Alameda County by roads, rail, air, and water. The new facilities at OAK would include new facilities for airplane freighter cargo and belly cargo for passenger planes. These new facilities would improve the efficiency of air goods movement in Alameda County resulting in the Proposed Project assisting in meeting the goods movement plans' long-term strategy.
- Plan Bay Area 2050
    - This document recommends increasing non-auto travel mode share and reducing VMT per capita and per employee. As shown in the VMT section, the VMT per enplanement in 2028 and 2038 with the Proposed Project is less than the 2019 VMT. Additionally, the proportion of passengers and employees taking transit to OAK is anticipated to increase between 2019 and future years (2028 and 2038). Therefore, the Proposed Project meets the recommendation to increase non-auto travel.
- San Francisco Bay Plan
    - **Transportation Policy 4:** Transportation projects should include bicycle and pedestrian paths. OAK contains separated bicycle and pedestrian pathways connecting OAK to Doolittle Drive and running along Ron Cowan Parkway to connect at Harbor Bay Parkway. The Proposed Project would not affect the non-auto facilities on Doolittle Drive and Ron Cowan Parkway resulting in no conflict with this policy.
    - **Public Access Policy 2:** Maximum feasible access should be provided to the waterfront. Given security and safety concerns surrounding OAK, public access to the waterfront is primarily provided near the golf course and connections to Oyster Bay Regional Shoreline via the Bay Trail and the Bill Lockyer Bay Trail Bridge. The Proposed Project would not alter these access points, so no conflict is anticipated.

  - **Public Access Policy 10:** Access to the waterfront should be provided by walkway and trails to connect public thoroughfares where convenient parking and public transit are available. OAK has extensive parking and a BART station which can provide access to the Bay Trail and unrestricted waterfront locations. The Proposed Project would not alter these connections and no adverse effect on this policy is anticipated.

- Land Use and Transportation Element of Oakland's General Plan
  - **Policy T3.5, Including Bikeways and Pedestrian Walks**: No new streets are proposed as part of the Proposed Project. The terminal access area would be modified with realigned pick-up/drop-off areas. However, these would be designed to accommodate pedestrians and incorporate appropriate pedestrian connections to the various terminals and BART station.
  - **Policy T3.6, Encouraging Transit**: OAK has a dedicated BART station providing connections to the rest of BART's network. No changes to the BART station are anticipated that would discourage transit.
  - **Policy T3.7, Resolving Transportation Conflicts**: BART currently operates in its own right-of-way and has no transportation conflicts with vehicles. The Proposed Project would not introduce any new conflicts between transportation modes.
  - **Policy T4.1, Incorporating Design Features for Alternative Travel**: The Proposed Project would continue to provide direct access to an existing BART station, and would not impact existing bicycle and pedestrian facilities.
  - **Policy W6.3, Enhancing Intermodal Transportation**: Transportation corridors serving airport terminals should be preserved and enhanced. The Proposed Project would not alter access to the airport. It is only modifying the pickup/drop off area to accommodate the proposed new facilities.

- Bicycle Master Plan
  - There are currently separated bicycle pathways along Bessie Coleman Drive and Ron Cowan Parkway. There is an existing Class 3 bicycle route on John Glenn Drive providing access to the airport terminal. The Proposed Project would not change the bicycle pathways, but would remove part of John Glenn Drive, which would also potentially affect the bicycle access to the terminals.

- Pedestrian Master Plan
  - Pedestrian access to OAK is provided along the same facilities as bicycles with pathways along Bessie Coleman Drive and Ron Cowan Parkway and a sidewalk connection along John Glenn Drive. The Proposed Project would remove a portion of John Glenn Drive and potentially affect pedestrian access to the terminals.

Impact TRAF-1: The Proposed Project would remove a portion of the existing John Glenn Drive, which provides pedestrian and bicycle connections between OAK terminals and the surrounding transportation infrastructure. Removing this connection conflicts with both the bicycle and pedestrian master plans for the city of Oakland and is considered a significant impact.

Mitigation Measure TRAF-1: The Proposed Project will maintain pedestrian and bicycle access during construction and ensure that the pedestrian and bicycle connection between Ron Cowan Parkway and the proposed project are made upon project completion to replace the connection lost by the removal of part of John Glenn Drive.

Implementing Mitigation Measure TRAF-1 would reduce the impact of the Proposed Project to less than significant.

Significance After Mitigation: Less than significant

TRAF-2	**The Proposed Project would not conflict with or be inconsistent with CEQA Guideline section 15064.3, subdivision (b), as it would not cause substantial additional VMT per capita, per service population, or other appropriate efficiency measure. This would be considered a less than significant impact.**

The VMT per enplanement for existing conditions is 46.4 miles in 2019. VMT per enplanement in 2028 and 2038 with the Proposed Project is projected to be less at 44.5 miles and 42.5 miles, respectively. The decrease in VMT per enplanement is the result of increases in transit access to OAK and increased average vehicle occupancy for people traveling to OAK. Since the VMT per enplanement in 2028 and 2038 with the Proposed Project is less than the VMT per enplanement in 2019, the project does not result in a significant impact based on VMT and no mitigation measures are required.

TRAF-3	**The Proposed Project would not substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment). This would be considered a less than significant impact.**

The Proposed Project would not substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment). This would be considered a less than significant impact.

The Proposed Project does not represent an incompatible use since the site is currently an airport and the project involves modernizing and constructing new facilities for existing land use.

The design of the revised circulation system and parking facilities for the Proposed Project is also not anticipated to substantially increase hazards since the circulation changes would be required to adhere to Oakland Fire Department's design standards, which are imposed by the State and Oakland's Fire Department during the building plan check and development review process. These reviews would ensure that hazards due to design features would not occur and that the placement of the circulation improvements would not create a conflict for motorists, pedestrians, or bicyclists traveling within or around the project site.

Since the Project is not incompatible with surrounding land uses, there are no off-site improvements, and all on-site improvements would be made adhering to the latest design standards for Oakland, the Proposed Project would not result in a significant impact and no mitigation measures would be required.

TRAF-4	**The Proposed Project would not result in inadequate emergency access. This would be considered a less than significant impact.**

Emergency response requires a balance of emergency response time and evacuation needs with other community concerns, such as urban design and traffic calming. To address emergency and fire access needs, the site improvements are required to be designed in accordance with all applicable Oakland Fire Department design standards for emergency access (e.g., minimum lane width and turning radius). Since adequate emergency access will be required per the local fire code and the site plans would be reviewed by the local fire officials as part of the design review, the Proposed Project would not result in inadequate emergency vehicle access. Therefore, the Proposed Project has a less than significant impact and no mitigation measures would be required.



Section 6 Non-CEQA Analysis

NON-CEQA ANALYSIS FOR INFORMATIONAL PURPOSES ONLY

The use of LOS is no longer an allowed metric for assessing transportation impacts related to CEQA. However, LOS still provides a valuable tool for understanding how the Proposed Project may affect the operations of intersections in the vicinity of a project. Therefore, this section provides an overview of intersection operations in the vicinity of OAK in 2019, 2028, and 2038 for informational purposes and does not affect the CEQA impact assessment.

STUDY INTERSECTIONS AND DATA COLLECTION

Seven intersections in the immediate vicinity of the Proposed Project were identified as study intersections. Exhibit 22 lists the study intersections and control type.

Exhibit 23: Study Intersections

Intersection Number	Intersection Location	Intersection Control
1	Harbor Bay Parkway & Doolittle Drive	Signalized
2	Harbor Bay Parkway & Ron Cowan Parkway	Signalized
3	Air Cargo Way & Ron Cowan Parkway	Signalized
4	John Glenn Drive & Ron Cowan Parkway	Signalized
5	Neil Armstrong Way & Ron Cowan Parkway	Signalized
6	Hegenberger Road & Doolittle Drive	Signalized
7	Airport Access Road & Doolittle Drive	Signalized

Source: Kittelson & Associates, Inc.

Data at these seven intersections were collected in December 2021 on a typical midweek day when schools were in session for the a.m. (7-9 a.m.) and p.m. (4-6 p.m.) peak periods. The raw traffic count data are provided in Appendix A.

ANALYSIS METHODOLOGIES & LEVEL OF SERVICE STANDARDS

To determine 2021 traffic conditions and how the Proposed Project may affect the surrounding transportation system, traffic operations were evaluated at the seven study intersections. LOS was determined for each study intersection for the following scenarios:

- 2021 Conditions
- 2021 Conditions with the Proposed Project
- 2028 Conditions

- 2028 Conditions with the Proposed Project
- 2038 Conditions
- 2038 Conditions with the Proposed Project

LOS describes the operating conditions experienced by users of a facility. LOS is a qualitative measure of the effect of a number of factors, including speed and travel time, traffic interruptions, freedom to maneuver, driving comfort, and convenience. Levels of service are designated "A" through "F" from best to worst, which cover the entire range of traffic operations that might occur. LOS "A" through "E" generally represent traffic volumes at less than roadway capacity, while LOS "F" represents locations over capacity and/or experiencing significant delays. These conditions are generally described in Exhibit 23.

Intersection operations were evaluated using the Highway Capacity Manual (HCM) 7th Edition methodology and Vistro 2022 software. The HCM 7th Edition procedure calculates a weighted average stop delay in seconds per vehicle at an intersection and assigns a LOS designation based on the delay as detailed in Exhibit 23.

Exhibit 24: Intersection Level of Service Definitions

LOS	Description of Traffic Conditions	Weighted Average Delay per Vehicle (Seconds)	
		Signalized Intersection	Unsignalized Intersection
A	LOS A represents free-flow travel with excellent levels of comfort and convenience and the freedom to maneuver.	≤10.0	≤10.0
B	LOS B has stable operating conditions, but the presence of other road users causes a noticeable, though slight, reduction in comfort, convenience, and maneuvering freedom.	>10.0 and ≤20.0	>10.0 and ≤15.0
C	LOS C has stable operating conditions, but the operation of individual users is substantially affected by the interaction with others in the traffic stream.	>20.0 and ≤35.0	>15.0 and ≤25.0
D	LOS D represents high-density, but stable flow. Users experience severe restriction in speed and freedom to maneuver, with poor levels of comfort and convenience.	>35.0 and ≤55.0	>25.0 and ≤35.0
E	LOS E represents operating conditions near capacity. Speeds are reduced to a low but relatively uniform value. Freedom to maneuver is difficult with users experiencing frustration and poor comfort and convenience. Unstable operation is frequent, and minor disturbances in traffic flow can cause breakdown conditions.	>55.0 and ≤80.0	>35.0 and ≤50.0
F	LOS F is used to define forced or breakdown conditions. This condition exists wherever the volume of traffic exceeds the capacity of the roadway. Long queues can form behind these bottleneck points with queued traffic traveling in a stop-and-go fashion.	>80.0	>50.0

Source: Transportation Research Board, *Highway Capacity Manual, 7th Edition,* Washington, D.C., 2022

2021 CIRCULATION SYSTEM PERFORMANCE

Based on the collected data at the seven study intersections and using the methodologies described in the "Methodology" section of this report, Kittelson determined the intersection operations for 2021 and 2021 with the Proposed Project for the a.m. (Exhibit 24) and p.m. (Exhibit 25) peak hours. As shown in these exhibits, all study intersections are anticipated to operate at LOS C or better with the Proposed Project in 2021. This is representative of stable operating conditions, so the project is not anticipated to have a detrimental effect on vehicle operations in 2021. The detailed outputs from the 2021analysis are provided in Appendix B.

Exhibit 25: 2021 Conditions a.m. Peak Hour Operations and with the Proposed Project

#	Intersection	2021			2021 Plus Proposed Project		
		V/C	Delay	LOS	V/C	Delay	LOS
1	Harbor Bay Parkway & Doolittle Drive	0.35	11.2	B	0.35	11.2	B
2	Harbor Bay Parkway & Ron Cowan Parkway	0.48	17.5	B	0.48	17.5	B
3	Air Cargo Way & Ron Cowan Parkway	0.57	8.1	A	0.58	8.1	A
4	John Glenn Drive & Ron Cowan Parkway	0.34	20.9	C	0.23	12.5	B
5	Neil Armstrong Way & Ron Cowan Parkway	0.20	3.3	A	0.22	5.4	A
6	Hegenberger Road & Doolittle Drive	0.52	26.8	C	0.54	26.8	C
7	Airport Access Road & Doolittle Drive	0.60	17.7	B	0.62	19.4	B

Source: Kittelson & Associates, Inc. 2022

Exhibit 26: 2021 Conditions p.m. Peak Hour Operations and with the Proposed Project

#	Intersection	2021			2021 Plus Proposed Project		
		V/C	Delay	LOS	V/C	Delay	LOS
1	Harbor Bay Parkway & Doolittle Drive	0.41	12.1	B	0.41	12.1	B
2	Harbor Bay Parkway & Ron Cowan Parkway	0.32	10.3	B	0.32	10.3	B
3	Air Cargo Way & Ron Cowan Parkway	0.60	8.2	A	0.61	8.2	A
4	John Glenn Drive & Ron Cowan Parkway	0.34	13.1	B	0.34	12.6	B
5	Neil Armstrong Way & Ron Cowan Parkway	0.27	3.2	A	0.29	3.6	A
6	Hegenberger Road & Doolittle Drive	0.52	26.8	C	0.54	26.9	C
7	Airport Access Road & Doolittle Drive	0.57	20.0	B	0.59	21.3	C

Source: Kittelson & Associates, Inc. 2022

2028 CIRCULATION SYSTEM PERFORMANCE

Traffic volumes for both background growth in other land uses and anticipated growth at OAK were forecast for the seven study intersections in 2028. These forecasts were then evaluated to estimate how the study intersections would operate in 2028 with and without the Proposed Project. The a.m. and p.m. peak hour intersection operations in 2028 are shown in Exhibit 26 (a.m. peak hour) and Exhibit 27 (p.m. peak hour). Similar to 2021, the seven study intersections are anticipated to operate at LOS C or better with the Proposed Project indicating acceptable operations. Detailed outputs for the 2028 conditions analysis are provided in Appendix E.

Exhibit 27: 2028 Conditions a.m. Peak Hour Operations with and without Proposed Project

#	Intersection	2028			2028 Plus Proposed Project		
		V/C	Delay	LOS	V/C	Delay	LOS
1	Harbor Bay Parkway & Doolittle Drive	0.41	11.5	B	0.41	11.5	B
2	Harbor Bay Parkway & Ron Cowan Parkway	0.61	20.0	B	0.61	19.9	B
3	Air Cargo Way & Ron Cowan Parkway	0.64	8.8	A	0.64	8.8	A
4	John Glenn Drive & Ron Cowan Parkway	0.47	25.1	C	0.36	13.3	B
5	Neil Armstrong Way & Ron Cowan Parkway	0.29	3.5	A	0.31	5.3	A
6	Hegenberger Road & Doolittle Drive	0.73	32.6	C	0.75	33.2	C
7	Airport Access Road & Doolittle Drive	0.63	20.1	C	0.66	22.3	C

Source: Kittelson & Associates, Inc. 2022

Exhibit 28: 2028 Conditions p.m. Peak Hour Operations with and without Proposed Project

#	Intersection	2028			2028 Plus Proposed Project		
		V/C	Delay	LOS	V/C	Delay	LOS
1	Harbor Bay Parkway & Doolittle Drive	0.48	12.9	B	0.48	12.9	B
2	Harbor Bay Parkway & Ron Cowan Parkway	0.61	15.0	B	0.61	15.0	B
3	Air Cargo Way & Ron Cowan Parkway	0.70	8.6	A	0.71	8.7	A
4	John Glenn Drive & Ron Cowan Parkway	0.60	19.0	B	0.54	16.0	B
5	Neil Armstrong Way & Ron Cowan Parkway	0.45	7.3	A	0.47	7.5	A
6	Hegenberger Road & Doolittle Drive	0.57	29.1	C	0.59	29.1	C
7	Airport Access Road & Doolittle Drive	0.61	21.4	C	0.63	23.0	C

Source: Kittelson & Associates, Inc. 2022

2038 CIRCULATION SYSTEM PERFORMANCE

The Proposed Project's effect on 2038 forecast intersection operations is shown in Exhibit 28 and Exhibit 29 for the a.m. and p.m. peak hours, respectively. Two intersections in 2038 are anticipated to operate below LOS D without the Proposed Project including Hegenberger Road and Doolittle Drive (LOS E in the a.m. peak hour) and John Glenn Drive and Ron Cowan Parkway (LOS E in the p.m. peak hour). At Hegenberger Road and Doolittle Drive, the Proposed Project would result in the average intersection delay increasing by about 4 seconds, but the intersection would still operate at LOS E, which is less than capacity. The intersection of John Glenn Drive and Ron Cowan Parkway would improve with the Proposed Project as vehicle trips would be rerouted to different parking areas improving the intersection from LOS E to LOS C in the p.m. peak hour.

Detailed output files documenting the intersection operations in 2038 with and without the Proposed Project are provided in Appendix F.

Exhibit 29: 2038 Conditions a.m. Peak Hour Operations with and without Proposed Project

#	Intersection	2038			2038 Plus Proposed Project		
		V/C	Delay	LOS	V/C	Delay	LOS
1	Harbor Bay Parkway & Doolittle Drive	0.49	11.6	B	0.49	11.6	B
2	Harbor Bay Parkway & Ron Cowan Parkway	0.65	23.6	C	0.65	23.5	C
3	Air Cargo Way & Ron Cowan Parkway	0.75	10.7	B	0.75	10.7	B
4	John Glenn Drive & Ron Cowan Parkway	0.67	36.2	D	0.54	16.5	B
5	Neil Armstrong Way & Ron Cowan Parkway	0.41	4.4	A	0.43	5.8	A
6	Hegenberger Road & Doolittle Drive	**0.95**	**57.7**	**E**	**0.97**	**61.3**	**E**
7	Airport Access Road & Doolittle Drive	0.83	34.6	C	0.87	46.0	D

Source: Kittelson & Associates, Inc. 2022

Exhibit 30: 2038 Conditions p.m. Peak Hour Operations with and without Proposed Project

#	Intersection	2038			2038 Plus Proposed Project		
		V/C	Delay	LOS	V/C	Delay	LOS
1	Harbor Bay Parkway & Doolittle Drive	0.57	15.6	B	0.57	15.6	B
2	Harbor Bay Parkway & Ron Cowan Parkway	0.63	22.8	C	0.64	22.8	C
3	Air Cargo Way & Ron Cowan Parkway	0.80	11.5	B	0.80	11.7	B
4	John Glenn Drive & Ron Cowan Parkway	**0.96**	**57.9**	**E**	0.90	30.3	C
5	Neil Armstrong Way & Ron Cowan Parkway	0.68	13.1	B	0.71	13.9	B
6	Hegenberger Road & Doolittle Drive	0.76	33.8	C	0.77	33.9	C
7	Airport Access Road & Doolittle Drive	0.67	23.9	C	0.70	26.2	C

Source: Kittelson & Associates, Inc. 2022



Section 7 Conclusions

CONCLUSIONS

This transportation assessment was performed to determine how the Terminal Modernization and Development Project at Oakland International Airport would affect the surrounding transportation and circulation system. The Proposed Project includes modernizing Terminals 1 and 2, consolidating passenger processing functions (e.g., ticketing, baggage check-in, security screening), constructing the expansion of international arrivals facilities, constructing a new terminal, relocating existing cargo and support facilities, and improving the terminal area roadway, parking areas, and support facilities. The Proposed Project would not increase the number of passengers enplanements at OAK. The following summarizes the Proposed Project's effects:

- Based on collected data of vehicle trip generation, passenger enplanements, and average trip length, OAK's VMT per enplanement is estimated at 46.4 miles on a typical day in 2019. Since the number of passenger enplanements is projected to grow faster than vehicle trip generation, the VMT per enplanement is anticipated to decrease with the Proposed Project to 44.3 miles in 2028 and 42.4 miles on a typical day in 2038. With a lower VMT per enplanement in future years with the Proposed Project compared to 2019 conditions, the Proposed Project would not have a significant impact on the circulation system related to VMT.
- A review of programs, plans, ordinances, and policies addressing the circulation system found the Proposed Project could potentially conflict with the bicycle and pedestrian master plans for Oakland since the pedestrian and bicycle access between Ron Cowan Parkway and the OAK terminals along John Glenn Drive would be removed, cutting off the existing connection. However, this significant impact can be mitigated to less than significant by incorporating new pedestrian and bicycle pathways into the Proposed Project with implementation of Mitigation Measure TRAF-1.
- While not required under CEQA, the following summarizes additional effects for informational purposes only:
    - OAK passenger enplanements on a typical day are estimated to grow without construction of the Proposed Project from about 16,500 in 2019 to about 22,000 in 2028 and 30,000 in 2038 or about 3.3 percent per year.
    - OAK total vehicle trip generation on a typical day is estimated to increase without construction of the Proposed Project from about 46,000 vehicles in 2019 to 57,000 in 2028 and 77,000 in 2038 or about 2.7 percent per year.
    - A review of intersection vehicle operations at the seven signalized intersections located closest to OAK found that all intersections would operate at LOS C or better with the Proposed Project for 2019 and 2028 conditions. In 2038, two intersections[14] were found to operate at LOS E without the Proposed Project. The addition of project traffic would result in the intersection of John Glenn Drive and Ron Cowan Parkway improving in the p.m. peak hour due to rerouting of traffic, while the intersection of

[14] John Glenn Drive/Ron Cowan Parkway and Hegenberger Road/Doolittle Drive

Hegenberger Road and Doolittle Drive is anticipated to have the average vehicle delay increase by about 4 seconds per vehicle. All intersections would continue to operate at LOS E or better in 2038 with the Proposed Project indicating none would be over capacity.

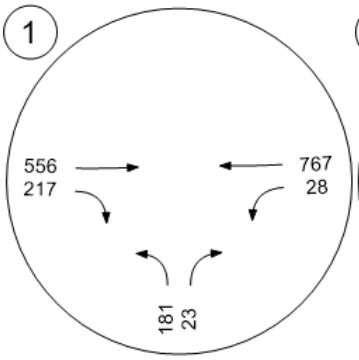


Appendix A 2021 Intersection Turn Movement Counts

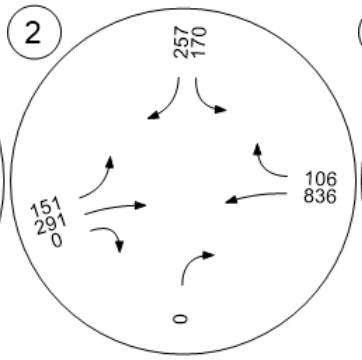
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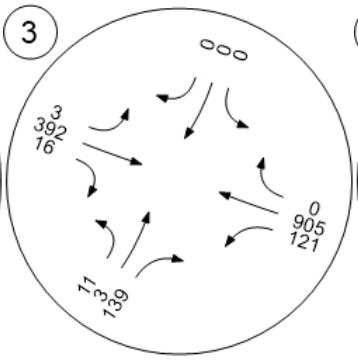
Harbor Bay Parkway & Doolit



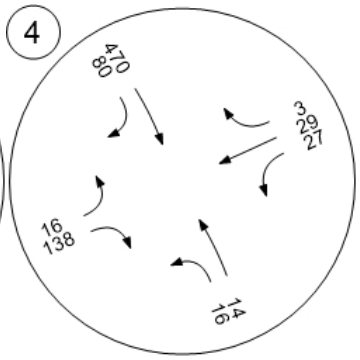
Harbor Bay Parkway & Ron



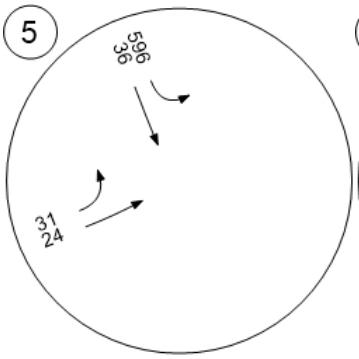
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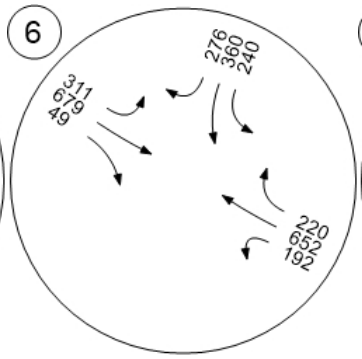
Ron Cowan Parkway & John



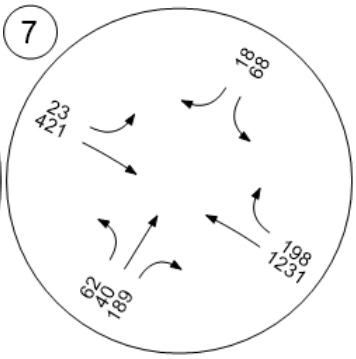
Ron Cowan Pkwy & Neil Arm



Hegenberger Road & Doolittl



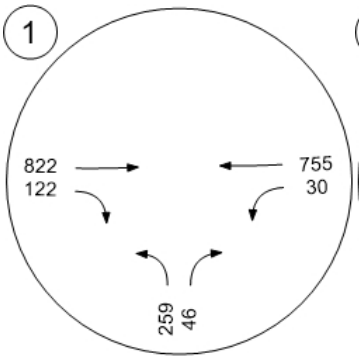
Doolittle Drive & Airport Acce



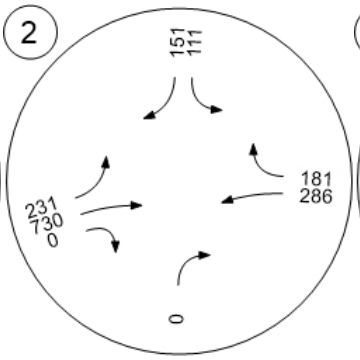
Traffic Volume - Future Total Volume



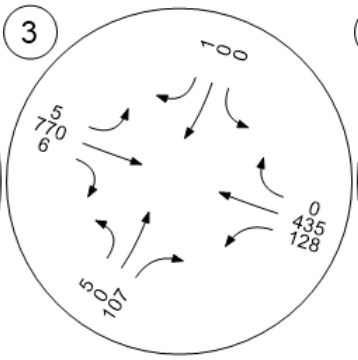
Harbor Bay Parkway & Doolit



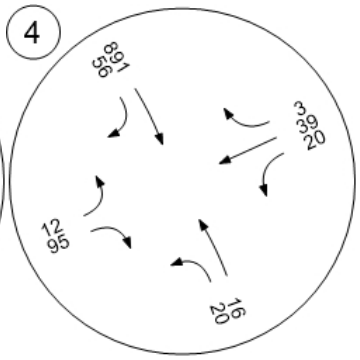
Harbor Bay Parkway & Ron



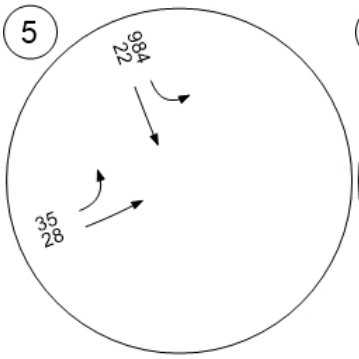
Air Cargo Way & Ron Cowan



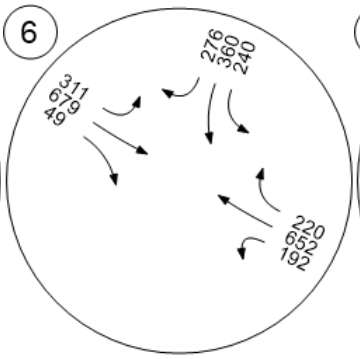
Ron Cowan Parkway & John



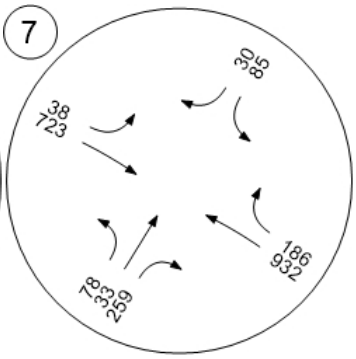
Ron Cowan Pkwy & Neil Arm



Hegenberger Road & Doolittl



Doolittle Drive & Airport Acce



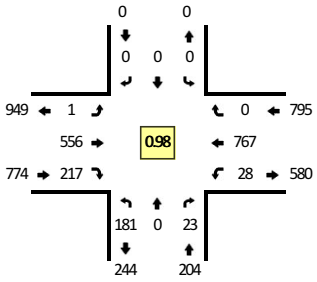
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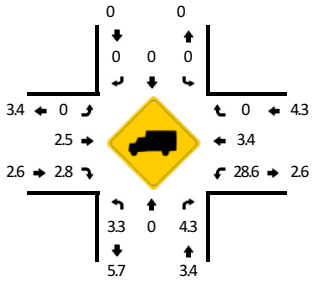
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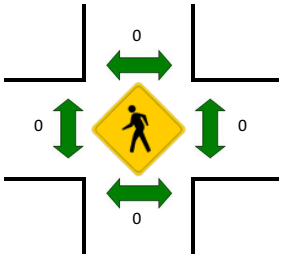
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CITY/STATE: Alameda, CA

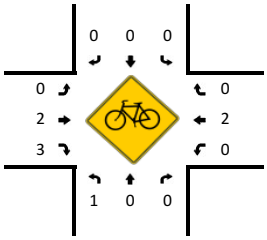
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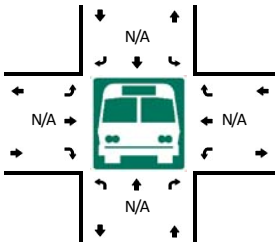
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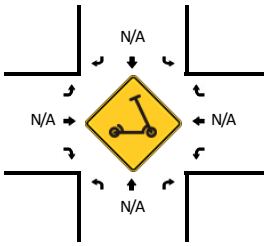












15-Min Count Period Beginning At	Harbor Bay Pkwy (Northbound)				Harbor Bay Pkwy (Southbound)				Doolittle Dr (Eastbound)				Doolittle Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	27	0	6	0	0	0	0	0	0	85	45	0	6	66	0	0	235	
7:15 AM	19	0	6	0	0	0	0	0	0	84	47	0	8	134	0	0	298	
7:30 AM	27	0	2	0	0	0	0	0	0	113	23	0	7	157	0	0	329	
7:45 AM	24	0	10	0	0	0	0	0	0	129	57	0	4	215	0	0	439	1301
8:00 AM	52	0	2	0	0	0	0	0	0	125	39	0	3	202	0	0	423	1489
8:15 AM	47	0	8	0	0	0	0	0	0	115	73	1	7	195	0	0	446	1637
8:30 AM	58	0	9	0	0	0	0	0	0	169	52	0	6	160	0	0	454	1762
8:45 AM	24	0	4	0	0	0	0	0	0	147	53	0	11	210	0	1	450	1773

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	232	0	36	0	0	0	0	0	0	676	208	0	24	640	0	0	1816
Heavy Trucks	8	0	4		0	0	0		0	16	0		4	40	0		72
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	4	0		0	0	0		4
Scooters																	

Comments:

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SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

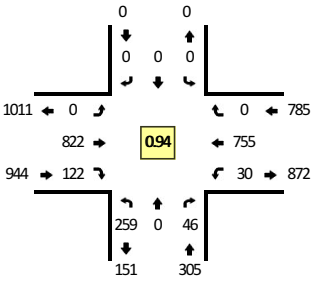
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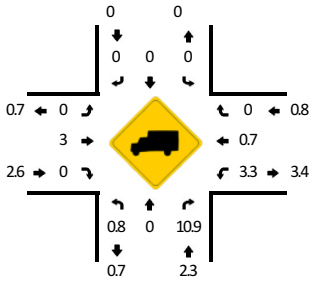
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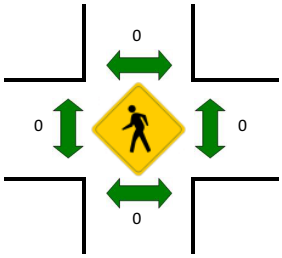
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CITY/STATE: Alameda, CA

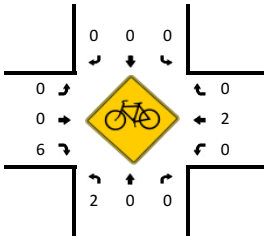
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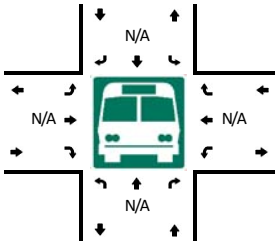
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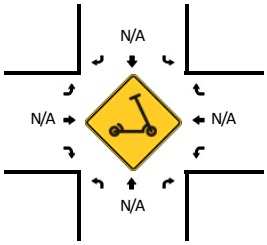


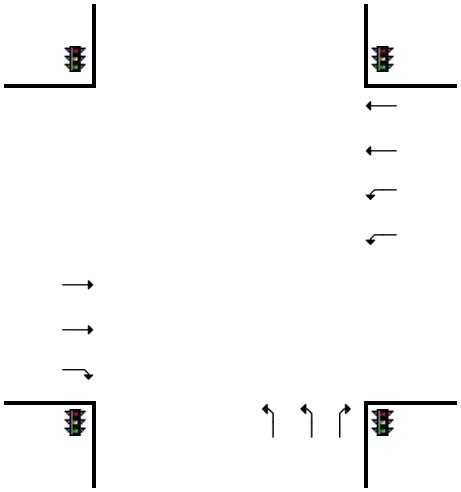












15-Min Count Period Beginning At	Harbor Bay Pkwy (Northbound)				Harbor Bay Pkwy (Southbound)				Doolittle Dr (Eastbound)				Doolittle Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	54	0	15	0	0	0	0	0	0	195	43	0	6	191	0	0	504	
4:15 PM	41	0	11	1	0	0	0	0	0	203	38	0	5	152	0	1	452	
4:30 PM	73	0	8	0	0	0	0	0	0	223	48	0	4	178	0	0	534	
4:45 PM	54	0	12	3	0	0	0	0	0	151	22	0	7	197	0	3	449	1939
5:00 PM	75	0	21	0	0	0	0	0	0	225	28	0	4	188	0	0	541	1976
5:15 PM	54	0	5	0	0	0	0	0	0	223	24	0	11	192	0	1	510	2034
5:30 PM	50	0	9	0	0	0	0	0	0	205	24	0	4	186	0	0	478	1978
5:45 PM	35	0	8	0	0	0	0	0	0	223	25	0	4	137	0	0	432	1961
6:00 PM	31	0	5	0	0	0	0	0	0	208	19	0	1	129	0	1	394	1814
6:15 PM	39	0	2	0	0	0	0	0	0	273	18	0	2	141	0	0	475	1779
6:30 PM	22	0	8	0	0	0	0	0	0	252	28	0	5	102	0	0	417	1718
6:45 PM	15	0	5	0	0	0	0	0	0	193	27	1	3	94	0	0	338	1624
7:00 PM	24	0	8	0	0	0	0	0	0	104	11	1	3	86	0	0	237	1467
7:15 PM	14	0	2	0	0	0	0	0	0	73	9	0	2	85	0	0	185	1177
7:30 PM	14	0	4	0	0	0	0	0	0	67	10	0	3	78	0	1	177	937
7:45 PM	33	0	7	0	0	0	0	0	0	71	14	0	2	65	0	0	192	791

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	300	0	84	0	0	0	0	0	0	900	112	0	16	752	0	0	2164
Heavy Trucks	4	0	8		0	0	0		0	16	0		0	12	0		40
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	12		0	0	0		12
Scooters																	

Comments:

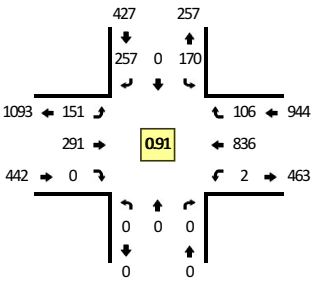
Report generated on 1/7/2022 3:07 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

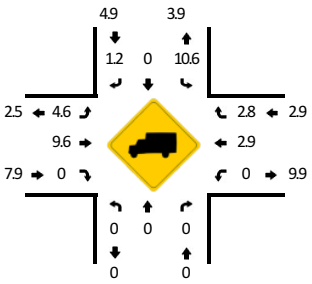
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

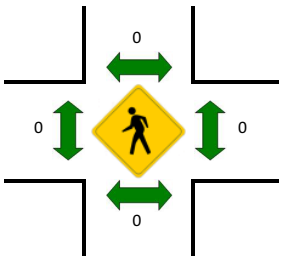
LOCATION: Harbor Bay Pkwy -- Harbor Bay Pkwy/Ron Cowan Pkwy | **QC JOB #:** 15593235
CITY/STATE: Alameda, CA | **DATE:** Thu, Dec 2 2021

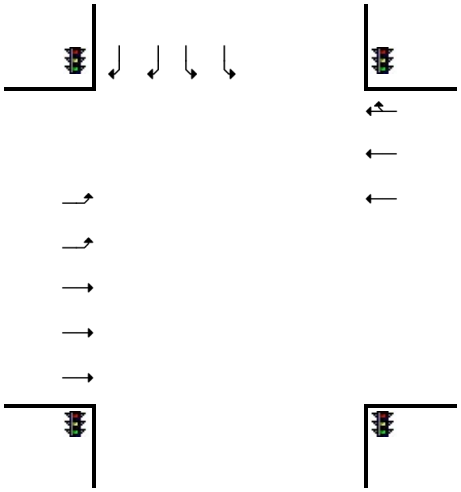
Peak-Hour: 7:45 AM -- 8:45 AM
Peak 15-Min: 8:30 AM -- 8:45 AM

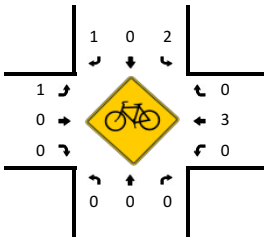


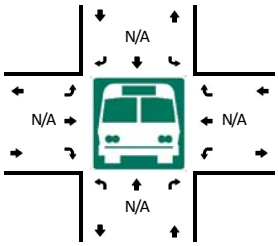
Quality Counts
DATA THAT DRIVES COMMUNITIES

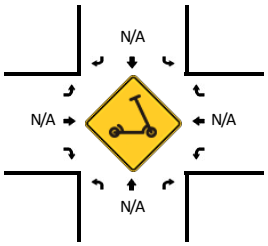












15-Min Count Period Beginning At	Harbor Bay Pkwy (Northbound)				Harbor Bay Pkwy (Southbound)				Harbor Bay Pkwy/Ron Cowan Pkwy (Eastbound)				Harbor Bay Pkwy/Ron Cowan Pkwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	0	0	0	32	0	81	0	30	63	0	0	0	139	23	0	368	
7:15 AM	0	0	0	0	32	0	55	0	14	37	0	0	0	165	24	0	327	
7:30 AM	0	0	0	0	32	0	31	0	26	30	0	0	0	131	21	0	271	
7:45 AM	0	0	0	0	47	0	57	0	18	53	0	0	0	207	30	0	412	1378
8:00 AM	0	0	0	0	47	0	51	0	32	62	0	0	0	203	24	0	419	1429
8:15 AM	0	0	0	0	41	0	80	0	34	73	0	0	0	218	34	2	482	1584
8:30 AM	0	0	0	0	35	0	69	0	67	103	0	0	0	208	18	0	500	1813
8:45 AM	0	0	0	0	45	0	68	0	22	44	0	0	0	183	27	1	390	1791

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	140	0	276	0	268	412	0	0	0	832	72	0	2000
Heavy Trucks	0	0	0		4	0	12		8	20	0		0	4	4		52
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		8	0	0		0	0	0		0	4	0		12
Scooters																	

Comments:

Report generated on 1/7/2022 3:07 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

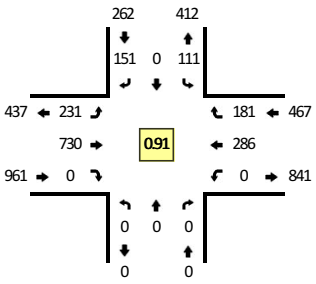
Type of peak hour being reported: Intersection Peak

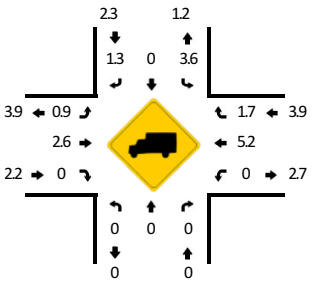
Method for determining peak hour: Total Entering Volume

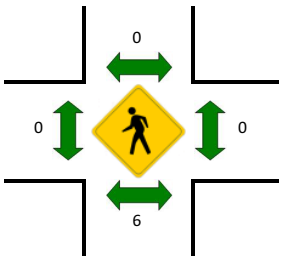
LOCATION: Harbor Bay Pkwy -- Harbor Bay Pkwy/Ron Cowan Pkwy
CITY/STATE: Alameda, CA

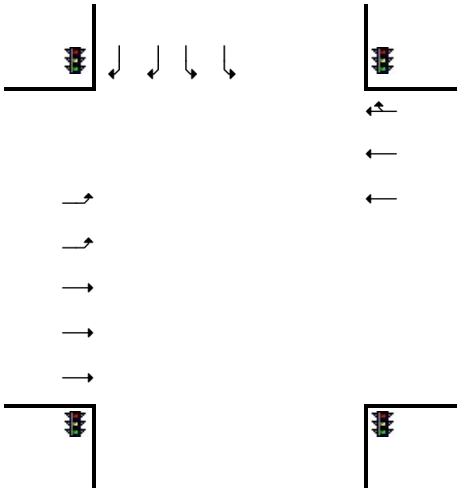
QC JOB #: 15593236
DATE: Thu, Dec 2 2021

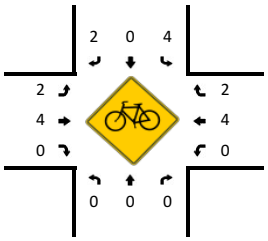
Peak-Hour: 4:00 PM -- 5:00 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

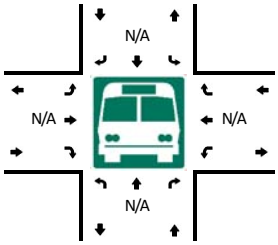


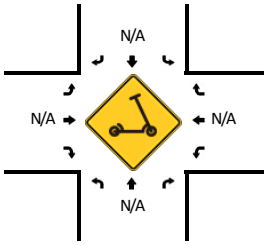












15-Min Count Period Beginning At	Harbor Bay Pkwy (Northbound)				Harbor Bay Pkwy (Southbound)				Harbor Bay Pkwy/Ron Cowan Pkwy (Eastbound)				Harbor Bay Pkwy/Ron Cowan Pkwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	24	0	40	0	56	181	0	0	0	103	49	0	453	
4:15 PM	0	0	0	0	31	0	44	0	50	155	0	0	0	76	39	0	395	
4:30 PM	0	0	0	0	35	0	40	0	79	207	0	0	0	56	45	0	462	
4:45 PM	0	0	0	0	21	0	27	0	46	187	0	0	0	51	48	0	380	1690
5:00 PM	0	0	0	0	23	0	29	0	75	183	0	0	0	49	51	0	410	1647
5:15 PM	0	0	0	0	30	0	33	0	52	154	0	0	0	46	53	0	368	1620
5:30 PM	0	0	0	0	22	0	26	0	55	126	0	0	0	32	35	0	296	1454
5:45 PM	0	0	0	0	25	0	15	0	41	95	0	0	0	34	39	0	249	1323
6:00 PM	0	0	0	0	22	0	17	0	36	94	0	0	0	33	39	0	241	1154
6:15 PM	0	0	0	0	26	0	8	0	29	77	0	0	0	26	47	0	213	999
6:30 PM	0	0	0	0	28	0	19	0	20	73	0	0	0	23	46	0	209	912
6:45 PM	0	0	0	0	24	0	41	0	12	52	0	0	0	32	38	0	199	862
7:00 PM	0	0	0	0	19	0	16	0	14	38	0	0	0	24	27	0	138	759
7:15 PM	0	0	0	0	16	0	6	0	5	35	0	0	0	26	25	0	113	659
7:30 PM	0	0	0	0	10	0	11	0	13	33	0	0	0	23	20	0	110	560
7:45 PM	0	0	0	0	14	0	11	0	15	29	0	0	0	27	31	1	128	489

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	140	0	160	0	316	828	0	0	0	224	180	0	1848
Heavy Trucks	0	0	0		0	0	0		0	20	0		0	12	8		40
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		4	0	0		4	0	0		0	8	4		20
Scooters																	

Comments:

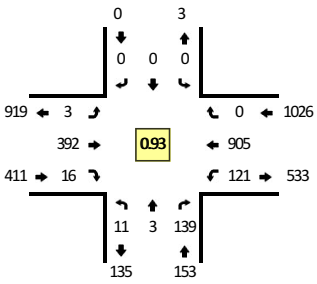
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SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

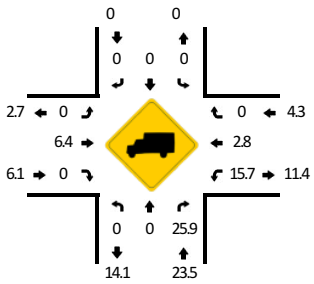
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

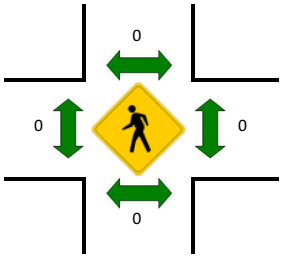
LOCATION: Air Cargo Wy -- Ron Cowan Pkwy | **QC JOB #:** 15593237
CITY/STATE: Oakland, CA | **DATE:** Tue, Dec 7 2021

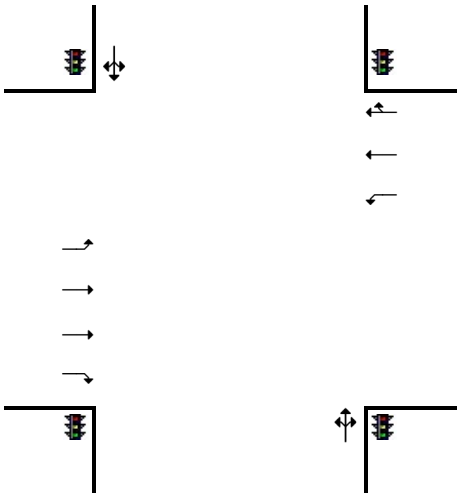
Peak-Hour: 7:45 AM -- 8:45 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

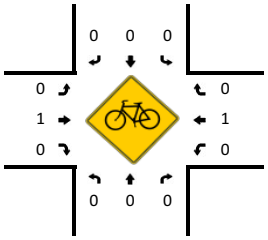


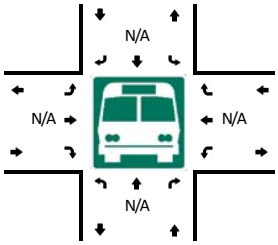


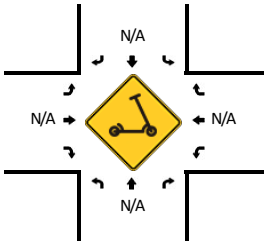












15-Min Count Period Beginning At	Air Cargo Wy (Northbound)				Air Cargo Wy (Southbound)				Ron Cowan Pkwy (Eastbound)				Ron Cowan Pkwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	2	0	33	0	0	0	0	0	0	74	3	0	54	183	0	0	349	
7:15 AM	6	0	49	0	0	0	0	0	0	57	5	0	69	158	0	3	347	
7:30 AM	5	0	82	0	0	0	0	0	0	70	0	1	61	135	0	0	354	
7:45 AM	4	0	64	0	0	0	0	0	0	81	6	0	43	231	0	0	429	1479
8:00 AM	2	2	35	0	0	0	0	0	0	86	3	1	30	194	0	1	354	1484
8:15 AM	3	1	22	0	0	0	0	0	0	96	5	1	19	236	0	1	384	1521
8:30 AM	2	0	18	0	0	0	0	0	0	129	2	1	27	244	0	0	423	1590
8:45 AM	1	0	13	0	0	0	0	0	0	108	0	0	28	225	0	1	376	1537

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	16	0	256	0	0	0	0	0	0	324	24	0	172	924	0	0	1716
Heavy Trucks	0	0	104		0	0	0		0	32	0		12	40	0		188
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	4	0		4
Scooters																	

Comments:

Report generated on 1/7/2022 3:07 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

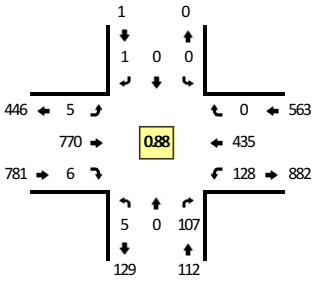
Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

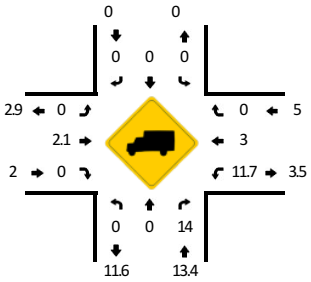
LOCATION: Air Cargo Wy -- Ron Cowan Pkwy
CITY/STATE: Oakland, CA

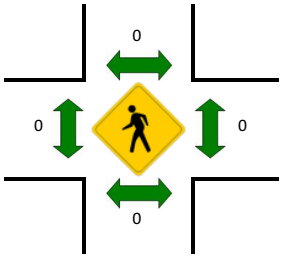
QC JOB #: 15593238
DATE: Tue, Dec 7 2021

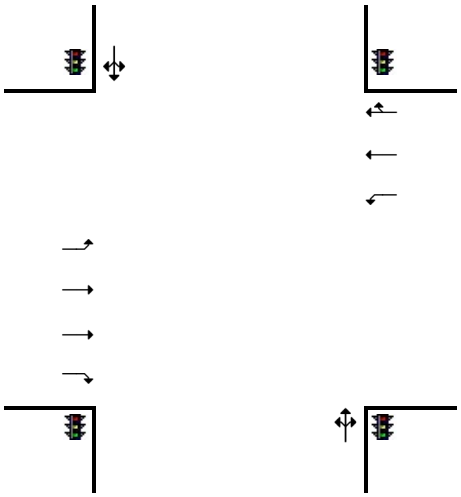
Peak-Hour: 4:00 PM -- 5:00 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

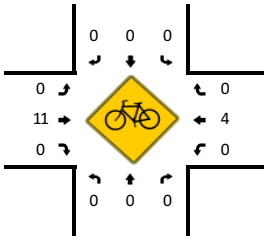


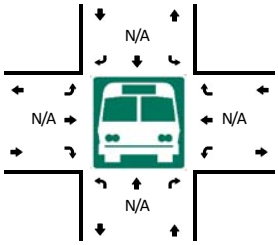


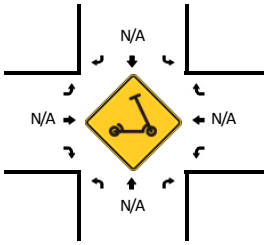












15-Min Count Period Beginning At	Air Cargo Wy (Northbound)				Air Cargo Wy (Southbound)				Ron Cowan Pkwy (Eastbound)				Ron Cowan Pkwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	2	0	29	0	0	0	0	0	0	184	2	0	30	126	0	1	374	
4:15 PM	2	0	26	0	0	0	1	0	0	177	2	2	30	118	0	1	359	
4:30 PM	1	0	29	0	0	0	0	0	0	243	2	2	40	95	0	2	414	
4:45 PM	0	0	23	0	0	0	0	0	0	166	0	1	23	96	0	1	310	1457
5:00 PM	2	0	15	0	0	0	0	0	0	241	3	1	15	73	0	0	350	1433
5:15 PM	0	0	8	0	0	0	0	0	0	163	1	0	21	98	0	1	292	1366
5:30 PM	0	0	11	0	0	0	0	0	0	118	3	0	15	77	0	1	225	1177
5:45 PM	1	1	14	0	0	0	0	0	0	133	2	0	24	65	0	2	242	1109
6:00 PM	2	0	20	0	0	0	0	0	0	138	2	1	19	69	0	0	251	1010
6:15 PM	3	0	6	0	0	0	0	0	0	78	1	0	19	61	0	0	168	886
6:30 PM	4	0	19	0	0	0	0	0	0	71	2	0	15	58	0	0	169	830
6:45 PM	1	0	16	0	0	0	0	0	0	60	0	1	20	48	0	1	147	735
7:00 PM	1	0	12	1	0	0	0	0	0	61	1	0	21	62	0	0	159	643
7:15 PM	1	0	18	0	0	0	0	0	0	48	6	0	34	39	0	0	146	621
7:30 PM	1	0	19	0	0	0	0	0	0	45	2	0	27	57	0	0	151	603
7:45 PM	0	0	14	0	0	0	0	0	0	37	3	1	24	49	0	3	131	587

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	4	0	116	0	0	0	0	0	0	972	8	8	160	380	0	8	1656
Heavy Trucks	0	0	12		0	0	0		0	12	0		20	16	0		60
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	8	0		8
Scooters																	

Comments:

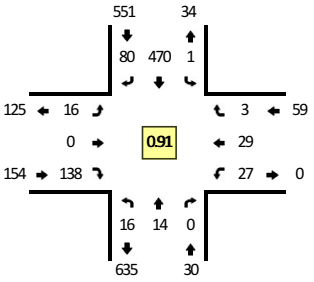
Report generated on 1/7/2022 3:07 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

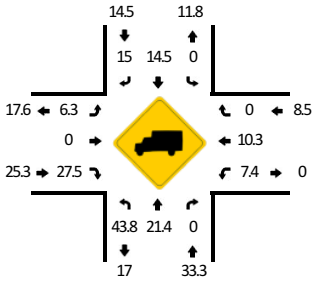
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

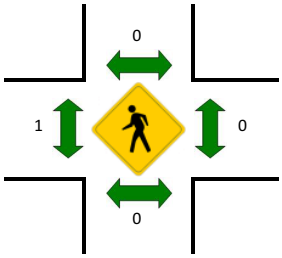
LOCATION: Ron Cowan Pkwy -- John Glenn Dr/Ramp from WB Bessie Coleman Dr | **QC JOB #:** 15593239
CITY/STATE: Oakland, CA | **DATE:** Tue, Dec 7 2021

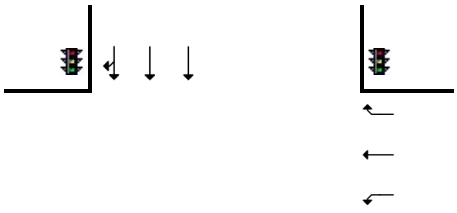
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:30 AM -- 7:45 AM

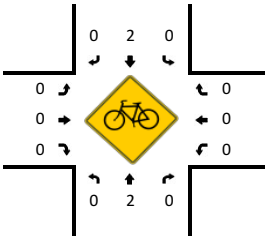


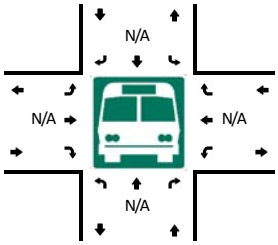




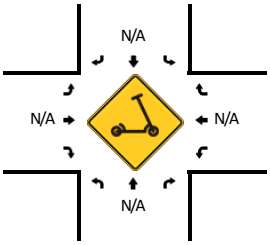












15-Min Count Period Beginning At	Ron Cowan Pkwy (Northbound)				Ron Cowan Pkwy (Southbound)				John Glenn Dr/Ramp from WB Bessie Coleman Dr (Eastbound)				John Glenn Dr/Ramp from WB Bessie Coleman Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	1	4	0	0	0	111	9	1	5	0	41	0	4	2	1	0	179	
7:15 AM	6	4	0	0	0	98	20	0	4	0	34	0	5	14	2	0	187	
7:30 AM	4	1	0	0	0	129	24	0	5	0	39	0	8	9	0	0	219	
7:45 AM	5	5	0	0	0	132	27	0	2	0	24	0	10	4	0	0	209	794
8:00 AM	3	6	0	0	0	103	16	0	9	0	25	0	5	7	0	0	174	789
8:15 AM	3	4	0	0	0	111	13	0	2	0	11	0	4	9	3	0	160	762
8:30 AM	12	4	0	0	0	143	15	0	3	0	12	0	4	8	0	0	201	744
8:45 AM	3	2	0	0	0	109	18	0	4	0	9	0	2	14	2	0	163	698

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	16	4	0	0	0	516	96	0	20	0	156	0	32	36	0	0	876
Heavy Trucks	4	0	0		0	92	8		0	0	52		0	4	0		160
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	4	0		0	4	0		0	0	0		0	0	0		8
Scooters																	

Comments:

Report generated on 1/7/2022 3:07 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

LOCATION: Ron Cowan Pkwy -- John Glenn Dr/Ramp from WB Bessie Coleman Dr

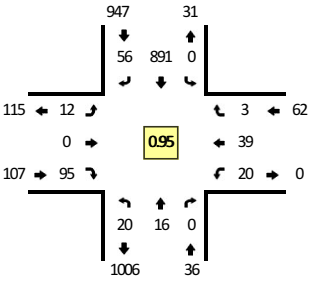
QC JOB #: 15593240

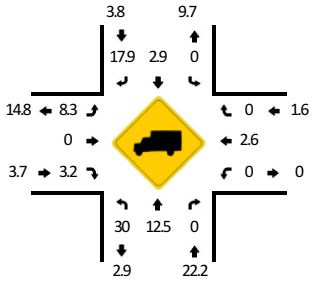
CITY/STATE: Oakland, CA

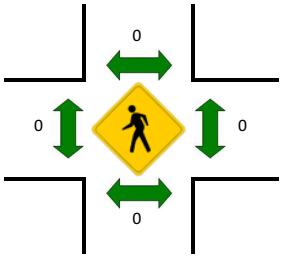
DATE: Tue, Dec 7 2021

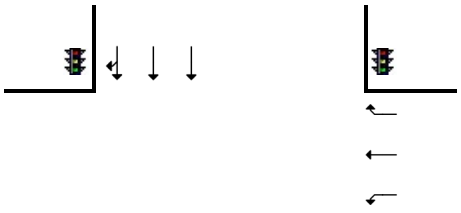
Peak-Hour: 4:15 PM -- 5:15 PM

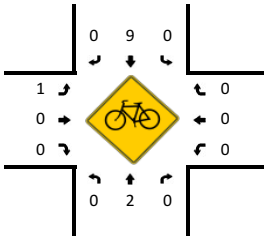
Peak 15-Min: 4:30 PM -- 4:45 PM

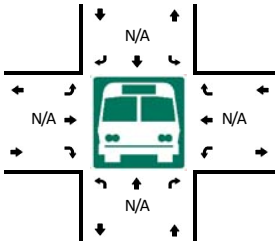




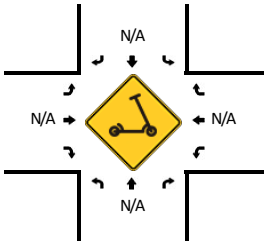












15-Min Count Period Beginning At	Ron Cowan Pkwy (Northbound)				Ron Cowan Pkwy (Southbound)				John Glenn Dr/Ramp from WB Bessie Coleman Dr (Eastbound)				John Glenn Dr/Ramp from WB Bessie Coleman Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	5	9	0	0	0	205	11	0	3	0	16	0	11	12	0	0	272	
4:15 PM	7	5	0	0	0	199	24	0	4	0	24	0	6	12	1	0	282	
4:30 PM	3	4	0	0	0	239	16	0	2	0	22	0	7	8	1	0	302	
4:45 PM	4	3	0	0	0	219	8	0	3	0	26	0	3	10	0	0	276	1132
5:00 PM	6	4	0	0	0	234	8	0	3	0	23	0	4	9	1	0	292	1152
5:15 PM	10	1	0	0	0	185	6	0	1	0	16	0	2	5	1	0	227	1097
5:30 PM	2	5	0	0	0	131	9	0	1	0	14	0	2	8	0	0	172	967
5:45 PM	4	7	0	0	0	134	11	0	1	0	9	0	2	12	0	0	180	871
6:00 PM	6	4	0	0	0	146	12	0	1	0	18	0	1	26	0	0	214	793
6:15 PM	5	4	0	0	0	92	19	0	1	0	23	1	2	31	0	0	178	744
6:30 PM	9	3	0	0	0	91	16	0	2	0	22	0	2	38	1	0	184	756
6:45 PM	5	3	0	0	0	71	30	0	1	0	23	0	1	34	2	0	170	746
7:00 PM	11	4	0	0	0	70	31	0	5	0	21	0	1	21	0	0	164	696
7:15 PM	6	5	0	0	0	63	16	0	3	0	18	0	1	14	0	0	126	644
7:30 PM	3	3	0	0	0	59	8	0	6	0	26	0	0	12	1	0	118	578
7:45 PM	5	3	0	0	0	47	22	0	1	0	25	0	4	9	2	0	118	526

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	12	16	0	0	0	956	64	0	8	0	88	0	28	32	4	0	1208
Heavy Trucks	8	4	0		0	24	8		0	0	4		0	0	0		48
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	8	0		0	12	0		0	0	0		0	0	0		20
Scooters																	

Comments:

Report generated on 1/7/2022 3:07 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

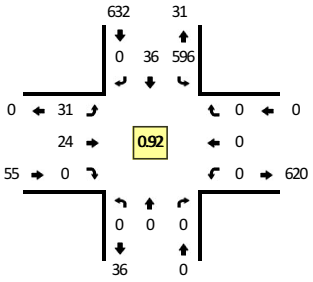
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

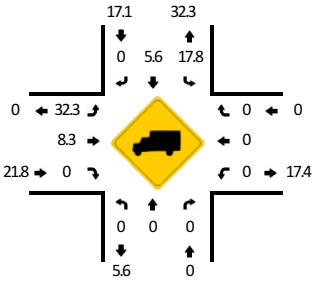
LOCATION: Ron Cowan Pkwy -- Neil Armstrong Wy/Ramp to EB Bessie Coleman Dr | **QC JOB #:** 15593241

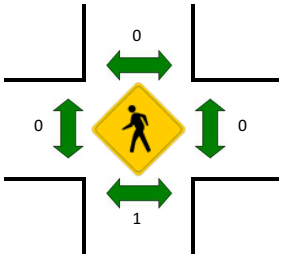
CITY/STATE: Oakland, CA | **DATE:** Tue, Dec 7 2021

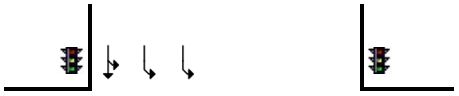
Peak-Hour: 7:00 AM -- 8:00 AM

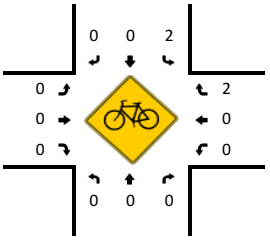
Peak 15-Min: 7:45 AM -- 8:00 AM

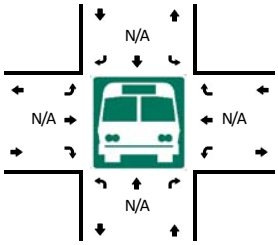




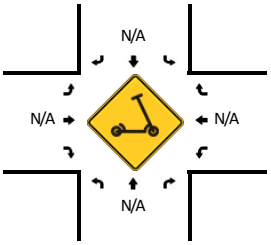












15-Min Count Period Beginning At	Ron Cowan Pkwy (Northbound)				Ron Cowan Pkwy (Southbound)				Neil Armstrong Wy/Ramp to EB Bessie Coleman Dr (Eastbound)				Neil Armstrong Wy/Ramp to EB Bessie Coleman Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	0	0	0	148	7	0	0	6	5	0	0	0	0	0	0	166	
7:15 AM	0	0	0	0	129	8	0	0	9	8	0	0	0	0	0	0	154	
7:30 AM	0	0	0	0	161	10	0	0	7	2	0	0	0	0	0	0	180	
7:45 AM	0	0	0	0	158	11	0	0	9	9	0	0	0	0	0	0	187	687
8:00 AM	0	0	0	0	128	6	0	0	8	3	0	0	0	0	0	0	145	666
8:15 AM	0	0	0	0	125	5	0	0	7	4	0	0	0	0	0	0	141	653
8:30 AM	0	0	0	0	153	5	0	0	16	6	0	0	0	0	0	0	180	653
8:45 AM	0	0	0	0	118	3	0	0	5	10	0	0	0	0	0	0	136	602

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	632	44	0	0	36	36	0	0	0	0	0	0	748
Heavy Trucks	0	0	0		140	8	0		8	4	0		0	0	0		160
Buses																	
Pedestrians		4				0				0				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	4		4
Scooters																	

Comments:

Report generated on 1/7/2022 3:07 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

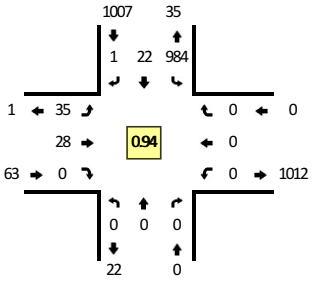
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

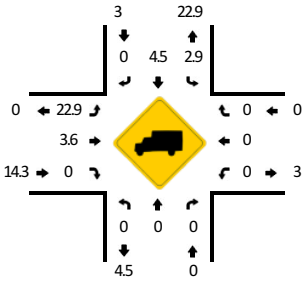
LOCATION: Ron Cowan Pkwy -- Neil Armstrong Wy/Ramp to EB Bessie Coleman Dr | **QC JOB #:** 15593242

CITY/STATE: Oakland, CA | **DATE:** Tue, Dec 7 2021

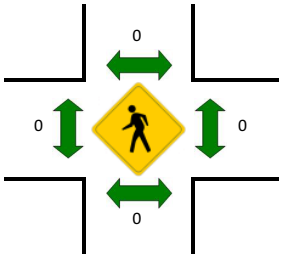
Peak-Hour: 4:15 PM -- 5:15 PM

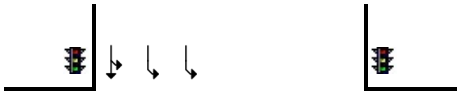
Peak 15-Min: 4:30 PM -- 4:45 PM

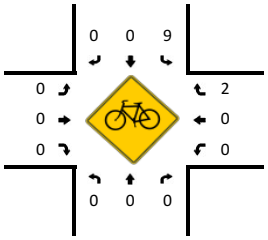


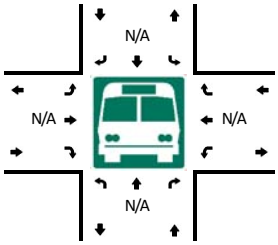


Quality Counts
DATA THAT DRIVES COMMUNITIES

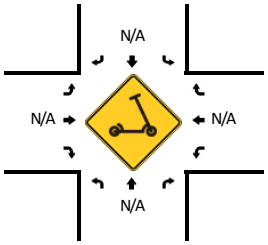












15-Min Count Period Beginning At	Ron Cowan Pkwy (Northbound)				Ron Cowan Pkwy (Southbound)				Neil Armstrong Wy/Ramp to EB Bessie Coleman Dr (Eastbound)				Neil Armstrong Wy/Ramp to EB Bessie Coleman Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	229	12	0	0	13	8	0	0	0	0	0	0	262	
4:15 PM	0	0	0	0	218	8	0	0	12	7	0	0	0	0	0	0	245	
4:30 PM	0	0	0	0	262	7	0	0	7	8	0	0	0	0	0	0	284	
4:45 PM	0	0	0	0	247	1	1	0	7	6	0	0	0	0	0	0	262	1053
5:00 PM	0	0	0	0	257	6	0	0	9	7	0	0	0	0	0	0	279	1070
5:15 PM	0	0	0	0	202	2	0	0	11	9	0	0	0	0	0	0	224	1049
5:30 PM	0	0	0	0	142	2	0	0	7	8	0	0	0	0	0	0	159	924
5:45 PM	0	0	0	0	148	1	0	0	11	0	0	0	0	0	0	0	160	822
6:00 PM	0	0	0	0	165	1	0	0	10	3	0	0	0	0	0	0	179	722
6:15 PM	0	0	0	0	113	2	0	0	9	2	0	0	0	0	0	0	126	624
6:30 PM	0	0	0	0	114	3	0	0	12	3	0	0	0	0	0	0	132	597
6:45 PM	0	0	0	0	95	2	0	0	9	12	1	0	0	0	0	0	119	556
7:00 PM	0	0	0	0	91	2	0	0	14	5	0	0	0	0	0	0	112	489
7:15 PM	0	0	0	0	81	0	0	0	11	14	1	0	0	0	0	0	107	470
7:30 PM	0	0	0	0	86	0	0	0	7	10	0	0	0	0	0	0	103	441
7:45 PM	0	0	0	0	75	3	0	0	7	2	0	0	0	0	0	0	87	409

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	1048	28	0	0	28	32	0	0	0	0	0	0	1136
Heavy Trucks	0	0	0		28	0	0		12	0	0		0	0	0		40
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		12	0	0		0	0	0		0	0	8		20
Scooters																	

Comments:

Report generated on 1/7/2022 3:07 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

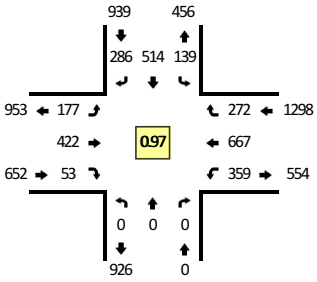
Type of peak hour being reported: Intersection Peak

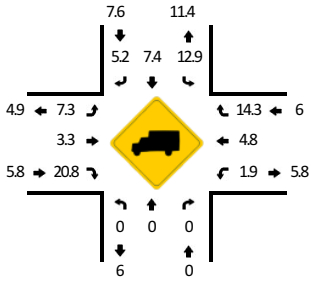
Method for determining peak hour: Total Entering Volume

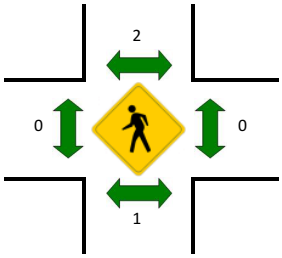
LOCATION: Hegenberger Rd -- Doolittle Dr
CITY/STATE: Oakland, CA

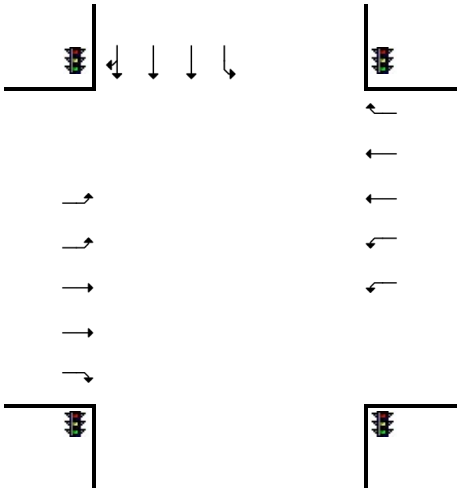
QC JOB #: 15593243
DATE: Thu, Dec 2 2021

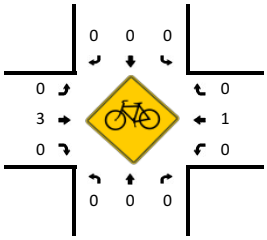
Peak-Hour: 7:45 AM -- 8:45 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

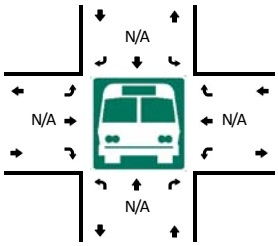


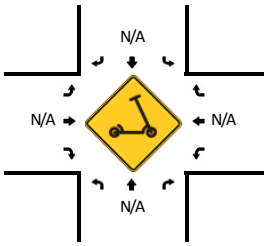












15-Min Count Period Beginning At	Hegenberger Rd (Northbound)				Hegenberger Rd (Southbound)				Doolittle Dr (Eastbound)				Doolittle Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	0	0	0	26	122	42	0	15	79	5	0	44	77	33	0	443	
7:15 AM	0	0	0	0	36	145	43	1	24	69	8	0	49	115	46	0	536	
7:30 AM	0	0	0	0	23	147	67	1	32	92	12	0	57	128	59	0	618	
7:45 AM	0	0	0	0	40	160	78	0	41	91	13	0	81	177	63	0	744	2341
8:00 AM	0	0	0	0	31	143	58	2	42	102	14	0	85	155	67	0	699	2597
8:15 AM	0	0	0	0	30	111	77	3	39	112	13	0	115	169	72	0	741	2802
8:30 AM	0	0	0	0	31	100	73	2	55	117	13	0	78	166	70	0	705	2889
8:45 AM	0	0	0	0	34	102	77	0	44	147	11	0	56	155	47	0	673	2818

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	160	640	312	0	164	364	52	0	324	708	252	0	2976
Heavy Trucks	0	0	0		8	56	20		4	8	8		4	32	32		172
Buses																	
Pedestrians		4				0				0				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	4	0		4
Scooters																	

Comments:

Report generated on 1/7/2022 3:07 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

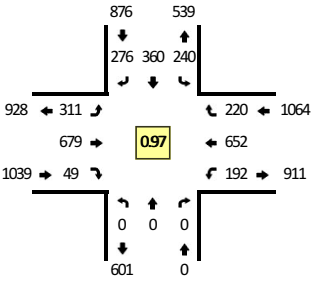
Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

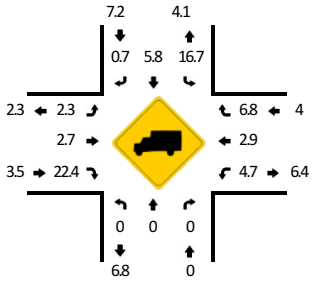
LOCATION: Hegenberger Rd -- Doolittle Dr
CITY/STATE: Oakland, CA

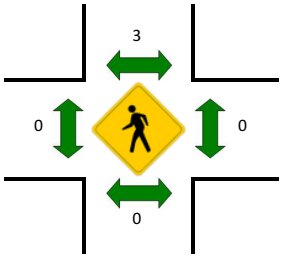
QC JOB #: 15593244
DATE: Thu, Dec 2 2021

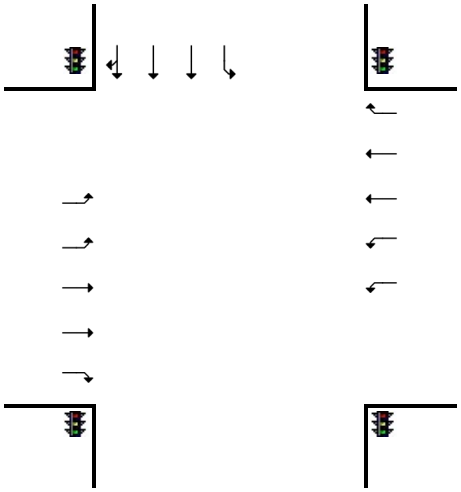
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

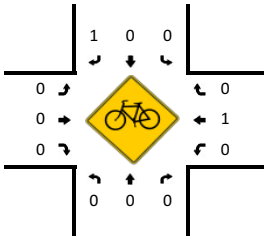


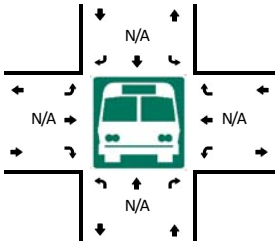


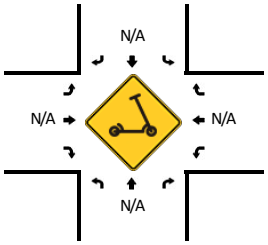












15-Min Count Period Beginning At	Hegenberger Rd (Northbound)				Hegenberger Rd (Southbound)				Doolittle Dr (Eastbound)				Doolittle Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	47	89	73	2	70	182	14	0	50	140	59	0	726	
4:15 PM	0	0	0	0	45	109	55	1	81	153	9	0	57	138	46	0	694	
4:30 PM	0	0	0	0	59	116	53	1	77	147	14	0	64	160	70	0	761	
4:45 PM	0	0	0	0	49	99	65	3	78	170	6	0	23	169	46	0	708	2889
5:00 PM	0	0	0	0	61	75	87	1	77	174	15	0	47	146	58	0	741	2904
5:15 PM	0	0	0	0	63	70	71	3	79	188	14	0	58	177	46	0	769	2979
5:30 PM	0	0	0	0	38	55	56	0	58	180	11	0	34	113	50	0	595	2813
5:45 PM	0	0	0	0	21	53	55	1	47	178	17	1	33	105	46	0	557	2662
6:00 PM	0	0	0	0	23	78	44	1	54	177	35	0	39	119	33	0	603	2524
6:15 PM	0	0	0	0	17	81	45	3	64	201	49	0	39	106	22	0	627	2382
6:30 PM	0	0	0	0	25	85	36	5	63	172	68	0	42	87	23	0	606	2393
6:45 PM	0	0	0	0	27	118	54	1	53	143	32	0	35	76	26	0	565	2401
7:00 PM	0	0	0	0	21	83	32	4	82	104	18	0	32	76	20	0	472	2270
7:15 PM	0	0	0	0	22	91	37	3	46	78	10	0	17	63	15	0	382	2025
7:30 PM	0	0	0	0	12	86	45	1	49	59	16	0	21	54	24	0	367	1786
7:45 PM	0	0	0	0	9	90	32	4	54	63	13	0	29	59	15	0	368	1589

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	252	280	284	12	316	752	56	0	232	708	184	0	3076
Heavy Trucks	0	0	0		16	24	0		8	24	12		8	24	20		136
Buses																	
Pedestrians		0				8				0				0			8
Bicycles	0	0	0		0	0	4		0	0	0		0	0	0		4
Scooters																	

Comments:

Report generated on 1/7/2022 3:07 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

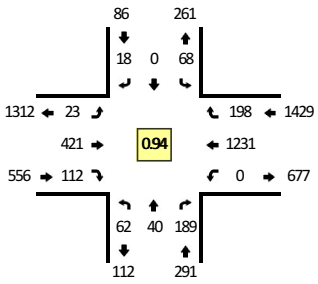
Type of peak hour being reported: Intersection Peak

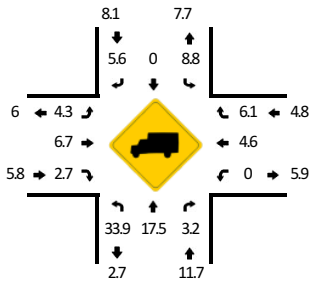
Method for determining peak hour: Total Entering Volume

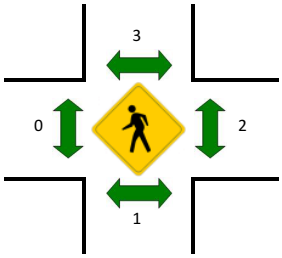
LOCATION: Airport Access Rd/Ramp from NB 98th Ave -- Doolittle Dr
CITY/STATE: Oakland, CA

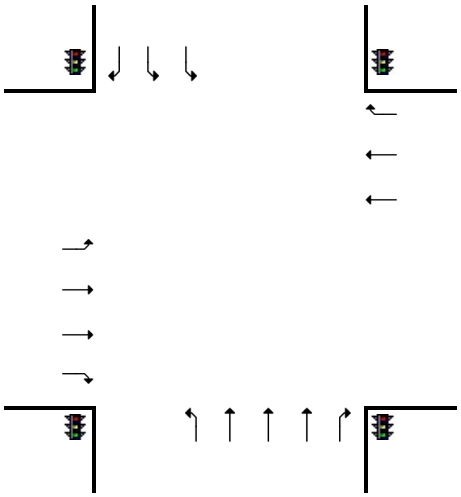
QC JOB #: 15593245
DATE: Thu, Dec 2 2021

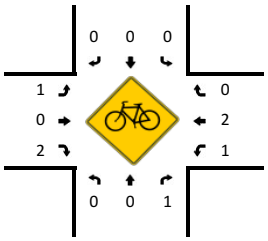
Peak-Hour: 7:45 AM -- 8:45 AM
Peak 15-Min: 8:15 AM -- 8:30 AM

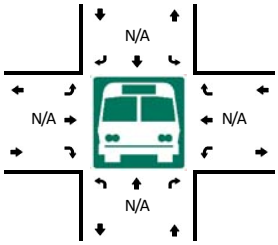


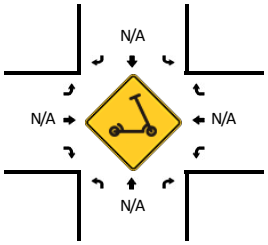












15-Min Count Period Beginning At	Airport Access Rd/Ramp from NB 98th Ave (Northbound)				Airport Access Rd/Ramp from NB 98th Ave (Southbound)				Doolittle Dr (Eastbound)				Doolittle Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	14	11	54	0	14	0	8	0	2	77	21	0	0	131	16	0	348	
7:15 AM	20	13	36	0	7	0	7	0	4	85	21	0	0	181	11	0	385	
7:30 AM	18	13	36	0	17	0	3	0	4	82	27	0	0	225	21	0	446	
7:45 AM	13	8	33	0	12	0	5	0	3	100	28	0	0	324	56	0	582	1761
8:00 AM	17	12	45	0	17	0	2	0	6	104	24	0	0	305	44	0	576	1989
8:15 AM	12	14	48	0	14	0	5	0	6	114	23	0	0	338	54	0	628	2232
8:30 AM	20	6	63	0	24	0	6	1	7	103	37	1	0	264	44	0	576	2362
8:45 AM	11	8	49	0	18	0	3	0	9	139	30	2	0	236	32	0	537	2317

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	48	56	192	0	56	0	20	0	24	456	92	0	0	1352	216	0	2512
Heavy Trucks	16	12	0		4	0	0		0	28	0		0	60	12		132
Buses																	
Pedestrians		0				4				0				4			8
Bicycles	0	0	0		0	0	0		0	0	4		0	4	0		8
Scooters																	

Comments:

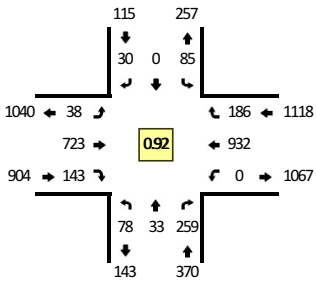
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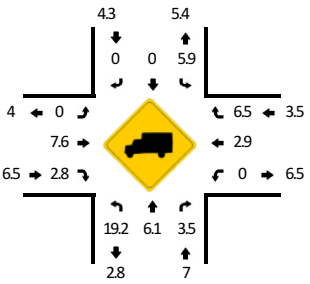
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

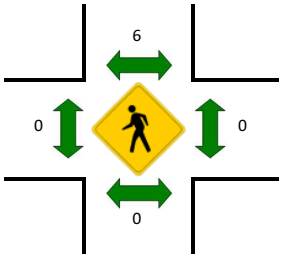
LOCATION: Airport Access Rd/Ramp from NB 98th Ave -- Doolittle Dr | **QC JOB #:** 15593246
CITY/STATE: Oakland, CA | **DATE:** Thu, Dec 2 2021

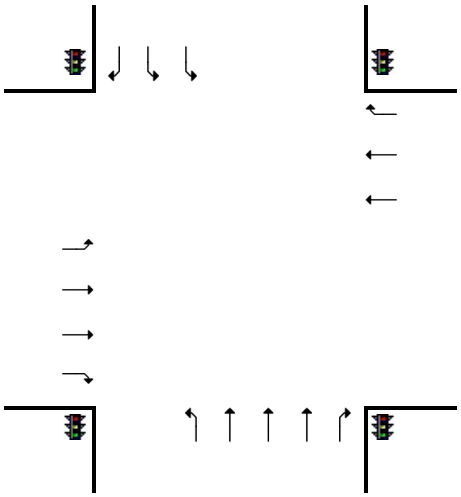
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

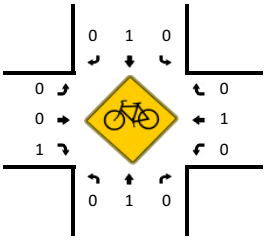


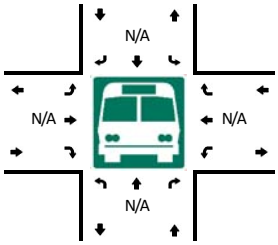


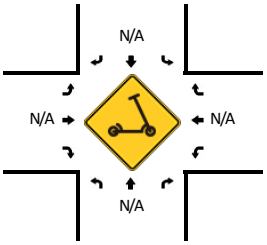
Quality Counts
DATA THAT DRIVES COMMUNITIES











15-Min Count Period Beginning At	Airport Access Rd/Ramp from NB 98th Ave (Northbound)				Airport Access Rd/Ramp from NB 98th Ave (Southbound)				Doolittle Dr (Eastbound)				Doolittle Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	19	18	72	0	33	0	7	0	10	194	33	1	0	215	39	0	641	
4:15 PM	13	8	52	0	22	0	6	0	9	159	34	0	0	243	34	0	580	
4:30 PM	19	10	65	0	19	0	9	0	7	165	32	0	0	268	44	0	638	
4:45 PM	22	10	69	0	25	0	4	0	4	180	26	0	0	210	43	0	593	2452
5:00 PM	21	6	51	0	17	0	7	0	12	175	45	0	0	204	55	0	593	2404
5:15 PM	16	7	74	0	24	0	10	0	15	203	40	0	0	250	44	0	683	2507
5:30 PM	14	6	56	0	17	0	2	0	6	175	41	0	0	190	36	0	543	2412
5:45 PM	12	6	34	0	13	0	7	0	16	144	41	0	0	169	16	0	458	2277
6:00 PM	17	11	37	0	10	0	10	0	9	152	38	0	0	168	13	0	465	2149
6:15 PM	18	10	52	0	11	0	5	0	18	158	43	0	0	138	11	0	464	1930
6:30 PM	24	4	28	0	11	0	8	0	7	145	41	0	0	118	17	0	403	1790
6:45 PM	17	16	31	0	11	0	13	0	12	126	36	0	0	112	21	0	395	1727
7:00 PM	15	16	37	0	8	0	7	0	9	89	28	0	0	109	13	0	331	1593
7:15 PM	15	9	22	0	6	0	2	0	6	62	29	0	0	74	10	0	235	1364
7:30 PM	18	6	15	0	6	0	3	0	10	42	20	0	0	81	11	0	212	1173
7:45 PM	9	3	16	0	7	0	12	0	12	41	18	1	0	78	10	0	207	985

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	64	28	296	0	96	0	40	0	60	812	160	0	0	1000	176	0	2732
Heavy Trucks	12	4	0		8	0	0		0	36	4		0	36	16		116
Buses																	
Pedestrians		0				4				0				0			4
Bicycles	0	0	0		0	0	0		0	0	4		0	0	0		4
Scooters																	

Comments:

Report generated on 1/7/2022 3:07 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212



Appendix B 2021 Intersection Operations Outputs

Oakland Terminal Project

Vistro File: H:\...\22916_Oakland Terminal_20221003.vistro
Report File: H:\...\2019_AM.pdf

Scenario 1 2019 AM
10/3/2022

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Harbor Bay Parkway & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.349	11.2	B
2	Harbor Bay Parkway & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.480	17.5	B
3	Air Cargo Way & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.569	8.1	A
4	Ron Cowan Parkway & John Glenn Dr	Signalized	HCM 7th Edition	EB Right	0.341	20.9	C
5	Ron Cowan Pkwy & Neil Armstrong Way	Signalized	HCM 7th Edition	EB Left	0.195	3.3	A
6	Hegenberger Road & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.517	26.8	C
7	Doolittle Drive & Airport Access Road	Signalized	HCM 7th Edition	EB Left	0.595	17.7	B

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Harbor Bay Parkway & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	11.2
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.349

Intersection Setup

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	2	0
Entry Pocket Length [ft]	100.00	100.00	100.00	550.00	320.00	100.00
No. of Lanes in Exit Pocket	0	1	0	0	0	1
Exit Pocket Length [ft]	0.00	180.00	0.00	0.00	0.00	310.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Base Volume Input [veh/h]	181	23	556	217	28	767
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.30	4.30	2.50	2.80	28.60	3.40
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	181	23	556	217	28	767
Peak Hour Factor	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	46	6	142	55	7	196
Total Analysis Volume [veh/h]	185	23	567	221	29	783
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0		0		0	
v_di, Inbound Pedestrian Volume crossing major street [	0		0		0	
v_co, Outbound Pedestrian Volume crossing minor stree	0		0		0	
v_ci, Inbound Pedestrian Volume crossing minor street [	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		5		2	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Protected	Permissive
Signal Group	8	0	2	0	1	6
Auxiliary Signal Groups						
Lead / Lag	Lead	-	-	-	Lead	-
Minimum Green [s]	11	0	10	0	10	7
Maximum Green [s]	20	0	30	0	20	30
Amber [s]	4.8	0.0	5.2	0.0	4.8	5.2
All red [s]	1.0	0.0	1.0	0.0	1.0	1.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	5.0	0.0	4.0	0.0	2.2	4.0
Walk [s]	11	0	7	0	0	0
Pedestrian Clearance [s]	29	0	28	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No		No			No
I1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	3.8	0.0	4.2	0.0	3.8	4.2
Minimum Recall	No		Yes		No	Yes
Maximum Recall	No		No		No	No
Pedestrian Recall	No		No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	R	L	C
C, Cycle Length [s]	43	43	43	43	43	43
L, Total Lost Time per Cycle [s]	5.80	5.80	6.20	6.20	5.80	6.20
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.80	3.80	4.20	4.20	3.80	4.20
g_i, Effective Green Time [s]	10	10	12	12	3	21
g / C, Green / Cycle	0.23	0.23	0.28	0.28	0.07	0.49
(v / s)_i Volume / Saturation Flow Rate	0.05	0.01	0.16	0.14	0.01	0.22
s, saturation flow rate [veh/h]	3422	1560	3546	1554	2720	3520
c, Capacity [veh/h]	802	366	1011	443	189	1720
d1, Uniform Delay [s]	13.42	12.89	13.17	12.86	18.95	7.28
k, delay calibration	0.23	0.23	0.15	0.15	0.06	0.15
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.31	0.15	0.70	1.24	0.20	0.27
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.23	0.06	0.56	0.50	0.15	0.46
d, Delay for Lane Group [s/veh]	13.73	13.04	13.87	14.10	19.15	7.55
Lane Group LOS	B	B	B	B	B	A
Critical Lane Group	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.65	0.16	2.02	1.62	0.13	1.71
50th-Percentile Queue Length [ft/ln]	16.28	4.07	50.53	40.42	3.17	42.65
95th-Percentile Queue Length [veh/ln]	1.17	0.29	3.64	2.91	0.23	3.07
95th-Percentile Queue Length [ft/ln]	29.30	7.32	90.95	72.75	5.70	76.78

Movement, Approach, & Intersection Results

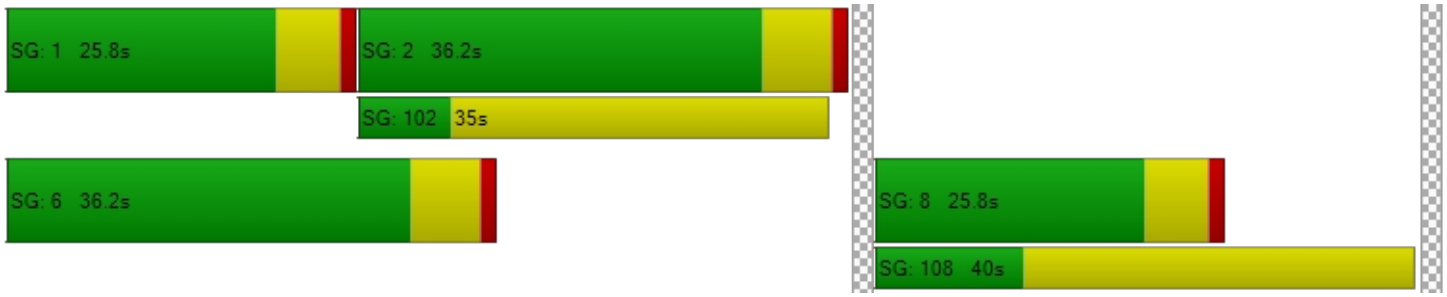
d_M, Delay for Movement [s/veh]	13.73	13.04	13.87	14.10	19.15	7.55
Movement LOS	B	B	B	B	B	A
d_A, Approach Delay [s/veh]	13.66		13.93		7.97	
Approach LOS	B		B		A	
d_I, Intersection Delay [s/veh]	11.22					
Intersection LOS	B					
Intersection V/C	0.349					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	15.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	12.00	9.20	0.00
I_p,int, Pedestrian LOS Score for Intersection	2.484	2.589	0.000
Crosswalk LOS	B	B	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	926	1389	1389
d_b, Bicycle Delay [s]	6.23	2.02	2.02
I_b,int, Bicycle LOS Score for Intersection	1.560	2.210	2.230
Bicycle LOS	A	B	B

Sequence

Ring 1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Harbor Bay Parkway & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	17.5
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.480

Intersection Setup

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	190.00	100.00	300.00	190.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	0	0	0	170	0	257	151	291	0	0	836	106
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	0.00	10.60	2.00	1.20	4.60	9.60	0.00	2.00	2.90	2.80
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	170	0	257	151	291	0	0	836	106
Peak Hour Factor	1.0000	1.0000	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	47	0	71	41	80	0	0	230	29
Total Analysis Volume [veh/h]	0	0	0	187	0	282	166	320	0	0	919	116
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			3		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Overla	Permis	Overla	Protect	Overla	Overla	Permis	Permis	Overla
Signal Group	0	0	4	3	0	3	5	2	2	0	6	6
Auxiliary Signal Groups				3,4		3,5		2,3	2,3			3,4,6
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	6	9	0	9	10	8	8	0	10	10
Maximum Green [s]	0	0	45	27	0	27	18	34	34	0	40	40
Amber [s]	0.0	0.0	3.6	4.1	0.0	4.1	4.1	4.8	4.8	0.0	4.8	4.8
All red [s]	0.0	0.0	1.2	1.2	0.0	1.2	1.2	1.2	1.2	0.0	1.2	1.2
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	3.0	3.2	0.0	3.2	2.5	3.2	3.2	0.0	3.2	3.2
Walk [s]	0	0	6	0	0	0	0	0	0	0	6	6
Pedestrian Clearance [s]	0	0	36	0	0	0	0	0	0	0	28	28
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk			No	No				No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	2.8	3.3	0.0	3.3	3.3	4.0	4.0	0.0	4.0	4.0
Minimum Recall			No	No		No	No	Yes	Yes		Yes	Yes
Maximum Recall			No	No		No	No	No	No		No	No
Pedestrian Recall			No	No		No	No	No	No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	20.0	20.0	0.0	20.0	20.0	20.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	R	L	R	L	C	R	C	R
C, Cycle Length [s]	74	74	74	74	74	74	74	74
L, Total Lost Time per Cycle [s]	4.80	4.80	5.30	5.30	5.30	5.30	6.00	4.80
l1_p, Permitted Start-Up Lost Time [s]	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.80	0.00	0.00	3.30	0.00	0.00	4.00	4.00
g_i, Effective Green Time [s]	6	24	39	10	58	58	24	48
g / C, Green / Cycle	0.08	0.33	0.52	0.13	0.78	0.78	0.32	0.65
(v / s)_i Volume / Saturation Flow Rate	0.00	0.08	0.10	0.05	0.10	0.00	0.26	0.07
s, saturation flow rate [veh/h]	1615	2411	2790	3386	3343	1615	3535	1566
c, Capacity [veh/h]	128	885	1458	443	2621	1266	1146	1021
d1, Uniform Delay [s]	0.00	20.93	9.35	29.40	1.91	0.00	22.83	3.11
k, delay calibration	0.11	0.12	0.12	0.08	0.12	0.12	0.12	0.12
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.00	0.13	0.07	0.39	0.02	0.00	1.47	0.05
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.00	0.21	0.19	0.38	0.12	0.00	0.80	0.11
d, Delay for Lane Group [s/veh]	0.00	21.06	9.42	29.79	1.93	0.00	24.29	3.17
Lane Group LOS	A	C	A	C	A	A	C	A
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	Yes
50th-Percentile Queue Length [veh/ln]	0.00	1.10	1.10	1.33	0.28	0.00	7.08	0.34
50th-Percentile Queue Length [ft/ln]	0.00	27.56	27.48	33.35	7.07	0.00	176.89	8.54
95th-Percentile Queue Length [veh/ln]	0.00	1.98	1.98	2.40	0.51	0.00	11.44	0.61
95th-Percentile Queue Length [ft/ln]	0.00	49.61	49.46	60.02	12.73	0.00	285.95	15.37

Movement, Approach, & Intersection Results

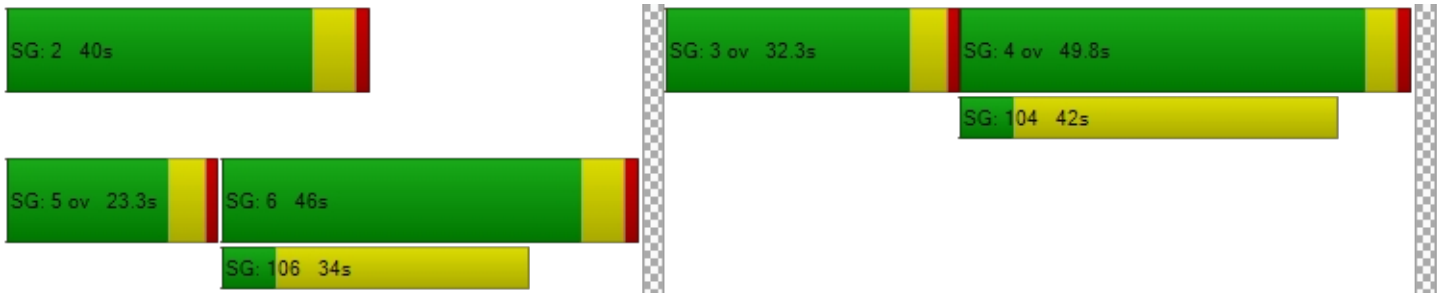
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	21.06	0.00	9.42	29.79	1.93	0.00	0.00	24.29	3.17
Movement LOS			A	C		A	C	A	A		C	A
d_A, Approach Delay [s/veh]	0.00			14.06			11.45			21.93		
Approach LOS	A			B			B			C		
d_I, Intersection Delay [s/veh]	17.51											
Intersection LOS	B											
Intersection V/C	0.480											

Other Modes

g_Walk,mi, Effective Walk Time [s]	-6.0	10.0	-5.3	10.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	43.28	27.71	42.53	27.71
l_p,int, Pedestrian LOS Score for Intersection	1.723	2.565	2.837	2.838
Crosswalk LOS	A	B	C	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1215	2087	170	1080
d_b, Bicycle Delay [s]	5.71	0.07	31.01	7.85
l_b,int, Bicycle LOS Score for Intersection	1.560	1.560	1.961	2.413
Bicycle LOS	A	A	A	B

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Air Cargo Way & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	8.1
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.569

Intersection Setup

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	160.00	100.00	160.00	375.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			Yes		

Volumes

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	11	3	139	0	0	0	3	392	16	121	905	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	25.90	0.00	0.00	0.00	0.00	6.40	0.00	15.70	2.80	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	11	3	139	0	0	0	3	392	16	121	905	0
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	1	37	0	0	0	1	105	4	33	243	0
Total Analysis Volume [veh/h]	12	3	149	0	0	0	3	422	17	130	973	0
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			1			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	3.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	26	0	0	0	0	0	24	0	0	18	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	R	L	C	C
C, Cycle Length [s]	24	24	24	24	24	24	24	24
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	3	3	0	6	6	3	9	9
g / C, Green / Cycle	0.14	0.14	0.00	0.25	0.25	0.12	0.37	0.37
(v / s)_i Volume / Saturation Flow Rate	0.10	0.00	0.00	0.12	0.01	0.08	0.26	0.26
s, saturation flow rate [veh/h]	1699	809	1810	3435	1580	1585	1858	1858
c, Capacity [veh/h]	395	260	8	858	395	194	683	683
d1, Uniform Delay [s]	10.05	0.00	12.21	7.89	7.00	10.32	6.66	6.66
k, delay calibration	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.26	0.00	9.65	0.16	0.02	1.50	0.52	0.52
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.42	0.00	0.36	0.49	0.04	0.67	0.71	0.71
d, Delay for Lane Group [s/veh]	10.31	0.00	21.86	8.05	7.01	11.82	7.18	7.18
Lane Group LOS	B	A	C	A	A	B	A	A
Critical Lane Group	Yes	No	Yes	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.57	0.00	0.03	0.55	0.04	0.52	1.04	1.04
50th-Percentile Queue Length [ft/ln]	14.20	0.00	0.85	13.85	1.00	12.96	25.95	25.95
95th-Percentile Queue Length [veh/ln]	1.02	0.00	0.06	1.00	0.07	0.93	1.87	1.87
95th-Percentile Queue Length [ft/ln]	25.56	0.00	1.52	24.93	1.80	23.33	46.71	46.71

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	10.31	10.31	10.31	0.00	0.00	0.00	21.86	8.05	7.01	11.82	7.18	7.18
Movement LOS	B	B	B	A	A	A	C	A	A	B	A	A
d_A, Approach Delay [s/veh]	10.31			0.00			8.11			7.73		
Approach LOS	B			A			A			A		
d_I, Intersection Delay [s/veh]	8.08											
Intersection LOS	A											
Intersection V/C	0.569											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	3.71	3.71	0.00	3.71
I_p,int, Pedestrian LOS Score for Intersection	1.776	1.628	0.000	2.536
Crosswalk LOS	A	A	F	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	2450	2450	2450	2450
d_b, Bicycle Delay [s]	0.62	0.62	0.62	0.62
I_b,int, Bicycle LOS Score for Intersection	1.830	1.560	1.924	2.470
Bicycle LOS	A	A	A	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Ron Cowan Parkway & John Glenn Dr

Control Type:	Signalized	Delay (sec / veh):	20.9
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.341

Intersection Setup

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	220.00	100.00	220.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			Yes			No		

Volumes

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Base Volume Input [veh/h]	16	14	0	0	470	80	16	0	138	27	29	3
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	43.80	21.40	2.00	2.00	14.50	15.00	6.30	2.00	27.50	7.40	10.30	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	16	14	0	0	470	80	16	0	138	27	29	3
Peak Hour Factor	0.9100	0.9100	1.0000	1.0000	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	4	0	0	129	22	4	0	38	7	8	1
Total Analysis Volume [veh/h]	18	15	0	0	516	88	18	0	152	30	32	3
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			1			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			1			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			2			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	76
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	ProtPer	Permis	Permis	Permis	Permis	Permis	Split	Permis	Split	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	2	0	1	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	10	0	0	10	0	4	10	0	4	4	0
Maximum Green [s]	10	20	0	0	20	0	15	20	0	10	15	0
Amber [s]	4.0	4.0	0.0	0.0	4.0	0.0	3.5	4.0	0.0	4.0	3.5	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	13	34	0	0	21	0	15	21	0	13	27	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	0	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	Yes	Yes			Yes		No				No	
Maximum Recall	No	No			No		No				No	
Pedestrian Recall	No	No			No		No				No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	C	C	C	L	C	R
C, Cycle Length [s]	76	76	76	76	76	76	76	76
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	49	49	40	40	11	4	4	4
g / C, Green / Cycle	0.65	0.65	0.53	0.53	0.14	0.05	0.05	0.05
(v / s)_i Volume / Saturation Flow Rate	0.02	0.01	0.13	0.13	0.13	0.02	0.02	0.00
s, saturation flow rate [veh/h]	724	1437	3203	1545	1279	1704	1745	1615
c, Capacity [veh/h]	560	935	1704	822	185	79	81	75
d1, Uniform Delay [s]	5.28	4.69	9.52	9.57	32.05	35.17	35.20	34.62
k, delay calibration	0.11	0.50	0.50	0.50	0.18	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.02	0.03	0.33	0.71	23.88	2.96	3.08	0.22
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.03	0.02	0.24	0.24	0.92	0.38	0.39	0.04
d, Delay for Lane Group [s/veh]	5.30	4.72	9.85	10.28	55.93	38.13	38.28	34.83
Lane Group LOS	A	A	A	B	E	D	D	C
Critical Lane Group	Yes	No	No	Yes	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.09	0.08	1.69	1.78	4.20	0.59	0.63	0.06
50th-Percentile Queue Length [ft/ln]	2.26	1.90	42.15	44.47	105.10	14.80	15.80	1.41
95th-Percentile Queue Length [veh/ln]	0.16	0.14	3.03	3.20	7.57	1.07	1.14	0.10
95th-Percentile Queue Length [ft/ln]	4.06	3.42	75.87	80.05	189.16	26.64	28.44	2.54

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	5.30	4.72	0.00	0.00	9.94	10.28	55.93	0.00	55.93	38.13	38.28	34.83
Movement LOS	A	A			A	B	E		E	D	D	C
d_A, Approach Delay [s/veh]	5.04			9.99			55.93			38.06		
Approach LOS	A			A			E			D		
d_I, Intersection Delay [s/veh]	20.85											
Intersection LOS	C											
Intersection V/C	0.341											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	9.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	5015.56	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	29.54	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	1.872	0.000
Crosswalk LOS	F	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	763	421	276	592
d_b, Bicycle Delay [s]	14.55	23.71	28.23	18.83
I_b,int, Bicycle LOS Score for Intersection	1.587	1.892	1.840	1.667
Bicycle LOS	A	A	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Ron Cowan Pkwy & Neil Armstrong Way

Control Type:	Signalized	Delay (sec / veh):	3.3
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.195

Intersection Setup

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	2
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	139.61
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No					
Crosswalk	Yes			No			Yes			No		

Volumes

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Base Volume Input [veh/h]	0	0	0	596	36	0	31	24	0	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	17.80	5.60	2.00	32.30	8.30	2.00	2.00	2.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	596	36	0	31	24	0	0	0	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9200	0.9200	1.0000	0.9200	0.9200	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	162	10	0	8	7	0	0	0	0
Total Analysis Volume [veh/h]	0	0	0	648	39	0	34	26	0	0	0	0
Presence of On-Street Parking				No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	38
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	6.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Permis	Split	Split	Permis	Permis	Permis	Permis
Signal Group	0	0	0	4	6	0	5	4	0	0	0	6
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	0	0	5
Maximum Green [s]	0	0	0	11	11	0	5	11	0	0	0	11
Amber [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0
Split [s]	0	0	0	15	23	0	0	15	0	0	0	23
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
Walk [s]	0	0	0	0	4	0	0	0	0	0	0	4
Pedestrian Clearance [s]	0	0	0	0	7	0	0	0	0	0	0	7
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No				
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
Minimum Recall					No			No				
Maximum Recall					No			No				
Pedestrian Recall					No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	L	C	
C, Cycle Length [s]		38	38	38	38	
L, Total Lost Time per Cycle [s]		4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]		2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]		28	28	2	2	
g / C, Green / Cycle		0.73	0.73	0.06	0.06	
(v / s)_i Volume / Saturation Flow Rate		0.14	0.14	0.02	0.02	
s, saturation flow rate [veh/h]		3020	1742	1348	1756	
c, Capacity [veh/h]		2192	1265	85	111	
d1, Uniform Delay [s]		1.66	1.66	16.98	16.97	
k, delay calibration		0.50	0.50	0.11	0.11	
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]		0.20	0.35	2.05	1.51	
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	
Rp, platoon ratio		1.00	1.00	1.00	1.00	
PF, progression factor		1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity		0.20	0.20	0.31	0.30	
d, Delay for Lane Group [s/veh]		1.87	2.02	19.03	18.48	
Lane Group LOS		A	A	B	B	
Critical Lane Group		Yes	No	Yes	No	
50th-Percentile Queue Length [veh/ln]		0.06	0.12	0.24	0.29	
50th-Percentile Queue Length [ft/ln]		1.55	3.09	5.94	7.15	
95th-Percentile Queue Length [veh/ln]		0.11	0.22	0.43	0.51	
95th-Percentile Queue Length [ft/ln]		2.79	5.57	10.69	12.87	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	1.92	2.02	0.00	18.95	18.48	0.00	0.00	0.00	0.00
Movement LOS				A	A		B	B				
d_A, Approach Delay [s/veh]	0.00			1.92			18.72			0.00		
Approach LOS	A			A			B			A		
d_I, Intersection Delay [s/veh]	3.27											
Intersection LOS	A											
Intersection V/C	0.195											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	8.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	9.58	0.00	11.83	0.00
l_p,int, Pedestrian LOS Score for Intersection	1.409	0.000	1.700	0.000
Crosswalk LOS	A	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1001	579	0
d_b, Bicycle Delay [s]	18.98	4.74	9.58	18.98
l_b,int, Bicycle LOS Score for Intersection	4.132	2.693	1.659	4.132
Bicycle LOS	D	B	A	D

Sequence

Ring 1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: Hegenberger Road & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	26.8
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.517

Intersection Setup

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	2	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	210.00	100.00	210.00	275.00	100.00	160.00	275.00	100.00	210.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	1	0	0	1
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	0	0	0	240	360	276	311	679	49	192	652	220
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	17.00	6.00	1.00	2.00	3.00	22.00	5.00	3.00	7.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	240	360	276	311	679	49	192	652	220
Peak Hour Factor	1.0000	1.0000	1.0000	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	62	93	71	80	175	13	49	168	57
Total Analysis Volume [veh/h]	0	0	0	247	371	285	321	700	51	198	672	227
Presence of On-Street Parking				No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	99.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Split	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	0	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	0	0	30	45	0	35	45	0	25	40	0
Amber [s]	0.0	0.0	0.0	3.0	4.0	0.0	3.0	4.5	0.0	3.0	4.5	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	43	0	18	38	0	19	39	0
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	0	0	0	31	0	0	0	0	0	26	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	3.0	0.0	2.0	3.5	0.0	2.0	3.5	0.0
Minimum Recall					No		No	Yes		No	Yes	
Maximum Recall					No		No	No		No	No	
Pedestrian Recall					No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	C	L	C	R	L	C	R
C, Cycle Length [s]		100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	4.00	5.50	5.50	4.00	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	2.00	3.50	3.50	2.00	3.50	3.50
g_i, Effective Green Time [s]		22	22	22	11	55	55	8	52	52
g / C, Green / Cycle		0.22	0.22	0.22	0.11	0.55	0.55	0.08	0.52	0.52
(v / s)_i Volume / Saturation Flow Rate		0.16	0.11	0.19	0.09	0.20	0.04	0.06	0.19	0.15
s, saturation flow rate [veh/h]		1567	3446	1518	3459	3532	1334	3375	3532	1507
c, Capacity [veh/h]		349	768	338	398	1946	735	275	1828	780
d1, Uniform Delay [s]		35.91	33.90	37.23	43.23	12.58	10.49	44.89	14.40	13.70
k, delay calibration		0.11	0.11	0.11	0.11	0.50	0.50	0.11	0.50	0.50
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		2.65	0.47	5.70	3.92	0.52	0.18	3.56	0.57	0.95
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity		0.71	0.48	0.84	0.81	0.36	0.07	0.72	0.37	0.29
d, Delay for Lane Group [s/veh]		38.55	34.37	42.93	47.14	13.10	10.67	48.45	14.97	14.64
Lane Group LOS		D	C	D	D	B	B	D	B	B
Critical Lane Group		No	No	Yes	Yes	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]		5.75	3.94	7.11	4.06	4.32	0.54	2.52	4.50	3.01
50th-Percentile Queue Length [ft/ln]		143.75	98.62	177.69	101.51	107.97	13.62	62.98	112.61	75.16
95th-Percentile Queue Length [veh/ln]		9.68	7.10	11.48	7.31	7.73	0.98	4.53	7.99	5.41
95th-Percentile Queue Length [ft/ln]		242.06	177.51	287.00	182.73	193.18	24.52	113.36	199.63	135.29

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	38.55	34.37	42.93	47.14	13.10	10.67	48.45	14.97	14.64
Movement LOS				D	C	D	D	B	B	D	B	B
d_A, Approach Delay [s/veh]	0.00			38.22			23.18			20.94		
Approach LOS	A			D			C			C		
d_I, Intersection Delay [s/veh]	26.80											
Intersection LOS	C											
Intersection V/C	0.517											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	39.64	39.64	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	2.694	2.881	0.000
Crosswalk LOS	F	B	C	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	759	650	670
d_b, Bicycle Delay [s]	50.03	19.26	22.81	22.15
l_b,int, Bicycle LOS Score for Intersection	4.132	2.056	2.444	2.465
Bicycle LOS	D	B	B	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: Doolittle Drive & Airport Access Road

Control Type:	Signalized	Delay (sec / veh):	17.7
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.595

Intersection Setup

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	1	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	62	40	189	68	0	18	23	421	0	0	1231	198
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	33.90	17.50	3.20	8.80	2.00	5.60	4.30	6.70	2.00	2.00	4.60	6.10
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	62	40	189	68	0	18	23	421	0	0	1231	198
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	1.0000	0.9400	0.9400	0.9400	1.0000	1.0000	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	16	11	50	18	0	5	6	112	0	0	327	53
Total Analysis Volume [veh/h]	66	43	201	72	0	19	24	448	0	0	1310	211
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	1			2			0			1		
v_di, Inbound Pedestrian Volume crossing major street [	0			1			1			2		
v_co, Outbound Pedestrian Volume crossing minor stree	1			0			0			1		
v_ci, Inbound Pedestrian Volume crossing minor street [	1			0			0			1		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			0			2			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	41.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Permis	Split	Protect	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	4	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	5	0	5	0	0	5	5	0	0	5	0
Maximum Green [s]	0	65	0	30	0	0	20	55	0	0	35	0
Amber [s]	0.0	4.0	0.0	3.0	0.0	0.0	3.0	4.5	0.0	0.0	4.5	0.0
All red [s]	0.0	1.0	0.0	1.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	33	0	18	0	0	15	49	0	0	34	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	0	0	0	0	0	0	5	0
Pedestrian Clearance [s]	0	23	0	0	0	0	0	0	0	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No		No				No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No		No			No	Yes			Yes	
Maximum Recall		No		No			No	No			No	
Pedestrian Recall		No		No			No	No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	0.0	0.0	20.0	20.0	0.0	0.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	R	L	C	C	R
C, Cycle Length [s]	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	17	17	17	5	5	2	67	60	60
g / C, Green / Cycle	0.17	0.17	0.17	0.05	0.05	0.02	0.67	0.60	0.60
(v / s)_i Volume / Saturation Flow Rate	0.05	0.01	0.13	0.02	0.01	0.01	0.13	0.38	0.14
s, saturation flow rate [veh/h]	1325	4460	1548	3270	1544	1748	3426	3486	1515
c, Capacity [veh/h]	221	743	258	152	72	43	2285	2099	912
d1, Uniform Delay [s]	36.59	35.10	39.85	46.54	46.08	48.28	6.39	12.69	9.19
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.75	0.03	5.06	2.27	1.94	10.55	0.19	1.41	0.59
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.30	0.06	0.78	0.47	0.26	0.55	0.20	0.62	0.23
d, Delay for Lane Group [s/veh]	37.34	35.14	44.91	48.81	48.02	58.82	6.58	14.11	9.78
Lane Group LOS	D	D	D	D	D	E	A	B	A
Critical Lane Group	No	No	Yes	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.46	0.30	5.04	0.92	0.49	0.72	1.70	8.96	2.14
50th-Percentile Queue Length [ft/ln]	36.39	7.40	125.96	22.94	12.33	17.92	42.47	224.09	53.59
95th-Percentile Queue Length [veh/ln]	2.62	0.53	8.72	1.65	0.89	1.29	3.06	13.87	3.86
95th-Percentile Queue Length [ft/ln]	65.49	13.32	217.99	41.30	22.19	32.25	76.45	346.84	96.46

Movement, Approach, & Intersection Results

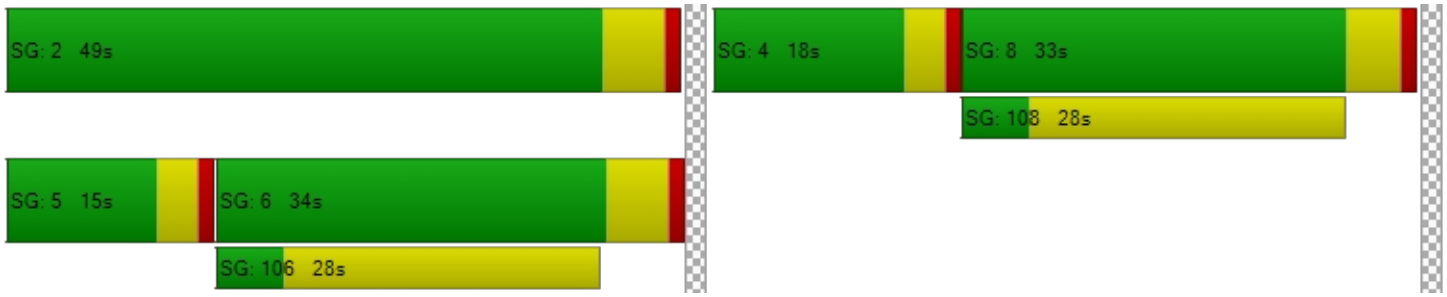
d_M, Delay for Movement [s/veh]	37.34	35.14	44.91	48.81	0.00	48.02	58.82	6.58	0.00	0.00	14.11	9.78
Movement LOS	D	D	D	D		D	E	A			B	A
d_A, Approach Delay [s/veh]	41.94			48.65			9.24			13.51		
Approach LOS	D			D			A			B		
d_I, Intersection Delay [s/veh]	17.68											
Intersection LOS	B											
Intersection V/C	0.595											

Other Modes

g_Walk,mi, Effective Walk Time [s]	43.5	9.0	14.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	15.99	41.44	37.01	41.44
l_p,int, Pedestrian LOS Score for Intersection	2.329	2.652	2.666	2.744
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	560	280	869	570
d_b, Bicycle Delay [s]	25.96	37.01	16.00	25.62
l_b,int, Bicycle LOS Score for Intersection	1.730	1.560	1.949	2.814
Bicycle LOS	A	A	A	C

Sequence

Ring 1	-	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Oakland Terminal Project

Vistro File: H:\...\22916_Oakland Terminal_20221003.vistro
Report File: H:\...\2019_PM.pdf

Scenario 2 2019 PM
10/3/2022

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Harbor Bay Parkway & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.408	12.1	B
2	Harbor Bay Parkway & Ron Cowan Parkway	Signalized	HCM 7th Edition	WB Thru	0.315	10.3	B
3	Air Cargo Way & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.602	8.2	A
4	Ron Cowan Parkway & John Glenn Dr	Signalized	HCM 7th Edition	EB Right	0.340	13.1	B
5	Ron Cowan Pkwy & Neil Armstrong Way	Signalized	HCM 7th Edition	EB Left	0.270	3.2	A
6	Hegenberger Road & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.517	26.8	C
7	Doolittle Drive & Airport Access Road	Signalized	HCM 7th Edition	EB Left	0.570	20.0	B

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Harbor Bay Parkway & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	12.1
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.408

Intersection Setup

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	2	0
Entry Pocket Length [ft]	100.00	100.00	100.00	550.00	320.00	100.00
No. of Lanes in Exit Pocket	0	1	0	0	0	1
Exit Pocket Length [ft]	0.00	180.00	0.00	0.00	0.00	310.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Base Volume Input [veh/h]	259	46	822	122	30	755
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.80	10.90	3.00	0.00	3.30	0.70
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	259	46	822	122	30	755
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	69	12	219	32	8	201
Total Analysis Volume [veh/h]	276	49	874	130	32	803
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0		0		0	
v_di, Inbound Pedestrian Volume crossing major street [	0		0		0	
v_co, Outbound Pedestrian Volume crossing minor stree	0		0		0	
v_ci, Inbound Pedestrian Volume crossing minor street [	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		6		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Protected	Permissive
Signal Group	8	0	2	0	1	6
Auxiliary Signal Groups						
Lead / Lag	Lead	-	-	-	Lead	-
Minimum Green [s]	11	0	10	0	10	7
Maximum Green [s]	20	0	30	0	20	30
Amber [s]	4.8	0.0	5.2	0.0	4.8	5.2
All red [s]	1.0	0.0	1.0	0.0	1.0	1.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	5.0	0.0	4.0	0.0	2.2	4.0
Walk [s]	11	0	7	0	0	0
Pedestrian Clearance [s]	29	0	28	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No		No			No
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	2.0
l2, Clearance Lost Time [s]	3.8	0.0	4.2	0.0	3.8	4.2
Minimum Recall	No		Yes		No	Yes
Maximum Recall	No		No		No	No
Pedestrian Recall	No		No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	R	L	C
C, Cycle Length [s]	51	51	51	51	51	51
L, Total Lost Time per Cycle [s]	5.80	5.80	6.20	6.20	5.80	6.20
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.80	3.80	4.20	4.20	3.80	4.20
g_i, Effective Green Time [s]	11	11	19	19	4	28
g / C, Green / Cycle	0.21	0.21	0.37	0.37	0.07	0.55
(v / s)_i Volume / Saturation Flow Rate	0.08	0.03	0.25	0.08	0.01	0.22
s, saturation flow rate [veh/h]	3492	1476	3532	1590	3422	3598
c, Capacity [veh/h]	745	315	1293	582	248	1986
d1, Uniform Delay [s]	17.19	16.37	13.65	11.17	22.20	6.60
k, delay calibration	0.23	0.23	0.15	0.15	0.06	0.15
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.66	0.49	0.89	0.27	0.12	0.19
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.37	0.16	0.68	0.22	0.13	0.40
d, Delay for Lane Group [s/veh]	17.84	16.86	14.54	11.45	22.33	6.79
Lane Group LOS	B	B	B	B	C	A
Critical Lane Group	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.31	0.46	3.71	0.91	0.17	1.85
50th-Percentile Queue Length [ft/ln]	32.67	11.54	92.70	22.70	4.26	46.23
95th-Percentile Queue Length [veh/ln]	2.35	0.83	6.67	1.63	0.31	3.33
95th-Percentile Queue Length [ft/ln]	58.81	20.77	166.86	40.87	7.66	83.21

Movement, Approach, & Intersection Results

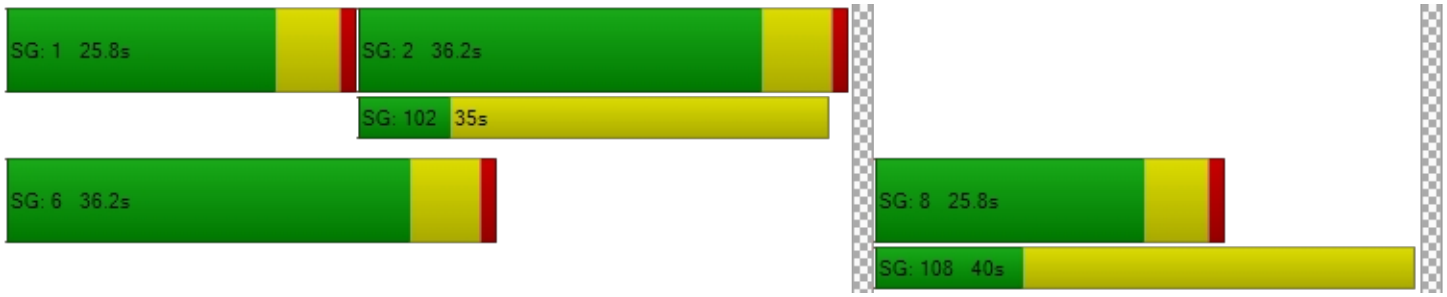
d_M, Delay for Movement [s/veh]	17.84	16.86	14.54	11.45	22.33	6.79
Movement LOS	B	B	B	B	C	A
d_A, Approach Delay [s/veh]	17.69		14.14		7.39	
Approach LOS	B		B		A	
d_I, Intersection Delay [s/veh]	12.07					
Intersection LOS	B					
Intersection V/C	0.408					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	15.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	15.71	12.73	0.00
l_p,int, Pedestrian LOS Score for Intersection	2.500	2.665	0.000
Crosswalk LOS	B	B	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	784	1175	1175
d_b, Bicycle Delay [s]	9.44	4.35	4.34
l_b,int, Bicycle LOS Score for Intersection	1.560	2.388	2.248
Bicycle LOS	A	B	B

Sequence

Ring 1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Harbor Bay Parkway & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	10.3
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.315

Intersection Setup

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	190.00	100.00	300.00	190.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	0	0	0	111	0	151	231	730	0	0	286	181
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	0.00	3.60	2.00	1.30	0.90	2.60	0.00	2.00	5.20	1.70
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	111	0	151	231	730	0	0	286	181
Peak Hour Factor	1.0000	1.0000	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	30	0	41	63	201	0	0	79	50
Total Analysis Volume [veh/h]	0	0	0	122	0	166	254	802	0	0	314	199
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			2			4			6		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Overla	Permis	Overla	Protect	Overla	Overla	Permis	Permis	Overla
Signal Group	0	0	4	3	0	3	5	2	2	0	6	6
Auxiliary Signal Groups				3,4		3,5		2,3	2,3			3,4,6
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	6	9	0	9	10	8	8	0	10	10
Maximum Green [s]	0	0	45	27	0	27	18	34	34	0	40	40
Amber [s]	0.0	0.0	3.6	4.1	0.0	4.1	4.1	4.8	4.8	0.0	4.8	4.8
All red [s]	0.0	0.0	1.2	1.2	0.0	1.2	1.2	1.2	1.2	0.0	1.2	1.2
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	3.0	3.2	0.0	3.2	2.5	3.2	3.2	0.0	3.2	3.2
Walk [s]	0	0	6	0	0	0	0	0	0	0	6	6
Pedestrian Clearance [s]	0	0	36	0	0	0	0	0	0	0	28	28
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk			No	No				No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	2.8	3.3	0.0	3.3	3.3	4.0	4.0	0.0	4.0	4.0
Minimum Recall			No	No		No	No	Yes	Yes		Yes	Yes
Maximum Recall			No	No		No	No	No	No		No	No
Pedestrian Recall			No	No		No	No	No	No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	20.0	20.0	0.0	20.0	20.0	20.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	R	L	R	L	C	R	C	R
C, Cycle Length [s]	62	62	62	62	62	62	62	62
L, Total Lost Time per Cycle [s]	4.80	4.80	5.30	5.30	5.30	5.30	6.00	4.80
l1_p, Permitted Start-Up Lost Time [s]	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.80	0.00	0.00	3.30	0.00	0.00	4.00	4.00
g_i, Effective Green Time [s]	5	26	40	10	46	46	10	36
g / C, Green / Cycle	0.09	0.41	0.65	0.16	0.75	0.75	0.16	0.58
(v / s)_i Volume / Saturation Flow Rate	0.00	0.06	0.06	0.07	0.23	0.00	0.09	0.13
s, saturation flow rate [veh/h]	1615	2146	2787	3489	3543	1615	3469	1582
c, Capacity [veh/h]	141	999	1820	560	2654	1210	566	916
d1, Uniform Delay [s]	0.00	14.97	3.93	23.44	2.51	0.00	23.75	4.04
k, delay calibration	0.11	0.12	0.12	0.08	0.12	0.12	0.12	0.12
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.00	0.06	0.02	0.43	0.07	0.00	0.93	0.13
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.00	0.12	0.09	0.45	0.30	0.00	0.55	0.22
d, Delay for Lane Group [s/veh]	0.00	15.03	3.95	23.87	2.58	0.00	24.68	4.17
Lane Group LOS	A	B	A	C	A	A	C	A
Critical Lane Group	No	Yes	No	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.00	0.46	0.27	1.60	0.75	0.00	2.05	0.64
50th-Percentile Queue Length [ft/ln]	0.00	11.47	6.85	40.10	18.76	0.00	51.14	15.98
95th-Percentile Queue Length [veh/ln]	0.00	0.83	0.49	2.89	1.35	0.00	3.68	1.15
95th-Percentile Queue Length [ft/ln]	0.00	20.64	12.33	72.18	33.77	0.00	92.05	28.77

Movement, Approach, & Intersection Results

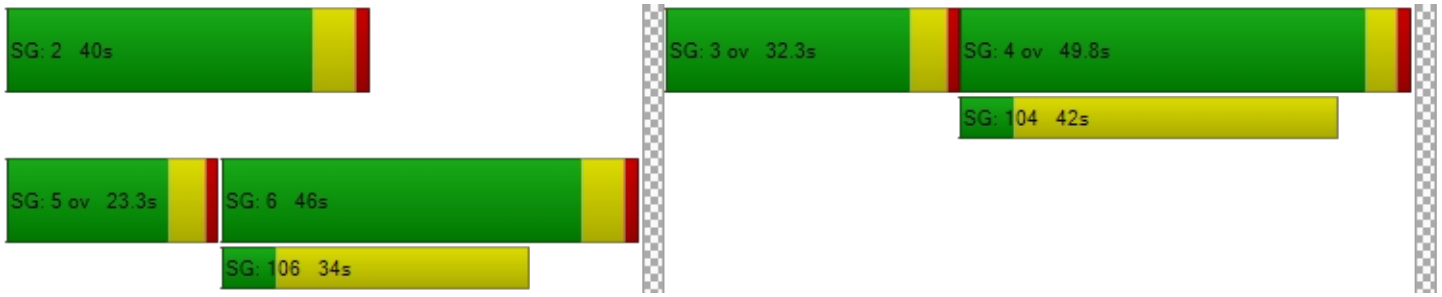
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	15.03	0.00	3.95	23.87	2.58	0.00	0.00	24.68	4.17
Movement LOS			A	B		A	C	A	A		C	A
d_A, Approach Delay [s/veh]	0.00			8.65			7.70			16.72		
Approach LOS	A			A			A			B		
d_I, Intersection Delay [s/veh]	10.34											
Intersection LOS	B											
Intersection V/C	0.315											

Other Modes

g_Walk,mi, Effective Walk Time [s]	-6.0	10.0	-5.3	10.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	37.07	21.59	36.31	21.59
l_p,int, Pedestrian LOS Score for Intersection	1.717	2.554	2.809	2.719
Crosswalk LOS	A	B	C	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1462	2511	205	1300
d_b, Bicycle Delay [s]	2.23	2.01	24.85	3.79
l_b,int, Bicycle LOS Score for Intersection	1.560	1.560	2.431	1.983
Bicycle LOS	A	A	B	A

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Air Cargo Way & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	8.2
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.602

Intersection Setup

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	160.00	100.00	160.00	375.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			Yes		

Volumes

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	5	0	107	0	0	1	5	770	6	128	435	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	14.00	0.00	0.00	0.00	0.00	2.10	0.00	11.70	3.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	0	107	0	0	1	5	770	6	128	435	0
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	0	30	0	0	0	1	219	2	36	124	0
Total Analysis Volume [veh/h]	6	0	122	0	0	1	6	875	7	145	494	0
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			11			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	3.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	26	0	0	0	0	0	24	0	0	18	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	R	L	C	C
C, Cycle Length [s]	28	28	28	28	28	28	28	28
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	3	3	0	9	9	3	13	13
g / C, Green / Cycle	0.11	0.11	0.01	0.34	0.34	0.12	0.45	0.45
(v / s)_i Volume / Saturation Flow Rate	0.07	0.00	0.00	0.25	0.00	0.09	0.13	0.13
s, saturation flow rate [veh/h]	1712	615	1810	3558	1563	1642	1855	1855
c, Capacity [veh/h]	329	198	15	1205	529	201	839	839
d1, Uniform Delay [s]	11.97	11.08	13.92	8.18	6.20	11.93	4.88	4.88
k, delay calibration	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.28	0.00	5.94	0.32	0.00	1.85	0.07	0.07
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.39	0.01	0.39	0.73	0.01	0.72	0.29	0.29
d, Delay for Lane Group [s/veh]	12.25	11.09	19.86	8.50	6.20	13.78	4.95	4.95
Lane Group LOS	B	B	B	A	A	B	A	A
Critical Lane Group	Yes	No	No	Yes	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	0.58	0.00	0.05	1.38	0.02	0.74	0.42	0.42
50th-Percentile Queue Length [ft/ln]	14.61	0.11	1.36	34.48	0.42	18.38	10.39	10.39
95th-Percentile Queue Length [veh/ln]	1.05	0.01	0.10	2.48	0.03	1.32	0.75	0.75
95th-Percentile Queue Length [ft/ln]	26.29	0.19	2.45	62.06	0.75	33.09	18.71	18.71

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	12.25	12.25	12.25	11.09	11.09	11.09	19.86	8.50	6.20	13.78	4.95	4.95
Movement LOS	B	B	B	B	B	B	B	A	A	B	A	A
d_A, Approach Delay [s/veh]	12.25			11.09			8.56			6.96		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	8.23											
Intersection LOS	A											
Intersection V/C	0.602											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	5.21	5.21	0.00	5.21
l_p,int, Pedestrian LOS Score for Intersection	1.775	1.642	0.000	2.542
Crosswalk LOS	A	A	F	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	2135	2135	2135	2135
d_b, Bicycle Delay [s]	0.06	0.06	0.06	0.06
l_b,int, Bicycle LOS Score for Intersection	1.771	1.561	2.292	2.087
Bicycle LOS	A	A	B	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Ron Cowan Parkway & John Glenn Dr

Control Type:	Signalized	Delay (sec / veh):	13.1
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.340

Intersection Setup

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	220.00	100.00	220.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			Yes			No		

Volumes

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Base Volume Input [veh/h]	20	16	0	0	891	56	12	0	95	20	39	3
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	30.00	12.50	2.00	2.00	2.90	17.90	8.30	2.00	3.20	0.00	2.60	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	20	16	0	0	891	56	12	0	95	20	39	3
Peak Hour Factor	0.9500	0.9500	1.0000	1.0000	0.9500	0.9500	0.9500	1.0000	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	4	0	0	234	15	3	0	25	5	10	1
Total Analysis Volume [veh/h]	21	17	0	0	938	59	13	0	100	21	41	3
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			9			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	76
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	ProtPer	Permis	Permis	Permis	Permis	Permis	Split	Permis	Split	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	2	0	1	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	10	0	0	10	0	4	10	0	4	4	0
Maximum Green [s]	10	20	0	0	20	0	15	20	0	10	15	0
Amber [s]	4.0	4.0	0.0	0.0	4.0	0.0	3.5	4.0	0.0	4.0	3.5	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	13	34	0	0	21	0	15	21	0	13	27	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	0	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	Yes	Yes			Yes		No				No	
Maximum Recall	No	No			No		No				No	
Pedestrian Recall	No	No			No		No				No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	C	C	C	L	C	R
C, Cycle Length [s]	76	76	76	76	76	76	76	76
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	53	53	44	44	7	4	4	4
g / C, Green / Cycle	0.70	0.70	0.58	0.58	0.09	0.05	0.05	0.05
(v / s)_i Volume / Saturation Flow Rate	0.04	0.01	0.19	0.19	0.07	0.01	0.02	0.00
s, saturation flow rate [veh/h]	587	1558	3535	1791	1594	1810	1861	1615
c, Capacity [veh/h]	505	1093	2059	1043	150	84	87	75
d1, Uniform Delay [s]	4.17	3.43	8.16	8.13	33.55	34.96	35.33	34.62
k, delay calibration	0.11	0.50	0.50	0.50	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.03	0.03	0.42	0.80	7.34	1.53	3.98	0.22
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.04	0.02	0.32	0.32	0.75	0.25	0.47	0.04
d, Delay for Lane Group [s/veh]	4.21	3.45	8.57	8.94	40.89	36.49	39.31	34.83
Lane Group LOS	A	A	A	A	D	D	D	C
Critical Lane Group	Yes	No	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.08	0.07	2.54	2.65	2.28	0.40	0.82	0.06
50th-Percentile Queue Length [ft/ln]	2.08	1.66	63.51	66.18	57.05	10.06	20.48	1.41
95th-Percentile Queue Length [veh/ln]	0.15	0.12	4.57	4.76	4.11	0.72	1.47	0.10
95th-Percentile Queue Length [ft/ln]	3.74	2.99	114.31	119.12	102.68	18.11	36.86	2.54

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	4.21	3.45	0.00	0.00	8.68	8.94	40.89	0.00	40.89	36.49	39.31	34.83
Movement LOS	A	A			A	A	D		D	D	D	C
d_A, Approach Delay [s/veh]	3.87			8.69			40.89			38.19		
Approach LOS	A			A			D			D		
d_I, Intersection Delay [s/veh]	13.12											
Intersection LOS	B											
Intersection V/C	0.340											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	9.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	29.54	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	1.840	0.000
Crosswalk LOS	F	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	763	421	276	592
d_b, Bicycle Delay [s]	14.55	23.79	28.23	18.83
I_b,int, Bicycle LOS Score for Intersection	1.591	2.108	1.746	1.667
Bicycle LOS	A	B	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Ron Cowan Pkwy & Neil Armstrong Way

Control Type:	Signalized	Delay (sec / veh):	3.2
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.270

Intersection Setup

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	2
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	139.61
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No					
Crosswalk	Yes			No			Yes			No		

Volumes

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Base Volume Input [veh/h]	0	0	0	984	22	0	35	28	0	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.90	4.50	2.00	22.90	3.60	2.00	2.00	2.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	984	22	0	35	28	0	0	0	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9400	0.9400	1.0000	0.9400	0.9400	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	262	6	0	9	7	0	0	0	0
Total Analysis Volume [veh/h]	0	0	0	1047	23	0	37	30	0	0	0	0
Presence of On-Street Parking				No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	38
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	6.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Permis	Split	Split	Permis	Permis	Permis	Permis
Signal Group	0	0	0	4	6	0	5	4	0	0	0	6
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	0	0	5
Maximum Green [s]	0	0	0	11	11	0	5	11	0	0	0	11
Amber [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0
Split [s]	0	0	0	15	23	0	0	15	0	0	0	23
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
Walk [s]	0	0	0	0	4	0	0	0	0	0	0	4
Pedestrian Clearance [s]	0	0	0	0	7	0	0	0	0	0	0	7
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No				
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
Minimum Recall					No			No				
Maximum Recall					No			No				
Pedestrian Recall					No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	L	C	
C, Cycle Length [s]		38	38	38	38	
L, Total Lost Time per Cycle [s]		4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]		2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]		27	27	3	3	
g / C, Green / Cycle		0.72	0.72	0.07	0.07	
(v / s)_i Volume / Saturation Flow Rate		0.21	0.21	0.02	0.02	
s, saturation flow rate [veh/h]		3434	1751	1482	1830	
c, Capacity [veh/h]		2476	1262	101	125	
d1, Uniform Delay [s]		1.86	1.86	16.82	16.81	
k, delay calibration		0.50	0.50	0.11	0.11	
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]		0.29	0.57	1.66	1.29	
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	
Rp, platoon ratio		1.00	1.00	1.00	1.00	
PF, progression factor		1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity		0.29	0.29	0.30	0.29	
d, Delay for Lane Group [s/veh]		2.15	2.43	18.48	18.10	
Lane Group LOS		A	A	B	B	
Critical Lane Group		Yes	No	Yes	No	
50th-Percentile Queue Length [veh/ln]		0.12	0.22	0.26	0.30	
50th-Percentile Queue Length [ft/ln]		3.05	5.54	6.57	7.59	
95th-Percentile Queue Length [veh/ln]		0.22	0.40	0.47	0.55	
95th-Percentile Queue Length [ft/ln]		5.49	9.97	11.83	13.67	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	2.24	2.43	0.00	18.43	18.10	0.00	0.00	0.00	0.00
Movement LOS				A	A		B	B				
d_A, Approach Delay [s/veh]	0.00			2.25			18.27			0.00		
Approach LOS	A			A			B			A		
d_I, Intersection Delay [s/veh]	3.19											
Intersection LOS	A											
Intersection V/C	0.270											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	8.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	9.58	0.00	11.83	0.00
l_p,int, Pedestrian LOS Score for Intersection	1.394	0.000	1.704	0.000
Crosswalk LOS	A	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1001	579	0
d_b, Bicycle Delay [s]	18.98	4.74	9.58	18.98
l_b,int, Bicycle LOS Score for Intersection	4.132	3.325	1.670	4.132
Bicycle LOS	D	C	A	D

Sequence

Ring 1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: Hegenberger Road & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	26.8
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.517

Intersection Setup

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	2	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	210.00	100.00	210.00	275.00	100.00	160.00	275.00	100.00	210.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	1	0	0	1
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	0	0	0	240	360	276	311	679	49	192	652	220
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	16.70	5.80	0.70	2.30	2.70	22.40	4.70	2.90	6.80
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	240	360	276	311	679	49	192	652	220
Peak Hour Factor	1.0000	1.0000	1.0000	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	62	93	71	80	175	13	49	168	57
Total Analysis Volume [veh/h]	0	0	0	247	371	285	321	700	51	198	672	227
Presence of On-Street Parking				No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			2			0			1		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			1			0			2		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	99.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Split	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	0	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	0	0	30	45	0	35	45	0	25	40	0
Amber [s]	0.0	0.0	0.0	3.0	4.0	0.0	3.0	4.5	0.0	3.0	4.5	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	43	0	18	38	0	19	39	0
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	0	0	0	31	0	0	0	0	0	26	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	3.0	0.0	2.0	3.5	0.0	2.0	3.5	0.0
Minimum Recall					No		No	Yes		No	Yes	
Maximum Recall					No		No	No		No	No	
Pedestrian Recall					No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	C	L	C	R	L	C	R
C, Cycle Length [s]		100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	4.00	5.50	5.50	4.00	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	2.00	3.50	3.50	2.00	3.50	3.50
g_i, Effective Green Time [s]		22	22	22	11	55	55	8	52	52
g / C, Green / Cycle		0.22	0.22	0.22	0.11	0.55	0.55	0.08	0.52	0.52
(v / s)_i Volume / Saturation Flow Rate		0.16	0.11	0.19	0.09	0.20	0.04	0.06	0.19	0.15
s, saturation flow rate [veh/h]		1571	3452	1521	3450	3540	1329	3384	3535	1507
c, Capacity [veh/h]		349	768	338	397	1953	733	275	1829	780
d1, Uniform Delay [s]		35.92	33.91	37.25	43.22	12.55	10.47	44.89	14.39	13.69
k, delay calibration		0.11	0.11	0.11	0.11	0.50	0.50	0.11	0.50	0.50
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		2.63	0.47	5.69	3.93	0.51	0.18	3.55	0.57	0.95
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity		0.71	0.48	0.84	0.81	0.36	0.07	0.72	0.37	0.29
d, Delay for Lane Group [s/veh]		38.55	34.39	42.93	47.15	13.07	10.65	48.44	14.96	14.63
Lane Group LOS		D	C	D	D	B	B	D	B	B
Critical Lane Group		No	No	Yes	Yes	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]		5.75	3.95	7.11	4.06	4.31	0.54	2.52	4.50	3.00
50th-Percentile Queue Length [ft/ln]		143.71	98.64	177.68	101.53	107.76	13.61	62.97	112.56	75.12
95th-Percentile Queue Length [veh/ln]		9.68	7.10	11.48	7.31	7.72	0.98	4.53	7.98	5.41
95th-Percentile Queue Length [ft/ln]		242.01	177.55	286.99	182.76	192.88	24.50	113.35	199.55	135.22

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	38.55	34.39	42.93	47.15	13.07	10.65	48.44	14.96	14.63
Movement LOS				D	C	D	D	B	B	D	B	B
d_A, Approach Delay [s/veh]	0.00			38.22			23.16			20.94		
Approach LOS	A			D			C			C		
d_I, Intersection Delay [s/veh]	26.79											
Intersection LOS	C											
Intersection V/C	0.517											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	2176.70	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	39.64	39.64	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	2.694	2.881	0.000
Crosswalk LOS	F	B	C	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	759	650	670
d_b, Bicycle Delay [s]	50.03	19.26	22.81	22.15
l_b,int, Bicycle LOS Score for Intersection	4.132	2.056	2.444	2.465
Bicycle LOS	D	B	B	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: Doolittle Drive & Airport Access Road

Control Type:	Signalized	Delay (sec / veh):	20.0
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.570

Intersection Setup

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	1	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	78	33	259	85	0	30	38	723	0	0	932	186
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	19.20	6.10	3.50	5.90	2.00	0.00	0.00	7.60	2.00	2.00	2.90	6.50
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	78	33	259	85	0	30	38	723	0	0	932	186
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	1.0000	0.9200	0.9200	0.9200	1.0000	1.0000	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	21	9	70	23	0	8	10	196	0	0	253	51
Total Analysis Volume [veh/h]	85	36	282	92	0	33	41	786	0	0	1013	202
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			3			0			3		
v_di, Inbound Pedestrian Volume crossing major street [	0			3			0			3		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			1			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	41.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Permis	Split	Protect	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	4	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	5	0	5	0	0	5	5	0	0	5	0
Maximum Green [s]	0	65	0	30	0	0	20	55	0	0	35	0
Amber [s]	0.0	4.0	0.0	3.0	0.0	0.0	3.0	4.5	0.0	0.0	4.5	0.0
All red [s]	0.0	1.0	0.0	1.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	33	0	18	0	0	15	49	0	0	34	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	0	0	0	0	0	0	5	0
Pedestrian Clearance [s]	0	23	0	0	0	0	0	0	0	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No		No				No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No		No			No	Yes			Yes	
Maximum Recall		No		No			No	No			No	
Pedestrian Recall		No		No			No	No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	0.0	0.0	20.0	20.0	0.0	0.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	R	L	C	C	R
C, Cycle Length [s]	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	22	22	22	5	5	3	62	54	54
g / C, Green / Cycle	0.22	0.22	0.22	0.05	0.05	0.03	0.62	0.54	0.54
(v / s)_i Volume / Saturation Flow Rate	0.06	0.01	0.18	0.03	0.02	0.02	0.23	0.29	0.13
s, saturation flow rate [veh/h]	1535	4926	1550	3350	1588	1810	3400	3535	1508
c, Capacity [veh/h]	331	1062	334	164	78	62	2093	1913	816
d1, Uniform Delay [s]	32.61	31.04	37.55	46.56	46.23	47.76	9.62	14.77	12.14
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.41	0.01	5.82	2.98	3.63	11.17	0.52	1.05	0.72
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.26	0.03	0.84	0.56	0.42	0.66	0.38	0.53	0.25
d, Delay for Lane Group [s/veh]	33.02	31.05	43.37	49.54	49.86	58.93	10.14	15.82	12.86
Lane Group LOS	C	C	D	D	D	E	B	B	B
Critical Lane Group	No	No	Yes	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.74	0.23	7.05	1.18	0.87	1.20	4.13	7.27	2.45
50th-Percentile Queue Length [ft/ln]	43.52	5.75	176.19	29.56	21.80	29.97	103.20	181.75	61.37
95th-Percentile Queue Length [veh/ln]	3.13	0.41	11.40	2.13	1.57	2.16	7.43	11.69	4.42
95th-Percentile Queue Length [ft/ln]	78.34	10.36	285.04	53.20	39.25	53.94	185.77	292.29	110.47

Movement, Approach, & Intersection Results

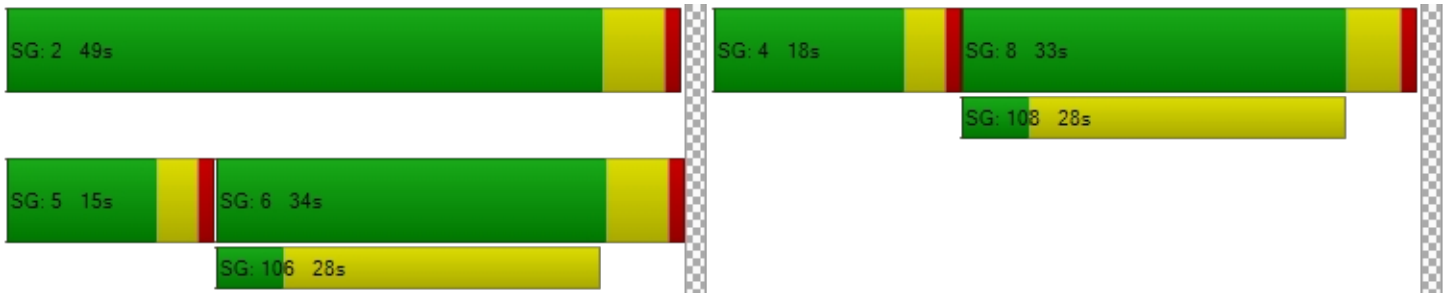
d_M, Delay for Movement [s/veh]	33.02	31.05	43.37	49.54	0.00	49.86	58.93	10.14	0.00	0.00	15.82	12.86
Movement LOS	C	C	D	D		D	E	B			B	B
d_A, Approach Delay [s/veh]	40.09			49.63			12.56			15.33		
Approach LOS	D			D			B			B		
d_I, Intersection Delay [s/veh]	19.99											
Intersection LOS	B											
Intersection V/C	0.570											

Other Modes

g_Walk,mi, Effective Walk Time [s]	43.5	9.0	14.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	15.99	41.44	37.01	41.44
l_p,int, Pedestrian LOS Score for Intersection	2.347	2.657	2.684	2.770
Crosswalk LOS	B	B	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	560	280	869	570
d_b, Bicycle Delay [s]	25.96	37.03	16.00	25.60
l_b,int, Bicycle LOS Score for Intersection	1.781	1.560	2.242	2.562
Bicycle LOS	A	A	B	B

Sequence

Ring 1	-	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Oakland Terminal Project

Vistro File: H:\...\22916_Oakland Terminal_20221003.vistro
Report File: H:\...\2019_PlusProject_AM.pdf

Scenario 3 2019 AM Plus Project
10/3/2022

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Harbor Bay Parkway & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.349	11.2	B
2	Harbor Bay Parkway & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.480	17.5	B
3	Air Cargo Way & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.576	8.1	A
4	Ron Cowan Parkway & John Glenn Dr	Signalized	HCM 7th Edition	EB Right	0.234	12.5	B
5	Ron Cowan Pkwy & Neil Armstrong Way	Signalized	HCM 7th Edition	EB Thru	0.217	5.4	A
6	Hegenberger Road & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.539	26.8	C
7	Doolittle Drive & Airport Access Road	Signalized	HCM 7th Edition	EB Left	0.618	19.4	B

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Harbor Bay Parkway & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	11.2
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.349

Intersection Setup

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	2	0
Entry Pocket Length [ft]	100.00	100.00	100.00	550.00	320.00	100.00
No. of Lanes in Exit Pocket	0	1	0	0	0	1
Exit Pocket Length [ft]	0.00	180.00	0.00	0.00	0.00	310.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Base Volume Input [veh/h]	181	23	556	217	28	767
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.30	4.30	2.50	2.80	28.60	3.40
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	-2	0	4	-4	0	2
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	179	23	560	213	28	769
Peak Hour Factor	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	46	6	143	54	7	196
Total Analysis Volume [veh/h]	183	23	571	217	29	785
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0		0		0	
v_di, Inbound Pedestrian Volume crossing major street [	0		0		0	
v_co, Outbound Pedestrian Volume crossing minor stree	0		0		0	
v_ci, Inbound Pedestrian Volume crossing minor street [	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		5		2	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Protected	Permissive
Signal Group	8	0	2	0	1	6
Auxiliary Signal Groups						
Lead / Lag	Lead	-	-	-	Lead	-
Minimum Green [s]	11	0	10	0	10	7
Maximum Green [s]	20	0	30	0	20	30
Amber [s]	4.8	0.0	5.2	0.0	4.8	5.2
All red [s]	1.0	0.0	1.0	0.0	1.0	1.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	5.0	0.0	4.0	0.0	2.2	4.0
Walk [s]	11	0	7	0	0	0
Pedestrian Clearance [s]	29	0	28	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No		No			No
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	2.0
l2, Clearance Lost Time [s]	3.8	0.0	4.2	0.0	3.8	4.2
Minimum Recall	No		Yes		No	Yes
Maximum Recall	No		No		No	No
Pedestrian Recall	No		No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	R	L	C
C, Cycle Length [s]	43	43	43	43	43	43
L, Total Lost Time per Cycle [s]	5.80	5.80	6.20	6.20	5.80	6.20
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.80	3.80	4.20	4.20	3.80	4.20
g_i, Effective Green Time [s]	10	10	12	12	3	21
g / C, Green / Cycle	0.23	0.23	0.29	0.29	0.07	0.49
(v / s)_i Volume / Saturation Flow Rate	0.05	0.01	0.16	0.14	0.01	0.22
s, saturation flow rate [veh/h]	3422	1560	3546	1554	2720	3520
c, Capacity [veh/h]	800	365	1015	445	189	1723
d1, Uniform Delay [s]	13.44	12.92	13.16	12.80	18.96	7.27
k, delay calibration	0.23	0.23	0.15	0.15	0.06	0.15
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.31	0.15	0.70	1.18	0.20	0.27
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.23	0.06	0.56	0.49	0.15	0.46
d, Delay for Lane Group [s/veh]	13.75	13.07	13.86	13.98	19.16	7.54
Lane Group LOS	B	B	B	B	B	A
Critical Lane Group	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.65	0.16	2.04	1.58	0.13	1.71
50th-Percentile Queue Length [ft/ln]	16.13	4.08	50.91	39.46	3.17	42.72
95th-Percentile Queue Length [veh/ln]	1.16	0.29	3.67	2.84	0.23	3.08
95th-Percentile Queue Length [ft/ln]	29.03	7.34	91.64	71.03	5.71	76.90

Movement, Approach, & Intersection Results

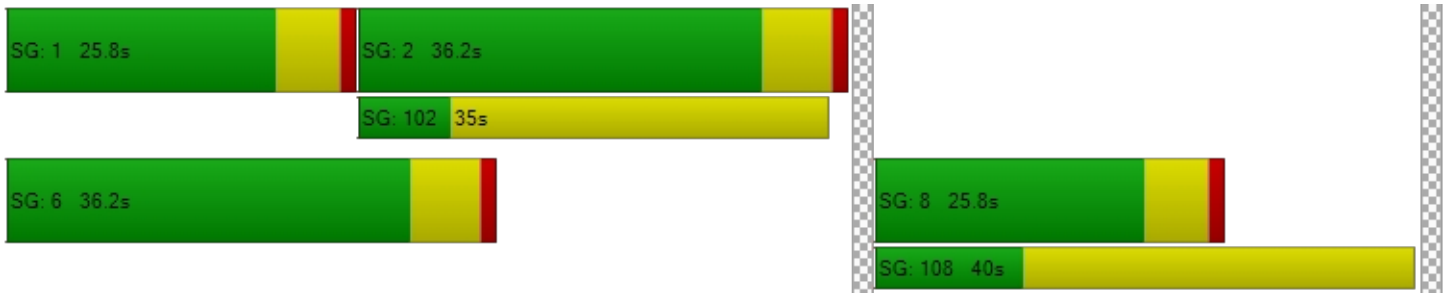
d_M, Delay for Movement [s/veh]	13.75	13.07	13.86	13.98	19.16	7.54
Movement LOS	B	B	B	B	B	A
d_A, Approach Delay [s/veh]	13.68		13.90		7.95	
Approach LOS	B		B		A	
d_I, Intersection Delay [s/veh]	11.20					
Intersection LOS	B					
Intersection V/C	0.349					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	15.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	12.02	9.22	0.00
I_p,int, Pedestrian LOS Score for Intersection	2.483	2.589	0.000
Crosswalk LOS	B	B	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	925	1388	1388
d_b, Bicycle Delay [s]	6.24	2.03	2.03
I_b,int, Bicycle LOS Score for Intersection	1.560	2.210	2.231
Bicycle LOS	A	B	B

Sequence

Ring 1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Harbor Bay Parkway & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	17.5
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.480

Intersection Setup

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	190.00	100.00	300.00	190.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	0	0	0	170	0	257	151	291	0	0	836	106
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	0.00	10.60	2.00	1.20	4.60	9.60	0.00	2.00	2.90	2.80
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	-4	0	0	0	0	0	0	-1	-2
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	166	0	257	151	291	0	0	835	104
Peak Hour Factor	1.0000	1.0000	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	46	0	71	41	80	0	0	229	29
Total Analysis Volume [veh/h]	0	0	0	182	0	282	166	320	0	0	918	114
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			3		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Overla	Permis	Overla	Protect	Overla	Overla	Permis	Permis	Overla
Signal Group	0	0	4	3	0	3	5	2	2	0	6	6
Auxiliary Signal Groups				3,4		3,5		2,3	2,3			3,4,6
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	6	9	0	9	10	8	8	0	10	10
Maximum Green [s]	0	0	45	27	0	27	18	34	34	0	40	40
Amber [s]	0.0	0.0	3.6	4.1	0.0	4.1	4.1	4.8	4.8	0.0	4.8	4.8
All red [s]	0.0	0.0	1.2	1.2	0.0	1.2	1.2	1.2	1.2	0.0	1.2	1.2
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	3.0	3.2	0.0	3.2	2.5	3.2	3.2	0.0	3.2	3.2
Walk [s]	0	0	6	0	0	0	0	0	0	0	6	6
Pedestrian Clearance [s]	0	0	36	0	0	0	0	0	0	0	28	28
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk			No	No				No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	2.8	3.3	0.0	3.3	3.3	4.0	4.0	0.0	4.0	4.0
Minimum Recall			No	No		No	No	Yes	Yes		Yes	Yes
Maximum Recall			No	No		No	No	No	No		No	No
Pedestrian Recall			No	No		No	No	No	No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	20.0	20.0	0.0	20.0	20.0	20.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	R	L	R	L	C	R	C	R
C, Cycle Length [s]	74	74	74	74	74	74	74	74
L, Total Lost Time per Cycle [s]	4.80	4.80	5.30	5.30	5.30	5.30	6.00	4.80
l1_p, Permitted Start-Up Lost Time [s]	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.80	0.00	0.00	3.30	0.00	0.00	4.00	4.00
g_i, Effective Green Time [s]	6	24	39	10	58	58	24	48
g / C, Green / Cycle	0.08	0.33	0.52	0.13	0.78	0.78	0.32	0.65
(v / s)_i Volume / Saturation Flow Rate	0.00	0.08	0.10	0.05	0.10	0.00	0.26	0.07
s, saturation flow rate [veh/h]	1615	2414	2791	3386	3343	1615	3535	1566
c, Capacity [veh/h]	128	884	1457	444	2620	1265	1146	1019
d1, Uniform Delay [s]	0.00	20.88	9.33	29.27	1.91	0.00	22.75	3.12
k, delay calibration	0.11	0.12	0.12	0.08	0.12	0.12	0.12	0.12
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.00	0.12	0.07	0.39	0.02	0.00	1.46	0.05
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.00	0.21	0.19	0.37	0.12	0.00	0.80	0.11
d, Delay for Lane Group [s/veh]	0.00	21.00	9.40	29.65	1.93	0.00	24.21	3.17
Lane Group LOS	A	C	A	C	A	A	C	A
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	Yes
50th-Percentile Queue Length [veh/ln]	0.00	1.07	1.09	1.33	0.28	0.00	7.04	0.34
50th-Percentile Queue Length [ft/ln]	0.00	26.71	27.37	33.18	7.05	0.00	175.88	8.38
95th-Percentile Queue Length [veh/ln]	0.00	1.92	1.97	2.39	0.51	0.00	11.39	0.60
95th-Percentile Queue Length [ft/ln]	0.00	48.08	49.27	59.73	12.69	0.00	284.63	15.08

Movement, Approach, & Intersection Results

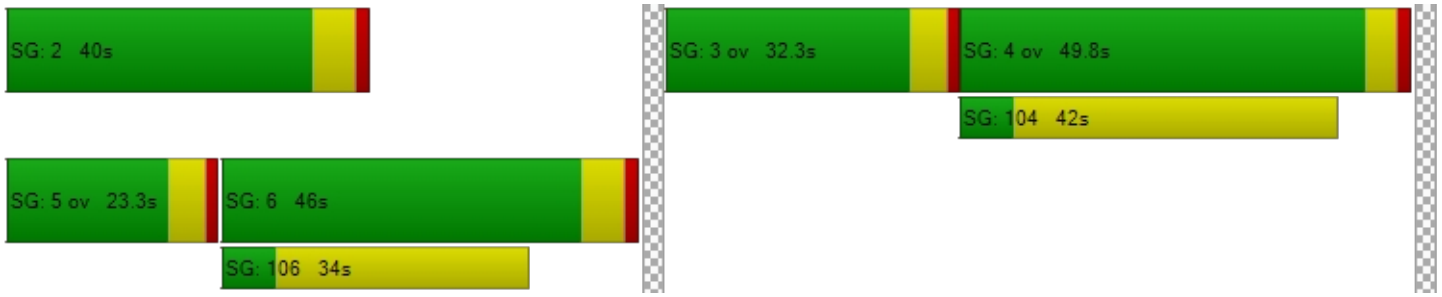
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	21.00	0.00	9.40	29.65	1.93	0.00	0.00	24.21	3.17
Movement LOS			A	C		A	C	A	A		C	A
d_A, Approach Delay [s/veh]	0.00			13.95			11.40			21.88		
Approach LOS	A			B			B			C		
d_I, Intersection Delay [s/veh]	17.46											
Intersection LOS	B											
Intersection V/C	0.480											

Other Modes

g_Walk,mi, Effective Walk Time [s]	-6.0	10.0	-5.3	10.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	43.15	27.58	42.39	27.58
I_p,int, Pedestrian LOS Score for Intersection	1.723	2.564	2.836	2.830
Crosswalk LOS	A	B	C	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1219	2095	171	1084
d_b, Bicycle Delay [s]	5.62	0.08	30.87	7.75
I_b,int, Bicycle LOS Score for Intersection	1.560	1.560	1.961	2.411
Bicycle LOS	A	A	A	B

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Air Cargo Way & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	8.1
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.576

Intersection Setup

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	160.00	100.00	160.00	375.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			Yes		

Volumes

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	11	3	139	0	0	0	3	392	16	121	905	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	25.90	0.00	0.00	0.00	0.00	6.40	0.00	15.70	2.80	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	-2	0	0	20	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	11	3	139	0	0	0	3	390	16	121	925	0
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	1	37	0	0	0	1	105	4	33	249	0
Total Analysis Volume [veh/h]	12	3	149	0	0	0	3	419	17	130	995	0
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			1			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	3.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	26	0	0	0	0	0	24	0	0	18	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	R	L	C	C
C, Cycle Length [s]	25	25	25	25	25	25	25	25
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	3	3	0	6	6	3	9	9
g / C, Green / Cycle	0.14	0.14	0.00	0.26	0.26	0.12	0.37	0.37
(v / s)_i Volume / Saturation Flow Rate	0.10	0.00	0.00	0.12	0.01	0.08	0.27	0.27
s, saturation flow rate [veh/h]	1697	815	1810	3435	1580	1585	1858	1858
c, Capacity [veh/h]	392	258	8	878	404	193	693	693
d1, Uniform Delay [s]	10.17	0.00	12.33	7.84	6.96	10.43	6.67	6.67
k, delay calibration	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.26	0.00	9.66	0.15	0.02	1.52	0.53	0.53
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.42	0.00	0.36	0.48	0.04	0.67	0.72	0.72
d, Delay for Lane Group [s/veh]	10.43	0.00	21.99	7.99	6.97	11.95	7.20	7.20
Lane Group LOS	B	A	C	A	A	B	A	A
Critical Lane Group	Yes	No	Yes	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.58	0.00	0.03	0.55	0.04	0.53	1.07	1.07
50th-Percentile Queue Length [ft/ln]	14.49	0.00	0.85	13.78	1.00	13.20	26.84	26.84
95th-Percentile Queue Length [veh/ln]	1.04	0.00	0.06	0.99	0.07	0.95	1.93	1.93
95th-Percentile Queue Length [ft/ln]	26.08	0.00	1.53	24.80	1.81	23.76	48.31	48.31

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	10.43	10.43	10.43	0.00	0.00	0.00	21.99	7.99	6.97	11.95	7.20	7.20
Movement LOS	B	B	B	A	A	A	C	A	A	B	A	A
d_A, Approach Delay [s/veh]	10.43			0.00			8.05			7.75		
Approach LOS	B			A			A			A		
d_I, Intersection Delay [s/veh]	8.08											
Intersection LOS	A											
Intersection V/C	0.576											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	3.81	3.81	0.00	3.81
l_p,int, Pedestrian LOS Score for Intersection	1.777	1.629	0.000	2.541
Crosswalk LOS	A	A	F	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	2426	2426	2426	2426
d_b, Bicycle Delay [s]	0.56	0.56	0.56	0.56
l_b,int, Bicycle LOS Score for Intersection	1.830	1.560	1.922	2.488
Bicycle LOS	A	A	A	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Ron Cowan Parkway & John Glenn Dr

Control Type:	Signalized	Delay (sec / veh):	12.5
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.234

Intersection Setup

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	220.00	100.00	220.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			Yes			No		

Volumes

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Base Volume Input [veh/h]	16	14	0	0	470	80	16	0	138	27	29	3
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	43.80	21.40	2.00	2.00	14.50	15.00	6.30	2.00	27.50	7.40	10.30	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	3	0	0	6	-5	-6	0	-109	19	-75	25
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	16	17	0	0	476	75	10	0	29	46	0	28
Peak Hour Factor	0.9100	0.9100	1.0000	1.0000	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	5	0	0	131	21	3	0	8	13	0	8
Total Analysis Volume [veh/h]	18	19	0	0	523	82	11	0	32	51	0	31
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			1			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			1			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			2			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	76
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	ProtPer	Permis	Permis	Permis	Permis	Permis	Split	Permis	Split	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	2	0	1	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	10	0	0	10	0	4	10	0	4	4	0
Maximum Green [s]	10	20	0	0	20	0	15	20	0	10	15	0
Amber [s]	4.0	4.0	0.0	0.0	4.0	0.0	3.5	4.0	0.0	4.0	3.5	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	13	34	0	0	21	0	15	21	0	13	27	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	0	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	Yes	Yes			Yes		No				No	
Maximum Recall	No	No			No		No				No	
Pedestrian Recall	No	No			No		No				No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	C	C	C	L	C	R
C, Cycle Length [s]	76	76	76	76	76	76	76	76
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	57	57	48	48	3	4	4	4
g / C, Green / Cycle	0.75	0.75	0.63	0.63	0.04	0.05	0.05	0.05
(v / s)_i Volume / Saturation Flow Rate	0.03	0.01	0.13	0.13	0.03	0.03	0.00	0.02
s, saturation flow rate [veh/h]	751	1437	3203	1554	1300	1704	1745	1615
c, Capacity [veh/h]	652	1070	2006	973	55	93	95	88
d1, Uniform Delay [s]	2.91	2.50	6.07	6.10	36.03	35.03	0.00	34.64
k, delay calibration	0.11	0.50	0.50	0.50	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.02	0.03	0.23	0.48	20.30	4.99	0.00	2.39
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.03	0.02	0.20	0.21	0.78	0.55	0.00	0.35
d, Delay for Lane Group [s/veh]	2.93	2.53	6.30	6.58	56.33	40.01	0.00	37.03
Lane Group LOS	A	A	A	A	E	D	A	D
Critical Lane Group	Yes	No	No	Yes	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	0.06	0.05	1.21	1.29	1.08	1.03	0.00	0.60
50th-Percentile Queue Length [ft/ln]	1.41	1.35	30.36	32.17	27.08	25.67	0.00	14.96
95th-Percentile Queue Length [veh/ln]	0.10	0.10	2.19	2.32	1.95	1.85	0.00	1.08
95th-Percentile Queue Length [ft/ln]	2.54	2.42	54.64	57.91	48.74	46.20	0.00	26.92

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	2.93	2.55	0.00	0.00	6.36	6.58	56.33	0.00	56.33	40.01	0.00	37.03
Movement LOS	A	A			A	A	E		E	D	A	D
d_A, Approach Delay [s/veh]	2.74			6.39			56.33			38.89		
Approach LOS	A			A			E			D		
d_I, Intersection Delay [s/veh]	12.49											
Intersection LOS	B											
Intersection V/C	0.234											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	9.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	5131.48	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	29.54	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	1.795	0.000
Crosswalk LOS	F	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	763	421	276	592
d_b, Bicycle Delay [s]	14.55	23.71	28.23	18.83
l_b,int, Bicycle LOS Score for Intersection	1.590	1.892	1.631	1.695
Bicycle LOS	A	A	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Ron Cowan Pkwy & Neil Armstrong Way

Control Type:	Signalized	Delay (sec / veh):	5.4
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.217

Intersection Setup

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	2
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	139.61
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No					
Crosswalk	Yes			No			Yes			No		

Volumes

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Base Volume Input [veh/h]	0	0	0	596	36	0	31	24	0	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	17.80	5.60	2.00	32.30	8.30	2.00	2.00	2.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	-104	20	0	3	71	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	492	56	0	34	95	0	0	0	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9200	0.9200	1.0000	0.9200	0.9200	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	134	15	0	9	26	0	0	0	0
Total Analysis Volume [veh/h]	0	0	0	535	61	0	37	103	0	0	0	0
Presence of On-Street Parking				No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	38
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	6.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Permis	Split	Split	Permis	Permis	Permis	Permis
Signal Group	0	0	0	4	6	0	5	4	0	0	0	6
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	0	0	5
Maximum Green [s]	0	0	0	11	11	0	5	11	0	0	0	11
Amber [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0
Split [s]	0	0	0	15	23	0	0	15	0	0	0	23
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
Walk [s]	0	0	0	0	4	0	0	0	0	0	0	4
Pedestrian Clearance [s]	0	0	0	0	7	0	0	0	0	0	0	7
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No				
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
Minimum Recall					No			No				
Maximum Recall					No			No				
Pedestrian Recall					No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	L	C	
C, Cycle Length [s]		38	38	38	38	
L, Total Lost Time per Cycle [s]		4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]		2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]		26	26	4	4	
g / C, Green / Cycle		0.69	0.69	0.10	0.10	
(v / s)_i Volume / Saturation Flow Rate		0.12	0.12	0.03	0.06	
s, saturation flow rate [veh/h]		3020	1753	1348	1775	
c, Capacity [veh/h]		2073	1203	138	182	
d1, Uniform Delay [s]		2.13	2.13	15.70	16.21	
k, delay calibration		0.50	0.50	0.11	0.11	
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]		0.19	0.33	1.02	2.73	
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	
Rp, platoon ratio		1.00	1.00	1.00	1.00	
PF, progression factor		1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity		0.18	0.18	0.27	0.56	
d, Delay for Lane Group [s/veh]		2.33	2.46	16.72	18.94	
Lane Group LOS		A	A	B	B	
Critical Lane Group		Yes	No	No	Yes	
50th-Percentile Queue Length [veh/ln]		0.15	0.21	0.29	0.86	
50th-Percentile Queue Length [ft/ln]		3.63	5.37	7.25	21.46	
95th-Percentile Queue Length [veh/ln]		0.26	0.39	0.52	1.54	
95th-Percentile Queue Length [ft/ln]		6.53	9.67	13.04	38.62	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	2.36	2.46	0.00	16.72	18.94	0.00	0.00	0.00	0.00
Movement LOS				A	A		B	B				
d_A, Approach Delay [s/veh]	0.00			2.38			18.35			0.00		
Approach LOS	A			A			B			A		
d_I, Intersection Delay [s/veh]	5.42											
Intersection LOS	A											
Intersection V/C	0.217											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	8.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	9.58	0.00	11.83	0.00
l_p,int, Pedestrian LOS Score for Intersection	1.431	0.000	1.739	0.000
Crosswalk LOS	A	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1001	579	0
d_b, Bicycle Delay [s]	18.98	4.74	9.58	18.98
l_b,int, Bicycle LOS Score for Intersection	4.132	2.543	1.791	4.132
Bicycle LOS	D	B	A	D

Sequence

Ring 1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: Hegenberger Road & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	26.8
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.539

Intersection Setup

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	2	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	210.00	100.00	210.00	275.00	100.00	160.00	275.00	100.00	210.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	1	0	0	1
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	0	0	0	240	360	276	311	679	49	192	652	220
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	17.00	6.00	1.00	2.00	3.00	22.00	5.00	3.00	7.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	14	-31	15	3	20	0	-5	32	2
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	254	329	291	314	699	49	187	684	222
Peak Hour Factor	1.0000	1.0000	1.0000	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	65	85	75	81	180	13	48	176	57
Total Analysis Volume [veh/h]	0	0	0	262	339	300	324	721	51	193	705	229
Presence of On-Street Parking				No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	99.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Split	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	0	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	0	0	30	45	0	35	45	0	25	40	0
Amber [s]	0.0	0.0	0.0	3.0	4.0	0.0	3.0	4.5	0.0	3.0	4.5	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	43	0	18	38	0	19	39	0
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	0	0	0	31	0	0	0	0	0	26	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	3.0	0.0	2.0	3.5	0.0	2.0	3.5	0.0
Minimum Recall					No		No	Yes		No	Yes	
Maximum Recall					No		No	No		No	No	
Pedestrian Recall					No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	C	L	C	R	L	C	R
C, Cycle Length [s]		100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	4.00	5.50	5.50	4.00	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	2.00	3.50	3.50	2.00	3.50	3.50
g_i, Effective Green Time [s]		23	23	23	12	54	54	8	51	51
g / C, Green / Cycle		0.23	0.23	0.23	0.12	0.54	0.54	0.08	0.51	0.51
(v / s)_i Volume / Saturation Flow Rate		0.17	0.10	0.20	0.09	0.20	0.04	0.06	0.20	0.15
s, saturation flow rate [veh/h]		1567	3446	1519	3459	3532	1334	3375	3532	1507
c, Capacity [veh/h]		364	800	352	401	1919	725	269	1792	764
d1, Uniform Delay [s]		35.45	32.74	36.79	43.19	13.12	10.86	44.97	15.19	14.30
k, delay calibration		0.11	0.11	0.11	0.11	0.50	0.50	0.11	0.50	0.50
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		2.70	0.36	5.81	3.93	0.56	0.19	3.55	0.65	1.00
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity		0.72	0.42	0.85	0.81	0.38	0.07	0.72	0.39	0.30
d, Delay for Lane Group [s/veh]		38.15	33.10	42.60	47.12	13.68	11.05	48.52	15.84	15.31
Lane Group LOS		D	C	D	D	B	B	D	B	B
Critical Lane Group		No	No	Yes	Yes	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]		6.08	3.51	7.48	4.10	4.58	0.56	2.46	4.91	3.12
50th-Percentile Queue Length [ft/ln]		152.12	87.81	186.88	102.47	114.61	13.92	61.42	122.83	78.00
95th-Percentile Queue Length [veh/ln]		10.13	6.32	11.96	7.38	8.10	1.00	4.42	8.55	5.62
95th-Percentile Queue Length [ft/ln]		253.26	158.07	298.97	184.44	202.40	25.06	110.56	213.70	140.40

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	38.15	33.10	42.60	47.12	13.68	11.05	48.52	15.84	15.31
Movement LOS				D	C	D	D	B	B	D	B	B
d_A, Approach Delay [s/veh]	0.00			37.73			23.45			21.33		
Approach LOS	A			D			C			C		
d_I, Intersection Delay [s/veh]	26.80											
Intersection LOS	C											
Intersection V/C	0.539											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	39.64	39.64	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	2.694	2.891	0.000
Crosswalk LOS	F	B	C	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	759	650	670
d_b, Bicycle Delay [s]	50.03	19.26	22.81	22.15
l_b,int, Bicycle LOS Score for Intersection	4.132	2.055	2.464	2.489
Bicycle LOS	D	B	B	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: Doolittle Drive & Airport Access Road

Control Type:	Signalized	Delay (sec / veh):	19.4
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.618

Intersection Setup

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	1	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	62	40	189	68	0	18	23	421	0	0	1231	198
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	33.90	17.50	3.20	8.80	2.00	5.60	4.30	6.70	2.00	2.00	4.60	6.10
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	-8	4	22	0	26	15	19	0	0	3	12
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	62	32	193	90	0	44	38	440	0	0	1234	210
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	1.0000	0.9400	0.9400	0.9400	1.0000	1.0000	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	16	9	51	24	0	12	10	117	0	0	328	56
Total Analysis Volume [veh/h]	66	34	205	96	0	47	40	468	0	0	1313	223
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	1			2			0			1		
v_di, Inbound Pedestrian Volume crossing major street [	0			1			1			2		
v_co, Outbound Pedestrian Volume crossing minor stree	1			0			0			1		
v_ci, Inbound Pedestrian Volume crossing minor street [	1			0			0			1		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			0			2			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	41.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Permis	Split	Protect	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	4	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	5	0	5	0	0	5	5	0	0	5	0
Maximum Green [s]	0	65	0	30	0	0	20	55	0	0	35	0
Amber [s]	0.0	4.0	0.0	3.0	0.0	0.0	3.0	4.5	0.0	0.0	4.5	0.0
All red [s]	0.0	1.0	0.0	1.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	33	0	18	0	0	15	49	0	0	34	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	0	0	0	0	0	0	5	0
Pedestrian Clearance [s]	0	23	0	0	0	0	0	0	0	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No		No				No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No		No			No	Yes			Yes	
Maximum Recall		No		No			No	No			No	
Pedestrian Recall		No		No			No	No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	0.0	0.0	20.0	20.0	0.0	0.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	R	L	C	C	R
C, Cycle Length [s]	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	17	17	17	5	5	3	66	59	59
g / C, Green / Cycle	0.17	0.17	0.17	0.05	0.05	0.03	0.66	0.59	0.59
(v / s)_i Volume / Saturation Flow Rate	0.05	0.01	0.13	0.03	0.03	0.02	0.14	0.38	0.15
s, saturation flow rate [veh/h]	1325	4460	1548	3270	1544	1748	3426	3486	1515
c, Capacity [veh/h]	224	753	261	170	80	59	2259	2040	887
d1, Uniform Delay [s]	36.40	34.85	39.76	46.35	46.40	47.81	6.73	13.81	10.07
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.73	0.02	5.14	2.91	6.59	12.41	0.21	1.58	0.68
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.29	0.05	0.78	0.56	0.59	0.67	0.21	0.64	0.25
d, Delay for Lane Group [s/veh]	37.12	34.88	44.90	49.27	53.00	60.22	6.94	15.39	10.75
Lane Group LOS	D	C	D	D	D	E	A	B	B
Critical Lane Group	No	No	Yes	No	Yes	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.45	0.23	5.14	1.23	1.29	1.19	1.85	9.52	2.42
50th-Percentile Queue Length [ft/ln]	36.26	5.82	128.54	30.74	32.13	29.66	46.13	238.08	60.39
95th-Percentile Queue Length [veh/ln]	2.61	0.42	8.86	2.21	2.31	2.14	3.32	14.58	4.35
95th-Percentile Queue Length [ft/ln]	65.27	10.47	221.51	55.34	57.83	53.38	83.04	364.60	108.70

Movement, Approach, & Intersection Results

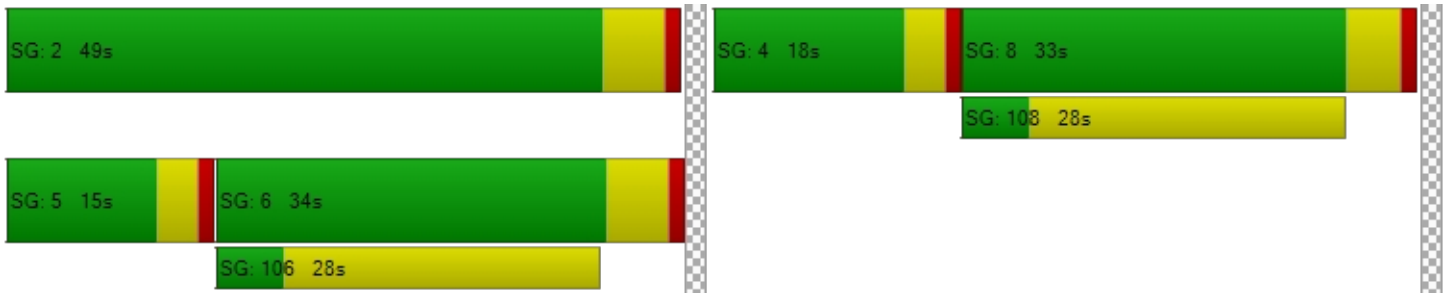
d_M, Delay for Movement [s/veh]	37.12	34.88	44.90	49.27	0.00	53.00	60.22	6.94	0.00	0.00	15.39	10.75
Movement LOS	D	C	D	D		D	E	A			B	B
d_A, Approach Delay [s/veh]	42.10			50.49			11.14			14.72		
Approach LOS	D			D			B			B		
d_I, Intersection Delay [s/veh]	19.39											
Intersection LOS	B											
Intersection V/C	0.618											

Other Modes

g_Walk,mi, Effective Walk Time [s]	43.5	9.0	14.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	15.99	41.44	37.01	41.44
I_p,int, Pedestrian LOS Score for Intersection	2.328	2.662	2.679	2.756
Crosswalk LOS	B	B	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	560	280	869	570
d_b, Bicycle Delay [s]	25.96	37.01	16.00	25.62
I_b,int, Bicycle LOS Score for Intersection	1.727	1.560	1.979	2.827
Bicycle LOS	A	A	A	C

Sequence

Ring 1	-	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Oakland Terminal Project

Vistro File: H:\...\22916_Oakland Terminal_20221003.vistro
Report File: H:\...\2019_PlusProject_PM.pdf

Scenario 4 2019 PM Plus Project
10/3/2022

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Harbor Bay Parkway & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.409	12.1	B
2	Harbor Bay Parkway & Ron Cowan Parkway	Signalized	HCM 7th Edition	WB Thru	0.315	10.3	B
3	Air Cargo Way & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.606	8.2	A
4	Ron Cowan Parkway & John Glenn Dr	Signalized	HCM 7th Edition	EB Right	0.343	12.6	B
5	Ron Cowan Pkwy & Neil Armstrong Way	Signalized	HCM 7th Edition	EB Left	0.292	3.6	A
6	Hegenberger Road & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.536	26.9	C
7	Doolittle Drive & Airport Access Road	Signalized	HCM 7th Edition	EB Left	0.591	21.3	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Harbor Bay Parkway & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	12.1
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.409

Intersection Setup

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	2	0
Entry Pocket Length [ft]	100.00	100.00	100.00	550.00	320.00	100.00
No. of Lanes in Exit Pocket	0	1	0	0	0	1
Exit Pocket Length [ft]	0.00	180.00	0.00	0.00	0.00	310.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Base Volume Input [veh/h]	259	46	822	122	30	755
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.80	10.90	3.00	0.00	3.30	0.70
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	-1	0	4	0	0	2
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	258	46	826	122	30	757
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	69	12	220	32	8	201
Total Analysis Volume [veh/h]	274	49	879	130	32	805
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0		0		0	
v_di, Inbound Pedestrian Volume crossing major street [	0		0		0	
v_co, Outbound Pedestrian Volume crossing minor stree	0		0		0	
v_ci, Inbound Pedestrian Volume crossing minor street [	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		6		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Protected	Permissive
Signal Group	8	0	2	0	1	6
Auxiliary Signal Groups						
Lead / Lag	Lead	-	-	-	Lead	-
Minimum Green [s]	11	0	10	0	10	7
Maximum Green [s]	20	0	30	0	20	30
Amber [s]	4.8	0.0	5.2	0.0	4.8	5.2
All red [s]	1.0	0.0	1.0	0.0	1.0	1.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	5.0	0.0	4.0	0.0	2.2	4.0
Walk [s]	11	0	7	0	0	0
Pedestrian Clearance [s]	29	0	28	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No		No			No
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	2.0
l2, Clearance Lost Time [s]	3.8	0.0	4.2	0.0	3.8	4.2
Minimum Recall	No		Yes		No	Yes
Maximum Recall	No		No		No	No
Pedestrian Recall	No		No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	R	L	C
C, Cycle Length [s]	51	51	51	51	51	51
L, Total Lost Time per Cycle [s]	5.80	5.80	6.20	6.20	5.80	6.20
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.80	3.80	4.20	4.20	3.80	4.20
g_i, Effective Green Time [s]	11	11	19	19	4	28
g / C, Green / Cycle	0.21	0.21	0.37	0.37	0.07	0.55
(v / s)_i Volume / Saturation Flow Rate	0.08	0.03	0.25	0.08	0.01	0.22
s, saturation flow rate [veh/h]	3492	1476	3532	1590	3422	3598
c, Capacity [veh/h]	743	314	1298	584	248	1990
d1, Uniform Delay [s]	17.24	16.43	13.65	11.15	22.26	6.59
k, delay calibration	0.23	0.23	0.15	0.15	0.06	0.15
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.65	0.49	0.89	0.27	0.12	0.19
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.37	0.16	0.68	0.22	0.13	0.40
d, Delay for Lane Group [s/veh]	17.89	16.92	14.54	11.42	22.38	6.78
Lane Group LOS	B	B	B	B	C	A
Critical Lane Group	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.30	0.46	3.74	0.91	0.17	1.85
50th-Percentile Queue Length [ft/ln]	32.54	11.59	93.42	22.70	4.27	46.37
95th-Percentile Queue Length [veh/ln]	2.34	0.83	6.73	1.63	0.31	3.34
95th-Percentile Queue Length [ft/ln]	58.58	20.86	168.15	40.87	7.68	83.46

Movement, Approach, & Intersection Results

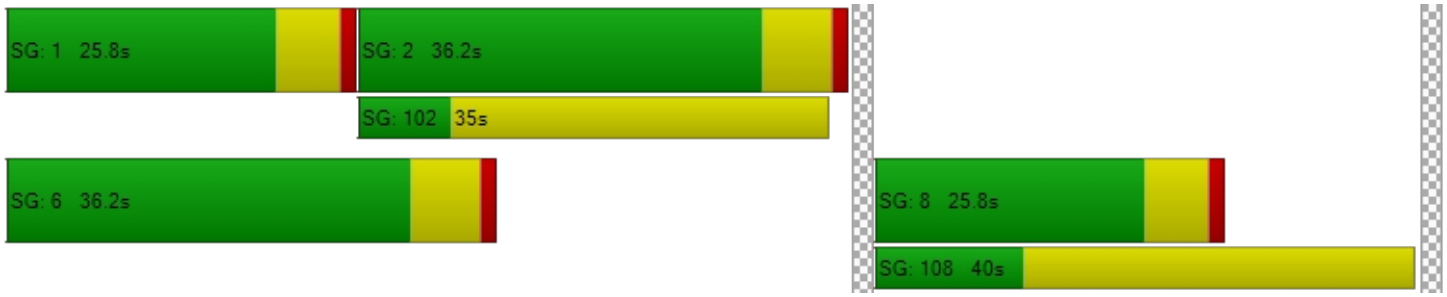
d_M, Delay for Movement [s/veh]	17.89	16.92	14.54	11.42	22.38	6.78
Movement LOS	B	B	B	B	C	A
d_A, Approach Delay [s/veh]	17.75		14.14		7.38	
Approach LOS	B		B		A	
d_I, Intersection Delay [s/veh]	12.07					
Intersection LOS	B					
Intersection V/C	0.409					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	15.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	15.77	12.78	0.00
I_p,int, Pedestrian LOS Score for Intersection	2.500	2.667	0.000
Crosswalk LOS	B	B	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	782	1173	1173
d_b, Bicycle Delay [s]	9.49	4.39	4.38
I_b,int, Bicycle LOS Score for Intersection	1.560	2.392	2.250
Bicycle LOS	A	B	B

Sequence

Ring 1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Harbor Bay Parkway & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	10.3
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.315

Intersection Setup

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	190.00	100.00	300.00	190.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	0	0	0	111	0	151	231	730	0	0	286	181
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	0.00	3.60	2.00	1.30	0.90	2.60	0.00	2.00	5.20	1.70
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	-1	0	0	0	-1
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	111	0	151	231	729	0	0	286	180
Peak Hour Factor	1.0000	1.0000	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	30	0	41	63	200	0	0	79	49
Total Analysis Volume [veh/h]	0	0	0	122	0	166	254	801	0	0	314	198
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			2			4			6		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Overla	Permis	Overla	Protect	Overla	Overla	Permis	Permis	Overla
Signal Group	0	0	4	3	0	3	5	2	2	0	6	6
Auxiliary Signal Groups				3,4		3,5		2,3	2,3			3,4,6
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	6	9	0	9	10	8	8	0	10	10
Maximum Green [s]	0	0	45	27	0	27	18	34	34	0	40	40
Amber [s]	0.0	0.0	3.6	4.1	0.0	4.1	4.1	4.8	4.8	0.0	4.8	4.8
All red [s]	0.0	0.0	1.2	1.2	0.0	1.2	1.2	1.2	1.2	0.0	1.2	1.2
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	3.0	3.2	0.0	3.2	2.5	3.2	3.2	0.0	3.2	3.2
Walk [s]	0	0	6	0	0	0	0	0	0	0	6	6
Pedestrian Clearance [s]	0	0	36	0	0	0	0	0	0	0	28	28
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk			No	No				No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	2.8	3.3	0.0	3.3	3.3	4.0	4.0	0.0	4.0	4.0
Minimum Recall			No	No		No	No	Yes	Yes		Yes	Yes
Maximum Recall			No	No		No	No	No	No		No	No
Pedestrian Recall			No	No		No	No	No	No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	20.0	20.0	0.0	20.0	20.0	20.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	R	L	R	L	C	R	C	R
C, Cycle Length [s]	62	62	62	62	62	62	62	62
L, Total Lost Time per Cycle [s]	4.80	4.80	5.30	5.30	5.30	5.30	6.00	4.80
l1_p, Permitted Start-Up Lost Time [s]	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.80	0.00	0.00	3.30	0.00	0.00	4.00	4.00
g_i, Effective Green Time [s]	5	26	40	10	46	46	10	36
g / C, Green / Cycle	0.09	0.41	0.65	0.16	0.75	0.75	0.16	0.58
(v / s)_i Volume / Saturation Flow Rate	0.00	0.06	0.06	0.07	0.23	0.00	0.09	0.13
s, saturation flow rate [veh/h]	1615	2147	2787	3489	3543	1615	3469	1582
c, Capacity [veh/h]	141	1000	1820	560	2654	1210	566	916
d1, Uniform Delay [s]	0.00	14.97	3.93	23.43	2.51	0.00	23.74	4.04
k, delay calibration	0.11	0.12	0.12	0.08	0.12	0.12	0.12	0.12
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.00	0.06	0.02	0.43	0.07	0.00	0.92	0.13
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.00	0.12	0.09	0.45	0.30	0.00	0.55	0.22
d, Delay for Lane Group [s/veh]	0.00	15.03	3.95	23.86	2.58	0.00	24.66	4.17
Lane Group LOS	A	B	A	C	A	A	C	A
Critical Lane Group	No	Yes	No	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.00	0.46	0.27	1.60	0.75	0.00	2.04	0.64
50th-Percentile Queue Length [ft/ln]	0.00	11.47	6.85	40.08	18.73	0.00	51.12	15.89
95th-Percentile Queue Length [veh/ln]	0.00	0.83	0.49	2.89	1.35	0.00	3.68	1.14
95th-Percentile Queue Length [ft/ln]	0.00	20.64	12.33	72.15	33.71	0.00	92.01	28.60

Movement, Approach, & Intersection Results

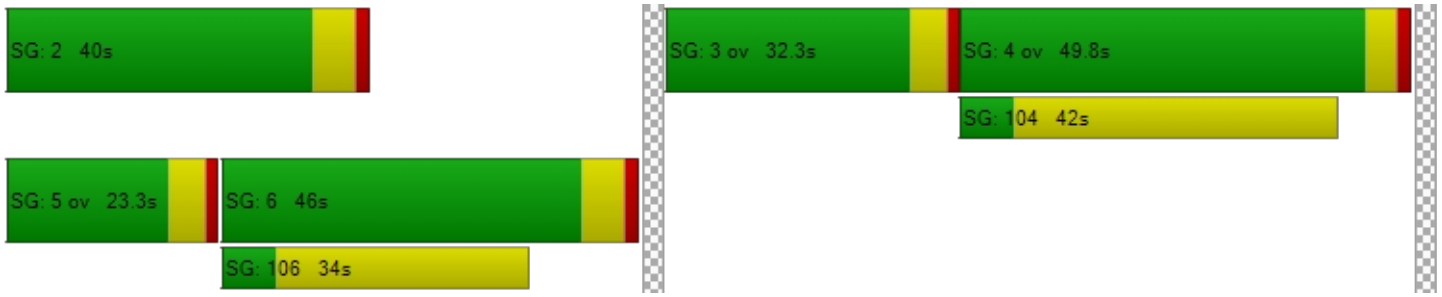
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	15.03	0.00	3.95	23.86	2.58	0.00	0.00	24.66	4.17
Movement LOS			A	B		A	C	A	A		C	A
d_A, Approach Delay [s/veh]	0.00			8.65			7.70			16.74		
Approach LOS	A			A			A			B		
d_I, Intersection Delay [s/veh]	10.34											
Intersection LOS	B											
Intersection V/C	0.315											

Other Modes

g_Walk,mi, Effective Walk Time [s]	-6.0	10.0	-5.3	10.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	37.06	21.58	36.30	21.58
l_p,int, Pedestrian LOS Score for Intersection	1.717	2.554	2.809	2.719
Crosswalk LOS	A	B	C	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1462	2512	205	1300
d_b, Bicycle Delay [s]	2.22	2.02	24.84	3.78
l_b,int, Bicycle LOS Score for Intersection	1.560	1.560	2.430	1.982
Bicycle LOS	A	A	B	A

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Air Cargo Way & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	8.2
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.606

Intersection Setup

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	160.00	100.00	160.00	375.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			Yes		

Volumes

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	5	0	107	0	0	1	5	770	6	128	435	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	14.00	0.00	0.00	0.00	0.00	2.10	0.00	11.70	3.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	13	0	0	9	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	0	107	0	0	1	5	783	6	128	444	0
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	0	30	0	0	0	1	222	2	36	126	0
Total Analysis Volume [veh/h]	6	0	122	0	0	1	6	890	7	145	505	0
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			11			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	3.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	26	0	0	0	0	0	24	0	0	18	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	R	L	C	C
C, Cycle Length [s]	28	28	28	28	28	28	28	28
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	3	3	0	10	10	3	13	13
g / C, Green / Cycle	0.11	0.11	0.01	0.34	0.34	0.12	0.45	0.45
(v / s)_i Volume / Saturation Flow Rate	0.07	0.00	0.00	0.25	0.00	0.09	0.14	0.14
s, saturation flow rate [veh/h]	1711	620	1810	3558	1564	1642	1855	1855
c, Capacity [veh/h]	327	197	15	1219	536	200	846	846
d1, Uniform Delay [s]	12.07	11.18	14.02	8.19	6.17	12.03	4.87	4.87
k, delay calibration	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.28	0.00	5.94	0.32	0.00	1.88	0.07	0.07
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.39	0.01	0.39	0.73	0.01	0.73	0.30	0.30
d, Delay for Lane Group [s/veh]	12.36	11.18	19.97	8.51	6.17	13.91	4.94	4.94
Lane Group LOS	B	B	B	A	A	B	A	A
Critical Lane Group	Yes	No	No	Yes	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	0.59	0.00	0.05	1.42	0.02	0.75	0.43	0.43
50th-Percentile Queue Length [ft/ln]	14.81	0.11	1.37	35.38	0.42	18.64	10.69	10.69
95th-Percentile Queue Length [veh/ln]	1.07	0.01	0.10	2.55	0.03	1.34	0.77	0.77
95th-Percentile Queue Length [ft/ln]	26.66	0.19	2.47	63.68	0.75	33.55	19.25	19.25

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	12.36	12.36	12.36	11.18	11.18	11.18	19.97	8.51	6.17	13.91	4.94	4.94
Movement LOS	B	B	B	B	B	B	B	A	A	B	A	A
d_A, Approach Delay [s/veh]	12.36			11.18			8.57			6.94		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	8.23											
Intersection LOS	A											
Intersection V/C	0.606											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	5.30	5.30	0.00	5.30
I_p,int, Pedestrian LOS Score for Intersection	1.776	1.642	0.000	2.548
Crosswalk LOS	A	A	F	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	2118	2118	2118	2118
d_b, Bicycle Delay [s]	0.05	0.05	0.05	0.05
I_b,int, Bicycle LOS Score for Intersection	1.771	1.561	2.305	2.096
Bicycle LOS	A	A	B	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Ron Cowan Parkway & John Glenn Dr

Control Type:	Signalized	Delay (sec / veh):	12.6
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.343

Intersection Setup

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	220.00	100.00	220.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			Yes			No		

Volumes

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Base Volume Input [veh/h]	20	16	0	0	891	56	12	0	95	20	39	3
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	30.00	12.50	2.00	2.00	2.90	17.90	8.30	2.00	3.20	0.00	2.60	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	1	0	0	33	-4	-2	0	-72	97	-64	11
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	20	17	0	0	924	52	10	0	23	117	0	14
Peak Hour Factor	0.9500	0.9500	1.0000	1.0000	0.9500	0.9500	0.9500	1.0000	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	4	0	0	243	14	3	0	6	31	0	4
Total Analysis Volume [veh/h]	21	18	0	0	973	55	11	0	24	123	0	15
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			9			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	76
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	ProtPer	Permis	Permis	Permis	Permis	Permis	Split	Permis	Split	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	2	0	1	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	10	0	0	10	0	4	10	0	4	4	0
Maximum Green [s]	10	20	0	0	20	0	15	20	0	10	15	0
Amber [s]	4.0	4.0	0.0	0.0	4.0	0.0	3.5	4.0	0.0	4.0	3.5	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	13	34	0	0	21	0	15	21	0	13	27	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	0	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	Yes	Yes			Yes		No				No	
Maximum Recall	No	No			No		No				No	
Pedestrian Recall	No	No			No		No				No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	C	C	C	L	C	R
C, Cycle Length [s]	76	76	76	76	76	76	76	76
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	54	54	45	45	3	7	7	7
g / C, Green / Cycle	0.71	0.71	0.59	0.59	0.03	0.10	0.10	0.10
(v / s)_i Volume / Saturation Flow Rate	0.04	0.01	0.19	0.19	0.02	0.07	0.00	0.01
s, saturation flow rate [veh/h]	574	1558	3535	1797	1629	1810	1861	1615
c, Capacity [veh/h]	501	1106	2090	1062	57	176	181	157
d1, Uniform Delay [s]	3.98	3.24	7.88	7.85	36.19	33.22	0.00	31.25
k, delay calibration	0.11	0.50	0.50	0.50	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.03	0.03	0.42	0.80	10.48	4.91	0.00	0.26
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.04	0.02	0.33	0.32	0.62	0.70	0.00	0.10
d, Delay for Lane Group [s/veh]	4.02	3.26	8.30	8.65	46.67	38.12	0.00	31.51
Lane Group LOS	A	A	A	A	D	D	A	C
Critical Lane Group	Yes	No	Yes	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	0.08	0.07	2.56	2.67	0.79	2.37	0.00	0.26
50th-Percentile Queue Length [ft/ln]	1.98	1.68	63.98	66.63	19.77	59.37	0.00	6.41
95th-Percentile Queue Length [veh/ln]	0.14	0.12	4.61	4.80	1.42	4.27	0.00	0.46
95th-Percentile Queue Length [ft/ln]	3.57	3.02	115.16	119.94	35.59	106.87	0.00	11.53

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	4.02	3.26	0.00	0.00	8.40	8.65	46.67	0.00	46.67	38.12	0.00	31.51
Movement LOS	A	A			A	A	D		D	D	A	C
d_A, Approach Delay [s/veh]	3.67			8.42			46.67			37.40		
Approach LOS	A			A			D			D		
d_I, Intersection Delay [s/veh]	12.57											
Intersection LOS	B											
Intersection V/C	0.343											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	9.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	29.54	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	1.781	0.000
Crosswalk LOS	F	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	763	421	276	592
d_b, Bicycle Delay [s]	14.55	23.79	28.23	18.83
I_b,int, Bicycle LOS Score for Intersection	1.592	2.125	1.617	1.787
Bicycle LOS	A	B	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Ron Cowan Pkwy & Neil Armstrong Way

Control Type:	Signalized	Delay (sec / veh):	3.6
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.292

Intersection Setup

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	2
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	139.61
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No					
Crosswalk	Yes			No			Yes			No		

Volumes

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Base Volume Input [veh/h]	0	0	0	984	22	0	35	28	0	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.90	4.50	2.00	22.90	3.60	2.00	2.00	2.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	-42	100	0	1	19	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	942	122	0	36	47	0	0	0	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9400	0.9400	1.0000	0.9400	0.9400	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	251	32	0	10	13	0	0	0	0
Total Analysis Volume [veh/h]	0	0	0	1002	130	0	38	50	0	0	0	0
Presence of On-Street Parking				No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	38
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	6.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Permis	Split	Split	Permis	Permis	Permis	Permis
Signal Group	0	0	0	4	6	0	5	4	0	0	0	6
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	0	0	5
Maximum Green [s]	0	0	0	11	11	0	5	11	0	0	0	11
Amber [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0
Split [s]	0	0	0	15	23	0	0	15	0	0	0	23
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
Walk [s]	0	0	0	0	4	0	0	0	0	0	0	4
Pedestrian Clearance [s]	0	0	0	0	7	0	0	0	0	0	0	7
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No				
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
Minimum Recall					No			No				
Maximum Recall					No			No				
Pedestrian Recall					No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	L	C	
C, Cycle Length [s]		38	38	38	38	
L, Total Lost Time per Cycle [s]		4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]		2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]		27	27	3	3	
g / C, Green / Cycle		0.71	0.71	0.08	0.08	
(v / s)_i Volume / Saturation Flow Rate		0.22	0.22	0.03	0.03	
s, saturation flow rate [veh/h]		3434	1774	1482	1846	
c, Capacity [veh/h]		2432	1256	120	149	
d1, Uniform Delay [s]		2.07	2.06	16.45	16.47	
k, delay calibration		0.50	0.50	0.11	0.11	
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]		0.33	0.62	1.50	1.31	
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	
Rp, platoon ratio		1.00	1.00	1.00	1.00	
PF, progression factor		1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity		0.31	0.30	0.32	0.33	
d, Delay for Lane Group [s/veh]		2.40	2.68	17.94	17.78	
Lane Group LOS		A	A	B	B	
Critical Lane Group		Yes	No	No	Yes	
50th-Percentile Queue Length [veh/ln]		0.20	0.31	0.32	0.40	
50th-Percentile Queue Length [ft/ln]		5.00	7.67	7.89	10.11	
95th-Percentile Queue Length [veh/ln]		0.36	0.55	0.57	0.73	
95th-Percentile Queue Length [ft/ln]		8.99	13.81	14.21	18.20	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	2.47	2.68	0.00	17.94	17.78	0.00	0.00	0.00	0.00
Movement LOS				A	A		B	B				
d_A, Approach Delay [s/veh]	0.00			2.49			17.85			0.00		
Approach LOS	A			A			B			A		
d_I, Intersection Delay [s/veh]	3.60											
Intersection LOS	A											
Intersection V/C	0.292											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	8.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	9.58	0.00	11.83	0.00
l_p,int, Pedestrian LOS Score for Intersection	1.498	0.000	1.714	0.000
Crosswalk LOS	A	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1001	579	0
d_b, Bicycle Delay [s]	18.98	4.74	9.58	18.98
l_b,int, Bicycle LOS Score for Intersection	4.132	3.427	1.705	4.132
Bicycle LOS	D	C	A	D

Sequence

Ring 1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: Hegenberger Road & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	26.9
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.536

Intersection Setup

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	2	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	210.00	100.00	210.00	275.00	100.00	160.00	275.00	100.00	210.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	1	0	0	1
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	0	0	0	240	360	276	311	679	49	192	652	220
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	16.70	5.80	0.70	2.30	2.70	22.40	4.70	2.90	6.80
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	12	-26	13	3	18	0	6	28	1
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	252	334	289	314	697	49	198	680	221
Peak Hour Factor	1.0000	1.0000	1.0000	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	65	86	74	81	180	13	51	175	57
Total Analysis Volume [veh/h]	0	0	0	260	344	298	324	719	51	204	701	228
Presence of On-Street Parking				No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			2			0			1		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			1			0			2		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	99.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Split	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	0	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	0	0	30	45	0	35	45	0	25	40	0
Amber [s]	0.0	0.0	0.0	3.0	4.0	0.0	3.0	4.5	0.0	3.0	4.5	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	43	0	18	38	0	19	39	0
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	0	0	0	31	0	0	0	0	0	26	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	3.0	0.0	2.0	3.5	0.0	2.0	3.5	0.0
Minimum Recall					No		No	Yes		No	Yes	
Maximum Recall					No		No	No		No	No	
Pedestrian Recall					No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	C	L	C	R	L	C	R
C, Cycle Length [s]		100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	4.00	5.50	5.50	4.00	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	2.00	3.50	3.50	2.00	3.50	3.50
g_i, Effective Green Time [s]		23	23	23	12	54	54	8	51	51
g / C, Green / Cycle		0.23	0.23	0.23	0.12	0.54	0.54	0.08	0.51	0.51
(v / s)_i Volume / Saturation Flow Rate		0.17	0.10	0.20	0.09	0.20	0.04	0.06	0.20	0.15
s, saturation flow rate [veh/h]		1571	3452	1521	3450	3540	1329	3384	3535	1507
c, Capacity [veh/h]		362	796	351	400	1917	720	281	1798	766
d1, Uniform Delay [s]		35.52	32.92	36.86	43.18	13.20	10.94	44.80	15.08	14.21
k, delay calibration		0.11	0.11	0.11	0.11	0.50	0.50	0.11	0.50	0.50
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		2.68	0.37	5.78	3.95	0.56	0.19	3.56	0.64	0.99
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity		0.72	0.43	0.85	0.81	0.37	0.07	0.73	0.39	0.30
d, Delay for Lane Group [s/veh]		38.20	33.29	42.64	47.13	13.76	11.13	48.36	15.72	15.20
Lane Group LOS		D	C	D	D	B	B	D	B	B
Critical Lane Group		No	No	Yes	Yes	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]		6.04	3.58	7.43	4.10	4.59	0.56	2.59	4.86	3.09
50th-Percentile Queue Length [ft/ln]		150.96	89.46	185.63	102.48	114.69	14.00	64.84	121.49	77.30
95th-Percentile Queue Length [veh/ln]		10.07	6.44	11.89	7.38	8.10	1.01	4.67	8.48	5.57
95th-Percentile Queue Length [ft/ln]		251.71	161.03	297.36	184.47	202.50	25.19	116.72	211.88	139.15

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	38.20	33.29	42.64	47.13	13.76	11.13	48.36	15.72	15.20
Movement LOS				D	C	D	D	B	B	D	B	B
d_A, Approach Delay [s/veh]	0.00			37.80			23.52			21.49		
Approach LOS	A			D			C			C		
d_I, Intersection Delay [s/veh]	26.90											
Intersection LOS	C											
Intersection V/C	0.536											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	2172.21	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	39.64	39.64	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	2.694	2.890	0.000
Crosswalk LOS	F	B	C	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	759	650	670
d_b, Bicycle Delay [s]	50.03	19.26	22.81	22.15
l_b,int, Bicycle LOS Score for Intersection	4.132	2.056	2.462	2.494
Bicycle LOS	D	B	B	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: Doolittle Drive & Airport Access Road

Control Type:	Signalized	Delay (sec / veh):	21.3
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.591

Intersection Setup

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	1	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	78	33	259	85	0	30	38	723	0	0	932	186
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	19.20	6.10	3.50	5.90	2.00	0.00	0.00	7.60	2.00	2.00	2.90	6.50
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	-2	-2	18	0	22	14	16	0	0	13	8
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	78	31	257	103	0	52	52	739	0	0	945	194
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	1.0000	0.9200	0.9200	0.9200	1.0000	1.0000	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	21	8	70	28	0	14	14	201	0	0	257	53
Total Analysis Volume [veh/h]	85	34	279	112	0	57	57	803	0	0	1027	211
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			3			0			3		
v_di, Inbound Pedestrian Volume crossing major street [	0			3			0			3		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			1			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	41.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Permis	Split	Protect	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	4	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	5	0	5	0	0	5	5	0	0	5	0
Maximum Green [s]	0	65	0	30	0	0	20	55	0	0	35	0
Amber [s]	0.0	4.0	0.0	3.0	0.0	0.0	3.0	4.5	0.0	0.0	4.5	0.0
All red [s]	0.0	1.0	0.0	1.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	33	0	18	0	0	15	49	0	0	34	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	0	0	0	0	0	0	5	0
Pedestrian Clearance [s]	0	23	0	0	0	0	0	0	0	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No		No				No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No		No			No	Yes			Yes	
Maximum Recall		No		No			No	No			No	
Pedestrian Recall		No		No			No	No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	0.0	0.0	20.0	20.0	0.0	0.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	R	L	C	C	R
C, Cycle Length [s]	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	21	21	21	6	6	4	61	53	53
g / C, Green / Cycle	0.21	0.21	0.21	0.06	0.06	0.04	0.61	0.53	0.53
(v / s)_i Volume / Saturation Flow Rate	0.06	0.01	0.18	0.03	0.04	0.03	0.24	0.29	0.14
s, saturation flow rate [veh/h]	1535	4926	1550	3350	1589	1810	3400	3535	1508
c, Capacity [veh/h]	328	1052	331	194	92	75	2071	1864	795
d1, Uniform Delay [s]	32.79	31.19	37.67	45.99	46.08	47.48	10.02	15.76	12.97
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.42	0.01	5.84	2.72	6.68	14.24	0.55	1.18	0.82
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.26	0.03	0.84	0.58	0.62	0.76	0.39	0.55	0.27
d, Delay for Lane Group [s/veh]	33.20	31.20	43.51	48.71	52.75	61.73	10.57	16.94	13.78
Lane Group LOS	C	C	D	D	D	E	B	B	B
Critical Lane Group	No	No	Yes	No	Yes	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.75	0.22	6.98	1.42	1.55	1.70	4.35	7.71	2.68
50th-Percentile Queue Length [ft/ln]	43.67	5.45	174.50	35.60	38.70	42.41	108.65	192.68	67.07
95th-Percentile Queue Length [veh/ln]	3.14	0.39	11.31	2.56	2.79	3.05	7.76	12.26	4.83
95th-Percentile Queue Length [ft/ln]	78.60	9.81	282.83	64.08	69.65	76.34	194.12	306.51	120.72

Movement, Approach, & Intersection Results

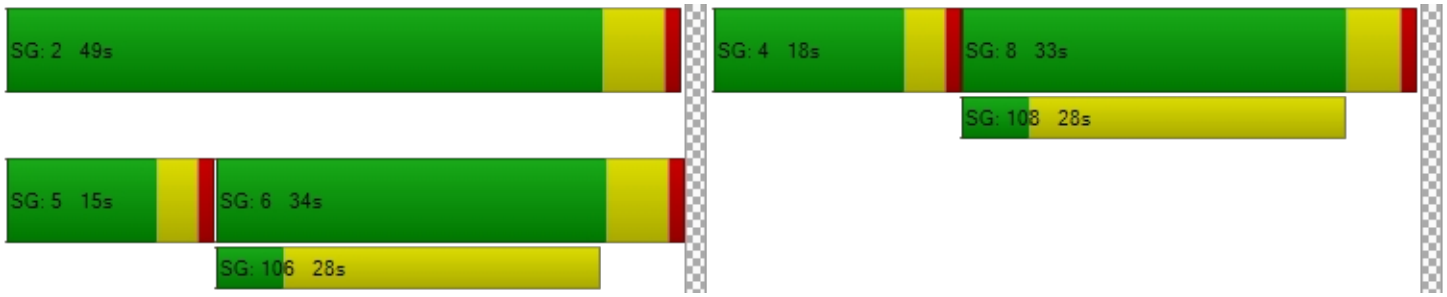
d_M, Delay for Movement [s/veh]	33.20	31.20	43.51	48.71	0.00	52.75	61.73	10.57	0.00	0.00	16.94	13.78
Movement LOS	C	C	D	D		D	E	B			B	B
d_A, Approach Delay [s/veh]	40.26			50.07			13.96			16.40		
Approach LOS	D			D			B			B		
d_I, Intersection Delay [s/veh]	21.31											
Intersection LOS	C											
Intersection V/C	0.591											

Other Modes

g_Walk,mi, Effective Walk Time [s]	43.5	9.0	14.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	15.99	41.44	37.01	41.44
I_p,int, Pedestrian LOS Score for Intersection	2.346	2.666	2.698	2.781
Crosswalk LOS	B	B	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	560	280	869	570
d_b, Bicycle Delay [s]	25.96	37.03	16.00	25.60
I_b,int, Bicycle LOS Score for Intersection	1.779	1.560	2.269	2.581
Bicycle LOS	A	A	B	B

Sequence

Ring 1	-	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



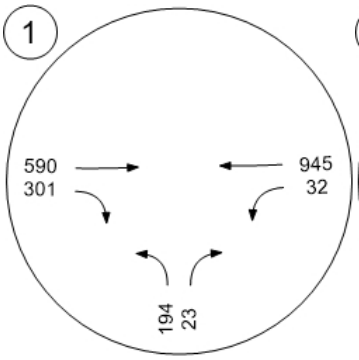


Appendix C 2028 and 2038 Intersection Turn Movement Counts

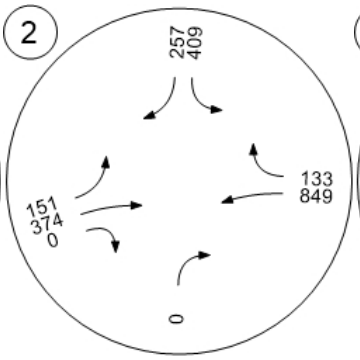
Traffic Volume - Future Total Volume



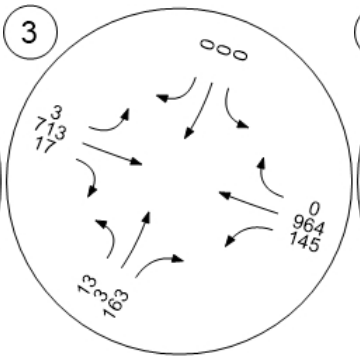
Harbor Bay Parkway & Doolit



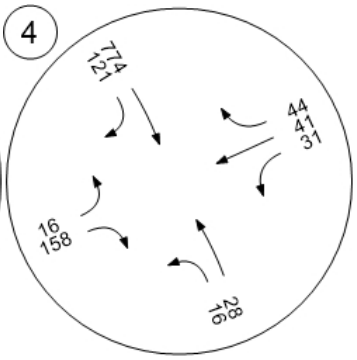
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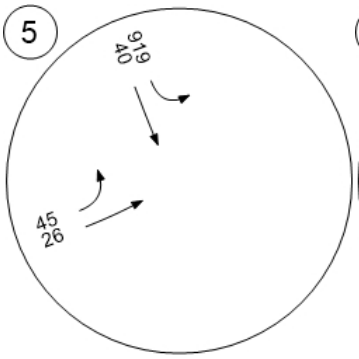
Air Cargo Way & Ron Cowan



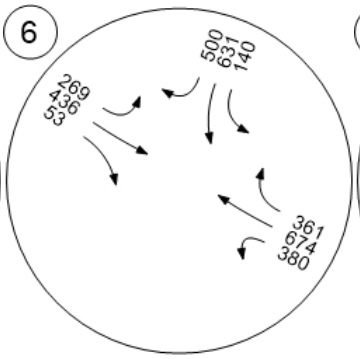
Ron Cowan Parkway & John



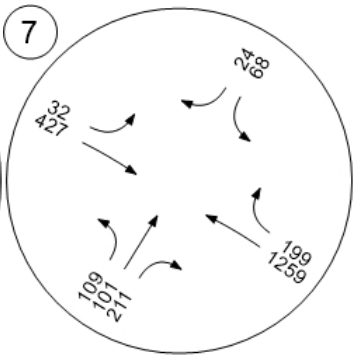
Ron Cowan Pkwy & Neil Arm



Hegenberger Road & Doolittl



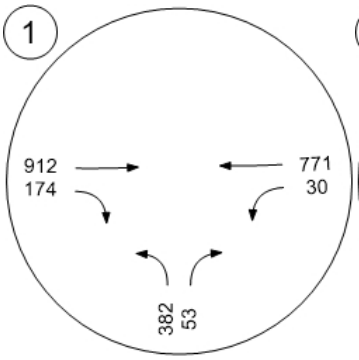
Doolittle Drive & Airport Acce



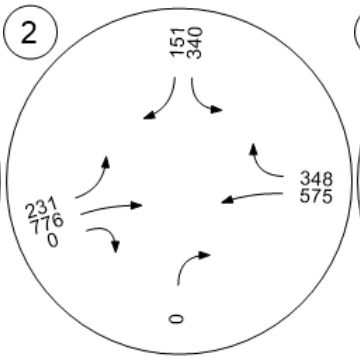
Traffic Volume - Future Total Volume



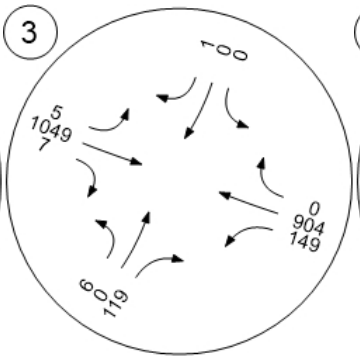
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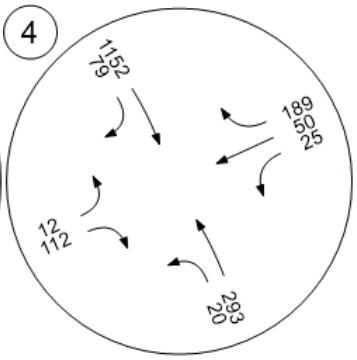
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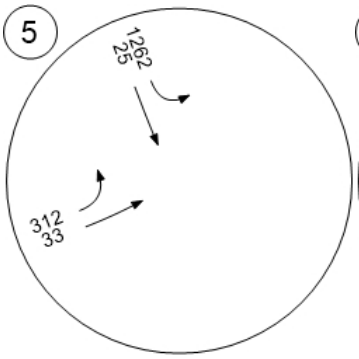
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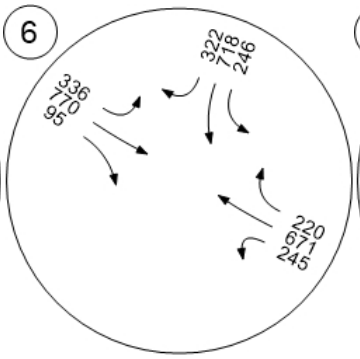
Ron Cowan Parkway & John



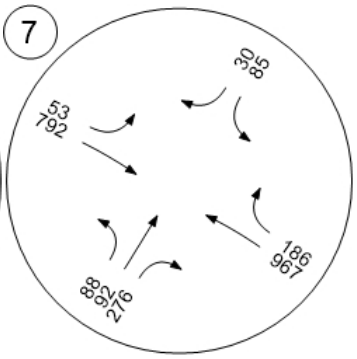
Ron Cowan Pkwy & Neil Arm



Hegenberger Road & Doolittl



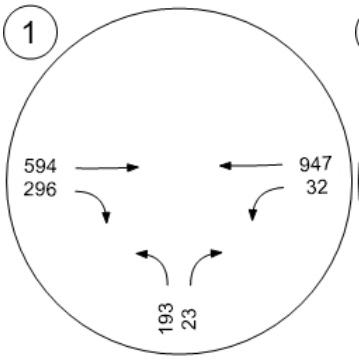
Doolittle Drive & Airport Acce



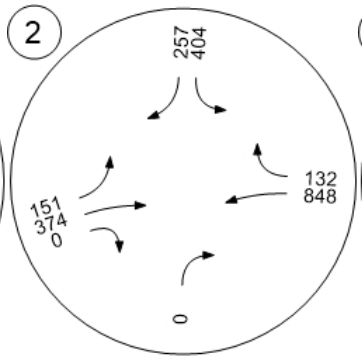
Traffic Volume - Future Total Volume



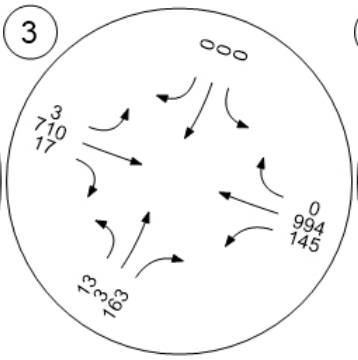
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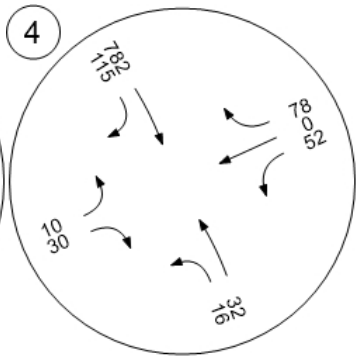
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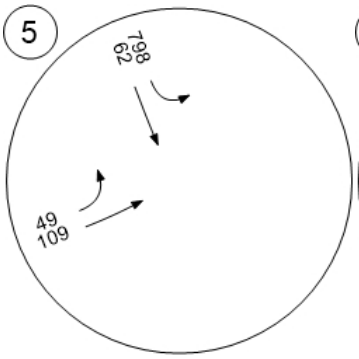
Air Cargo Way & Ron Cowan



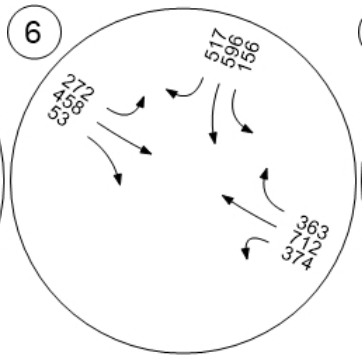
Ron Cowan Parkway & John



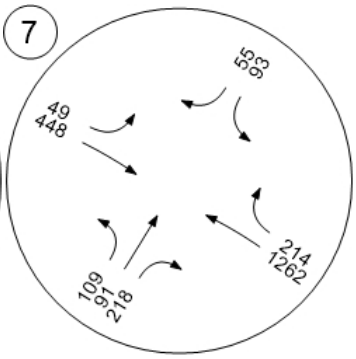
Ron Cowan Pkwy & Neil Arm



Hegenberger Road & Doolittl



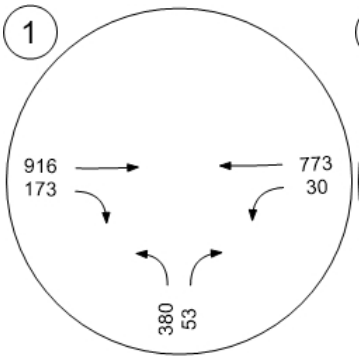
Doolittle Drive & Airport Acce



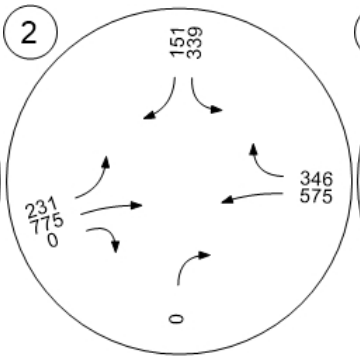
Traffic Volume - Future Total Volume



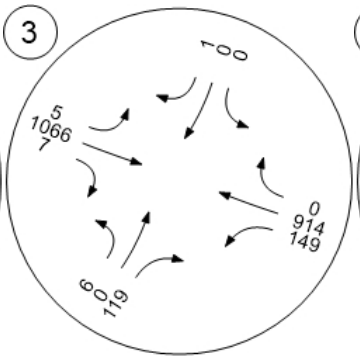
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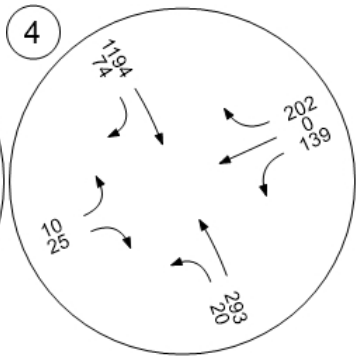
Harbor Bay Parkway & Ron



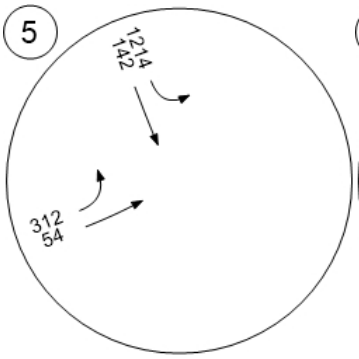
Air Cargo Way & Ron Cowan



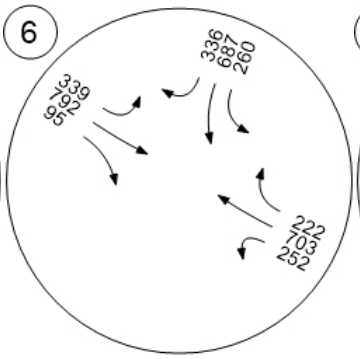
Ron Cowan Parkway & John



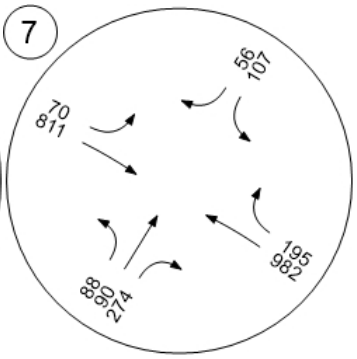
Ron Cowan Pkwy & Neil Arm



Hegenberger Road & Doolittl



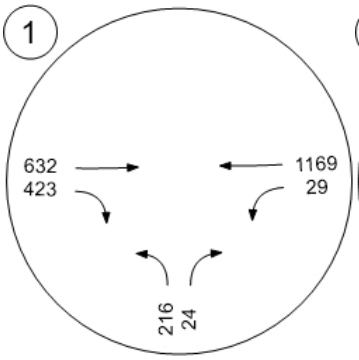
Doolittle Drive & Airport Acce



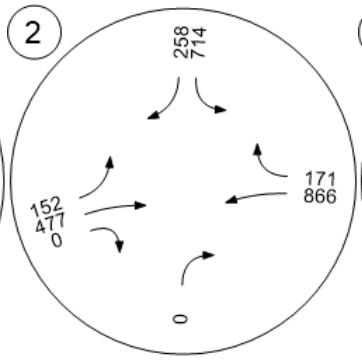
Traffic Volume - Future Total Volume



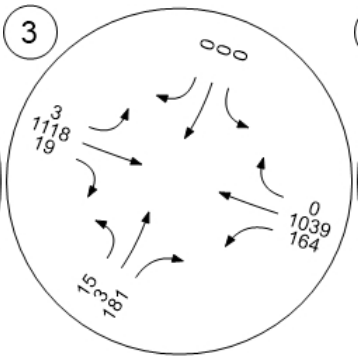
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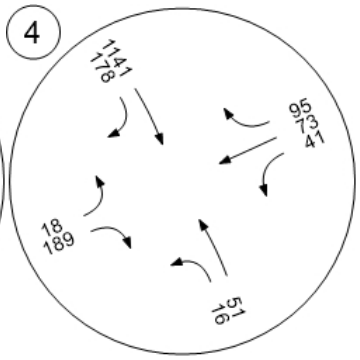
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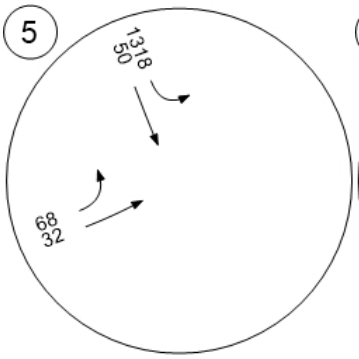
Air Cargo Way & Ron Cowan



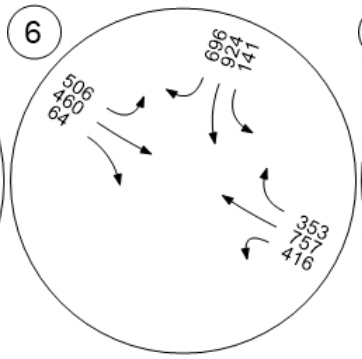
Ron Cowan Parkway & John



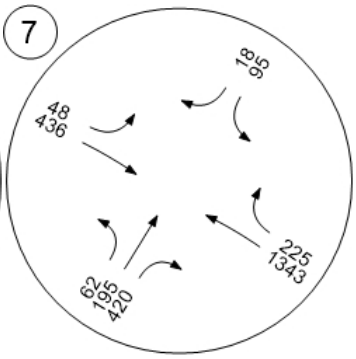
Ron Cowan Pkwy & Neil Arm



Hegenberger Road & Doolittl



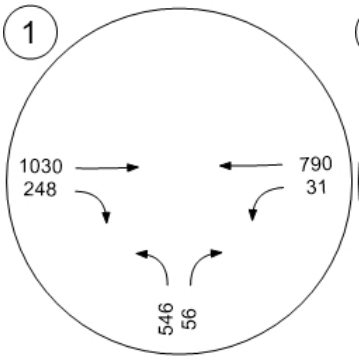
Doolittle Drive & Airport Acce



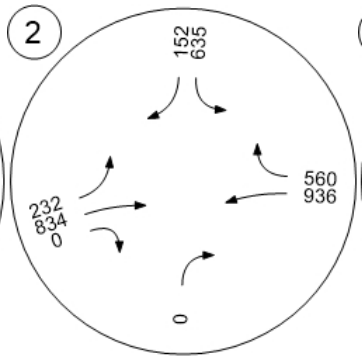
Traffic Volume - Future Total Volume



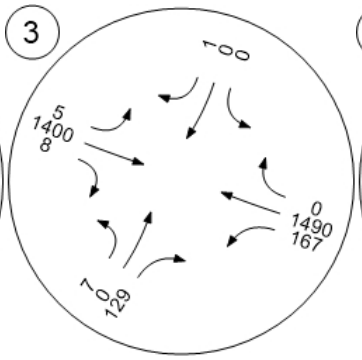
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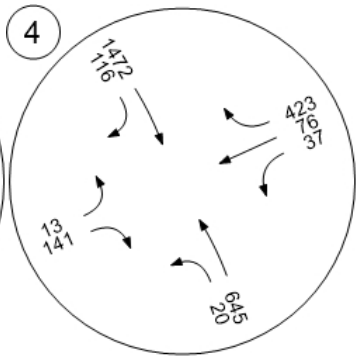
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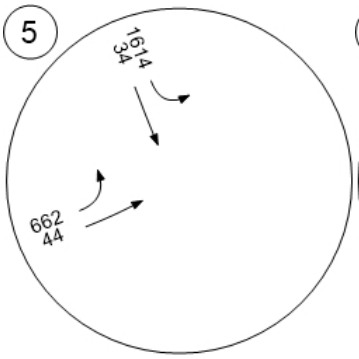
Air Cargo Way & Ron Cowan



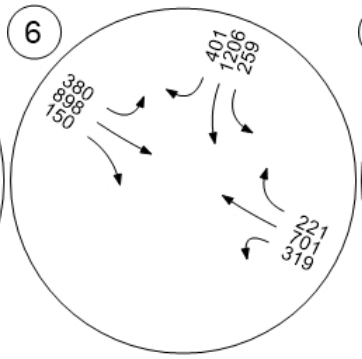
Ron Cowan Parkway & John



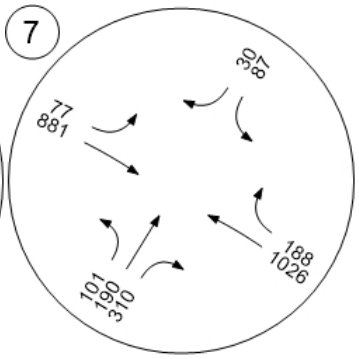
Ron Cowan Pkwy & Neil Arm



Hegenberger Road & Doolittl



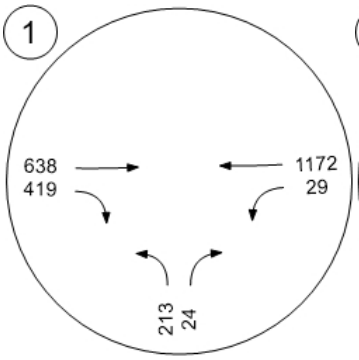
Doolittle Drive & Airport Acce



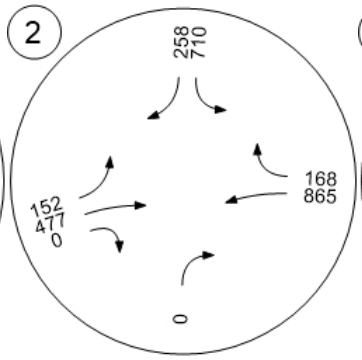
Traffic Volume - Future Total Volume



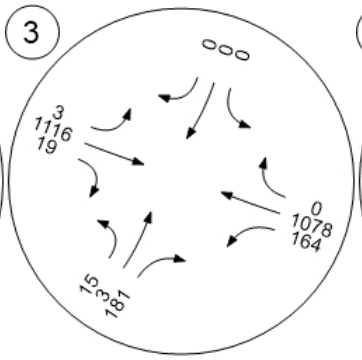
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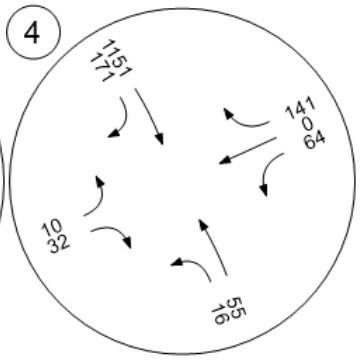
Harbor Bay Parkway & Ron



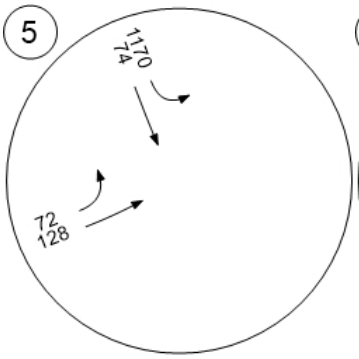
Air Cargo Way & Ron Cowan



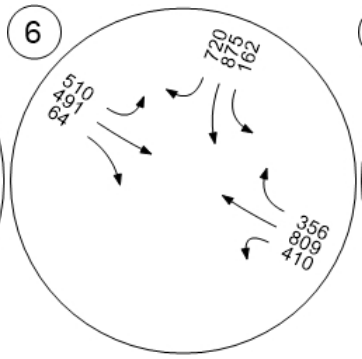
Ron Cowan Parkway & John



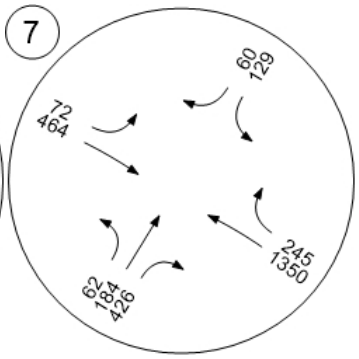
Ron Cowan Pkwy & Neil Arm



Hegenberger Road & Doolittl



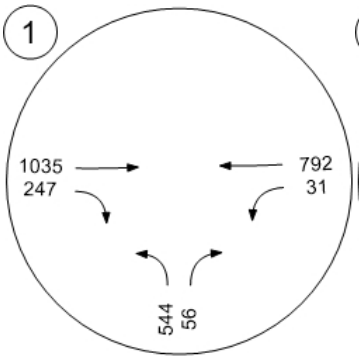
Doolittle Drive & Airport Acce



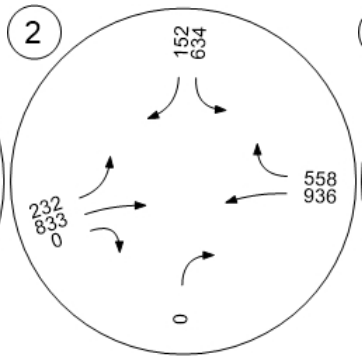
Traffic Volume - Future Total Volume



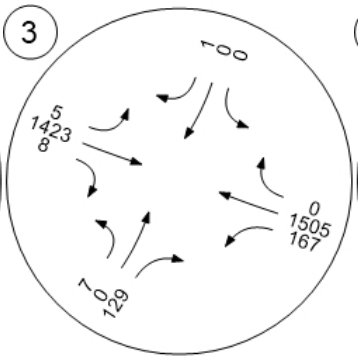
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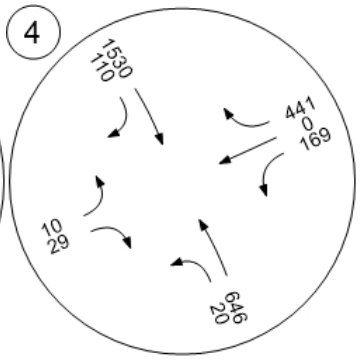
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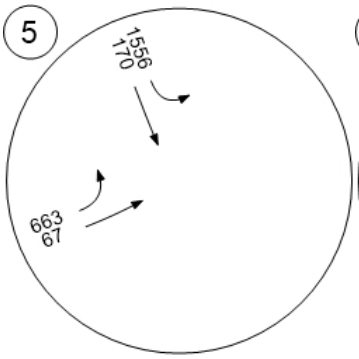
Air Cargo Way & Ron Cowan



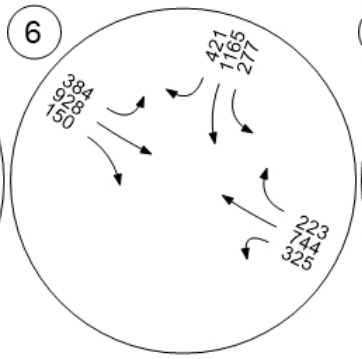
Ron Cowan Parkway & John



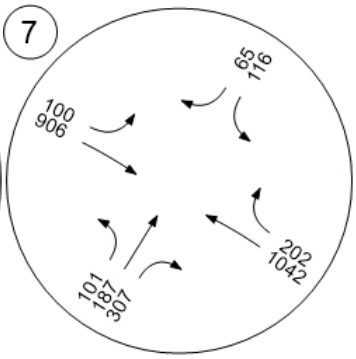
Ron Cowan Pkwy & Neil Arm



Hegenberger Road & Doolittl



Doolittle Drive & Airport Acce



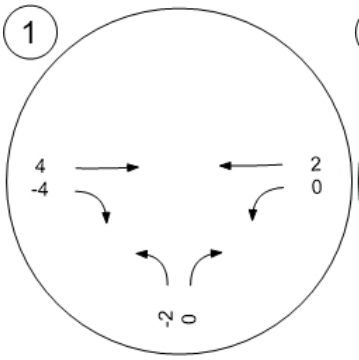


Appendix D Project Vehicle Trip Redistribution (2021, 2028, and 2038)

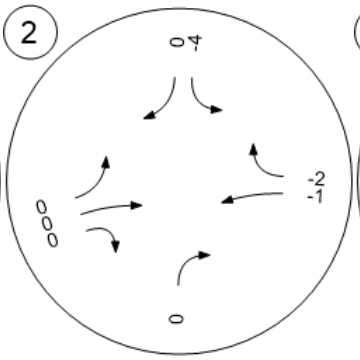
Traffic Volume - Net New Site Trips



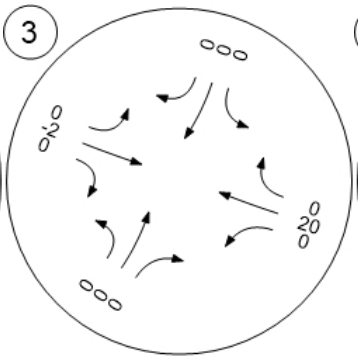
Harbor Bay Parkway & Doolit



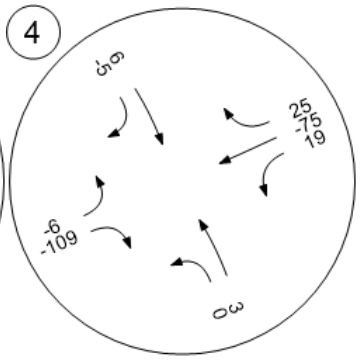
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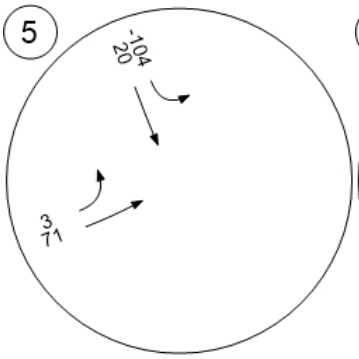
Air Cargo Way & Ron Cowan



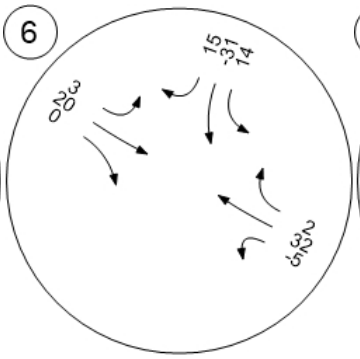
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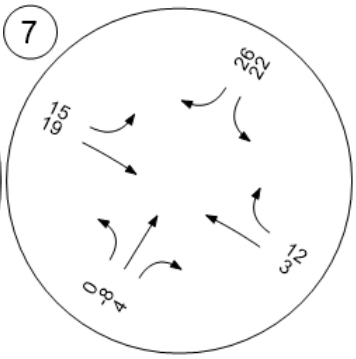
Ron Cowan Pkwy & Neil Arm



Hegenberger Road & Doolittl



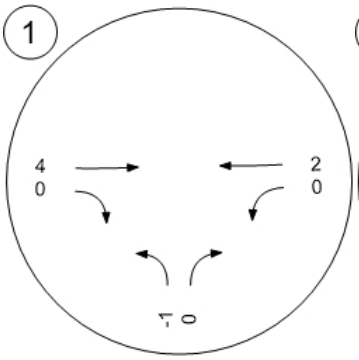
Doolittle Drive & Airport Acce



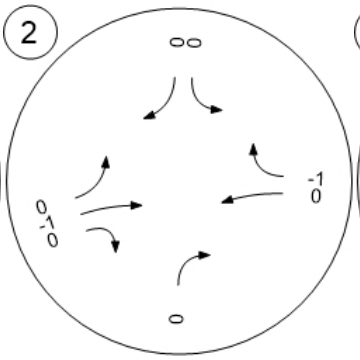
Traffic Volume - Net New Site Trips



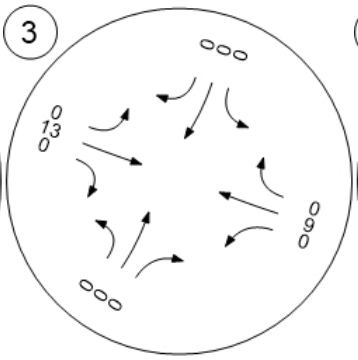
Harbor Bay Parkway & Doolit



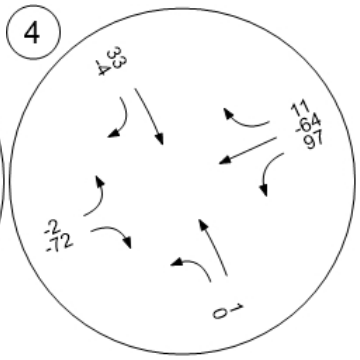
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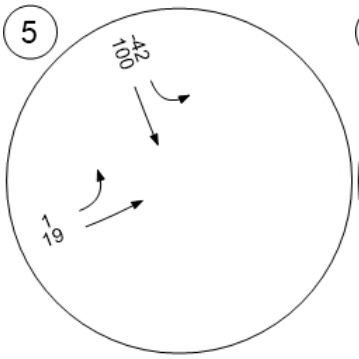
Air Cargo Way & Ron Cowan



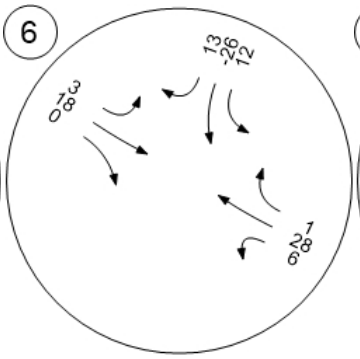
Ron Cowan Parkway & John



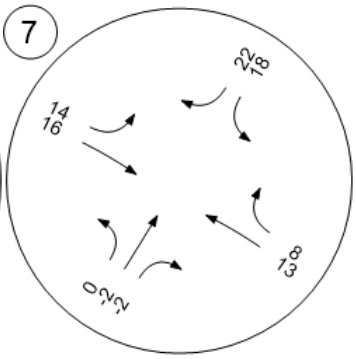
Ron Cowan Pkwy & Neil Arm



Hegenberger Road & Doolittl



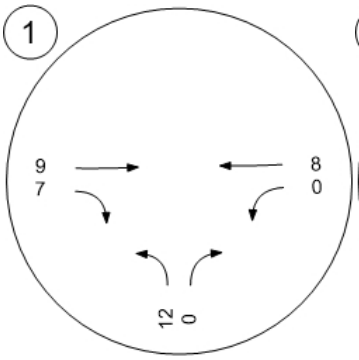
Doolittle Drive & Airport Acce



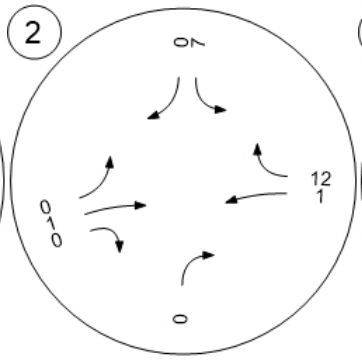
Traffic Volume - Net New Site Trips



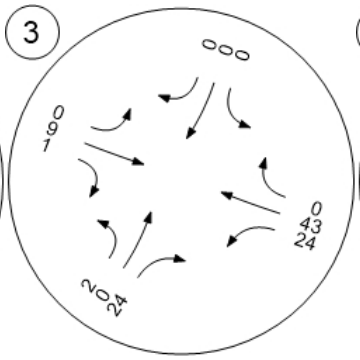
Harbor Bay Parkway & Doolit



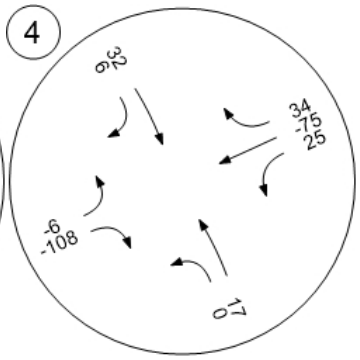
Harbor Bay Parkway & Ron



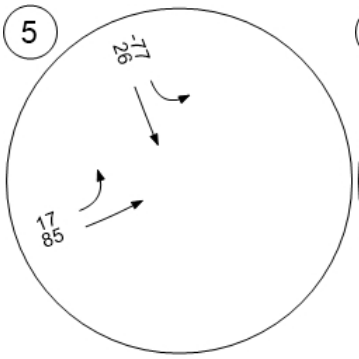
Air Cargo Way & Ron Cowan



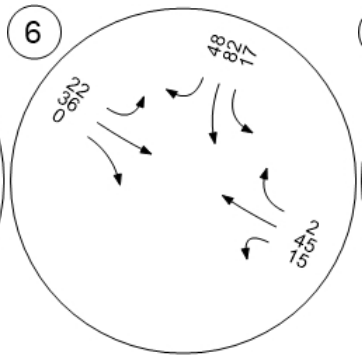
Ron Cowan Parkway & John



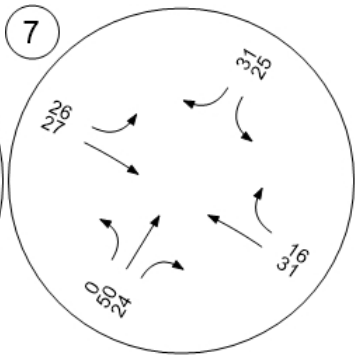
Ron Cowan Pkwy & Neil Arm



Hegenberger Road & Doolittl



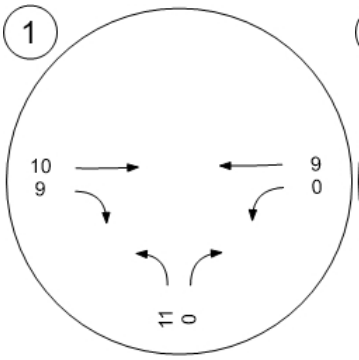
Doolittle Drive & Airport Acce



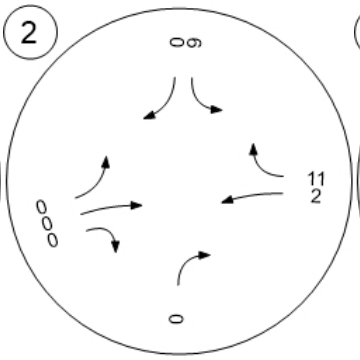
Traffic Volume - Net New Site Trips



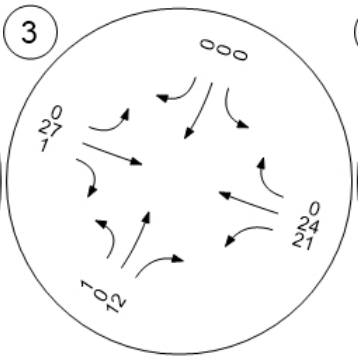
Harbor Bay Parkway & Doolit



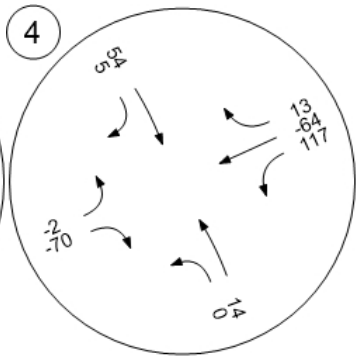
Harbor Bay Parkway & Ron



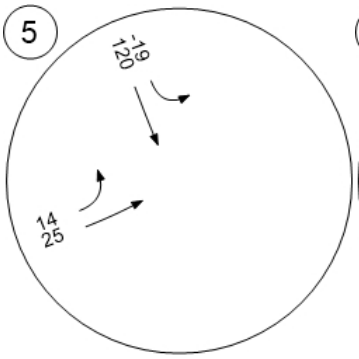
Air Cargo Way & Ron Cowan



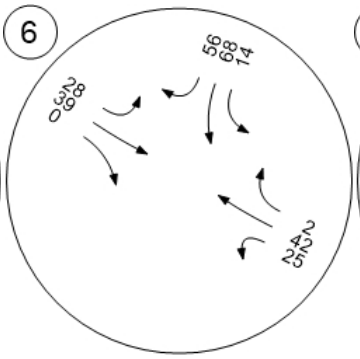
Ron Cowan Parkway & John



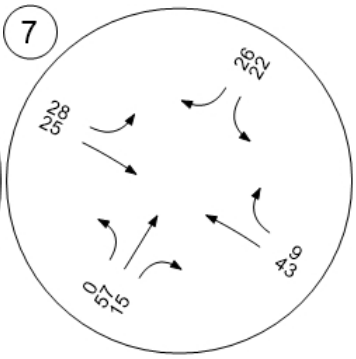
Ron Cowan Pkwy & Neil Arm



Hegenberger Road & Doolittl



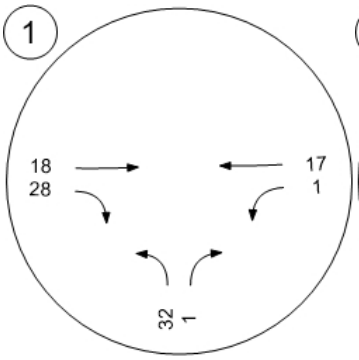
Doolittle Drive & Airport Acce



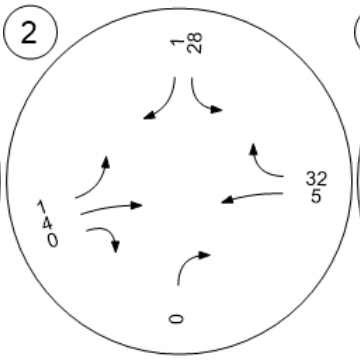
Traffic Volume - Net New Site Trips



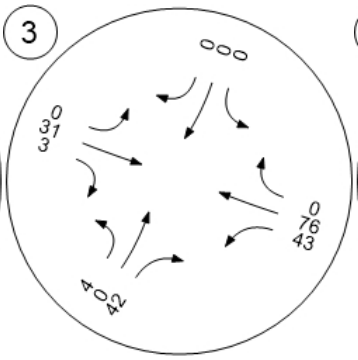
Harbor Bay Parkway & Doolit



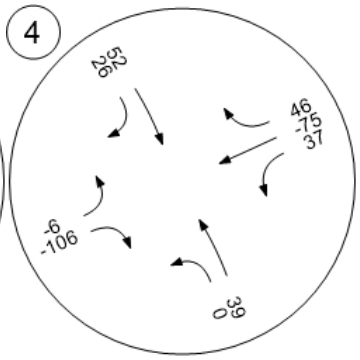
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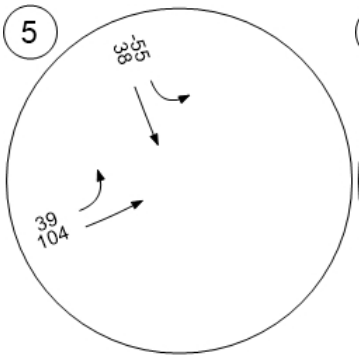
Air Cargo Way & Ron Cowan



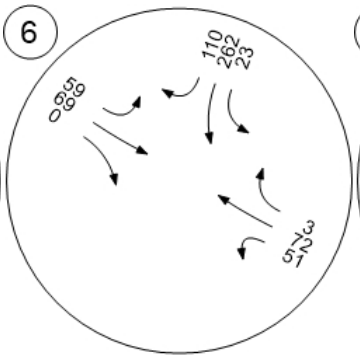
Ron Cowan Parkway & John



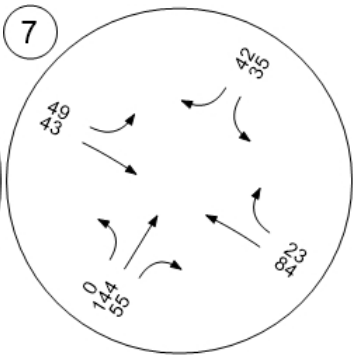
Ron Cowan Pkwy & Neil Arm



Hegenberger Road & Doolittl



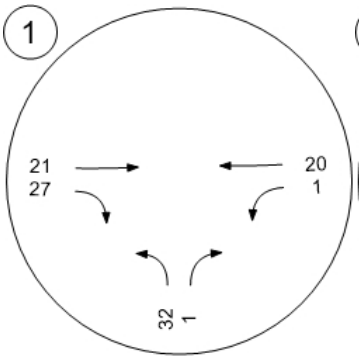
Doolittle Drive & Airport Acce



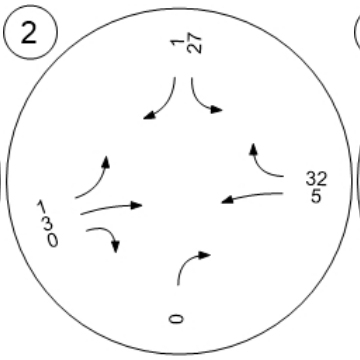
Traffic Volume - Net New Site Trips



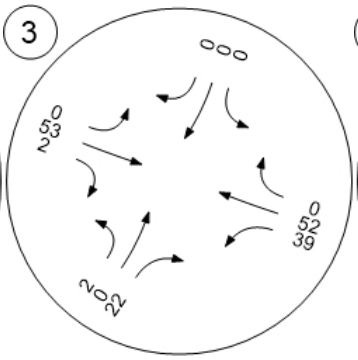
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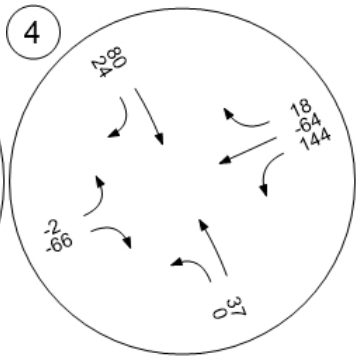
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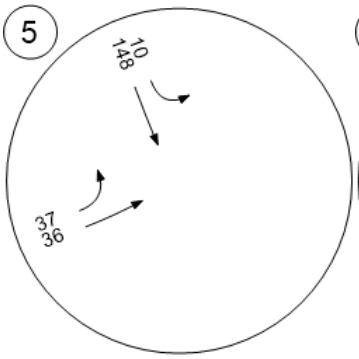
Air Cargo Way & Ron Cowan



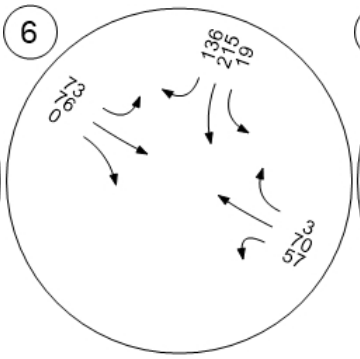
Ron Cowan Parkway & John



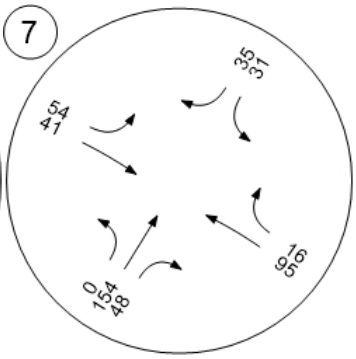
Ron Cowan Pkwy & Neil Arm



Hegenberger Road & Doolittl



Doolittle Drive & Airport Acce



Appendix E 2028 Intersection Operations Outputs

Oakland Terminal Project

Vistro File: H:\...\22916_Oakland Terminal_20221003.vistro
Report File: H:\...\2028_AM.pdf

Scenario 5 2028 AM
10/3/2022

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Harbor Bay Parkway & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.411	11.5	B
2	Harbor Bay Parkway & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.614	20.0	B
3	Air Cargo Way & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.636	8.8	A
4	Ron Cowan Parkway & John Glenn Dr	Signalized	HCM 7th Edition	EB Right	0.473	25.1	C
5	Ron Cowan Pkwy & Neil Armstrong Way	Signalized	HCM 7th Edition	EB Left	0.291	3.5	A
6	Hegenberger Road & Doolittle Drive	Signalized	HCM 7th Edition	EB Left	0.732	32.6	C
7	Doolittle Drive & Airport Access Road	Signalized	HCM 7th Edition	EB Left	0.627	20.1	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Harbor Bay Parkway & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	11.5
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.411

Intersection Setup

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	2	0
Entry Pocket Length [ft]	100.00	100.00	100.00	550.00	320.00	100.00
No. of Lanes in Exit Pocket	0	1	0	0	0	1
Exit Pocket Length [ft]	0.00	180.00	0.00	0.00	0.00	310.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Base Volume Input [veh/h]	181	23	585	289	32	939
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.30	4.30	2.50	2.80	28.60	3.40
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	13	0	5	12	0	6
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	194	23	590	301	32	945
Peak Hour Factor	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	49	6	151	77	8	241
Total Analysis Volume [veh/h]	198	23	602	307	33	964
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0		0		0	
v_di, Inbound Pedestrian Volume crossing major street [	0		0		0	
v_co, Outbound Pedestrian Volume crossing minor stree	0		0		0	
v_ci, Inbound Pedestrian Volume crossing minor street [	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		5		2	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Protected	Permissive
Signal Group	8	0	2	0	1	6
Auxiliary Signal Groups						
Lead / Lag	Lead	-	-	-	Lead	-
Minimum Green [s]	11	0	10	0	10	7
Maximum Green [s]	20	0	30	0	20	30
Amber [s]	4.8	0.0	5.2	0.0	4.8	5.2
All red [s]	1.0	0.0	1.0	0.0	1.0	1.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	5.0	0.0	4.0	0.0	2.2	4.0
Walk [s]	11	0	7	0	0	0
Pedestrian Clearance [s]	29	0	28	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No		No			No
I1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	3.8	0.0	4.2	0.0	3.8	4.2
Minimum Recall	No		Yes		No	Yes
Maximum Recall	No		No		No	No
Pedestrian Recall	No		No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	R	L	C
C, Cycle Length [s]	47	47	47	47	47	47
L, Total Lost Time per Cycle [s]	5.80	5.80	6.20	6.20	5.80	6.20
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.80	3.80	4.20	4.20	3.80	4.20
g_i, Effective Green Time [s]	10	10	15	15	4	24
g / C, Green / Cycle	0.22	0.22	0.32	0.32	0.08	0.52
(v / s)_i Volume / Saturation Flow Rate	0.06	0.01	0.17	0.20	0.01	0.27
s, saturation flow rate [veh/h]	3422	1560	3546	1555	2720	3520
c, Capacity [veh/h]	764	348	1131	496	207	1828
d1, Uniform Delay [s]	14.93	14.27	13.02	13.42	20.14	7.42
k, delay calibration	0.23	0.23	0.15	0.15	0.06	0.15
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.38	0.17	0.56	1.80	0.19	0.34
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.26	0.07	0.53	0.62	0.16	0.53
d, Delay for Lane Group [s/veh]	15.31	14.44	13.58	15.22	20.34	7.75
Lane Group LOS	B	B	B	B	C	A
Critical Lane Group	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.79	0.18	2.23	2.50	0.16	2.30
50th-Percentile Queue Length [ft/ln]	19.79	4.58	55.85	62.61	3.92	57.49
95th-Percentile Queue Length [veh/ln]	1.42	0.33	4.02	4.51	0.28	4.14
95th-Percentile Queue Length [ft/ln]	35.62	8.25	100.54	112.69	7.06	103.48

Movement, Approach, & Intersection Results

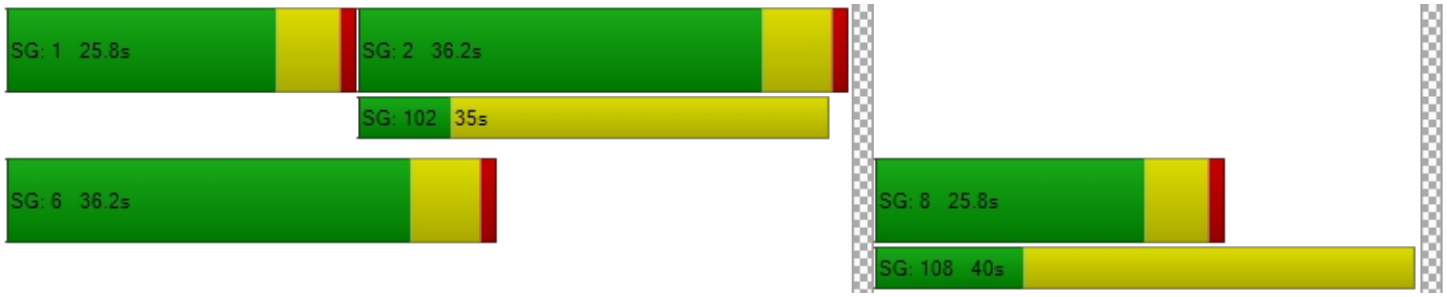
d_M, Delay for Movement [s/veh]	15.31	14.44	13.58	15.22	20.34	7.75
Movement LOS	B	B	B	B	C	A
d_A, Approach Delay [s/veh]	15.22		14.13		8.17	
Approach LOS	B		B		A	
d_I, Intersection Delay [s/veh]	11.45					
Intersection LOS	B					
Intersection V/C	0.411					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	15.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	13.56	10.67	0.00
I_p,int, Pedestrian LOS Score for Intersection	2.506	2.656	0.000
Crosswalk LOS	B	B	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	860	1290	1290
d_b, Bicycle Delay [s]	7.56	2.94	2.93
I_b,int, Bicycle LOS Score for Intersection	1.560	2.310	2.382
Bicycle LOS	A	B	B

Sequence

Ring 1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Harbor Bay Parkway & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	20.0
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.614

Intersection Setup

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	190.00	100.00	300.00	190.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	0	0	0	397	0	257	151	373	0	0	847	120
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	0.00	10.60	2.00	1.20	4.60	9.60	0.00	2.00	2.90	2.80
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	12	0	0	0	1	0	0	2	13
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	409	0	257	151	374	0	0	849	133
Peak Hour Factor	1.0000	1.0000	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	112	0	71	41	103	0	0	233	37
Total Analysis Volume [veh/h]	0	0	0	449	0	282	166	411	0	0	933	146
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			3		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Overla	Permis	Overla	Protect	Overla	Overla	Permis	Permis	Overla
Signal Group	0	0	4	3	0	3	5	2	2	0	6	6
Auxiliary Signal Groups				3,4		3,5		2,3	2,3			3,4,6
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	6	9	0	9	10	8	8	0	10	10
Maximum Green [s]	0	0	45	27	0	27	18	34	34	0	40	40
Amber [s]	0.0	0.0	3.6	4.1	0.0	4.1	4.1	4.8	4.8	0.0	4.8	4.8
All red [s]	0.0	0.0	1.2	1.2	0.0	1.2	1.2	1.2	1.2	0.0	1.2	1.2
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	3.0	3.2	0.0	3.2	2.5	3.2	3.2	0.0	3.2	3.2
Walk [s]	0	0	6	0	0	0	0	0	0	0	6	6
Pedestrian Clearance [s]	0	0	36	0	0	0	0	0	0	0	28	28
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk			No	No				No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	2.8	3.3	0.0	3.3	3.3	4.0	4.0	0.0	4.0	4.0
Minimum Recall			No	No		No	No	Yes	Yes		Yes	Yes
Maximum Recall			No	No		No	No	No	No		No	No
Pedestrian Recall			No	No		No	No	No	No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	20.0	20.0	0.0	20.0	20.0	20.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	R	L	R	L	C	R	C	R
C, Cycle Length [s]	87	87	87	87	87	87	87	87
L, Total Lost Time per Cycle [s]	4.80	4.80	5.30	5.30	5.30	5.30	6.00	4.80
l1_p, Permitted Start-Up Lost Time [s]	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.80	0.00	0.00	3.30	0.00	0.00	4.00	4.00
g_i, Effective Green Time [s]	6	33	48	10	71	71	28	61
g / C, Green / Cycle	0.07	0.38	0.55	0.11	0.81	0.81	0.32	0.70
(v / s)_i Volume / Saturation Flow Rate	0.00	0.21	0.10	0.05	0.12	0.00	0.26	0.09
s, saturation flow rate [veh/h]	1615	2189	2787	3386	3343	1615	3535	1567
c, Capacity [veh/h]	112	916	1531	384	2722	1315	1130	1099
d1, Uniform Delay [s]	0.00	23.37	9.76	35.85	1.71	0.00	27.26	2.75
k, delay calibration	0.11	0.12	0.12	0.08	0.12	0.12	0.12	0.12
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.00	0.44	0.06	0.57	0.03	0.00	1.73	0.06
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.00	0.49	0.18	0.43	0.15	0.00	0.83	0.13
d, Delay for Lane Group [s/veh]	0.00	23.81	9.82	36.43	1.73	0.00	28.98	2.81
Lane Group LOS	A	C	A	D	A	A	C	A
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.00	3.19	1.26	1.64	0.38	0.00	8.84	0.44
50th-Percentile Queue Length [ft/ln]	0.00	79.69	31.42	41.08	9.57	0.00	220.94	11.10
95th-Percentile Queue Length [veh/ln]	0.00	5.74	2.26	2.96	0.69	0.00	13.71	0.80
95th-Percentile Queue Length [ft/ln]	0.00	143.44	56.56	73.94	17.23	0.00	342.82	19.99

Movement, Approach, & Intersection Results

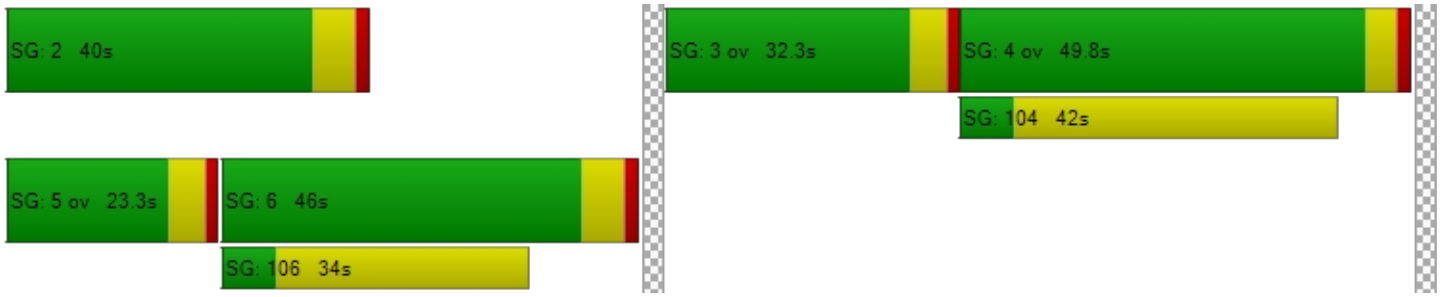
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	23.81	0.00	9.82	36.43	1.73	0.00	0.00	28.98	2.81
Movement LOS			A	C		A	D	A	A		C	A
d_A, Approach Delay [s/veh]	0.00			18.41			11.71			25.44		
Approach LOS	A			B			B			C		
d_I, Intersection Delay [s/veh]	19.97											
Intersection LOS	B											
Intersection V/C	0.614											

Other Modes

g_Walk,mi, Effective Walk Time [s]	-6.0	10.0	-5.3	10.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.57	33.93	48.82	33.93
I_p,int, Pedestrian LOS Score for Intersection	1.729	2.621	2.857	3.276
Crosswalk LOS	A	B	C	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1038	1783	145	923
d_b, Bicycle Delay [s]	10.03	0.51	37.29	12.60
I_b,int, Bicycle LOS Score for Intersection	1.560	1.560	2.036	2.450
Bicycle LOS	A	A	B	B

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Air Cargo Way & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	8.8
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.636

Intersection Setup

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	160.00	100.00	160.00	375.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			Yes		

Volumes

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	11	3	139	0	0	0	3	701	16	121	951	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	25.90	0.00	0.00	0.00	0.00	6.40	0.00	15.70	2.80	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	2	0	24	0	0	0	0	12	1	24	13	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	13	3	163	0	0	0	3	713	17	145	964	0
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	1	44	0	0	0	1	192	5	39	259	0
Total Analysis Volume [veh/h]	14	3	175	0	0	0	3	767	18	156	1037	0
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			1			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	3.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	26	0	0	0	0	0	24	0	0	18	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	R	L	C	C
C, Cycle Length [s]	29	29	29	29	29	29	29	29
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	4	4	0	9	9	4	12	12
g / C, Green / Cycle	0.15	0.15	0.00	0.31	0.31	0.12	0.43	0.43
(v / s)_i Volume / Saturation Flow Rate	0.12	0.00	0.00	0.22	0.01	0.10	0.28	0.28
s, saturation flow rate [veh/h]	1639	1049	1810	3435	1581	1585	1858	1858
c, Capacity [veh/h]	384	284	8	1064	490	198	800	800
d1, Uniform Delay [s]	11.81	0.00	14.46	8.93	7.02	12.36	6.55	6.55
k, delay calibration	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.38	0.00	11.71	0.35	0.01	2.62	0.33	0.33
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.50	0.00	0.39	0.72	0.04	0.79	0.65	0.65
d, Delay for Lane Group [s/veh]	12.19	0.00	26.17	9.28	7.03	14.98	6.88	6.88
Lane Group LOS	B	A	C	A	A	B	A	A
Critical Lane Group	Yes	No	No	Yes	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	0.90	0.00	0.04	1.37	0.05	0.87	1.30	1.30
50th-Percentile Queue Length [ft/ln]	22.39	0.00	1.01	34.36	1.26	21.63	32.57	32.57
95th-Percentile Queue Length [veh/ln]	1.61	0.00	0.07	2.47	0.09	1.56	2.35	2.35
95th-Percentile Queue Length [ft/ln]	40.31	0.00	1.81	61.85	2.26	38.93	58.63	58.63

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	12.19	12.19	12.19	0.00	0.00	0.00	26.17	9.28	7.03	14.98	6.88	6.88
Movement LOS	B	B	B	A	A	A	C	A	A	B	A	A
d_A, Approach Delay [s/veh]	12.19			0.00			9.30			7.94		
Approach LOS	B			A			A			A		
d_I, Intersection Delay [s/veh]	8.81											
Intersection LOS	A											
Intersection V/C	0.636											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	5.58	5.58	0.00	5.58
I_p,int, Pedestrian LOS Score for Intersection	1.820	1.644	0.000	2.642
Crosswalk LOS	A	A	F	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	2069	2069	2069	2069
d_b, Bicycle Delay [s]	0.02	0.02	0.02	0.02
I_b,int, Bicycle LOS Score for Intersection	1.876	1.560	2.210	2.544
Bicycle LOS	A	A	B	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Ron Cowan Parkway & John Glenn Dr

Control Type:	Signalized	Delay (sec / veh):	25.1
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.473

Intersection Setup

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	220.00	100.00	220.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			Yes			No		

Volumes

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Base Volume Input [veh/h]	16	15	0	0	750	109	16	0	138	27	29	44
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	43.80	21.40	2.00	2.00	14.50	15.00	6.30	2.00	27.50	7.40	10.30	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	13	0	0	24	12	0	0	20	4	12	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	16	28	0	0	774	121	16	0	158	31	41	44
Peak Hour Factor	0.9100	0.9100	1.0000	1.0000	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	8	0	0	213	33	4	0	43	9	11	12
Total Analysis Volume [veh/h]	18	31	0	0	851	133	18	0	174	34	45	48
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			1			0		
v_ci, Inbound Pedestrian Volume crossing minor street	0			1			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			2			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	76
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	ProtPer	Permis	Permis	Permis	Permis	Permis	Split	Permis	Split	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	2	0	1	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	10	0	0	10	0	4	10	0	4	4	0
Maximum Green [s]	10	20	0	0	20	0	15	20	0	10	15	0
Amber [s]	4.0	4.0	0.0	0.0	4.0	0.0	3.5	4.0	0.0	4.0	3.5	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	13	34	0	0	21	0	15	21	0	13	27	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	0	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	Yes	Yes			Yes		No				No	
Maximum Recall	No	No			No		No				No	
Pedestrian Recall	No	No			No		No				No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	C	C	C	L	C	R
C, Cycle Length [s]	76	76	76	76	76	76	76	76
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	48	48	39	39	11	5	5	5
g / C, Green / Cycle	0.64	0.64	0.52	0.52	0.14	0.06	0.06	0.06
(v / s)_i Volume / Saturation Flow Rate	0.04	0.02	0.20	0.21	0.15	0.02	0.03	0.03
s, saturation flow rate [veh/h]	620	1437	3203	1554	1277	1704	1745	1615
c, Capacity [veh/h]	458	914	1657	804	185	104	107	99
d1, Uniform Delay [s]	6.13	5.13	11.14	11.23	32.50	34.18	34.38	34.52
k, delay calibration	0.11	0.50	0.50	0.50	0.24	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.05	0.06	0.71	1.53	56.11	1.79	2.62	3.66
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.05	0.03	0.40	0.41	1.04	0.33	0.42	0.49
d, Delay for Lane Group [s/veh]	6.17	5.18	11.85	12.76	88.61	35.97	37.00	38.18
Lane Group LOS	A	A	B	B	F	D	D	D
Critical Lane Group	Yes	No	No	Yes	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.13	0.14	3.17	3.38	6.17	0.64	0.86	0.94
50th-Percentile Queue Length [ft/ln]	3.26	3.38	79.34	84.42	154.22	15.99	21.51	23.46
95th-Percentile Queue Length [veh/ln]	0.23	0.24	5.71	6.08	10.40	1.15	1.55	1.69
95th-Percentile Queue Length [ft/ln]	5.87	6.09	142.81	151.95	260.02	28.79	38.72	42.23

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	6.17	5.38	0.00	0.00	12.06	12.76	88.61	0.00	88.61	35.97	37.00	38.18
Movement LOS	A	A			B	B	F		F	D	D	D
d_A, Approach Delay [s/veh]	5.67			12.15			88.61			37.17		
Approach LOS	A			B			F			D		
d_I, Intersection Delay [s/veh]	25.12											
Intersection LOS	C											
Intersection V/C	0.473											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	9.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	3486.72	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	29.54	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	1.916	0.000
Crosswalk LOS	F	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	763	421	276	592
d_b, Bicycle Delay [s]	14.55	23.71	28.23	18.83
l_b,int, Bicycle LOS Score for Intersection	1.600	2.101	1.876	1.769
Bicycle LOS	A	B	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Ron Cowan Pkwy & Neil Armstrong Way

Control Type:	Signalized	Delay (sec / veh):	3.5
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.291

Intersection Setup

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	2
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	139.61
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No					
Crosswalk	Yes			No			Yes			No		

Volumes

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Base Volume Input [veh/h]	0	0	0	875	36	0	32	24	0	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	17.80	5.60	2.00	32.30	8.30	2.00	2.00	2.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	44	4	0	13	2	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	919	40	0	45	26	0	0	0	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9200	0.9200	1.0000	0.9200	0.9200	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	250	11	0	12	7	0	0	0	0
Total Analysis Volume [veh/h]	0	0	0	999	43	0	49	28	0	0	0	0
Presence of On-Street Parking				No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	38
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	6.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Permis	Split	Split	Permis	Permis	Permis	Permis
Signal Group	0	0	0	4	6	0	5	4	0	0	0	6
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	0	0	5
Maximum Green [s]	0	0	0	11	11	0	5	11	0	0	0	11
Amber [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0
Split [s]	0	0	0	15	23	0	0	15	0	0	0	23
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
Walk [s]	0	0	0	0	4	0	0	0	0	0	0	4
Pedestrian Clearance [s]	0	0	0	0	7	0	0	0	0	0	0	7
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No				
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
Minimum Recall					No			No				
Maximum Recall					No			No				
Pedestrian Recall					No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	L	C	
C, Cycle Length [s]		38	38	38	38	
L, Total Lost Time per Cycle [s]		4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]		2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]		27	27	3	3	
g / C, Green / Cycle		0.72	0.72	0.07	0.07	
(v / s)_i Volume / Saturation Flow Rate		0.22	0.22	0.03	0.02	
s, saturation flow rate [veh/h]		3020	1739	1348	1745	
c, Capacity [veh/h]		2158	1243	100	130	
d1, Uniform Delay [s]		1.98	1.98	16.67	16.66	
k, delay calibration		0.50	0.50	0.11	0.11	
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]		0.37	0.64	1.96	1.47	
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	
Rp, platoon ratio		1.00	1.00	1.00	1.00	
PF, progression factor		1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity		0.31	0.31	0.34	0.33	
d, Delay for Lane Group [s/veh]		2.35	2.61	18.63	18.13	
Lane Group LOS		A	A	B	B	
Critical Lane Group		Yes	No	Yes	No	
50th-Percentile Queue Length [veh/ln]		0.16	0.28	0.29	0.36	
50th-Percentile Queue Length [ft/ln]		4.00	6.90	7.37	8.92	
95th-Percentile Queue Length [veh/ln]		0.29	0.50	0.53	0.64	
95th-Percentile Queue Length [ft/ln]		7.21	12.42	13.26	16.06	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	2.44	2.61	0.00	18.50	18.13	0.00	0.00	0.00	0.00
Movement LOS				A	A		B	B				
d_A, Approach Delay [s/veh]	0.00			2.44			18.35			0.00		
Approach LOS	A			A			B			A		
d_I, Intersection Delay [s/veh]	3.54											
Intersection LOS	A											
Intersection V/C	0.291											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	8.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	9.58	0.00	11.83	0.00
l_p,int, Pedestrian LOS Score for Intersection	1.413	0.000	1.709	0.000
Crosswalk LOS	A	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1001	579	0
d_b, Bicycle Delay [s]	18.98	4.74	9.58	18.98
l_b,int, Bicycle LOS Score for Intersection	4.132	3.279	1.687	4.132
Bicycle LOS	D	C	A	D

Sequence

Ring 1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: Hegenberger Road & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	32.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.732

Intersection Setup

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	2	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	210.00	100.00	210.00	275.00	100.00	160.00	275.00	100.00	210.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	1	0	0	1
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	0	0	0	139	514	469	250	422	53	359	667	361
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	17.00	6.00	1.00	2.00	3.00	22.00	5.00	3.00	7.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	1	117	31	19	14	0	21	7	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	140	631	500	269	436	53	380	674	361
Peak Hour Factor	1.0000	1.0000	1.0000	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	36	163	129	69	112	14	98	174	93
Total Analysis Volume [veh/h]	0	0	0	144	651	515	277	449	55	392	695	372
Presence of On-Street Parking				No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	99.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Split	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	0	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	0	0	30	45	0	35	45	0	25	40	0
Amber [s]	0.0	0.0	0.0	3.0	4.0	0.0	3.0	4.5	0.0	3.0	4.5	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	43	0	18	38	0	19	39	0
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	0	0	0	31	0	0	0	0	0	26	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	3.0	0.0	2.0	3.5	0.0	2.0	3.5	0.0
Minimum Recall					No		No	Yes		No	Yes	
Maximum Recall					No		No	No		No	No	
Pedestrian Recall					No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	C	L	C	R	L	C	R
C, Cycle Length [s]		100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	4.00	5.50	5.50	4.00	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	2.00	3.50	3.50	2.00	3.50	3.50
g_i, Effective Green Time [s]		36	36	36	10	36	36	14	39	39
g / C, Green / Cycle		0.36	0.36	0.36	0.10	0.36	0.36	0.14	0.39	0.39
(v / s)_i Volume / Saturation Flow Rate		0.09	0.19	0.34	0.08	0.13	0.04	0.12	0.20	0.25
s, saturation flow rate [veh/h]		1567	3446	1519	3459	3532	1334	3375	3532	1507
c, Capacity [veh/h]		568	1250	551	356	1256	474	462	1376	587
d1, Uniform Delay [s]		22.40	25.07	30.77	43.81	23.82	21.68	42.19	23.22	24.66
k, delay calibration		0.11	0.11	0.27	0.11	0.50	0.50	0.11	0.50	0.50
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		0.23	0.34	16.30	3.71	0.80	0.50	4.41	1.33	5.14
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity		0.25	0.52	0.93	0.78	0.36	0.12	0.85	0.50	0.63
d, Delay for Lane Group [s/veh]		22.63	25.41	47.07	47.51	24.61	22.18	46.60	24.54	29.81
Lane Group LOS		C	C	D	D	C	C	D	C	C
Critical Lane Group		No	No	Yes	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		2.39	6.01	14.06	3.51	4.00	0.93	4.97	6.34	7.76
50th-Percentile Queue Length [ft/ln]		59.76	150.37	351.48	87.64	99.98	23.16	124.14	158.40	193.88
95th-Percentile Queue Length [veh/ln]		4.30	10.04	20.21	6.31	7.20	1.67	8.62	10.46	12.32
95th-Percentile Queue Length [ft/ln]		107.56	250.93	505.21	157.75	179.97	41.69	215.50	261.60	308.06

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	22.63	25.41	47.07	47.51	24.61	22.18	46.60	24.54	29.81
Movement LOS				C	C	D	D	C	C	D	C	C
d_A, Approach Delay [s/veh]	0.00			33.62			32.56			31.81		
Approach LOS	A			C			C			C		
d_I, Intersection Delay [s/veh]	32.65											
Intersection LOS	C											
Intersection V/C	0.732											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	39.64	39.64	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	2.776	2.876	0.000
Crosswalk LOS	F	C	C	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	759	650	670
d_b, Bicycle Delay [s]	50.03	19.26	22.81	22.15
l_b,int, Bicycle LOS Score for Intersection	4.132	2.280	2.204	2.763
Bicycle LOS	D	B	B	C

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: Doolittle Drive & Airport Access Road

Control Type:	Signalized	Delay (sec / veh):	20.1
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.627

Intersection Setup

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	1	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	109	41	194	68	0	24	23	421	0	0	1231	198
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	33.90	17.50	3.20	8.80	2.00	5.60	4.30	6.70	2.00	2.00	4.60	6.10
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	60	17	0	0	0	9	6	0	0	28	1
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	109	101	211	68	0	24	32	427	0	0	1259	199
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	1.0000	0.9400	0.9400	0.9400	1.0000	1.0000	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	29	27	56	18	0	6	9	114	0	0	335	53
Total Analysis Volume [veh/h]	116	107	224	72	0	26	34	454	0	0	1339	212
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	1			2			0			1		
v_di, Inbound Pedestrian Volume crossing major street [	0			1			1			2		
v_co, Outbound Pedestrian Volume crossing minor stree	1			0			0			1		
v_ci, Inbound Pedestrian Volume crossing minor street [	1			0			0			1		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			0			2			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	41.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Permis	Split	Protect	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	4	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	5	0	5	0	0	5	5	0	0	5	0
Maximum Green [s]	0	65	0	30	0	0	20	55	0	0	35	0
Amber [s]	0.0	4.0	0.0	3.0	0.0	0.0	3.0	4.5	0.0	0.0	4.5	0.0
All red [s]	0.0	1.0	0.0	1.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	33	0	18	0	0	15	49	0	0	34	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	0	0	0	0	0	0	5	0
Pedestrian Clearance [s]	0	23	0	0	0	0	0	0	0	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No		No				No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No		No			No	Yes			Yes	
Maximum Recall		No		No			No	No			No	
Pedestrian Recall		No		No			No	No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	0.0	0.0	20.0	20.0	0.0	0.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	R	L	C	C	R
C, Cycle Length [s]	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	18	18	18	5	5	3	65	58	58
g / C, Green / Cycle	0.18	0.18	0.18	0.05	0.05	0.03	0.65	0.58	0.58
(v / s)_i Volume / Saturation Flow Rate	0.09	0.02	0.14	0.02	0.02	0.02	0.13	0.38	0.14
s, saturation flow rate [veh/h]	1325	4460	1548	3270	1544	1748	3426	3486	1515
c, Capacity [veh/h]	244	822	285	154	73	54	2223	2014	875
d1, Uniform Delay [s]	36.52	34.14	38.85	46.47	46.23	47.94	7.12	14.49	10.35
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.43	0.07	4.76	2.18	2.93	11.28	0.21	1.75	0.66
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.48	0.13	0.79	0.47	0.36	0.63	0.20	0.66	0.24
d, Delay for Lane Group [s/veh]	37.95	34.21	43.60	48.65	49.16	59.22	7.33	16.25	11.01
Lane Group LOS	D	C	D	D	D	E	A	B	B
Critical Lane Group	No	No	Yes	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	2.62	0.73	5.55	0.92	0.68	1.00	1.86	10.09	2.33
50th-Percentile Queue Length [ft/ln]	65.38	18.23	138.73	22.89	17.09	25.10	46.50	252.21	58.27
95th-Percentile Queue Length [veh/ln]	4.71	1.31	9.41	1.65	1.23	1.81	3.35	15.30	4.20
95th-Percentile Queue Length [ft/ln]	117.68	32.81	235.31	41.21	30.76	45.18	83.69	382.43	104.89

Movement, Approach, & Intersection Results

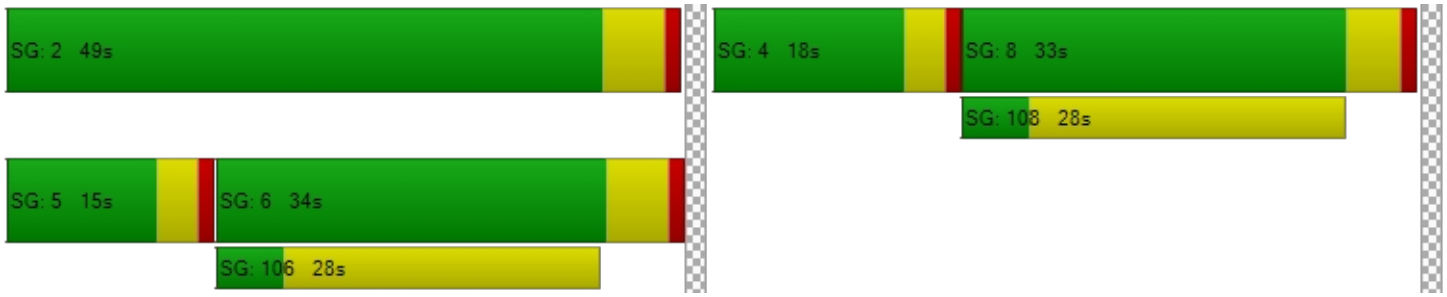
d_M, Delay for Movement [s/veh]	37.95	34.21	43.60	48.65	0.00	49.16	59.22	7.33	0.00	0.00	16.25	11.01
Movement LOS	D	C	D	D		D	E	A			B	B
d_A, Approach Delay [s/veh]	39.89			48.79			10.94			15.53		
Approach LOS	D			D			B			B		
d_I, Intersection Delay [s/veh]	20.14											
Intersection LOS	C											
Intersection V/C	0.627											

Other Modes

g_Walk,mi, Effective Walk Time [s]	43.5	9.0	14.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	15.99	41.44	37.01	41.44
l_p,int, Pedestrian LOS Score for Intersection	2.355	2.663	2.686	2.755
Crosswalk LOS	B	B	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	560	280	869	570
d_b, Bicycle Delay [s]	25.96	37.01	16.00	25.62
l_b,int, Bicycle LOS Score for Intersection	1.805	1.560	1.962	2.839
Bicycle LOS	A	A	A	C

Sequence

Ring 1	-	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Oakland Terminal Project

Vistro File: H:\...\22916_Oakland Terminal_20221003.vistro
Report File: H:\...\2028_PM.pdf

Scenario 6 2028 PM
10/3/2022

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Harbor Bay Parkway & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.480	12.9	B
2	Harbor Bay Parkway & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.611	15.0	B
3	Air Cargo Way & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.702	8.6	A
4	Ron Cowan Parkway & John Glenn Dr	Signalized	HCM 7th Edition	EB Right	0.596	19.0	B
5	Ron Cowan Pkwy & Neil Armstrong Way	Signalized	HCM 7th Edition	EB Left	0.448	7.3	A
6	Hegenberger Road & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.568	29.1	C
7	Doolittle Drive & Airport Access Road	Signalized	HCM 7th Edition	EB Left	0.605	21.4	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Harbor Bay Parkway & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	12.9
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.480

Intersection Setup

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	2	0
Entry Pocket Length [ft]	100.00	100.00	100.00	550.00	320.00	100.00
No. of Lanes in Exit Pocket	0	1	0	0	0	1
Exit Pocket Length [ft]	0.00	180.00	0.00	0.00	0.00	310.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Base Volume Input [veh/h]	369	53	906	164	30	764
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.80	10.90	3.00	0.00	3.30	0.70
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	13	0	6	10	0	7
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	382	53	912	174	30	771
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	102	14	243	46	8	205
Total Analysis Volume [veh/h]	406	56	970	185	32	820
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0		0		0	
v_di, Inbound Pedestrian Volume crossing major street [	0		0		0	
v_co, Outbound Pedestrian Volume crossing minor stree	0		0		0	
v_ci, Inbound Pedestrian Volume crossing minor street [	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		6		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Protected	Permissive
Signal Group	8	0	2	0	1	6
Auxiliary Signal Groups						
Lead / Lag	Lead	-	-	-	Lead	-
Minimum Green [s]	11	0	10	0	10	7
Maximum Green [s]	20	0	30	0	20	30
Amber [s]	4.8	0.0	5.2	0.0	4.8	5.2
All red [s]	1.0	0.0	1.0	0.0	1.0	1.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	5.0	0.0	4.0	0.0	2.2	4.0
Walk [s]	11	0	7	0	0	0
Pedestrian Clearance [s]	29	0	28	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No		No			No
I1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	3.8	0.0	4.2	0.0	3.8	4.2
Minimum Recall	No		Yes		No	Yes
Maximum Recall	No		No		No	No
Pedestrian Recall	No		No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	R	L	C
C, Cycle Length [s]	54	54	54	54	54	54
L, Total Lost Time per Cycle [s]	5.80	5.80	6.20	6.20	5.80	6.20
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.80	3.80	4.20	4.20	3.80	4.20
g_i, Effective Green Time [s]	11	11	21	21	4	31
g / C, Green / Cycle	0.20	0.20	0.39	0.39	0.07	0.57
(v / s)_i Volume / Saturation Flow Rate	0.12	0.04	0.27	0.12	0.01	0.23
s, saturation flow rate [veh/h]	3492	1476	3532	1590	3422	3598
c, Capacity [veh/h]	712	301	1394	628	246	2065
d1, Uniform Delay [s]	19.37	17.79	13.64	11.17	23.49	6.35
k, delay calibration	0.23	0.23	0.15	0.15	0.06	0.15
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.54	0.63	0.90	0.37	0.13	0.18
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.57	0.19	0.70	0.29	0.13	0.40
d, Delay for Lane Group [s/veh]	20.91	18.42	14.54	11.54	23.62	6.53
Lane Group LOS	C	B	B	B	C	A
Critical Lane Group	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	2.23	0.58	4.31	1.36	0.18	1.91
50th-Percentile Queue Length [ft/ln]	55.69	14.47	107.74	33.91	4.56	47.80
95th-Percentile Queue Length [veh/ln]	4.01	1.04	7.71	2.44	0.33	3.44
95th-Percentile Queue Length [ft/ln]	100.23	26.04	192.85	61.03	8.21	86.03

Movement, Approach, & Intersection Results

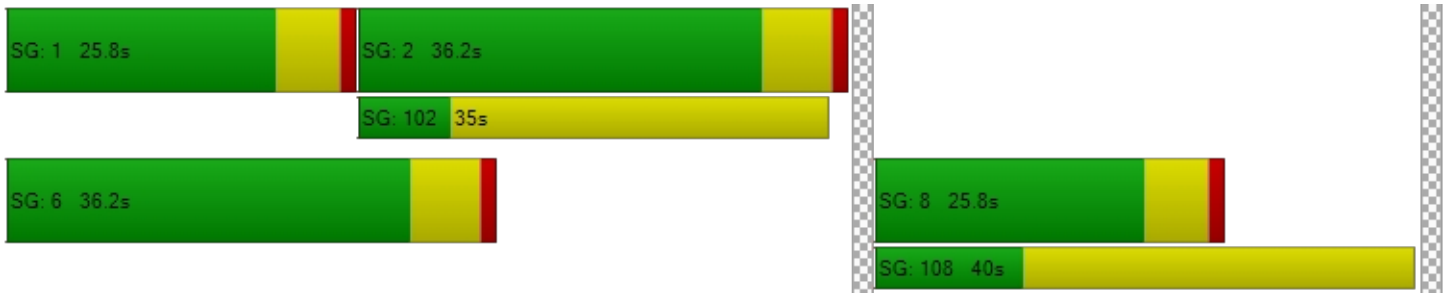
d_M, Delay for Movement [s/veh]	20.91	18.42	14.54	11.54	23.62	6.53
Movement LOS	C	B	B	B	C	A
d_A, Approach Delay [s/veh]	20.61		14.06		7.17	
Approach LOS	C		B		A	
d_I, Intersection Delay [s/veh]	12.91					
Intersection LOS	B					
Intersection V/C	0.480					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	15.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	17.07	14.04	0.00
l_p,int, Pedestrian LOS Score for Intersection	2.534	2.727	0.000
Crosswalk LOS	B	B	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	742	1113	1113
d_b, Bicycle Delay [s]	10.66	5.32	5.30
l_b,int, Bicycle LOS Score for Intersection	1.560	2.512	2.263
Bicycle LOS	A	B	B

Sequence

Ring 1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Harbor Bay Parkway & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	15.0
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.611

Intersection Setup

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	190.00	100.00	300.00	190.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	0	0	0	330	0	151	231	775	0	0	573	335
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	0.00	3.60	2.00	1.30	0.90	2.60	0.00	2.00	5.20	1.70
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	10	0	0	0	1	0	0	2	13
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	340	0	151	231	776	0	0	575	348
Peak Hour Factor	1.0000	1.0000	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	93	0	41	63	213	0	0	158	96
Total Analysis Volume [veh/h]	0	0	0	374	0	166	254	853	0	0	632	382
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			2			4			6		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Overla	Permis	Overla	Protect	Overla	Overla	Permis	Permis	Overla
Signal Group	0	0	4	3	0	3	5	2	2	0	6	6
Auxiliary Signal Groups				3,4		3,5		2,3	2,3			3,4,6
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	6	9	0	9	10	8	8	0	10	10
Maximum Green [s]	0	0	45	27	0	27	18	34	34	0	40	40
Amber [s]	0.0	0.0	3.6	4.1	0.0	4.1	4.1	4.8	4.8	0.0	4.8	4.8
All red [s]	0.0	0.0	1.2	1.2	0.0	1.2	1.2	1.2	1.2	0.0	1.2	1.2
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	3.0	3.2	0.0	3.2	2.5	3.2	3.2	0.0	3.2	3.2
Walk [s]	0	0	6	0	0	0	0	0	0	0	6	6
Pedestrian Clearance [s]	0	0	36	0	0	0	0	0	0	0	28	28
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk			No	No				No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	2.8	3.3	0.0	3.3	3.3	4.0	4.0	0.0	4.0	4.0
Minimum Recall			No	No		No	No	Yes	Yes		Yes	Yes
Maximum Recall			No	No		No	No	No	No		No	No
Pedestrian Recall			No	No		No	No	No	No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	20.0	20.0	0.0	20.0	20.0	20.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	R	L	R	L	C	R	C	R
C, Cycle Length [s]	81	81	81	81	81	81	81	81
L, Total Lost Time per Cycle [s]	4.80	4.80	5.30	5.30	5.30	5.30	6.00	4.80
l1_p, Permitted Start-Up Lost Time [s]	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.80	0.00	0.00	3.30	0.00	0.00	4.00	4.00
g_i, Effective Green Time [s]	7	35	50	10	64	64	20	55
g / C, Green / Cycle	0.09	0.44	0.62	0.12	0.79	0.79	0.24	0.68
(v / s)_i Volume / Saturation Flow Rate	0.00	0.19	0.06	0.07	0.24	0.00	0.18	0.24
s, saturation flow rate [veh/h]	1615	1948	2784	3489	3543	1615	3469	1582
c, Capacity [veh/h]	142	912	1714	428	2792	1272	848	1075
d1, Uniform Delay [s]	0.00	20.24	6.35	33.74	2.41	0.00	28.36	3.55
k, delay calibration	0.11	0.12	0.12	0.08	0.12	0.12	0.12	0.23
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.00	0.32	0.03	0.98	0.07	0.00	1.44	0.43
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.00	0.41	0.10	0.59	0.31	0.00	0.74	0.36
d, Delay for Lane Group [s/veh]	0.00	20.56	6.38	34.72	2.48	0.00	29.80	3.98
Lane Group LOS	A	C	A	C	A	A	C	A
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	Yes
50th-Percentile Queue Length [veh/ln]	0.00	2.11	0.51	2.37	1.10	0.00	5.65	1.48
50th-Percentile Queue Length [ft/ln]	0.00	52.80	12.86	59.36	27.39	0.00	141.14	36.97
95th-Percentile Queue Length [veh/ln]	0.00	3.80	0.93	4.27	1.97	0.00	9.54	2.66
95th-Percentile Queue Length [ft/ln]	0.00	95.05	23.14	106.85	49.30	0.00	238.56	66.55

Movement, Approach, & Intersection Results

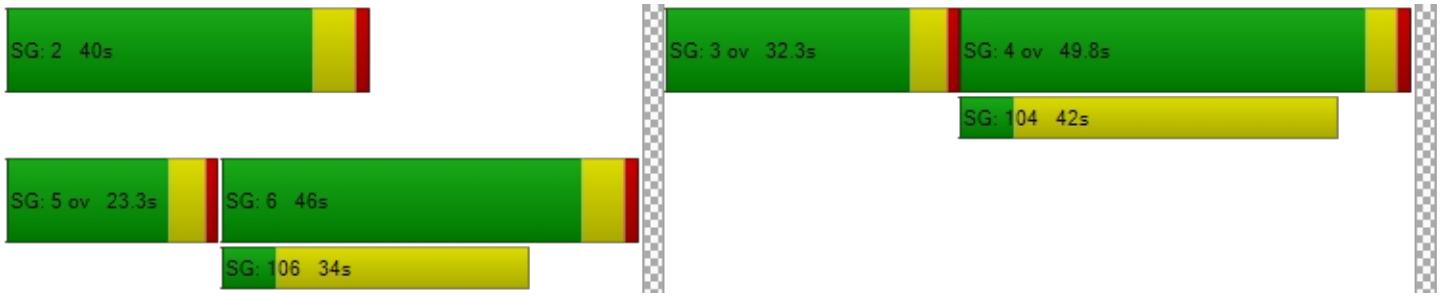
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	20.56	0.00	6.38	34.72	2.48	0.00	0.00	29.80	3.98
Movement LOS			A	C		A	C	A	A		C	A
d_A, Approach Delay [s/veh]	0.00			16.20			9.87			20.07		
Approach LOS	A			B			A			C		
d_I, Intersection Delay [s/veh]	15.04											
Intersection LOS	B											
Intersection V/C	0.611											

Other Modes

g_Walk,mi, Effective Walk Time [s]	-6.0	10.0	-5.3	10.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	46.84	31.23	46.09	31.23
l_p,int, Pedestrian LOS Score for Intersection	1.726	2.639	2.870	3.212
Crosswalk LOS	A	B	C	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1108	1903	155	985
d_b, Bicycle Delay [s]	8.08	0.10	34.63	10.50
l_b,int, Bicycle LOS Score for Intersection	1.560	1.560	2.473	2.396
Bicycle LOS	A	A	B	B

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Air Cargo Way & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	8.6
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.702

Intersection Setup

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	160.00	100.00	160.00	375.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			Yes		

Volumes

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	5	0	107	0	0	1	5	1039	6	128	890	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	14.00	0.00	0.00	0.00	0.00	2.10	0.00	11.70	3.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	1	0	12	0	0	0	0	10	1	21	14	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	6	0	119	0	0	1	5	1049	7	149	904	0
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	0	34	0	0	0	1	298	2	42	257	0
Total Analysis Volume [veh/h]	7	0	135	0	0	1	6	1192	8	169	1027	0
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			11			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	3.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	26	0	0	0	0	0	24	0	0	18	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	R	L	C	C
C, Cycle Length [s]	35	35	35	35	35	35	35	35
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	4	4	0	15	15	5	19	19
g / C, Green / Cycle	0.11	0.11	0.01	0.42	0.42	0.13	0.54	0.54
(v / s)_i Volume / Saturation Flow Rate	0.09	0.00	0.00	0.34	0.01	0.10	0.28	0.28
s, saturation flow rate [veh/h]	1656	799	1810	3558	1567	1642	1855	1855
c, Capacity [veh/h]	290	190	15	1489	656	219	1009	1009
d1, Uniform Delay [s]	15.37	14.08	17.57	9.05	6.05	14.91	5.13	5.13
k, delay calibration	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.48	0.00	6.42	0.39	0.00	2.19	0.15	0.15
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.49	0.01	0.40	0.80	0.01	0.77	0.51	0.51
d, Delay for Lane Group [s/veh]	15.85	14.08	23.99	9.44	6.05	17.10	5.27	5.27
Lane Group LOS	B	B	C	A	A	B	A	A
Critical Lane Group	Yes	No	No	Yes	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	0.95	0.01	0.07	2.63	0.02	1.20	1.19	1.19
50th-Percentile Queue Length [ft/ln]	23.74	0.15	1.70	65.80	0.58	29.99	29.77	29.77
95th-Percentile Queue Length [veh/ln]	1.71	0.01	0.12	4.74	0.04	2.16	2.14	2.14
95th-Percentile Queue Length [ft/ln]	42.73	0.27	3.06	118.45	1.05	53.98	53.58	53.58

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	15.85	15.85	15.85	14.08	14.08	14.08	23.99	9.44	6.05	17.10	5.27	5.27
Movement LOS	B	B	B	B	B	B	C	A	A	B	A	A
d_A, Approach Delay [s/veh]	15.85			14.08			9.49			6.94		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	8.65											
Intersection LOS	A											
Intersection V/C	0.702											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	8.44	8.44	0.00	8.44
I_p,int, Pedestrian LOS Score for Intersection	1.813	1.661	0.000	2.735
Crosswalk LOS	A	A	F	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1691	1691	1691	1691
d_b, Bicycle Delay [s]	0.42	0.42	0.42	0.42
I_b,int, Bicycle LOS Score for Intersection	1.794	1.561	2.555	2.546
Bicycle LOS	A	A	B	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Ron Cowan Parkway & John Glenn Dr

Control Type:	Signalized	Delay (sec / veh):	19.0
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.596

Intersection Setup

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	220.00	100.00	220.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			Yes			No		

Volumes

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Base Volume Input [veh/h]	20	279	0	0	1140	69	12	0	95	22	39	189
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	30.00	12.50	2.00	2.00	2.90	17.90	8.30	2.00	3.20	0.00	2.60	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	14	0	0	12	10	0	0	17	3	11	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	20	293	0	0	1152	79	12	0	112	25	50	189
Peak Hour Factor	0.9500	0.9500	1.0000	1.0000	0.9500	0.9500	0.9500	1.0000	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	77	0	0	303	21	3	0	29	7	13	50
Total Analysis Volume [veh/h]	21	308	0	0	1213	83	13	0	118	26	53	199
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			9			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	76
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	ProtPer	Permis	Permis	Permis	Permis	Permis	Split	Permis	Split	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	2	0	1	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	10	0	0	10	0	4	10	0	4	4	0
Maximum Green [s]	10	20	0	0	20	0	15	20	0	10	15	0
Amber [s]	4.0	4.0	0.0	0.0	4.0	0.0	3.5	4.0	0.0	4.0	3.5	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	13	34	0	0	21	0	15	21	0	13	27	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	0	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	Yes	Yes			Yes		No				No	
Maximum Recall	No	No			No		No				No	
Pedestrian Recall	No	No			No		No				No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	C	C	C	L	C	R
C, Cycle Length [s]	76	76	76	76	76	76	76	76
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	44	44	35	35	8	12	12	12
g / C, Green / Cycle	0.58	0.58	0.46	0.46	0.11	0.16	0.16	0.16
(v / s)_i Volume / Saturation Flow Rate	0.12	0.10	0.24	0.24	0.08	0.01	0.03	0.12
s, saturation flow rate [veh/h]	1394	1558	3535	1785	1591	1810	1861	1615
c, Capacity [veh/h]	878	897	1615	815	171	287	295	256
d1, Uniform Delay [s]	8.07	7.63	14.84	14.80	32.99	27.30	27.70	30.69
k, delay calibration	0.31	0.50	0.50	0.50	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.30	0.44	1.27	2.46	6.93	0.13	0.29	5.02
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.19	0.18	0.54	0.53	0.76	0.09	0.18	0.78
d, Delay for Lane Group [s/veh]	8.37	8.07	16.12	17.25	39.92	27.43	27.98	35.71
Lane Group LOS	A	A	B	B	D	C	C	D
Critical Lane Group	Yes	No	Yes	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.25	1.21	5.19	5.44	2.61	0.40	0.84	3.74
50th-Percentile Queue Length [ft/ln]	31.15	30.19	129.66	136.05	65.22	10.08	20.89	93.38
95th-Percentile Queue Length [veh/ln]	2.24	2.17	8.92	9.27	4.70	0.73	1.50	6.72
95th-Percentile Queue Length [ft/ln]	56.07	54.35	223.03	231.70	117.39	18.15	37.60	168.09

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	8.37	8.21	0.00	0.00	16.44	17.25	39.92	0.00	39.92	27.43	27.98	35.71
Movement LOS	A	A			B	B	D		D	C	C	D
d_A, Approach Delay [s/veh]	8.22			16.50			39.92			33.46		
Approach LOS	A			B			D			C		
d_I, Intersection Delay [s/veh]	18.99											
Intersection LOS	B											
Intersection V/C	0.596											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	9.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	29.54	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	1.963	0.000
Crosswalk LOS	F	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	763	421	276	592
d_b, Bicycle Delay [s]	14.55	23.80	28.23	18.84
l_b,int, Bicycle LOS Score for Intersection	1.831	2.272	1.776	2.018
Bicycle LOS	A	B	A	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Ron Cowan Pkwy & Neil Armstrong Way

Control Type:	Signalized	Delay (sec / veh):	7.3
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.448

Intersection Setup

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	2
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	139.61
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No					
Crosswalk	Yes			No			Yes			No		

Volumes

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Base Volume Input [veh/h]	0	0	0	1233	22	0	298	29	0	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.90	4.50	2.00	22.90	3.60	2.00	2.00	2.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	29	3	0	14	4	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	1262	25	0	312	33	0	0	0	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9400	0.9400	1.0000	0.9400	0.9400	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	336	7	0	83	9	0	0	0	0
Total Analysis Volume [veh/h]	0	0	0	1343	27	0	332	35	0	0	0	0
Presence of On-Street Parking				No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	38
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	6.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Permis	Split	Split	Permis	Permis	Permis	Permis
Signal Group	0	0	0	4	6	0	5	4	0	0	0	6
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	0	0	5
Maximum Green [s]	0	0	0	11	11	0	5	11	0	0	0	11
Amber [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0
Split [s]	0	0	0	15	23	0	0	15	0	0	0	23
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
Walk [s]	0	0	0	0	4	0	0	0	0	0	0	4
Pedestrian Clearance [s]	0	0	0	0	7	0	0	0	0	0	0	7
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No				
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
Minimum Recall					No			No				
Maximum Recall					No			No				
Pedestrian Recall					No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	L	C	
C, Cycle Length [s]		38	38	38	38	
L, Total Lost Time per Cycle [s]		4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]		2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]		24	24	6	6	
g / C, Green / Cycle		0.62	0.62	0.17	0.17	
(v / s)_i Volume / Saturation Flow Rate		0.26	0.26	0.11	0.11	
s, saturation flow rate [veh/h]		3434	1750	1482	1773	
c, Capacity [veh/h]		2130	1086	250	299	
d1, Uniform Delay [s]		3.71	3.71	14.76	14.76	
k, delay calibration		0.50	0.50	0.11	0.11	
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]		0.63	1.22	3.09	2.59	
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	
Rp, platoon ratio		1.00	1.00	1.00	1.00	
PF, progression factor		1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity		0.43	0.43	0.67	0.67	
d, Delay for Lane Group [s/veh]		4.34	4.93	17.85	17.34	
Lane Group LOS		A	A	B	B	
Critical Lane Group		Yes	No	Yes	No	
50th-Percentile Queue Length [veh/ln]		0.87	1.07	1.32	1.54	
50th-Percentile Queue Length [ft/ln]		21.82	26.66	33.05	38.47	
95th-Percentile Queue Length [veh/ln]		1.57	1.92	2.38	2.77	
95th-Percentile Queue Length [ft/ln]		39.28	47.98	59.48	69.24	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	4.53	4.93	0.00	17.60	17.34	0.00	0.00	0.00	0.00
Movement LOS				A	A		B	B				
d_A, Approach Delay [s/veh]	0.00			4.54			17.57			0.00		
Approach LOS	A			A			B			A		
d_I, Intersection Delay [s/veh]	7.29											
Intersection LOS	A											
Intersection V/C	0.448											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	8.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	9.56	0.00	11.81	0.00
l_p,int, Pedestrian LOS Score for Intersection	1.398	0.000	1.850	0.000
Crosswalk LOS	A	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1002	580	0
d_b, Bicycle Delay [s]	18.97	4.73	9.56	18.97
l_b,int, Bicycle LOS Score for Intersection	4.132	3.820	2.165	4.132
Bicycle LOS	D	D	B	D

Sequence

Ring 1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: Hegenberger Road & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	29.1
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.568

Intersection Setup

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	2	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	210.00	100.00	210.00	275.00	100.00	160.00	275.00	100.00	210.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	1	0	0	1
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	0	0	0	246	619	280	311	753	95	227	661	220
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	16.70	5.80	0.70	2.30	2.70	22.40	4.70	2.90	6.80
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	99	42	25	17	0	18	10	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	246	718	322	336	770	95	245	671	220
Peak Hour Factor	1.0000	1.0000	1.0000	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	63	185	83	87	198	24	63	173	57
Total Analysis Volume [veh/h]	0	0	0	254	740	332	346	794	98	253	692	227
Presence of On-Street Parking				No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			2			0			1		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			1			0			2		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	99.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Split	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	0	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	0	0	30	45	0	35	45	0	25	40	0
Amber [s]	0.0	0.0	0.0	3.0	4.0	0.0	3.0	4.5	0.0	3.0	4.5	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	43	0	18	38	0	19	39	0
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	0	0	0	31	0	0	0	0	0	26	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	3.0	0.0	2.0	3.5	0.0	2.0	3.5	0.0
Minimum Recall					No		No	Yes		No	Yes	
Maximum Recall					No		No	No		No	No	
Pedestrian Recall					No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	C	L	C	R	L	C	R
C, Cycle Length [s]		100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	4.00	5.50	5.50	4.00	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	2.00	3.50	3.50	2.00	3.50	3.50
g_i, Effective Green Time [s]		26	26	26	12	50	50	10	47	47
g / C, Green / Cycle		0.26	0.26	0.26	0.12	0.50	0.50	0.10	0.47	0.47
(v / s)_i Volume / Saturation Flow Rate		0.16	0.21	0.22	0.10	0.22	0.07	0.07	0.20	0.15
s, saturation flow rate [veh/h]		1571	3452	1521	3450	3540	1329	3384	3535	1506
c, Capacity [veh/h]		411	904	398	420	1754	659	331	1667	710
d1, Uniform Delay [s]		32.54	34.72	34.90	42.91	16.43	13.76	44.04	17.39	16.43
k, delay calibration		0.11	0.11	0.11	0.11	0.50	0.50	0.11	0.50	0.50
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		1.51	1.90	4.60	4.09	0.85	0.48	3.68	0.76	1.19
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity		0.62	0.82	0.83	0.82	0.45	0.15	0.76	0.42	0.32
d, Delay for Lane Group [s/veh]		34.06	36.62	39.50	47.00	17.27	14.23	47.72	18.15	17.61
Lane Group LOS		C	D	D	D	B	B	D	B	B
Critical Lane Group		No	No	Yes	No	Yes	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]		5.52	8.55	8.00	4.38	5.90	1.26	3.20	5.25	3.38
50th-Percentile Queue Length [ft/ln]		137.99	213.73	200.09	109.50	147.41	31.59	80.12	131.17	84.39
95th-Percentile Queue Length [veh/ln]		9.37	13.34	12.64	7.81	9.88	2.27	5.77	9.00	6.08
95th-Percentile Queue Length [ft/ln]		234.31	333.61	316.08	195.31	246.97	56.87	144.22	225.09	151.90

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	34.06	36.62	39.50	47.00	17.27	14.23	47.72	18.15	17.61
Movement LOS				C	D	D	D	B	B	D	B	B
d_A, Approach Delay [s/veh]	0.00			36.85			25.34			24.43		
Approach LOS	A			D			C			C		
d_I, Intersection Delay [s/veh]	29.14											
Intersection LOS	C											
Intersection V/C	0.568											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	2176.70	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	39.64	39.64	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	2.766	2.914	0.000
Crosswalk LOS	F	C	C	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	759	650	670
d_b, Bicycle Delay [s]	50.03	19.26	22.81	22.15
l_b,int, Bicycle LOS Score for Intersection	4.132	2.289	2.581	2.527
Bicycle LOS	D	B	B	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: Doolittle Drive & Airport Access Road

Control Type:	Signalized	Delay (sec / veh):	21.4
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.605

Intersection Setup

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	1	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	88	33	259	85	0	30	42	786	0	0	939	186
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	19.20	6.10	3.50	5.90	2.00	0.00	0.00	7.60	2.00	2.00	2.90	6.50
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	59	17	0	0	0	11	6	0	0	28	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	88	92	276	85	0	30	53	792	0	0	967	186
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	1.0000	0.9200	0.9200	0.9200	1.0000	1.0000	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	24	25	75	23	0	8	14	215	0	0	263	51
Total Analysis Volume [veh/h]	96	100	300	92	0	33	58	861	0	0	1051	202
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			3			0			3		
v_di, Inbound Pedestrian Volume crossing major street [	0			3			0			3		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			1			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	41.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Permis	Split	Protect	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	4	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	5	0	5	0	0	5	5	0	0	5	0
Maximum Green [s]	0	65	0	30	0	0	20	55	0	0	35	0
Amber [s]	0.0	4.0	0.0	3.0	0.0	0.0	3.0	4.5	0.0	0.0	4.5	0.0
All red [s]	0.0	1.0	0.0	1.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	33	0	18	0	0	15	49	0	0	34	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	0	0	0	0	0	0	5	0
Pedestrian Clearance [s]	0	23	0	0	0	0	0	0	0	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No		No				No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No		No			No	Yes			Yes	
Maximum Recall		No		No			No	No			No	
Pedestrian Recall		No		No			No	No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	0.0	0.0	20.0	20.0	0.0	0.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	R	L	C	C	R
C, Cycle Length [s]	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	23	23	23	5	5	4	60	52	52
g / C, Green / Cycle	0.23	0.23	0.23	0.05	0.05	0.04	0.60	0.52	0.52
(v / s)_i Volume / Saturation Flow Rate	0.06	0.02	0.19	0.03	0.02	0.03	0.25	0.30	0.13
s, saturation flow rate [veh/h]	1535	4926	1550	3350	1588	1810	3400	3535	1508
c, Capacity [veh/h]	351	1128	355	164	78	77	2048	1838	784
d1, Uniform Delay [s]	31.76	30.39	36.80	46.56	46.23	47.44	10.60	16.42	13.29
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.42	0.03	5.56	2.98	3.63	14.02	0.64	1.30	0.79
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.27	0.09	0.85	0.56	0.42	0.76	0.42	0.57	0.26
d, Delay for Lane Group [s/veh]	32.17	30.42	42.36	49.54	49.86	61.46	11.24	17.71	14.08
Lane Group LOS	C	C	D	D	D	E	B	B	B
Critical Lane Group	No	No	Yes	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.94	0.64	7.43	1.18	0.87	1.72	4.88	8.13	2.60
50th-Percentile Queue Length [ft/ln]	48.53	15.88	185.78	29.56	21.80	43.03	122.03	203.36	65.02
95th-Percentile Queue Length [veh/ln]	3.49	1.14	11.90	2.13	1.57	3.10	8.50	12.81	4.68
95th-Percentile Queue Length [ft/ln]	87.36	28.58	297.55	53.20	39.25	77.45	212.61	320.30	117.03

Movement, Approach, & Intersection Results

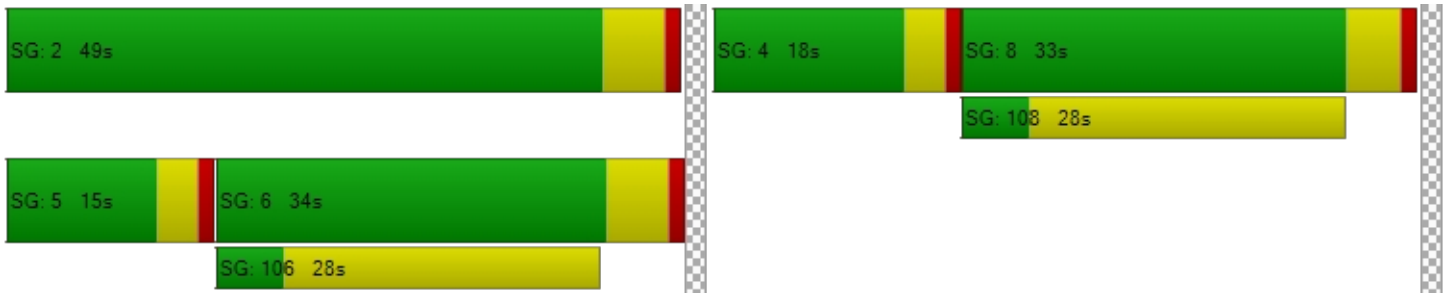
d_M, Delay for Movement [s/veh]	32.17	30.42	42.36	49.54	0.00	49.86	61.46	11.24	0.00	0.00	17.71	14.08
Movement LOS	C	C	D	D		D	E	B			B	B
d_A, Approach Delay [s/veh]	37.98			49.63			14.41			17.13		
Approach LOS	D			D			B			B		
d_I, Intersection Delay [s/veh]	21.39											
Intersection LOS	C											
Intersection V/C	0.605											

Other Modes

g_Walk,mi, Effective Walk Time [s]	43.5	9.0	14.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	15.99	41.44	37.01	41.44
l_p,int, Pedestrian LOS Score for Intersection	2.365	2.668	2.711	2.795
Crosswalk LOS	B	B	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	560	280	869	570
d_b, Bicycle Delay [s]	25.96	37.03	16.00	25.60
l_b,int, Bicycle LOS Score for Intersection	1.832	1.560	2.318	2.593
Bicycle LOS	A	A	B	B

Sequence

Ring 1	-	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Oakland Terminal Project

Vistro File: H:\...\22916_Oakland Terminal_20221003.vistro
Report File: H:\...\2028_PlusProject_AM.pdf

Scenario 7 2028 AM Plus Project
10/3/2022

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Harbor Bay Parkway & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.412	11.5	B
2	Harbor Bay Parkway & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.611	19.9	B
3	Air Cargo Way & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.635	8.8	A
4	Ron Cowan Parkway & John Glenn Dr	Signalized	HCM 7th Edition	EB Right	0.361	13.3	B
5	Ron Cowan Pkwy & Neil Armstrong Way	Signalized	HCM 7th Edition	EB Thru	0.312	5.3	A
6	Hegenberger Road & Doolittle Drive	Signalized	HCM 7th Edition	SB Right	0.747	33.2	C
7	Doolittle Drive & Airport Access Road	Signalized	HCM 7th Edition	EB Left	0.663	22.3	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Harbor Bay Parkway & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	11.5
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.412

Intersection Setup

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	2	0
Entry Pocket Length [ft]	100.00	100.00	100.00	550.00	320.00	100.00
No. of Lanes in Exit Pocket	0	1	0	0	0	1
Exit Pocket Length [ft]	0.00	180.00	0.00	0.00	0.00	310.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Base Volume Input [veh/h]	181	23	585	289	32	939
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.30	4.30	2.50	2.80	28.60	3.40
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	12	0	9	7	0	8
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	193	23	594	296	32	947
Peak Hour Factor	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	49	6	152	76	8	242
Total Analysis Volume [veh/h]	197	23	606	302	33	966
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0		0		0	
v_di, Inbound Pedestrian Volume crossing major street [	0		0		0	
v_co, Outbound Pedestrian Volume crossing minor stree	0		0		0	
v_ci, Inbound Pedestrian Volume crossing minor street [	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		5		2	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Protected	Permissive
Signal Group	8	0	2	0	1	6
Auxiliary Signal Groups						
Lead / Lag	Lead	-	-	-	Lead	-
Minimum Green [s]	11	0	10	0	10	7
Maximum Green [s]	20	0	30	0	20	30
Amber [s]	4.8	0.0	5.2	0.0	4.8	5.2
All red [s]	1.0	0.0	1.0	0.0	1.0	1.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	5.0	0.0	4.0	0.0	2.2	4.0
Walk [s]	11	0	7	0	0	0
Pedestrian Clearance [s]	29	0	28	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No		No			No
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	2.0
l2, Clearance Lost Time [s]	3.8	0.0	4.2	0.0	3.8	4.2
Minimum Recall	No		Yes		No	Yes
Maximum Recall	No		No		No	No
Pedestrian Recall	No		No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	R	L	C
C, Cycle Length [s]	46	46	46	46	46	46
L, Total Lost Time per Cycle [s]	5.80	5.80	6.20	6.20	5.80	6.20
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.80	3.80	4.20	4.20	3.80	4.20
g_i, Effective Green Time [s]	10	10	15	15	3	24
g / C, Green / Cycle	0.22	0.22	0.32	0.32	0.08	0.52
(v / s)_i Volume / Saturation Flow Rate	0.06	0.01	0.17	0.19	0.01	0.27
s, saturation flow rate [veh/h]	3422	1560	3546	1555	2720	3520
c, Capacity [veh/h]	766	349	1124	493	207	1823
d1, Uniform Delay [s]	14.84	14.20	13.07	13.40	20.07	7.44
k, delay calibration	0.23	0.23	0.15	0.15	0.06	0.15
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.38	0.17	0.58	1.76	0.19	0.34
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.26	0.07	0.54	0.61	0.16	0.53
d, Delay for Lane Group [s/veh]	15.22	14.37	13.65	15.16	20.26	7.78
Lane Group LOS	B	B	B	B	C	A
Critical Lane Group	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.78	0.18	2.25	2.45	0.16	2.30
50th-Percentile Queue Length [ft/ln]	19.56	4.55	56.28	61.25	3.90	57.60
95th-Percentile Queue Length [veh/ln]	1.41	0.33	4.05	4.41	0.28	4.15
95th-Percentile Queue Length [ft/ln]	35.21	8.20	101.31	110.25	7.02	103.68

Movement, Approach, & Intersection Results

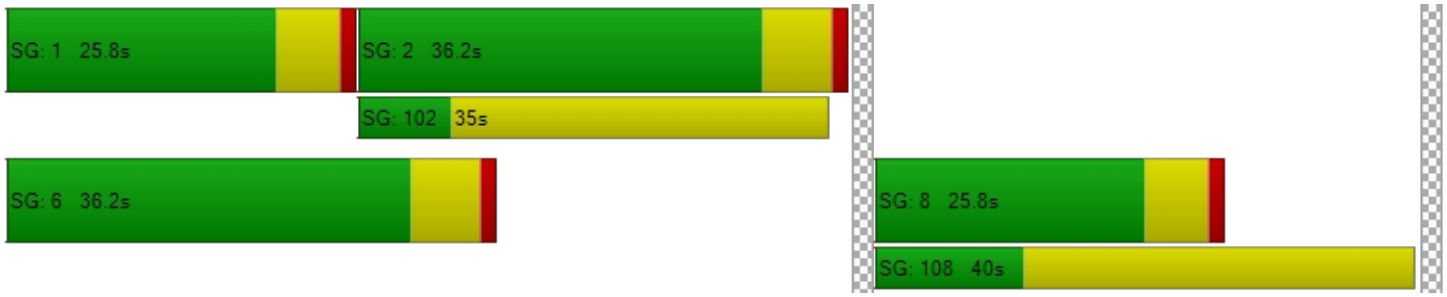
d_M, Delay for Movement [s/veh]	15.22	14.37	13.65	15.16	20.26	7.78
Movement LOS	B	B	B	B	C	A
d_A, Approach Delay [s/veh]	15.13		14.15		8.20	
Approach LOS	B		B		A	
d_I, Intersection Delay [s/veh]	11.46					
Intersection LOS	B					
Intersection V/C	0.412					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	15.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	13.47	10.59	0.00
l_p,int, Pedestrian LOS Score for Intersection	2.505	2.656	0.000
Crosswalk LOS	B	B	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	863	1295	1295
d_b, Bicycle Delay [s]	7.48	2.89	2.88
l_b,int, Bicycle LOS Score for Intersection	1.560	2.309	2.384
Bicycle LOS	A	B	B

Sequence

Ring 1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Harbor Bay Parkway & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	19.9
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.611

Intersection Setup

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	190.00	100.00	300.00	190.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	0	0	0	397	0	257	151	373	0	0	847	120
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	0.00	10.60	2.00	1.20	4.60	9.60	0.00	2.00	2.90	2.80
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	7	0	0	0	1	0	0	1	12
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	404	0	257	151	374	0	0	848	132
Peak Hour Factor	1.0000	1.0000	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	111	0	71	41	103	0	0	233	36
Total Analysis Volume [veh/h]	0	0	0	444	0	282	166	411	0	0	932	145
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			3		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Overla	Permis	Overla	Protect	Overla	Overla	Permis	Permis	Overla
Signal Group	0	0	4	3	0	3	5	2	2	0	6	6
Auxiliary Signal Groups				3,4		3,5		2,3	2,3			3,4,6
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	6	9	0	9	10	8	8	0	10	10
Maximum Green [s]	0	0	45	27	0	27	18	34	34	0	40	40
Amber [s]	0.0	0.0	3.6	4.1	0.0	4.1	4.1	4.8	4.8	0.0	4.8	4.8
All red [s]	0.0	0.0	1.2	1.2	0.0	1.2	1.2	1.2	1.2	0.0	1.2	1.2
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	3.0	3.2	0.0	3.2	2.5	3.2	3.2	0.0	3.2	3.2
Walk [s]	0	0	6	0	0	0	0	0	0	0	6	6
Pedestrian Clearance [s]	0	0	36	0	0	0	0	0	0	0	28	28
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk			No	No				No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	2.8	3.3	0.0	3.3	3.3	4.0	4.0	0.0	4.0	4.0
Minimum Recall			No	No		No	No	Yes	Yes		Yes	Yes
Maximum Recall			No	No		No	No	No	No		No	No
Pedestrian Recall			No	No		No	No	No	No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	20.0	20.0	0.0	20.0	20.0	20.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	R	L	R	L	C	R	C	R
C, Cycle Length [s]	86	86	86	86	86	86	86	86
L, Total Lost Time per Cycle [s]	4.80	4.80	5.30	5.30	5.30	5.30	6.00	4.80
l1_p, Permitted Start-Up Lost Time [s]	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.80	0.00	0.00	3.30	0.00	0.00	4.00	4.00
g_i, Effective Green Time [s]	6	33	48	10	70	70	28	61
g / C, Green / Cycle	0.07	0.38	0.55	0.11	0.81	0.81	0.32	0.70
(v / s)_i Volume / Saturation Flow Rate	0.00	0.20	0.10	0.05	0.12	0.00	0.26	0.09
s, saturation flow rate [veh/h]	1615	2192	2787	3386	3343	1615	3535	1567
c, Capacity [veh/h]	112	916	1531	385	2720	1314	1130	1098
d1, Uniform Delay [s]	0.00	23.31	9.74	35.72	1.71	0.00	27.18	2.76
k, delay calibration	0.11	0.12	0.12	0.08	0.12	0.12	0.12	0.12
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.00	0.43	0.06	0.57	0.03	0.00	1.72	0.06
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.00	0.48	0.18	0.43	0.15	0.00	0.82	0.13
d, Delay for Lane Group [s/veh]	0.00	23.74	9.80	36.29	1.74	0.00	28.90	2.81
Lane Group LOS	A	C	A	D	A	A	C	A
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.00	3.14	1.25	1.64	0.38	0.00	8.80	0.44
50th-Percentile Queue Length [ft/ln]	0.00	78.48	31.32	40.92	9.57	0.00	219.89	11.02
95th-Percentile Queue Length [veh/ln]	0.00	5.65	2.26	2.95	0.69	0.00	13.66	0.79
95th-Percentile Queue Length [ft/ln]	0.00	141.26	56.38	73.65	17.23	0.00	341.49	19.83

Movement, Approach, & Intersection Results

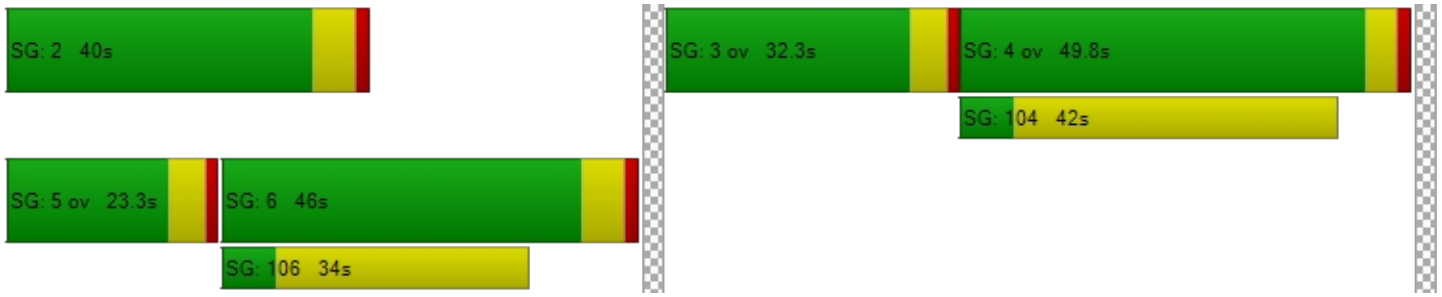
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	23.74	0.00	9.80	36.29	1.74	0.00	0.00	28.90	2.81
Movement LOS			A	C		A	D	A	A		C	A
d_A, Approach Delay [s/veh]	0.00			18.32			11.68			25.39		
Approach LOS	A			B			B			C		
d_I, Intersection Delay [s/veh]	19.91											
Intersection LOS	B											
Intersection V/C	0.611											

Other Modes

g_Walk,mi, Effective Walk Time [s]	-6.0	10.0	-5.3	10.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.44	33.81	48.69	33.81
l_p,int, Pedestrian LOS Score for Intersection	1.729	2.620	2.856	3.268
Crosswalk LOS	A	B	C	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1041	1788	146	925
d_b, Bicycle Delay [s]	9.94	0.49	37.16	12.50
l_b,int, Bicycle LOS Score for Intersection	1.560	1.560	2.036	2.448
Bicycle LOS	A	A	B	B

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Air Cargo Way & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	8.8
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.635

Intersection Setup

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	160.00	100.00	160.00	375.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			Yes		

Volumes

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	11	3	139	0	0	0	3	701	16	121	951	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	25.90	0.00	0.00	0.00	0.00	6.40	0.00	15.70	2.80	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	2	0	24	0	0	0	0	9	1	24	43	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	13	3	163	0	0	0	3	710	17	145	994	0
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	1	44	0	0	0	1	191	5	39	267	0
Total Analysis Volume [veh/h]	14	3	175	0	0	0	3	763	18	156	1069	0
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			1			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	3.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	26	0	0	0	0	0	24	0	0	18	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	R	L	C	C
C, Cycle Length [s]	29	29	29	29	29	29	29	29
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	4	4	0	9	9	4	12	12
g / C, Green / Cycle	0.15	0.15	0.00	0.31	0.31	0.12	0.43	0.43
(v / s)_i Volume / Saturation Flow Rate	0.12	0.00	0.00	0.22	0.01	0.10	0.29	0.29
s, saturation flow rate [veh/h]	1639	1047	1810	3435	1581	1585	1858	1858
c, Capacity [veh/h]	384	284	8	1060	488	198	798	798
d1, Uniform Delay [s]	11.78	0.00	14.42	8.92	7.02	12.33	6.63	6.63
k, delay calibration	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.38	0.00	11.71	0.35	0.01	2.61	0.37	0.37
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.50	0.00	0.39	0.72	0.04	0.79	0.67	0.67
d, Delay for Lane Group [s/veh]	12.16	0.00	26.13	9.27	7.03	14.94	7.00	7.00
Lane Group LOS	B	A	C	A	A	B	A	A
Critical Lane Group	Yes	No	No	Yes	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	0.89	0.00	0.04	1.36	0.05	0.86	1.36	1.36
50th-Percentile Queue Length [ft/ln]	22.30	0.00	1.01	34.06	1.25	21.54	34.02	34.02
95th-Percentile Queue Length [veh/ln]	1.61	0.00	0.07	2.45	0.09	1.55	2.45	2.45
95th-Percentile Queue Length [ft/ln]	40.13	0.00	1.81	61.31	2.26	38.78	61.23	61.23

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	12.16	12.16	12.16	0.00	0.00	0.00	26.13	9.27	7.03	14.94	7.00	7.00
Movement LOS	B	B	B	A	A	A	C	A	A	B	A	A
d_A, Approach Delay [s/veh]	12.16			0.00			9.28			8.01		
Approach LOS	B			A			A			A		
d_I, Intersection Delay [s/veh]	8.83											
Intersection LOS	A											
Intersection V/C	0.635											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	5.55	5.55	0.00	5.55
I_p,int, Pedestrian LOS Score for Intersection	1.819	1.644	0.000	2.648
Crosswalk LOS	A	A	F	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	2075	2075	2075	2075
d_b, Bicycle Delay [s]	0.02	0.02	0.02	0.02
I_b,int, Bicycle LOS Score for Intersection	1.876	1.560	2.206	2.570
Bicycle LOS	A	A	B	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Ron Cowan Parkway & John Glenn Dr

Control Type:	Signalized	Delay (sec / veh):	13.3
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.361

Intersection Setup

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	220.00	100.00	220.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			Yes			No		

Volumes

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Base Volume Input [veh/h]	16	15	0	0	750	109	16	0	138	27	29	44
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	43.80	21.40	2.00	2.00	14.50	15.00	6.30	2.00	27.50	7.40	10.30	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	17	0	0	32	6	-6	0	-108	25	-75	34
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	16	32	0	0	782	115	10	0	30	52	0	78
Peak Hour Factor	0.9100	0.9100	1.0000	1.0000	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	9	0	0	215	32	3	0	8	14	0	21
Total Analysis Volume [veh/h]	18	35	0	0	859	126	11	0	33	57	0	86
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			1			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			1			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			2			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	76
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	ProtPer	Permis	Permis	Permis	Permis	Permis	Split	Permis	Split	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	2	0	1	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	10	0	0	10	0	4	10	0	4	4	0
Maximum Green [s]	10	20	0	0	20	0	15	20	0	10	15	0
Amber [s]	4.0	4.0	0.0	0.0	4.0	0.0	3.5	4.0	0.0	4.0	3.5	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	13	34	0	0	21	0	15	21	0	13	27	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	0	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	Yes	Yes			Yes		No				No	
Maximum Recall	No	No			No		No				No	
Pedestrian Recall	No	No			No		No				No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	C	C	C	L	C	R
C, Cycle Length [s]	76	76	76	76	76	76	76	76
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	54	54	45	45	3	6	6	6
g / C, Green / Cycle	0.71	0.71	0.60	0.60	0.04	0.08	0.08	0.08
(v / s)_i Volume / Saturation Flow Rate	0.04	0.02	0.21	0.21	0.03	0.03	0.00	0.05
s, saturation flow rate [veh/h]	663	1437	3203	1561	1299	1704	1745	1615
c, Capacity [veh/h]	538	1025	1906	929	57	145	148	137
d1, Uniform Delay [s]	3.89	3.17	7.84	7.89	35.98	32.93	0.00	33.62
k, delay calibration	0.11	0.50	0.50	0.50	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.04	0.05	0.50	1.06	20.00	1.74	0.00	4.65
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.05	0.03	0.34	0.35	0.78	0.39	0.00	0.63
d, Delay for Lane Group [s/veh]	3.93	3.22	8.34	8.95	55.98	34.67	0.00	38.27
Lane Group LOS	A	A	A	A	E	C	A	D
Critical Lane Group	Yes	No	No	Yes	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.10	0.10	2.47	2.62	1.10	1.04	0.00	1.67
50th-Percentile Queue Length [ft/ln]	2.44	2.47	61.66	65.59	27.57	25.99	0.00	41.76
95th-Percentile Queue Length [veh/ln]	0.18	0.18	4.44	4.72	1.99	1.87	0.00	3.01
95th-Percentile Queue Length [ft/ln]	4.39	4.45	110.99	118.06	49.63	46.77	0.00	75.17

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	3.93	3.39	0.00	0.00	8.48	8.95	55.98	0.00	55.98	34.67	0.00	38.27
Movement LOS	A	A			A	A	E		E	C	A	D
d_A, Approach Delay [s/veh]	3.57			8.54			55.98			36.84		
Approach LOS	A			A			E			D		
d_I, Intersection Delay [s/veh]	13.33											
Intersection LOS	B											
Intersection V/C	0.361											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	9.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	3605.89	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	29.54	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	1.823	0.000
Crosswalk LOS	F	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	763	421	276	592
d_b, Bicycle Delay [s]	14.55	23.71	28.23	18.83
l_b,int, Bicycle LOS Score for Intersection	1.603	2.101	1.632	1.796
Bicycle LOS	A	B	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Ron Cowan Pkwy & Neil Armstrong Way

Control Type:	Signalized	Delay (sec / veh):	5.3
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.312

Intersection Setup

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	2
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	139.61
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No					
Crosswalk	Yes			No			Yes			No		

Volumes

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Base Volume Input [veh/h]	0	0	0	875	36	0	32	24	0	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	17.80	5.60	2.00	32.30	8.30	2.00	2.00	2.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	-77	26	0	17	85	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	798	62	0	49	109	0	0	0	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9200	0.9200	1.0000	0.9200	0.9200	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	217	17	0	13	30	0	0	0	0
Total Analysis Volume [veh/h]	0	0	0	867	67	0	53	118	0	0	0	0
Presence of On-Street Parking				No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	38
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	6.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Permis	Split	Split	Permis	Permis	Permis	Permis
Signal Group	0	0	0	4	6	0	5	4	0	0	0	6
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	0	0	5
Maximum Green [s]	0	0	0	11	11	0	5	11	0	0	0	11
Amber [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0
Split [s]	0	0	0	15	23	0	0	15	0	0	0	23
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
Walk [s]	0	0	0	0	4	0	0	0	0	0	0	4
Pedestrian Clearance [s]	0	0	0	0	7	0	0	0	0	0	0	7
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No				
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
Minimum Recall					No			No				
Maximum Recall					No			No				
Pedestrian Recall					No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	L	C	
C, Cycle Length [s]		38	38	38	38	
L, Total Lost Time per Cycle [s]		4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]		2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]		26	26	4	4	
g / C, Green / Cycle		0.68	0.68	0.11	0.11	
(v / s)_i Volume / Saturation Flow Rate		0.20	0.19	0.04	0.07	
s, saturation flow rate [veh/h]		3020	1746	1348	1775	
c, Capacity [veh/h]		2048	1184	150	197	
d1, Uniform Delay [s]		2.45	2.44	15.60	16.05	
k, delay calibration		0.50	0.50	0.11	0.11	
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]		0.36	0.61	1.42	2.89	
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	
Rp, platoon ratio		1.00	1.00	1.00	1.00	
PF, progression factor		1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity		0.29	0.29	0.35	0.60	
d, Delay for Lane Group [s/veh]		2.81	3.06	17.02	18.94	
Lane Group LOS		A	A	B	B	
Critical Lane Group		Yes	No	No	Yes	
50th-Percentile Queue Length [veh/ln]		0.29	0.41	0.42	0.98	
50th-Percentile Queue Length [ft/ln]		7.20	10.36	10.43	24.49	
95th-Percentile Queue Length [veh/ln]		0.52	0.75	0.75	1.76	
95th-Percentile Queue Length [ft/ln]		12.96	18.65	18.78	44.08	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	2.88	3.06	0.00	17.02	18.94	0.00	0.00	0.00	0.00
Movement LOS				A	A		B	B				
d_A, Approach Delay [s/veh]	0.00			2.90			18.34			0.00		
Approach LOS	A			A			B			A		
d_I, Intersection Delay [s/veh]	5.29											
Intersection LOS	A											
Intersection V/C	0.312											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	8.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	9.58	0.00	11.83	0.00
l_p,int, Pedestrian LOS Score for Intersection	1.437	0.000	1.755	0.000
Crosswalk LOS	A	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1001	579	0
d_b, Bicycle Delay [s]	18.98	4.74	9.58	18.98
l_b,int, Bicycle LOS Score for Intersection	4.132	3.101	1.842	4.132
Bicycle LOS	D	C	A	D

Sequence

Ring 1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: Hegenberger Road & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	33.2
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.747

Intersection Setup

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	2	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	210.00	100.00	210.00	275.00	100.00	160.00	275.00	100.00	210.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	1	0	0	1
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	0	0	0	139	514	469	250	422	53	359	667	361
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	17.00	6.00	1.00	2.00	3.00	22.00	5.00	3.00	7.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	17	82	48	22	36	0	15	45	2
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	156	596	517	272	458	53	374	712	363
Peak Hour Factor	1.0000	1.0000	1.0000	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	40	154	133	70	118	14	96	184	94
Total Analysis Volume [veh/h]	0	0	0	161	614	533	280	472	55	386	734	374
Presence of On-Street Parking				No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	99.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Split	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	0	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	0	0	30	45	0	35	45	0	25	40	0
Amber [s]	0.0	0.0	0.0	3.0	4.0	0.0	3.0	4.5	0.0	3.0	4.5	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	43	0	18	38	0	19	39	0
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	0	0	0	31	0	0	0	0	0	26	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	3.0	0.0	2.0	3.5	0.0	2.0	3.5	0.0
Minimum Recall					No		No	Yes		No	Yes	
Maximum Recall					No		No	No		No	No	
Pedestrian Recall					No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	C	L	C	R	L	C	R
C, Cycle Length [s]		100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	4.00	5.50	5.50	4.00	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	2.00	3.50	3.50	2.00	3.50	3.50
g_i, Effective Green Time [s]		37	37	37	10	35	35	14	38	38
g / C, Green / Cycle		0.37	0.37	0.37	0.10	0.35	0.35	0.14	0.38	0.38
(v / s)_i Volume / Saturation Flow Rate		0.10	0.18	0.35	0.08	0.13	0.04	0.11	0.21	0.25
s, saturation flow rate [veh/h]		1567	3446	1519	3459	3532	1334	3375	3532	1506
c, Capacity [veh/h]		581	1277	563	359	1233	466	457	1345	574
d1, Uniform Delay [s]		22.10	24.13	30.54	43.76	24.48	22.12	42.26	24.23	25.43
k, delay calibration		0.11	0.11	0.29	0.11	0.50	0.50	0.11	0.50	0.50
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		0.26	0.28	18.53	3.72	0.90	0.52	4.36	1.60	5.67
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity		0.28	0.48	0.95	0.78	0.38	0.12	0.84	0.55	0.65
d, Delay for Lane Group [s/veh]		22.36	24.41	49.07	47.48	25.39	22.64	46.62	25.83	31.10
Lane Group LOS		C	C	D	D	C	C	D	C	C
Critical Lane Group		No	No	Yes	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		2.66	5.51	14.90	3.54	4.29	0.94	4.89	6.93	7.99
50th-Percentile Queue Length [ft/ln]		66.61	137.76	372.51	88.58	107.32	23.46	122.19	173.16	199.81
95th-Percentile Queue Length [veh/ln]		4.80	9.36	21.23	6.38	7.69	1.69	8.51	11.24	12.63
95th-Percentile Queue Length [ft/ln]		119.90	234.00	530.78	159.44	192.27	42.22	212.83	281.07	315.73

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	22.36	24.41	49.07	47.48	25.39	22.64	46.62	25.83	31.10
Movement LOS				C	C	D	D	C	C	D	C	C
d_A, Approach Delay [s/veh]	0.00			34.21			32.87			32.52		
Approach LOS	A			C			C			C		
d_I, Intersection Delay [s/veh]	33.21											
Intersection LOS	C											
Intersection V/C	0.747											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	39.64	39.64	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	2.777	2.888	0.000
Crosswalk LOS	F	C	C	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	759	650	670
d_b, Bicycle Delay [s]	50.03	19.26	22.81	22.15
l_b,int, Bicycle LOS Score for Intersection	4.132	2.279	2.225	2.792
Bicycle LOS	D	B	B	C

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: Doolittle Drive & Airport Access Road

Control Type:	Signalized	Delay (sec / veh):	22.3
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.663

Intersection Setup

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	1	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	109	41	194	68	0	24	23	421	0	0	1231	198
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	33.90	17.50	3.20	8.80	2.00	5.60	4.30	6.70	2.00	2.00	4.60	6.10
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	50	24	25	0	31	26	27	0	0	31	16
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	109	91	218	93	0	55	49	448	0	0	1262	214
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	1.0000	0.9400	0.9400	0.9400	1.0000	1.0000	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	29	24	58	25	0	15	13	119	0	0	336	57
Total Analysis Volume [veh/h]	116	97	232	99	0	59	52	477	0	0	1343	228
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	1			2			0			1		
v_di, Inbound Pedestrian Volume crossing major street [	0			1			1			2		
v_co, Outbound Pedestrian Volume crossing minor stree	1			0			0			1		
v_ci, Inbound Pedestrian Volume crossing minor street [	1			0			0			1		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			0			2			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	41.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Permis	Split	Protect	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	4	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	5	0	5	0	0	5	5	0	0	5	0
Maximum Green [s]	0	65	0	30	0	0	20	55	0	0	35	0
Amber [s]	0.0	4.0	0.0	3.0	0.0	0.0	3.0	4.5	0.0	0.0	4.5	0.0
All red [s]	0.0	1.0	0.0	1.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	33	0	18	0	0	15	49	0	0	34	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	0	0	0	0	0	0	5	0
Pedestrian Clearance [s]	0	23	0	0	0	0	0	0	0	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No		No				No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No		No			No	Yes			Yes	
Maximum Recall		No		No			No	No			No	
Pedestrian Recall		No		No			No	No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	0.0	0.0	20.0	20.0	0.0	0.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	R	L	C	C	R
C, Cycle Length [s]	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	19	19	19	6	6	4	63	55	55
g / C, Green / Cycle	0.19	0.19	0.19	0.06	0.06	0.04	0.63	0.55	0.55
(v / s)_i Volume / Saturation Flow Rate	0.09	0.02	0.15	0.03	0.04	0.03	0.14	0.39	0.15
s, saturation flow rate [veh/h]	1325	4460	1549	3270	1544	1748	3426	3486	1515
c, Capacity [veh/h]	250	842	292	196	93	68	2163	1927	837
d1, Uniform Delay [s]	36.12	33.69	38.65	45.61	45.99	47.68	7.90	16.29	11.76
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.34	0.06	4.88	1.99	7.03	16.40	0.24	2.12	0.80
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.46	0.12	0.79	0.50	0.64	0.77	0.22	0.70	0.27
d, Delay for Lane Group [s/veh]	37.46	33.75	43.53	47.60	53.02	64.08	8.14	18.41	12.56
Lane Group LOS	D	C	D	D	D	E	A	B	B
Critical Lane Group	No	No	Yes	No	Yes	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	2.59	0.66	5.75	1.24	1.61	1.59	2.11	10.97	2.74
50th-Percentile Queue Length [ft/ln]	64.87	16.38	143.77	31.03	40.18	39.66	52.63	274.23	68.40
95th-Percentile Queue Length [veh/ln]	4.67	1.18	9.68	2.23	2.89	2.86	3.79	16.40	4.93
95th-Percentile Queue Length [ft/ln]	116.77	29.48	242.09	55.85	72.33	71.39	94.73	410.02	123.13

Movement, Approach, & Intersection Results

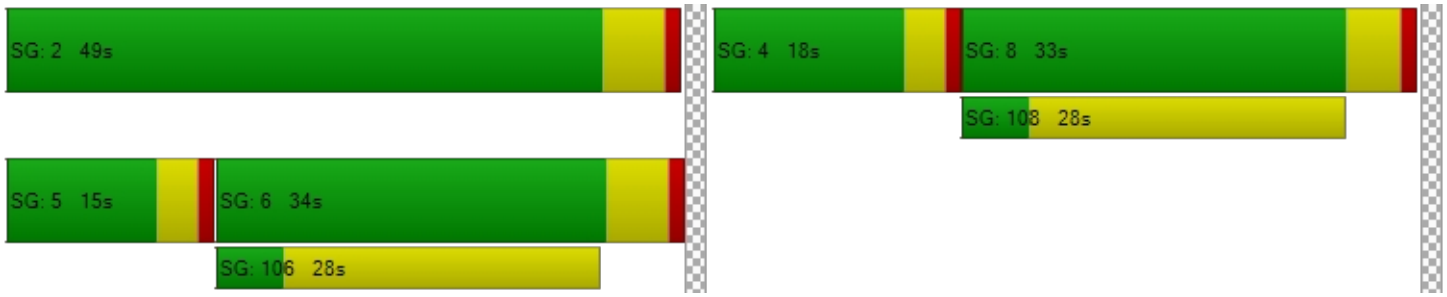
d_M, Delay for Movement [s/veh]	37.46	33.75	43.53	47.60	0.00	53.02	64.08	8.14	0.00	0.00	18.41	12.56
Movement LOS	D	C	D	D		D	E	A			B	B
d_A, Approach Delay [s/veh]	39.81			49.62			13.64			17.56		
Approach LOS	D			D			B			B		
d_I, Intersection Delay [s/veh]	22.33											
Intersection LOS	C											
Intersection V/C	0.663											

Other Modes

g_Walk,mi, Effective Walk Time [s]	43.5	9.0	14.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	15.99	41.44	37.01	41.44
l_p,int, Pedestrian LOS Score for Intersection	2.355	2.675	2.701	2.770
Crosswalk LOS	B	B	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	560	280	869	570
d_b, Bicycle Delay [s]	25.96	37.01	16.00	25.62
l_b,int, Bicycle LOS Score for Intersection	1.804	1.560	1.996	2.856
Bicycle LOS	A	A	A	C

Sequence

Ring 1	-	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Oakland Terminal Project

Vistro File: H:\...\22916_Oakland Terminal_20221003.vistro
Report File: H:\...\2028_PlusProject_PM.pdf

Scenario 8 2028 PM Plus Project
10/3/2022

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Harbor Bay Parkway & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.481	12.9	B
2	Harbor Bay Parkway & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.611	15.0	B
3	Air Cargo Way & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.706	8.7	A
4	Ron Cowan Parkway & John Glenn Dr	Signalized	HCM 7th Edition	EB Right	0.537	16.0	B
5	Ron Cowan Pkwy & Neil Armstrong Way	Signalized	HCM 7th Edition	EB Left	0.472	7.5	A
6	Hegenberger Road & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.588	29.1	C
7	Doolittle Drive & Airport Access Road	Signalized	HCM 7th Edition	EB Left	0.631	23.0	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Harbor Bay Parkway & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	12.9
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.481

Intersection Setup

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	2	0
Entry Pocket Length [ft]	100.00	100.00	100.00	550.00	320.00	100.00
No. of Lanes in Exit Pocket	0	1	0	0	0	1
Exit Pocket Length [ft]	0.00	180.00	0.00	0.00	0.00	310.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Base Volume Input [veh/h]	369	53	906	164	30	764
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.80	10.90	3.00	0.00	3.30	0.70
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	11	0	10	9	0	9
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	380	53	916	173	30	773
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	101	14	244	46	8	206
Total Analysis Volume [veh/h]	404	56	974	184	32	822
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0		0		0	
v_di, Inbound Pedestrian Volume crossing major street [	0		0		0	
v_co, Outbound Pedestrian Volume crossing minor stree	0		0		0	
v_ci, Inbound Pedestrian Volume crossing minor street [	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		6		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Protected	Permissive
Signal Group	8	0	2	0	1	6
Auxiliary Signal Groups						
Lead / Lag	Lead	-	-	-	Lead	-
Minimum Green [s]	11	0	10	0	10	7
Maximum Green [s]	20	0	30	0	20	30
Amber [s]	4.8	0.0	5.2	0.0	4.8	5.2
All red [s]	1.0	0.0	1.0	0.0	1.0	1.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	5.0	0.0	4.0	0.0	2.2	4.0
Walk [s]	11	0	7	0	0	0
Pedestrian Clearance [s]	29	0	28	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No		No			No
I1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	3.8	0.0	4.2	0.0	3.8	4.2
Minimum Recall	No		Yes		No	Yes
Maximum Recall	No		No		No	No
Pedestrian Recall	No		No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	R	L	C
C, Cycle Length [s]	54	54	54	54	54	54
L, Total Lost Time per Cycle [s]	5.80	5.80	6.20	6.20	5.80	6.20
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.80	3.80	4.20	4.20	3.80	4.20
g_i, Effective Green Time [s]	11	11	21	21	4	31
g / C, Green / Cycle	0.20	0.20	0.40	0.40	0.07	0.57
(v / s)_i Volume / Saturation Flow Rate	0.12	0.04	0.28	0.12	0.01	0.23
s, saturation flow rate [veh/h]	3492	1476	3532	1590	3422	3598
c, Capacity [veh/h]	711	300	1398	629	245	2068
d1, Uniform Delay [s]	19.41	17.84	13.64	11.15	23.53	6.34
k, delay calibration	0.23	0.23	0.15	0.15	0.06	0.15
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.53	0.63	0.91	0.36	0.13	0.18
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.57	0.19	0.70	0.29	0.13	0.40
d, Delay for Lane Group [s/veh]	20.94	18.47	14.54	11.51	23.66	6.52
Lane Group LOS	C	B	B	B	C	A
Critical Lane Group	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	2.22	0.58	4.33	1.35	0.18	1.92
50th-Percentile Queue Length [ft/ln]	55.51	14.51	108.37	33.70	4.57	47.94
95th-Percentile Queue Length [veh/ln]	4.00	1.04	7.75	2.43	0.33	3.45
95th-Percentile Queue Length [ft/ln]	99.92	26.11	193.73	60.65	8.22	86.30

Movement, Approach, & Intersection Results

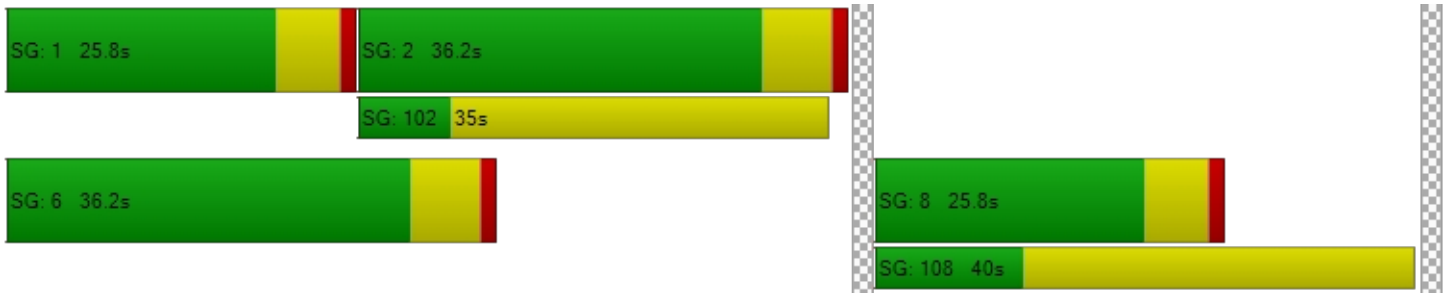
d_M, Delay for Movement [s/veh]	20.94	18.47	14.54	11.51	23.66	6.52
Movement LOS	C	B	B	B	C	A
d_A, Approach Delay [s/veh]	20.64		14.06		7.16	
Approach LOS	C		B		A	
d_I, Intersection Delay [s/veh]	12.90					
Intersection LOS	B					
Intersection V/C	0.481					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	15.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	17.12	14.08	0.00
I_p,int, Pedestrian LOS Score for Intersection	2.534	2.728	0.000
Crosswalk LOS	B	B	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	741	1111	1111
d_b, Bicycle Delay [s]	10.70	5.35	5.33
I_b,int, Bicycle LOS Score for Intersection	1.560	2.515	2.264
Bicycle LOS	A	B	B

Sequence

Ring 1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Harbor Bay Parkway & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	15.0
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.611

Intersection Setup

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	190.00	100.00	300.00	190.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	0	0	0	330	0	151	231	775	0	0	573	335
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	0.00	3.60	2.00	1.30	0.90	2.60	0.00	2.00	5.20	1.70
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	9	0	0	0	0	0	0	2	11
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	339	0	151	231	775	0	0	575	346
Peak Hour Factor	1.0000	1.0000	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	93	0	41	63	213	0	0	158	95
Total Analysis Volume [veh/h]	0	0	0	373	0	166	254	852	0	0	632	380
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			2			4			6		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Overla	Permis	Overla	Protect	Overla	Overla	Permis	Permis	Overla
Signal Group	0	0	4	3	0	3	5	2	2	0	6	6
Auxiliary Signal Groups				3,4		3,5		2,3	2,3			3,4,6
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	6	9	0	9	10	8	8	0	10	10
Maximum Green [s]	0	0	45	27	0	27	18	34	34	0	40	40
Amber [s]	0.0	0.0	3.6	4.1	0.0	4.1	4.1	4.8	4.8	0.0	4.8	4.8
All red [s]	0.0	0.0	1.2	1.2	0.0	1.2	1.2	1.2	1.2	0.0	1.2	1.2
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	3.0	3.2	0.0	3.2	2.5	3.2	3.2	0.0	3.2	3.2
Walk [s]	0	0	6	0	0	0	0	0	0	0	6	6
Pedestrian Clearance [s]	0	0	36	0	0	0	0	0	0	0	28	28
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk			No	No				No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	2.8	3.3	0.0	3.3	3.3	4.0	4.0	0.0	4.0	4.0
Minimum Recall			No	No		No	No	Yes	Yes		Yes	Yes
Maximum Recall			No	No		No	No	No	No		No	No
Pedestrian Recall			No	No		No	No	No	No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	20.0	20.0	0.0	20.0	20.0	20.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	R	L	R	L	C	R	C	R
C, Cycle Length [s]	81	81	81	81	81	81	81	81
L, Total Lost Time per Cycle [s]	4.80	4.80	5.30	5.30	5.30	5.30	6.00	4.80
l1_p, Permitted Start-Up Lost Time [s]	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.80	0.00	0.00	3.30	0.00	0.00	4.00	4.00
g_i, Effective Green Time [s]	7	35	50	10	64	64	20	55
g / C, Green / Cycle	0.09	0.43	0.62	0.12	0.79	0.79	0.24	0.68
(v / s)_i Volume / Saturation Flow Rate	0.00	0.19	0.06	0.07	0.24	0.00	0.18	0.24
s, saturation flow rate [veh/h]	1615	1949	2784	3489	3543	1615	3469	1582
c, Capacity [veh/h]	142	912	1714	429	2792	1273	848	1074
d1, Uniform Delay [s]	0.00	20.22	6.35	33.69	2.40	0.00	28.33	3.55
k, delay calibration	0.11	0.12	0.12	0.08	0.12	0.12	0.12	0.23
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.00	0.32	0.03	0.97	0.07	0.00	1.44	0.42
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.00	0.41	0.10	0.59	0.31	0.00	0.75	0.35
d, Delay for Lane Group [s/veh]	0.00	20.54	6.38	34.66	2.47	0.00	29.77	3.97
Lane Group LOS	A	C	A	C	A	A	C	A
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	Yes
50th-Percentile Queue Length [veh/ln]	0.00	2.10	0.51	2.37	1.09	0.00	5.64	1.47
50th-Percentile Queue Length [ft/ln]	0.00	52.60	12.84	59.26	27.23	0.00	140.95	36.67
95th-Percentile Queue Length [veh/ln]	0.00	3.79	0.92	4.27	1.96	0.00	9.53	2.64
95th-Percentile Queue Length [ft/ln]	0.00	94.69	23.11	106.67	49.02	0.00	238.30	66.01

Movement, Approach, & Intersection Results

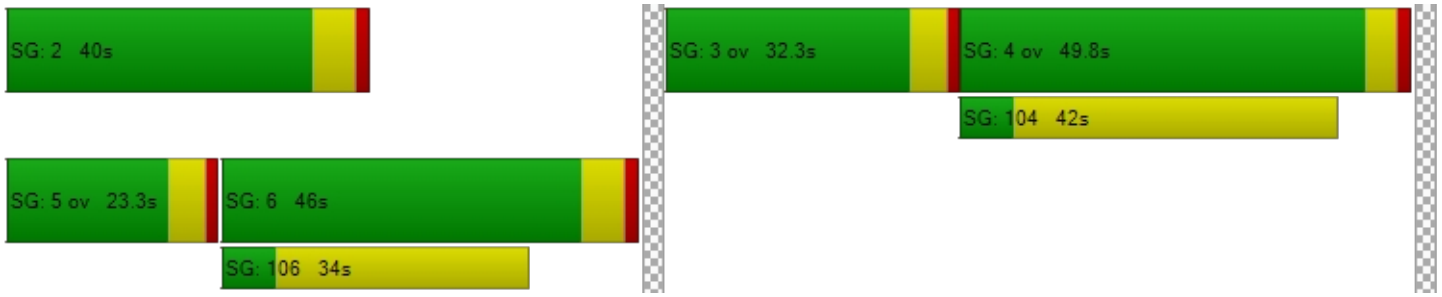
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	20.54	0.00	6.38	34.66	2.47	0.00	0.00	29.77	3.97
Movement LOS			A	C		A	C	A	A		C	A
d_A, Approach Delay [s/veh]	0.00			16.18			9.86			20.08		
Approach LOS	A			B			A			C		
d_I, Intersection Delay [s/veh]	15.04											
Intersection LOS	B											
Intersection V/C	0.611											

Other Modes

g_Walk,mi, Effective Walk Time [s]	-6.0	10.0	-5.3	10.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	46.79	31.18	46.04	31.18
l_p,int, Pedestrian LOS Score for Intersection	1.726	2.639	2.870	3.212
Crosswalk LOS	A	B	C	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1109	1906	155	986
d_b, Bicycle Delay [s]	8.05	0.09	34.58	10.46
l_b,int, Bicycle LOS Score for Intersection	1.560	1.560	2.472	2.395
Bicycle LOS	A	A	B	B

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Air Cargo Way & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	8.7
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.706

Intersection Setup

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	160.00	100.00	160.00	375.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			Yes		

Volumes

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	5	0	107	0	0	1	5	1039	6	128	890	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	14.00	0.00	0.00	0.00	0.00	2.10	0.00	11.70	3.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	1	0	12	0	0	0	0	27	1	21	24	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	6	0	119	0	0	1	5	1066	7	149	914	0
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	0	34	0	0	0	1	303	2	42	260	0
Total Analysis Volume [veh/h]	7	0	135	0	0	1	6	1211	8	169	1039	0
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			11			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	3.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	26	0	0	0	0	0	24	0	0	18	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	R	L	C	C
C, Cycle Length [s]	36	36	36	36	36	36	36	36
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	4	4	0	15	15	5	20	20
g / C, Green / Cycle	0.11	0.11	0.01	0.42	0.42	0.13	0.55	0.55
(v / s)_i Volume / Saturation Flow Rate	0.09	0.00	0.00	0.34	0.01	0.10	0.28	0.28
s, saturation flow rate [veh/h]	1652	812	1810	3558	1567	1642	1855	1855
c, Capacity [veh/h]	288	190	15	1507	664	219	1017	1017
d1, Uniform Delay [s]	15.60	14.28	17.84	9.11	6.04	15.13	5.12	5.12
k, delay calibration	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.49	0.00	6.43	0.39	0.00	2.19	0.15	0.15
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.49	0.01	0.40	0.80	0.01	0.77	0.51	0.51
d, Delay for Lane Group [s/veh]	16.09	14.29	24.27	9.50	6.04	17.33	5.26	5.26
Lane Group LOS	B	B	C	A	A	B	A	A
Critical Lane Group	Yes	No	No	Yes	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	0.97	0.01	0.07	2.73	0.02	1.22	1.22	1.22
50th-Percentile Queue Length [ft/ln]	24.26	0.16	1.72	68.28	0.59	30.60	30.60	30.60
95th-Percentile Queue Length [veh/ln]	1.75	0.01	0.12	4.92	0.04	2.20	2.20	2.20
95th-Percentile Queue Length [ft/ln]	43.67	0.28	3.10	122.90	1.07	55.08	55.09	55.09

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	16.09	16.09	16.09	14.29	14.29	14.29	24.27	9.50	6.04	17.33	5.26	5.26
Movement LOS	B	B	B	B	B	B	C	A	A	B	A	A
d_A, Approach Delay [s/veh]	16.09			14.29			9.55			6.95		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	8.69											
Intersection LOS	A											
Intersection V/C	0.706											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	8.69	8.69	0.00	8.69
I_p,int, Pedestrian LOS Score for Intersection	1.814	1.662	0.000	2.742
Crosswalk LOS	A	A	F	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1666	1666	1666	1666
d_b, Bicycle Delay [s]	0.50	0.50	0.50	0.50
I_b,int, Bicycle LOS Score for Intersection	1.794	1.561	2.570	2.556
Bicycle LOS	A	A	B	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Ron Cowan Parkway & John Glenn Dr

Control Type:	Signalized	Delay (sec / veh):	16.0
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.537

Intersection Setup

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	220.00	100.00	220.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			Yes			No		

Volumes

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Base Volume Input [veh/h]	20	279	0	0	1140	69	12	0	95	22	39	189
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	30.00	12.50	2.00	2.00	2.90	17.90	8.30	2.00	3.20	0.00	2.60	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	14	0	0	54	5	-2	0	-70	117	-64	13
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	20	293	0	0	1194	74	10	0	25	139	0	202
Peak Hour Factor	0.9500	0.9500	1.0000	1.0000	0.9500	0.9500	0.9500	1.0000	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	77	0	0	314	19	3	0	7	37	0	53
Total Analysis Volume [veh/h]	21	308	0	0	1257	78	11	0	26	146	0	213
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			9			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	76
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	ProtPer	Permis	Permis	Permis	Permis	Permis	Split	Permis	Split	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	2	0	1	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	10	0	0	10	0	4	10	0	4	4	0
Maximum Green [s]	10	20	0	0	20	0	15	20	0	10	15	0
Amber [s]	4.0	4.0	0.0	0.0	4.0	0.0	3.5	4.0	0.0	4.0	3.5	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	13	34	0	0	21	0	15	21	0	13	27	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	0	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	Yes	Yes			Yes		No				No	
Maximum Recall	No	No			No		No				No	
Pedestrian Recall	No	No			No		No				No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	C	C	C	L	C	R
C, Cycle Length [s]	76	76	76	76	76	76	76	76
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	48	48	39	39	3	13	13	13
g / C, Green / Cycle	0.64	0.64	0.52	0.52	0.04	0.17	0.17	0.17
(v / s)_i Volume / Saturation Flow Rate	0.12	0.10	0.25	0.25	0.02	0.08	0.00	0.13
s, saturation flow rate [veh/h]	1394	1558	3535	1791	1626	1810	1861	1615
c, Capacity [veh/h]	980	991	1829	927	58	308	317	275
d1, Uniform Delay [s]	5.99	5.62	11.83	11.78	36.16	28.47	0.00	30.14
k, delay calibration	0.31	0.50	0.50	0.50	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.24	0.35	0.93	1.78	10.94	1.13	0.00	4.65
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.17	0.16	0.49	0.48	0.64	0.47	0.00	0.77
d, Delay for Lane Group [s/veh]	6.23	5.97	12.76	13.56	47.10	29.60	0.00	34.80
Lane Group LOS	A	A	B	B	D	C	A	C
Critical Lane Group	Yes	No	Yes	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.00	0.96	4.57	4.78	0.84	2.42	0.00	3.95
50th-Percentile Queue Length [ft/ln]	25.09	24.07	114.35	119.43	20.97	60.53	0.00	98.66
95th-Percentile Queue Length [veh/ln]	1.81	1.73	8.08	8.36	1.51	4.36	0.00	7.10
95th-Percentile Queue Length [ft/ln]	45.16	43.32	202.04	209.05	37.74	108.95	0.00	177.59

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	6.23	6.09	0.00	0.00	12.99	13.56	47.10	0.00	47.10	29.60	0.00	34.80
Movement LOS	A	A			B	B	D		D	C	A	C
d_A, Approach Delay [s/veh]	6.10			13.03			47.10			32.68		
Approach LOS	A			B			D			C		
d_I, Intersection Delay [s/veh]	15.96											
Intersection LOS	B											
Intersection V/C	0.537											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	9.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	29.54	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	1.904	0.000
Crosswalk LOS	F	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	763	421	276	592
d_b, Bicycle Delay [s]	14.55	23.79	28.23	18.83
I_b,int, Bicycle LOS Score for Intersection	1.831	2.294	1.621	2.152
Bicycle LOS	A	B	A	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Ron Cowan Pkwy & Neil Armstrong Way

Control Type:	Signalized	Delay (sec / veh):	7.5
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.472

Intersection Setup

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	2
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	139.61
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No					
Crosswalk	Yes			No			Yes			No		

Volumes

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Base Volume Input [veh/h]	0	0	0	1233	22	0	298	29	0	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.90	4.50	2.00	22.90	3.60	2.00	2.00	2.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	-19	120	0	14	25	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	1214	142	0	312	54	0	0	0	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9400	0.9400	1.0000	0.9400	0.9400	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	323	38	0	83	14	0	0	0	0
Total Analysis Volume [veh/h]	0	0	0	1291	151	0	332	57	0	0	0	0
Presence of On-Street Parking				No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	38
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	6.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Permis	Split	Split	Permis	Permis	Permis	Permis
Signal Group	0	0	0	4	6	0	5	4	0	0	0	6
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	0	0	5
Maximum Green [s]	0	0	0	11	11	0	5	11	0	0	0	11
Amber [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0
Split [s]	0	0	0	15	23	0	0	15	0	0	0	23
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
Walk [s]	0	0	0	0	4	0	0	0	0	0	0	4
Pedestrian Clearance [s]	0	0	0	0	7	0	0	0	0	0	0	7
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No				
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
Minimum Recall					No			No				
Maximum Recall					No			No				
Pedestrian Recall					No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	L	C	
C, Cycle Length [s]		38	38	38	38	
L, Total Lost Time per Cycle [s]		4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]		2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]		23	23	7	7	
g / C, Green / Cycle		0.61	0.61	0.18	0.18	
(v / s)_i Volume / Saturation Flow Rate		0.28	0.27	0.12	0.12	
s, saturation flow rate [veh/h]		3434	1771	1482	1781	
c, Capacity [veh/h]		2106	1086	260	313	
d1, Uniform Delay [s]		3.92	3.90	14.62	14.62	
k, delay calibration		0.50	0.50	0.11	0.11	
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]		0.71	1.33	3.10	2.59	
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	
Rp, platoon ratio		1.00	1.00	1.00	1.00	
PF, progression factor		1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity		0.45	0.45	0.68	0.68	
d, Delay for Lane Group [s/veh]		4.63	5.24	17.72	17.20	
Lane Group LOS		A	A	B	B	
Critical Lane Group		Yes	No	Yes	No	
50th-Percentile Queue Length [veh/ln]		0.99	1.20	1.39	1.62	
50th-Percentile Queue Length [ft/ln]		24.85	29.94	34.73	40.58	
95th-Percentile Queue Length [veh/ln]		1.79	2.16	2.50	2.92	
95th-Percentile Queue Length [ft/ln]		44.73	53.90	62.51	73.05	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	4.79	5.24	0.00	17.48	17.20	0.00	0.00	0.00	0.00
Movement LOS				A	A		B	B				
d_A, Approach Delay [s/veh]	0.00			4.84			17.44			0.00		
Approach LOS	A			A			B			A		
d_I, Intersection Delay [s/veh]	7.51											
Intersection LOS	A											
Intersection V/C	0.472											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	8.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	9.56	0.00	11.81	0.00
l_p,int, Pedestrian LOS Score for Intersection	1.518	0.000	1.861	0.000
Crosswalk LOS	A	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1002	580	0
d_b, Bicycle Delay [s]	18.97	4.73	9.56	18.97
l_b,int, Bicycle LOS Score for Intersection	4.132	3.939	2.201	4.132
Bicycle LOS	D	D	B	D

Sequence

Ring 1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: Hegenberger Road & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	29.1
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.588

Intersection Setup

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	2	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	210.00	100.00	210.00	275.00	100.00	160.00	275.00	100.00	210.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	1	0	0	1
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	0	0	0	246	619	280	311	753	95	227	661	220
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	16.70	5.80	0.70	2.30	2.70	22.40	4.70	2.90	6.80
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	14	68	56	28	39	0	25	42	2
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	260	687	336	339	792	95	252	703	222
Peak Hour Factor	1.0000	1.0000	1.0000	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	67	177	87	87	204	24	65	181	57
Total Analysis Volume [veh/h]	0	0	0	268	708	346	349	816	98	260	725	229
Presence of On-Street Parking				No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			2			0			1		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			1			0			2		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	99.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Split	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	0	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	0	0	30	45	0	35	45	0	25	40	0
Amber [s]	0.0	0.0	0.0	3.0	4.0	0.0	3.0	4.5	0.0	3.0	4.5	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	43	0	18	38	0	19	39	0
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	0	0	0	31	0	0	0	0	0	26	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	3.0	0.0	2.0	3.5	0.0	2.0	3.5	0.0
Minimum Recall					No		No	Yes		No	Yes	
Maximum Recall					No		No	No		No	No	
Pedestrian Recall					No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	C	L	C	R	L	C	R
C, Cycle Length [s]		100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	4.00	5.50	5.50	4.00	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	2.00	3.50	3.50	2.00	3.50	3.50
g_i, Effective Green Time [s]		27	27	27	12	49	49	10	46	46
g / C, Green / Cycle		0.27	0.27	0.27	0.12	0.49	0.49	0.10	0.46	0.46
(v / s)_i Volume / Saturation Flow Rate		0.17	0.21	0.23	0.10	0.23	0.07	0.08	0.21	0.15
s, saturation flow rate [veh/h]		1571	3452	1521	3450	3540	1329	3384	3535	1506
c, Capacity [veh/h]		424	931	410	423	1719	645	338	1635	697
d1, Uniform Delay [s]		32.18	33.58	34.55	42.88	17.23	14.31	43.94	18.18	17.00
k, delay calibration		0.11	0.11	0.11	0.11	0.50	0.50	0.11	0.50	0.50
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		1.56	1.31	4.76	4.11	0.94	0.50	3.70	0.87	1.26
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity		0.63	0.76	0.84	0.82	0.47	0.15	0.77	0.44	0.33
d, Delay for Lane Group [s/veh]		33.75	34.89	39.31	46.98	18.17	14.81	47.64	19.06	18.26
Lane Group LOS		C	C	D	D	B	B	D	B	B
Critical Lane Group		No	No	Yes	No	Yes	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]		5.81	7.93	8.35	4.42	6.27	1.30	3.29	5.68	3.48
50th-Percentile Queue Length [ft/ln]		145.35	198.22	208.66	110.46	156.72	32.39	82.30	142.10	87.09
95th-Percentile Queue Length [veh/ln]		9.77	12.55	13.08	7.87	10.38	2.33	5.93	9.59	6.27
95th-Percentile Queue Length [ft/ln]		244.22	313.66	327.11	196.65	259.38	58.30	148.15	239.84	156.77

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	33.75	34.89	39.31	46.98	18.17	14.81	47.64	19.06	18.26
Movement LOS				C	C	D	D	B	B	D	B	B
d_A, Approach Delay [s/veh]	0.00			35.81			25.87			25.03		
Approach LOS	A			D			C			C		
d_I, Intersection Delay [s/veh]	29.06											
Intersection LOS	C											
Intersection V/C	0.588											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	2167.73	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	39.64	39.64	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	2.766	2.924	0.000
Crosswalk LOS	F	C	C	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	759	650	670
d_b, Bicycle Delay [s]	50.03	19.26	22.81	22.15
l_b,int, Bicycle LOS Score for Intersection	4.132	2.287	2.602	2.561
Bicycle LOS	D	B	B	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: Doolittle Drive & Airport Access Road

Control Type:	Signalized	Delay (sec / veh):	23.0
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.631

Intersection Setup

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	1	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	88	33	259	85	0	30	42	786	0	0	939	186
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	19.20	6.10	3.50	5.90	2.00	0.00	0.00	7.60	2.00	2.00	2.90	6.50
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	57	15	22	0	26	28	25	0	0	43	9
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	88	90	274	107	0	56	70	811	0	0	982	195
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	1.0000	0.9200	0.9200	0.9200	1.0000	1.0000	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	24	24	74	29	0	15	19	220	0	0	267	53
Total Analysis Volume [veh/h]	96	98	298	116	0	61	76	882	0	0	1067	212
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			3			0			3		
v_di, Inbound Pedestrian Volume crossing major street [	0			3			0			3		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			1			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	41.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Permis	Split	Protect	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	4	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	5	0	5	0	0	5	5	0	0	5	0
Maximum Green [s]	0	65	0	30	0	0	20	55	0	0	35	0
Amber [s]	0.0	4.0	0.0	3.0	0.0	0.0	3.0	4.5	0.0	0.0	4.5	0.0
All red [s]	0.0	1.0	0.0	1.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	33	0	18	0	0	15	49	0	0	34	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	0	0	0	0	0	0	5	0
Pedestrian Clearance [s]	0	23	0	0	0	0	0	0	0	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No		No				No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No		No			No	Yes			Yes	
Maximum Recall		No		No			No	No			No	
Pedestrian Recall		No		No			No	No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	0.0	0.0	20.0	20.0	0.0	0.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	R	L	C	C	R
C, Cycle Length [s]	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	23	23	23	6	6	5	59	50	50
g / C, Green / Cycle	0.23	0.23	0.23	0.06	0.06	0.05	0.59	0.50	0.50
(v / s)_i Volume / Saturation Flow Rate	0.06	0.02	0.19	0.03	0.04	0.04	0.26	0.30	0.14
s, saturation flow rate [veh/h]	1535	4926	1550	3350	1590	1810	3400	3535	1508
c, Capacity [veh/h]	349	1120	352	202	96	100	2015	1758	750
d1, Uniform Delay [s]	31.89	30.50	36.89	45.79	45.94	46.66	11.23	18.12	14.68
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.42	0.03	5.60	2.55	6.78	11.30	0.69	1.57	0.94
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.28	0.09	0.85	0.57	0.64	0.76	0.44	0.61	0.28
d, Delay for Lane Group [s/veh]	32.31	30.53	42.49	48.33	52.71	57.96	11.92	19.68	15.62
Lane Group LOS	C	C	D	D	D	E	B	B	B
Critical Lane Group	No	No	Yes	No	Yes	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.95	0.62	7.39	1.47	1.65	2.17	5.21	8.84	2.92
50th-Percentile Queue Length [ft/ln]	48.65	15.59	184.78	36.70	41.35	54.21	130.29	220.89	72.95
95th-Percentile Queue Length [veh/ln]	3.50	1.12	11.85	2.64	2.98	3.90	8.96	13.71	5.25
95th-Percentile Queue Length [ft/ln]	87.58	28.06	296.24	66.06	74.44	97.58	223.89	342.76	131.32

Movement, Approach, & Intersection Results

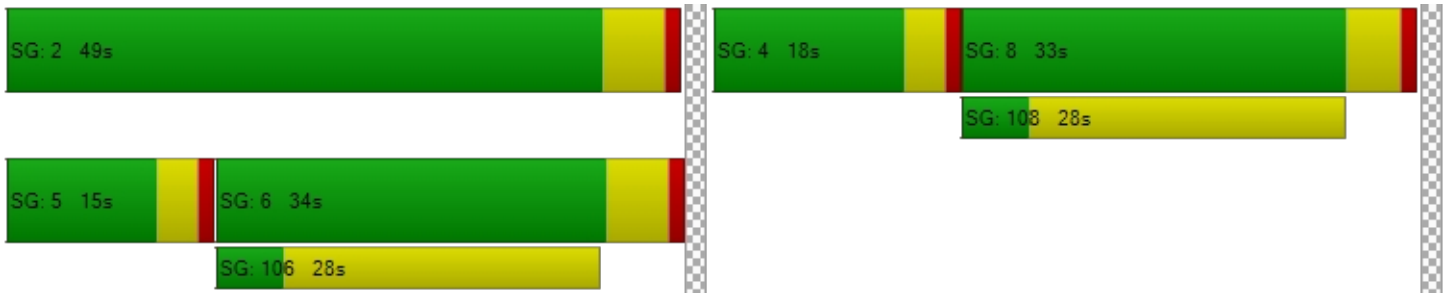
d_M, Delay for Movement [s/veh]	32.31	30.53	42.49	48.33	0.00	52.71	57.96	11.92	0.00	0.00	19.68	15.62
Movement LOS	C	C	D	D		D	E	B			B	B
d_A, Approach Delay [s/veh]	38.12			49.84			15.58			19.01		
Approach LOS	D			D			B			B		
d_I, Intersection Delay [s/veh]	22.99											
Intersection LOS	C											
Intersection V/C	0.631											

Other Modes

g_Walk,mi, Effective Walk Time [s]	43.5	9.0	14.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	15.99	41.44	37.01	41.44
l_p,int, Pedestrian LOS Score for Intersection	2.364	2.679	2.727	2.809
Crosswalk LOS	B	B	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	560	280	869	570
d_b, Bicycle Delay [s]	25.96	37.03	16.00	25.60
l_b,int, Bicycle LOS Score for Intersection	1.830	1.560	2.350	2.615
Bicycle LOS	A	A	B	B

Sequence

Ring 1	-	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-





Appendix F 2038 Intersection Operations Outputs

Oakland Terminal Project

Vistro File: H:\...\22916_Oakland Terminal_20221003.vistro
Report File: H:\...\2038_AM.pdf

Scenario 9 2038 AM
10/3/2022

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Harbor Bay Parkway & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.488	11.6	B
2	Harbor Bay Parkway & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.651	23.6	C
3	Air Cargo Way & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.748	10.7	B
4	Ron Cowan Parkway & John Glenn Dr	Signalized	HCM 7th Edition	EB Right	0.671	36.2	D
5	Ron Cowan Pkwy & Neil Armstrong Way	Signalized	HCM 7th Edition	EB Left	0.414	4.4	A
6	Hegenberger Road & Doolittle Drive	Signalized	HCM 7th Edition	SB Right	0.951	57.7	E
7	Doolittle Drive & Airport Access Road	Signalized	HCM 7th Edition	EB Left	0.833	34.6	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Harbor Bay Parkway & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	11.6
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.488

Intersection Setup

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	2	0
Entry Pocket Length [ft]	100.00	100.00	100.00	550.00	320.00	100.00
No. of Lanes in Exit Pocket	0	1	0	0	0	1
Exit Pocket Length [ft]	0.00	180.00	0.00	0.00	0.00	310.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Base Volume Input [veh/h]	181	23	620	391	28	1155
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.30	4.30	2.50	2.80	28.60	3.40
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	35	1	12	32	1	14
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	216	24	632	423	29	1169
Peak Hour Factor	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	55	6	161	108	7	298
Total Analysis Volume [veh/h]	220	24	645	432	30	1193
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0		0		0	
v_di, Inbound Pedestrian Volume crossing major street [	0		0		0	
v_co, Outbound Pedestrian Volume crossing minor stree	0		0		0	
v_ci, Inbound Pedestrian Volume crossing minor street [	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		5		2	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Protected	Permissive
Signal Group	8	0	2	0	1	6
Auxiliary Signal Groups						
Lead / Lag	Lead	-	-	-	Lead	-
Minimum Green [s]	11	0	10	0	10	7
Maximum Green [s]	20	0	30	0	20	30
Amber [s]	4.8	0.0	5.2	0.0	4.8	5.2
All red [s]	1.0	0.0	1.0	0.0	1.0	1.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	5.0	0.0	4.0	0.0	2.2	4.0
Walk [s]	11	0	7	0	0	0
Pedestrian Clearance [s]	29	0	28	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No		No			No
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	2.0
l2, Clearance Lost Time [s]	3.8	0.0	4.2	0.0	3.8	4.2
Minimum Recall	No		Yes		No	Yes
Maximum Recall	No		No		No	No
Pedestrian Recall	No		No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	R	L	C
C, Cycle Length [s]	52	52	52	52	52	52
L, Total Lost Time per Cycle [s]	5.80	5.80	6.20	6.20	5.80	6.20
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.80	3.80	4.20	4.20	3.80	4.20
g_i, Effective Green Time [s]	11	11	20	20	4	29
g / C, Green / Cycle	0.21	0.21	0.38	0.38	0.07	0.56
(v / s)_i Volume / Saturation Flow Rate	0.06	0.02	0.18	0.28	0.01	0.34
s, saturation flow rate [veh/h]	3422	1560	3546	1556	2720	3520
c, Capacity [veh/h]	704	321	1358	596	187	1983
d1, Uniform Delay [s]	17.52	16.65	12.09	13.62	22.80	7.50
k, delay calibration	0.23	0.23	0.15	0.15	0.06	0.15
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.54	0.21	0.37	2.40	0.21	0.42
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.31	0.07	0.47	0.72	0.16	0.60
d, Delay for Lane Group [s/veh]	18.06	16.86	12.46	16.02	23.01	7.92
Lane Group LOS	B	B	B	B	C	A
Critical Lane Group	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.06	0.23	2.44	3.97	0.17	3.20
50th-Percentile Queue Length [ft/ln]	26.47	5.68	61.01	99.36	4.14	80.00
95th-Percentile Queue Length [veh/ln]	1.91	0.41	4.39	7.15	0.30	5.76
95th-Percentile Queue Length [ft/ln]	47.64	10.23	109.81	178.85	7.45	143.99

Movement, Approach, & Intersection Results

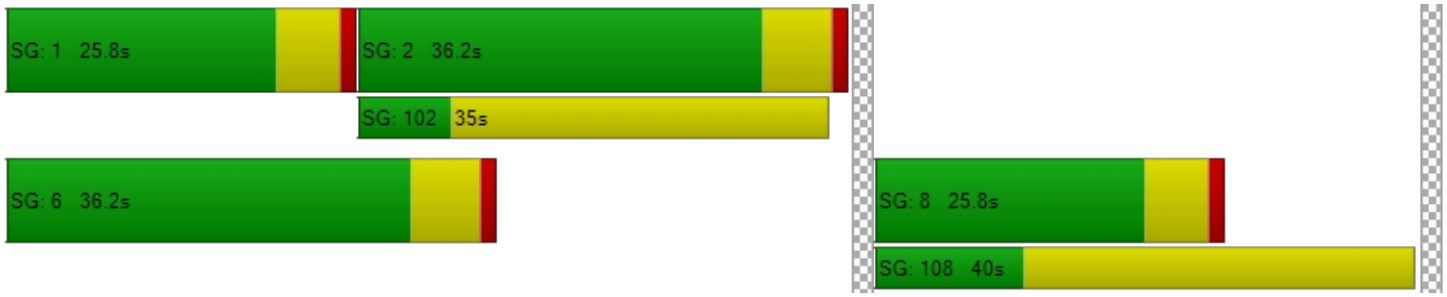
d_M, Delay for Movement [s/veh]	18.06	16.86	12.46	16.02	23.01	7.92
Movement LOS	B	B	B	B	C	A
d_A, Approach Delay [s/veh]	17.94		13.89		8.29	
Approach LOS	B		B		A	
d_I, Intersection Delay [s/veh]	11.59					
Intersection LOS	B					
Intersection V/C	0.488					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	15.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	16.11	13.11	0.00
l_p,int, Pedestrian LOS Score for Intersection	2.536	2.746	0.000
Crosswalk LOS	B	B	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	771	1156	1156
d_b, Bicycle Delay [s]	9.80	4.63	4.62
l_b,int, Bicycle LOS Score for Intersection	1.560	2.448	2.569
Bicycle LOS	A	B	B

Sequence

Ring 1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Harbor Bay Parkway & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	23.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.651

Intersection Setup

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	190.00	100.00	300.00	190.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	0	0	0	682	0	257	151	473	0	0	860	136
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	0.00	10.60	2.00	1.20	4.60	9.60	0.00	2.00	2.90	2.80
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	32	0	1	1	4	0	0	6	35
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	714	0	258	152	477	0	0	866	171
Peak Hour Factor	1.0000	1.0000	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	196	0	71	42	131	0	0	238	47
Total Analysis Volume [veh/h]	0	0	0	785	0	284	167	524	0	0	952	188
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			3		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Overla	Permis	Overla	Protect	Overla	Overla	Permis	Permis	Overla
Signal Group	0	0	4	3	0	3	5	2	2	0	6	6
Auxiliary Signal Groups				3,4		3,5		2,3	2,3			3,4,6
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	6	9	0	9	10	8	8	0	10	10
Maximum Green [s]	0	0	45	27	0	27	18	34	34	0	40	40
Amber [s]	0.0	0.0	3.6	4.1	0.0	4.1	4.1	4.8	4.8	0.0	4.8	4.8
All red [s]	0.0	0.0	1.2	1.2	0.0	1.2	1.2	1.2	1.2	0.0	1.2	1.2
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	3.0	3.2	0.0	3.2	2.5	3.2	3.2	0.0	3.2	3.2
Walk [s]	0	0	6	0	0	0	0	0	0	0	6	6
Pedestrian Clearance [s]	0	0	36	0	0	0	0	0	0	0	28	28
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk			No	No				No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	2.8	3.3	0.0	3.3	3.3	4.0	4.0	0.0	4.0	4.0
Minimum Recall			No	No		No	No	Yes	Yes		Yes	Yes
Maximum Recall			No	No		No	No	No	No		No	No
Pedestrian Recall			No	No		No	No	No	No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	20.0	20.0	0.0	20.0	20.0	20.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	R	L	R	L	C	R	C	R
C, Cycle Length [s]	96	96	96	96	96	96	96	96
L, Total Lost Time per Cycle [s]	4.80	4.80	5.30	5.30	5.30	5.30	6.00	4.80
l1_p, Permitted Start-Up Lost Time [s]	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.80	0.00	0.00	3.30	0.00	0.00	4.00	4.00
g_i, Effective Green Time [s]	7	40	54	10	79	79	31	70
g / C, Green / Cycle	0.08	0.41	0.56	0.10	0.82	0.82	0.32	0.73
(v / s)_i Volume / Saturation Flow Rate	0.00	0.39	0.10	0.05	0.16	0.00	0.27	0.12
s, saturation flow rate [veh/h]	1615	2036	2786	3386	3343	1615	3535	1568
c, Capacity [veh/h]	123	898	1569	347	2738	1323	1128	1145
d1, Uniform Delay [s]	0.00	28.13	10.20	40.83	1.87	0.00	30.58	2.56
k, delay calibration	0.11	0.20	0.12	0.08	0.12	0.12	0.12	0.12
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.00	5.19	0.06	0.77	0.04	0.00	1.97	0.07
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.00	0.87	0.18	0.48	0.19	0.00	0.84	0.16
d, Delay for Lane Group [s/veh]	0.00	33.32	10.26	41.60	1.91	0.00	32.54	2.64
Lane Group LOS	A	C	B	D	A	A	C	A
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.00	7.32	1.40	1.89	0.62	0.00	10.30	0.59
50th-Percentile Queue Length [ft/ln]	0.00	183.05	34.96	47.28	15.48	0.00	257.44	14.81
95th-Percentile Queue Length [veh/ln]	0.00	11.76	2.52	3.40	1.11	0.00	15.56	1.07
95th-Percentile Queue Length [ft/ln]	0.00	293.99	62.93	85.11	27.86	0.00	389.00	26.66

Movement, Approach, & Intersection Results

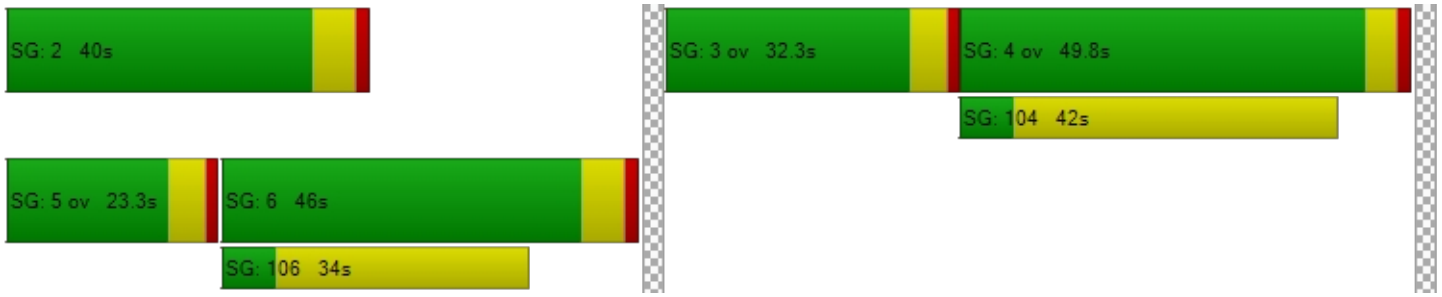
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	33.32	0.00	10.26	41.60	1.91	0.00	0.00	32.54	2.64
Movement LOS			A	C		B	D	A	A		C	A
d_A, Approach Delay [s/veh]	0.00			27.20			11.50			27.61		
Approach LOS	A			C			B			C		
d_I, Intersection Delay [s/veh]	23.62											
Intersection LOS	C											
Intersection V/C	0.651											

Other Modes

g_Walk,mi, Effective Walk Time [s]	-6.0	10.0	-5.3	10.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.32	38.66	53.58	38.66
I_p,int, Pedestrian LOS Score for Intersection	1.732	2.688	2.879	3.646
Crosswalk LOS	A	B	C	D
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	935	1606	131	831
d_b, Bicycle Delay [s]	13.65	1.87	42.04	16.47
I_b,int, Bicycle LOS Score for Intersection	1.560	1.560	2.130	2.500
Bicycle LOS	A	A	B	B

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Air Cargo Way & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	10.7
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.748

Intersection Setup

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	160.00	100.00	160.00	375.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			Yes		

Volumes

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	11	3	139	0	0	0	3	1085	16	121	1002	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	25.90	0.00	0.00	0.00	0.00	6.40	0.00	15.70	2.80	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	4	0	42	0	0	0	0	33	3	43	37	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	15	3	181	0	0	0	3	1118	19	164	1039	0
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	1	49	0	0	0	1	301	5	44	279	0
Total Analysis Volume [veh/h]	16	3	195	0	0	0	3	1202	20	176	1117	0
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			1			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	3.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	26	0	0	0	0	0	24	0	0	18	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	R	L	C	C
C, Cycle Length [s]	44	44	44	44	44	44	44	44
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	7	7	0	18	18	6	24	24
g / C, Green / Cycle	0.17	0.17	0.00	0.42	0.42	0.14	0.55	0.55
(v / s)_i Volume / Saturation Flow Rate	0.13	0.00	0.00	0.35	0.01	0.11	0.30	0.30
s, saturation flow rate [veh/h]	1620	1382	1810	3435	1581	1585	1858	1858
c, Capacity [veh/h]	360	314	7	1431	659	224	1028	1028
d1, Uniform Delay [s]	17.42	0.00	21.69	11.43	7.53	18.13	6.22	6.22
k, delay calibration	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.59	0.00	12.34	0.53	0.01	2.33	0.17	0.17
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.59	0.00	0.40	0.84	0.03	0.79	0.54	0.54
d, Delay for Lane Group [s/veh]	18.00	0.00	34.04	11.96	7.53	20.46	6.39	6.39
Lane Group LOS	B	A	C	B	A	C	A	A
Critical Lane Group	Yes	No	No	Yes	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	1.83	0.00	0.05	3.97	0.09	1.63	2.06	2.06
50th-Percentile Queue Length [ft/ln]	45.75	0.00	1.33	99.20	2.15	40.82	51.59	51.59
95th-Percentile Queue Length [veh/ln]	3.29	0.00	0.10	7.14	0.15	2.94	3.71	3.71
95th-Percentile Queue Length [ft/ln]	82.34	0.00	2.39	178.55	3.86	73.47	92.87	92.87

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	18.00	18.00	18.00	0.00	0.00	0.00	34.04	11.96	7.53	20.46	6.39	6.39
Movement LOS	B	B	B	A	A	A	C	B	A	C	A	A
d_A, Approach Delay [s/veh]	18.00			0.00			11.94			8.31		
Approach LOS	B			A			B			A		
d_I, Intersection Delay [s/veh]	10.70											
Intersection LOS	B											
Intersection V/C	0.748											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	12.17	12.17	0.00	12.17
I_p,int, Pedestrian LOS Score for Intersection	1.872	1.675	0.000	2.782
Crosswalk LOS	A	A	F	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1377	1377	1377	1377
d_b, Bicycle Delay [s]	2.11	2.11	2.11	2.11
I_b,int, Bicycle LOS Score for Intersection	1.913	1.560	2.570	2.626
Bicycle LOS	A	A	B	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Ron Cowan Parkway & John Glenn Dr

Control Type:	Signalized	Delay (sec / veh):	36.2
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.671

Intersection Setup

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	220.00	100.00	220.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			Yes			No		

Volumes

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Base Volume Input [veh/h]	16	16	0	0	1099	145	16	0	138	27	29	95
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	43.80	21.40	2.00	2.00	14.50	15.00	6.30	2.00	27.50	7.40	10.30	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	35	0	0	42	33	2	0	51	14	44	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	16	51	0	0	1141	178	18	0	189	41	73	95
Peak Hour Factor	0.9100	0.9100	1.0000	1.0000	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	14	0	0	313	49	5	0	52	11	20	26
Total Analysis Volume [veh/h]	18	56	0	0	1254	196	20	0	208	45	80	104
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			1			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			1			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			2			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	76
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	ProtPer	Permis	Permis	Permis	Permis	Permis	Split	Permis	Split	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	2	0	1	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	10	0	0	10	0	4	10	0	4	4	0
Maximum Green [s]	10	20	0	0	20	0	15	20	0	10	15	0
Amber [s]	4.0	4.0	0.0	0.0	4.0	0.0	3.5	4.0	0.0	4.0	3.5	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	13	34	0	0	21	0	15	21	0	13	27	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	0	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	Yes	Yes			Yes		No				No	
Maximum Recall	No	No			No		No				No	
Pedestrian Recall	No	No			No		No				No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	C	C	C	L	C	R
C, Cycle Length [s]	76	76	76	76	76	76	76	76
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	45	45	36	36	11	8	8	8
g / C, Green / Cycle	0.60	0.60	0.48	0.48	0.14	0.10	0.10	0.10
(v / s)_i Volume / Saturation Flow Rate	0.07	0.03	0.30	0.31	0.18	0.03	0.05	0.06
s, saturation flow rate [veh/h]	518	1437	3203	1554	1276	1704	1745	1615
c, Capacity [veh/h]	348	857	1529	742	185	171	176	163
d1, Uniform Delay [s]	8.76	6.37	14.87	15.07	32.49	31.58	32.22	32.86
k, delay calibration	0.11	0.50	0.50	0.50	0.34	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.12	0.10	2.00	4.41	131.82	0.80	1.84	4.14
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.10	0.05	0.63	0.65	1.23	0.26	0.46	0.64
d, Delay for Lane Group [s/veh]	8.88	6.47	16.87	19.48	164.32	32.38	34.06	37.01
Lane Group LOS	A	A	B	B	F	C	C	D
Critical Lane Group	Yes	No	No	Yes	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.22	0.26	6.06	6.62	10.07	0.78	1.44	1.98
50th-Percentile Queue Length [ft/ln]	5.45	6.38	151.41	165.42	251.76	19.57	36.01	49.45
95th-Percentile Queue Length [veh/ln]	0.39	0.46	10.09	10.84	16.60	1.41	2.59	3.56
95th-Percentile Queue Length [ft/ln]	9.81	11.48	252.31	270.88	415.12	35.23	64.82	89.01

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	8.88	7.17	0.00	0.00	17.47	19.48	164.32	0.00	164.32	32.38	34.06	37.01
Movement LOS	A	A			B	B	F		F	C	C	D
d_A, Approach Delay [s/veh]	7.59			17.74			164.32			35.07		
Approach LOS	A			B			F			D		
d_I, Intersection Delay [s/veh]	36.24											
Intersection LOS	D											
Intersection V/C	0.671											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	9.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	1352.34	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	29.54	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	1.987	0.000
Crosswalk LOS	F	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	763	421	276	592
d_b, Bicycle Delay [s]	14.55	23.71	28.23	18.84
I_b,int, Bicycle LOS Score for Intersection	1.621	2.357	1.936	1.937
Bicycle LOS	A	B	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Ron Cowan Pkwy & Neil Armstrong Way

Control Type:	Signalized	Delay (sec / veh):	4.4
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.414

Intersection Setup

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	2
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	139.61
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No					
Crosswalk	Yes			No			Yes			No		

Volumes

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Base Volume Input [veh/h]	0	0	0	1225	36	0	33	24	0	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	17.80	5.60	2.00	32.30	8.30	2.00	2.00	2.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	93	14	0	35	8	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	1318	50	0	68	32	0	0	0	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9200	0.9200	1.0000	0.9200	0.9200	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	358	14	0	18	9	0	0	0	0
Total Analysis Volume [veh/h]	0	0	0	1433	54	0	74	35	0	0	0	0
Presence of On-Street Parking				No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	38
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	6.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Permis	Split	Split	Permis	Permis	Permis	Permis
Signal Group	0	0	0	4	6	0	5	4	0	0	0	6
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	0	0	5
Maximum Green [s]	0	0	0	11	11	0	5	11	0	0	0	11
Amber [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0
Split [s]	0	0	0	15	23	0	0	15	0	0	0	23
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
Walk [s]	0	0	0	0	4	0	0	0	0	0	0	4
Pedestrian Clearance [s]	0	0	0	0	7	0	0	0	0	0	0	7
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No				
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
Minimum Recall					No			No				
Maximum Recall					No			No				
Pedestrian Recall					No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	L	C	
C, Cycle Length [s]		38	38	38	38	
L, Total Lost Time per Cycle [s]		4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]		2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]		27	27	3	3	
g / C, Green / Cycle		0.70	0.70	0.09	0.09	
(v / s)_i Volume / Saturation Flow Rate		0.31	0.31	0.04	0.04	
s, saturation flow rate [veh/h]		3020	1738	1348	1738	
c, Capacity [veh/h]		2108	1213	123	158	
d1, Uniform Delay [s]		2.52	2.51	16.25	16.24	
k, delay calibration		0.50	0.50	0.11	0.11	
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]		0.69	1.19	2.02	1.53	
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	
Rp, platoon ratio		1.00	1.00	1.00	1.00	
PF, progression factor		1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity		0.45	0.45	0.39	0.38	
d, Delay for Lane Group [s/veh]		3.21	3.71	18.26	17.76	
Lane Group LOS		A	A	B	B	
Critical Lane Group		Yes	No	Yes	No	
50th-Percentile Queue Length [veh/ln]		0.40	0.63	0.40	0.49	
50th-Percentile Queue Length [ft/ln]		10.11	15.79	10.08	12.27	
95th-Percentile Queue Length [veh/ln]		0.73	1.14	0.73	0.88	
95th-Percentile Queue Length [ft/ln]		18.19	28.42	18.14	22.09	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	3.38	3.71	0.00	18.11	17.76	0.00	0.00	0.00	0.00
Movement LOS				A	A		B	B				
d_A, Approach Delay [s/veh]	0.00			3.39			17.98			0.00		
Approach LOS	A			A			B			A		
d_I, Intersection Delay [s/veh]	4.39											
Intersection LOS	A											
Intersection V/C	0.414											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	8.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	9.58	0.00	11.83	0.00
l_p,int, Pedestrian LOS Score for Intersection	1.424	0.000	1.724	0.000
Crosswalk LOS	A	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1001	579	0
d_b, Bicycle Delay [s]	18.98	4.74	9.58	18.98
l_b,int, Bicycle LOS Score for Intersection	4.132	4.013	1.739	4.132
Bicycle LOS	D	D	A	D

Sequence

Ring 1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: Hegenberger Road & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	57.7
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.951

Intersection Setup

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	2	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	210.00	100.00	210.00	275.00	100.00	160.00	275.00	100.00	210.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	1	0	0	1
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	0	0	0	139	613	610	451	422	64	359	737	353
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	17.00	6.00	1.00	2.00	3.00	22.00	5.00	3.00	7.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	2	311	86	55	38	0	57	20	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	141	924	696	506	460	64	416	757	353
Peak Hour Factor	1.0000	1.0000	1.0000	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	36	238	179	130	119	16	107	195	91
Total Analysis Volume [veh/h]	0	0	0	145	953	718	522	474	66	429	780	364
Presence of On-Street Parking				No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	99.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Split	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	0	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	0	0	30	45	0	35	45	0	25	40	0
Amber [s]	0.0	0.0	0.0	3.0	4.0	0.0	3.0	4.5	0.0	3.0	4.5	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	43	0	18	38	0	19	39	0
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	0	0	0	31	0	0	0	0	0	26	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	3.0	0.0	2.0	3.5	0.0	2.0	3.5	0.0
Minimum Recall					No		No	Yes		No	Yes	
Maximum Recall					No		No	No		No	No	
Pedestrian Recall					No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	C	L	C	R	L	C	R
C, Cycle Length [s]		100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	4.00	5.50	5.50	4.00	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	2.00	3.50	3.50	2.00	3.50	3.50
g_i, Effective Green Time [s]		38	38	38	14	33	33	15	34	34
g / C, Green / Cycle		0.38	0.38	0.38	0.14	0.33	0.33	0.15	0.33	0.33
(v / s)_i Volume / Saturation Flow Rate		0.09	0.28	0.47	0.15	0.13	0.05	0.13	0.22	0.24
s, saturation flow rate [veh/h]		1567	3446	1519	3459	3532	1334	3375	3532	1506
c, Capacity [veh/h]		595	1308	577	489	1162	439	495	1182	504
d1, Uniform Delay [s]		21.27	26.68	31.11	43.05	26.07	23.74	41.81	28.49	29.15
k, delay calibration		0.11	0.11	0.49	0.11	0.50	0.50	0.11	0.50	0.50
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		0.21	0.79	124.23	40.30	1.06	0.72	4.70	2.90	8.68
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity		0.24	0.73	1.25	1.07	0.41	0.15	0.87	0.66	0.72
d, Delay for Lane Group [s/veh]		21.48	27.47	155.33	83.35	27.13	24.47	46.51	31.39	37.83
Lane Group LOS		C	C	F	F	C	C	D	C	D
Critical Lane Group		No	No	Yes	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		2.33	9.61	33.24	8.71	4.49	1.18	5.45	8.29	8.68
50th-Percentile Queue Length [ft/ln]		58.27	240.19	831.12	217.84	112.23	29.59	136.26	207.35	217.04
95th-Percentile Queue Length [veh/ln]		4.20	14.69	49.03	13.95	7.96	2.13	9.28	13.02	13.51
95th-Percentile Queue Length [ft/ln]		104.88	367.27	1225.7	348.73	199.10	53.26	231.98	325.43	337.85

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	21.48	27.47	155.33	83.35	27.13	24.47	46.51	31.39	37.83
Movement LOS				C	C	F	F	C	C	D	C	D
d_A, Approach Delay [s/veh]	0.00			77.55			54.60			37.00		
Approach LOS	A			E			D			D		
d_I, Intersection Delay [s/veh]	57.74											
Intersection LOS	E											
Intersection V/C	0.951											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	39.67	39.67	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	2.897	2.955	0.000
Crosswalk LOS	F	C	C	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	759	649	669
d_b, Bicycle Delay [s]	50.07	19.29	22.84	22.18
l_b,int, Bicycle LOS Score for Intersection	4.132	2.558	2.436	2.857
Bicycle LOS	D	B	B	C

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: Doolittle Drive & Airport Access Road

Control Type:	Signalized	Delay (sec / veh):	34.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.833

Intersection Setup

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	1	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	62	40	371	94	0	18	23	421	0	0	1266	222
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	33.90	17.50	3.20	8.80	2.00	5.60	4.30	6.70	2.00	2.00	4.60	6.10
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	155	49	1	0	0	25	15	0	0	77	3
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	62	195	420	95	0	18	48	436	0	0	1343	225
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	1.0000	0.9400	0.9400	0.9400	1.0000	1.0000	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	16	52	112	25	0	5	13	116	0	0	357	60
Total Analysis Volume [veh/h]	66	207	447	101	0	19	51	464	0	0	1429	239
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	1			2			0			1		
v_di, Inbound Pedestrian Volume crossing major street [	0			1			1			2		
v_co, Outbound Pedestrian Volume crossing minor stree	1			0			0			1		
v_ci, Inbound Pedestrian Volume crossing minor street [	1			0			0			1		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			0			2			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	41.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Permis	Split	Protect	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	4	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	5	0	5	0	0	5	5	0	0	5	0
Maximum Green [s]	0	65	0	30	0	0	20	55	0	0	35	0
Amber [s]	0.0	4.0	0.0	3.0	0.0	0.0	3.0	4.5	0.0	0.0	4.5	0.0
All red [s]	0.0	1.0	0.0	1.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	33	0	18	0	0	15	49	0	0	34	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	0	0	0	0	0	0	5	0
Pedestrian Clearance [s]	0	23	0	0	0	0	0	0	0	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No		No				No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No		No			No	Yes			Yes	
Maximum Recall		No		No			No	No			No	
Pedestrian Recall		No		No			No	No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	0.0	0.0	20.0	20.0	0.0	0.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	R	L	C	C	R
C, Cycle Length [s]	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	32	32	32	5	5	4	51	43	43
g / C, Green / Cycle	0.32	0.32	0.32	0.05	0.05	0.04	0.51	0.43	0.43
(v / s)_i Volume / Saturation Flow Rate	0.05	0.05	0.29	0.03	0.01	0.03	0.14	0.41	0.16
s, saturation flow rate [veh/h]	1325	4460	1551	3270	1544	1748	3426	3486	1514
c, Capacity [veh/h]	423	1424	495	169	80	68	1745	1501	652
d1, Uniform Delay [s]	24.44	24.36	32.44	46.52	45.64	47.71	13.96	27.55	19.25
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.17	0.05	6.34	3.35	1.52	15.25	0.37	14.32	1.59
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.16	0.15	0.90	0.60	0.24	0.75	0.27	0.95	0.37
d, Delay for Lane Group [s/veh]	24.61	24.40	38.78	49.87	47.16	62.96	14.34	41.87	20.84
Lane Group LOS	C	C	D	D	D	E	B	D	C
Critical Lane Group	No	No	Yes	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.14	1.17	10.90	1.30	0.49	1.54	2.97	18.63	3.94
50th-Percentile Queue Length [ft/ln]	28.39	29.21	272.46	32.59	12.15	38.53	74.31	465.67	98.60
95th-Percentile Queue Length [veh/ln]	2.04	2.10	16.31	2.35	0.87	2.77	5.35	25.70	7.10
95th-Percentile Queue Length [ft/ln]	51.10	52.57	407.82	58.67	21.86	69.35	133.77	642.62	177.48

Movement, Approach, & Intersection Results

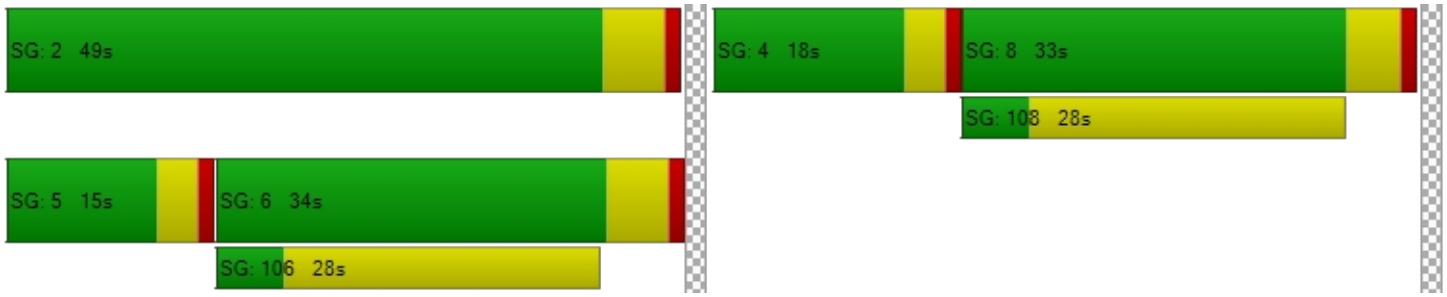
d_M, Delay for Movement [s/veh]	24.61	24.40	38.78	49.87	0.00	47.16	62.96	14.34	0.00	0.00	41.87	20.84
Movement LOS	C	C	D	D		D	E	B			D	C
d_A, Approach Delay [s/veh]	33.35			49.44			19.15			38.85		
Approach LOS	C			D			B			D		
d_I, Intersection Delay [s/veh]	34.61											
Intersection LOS	C											
Intersection V/C	0.833											

Other Modes

g_Walk,mi, Effective Walk Time [s]	43.5	9.0	14.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	16.02	41.47	37.05	41.47
l_p,int, Pedestrian LOS Score for Intersection	2.409	2.687	2.698	2.829
Crosswalk LOS	B	B	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	559	280	869	569
d_b, Bicycle Delay [s]	25.99	37.05	16.03	25.65
l_b,int, Bicycle LOS Score for Intersection	1.956	1.560	1.984	2.936
Bicycle LOS	A	A	A	C

Sequence

Ring 1	-	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Oakland Terminal Project

Vistro File: H:\...\22916_Oakland Terminal_20221003.vistro
Report File: H:\...\2038_PM.pdf

Scenario 10 2038 PM
10/3/2022

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Harbor Bay Parkway & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.568	15.6	B
2	Harbor Bay Parkway & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.634	22.8	C
3	Air Cargo Way & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.795	11.5	B
4	Ron Cowan Parkway & John Glenn Dr	Signalized	HCM 7th Edition	SB Right	0.964	57.9	E
5	Ron Cowan Pkwy & Neil Armstrong Way	Signalized	HCM 7th Edition	EB Left	0.677	13.1	B
6	Hegenberger Road & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.762	33.8	C
7	Doolittle Drive & Airport Access Road	Signalized	HCM 7th Edition	EB Left	0.668	23.9	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Harbor Bay Parkway & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	15.6
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.568

Intersection Setup

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	2	0
Entry Pocket Length [ft]	100.00	100.00	100.00	550.00	320.00	100.00
No. of Lanes in Exit Pocket	0	1	0	0	0	1
Exit Pocket Length [ft]	0.00	180.00	0.00	0.00	0.00	310.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Base Volume Input [veh/h]	512	55	1014	220	30	772
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.80	10.90	3.00	0.00	3.30	0.70
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	34	1	16	28	1	18
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	546	56	1030	248	31	790
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	145	15	274	66	8	210
Total Analysis Volume [veh/h]	581	60	1096	264	33	840
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0		0		0	
v_di, Inbound Pedestrian Volume crossing major street [	0		0		0	
v_co, Outbound Pedestrian Volume crossing minor stree	0		0		0	
v_ci, Inbound Pedestrian Volume crossing minor street [	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		6		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Protected	Permissive
Signal Group	8	0	2	0	1	6
Auxiliary Signal Groups						
Lead / Lag	Lead	-	-	-	Lead	-
Minimum Green [s]	11	0	10	0	10	7
Maximum Green [s]	20	0	30	0	20	30
Amber [s]	4.8	0.0	5.2	0.0	4.8	5.2
All red [s]	1.0	0.0	1.0	0.0	1.0	1.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	5.0	0.0	4.0	0.0	2.2	4.0
Walk [s]	11	0	7	0	0	0
Pedestrian Clearance [s]	29	0	28	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No		No			No
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	2.0
l2, Clearance Lost Time [s]	3.8	0.0	4.2	0.0	3.8	4.2
Minimum Recall	No		Yes		No	Yes
Maximum Recall	No		No		No	No
Pedestrian Recall	No		No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	R	L	C
C, Cycle Length [s]	62	62	62	62	62	62
L, Total Lost Time per Cycle [s]	5.80	5.80	6.20	6.20	5.80	6.20
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.80	3.80	4.20	4.20	3.80	4.20
g_i, Effective Green Time [s]	15	15	26	26	4	36
g / C, Green / Cycle	0.24	0.24	0.41	0.41	0.07	0.57
(v / s)_i Volume / Saturation Flow Rate	0.17	0.04	0.31	0.17	0.01	0.23
s, saturation flow rate [veh/h]	3492	1476	3532	1590	3422	3598
c, Capacity [veh/h]	825	349	1444	650	242	2058
d1, Uniform Delay [s]	21.90	19.03	15.86	13.08	27.28	7.47
k, delay calibration	0.23	0.23	0.15	0.15	0.06	0.15
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.37	0.50	1.20	0.58	0.14	0.19
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.70	0.17	0.76	0.41	0.14	0.41
d, Delay for Lane Group [s/veh]	24.26	19.52	17.06	13.66	27.42	7.66
Lane Group LOS	C	B	B	B	C	A
Critical Lane Group	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	3.88	0.70	6.10	2.43	0.23	2.54
50th-Percentile Queue Length [ft/ln]	97.09	17.41	152.45	60.79	5.63	63.53
95th-Percentile Queue Length [veh/ln]	6.99	1.25	10.15	4.38	0.41	4.57
95th-Percentile Queue Length [ft/ln]	174.77	31.34	253.70	109.43	10.13	114.36

Movement, Approach, & Intersection Results

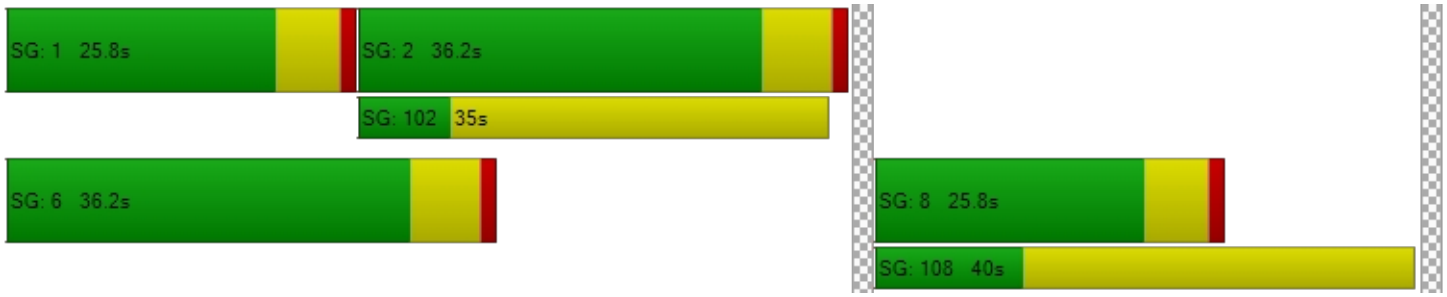
d_M, Delay for Movement [s/veh]	24.26	19.52	17.06	13.66	27.42	7.66
Movement LOS	C	B	B	B	C	A
d_A, Approach Delay [s/veh]	23.82		16.40		8.41	
Approach LOS	C		B		A	
d_I, Intersection Delay [s/veh]	15.63					
Intersection LOS	B					
Intersection V/C	0.568					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	15.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	21.19	18.02	0.00
l_p,int, Pedestrian LOS Score for Intersection	2.585	2.815	0.000
Crosswalk LOS	B	C	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	641	961	961
d_b, Bicycle Delay [s]	14.42	8.45	8.42
l_b,int, Bicycle LOS Score for Intersection	1.560	2.682	2.280
Bicycle LOS	A	B	B

Sequence

Ring 1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Harbor Bay Parkway & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	22.8
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.634

Intersection Setup

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	190.00	100.00	300.00	190.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	0	0	0	607	0	151	231	830	0	0	931	526
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	0.00	3.60	2.00	1.30	0.90	2.60	0.00	2.00	5.20	1.70
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	28	0	1	1	4	0	0	5	34
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	635	0	152	232	834	0	0	936	560
Peak Hour Factor	1.0000	1.0000	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	174	0	42	64	229	0	0	257	154
Total Analysis Volume [veh/h]	0	0	0	698	0	167	255	916	0	0	1029	615
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			2			4			6		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Overla	Permis	Overla	Protect	Overla	Overla	Permis	Permis	Overla
Signal Group	0	0	4	3	0	3	5	2	2	0	6	6
Auxiliary Signal Groups				3,4		3,5		2,3	2,3			3,4,6
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	6	9	0	9	10	8	8	0	10	10
Maximum Green [s]	0	0	45	27	0	27	18	34	34	0	40	40
Amber [s]	0.0	0.0	3.6	4.1	0.0	4.1	4.1	4.8	4.8	0.0	4.8	4.8
All red [s]	0.0	0.0	1.2	1.2	0.0	1.2	1.2	1.2	1.2	0.0	1.2	1.2
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	3.0	3.2	0.0	3.2	2.5	3.2	3.2	0.0	3.2	3.2
Walk [s]	0	0	6	0	0	0	0	0	0	0	6	6
Pedestrian Clearance [s]	0	0	36	0	0	0	0	0	0	0	28	28
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk			No	No				No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	2.8	3.3	0.0	3.3	3.3	4.0	4.0	0.0	4.0	4.0
Minimum Recall			No	No		No	No	Yes	Yes		Yes	Yes
Maximum Recall			No	No		No	No	No	No		No	No
Pedestrian Recall			No	No		No	No	No	No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	20.0	20.0	0.0	20.0	20.0	20.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	R	L	R	L	C	R	C	R
C, Cycle Length [s]	108	108	108	108	108	108	108	108
L, Total Lost Time per Cycle [s]	4.80	4.80	5.30	5.30	5.30	5.30	6.00	4.80
l1_p, Permitted Start-Up Lost Time [s]	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.80	0.00	0.00	3.30	0.00	0.00	4.00	4.00
g_i, Effective Green Time [s]	13	45	60	11	86	86	37	82
g / C, Green / Cycle	0.12	0.41	0.56	0.10	0.79	0.79	0.34	0.75
(v / s)_i Volume / Saturation Flow Rate	0.00	0.36	0.06	0.07	0.26	0.00	0.30	0.39
s, saturation flow rate [veh/h]	1615	1936	2781	3489	3543	1615	3469	1579
c, Capacity [veh/h]	187	824	1544	342	2804	1278	1181	1191
d1, Uniform Delay [s]	0.00	32.37	11.40	47.64	3.19	0.00	33.57	3.50
k, delay calibration	0.11	0.23	0.12	0.08	0.12	0.12	0.12	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.00	5.14	0.03	2.41	0.07	0.00	2.32	1.60
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.00	0.85	0.11	0.75	0.33	0.00	0.87	0.52
d, Delay for Lane Group [s/veh]	0.00	37.51	11.43	50.05	3.26	0.00	35.89	5.10
Lane Group LOS	A	D	B	D	A	A	D	A
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.00	7.08	0.94	3.46	2.13	0.00	12.81	3.41
50th-Percentile Queue Length [ft/ln]	0.00	176.90	23.48	86.38	53.16	0.00	320.14	85.15
95th-Percentile Queue Length [veh/ln]	0.00	11.44	1.69	6.22	3.83	0.00	18.67	6.13
95th-Percentile Queue Length [ft/ln]	0.00	285.96	42.26	155.48	95.68	0.00	466.85	153.27

Movement, Approach, & Intersection Results

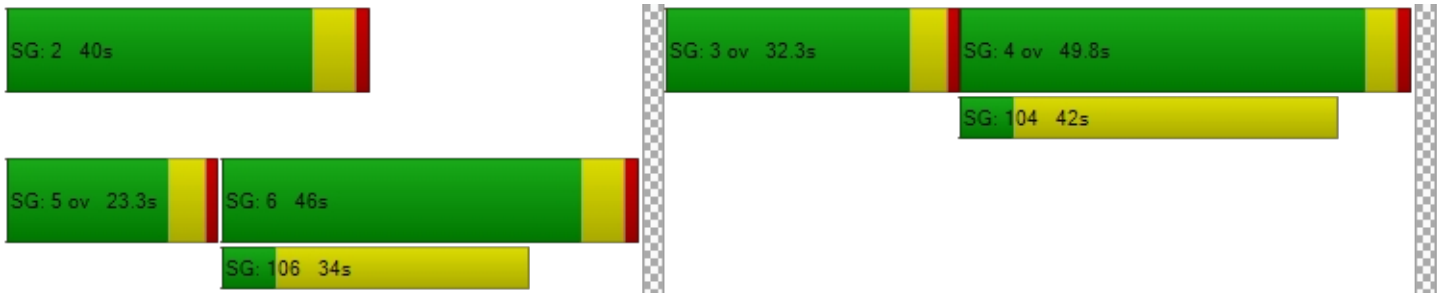
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	37.51	0.00	11.43	50.05	3.26	0.00	0.00	35.89	5.10
Movement LOS			A	D		B	D	A	A		D	A
d_A, Approach Delay [s/veh]	0.00			32.48			13.45			24.37		
Approach LOS	A			C			B			C		
d_I, Intersection Delay [s/veh]	22.80											
Intersection LOS	C											
Intersection V/C	0.634											

Other Modes

g_Walk,mi, Effective Walk Time [s]	-6.0	10.0	-5.3	10.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	60.38	44.67	59.64	44.67
l_p,int, Pedestrian LOS Score for Intersection	1.737	2.744	2.945	3.701
Crosswalk LOS	A	B	C	D
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	830	1426	116	738
d_b, Bicycle Delay [s]	18.55	4.47	48.19	21.66
l_b,int, Bicycle LOS Score for Intersection	1.560	1.560	2.526	2.916
Bicycle LOS	A	A	B	C

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Air Cargo Way & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	11.5
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.795

Intersection Setup

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	160.00	100.00	160.00	375.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			Yes		

Volumes

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	5	0	107	0	0	1	5	1370	6	128	1453	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	14.00	0.00	0.00	0.00	0.00	2.10	0.00	11.70	3.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	2	0	22	0	0	0	0	30	2	39	37	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	7	0	129	0	0	1	5	1400	8	167	1490	0
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	0	37	0	0	0	1	398	2	47	423	0
Total Analysis Volume [veh/h]	8	0	147	0	0	1	6	1591	9	190	1693	0
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			11			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	3.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	26	0	0	0	0	0	24	0	0	18	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	R	L	C	C
C, Cycle Length [s]	52	52	52	52	52	52	52	52
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	6	6	0	26	26	8	34	34
g / C, Green / Cycle	0.12	0.12	0.01	0.50	0.50	0.15	0.64	0.64
(v / s)_i Volume / Saturation Flow Rate	0.10	0.00	0.00	0.45	0.01	0.12	0.46	0.46
s, saturation flow rate [veh/h]	1617	1113	1810	3558	1570	1642	1855	1855
c, Capacity [veh/h]	270	204	15	1791	790	240	1190	1190
d1, Uniform Delay [s]	22.39	20.27	25.95	11.72	6.52	21.67	6.21	6.21
k, delay calibration	0.04	0.04	0.04	0.04	0.04	0.04	0.27	0.27
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.72	0.00	6.69	0.63	0.00	2.23	1.98	1.98
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.58	0.00	0.41	0.89	0.01	0.79	0.71	0.71
d, Delay for Lane Group [s/veh]	23.11	20.27	32.64	12.36	6.52	23.91	8.20	8.20
Lane Group LOS	C	C	C	B	A	C	A	A
Critical Lane Group	Yes	No	No	Yes	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	1.75	0.01	0.10	6.42	0.04	2.20	4.30	4.30
50th-Percentile Queue Length [ft/ln]	43.79	0.25	2.42	160.50	1.00	55.07	107.60	107.60
95th-Percentile Queue Length [veh/ln]	3.15	0.02	0.17	10.58	0.07	3.97	7.71	7.71
95th-Percentile Queue Length [ft/ln]	78.83	0.46	4.36	264.38	1.79	99.13	192.65	192.65

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	23.11	23.11	23.11	20.27	20.27	20.27	32.64	12.36	6.52	23.91	8.20	8.20
Movement LOS	C	C	C	C	C	C	C	B	A	C	A	A
d_A, Approach Delay [s/veh]	23.11			20.27			12.40			9.78		
Approach LOS	C			C			B			A		
d_I, Intersection Delay [s/veh]	11.50											
Intersection LOS	B											
Intersection V/C	0.795											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	16.38	16.38	0.00	16.38
I_p,int, Pedestrian LOS Score for Intersection	1.857	1.688	0.000	2.975
Crosswalk LOS	A	A	F	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1144	1144	1144	1144
d_b, Bicycle Delay [s]	4.80	4.80	4.83	4.81
I_b,int, Bicycle LOS Score for Intersection	1.815	1.561	2.885	3.113
Bicycle LOS	A	A	C	C

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Ron Cowan Parkway & John Glenn Dr

Control Type:	Signalized	Delay (sec / veh):	57.9
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.964

Intersection Setup

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	220.00	100.00	220.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			Yes			No		

Volumes

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Base Volume Input [veh/h]	20	609	0	0	1450	86	12	0	95	25	39	423
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	30.00	12.50	2.00	2.00	2.90	17.90	8.30	2.00	3.20	0.00	2.60	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	36	0	0	22	30	1	0	46	12	37	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	20	645	0	0	1472	116	13	0	141	37	76	423
Peak Hour Factor	0.9500	0.9500	1.0000	1.0000	0.9500	0.9500	0.9500	1.0000	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	170	0	0	387	31	3	0	37	10	20	111
Total Analysis Volume [veh/h]	21	679	0	0	1549	122	14	0	148	39	80	445
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			9			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	76
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	ProtPer	Permis	Permis	Permis	Permis	Permis	Split	Permis	Split	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	2	0	1	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	10	0	0	10	0	4	10	0	4	4	0
Maximum Green [s]	10	20	0	0	20	0	15	20	0	10	15	0
Amber [s]	4.0	4.0	0.0	0.0	4.0	0.0	3.5	4.0	0.0	4.0	3.5	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	13	34	0	0	21	0	15	21	0	13	27	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	0	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	Yes	Yes			Yes		No				No	
Maximum Recall	No	No			No		No				No	
Pedestrian Recall	No	No			No		No				No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	C	C	C	L	C	R
C, Cycle Length [s]	76	76	76	76	76	76	76	76
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	31	31	22	22	10	23	23	23
g / C, Green / Cycle	0.41	0.41	0.29	0.29	0.13	0.30	0.30	0.30
(v / s)_i Volume / Saturation Flow Rate	0.27	0.23	0.32	0.31	0.10	0.02	0.04	0.28
s, saturation flow rate [veh/h]	1252	1558	3535	1773	1589	1810	1861	1615
c, Capacity [veh/h]	494	642	1035	519	204	546	561	487
d1, Uniform Delay [s]	17.72	17.07	26.88	26.88	32.14	18.95	19.38	25.60
k, delay calibration	0.50	0.50	0.50	0.50	0.11	0.11	0.11	0.36
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	7.75	3.49	50.72	60.29	6.77	0.05	0.12	18.77
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.69	0.56	1.08	1.07	0.79	0.07	0.14	0.91
d, Delay for Lane Group [s/veh]	25.47	20.56	77.60	87.16	38.90	19.01	19.49	44.37
Lane Group LOS	C	C	F	F	D	B	B	D
Critical Lane Group	Yes	No	Yes	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	5.25	5.07	16.12	17.55	3.18	0.48	1.01	9.82
50th-Percentile Queue Length [ft/ln]	131.36	126.63	402.92	438.75	79.59	12.02	25.21	245.45
95th-Percentile Queue Length [veh/ln]	9.01	8.76	23.72	25.49	5.73	0.87	1.82	14.96
95th-Percentile Queue Length [ft/ln]	225.35	218.91	593.06	637.13	143.27	21.63	45.38	373.92

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	25.47	22.88	0.00	0.00	80.28	87.16	38.90	0.00	38.90	19.01	19.49	44.37
Movement LOS	C	C			F	F	D		D	B	B	D
d_A, Approach Delay [s/veh]	22.96			80.78			38.90			39.09		
Approach LOS	C			F			D			D		
d_I, Intersection Delay [s/veh]	57.93											
Intersection LOS	E											
Intersection V/C	0.964											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	9.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	29.54	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	2.099	0.000
Crosswalk LOS	F	F	B	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	763	421	276	592
d_b, Bicycle Delay [s]	14.55	23.80	28.23	18.84
l_b,int, Bicycle LOS Score for Intersection	2.137	2.479	1.827	2.490
Bicycle LOS	B	B	A	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Ron Cowan Pkwy & Neil Armstrong Way

Control Type:	Signalized	Delay (sec / veh):	13.1
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.677

Intersection Setup

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	2
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	139.61
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No					
Crosswalk	Yes			No			Yes			No		

Volumes

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Base Volume Input [veh/h]	0	0	0	1546	22	0	626	31	0	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.90	4.50	2.00	22.90	3.60	2.00	2.00	2.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	68	12	0	36	13	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	1614	34	0	662	44	0	0	0	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9400	0.9400	1.0000	0.9400	0.9400	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	429	9	0	176	12	0	0	0	0
Total Analysis Volume [veh/h]	0	0	0	1717	36	0	704	47	0	0	0	0
Presence of On-Street Parking				No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	38
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	6.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Permis	Split	Split	Permis	Permis	Permis	Permis
Signal Group	0	0	0	4	6	0	5	4	0	0	0	6
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	0	0	5
Maximum Green [s]	0	0	0	11	11	0	5	11	0	0	0	11
Amber [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0
Split [s]	0	0	0	15	23	0	0	15	0	0	0	23
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
Walk [s]	0	0	0	0	4	0	0	0	0	0	0	4
Pedestrian Clearance [s]	0	0	0	0	7	0	0	0	0	0	0	7
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No				
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
Minimum Recall					No			No				
Maximum Recall					No			No				
Pedestrian Recall					No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	L	C	
C, Cycle Length [s]		38	38	38	38	
L, Total Lost Time per Cycle [s]		4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]		2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]		19	19	10	10	
g / C, Green / Cycle		0.51	0.51	0.28	0.28	
(v / s)_i Volume / Saturation Flow Rate		0.34	0.34	0.23	0.23	
s, saturation flow rate [veh/h]		3434	1750	1482	1768	
c, Capacity [veh/h]		1763	899	407	485	
d1, Uniform Delay [s]		6.75	6.74	12.92	12.91	
k, delay calibration		0.50	0.50	0.24	0.24	
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]		1.95	3.75	10.03	8.47	
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	
Rp, platoon ratio		1.00	1.00	1.00	1.00	
PF, progression factor		1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity		0.66	0.66	0.84	0.84	
d, Delay for Lane Group [s/veh]		8.71	10.50	22.95	21.38	
Lane Group LOS		A	B	C	C	
Critical Lane Group		Yes	No	Yes	No	
50th-Percentile Queue Length [veh/ln]		2.44	2.93	3.25	3.66	
50th-Percentile Queue Length [ft/ln]		61.04	73.24	81.18	91.43	
95th-Percentile Queue Length [veh/ln]		4.39	5.27	5.85	6.58	
95th-Percentile Queue Length [ft/ln]		109.86	131.84	146.13	164.58	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	9.28	10.50	0.00	22.15	21.38	0.00	0.00	0.00	0.00
Movement LOS				A	B		C	C				
d_A, Approach Delay [s/veh]	0.00			9.31			22.09			0.00		
Approach LOS	A			A			C			A		
d_I, Intersection Delay [s/veh]	13.14											
Intersection LOS	B											
Intersection V/C	0.677											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	8.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	9.53	0.00	11.78	0.00
l_p,int, Pedestrian LOS Score for Intersection	1.406	0.000	2.037	0.000
Crosswalk LOS	A	F	B	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1003	581	0
d_b, Bicycle Delay [s]	18.94	4.70	9.53	18.94
l_b,int, Bicycle LOS Score for Intersection	4.132	4.452	2.799	4.132
Bicycle LOS	D	E	C	D

Sequence

Ring 1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: Hegenberger Road & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	33.8
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.762

Intersection Setup

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	2	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	210.00	100.00	210.00	275.00	100.00	160.00	275.00	100.00	210.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	1	0	0	1
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	0	0	0	258	950	285	311	852	150	268	674	220
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	16.70	5.80	0.70	2.30	2.70	22.40	4.70	2.90	6.80
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	1	256	116	69	46	0	51	27	1
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	259	1206	401	380	898	150	319	701	221
Peak Hour Factor	1.0000	1.0000	1.0000	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	67	311	103	98	231	39	82	181	57
Total Analysis Volume [veh/h]	0	0	0	267	1243	413	392	926	155	329	723	228
Presence of On-Street Parking				No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			2			0			1		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			1			0			2		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	99.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Split	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	0	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	0	0	30	45	0	35	45	0	25	40	0
Amber [s]	0.0	0.0	0.0	3.0	4.0	0.0	3.0	4.5	0.0	3.0	4.5	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	43	0	18	38	0	19	39	0
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	0	0	0	31	0	0	0	0	0	26	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	3.0	0.0	2.0	3.5	0.0	2.0	3.5	0.0
Minimum Recall					No		No	Yes		No	Yes	
Maximum Recall					No		No	No		No	No	
Pedestrian Recall					No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	C	L	C	R	L	C	R
C, Cycle Length [s]		100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	4.00	5.50	5.50	4.00	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	2.00	3.50	3.50	2.00	3.50	3.50
g_i, Effective Green Time [s]		37	37	37	13	37	37	12	36	36
g / C, Green / Cycle		0.37	0.37	0.37	0.13	0.37	0.37	0.12	0.36	0.36
(v / s)_i Volume / Saturation Flow Rate		0.17	0.33	0.33	0.11	0.26	0.12	0.10	0.20	0.15
s, saturation flow rate [veh/h]		1571	3452	1576	3450	3540	1329	3384	3535	1505
c, Capacity [veh/h]		574	1262	576	461	1310	492	405	1258	536
d1, Uniform Delay [s]		24.28	29.94	30.28	42.40	26.92	22.50	42.97	26.10	24.41
k, delay calibration		0.11	0.11	0.26	0.11	0.50	0.50	0.11	0.50	0.50
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		0.59	2.48	13.15	4.49	3.24	1.68	3.96	1.91	2.46
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity		0.46	0.89	0.91	0.85	0.71	0.32	0.81	0.57	0.43
d, Delay for Lane Group [s/veh]		24.87	32.42	43.43	46.89	30.16	24.18	46.94	28.02	26.87
Lane Group LOS		C	C	D	D	C	C	D	C	C
Critical Lane Group		No	No	Yes	No	Yes	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]		4.84	12.81	13.80	4.98	9.75	2.79	4.16	7.15	4.39
50th-Percentile Queue Length [ft/ln]		121.03	320.28	344.96	124.45	243.81	69.83	103.95	178.75	109.65
95th-Percentile Queue Length [veh/ln]		8.45	18.68	19.89	8.64	14.87	5.03	7.48	11.54	7.82
95th-Percentile Queue Length [ft/ln]		211.25	467.03	497.26	215.93	371.85	125.70	187.10	288.39	195.51

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	24.87	33.44	43.43	46.89	30.16	24.18	46.94	28.02	26.87
Movement LOS				C	C	D	D	C	C	D	C	C
d_A, Approach Delay [s/veh]	0.00			34.39			33.98			32.68		
Approach LOS	A			C			C			C		
d_I, Intersection Delay [s/veh]	33.79											
Intersection LOS	C											
Intersection V/C	0.762											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	2172.21	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	39.64	39.64	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	2.871	2.962	0.000
Crosswalk LOS	F	C	C	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	759	650	670
d_b, Bicycle Delay [s]	50.03	19.26	22.81	22.15
l_b,int, Bicycle LOS Score for Intersection	4.132	2.617	2.775	2.616
Bicycle LOS	D	B	C	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: Doolittle Drive & Airport Access Road

Control Type:	Signalized	Delay (sec / veh):	23.9
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.668

Intersection Setup

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	1	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	101	33	259	85	0	30	46	865	0	0	947	186
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	19.20	6.10	3.50	5.90	2.00	0.00	0.00	7.60	2.00	2.00	2.90	6.50
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	157	51	2	0	0	31	16	0	0	79	2
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	101	190	310	87	0	30	77	881	0	0	1026	188
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	1.0000	0.9200	0.9200	0.9200	1.0000	1.0000	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	27	52	84	24	0	8	21	239	0	0	279	51
Total Analysis Volume [veh/h]	110	207	337	95	0	33	84	958	0	0	1115	204
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			3			0			3		
v_di, Inbound Pedestrian Volume crossing major street [	0			3			0			3		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			1			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	41.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Permis	Split	Protect	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	4	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	5	0	5	0	0	5	5	0	0	5	0
Maximum Green [s]	0	65	0	30	0	0	20	55	0	0	35	0
Amber [s]	0.0	4.0	0.0	3.0	0.0	0.0	3.0	4.5	0.0	0.0	4.5	0.0
All red [s]	0.0	1.0	0.0	1.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	33	0	18	0	0	15	49	0	0	34	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	0	0	0	0	0	0	5	0
Pedestrian Clearance [s]	0	23	0	0	0	0	0	0	0	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No		No				No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No		No			No	Yes			Yes	
Maximum Recall		No		No			No	No			No	
Pedestrian Recall		No		No			No	No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	0.0	0.0	20.0	20.0	0.0	0.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	R	L	C	C	R
C, Cycle Length [s]	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	25	25	25	5	5	6	58	48	48
g / C, Green / Cycle	0.25	0.25	0.25	0.05	0.05	0.06	0.58	0.48	0.48
(v / s)_i Volume / Saturation Flow Rate	0.07	0.04	0.22	0.03	0.02	0.05	0.28	0.32	0.14
s, saturation flow rate [veh/h]	1535	4926	1550	3350	1588	1810	3400	3535	1507
c, Capacity [veh/h]	391	1256	395	165	78	110	1958	1680	717
d1, Uniform Delay [s]	29.93	29.01	35.38	46.58	46.20	46.34	12.54	20.13	15.90
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.39	0.06	5.27	3.15	3.58	10.59	0.88	2.08	1.00
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.28	0.16	0.85	0.58	0.42	0.77	0.49	0.66	0.28
d, Delay for Lane Group [s/veh]	30.32	29.07	40.64	49.72	49.78	56.93	13.42	22.21	16.89
Lane Group LOS	C	C	D	D	D	E	B	C	B
Critical Lane Group	No	No	Yes	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	2.16	1.29	8.23	1.22	0.87	2.37	6.17	9.99	2.95
50th-Percentile Queue Length [ft/ln]	53.88	32.29	205.77	30.59	21.78	59.23	154.14	249.83	73.64
95th-Percentile Queue Length [veh/ln]	3.88	2.32	12.94	2.20	1.57	4.26	10.24	15.18	5.30
95th-Percentile Queue Length [ft/ln]	96.99	58.12	323.39	55.06	39.20	106.62	255.94	379.44	132.55

Movement, Approach, & Intersection Results

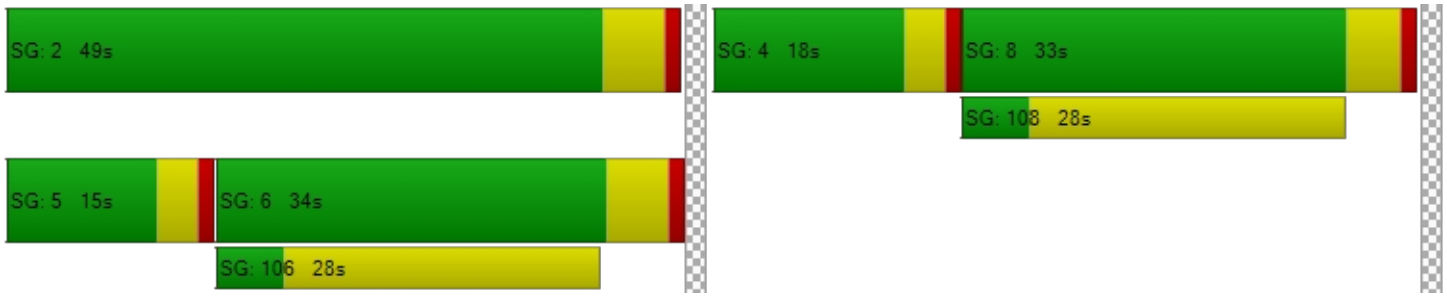
d_M, Delay for Movement [s/veh]	30.32	29.07	40.64	49.72	0.00	49.78	56.93	13.42	0.00	0.00	22.21	16.89
Movement LOS	C	C	D	D		D	E	B			C	B
d_A, Approach Delay [s/veh]	35.24			49.74			16.92			21.39		
Approach LOS	D			D			B			C		
d_I, Intersection Delay [s/veh]	23.95											
Intersection LOS	C											
Intersection V/C	0.668											

Other Modes

g_Walk,mi, Effective Walk Time [s]	43.5	9.0	14.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	15.99	41.44	37.01	41.44
l_p,int, Pedestrian LOS Score for Intersection	2.396	2.687	2.750	2.835
Crosswalk LOS	B	B	C	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	560	280	869	570
d_b, Bicycle Delay [s]	25.96	37.03	16.00	25.60
l_b,int, Bicycle LOS Score for Intersection	1.919	1.560	2.419	2.648
Bicycle LOS	A	A	B	B

Sequence

Ring 1	-	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Oakland Terminal Project

Vistro File: H:\...\22916_Oakland Terminal_20221003.vistro
Report File: H:\...\2038_PlusProject_AM.pdf

Scenario 11 2038 AM Plus Project
10/3/2022

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Harbor Bay Parkway & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.488	11.6	B
2	Harbor Bay Parkway & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.651	23.5	C
3	Air Cargo Way & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.747	10.7	B
4	Ron Cowan Parkway & John Glenn Dr	Signalized	HCM 7th Edition	EB Right	0.537	16.5	B
5	Ron Cowan Pkwy & Neil Armstrong Way	Signalized	HCM 7th Edition	EB Thru	0.431	5.8	A
6	Hegenberger Road & Doolittle Drive	Signalized	HCM 7th Edition	SB Right	0.971	61.3	E
7	Doolittle Drive & Airport Access Road	Signalized	HCM 7th Edition	WB Thru	0.868	46.0	D

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Harbor Bay Parkway & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	11.6
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.488

Intersection Setup

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	2	0
Entry Pocket Length [ft]	100.00	100.00	100.00	550.00	320.00	100.00
No. of Lanes in Exit Pocket	0	1	0	0	0	1
Exit Pocket Length [ft]	0.00	180.00	0.00	0.00	0.00	310.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Base Volume Input [veh/h]	181	23	620	391	28	1155
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.30	4.30	2.50	2.80	28.60	3.40
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	32	1	18	28	1	17
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	213	24	638	419	29	1172
Peak Hour Factor	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	54	6	163	107	7	299
Total Analysis Volume [veh/h]	217	24	651	428	30	1196
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0		0		0	
v_di, Inbound Pedestrian Volume crossing major street [	0		0		0	
v_co, Outbound Pedestrian Volume crossing minor stree	0		0		0	
v_ci, Inbound Pedestrian Volume crossing minor street [	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		5		2	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Protected	Permissive
Signal Group	8	0	2	0	1	6
Auxiliary Signal Groups						
Lead / Lag	Lead	-	-	-	Lead	-
Minimum Green [s]	11	0	10	0	10	7
Maximum Green [s]	20	0	30	0	20	30
Amber [s]	4.8	0.0	5.2	0.0	4.8	5.2
All red [s]	1.0	0.0	1.0	0.0	1.0	1.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	5.0	0.0	4.0	0.0	2.2	4.0
Walk [s]	11	0	7	0	0	0
Pedestrian Clearance [s]	29	0	28	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No		No			No
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	2.0
l2, Clearance Lost Time [s]	3.8	0.0	4.2	0.0	3.8	4.2
Minimum Recall	No		Yes		No	Yes
Maximum Recall	No		No		No	No
Pedestrian Recall	No		No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	R	L	C
C, Cycle Length [s]	52	52	52	52	52	52
L, Total Lost Time per Cycle [s]	5.80	5.80	6.20	6.20	5.80	6.20
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.80	3.80	4.20	4.20	3.80	4.20
g_i, Effective Green Time [s]	11	11	20	20	4	29
g / C, Green / Cycle	0.21	0.21	0.38	0.38	0.07	0.56
(v / s)_i Volume / Saturation Flow Rate	0.06	0.02	0.18	0.28	0.01	0.34
s, saturation flow rate [veh/h]	3422	1560	3546	1556	2720	3520
c, Capacity [veh/h]	705	321	1354	594	187	1980
d1, Uniform Delay [s]	17.45	16.60	12.13	13.59	22.73	7.51
k, delay calibration	0.23	0.23	0.15	0.15	0.06	0.15
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.52	0.21	0.38	2.36	0.21	0.43
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.31	0.07	0.48	0.72	0.16	0.60
d, Delay for Lane Group [s/veh]	17.97	16.81	12.51	15.95	22.94	7.94
Lane Group LOS	B	B	B	B	C	A
Critical Lane Group	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.04	0.23	2.47	3.92	0.16	3.21
50th-Percentile Queue Length [ft/ln]	25.97	5.66	61.66	97.91	4.12	80.21
95th-Percentile Queue Length [veh/ln]	1.87	0.41	4.44	7.05	0.30	5.78
95th-Percentile Queue Length [ft/ln]	46.75	10.19	110.98	176.24	7.42	144.38

Movement, Approach, & Intersection Results

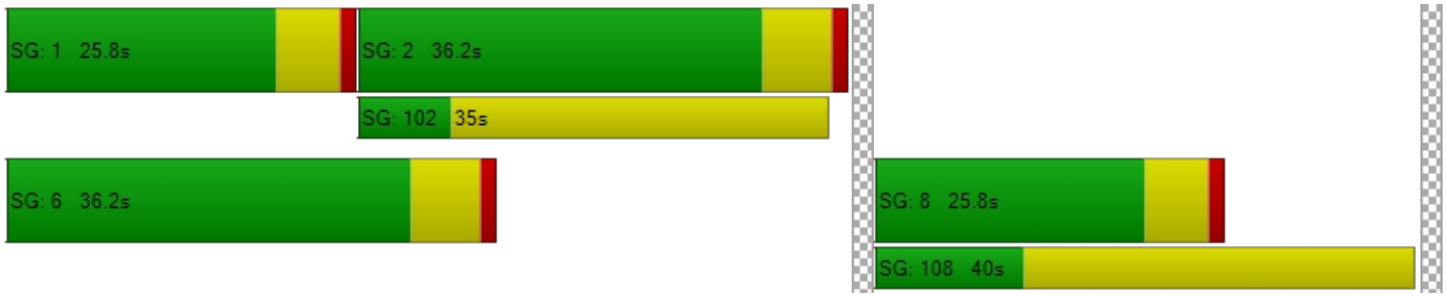
d_M, Delay for Movement [s/veh]	17.97	16.81	12.51	15.95	22.94	7.94
Movement LOS	B	B	B	B	C	A
d_A, Approach Delay [s/veh]	17.86		13.88		8.31	
Approach LOS	B		B		A	
d_I, Intersection Delay [s/veh]	11.57					
Intersection LOS	B					
Intersection V/C	0.488					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	15.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	16.04	13.05	0.00
l_p,int, Pedestrian LOS Score for Intersection	2.535	2.746	0.000
Crosswalk LOS	B	B	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	773	1160	1160
d_b, Bicycle Delay [s]	9.74	4.58	4.57
l_b,int, Bicycle LOS Score for Intersection	1.560	2.450	2.571
Bicycle LOS	A	B	B

Sequence

Ring 1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Harbor Bay Parkway & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	23.5
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.651

Intersection Setup

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	190.00	100.00	300.00	190.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	0	0	0	682	0	257	151	473	0	0	860	136
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	0.00	10.60	2.00	1.20	4.60	9.60	0.00	2.00	2.90	2.80
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	28	0	1	1	4	0	0	5	32
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	710	0	258	152	477	0	0	865	168
Peak Hour Factor	1.0000	1.0000	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	195	0	71	42	131	0	0	238	46
Total Analysis Volume [veh/h]	0	0	0	780	0	284	167	524	0	0	951	185
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			3		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Overla	Permis	Overla	Protect	Overla	Overla	Permis	Permis	Overla
Signal Group	0	0	4	3	0	3	5	2	2	0	6	6
Auxiliary Signal Groups				3,4		3,5		2,3	2,3			3,4,6
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	6	9	0	9	10	8	8	0	10	10
Maximum Green [s]	0	0	45	27	0	27	18	34	34	0	40	40
Amber [s]	0.0	0.0	3.6	4.1	0.0	4.1	4.1	4.8	4.8	0.0	4.8	4.8
All red [s]	0.0	0.0	1.2	1.2	0.0	1.2	1.2	1.2	1.2	0.0	1.2	1.2
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	3.0	3.2	0.0	3.2	2.5	3.2	3.2	0.0	3.2	3.2
Walk [s]	0	0	6	0	0	0	0	0	0	0	6	6
Pedestrian Clearance [s]	0	0	36	0	0	0	0	0	0	0	28	28
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk			No	No				No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	2.8	3.3	0.0	3.3	3.3	4.0	4.0	0.0	4.0	4.0
Minimum Recall			No	No		No	No	Yes	Yes		Yes	Yes
Maximum Recall			No	No		No	No	No	No		No	No
Pedestrian Recall			No	No		No	No	No	No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	20.0	20.0	0.0	20.0	20.0	20.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	R	L	R	L	C	R	C	R
C, Cycle Length [s]	96	96	96	96	96	96	96	96
L, Total Lost Time per Cycle [s]	4.80	4.80	5.30	5.30	5.30	5.30	6.00	4.80
l1_p, Permitted Start-Up Lost Time [s]	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.80	0.00	0.00	3.30	0.00	0.00	4.00	4.00
g_i, Effective Green Time [s]	7	40	54	10	79	79	31	70
g / C, Green / Cycle	0.08	0.41	0.56	0.10	0.82	0.82	0.32	0.73
(v / s)_i Volume / Saturation Flow Rate	0.00	0.38	0.10	0.05	0.16	0.00	0.27	0.12
s, saturation flow rate [veh/h]	1615	2035	2786	3386	3343	1615	3535	1568
c, Capacity [veh/h]	122	898	1569	348	2740	1324	1127	1145
d1, Uniform Delay [s]	0.00	28.05	10.18	40.75	1.86	0.00	30.55	2.56
k, delay calibration	0.11	0.20	0.12	0.08	0.12	0.12	0.12	0.12
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.00	4.90	0.06	0.76	0.04	0.00	1.97	0.07
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.00	0.87	0.18	0.48	0.19	0.00	0.84	0.16
d, Delay for Lane Group [s/veh]	0.00	32.94	10.24	41.51	1.90	0.00	32.52	2.63
Lane Group LOS	A	C	B	D	A	A	C	A
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.00	7.22	1.40	1.89	0.61	0.00	10.27	0.58
50th-Percentile Queue Length [ft/ln]	0.00	180.44	34.88	47.19	15.33	0.00	256.77	14.54
95th-Percentile Queue Length [veh/ln]	0.00	11.62	2.51	3.40	1.10	0.00	15.53	1.05
95th-Percentile Queue Length [ft/ln]	0.00	290.60	62.78	84.94	27.60	0.00	388.17	26.17

Movement, Approach, & Intersection Results

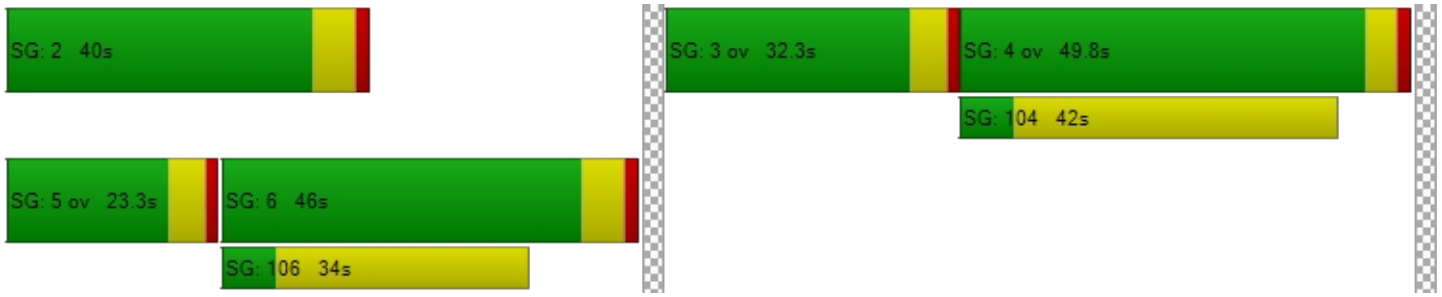
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	32.94	0.00	10.24	41.51	1.90	0.00	0.00	32.52	2.63
Movement LOS			A	C		B	D	A	A		C	A
d_A, Approach Delay [s/veh]	0.00			26.88			11.47			27.65		
Approach LOS	A			C			B			C		
d_I, Intersection Delay [s/veh]	23.50											
Intersection LOS	C											
Intersection V/C	0.651											

Other Modes

g_Walk,mi, Effective Walk Time [s]	-6.0	10.0	-5.3	10.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.25	38.58	53.51	38.58
I_p,int, Pedestrian LOS Score for Intersection	1.732	2.687	2.879	3.637
Crosswalk LOS	A	B	C	D
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	936	1608	131	832
d_b, Bicycle Delay [s]	13.60	1.84	41.97	16.41
I_b,int, Bicycle LOS Score for Intersection	1.560	1.560	2.130	2.497
Bicycle LOS	A	A	B	B

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Air Cargo Way & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	10.7
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.747

Intersection Setup

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	160.00	100.00	160.00	375.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			Yes		

Volumes

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	11	3	139	0	0	0	3	1085	16	121	1002	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	25.90	0.00	0.00	0.00	0.00	6.40	0.00	15.70	2.80	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	4	0	42	0	0	0	0	31	3	43	76	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	15	3	181	0	0	0	3	1116	19	164	1078	0
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	1	49	0	0	0	1	300	5	44	290	0
Total Analysis Volume [veh/h]	16	3	195	0	0	0	3	1200	20	176	1159	0
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			1			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	3.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	26	0	0	0	0	0	24	0	0	18	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	R	L	C	C
C, Cycle Length [s]	43	43	43	43	43	43	43	43
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	7	7	0	18	18	6	24	24
g / C, Green / Cycle	0.17	0.17	0.00	0.42	0.42	0.14	0.55	0.55
(v / s)_i Volume / Saturation Flow Rate	0.13	0.00	0.00	0.35	0.01	0.11	0.31	0.31
s, saturation flow rate [veh/h]	1620	1381	1810	3435	1581	1585	1858	1858
c, Capacity [veh/h]	360	314	7	1429	658	224	1028	1028
d1, Uniform Delay [s]	17.38	0.00	21.66	11.42	7.53	18.09	6.33	6.33
k, delay calibration	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.58	0.00	12.34	0.53	0.01	2.33	0.18	0.18
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.59	0.00	0.40	0.84	0.03	0.79	0.56	0.56
d, Delay for Lane Group [s/veh]	17.97	0.00	34.00	11.95	7.53	20.43	6.51	6.51
Lane Group LOS	B	A	C	B	A	C	A	A
Critical Lane Group	Yes	No	No	Yes	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	1.83	0.00	0.05	3.95	0.09	1.63	2.18	2.18
50th-Percentile Queue Length [ft/ln]	45.64	0.00	1.33	98.80	2.14	40.73	54.38	54.38
95th-Percentile Queue Length [veh/ln]	3.29	0.00	0.10	7.11	0.15	2.93	3.92	3.92
95th-Percentile Queue Length [ft/ln]	82.14	0.00	2.39	177.85	3.86	73.31	97.89	97.89

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	17.97	17.97	17.97	0.00	0.00	0.00	34.00	11.95	7.53	20.43	6.51	6.51
Movement LOS	B	B	B	A	A	A	C	B	A	C	A	A
d_A, Approach Delay [s/veh]	17.97			0.00			11.93			8.35		
Approach LOS	B			A			B			A		
d_I, Intersection Delay [s/veh]	10.67											
Intersection LOS	B											
Intersection V/C	0.747											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	12.14	12.14	0.00	12.14
I_p,int, Pedestrian LOS Score for Intersection	1.872	1.675	0.000	2.790
Crosswalk LOS	A	A	F	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1380	1380	1380	1380
d_b, Bicycle Delay [s]	2.09	2.09	2.09	2.09
I_b,int, Bicycle LOS Score for Intersection	1.913	1.560	2.569	2.661
Bicycle LOS	A	A	B	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Ron Cowan Parkway & John Glenn Dr

Control Type:	Signalized	Delay (sec / veh):	16.5
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.537

Intersection Setup

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	220.00	100.00	220.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			Yes			No		

Volumes

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Base Volume Input [veh/h]	16	16	0	0	1099	145	16	0	138	27	29	95
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	43.80	21.40	2.00	2.00	14.50	15.00	6.30	2.00	27.50	7.40	10.30	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	39	0	0	52	26	-6	0	-106	37	-75	46
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	16	55	0	0	1151	171	10	0	32	64	0	141
Peak Hour Factor	0.9100	0.9100	1.0000	1.0000	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	15	0	0	316	47	3	0	9	18	0	39
Total Analysis Volume [veh/h]	18	60	0	0	1265	188	11	0	35	70	0	155
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			1			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			1			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			2			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	76
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	ProtPer	Permis	Permis	Permis	Permis	Permis	Split	Permis	Split	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	2	0	1	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	10	0	0	10	0	4	10	0	4	4	0
Maximum Green [s]	10	20	0	0	20	0	15	20	0	10	15	0
Amber [s]	4.0	4.0	0.0	0.0	4.0	0.0	3.5	4.0	0.0	4.0	3.5	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	13	34	0	0	21	0	15	21	0	13	27	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	0	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	Yes	Yes			Yes		No				No	
Maximum Recall	No	No			No		No				No	
Pedestrian Recall	No	No			No		No				No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	C	C	C	L	C	R
C, Cycle Length [s]	76	76	76	76	76	76	76	76
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	51	51	42	42	3	10	10	10
g / C, Green / Cycle	0.67	0.67	0.55	0.55	0.05	0.13	0.13	0.13
(v / s)_i Volume / Saturation Flow Rate	0.07	0.03	0.30	0.31	0.04	0.04	0.00	0.10
s, saturation flow rate [veh/h]	564	1437	3203	1559	1297	1704	1745	1615
c, Capacity [veh/h]	411	956	1751	853	59	223	229	212
d1, Uniform Delay [s]	6.09	4.38	11.19	11.32	35.90	29.92	0.00	31.74
k, delay calibration	0.11	0.50	0.50	0.50	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.09	0.08	1.26	2.74	19.41	0.79	0.00	4.82
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.09	0.04	0.55	0.57	0.78	0.31	0.00	0.73
d, Delay for Lane Group [s/veh]	6.18	4.46	12.45	14.06	55.30	30.72	0.00	36.56
Lane Group LOS	A	A	B	B	E	C	A	D
Critical Lane Group	Yes	No	No	Yes	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.18	0.20	4.94	5.34	1.14	1.18	0.00	2.93
50th-Percentile Queue Length [ft/ln]	4.45	4.99	123.53	133.43	28.55	29.45	0.00	73.37
95th-Percentile Queue Length [veh/ln]	0.32	0.36	8.59	9.13	2.06	2.12	0.00	5.28
95th-Percentile Queue Length [ft/ln]	8.02	8.98	214.66	228.15	51.40	53.01	0.00	132.07

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	6.18	5.00	0.00	0.00	12.83	14.06	55.30	0.00	55.30	30.72	0.00	36.56
Movement LOS	A	A			B	B	E		E	C	A	D
d_A, Approach Delay [s/veh]	5.27			12.99			55.30			34.74		
Approach LOS	A			B			E			C		
d_I, Intersection Delay [s/veh]	16.45											
Intersection LOS	B											
Intersection V/C	0.537											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	9.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	1484.43	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	29.54	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	1.861	0.000
Crosswalk LOS	F	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	763	421	276	592
d_b, Bicycle Delay [s]	14.55	23.71	28.23	18.83
l_b,int, Bicycle LOS Score for Intersection	1.624	2.359	1.636	1.931
Bicycle LOS	A	B	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Ron Cowan Pkwy & Neil Armstrong Way

Control Type:	Signalized	Delay (sec / veh):	5.8
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.431

Intersection Setup

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	2
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	139.61
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No					
Crosswalk	Yes			No			Yes			No		

Volumes

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Base Volume Input [veh/h]	0	0	0	1225	36	0	33	24	0	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	17.80	5.60	2.00	32.30	8.30	2.00	2.00	2.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	-55	38	0	39	104	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	1170	74	0	72	128	0	0	0	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9200	0.9200	1.0000	0.9200	0.9200	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	318	20	0	20	35	0	0	0	0
Total Analysis Volume [veh/h]	0	0	0	1272	80	0	78	139	0	0	0	0
Presence of On-Street Parking				No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	38
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	6.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Permis	Split	Split	Permis	Permis	Permis	Permis
Signal Group	0	0	0	4	6	0	5	4	0	0	0	6
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	0	0	5
Maximum Green [s]	0	0	0	11	11	0	5	11	0	0	0	11
Amber [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0
Split [s]	0	0	0	15	23	0	0	15	0	0	0	23
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
Walk [s]	0	0	0	0	4	0	0	0	0	0	0	4
Pedestrian Clearance [s]	0	0	0	0	7	0	0	0	0	0	0	7
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No				
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
Minimum Recall					No			No				
Maximum Recall					No			No				
Pedestrian Recall					No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	L	C	
C, Cycle Length [s]		38	38	38	38	
L, Total Lost Time per Cycle [s]		4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]		2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]		25	25	5	5	
g / C, Green / Cycle		0.67	0.67	0.12	0.12	
(v / s)_i Volume / Saturation Flow Rate		0.28	0.28	0.06	0.08	
s, saturation flow rate [veh/h]		3020	1743	1348	1775	
c, Capacity [veh/h]		2012	1161	165	218	
d1, Uniform Delay [s]		2.95	2.94	15.47	15.82	
k, delay calibration		0.50	0.50	0.11	0.11	
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]		0.67	1.14	2.09	3.10	
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	
Rp, platoon ratio		1.00	1.00	1.00	1.00	
PF, progression factor		1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity		0.43	0.42	0.47	0.64	
d, Delay for Lane Group [s/veh]		3.62	4.08	17.56	18.92	
Lane Group LOS		A	A	B	B	
Critical Lane Group		Yes	No	No	Yes	
50th-Percentile Queue Length [veh/ln]		0.56	0.79	0.62	1.15	
50th-Percentile Queue Length [ft/ln]		14.00	19.83	15.58	28.70	
95th-Percentile Queue Length [veh/ln]		1.01	1.43	1.12	2.07	
95th-Percentile Queue Length [ft/ln]		25.20	35.70	28.04	51.66	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	3.76	4.08	0.00	17.56	18.92	0.00	0.00	0.00	0.00
Movement LOS				A	A		B	B				
d_A, Approach Delay [s/veh]	0.00			3.78			18.43			0.00		
Approach LOS	A			A			B			A		
d_I, Intersection Delay [s/veh]	5.81											
Intersection LOS	A											
Intersection V/C	0.431											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	8.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	9.56	0.00	11.81	0.00
l_p,int, Pedestrian LOS Score for Intersection	1.449	0.000	1.777	0.000
Crosswalk LOS	A	F	A	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1002	580	0
d_b, Bicycle Delay [s]	18.97	4.73	9.56	18.97
l_b,int, Bicycle LOS Score for Intersection	4.132	3.790	1.918	4.132
Bicycle LOS	D	D	A	D

Sequence

Ring 1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: Hegenberger Road & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	61.3
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.971

Intersection Setup

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	2	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	210.00	100.00	210.00	275.00	100.00	160.00	275.00	100.00	210.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	1	0	0	1
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	0	0	0	139	613	610	451	422	64	359	737	353
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	17.00	6.00	1.00	2.00	3.00	22.00	5.00	3.00	7.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	23	262	110	59	69	0	51	72	3
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	162	875	720	510	491	64	410	809	356
Peak Hour Factor	1.0000	1.0000	1.0000	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	42	226	186	131	127	16	106	209	92
Total Analysis Volume [veh/h]	0	0	0	167	902	742	526	506	66	423	834	367
Presence of On-Street Parking				No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	99.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Split	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	0	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	0	0	30	45	0	35	45	0	25	40	0
Amber [s]	0.0	0.0	0.0	3.0	4.0	0.0	3.0	4.5	0.0	3.0	4.5	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	43	0	18	38	0	19	39	0
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	0	0	0	31	0	0	0	0	0	26	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	3.0	0.0	2.0	3.5	0.0	2.0	3.5	0.0
Minimum Recall					No		No	Yes		No	Yes	
Maximum Recall					No		No	No		No	No	
Pedestrian Recall					No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	C	L	C	R	L	C	R
C, Cycle Length [s]		100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	4.00	5.50	5.50	4.00	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	2.00	3.50	3.50	2.00	3.50	3.50
g_i, Effective Green Time [s]		38	38	38	14	33	33	14	34	34
g / C, Green / Cycle		0.38	0.38	0.38	0.14	0.33	0.33	0.14	0.33	0.33
(v / s)_i Volume / Saturation Flow Rate		0.11	0.26	0.49	0.15	0.14	0.05	0.13	0.24	0.24
s, saturation flow rate [veh/h]		1567	3446	1519	3459	3532	1334	3375	3532	1506
c, Capacity [veh/h]		595	1308	577	489	1167	441	491	1182	504
d1, Uniform Delay [s]		21.60	26.14	31.11	43.05	26.23	23.64	41.86	29.06	29.23
k, delay calibration		0.11	0.11	0.50	0.11	0.50	0.50	0.11	0.50	0.50
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		0.26	0.66	141.90	43.38	1.17	0.72	4.61	3.56	8.91
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity		0.28	0.69	1.29	1.08	0.43	0.15	0.86	0.71	0.73
d, Delay for Lane Group [s/veh]		21.86	26.80	173.01	86.43	27.40	24.36	46.48	32.62	38.14
Lane Group LOS		C	C	F	F	C	C	D	C	D
Critical Lane Group		No	No	Yes	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		2.73	8.90	36.07	8.92	4.84	1.18	5.37	9.11	8.80
50th-Percentile Queue Length [ft/ln]		68.20	222.42	901.87	223.07	120.91	29.51	134.23	227.75	219.89
95th-Percentile Queue Length [veh/ln]		4.91	13.79	53.66	14.27	8.44	2.12	9.17	14.06	13.66
95th-Percentile Queue Length [ft/ln]		122.76	344.71	1341.4	356.75	211.08	53.11	229.23	351.50	341.48

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	21.86	26.80	173.01	86.43	27.40	24.36	46.48	32.62	38.14
Movement LOS				C	C	F	F	C	C	D	C	D
d_A, Approach Delay [s/veh]	0.00			86.25			55.50			37.47		
Approach LOS	A			F			E			D		
d_I, Intersection Delay [s/veh]	61.33											
Intersection LOS	E											
Intersection V/C	0.971											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	39.67	39.67	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	2.897	2.971	0.000
Crosswalk LOS	F	C	C	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	759	649	669
d_b, Bicycle Delay [s]	50.07	19.29	22.84	22.18
l_b,int, Bicycle LOS Score for Intersection	4.132	2.556	2.465	2.899
Bicycle LOS	D	B	B	C

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: Doolittle Drive & Airport Access Road

Control Type:	Signalized	Delay (sec / veh):	46.0
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.868

Intersection Setup

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	1	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	62	40	371	94	0	18	23	421	0	0	1266	222
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	33.90	17.50	3.20	8.80	2.00	5.60	4.30	6.70	2.00	2.00	4.60	6.10
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	144	55	35	0	42	49	43	0	0	84	23
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	62	184	426	129	0	60	72	464	0	0	1350	245
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	1.0000	0.9400	0.9400	0.9400	1.0000	1.0000	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	16	49	113	34	0	16	19	123	0	0	359	65
Total Analysis Volume [veh/h]	66	196	453	137	0	64	77	494	0	0	1436	261
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	1			2			0			1		
v_di, Inbound Pedestrian Volume crossing major street [	0			1			1			2		
v_co, Outbound Pedestrian Volume crossing minor stree	1			0			0			1		
v_ci, Inbound Pedestrian Volume crossing minor street [	1			0			0			1		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			0			2			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	41.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Permis	Split	Protect	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	4	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	5	0	5	0	0	5	5	0	0	5	0
Maximum Green [s]	0	65	0	30	0	0	20	55	0	0	35	0
Amber [s]	0.0	4.0	0.0	3.0	0.0	0.0	3.0	4.5	0.0	0.0	4.5	0.0
All red [s]	0.0	1.0	0.0	1.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	33	0	18	0	0	15	49	0	0	34	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	0	0	0	0	0	0	5	0
Pedestrian Clearance [s]	0	23	0	0	0	0	0	0	0	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No		No				No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No		No			No	Yes			Yes	
Maximum Recall		No		No			No	No			No	
Pedestrian Recall		No		No			No	No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	0.0	0.0	20.0	20.0	0.0	0.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	R	L	C	C	R
C, Cycle Length [s]	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	32	32	32	7	7	6	50	40	40
g / C, Green / Cycle	0.32	0.32	0.32	0.07	0.07	0.06	0.49	0.40	0.40
(v / s)_i Volume / Saturation Flow Rate	0.05	0.04	0.29	0.04	0.04	0.04	0.14	0.41	0.17
s, saturation flow rate [veh/h]	1325	4460	1551	3270	1544	1748	3426	3486	1514
c, Capacity [veh/h]	425	1431	498	215	101	101	1692	1382	600
d1, Uniform Delay [s]	24.34	24.19	32.48	45.68	45.66	46.57	15.00	30.26	22.00
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.17	0.04	6.80	3.13	6.33	11.29	0.44	35.06	2.29
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.16	0.14	0.91	0.64	0.63	0.76	0.29	1.04	0.44
d, Delay for Lane Group [s/veh]	24.51	24.24	39.27	48.81	51.99	57.86	15.44	65.32	24.30
Lane Group LOS	C	C	D	D	D	E	B	F	C
Critical Lane Group	No	No	Yes	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.13	1.10	11.13	1.75	1.72	2.20	3.33	22.60	4.74
50th-Percentile Queue Length [ft/ln]	28.31	27.51	278.19	43.66	43.05	54.91	83.19	565.10	118.57
95th-Percentile Queue Length [veh/ln]	2.04	1.98	16.60	3.14	3.10	3.95	5.99	31.25	8.31
95th-Percentile Queue Length [ft/ln]	50.96	49.52	414.95	78.59	77.48	98.83	149.74	781.31	207.86

Movement, Approach, & Intersection Results

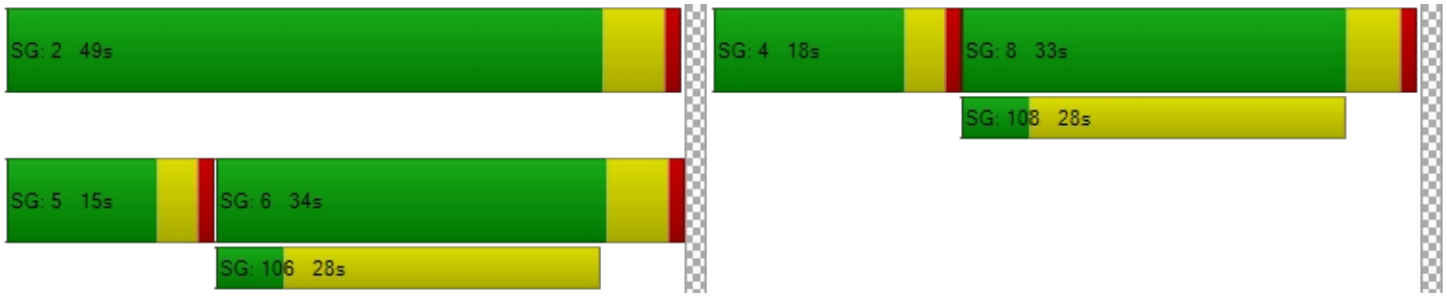
d_M, Delay for Movement [s/veh]	24.51	24.24	39.27	48.81	0.00	51.99	57.86	15.44	0.00	0.00	65.32	24.30
Movement LOS	C	C	D	D		D	E	B			F	C
d_A, Approach Delay [s/veh]	33.79			49.82			21.16			59.01		
Approach LOS	C			D			C			E		
d_I, Intersection Delay [s/veh]	45.98											
Intersection LOS	D											
Intersection V/C	0.868											

Other Modes

g_Walk,mi, Effective Walk Time [s]	43.5	9.0	14.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	16.02	41.47	37.05	41.47
l_p,int, Pedestrian LOS Score for Intersection	2.408	2.703	2.719	2.849
Crosswalk LOS	B	B	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	559	280	869	569
d_b, Bicycle Delay [s]	25.99	37.05	16.03	25.65
l_b,int, Bicycle LOS Score for Intersection	1.953	1.560	2.031	2.960
Bicycle LOS	A	A	B	C

Sequence

Ring 1	-	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Oakland Terminal Project

Vistro File: H:\...\22916_Oakland Terminal_20221003.vistro
Report File: H:\...\2038_PlusProject_PM.pdf

Scenario 12 2038 PM Plus Project
10/3/2022

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Harbor Bay Parkway & Doolittle Drive	Signalized	HCM 7th Edition	WB Left	0.569	15.6	B
2	Harbor Bay Parkway & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.635	22.8	C
3	Air Cargo Way & Ron Cowan Parkway	Signalized	HCM 7th Edition	EB Left	0.801	11.7	B
4	Ron Cowan Parkway & John Glenn Dr	Signalized	HCM 7th Edition	EB Right	0.900	30.3	C
5	Ron Cowan Pkwy & Neil Armstrong Way	Signalized	HCM 7th Edition	EB Left	0.705	13.9	B
6	Hegenberger Road & Doolittle Drive	Signalized	HCM 7th Edition	EB Left	0.770	33.9	C
7	Doolittle Drive & Airport Access Road	Signalized	HCM 7th Edition	EB Left	0.704	26.2	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Harbor Bay Parkway & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	15.6
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.569

Intersection Setup

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	2	0
Entry Pocket Length [ft]	100.00	100.00	100.00	550.00	320.00	100.00
No. of Lanes in Exit Pocket	0	1	0	0	0	1
Exit Pocket Length [ft]	0.00	180.00	0.00	0.00	0.00	310.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	Harbor Bay Parkway		Doolittle Drive		Doolittle Drive	
Base Volume Input [veh/h]	512	55	1014	220	30	772
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.80	10.90	3.00	0.00	3.30	0.70
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	32	1	21	27	1	20
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	544	56	1035	247	31	792
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	145	15	275	66	8	211
Total Analysis Volume [veh/h]	579	60	1101	263	33	843
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0		0		0	
v_di, Inbound Pedestrian Volume crossing major street [	0		0		0	
v_co, Outbound Pedestrian Volume crossing minor stree	0		0		0	
v_ci, Inbound Pedestrian Volume crossing minor street [	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		6		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Protected	Permissive
Signal Group	8	0	2	0	1	6
Auxiliary Signal Groups						
Lead / Lag	Lead	-	-	-	Lead	-
Minimum Green [s]	11	0	10	0	10	7
Maximum Green [s]	20	0	30	0	20	30
Amber [s]	4.8	0.0	5.2	0.0	4.8	5.2
All red [s]	1.0	0.0	1.0	0.0	1.0	1.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	5.0	0.0	4.0	0.0	2.2	4.0
Walk [s]	11	0	7	0	0	0
Pedestrian Clearance [s]	29	0	28	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No		No			No
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	2.0
l2, Clearance Lost Time [s]	3.8	0.0	4.2	0.0	3.8	4.2
Minimum Recall	No		Yes		No	Yes
Maximum Recall	No		No		No	No
Pedestrian Recall	No		No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	R	L	C
C, Cycle Length [s]	62	62	62	62	62	62
L, Total Lost Time per Cycle [s]	5.80	5.80	6.20	6.20	5.80	6.20
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.80	3.80	4.20	4.20	3.80	4.20
g_i, Effective Green Time [s]	15	15	26	26	4	36
g / C, Green / Cycle	0.24	0.24	0.41	0.41	0.07	0.57
(v / s)_i Volume / Saturation Flow Rate	0.17	0.04	0.31	0.17	0.01	0.23
s, saturation flow rate [veh/h]	3492	1476	3532	1590	3422	3598
c, Capacity [veh/h]	822	348	1447	652	242	2061
d1, Uniform Delay [s]	21.94	19.08	15.86	13.04	27.31	7.46
k, delay calibration	0.23	0.23	0.15	0.15	0.06	0.15
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.37	0.50	1.21	0.57	0.14	0.19
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.70	0.17	0.76	0.40	0.14	0.41
d, Delay for Lane Group [s/veh]	24.31	19.58	17.06	13.61	27.45	7.65
Lane Group LOS	C	B	B	B	C	A
Critical Lane Group	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	3.88	0.70	6.13	2.42	0.23	2.55
50th-Percentile Queue Length [ft/ln]	96.92	17.45	153.35	60.45	5.64	63.72
95th-Percentile Queue Length [veh/ln]	6.98	1.26	10.20	4.35	0.41	4.59
95th-Percentile Queue Length [ft/ln]	174.46	31.42	254.89	108.81	10.14	114.70

Movement, Approach, & Intersection Results

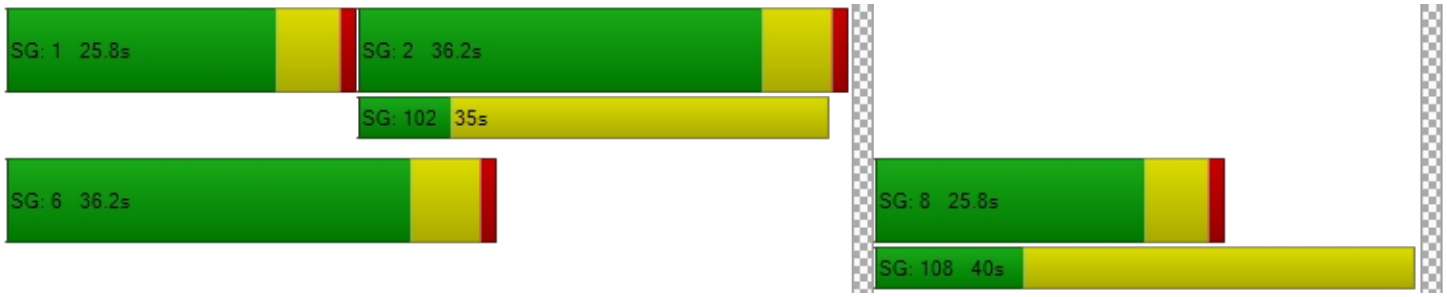
d_M, Delay for Movement [s/veh]	24.31	19.58	17.06	13.61	27.45	7.65
Movement LOS	C	B	B	B	C	A
d_A, Approach Delay [s/veh]	23.87		16.40		8.39	
Approach LOS	C		B		A	
d_I, Intersection Delay [s/veh]	15.62					
Intersection LOS	B					
Intersection V/C	0.569					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	15.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	21.22	18.05	0.00
I_p,int, Pedestrian LOS Score for Intersection	2.585	2.816	0.000
Crosswalk LOS	B	C	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	640	960	960
d_b, Bicycle Delay [s]	14.45	8.47	8.45
I_b,int, Bicycle LOS Score for Intersection	1.560	2.685	2.282
Bicycle LOS	A	B	B

Sequence

Ring 1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Harbor Bay Parkway & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	22.8
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.635

Intersection Setup

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	190.00	100.00	300.00	190.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Access Road			Harbor Bay Parkway			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	0	0	0	607	0	151	231	830	0	0	931	526
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	0.00	3.60	2.00	1.30	0.90	2.60	0.00	2.00	5.20	1.70
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	27	0	1	1	3	0	0	5	32
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	634	0	152	232	833	0	0	936	558
Peak Hour Factor	1.0000	1.0000	0.9100	0.9100	1.0000	0.9100	0.9100	0.9100	0.9100	1.0000	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	174	0	42	64	229	0	0	257	153
Total Analysis Volume [veh/h]	0	0	0	697	0	167	255	915	0	0	1029	613
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			2			4			6		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Overla	Permis	Overla	Protect	Overla	Overla	Permis	Permis	Overla
Signal Group	0	0	4	3	0	3	5	2	2	0	6	6
Auxiliary Signal Groups				3,4		3,5		2,3	2,3			3,4,6
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	6	9	0	9	10	8	8	0	10	10
Maximum Green [s]	0	0	45	27	0	27	18	34	34	0	40	40
Amber [s]	0.0	0.0	3.6	4.1	0.0	4.1	4.1	4.8	4.8	0.0	4.8	4.8
All red [s]	0.0	0.0	1.2	1.2	0.0	1.2	1.2	1.2	1.2	0.0	1.2	1.2
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	3.0	3.2	0.0	3.2	2.5	3.2	3.2	0.0	3.2	3.2
Walk [s]	0	0	6	0	0	0	0	0	0	0	6	6
Pedestrian Clearance [s]	0	0	36	0	0	0	0	0	0	0	28	28
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk			No	No				No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	2.8	3.3	0.0	3.3	3.3	4.0	4.0	0.0	4.0	4.0
Minimum Recall			No	No		No	No	Yes	Yes		Yes	Yes
Maximum Recall			No	No		No	No	No	No		No	No
Pedestrian Recall			No	No		No	No	No	No		No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	20.0	20.0	0.0	20.0	20.0	20.0	20.0	0.0	20.0	20.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	R	L	R	L	C	R	C	R
C, Cycle Length [s]	108	108	108	108	108	108	108	108
L, Total Lost Time per Cycle [s]	4.80	4.80	5.30	5.30	5.30	5.30	6.00	4.80
l1_p, Permitted Start-Up Lost Time [s]	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.80	0.00	0.00	3.30	0.00	0.00	4.00	4.00
g_i, Effective Green Time [s]	12	45	60	11	86	86	37	82
g / C, Green / Cycle	0.12	0.41	0.56	0.10	0.79	0.79	0.34	0.75
(v / s)_i Volume / Saturation Flow Rate	0.00	0.36	0.06	0.07	0.26	0.00	0.30	0.39
s, saturation flow rate [veh/h]	1615	1936	2782	3489	3543	1615	3469	1580
c, Capacity [veh/h]	186	824	1544	342	2805	1278	1181	1191
d1, Uniform Delay [s]	0.00	32.34	11.40	47.61	3.18	0.00	33.54	3.49
k, delay calibration	0.11	0.23	0.12	0.08	0.12	0.12	0.12	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.00	5.09	0.03	2.41	0.07	0.00	2.32	1.59
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.00	0.85	0.11	0.74	0.33	0.00	0.87	0.51
d, Delay for Lane Group [s/veh]	0.00	37.43	11.43	50.02	3.25	0.00	35.86	5.09
Lane Group LOS	A	D	B	D	A	A	D	A
Critical Lane Group	No	Yes	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.00	7.05	0.94	3.45	2.12	0.00	12.79	3.39
50th-Percentile Queue Length [ft/ln]	0.00	176.37	23.47	86.32	52.89	0.00	319.87	84.65
95th-Percentile Queue Length [veh/ln]	0.00	11.41	1.69	6.21	3.81	0.00	18.66	6.09
95th-Percentile Queue Length [ft/ln]	0.00	285.27	42.25	155.37	95.19	0.00	466.53	152.37

Movement, Approach, & Intersection Results

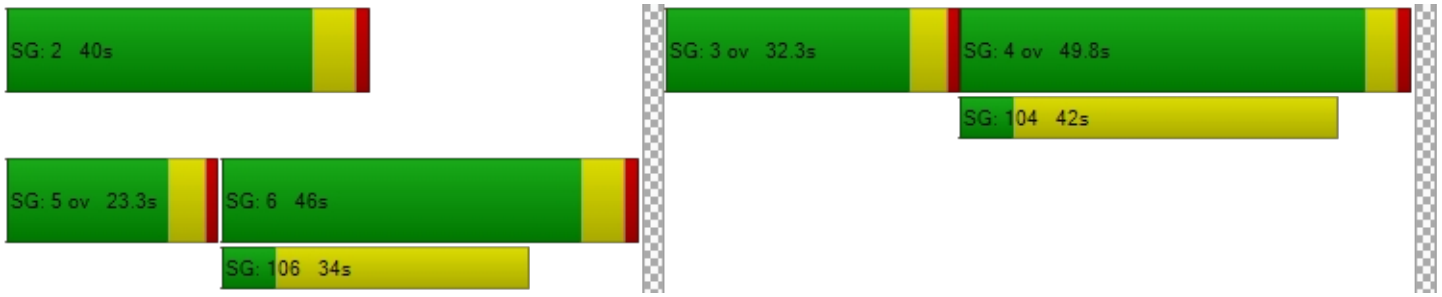
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	37.43	0.00	11.43	50.02	3.25	0.00	0.00	35.86	5.09
Movement LOS			A	D		B	D	A	A		D	A
d_A, Approach Delay [s/veh]	0.00			32.40			13.44			24.37		
Approach LOS	A			C			B			C		
d_I, Intersection Delay [s/veh]	22.78											
Intersection LOS	C											
Intersection V/C	0.635											

Other Modes

g_Walk,mi, Effective Walk Time [s]	-6.0	10.0	-5.3	10.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	60.35	44.64	59.61	44.64
I_p,int, Pedestrian LOS Score for Intersection	1.737	2.744	2.945	3.698
Crosswalk LOS	A	B	C	D
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	831	1427	116	738
d_b, Bicycle Delay [s]	18.52	4.46	48.16	21.63
I_b,int, Bicycle LOS Score for Intersection	1.560	1.560	2.525	2.914
Bicycle LOS	A	A	B	C

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Air Cargo Way & Ron Cowan Parkway

Control Type:	Signalized	Delay (sec / veh):	11.7
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.801

Intersection Setup

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	1	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	160.00	100.00	160.00	375.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			Yes		

Volumes

Name	Air Cargo Way			Air Cargo Way			Ron Cowan Parkway			Ron Cowan Parkway		
Base Volume Input [veh/h]	5	0	107	0	0	1	5	1370	6	128	1453	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	14.00	0.00	0.00	0.00	0.00	2.10	0.00	11.70	3.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	2	0	22	0	0	0	0	53	2	39	52	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	7	0	129	0	0	1	5	1423	8	167	1505	0
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	0	37	0	0	0	1	404	2	47	428	0
Total Analysis Volume [veh/h]	8	0	147	0	0	1	6	1617	9	190	1710	0
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			11			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	8	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	30	30	0	30	30	0	30	30	0
Amber [s]	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	3.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	26	0	0	0	0	0	24	0	0	18	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	R	L	C	C
C, Cycle Length [s]	53	53	53	53	53	53	53	53
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	6	6	0	27	27	8	34	34
g / C, Green / Cycle	0.12	0.12	0.01	0.51	0.51	0.15	0.65	0.65
(v / s)_i Volume / Saturation Flow Rate	0.10	0.00	0.00	0.45	0.01	0.12	0.46	0.46
s, saturation flow rate [veh/h]	1617	1120	1810	3558	1570	1642	1855	1855
c, Capacity [veh/h]	268	204	15	1806	797	239	1197	1197
d1, Uniform Delay [s]	22.75	20.60	26.36	11.87	6.51	22.03	6.23	6.23
k, delay calibration	0.04	0.04	0.04	0.04	0.04	0.04	0.29	0.29
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.74	0.00	6.72	0.68	0.00	2.26	2.13	2.13
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.58	0.00	0.41	0.90	0.01	0.79	0.71	0.71
d, Delay for Lane Group [s/veh]	23.49	20.60	33.08	12.55	6.51	24.29	8.36	8.36
Lane Group LOS	C	C	C	B	A	C	A	A
Critical Lane Group	Yes	No	No	Yes	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	1.79	0.01	0.10	6.70	0.04	2.25	4.47	4.47
50th-Percentile Queue Length [ft/ln]	44.71	0.26	2.46	167.55	1.01	56.22	111.71	111.71
95th-Percentile Queue Length [veh/ln]	3.22	0.02	0.18	10.95	0.07	4.05	7.94	7.94
95th-Percentile Queue Length [ft/ln]	80.47	0.46	4.42	273.70	1.82	101.19	198.38	198.38

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	23.49	23.49	23.49	20.60	20.60	20.60	33.08	12.55	6.51	24.29	8.36	8.36
Movement LOS	C	C	C	C	C	C	C	B	A	C	A	A
d_A, Approach Delay [s/veh]	23.49			20.60			12.59			9.95		
Approach LOS	C			C			B			A		
d_I, Intersection Delay [s/veh]	11.69											
Intersection LOS	B											
Intersection V/C	0.801											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	16.78	16.78	0.00	16.78
I_p,int, Pedestrian LOS Score for Intersection	1.858	1.689	0.000	2.985
Crosswalk LOS	A	A	F	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1126	1126	1126	1126
d_b, Bicycle Delay [s]	5.09	5.09	5.12	5.10
I_b,int, Bicycle LOS Score for Intersection	1.815	1.561	2.906	3.127
Bicycle LOS	A	A	C	C

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Ron Cowan Parkway & John Glenn Dr

Control Type:	Signalized	Delay (sec / veh):	30.3
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.900

Intersection Setup

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	100.00	220.00	100.00	220.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			No			Yes			No		

Volumes

Name	Ron Cowan Parkway			Ron Cowan Parkway			John Glenn Dr			Be-Ra		
Base Volume Input [veh/h]	20	609	0	0	1450	86	12	0	95	25	39	423
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	30.00	12.50	2.00	2.00	2.90	17.90	8.30	2.00	3.20	0.00	2.60	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	37	0	0	80	24	-2	0	-66	144	-64	18
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	20	646	0	0	1530	110	10	0	29	169	0	441
Peak Hour Factor	0.9500	0.9500	1.0000	1.0000	0.9500	0.9500	0.9500	1.0000	0.9500	0.9500	0.9500	0.9500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	170	0	0	403	29	3	0	8	44	0	116
Total Analysis Volume [veh/h]	21	680	0	0	1611	116	11	0	31	178	0	464
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			9			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	76
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	12.00

Phasing & Timing

Control Type	ProtPer	Permis	Permis	Permis	Permis	Permis	Split	Permis	Split	Split	Split	Split
Signal Group	1	6	0	0	2	0	3	2	0	1	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	10	0	0	10	0	4	10	0	4	4	0
Maximum Green [s]	10	20	0	0	20	0	15	20	0	10	15	0
Amber [s]	4.0	4.0	0.0	0.0	4.0	0.0	3.5	4.0	0.0	4.0	3.5	0.0
All red [s]	1.0	1.0	0.0	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	13	34	0	0	21	0	15	21	0	13	27	0
Vehicle Extension [s]	3.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	0	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No		No				No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall	Yes	Yes			Yes		No				No	
Maximum Recall	No	No			No		No				No	
Pedestrian Recall	No	No			No		No				No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	C	C	C	L	C	R
C, Cycle Length [s]	76	76	76	76	76	76	76	76
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	37	37	28	28	3	25	25	25
g / C, Green / Cycle	0.48	0.48	0.36	0.36	0.04	0.32	0.32	0.32
(v / s)_i Volume / Saturation Flow Rate	0.25	0.23	0.33	0.32	0.03	0.10	0.00	0.29
s, saturation flow rate [veh/h]	1381	1558	3535	1780	1620	1810	1861	1615
c, Capacity [veh/h]	667	750	1281	645	63	582	599	520
d1, Uniform Delay [s]	13.77	13.19	22.91	22.83	36.05	19.39	0.00	24.53
k, delay calibration	0.50	0.50	0.50	0.50	0.11	0.11	0.11	0.24
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.93	2.10	10.17	17.03	11.52	0.29	0.00	11.39
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.52	0.47	0.90	0.89	0.67	0.31	0.00	0.89
d, Delay for Lane Group [s/veh]	16.70	15.29	33.07	39.86	47.57	19.69	0.00	35.92
Lane Group LOS	B	B	C	D	D	B	A	D
Critical Lane Group	Yes	No	Yes	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	4.21	4.10	10.83	12.05	0.95	2.30	0.00	9.08
50th-Percentile Queue Length [ft/ln]	105.22	102.40	270.83	301.15	23.82	57.56	0.00	227.02
95th-Percentile Queue Length [veh/ln]	7.57	7.37	16.23	17.74	1.71	4.14	0.00	14.02
95th-Percentile Queue Length [ft/ln]	189.34	184.32	405.78	443.45	42.87	103.61	0.00	350.57

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	16.70	15.97	0.00	0.00	35.01	39.86	47.57	0.00	47.57	19.69	0.00	35.92
Movement LOS	B	B			D	D	D		D	B	A	D
d_A, Approach Delay [s/veh]	15.99			35.33			47.57			31.42		
Approach LOS	B			D			D			C		
d_I, Intersection Delay [s/veh]	30.34											
Intersection LOS	C											
Intersection V/C	0.900											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	9.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	29.54	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	2.010	0.000
Crosswalk LOS	F	F	B	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	763	421	276	592
d_b, Bicycle Delay [s]	14.55	23.80	28.23	18.84
l_b,int, Bicycle LOS Score for Intersection	2.138	2.509	1.629	2.619
Bicycle LOS	B	B	A	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Ron Cowan Pkwy & Neil Armstrong Way

Control Type:	Signalized	Delay (sec / veh):	13.9
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.705

Intersection Setup

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	2
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	139.61
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No					
Crosswalk	Yes			No			Yes			No		

Volumes

Name				Ron Cowan Parkway			Ai Dr			Neil Armstrong Way		
Base Volume Input [veh/h]	0	0	0	1546	22	0	626	31	0	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.90	4.50	2.00	22.90	3.60	2.00	2.00	2.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	10	148	0	37	36	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	1556	170	0	663	67	0	0	0	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9400	0.9400	1.0000	0.9400	0.9400	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	414	45	0	176	18	0	0	0	0
Total Analysis Volume [veh/h]	0	0	0	1655	181	0	705	71	0	0	0	0
Presence of On-Street Parking				No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	38
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	6.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Permis	Split	Split	Permis	Permis	Permis	Permis
Signal Group	0	0	0	4	6	0	5	4	0	0	0	6
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	0	0	5
Maximum Green [s]	0	0	0	11	11	0	5	11	0	0	0	11
Amber [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0
Split [s]	0	0	0	15	23	0	0	15	0	0	0	23
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	0.0	0.0	3.0
Walk [s]	0	0	0	0	4	0	0	0	0	0	0	4
Pedestrian Clearance [s]	0	0	0	0	7	0	0	0	0	0	0	7
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No				
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	0.0	0.0	2.0
Minimum Recall					No			No				
Maximum Recall					No			No				
Pedestrian Recall					No			No				
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	L	C	
C, Cycle Length [s]		38	38	38	38	
L, Total Lost Time per Cycle [s]		4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]		2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]		19	19	11	11	
g / C, Green / Cycle		0.51	0.51	0.28	0.28	
(v / s)_i Volume / Saturation Flow Rate		0.35	0.35	0.24	0.24	
s, saturation flow rate [veh/h]		3434	1770	1482	1772	
c, Capacity [veh/h]		1745	899	415	496	
d1, Uniform Delay [s]		7.07	7.02	12.86	12.85	
k, delay calibration		0.50	0.50	0.26	0.26	
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]		2.34	4.28	11.20	9.38	
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	
Rp, platoon ratio		1.00	1.00	1.00	1.00	
PF, progression factor		1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity		0.70	0.69	0.85	0.85	
d, Delay for Lane Group [s/veh]		9.41	11.30	24.06	22.22	
Lane Group LOS		A	B	C	C	
Critical Lane Group		Yes	No	Yes	No	
50th-Percentile Queue Length [veh/ln]		2.73	3.25	3.47	3.89	
50th-Percentile Queue Length [ft/ln]		68.18	81.22	86.71	97.17	
95th-Percentile Queue Length [veh/ln]		4.91	5.85	6.24	7.00	
95th-Percentile Queue Length [ft/ln]		122.73	146.19	156.07	174.91	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	9.91	11.30	0.00	23.15	22.22	0.00	0.00	0.00	0.00
Movement LOS				A	B		C	C				
d_A, Approach Delay [s/veh]	0.00			10.05			23.06			0.00		
Approach LOS	A			B			C			A		
d_I, Intersection Delay [s/veh]	13.91											
Intersection LOS	B											
Intersection V/C	0.705											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	8.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	9.53	0.00	11.78	0.00
l_p,int, Pedestrian LOS Score for Intersection	1.548	0.000	2.049	0.000
Crosswalk LOS	A	F	B	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1003	581	0
d_b, Bicycle Delay [s]	18.94	4.70	9.53	18.94
l_b,int, Bicycle LOS Score for Intersection	4.132	4.589	2.840	4.132
Bicycle LOS	D	E	C	D

Sequence

Ring 1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: Hegenberger Road & Doolittle Drive

Control Type:	Signalized	Delay (sec / veh):	33.9
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.770

Intersection Setup

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	1	2	0	1	2	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	210.00	100.00	210.00	275.00	100.00	160.00	275.00	100.00	210.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	1	0	0	1
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present				No			No			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name	John Glenn Dr			Hegenberger Rd			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	0	0	0	258	950	285	311	852	150	268	674	220
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	16.70	5.80	0.70	2.30	2.70	22.40	4.70	2.90	6.80
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	19	215	136	73	76	0	57	70	3
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	277	1165	421	384	928	150	325	744	223
Peak Hour Factor	1.0000	1.0000	1.0000	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700	0.9700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	71	300	109	99	239	39	84	192	57
Total Analysis Volume [veh/h]	0	0	0	286	1201	434	396	957	155	335	767	230
Presence of On-Street Parking				No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			2			0			1		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			1			0			2		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	99.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Split	Split	Split	Protect	Permis	Permis	Protect	Permis	Permis
Signal Group	0	0	0	7	4	0	5	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	0	0	30	45	0	35	45	0	25	40	0
Amber [s]	0.0	0.0	0.0	3.0	4.0	0.0	3.0	4.5	0.0	3.0	4.5	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	43	0	18	38	0	19	39	0
Vehicle Extension [s]	0.0	0.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	0	0	0	7	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	0	0	0	31	0	0	0	0	0	26	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk					No			No			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	3.0	0.0	2.0	3.5	0.0	2.0	3.5	0.0
Minimum Recall					No		No	Yes		No	Yes	
Maximum Recall					No		No	No		No	No	
Pedestrian Recall					No		No	No		No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0	20.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group		L	C	C	L	C	R	L	C	R
C, Cycle Length [s]		100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	4.00	5.50	5.50	4.00	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	2.00	3.50	3.50	2.00	3.50	3.50
g_i, Effective Green Time [s]		36	36	36	13	37	37	12	36	36
g / C, Green / Cycle		0.36	0.36	0.36	0.13	0.37	0.37	0.12	0.36	0.36
(v / s)_i Volume / Saturation Flow Rate		0.18	0.32	0.33	0.11	0.27	0.12	0.10	0.22	0.15
s, saturation flow rate [veh/h]		1571	3452	1562	3450	3540	1329	3384	3535	1505
c, Capacity [veh/h]		571	1256	568	464	1310	492	411	1261	537
d1, Uniform Delay [s]		24.77	29.96	30.31	42.36	27.24	22.50	42.90	26.46	24.38
k, delay calibration		0.11	0.11	0.26	0.11	0.50	0.50	0.11	0.50	0.50
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		0.68	2.38	12.71	4.54	3.62	1.68	3.99	2.19	2.49
d3, Initial Queue Delay [s]		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity		0.50	0.89	0.91	0.85	0.73	0.32	0.82	0.61	0.43
d, Delay for Lane Group [s/veh]		25.45	32.34	43.02	46.90	30.86	24.17	46.89	28.64	26.87
Lane Group LOS		C	C	D	D	C	C	D	C	C
Critical Lane Group		No	No	Yes	No	Yes	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]		5.29	12.64	13.48	5.03	10.24	2.79	4.23	7.72	4.43
50th-Percentile Queue Length [ft/ln]		132.14	316.12	336.92	125.78	256.01	69.82	105.84	192.96	110.64
95th-Percentile Queue Length [veh/ln]		9.06	18.48	19.50	8.71	15.49	5.03	7.61	12.27	7.88
95th-Percentile Queue Length [ft/ln]		226.41	461.92	487.44	217.74	387.21	125.67	190.20	306.86	196.90

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	25.45	33.09	43.02	46.90	30.86	24.17	46.89	28.64	26.87
Movement LOS				C	C	D	D	C	C	D	C	C
d_A, Approach Delay [s/veh]	0.00			34.19			34.38			32.93		
Approach LOS	A			C			C			C		
d_I, Intersection Delay [s/veh]	33.90											
Intersection LOS	C											
Intersection V/C	0.770											

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	2163.24	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	39.64	39.64	0.00
l_p,int, Pedestrian LOS Score for Intersection	0.000	2.872	2.976	0.000
Crosswalk LOS	F	C	C	F
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	759	650	670
d_b, Bicycle Delay [s]	50.03	19.26	22.81	22.15
l_b,int, Bicycle LOS Score for Intersection	4.132	2.616	2.804	2.659
Bicycle LOS	D	B	C	B

Sequence

Ring 1	1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: Doolittle Drive & Airport Access Road

Control Type:	Signalized	Delay (sec / veh):	26.2
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.704

Intersection Setup

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	1	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Airport Access Road			Airport Access Road			Doolittle Drive			Doolittle Drive		
Base Volume Input [veh/h]	101	33	259	85	0	30	46	865	0	0	947	186
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	19.20	6.10	3.50	5.90	2.00	0.00	0.00	7.60	2.00	2.00	2.90	6.50
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	154	48	31	0	35	54	41	0	0	95	16
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	101	187	307	116	0	65	100	906	0	0	1042	202
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	1.0000	0.9200	0.9200	0.9200	1.0000	1.0000	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	27	51	83	32	0	18	27	246	0	0	283	55
Total Analysis Volume [veh/h]	110	203	334	126	0	71	109	985	0	0	1133	220
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing major stree	0			3			0			3		
v_di, Inbound Pedestrian Volume crossing major street [	0			3			0			3		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			1			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	41.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	9.00

Phasing & Timing

Control Type	Split	Split	Split	Split	Permis	Split	Protect	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	4	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	5	0	5	0	0	5	5	0	0	5	0
Maximum Green [s]	0	65	0	30	0	0	20	55	0	0	35	0
Amber [s]	0.0	4.0	0.0	3.0	0.0	0.0	3.0	4.5	0.0	0.0	4.5	0.0
All red [s]	0.0	1.0	0.0	1.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	33	0	18	0	0	15	49	0	0	34	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	5	0	0	0	0	0	0	0	0	5	0
Pedestrian Clearance [s]	0	23	0	0	0	0	0	0	0	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No		No				No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Minimum Recall		No		No			No	Yes			Yes	
Maximum Recall		No		No			No	No			No	
Pedestrian Recall		No		No			No	No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	20.0	0.0	20.0	0.0	0.0	20.0	20.0	0.0	0.0	20.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	R	L	C	C	R
C, Cycle Length [s]	100	100	100	100	100	100	100	100	100
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
g_i, Effective Green Time [s]	25	25	25	7	7	8	56	45	45
g / C, Green / Cycle	0.25	0.25	0.25	0.07	0.07	0.08	0.56	0.45	0.45
(v / s)_i Volume / Saturation Flow Rate	0.07	0.04	0.22	0.04	0.04	0.06	0.29	0.32	0.15
s, saturation flow rate [veh/h]	1535	4926	1550	3350	1590	1810	3400	3535	1507
c, Capacity [veh/h]	387	1243	391	224	106	139	1907	1570	669
d1, Uniform Delay [s]	30.14	29.19	35.54	45.29	45.59	45.42	13.59	22.76	18.06
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.40	0.06	5.37	2.20	7.00	9.38	1.00	2.90	1.31
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.28	0.16	0.85	0.56	0.67	0.79	0.52	0.72	0.33
d, Delay for Lane Group [s/veh]	30.54	29.25	40.91	47.49	52.59	54.80	14.60	25.66	19.37
Lane Group LOS	C	C	D	D	D	D	B	C	B
Critical Lane Group	No	No	Yes	No	Yes	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	2.16	1.27	8.18	1.58	1.92	3.00	6.72	11.09	3.46
50th-Percentile Queue Length [ft/ln]	54.12	31.77	204.50	39.45	47.99	75.12	167.94	277.18	86.62
95th-Percentile Queue Length [veh/ln]	3.90	2.29	12.87	2.84	3.46	5.41	10.97	16.55	6.24
95th-Percentile Queue Length [ft/ln]	97.41	57.19	321.76	71.02	86.38	135.21	274.21	413.70	155.92

Movement, Approach, & Intersection Results

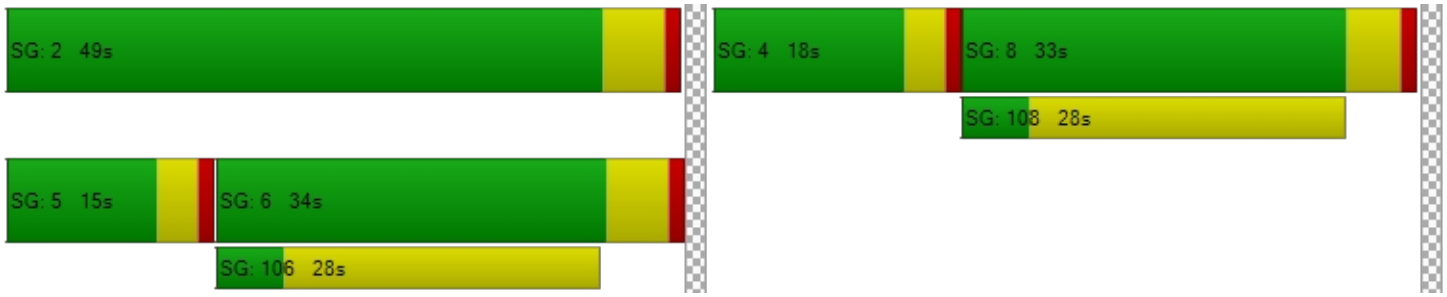
d_M, Delay for Movement [s/veh]	30.54	29.25	40.91	47.49	0.00	52.59	54.80	14.60	0.00	0.00	25.66	19.37
Movement LOS	C	C	D	D		D	D	B			C	B
d_A, Approach Delay [s/veh]	35.49			49.33			18.60			24.64		
Approach LOS	D			D			B			C		
d_I, Intersection Delay [s/veh]	26.24											
Intersection LOS	C											
Intersection V/C	0.704											

Other Modes

g_Walk,mi, Effective Walk Time [s]	43.5	9.0	14.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	15.99	41.44	37.01	41.44
l_p,int, Pedestrian LOS Score for Intersection	2.394	2.702	2.772	2.852
Crosswalk LOS	B	B	C	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	560	280	869	570
d_b, Bicycle Delay [s]	25.96	37.03	16.00	25.60
l_b,int, Bicycle LOS Score for Intersection	1.915	1.560	2.462	2.676
Bicycle LOS	A	A	B	B

Sequence

Ring 1	-	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Technical Memorandum

November 9, 2022 Project# 22916

To: David Full, Vice President
RS&H
369 Pine Street, Suite 610
San Francisco, CA 94104

From: Aaron Elias

RE: Methodology and Preliminary Findings for Determining VMT at OAK

OVERVIEW

This technical memorandum documents the Kittelson & Associates, Inc. (Kittelson) methodology and findings for determining vehicle miles traveled (VMT) at Oakland International Airport (OAK) as part of the Environmental Impact Report (EIR) being prepared for the proposed Terminal Modernization and Development Project (Proposed Project). VMT is determined using a combination of vehicle trip generation, passenger enplanements, and average trip length. These inputs were used to calculate VMT for the base year (2019) and two future analysis years (2028 and 2038) without and with the Proposed Project. Proposed significance thresholds for VMT are also discussed. The findings of this analysis show that the Proposed Project will not have a significant impact on VMT.

VMT SIGNIFICANCE THRESHOLDS

The Port of Oakland has not established thresholds of significance for VMT. Guidance on VMT thresholds can be found in documents published by the State of California Office of Planning and Research (OPR) and the adopted guidelines of other jurisdictions in the Bay Area. These guidelines adopt thresholds for retail, residential, and commercial development. These guidelines for other types of land uses, such as airports, do not have a specific threshold for VMT. This requires a customized VMT metric to be developed for environmental documents such as EIRs that study land uses that are not explicitly retail, residential, or commercial.

Kittelson reviewed other relevant EIRs to determine the metrics being applied. The Mineta San Jose International Airport Master Plan, adopted in 2020, is a recent example of an EIR for an airport project where the chosen significance threshold was no net increase in VMT per passenger compared to existing conditions. Kittelson recommends a similar metric be applied to the Proposed Project but specifically focused on enplanements[1] since the available data is specific to enplanements and does not include deplanements from the aircraft[2]. Therefore, the Proposed Project's impact is considered significant if VMT per enplanement increases compared to the existing condition.

[1] Number of passengers boarding an aircraft.
[2] Generally, passenger enplanements and passenger deplanements are about the same at OAK.

VEHICLE TRIP GENERATION

Vehicle trip generation was estimated for the base year (2019) and two forecast years (2028 and 2038) for the various components of OAK (on-airport parking, general aviation, rental car center, etc.). The collected data and forecasts for these components captured the total trip generation for OAK. Details of these estimates and how the underlying data were collected are discussed in this section.

Data Collection

The first step in determining vehicle trip generation of the various components of OAK was to collect vehicle counts for all elements of OAK that are accessed by vehicle. These data were collected over either a seven-day period between December 3 and December 9, 2021 or a three-day period between December 7 and December 9, 2021 and differentiated between automobiles, trucks, and buses. OAK vehicle trip generation comes from passenger activity, employee activity, and deliveries which were segmented into six primary sources:

- Employee Parking (employees)
- On-Airport Passenger Parking (passengers)
- Off-Airport Passenger Parking (passengers)
- Rental Car Center (passengers)
- Corporate/General Aviation (passengers and employees)
- Drop Off/Pick Up/Other (employees, passengers, and deliveries)

EMPLOYEE PARKING

There are several parking lots for employees located throughout OAK. To understand employee parking activity, Kittelson collected data to capture inbound and outbound employee trips at the various parking facilities in early December 2021. These employee parking facilities and how the inbound and outbound trips were calculated are described below:

- **FedEx, Airport Traffic Control Tower, and Oakland Fire Station No. 22** – These facilities are accessed from Air Cargo Way. A pneumatic tube counter that can differentiate between trucks and passenger vehicles (2 axle cars and pickup trucks) was placed on Air Cargo Way near Ron Cowan Parkway over a seven-day period. Any passenger vehicles passing over this tube counter were assumed to be associated with an employee of one of these facilities.
- **Southwest, SwissPort, and Edward White Way parking near Terminal 2** – These parking facilities are accessed using Neil Armstrong Way. A pneumatic tube counter was set up on Neil Armstrong Way near Edward White Way to capture trucks and passenger vehicles. Any passenger vehicles passing over these counters were assumed to be either employee vehicles or OAK service vehicles accessing the gate at the end of Edward White Way near Terminal 2 which separates public areas of OAK from the airside operations. Using counts from this gate's entries and exits supplied by the Port of Oakland (which are assumed to represent only OAK service vehicles), Kittelson removed the OAK service vehicles from the tube count data leaving just counts of employee vehicles parking in the three parking lots noted.
- **UPS and Southwest Provisioning** – Employee parking for these two facilities is located north of Air Cargo Road which is accessed via Alan Shepard Way. A pneumatic tube counter was placed on Air Cargo Road near Alan Shepard Way to capture both trucks and passenger vehicles over a seven-day period. All passenger vehicles passing over the tube counter during

this time were assumed to be employees entering or leaving a parking facility. The employee parking for UPS and Southwest Provisioning were further separated in the analysis by splitting them between UPS and Southwest Provisioning based on the number of parking spaces each facility had in its parking lot.[3]

- **Unsecure Airport Employee** – Located between John Glenn Drive and Airport Drive, the unsecure employee parking was captured using pneumatic tube counters placed at parking lot driveways over a seven-day period. All vehicles entering and departing this facility were assumed to be employee trips.
- **Secure Airport Employee** – These parking facilities are accessed via John Glenn Drive through a security gate. A camera was placed to observe the security gate over a three-day period. The data were reduced to differentiate between personal vehicles and other vehicles such as trucks. All personal vehicles were assumed to be employees parking over the three-day period. These three-day counts were adjusted to seven-day counts by using data from the nearby unsecure employee parking facility, which had seven-day tube counts. These seven-day counts were used to develop a factor to account for the four days not collected via video. This assumes the vehicles for the missing four days are in the same relative proportion to the other parking facilities as the three days of collected data.
- **General Airport Employee** – Parking for most OAK employees occurs in the large lot located near the intersection of John Glenn Drive and Ron Cowan Parkway. This parking lot was observed via video over a three-day period to capture entering and leaving vehicles. These counts were used to determine the trip generation of this parking lot. The three-day counts were adjusted to seven-day counts as described for the secure employee parking.

ON-AIRPORT PASSENGER PARKING

On-airport parking is for passengers who wish to park their vehicles in either the premier, hourly, daily, or economy parking lots provided at OAK for a fee. To determine vehicle trip generation of these facilities, Kittelson requested parking data from the Port of Oakland for the early December 2021 data collection period when tube counts were collected by Kittelson. These data were provided to Kittelson as hourly counts differentiating between the economy parking lot and the premier/hour/daily lot as well as entering versus exiting vehicles.

OFF-AIRPORT PASSENGER PARKING

In addition to the on-airport parking, there are several off-airport lots that provide OAK parking for passengers. These off-airport lots include the following:

- Park 'N Fly (82 98th Ave, Oakland, CA 94603)
- Park 'N' Travel (10001 Doolittle Dr, Oakland, CA 94603)
- VIP Airport Parking (50 Airport Access Rd, Oakland, CA 94603)
- Airpark Oakland Airport Parking (111 b Ave, Oakland, CA 94603)
- FastTrack Airport Parking (195 98th Ave, Oakland, CA 94603)
- Fly N Save OAK Airport Parking (250 Hegenberger Rd, Oakland, CA 94621)

To estimate the vehicle trip generation of these lots, Kittelson used StreetLight Data[4]. StreetLight Data tracks mobile device information and allows for a determination of relative vehicle trip activity between different geographic areas. Kittelson created an analysis "zone" for each of these off-airport lots and the on-airport economy lot. StreetLight Data provided the relative vehicle trip activity for each of these off-airport parking facilities and the on-airport economy lot. Since the trip generation for

[3] Southwest Provisioning has 40 parking spaces and UPS has 206.
[4] StreetLight Data indexes and processes transportation location data from connected devices. This information is used to assess origin-destination data and relative vehicle volumes.

the on-airport parking lot is known from parking data provided by the Port, it can be used in combination with the relative trip generation metrics from StreetLight to estimate the amount of vehicle trip generation for the off-airport parking facilities. For example, if the vehicle activity at the Fly N Save OAK Parking lot in 2019 had a relative difference of 80 percent compared to the economy parking lot, then the vehicle trip generation of that off-airport parking lot was assumed to be 80 percent of the economy lot.

RENTAL CAR CENTER

The rental car center (RAC) is in the general aviation area of OAK known as North Field and provides a shuttle service to and from the OAK terminals. Vehicle trip generation for the RAC was collected using a combination of pneumatic tube counts and video camera data. Pneumatic tube counts were collected over a seven-day period on Cessna Street and Sikorsky Street to capture most of the vehicles entering and leaving the RAC. In addition to the two pneumatic tube count locations, there are two additional driveways serving rental cars at the RAC. These driveways, one on Earhart Road and one on Langley Street, were surveyed using a video camera over a three-day period. The three-day counts were adjusted to seven-day counts by assuming the traffic on the missing four days was proportional to the pneumatic tube counts collected over the seven-day period.

CORPORATE/GENERAL AVIATION

The general aviation portion of OAK is accessed primarily via Doolittle Drive. Vehicle trip generation was collected using pneumatic tube counters placed to capture inbound vehicles at Langley Street and Swan Way off Doolittle Drive and inbound vehicles on Earhart Road off Hegenberger Road over a seven-day period. Outbound trips from the general aviation portion of OAK were estimated using StreetLight Data and the collected inbound traffic count data. StreetLight Data can provide the proportion of inbound versus outbound trips by each hour of the day. This proportion was used to estimate the outbound volumes based on the inbound volumes collected using pneumatic tube counts so that both inbound and outbound volumes by time of day are known. These volumes were further adjusted to remove the trips accessing the RAC so that vehicle trips are not double counted.

PICK-UP, DROP-OFF, OTHER

The final vehicle trip generation is for passengers or employees being picked up or dropped off at the terminals via personal vehicle, taxicab, or transportation network company (Uber/Lyft) vehicle. This category has the highest trip generation at about 50% of the total airport vehicle trip generation and includes deliveries in addition to employee and passenger trips. This vehicle trip generation was determined using seven-day pneumatic tube counts placed on John Glenn Drive, Airport Drive inbound/outbound, and on the access road between Airport Drive and Ron Cowan Parkway which are strategic screen lines for vehicles accessing OAK. These access points also contain vehicle trip generation for some of the employee parking lots and all the on-airport parking lots. Therefore, the vehicle trip generation for both the employee and on-airport passenger parking lots was removed from the totals to estimate the pick-up/drop-off/other trip component.

Vehicle Trip Generation Adjustment

Data collection for these OAK elements occurred in December 2021. The base year for existing conditions in the EIR is 2019, representing more typical traffic conditions prior to Covid. Therefore, Kittelson adjusted the 2021 data collection to 2019 conditions using StreetLight Data. The relative volumes from late 2021 for each type of vehicle trip generation were compared to typical conditions in 2019. The trip generation estimates were then adjusted based on the relative volume changes

between 2019 and 2021. For example, if the on-airport parking facilities were found to be 30 percent higher in terms of vehicle trip generation in 2019 compared to December 2021 conditions, the 2021 data were increased by 30 percent. This provided a trip generation baseline representative of typical conditions in 2019.

Typical conditions were chosen rather than a peak day because while higher activity levels are more conservative for capacity measures like LOS, for a normalized measure like VMT per enplanement, higher activity levels are not necessarily more conservative. A higher activity day or month could actually have less VMT per enplanement if more people carpool or take transit on the busier days.

Base Year 2019 Trip Generation

Based on the collected data from December 2021 and the adjustment using StreetLight to compare December 2021 data to a typical day in 2019, the resulting trip generation for OAK on a typical day in 2019 is shown in Exhibit 1. As shown, trip generation is broken down into trucks, buses, cars, and total for each hour of a typical day. The resulting total trip generation is about 46,315 vehicle trips per day.

Exhibit 1: Base Year 2019 Trip Generation for OAK

Time	Existing Total Trips			
	Trucks	Buses	Cars	Total
0:00	47	22	617	686
1:00	49	24	405	478
2:00	66	28	455	549
3:00	105	28	441	574
4:00	186	41	1,024	1,251
5:00	187	52	1,514	1,753
6:00	207	50	1,906	2,163
7:00	171	46	2,354	2,571
8:00	148	48	2,038	2,234
9:00	166	48	2,024	2,238
10:00	181	48	2,140	2,369
11:00	183	47	2,262	2,492
12:00	153	47	2,717	2,917
13:00	149	50	2,555	2,754
14:00	120	46	2,375	2,541
15:00	140	47	2,038	2,225
16:00	152	52	2,151	2,355
17:00	211	51	1,982	2,244
18:00	190	41	2,679	2,910
19:00	178	40	2,149	2,367
20:00	146	37	2,342	2,525
21:00	134	29	1,974	2,137
22:00	98	26	1,238	1,362
23:00	34	0	586	620
Total	**3,401**	**948**	**41,966**	**46,315**

Source: Kittelson & Associates, Inc. 2022

Forecast OAK Trip Generation

Kittelson developed forecast vehicle trip generation for two future years 2028 and 2038. The forecast for these future years was based on the forecast demand for various components of OAK activity including passenger activity, cargo tonnage, and aircraft operations. Exhibit 2 shows the anticipated demand for these elements of OAK.

Exhibit 2: Aviation Activity Forecast Growth for OAK between 2019 and 2038

	Forecast in Calendar Years		
	2019 (Base Year)	2028 (Planning Activity Level 1)	2038 (Planning Activity Level 2)
Passenger Activity			
Passenger Enplanements	6,689,457	8,792,855	12,342,518
Million Annual Passengers (MAP)	*13.4*	*17.6*	*24.7*
Cargo Tonnage			
Belly Cargo (US Tons)	9,678	16,905	24,650
Freighter Cargo (US Tons)	632,727	757,987	859,437
Total Air Cargo Tonnage (US Tons)	*642,405*	*774,892*	*884,087*
Aircraft Operations			
Passenger Airline Operations	113,272	132,830	181,270
Cargo Airline Operations	20,698	23,200	24,800
Business/General Aviation	107,861	110,758	116,431
Military	926	1,000	1,000
Total Aircraft Operation	*242,757*	*267,788*	*323,501*

Source: EIR Chapter 2, Project Description, September 2022

Vehicle trip generation for OAK in 2019 was divided into 18 distinct zones. Each one of these zones was tied to one element of the aviation activity forecast demand shown in Exhibit 2. Exhibit 3 shows the 18 zones for OAK and the element of the aviation activity forecast its demand was associated with. The reasoning behind the various aviation activity forecast associations with the various zones includes:

- Freighter Cargo (US Tons)
  - Used to estimate demand for both FedEx and UPS since freighter cargo is anticipated to be the primary driver of their operations in the future.
- Passenger Airline Operations
  - The Neil Armstrong parking lot, Southwest Provisioning, and the OMC Employee parking lot are primarily used by employees of the various airlines. Kittelson has assumed that the demand in these areas will be tied to the number of passenger airline operations.
- Total Air Operations
  - Both the non-secure and secure employee parking lots are used by Port of Oakland management staff at OAK. Therefore, Kittelson has assumed that demand for these positions will be tied to the total number of aircraft operations at OAK.
- Corporate/General Aviation Air Operations
  - The corporate/general aviation area of OAK is in the North Field and is separate from the passenger terminal in the South Field. Kittelson has assumed that the demand to this area will be related to the total number of aviation aircraft operations.

- Passenger Enplanements
    - This metric captures the total number of commercial aviation passengers that will board an aircraft. Kittelson has assumed that all passenger parking areas, both on airport and off-airport, as well as the rental car center and pick up/drop off/other trips will have a demand level associated with passenger enplanements.

Exhibit 3: OAK Zone and Aviation Activity Forecast Element Used for Future Trip Generation Estimates

Zone	Description	Aviation Activity Forecast Element
1	FedEx	Freighter Cargo
2	Neil Armstrong	Passenger Air Operations
3	UPS	Freighter Cargo
4	SW Provisioning	Passenger Air Operations
5	Non-secure Employee	Total Air Operations
6	Secure Employee	Total Air Operations
7	OMC Employee Parking	Passenger Air Operations
8	Rental Car Center	Passenger Enplanements
9	Corporate/General Aviation	General Aviation Air Operations
10	Parking Bowl	Passenger Enplanements
11	Economy	Passenger Enplanements
12	Park 'N Fly	Passenger Enplanements
13	Park 'N Travel	Passenger Enplanements
14	VIP Airport Parking	Passenger Enplanements
15	Airpark Oakland	Passenger Enplanements
16	FastTrack	Passenger Enplanements
17	Fly N Save	Passenger Enplanements
18	Other	Passenger Enplanements

Source: Kittelson & Associates, Inc. 2022

The forecast demand levels in Exhibit 2 can be used directly to increase or decrease the 2019 existing vehicle trip generation to future years. However, this would assume that travel behavior and mode choice (transit and vehicle) would not change between existing and future conditions meaning passengers taking transit or taking a vehicle to OAK would remain in the same relative proportion in the future as it occurs today.

To determine whether mode choice may change in the future, Kittelson used the Alameda County Transportation Commission's countywide travel demand model which relies on land use growth assumptions and future transportation network improvements for both transit and vehicles to determine mode choice. Based on our analysis of the travel demand model, the mode choice for passengers taking transit would grow by about 2.9% between 2019 and 2038. Employee mode choice for transit is anticipated to increase by 0.8% in the same time period. Mode shifts for 2028 were estimated based on a linear interpolation between 2019 and 2038. These increases in transit mode share correspond to an equivalent reduction in vehicle mode share. Therefore, the demand levels from Exhibit 2 were adjusted to account for the forecast mode shift from vehicles to transit. For example, the passenger enplanements shown in Exhibit 2 are projected to grow by about 3.1% between 2019 and 2028. However, there is a slight shift to more transit usage among passengers. Accounting for this mode shift results in a compound annual growth rate of about 2.9% for passengers between 2019 and 2028 as shown in Exhibit 4.

Exhibit 4 provides the compound annual growth rate between 2019 and both 2028 and 2038 for each of the 18 zones used to define the OAK trip generation based on the aviation activity forecasts (Exhibit 2) and the adjustments based on mode choice.

Exhibit 4: Calculated Compound Annual Growth Rate for Each Analysis Zone at OAK

Zone	Description	Compound Annual Growth Rate*	
		2019 to 2028	2019 to 2038
1	FedEx	2.0%	1.6%
2	Neil Armstrong & SwissPort	1.7%	2.5%
3	UPS	2.0%	1.6%
4	SW Provisioning	1.7%	2.5%
5	Non-secure Employee	1.1%	1.5%
6	Secure Employee	1.1%	1.5%
7	OMC Employee Parking	1.7%	2.5%
8	Rental Car Center	2.9%	3.1%
9	Corporate/General Aviation	0.3%	0.4%
10	Parking Bowl	2.9%	3.1%
11	Economy	2.9%	3.1%
12	Park 'N Fly	2.9%	3.1%
13	Park 'N Travel	2.9%	3.1%
14	VIP Airport Parking	2.9%	3.1%
15	Airpark Oakland	2.9%	3.1%
16	FastTrack	2.9%	3.1%
17	Fly N Save	2.9%	3.1%
18	Other	2.9%	3.1%

Source: Kittelson & Associates, Inc. 2022
*Compound annual growth rates include adjustment for mode choice

The growth rates shown in Exhibit 4 were applied to the 2019 vehicle trip generation to determine the estimated trip generation of OAK in both 2028 and 2038. The resulting trip generation for cars, buses, and trucks for each hour of a typical day is shown in Exhibit 5.

Exhibit 5: OAK Trip Generation in 2019, 2028, and 2038

Time	2019 Total Vehicle Trips				2028 Total Vehicle Trips				2038 Total Vehicle Trips			
	Trucks	Buses	Cars	Total	Trucks	Buses	Cars	Total	Trucks	Buses	Cars	Total
0:00	47	22	617	686	56	28	775	859	69	40	1,034	1,143
1:00	49	24	405	478	58	31	488	577	72	44	610	726
2:00	66	28	455	549	78	37	539	654	96	52	664	812
3:00	105	28	441	574	123	37	527	687	162	52	669	883
4:00	186	41	1,024	1,251	218	54	1,254	1,526	281	75	1,647	2,003
5:00	187	52	1,514	1,753	217	68	1,888	2,173	281	95	2,524	2,900
6:00	207	50	1,906	2,163	239	65	2,377	2,681	305	92	3,166	3,563
7:00	171	46	2,354	2,571	196	61	2,926	3,183	249	85	3,866	4,200
8:00	148	48	2,038	2,234	170	64	2,524	2,758	216	88	3,341	3,645
9:00	166	48	2,024	2,238	190	63	2,529	2,782	238	89	3,379	3,706
10:00	181	48	2,140	2,369	209	63	2,677	2,949	264	89	3,593	3,946
11:00	183	47	2,262	2,492	210	62	2,837	3,109	263	86	3,814	4,163
12:00	153	47	2,717	2,917	174	62	3,403	3,639	221	86	4,569	4,876
13:00	149	50	2,555	2,754	169	66	3,183	3,418	215	92	4,253	4,560
14:00	120	46	2,375	2,541	136	61	2,963	3,160	171	85	3,955	4,211
15:00	140	47	2,038	2,225	160	62	2,543	2,765	205	86	3,401	3,692
16:00	152	52	2,151	2,355	173	68	2,708	2,949	220	95	3,632	3,947
17:00	211	51	1,982	2,244	242	67	2,504	2,813	313	93	3,377	3,783
18:00	190	41	2,679	2,910	220	54	3,401	3,675	278	76	4,616	4,970
19:00	178	40	2,149	2,367	205	53	2,731	2,989	265	74	3,705	4,044
20:00	146	37	2,342	2,525	167	49	2,954	3,170	211	68	3,976	4,255
21:00	134	29	1,974	2,137	154	38	2,488	2,680	193	54	3,328	3,575
22:00	98	26	1,238	1,362	113	34	1,558	1,705	139	48	2,107	2,294
23:00	34	0	586	620	40	0	723	763	44	0	956	1,000
Total	3,401	948	41,966	46,315	3,917	1,247	52,500	57,664	4,971	1,744	70,182	76,897

PASSENGER ENPLANEMENTS

For environmental analyses, VMT is typically evaluated as an efficiency metric such as VMT per capita or VMT per employee. To be consistent with this practice and with recent VMT studies of airports such as Norman Y. Mineta San Jose International Airport, Kittelson used a VMT per passenger enplanement efficiency metric for OAK. This requires that the number of passengers boarding airplanes be known in both 2019 and the future analysis years (2028 and 2038).

2019 Passenger Enplanements

To determine the number of enplanements at OAK for 2019, Kittelson used data on the number of people transiting security at OAK in early December 2019 that was provided by the Port of Oakland. The 2019 data were adjusted from December 2019 to a typical day in 2019 using StreetLight Data which indicated December has about 93% of the total trip generation compared to a typical day in 2019. Based on the security information and the adjustment to represent a typical day in 2019, the estimated total number of enplanements on a typical day in 2019 is 16,516.

Forecast Passenger Enplanements

Kittelson developed daily forecast passenger enplanements based on the aviation activity forecasts (Exhibit 2). These forecasts show the air carrier passenger enplanements are anticipated to grow by a compound annual growth rate of 3.1% between 2019 and 2028 and 3.3% between 2019 and 2038 resulting in the passenger enplanements on a typical day shown in Exhibit 6.

Exhibit 6: Estimated Passenger Enplanements on a Typical Day in 2019, 2028, and 2038

Year	Typical Day Enplanements
2019	16,516
2028	21,709
2038	30,473

Source: Kittelson & Associates, Inc. 2022

AVERAGE TRIP LENGTH

A key component in the calculation of VMT is to determine the average trip length for vehicles accessing OAK for the base year (2019) and future years (2028 & 2038).

2019 Average Trip Length

To determine the average trip length in 2019, Kittelson used StreetLight Data which provides average trip length for various zones. Many areas within or near OAK were consolidated to ensure a large enough sample size for an accurate estimation of average trip length. This resulted in a total of six groupings to apply to the trip generation including:

- Group 1: FedEx Including:

    - FedEx, Airport Traffic Control Tower, and Oakland Fire Station No. 22
- Group 2: Employee Parking Including:
    - Neil Armstrong and Nearby Parking (Southwest, SwissPort, and Edward White Way parking near Terminal 2)
    - UPS
    - Southwest Provisioning
    - Unsecure Airport Employee
    - Secure Airport Employee
    - General Airport Employee Parking (OMC)
- Group 3: Rental Car Center
- Group 4: Corporate/General Aviation
- Group 5: Passenger Parking (On and Off Airport) Including:
    - Hourly, Premier, and Daily Parking
    - Economy Lot
    - Park 'N Fly (82 98th Ave, Oakland, CA 94603)
    - Park 'N' Travel (10001 Doolittle Dr, Oakland, CA 94603)
    - VIP Airport Parking (50 Airport Access Rd, Oakland, CA 94603)
    - Airpark Oakland Airport Parking (111 98th Ave, Oakland, CA 94603)
    - FastTrack Airport Parking (195 98th Ave, Oakland, CA 94603)
    - Fly N Save OAK Airport Parking (250 Hegenberger Rd, Oakland, CA 94621)
- Group 6: Pick-Up & Drop-Off, and Other Including:
    - TNC[5] vehicles, park and call, deliveries, etc.

Exhibit 7 shows the average trip length in and out of OAK for each of these groupings in 2019. As shown, the average trip length ranges from about 14.4 miles to 23.2 miles.

Exhibit 7: Average Trip Length in 2019 to Each OAK Zone Group

Group	Description	2019 Average Trip Length (miles)
1	FedEx	16.2
2	Employee Parking	19.9
3	Rental Car Center	14.7
4	Corporate/General Aviation	14.4
5	Passenger Parking	23.2
6	Pick-Up and Drop-Off	17.3

Source: Kittelson & Associates, Inc. Based on StreetLight Data 2022

Forecast Average Trip Length

Average trip length in the future can be affected by land use and other changes. For example, densification in nearby cities may lead to a decrease in average trip length as customers of OAK do not have to travel as far to access OAK. There is also continued development on the periphery of the urban area which can cause an increase in average trip length. To estimate how average trip length may change between 2019 and future years, Kittelson used the Alameda County Transportation Commission's countywide travel demand model similar to how the mode choice adjustment was made.

The travel demand model estimates that the average passenger trip length for OAK is anticipated to decrease by 0.5% while the average employee trip length is anticipated to increase by 2.5% between

[5] Transportation Network Companies (Uber, Lyft, etc.)

2019 and 2038. These factors were applied to estimate the average trip length in 2038 for each of the 18 zones used to represent OAK. Average trip length for 2028 was determined as an interpolation between 2019 and 2038. Applying these factors results in the estimated average inbound and outbound trip lengths in Exhibit 8. As shown, there is a mix with some trip lengths increasing and other decreasing[6].

Exhibit 8: Average of the Inbound and Outbound Trip Length by Zone and Year

Zone	Description	Average Trip Length (Miles)		
		2019	2028	2038
1	FedEx	16.2	16.3	16.6
2	Neil Armstrong	19.9	20.1	20.4
3	UPS	19.9	20.1	20.4
4	SW Provisioning	19.9	20.1	20.4
5	Unsecure	19.9	20.1	20.4
6	Secure	19.9	20.1	20.4
7	OMC	19.9	20.1	20.4
8	Rental Car Center	14.7	14.7	14.6
9	Corporate/General Aviation	14.4	14.6	14.8
10	Parking Bowl	23.2	23.1	23.0
11	Economy	23.2	23.1	23.0
12	Park N Fly	23.2	23.1	23.0
13	Park N Travel	23.2	23.1	23.0
14	VIP	23.2	23.1	23.0
15	Airpark Oakland	23.2	23.1	23.0
16	FastTrack	23.2	23.1	23.0
17	Fly N Save	23.2	23.1	23.0
18	Other	17.3	17.3	17.3

Source: Kittelson & Associates, Inc. 2022

VEHICLE MILES TRAVELED

VMT is calculated as the product of the average trip length and trip generation. Kittelson used the average trip length and vehicle trip generation in 2019 and the future years (2028 and 2038) to develop VMT by multiplying the inbound trip generation by the inbound average trip length and adding the outbound trip generation times the outbound average trip length to obtain VMT for cars, buses, and trucks.

2019 Vehicle Miles Traveled

Using the data on vehicle trip length and vehicle trip generation for 2019, Exhibit 9 shows the VMT by vehicle classification on a typical day.

[6] The "Other" trip lengths are decreasing between 2019 and 2038 but not by more than one decimal place.

Exhibit 9: 2019 VMT for Cars, Trucks, and Buses on a Typical Day

	2019 Total VMT
Cars	749,445
Trucks	56,476
Buses	16,437

Source: Kittelson & Associates, Inc. 2022

CEQA Section 15064.3, subdivision (a), states, *"For the purposes of this section, 'vehicle miles traveled' refers to the amount and distance of automobile travel attributable to a project." Here, the term "automobile" refers to on-road passenger vehicles, specifically cars and light trucks.* Based on this, the truck VMT from Exhibit 9 will not be used in the calculation of VMT for the Proposed Project and only car (which includes light trucks) and bus VMT will be used.

Combining the car and bus VMT results in a total VMT for a typical day in 2019 of 765,882 miles. Dividing this number by the typical daily number of passenger enplanements in 2019 of 16,516 results in a VMT per enplanement of 46.4 miles in 2019.

Forecast Vehicle Miles Traveled

Using the forecasted trip generation and average trip length, estimates of VMT in 2028 and 2038 without the Proposed Project are shown in Exhibit 10 along with a comparison to the 2019 VMT. Exhibit 11 shows a comparison of VMT[7] per enplanement between 2019, 2028, and 2038. As shown, the VMT per enplanement is anticipated to decline between 2019 and 2038.

Exhibit 10: OAK VMT for Cars, Trucks, and Buses without the Proposed Project

Vehicle Type	Total VMT		
	2019	2028	2038
Cars	749,445	940,286	1,261,776
Trucks	56,476	65,391	83,626
Buses	16,437	21,580	30,103

Source: Kittelson & Associates, Inc. 2022

Exhibit 11: VMT Per Enplanement in 2019, 2028, and 2038 without the Proposed Project

	2019	2028	2038
Car VMT	749,445	940,286	1,261,776
Bus VMT	16,437	21,580	30,103
Total VMT	765,882	961,866	1,291,879
Enplanements	16,516	21,709	30,473
VMT/Enplanement	46.4	44.3	42.4

Source: Kittelson & Associates, Inc. 2022

[7] VMT for only cars and buses is used to determine VMT per enplanement and not trucks based on the CEQA guidelines.

PROPOSED PROJECT EFFECTS ON VMT

The Proposed Project will affect two components of the VMT calculation including trip generation and average trip length.

Proposed Project Trip Generation

OAK trip generation is not anticipated to change significantly as a result of the Proposed Project since the passenger forecasts shown in Exhibit 2 will occur whether the Proposed Project is constructed or not. Based on discussions with the Port of Oakland staff, the potential change to vehicle trip generation would be from two sources:

- Estimated additional employees needed to operate and maintain the new facilities that would not be needed if the new terminal were not constructed; and
- additional shuttle buses needed to service the relocated parking areas.

The Port of Oakland has estimated approximately 70 additional employees per day to operate new facilities, which would include 12 management positions and 60 facilities personnel. These new employees are anticipated to park in both the secure parking lot (management positions) and the equivalent of the OMC parking lot[8] (facilities positions). The resulting additional trip generation is anticipated to correspond to the number of new employees. Therefore, approximately 70 inbound and 70 outbound trips or about 140 total trips are anticipated as a result of the increased employment on a typical day.

As a result of the Proposed Project, the existing economy lot for passengers and OMC parking lot for employees would be relocated. The OMC parking lot would be relocated to two lots including the North Field lot located off Doolittle Drive north of the rental car center and to the Golf Course lot located at the intersection of Doolittle Drive and Eden Road. The economy parking lot would be relocated to two lots including the Maitland lot located north of FedEx on Ron Cowan Parkway and the Ron Cowan lot located near the intersection of Ron Cowan Parkway and John Glenn Drive.

These new parking lots will require additional shuttle buses to maintain the same bus frequencies for passengers as the current economy lot shuttle and for employees similar to the existing OMC shuttle. Kittelson used data provided by the Port showing the route and number of bus trips per day that service the three parking lots with shuttle service (passenger economy lot, employee OMC lot, and employee Neil Armstrong lot) to estimate that shuttle buses at OAK generate 558 VMT on a typical day under existing conditions (Exhibit 12).

Based on the location of the proposed replacement parking lots for the passenger economy lot and the employee OMC lot, Kittelson estimated the round trip loop distance a shuttle would perform for each trip between these parking lots and OAK. After assuming the same number of shuttle trips would be performed each day, Exhibit 13 shows the VMT for shuttle buses with the Proposed Project. As shown, the Proposed Project would add 237 additional bus trips per day resulting in an increased VMT of 1,430 miles.

[8] The OMC parking lot is being removed for the proposed project with its parking being relocated to both a North Field parking lot and one near the golf course near the intersection of Doolittle Drive and Eden Road

Exhibit 12: 2019 OAK Shuttle Bus VMT

2019 Shuttle Bus VMT			
Bus Route	Loop Distance (Miles)	Trips Per Day	VMT
Economy Lot	2.13	117	249
OMC Lot	1.86	120	223
Neil Armstrong Lot	0.89	96	86
	Total:	333	558

Source: Kittelson & Associates, Inc. 2022

Exhibit 13: Proposed Project OAK Shuttle Bus VMT

Proposed Project Shuttle Bus VMT			
	Loop Distance	Trips Per Day	VMT
Neil Armstrong Lot	0.89	96	85
North Field Lot (OMC)	5.9	120	708
Golf Course Lot (OMC)	4.4	120	528
Maitland Lot (Economy)	4.1	117	480
Ron Cowan Lot (Economy)	1.6	117	187
	Total:	570	1,988

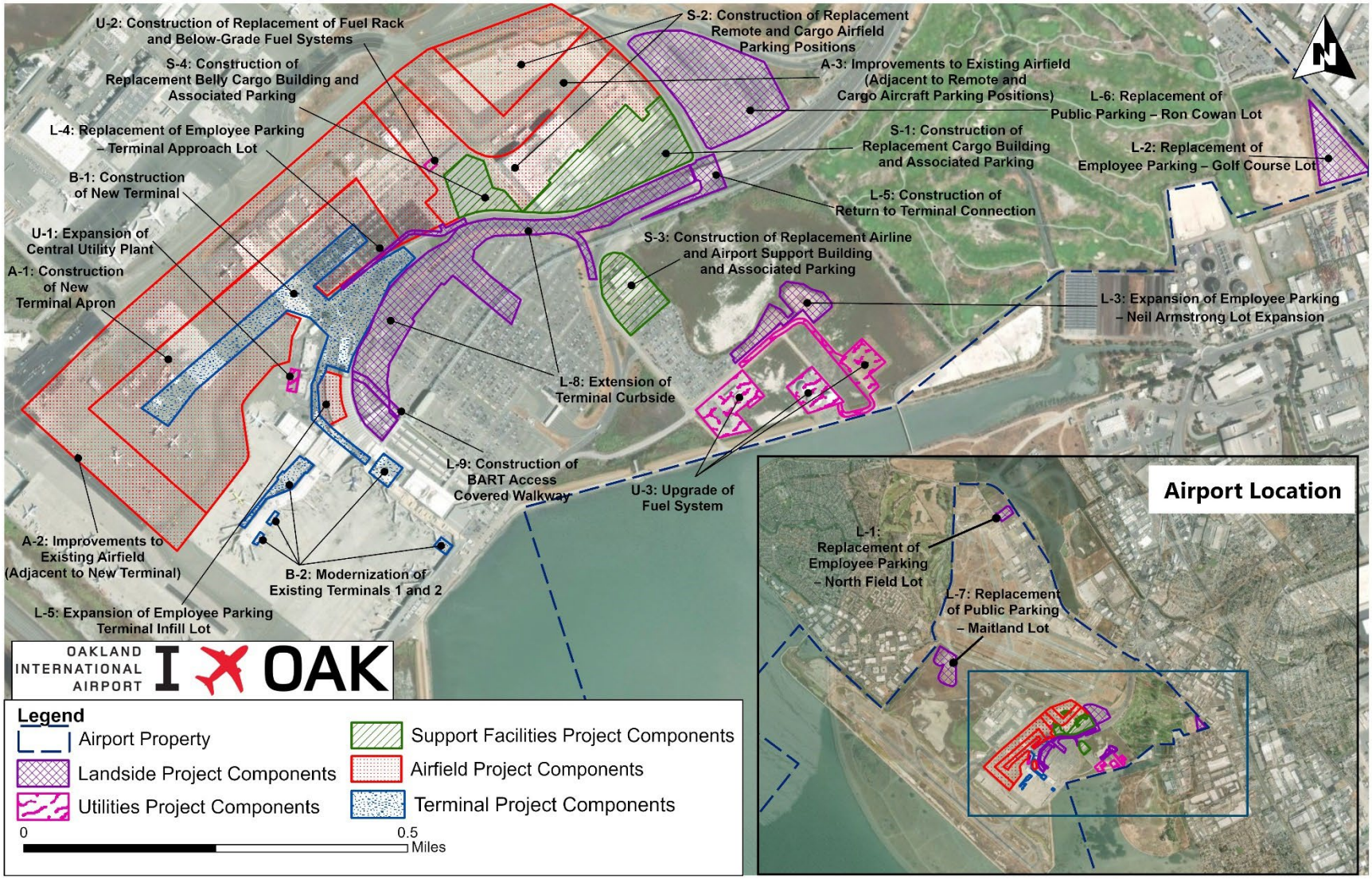
Source: Kittelson & Associates, Inc. 2022

Proposed Project Average Trip Length

As a result of the relocation of certain parking areas, the average trip length for certain zones will change as vehicles accessing the new parking areas (Exhibit 14) travel either more or less distance. Parking area changes include the following based on the description of the Proposed Project:

- Approximately 40% of the existing employees parking in the Neil Armstrong lot will be relocated to the North Field parking area.
- The management secure parking area will be relocated to two new parking areas with about 54% being relocated to the secure infill lot and 46% relocated to the secure approach lot.
- The OMC employee parking lot will have about 49% of its parking relocated to the North Field lot and 51% relocated to the golf course lot.
- Approximately 7% of the parking bowl (daily, hourly, premier parking) will be relocated to the Ron Cowan lot.
- The economy parking lot will be relocated to both the Maitland lot (62%) and the Ron Cowan lot (38%).

Exhibit 14: Location of Parking Lots with Proposed Project



Kittelson considered a total of five origin/destination locations for how vehicle trips would arrive to and depart from OAK within the transportation study area and calculated how the average trip length from each one may change because of the relocation of the parking areas. These five origin/destinations included:

1. Harbor Bay Parkway at Ron Cowan Parkway
2. Doolittle Drive at Harbor Bay Parkway
3. Hegenberger Road at Doolittle Drive
4. 98th Avenue at Airport Access Road
5. Doolittle Drive at Davis Street

The difference in distance between each of these origin/destination areas and the parking areas that are being relocated was determined using Google Maps. For example, a vehicle traveling between Harbor Bay Parkway at Ron Cowan Parkway and the UPS parking area would travel 0.7 miles less with the Proposed Project compared to existing conditions since the UPS parking lot is moving closer to the entrance to OAK. Conversely, an employee traveling to the Neil Armstrong parking lot with the Proposed Project from Harbor Bay Parkway and Ron Cowan Parkway would travel 1.3 miles farther to access the relocated parking in the North Field area compared to existing conditions.

Based on the changes in distance to each parking area from the five origin/destinations, the change to average trip length for each of the 18 zones was calculated and is shown in Exhibit 15. The resulting changes to average trip length for the Proposed Project is compared to existing conditions average trip length in Exhibit 16

Exhibit 15: Trip Length Adjustment Applied to Existing Condition Average Trip Length for Each Zone

Zones	Proposed Project Trip Length Adjustment (miles)	
1	FedEx	0.00
2	Neil Armstrong	0.12
3	UPS	-0.70
4	SW Provisioning	-0.60
5	Unsecure	0.00
6	Secure	-0.05
7	OMC	0.26
8	Rental Car Center	0.00
9	Corporate/General Aviation	0.00
10	Parking Bowl	-0.02
11	Economy	0.25
12	Park N Fly	0.00
13	Park N Travel	0.00
14	VIP	0.00
15	Airpark Oakland	0.00
16	FastTrack	0.00
17	Fly N Save	0.00
18	Other	0.00

Source: Kittelson & Associates, Inc. 2022

Exhibit 16: Average Trip Length Comparison by Zone

Zone	Description	Existing Conditions Average Trip Length			Proposed Project Average Trip Length		
		2019	2028	2038	2019	2028	2038
1	FedEx	16.2	16.3	16.6	16.2	16.3	16.6
2	Neil Armstrong	19.9	20.1	20.4	20.0	20.2	20.5
3	UPS	19.9	20.1	20.4	19.2	19.4	19.7
4	SW Provisioning	19.9	20.1	20.4	19.3	19.5	19.8
5	Unsecure	19.9	20.1	20.4	19.9	20.1	20.4
6	Secure	19.9	20.1	20.4	19.9	20.1	20.4
7	OMC	19.9	20.1	20.4	20.2	20.4	20.7
8	Rental Car Center	14.7	14.7	14.6	14.7	14.7	14.6
9	Corporate/General Aviation	14.4	14.6	14.8	14.4	14.6	14.8
10	Parking Bowl	23.2	23.1	23.0	23.1	23.1	23.0
11	Economy	23.2	23.1	23.0	23.4	23.4	23.3
12	Park N Fly	23.2	23.1	23.0	23.2	23.1	23.0
13	Park N Travel	23.2	23.1	23.0	23.2	23.1	23.0
14	VIP	23.2	23.1	23.0	23.2	23.1	23.0
15	Airpark Oakland	23.2	23.1	23.0	23.2	23.1	23.0
16	FastTrack	23.2	23.1	23.0	23.2	23.1	23.0
17	Fly N Save	23.2	23.1	23.0	23.2	23.1	23.0
18	Other	17.3	17.3	17.3	17.3	17.3	17.3

Source: Kittelson & Associates, Inc. 2022

Proposed Project VMT

The changes to trip generation for the new employees and additional shuttle buses along with the changes to average trip length[9] were used to calculate the VMT with the addition of the Proposed Project. A comparison between the Proposed Project VMT and existing condition VMT is shown in Exhibit 17. As shown, the VMT per enplanement with the Proposed Project in 2028 and 2038 would be less than the VMT per enplanement under existing conditions. Since the 2028 and 2038 VMT with the Proposed Project is less than existing condition VMT, no significant VMT impacts are anticipated based on the significance criteria.

Exhibit 17: VMT Per Enplanement for Existing Conditions (2019) and 2028 and 2038 with the Proposed Project

	Existing Conditions	Proposed Project	
	2019	2028	2038
Car VMT	749,445	943,094	1,264,780
Bus VMT	16,437	23,011	31,533
VMT	765,882	966,105	1,296,314
Enplanements	16,516	21,709	30,473
VMT/Enplanement	**46.4**	**44.5**	**42.5**

Source: Kittelson & Associates, Inc. 2022

[9] Trip length estimation for the new shuttle bus routes was estimated using Google Maps as the round trip distance between the terminal boarding/alighting area and the proposed parking lot location.