

TO: Robert Palmer, PE, Strategic Land Solutions

FROM: Alexander E. Larson, PE

DATE: July 13, 2024 (Revised August 13, 2024)

SUBJECT: Traffic Memorandum - McDonald's Restaurant at Eagle Ridge
21360 E. 6th Ave Aurora, CO

CoA DA-2338-03 | PTE 24016 | SLS JN: 22-0001-195

Introduction

McDonald's Corporation is planning to develop a portion of Eagle Ridge Filing No.1 within the Eagle Ridge Master Planned Development (PD) with a new McDonald's Drive Thru Restaurant, parking, landscaping, drive aisles, and utility improvements (Project).

The purpose of this traffic memo is to confirm that the Project's traffic characteristics are in conformance with those base conditions in the original approved master traffic impact study, and address comments by Aurora staff during a previous review cycle.

Planned Development

The Eagle Ridge Master PD is located southwest of the Stephen B Hogan Pkwy and Piccadilly Rd intersection in Aurora, CO. The proposed site is illustrated in **Attached Figure A**. The PD's approved master traffic impact analysis (TIA), *Eagle Ridge Master TIA* [1] (Master TIA) included trip generation estimates for two phases across five Planning Areas (PA) within the PD.

Proposed Project

The Project is located at *21360 E. 6th Avenue, Aurora, CO* as shown in the Vicinity Map in **Figure 1** and illustrated within a portion of the master site plan in **Attached Figure B**. This traffic letter refers to the same Study Locations as the Master TIA and uses the same numbering conventions.

Land Use Scenarios

The Project is located within PA#1, as defined in the Master TIA. Two land use scenarios within PA#1 are evaluated in this memo, the Master TIA scenario and the Project Scenario, both of which are described in more detail below.

- **Master TIA Land Use Scenario.** The *Master TIA* land use scenario refers to the proposed land uses within PA#1 that were originally analyzed in the Master TIA. PA#1 and the individual parcels with specific assumed land uses are illustrated in **Attached Figure A**.

Figure 1 Project Vicinity Map



- **Project Land Use Scenario.** The *Project* land use scenario includes the Project, in place of two zones in the Master TIA. **Attached Figure B** indicates the Project location on the PD’s master site plan.

This section’s outcome is the identification of the total gross floor areas of each land use type for each land use scenario. Subsequently, the total GFA is used as the basis for the trip generation estimates in the following section. For comparison purposes, the PA#1 land uses and gross floor areas (GFA) under each scenario are summarized in **Attached Table A**.

The primary difference between the two land use scenarios is that the Project occupies both Zone 4 and Zone 5, as denoted in **Attached Table A** and **Attached Figure B**. This change results in the removal of land uses in the Project land use scenario, originally assumed as Bank and Drive-Thru in Zone 4 and Zone 5, respectively.

As a final note regarding land uses, the Project is the first proposed development within the PD, and information regarding other specific developments is not available at the time this traffic memo was prepared. As such, PA#2 through PA#5 are assumed to have **no net changes to land uses**, which naturally results in no changes to trips generated or traffic impacts. Therefore PA#2 through PA#5 are not evaluated in this memo, and the focus is placed on the differences within PA#1.

Trip Generation

The trip generation for both land use scenarios was estimated using the ITE Trip Generation [2] rates, as detailed in **Attached Table B** and **Attached Table C**. **Table 1** summarizes the total estimated trips in PA#1 from each attached table, and the resulting differences. Those differences, or Net New Project Trips, represent the estimated new trips introduced by the Project when compared to the original assumptions of the Master TIA land use scenario.

Table 1 Comparison of PA#1 Trip Generation Totals - Master TIA vs. Project Land Use Scenarios

Land Use Scenario	Avg Weekday Traffic	Morning Peak Hour (AM) (trips/h)		Afternoon Peak Hour (PM) (trips/h)	
		In (AM)	Out (AM)	In (PM)	Out (PM)
Master TIA	7,670	335	316	320	303
Project	7,830	340	326	302	284
Net New Project Trips (Trip Assignments)	160 2%	5 1%	10 3%	(18 5%)	(19 6%)

Notes:

1. Refer to Trip Generation details for each land use scenario in **Attached Table B** and **Attached Table C**.
2. Net New Project Trips do not include trip reductions for internal trip capture or pass-by trips.

Trip Assignments

The Net New Project Trips summarized in **Table 1** above are illustrated in **Figure 2** by turn movement at the Study Locations. The assignment of Net New Project Trips is based on the trip distribution used in the Master TIA.

Figure 2: Net New Project Trip Assignments (PA#1)



Capacity Evaluation

The magnitude of the Net New Project Trips shown in **Figure 2** highlight that very few Net New Project Trips are assigned to any individual turning movement at the Study Locations. For instance, in the morning (AM) peak period, the number of Net New Project Trips assigned to any turning movement ranges from one (1) to four (4) vehicles per hour, and in the afternoon (PM) peak period, the Net New Project Trips are reduced. These are very low hourly volumes that will have no appreciable impact on

estimated AM peak period delays compared to the analysis in the Master TIA. Additionally, during the PM peak period, the decrease in total trips generated and the negative Net New Project Trips assigned in **Figure 2** suggest that fewer new trips are expected in the PM peak period as a result of the Project than were originally assumed in the Master TIA. It is for these reasons that no new capacity analysis has been conducted as part of this traffic memo. To review the available capacity analysis of the Study Locations, please refer to the Master TIA [1].

The Net New Project Trips occur hourly, indicating that, for a given turning movement during the AM peak period, a single Net New Project Trip could occur as seldom as once every hour or as regularly as once every quarter of an hour.

Queueing Analysis

The Project proposes on-site queue storage capacity as follows. Refer also to the Project site plan excerpt in **Attached Figure C**.

1. 68 feet from 3rd window to payment window
2. 88 feet from payment window to merge point
3. 208 feet (total length of 2 lanes) from merge point to site property line
364 feet total storage capacity, or 18 vehicles

Two studies of drive-thru queue lengths, including one conducted in 2012 [3] and an updated report in 2019 [4] monitored and identified key measures about fast food drive-thru restaurant queue behaviors. The findings of each study are summarized in **Table 2**. The report from the 2012 study specifically stated that McDonald's restaurants were included in its sample, but the 2019 findings did not name specific restaurants included in its sample.

Table 2 Fast-Food Restaurant Drive-Thru Queue Generation Data

Measure	2012 Study [3]	2019 Study [4]
Number of Data Points	14	6
Average Maximum Queue (Vehicles)	8.50	8.00
Standard Deviation (Vehicles)	2.68	3.41
Coefficient of Variation	32%	43%
Range (Vehicles)	5 to 13	5 to 14
85 th Percentile Queue Length (Vehicles)	12.00	13.80
33 rd Percentile Queue Length (Vehicles)	7.90	6.00
85 th Percentile Queue Length (Feet)	240	260

The Project's proposed drive-thru provides queue storage of 364 feet or 18 vehicles, which is longer than the 85th percentile queues from either study (12.00 and 13.80 vehicles) and exceeds the highest maximum queue length (13 and 14 vehicles) observed in either study.

Conclusion

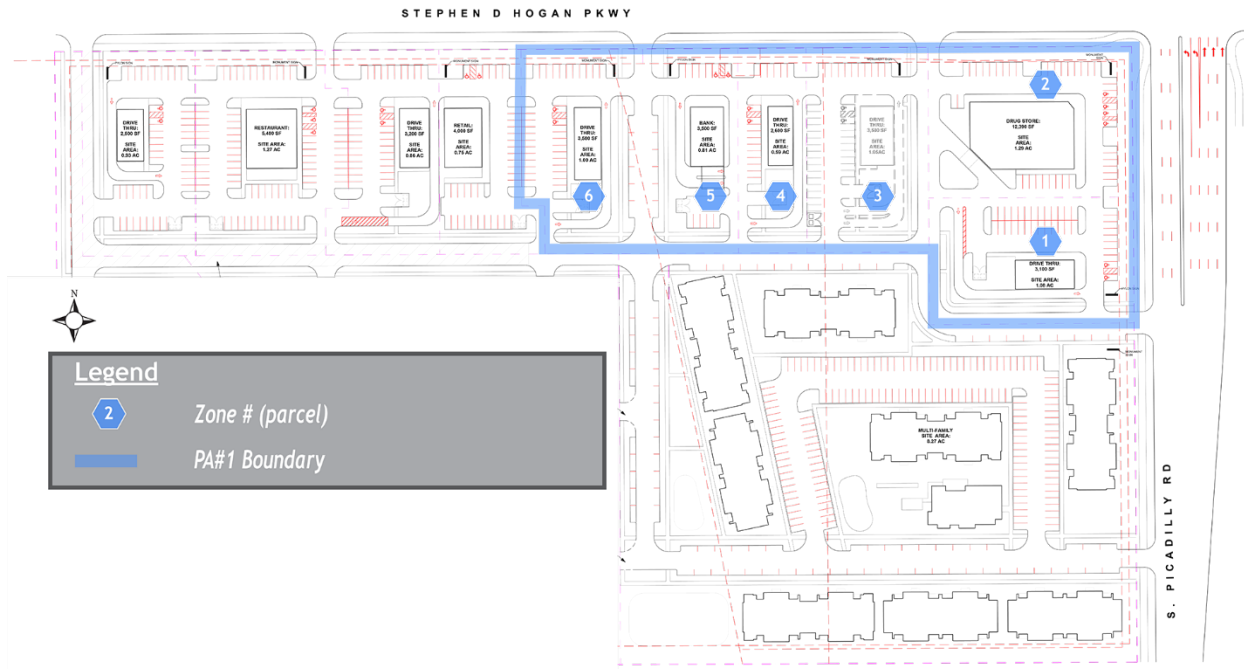
This memo demonstrated that a proposed new McDonald's Drive Thru Restaurant, parking, landscaping, drive aisles, and utility improvements at Lot 2 of Eagle Ridge Filing No.1 within the Eagle Ridge Master Planned Development is in conformance with the Eagle Ridge Master Planned Development's Master Traffic Impact Analysis and according to the cited data source, the drive-thru provides a queue storage capacity that will maintain queues within its property lines.

References

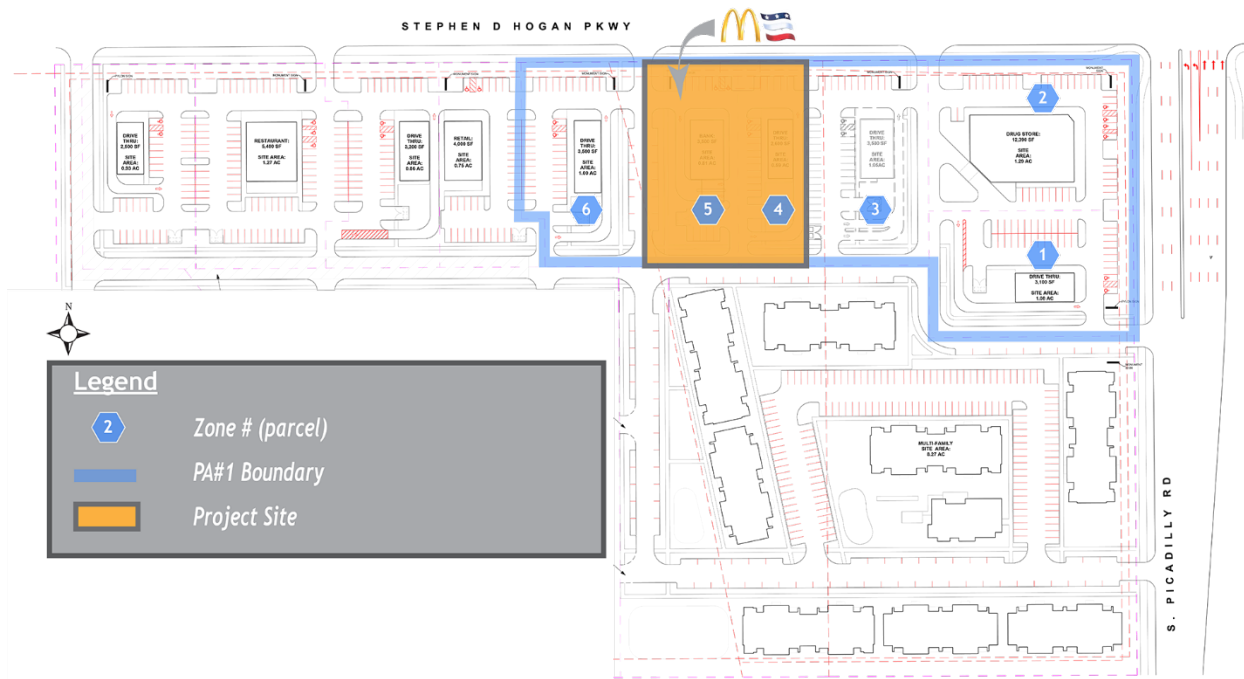
- [1] LSC Transportation Consultants, "Eagle Ridge Traffic Impact Analysis (Master)," 31 March 2023.
- [2] Institute of Transportation Engineers, "ITE Trip Generation Manual, 11th Edition," Transoft Solutions, Inc., 2021. [Online]. Available: <https://itetripgen.org/>.
- [3] M. Spack, M. Moreland, L. de Leeuw and N. Hood, "Drive-Through Queue Generation," 2012.
- [4] "Drive-Thru Queue Generation," Spack Solutions, 2019.

Attachments

Attached Figure A Master TIA Land Use Assumptions



Attached Figure B Project Land Use Assumptions



Attached Table A: PA#1 Gross Floor Areas (GFA) by Zone #s and Land Use Scenario

Development Scenario	Zone # (refer to Attached Figure A & Attached Figure B)	Bank	Drug Store	Drive-Thru (TBD)	Drive-Thru (Project)
Master TIA	1			3.10	
	2		12.39		
	3			3.50	
	4			2.60	
	5	3.50			
	6			3.58	
	Totals:	3.50	12.39	12.78	0.00
Project	1			3.10	
	2		12.39		
	3			3.50	
	4 & 5*				3.69*
	6			3.58	
	Totals:	0.00	12.39	10.18	3.69

Table Note:

* Proposed Project

Attached Table B: Summary of Eagle Ridge PA#1 Trip Generation Scenario - Master TIA

ITE Land Use	Trip Gen Qty	Trip Gen Units	Avg Weekday Traffic (Rate) (trips/unit)	In (AM Rate) (trips/unit)	Out (AM Rate) (trips/unit)	In (PM Rate) (trips/unit)	Out (PM Rate) (trips/unit)	Avg Weekday Traffic (trips/d)	In (AM) (trips/h)	Out (AM) (trips/h)	In (PM) (trips/h)	Out (PM) (trips/h)
934 Fast-Food Restaurant with Drive-Through Window	12.78	KSF	467.480	22.751	21.859	17.176	15.854	5,974	291	279	220	203
912 Drive-in Bank	3.5	KSF	100.350	5.771	4.179	10.505	10.505	351	20	15	37	37
881 Pharmacy/Drugstore with Drive-Through Window	12.4	KSF	108.400	1.945	1.795	5.125	5.125	1,344	24	22	64	64
								7,670	335	316	320	303

Attached Table C: Summary of Eagle Ridge PA#1 Trip Generation Scenario - Project

Land Use Description	Trip Gen Qty	Trip Gen Units	Avg Weekday Traffic (Rate) (trips/unit)	In (AM Rate) (trips/unit)	Out (AM Rate) (trips/unit)	In (PM Rate) (trips/unit)	Out (PM Rate) (trips/unit)	Avg Weekday Traffic (trips/d)	In (AM) (trips/h)	Out (AM) (trips/h)	In (PM) (trips/h)	Out (PM) (trips/h)
934 Fast-Food Restaurant with Drive-Through Window (Project)	3.694	KSF	467.480	22.751	21.859	17.176	15.854	1,727	84	81	63	59
934 Fast-Food Restaurant with Drive-Through Window (Other)	10.18	KSF	467.480	22.751	21.859	17.176	15.854	4,759	232	223	175	161
912 Drive-in Bank	0	KSF	100.350	5.771	4.179	10.505	10.505	-	-	-	-	-
881 Pharmacy/Drugstore with Drive-Through Window	12.4	KSF	108.400	1.945	1.795	5.125	5.125	1,344	24	22	64	64
								7,830	340	326	302	284

Attached Figure C Project Drive Thru Queue Storage

