Appendix FEIR-7

Processing Time and Queuing Memorandum

MEMORANDUM

TO: Stephanie Eyestone-Jones, Eyestone Environmental

FROM: Patrick A. Gibson, P.E., PTOE
             Jonathan Chambers, P.E.

DATE: February 2, 2023

RE: Confirmation of Adequate Entry Gate Locations and Queuing Areas
             for Television City
             Los Angeles, California   **Ref:** J1750a

This memorandum documents queuing assumptions and resulting entry configuration requirements for Television City (Project). The determination of inbound queues at controlled gate entry driveways requires an estimate of: (a) the inbound volume to be processed; (b) the mix of various types of vehicles to be served; (c) the processing time to serve each vehicle type; and (d) the number of gates available. In the case of the Project, the estimates for (a), (b), and (c) would yield the number of gates (d) required and the likely queues behind each of the inbound gates.

INBOUND VOLUMES

Queue lengths at Project driveways were evaluated in Section 5B of the Transportation Assessment (Appendix M.1 of the Draft EIR) as part of the non-CEQA transportation analysis. Figure 25 of the Project's Transportation Assessment showed the number of entering and exiting vehicles at each Project gate for both the morning and afternoon peak hours. These volumes consist of employees, trucks, and site visitors (including audience visitors).

PROCESSING TIMES

Although not required by the Los Angeles Department of Transportation (LADOT) or the *LADOT Transportation Assessment Guidelines* (July 2020, amended in August 2022), to confirm that the proposed vehicular entrance gate locations and queuing areas are adequate in response to comments, field studies of inbound processing times were conducted at three Southern California studio complexes: Television City, Radford Studio Center, and The Culver Studios. The studies were conducted during the morning and afternoon peak hours, measuring the time it took to process the three different types of inbound vehicles. Table 1 summarizes the detailed results at the Project Site. All data from Television City was collected at the Beverly Boulevard gate because it serves employees, visitors, and trucks today whereas the Fairfax Avenue gate only serves employees.

When all the empirical data from the three studios was compiled and reviewed, the processing times calculated were:

Vehicle Type	Processing Time
Employee Auto	9 seconds
Visitor/Audience Auto	30 seconds
Truck	60 seconds

These processing times represent the upper end of the range for each vehicle type and are, therefore, considered conservative (i.e., high) when applied to every vehicle entering the Project Site.

Table 2 shows the calculation of average processing times when applied to the three signalized gates into the Project Site for the morning and afternoon peak hours. The signalized driveways on Beverly Boulevard and The Grove Drive would provide one lane for visitors, audience members, and trucks and one or more additional lanes exclusively for employees (who would have key card access and would not need to interact with security staff). Employees would also be able to use the visitor/audience/truck lane using their key cards as needed.

QUEUING CALCULATIONS

The Poisson Distribution is the industry standard distribution calculation for converting an inbound flow from a smooth average flow to a random arrival pattern. By applying this random distribution pattern to the inbound hourly flow, the calculation will estimate the magnitude of queue lengths during peak demand. The peak hour inbound flow at each driveway was simulated 1,000 times to determine the maximum queue length that would result from each simulation test. This exercise used the 95th percentile queue length to determine the required queue length for each inbound lane. The 95th percentile means that out of the 1,000 tests, the maximum number of cars queued behind the entrance gate would be equal to or less than the calculated length 95% of the time.

Table 3 shows the application of a Poisson Distribution arrival pattern to the anticipated inbound gates at the three signalized entrances to the Project Site during the peak hours. It reports the 85th and 95th percentiles queues. As shown in Table 3, the 95th percentile queue would be four vehicles at the Fairfax Avenue driveway (assumed to share a single lane), four vehicles at the Beverly Boulevard driveway (distributed across two lanes), and six vehicles at The Grove Drive driveway (distributed across two lanes, conservatively excluding the availability of a third reversible lane during the morning peak hours). The detailed Poisson Distribution outputs are provided in the Attachment.

RECOMMENDED DRIVEWAY INBOUND STORAGE

The morning peak hour has the highest inbound peak volumes, so it was used to test the inbound queuing requirements. The results of the 95th percentile queuing test demonstrate that the three signalized inbound gates would require the following storage lengths (assuming 25 feet per vehicle, which is an industry-standard average distance assumption for a vehicle plus a gap before a following queued vehicle):

Driveway	Inbound Storage Required	Inbound Storage Provided (per lane)
Fairfax Avenue	100 feet	100 feet
Beverly Boulevard	50 feet	125 feet
The Grove Drive	75 feet	160 feet

As shown above, all three gates provide equal to or more storage than required by the 95th percentile calculations.

TABLE 1
PROCESSING TIME AT STUDIO GATE ENTRY - TELEVISION CITY

Beverly Gate, June 10, 2022

Morning Peak Hour				Afternoon Peak Hour	
Total Records	43			Total Records	27
Average (s)	00:19.7			Average (s)	00:52.4
Time	**Type of Visitor**	**Time**	**Type of Visitor**	**Time**	**Type of Visitor**
00:16.3	Production guest	00:21.5	Production guest	00:18.4	Vendor
00:16.8	Production guest	00:17.4	Production guest	00:43.0	Vendor
00:19.9	Production guest	00:13.6	Production guest	01:40.8	Vendor
00:19.2	Production guest	00:12.9	Production guest	00:15.2	Vendor
00:52.1	Production guest	00:19.3	Production guest	00:18.9	Vendor
00:12.8	Production guest	00:15.9	Production guest	00:29.3	Vendor
00:13.9	Production guest	00:16.2	Production guest	01:16.0	Vendor
00:16.8	Production guest	00:19.5	Production guest	00:19.2	Guest
00:19.4	Production guest	00:32.0	Production guest	00:16.0	Guest
00:13.2	Production guest	00:21.5	Production guest	01:17.9	Vendor
00:14.8	Production guest	00:12.2	Production guest	00:50.5	Production guest
00:32.1	Production guest	00:14.2	Production guest	00:19.1	Guest
00:13.2	Production guest	00:20.7	Production guest	00:49.5	Guest
00:13.4	Production guest	00:21.3	Production guest	01:11.4	Vendor
00:10.0	Production guest	00:18.2	Production guest	00:41.9	Vendor
00:20.2	Production guest	00:21.3	Production guest	00:43.8	Guest
00:22.4	Production guest	00:27.8	Production guest	00:44.0	Guest
00:49.8	Vendor	00:20.4	Production guest	00:37.4	Guest
00:16.8	Production guest	00:21.8	Production guest	00:32.9	Guest
00:16.0	Production guest	00:15.7	Production guest	00:44.8	Guest
00:12.1	Production guest	00:12.4	Production guest	01:14.3	Guest
00:10.1	Vendor	00:16.2	Production guest	01:02.8	Guest
00:12.9	Production guest	00:25.1	Production guest	00:22.0	Guest
00:20.9	Vendor	02:10.1	Production guest	00:31.8	Guest
00:16.6	Production guest	00:21.7	Production guest	03:33.3	Guest
00:20.8	Production guest	00:18.9	Production guest	01:09.8	Vendor
00:16.9	Production guest	01:10.2	Vendor	01:31.4	Guest
00:15.4	Production guest	00:20.7	Production guest		
00:20.6	Production guest	00:18.9	Guest		
00:18.0	Production guest	01:01.7	Production guest		
00:17.2	Production guest	00:04.4	Vendor		
00:17.3	Production guest	00:16.6	Vendor		
00:48.7	Employee	00:25.8	Vendor		
00:11.2	Production guest	00:22.7	Production guest		
00:12.9	Production guest	00:12.0	Production guest		
00:12.5	Production guest	00:23.5	Vendor		
00:45.2	Production guest	00:56.5	Production guest		
00:15.4	Production guest	00:26.1	Production guest		
00:15.0	Production guest	00:58.5	Vendor		
00:29.2	Production guest	00:22.1	Production guest		
00:14.9	Production guest	00:25.0	Production guest		
00:11.8	Production guest	05:20.6	Production guest		
00:21.9	Production guest	00:21.7	Production guest		

TABLE 2
AVERAGE INBOUND PROCESSING TIME AT TELEVISION CITY STUDIO GATES

Location and Vehicle Type	Peak Hour Vehicle Volume	Average Processing Time (s)	Total Processing Time (s)	Average Overall Processing Time (s)
Morning Peak Hour				
Fairfax Avenue at First Street				
Employee Car	129	9	1,161	
Visitor/Audience	14	30	420	
Truck	0	60	0	
TOTAL	143		1,581	11.1
Beverly Boulevard at Genesee Avenue				
Employee Car	241	9	2,169	
Visitor/Audience	27	30	810	
Truck	6	60	360	
TOTAL	274		3,339	12.2
The Grove Drive				
Employee Car	289	9	2,601	
Visitor/Audience	33	30	990	
Truck	6	60	360	
TOTAL	328		3,951	12.0
Afternoon Peak Hour				
Fairfax Avenue at First Street				
Employee Car	45	9	405	
Visitor/Audience	15	30	450	
Truck	0	60	0	
TOTAL	60		855	14.3
Beverly Boulevard at Genesee Street				
Employee Car	81	9	729	
Visitor/Audience	46	30	1,380	
Truck	3	60	180	
TOTAL	130		2,289	17.6
The Grove Drive				
Employee Car	91	9	819	
Visitor/Audience	42	30	1,260	
Truck	3	60	180	
TOTAL	136		2,259	16.6

TABLE 3
QUEUE LENGTHS AT TELEVISION CITY STUDIO GATES

Location and Vehicle Type	Fairfax Avenue at First Street	Beverly Boulevard at Genesee Avenue	The Grove Drive
Morning Peak Hour			
[a] Total Volume	143	274	328
[a] Average Processing Time	11.1	12.2	12.0
Number of Lanes	1 [b]	2	2 [c]
[d] 85th Percentile Queue	3	3	4
[d] 95th Percentile Queue	4	4	6
95th Percentile Queue per Lane	4	2	3
Afternoon Peak Hour			
[a] Total Volume	60	130	136
[a] Average Processing Time	14.3	17.6	16.6
Number of Lanes	1 [b]	2	2
[d] 85th Percentile Queue	1	1	1
[d] 95th Percentile Queue	2	2	2
95th Percentile Queue per Lane	2	1	1

Notes:

[a] See Table 2.

[b] One lane would be dedicated to passenger vehicles going to park. A second lane would be dedicated to trucks. For a conservative analysis, one combined lane was assumed.

[c] While this driveway proposes to have one reversible lane which would typicaly be used for inbound traffic during the morning peak hour, that lane was conservatively excluded from this analysis.

[d] See Attachment for detailed Poisson queue results.

Attachment

Queuing Worksheets

Queuing Worksheet - Poisson Distribution

Fairfax Driveway - Mixed-Flow Lane - Morning Peak Hour

Gibson Transportation Consulting, Inc.
January 2023

Inputs

Lanes:	1
Average Transaction Time (s):	11.1
Transactions per Minute:	5.41
Number of Hours:	2
Number of Periods:	8
Average Peak Hour Arrivals:	143

15-Minute Periods	Volume
1	31
2	34
3	39
4	43
5	40
6	36
7	33
8	30

Outputs

Max Cars in Queue	Frequency	Percentile
0	9	0.9%
1	172	18.1%
2	416	59.7%
3	261	85.8%
4	108	96.6%
5	29	99.5%
6	4	99.9%
7	1	1

Total Queue Percentiles

85th Percentile:	3
90th Percentile:	4
95th Percentile:	4

Maximum Queues (1,000 test runs)

```
3 3 3 5 2 1 3 3 2 4 3 2 2 2 0 2 4 4 2 1 4 3 1 1 2
2 4 3 2 3 4 2 2 2 2 3 2 2 2 4 1 2 2 1 2 3 2 3 2 2
4 4 2 2 3 4 2 2 2 2 2 3 4 2 4 2 2 2 5 5 3 2 3 2 2
2 1 3 3 2 2 1 2 2 3 2 4 2 3 1 2 3 2 1 1 3 1 4 3 4
2 2 5 3 1 2 3 3 2 3 2 2 3 3 1 3 2 2 2 2 2 3 3 2 2
1 4 2 1 4 2 2 2 2 1 3 3 3 2 3 2 2 2 1 3 2 2 1 1 2
3 1 4 2 0 4 2 3 1 2 4 4 3 2 1 2 4 1 4 2 2 5 4 2 1
2 1 2 1 2 3 2 2 3 2 1 3 1 4 3 5 1 4 4 2 2 2 1 2 3
3 0 2 4 3 4 2 1 2 4 2 4 3 1 2 2 2 2 1 2 2 4 3 1 1
2 3 2 3 2 2 2 1 2 4 3 2 4 3 2 1 3 1 1 3 2 3 1 3 3
2 2 3 3 3 3 2 2 6 4 2 1 2 2 1 2 3 2 3 1 2 2 2 3 1
3 3 2 5 1 2 2 2 2 2 3 2 2 3 2 3 2 2 1 2 3 3 2 4 2
4 2 3 2 1 2 2 3 4 1 3 2 6 1 1 2 4 2 3 2 2 1 2 2 2
2 1 2 1 2 2 1 2 3 3 1 2 2 5 1 3 2 2 4 2 4 2 4 3 1
2 2 2 1 4 3 4 3 5 2 2 1 2 1 2 1 4 2 0 3 2 2 3 1 2
2 3 1 3 4 2 2 1 1 1 2 3 2 5 2 2 2 2 3 3 2 1 0 4 2
2 3 2 1 0 2 2 3 3 2 1 2 1 3 3 2 1 2 2 3 4 2 2 2 2
3 3 1 4 2 2 2 1 4 3 2 2 2 3 2 2 1 2 1 1 3 3 3 1 2
1 3 4 2 5 4 2 2 2 2 2 2 3 1 3 4 1 3 4 4 3 2 2 7 4
2 3 1 1 2 2 2 2 5 2 4 4 3 2 4 2 1 2 3 1 2 2 3 2 1
2 2 4 3 2 2 4 3 1 2 2 2 4 1 1 1 4 2 3 3 3 0 2 1 2
3 1 2 1 3 1 1 4 2 4 2 2 3 1 3 2 2 4 2 1 3 5 3 2 2
2 4 1 3 2 4 2 3 2 2 2 1 2 2 3 1 1 2 2 4 2 2 3 5 4
2 2 2 4 3 2 4 3 3 2 1 5 6 3 4 2 3 2 3 3 2 2 3 2 1
3 2 3 2 2 2 3 2 3 2 3 1 2 2 2 2 2 3 3 1 3 3 3 3 2
3 4 2 3 5 3 3 3 3 4 2 2 1 3 1 2 3 1 2 2 2 5 2 1 3
2 3 4 2 1 1 3 3 3 2 2 3 4 2 3 4 3 2 4 1 1 2 1 2 3
3 1 3 3 3 3 4 2 2 5 2 3 3 1 1 2 1 1 1 2 2 3 2 3 1
1 2 2 1 3 2 3 3 3 2 2 5 1 2 3 1 3 4 4 2 1 2 2 2 4
2 2 3 5 2 3 3 2 3 2 3 2 3 1 1 2 2 3 2 1 2 2 2 1 1
2 2 3 2 3 2 2 1 2 4 1 2 0 1 5 2 1 2 1 2 2 2 4 4 0
4 2 2 3 3 5 2 3 3 3 4 3 3 3 3 1 2 5 2 2 1 5 4 1 3
2 3 4 6 2 2 4 2 1 2 2 2 3 5 3 3 2 3 3 3 2 1 4 2 1
```

Queuing Worksheet - Poisson Distribution

Fairfax Driveway - Mixed-Flow Lane - Afternoon Peak Hour

Gibson Transportation Consulting, Inc.
January 2023

Inputs

Lanes:	1
Average Transaction Time (s):	14.3
Transactions per Minute:	4.20
Number of Hours:	2
Number of Periods:	8
Average Peak Hour Arrivals:	60

15-Minute Periods	Volume
1	13
2	14
3	16
4	18
5	17
6	15
7	14
8	13

Outputs

Max Cars in Queue	Frequency	Percentile
0	588	58.8%
1	328	91.6%
2	76	99.2%
3	8	100.0%

Total Queue Percentiles

85th Percentile:	1
90th Percentile:	1
95th Percentile:	2

Maximum Queues (1,000 test runs)

```
2 0 0 1 1 1 1 0 0 1 0 1 0 0 0 1 1 0 0 0 2 0 1 0 1
1 1 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 2 1 0 0 0 0 1 0
1 1 2 0 0 0 0 0 1 2 1 0 0 0 0 0 2 1 0 1 0 1 1 1 0
2 0 1 1 0 0 1 0 2 0 1 2 1 1 0 1 1 0 0 0 0 2 0 0 0
1 1 0 0 1 1 2 1 0 0 2 0 1 0 0 0 0 0 1 1 3 0 0 1 1
1 1 1 1 0 0 0 0 1 0 0 1 0 0 1 1 1 0 1 1 0 2 0 0 0
0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 1 0 1 2 0 0 0 1 2 0
0 0 1 0 0 1 0 1 0 1 1 0 0 0 1 0 1 0 1 1 0 1 2 0 2
1 1 1 1 0 1 1 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0
1 0 2 2 1 0 0 0 1 1 1 0 1 1 1 1 1 0 2 1 1 0 1 0 0
0 0 1 0 1 0 1 0 0 3 0 0 1 0 2 0 0 0 0 1 1 0 1 1 1
2 2 1 0 1 0 1 2 0 0 2 1 0 0 0 0 0 1 0 0 0 0 0 0 0
0 1 0 0 2 0 0 0 0 0 0 0 0 1 1 2 0 1 1 0 0 1 0 0 1
1 0 0 1 0 0 1 0 1 0 0 1 1 0 1 0 0 0 0 1 0 1 1 1 0
0 1 0 0 0 1 0 0 0 2 2 0 0 0 0 0 0 1 1 2 0 2 1 0 3
1 0 0 0 0 0 0 0 1 0 0 0 1 0 0 1 0 0 0 0 1 0 0 1 1
0 1 0 1 2 1 0 2 0 1 0 0 1 1 0 2 0 0 1 0 0 0 0 0 0
0 0 0 1 0 0 1 0 1 1 0 2 1 0 0 0 2 1 0 2 0 1 0 0 0
0 0 1 0 0 0 1 1 0 0 1 0 0 1 0 0 2 1 0 1 1 0 0 1 2
1 1 2 1 0 1 0 0 1 1 1 0 1 0 0 1 0 0 0 0 0 0 1 0 0
0 0 0 2 1 0 0 1 0 0 1 1 1 1 1 0 0 0 0 1 1 1 1 1 0
1 0 0 0 1 2 1 0 0 2 0 0 0 0 2 1 1 0 2 0 0 0 1 1 0
0 0 1 1 0 1 0 0 3 1 0 0 1 1 0 0 0 0 0 1 0 0 0 0 0
1 1 1 1 2 1 0 1 0 0 0 1 0 2 1 0 0 0 0 0 1 0 2 1 1
1 1 0 1 0 0 0 3 0 1 0 0 1 0 0 1 2 1 0 0 2 1 0 0 0
0 1 0 0 0 0 1 1 0 1 0 0 0 0 2 2 0 1 0 0 0 0 1 0 1
1 0 1 1 0 0 1 1 1 1 0 1 1 1 1 0 1 0 1 2 0 2 0 0 0
0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 1 1 1 0 0 1 0 0 1 0
0 0 0 1 0 2 1 0 1 1 1 0 0 3 1 0 0 0 2 0 0 0 2 0 1
1 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 0 0 0 0 1 1 0 1
0 1 2 1 0 1 0 0 1 1 2 0 1 1 0 0 0 0 0 2 1 0 0 1 0
0 0 0 2 0 3 0 0 2 1 0 2 0 0 1 0 0 0 0 1 0 0 0 0 0
0 2 1 1 0 0 0 1 1 2 0 1 1 1 0 0 0 1 0 0 0 1 0 2 1
0 1 0 1 0 0 1 0 1 0 0 0 1 0 0 0 0 0 1 1 0 0 0 0 1
1 0 0 0 0 1 1 1 0 0 0 1 0 1 1 1 0 0 1 0 1 0 1 0 0
0 2 1 0 0 0 0 0 2 1 0 0 1 1 0 0 1 1 0 0 0 1 1 1 1
0 0 0 1 0 1 0 1 0 0 1 0 0 0 0 0 1 3 0 2 1 0 0 0 0
1 0 0 0 0 0 0 0 1 1 0 2 0 1 1 0 1 0 1 1 0 2 1 0 0
1 0 1 0 0 1 0 1 0 0 0 2 0 0 0 0 0 0 0 0 0 1 0 0 0
1 0 0 1 0 0 1 0 0 0 1 0 1 2 0 0 2 0 0 0 1 0 0 1 0
```

Queuing Worksheet - Poisson Distribution

Beverly & Genesee Driveway - Two Lanes - Morning Peak Hour

Inputs

Lanes:	2
Average Transaction Time (s):	12.2
Transactions per Minute:	9.84
Number of Hours:	2
Number of Periods:	8
Average Peak Hour Arrivals:	274

15-Minute Periods	Volume
1	60
2	66
3	74
4	82
5	77
6	69
7	63
8	58

Outputs

Max Cars in Queue	Frequency	Percentile
0	290	29.0%
1	325	61.5%
2	233	84.8%
3	93	94.1%
4	42	98.3%
5	15	99.8%
6	2	100.0%

Total Queue Percentiles

85th Percentile:	3
90th Percentile:	3
95th Percentile:	4

Maximum Queues (1,000 test runs)

```
0 1 2 1 0 0 0 2 3 2 2 4 2 1 1 1 3 0 2 3 0 1 1 0 4
1 2 0 2 3 0 2 0 0 1 2 1 0 0 0 1 2 2 1 0 4 2 5 2 0
3 1 6 2 1 2 4 2 1 0 3 2 0 1 1 3 2 3 0 4 0 0 2 1 4
1 3 3 0 3 1 2 0 1 1 0 3 0 2 0 0 5 1 2 1 1 1 0 0 0
1 1 1 1 0 1 0 2 2 2 2 0 4 0 2 0 3 0 0 0 2 0 0 2 3
1 1 2 2 5 3 2 1 3 0 1 1 0 3 2 0 3 1 2 1 0 0 1 0 0
1 0 1 2 1 0 5 0 2 2 2 3 2 1 1 3 2 0 3 1 0 1 2 6 3
4 2 0 2 2 1 1 0 0 1 1 3 1 0 0 0 1 2 1 1 1 1 2 1 0
3 0 0 0 3 1 0 1 4 1 3 1 4 2 0 2 0 3 2 2 2 0 0 0 0
1 0 1 2 4 0 0 2 2 1 0 1 1 1 1 0 1 1 0 0 1 2 2 0 1
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0 1 2 1 2 0 0 3 1 1 3 1 1 1 2 2 2 3 0 1 0 1 0 2 1
1 1 2 2 1 1 0 2 1 1 2 1 1 4 0 0 0 1 2 4 1 3 1 0 2
5 1 2 1 0 3 1 1 0 1 0 1 1 1 0 2 1 1 0 1 0 2 4 0 0
0 2 0 0 0 0 1 1 2 3 0 2 0 0 1 0 4 1 3 0 1 0 0 1 1
2 0 1 4 0 1 0 0 5 2 2 1 0 1 1 1 1 2 5 0 1 3 0 1 1
1 1 3 0 1 2 3 2 1 0 1 0 2 1 2 3 0 2 1 1 0 0 1 2 1
1 1 2 1 2 2 0 1 0 4 2 0 0 0 0 0 2 2 0 1 1 2 0 1 5
1 0 2 0 1 4 2 0 2 2 0 3 0 3 3 0 0 0 0 3 3 1 1 0 1
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2 1 2 2 4 3 1 0 0 4 0 4 0 1 3 0 1 2 2 2 1 1 1 3 2
0 1 1 0 1 0 1 1 0 1 1 1 1 1 0 0 1 2 3 1 2 1 0 0 1
4 0 0 1 1 1 2 3 1 0 0 2 2 1 2 0 2 1 1 2 1 2 0 1 1
0 0 2 3 2 2 1 2 1 1 3 2 0 0 3 2 2 1 2 1 1 1 3 3 1
0 1 4 0 2 2 0 0 1 2 0 2 0 1 0 1 3 1 1 1 2 2 1 1 3
0 1 0 0 5 2 0 2 1 0 0 1 2 2 0 0 2 3 0 1 1 0 1 0 2
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3 0 0 2 3 0 0 1 0 3 2 0 2 0 2 0 1 2 1 1 1 2 0 0 1
1 1 3 1 0 0 3 4 2 2 1 0 3 5 4 2 0 1 4 2 1 1 1 0 0
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1 2 2 2 1 2 0 2 2 0 0 1 2 1 2 0 2 1 2 0 1 0 0 1 2
1 1 0 4 0 0 1 0 2 2 0 1 1 1 2 5 3 2 1 2 2 1 2 1 1
1 1 1 2 2 0 0 0 0 0 0 0 1 1 1 2 2 0 4 3 2 2 2 1 3
2 1 2 1 2 2 1 0 1 1 2 2 4 0 1 0 1 2 1 2 1 1 0 2 4
1 1 1 2 0 2 1 4 1 3 3 1 0 2 0 4 1 2 2 1 0 0 3 1 0
2 5 4 1 1 1 1 1 1 1 0 2 2 0 1 2 0 3 0 0 2 3 1 0 2 4
```

Queuing Worksheet - Poisson Distribution

Beverly & Genesee Driveway - Two Lanes - Afternoon Peak Hour

Inputs

Lanes:	2
Average Transaction Time (s):	17.6
Transactions per Minute:	6.82
Number of Hours:	2
Number of Periods:	8
Average Peak Hour Arrivals:	130

15-Minute Periods	Volume
1	29
2	31
3	35
4	39
5	36
6	33
7	30
8	27

Outputs

Max Cars in Queue	Frequency	Percentile
0	759	75.9%
1	178	93.7%
2	47	98.4%
3	16	100.0%

Total Queue Percentiles

85th Percentile:	1
90th Percentile:	1
95th Percentile:	2

Maximum Queues (1,000 test runs)

```
0 0 0 0 0 0 0 0 1 0 1 0 0 0 2 0 0 1 0 0 0 0 0 1 0
0 1 0 1 0 0 0 2 0 0 0 0 0 0 0 0 1 0 2 3 0 0 0 0 0
1 0 0 0 1 0 0 1 0 0 0 3 2 1 1 1 0 0 0 0 0 0 0 2 1
0 0 0 0 0 2 0 0 1 1 0 0 0 0 1 0 0 0 1 0 0 0 0 0 1
0 0 0 1 0 0 0 0 0 0 0 1 0 2 0 0 0 0 0 0 1 0 0 1 0
1 0 0 0 1 1 0 0 0 0 0 0 1 0 0 0 0 1 0 1 0 0 1 0 2
0 1 0 0 0 1 0 0 0 0 0 1 0 0 0 1 1 0 0 0 2 1 0 1 0
0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 1 0 1 0 0 1 0 0 0 0
1 0 0 0 1 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 1 0
0 0 1 0 0 0 3 1 0 0 0 0 0 1 0 0 3 0 1 0 0 0 0 0 1
2 0 0 0 1 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 1 1 0 3
0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 1 0 0 0 0 0 1 2 0 0 0 0 0 0 0 1 0 1 0 0 0 1
0 0 0 0 0 0 1 0 0 0 0 3 2 0 0 1 1 1 1 0 2 0 1 0 0
0 1 0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0
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0 0 1 0 0 0 1 1 0 0 0 2 0 0 0 2 1 0 0 0 0 0 1 0 0
1 2 0 1 0 1 0 0 0 0 1 0 0 0 2 0 0 0 0 1 0 0 0 0 0
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0 0 0 1 1 0 2 0 0 0 1 1 0 0 0 2 0 0 0 0 0 0 0 0 0
0 0 3 0 1 0 0 0 0 0 0 0 1 1 1 0 1 0 0 1 1 0 0 0 3
2 2 0 0 0 0 0 0 0 0 0 1 0 0 0 2 0 0 0 1 0 3 0 1 0
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0 0 1 0 0 0 0 0 0 0 1 0 0 1 0 1 0 1 0 0 1 0 3 1 0
0 0 0 2 0 0 0 0 2 0 1 0 0 0 0 0 0 1 1 0 0 1 0 2 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0
0 2 1 0 0 0 0 2 0 0 0 0 0 1 0 0 1 0 0 0 0 0 1 0 0
0 0 0 1 0 0 0 0 2 0 0 0 1 0 0 0 0 0 0 1 1 0 0 0 0
0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0
1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 1 2 0 0 0 0 0 0 0 1 1 1 2 0 1 2 0 0 0 0 0 3
0 1 2 0 0 0 1 1 1 1 0 1 2 0 0 0 0 0 0 1 0 0 0 0 0
0 0 0 0 1 1 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 1 0 2 0
0 0 0 2 2 0 0 0 0 0 0 0 0 1 0 0 0 2 0 1 2 0 1 0 0
0 0 1 0 0 0 1 0 0 0 0 0 0 1 0 1 1 0 0 0 0 0 0 1 0
0 1 0 0 0 1 0 0 0 2 0 0 0 0 1 0 0 1 2 0 0 0 0 0 1
0 0 0 0 1 0 0 0 0 1 0 0 0 0 0 2 0 0 0 0 0 1 0 0 1
1 3 0 0 0 0 0 1 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0
```

Queuing Worksheet - Poisson Distribution

The Grove Drive Driveway - Two Lanes - Morning Peak Hour

Inputs

Lanes:	2
Average Transaction Time (s):	12.0
Transactions per Minute:	10.00
Number of Hours:	2
Number of Periods:	8
Average Peak Hour Arrivals:	328

15-Minute Periods	Volume
1	72
2	79
3	89
4	98
5	92
6	82
7	75
8	69

Outputs

Max Cars in Queue	Frequency	Percentile
0	25	2.5%
1	142	16.7%
2	269	43.6%
3	269	70.5%
4	151	85.6%
5	78	93.4%
6	42	97.6%
7	16	99.2%

Total Queue Percentiles

85th Percentile:	4
90th Percentile:	5
95th Percentile:	6

Maximum Queues (1,000 test runs)

```
3 2 1 2 3 2 3 7 1 2 8 1 6 2 5 3 5 4 3 4 3 5 1 2 0
2 3 2 3 3 5 2 6 3 1 2 4 4 3 3 3 5 5 2 4 2 4 4 3 5
7 2 2 3 2 4 2 4 5 3 2 3 3 4 4 2 2 1 3 2 0 6 3 4 1
2 2 4 3 5 3 3 3 3 2 4 5 6 5 4 1 6 4 2 3 3 2 5 3 1
5 5 1 4 2 6 2 4 3 3 3 4 0 3 2 3 2 2 4 3 0 1 0 3 3
3 1 3 3 1 1 2 4 4 2 2 2 2 4 6 2 3 0 3 5 4 5 6 2 2
2 5 3 2 5 2 5 3 4 1 6 4 3 2 1 2 5 3 1 4 3 6 2 3 4
0 1 8 4 2 3 1 3 1 2 2 3 3 4 4 5 2 3 3 2 3 3 6 5 2
3 3 2 3 1 0 5 1 3 4 2 3 3 2 2 1 4 2 1 3 2 1 5 3 5
2 2 2 2 3 3 3 3 3 1 2 4 6 3 5 2 3 3 2 3 5 2 2 3 5
2 7 3 2 2 3 6 2 3 3 1 1 1 8 1 3 3 1 4 1 1 2 1 2 3
7 2 2 5 3 6 2 0 2 1 2 2 1 4 4 3 2 2 1 4 3 2 4 3 1
1 3 3 4 4 2 4 3 5 3 4 3 3 1 2 3 2 5 3 1 2 3 1 2 3
2 1 4 4 2 2 1 4 5 5 7 3 4 4 5 4 3 2 2 3 4 4 3 5 3
2 5 3 3 1 3 3 0 5 1 4 3 2 3 2 2 3 1 2 1 5 2 2 1 2
1 5 2 3 7 1 3 2 4 3 2 2 7 4 1 2 1 3 3 2 2 3 1 4 3
2 2 3 2 4 6 0 7 3 6 3 1 1 2 3 2 3 4 3 1 2 5 2 0 4
3 4 4 4 2 4 1 3 1 1 3 1 2 2 2 2 1 3 3 2 6 2 3 5 1
2 2 4 3 6 3 2 2 4 4 3 6 4 3 3 3 2 4 3 1 1 4 8 3 2
5 3 2 2 2 1 2 4 5 3 3 4 3 2 6 3 1 2 7 4 4 2 1 3 2
4 3 4 3 3 2 2 4 2 5 5 1 4 1 2 2 7 4 2 1 3 0 3 1 2
1 2 1 1 4 2 3 4 5 1 1 2 5 2 0 6 1 2 5 5 3 4 3 2 2
1 2 2 5 4 5 1 2 1 3 4 1 1 2 6 4 4 2 4 1 1 1 4 3 3
6 3 2 4 4 2 7 3 1 1 2 1 3 2 3 3 7 3 3 1 2 2 2 4 2
3 1 2 3 3 3 2 5 3 3 2 4 3 2 2 4 4 1 5 5 1 3 6 5 4
3 3 2 0 3 2 4 4 4 5 5 2 4 3 3 2 1 1 2 6 2 1 3 3 2
3 2 2 2 3 3 2 2 3 2 1 5 2 1 2 1 2 3 1 3 3 4 6 2 3
5 2 2 0 4 3 3 2 4 2 1 4 5 2 4 1 6 3 3 4 4 5 3 2 1
3 2 4 4 3 2 3 8 3 3 4 3 2 3 2 3 4 1 3 4 2 2 3 1 5
5 2 4 2 4 4 3 3 1 2 1 1 3 6 2 0 2 3 3 3 3 2 2 2 2
3 2 1 2 2 3 5 5 3 3 0 6 2 3 0 3 4 5 4 4 2 3 3 2 2
4 5 5 6 1 1 3 4 2 4 2 2 2 4 6 4 3 3 5 3 5 2 1 3 4
8 2 3 4 4 1 2 1 4 2 1 2 0 8 6 4 3 1 2 1 1 3 5 3 1
2 2 6 5 4 3 2 3 3 1 0 1 2 2 1 1 3 6 2 3 3 2 3 2 2
0 2 2 4 1 3 4 7 6 10 3 2 3 2 1 2 3 1 4 4 1 2 2 3 2
7 3 2 4 3 3 4 2 3 2 2 4 2 5 7 3 3 6 2 3 4 3 4 2 1
2 3 3 2 4 1 3 1 3 5 2 1 3 4 2 3 4 4 1 7 3 2 3 4 0
3 1 1 3 2 2 2 3 2 4 6 4 5 6 6 3 5 3 5 2 4 5 2 3 3
4 3 3 3 3 6 1 2 3 3 2 2 3 3 2 2 2 6 2 1 1 0 4 4 1
1 1 4 1 2 4 3 3 4 0 3 3 4 3 2 3 2 2 3 6 4 2 2 1 2
```

Queuing Worksheet - Poisson Distribution

The Grove Drive Driveway - Two Lanes - Afternoon Peak Hour

Inputs

Lanes:	2
Average Transaction Time (s):	16.6
Transactions per Minute:	7.23
Number of Hours:	2
Number of Periods:	8
Average Peak Hour Arrivals:	136

15-Minute Periods	Volume
1	30
2	33
3	37
4	41
5	38
6	34
7	31
8	29

Outputs

Max Cars in Queue	Frequency	Percentile
0	682	68.2%
1	241	92.3%
2	63	98.6%
3	13	99.9%
4	1	100.0%

Total Queue Percentiles

85th Percentile:	1
90th Percentile:	1
95th Percentile:	2

Maximum Queues (1,000 test runs)

```
0 0 0 1 0 0 1 0 0 0 0 1 1 0 0 0 0 0 0 0 0 2 0 2 0
1 0 0 0 0 0 0 0 2 1 0 3 0 1 1 0 1 0 1 1 0 0 0 1 0
1 0 1 0 1 0 1 0 0 3 0 0 0 0 0 0 3 0 1 0 0 0 0 1 0
0 1 1 0 1 1 0 2 0 0 2 0 0 0 2 0 0 0 1 0 0 0 1 0 1
1 0 0 0 0 0 0 0 0 0 0 0 2 0 0 1 0 1 0 0 1 0 0 0 0
0 0 3 1 1 0 0 0 2 1 0 1 1 0 0 1 1 0 0 2 0 0 0 0 0
1 0 0 0 0 0 0 1 0 0 0 0 0 1 1 0 0 1 0 0 0 0 0 2 0
0 0 0 0 0 0 0 0 1 0 0 1 0 1 1 0 0 0 2 0 0 0 2 0 0
0 0 0 0 1 0 0 0 1 0 0 0 0 1 0 1 0 0 0 1 0 1 0 0 1
0 1 0 0 0 2 2 0 0 2 0 0 0 0 1 0 1 0 0 0 0 2 0 0
0 0 0 0 0 0 0 0 2 1 0 0 1 0 0 1 1 0 2 0 1 0 0 0 0
0 0 0 0 0 0 2 0 0 0 0 0 2 0 0 0 0 1 0 2 0 0 0 0 0
0 0 1 0 0 0 0 2 0 0 0 0 0 0 1 0 0 0 0 0 0 2 0 0 0
1 1 0 3 3 0 0 1 0 0 0 2 1 0 0 2 0 0 1 0 2 0 0 0 0
0 0 0 1 0 0 0 0 0 0 0 0 2 0 2 1 0 2 0 0 0 0 0 1 0
2 1 0 0 1 0 0 2 0 1 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 2 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 1 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 2 0 0 0 1 1 1 2 1
0 0 1 0 1 0 1 1 2 2 0 1 0 0 0 0 1 2 0 0 0 0 0 0 0
0 1 0 1 1 0 0 2 0 0 0 1 1 0 0 0 0 0 1 1 1 3 2 0 0
0 0 0 1 0 1 0 0 0 0 0 0 0 1 0 1 1 0 0 1 0 0 0 0 0
0 0 0 1 0 0 0 0 0 1 0 1 1 0 0 1 0 3 1 0 0 1 0 0 0
1 1 1 0 2 1 1 1 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1
0 1 0 1 0 0 0 0 0 0 0 1 0 1 2 0 2 1 1 0 0 0 1 0 0
1 0 0 0 2 1 0 0 0 2 0 1 0 1 0 0 0 0 0 0 0 1 0 1 3
2 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 1 0
0 1 0 1 0 1 0 0 0 3 1 0 2 0 1 0 0 1 0 0 0 0 0 0 0
3 1 2 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 1 1 0 0
1 0 0 2 0 0 2 0 1 1 0 1 0 0 0 1 0 0 0 0 0 1 1 1 0
0 0 1 0 0 0 1 1 0 0 0 0 0 1 0 0 0 1 1 0 1 0 0 0 0
0 0 1 1 0 2 0 0 0 0 1 2 0 0 0 2 1 0 0 1 0 0 2 0 0
0 1 0 1 0 0 0 0 0 0 1 0 0 1 0 0 1 0 0 1 1 0 0 0 0
0 0 0 1 1 1 0 0 1 2 0 2 1 0 0 1 0 1 0 1 0 1 0 0 1
1 0 1 0 0 1 1 0 1 1 1 0 0 3 0 1 0 0 4 0 0 0 0 0 1
0 0 1 0 0 0 0 0 1 0 2 0 3 0 0 0 1 0 1 0 1 0 0 0 0
0 0 1 1 0 1 0 0 0 1 0 1 1 0 0 1 0 1 0 0 1 0 0 1 0
1 0 1 0 1 0 0 0 1 0 1 1 1 1 0 0 0 0 1 0 0 0 0 1 0
0 1 0 1 0 2 0 0 0 2 0 0 0 1 0 0 1 1 0 0 0 0 0 0 0
1 1 1 0 0 0 2 0 0 0 0 0 0 0 1 0 0 1 0 0 1 0 2 2 0
0 0 0 0 1 0 1 2 0 1 0 1 1 0 0 1 1 1 0 0 0 1 0 0 1
```