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From: Courtney E. Sudak, PE – Tetra Tech

Date: June 8, 2022

Subject: Construction Traffic Assessment
Proposed Sutton Douglas Development
Sutton & Douglas, MA

Tetra Tech has prepared the following construction transportation assessment for the proposed Sutton Douglas Development (“the Project”) to be located on Duval Road in Sutton, Massachusetts and Forest Street in Douglas, Massachusetts. As described in the September 2021 Traffic Impact and Access Study (TIAS) previously prepared by Tetra Tech for the project, permanent access to the site will be provided by two full-access subdivision roadways – one each on Duval Road in Sutton and on Forest Street in Douglas. However, the proposed subdivision roadway on Duval Road will serve as the primary access way during construction.

The previously prepared TIAS evaluated the potential transportation-related impacts of the project once completed and occupied. Subsequent to the submittal of the TIAS, the Applicant was asked during the local planning board hearing processes for the project to conduct a transportation assessment of the anticipated construction activity.

Peak construction traffic is expected to occur during the project’s Phase I roadway paving and is estimated to generate approximately 88 vehicle trips on a typical weekday with 16 vehicle trips occurring during the weekday morning and weekday evening peak hours. This phase of the construction process is anticipated to last one week. These estimates conservatively assume that all construction workers and construction trucks would arrive within the same hour and depart within the same hour and that the peak hour of construction occurs during the peak hour of the adjacent street traffic. Additionally, there are several routes connecting the site to the regional roadway system thereby reducing impacts to any single roadway segment or intersection. The remainder of the construction period is anticipated to generate fewer vehicle trips. The adjacent roadways are anticipated to have ample capacity to accommodate the temporary increases in daily and peak hour traffic expected to occur during construction of the project.

This memorandum summarizes the anticipated operations, estimates vehicle trip generation associated with the construction of the project and provides a qualitative assessment of transportation-related impacts on study area roadways and intersections associated with the project’s construction activity. Potential truck haul routes were also identified between the site and the regional roadway system to reduce construction-related traffic impacts and a temporary construction management plan will be prepared prior to the beginning of construction.

ANTICIPATED CONSTRUCTION OPERATIONS

The proposed residential project is anticipated to be constructed in phases. The peak construction activity is anticipated to occur during Phase I of the project and will consist of the following general construction phases:

- Tree clearing
- Construction Equipment Mobilization

- Roadway Construction
- Roadway Paving
- Street Sign Installation
- House Lot Construction
- Screening Loam

Most phases of construction are anticipated to last for two weeks or less and the construction phases are generally not anticipated to overlap. The phase estimated to generate the highest level of daily traffic is the roadway paving phase. This phase will be very temporary lasting for approximately one week. The construction phase anticipated to experience the longest continuous duration is the Phase I roadway construction (i.e., grading, drainage, etc.). However, this phase is also very temporary lasting approximately 2.5 to 3 months. Truck activity associated with the roadway construction phase is not expected to occur every day and will only occur two to three days per week during this phase of construction. A detailed summary of the construction operations assumptions used in this analysis is provided in the Attachments.

CONSTRUCTION VEHICLE TRIP GENERATION

Vehicle trip generation estimates for the project's construction activities were developed based on the anticipated construction operations outlined above. Construction hours of operation are assumed to generally be 7 AM to 5 PM with construction workers arriving prior to 7 AM and departing after 5 PM. Since the peak hours of the adjacent street traffic occur during the peak commuting periods of 7 AM to 9 AM and 4 PM to 6 PM, it is expected that the majority of construction workers would be arriving and departing the site outside of the typical weekday morning and weekday evening commuter peak hours of the adjacent street. However, to present a conservative assessment of potential traffic increases associated with the project's construction, it is assumed that all the construction workers would arrive during the weekday morning peak hour and depart during the weekday evening peak hour. The supporting trip generation calculations and assumptions for the proposed project's construction activity are provided in the Attachments.

As discussed in the September 2021 TIAS prepared for the project, the Worcester Regional Transit Authority (WRTA) operates bus service via WRTA Route A through the northeasterly portion of the Town of Sutton and WRTA Route B in neighboring Northbridge with a stop at the Walmart located at the Town line with Sutton. However, both of these services are located more than 8 miles from the site and, therefore, are unlikely to be used by the construction workforce. Therefore, no credit (reduction) was applied to the trip generation estimates for public transportation use.

Some construction workers may arrive and depart the site together (carpooling). For purposes of this assessment, it was assumed that none of the construction workers will carpool to travel to/from to present a conservative analysis. Table 1 presents a summary of the trip generation estimates for the project's peak construction activities.

Table 1 Trip Generation Summary – Peak Construction Phase (Phase I Roadway Paving)

Time Period/ Direction	Site Trips ¹			
	Logging/Trailer Truck Deliveries ²	Tri-Axle Dump Truck Deliveries	Construction Workforce ³	Total
Weekday Daily				
Enter	0	4	8	12
<u>Exit</u>	<u>0</u>	<u>4</u>	<u>0</u>	<u>4</u>
Total	0	8	8	16
Weekday AM Peak Hour				
Enter	0	4	0	4
<u>Exit</u>	<u>0</u>	<u>4</u>	<u>8</u>	<u>12</u>
Total	0	8	8	16
Weekday PM Peak Hour				
Enter	0	32	12	44
<u>Exit</u>	<u>0</u>	<u>32</u>	<u>12</u>	<u>44</u>
Total	0	64	24	88

- 1) Assumed 8 laborers per day and 4 trucks per hour. Conservatively assumed trips overlap with adjacent street peaks. Peak construction activity is anticipated to occur for a period of approximately one week. The remainder of the construction period is anticipated to generate fewer vehicle trips.
- 2) Estimated to generate negligible trips during the roadway paving phase. See Attachments for detailed breakdown of assumptions for each phase by vehicle type.
- 3) Construction workforce includes laborers anticipated to drive their personal vehicles on-site. Truck drivers are excluded from the construction workforce trips as their trip activity is accounted for under the truck delivery categories.

As shown in Table 1, the peak construction activity for the proposed residential project is expected to generate 88 new vehicle trips (44 entering and 44 exiting) on a typical weekday, with approximately 16 new vehicle trips (12 entering and 4 exiting) during the weekday morning peak hour and 16 new vehicle trips (4 entering and 12 exiting) during the weekday evening peak hour.

The construction phase anticipated to experience the longest continuous duration is the Phase I roadway construction (i.e., grading, drainage, etc.). This phase is temporary and expected to last approximately 2.5 to 3 months. It will generate even fewer daily and peak hour trips than the Phase I paving phase. Table 2 summarizes the estimated trip generation associated with the Phase I roadway construction.

Table 2 Trip Generation Summary – Phase I Roadway Construction Phase

Time Period/ Direction	Site Trips ¹			
	Logging/Trailer Truck Deliveries ²	Tri-Axle Dump Truck Deliveries	Construction Workforce ³	Total
Weekday Daily				
Enter	0	2	8	10
<u>Exit</u>	<u>0</u>	<u>2</u>	<u>0</u>	<u>2</u>
Total	0	4	8	12
Weekday AM Peak Hour				
Enter	0	2	0	2
<u>Exit</u>	<u>0</u>	<u>2</u>	<u>8</u>	<u>10</u>
Total	0	4	8	12
Weekday PM Peak Hour				
Enter	0	16	12	28
<u>Exit</u>	<u>0</u>	<u>16</u>	<u>12</u>	<u>28</u>
Total	0	32	24	56

- 4) Assumed 8 laborers per day and 2 trucks per hour. Conservatively assumed trips overlap with adjacent street peaks. The roadway construction phase is anticipated to occur for a period of approximately 2.5 to 3 months. Trucks are only expected 2 to 3 days per week during this phase. The remainder of the construction period is anticipated to generate fewer vehicle trips.
- 5) Estimated to generate negligible trips during the roadway construction phase. See Attachments for detailed breakdown of assumptions for each phase by vehicle type.
- 6) Construction workforce includes laborers anticipated to drive their personal vehicles on-site. Truck drivers are excluded from the construction workforce trips as their trip activity is accounted for under the truck delivery categories.

INTERSECTION OPERATIONS

Previous intersection operations analyses conducted by Tetra Tech in the September 2021 TIAS, the Response to Traffic Peer Review Comments memorandum (Dated April 28, 2022) and the Peak Season Traffic Volume Assessment memorandum (Dated June 2, 2022) prepared for the project indicated that the study area intersections are expected to operate well below capacity at LOS B or better operations (with or without the proposed single-family homes) indicating ample capacity to support the proposed residential development. The construction-related trip activity shown in Table 1 is less than the daily and peak hour trips associated with post-construction traffic to be generated by the proposed single-family homes. Therefore, the adjacent roadways are anticipated to have ample capacity to accommodate the temporary increase in daily and peak hour traffic with the project's construction activity.

TRUCK HAUL ROUTES

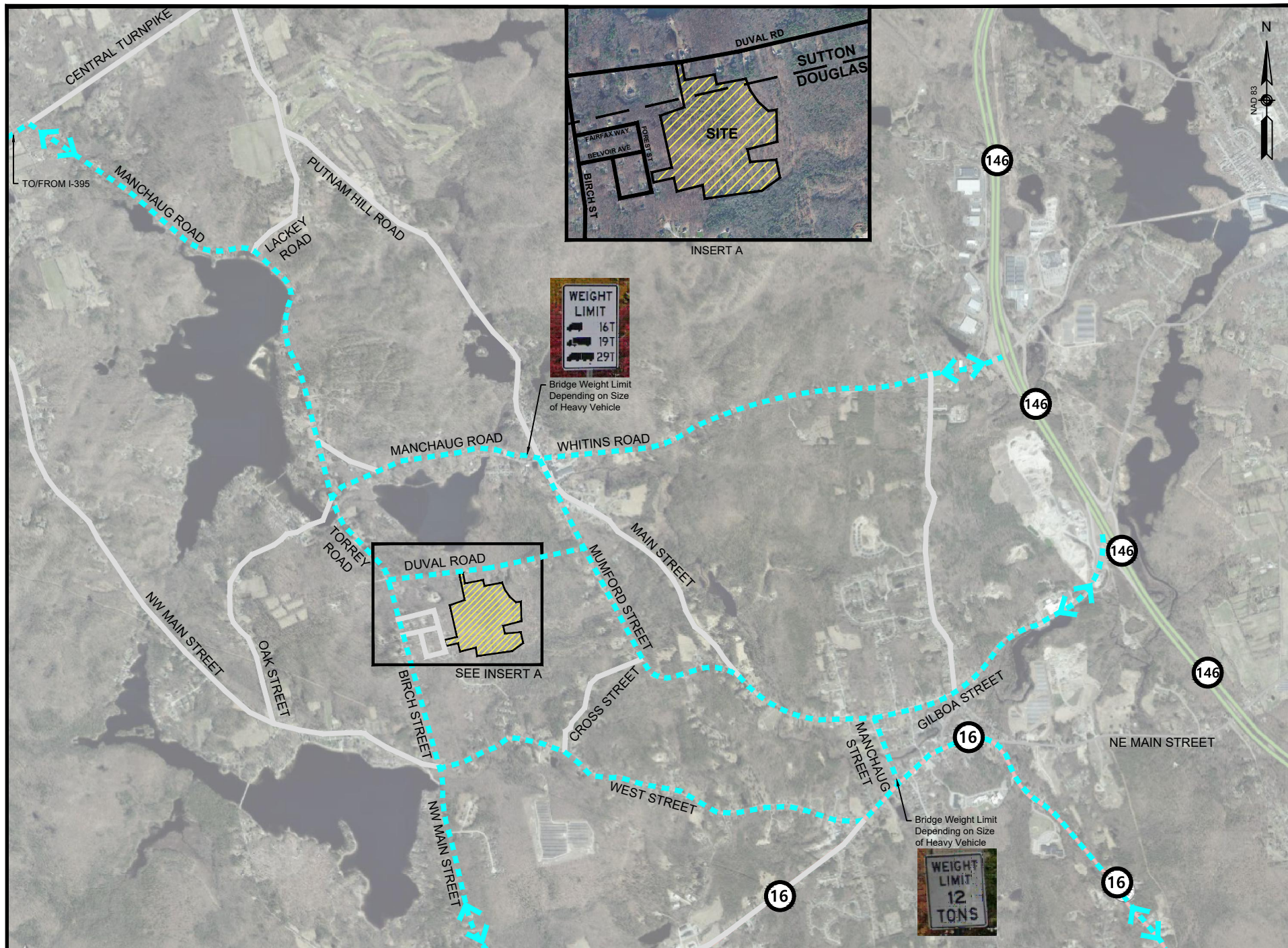
The construction of the proposed residential development will, on occasion, require large vehicle deliveries for a variety of materials that may include concrete, lumber, earth materials, building materials, etc. Tetra Tech identified potential truck haul routes between the site parcels and the regional roadway system for these larger vehicles. For purposes of this assessment, it was assumed that the deliveries would originate from three primary geographical areas: Route 146, Route 16 and I-395. Factors considered in developing potential truck haul routes are summarized below.

- Avoid roadway segments having bridge height and weight limitations based on a review of the MassDOT database.
- Minimize impacts to schools, traffic signals, and areas with pedestrian activity.
- Minimize turns at locations with geometric limitations.

The potential regional truck haul routes are shown in Figure 1. A temporary construction traffic management plan will be developed prior to the beginning of construction which will include appropriate construction signage and use of construction personnel acting as flaggers, as needed, at the Duval Road intersections with Torrey Road and Mumford Road to direct traffic when the larger construction vehicles associated with the project are passing through.

CONCLUSIONS

The peak construction activity associated with the proposed residential development is expected to generate approximately 16 trips during the weekday morning peak hour and 16 trips during the weekday evening peak hour. Peak construction activity is currently anticipated to occur for a period of approximately one week. The remainder of the construction period is anticipated to generate fewer vehicle trips. These trip generation estimates are conservative as the majority of peak hour trips are likely to occur outside of the typical weekday commuter peak hours of the adjacent street traffic and do not take credit for possible vehicle trip reductions associated with carpooling by construction workers. The peak construction trip generation is less than the estimated number of trips to be generated by the proposed single-family homes. The adjacent roadways are anticipated to have ample capacity to accommodate the temporary increase in daily and peak hour traffic. Potential truck haul routes were identified between the site parcels and the regional highway system to reduce construction-related traffic impacts and a temporary construction management plan will be prepared prior to the beginning of construction.



Attachments

Sutton Douglas Development - Phase I Construction Operations Assumptions

Task/Subtask	# Per Day				Duration	Notes
	Logging/Trailer Trucks	Dump Trucks	Crew Size (# Workers)	Total		
Tree Clearing	2	0	4	6	13 days (1-2 weeks)	21 acres to clear; assumed 3500 bf/acre and 3500 bf/truck
Construction Equipment Mobilization	4	0	2	6	2 days	
Roadway Construction	0	16	8	24	2.5-3 months (with 2 crews); dump trucks 2-3 times per week	Assume 1-2 trucks per hour and an 8-hour workday; assume 4 workers per crew (2 machine operators plus 1 in trench and 1 handing materials to worker in trench). Assume won't hit rock when digging.
Paving	0	32	8	40		Assume 1 crew with 8 laborers on the ground (2 machine operators, 2 laborers sweeping/removing debris, 2 laborers raking asphalt, 1 foreman and 1 superintendent)
Road = Subgrade Gravel	0	32	8	40	5-6 days	Assume 4 trucks per hour and an 8-hour workday
Road = Trailer Trucks w/ Asphalt for roadway	16	0	8	24	3 days	Assume 2 trailer trucks per hour and an 8-hour workday; Assume 1 crew with 8 laborers on the ground (2 machine operators, 2 laborers sweeping/removing debris, 2 laborers raking asphalt, 1 foreman and 1 superintendent)
Road = Tri-axle Trucks w/ Asphalt for berm install	0	16	8	24	3 days	Assume 2 tri-axes per hour and an 8-hour workday;
Sidewalks = Trailer Trucks w/ Gravel	9	0	8	17	3 days	Assume 2-3 trucks and 2-3 loads per truck (conservatively 9 loads per day)
Sidewalk = Tri-Axles w/Asphalt	0	9	8	17	4-5 days	Assume 2-3 trucks and 2-3 loads per truck (conservatively 9 loads per day); Assume 1 crew with 8 laborers on the ground (2 machine operators, 2 laborers sweeping/removing debris, 2 laborers raking asphalt, 1 foreman and 1 superintendent)
Sidewalk = Loam	0	2	4	6	7-8 days	
Sidewalk = Hydroseeding	0	1	2	3	1 day	
Street Signs	0	0	2	2	1 day	
House Lot Construction (Per Home)	4	2	10	16		
Foundation Excavation	0	2	4	6	2 days	
Pour Foundation	0	1	4	5	1 day	
Site Work	0	0	10	10	14 days	Assume negligible truck trips (assume 5 workers plus 5 framers)
Lumber Deliveries	4	0	2	6		Assume 4 trailer loads of lumber material per house total (conservatively assume 4 per day per house)
Asphalt/Concrete/Hydroseeding Deliveries	0	2	2	4		Assume 3-4 trucks total per house (assume 2 per day)
Screening Loam	0	32	4	36	3-7 days	Assume 4 trucks per hour and an 8-hour workday

Source: Tetra Tech

NOTE: Each task is anticipated to be conducted on separate days and would not overlap. For the Paving and House Lot Construction tasks, the maximum trucks/crews per day for the subtasks was selected as most of the subtasks were assumed to not overlap. The number of homes to be constructed at the same time is unknown; it is assumed that only one home will be constructed at a time for analysis purposes.

Peak Construction Activity Trip Generation Calculations
Roadway Paving Phase (Peak Daily Trips)
Proposed Sutton Douglas Development

Construction Site Driveway Trips				
	Logging/Trailer Truck Deliveries	Tri-Axle Dump Truck Deliveries	Construction Workforce	Total
AM Peak Hour:				
Enter	0	4	8	12
Exit	0	4	0	4
Total	0	8	8	16
PM Peak Hour:				
Enter	0	4	0	4
Exit	0	4	8	12
Total	0	8	8	16
Weekday Daily:				
Enter	0	32	12	44
Exit	0	32	12	44
Total	0	64	24	88

CALCULATIONS

(8 workers x 100% arrive) x (100% - 0% carpool x 1 vehicle/2 carpool workers) + (0 Logging/Trailer Trucks arrive) + (4 Tri-Axle Dump Trucks arrive) = 12
 (0 workers x 100% depart) x (100% - 0% carpool x 1 vehicle/2 carpool workers) + (0 Logging/Trailer Trucks depart) + (4 Tri-Axle Dump Trucks depart) = 4

(0 workers x 100% arrive) x (100% - 0% carpool x 1 vehicle/2 carpool workers) + (0 Logging/Trailer Trucks arrive) + (4 Tri-Axle Dump Trucks arrive) = 4
 (8 workers x 100% depart) x (100% - 0% carpool x 1 vehicle/2 carpool workers) + (0 Logging/Trailer Trucks depart) + (4 Tri-Axle Dump Trucks depart) = 12

(8 workers x 100% arrive in AM) x (100% - 0% carpool x 1 vehicle/2 carpool workers) + (8 workers x 50% return from lunch/errands midday) + (0 Logging/Trailer Trucks arrive) + (32 Tri-Axle Dump Trucks arrive) = 44
 (8 workers x 100% depart in PM) x (100% - 0% carpool x 1 vehicle/2 carpool workers) + (8 workers x 50% leave for lunch/errands midday) + (0 Logging/Trailer Trucks depart) + (32 Tri-Axle Dump Trucks depart) = 44

Travel Assumption	AM Peak Hour	PM Peak Hour	Off-Peak
% Workers Arriving:	100%	0%	50%
% Workers Departing:	0%	100%	50%
% Leave Midday for Lunch/Errands	0%	50%	0%
% Carpool ¹ :	0.0%	0.0%	0.0%
Carpool VOR ² :	2.00	2.00	1.00

Source: Tetra Tech

¹Enter % per population - formulas above account for VOR

²VOR for carpoolers only

NOTE: As a conservative measure, assumed that trucks arrive and depart during the laborer arrival/departure peak hours. However, it is very likely that laborers will arrive in the hour before truck deliveries begin and depart during the hour after trucks are done for the day. The peak paving subtask is expected to last less than one week.

Peak Construction Activity Trip Generation Calculations
Roadway Construction Phase (Longest Duration Phase)
Proposed Sutton Douglas Development

Construction Site Driveway Trips				
	Logging/Trailer Truck Deliveries	Tri-Axle Dump Truck Deliveries	Construction Workforce	Total
AM Peak Hour:				
Enter	0	2	8	10
Exit	0	2	0	2
Total	0	4	8	12
PM Peak Hour:				
Enter	0	2	0	2
Exit	0	2	8	10
Total	0	4	8	12
Weekday Daily:				
Enter	0	16	12	28
Exit	0	16	12	28
Total	0	32	24	56

CALCULATIONS

(8 workers x 100% arrive) x (100% - 0% carpool x 1 vehicle/2 carpool workers) + (0 Logging/Trailer Trucks arrive) + (2 Tri-Axle Dump Trucks arrive) = 10
 (0 workers x 100% depart) x (100% - 0% carpool x 1 vehicle/2 carpool workers) + (0 Logging/Trailer Trucks depart) + (2 Tri-Axle Dump Trucks depart) = 2

(0 workers x 100% arrive) x (100% - 0% carpool x 1 vehicle/2 carpool workers) + (0 Logging/Trailer Trucks arrive) + (2 Tri-Axle Dump Trucks arrive) = 2
 (8 workers x 100% depart) x (100% - 0% carpool x 1 vehicle/2 carpool workers) + (0 Logging/Trailer Trucks depart) + (2 Tri-Axle Dump Trucks depart) = 10

(8 workers x 100% arrive in AM) x (100% - 0% carpool x 1 vehicle/2 carpool workers) + (8 workers x 50% return from lunch/errands midday) + (0 Logging/Trailer Trucks arrive) + (16 Tri-Axle Dump Trucks arrive) = 28
 (8 workers x 100% depart in PM) x (100% - 0% carpool x 1 vehicle/2 carpool workers) + (8 workers x 50% leave for lunch/errands midday) + (0 Logging/Trailer Trucks depart) + (16 Tri-Axle Dump Trucks depart) = 28

Travel Assumption	AM Peak Hour	PM Peak Hour	Off-Peak
% Workers Arriving:	100%	0%	50%
% Workers Departing:	0%	100%	50%
% Leave Midday for Lunch/Errands	0%	50%	0%
% Carpool ¹ :	0.0%	0.0%	0.0%
Carpool VOR ² :	2.00	2.00	1.00

Source: Tetra Tech

¹Enter % per population - formulas above account for VOR

²VOR for carpoolers only

NOTE: As a conservative measure, assumed that trucks arrive and depart during the laborer arrival/departure peak hours. However, it is very likely that laborers will arrive in the hour before truck deliveries begin and depart during the hour after trucks are done for the day. The peak paving subtask is expected to last less than one week.