



MEMORANDUM

To: Romar Homes, Inc
Attn: Mark Rychlik
From: Trisha Dudala, Srinivas Sattoor, Bojana Maric, Paul Miller
Re: Project Generation and Distribution Assumptions

Date: April 23, 2007
Project: Romar Homes TIAR
Job No.: 25-6102-01
File No.: C1105MEM003.doc

CC:

INTRODUCTION AND BACKGROUND

Romar Homes, Inc. has retained OMNI-MEANS to complete an initial transportation planning regarding the proposed Romar Homes Subdivision project. The subject property is located northeast of Cottonwood, in Shasta County. This memorandum has been prepared to summarize the project trip generation and distribution assumptions, projected AM and PM peak hour trips at study intersections, potential left turn lane requirements, and roadway adjustment requirements at the Balls Ferry Road UPRR crossing.

PROJECT DESCRIPTION

The proposed development of the project site is envisioned to contain 446 single family residential units. The Project Location Exhibit (dated October, 2006) shown on **Exhibit 1** identifies a new residential street connecting to Ball's Ferry Road just northwest of the existing railroad crossing. *{Note: Per a pre-proposal meeting with Romar Homes, SDS, and the County, modifications to this access location were discussed.}* The project site will be served by three access points along Locust Road and one access point on Ball's Ferry Road.

Ball's Ferry Road/UPRR crossing

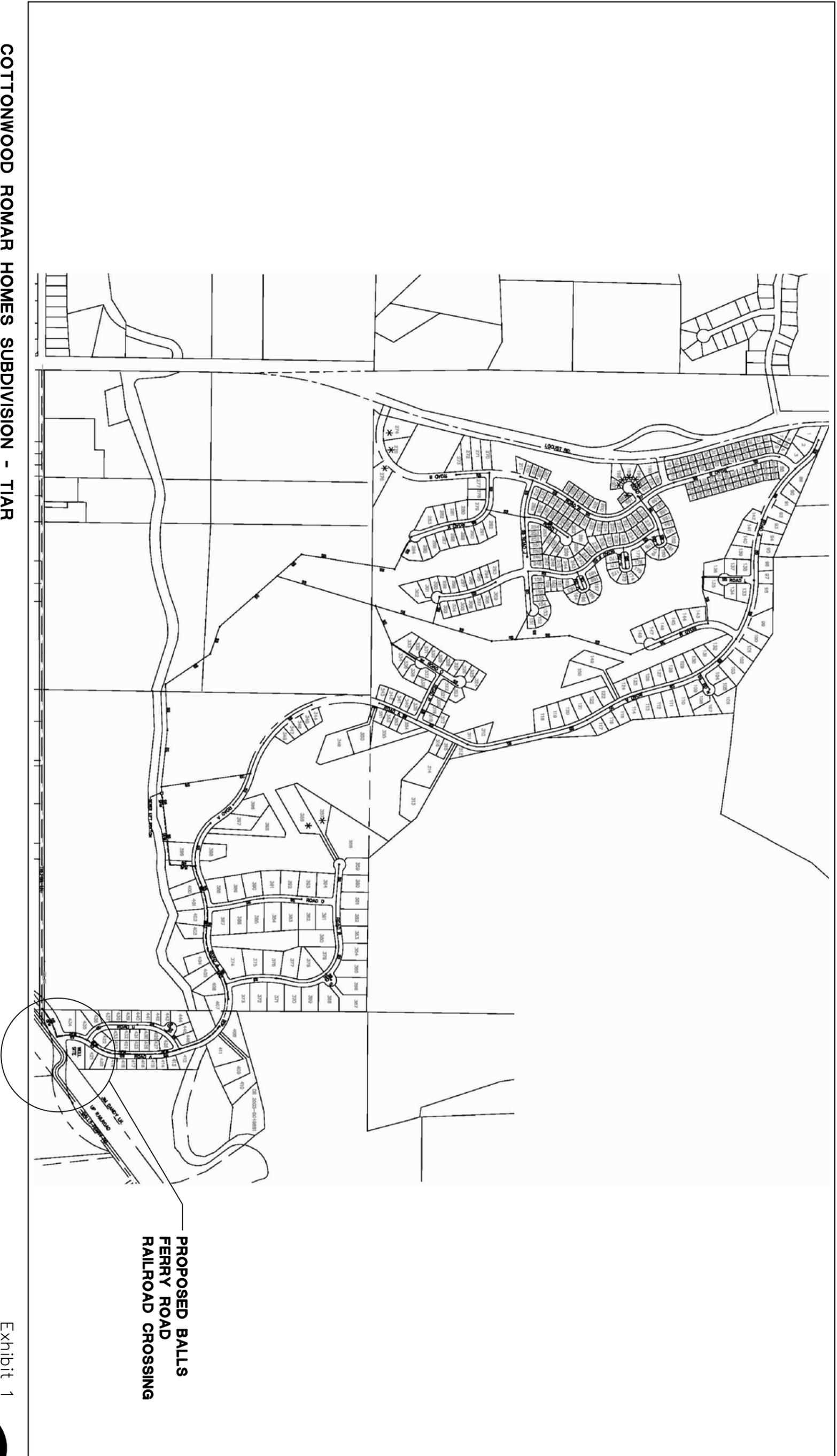
Specific focus has been given to the alignment of Ball's Ferry Road just east of Trefoil Lane at the existing railroad crossing. Ball's Ferry Road is classified as a Major Arterial and will require significant realignment in the future to conform with County standards. The existing Ball's Ferry Road is skewed at 70 degrees at the railroad crossing, with a curve radius of 50 feet resulting in minimum sight distances.

There are two main design considerations for the proposed Balls Ferry Road Railroad Crossing:

1. Horizontal Curve Radius
2. Railroad crossing skew angle

Horizontal Curve Radius for Balls Ferry Road

Based on the design speed of 45 mph on Balls Ferry Road, the minimum horizontal curve radius is determined to be 700 feet.



COTTONWOOD ROMAR HOMES SUBDIVISION - TIAR

TENTATIVE SITE PLAN

**PROPOSED BALLS
FERRY ROAD
RAILROAD CROSSING**

Exhibit 1



1. Highway Design Manual
Topic 201 – Sight Distance
Table 203.2 – Standards for Curve Radius
 Lists the minimum radius of curve for specific speeds.
 Design Speed = 40 mph R = 550 feet
 Design Speed = 50 mph R = 850 feet
 Therefore R = 700 feet for Balls Ferry Road design speed of 45 mph.

2. Shasta County Development Standards
Chapter 2 – Road Policies and Standards
Section E.5 – Design: Horizontal Curves
 Provides a formula which should be used to calculate horizontal curves
 $R = V^2 / 15(S+F) = 45^2 / 15(0.05+0.145) = 692$ feet
 where: R - Radius of curve (feet)
 V - Design Speed (mph)
 S - Superelevation (ft/ft), assumed 5%
 F - Friction Factor (see table in Section E.5)

Railroad Crossing Skew Angle

Based on the below listed reference material, the minimum railroad crossing skew angle is determined to be 75 degrees.

1. Highway Design Manual
Topic 403 – Principles of Channelization
Section 403.3 and Figure 403.3 – Angle of Intersection
 State that “When a right angle cannot be provided due to physical constraints, the interior angle should be designed as close to 90° as is practical, but should not be less than 75°.” This section applies to roadway intersections; there are no specific geometric standards for railroad crossings.

2. Shasta County Development Standards
Chapter 2 – Road Policies and Standards
Section E.12 – Design: Railroad Crossings
 Discusses necessary provisions related to railroad crossings; there are no specific geometric standards.

3. A Policy on Geometric Design of Highways and Streets
Chapter 9 – Intersections
Railroad-Highway Grade Crossings section
 States that “If practical, the highway should intersect the tracks at a right angle with no nearby intersections or driveways.” Sight distance equations require adjustments for skewed crossings; however, there are no specific minimum skew angle standards.

4. Railroad-Highway Grade Crossing Handbook
Chapter IV – Identification of Alternatives
Section D.2 – Site and Operational Improvements: Geometrics
 States that “If the intersection between track and highway cannot be made at right angles, the variation from 90 degrees should be minimized. One State limits the minimum skew to 70 degrees.”

5. Rules of Tennessee Department of Transportation
Chapter 1680-12-1: Railroad Grade Crossing Standards
Section 1680-12-1-.04 (2)(a)3 – Standards: Roadway Standards – Horizontal Alignment
 State that “The roadway shall be designed to provide no less than a 75-degree approach at the grade crossing, and, if practical, the roadway should be designed to intersect with the railroad track or tracks at a right angle or as near to a right angle as possible.

These future alignments will affect the envisioned potential project access roadways. **Exhibit 2** illustrates a planning level roadway layout schematic showing the future alignment for Ball’s Ferry Road. Further engineering study would be required for an accurate realignment of Balls Ferry Road, which would confirm with the County standards. Alternative alignment would consist of a grade separation at the crossing. However construction costs for this alternative would be significant.

PROJECT TRIP GENERATION

Table 1 provides a summary of trip generation characteristics for the proposed Romar Homes Subdivision development.

Project site trip generation has been estimated utilizing trip generation rates contained in the Institute of Transportation Engineers (ITE) Publication *Trip Generation (Seventh Edition)*. Wherever fitted curve equations were available, they were used rather than average rates to establish trip generation for the proposed project. Table 1 provides a summary of the land uses and quantities (i.e., the dwelling units) assumed within the proposed project, along with corresponding ITE land use codes from which trip generation characteristics were established.

**TABLE 1
PROJECT TRIP GENERATION**

Landuse Category	Unit	Weekday Daily Trip Rate	AM Peak Hour Trip Rate			PM Peak Hour Trip Rate		
			Total	In	Out	Total	In	Out
Single Family Detached Housing (210)	per d.u.	9.23	0.72	25%	75%	0.92	63%	37%
Landuse Description	Quantity	Weekday Daily Trips	AM Peak Hour Trips			PM Peak Hour Trips		
Romar Homes Subdivision	446 d.u.	4115	322	81	241	412	260	152
TOTAL		4,115	322	81	241	412	260	152

Note:-

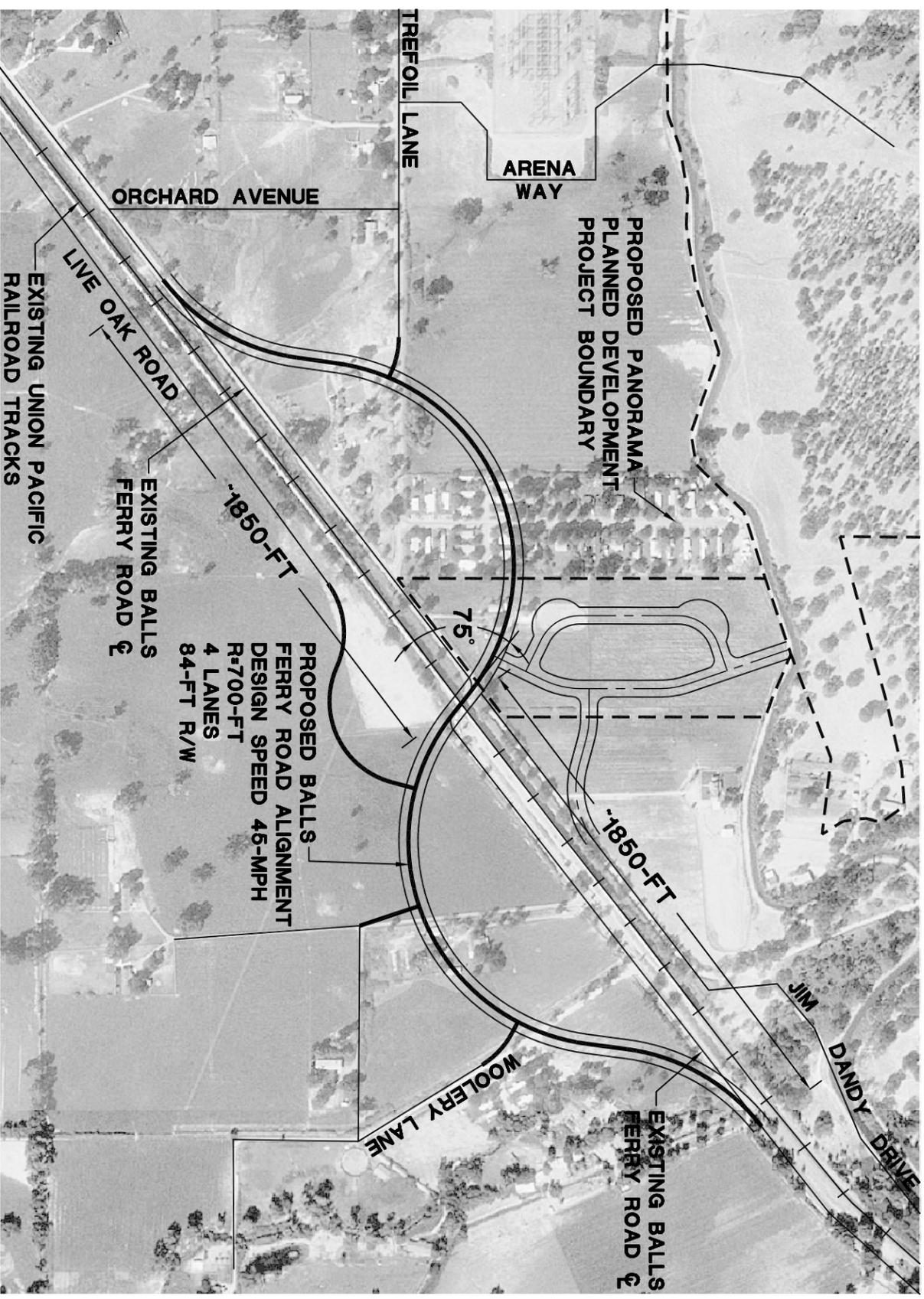
d.u :- dwelling unit

Trip rates obtained from ITE Trip Generation 7th Edition

As shown in Table 1, the proposed project is projected to generate a total of 4,115 daily trips of which 322 (81 inbound, 241 outbound) are projected to occur during the AM peak hour period and 412 (260 inbound, 152 outbound) are projected to occur during the PM peak hour period.

PROJECT TRIP DISTRIBUTION AND ASSIGNMENT

The directional trip distribution and assignment of project-generated trips was estimated based on an understanding of existing and projected future traffic flows and travel patterns within the vicinity of the project site, location of local and regional housing and employment/commercial centers in relation to the



COTTONWOOD ROMAR HOMES SUBDIVISION - TIAR

Exhibit 2

PROPOSED BALLS FERRY ROAD RAILROAD CROSSING



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proposed project site. A percentage of the trips to/from the homes closer to the driveway on Trefoil Lane having origin/destination North on I-5/North on SR 273 was assumed to travel internally on “Road A” to enter/exit from North most project driveway on Locust Road. The following trip distribution has been assumed for the proposed Romar Homes Subdivision development:

- North on I-5 – 46%
- East on Deschutes Road – 5%
- South on I-5 – 15%
- North on Balls Ferry Road – 2%
- North on SR 273 – 20%
- West on Gas point Road – 5%
- South on Main Street – 2%
- North on Rhonda Road – 5%

Note: The travel time study submitted by Sharrah, Dunlap, Sawyer, Inc has been included while estimating the trip distribution.

SUMMARY OF PROJECT GENERATED TRIPS AT STUDY INTERSECTION

Study Intersections

The following intersections, which were selected in coordination with Shasta County, will be included for existing, short-term and cumulative traffic impact analysis, for conditions both without and with the proposed project for the AM and PM peak periods:

1. Gas Point Road/Rhonda Road
2. I-5 SB Ramps/Gas Point Road
3. I-5 NB Ramps/Gas Point Road
4. 4th Street/Main Street
5. 4th Street/Locust Road
6. 4th Street/Ball’s Ferry Road/Black Lane
7. Ball’s Ferry Road/Trefoil Lane (*new counts*)
8. Ball’s Ferry Road/Jim Dandy Drive (*new counts*)
9. Locust Road/Trefoil Lane (*new counts*)
10. Locust Road/Project Access Road 1
11. Locust Road/Project Access Road 2
12. Locust Road/Project Access Road 3
13. Main Street/Trefoil Lane I-5 NB Ramps/Main Street I-5 SB Ramps/Main Street Locust Road/Kimberly Road/Panorama Point Road (*new counts*)
14. Locust Road/S. Barney Road (*new counts*)
15. I-5 NB Ramps/Deschutes Road/Locust Road
16. I-5 SB Ramps/Deschutes Road

The AM peak hour is defined as one-hour of peak traffic flow counted between 7:00 AM and 9:00 AM and the PM peak hour is defined as one-hour of peak traffic flow counted between 4:00 PM and 6:00 PM. New AM and PM peak hour intersection will be counted by OMNI-MEANS.

Based upon the above trip distribution assumptions, **Table 2** below summarizes project generated trips during the AM peak hour period and **Table 3** summarizes the project generated trips during the PM peak hour period at study intersections.

**TABLE 2
SUMMARY OF PROJECT GENERATED TRIPS AT STUDY INTERSECTIONS (AM PEAK HOUR)**

#	Intersection	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	TOTAL
1	Gas Point Road/Rhonda Road	0	0	0	4	0	0	0	4	0	0	12	12	32
2	I-5 SB Ramps/Gas Point Road	0	0	0	0	0	0	0	8	0	36	24	0	68
3	I-5 NB Ramps/Gas Point Road	0	0	12	0	0	0	0	8	0	0	60	0	80
4	4th Street/Main Street	0	0	2	0	0	36	12	8	0	5	24	0	87
5	4th Street/Locust Road	0	0	0	0	0	27	9	1	0	0	2	0	39
6	4th Street/Ball's Ferry Road/Black Lane	0	0	0	0	0	2	1	0	0	0	0	0	3
7	Ball's Ferry Road/Trefoil Lane	1	0	0	0	0	2	7	0	2	0	0	0	12
8	Ball's Ferry Road/Jim Dandy Drive	0	0	0	7	0	27	9	3	0	0	1	2	49
9	Locust Road/Trefoil Lane	0	8	1	3	22	64	21	8	0	4	23	1	155
10	Locust Road/Project Access Road 1	0	13	17	1	39	0	0	0	0	50	0	3	123
11	Locust Road/Project Access Road 2	0	10	5	13	23	0	0	0	0	16	0	39	106
12	Locust Road/Project Access Road 3	0	42	8	25	14	0	0	0	0	23	0	76	188
13	Main Street/Trefoil Lane	0	0	12	17	0	0	0	0	0	36	0	51	116
14	I-5 NB Ramps/Main Street	0	51	0	0	0	0	0	0	17	0	0	0	68
15	I-5 SB Ramps/Main Street	0	0	0	17	0	0	0	0	0	0	0	0	17
16	Locust Road/Kimberly Road/Panorama Point Road	118	0	0	0	0	0	0	1	40	0	2	0	161
17	Locust Road/S. Barney Road	0	0	0	15	0	0	0	25	0	0	75	45	160
18	I-5 NB Ramps/Deschutes Road/Locust Road	0	75	0	0	0	0	0	11	25	0	33	0	144
19	I-5 SB Ramps/Deschutes Road	0	0	0	25	0	0	0	11	0	0	33	0	69
	Total													1,677

TABLE 3
SUMMARY OF PROJECT GENERATED TRIPS AT STUDY INTERSECTIONS (PM PEAK HOUR)

#	Intersection	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	TOTAL
1	Gas Point Road/Rhonda Road	0	0	0	13	0	0	0	13	0	0	8	8	42
2	I-5 SB Ramps/Gas Point Road	0	0	0	0	0	0	0	26	0	23	15	0	64
3	I-5 NB Ramps/Gas Point Road	0	0	39	0	0	0	0	26	0	0	38	0	103
4	4th Street/Main Street	0	0	5	0	0	23	39	26	0	3	15	0	111
5	4th Street/Locust Road	0	0	0	0	0	17	29	3	0	0	2	0	51
6	4th Street/Ball's Ferry Road/Black Lane	0	0	0	0	0	2	3	0	0	0	0	0	5
7	Ball's Ferry Road/Trefoil Lane	3	0	0	0	0	8	5	0	2	0	0	0	18
8	Ball's Ferry Road/Jim Dandy Drive	0	0	0	4	0	17	29	2	0	0	3	8	63
9	Locust Road/Trefoil Lane	0	24	4	2	14	40	69	25	0	3	15	3	199
10	Locust Road/Project Access Road 1	0	42	54	3	24	0	0	0	0	32	0	2	157
11	Locust Road/Project Access Road 2	0	26	17	42	17	0	0	0	0	10	0	25	137
12	Locust Road/Project Access Road 3	0	26	24	82	45	0	0	0	0	14	0	48	239
13	Main Street/Trefoil Lane	0	0	39	55	0	0	0	0	0	23	0	32	149
14	I-5 NB Ramps/Main Street	0	32	0	0	0	0	0	0	55	0	0	0	87
15	I-5 SB Ramps/Main Street	0	0	0	55	0	0	0	0	0	0	0	0	55
16	Locust Road/Kimberly Road/Panorama Point Road	74	0	0	0	0	0	0	3	127	0	2	0	206
17	Locust Road/S. Barney Road	0	0	0	48	0	0	0	81	0	0	48	28	205
18	I-5 NB Ramps/Deschutes Road/Locust Road	0	48	0	0	0	0	0	35	81	0	21	0	185
19	I-5 SB Ramps/Deschutes Road	0	0	0	81	0	0	0	35	0	0	21	0	137
	Total													2,213

Potential Need for Left Turn Lanes

Based upon the project generated peak hour trips at study intersections shown in Tables 2 and Table 3, it is anticipated that separate left-turn lanes may have to be constructed at all those approaches that have 50 or more left-turn volume. Following is a list of intersections where a need for a separate left-turn lane should be studied to determine if installation is required:

1. Locust Road/Trefoil Lane (Separate EB left-turn lane)
2. Locust Road/Project Access Road 1 (Separate WB left-turn lane)
3. Locust Road/project Access Road 3 (Separate SB left-turn lane)
4. Main Street/Trefoil lane (Separate SB left-turn lane)
5. I-5 NB Ramps/Main Street (Separate EB right-turn lane)
6. I-5 SB Ramps/Main Street (Separate SB left-turn lane)
7. Locust Road/Kimberly Road/Panorama Point Road (Separate NB left-turn lane)
8. Locust Road/Kimberly Road/Panorama Point Road (Separate EB right-turn lane)
9. I-5 SB Ramps/Deschutes Road (Separate SB left-turn lane)