
US 97/BRAY'S LANDING ROAD
INTERSECTION ANALYSIS

May 9, 2008

Prepared by:

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Client:

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This report was prepared pursuant to the Washington State Department of Transportation's (WSDOT) request for a future year analysis of the project impact at the US 97/Bray's Landing Road intersection. The intent of this analysis is to determine if additional intersection improvements; i.e., a left turn lane and right turn lane, are required at this location.

The scope of work was identified in an e-mail from Dave Honsinger; WSDOT to Gary Norris, DN traffic dated March 14, 2008. In this e-mail, Dave requested the analysis be conducted in this manner:

- ✓ Use the 2015 Design Year AADT/DDHV for the SR 97, MP 220.50, I/S Brays Road intersection provided by the WSDOT Transportation Data Office (TDO) dated February 2008. No additional counts are necessary.
- ✓ Disregard the forecast for Bray's Landing Road. The volume on Bray's Landing Road needs to come from 1) an assumption of the original background traffic without any Desert Canyon development; then 2.) add the ITE generation for the permitted development as listed by Douglas County and presented at the 2-4-2008, then 3) add the new developments using the ITE generation rates.
- ✓ For the trip distribution, you may choose one or two scenarios. We will accept a range of 10 to 20 % of all Desert Canyon and the new proposed development to use the northern Brays Road route. This county road is signed 35 mph, only a 22" wide BST surface with 1 foot to 2 foot gravel shoulders. This is not a preferred routed. Do not assume any traffic using the Browns Canyon Road that goes off to the East. At the main Bray's Road intersection, you can assume a rate of 20 to 30 % from the North, and the remaining 70 to 80% to the South. Use standard ITE enter and exit rates.
- ✓ Analyze for LOS and the WSDOT guideline thresholds as per Design Manual Chapter 910, especially Figures 910-12a and 910-15.

Since there was no documentation in the information provided regarding the volume on Bray's Landing Road prior to the development of Desert Canyon, Dave was asked to clarify what numbers to use.

In a subsequent e-mail on Wednesday April 30, 2008, Dave directed the use of the 2015 DDHV for Bray's Landing Road as presented in Attachment Page 4 which was attached to the e-mail.

Project Background

The US 97/Bray's Landing Road intersection has been a subject of conversation since the initial approval of the Desert Canyon Planned Residential Development (PRD) in October 1991. The Douglas County Hearing Examiner, in September 1994, outlined specific road improvements that would be required at the intersection as part of the Desert Canyon development. A preliminary agreement between Douglas County and the Desert Canyon Associates called for a south bound left turn lane on US 97, a new north bound right turn lane, and necessary right-of-way to construct the improvements.

In November 2002, Gibson Traffic Consultants (GTC) prepared a traffic analysis to determine what improvements at the US 97/Bray's Landing Road were necessary to

mitigate the impacts of the proposed Phase IV development and identify a traffic impact fee structure for pending Phase IV and future development of Desert Canyon. The results of this analysis was as follows:

- ✓ A full north bound right turn deceleration lane is warranted at the US 97/Bray's Landing Road and should be constructed after a total of 143 new Desert Canyon residential units are occupied.
- ✓ A south bound left turn lane is warranted and should be constructed after 210 new Desert Canyon residential units are occupied.

The only immediate recommended mitigation was the construction of a north bound right turn pocket which is currently in place.

In February 2006, GTC updated there traffic analysis to determine if additional channelization improvements were necessary at the US 97/Bray's Landing Road. The analysis updated the anticipated development for Phase IV and Phase V of the Desert Canyon PRD. The results of the analysis indicated no additional improvements would be required to accommodate 176 additional condo units and 24 lodge/timeshare units associated with Phase V and the completion of Phase IV.

In May 2007, a traffic study was conducted by DN Traffic Consultants for the proposed Bray's Heights development located adjacent to Desert Canyon on the west. Bray's Heights included 27 single family dwelling units. In addition, the analysis included the impact of 340 additional single family dwelling units in the vicinity of the site. Based on the level of service analysis, no additional improvements were recommended. Although, a pro-rata share of the cost of the planned left turn was identified. At that time, the County rejected the Bray's Heights findings and recommended additional coordination with WSDOT regarding the need to implement additional improvements on US 97.

In December 2007, the WSDOT informed DN Traffic that a pro-rata share of the improvements would be acceptable mitigation for the Bray's Height development and WSDOT would make that recommendation to the County.

In January 2008, the WSDOT informed DN Traffic that a pro-rata share was no longer acceptable and that construction of the improvements was required.

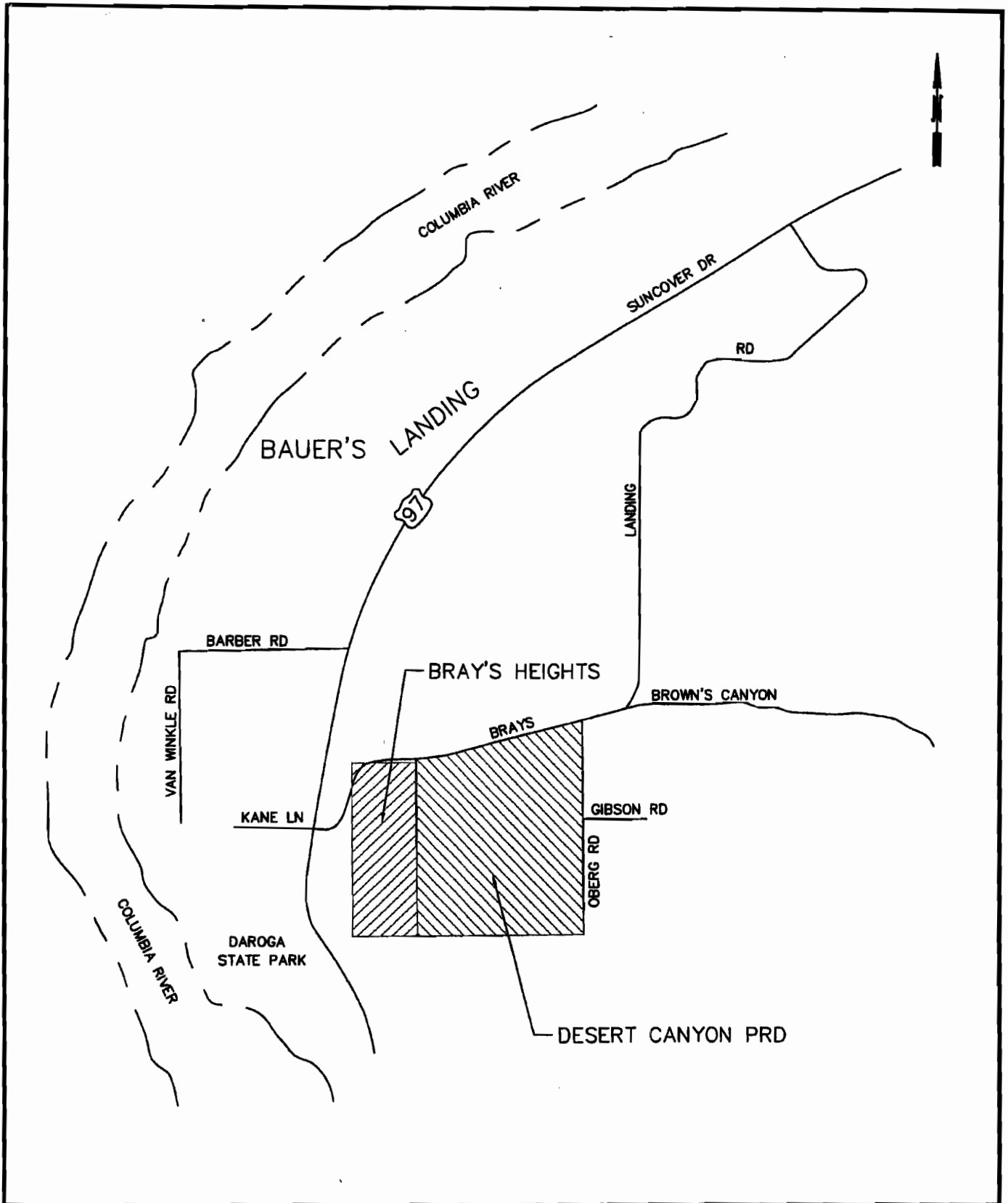
February 2008, all impacted developments met with WSDOT and Douglas County at the Douglas County Permit Center. It was agreed at that meeting, if it could be shown that the improvements to the US 97/Bray's Landing Road identified in the original Hearing Examiners recommendation are no longer needed, no additional mitigation would be required.

As a follow up to that meeting, the scope identified above was developed in coordination with WSDOT and Douglas County.

A vicinity map of the US 97/Bray's Landing Road is presented in Figure 1.

Findings

The following section provides a discussion on the 2015 background traffic volumes used in the analysis, identification of the future development proposal as identified by Douglas County, anticipated trip generation resulting from the proposed development, and 2015 traffic volumes with the proposed development. In addition, an evaluation of the 2015 PM peak level of service is included as well as the left and right turn warrant evaluation.



<p>DN TRAFFIC CONSULTANTS</p>	<p>VICINITY MAP</p> <p>FIGURE 1</p>	<p>BRAY'S LANDING ROAD ANALYSIS</p>
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Background Traffic

As stated above, the 2015 DDHV volumes presented in Attachment 4 were to be used as the background traffic for the analysis. A review of these numbers for the 2015 analysis appeared reasonable. The 2015 DDHV is presented in Figure 2. The volumes presented in Figure 2 for US 97 and Bray's Landing Road are consistent with the existing volumes identified by GTC in the November 2002 traffic study. Therefore, a reasonable analysis would be generated by adding proposed development beyond 2002 to the 2015 DDHV as suggested by WSDOT staff.

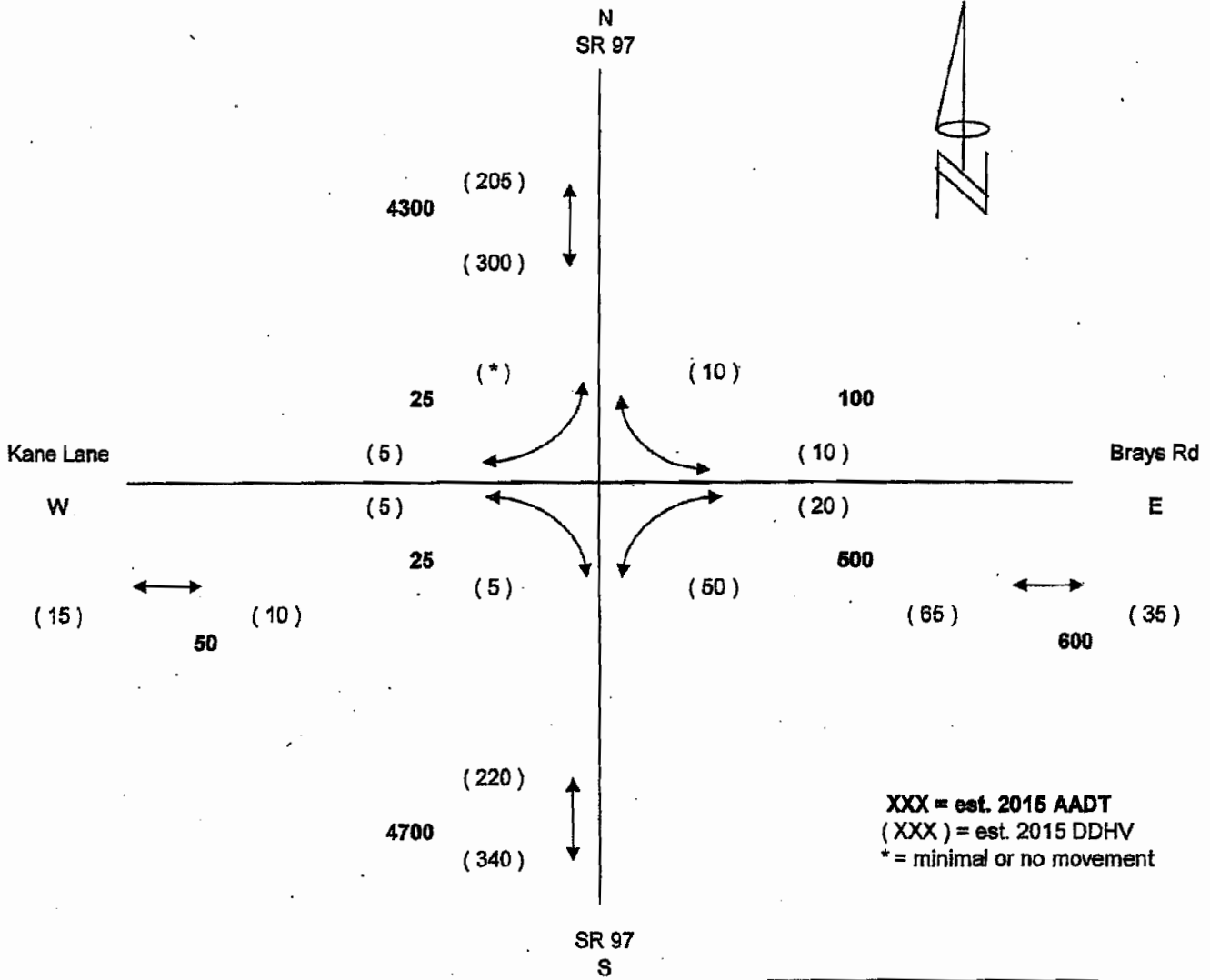
Proposed Development

The WSDOT requested this study add the known development from Desert Canyon and other proposals to the 2015 DDHV with the exception that the Bray's Landing Road volumes be adjusted to the volume prior to any Desert Canyon development (1991). However, none of the available studies offered traffic volume information on Bray's Landing Road prior to 1991. As stated above, the GTC 2002 study did indicate an AADT volume on Bray's Landing Road of 600 vehicles per day which matched the 2015 DDHV on Bray's Landing Road of 600 vehicles per day. Therefore, it was assumed that all of the Desert Canyon PRD development completed and occupied prior to this time (2002) would already be included in the 2015 DDHV for Bray's Landing Road. As a result, only the additional development as identified in the GTC 2002 traffic analysis was added to the 2015 DDHV.

The additional development included Desert Canyon Phase IV, Division 2 (33 - single family dwelling units); Amended Division 2 (4 additional single family dwelling units); Red Hawk Division 1 (6 residential condominiums); Red Hawk Division 2 (6 residential condominiums); Falcon Point (48 residential condominiums); and the Great Links Lodge (21 residential condominiums); Desert Canyon Phase V, (176 residential condominiums and 24 lodge units); Desert Highlands (144 single family dwelling units); and Bray's Heights (27 single family dwelling units). A summary of the additional development is presented in Table 1.

Location: SR 97, MP 220.50, I/S Brays Rd Intersection

DISPLAY EST. DESIGN YEAR AADT & DDHV



SR 97
 Brays Rd. Intersection
 MP 220.50
 TDO 2/2008 rd

Attachment Page 4

DN TRAFFIC CONSULTANTS	2015 DDHV W/O PROJECT FIGURE 2	BRAY'S LANDING ROAD ANALYSIS
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Table 1. Desert Canyon Et Al Development Beyond 2002

Name	Land Use	Units	Occupied Prior to 2002	Remainder
Desert Canyon First Addition	Single Family	42	9	33
Desert Canyon First Addition Amended	Single Family	4	0	4
Red Hawk Division 1	Residential Condos	6		6
Red Hawk Division 2	Residential Condos	6		6
Falcon Point	Residential Condos	48		48
Great Links Lodge	Residential Condos	21		21
Phase V	Residential Condos	176		176
	Lodge	24		24
Desert Highlands	Single Family	144		144
Bray's Heights	Single Family	27		27

As shown in Table 1, the total additional development beyond that occupied prior to 2002 includes 208 single family dwelling units, 257 residential condominiums, and 24 resort hotel units.

Trip Generation

A summary of the additional PM peak hour traffic generated by the proposed additional development is shown in Table 2. Trip generation rates were obtained from the Institute of Transportation Engineers "Trip Generation Report" (7th Edition). Trip generation for single family was generated using Land Use Code 210, for residential condominiums Land Use Code 230; and for Resort Hotel, Land Use Code 330.

Table 2. PM Peak Hour Trip Generation

Name	Units	Rate	Total	In	Out
Desert Canyon First Addition	33 sfdu's	1.01	33	21	12
Desert Canyon First Addition Amended	4 sfdu's	1.01	4	3	1
Red Hawk Division 1	6 condos	0.52	3	2	1
Red Hawk Division 2	6 condos	0.52	3	2	1
Falcon Point	48 condos	0.52	25	17	8
Great Links Lodge	21 condos	0.52	11	7	4
Phase V	176 condos	0.52	92	62	30
	24 resort hotel	0.42	10	4	6
Desert Highlands	144 sfdu's	1.01	145	91	54
Bray's Heights	27 sfdu's	1.01	27	17	10
Totals			353	226	127

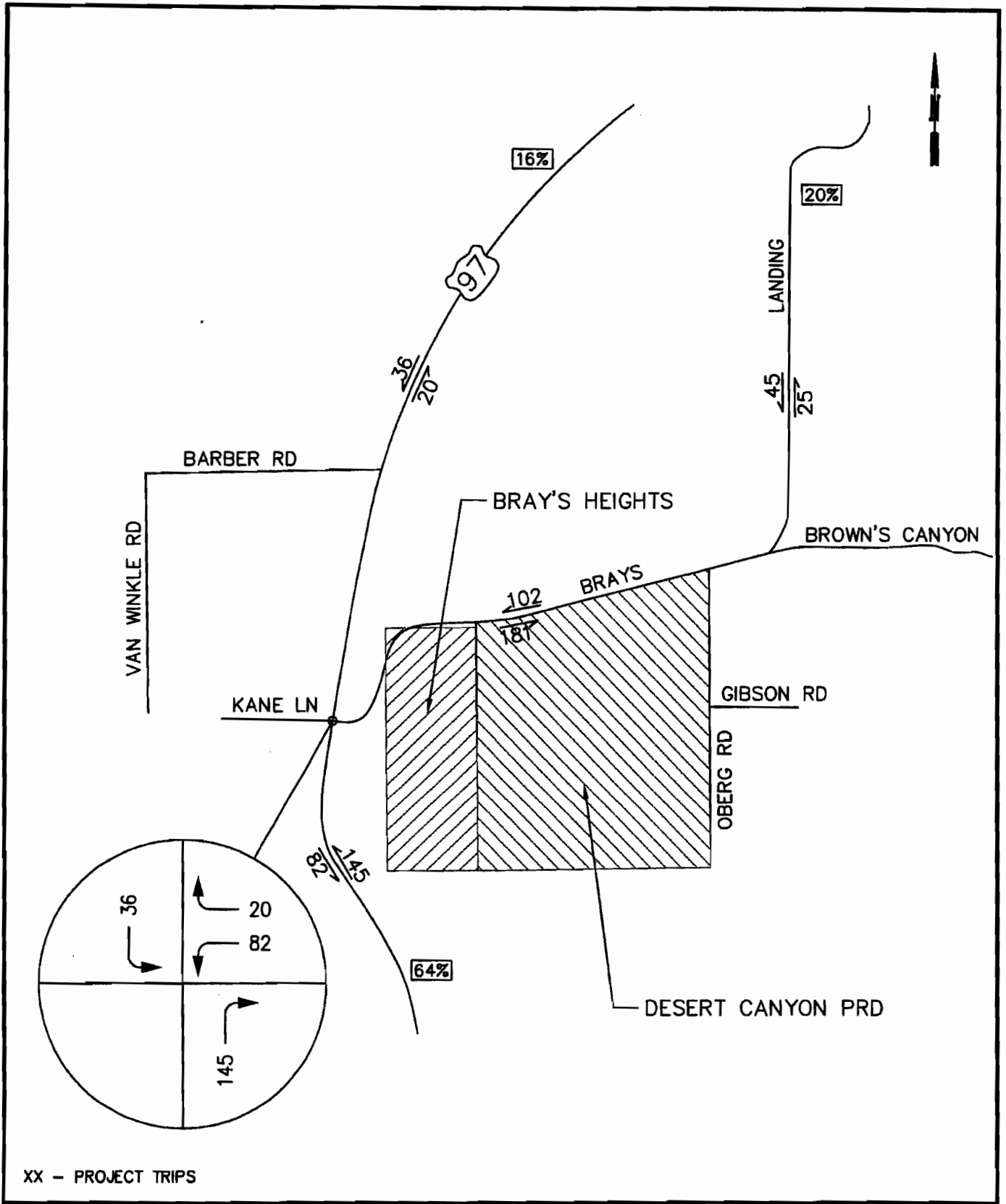
As shown in Table 2, the proposed additional development is estimated to generate 353 total PM peak hour trips with 226 inbound and 127 outbound. These trips were added to the 2015 DDHV volumes provided by WSDOT based on the trip distribution percentages identified below.

Trip Distribution/Traffic Assignment

The WSDOT identified two scenarios they considered acceptable for traffic assignment. For trips to the north on Bray's Landing Road, WSDOT allowed a range of 10 to 20 percent. Twenty percent was assumed as it was more consistent with the field data observed in the previous studies. For the US 97 corridor, WSDOT allowed a range of 70 to 80 percent to the south. Since 20 percent to the north more closely approximated field studies, 20 percent was assigned to the north and 80 percent to the south. The results of the project traffic assignment are shown in Figure 3 and the resultant 2015 DDHV with all known development generated PM peak hour trips is presented in Figure 4.

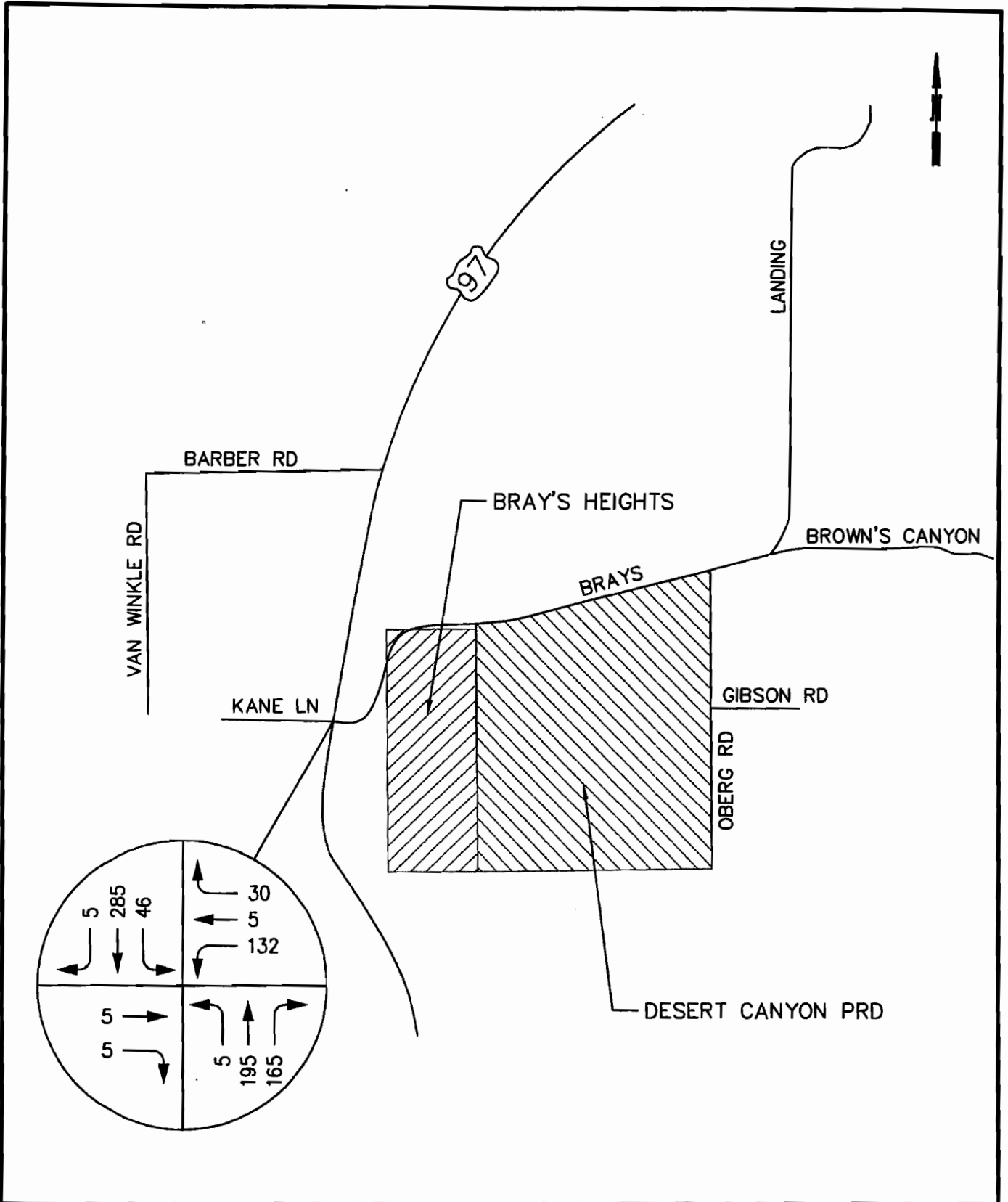
Level of Service

The level of service (LOS) for the 2015 DDHV including all development generated traffic was conducted using Synchro 7.0. The results of the LOS analysis is presented in Table 3.



XX - PROJECT TRIPS

<p>DN TRAFFIC CONSULTANTS</p>	<p>PROJECT TRAFFIC FIGURE 3</p>	<p>BRAY'S LANDING ROAD ANALYSIS</p>
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DN TRAFFIC
CONSULTANTS

2015 WITH PROJECT TRAFFIC
FIGURE 4

BRAY'S
LANDING ROAD
ANALYSIS

Table 3. 2015 DDHV LOS

Intersection	Traffic Control	2015 PM Peak	
		w/o development	w/development
US 97/Bray's Landing Rd	Two way stop	B (14.2)	C (20.7)

As shown in Table 3, the 2015 DDHV level of service is B without the additional development and C with the additional development. Therefore, no intersection improvements are required to address level of service.

Turn Lane Analysis

As stated in the Douglas County Hearing Examiner conditions for the Desert Canyon PRD, a north bound right turn lane and south bound left turn lane would be required to address the project impacts at the US 97/Bray's Landing Road intersection at full development. However, as stated in the previous GTC reports, such improvements weren't required to address the impacts of all five phases of Desert Canyon. The purpose of this analysis is to determine if such improvements are necessary to mitigate the impact of the sum of the traffic generated by Desert Canyon, Desert Highlands, and Bray's Heights.

Left Turn Lane

To determine if a left turn lane was warranted, the 2015 DDHV with development volumes were applied to Figure 910-12a (Left Turn Storage Guidelines: Two Lane, Unsignalized) of the WSDOT Design Manual. The results of the evaluation indicate the DHV on US 97 is significant enough to consider the installation of a south bound left turn lane. Based on the posted speed, (60 mph) and the potential for high speed rear end collisions, it is recommended that a left turn lane be installed. The length of the left turn storage is dictated by Figure 910-13c (Left Turn Storage Length: Two Lane, Unsignalized) which indicates based on the volumes presented in Figure 4 that 100 feet of storage is required. The relevant Design Manual figures with the results of the evaluation are presented in the attached Technical Appendix.

Right Turn Lane

The right turn lane configuration is determined by Figure 910-15 (Right Turn Guidelines) presented in the WSDOT Design Manual. The results of the evaluation indicate a right turn lane should be considered. In fact the right turn volume (165 vph) is off the axis of the chart. The parameters for the right turn lane design is presented in Figure 910-17. The relevant Design Manual Figures for the Right Turn Lane are presented in the Technical Appendix.

Conclusions

The results of the analysis indicate that a south bound left turn lane and a north bound right turn lane will be required at the US 97/Bray's Landing Road with full development of Desert Canyon and development of Bray's Heights and Desert Highlands in the 2015 time horizon.

According to Douglas County records, there are 208 additional single family units, 257 multi family units, and 24 resort hotel units anticipated beyond the development in place in the 2002 base year scenario. This results in an increase of 353 PM peak hour trips.

It was assumed through the analysis that 20 percent of these trips would use Bray's Landing Road to the north; 16 percent would use US 97 to the north and 64 percent would use US 97 to the south. This resulted in 46 south bound left turn trips and 165 north bound right turn trips. These volumes were significant enough to warrant the turn lane requirements.

The next step of the process will be the development and approval of a Channelization Plan per WSDOT requirements.

TECHNICAL APPENDIX

Brays Landing Road/Desert Canyon Developments Traffic Impact Totals

Recorded Documents	Residences		New
Desert Canyon Golf Course (Phase 1)	0 Golf Course Only	<i>constructed</i>	0
Desert Canyon 1st Addition (Phase 2)	42 SF +4 Tracts	<i>9 const = 33</i>	33
Desert Canyon Golf Villas (Phase 3)	15 Condos + 2 Tracts	<i>constructed</i>	0
Desert Canyon 1st Addition - Amended (Phase 2 continued)	4 SF		4
Red Hawk Phase 1 (Phase 4)	6 units (type unknown)	<i>MF 12 condos const.</i>	48
Red Hawk Phase 2 (Phase 4)	6 units (type unknown)		
Falcon Point (Phase 4)	28 units (type unknown) 20 units (type unknown)	<i>MF</i>	48
Phase 4 - Totals	28 Constructed		
<i>(Note: Phase 4 total numbers greater by +2 units than recorded plats of Red Hawk & Falcon Point)</i>	16 Constructed 18 Pending		
Great Links Lodge (Condominium)	21 units (type unknown)	<i>MF retail space - no retail</i>	21
Total Post Phase 4	142 =		18
Total Post Phase 4 (minus pending units)	124 Currently Occupied =		
Phase 5	200 MF (subject to conditions)	} Pending Phases	371
Phase 6 Desert Highlands	144 SF (subject to conditions)		
Brays Heights	27		
Total Post Brays Heights	495		

Completed Phases (2006)

Pending Phases

500 MAY

34
158 =

DH
2/7/08

Bray's Landing Road Analysis
US 97/Bray's Landing Road
PM Peak Hour: 4:00 PM - 5:00 PM
Date Collected: 4/23/07

	2007 PM Peak	2015 DDHV	Project Traffic	2015 With Project	Peak Hour Factor	Percent Trucks/Busses
EBLT	0	0	0	0		
EBT	0	5	0	5	na	na
EBRT	0	5	0	5		
WBLT	14	50	82	132		
WBT	0	5	0	5	0.47	0.00
WBRT	6	10	20	30		
NBLT	0	5	0	5		
NBT	167	195	0	195	0.81	11
NBRT	9	20	145	165		
SBLT	4	10	36	46		
SBT	173	285	0	285	0.75	22
SBRT	0	5	0	5		
	373	595	283	878		

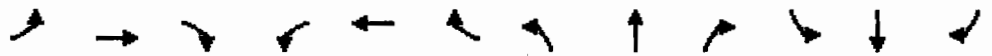
US 97/Bray's Landing Road Analysis
 3: Bray's Landing Road & US 97

2015 w/o development
 May 5, 2008

Movement	EB	EBT	EBR	WB	WB	WB	WB	WB	WB	WB	WB	WB
Lane Configurations		+			+			+	+		+	
Volume (veh/h)	0	5	5	50	5	10	5	195	20	10	285	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	5	5	54	5	11	5	212	22	11	310	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	560	579	312	560	560	212	315			234		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	560	579	312	560	560	212	315			234		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	99	99	87	99	99	100			99		
cM capacity (veh/h)	425	421	728	427	432	828	1245			1334		
Volume Total	11	71	217	22	326							
Volume Left	0	54	5	0	11							
Volume Right	5	11	0	22	5							
cSH	533	462	1245	1700	1334							
Volume to Capacity	0.02	0.15	0.00	0.01	0.01							
Queue Length 95th (ft)	2	13	0	0	1							
Control Delay (s)	11.9	14.2	0.2	0.0	0.3							
Lane LOS	B	B	A		A							
Approach Delay (s)	11.9	14.2	0.2		0.3							
Approach LOS	B	B										
Average Delay			2.0									
Intersection Capacity Utilization			40.4%			ICU Level of Service				A		
Analysis Period (min)			15									

US 97/Bray's Landing Road Analysis
 3: Bray's Landing Road & US 97

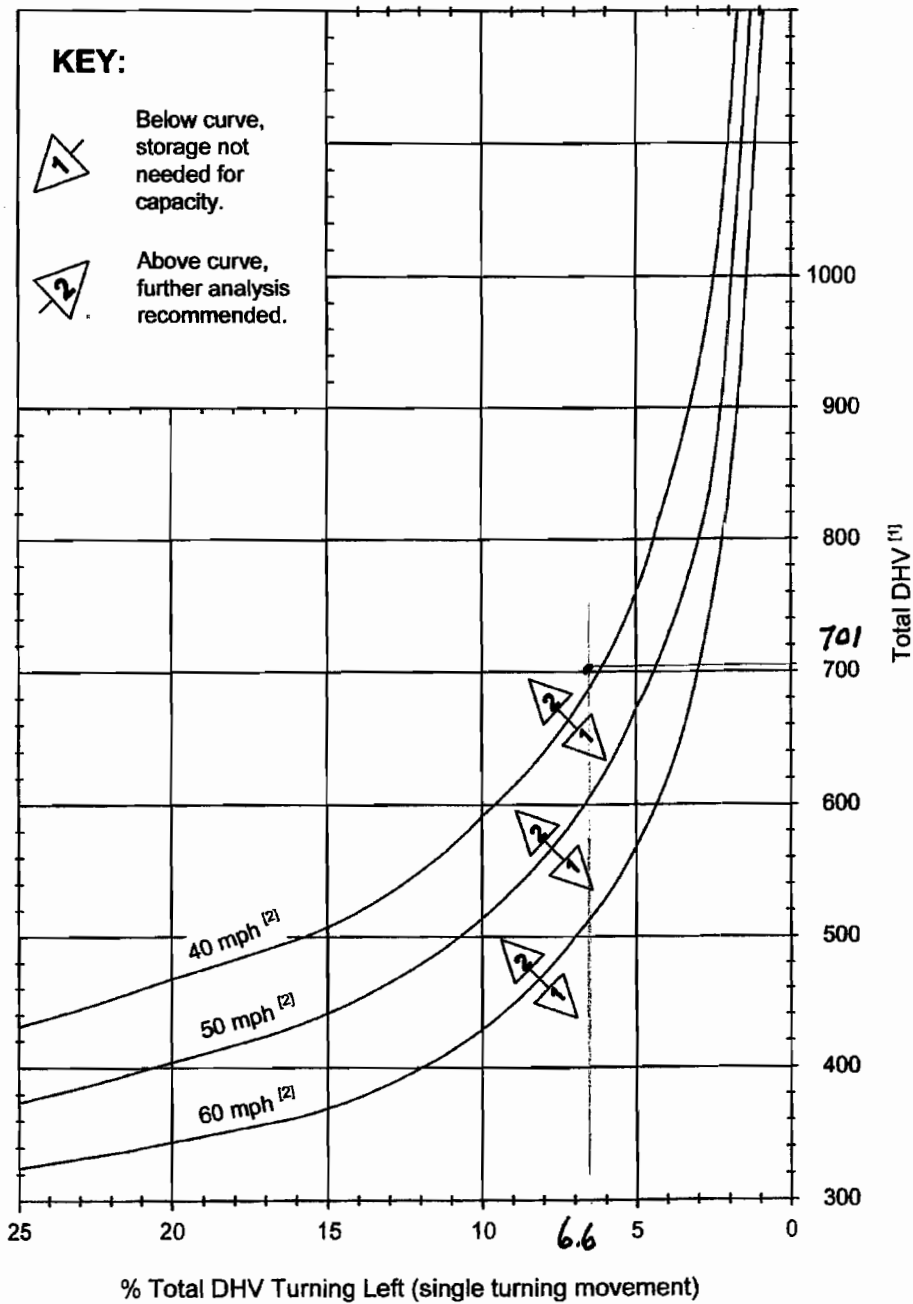
2015 w/development
 May 5, 2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NB	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↑	↗		↕	
Volume (veh/h)	0	5	5	132	5	30	5	195	165	46	285	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	5	5	143	5	33	5	212	179	50	310	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	638	815	312	638	638	212	315			391		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	638	815	312	638	638	212	315			391		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	98	99	61	99	96	100			96		
cM capacity (veh/h)	357	297	728	367	376	828	1245			1167		

Volume Total	11	182	217	179	365							
Volume Left	0	143	5	0	50							
Volume Right	5	33	0	179	5							
cSH	422	409	1245	1700	1167							
Volume to Capacity	0.03	0.44	0.00	0.11	0.04							
Queue Length 95th (ft)	2	56	0	0	3							
Control Delay (s)	13.8	20.7	0.2	0.0	1.5							
Lane LOS	B	C	A		A							
Approach Delay (s)	13.8	20.7	0.1		1.5							
Approach LOS	B	C										

Average Delay		4.7										
Intersection Capacity Utilization		54.5%		ICU Level of Service					A			
Analysis Period (min)		15										



Notes:

- [1] DHV is total volume from both directions.
- [2] Speeds are posted speeds.

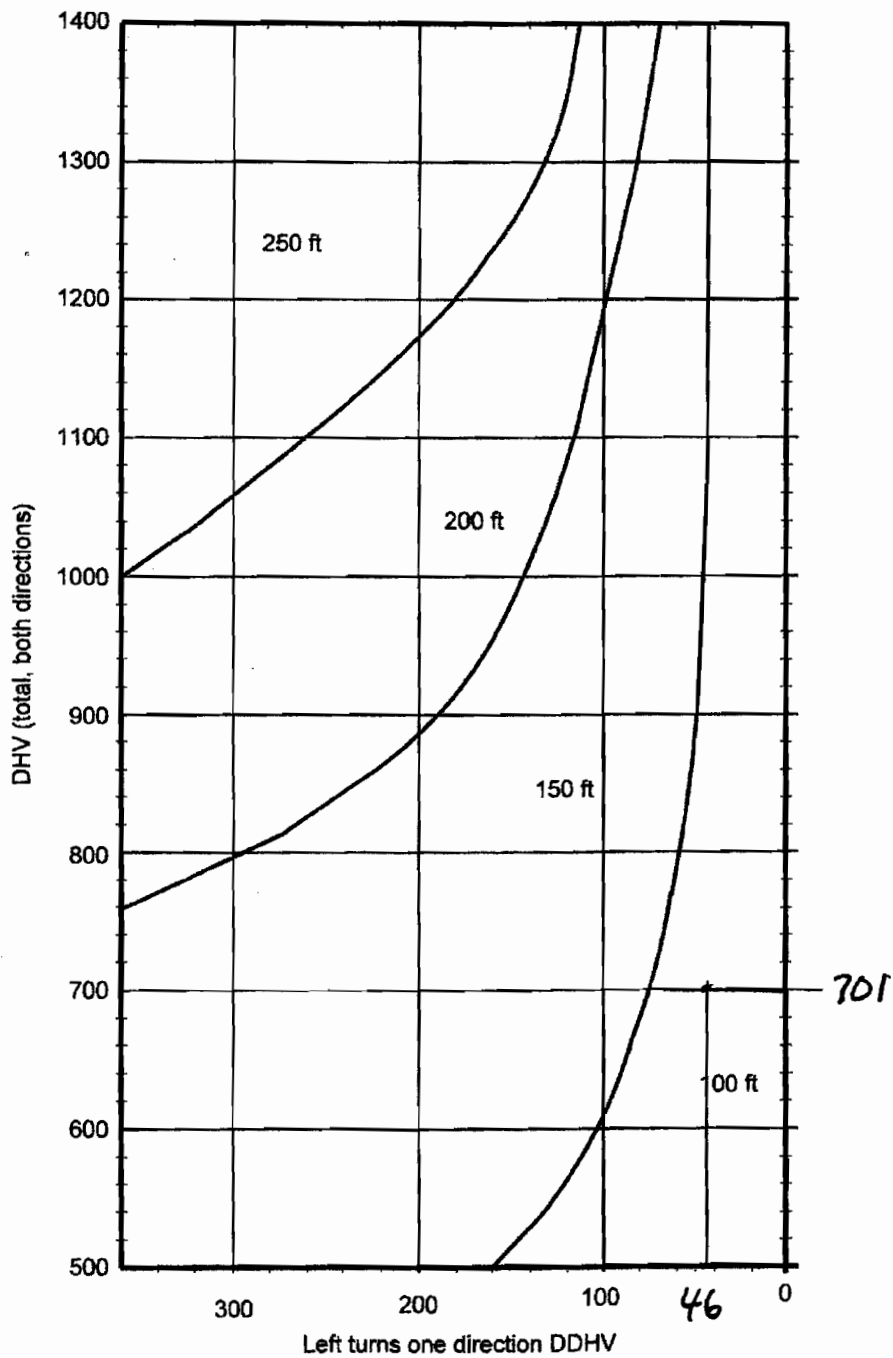
$DHV = NB + SB \text{ (Figure 4)} = 336 + 365 = 701 \text{ vph}$

$\% \text{ Total DHV Turning Left}_{so} = 46/701 = 6.6\%$

Left-Turn Storage Guidelines: Two-Lane, Unsignalized
Figure 910-12a

\therefore Above curve - further analysis warranted

60 mph posted speed



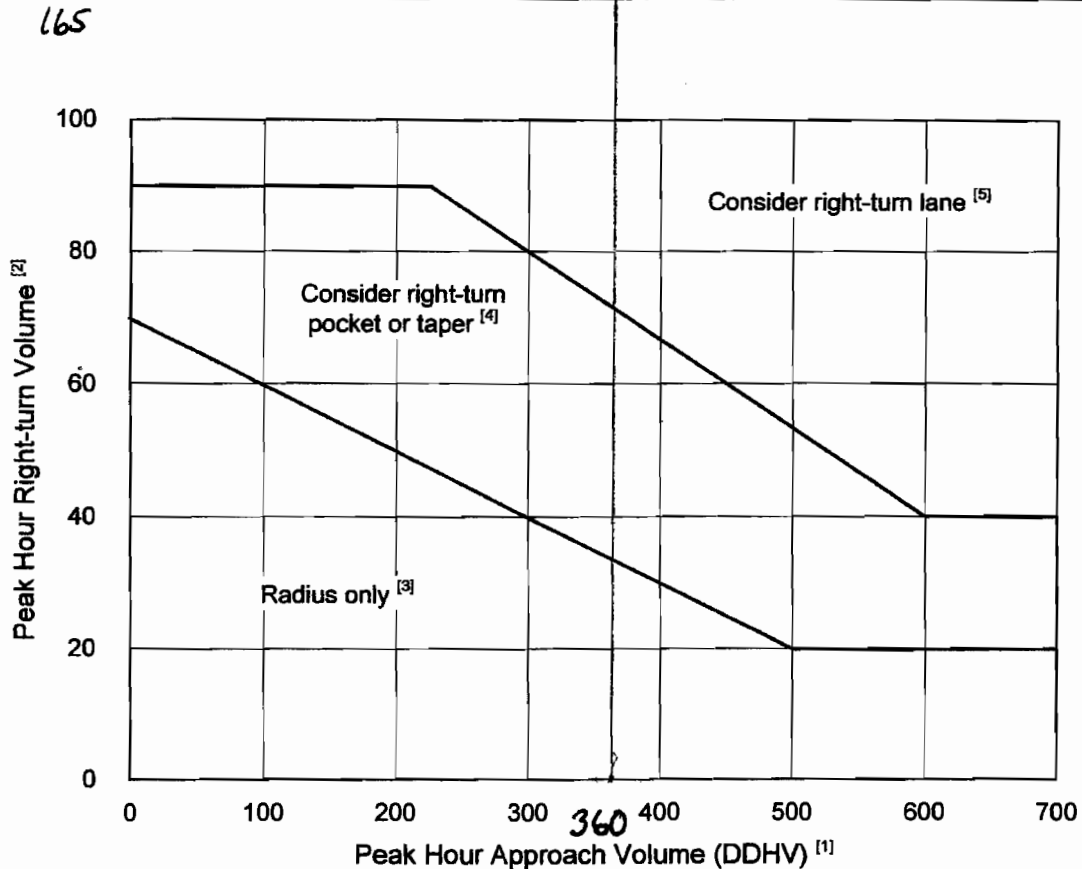
LEFT TURNS = SBLT = 46 vph (See Figure 4)

DHV = NB + SB = 701 vph (See Figure 4)

Left-Turn Storage Length: Two-Lane, Unsignalized

Figure 910-13c

∴ Left-Turn Storage Length = 100 feet

**Notes:**

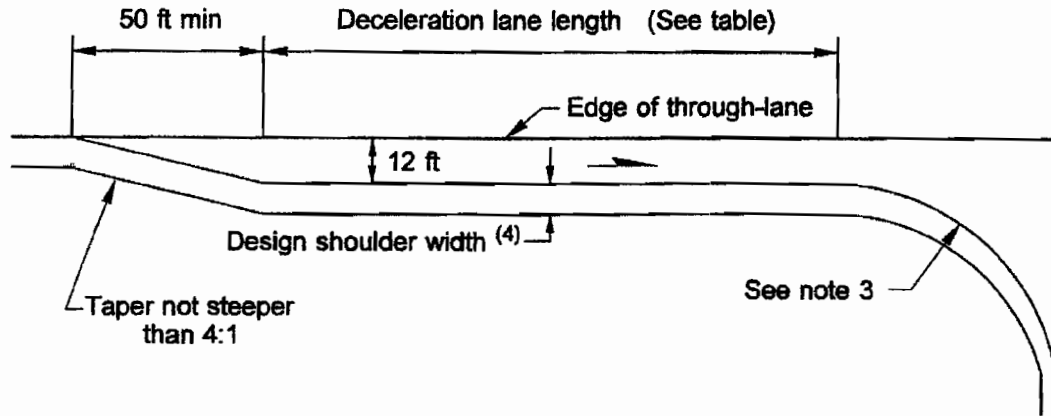
- [1] For two-lane highways, use the peak hour DDHV (through + right-turn).
For multilane, high-speed highways (posted speed 45 mph or above), use the right-lane peak hour approach volume (through + right-turn).
- [2] When all three of the following conditions are met, reduce the right-turn DDHV by 20.
- The posted speed is 45 mph or less
 - The right-turn volume is greater than 40 VPH
 - The peak hour approach volume (DDHV) is less than 300 VPH
- [3] For right-turn corner design, see Figure 910-11.
- [4] For right-turn pocket or taper design, see Figure 910-16.
- [5] For right-turn lane design, see Figure 910-17.
- [6] For additional guidance, see 910.07(3).

Peak Hour Right Turn Volume = 165 vph (See Figure 4)

Peak Hour Approach = NBT + NBRT = 195 + 165 = 360 vph

∴ Right Turn Volume is off the chart = Right Turn Lane

Right-Turn Lane Guidelines^[6]
Figure 910-15



Highway Design Speed (mph)	Turning Roadway Design Speed (mph)		
	Stop ^[1]	15	20
30	235	200 ^[2]	170 ^[2]
35	280	250	210
40	320	295	265
45	385	350	325
50	435	405	385
55	480	455	440
60	530	500	480
65	570	540	520
70	615	590	570

Minimum Deceleration Lane Length (ft)

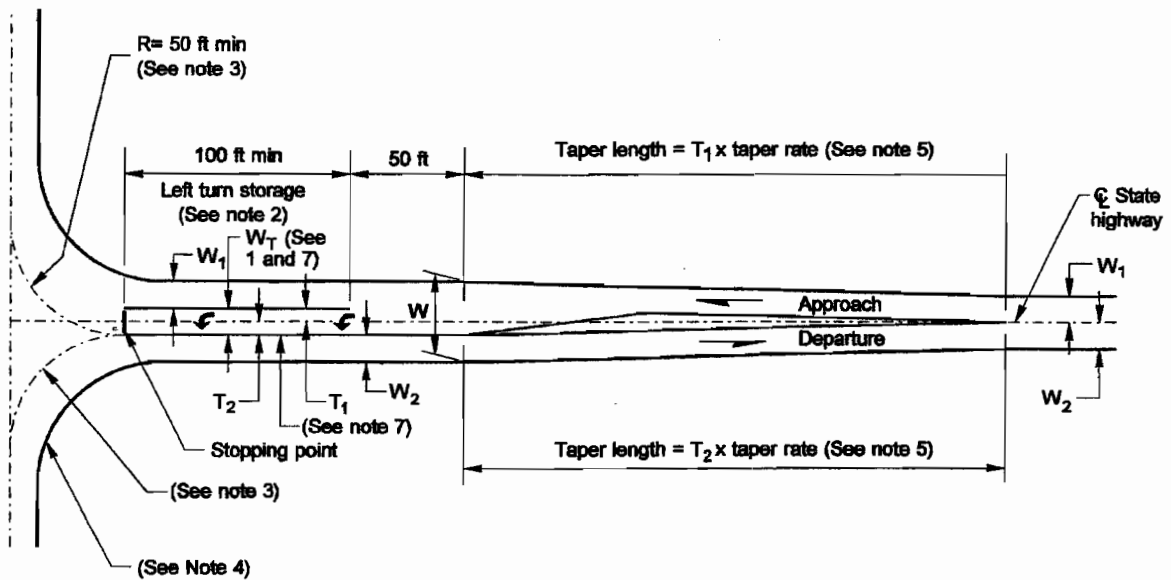
Grade	Upgrade	Downgrade
3% to less than 5%	0.9	1.2
5% or more	0.8	1.35

Adjustment Multiplier for Grades 3% or Greater

Notes:

- [1] For use when the turning traffic is likely to stop before completing the turn (for example, where pedestrians are present).
- [2] When adjusting for grade, do not reduce the deceleration lane to less than 150 ft.
- [3] For right-turn corner design, see Figure 910-11.
- [4] May be reduced (see 910.07).
- [5] For pavement marking details, see the *Standard Plans* and the MUTCD.

Right-Turn Lane
Figure 910-17



Notes:

- [1] The minimum width of the left-turn storage lane (T_1+T_2) is 11 ft. The desirable width is 12 ft.
- [2] For left-turn storage length, see Figures 910-12b for 4-lane roadways or 13a through 13c for 2-lane roadways.
- [3] Desirable radius not less than 50 ft. Use templates to verify that the design vehicle can make the turn.
- [4] For right-turn corner design, see Figure 910-11.
- [5] For desirable taper rates, see Table 1. With justification, taper rates from Table 2, Figure 910-14c, may be used.
- [6] For pavement marking details, see the *Standard Plans* and the MUTCD.
- [7] When curb is provided, add the width of the curb and the required shoulders to the left-turn lane width. For required shoulder widths at curbs, see 910.07(6) and Chapter 440.

- W_1 = Approaching through lane
- W_2 = Departing lane
- T_1 = Width of left-turn lane on approach side of centerline
- T_2 = Width of left-turn lane on departure side of centerline
- W_T = Total width of left-turn lane
- W = Total width of channelization ($W_1+W_2+T_1+T_2$)

Posted Speed	Desirable Taper Rate ^[6]
55 mph	55:1
50 mph	50:1
45 mph	45:1
40 mph	40:1
35 mph	35:1
30 mph	30:1
25 mph	25:1

Table 1

Median Channelization: Widening
 Figure 910-14a

US 97/Bray's Landing Road Intersection Analysis

Proposed Scope of Work

February 20, 2008

The following scope of work was prepared to address the concerns of Douglas County and the Washington State Department of Transportation (WSDOT) in regards to the need for channelization and traffic control improvements at the US 97/Bray's Landing Road in Douglas County to support known development proposals. Specifically the study is intended to evaluate the need for construction of a right turn lane and a left turn lane on US 97.

Previous traffic reports have provided conflicting information in regards to the need for such improvements. It is intended that this analysis will provide a conclusive result to that question through the cooperative participation of all known developers and the review agencies in the formulation and review of the traffic analysis.

Task 1. Data Collection

- Existing Traffic Volumes
 - The consultant will conduct a PM peak period (4:00 PM to 6:00PM) turning movement count at the US 97/Brays Landing Road intersection on an average weekday.
 - The consultant will obtain from the WSDOT the average annual growth rate on US 97 in the vicinity of the Bray's Landing intersection during the last 10 year period. It is assumed this information will be obtained from DOT count station R084.
 - The consultant will obtain from the WSDOT the monthly adjustment factor to convert the traffic count identified above to an average annual PM peak hour count.
 - The consultant will collect PM peak hour traffic assignment patterns from existing development on Bray's Landing Road. It is assumed the existing Desert Canyon access will serve as a reliable source of traffic flow characteristics.
- Proposed Development
 - The consultant will obtain from known developers along Bray's Landing Road current development proposals anticipated during the next ten year period.
 - Current development proposals include Desert Canyon Phase V; Bray's Heights; and Desert Canyon Highlands.

Task 2. Analysis

- Based on the data obtained above, the consultant will prepare an existing and full build out of the known development proposals.

Memorandum

TO: Jolene Gosselin, County Engineer, Douglas County TLS

FROM: Terry Gibson, Gibson Traffic Consultants (GTC) *TLG*

DATE: February 2, 2006

RE: **Traffic Study Update for Desert Canyon Phase V Development (Douglas Co.)**

Background: In November 2002, Gibson Traffic Consultants (GTC) completed a traffic impact analysis (TIA) study for proposed Phase IV development and likely Phase V development at the Desert Canyon Resort/Community on Brays Road east of SR-97 in Douglas County. A northbound right-turn pocket at the SR-97/Brays intersection was recommended and constructed with Phase IV development. The 36 condominium units for Phase IV were constructed but not the 24 lodge units, which are now included in Phase V Division 1 for current development plans. Prior Phase V development was to include a total of 364 residential units, with 91 SFD homes and 273 multi-family condos/villas. The current Phase V development plans include 200 total residential units with 176 condo/cottage units and 24 lodge/timeshare units. In December 2005, GTC discussed scoping and methodology for this traffic study update with County TLS staff (Jennifer Lange). It was agreed that new traffic counts were not required, and GTC could update the future trip generation estimates for Desert Canyon Phases IV/V development plans as well as future 2015 peak LOS conditions and channelization warrants at the critical SR-97/Brays access intersection. This memorandum summarizes the findings and conclusions of the Desert Canyon Traffic Study Update and whether additional channelization improvements are warranted at the SR-97/Brays intersection.

Update on Desert Canyon Development: GTC coordinated with Michelle Thompson and Lisa Guthrie of Homestead NW Development to obtain current information on prior Phase IV and proposed Phase V development at the Desert Canyon Resort properties. The 36 condo units for Phase IV have been constructed but not the 24 lodge/timeshare units, which are now included as part of Phase V Division I development (see attached preliminary plans). Division I would also include 46 cottages/duplex condos, 2 small water slides, 3 pools, hot tubs and snack bar to support the guest water park. Note: The "water park" amenities are being implemented for use of residents and guests only, mainly mothers and kids while fathers are golfing at the Desert Canyon golf course. Division II would include 20 duplex cottages and tri-plex buildings, while Division III proposes a total of 36 residential units with 3-plex and 4-plex cottages plus 12-plex condos on top of the bluff. Division IV would include a maximum of 50 units including duplex cottages, 3 and 4-plex buildings and 8-plex condos around a man-made lake with paddle boats provided for guest use only. Division V would include 24 duplex and tri-plex cottages nearest to Brays Road and the proposed second/west access. There would also be pedestrian/biking trails provided that would meander throughout the entire Phase V development properties. In summary, Phase V development would include 176 cottages or condo units plus 24 lodge/timeshare units.

Trip Generation (Phase V): Daily and PM peak trip generation has been estimated using average trip rates provided in the ITE *Trip Generation* manual (7th edition, 2003). Using sections 230 (Resid. Condo/Townhome) and 330 (Resort Hotel), GTC estimates that **1,200 daily and 104 PM peak trips would be generated each weekday**. During the critical PM peak period, the directional split would be 67 vph inbound and 37 vph outbound. Since the new 36 condo units were not built at the time of latest traffic counts (Oct. 2002), an additional 20 PM peak trips (13 in and 7 out) were added as “pipeline” trips for the traffic/LOS analysis.

Trip Distribution & Assignments: The likely distribution of Phase V site traffic is portrayed on **Figure 1**. Specific distribution percentages were estimated based on existing travel patterns/splits at the SR-97/Brays and Brays Road/Desert Canyon Blvd. intersections. With construction of the west access road with Phase V development, a second connection would be provided to Brays Road. An estimated 65 % of site trips would use the new west access road, since is a much shorter route to the SR-97/Brays intersection. The remaining 35 % would use the existing Desert Canyon entrance and Brays Road to/from SR-97, with the majority of this traffic destined north toward Lake Chelan. Daily and PM peak site trips were assigned to the adjacent County roads and SR-97 using these trip distribution percentages.

Future 2015 Traffic Volumes & Peak LOS: For the original 2002 TIA study, a 4 % annual growth rate was assumed to estimate future 2015 baseline traffic volumes for the affected County/State road system. This 4 % growth factor was based on growth in SR-97 traffic from 1997 to 2001 at the R084 traffic count station north of US-2. Daily traffic volumes on SR-97 have been fairly steady the past 3 years (2002-2004), with 3,991 AADT in 2001 and 3,877 AADT in 2004 at count station R084 (see attached traffic count summary). SR-97 traffic grew by a total of 8 % or 2 % annually from 1999 to 2003. From 2000 to 2004, SR-97 traffic increased by about 5 % or 1.3 % annually. To be conservative, GTC has assumed **an annual growth rate of 2 % compounded annually** to estimate 2015 future baseline peak volumes on the affected road system and the critical SR-97/Brays Road intersection. Note: The same Oct. 2002 TM count was utilized at SR-97/Brays intersection, with peak traffic counted then increased by 7 % to reflect summer peak conditions.

Using HCS2000 software, GTC recalculated the future 2015 peak LOS conditions with Phase V development at the **SR-97/Brays intersection**. This stop-controlled intersection, with a NB right-turn lane, is projected to operate at **acceptable LOS C** with 15.2 seconds delay on the Brays WB approach at full build-out of Phase V development.

Channelization Warrant Update: Summarized below are projected 2015 PM peak turning/through volumes on SR-97 at the south Brays Road intersection.

2015 PM Peak Volumes at SR-97/Brays Intersection

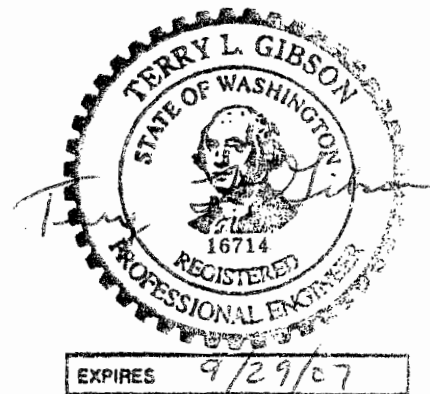
<u>Inbound Left</u>	<u>Inbound Right</u>	<u>Southbound Thru</u>	<u>Northbound Thru</u>
17 vph	72 vph	318 vph	184 vph

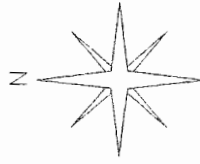
The inbound left-turn movement is projected to be 17 vph during the critical PM peak period, while the inbound right-turn movement is 72 vph. Using WSDOT's "Left-Turn Storage Guideline" (Figure 910-8a), the percent of the total DHV (593 vph) turning left is 2.87 % and **left-turn channelization is not warranted for projected 2015 peak volumes with full build-out of proposed Phase V development.** Using WSDOT's "Right-Turn Lane Guidelines" (Figure 910-11), projected 2015 PM peak volumes of 72 vph for northbound right-turn and 257 vph for northbound approach **warrant a right-turn pocket or taper on the SR-97 northbound approach at the Brays intersection.** Note: Since there is already a 60-foot right-turn pocket, which was constructed with Phase IV development, **no additional channelization improvements are required with Phase V development at the Desert Canyon Resort.**

We trust that GTC's supplemental traffic impact analysis for Desert Canyon Phase V development is helpful to Douglas County, WSDOT and the developer in updating projected 2015 peak traffic volumes/LOS on adjacent roads and channelization warrants at the SR-97/Brays Road intersection. If you have any questions on GTC's update calculations or findings, please call me at (253) 857-8840. Thanks again, Jolene, for your timely input and coordination.

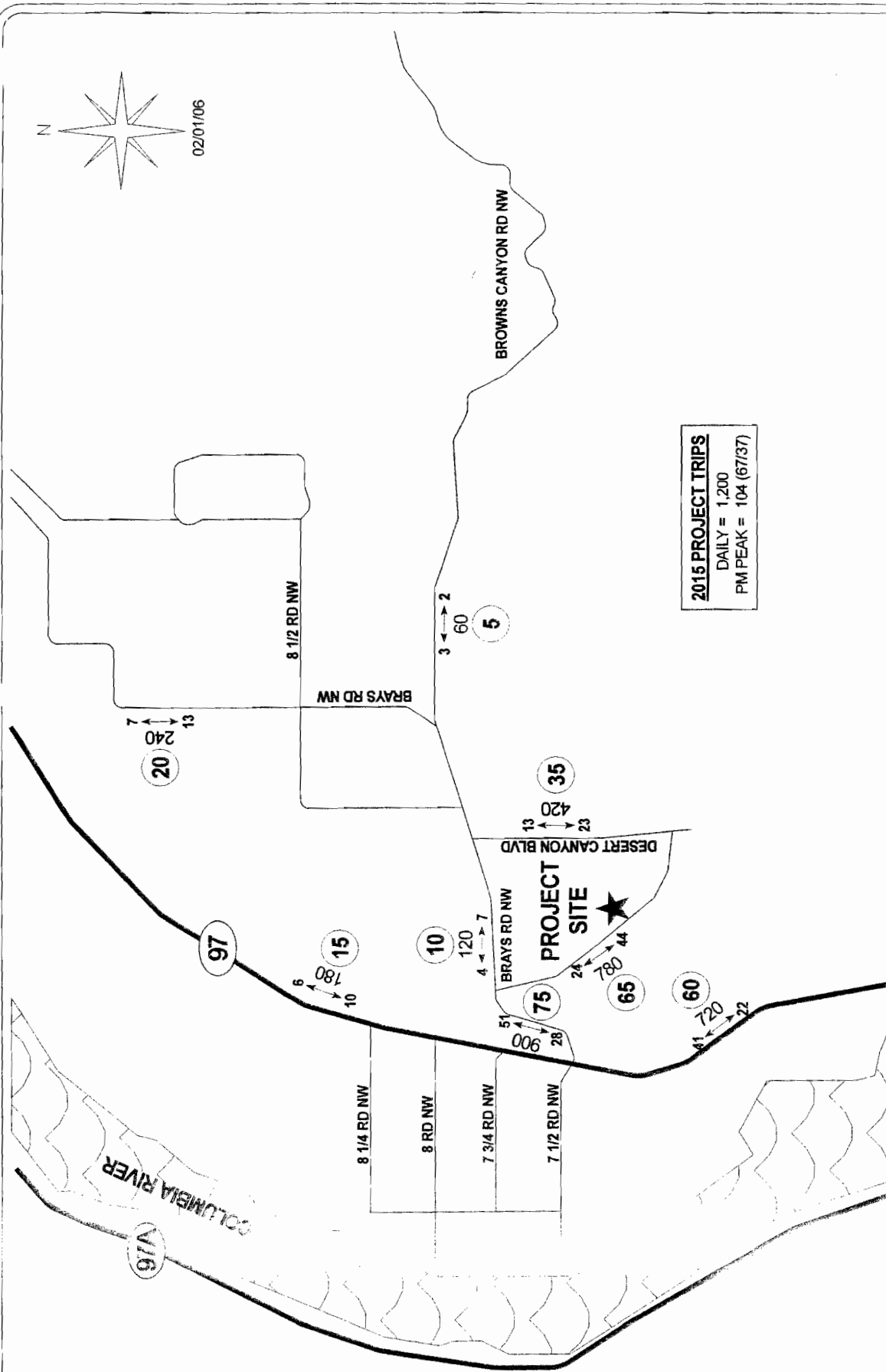
Attachments

XC: Michelle Thompson, Homestead NW Development





02/01/06



TRAFFIC IMPACT STUDY
 GTC #05-310

FIGURE 1
SITE VICINITY &
TRIP DISTRIBUTION

GIBSON TRAFFIC CONSULTANTS

DESERT CANYON
PHASE V DEVELOPMENT
 (176 CONDOS/24 LODGE UNITS)

DOUGLAS COUNTY

LEGEND
 NEW SITE TRAFFIC
 (DAILY/PEAK HOUR)
 AWDT
 PM ← PEAK
 TRIP DISTRIBUTION %

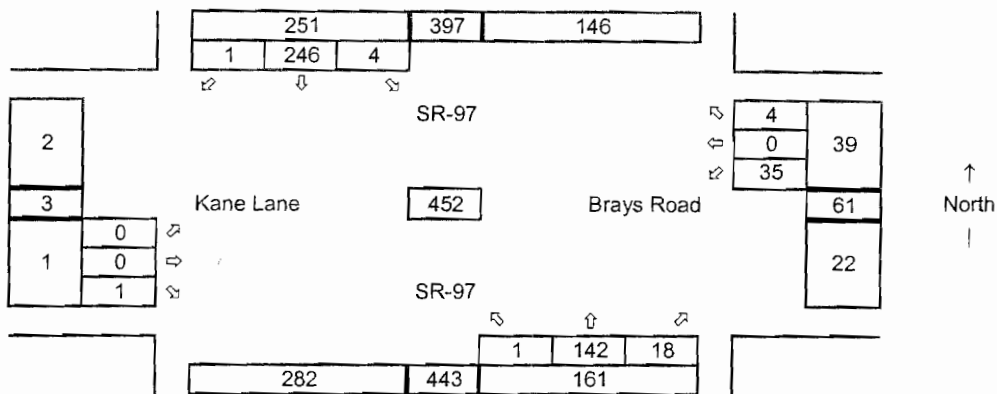
25

Existing
Average Weekday
PM Peak Hour

Year: 10/16/2002

Data Source: GTC

Includes a 7% seasonal factor
to "Non-Seasonal Trips", see below



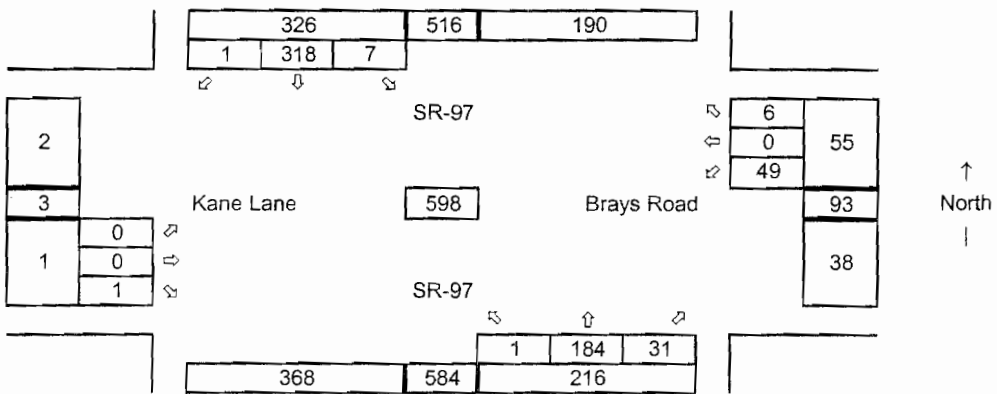
Future without Project
Average Weekday
PM Peak Hour

Year: 2015

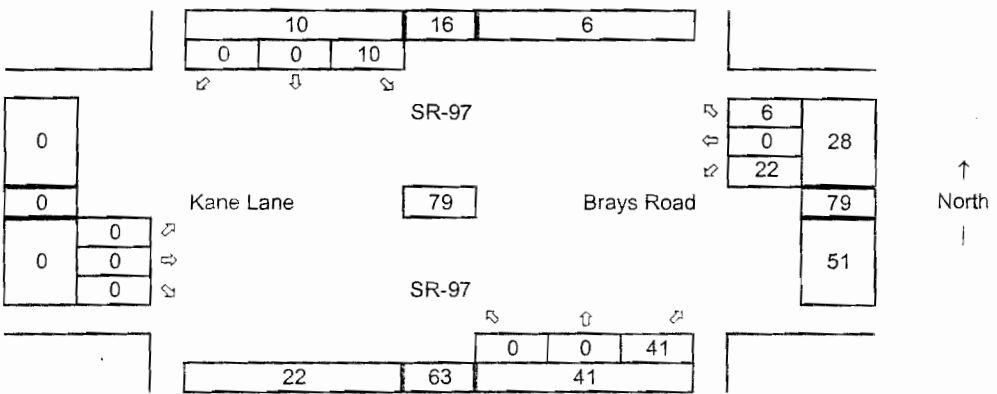
Growth Rate = 2.0%

Years of Growth = 13

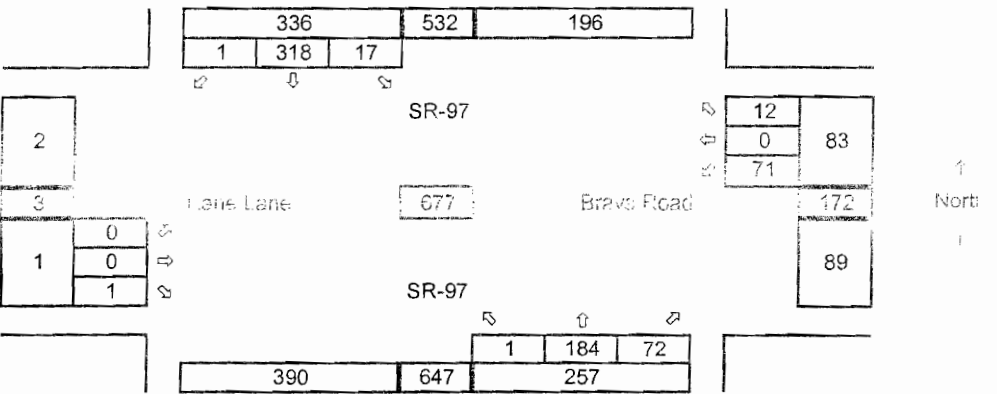
Total Growth = 1.2936



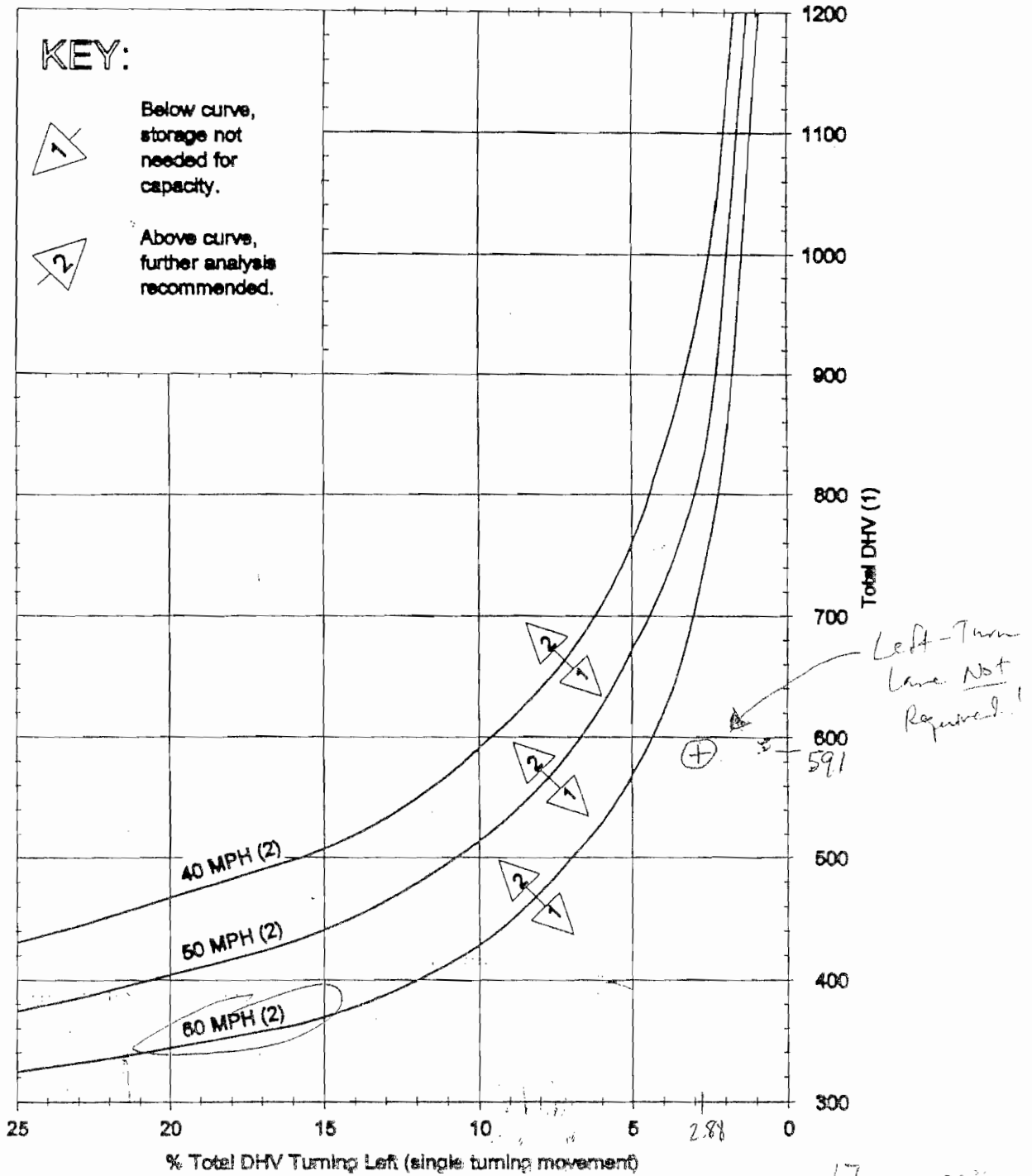
Total Project Trips
Average Weekday
PM Peak Hour



Future with Project
Average Weekday
PM Peak Hour



SL-970 Brays Rd → 2015 @ full Build-out
 (Desert Canyon Retort)



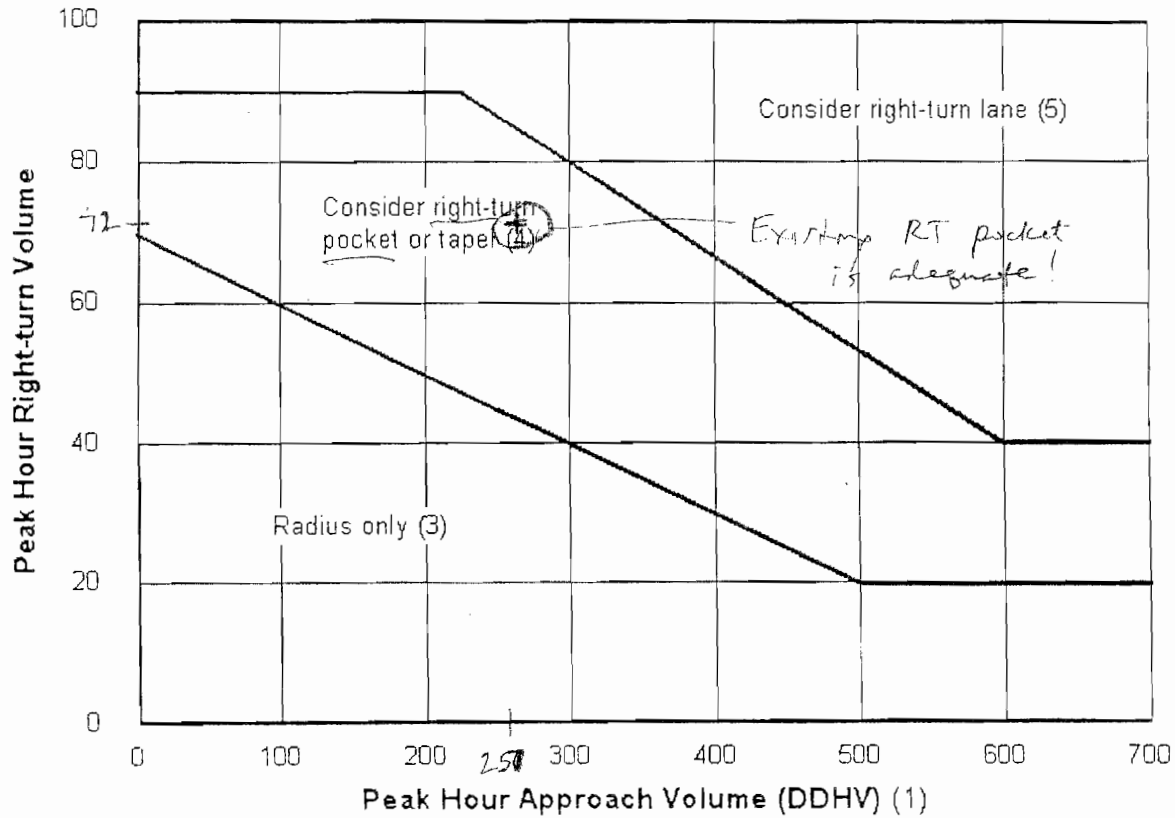
(1) DHV is total volume from both directions.

(2) Speeds are posted speeds.

Left-Turn Storage Guidelines (Two-Lane, Unsignalized)

Figure 910-8a

SR-97 @ Brays Rd → 2015 @ Full Build-out



Notes:

- (1) For two-lane highways, use the peak hour DDHV (through + right-turn).
For multilane, high speed highways (posted speed 45 mph or above), use the right-lane peak hour approach volume (through + right-turn).
- (2) When all three of the following conditions are met, reduce the right-turn DDHV by 20.
 - The posted speed is 45 mph or less.
 - The right-turn volume is greater than 40 VPH.
 - The peak hour approach volume (DDHV) is less than 300 VPH.
- (3) See Figure 910-7 for right-turn corner design.
- (4) See Figure 910-12 for right-turn pocket or taper design.
- (5) See Figure 910-13 for right-turn lane design.
- (6) For additional guidance, see 910.07(2) in the text.

Right-Turn Lane Guidelines (6)
Figure 910-11

TWO-WAY STOP CONTROL SUMMARY								
General Information			Site Information					
Analyst	T. Gibson		Intersection	SR-97 @ Brays Road				
Agency/Co.	GTC		Jurisdiction	Douglas County				
Date Performed	2/1/2006		Analysis Year	2015 With Full Development				
Analysis Time Period	PM Peak Hour							
Project Description <i>Desert Canyon Resort Update (Phase V Development)</i>								
East/West Street: <i>Brays Road NW</i>			North/South Street: <i>SR-97</i>					
Intersection Orientation: <i>North-South</i>			Study Period (hrs): <i>0.25</i>					
Vehicle Volumes and Adjustments								
Major Street	Northbound			Southbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume	1	184	72	17	318	1		
Peak-Hour Factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91		
Hourly Flow Rate, HFR	1	202	79	18	349	1		
Percent Heavy Vehicles	12	--	--	18	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	1	0	1	0		
Configuration	LT		R	LTR				
Upstream Signal		0			0			
Minor Street	Westbound			Eastbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume	71	0	12	0	0	1		
Peak-Hour Factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91		
Hourly Flow Rate, HFR	78	0	13	0	0	1		
Percent Heavy Vehicles	3	0	3	0	0	0		
Percent Grade (%)		-2			3			
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration		LTR			LTR			
Delay, Queue Length, and Level of Service								
Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT	LTR		LTR			LTR	
v (vph)	1	18		91			1	
C (m) (vph)	1155	1195		443			698	
v/c	0.00	0.02		0.21			0.00	
95% queue length	0.00	0.05		0.76			0.00	
Control Delay	8.1	8.1		15.2			10.2	
LOS	A	A		C			B	
Approach Delay	--	--		15.2			10.2	
Approach LOS	--	--		C			B	

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STATE OF WASHINGTON - DEPARTMENT OF TRANSPORTATION
 T R I P S S Y S T E M
 AUTOMATED DATA COLLECTION RECORDERS
 ANNUAL AVERAGE DAILY TRAFFIC VOLUMES
 RURAL STATIONS

158 23 54

RECORDER NUMBER	1995 AADT	1996 AADT	1997 AADT	1998 AADT	1999 AADT	2000 AADT	2001 AADT	2002 AADT	2003 AADT	2004 AADT
R076	1546	1547	1809	1801	1914	*	1983	1926	1878	1861
	762	759	888	887	932	*	968	946	924	910
	785	788	923	919	982	*	1014	980	955	952
R077	1833	1801	*	*	2309	2267	1963	1931	1794	1841
	880	863	*	*	1125	1103	952	938	869	893
	955	937	1041	*	1185	1164	1010	993	926	948
R083	1489	1487	1568	1666	1698	1723	1723	1789	1765	1805
	739	732	773	829	848	867	867	897	887	918
	751	755	795	837	848	856	856	891	878	887
R084	*	*	3502	*	3849	3694	3991	3826	4158	3877
	*	*	1725	*	1958	1838	1989	1905	2065	1928
	*	*	1777	*	1891	1856	2002	1925	2093	1949
R085	14268	14145	14957	15222	15965	15838	16089	16538	16721	17013
	7196	7094	7487	7636	8001	7920	8048	8270	8357	8390
	7072	7065	7467	7585	7964	7919	8041	8268	8364	8623
R086	12770	12661	*	14516	15315	15013	15144	16047	16327	16225
	6405	6360	*	7279	7673	7532	7600	8052	8189	8106
	6349	6292	*	7237	7642	7480	7547	8007	8138	8116
R088	*	*	*	*	*	*	*	41771	42665	43137
	*	*	*	*	*	*	*	20641	21071	21345
	*	*	*	*	*	*	*	21129	21594	21792
R089	*	*	*	*	*	*	*	15813	16196	16694
	*	*	*	*	*	*	*	8007	8202	8447
	*	*	*	*	*	*	*	7809	7994	8247
R094	*	*	*	*	*	*	*	*	*	73009
	*	*	*	*	*	*	*	*	*	36482
	*	*	*	*	*	*	*	*	*	36523
R095	*	*	*	*	*	*	*	*	5716	5845
	*	*	*	*	*	*	*	*	2902	2967
	*	*	*	*	*	*	*	*	2814	2878
R096	*	*	*	*	*	*	*	*	14982	15459
	*	*	*	*	*	*	*	*	7444	7723
	*	*	*	*	*	*	*	*	7538	7736
S612	3296	3117	*	3245	3243	3211	3228	3394	3397	3502
	1735	1638	*	1624	1615	1604	1608	1693	1696	1757
	1569	1482	*	1621	1628	1607	1620	1701	1700	1745

* NOT AVAILABLE



November 12, 2002

Mr. Peter Ringsrud, Director
Douglas County, Public Works
470 – 9th Street NE
East Wenatchee, WA 98802

RE: **Traffic Impact Analysis for Desert Canyon Development (Douglas County)**

Dear Mr. Ringsrud:

Background: Gibson Traffic Consultants (GTC) has been retained by Homestead NW Development Company to complete a traffic impact study for the proposed Development Plan IV for Desert Canyon Resort, which is located on Brays Road east of SR-97 in Douglas County. The original PRD for the Desert Canyon planned residential community (PRD) was approved by in October 1991 and includes an 18-hole golf course, 300-400 multi-family (MF) units and 100 single-family lots. Phase I development constructed the 18-hole championship golf course in 1992. Phase II development of 42 single-family residential lots was approved in 1993 and 9 SFD homes have been constructed. In 1994, Phase III development was approved for 15 MF golf villas which have been built. Development Plan IV was also approved by the Douglas County Board of County Commissioners in 1994 for 67 MF golf villas and 122 MF condominiums. To date, 12 condos have been constructed. The current Phase IV development proposal includes 36 MF condos and 24 lodge units with construction scheduled by 2005.

On October 3rd, GTC discussed scoping and methodology issues for the Desert Canyon traffic study with the County. It was agreed that GTC should analyze the weekday PM peak period for the SR-97/Brays Road and Brays Road/Desert Canyon Blvd. intersections. Afternoon peak traffic counts were conducted on Wednesday, October 16, 2002 at both study intersections between 3:30 and 5:30 PM. GTC also coordinated with Jack Frei at the Desert Canyon Resort to discuss the proposed Phase IV development and to clarify the status and number of residential and lodge units to be constructed. GTC also reviewed the Hearing Examiner's decision, dated September 8, 1994, which outlined specific road improvements that would be required at the SR-97/Brays Road intersection based on actual traffic counts. A preliminary agreement between Douglas County and the Desert Canyon Associates called for new left-turn lanes on SR-97 and Brays Road, a new right-turn lane on SR-97 and necessary right-of-way to construct the improvements. During scoping for this traffic study, the County requested that this traffic analysis confirm what improvements are needed to mitigate the impacts of proposed Phase IV development. This report memorandum addresses existing and future peak traffic conditions/LOS at study intersections as well as identifies/clarifies appropriate transportation improvements to SR-97, Brays Road and study intersections plus traffic mitigation fee structure for pending Phase IV and future development at Desert Canyon.

PROPOSED SITE DEVELOPMENT & ACCESS

The proposed Phase IV development would include a total of 36 MF condominium units and 24 lodge units at the Desert Canyon Resort. Per Jack Frei, it is anticipated that the first 12 condo units would be constructed by June 2005 and the remaining 24 condo units by 2005. The proposed Desert Canyon Lodge should also be constructed by 2005, with a total of 24 units. The lodge units would include a master bedroom and a Murphy bed in the living area, with a maximum occupancy of 4 adults or 2 couples. As for future planned development, there are 60 additional condominium units proposed east of the project site but they would be constructed no sooner than 2010 and are not included in the subject application. Site access would be provided exclusively via Desert Canyon Blvd. and to Brays Road west of SR-97. The external road system is already provided (with construction of the championship golf course) and the only improvements needed would be for internal roads and driveways to access each new condominium complex and the proposed Desert Canyon Lodge.

SCOPE OF ANALYSIS & METHODOLOGY

Per our scoping discussions in early October, it was agreed that the critical period for this traffic analysis is the weekday PM peak period since all site traffic except the golf course (which has minimal traffic) would peak during this period. The County's primary concern with future development at the Desert Canyon Resort and adjacent residential homes is weekday peak traffic/LOS conditions at the SR-97/Brays Road and Brays Road at Desert Canyon Blvd. intersections. New PM peak traffic counts were taken at both intersections on Wednesday, October 16, 2002 on a clear day with 70 degrees for a high temperature. This count day had an unusually high number of golfers for October, with 70 % of maximum operations (July through September months at Desert Canyon Golf Resort) vs. the usual 50 % of maximum daily golf rounds for typical October days.

For the future traffic analysis, GTC has assumed an average annual growth rate of 4 % for background traffic. Per input from Douglas County Public Works, the average annual growth rate is 3.3 % for this area of the County. Per WSDOT's *2001 Annual Traffic Report*, SR-97 presently carries 3,991 average daily trips (ADT) north of US-2 compared with 3,502 ADT in 1997 or an average growth rate of 3.5 %. The pending residential development of 12 condominiums should occur by 2003 with an additional 24 condos by 2005 and the proposed 24-unit lodge also by expected by 2005. Thus, a horizon year of 2005 has been assumed for this traffic impact analysis. Trip generation estimates for future residential traffic at the Desert Canyon planned residential development (PRD) are based on average trip rates for section 210 (Single-Family Residential) and section 230 (Residential Condominium/Townhouse) of the 1997/6th edition of the *ITE Trip Generation* manual. For the proposed Desert Canyon Lodge, GTC has assumed "Resort Hotel" (section 330) to estimate trip generation. The trip distribution for new site traffic was determined using existing travel patterns based on October 2002 traffic counts at the study intersections. Peak-hour level-of-service (LOS) determinations were conducted

using the methodology described in the 2000 *Highway Capacity Manual* (HCM), TRB Special Report 209 and HCM software developed by McTrans for the FHWA. Channelization requirements at site access intersections are based on nomographs provided in WSDOT's *Design Manual*. Terry Gibson, responsible for the traffic analysis and report, is a licensed professional engineer (Civil) in the State of Washington and past President of the Washington State section of ITE.

EXISTING CONDITIONS

Road System & Traffic Control: The primary roadways which will provide access to the subject Desert Canyon PRD/Resort site are SR-97, Brays Road and Desert Canyon Blvd. (see **Figure 1**). **SR-97** is a north-south principal arterial which traverses the State of Washington, passes through Blewitt Pass and travels on the east side of the Columbia River north of Wenatchee. SR-97 has two (2) travel lane with 6-foot paved shoulders on both sides and is posted for 60 mph. **Brays Road** is a 2-lane County arterial which connects to SR-97 at 2 places at the study intersection and a second intersection about 3.5 miles further north. Two (2) travel lanes are provided with minimal gravel shoulders and a posted speed of 50 mph, although sharp horizontal curves just east of SR-97 are posted for 25-35 mph. With construction of the golf course and initial residential homes, **Desert Canyon Blvd.** has been improved to provide a boulevard section with 20-foot travel lanes in both directions plus a wide landscaped median near the entrance onto Brays Road. The posted speed limit is 25 mph on Desert Canyon Blvd. No traffic signals are operating in the site vicinity (nearest signal at US-2/SR-97 junction with SR-28 to the south). All intersections in the project vicinity are stop-controlled with stop signs provided on the minor road approaches.

Existing Traffic Volumes & Peak LOS: Based on the latest traffic counts by WSDOT (on SR-97 north of US-2 at count station R 084), SR-97 presently carries an average annual daily traffic volume of 3,991. PM peak traffic volumes from the count at SR-97/Brays Road intersection on October 16, 2002 were adjusted/increased by 7 % to reflect summer peak conditions, using monthly traffic variation data for the nearby WSDOT count station. With this "summer peak" adjustment, SR-97 presently handles about 4,450 vehicles per day which represents 10 times the existing PM peak volume south of Brays Road (see TM diagram/spreadsheet). Thus, the existing daily traffic volume on SR-97 represents about 40 % of the daily capacity (12,000 vph) for this 2-lane highway with shoulders. Brays Road currently carries about 600 vpd or about 8 % of the capacity of this 2-lane road without shoulders (7,000-8,000 vpd). Thus, the existing road system affected by the proposed Desert Canyon PRD development currently operates well below capacity.

Traffic congestion on roadways or at intersections is generally measured in terms of level of service (LOS). In accordance with the 2000 Highway Capacity Manual, road facilities or intersections are rated between LOS A and F, with LOS A being free flow and LOS F being forced flow or over-capacity conditions (see **Table 1**). The LOS at unsignalized intersections is based on stopped delay times for the critical approach, and on overall

intersection delay for signalized intersections. Geometric characteristics and conflicting traffic movements are taken into consideration when determining LOS values. As shown in **Table 2**, the SR-97 unsignalized intersection at Brays Road presently operates at LOS B for existing conditions with 12.2 seconds of average delay for the Brays westbound stopped approach. The Brays Road at Desert Canyon Blvd. unsignalized intersection operates at desirable LOS A during the critical PM peak with 9.0 seconds of average delay for the existing Desert Canyon entrance approach.

FUTURE CONDITIONS (2005) - IMPACTS OF PROPOSAL

Background Traffic & Horizon Year: Based on historic traffic count data obtained from the SR-97 traffic count station just north of Brays Road, traffic on SR-97 has grown at a rate of about 3.5 % annually between 1997 and 2001. Thus, in order to be conservative, GTC has assumed a growth factor of 4 % compounded annually to estimate future baseline traffic volumes for the affected County/State road system. The first phase of proposed condominiums (12 units) is scheduled for construction by June 2003, with the second phase for 24 additional condos to be built by 2005. Proposed construction of the 24-unit lodge at Desert Canyon Resort is also scheduled for 2005. There are also future plans to construct an additional 60 condominium units as part of Phase IV development, with construction estimated to be complete by 2010.

Trip Generation: GTC has estimated daily and peak-hour site traffic for the proposed condominiums (36) and 24-unit lodge using the ITE *Trip Generation* manual (6th edition, 1997). As summarized in **Table 3** below, the proposed 36 condominiums would generate 210 daily and 20 PM peak trips while the 20 lodge units when fully occupied would contribute 165 daily and 12 PM peak trips on an average weekday. Thus, the proposed Phase IV development would generate a total of **375 daily and 32 PM peak trips** on an average weekday. During the critical PM peak hour, the directional split for new site trips would be 59 % inbound (19) and 41 % (13) outbound.

Table 3

Trip Generation Summary

<u>Proposed Development</u>	<u>ITE Code</u>	<u>Daily Trips</u>	<u>PM Peak Trips</u>
12 Condominiums (2003)	230	70	7
24 Condominiums (2005)	230	140	13
24 Hotel/Lodge Units (2005)	330	<u>165</u>	<u>12</u>
	Trip Totals	375	32 (19 IB/13 OB)



Trip Distribution: The distribution of site traffic to be generated by the proposed 36 condominiums and the 24 lodge units is portrayed on **Figure 1**. Specific distribution percentages were estimated based on turning patterns/splits at the SR-97/Brays Road intersections using the recent PM peak traffic count. An estimated 75 % of site traffic would be destined west on Brays Road, with 60 % to the south on SR-97 and 15 % north on SR-97. For remaining site traffic, 20 % would arrive from the north via Brays Road, which connects to SR-97 further north, and 5 % from the east via Browns Canyon Road. Note: Since Brays Road turns north just east of the Desert Canyon entrance, the majority of traffic arriving from the north on SR-97 would use Brays Road as a short-cut to the resort/residential site. Expected weekday daily and PM peak site trips were assigned to adjacent County/State roads using these assumed distribution percentages. Note: PM peak turning traffic splits for site traffic at each study intersection are shown on the attached Excel volume spreadsheets.

Future 2005 Traffic Volumes and Peak LOS: With the proposed 36 condominiums and 24 lodge units plus 4 % annual background traffic growth to account for other minor development in the area, GTC estimated daily and PM peak-hour traffic volumes for SR-97 and the affected County road system and intersections. With the additional 375 daily trips from the proposed/pending development, daily traffic on Brays Road is projected to increase by 280 vehicles per day (vpd) to a projected 950 vpd by the 2005 horizon year. Daily traffic on SR-97 south of Brays Road would increase by 225 vpd to a daily volume of 5,200 vpd with the project. With the daily capacity of SR-97 being 10-12,000 vpd and 8,000 vpd on Brays Road, there would be **more than adequate traffic capacities on both roadways to accommodate projected daily traffic volumes.**

As shown in **Table 2**, PM peak-hour conditions at the critical stop-controlled intersection of SR-97 and Brays Road would continue to operate at desirable LOS B in 2004 with or without the proposed development. The expected average delay would increase from 13.0 to 13.3 seconds in 2005 with the project. With proposed mitigation to construct a right-turn pocket northbound on SR-97 at Brays Road, the average delay on the Brays westbound approach would decrease to 13.1 seconds. The site entrance intersection of Desert Canyon Blvd. and Brays Road would continue to operate at desirable LOS A with 9.2 seconds of average stopped delay on the Desert Canyon entrance approach. Thus, **all study intersections are projected to operate at an acceptable service level (LOS B or better) in 2004 with pending Phase IV development of condominiums and lodge units at the Desert Canyon PRD site.**

Access/Channelization Needs: GTC assessed future 2005 PM peak volumes at critical access intersections to determine if left-turn or right-turn channelization improvements are warranted. Summarized below are projected 2005 PM peak turning volumes at each access intersection:

	<u>SR-97 @ Brays Rd.</u>	<u>Brays Rd. @ Desert Canyon</u>
Inbound Left Turn	7	8
Inbound Right Turn	31	18

Using WSDOT's channelization nomographs from their *Design Manual*, GTC assessed left and right-turn channelization needs for both access intersections. As shown on the attached Figure 910-12, a right-turn pocket is not warranted for the SR-97/Brays Road intersection based on projected 2005 peak volumes with the project (despite the fact that the County and WSDOT are both expecting a right-turn deceleration lane to be constructed with pending Phase IV development). As shown in Figure 910-9a, the project peak left-turn volume on SR-97 (7 vph) is well below WSDOT requirements for providing a separate southbound left-turn lane at the SR-97/Brays Road intersection with the proposed/pending development. Thus, left or right-turn channelization improvements are not warranted at the SR-97/Brays Road intersection with proposed development although **GTC recommends construction of a northbound right-turn pocket per WSDOT standards at this intersection with proposed Phase IV development.**

Sight Visibility & Safety Issues: GTC conducted field investigations at proposed access intersections to confirm that adequate sight visibility is available for entering and exiting motorists. As shown in attached Site Photos, sight visibility is and unobstructed in both directions on SR-97 to the north and south of the Brays Road intersection. Views of site are clear for over 800 feet to the north and for over 1,000 feet to the south. AASHTO design standards for a 65-mph design speed (60-mph posted speed) require 710 feet of entering sight distance (ESD) for the exiting left-turn movement and 625 feet of ESD for the exiting right-turn movement at the SR-97/Brays Road intersection. The Brays Road at Desert Canyon Blvd. intersection also has excellent sight visibility with over 800 feet of clear distance to the west/left and over 1,000 feet of clear distance to the east/right from the entrance intersection. For a design speed of 55 mph (50 mph posted speed) on Brays Road, the left-turn movement would require an ESD of 605 feet and the right-turn movement would require 525 feet of ESD. In summary, **both access intersections would have more than adequate sight visibility to safely accommodate turning traffic in/out per AASHTO design standards.**

FUTURE 2010/2015 DEVELOPMENT – LOS & ACCESS NEEDS

GTC's future 2005 traffic analysis of proposed/pending Phase IV development at the Desert Canyon Resort/PRD site indicates that an acceptable service level (LOS B or better) would be provided at the critical SR-97/Brays Road and Brays/Desert Canyon Blvd. intersections. Note: The Brays/Desert Canyon intersection has low peak traffic volumes and the only mitigation needed for the short-term (2005) or long-term is the eastbound right-turn lane being constructed with Phase IV development at this location. In order to determine when future channelization improvements would be warranted at the SR-97/Brays Road intersection, GTC estimated future PM peak volumes for each remaining development phase/element of the Desert Canyon PRD approved by Douglas County in October 1991 (includes 18-hole golf course, 100 single-family lots and 300-400 multi-family units). Since only 60 future condominium units are presently planned for construction by 2010, GTC assumed 2015 as the horizon year for future development of the Desert Canyon PRD properties.

2015 PM Peak Volumes/LOS for Future Developments: Based on GTC's research of the Desert Canyon PRD development history plus the status of existing and proposed developments, the remaining residential development can be broken down into 5 groups or stages (timing and order uncertain for each development element):

<u>97/Brays¹</u>	<u>2015 Cumulative LOS @ SR-</u>
1. 33 single-family detached (SFD) homes	LOS C - 19.8 seconds
2. 110 multi-family condominiums	LOS C - 21.6 seconds
3. 67 multi-family golf villas	LOS C - 22.9 seconds
4. 58 SFD homes	LOS D - 25.2 seconds
5. 96 multi-family condos/villas	LOS D - 28.6 seconds

GTC has estimated 2015 cumulative PM peak volumes for the critical SR-97/Brays Road intersection for each of the 5 development stages remaining at the Desert Canyon PRD site (see attached TM summary volume sketches). As for the 2005 LOS analysis, a 4 % growth factor compounded annually has been assumed for background traffic growth on SR-97 and Brays Road. The results of the future 2015 LOS analysis for the existing SR-97/Brays Road intersection, without proposed left and right-turn improvements, are summarized above and in **Table 4**. The first 3 development stages, including the 67 golf villas development, could be developed with acceptable 2015 peak conditions (LOS C or better) at the SR-97/Brays intersection per Douglas County and WSDOT standards. **With proposed mitigation to construct ultimate left and right-turn channelization improvements (see next section), the remaining development stages (#4 - 58 SFD homes and #5 - 96 MF condos or golf villas) could also be constructed with acceptable LOS C peak conditions at this intersection.**

Future 2015 Channelization Improvement Needs (SR-97@ Brays Rd.): GTC has also assessed left and right-turn channelization improvement needs on a cumulative basis for each future development stage/element. As shown in Figure 910-9a, a **left-turn deceleration lane would be warranted on SR-97 southbound at the Brays Road intersection per WSDOT standards and with construction/occupancy of the 67 MF golf villas (3rd development stage)**. As shown in Figure 910-12, a **full right-turn deceleration lane is warranted on SR-97 northbound at the Brays intersection with construction/occupancy of the 110 condominiums (2nd development stage)**. Note: It was assumed that a right-turn pocket per WSDOT standards would be constructed on SR-97 northbound approach to Brays Road with the proposed Phase IV development project.

MITIGATION & RECOMMENDED IMPROVEMENTS

Off-Site Mitigation With Project (2005): As shown in **Table 2**, all study intersections are projected to operate at an acceptable service level per Douglas County LOS standards

¹ Assumes the existing channelization at the SR-97/Brays intersection (no left or right-turn improvements)

(LOS C or better) with the project for the PM peak period when “worst case” peak traffic conditions occur. Thus, no off-site improvements are required to mitigate an inadequate or substandard LOS condition during peak periods. Per WSDOT channelization guidelines, separate right-turn channelization is not warranted at the SR-97/Brays intersection although a **right-turn pocket** (60 feet of turn storage + 165-foot taper) is **recommended for safety reasons** since the projected 2005 peak volume exceeds 30 vph. Projected peak volumes on Bray Road at Desert Canyon Blvd. are very low and separate channelization for right or left-turn lanes are not warranted. However, since additional pavement/widening is already provided along site frontage, GTC recommends **striping the eastbound Brays Road approach for a separate right-turn pocket** to WSDOT standards (60 feet of turn storage plus a 165-foot taper if adequate frontage is provided).

Recommended Future Improvements @ SR-97/Brays Road Intersection: Based on GTC’s traffic analysis of 2005 and 2015 peak LOS conditions and peak turning volumes at the SR-97/Brays intersection, the following channelization improvements are recommended for implementation when warranted per WSDOT guidelines included in DOT’s *Design Manual*. Note: Widening of the Brays Road westbound approach to the SR-97 intersection is not warranted since the WB right-turn peak volume even for the year 2015 is very low (25 vph or less).

- Provide additional widening on the SR-97 northbound approach to accommodate a **full 12-foot right-turn deceleration lane** to WSDOT design standards. Per Figure 910-9a of the *Design Manual*, a **490-foot turn lane is required for a 60-mph posted speed plus a 50-foot taper**. The minimum turning radius should be 55 feet for the right-turn movement with a 14-foot width for the eastbound receiving lane.

Timing of Improvement: As shown on attached Figure 910-12, the full right-turn deceleration lane is warranted and should be constructed with development stage #2 (110 condominiums) or **after a total of 143 new residential units are occupied at the Desert Canyon PRD site**. Note: The full right-turn lane would be needed after 143 additional future residential units are constructed at Desert Canyon (not including the proposed 36 condos and 24 lodge units).

- Widen SR-97 at the Brays Road intersection to provide a full left-turn deceleration lane per WSDOT design standards. Per Figure 910-10c of the *Design Manual*, a 100-foot turn lane is required for the projected 2015 peak volume of 31 vph plus a 50-foot gap and standard taper section for a 60-mph posted speed.

Timing of Improvement: As shown on attached Figure 910-9a, the left-turn deceleration lane is warranted and should be constructed with development stage #3 (67 golf villas) project or after 210 new residential units (not including proposed 36 condos + 24 lodge units) are occupied at the Desert Canyon PRD site.

Traffic Mitigation per Residential Unit: As summarized on attached turning movement sketches for 2015 PM peak volumes by development stage, a total of 180 future PM peak site trips would be contributed to the SR-97/Brays Road intersection with

Mr. Peter Ringsrud, Director
November 7, 2002
Page 9

future development of Desert Canyon PRD properties. Including the proposed project traffic (Stage IV) of 24 PM peak trips through this intersection, the **total additional PM peak trips from Desert Canyon development is 204 new trips**. Note: This proposed plus future development traffic represents 21.52 % of total projected 2015 PM peak entering traffic at the SR-97/Brays Road intersection.

The estimated construction cost for proposed intersection improvements is \$ 175,000
Note: This cost estimate was prepared by others; it is not clear what improvements are included and whether has been updated to current construction costs. Assuming that \$ 175,000 is a valid cost estimate for proposed SR-97/Brays intersection/channelization improvements and that Desert Canyon would be funding 100 % of these improvements, the estimated **traffic mitigation fee for proposed/future development at Desert Canyon would be about \$ 860 per new residential unit**.

We trust that GTC's traffic impact analysis is helpful to Douglas County, WSDOT and the developer in addressing traffic and safety impacts of proposed/future development of Desert Canyon PRD properties, as well as funding of needed off-site mitigation improvements. If you have questions on our traffic study findings or recommendations, please call me at (253) 857-8840. Thanks, Peter, for your timely input and coordination.

Sincerely,

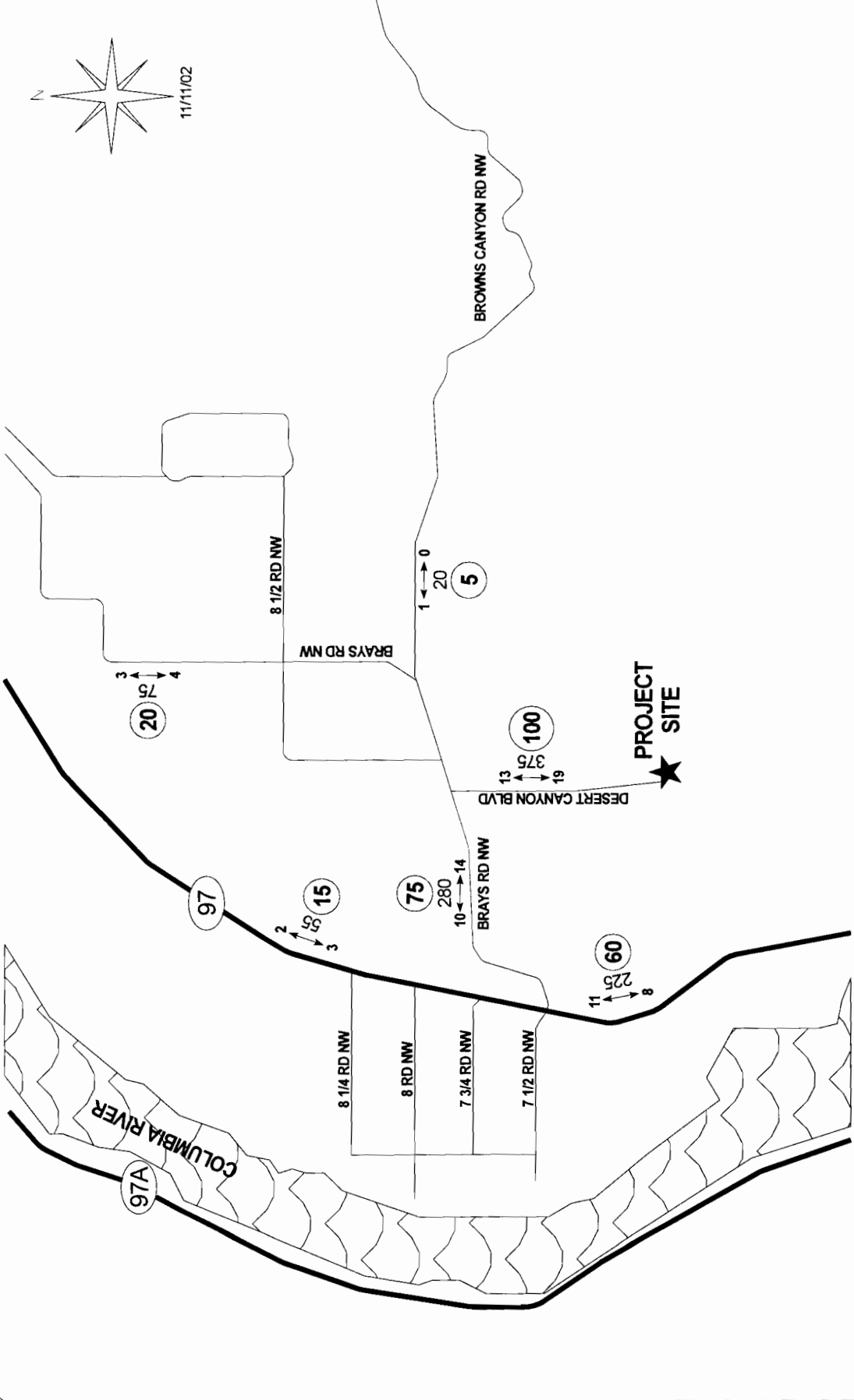
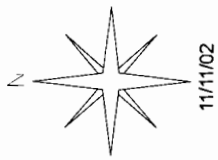
GIBSON TRAFFIC CONSULTANTS, INC. PS.

Terry L. Gibson, P.E.
President

Attachments

XC: Andy Zupke, Homestead NW Development
Fred Sutar, WSDOT, North Central Region
Jack Frei, Desert Canyon Resort

GIBSON
TRAFFIC
CONSULTANTS



TRAFFIC IMPACT STUDY
GTC #02-139

FIGURE 1
SITE VICINITY &
TRIP DISTRIBUTION

GIBSON TRAFFIC CONSULTANTS

DESERT CANYON
DEVELOPMENT IV
(36 CONDOS/24 UNITS)

DOUGLAS COUNTY

LEGEND

AWDT → PEAK
PM ←

NEW SITE TRAFFIC
(DAILY/PEAK HOUR)

TRIP DISTRIBUTION %

(25)

TABLE 1

INTERSECTION LEVEL OF SERVICE (LOS) CRITERIA

Level of Service ¹	Expected Delay	Control Delay (Seconds per Vehicle)	
		Unsignalized Intersections	Signalized Intersections
A	Little/No Delay	≤10	≤10
B	Short Delays	>10 and ≤15	>10 and ≤20
C	Average Delays	>15 and ≤25	>20 and ≤35
D	Long Delays	>25 and ≤35	>35 and ≤55
E	Very Long Delays	>35 and ≤50	>55 and ≤80
F	*	>50	>80

* When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection.

Source: *Highway Capacity Manual 2000.*

¹ LOS A: free-flow traffic conditions, with minimal delay to stopped vehicles (no vehicle is delayed longer than one cycle at signalized intersection).

LOS B: generally stable traffic flow conditions.

LOS C: occasional back-ups may develop, but delay to vehicles is short term and still tolerable.

LOS D: during short periods of the peak hour, delays to approaching vehicles may be substantial but are tolerable during times of less demand (i.e. vehicles delayed one cycle or less at signal).

LOS E: intersections operate at or near capacity, with long queues developing on all approaches and long delays.

LOS F: jammed conditions on all approaches with excessively long delays and vehicles unable to move at times.

TABLE 2
EXISTING LEVEL OF SERVICE
Weekday PM Peak Hour

Intersection	EXISTING CONDITIONS	
	LOS	Delay
1. SR-97 @ Brays Road/Kane Lane	B	12.2 sec
2. Brays Road @ Desert Canyon Boulevard	A	9.0 sec

TABLE 2
LEVEL OF SERVICE
Weekday PM Peak Hour

Intersection	EXISTING CONDITIONS		FUTURE 2005 CONDITIONS ¹					
	LOS	Delay	Without Project		With Project		With Mitigation ²	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
1. SR-97 @ Brays Road/Kane Lane	B	12.2 sec	B	13.0 sec	B	13.3 sec	B	13.1 sec
2. Brays Road @ Desert Canyon Boulevard	A	9.0 sec	A	9.1 sec	A	9.2 sec		

¹ Includes a 4.0% annual growth factor.

² Mitigation includes a northbound right-turn pocket, per WSDOT standards.

Memorandum

TO: Jolene Gosselin, County Engineer, Douglas County TLS
FROM: Terry Gibson, Gibson Traffic Consultants (GTC) *TLG*
DATE: February 2, 2006
RE: **Traffic Study Update for Desert Canyon Phase V Development (Douglas Co.)**

Background: In November 2002, Gibson Traffic Consultants (GTC) completed a traffic impact analysis (TIA) study for proposed Phase IV development and likely Phase V development at the Desert Canyon Resort/Community on Brays Road east of SR-97 in Douglas County. A northbound right-turn pocket at the SR-97/Brays intersection was recommended and constructed with Phase IV development. The 36 condominium units for Phase IV were constructed but not the 24 lodge units, which are now included in Phase V Division I for current development plans. Prior Phase V development was to include a total of 364 residential units, with 91 SFD homes and 273 multi-family condos/villas. The current Phase V development plans include 200 total residential units with 176 condo/cottage units and 24 lodge/timeshare units. In December 2005, GTC discussed scoping and methodology for this traffic study update with County TLS staff (Jennifer Lange). It was agreed that new traffic counts were not required, and GTC could update the future trip generation estimates for Desert Canyon Phases IV/V development plans as well as future 2015 peak LOS conditions and channelization warrants at the critical SR-97/Brays access intersection. This memorandum summarizes the findings and conclusions of the Desert Canyon Traffic Study Update and whether additional channelization improvements are warranted at the SR-97/Brays intersection.

Update on Desert Canyon Development: GTC coordinated with Michelle Thompson and Lisa Guthrie of Homestead NW Development to obtain current information on prior Phase IV and proposed Phase V development at the Desert Canyon Resort properties. The 36 condo units for Phase IV have been constructed but not the 24 lodge/timeshare units, which are now included as part of Phase V Division I development (see attached preliminary plans). Division I would also include 46 cottages/duplex condos, 2 small water slides, 3 pools, hot tubs and snack bar to support the guest water park. Note: The "water park" amenities are being implemented for use of residents and guests only, mainly mothers and kids while fathers are golfing at the Desert Canyon golf course. Division II would include 20 duplex cottages and tri-plex buildings, while Division III proposes a total of 36 residential units with 3-plex and 4-plex cottages plus 12-plex condos on top of the bluff. Division IV would include a maximum of 50 units including duplex cottages, 3 and 4-plex buildings and 8-plex condos around a man-made lake with paddle boats provided for guest use only. Division V would include 24 duplex and tri-plex cottages nearest to Brays Road and the proposed second/west access. There would also be pedestrian/biking trails provided that would meander throughout the entire Phase V development properties. In summary, Phase V development would include 176 cottages or condo units plus 24 lodge/timeshare units.

Trip Generation (Phase V): Daily and PM peak trip generation has been estimated using average trip rates provided in the ITE *Trip Generation* manual (7th edition, 2003). Using sections 230 (Resid. Condo/Townhome) and 330 (Resort Hotel), GTC estimates that **1,200 daily and 104 PM peak trips would be generated each weekday**. During the critical PM peak period, the directional split would be 67 vph inbound and 37 vph outbound. Since the new 36 condo units were not built at the time of latest traffic counts (Oct. 2002), an additional 20 PM peak trips (13 in and 7 out) were added as “pipeline” trips for the traffic/LOS analysis.

Trip Distribution & Assignments: The likely distribution of Phase V site traffic is portrayed on **Figure 1**. Specific distribution percentages were estimated based on existing travel patterns/splits at the SR-97/Brays and Brays Road/Desert Canyon Blvd. intersections. With construction of the west access road with Phase V development, a second connection would be provided to Brays Road. An estimated 65 % of site trips would use the new west access road, since is a much shorter route to the SR-97/Brays intersection. The remaining 35 % would use the existing Desert Canyon entrance and Brays Road to/from SR-97, with the majority of this traffic destined north toward Lake Chelan. Daily and PM peak site trips were assigned to the adjacent County roads and SR-97 using these trip distribution percentages.

Future 2015 Traffic Volumes & Peak LOS: For the original 2002 TIA study, a 4 % annual growth rate was assumed to estimate future 2015 baseline traffic volumes for the affected County/State road system. This 4 % growth factor was based on growth in SR-97 traffic from 1997 to 2001 at the R084 traffic count station north of US-2. Daily traffic volumes on SR-97 have been fairly steady the past 3 years (2002-2004), with 3,991 AADT in 2001 and 3,877 AADT in 2004 at count station R084 (see attached traffic count summary). SR-97 traffic grew by a total of 8 % or 2 % annually from 1999 to 2003. From 2000 to 2004, SR-97 traffic increased by about 5 % or 1.3 % annually. To be conservative, GTC has assumed **an annual growth rate of 2 % compounded annually** to estimate 2015 future baseline peak volumes on the affected road system and the critical SR-97/Brays Road intersection. Note: The same Oct. 2002 TM count was utilized at SR-97/Brays intersection, with peak traffic counted then increased by 7 % to reflect summer peak conditions.

Using HCS2000 software, GTC recalculated the future 2015 peak LOS conditions with Phase V development at the **SR-97/Brays intersection**. This stop-controlled intersection, with a NB right-turn lane, is projected to operate at **acceptable LOS C** with 15.2 seconds delay on the Brays WB approach at full build-out of Phase V development.

Channelization Warrant Update: Summarized below are projected 2015 PM peak turning/through volumes on SR-97 at the south Brays Road intersection.

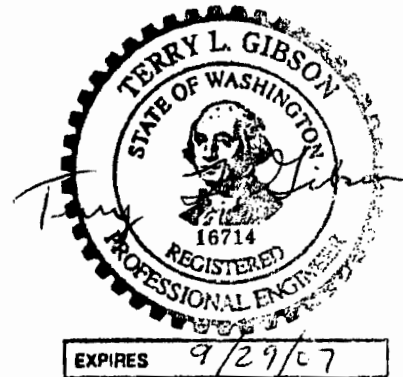
2015 PM Peak Volumes at SR-97/Brays Intersection			
<u>Inbound Left</u>	<u>Inbound Right</u>	<u>Southbound Thru</u>	<u>Northbound Thru</u>
17 vph	72 vph	318 vph	184 vph

The inbound left-turn movement is projected to be 17 vph during the critical PM peak period, while the inbound right-turn movement is 72 vph. Using WSDOT's "Left-Turn Storage Guideline" (Figure 910-8a), the percent of the total DHV (593 vph) turning left is 2.87 % and **left-turn channelization is not warranted for projected 2015 peak volumes with full build-out of proposed Phase V development.** Using WSDOT's "Right-Turn Lane Guidelines" (Figure 910-11), projected 2015 PM peak volumes of 72 vph for northbound right-turn and 257 vph for northbound approach **warrant a right-turn pocket or taper on the SR-97 northbound approach at the Brays intersection.** Note: Since there is already a 60-foot right-turn pocket, which was constructed with Phase IV development, **no additional channelization improvements are required with Phase V development at the Desert Canyon Resort.**

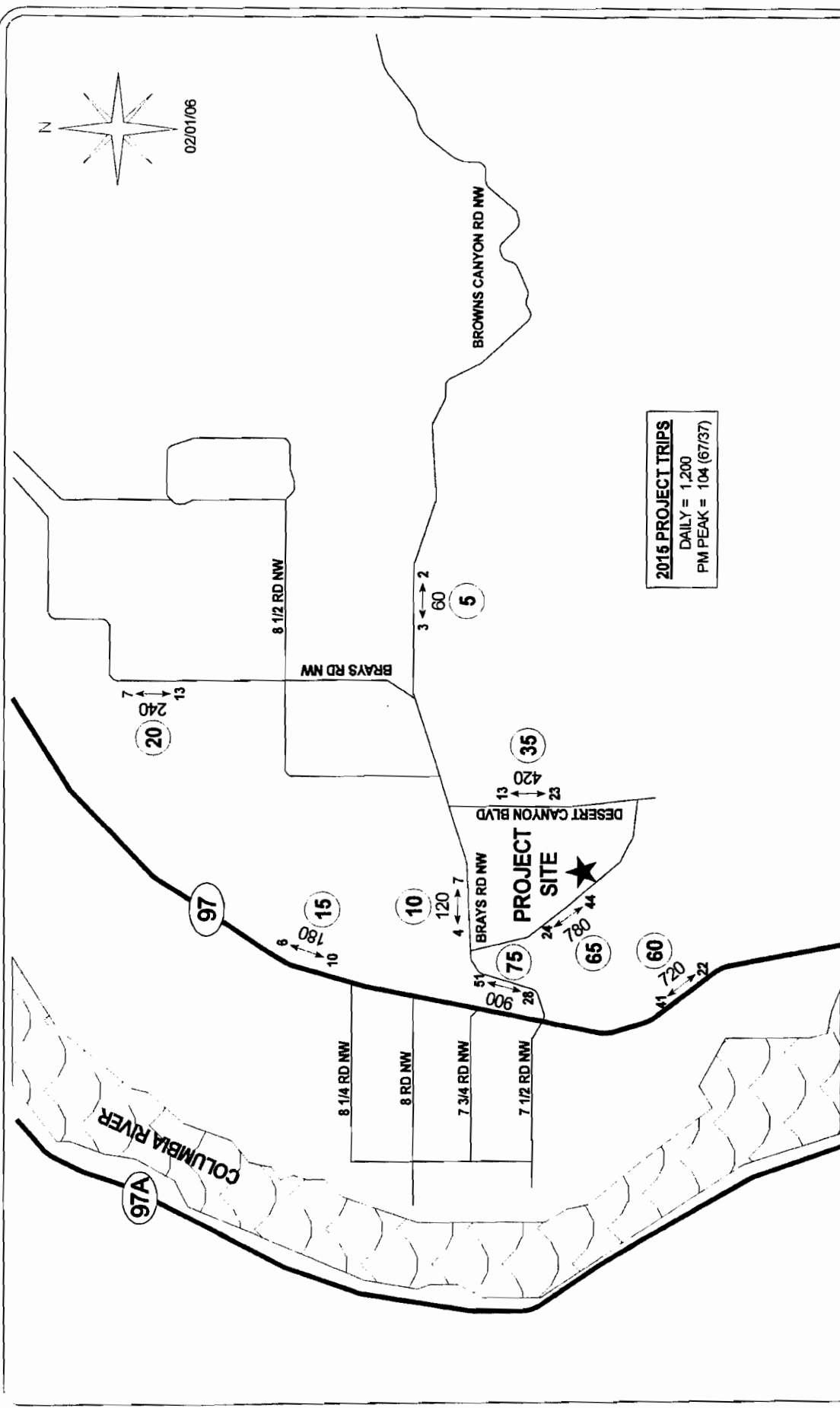
We trust that GTC's supplemental traffic impact analysis for Desert Canyon Phase V development is helpful to Douglas County, WSDOT and the developer in updating projected 2015 peak traffic volumes/LOS on adjacent roads and channelization warrants at the SR-97/Brays Road intersection. If you have any questions on GTC's update calculations or findings, please call me at (253) 857-8840. Thanks again, Jolene, for your timely input and coordination.

Attachments

XC: Michelle Thompson, Homestead NW Development



GIBSON
TRAFFIC
CONSULTANTS



TRAFFIC IMPACT STUDY
 GTC #05-310

FIGURE 1
SITE VICINITY &
TRIP DISTRIBUTION

GIBSON TRAFFIC CONSULTANTS

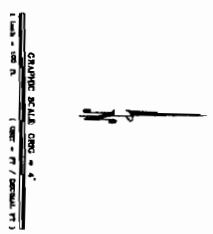
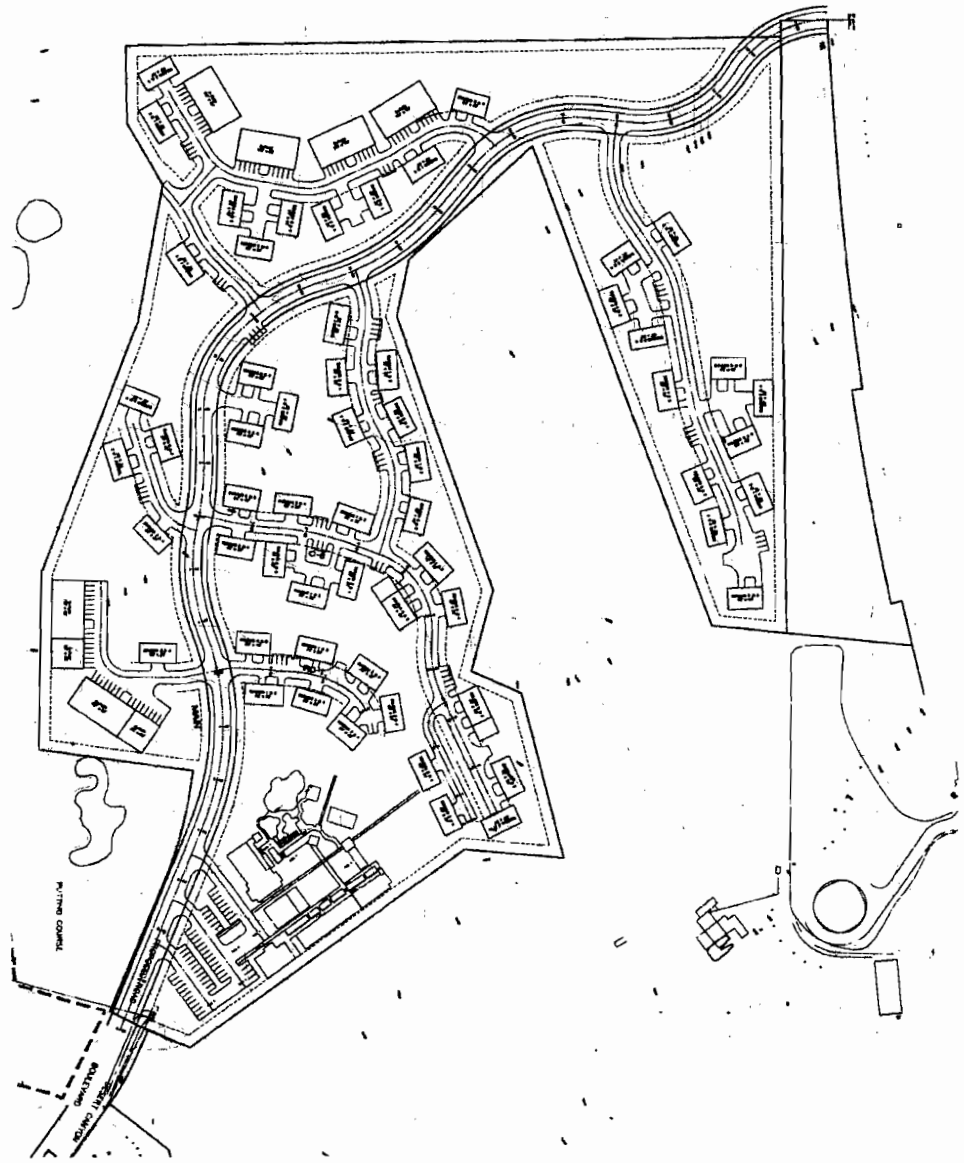
DESERT CANYON
PHASE V DEVELOPMENT
(176 CONDOS/24 LODGE UNITS)

DOUGLAS COUNTY

LEGEND
 AWDT
 PM ← → PEAK

NEW SITE TRAFFIC
 (DAILY/PEAK HOUR)
 TRIP DISTRIBUTION %

(25)



		HOMESTEAD NORTHWEST PRELIMINARY LAYOUT			
SHEET NO. 88-05-000	PROJECT NO. 88-05-000	FILE NAME 88-05-000	SCALE 1" = 100'	PROJECT MANAGER DATE	PROJECT ENGINEER DATE
DATE DATE	DESIGNER DATE	DRAWN DATE	CHECKED DATE	DATE DATE	DATE DATE
NO.		REVISIONS		BY DATE	