CITY AND BOROUGH OF JUNEAU

TRAFFIC IMPACT ANALYSIS

NORTH DOUGLAS HIGHWAY REZONE

Juneau, Alaska

August 2009

Prepared for:
City and Borough of Juneau
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ATTACHMENT D

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SUMMARY

The City and Borough of Juneau is anticipating the re-zoning of land along North Douglas Highway. The re-zoning is allowed under the 2008 update of the City and Borough of Juneau Comprehensive Plan. The City and Borough of Juneau is extending the sanitary sewer system along North Douglas Highway, which removes a significant impediment to development. Housing growth is expected to include both the development of vacant land and subdivision of existing, developed parcels.

This Traffic Impact Analysis includes estimates of projected growth along this corridor and the analysis of impacts to traffic conditions at the Douglas roundabout and at the Egan Drive and 10th Street intersection. Level of service and capacity at these intersections will be negatively impacted by development along North Douglas Highway. The rezoning action will not generate traffic, but as development occurs over time, capacity improvements will eventually be required to meet minimum traffic standards.

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ACRONYMS

CBJ.....City and Borough of Juneau
CDD.....Community Development Department
DOL.....Alaska Department of Labor and Workforce Development
DOT&PF.....Alaska Department of Transportation and Public Facilities
DU.....dwelling unit
EIS.....Environmental Impact Statement
ITE.....Institute of Transportation Engineers
LOS.....level of service
NCHRP.....National Cooperative Highway Research Program
NDH.....North Douglas Highway
PPH.....persons-per-household
PUD.....Planned Unit Development
ROW.....right-of-way
TIA.....Traffic Impact Analysis
v/c.....volume to capacity ratio

1 INTRODUCTION

The City and Borough of Juneau (CBJ) has requested a traffic impact analysis (TIA) for the re-zoning of land along North Douglas Highway (NDH), and specifically for the area bounded by Kowee Creek on the southeast and Bonnie Brae subdivision to the northwest. The re-zoning is anticipated and allowed under the 2008 update of the CBJ Comprehensive Plan

It is unlikely that proposed development over time due to the rezone will tax the capacity of NDH. The Alaska Department of Transportation and Public Facilities (DOT&PF) is most interested in the potential impacts to traffic conditions at the Douglas roundabout and at the intersection of Egan Drive and 10th Street. This TIA includes a development projection to support the traffic projections needed for the analysis of these intersections. The analysis includes capacity and safety studies.

2 DEVELOPMENT PROJECTION

The NDH corridor can be divided into three fairly specific sections (see Figure 1 – Study Area Map). Section One is the first mile or so of NDH that will be served by the upcoming sewer project. Section Two is the area between Section One and Bonnie Brae. Section Three is Bonnie Brae itself and the area across the highway on the channel side. The development potential for each section will be projected in this Development Projection Summary. First, however, some general information and analysis of Juneau's population and housing history are needed to set the stage.

2.1 CBJ Development Trends

The development of a city can be somewhat characterized with statistics on population and housing. There are three sources of information on population in Alaska: 1) the U.S. Census Bureau; 2) the Alaska Department of Labor and Workforce Development (DOL); and 3) the CBJ's Community Development Department (CDD) annual population estimate. Data on housing is taken from CDD's building permit records and the Assessor's records. Table 1 shows combined data from these sources.

There is quite a difference between CDD's estimate for 1990 and the U.S. Census result for that year. More recently, the DOL and CDD estimates are much closer to each other and both agencies show that the population high point was in 2005. The difference between the estimates was only 11 people. More significantly, Juneau has lost population from 2005 to the present. This is due to several factors:

- Construction on the Kensington Mine was largely complete by May 2008, and construction workers that had moved to Juneau on a temporary basis had left town by the time the estimate was prepared[1].
- Movement of several state department commissioner positions, and their support staff, to places outside Juneau.
- A generally flat economy locally.
- The 2008 nationwide general recession, first sensed in early 2008, but in full tilt by the end of the year.

Two sources of data on the housing stock are in play. Table 1 shows housing stock estimates drawn from the CBJ Assessor's records. The other source is CDD's Building Permit records. Table 2 provides a summary of the history from that source.

[1] A large reduction in staff at the Kensington Mine from over 100 to about 20 today occurred after CDD published the 2008 population estimate. This decline will show up in the mid-2009 estimate, if CDD does one.

Table 1 - CBJ Housing and Population History					
No. Dwelling Units* (DU)	Persons per Household (PPH)	Population Estimates			
		Year	AK Dept. of Labor	CBJ Comm. Dev. Dept	
				Population	Mo./Yr. Prepared
13,007	2.48	2008	N/A	30,947	05/08
		2007	N/A	N/A	
12,801	2.48	2006	30,650	31,160	06/06
		2005	31,182	31,193	02/06
		2004	31,094	31,142	1/05
		2003	31,286	31,283	1/04
		2002	30,991	30,981	1/03
12,369	2.49	2001	30,453	30,903	11/01
		2000	(US Census) 30,711	31,262	11/00
		1999		30,852	11/99
11,965	2.60	1998		30,684	10/98
11,781	2.60	1997		30,396	10/97
11,515	2.65	1996		30,209	10-11/96
11,186	2.65	1995		29,755	10/95
10,912	2.64	1994		29,078	10/94
10,821	2.64	1993		28,791	10/93
10,538	2.76	1992		29,251	10/92
10,451	2.76	1991		28,965	9-10/91
		1990	(US Census) 26,751	29,881	9-10/90

* This number is derived from Assessor records, not the Building Permit data.
DU – Dwelling Unit
PPH – Persons Per Household

Table 2- Building Permit Records	
Year	**No. Res. Units Added**
1997	232
1998	147
1999	138
2000	114
2001	108
2002	153
2003	205
2004	149
2005	142
2006	157
2007	97
2008	55
Total	1,694

One discrepancy is evident. The number of Dwelling Units (DUs) claimed (Assessor) in 1997 was 11,781. Table 2 (Building Permit) shows that 1,694 units were added to the housing stock. These two numbers total 13,475, yet the CDD claims (Assessor) just 13,007 DUs in 2008; so where are the missing 468 DUs? This seems like a large number. There are three considerations.

1. The City does not keep good records of the number of DUs lost over the years. There may be data available, but it doesn't show up in the two City sources used to develop the tables above.
2. The Building Permit information is based on permits issued and may not reflect how many units were actually built. A discussion with Debra Purves, the CBJ Building Official, suggests this is unlikely to account for very many units. By the time a developer is all the way to the end of the Building Permit process, there has been a significant amount of time and money spent on planning and design and so the incentive to finish the project is high.
3. CDD's DU totals for building permits processed in 2008 were reviewed by Walsh Planning & Development Services and found to be somewhat inaccurate. Some building permits were listed as showing production of a new DU when in fact they did not. Some projects were remodel efforts that were listed as creating new units but in fact did not. One project clearly removed an apartment from a house, lowering the inventory by one.

The larger question though, is if there are were 28,965 people living in Juneau in 1991 in 10,451 DUs, and in 2008 there were 13,007 DUs housing 30,947 people (and this after the population had actually been larger, topping out in 2005 according to both DOL and CDD); then how can so few people inhabit so many homes? The answer is in two parts, Persons Per Household (PPH) and vacancy rates. The former is lower than in 1991 and the latter is much higher.

Table 3 - Occupancy and Vacancy Data							
	No. DU	Vac. Rate	Occupied Units	Multiply	Persons per Household	Gross Derived Population	Corrected After Summing Subarea Calculations
1991	10,451	1.20%	10,325	X	2.76	28,497	28,965
2008	13,007	3.55%	12,546	X	2.48	31,114	30,947
NOTE: The reason for the difference between the "Gross" and "Corrected" populations is that CDD performs the Vacancy/PPH calculation for each of nine subareas in the City and sums the products of those calculations. The Gross column above is the product of the summary numbers in the table							

Juneau had a housing shortage in 1991 (and anecdotally, has had since anyone can remember) causing the higher PPH and very low vacancy rates. It was a seller's market. Other data show an aging of the population, which indicates that there were more children in homes in 1991 compared to 2008. As the children moved out and started their own households, the parents stayed on as well, thus lowering the PPH.

A true buyer's market is generally said to reflect a 5 percent vacancy rate. In 2008 Juneau was getting close. Apartments (4.42 percent) were near 5 percent and duplexes (7.29 percent) were considerably higher; but the gold standard – the detached single-family home – only reached 2.16 percent[2]. Local real estate agents say this is enough to cause sellers to be "negotiable" and home prices did fall slightly in 2008.

The 2008 year was an instructive one for housing analysis. According to a real estate broker whose firm handled 20 percent of the transactions in 2008, there were 284 residential sales in Juneau during that year, including condominiums, townhouses, attached homes, and detached single-family homes. The broker's estimate was that 75 percent of the buyers were people who already lived in Juneau and wanted to upgrade (or perhaps downgrade to reflect smaller family size) from previous quarters.

2.2 Future CBJ Trends

The recent past might seem to portend a glum development future for Juneau. This will be explored further below, but the *need* for additional housing should also be examined. The CBJ conducted a housing study recently. The key standard for assessing housing affordability, as set forth in the study, is as follows:

> "For a homeowner, the mortgage, private mortgage insurance, homeowners' association fee, and taxes, plus essential utilities, should not exceed 30% of the household's income."[3]

A similar standard is set for renters. The report goes on to say that in 2000, "approximately 37 percent of CBJ *renter* households paid more than 30 percent of their income for shelter and about 17 percent of *owner* households paid more than 30 percent of their income for shelter." (Emphasis in the original)

[2] All of these vacancy factors came from CDD's 2008 population estimate.

[3] The report does not specify whether this is gross income or net take-home pay. Discussions with local bankers show bank policy of 30 percent, or less, of the gross is needed to qualify for a mortgage. The 30 percent is to cover the mortgage, all insurances, homeowner's fees, and taxes. It does not include utilities.

Oddly, the report goes on to say these figures did not include the costs of essential utilities such as home heating, power, water, sewer, and garbage service. Obviously, if the essential utilities were included, the number of renters and owners who pay too much would be higher still, especially considering the recent price hikes in fuel oil. Neither standard addresses fire and liability insurance.

Two other standards relating to the health of the housing stock relate to safety/sanitary conditions and overcrowding. The report says Juneau is doing well regarding these standards, but clearly not in the affordability department. Finally, after some hedging, the report declares that "an addition of 750 to 1,000 units in the near term would probably significantly ease the cost burden on Juneau households."

The CBJ report does not specify what kind of additional units should be supplied and it should be clear that this is an expression of need based on affordability - not necessarily market demand. In general, it is safe to say that as long as there is an assured variety in the units – ranging from rental apartments through large, detached single-family homes – then Juneau's housing affordability problem would be addressed by additional development. The report goes on to address ways and means to expand the housing inventory. The original purpose for this traffic study – to rezone a large area of land soon to be served with sewer along NDH – will definitely serve to help meet the report's goals. The CBJ is serious about expanding the housing stock, having already taken several actions to encourage developers to produce affordable units.

Finally, on the subject of housing, the conclusion is apparent that even with little or no population growth, there is still pressure to build more dwelling units to address that part of the population that wants to upgrade (or perhaps just live in a different location), and to address that part of the population that does not have enough affordable housing options.

Population growth has been slow in Juneau. Just how slow depends on which starting point is used. The DOL estimates are never exactly the same as CDD's but they are much closer in recent years. At the common starting point on Table 1, 1990, there is a much wider discrepancy. DOL uses the U.S. Census for years ending in zero and the number in 1990 was 26,751. CDD's estimate for 1990 was 29,881, a difference of 3,130 people.

The highest population, according to both CDD and DOL, was in 2005. Using DOL numbers, the population grew by 4,431 people from 1990 to 2005. According to CDD, the population grew by about 1,312 people over the same 15-year period. The DOL numbers indicate a growth rate of 1.04 percent per year compounded annually. The CDD growth rate works out to about 0.3 percent per year.

CDD and the DOT&PF have typically used growth rates of 1.0 to 1.5 percent per year for planning purposes. Merging the DOL and CDD numbers to arrive at an anticipated growth rate is mathematically awkward, and the past does not always foretell the future. Even so, there are anticipated events that may help a projection:

- Opening of the Kensington Mine will require 300 workers to finish construction and begin operations. Construction could finish in mid-to-late 2010, at that point the permanent mine population is expected to be about 200, which will generate another 170 indirect jobs. The 370 total jobs could reflect a population increase of 500 to include spouses and children.
- The Juneau access road, now called the Lynn Canal Highway, will generate construction jobs for many years if it goes forward. There is still doubt over whether the project will ever launch, but it is

state and local policy that it should. DOT&PF has stated the intention that the work will be broken up into small increments that will allow local and regional contractors to bid on the job. The Final Environmental Impact Statement (EIS) for the road estimates that direct, indirect, and induced employment will total 360 jobs. The project will go on for several years – at least 5 and potentially as long as 12.

- The Alaska state budget looks flat for the immediate future but if the price of oil stabilizes post-recession, and the gas pipeline draws closer to reality, it can be expected that the Juneau-based state employee work force will grow modestly.
- The price of gold is higher at present than it has been for decades. If the mining industry sees the price stay high, then interest in other mines could be sparked. The Tulsequah Chief Mine up the Taku River is slated to start up in 2009. A few local direct jobs will be created, and the mine's developer expects to spend about $25 million a year in Juneau (mostly on commodities), which will generate some indirect jobs. There are many other historic mine sites, which are still believed to contain valuable ore. Foremost of these is the AJ Mine, which was the subject of much endeavor during the late 1980s and the first half of the 1990s, sparking a lot of economic activity just in the exploration, planning, and permitting effort.
- Juneau has many amenities and appears to be a reasonably attractive place to retire. Many who have lived here during their careers continue to stay after retiring. Certainly the City and Borough of Sitka has enjoyed this status, even to the point where people from out-of-town have arrived to retire.
- There is also a pattern of in-migration from the smaller outlying communities that are having economic problems of their own.

All of the foregoing suggests that the current decline may be short and that modest growth can be expected in the next 20 years. A merged DOL/CDD derived growth rate of 0.7 percent might actually reflect reality, but working with a slightly higher rate will ensure that traffic is not under-projected. So, Table 4 is based on a 1.0 percent population growth rate. However, the housing growth rate is based on a higher number. As noted above, there are higher vacancy rates and lower occupancy rates today than 18 years ago. From 1990 to 2000, housing grew at almost 1.8 percent. From 2001 to 2008 the rate dropped to less than 1.0 percent. For the future, given natural growth, new industry, and community pressure to make housing more affordable, a housing growth rate of 1.2 percent was used.

Table 4 was compounded on an annual basis. The population for each year is 101.0 percent of the preceding year and the housing units for each year are 101.2 percent of the number for the preceding year.

Table 4 - Population and Housing Growth Projection

Year	Pop. @ 1.0%/yr.	Dwelling Units @ 1.2%/yr
2009	*31,247	**13,062
2010	31,559	13,219
2011	31,875	13,377
2012	32,193	13,538
2013	32,516	13,700
2014	32,840	13,865
2015	33,169	14,031
2016	33,501	14,200
2017	33,836	14,370
2018	34,174	14,542

Table 4 - Population and Housing Growth Projection		
Year	**Pop. @ 1.0%/yr.**	**Dwelling Units @ 1.2%/yr**
2019	34,516	14,717
2020	34,861	14,894
2021	35,210	15,072
2022	35,562	15,253
2023	35,917	15,436
2024	36,276	15,622
2025	36,640	15,809
2026	37,006	15,999
2027	37,376	16,190
2028	37,750	16,384
2029	38,127	16,580
2030	38,509	16,779
*Taken from the 2008 CDD estimate with a 300 increase due to start up of the Kensington. ** These are the 2008 (May) numbers plus the building permits issued that year.		

This indicates 1,832 new units will be added between 2010 and 2020, and an additional 1,885 new units between 2021 and 2030[4]. The question arises, what kind will they be? The percentage of high-density units like condos and apartments is sure to go up because there is so little land available for lower-density developments. According to its population estimate, CDD describes the distribution of housing types in 2008 as follows (Table 5):

Table 5 - Housing Mix in 2008		
Housing Type	**Total Units**	**% of Whole**
Single-family (SF)	5,735	44.09
Apartments (SF)	683	5.25
Duplex	580	4.46
Zero-Lot	826	6.35
Condo/Townhouse	1,184	9.10
Multi-Family	2,666	20.49
Mobile Home	1,237	9.52
Boats	89	0.68
RVs	7	0.06
Total Housing Units	13,007	100.00

Some further background will set the stage for estimating the future housing mix. The CBJ requires public sewer and water for any development that is denser than one unit per acre. There are several areas north of Auke Bay that are in private ownership and have been developed at this density, and several areas also in private ownership that could be so developed in the future. This is the most land-consumptive and least affordable form of residential development. Traditional neighborhoods in the utility-served areas of town are developed at densities of three to five units per acre. These are the D-3 and D-5 zoning districts, which also allow duplexes and zero-lot line structures. There is a land penalty for the double units. In D-3, the minimum lot size for a single-family unit is 12,000 square feet. A

[4] Despite the difference in growth rates, the change in PPH is very small. It will shrink from 2.39 in 2009 to 2.29 in 2030, according to the table.

double unit requires 18,000 square feet. For D-5, the single unit minimum is 7,000 square feet and a double unit needs 10,500 square feet.

This kind of development is most easily done on flat dry land, and the east Mendenhall Valley (east of the Mendenhall River) has become Juneau's primary traditional residential area since it is served with both water and sewer. There is relatively little un-built area left in the east valley but sewer has now been extended to the upper west valley along Back Loop Road, and D-3/D-5 development is proceeding there, albeit at a slow pace. There are also sloping areas supporting D-3/D-5 developments, with Mountainside Estates and West Juneau as the primary examples. These homes have views as well as higher development costs and are less affordable than those in flat areas. There is some room for further growth in both areas but the homes will be expensive, generally over $500,000.

So, the first factor to consider is the increasing scarcity of flat, dry land that is served with public water and sewer. A second factor is the general increase in the cost of building materials ranging from sand to concrete and lumber. A third factor is that the CBJ land use code now provides more options for smaller homes. These are:

1. The Planned Unit Development (PUD) code that allows higher-density, i.e., smaller lots, in exchange for creating public areas and parks to be shared by the development's residents. There is no limit on the house size for PUDs.
2. The Cottage Housing code, similar to PUDs, where there are shared amenities but no real lot associated with the house. Each house would be a single unit, but limited to 1,200 square feet on two floors.
3. Bungalow housing, which will allow small homes no greater than 1,000 square feet to be built as infill on pre-developed lots.

All three of these new options provide that each unit can be bought, thus allowing the owner to gain equity just as in traditional housing, but the land is managed by the community association in the same way as a condominium association. All three would allow the feel of single-family homes in much denser developments, thus providing more affordable homes than traditional single-family developments.

A fourth factor is recent local trends in housing type development. The period from 2001 to 2008 may be more instructive than the earlier housing history. The housing mix in 2001, compared with that of 2008 in percentages, is demonstrated in Table 6:

Table 6 - Housing Mix Comparison: 2001-2008

	Housing Mix in 2001		2008
Housing Type	Total Units	% of Whole	% of Whole
Single-family (SF)	5,323	43.06	44.09
Apartments (SF)	587	4.76	5.25
Duplex	572	4.48	4.46
Zero-Lot	774	6.28	6.35
Condo/Townhouse	1,098	8.89	9.10
Multi-Family	2,628	21.26	20.49
Mobile Home	1,225	9.93	9.52
Boats	129	1.06	0.68

Table 6 - Housing Mix Comparison: 2001-2008			
	Housing Mix in 2001		2008
Housing Type	Total Units	% of Whole	% of Whole
RVs	33	0.28	0.06
Total Housing Units	12,369	100.00	100.00

As can be seen, no meaningful trend is apparent (except for RVs). What can be expected, given the other factors cited, is that more of the single-family detached dwellings will be of the smaller size now contemplated in the land use code. With that, the projections for the future can be estimated based on the current mix. For 2020 and 2030, the distributions of new units are expected to be as follows (Table 7):

Table 7 - Housing Mix Comparison, New Units: 2020 to 2030				
	Housing Mix in 2020, New Units		Housing Mix in 2030, New	
Housing Type	Total Units	% of Whole	Total Units	% of Whole
Single-family (SF)	808	44.09	831	44.09
Apartments (SF)	96	5.25	99	5.25
Duplex	82	4.46	84	4.46
Zero-Lot	116	6.35	120	6.35
Condo/Townhouse	168	9.10	172	9.10
Multi-Family	375	20.49	386	20.49
Mobile Home	174	9.52	179	9.52
Boats	12	0.68	13	0.68
RVs	1	0.06	1	0.06
Total Housing Units	1,832	100.00	1,885	100.00

The 2020 projection added to the 2030 projection accounts for all of the 3,717 new housing units expected to be built in Juneau by 2030.

2.3 North Douglas Projections

Now the question of how many of these new units would or could be built along NDH can be addressed. First, it appears that the entire length of NDH, out to Bonnie Brae, will eventually be served with sewer before 2020. The current sewer project, to be completed in 2009, will start at the Douglas Bridge and extend about 1-mile northwest, ending at 4300 North Douglas Highway. A second phase, funded and planned for 2010, will go at least as far as the Channel View Terrace mobile home park. What remains is a third phase to connect the rest of the way to Bonnie Brae, which is already served with public sewer. This is not funded but is seen by CBJ Engineering to be reasonable for near-term completion and thus is assumed to be built for our projections.

2.4 Section One: Kowee Creek to End of 2009 Sewer Extension

This area, on the uphill side of the highway, is specifically addressed in the 2008 update of the CBJ Comprehensive Plan as a transition area that is to be given high-density residential zoning when sewer is available. The area beyond is not given any transitional status. The Comprehensive Plan shows Section One as transitioning from "Urban Low-density Residential" to "Medium Density Residential." In zoning terms, this has the practical effect of changing from a one unit per acre limitation (forced by lack

of sewer, not zoning) to one or more of three higher-density options: 10 units per acre, 15 units per acre, or 18 units per acre. This analysis will address development potential as if the entire area uphill of NDH is rezoned to one of the three classifications. The uphill area is a band of land about 1,200 feet wide and almost a mile long.

The area on the water side of Section One is not shown as transitional, meaning it would keep the zoning it has now – D-3. There are 31 individual parcels on the water side of Section One. All but 5 have houses on them, sometimes duplexes. The arrival of sewer will enable more duplexes, or apartment additions to single-family homes. There is one tract that has about 600 feet of frontage on the highway and might be seen to have subdivision potential, but this is made difficult by the CBJ rule that requires new lots to front on residential streets, not arterials, which is the classification of NDH. There are topographic challenges as well. The overall growth potential for this tract is no more than 20 new units

The uphill side of Section One has the most significant growth potential. The rezone application submitted in July 2008 was specific to Parcel 1 and Parcel 5 (see Figure 2). It is anticipated that the City will expand the request to include the entire area between those two parcels and actually, a little further; one parcel short of the area presently zoned General Commercial. This would have the effect of rezoning Parcels 2, 3, and 4 as well as all of the smaller lots – nearly all of which have been developed with single-family houses. The five major parcels are vacant save for Parcel 3, which has a church building on it. The rezone application requests change to D-18, or 18 units per acre. This is typical for apartments, condominiums, row houses, townhouses, and for the new DU types envisioned in the City's new cottage and bungalow housing options.

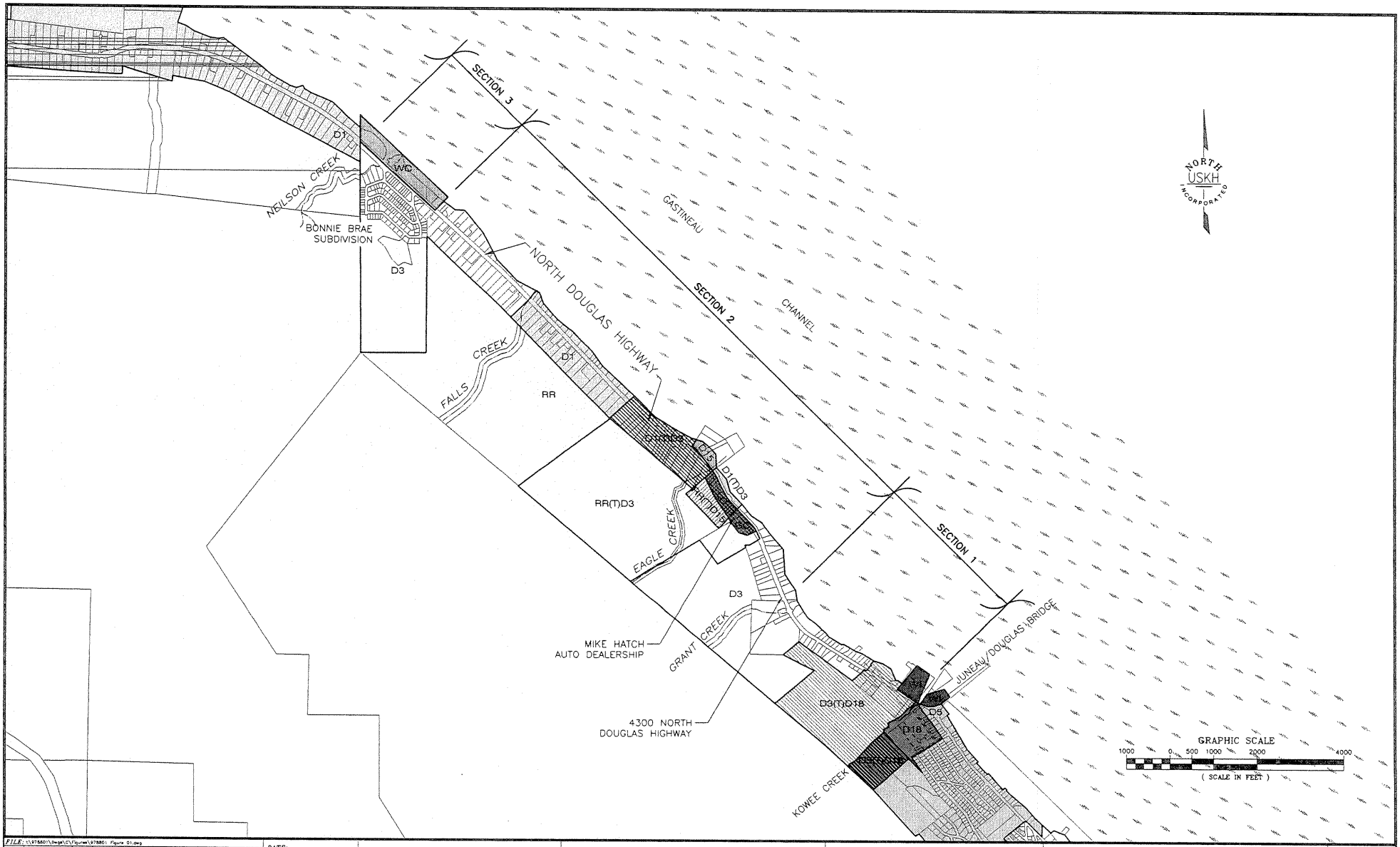
Parcel 1: 86 acres. No direct access to an existing street. There is an access agreement with the owner of Parcel 4 and a pioneer road, with gate, has been built across Parcel 4 and across the lower portion of Parcel 1. This is shown on Figure 1. A DOT&PF driveway permit was obtained for the driveway intersection with NDH, and sight distance was evaluated at that time. The pioneer road was built to meet CBJ grade and curve requirements and can easily be finished as a public street.

The upper portion of Parcel 1 may be very difficult to develop because of steep slopes and perched wetlands. Legal density for a given parcel is calculated on the basis of how much land is available *after the land needed for right-of-way (ROW) is deducted.* A rough layout of roads for Parcel 1 indicates that up to 8 acres of ROW would have to be dedicated. Rough development considerations that account for wetlands and steep slopes produce another 20-acre penalty leaving 58 acres for density calculation. This produces a development potential of 1,044 DUs if rezoned to D-18.

Parcel 2: 6 acres. Has direct adjacency with NDH. Moderate uphill slope with view potential. This parcel could be developed with a public street. Doing so would probably consume an acre, producing development potential of 90 units. The potential rises to 108 units if no public road is dedicated. There is a possibility that street development on Parcel 2 could be designed to facilitate access to USS 569, and lots 4, 5, and 6 to the west of Parcel 2, which are presently land locked. (There appears to be an unconnected section of ROW in front of these three lots and so there would be no ROW deduction penalty for the three.) Lot 5 presently has a duplex on it, accessed by a long driveway across the private land between it and NDH. Together, these three

lots comprise 148,104 square feet. At D-18, the three lots could host 61 DUs; a total of 151 units supplying traffic to the intersection location shown for Parcel 2.

Parcel 3: 4.23 acres. The parcel has two potential access locations to NDH. The arrow on the map points to an existing driveway. There is a 6,048 square foot building presently in use as a church. The property has a moderate uphill slope with view potential. The slope is too steep to allow convenient development with internal public streets, so the most likely high-density development scenario is as an apartment or condominium facility. At D-18, the parcel could host 76 DUs.



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REV.	DATE	BY	DESCRIPTION OF CHANGE

RECORD OF REVISIONS

DATE: 7/17/09
DESIGN: NCL
DRAWN: WJP
CHECKED: WW

USKH Architecture • Engineering
Land Surveying • Planning
3031 Clinton Drive, Suite 200
Juneau, Alaska 99801
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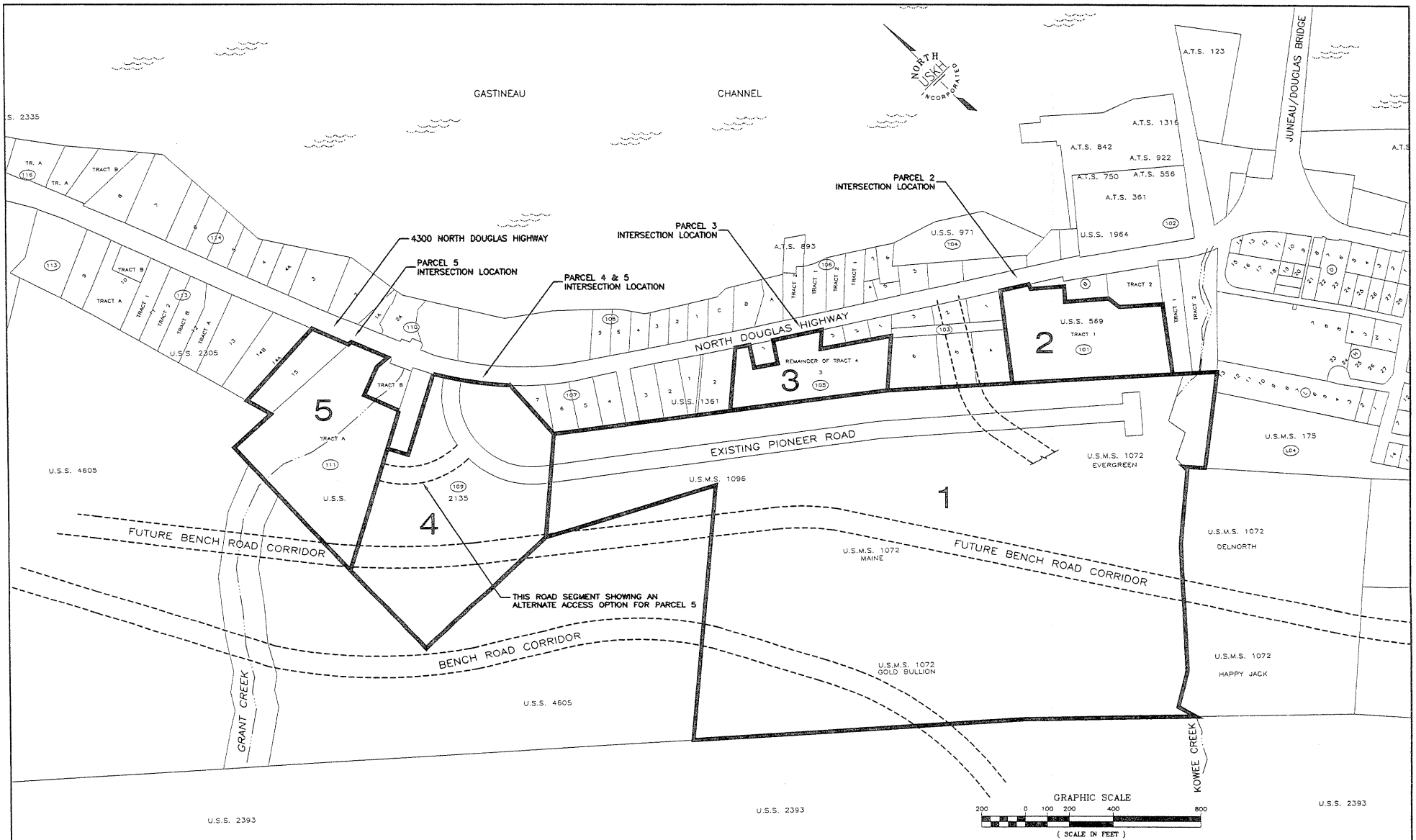
907/790-3901 (fax)
USKH WO# 978801

CITY AND BOROUGH OF JUNEAU
★ ALASKA'S CAPITAL CITY
DEPARTMENT OF ENGINEERING

NORTH DOUGLAS HIGHWAY REZONE
TRAFFIC IMPACT ANALYSIS

STUDY AREA MAP

FIGURE NO. 1



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CITY AND BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
DEPARTMENT OF ENGINEERING

NORTH DOUGLAS HIGHWAY REZONE
TRAFFIC IMPACT ANALYSIS
SECTION 1
KOWEE CREEK TO END OF 2009 SEWER EXTENSION

FIGURE NO. 2

Parcel 4: 17 acres. This parcel has an easy uphill slope and has been developed with the pioneer road leading to Parcel 1. If developed as shown, about an acre of land would be lost to ROW leaving 16 acres to calculate density. This would enable the parcel to host up to 288 dwelling units at D-18 zoning.

Parcel 5: 10.4 acres. The parcel also has an easy uphill slope. Present development planning shows a direct street intersection with NDH. That same planning has resulted in a trial road layout that would consume 1.4 acres of land, leaving 9 acres for density calculation. At D-18, the parcel could host 162 units.

Alternative for Parcels 4 and 5: There may be reluctance to have two public street intersections so close together; as would be the case if both Parcels 4 and 5 were developed independently. An option would be to extend access from Parcel 4 over to Parcel 5 uphill from NDH (see Figure 2). This additional length of road would deduct about nine units from the full build-out potential for Parcel 4. The result, however, would be a street intersection with NDH that supports traffic from Parcels 1, 4, and 5. At full build-out, this could be traffic from 1,485 dwelling units. By contrast, the Cordova Street intersection with Douglas Highway receives traffic from 390 dwelling units, (approximately 210 SF DUs and 180 apartment units.)

At present, it is expected that all of the land will convert to D-18. There are, however, options for lower-density zones such as D-15 and D-10. It is possible that the City could resort to lower-density zones as a compromise. Table 8 shows the development potential under each scenario.

Table 8 - Section One, Uphill Side, Development Potential Scenarios

Parcel	Usable Acres	No. DU @ D-10	No. DU @ D-15	No. DU @ D-18
1	58	580	870	1,044
2	6	60	90	108
3	4.23	42	63	76
4	16	160	240	288
5	9	90	135	162
Totals	77.53	932	1,398	1,678

2.5 Section Two: End of 2009 Sewer Extension to Bonnie Brae

The water side has a short multi-family area containing two mobile home parks and a small apartment building. These have been on private sewer for many years and were created long before the modern CBJ land use code. The arrival of public sewer would increase the development potential, but probably not by much since the mobile home units already cover most of the usable land. The apartment building could be enlarged somewhat but it sits on a very small parcel. Further out, there are 64 waterfront single-family parcels, of which only 5 are vacant. There is potential to add apartments to the single-family homes but otherwise there is just no meaningful amount of land to develop.

The uphill side has 74 parcels, of which 11 are vacant. Many are the result of "panhandle" subdivisions where a single, wide and deep parcel is cut into two lots, one behind the other and they share a single driveway for access to NDH. There are 34 lots configured this way, and an additional 21 that are large enough to divide as well. This produces the potential for 21 additional lots, most of which would be

large enough to host a duplex. That, plus the ability to add apartments and the vacant lots add up to a potential increase of 60 units over the next 20 years.

2.6 Section Three: Bonnie Brae-Subdivision and the Commercial Area on the Water Side

The water side is zoned Waterfront Commercial, a fairly limited category where most development must be related to the water in some way. Apartment buildings are not allowed, but hotels and motels are. Single-family homes and duplexes are allowed, as are subdivisions. The parcels are narrow and the residential road requirement discussed above would make subdividing for residential purposes very challenging. Finally, there are two large parcels. One is the ERA Helicopters base and they are not likely to be willing to redevelop their parcel. The other parcel is undeveloped, but its owners have been discussing commercial options with the CBJ.

The uphill side is Bonnie Brae subdivision, which contains 112 dwelling units, mostly in zero-lot line configurations, and 12 vacant lots. All of the vacant lots have the potential to add 2 units so there is an immediate opportunity to build 24 more units on lots that already have street frontage and utilities. Interestingly, there is a 98-acre parcel above Bonnie Brae that is left over from the original subdivision. Within this parcel is another 6.6-acre area designated as a park site and the CBJ is shown as a co-owner. The other 91.4 acres likely have some development potential but also contain a lot of forested wetlands and muskegs. Moreover, a new access route would most likely be required to connect the undeveloped area to NDH. The existing Bonnie Brae entrances might allow some modest development of the area immediately adjacent to the upper portion of Bonnie Brae, but not for the potentially hundreds of lots that could be created with road access. Absent a new road, there is probably potential for another 50 units.

2.7 Summary

The overall population and housing growth projections above estimate the demand for 3,717 new dwelling units over the next 20 years. The three sections of NDH under this analysis would be able to host nearly half of those. Absent some dramatic new availability of land, such as on West Douglas, there is every likelihood that the development predicted for North Douglas will occur.

Table 9 - Development Potential, Kowee Creek to Bonnie Brae					
		Existing DU	New DU Potential		
Section One	Water Side of NDH	27	20		
	Uphill Side of NDH	32	D-10	D-15	D-18
			580	870	1,044
			60	90	108
			42	63	76
			160	240	288
			90	135	162
Section Two	Water Side of NDH	115	20	20	20
	Uphill Side of NDH	63	60	60	60
Section Three	Water Side of NDH	2	10	10	10
	Bonnie Brae Sub.	112	74	74	74
	Totals	351	1,116	1,582	1,862

The CBJ Engineering Department issued a conceptual design and technical report for the North Douglas sewer project in 1998. This document presented a 30-year population forecast that coincides with the 20-year planning horizon for the re-zone study. The sewer study included nine zones, the first four of which include the re-zone study area limits. The sewer study provides estimates for the design year (2028) population and full build-out, or saturation, population. Table 10 summarizes developable land area, the potential mix of DU types, and population projections from the sewer study. The sewer study predicted a growth in housing units of 219 housing units from 1998 to 2028, and a saturation-level increase of 1393 housing units.

The growth of 1,116 to 1,862 housing units reported in this Development Projection Summary is more in line with the saturation projections than the 2028 forecast in the sewer report.

Table 10 - North Douglas Sewer - Growth Projection Summary							
Zone	Undeveloped Land (Acres)	Existing (1998)		Design (2028)		Saturation	
		DU	Population	DU	Population	DU	Population
1	214	80	223	112	312	510	1,564
2	145	48	260	133	370	297	860
3	264	87	242	119	332	328	947
4	150	81	226	151	421	554	1,567
Totals	773	296	951	515	1,435	1,689	4,938
Source: North Douglas Sewer Conceptual Design and Technical Report, CBJ Engineering Department, December 1985							

3 TRAFFIC ANALYSIS

This section describes existing traffic conditions, and projected traffic conditions in the year 2028 with the development of the NDH corridor area. It is organized into sections that describe: project trip generation and assignment; 2028 with-project volumes; and future LOS.

3.1 Trip Generation and Distribution

Trip generation for this project was based on the methodologies outlined in the Institute of Transportation Engineers (ITE) *Trip Generation Manual.* The ITE *Trip Generation Manual* is a nationally recognized and locally accepted method for estimating the travel characteristics of homes and businesses. Trip generation was determined by creating a composite trip generation rate based on the variety of possible developments that are expected to take place along NDH.

Table 11 below outlines the land uses that were used to calculate the composite trip generation rate.

Table 11- ITE Land Uses and Descriptions

Land Use	Description
210: Single-Family Detached Housing	All single-family detached homes on individual lots. Typical subdivision.
220: Apartment	Rental dwelling unit with at least three other dwelling units. Typical four-plex.
221: Low-Rise Apartment	Rental dwelling units located in rental buildings that have one or two levels.
223: Mid-Rise Apartment	Rental dwelling units located in rental buildings that have between three and ten levels.
230: Condo/Townhouse	Residential ownership units that have at least one other unit in the same building structure.
231: Low-Rise Condo/Townhouse	Residential units located in buildings with one or two levels.
270: Residential PUD	Residential planned urban development is a combination of residential land uses.

All land uses described in the Table 11 were used to determine two composite trip generation rates. Composite Rate A was based on land uses 210, 220, 221, and 270. This rate was then applied to all development proposed on the water side in Section One of NDH, all of Section Two and Section Three. Composite Rate B was based on land uses 220, 221, 223, 230, and 231. This rate was applied to all development proposed on the uphill side of NDH for Section One only. The trip generation rates equate trip generation to the number of dwelling units.

After the composite trip generation rates were calculated, they were applied to the projected number of new dwelling units described earlier in this report in Table 9. Trips for three different scenarios were calculated based on the different zoning options available, including: D-10, D-15, and D-18. The trips calculated for areas on the water and uphill sides of NDH were combined to determine the total new trip generation for both the AM and PM peak hour conditions.

A summary of trip generation projections for NDH is shown in the following tables for the weekday AM and PM peak hours. Table 12, Table 13, and Table 14 outline the trip generation for the D-10, D-15, and D-18 development scenarios, respectively.

Table 12 - Project Trip Generation, D-10 Zoning

	Dwelling Units	AM Peak Hour Trips			PM Peak Hour Trips		
		In	Out	Total	In	Out	Total
Composite Rate A	184	23	80	103	85	45	129
Composite Rate B	932	102	342	444	339	199	539
Total							

Source: ITE Trip Generation Manual (8th Edition)

Table 13 - Project Trip Generation, D-15 Zoning

	Dwelling Units	AM Peak Hour Trips			PM Peak Hour Trips		
		In	Out	Total	In	Out	Total
Composite Rate A	184	23	80	103	85	45	129
Composite Rate B	1,398	153	512	665	509	299	808
Total							

Source: ITE Trip Generation Manual (8th Edition)

Table 14 - Project Trip Generation, D-18 Zoning

	Dwelling Units	AM Peak Hour Trips			PM Peak Hour Trips		
		In	Out	Total	In	Out	Total
Composite Rate A	184	23	80	103	85	45	129
Composite Rate B	1,678	184	615	799	611	359	970
Total							

Source: ITE Trip Generation Manual (8th Edition)

3.2 Trip Distribution and Forecast Traffic Volumes

Trip distributions from the proposed development were estimated based on existing turning movement distributions at the Douglas roundabout and at the 10th and Egan intersections. As such, 10 percent of project trips are expected to/from Douglas, thus traveling straight through the Douglas Highway/NDH roundabout. The remaining trips cross the bridge and diverge at the Egan Drive/10th Street intersection. At this point, 25 percent of total project trips are expected to/from the north on Egan Drive (toward the Mendenhall Valley), 5 percent to/from the east on 10th Street, and 60 percent to/from the south on Egan Drive (toward downtown).

Project trips were then assigned to the study area based on the distribution assumptions. Typically, a growth rate is applied to existing traffic and added to project generated trips. A growth rate was not used in this case because Juneau has not shown any significant traffic growth in the past several years. The project trip assignments were combined with existing traffic volumes for both the AM and PM peak hours.

3.3 Traffic Operations

Traffic conditions were evaluated for this study using the Level of Service (LOS) methodologies of the *Highway Capacity Manual* (Transportation Research Board, 2000). The *Highway Capacity Manual* (HCM) is a nationally recognized and locally accepted method of measuring traffic flow and congestion for intersections. Criteria range from LOS A, indicating free-flow conditions with minimal vehicle delays, to LOS F, indicating congestion with significant vehicle delays.

LOS for a signalized intersection is defined in terms of the average delay experienced by all vehicles at the intersection, typically over a specified time period such as a peak hour. Threshold values are listed in Table 15. LOS for roundabout intersections has not been defined by the HCM due to the variety of analysis methods available. However, the National Cooperative Highway Research Program (NCHRP) Report 572 recommends using stop controlled intersection criteria for roundabout LOS. These criteria are shown in Table 15 and are reported by approach. The differing LOS criteria reflect drivers' increased tolerance for delay at signalized intersections.

Table 15- Intersection Level of Service Criteria

Level of Service	Signalized Control Delay (sec/veh)	Roundabout Control Delay (sec/veh)	General Description
A	≤10	≤10	Free flow
B	>10 – 20	>10-15	Stable flow (slight delays)
C	>20 – 35	>15-25	Stable flow (acceptable delays)
D	>35 – 55	>25-35	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 – 80	>35-50	Unstable flow (intolerable delay)
F	> 80	>50	Forced flow (jammed)

Source: Highway Capacity Manual (TRB, 2000)

The Egan Drive and 10th Street intersection is a signalized intersection. The LOS was calculated using Synchro Version 7, Build 793 (Trafficware, 2007). This intersection analysis software tool is based on the methodologies of HCM 2000 and is accepted by DOT&PF. The Douglas roundabout intersection was analyzed using the methodologies presented in NCHRP 572, which is the DOT&PF preferred method. Roundabout delay and LOS are reported as a weighted average for the entire intersection, while the volume to capacity (v/c) ratio is reported for the approach with the highest v/c ratio. Signal statistics are reported as an average for the entire intersection.

3.3.1 Existing Conditions

Existing traffic operations were analyzed as a means of comparison again the trips generated by the development along NDH. Evaluations were conducted based upon existing road geometries and control data noted in the field. Table 16 and Table 17 provide summaries of existing LOS, average vehicle delays, and the v/c ratio.

Table 16- Existing Level of Service Summary – AM Peak Hour

Location	LOS[1]	Delay[2]	V/C[3]
Egan/10th	E	57.0	1.12
Douglas Hwy/NDH	B	12.5	0.77

1. LOS = level-of-service
2. Average control delay for intersection (sec/veh)
3. V/C = volume to capacity ratio

Table 17 - Existing Level of Service Summary – PM Peak Hour

Location	LOS[1]	Delay[2]	V/C[3]
Egan/10th	D	51.0	1.17
Douglas Hwy/NDH	A	8.4	0.65

1. LOS = level-of-service
2. Average control delay for intersection (sec/veh)
3. V/C = volume to capacity ratio

3.3.2 Future Conditions

The intersections were analyzed to evaluate traffic conditions and operations that include the proposed development, based on the forecasts described above. Table 18 and Table 19 provide a summary of the analyses for the AM and PM peak hours, respectively.

Table 18- Future Level of Service Summary – AM Peak Hour

Location	D-10 Development			D-15 Development			D-18 Development		
	LOS[1]	Delay[2]	V/C[3]	LOS	Delay	V/C	LOS	Delay	V/C
Egan/10th	F	103.1	1.30	F	125.9	1.50	F	361.9	3.11
Douglas Hwy/NDH	F	149.7	1.17	F	343.7	1.38	F	519.3	1.52

1. LOS = level-of-service
2. Average control delay for intersection (sec/veh)
3. V/C = volume to capacity ratio

Table 19- Future Level of Service Summary – PM Peak Hour									
Location	D-10 Development			D-15 Development			D-18 Development		
	LOS[1]	Delay[2]	V/C[3]	LOS	Delay	V/C	LOS	Delay	V/C
Egan/10th	F	184.4	2.18	F	244.6	2.58	F	361.9	3.11
Douglas Hwy/NDH	B	13.7	0.71	C	24.2	0.90	E	48.0	1.00

1. LOS = level-of-service
2. Average control delay for intersection (sec/veh)
3. V/C = volume to capacity ratio

Traffic Volumes at these two intersections are portrayed in Figures 3 through 6. AM and PM traffic volumes are shown for the existing conditions along with each of the different levels of development.

The intersections were also evaluated to estimate how much additional traffic could be added before the LOS was reduced to F. At Egan Drive/10th Street, the limiting time was the PM peak hour. The intersection would be able to accommodate an additional 517 entering vehicles before reaching LOS F during the PM peak hour, assuming the signal phase splits could be optimized for the traffic volumes. This corresponds to an additional 184 dwelling units at Composite Rate A plus an additional 666 dwelling units at Composite Rate B.

At the Douglas Highway/NDH roundabout, the AM peak hour was the limiting time, at which time the roundabout would be able to accommodate an additional 334 vehicles before reaching LOS F. This corresponds to an additional 184 dwelling units at Composite Rate A plus an additional 481 dwelling units at Composite Rate B. The Federal Highway Administration states that when v/c ratios on roundabout approaches exceed 0.85, operations tend to breakdown frequently and unpredictably. If the v/c ratio threshold is used to determine roundabout failure, only 126 additional AM peak hour vehicles could be added. This corresponds to an additional 184 dwelling units at Composite Rate A plus an additional 48 dwelling units at Composite Rate B.

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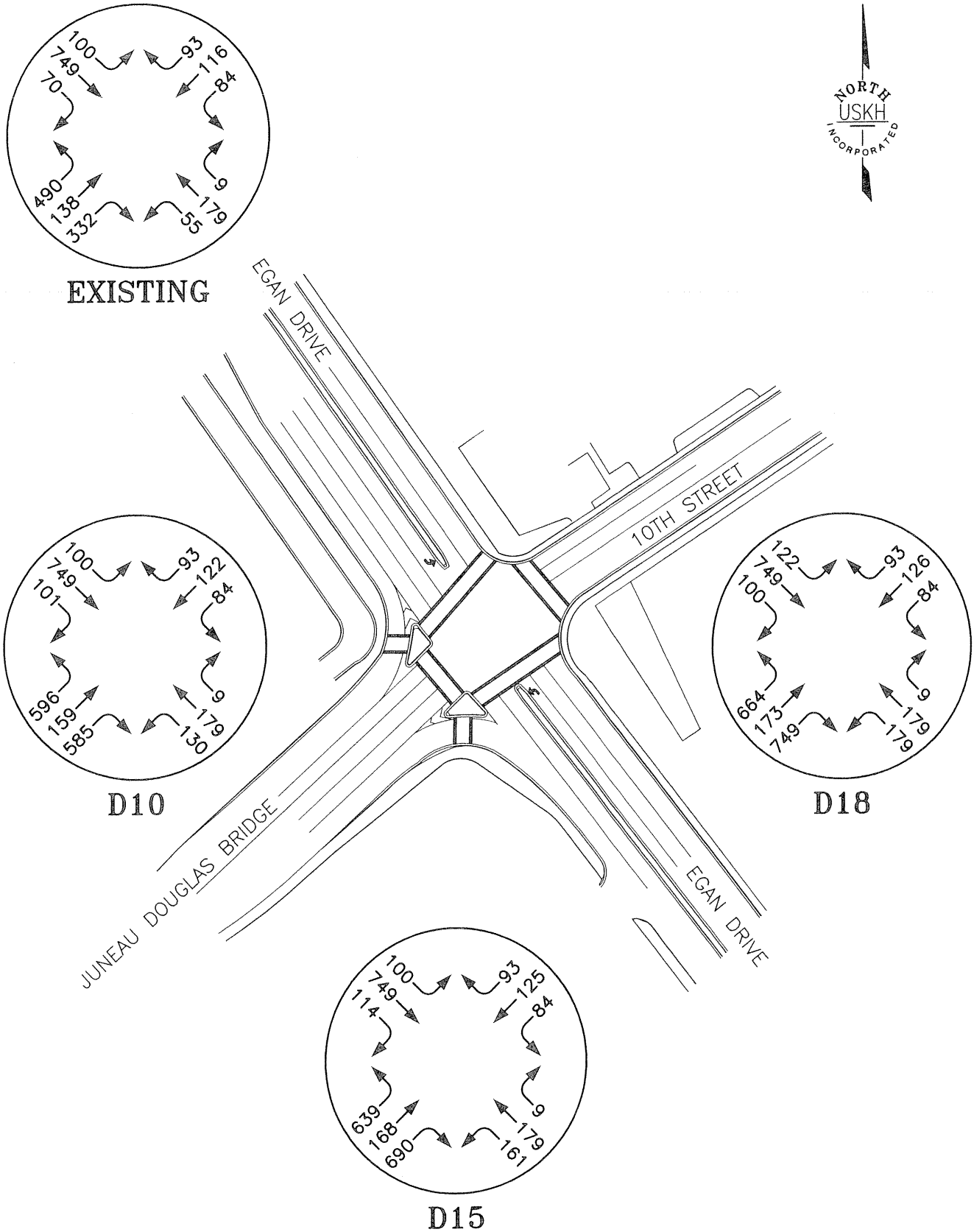

USKH Architecture • Engineering Land Surveying • Planning	CITY AND BOROUGH OF JUNEAU ★ ALASKA'S CAPITAL CITY DEPARTMENT OF ENGINEERING	PROJECT:	NORTH DOUGLAS HIGHWAY REZONE TRAFFIC IMPACT ANALYSIS
		TITLE:	AM VOLUME DATA FOR 10TH STREET & EGAN DRIVE
		CLIENT:	CITY & BOROUGH OF JUNEAU
		FIGURE NO.	3

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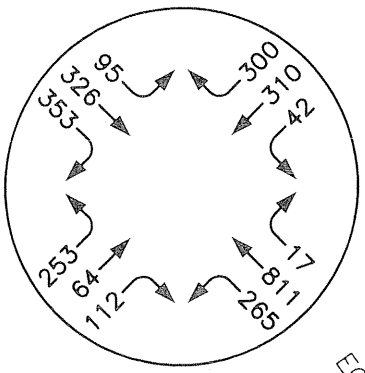

EXISTING

NORTH
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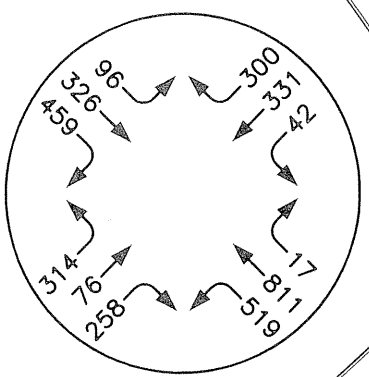
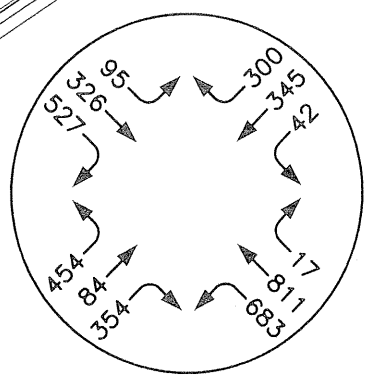
INCORPORATED

EGAN DRIVE

10TH STREET



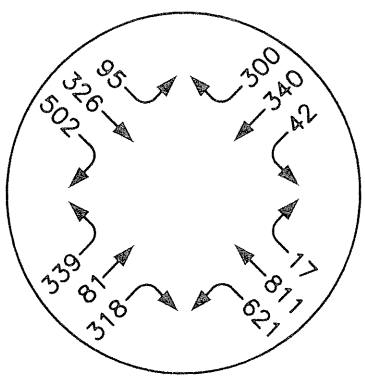
D10



D18

JUNEAU DOUGLAS BRIDGE

EGAN DRIVE



D15

USKH Architecture • Engineering Land Surveying • Planning	CITY AND BOROUGH OF JUNEAU ★ ALASKA'S CAPITAL CITY DEPARTMENT OF ENGINEERING	PROJECT: NORTH DOUGLAS HIGHWAY REZONE TRAFFIC IMPACT ANALYSIS	FIGURE NO. 4
		TITLE: PM VOLUME DATA FOR 10TH STREET & EGAN DRIVE	
		CLIENT: CITY & BOROUGH OF JUNEAU	

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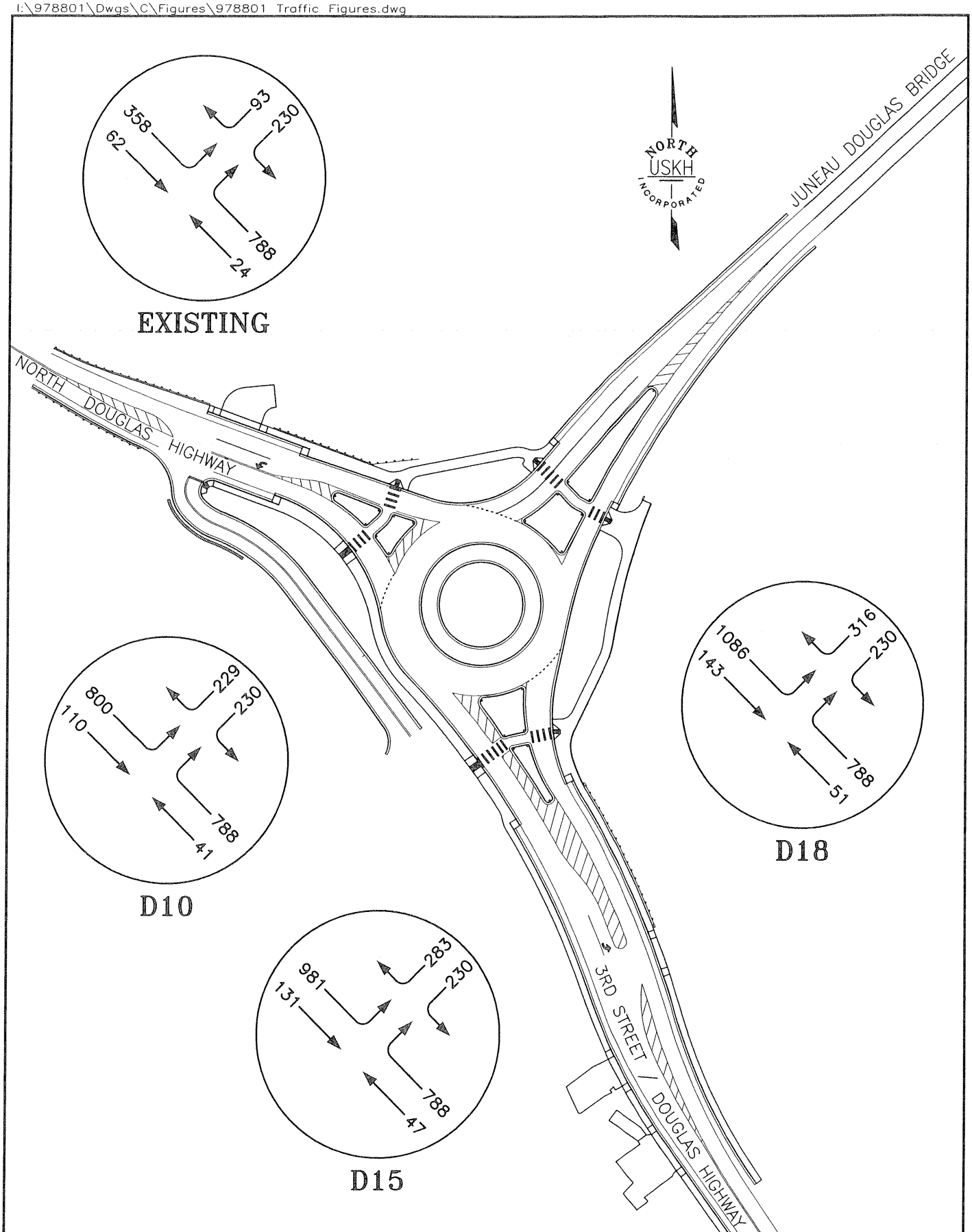

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		TITLE: AM VOLUME DATA FOR THE DOUGLAS ROUNDABOUT	
		CLIENT: CITY & BOROUGH OF JUNEAU	

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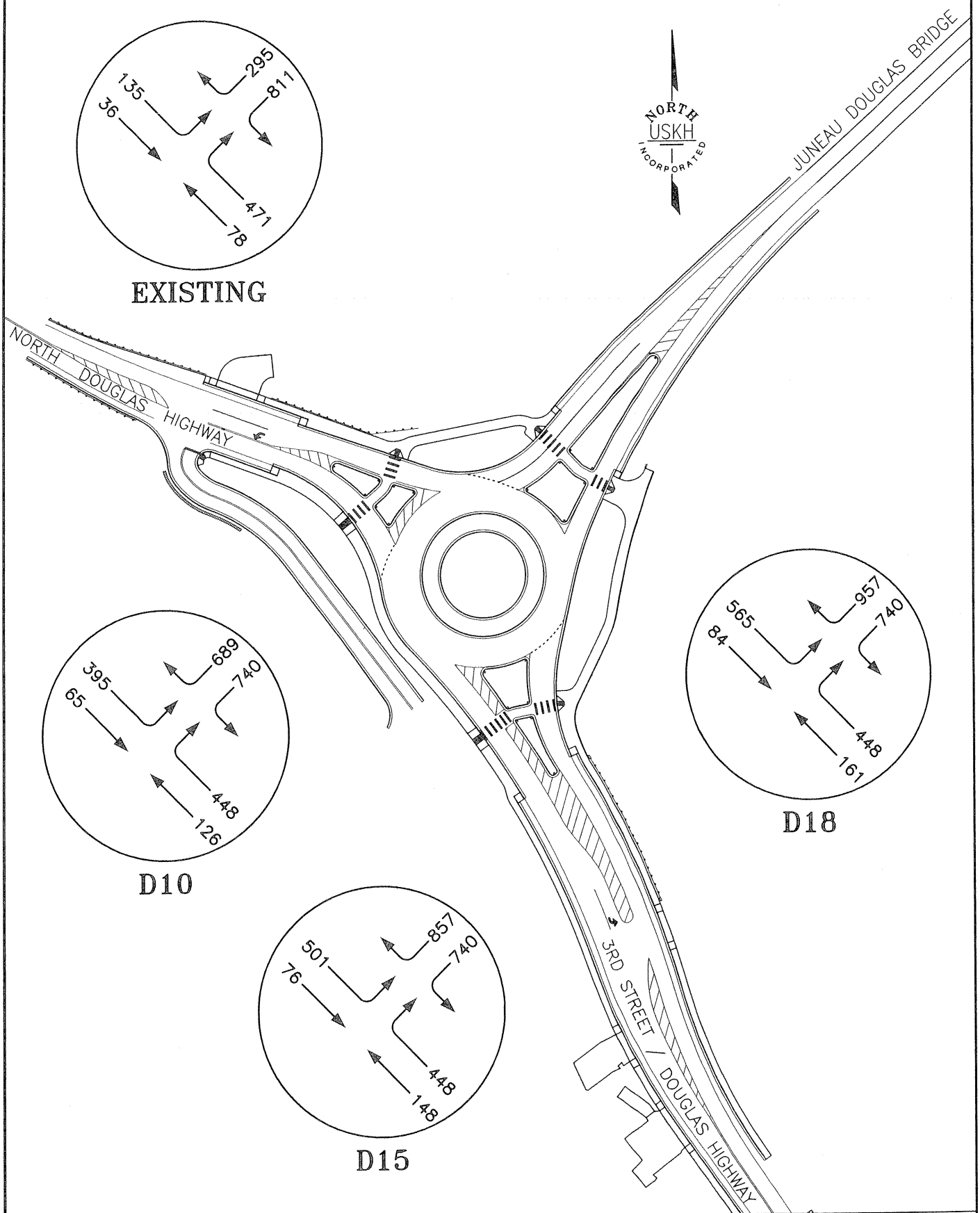

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		TITLE:	PM VOLUME DATA FOR THE DOUGLAS ROUNDABOUT
		CLIENT:	CITY & BOROUGH OF JUNEAU
		FIGURE NO.	6

3.4 Access Road Intersections

The access road schemes for future development along the NDH corridor have not been established at this time. Driveways and access roads connecting to NDH will be subject to the DOT&PF driveway permit process. In general, access points for new developments should be aggregated to the extent feasible, and access roads should be spaced at least one quarter mile from adjacent access roads.

The need for auxiliary lanes at access road intersections will depend on the traffic demands at the intersection, both turning onto the access road and continuing through the intersection on NDH. The following figures from NCHRP 457 give guidance on what traffic thresholds justify adding auxiliary turn bays onto NDH. Figure 7 applies for left-turn lanes and Figure 8 is applicable to right-turn lanes. It will be the responsibility of the developer to determine what, if any, auxiliary lanes are necessary on the access roads.

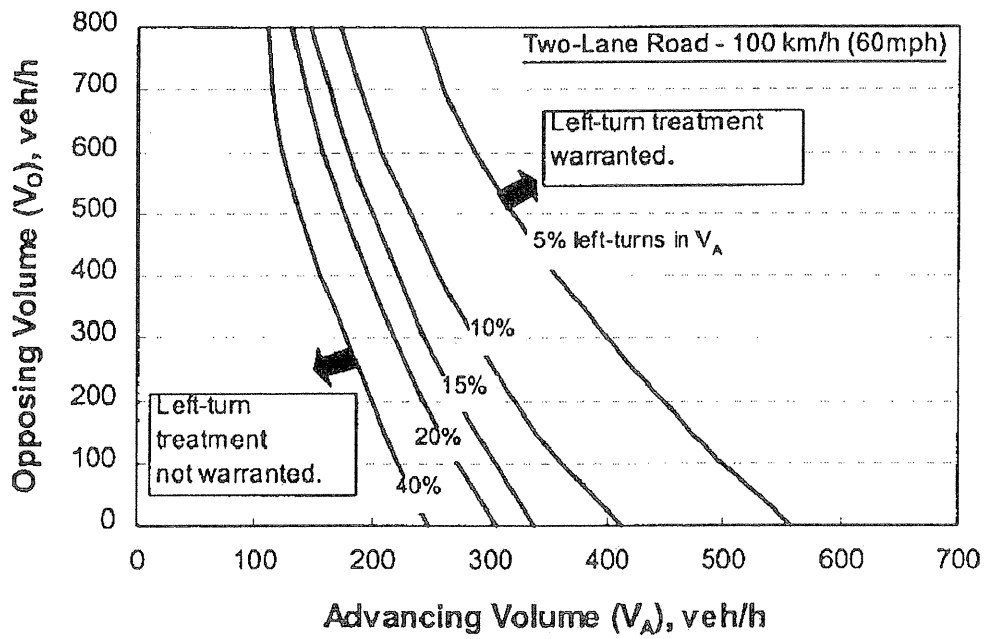

Figure 7 Left-Turn Lane Thresholds

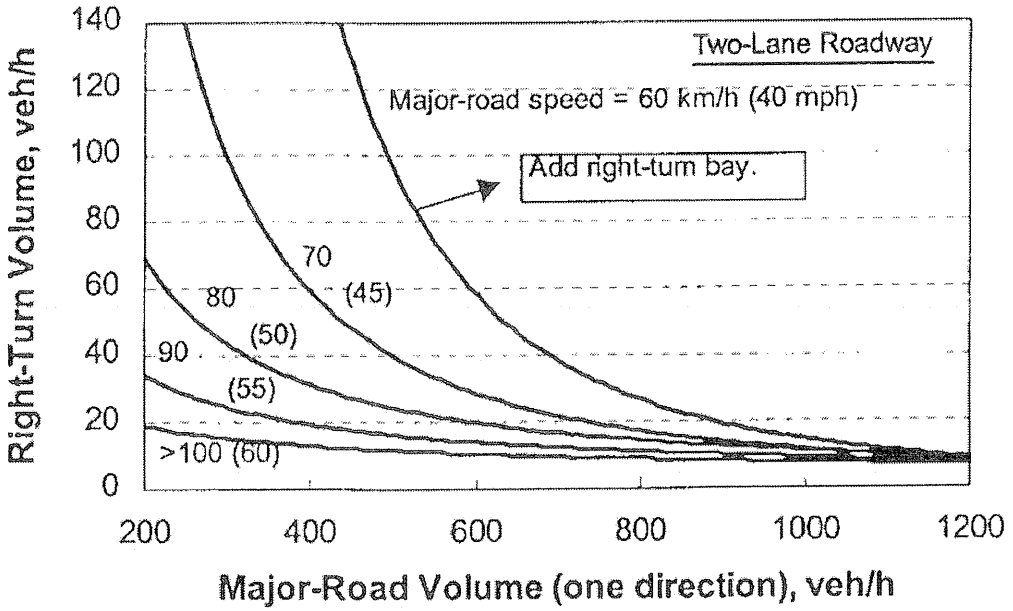

Figure 8 Right-Turn Lane Thresholds

3.5 Pedestrian and Bicycle Facilities

This segment of North Douglas Highway has 12-foot traffic lanes and 6- to 8-foot shoulders. Commuter bicycle traffic may use the traffic lanes or shoulders. The shoulders provide for other non-motorized traffic. In the 5-year time period analyzed in Section 2.6, only one collision involving non-motorized traffic has occurred. In May 2004 a vehicle collided with a pedestrian near 1.3 Mile causing a minor injury. The collision occurred during daylight hours on a straight and dry section of highway; inadequate pedestrian facilities do not appear to have been a factor.

Shoulder widths should be maintained when adding or improving access points along the highway. If auxiliary lanes are warranted, maintaining current lane and shoulder widths will help maintain a safe environment for non-motorized use.

3.6 Accident Analysis

DOT&PF analyzed safety at the intersections of Egan Drive and 10th Street and Douglas Highway and NDH and published the results in a Preliminary Engineering Report in December 2002. The analysis concluded that both intersections warranted safety improvements. DOT&PF constructed the roundabout at the Douglas Highway and NDH intersection to address capacity and safety in 2006. Recommended improvements at Egan Drive and 10th Street have not been constructed. DOT&PF has not recently studied collisions at these two intersections, but since traffic volumes have not increased, anecdotal evidence suggests no significant changes in safety conditions at the Egan Drive and 10th Street intersection, and improved safety at the Douglas roundabout.

DOT&PF provided collision statistics for NDH north of the roundabout for 2003 through 2007. A total of 37 collisions were reported within the limits of this study. No collisions resulted in fatalities, 3 caused

an incapacitating injury, 12 caused only non-incapacitating or possible injuries, and 22 resulted only in property damage. The tables below summarize the number of collisions by date, location and type.

Table 20 - Collisions by Year	
Year	**No.**
2003	12
2004	7
2005	5
2006	6
2007	7
Total	37

Table 21 - Collisions by Location	
Milepoint Range	**No.**
0 - 0.5	7
0.5 - 1	5
1 - 1.5	8
1.5 - 2	6
2 - 2.5	2
2.5 - 3	4
3 - 3.3	5
Total	37

Table 22 - Collisions by Type	
Type	**No.**
Rear End	8
Angle	9
Pedestrian	1
Parked Vehicle	1
Intersection/Driveway	15
Single Vehicle	17
Multiple Vehicle	20

The collision history shows a pattern of accidents at intersections and driveways, which is typical of high-speed highways with many access points. The rate of accidents is not high, but adding driveways along NDH is likely to increase that rate. To the extent possible, new development should use existing access points. New and improved access points should meet DOT&PF intersection and driveway design standards. Auxiliary lanes, if warranted (Section 2.4), should be used.

3.7 Traffic Impact Mitigation

Full development at any of the three housing mix scenarios presented in Chapter 1 would eventually result in LOS levels at Egan Drive and 10th Street that fall below minimum LOS standards. However, this development will occur over time and the re-zoning action in and of itself does not generate traffic. The re-zoning action will not require traffic impact mitigation. This report identifies the likelihood of decreased LOS at the critical intersections analyzed in this study as development occurs along NDH.

4 CONCLUSIONS

The development of land along NDH has the potential to accommodate much of Juneau's population growth for the next 20 years. The traffic generated by this development will negatively impact the LOS at the Douglas roundabout and the intersection of Egan Drive and 10th Street. Eventually, improvements to these intersections may be warranted to allow this growth to occur. Mitigation of impacts to pedestrian and bicycle facilities and safety are not likely to be warranted.

The re-zoning action will not cause impacts to traffic, but does increase the opportunity and potential for growth in the study area. Mitigation of these future impacts is not required for the rezoning action. As the development occurs over time, the impacts are projected to increase to the point that improvements at the subject intersections will be necessary.