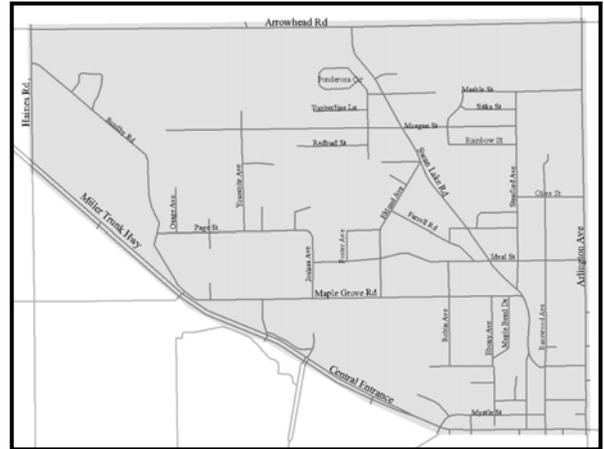


Duluth Heights Traffic Circulation Study



August 2006



Produced by the Duluth-Superior Metropolitan Interstate Council

Duluth Heights Traffic Circulation Study

August 2006

Prepared by



Duluth-Superior Metropolitan Interstate Council

*Duluth and Superior urban area communities
cooperating in planning and development
through a joint venture of the
Arrowhead Regional Development Commission
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Map Disclaimer

The information contained in the following maps is a compilation of data from various federal, state, county, regional, and municipal sources. Geographic information has limitations due to the scale, resolution, date and interpretation of the original source materials. Users should consult available data documentation (metadata) to determine limitations and the precision to which the data depicts distance, direction, location or other geographic characteristics. These maps and/or data are not legal survey documents to be used for describing land for the purpose of ownership or title.

INTRODUCTION

Background

The Miller Hill area has developed as the primary shopping area in our region. This retail district draws large amounts of traffic from all neighborhoods in Duluth as well as from across the region.

Currently, traffic from eastern Duluth and the townships north of Duluth destined for the Miller Hill area use a variety of routes including residential streets. Many of those residential streets were not designed to handle large amounts of traffic. Local residents have seen the traffic increase as the Miller Hill area has experienced additional development over the years. The Metropolitan Interstate Council (MIC) was approached and asked to study the problem and identify solutions to lessen the impact of cut through traffic on the Duluth Heights neighborhood.

Objective

The objective of the Duluth Heights Traffic Circulation Study is to document neighborhood cut through traffic, and identify options to reduce impacts and improve traffic flow in and around the Duluth Heights neighborhood.

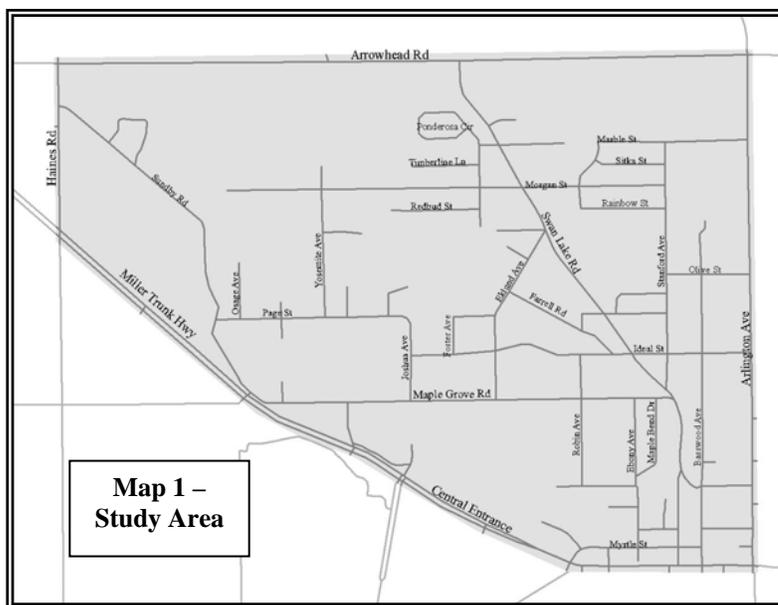
Study Area

The study area is defined as the area bounded by Arrowhead Road on the north, Arlington Road on the east, Central Entrance/Miller Trunk Highway on the south, and Haines Road on the west. See shaded area on Map 1.

Study Process

The study process consisted of problem identification and solution development. The problem identification phase of the study included an initial public meeting and the collection of traffic data. The initial public meeting allowed area residents to voice their concerns and issues. The traffic data compiled included historic traffic counts, current traffic counts, turning movement counts at key intersections, trip generation rates, and cut through traffic counts.

The solution development phase of the study included public input from a resident survey and two more public meetings. Potential solutions were filtered through a set of criteria and further analysis to identify affordable, effective and feasible methods of deterring cut through traffic.



Oversight Committee

Professional staff from the City of Duluth, St. Louis County, Minnesota Department of Transportation (MnDOT) and the MIC was organized to assist with the study. Their primary tasks were to assist in traffic data collection, review methodology and results of traffic data analysis, review solution options and assist with public meetings. The committee met on an as-needed basis throughout the study.

Oversight Committee Members

Jim Benning – Acting City Engineer, City of Duluth

Brian Boder – Traffic Engineer, St. Louis County

Ron Chicka – Director, Metropolitan Interstate Council

Jim Foldesi – Resident Engineer, St. Louis County

Chuck Froseth – Senior Planner, City of Duluth

James Gittemeier – Planner, Metropolitan Interstate Council

Denny Johnson – District Planning Director, MnDOT

Cari Pedersen – Acting Chief Engineer of Transportation, City of Duluth

Paul Scanlan – Senior Engineering Specialist, City of Duluth

Public Input

Public input is critical to the success of this study. MIC staff received public input through three public meetings, a resident survey and general public comment through phone calls, emails and letters.

The first public meeting was an Issues Identification Meeting held on September 8, 2005. A brief presentation describing the study was done, followed by a session in which residents wrote their issues and concerns on aerial photos of the study area. Approximately 75 people attended the meeting.

The second public meeting was a Public Open House/Solution Identification Meeting held on February 16, 2006. The meeting began with a review of all the traffic data collected for the study and the results of the resident survey. The second half of the meeting was dedicated to having residents brainstorm potential solutions, and to writing and drawing their ideas on aerial photos. Approximately 100 people participated in this meeting.

The final public meeting was held on June 20, 2006 to review proposed solutions and get public comment. The proposed solutions were presented to the attendees. The meeting concluded with public comment. Approximately 100 people attended with about 25 people signing up to comment. Comments were taken into consideration in developing the final recommendations.

A resident survey was sent to 875 households in the study area with 285 completed surveys returned to us for a response rate of 33%. The survey sought residents' attitudes on the magnitude of the cut through problem, traffic calming, new roadways and improvements to current roadways. Residents also provided general comment on neighborhood traffic issues.

General comments were received throughout the study by letters, emails, and phone calls. An article that ran in the Duluth News Tribune around the end of the year prompted a large amount of public comment.

Detailed summaries of the public input are included throughout this document. The full results of the resident survey are included in the Appendix.

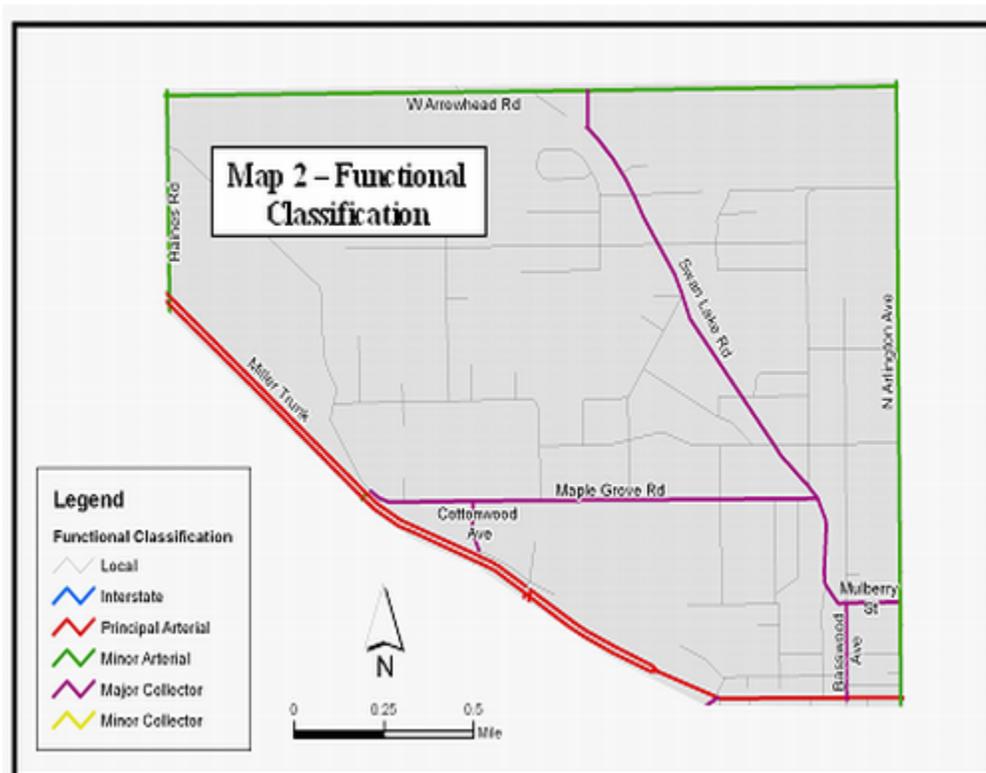
EXISTING CONDITIONS

The description of existing conditions helps us understand the issues in this planning process. The existing conditions include what types of roads are in the study area, who is responsible for maintaining them, and the amount of traffic is using them. The study area is located at or in close proximity to the Miller Hill retail area. The majority of the study area is low density residential with some commercial use. The road system is mostly rural section roadways without curb and gutter and there are very few sidewalks in the study area.

The Miller Hill area has developed as the primary retail area in the Duluth-Superior region. It attracts customers from long distances such as the Iron Range and as far as Thunder Bay, Ontario. The retail area is almost entirely auto-oriented development with little pedestrian and bicycle facilities.

Roadway Functional Classification

Functional classification is the process in which streets and highways are grouped in “classes”, or systems, according to the way people use them. These classifications include interstate highways, other freeways and expressways, principal arterials, minor arterials, major collectors, minor collectors and local streets. It is important to remember that roads do not work independent of each other. The purpose of any road network is to move people and goods from one point to another point. In the state of Minnesota, functionally classifying roadways are typically carried out at the state level in cooperation with regional and local officials through the regional development commissions and metropolitan planning organizations. These classifications aid state, county and city jurisdictions in setting priorities for the various

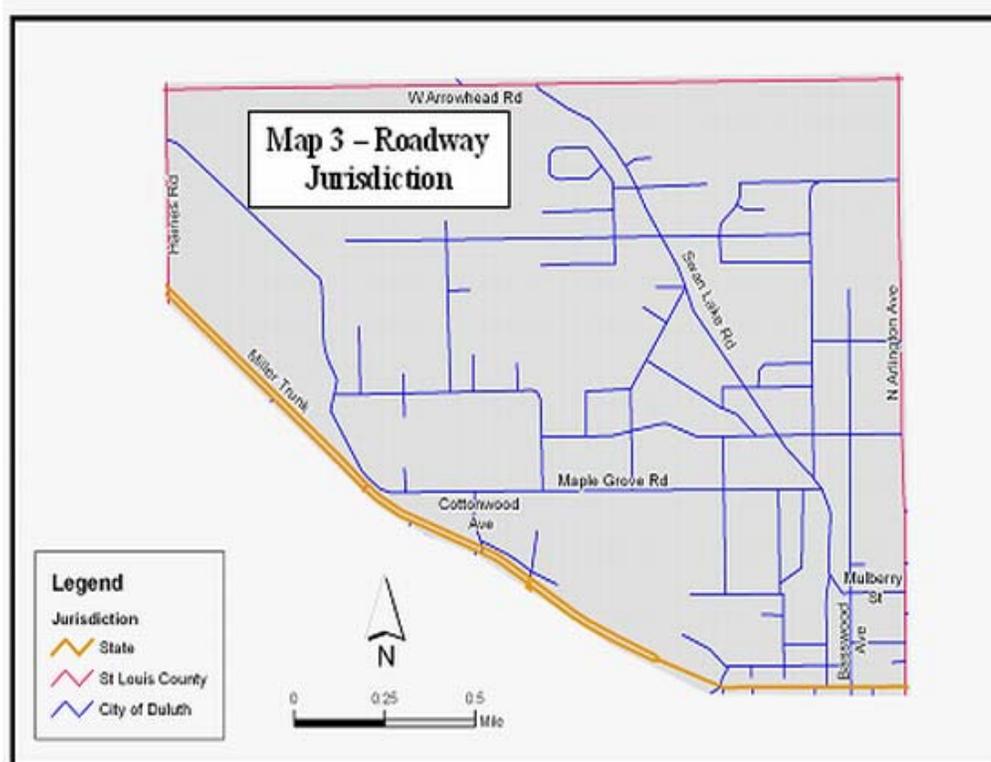


roadways. These priorities can be set for such things as reconstruction and maintenance. Two major criteria, mobility and access, determine a road's classification. The highest classifications are interstate highways and freeways, which accommodate high levels of traffic at high speeds but have a low level of access and turning movements. Their function is to carry large amounts of traffic to connecting roadways, to offer access to trip destinations. In contrast, the lowest classification is local roads, which carry less traffic, provide access to residential areas and connect to higher classified roads.

The perimeter of the study area is minor arterials on the west, north, and east with a principal arterial on the south. On the interior of the study area, there are major collectors – Maple Grove Road, Swan Lake Road, Basswood Avenue (from Swan Lake Road to Central Entrance), Cottonwood Avenue (from Maple Grove Road to Miller Trunk Highway) and Mulberry Street.

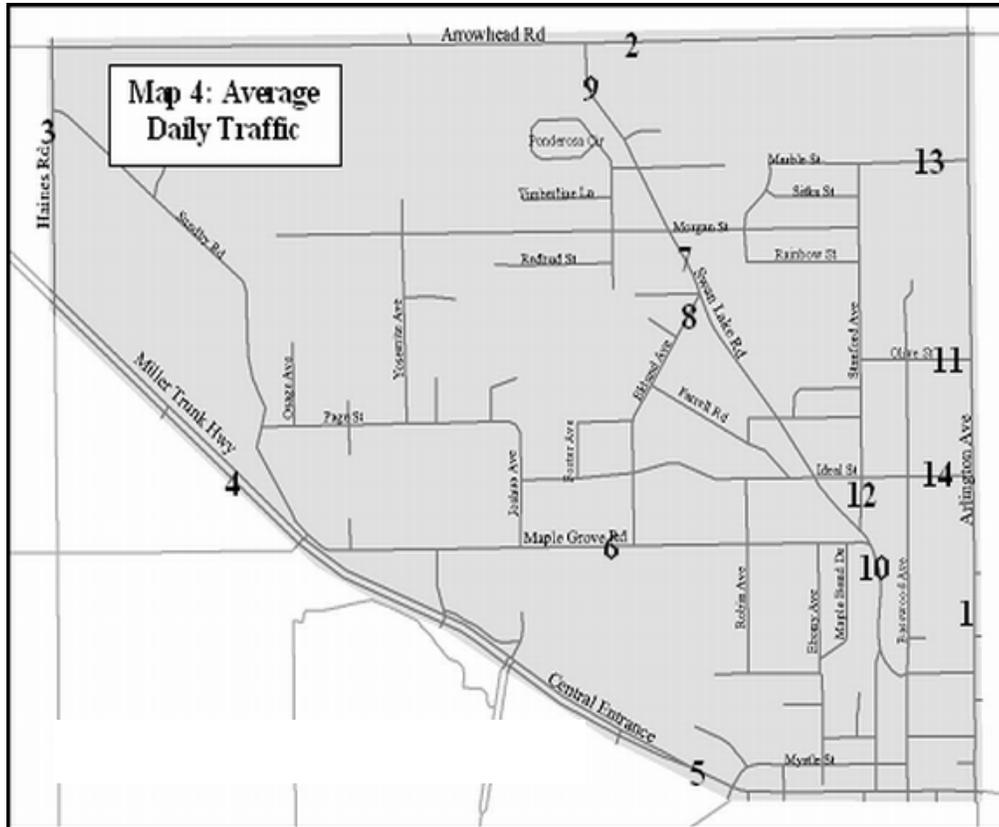
Roadway Jurisdiction

Not all roadways within the City of Duluth are managed by the city. MnDOT and St. Louis County manage various roadways within the city limits. MnDOT manages the Trunk Highways throughout the state including Central Entrance/Miller Trunk Highway. St. Louis County manages the County State Aid Highways within the City of Duluth including Arlington Avenue, Arrowhead Road and Haines Road. These four major roads surround the study area. The roadways within the study area are managed by the City of Duluth. The responsible jurisdiction is accountable for the maintenance, reconstruction and operation of the roadways. Typically, the higher level of government manages the higher functionally classified roadways. Roadways serving statewide centers of economic activity are managed by the state. Roadways connecting sub-regional centers of economic activity are usually managed by a county. Lesser roads that provide a higher level of access are normally managed by a city.



Average Daily Traffic

The average daily traffic volumes were taken between 2000 and 2005. The numbers in the lists below correspond to Map 4. The arterial roads surrounding the study area had the following traffic volumes:



1. Arlington Avenue – 8,000 vehicles per day (vpd)
2. Arrowhead Road – 6,600 vpd
3. Haines Road – 9,700 vpd
4. Miller Trunk Highway – from 17,400 to 25,200 vpd
5. Central Entrance – from 20,000 to 21,900 vpd

Specifically for this study, the following traffic volumes were counted on these study area roads in August 2005:

6. Maple Grove Road west of Eklund Avenue – 3,150 vpd
7. Swan Lake Road north of Eklund Avenue – 2,800 vpd
8. Eklund Avenue south of Swan Lake Road – 2,250 vpd
9. Swan Lake Road south of Arrowhead Road – 2,000 vpd
10. Swan Lake Road south of Maple Grove Road – 1,800 vpd
11. Olive Street west of Arlington Avenue – 610 vpd
12. Stanford Avenue south of Ideal Street – 525 vpd
13. Marble Street west of Arlington Avenue – 500 vpd
14. Ideal Street west of Arlington Avenue – 240 vpd

Cut Through Timing Runs

Timing runs were conducted to compare how long it takes to get to the mall area by using primary roadways versus cutting through the neighborhood. The following methodology was utilized:

Origin-Destination

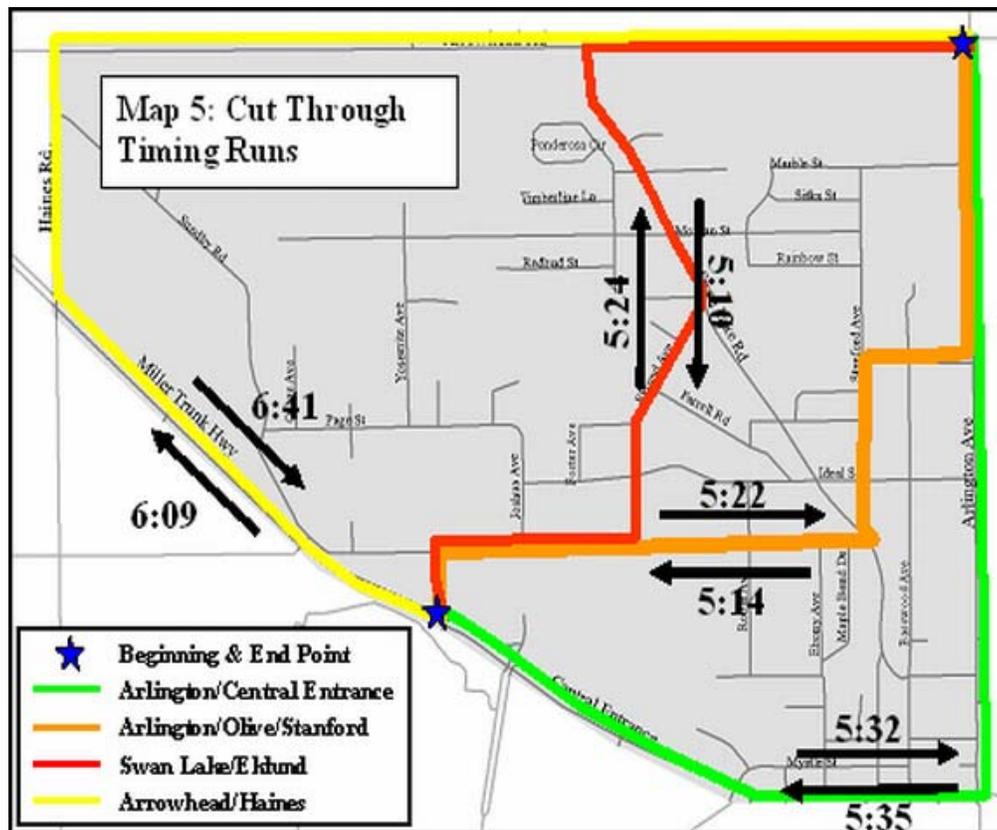
- Begin and/or end at Arrowhead Road and Arlington Avenue intersection
- Begin and/or end at Miller Trunk Highway and Cottonwood Avenue intersection

Routes

- Arlington Avenue to Central Entrance to Miller Trunk Highway (2.76 miles)
- Arrowhead Road to Haines Road to Miller Trunk Highway (3.6 miles)
- Arrowhead Road to Swan Lake Road to Eklund Avenue to Maple Grove Road to Cottonwood Avenue (2.55 miles)
- Arlington Avenue to Olive Street to Stanford Avenue to Swan Lake Road to Maple Grove Road to Cottonwood Avenue (2.35 miles)

Timing

Timing begins as the vehicle passes through origin. Timing ends as vehicle lines up at destination intersection. All speed limits are followed and vehicle comes to a full stop at all stop sign controlled intersections.



Conditions

The timing runs were conducted in a variety of weather conditions.

Time of Day

The timing runs were conducted at different times of the day to get a variety of traffic conditions. The timing runs were done between 8 a.m. and 6 p.m. during the work week on Mondays through Fridays.

Results

The results of the timing runs are shown on Map 5. They show that there is very little time saved, between 10 and 25 seconds, by cutting through the neighborhood. The Arrowhead Road/Haines Road route took the longest, but was probably not the best comparison given that most people that take this route are destined for location farther west than our end point at Cottonwood Avenue and Miller Trunk Highway. The better comparison would be Arlington Avenue/Central Entrance to the neighborhood cut through routes. These two primary roadways are functionally classified as a minor arterial (Arlington Avenue) and a principal arterial (Central Entrance). The routes that cut through the neighborhood go over streets that are primarily functionally classified as local streets that were not designed or built to handle higher traffic levels.

License Plate Survey Counts

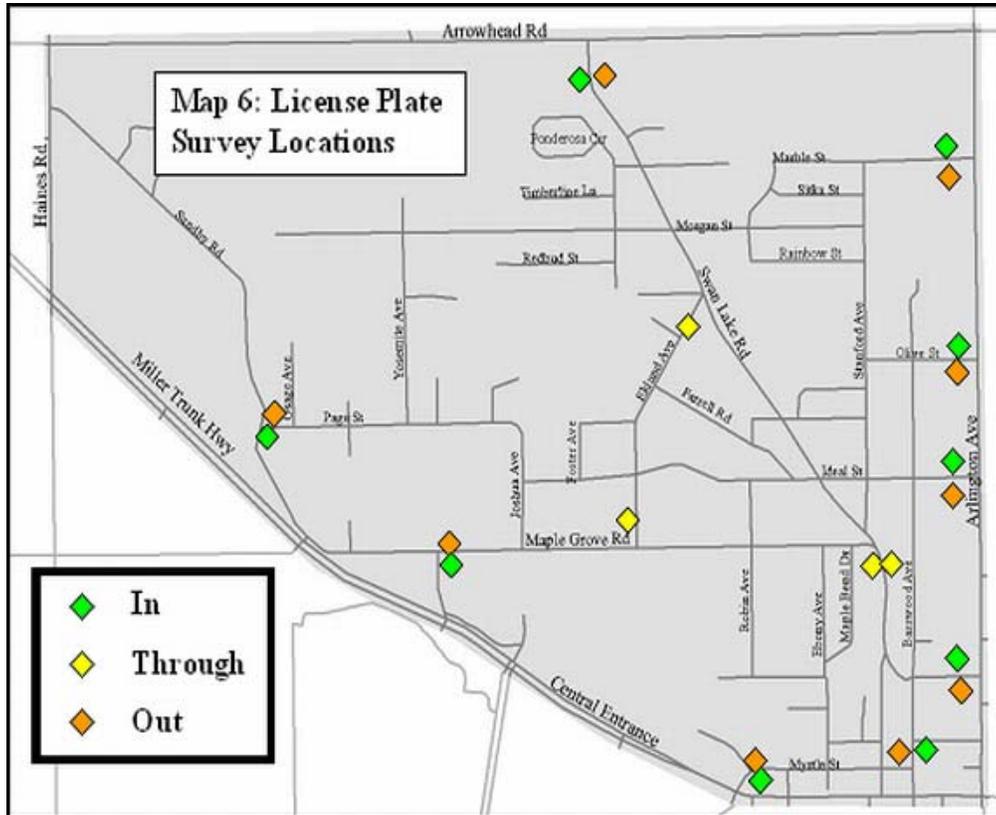
These counts were designed to identify the percentage of traffic that is using the study area neighborhood streets as a cut through to the Miller Hill commercial area. A total of 17 people counted 22 traffic movements. Vehicles were counted entering and exiting the study area at 9 locations and 4 internal movement counts were taken (see Map 6). The counts were conducted over a two-hour period on Tuesday, September 27th from 4:30 – 6:30 p.m.



Staff and neighborhood volunteers conducted license plate survey counts to identify the percent of traffic using the local streets as a cut-through to the Miller Hill commercial area.

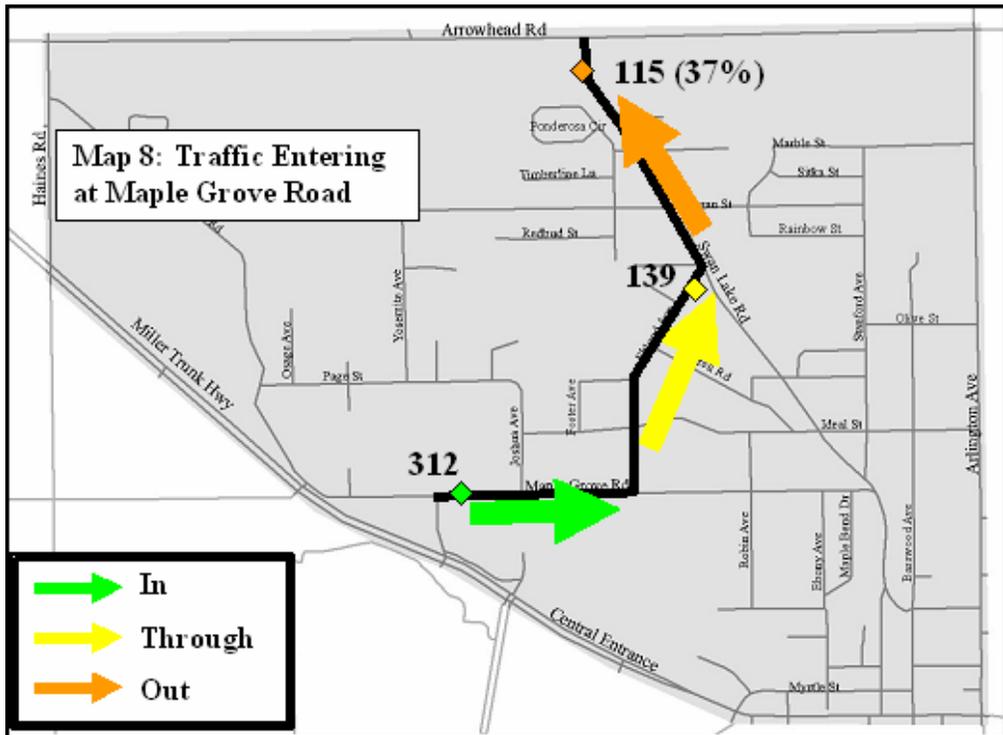
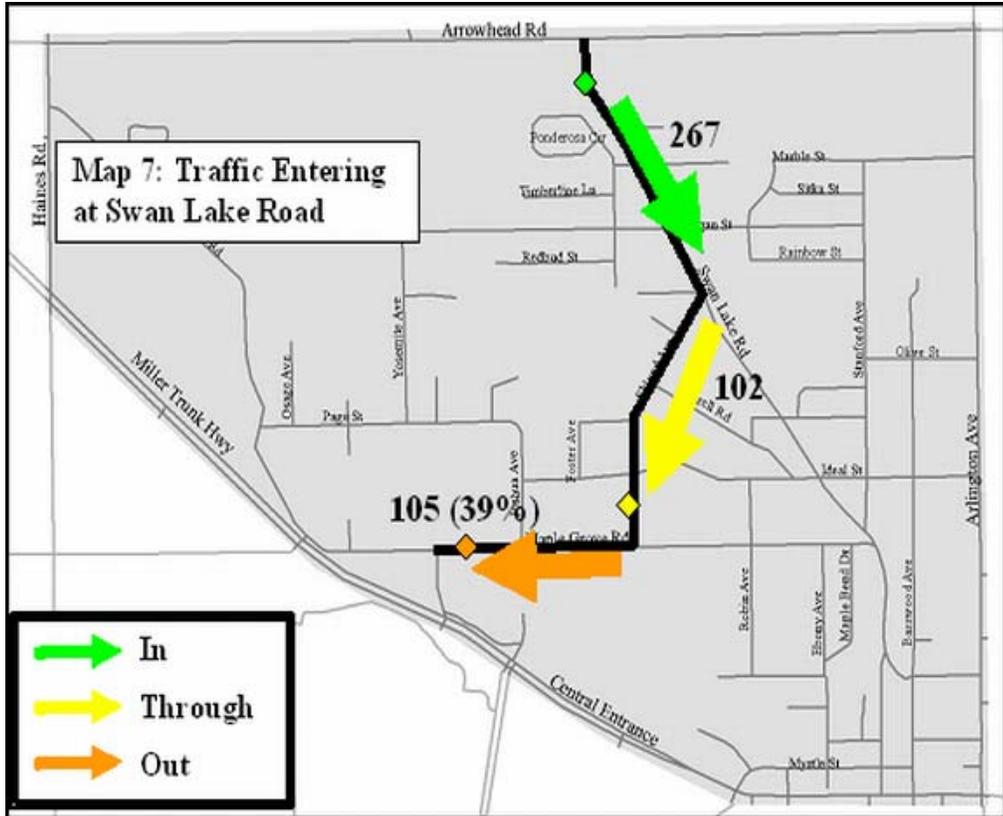
Methodology

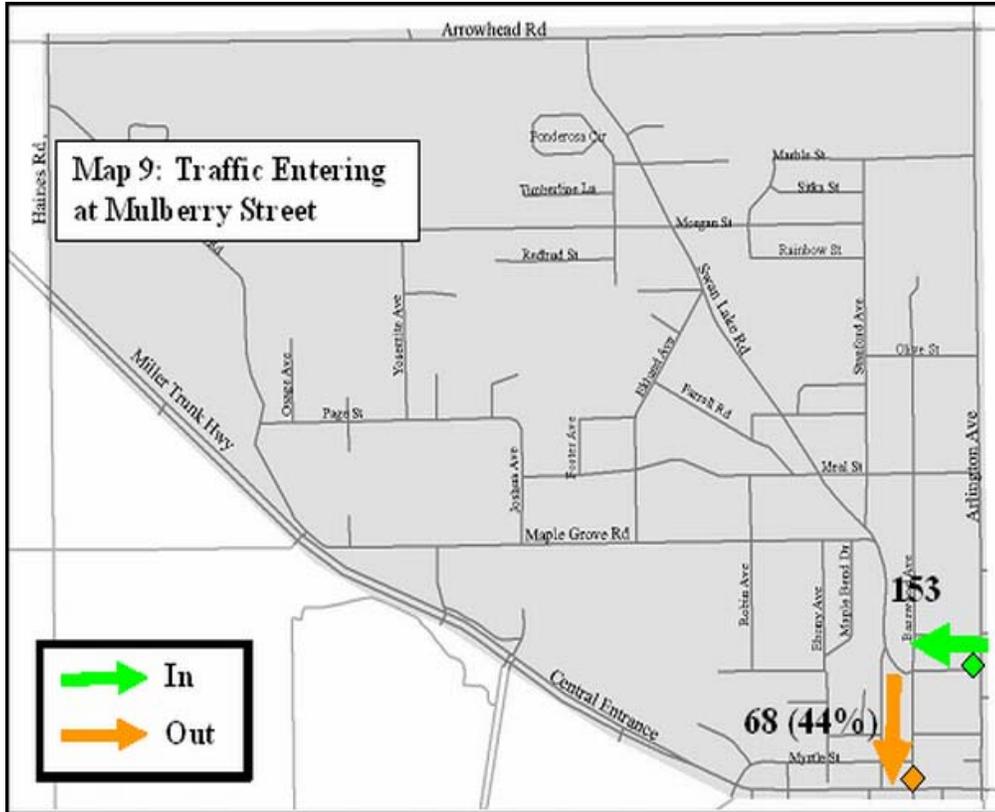
A combination of neighborhood volunteers and professional staff from the City of Duluth, St. Louis County and the MIC conducted the counts. At each count location, the counters recorded the last three digits from vehicle license plates that passed by their location. At the end of the counting period, all partial license plate numbers were entered into a spreadsheet and a match analysis was conducted. The analysis identified matches that entered at one location and exited at another location within 10 minutes. Vehicles that remained in the study area more than 10 minutes were considered local traffic.



Results

The results of the analysis showed that three entry points had significant amounts of traffic cutting through the study area (see Maps 7-9). Two entry points were associated with one cut through route. Traffic entering on Swan Lake Road from Arrowhead Road cut through in high numbers on Eklund Avenue to Maple Grove Road. This route mirrored the reverse route from Maple Grove Road near Cottonwood Avenue to Swan Lake Road south of Arrowhead Road. The other route with significant cut through traffic is westbound Mulberry Street to southbound Basswood Avenue.





Pedestrians also use the neighborhood streets.

PROBLEM IDENTIFICATION

Residents of the study area have voiced concerns over the high volume of traffic in their neighborhood. By examining the traffic information from the previous chapter, we observed that non-local traffic is using local streets for access to the Miller Hill Mall area. These streets were not designed to carry this amount of traffic. This chapter examines the problem identification process by summarizing the input received from the public.

Issues Identification Meeting – September 8, 2005

An issues identification meeting was held in September of 2005 to help staff better understand the problems within the study area. We mailed an invitation to all households within the study area. The mailing list was developed by the City of Duluth's Assessors Office.

MIC staff started the meeting by explaining the objective and background of the study and some of the work tasks that would be taking place. Approximately 75 area residents attended. The majority of the meeting was dedicated to having participants write or draw their concerns on aerial photos of the study area. The following text organizes the 131 comments that were received at the meeting into categories.

- Traffic Calming - Include traffic calming measures: reduce dangerous and non-local traffic. *32 Comments*

Traffic calming measures should include the following: reducing cut-through traffic from Arrowhead to Miller Hill Mall along Eklund, Stanford, and Swan Lake; measures to slow the speed of traffic along Marble-Stanford-Swan Lake and Stanford-Maple Grove routes; and installing a traffic signal on Swan Lake (note: This traffic calming measure comment was mentioned 11 times)

- Arterial Connection – Build arterial connection from Maple Grove Road to Arrowhead/Rice Lake Road. *23 Comments*

Build Maple Grove to Arrowhead connection; options include extending Sundby north to Arrowhead, or using the Yosemite alignment and extending Trinity Road while avoiding existing residences by using vacant land.

- Public Outreach – Include more public outreach. *11 Comments*

Include more public outreach of various traffic calming/control devices (traffic circles, islands) and cut through issues, as well as more public outreach of past studies/plans, including an examination of the plans for Basswood, Mulberry and Swan Lake intersections.

- Road Closures – Close off neighborhood cut-through routes. *11 Comments*

Close or gate off (barrier) the following: Maple Grove east of Joshua/Trinity Ave, Eklund at Swan Lake, Swan Lake from Arrowhead to Maple Grove, West Page at Joshua Avenue, and Sundby Road between Haines and Maple Grove.



At the initial public meeting, neighborhood participants wrote or drew their concerns on aerial photos of the study area.

- **Infrastructure Improvements** – Recondition neighborhood roadways. *10 Comments*
 Improve transportation infrastructure by reconditioning the neighborhood streets, specifically streets with serious pavement deterioration, streets that are narrow with no sidewalks, and streets used as busy thoroughfares for heavy trucks (Sundby Road); address poor sight visibility and dips along Maple Grove Rd; and examine guardrail, fencing and drainage retention issues along Basswood and Swan Lake Rd.
- **No Arterial Connection** – Do not build arterial connection from Maple Grove Road to Arrowhead Road/Rice Lake Road. *9 Comments*
 Instead of adding a new arterial, improve Haines Road and Arlington Avenue. Are there real time savings, financial justifications, and it will create more cut through traffic on other neighborhood roads.
- **Intersection Improvements** – Improve neighborhood intersections. *7 Comments*
 Improve neighborhood intersections, including Sundby and Haines, and Maple Grove/Sundby and US Hwy 53; install turn lanes at Arlington and Mulberry; and add a left-turn lane and signal on southbound Arlington at Central Entrance.
- **One-Way Road Conversions** – Convert roads to one-ways. *6 Comments*
 Convert Eklund into a one-way southbound and Stanford into a one-way southbound from Ideal to Swan Lake.
- **Pedestrian Facilities** – Build sidewalks. *6 Comments*
- **Future Studies** – Undertake future studies and plans. *4 Comments*
 Future studies should focus on traffic flow changes on Sundby Road and Maple Grove Road from the upcoming Miller Trunk Highway Improvement construction projects, the

Northwest Corner Study and how future development plans fit with this study, and undertaking land use planning efforts in regards to the housing development plans southwest of Sundby Road.

- Fire Station Traffic Control Device – Install traffic control devices for the Fire Station on Cottonwood Avenue. *3 Comments*
- Maple Grove Road Extension to Arlington Avenue – Extend Maple Grove Road to Arlington Avenue. *3 Comments*
- Transit Service Improvements – Improve transit service to neighborhood and improve transit amenities (shelters). *2 Comments*
- Road Widening Concerns – Do not widen Eklund Avenue and Joshua Avenue. *2 Comments*
- Environmental Concerns – Protect Miller Creek and area wetlands. *1 Comment*
- No Maple Grove Road to Arlington Avenue Extension – Do not extend Maple Grove Road to Arlington Avenue. *1 Comment*

General Public Comment

A number of people from the study area as well as other areas across the region called, wrote letters, or emailed MIC staff to voice their issues, concerns, and opinions. This section lists these comments in no specific order. A large number of these comments came after an article in the Duluth News Tribune ran in late 2005.

- Would like to see Joshua Avenue connected to Maple Grove Road as soon as possible so they can get to the mall area quicker. Currently they have to take a round about way to there.
- There is some cut through traffic on Ideal Street but it is not too bad. Very quiet neighborhood.
- A resident in the study area stated that traffic in front of her house is very fast and it is hard to get to her mailbox. She would like to see more enforcement of speed limits and improved driver behavior. It is a neighborhood and not a cut through route to the mall.
- Widen and pave West Orange Street between 8th Avenue West and Arlington Avenue.
- Taxpayers pay taxes for all roads and should be able to drive where they want. There is a need to move traffic in the Duluth Heights area and all roads should be used.
- Time the cut through and educate the general public that the time savings is minimal. There are negative impacts on neighborhoods with large amounts of cut through traffic. Traffic calming in the Lakeview neighborhood doesn't work; more signage and enforcement would solve the problem. Let the neighborhood pay for and maintain more severe traffic calming measures.
- Without these alternate routes the clogged streets are and will continue to be Arlington Avenue, Haines Road, etc. We must face the reality that the Miller Hill Mall corridor is

continuing to expand and more routes will be needed to handle the traffic. The locals must be educated that:

1. These streets do NOT belong to them, they belong to all taxpayers.
 2. Streets were built to serve traffic - cars, trucks, motorcycles, etc.
 3. Streets are NOT playgrounds for children.
 4. Streets are NOT dog parks or dog exercise areas.
- What do the residents mean by congestion? Overcrowded? Overburdened? I don't think so....just a few more vehicles during the course of the day. Post a reasonable speed limit and then enforce it!
 - Drivers need to get to the mall in a safe manner. Central Entrance is congested and not comfortable to drive.
 - The cut through issue would be solved by putting up more signs and enforcing them. Enforcement of speed limits would also stop some of the cut through.
 - Taxpayers have the right to use city streets to get to where they are going. The city should provide safe streets to drive on and not drive through neighborhoods.

Resident Survey

A survey was mailed to study area residents in January 2006 to get an idea on how residents viewed the current cut through traffic issues and how receptive they were to certain types of solutions. We mailed 875 surveys and received 287 back for a 33% return rate. This section contains the questions that asked residents about the traffic problem. For full survey results see the Appendix .

1. Do you think cut through traffic is a problem in your neighborhood?
 - 12% Not a problem
 - 15% Minor problem
 - 34% Moderate problem
 - 38% Serious problem
 - 1% Did not answer

2. What are your neighborhood traffic safety concerns? Rank in order of greatest concern. (14% or 44 respondents did not provide a ranking with their answer to this question. 243 survey responses were used to determine the following results).
 - Ranked #1
 - 44% - Traffic driving too fast
 - 25% - Pedestrian safety
 - 23% - Too much vehicle traffic
 - 5% - Other
 - 2% - No answer

Problem Summary

The results of the Issues Identification Meeting along with the first two questions in the resident survey showed that the study area residents are very concerned with traffic issues in their neighborhood. Survey respondents said the number one concern is traffic driving too fast. The results of the license plate survey from the previous chapter confirm that there is a high volume of traffic that uses the neighborhood streets as a cut through route to the Miller Hill Mall area. There was consensus from all stakeholders that a problem exists with excess traffic entering the neighborhood and using local streets for access to the Miller Hill Mall area. The current signage that states “No Through Traffic” is having little impact on the amount of vehicles cutting through.

SOLUTION OPTIONS

This chapter outlines how potential solutions were developed, what criteria were used to choose them and what proposed solutions were chosen. The solution phase of the study began with the results of the resident survey, continued with input from the February 16, 2006 Public Open House and concluded with a review of the proposed solutions at the June 20, 2006 Public Meeting. Solutions were categorized into proposed new roadways, traffic calming and improvements to current roadways.

Solution Development

After the problem identification phase of the study, solutions to address the cut through traffic were needed. The resident survey asked four questions directly related to potential solutions in order to get an idea of attitudes toward different types of solutions. A brainstorming session at the Public Open House provided a wealth of ideas for potential solutions. Those potential solutions were processed through a set of solution filters to identify what could be implemented in an effective and affordable manner.

Resident Survey Responses

This section contains the portion of the resident survey that addresses residents' attitudes toward different solutions to the cut through traffic problem. The complete survey results can be seen in the Appendix.

3. How much delay in your daily travel times into and out of your neighborhood are you willing to accept to lower the amount of cut through traffic in your neighborhood?

21% No delay
33% 1-2 minutes
23% 3-5 minutes
17% More than 5 minutes
7% Did not answer

4. Do you support the use of traffic calming* techniques to alleviate cut through traffic?

69% Yes
27% No
3% Did not answer

* Definition of traffic calming from the Institute of Traffic Engineers (ITE): *Traffic calming involves changes in street alignment, installation of barriers, and other physical measures to reduce traffic speeds and/or cut-through volumes, in the interest of street safety, livability, and other public purposes.*

5. Do you support the improvement of current primary roadways such as Haines Road and Arlington Avenue to attract traffic away from the neighborhood?

81% Yes
17% No

2% Did not answer

6. Do you support the development of a new primary roadway linking Central Entrance/Miller Trunk Highway and Arrowhead Road to reduce neighborhood cut through traffic?

77% Yes

19% No

4% Did not answer

The survey results provided valuable information on resident attitudes on potential solutions. Residents weighed in on a number of solution related issues such as travel delay, traffic calming, roadway improvements and new roadways. In question 3, 73% of respondents said they are willing to accept some delay in their daily travel times to lower the amount of cut through traffic. Responses to question 4 showed that respondents support traffic calming. In questions 5 and 6, respondents showed a high level of support for improving current roadways and developing a new roadway.

Public Open House/Solution Identification – February 16, 2006

At this meeting, MIC staff presented traffic data collected to date as well as public input. The traffic data included average daily traffic, cut through traffic counts, timing runs and trip generation. The public input was a summary of the Issues Identification Meeting from September 8, 2005 and the results of the resident survey we mailed out in January 2006.

After the presentation, meeting participants were asked to brainstorm solutions to address the cut through traffic problem and write or draw them on the aerial photos that were provided. Most comments were geographic in nature, associated with a specific location and some comments were more general. The geographic comments from the maps were difficult to count given some were just lines drawn on the map. The following text is a summary of the solutions suggested by meeting participants.

New Primary Road Connections –

- Build new primary road on higher ground
- Extend Joshua Street to Arrowhead Road
- Extend Joshua Street to Arrowhead Road as a parkway
- Make new Joshua Avenue extension a four lane road
- Rebuild Maple Grove Road from Miller Trunk Highway and extend to Arlington Avenue
- Extend Sundby Road north to Arrowhead Road
- The extension of Joshua Avenue has been on the books since 1922
- Extend Maple Grove Road to Arlington Avenue
- Extend Cottonwood Avenue to Arrowhead Road
- Use alignment west of Joshua Street alignment for new road
- Build Joshua Street to Arrowhead Road with no access to neighborhood

Traffic Calming

- Install raised speed tables on Eklund Avenue

- Install speed tables on Stanford and Maple Grove
- Traffic circles and center islands should be put on both Swan Lake Road and Eklund Avenue.
- Install speed bumps
- Install traffic circles and center islands at Swan Lake and Eklund
- Install a roundabout at Swan Lake and Maple Grove
- Plant trees along Eklund to reduce sight lines
- Narrow driving lanes on Eklund and Swan Lake to slow traffic and provide more room for pedestrians and bicyclists
- Install speed tables on Swan Lake and Stanford
- Paint edgelines and centerlines on Eklund

Local Road Closures

- Close Eklund Avenue to through traffic
- Close Swan Lake Road near Hugo Street
- Close Swan Lake Road at Arrowhead Road and extend Swan Lake to connect with Joshua Street extension south of Arrowhead Road
- Close West Morgan Street at intersection with new Joshua Street extension
- Close Maple Grove Road at Swan Lake Road

Conversion of Two-Way Streets to One Way

- Convert Eklund to one-way for one block
- Convert Eklund to one-way from Maple Grove to Swan Lake
- Convert Eklund to a southbound one-way

Install Traffic Signal or Traffic Control Sign

- Install traffic signals at Swan Lake Road and Arrowhead Road intersection
- Install traffic signals at Swan Lake and Arrowhead intersection that has a very long signal phase, making left turns for westbound Arrowhead traffic inconvenient
- Install a sign that does not allow left turn from westbound Arrowhead to southbound Swan Lake Road
- Install stop signs at the following intersections:
 - Swan Lake & Marble
 - Swan Lake & Morgan
 - Morgan & Ponderosa
 - Morgan & Yosemite
 - Yosemite & Page
 - Eklund & Dale
 - Eklund & Farrell
 - Eklund & Page
 - Eklund & Ideal
 - Maple Grove & Eklund
 - Swan Lake & Terrace
 - Swan Lake & Ideal

Improve Current Primary Roadways

- Widen Haines Road
- Widen Arlington Avenue
- Divert traffic to roads south of the mall
- Make Arlington four lanes
- Install right turn lane on Haines for eastbound Arrowhead traffic

Pedestrian Improvements

- Improve pedestrian safety along Central Entrance
- Preserve areas for dog walking and ski trails
- Build sidewalks along Eklund Avenue to narrow road
- Improve crosswalk on Arlington Avenue at Myrtle Street for Pennel Park residents
- Stripe Swan Lake and Eklund to make more room for pedestrians and bicyclists
- Preserve undeveloped area in center of study area

General Improvements

- Improve lighting on Maple Grove
- Improve police enforcement of existing traffic laws

Meeting Summary

MIC staff compiled all the comments from the meeting and met with the Oversight Committee to analyze potential solutions. Similar comments were grouped and solutions were categorized into new roadways, traffic calming and improvement to current roadways. All potential solutions were compared to attitudes derived from the resident survey and were analyzed with the solution filters.



At the second public meeting, MIC staff presented traffic data and public input. Meeting participants were then asked to brainstorm solutions to address the cut-through traffic problem.

Solution Filters

The potential solutions that were developed at the February 16, 2006 Public Open House were filtered through the following set of criteria to determine the feasibility of each potential solution:

Effectiveness at Solving the Problem: All solution options were analyzed to identify how effective it would be in lowering the cut through traffic.

Not Pushing the Problem Elsewhere: It is important to look at the study area as a whole to make sure proposed solutions did not push cut through traffic to other roads in the study area.

Manual on Uniform Traffic Control Devices (MUTCD): This manual describes how signage may be used. The regulations are designed to bring consistency to roadway signage so the motorists will be able to easily understand the signage.

Traffic Signal Warrants: The Federal Highway Administration developed warrants that define minimum conditions under which traffic signal installations may be justified. Conditions that traffic warrants examine include traffic volume, pedestrian volume, accidents, peak hour delay and peak hour volumes.

Financial Considerations: Potential solutions should be able to be implemented. Does the City of Duluth have the funding necessary to implement the solution in a timely manner? Also, is there a state or federal source that would provide funding for a proposed solution?

State Aid Roadway Rules: All roads surrounding the study area are on the State Aid System. These include Arlington Avenue, Arrowhead Road, and Haines Road, which are County State Aid Highways (CSAH) and Central Entrance/Miller Trunk Highway, which are Trunk Highways. These roads all have regulations describing allowable improvements.

Environmental Concerns: A number of factors were analyzed such as streams and wetlands to see how the potential solutions would impact them.

Emergency Vehicle Access Concerns: All of the proposed solutions were discussed with the City of Duluth Fire Department to find out their concerns. They provided design concerns and a review of proposed solutions.

Transit Route Concerns: A number of study area residents depend upon transit for their mobility options. Currently, DTA Route 14 – West 4th Blvd. Eklund – Mall coming from downtown enters the study area westbound on Central Entrance turning north on Basswood Avenue to Swan Lake Road, turning south on Eklund Avenue, turning west on Maple Grove Road and finally south on Cottonwood Avenue to Miller Hill Mall. On its return trip to downtown, the route follows the same streets. The proposed solutions were examined to identify their impact on transit routes.

School Bus Routing: The proposed solutions were sent to school district transportation officials for their review.

Solution Identification

This section describes the solution options that were examined in more detail. Three categories of solutions were examined – new roadways, traffic calming and improvements to current roadways. The results from this further analysis were compiled for review by the residents at the June 20, 2006 Public Meeting.

New Roadway Options

From the suggested new roadway alignments three options were identified – Sundby Road Extended, Trinity Road Extended and Maple Grove Road Extended to Arlington. The MIC contracted with URS Corporation to model these three options to identify which alignment would be most effective at addressing cut through traffic. The following section contains excerpts from a technical memorandum that was written by URS staff. It describes the modeling methodology and results.

Introduction

The purpose of this technical memorandum is to present the 2030 Duluth Heights traffic forecasts with the existing network and 2006 and 2030 Duluth Heights traffic forecasts for three alternatives: A) Extension of Trinity Road from TH 53 to Arrowhead Road, B) New road to continue between Sundby Road's north-south alignment to Arrowhead Road and C) Extension of Maple Grove Road to Arlington Avenue.

Methodology

The Duluth-Superior Metropolitan Travel Demand Model was utilized to test two transportation improvement alternatives designed to divert existing cut-through traffic traversing the Duluth Heights Neighborhood. The first step in this process involved refining the road network to include those roads in the Duluth Heights area that have been shown to attract through-trips. Travel time runs provided by the MIC were used to adjust the model network to replicate time savings associated with the cut-through routes.

Model Results

The model results are shown in Maps 10 and 11 below. Map 10 lists the current (i.e. most recent) Average Daily Traffic volumes and the base year model volumes for the three alternatives. Map 11 lists the projected traffic volumes for the year 2030. Alternative A significantly reduces the amount of cut through traffic via the Swan Lake Rd/Eklund Ave route. Alternative B does have some impact for reducing cut through traffic, although not to the degree of Alternative A. Alternative C is attracting trips from Central Entrance into the neighborhood, which would potentially create another undesirable cut through problem.

Option A was chosen as the best option for new roadways. This option is the most effective at attracting trips away from the neighborhood without creating another route that puts more traffic on neighborhood streets. The lack of a north-south arterial is what

draws much of the traffic through the neighborhood. Spacing for arterials should be about one mile. Currently it is two miles from Arlington Avenue to Haines Road.

The intersection of Trinity Road with Central Entrance and Miller Trunk Highway would be the best connection for a new roadway. This intersection has the capacity necessary to handle the projected amount of trips from the new roadway

Traffic Calming Options

The following traffic calming techniques are utilized across the U.S. to make neighborhoods more livable. Drivers tend to find the least congested or easiest path to their destination. At times this can mean taking a shortcut or a less congested road, which may not be designed to handle the through-trips. These traffic calming techniques are designed to slow or reduce traffic in residential areas.

Definition

Traffic calming involves changes in street alignment, installation of barriers, and other physical measures to reduce traffic speeds and/or cut-through volumes, in the interest of street safety, livability, and other public purposes.

Listed below are traffic calming techniques that are divided into those that address speed, those that address volume and passive techniques. A short definition is also included.

Techniques that Address Speed

- Speed Tables: raised tables in road surface extending across the street usually less than five inches in height.
- Raised Intersections: flat raised areas covering entire intersections, often with brick or other textured materials on the flat section.
- Traffic Circles: raised landscaped island located at the intersection of two streets.
- Center Islands: islands located along the centerline of a street that narrow the street at that location.
- Neck Downs: curb extensions at intersections that reduce roadway width curb-to-curb.
- Chokers: mid-block curb extensions that reduce roadway width curb-to-curb.
- Protected Parking: landscaped extension projecting out from the curb creating protected parking bays.
- Techniques that Address Volume
- Half Closure: barriers that block travel in one direction for a short distance on otherwise two-way streets.
- Full Closure: complete barrier of a street leaving the block open to local traffic at one end, but physically closing the other end.
- Chicane: a form of curb extension, which alternates from one side of the street to the other, forming S-shaped curves.

- Diagonal Diverter: a barrier placed diagonally across an intersection to disconnect streets.
- Truncated Diagonal Diverter: a barrier placed diagonally across that does not fully close the intersection. Restricts through traffic by forcing traffic to turn.

Passive Techniques

- Pavement Edge Striping: lines painted along roadway have the effect of making the road seem narrow and give the driver the perception that they have a smaller area to operate their vehicle, which slows them down.
- Landscaping/Tree Planting: Adding trees to the edge of the road gives the road a feeling of narrowness and has the effect of slowing traffic.

Traffic Calming Summary

The Appendix contains more detailed information on each traffic calming technique.

MIC staff researched many traffic calming techniques from current and past projects and also examined case study literature on the effectiveness of the different techniques. Given the nature of the road system and the cut through traffic problem in the study area, some of the techniques would not be as effective at addressing the problem. Experiences in other communities and neighborhoods focused on half and full closures as the most effective techniques at addressing cut through traffic problems on the types of roads in the study area.

The process of choosing traffic calming techniques entailed examining the license plate survey and resident survey information to identify the worst cut through routes and how much delay in travel times residents are willing to accept. The study area roads were considered as a system and traffic calming that was proposed should divert traffic back to the arterial roads by making the primary cut through route inconvenient.

Improvements to Existing Roadways

Potential options include expanding the capacity of roadways and intersections. Information from other studies as well as projects that are currently programmed were examined. Right of way issues are problematic at some intersections because of the current land uses and access issues. The improvements that were identified would be dependent upon being able to acquire right of way without removing businesses.

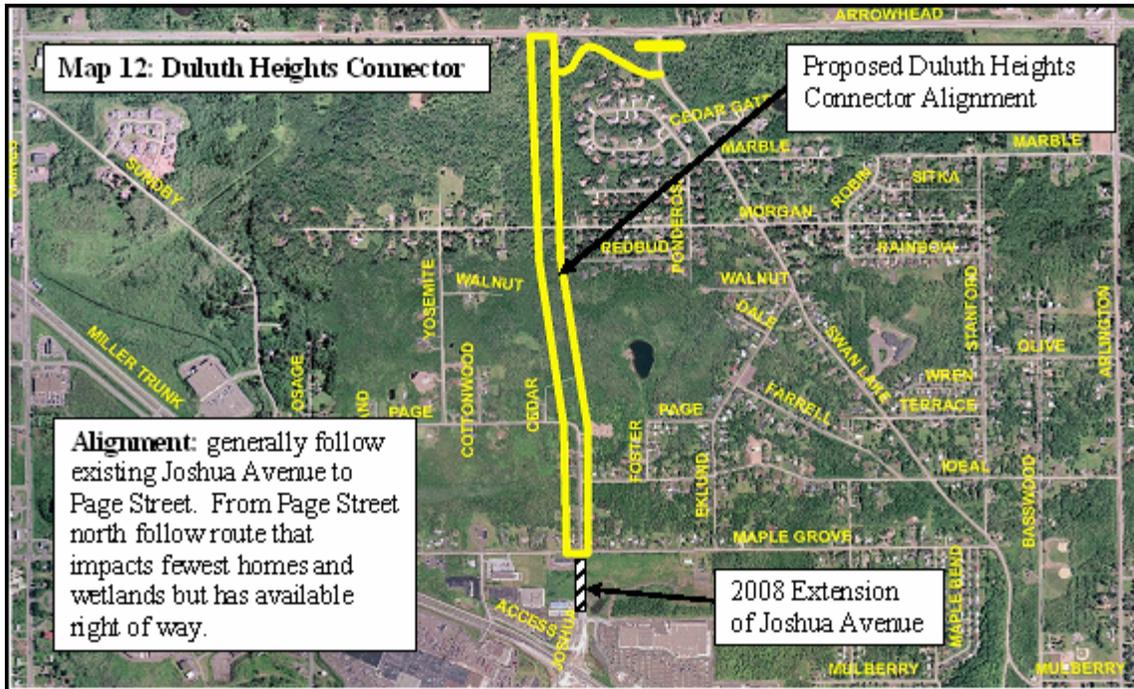
Proposed Solutions

Prior to the June 20, 2006 Public Meeting, MIC staff, working in conjunction with the Oversight Committee identified proposed solutions. The central piece of these proposed solutions is the development of a new connector roadway from Maple Grove Road to Arrowhead Road following the existing Joshua Avenue alignment. A temporary system of traffic calming was also proposed to provide relief to the neighborhood in the short term until the new connector can be built. Minor improvements to the current system were also proposed. The following section

is a description of the proposed solutions that were made available to the residents prior to the public meeting.

New Primary Roadway

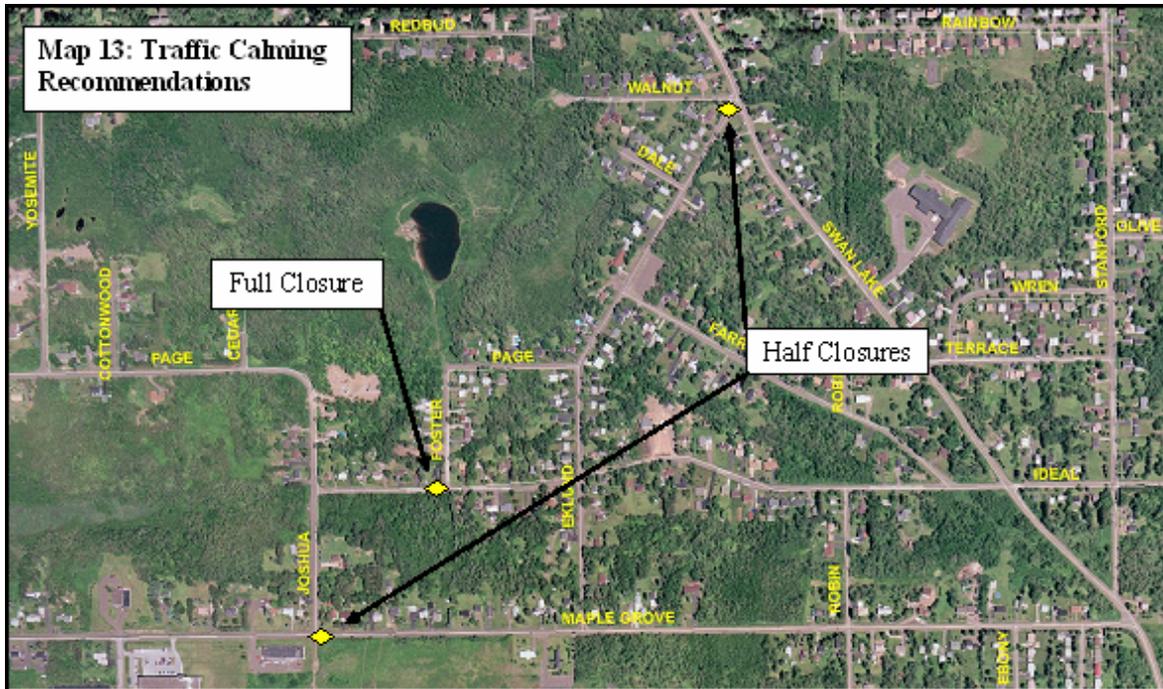
The long-term solution to solving cut through traffic is to build the Duluth Heights Connector, a north-south connector from the intersection of Joshua Avenue and Maple Grove Road to Arrowhead Road. Swan Lake Road should be closed at its current connection with Arrowhead Road and extended to connect with the new roadway. The intersection of Arrowhead Road and the Duluth Heights Connector should include right and left turn lanes. This recommended solution should be implemented between 2011 and 2016.



Traffic Calming

Short-term temporary traffic calming measures are necessary to address cut through traffic until the long-term solution is implemented. When the Duluth Heights Connector is built, all temporary traffic calming devices will be removed.

Install temporary half closures at Maple Grove Road east of Joshua Avenue and Eklund Avenue west of Swan Lake Road and install temporary full closure on Ideal Street west of Foster Avenue. (Map 13, below). This will have the greatest impact on cut through traffic and still allow emergency vehicles access to the neighborhood. Install the Eklund Avenue half closure in the spring of 2007 and the Ideal Street full closure and Maple Grove Road half closure in the fall of 2008.



Improvements to Current Roadways

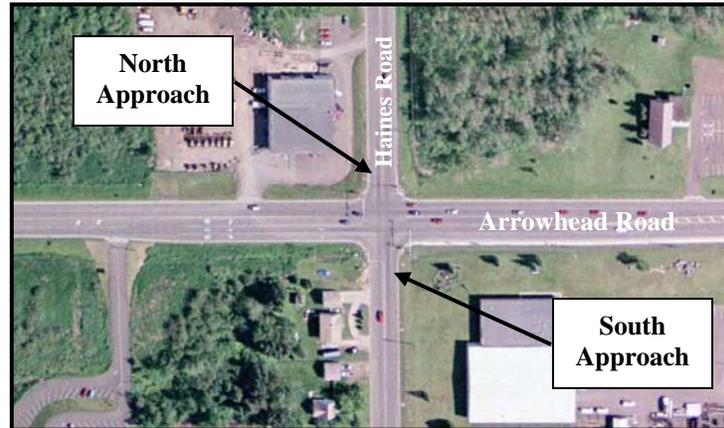
Arlington Avenue/Central Entrance Intersection (Long-term)

Add a right turn lane on the north approach for Arlington Avenue traffic. This recommendation is long-term due to difficult right-of-way issues.



Haines Road/Arrowhead Road Intersection (Short-term)

- Add a right turn lane on the north approach. The right turn lane should include approximately 150 feet of storage space.
- Add a right turn lane on the south approach. The right turn lane should include approximately 150 feet of storage space.



Miller Trunk Highway/Haines Road Intersection (Short-term)

Reconstruct the north approach to include one left turn lane, two through lanes, and one right turn lane. The length of the second through lane should be at least 350 feet.



These traffic calming recommendations were reviewed by the City of Duluth Fire Department, the Duluth Transit Authority and Duluth Public Schools transportation officials. All three groups were comfortable that service to the neighborhood would remain at current levels.

All of these traffic calming devices will be measured for their effectiveness. If the implementation of these traffic calming measures results in significant increases in cut

through traffic elsewhere, other traffic mitigation measures will be implemented. The intent is not to push the cut through traffic to other local neighborhood streets. These traffic calming measures should result in traffic using the primary roadway system.

Public Meeting/Solution Review – June 20, 2006

The public meeting was announced by mailing to all study area residents and instructions were given to view the proposed solutions prior to the meeting. Residents had the option of calling, writing or emailing to request that a hard copy of the proposed solution be mailed to them or they could look at them on the MIC page of the ARDC website.

The meeting began with the introduction of staff working on the study and a presentation of the proposed solutions. Public comment and questions were taken for the last 90 minutes of the meeting. The following summarizes the questions and comments from the meeting attendees by issues of concern. Some residents that commented had multiple questions or comments. Text in italics shows the responses from staff to the meeting participants.

Traffic Calming

- Will traffic calming be long-term, and is the new connector a “done deal?”
Traffic calming devices will be temporary until the new connector is developed. The recommendations of this plan are advisory to the City of Duluth. The City will decide whether to implement proposed solutions or not.
- Why weren't other traffic calming devices chosen, such as speed bumps?
The proposed traffic calming devices were chosen because they are more effective at addressing traffic volumes than speed bumps or other devices designed for traffic speeds.
- If traffic calming doesn't solve the problem, will the devices be removed?
The traffic calming devices will be measured for their effectiveness. They will be removed if they prove ineffective.
- We heard from engineers that traffic will go to any lengths to avoid traveling on a main arterial, while the opinion of those working on this project is that they will not, after traffic calming has been implemented. Clarify.
The inconvenience of the cut through route with the traffic calming should make the arterial route much faster and more convenient.

Proposed New Connector Road

- Where will the new connector be located?
An exact alignment hasn't been chosen. The proposed solution recommends that the existing Joshua Street alignment be extended to the north.
- What are the new parameters (alignment) for the connector from Maple Grove to Arrowhead?
The alignment will generally follow the existing Joshua Street but an exact alignment will be determined in the alignment study.

- Will there be an intersection or overpass at Morgan Street? Likes the plan for the road closures.
The alignment study will determine local road connections to the proposed connector.
- Will there be stoplights for the left turn to Arrowhead Road from the new connector?
The new connector would probably need a stoplight at Arrowhead Road given the amount of traffic projected for the new connector and what currently exists on Arrowhead.
- Will housing develop along the new connector?
The development of the City of Duluth's Comprehensive Plan would address that issue.
- Have the plans been put in motion?
Nothing has been started regarding a new connector.
- Very few people live on the other side of Arrowhead; is the proposed connector really necessary?
The traffic that will be using the new connector is originating from eastern Duluth neighborhoods as well as nearby townships.
- How does the City Council decide on the steps for the project and for notification?
The City Council would have to approve the project by resolution. The next step in the process is to conduct an alignment study, which would address right of way issues, roadway alignment, local road connections, wetlands impacts and preliminary design.
- Is there a way to accelerate the process for putting in the new connector?
It is difficult to accelerate the process for new roads given the amount of right of way, design, and environmental review that needs to be done. Funding is also a difficult issue.
- Will Redbud still be a dead end?
The alignment study proposed by the City will determine local road connections.

Surrounding Roadways

- When traveling West on Arrowhead to Swan Lake Rd, will there be no left turn?
Banning left turns from westbound Arrowhead Road to Swan Lake Road was tried in the past and resulted in many safety concerns.
- How will people going north from Swan Lake Rd get to their homes?
- Concern expressed that these measures will create chaos on Swan Lake Rd.
Left turns from northbound Swan Lake to Eklund will be allowed.
- What is the reason for not discontinuing Swan Lake Rd to Arrowhead?
Closing Swan Lake near Arrowhead would inconvenience far more people than the proposed traffic calming to achieve similar results.
- If there is no right turn on Maple Grove Rd, where will the traffic go?
Once traffic finds out that cutting through the neighborhood is inconvenient, it should move to the more convenient arterials such as Arlington and Haines.
- Will there be a turn lane going south on Arlington too, or just north?
The turn lane will be on the north approach at Arlington and Central Entrance.

- Why are you opening the lower part of Joshua? How will it help?
Connecting Joshua Avenue to Maple Grove Road is part of a large project to improve traffic flow on Miller Trunk Highway. The project is designed to provide a loop system so local traffic moving between the different retail areas does not have to use the highway for short trips. This should ease congestion along the highway.

Neighborhood Impacts

- Concerned that after going to the mall, driving back will require taking a different and longer route, due to the left turn on Cottonwood; seen as a big problem.
- Concerned that traffic traveling from Swan Lake Rd to Eklund Ave will continue on and turn onto Terrace.
- Coming home from work and going to the mall will require taking different and probably slightly longer routes, but is not bothered by adding an extra 30 or so seconds of driving time. Likes the idea for adding the connector.
- How many other people will be inconvenienced by the project?
- Concerned that the left turn closure will cause drivers to continue on to Haines Rd.
- It's unfair to have to take Basswood back home from the mall, as it will require a much greater distance to travel.
- There is concern that the Maple Grove half closure will cut off the right turn to the new Shepherd of the Hills Lutheran Church and make access more difficult.
The traffic calming is an inconvenience to area residents but is a tradeoff to lower the amount of cut through traffic in the neighborhood.

Other Comments

- Appreciates the increased police enforcement in the area.
- Concerned that since there are a large number of children playing around Morgan St., with a lot of parked cars along it and little visibility, the project will create a dangerous situation for those children with an increase in traffic.
- Notification looks like junk mail and as a result, believes that many people threw their notifications away.
- There is a lack of communication and discrepancy between MnDOT and the City regarding getting traffic off the road. Doesn't like the road closures.
- In the past 5 years, City administration hasn't tried to add an arterial at the current location. Doesn't like the road closures, but likes the idea of adding the connector.
- Suggested using a method practiced in Arizona, using cameras to photograph speeding vehicles' license plates and sending them fines in the mail, saving the state a great deal of money.
- Stated that in the 1990's, the idea for adding the connector was voted down, and that according to the Bill of Rights, government officials are the "employees" of the people, and must act according to the wishes of the voters.
- An east-end entrance should have been built before the development of the mall and any other businesses came into the area.

- Believes half closures are good. Concerned that cut through traffic will inconvenience other neighbors. Suggested creating an island in addition to traffic calming that would further deter cut through traffic.
- Believes the connector is the ultimate solution and thinks discussions with Oberstar would help.
- A half closure on Page St. didn't work when it was put in place 12 years ago.
- Concerns about traffic increases near the Duluth Heights Community Center with many children playing in the area.
- There is much documentation and a history of solutions for this issue that have not been implemented.
- The community didn't support the connector in 1988.
- Many of these same issues were presented in the Stone Ridge court case.
- Cottonwood Ave was not an option for the connector; look at why Joshua – Maple Grove is.
- There were many viable recommendations given in 1996.

Public Meeting Summary

After the meeting, we heard from a number of people who generally supported the proposed solutions. MIC staff and the Oversight Committee discussed the input received at the meeting. The consensus was that even though there was some disagreement with some of the proposed solutions, there was also general support to build the new connector road and try some techniques of traffic calming for short-term relief. Emphasis on monitoring and measuring the effectiveness of each traffic calming device was stressed.



At the final public meeting, proposed solutions to the cut-through traffic problem were presented. Public comment and questions were taken for the last 90 minutes.

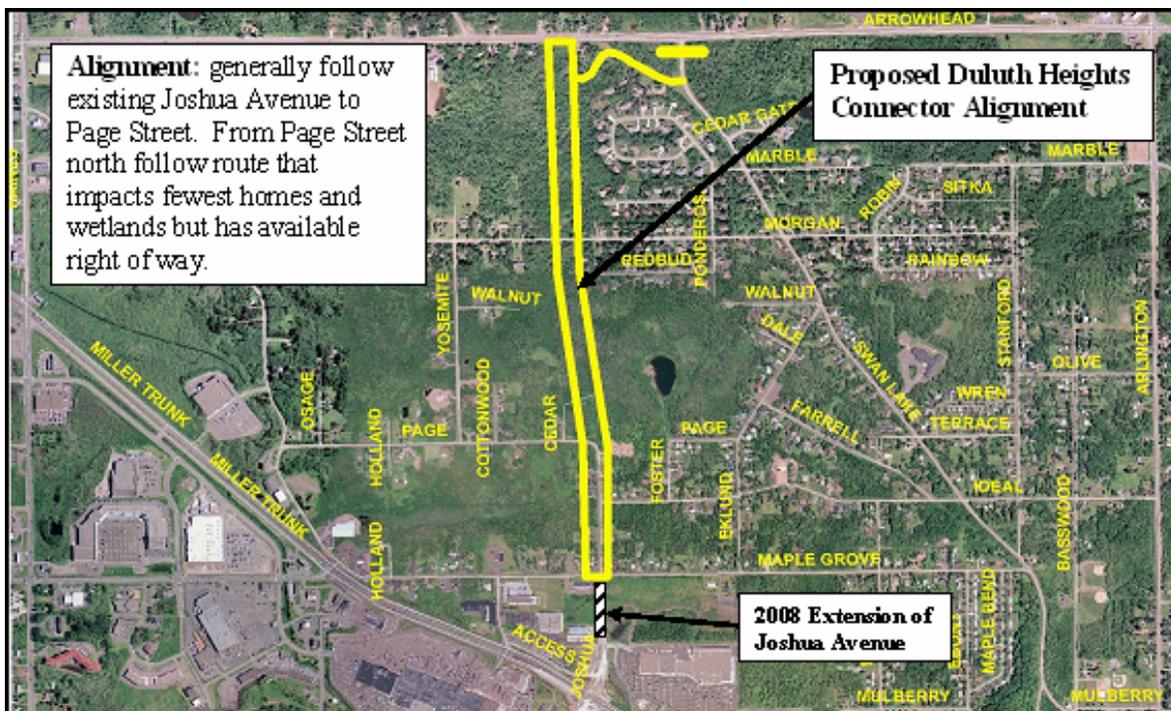
RECOMMENDATIONS & IMPLEMENTATION SCHEDULE

All of the solutions identified in the Public Open House held at the Duluth Heights Community Club on February 16, 2006 were analyzed and categorized. They were broken into three categories: **1) new primary roadways, 2) traffic calming, and 3) improvements to existing primary roadways.** All of the solution options were analyzed to identify how effective they would be at lowering the amount of cut through traffic. After analyzing the options some were combined in order that the entire study area was addressed as one system. Other considerations were taken into account such as the street improvement of Maple Grove Road from Joshua Ave to Swan Lake Road in 2006, and the 2008 Miller Trunk Improvement Project, which will connect Miller Trunk Highway to Maple Grove Road along Joshua Avenue. These recommendations include temporary solutions and longer term solutions. Two time periods were examined when compiling these recommendations. The short-term recommendations are slated for 0-5 years and the long-term are 5-15 years out.

Public comment from the June 20, 2006 Public Meeting was considered in compiling the final recommendations. These recommendations are designed as a system to effectively address the cut through traffic in the study area. The primary recommendation is to build a new roadway connecting Arrowhead Road to Miller Trunk Highway. Temporary traffic calming measures are also recommended to provide relief from cut through traffic until the new roadway can be built. Minor changes to existing primary roadways should also help. This section describes these recommendations in greater detail.

New Primary Roadway

Recommendation: The long-term solution to solving cut through traffic is to build the Duluth Heights Connector, a north-south connector from the intersection of Joshua Avenue



and Maple Grove Road to Arrowhead Road. Swan Lake Road should be closed at its current connection with Arrowhead Road and extended to connect with the new roadway. The intersection of Arrowhead Road and the Duluth Heights Connector should include right and left turn lanes. This recommended solution should be implemented between 2011 and 2016.

This roadway alignment was chosen because:

- It fills the spacing needs for primary roadways. They should be spaced one mile apart. This alignment is one mile from Arlington Avenue and one mile from Haines Road.
- The southerly intersection connection with Trinity Road and Miller Trunk Highway provides the necessary intersection capacity to handle the anticipated amount of traffic from the new roadway.

Connection at Arrowhead Road: Arrowhead Road will need additional turn lanes with the connection of the Duluth Heights Connector. The road will need to look similar to the current connection with Swan Lake Road.



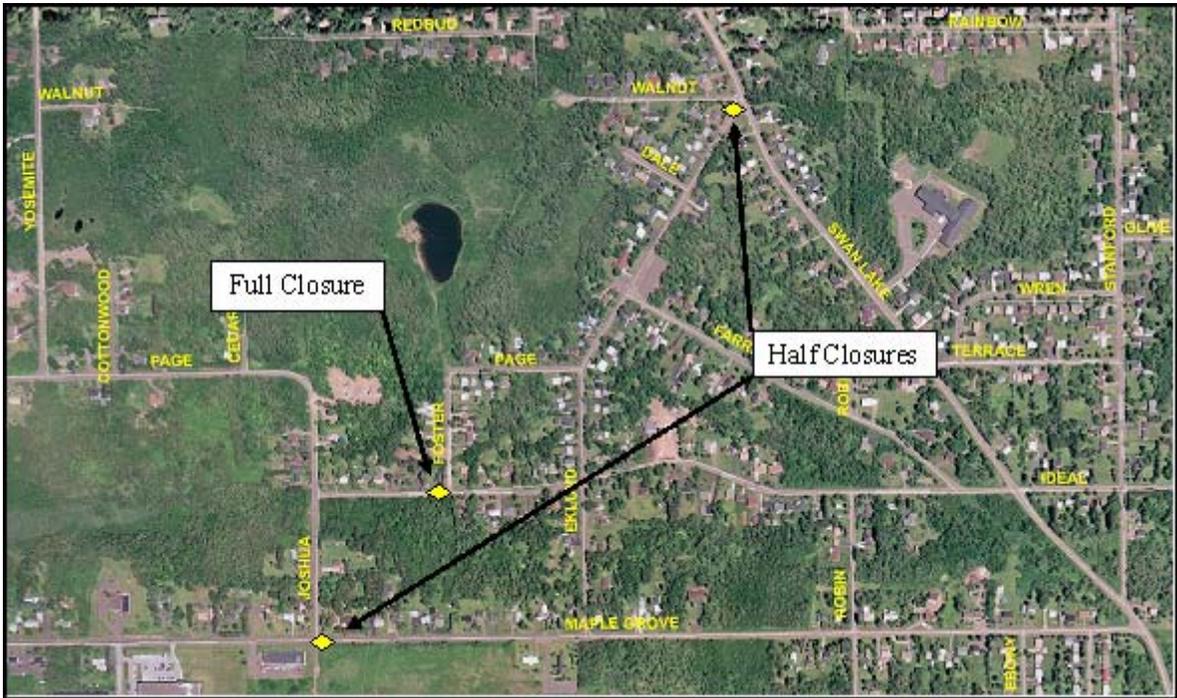
Traffic Calming

Short-term temporary traffic calming measures are necessary to address cut through traffic until the long-term solution is implemented. When the Duluth Heights Connector is built, all temporary traffic calming devices will be removed.

Recommendation: Install temporary half closures at Maple Grove Road east of Joshua Avenue and Eklund Avenue west of Swan Lake Road (see figure, below). Install a temporary full closure on Ideal Street west of Foster Avenue.

This option was chosen because it will have the greatest impact on cut through traffic and still allow emergency vehicles access to the neighborhood. Install the Eklund Avenue half closure in the spring of 2007 and the Ideal Street full closure and Maple Grove Road half closure in the fall of 2008.

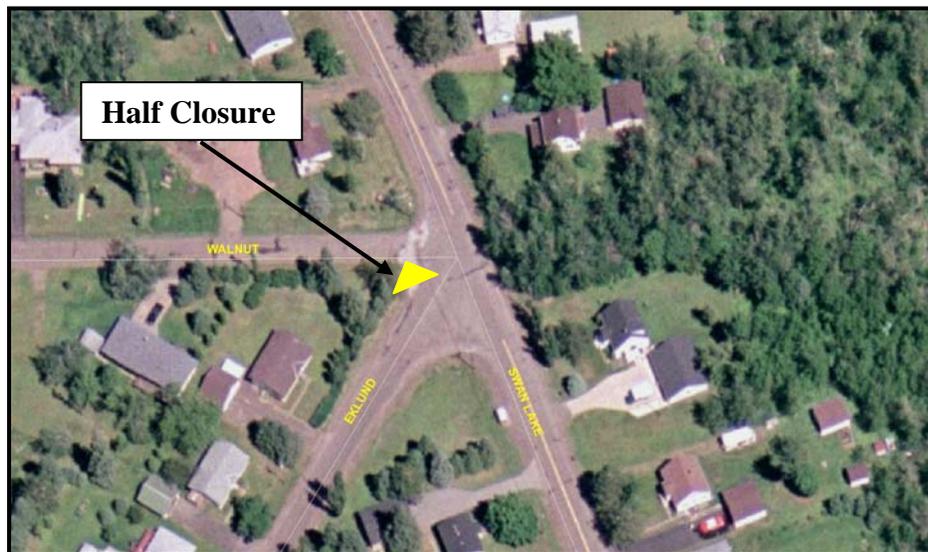
These traffic calming recommendations were reviewed by the City of Duluth Fire Department, the Duluth Transit Authority and Duluth Public Schools transportation officials. All three groups were comfortable that service to the neighborhood would remain at current levels.



All of these traffic calming devices will be measured for their effectiveness. If the implementation of these traffic calming measures results in significant increases in cut through traffic elsewhere, other traffic mitigation measures will be implemented. The intent is not to push the cut through traffic to other local neighborhood streets. These traffic calming measures should result in traffic using the primary roadway system.

Eklund Avenue Half Closure

Install a half closure (Spring 2007) on the north end of Eklund Avenue preventing a right turn from Swan Lake Road. This half closure would prevent southbound cut through traffic on Eklund Avenue.



Maple Grove Road Half Closure

When the Miller Trunk Improvement Project connects Joshua Street to Maple Grove Road, install a half closure (Fall 2008) on Maple Grove Road near Joshua Avenue preventing traffic from proceeding eastbound on Maple Grove Road.



Ideal Street Full Closure

Close Ideal Street (Fall 2008) on the west side of the intersection with Foster Street. This closure is necessary to prevent traffic from creating a new cut through route.



Measuring the Effectiveness of Traffic Calming System

All of the proposed traffic calming methods are temporary. They will be installed and given 30-60 days to provide drivers a chance to change their driving patterns. After this initial period, the effectiveness of each traffic calming method will be measured using some of methods described below:

Traffic Counters (24 and 48 hour counts)

These will be placed in areas where counts were taken in the summer of 2005. The 2005 counts will be compared to the new counts to identify differences.

Resident Surveys

A survey will be mailed to residents living along roadways with traffic calming devices and within a specific distance on other roads in the vicinity of the traffic calming devices. Residents will be asked their opinions on the effectiveness of the traffic calming devices and how traffic levels compare to pre-traffic calming.

Turning Movement Counts

Using specialized hardware (turning movement counters), traffic at specific intersections will be tracked to determine the direction traffic is moving.

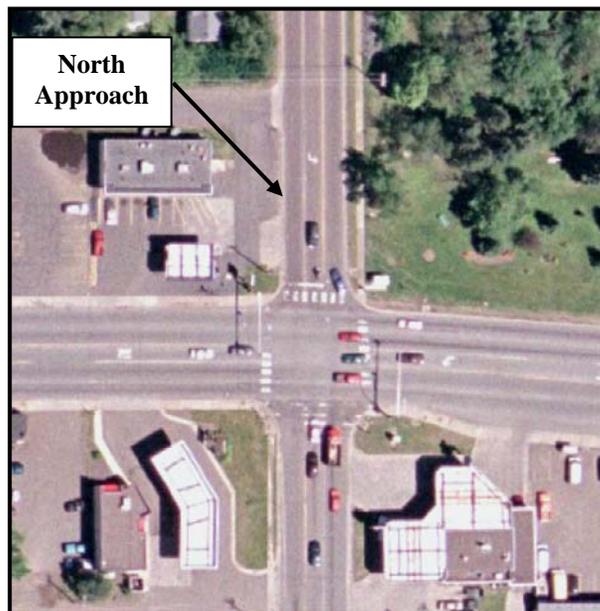
License Plate Cut Through Counts

Use the same methodology as was used in September 2005 to track vehicles entering the study area and find out the amount of traffic that is passing through the area.

Improvements to Current Roadways

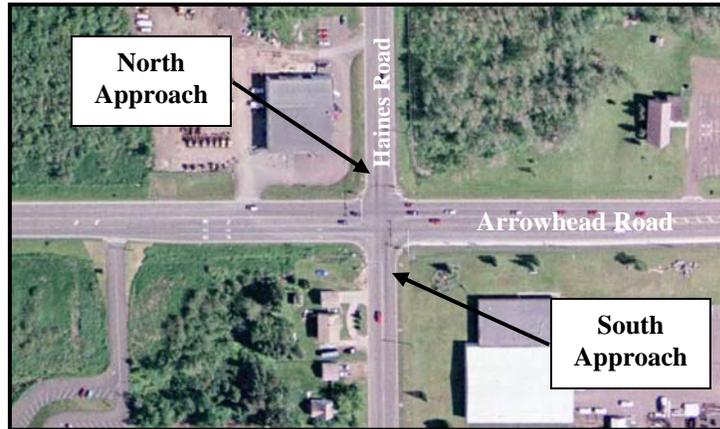
Arlington Avenue/Central Entrance Intersection (Long-term)

Add a right turn lane on the north approach for Arlington Avenue traffic. This recommendation is long-term due to difficult right-of-way issues.



Haines Road/Arrowhead Road Intersection (Short-term):

- Add a right turn lane on the north approach. The right turn lane should include approximately 150 feet of storage space.
- Add a right turn lane on the south approach. The right turn lane should include approximately 150 feet of storage space.



Miller Trunk Highway/Haines Road Intersection (Short-term)

Reconstruct the north approach to include one left turn lane, two through lanes, and one right turn lane. The length of the second through lane should be at least 350 feet.



These traffic calming recommendations were reviewed by the City of Duluth Fire Department, the Duluth Transit Authority and Duluth Public Schools transportation officials. All three groups were comfortable that service to the neighborhood would remain at current levels.

All of these traffic calming devices will be measured for their effectiveness. If the implementation of these traffic calming measures results in significant increases in cut through traffic elsewhere, other traffic mitigation measures will be implemented. The intent

is not to push the cut through traffic to other local neighborhood streets. These traffic calming measures should result in traffic using the primary roadway system.

Implementation Activities and Schedule

New Primary Roadway

The City of Duluth in conjunction with St. Louis County should apply for federal funding for Fiscal Year 2011 through the Transportation Improvement Program administered by the MIC. This application is due in late December 2006. The City of Duluth should be the project lead with St. Louis County participating as a project partner.

The next step in development of this new roadway is for the City of Duluth to conduct an alignment study. This study would identify a roadway alignment as well as the right of way that needs to be obtained. Other details that the study would address include what type of road it would be and what local streets would be connected. An access management strategy also needs to be developed.

Traffic Calming

The half closure at Swan Lake and Eklund Avenue will be installed in the spring of 2007. This traffic calming device will be temporary and its effectiveness will be measured after the public has had a short period to adjust their driving habits.

The half closure at Maple Grove Road east of Joshua Avenue will be installed in the fall of 2008 after construction of the Joshua Avenue connection from Miller Trunk Highway to Maple Grove Road is completed. This short connection is an element of the Miller Trunk Highway Improvement Project and is scheduled to be constructed during the summer of 2008. This traffic calming device will be temporary and its effectiveness will be measured after the public has had a short period to adjust their driving habits.

The full closure of Ideal Street west of Foster Avenue will also be installed in the fall of 2008. This traffic calming device will also follow the connection of Joshua Avenue to Maple Grove Road from Miller Trunk Highway.

All three of the above traffic calming devices will be removed when the new Duluth Heights Connector is constructed.

Improvements to Existing Roadways

The right turn lane on the north approach of Arlington Avenue at Central Entrance will be installed when right of way can be acquired. This should be accomplished without St. Louis County having to purchase the gas station/convenience store on this corner. This is a longer term recommendation and will be implemented when the right of way issue is resolved.

The right turn lanes on the north and south approaches of Haines Road at Arrowhead Road will be installed in conjunction with a resurfacing project that St. Louis County has scheduled for Fiscal Year 2009. This project will take place in either late 2008 or 2009.

The addition of a through lane on the north approach of Haines Road at Miller Trunk Highway is a short term project that has not been programmed yet. This intersection change was recommended from the traffic modeling analysis conducted for the Hermantown Section 13 Circulation Analysis Report from September 2005.

APPENDIX

Resident Survey

A survey was mailed to study area residents in January 2006 to get an idea on how residents viewed the current cut through traffic issues and how receptive they were to certain types of solutions. We mailed 875 surveys and received 287 completed surveys for a 33% return rate. The mail list was obtained from the City of Duluth Assessors office.

3. Do you think cut through traffic is a problem in your neighborhood?
 - 12% Not a problem
 - 15% Minor problem
 - 34% Moderate problem
 - 38% Serious problem
 - 1% Did not answer

4. What are your neighborhood traffic safety concerns? Rank in order of greatest concern. (14% or 44 respondents did not provide a ranking with their answer to this question. 243 survey responses were used to determine the following results).

Rank #1

 - 23% #1 - Too much vehicle traffic
 - 44% #1 - Traffic driving too fast
 - 25% #1 - Pedestrian safety
 - 5% #1 - Other
 - 2% No answer

5. How much delay in your daily travel times into and out of your neighborhood are you willing to accept to lower the amount of cut through traffic in your neighborhood?
 - 21% No delay
 - 33% 1-2 minutes
 - 23% 3-5 minutes
 - 17% More than 5 minutes
 - 7% Did not answer

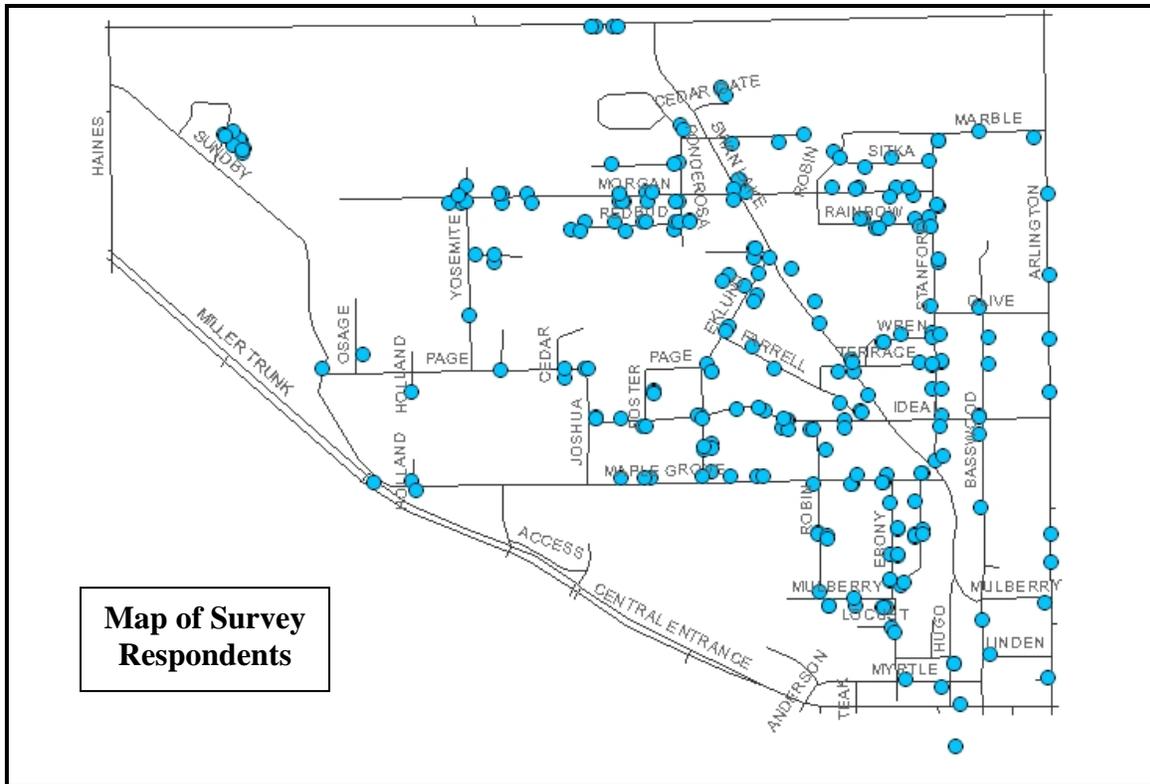
6. Do you support the use of traffic calming techniques to alleviate cut through traffic?
 - 69% Yes
 - 27% No
 - 3% Did not answer

7. Do you support the improvement of current primary roadways such as Haines Road and Arlington Avenue to attract traffic away from the neighborhood?
 - 81% Yes
 - 17% No
 - 2% Did not answer

8. Do you support the development of new primary roadway linking Central Entrance/Miller Trunk Highway and Arrowhead Road to reduce neighborhood cut through traffic?

- 77% Yes
- 19% No
- 4% Did not answer

9. What is your Address?



Comments – a space was included at the end of the survey for respondents to comment. The comments are organized by the category.

Road Improvement Suggestions

- Road conditions themselves are in poor conditions.
- How about improvements in general? Roads in Duluth are in terrible shape.
- Would really like to see road conditions improve especially on Swan Lake Rd and Maple Grove. The streets are not only dangerous for cars, in my opinion but also for pedestrians. I sprained my ankle and almost overturned my baby stroller while walking on Swan Lake Rd when I encountered a large crevice in the street.
- There should be a stoplight at Swan Lake Rd/Arrowhead. People will always cut through as long as the opportunity is there.
- Need road improvements.
- Rebuild Maple Grove Road- it needs it badly.

- Please plow and sand the hills in the winter.
- Connect Joshua to Maple Grove to make the mall more accessible.
- Fix Maple Grove Rd behind the mall. It has to be the worst road in the city.
- I think that the condition of the roads is more of an issue that traffic safety.
- With all the new business on Haines Rd between Hwy 53 and Arrowhead, we need extra turning lanes north and south. Why doesn't Arlington Ave at Hwy 53 have turning signals for all directions?
- People cut through the Heights because Central Entrance traffic lights seem to be so poorly timed. Improve flow and there won't be a problem with cutting through the neighborhoods. It seems like I sit forever waiting to make a left turn when no cars are in sight.
- Just fix Maple Grove Rd.
- It would be nice to see the entrance/exit by Kohls improved along with improving Sundby Rd. for the primary linkage between Hwy 53 and Arrowhead.
- Roads are in poor shape and hardly ever fixed.
- Maple Grove Rd is in serious need of repair.
- Please please re-surface road at least. Once every 15 years make this road one huge "pot hole road".
- Don't take a traffic problem off of one neighborhood and move it to another, like Joshua. Improve the roads that are already there.
- Please put repairs of the other roads in the Heights, such as Swan Lake on the top of the lists also.
- Resurface Maple Grove, Swan Lake and Eklund
- I wish that the snowplow would go down the other side of the street where no one lives. Instead of always going by and shoving snow on our driveways. We are all senior citizens and can not get the snow out all of the time.

Driver Behavior Concerns/Enforcement Needed

- People drive too fast and no place to walk.
- Sundby Rd is the road that could use more restrictions on speeders.
- Traffic normally moves from 40-60 mph past our home. Enforcing the speed limit of 30 mph at least once a month might help.
- We live on a dead-end street and yet people come by looking for a short cut. It is not uncommon to see vehicles traveling 40-50 mph
- Long range outlook given realities of growth are definitely needed along with improved public transportation schedules.
- A police person posted on Maple Grove would sure rake up.
- Try radar on Eklund and Swan Lake. Speed is a major problem.
- My main concern is the speed on Swan Lake, and that hardly anyone stops at the stop signs on Swan Lake (Eklund and Maple Grove). When is Maple Grove going to be repaired? The worst road in Duluth.
- People are in such a hurry that some even pass us on the left when we turn on signal to turn into our driveway. Also, the recent traffic survey (to see who was neighborhood traffic) was done on a very slow Tuesday night before end of the month payday. It should have been done the following Saturday after payday.

Concerns Over Doing Nothing

- The sooner the better.
- I encourage all agencies to stop studying and start doing. As you know this has been studied for 40 years. The solutions are getting harder, not easier. It is time to do something.
- I have lived at my residence for 28 years. Traffic problems have escalated drastically in the last 10 years. It is no longer safe to walk on the streets.
- Project(s) need to be done ASAP as thru traffic has gotten worse during the 19 years I have lived here.
- With all the appropriation and bonding bills considered each year we must get off to a better, faster conclusion.
- Lets get going, quit BSing and show progress.
- Lets get something done soon! I have been here for 35 years and still have the same problem.
- This is an issue that has been put off too long. Children need to be considered unsafe in the current setup.
- "Politics" need to be cast aside in decisions being made.
- No matter how you decide to alleviate the cut through traffic problems, you will never satisfy everyone. Just go ahead and do something.
- Something needs to be done now. This has been talked about and delayed long enough. Talking and studies only make for politics. Nothing ever gets done.

Traffic Speed and Volume Concerns

- My road is now very dangerous!! Please Help!
- Vehicles commonly travel 35 to 45 on Maple Grove now. Be it to/ from Swan Lake Rd or just Eklund Ave. By improving this road and still letting cut through traffic to continue I believe speeds will commonly be 40-50. Police can only be in one place at one time.
- Suggestion to reduce speed limits on Sundby Rd to see if people taking shortcuts or speeders are significant
- Going down Swan Lake Rd may save 3-5 minutes to the mall area.
- Maple Grove/Sundby/Page/Morgan/Yosemite are all ruined by too much traffic.
- Arlington Ave is getting too much traffic in a neighborhood with lots of residential housing. You can't even cross the street at the pedestrian walkway with out fearing for your safety.
- My street is one of the few "thru" streets and it is used for connecting to Central Entrance via Sundby and Maple Grove, which creates more traffic on my street not to mention lots of pot holes.
- Speed limit needs to be reduced to 30 MPH on Arlington. The traffic on my street is more every year.
- Too much turning onto Swan Lake Rd from Kenwood
- I live on Arlington and traffic has increased a lot in the past few years.
- My church is on Eklund Ave. Our parking lot is across the road. There is too much cut through traffic making crossing the street dangerous especially for seniors.
- I am on the corner of Ponderosa Cir and Morgan. Since the development of Ponderosa

Cir we have see accidents on this corner more so than needed. as we have several dead-end streets and people cutting through on Morgan, we requested and got yield signs but haven't seen much result

- Traffic problem is from Arlington Ave to Marble St on to Stanford Ave to Morgan Ave and vise versa when they come back from the mall area.
- We have three ways to leave. Arrowhead and Swan Lake, Maple Grove and Central entrance. All three are long waits during prime hours.
- Our neighborhood complained about the speed of vehicles traveling on Olive St, particularly since there is a physically handicapped child on the corner of Olive and Basswood. Instead of a yield sign being placed on Olive a stop sign was placed on Basswood (dead-end street).
- To reach Hwy 53 I have two options- Sundby Rd to Haines or Sundby to Maple Grove to Hwy 53. With the opening of Gander Mountain and new motel, turning onto Haines is almost impossible. Traffic coming from Arrowhead onto Haines to get to Kohls take Sundby Road, speeds are over 40mph on a road with no shoulders and broken surface asphalt that is very dangerous Intersection of Sundby, Maple Grove and 53 is a death trap.
- I live off Sundby Rd a little way in from Haines. Haines gets a lot of traffic. It takes a little time to off of Sundby onto Haines.
- Hwy 53 and Maple Grove intersection is dangerous. Pulling off of Page on to (left) Sundby is dangerous, as you can not see oncoming traffic until its upon you. Also, the cars drive too fast and so once you see them, they are almost on top of you.
- The intersection of Sundby Rd and Haines Rd is very dangerous now with the entrance to Gander Mountain across from it.
- Intersection of Miller Trunk, Maple Grove of or onto Sundby Road very unsafe.
- We have a hard time turning into our driveway. Currently people will not wait for us to turn in and out of our driveway.
- Arlington should be one speed limit of 30mph. Currently traffic goes by our house at the same speed they are going when coming off of Arrowhead. Too fast for the hill before our house.
- We have seen cars going 45-50 mph on our road. People are trying to walk and pulling out of their driveway. Please help to get these cars out of the neighborhood.
- Eklund is a huge issue! With families outside, it's amazing there aren't people being killed at a high rate. Eklund is used more by cut through then neighbors.

Traffic Calming Suggestions

- Close off Swan Lake to Eklund. Use Haines from Hwy 53 to Arrowhead and Sundby to Hwy 53 to Arrowhead. Don't disrupt neighbors, make use of existing roads.
- We cannot even get the city to have radar set up on Eklund during busy traffic. We need stops signs at each intersection and speed bumps.
- Need a 4 way stop sign at Walnut St intersection.
- We requested a stop sign on Olive St. One was placed on Basswood Ave, causing speed of cut through traffic.
- I would support stop signs, in addition to the traffic calming in question 4. While cutting through isn't illegal, speeding is. I would like to see both issues addressed.

- Should be a 3way stop sign on Page St and Sundby Rd.
- Consider making Eklund a oneway away from the mall, or else block off the end of Eklund at Swan Lake.
- I strongly believe that well placed stop signs on Swan Lake Rd would stop cut through traffic. This would be more cost effective than a new road.
- We need a stop sign on Wren Dr at the intersection with Stanford. Swan Lake: both traffic and speed pose a particular problem.
- Stop sign and 20 MPH speed signs at intersection of Robin Ave and Mulberry St and yield signs on Mulberry.

Support of New Primary Roadway

- We feel that there should be a new large artery to the mall and Joshua Ave would be the least costly and the least inconvenient to all people concerned.
- The best solution is to develop Joshua from Central Entrance to Arrowhead Rd. There has been much politics the past 25 years from preventing this to happen. This has been unfair to the rest of the area residents.
- Lets get Joshua connected to Maple Grove Rd I think that it is wrong that a few people can halt the progress of putting the street across from Trinity Rd (Cottonwood?) through to Arrowhead Rd.
- Show some guts! The Joshua extension affects the smallest number of residences and provides the most direct and safest solution. Let's see if our government can still put the safety of the majority over the concerns of the privileged few.
- Joshua Ave needs to meet Miller Trunk Highway.
- Do not say can't be done. There is always another way, a practical way. Morgan St South to Highway
- Putting Joshua through would solve the traffic problems on Swan Lake Rd (which is in terrible condition)
- The building of Joshua from Central entrance to Arrowhead Rd makes the most sense. Also I feel sorry for those that live on Eklund at the present time.
- It is time to put Joshua through.
- Joshua Ave project has been looked at for many years. It is time to implement it.
- If a road was to be built from Arrowhead to Maple Grove it must be direct. No intersection except for Maple Grove. Dead-end streets should be developed.
- A handful of property owners should not prevent the most prudent option for improving traffic flow and public Joshua Ave should be cut through from Central Entrance to Arrowhead Rd.
- Attach Joshua to Trinity
- Build Joshua with sound barriers could possibly help this proposal. I know from past experience in the Twin Cities when main roads were proposed in backyards of somewhat rural neighborhoods the idea was positively received.
- Joshua to Arrowhead
- If Joshua is extended to Maple Grove only, it will constitute a nightmare of traffic; unless Joshua is extended through to Arrowhead.
- Extending Joshua would affect a few people but the danger to all those living on Eklund with no front yards on such a narrow street is too high. I am amazed that no one has been

killed or seriously injured yet.

- Create Joshua Route
- On the map they have listed two options for extensions. The first is Joshua to Arrowhead. The second is extending Yosemite to Arrowhead and Central Entrance. That is the way it was planned 30 years ago and still is the best option!
- To take care of the cut through problem is to connect Joshua to Arrowhead Rd. All else would be pure folly!
- It is too bad the political system got in the way and stopped the progress. One mayor and resident spoke for us all which was so unfair and has caused this issue now.
- Maple Grove Rd will be a new road soon and it will be a speedway if there isn't a road taking cut through traffic away and back to Arrowhead Rd.

Do Not Support New Primary Roadway

- Joshua should be abandoned permanently. It just moves the problem from one area to another. It will just create more hassle at intersections and will not save time.
- I have lived on West Morgan for 17 years and have seen less traffic in the last few years. A new road will ruin a great neighborhood.
- Make improvements as needed to roadways already in place instead of harboring another area to create another problem to already existing neighborhoods.
- The cost of a new roadway is such a great expense, the city can not afford it.
- Let's start preserving neighborhoods and improving the safety instead of pushing more roads thru. Lakeside preserves their neighborhoods, can't we?
- I would hate to see our neighborhoods ruined by one more expressway cutting through it.
- Let's use the streets that are built for mall traffic. A new through road would reduce travel time by a whole 30 seconds. Not worth millions of dollars for a new road.
- To build an entire new road linking Central Entrance to Arrowhead in order to save two or three minutes of East end resident mall goer's commute time is not cost effective solution. Simply put, building an entire new roadway in order to save two or three minutes of travel time from Arrowhead to Central Entrance is not a cost effective expenditure of taxpayers funds. A roadway of this magnitude is also unfair to the residents in the study area. They are being asked to give up their peaceful, safe way of life in order to accommodate a slight improvement in the commute time of east end resident' trip to the mall. It is also evident that the progress of new, additional business in the mall area is moving in the direction of Hermantown. This geographical business migration will facilitate the natural course of traffic to increase it's utilization of Arrowhead to Haines, rather than directly to the mall. Any new roadway from Arrowhead to Central Entrance would be outdated and unnecessary within a few short years. Perhaps it is the mall owner and merchants of the mall that realize this fact, and explains why they are so staunchly in favor of a more direct link from Arrowhead to their front door, regardless of the cost to the residents in the study area. Currently, East end residents are reluctant to take Arlington to Central Entrance route to the mall because of the bottleneck traffic at the corner of Arlington and Central Entrance. Let's not create a new bottleneck at Central Entrance by creating a more direct path to the mall from Arrowhead. Traffic should be dispersed, rather than collected and compressed, in order to maintain steady and safe movement. Give travelers several good routes by improving existing roadways. Make those improvements "resident friendly" by installing safe

walkways and bike paths. Assure the residents along those routes that they would not shoulder the cost of those improvements, but that general funds would be applied. Unfortunately, cut through traffic on Swan Lake and Eklund will increase significantly, once the Joshua to Maple Grove connection is completed. Perhaps a short extension, or bridging, of Maple Grove to Arlington would be the best solution for relieving this problem. East end traffic could then take Arlington to Maple Grove to Joshua to Central Entrance. Most of this route would utilize existing roadways, with only a short extension of Maple Grove needed to complete the connection.

- We feel that it is ridiculous to build a new road when the rest of the roads in Duluth need attention. We feel it is wrong to push the "mall traffic" deeper into the middle of the Heights. We feel the green space in this area is diminishing and must be preserved. Moving the traffic problem to another street is not the answer.
- Complete Joshua from Maple Grove to Central Entrance, but not to Arrowhead.
- The facts are there... this is a perceived shortcut. Building a new road so we can save 10-20 seconds. This is cost justification. Why cater to these people. It is time to change their mentality. Speed bumps on Eklund.
- Has a traffic volume study been done on Swan Lake? Need to keep 194 to Arrowhead out of residential area.

Right to Drive Anywhere Anytime

- Roads belong to everyone and not the neighborhood and the issues at hand could or should at least be attempted by enforcing speed limits and other driving laws first.
- Everybody has the right to use all roads because we all pay taxes to build them and maintain them.
- We as tax payers feel free that we should take the streets we want to get to the malls and other places.

Need Sidewalks

- Neighborhood streets also are in serious need of reconstruction to include sidewalks.
- Roads need serious work with the creation of sidewalks.
- Too many pot holes- unsafe to walk. Sidewalks and pedestrian pathways would be great for the community.
- Need Sidewalks
- Put Joshua through to the mall. There are no sidewalks in the neighborhood.
- We haven't any sidewalks up here and have to walk in the streets. It's plenty bad when you jump in snow banks or ditches because of motorists speeding through here. I have been yelled at and sworn at too.

Need More Information

- A report on the end result would be good.
- We need more information before we support it one way or the other.
- Will not be able to attend the meeting on the 16th, will be out of town. Would like to get more input following the meeting.

Appreciate the Study

- I look forward to seeing your plan.

- Thanks for working on this issue!
- We appreciate you looking into this.
- Thank you for asking for our input.
- I am new to the area and live on a dead-end street. Thanks for asking.
- Thank you for the survey.
- Thank you so much for listening to our serious and alarming traffic problems and concerns.
- Thanks for your help!

General Comments

- We are being turned slowly, but surely into a commercial district instead of residential.
- Traffic seems to be some what less than past years.
- More access to neighborhood streets promotes crime.
- Stop sign is useless here. 8 out of 10 do not know what a stop sign is.
- What if people in Kenwood decided that they don't like traffic on Arrowhead Rd.
- It would be nice if the Mt of Olive Church could have another entrance/exit to their church without creating another cut through.
- This is a neighborhood not a freeway.
- Common sense needs to be implemented when work is done. The mess on Maple Grove/Sundby intersection with Hwy 53 is a prime example of the lack of planning.
- I don't agree with the residents needing to fund the improvements to Maple Grove Rd, when it is used by so many more people than local residents.
- Traffic will follow the most direct and quickest route.
- It would be nice to find a way to enter Central Entrance safely from Sundby Rd.
- Not as big of a problem because we live on a dead-end
- Extending Joshua Ave from Maple Grove to Central Entrance will save me time miles and not stopping for signs and red lights.
- Has it been considered closing off access to Arrowhead from Swan Lake if a new cut through road is built? The plan doesn't include upgrades to current neighborhood roads, issues such as overall condition, sidewalks, curb and gutter etc.... Give a little to get a little.
- We live on a dead-end street and are not bothered by traffic except adjacent streets.
- I live on Arlington. I use Eklund occasionally, but I don't see a lot of other traffic. I see more on Maple Grove. I also don't use this much.
- We live on a dead-end street and want to keep it that way.
- If Joshua is extended make it a toll road and make the users pay for it. The city cant keep the new roads plowed
- Maple Grove Rd should not be extended to Arlington.
- The city and county should stop spending money on crap and get back to basics.
- Besides traffic there are serious public concerns in the same neighborhood- no city sewer.
- You are forcing families to look into quieter, safe, neighborhoods to move into. Your decisions could either positively affect our Duluth Heights neighborhood or greatly diminish the quality of this area.
- There use to be enough room for a primary road.

Traffic Calming

Definition

Traffic calming involves changes in street alignment, installation of barriers, and other physical measures to reduce traffic speeds and/or cut-through volumes, in the interest of street safety, livability, and other public purposes.

Traffic Calming Techniques

Techniques that Address Speed

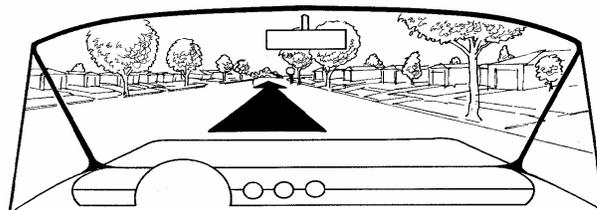
- Speed Tables – page 2
- Raised Intersections – page 3
- Traffic Circles – page 4
- Center Islands – page 5
- Neck Downs – page 6
- Chokers – page 7
- Protected Parking – page 8

Techniques that Address Volume

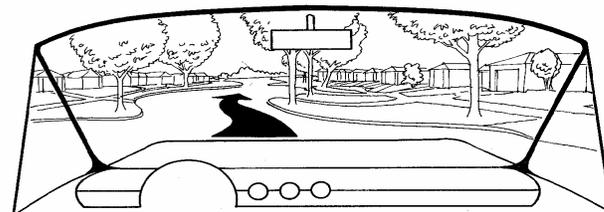
- Half Closure – page 9
- Full Closure – page 10
- Chicane – page 11
- Diagonal Diverter – page 12
- Truncated Diagonal Diverter – page 13

Passive Techniques

- Pavement Edge Striping – page 14
- Landscaping/Tree Planting – page 15

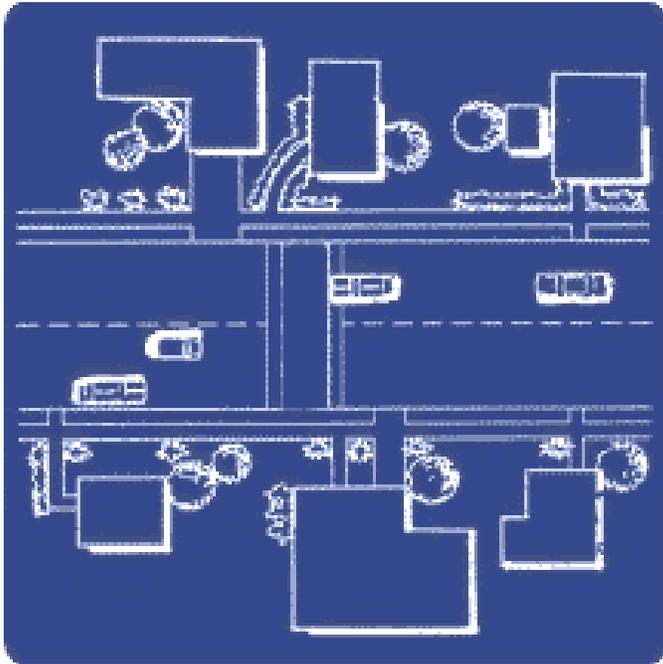


Interruption of sight lines is a critical component of most traffic calming strategies.



Speed Tables

Speed Tables: raised tables in road surface extending across the street usually less than five inches in height.



Advantages

- Aggressive speed control device
- Relatively low cost

Disadvantages

- Can damage vehicles
- Causes emergency vehicles to almost stop at each bump
- Speeding vehicles can lose control

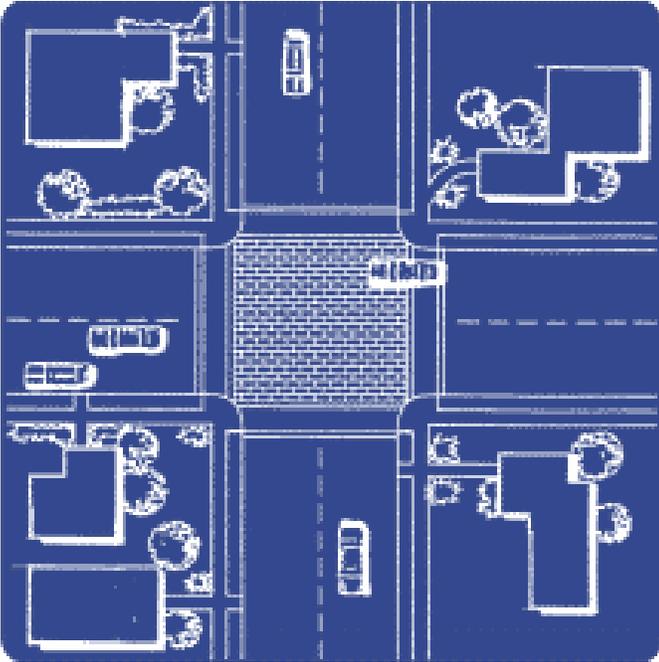


Effectiveness

Reduces speeds by 9% - 23%

Raised Intersections

Raised Intersections: flat raised areas covering entire intersections, often with brick or other textured materials on the flat section.



Advantages

- Aggressive speed control device
- Provides safer pedestrian crossing

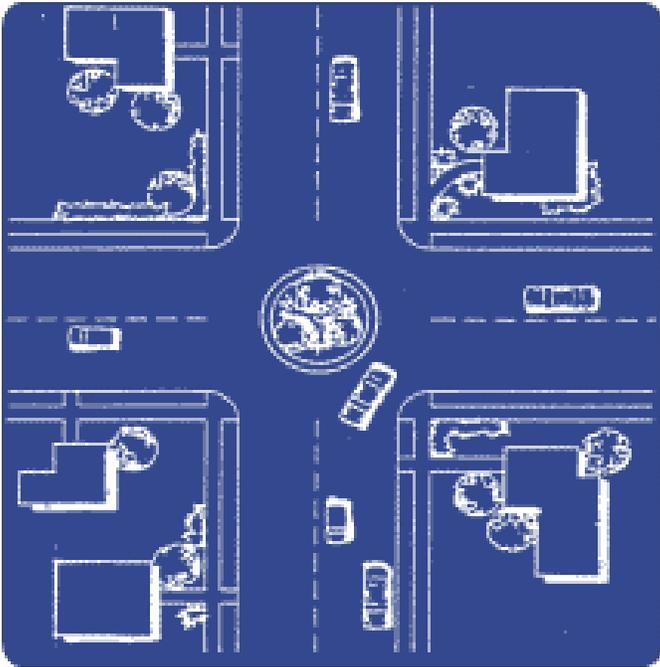
Disadvantages

- Can damage vehicles
- Causes emergency vehicles to almost stop
- Speeding vehicles can lose control



Traffic Circles

Traffic Circle: raised landscaped island located at the intersection of two streets.



Advantages

- Significantly reduces crashes compared to 2-way, 4-way stop signs and traffic signals
- Reduces vehicle speed

Disadvantages

- Difficult for large vehicles
- More difficult for snow plows
- May lose some parking

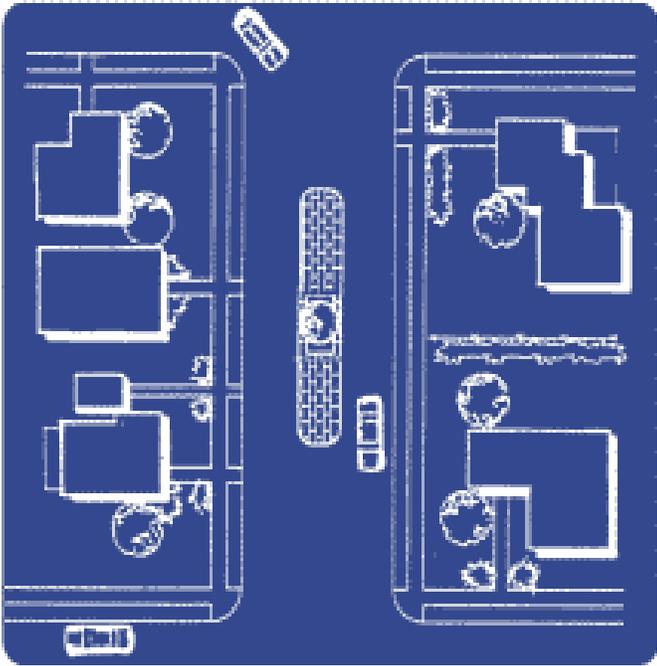
Effectiveness

Reduces speeds by 11%



Center Islands

Center Island: islands located along the centerline of a street that narrow the street at that location.



Advantages

- Reduces vehicle speed without reducing access
- Provides refuge for pedestrians crossing the street

Disadvantages

- High cost of retrofitting
- Loss of parking

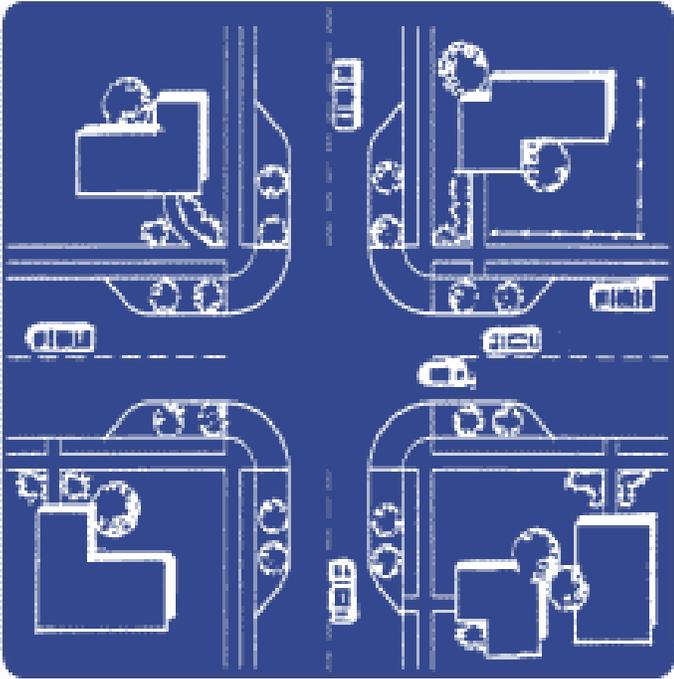
Effectiveness

Reduces speeds by 7%



Neck Downs

Neck Down: curb extensions at intersections that reduce roadway width curb-to-curb



Advantages

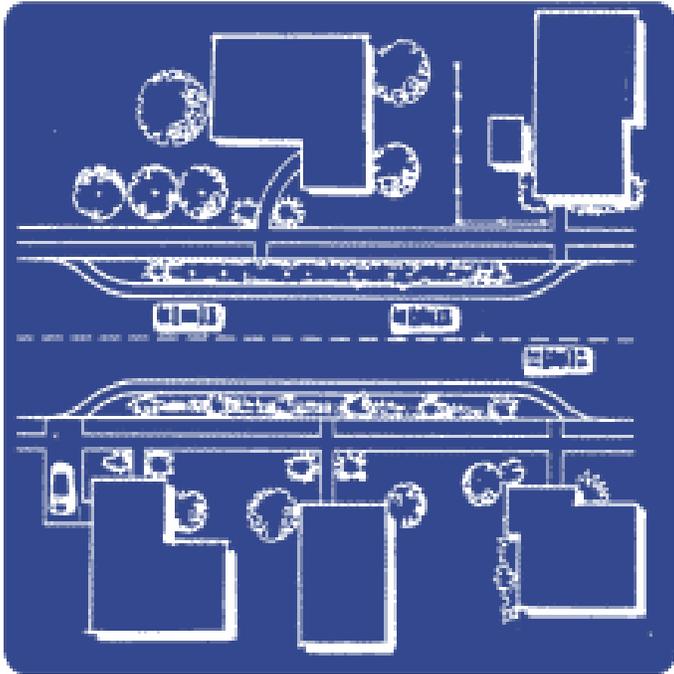
- Reduces vehicle speed without reducing access
- Enhances the amenity of the street
- Provides shorter crossing for pedestrians

Disadvantages

- High cost of retrofitting
- Better as part of street reconstruction or initial construction.

Chokers

Chokers: mid-block curb extensions that reduce roadway width curb-to-curb



Advantages

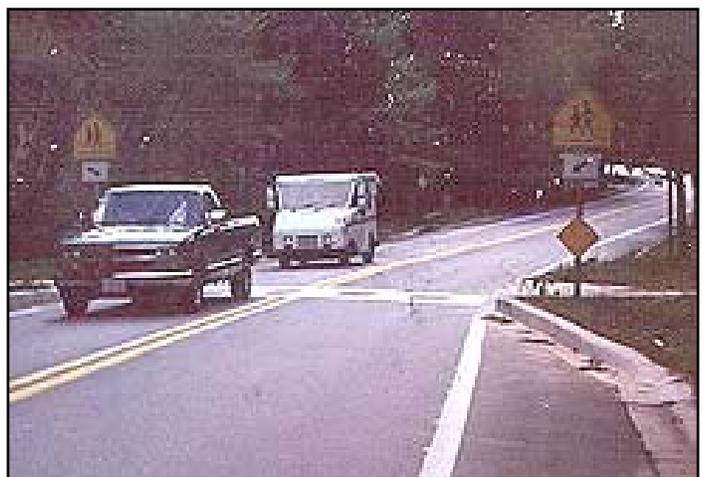
- Reduces vehicle speed without reducing access
- Enhances the amenity of the street

Disadvantages

- High cost of retrofitting
- Loss of parking

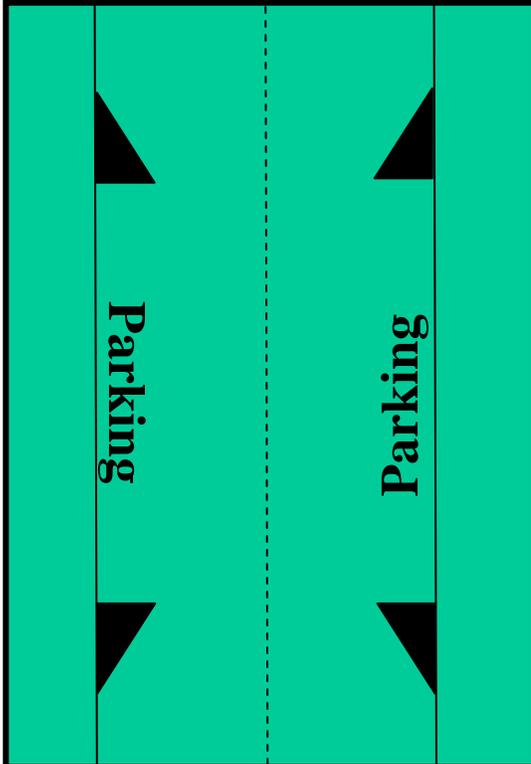
Effectiveness

Reduces speeds by 7%



Protected Parking

Protected Parking: landscaped extension projecting out from the curb creating protected parking bays.



Advantages

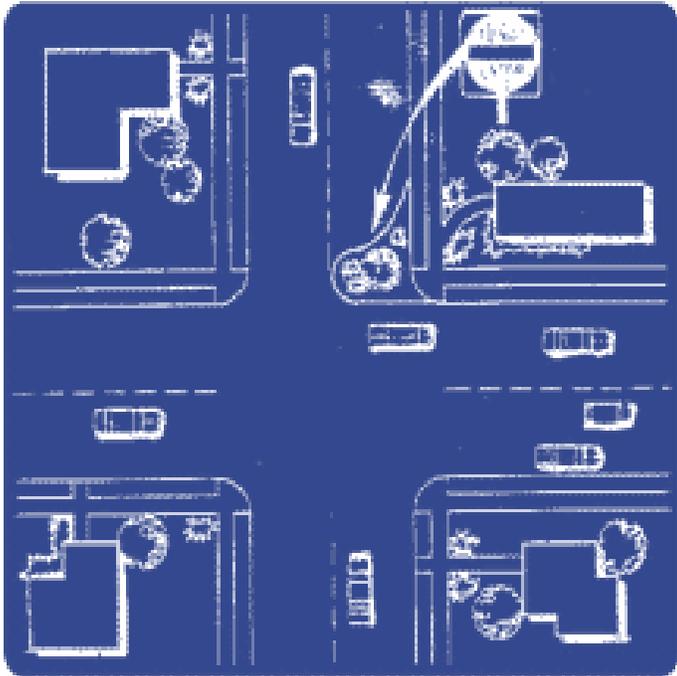
- Reduces vehicle speed without reducing access
- Enhances the amenity of the street
- Lower cost than chokers and neck downs

Disadvantages

- Loss of parking

Half Closure

Half Closures: barriers that block travel in one direction for a short distance on otherwise two-way streets.



Advantages

- Reduces through traffic in one direction
- Allows two-way traffic on the remainder of the street

Disadvantages

- Reduces access for residents.
- Emergency vehicles only partially affected as they have to drive around partial closure.

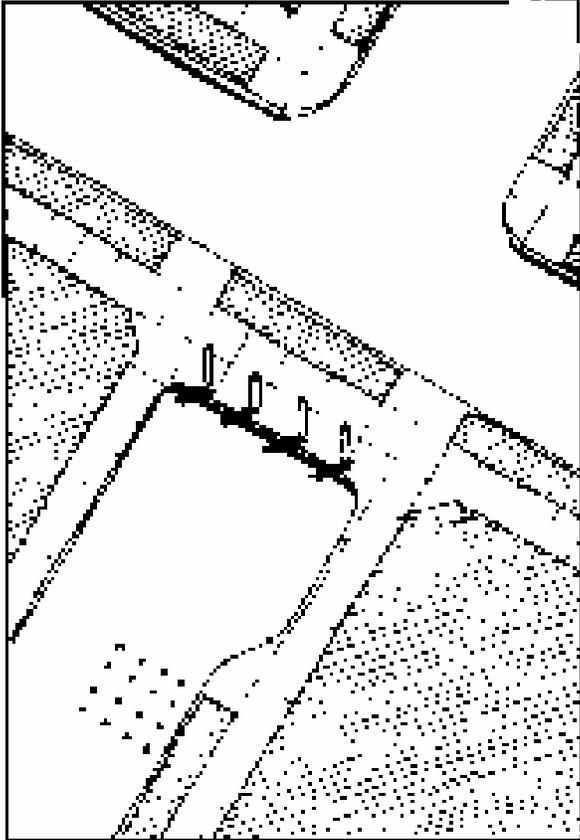
Effectiveness

Reduces vehicle volumes by an average of 42%



Full Closure

Full Closure: complete barrier of a street leaving the block open to local traffic at one end, but physically closing the other end.



Advantages

- Eliminates through traffic
- Reduces speed of remaining vehicles

Disadvantages

- Reduces emergency vehicle access
- Reduces access to properties for residents

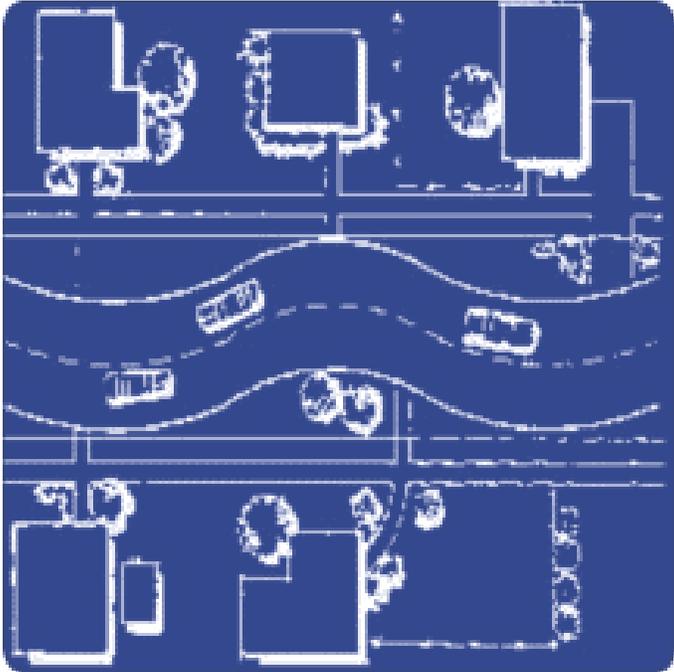
Effectiveness

Reduces vehicle volumes by an average of 44%



Chicane

Chicanes: a form of curb extension, which alternate from one side of the street to the other which form S-shaped curves.



Advantages

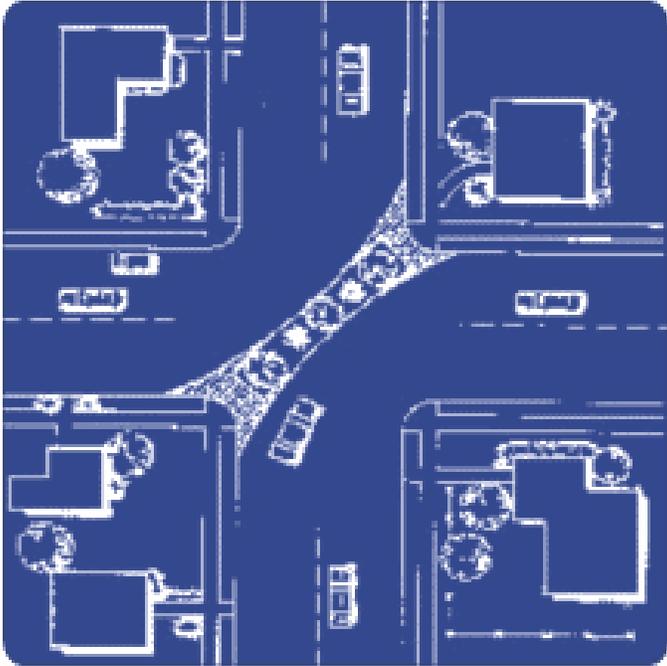
- Reduces speed
- Reduces through traffic
- Allows two-way traffic

Disadvantages

- Diverts traffic to other streets
- High cost of retrofitting
- Loss of parking

Diagonal Diverter

Diagonal Diverter: a barrier placed diagonally across an intersection to disconnect streets.



Advantages

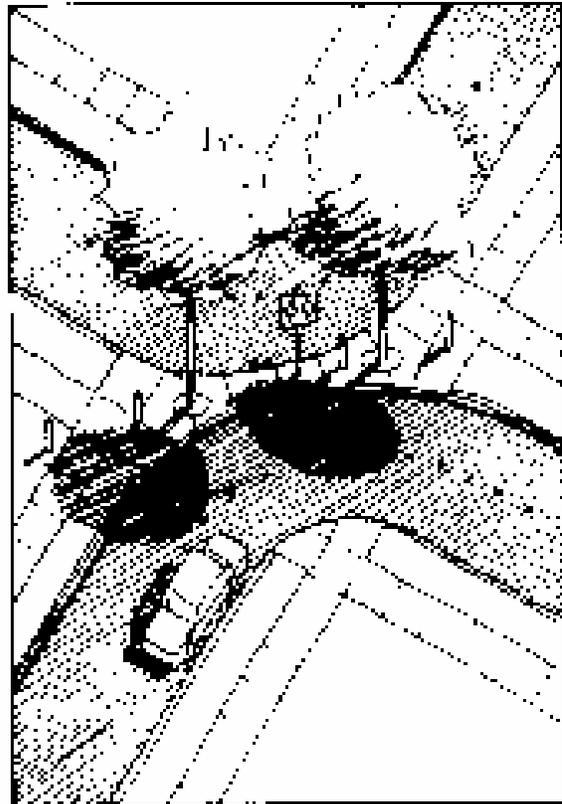
- Eliminates through traffic
- Reduces conflicts
- Increases pedestrian safety

Disadvantages

- Restricts residents access to their properties
- Inhibits access by emergency vehicles
- Will move through traffic to other streets

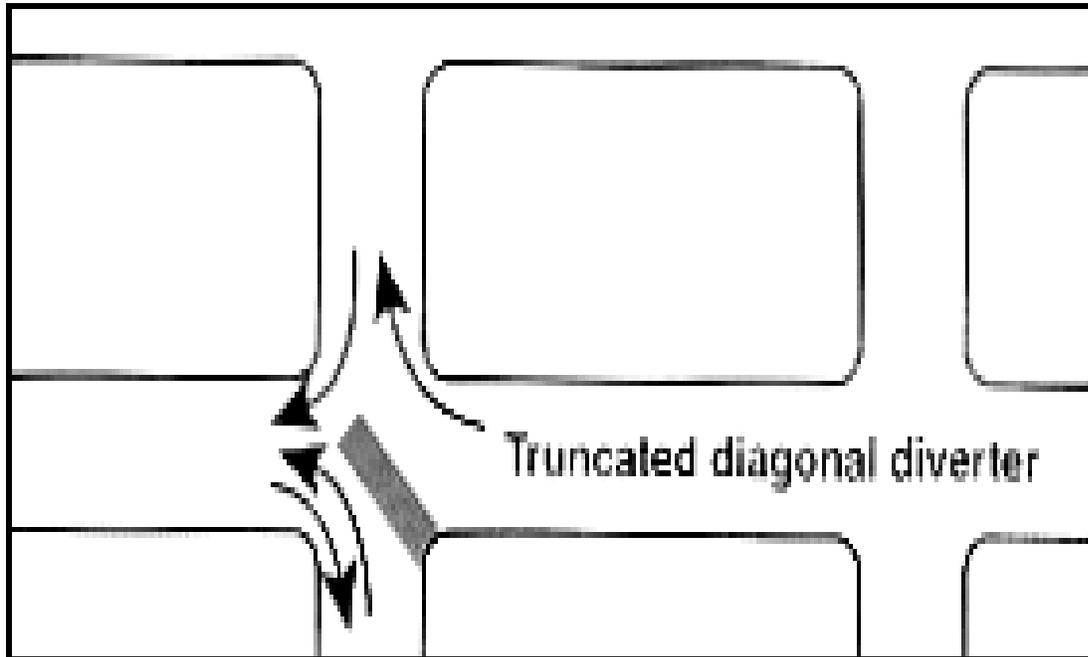
Effectiveness

Reduces vehicle volumes by an average of 35%



Truncated Diagonal Diverter

Truncated Diagonal Diverter: a barrier placed diagonally across that does not fully close the intersection. Restricts through traffic by forcing traffic to turn.



Advantages

- Eliminates through traffic

Disadvantages

- Restricts residents access to their properties
- Inhibits access by emergency vehicles
- Will move through traffic to other streets

Pavement Edge Striping

Pavement Edge Striping: Lines painted along roadway have the effect of making the road seem narrow and giving the driver the perception that they have a smaller area to operate their vehicle which slows them down.



Landscaping/Tree Planting

Adding trees to the edge of the road gives the road a feeling of narrowness and has the effect of slowing traffic.

