

**Appendix D
Traffic Study**



D. Traffic Study

EXISTING FREEWAY ACCESS

Access to I-5 is provided via three interchanges in Mountlake Terrace, SR 104 (244th St. SW), 236th St. SW and 220th St. SW. WSDOT is currently constructing HOV lanes on I-5 through Mountlake Terrace and some changes to the access at the 236th St. SW interchange ramps are planned. Previously, traffic from the west on SR 104 was able to travel via ramps to the 236th St. interchange to access the Park & Ride lot. After the proposed ramp revisions are complete, this movement will no longer be possible. This traffic will have to travel through congested areas via 56th Ave. W and into the downtown to access the Park & Ride lot.

A special study was conducted of the traffic using the ramp from 244th to 236th St. SW before the construction closed off access. In the AM peak hour (7:15 to 8:15) there were 31 vehicles making this movement. Similarly in the PM peak hour (5:00 to 6:00) there were 163 vehicles making this movement. Obviously the PM peak is much higher and these 163 vehicles will need to find alternative access routes.

Excess capacity exists in key Downtown intersections. Thus, current capacity will accommodate the additional traffic that will be redirected because of this change in ramp configuration.

EXISTING ARTERIAL CLASSIFICATION

The arterial street network in Mountlake Terrace has been classified by the Mountlake Terrace Transportation Study into the following classifications:

- Interstate
- Principal Arterial
- Secondary Arterial
- Collector Arterial

As shown in Figure D-1, 56th Ave. W, 220th St. SW and 236th St. SW are all classified as a Secondary Arterials. By comparison, 58th Ave. W, and 230th St. SW in the study area and 48th Ave. W east of the study area are all classified as Collector Arterials.

Higher classes of arterials are designed to carry heavier traffic volume loads. It is therefore appropriate, for example, to design additional capacity carrying features into 56th Ave. W as compared to 58th Ave. W. Such improvements include added turn lanes, bus pull-outs, wider intersection radii, etc.

EXISTING TRAFFIC VOLUMES

As shown in Figure D-2, average daily traffic volumes on streets in the study area shows heavy reliance on a few arterial streets. 56th Ave. W is the predominant north-south arterial with an average daily traffic volume of 9,000 to 10,000 in the study area. By contrast, 58th Ave. W carries only 3,000 vehicles per day. To the north, 220th St. SW carries east-west traffic at the rate of 12,300 vehicles per day west of 56th Ave. W. To the south of the city center, east-west traffic on 236th St. SW carries from 10,000 to 12,000 vehicles per day. In the city center, east-west traffic on 232nd St. SW is only 5,000 vehicles per day between 56th Ave. W and 58th Ave. W.

170 busses pass through the Downtown each day, with a morning 5 a.m.-9 a.m. peak total of 47 and an afternoon 4 p.m.-7 p.m. peak of 40 busses.

These traffic volumes reflect the importance of maintaining safe and efficient traffic flow on these few important streets. The relatively high volumes also underscore the need for enhancing pedestrian safety along 56th Ave. W.

TRAFFIC CONTROL

In the study area intersections are controlled by two-way stop signs, four-way stop signs and traffic signals located as shown in Figure D-3. The arterial streets mentioned above are the through streets with two-way stop sign control for the side streets.

Traffic signal control in the study area is provided at the following locations:

- 56th Ave. W & 236th St. SW
- 56th Ave. W & 232nd St. SW
- 56th Ave. W & 220th St. SW
- 236th St. SW & I-5 Ramp at Park & Ride lot

All-way stop control is provided in the study area at the intersection of 232nd St. SW and 58th Ave. SW near City Hall. Five other intersections are provided within the residential district east of the city center but are not within the study area.

No new traffic signals or four-way stop controls are required to accommodate the traffic volumes existing or expected within the study area.

EXISTING INTERSECTION TURNING MOVEMENT COUNTS

Turning movement counts for the PM peak hour at key intersections in the study area are shown in Figure D-4. These movements are not unusually heavy and can be accommodated by conventional intersection and traffic signal designs.

Left turns are the most critical movement to consider at intersections since they must yield to oncoming traffic, and proper storage length must be provided for these movements to ensure they do not block through traffic. The highest left turn volume occurs on 56th Ave. W at the 220th St. SW intersection. There, the northbound left turn volume is 283. Fortunately, there is very little traffic opposing this movement, and the signal is able to operate satisfactorily. In the city center, left turn movements are quite low. As an example, on 56th Ave. W at 232nd St. SW the northbound left turn volume is only 87 while for the southbound direction there are only 28 left turns. At 232nd St. SW, left turn arrow signal control is provided on the northbound and southbound approaches. At the southern end of the study area, at 236th St. SW, left turn volumes are somewhat heavier. For example, the eastbound left turn is 120 vehicles and the southbound left turn is 113. Northbound and westbound left turn volumes are much lower, at 26 and 43 vehicles, respectively.

All these volumes can easily be handled by these key intersections since there are existing left turn lanes provided on all four legs.

UNSIGNALIZED INTERSECTIONS

For the case of unsignalized intersections, the level of service (LOS) of the stop controlled movements and left turn movements are calculated. The method of reporting LOS is based upon the concept of reserve capacity (RC), that is the number of additional vehicles which theoretically can be accommodated by the particular movement. The reserve capacity value established for each LOS criteria is listed in Table 1. Only the major street left turn movements and the minor approach movements are analyzed by the unsignalized LOS method.

Reserve Capacity (per Hour)	Level of Service	Expected Delay to Minor Street Traffic
≥ 400	A	Little or no delay
300-399	B	Short traffic delays
200-299	C	Average traffic delays
100-199	D	Long traffic delays
0-99	E	Very long traffic delays
< 0	F	Extreme delays and queuing

Table D-1: Unsignalized Intersection Level of Service Criteria

SIGNALIZED INTERSECTIONS

For the case of signalized intersections the LOS of each movement, and the intersection as a whole, is computed in seconds of delay per vehicle. The delay value established for each LOS criteria is listed in Table 2.

Level of Service	Stopped Delay per Vehicle
A	< 5.0
B	5.1 to 15.0
C	15.1 to 25.0
D	25.1 to 40.0
E	40.1 to 60.0
F	> 60.0

*Table D-2:
Signalized Intersection Level of Service Criteria*

Level of service at all key intersections in the study area are all LOS D or better (with most being LOS C) since they have dedicated left turn lanes. Some intersections (e.g., 56th Ave. W and 232nd St. SW) could still maintain adequate levels of service without the need for dedicated left turn lanes. However, it was determined that the City desires to include left turn lanes whenever possible, so no intersection design alternatives were developed without left turn lanes.

In general, the presence of left turn lanes does not indicate the need for separate left turn signal phasing (i.e., green arrow). In fact, overall signal operations are improved only when left turn phases are warranted by higher left turn traffic volumes facing significant opposing through volumes.

PARKING

56th Ave. W in the study area is characterized by two land use zones - commercial zoning and land use in the city center area, and residential and commercial zoning and land uses both north and south of the city center. On-street parking is generally not currently provided in the commercial area which runs from 230th St. SW to 236th St. SW. Residential areas are provided with on-street parking on both sides of 56th Ave. W.

The value of retaining parking in the residential portions of 56th Ave. W was established during the public meeting process. Where possible, it will be desirable to allow some on-street parking in the commercial portions of the

street to provide additional parking and to better separate vehicular traffic from pedestrians using the sidewalk.

Some concern over on-street parking due to transit riders near the 228th St. SW intersection was expressed. The adjacent Baptist Church is a designated Park & Pool lot that is underutilized. Signing will be installed directing transit patrons to use the church parking lot on the west side of the building.

PEDESTRIAN FACILITIES

Sidewalks and crosswalks are key elements in providing for safe and convenient pedestrian travel through the study area. As shown in Figure D-5, Sidewalk Inventory from the Mountlake Terrace Transportation Plan, existing sidewalks are provided on virtually all arterial streets.

At signalized intersections on 56th Ave. W pedestrian indications and pedestrian push buttons (actuated signals only) are provided to control pedestrian movements.

Improving pedestrian amenities and enhancing pedestrian access through the area between 56th Ave. W, 58th Ave. W, 232nd St. SW and 234th St. SW should be a priority of redevelopment efforts. To enhance the connectivity of this area to the civic services on the west and shopping services to the north, mid-block crosswalks have been installed. It is recommended that an additional mid-block crosswalk be installed to further connect the area to the east side of 56th Ave. W. This crosswalk would be located near the Arctic Circle Drive In and should be designed with curb "bulbs" to minimize the crossing distance. Block type pavement markings should be utilized to emphasize the crossing.

In addition, wherever possible, intersection "bulbs" (curb extensions) should be utilized to minimize the pedestrian crossing distance at intersections. In addition to reducing the distance (and time) it takes to cross the street, safety is enhanced and often larger intersection radii can be constructed to aid traffic flow.

BICYCLE FACILITIES

The Mountlake Terrace Bicycle Plan is shown in Figure D-6 taken from the Mountlake Terrace Transportation Plan.

In the study area 56th Ave. W is planned to incorporate bicycles as part of the vehicular traffic without marked lanes or separate paths (Class III). Wherever possible, increasing the through traffic lane widths by 2 to 3 feet would be desirable to make passing of bicyclists easier, but is not required.

In addition, transit stops and business locations should be encouraged to provide lockable bicycle racks to promote cycling as a mode of travel for transit access and shopping.

The only street in the study area planned to have a higher class of bicycle facility is 58th Ave. W which is slated for a Class II (striped lane) treatment. This route has a much lower traffic volume than 56th Ave, (one-third) and few intersections with turn lanes which leaves more room for bicycles.

CONCLUSION

The following elements should be included in the final plan for this project.

Transit Facilities

1. Bus pull-outs should be included wherever practical to keep transit operations from blocking street traffic.
2. Additional transit shelters should be installed where transit usage is highest. Use of associated street furniture (benches, trash receptacles, light standards, pavement textures/colors, bicycle racks, etc.) should be encouraged and should be coordinated in design to provide an overall street design theme.
3. Intersection bulbs, curb radii, and lane widths must be designed to accommodate turning bus traffic.

Pedestrian Facilities

1. Redevelopment efforts should be strongly encouraged to improve pedestrian amenities and enhance pedestrian access through the area between 56th Ave. W, 58th Ave. W, 232nd Street SW, and 234th St. SW.
2. Install an additional mid-block crosswalk to further connect the area to the east side of 56th Ave. W. This crosswalk would be located near the Arctic Circle Drive-In and should be designed with curb "bulbs" to minimize the crossing distance. Block-type pavement markings should be utilized to emphasize the crossing.
3. Utilize intersection "bulbs" (curb extensions) wherever possible to minimize the pedestrian crossing distance at intersections. In addition to reducing the distance (and time) it takes to cross the street, bulbs enhance safety and often allow larger intersection radii to be constructed to aid traffic flow.
4. Wherever practical, designating bus pull-outs and on-street parking areas should be included. This will provide a buffer space between pedestrian traffic and vehicular traffic, which will increase safety for pedestrians.

Bicycle Facilities

1. Transit stops and business locations should be encouraged to provide lockable bicycle racks to promote bicycles as a mode of travel for transit access and shopping.
2. Provide bus pull-outs to allow bicyclists to easily pass loading busses.

Operational Aspects

1. Lower the speed limit on the Downtown portion of 56th Ave. W to 25 MPH. This will increase vehicular and pedestrian safety and enhance the sense of "place" of the Downtown. Note this is a common treatment for downtown commercial districts, where traffic congestion and heavier pedestrian traffic is to be expected. The reduction in speed limit will result in somewhat longer (17%) travel times through the area, but overall capacity will not be noticeably changed since the intersection capacities will still govern.
2. The traffic signal at 232nd St. SW should be improved to allow full actuation of the signal rather than the current semi-actuated design.
3. In addition, the traffic signals at both 232nd St. SW and 236th St. SW should be evaluated to consider the conversion of protected left turns to protected/ permissive left turn phasing (i.e., arrow and green ball) to reduce intersection delay.

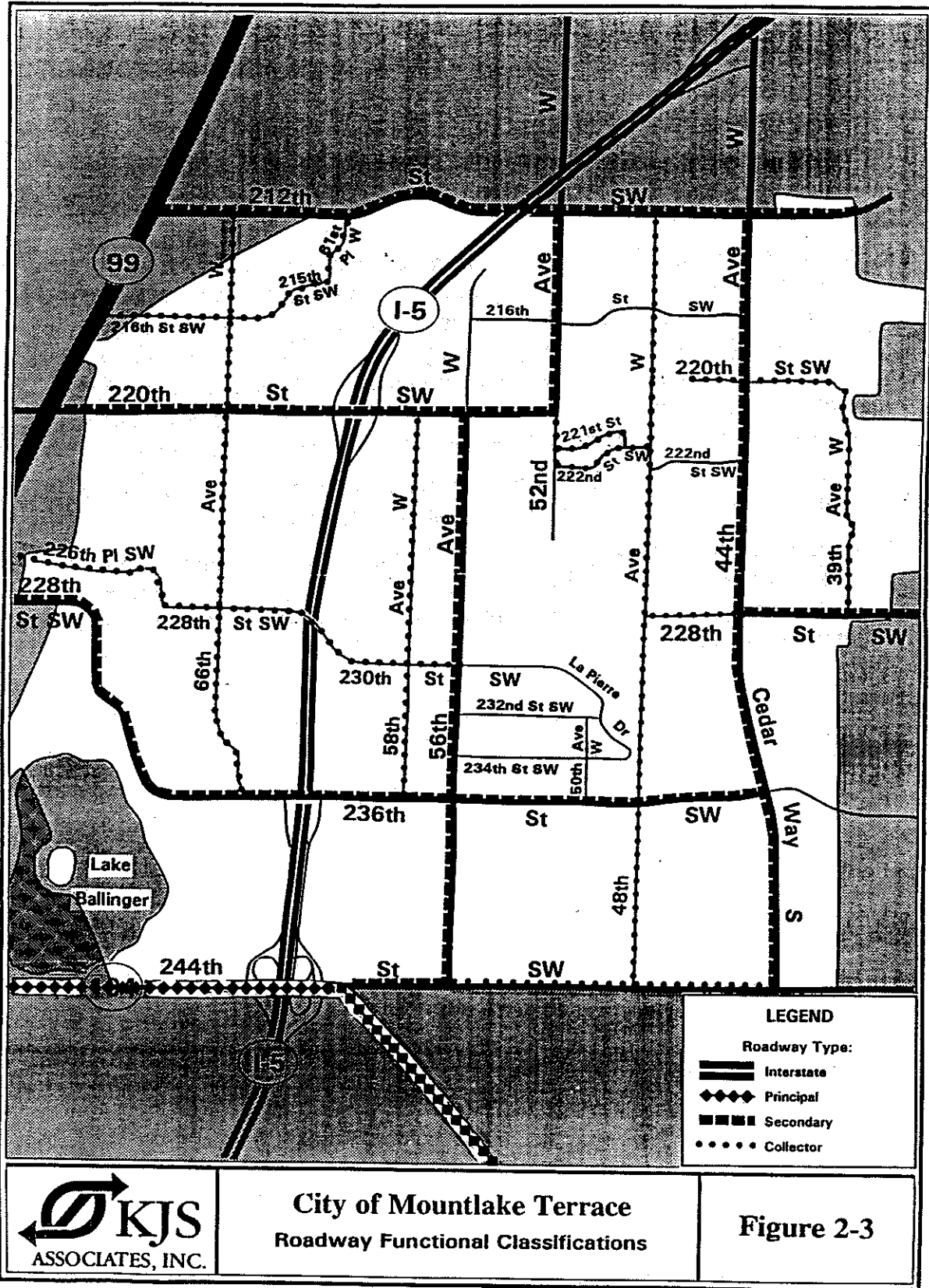


Figure D-1: Existing Arterial Classification

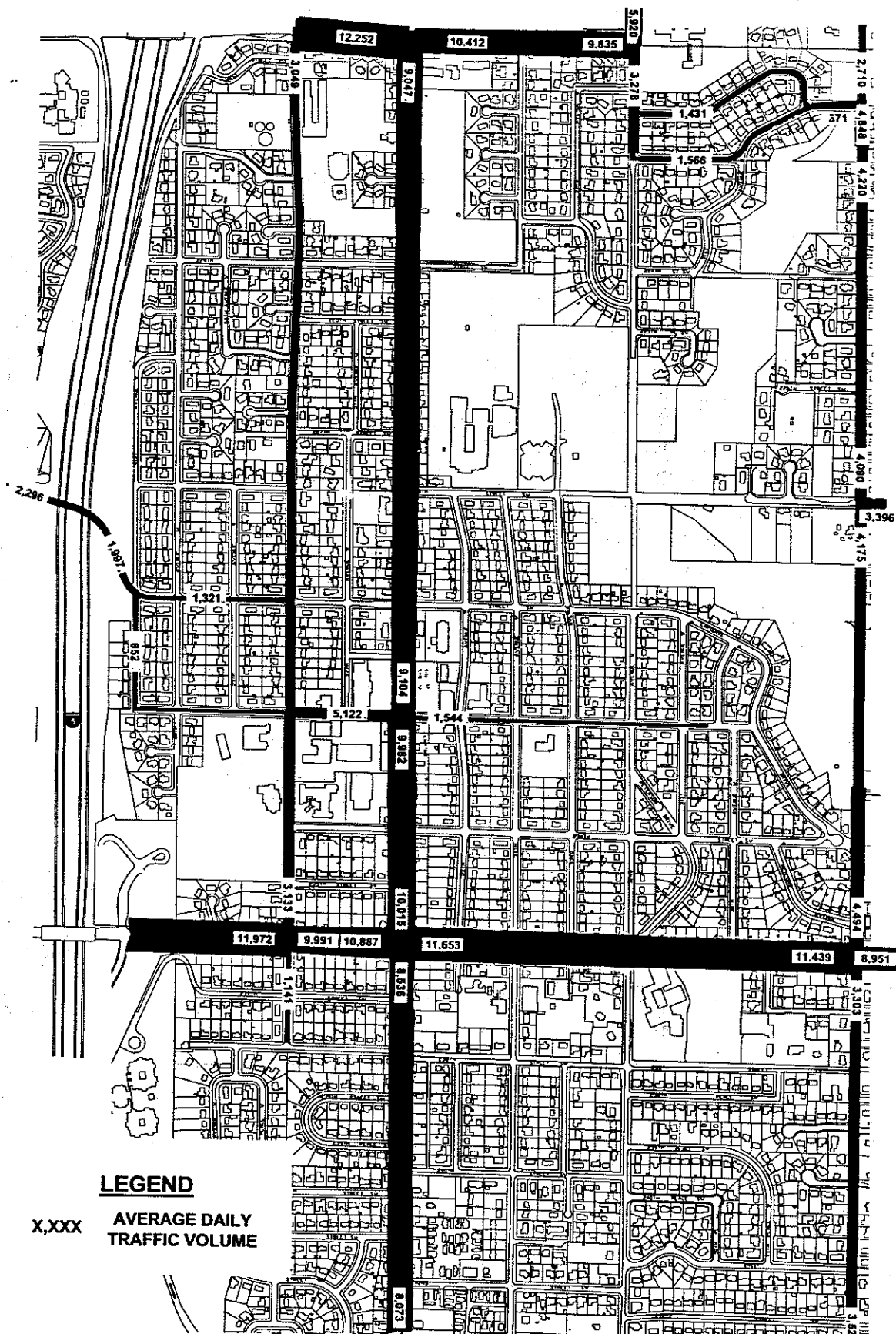





Figure D-2: Existing Traffic Volumes

LEGEND

-  STOP SIGN
-  4-WAY STOP
-  TRAFFIC SIGNAL

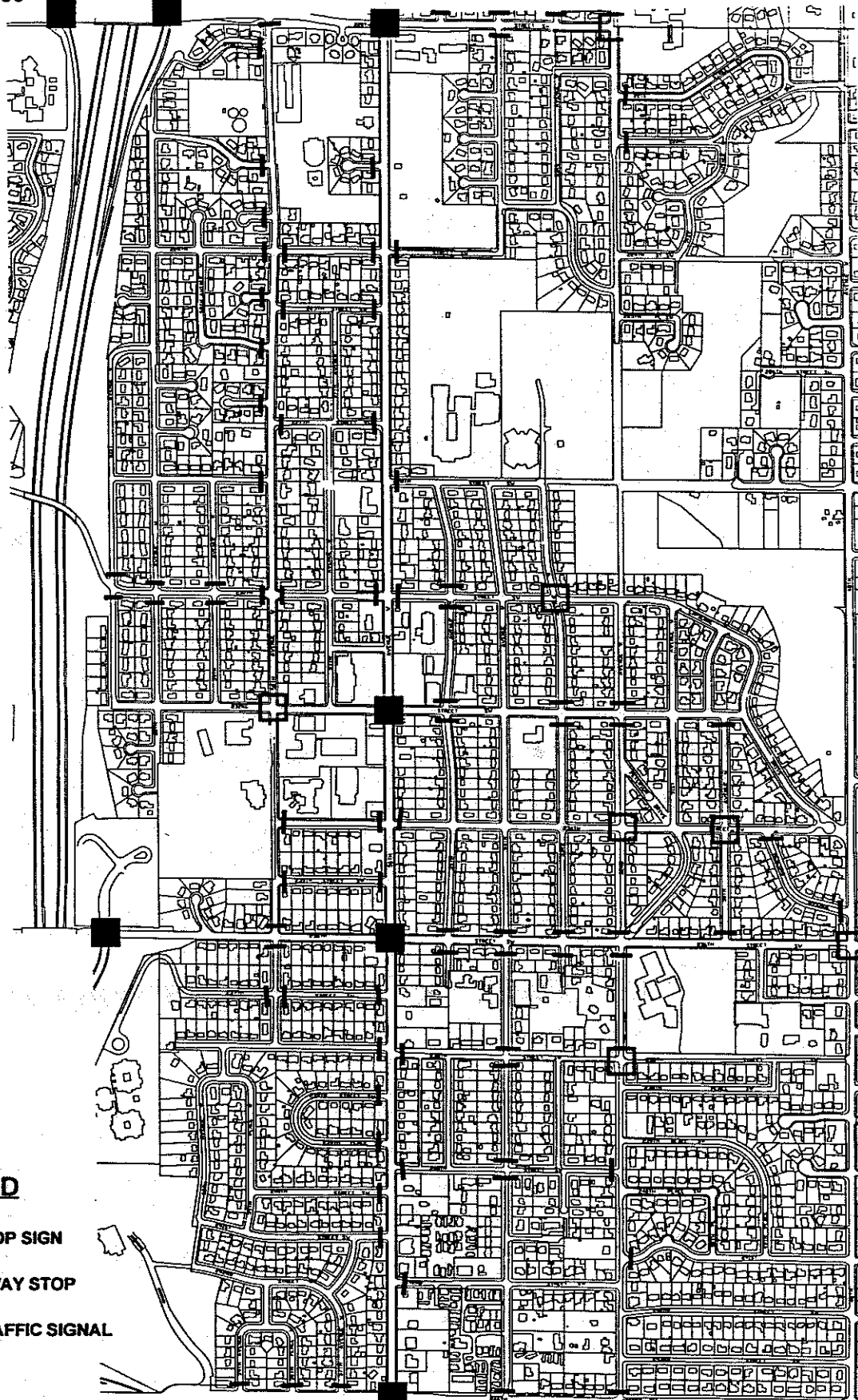


Figure D-3: Existing Traffic Control

ISTEA/56th Avenue West Beautification & Multi-Modal Transportation Project

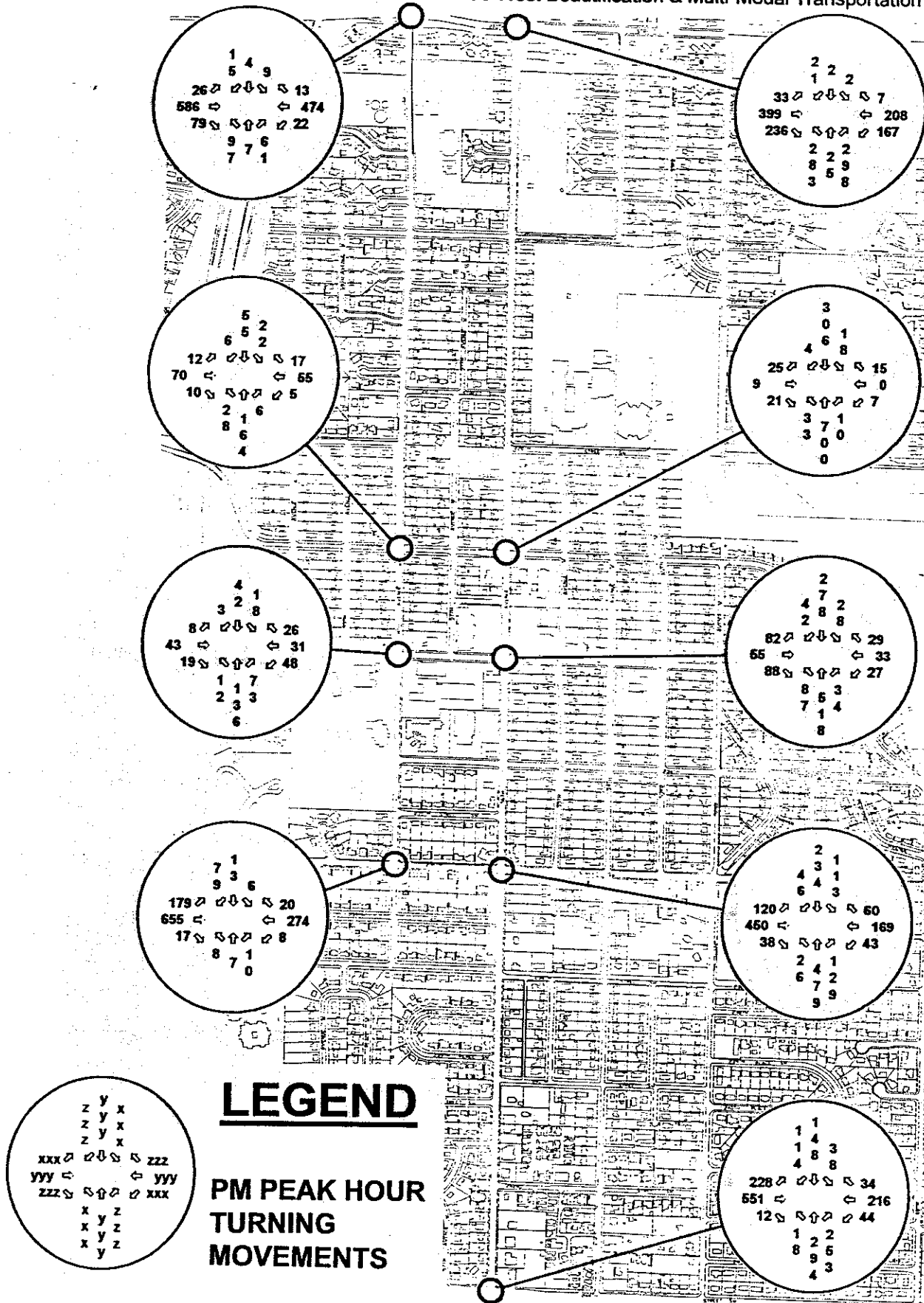


Figure D-4: Existing Intersection Turning Movement Counts

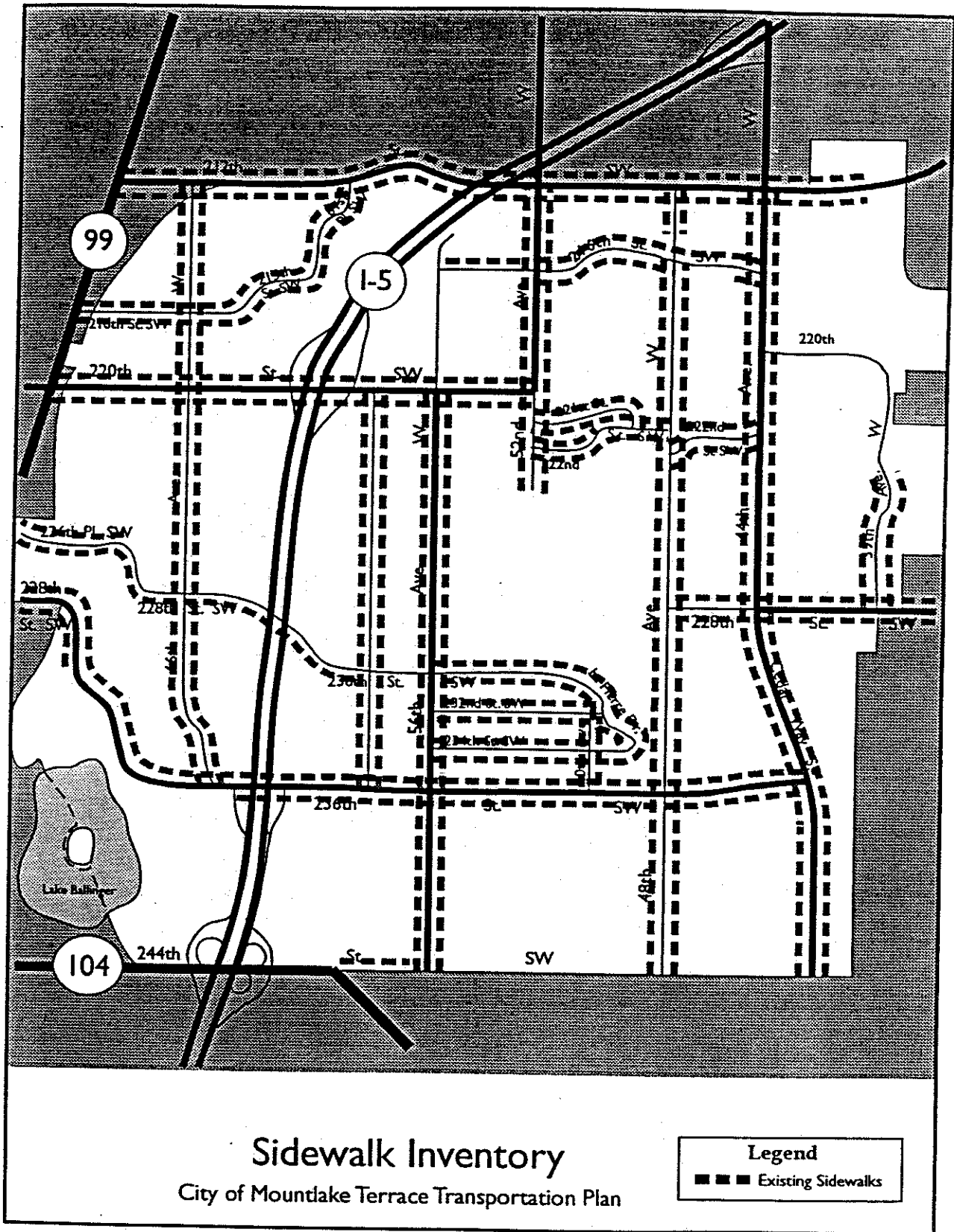


Figure D-5: Existing Sidewalk Inventory

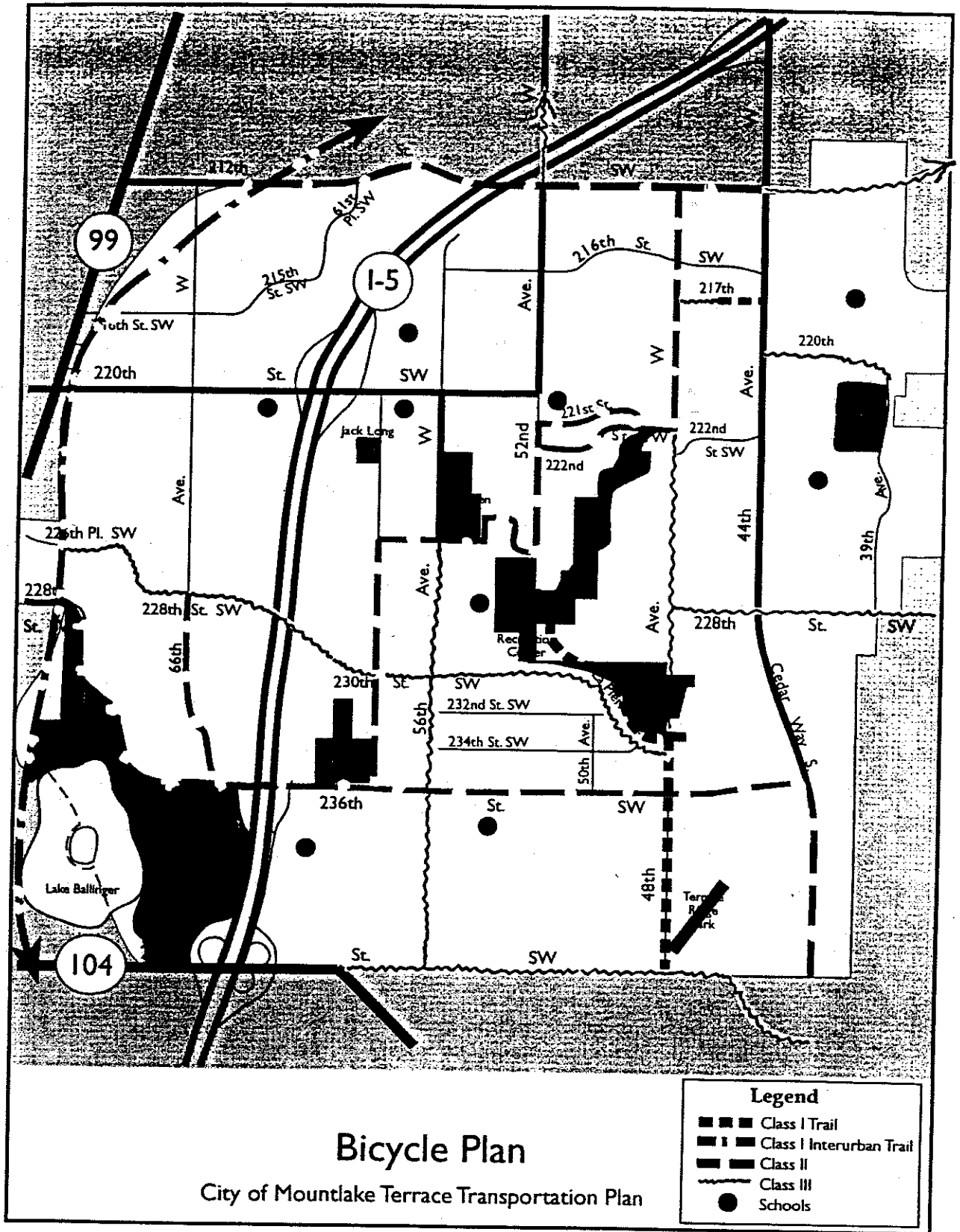


Figure D-6: Mountlake Terrace Bicycle Plan

