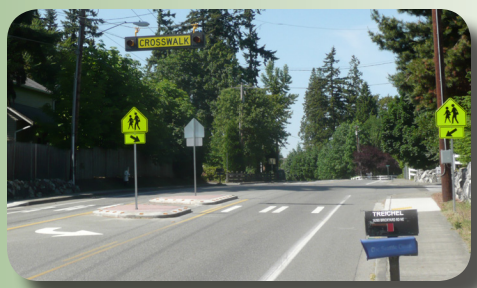
Stationary Radar
Speed Limit Sign

School Zone Crossing
Before Improvements



School Zone Crossing
After Improvements

School Zone Flasher

Collector Corridor Traffic Safety Program

Public Works Department
City of Bothell
October 2009

City of Bothell™

Collector Corridor Traffic Safety Program
of the
City of Bothell

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1 - INTRODUCTION

The City of Bothell Collector Corridor Traffic Safety Program has been developed to respond in a uniform manner to traffic related issues and safety improvements on collector roadways within the City. The Program will provide a means to address safe mobility for all users along collector streets. The Collector Corridor Traffic Safety Program is intended to apply to roadways which are defined as "collectors" in the Transportation Element of the City's Comprehensive Plan, *Imagine Bothell:*

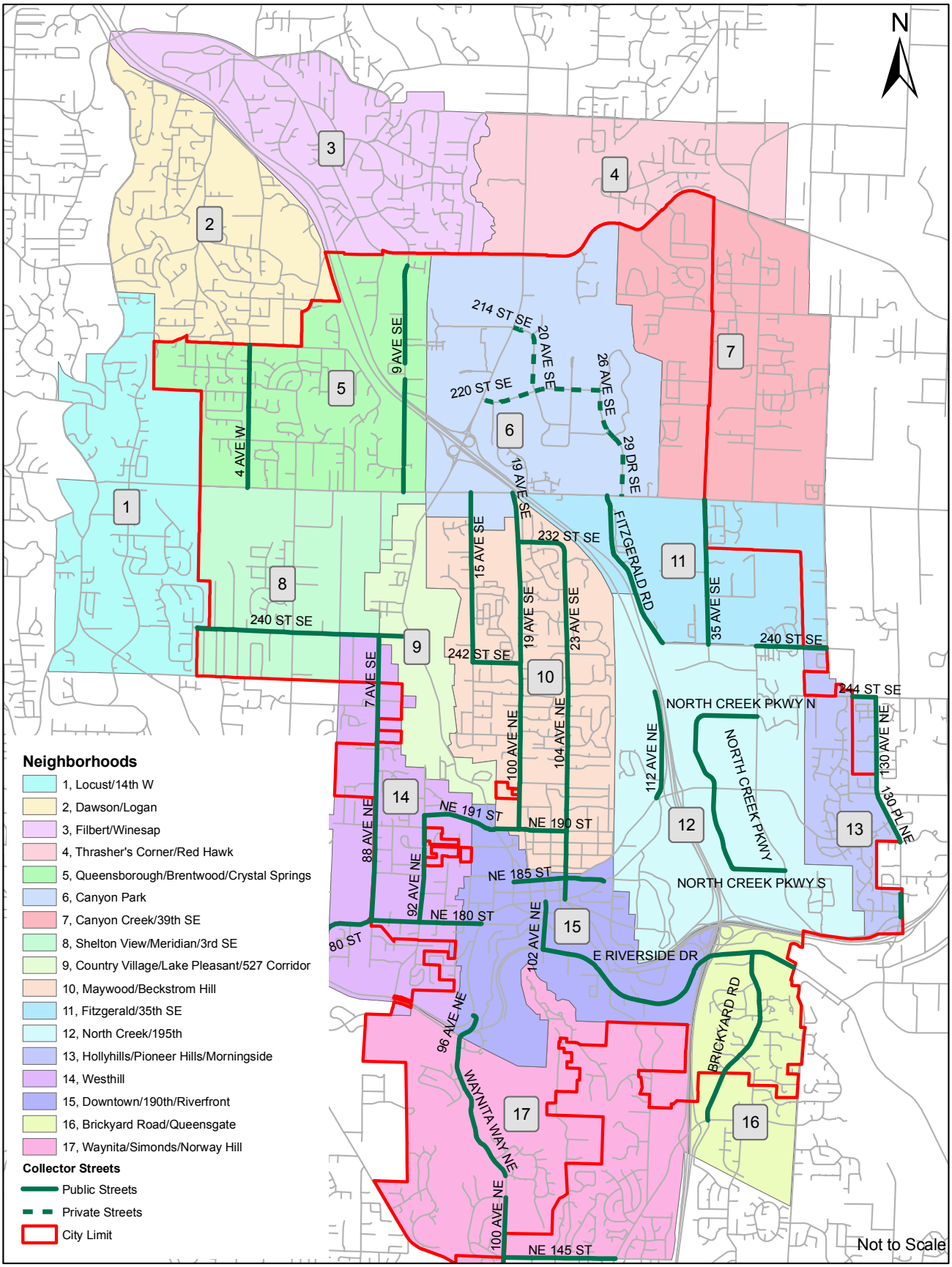
"Collector streets connect minor and principal arterials to neighborhoods and subdivisions. They are intended to be the lowest level classification for an arterial and are not intended to provide through connections except between neighborhoods within Bothell."

The City of Bothell has approximately 150 miles of arterial roadways and local streets of which approximately 24 miles are designated "collector" arterials or about 12 percent of the total road mileage within the City. The collectors are typically bordered by residential uses with direct residential access or indirectly from subdivision access roads. The posted speed limit on City collectors are between 25 and 35 mph. **Figure 1** shows a map of the current designated collectors within the City of Bothell.

Program History

In the spring of 2006, the City of Bothell undertook a comprehensive study of the traffic calming needs in its residential neighborhoods. That effort led to the development of the Bothell Citywide Traffic Calming Program which was adopted by the City Council on July 18, 2006 (Resolution 1191- 2006).

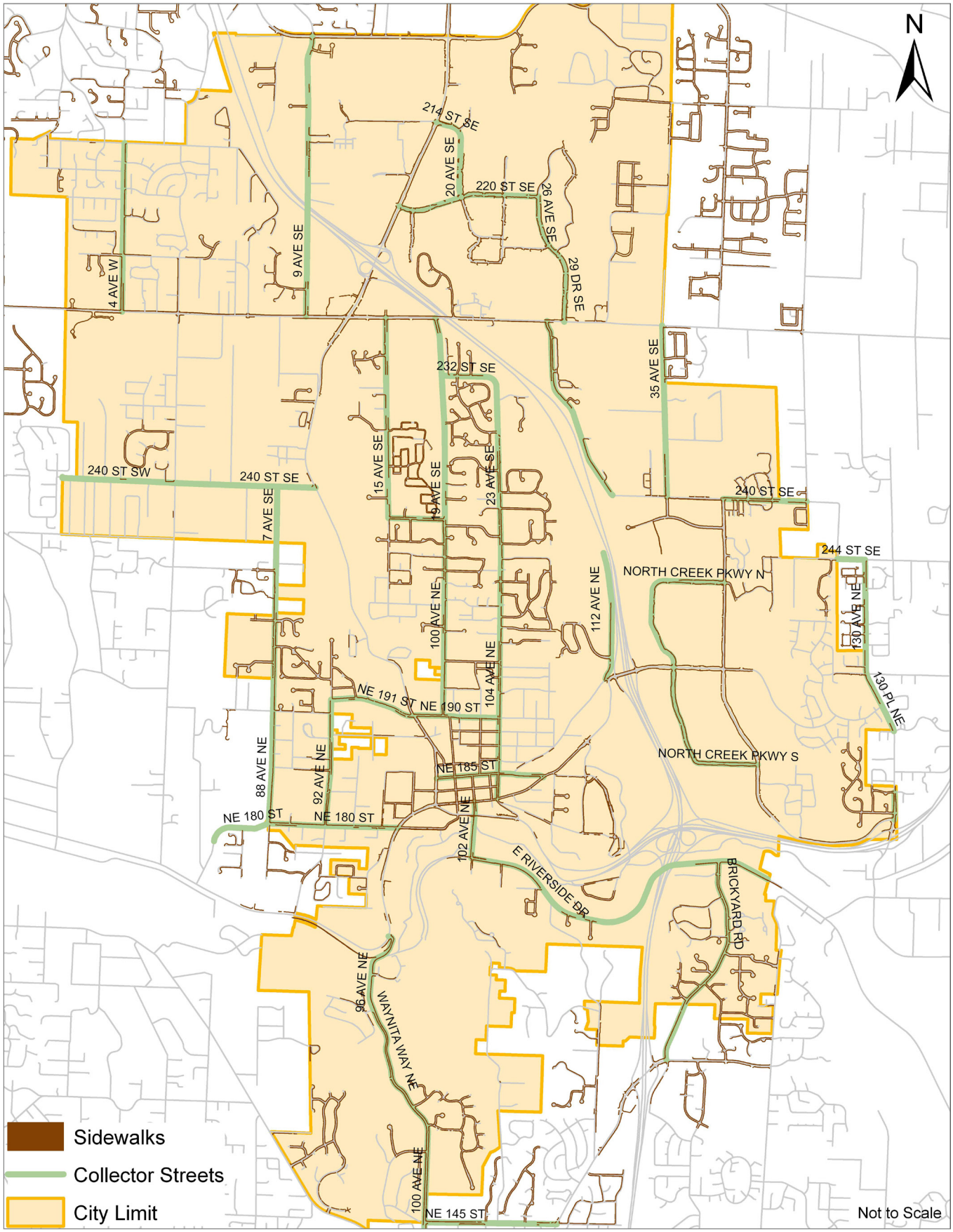
The Citywide Traffic Calming Program was then utilized to develop and implement a series of traffic calming treatments in Bothell's Westhill neighborhood. The Citywide Traffic Calming Program has been aimed at addressing traffic safety issues along residential streets. A parallel effort began in 2007 to expand such a program to address motorized and non-motorized traffic, and pedestrian and school children crossings along Bothell's collector roadways. Since collector roadway concerns are not addressed in the Citywide Traffic Calming Program, the Collector Corridor Traffic Safety Program was developed to address these concerns. **Figure 2** shows the City of Bothell's collector roadways and existing sidewalk system. The graphic is often used to assist in the identification process for opportunities to improve and enhance pedestrian connectivity along the collector roadway system.



City of Bothell

FIGURE 1
COLLECTOR STREETS IN NEIGHBORHOODS

COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM



City of Bothell

FIGURE 2
COLLECTOR STREETS & SIDEWALKS
Printed: August 2009

COLLECTOR CORRIDOR
TRAFFIC SAFETY
PROGRAM

The adoption process for the Collector Corridor Traffic Safety Program included City staff review through the Public Works Technical Traffic Committee which includes members from the Transportation, and Maintenance and Operations divisions of Public Works, Community Development, and the Bothell Police and Fire Departments. The program was then brought to the City Council for review and public input, and ultimately Council adoption by resolution.

The application of the Collector Corridor Traffic Safety Program is expected to provide the process for obtaining the goals and objectives of maintaining safety and traffic operations of the collector designated roadways through policy revisions and/or installation of physical devices. Many of the techniques and tools in this Program have already been included in the adopted Citywide Traffic Calming Program; however, the unique application of these treatments to collector roadways are not covered through the Citywide Traffic Calming Program.

2 - PROGRAM GOALS

2.1 - Program Goals

The goals of the Collector Corridor Traffic Safety Program are primarily to enhance vehicular, pedestrian, and bicycle safety along the City's collector roadways. Residents use the collector roadways to travel from the local streets to reach the City's major regional arterial street network which connect to their final destinations such as employment, shopping, or services.

Specific goals of the Program are:

1. Reduce the 85th percentile travel speeds to less than 5 mph over the posted speed limit
2. Provide safe pedestrian crossings and mobility
3. Maintain continuity of the bicycle network
4. Balance vehicular and non-motorized modes of travel mobility
5. Reduce severity and frequency of accident occurrence
6. Provide safe children crossings in school zones
7. Accommodate Americans with Disabilities Act (ADA) needs

In designing and implementing the Collector Corridor Traffic Safety Program along any collector corridor, adverse impacts on the adjacent local streets and parallel corridors will be addressed. Collector improvements are not meant to deter traffic to other routes. Also, in the selection of a collector corridor, attempts will be made to ensure an overall citywide equity in addressing non-motorized crossing safety and speed management.

2.2 - Program Criteria

The criteria developed for this program are related to both operational characteristics of collectors as well as roadway geometry characteristics such as the following:

Operational characteristics - vehicular volumes and travel speeds
Geometric design characteristics - street widths, roadway alignment, number of travel and bike lanes.

These criteria were found to be useful in establishing parameters upon which improvement needs could be prioritized. Program parameters to determine application and implementation procedures were developed and are discussed below.

2.3 - Program Parameters

The most important criteria that seem to affect collector roadway safety are speed, traffic volumes, and accidents. Therefore, the criteria used to determine whether improvements should be considered for the collector roadway in question are:

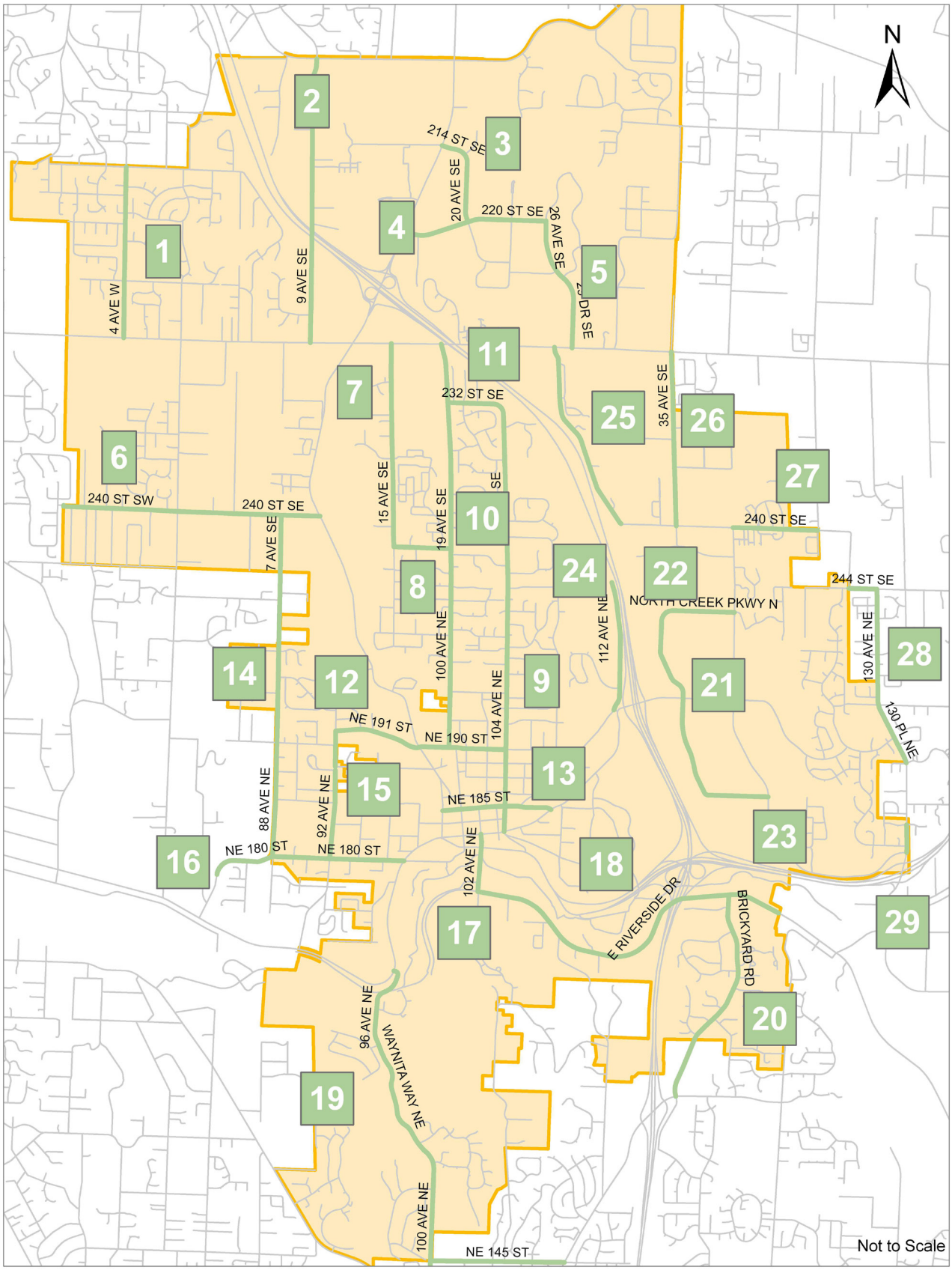
1. *Speed:* The 85th percentile speeds are greater than or equal to 5 mph over the posted speed limit; and

2. *Traffic Collision Rate/MVM:* Total collision of four or more per year.

Note: Traffic volumes of 10,000 vehicles per day was selected as the upper limit of applicability for the Collector Roadway Program.

3 - CORRIDOR SAFETY CONCERNS

Safety concerns along the collector roadways are related to both vehicular and non-motorized traffic conditions. There are 29 collector roadways within the City. Of these, over 70 percent (26 of the 37 sections) experience high speed traffic (defined as having 85th percentile speeds that equal or exceed the posted speed limit by at least 5 mph). Existence of this high speed traffic is a major safety concern to many residents and also seems to be a contributing factor to accident occurrence and their severities. **Figure 3** shows the location indexes of these facilities and the operational characteristics of these collector roadways are summarized in **Table 1**.



City of Bothell

FIGURE 3
COLLECTOR STREET DATA INDEX

COLLECTOR CORRIDOR
TRAFFIC SAFETY
PROGRAM

Table 1
Existing Collector Street Data
(Data collected in 2007 unless otherwise indicated)

Location on Data Index Map (see Figure 3)	Street	From	To	Speed Limit (MPH)	85% Speeds	5+ MPH Over	Daily Traffic Volumes	Location on Neighborhood Map (see Figure 1)
1	4th Ave W	228th St SW	216th St SW	30	35	x	6500	5
2	9th Ave SE	228th St SW	SR 524	35	39		7100	5
3	20th Ave SE	220th St SE	SR 527	25	N/A		N/A	6
4	220th St SE	SR 527	26th Pl SE	25	29		8900	6
5	29th Dr SE	26th Pl SE	228th St SE	25	31		6300	6
6-a	240th St SE	7th Ave W	Meridian	25	32	x	2200	8
6-b	240th St SE	7th Ave SE	SR-527	30	38	x	10000	9
7	15th Ave SE	242nd St SE	228th St SE	35	39		4000	6, 10
8	242nd St SE	15th Ave SE	19th Ave SE	25	32	x	1600*	6, 10
9-a	104th Ave NE (23rd Ave SE)	232nd St SE	242nd St SE	25	39	x	3400	10
9-b	104th Ave NE (23rd Ave SE)	204th St SE	NE 190th St	25	30	x	5500	10
10-a	100 Ave NE (19th Ave SE)	228th St SE	232nd St SE	35	41	x	8700	10
10-b	100 Ave NE (19th Ave SE)	232nd St SE	242nd St SE	35	44	x	4500	10
10-c	100 Ave NE (19th Ave SE)	242nd StSE	NE 190th St	35	40	x	7900	10
11	232nd St SE	19th Ave SE	23rd Ave SE	25	31	x	4000*	10
12-a	NE 190th St	92nd Ave NE	SR-527	25	34	x	4100*	14, 15
12-b	NE 190th St	SR-527	100th Ave NE	25	31	x	7400*	15, 10
12-c	NE 190th St	100th Ave NE	104th Ave NE	25	30	x	6400*	10
13	NE 185th St	SR 527	Beardslee Blvd	25	30	x	5700	15
14-a	88th Ave NE	240th St SE	NE 203rd Pl	35	43	x	4200*	14
14-b	88th Ave NE	NE 203rd Pl	NE 193rd St	35	34		4300*	14
14-c	88th Ave NE	NE 193rd St	NE 180th St	35	40	x	3500*	14
15	92nd Ave NE	NE 180th St	NE 190th St	25	32	x	3700	14
16	NE 180th St	84th Ave NE	SR 522	25	35	x	6000	14, 15
17	102nd Ave NE	E Riverside Dr	Beardslee Blvd	25	32	x	8200	15
18	E Riverside Dr	102nd Ave NE	124th Ave NE	25	33	x	7100	15, 16
19	100 Ave NE/ Waynita Way	Simonds Rd NE/ NE 145th St	SR 522	25	37	x	10000	15, 17
20	Brickyard Rd	NE 160th St/ Woodinville Way NE	E Riverside Dr	25	37	x	5000**	16
21	North Creek Pkwy	North Creek Pkwy N	North Creek Pkwy S	25	33	x	6400	12
22	North Creek Pkwy N	North Creek Pkwy	120th Ave NE	25	39	x	3500	12
23	North Creek Pkwy S	North Creek Pkwy	120th Ave NE	25	N/A		N/A	12
24	112th Ave NE	I-405	Ross Rd	25	N/A		N/A	12
25	Fitzgerald Rd	228th St SW	240th St SE	30	36	x	5400	11
26	35th Ave SE	228th St SW	240th St SE	35	42	x	6500	11
27	240th St SE	120th Ave NE	45th Ave SE	30	33		5000	11
28	130th Ave NE/ 130th Pl NE	NE 190th St	NE 205th St	35	36		7200	13
29	132nd Ave NE	NE 180th St	NE 185th St	35	36		8200**	13

***Data Collected in 2006**

****Data Collected in 2008**

Data Collected in 2009

4 - PUBLIC SAFETY CONCERNS

Based on conversations and written communication between the City staff and concerned citizens, the following summary of safety related issues has been developed:

4.1 - Vehicular Traffic

- Fast traffic
- Difficult access from side streets or driveways due to high traffic volumes
- Sight distance issues
- High accident history

4.2 - Non-Motorized Traffic

- Lack of safe and/or adequate number of pedestrian crossings
- Lack of pedestrian facilities along the roadway
- Pedestrian visibility issues (line of sight)
- Inadequate street lighting

5 - POTENTIAL CONSIDERATIONS AND OPTIONS

The treatment options considered for this program are aimed to reduce speed and provide safe non-motorized crossings along collector roadways. There are two general types of treatments which are typically considered to accomplish these goals. They are horizontal and vertical deflection treatments. Studies have found that vertical deflection treatments are typically more effective in reducing travel speed than horizontal deflection treatments but are less aesthetic and may reduce emergency vehicle response. However, by definition, the purpose of collectors is to keep traffic moving and typically carry higher traffic volumes than residential streets. It is not the intent of these treatments to delay or hamper traffic flow on Bothell's collector roadways, rather to reduce speed to the posted speed limits.

Horizontal deflection treatments require vehicles to maneuver around devices that act as an obstruction as a means of raising driver awareness, which in turn would require a reduction in speed to negotiate through the devices. Examples of horizontal deflection measures include medians, curb extension/bulb-outs, chokers, speed dots, traffic circles, and lane narrowing using striping and channelization.

Vertical deflection treatments require vehicles to drive over a device that is built above the roadway grade to create an obstruction that must be driven over at a slower speed (dependent on design) to avoid potential loss of driver control or vehicle damage. Examples of vertical deflection treatments include speed cushions, humps, and or speed tables. Vertical deflection treatments for collector roadways

in this program will be considered on a conditional (case-by-case) basis due to their potential adverse impacts on emergency service response routes. Coordination with emergency services such as fire and police is specified in the evaluation and approval process. The treatment options utilized by other agencies are summarized in **Table 2.**

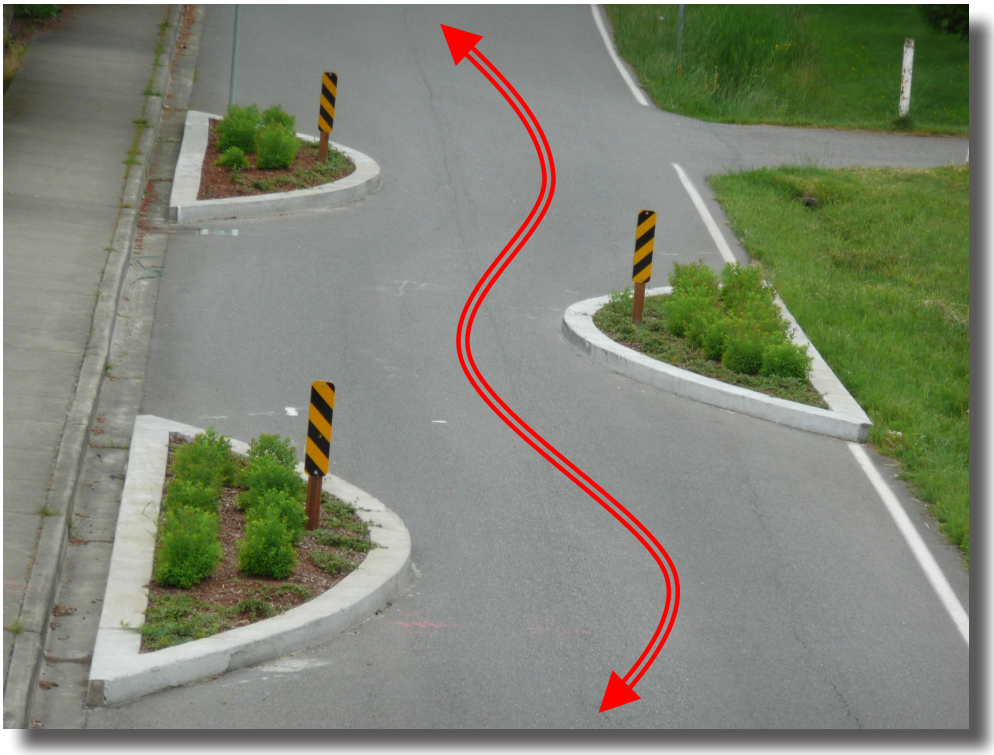
Figure 4 depicts examples demonstrating horizontal versus vertical vehicular deflection treatments. The preferred use of horizontal deflection devices over vertical deflection devices on collector roadways to reduce speed while not impacting traffic flow or carrying capacity, is consistent with the plans and programs of other agencies.

Table 2
Other Agencies Treatment Options

		Agency				
Vehicular Deflection Impact	**Treatments**	**Bellevue**	**Redmond**	**Kirkland**	**Shoreline**	**Bothell**
Vertical	Speed Cushion	Yes(1)	Yes	No	Yes(2)	**No**
	Speed Table	Yes(1)	No	No	Yes(2)	**Yes(4)**
Horizontal	Choker	No	No	Yes	Yes	**Yes(3)**
	Median	Yes	Yes	Yes	Yes	**Yes**
	Bulb-Out	Yes	Yes	Yes	Yes	**Yes(3)**
	Curb Extension	Yes	Yes	Yes	Yes	**Yes(3)**
	Speed Dot	Yes	No	Yes	Yes	**Yes(5)**
	Traffic Circle	Yes(1)	Yes	No	No	**No**
Other	Speed Radar Sign	Yes	Yes	Yes	Yes	**Yes**
	Turn Restriction	N/A	N/A	No	Yes	**No**
	Entry Treatment	Yes	Yes	Yes	Yes	**Yes**
	Textured Crosswalk	Yes	Yes	Yes	Yes	**Yes(4)**
	Lane Narrowing	Yes	Yes	Yes	Yes	**Yes**
	Raised Intersection	N/A	Yes	Yes	Yes(2)	**No**

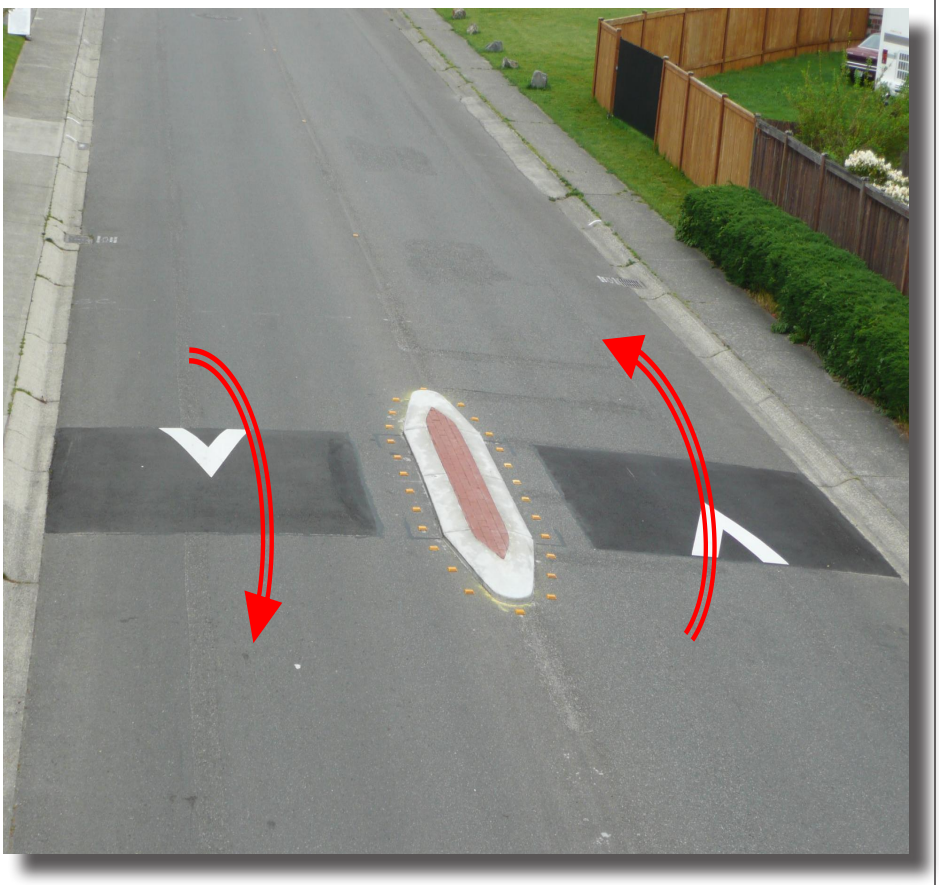
(1) Under 3500 vehicles per day (VPD) for speed cushions or speed tables and 2000 VPD for traffic circle
(2) Treatments allowed but not recommended on arterial roadways
(3) Only with no impact to bike lanes
(4) Not included in current Bothell CitywideTraffic Calming Program
(5) Unless speed exceeds 35 MPH

Of all the devices compared among other agencies, all of the horizontal deflection treatments are acceptable uses for collector roadways at each of the other agencies, with the exception of traffic circles and chokers due to their potential impact on traffic flow and operations. Of the vertical deflection treatments, only the speed table will be considered for Bothell collector roadways. Some of the other agencies also use speed cushions or raised intersections on their roadways; however, the definition of a collector roadway at other agencies may be different from those defined in Bothell. Raised intersections have a high cost with limited location applicability in Bothell.



Horizontal Deflector

Vertical Deflector



City of Bothell

FIGURE 4
VEHICULAR DEFLECTOR TREATMENTS

COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

The Collector Corridor Traffic Safety Program is designed for collector roadways, whereas, the Citywide Traffic Calming Program treatments focus on local streets. Speed dots, speed tables, and traffic circles are considered on a conditional basis for all designated collectors. **Table 3** is a list of the current tool box of treatments used in the City's Traffic Calming Program and the application differences between the Traffic Calming and Collector Corridor Traffic Safety Programs.

Table 3
Traffic Safety/Calming Treatments

Vehicular Deflection Impact	Treatments	Collector Roadway (posted speed limit)		Local Street Citywide Traffic Calming
		30 MPH or Less	Over 30 MPH	
Vertical	Speed Cushion	No	No	Yes
	Speed Table	Conditional	No	Yes
Horizontal	Choker	Yes	Yes	Yes
	Median	Yes	Yes	Yes
	Bulb-Out/Curb Extension	Yes	Yes	Yes
	Speed Dot	Conditional	Conditional	Yes
	Traffic Circle	Conditional	Conditional	Yes
	Chicanes	No	No	Yes
	Diverter	No	No	Yes
	Partial Closure	No	No	Yes
Other	Speed Radar Sign	Yes	Yes	Yes
	Turn Restriction	No	No	Yes
	Entry Treatment	Yes	Yes	Yes
	Textured Crosswalk	Yes	Yes	Yes

In addition to the treatments outlined in Table 3, other treatments could also be considered for collectors that are not part of the current Citywide Traffic Calming Program. These treatments may include speed limit revisions and/or intersection traffic control changes.

The preferred collector treatments that may be considered for use along the City of Bothell collector roadways to address traffic safety concerns are listed below and shown on the corresponding graphic pages.

1. Medians (page 13)
2. Traffic Circles (page 13)
3. Speed Dots (page 13)
4. Chokers (page 14)
5. Curb Extensions/Bulb-Outs (page 14)
6. Stationary Radar Signs (page 15)
7. Speed Tables (page 15)
8. Entry Treatments (page 15)

Treatments for Roadways with Bike Lanes

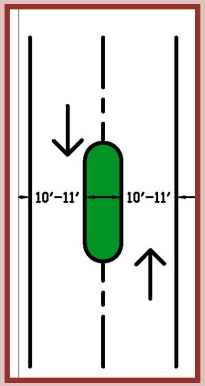
The treatments shown above in Table 3 are effective for roadways without bike lanes. However, to maintain continuity along roadways with a designated bike lane, the proposed treatment includes a modified curb extension with an at-grade ramp through the bike lane section with a curb face next to the vehicle travel lane to create the narrower roadway section for calming traffic. **Figure 5** shows an example of the proposed treatment.

Treatments for Pedestrian/Non-Motorized Crossings

Uncontrolled pedestrian crossings will be evaluated to meet Federal Highway Administration (FHWA) crossing application guidelines as referenced in the FHWA documentation summarized in **Table 4**. Pedestrian crossing treatments will vary depending on location, roadway width, travel speeds, traffic volumes, and existing pedestrian facilities. To enhance the visibility of future pedestrian crossings, low cost measures such as pedestrian crossing flags, pedestrian safety cones, advanced signing or pavement markings (advance stop lines) may be used. These tools may be implemented in lieu of other costlier (but more effective) internally illuminated overhead or side mounted crosswalk signs or flasher systems.

PEDESTRIAN CROSSING FLAGS

TREATMENT GRAPHICS (1 of 3)



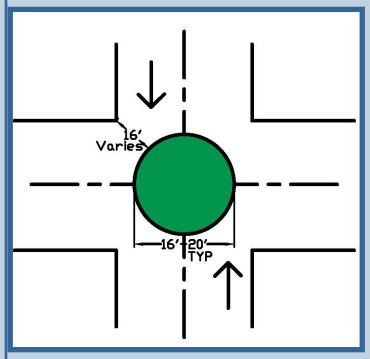
1. MEDIANS

ADVANTAGES

- Narrowed lanes can slow vehicles
- Provides pedestrian refuge
- May decrease cross traffic
- Opportunity for landscaping and visual enhancement

DISADVANTAGES

- May require removal of some on-street parking
- May prohibit or limit driveway access
- May affect emergency response during inclement weather if installed on a grade



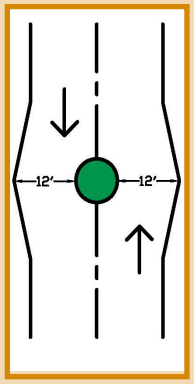
2. TRAFFIC CIRCLES

ADVANTAGES

- May decrease traffic speeds
- May divert traffic if adjacent arterial street exists
- Opportunity for landscaping and beautification

DISADVANTAGES

- Emergency response may be adversely impacted
- May cause diversion of traffic to adjacent neighborhood streets
- May require removal of some on-street parking



3. SPEED DOTS

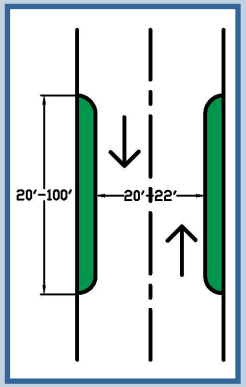
ADVANTAGES

- May decrease traffic speeds
- May divert traffic if adjacent arterial street exists
- Opportunity for landscaping and beautification

DISADVANTAGES

- Emergency response may be adversely impacted
- May cause diversion of traffic to adjacent neighborhood streets
- May require removal of some on-street parking

TREATMENT GRAPHICS (2 of 3)



4. CHOKERS*

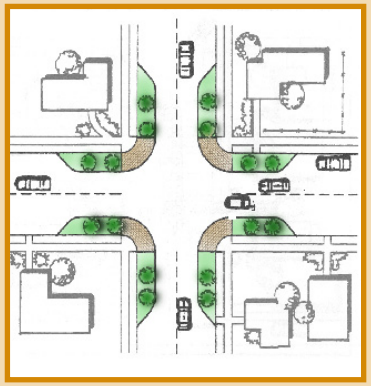
ADVANTAGES

- Narrowed lanes can slow vehicles
- May shorten pedestrian crossing width
- Prevents passing
- Improves sight distance
- Opportunity for landscaping and visual enhancement

DISADVANTAGES

- May require removal of some on-street parking
- May create hazard for bicyclists
- May prohibit or limit driveway access
- May create drainage issues
- May affect emergency response during inclement weather if installed on a grade

*Not used with striped bike lanes



5. CURB EXTENSIONS/BULB OUTS*

ADVANTAGES

- Reduces pedestrians' crossing distance
- May increase sight distance at intersections
- Narrowed lanes can slow vehicles
- Opportunity for landscaping

DISADVANTAGES

- May require removal of some on-street parking
- May create drainage issues
- Effective curb extension design may limit marked bicycle lanes
- Impacts large vehicle turn movements

*w/Bike Lane Treatment - provides for safe bike access along bike routes

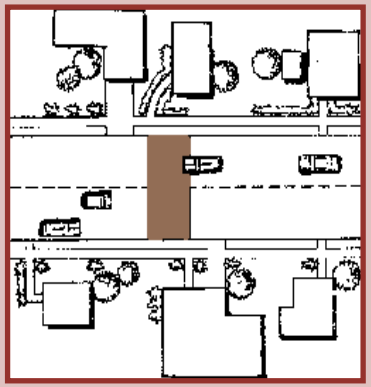
6. STATIONARY RADAR SIGNS

ADVANTAGES

- Heightens driver awareness to the posted speed limit
- Does not impact emergency response vehicles
- Slows traffic - potentially 1-6mph decrease in the vicinity of the sign
- May be installed on roadways which do not qualify for other devices due to roadway slopes, volumes, or other characteristics

DISADVANTAGES

- Installation sites must be near power source
- Effectiveness may decrease over time



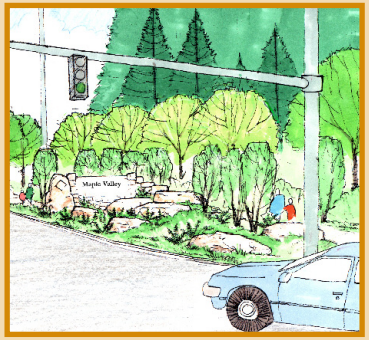
7. SPEED TABLES

ADVANTAGES

- Slows traffic more gradually than speed cushions
- Provides level surface for potential pedestrian access
- Self-enforcing

DISADVANTAGES

- May cause diversion of traffic to adjacent neighborhood streets
- Acceleration/deceleration noise adjacent to speed table
- Higher potential for drainage obstruction



8. ENTRY TREATMENTS

ADVANTAGES

- Notifies drivers that they are entering a neighborhood or residential area
- Narrowed lanes may slow vehicles
- Opportunity for landscaping and/or neighborhood signs

DISADVANTAGES

- May require parking removal near the treatment
- May create sight distance obstacles

TREATMENT GRAPHICS (3 of 3)

City of Bothell

FIGURE 5
CURB EXTENSION TREATMENT
WITH BIKE LANES

COLLECTOR CORRIDOR
TRAFFIC SAFETY
PROGRAM

Table 4
Recommended FHWA Guidelines for Installing Marked Crosswalks and Other Needed Pedestrian Improvements at Uncontrolled Pedestrian Crossings*

Roadway Type (Number of Travel Lanes and Median	Vehicle ADT ≤9,000			Vehicle ADT >9,000 to 12,000			Vehicle ADT >12,000 to 15,000			Vehicle ADT >15,000		
	Speed Limit**											
	≤30 mph	35 mph	40 mph	≤30 mph	35 mph	40 mph	≤30 mph	35 mph	40 mph	≤30 mph	35 mph	40 mph
Two Lanes	C	C	P	C	C	P	C	C	N	C	P	N
Three lanes	C	C	P	C	P	P	P	P	N	P	N	N
Multilane (Four or more lanes) with raised median***	C	C	P	C	P	N	P	P	N	N	N	N
Multilane (Four or more lanes) without raised median	C	P	N	P	P	N	N	N	N	N	N	N

Notes for Table 4:

C = Candidate sites for marked crosswalks Marked crosswalks must be installed carefully and selectively. Before installing new marked crosswalks, an engineering study is needed to determine whether the location is suitable for a marked crosswalk. For an engineering study, a site review may be sufficient at some locations, while a more in-depth study of pedestrian volume, vehicle speed, sight distance, vehicle mix, and other factors may be needed at other sites. It is recommended that a minimum utilization of 20 pedestrian crossings per peak hour (or 15 or more elderly and/or child pedestrians) be confirmed at a location before placing a high priority on the installation of a marked crosswalk alone.

P = Possible increase in pedestrian crash risk may occur if crosswalks are added without other pedestrian facility enhancements. These locations should be closely monitored and enhanced with other pedestrian crossing improvements, if necessary, before adding a marked crosswalk.

N = Marked crosswalks alone are insufficient, since pedestrian crash risk may be

increased by providing marked crosswalks alone. Consider using other treatments, such as traffic-calming treatments, traffic signals with pedestrian signals where warranted, or other substantial crossing improvement to improve crossing safety for pedestrians.

In some situations (e.g., low-speed, two-lane streets in downtown areas), installing a marked crosswalk may consolidate multiple crossing points. Engineering judgment should be used to install crosswalks at preferred crossing locations (e.g., at a crossing location at a streetlight as opposed to an unlit crossing point nearby). While overuse of marked crossings at uncontrolled locations should be avoided, higher priority should be placed on providing crosswalk markings where pedestrian volume exceeds about 20 per peak hour (or 15 or more elderly pedestrians and/or children per peak hour).

Marked crosswalks and other pedestrian facilities (or lack of facilities) should be routinely monitored to determine what improvements are needed.

* These guidelines include intersection and midblock locations with no traffic signals on the approach to the crossing. They do not apply to school crossings. A two-way center turn lane is not considered a median. Crosswalks should not be installed at locations that could present an increased safety risk to pedestrians, such as where there is poor sight distance, complex or confusing designs, a substantial volume of heavy trucks, or other dangers, without first providing adequate design features and/or traffic control devices. Adding crosswalks alone will not make crossings safer, nor will they necessarily result in more vehicles stopping for pedestrians. Whether or not marked crosswalks are installed, it is important to consider other pedestrian facility enhancements (e.g., raised median, traffic signal, roadway narrowing, enhanced overhead lighting, traffic-calming measures, curb extensions), as needed, to improve the safety of the crossing. These are general recommendations; good engineering judgment should be used in individual cases for deciding where to install crosswalks.

** Where the speed limit exceeds 64.4 km/h (40 mi/h), marked crosswalks alone should not be used at non-signalized locations.

*** The raised median or crossing island must be at least 1.2 m (4ft) wide and 1.8 m (6ft) long to serve adequately as a refuge area for pedestrians, in accordance with MUTCD and American Association of State Highway and Transportation Officials (AASHTO) guidelines.

6 - PROGRAM DEVELOPMENT PROCESS

Similar to the Citywide Traffic Calming Program, future revisions to the adopted Collector Corridor Traffic Safety Program process and the treatment types may be considered. Depending on the effectiveness of the current process and treatments, and Bothell's current roadway characteristics, the program will be reviewed and evaluated with modifications if and when appropriate. All collector corridor and traffic calming projects provide for and encourage citizen involvement. The Program

recommended for developing specific Collector Corridor Traffic Safety treatment recommendations is outlined below with the process steps summarized in **Figure 6.**

6.1 - Program Process Steps

1. Upon the receipt of an inquiry or a petition signed by a minimum of five residents, or by staff initiation, a review will be conducted. If necessary, historical information will be reviewed and a field investigation including data collection may be performed.

2. If the evaluation and analysis confirms that the corridor identified meets the threshold criteria of the program, the Public Works staff will develop a preliminary plan. The documented problem and the preliminary plan will be presented to the Technical Traffic Committee (TTC) for discussion. Input from the various departments and disciplines will allow for a well rounded solution.

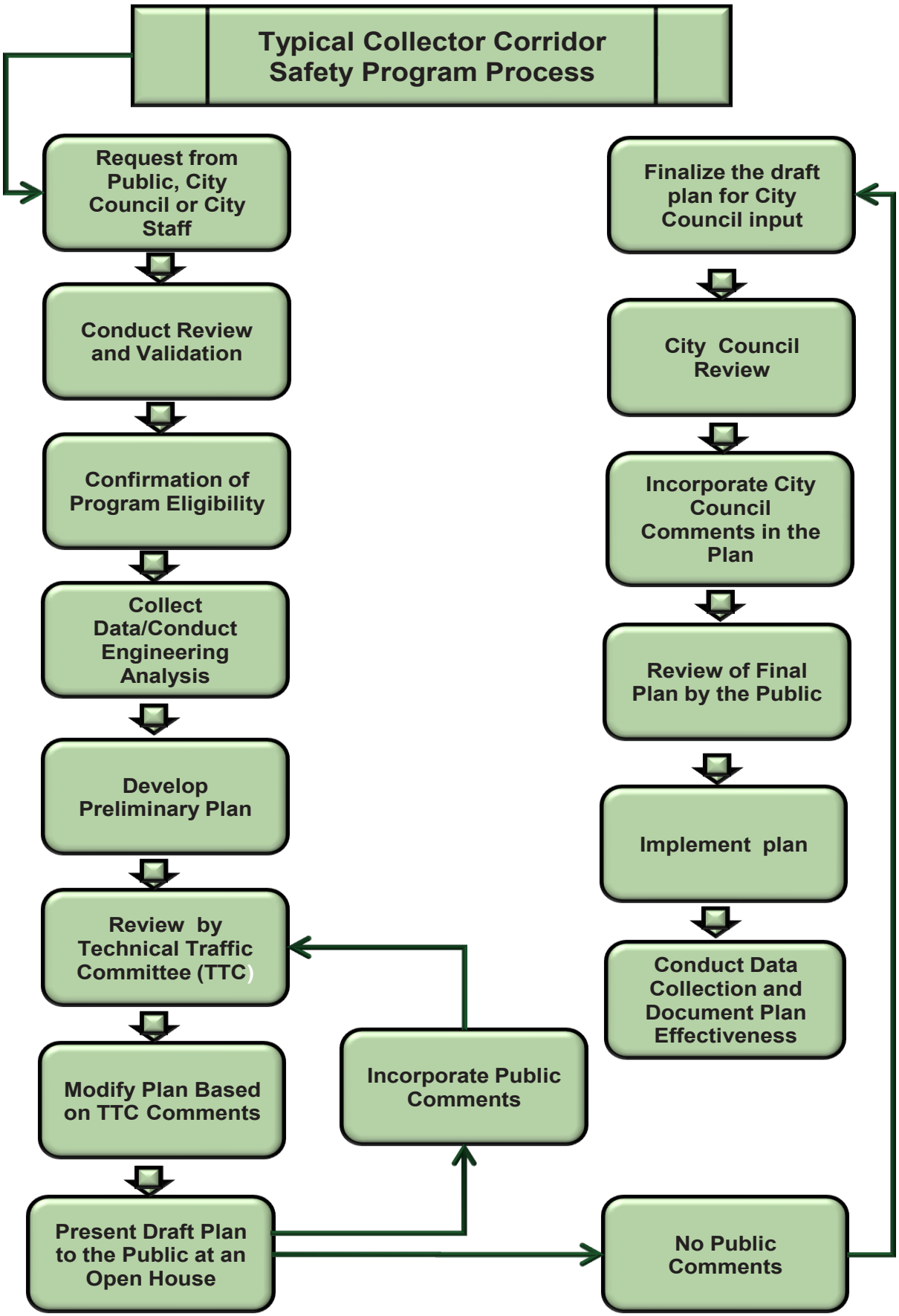
3. Staff will incorporate the TTC comments where appropriate and prepare for a community open house and present the proposed implementation plan and gather community input. The plan may be revised depending on public comment.

4. Staff will brief the City Council on the final corridor improvement plan and the community comments, although no Council action will be required unless a speed limit change is proposed. Staff will then prepare a final implementation plan for a second community open house presentation.

5. Implementation of the plan will be carried out upon the development of a plans, specifications, and estimate (PSE) bid package and the ultimate selection of a contractor. A follow up evaluation to measure the effectiveness of the plan will occur approximately three to six months after project completion. The evaluation should consider comparable seasonal traffic conditions for comparison purposes.

6.2 - Program Time-line

The Collector Corridor Traffic Safety Program time-line is expected to take approximately two years to complete (from the time the project has been identified and validated to the completion of the construction phase of the project). Such a time frame is for a typical project and it is possible that some projects may be completed sooner or longer than the two year period depending on the complexity and the construction costs. **Table 5** depicts the typical time-line for a collector corridor project based on the steps as identified in this program.

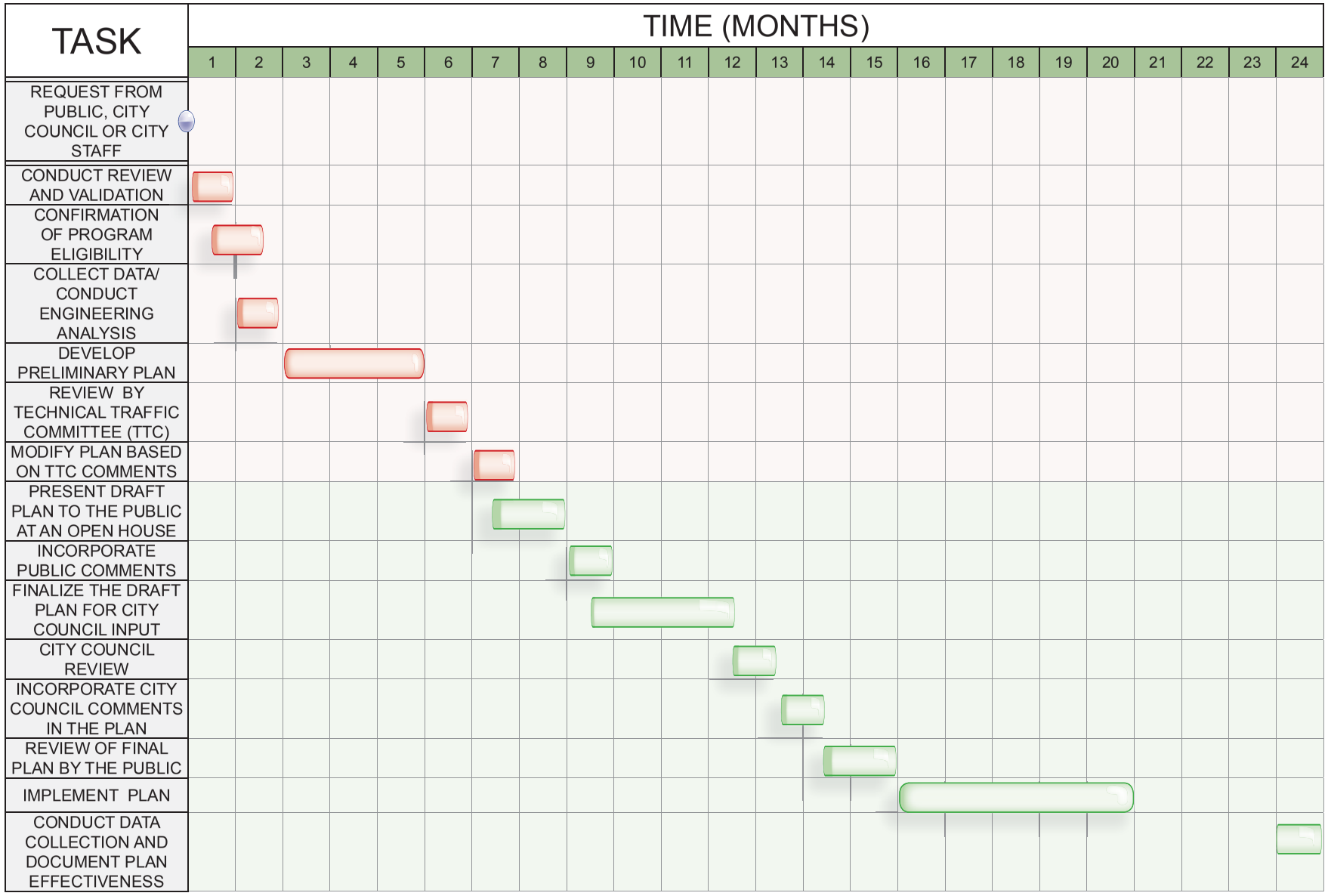


City of Bothell

FIGURE 6
PROGRAM PROCESS DIAGRAM

COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

TABLE 5
COLLECTOR CORRIDOR SAFETY PROGRAM
TYPICAL IMPLEMENTATION TIME-LINE



The number of projects to qualify for this program could potentially exceed the available funding. Therefore, a ranking criterion as noted in **Table 6** has been developed for use in evaluating and prioritizing project requests.

Potential projects will be scored based on the points assigned for each criteria and totaled. The potential projects with the highest score will have the highest initial priority for consideration. Other non-technical transportation factors to consider for selection for program development will include estimated project costs and schedules, available City funding, coordination with other City of Bothell capital facilities projects and private development projects.

7 - DESIGN CONSIDERATIONS

The following design considerations and guidelines will be reviewed for collector corridor traffic safety plans developed under this Program:

1. At least one of the two Program Threshold Criteria (Section 2.3) are met.

2. Safety treatments priority will be applied to collectors carrying less than 10,000 vehicles per day as a part of this program.

3. Stationary speed radar signs may be used in lieu of physical treatments due to geometric or sight distance concerns or financial constraints.

4. No vertical deflection devices will be used on designated collectors with the exception of the potential use of a speed table on collectors with 25 or 30 MPH posted speed.

5. Travel lanes will not be reduced to less than 10 feet with recommended measures.

6. New midblock crosswalk locations on collector roadways should include a center median and/or curb bulb-outs and appropriate illumination where adequate right of way space allows.

7. Existing designated bike lanes will not be adversely impacted by this program.

8. Surface water and drainage issues need to be reviewed and addressed if impacted by the treatment plan.

Table 6
Ranking Criteria

CRITERIA	POINTS
Traffic Volume (vehicle/day)	
Under 2000	1
2001-3500	2
3501-5000	3
> 5000	4
Correctable Accidents History	
1 per year per 1/4 mile	3
2 per year per 1/4 mile	4
3 per year per 1/4 mile	5
85% Speed	
5-7 MPH	2
8-10 MPH	4
> 10 MPH	6
Street Conditions	
Sidewalk on both sides	1
Sidewalk on one side	2
No Sidewalk	3

9. The improvements should be constructed in compliance under standard ADA requirements.

10. Vertical and horizontal sight distance should be considered for placement of midblock crosswalks and treatment devices if necessary.

11. Use of low maintenance landscaping will be used for treatment devices as applicable.

12. Development of treatments will include the potential to create pervious surface if previously paved.

13. Safety treatment plans will not adversely impact access to adjacent properties, mailboxes, fire hydrants, etc.

14. Treatment plans will minimize impacts to emergency service response and equipment.

15. Treatment plans will have minimal impacts to Public Works Maintenance and Operations activities and tasks.

16. Treatment plans will review and access accident history if data is available.

17. Treatment plans will be reviewed and coordinated with capital facilities and future development projects where applicable.

8 - OTHER DESIGN CONSIDERATIONS

8.1 - Capital Facilities Project and Future Development Coordination

In addition to the community requests and traffic data collected to analyze the traffic safety issue associated with a corridor improvement project, future projects will also need to consider coordination with other Bothell Capital Facilities Projects or property development that may be scheduled or planned in the vicinity of the proposed improvement. Coordination with utility and maintenance programs for surface water drainage improvements and roadway asphalt overlay projects as well as future private or public developments will be reviewed for implementation with the traffic safety improvements to minimize community impacts for motorized and non-motorized travelers.

8.2 - Integration of Green Concepts

In accordance with the City of Bothell's goal of reducing the carbon footprint and achieving increased "green" facilities and roadways, improvement projects involving treatments such as curb extensions, bulb-outs, medians, chicanes, and chokers will need to consider the development of a natural "rain garden" system approach to obtain a sustainable storm water treatment system that manages and reduces flows, and improves water quality and treatment to enhance watershed health. **Figure 7** shows rain garden systems in Portland, OR.

8.3 - Emergency Services Coordination

Traffic safety improvements are typically designed to reduce travel speed along roadways as lower speeds are associated with a safer environment for both vehicles and non-motorized travelers. However, treatments used to lower travel speeds on the City's collectors may also affect emergency service response times as response routes designated by such services may coincide. Therefore, coordination with emergency services staff to identify response routes that may be impacted and the potential time delay with planned treatments would be reviewed to minimize conflicts.

8.4 - Pedestrian Safety Design Considerations

In order to enhance pedestrian crossing safety and as a part of any potential pedestrian crossing project, this program has recognized the need for the integration of American Disability Act (ADA) requirements. Under such a provision ADA accessible ramps would be placed to connect designated crosswalks to the adjacent sidewalk or any raised traffic calming treatments such as medians and bulb-outs. The program also recognizes the need for placement of overhead pedestrian flashers and related push buttons to make the crosswalk more visible to the travelling motorists.

City of Bothell

FIGURE 7
RAIN GARDEN TREATMENTS

COLLECTOR CORRIDOR
TRAFFIC SAFETY
PROGRAM

9 - PUBLIC INVOLVEMENT

The public involvement for a collector corridor plan will be an essential element for the development of a corridor improvement plan. To emphasize the public role and participation, the program specifies for at least two public open house presentations and a Council meeting.

Additionally, the public will be notified through one or more of the following: City website, local newspaper, press releases, portable reader boards and/or direct notification to residents within 300 feet of the project.

10 - PROJECT COST EFFECTIVENESS

The ability to implement the Collector Corridor Safety Program elements is dependent upon the funds budgeted for construction and implementation. The construction costs for the individual treatments could range from approximately $4,000 up to $20,000 depending upon the treatment option selected. Stop signs could cost less than $1,000, if and when warranted. Financial considerations for the design and construction elements of the program would assume the following:

1. Availability of adequate funding.
2. Identification of a specific project based on a priority assessment.
3. Maintenance funding (specifically with Green Concept)

The potential traffic calming and collector corridor treatments effectiveness for various treatment types are summarized in **Table 7**.

Table 7
Treatment Effectiveness Evaluation

Treatments	Typical Cost**	Cost	Overall Effectiveness
Speed Cushion*	$4,000	L	H
Choker	$15,000	M	M
Median	$15,000	M	L
Chicane*	$20,000	H	H
Bulb-Out/Curb Extension	$20,000	H	M
Bike Lane Extension	$10,000	M	M
Speed Dot	$10,000	M	L
Traffic Circle	$15,000	M	H
Diverter*	$10,000+	M	M
Stationary Speed Radar Sign (per direction)	$15,000	M	M
Turn Restriction*	$1,000+	L	L
Entry Treatment	$5,000+	L	L
Stop Signs	500	L	M
Speed Table	$20,000+	H	H

*Not applicable to Collector Roadway
**Add estimated 20% design costs

Notes:
Ranking Definitions: H (High) M (Medium) L (Low)

11 - MAINTENANCE CONSIDERATIONS

Many collector safety and traffic calming treatments offer the opportunity to provide landscaping as a part of the treatment device for added aesthetic value. These treatments include medians, curb extensions, bulb-outs, speed dots, and traffic circles. However, the labor cost to maintain landscaped treatments are significant. The potential for additional treatments requiring maintenance is expected to increase as more treatments are implemented to address traffic concerns.

Therefore, as future improvement projects are designed and developed, the implementation of those allowing landscaped treatments will be contingent upon a commitment of nearby and adjacent residents to maintain the landscaping once the project is completed. In the absence of resident support through pre-construction agreements, the landscaping elements of the projects may be replaced by hard surface in-fills (such as pavers, concrete, or asphalt) in the final design plans. **Figure 8** shows examples of hard surface finishes in lieu of landscaping.

City of Bothell

FIGURE 8
HARD SURFACE TREATMENTS

COLLECTOR CORRIDOR
TRAFFIC SAFETY
PROGRAM

12 - PROJECT EFFECTIVENESS AND EVALUATION

The effectiveness of any completed collector corridor traffic safety plan will be determined and documented for use in future projects and discussions as well as for updating City Council members. Therefore, the following steps will be conducted to review the "before and after" traffic conditions of a completed project:

Pre-construction Traffic Data Documentation

- Traffic data including traffic volumes and travel speed, will be collected for a 3-day period that best represents the typical traffic condition which the concerns are most predominant (i.e., weekdays with or without school in session or weekends).
- The results of the traffic data collection effort will be reviewed and summarized for use in initial public neighborhood meetings and/or presentations to City Council.

Post Project Construction Traffic Data Documentation

- The traffic data will again be collected for evaluation approximately three to six months following completion of the improvements.
- The data will be collected under comparable traffic conditions as the initial data collection effort and will also include traffic volumes and travel speed for a 3-day period.
- A survey will be prepared and mailed for community response in a study area defined to be any residence within 300 feet of the project limits.

Overall Project Effectiveness Assessment

- The results, findings, and conclusions of the before and after traffic data evaluation will be presented to the City's Technical Traffic Committee (TTC) for input and discussion utilizing the Project Effectiveness and Evaluation Guideline Before and After Study provided in the attached appendix.
- A final memo and/or presentation of the evaluation results will be prepared for City Council review and project documentation.

13 - REFERENCES

1. Manual on Uniform Traffic Control Devices, Millennium Edition, U. S. Department of Transportation, Federal Highway Administration, 2000

2. Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials, 2004

3. Traffic Calming State of the Practice, Institute of Transportation Engineers, August 1999

4. Imagine Bothell…Comprehensive Plan, City of Bothell, 2004

5. City of Bothell Design and Construction Standards, City of Bothell, 2000

6. Bothell Citywide Traffic Calming Program, City of Bothell, January 23, 2007

7. Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations Final Report and Recommended Guidelines, FHWA-RD-04-100, Federal Highway Administration, August 2005

8. Portland Green Street Program, City of Portland, OR, 2007

9. City of Sammamish Bike Route Treatment, Sammamish, WA, 2009

10. Washington State Department of Transportation Design Manual, M 22-01, June, 2009

APPENDIX

COLLECTOR SAFETY PROGRAM
CITIZEN INQUIRY AND PETITION FORMS

Date: .....

Contact Name: .....

Address: .....

.....

City: Bothell State: WA Zip Code:

Daytime Phone: .....

E-mail Address: .....

Location of Concern: .....

.....

.....

What concerns do you have about the above location?

.....

.....

.....

Please check all that apply

- ◯ Speeding
- ◯ Pedestrian Safety
- ◯ Accidents
- ◯ Sight Distance
- ◯ Traffic Volume
- ◯ Other (Please describe above)

Return To:
City of Bothell Public Works Department
Attn: Transportation Engineering Division
9654 NE 182nd Street
Bothell, WA 98011
Phone: 425-486-2768 Ext: 4402
www.ci.bothell.wa.us

COLLECTOR SAFETY PROGRAM PETITION

Neighborhood/Street _____ *Page* ____ *of* _____

NO.	NAME	ADDRESS	PHONE	SIGNATURE (one per household)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

PROJECT EFFECTIVENESS AND EVALUATION GUIDELINE
BEFORE AND AFTER STUDY

Project Background

- Origin of Request
- Description of Concern
- Description of Improvements
- Construction Completion Date and Cost

Data Collection

- Before Corridor Improvements
- Data Collection Dates
- Seasonal or Operational Conditions
- After Corridor Improvements

Data Analysis and Effectiveness Assessment

- Data Collection Periods Analyzed
- Data Results Summary
    - Traffic Volume Data
    - Travel Speed Data
- Before and After Comparisons
- Data Assessment

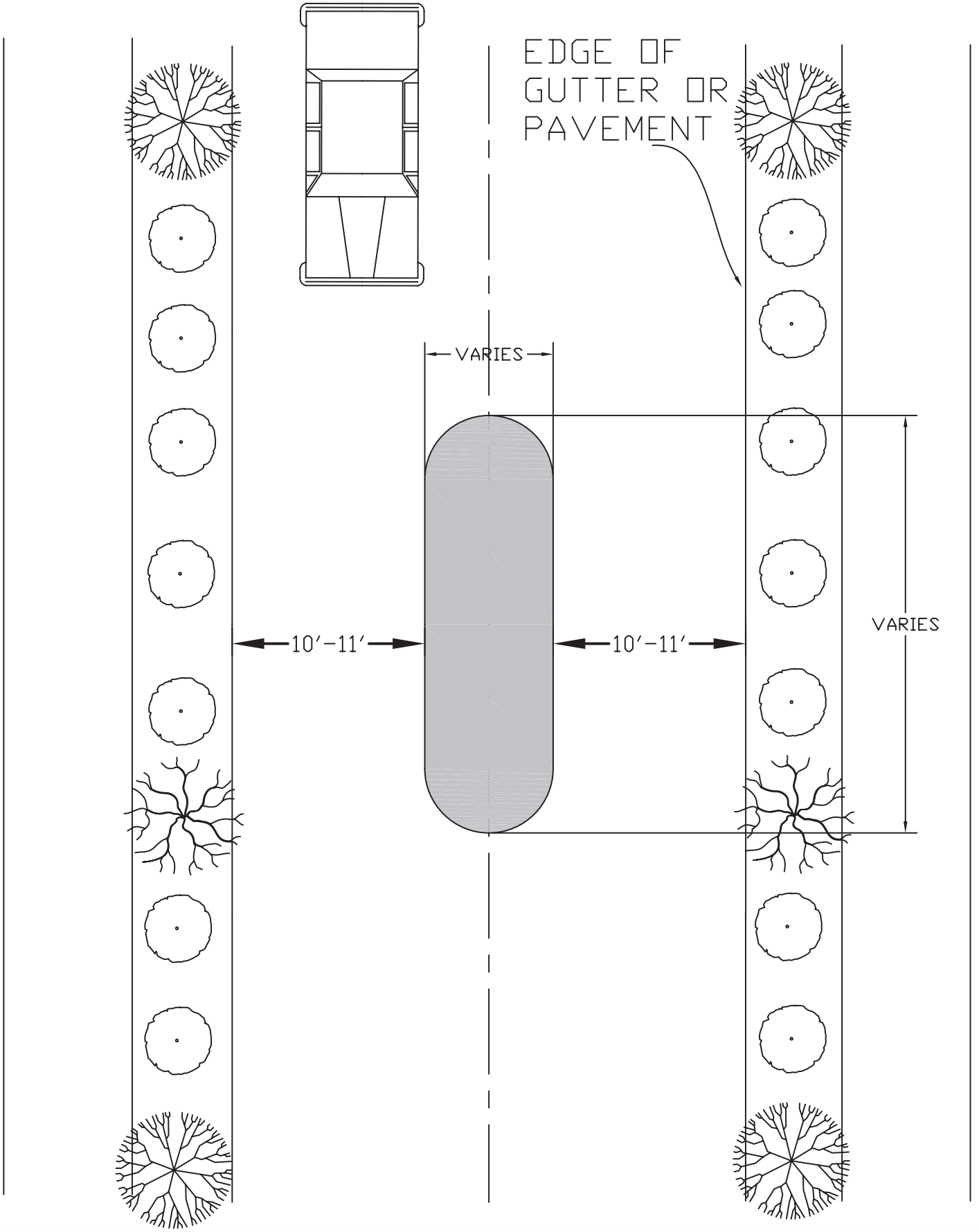
Project Feedback and Input

- Public Comments
- Agency Comments
- Feedback Summary

Study Findings, Conclusions, and Recommendations

- Goals Obtained and Effectiveness
- Staff Recommendations
- Potential Need for Improvement Modifications

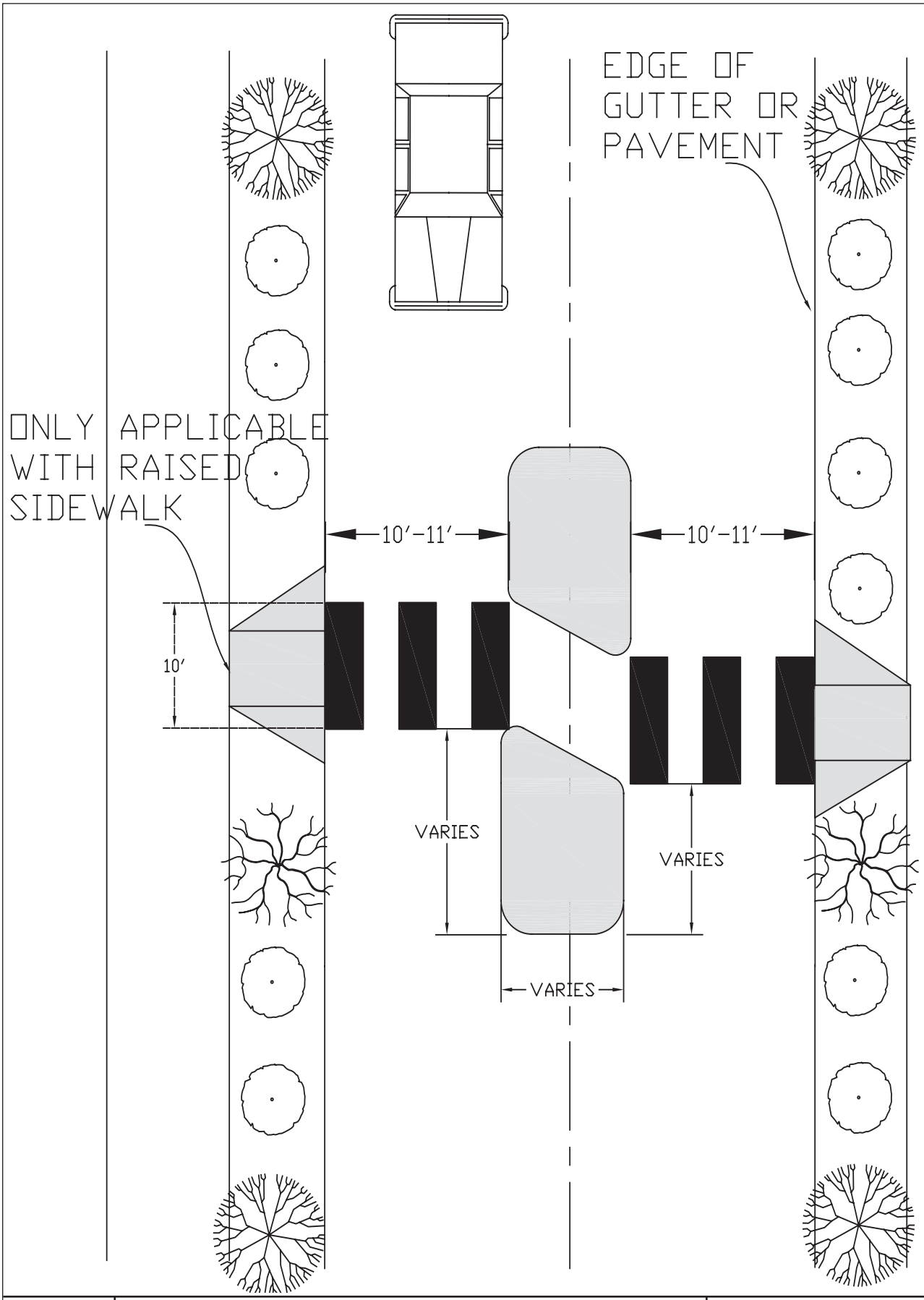
MEDIAN



City of Bothell

MEDIAN CONCEPT

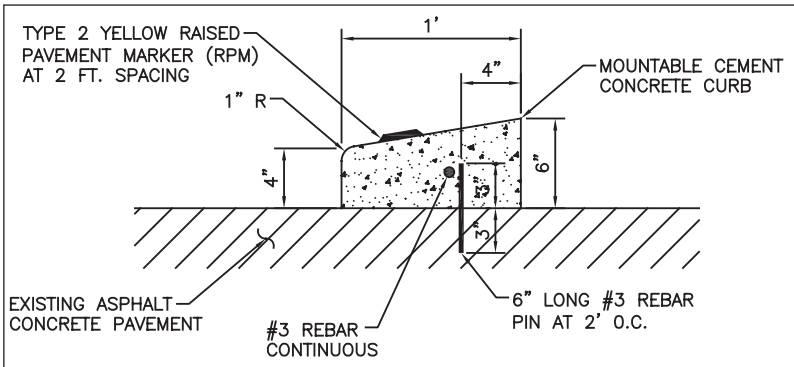
COLLECTOR CORRIDOR
TRAFFIC SAFETY
PROGRAM



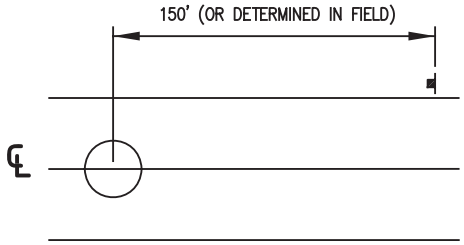
City of Bothell

MEDIAN CONCEPT WITH CROSSWALK

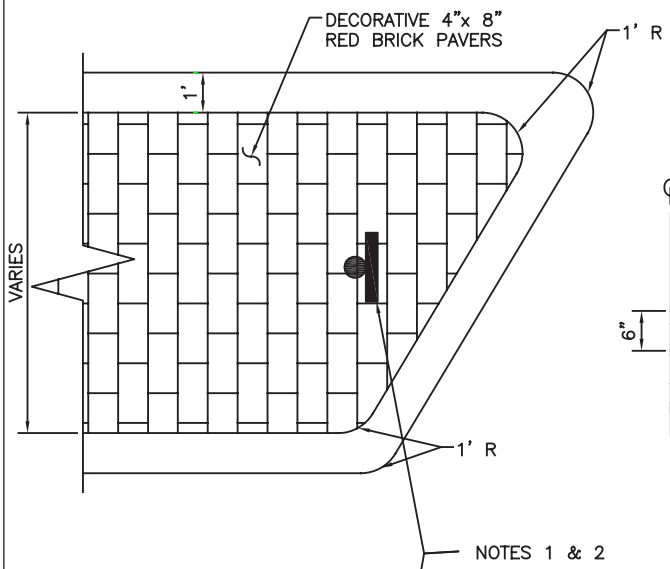
COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

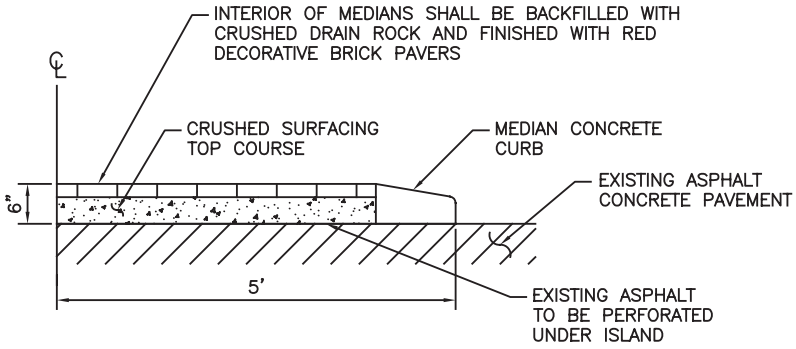


MID-BLOCK MEDIAN CURB DETAIL



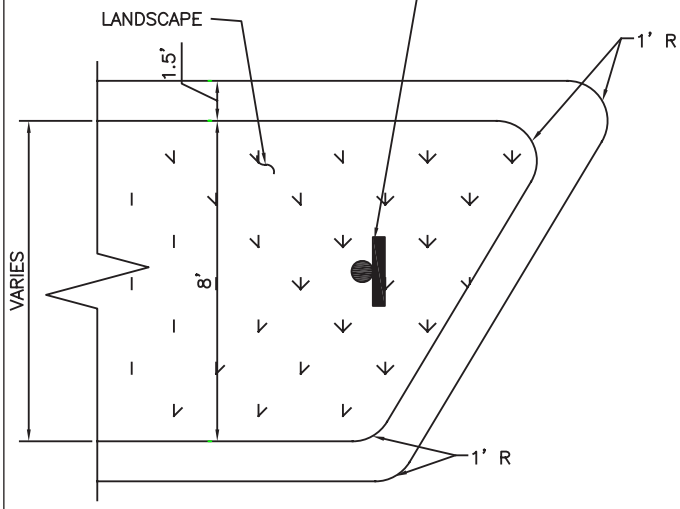
ADVANCED SIGN LOCATION

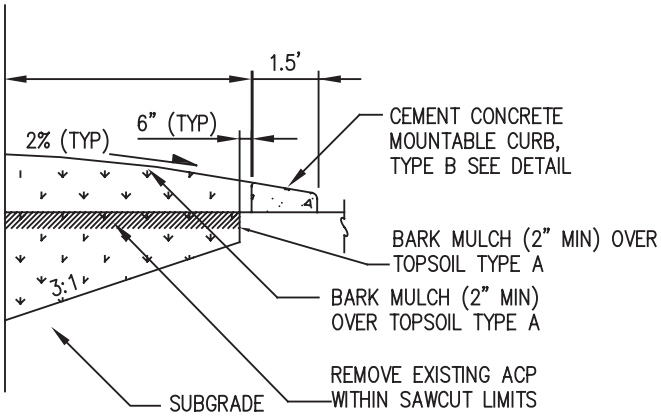




MEDIAN TYPICAL PAVER SECTION INFILL DETAIL

NTS





MEDIAN TYPICAL LANDSCAPE SECTION INFILL DETAIL

NTS

NOTES:
1. WITH CROSSWALK; SEE SIGN DETAIL S1–1 OR W11–2 AND W16–7PL AND SIGN MOUNTING DETAIL A
2. WITHOUT CROSSWALK; SEE SIGN DETAIL R4–7 OR R4–8 AND SIGN MOUNTING DETAIL B

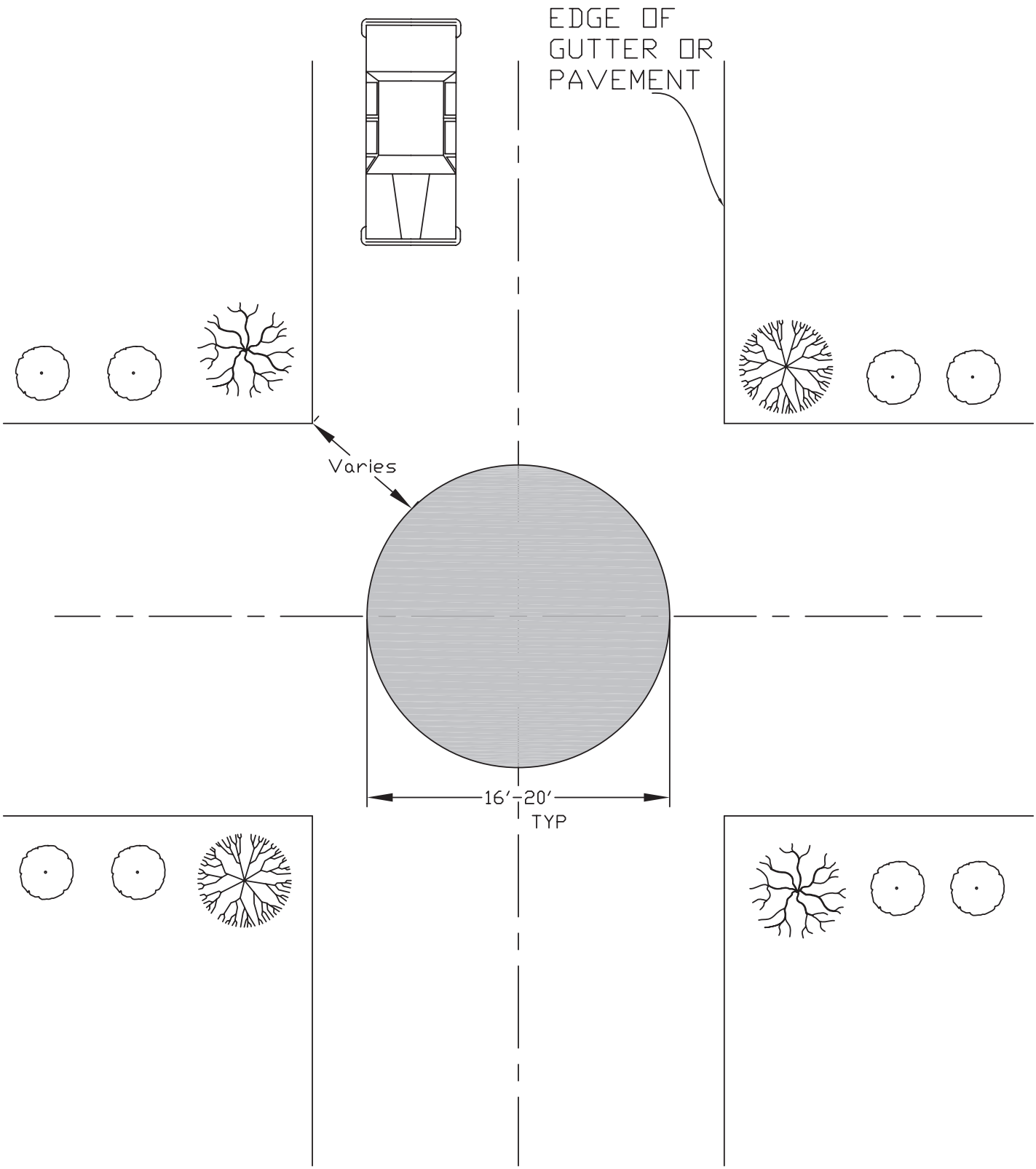
City of Bothell	SHEET #: 1	**MEDIAN STANDARDS**	DATE: OCTOBER 2009	COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

City of Bothell

TYPICAL MEDIAN WITH CROSSWALK

COLLECTOR CORRIDOR
TRAFFIC SAFETY
PROGRAM

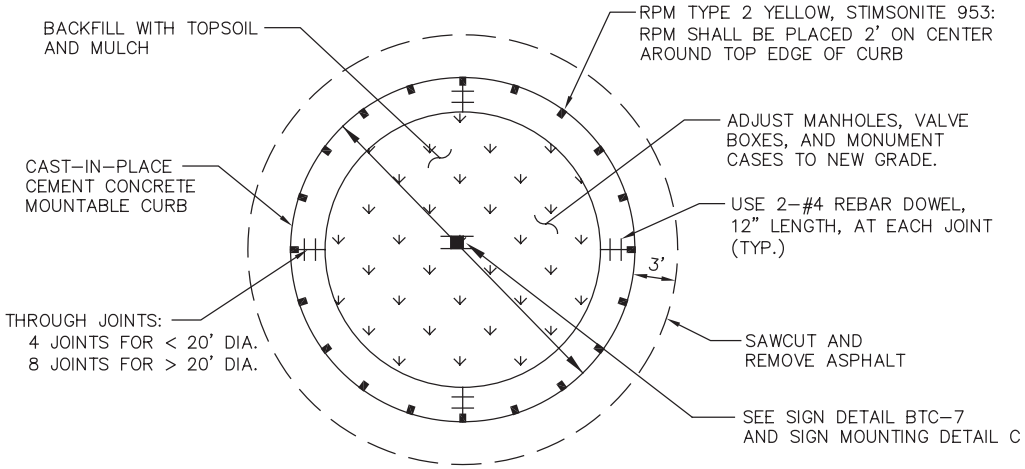
TRAFFIC CIRCLE



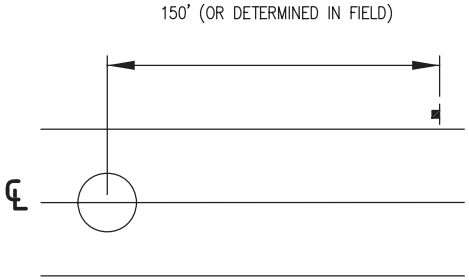
City of Bothell

TRAFFIC CIRCLE CONCEPT

COLLECTOR CORRIDOR
TRAFFIC SAFETY
PROGRAM



TYPICAL TRAFFIC CIRCLE



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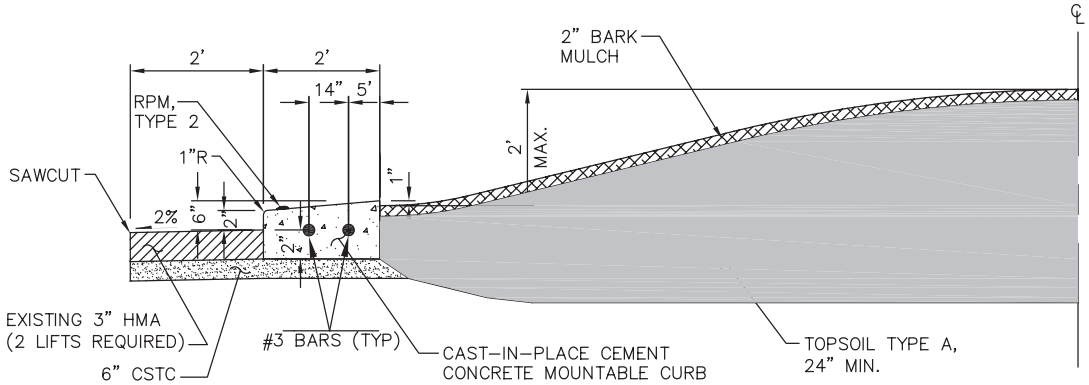


TYPICAL SECTION

NOTES:

1. LANDSCAPING TO BE DETERMINED BY TRANSPORTATION/OPERATIONS STAFF.
2. MONUMENT PROTECTION/PRESERVATION: NOTIFY C.O.B. SURVEYING PRIOR TO MONUMENT ADJUSTMENT. RAISE MONUMENT TO GRADE IN APPROPRIATE CASING.

City of Bothell

SHEET #: 2

TRAFFIC CIRCLE STANDARDS

DATE: OCTOBER 2009

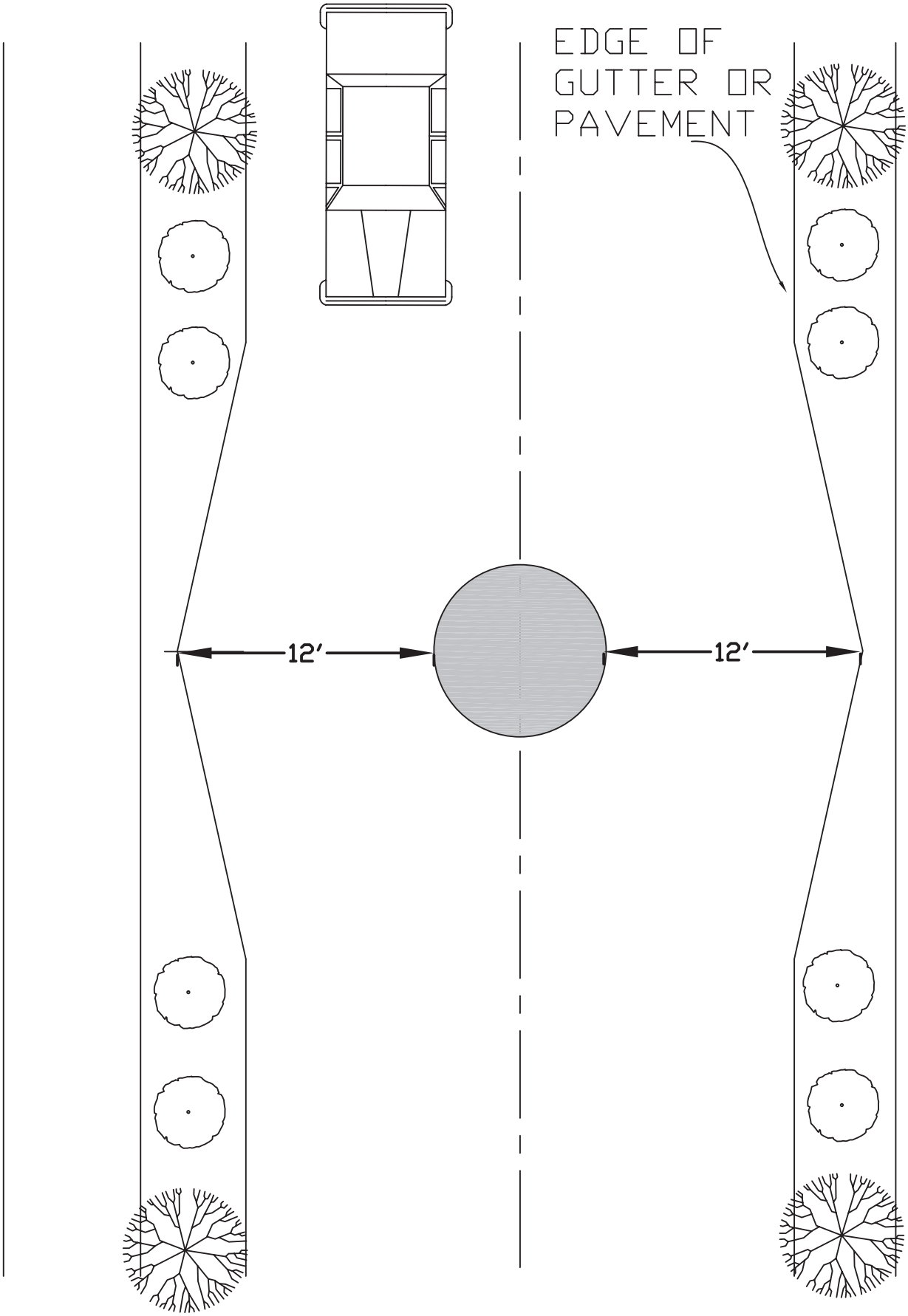
COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

City of Bothell

TYPICAL TRAFFIC CIRCLE

COLLECTOR CORRIDOR
TRAFFIC SAFETY
PROGRAM

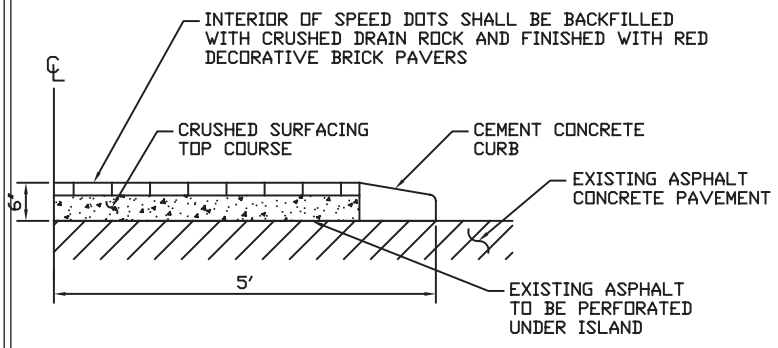
SPEED DOT



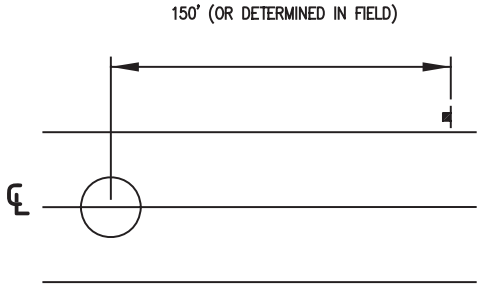
City of Bothell

SPEED DOT CONCEPT

COLLECTOR CORRIDOR
TRAFFIC SAFETY
PROGRAM



SPEED DOT TYPICAL PAVER SECTION



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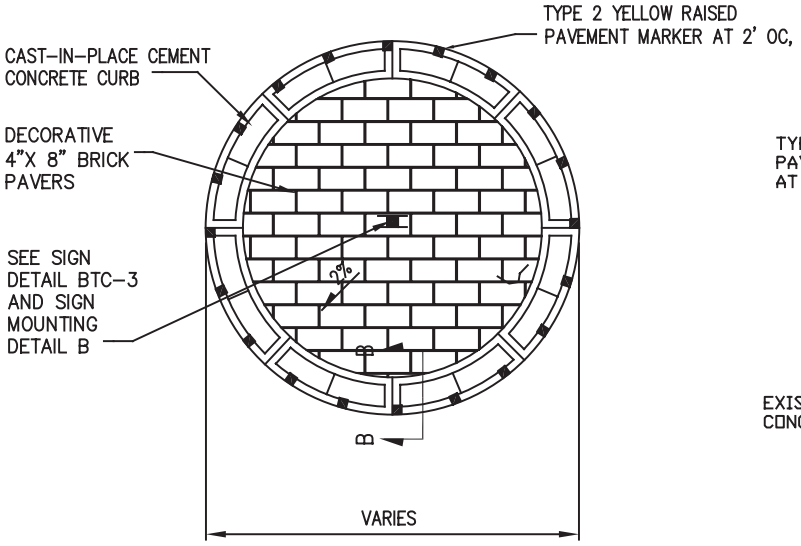
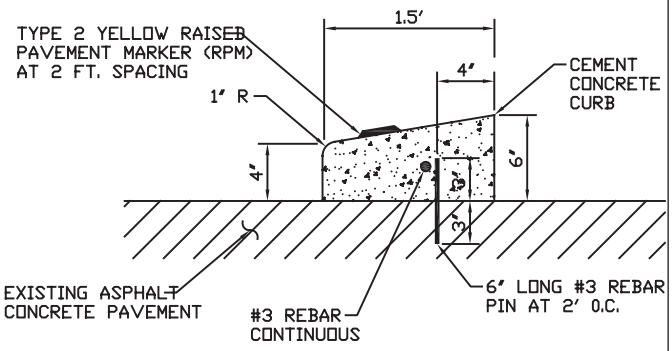




SECTION B-B

SPEED DOT CURB DETAIL

SPEED DOT DETAILS

NTS

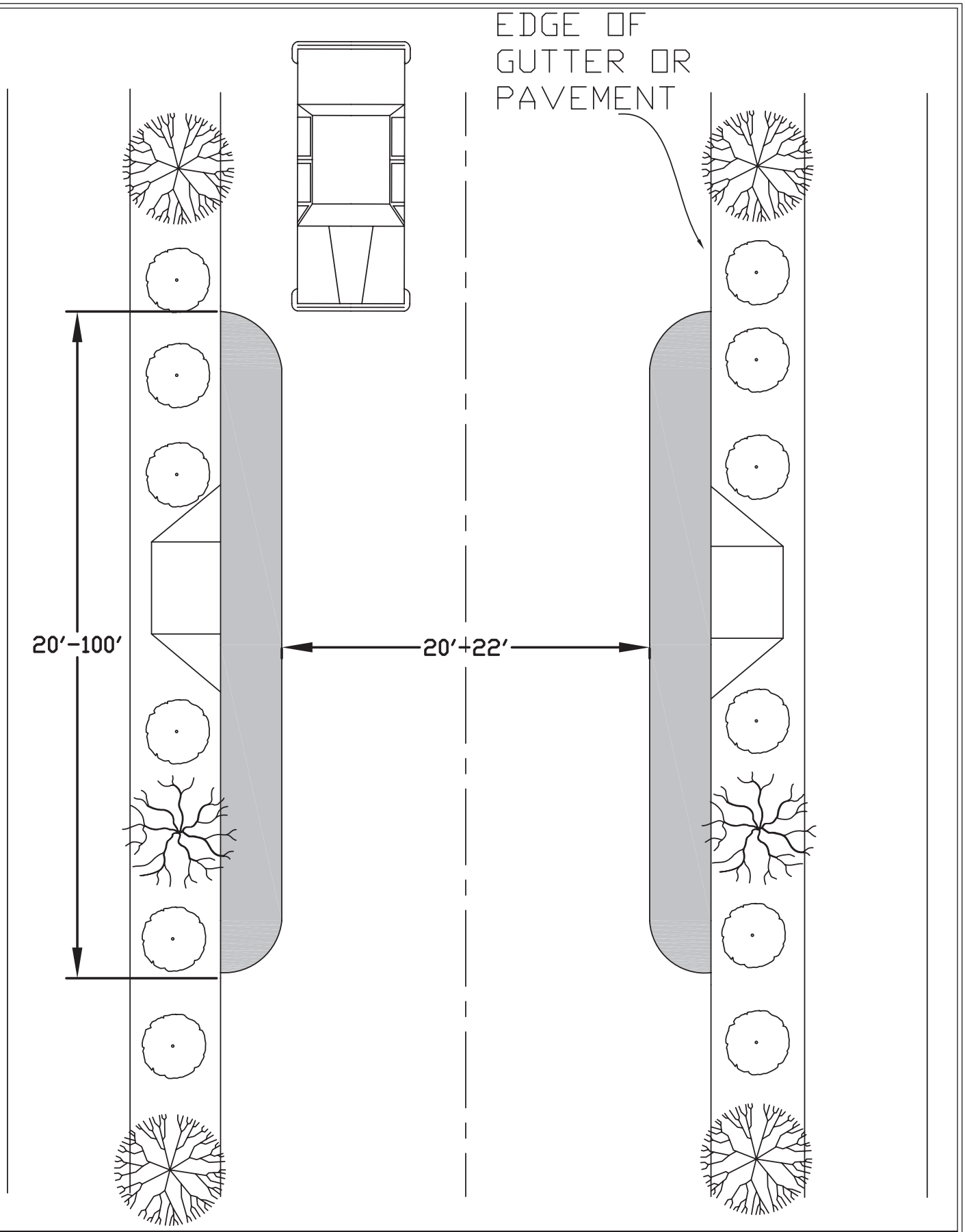
City of Bothell	SHEET #: 3	SPEED DOT STANDARDS	DATE: OCTOBER 2009	COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

City of Bothell

TYPICAL SPEED DOT

COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

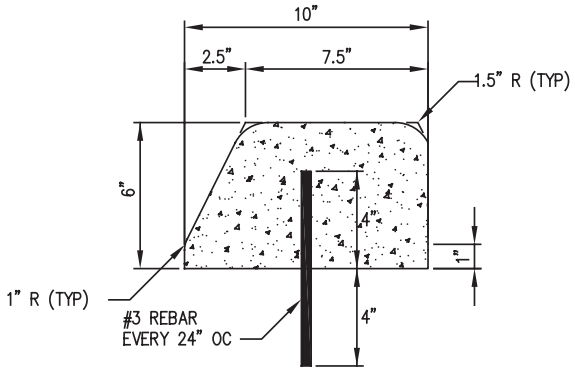
CURB EXTENSION/CHOKER



City of Bothell

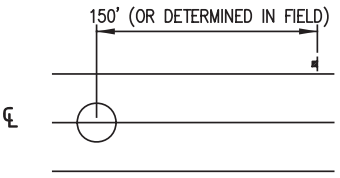
CURB EXTENSION/CHOKER CONCEPT

COLLECTOR CORRIDOR
TRAFFIC SAFETY
PROGRAM



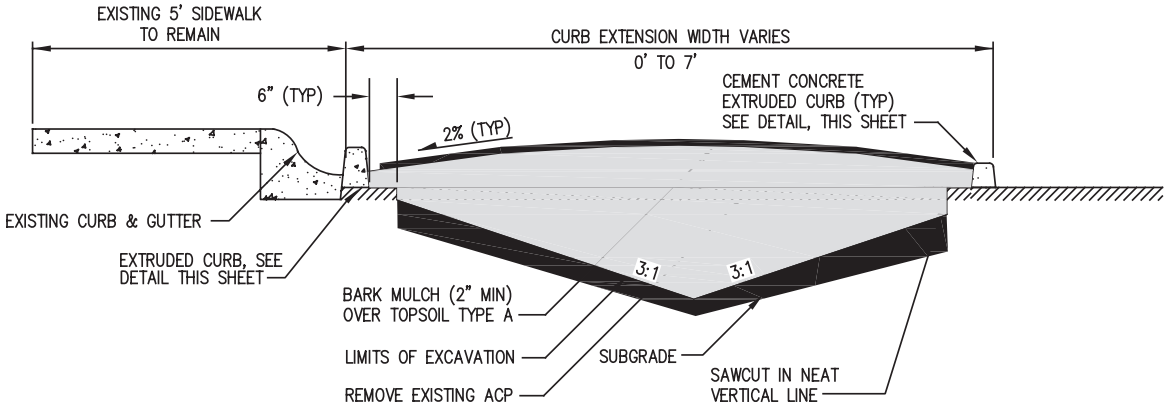
CEMENT CONCRETE EXTRUDED CURB DETAIL

NTS

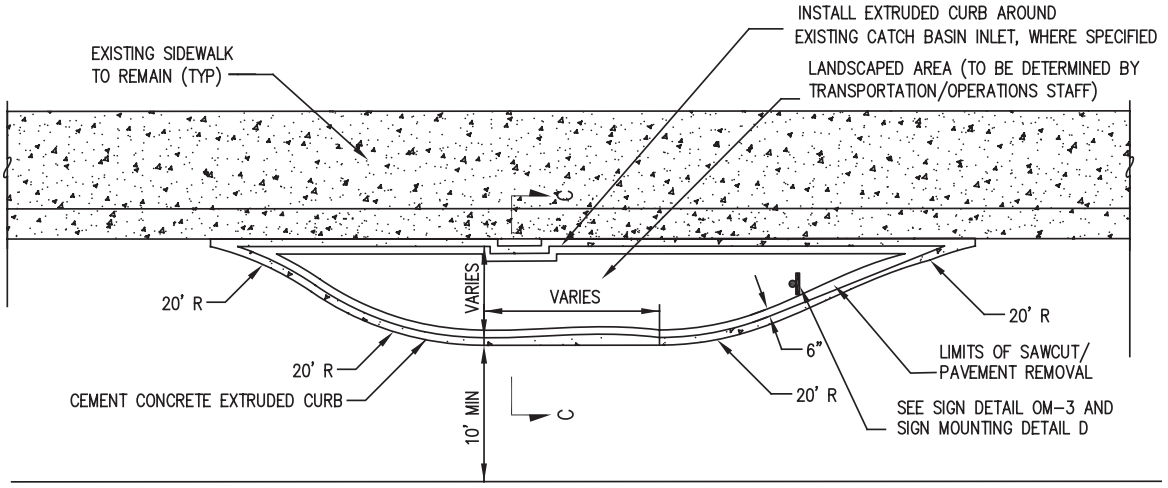


ADVANCED SIGN LOCATION

NTS



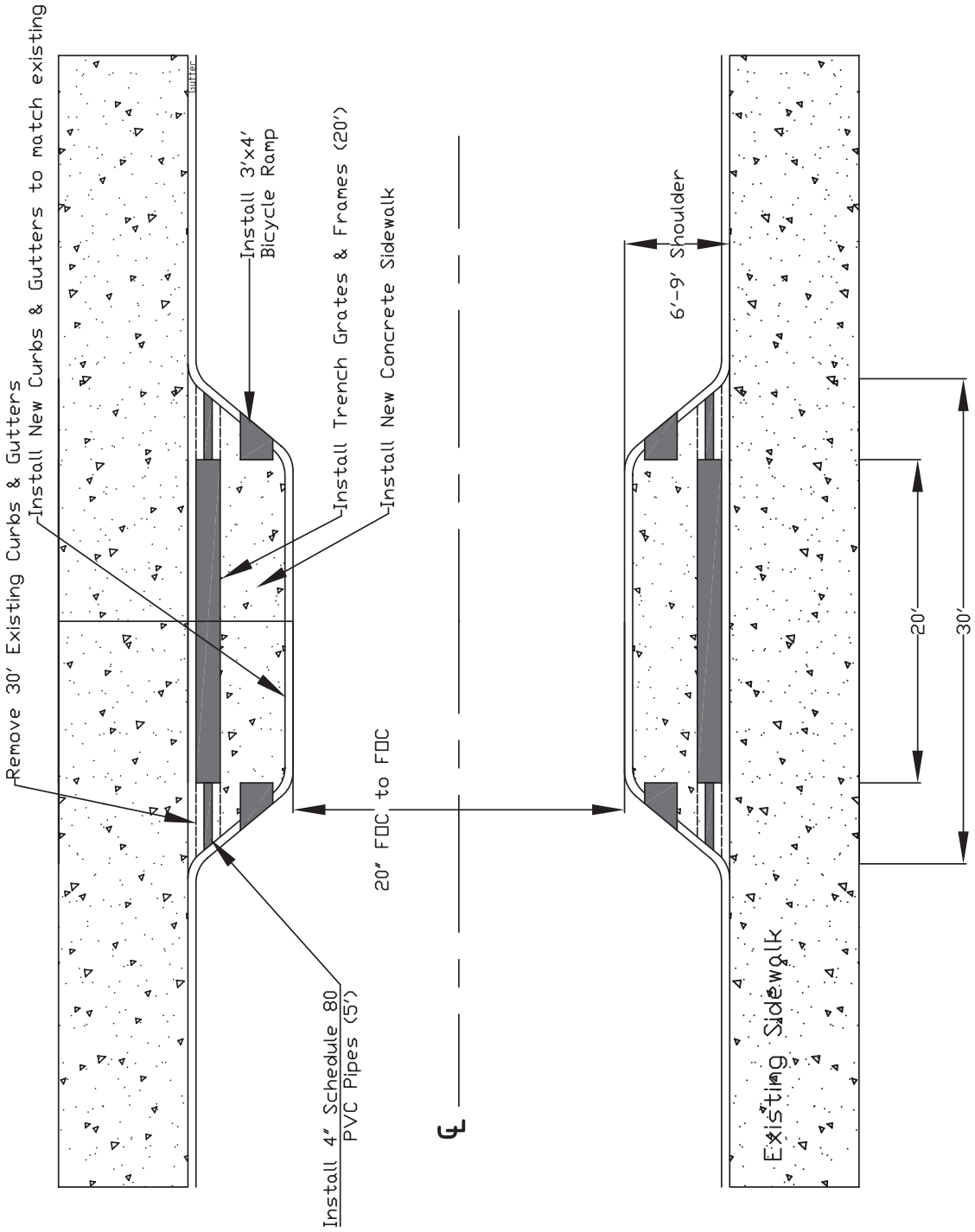
SECTION C–C



CURB EXTENSION DETAIL

NTS

City of Bothell	SHEET #: 4	**CURB EXTENSION/CHOKER STANDARDS**	DATE: OCTOBER 2009	COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM



City of Bothell	SHEET #: 5	CURB EXTENSION/CHOKER WITH BIKE LANE STANDARDS	DATE: OCTOBER 2009	COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

City of Bothell

TYPICAL CURB EXTENSION/CHOKER WITH BIKE LANES

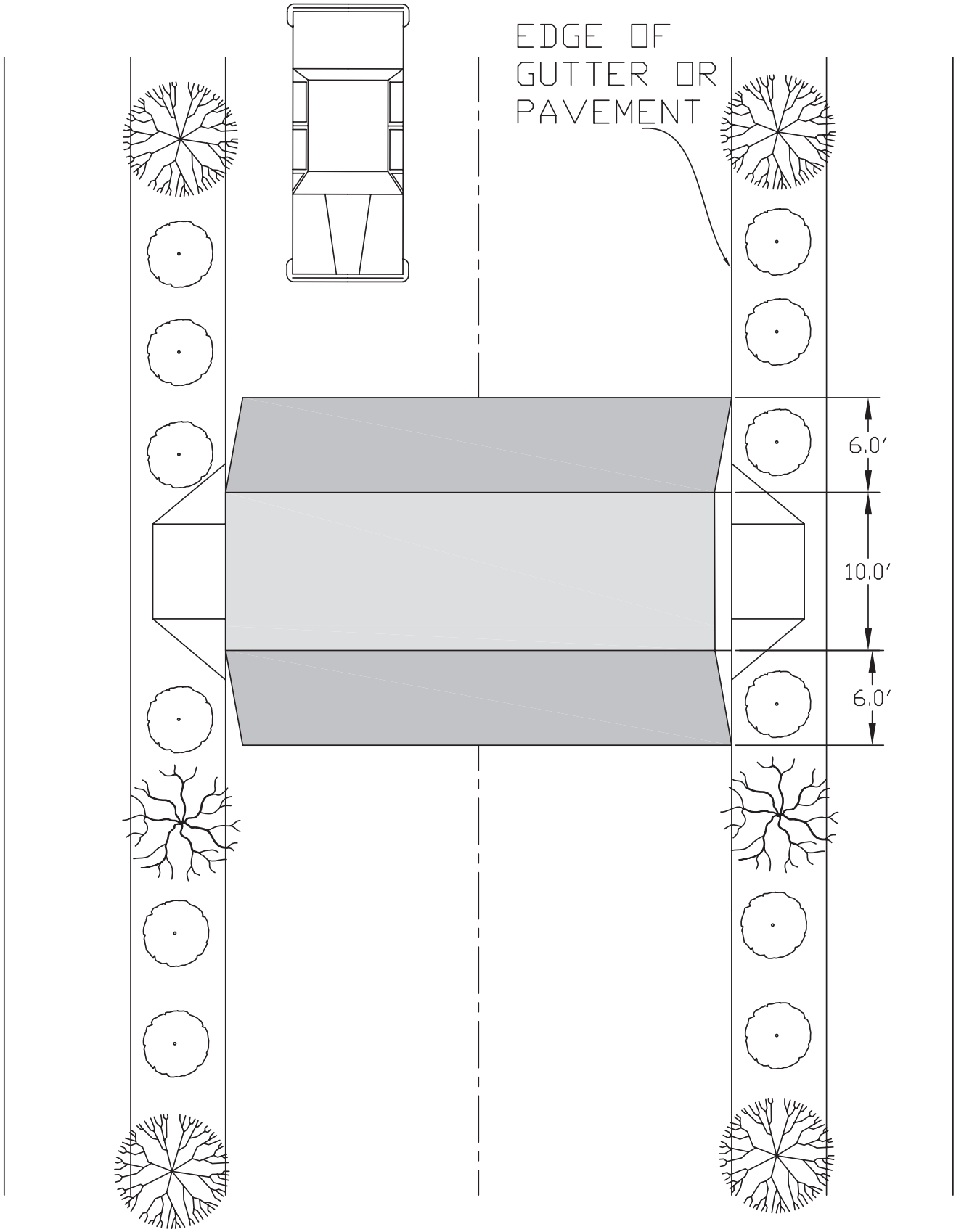
COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

City of Bothell

TYPICAL CURB EXTENSION/CHOKER

COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

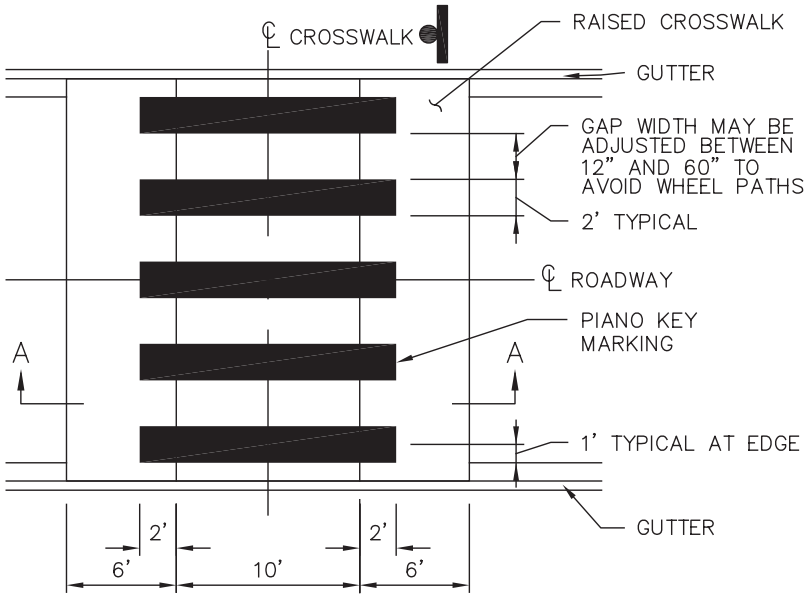
SPEED TABLE

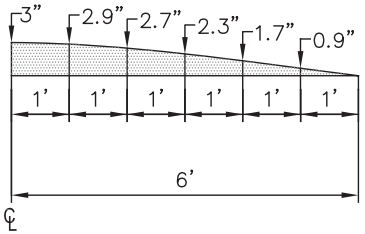


City of Bothell

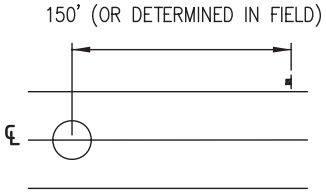
SPEED TABLE CONCEPT

COLLECTOR CORRIDOR
TRAFFIC SAFETY
PROGRAM

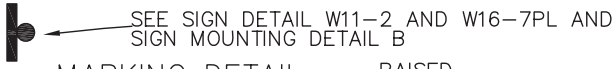




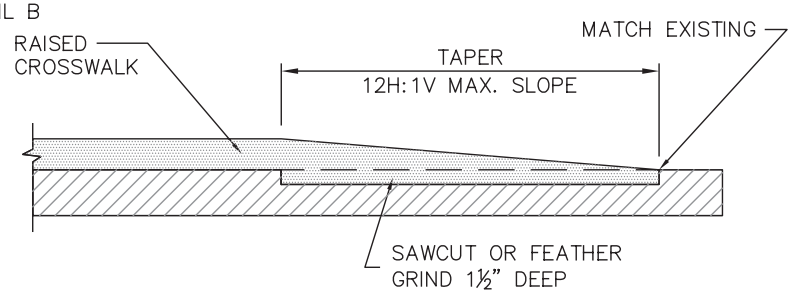
APPROACH ARC DETAIL



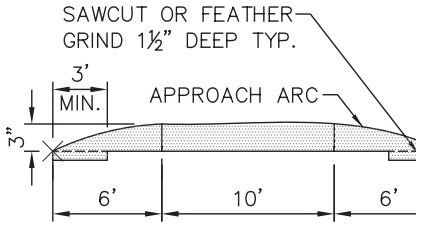
ADVANCED SIGN LOCATION



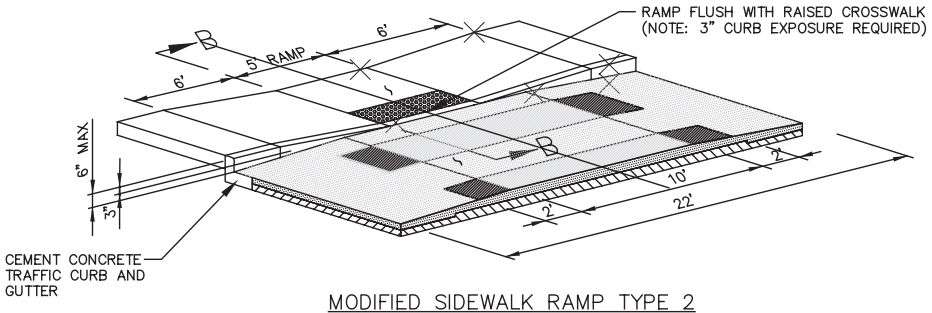
MARKING DETAIL



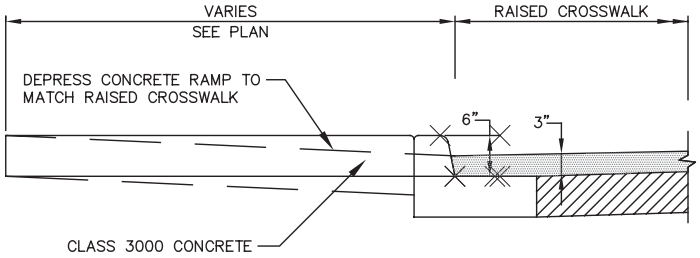
RAISED CROSSWALK/ASPHALT WIDENING SECTION



SECTION A–A



MODIFIED SIDEWALK RAMP TYPE 2



SECTION B–B

City of Bothell

SHEET #: 6

SPEED TABLE STANDARDS

DATE: OCTOBER 2009

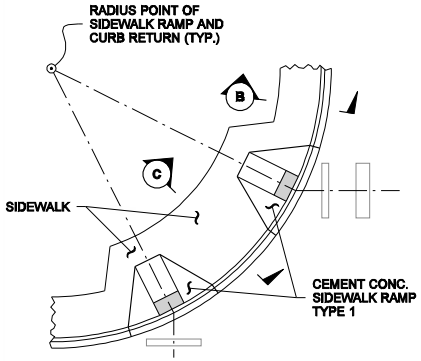
COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

City of Bothell

TYPICAL SPEED TABLE

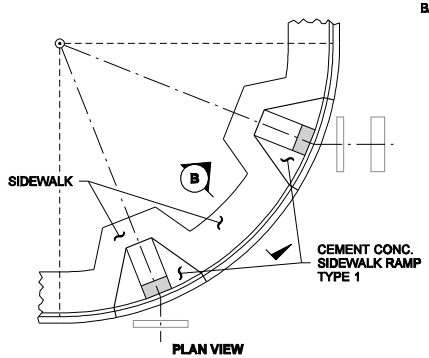
COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

RAMPS



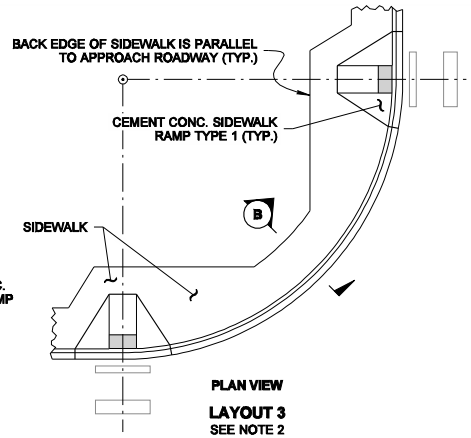
PLAN VIEW

LAYOUT 1
SEE NOTE 2



PLAN VIEW

LAYOUT 2
SEE NOTE 2

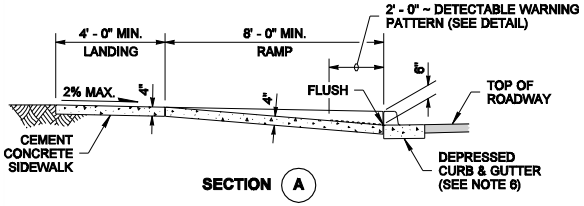


PLAN VIEW

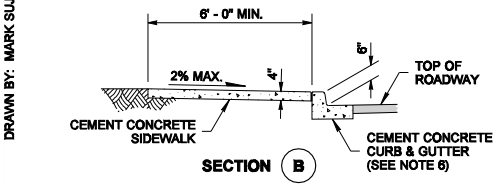
LAYOUT 3
SEE NOTE 2

NOTES

1. The bottom of the ramp shall have a level area (not in excess of 2% in any direction), 4' × 4'.
2. Layouts 1, 2, & 3 require two (2) of this bid item: "Cement Conc. Sidewalk Ramp Type 1". The bid item does not include the adjacent Curb (or Curb & Gutter), or Sidewalk.
3. Ramp slopes shall not be steeper than 12H:1V.
4. To the maximum extent feasible, ramp cross slopes shall not exceed 2%.
5. Avoid placing drainage structures, junction boxes or other obstructions in front of ramp access areas.
6. Curb & Gutter is shown, see the Contract Plans for the curb design specified. See Standard Plan F-10.12 for curb details.
7. See Standard Plan F-30.10 for sidewalk joint placement and details.



SECTION A



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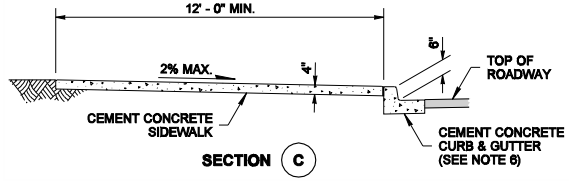
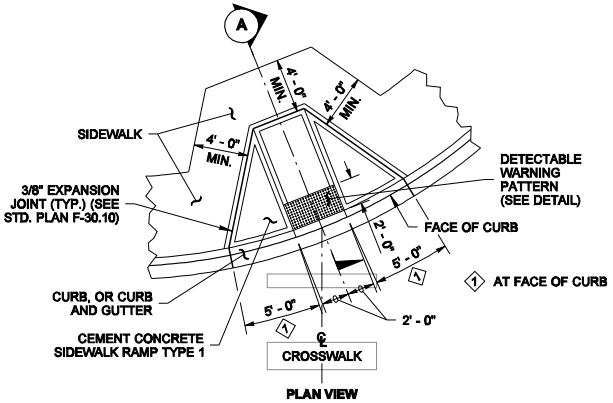
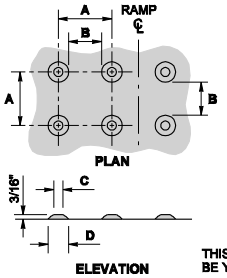


SECTION C



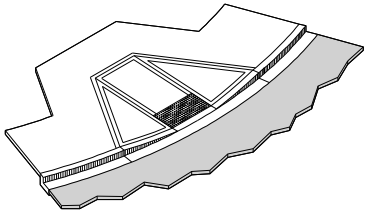
PLAN VIEW

SIDEWALK RAMP TYPE 1
FOR LAYOUTS 1, 2, & 3



	MIN.	MAX.
A	1 5/8"	2 3/8"
B	5/8"	1 1/2"
C	7/16"	3/4"
D	7/8"	1 7/16"

DETECTABLE WARNING PATTERN DETAIL



ISOMETRIC VIEW

EXPIRES JUNE 19, 2008

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SIDEWALK RAMP TYPE 1 WITH LAYOUTS

STANDARD PLAN F-40.10-01

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

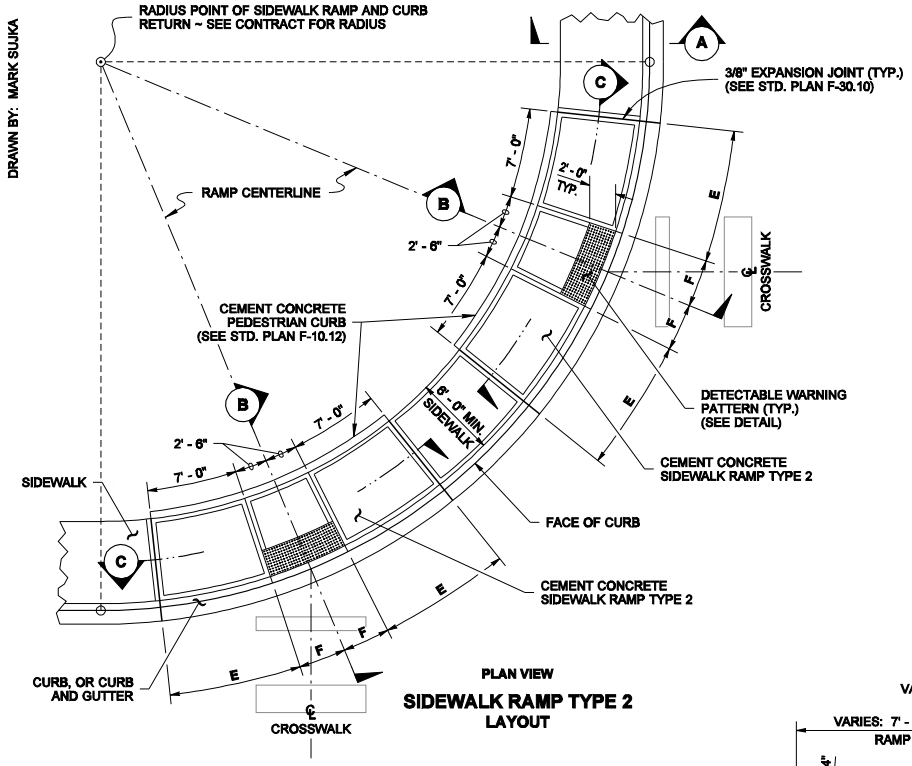
Pasco Bakotich III — STATE DESIGN ENGINEER
10-05-07 — DATE

Washington State Department of Transportation

DRAWN BY: MARK SUJKA

City of Bothell	SHEET #: 7	TYPE 1 SIDEWALK RAMP	DATE: OCTOBER 2009	COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

DRAWN BY: MARK SUJKA



PLAN VIEW

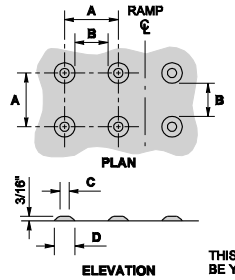
SIDEWALK RAMP TYPE 2 LAYOUT

RADIUS AT FACE OF CURB	E	F
20 FEET	10' - 4 3/4"	3' - 8 1/2"
30 FEET	8' - 11 1/2"	3' - 2 1/4"
40 FEET	8' - 4 1/2"	2' - 11 3/4"
50 FEET	8' - 0 3/4"	2' - 10 1/4"
60 FEET	7' - 10 1/4"	2' - 9 3/4"
70 FEET	7' - 8 3/4"	2' - 9"
80 FEET	7' - 7 1/2"	2' - 8 3/4"
90 FEET	7' - 6 1/2"	2' - 8 1/4"
100 FEET	7' - 6"	2' - 8"
	DIMENSIONS AT FACE OF CURB	

INTERMEDIATE RADII CAN BE INTERPOLATED

NOTES

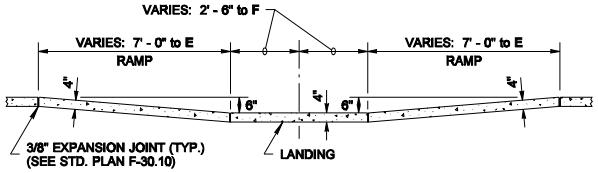
1. The bottom of the ramp shall have a level area (not in excess of 2% in any direction), 4' × 4'.
2. The Type 2 Ramp Layout requires two (2) of this bid item: "Cement Conc. Sidewalk Ramp Type 2". The bid item does not include the adjacent Curb (or Curb & Gutter), the Sidewalk between Ramps, or the Cement Conc. Pedestrian Curb.
3. Ramp slopes shall not be steeper than 12H:1V.
4. Avoid placing drainage structures, junction boxes or other obstructions in front of ramp access areas.
5. Curb & Gutter is shown, see the Contract Plans for the curb design specified. See Standard Plan F-10.12 for curb details.
6. See Std. Plan F-30.10 for sidewalk joint placement and details.



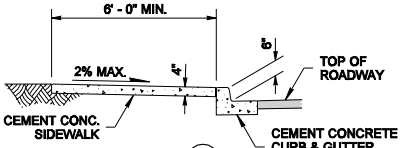
	MIN.	MAX.
A	1 5/8"	2 3/8"
B	5/8"	1 1/2"
C	7/16"	3/4"
D	7/8"	1 7/16"

THIS PATTERN AREA SHALL BE YELLOW IN COLOR

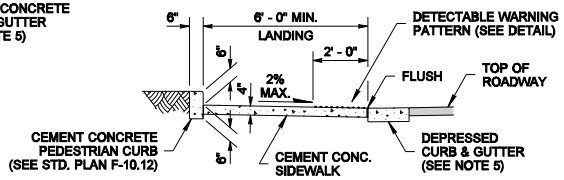
DETECTABLE WARNING PATTERN DETAIL



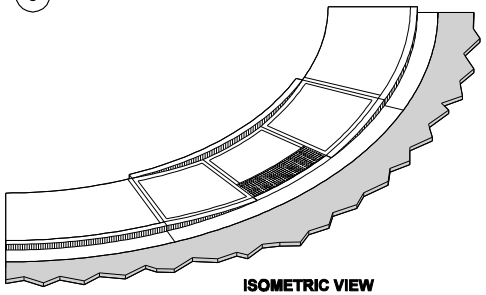
SECTION C



SECTION A



SECTION B



ISOMETRIC VIEW

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SIDEWALK RAMP TYPE 2 WITH LAYOUT

STANDARD PLAN F-40.12-00

SHEET 1 OF 1 SHEET

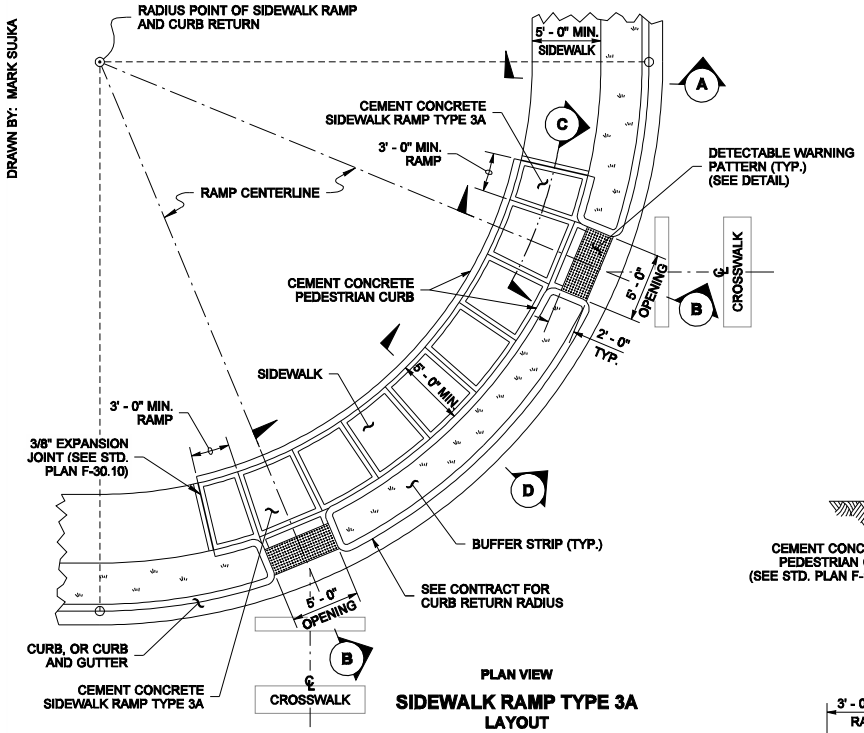
APPROVED FOR PUBLICATION

Ken L. Smith — STATE DESIGN ENGINEER
02-07-07 — DATE

Washington State Department of Transportation

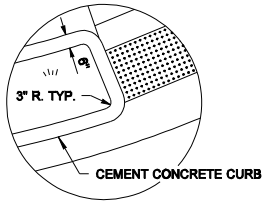
City of Bothell	SHEET #: 8	TYPE 2 SIDEWALK RAMP	DATE: OCTOBER 2009	COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

DRAWN BY: MARK SUJKA



PLAN VIEW

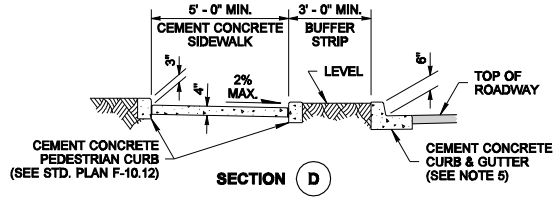
SIDEWALK RAMP TYPE 3A LAYOUT



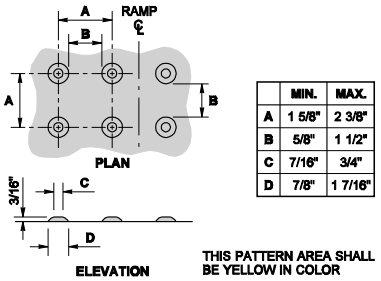
CURB RADIUS DETAIL

NOTES

1. The bottom of the ramp shall have a level area (not in excess of 2% in any direction), 4' × 4'.
2. The Type 3A Ramp Layout requires two (2) of this bid item: "Cement Conc. Sidewalk Ramp Type 3A". The bid item does not include the adjacent Curb (or Curb & Gutter), the Sidewalk between Ramps, or the Cement Conc. Pedestrian Curb.
3. Ramp slopes shall not be steeper than 12H:1V.
4. Avoid placing drainage structures, junction boxes or other obstructions in front of ramp access areas.
5. Curb & Gutter is shown, see the Contract Plans for the curb design specified. See Standard Plan F-10.12 for curb details.
6. See Std. Plan F-30.10 for sidewalk joint placement and details.

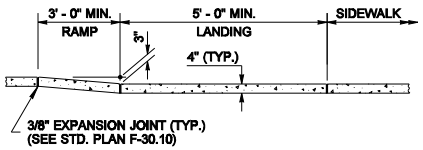


SECTION D

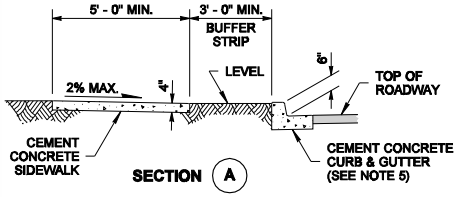


	MIN.	MAX.
A	1 5/8"	2 3/8"
B	5/8"	1 1/2"
C	7/16"	3/4"
D	7/8"	1 7/16"

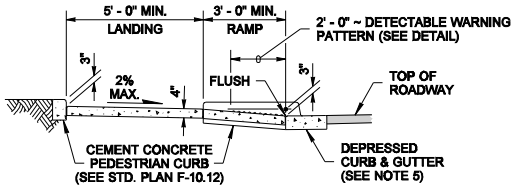
DETECTABLE WARNING PATTERN DETAIL



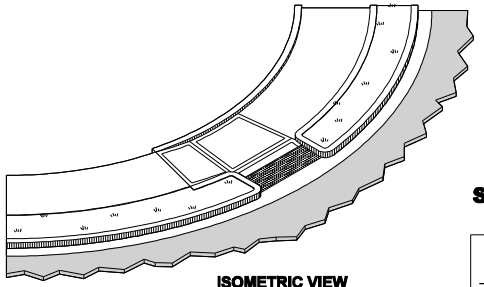
SECTION C



SECTION A



SECTION B



ISOMETRIC VIEW

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SIDEWALK RAMP TYPE 3A WITH LAYOUT

STANDARD PLAN F-40.14-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

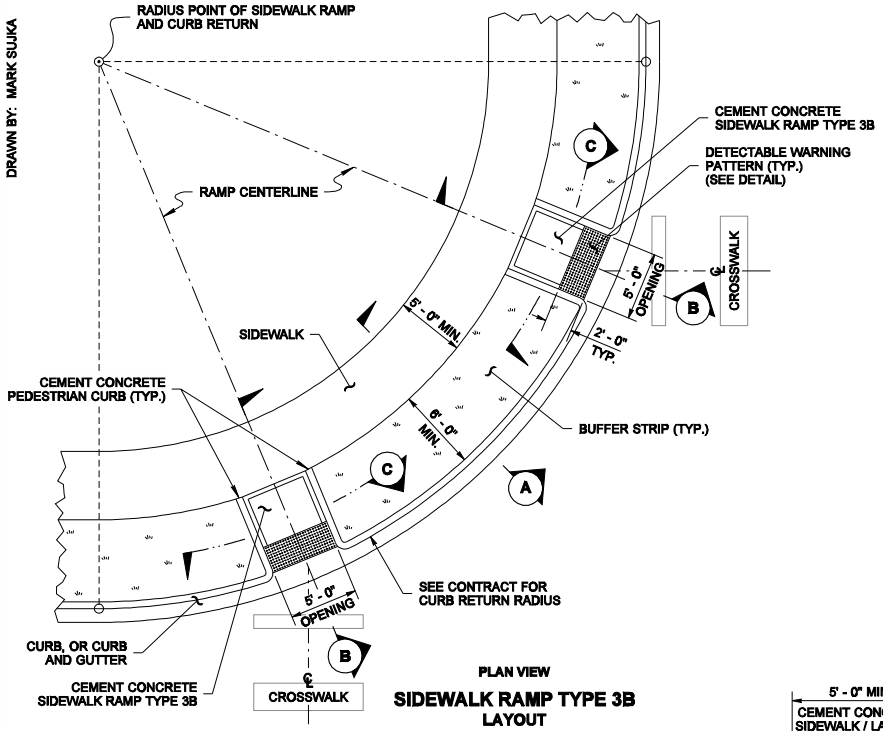
Ken L. Smith — STATE DESIGN ENGINEER

02-07-07 — DATE

Washington State Department of Transportation

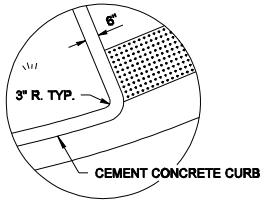
City of Bothell	SHEET #: 9	TYPE 3A SIDEWALK RAMP	DATE: OCTOBER 2009	COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

DRAWN BY: MARK SUJKA



PLAN VIEW

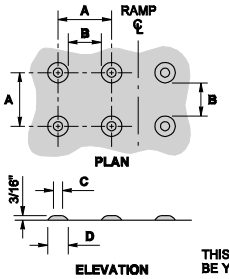
SIDEWALK RAMP TYPE 3B LAYOUT



CURB RADIUS DETAIL

NOTES

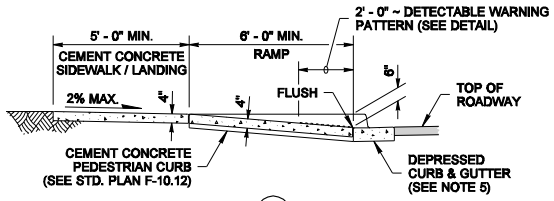
1. The bottom of the ramp shall have a level area (not in excess of 2% in any direction), 4' × 4'.
2. The Type 3B Ramp Layout requires two (2) of this bid item: "Cement Conc. Sidewalk Ramp Type 3B". The bid item does not include the adjacent Curb (or Curb & Gutter), the Sidewalk between Ramps, or the Cement Conc. Pedestrian Curb.
3. Ramp slopes shall not be steeper than 12H:1V.
4. Avoid placing drainage structures, junction boxes or other obstructions in front of ramp access areas.
5. Curb & Gutter is shown, see the Contract Plans for the curb design specified. See Standard Plan F-10.12 for curb details.
6. See Std. Plan F-30.10 for sidewalk joint placement and details.



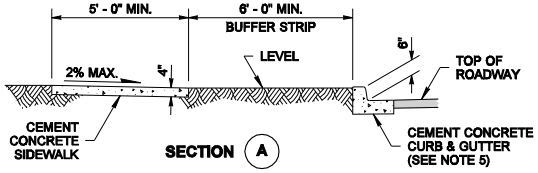
	MIN.	MAX.
A	1 5/8"	2 3/8"
B	5/8"	1 1/2"
C	7/16"	3/4"
D	7/8"	1 7/16"

THIS PATTERN AREA SHALL BE YELLOW IN COLOR

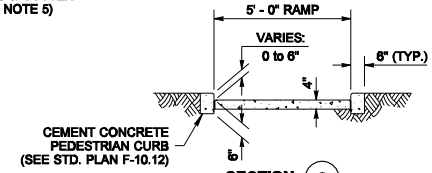
DETECTABLE WARNING PATTERN DETAIL



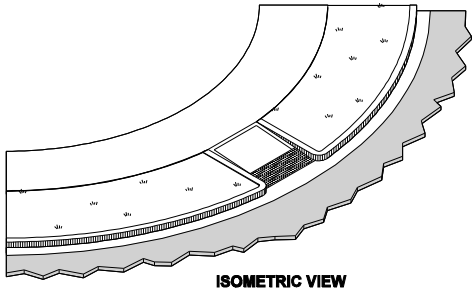
SECTION B



SECTION A



SECTION C



ISOMETRIC VIEW

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER, WITH THE ENGINEER'S SEAL, IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.

SIDEWALK RAMP TYPE 3B WITH LAYOUT

STANDARD PLAN F-40.15-00

SHEET 1 OF 1 SHEET

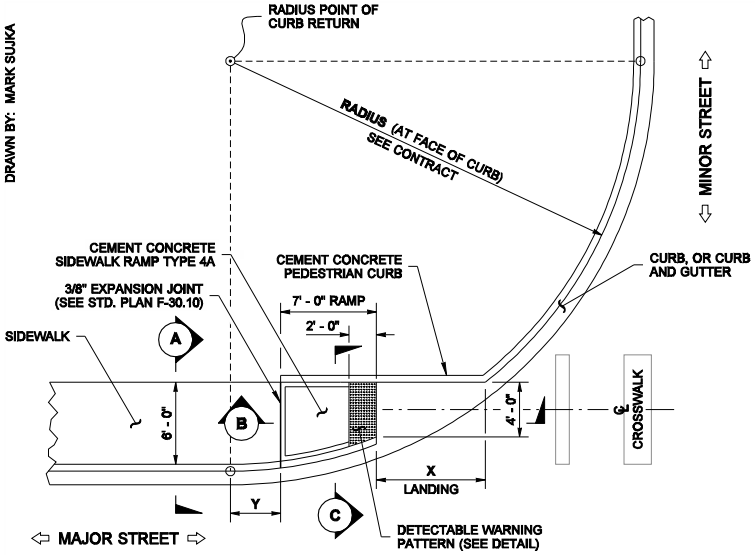
APPROVED FOR PUBLICATION

Ken L. Smith — STATE DESIGN ENGINEER — *02-07-07* — DATE

Washington State Department of Transportation

City of Bothell	SHEET #: 10	TYPE 3B SIDEWALK RAMP	DATE: OCTOBER 2009	COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

DRAWN BY: MARK SUJKA



PLAN VIEW

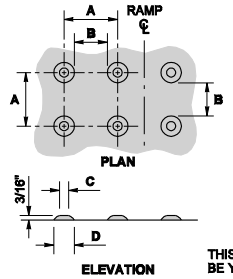
SIDEWALK RAMP TYPE 4A LAYOUT

RADIUS AT FACE OF CURB	X LANDING	Y DISTANCE FROM P.C.
20 FEET	6' - 2 1/2"	1' - 7"
30 FEET	8' - 0 1/4"	3' - 8"
40 FEET	9' - 6 1/4"	5' - 4 3/4"
50 FEET	10' - 9 3/4"	6' - 11"
60 FEET	11' - 11 1/2"	8' - 3 1/2"
70 FEET	13' - 0"	9' - 6 1/2"
80 FEET	13' - 11 1/2"	10' - 8 1/2"
90 FEET	14' - 10 1/2"	11' - 9 3/4"
100 FEET	15' - 8 3/4"	12' - 10 1/4"

INTERMEDIATE RADII CAN BE INTERPOLATED

NOTES

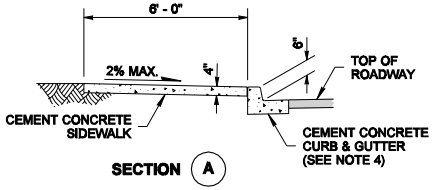
1. This layout is used to provide access to a single crosswalk parallel to the major street. The bid item "Cement Conc. Sidewalk Ramp Type 4A" does not include the adjacent Curb (or Curb & Gutter), the Sidewalk, or the Cement Conc. Pedestrian Curb.
2. Ramp slopes shall not be steeper than 12H:1V.
3. Avoid placing drainage structures, junction boxes or other obstructions in front of ramp access areas.
4. Curb & Gutter is shown, see the Contract Plans for the curb design specified. See Standard Plan F-10.12 for curb details.
5. See Std. Plan F-30.10 for sidewalk joint placement and details.
6. The bottom of the ramp shall have a level area (not in excess of 2% in any direction), 4' × 4'.



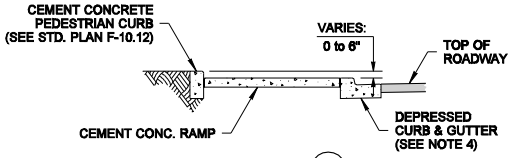
	MIN.	MAX.
A	1 5/8"	2 3/8"
B	5/8"	1 1/2"
C	7/16"	3/4"
D	7/8"	1 7/16"

THIS PATTERN AREA SHALL BE YELLOW IN COLOR

DETECTABLE WARNING PATTERN DETAIL



SECTION A



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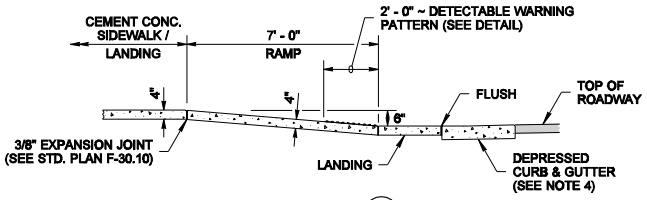

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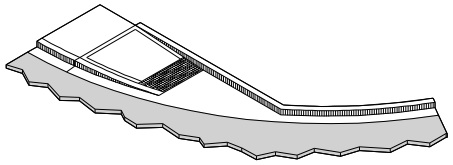

ISOMETRIC VIEW

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SIDEWALK RAMP TYPE 4A WITH LAYOUT

STANDARD PLAN F-40.16-00

SHEET 1 OF 1 SHEET

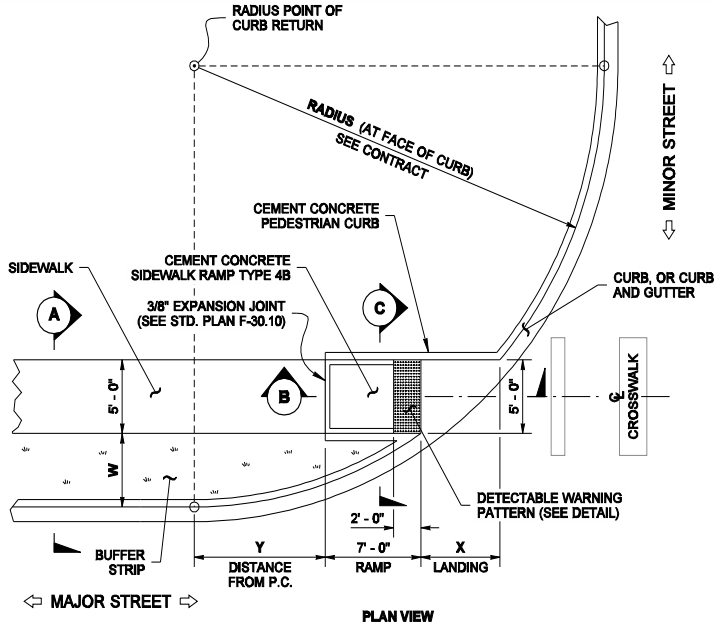
APPROVED FOR PUBLICATION

Ken L. Smith — STATE DESIGN ENGINEER
02-07-07 — DATE

Washington State Department of Transportation

City of Bothell	SHEET #: 11	TYPE 4A SIDEWALK RAMP	DATE: OCTOBER 2009	COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

DRAWN BY: MARK SUJKA

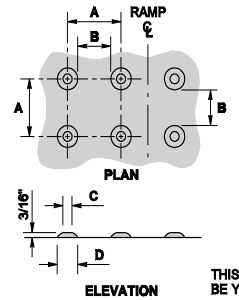


PLAN VIEW

SIDEWALK RAMP TYPE 4B
PLAN

RADIUS AT FACE OF CURB	W = 3' - 0"		W = 4' - 0"		W = 5' - 0"		W = 6' - 0"		W = 7' - 0"	
	X	Y	X	Y	X	Y	X	Y	X	Y
20 FEET	5' - 5 1/2"	3' - 6 1/2"	4' - 8 1/2"	5' - 0"	4' - 1"	6' - 2 3/4"	3' - 7"	7' - 3 1/2"	3' - 1 1/2"	8' - 2 1/2"
30 FEET	7' - 3 3/4"	6' - 1"	6' - 5 1/2"	7' - 11 1/2"	5' - 9 1/4"	9' - 7"	5' - 2 1/2"	11' - 0"	4' - 8 3/4"	12' - 3 1/4"
40 FEET	8' - 9 1/2"	8' - 2 1/2"	7' - 10"	10' - 5 1/4"	7' - 1"	12' - 4 1/2"	6' - 5 3/4"	14' - 3/4"	5' - 11 1/2"	15' - 7 1/4"
50 FEET	10' - 3/4"	10' - 3/4"	9' - 1/4"	12' - 7 1/4"	8' - 2 1/2"	14' - 9 1/2"	7' - 6 1/2"	16' - 9"	6' - 11 3/4"	18' - 6 1/4"
60 FEET	11' - 2 1/2"	11' - 8 3/4"	10' - 3/4"	14' - 6 1/2"	9' - 2 1/4"	16' - 11 3/4"	8' - 5 3/4"	19' - 1 3/4"	7' - 10 1/2"	21' - 1 1/2"
70 FEET	12' - 2 3/4"	13' - 3 1/4"	11' - 1/4"	16' - 4"	10' - 1"	18' - 11 3/4"	9' - 3 3/4"	21' - 4 1/4"	8' - 8 1/4"	23' - 6 1/4"
80 FEET	13' - 2"	14' - 8 1/2"	11' - 10 1/2"	17' - 11 3/4"	10' - 10 3/4"	20' - 10"	10' - 1"	23' - 4 3/4"	9' - 5"	25' - 8 3/4"
90 FEET	14' - 1/2"	16' - 1/2"	12' - 8 1/4"	19' - 6 1/2"	11' - 7 3/4"	22' - 7"	10' - 9 3/4"	25' - 3 3/4"	10' - 1 1/4"	27' - 9 1/2"
100 FEET	14' - 10 1/2"	17' - 3 3/4"	13' - 5 1/2"	21' - 0"	12' - 4 1/4"	24' - 2 3/4"	11' - 5 3/4"	27' - 1 1/2"	10' - 9"	29' - 9"

INTERMEDIATE RADII CAN BE INTERPOLATED



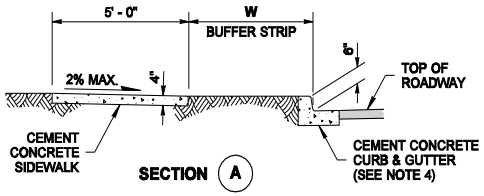
	MIN.	MAX.
A	1 5/8"	2 3/8"
B	5/8"	1 1/2"
C	7/16"	3/4"
D	7/8"	1 7/16"

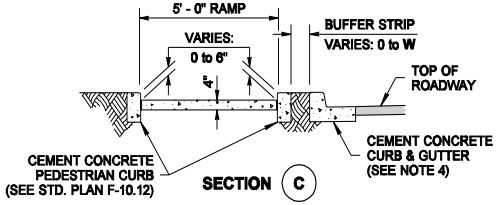
THIS PATTERN AREA SHALL BE YELLOW IN COLOR

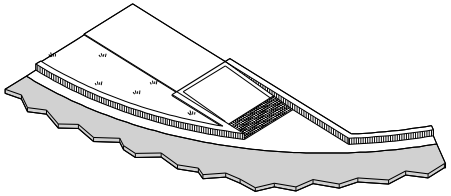
DETECTABLE WARNING PATTERN DETAIL

NOTES

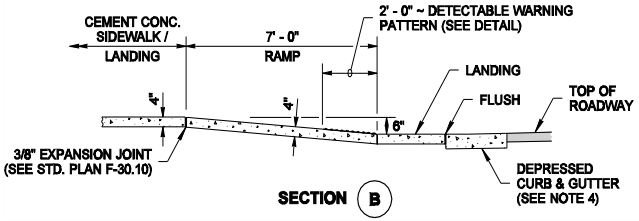
1. This layout is used to provide access to a single crosswalk parallel to the major street. The bid item "Cement Conc. Sidewalk Ramp Type 4B" does not include the adjacent Curb (or Curb & Gutter), the Sidewalk, or the Cement Conc. Pedestrian Curb.
2. Ramp slopes shall not be steeper than 12H:1V.
3. Avoid placing drainage structures, junction boxes or other obstructions in front of ramp access areas.
4. Curb & Gutter is shown, see the Contract Plans for the curb design specified. See Standard Plan F-10.12 for curb details.
5. See Std. Plan F-30.10 for sidewalk joint placement and details.
6. The bottom of the ramp shall have a level area (not in excess of 2% in any direction), 4' × 4'.







ISOMETRIC VIEW



KEN LEROY SMITH
STATE OF WASHINGTON
31805
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES AUGUST 26, 2007

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER, IS ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.

SIDEWALK RAMP TYPE 4B WITH LAYOUT

STANDARD PLAN F-40.18-00

SHEET 1 OF 1 SHEET

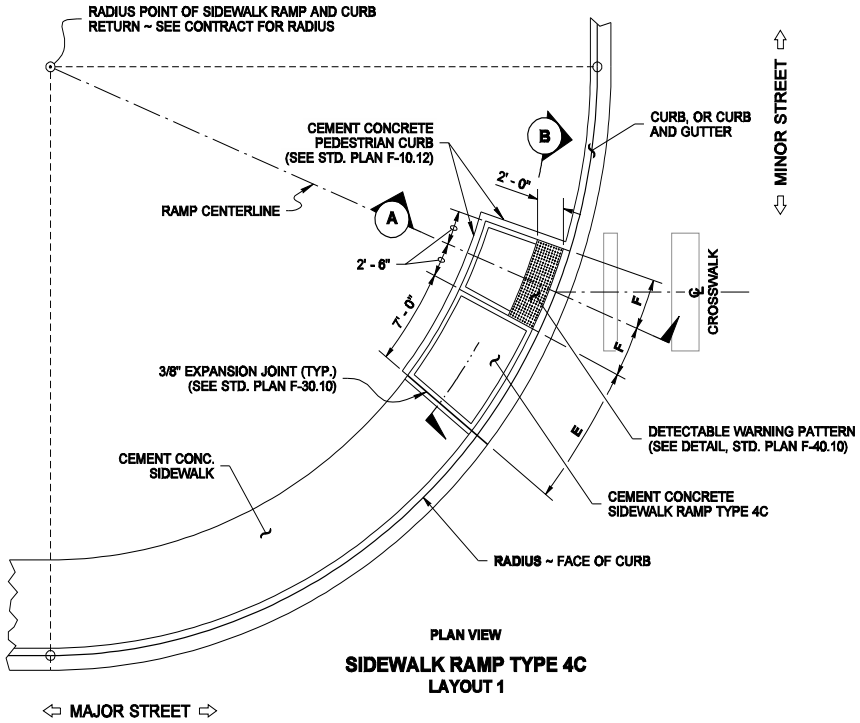
APPROVED FOR PUBLICATION

Ken L. Smith — STATE DESIGN ENGINEER
02-07-07 — DATE

Washington State Department of Transportation

City of Bothell	SHEET #: 12	TYPE 4B SIDEWALK RAMP	DATE: OCTOBER 2009	COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM

DRAWN BY: MARK SUJKA



PLAN VIEW

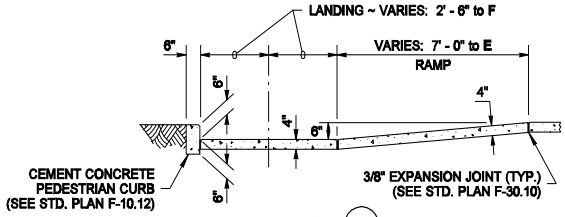
SIDEWALK RAMP TYPE 4C
LAYOUT 1

RADIUS AT FACE OF CURB	E	F
20 FEET	10' - 4 3/4"	3' - 8 1/2"
30 FEET	8' - 11 1/2"	3' - 2 1/4"
40 FEET	8' - 4 1/2"	2' - 11 3/4"
50 FEET	8' - 0 3/4"	2' - 10 1/4"
60 FEET	7' - 10 1/4"	2' - 9 3/4"
70 FEET	7' - 8 3/4"	2' - 9"
80 FEET	7' - 7 1/2"	2' - 8 3/4"
90 FEET	7' - 6 1/2"	2' - 8 1/4"
100 FEET	7' - 6"	2' - 8"
	DIMENSIONS AT FACE OF CURB	

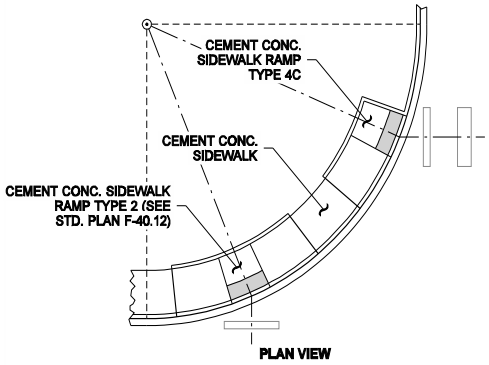
INTERMEDIATE RADII CAN BE INTERPOLATED

NOTES

1. The ramp shown on this plan is ideal and assumes optimal roadway geometric design. It assumes a curb height of 6". Adjustments must be made for conditions in the field such as roadway grade, actual curb height, etc.
2. The maximum allowable ramp slope is 12H:1V (8.34% grade). **The Federal Highway Administration (FHWA) does not accept sidewalk ramps with slopes steeper than 12H:1V.** Flatter ramp slopes are permissable. Field verify the forms before pouring concrete.
3. To the maximum extent feasible, the ramp cross slope shall not exceed 2%
4. The bottom of the ramp shall have a level area (not in excess of 2% in any direction), 4' × 4'.
5. Avoid placing drainage structures, junction boxes or other obstructions in front of ramp access areas.
6. Layout 1 is used to provide access to a single crosswalk parallel to the major street. The bid item "Cement Conc. Sidewalk Ramp Type 4C" does not include the adjacent Curb (or Curb & Gutter), the Sidewalk, or the Cement Conc. Pedestrian Curb.
7. Curb & Gutter is shown, see the Contract Plans for the curb design specified. See Standard Plan F-10.12 for curb details.
8. See Standard Plan F-30.10 for Cement Concrete Sidewalk details, sections, etc.

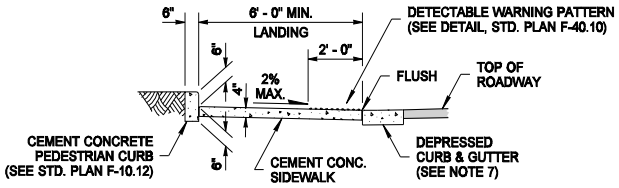


SECTION B

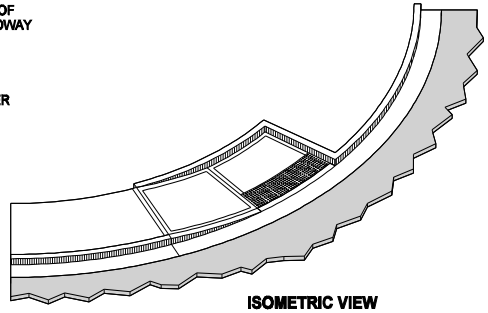


PLAN VIEW

LAYOUT 2
SEE NOTE 6



SECTION A



ISOMETRIC VIEW

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SIDEWALK RAMP TYPE 4C WITH LAYOUTS

STANDARD PLAN F-40.20-00

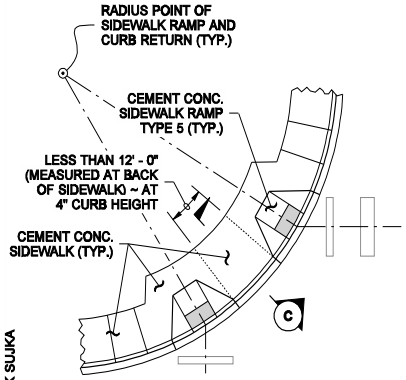
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Pasco Bakotich III — STATE DESIGN ENGINEER
10-05-07 — DATE

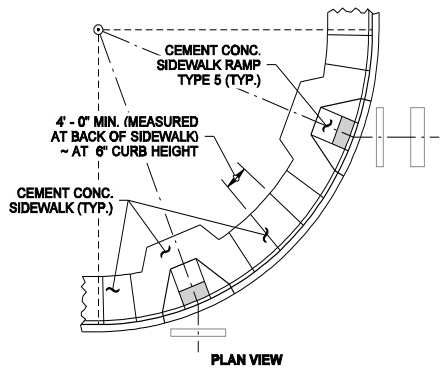
Washington State Department of Transportation

City of Bothell	SHEET #: 13	TYPE 4C SIDEWALK RAMP	DATE: OCTOBER 2009	COLLECTOR CORRIDOR TRAFFIC SAFETY PROGRAM



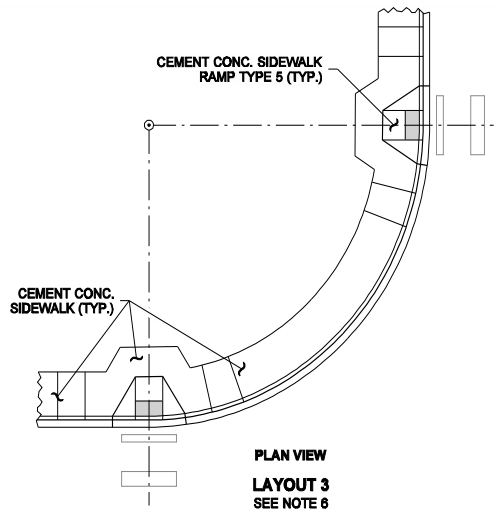
PLAN VIEW

LAYOUT 1
SEE NOTE 6



PLAN VIEW

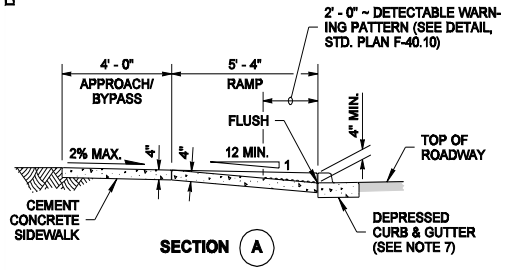
LAYOUT 2
SEE NOTE 6



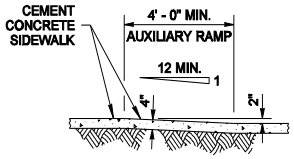
PLAN VIEW

LAYOUT 3
SEE NOTE 6

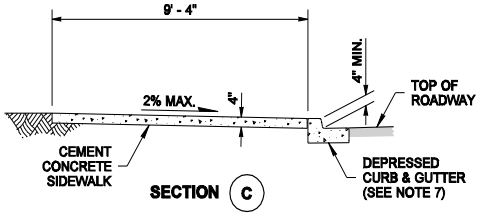
DRAWN BY: MARK SUJKA



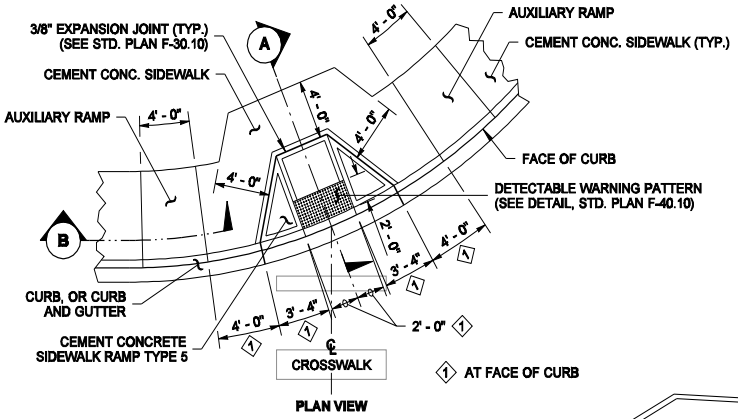
SECTION A



SECTION B

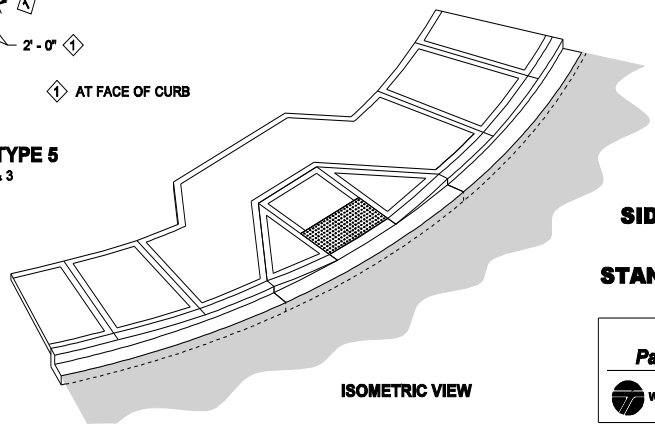


SECTION C



PLAN VIEW

SIDEWALK RAMP TYPE 5
FOR LAYOUTS 1, 2, & 3



ISOMETRIC VIEW

NOTES

1. The ramp shown on this plan is ideal and assumes optimal roadway geometric design. A given initial curb height of 6" is first reduced to 4", via the Auxiliary Ramp, staging the final descent to the roadway. Adjustments must be made for conditions in the field such as roadway grade, existing curb height, etc. The dimensions shown are the minimums unless labeled otherwise.
2. The maximum allowable ramp slope is 12H:1V (8.34% grade). **The Federal Highway Administration (FHWA) does not accept sidewalk ramps with slopes steeper than 12H:1V**. Flatter ramp slopes are permissable. Field verify the forms before pouring concrete.
3. To the maximum extent feasible, ramp cross slopes shall not exceed 2%.
4. The bottom of the ramp shall have a level area (not in excess of 2% in any direction), 4' × 4'.
5. Avoid placing drainage structures, junction boxes or other obstructions in front of ramp access areas.
6. Layouts 1, 2, & 3 require two (2) of this bid item: "Cement Conc. Sidewalk Ramp Type 5". The bid item does not include the adjacent Curb (or Curb & Gutter), or Sidewalk.
7. Curb & Gutter is shown, see the Contract Plans for the curb design specified. See Standard Plan F-10.12 for curb details.
8. See Standard Plan F-30.10 for Cement Concrete Sidewalk details, sections, etc.

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SIDEWALK RAMP TYPE 5 WITH LAYOUTS

STANDARD PLAN F-42.10-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Pasco Bakotich III — STATE DESIGN ENGINEER
10-05-07 — DATE
Washington State Department of Transportation

SIGN SHEET

BTC-1

30x30
36x36

BTC-2

30x30
36x36

BTC-3

30x30
36x36

BTC-4

30x30
36x36

W16-9P
(Y or FYG)
24x12
30x18

BTC-5

24x12
30x18

BTC-6

30x30
36x36

OM-3

12x36
(L or R)
3” Stripe

S1-1

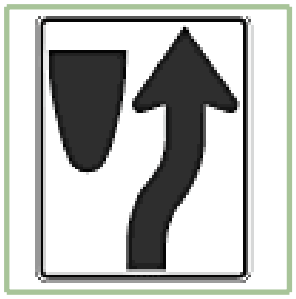
30x30
36x36

W11-2

30x30
36x36

W16-7PL

24x12
30x18



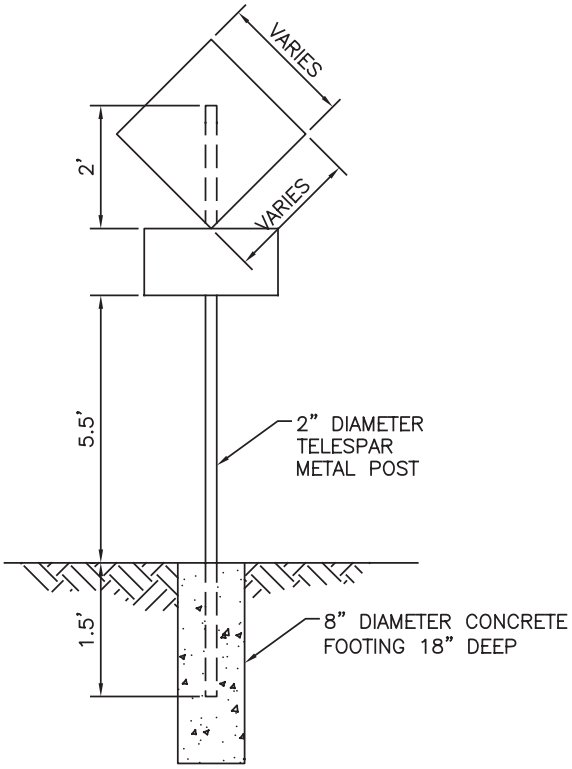
R4-7(R)
R4-8(L)
18x24, 24x30,
36x48

R4-7P(R)
R4-8P(L)
24x18

BTC-7

18x24
24x30

SIGN MOUNTING SHEET



SIGN MOUNTING DETAIL A
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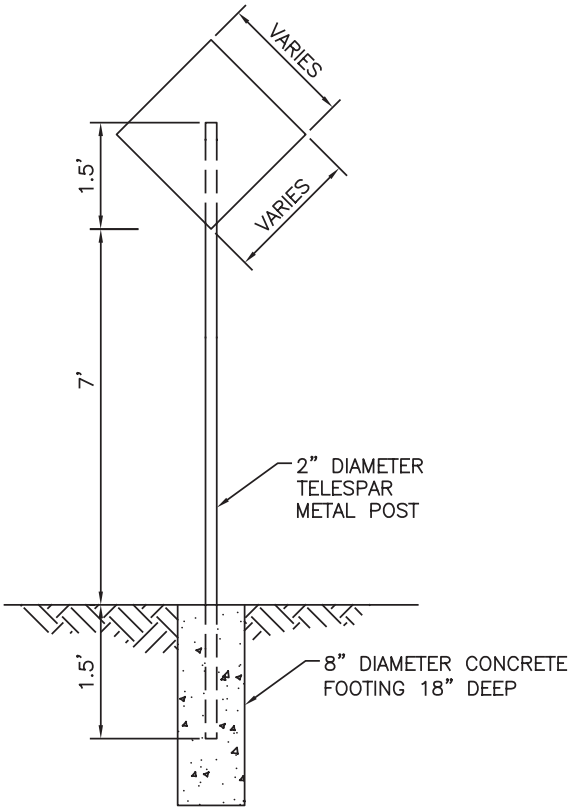
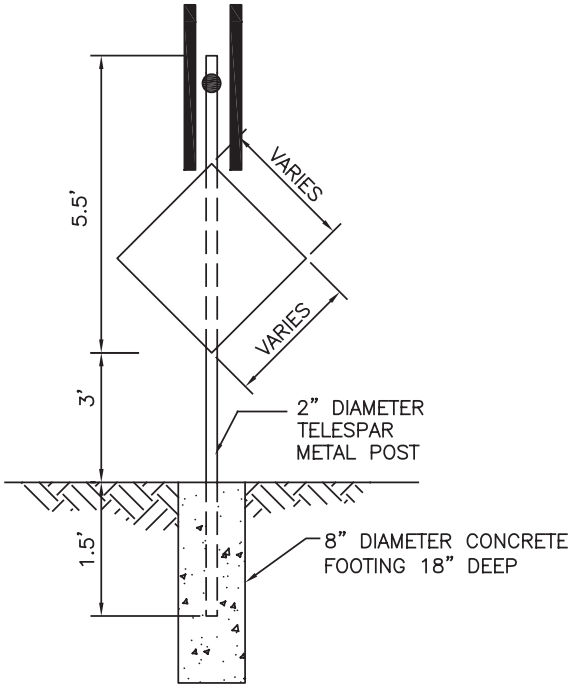
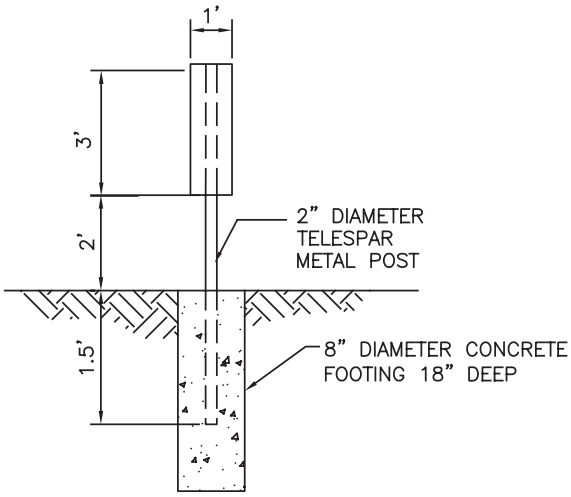


SIGN MOUNTING DETAIL B
NTS



SIGN MOUNTING DETAIL C
NTS



SIGN MOUNTING DETAIL D
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