WACONIA CITY COUNCIL MEETING AGENDA

Wednesday, January 25, 2023
5:30 PM

VISION STATEMENT
A thriving, connected community with deep roots: a great place to live for a lifetime.

MISSION STATEMENT
A city that leads, serves, and governs to enhance the quality of life for all community members.

MAYOR:	NICOLE WALDRON
COUNCIL MEMBER :	RANDY SORENSEN
COUNCIL MEMBER:	STEVE YETZER
COUNCIL MEMBER:	NICK GLEASON
COUNCIL MEMBER:	JEFF GRENGS

NOTE: TO ENSURE THAT YOU ARE PRESENT FOR ITEMS OF INTEREST, PLEASE BE PRESENT AT 6:00 P.M.

Special Meeting

Those with items on the agenda should reach out to their staff contact. Others who wish to participate in the meeting, please contact the City Administrator at 952-442-3100 or sfineran@waconia.org to make certain that you are called upon during the meeting.

1. CALL MEETING TO ORDER AND ROLL CALL

2. PLEDGE OF ALLEGIANCE

3. ADOPT AGENDA

4. COUNCIL BUSINESS

1) Downtown Construction Phase 1 Layout Review
   Motion to direct staff on final preparation of plans and specifications.

5. STAFF REPORTS

6. BOARD REPORTS

1) Councilmember Sorensen
2) Councilmember Yetzer
3) Councilmember Gleason
4) Councilmember Grengs
5) Mayor Waldron

7. ANNOUNCEMENTS

8. ADJOURN REGULAR MEETING .....OFFICE OF THE CITY ADMINISTRATOR
Shane Fineran

Work Session: None

UPCOMING CALENDAR OF EVENTS/MEETINGS:

REQUEST FOR CITY COUNCIL ACTION

Meeting Date:	January 25, 2023					
Item Name:	Downtown Construction Phase 1 Layout Review					
Originating Department:	Administration					
Presented by:	Shane Fineran					
Previous Council Action (if any):						
Item Type (X only one):	Consent		Regular Session	X	Discussion Session	

RECOMMENDATIONS/COUNCIL ACTION/MOTION REQUESTED *(Include motion in proper format.)*

Motion to direct staff on final preparation of plans and specifications.

EXPLANATION OF AGENDA ITEM *(Include a description of background, benefits, and recommendations.)*

At work session on January 17th the City Council had expressed interest in re-visiting the layout, public engagement, and decision making process of the phase 1 downtown project. Currently the project is on track to have completed plans and specifications with the goal of obtaining City Council authorization to advertise for bid on February 21, 2023.

In 2021 the public engagement process began to receive feedback regarding the project area utilizing an online tool called Input ID. This tool was advertised and made available on the City's website. In the spring of 2022 two open houses were held incorporating some of the feedback received via Input ID and utilizing goals identified in the Downtown Master Plan, 4 different layout scenarios were presented to the public and comment sought. This feedback was compiled and presented to the City Council at work session in June 2022, with the direction to prepare a layout that reflected a hybrid of two options. which included a 12' sidewalk on the north side of Main street and an 8' sidewalk on the south side of Main Street between Olive Street and Maple Street. This design layout was ratified by the City Council on July 20th via Resolution #2022-207.

On October 17, 2022 the City Council was presented with the feasibility study, which was accepted and improvements were ordered via Resolution #2022-276, with direction to staff to prepare information regarding information and options related to curb extension design at intersections along Main Street. This information was presented to the City Council at work session on November 20th, with direction by the City Council to prepare a resolution which contained three options for curb extension design which were to include a maximum curb extension design, a medium curb extension design, and no curb extension design for formal vote by the City Council. On December 19th, via resolution 2022-329 the City Council directed that the layout design featuring no curb extension be designed.

Currently the layout on Main Street features 15'-16' drive lanes, angled parking on the north side of Main Street between Olive Street and Maple Street with parallel parking on the south side of Main Street. Sidewalk width on the north side remains at 12' and 8' on the south side. The layout on Olive Street features 12' drive lanes, parallel parking stalls accommodating 10' width and a minimum of 8' sidewalk on each side. The current design meets all design standards for state aide roadways and the American with Disabilities Act (ADA).

Included as attachments are the work session packet from June, summarizing the public engagement regarding the four layout options presented, and the existing layout. A memo from City Engineer, Jake Saulsbury detailing process, current conditions of the project plans, and project timeline information. Also attached is a guide published by the US Department of Transportation which provides helpful insight into design elements for pedestrian facilities that meet ADA requirements and what is being accomplished with the current layout.

Staff is seeking direction on the final preparation of plans and specifications.

Attachments:

1. 6.20.22 Worksession Memo.pdf
2. 2023-01-25 Final Downtown Project Update.docx
3. Informational Guide - Accessible Sidewalks and Street Crossings.pdf

FINANCIAL IMPLICATIONS: Funding Sources & Uses:	***ADVISORY BOARD RECOMMENDATIONS:***	
Budget Information: _____Budgeted _____Non Budgeted _____Amendment Required	Planning Commission	
	Parks and Recreation Board	
	Safari Island Advisory Board	
	Other	

PUBLIC SERVICES DEPARTMENT MEMO

To: Honorable Mayor and City Council
From: Craig Eldred, Public Services Director
Date: June 20, 2022
RE: Downtown Reconstruction
CC: Shane Fineran, City Administrator & Department Head Staff

Aside from this short memo, you will find a cover letter from Jake Saulsbury defining information obtained and accrued since the inception of the First Virtual Downtown Open House engaging the public held in early 2021. At this juncture we are at a point where a discussion and recommendation to staff be made determining the above grade, or street layout for the Downtown. Staff will bring forth information from the Work Session to the July 18th, 2022; city council meeting and a recommendation to prepare "Preliminary Design & Scope of Services".

A few points of concern as noted in the cover letter. Parking continues to be a major subject matter. The issue at hand are the street widths, specifically the side streets. Within the side street, and specifically Elm Street, part of Phase II; internally we have discussed eliminating the East side of street parallel parking to keep the angle parking. Jake touches upon this on Page 5 of the cover letter. Alternatives to current use/design are necessary to meet traffic and pedestrian movement requirements. Some of these concerns are also impactful for First Street between Olive and Elm Streets as part of the programmed 2025 Improvement Project.

There are many more items to discuss for this project. However, at this point we would like for Council to consider the information provided for discussion and provide direction to staff on which alternative may be utilized for design. The large boards provided during the Open House will be set-up in the Maple Conference room in advance of the City Council meeting and available during the work session.

Staff would also like to discuss and gain direction on different options of project management in the downtown core to increase communication and accountability. These concepts would require additional investment by the city with the goal of providing additional assistance and touch points for affected property owners and reducing impacts of construction. One concept would be the hiring of a “Business Liaison”. This would be a temporary, part-time role during construction that would be the go-to person for property owners in the project area, lead communication efforts, and assist in project coordination. The other concept would be providing incentives, or bonus, to the contractor for expediency of the completed project.

BOLTON & MENK
Real People. Real Solutions.

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Chaska, MN 55318-1172

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Fax: (952) 448-8805
Bolton-Menk.com

June 20, 2022

City of Waconia
Attn: Shane Fineran
201 Vine Street South
Waconia, MN 55387

RE: Downtown Reconstruction Project – Layout Options

Dear Mr. Fineran,

Project Area & Completed Steps:
The reconstruction of the City's downtown area has been discussed with Council, staff, and residents over approximately the past two years. The construction of this project is generally planned to be completed in two phases over two years (2023 and 2024). These proposed project areas are explained below and shown in the following picture:

- Phase 1 is proposed to consist of 3 blocks over the western project area
  - 2 blocks of Main Street from Maple Street to Olive Street
  - 1 block of Olive Street from First Street to Main Street
- Phase 2 is proposed to consist of 6 blocks over the eastern project area
  - 3 blocks of Main Street from Olive Street to Spruce Street
  - 1 block each of Elm Street, Pine Street, & Spruce Street from First St. to Main St.

The timeline of completed steps pertaining to this project is approximately as follows:

1. Fall 2020 Initial project scope and schedule discussed with staff
2. January 2021 Project website was created and was linked to the City's website
3. 1/18/2021 Project introduced to business owners at Chamber of Commerce meeting
4. 2/11/2021 Virtual Open House held with business owners and the public
5. Spring 2021 Geotechnical evaluation and topographic survey work completed
6. Spring 2021 City Council directed staff to delay Phase 1 of the project for 1 year
7. Winter 2022 Layout options prepared after discussions with City staff
8. Spring 2022 Open Houses held on 5/18 and 6/1 to gather input on 4 layouts

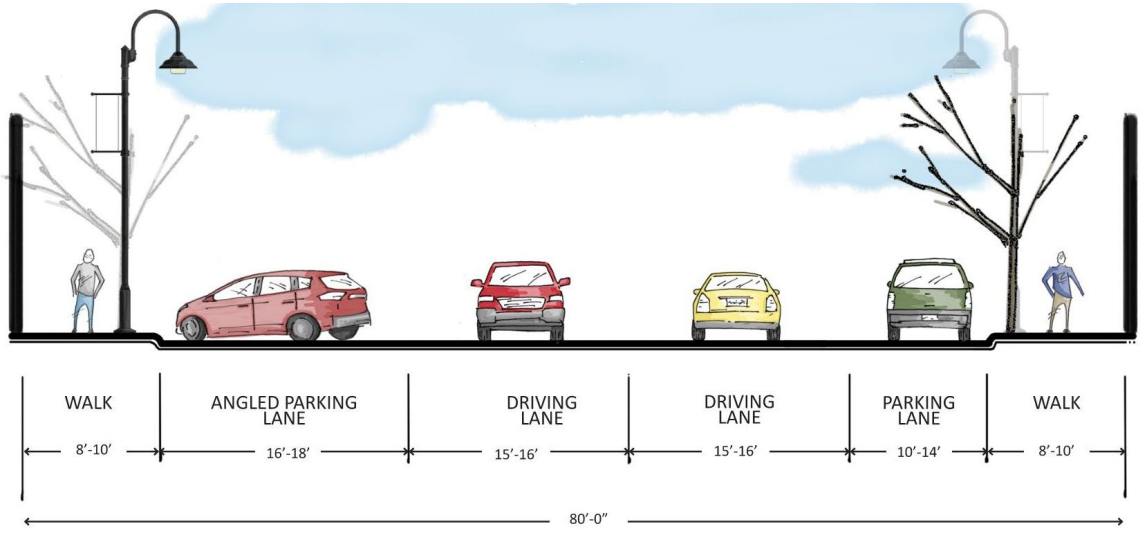
Layout Options:

The reconstruction of the core of the downtown area is an opportune time to evaluate what is wanted and needed by the business owners and the general public. Four layouts with different footprints were developed based on the initial input received and from discussions with the City Council and City staff. All options consist of complete replacement of the sanitary sewer mains/services, watermains and water services, and the storm sewer system. These utility improvements are not shown on these layouts and are not discussed in this submittal as they are generally the same for each option. The upcoming Feasibility Study will address these utility replacements in more detail.

Comments from the four layout options that were shared with the public at the recent Open Houses are included in Attachment A & B to this letter. A general description of the existing section and these various proposed layouts along with a cross section for each are shown below:

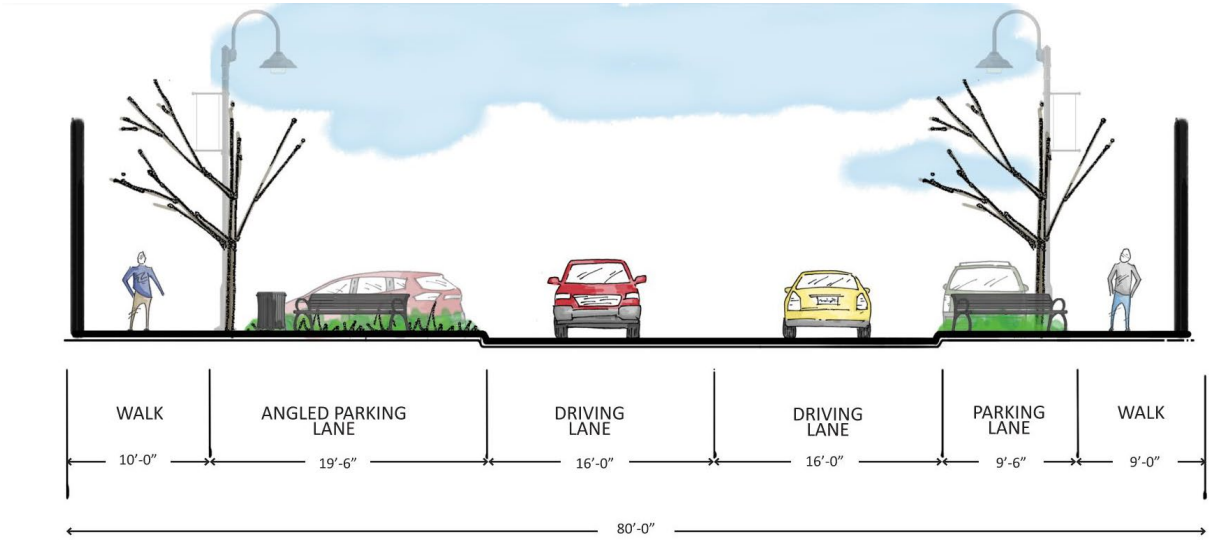
Main Street Existing Section (Maple Street to Elm Street)

The various widths vary slightly from block to block, but they are generally as shown below. This angled parking is at approximately 60 degrees along the north side of the road. The average width from back of curb to back of curb is approximately 62.5 feet.



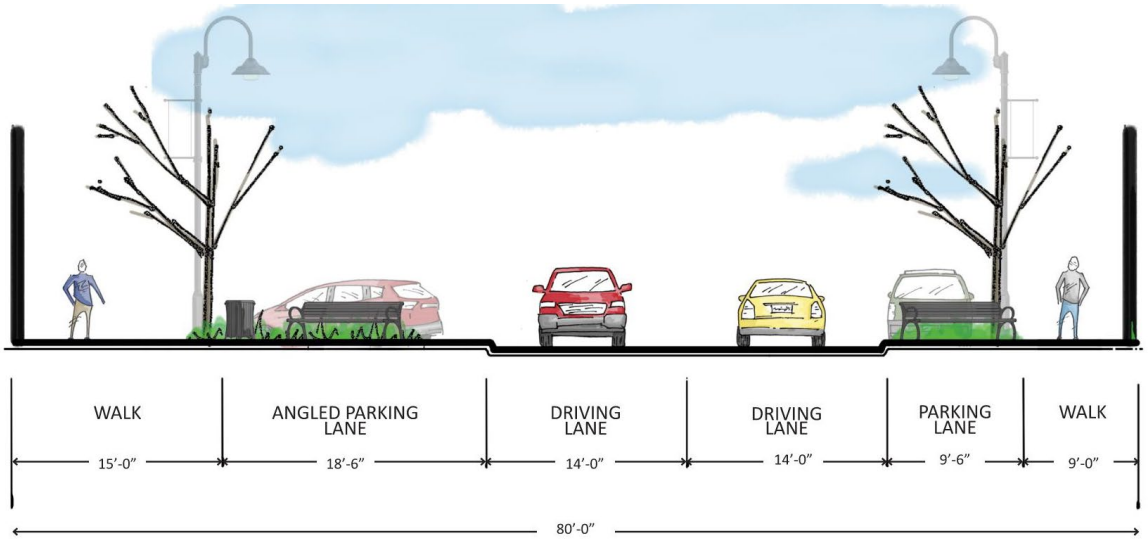
Main Street Layout Option 1 (Maple Street to Elm Street)

This option most closely mimics the existing condition through the core of the downtown. This option contains 60º angled parking on the north side of the road and parallel parking on the south side of the road, however with slightly different dimensions and widths. This option, along with the others, also contains bumpouts at several of the intersections. The back of curb to back of curb width is 61 feet which leaves 19 feet behind the curb for sidewalk and other features (1.5' more than the existing condition). There is no loss of parking on Main Street with this option.

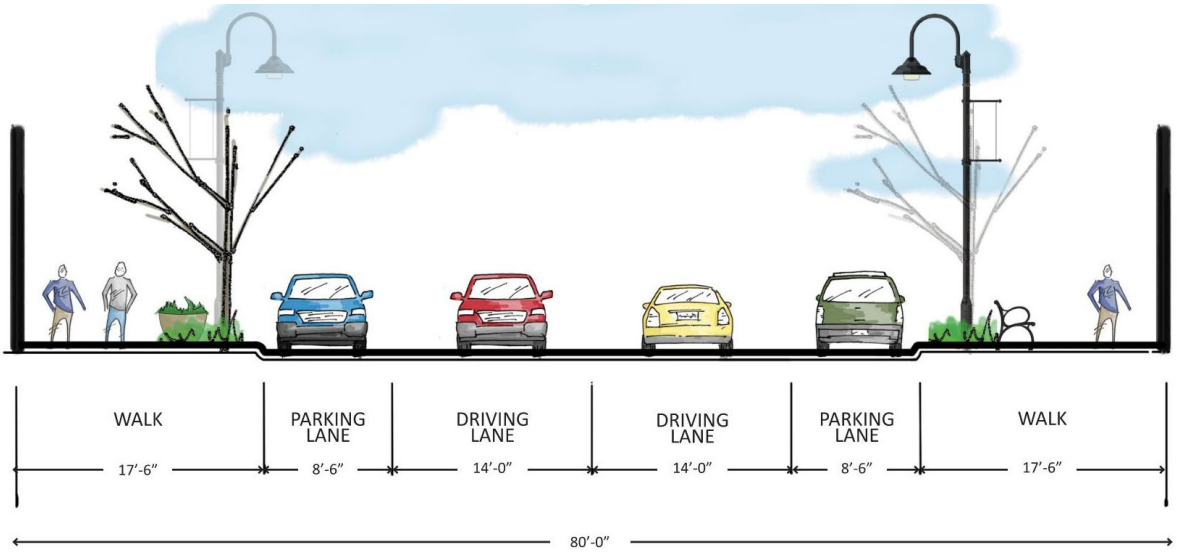


Main Street Layout Option 2 (Maple Street to Elm Street)

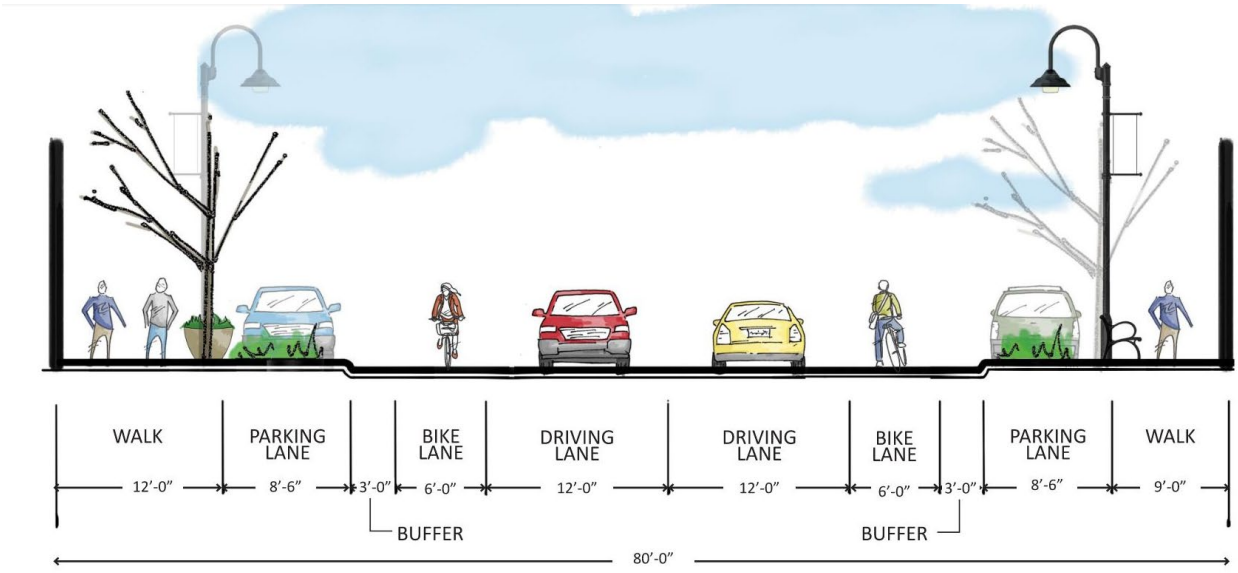
This option is similar to Option 1, only that the angled parking along the north side of the road is 45º parking. This change reduces the curb to curb footprint to 56 feet and increases the area behind the curb for sidewalk or other features to 24 feet. This change also reduces the number of on-street parking stalls on Main Street by 19 stalls.



Main Street Layout Option 3 (Maple Street to Elm Street)
This option consists of parallel parking on both sides of the road. This would match the recently reconstructed blocks of Main Street to the west and would approximately match the existing section of Main Street from Elm Street to the east. This change reduces the curb to curb footprint to 45 feet and increases the area behind the curb for sidewalk or other features to 35 feet. This change also reduces the number of on-street parking stalls on Main Street by 41 stalls.

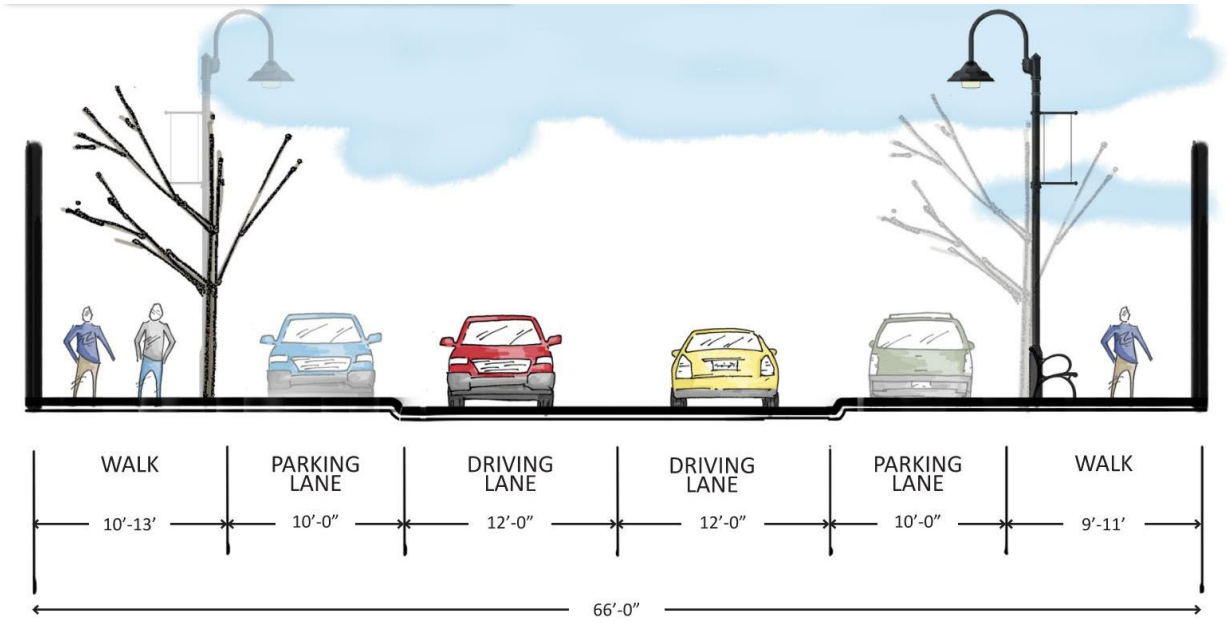


Main Street Layout Option 4 (Maple Street to Elm Street)
This option is similar to Option 3 in that it contains parallel parking on both sides of the road. However, this option also contains bike lanes on each side of the road between the drive lanes and the parking lanes. This change reduces the curb to curb footprint to 59 feet and increases the area behind the curb for sidewalk or other features to 21 feet. This change also reduces the number of on-street parking stalls on Main Street by 41 stalls (same as in Option 3).



Main Street Layout – All Options (Elm Street to Spruce Street)
The eastern two blocks of Main Street from Elm Street to Spruce Street are proposed to contain the same cross section for all options. This area is primarily residential and does not warrant the need for increased parking as it does to the west. The proposed section for these two blocks is the same as in Option 3 except for the 17.5 feet behind the curb on both sides of the road would consist of a 6-foot concrete walk and 11.5 feet of green space. This section would also match the recently reconstructed portion of Main Street from Walnut Street to Maple Street.

Side Street Layouts (Olive Street, Elm Street, Pine Street, & Spruce Street)
The side streets of Olive Street, Elm Street, Pine Street, and Spruce Street are all proposed to contain a section with a 44-foot wide street and parallel parking on both sides. This matches the recently reconstructed roadways over portions of First Street, Second Street, Third Street, Walnut Street, and Maple Street. The segments with sidewalks are proposed to vary. Sidewalk is proposed on both sides of Olive Street and on Elm Street. Sidewalk is proposed on the west side of Pine Street, and no sidewalk is proposed on Spruce Street. Please note the right-of-way widths of these side streets is 66 feet rather than the 80-foot right-of-way on Main Street.



This proposed section results in no change to the parking count other than on Elm Street. Elm Street currently contains diagonal parking on the west side of the road. Changing this to parallel parking results in a loss of 16 parking stalls. The existing roadway width on Elm Street and the proposed roadway width of 44 feet do not allow for this angled parking configuration to remain. However, an option does exist to remove the parallel parking on the east side of the road to keep the angled parking on the west side of the road. This change would result in a loss of approximately 9 stalls rather than 16 stalls.

Public Input:
The first Open House where these various layout options were shared was held on May 18, 2022. Formal comments were collected from attendees interested in providing their thoughts. A table of the comments received at this meeting is included as part of Attachment A. These comments and the discussions held with the attendees of this meeting were overwhelmingly pertaining to the

concerns over losing parking stalls. Therefore, Option 1 and Option 2 were viewed much more favorably by those in attendance.

The second Open House was held on June 1, 2022. The same process of collecting formal comments was completed, and these are also included in Attachment B. The main talking point at this meeting was again the need for parking. Two or three attendees also spoke favorably of wanting bike lanes and/or a bike trail through the downtown area. Option 1 and Option 2 appeared to garner the most support again along with some advocating for Option 4.

Other comments were collected before the layout options were developed and shared. These comments were gathered through the project website over 15 months prior to the recent Open Houses. The 15-month comments are provided, as Attachment C; as is a summary of Open House comments within Attachment A & B.

Next Steps & Schedule:

The tentative project schedule shared with the public over the previous year was that a Feasibility Study would be completed by the fall of 2022 and then a Public Hearing would be conducted before the end of the year. In order to proceed to the Feasibility Study phase, we are asking for City Council direction as to the proposed layout. Assuming that occurs in the near-term, the major items of the project schedule moving forward would be approximately as follows:

- Summer 2022 — Determine project layout & proceed to Feasibility Study for Phase 1
- Fall 2022 — Complete Ph. 1 Feasibility Study & call for the Improvement Hearing
- Winter 2022 — Order improvements & proceed to final design for Phase 1
- Spring 2023 — Bid and award Phase 1 project
- Summer 2023 — Start Phase 1 construction & initiate Feasibility Study for Phase 2
- Fall 2023 — Complete Ph. 2 Feasibility Study & call for the Improvement Hearing
- Winter 2023 — Order improvements & proceed to final design for Phase 2
- Spring 2024 — Bid and award Phase 2 project
- Summer 2024 — Start Phase 2 construction & final Phase 1 construction
- Summery 2025 — Final Phase 2 construction

I am available to discuss this project and these various layout options at your convenience.

Sincerely,

Bolton & Menk, Inc.

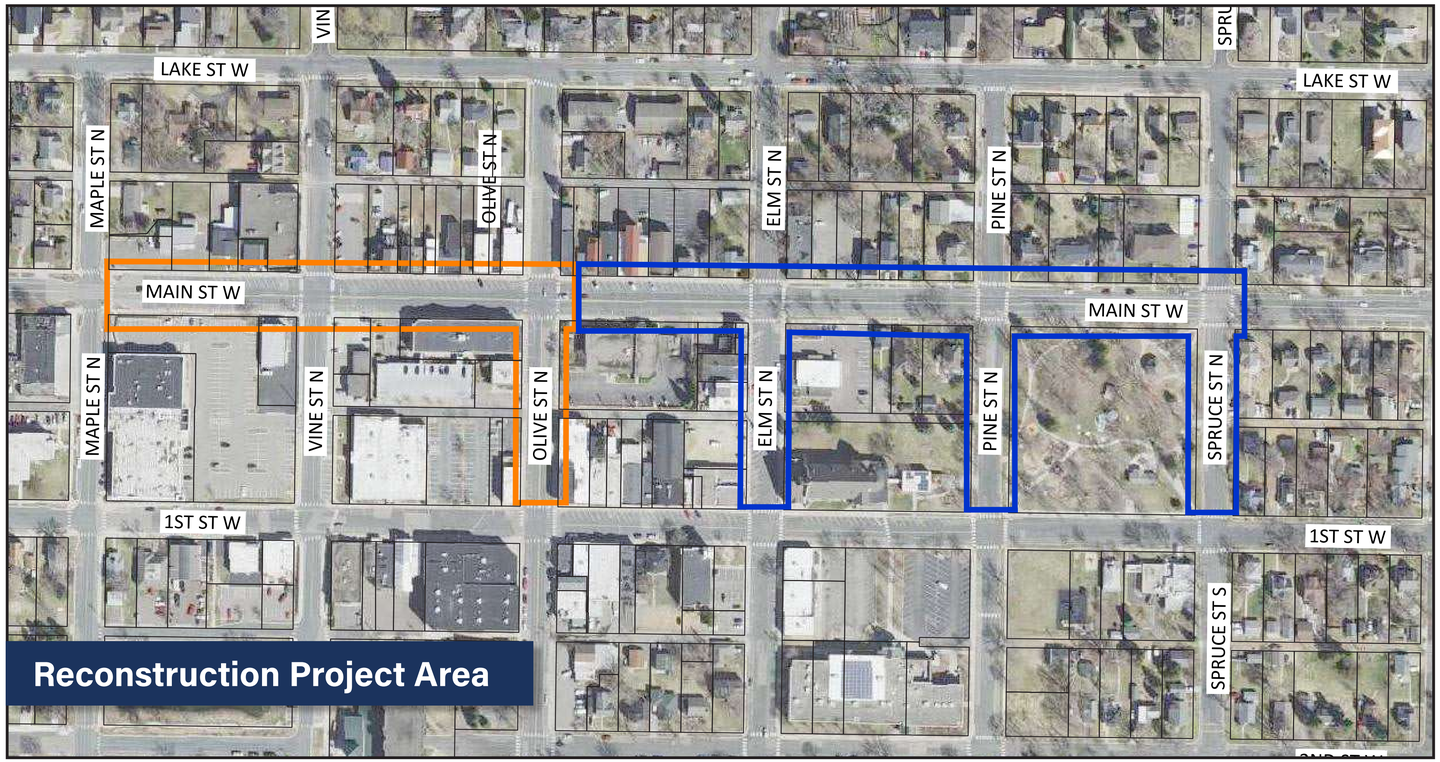
Jake D. Saulsbury

Jake Saulsbury, P.E.

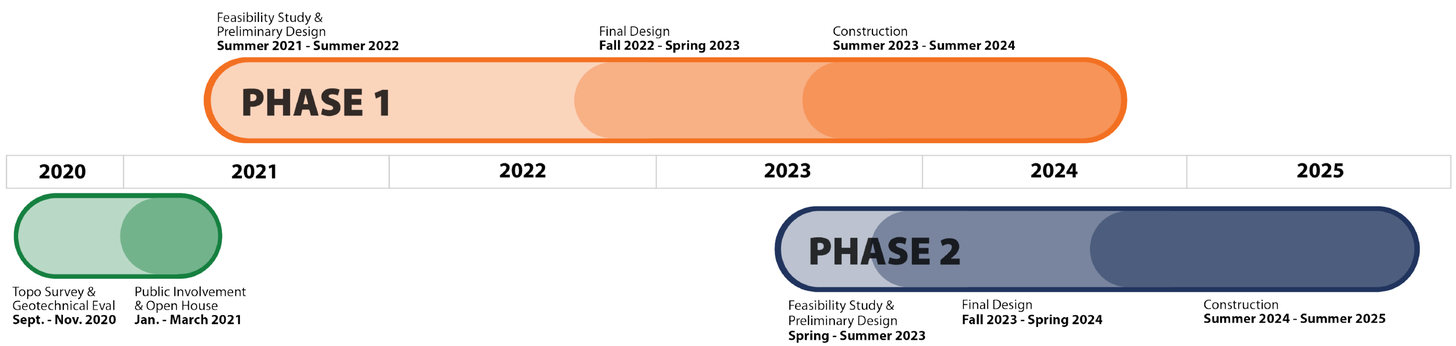
Cc: Craig Eldred, City of Waconia

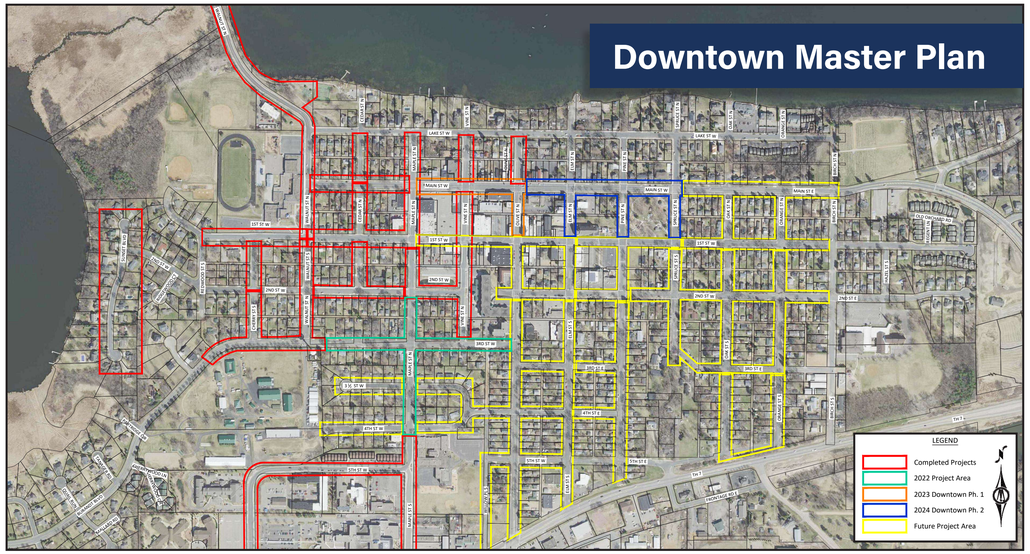
Downtown Waconia Reconstruction

PROJECT OVERVIEW



ANTICIPATED PROJECT TIMELINE





In 2014, a **Downtown Master Plan** was created for the City of Waconia, to provide a framework that would help city leaders and other stakeholders revitalize downtown Waconia, physically and economically by:

- Improving parking and pedestrian infrastructure
- Developing a unique identify for downtown Waconia through signage and streetscaping
- Re-establish Lake Waconia as a public destination that is easily accessible from the downtown

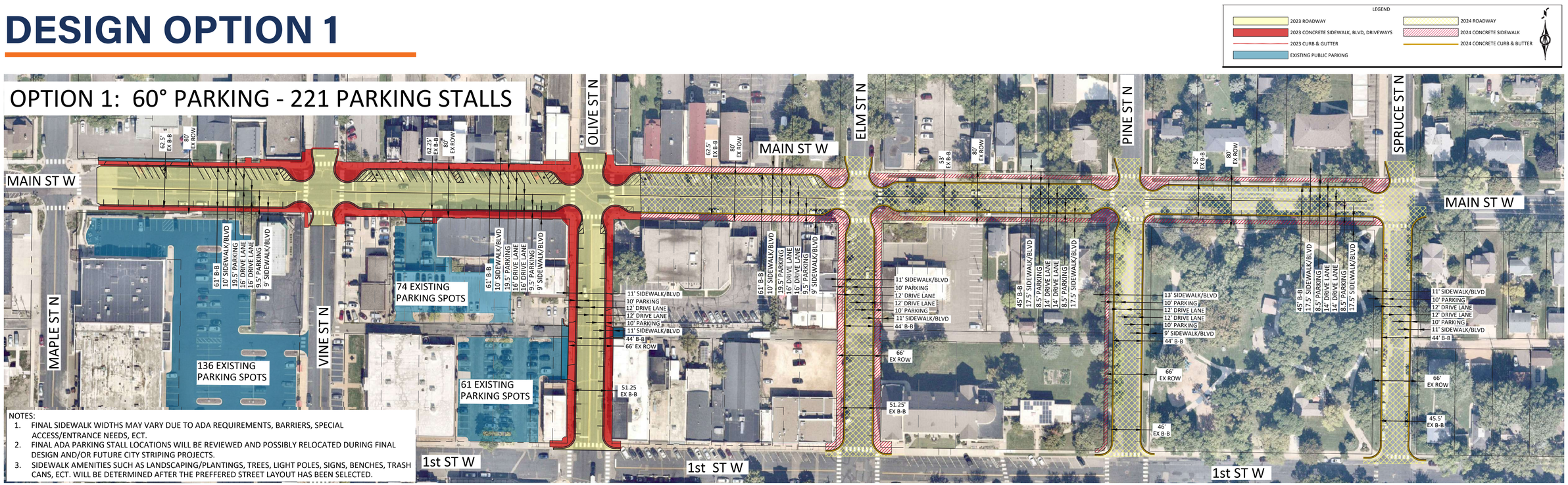
What will this project accomplish?

- Remove and replace the roadway, parking, adjacent sidewalks, and the underlying public utilities
- Replace and expand the storm sewer/drainage system
- Implement stormwater treatment infrastructure
- Replace and improve street lighting
- Incorporate wayfinding and decorative signage

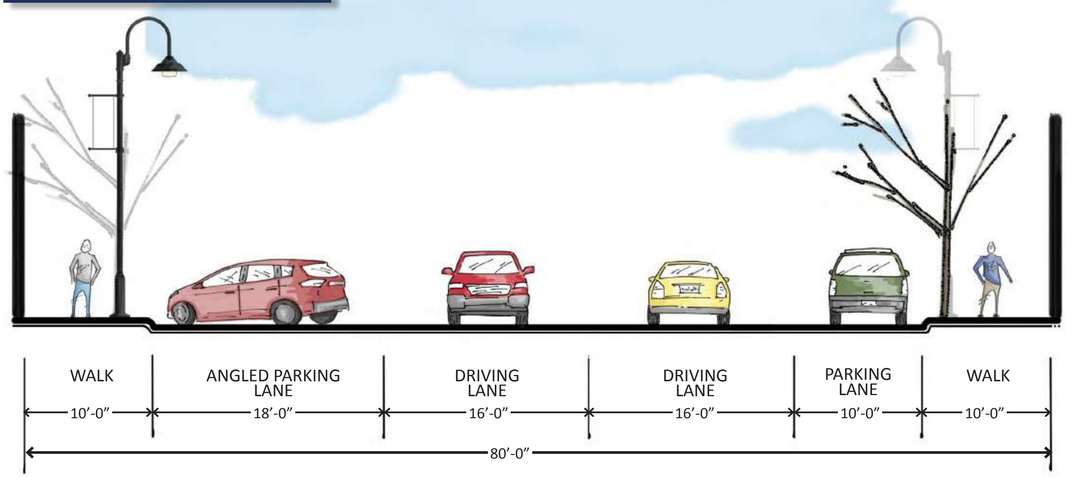
Sign up for project updates on the project website: clients.bolton-menk.com/waconiadowntown

Downtown Waconia Reconstruction

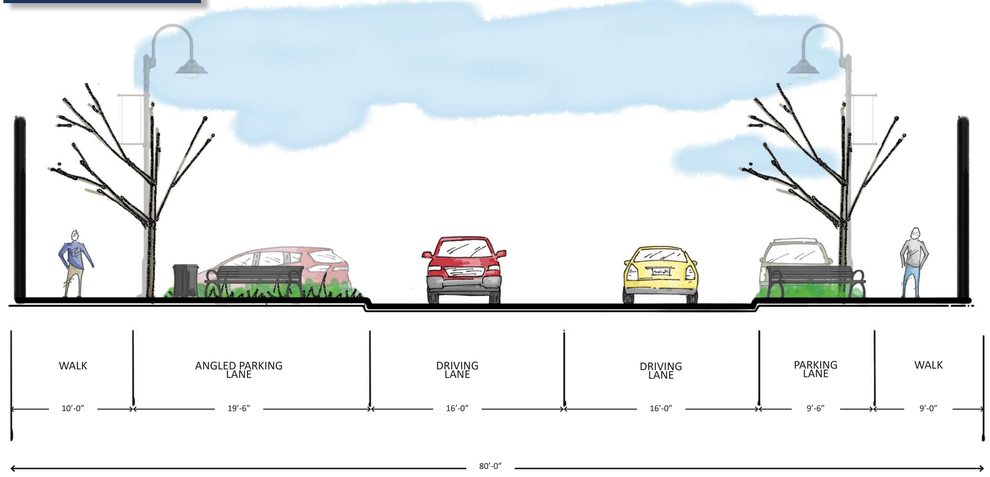
DESIGN OPTION 1



Existing Corridor



Option 1



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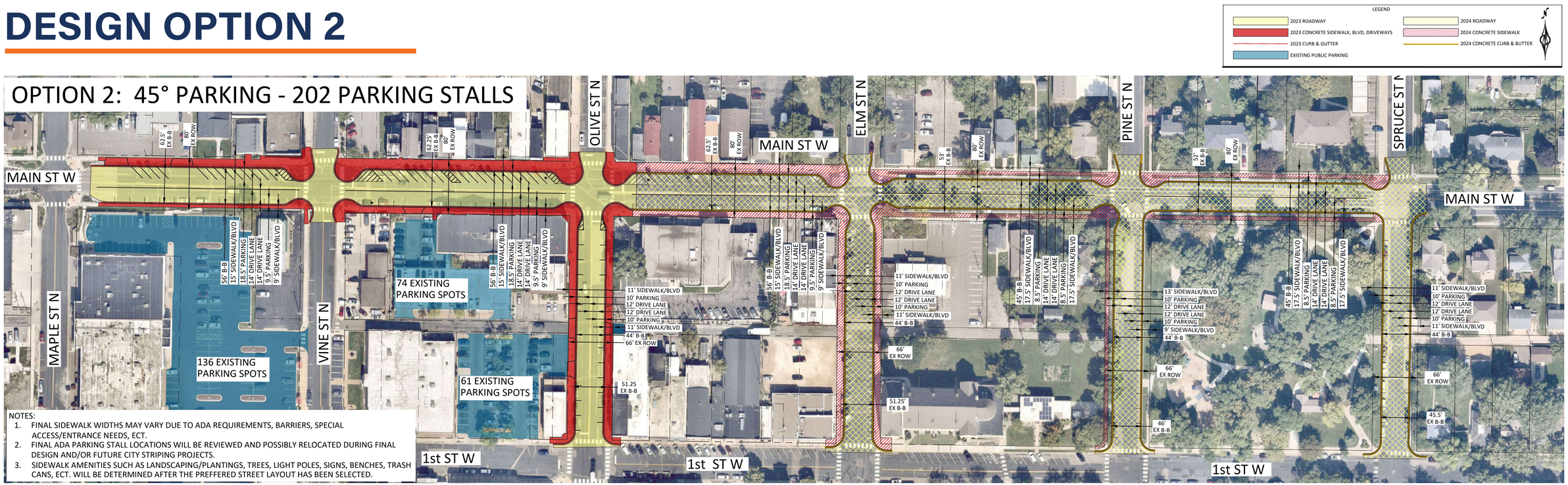
Downtown Waconia Reconstruction

DESIGN OPTION 2



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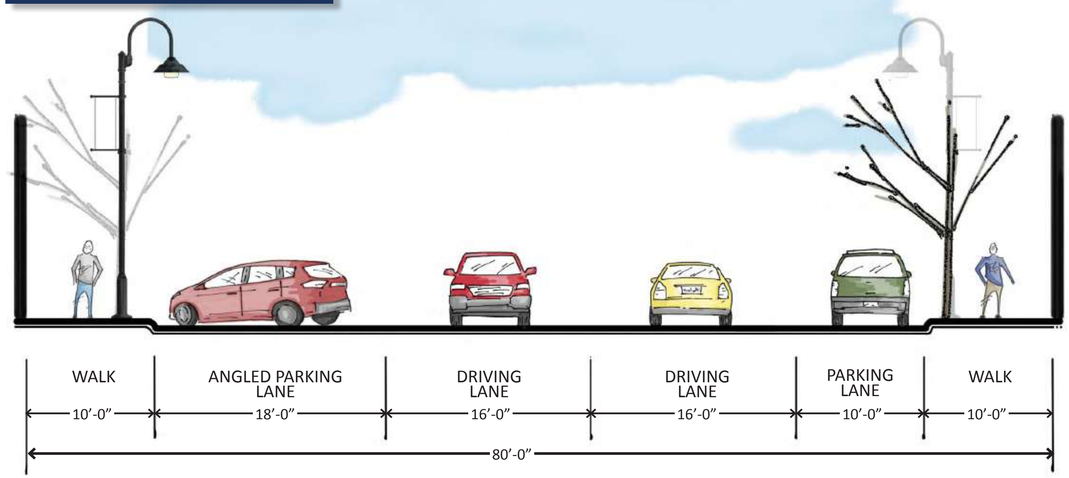
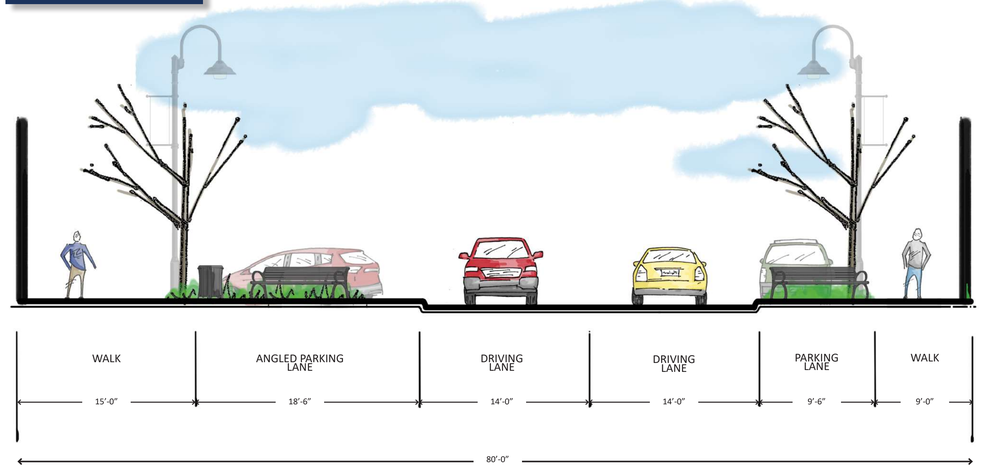


Option 2



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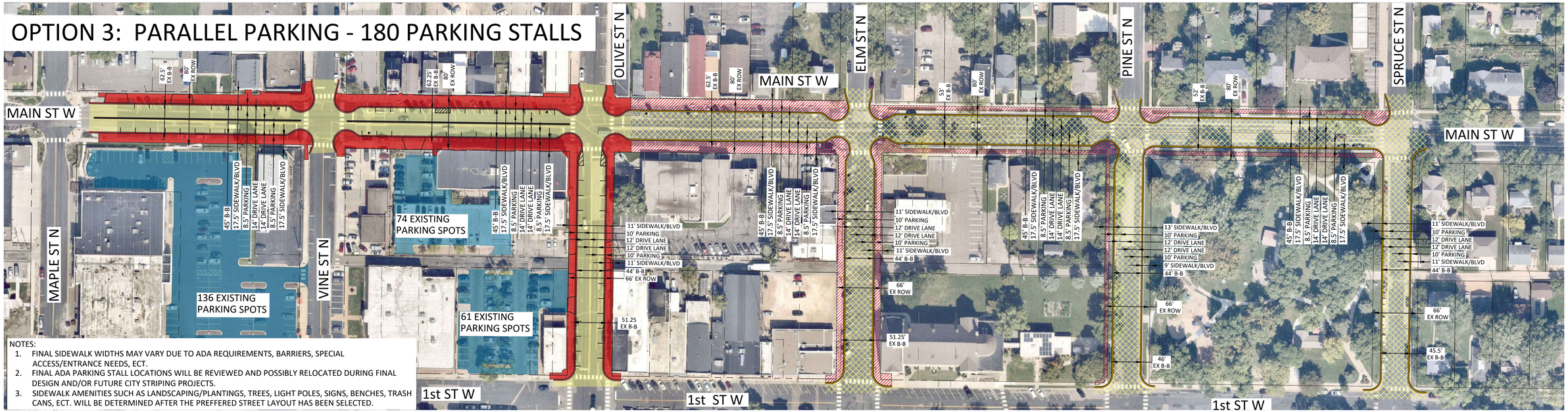
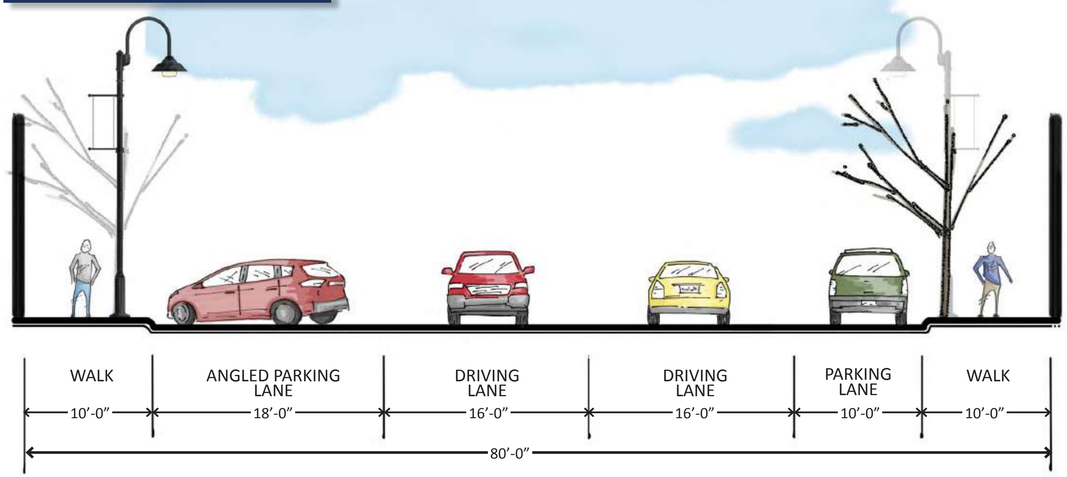
Downtown Waconia Reconstruction

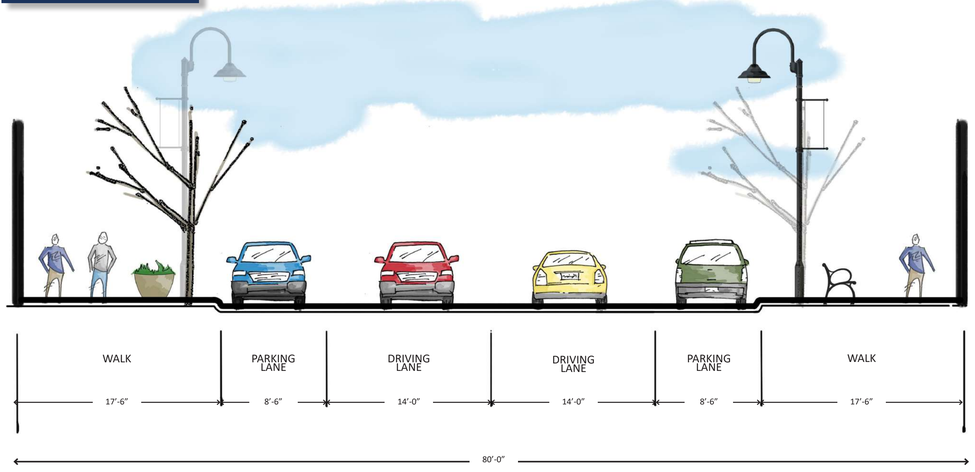
DESIGN OPTION 3



Existing Corridor



Option 3



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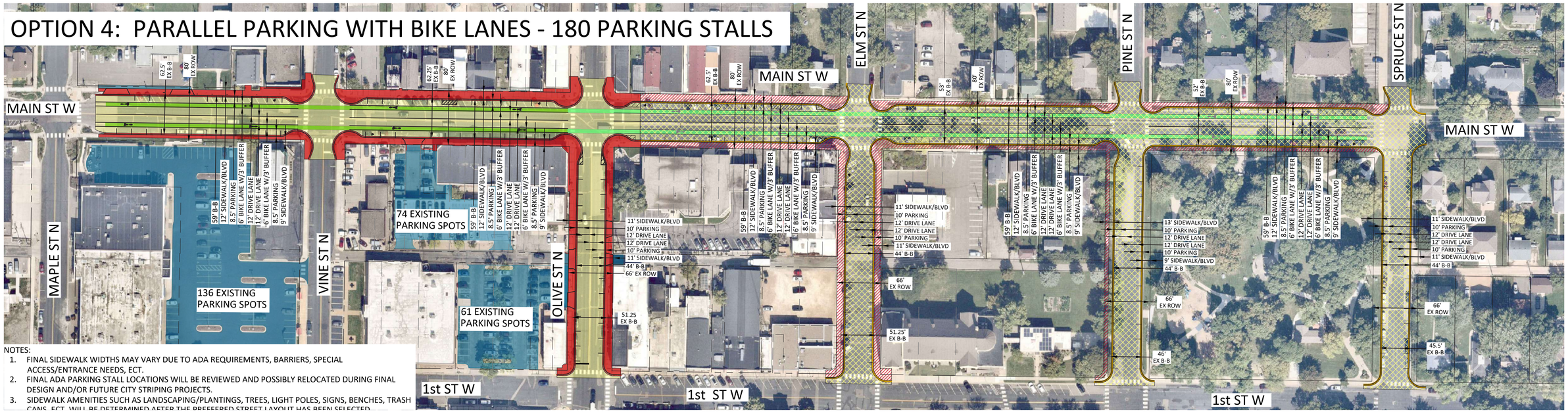
Downtown Waconia Reconstruction

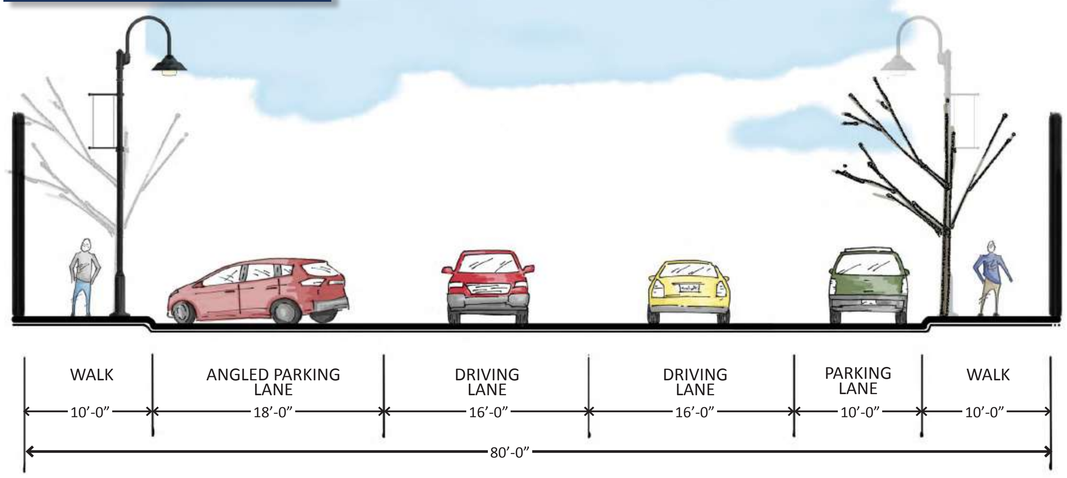
DESIGN OPTION 4



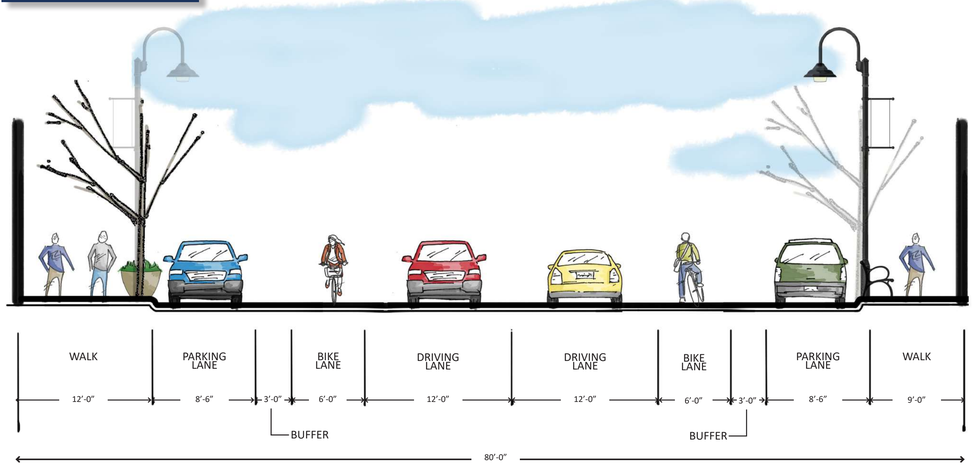
NOTES:

1. FINAL SIDEWALK WIDTHS MAY VARY DUE TO ADA REQUIREMENTS, BARRIERS, SPECIAL ACCESS/ENTRANCE NEEDS, ECT.
2. FINAL ADA PARKING STALL LOCATIONS WILL BE REVIEWED AND POSSIBLY RELOCATED DURING FINAL DESIGN AND/OR FUTURE CITY STRIPING PROJECTS.
3. SIDEWALK AMENITIES SUCH AS LANDSCAPING/PLANTINGS, TREES, LIGHT POLES, SIGNS, BENCHES, TRASH CANS, ECT. WILL BE DETERMINED AFTER THE PREFERRED STREET LAYOUT HAS BEEN SELECTED.

Existing Corridor



Option 4



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Attachment A; City of Waconia
Downtown Waconia Reconstruction
5/18 Open House Comments

Name:	Taylor Hubbard
Comment:	Please - if you are taking away parking - you need to come up with alternative spots - I understand why but it's a disservice to lose spots and businesses are important part/stakeholder in this community - it matters!

Name:	Paul Mackenthun, 952-240-4750
Comment:	Need more parking in downtown spread out throughout. Do we really need bike lanes and wide sidewalks? Not at the expense of parking.

Name:	Steve Yetzer
Comment:	Can not narrow Elm St and lose the diagonal parking - 16 spaces lost

Name:	Dan & Becky Nuebauer
Comment:	Option #2 seems to make the most sense considering the lack of parking already. This seems to be a good compromise between what we have now and Option 3 with very wide sidewalks (& so much less parking). Thank you!

Name:	Dee Delange
Comment:	I like option 2 so that restaurants can put a few tables out. Glad to hear our utilities will not be impacted! Thanks All.

Name:	Steve Yetzer
Comment:	Options 3 & 4 should be discarded! No parking! Keep parking or have plan for parking to replace lost. Do away with bumpouts at corners. Semi/Truck can't make turns without going into oncoming lane. Cleanup bumpout rain gardens. They look terrible!!

Name:	Kara Frank, Owner Main Street Exchange - kara@twinrealtyinvest.com
Comment:	With the resurfacing of Main Street - PLEASE resurface the city parking lots adjacent to my property. It is a liability, a hazard, and an absolute eye sore. I have been asking for patching or resurfacing for years with no result.

Name:	Vicky Polunc, Framing Images - 11 N Olive St
Comment:	We would like to have a marked parking spot in front of our entrance for loading and unloading. We have a handicapped entrance and it would be easier for customers when they puck up their framed project. At this time we like option #1 for downtown Waconia reconstruction.

Attachment B; City of Waconia
Downtown Waconia Reconstruction
6/1 Open House Comments

Name:	Ben Strasheim, 402-499-7934
Comment:	Preferred Option #4. Was bike lane on the inside of parking considered? Would be safer for bikers and add additional buffer for pedestrians. No concerns about loss of parking, plenty available in lots and streets off Main.

Name:	Tom Plihal
Comment:	East Main St. - heavy traffic noise and trucks. Main St. should not be a truck route. Enforce a noise ordinance in city. Lower speed limit to 20-25 miles per hour. Downtown - I like no angle parking and wide sidewalks.

Name:	Christine Fenner, cfenner@destinationwaconia.org
Comment:	In talking with several downtown business owners, parking is the #1 concern. Next, it would make most sense to widen sidewalks only on the North side of Main St. from Elm to Vine if sidewalks were to be widened. Last, there are concerns about the sidewalk "bumpouts" for size of vehicles, delivery trucks and making turns.

Name:	Greg James, 952-300-0518
Comment:	I vote Plan 2 without the bump outs.

Name:	Clarence/H.E.I Collision
Comment:	Plan 2 seems to be what I would see. But the think I don't like is the bump outs, I would think it would be a problem for plowing streets.

Name:	Soltis Family Chiropractic, Dr. Jeff and Leah
Comment:	We are excited about this project and what it means for our community. However, as a business owner it presents us with many challenges. 60+ patients walk though our doors each day and need easy accessible parking because many of them are in pain. Walking even a block or two is not an option for some of our patients. We do not have parking in the rear of our building and the alley is not maintained like the alley ways West of us. We hope to have a very clear idea of what this will look like for our business and patients. Also, will there be extended periods of time without water and sewer? Anxious to learn more! Thank you.

Name:	Steve Dvorak, Resident of 104 E Main St.
Comment:	Option 2 looks to me to be a good choice. Not a fan of #4.

Name:	Unnamed Attendee
Comment:	Option #1 the shortcut. No parallel parking on North. Will clients be able to use front door entrance at all? Water concern to accommodate our daily clients. Possible handicap spot on Northside of 132 W Main. Address the back alley road for our clients to use while roads are closed – delivery trucks are wear and tear! No bump outs please. Sidewalk width is good as is, but no bricks. Guesstimated cost per business.

Jake Saulsbury

From: gis-dept@bolton-menk.com
Sent: Monday, June 6, 2022 9:17 AM
To: Jake Saulsbury; Mikaela Isaacson
Cc: Nate Christ; David Sandberg
Subject: Input ID Comment updates for Downtown Waconia

0 new comments and 0 new replies from Downtown Waconia since Monday, May 30, 2022.

18 Total Initial Comments and 8 Total Replies.

Most Liked Comments

👍 4 👎 0 | It would be great to see a bit more green along Main St. I know space is limited, but possibly a handful of small trees with limited growth or narrow elevated planters near the curbs on the sidewalks would really improve the aesthetics. - 02/12/2021 - 9:40:12 am | view in map

👍 3 👎 0 | As a business owner close to the corner of Olive and Main Street, we have noticed that people frequently fail to stop at that intersection. Having better signage regarding the 4 way stop would be a great improvement. - 02/05/2021 - 3:29:22 pm | view in map

👍 3 👎 0 | Bike lanes would help get bikers from regional trail system and Waconia regional park to downtown safely. With main street's wider right of way, it makes the most sense for adding bike lanes. - 02/19/2021 - 9:42:33 am | view in map

👍 1 👎 0 | Water flows/freezes on ped ramp - 02/11/2021 - 6:25:16 pm | view in map

👍 1 👎 0 | This area is outside of the project, but relevant to discussion on a broader trail connection from Old Beach Road through downtown...this intersection has sight distance issues and the travel lanes should be shifted south to improve visibility for motorists on the north approach. - 05/12/2022 - 9:05:21 am | view in map

Most Disliked Comments

👍 0 👎 2 | I do not like how the curbs were extended on the corners of the blocks. It harder to make a safe turn there and I am sure it is harder for the city to plow snow when the curb sticks out. Most of the time the flowers etc. don't even look nice in those catch basin's. - 08/06/2021 - 9:49:49 am | view in map

👍 0 👎 0 | In order to in fact improve the downtown, First Street needs to be added to the project. It is strongly suggested that First Street between Vine and Olive be added to the 2022 project and First Street between Olive and Elm be added to the 2023 project. - 08/06/2021 - 3:19:45 pm | view in map

👍 1 👎 0 | The parking lot next to main street exchange really needs a repave, potholes everywhere - 08/06/2021 - 9:28:43 am | view in map

👍 1 👎 0 | This area is outside of the project, but relevant to discussion on a broader trail connection from Old Beach Road through downtown...this intersection has sight distance issues and the travel lanes should be shifted south to

improve visibility for motorists on the north approach. - 05/12/2022 - 9:05:21 am | view in map

👍 3 👎 0 | As a business owner close to the corner of Olive and Main Street, we have noticed that people frequently fail to stop at that intersection. Having better signage regarding the 4 way stop would be a great improvement. - 02/05/2021 - 3:29:22 pm | view in map

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Prior Comments and Replies

👍 0 👎 0 | **Kevin Nowak:** Very Blind crossing along sidewalk from people leaving bank to pedestrians. Consideration needed.
05/12/2022 - 9:46:57 am | view in map | contact this person

👍 0 👎 0 | **Kevin Nowak:** Very Blind crossing along sidewalk from people leaving bank to pedestrians. Consideration needed.
05/12/2022 - 9:46:53 am | view in map | contact this person

👍 0 👎 0 | **Kevin Nowak:** No Dogs make this park not inviting to many people walking their pets. What do you want people to do, cross the street to avoid the park? Consider removing these signs.
05/12/2022 - 9:43:40 am | view in map | contact this person

👍 0 👎 0 | **Matt Pacyna:** Consider removing the parallel parking on the south side of Main Street to add curb-side space and an off-street trail.
05/12/2022 - 9:07:44 am | view in map | contact this person

👍 0 👎 0 | **Matt Pacyna:** An off-street trail should be provided along the corridor to provide the safest multimodal facility possible as well as be part of a future loop trail around the lake.
05/12/2022 - 9:06:32 am | view in map | contact this person

👍 1 👎 0 | **Matt Pacyna:** This area is outside of the project, but relevant to discussion on a broader trail connection from Old Beach Road through downtown...this intersection has sight distance issues and the travel lanes should be shifted south to improve visibility for motorists on the north approach.
05/12/2022 - 9:05:21 am | view in map | contact this person

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0 0 | **Paul Melchert:** In order to in fact improve the downtown, First Street needs to be added to the project. It is strongly suggested that First Street between Vine and Olive be added to the 2022 project and First Street between Olive and Elm be added to the 2023 project.
08/06/2021 - 3:19:45 pm | view in map | contact this person
Replies:
0 0 | Agree - 05/02/2022 - 9:13:54 pm

---

0 2 | **Mike Keaveny:** I do not like how the curbs were extended on the corners of the blocks. It harder to make a safe turn there and I am sure it is harder for the city to plow snow when the curb sticks out. Most of the time the flowers etc. don't even look nice in those catch basin's.
08/06/2021 - 9:49:49 am | view in map | contact this person
Replies:
1 0 | Neckdowns greatly improve pedestrian safety by slowing turning speeds and reducing crossing distance. Added bonus is additional space for amenities (green space, benches, bike parking). Hope to see more of these downtown. - 05/02/2022 - 2:31:42 pm

---

1 0 | **Cody:** The parking lot next to main street exchange really needs a repave, potholes everywhere
08/06/2021 - 9:28:43 am | view in map | contact this person
Replies:
0 0 | Better wayfinding signage to existing public parking should be provided - 05/12/2022 - 9:02:17 am

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1 0 | **Stan Mader:** could have cafe style seating ala Covid.
03/12/2021 - 4:53:06 pm | view in map | contact this person

---

0 0 | **Fr. Stan Mader :** school children cross here to church several times a week.
03/12/2021 - 4:48:57 pm | view in map | contact this person

---

1 0 | **Bonnie Delaney:** We will need access to the driveway on Pine street that leads to our Rectory.
03/12/2021 - 10:30:39 am | view in map | contact this person

---

1 0 | **Bonnie Delaney:** During the school year, a number of children walk through the downtown area on their way to and from school. Detour signs or safe walk routes will be needed
03/12/2021 - 10:29:29 am | view in map | contact this person

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1 0 | **Bonnie Delaney:** St. Joseph utilizes much of the surrounding streets for parking during Mass times (primarily on weekends), also funeral parking. We do overflow into the Food Shelf parking at these times. Other than street parking, we have a large parking lot across 1st street near the school which perhaps will nto be impacted.
03/12/2021 - 10:27:39 am | view in map | contact this person
Replies:
0 0 | Three weekend Masses/week. About 30 funerals/yr, but only 15 where parking is tight. - 03/12/2021 - 4:50:32 pm

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3 0 | **Ben S.:** Bike lanes would help get bikers from regional trail system and Waconia regional park to downtown safely. With main street's wider right of way, it makes the most sense for adding bike lanes.
02/19/2021 - 9:42:33 am | view in map | contact this person
Replies:
1 0 | This is important - 03/01/2021 - 1:16:01 pm
1 0 | I would prefer to see an off-street trail (separated bikeway) as opposed to on-street bike lanes...its more safe for all users, and especially kids going to/from school and/or ice cream - 05/12/2022 - 9:00:17 am

---

4 0 | **Ben McQuillan:** It would be great to see a bit more green along Main St. I know space is limited, but possibly a handful of small trees with limited growth or narrow elevated planters near the curbs on the sidewalks would really improve the aesthetics.
02/12/2021 - 9:40:12 am | view in map | contact this person

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1 0 | **Jake:** Water flows/freezes on ped ramp
02/11/2021 - 6:25:16 pm | view in map | contact this person

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3 0 | **Jennifer Templin:** As a business owner close to the corner of Olive and Main Street, we have noticed that people frequently fail to stop at that intersection. Having better signage regarding the 4 way stop would be a great improvement.
02/05/2021 - 3:29:22 pm | view in map | contact this person
Replies:
0 0 | Or simply ticket people who fail to stop I think enforcement is key. It's a very dangerous intersection. - 08/06/2021 - 3:31:43 pm
0 0 | I would suggest adding bump outs, particularly on the north side of Main Street along with tightening up the lanes to reduce the ped crossing distance - 05/12/2022 - 9:01:51 am

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Anything else you'd like to know?

BOLTON & MENK
Real People. Real Solutions.

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Chaska, MN 55318-1172

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Fax: (952) 448-8805
Bolton-Menk.com

January 25, 2023

City of Waconia
Attn: Shane Fineran
201 South Vine Street
Waconia, MN 55387

RE: Downtown Reconstruction Project – Final Design Update

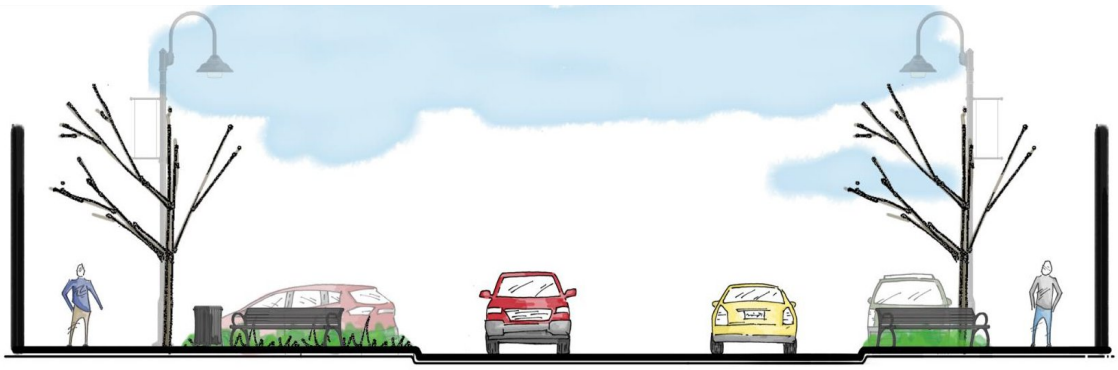
Dear Mr. Fineran,

The purpose of this letter is to provide an update on the preparation of final plans and specifications necessary to advertise for bids for the Downtown Reconstruction, Phase 1 project. This update addresses the street widths that have been included in the final design drawings.

Street Width Summary:
The scope of the project has recently been discussed with the City Council at various meetings. These meeting dates and the resultant actions are as follows:

- 10/17/2022 Authorized final design (preparation of final plans and specifications).
- 11/21/2022 Discussed project scope and assessments at a Work Session.
- 12/19/2022 Reviewed project scope and eliminated bumpouts and rain gardens.

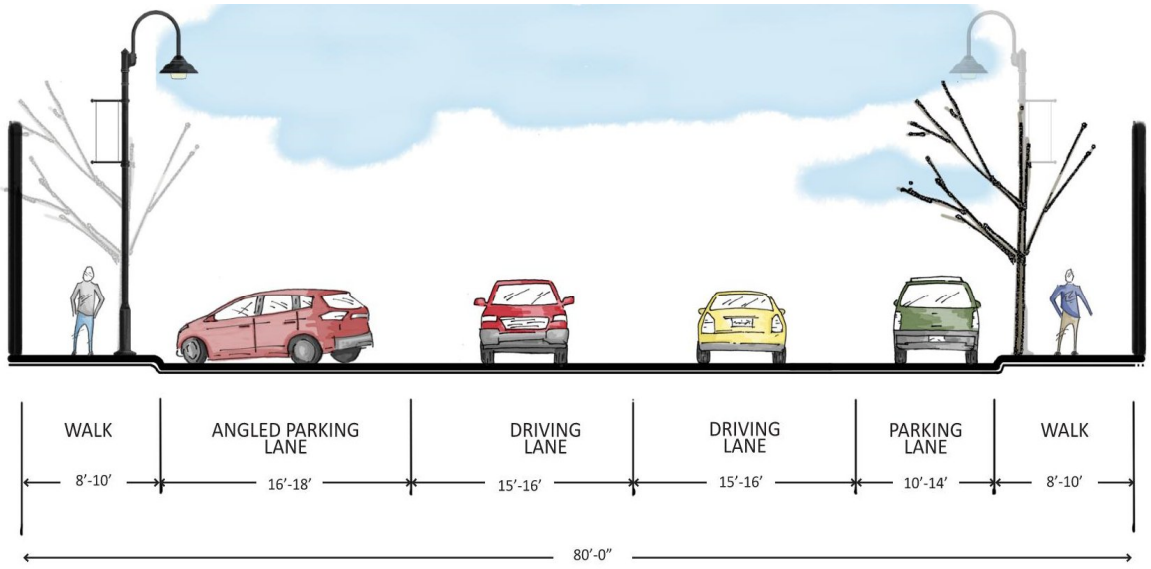
In addition to the recent items listed above, project input was gathered through an interactive website and through multiple Open Houses this past spring. As a result, at the June 20, 2022, Work Session the City Council selected the following typical section for Main Street from Maple Street to Olive Street. This typical section choice was then affirmed at the October 17, 2022, City Council meeting (with the inclusion of bumpouts to be decided later).



North Walk	Angled Parking	Driving Lane	Driving Lane	Parallel Parking	South Walk
12.0'	18.5'	16.0'	15.0'	10.5'	8.0'

This is the option that most closely matches the current condition with 60-degree angled parking on the north side of the roadway and parallel parking on the south side of the roadway. This is also the option that maximizes the amount of on-street parking. Please note, this graphic includes bumpouts which were removed from the project scope on December 19, 2022. These dimensions are similar to the existing widths which are summarized below.

Main Street Existing Section (Maple Street to Elm Street)
The various widths vary slightly from block to block, but they are generally as shown below. The average width from back of curb to back of curb is approximately 62.5 feet.



The following table compares these existing Main Street widths and final design widths to the minimum design standards.

Roadway Component	Existing Main St.	Final Design Main St.	Design Minimum	Notes
North Sidewalk	9.0	12.0	5.0	6' min. adjacent to buildings, 8' min. if obstacles
60 Degree Parking	18.5	18.5	16.5	19.0' minimum (with 2.5' curb overhang)
North Thru Lane	16.5	16.0	13.0	
South Thru Lane	16.0	15.0	13.0	
Parallel Parking	11.5	10.5	7.5	
South Sidewalk	8.5	8.0	5.0	6' min. adjacent to buildings, 8' min. if obstacles
Curb to Curb Total	62.5	60.0	50.0	
Right-of-Way Total	80.0	80.0	NA	

*All Dimensions are in Feet. Existing Dimensions ± 0.5'.

Additionally, the current project includes one block of Olive Street to the south of Main Street. The proposed width of this block is 44 feet wide (12-foot driving lanes and 10-foot parking lanes). The existing width of this block is between 50 and 51 feet. The design minimums for a State Aid local roadway are 11-foot driving lanes and 7-foot parking lanes for a total roadway width of 36 feet.

This proposed 44-foot wide roadway matches other truck routes on Walnut Street, Maple Street, First Street, and Third Street that were previously reconstructed in various projects completed since 2014.

Final Design & Schedule Update:
The final design of the current project is approximately 50% to 60% complete. Any changes to the proposed street widths discussed herein would require taking a step back and redoing portions of the construction plans (storm sewer, street plan/profile, intersection details, cross-sections, etc.). This would delay the tentative schedule listed within this letter by 2 to 3 weeks.

The current project schedule is tentatively as follows:

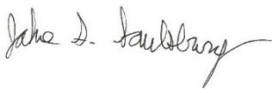
1. Ongoing — Existing property building inspections
2. Ongoing — Coordination with various utility companies
3. 2/15/2023 — Final design Open House
4. February — Authorization to advertise for bids
5. March — Advertise project
6. April — Open bids and award project

This schedule allows for construction to begin shortly after road restrictions are removed in May. The precise schedule will be finalized after the coordination items (No. 1 and No. 2) are completed.

I am available at your convenience to answer any questions or to discuss this project further.

Sincerely,

Bolton & Menk, Inc.

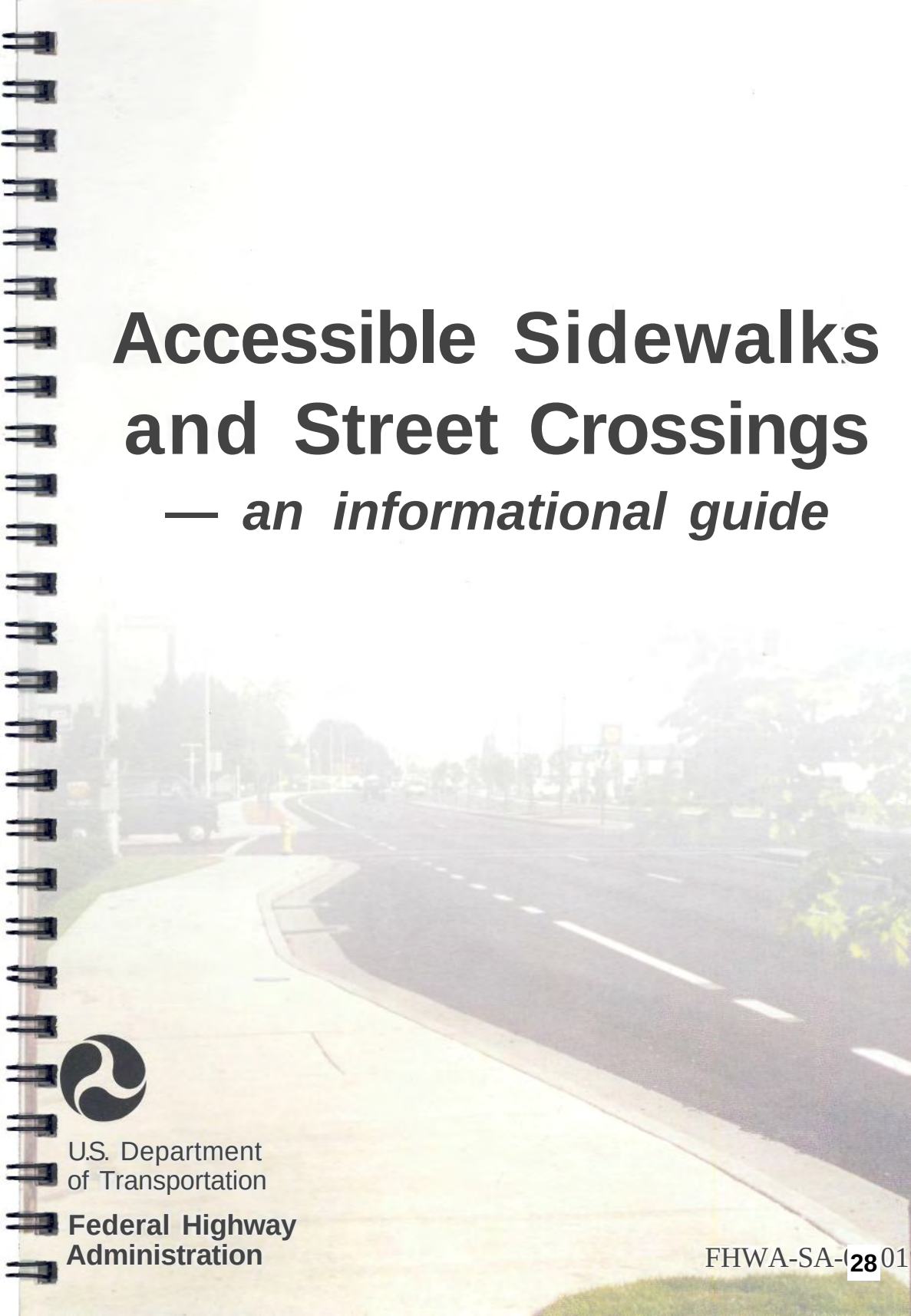


Jake Saulsbury, P.E.

Cc: Craig Eldred, Public Services Director

Accessible Sidewalks and Street Crossings

— *an informational guide*



U.S. Department of Transportation

Federal Highway Administration

FHWA-SA-01-028

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Copies can be ordered from the website at:
http://safety.fhwa.dot.gov/programs/ped_bike.htm
Click on "What's New"

Content

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Providing Accessible Sidewalks and Street Crossings

In order to meet the needs of all sidewalk users, designers must have a clear understanding of the wide range of abilities that occur within the population. Sidewalks, like roadways, should be designed to serve all users. This includes children, older people, parents with strollers, pedestrians who have vision impairments, and people using wheelchairs and other assistive devices. Just as a roadway will not be designed for one type of vehicle, the design of sidewalks should not be limited to only a single type of pedestrian user. Because the sidewalk is the basic unit of mobility within our overall system of transportation, every route and facility must be usable.

Pedestrian facility design and operation must comply with the accessibility standards in the *Architectural Barriers Act (ABA) of 1968, the Rehabilitation Act of1973 (Section 504), and the Americans with Disabilities Act (ADA) of 1990.* Implementing regulations for Title II of the ADA, which covers State and local governments, also address "communications and information access," requiring 'effective communications' with persons with disabilities. In the sidewalk/street crossing environment, this would include accessible pedestrian signals, markings, and signage. The latest version of the Manual on Uniform Traffic Control Devices (MUTCD) contains standards on Accessible Pedestrian Signals (APS) that have audible, visual, and vibrotactile features. These standards represent the minimum; designers should use more conservative design parameters whenever possible.

Temporary and alternate pedestrian routes where sidewalks are obstructed by work zones must meet accessibility standards, as well. Pedestrians who must cross the street and then cross back again in order to continue on their destination will be exposed to significantly increased risk from vehicles.

The intent of this guide is to focus on some of the emerging accessibility issues and the design parameters that affect sidewalk and street crossing design and operation.

The Legal Framework:

During the 1990s, several key pieces of legislation were passed that impacted transportation planning. The first, the Americans with Disabilities Act (ADA) of 1990, protects the civil rights of people with disabilities. Secondly, the 1991 reauthorization of the Federal transportation legislation, the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), specifically called for integrating pedestrian travel into the transportation system. ISTEA increased the Federal-aid funding options for pedestrian facilities and programs. In 1998, the Transportation Equity Act for the 21st Century (TEA-21) extended the opportunities established in ISTEA and increased funding available for pedestrian facilities. These laws complimented more than 40 years of legislation aimed at guaranteeing the rights of people with disabilities. Following is a brief chronological summary of the laws and regulations mandating accessible environments and programs:

Americans National Standards Institute (ANSI A117.1), 1961: The first building standard to address issues of accessibility.

Architectural Barriers Act (ABA) of 1968 (Public Law 90-480): This was the first Federal law requiring new facilities constructed for Federal agencies or with Federal funding to meet accessibility standards (UFAS).

Rehabilitation Act of 1973, Title V, Section 504 (Public Law 93-112, amended by PL 516 and PL 95-602): Section 504 requires federally funded facilities and programs to be accessible to people with disabilities.

Education of All Handicapped Children Act of 1975 (now The Individuals with Disabilities Education Act (IDEA)): This Act greatly expanded educational opportunities by requiring school accommodations for children with disabilities.

Uniform Federal Accessibility Standards (UFAS, Federal Standard 795): The UFAS defined the minimum standards for design, construction, and alteration of buildings to meet the requirements of the ABA. UFAS derived from ANSI A 117.1-1980 and the Access Board's 1982 Minimum Guidelines and Requirements for Accessible Design (MGRAD).

Americans with Disabilities Act of 1990 (ADA): ADA extends the coverage of the ABA, and the Rehabilitation Act, Section 504 to include all public facilities regardless of funding. The Title II implementing regulations for the ADA require all newly constructed and altered facilities to be readily accessible to persons with disabilities. Transportation agencies are responsible for developing a transition plan for removing the structural barriers, including communication barriers, and providing access to existing pedestrian facilities.

State Laws: In some States, codes have been adopted that exceed the requirements set forth in the ADA guidelines. In these States, both the ADA and the State code must be satisfied.

2 Understanding Sidewalk Users:

People have differing abilities: A variety of users need to access the sidewalk system. Their abilities vary in agility, balance, cognition, coordination, endurance, flexibility, hearing, problem solving, strength, vision, and walking speed.

Designing for all abilities: The design of sidewalk environments is important to all pedestrians, but is particularly important to those with disabilities who have limited travel choices and rely most on the pedestrian environment. For example, older adults, persons with vision impairments, and children frequently rely on the sidewalk to travel independently within their community for shopping, recreation, exercise, and walking to school.

Traditionally, design parameters have been based on the "standard pedestrian," an agile person with good vision, hearing, and mobility. These design parameters do not meet the needs of the growing disabled population. The Bureau of Census data indicates that:

- Approximately 20 percent of all Americans have a disability, and that percentage is increasing.
- By the year 2030, one in five Americans will be 65 years or older.

Universal design principles are based on creating an environment that is usable for people of all abilities. Incorporating these principles into all aspects of sidewalk development can eliminate the barriers and create a truly functional sidewalk system.

Movement and Informational barriers may limit an individual's access to the sidewalk environment:

Movement barriers restrict an individual's ability to physically move along or within an environment. They may limit the individual's movement from one side of the intersection to the other, or ability to use the push button to activate the pedestrian signal. Movement barriers within the pedestrian environment include curbs, steep slopes, obstacles within the path (poles, etc.), and widths too narrow to pass through.

Information barriers restrict an individual's use of information contained in the pedestrian environment. These barriers limit the pedestrian's ability to recognize and receive information (e.g., loss of vision prevents the individual from utilizing visual signs), or understand the information received and decide on a course of action. Information barriers within the environment include complex intersections, diverted paths (e.g., in work zones), and lack of street crossing information.

***Conflicting Pedestrian** Needs*

To create a truly accessible sidewalk network that is usable by all pedestrians, designers need to understand how the users' abilities are impacted by their design decisions. Pedestrians have varying needs, therefore, changing a design to enhance access for one group can create additional barriers for other individuals. The goal should be to make all sidewalks accessible to the largest possible number of pedestrian users by incorporating the principles of universal design.

Assistive Technology:

Assistive technologies play a valuable role in enhancing the ability of people with disabilities to travel independently through the environment. These devices may be used to minimize and eliminate the activity limitations and participation restrictions that exist within the sidewalk environment. Technologies may be personal, activity-specific, or environmental. Following are examples of personal technologies:

- A manual wheelchair provides easy mobility on flat, firm, obstacle free surfaces. However, it is difficult to maneuver on steep grades or cross slopes, and across uneven transition points like street to sidewalk.
- A prosthetic leg allows an individual to retain some mobility. However, a prosthetic leg does not provide the sensory feedback that is needed to ensure stable foot placement, detect obstacles, or maintain balance.
- A white cane used by individuals with severe vision loss provides advance warning about obstacles on the path ahead 0.6 m-0.9 m (2 ft—3 ft), but is not effective at detecting obstacles above 0.7 m (2.3 ft).
- Motorized wheelchairs and scooters can maneuver on steeper grades and travel longer distances than manual wheelchairs.
- Service dogs are trained to respond to specific commands and to avoid obstacles. Service dogs require care and maintenance.
- A hearing aid can be used to amplify the traffic sounds. The magnification is not selective, so the sounds of traffic and Audible Pedestrian Signal (APS) are all magnified.

Environmental technologies include APS, and engineering treatments like curb ramps and detectable warnings. **(See Section 9).**

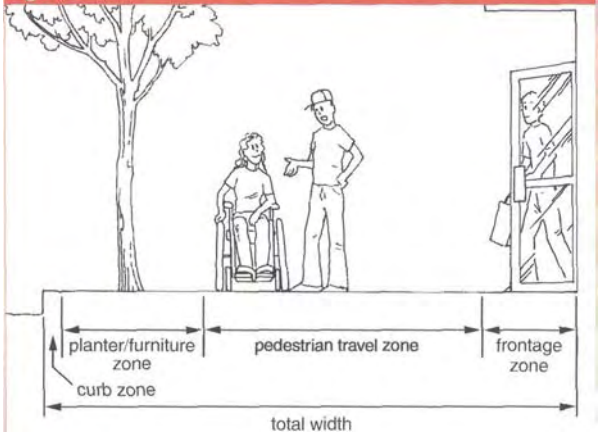
3 Sidewalk Corridors:

The "Sidewalk Corridor" is the portion of the pedestrian system from the edge of the roadway to the edge of the right-of-way (property line or building edge), generally parallel to the street. Attributes of good sidewalk corridor design include:

- Accessibility by ALL users.
- Adequate width.
- Safe to use (sidewalk users should not feel threatened by adjacent traffic or by the environment).
- Continuity and connectivity.
- Landscaping to create a buffer space between pedestrians and traffic and also provide shade.
- Social space (area where pedestrians can safely participate in public life).

The Zone System **(See Figure 1):** Sidewalks in central business districts and downtown areas need to be designed to accommodate larger volumes of pedestrian traffic than in residential areas. Streetscapes in these areas often function for multiple purposes, and generally consist of the following zones: the building frontage zone, the pedestrian zone, the planter/furniture zone, and the curb zone.

Figure 1



The zone system divides the sidewalk corridor into four zones to ensure that pedestrians have a sufficient amount of clear space to travel.

Building Frontage Zone: The building frontage zone is the area between the building wall and the pedestrian zone. Pedestrians don't feel comfortable walking directly adjacent to a building wall or fence. At a minimum pedestrians prefer to keep at least 0.6 m (2 ft) of "shy" distance away from the building wall.

Depending on the use of this area, the frontage width should be increased and physically separated from the pedestrian zone (example, allow extra space for a door opening into the frontage area, sidewalk cafes, etc.). People with vision impairments often travel in the frontage zone and use the sound from the adjacent building for orientation. Some use the building edge as a guide for a white cane, traveling between 0.3 m-1.2 m (1 ft-4 ft) from the building. The frontage zone should be free of obstacles and protruding objects. If not,

obstacles in the frontage zone should be detectable by people who use long white canes. Level landings are required at building entrances and around sidewalk furnishings such as drinking fountains, benches, etc.

Pedestrian Travel Zone: The pedestrian zone is the area of the sidewalk corridor that is specifically reserved for pedestrian travel. This area should be free of all obstacles, protruding objects, and any vertical obstructions hazardous to pedestrians, particularly for individuals with vision impairments. The pedestrian zone should be at least 1.8 m-3.0 m (6-10 ft) wide or greater to meet the desired level of service in areas with higher pedestrian volumes. This allows pedestrians to walk side by side or for pedestrians going in the opposite direction to pass each other. The pedestrian zone should never be less than 1.2 m (4 ft), which is the minimum width required for people using a guide dog, crutches, and walkers. Wheelchair users need about 1.5 m (5 ft) to turn around and 1.8 m (6 ft) to pass other wheelchairs.

Planter/Furniture Zone: The planter/furniture zone lies between the curb and the pedestrian travel zone. This area provides a buffer from the street traffic and allows for the consolidation of elements like utilities (poles, hydrants, telephone kiosks, etc), and street furniture (benches, signs, etc). *The intent is to ensure that the pedestrian travel zone is free of ALL obstacles.* On local and collector streets, 1.2 m (4 ft) is preferred and on arterial and major streets 1.8 m (6 ft) is preferred. Additional space will be required for transit stops and bus shelters which may include a boarding pad typically 1.5 m x 2.4 m (5 ft—8 ft). States that have significant accumulations of snow during the winter months will require wider planter/furniture zones. This allows the snow to be stored in the planter/furniture zone and keeps the pedestrian zone obstacle free.

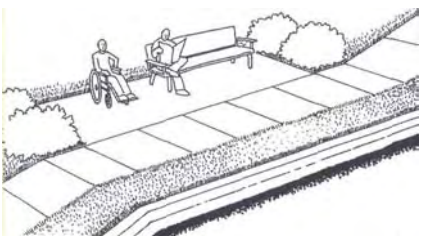
Curb Zone: The curb zone is the first 0.15 m (6 in) of the sidewalk corridor, located adjacent to the roadway. It is an integral part of the road/drainage system and keeps excess water off the sidewalk corridor. The curb zone also discourages motor vehicles from entering/exiting the sidewalk corridor except at designated locations and is a valuable safety and guide cue for pedestrians with vision impairments.

4 Sidewalk Grades and Cross Slopes:

Steep grades and cross slopes should be avoided where possible or integrated with level rest areas. Both powered and manual wheelchairs can become very unstable and/or difficult to control on sloped surfaces. When areas with steep sidewalks and ramps are wet, icy, or covered with snow, they have little or no slip resistance and a slide will usually end in the street.

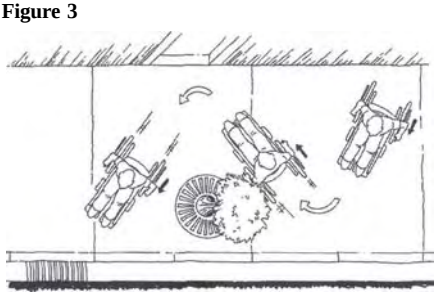
Grade: Grades are often difficult to control in the sidewalk environment because sidewalks follow the path of the street. The sidewalk grade ideally should not exceed 5 percent. Design parameters developed for ramps on buildings and sites, permit a maximum grade of 8.3 percent for a distance of 9.1 m (30 ft) before a level landing must be installed. Where the sidewalk grade approaches or exceeds that of the maximum permitted for a ramp, it is good practice to provide a level rest area. The slope of the level landing should not exceed 2 percent in any direction **(See Figure 2).** The dimensions of the level landing should be at least 1.5 m x 1.5 m (5 ft x 5 ft) to allow wheelchair users to stop and rest without blocking the flow of pedestrians. This area can be greater with the inclusion of other amenities such as benches, hand rails, and drinking fountains. In areas with steep slopes, consider installing wide sidewalk corridors that permit the wheelchair user to travel in a zig-zag motion **(See Figure 3).**

Figure 2



Level landing with benches provide a resting point that will not impede the flow of pedestrian traffic.

Figure 3



In areas of steep terrain, a wide sidewalk allows wheelchair users to travel in a zigzag motion which reduces the grade they must travel, although the overall distance of their trip is increased.

*Cross **Slope:*** The maximum cross slope permitted by ADA Accessibility Guidelines (ADAAG) is 2 percent. Severe cross slopes require wheelchair users and other pedestrians to work against the effects of gravity to maintain their lateral balance. Pedestrians using crutches or canes may be forced to turn sideways in order to keep their base of support at a manageable angle. Severe cross slopes can cause wheelchair users to veer towards the curb and into the street **(See Figure 4).** The impact of cross slopes are compounded when combined with steep grades and uneven surfaces. Designers and those constructing

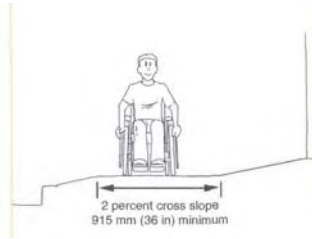
facilities need to understand the impact of grades and cross slopes and take particular care to stay within construction tolerances as well as within design standards. For example, Portland Cement Concrete has a construction tolerance of 1/4 in per 10 ft.

For ***sidewalks with steep cross slopes*** the designer can create a level area of at least 915 mm (3 ft) within the pedestrian zone **(See Figure 5)** or increase the height of the curb **(See Figure 6)** The latter case can create problems for curb ramp design and on-street parking (car doors may not be able to swing over the curb).

Figure 4

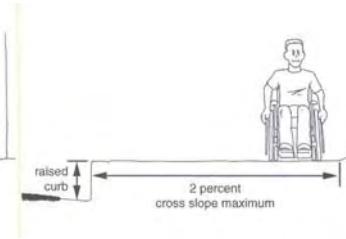
PROBLEM Wheelchair users traveling on a sidewalk with a cross slope greater than 2% use more energy to to offset the force of gravity that directs them towards the curb and into the street

Figure 5



GOOD DESIGN A level area at least 915 mm (36 in) wide improves access when the street elevation is lower than the building elevation

Figure 6



ACCEPTABLE DESIGN Increasing the height of the curb provides a level pathway when the street elevation is lower that the building elevation This solution may not be ideal if sidewalks are not wide enough to install well-designed curb ramps

5 Sidewalk Surfaces:

Factors that affect the usability of the sidewalk surface include:

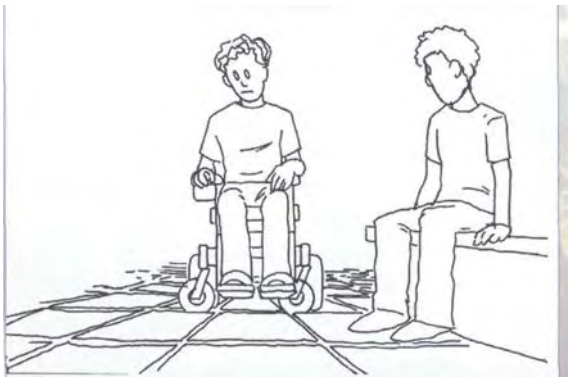
- Surface materials
- Changes in level
- Firmness, stability, and slip resistance
- Dimensions of gaps, grates and openings
- Visual consistency

Surface materials generally consist of concrete or asphalt; however, tile, stone, and brick are also used. Typically, sidewalks of concrete and asphalt are firm, stable, and fairly slip resistant when dry. A broom finish used on concrete sidewalks increases the slip resistance. Surfaces that are not slip resistant are especially difficult for people who use wheelchairs or walking aids to travel across. Crutch users, for example, rely on being able to securely plant their crutch tip to travel effectively on the sidewalk. Surfaces that are not visually consistent (all one color and texture) can make it difficult for pedestrians with vision disabilities to distinguish the difference between a change in color and pattern on the sidewalk and a drop off or change in level.

Decorative surface materials such as paints and surface materials, polished stones or exposed aggregate rock, are not as slip resistant and should be avoided. Paint and thermoplastic materials, commonly used to mark crosswalks, are generally not as slip resistant when wet. Slip resistant contact is more difficult to achieve when the sidewalk material is wet or icy. Texture added to the thermoplastic will improve the slip resistance.

Brick and cobblestone may improve the aesthetic quality of the sidewalk, but may also increase the amount of work required by pedestrians with mobility impairments. For example, tiles that are not tightly spaced together can create grooves that catch wheelchair casters **(See Figure 7).** These decorative surfaces may also create a vibrating bumpy ride that can be uncomfortable and painful for those in wheelchairs. The surface texture should not include more than a 1/4 inch rise every 30 inch. Brick and cobblestone may heave or settle, creating unsafe changes in level or become a tripping hazard for pedestrians, especially those with vision and mobility disabilities. Decorative textured surface materials can make it more difficult for pedestrians with vision impairments to identify

Figure 7



The space between the jointed surface causes wheelchair casters to swivel and catch and greatly increases the rolling resistance.

detectable warnings, which provide critical information about the transition **from** the sidewalk to the street. For these reasons, brick and cobblestone are not recommended. Creative alternatives include smooth walkways with brick trim, and colored concrete.

Changes in level/elevation are vertical rises between adjacent surfaces. Causes of changes in level include:

- Tree roots pushing upwards.
- Uneven transitions from street to gutter to ramp.
- Heaving and settling due to frost.
- Buckling due to improper sub-base preparation.

Changes in level/elevation can cause major problems for:

- Pedestrians with mobility impairments-difficulty lifting feet, or crutches (causing tripping).
- Pedestrians with vision impairments-difficulty detecting elevation changes, (causing tripping).
- Pedestrian using wheelchairs-small front caster wheels swivel sideways and cannot climb over.
- Pedestrian using wheelchairs-difficult time rolling over large changes in elevation.

Changes in level/elevation requirements:

- Up to 6 mm (0.25 in)-can remain without beveling.
- 6-13 mm (0.25 in-0.5 in)-bevel the surface with a maximum grade of 50 percent (1:2).
- Greater than 13 mm (0.5 in)-remove or install a ramp with a maximum grade of 8.3 percent.

Gaps, grates and other openings occur at railroad tracks, drainage inlets, air vents, tree grates, etc. Wheelchair casters, inline skating wheels, as well as bicycle wheels often get caught in openings and gaps wider than 1/2 inch or which are incorrectly aligned. In these cases there is potential for the person to be suddenly pitched forward. Walking aids such as canes and crutches can also get caught in grates and gaps. When the cane tip slips through an opening, the pedestrian can become unstable and risk falling. Grates should be placed within the planter/furniture zone **(See Figure 1)** away from the pedestrian travel area, **and** also away from the bottom of crosswalks and curb ramps.

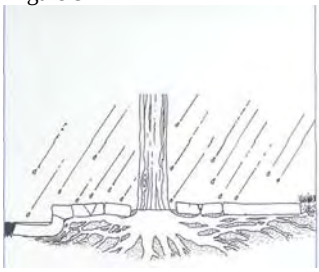
Gaps and grates should be designed so that:

- Openings do not allow the passage of a 13 mm (0.5 in) sphere.
- The long dimension of the opening is perpendicular or diagonal to the dominant direction of travel.

The impact of trees on the sidewalk corridor-- trees are generally planted because they improve the pedestrian experience, improve the aesthetic appearance of the streetscape, serve as a visual and auditory buffer between pedestrians and traffic, provide shade, and may have a traffic calming effect. Trees need a minimum of 1.2 m x 1.2 m (4 ft x 4 ft). They are also one of the

most common causes of sidewalk cracks and changes in level. When water is limited, tree roots tend to push through the surface **(See Figure 8)** and spread out rather than down **(See Figure 9)** to look for new water sources. Tree branches should be maintained to hang no lower than 2.0 m (6.7 ft) (See **Figure 10).** Low hanging branches can be a safety hazard, especially for pedestrians with vision impairments who may not detect them. Other pedestrians with mobility impairments may have difficulty bending under them. Careful selections of tree type, their placement and maintenance can provide a comfortable and safer environment for all road users including pedestrians.

Figure 8

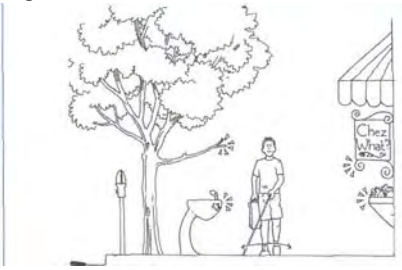


When trees do not get enough water they tend to spread their roots out, which can break up the surface of the sidewalk.

Figure 9

Trees planted with grates are less likely to cause sidewalk cracks than trees planted without grates because the grate allows a sufficient amount of water to reach the tree roots.

Figure 10



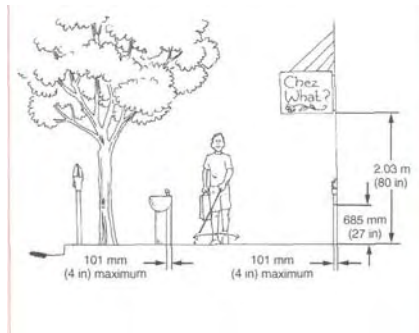
This pedestrian, who is blind is walking down a sidewalk that contains a number of obstacles that are difficult to detect using a long white cane, because they protrude into the path of travel between 685 mm (2.3 ft) up from ground level and below 2.03 m (6.7 ft) in height.

6 Protruding Objects:

Objects that protrude into the sidewalk corridor above 2 m (6.7 ft) are not generally a problem for pedestrians with vision impairments (See **Figure** 11). Pedestrians who use long canes will usually detect and avoid objects on the sidewalk that extend below 0.69 m (2.3 ft). However, obstacles that protrude into the sidewalk corridor between 0.69 m-2 m (2.3 ft—6.7 ft) and do not extend to the ground **(See Figure 10)** are more difficult to detect and avoid.

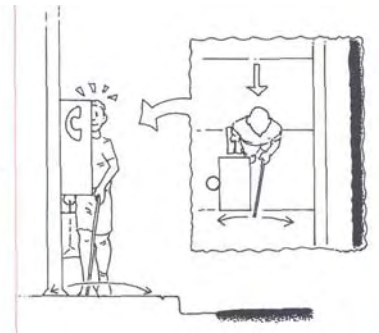
Pedestrians with vision impairments often travel using the edge of the building line. Objects mounted on the wall, post, or side of a building, should therefore not protrude more than 0.1 m (4 in) into the sidewalk corridor (See **Figure** 12).

Figure 11



This pedestrian. who is blind, will have a much easier time traveling on this sidewalk because there are no walls or post-mounted obstacles that protrude more than 101 mm (4 in)

Figure 12

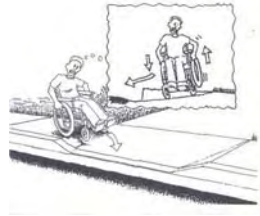


POTENTIAL PROBLEM:
When obstacles mounted on posts can be approached from the side they should not protrude more than 101mm (4 in). This pedestrian who is blind does not detect the pole, which could cause him to collide with the obstacle.

7 Driveway Crossings:

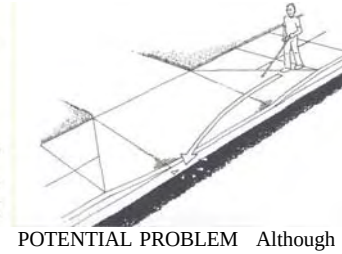
Driveway crossings serve the same purpose for cars as curb ramps serve for pedestrians. They consist of many of the same components found in curb ramps. Designers need to remember that as they change the grade to allow cars to effectively negotiate the elevation change between the street and the sidewalk, they **must not** compromise good pedestrian design practice. Unfortunately, this happens quite often and pedestrians using wheelchairs and other walking aids are sometimes put at risk of becoming unstable and falling. ADAAG does not permit the cross slope of the sidewalk to exceed 2 percent. Driveway crossings are often built with grade changes in the sidewalk corridor that have cross slopes greater than 2 percent. Driveway crossings without level landings force users to travel over the sidewalk flare. This design results in rapid changes in grade and cross slope **(See Figure 13),** wheelchair users can lose control and possibly tip over as the front wheel loses contact with the ground followed by the opposing back wheel. Pedestrians with vision impairments may not detect the difference in slope of the driveway flare and veer towards the street and may enter the street without realizing it **(See Figure 14).**

Figure 13



PROBLEM This driveway design is not allowed by ADAAG Driveway crossings must be level and not force users to travel over the sidewalk flare This design results in rapid changes in cross slope, which compromises balance and stability for people who use wheelchairs The right front wheel loses contact with the ground followed by the opposing back wheel

Figure 14



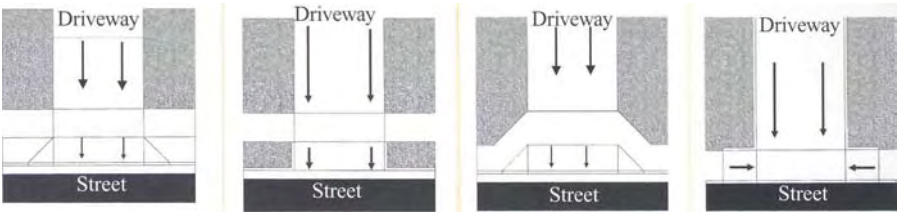
POTENTIAL PROBLEM Although gradually sloped driveway crossings are beneficial to people with mobility impairments, they can be problematic for people with vision impairments unless there is a detectable difference in slope at the edge of the street If a visually impaired person veers toward the street and isn't able to recognize where the driveway ends and the street begins, he or she may enter the street without realizing it

Driveway crossings should be designed with the following guidance:

- Cross slope = 2.0 percent maximum
- Level maneuvering space
- Changes in level = flush (1/4 inch maximum)
- Flare slope =10 percent maximum

Figure 15 illustrates good or acceptable design practice

Figure 15 Driveway Crossings



Good Design
Driveway crossings with wide level sidewalks

Good Design
Driveway crossings with level sidewalk

Acceptable Design
Driveway crossing with a level landing jogged away from the street
see *1

Acceptable Design
Driveway crossing with ramps parallel to the sidewalk and sidewalk at grade with the street
see *2

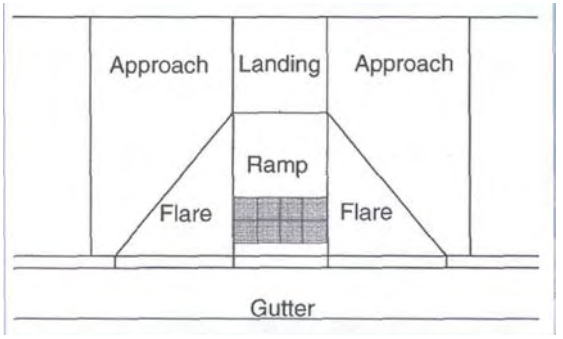
*1 Potential tripping problem for pedestrians traveling over flare

*2 May have drainage problems There needs to be a detectable edge or lip for pedestrians with vision impairments to distinguish the sidewalk and street boundary at the base of the driveway

8 Curb Ramps:

Curb ramps are necessary for access between the sidewalk and the street for people who use wheelchairs **(See Figure 16).** Title II of the ADA specifically requires curb ramps for existing facilities, as well as all new construction or altered facilities. However, curb ramps can create a barrier for people with vision impairments who use the curb to identify the transition point between the sidewalk and the street. Because curb ramps eliminate the vertical edge of the curb used by pedestrians with vision impairments, it is necessary to install detectable warnings **(Section 9)** to mark the boundary between the sidewalk and street. For some pedestrians who use walking aids such as canes, walkers or crutches, curb ramps may be difficult to access. The pedestrian must have strength to lift his or her body up over the supporting device. A wider crosswalk to allow use of curb and curb ramp **(See Figure 17)** will enhance access for all users

Figure 16

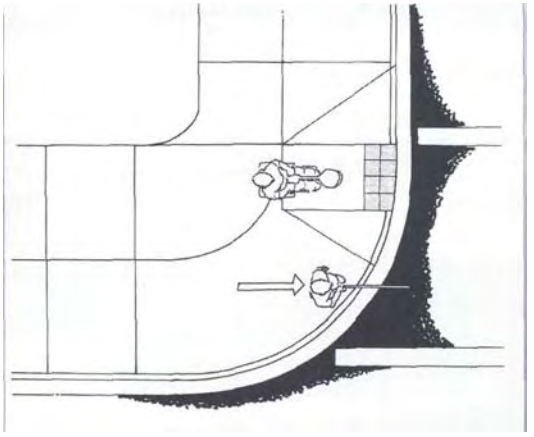


Curb ramp components.

***Curb ramp** types:*

Curb ramp types are usually categorized by their structural design and how they are positioned relative to the sidewalk or street. Selecting a curb ramp design depends on site conditions. Curb ramp types include perpendicular, diagonal, parallel, combination, and depressed corners. Table 1 discussed the advantages and disadvantages of each curb ramp types.

Figure 17

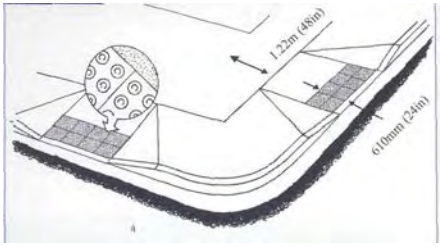


GOOD DESIGN:
When a portion of the curb is included in the crosswalk, it is easier for people with vision impairment to detect the transition between the sidewalk and the street

Table 2: Advantages and disadvantages of curb ramp types

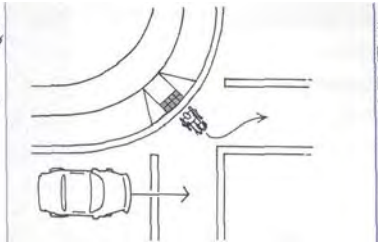
Ramp Type	Advantage to Pedestrian	Disadvantage to Pedestrian
Perpendicular **See Figure 17,18**	1) Ramp aligned with the crosswalk. 2) Straight path of travel on tight radius. 3) Two ramps per corner.	1) May not provide a straight path of travel on larger radius corners.
Diagonal **See Figure 19**	Not recommended	1) Pedestrian with a vision impairment can mistake a diagonal ramp for a perpendicular ramp and unintentionally travel into the intersection because it is not aligned with the crossing direction. 2) May conflict with motorists who are traveling straight or turning if corner radius is small. 3) Directs wheelchair users into the intersections. Requires wheelchair turning at the top and bottom of the ramp. A 1.2 m x 1.2 m (4 ft x 4 ft) bottom landing is required. **(See Figure 19).**
Parallel **See Figure 20, 21, 22**	1) Requires minimal right-of-way. 2) Provides an area to align with the crossing. The bottom landing is contained in the sidewalk and not the street. 3) Allows ramps to be extended to reduce ramp grade. 4) Provides edges on the side of the ramp that are clearly defined for pedestrians with vision impairments.	1) Pedestrians need to negotiate two or more ramp grades (makes it more difficult for wheelchair users). 2) Improper design can result in the accumulation of water or debris on the landing at the bottom of the ramp.
Combined Parallel and Perpendicular **See Figure 23**	1) Does not require turning or maneuvering on the ramp. 2) Ramp aligned perpendicular to the crosswalk. 3) Level maneuvering area at the top and bottom of ramps.	1) Visually impaired pedestrians need to negotiate sidewalk ramps.
Depressed Corners See **Figure** 24, 25	1) Eliminates the need for a curb ramp.	1) Pedestrians with cognitive impairments may have the illusions that the sidewalk and street are unified pedestrian space (i.e., safe). 2) Improper design can allow large vehicles to travel onto the sidewalk to make tight turns which puts the pedestrian at risk. 3) More difficult to detect the boundary between the sidewalk and the street for persons with vision impairments. 4) Service dogs may not distinguish the boundary between the sidewalk and the street and continue walking. 5) The design may encourage motorist to turn faster by traveling onto the sidewalk.

Figure 18



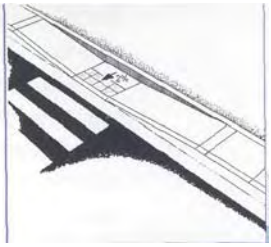
GOOD DESIGN:
A level landing at the top of the ramp of at least 1.2 m (4 ft). A 610 mm (2 ft) strip of detectable warnings must be installed at the bottom of a perpendicular curb ramp.

Figure 19



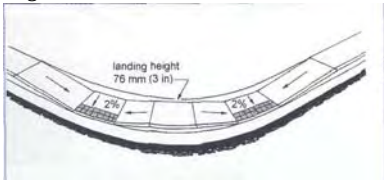
Diagonal curb ramps arc not recommended. However, users must have enough room to maneuver towards the direction of the crosswalk. There must be a 1.2 m x 1.2 m (4 ft x 4 ft) bottom level landing of clear space outside the direction of motor vehicle travel.

Figure 20



Parallel curb ramps won't well on narrow sidewalks but require users continuing on the pathway to negotiate two ramp grades

Figure 21

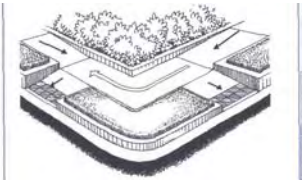


At intersections with narrow sidewalks and wide turning radii, two parallel curb ramps should be considered.

Figure 22

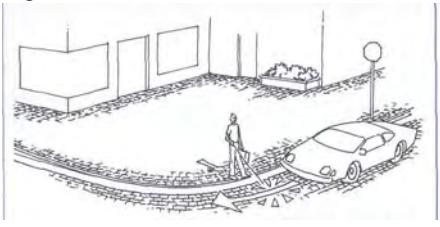
NOT RECOMMENDED

Figure 23



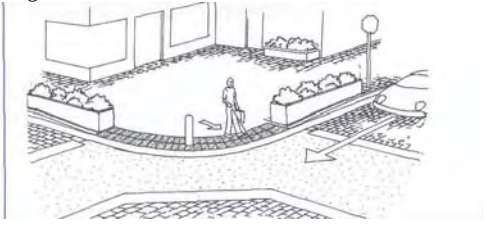
Combined parallel and perpendicular curb ramps lowers the elevation of level landings while bridging the remaining elevation gap.

Figure 24



PROBLEM: Decorative patterns used at depressed corners, such as this brick pattern, create a continuous pathway. People with vision and cognitive impairments have difficulty detecting where the street begins and ends.

Figure 25



Detectable warnings, contracting surface materials, and barrier posts are measures that can be used to convey the transition between the street and sidewalk at depressed corners. This corner would be a good location for accessible signals.

Curb Ramp Specifications:

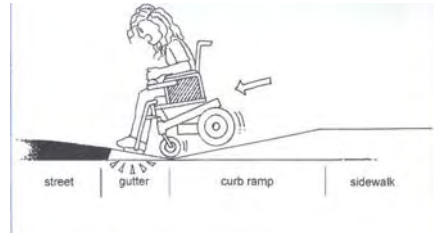
- ***Ramp Grade:*** ADAAG permits a maximum curb ramp slope of 8.3 percent (preferred 7 1 percent to allow for construction tolerance)
- ***Cross slope*** on the ramp may not exceed 2 0 percent.

[1] Minimum ***ramp width*** should be 1.2 m (4 ft) in new construction. In restricted spaces only, the minimum width should not be less than 915 mm (3 ft).

Significant ***changes of grade*** as the pedestrians travel from the down slope of the ramp to the up slope of the gutter can cause wheelchair users to fall forward **(See Figure 26)** and should be 13 percent or less. Counterslope should not exceed 5 percent.

Curb ramp alignment should be perpendicular to the curb face. The ramp needs to be aligned within the crosswalk with a straight path of travel from the top of the ramp to the roadway to the curb ramp on the other side.

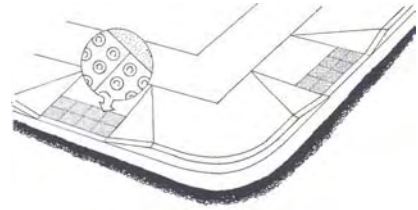
Figure 26



A wheelchair can bottom out at areas of rapid change of grade (greater than 13 percent). The wheelchair can be pitched forward or thrown backwards.

[1] ***Detectable warnings*** **(See Figure 27)** across the lower part of the ramp are required. Ramps make it difficult for pedestrians with vision impairments to detect the transition between the sidewalk and the street. Detectable warnings should have a visual contrast with the adjacent walking surfaces. **(See Section 9)**

Figure 27

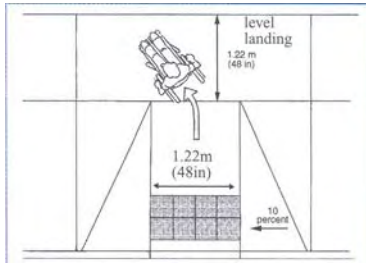


GOOD DESIGN

A 610 mm (2 ft) strip of detectable warnings shall be installed at the bottom of a curb ramp to indicate the transition from the sidewalk to the street.

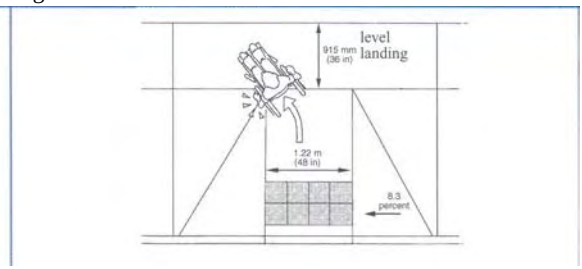
- ***Transition points*** between adjacent curb ramp surfaces should be flush. Even a 13 mm (0.5 in) change in level combined with a change in grade can complicate access for wheelchair users. Curb ramp lips are not allowed by ADAAG.
- ***Sidewalk approach width*** should have a minimum of 1.2 m (4 ft). (See previous discussion in Section 3, Sidewalk Corridors.)
- ***Level landing*** at the top and bottom of the curb ramp should be 1.2 m x 1.2 m (4 ft x 4 ft) and the cross slope should not exceed 2 percent in any direction. This is necessary to allow wheelchair users to maneuver off the ramp

Figure 28



The 1.2 m (4 ft) width of this curb ramp provides sufficient turning space for this wheelchair user. The maximum slope of the flares at this curb ramp should be 10 percent. Measured at the face of the curb.

Figure 29



The 915 mm (3 ft) width of this landing forces this wheelchair user to travel over a portion of the flare to maneuver onto the narrow landing. For this reason, the maximum slope of the flare should not exceed 8.3 percent and should be blended at the top appex. The ramp width should be widened up to 1.2 m (4 ft) to allow for a tighter turn onto the landing.

and onto the path of travel within the pedestrian zone. **(See Figure 28).** If space is limited, the absolute minimum level landing width should not be less than 915 mm (3 ft). **(See Figure 29).** However, in such a case, wheelchair users may have to travel over a portion of the flare in order to move off the ramp onto the path of travel. To compensate, the warping of the slope at the top area of the *flare* should be blended for easier travel across, and the ramp width should not be less than 1.2 m (4 ft). The maximum slope of the flare should not exceed 8.3 percent if the landing is between 0.9m-1.2m(3 ft-4 ft).

Table 2. Ramp length for perpendicular curb ramps based on ramp slope

Change in Elevation	Ramp Length for 7.1 Percent Slope	Ramp Length for 8.3 Percent Slope
203 mm (8 m)	**4.0 m (13.1 ft)**	**3.2 m (10.7 ft)**
178 mm (7 in)	**3.5 m (11.4 ft)**	**2.8 m (9.3 ft)**
152 mm (6 m)	**3.0 m (9.8 ft)**	**2.4 m (7.9 ft)**
127 mm (5 in)	**2.5 m (8.2 ft)**	**2.0 m (6.6 ft)**
101 mm (4 in)	**2.0m (6.5 ft)**	**1.6 m (5.3 ft)**

This table assumes that the sidewalk corridor has a 2 percent slope and that the corner is level. The length is for the ramp only and does not include sidewalk width required for level landing.

Curb ramp length is determined by the vertical height of the curb between the roadway and the sidewalk. Assuming the cross slope of the corridor is constant at 2 percent, the formula for determining ramp length is:

$$\text{ramp length} = \frac{\text{curb height}}{(\text{ramp slope/percent} - \text{sidewalk corridor cross slope/percent})}$$

Table 2 calculates the minimum ramp length required for a 7.1 percent ramp and an 8.3 percent ramp, based on the height of the required vertical change.

Additional good practice curb ramp *design:*

- Align the curb ramp within the marked crosswalk, so there is a straight path of travel to the curb ramp on the other side.
- Provide adequate drainage to prevent the accumulation of water and debris on or at the bottom of the ramp.
- Minimize ramp length by lowering the sidewalk to reduce the curb height. Applicable in areas with narrow sidewalks.

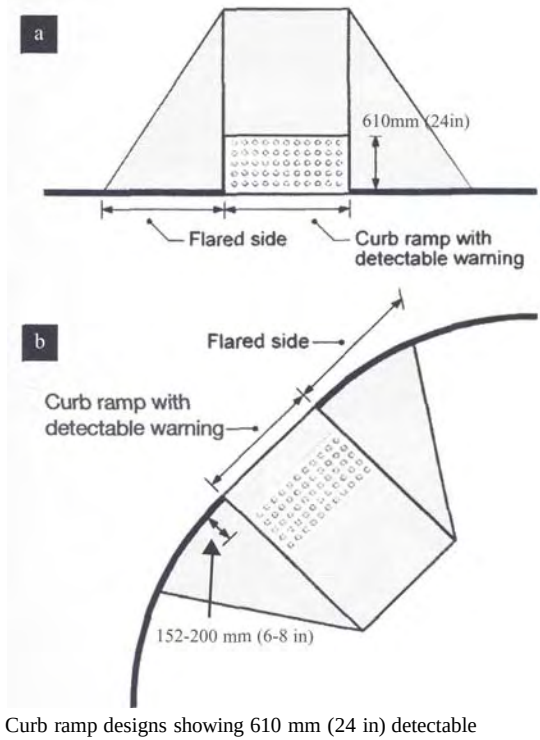
9 Providing Information to Pedestrians:

Pedestrians with vision impairments rely on nonvisual audible and tactile cues to travel. Cues in the environment include the sound of traffic, presence of curb ramps, verbal messages and audible tones in pedestrian signals, and detectable warnings.

To accommodate the information needs of all pedestrians, it is important to provide information in formats that can be assimilated using more than one sense. Pedestrian information includes pedestrian signage, Accessible Pedestrian Signals (APS) - audible tones, verbal messages, and vibrotactile information, and detectable warnings.

Detectable warnings **(See Figure 30)** are a standardized surface feature built in or applied to walking surfaces or other elements to warn visually impaired people of potential hazards.

Figure 30



Curb ramp designs showing 610 mm (24 in) detectable warning (U.S. Access Board-Detectable Warnings: Synthesis).

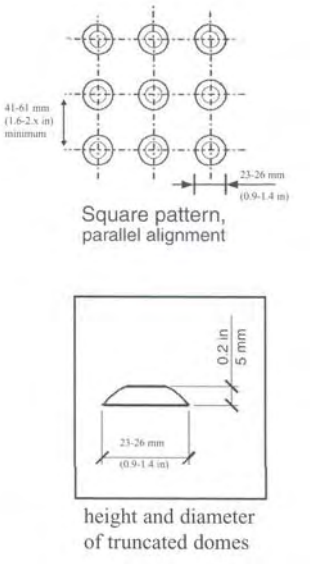
Detectable warnings shall consist of a surface of truncated domes aligned in a square grid pattern **(See Figure 31):**

- Base diameter of 23mm-26 mm (0.9in-1.4in).
- Top diameter of 50-60 percent of base diameter.
- Height of 5 mm (0.2 in).
- Center-to-center spacing of 41 mm-61 mm (1.6 in-2.4 in).
- Visual contrast of light-on-dark or dark-on-light with adjacent walking surfaces.

ADAAG Appendix, Section A, 29.2 recommends that the materials used provide a contrast of at least 70 percent.

Contrast = [(Bl- B 2) / Bl] x 100
B1 = light reflectance value of lighter area (LRV)
B2 = light reflectance value of darker area (LRV)

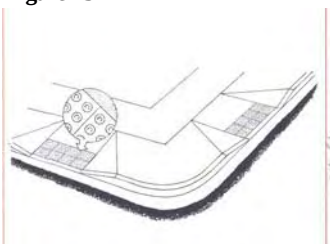
Figure 31



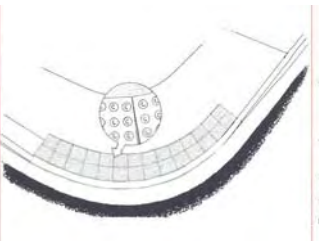
Truncated domes aligned so that wheels may pass between them arc easier for some wheelchair users to negotiate (Bentzen, Barlow, & Tabor, 2000.)

Detectable Warning Design Applications

Figure 32

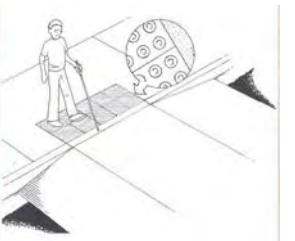


A 610 mm (2 ft) strip of detectable warnings shall be installed at the bottom of a curb ramp to indicate the transition from the sidewalk to the street.



A 610 mm (2 ft) strip of warnings shall be installed at the border of a depressed corner to identify the transition between the sidewalk and the street.

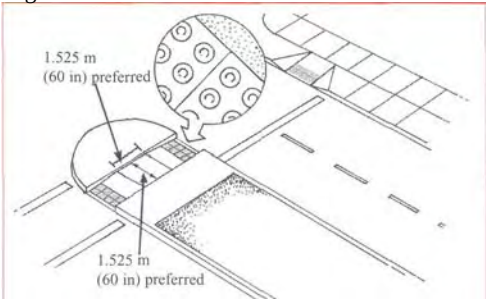
Figure 34



A 610 mm (2 ft) strip of warnings shall be installed at the edge of a raised crosswalk to identify the transition between the sidewalk and street.

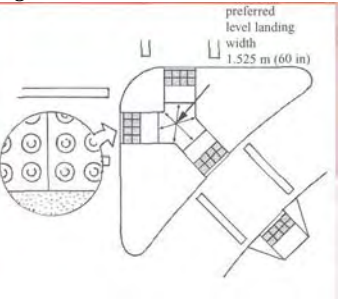
Detectable warnings shall be placed at the bottom of curb ramps **(See Figure 32)** and other locations such as depressed corners **(See Figure 33),** raised crosswalks and raised intersections **(See Figure 34),** borders of medians and islands **(See Figures 35 and 36),** and at the edge of transit platforms and where railroad tracks cross the sidewalk to warn people with visual impairments of potential hazards. Detectable warnings must be installed across the full width of ramps, and 610 mm (2 ft) in length up the ramp. The detectable warning

Figure 35



A ramped median should have a level landing that is 1.5 m (5 ft) level landing.

Figure 36

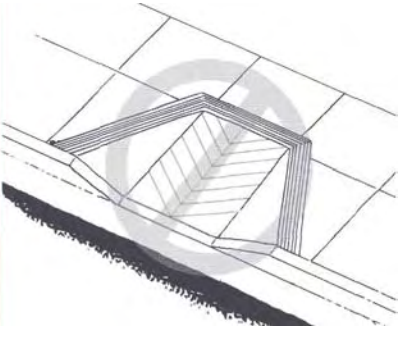


Ramped islands shall include detectable warnings and have a level landing.

should be set back 152 mm-200 mm (6 in-8 in) from the bottom of the curb **(refer to Figure 30 b above).** This allows wheelchair users to gain momentum before traveling over the truncated domes. It provides pedestrians with vision impairments additional time to react to the detectable warning or advanced warning before they reach the street. Smooth surfaces should be provided adjoining the detectable warning to maximize contrast. Bricks and other textured surfaces affect the ability of the pedestrian to detect the truncated dome warnings.

Grooves do not provide a detectable warning and pedestrians can easily confuse them with sidewalk expansion joints or cracks in the sidewalk **(See Figure 37).** They are not allowed as a detectable warning by ADAAG.

Figure 37



Potential Problem:
Grooves are not the equivalent of a detectable warning because they are not detectable underfoot.

Accessible Pedestrian Signals:

The implementing regulation under Title II of the ADA requires that all facilities constructed or altered after January 1992 be designed and constructed to be accessible to people with disabilities.

Audible tones and speech messages can provide standard information about the status of the signal cycle (WALK, DON'T WALK). Information on the location, direction of travel, and the name of the street to be crossed can also be included. Infrared or Light Emitting Diodes (LED) transmitters can send speech messages to personal receivers. In addition to providing information in multiple formats, the physical design, placement, and location of the pedestrian signal device need to be accessible to pedestrians with vision and mobility impairments.

Accessible Pedestrian Signal (APS)

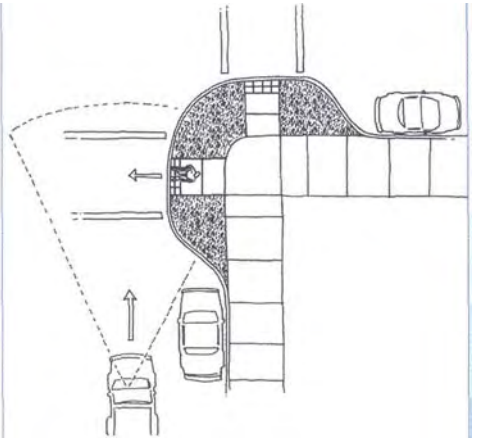
- Locate the push button as close as possible to the curb ramp without interfering with clear space.
- The device should be operated from a level landing.
- Mount the device no higher than 1.0 m (3.5 ft) above the sidewalk.
- The control face of the button shall be parallel to the direction of the marked crosswalk.
- One button per pole, each separated by 3 m (10 ft) is preferred.
- Place the device no closer than 760 mm (2.5 ft) to the curb, and no more than 1.5 m (5 ft) from the crosswalk.
- The button should be a minimum of 50 mm (2 in) in diameter to be easily operated by pedestrians with limited hand function. Avoid activation buttons that require conductivity (unusable by pedestrians with prosthetic hands).
- The force to actuate the button should require a minimum amount of force no greater than 15.5 N or 3 lbf to activate.

(For more information on Accessible Pedestrian Signals visit the Web sites at http://www.mutcd.gov, www.access-board.gov and www.accessforblind.org)

Pedestrian Crossings:

Designing an effective pedestrian crossing involves the correct layout of pedestrian elements including: information (signs, accessible pedestrian/traffic signals, markings), turning radius, visible crosswalks (including raised crosswalks), adequate crossing times, medians **(See Figure 35),** refuge islands, corner island (See **Figure 36),** curb ramps with detectable warnings, and curb extensions **(See Figure 38).** It also involves careful consideration of adequate sight lines, traffic patterns, and traffic signal phasing. Other techniques such as restrictions on right turns, pedestrian lead times, and traffic calming measures will benefit all pedestrians. Regulations that prohibit parking at the corner can also improve blocked sight lines.

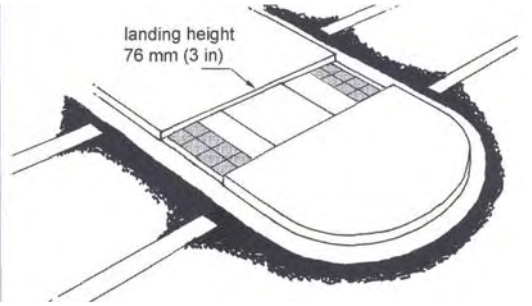
Figure 38



Curb extensions improve visibility between pedestrians and motorists and make it easier to install perpendicular curb ramps with level landing. Regulations that prohibit parking at the corner can also improve blocked sight lines

Medians: Medians generally reduce crossing exposure and allow pedestrians to negotiate vehicle traffic one direction at a time. Medians should be curbed or barrier medians to physically separate pedestrians and motorists rather than painted flush. Furthermore, all medians should be accessible to pedestrians. The nose of the median should be extended beyond the crosswalk (See **Figure** 39). If a cut through **(See Figure 40)** is provided, it should be at least 1.8 m (6 ft) long and 1.5 m (5 ft) wide. This allows 2 wheelchair users to pass each other. In addition the edges of the cut through must be perpendicular to the street being crossed.

Figure 39



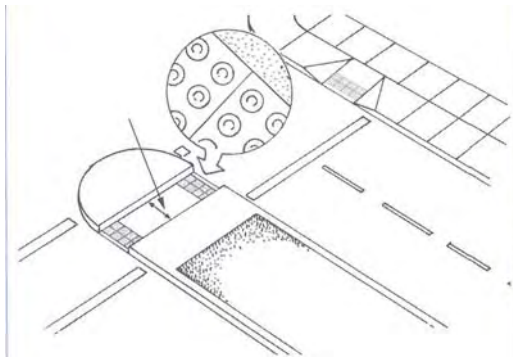
GOOD DESIGN: The height of this median does not exceed 76 mm (3 in). This design allows for the construction of shorter curb ramps and a longer level landing.

Ramped medians **(See Figure 35),** should have a curb ramp at either end and a level landing at least 1.5 m x 1.5 m (5 ft x 5 ft). For all medians, cut through or ramped, a 0.6 m (2 ft) strip of detectable warnings should be located at the entrance and exit.

Corner Island: The design guidance for the island itself is similar to those of the median. The island should be raised and designed with curb ramps **(See Figure 36)** or a pedestrian cut-through **(See Figure 41).** If a cut-through design is selected, it should provide at least 1.5 m (5 ft) of clear space in all directions. In addition, a 0.6 m (2 ft) strip of detectable warning should be included at every exit point on the island.

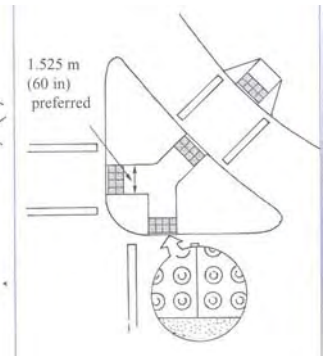
Ramped Corner Island **(See Figure 36):** The design should include curb ramps that are at least 1.5 m (5 ft) wide (preferred), 1.5 m x 1.5 m (5 ft x 5 ft) level landing and detectable warnings.

Figure 40



Cut-through medians should be at least 1.525 m (60 in) wide and should include 610 mm (24 in) strips of detectable warnings at both ends.

Figure 41



Corner islands with cut-throughs should be at least 1.525 m (60 in) wide at all locations and include 610 mm (24 in) strips of detectable warnings