Accessible Pedestrian Crossing

A guided analysis of the corner of Hickory & Fry

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Introduction

A number of affordances are required to enable pedestrians to cross a street in as safe a manner as possible at a traffic intersection. It is equally important these affordances be available to pedestrians of all sight abilities. Those with limited to no visible acuity desire the same independence sighted individuals appreciate when navigating the world.

However, due to changes in traffic light control systems in recent decades, the visually impaired find it more difficult to use the cues they historically rely on to safely cross a street. Once aligned to a street intersection, the main trigger used to know when to cross a street at traffic signaled intersection was to walk in the direction of the audible surge of traffic in the appropriate direction of travel. More complex traffic control systems, varied traffic conditions and intersections make this option unreliable.

Crossings that have been designed to use accessible pedestrian signals and accessible crosswalk design features not only increase effectiveness and safety for the visually impaired, but also prove to aid sighted individuals. This case study will describe and evaluate the affordances provided at a frequently used intersection many students from the University of North Texas cross to travel home, buy school supplies, or acquire refreshments and entertainment. The analysis will conclude with recommendations for accessibility improvements.

The Steps to Cross a Street

The sighted and visually impaired both use the same process to cross the street. It is only the means of acquiring the information that differs between the two groups. Sighted individuals rely mostly on their eyes to take in all of the information relatively quickly, while the visually impaired rely on audible and tactile cues to process all of the inputs available.

Accessible pedestrian crossing design ensures all of this information is available to individuals of all means as much as possible.

1. Detects the Street
2. Identifies the Street
3. Analyzing Intersection Geometry
4. Analyzing Traffic Control System
5. Identify the Crossing Interval
6. Start the Crossing
7. Maintain Crossing Alignment

Accessible Crossing Features

A number of accessible crossing elements are used in the United States to guide the visually impaired across a signalized street. The use of the features depends upon unique circumstances of each intersection, including the number of streets involved, traffic directions, traffic patterns, existing neighborhood vicinity, existing or potential technological and physical infrastructure, etc. Some of the most commonly used features, recommended as best practices by the Federal Highway Administration or the National Cooperative Highway Research Program include:

Accessible Pedestrian Signal Features

WALK indication	An audible signal indicating the onset of the pedestrian walking cycle has begun and pedestrians may cross [Audio Sample]
Pushbutton locator tone	An audible tone that allows individuals to locate where the crossing pushbutton is located [Audio Sample]
Tactile arrow	A vibrotactile arrow that points in the direction of crossing travel. This allows individuals to determine if the pushbutton they are pressing is inline with their destination. 
Automatic volume adjustment	The locator tones and walk indication signals increase and decrease in volume based upon the surrounding noise levels
Actuation indicator	Some pushbuttons vibrate on contact or audible signal providing feedback to the user it has been activated
Extended button press	Holding down on the pushbutton for 1-3 seconds provides additional information to user including street name, crossing time warnings or increases the pedestrian crossing time

Accessible Pedestrian Physical Features

Detectable Warning (Truncated Dome)	A detectable warning indicates hazards are present past this path 
Curb Ramp within Crosswalk	Curb ramps that are located within the bounds of the crosswalk aids in maintaining the appropriate geometry to gain access to the corresponding ramp

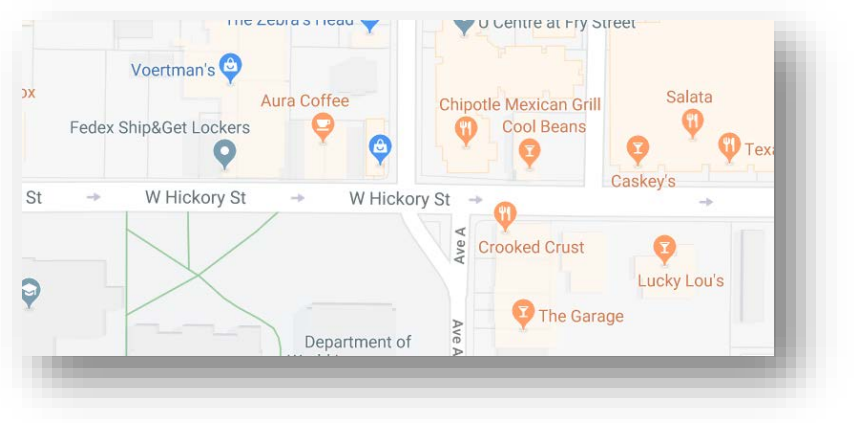
Accessible Intersection Case Study:

Following we will explore the accessible crossing features available at a specific intersection near the University of North Texas Campus. Leila Adams, a visually impaired student at the University of North Texas will attempt to navigate this intersection during her available break between two classes.

Location - Hickory St & Fry St in Denton, TX

Hickory St – a one way east bound street with two lanes of traffic with peak usage at 8am and 3pm[1], but consistent foot traffic all night.

Fry St – a two way north and south bound street with one lane of traffic in either direction. The traffic on Fry street is lighter compared to Hickory, with entry into campus territory in the Southbound direction.



Popular destinations frequented by UNT students, faculty and the public near the signaled pedestrian crossing include: Aura St Coffee, Voertmanns Books, Chipotle, Insomnia Cookies, Potbelly's, Crooked Crust, Pita Grill, and the UNT World Languages, English and College of Visual Arts and Design buildings.

[1] Verify with Denton traffic data if available. Otherwise remove

Street Crossing Accessible Features

Below is picture of the intersection and available accessible pedestrian crossing features on the Southwest, Northwest and North east corners. The path of travel explored will be from the corner of UNT, north across Hickory, then east across Fry.

FIGURE 1 - THE SOUTH WEST, NORTH WEST AND NORTH EAST CORNERS

1 Southwest to Northwest - Push button integrated Accessible Pedestrian Signal, Curb Ramp, Tactile Arrow, Rapid Tick Indicator, Locator Tone
2 Northwest to Northeast – Push button integrated Accessible Pedestrian Signal, Truncated Dome, Curb Ramp, Ramp, Tactile Arrow
3 Northeast to Northwest – Push button integrated Accessible Pedestrian Signal, Locator Tone, Tactile Arrow, Curb Ramp with Truncated Domes
4 Northwest to Southwest – Push button integrated Accessible Pedestrian Signal, Locator Tone, Tactile Arrow, Rapid Tick Indicator, Curb Ramp

FIGURE 2 - THE NORTH WEST AND NORTH EAST CORNER

User Persona

Leila Adams

A visually disabled student wants to acquire items at Voertmanns and get some lunch at Chipotle before returning to class in two hours.

Demographics:

Age: 18
Location: Denton, TX – recent transplant from Garland, TX
Education: pursuing Bachelors of Science in Music
Job: Full Time Student
Primary Mobility Tool: White Cane with Red Tip

Goals

- Traverse from the UNT campus to buy a gift for her parents from Voertmans College Bookstore
- Purchase lunch at Chipotle
- Return to campus before her next class starts in two hours
- Cross any necessary streets safely and independently
- Communicate a positive experience travelling off campus to her parents

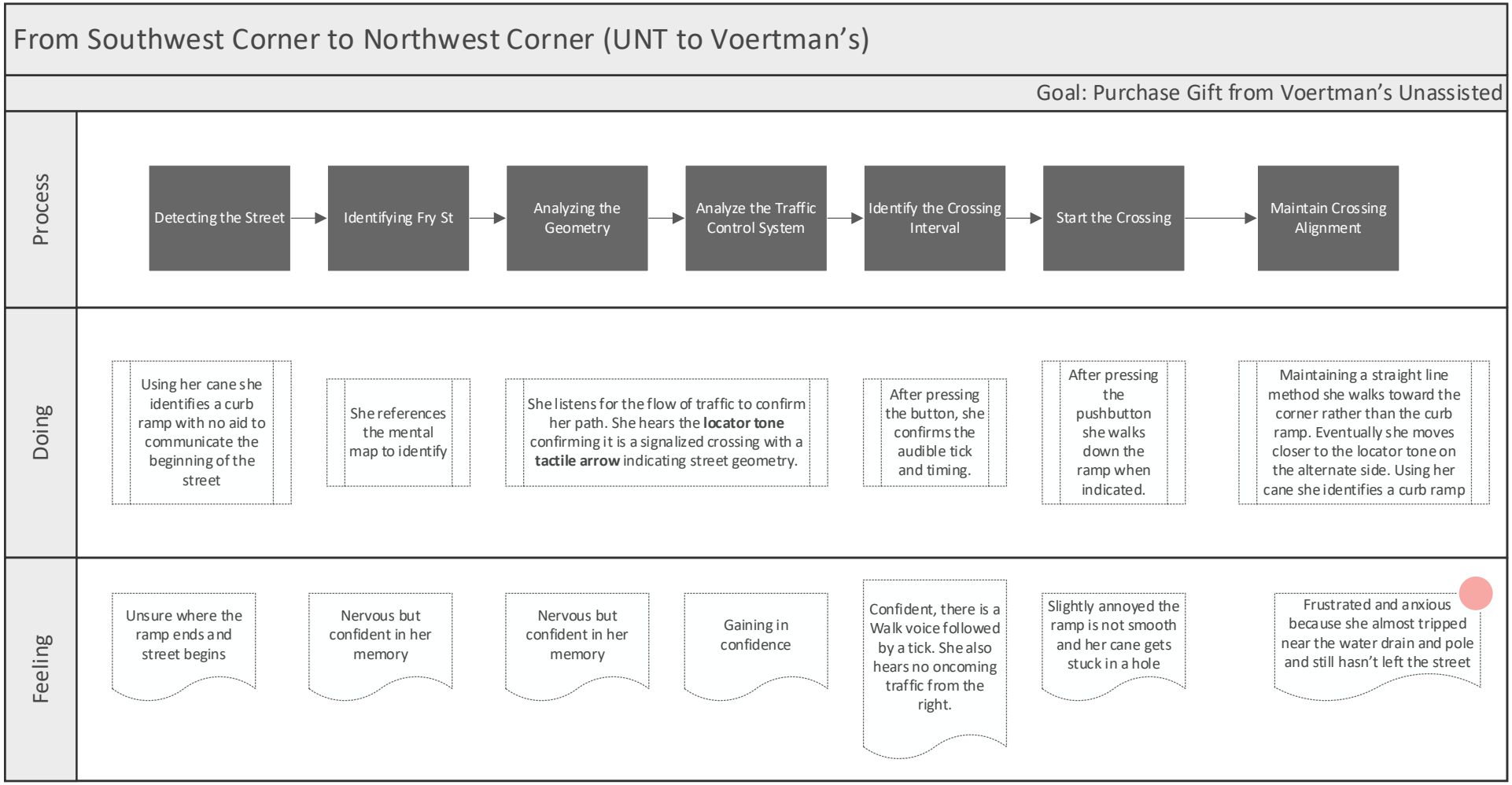
Frustrations

- She has sighted parents who are very concerned with her wellbeing. This will be her first time away from home for an extended period of time without their assistance. She believes they are overprotective with their constant phone calls and reminders
- Though she knows it might be simpler, Leila is highly independent and would prefer to figure out situations for herself. She believes asking for assistance leaves sighted individuals with the impression the visually impaired cannot move freely in the world.

Destined Route

Leila plans on heading North on Avenue A until she approaches to the Hickory and Fry intersection. She will cross Hickory North towards Voertman's. After making her purchases, she will walk East on Hickory to Chipotle across the street. When she is done with her lunch she will return to UNT by heading West on Hickory and then South on Fry. There are accessible pedestrian signals in each direction. A video of the route to Chipotle and back from Chipotle is available to view online. .

Experience Map – Crossing from UNT to Voertman's



Analysis of the Accessible Pedestrian Crossing UNT to Voertman's Crossing

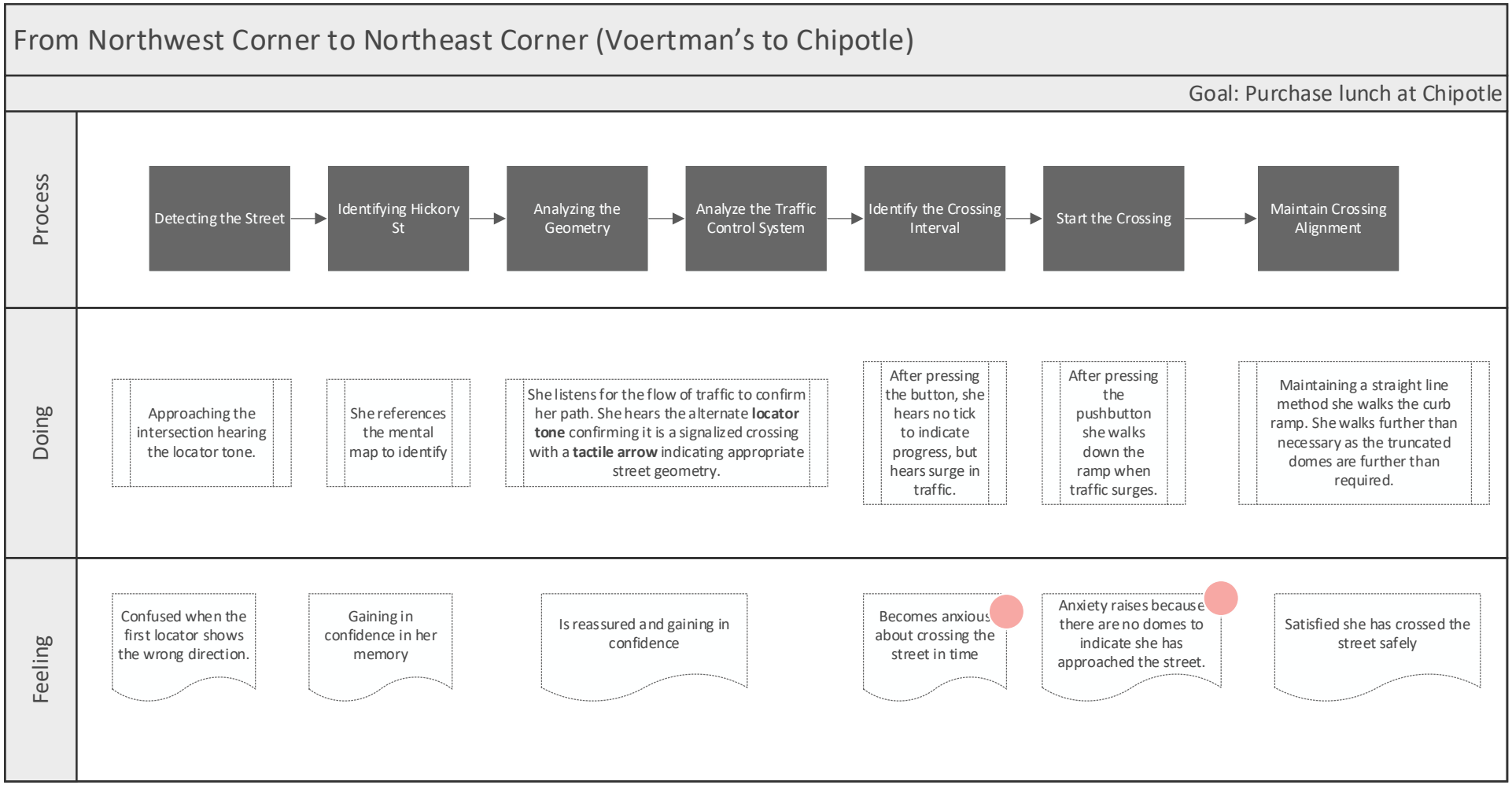
FIGURE 4 MISSING TRUNCATED DOMES

FIGURE 3 B - CROSSWALK NOT ALIGNED TO RAMPS

Summary: The Southwest to Northeast crossing has the minimum accessible pedestrian crossing features to determine when and in which direction to cross. The lack of truncated domes prevents Leila from knowing with complete certainty when she has entered an area of danger. Additionally, the curb ramps are not within the bounds of the crosswalk, so walking in a straight line prevents her from reaching the opposing curb ramp without error.

Recommendations for Improvement: Adding truncated domes will ensure the visually impaired do not enter the street too soon. Additional street geometry indicators, activated through the pushbutton can ensure she aims to her left as she's crossing to reach the appropriate curb ramp

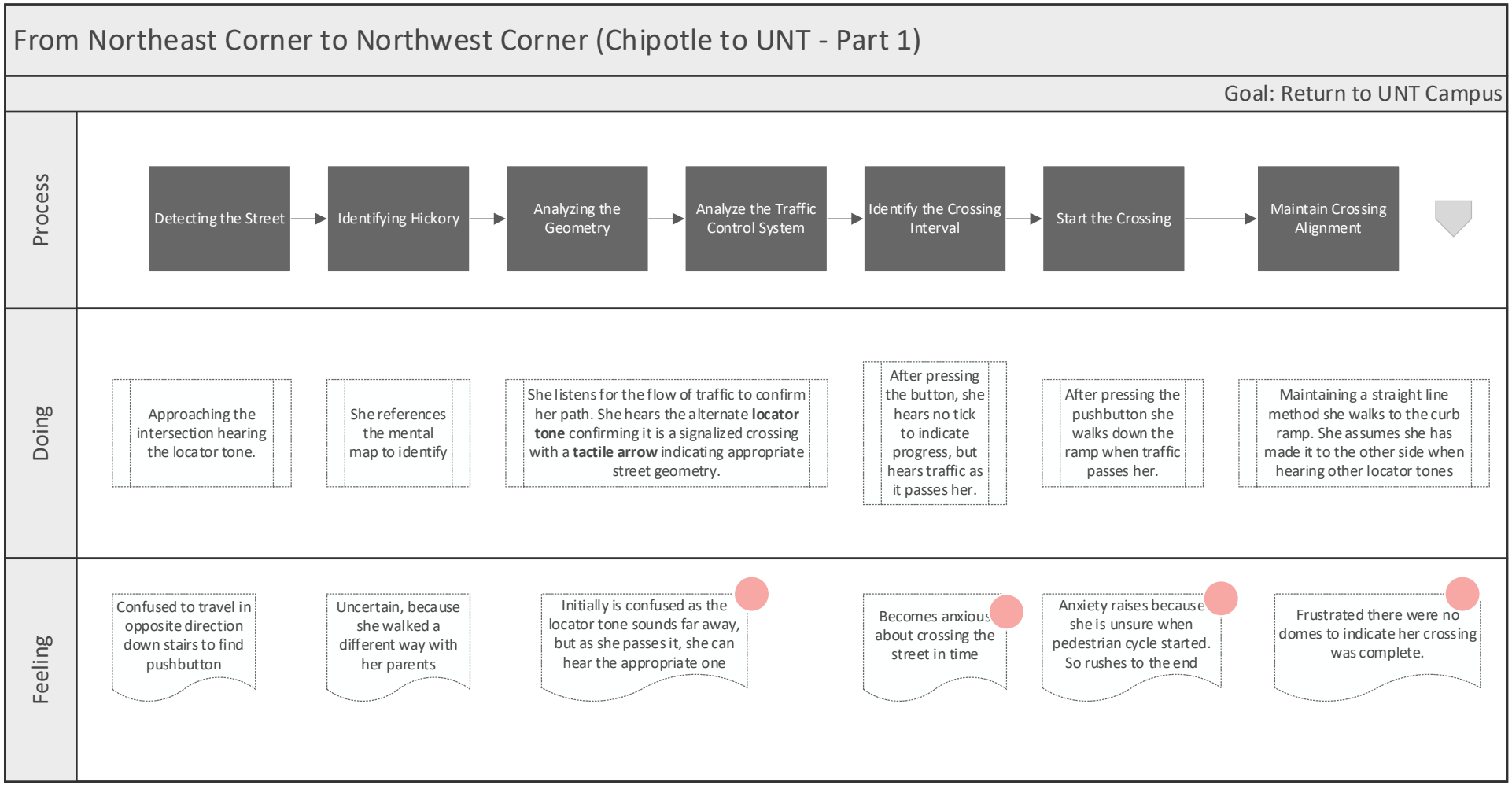
Experience Map & Analysis – Crossing from Voertman's to Chipotle



Summary: The initial locator tone at this intersection is for the crossing towards UNT. There is another locator tone at a lower decibel, but it is currently in sync with the louder one making it harder to hear. The Northwest to Northeast crossing does not have truncated domes to aid in knowing where you may begin to cross. While Leila could try to stay further back from the road to ensure her safety, the lack of a walk indicator means it will take her longer to cross the street than necessary since she is not starting from the optimal distance.

Recommendations for Improvement: Truncated domes will ensure the visually impaired do not enter the street too soon. Also, equipping the pushbutton indicators with a rapid tick signal or other walk indicators ensures she crosses at the most appropriate time.

Experience Map – From Chipotle to UNT



Analysis of the Accessible Pedestrian Crossing Chipotle to the Northwest Corner

FIGURE 5 TRUNCATED DOMES EARLY TERMINATION

Complications: The NE to NW corner pushbutton is more difficult to find depending upon which door is used to exit Chipotle. The pushbutton is difficult to locate if exiting from the West exits. If you exit from the West, the initial locator tone will direct you to the wrong street. When attempting to find the other locator button, you will notice it is inaudible from your current position. There is also a street pole, small clearance, and a ramp pole that will impact your travel to find the other pushbutton indicator. The alternate pushbutton is over 10 feet away, more than the ADA standard distance, from the current one found.

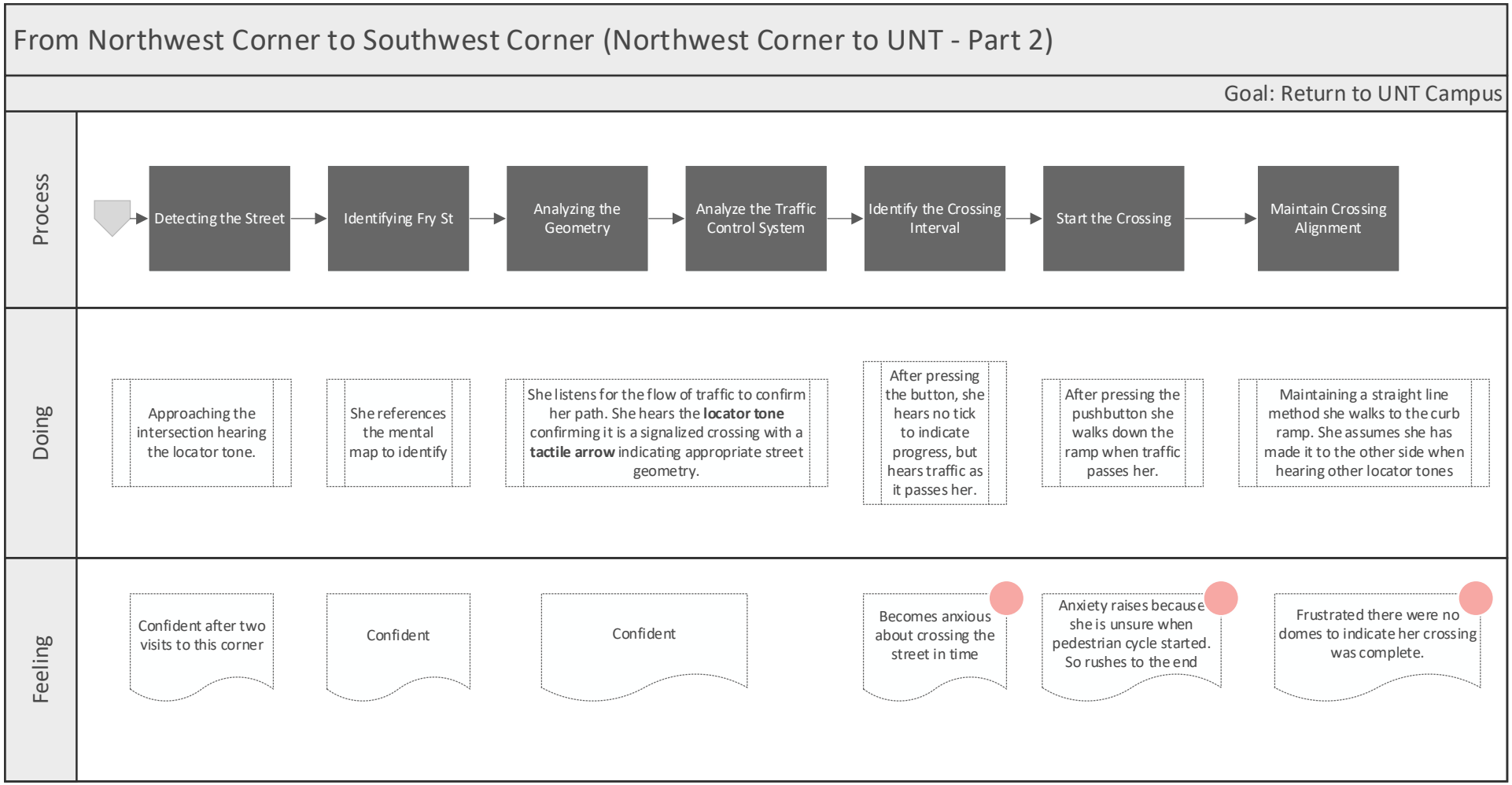
If you exist from the South, only the South crossing pushbutton is audible, and the West crossing is impeded by a bar if the button is accessed from the back (the area nearest. If the individual tries to leave from the South exit, they will need to follow the bar to the East (the opposite direction of travel) to go down the stairs then follow the bar West to the pushbutton, which is overshadowed by the locator tone for pushbutton for the South crossings. Tactile information is the most accurate way the individual could cross this street.

FIGURE 6 PUSHBUTTON LOCATIONS

Summary: The Northeast to Northwest crossing has truncated domes that terminate prior to the start of the street. Unbeknownst to Leila, she is starting her crossing further back than necessary. Once again she will encounter an intersection that fails to alert her to with a walk indication, presenting similar timing concerns as her previous trek across Fry St.

Recommendations for Improvement: Add truncated domes to the remaining portion of the curb prior to the beginning of the street. Add a walk indicator to inform the pedestrian when it is appropriate to walk. Unfortunately, moving the pushbutton indicator so it is a more optimal position in relation to it's counterpart and also in relation to the doors of Chipotle may require a larger investment to overhaul the current physical infrastructure.

Experience Map – From Chipotle to UNT - continued



Summary: The initial crossing is fine as she is familiar with this intersection. However, she does run into the curb again, because it is not quite straight.

Recommendations for Improvement: Truncated domes will ensure the visually impaired do not enter the street too soon. Also, equipping the pushbutton indicators additional information regarding street geometry will assist.

Summarized List of Recommendations to Traffic Intersections

Each leg of Leila's journey has a moment of frustration and anxiety in her ability to cross the streets safely. The inconsistency in use of walk onset indicators and detectable crossing warnings does not afford the visually impaired with the ability to navigate these popular off campus destinations comfortably unaided.

In accordance with ADA recommendations, the following summarizes changes to the intersection that could better serve the visually impaired populations.

Intersection	Pedestrian Signal	Physical Features
SW to NW Corner	N/A	• Truncated Domes on Curb Ramp • Curb Ramp within Crosswalk – Improved Alignment or Street Geometry Indicator
NW to NE Corner	N/A	• Truncated Domes • Walk Onset Indicator – Rapid Tick
NE to NW Corner	• Louder locator tone • Alternate locator tone	• Curb Ramp should end at the onset of the street • Walk Onset Indicator – Rapid Tick
NW to SW Corner	• Louder locator tone • Truncated Domes	• Curb Ramp within crosswalk – Improved Alignment or Street Geometry Indicator that does not lead to an obstruction