Traffic Study and Concept Reviews

City of McKinney

Downtown Parking Structure – Site 1

April 28, 2015

Kimley-Horn and Associates, Inc.
McKinney, Texas

Project #068176043
Registered Firm F-928

Kimley»Horn

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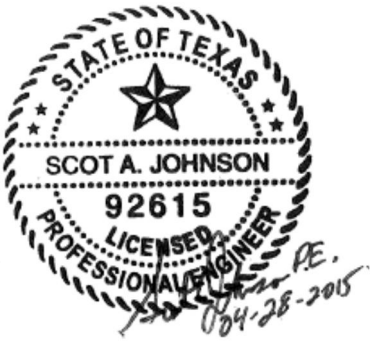
MEMORANDUM

To: City of McKinney

From: Scot A. Johnson, P.E., PTOE
Kimley-Horn and Associates, Inc.

Date: April 28, 2015

Subject: McKinney Downtown Parking Structure - Site 1
Traffic Study and Concept Reviews



Executive Summary

Concept 1A/1B would provide slightly better vehicular access between the structure and the public streets than Concept 2A/2B. The exit to Church Street of Concept 1A/1B is more flexible for exiting drivers, reduces the number of access points along the major couplet streets, and may have advantages for the pedestrian experience and façade treatment. Both concepts provide approximately the same pedestrian access, and there do not appear to be fatal flaws in either concept.

The closure of Church Street is technically feasible, but would have serious negative impacts on the quality of life along Benge Street, and would break an important link in the Downtown street grid. Since the closure of Church Street is not offset by gaining a significantly improved parking structure in Concept 2A/2B, the closure of Church Street is not recommended.

Therefore, Concept 1A/1B is recommended as the clear choice, having superior design characteristics and not requiring closure of Church Street.

Introduction

The City of McKinney retained Kimley-Horn to review the concepts for the proposed McKinney Downtown Parking Structure (MDPS) at the location known as Site 1, east of Church Street between Louisiana Street and Virginia Street. The reviews included examinations of the MDPS concepts for vehicular and pedestrian accessibility, covering both the preliminary schemes and a more detailed analysis (this document) as the number of concepts was narrowed down. A separate examination was made of the impacts of closing Church Street, which is also included in this document.

Existing Conditions

The proposed MDPS would be located on Site 1, which was selected for further study from a number of potential sites around the Downtown area. Site 1 is the present Lot 2 public surface parking lot, one block west of the Historic Downtown Square. Lot 2 currently provides 75 public parking spaces, with entry and exits to and from Louisiana Street and Virginia Street.

Site 1 is generally surrounded by commercial or future commercial areas, with Dr. Glenn Mitchell Memorial Park occupying the block to the west across Church Street. Church Street is a two-lane undivided roadway with no parking allowed. Louisiana Street and Virginia Street are a one-way couplet with Louisiana Street being eastbound and Virginia Street westbound. Each street has two travel lanes and parallel parking on both sides of the street.

To provide a baseline for vehicular traffic conditions, the City collected 24-hour machine counts on streets around Site 1. The data collection was conducted on Saturday, March 7 through Tuesday, March 10. The resulting weekday daily, AM peak hour, and PM peak hour link volumes are shown in **Exhibit 1**. Some links had noticeable midday peaks as well, but not out of line with AM and PM peaks, so only AM and PM peaks were examined. Daily volumes are consistently but not dramatically lower than most recent historical counts, probably due to seasonal divergence and adverse weather on the count days.

Table 1. Historical Count Comparisons

Location	Historical Count		2015 Count	
Louisiana Street (EB) East of Church Street	4,668	9/28/2011	3,818	3/9/2015
Virginia Street (WB) East of Church Street	4,105	9/28/2011	3,643	3/10/2015
Church Street North of Virginia Street	1,980	9/9/2009	1,715	3/10/2015

The Saturday daily and midday peak hour link volumes are shown in **Exhibit 2**. The Saturday midday was identified as the peak traffic time, as the roads were busier at that time than in the evening hours.

The data collection shows that all observed roadway links are well below their technical vehicle capacity for both daily and peak hour volumes. This capacity is approximately 4,500 per day in each lane, or 450 per hour, where parking does not obstruct two-way flows.

However, most link volumes are high enough to be considered significant when examined for subjective quality of life measures for residential adjacency or downtown walkability. That is, the roadways can

technically handle significantly larger volumes, but the perceived impact would be unreasonable to the local residents and pedestrians.

General Vehicular Access

Consideration of the Site 1 location and access characteristics led to the following general access principles, which were used as part of the review of the early concepts:

Inbound Access

- Favorable – Direct entry from both Louisiana Street and Virginia Street
- Acceptable – Entry from Church Street
- Unfavorable/Unacceptable – Direct entry from only one of Louisiana Street or Virginia Street

Outbound Access

- Favorable – Exit to Church Street
- Acceptable – Direct exit to both Louisiana Street and Virginia Street
- Unfavorable/Unacceptable – Direct exit to only one of Louisiana Street or Virginia Street

Concept 1A/1B

Concept 1A is a parking structure contained within the basic boundaries of the current Site 1 surface parking lot. Concept 1B adds a basement level with the additional ramp needed for that area, but as there are no significant differences in the external traffic characteristics, the two variants are considered together. Please see the Carl Walker exhibits for depictions of Concepts 1A and 1B.

Concept 1A/1B has entrances directly from Louisiana Street and Virginia Street, the major one-way couplet streets. These are favorable since they replicate the existing parking lot entrances and provide direct access from the major vehicular routes in and out of Downtown. These direct access paths make for simple one-step wayfinding to guide drivers into the parking structure.

With the one-way flow on the couplet streets, and without exits at the same locations, the entry movements do not have vehicular conflicts as they turn into the structure. Inbound vehicles simply slow as necessary and leave the one-way roadway. With two lanes on each couplet street, following vehicles can move around vehicles entering the structure.

Concept 1A/1B has an exit to Church Street. The two-lane exit will allow separate left- and right-turning outbound movements. Exiting to Church Street allows the structure to have only one exit for the easiest internal wayfinding, while retaining the flexibility for outbound vehicles to reach either Louisiana Street or Virginia Street. Outbound vehicles can more easily enter Church Street that the couplet streets, since there is less conflicting background traffic. The exit point is placed at a proper separation from the Church Street intersections with Louisiana Street and Virginia Street.

Having only the entrances from the couplet streets and the exit to Church Street does limit the inbound path from Church Street. Vehicles who turn on to Church Street from Louisiana Street in error, or those approaching southbound on Church Street, have no opportunity to directly enter the structure. From

northbound Church Street, those vehicles must circle around via the Square or Benge Street to reach one of the couplet street entrances. From southbound Church Street, it is fairly easy to turn onto Louisiana Street to reach the entrance there. Compared to the major approach paths originating on the couplet streets, this is only a minor concern.

Concept 1A/1B probably requires the modification of the east curb of Church Street in order to maintain a minimum sidewalk width between the structure façade and the curb. This narrowing is acceptable as long as Church Street maintains a width of at least 24' face-to-face to meet fire lane standards.

Concept 1A/1B has pedestrian elevators and stairs at both northeast and southeast corners, and uses the 10' setback from the east property line as part of the pedestrian area. This is the most favorable configuration for pedestrian access between the structure and the street, since it matches the dominant desire path to and from the Square. Concept 1A/1B requires only one vehicular crossing of the pedestrian realm along Louisiana Street and Virginia Street, minimizing the potential for pedestrian-vehicle conflicts.

In general, Concept 1A/1B is considered to have favorable vehicular access in both inbound and outbound directions, and to meet other vehicular and pedestrian access expectations.

Concept 2A/2B

Concept 2A is a parking structure which extends over both the current surface parking lot and the Church Street ROW, requiring the closure of Church Street to through traffic. Concept 2B adds a basement level with the additional ramp needed for that area, but as there are no significant differences in the external traffic characteristics, the two variants are considered together. Please see the Carl Walker exhibits for depictions of Concepts 2A and 2B.

Concept 2A/2B has entrances and exits directly to and from Louisiana Street and Virginia Street, the major one-way couplet streets. The entries are favorable since they provide direct access from the major vehicular routes in and out of Downtown. These direct access paths make for simple one-step wayfinding to guide drivers into the parking structure. However, having exits directly to Louisiana Street and Virginia Street requires all outbound vehicles to conflict with the large couplet traffic flows, possibly leading to increased queuing within the structure during peak times.

Having the entrance before the exit along Virginia Street means garage traffic flows are not in conflict with each other at that point. The opposite is true on Louisiana Street, where the exit before the entrance means that garage traffic flows overlap each other at that point, adding to the conflicts with the through traffic.

Having both an entrance and an exit on each couplet street may affect the quality of façade which is possible along those important building faces.

Concept 2A/2B requires the removal of Church Street from the Downtown street grid, which is considered a negative for the area. See the Church Street discussion later for more details. Concept 2A/2B does not have significant advantages in layout, efficiency, cost-effectiveness, or other factors, which might offset this negative impact.

Without Church Street, current users of Church Street may attempt to continue making that connection by travelling through the structure from Louisiana Street to Virginia Street. This would add to the internal circulation volume and would be negative for vehicular and pedestrian operations within the structure.

Concept 2A/2B has pedestrian elevators and stairs at both northeast and southeast corners, and uses the 10' setback from the east property line as part of the pedestrian area. This is the most favorable configuration for pedestrian access between the structure and the street, since it matches the dominant desire path to and from the Square. Concept 2A/2B requires two vehicular crossings of the pedestrian realm along each of Louisiana Street and Virginia Street.

In general, Concept 2A/2B is considered to have favorable vehicular access in the inbound direction and acceptable access in the outbound direction. However, the complications of closing Church Street between Louisiana Street and Virginia Street are a serious negative factor, without resulting in a significantly improved structure over Concept 1A/1B.

On-Street Parallel Parking

The concept plans show the removal of the existing parallel parking spaces adjacent to the site on Louisiana Street and Virginia Street. This would tend to improve the efficiency of the structure access points by removing potential conflicts with vehicles entering or exiting the parking spaces. However, the presence of parallel parking is favorable for the pedestrian experience on the adjacent sidewalks, and may be useful for screening the structure and reducing the contrast to the nearby historic buildings. With only a few spaces in question, the number of conflicting parking maneuvers are minimal. Therefore, retaining the parallel parking should be considered where possible.

Under Concept 1A/1B, several of the existing parallel parking spaces on the south side of Virginia Street near Church Street should be removed to improve the intersection sight distance for drivers at the stop sign on northbound Church Street. Conversely, the removal of the existing Lot 2 exit to Louisiana Street may allow the addition of a new parallel parking space at that location, provided a suitable gap is retained around the MDPS entrance.

With Concept 2A/2B, the separate entries and exits to Louisiana Street and Virginia Street will limit the potential for parallel parking.

Church Street Closure Traffic Flow Modifications

Using the traffic data discussed earlier, the traffic diversions due to the closure of Church Street were examined. **Exhibit 3** and **Exhibit 4** show the potential diversion paths and resulting traffic volumes for the weekday and Saturday scenarios, respectively.

Church Street Closure Traffic Flow Modifications - Northbound

To avoid using the Downtown Square, existing northbound Church Street traffic would tend to divert to northbound Benge Street if arriving from eastbound Louisiana Street. Once on northbound Benge Street, the next viable eastbound street is Hunt Street.

From northbound Church Street south of Louisiana Street, or from Louisiana Street and choosing not to use Benge Street, diverted traffic would have to proceed three blocks east and turn north on Tennessee Street through the Square.

These anticipated diversion paths are shown in yellow on **Exhibits 3-4**. Using very conservative assumptions that all diverted traffic moves to Benge Street, the northbound traffic volume changes would be as shown in **Table 2**.

Church Street Closure – Northbound Traffic Discussion

With Church Street closed between Louisiana and Virginia, northbound Church Street north of Virginia would also have fairly low volume, since it would only be fed by westbound Virginia Street. A small number of residences or commercial sites would be affected.

Longer-distance northbound traffic would want to return to Church Street via Hunt Street or another east-west street north of Hunt. There should be no changes to Hunt Street volume east of Church Street, since diverted traffic desiring to go east would have returned to their normal path by that point.

Northbound Benge Street between Louisiana and Virginia would experience a 114% to 202% increase in traffic volume across the time periods. Both the highest daily volume of 1,645 vpd and the highest hourly volume of 161 vph are still well below technical capacity. However, there would be a huge increase in perceived traffic volume on a daily basis and at busy times. There is also a subjective change from being a primarily local access and park boundary street to being a busier collector street.

Northbound Benge Street between Virginia and Hunt would experience a 215% to 490% increase in traffic volume across the time periods. Both the highest daily volume of 1,463 vpd and the highest hourly volume of 177 vph are still well below technical capacity. However, there would be a huge increase in perceived traffic volume on a daily basis and at busy times. There is also a subjective change from being a primarily local access street to being a busier collector street.

Currently the intersection of Benge Street and Hunt Street has two-way stop control of the Benge Street approaches. This configuration could remain unaltered and provide acceptable service. Changing to have Benge Street proceed and Hunt Street be stop-controlled (matching existing Church/Hunt intersection) is not recommended since it would encourage northbound traffic to remain on Benge Street. Four-way stop control may be useful to balance vehicular delays across all approaches.

Table 2. Northbound Volumes – Church Street Closure

Street Link With Diversion Traffic	Time Period	Existing Volume	Volume After Diversion
Church Street Northbound Between Louisiana and Virginia	Weekday	932	0 (Closed)
	Weekday AM Pk Hr	69	
	Weekday PM Pk Hr	74	
	Saturday	985	
	Sat. Mid-Day Pk Hr	86	
Church Street Northbound Between Virginia and Hunt	Weekday	918	Small Remaining Volume From WB Virginia
	Weekday AM Pk Hr	69	
	Weekday PM Pk Hr	63	
	Saturday	1,166	
	Sat. Mid-Day Pk Hr	147	
Benge Street Northbound Between Louisiana and Virginia	Weekday	514	1,446
	Weekday AM Pk Hr	34	103
	Weekday PM Pk Hr	47	121
	Saturday	660	1,645
	Sat. Mid-Day Pk Hr	75	161
Benge Street Northbound Between Virginia and Hunt	Weekday	281	1,197
	Weekday AM Pk Hr	32	101
	Weekday PM Pk Hr	26	89
	Saturday	297	1,463
	Sat. Mid-Day Pk Hr	30	177

Similar sign modifications to assist the diverted traffic flows may be useful at other stop-controlled intersections in the area, but do not seem to be required at present traffic volumes. Operational analysis with turning movement counts would be needed for specific answers.

There would be a small impact to First United Methodist Church, with traffic from south arriving at the rear of the site after using Benge Street. There would be no significant change to outbound traffic to south.

Other than having a significant impact on Benge Street quality of life, the Church Street closure would have no significant impact to traffic pattern currently using Church Street and Hunt Street to reach the north side of Downtown.

Church Street Closure Traffic Flow Modifications - Southbound

Due to the westbound direction of Virginia Street, all southbound Church Street traffic would have to divert to Benge Street, by remaining on or turning onto Virginia Street.

If diverted traffic desires to continue south of Louisiana Street, they could continue on Benge Street, or return to southbound Church Street by Louisiana Street. Diverted traffic desiring to return east can do so on Louisiana Street.

These anticipated diversion paths are shown in green on **Exhibits 3-4**. Using very conservative assumptions that all diverted traffic moves to Benge Street, the southbound traffic volume changes would be as shown in **Table 3**.

Table 3. Southbound Volumes – Church Street Closure

Street Link With Diversion Traffic	Time Period	Existing Volume	Volume After Diversion
Church Street Southbound Between Virginia and Louisiana	Weekday	504	0 (Closed)
	Weekday AM Pk Hr	26	
	Weekday PM Pk Hr	39	
	Saturday	716	
	Sat. Mid-Day Pk Hr	65	
Benge Street Southbound Between Virginia and Louisiana	Weekday	200	704
	Weekday AM Pk Hr	17	43
	Weekday PM Pk Hr	26	65
	Saturday	244	960
	Sat. Mid-Day Pk Hr	21	86
Benge Street Southbound Between Louisiana and Davis	Weekday	151	655
	Weekday AM Pk Hr	19	45
	Weekday PM Pk Hr	10	49
	Saturday	278	994
	Sat. Mid-Day Pk Hr	42	107

Church Street Closure – Southbound Traffic Discussion

With Church Street closed between Virginia and Louisiana, southbound Church Street traffic has a straightforward diversion to Benge Street. There are no changes to Davis Street volume east of Church Street, since diverted traffic desiring to go east would have returned to their normal path by that point.

Southbound Benge Street between Virginia and Louisiana would experience a 150% to 410% increase in traffic volume across the time periods. Both the highest daily volume of 960 vpd and the highest hourly volume of 86 vph are still well below technical capacity. However, there would be a huge increase in perceived traffic volume on a daily basis and at busy times. There is also a subjective change from being a primarily local access and park boundary street to being a busier collector street.

Southbound Benge Street between Louisiana and Davis would experience a 136% to 390% increase in traffic volume across the time periods. Both the highest daily volume of 994 vpd and the highest hourly volume of 107 vph are still well below technical capacity. However, there would be a huge increase in perceived traffic volume on a daily basis and at busy times. There is also a subjective change from being a primarily local access street to being a busier collector street.

Similar stop-sign modification as discussed in the northbound direction may be useful at the intersections along Davis Street.

Church Street Closure Traffic Flow Modifications - Events

When the Downtown Square is closed for major events, Church Street is the first available north-south street west of the Square. If Church Street is closed between Louisiana and Virginia, north-south traffic will divert to Benge Street with the same negative effects as noted in the typical weekday and Saturday discussion. Due to extra traffic control devices and officers possible through an event traffic management plan, Benge Street or other diversion paths will have sufficient technical capacity to accommodate the event traffic demands. The closure of Church Street and the replacement of the existing public parking lot will require modification to those events which use those areas for staging or event movements (e.g., Bike the Bricks).

Church Street Closure – Block Lengths

Not counting the Wood Street alley, the current east-west block length between Kentucky Street and Church Street is between 450 and 500 feet. This is already at the high end of block length favorable for walkable areas. A dense grid of streets with block lengths of 250-450 feet is considered ideal to spread out vehicular traffic, while encouraging pedestrian activity by the smaller scale and number of path options.

Removing Church Street would change the block length west of the Square to be over 700 feet. While pedestrians can use the park so their potential paths are not much affected, this distance is excessive for vehicular traffic. The next block to the west, from Benge Street to College Street, is also very long at about 900 feet. With Church Street closed, Benge Street would be the only real north-south vehicle connection in the 1,600 feet between Kentucky Street and College Street. This bottleneck leads to the traffic concentration on Benge Street noted above.

Church Street Closure Summary

The vehicular traffic diversions from the closure of Church Street between Louisiana and Virginia can be accommodated within the technical capacity of other nearby roadway links and intersections. However, the diversion of traffic would have significant negative effects on the established character and quality of life along the diversion routes, specifically Benge Street between Hunt Street and Davis Street.

The closure of Church Street would also break a link in the Downtown street grid, reducing the flexibility and predictability of the grid where it is already weakened by the one-way couplet of Louisiana Street and Virginia Street.

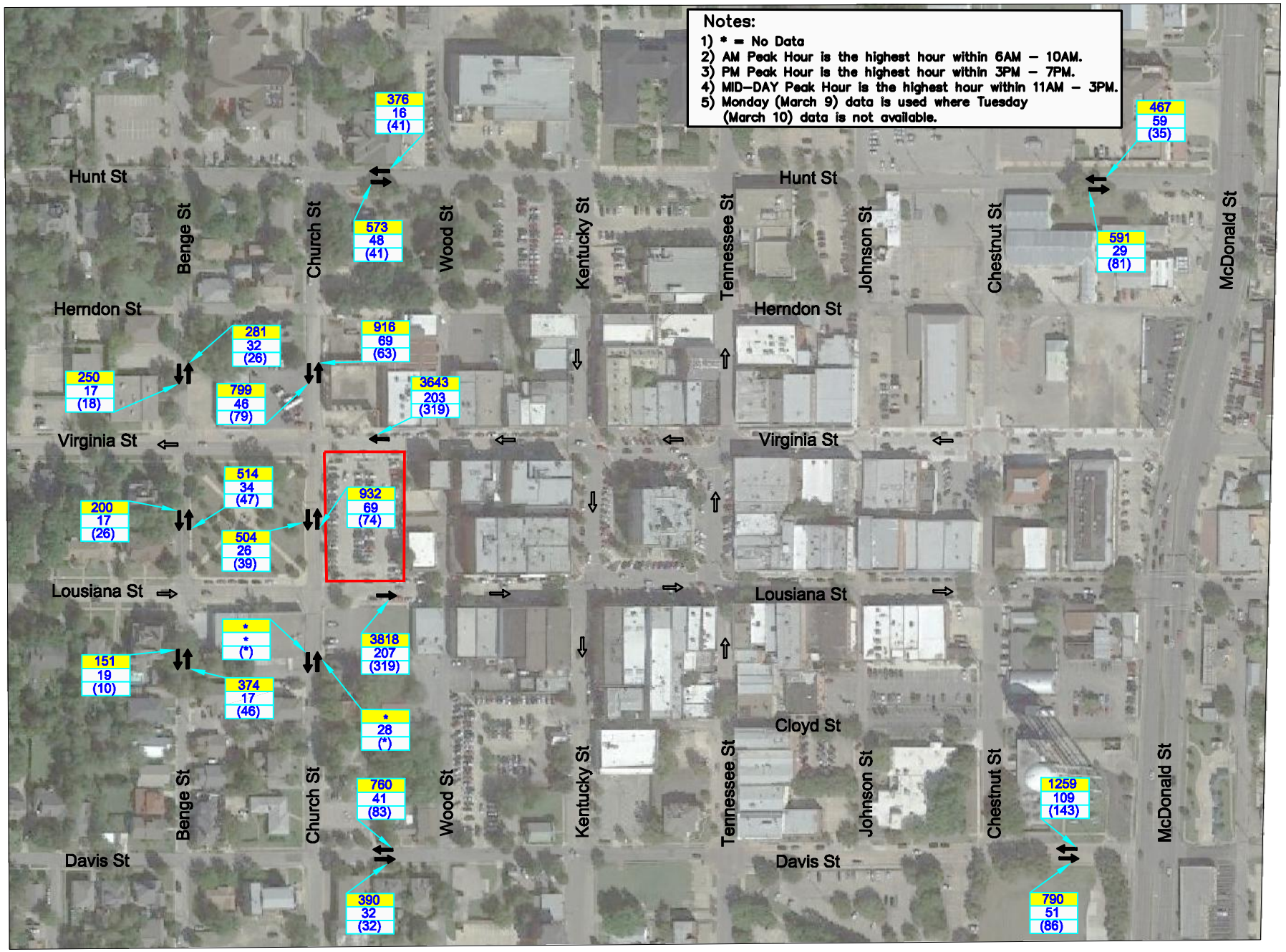
Unless the closure of Church Street would allow the construction of a strikingly more effective parking structure than would be possible without the use of Church Street, the accumulation of negative impacts on the community results in the conclusion that the closure of Church Street would be a net negative for the neighborhood and the City.

Conclusion and Recommendations

Concept 1A/1B provides for favorable vehicular access in both inbound and outbound directions, while in comparison Concept 2A/2B has acceptable but less favorable outbound access. Both concepts provide approximately the same pedestrian access, and there do not appear to be fatal flaws in either concept.

Since the additional site area of Concept 2A/2B does not result in a significantly improved parking structure, the closure of Church Street cannot be recommended due to its other negative consequences.

Therefore, Concept 1A/1B is recommended as the clear choice, being both superior in design and not requiring closure of Church Street.



LEGEND

- PROJECT SITE
- TRAFFIC FLOW
- ONE WAY STREET

XXXX WEEKDAY VOLUME
XXX WEEKDAY AM PEAK HOUR
(XXX) WEEKDAY PM PEAK HOUR

0 125 250
1: 250

NORTH

12750 MERIT DR. SUITE 1000
DALLAS TX 75251
PH (972) 770-1300

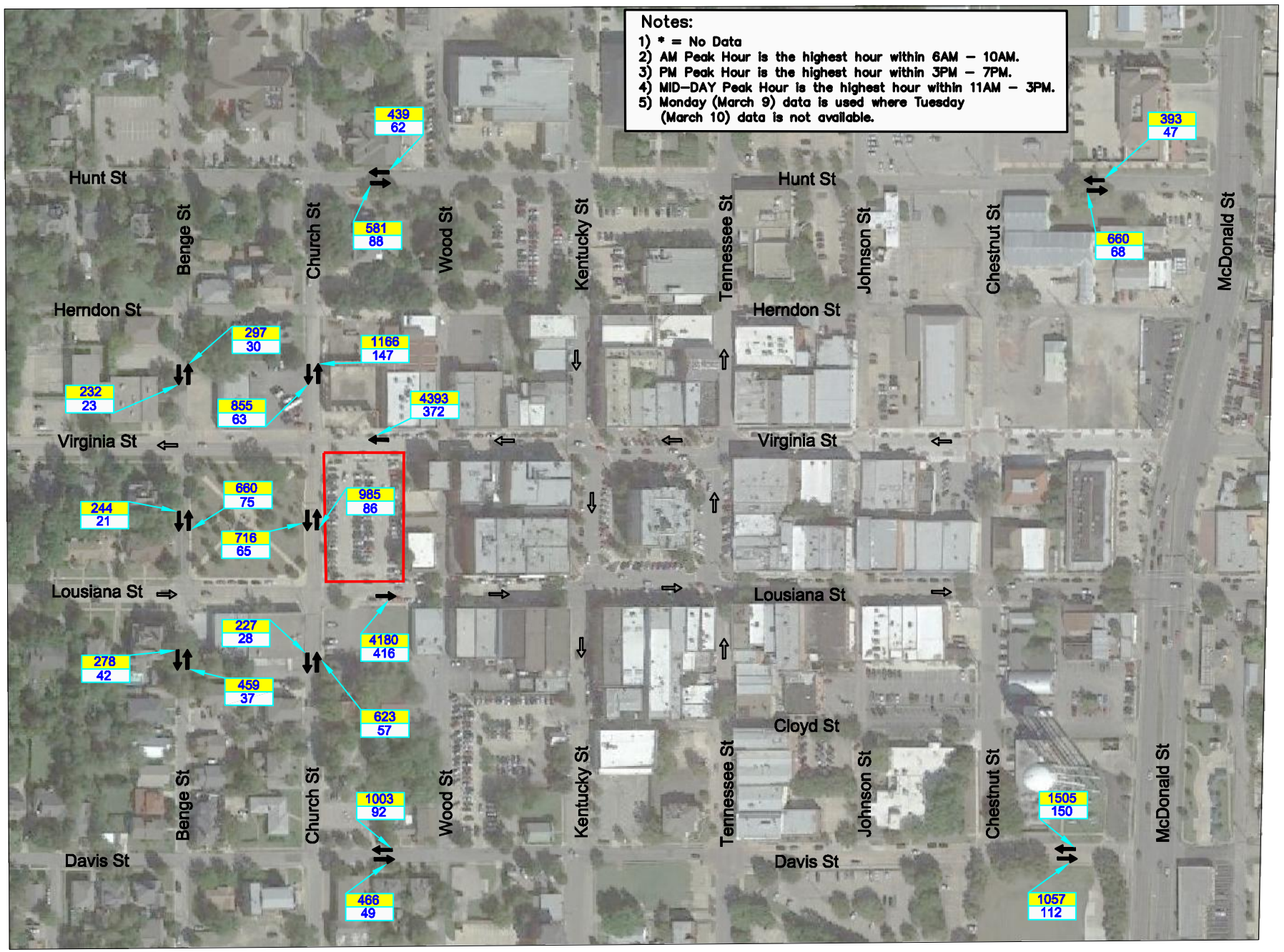
Kimley»Horn

SCALE: AS NOTED
DRAWN BY: HWT
CHECKED BY: SAJ

MCKINNEY DOWNTOWN PARKING STRUCTURE
EXISTING WEEKDAY TRAFFIC DATA

DATE
MARCH

EXHIBIT NO.
1



LEGEND

- PROJECT SITE
- TRAFFIC FLOW
- ONE WAY STREET
- XXXX SATURDAY VOLUME
- XXX SATURDAY MID–DAY PEAK HOUR

0 125 250

1: 250

NORTH

12750 MERIT DR. SUITE 1000
DALLAS TX 75251
PH (972) 770-1300

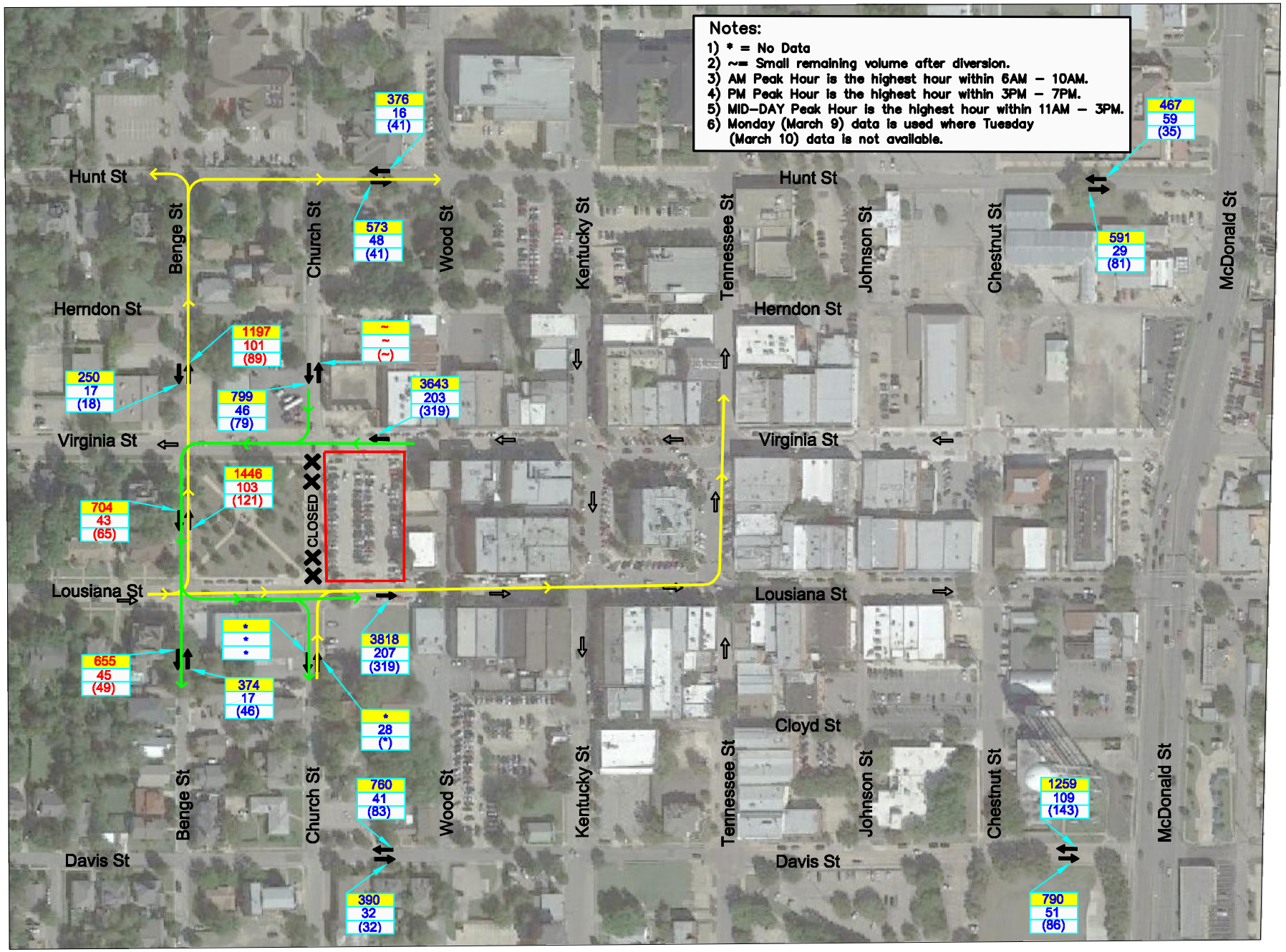
Kimley»Horn

SCALE: AS NOTED
DRAWN BY: HWT
CHECKED BY: SAJ

MCKINNEY DOWNTOWN PARKING STRUCTURE
EXISTING SATURDAY TRAFFIC DATA

DATE
MARCH

EXHIBIT NO.
2



12750 MERIT DR. SUITE 1000
DALLAS TX 75251
PH (972) 770-1300

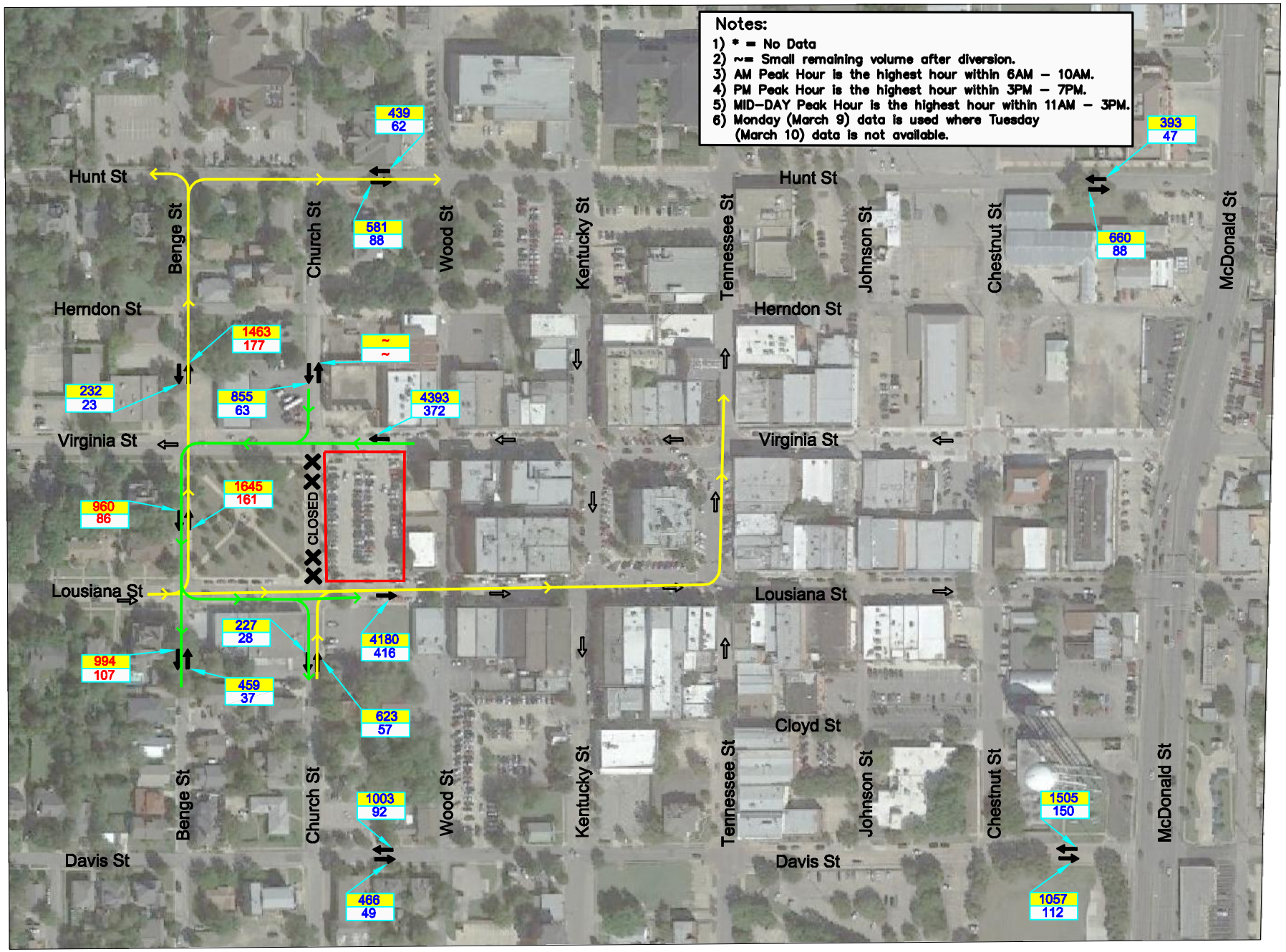
Kimley»Horn

SCALE: AS NOTED
DRAWN BY: HWT
CHECKED BY: SAJ

MCKINNEY DOWNTOWN PARKING STRUCTURE
CHURCH STREET CLOSURE
WEEKDAY DIVERSION PATHS AND VOLUMES

DATE
MARCH

EXHIBIT NO.
3



12750 MERIT DR. SUITE 1000
DALLAS TX 75251
PH (972) 770-1300

Kimley»Horn

SCALE: AS NOTED
DRAWN BY: HWT
CHECKED BY: SAJ

MCKINNEY DOWNTOWN PARKING STRUCTURE
CHURCH STREET CLOSURE
SATURDAY DIVERSION PATHS AND VOLUMES

DATE
MARCH

EXHIBIT NO.
4