TRAFFIC IMPACT STUDY

DRAFT

Cobey Creek Development

On MO-150

Lee's Summit, MO

Prepared for:

JCM Development

Prepared by:

Hg Consult Inc engineers planners

2018-050 - -

RECEIVED

MAR 30 2018

Development Services

March, 2018

PROJECT LOCATION

Hg Consult has been retained to review and evaluate the effects of the Cobey Creek development on MO-150 in Lee's Summit, MO. The study limits are Doc Henry Road to the east (Greenwood City Limit) and the MO-291 interchange to the west. The purpose of this study is to identify what infrastructure improvements are necessary on MO-150, Doc Henry Road and the entrances to accommodate the traffic generated from the proposed development. The proposed development is a 100 acre mixed-use development with four commercial lots fronting MO-150 and single residential and duplexes to the back of the site.

EXISTING CONDITIONS

The MoDOT functional classification for MO-150 at the project location is a Minor Arterial. East of the East Outer Road and through the proposed project location MO-150 is a 2-lane 26' facility and a 45 mph speed limit, dropping to 35 mph just east of the Doc Henry Road intersection entering Greenwood City Limit.

The Doc Henry Road intersection with MO-150 has recently been improved to add left turn lanes with approximately 100' storage bays for eastbound and westbound MO-150. The north approach has been recently added with 4 lanes at the intersection (two northbound lanes, a 100' southbound right turn lane and a southbound through-left turn lane. The north approach is stubbed out about 500' to the north but remains closed to traffic as there are no current developments to provide access to. The south approach of Doc Henry Road is a 2-lane 22' residential collector with a 35 mph speed limit providing access to residential neighborhoods. The south approach of Doc Henry Road is stop controlled at the MO-150 intersection.

At the MO-150/291 interchange and up to the east outer road, MO-150 is a 4-lane facility with a 45 mph posted speed limit and has an "Other Principal Arterial" classification. The interchange ramps are signalized. The southbound approach has dual left turn lanes and dual right turn lanes, while the northbound approach is a single lane with a right turn island with a yield. The eastbound approach has dual lefts with a protected only signal phase and the westbound approach has a single left with a protected/permissive signal phasing.

The east outer road intersection is a signalized intersection with MO-150 and is 680' east of the northbound ramps intersection. The intersection has left turn storage bays and right turn islands with yields on all approaches, with single through lanes on northbound and southbound approaches and two through lanes for eastbound and westbound approaches. MO-150 converts to a 2-lane road 450' east of the East Outer Road intersection. Doc Henry Road is about 3,120' east of the East Outer Road intersection.

EXISTING TRAFFIC

Turning movement counts were obtained for the AM and PM peak periods at the four intersections with MO-150 (Doc Henry Road, MO-291 southbound ramps and northbound ramps and East Outer Road) and a 24-hour count was taken at the Doc Henry Road intersection. The peak hour in the AM was from 6:45-7:45 at the Doc Henry Road intersection and 7:00-8:00 at the interchange and outer road intersections. The PM peak hour was from 5:00-6:00 at all intersections. The predominant movements are to the west and north in the AM and to the east in the PM. For the 24 hours on MO-150 in front of the proposed development (west approach of the Doc Henry intersection) the total was 13,421 vehicles. The AM peak is highly directional with 80% of the traffic in front of the proposed site on MO-150 traveling westbound. The PM is slightly more balanced with 65% of the traffic traveling eastbound. See Appendix A for existing traffic counts.

PROPOSED DEVELOPMENT

The property for the proposed development begins 1660' west of Doc Henry Road and extends along MO-150 up to Doc Henry Road on the east end. The site is on the north side of MO-150 and extends 2650' to the north for a total of approximately 100 acres, with the full development expected to occur in four phases. Four pads sit along the MO-150 frontage with one new full access intersection to MO-150 at the main entrance towards the west end of the site (1425' west of Doc Henry) and a secondary access "Proposed Road B" midway between the commercial pads (600' west of Doc Henry). Proposed Road B is planned to be the sole access to the site for Phase I with full access to MO-150. Beginning Phase 2, the main entrance will be built and Proposed Road B will be converted to Right In/Right Out (RI/RO). No access points to Doc Henry Road are planned at this time. The four Phases are currently composed of:

Phase I:

39 Single Family Residential lots (ITE Land Use Code #210)

12 Multi-Family Residential lots (24 Units) (220)

Pad 1 – 5,000 S.F. High Turnover "Sit Down" Restaurant (932)

Pad 2 – 7,100 S.F. High Turnover "Sit Down" Restaurant (932)

Phase II:

54 Single Family Residential lots (210)

17 Multi-Family Residential lots (34 Units) (220)

Pad 3 – 4,280 S.F. Drive In Bank (912)

Pad 4 – 127,000 S.F. Assisted Living Facility (254)

Phase III:

42 Single Family Residential lots (210)

15 Multi-Family Residential lots (30 Units) (220)

Phase IV:

51 Single Family Residential lots (210)

Total:

186 Single Family Residential lots (210)

44 Multi-Family Residential lots (88 Units) (220)

127,000 S.F. Assisted Living Facility (254)

4,280 S.F. Drive In Bank (912)

12,100 S.F. High Turnover "Sit Down" Restaurant (932)

Between the commercial pads and residential lots is a proposed backage road running east/west for the entirety of the site providing access to each of the commercial sites and a roundabout at the intersection of the backage road with the main entrance.

The main entrance is proposed to be three exiting lanes to MO-150, one left turning and one right turning and a future through for access to a possible development south of MO-150 in the future. It is proposed to have a 330' driveway throat length. MO-150 has a small crest vertical curve to the west and some utility poles near the proposed intersection. With sight distance a concern, high existing traffic volumes and moderate proposed development volumes signals are recommended for this intersection. Doc Henry is planned to be signalized at some point in the near future. Knowing that, the entrance was placed to meet the ¼ mile minimum spacing between signalized intersections. Sight distance for Proposed Road B exceeds the 530' minimum required sight distance. The backage road is a two lane road (28' back of curb to back of curb).

See the attached sheet for the roadway and site development layout and development phasing concept.

TRIP GENERATION

The Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition was utilized to forecast the expected traffic volumes generated by each of the developments for the AM and PM peak hours. All the developments are expected to generate a certain amount of traffic per 1,000 sq. ft. of area or per residential dwelling based on numerous studies of developments of various sizes. Due to the phasing of the development and different proposed access between Phase I and Phase II (through IV), Phase I was analyzed separately in addition to the Final site configuration (Phase IV). In summary, Phase I of the site is anticipated to generate 164 trips in the AM (77 entering and 87 exiting) and 176 trips in the PM (110 entering and 66 exiting). By Phase IV, the site is anticipated to generate 390 trips in the AM (173 entering and 217 exiting) and 504 trips in the PM (284 entering and 220 exiting). Not all of these are new trips added to the existing volumes. Some trips are assumed to be "pass-by" trips, meaning vehicles that are already in the network will stop at the new developments as recommended by ITE. The Lee's Summit Access Management Code allows sites like restaurants, gas stations and banks to have "pass-by" trip percentages up to 10% of adjacent street traffic or 25% of proposed site trips but were kept to 20% or under. With over 200 residential units, some trips were assumed to be internal, meaning some of the trips to a restaurant in the morning might originate from the residential lots and are not added external trips to the street network. No internal trips were assumed for Phase I given the scale of the development and for conservative estimations on the analysis. Some nominal percentages (10% or under) were assumed for the Phase IV analysis between residential and the restaurants. Details of the trip generation study can be found in Appendix B.

Trip distributions are assumed to estimate where traffic is coming from and going to help study the impacts to the area. The distributions attempted to replicate the existing traffic patterns, entering and exiting, for both the AM and PM peak hours. In the AM, nearly 80% of entering traffic came from the east. A nominal percentage came from the south from Doc Henry Road, and the remaining from the west were split amongst entering volumes from the southbound MO-291 lefts, northbound MO-291 rights, and eastbound throughs through the interchange. Exiting AM traffic keeps the same patterns with nearly 80% going westbound to the interchange, split amongst the westbound rights to northbound MO-291, lefts to southbound MO-291, and throughs to continue on westbound MO-150. A similar approach was taken for the PM peak hour except with the existing distributions of roughly 67% from the west and 33% from the east.

EXISTING TRAFFIC ANALYSIS

Traffic was analyzed using Synchro traffic modeling software, the industry standard for intersections based on the Highway Capacity Manual. Synchro calculates several Measures of Effectiveness (MOEs) based on traffic volumes, lane configurations, and type of intersection control. Some of the more commonly used MOE's are Delay, Queue lengths, and Level of Service. Level of Service (LOS) is a qualitative measure used to relate the quality of traffic service. The HCM defines LOS for signalized and unsignalized intersections as a function of the average vehicle control delay. LOS ranges from A (unimpeded driving, no delays) to F (highly congested roads, high delays).

The table below gives the average vehicle delay ranges for each Level of Service.

Level of Service (LOS)	Control Delay per Vehicle (sec.)	
	Signalized	Unsignalized
A	<= 10	<= 10
B	10-20	10-15
C	20-35	15-25
D	35-55	25-35
E	55-80	35-50
F	> 80	> 50

The existing conditions were analyzed as a baseline to compare the effects of future development and traffic growth. Existing signal timings from field data were used at signalized intersections in the Synchro models. The intersections ran on 70 second cycles and appeared to be side street actuated. Synchro results were compared with site observations to ensure calibration. Below are the results for the Existing AM and PM peak hours. In all tables, Delay is the average control delay per vehicle and listed in seconds. (U) denotes an unsignalized intersection while (S) denotes a signalized intersection.

Existing AM - Avg. Delay/LOS					
	NB	SB	EB	WB	Intersection
MO-150/Doc Henry (U)	46/E	-	0/A	0/A	3/A
MO-150/E. Outer Road (S)	30/C	3/A	8/A	9/A	11/B
MO-150/NB MO-291 Ramps (S)	27/C	-	16/B	14/B	16/B
MO-150/SB MO-291 Ramps (S)	-	18/B	11/B	3/A	9/A

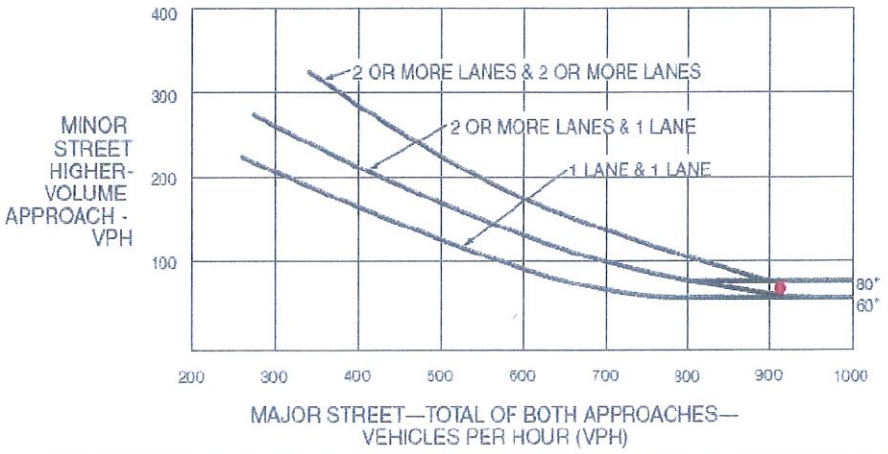
Existing PM - Avg. Delay/LOS					
	NB	SB	EB	WB	Intersection
MO-150/Doc Henry (U)	58/F	-	0/A	0/A	2/A
MO-150/E. Outer Road (S)	27/C	23/C	9/A	6/A	9/A
MO-150/NB MO-291 Ramps (S)	12/B	-	9/A	16/B	10/A
MO-150/SB MO-291 Ramps (S)	-	13/B	11/B	5/A	11/B

SIGNAL WARRANTS

Signal warrants were checked at the main entrance intersection with MO-150 to see if it warranted signals, as per MUTCD and MoDOT EPG. There are nine warrants available to be met for guidance on when a signal should be installed for a variety of scenarios, whether it's high mainline volumes, high intersecting volumes, etc. Several don't apply such as for School Crossings or Intersection near a Grade Crossing. Warrant 1, Eight-Hour Vehicular Volume is the primary one used, ideally. However with a new development limited data can be derived for trip generation beyond peak hours or weekday. 4-Hour warrants (Warrant 2) were analyzed using the 7:00-9:00 AM and 4:00-6:00 PM hours from the traffic

counts, and the proposed trips generated for the sites were used for both hours. Although the trips generated may not sustain those levels for each of the two hours, they are valid for those timeframes in the trip generation studies and used for both hours for a conservative estimate. The warrants were analyzed as one lane major approaches and two lane minor approaches since there are left turn and right turn lanes. With 45 mph speed limits the 70% factors were also analyzed. MoDOT EPG methodology was used for the right turn reduction factor on the minor approach. In the AM peak hour with 44 vehicles turning left and 49 turning right, the right turn percentage is between 50 to 75 percent of the total approach volume so a reduction of 50% was used, giving a total approach volume of 44 + 25 = 69. For the PM peak hour the right turn percentage is 0 to 25 percent of the total approach volume so the percent used is 100, giving 14 + 131 = 145 total minor approach volume. The minimum minor approach volume for each of any four hours is 80 for a 2 lane approach so the AM peak hour of 69 does not meet the threshold. Signal Warrant 2, Four Hour is shown below.

Warrant 2 - 4 Hour (70%)

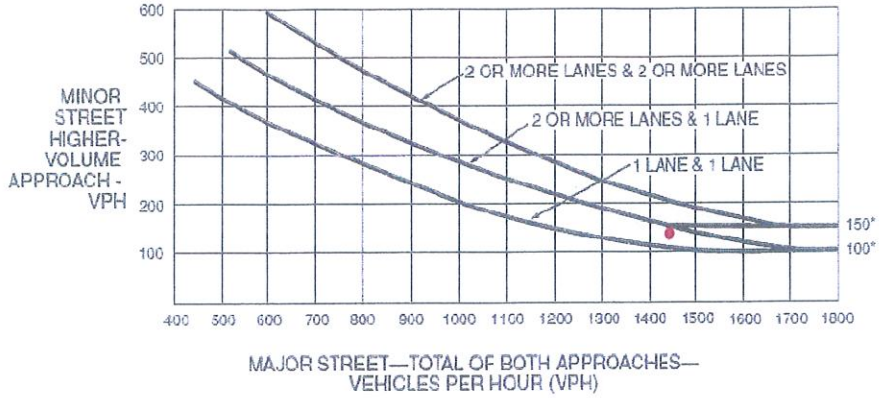


Hour	(1 Lane) Major - Total Both Approaches =	(2 Lanes) Minor
7-8 AM	909	69
8-9 AM	1232	69
4-5 PM	1142	145
5-6 PM	1423	145

Right turn reduction calcs: AM: 44 Lt & 49 Rt : Rt turn = 50-75% of approach, use 50% = 44 + 25 = 69
PM: 14 Lt & 131 Rt : Rt Turn = 0-25% of approach, use 100% = 14+131=145
80 Min. for Minor Approach w/ 2 Lanes
Warrant Not Met for 1 Lane Major/2 Lane Minor (Lt turn lane and Rt turn lane)

Similar methodology was used for Warrant 3, Peak Hour. The peak hour for Warrant 3 (Peak Hour Warrant) was from 5:00-6:00 PM. The minimum for a 2 lane approach is 150 vehicles per hour, which at 145 the PM peak just falls short. Using the 70% factor for the 45 mph speed limit, the minimum minor approach volume is 100, which along with the mainline volumes the warrant for signals is met. Signal Warrant 3, Peak Hour is shown on the following page.

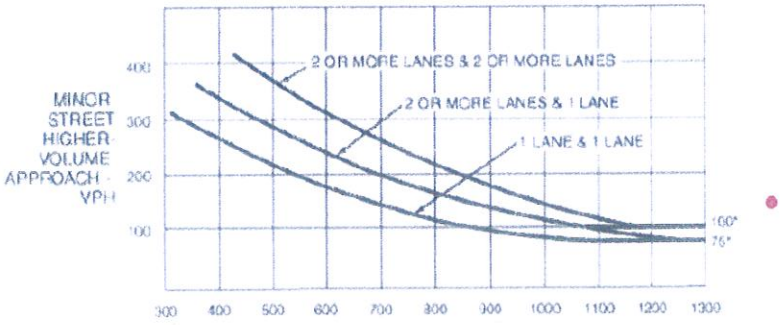
Warrant 3 - Peak Hour (100%)



(1 Lane) Major - Total Both Approaches = 1423 (5-6 PM)
(2 Lanes) Minor - 14 Lt & 131 Rt. Rt Turn = 0-25% of Approach, Use 100% of Right Turns. 14+131=145
150 Min. for Minor Approach w/ 2 Lanes.
Warrant Not Met

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

70% Factor for 45 mph mainline speed limit
(1 Lane) Major - Total Both Approaches = 1423 (5-6 PM)
(2 Lanes) Minor - 14 Lt & 131 Rt Rt Turn = 0-25% of Approach, Use 100% of Right Turns 14+131=145
100 Min for Minor Approach w/ 2 Lanes
Warrant Met

PROPOSED TRAFFIC ANALYSIS

- **PHASE I**

For Phase I, full access will be maintained at the MO-150/Proposed "B" intersection. The development entrance approach to MO-150 is one lane and stop controlled, while MO-150 has "free" movements. While MO-150 peak hour traffic volumes are high, the amount of trips generated in Phase I is fairly low. AM peak hour volumes of 18 turning left and 69 turning right out of the development are expected to not have much trouble getting out with an average approach delay of 33 seconds and an approach LOS of D. The duration of the Phase I access is expected to be short term. There is expected to be about a year that the Phase I configuration will be in place before Phase II begins, along with its final access configuration and Main entrance signalization.

Phase I Build AM - Avg. Delay/LOS					
	NB	SB	EB	WB	Intersection
MO-150/Doc Henry (U)	64/F	-	0/A	8/A	3/A
MO-150/Secondary Entrance (U)	-	33/D	1/A	0/A	2/A
MO-150/E. Outer Road (S)	30/C	3/A	9/A	10/A	12/B
MO-150/NB MO-291 Ramps (S)	29/C	-	18/B	12/B	16/B
MO-150/SB MO-291 Ramps (S)	-	24/C	11/B	2/A	10/B

PM peak hour fares a little worse as 44 vehicles trying to turn left begin to have difficulty finding gaps. With a delay of 68 seconds at an unsignalized intersection the LOS reaches F. However the 95th percentile queue length of 72' suggests no more than a few cars get backed up at a time.

Phase I Build PM - Avg. Delay/LOS					
	NB	SB	EB	WB	Intersection
MO-150/Doc Henry (U)	74/F	-	0/A	11/B	3/A
MO-150/Secondary Entrance (U)	-	68/F	2/A	0/A	4/A
MO-150/E. Outer Road (S)	27/C	23/C	12/B	6/A	11/B
MO-150/NB MO-291 Ramps (S)	16/B	-	10/A	9/A	10/A
MO-150/SB MO-291 Ramps (S)	-	18/B	13/B	2/A	13/B

- **FULL BUILD**

The main entrance is proposed to be signalized, and the main movements eastbound and westbound on MO-150 are "free", with just the eastbound left turns yielding to the oncoming throughs. The main throughs have no delay and the vehicles turning left into the site have very little delay, resulting in little to no delay for the approach. Below are Delay and LOS tables of the proposed intersections for the Build AM and Build PM scenarios.

Full Build AM - Avg. Delay/LOS					
	NB	SB	EB	WB	Intersection
MO-150/Doc Henry (U)	87/F	-	0/A	8/A	5/A
MO-150/Secondary Entrance (U)	-	34/D	0/A	0/A	2/A
MO-150/Main Entrance (S)	-	15/B	8/A	43/D	34/C
MO-150/E. Outer Road (S)	30/C	3/A	9/A	11/B	12/B
MO-150/NB MO-291 Ramps (S)	28/C	-	18/B	10/A	14/B
MO-150/SB MO-291 Ramps (S)	-	26/C	11/B	2/A	11/B

Full Build PM - Avg. Delay/LOS					
	NB	SB	EB	WB	Intersection
MO-150/Doc Henry (U)	109/F	-	0/A	12/B	4/A
MO-150/Secondary Entrance (U)	-	12/B	0/A	0/A	0/A
MO-150/Main Entrance (S)	-	16/B	54/D	11/B	38/D
MO-150/E. Outer Road (S)	27/C	23/C	12/B	6/A	11/B
MO-150/NB MO-291 Ramps (S)	16/B	-	9/A	9/A	10/A
MO-150/SB MO-291 Ramps (S)	-	20/B	14/B	2/A	15/B

Signalizing MO-150 with one through lane is beginning to show degradation of mainline operations in the directional peak hours as evidenced by the LOS D for westbound MO-150 in the AM and eastbound in the PM. The increase in traffic is showing increasing delays to the northbound Doc Henry approach. Local residents are appearing to be avoiding the intersection and instead currently routing to the west via the E. Outer Road as the AM lefts onto MO-150 from Doc Henry is 55, and 164 from the E. Outer Road while the reciprocal PM eastbound right is 96 at the E. Outer Road and 112 at Doc Henry. It is expected the diversion to the E. Outer Road will continue to increase as traffic volumes increase until the signal at Doc Henry is constructed.

The effects of the planned increase in traffic from the development were also analyzed at the MO-150/E. Outer Road and MO-150/MO-291 interchange. The additional through lanes on MO-150 and the full build-out of the interchange in this area is beneficial as it absorbed the added traffic with minimal effects on operational performance as the intersections performed at levels of service of A's or B's for the proposed condition. Synchro output is shown in Appendix C.

CONCLUSIONS

If development occurs to the south and full access is needed across MO-150 to the north and south (resulting in additional signal phases along with an increase in traffic), second through lanes on MO-150 may be needed to keep the system operating at acceptable levels. The proposed intersections of the Main entrance and secondary entrance (RI/RO) with MO-150 are planned with the future in mind. To the west, MO-150 is a five-lane section. The proposed sites are offset far enough north to accommodate the second westbound lane on proposed right of way. The westbound right turn lane at the main entrance could be the future second westbound lane. Should a second eastbound lane be desired in the future, widening to the south may need right of way from the adjacent property owner. Adding the second westbound lane with the proposed improvements now, although possible, provides little benefit until the second westbound lane can be continued to the four lane divided section at the E. Outer Road. The proposed signal is anticipated to operate effectively and is not in immediate need of a second westbound through lane with the proposed development. Upstream constraints should also be considered. Depending on the configuration, the planned signal at Doc Henry (separate project) may meter westbound traffic unless it has a second through lane, and it would require the cooperation of multiple property owners along the corridor to be effective.

It should be noted that although still conceptual, the area to the west between the end of the four lane section and the west site limits may be developed. At that time, it would offer a good opportunity to acquire the Right of Way to the north to have a continuous second westbound lane. The site is likely to access MO-150 via the Main entrance signal for this development in addition to the E. Outer Road.

RECOMENDATIONS

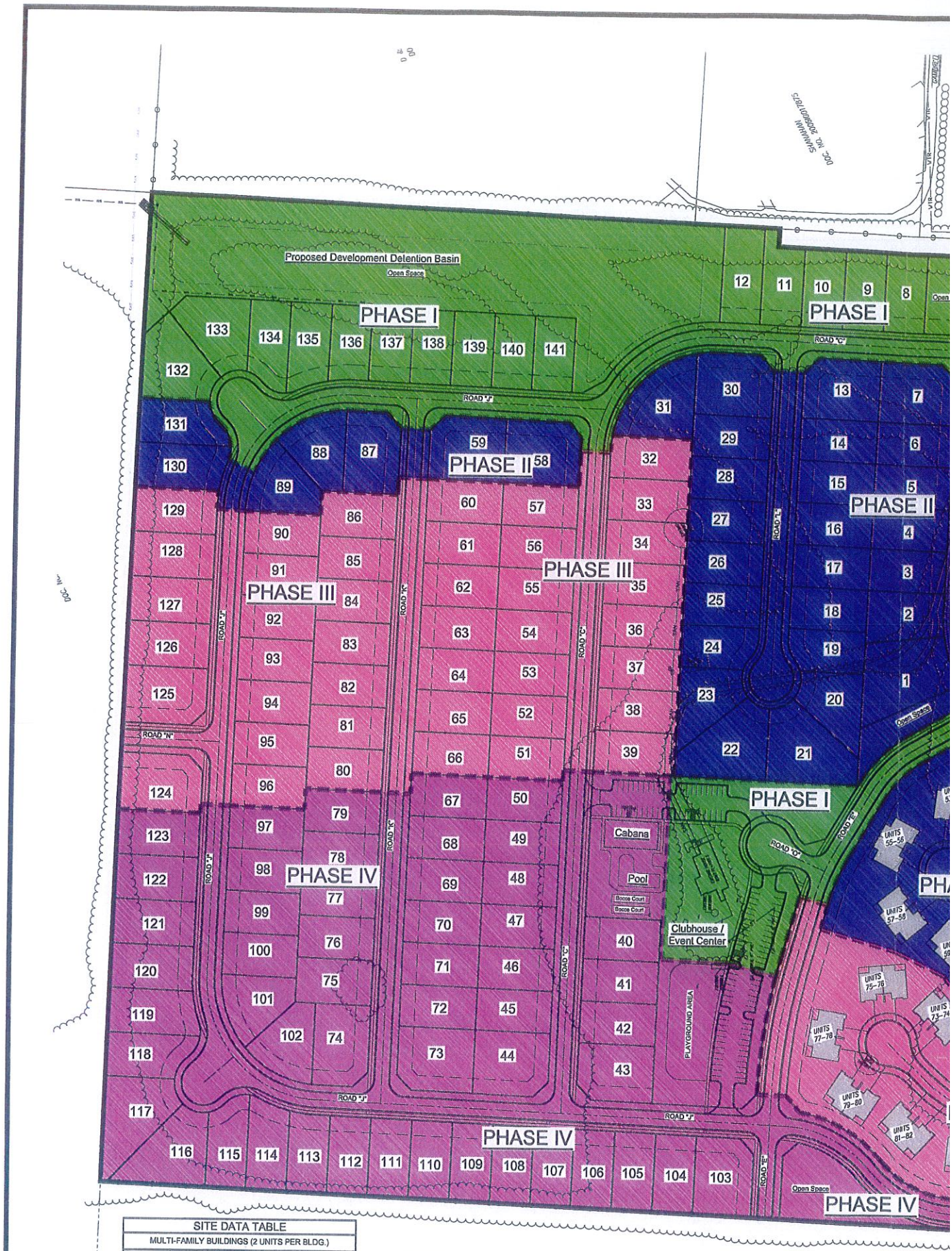
In summary, a proposed signal at the MO-150/Main Entrance intersection is recommended for the final configuration beginning Phase II. MO-150 is recommended to be widened to the north for the limits of the site property to allow for a 100' eastbound left turn storage bay and a 100' westbound right turn storage bay at the main entrance with MO-150. The secondary entrance is recommended to have full access as the sole access point for Phase I. Upon the construction of the Main entrance and signal in Phase II it is recommended to install a median island and convert the entrance to right in/right out.

Considering the minimal impacts of the development to the MO-150/MO-291 interchange and E. Outer Road intersections, no improvements are recommended west of the proposed development.

Sincerely,

Eric Reinkemeyer

Eric Reinkemeyer, P.E., PTOE
Hg Consult



SITE DATA TABLE				
MULTI-FAMILY BUILDINGS (2 UNITS PER BLDG.)				
PHASE I	PHASE II	PHASE III	PHASE IV	TOTAL
12	17	15	0	44
VILLA LOTS				
23	22	0	0	45
PREMIERE LOTS				
15	33	42	51	141
RESIDENTIAL LOT TOTALS BY PHASE				
38	55	42	51	186
COMMERCIAL PAD SITES				
2	2	0	0	4

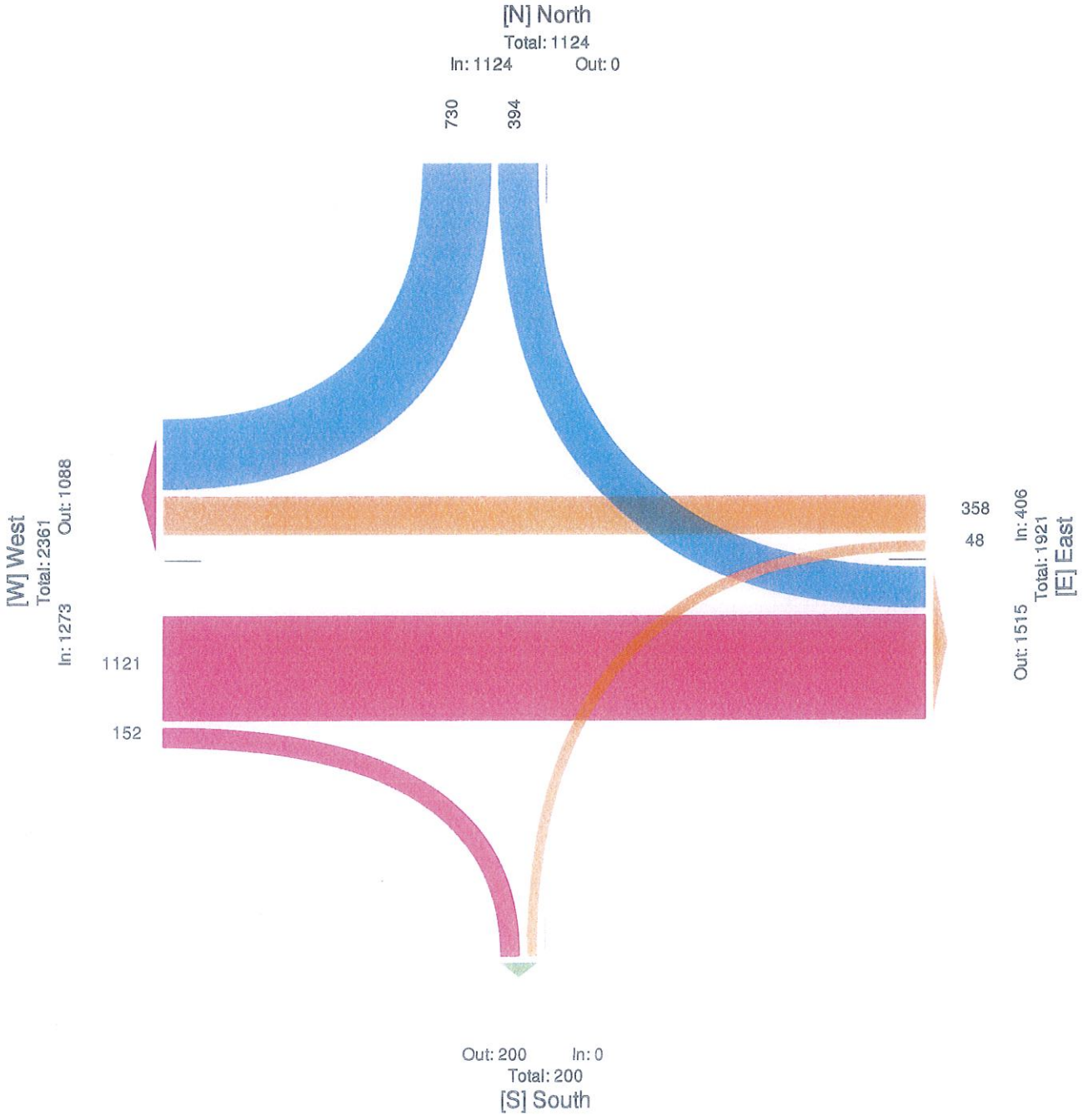
Site Data Table			
Pad #	Use	Lot Area (S.F. / Acres)	Building (S.F.)
1	"Sit Down" Restaurant	85,724 / 1.97	5,000
2	"Sit Down" Restaurant	84,884 / 1.95	7,100
3	Bank / Credit Union	62,083 / 1.43	4,280
4	Assisted Living Facility (3 Story)	206,261 / 4.73	42,500 (Per Floor)

Appendix A – Traffic Volumes

MO-150 at SB 291 Ramps - TMC
Thu Feb 9, 2017
PM Peak (5PM - 6PM) - Overall Peak Hour
All Classes (Articulated Trucks, Buses and Single-Unit Trucks, Lights)
All Movements
ID: 381740, Location: 38.852575, -94.376925

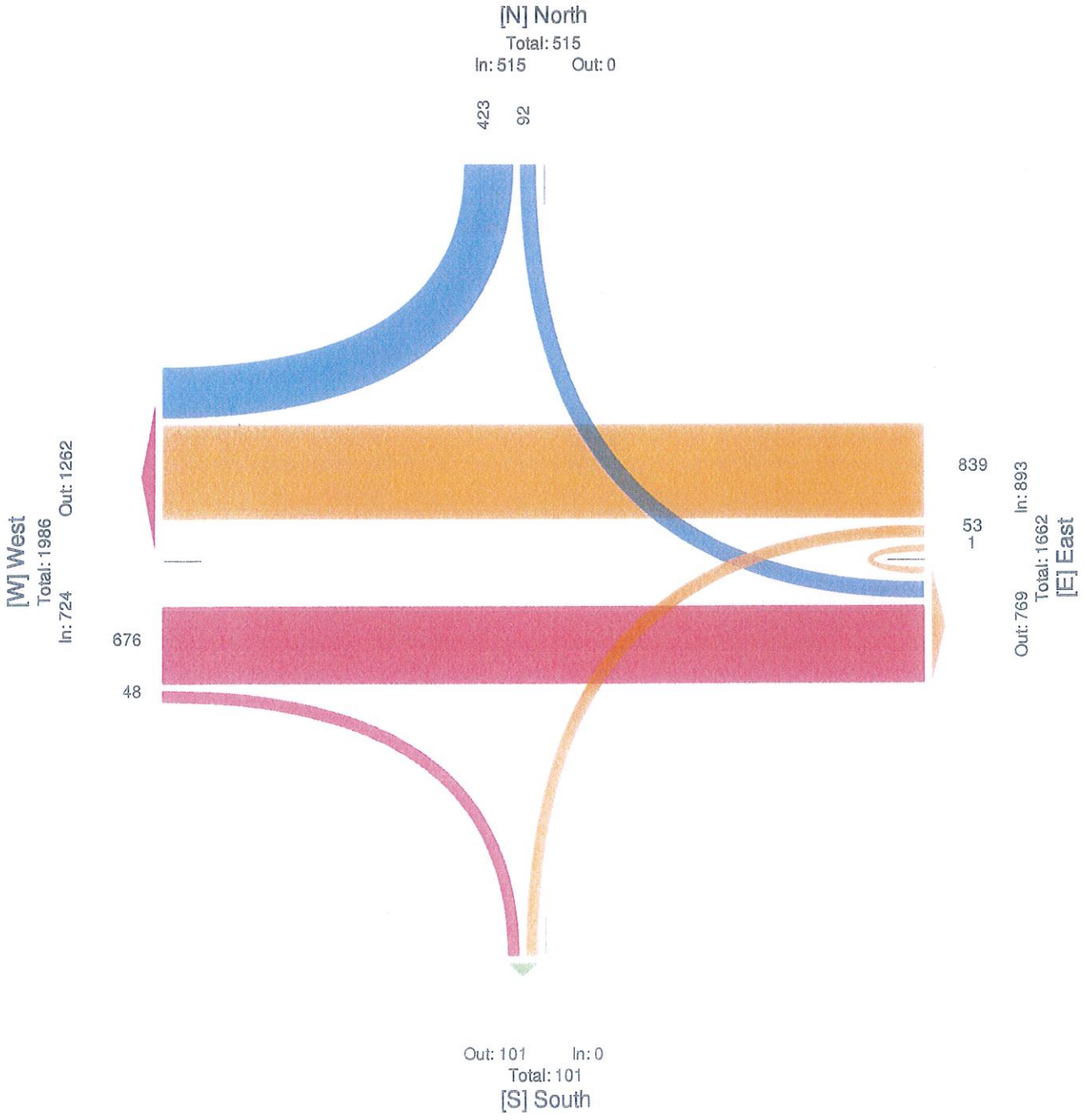
GEWALT HAMILTON ASSOCIATES, INC.

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



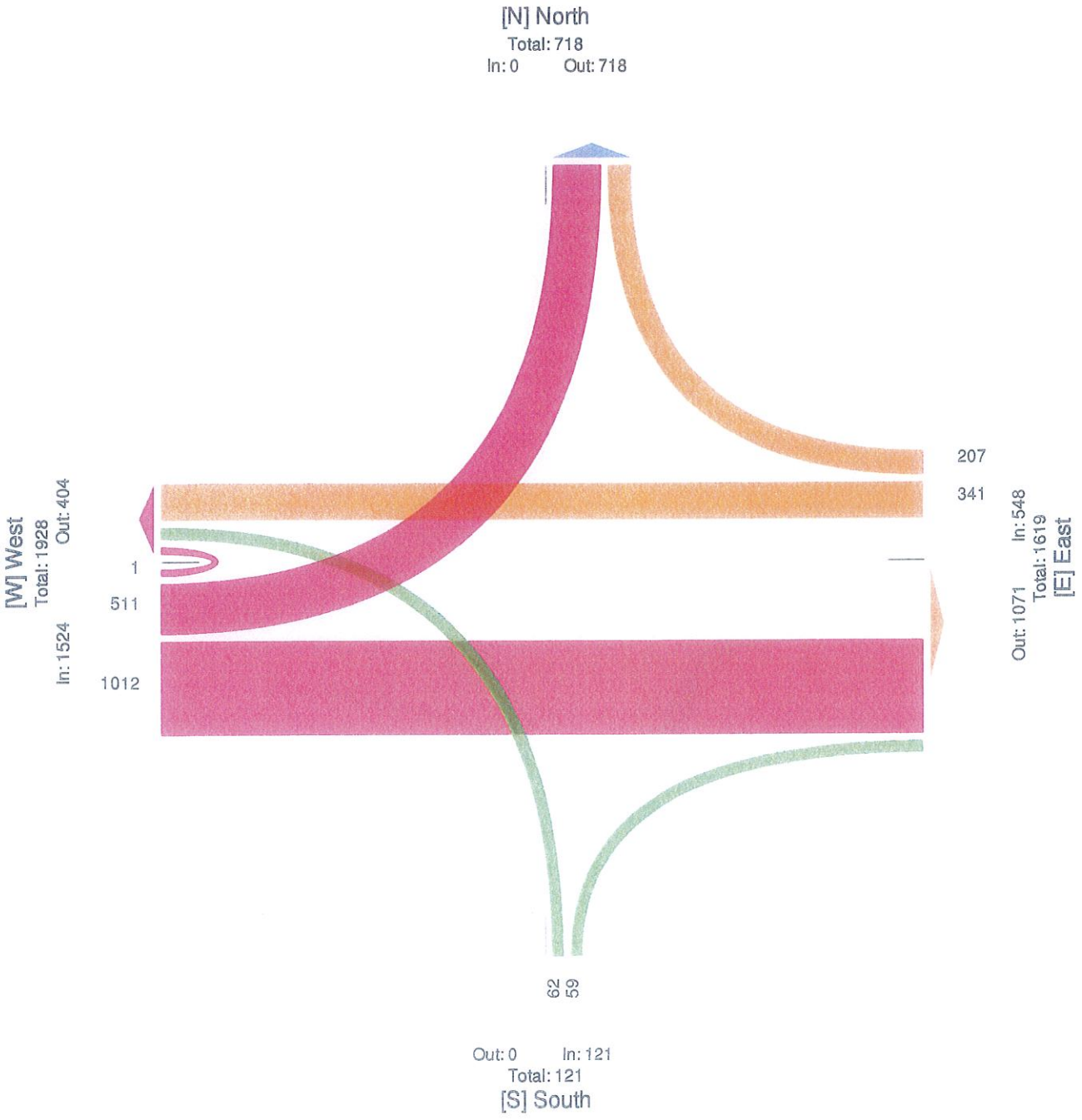
MO-150 at SB 291 Ramps - TMC
Thu Feb 9, 2017
AM Peak (7AM - 8AM)
All Classes (Articulated Trucks, Buses and Single-Unit Trucks, Lights)
All Movements
ID: 381740, Location: 38.852575, -94.376925

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



MO-150 at NB 291 Ramps - TMC
Thu Feb 9, 2017
PM Peak (5PM - 6PM) - Overall Peak Hour
All Classes (Articulated Trucks, Buses and Single-Unit Trucks, Lights)
All Movements
ID: 381739, Location: 38.852508, -94.374618

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



MO-150 at NB 291 Ramps - TMC
Thu Feb 9, 2017
AM Peak (7AM - 8AM)
All Classes (Articulated Trucks, Buses and Single-Unit Trucks, Lights)
All Movements
ID: 381739, Location: 38.852508, -94.374618

GEWALT HAMILTON ASSOCIATES, INC.
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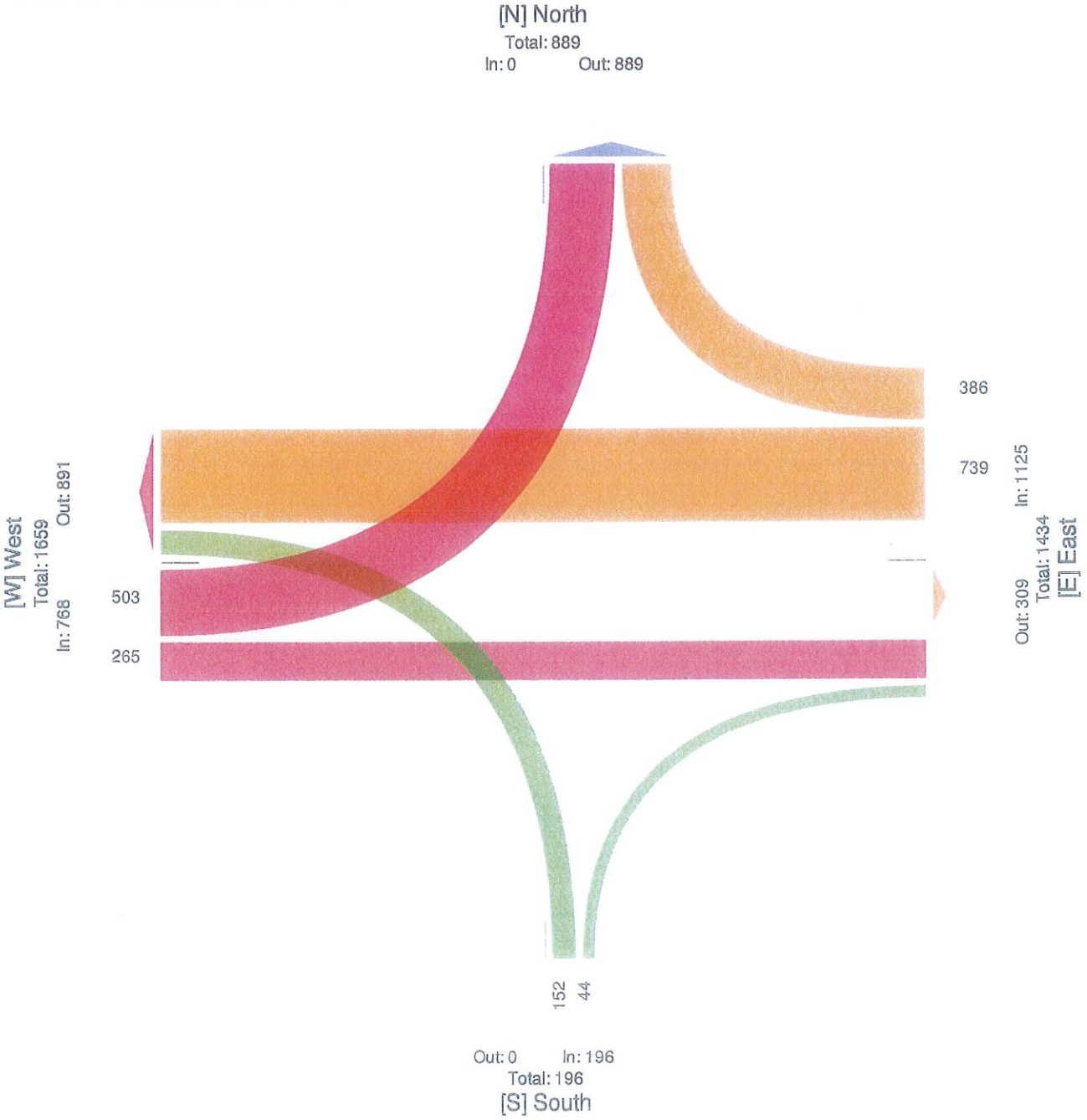
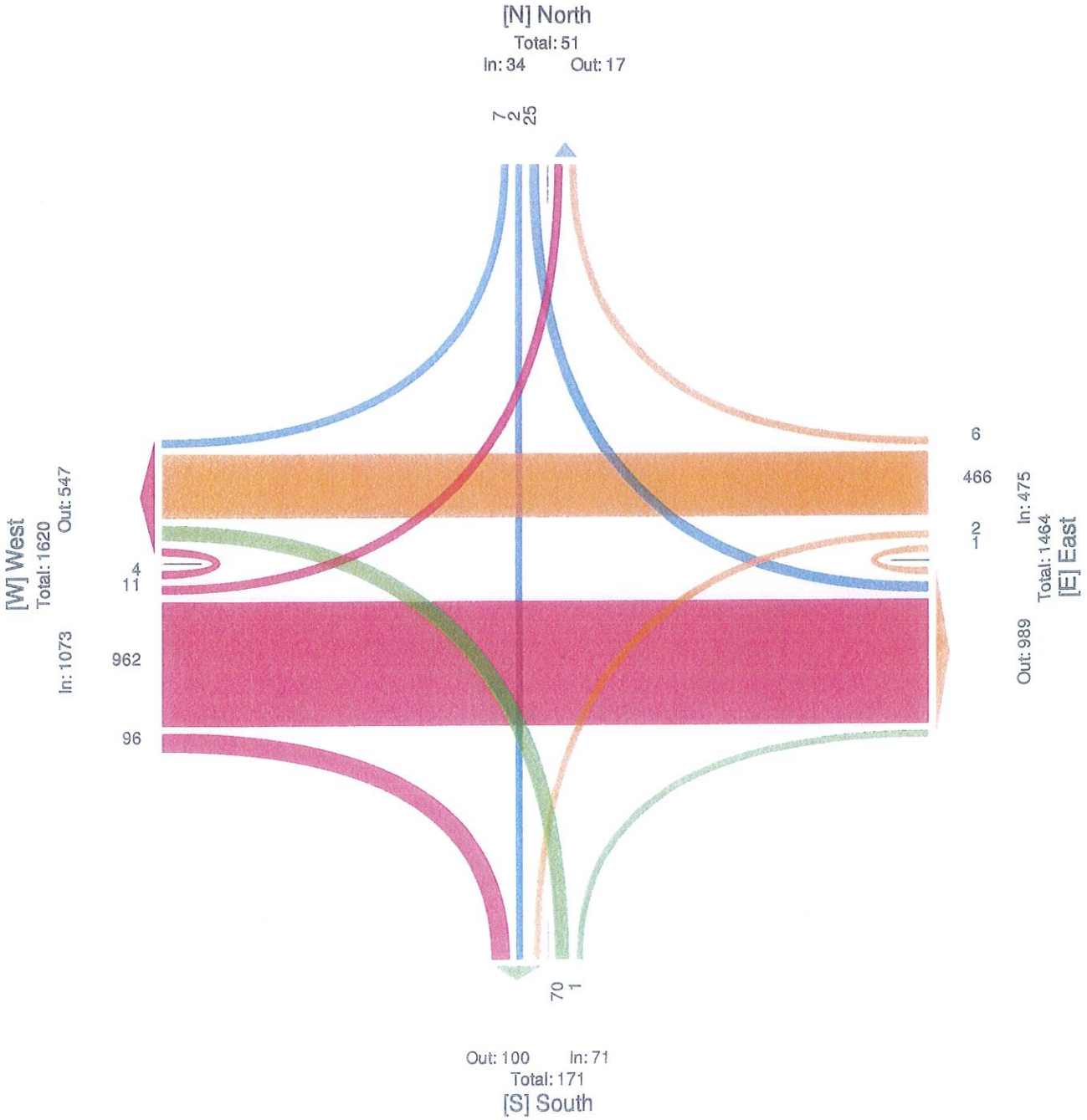


MO-150 at E Outer Drive - TMC
Thu Feb 9, 2017
PM Peak (5PM - 6PM) - Overall Peak Hour
All Classes (Articulated Trucks, Buses and Single-Unit Trucks, Lights)
All Movements
ID: 381737, Location: 38.852425, -94.372183

GEWALT HAMILTON ASSOCIATES, INC.

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



MO-150 at E Outer Drive - TMC
Thu Feb 9, 2017
AM Peak (7AM - 8AM)
All Classes (Articulated Trucks, Buses and Single-Unit Trucks, Lights)
All Movements
ID: 381737, Location: 38.852425, -94.372183

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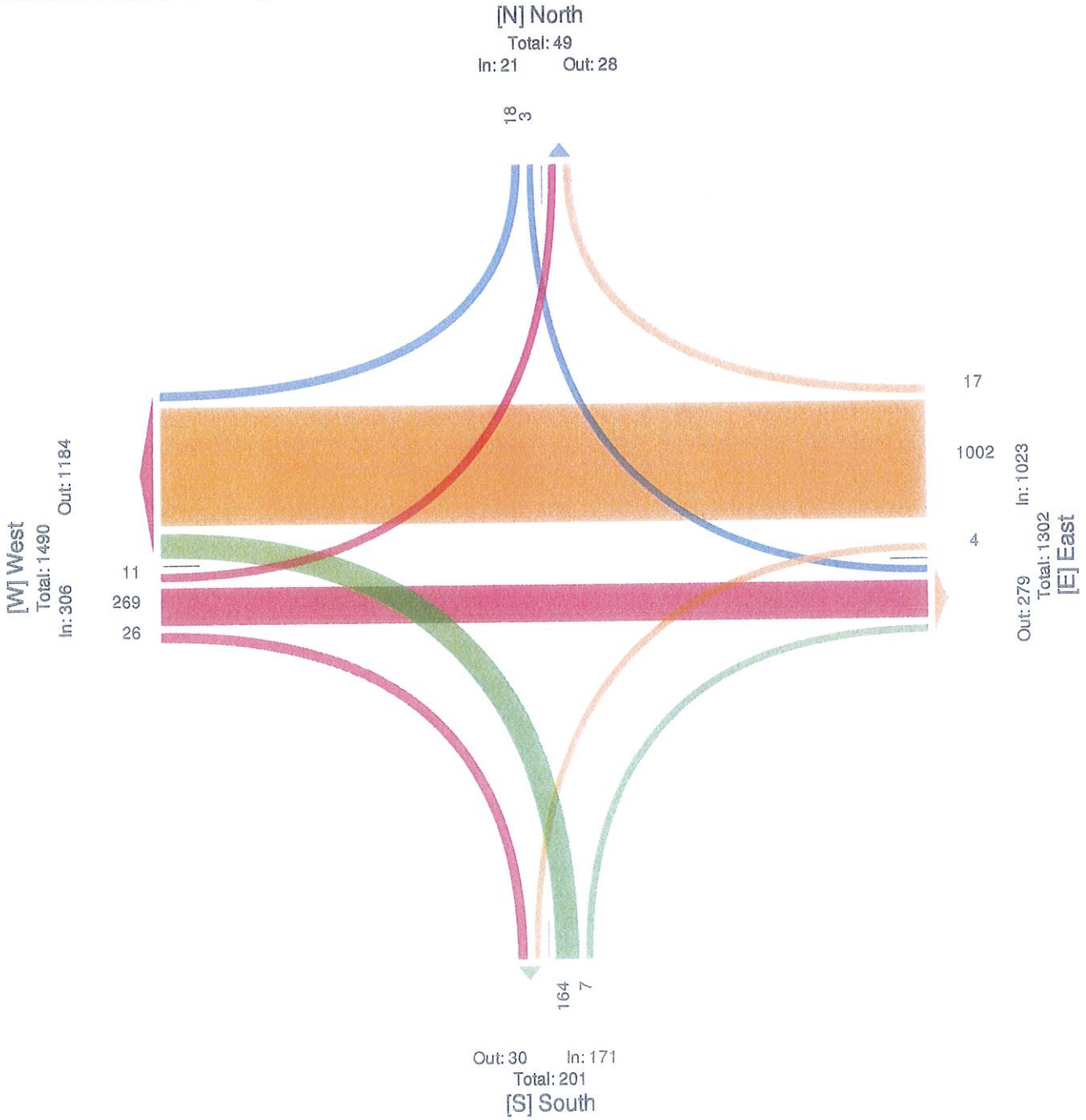
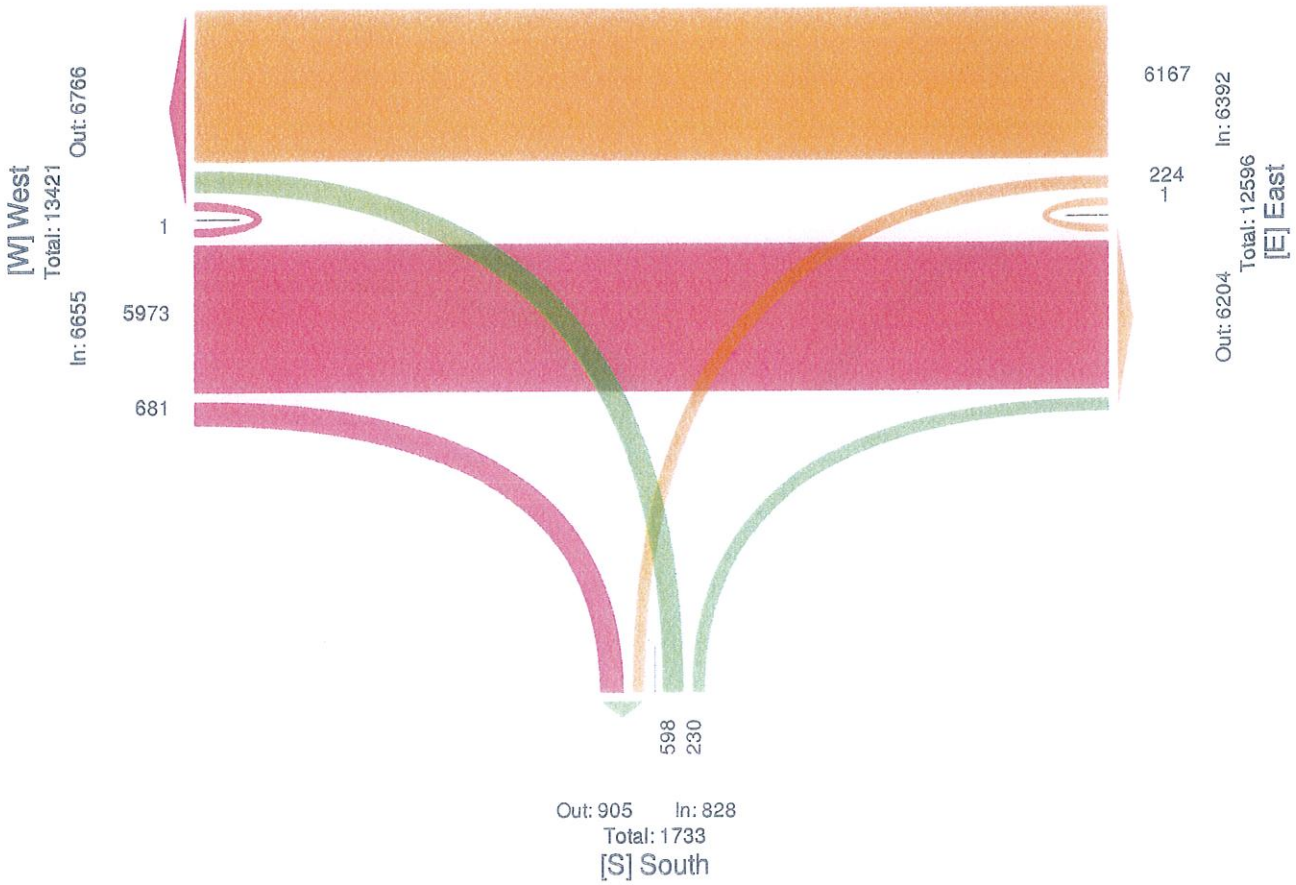
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



MO-150 at Doc Henry - TMC
Thu Feb 9, 2017
Full Length (12AM-12AM (+1))
All Classes (Articulated Trucks, Buses and Single-Unit Trucks, Lights)
All Movements
ID: 381736, Location: 38.852066, -94.361245

GEWALT HAMILTON ASSOCIATES, INC.

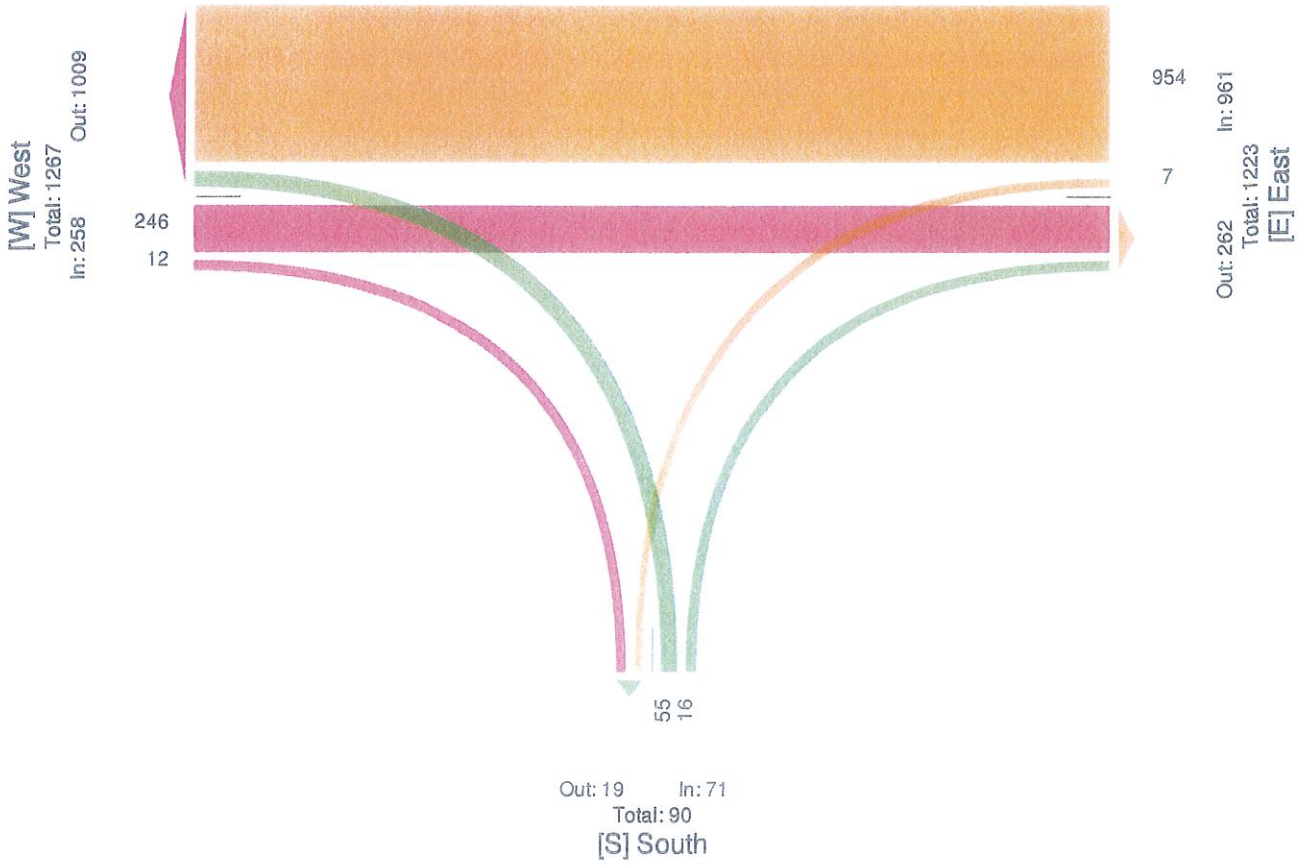
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



MO-150 at Doc Henry - TMC
Thu Feb 9, 2017
AM Peak (Feb 09 2017 6:45AM - 7:45AM)
All Classes (Articulated Trucks, Buses and Single-Unit Trucks, Lights)
All Movements
ID: 381736, Location: 38.852066, -94.361245

GEWALT HAMILTON ASSOCIATES, INC.

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



MO-150/Doc Henry Intersection	East				South				West				
Leg	Westbound				Northbound				Eastbound				
Direction	Thru	Left	U-Turn	App Total	Right	Left	U-Turn	App Total	Right	Thru	U-Turn	App Total	Int Total
Start Time													
2017-02-09 00:00:00	4	0	0	4	0	0	0	0	1	10	0	11	15
2017-02-09 00:15:00	4	0	0	4	0	0	0	0	1	8	0	9	13
2017-02-09 00:30:00	2	0	0	2	0	0	0	0	0	6	0	6	8
2017-02-09 00:45:00	2	0	0	2	0	0	0	0	1	5	0	6	8
2017-02-09 01:00:00	4	0	0	4	0	1	0	1	1	6	0	7	12
2017-02-09 01:15:00	1	0	0	1	0	0	0	0	1	2	0	3	4
2017-02-09 01:30:00	3	0	0	3	0	0	0	0	0	0	0	0	3
2017-02-09 01:45:00	4	0	0	4	0	0	0	0	0	5	0	5	9
2017-02-09 02:00:00	1	0	0	1	0	0	0	0	0	3	0	3	4
2017-02-09 02:15:00	2	0	0	2	0	0	0	0	0	4	0	4	6
2017-02-09 02:30:00	7	0	0	7	0	0	0	0	0	3	0	3	10
2017-02-09 02:45:00	1	0	0	1	0	0	0	0	0	3	0	3	4
2017-02-09 03:00:00	3	0	0	3	0	0	0	0	0	2	0	2	5
2017-02-09 03:15:00	6	0	0	6	0	0	0	0	0	2	0	2	8
2017-02-09 03:30:00	5	0	0	5	0	1	0	1	0	5	0	5	11
2017-02-09 03:45:00	12	1	0	13	0	0	0	0	0	4	0	4	17
2017-02-09 04:00:00	7	0	0	7	0	1	0	1	0	2	0	2	10
2017-02-09 04:15:00	12	0	0	12	0	0	0	0	0	2	0	2	14
2017-02-09 04:30:00	27	0	0	27	0	3	0	3	0	3	0	3	33
2017-02-09 04:45:00	25	0	0	25	0	1	0	1	0	4	0	4	30
2017-02-09 05:00:00	37	0	0	37	0	2	0	2	0	7	0	7	46
2017-02-09 05:15:00	51	0	0	51	0	4	0	4	0	7	0	7	62
2017-02-09 05:30:00	79	0	0	79	1	11	0	12	1	10	0	11	102
2017-02-09 05:45:00	89	0	0	89	1	12	0	13	3	15	0	18	120
2017-02-09 06:00:00	120	0	0	120	0	11	0	11	1	18	0	19	150
2017-02-09 06:15:00	153	0	0	153	3	10	0	13	2	22	0	24	190
2017-02-09 06:30:00	206	1	0	207	4	14	0	18	0	37	0	37	262
2017-02-09 06:45:00	251	1	0	252	4	11	0	15	5	48	0	53	320
2017-02-09 07:00:00	279	0	0	279	4	9	0	13	1	48	0	49	341
2017-02-09 07:15:00	238	3	0	241	5	18	0	23	5	89	0	94	358
2017-02-09 07:30:00	186	3	0	189	3	17	0	20	1	61	0	62	271
2017-02-09 07:45:00	187	1	0	188	5	13	0	18	4	65	0	69	275
2017-02-09 08:00:00	172	3	0	175	5	15	0	20	3	66	0	69	264
2017-02-09 08:15:00	149	3	0	152	5	11	0	16	7	69	0	76	244
2017-02-09 08:30:00	139	0	0	139	11	13	0	24	4	43	0	47	210
2017-02-09 08:45:00	107	2	0	109	3	7	0	10	4	61	0	65	184
2017-02-09 09:00:00	87	3	0	90	1	7	0	8	4	48	0	52	150
2017-02-09 09:15:00	91	2	0	93	5	6	0	11	7	45	0	52	156
2017-02-09 09:30:00	80	4	0	84	3	4	0	7	2	42	0	44	135
2017-02-09 09:45:00	74	4	0	78	2	5	0	7	9	57	0	66	151
2017-02-09 10:00:00	52	3	0	55	1	6	0	7	5	53	0	58	120
2017-02-09 10:15:00	73	0	0	73	0	5	0	5	7	53	0	60	138
2017-02-09 10:30:00	63	2	0	65	4	6	0	10	1	47	0	48	123
2017-02-09 10:45:00	63	0	0	63	4	5	0	9	6	61	0	67	139
2017-02-09 11:00:00	66	2	0	68	4	4	0	8	1	47	0	48	124
2017-02-09 11:15:00	60	2	0	62	4	6	0	10	6	59	0	65	137
2017-02-09 11:30:00	69	3	0	72	2	4	0	6	3	63	0	66	144
2017-02-09 11:45:00	74	2	0	76	3	1	0	4	5	69	0	74	154

MO-150/Doc Henry Intersection													
Leg	East				South				West				
Direction	Westbound				Northbound				Eastbound				
Start Time	Thru	Left	U-Turn	App Total	Right	Left	U-Turn	App Total	Right	Thru	U-Turn	App Total	Int Total
2017-02-09 12:00:00	77	4	0	81	0	11	0	11	10	71	0	81	173
2017-02-09 12:15:00	62	1	0	63	2	5	0	7	7	61	0	68	138
2017-02-09 12:30:00	65	2	0	67	2	9	0	11	5	57	0	62	140
2017-02-09 12:45:00	73	1	0	74	2	6	0	8	3	85	0	88	170
2017-02-09 13:00:00	81	3	0	84	2	6	0	8	13	64	0	77	169
2017-02-09 13:15:00	72	5	0	77	3	11	0	14	7	79	0	86	177
2017-02-09 13:30:00	60	1	0	61	2	5	0	7	6	89	0	95	163
2017-02-09 13:45:00	68	5	0	73	1	7	0	8	5	78	0	83	164
2017-02-09 14:00:00	82	1	0	83	2	3	0	5	13	84	0	97	185
2017-02-09 14:15:00	67	3	0	70	1	4	0	5	9	77	0	86	161
2017-02-09 14:30:00	76	3	0	79	1	4	0	5	12	136	0	148	232
2017-02-09 14:45:00	78	0	0	78	7	13	0	20	6	130	0	136	234
2017-02-09 15:00:00	78	3	0	81	2	10	0	12	10	107	0	117	210
2017-02-09 15:15:00	88	4	0	92	5	11	0	16	15	144	0	159	267
2017-02-09 15:30:00	96	6	0	102	7	12	0	19	18	132	1	151	272
2017-02-09 15:45:00	98	1	0	99	3	9	0	12	11	146	0	157	268
2017-02-09 16:00:00	100	6	0	106	4	4	0	8	19	153	0	172	286
2017-02-09 16:15:00	94	7	1	102	3	8	0	11	22	184	0	206	319
2017-02-09 16:30:00	78	8	0	86	3	8	0	11	16	191	0	207	304
2017-02-09 16:45:00	74	5	0	79	2	6	0	8	12	173	0	185	272
2017-02-09 17:00:00	98	3	0	101	5	4	0	9	17	192	0	209	319
2017-02-09 17:15:00	112	13	0	125	3	10	0	13	26	219	0	245	383
2017-02-09 17:30:00	126	8	0	134	5	11	0	16	32	234	0	266	416
2017-02-09 17:45:00	87	10	0	97	2	8	0	10	37	210	0	247	354
2017-02-09 18:00:00	101	8	0	109	9	24	0	33	21	150	0	171	313
2017-02-09 18:15:00	85	10	0	95	7	8	0	15	21	130	0	151	261
2017-02-09 18:30:00	67	5	0	72	3	15	0	18	17	124	0	141	231
2017-02-09 18:45:00	63	6	0	69	2	8	0	10	28	94	0	122	201
2017-02-09 19:00:00	46	7	0	53	12	27	0	39	19	84	0	103	195
2017-02-09 19:15:00	45	1	0	46	1	9	0	10	16	103	0	119	175
2017-02-09 19:30:00	38	3	0	41	6	10	0	16	20	77	0	97	154
2017-02-09 19:45:00	49	12	0	61	2	13	0	15	26	95	0	121	197
2017-02-09 20:00:00	21	2	0	23	9	13	0	22	18	89	0	107	152
2017-02-09 20:15:00	33	2	0	35	1	3	0	4	10	79	0	89	128
2017-02-09 20:30:00	33	1	0	34	2	4	0	6	12	75	0	87	127
2017-02-09 20:45:00	27	7	0	34	2	3	0	5	7	54	0	61	100
2017-02-09 21:00:00	34	1	0	35	4	10	0	14	8	40	0	48	97
2017-02-09 21:15:00	24	3	0	27	10	16	0	26	5	50	0	55	108
2017-02-09 21:30:00	23	1	0	24	0	1	0	1	1	45	0	46	71
2017-02-09 21:45:00	15	0	0	15	1	1	0	2	3	29	0	32	49
2017-02-09 22:00:00	7	0	0	7	2	1	0	3	3	33	0	36	46
2017-02-09 22:15:00	10	2	0	12	1	1	0	2	2	33	0	35	49
2017-02-09 22:30:00	6	0	0	6	0	1	0	1	1	13	0	14	21
2017-02-09 22:45:00	7	1	0	8	0	0	0	0	2	26	0	28	36
2017-02-09 23:00:00	6	0	0	6	0	0	0	0	1	15	0	16	22
2017-02-09 23:15:00	4	3	0	7	0	1	0	1	5	15	0	20	28
2017-02-09 23:30:00	3	1	0	4	0	0	0	0	2	18	0	20	24
2017-02-09 23:45:00	3	0	0	3	0	0	0	0	0	17	0	17	20
Grand Total	6167	224	1	6392	230	598	0	828	681	5973	1	6655	13875
% Approach	96.5%	3.5%	0.0%		27.8%	72.2%	0.0%		10.2%	89.8%	0.0%		
% Total	44.4%	1.6%	0.0%	46.1%	1.7%	4.3%	0.0%	6.0%	4.9%	43.0%	0.0%	48.0%	
Lights	5902	214	1	6117	224	590	0	814	669	5686	1	6356	13287
% Lights	95.7%	95.5%	100.0%	95.7%	97.4%	98.7%	0.0%	98.3%	98.2%	95.2%	100.0%	95.5%	95.8%
Articulated Trucks	56	0	0	56	0	1	0	1	0	46	0	46	103
% Articulated Trucks	0.9%	0.0%	0.0%	0.9%	0.0%	0.2%	0.0%	0.1%	0.0%	0.8%	0.0%	0.7%	0.7%
Buses and Single-Unit Trucks	209	10	0	219	6	7	0	13	12	241	0	253	485
% Buses and Single-Unit Trucks	3.4%	4.5%	0.0%	3.4%	2.6%	1.2%	0.0%	1.6%	1.8%	4.0%	0.0%	3.8%	3.5%

Consult Inc engineers planners

Project: Cobey Creek

Recorded by: EJR

Reviewed by:

Date: 6/14/17