Orth-Rodgers & Associates, Inc.
TRANSPORTATION ENGINEERS AND PLANNERS

ANALYSIS OF TRAFFIC IMPACT

AND

TRAFFIC COMMENTS AND RECOMMENDATIONS

FOR THE

PROPOSED MARSHALL'S CORNER/PENNYTOWN REDEVELOPMENT

HOPEWELL TOWNSHIP, MERCER COUNTY, NJ

March, 2013

Prepared by

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INTRODUCTION

Investigative efforts by the Hopewell Township Planning Board in the summer of 2009 determined conditions sufficient to designate the Pennytown, Kooltronic and PSE&G properties in the northeast part of the Township (Figure 1) as "An Area in Need of Redevelopment". Those properties were so designated by a Township resolution adopted in September, 2009.

The Marshall's Corner–Pennytown Redevelopment area is generally bounded on the west by NJ Route 31, on the north by County Routes 612 and 654, on the east by the CSX West Trenton Rail Line, and on the south by the Stony Brook Branch. County Route 654 extends northeastward from signalized intersection with NJ Route 31 through the Redevelopment Area and an intersection with County Route 612 to Hopewell Borough.

The Kooltronic manufacturing facility, the only major traffic generator in the Redevelopment Area, is located on the east side of County Route 654 and has direct access to that highway via an access drive about 600 feet south of the intersection with County Route 612. Kooltronic currently employs a total of about 100 people

As result of Task Force and Township efforts over the past 3 ½ years a Concept Redevelopment Plan has been prepared. This report documents the results of a study of traffic and transportation issues and impacts associated with plan development since fall, 2011. The study has been directed at the following:

- Assist the Township Committee and Planning Board by providing advisory assistance in preparation of a redevelopment plan for the Marshall's Corner–Pennytown area
- Establish a baseline of existing conditions
- Estimate the volume and pattern of traffic which might be generated by redevelopment
- Identify and evaluate potential traffic management options to help provide for safe and efficient traffic movement

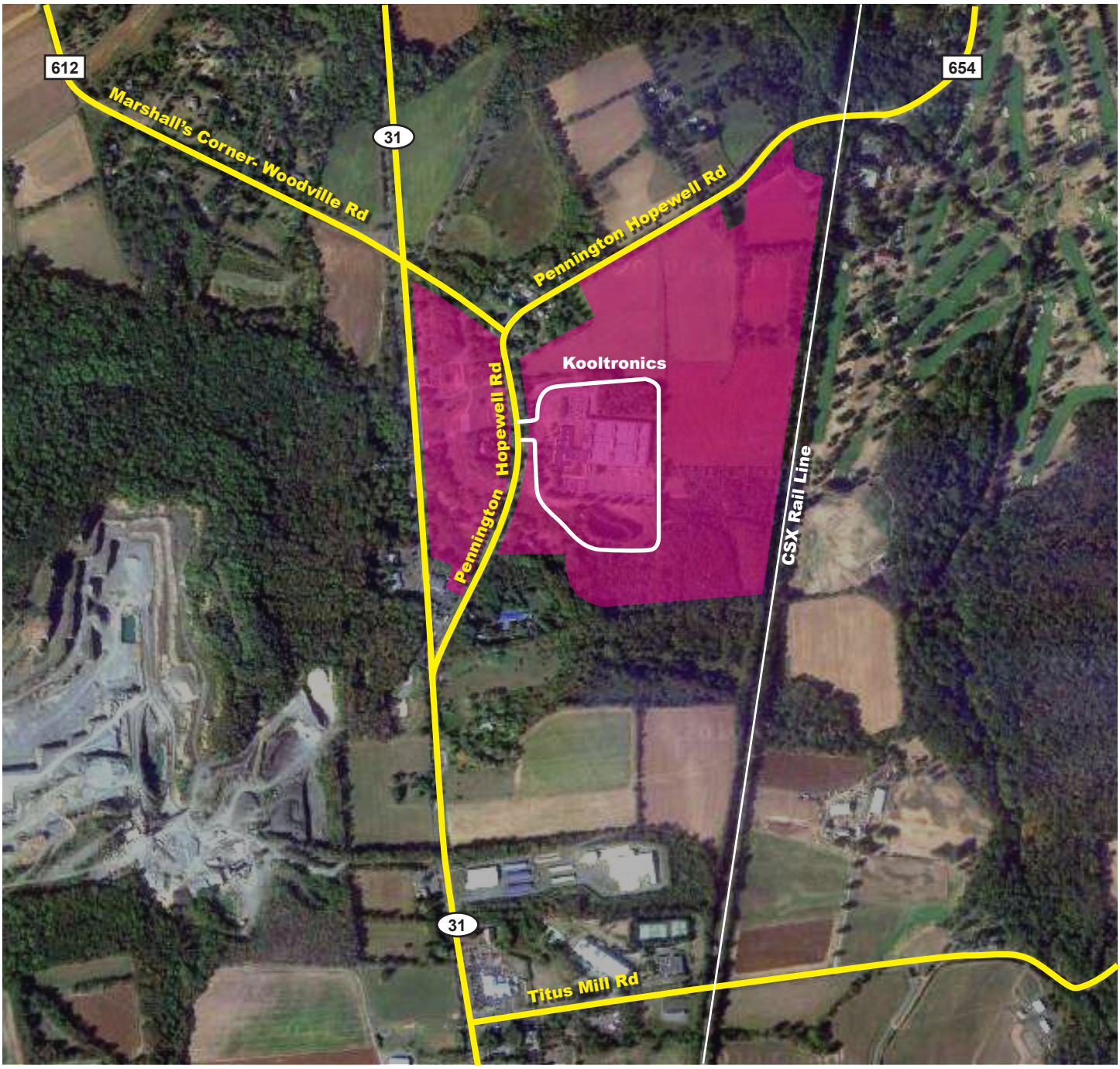
The primary traffic and transportation goals of the Redevelopment Plan as developed over the past few years are to:

- Design streetscape to slow traffic within the Village of Marshall's Corner
- Extend pedestrian access to existing Marshall's Corner residents
- Incorporate pedestrian access throughout the redevelopment zone
- Provide access to the Else Tract off Pennington-Hopewell Road
- Extend existing bus routes on N.J. Route 31 to connect to Marshall's Corner

It is not the intent of the study to develop a detailed, final traffic access/circulation plan but rather to provide a base and framework to be utilized by the Township Committee and Planning Board and the future developer as planning proceeds.

Marshall's Corner/Pennytown Redevelopment Area Location Map

HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY



- Redevelopment Boundary

This report includes a review of existing traffic volumes, patterns and conditions and projections of future traffic on area roads resulting from general growth and development in the area and from implementation of the Redevelopment Plan. Comment/suggestions relative to the proposed internal circulation scheme and site access design and location are also presented. Finally, recommendations to help achieve the traffic/transportation goals of the Redevelopment Plan are presented.

EXISTING ROADWAY AND TRAFFIC CONDITIONS

A field view and inventory of the three major roadways serving the Redevelopment Area indicates the following:

- State Route 31 is classified by the New Jersey Department of Transportation (NJDOT) as a rural principal arterial. It extends north from the City of Trenton trough Mercer County and Hopewell Township into Hunterdon County. In the vicinity of the Redevelopment Area the roadway typically consists of a non-divided highway with one through travel lane in the northbound direction and one through travel lane in the southbound direction. Northbound and southbound shoulders vary in width from six feet to eight feet. "No Stopping, Standing or Parking" signs are posted along the Route 31 shoulders in both directions. The posted speed limit on Route 31 is 45 miles per hour north of its intersection with County Route 612, and 40 miles per hour from its intersection with CR 612 south to the Hopewell/ Pennington Township line. Overhead street lighting is provided at its intersections but there are no sidewalks or pedestrian paths.

- County Route 654 (Pennington-Hopewell Road) is classified by NJDOT as a rural major collector and has a general north/ south orientation. As noted earlier, County Route 654 extends northeast from an intersection with NJ Route 31 near the southwest corner of the Redevelopment Area through Hopewell Borough. County Route 654 provides one traffic lane in each direction. The width of travel way varies from 26 to 28 feet. Shoulders vary in width from zero to 5.5 feet. County Route 654 passes under the CSX rail line about one-half mile north of its intersection with County Route 612. There is a posted height limit of 13 feet. There is no overhead street lighting along the roadway nor any sidewalks or pedestrian paths. The posted speed limit on CR 654 is 40 miles per hour north of its intersection with Route 31. An advisory speed limit of 25 miles per hour warning motorists of the northbound roadway curve is located approximately 400' north of the Kooltronic driveway.

- County Route 612 (Marshall's Corner-Woodsville Road) is classified by NJDOT as a rural local roadway and has a general east/ west orientation. In the vicinity of the Redevelopment Area, the roadway consists of a non-divided highway with one through travel lane in the eastbound direction and one through travel lane in the westbound direction. The width of travel way approximates 22 feet. Eastbound and westbound shoulders vary in width from zero to two feet between Route 31 and CR 654. There is no posted speed limit on CR 612, so the New Jersey statutory speed limit of 50 miles per hour is assumed for this rural roadway. There is no street lighting along its length nor are there any sidewalks or pedestrian paths.

Intersections within and adjacent to the Redevelopment Area include:

- The intersection of SR 31 and CR 654 (Pennington-Hopewell Road) is a three-leg intersection controlled by a two-phase traffic signal. The signal operates on a 120 second cycle length during the AM and PM peak periods, and a 90 second cycle length throughout the remainder of the day with the exception of the period from 10 PM to 6 AM, when it runs on a variable cycle length to accommodate traffic presence. The signal is pedestrian pushbutton actuated and is part of a coordinated signal system with the intersection of SR 31 and CR 612. Route 31 has a single through lane in each direction at this intersection and a channelized, free right turn lane northbound onto CR 654. The southbound approach of CR 654 has a channelized right turn lane controlled by a 'Yield' sign, while the left turn onto southbound SR 31 is under signal control. One 200 watt overhead street light is mounted on a utility pole located at the northern half of the intersection, in the island separating southbound CR 654 and southbound Route 31; one utility pole-mounted light overhangs the northbound Route 31 approach to the intersection, approximately 45 feet south of the stop bar. No sidewalk exists at the intersection.

- The intersection of SR 31 and CR 612 (Marshalls Corner/ Woodsville Road) is a four-leg intersection controlled by a two phase traffic signal. The signal operates on a 120 second cycle length during the AM and PM peak periods, and a 90 second cycle length throughout the remainder of the day with the exception of the period from 10 PM to 6 AM, when it operates on a variable cycle length to accommodate traffic presence. The signal is pedestrian pushbutton actuated and is part of a coordinated signal system with the intersection of SR 31 and CR 654. All intersection approaches provide a single lane to accommodate left turn through and right turn movements. Right turn movements on the eastbound CR 612 approach are limited by a 'No Turn on Red' sign. A "Signal Ahead" sign is located on the southbound Route 31 approach to the intersection, approximately a quarter mile north of the intersection. Another "Signal Ahead" sign is located over 500' east of the intersection on the Woodsville Road westbound approach. Two 250 watt overhead street lights are signal pole-mounted on the northeast and southwest corners of the intersection. No sidewalk exists at the intersection.

- The intersection of CR 654 and CR 612 is a three-leg intersection controlled by a 'Stop' sign on its minor approach, CR 612 (Marshalls Corner/ Woodsville Road). CR 654 makes a close to 90 degree curve at its intersection with CR 612, and has 'elephant tracks' tracing the roadway centerline to assist motorists in following the curve. All three approaches provide a single through lane in each direction at this intersection, to accommodate left turn, through and right turn movements. No overhead street lighting exists at this intersection. There is no sidewalk.

In addition, as noted earlier, the driveway serving the Kooltronic site intersects CR 654 at a point about 600 feet south of the intersection with CR 612. Vehicles exiting the Kooltronic site via the single lane driveway approach at this three-leg intersection are controlled by a "Stop" sign. Both northbound and southbound approaches on CR 654 provide a single traffic lane although an approximate seven foot wide shoulder on the

northbound approach is utilized to ease the right turn entry movement. There is no overhead street lighting at this intersection. There is also no sidewalk.

Traffic volumes using area roads and intersections were determined through review of available data and conduct of a series of counts in October, 2011.

It is important to recognize that the bridge on CR 518 over Stony Creek to the north of the Redevelopment Area was closed at the time the traffic counts were conducted in October, 2011 due to damage from Hurricane Irene. A detour plan prepared by Mercer County was in effect and traffic volumes and patterns at the intersections of CR 612 with NJ Route 31 and CR 654 were impacted. However, the project schedule at the time did not allow for the counts to be delayed. Therefore, the traffic counts were conducted in order to provide a reasonable indication of the pattern and 'order of the magnitude' of traffic volumes passing through the Redevelopment Area.

It is assumed that volumes on Route 31 north of CR 612 and on CR 612 between Route 31 and CR 654 were heavier than normal as a result of re-routed Route 518 traffic. Left-turns from southbound Route 31 to eastbound CR 612 and from CR 612 to CR 654 and the reverse movements - - i.e., southbound right turns from CR654 to westbound CR 612 and westbound right-turns from CR 612 to northbound Route 31 per the detour plan.

Trucks over 13 feet in height were re-routed via Route 31 to Delaware Avenue, to Elm Ridge Road to Carter Road to Princeton Avenue. These vehicles represent relatively small traffic volumes and don't significantly affect total traffic demand in the vicinity of the Redevelopment Area.

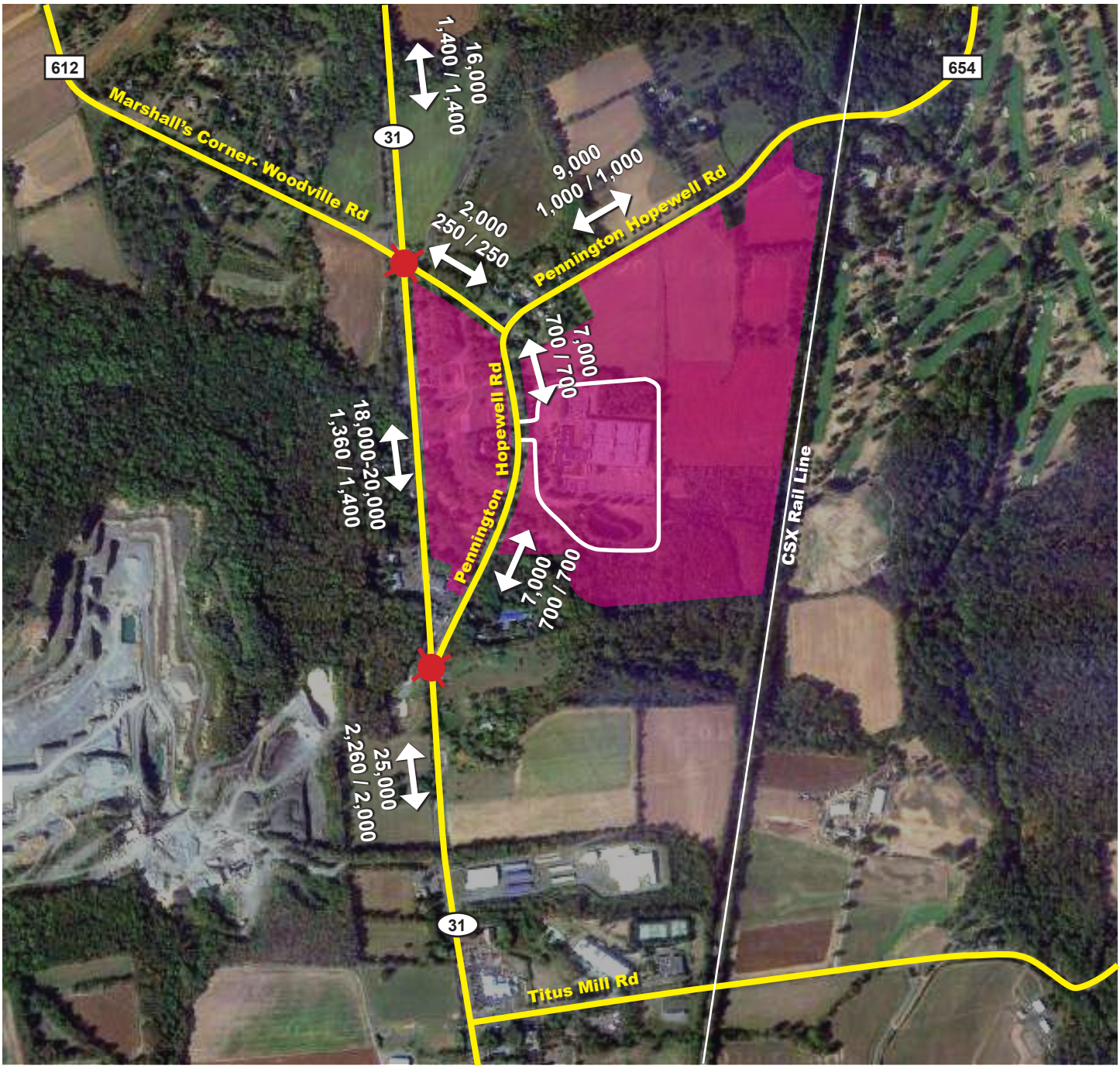
Review of the count results and other available data indicate that daily traffic volume on N.J. Route 31 south of Hopewell-Pennington Road (C.R. 654) approximates 25,000 vehicles (12,500 vehicles per direction). Daily traffic on Route 31 north of Marshall's Corner-Woodville Road (C.R. 612) is about 16,000 vehicles (Figure 2). Daily traffic on C.R. 654 ranges from about 7,000 vehicles just north of the intersection with Route 31 to about 9,000 vehicles north of the intersection with C.R. 612. C.R. 612 is estimated to carry about 2,000 vehicles per day. Again, it should be noted that the counts – particularly on C.R. 612 – reflect the detour in operation at the time. Present volumes are probably less.

Further review of the count data shows that peak hourly volumes, generally noted from 7:30AM to 8:30AM and from 5:00PM to 6:00PM, are about 8-10% of daily demand. As shown in Figure 2, peak hourly volumes range from about 1,400 vehicles (total, both directions) to as much as 2,260 vehicles on Route 31. Peak hourly traffic on C.R. 654 ranges from about 700 vehicles to 1,000 vehicles (total, both directions).

Trucks and tractor-trailers represent about five percent of peak hour demand on Route 31 and generally between two percent and four percent of peak hourly volumes on C.R. 654 and C.R. 612. Pedestrian crossings at all intersections in the area were minimal (i.e., less than five) during both peak hours.

Marshall's Corner/Pennytown Redevelopment Area
Existing Traffic Volumes

HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY



- Redevelopment Boundary
- Traffic Signal
- ADT *(Average Daily Traffic)*
- # / # - AM Peak Hour / PM Peak Hour

Comparison of peak hour volumes with intersection capacity indicates that intersections are operating at very acceptable 'levels of service' with average delays of less than one minute during peak traffic periods. The highest delays are encountered on C.R. 654 and C.R. 612 at their respective signalized intersections with Route 31. Delays encountered on approaches to STOP sign controlled intersections – i.e., C.R. 612 at C.R. 654 and the Kooltronic driveway with C.R. 654 – are also within acceptable ranges.

More detailed intersection traffic counts and level of service analyses are provided in the appendix to this report.

TRAFFIC ACCIDENT EXPERIENCE:

Traffic accident data for roads and intersections in the vicinity of the Redevelopment Area was provided by Hopewell Township for an almost six year period from 2006 through September, 2011. There were a total of 120 reported accidents - - 9 in 2006, 14 in 2007, 23 in 2008, 32 in 2009, 22 in 2010, and 20 in the first nine months of 2011.

Almost one-half of the reported accidents occurred at or near the signalized intersections of Route 31 with CR 612 or CR 654. A total of 50 of the 81 accidents reported at these locations were of the 'rear-end" type, which is not atypical at signalized intersections. Review of the crash data indicated that there were no fatal accidents, or accidents that involved pedestrians or bicyclists, nor were there any accidents where alcohol was a factor.

The total number of reported accidents over the almost six-year period does not appear inordinate given the number of intersections and road segments examined and the volume of traffic involved. However, the experience at two particular locations does stand out:

- At the intersection of SR 31 and CR 654, there was a high concentration of rear end accidents. While these are the type expected to occur at signalized intersections, the number and frequency (eight on CR 654 approaching SR 31, and 23 on SR 31 approaching CR 654) are of concern.

- At the intersection of CR 654 and CR 612, there were a high concentration of accidents in 'wet' conditions (19 out of 25, or 76%), with all but one, with a drowsy driver involved, reported as being the result of skidding while approaching around the roadway curve. It should be noted that Mercer County, in the interim, has resurfaced this intersection and crash experience has been reduced.

THE REDEVELOPMENT PLAN AND FUTURE TRAFFIC

The Redevelopment Plan for Marshall's Corner/Pennytown (Figure 3) proposes a mix of uses including residential, retail-commercial, and community activities (e.g., a senior center, a Y, etc.). The Redevelopment Area totals 125 acres and is bisected by C.R. 654 (Pennington-Hopewell Road) with 100 acres on the east side of C.R. 654 and with 25 acres on the west side between C.R. 654 and N.J. Route 31.

The Redevelopment Plan proposes the following type and size of development:

- East Side:
  - 69 single family units (detached)
  - 4 single family units (attached)
  - 47 townhouses
  - 108 apartments

- West Side:
  - 16 single family units (attached)
  - 22 townhouses
  - 84 apartments
  - 14,000 sf retail
  - 15,000 sf office
  - 70,000 sf Community Center/Senior Center

As shown in Figure 4, access to the West Side will be provided directly via Route 31 and Route 654 via a 'primary street' which will intersect C.R. 654 at a point opposite the primary access to the East Side. Access to the West Side will also be available via several points on C.R. 654 and on C.R. 612 while the East Side will also access C.R. 654 at a point north of the intersection with C.R. 612. Additional discussion of site access and circulation is presented later in this report.

The Marshall's Corner/Pennytown Redevelopment will generate some additional traffic on area roads as would any new development. In fact, NJ DOT data indicates that traffic on area roads will generally increase by about 10% over the next five years as a result of general growth and development in the region.

Application of trip generation data from Trip Generation (9^{th} Edition, 2012), a report published by the Institute of Transportation Engineers, and other sources results in the projections of weekday peak hourly and daily traffic as well as Saturday traffic which will be generated by the proposed plan (Table I).

FIGURE 3

Pennytown Site (±28 AC)

Single Family Attached (16)

Townhouses (22)

Multi-family (84)

Retail/Commercial (14,000 sf)

Office (15,000 sf)

Institutional/Civic
- YMCA (60,000 sf)
- Senior Center (10,000 sf)

Open Space (±13.7 AC) (49% of tract area)
- Conservation O.S. (±10.9 AC)
- Park O.S. (± 2.8 AC)

Subtotal Dwelling Units = 122

Kooltronic Site (±76 AC)

Single-Family Detached (69)

Single Family Attached (4)

Townhouses (47)

Multi-family (108)

Open Space (±39.9 AC) (53% of tract area)
- Conservation O.S. (± 22.4AC)
- Park O.S. (± 5.9 AC)
- Agriculture O.S. (±12 AC)

Subtotal Dwelling Units = 228

Total Dwelling Units = 350

LEGEND / SUBTOTALS (±104 AC)

- Single-Family Attached
- Townhouses
- Multi-family
- Office
- Retail/Commercial w/Multi-family
- Community Center/Senior Center
- Open Space (±51 AC) (49% of tract area)

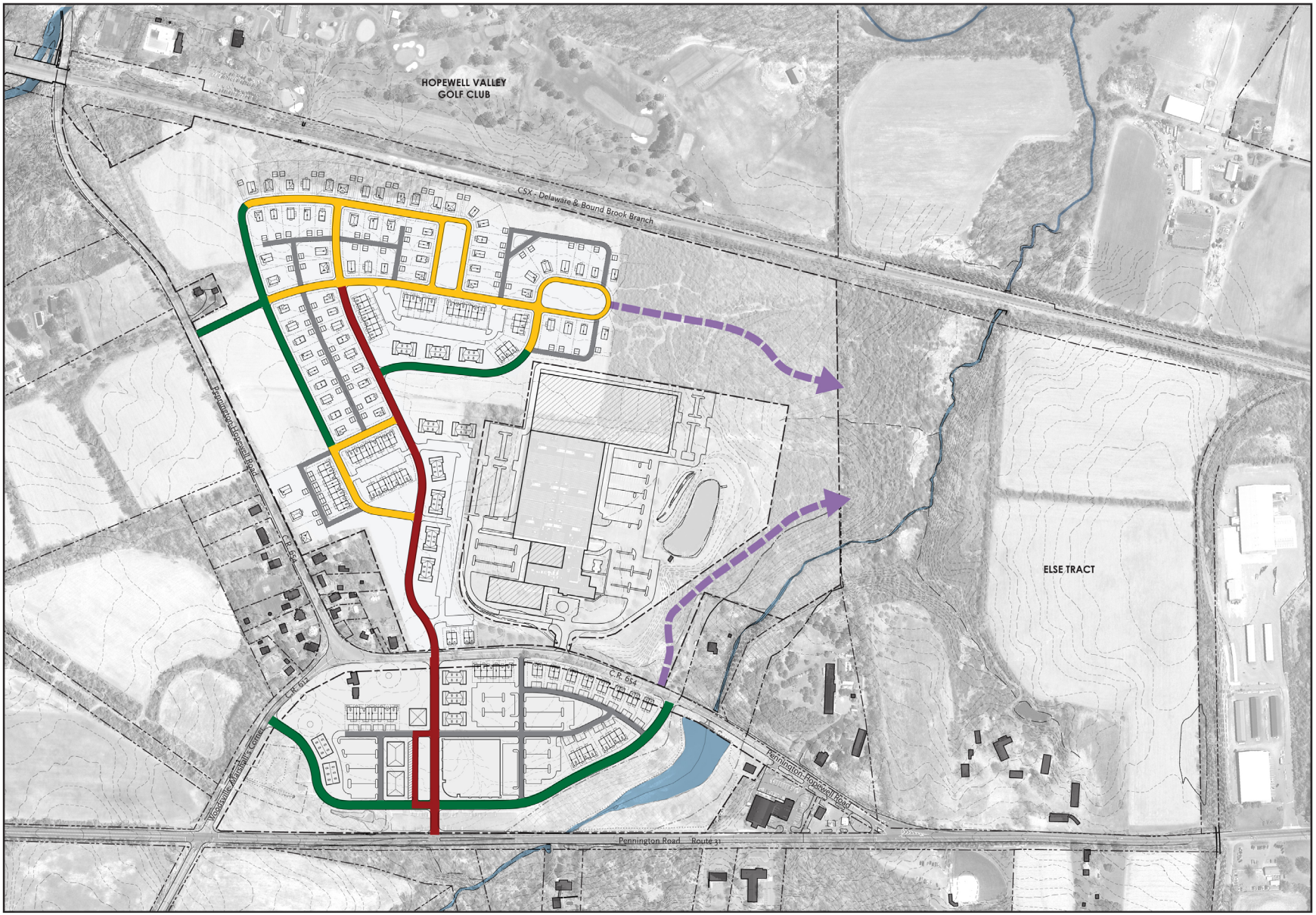
0' 180' 360'
SCALE

Marshall's Corner/Pennytown Redevelopment: Draft Illustrative Plan

Hopewell Township, Mercer County, NJ March 14, 2012

Clarke Caton Hintz
Architecture
Planning
Landscape Architecture

FIGURE 4



Marshall's Corner/Pennytown Redevelopment: Draft Circulation Plan

Hopewell Township, Mercer County, NJ March 14, 2012

Clarke Caton Hintz
Architecture
Planning
Landscape Architecture

Table I
Estimated Trip Generation
Marshall's Corner/Pennytown Redevelopment

	AM peak hour			PM peak hour			Daily	Saturday peak hour		
Land use	In	Out	Total	In	Out	Total	(In & Out)	In	Out	Total
East Side (Kooltronic)										
- 4 SFU (Attached)	1	2	3	2	1	3	20	2	2	4
- 69 SFU (Detached)	15	45	60	50	30	80	400	35	35	70
- 47 TH	5	20	25	20	10	30	330	15	15	30
- 108 Apts	15	45	60	45	20	65	750	35	35	70
Total East Side	36	112	148	117	61	178	1500	87	87	174
West Side										
- 16 SFU (Attached)	3	15	18	15	5	20	160	10	10	20
- 22 TH	2	10	12	15	5	20	160	10	10	20
- 84 Apts	15	35	50	35	15	50	600	30	30	60
- 14k SF Retail *	20	10	30	50	50	100	800	50	50	100
- 15k SF Office	20	5	25	5	20	25	160	20	20	40
- Community Ctr / Senior Ctr	60	25	85	100	90	190	1600	?	?	?
Total West Side	120	100	220	220	185	405	3480	?	?	?
Total	156	212	368	337	246	583	4980	?	?	?

** Includes 'New' plus 'Pass-By' traffic*
? Insufficient data available to estimate generated traffic volumes

It might be noted that the estimates of development-generated traffic are, most likely, somewhat 'high' because:

- At least some of the generated traffic will be internal (including residents travelling to/from on-site retail/commercial uses or the community center) and will not use the external road system at all
- Some of the traffic attracted to the retail/commercial uses or community activities will be diverted from passing traffic – e.g., motorists currently passing the site on either Route 31 or C.R. 654 who stop in before or after work or between other trips

As shown, the volume of daily traffic estimated to be generated by the proposed redevelopment totals 4,980 trips – 2,490 'in' and 2,490 'out'. About 70% of generated traffic is associated with proposed uses and activities in the western part of the redevelopment area – between N.J. Route 31 and C.R. 654. About one-half of total

redevelopment traffic will be generated by new residential units with the other half generated by retail/commercial/office uses and the proposed senior center/Y.

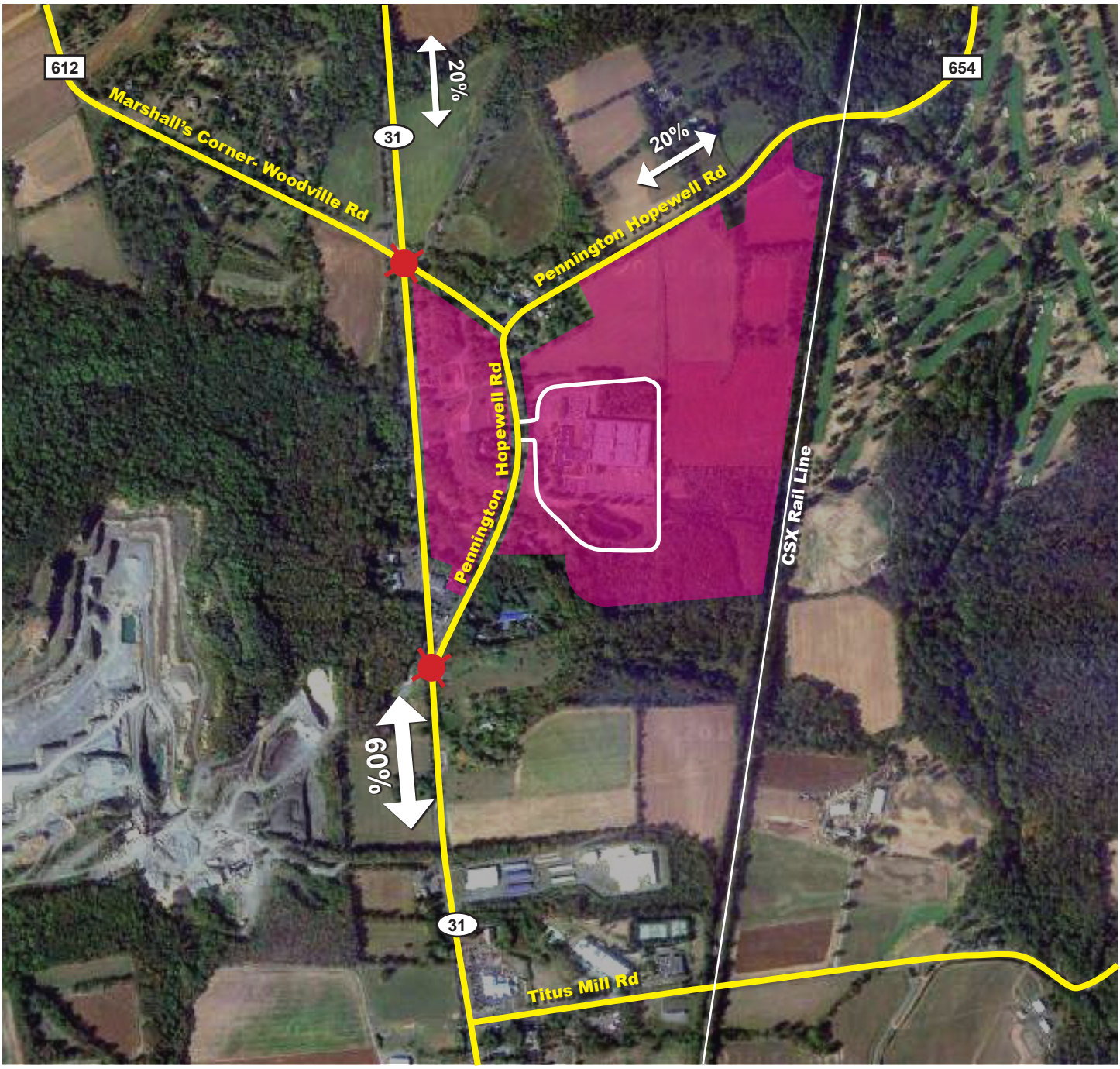
Peak hourly volumes will total 368 trips ('in' plus 'out') during the typical morning commuter peak (between 7:00AM and 9:00AM) and 583 vehicles during the late afternoon/early evening peak (sometime between 4:00PM and 6:00PM).

Redevelopment traffic will be spread over several different routes. As shown in Figure 5, about 60% of redevelopment traffic will be oriented to/from the south on N.J. Route 31, about 20% to/from the north on N.J. Route 31 (and/or west on C.R. 612), and 20% to/from the north on C.R. 654. This traffic will, as noted earlier, enter/exit the redevelopment site via various access points on N.J. Route 31, C.R 654, and C.R. 612. As a result, redevelopment traffic will add relatively small traffic volumes to individual segments of the area road network. For example, peak hour site-generated traffic will generally range from 55 vehicles to as many as 120 vehicles (total, both directions) on most adjacent roads and intersections. The highest volume of peak hour development-generated traffic will be added to the intersection of C.R. 654 and N.J. Route 31 – not unexpected in view of estimate that 60% of development traffic will be oriented to the south on N.J. Route 31. Added volume on N.J. Route 31 north of the intersection with the 'primary street' serving the redevelopment site as well as on C.R. 654 from N.J. Route 31 north through the intersection with C.R. 612 will range from about 60 to 100 vehicles.

Peak hour development traffic added to most other adjacent roads and intersections will total 100 vehicles or less during the AM and 200 vehicles or less during the PM (Table II). Development traffic will generally add between 4% and 10% to existing AM peak hour volumes and larger percentages during the PM peak. In many cases, the volume of redevelopment traffic added to area roads will be less than that expected as a result of general background growth and development over the next few years (i.e., less than 10%).

Marshall's Corner/Pennytown Redevelopment Area
Estimated Distribution of Redevelopment Traffic

HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY



- Redevelopment Boundary
- Traffic Signal
% - Direction of Approach / Departure Projected Redevelopment Traffic

Table II
Additional Redevelopment Traffic
Marshall's Corner/Pennytown Redevelopment

	AM Peak Hour			PM Peak Hour		
Intersections	Existing (2011)	Added Development Traffic	%	Existing (2011)	Added Development Traffic	%
C.R. 654 / C.R. 612	972	66	7%	949	108	11%
C.R. 612 / N.J. Route 31	1648	74	4%	1602	117	7%
C.R. 654 / N.J. Route 31	2096	221	10%	1930	372	16%
	AM Peak Hour			PM Peak Hour		
C.R. 654 Road Segments	Existing (2011)	Added Development Traffic	%	Existing (2011)	Added Development Traffic	%
North of Site	956	73	8%	936	116	12%
Between 'Primary St.' & C.R. 612	755	55	7%	723	88	12%
South of Kooltronic Dr.	712	93	13%	680	108	16%
Between 'Park Dr' & N.J. Route 31	745	157	21%	606	250	41%

Analysis of projected future total traffic on roads and intersections serving the site – i.e., existing, background growth, and redevelopment traffic – indicates there is no need from a traffic capacity viewpoint to construct any major highway improvements to accommodate future demand.

However, the intersection of C.R. 654 and C.R. 612 remains problematic. Grades and alignment result in some difficult traffic maneuvers and also make potential feasible improvement difficult.

Crash experience suggests that wet pavement played a role in most accidents at this location. The intersection has been resurfaced and pavement markings upgraded.

On the other hand, new development will add relatively little traffic to the intersection (i.e., about 66 vehicles during the AM peak, about 108 vehicles during the PM peak) as compared with present peak hour intersection traffic which approximates 1,000 vehicles.

It is recommended that updated turning movement counts be conducted at the intersection and examined at the time site plans are prepared so as to coordinate any design revisions at the intersection with final design plans for the new development. More detailed engineering analysis might result in some proposal to narrow travel paths and/or re-align traffic flows (or to prohibit some particular movement) within the intersection to help reduce potential conflicts.

More detailed traffic projections and analyses of future conditions are presented in the appendix. Those analyses indicate that levels of service and associated delays on area roads and intersections will be within acceptable limits even during peak traffic hours (i.e., Level of Service 'D'/'d' or better). These periods are typically the subject of traffic impact analysis since they usually represent the 'worst case' traffic conditions and are used to identify possible need for improvement.

TRAFFIC ACCESS/CIRCULATION ISSUES AND OPTIONS FOR TRAFFIC MANAGEMENT

As previously discussed, analysis of projected future traffic volumes and review of anticipated future conditions indicate no need for major improvement to the roads which serve the redevelopment site. However, there are a number of issues and options for traffic management to safely and efficiently serve redevelopment traffic while also addressing some existing concerns. These include the following:

- Location and design of site access
- Traffic calming on C.R. 654
- Walkability/pedestrian accessibility

Each of these issues is discussed individually below but all are also inter-related to some extent.

SITE ACCESS

As currently proposed, access to the West Side of the redevelopment zone will be provided via N.J. Route 31, C.R. 654, and C.R. 612. A proposed 'primary street' will intersect N.J. Route 31, and extend through the West Side of the site across an intersection with C.R. 654 into the East Side. There will be additional connections with C.R. 654 south of the intersection with the 'primary street' (and the existing Kooltronic access drive) and also via the segment north of the intersection with C.R. 612. In addition, there will be an East Side connection with C.R. 612 (via the 'park drive') between C.R. 654 and N.J. Route 31.

Each of these are reviewed below.

Intersection of N.J. Route 31 and 'Primary Street'

Particular attention was directed at the intersection of N.J. Route 31 and the main site access road (the 'primary street'). Three alternates were considered:

- Signalization with all moves permitted (i.e., left-turn and right-turn entry and exits)
- Right-turn only entry and exit with no signalization
- Right-turn entry and exit and left-turn entry (but no left-turn exit) – with signalization if permitted by N.J. DOT or no signalization if not permitted

The key issue with regard to signalization of this intersection is the spacing of traffic signals along C.R. Route 654. The main site access road ('primary street') will intersect N.J. Route 31 about 850 feet south of C.R. 612 and about 1,800 feet north of C.R. 654 (total distance of about 2,650 feet). NJ DOT prefers a minimum distance of 1,800 feet between signalized intersections on state highways similar to N.J. Route 31. However,

the Department has shown some flexibility with regard to spacing criteria if it can be shown through analysis (e.g., time-space diagram) that progressive traffic movement can still be maintained. It appears likely that NJ DOT would not approve signalization of the proposed intersection.

Without signalization, left-turn exit from the West Side of the redevelopment site onto southbound N.J. Route 31 could be potentially difficult and would result in long delays for traffic exiting the site.

Review of projected volumes indicates that, without signalization, the next best option would be to permit right-turn entry and exit and left-turn entry with provision for a separate southbound left-turn lane (as shown in Figure 6).

This alternate would provide direct access for the 60% of West Side redevelopment traffic estimated to approach from the south on N.J. Route 31 and direct access and egress for the 20% of redevelopment traffic oriented to the north. The 60% of redevelopment traffic wishing to depart to the south would use one of the proposed connections to C.R. 654 (either the 'primary street' or the 'park drive') or to C.R. 612 (via the 'park drive') and back to the south on N.J. Route 31 via a left-turn at either the signalized intersection with C.R. 654 or with C.R. 612.

The third option, allowing only right-turn entry and exit movements (without signalization) would provide the least benefit in terms of distributing redevelopment traffic to the area road network. It would result in increased traffic on both C.R. 612 and C.R. 654 (particularly the southern segment of the latter route).

Therefore, it is recommended that the site driveway (i.e., 'primary street') intersection with N.J. Route 31 be designed to permit right-turn entry and exit movements and left-turn entry movements (from southbound N.J. Route 31). Left-turn exit would be prohibited. A separate southbound left-turn lane would be constructed on N.J. Route 31.

This option will not require (nor warrant) signalization but still accommodate a majority of redevelopment traffic generated by the West Side and at least some traffic generated by the East Side of the redevelopment. Review and approval of the proposed intersection design will be required from NJ DOT.

<u>Intersection of C.R. 654 and 'Primary Street'</u>

The other intersection expected to serve a substantial percentage of redevelopment traffic is that of C.R. 654 with the 'primary street'. This intersection, about 300 feet south of the intersection with C.R. 612 should be designed as a typical 4-legged intersection with one approach lane in each direction – i.e., northbound and southbound on C.R. 654 and eastbound and westbound on the 'primary street'.

Upon reaching 100% of the development, it is anticipated that a traffic signal will be warranted at this intersection and a signal should be installed as soon as warranted.

FIGURE 6

No.	Revision	Date

CONCEPT PLAN

Orth-Rodgers and Associates, Inc.
NJ Certificate of Authorization No. 24GA28015700
Executive Offices 4729 West Chester Pike Newtown Square, PA 19073 (610) 355-1932
800C Dence Road, Box 281 Pennington, NJ 08534 (609) 530-0888
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NJ ROUTE 31 AT PROPOSED PENNYTOWN SITE ACCESS

TOWNSHIP OF HOPEWELL	MERCER COUNTY	NEW JERSEY
30' 0' 30' SCALE	DWG: layout_Mar2013.dwg DATE: 5 MARCH 2013	SHEET NUMBER 1 OF 1

FILENAME: C:\Documents and Settings\jstankus\My Documents\Ortho Photos\Pennytown\layout_Mar2013.dwg
PLOTTED: Mar 05, 2013 - 4:18pm
Orth-Rodgers and Associates, Inc.

In addition to serving vehicular volume this intersection will be subject to some pedestrian traffic. Residents of the East Side will most likely be attracted to the retail/commercial activity and community center proposed for the West Side. The intersection should be designed to include clearly signed and striped pedestrian crossings with textured pavement in the crossing area.

The proposed traffic signal, together with special pedestrian treatment, will help 'calm' traffic flow on C.R. 654 (as discussed later).

It should be noted that some consideration was given to construction of a round-about on C.R. 654 at this intersection. However, this option was rejected for several reasons including concern about providing for safe pedestrian movement through and across the intersection.

Other Site Access

As previously noted and as shown in Figure 4, both sides of the redevelopment zone will have more than one link to the adjacent existing road network. This will provide routing options for residents and others travelling to/from the site and help distribute redevelopment traffic to several routes further reducing traffic impact. For example, proposed connections with C.R. 654 north of C.R. 612 and with C.R. 612 between N.J. Route 31 and C.R. 654 in particular should reduce the volume of redevelopment traffic which will pass through the intersection of C.R. 654 and C.R. 612.

Spacing of new intersections along C.R. 654 and C.R. 612 must consider possible overlay areas and conflicting maneuvers. A minimum distance between intersections of 300 feet is recommended. This suggests that particular attention should be directed at providing advance intersection warning signs on southbound C.R. 654 in advance of the existing intersection with C.R. 612 and the proposed intersection with the 'primary street' serving the redevelopment. The recommended reduction in the posted speed limit along C.R. 654 to 25mph is also essential.

TRAFFIC CALMING ON C.R. 654

Present peak hour traffic volumes on C.R. 654 (about 700 vehicles per hour, total both directions) are significantly less than the capacity of the roadway and will remain so in the future even with the addition of background growth and redevelopment-generated traffic. A two-lane roadway under ideal conditions can carry as many as 2,000 vehicles per hour though drivers may feel "crowded" as hourly volumes approach 1,000 to 1,200 vehicles.

Comments and discussions at several meetings throughout the redevelopment planning process suggest that speed and not capacity is, in fact, the concern of area residents. A recent speed check by Hopewell Township Police confirmed this point. That survey indicates that less than 10% of motorists on C.R. 654 travel C.R. 654 at 40mph or less

(the posted speed limit is 40mph). About 80% of drivers in both directions travel the road at between 40 and 50mph, and about 10% travel between 50 and 60mph.]

It is anticipated that proposed uses and new activity on the redevelopment site will, with the creation of new intersections along C.R. 654, help 'calm' traffic. It is also recommended that the posted speed limit on C.R. 654 be reduced to 25mph when new development begins and site activity increases.

As noted above, the installation of a new traffic signal on C.R. 654 at the intersection with the 'primary street' serving the redevelopment site will, together with appropriate advance warning signs and incorporation of pedestrian crossing treatment (possibly including textured pavement in the crossing area) should also encourage slower travel speed. 'In-street' pedestrian crossing warning signs requiring motorists to stop if pedestrians are within the crosswalk should be installed.

Additional signed and marked pedestrian crossings could also help 'calm' traffic on C.R. 654. Such a crossing is recommended at the Kooltronic driveway on C.R. 654. The opportunity to create additional pedestrian crossings within the redevelopment zone are limited since there will be no sidewalks or pedestrian paths on at least one side of the road. However, if an when such opportunities arise in the future, they should be utilized.

The possibility of permitting on-street parking along C.R. 654 in order to further help calm traffic was considered. Driver and passenger door openings affect pavement widths and parallel parking stall widths. Additionally, the location of parallel parking must provide for adequate sight distance at all nearby intersections. Some widening of C.R. 654 will be necessary to provide a minimum seven-foot wide parking lane width. Consideration should be given to limiting parking to one side of the road (most likely the west side) as site design work proceeds.

The possibility of constructing a round-about at the intersection of C.R. 654 and C.R. 612 was considered. This option would help 'calm' traffic on both routes and perhaps provide some improvement to safe traffic flow through the intersection. However, existing roadway alignment and grading at the intersection suggests that a round-about at this location would not be feasible.

Another option that would have significant impact on traffic movement including a substantial reduction of traffic on C.R. 654 would involve the discontinuance of C.R. 654 as a 'through route' between N.J. Route 31 and Hopewell Borough. This could be done by terminating C.R. 654 at either C.R. 612 or at the proposed intersection with the 'primary street' serving the redevelopment area. It would reduce the accessibility of the redevelopment site and would divert additional traffic to C.R. 612, the 'primary street' through the redevelopment, and/or to N.J. Route 31. It would also affect accessibility of the existing Kooltronic site – especially for employees and others oriented to the north.

PEDESTRIAN TRAVEL/WALKABILITY

A hierarchical street network within the site is designed not only to serve vehicular traffic but, equally important, to accommodate and encourage pedestrian travel. A pedestrian walkway with a minimum width of eight feet should be provided around the perimeter of the site along C.R. 654 and C.R. 612. Possible connections with Marshall's Corner will depend upon cooperation of some adjacent property owners. Street widths within the redevelopment area will range from 30 feet (for 'secondary streets') to 35 feet (for 'primary street' and 'park drive') with parking permitted on both sides. A 15-foot wide walkway will be provided along the segment of the 'primary street' within the core of the West Side of the redevelopment with six to eight foot wide walkways provided along other road segments. A six to eight foot wide walkway will be provided along both sides of the 'park drive' with five-foot wide walks provided along 'secondary streets'.

Pedestrian crossings at intersections within the redevelopment area should be clearly marked and signed. As appropriate along the 'primary street' and 'park drive', in-street pedestrian crossing warning signs requiring motorists to stop if pedestrians are present within the crosswalk should be installed.

As noted earlier, particular attention should be directed at pedestrian crossings of C.R. 654 at the intersections with the 'primary street' and with the Kooltronic driveway.

OTHER PROPOSALS

Two other possible longer-term transportation-related actions which should be considered as planning/implementation of the redevelopment proceeds are:

- The possibility of providing new pedestrian/vehicular extensions/connections between the redevelopment zone and the Else Tract
- The possibility of extending bus service north along N.J. Route 31 to serve the Marshall's Corner-Pennytown area

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TRANSPORTATION ENGINEERS AND PLANNERS

APPENDIX

TO THE

ANALYSIS OF TRAFFIC IMPACT

AND

TRAFFIC COMMENTS AND RECOMMENDATIONS

FOR THE

PROPOSED MARSHALL'S CORNER/PENNYTOWN REDEVELOPMENT

HOPEWELL TOWNSHIP, MERCER COUNTY, NJ

March, 2013

Prepared by

Orth-Rodgers & Associates Inc.

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Senior Consultant

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APPENDIX

This appendix to the March, 2013 "Analysis of Traffic Impact and Traffic Comments and Recommendations" report includes the following:

- A summary of AM and PM peak period turning movement traffic counts conducted at intersections adjacent to the Marshall's Corner/Pennytown Redevelopment Site in October, 2011 (Figures A-1 and A-2)
- A summary of AM and PM peak hour traffic volumes added to roads and intersections adjacent to the Redevelopment Site by the proposed Redevelopment (Figures A-3 and A-4)
- A summary of projected future AM and PM peak hour traffic volumes at intersections adjacent to the Redevelopment Site – with background growth (10%) and with redevelopment traffic (Figures A-5 and A-6)
- A comparison of October, 2011 AM and PM peak hour intersection traffic volumes with intersection capacity and associated Levels of Service (Figures A-7 and A-8)
- A comparison of projected future AM and PM peak hour volumes with intersection capacities and resultant LOS (Figures A-9 and A-10)

A series of turning movement traffic counts were conducted at intersections adjacent to the Redevelopment Site in October, 2011 in order to establish existing conditions. At the time of the counts, the bridge on C.R. 518 over the Stony Creek to the north of the Redevelopment Site was closed due to damage from Hurricane Irene. Because of study schedule at the time it was decided to utilize the count data with consideration of other available data. Review of the count information suggested that the count volumes are probably higher than those which might be typically encountered without the detour.

Peak hourly volumes as counted in October, 2011 are shown in Figures A-1 (AM Peak) and A-2 (PM peak). It is noted that review of weekday count data indicates that trucks and tractor-trailers represent about 5% of peak hour volume on N.J. Route 31 and about 2% to 4% of peak hour volumes on C.R. 654 and C.R. 612. Pedestrian crossings at all intersections were minimal during both AM and PM peak periods.

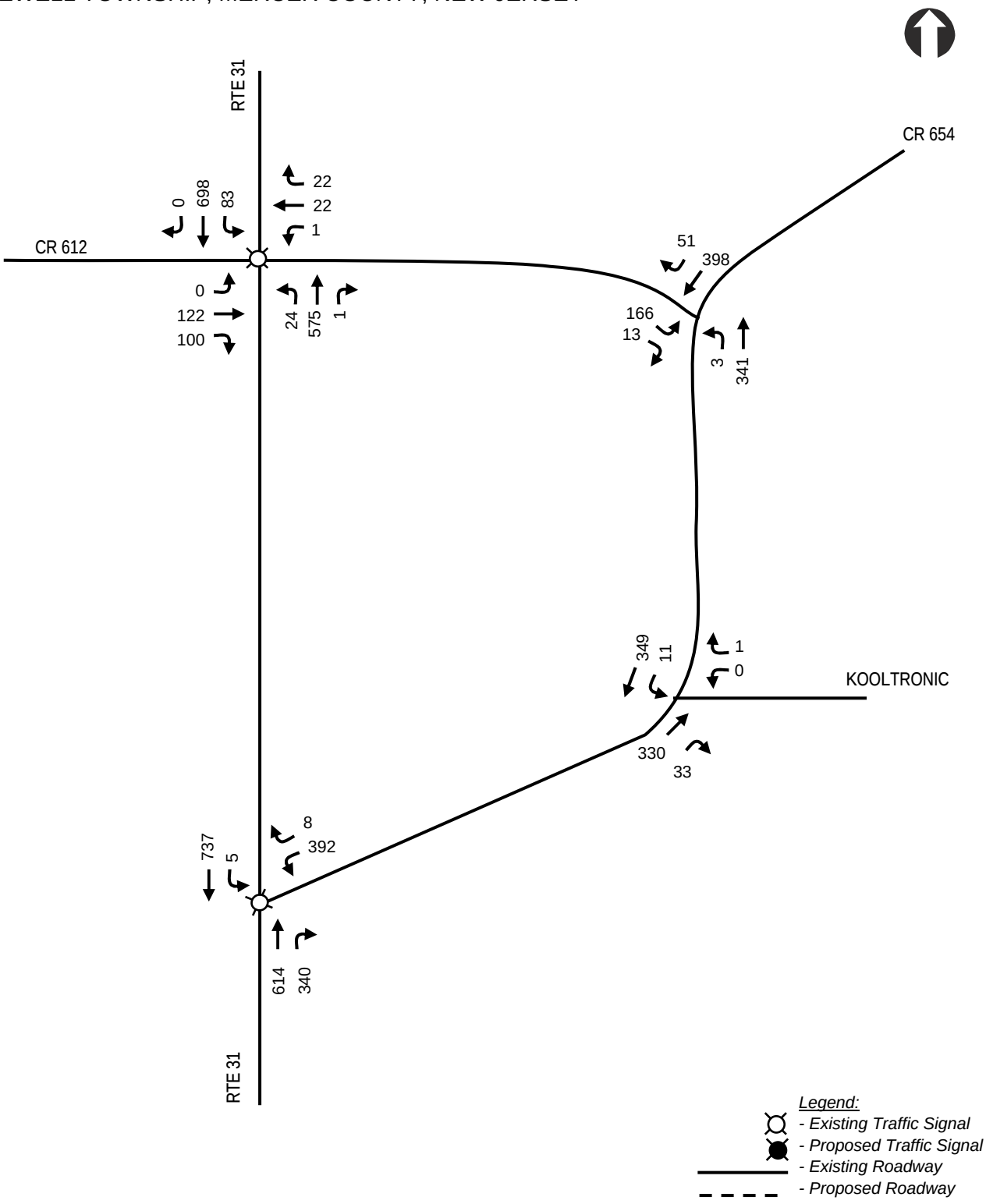
More discussion of the counts and other information is presented in "Technical Memorandum, Traffic Engineering Review Existing Conditions, Marshall's Corner/Pennytown Redevelopment Area" by Orth-Rodgers & Associates dated October, 2011.

Estimated AM and PM peak hour traffic which will be added to roads and intersections adjacent to the redevelopment site are illustrated in Figures A-3 and A-4. These projections are the estimates of redevelopment-generated traffic summarized in Table I of the report, the estimated distribution of that traffic to the area road network as shown in Figure 5 of the report, and assumed connections of the redevelopment site to the adjacent roads as illustrated in the Draft Circulation Plan (Figure 4).

Existing AM Peak Hour Traffic Volumes

Marshall's Corner/Pennytown Redevelopment Area

HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY



^ *NOTE: Traffic counts conducted in October, 2011*

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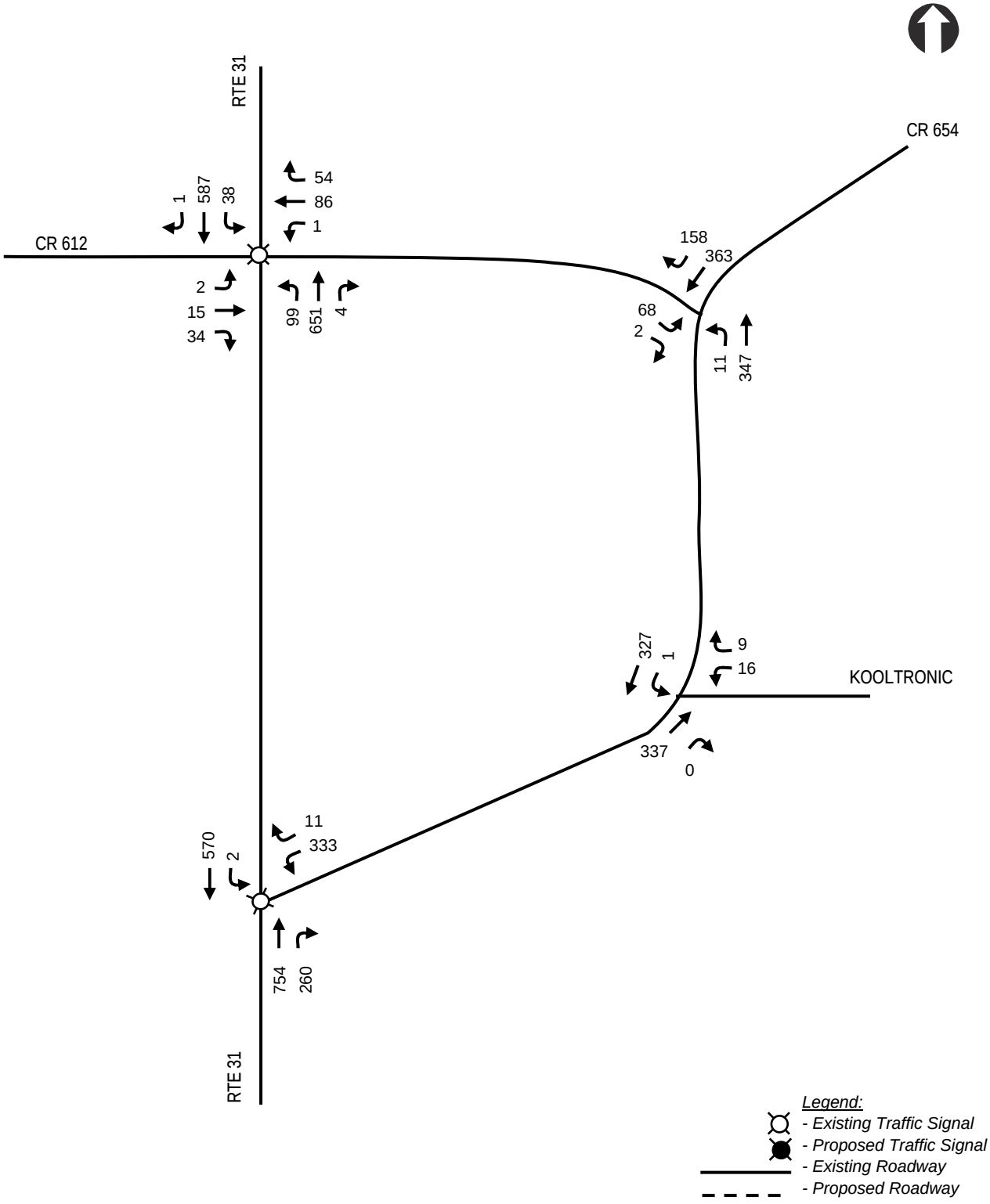
TRANSPORTATION ENGINEERS AND PLANNERS

FIGURE A-2

Existing PM Peak Hour Traffic Volumes

Marshall's Corner/Pennytown Redevelopment Area

HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY

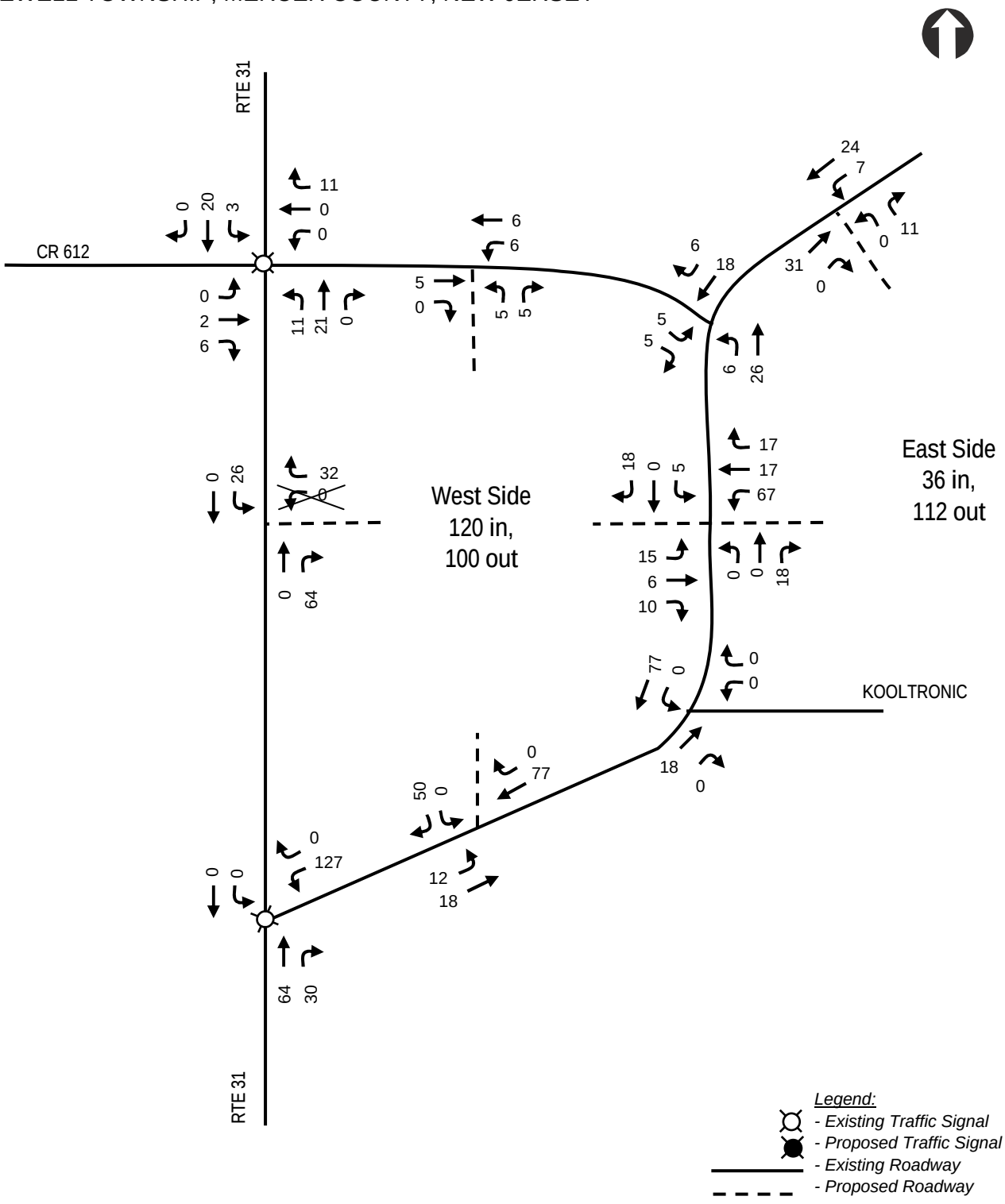


^ *NOTE: Traffic counts conducted in October, 2011*

Projected AM Peak Hour Redevelopment Traffic Volumes

Marshall's Corner/Pennytown Redevelopment Area

HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY

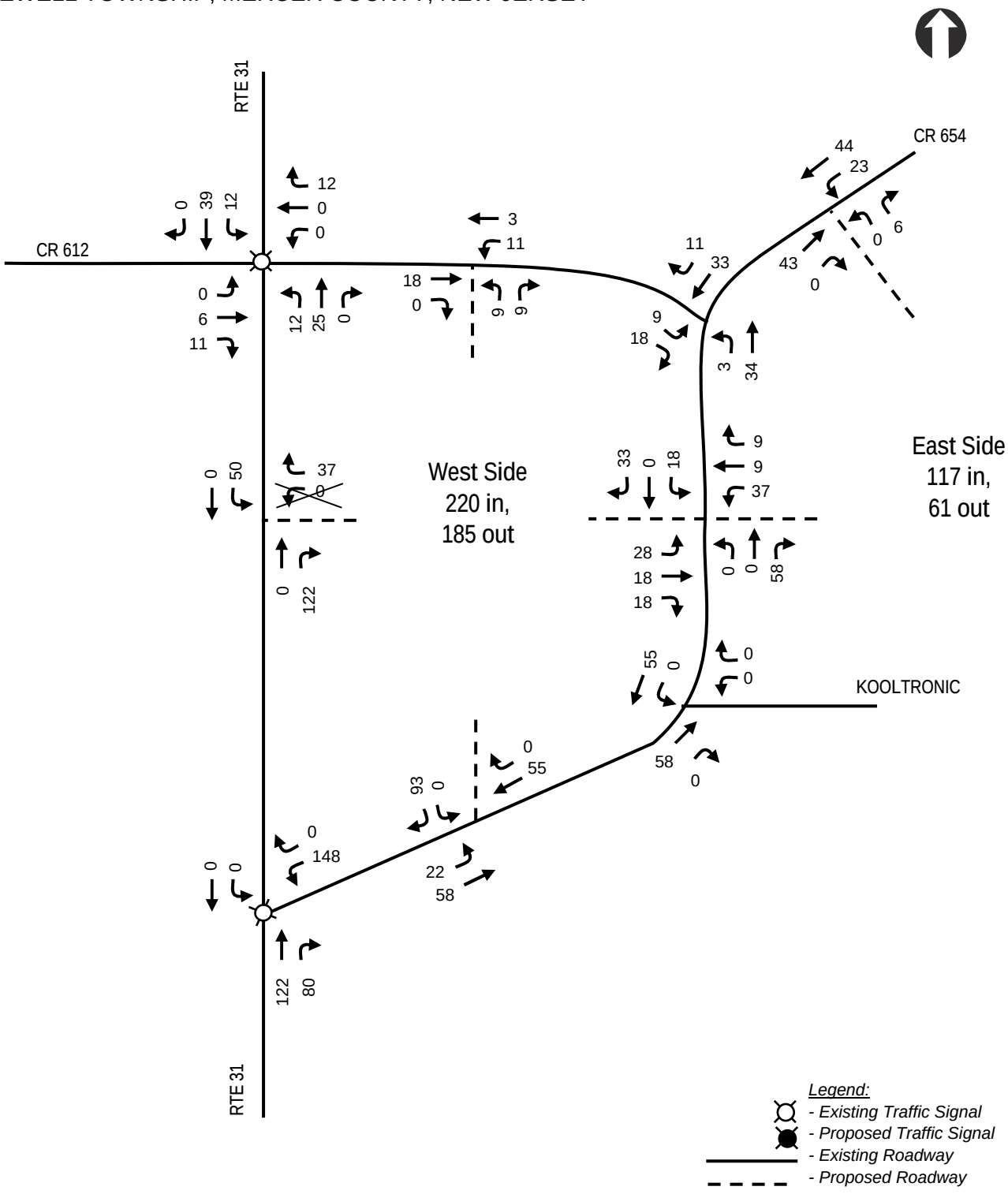


^ *NOTE: Based upon traffic estimates for Redevelopment Plan and estimated traffic distribution noted in March, 2013 Traffic Report*

Projected PM Peak Hour Redevelopment Traffic Volumes

Marshall's Corner/Pennytown Redevelopment Area

HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY



*NOTE: Based upon traffic estimates for Redevelopment Plan and estimated traffic distribution noted in March, 2013 Traffic Report

Figures A-5 and A-6 show total projected future AM and PM peak hour volumes – including existing traffic, 10% background growth, and estimated redevelopment traffic – on roads and intersections adjacent to the redevelopment site.

Volume-Capacity and Level of Service

While traffic volumes provide an important measure of activity on the area road system, evaluating how well that system accommodates those volumes is also important, i.e., a comparison of peak traffic volumes with available roadway capacity. By definition, capacity represents the maximum number of vehicles which can be accommodated given the constraints of roadway geometry, environment, traffic characteristics and controls.

Primary intersections control capacity in road networks, since conflicts exist at these points between through, crossing and turning traffic. Because of these conflicts, congestion is most likely to occur at intersections. Therefore, intersections are studied most often when determining the quality of traffic flow.

Although an unsignalized intersection on a through route is seldom critical to the overall capacity of the through route, it may significantly affect the capacity of the minor cross route and it may influence the quality of traffic flow on both. When analyzing unsignalized intersections, major street through movements and right turns are unimpeded and have the right-of-way over all side street traffic and left turns from the major street. All other turning movements in the intersection cross, merge with, or are otherwise unimpeded by major street movements.

Traffic delays at unsignalized intersections are determined by sequentially processing these unimpeded movements. For each impeded movement in turn, all conflicting flows are summed. It should be noted that the Highway Capacity Manual (HCM) assumes a random arrival for all the movements, which is not always the case (i.e., an adjacent signal will platoon vehicles).

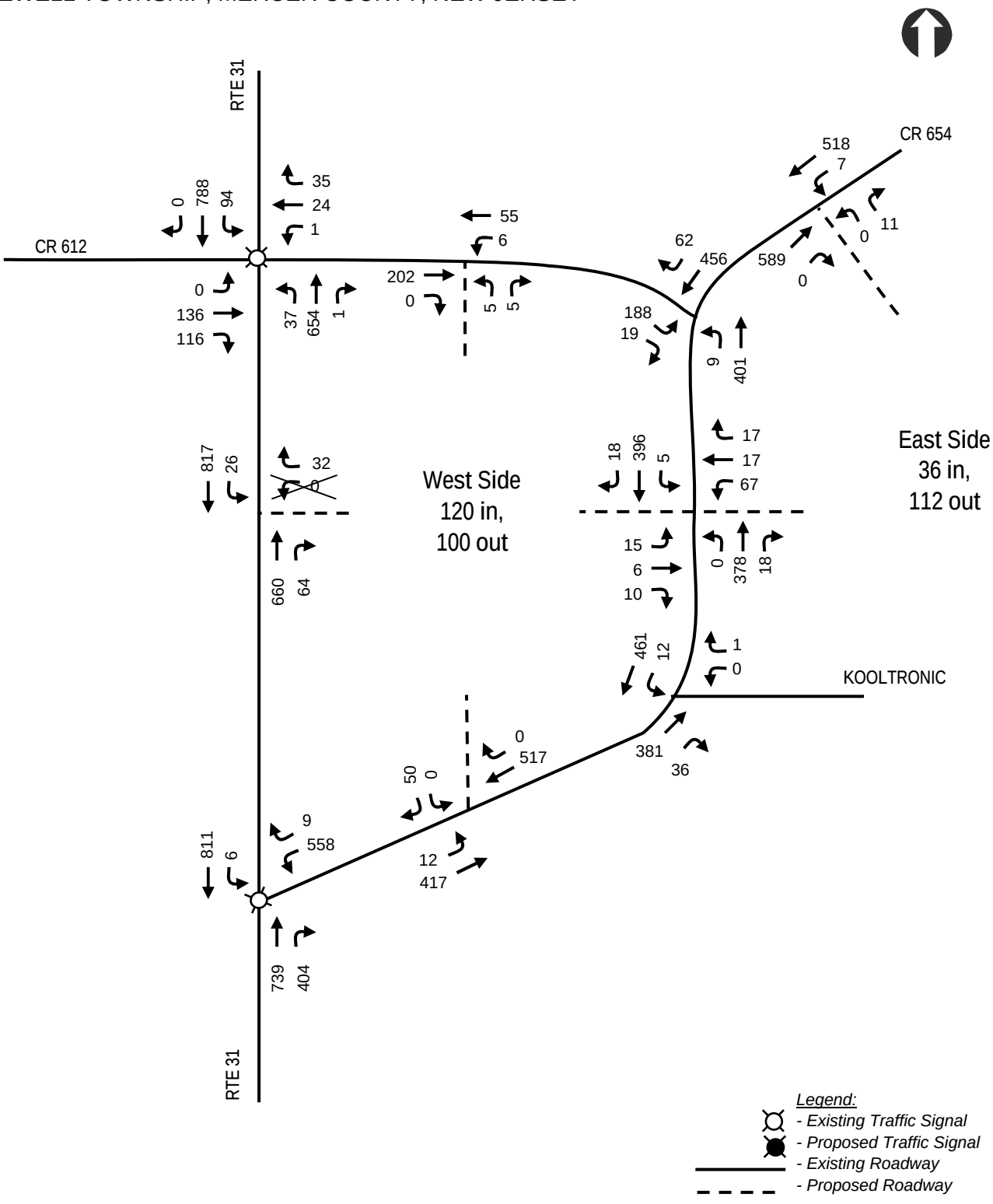
Since operation at capacity is usually unsatisfactory to most drivers, a descriptive concept has been developed for unsignalized intersections called level of service. Level of service relates expected traffic delay to each critical movement. Unsignalized levels of service range from level of service ‘a’ (indicating average delays of 10 seconds or less), to level of service ‘f’ (indicating average delays of greater than 50 seconds). A more detailed level of service description for unsignalized intersections is summarized in Table A-I.

Factors that affect the various approach capacities at signalized intersections include width of approach, number of lanes, signal ‘green’ time, turning percentages, truck volumes, etc. However, operation at capacity can be less than satisfactory since substantial delays or reduced operating speeds are likely. Table A-II summarizes descriptions of levels of service for signalized intersections.

Projected Future AM Peak Hour Traffic Volumes

Marshall's Corner/Pennytown Redevelopment Area

HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY

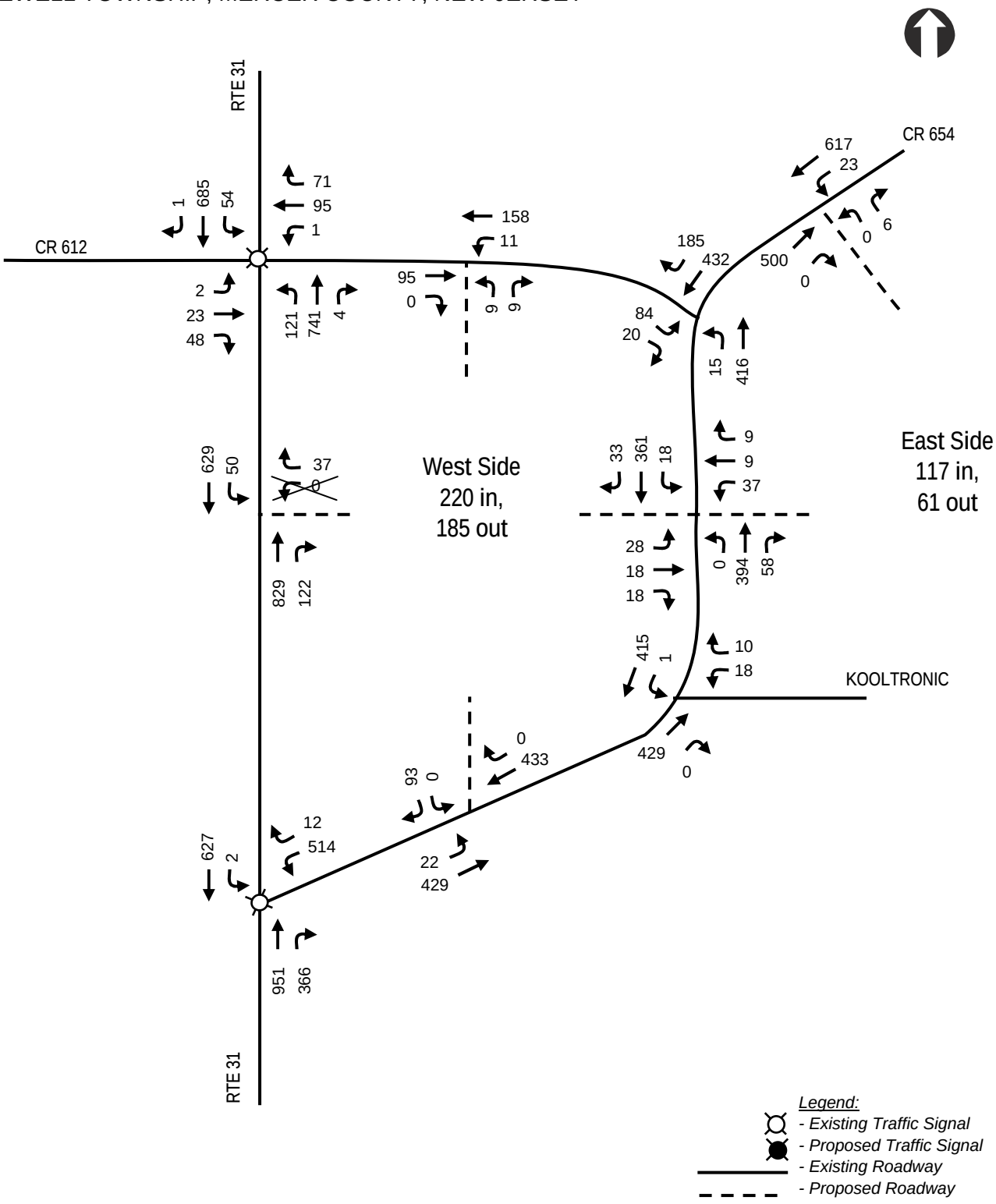


^ NOTE: Volumes include existing traffic plus 10% background growth plus redevelopment traffic

Projected Future PM Peak Hour Traffic Volumes

Marshall's Corner/Pennytown Redevelopment Area

HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY



^ NOTE: Volumes include existing traffic plus 10% background growth plus redevelopment traffic

TABLE A-I

LEVEL OF SERVICE AND EXPECTED DELAY
FOR UNSIGNALIZED INTERSECTIONS[1)]

LEVEL OF SERVICE	EXPECTED TRAFFIC DELAY	AVERAGE CONTROL DELAY (SECONDS/VEHICLE)
a	Little or no delay	≤ 10.0
b	Short traffic delays	10.1 to 15.0
c	Average traffic delays	15.1 to 25.0
d	Long traffic delays	25.1 to 35.0
e	Long traffic delays	35.1 to 50.0
f	Very long traffic delays	> 50.0

1) *Highway Capacity Manual, published by the Transportation Research Board, Washington, D.C., 2000.*

TABLE A-II

LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS[1)]

LEVEL OF SERVICE	EXPECTED TRAFFIC DELAY	AVERAGE CONTROL DELAY PER VEHICLE (SECONDS/VEHICLE)
A	Very low delay, good progression; most vehicles do not stop at intersection.	10.0
B	Generally good signal progression and/or short cycle length; more vehicles stop at intersection than level of service A.	10.1 to 20.0
C	Fair progression and/or longer cycle length; significant number of vehicles stop at intersection.	20.1 to 35.0
D	Congestion becomes noticeable; individual cycle failures; longer delays from unfavorable progression, long cycle length, or high volume/ capacity ratios; most vehicles stop at intersection.	35.1 to 55.0
E	Usually considered limit of acceptable delay indicative of poor progression, long cycle length, or high volume/capacity ratio; frequent individual cycle failures.	55.1 to 80.0
F	Could be considered excessive delay in some areas, frequently an indication of oversaturation (i.e., arrival flow exceeds capacity), or very long cycle lengths with minimal side street green time. Capacity is not necessarily exceeded under this level of service	> 80.0

1) *Highway Capacity Manual, published by the Transportation Research Board, Washington, D.C., 2000*

Delays cannot be related to capacity in a simple one-to-one fashion. It is possible to have delays in the level of service 'F' range without exceeding roadway capacity. Substantial delays can exist without exceeding capacity if one or more of the following conditions exist:

- long signal cycle lengths;
- a particular traffic movement experiences a long red time; or,
- progressive movement for a particular lane group is poor.

Analysis of existing volume-capacity and level of service relationships during weekday AM and PM peak hours yields the results illustrated in Figure A-7 (AM) and A-8 (PM). Review of the results indicate that the two signalized intersections on Route 31 (i.e., at C.R. 612 and C.R. 654) operate at a very satisfactory level of service (i.e., 'B' or 'C') during both AM and PM peak hours. However, the county road approaches to Route 31 at both intersections do encounter some delay (i.e., LOS D).

The 'Stop' sign controlled approaches on C.R. 612 at C.R. 654 and on Kooltronic driveway at C.R. 654 operate at Level of Service 'c' or better during both peak periods with one exception - - the eastbound approach on C.R. 612 at C.R. 654 during the AM peak which functions at LOS 'e'. Again, it is likely that volume making this movement at the time of the count is somewhat greater than normal because of the Route 518 detour.

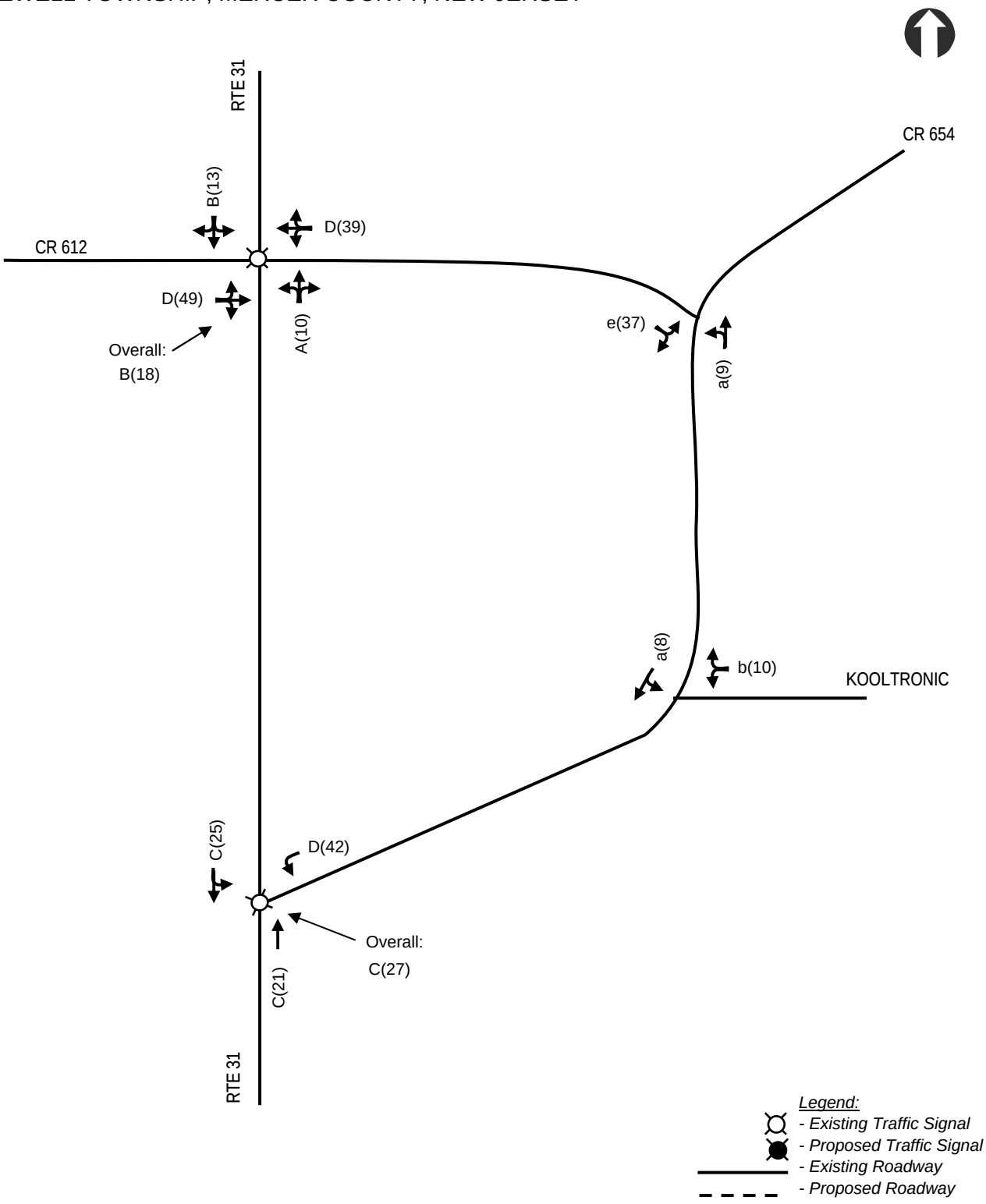
Calculated AM and PM peak hour levels of service under anticipated future conditions (with background growth and with redevelopment) are shown in Figures A-9 (AM and A-10 (PM). As indicated, analyses generally indicates that there will be some increase in delay in the future – as would be expected with any increase in traffic volume – but there should be no significant deterioration in the levels of traffic service. Overall intersection service levels will be satisfactory during both peak hours but the southbound approach on C.R. 654 at N.J. Route 31 will operate at LOS 'E' during both peaks. Traffic signal timing should be monitored at this intersection as development proceeds.

Figures A-9 and A-10 show calculated LOS results at the intersection of the 'primary street' with C.R. 654 if the intersection were signalized in the future. As shown, the intersection would operate at satisfactory service levels.

Existing AM Peak Hour Levels of Service

Marshall's Corner/Pennytown Redevelopment Area

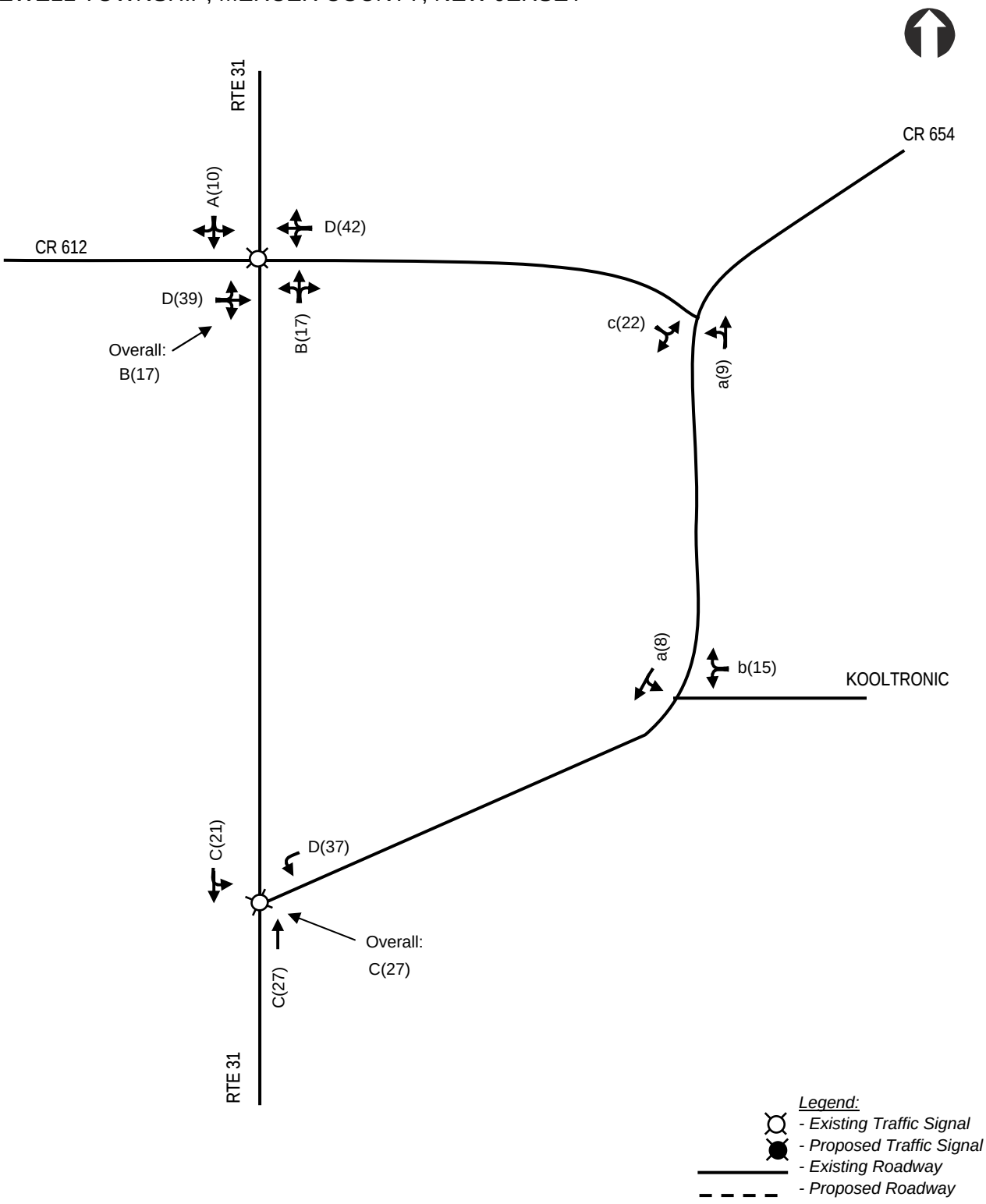
HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY



Existing PM Peak Hour Levels of Service

Marshall's Corner/Pennytown Redevelopment Area

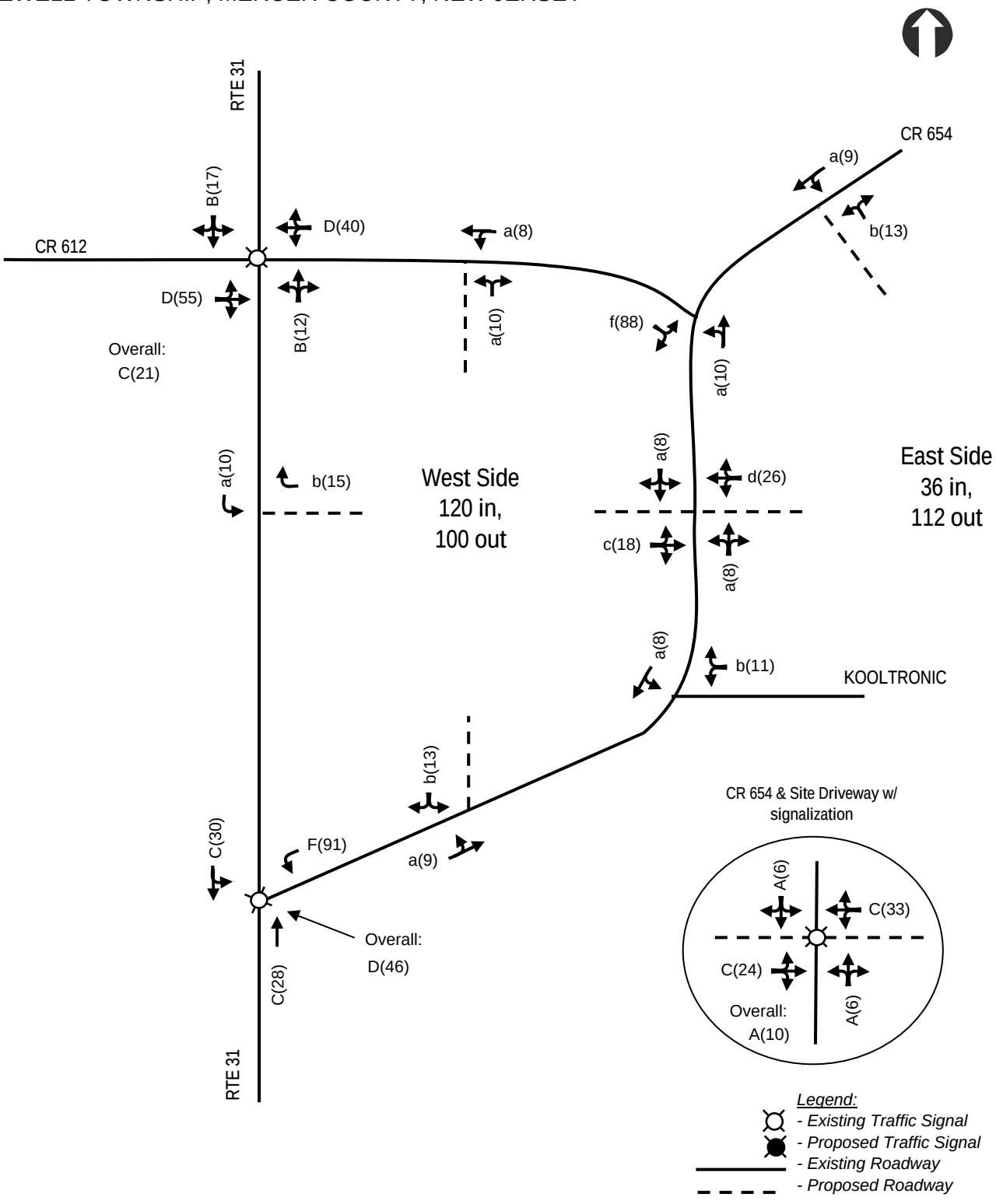
HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY



Projected Future AM Peak Hour Levels of Service

Marshall's Corner/Pennytown Redevelopment Area

HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY

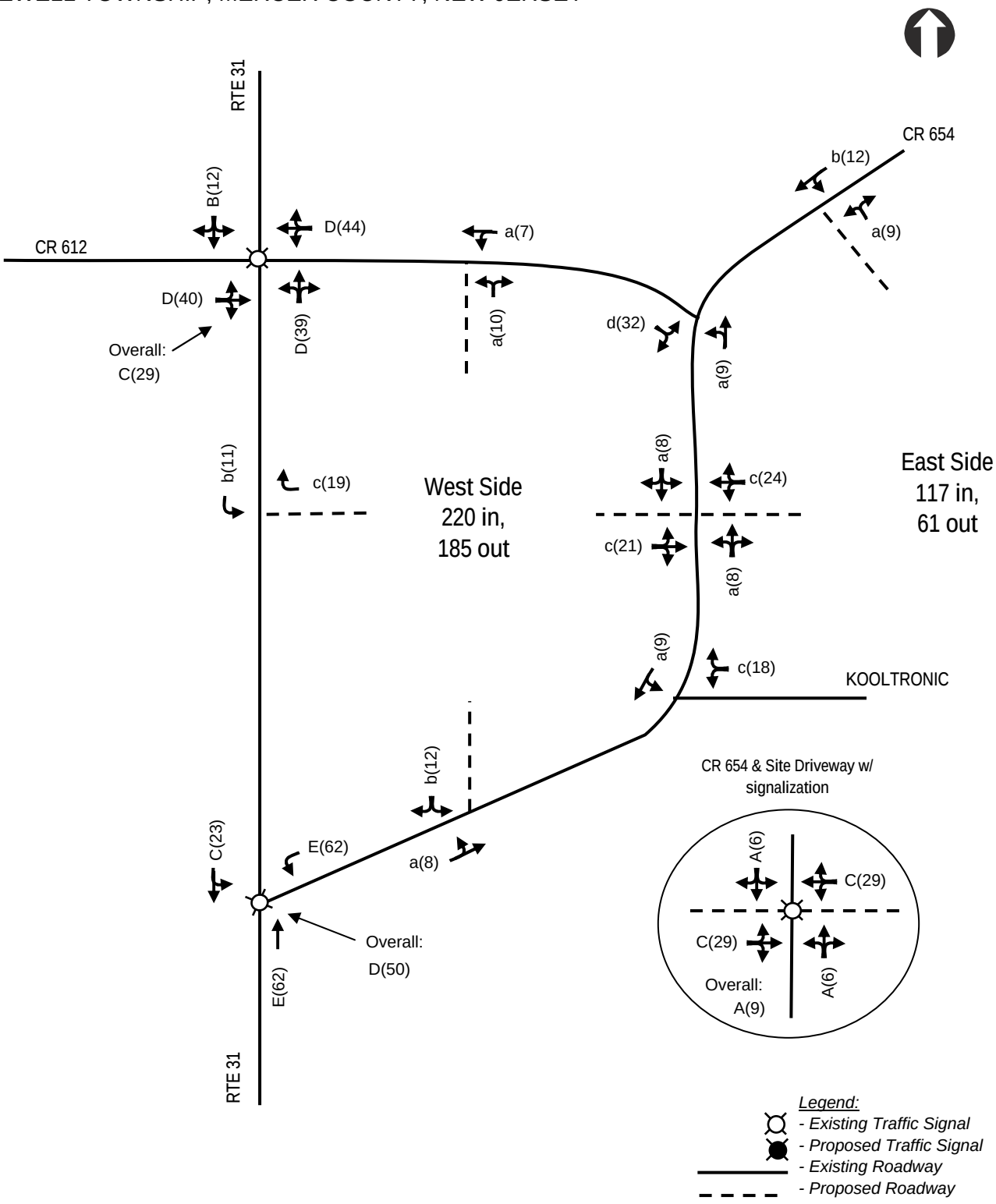


** NOTE: Assuming projected future traffic volumes (as shown in Figure A-5)*

Projected Future PM Peak Hour Levels of Service

Marshall's Corner/Pennytown Redevelopment Area

HOPEWELL TOWNSHIP, MERCER COUNTY, NEW JERSEY



*NOTE: Assuming projected future traffic volumes (as shown in Figure A-6)