HIGHWAY ACCESS MANAGEMENT
Along Pennsylvania Highways
In the Delaware Valley

Case Study Corridor:
DURHAM ROAD (PA 413)

Wrightstown and Newtown Townships, Bucks County, Pennsylvania

Delaware Valley Regional Planning Commission
OCTOBER 2008
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EXECUTIVE SUMMARY

This access management case study addresses a 4-mile-long congested segment of Durham Road (PA 413)—a two-lane, north–south, principal arterial highway traversing suburban and developing settings in Newtown and Wrightstown Townships, Bucks County, Pennsylvania.

Highway access management techniques were assembled into a conceptual plan for the corridor to improve safety and mobility and to prolong the highway’s serviceability in light of ongoing regional growth and development. The work was performed by DVRPC staff in support of PennDOT’s effort to promote wider planning for and application of access management procedures within the Commonwealth. The procedures are applicable to both state and local highways, and the strategies are most effectively delivered through municipal ordinances that govern the land development design, application, review and approval process. As such, principal guidance for developing the plan work was obtained from PennDOT’s publication *Access Management Model Ordinances for Pennsylvania Municipalities Handbook.*

The foundation of the conceptual access management plan for Durham Road lies within its classification as a principal arterial highway. Principal arterials should emphasize and provide for mobility for longer distance trips and through-travel, versus direct access to abutting property and local trips. Accordingly, to support its purpose and functional integrity for the foreseeable future, changes to property access, and recommendations for geometric improvements and traffic control were integrated into the plan. Within Newtown, the more developed portion of the corridor, current access designs and practices are established and well defined. More opportunities were identified in the Wrightstown portion of the corridor due to its developing nature.

Improvement recommendations were developed with municipal, county and PennDOT staff participation. In summary, the conceptual plan recommends:

- closing or modifying selected existing driveways along Durham Road;
- identifying potential future access points for developable properties;
- providing traffic signals and additional dedicated turn lanes for key intersections along Durham Road;
- establishing cross easements between adjacent properties to manage / direct traffic to full movement access points regulated by traffic signals; and
- integrating internal development roadways, trails and sidewalks to distribute vehicles more effectively, reduce reliance on higher order highways for local trips, and serve / encourage non-motorized travel.

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1 The document is available on-line at:
1. INTRODUCTION

**access** \(\text{ˈək-səs}\) also ik-ˈses\ n 2a: permission, liberty, or ability to enter, approach, or pass to and from a place or to approach or communicate with a person or thing

**management** \(\text{ˈmə-nij-mənt}\) n 2: judicious use of means to accomplish an end

**access management** \(\text{ˈək-səs-ˈmə-nij-mənt}\) n 1: systematic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway

Highway access management is one of many strategies available to prolong and/or improve the function of a state or local roadway. The methods employed in access management seek to identify corridor needs, optimize the existing transportation infrastructure, and accommodate eventual change. Access management strategies generally work toward eliminating turning movements at driveways, reducing through travel interruptions, and making vehicle entrances and exits to/from driveways and roadways more predictable.

Because the strategy is so closely related to land development, and land use and development are municipal responsibilities, implementation can most effectively be achieved through the practices, plans, and ordinances which guide and support the municipality’s land development design, application, review and approval processes (e.g., the Official Map, the Comprehensive Plan, the Zoning Ordinance and the Subdivision and Land Development Ordinance). In turn, formal placement and design of new intersecting streets and driveways along important state and municipal highways within its jurisdiction can be regulated by the municipality. Where state highways are involved, formalized access management plans can also be supported by PennDOT’s highway occupancy permitting process. The plan’s successful outcome, for both highway systems, very often is hinged upon early and frequent communication, coordination and cooperation between the developer, the municipality, and PennDOT (where state highways are involved).

Access management can be a relatively low cost means of reducing congestion and increasing both the efficiency and safety of a roadway if implemented through the land development design and approval process. Access management techniques can be introduced on a case-by-case basis by retrofitting access at individual parcels along developed highway corridors or incrementally along growing corridors. The key to each is to have a defined plan of approach and the legal basis for requiring compliance.

According to the Transportation Research Board the goals of access management are accomplished by applying the following principles:

1. Provide a specialized roadway system – design and manage roadways according to the transportation function they are expected to serve;
2. Limit direct access to major roadways – limiting points of interruption favors travel mobility;
3. Promote intersection hierarchy – transitions between differing highway classes should be logical and efficient;
4. Locate traffic signals to favor through movement – long, uniform spacing between signalized intersections is more amenable to coordinated traffic control systems that provide for continuous traffic movement at desired speeds;
5. Preserve the functional areas of intersections and interchanges – areas within an intersection where deceleration and maneuvering decisions are made, as a result of the intersection’s design / control, should remain free of external, extraneous influences;

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2 Merriam-Webster’s Collegiate Dictionary. – Eleventh edition
6. Limit the number of conflict points (places where the paths of vehicles intersect) – to simplify the driving experience, and reduce decision making and the chances for making mistakes that can lead to collisions;
7. Separate conflict areas – provide sufficient distance and time for decision making;
8. Remove turning vehicles from through-traffic lanes – separate / protect turning vehicles with lanes that accommodate deceleration and storage to reduce stopping interruptions and conflicts along the main thoroughfare;
9. Use nontraversable medians to manage turning movements – effective for improving roadway safety; and
10. Provide a supporting street and circulation system – networks of local and collector streets which accommodate development, and unify property access and circulation systems are highly desirable for dispersing traffic demand and eliminating local travel from higher order highways. Interconnected streets, sidewalks and trails also provide alternate routes for bicyclists and pedestrians.

National studies indicate that where access management techniques are consistently implemented along a highway corridor, collisions can be reduced by as much as 50 percent;\(^4\) capacities increased between 23 and 45 percent; and travel times and delays reduced as much as 40 to 60 percent\(^5\) versus highway segments with un- or under regulated access management practices. Other studies have concluded that increasing driveway interferences (e.g., conflict points) from 10 to 20 per mile can result in a 30 to 40 percent increase in crashes along a highway.

*Highway functional classification* is a term that implies the hierarchy and interconnectivity of a highway network. Typically, freeways, expressways, and arterial highways provide for through-travel and mobility over longer distances. Local travel, composed of shorter trips, is served by collector roads and local streets. More often than not, trips include both local and longer-distance elements, hence the importance of interconnectivity and continuity of the system to serve all highway trips. Functional classification is an important parameter in determining the extent to which access management strategies should be applied.

The federal aid highway functional classification system for the study corridor is illustrated in Figure 1. Besides defining a network of highways that are most important locally, regionally, and nationally; highways designated in the system may also be eligible for federal funding assistance when transportation improvement projects are contemplated.

The relationship between mobility and land access represented by a highway’s functional class is conceptualized in Figure 2. With the exception of limited access highways (e.g., expressways, where movements to and from the highway occur only at interchanges) and some principal arterial highways (the Newtown Bypass being an example), properties abutting highways are legally entitled to access. Proper emphasis of the highway’s main purpose can be achieved through recognition and definition—to carry traffic or serve abutting property—and design. Access management plans / designs supported by ordinances reinforce the desired purpose of the highway.

A foundation for understanding the hierarchy of roads is represented by the federal aid highway classification system. Typically, functional classification maps and highway designations are also found in municipal comprehensive plans. Highway design standards, contained in PennDOT manuals and

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\(^4\) National Cooperative Highway Research Program (NCHRP) Report 420.
\(^5\) National Highway Institute (NHI).
municipal ordinances, reinforce the intended function of a highway. PennDOT’s Access Management Model Ordinances Handbook also arranges its guidelines in relation to a highway’s functional classification.

DVRPC’s access management work program was created to promote and support PennDOT’s Model Access Management Ordinance project with the participation of the membership and the municipalities. To do this, DVRPC’s approach focuses on identifying and selecting appropriate corridor segments from ongoing plans and studies, and conducting a highway access management case study which may be more clearly understood and/or put into practice by the involved municipality(ies).

Principally, DVRPC’s highway access management planning methodology draws from the region’s federally mandated Congestion Management Process (CMP), which aims to minimize congestion and enhance the mobility of both people and goods along a defined network of highways. The CMP acts as a connection between the region’s Long Range Plan and the region’s Transportation Improvement Program (TIP) to ensure that appropriate strategies are applied to improve regional transportation facilities. An initial step in the CMP was to define congested corridors throughout the Delaware Valley. The process then considered characteristics within each corridor and preliminarily identified strategies—including access management techniques—to mitigate congestion. Consequently, with the direct participation of the local municipality in the case study evaluation, DVRPC’s access management corridor approach provides a more detailed evaluation of the CMP’s general recommendations and a sounding board for its acceptance.

Figure 2 – Roadway Purpose and Classification

A suitable balance between land access and mobility—reinforced by design—promotes a highway’s intended purpose (i.e., its functional classification).

Both existing and emerging congested corridors.
A multijurisdictional, multimodal steering committee was formed in January 2007 to help initiate and guide the regional work program, and provide comments on the individual case study products. The steering committee was represented by regional and county transportation and community planners, staff from the City of Philadelphia’s Planning Commission and its Department of Streets, PennDOT District 6-0’s Traffic Engineering and Highway Permits units, and SEPTA’s Service Planning Department. Usually, the “host” steering committee member participated in working meetings with the local municipality. Municipal representatives that participated in the corridor case study planning exercises were also given the opportunity to review and make comments on the draft report.

The congested corridor subject for this case study evaluation is Durham Road (PA 413)—between Second Street Pike (PA 232), in Wrightstown Township, and the Newtown Bypass (PA 413 / PA 532), in Newtown Township, Bucks County, Pennsylvania. DVRPC’s current CMP identifies the portion of PA 413 within Newtown Township in association with the PA 332 and the Newtown Bypass as congested corridors. The limits of the study corridor were extended to PA 232, in Wrightstown, to provide a logical terminus on the north. The corridor extends approximately 4 miles. Roughly half of the corridor is situated in each township. The study roadway is a two-lane highway and has dedicated left-and/or right-turning lanes provided at selected locations.
2. **ROADWAY, TRAFFIC and TRANSPORTATION CHARACTERISTICS**

Durham Road (PA 413) is an undivided, two-lane, state-owned and -maintained highway, signed for north–south travel. Speed limit signs are posted for 45 miles per hour throughout, and there is no parking along the highway. Travel lane widths are 12 feet, and 4-foot-wide paved shoulders are typical along both sides of the highway. Auxiliary / separate left- and/or right-turning lanes and wider shoulders are common at driveways and along frontages of newer developments in the corridor. Within Newtown, the more developed portion of the corridor, access designs are relatively well defined. In Wrightstown, more opportunity exists to influence future conditions because of the less developed nature of the land abutting the corridor.

The highway is classified as an urban principal arterial in the federal aid highway functional classification system. The highway carries an average of between 13,000 and 15,000 vehicles per day, with a spike in volume—to 17,000 or 18,000 vehicles per average day—occurring in the segment between the Worthington Mill / Wrightstown roads and Stoopville Road intersections (Figure 3).

Other noteworthy roadways intersecting Durham Road are described below.

- Windy Bush Road (PA 232, north of PA 413) – a two-lane Urban Collector, serving approximately 5,000 vehicles per day on average;
- Second Street Pike (PA 232, south of PA 413) – a two-lane Urban Minor Arterial, serving approximately 6,000 vehicles per day on average;
- Wrightstown Road – a two-lane Rural Minor Collector, serving approximately 2,000 vehicles per day on average;
- Worthington Mill Road – a two-lane Urban Collector, serving approximately 2,000 vehicles per day on average;
- Stoopville Road – a two-lane Urban Collector, serving about 6,000 vehicles per day on average;
- Newtown Bypass (PA 532, north of PA 413) – a two-lane Urban Minor Arterial, serving approximately 10,000 vehicles per day on average; and
- Newtown Bypass (PA 413 / PA 532, south of Durham Road) – a four-lane Urban Principal Arterial, serving approximately 18,000 vehicles on average.

Each is a state owned and maintained highway.

Other intersecting roadways are owned and maintained by the townships. Their primary function is to serve local travel and abutting properties; they serve low volumes of traffic and are not part of the federal aid highway system. Although in the scheme of circulation within the townships, they too reflect a hierarchy for local travel. A variety of commercial and residential driveways also intersect Durham Road.

The following intersection lane assignments and methods of intersection traffic control are encountered along Durham Road, traveling southbound from the PA 232 intersection.

- A five-legged signalized intersection at PA 232 / Park Avenue permitting all traffic movements without dedicated left or right turn lanes;
- An unsignalized (minor street stop sign controlled) “T” intersection with Anchor Road (one way toward PA 413) allowing only right turns from Anchor Road to PA 413 southbound;
- A series of unsignalized (minor streets stop sign controlled) “T” intersections with public roads (Midland Road, Wrenwood Road, Brownsburg Road, and Penns Park Road) which permit all traffic movements and do not provide dedicated turning lanes;
• An unsignalized (minor street stop sign controlled) four-way intersection with Wrightstown Road / Worthington Mill Road which permits all movements without dedicated turning lanes (as a result of a developer agreement, the township has installed separate center left tuning lanes on the PA 413 approaches with traffic signalization of the intersection anticipated by the end of October 2008);
• An unsignalized (minor street stop sign controlled) “T” intersection with Stoopville Road which permits all traffic movements without dedicated turning lanes;
• An unsignalized (minor street stop sign controlled) “T” intersection with Twining Bridge Road which provides for all traffic movements without dedicated turning lanes;
• A signalized “T” intersection with North Drive which permits all traffic movements, and has dedicated lanes for southbound left turns and northbound right turns;
• An unsignalized (minor street stop sign controlled) “T” intersection with Municipal Drive which allows all traffic movements and has a dedicated southbound right turn lane;
• An unsignalized (minor street stop sign controlled) four-way intersection with South Drive / All Saints Cemetery allowing all traffic movements with a dedicated center left turn lane on PA 413, and a separate northbound right turn lane to South Drive;
• A signalized “T” intersection with Wrights Road which permits all traffic movements and has dedicated lanes for southbound left turns and northbound right turns;
• A series of unsignalized (minor streets stop sign controlled) “T” intersections with roadways serving abutting residential developments (Chatham Place, Maple Lane, Cloverlee Lane, and Valley View Way) which permit all traffic movements, only the Chatham Place intersection is afforded a dedicated northbound left turn lane; and
• A four-way signalized intersection with the Newtown Bypass / Newtown Shopping Center serving all traffic movements with dedicated left and right turn lanes throughout.

Crash data, covering the years 2001 through 2005, was obtained for PA 413 and evaluated. PennDOT’s database of reportable crashes occurring along state highways is confidential and was used in a general fashion to assess relative traffic safety conditions along the corridor. Organizing traffic crashes by location and type is a logical way of assessing traffic safety at a particular location or throughout a corridor. In turn, numbers of crashes, patterns of crashes, and related causation factors can be determined; and general countermeasures can be identified where concerns exist.

The majority of crashes along the Durham Road corridor involved property damage only, and the leading crash types were rear end crashes and angle accidents. No individual location (intersection or midblock) stood out as a serious traffic safety concern.

SEPTA operates one bus route in the wider study area. The Route 130 bus operates between the Franklin Mills Mall and the Newtown Campus of the Bucks County Community College located on Swamp Road. The bus route does not operate along Durham Road.

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7 Reportable crashes in Pennsylvania are defined to be those resulting in injury or death and/or requiring a tow-away. The crash data used in this report was provided by the Pennsylvania Department of Transportation for DVRPC’s traffic safety related transportation planning and programming purposes only. The raw data remains the property of PennDOT and its release to third parties is expressly prohibited without the written consent of the Department.
3. **LAND USE, and HUMAN and NATURAL ENVIRONMENTS**

The relationship between land use and transportation facilities is central to any traffic study. The use of the land—where people live, work and play—and its intensity is responsible for trip generation and its magnitude. The aerial spread of the uses and the transportation facilities connecting or serving the uses are responsible for how trips are made (e.g., by highway, transit, walking, etc.).

Natural and cultural resources sustain environmental functions, provide recreational opportunities, and enhance the quality of life for local residents.

**LAND USE**

*Figure 4a and Figure 4b* display the categories and spread of land coverage in 2005 for the Wrightstown and Newtown portions, respectively. The corridor is suburban in nature within Newtown Township but more lightly developed within Wrightstown. Single-family subdivisions and large undeveloped tracts presently wooded, vacant, or devoted to agriculture are typical along the corridor. Two townhome communities are present in Newtown Township, and retail concentrations are found at the PA 232 and Newtown Bypass ends of the corridor.

Anticipated growth in the corridor is reflected in development data obtained from the *Bucks County Regional Traffic Study* (DVRPC, 2007, Publication No. 07026) and Wrightstown and Newtown townships.

1) CVS Pharmacy (now open for business) at Anchor Road and PA 413
2) Toll-Chapman Corners: at the intersection of Wrightstown Road and PA 413, 46 single-family homes all accessing Wrightstown Road
3) Toll-Highlands at Chapman Corners: 22 single-family homes with access on Wrightstown Road across from Toll-Chapman Corners
4) Matthews Ridge: 16 single-family homes on Brownsburg Road
5) Baltimoral: 7 single-family homes, down the street from Matthews Ridge, accessing Brownsburg Road
6) Reeve Tract in Upper Makefield Township: approximately 65 single-family homes accessing Brownsburg Road, just north of the Wrightstown township line
7) Potentially two new Council Rock School District schools: accessing Durham Road across from Stoopville Road
8) Delancy Court: a 120 unit age-qualified townhome community currently being constructed across Durham Road from the Newtown Township municipal complex, accessing Durham Road opposite from and aligned with Municipal Drive
9) Woll Tract Park: a Newtown Township park located on Durham Road adjacent to the Newtown Elementary School and opposite the Newtown Township Nature Center; access is proposed via a driveway intersecting Durham Road aligned with the nature center's driveway, and via Wrights Road through the Newtown Elementary School's parking lot

Where possible, the development locations have been identified on the corridor’s conceptual access management plan.

**HUMAN AND NATURAL ENVIRONMENTS**

To the degree that federal funding might be involved in any aspect of developing or implementing recommendations from this study, it deserves mentioning that some advance inventorying work was performed in identifying human and natural environments along the corridor. As projects are developed,
the information may be helpful in engaging selected, targeted residents; helping identify avoidance steps; and/or preparing for the eventuality of compliance with the requirements of federal mandates. Federal law states that no person or group shall be excluded from participation in, or denied the benefits of, any program or activity utilizing federal funds. Each federal agency is required to identify any disproportionately high and adverse health or environmental effects of its programs on minority and low-income populations. In turn, Metropolitan Planning Organizations (MPO), as part of the United States Department of Transportation’s certification requirements, are charged with evaluating their plans and programs for environmental justice sensitivity, including expanding their outreach efforts to low-income, minority or other disadvantaged population groups.

As the MPO for the Philadelphia metropolitan region, DVRPC’s “Degrees of Disadvantage” process was applied to the study corridor using data from the 2000 Census. The finding of that process indicated that there are no census tracts along the Durham Road corridor containing disadvantaged populations exceeding defined regional thresholds. As such, special outreach activities to address environmental justice mandates will not be necessary.

Cultural landmarks and historic resources along the corridor include schools, colleges, municipal services buildings, medical sites, and historic sites. Those identified for the immediate PA 413 corridor are shown in Figure 5. As indicated, two houses of worship and the Newtown Township municipal complex abut the highway. The Wrightstown Historical District (centered at the intersection with Wrightstown and Worthington Mill roads) is bisected by Durham Road. The district is eligible for listing on the National Register of Historic Places.

Any impacts to these sites may require special review and clearances from:
- local interest groups
- the Pennsylvania Historical and Museum Commission

Local preservation codes may limit the scale or appearance of any improvements.

Natural features include floodplains, wetlands, and protected lands, etc., and are illustrated in Figure 6. Protected lands, under municipal ownership, exist in Newtown Township and in Wrightstown Township, and a floodplain crosses PA 413 at the northern end of the corridor in Wrightstown.

Impacts to water and wetlands features, as a consequence of physical changes financed with federal money, will require proper mitigation emanating from review and approvals by:
- the Pennsylvania Department of Environmental Protection
- the U.S. Army Corps of Engineers, and
- the municipality, where local ordinances require

Impacts upon public lands will necessitate the involvement of:
- the Pennsylvania Department of Conservation and Natural Resources, and
- county and municipal owners for public lands

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8 Sources: Cultural landmarks - Pennsylvania Cultural Resources GIS, ADC Map Book Series, and DVRPC’s GIS files.
9 Sources: Floodplain, FEMA; Wetlands, US Fish & Wildlife Service; Water Features, DVRPC’s 2005 Land Use file.
Durham Road (PA 413) Case Study Corridor

Figure 4a: Study Area Land Use

Land Use (2005)
- Agriculture
- Commercial
- Community Services
- Residential: Multi-Family
- Parking
- Recreation
- Residential: Single Family
- Vacant
- Water
- Wooded

Map Features
- Municipal Boundary
- Local Road Network
- PA 413 - Study Corridor

Wrightstown Township

DELAVARE VALLEY REGIONAL PLANNING COMMISSION JUNE 2008
* aerial photos from the year 2006
Figure 4b: Study Area Land Use

Land Use (2005):
- Agriculture
- Commercial
- Community Services
- Residential: Multi-Family
- Vacant
- Water
- Wooded
- Transportation

Map Features:
- Municipal Boundary
- Local Road Network
- PA 413 - Study Corridor
4. CORRIDOR CONCEPTUAL PLAN

PennDOT’s publication *Access Management Model Ordinances for Pennsylvania Municipalities Handbook* was the prime resource used in generating recommendations in the study corridor. Access management strategies and applications within the model ordinances are structured in three tiers in which differing techniques are applied over different physical limits or geographic areas. The first tier focuses on applications suitable for individual parcels (i.e., number, placement, and design of driveways serving a parcel). The second tier addresses techniques for roadways (i.e., provisions for separate turning lanes along, and driveway placement within, a given roadway segment; traffic signal spacing). The third tier includes more comprehensive traffic and land use planning practices (including zoning overlay districts, official maps, continuous two-way left turn lanes versus nontraversable medians, etc.).

DVRPC staff drew from all three tiers and took the developments and traffic related improvements proposed by the townships into consideration, to develop the improvement scheme. To finalize the corridor’s conceptual plan, staff met and reviewed the suggestions with the municipal, county and PennDOT project advisory group.

General design guidelines underlying the conceptual plan were taken from the *Handbook*. The conceptual access management plan assumes that direct land access is more suited to secondary roadways than a principal arterial highway (Durham Road). Other guidelines were:

- Signalization along PA 413 should be limited to intersections with public streets. The locations would yield a minimum spacing of 1,000 feet between traffic signals.
- Primary development access, with all traffic movements permitted, should be aligned with the signalized locations to reduce conflict points for safety and to lessen interruptions to through travel.
- Cross easements and shared roadways should be pursued which will provide ingress and egress for multiple developments at the signalized locations.
- Other primary, full movement driveways should be directed to intersect secondary cross streets, or shared with adjacent developments and spaced at intervals of 600 feet (minimum) along Durham Road.
- Minor or secondary driveways serving properties along Durham Road should be restricted to right turns only.

The conceptual plan is illustrated in Figures 7a, 7b and 7c. Physical improvement elements within the plan include:

- closing or modifying selected existing driveways along Durham Road;
- identifying potential future access points for developable properties;
- providing traffic signals and additional dedicated turn lanes for key intersections along Durham Road (PA 232, Midland Road, Brownsburg Road, Penns Park Road, Wrightstown / Worthington Mill roads, Stoopville Road, North Drive and Wrights Road);
- establishing cross easements between adjacent properties to manage / direct traffic from multiple properties / developments to full movement access points regulated by traffic signals; and
- integrating internal development roadways to distribute vehicles more effectively, reduce reliance on higher order highways for local trips, and serve / encourage non-motorized travel.

Figures 8, 9, 10 and 11 provide enlargements of selected corridor recommendations, which are also briefly described in the following sections.
Idealized relocating the Park Avenue leg of the intersection (to make a conventional four-legged intersection) would be most effective as an initial step in accommodating traffic volume, but the strategy was considered undesirable to Wrightstown Township.

Alternatively, widening the PA 413 approaches to provide separate northbound and southbound left turn lanes and adding a protected left turn phase for the approaches is the basic traffic improvement recommendation for the intersection (Figure 8).

Driveway modifications in the immediate vicinity of the intersection are also recommended to better define the boundaries of the intersection and to reduce decision and conflict points within the functional area of the intersection. These improvements could be implemented through the municipal land development design, review, and approval process, and PennDOT’s Highway Occupancy Permits (HOP) process as adjacent properties develop and/or are redeveloped for change(s) in use or ownership.

The essence and perhaps majority of the intersection’s mobility improvement (e.g., excluding the access modifications) could be captured through a relatively low cost improvement which would update the traffic signal and reconstruct PA 413’s shoulders, repave and restrripe the intersection to supply the center left turning lanes without affecting adjacent properties. Potentially these improvements could be implemented in partnership with PennDOT maintenance, while engineering and traffic signalization costs would be borne by Wrightstown Township.
More complex alternatives for controlling traffic at the intersection have been identified, including a modern roundabout and far-side jug handles in place of left turn lanes. Both will be more costly to develop and construct, and may involve right-of-way acquisition; but may warrant deeper evaluations, if a conventional style improvement (as that depicted) does not yield sufficient traffic benefit. At the same time, both concepts are well beyond the matter at hand—highway access management.

**Intersection of Durham Road, Brownsburg Road and Penns Park Road**

Controlling access and managing traffic flow by closing driveways, establishing cross easements, and creating new shared driveways form the basis for the recommendation along Durham Road between the Brownsburg Road and Penns Park Road intersections. The concept is shown in Figure 9.

Full movement access to the properties should take place from the secondary roadways (Brownsburg and Penns Park roads) or via the shared development driveways that are in alignment with them. In turn, traffic signalization and left turning lanes on PA 413 should be provided at the newly created four-legged intersections. A nontraversable median is recommended between the signalized intersections to restrict turning movements at the intervening driveways.

Landscaping and curbing are recommended to define the development frontage, and roadway and driveway intersections. Parking (replacement) is situated behind the buildings with convenient access to the circulatory roadways.

The nature of the conceptual plan complements this stretch of Durham Road, where adjacent land use and zoning is a mix of commercial, residential and recreational uses. Were it to develop as such, a “village” might be established. Further, such settings—where posted speeds are 40 miles per hour or less—can also be candidates for traffic calming measures. As an example, textured / decorative crosswalks are depicted in Figure 9.

**Intersection of Durham Road and Wrightstown Road / Worthington Mill Road**

Wrightstown Township will install left turn lanes on PA 413 and a traffic signal at the intersection as a result of an agreement with Toll Brothers home builders (Figure 10). The improvement is scheduled for completion by the end of October 2008.
Intersection of Durham Road and Stoopville Road

Durham Road southbound approaching Stoopville Road: Wide shoulder allows through traffic to bypass stopped left turning vehicles (the school bus in the photo).

Photo by: DVRPC

Suggested intersection upgrades are contingent upon construction and the likely traffic effects of one or possibly two new Council Rock School District schools occupying the property opposite Stoopville Road—with primary access to/from Durham Road in alignment with Stoopville Road (Figure 11).

Adding dedicated center left turn lanes on PA 413 and traffic signalization are recommended for the intersection. In conjunction, pedestrian safety should be addressed with sidewalks or trails connected to adjacent subdivisions, and painted crosswalks and protected phasing accounted for in the signalized intersection design.
Durham Road (PA 413) Case Study Corridor

Figure 7a: Conceptual Access Management Plan

Access Management
- Development
- DVRPC Note
- Driveway Alignment
- Driveway Closing / Shoulder
- Signal
- Cross Easement

Map Features
- Municipal Boundary
- Local Road Network
- Signalized Intersection
- Parcels

Legend:
- Development
- DVRPC Note
- Driveway Alignment
- Driveway Closing / Shoulder
- Signal
- Cross Easement

Legend:
- Municipal Boundary
- Local Road Network
- Signalized Intersection
- Parcels

Note: Aerial photos from the year 2008.

[Map showing various access points and infrastructure, with labeled key features]
Durham Road (PA 413) Case Study Corridor

Figure 8: PA 413 / PA 232 / Park Avenue Intersection

Access Management
- Development
- DVRPC Note
- Recommendations
- Traffic Flow

Map Features
- Municipal Boundary
- Signalized Intersection
- Local Road Network
- Parcels
Figure 9: PA 413 / Brownsburg Road Area

The driveways depicted in this figure show the combination of shared access, service roads, and property aligned driveways. While implementing the shown configuration may be prohibitively difficult, it may be used as an example to influence future development in the corridor.

When these parcels are developed access should be obtained via Brownsburg Road and/or an extension of Fanno Park Road, including left turn lanes and a signalized intersection. Access between the parcels may be facilitated with a public easement.

Access Management

- Development
- DVRPC Note
- Recommendations
- Traffic Flow
- Median
- Driveway Alignment
- Driveway Closing / Shoulder
- Signal
- Cross Easement
- Decorative / textured Crosswalk

Map Features

- Municipal Boundary
- Signalized Intersection
- Local Road Network
- Parcels
5. CONCLUSIONS and IMPLEMENTATION

This access management case study addresses a 4-mile-long congested segment of Durham Road (PA 413)—a two-lane, north–south, principal arterial highway traversing suburban and developing settings in Newtown and Wrightstown Townships, Bucks County, Pennsylvania.

Highway access management techniques were assembled into a conceptual plan for the corridor to improve safety and mobility and to prolong the highway’s serviceability in light of ongoing regional growth and development. The work was performed by DVRPC staff in support of PennDOT’s effort to promote planning for and application of access management procedures within the Commonwealth. The procedures are applicable to both state and local highways, and the strategies are most effectively delivered through municipal ordinances that govern the land development design, application, review and approval process. As such, principal guidance for developing the plan was obtained from PennDOT’s publication Access Management Model Ordinances for Pennsylvania Municipalities Handbook.10

The foundation of the conceptual access management plan for Durham Road lies within its classification as a principal arterial highway. Principal arterials should emphasize and provide for mobility for longer distance trips and through-travel, versus direct access to abutting property and local trips. Accordingly, to support its purpose and functional integrity for the foreseeable future, changes to property access, and recommendations for geometric improvements and traffic control were integrated into the plan. Within Newtown, the more developed portion of the corridor, current access designs and practices are established and well defined. More opportunities were identified in the Wrightstown portion of the corridor due to its developing nature.

Major physical elements contained in the conceptual plan include:

- Selected existing driveways along Durham Road should be closed or relocated and consolidated along the highway and within the functional areas of important intersections to reduce conflict points and simplify the driving experience.
- Potential future access points for developable properties were cited.
- Traffic signalization along PA 413 should be limited to intersections with public streets. Existing and proposed intersections for traffic signalization along the corridor are: PA 232, Midland Road, Brownsburg Road, Penns Park Road, Wrightstown / Worthington Mill roads, Stoopville Road, North Drive, Wrights Road and the Newtown Bypass. [Note: a minimum spacing of approximately 1,000 feet between traffic signals can be maintained with the identified configuration.]
- Primary development access should be directed to secondary cross streets or aligned with signalized public roads for safety. Cross easements through adjacent properties should be pursued and shared roadways constructed to manage traffic flow, to help warrant traffic signals, to direct left turning vehicles generated by multiple developments to the signalized locations for safer ingress and egress, and to minimize interruptions along PA 413.
- Absent the ability to access secondary roadways or proposed shared driveways aligned with the traffic signals; new full movement, primary development driveways should be spaced at intervals of 600 feet (minimum) along Durham Road.
- Auxiliary lanes, particularly center left turn lanes, are suggested along PA 413 at the signalized intersections to reduce conflicts and enhance corridor mobility. Pedestrian safety elements should

be addressed in the signalized intersection design (e.g., protected phasing and painted crosswalks).

- Minor or secondary driveways intersecting Durham Road should be designed for right turns only, with separate right turn deceleration lanes provided along the arterial.
- Internal development roadways between adjacent developments should be integrated to distribute vehicles more effectively, to reduce reliance on higher order highways (for local trips), and to encourage non-motorized travel.
- Sidewalks and/or multiuse trails should be provided along internal development streets, and along development frontages to serve non-motorized travel.

Recommendations for developed properties are achievable to the degree that changes in use and or ownership occur through redevelopment. Appropriately designed access for new development is a simpler task to accomplish, but both developed and developing parcels need to be recognized and addressed in the vision—to effect a comprehensive improvement for the corridor.

Desirably, because the municipality is responsible for land use decisions, implementation should formally take place through the municipal land development design, application, review and approval process and be formally made part of the plans (the Official Map, the Comprehensive Plan) and codes (as overlay districts in the Zoning Ordinance, and design requirements in the Subdivision and Land Development Ordinances) for both Wrightstown and Newtown. The access management model ordinance handbook contains a more extensive list of techniques and designs (than are represented in the conceptual plan for the Durham Road corridor) to consider in a formal municipal ordinance.

The ultimate access management plans and municipal access management regulations should be communicated and coordinated with the county and PennDOT. Similarly, access design reviews of actual development proposals should be sought. Acknowledgement and consideration by these experts in these matters will further empower the vision of the municipalities and improve opportunities for implementing the plan (e.g., as add-ons to transportation projects being constructed by others and/or to garner support where significant cost sharing assistance would be sought through the regional Transportation Improvement Program).
REFERENCES


Pennsylvania Department of Transportation and New Jersey Department of Transportation, *SMART TRANSPORTATION GUIDEBOOK – Planning and Designing Highways and Streets that Support Sustainable and Livable Communities*, March 2008.

Title of Report: ACCESS MANAGEMENT ALONG PENNSYLVANIA HIGHWAYS IN THE DELAWARE VALLEY — Case Study Corridor: Durham Road (PA 413), Wrightstown and Newtown Townships, Bucks County, PA

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Geographic Area Covered: Wrightstown and Newtown Townships in Bucks County, Pennsylvania.

Key Words: Access management, congestion management, traffic safety, accident mitigation, corridor planning, model ordinance, growth management

ABSTRACT: The evaluations summarized in this report were performed in support of PennDOT’s statewide effort to promote the establishment of formal access management ordinances for state and local highways. A case study of Durham Road (PA 413), between PA 232 and the Newtown Bypass, was conducted and a conceptual plan prepared for a segment of Durham Road as a tangible illustration of the benefits of planning and implementing access management strategies; and as a means of combating congestion and enhancing traffic safety.

Principles and procedures outlined within PennDOT’s Access Management Model Ordinances for Pennsylvania Municipalities Handbook, the Transportation Research Board’s Access Management Manual, and the PennDOT / NJDOT Smart Transportation Guidebook were followed in developing the conceptual plan. The work was performed with the participation of staff from the Bucks County Planning Commission, PennDOT, and representatives from Wrightstown and Newtown townships.

Broadly described, the safety and mobility improvements suggested for the corridor included eliminating turning movements (by closing driveways or restricting movements), reducing through travel interruptions (by adding auxiliary turning lanes at traffic signals and providing a minimum of 1,000 feet between traffic signals), making vehicle entrances and exits to and from driveways and roadways more predictable (by supplying uniform spacing and better defined driveways, and provisions for shared access and integrated roadway, sidewalk and trail networks). Formal access management plans and codified ordinances are recommended, and close coordination with personnel from the PennDOT District 6-0 Traffic Unit and the Bucks County Planning Commission to secure the vision and benefits for PA 413 within Wrightstown and Newtown townships.

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