

Chapter 4: Roadway

4.1 Introduction

In 2010, the City of Hilliard partnered with Columbus Public Health and other local government, nonprofit, and business leaders to create the Franklin County Physical Activity Plan. This plan acknowledges that transportation, specifically a built environment that promotes *active* transportation such as walking and bicycling, is a key component in transforming communities into places that support healthy lifestyles and increase the opportunity for physical activity for all residents in their daily lives. The added benefit of increasing the opportunities to walk and bicycle is the potential for reduced automobile congestion, which impacts the livability and economic viability of the community. The City of Hilliard roadway standards provided herein encourage street connectivity and aim to create a comprehensive, integrated, and connected network for all modes of travel to promote active transportation, reduce congestion, and provide choices to residents that promote healthy living.

In 2011, the City of Hilliard adopted the Hilliard Comprehensive Plan (Ordinance 11-36). This plan evaluated the integral relationship between land use, transportation, public spaces, and economic development and establishes the vision and goals for the Hilliard of the future. Plan goals include:

- Become a better connected community
- Grow into a truly sustainable community
- Promote active and healthy lifestyles
- Define and reinforce the character of Hilliard
- Optimize development potential in ways that benefit current and future residents
- Collaborate with surrounding communities and local stakeholders

Roadway design has an impact on each of the above Plan goals, and recommendations of the Comprehensive Plan include specific action items that pertain to the way in which roadways are designed and policies that govern the way in which our roadways are used to achieve those goals.

In 2012, the City of Hilliard adopted a Complete Streets Policy (Resolution 12-R-14), which recognizes the need to accommodate all users within the public right-of-way and to provide adequate connections between the public right-of-way and private property. “All users” includes pedestrians, bicyclists, and transit passengers of all ages and abilities, as well as trucks, buses, and automobiles. Though the intent of the City of Hilliard roadway standards is to be context sensitive for any given type of roadway, the needs of *all* users shall be considered and factored into the planning, design, maintenance, and operations of all roadway systems.

This chapter establishes design criteria required for roadways, intersection control, and access management within the City of Hilliard that support the goals and objectives of the Hilliard Comprehensive Plan.

4.2 Roadway Planning

4.2.1 Roadway Functional Classification

All roadways within the City of Hilliard are classified based upon the following descriptions, and each roadway is assigned a functional classification. The design criteria and goals for a given roadway are based on this functional classification.

4.2.1.A Major Arterial

Major arterial roadways serve the major activity centers, the highest traffic volume corridors, and the longest trips. Service to abutting land should be subordinate to travel service. This system carries the major portion of trips entering and leaving an urban area as well as the majority of through movements desiring to bypass the area. Major arterials range from interstates/freeways to principal streets and highways.

4.2.1.B Minor Arterial

Minor arterial streets and highways interconnect with and augment the major arterial system and provide service to trips of moderate length at a somewhat lower level of travel mobility. This system places more emphasis on land access and distributes travel to geographic areas smaller than those identified with the major arterial system.

4.2.1.C Network Collector

Network collector streets penetrate development subareas and neighborhoods, collect traffic from local streets and channel it into the arterial systems. A minor amount of through traffic may be carried on collector streets, but the system primarily provides land access service and carries local traffic movements within residential, commercial, and industrial areas.

4.2.1.D Local Street

Local streets are not those classified in another system and primarily provide direct access to abutting land and access to the other systems. They offer the lowest level of mobility, and service to through traffic should be deliberately discouraged.

4.2.2 Right of Way Requirements

The right-of-way widths for subdivision and thoroughfare roadways are based on typical cross-section needs beyond the actual travel way. See cross sections and charts throughout this chapter for details.

4.2.3 Block Lengths

Block Lengths are encouraged to be 400 to 550 feet between pedestrian and/or vehicular connections, encourage rear access along the Thoroughfare Plan streets, provide access to desirable amenities and public spaces, and ensure sufficient connectivity to adjacent development. Such connections should provide direct paths between both residential and commercial uses, and complementary uses such as retail and recreational uses.

4.2.4 Streets Within (Re)Developments

The City of Hilliard encourages the development of a grid-style network. Multiple connections on all sides of new developments should be considered. Large housing developments should provide multiple connections to adjacent neighborhoods and major streets, reducing congestion and through traffic on all streets within the development. Stub streets and paths in adjacent developments should be connected to the new development. Where the adjacent property has (re)development potential, stub streets should be built to facilitate new connections in the future. Pedestrian/bike connections should be made between neighborhoods and residential and non-residential properties. Culs-de-sac and dead-end streets are not permitted within the City of Hilliard. Developers should require special permission from the City Engineer to include culs-de-sac and dead-end streets where necessary in their subdivisions.

4.3 Thoroughfare Plan Streets

- 4.3.1 Applicability.** Roadways that are listed on the Hilliard Thoroughfare Plan include major arterials, minor arterials and network collector streets. These types of roadways place a higher priority on movement of all modes of traffic along the corridors with less emphasis placed on access to individual properties, especially in close proximity to major intersections where queues in traffic are common.
- 4.3.2 Exceptions.** Main Street, Center Street, and Norwich Street in Old Hilliard, while listed in the Hilliard Thoroughfare Plan, are unique roadways because of the surrounding land use and density. Specific roadway design guidance and standards, which are more appropriate for a downtown district, are provided in Section 4.6.
- 4.3.3 Planning and Design Goals.** Goals for planning and designing Thoroughfare Plan streets include movement of motorized and non-motorized traffic in a harmonious manner, minimizing direct access to individual properties, and balancing the sometimes competing needs of large motorized users (trucks, buses, and emergency vehicles), small motorized users (cars and motorcycles), and non-motorized users (pedestrians and bicyclists).
- 4.3.4 Roadway Characteristics.** Table 1 of the Hilliard Thoroughfare Plan establishes the number of vehicle lanes, pedestrian and bicycle facilities, design designation, level of access control, and right-of-way widths for all Thoroughfare Plan streets. Typical sections shown in Figure 2 of the Hilliard Thoroughfare Plan provide details on minimum vehicle lane, median, tree lawn, and pedestrian/bicycle facility widths for each street.
- 4.3.5 Speed.** The speed limits of roadways included in the Thoroughfare Plan within City of Hilliard jurisdictional boundaries are typically 35 mph to 45 mph. Roadways should be designed in a manner to achieve 85th percentile operating speeds consistent with the speed limit. Overdesign of roadways to obtain a “factor of safety” is discouraged because it tends to encourage faster speeds thereby defeating the intent of improving safety along a roadway. Vertical traffic calming measures are not appropriate along Thoroughfare Plan streets, but horizontal measures may be appropriate and effective at controlling speeds. Horizontal measures include installation of medians, narrowing vehicle lanes, reducing building setbacks in the built environment, and installation of street trees to calm traffic.
- 4.3.6 Pedestrian Facilities.** Sidewalks (5’ minimum width) and/or multi-use paths (8’ minimum/10’ recommended) are required on both sides of all Thoroughfare Plan streets. For corridors with few access points, multi-use paths are recommended on both sides of the street to better accommodate all non-motorized users. Engineering judgment should be used to determine the appropriate pedestrian accommodation based on vehicle and pedestrian volume, adjacent land use, available right-of-way, and future conditions.
- 4.3.7 Bicycle Facilities.** On Thoroughfare Plan streets, it is important to provide bicycle facilities to accommodate less confident users separated from vehicular traffic as well provide horizontal space on the street so that more confident, faster-moving bicyclists can use the roadway without negatively impeding vehicular traffic. Slower or casual bicyclists (children, families, seniors) may be accommodated through the use of multi-use paths (8’ minimum/10’ recommended) that run parallel to the street and separated from traffic by a tree lawn or another buffered area. These paths are typically shared with pedestrians. Faster or more confident bicyclists (commuters, experienced adults, fitness enthusiasts) may be accommodated through the use of bike lanes, paved shoulders, or wider outside vehicle lanes. Engineering judgment should be used to determine the

appropriate bicycle accommodation based on vehicle and pedestrian volume, vehicle speed, adjacent land use, available right-of-way, and future conditions.

- 4.3.8 Sidewalk and Multi-use Path Crossing of a Public Street.** Pedestrians and bicyclists are legitimate users of the transportation system, and they should, therefore, be able to use this system safely and without unreasonable delay. Pedestrians and bicyclists have a right to cross roads safely, and planners and engineers have a professional responsibility to plan, design, and install safe and convenient crossing facilities. Pedestrians and bicyclists should be included as design users for all city streets. Where a sidewalk or multi-use path crosses a public street, the crossing of the stop or signal-controlled side street shall be in a manner that maintains the alignment of the ramp and marked or unmarked crosswalk with the approaching sidewalk or path that runs parallel to the main street, keeping the crosswalk in front of stopped vehicles on the side street and providing better visibility of pedestrians for vehicles turning from the main street to the side street at the intersection. The crossing of the main street shall be clearly defined and marked at a traffic signal or a roundabout. The crossing of the main street at an uncontrolled location, such as at an unsignalized intersection or midblock crossing, shall be evaluated on a case-by-case basis taking vehicular volume, speed, number of lanes, and visibility into consideration. Engineering judgment shall be used in establishing mid-block crossings that are not legal crossings absent of a marked crosswalk.
- 4.3.9 On-Street Parking.** On-street parking is prohibited on major and minor arterial streets listed in Thoroughfare Plan outside the Old Hilliard District. On-street parking may be permitted on lower volume network collector streets where homes front directly onto the street provided that sufficient roadway width is available. In new development, any homes that front onto a network collector street shall be built with consolidated driveways that provide for on-street parking on parallel access drives. In situations where neighborhood-serving non-residential uses (schools, community centers, public or private recreational facilities or neighborhood retail) are located along network collector streets, it may be appropriate to provide on-street parking to supplement off-street parking that is provided on the site. Engineering judgment should be used to determine the appropriate location of on-street parking on network collector streets based on land use, building setbacks, pedestrian/bicycle accommodations, and vehicle speeds.
- 4.3.10 Buffer Zone.** A buffer zone is the area between the back of the curb (or vehicular travel lane if uncurbed) and the off-street pedestrian/bicycle facility. A buffer zone may be referred to as a “tree lawn” and includes space for public signs, street lights, street furniture, transit stops, utilities, trees, and other landscaping elements. Buffer zones not only provide space for necessary roadside elements, but they also provide a barrier between pedestrians and vehicular traffic. This area provides the space for curb ramps, which pedestrians can use to transition from the sidewalk to the street. Buffer zones vary in width depending on the type and size of contents within the buffer zone. In order to provide curb ramps without altering the typical elevation of the adjacent sidewalk or multi-use path, the minimum width of the buffer zone is eight (8) feet. A wider tree lawn may be appropriate in a high-volume pedestrian environment, a higher-speed vehicular environment, or in locations where larger street trees will be used.
- 4.3.11 Street Trees.** The benefits of street trees in an urban and suburban environment are numerous and well documented. Not only do street trees provide beauty, shade, and environmental benefits, but a well-designed street tree planting arrangement also reduces vehicle speeds, creates a safer walking environment, provides for a vertical buffer along a street, and adds value to the homes and businesses along the street. In order to achieve these benefits, street trees must be selected and placed in a manner that is appropriate for the available space. Care should be taken to ensure that street trees and other landscaping

features do not block sight distance at intersections and driveways, do not block visibility of traffic control devices, and do not inhibit the illumination of the street or walks. It is also important to consider the available horizontal space within the buffer zone and the presence of aboveground or underground utilities that may be impacted by the tree or its roots as it grows. See Chapter 12 for additional details on street trees.

4.3.12 Access Management. Access management is critical on Thoroughfare Plan streets, particularly higher level major and minor arterials, in order to preserve the capacity of the roadway and improve safety. The City of Hilliard Access Management Plan, included as a technical appendix in the Thoroughfare Plan, shall govern the location and design of driveways. The level of access management is based on the access category of the street and the volume of traffic anticipated on the driveway. Special attention shall be taken to ensure that new driveways are placed outside the functional area of intersections.

4.3.13 Design Guidance. The American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets*, commonly referred to as the “Green Book,” shall guide the design of all roadways within the City of Hilliard. In all cases, engineering judgment shall be used to determine an appropriate design speed, design vehicle, and other key design parameters to create a roadside environment that balances all users. In many cases the Ohio Department of Transportation provides appropriate design guidance. However, care should be taken to ensure that the particular guidance is appropriate for streets within a municipal corporation with slower speeds and higher emphasis on mobility and safety of more vulnerable road users.

4.3.13.A Horizontal, Vertical, and Geometric Design Guidance. The most current version of the Ohio Department of Transportation (ODOT) *Location and Design Manual* shall guide and govern the site distance, horizontal alignment, vertical alignment, and geometric design of all Thoroughfare Plan streets.

4.3.13.B Roundabout Design. The design of modern roundabouts shall be governed by the National Cooperative Highway Research Program (NCHRP) Report 672 *Roundabouts: An Informational Guide, Second Edition* or subsequent later editions. Roundabouts shall be evaluated for all new intersection improvements in the City of Hilliard unless the intersection is within a closed loop signal system.

4.3.13.C Pedestrian Facility Design. The design of pedestrian facilities is governed by the most current version of the U.S. Access Board *Public Right-of-Way Accessibility Guidelines* (PROWAG). All public street intersections are legal pedestrian crossings. Safe and convenient pedestrian crossing of the public streets shall be considered at all times. Engineering judgment shall be used in the design of pedestrian crossings with particular attention made at uncontrolled locations, which may benefit from the installation of raised medians for pedestrian refuge or other high visibility treatments or enhancements to improve pedestrian safety. Volume and speed of vehicular traffic, volume of pedestrian traffic, and location of high pedestrian generating land uses shall be evaluated in determining the best crossing treatment at a given location.

4.3.13.D Bicycle Facility Design. The design of bicycle facilities is governed by the most current version of the U.S. Access Board *Public Right-of-Way Accessibility Guidelines* (PROWAG), the American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities*, and the National Association of City Transportation Officials (NATCO) *Urban Bikeway Design Guide*.

4.3.13.E Traffic Control Design. The location and design of all traffic control devices for all streets, highways, bikeways, and private roads open to public travel are governed by the most current version of the Ohio Department of Transportation (ODOT) *Ohio Manual of Uniform Traffic Control Devices* (OMUTCD) and supplemental City of Hilliard specifications.

4.3.13.F Street Lighting Design. For street lighting standards, see Chapter 10

4.4 Local (Residential) Streets

4.4.1 Applicability. Roadways that are not listed on the Hilliard Thoroughfare Plan are local streets. These types of roadways place a higher priority on access to individual properties and parking. Local streets include:

Neighborhood (subdivision) collector streets, which provide access to homes or neighborhood-serving non-residential uses (schools, community centers, public or private recreational facilities or neighborhood retail) and intersect with the higher level Thoroughfare Plan street network;

Neighborhood (subdivision) local streets, which provide access to homes and do not intersect with higher level Thoroughfare Plan street network; and

Lower-level commercial or industrial streets with the primary function of access to business or industry, not efficient movement of through traffic.

4.4.2 Planning and Design Goals. Goals for planning and designing local neighborhood streets include access to property, vehicle speed management, connectivity, walkability, bikeability, comfort, aesthetics, and parking availability. These goals are achieved through the use of narrower, shorter streets to discourage high speed and high vehicle volumes, providing multiple points of connectivity, and encouraging parking on both sides of the roadway. Local streets shall maintain an environment that supports the efficient, safe, and comfortable movement of people along the street network with a lesser emphasis on efficient movement of motorized vehicles. The local street network shall be planned and designed in a grid-style manner that provides access to the higher level Thoroughfare Plan street network through multiple connections, distributing traffic equally between streets without concentrating vehicular traffic on one or two streets within a neighborhood. In all cases, local streets, including pedestrian and bicycle facilities, shall be planned to connect to future neighborhoods in multiple locations. No local street shall connect to more than one higher level Thoroughfare Plan street. Local street designs that utilize culs-de-sac and loop streets or lack connectivity (current and future) are highly discouraged.

4.4.3 Roadway Characteristics. In order to achieve the planning and design goals for residential streets, the following guidance is provided for the street layout:

Maximum Street Length: 1,500'

Maximum Block Length: 500'

Street widths vary based on:

- Type of street (Local versus Neighborhood Collector);
- Average lot width; and
- Orientation of the home frontage

The tables below provide guidance on appropriate street widths based on the above parameters. The maximum street length and block length applies to both neighborhood local streets and neighborhood collector streets.

Neighborhood Local Street			
ROW Width	Avg. Lot Width	Street Width (f/f curb)	Tree Lawn Width
60'	>65'	26'	10.5'
70'	<65'	32'	12.5'

Neighborhood Collector Street			
<i>With Home Frontage to Street</i>			
ROW Width	Avg. Lot Width	Street Width (f/f curb)	Tree Lawn Width
60'	>75'	26'	10.5'
70'	60' – 75'	32'	12.5'
70'	<60'	36'	10.5'
<i>Without Home Frontage to Street (minimum parking demand)</i>			
ROW Width	Avg. Lot Width	Street Width (f/f curb)	Tree Lawn Width (w/ 8' path in lieu of walk)
70'	N/A	26'	12.5'

See the “Roadway Characteristics” exhibits in the appendix for more information on roadway characteristics for residential streets.

- 4.4.4 Speed.** The speed limit on Local Streets is typically 25 mph. In predominantly industrial or commercial districts, the speed limit may be 35 mph as determined on a case-by-case basis with input from the Safety Department. Roadways shall be designed in a manner to achieve 85th percentile operating speeds consistent with the speed limit. Horizontal traffic calming elements may be incorporated into new Local Street designs, particularly those that exceed the maximum street length, to encourage slower vehicle speeds but not without first establishing a well-designed development layout with the roadway characteristics designated in Section 4.4.3. Examples of horizontal traffic calming measures include curb extensions at intersections and neighborhood traffic calming circles. Stop signs shall not be used for speed control.
- 4.4.5 Pedestrian Facilities.** Sidewalks (5' minimum width) are required on all Local Streets unless specifically waived for local streets in certain industrial zoning districts. In cases where homes do not front onto a neighborhood collector street, a paved multiuse path (8' minimum) may be used in lieu of the sidewalk. Sidewalks within a neighborhood shall connect to the existing and planned future pedestrian facilities along the Thoroughfare Plan street system. In addition to sidewalks, which typically extend along the front of residential districts parallel to the street, multi-use paths (8' minimum in street right-of-way/10' minimum outside of street right-of-way within parkland or open space) shall be provided within all neighborhoods to supplement and connect to the neighborhood sidewalk and regional path network. Connections to the path system shall be provided in multiple locations to ensure that public pathways are easily and conveniently accessible to residents within the neighborhood and by users outside the neighborhood for recreational or active transportation purposes. Stubs shall be provided on the path network to connect to future development. Engineering judgment should be used to determine the appropriate pedestrian accommodation based on vehicle and pedestrian volume, adjacent land use, available right-of-way, and future conditions.
- 4.4.6 Bicycle Facilities.** Because local streets should be designed to encourage the slow movement of vehicular traffic, bicyclists typically share the road with motorists and no

- special provisions are required to accommodate on-street cyclists. Multiuse paths (8' minimum in street right-of-way/10' minimum outside of street right-of-way within parkland or open space) shall be provided within all neighborhoods to supplement and connect to the local street and the path network. Connections to the path system shall be provided in multiple locations to ensure that public pathways are easily and conveniently accessible to residents within the neighborhood and by users outside the neighborhood for recreational or active transportation purposes. Stubs shall be provided on the path network to connect to future development. Engineering judgment should be used to determine the appropriate bicycle accommodation based on vehicle and pedestrian volume, vehicle speed, adjacent land use, available right-of-way, and future conditions
- 4.4.7 Sidewalk and Multiuse Path Crossing of a Public Street.** Pedestrians and bicyclists are critical components of a vibrant and active neighborhood and are legitimate users of the transportation system. While crossing local streets is typically safe and easy to do, certain infrastructure design elements create a more pedestrian and bicycle-friendly design. Where a sidewalk crosses a public street, the crossing of the stop-controlled side street shall be in a manner that maintains the alignment of the curb ramp and crosswalk with the approaching sidewalk or path that runs parallel to the main street, keeping the crosswalk in front of stopped vehicles on the side street and providing better visibility of pedestrians for vehicles turning from the main street to the side street at the intersection. Attempts should be made to keep the ramp crossing of the main street in line with the approaching sidewalk that runs parallel to the side street. However, narrow tree lawn widths may make this challenging. Therefore, the ramp crossing of the main street may be pulled around the radius of the curve and be offset slightly from the approaching sidewalk. In situations where a multiuse path connector intersects a local street, a curb ramp shall be provided to allow bicyclists riding on the street to access the off-street multiuse path. Crosswalks typically are not marked at local street intersections. Exceptions to this are in school zones or at high volume multiuse path crossings.
- 4.4.8 On-Street Parking.** Provisions for on-street parking on local streets are necessary to serve adjacent property owners and help to reduce vehicle speeds. On-street parking is typically provided along both sides of neighborhood streets. However, providing on-street parking where there is little to no demand for it results in wide streets with higher vehicle speeds. While it is appropriate to locate neighborhood-serving non-residential uses (schools, community centers, public or private recreational facilities or neighborhood retail) along local streets, care should be taken to accommodate additional parking needs in the area without adversely impacting the neighborhood or making access by emergency services difficult. Housing density, housing frontage, driveway density, and the presence of non-residential uses nearby all impact the use of on-street parking. Therefore, on-street parking and street widths need to be evaluated and specifically planned during the early stages of any new development or redevelopment proposal. In some cases, street width may need to vary by block to accommodate varying levels of on-street parking, vehicle access, and appropriate two-way access for vehicles at intersections.
- 4.4.9 Culs-de-sac and Dead-end Streets.** Culs-de-sac and dead end streets create an environment that is circuitous and unconnected, which is in opposition the principals of the Hilliard Comprehensive Plan. These types of streets are also difficult to maintain and to provide access for service vehicles. Therefore, the use of these types of streets is prohibited for new development without detailed justification by the developer in writing and approval by the City Engineer. Special approval of culs-de-sac and dead-end streets will be evaluated by the City Engineer on a case-by-case basis. In order to receive approval for these types of streets for new development, the developer shall ensure that

no eyebrows or common access drives to residential properties will be provided and the length of such streets shall be limited to 500 feet. The developer should provide one or more pedestrian/bicycle connections at the end of a cul-de-sac/dead-end street to the street or land behind the isolated street to facilitate a more direct non-vehicular connection. Separate easements shall be provided for these non-vehicular connections and the easement area shall be clearly defined to adjacent home owners through the use of fencing, landscape buffers, or other means to avoid private property encroachment upon the public pedestrian/bicycle connection. In a case where a dead-end street is provided only temporarily with the intent to extend in the future as development occurs, the intent to extend the dead-end street shall be clearly stated in the plat and through the use of signage erected at the terminus of the dead-end street.

4.4.10 Loop Streets. Similar to culs-de-sac and dead end streets, loop streets create an environment that is circuitous and unconnected, which is in opposition the principals of the Hilliard Comprehensive Plan. Loops streets frequently also result in the creation of two intersections of the same two streets. This is problematic from a mapping/GIS standpoint upon which many of today's computer and mobile applications are based. Therefore, the use of loop streets is highly discouraged. Approval of loop streets is required by the City Engineer and will be evaluated on a case-by-case basis. In order to receive approval for these types of streets for new development, the developer shall provide detailed preliminary design information on the proposed street design, including length of short and long legs of the loop street, curve radii, and lot layout to enable the City Engineer to adequately evaluate a proposed loop street design. The developer may be required to provide one or more pedestrian/bicycle connections within the length of the loop street to the street or land behind the loop street to facilitate a more direct non-vehicular connection. Separate easements shall be provided for these non-vehicular connections and the easement area shall be clearly defined to adjacent home owners through the use of fencing, landscape buffers, or other means to avoid private property encroachment upon the public pedestrian/bicycle connection.

4.4.11 Buffer Zone. A buffer zone is the area between the back of the curb (or vehicular travel lane if uncurbed) and the sidewalk or path. On the local street system, the buffer zone (or tree lawn) will predominantly consist of a grass lawn, trees, public signs, street lights, and underground utilities. In locations that include neighborhood-serving non-residential (schools, community centers, public or private recreational facilities or neighborhood retail), the buffer zone may also include other items, such as street furniture. This area provides the space for curb ramps, which pedestrians can use to transition from the sidewalk to the street. Buffer zones vary in width depending on the type and size of contents within the buffer zone. In order to provide curb ramps without altering the typical elevation of the adjacent sidewalk or multi-use path, the minimum width of the buffer zone is eight (8) feet. A wider tree lawn may be appropriate along the local street network to accommodate larger street trees with overhanging canopies that can add value to the neighborhood over time.

4.4.12 Street Trees. The benefits of street trees in an urban and suburban environment are numerous and well documented. Not only do street trees provide beauty, shade, and environmental benefits, but a well-designed street tree planting arrangement also reduces vehicle speeds, creates a safer walking environment, provides for a vertical buffer along a street, and adds value to the homes and businesses along the street. In order to achieve these benefits, street trees must be selected and placed in a manner that is appropriate for the available space. Care should be taken to ensure that street trees and other landscaping features do not block sight distance at intersections and driveways, do not block visibility of traffic control devices, and do not inhibit the illumination of the street or walks. It is

also important to consider the available horizontal space within the buffer zone and the presence of above ground or underground utilities that may be impacted by the tree or its roots as it grows. See Chapter 12 for additional information on street trees.

4.4.13 Access Management. Access is not managed on local streets except that consideration should be made to avoid placing a residential, commercial or industrial driveway within 150 feet of the intersection of the local street with the Thoroughfare Plan street. Placing driveways within this area encourages on-street parking close to the intersection, which may impede emergency access during peak periods. A better use of the first 150 feet of the local street may be landscaping or other entry features that add value to the surrounding area.

4.4.14 Design Guidance. The American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets*, commonly referred to as the “Green Book,” shall guide the design of all roadways within the City of Hilliard. In all cases, engineering judgment shall be used to determine an appropriate design speed, design vehicle, and other key design parameters to create a roadside environment that balances all users. In many cases the Ohio Department of Transportation provides appropriate design guidance. However, care should be taken to ensure that the particular guidance is appropriate for streets within a municipal corporation with slower speeds and higher emphasis on mobility and safety of more vulnerable road users.

4.4.14.A Horizontal, Vertical, and Geometric Design Guidance.

The most current version of the Ohio Department of Transportation (ODOT) *Location and Design Manual* shall guide and govern the site distance, horizontal alignment, vertical alignment, and geometric design of all residential streets.

4.4.14.B Roundabout Design. Modern roundabouts are typically not used at intersections of two local streets. However, mini-roundabouts or traffic calming circles may be used to control vehicle speeds and improve aesthetics within neighborhoods.

4.4.14.C Pedestrian Facility Design. The design of pedestrian facilities is governed by the most current version of the U.S. Access Board *Public Right-of-Way Accessibility Guidelines* (PROWAG).

4.4.14.D Bicycle Facility Design. The design of bicycle facilities is governed by the most current version of the U.S. Access Board *Public Right-of-Way Accessibility Guidelines* (PROWAG), the American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities*, and the National Association of City Transportation Officials (NATCO) *Urban Bikeway Design Guide*.

4.4.14.E Traffic Control Design. The location and design of all traffic control devices for all streets, highways, bikeways, and private roads open to public travel are governed by the most current version of the Ohio Department of Transportation (ODOT) *Ohio Manual of Uniform Traffic Control Devices* (OMUTCD) and supplemental City of Hilliard specifications.

4.4.14.F Street Lighting Design. For information on street lighting, see Chapter 10

4.5 Conservation District

4.5.1 Applicability. There is a need to ensure that future development protects habitat and natural features within the Big Darby area. The City of Hilliard participated in and acknowledges the recommendations of the Big Darby Accord Watershed Master Plan

(BDAWMP). About 2,800 acres of the Comprehensive Plan’s study area fall within the limits of the Watershed Master Plan and generally land west of Alton & Darby Creek Road. The master plan recommends development preserve sensitive environmental features in the area, including several stands of trees, numerous wetlands, and sensitive streams and agricultural ditches. The Comprehensive Plan recommends the use of conservation development principles when this area is developed, requiring the preservation of at least fifty % of new subdivisions as preserved open space.

- 4.5.2 Planning and Design Goals.** Goals for planning and designing streets in the Conservation District include movement of motorized and non-motorized traffic in a harmonious manner, minimizing direct access to individual properties, and balancing the sometimes competing needs of large motorized users (trucks, buses, and emergency vehicles), small motorized users (cars and motorcycles), and non-motorized users (pedestrians and bicyclists). Sidewalks are only permitted in the Heritage Preserve area. Open space is required when developing new areas within the district. The location of open space on any development site, such as a conservation development that sets aside 50% of the site, should be dictated by the location of environmentally-sensitive features within topography and features of the land.
- 4.5.3 Roadway Characteristics.** See the “Roadway Characteristics” exhibits in the appendix for more information on roadway characteristics for streets in the conservation district.
- 4.5.4 Speed.** The speed limit on streets within the district varies depending on the functional classification of the street. Typically Thoroughfare Plan street speed limits within the Conservation District are 35 - 45 mph; local streets within the Conservation District are posted with speed limits of 25-35 mph. Roadways shall be designed in a manner to achieve 85th percentile operating speeds consistent with the speed limit. Horizontal traffic calming elements may be incorporated into new Local Street designs within the subdivisions to encourage slower vehicle speeds but not without first establishing a well-designed development layout with the roadway characteristics designated in Section 4.4.3. Examples of horizontal traffic calming measures include curb extensions at intersections and neighborhood traffic calming circles. Stop signs shall not be used for speed control.
- 4.5.5 Pedestrian Facilities.** Sidewalks are permitted in the Conservation District, and the minimum width is 5’. Consideration should be given to using a multiuse path (8’ minimum/10’ recommended) in residential corridors only if homes do not front the street. Pathway lighting may be considered in high pedestrian areas or in areas where street lighting is not provided and pedestrian facilities are present. Engineering judgment should be used to determine the appropriate pedestrian accommodation based on vehicle and pedestrian volume, adjacent land use, proximity to the Heritage Rail Trail or other regional trails, available right-of-way, and future conditions.
- 4.5.6 Bicycle Facilities.** The City supports efforts to develop regional and local trail systems that link parks and open spaces. Development of a trail within dedicated easements should be pursued in coordination with developers, land owners and metro parks. The proposal and layout of any new bicycle facilities should make an effort to connect with the Heritage Rail Trail and the future regional trail that will connect from Prairie Oaks Metropark and Hilliard Municipal Park. The design of new streets or the rehabilitation of existing streets that are on the Thoroughfare Plan should consider using bike lanes or paved shoulders (6’ minimum width).
- 4.5.7 Sidewalk and Multi-use Path Crossing of a Public Street.** Pedestrians and bicyclists are legitimate users of the transportation system, and they should, therefore, be able to use this system safely and without unreasonable delay. Pedestrians and bicyclists have a right to cross roads safely, and planners and engineers have a professional responsibility

to plan, design, and install safe and convenient crossing facilities. Where a sidewalk or multiuse path crosses a public street, the crossing of the stop or signal-controlled side street shall be in a manner that maintains the alignment of the ramp and marked or unmarked crosswalk with the approaching sidewalk or path that runs parallel to the main street, keeping the crosswalk in front of stopped vehicles on the side street and providing better visibility of pedestrians for vehicles turning from the main street to the side street at the intersection. The crossing of the main street shall be clearly defined and marked at a traffic signal or a roundabout. The crossing of the main street at an uncontrolled location, such as at an unsignalized intersection or midblock crossing, shall be evaluated on a case-by-case basis taking vehicular volume, speed, number of lanes, and visibility into consideration. Engineering judgment shall be used in establishing mid-block crossings, which are not legal crossings absent of a marked crosswalk.

- 4.5.8 On-Street Parking.** On-street parking is not permitted on thoroughfare streets in the Conservation District. Parking is permitted on local streets and auxiliary parking areas may be permitted in subdivisions upon approval by the City Engineer. The City, however, will not be required to maintain these parking areas.
- 4.5.9 Buffer Zone.** The buffer zone on streets in the Conservation District varies. The buffer zone is the area between the vehicular travel lane or bike lane and the off-street pedestrian/bicycle facility, if applicable. A buffer zone may be referred to as a “tree lawn” and includes space for public signs, street lights, street furniture, transit stops, utilities, trees, and other landscaping elements. Buffer zones not only provide space for necessary roadside elements, but they also provide a barrier between pedestrians and vehicular traffic. This area provides the space for curb ramps, which pedestrians can use to transition from the sidewalk to the street. Buffer zones vary in width depending on the type and size of contents within the buffer zone. In order to provide curb ramps without altering the typical elevation of the adjacent sidewalk or multiuse path, the minimum width of the buffer zone is eight (8) feet. A wider tree lawn may be appropriate in a high volume pedestrian environment, a higher speed vehicular environment, or in locations where larger street trees will be used.
- 4.5.10 Street Trees.** The benefits of street trees in an urban and suburban environment are numerous and well documented. Not only do street trees provide beauty, shade, and environmental benefits, but a well-designed street tree planting arrangement also reduces vehicle speeds, creates a safer walking environment, provides for a vertical buffer along a street, and adds value to the homes and businesses along the street. In order to achieve these benefits, street trees must be selected and placed in a manner that is appropriate for the available space. Care should be taken to ensure that street trees and other landscaping features do not block sight distance at intersections and driveways, do not block visibility of traffic control devices, and do not inhibit the illumination of the street or walks. It is also important to consider the available horizontal space within the buffer zone and the presence of above ground or underground utilities that may be impacted by the tree or its roots as it grows. See Chapter 12 for additional information on street trees.
- 4.5.11 Access Management.** Access management is critical on streets in the Conservation District, particularly higher level major and minor arterials, in order to preserve the capacity of the roadway and improve safety. The City of Hilliard Access Management Plan, included as a technical appendix in the Thoroughfare Plan, shall govern the location and design of driveways. The level of access management is based on the access category of the street and the volume of traffic anticipated on the driveway. Special attention shall be taken to ensure that new driveways are placed outside the functional area of intersections.

4.5.12 Design Guidance. The American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets*, commonly referred to as the “Green Book,” shall guide the design of all roadways within the City of Hilliard. In all cases, engineering judgment shall be used to determine an appropriate design speed, design vehicle, and other key design parameters to create a roadside environment that balances all users. In many cases the Ohio Department of Transportation provides appropriate design guidance. However, care should be taken to ensure that the particular guidance is appropriate for streets within a municipal corporation with slower speeds and higher emphasis on mobility and safety of more vulnerable road users.

4.5.12.A Horizontal, Vertical, and Geometric Design Guidance. The most current version of the Ohio Department of Transportation (ODOT) *Location and Design Manual* shall guide and govern the site distance, horizontal alignment, vertical alignment, and geometric design of all Conservation District streets.

4.5.12.B Roundabout Design. The design of modern roundabouts shall be governed by the National Cooperative Highway Research Program (NCHRP) Report 672 *Roundabouts: An Informational Guide, Second Edition* or subsequent later editions. Roundabouts shall be evaluated for all new intersection improvements in the City of Hilliard unless the intersection is within a closed loop signal system.

4.5.12.C Pedestrian Facility Design. The design of pedestrian facilities is governed by the most current version of the U.S. Access Board *Public Right-of-Way Accessibility Guidelines (PROWAG)*. All public street intersections are legal pedestrian crossings. Safe and convenient pedestrian crossing of the public streets shall be considered at all times. Engineering judgment shall be used in the design of pedestrian crossings with particular attention made at uncontrolled locations, which may benefit from the installation of raised medians for pedestrian refuge or other high visibility treatments or enhancements to improve pedestrian safety. Volume and speed of vehicular traffic, volume of pedestrian traffic, and location of high pedestrian generating land uses shall be evaluated in determining the best crossing treatment at a given location.

4.5.12.D Bicycle Facility Design. The design of bicycle facilities is governed by the most current version of the U.S. Access Board *Public Right-of-Way Accessibility Guidelines (PROWAG)*, the American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities*, and the National Association of City Transportation Officials (NATCO) *Urban Bikeway Design Guide*.

4.5.12.E Traffic Control Design. The location and design of all traffic control devices for all streets, highways, bikeways, and private roads open to public travel are governed by the most current version of the Ohio Department of Transportation (ODOT) *Ohio Manual of Uniform Traffic Control Devices (OMUTCD)* and supplemental City of Hilliard specifications.

4.5.12.F Street Lighting Design. For information on street lighting, see Chapter 10.

4.6 Old Hilliard District

4.6.1 Applicability. Roadways that are within the Old Hilliard District include all or portions of:

Thoroughfare Plan streets: Main Street, Norwich Street, and Center Street

Local streets: North Street, Franklin Street, Madison Street, Wayne Street, and Columbia Street

Roadways within the Old Hilliard District place a high priority on pedestrian accessibility and encourage the use of the public right-of-way as a public gathering space.

- 4.6.2 Planning and Design Goals.** Goals for planning and designing streets within the Old Hilliard District include movement of pedestrians in a safe and convenient manner. This includes the use of wider sidewalks, smaller turning radii at corners, enhanced pedestrian crossings, on-street parallel or back-in angle parking, and buffered areas with street furniture and landscaping. Design elements that encourage high vehicle speeds, turn lanes, or wider pavements are strongly discouraged in the Old Hilliard District. Similarly, land uses that require such design elements should be avoided.
- 4.6.3 Roadway Characteristics.** All streets within the Old Hilliard District include a maximum of one through lane in each direction. Design of wide driveways or additional turn lanes to accommodate uses that are vehicle intense are discouraged. A grid-style street network with short block lengths shall be maintained and extended wherever feasible. Curb extensions at intersections are desirable design elements to shorten pedestrian crossings and slow vehicle speeds. Access to serve commercial uses in the Old Hilliard District should be to the rear via alleys. Access to serve residential uses in the Old Hilliard District may be to the front, but garages should be set back from the front of the house to deemphasize the vehicle accessibility. Curb and gutter is not permitted for streets within this District. See the “Roadway Characteristics” exhibits in the appendix for more information on roadway characteristics for streets in Old Hilliard.
- 4.6.4 Speed.** The speed limit on streets within the Old Hilliard District is 25 mph or less. Roadways shall be designed in a manner to achieve 85th percentile operating speeds consistent with the speed limit. Horizontal traffic calming elements, such as curb extensions, may be incorporated into new Old Hilliard street designs to encourage slower vehicle speeds. Stop signs shall not be used for speed control.
- 4.6.5 Pedestrian Facilities.** Sidewalks (5’ minimum width) are required on both sides of all Old Hilliard District streets. Commercial corridors with buildings at or near the right-of-way line should have sidewalks greater than 5’ to accommodate higher pedestrian traffic. Consideration may be given to using a multiuse path (8’ minimum/10’ recommended) in residential corridors or commercial corridors with buildings set further back from the right-of-way line. Engineering judgment should be used to determine the appropriate pedestrian accommodation based on vehicle and pedestrian volume, adjacent land use, proximity to the Heritage Rail Trail, available right-of-way, and future conditions.
- 4.6.6 Bicycle Facilities.** The Heritage Rail Trail bisects the Old Hilliard District and provides an important recreational and transportation resource to the community. The grid network of streets in Old Hilliard presents a unique opportunity to provide multiple connections to the Heritage Rail Trail through the use of low volume local streets within the District. Since streets within the Old Hilliard District should be designed to encourage the slow movement of vehicular traffic, experienced bicyclists can share the road with motorists, even on the higher volume streets like Main Street and Norwich Street. Less experienced cyclists would be better served by using lower volume alternate parallel routes such as Columbia Street and Wayne Street. To allow cyclists to bypass the busy Main Street corridor, Madison Street, Columbia Street, North Street, and Wayne Street should be designated as bike boulevards to give priority to slower moving bicyclists and provide better access to the Heritage Rail Trail. Engineering judgment should be used to determine the appropriate bicycle accommodation based on vehicle and pedestrian volume, vehicle speed, adjacent land use, connectivity to the Heritage Rail Trail, available right-of-way, and future conditions.

- 4.6.7 Sidewalk and Multiuse Path Crossing of a Public Street.** Pedestrians and bicyclists are legitimate users of the transportation system, and they should, therefore, be able to use this system safely and without unreasonable delay. Pedestrians and bicyclists have a right to cross roads safely, and planners and engineers have a professional responsibility to plan, design, and install safe and convenient crossing facilities. Pedestrians and bicyclists should be included as design users for all City streets. Where a sidewalk or multiuse path crosses a public street, the crossing of the stop or signal-controlled side street shall be in a manner that maintains the alignment of the ramp and marked or unmarked crosswalk with the approaching sidewalk or path that runs parallel to the main street, keeping the crosswalk in front of stopped vehicles on the side street and providing better visibility of pedestrians for vehicles turning from the main street to the side street at the intersection. The crossing of the main street shall be clearly defined and marked at a traffic signal. The crossing of the main street at an uncontrolled location, such as at an unsignalized intersection or midblock crossing, shall be evaluated on a case-by-case basis taking vehicular volume, speed, number of lanes, and visibility into consideration. Engineering judgment shall be used in establishing mid-block crossings, which are not legal crossings absent of a marked crosswalk.
- 4.6.8 On-Street Parking.** On-street parking is critical to the vitality of the Old Hilliard District. Because of narrow rights-of-way and the need to provide pedestrian facilities along all streets within the Old Hilliard District, parallel parking is the most logical choice because it requires the least amount of horizontal space within the public right-of-way. In locations where a wider right-of-way is available, back-in angle parking should be considered to maximize the number of public parking spaces. Perpendicular parking and traditional front-entry angle parking should be avoided because of the safety concerns these types of parking arrangements present for through motorists and bicyclists sharing the street. On-street parking should be designed in conjunction with curb extensions to protect parked cars, calm through traffic, and provide a shorter pedestrian crossing area at intersections.
- 4.6.9 Buffer Zone.** A buffer zone is the area between the back of the curb and the off-street pedestrian/bicycle facility. A buffer zone may be referred to as a “tree lawn” and includes space for public signs, street lights, street furniture, transit stops, utilities, trees, and other landscaping elements. Buffer zones not only provide space for necessary roadside elements, but they also provide a barrier between pedestrians and vehicular traffic. This area provides the space for curb ramps, which pedestrians can use to transition from the sidewalk to the street. Buffer zones vary in width depending on the type and size of contents within the buffer zone. In order to provide curb ramps without altering the typical elevation of the adjacent sidewalk or multi-use path, the minimum width of the buffer zone is eight (8) feet. The buffer zone is a critical design element in the Old Hilliard District; therefore, attempts should be made to maximize this space.
- 4.6.10 Street Trees.** The benefits of street trees in an urban and suburban environment are numerous and well documented. Not only do street trees provide beauty, shade, and environmental benefits, but a well-designed street tree planting arrangement also reduces vehicle speeds, creates a safer walking environment, provides for a vertical buffer along a street, and adds value to the homes and businesses along the street. In order to achieve these benefits, street trees must be selected and placed in a manner that is appropriate for the available space. Care should be taken to ensure that street trees and other landscaping features do not block sight distance at intersections and driveways, do not block visibility of traffic control devices, and do not inhibit the illumination of the street or walks. It is also important to consider the available horizontal space within the buffer zone and the

presence of above ground or underground utilities that may be impacted by the tree or its roots as it grows. See Chapter 12 for additional information on street trees.

4.6.11 Access Management. Access management is critical in the Old Hilliard District because fewer access points results in fewer conflict points for pedestrians and bicyclists.

However, this must be balanced with the desire to provide multiple small access points rather than fewer high volume access points. The grid system of streets and alleys in the Old Hilliard District presents a unique opportunity to balance these needs. Access to serve commercial uses in the Old Hilliard District should be to the rear via alleys. When no alley is available, access should be provided via the secondary side streets rather than direct access to Main Street. Access to serve residential uses in the Old Hilliard District may be to the front, but garages should be set back from the front of the house to deemphasize the vehicle accessibility. Restriction of access is critical along commercial corridors. A more relaxed approach to access management may be taken along residential corridors. However, if an existing residential corridor is likely to be converted to commercial or multi-family through redevelopment, access needs to be carefully planned. The City of Hilliard Access Management Plan, included as a technical appendix in the Thoroughfare Plan, shall govern the location and design of driveways. The level of access management is based on the access category of the street and the volume of traffic anticipated on the driveway. Special attention shall be taken to ensure that new driveways are placed outside the functional area of intersections.

4.6.12 Design Guidance. The American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets*, commonly referred to as the “Green Book,” shall guide the design of all roadways within the City of Hilliard. In all cases, engineering judgment shall be used to determine an appropriate design speed, design vehicle, and other key design parameters to create a roadside environment that balances all users. In many cases the Ohio Department of Transportation provides appropriate design guidance. However, care should be taken to ensure that the particular guidance is appropriate for streets within a municipal corporation with slower speeds and higher emphasis on mobility and safety of more vulnerable road users.

4.6.12.A Horizontal, Vertical, and Geometric Design Guidance. The most current version of the Ohio Department of Transportation (ODOT) *Location and Design Manual* shall guide and govern the site distance, horizontal alignment, vertical alignment, and geometric design of all streets within the Old Hilliard District.

4.6.12.B Roundabout Design. The design of modern roundabouts shall be governed by the National Cooperative Highway Research Program (NCHRP) Report 672 *Roundabouts: An Informational Guide, Second Edition* or subsequent later editions. Roundabouts shall be evaluated for all new intersection improvements in the City of Hilliard unless the intersection is within a closed loop signal system.

4.6.12.C Pedestrian Facility Design. The design of pedestrian facilities is governed by the most current version of the U.S. Access Board *Public Right-of-Way Accessibility Guidelines* (PROWAG). All public street intersections are legal pedestrian crossings. Safe and convenient pedestrian crossing of the public streets shall be considered at all times. Engineering judgment shall be used in the design of pedestrian crossings with particular attention made at uncontrolled locations, which may benefit from the installation of raised medians for pedestrian refuge or other high visibility treatments or enhancements to improve pedestrian safety. Volume and speed of vehicular

traffic, volume of pedestrian traffic, and location of high pedestrian generating land uses shall be evaluated in determining the best crossing treatment at a given location.

4.6.12.D Bicycle Facility Design. The design of bicycle facilities is governed by the most current version of the U.S. Access Board *Public Right-of-Way Accessibility Guidelines* (PROWAG), the American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities*, and the National Association of City Transportation Officials (NATCO) *Urban Bikeway Design Guide*.

4.6.12.E Traffic Control Design. The location and design of all traffic control devices for all streets, highways, bikeways, and private roads open to public travel are governed by the most current version of the Ohio Department of Transportation (ODOT) *Ohio Manual of Uniform Traffic Control Devices* (OMUTCD) and supplemental City of Hilliard specifications.

4.6.12.F Street Lighting Design. See Chapter 10 for information on lighting in the Old Hilliard District.

4.7 Pavement Design Information

4.7.1 General

4.7.1.A The minimum requirements that follow are based on adequate subgrade, subgrade drainage and traffic loads (specifically commercial vehicle percentage). Soil borings must be conducted for each project, and a geotechnical engineer must supply their recommendations on the suitability of the proposed pavement section. Each site must be examined individually and additional pavement thickness and/or base requirements may be necessary.

4.7.1.B The soil borings must provide a subgrade structural capacity number. The maximum allowable subgrade structural number by the City is 3. It may be less but in no instances will a number greater than 3 be allowed as part of the overall pavement structural number calculation.

4.7.1.C All pavement surfaces must be supported upon a prepared subgrade that has been compacted to at least 95% of maximum unit weight in accordance with ODOT standards.

4.7.1.D Should it be found that the excavation, removal and replacement of unstable subgrade material is impractical due to excessive depths, alternate pavement structure designs must be prepared by a geotechnical engineer and submitted to and approved by the City Engineer prior to pavement installation.

4.7.1.E Roller compacted concrete (RCC) may be substituted for bituminous base course, ODOT 301, for any of the Thoroughfare sections. The design shall be per the City of Columbus Supplemental Specification 1523. Noted exceptions include:

- Standard typical section is a fully flexible (asphalt) pavement. A roller compacted concrete base can be used in lieu of an asphalt base with special approval by the City Engineer.

- After placement of the intermediate and surface course asphalt pavement, the asphalt shall also be sawcut at the same locations as the underlying RCC pavement. The joints in the asphalt surface course shall be scored and sealed to control cracking.
- A min. compacted aggregate base of 4" shall be provided beneath the RCC.
- The RCC pavement section meets or exceeds the structural number of the flexible pavement section as determined by a geotechnical engineer. Pavement design must be submitted to the City Engineer for approval.
- The curb shall be marked at the location of each transverse contraction joint as a guide for sawcutting the asphalt after it is placed.

4.7.1.F Underdrain (ODOT Item 605) is required for all public roads.

4.7.2 Thoroughfare Plan Streets

The following pavement design applies to all portions of the roadway, including paved shoulders and on-street bicycle facilities.

4.7.2.A Arterials

- 1) Subgrade Requirements:
All subgrade, prior to placement of aggregate base course, must be compacted via proof-roll. When unstable subgrade materials, i.e., peat, muck, marl, wet clays, etc., are encountered, excavation and removal of such unstable materials and replacement to plan subgrade with approved materials compacted in place will be required. Fill materials must be approved by the City Engineer.
Should it be found that the excavation, removal and replacement of unstable subgrade material is impractical due to excessive depths, alternate pavement structure designs must be submitted to and approved by the City Engineer prior to pavement installation.
- 2) Aggregate Base Requirements:
A minimum of a 6" compacted thickness of ODOT 304 aggregate base course material will be placed for all roadways. Base shall be compacted to at least 95% of maximum dry density as determined by AASHTO T-99.
- 3) Asphalt Requirements (minimum)
 - a) 9" bituminous base course, ODOT 301, PG64-22.
 - b) 1.5" bituminous intermediate course, ODOT 441, Type 2 PG64-22
 - c) 1.5" bituminous surface course, ODOT 441, Type 1 PG64-22

The suitability of these minimum pavement cross section designs to meet the specific requirements of the project should be verified by an engineer.

4.7.2.B Network Collectors

- 1) Subgrade Requirements:
All subgrade, prior to placement of aggregate base course, must be compacted via proof-roll. When unstable subgrade materials, i.e., peat,

muck, marl, wet clays, etc., are encountered, excavation and removal of such unstable materials and replacement to plan subgrade with approved materials compacted in place will be required. Fill materials must be approved by the City Engineer.

Should it be found that the excavation, removal and replacement of unstable subgrade material is impractical due to excessive depths, alternate pavement structure designs must be submitted to and approved by the City Engineer prior to pavement installation.

- 2) Aggregate Base Requirements:
A minimum of a 6" compacted thickness of ODOT 304 aggregate base course material will be placed for all roadways. Base shall be compacted to at least 95% of maximum dry density as determined by AASHTO T-99.
- 3) Asphalt Requirements (minimum):
 - a) 6" bituminous base course, ODOT 301, PG64-22
 - b) 1.5" bituminous intermediate course, ODOT 441, Type 2 PG64-22
 - c) 1.5" bituminous surface course, ODOT 441, Type 1, PG64-22

The suitability of these minimum pavement cross section designs to meet the specific requirements of the project should be verified by an engineer.

4.7.3 Residential Streets

Roadway Width	Aggregate Base Course ODOT (304)	Bit Base Course ODOT (301)	Roller Compacted Concrete (RCC) COLS SS (1523)	Asphalt Concrete Intermediate Course, Type 2 PG64-22 (441)	Asphalt Concrete Surface Course, Type 1 PG64-22 (441)
26'	8"			2.5"	1.5"
32' or 36' with Asphalt Base	6"	4"		1.5"	1.5"
32' or 36' with RCC Base	4"		4"	1.5"	1.5"

4.7.4 Shared Use Paths

The following pavement design is applicable for separated, off-street pedestrian/bicycle facilities.

- a) 6" aggregate base course, ODOT 304.
- b) 2.5" bituminous intermediate course, ODOT 441, Type 2, PG64-22
- c) 1.5" bituminous surface course, ODOT 441, Type 1, PG64-22