Section VII
Design Standards: Traffic and Roadway Design

A. Purpose

The purpose of good subdivision and site design is to create a functional and attractive development, to minimize adverse impacts affecting county roads and drainage facilities, to protect the County's natural resources, and to ensure development is sustainable and will be a long-term asset to the community.

This section presents design and construction standards, general policies and improvement requirements for all developments related to traffic and roadway design. All proposed development must give appropriate consideration to the scale and character of the existing neighborhood in which the development is to be located.

B. General Policies

1. All developments subject to County approval shall provide for adequate roads, road improvements, intersections, driveways, bridges, culverts and other off-site and off-tract improvements required by the County Planning Board in accordance with these Standards, the Official County Map and the County Engineer necessary for the safe and efficient movement of traffic.

2. The County Planning Board shall require developments to include physical improvements for the safety and convenience of the traveling public. Improvements shall include but are not limited to: the dedication of additional rights-of-way for road or drainage ways, adequate drainage facilities and easements, road pavement widening, grading of rights-of-way, curbs, bikeways, bike facilities, sidewalks, cross-walks, shade trees, landscaping, street furniture, soil erosion and sediment control, stormwater management, stream protection, street and traffic control signs, traffic signals, marginal access streets, reverse frontage, off street parking facilities plus on or off tract highway and traffic design features necessary to correct potential traffic and safety hazards which could be created by an increase in traffic volumes or impediments to traffic flows caused by the development.

3. Off track improvements will be required by the County Planning Board to remediate any degradation of service or impact to public safety resulting from a proposed development or subdivision that affects a County road or drainage facility. The applicant will be required to contribute his fair share of the cost of such improvements.

4. Whenever blasting is proposed for a project, a blasting report shall be submitted to the County Engineer for review prior to the commencement of any construction operations.

5. The proposed interior streets and walkways shall be designed to provide optimal vehicular and pedestrian circulation for the development and for any existing streets, roads and walkways which may adjoin the development or may be constructed in the future.

6. The general development pattern and main entrance of a development shall be oriented towards the street. Pedestrian access, circulation and safety should be a foremost consideration over automobile traffic.

7. All development shall conform to road and traffic-related improvements which appear in the County Master Plan, Official County Map and other County plans. The development shall also consider all existing local and regional plans for the surrounding community.

8. Appropriate traffic calming facilities and techniques shall be incorporated where existing or proposed traffic conditions would benefit from such traffic calming approach.

9. All proposed development within the County shall be designed to improve, not deteriorate, traffic and circulation over existing conditions.

10. In proposing an application for development, the applicant shall clearly demonstrate that an alternate means of access for the site, which is not located on a County road, is not available.

11. The applicant shall wherever possible consider implementation of traffic mitigation measures in the form of ridesharing programs, deferred parking, public transportation, bicycling and pedestrian improvements in order to minimize traffic and subsequent road improvements.

12. The applicant shall wherever possible use construction techniques that are designed to be environmentally sustainable and which promote the conservation of energy. Such techniques and methods include but are not limited to installing porous pavement, porous concrete, vegetated islands and buffers, shielded street lighting, solar panels for lighted street signs.

13. Design or road improvements shall be in accordance with these Standards supplemented and modified, as needed by the County Planning Board based on the advice of the County Engineer.

C. Traffic Impact Report

Applicants are required to submit a Traffic Impact Report in accordance with the requirements set forth in Appendix F. A Traffic Impact Report shall be required for any proposed development that will generate in excess of 10 vehicle trips during the weekday, morning, evening or Saturday peak hour using the latest "Institute of Transportation (ITE) Engineering Trip Generation Rates," or as otherwise required by the County Engineer. The Traffic Impact Report will determine the necessity and extent to which road and traffic improvements will be required.

D. Level of Service (LOS)

Any development that causes a location on a roadway to operate in excess of capacity Level D is discouraged. A developer shall undertake mitigation or other corrective measures as may be necessary so that the traffic levels at any affected intersection remain at capacity Level D or better, per the Traffic Impact Reporting requirements. A developer may, by incorporating design modification or by contributing to the cost of off-site traffic improvements, be able to address traffic problems resulting from the development.

E. Streets and Circulation

1. General

a. The purpose of proper street design is to create a functional and attractive development, to minimize adverse impacts, to foster mass transit and pedestrian linkages and to eliminate unnecessary development cost.

b. The existing street system should be preserved and utilized for all development where practical and consistent with the circulation plan of the Hudson County Master Plan or Official Map.

c. Residential and non-residential developments that involve new streets shall as far as practical, connect with the existing street system, especially if the existing streets are for similar land uses.

d. The design of roadway improvements shall be in accordance with current American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets*, New Jersey Department of Transportation standards, the Institute of Transportation Engineers and the design standards contained herein. Construction details shall follow the New Jersey Department of Transportation construction detail sheets, or as specified by these regulations.

2. Street Hierarchy

a. Streets shall be classified in a street hierarchy system with design tailored to function in accordance with RSIS (N.J.A.C. 5:21-4.3).

b. The street hierarchy system shall be defined by road function and average daily traffic (ADT), calculated by trip generation rates for major land use categories, prepared by the Institute of Transportation Engineers (ITE).

c. Each new street shall be classified and designed to meet the RSIS standards for one of the street types

d. The applicant shall demonstrate to the planning board's satisfaction that the distribution of traffic to the proposed street system will not exceed the ADT thresholds indicated in Table VII-1 for any proposed street type.

Table VII-1
Residential Street Hierarchy Definitions

STREET TYPE	DESCRIPTION	AVERAGE DAILY TRAFFIC (max)
LOCAL/ RESIDENTIAL	Low order, County streets. An urban Local Street system is designed to carry small volumes of traffic with an emphasis on land access over traffic mobility. It should be a link to other street systems and provide direct access to adjacent land uses. An alternate land use is desirable for through traffic.	1,500*
COLLECTOR	Middle order of County Street. An Urban Collector Street system is designed to carry moderate volumes of traffic with an equal emphasis on land access over traffic mobility. It should be the Primary link between minor Arterials and local roads. These roads may run through residential neighborhoods.	5,000
MINOR ARTERIAL	High order of County Streets. A Minor Arterial Street system is designed to carry large volumes of traffic with slightly greater land access and less traffic mobility than a Principal Arterial. It should be the primary link between Principal Arterial and Collector Roadway Minor Arterials should not intrude into residential neighborhoods.	10,000
PRINCIPAL ARTERIAL	Highest order of County Streets. A Principal Arterial System is designed to carry large volumes of traffic at high speeds to and from major urban activity hubs and between major connections. Access to Principal Arterials should be limited in order to ensure minimum disruption of the traffic flow. This system is designed for longer trips	Over 20,000

	and should carry traffic wishing to bypass Downtown metropolitan areas. The Urban Principal Arterials can be further broken down into three types of roadways; Interstate, other Freeways, and expressways, and other Principal Arterials with no control of access.	
SPECIAL-PURPOSE STREETS		
Alley	A service road that provides a secondary means of access to lots. On the same level as residential access street, but different standards apply. No parking shall be permitted; alleys should be designed to discourage through traffic.	500
Cul-de-sac[1]	A street with a single means of ingress and egress and having a turnaround, the design of which may vary. A divided-type entrance roadway to at least the first cross street, with median of sufficient width to ensure freedom of continued emergency access by lanes on one side, shall not be considered part of a cul-de-sac. Parking lots with a single means of ingress and egress shall not be included within the definition of cul-de-sac.	250
Court	A street with a single means of ingress and egress, which serves multifamily development, that does not provide a means for vehicles to turn around. The length of multifamily courts is limited to 300 feet.	Note[2]
Divided street	Municipalities may require streets to be divided to provide alternate emergency access, protect the environment, or avoid grade changes. Design standards should be applied to the combined dimensions of the two street segments, as required by the street class. A street with a single means of ingress and egress.	1,000

* Residential access streets of "loop" configuration, that is two ways out, should be designed so no section conveys an ADT greater than 1,500. Eash half of a loop street maybe classified as a single residential access street, but the total traffic volume generated on the loop street should not exceed 1,500 ADT, nor should it exceed 750 ADT at any point of traffic concentration.

[1] Streets serving multifamily developments with a single means of ingress and egress shall be classified as multifamily access cul-de-sacs.

[2] There is no ADT limit for multifamily courts specified because the length of the court will effectively limit the ADT to acceptable levels.

3. Street Right-of-Way

a. The right-of-way shall be measured from lot line to lot line and shall be sufficiently wide to contain the cartway, curbs, shoulders, sidewalks, graded areas, utilities, planting strip and shade trees.

b. The right-of-way should vary according to the street hierarchy and should be sensitive to the intensity of development.

c. Right-of-way width should reflect future development as indicated by the County Master Plan.

d. Right-of-way requirements are shown in Table VII-2, and graphically depicted in Figures VII-1, VII-2, VII-3, AND VII-4 below.

e. Alternatives to the required right-of-way widths may be considered, such as those presented in the Institute of Traffic Engineers (ITE) *Context Sensitive Solutions*.

f. The right-of-way width of a new street that is a continuation of an existing street shall in no case be continued at a width less than the existing street.

Table VII-2
Roadway Pavement/ROW Requirements

STREET TYPE	TRAVEL/ MOVING LANE	PARKING LANE (a)	TOTAL CARTWAY	UTILITY, SIDEWALK & PLANTING AREA (c)	RECOMMENDED RIGHT OF WAY
Local	Two @ 10-11 ft	One Side 7-8 ft.	27 - 36 ft.	2 @ 8- 10 ft. Mi n.	50 - 56 ft.
Collector	Two @ 11 - 12 ft.	Two Sides @ 8-9 ft.	38- 42 ft.	2 @ 8- 10 ft. Mi n.	54 - 62 ft.
Minor Arterial	Two @ 12 ft.	Two Sides @ 8-10ft.	40- 44 ft.	2 @ 8- 10 ft. Mi n.	60 - 64 ft.
Principal Arterial	Four @ 12-13 ft.		48- 52 ft.	2 @ 8- 10 ft. Mi n.	> 64 ft
Alley:					
One-way	One @ 16 ft.	None	16 ft.		24 ft.
Two-way	Two @ 10 ft.	None	20 ft.		24 ft.
Residential					
Cul-de-sac	Two @ 12 ft.	0	24 ft.	2 @ 8- 10 ft. Mi n.	44 ft.
Court	Two @ 12 ft.	0	24 ft.	2 @ 8- 10 ft. Mi n.	44 ft.
Divided Street (b)					

(a) Refers to parallel parking. Angle parking shall not be permitted on through streets.
(b) Cartway width for divided streets shall conform to standards of street classification and should be the aggregate of the street width and median width. There shall be no parking along the median divider.
(c) Wider sidewalk and planting strip widths may be required in commercial areas per the sidewalk requirements of these regulations, or to match existing sidewalk and planting strip widths, or where required by the County Engineer.

RIGHT –OF-WAY DESIGN REQUIREMENTS

Figure VII-1
LOCAL

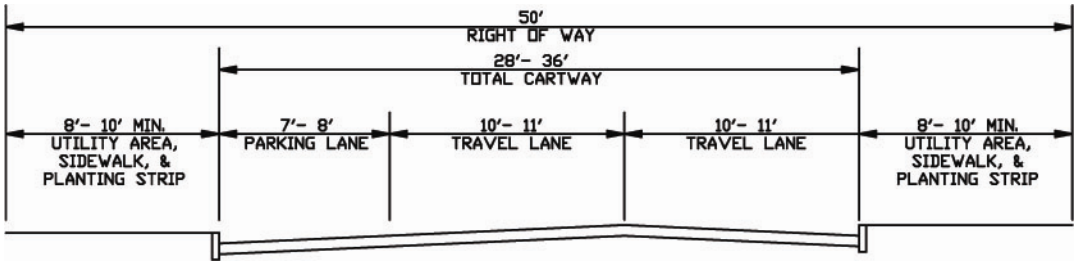


Figure VII-2
COLLECTOR

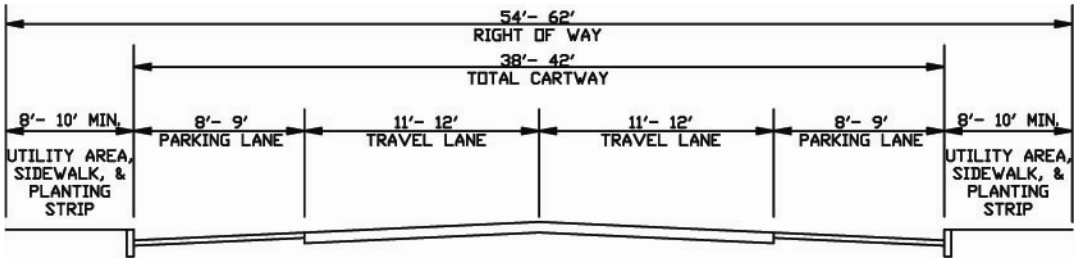


Figure VII-3
MINOR ARTERIAL

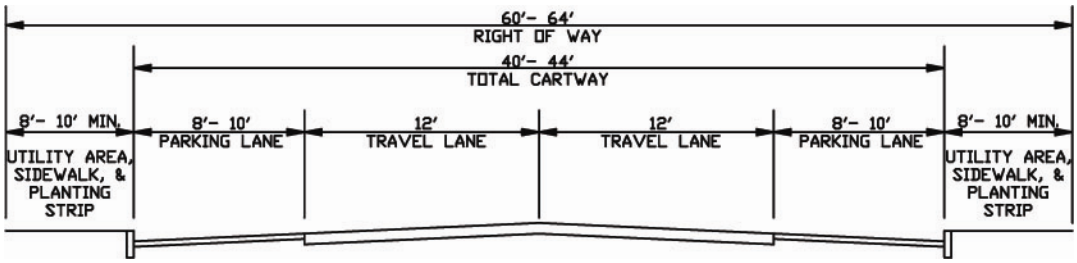
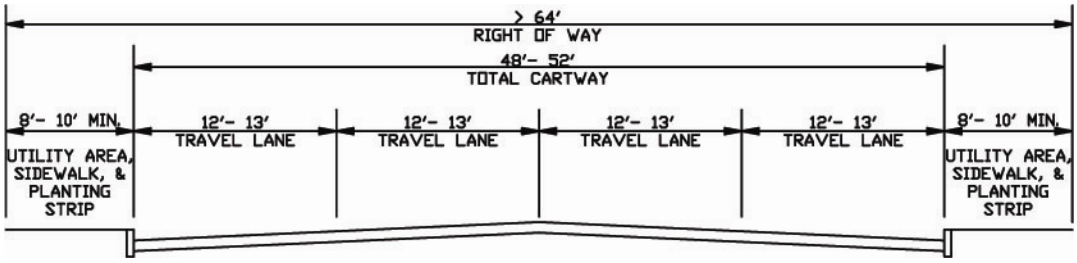


Figure VII-4
PRINCIPAL ARTERIAL



4. Cartway Width

a. Cartway width for each street classification shall be determined by parking and curbing requirements that are based on the intensity of development served by that street.

b. Cartway widths for each street classification are shown in Table VII-2

c. Cartway width also shall consider possible limitation imposed by sight distances, climate, terrain and maintenance needs.

d. Additional Cartway width may be required for streets which are part of a designated bike route as indicated in the County Master Plan to make them consistent with the AASHTO Guidelines for Bicycle-Compatible streets.

5. Roadway Widening

a. The County road frontage shall not be widened unless the development application involves any of the following, in which case it may be widened:

i. Residential subdivisions and site plans of densities equal to or greater than two (2) units per acre.

ii. Commercial, industrial and other nonresidential subdivision and site plan applications.

iii. The installation of a bikeway route, either as a dedicated bike lane or by increasing the travel lane width or shoulder width to accommodate bike traffic, in accordance with the bikeway standards in these Standards.

b. Where road widening is required, such widening shall be designed in accordance with the requirements specified in these Regulations, or as directed by the Planning Board.

c. Notwithstanding the above, a development may be required to make road improvements with respect to drainage, street intersections, driveway connections and traffic circulation as determined by the County Engineer and in accordance with other Sections of these Standards.

d. The alignment of road widening improvements shall conform to the County road improvement plans (where such plans exist) and the recommendations of the County Engineer, if in the judgment of the Planning Board such realignment will not impose an undue hardship on the applicant and other affected property owners.

e. The Planning Board may modify and waive the roadway widening standards in consideration of the following:

i. Where the pavement width and curb have been established by previous road improvements.

ii. Where an existing site is proposed for redevelopment, and the Planning Board has determined that the proposed changes will have little or no affect upon the County road and drainage systems.

iii. Where single-family residential lots are proposed using reverse frontage and no driveways or streets will connect to the County road.

f. Where a redevelopment plan or other plan has been adopted by the municipality with specific standards and widths of roadways and rights-of-way.

6. Street Grade

a. The minimum street grade for all streets is 0.5 percent; however, 0.75 percent should be used where topographic conditions permit.

b. Maximum street grade should vary according to road hierarchy, with flatter grades required for roads with higher Average Daily Traffic (See Table VII-3).

Table VII-3
Street Grade, Curve and Intersection Design Criteria

	ALLEY	COURT CUL-DE-SAC	LOCAL RESIDENTIAL	COLLECTOR	ARTERIALS Minor/Principal
Minimum Grade	0.50%	0.50%	0.50%	0.50%	0.50%
Maximum Grade	15%	12%	12%	10%	8% / 6%
Maximum Grade of Secondary Street within 50' of Intersection*	5%	5%	5%	5%	5% / 2%
Minimum Center-line Radius	100'	100'	100'	150'	300' / 500’
Minimum tangent length between reverse curves	0'	50'	50'	100'	150' / 300’
Curb Radii	20'	25'	25'	30'	35' / 50’

*As measured from the nearest right-of-way line.

7. Driveways

The following standards shall apply to all driveways.

a. Number of Driveways

i. No driveway which intersects the right-of-way line of a County road shall be constructed or modified unless a construction permit is first obtained from the County.

ii. The number of driveways permitted from a site directly onto any County road shall be limited in accordance with the specifications below, except under conditions where the safety and/or convenience of the general motoring public is impaired. Such conditions shall be determined and the number of permitted driveways specified by the County Planning Board upon receipt of advice of the County Traffic Engineer.

(a) Where lot frontage 100 feet or less, one (1) driveway is permitted.

(b) Where lot frontage is 101 feet to 200, two (2) driveways are permitted.

(c) Where lot frontage is 200 feet or greater, the number of permitted driveways shall be specified by Planning Board upon advice of the County Engineer and Planning Director.

b. Location of Driveways

i. All entrance and exit driveways to a County road shall be located to afford maximum safety to traffic on the County road.

ii. No entrance or exit driveway shall be located on the following portion of a County road: on a rotary; on a ramp of an interchange; or within thirty (30) feet of the beginning of any ramp or other portion of an interchange.

iii. Where two or more driveways connect a single site to any one County road, a minimum clear distance of thirty (30) feet shall separate the closer of any two such driveways.

iv. Where a site occupies a corner of two intersecting roads, no driveway entrance or exit shall be located within twenty-five (25) feet of the point of the curve of the exiting or proposed curb radius of the site.

v. Where a site occupies a corner of a signalized intersection, no driveway entrance or exit shall be located within 100 feet of the point of the curve of the existing or proposed curb radius of the site.

vi. Where feasible, no part of any driveway should be located within ten (10) feet of a side property line.

vii. Driveways shall be designed to permit all vehicles to turn around on the site in order to prevent vehicles from backing out on the County road.

viii. Access to a county road shall not be permitted if the site also abuts a municipal or adjacent driveway and access to the municipal road or adjacent driveway can be reasonably provided.

c. Sight Distance of Driveways

i. Whenever possible any exit driveway or driveway lane shall be so designed in profile and grading and shall be so located to permit the following minimum sight distance measured in each direction along the County road (See Table VII-4); the measurement shall be from a point at least ten (10) feet behind the edge of pavement and three and a half (3.5) feet above grade to a point four (4) feet above the center line of the roadway.

ii. The County Engineer reserves the right to require additional site distance based on existing conditions.

Table VII-4
Sight Distance

Design Speed on County Road	Minimum Stopping Sight Distance (ft)
25 MPH	155
30 MPH	200
35 MPH	250
40 MPH	305
45 MPH	360
50 MPH	425

Source: NJDOT Design Manual- Roadway, 2004

d. Driveway Dimensions

The dimensions of new driveways shall be designed to adequately accommodate the volume and character of vehicles anticipated to be attracted daily onto the land development for which a site plan is prepared. The required maximum and minimum dimensions for driveways are indicated in the following table. Driveways serving large volumes of traffic shall be required to utilize high to maximum dimensions. Driveways serving low daily traffic volumes shall be permitted to use low to minimum dimensions.

Table VII -5			
Driveway Width (feet)			
	One-way	**Two-way**	**Curb-radii**
Residential	10' - 12'	12' - 14'	5' – 15'
Multi-family	12' - 15'	24' - 30'	5' - 15'
Commercial	12' - 15'	24' - 36'	10' – 20'
Industrial	15' - 18'	30' - 36'	20'- 45'

e. Geometric Designs

The geometric design of a driveway connection to a County road should be governed by sound traffic engineering principles. Below are guidelines in preparing a geometric design, but deviation from them may be necessitated from time to time due to the many variables encountered in the course of preparing a design. The applicant should be aware, therefore, that although the driveway layout may conform to these guidelines, conditions may dictate deviations from them and requirements of the County Engineer shall be final.

i. Two-Way Operation: Driveways used for two-way operation will intersect the County road at a right angle (90 degrees) wherever possible, and in no case will be less than 60 degrees (measured at the center line of the intersecting driveway or road).

ii. One-Way Operation: Driveways used by vehicles in one direction of travel (right turn only) shall not form an angle smaller than 45 degrees with a County road.

iii. The dimensions of driveways shall be designed to adequately accommodate the volume and character of vehicles anticipated to be attracted daily onto the land development for which a site-plan is prepared. The required maximum and minimum dimensions for driveways connecting to a County road are set forth in Table VII-6.

iv. Driveways serving a large volume of daily traffic or traffic over 25 percent of which is truck traffic shall be required to utilize high to maximum dimensions. Driveways serving low daily traffic volumes or traffic less than 25 per cent of which is truck traffic shall be permitted to use low to minimum dimensions.

v. Any vertical curve on a driveway shall be flat enough to prevent the dragging of any vehicle undercarriage. The maximum permitted gradients for driveways shall not exceed a 2 percent grade for a distance of 10 feet or to the right-of-way line. Whenever possible the driveway shall be graded to prevent stormwater entering the site from the County road.

vi. Driveway geometry shall be in accordance with Table VII-6.

Table VII-6 Driveway Geometry			
	Single Family Res.	**Commercial & Multi Family**	**Industrial**
Turning Radius			
Min	5’	15’	30’
Max	15’	35’	45’
Min. Spacing			
From Property Line	5’	10’ or –R	-R
From Intersection	10’	25’	25’
Between Drives	50’	150’	150’
Angle			
Two Way	90 Deg	60 Deg	60 Deg
One Way (min)	-	45 Deg	45 Deg
Grade			
Grade (max)	+/- 8%	+/- 8% *	*
Note: The design of Commercial or Industrial driveways shall be approved in conjunction with a site plan application subject to the approval of the county engineer.			

f. Driveway Materials

i. The surface of any driveway within the existing or proposed right-of-way of a County road subject to County site-plan approval shall be constructed with hot mix asphalt and in accordance with current NJDOT Standards and Details.

ii. All driveway aprons and sidewalks within the County right-of-way shall be constructed of reinforced concrete and in accordance with current NJDOT Standards and Details.

8. Speed Change Lanes

a. A speed change lane is an auxiliary lane for the acceleration or deceleration of vehicles entering or leaving the through traffic lane. Speed change lanes may be required where certain development roads and driveways are proposed to intersect County roads.

i. Construction of speed-change lanes by the developer shall be at the direction of the County Engineer. Factors governing this determination shall include but not be limited to current and anticipated traffic volume and design speed on the County road and anticipated character and volume of traffic on the development street or driveway.

ii. Where pavement widening and curbing are required, the additional width of pavement may be acceptable as serving the purpose of speed change lanes.

iii. Where full width speed change lanes are required their dimensional design shall comply with current NJDOT Standards and Details.

9. Left-turn lanes, jughandles and Overpasses

The construction of and/or the conveyance of land to the County for left turn lanes, jughandles and overpasses may be required by the Planning Board, under one or more of the following circumstances:

b. Where a Master Plan, Official Map or engineering plan for the improvement of a County road exists, which shows the proposed location of jughandles and/or overpasses.

c. Where a development is proposed that provides 200 or more parking spaces on the site and the projected traffic flow warrants such a need for left turns.

d. When a development is proposed that provides peak hour traffic in excess of 150 vehicle trips. A trip is defined as a single or one-every-vehicle movement with the origin or destination inside the study site.

e. Where the sight distance is below that required by the standards in these regulations.

f. Where the existing level of service is Level "D", as described in the Highway Capacity Manual, published by the Highway Research Board, during the time period when the County road would be utilized by drivers entering and leaving the development.

10. Intersections

a. General

i. All street intersections with a County road shall, given the physical constraints of the site, be located to afford maximum safety to the traveling public.

ii. All street intersections with a County road shall be designed in accordance with current NJDOT Standards and Details.

b. Design of Street Intersections

i. Intersections shall be made at right angles, unless otherwise approved by the County Engineer. In no case should an intersection be less than 75 degrees.

ii. Where there is an existing or proposed street intersection on the County road opposite the frontage of the development and where site conditions allow, the road servicing the development shall be located directly across from said existing or proposed road forming a 4-way intersection.

iii. If the above 4-way intersection condition does not or cannot be applied, where site conditions allow, the proposed intersection with a County road shall be off-set with other proposed or existing intersections by a minimum distance of 250 feet.

iv. The angle of the intersection shall be measured at the intersection of the centerline of the intersecting street with the centerline of the County road.

c. Curb radii

i. Curb radii shall vary by street hierarchy and land use as presented in Table VII-3. The highest road classification at an intersection shall determine the curb return radii standard.

d. Grade

i. Intersections shall be designed with a flat grade wherever practical. A maximum grade of two percent (2%) should be maintained on streets connecting with a County road on the approaches to the intersection for at least 50 feet from the centerline of the County road.

e. **Sight Triangles**

i. Sight triangle easements shall be dedicated to the County by the developer at all existing and proposed road or street intersections with a county road and at driveways as determined to be necessary by the county traffic engineer.

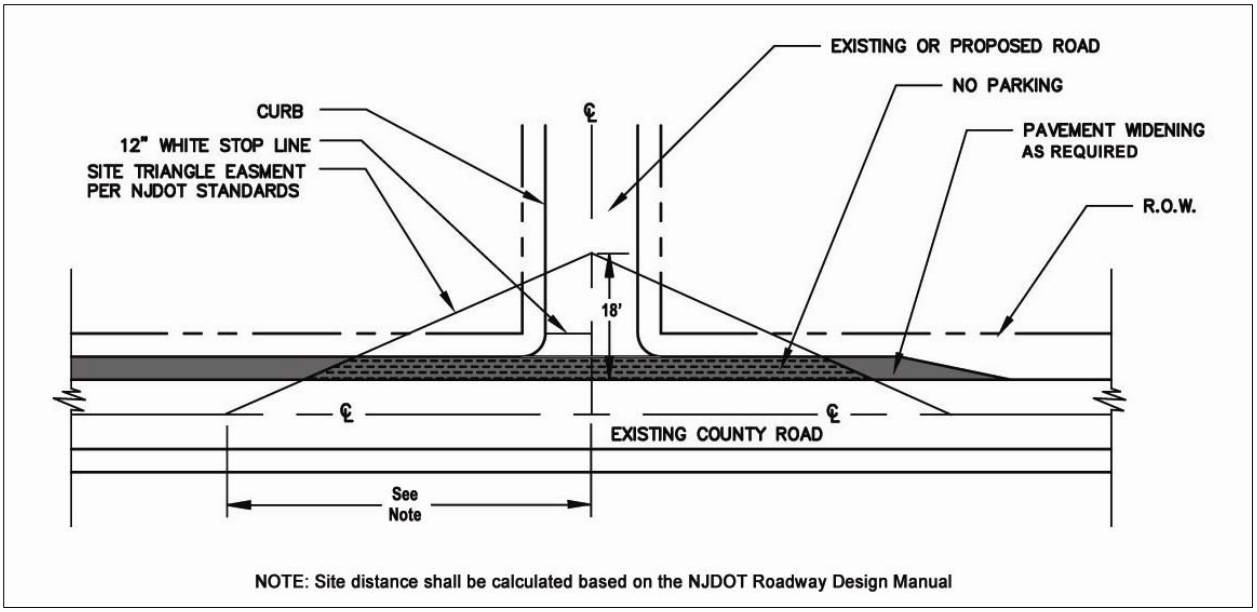
ii. In cases where the sight triangle easement extends beyond the property limits of the development, only that portion within the ownership or control of the developer is required.

iii. Natural or man-made obstacles shall not be located within the sight triangle. Such sight easements shall assure that an unobstructed view of the County road is maintained through the specified triangular area. Traffic control devices and other man-made or natural objects may remain if it can be demonstrated that they do not obstruct the view of on-coming traffic.

iv. Nothing shall be constructed, erected, placed, planted or allowed to grow in a manner as to obstruct vision along the county road from the road, street or driveway in accordance with current NJDOT Standards and Details.

v. In addition to the right-of-way widths required, sight triangle easements shall be provided as shown in Figure VII-5.

Figure VII-5
Sight Triangle Easements



11. Pavement

a. Street pavement thickness shall vary by usage/street hierarchy, sub-grade properties, and pavement type.

b. Pavement design standards for all county Roads shall conform to the specifications in RSIS (N.J.A.C. 5:21-4.19). The County Engineer reserves the right to request that pavement design

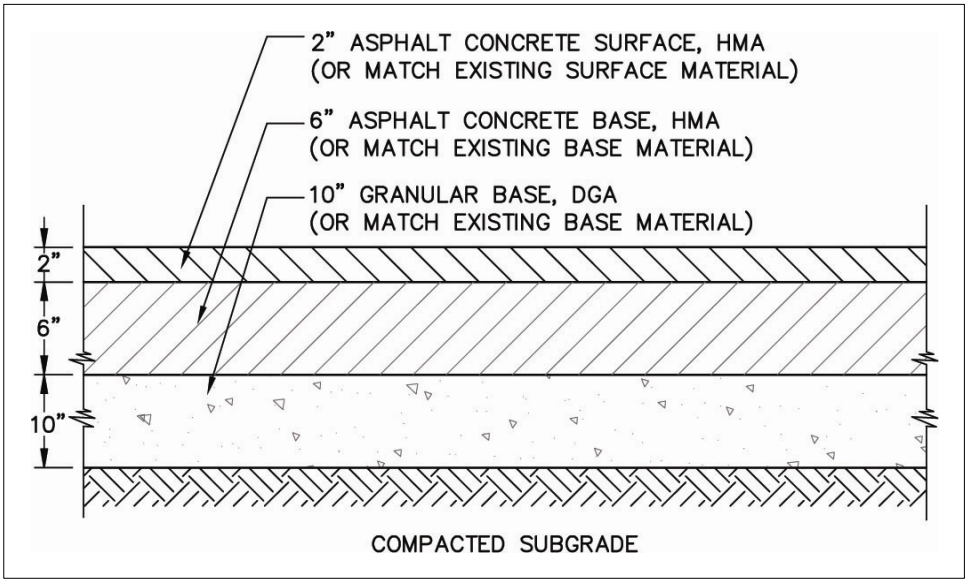
standards be in accordance with current NJDOT Standards and be used on all County Roads dependant on the quantity of the proposed Pavement. Pavement construction requirements shall be in accordance with Figure VII-6, and may be varied at the discretion of the County Engineer.

c. New pavement shall match the existing pavement surface, unless otherwise advised by the County Engineer.

d. Long-life pavements, which generally result in lower life-cycle costs and less impact on the environment, are recommended for pavement that is reconstructed or built new.

e. Shoulder Paving. Each land development requiring County approval shall install paving in the area between the edge of existing pavement and newly constructed curbing along the entire property frontage of the County road in accordance with RSIS (N.J.A.C. 5:21-4.19).

Figure VII-6
Pavement Detail



12. Curbing

a. Curbing shall be required for drainage purposes, safety and the delineation and protection of the pavement edge on all County Roads.

b. Each land development shall install curbs along the entire property frontage of the County road.

c. Curbs should be constructed according to current NJDOT Standards and Details and should comply with the American Disabilities Act (ADA) standards.

d. The alignment and grade of curbing is to be determined by that established or existing in the area and subject to approval by the County Engineer.

e. Before construction, a County curb construction permit will be required.

f. The County will determine the type and material of all curbing on County Roads to accommodate the aesthetics and the drainage required.

g. Depressed curbs

i. Curbing shall be designed to provide a curb ramp in compliance with the American with Disabilities Act (ADA) or the Barrier Free Subcode of the New Jersey Uniform Construction Code (5:23-7) at street intersections, as applicable.

ii. For all driveways, a depressed curb driveway shall be used. The height of such depressed curb shall be no more than one and a half (1 1/2) inches above the gutter grade.

13. Sidewalks

At the discretion of the County Board or Engineer, each land development application subject to County approval shall provide a sidewalk within the County road right-of-way in order to protect pedestrian traffic while facilitating vehicular traffic. The sidewalk area may include a paved area for pedestrian travel, a planting strip for vegetation and shade trees, vehicular and/or pedestrian-scale lighting, street furniture, ornamental tree grates, trash receptacles, landscaped stormwater planters, drainage facilities, curbing or other features required by the Board, and shall be provided in accordance with the following standards.

a. **Sidewalk placement**.

i. Sidewalks shall be placed in the right-of-way, parallel to the street within the right-of-way, unless an exception has been permitted to preserve topographical or natural features, or to provide visual interest, or unless the applicant shows that an alternate pedestrian system provides safe and convenient circulation.

ii. Sidewalks may be required to be installed away from the road system, in order to link dwelling units with other dwelling units, the street, parking areas, recreational areas and other on-site areas.

iii. Pedestrian way easements of 10 feet may be required by the Board through the center of blocks more than 600 feet long.

iv. Where the setback of buildings from the roadway exceeds 20 feet, sidewalk placement is encouraged that takes the most direct and shortest route between building entrances on-site, existing sidewalks, and street or driveway crosswalks. Sidewalk connectivity between adjacent sites is encouraged.

b. **Sidewalk construction specifications**.

i. Sidewalks shall be constructed in accordance with the most current standards and specifications of the New Jersey Department of Transportation (NJDOT).

ii. Where pedestrian crossings exist or are proposed, sidewalks and curbs shall be designed with ramps and curb cuts in accordance with ADA requirements and Barrier Free Subcode of the Uniform Construction Code (N.J.A.C. 5:23-7:31).

iii. Residential sidewalk widths shall be a minimum of four (4) feet. Where sidewalks abut the curb and cars overhang the sidewalk, widths shall be 6 feet.

iv. Commercial sidewalk widths shall be a minimum of fifteen (15) feet; however, the width of the sidewalk may be modified at the County's discretion.

v. Brick pavers may also be required if compatible with the surrounding area.

vi. The use of pervious pavers is encouraged when appropriate.

c. Sidewalk maintenance

The maintenance of the sidewalk is the responsibility of the Developer or owner of the site which is the subject of development.

14. Planting Strip

a. Along all residential streets, a landscaped planting strip shall be provided in between the sidewalk and the curb;

b. Along non-residential streets, a landscaped planting strip shall be provided in between the sidewalk and the curb where such exists on adjacent sites, or where required by the County Board or Engineer; otherwise the use of tree pits shall be provided on non-residential streets; appropriate paving materials such as pervious pavers or stamped concrete may also be requested in this area.

c. Continuous planting strips should be as wide as possible with a recommended width of 6 feet. In no case shall the planting strip for a tree be less than 4 feet wide.

d. Landscaping in the planting strip may include plant materials such as trees, shrubs, ground covers, perennials and annuals.

e. Landscaping must use native species that are hardy to urban conditions.

f. Plant materials shall be planted so as not to interfere with utilities, roadways, sidewalks, sight easements or site lighting.

g. The use of special landscape treatment, including paving, is recommended to give areas distinctive accents and a unique identity.

h. The installation of stormwater planters or gardens designed to capture, slow, cleanse, and infiltrate street runoff are encouraged as an alternative to a planting strip (See Figure VII-7

i. Maintenance of the planting strip, which shall extend to the curb, is the responsibility of the developer or owner of the site.

Figure VII-7
Urban Stormwater Gardens in Planting Strip
Source: Nevue Ngan Associates

15. Street Trees

a. Purpose

i. The planting and maintenance of healthy trees and vegetation throughout Hudson County and along County rights-of-way furthers the County's conservation goals and commitment to sustainability. Specifically, trees offer the following health, environmental, energy-saving and community benefits:

(a) Provides shade and comfort to pedestrians and residents.

(b) Reduces air temperatures and the urban "heat island" effect.

(c) Reduces air movement into buildings and conductive heat loss from buildings.

(d) Sequesters CO2, reducing its presence in the atmosphere.

(e) Reduces air pollutant emissions of NO2, PM10, volatile organic compounds (VOCs), and SO2 and improves overall air quality.

(f) Intercepts dust and particulate matter, thereby purifying the air.

(g) Reduces the amount of stormwater runoff and pollutant-loading in receiving waters.

(h) Reduces flooding and prevents soil erosion.

(i) Trees provide screening, which in turn aids in the reduction of noise and glare.

(j) Beautifies the surrounding area, provides shade that increases human comfort and sense of place.

(k) Provides natural habitat for wildlife and birds.

(l) Improves human health, privacy, and well-being.

(m) Protects and enhances property values and community image.

(n) Creates a traffic calming effect to induce desired operating speeds.

(o) Creates an interesting pedestrian realm.

b. Applicability

i. For all site plan and subdivision applications, street trees shall be provided along all streets to define the street and sidewalk and to unify areas with a distinct identity, in accordance with these regulations.

ii. These standards apply to trees planted along or near a County Road right-of-way (such that by their proximity are reasonably expected to impact the County Road ROW or infrastructure after reaching maturity) and to all development projects requiring County approval.

iii. Number of Tress. One (1) street tree shall be provided for every 30 feet of street frontage of the lot. Fractions equal to or greater than one-half (0.5) resulting from this calculation shall be considered to be one (1) tree. Such trees shall be planted at approximately equal intervals along the entire length of the curb of the roadway subject to these requirements.

iv. If determined by the County Engineer that physical conditions within the County right-of-way do not allow the safe and effective planting of the required trees, the Developer, upon approval of the Board and County Engineer, shall make a cash contribution to the Hudson County Shade Tree Fund to be used solely for the planting and preservation of trees. In arriving at the determination of such number of trees and the cash contribution, the Board shall take into consideration the written opinion of an expert provided by the applicant, and in the Board's discretion, an expert consultant selected by the Board. The costs of all experts shall be borne by the applicant. The cash contribution per tree shall be the estimated cost of purchasing and planting if it were to be planted on the site.

c. Tree selection

i. Only trees which exhibit the following characteristics shall be selected:

(a) native to New jersey;

(b) drought tolerant;

(c) urban tolerant

(d) suitable to thrive in the soil conditions on the site;

(e) tolerant of road salts;

(f) have root growth and crown shape that will not be physically intrusive to surrounding utilities or County roads and structures;

(g) adequate canopies at maturity to provide shade and rain absorption;

(h) and require low maintenance.

ii. Tree species shall be selected in accordance with their growth habit and environmental function. Commercial streets should have trees that compliment the building facade and shade the street and sidewalk. Residential streets should provide for an appropriate canopy that provides shade and serves as a visual buffer between the street and home.

iii. Trees shall be planted in groupings of similar varieties, although monoculture plantings are discouraged. Use trees of similar form, height and character along a roadway to promote uniformity.

iv. The minimum caliper of trees shall be 2.5 to 3.5 inches (based on American Association of Nurseryman standards). The caliper shall be measured at a point four (4) feet above the ground.

v. The mature height and spread shall be considered to ensure that it will not interfere with existing or proposed structures and overhead utilities.

vi. Selected trees shall not cause interference with walls, walks, drives, and other paved surfaces, or affect water and sewer lines or underground drainage systems or sight triangles.

vii. All trees shall be supplied by reputable nurserymen and planted in accordance with these regulations.

viii. Species may be selected from the list of approved trees provided in the *Hudson County Community Forestry Plan*.

ix. No tree planting approval will be issued without a two (2) year guarantee period.

e. **Spacing**

i. Spacing between trees shall be determined based upon species and the desired concept. Recommended spacing is 25 to 30 feet. Actual spacing may vary due to local conditions. Consideration will be made for bus stop locations. The maximum range is 25 to 45 feet to accommodate for variables such as streetlights, fire hydrants, underground vaults, bus stops…etc..

ii. Spacing of existing trees may determine the spacing standards for new street trees unless otherwise directed.

iii. Street trees may be inter-planted between existing street trees; however, the species should remain the same, or have similar growth habit and visual characteristics. Shade trees may vary from road to road.

iv. Street trees shall be spaced evenly along the street; however, if a specific effect is desired the trees may be massed at critical points or shall be a combination of both. If columnar trees are to be planted, the spacing may be closer. All tree spacing shall be subject to review and approval.

f. Planting location

i. Trees may not be planted such that their future growth will interfere with utility wires or other interference.

ii. Trees that grow taller than 35 feet should not be planted directly under power lines. When possible the tree leader shall be offset from power lines.

iii. All trees shall adhere to the following minimum planting distances for all utility or site infrastructure clearances:

(a) 10 feet from all buildings.

(b) 10 feet from streetlights, utility poles and above-ground utility wires.

(c) 3 feet from all underground utility lines.

(d) 10 feet from a fire hydrant and man-hole covers.

(e) 10 feet from all drain inlets, catch basins, and trench drains.

(f) 3 feet from the curbline or driveway.

(g) 10 feet from a stop sign.

(h) 25 feet from a street intersection.

iv. Within sight triangles, a single tree may be permitted only with site-specific approval of the Municipal Engineer. Such trees, including those at driveways, shall be of such size as will enable them to be immediately pruned up to seven feet height upon planting.

v. Consider the use of double and triple rows of street trees for special emphasis.

vi. Where on-street parking is provided, trees, shrubs and raised planters should be located as not to conflict with opening car doors or pedestrian access to and from on-street parking.

g. Planting Specifications

i. Trees shall be planted in tree pits or within a planting strip, in accordance with these requirements. Construction specifications for tree planting are provided in Figure VII-8 and Figure VII-9 below.

ii. Tree planting pits should be as large as possible to allow for ample growing space for tree roots and crown. The overall width of a sidewalk can limit the size of a tree pit. The minimum width of a tree pit in the sidewalk area is 5 feet.

iii. Consider using continuous planting strips as opposed to individual tree pits, where ever possible.

iv. Trees shall be properly planted in accordance with accepted horticultural standards; the standards and construction details used shall be submitted with the application and plans.

v. A protective root barrier shall be installed to a depth of eighteen (18) inches within the planting bed, between the sidewalk and curb.

vi. Depending on the size of the tree, staking of trees is not recommended unless required by the County Engineer or Inspector.

vii. A prepared planting medium shall be used that is capable of permitting the percolation of water and air.

viii. The surface of the planting area shall be mulched with wood-chips, or other suitable material to conserve soil moisture. Mulch shall be applied to a uniform depth of three (3) inches and shall be so distributed as to create a smooth, level cover over the exposed soil. A gap of approximately 2" should be left between the mulch and the trunk of the tree to avoid mounding above the trunk flare and to avoid the “mulch volcano.”

ix. On site irrigation methods shall be specified. Water hose locations shall be convenient and underground irrigation shall be provided if deemed appropriate and suitable.

x. The use of tree grates in areas with considerable commercial and pedestrian activity may be used as an alternative to tree pits, only where absolutely necessary and considered as a temporary structure with a 5-10 year life span. Only ADA compliant tree grates shall be permitted, as well as those that allow for radial expansion as the tree grows.

xi. During construction, protective barriers shall be installed around each plant and/or group of plants that are to be retained within the county right-of-way. Barriers shall be self-supporting and shall not be attached to the vegetation being protected. Barriers shall be a minimum of four (4) feet high and constructed of highly visible orange plastic mesh that is durable and that will last until construction is completed.

h. Tree Removal

i. No person shall remove any deciduous tree having a caliper of six (6) inches or greater or any coniferous tree having a height greater than nine (9) feet unless authorized by the Board.

ii. Every reasonable measure shall be taken to avoid the removal of deciduous trees with a caliper in excess of 24 inches and coniferous trees with a height in excess of fifteen (15) feet.

i. **Tree Replacement**

i. Any tree removed as a result of a site plan or subdivision application subject to County approval shall be replaced with a new tree at a ratio of one (1) new tree for every six (6) inches in diameter of existing tree removed, with a minimum caliper of three (3) inches.

ii. Developers are required to preserve as many of the existing trees as practical.

iii. Any planted tree that is dead or, in the opinion of Board, is in an unhealthy or unsightly condition, and/or has lost its natural shape due to dead branches, excessive pruning, inadequate or improper maintenance, or other causes including vandalism, prior to final acceptance, shall be replaced in the next planting season. There shall be a two (2) year guarantee on trees commencing after the final inspection of the permitted planting. The topsoil in the tree pit shall be changed when any replacement tree is planted.

iv. Where dead trees have been identified, whether due to natural causes or vandalism, the dead material shall be removed by the property owner, including stakes, and Arbor Tie within three (3) weeks of notification. When necessary, topsoil, grass seed or appropriate

paving material shall be added to the pit by the property owner to eliminate potential tripping hazards at the time of removal.

v. Where vandalism or related causes are agreed as the cause for tree replacement, the applicant or property owner shall be responsible for one replacement during the two (2) year guarantee period after final inspection of the permitted planting.

j. Maintenance

i. Maintenance of new trees shall be the responsibility of the adjoining property owner unless provided by the municipality.

ii. Maintenance shall include weeding, cultivating, edging, pruning, adjustment and repair of stakes, and Arbortie™, repair of minor washouts, soil replacement and other horticultural operations necessary for the proper growth of all trees, and for keeping the entire area within the planting area neat in appearance.

k. Time of Guarantee

All trees shall be guaranteed for a period of two (2) years from the date that all improvements are accepted as complete. Both the planting of and the two (2)-year guarantee for trees shall be covered under the developer's performance security for the road and/or drainage improvements.

l. **Finishing**

i. Paving blocks or tree pit guards shall be installed as finishes, and shall be designed to.

(a) Prevent dogs from depositing waste on tree trunks and in tree pits;

(b) Prevent pedestrians from stepping on the soil in the pit;

(c) Allow for the planting of flowers and ground covers in the pit;

(d) Protect a tree from mechanical damage caused by car doors, bumpers, bike locks, and other sidewalk traffic.;

(e) Prevent chemical, salt and other toxins from flowing into the tree pit.

ii. A tree pit guard must not:

(a) Restrict the growth of a tree.

(b) Raise the level of soil around the tree.

(c) Pose a trip hazard to pedestrians.

iii. Paving Blocks Design

Granite blocks shall be new or used and shall be cut from fine to medium grained sound and durable granite. The granite shall be reasonably uniform in quality and texture throughout and shall be free from an excess of mica and feldspar and from seams, scales or evidence of disintegration. If used blocks are utilized they shall be clean, free from mortar, asphalt, etc.

Blocks shall be fairly rectangular in shape. Granite blocks shall be so dressed that they may be laid with one (1) inch joints (See Figure VII-10).

iv. Tree Pit Guard Design

A tree pit guard is a device, usually a cast-iron fence or wrought-iron wickets, installed around a tree pit for protection. A low cast-iron fence or wrought-iron wickets from 18" to 30" high, around the perimeter of the tree pit are recommended. This will protect the tree from dogs and pedestrians and give it enough space to grow for many years. Guards should not be installed close to tree trunks as they strangle the tree as it grows and fail to protect the root zone. Guards are not appropriate for areas where car doors may swing into them (See Figure VII-10).

Figure VII-8
Tree Pit Guard and Paving Block Protection Approaches

Vegetated tree pit with brick paving blocks

Iron fence with an opening for car doors

Wrought Iron wicket fence elevated on granite curb with opening for car doors.

Iron fence elevated on granite blocks to protect the tree and allow room for growth

m. Resources

General methods, advice, and recommendations can be found in “Trees for New Jersey Streets”, New Jersey Federation of Shade Tree Commission, Blake Hall – Rutgers College of Agriculture and Environmental Science, New Brunswick, New Jersey, 1965.

Figure VII-9
Tree Planting Detail

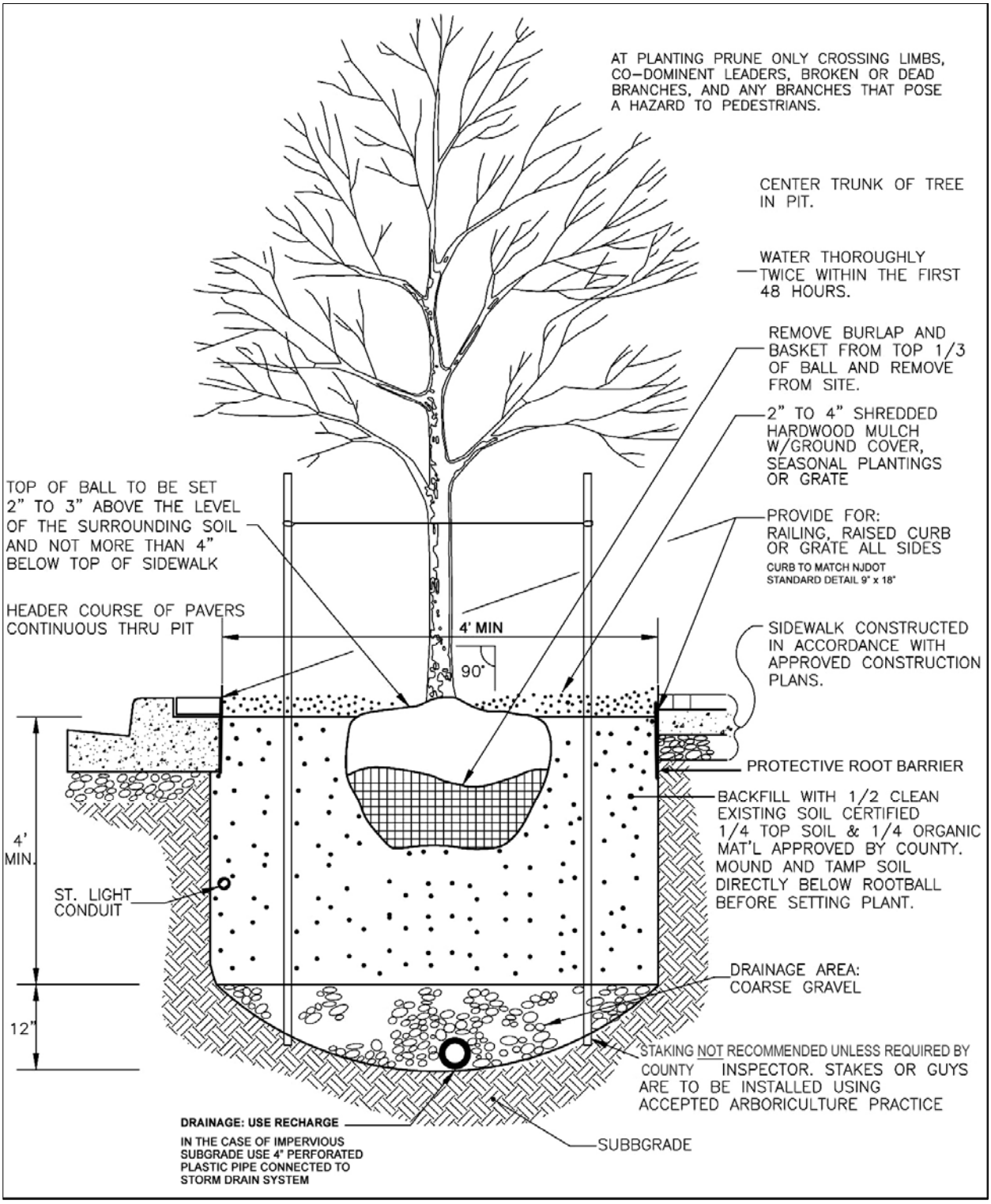
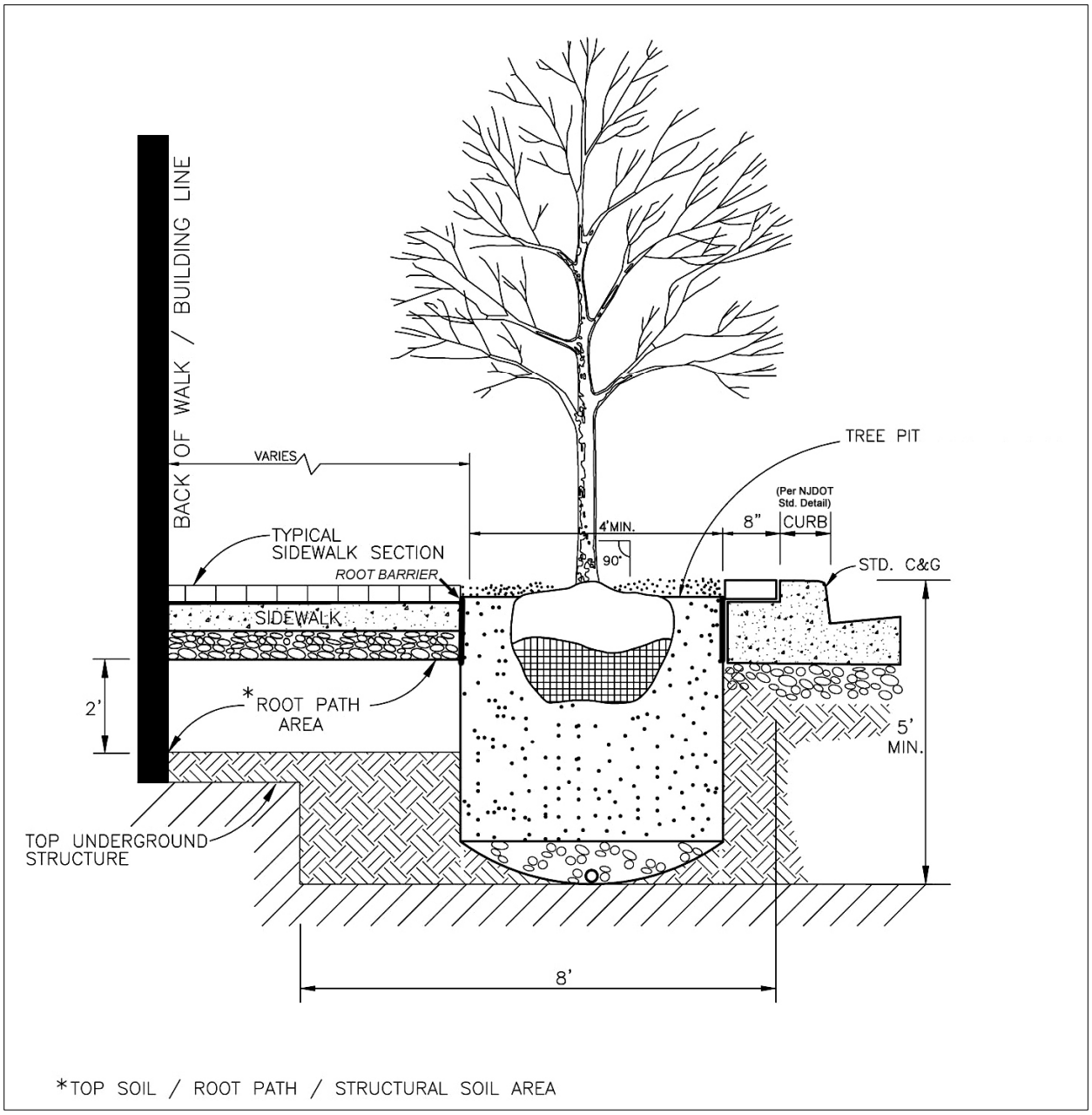


Figure VII-10
Tree Pit Detail



16. Roadway Lighting

a. All lighting shall be sufficiently illuminated to ensure traffic safety under all weather conditions.

b. The brightness of the roadway background, the glare from the luminaire and the reflected glare from pavement surface should be taken into consideration in determining adequate lighting.

c. Lighting for roadways shall be provided in accordance with the foot-candle levels set forth by the municipality or NJDOT, and should take into consideration the roadway hierarchy, area

classification, size and surface type. Where municipal requirements are not available, the standards recommended by the Illuminating Engineering Society (IES) should be used.

d. Systems should be designed to minimize energy use while meeting the lighting requirements in these regulations, as well as the requirements of the municipality and NJDOT.

e. The lighting design, including fixture, lamp and luminaire selection, number of fixtures per pole, pole height and placement, and adequacy of shielding should produce high lumens per watt, have high energy efficiency, uniform light distribution, minimized glare, light trespass control and aesthetic considerations.

f. An excessive number of fixtures and lamps per pole can create a glare problem and should be avoided to prevent excessive energy-charges and maintenance. Fixtures should be limited to one or two per pole.

g. Fixtures should be spaced to meet design requirements without glare, light trespass or light pollution, and which avoid "blind spots" and dark areas. Reference NJDOT requirements and the Illuminating Engineering Society of North American for spacing guidelines.

h. Lighting should illuminate storefronts, points of interest, and building facades.

i. Decorative/ornamental luminaires should be used where buildings are close to the street and sidewalk to provide an attractive appearance and to limit up-light. They should be mounted poles at heights between ten (10) and twenty (20) feet. The selected luminaire should be of a style, color and finish that match the architectural features of the streetscape. Decorative luminaries should meet the following criteria:

   i. Lamp type: 150 watt Metal Halide

   ii. Lamp lumens: 12,000 lm

   iii. Minimum luminaire efficiency: 66%

   iv. Color rendering index: 65 or higher

   v. Luminaire lumens between 75^{o} and 90^{o}: < 3percent

j. Proposed lighting should be selected to be consistent with existing lighting styles, where appropriate.

k. The applicant shall be responsible for the installation and maintenance of decorative street lighting along the property's frontage.

17. Street Furniture

The placement of street furniture in the County right-of-way, as defined in this Resolution, shall be encouraged subject to Planning Board approval of its location, style, type, color and design, and subject to the following conditions:

a. The proposed street furniture shall be found by the Board to be functionally and aesthetically appropriate to its location.

b. Since much street furniture is functional in nature, it should be located where needed. Benches should be placed at street corners, in plazas, or where people congregate; bollards should be

placed where desired to prevent vehicle access while still allowing access for pedestrians and cyclists; bus shelters should be required at major intersections or where there is heavy bus usage; bike racks should be located at schools, in shopping areas, and at playgrounds; kiosks, drinking fountains, game tables, and notice boards might be located in public plazas, in parks, or in other recreational areas.

c. The street furniture shall be found by the Board to be consistent with the architectural style of surrounding buildings and of other previously approved street furniture, and shall be of a color and design approved by the Board.

d. Items selected should be functional. For example, benches should have backs, especially where they will be used by the elderly; trash receptacles should have openings large enough for trash to be deposited easily; planters should be wide enough to allow for root growth; etc.

e. The street furniture shall be appropriately affixed or of sufficient weight to preclude its accidental rearrangement by persons, vehicles or natural forces.

f. Items should be durable. Street furniture must be designed to withstand the effects of the elements, including sun expansion-contraction, wind stress, moisture, and in some cases, salt spray, frost, or ice.

g. The placement of street furniture shall not impede pedestrian access to, from and through the area unless the purpose of such placement is to direct or redirect pedestrian access in an appropriate manner.

h. In selection of items, long-term cost should be considered -- a higher initial expense may be good economics if it yields longer life with less maintenance. To simplify maintenance, street furniture components such as lighting globes, signposts and blanks, bench slats, bolts, and stains and paint colors should be standardized.

i. Street furniture shall not obstruct sight fines at any intersection.

j. Street furniture shall not be utilized as or for signage.

k. Street furniture for bicyclists, such as bike racks and bike shelters, is encouraged in areas of high bicycle use, and may be required at the discretion of the County Engineer.

l. Street amenities should be located in a zone along or near the curb as a barrier to automobile traffic, especially lighting, parking meters, street trees, trash receptacles, news racks and heavy planters.

18. Waterfront Walkways

a. All proposed development along any tidally flowed waterway shall provide a 30 foot right-of-way and a 16 foot ADA-accessible walkway in accordance with NJ DEP's Coastal Zone Management regulations and guidelines, pursuant to NJAC 7:7E-8.11a et-seq.

b. All proposed development along any tidally flowed waterway shall provide ADA-accessible perpendicular access to the waterfront in accordance with NJ DEP's Coastal Zone Management regulations and guidelines, pursuant to NJAC 7:7E-8.11b et-seq.

19. Cross-walks and Pedestrian Signals

a. Crosswalks shall be provided in heavy pedestrian crossing areas and may be required at the discretion of the County Engineer.

b. Crosswalks shall be planned, designed and installed to conform to the specifications in the Manual on Uniform Traffic Control Devices (MUTCD).

c. Detectable pedestrian warning systems shall be provided in accordance with MUTCD requirements. Pedestrian countdown signals and call buttons must also be provided.

d. Accessible Pedestrian Signals (APS) shall be provided in accordance with PROWAG and ADA standards.

e. Crosswalks should be constructed with high visibility "ladder style" striping. Crosswalks may also be constructed with colored or textured pavers, or other material approved by the County Engineer.

20. Bikeways

a. Each land development subject to County approval shall provide a bikeway within or alongside the County right-of-way if such is required by any applicable zoning, subdivision, site planning or other ordinance of the Municipality or the County Master Plan.

b. Bikeways should be provided to link facilities on a site and to provide access to adjacent uses.

c. The construction of bikeways shall conform to the current version of NJDOT's *Planning and Design Guidelines for Bicycle Compatible Roadways and Bikeways* and the AASHTO *Guide for the Development of New Bicycle Facilities*, incorporated herein by reference.

d. Minimum pavement widths shall account for Average Daily Traffic (ADT), design speed, grade, and the presence of on-street parking as recommended by NJDOT.

e. Bikeways may take the following forms, as approved by the County Engineer:

i. Bicycle lanes at the edge of streets reserved and marked for the exclusive use of bicycles.

ii. Shared lanes which are designed to accommodate the shared use of the roadway by bicycles and motor vehicles.

iii. Shoulder lane within the right-of-way at widths that can safely accommodate bicyclists.

f. The Board may require increased widths to accommodate sight distances, truck, traffic, steep grades or traffic calming measures.

g. Bicycle-safe drainage grates shall be used in the construction of all streets.

21. Utility Poles

The presence of new or relocated utility poles in the right-of-way shall be avoided where feasible. Underground installation shall replace overhead lines within the limits of the site frontage along the County right-of-way.

22. Medians and Islands

a. Where a subdivision or site plan is expected to generate a large amount of traffic or creates a traffic safety hazard, the County Engineer may recommend that the land developer prepare plans, specifications, and construct a traffic control island to facilitate the safe and expeditious movement of traffic exiting and entering the land development. Such islands may serve as pedestrian safety islands or traffic channelization islands. In all cases, the islands are to be designed, signed, illuminated and marked in accordance with current editions of the Manual of Uniform Traffic Control Devices and "A Policy on Geometric Design of Highways", and all subsequent amendments thereto, subject to the approval of the New Jersey Department of Transportation.

b. Medians and islands shall be landscaped unless otherwise directed by the County Engineer.

c. Landscaped medians and islands shall be a minimum width of four (4) feet, as measured from the back of the curb. If large trees are to be planted in landscaped medians or islands, these medians or islands shall be a minimum of ten (10) feet in width measured from the back of curb, and include a minimum of 200 square feet of soil surface area per large tree.

d. All landscaped islands and medians shall receive a minimum of 6 inches of topsoil over finished subgrade, and shall be graded to provide adequate drainage.

e. Subsurface drainage may be recommended for landscaped medians and islands at the discretion of the County Engineer.

23. Traffic Control and Traffic Calming

Traffic control measures may include signals, pavement markings, signage and curbed islands.

a. The Planning Board may require installation of traffic control measures at driveways and intersections depending on the need as determined by the County Engineer and based upon the Traffic Impact Report as required by these regulations.

b. All traffic control measures shall be provided by the applicant and shall conform to the *Manual of Uniform Traffic Control Devices*, the New Jersey Department of Transportation, and the specifications of the County Engineer.

c. Traffic control measures in residential, environmentally sensitive and historic zones will be designed to take into consideration the character of the area.

d. Traffic calming measures shall be required at the discretion of the County Engineer and constructed in accordance with current NJDOT Standards and Details.

24. Traffic Signals

a. Where a subdivision or site plan is expected to generate an increase in the amount of traffic, or create a traffic safety hazard on any County Road, which would warrant the installation of a traffic signal, the Hudson County Engineer may recommend that the land developer prepare plans, specifications, and construct a traffic signal to facilitate traffic generated by the proposed development.

b. The County may also require the Developer to provide a fair share contribution for the improvement to any County Roadway facility or drainage facility that will be adversely affected by the proposed development.

c. Where it is determined at the time of the review of the land development that a traffic signal may be warranted in the near future, the land developer may be required to post a performance guarantee to cover the cost of designing and constructing the traffic signal. This performance guarantee shall be separate from other performance guarantees posted by the developer and shall remain in effect for five (5) years from the date of the first occupancy within the land development.

d. If and when the traffic signal becomes necessary during this five (5) year period, the land developer shall prepare plans, specifications, and construct the traffic signal.

e. In all cases, no traffic signal shall be installed unless it meets the warrants as specified in the Manual on Uniform Traffic Control Devices or due to hazardous and safety reasons, and the New Jersey Department of Transportation authorizes the design and installation of such signal.

f. The Hudson County Engineer may permit the relocation of existing County owned traffic signals and electrically illuminated 'signs provided an equally satisfactory and adequate site can be provided which is approved by the New Jersey Department of Transportation. This also applies to pull boxes conduits, cabinets and other constituent parts of traffic signals and electrical sign installations.

25. Guide Rail

Guide rails shall be provided and designed in accordance with current NJDOT Standards and Details.

26. Signs

a. General

i. The developer shall provide all signage required by the Municipality, County and NJDOT in accordance with the Manual on Uniform Traffic Control Devices (MUTCD).

ii. The location of a sign in a County right-of-way will require County approval.

iii. For any proposed sign in the County right-of-way, the developer shall coordinate with the County Engineering Department to get the required forms to be filled and submitted. All signage in the County right-of-way shall be included in the County's comprehensive signage inventory.

iv. All signs shall comply with the applicable provisions of the MUTCD, Uniform Construction Code and the electrical code of the municipality and shall be maintained in good structural condition.

v. Signs should be coordinated with other street amenities to unify areas with a distinct identity.

vi. Pedestrian oriented signs, including projecting signs, banners, and awnings, are encouraged.

b. Directional, regulatory and Advisory Signs

i. To facilitate the safe and efficient movement of traffic into and out of a site, the County may as a condition of the site plan or subdivision approval require the installation of specified directional, regulatory or advisory signs or pavement markings at designated locations.

ii. All proposed signing must conform to the current edition of the MUTCD for size, legend and placement.

c. Advertising Signs

i. No advertising sign, device or marking may be designed to be erected on or overhang a County roadway without County approval.

ii. Advertising signs which revolve, move, flash, give the illusion of movement or resemble official traffic control devices shall be prohibited within 25 feet of the right-of-way line or any other location that would adversely impact the safe operation of a motor vehicle or cause confusion to pedestrians or bicyclists.

27. Off-Street Parking and Loading Areas

a. Design of off-street parking areas

i. Off street parking areas shall be designed to prevent the maneuvering of vehicles into or out of parking spaces within the right of way of a County road. Off street parking areas shall be so designed to permit all vehicles to turn around on the site in order to prevent the necessity of any vehicle backing into a County road from such site.

ii. No required off street parking space including adjacent parking access lanes or maneuvering space shall be located within the existing or proposed right of way of the County road.

b. Parking Standards

i. For residential projects, parking shall be provided in accordance with New Jersey RSIS Standards (NJAC 5:21-4.14 through 4.16). Where a municipality in Hudson County has adopted Special Area Standards for residential parking, and those standards have been approved by resolution by the State Site Improvement Advisory Board, the municipal Special Area Standards for parking shall apply.

ii. For non-residential projects, parking shall be provided in accordance with recommended ITE or municipal established standards.

iii. Handicapped parking shall be provided in accordance with ADA Standards.

iv. Opportunities for shared parking and other parking mitigation strategies should be considered.

v. Bicycle parking racks shall be provided for multifamily, non-residential and mixed-use development projects. The racks shall accommodate bicycles at a ratio of one (1) bicycle space for every ten (10) vehicular parking spaces provided.

c. **Interior landscaping of parking lots**.

i. For parking areas designed to accommodate 20 or more vehicles, a minimum of 10 percent of the parking surface area shall be planted as landscaped island areas.

ii. Landscaped islands shall be developed and reasonably distributed throughout the parking surface area so as to provide visual and climatic relief from broad expanses of pavement in accordance with the following standards:

(a) Within the landscaped islands, there shall be provided one major shade tree for the first 20 parking spaces and one additional shade tree for every 10 additional parking spaces, provided there is no impairment to the visibility of motorists or pedestrians. Each tree, at the time of installation, having a clear trunk height of at least 6 feet and a minimum caliper of 2.5 inches.

(b) Shrubs or low, spreading plant materials may be planted within the required landscaped islands provided there is no impairment to the visibility of motorists or pedestrians.

iii. For the purpose of this Section, the area of a parking lot shall be the total vehicular surface area including circulation aisles.

iv. The total parking surface area for such calculation shall not include parking area in a parking garage other than the top level.

d. Off-street Loading Spaces and Areas

No part or any off street truck loading or unloading space shall be located within the right of way of the County road including the sidewalk area.

Off street truck loading and unloading spaces shall be located and designed to permit any truck to maneuver from a driveway into and out of such space without encroaching upon any portion of a County road existing or proposed right of way including the sidewalk area.

e. Customer Service Area

Any site plan that provides temporary, stopping space or maneuvering space for vehicles of customers or patrons seeking service at a roadside business establishment (such as a roadside grocery stand, filling station, drive in bank, etc.,) shall be located so that the stopping or maneuvering space is at least ten (10) feet back of the existing, or where applicable, future right of way line, of the County road.

28. Public Transportation

a. All roads should be designed to handle the needs of public transportation vehicles including weight and turning movement requirements in accordance with current NJDOT Standards and Details.

b. Transit facilities

i. The County Planning Board, with the advice of Transit providers, may require the applicant to provide facilities to support/encourage transit use, including the construction of bus turnouts/pullouts, bus lanes, bus shelters and provisions for transit information.

ii. Exclusive bus lanes, entrances and exits should be provided when traffic volumes warrant such facilities.

iii. Bus turnouts and pullouts shall be designed in accordance with current NJDOT Standards and Details and current NJ Transit standards.

iv. Provisions for bus shelters along the County road frontage contiguous with the proposed development site shall be required to accommodate existing and proposed bus or van services on the adjacent roadway.

v. Sheltered bus stops shall be provided at major boarding points and spaced to minimize walking distances from building entrances.

vi. Bus shelters shall be built in accordance with current NJDOT and NJ Transit design specifications, and with appropriate amenities as specified by the County Engineer. Bus shelter amenities can include benches with back rests, attractive landscaping, trash and recycling containers with lids, information displays and guides, appropriate lighting and public telephones for emergency communication. Shelters should be provided to protect riders from the weather and to buffer them from abutting streets. A sidewalk surface shall be proved between the bus shelter and the buildings, if applicable.

vii. Separate waiting places for transit patrons shall be provided out of the walking path of pedestrian circulation.

c. Rail Stations

i. Improvements at commuter rail stations proximate to the applicant's development may be required at the discretion of the County Engineer.

ii. Improvements to rail stations can include expanding or repaving parking areas, lengthening platforms, rail patron amenities, station access improvements or similar projects, and shall be built in accordance with the NJ Transit Station Design Guidelines.

iii. Station amenities and architectural treatments shall be consistent with the aesthetics and motif of the subject rail station.

29. Right-of-Way Encroachments

No development which adjoins or includes a County road or roads shall be designed to permit any of the following uses within the County road right-of-way: conduct of private business; erection of buildings, permanent or temporary; sales of merchandising displays; vehicular parking areas; servicing of vehicles; service equipment and appurtenances thereto; fencing of any kind, to include living and artificial or fabricated types; walls of timber, stone, concrete, metal or other materials; signs of all types, excepting traffic and regulatory and street signs; shrubberies and horticultural materials, excepting trees designated to remain or to be planted as a requirement under these regulations.

30. Right-of-way (ROW) Dedication

a. The requirements for existing and proposed County roads for rights-of way shall conform to the classification of County roads contained in the adopted County Master Plan or Official Map.

b. The developer must dedicate a minimum of ten (10) feet outside the proposed curb or ROW required by the county for any future potential proposed widening or roadway improvements.

c. All proposed developments that adjoin or include existing County roads that do not conform to the right-of-way widths as shown on the adopted County Master Plan or Official Map, shall dedicate the required additional right-of-way width for the entire frontage along one or both sides the County road or roads. If a development is on one side only, one-half (1/2) of the required extra width shall be dedicated, measured from the existing center line of the road.

d. Where any road classified as an arterial or collector road intersects with an arterial or a collector road in the adopted County Master plan or Official County Map, the right-of-way dedication shall

be increased an additional 12 feet along the development frontage or frontages on both roads for a distance of 250 feet from the intersection of the centerline of the roads.

e. The construction of and/or the conveyance of land to the County for left turn lanes, jughandles, and overpasses to a development may be required by the Planning Board.

f. Where by reason of special or unusual conditions or to conform to the adopted Master Plan or official map, the total additional right-of-way is to be secured from just one side of a County road, only one-half (1/2) of the required additional right-of-way shall be dedicated by the development as a condition of approval of the development. The development shall reserve the remaining area of right-of-way for future acquisition and shall so designate the area on the development maps. All building setbacks shall be measured and shown from the limits of the future right-of-way line.

g. The final subdivision plat (which is to be filed with the County Register), minor subdivision plat, or site plan shall bear the notation "Dedicated to Hudson County for Road Purposes" which shall further be defined by metes and bounds. In addition, the developer shall show concrete monuments to be set on the new right-of-way line at the tract corners and points of curvature.

h. The developer shall furnish the Planning Board with a bargain and sale type deed, drawn to Hudson County, a Municipal Corporation and shall include a metes and bounds description which corresponds to the dedicated area as shown on the subdivision plat, or site plan as the case might be.

i. The deed description shall include:

   i. A beginning point referenced to a tax map lot and block, a prior deed or filed map, and the nearest street intersection.

   ii. Square footage or acreage of the dedicated area.

   iii. A reference to the subdivision plat or site plan as the case may be stating the title, municipality, date and last revision, and the name and address of the surveyor/engineer.

31. Other Easements

a. In addition to the easements required under these regulations, other easements including but not limited to construction easements, slope easements, guiderail easements and traffic signal maintenance easements shall be required as necessary to construct and maintain improvements to county roads, county drainage structures, county drainage systems and county drainage facilities associated with the development.

b. The developer shall be responsible for the acquisition of any off-site easements and rights-of-way that are necessary to construct improvements to county roads, county drainage structures, county drainage systems and county drainage facilities that are required in conjunction with approval of the development.

c. The developer shall be required to attempt to acquire said off-site easements and rights-of-way by making reasonable offers to the affected property owners. If the developer is unsuccessful in his/her attempts to acquire the necessary easements and rights-of-way, proper documentation of same must be provided.

d. The county engineer on behalf of the Hudson County Planning Board, may recommend to the Board of Chosen Freeholders that the county undertake the acquisition of the required easements and rights-of-way. The developer shall reimburse the county to cover all of the cost associated with the acquisition including but not limited to property parcel maps in accordance with county parcel map details, property appraisals, legal fees, filing fees and the cost of the properties acquired.

Section VIII
Design Standards: Stormwater Management

A. Findings of Fact

It is hereby determined that:

Land development projects and associated increases in impervious cover alter the hydrolic response of local watersheds and increase stormwater runoff rates and volumes, flooding, stream channel erosion, and sediment transport and deposition;

This stormwater runoff contributes to increased quantities of water-borne pollutants, and;

Stormwater runoff, soil erosion and nonpoint source pollution can be controlled and minimized through the regulation of stormwater runoff from development sites.

Therefore, Hudson County establishes this set of policies to provide reasonable guidance for the regulation of stormwater runoff for the purpose of protecting local water resources from degradation. It is determined that the regulation of stormwater runoff discharges from land development projects and other construction activities in order to control and minimize increases in stormwater runoff rates and volumes, soil erosion, stream channel erosion, and nonpoint source pollution associated with stormwater runoff is in the public interest and will prevent threats to public health and safety.

1. To assure the provision of adequate public facilities needed to serve development projects by requiring each proposed development, as a condition of approval, to pay its pro rata share of the costs of such improvements.

2. To mitigate the adverse impacts on community facilities by providing a means of allocating the costs of needed services and facilities among new developments in proportion to the demand for such facilities created by each new development.

B. Purpose

1. The purpose of this Resolution is to establish minimum stormwater management requirements and controls to protect and safeguard the general health, safety, and welfare of the public residing in watersheds within this jurisdiction. This Resolution seeks to meet that purpose through the following objectives:

2. Minimize increases in stormwater runoff from any development in order to reduce flooding, siltation, increases in stream temperature, and stream bank erosion and maintain the integrity of stream channels;

3. Minimize increases in nonpoint source pollution caused by stormwater runoff from development which would otherwise degrade local water quality

4. Minimize the total annual volume of surface water runoff which flows from any specific site during and following development to not exceed the pre-development hydrologic regime to the maximum extent practicable.

5. Reduce stormwater runoff rates and volumes, soil erosion and nonpoint source pollution, wherever possible, through stormwater management controls and to ensure that these management controls are properly maintained and pose no threat to public safety.

6. Encourage the widespread use of stormwater best management practices (BMPs) and green infrastructure as a primary technique for stormwater management.

7. Reduce or eliminate the number and frequency of Combined Sewer Overflow events.

8. Reduce or eliminate the number and frequency of Combined Sewer Overflow events.

9. Protect

C. Compatibility with Other Permit and Ordinance Requirements

Development approvals issued for subdivisions and site plans pursuant to this Resolution are to be considered an integral part of development approvals under the subdivision and site plan review process and do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act, or ordinance. In their interpretation and application, the provisions of this Resolution shall be held to be the minimum requirements for the promotion of the public health, safety, and general welfare.

This Resolution is not intended to interfere with, abrogate, or annul any other ordinances, rule or regulation, statute, or other provision of law except that, where any provision of this Resolution imposes restrictions different from those imposed by any other ordinance, rule or regulation, or other provision of law, the more restrictive provisions or higher standards shall control.

D. Jurisdiction

All subdivision and site plans that discharge directly or indirectly to County Facilities shall be subject to County approval and shall provide for the management of stormwater runoff in a manner consistent with the policies and procedures of this Resolution.

E. General Policies

1. All subdivisions and site plans shall provide adequate drainage facilities in accordance with the standards established herein for the management of stormwater runoff that is generated by a development that now flows or will flow directly or indirectly to a County road or through a County drainage facility.

2. The developer shall be responsible for providing adequate drainage systems along County roadways as required and in accordance with the standards and construction herein.

3. Where there is stormwater runoff from a non-residential or mixed-use development impacting County roadways or county drainage facilities, or any such development that discharges to a County drainage facility, the applicant shall submit a Stormwater Management Plan. Where there is stormwater runoff from a residential development, the applicant shall submit a Stormwater Management Plan in accordance with N.J.A.C. 5:21. The Plan shall provide for drainage improvements of adequate design and capacity to intercept and dispose of stormwater from the proposed development in a manner which does not increase the drainage impact upon the County roads, County-maintained drainage facilities, or drainage systems within designated stormwater management areas.

4. All subdivisions and site plans requiring a Stormwater Management Plan and affecting County roadways or County drainage/stormwater management facilities shall be required to submit hydraulic calculations documenting the drainage basin studies. Depending on the location of the site in relationship to the total drainage basin, an on-site stormwater detention facility may be required where it is found that the installation of the facility will reduce the overall impact of stormwater runoff. In cases where on-site detention is not feasible due to specific site limitations such as space limitations, topography, location in the common drainage area and wetland conservation areas, a detention facility will not be required. All such developments not able to meet the standards of this Resolution shall be required to contribute to the future improvements of County drainage facilities, included, but not limited to, drainage channels, structures, and/or regional detention facilities within the common drainage area. The costs will be determined by the County Engineer based on the area of the site in relationship to the total drainage area and considering the amount of increased runoff rate from the site. Developments providing on-site infiltration or recharge facilities, and resulting in no change or increase in the amount of predevelopment stormwater runoff off-site, will not be required to contribute to County improvements.

5. In cases where stormwater runoff from a development discharges to bays, rivers, creeks, wetlands or other water bodies, the County may require special filtration and other water control measures in order to meet current permissible water quality standards and reduce the risk of contamination of the receiving water body from stormwater runoff. The applicable water quality standards are contained in NJDEP rules cited as NJAC 7:8, 7:9, 7:14, and 8:9 et. seq.

6. The development and disturbance of steep slopes is prohibited. Steep slopes include any slope equal or greater to 20 percent, as measured over a minimum run of ten (10) feet. Steep slopes are determined based on contour intervals of two (2) feet or less. Steep slopes are protected because, when disturbed, these areas contribute disproportionately to large loads of suspended solids, due to the velocity and erosive potential of runoff. Disturbance of steep slopes results in accelerated erosion processes from stormwater runoff and the subsequent sedimentation of water bodies with the associated degradation of water quality and loss of aquatic life support. Related effects include soil loss, changes in natural topography and drainage patterns, increased flooding potential, further fragmentation of forest and habitat areas, and compromised aesthetic value. It has become widely recognized that disturbance of steep slopes should be restricted or prevented based on the impact on water quality and quantity and the environmental integrity of landscapes (See N.J.A.C. 7:15 et seq.)

7. Nonstructural methods of stormwater management shall be used to the greatest extent possible, and explored before relying on structural BMP's, for the purpose of: flood control, minimizing stormwater volume and total suspended solid generation, maintaining natural filtration, groundwater recharge, simulating natural drainage systems and minimizing the discharge of pollutants to ground and surface waters. Nonstructural strategies include both environmentally sensitive site design and source controls that prevent pollutants from being placed on the site or from being exposed to stormwater. Source control plans should be developed based upon physical site conditions and the origin, nature, and the anticipated quantity or amount of potential pollutants. Multiple stormwater management BMPs may be necessary to achieve the established performance standards for water quality, quantity, and groundwater recharge. Structural BMPs should be integrated with nonstructural stormwater management strategies and proper maintenance plans.

8. These stormwater management standards shall be supplemented by the guidelines provided in the NJDEP Stormwater Best Management Practices Manual. The BMP Manual may be obtained from the Department's website at www.njstormwater.org

9. These policies and standards are intended to serve the needs of the County for the design of stormwater management plans, systems and facilities under its jurisdiction. The County Standards shall not take precedence over any municipal stormwater management ordinance which regulates the design of the systems and facilities internal to the development site. In such instances which involve the detention or retention stormwater flowing from the site into a County maintained drainage system or facility, the more stringent of the two standards shall be applied.

10. Stormwater management measures shall avoid adverse impacts of concentrated flow on habitat for threatened and endangered species as documented in the Department Landscape Project or Natural Heritage Database established under N.J.S.A. 13:1B-15.147 through 15.150.

11. A Development Permit shall be obtained before construction or development begins within any area of special flood hazard in accordance with Hudson County's Flood Damage Prevention Ordinance.

F. Stormwater Management Plan

A Stormwater Management Plan and Report shall contain but not be limited to the following information:

1. Separate pre and post development contoured drainage Area Maps outlining area referenced in the study with acreage, runoff, curve numbers and time of concentration paths, areas detained and undetained, proposed drainage structures and common points of analysis.

2. The resultant changes in the volume and peak rate of runoff for the designated storms from the various areas on the site toward the County drainage structures showing, in the instance of detention basins, inflow, outflow, undetained flow and total flow shall be presented in a summary table in the Executive Summary of the Report.

3. The proposed location of stormwater measures, the run-off volume, peak rate, flow path, detention and retention of stormwater on-site for the designated storms.

4. The volume and peak rate of off-site stormwater discharged from the site for the designated storms.

5. Hydraulic computations for the analysis and design of the stormwater Management facilities. All calculations, assumptions and criteria used in the design analysis should be justified and documented.

6. Detention basin routing computations by the Storage Indication (Modified PULS) Method or other appropriate procedure or method for the specified design storms.

7. Data, illustrations and narrative outlining provisions to meet water quality requirements.

8. Computations showing the total additional impervious surface for the development.

9. All Hydrologic and Hydraulic and calculations shall be based on Methods Approved by NJDEP including: Hec 1, Hec 2, Hec12, Hec Ras, TR-20, and TR-55. Other methods may be accepted at the discretion of the County Engineer.

10. An Urban Runoff Mitigation Plan as specified by this Resolution and detailed data, illustrations, and calculations for provided use of non-structural BMPs.

11. A Maintenance Plan providing for the immediate and long-term maintenance of the stormwater management facility shall be provided using the guidance of the New Jersey Stormwater Best Management Practices Manual.

G. County Storm Drainage Systems.

1. It shall be the applicant's responsibility to provide adequate drainage facilities along County roadways as required by the County Engineer.

2. When a drainage system or any part thereof is proposed for a development which discharges to a County roadway, the additional capacity necessary to accommodate the anticipated increased stormwater runoff from the development, or of areas tributary to the drainage system, shall be determined in accordance with the following procedures:

   a. The capacity and design of the drainage structure or system to accommodate stormwater runoff shall be determined by the applicant's engineer in accordance with these Standards. Storm drainage calculations and a storm drainage map shall be submitted by the applicant's engineer.

   b. If it is necessary to enlarge a drainage structure or system the applicant's engineer shall prepare plans and designs required to provide capacity for the anticipated increase in stormwater runoff for the post-development and for the predevelopment flow of stormwater for areas outside of the development which are tributary to the drainage system, subject to the approval of the County Engineer.

   c. If determined by the County Engineer a drainage structure or system cannot be enlarged by the applicant, the applicant shall make payment to the County in lieu of the installation of the drainage system. The County may also participate in the construction of improvements, or assume responsibility for construction of the drainage system. Payment for all improvements shall be consistent with the provisions of these standards.

H. Existing County Bridges and Culverts on Roads to be widened.

1. All modifications to existing Culverts or Bridges shall be designed and constructed in accordance to the Current New Jersey Department of Transportation Design Standards for Bridges and Culverts.

2. Where road pavement widening is required by these Standards, the developer shall extend bridges and culverts to the full width of the widened traveled way or future pavement width, whichever is greater, plus a sidewalk or embankment area, if such is required. In no instances, however, shall the traveled way be less than 26 feet (13 feet from centerline).

3. Where these Standards require widening on both sides of the road, the culvert or bridge shall be extended, or replaced as specified by this Resolution.

4. Where an existing bridge or culvert is found to be structurally or hydraulically inadequate to serve the proposed development, then total replacement of the structure shall be required by the Planning Board or County Engineer.

5. When bridges and culverts are designated for replacement but immediate replacement is found to be impossible or impractical, then full payment of the total replacement cost shall be charged to the developer as provided in these standards.

6. The design of bridges and culverts to be extended or replaced shall conform to the procedures and standards of the current New Jersey Department of Transportation Design Standards for Bridges and Culverts.

I. New Bridges and Culverts.

The County may assume jurisdiction and future maintenance of bridges and culverts on municipal roadways within developments when said structures will be for the purpose of spanning a waterway and will have a nominal four (4) foot clear span or greater. Said structures must further comply with the applicable standards for procedures, design, and construction as set forth in the Current New Jersey Department of Transportation Design Standards for Bridges and Culverts.

J. Bridges and Culverts Downstream of Development.

1. All developments, which drain to an existing County Bridge or Culvert, will be considered to directly increase the hydraulic requirements of that structure. Residential subdivisions of 3 lots or less, not involving any other subdivision action within the prior three years, and not involving addition of pavement, may be exempted from this requirement, at the discretion of the County Engineer.

2. A developer shall be required to pay a proportionate share of the cost of correcting an adverse drainage condition when the County Engineer or Planning Board determines that a development situated in a drainage basin:

   a. Would create an immediate or potential impact on a County drainage structure, such as increased stream flows and discharges; or

   b. When the development lies in a drainage basin where drainage facilities have previously been installed, replaced or altered under the provisions of these Standards.

3. The proportion of the cost of such facilities to be paid by a developer whose proposed development would drain into such facility will be equal to the proportion that the acreage of the proposed development bears to the acreage of the entire drainage basin. The developer's engineer shall perform all calculations of storm runoff based on consideration of the physical features of the basin and the future development of the area based on the future build out and existing local zoning ordinances. The County Engineer shall on behalf of the Planning Board review said calculations.

4. The proportionate cost of the drainage facility installation or alteration will be the estimated cost of installing the new facility as calculated by the County Engineer, plus 10 percent for contingencies. In cases where the payment is to be made toward the proportionate cost of facilities previously installed or the cost of previously performed alterations, the actual cost of the work performed will be used in place of an estimated cost.

5. Regardless of any other provision in these standards, the developer will not be financially responsible for any part of existing drainage facilities for which full payment has previously been made to the County by other developers in the same drainage basin.

K. Drainage Rights of Way and Easements.

1. All developments traversed by a water course, drainage way channel or stream shall provide a storm-water drainage easement or drainage right-of-way of such width as may be deemed necessary and adequate for the purpose of maintaining and preserving the drainage facility. The existing natural drainage features shall be preserved in the design of the development.

2. Drainage easements shall be established for all existing and proposed open or enclosed storm drainage systems. The purpose of the drainage easement shall be to enter upon, operate and maintain the system. The easement shall be no less than 20 feet in width.

3. All stormwater detention and infiltration facilities shall provide easements to permit access for maintenance in accordance with minimum standards established by the County or Municipal Engineer. A minimum width of 20 feet for the entire perimeter of the facility should be provided.

4. Where a development by necessity, design, or both, must discharge storm drain runoff or alter the course of a stream to flow onto or across lands of the downstream property owner(s), for which there is no drainage easement of record, the developer shall secure the necessary easement and/or right-of-discharge agreement from the downstream property owner and submit a copy of the easement and/or right-of-discharge agreement to the Planning Board.

5. The site plan or final development plat which is to be recorded in the Office of the Hudson County Register shall show all drainage easements and “Dedicated to the County of Hudson " (Town, Township or Borough) for storm drainage purposes," whichever is appropriate. In addition the developer shall furnish the County Engineer and Planning Board with deed of easement in accordance with these Standards.

L. Storm Drainage Design Criteria.

1. Methodology

a. All drainage facilities shall be designed using one of the following methods as required by the County Engineer:

i. Rational Method - for peak discharges of uniform drainage areas up to 50 acres.

ii. Modified Rational Method - for runoff volumes of uniform drainage areas of less than 20 acres.

iii. Soil Conservation Service (S.C.S.) Technical Release No. 55 or Hec 1, Hec 2, Hec 12, Hec Ras, TR-20 and TR-55for drainage areas between 1 acre and 2000 acres.

iv. Other methods subject to approval of the County Engineer.

b. Drainage calculations shall include computations of the total drainage basin area and the percentage of the total drainage from a development which connect directly into an existing County storm drain or requires drainage facilities to be installed within the County right-of-way. The applicant’s engineer shall submit hydraulic calculations for all storm drains, ditch cross sections, swales, culvert and bridge details which are part of, or related to, the development. A storm drainage map shall also be provided indicating the area tributary to the County roadway or drainage facility.

c. Drainage calculations for storm drain pipes shall be based on Mannings formula for pipes flowing full, as outlined in the NJDOT Drainage Design Manual.

d. Detention and retention facilities are to provide stormwater management for the proposed project and such facilities shall be designed to control stormwater runoff for the 2, 10, and 100 year storm events so that peak flow rates and velocities are not increased at or downstream of the point of discharge.

e. Recharge facilities shall provide stormwater management for the proposed project, and shall be designed to accommodate the additional runoff volume for the 100 year storm, and empty within 3 days.

2. Pipelines and Open Channel Hydraulics.

All storm sewers and open channels shall serve two major functions:

a. To carry the maximum discharge for which it is designed.

b. To transport suspended solids in such a manner that deposits in the sewer are kept to a minimum.

3. Design Formulas

a. Rainfall intensity shall be taken from the current NJDEP "Rainfall Intensity Curves for Hudson County". All pipelines within the development, County roadway drainage system, and stormwater systems shall be designed to carry flows of the 25 year storm frequency. All open channels, or culverts shall be designed for a 25 year storm frequency when the upstream drainage area is less than 50 acres. When the upstream drainage area equals or exceeds 50 acres, all open channels and culverts shall be designed for the 100 year storm frequency. All Bridges shall be designed for the 100 year storm frequency.

b. The runoff coefficient for a development shall be derived based on the future development of the project.

c. The values of the runoff coefficients shall be approved by the County Engineer and shall be in accordance with typical values established in TR-55 and current NJDEP Standards.

d. Minimum design velocity for pipes flowing full shall be 2.5 feet per second and the maximum velocity for pipes flowing full shall be 8 feet per second.

e. The friction factor Manning Coefficient "n" for pipe conduits shall be in accordance with the NJDOT Drainage Design Manual and current NJDOT Standards and Details.

4. Line Transition

For pipe sizes less than 48 inches in diameter, all transition in slope, horizontal direction, junction, and change in pipe sizes shall be confined to manholes, catch basins, or other accessible structures designed for one or more of these purposes. For pipelines 48 inches and larger, horizontal deflections may be accomplished without the use of such structures if the radius of the curve in feet is greater than ten times the diameter in inches of the proposed pipe.

5. Open Channel Flow

Open channels shall be designed using the Mannings Formula for hydraulic flow and the size and shape shall meet the requirements of runoff, depth, side slope, gradient, and velocity limitations in accordance with these standards. Open channels and swales shall also be designed so that the velocities do not exceed those stated the following table.

Table VIII-1 Open Channel Flow Permitted Velocities	
Soil Type (Feet Per Second)	**Allowable Velocities**
Sands	1.8
Sand loam (noncollodial)	2.5
Silt loam (also high loam clay)	3
Sandy clay loam	3.5
Clay loam	4
Clay, fine gravel,(graded loam to gravel)	5
Cobbles	5.5
Shale	6
Concrete lined ditch	10

Channels, swales, and other drainage systems shall be protected by the use of vegetation, rip rap, or paving and area subject to approval by the County Engineer.

M. Design of County Storm Drainage Systems.

1. Hydraulic calculations for storm drainage pipelines shall be based on Mannings Formula for pipes flowing full or other approved design methods acceptable to the County Engineer.

2. Pipelines shall be designed to carry the maximum runoff when flowing half full.

3. The minimum design velocity for pipes flowing full shall be 2.5 feet per second.

4. Minimum pipe diameters shall be 15 inches.

5. Pipes used shall be reinforced concrete pipe, Class III, Wall B, unless otherwise directed and approved by the County Engineer, and shall have a minimum of 2 feet of cover over the top of the pipe wherever possible. Where minimum cover cannot be obtained, the pipe strength or type shall be increased as approved by the County Engineer.

6. All changes in pipe size, slope and horizontal direction shall be made in a manhole, inlet or other accessible structure designed for the above purpose. The designer shall match pipe overts or provide hydraulic gradient calculations to determine the hydraulic losses in the Manhole transitions. All pipe ends shall be encased in a head-wall, FES or other appropriate structure conforming to the current NJDOT Standards and Details.

7. Design engineers shall use the Department of Transportation (NJDOT) Type N echo Head with a bicycle safe grate, which is described in Chapter 2.4 of the NJDOT Bicycle Compatible Roadways and Bikeways Planning and Design Guidelines (April 1996).

N. Storm Sewer Layout.

1. Inlet spacing shall not exceed 250 feet or a design inlet flow of 6 cubic feet per second, whichever conditions shall be more stringent. Access manholes shall be spaced at 500 foot intervals through right-of-ways and at sewer junctions where there are no catch basins.

2. Inlet Spacing and Gutter Spread Calculations shall be provided, for all roadway drainage systems, in accordance with NJDOT Drainage Design Manual and current NJDOT Standards and Details .

3. Inlets shall be located to intercept stormwater runoff before the runoff crosses intersections or crosswalks and at the beginning and end of new curbing.

4. All drainage facilities upon completion of construction shall be cleared of all debris, dirt and other objectionable material and shall be maintained in clean condition until such time as maintenance is accepted by the County Engineer.

5. Grease traps, oil skimmers, sediment basins and other water quality improvement or "Best Management Practices" structures shall be installed as required per NJDEP BMP.

O. Storm Sewer Construction Standards.

1. All inlets and manholes shall conform to current NJDOT Standards and Details, unless otherwise approved by the County Engineer.

2. Pre-cast concrete manholes, inlets or catch basins shall conform to the requirement of ASTM Specification C478-72A and shall withstand an HS-20 highway loading current New Jersey State Highway Department Standard Specifications for Road and Bridge Construction for 1961, as supplemented and amended.

P. Stream Encroachment & Wetlands Permits.

All projects with a total tributary drainage area less than 50 acres and all minor projects, as defined by the New Jersey DEP Flood Hazard Control Act may be approved by the County Engineer. All other projects must make application for a stream encroachment permit from the NJDEP. A copy of said application shall be forwarded by the applicant to the County Engineer. Stream encroachment lines established by the NJDEP shall be identified with bearings and distances on the subdivision plat or site plan submitted to the County for approval.

Q. Soil Erosion and Sediment Control.

1. Developers must provide Soil erosion and sediment control measures in accordance with the Hudson-Essex-Passaic Soil Conservation District standards.

2. All development must provide a Construction Access and shall be designed in accordance with the County SCS Standards.

R. Detention, Recharge, Water Quality Facilities.

Where required by these Standards, and as determined by the County Engineer, developments must construct stormwater detention/retention facilities to control the volume of runoff, rate of discharge and quality of water being discharged from the site. If municipal standards exist which differ from those of the County, the more stringent of the two standards would apply.

1. Stormwater Control.

a. The stormwater runoff resulting from the development of a site for the 2, l0, 25 and l00 year storm events shall be controlled so that the pre-development peak flow rates and velocities from the site onto downstream properties, watercourses, and/or drainage systems is not increased at or downstream of the point of discharge.

b. If a Stormwater Management Plan for the region or watershed containing the watercourse affected by a proposed development has been adopted by the County, the applicant shall design the project and its stormwater management facilities to conform to that plan.

c. The applicant shall provide for on-site detention facilities such that the development's post-project construction peak runoff for the two (2) year storm event is 50 percent of the pre-project construction peak runoff rate and; the post-project construction peak runoff rates for the 10 and 100 year storm events shall be 75 and 80 percent, respectively, of the pre-project construction peak runoff rates. These percentages only apply to the portion of the post-project runoff from the site under development. Off-site runoff may be computed at 100 percent of the pre-project rate.

d. The design storms used to achieve the required level of site runoff control described in these standards shall be defined by the current NJDEP 24-hour storm using the rainfall distribution. A 20 acre drainage area shall be the maximum used for the modified rational method unless otherwise approved by the County Engineer or as designated in the Standards adopted under the Site Improvement Act (N.J.S.A. 40:55D-40.1 et. seq).

e. The design engineer should provide controls to prevent or minimize the use or exposure of pollutants at the site, in order to prevent or minimize the release of those pollutants into stormwater runoff. Such source controls include, but are not limited to:

   i. Site design features that help to prevent accumulation of trash and debris in drainage systems.

   ii. Site design features that help to prevent discharge of trash and debris from drainage systems.

   iii. Site design features that help to prevent and/or contain spills or other harmful accumulations of pollutants at industrial or commercial developments; and

   iv. When establishing vegetation after land disturbance, applying fertilizer in accordance with the requirements established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq., and implementing rules.

2. Water Quality.

a. All non-residential and mixed-use site development or redevelopment shall be required to provide water quality control measures to meet current permissible water quality standards as set forth by current NJDEP standards. All residential development shall provide water quality control measures in accordance with N.J.A.C. 5:21.

b. A waiver may be requested from these water quality control measures if the total existing or proposed impervious surface on a development site is less than 1,000 square feet.

c. Stormwater management measures shall be designed to reduce the post-construction load of total suspended solids (TSS) in stormwater runoff by 80 percent of the anticipated load from the developed site, expressed as an annual average. The requirement to reduce TSS does not apply to any stormwater runoff in a discharge regulated under a numeric effluent limitation for TSS imposed under the New Jersey Pollution Discharge Elimination System (NJPDES) rules, N.J.A.C. 7:14A, or in a discharge specifically exempt under a NJPDES permit from this requirement. The water quality design storm is 1.25 inches of rainfall in two hours. Water quality calculations shall

take into account the distribution of rain from the water quality design storm, as reflected in Table VIII-2.

Table VIII-2:
Water Quality Design Storm Distribution

Time (Minutes)	Cumulative Rainfall (Inches)	Time (Minutes)	Cumulative Rainfall (Inches)
0	0	65	0.8917
5	0.0083	70	0.9917
10	0.0166	75	1.05
15	0.025	80	1.084
20	0.05	85	1.117
25	0.075	90	1.15
30	0.1	95	1.175
35	0.133	100	1.2
40	0.166	105	1.225
45	0.2	110	1.2334
50	0.2583	115	1.2417
55	0.3583	120	1.25
60	0.625		

d. For purposes of TSS reduction calculations, Table VIII-3 below presents the presumed removal rates for certain BMPs designed in accordance with the New Jersey Stormwater Best Management Practices Manual. The BMP Manual may be obtained from on the Department's website at www.njstormwater.org. The TSS reduction shall be calculated based on the removal rates for the BMPs in the Table below. Alternative removal rates and methods of calculating removal rates may be used if the design engineer provides documentation demonstrating the capability of these alternative rates and methods to the review agency. A copy of any approved alternative rate or method of calculating the removal rate shall be provided to the Department at the following address: Division of Watershed Management, New Jersey Department of Environmental Protection, PO Box 418 Trenton, New Jersey, 08625-0418.

e. If more than one BMP in series is necessary to achieve the required 80 percent TSS reduction for a site, the applicant shall utilize the following formula to calculate TSS reduction:

R = A + B – (AXB)/100

Where

R = total TSS percent load removal from application of both BMPs, and

A = the TSS percent removal rate applicable to the first BMP

B = the TSS percent removal rate applicable to the second BMP

Table VIII-3
TSS Removal Rates for BMPs

Best Management Practice	TSS Percent Removal Rate
Bioretention Systems	90
Constructed Stormwater Wetland	90
Extended Detention Basin	40-60
Infiltration Structure	80
Manufactured Treatment Device	See N.J.A.C. 7:8-5.7(c)
Sand Filter	80
Vegetative Filter Strip	60-80
Wet Pond	50-90

f. If there is more than one onsite drainage area, the 80 percent TSS removal rate shall apply to each drainage area, unless the runoff from the sub-areas converge on site in which case the removal rate can be demonstrated through a calculation using a weighted average.

g. Stormwater management measures shall also be designed to reduce, to the maximum extent feasible, the post-construction nutrient load of the anticipated load from the developed site in stormwater runoff generated from the water quality design storm. In achieving reduction of nutrients to the maximum extent feasible, the design of the site shall include nonstructural strategies and structural measures that optimize nutrient removal while still achieving the performance standards.

h. Additional information and examples are contained in the New Jersey Stormwater Best Management Practices Manual.

3. Special Water Protection Areas.

a. In accordance with the definition of FW1 at N.J.A.C. 7:9B-1.4, stormwater management measures shall be designed to prevent any increase in stormwater runoff to waters classified as FW1.

b. Special water resource protection areas shall be established along all waters designated Category One at N.J.A.C. 7:9B, and perennial or intermittent streams that drain into or upstream of the Category One waters as shown on the USGS Quadrangle Maps or in the County Soil Surveys, within the associated HUC14 drainage area. These areas shall be established for the protection of water quality, aesthetic value, exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, and exceptional fisheries significance of those established Category One waters. These areas shall be designated and protected as follows:

i. The applicant shall preserve and maintain a special water resource protection area in accordance with one of the following:

(a) A 300-foot special water resource protection area shall be provided on each side of the waterway, measured perpendicular to the waterway from the top of the bank outwards or from the centerline of the waterway where the bank is not defined, consisting of existing vegetation or vegetation allowed to follow natural succession is provided.

(b) Encroachment within the designated special water resource protection area shall only be allowed where previous development or disturbance has occurred (for example, active agricultural use, parking area or maintained lawn area). The encroachment shall only be allowed where applicant demonstrates that the functional value and overall condition of the special water resource protection area will be maintained to the maximum extent practicable. In no case shall the remaining special water resource protection area be reduced to less than 150 feet as measured perpendicular to the top of bank of the waterway or centerline of the waterway where the bank is undefined. All encroachments proposed under this subparagraph shall be subject to review and approval by NJDEP.

ii. All stormwater shall be discharged outside of and flow through the special water resource protection area and shall comply with the Standard for Off-Site Stability in the "Standards For Soil Erosion and Sediment Control in New Jersey," established under the Soil Erosion and Sediment Control Act , N.J.S.A. 4:24-39 et seq.

iii. If stormwater discharged outside of and flowing through the special water resource protection area cannot comply with the Standard For Off-Site Stability in the "Standards for Soil Erosion and Sediment Control in New Jersey," established under the Soil Erosion and Sediment Control Act , N.J.S.A. 4:24-39 et seq., then the stabilization measures in accordance with the requirements of the above standards may be placed within the special water resource protection area, provided that:

(a) Stabilization measures shall not be placed within 150 feet of the Category One waterway;

(b) Stormwater associated with discharges allowed by this section shall achieve a 95 percent TSS post-construction removal rate;

(c) Temperature shall be addressed to ensure no impact on the receiving waterway;

(d) The encroachment shall only be allowed where the applicant demonstrates that the functional value and overall condition of the special water resource protection area will be maintained to the maximum extent practicable;

(e) A conceptual project design meeting shall be held with the appropriate NJDEP staff and Soil Conservation District staff to identify necessary stabilization measures; and

(f) All encroachments proposed under this section shall be subject to review and approval by the Department.

iv. A stream corridor protection plan may be developed by a regional stormwater management planning committee as an element of a regional stormwater management plan, or by a municipality through an adopted municipal stormwater management plan. If a stream

corridor protection plan for a waterway has been approved by the Department of Environmental Protection, then the provisions of the plan shall be the applicable special water resource protection area requirements for that waterway. A stream corridor protection plan for a waterway shall maintain or enhance the current functional value and overall condition of the special water resource protection area as defined above. In no case shall a stream corridor protection plan allow the reduction of the Special Water Resource Protection Area to less than 150 feet as measured perpendicular to the waterway subject to this subsection.

v. Special water resource protection areas shall be established along all waters designated Category One at N.J.A.C. 7:9B, does not apply to the construction of one individual single family dwelling that is not part of a larger development on a lot receiving preliminary or final subdivision approval on or before February 2, 2004, provided that the construction begins on or before February 2, 2009.

4. Water Quality Design Storm

a. All runoff within the water quality design storm cited in N.J.A.C. 7:8-1.1 et. seq. shall be controlled by maximizing the use of feasible nonstructural management practices appropriate to the site or by structural management facilities which meet the standards of this rule.

i. The water quality design storm shall be defined as the one-year frequency S.C.S. Type III, 24-hour or 1.25 inches of rainfall falling uniformly in 2 hours. All practices and facilities used to meet the stormwater runoff quality goal shall be designed to control the water quality design storm unless otherwise specified.

ii. In computing the runoff from the water quality design storm, appropriate consideration shall be given to the relative runoff potential of pervious and impervious areas in order to accurately compute the rates and volume of runoff from the entire drainage area.

iii. The water quality design storm shall be controlled by Best Management Practices.These include, but are not limited to the following:

(a) In “dry” detention basins, provide for the retention of the water quality design storm, such that not more than 90 percent will be evacuated prior to 18 hours.

(b) In permanent ponds or “wet” basins, the water quality requirements of these rules shall be satisfied where the volume of permanent water is at least three times the volume of runoff produced by the water quality design storm.

(c) Infiltration practices such as drywells, infiltration basins, infiltration trenches, etc. may be used to meet the water quality standards, provided they produce zero runoff from the water quality design storm and allow for complete infiltration within 72 hours.

(d) Other Best Management Practices should be incorporated in the site design in order to meet water quality standards such as but not limited to: minimizing land disturbance, clustering, use of natural drainage ways, water quality swales, water quality chambers and landscaping. Reference should be made to the following documents for other suitable BMP’s and associated information:

(1) New Jersey Stormwater Quantity/Quality Management Manual, NewJersey, Department of Environmental Protection, February 1981.

(2) Stormwater and Non Point Pollution Control, Best Management Practices Manual, State of New Jersey, Department of Environmental Protection, Office of Land and Water Planning.

(3) Any Phase II Regional Stormwater Management Plan.

5. Design Standards for Detention Facilities

a. The following types of stormwater shall not be recharged:

i. Stormwater from areas of high pollutant loading. High pollutant loading areas are areas in industrial and commercial developments where solvents and/or petroleum products are loaded/unloaded, stored, or applied, areas where pesticides are loaded/unloaded or stored; areas where hazardous materials are expected to be present in greater than "reportable quantities" as defined by the United States Environmental Protection Agency (EPA) at 40 CFR 302.4; areas where recharge would be inconsistent with Department approved remedial action work plan or landfill closure plan and areas with high risks for spills of toxic materials, such as gas stations and vehicle maintenance facilities; and

ii. Industrial stormwater exposed to "source material." "Source material" means any material(s) or machinery, located at an industrial facility that is directly or indirectly related to process, manufacturing or other industrial activities, which could be a source of pollutants in any industrial stormwater discharge to groundwater. Source materials include, but are not limited to, raw materials; intermediate products; final products; waste materials; by-products; industrial machinery and fuels, and lubricants, solvents, and detergents that are related to process, manufacturing, or other industrial activities that are exposed to stormwater.

b. When designing infiltration or recharge basins, the design engineer shall assess the hydraulic impact on the groundwater table and design the site so as to avoid adverse hydraulic impacts. Potential adverse hydraulic impacts include, but are not limited to, exacerbating a naturally or seasonally high water table so as to cause surficial ponding, flooding of basements, or interference with the proper operation of subsurface sewage disposal systems and other subsurface structures in the vicinity or down-gradient of the groundwater recharge area

c. Stormwater management facilities shall not be located within the floodway of the watercourse unless they are constructed on-stream as part of a Phase II regional or watershed stormwater management plan.

d. Stormwater management facilities design and construction shall be in conformance with the current NJDEP or Soil Erosion and Sediment Control Act. Standards, which ever is more stringent.

e. Multiple storm events and overland relief must be evaluated for all detention/retention facilities.

f. Side slopes of the facilities should not exceed 3:1 ratios.

g. All detention basins should have length to width ratios of at least 2:1 and maximize to the extent feasible the distance between pond inflow and outflow.

h. The facilities should have a vegetative cover of water-tolerant species. Suggested varieties of cover include reed canary grass, fescue, perennial rye, orchard grass and Bermuda grass.

i. Outlets from the facilities should be designed to function independent of manual, electric or mechanical controls. The outlets should have a minimum diameter of 3 inches. Trash racks consisting of vertical parallel bars, which can be cleaned from above with a rake, must be placed at all outlets.

j. A drainage easement shall be provided for all detention/retention basins and other related facilities for the purpose of access and maintenance.

k. Alternative types of detention/retention facilities may be utilized in lieu of the conventional detention basin (subject to the approval of the County Engineer) in order to overcome existing physical limitations of the site and surrounding area. Alternative detention/retention options are as follows:

   i. Wet ponds/retention basins

   ii. Created Stormwater wetlands

   iii. Stabilized, vegetated or biofilter swales

   iv. Vegetated filter strips

   v. Infiltration basins

   vi. Perforated pipes for underground recharge

   vii. Underground Storage

l. The design, construction of the above named detention/retention facilities shall comply with the Current NJDEP Stormwater Management Regulations.

m. Any retention system proposing the use of infiltration (recharge) must provide a soil feasibility test for review and approval by the County Engineer. The design of an infiltration system must also provide for the removal and filtering of objectionable pollutants using methods described in the NJDEP Best Management Practices Manual for Stormwater and Non-point Source Pollution Control.

n. Groundwater recharge may be calculated in accordance with The New Jersey Geological Survey Report GSR-32 A Method for Evaluating Ground-Water Recharge Areas in New Jersey, incorporated herein by reference as amended and supplemented. Information regarding the methodology is available from the New Jersey Stormwater Best Management Practices Manual; at http://www.state.nj.us/dep/njgs/; or at New Jersey Geological Survey, 29 Arctic Parkway, P.O. Box 427 Trenton, New Jersey 08625-0427; (609) 984-6587.

o. If underground detention is proposed, the outflow calculations shall not allow for infiltration rates unless otherwise specified by the County Engineer. All detention and retention basins must have an outfall structure and emergency spillway.

p. A detention system proposing the use of underground storage for the purpose of controlling stormwater volume must provide for the treatment of the water quality design storm prior to stormwater discharges to the underground storage system.

q. If the invert of the outlet structure of a stormwater management measure is below the flood hazard design flood elevation as defined at N.J.A.C. 7:13, the design engineer shall take into account the effects of tail-water in the design of structural stormwater management measures.

S. Safety for Stormwater Management Basins.

1. This section sets forth requirements to protect public safety through the proper design and operation of stormwater management basins. This section applies to any new stormwater management basin.

2. The provisions of this section are not intended to preempt more stringent municipal or county safety requirements for new or existing stormwater management basins. Municipal and county stormwater management plans and ordinances may, pursuant to their authority, require existing stormwater management basins to be retrofitted to meet one or more of the safety standards below for trash racks, overflow grates, and escape provisions at outlet structures.

3. Requirements for Trash Racks, Overflow Grates and Escape Provisions

   a. A trash rack is a device designed to catch trash and debris and prevent the clogging of outlet structures. Trash racks shall be installed at the intake to the outlet from the stormwater management basin to ensure proper functioning of the basin outlets in accordance with the following:

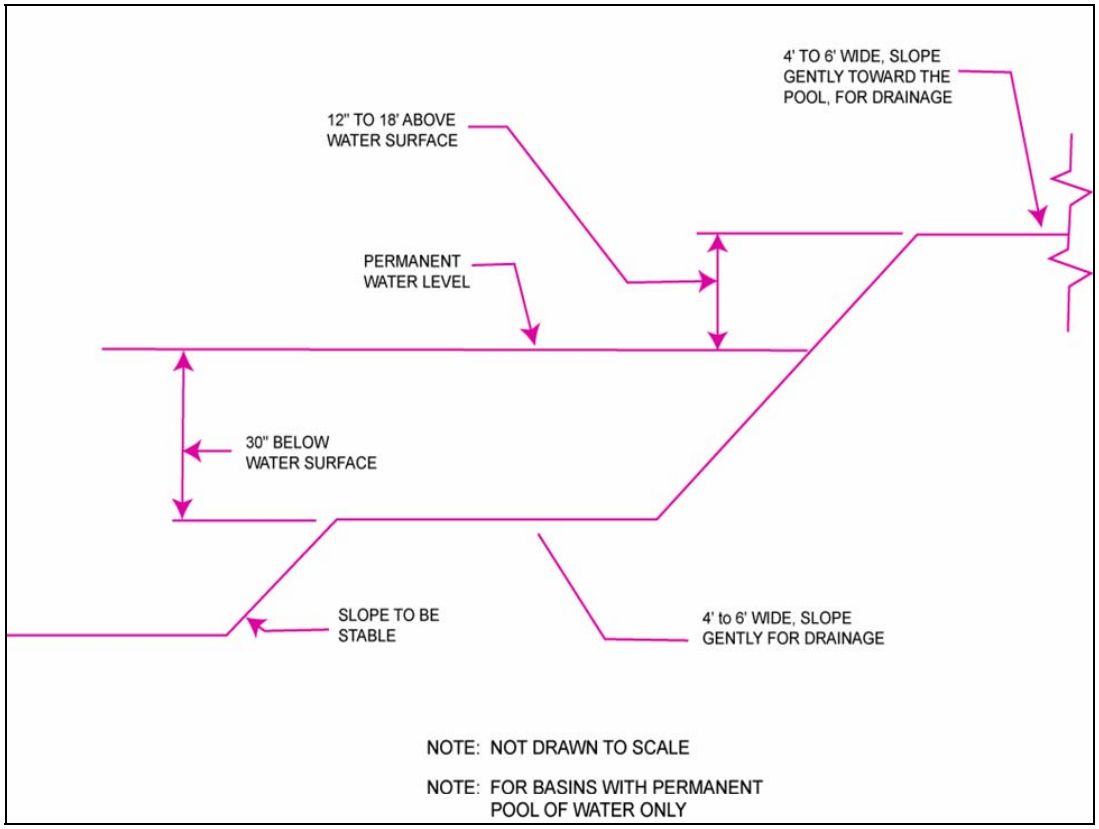
      i. The trash rack shall have parallel bars, with no greater than six inch spacing between the bars.

      ii. The trash rack shall be designed so as not to adversely affect the hydraulic performance of the outlet pipe or structure.

      iii. The average velocity of flow through a clean trash rack is not to exceed 2.5 feet per second under the full range of stage and discharge. Velocity is to be computed on the basis of the net area of opening through the rack.

      iv. The trash rack shall be constructed and installed to be rigid, durable, and corrosion resistant, and shall be designed to withstand a perpendicular live loading of 300 lbs/ft sq.

Figure VIII-1
Elevation View of Safety Ledges in a New Stormwater Management Basin.



T. Landscaping

1. Upon completion of a detention basin recharge facility, the applicant shall immediately provide stabilization of the ground surface with seeding or sodding with a water tolerant grass. Where seasonal conditions do not permit seeding or sodding, temporary mulch may be used. All of the above practices must be approved by the Hudson-Essex-Passaic County Soil Conservation District and shown on the soil erosion and sediment control plan required by that agency.

2. In cases where the detention/recharge basin has been used during construction for sediment control purposes, such facilities shall be restored by the removal of the accumulated sediment and debris, and sodded or re-seeded.

U. Maintenance

1. Detention/retention facilities which are required by the County due to drainage impacts on County facilities shall, as a condition of subdivision/site plan approval, submit proof of a maintenance agreement to the County Engineer and Planning Board for review and approval. After approval of the maintenance agreement, a copy will be placed on file in the County Engineer's office or some other appropriately designated location.

2. The maintenance agreement shall provide a program and schedule to include:

   a. Grass mowing (no higher than 2 inches)

b. Removal of debris from basin, trash rack, channel and culverts.

c. Name, address, and phone number of individual, company, or government.

d. Agency responsible for maintenance of the detention/retention facility.

e. Responsible party shall periodically inspect the basin capacity.

f. Set limits for silt accumulation after which time responsible party shall remove.

g. Dispose of silt in order to maintain the storage capacity of the facility.

V. Green Infrastructure

1. All subdivisions and site plans subject to County approval shall include the use of green infrastructure and non-structural best management practice (BMPs) to the maximum extent possible.

2. Each application for development must implement a minimum of two (2) infrastructure or non-structural BMP techniques.

3. The use of green infrastructure and low impact development (LID) techniques for Hudson County stormwater management is required for their numerous environmental, economic and human health benefits, including their ability to:

   i. Reduce stormwater runoff volumes and peak flows by utilizing the natural retention and absorption capabilities of vegetation and soils.

   ii. Reduce our reliance on traditional stormwater structures (i.e. pipes, channels, and treatment plants) that are expensive to build, operate and maintain.

   iii. Prevent pollutants in stormwater runoff from entering nearby surface waters by using soils, plants and microbes to naturally filter and break down pollutants.

   iv. Protect surface waters and protect and enhance drinking water supplies.

   v. Enhance the rate at which groundwater aquifers are recharged or replenished.

   vi. Limit the frequency of sewer overflow events by reducing runoff volumes and delaying stormwater discharges.

   vii. Increase carbon sequestration of plants and soils.

   viii. Mitigate the impact of urban heat islands produced from dense concentrations of pavement, buildings, vehicles, and other sources that trap and retain heat.

   ix. Reduce energy demands for air conditioning, thereby decreasing emissions from power plants.

   x. Improve air quality with trees and vegetation that absorb certain pollutants from the air through leaf uptake and contact removal.

   xi. Protect wildlife habitats and create additional open space by providing greenways, wetlands, vegetated swales, parks, etc.

   xii. Improve human health and quality of life.

xiii. Increase surrounding property values.

xiv. Reduce construction costs and long term maintenance costs.

4. Policies and Performance Requirements

   a. To the maximum extent possible, site design or techniques should incorporate on-site storage and infiltration, and reduce the amount of directly connected impervious surfaces.

   b. The selected on-site BMP techniques should address three (3) main factors: flow control, runoff pollution prevention and stormwater treatment.

   c. Best Management Practices (BMPs) shall be selected, designed and implemented so that the post-development peak discharge rate, volume and pollutant loading to receiving waters must meet the requirements listed herein.

   d. The applicant shall identify how each of the nine (9) nonstructural strategies identified in Subchapter 5 of the NJ Stormwater Management Rules (N.J.A.C. 7:8-5) and set forth in these regulations will be incorporated into the design of the project to the maximum extent practicable.

   e. If the applicant contends that it is not practical for engineering, environmental or safety reasons to incorporate any of the nine (9) nonstructural strategies into the design of a particular project, the applicant shall provide a detailed rationale establishing a basis for the contention that use of the strategy is not practical on the site.

   f. Where available, the design of the selected BMPs shall comply with standards in the NJDEP Stormwater Best Practices Manual.

5. Urban Runoff Mitigation Plan

   a. At the time of submittal of an application for subdivision or site plan approval, an applicant shall be required to submit an Urban Runoff Mitigation Plan to the Hudson County Department of Engineering.

   b. The Urban Runoff Mitigation Plan shall include the following information:

      i. A showing that the design for the infiltration and treatment of projected runoff ensures that the site complies with the detention, recharge and water quality requirements of this Resolution.

      ii. A narrative explaining how the selected combination of design elements will adequately provide pretreatment, treatment, conveyance, maintenance reduction, and landscaping.

      iii. An explanation as to how the design will meet each of the Policies and Performance Requirements as stated above.

      iv. A showing that the stormwater management design elements include an appropriate combination of non-structural Best Management Practices, so long as the required projected runoff infiltration treatment is achieved. The Plan shall show how the design:

         (a) Utilizes permeable areas to allow more infiltration of runoff into the ground through such means as Biofiltration, Filter strips, Swales, Infiltration trenches, Green roofs and/or Permeable pavement, and/or,

(b) Directs runoff to permeable areas and/or utilize stormwater storage for re-use or infiltration by such means as:

(1) Orienting roof runoff towards permeable surfaces, drywells, French drains, or other Best Management Practices (BMPs) rather than directly to driveways or non-permeable surfaces so that runoff will penetrate into the ground instead of flowing off-site.

(2) Grading impervious surfaces to direct runoff to permeable areas, utilizing level spreaders or other methods to distribute the impervious runoff over pervious surfaces.

(3) Using cisterns, retention structures, or rooftops to store precipitation or runoff for re-use.

(4) Designing curbs, berms, or the like so as to avoid isolation of permeable or landscaped areas.

v. A plan for the maintenance of all BMP's requiring on-going maintenance.

vi. The applicant's signed statement accepting responsibility for all structural and treatment control BMP maintenance. The transfer of property subject to an Urban Runoff Mitigation Plan must include as a written condition to the transfer that the transferee assumes full responsibility for maintenance of any structural, and/or source or treatment control BMPs.

c. The County Engineer shall review the proposed Urban Runoff Mitigation Plan for compliance with the standards set forth in this Section.

d. The County Engineer or his designee on behalf of the Board shall approve or disapprove the plan. If the plan is disapproved, the reasons for disapproval shall be given in writing to the developer. Any plan disapproved by the County Engineer must be revised by the developer and resubmitted for approval.

e. A waiver from the requirement to submit an Urban Runoff Mitigation Plan may be issued by the Board or County Engineer if the petitioner shows impracticability of implementing these requirements. Recognized circumstances demonstrating impracticability include:

i. Extreme limitations of space for treatment.

ii. Unfavorable (i.e., hydrologic soil group "D" soils) or unstable soil conditions at a site to attempt infiltration; and

iii. Risk of groundwater contamination because a known unconfined aquifer lies beneath the land surface or an existing potential underground source of drinking water is less than ten (10) feet from the soil surface.

f. If a waiver is granted for impracticability, the petitioner will be required to transfer the savings in cost, as determined by the County Engineer to a County stormwater mitigation fund to promote regional or alternative solutions for urban runoff pollution in the storm watershed, which may be operated by a public agency or a non-profit entity.

g. No building permit or other planning approval shall be issued until an Urban Runoff Mitigation Plan has been approved by the Board or County Engineer.

6. Permitted Green Infrastructure BMP Methods.

    a. Selected green infrastructure or stormwater Best Management Practices (BMPs) can include, but are not limited to the use of land compatible design, natural landscaping, better parking lot design, bioretention swales, permeable pavers, rain barrels and cisterns, and green roofs, as outlined in Appendix G, Green Infrastructure/BMP Methods.

    b. Additional methods of green infrastructure or stormwater Best Management Practices (BMPs) may be considered by the applicant, subject to the review and approval of the County Engineer.

Section IX
Off-Site and Off-Tract Improvements

A. Purpose

This Section is intended to:

1. To assure the provision of adequate public facilities needed to serve development projects by requiring each proposed development, as a condition of approval, to pay its pro rata share of the costs of such improvements.

2. To mitigate the adverse impacts on community facilities by providing a means of allocating the costs of needed services and facilities among new developments in proportion to the demand for such facilities created by each new development.

B. Requirements

As a condition of subdivision or site plan approval, the County Planning board may require an applicant to:

1. Improve, extend, expand, construct or re-construct the necessary improvement.

2. Make a fair share contribution toward improving or reconstructing said off tract improvement.

3. Make a payment-in-lieu to the county for improving or reconstructing off tract improvements to county roads or county drainage facilities.

C. Scope of Improvements

The provision of off-tract improvements may include, but not be limited to:

1. Improving circulation and water, sewerage, and drainage facilities,

2. The provision of land and easements, located off tract of the property limits of the subdivision or development.

3. Other improvements necessitated or required by the development, where "necessary" improvements are those clearly, directly, and substantially related to the development in question.

D. Notice and Determination

1. The County Planning Board shall provide in its resolution of approval the basis of the required improvements.

2. The capacity and design of the proposed improvements shall be based upon the circulation plan element and utility service plan element of the adopted master plan.

E. Cost Allocation

The proportionate or pro rata amount of the cost of such facilities within a related or common area shall be based on the following criteria.

1. Full Allocation

   In cases where off tract improvements are necessitated by the proposed development, and where no other property owner(s) receives) a special benefit thereby, the applicant may be required at his sole expense and as a condition of approval, to provide and install such improvements.

2. Proportionate Allocation

   Where it is determined that properties outside the development will also be benefited by the off tract improvement, the following criteria shall be utilized in determining the proportionate share of the cost of such improvements to the development.

3. Allocation formula

   a. Roadways

      The applicant's proportionate share of street improvements, alignment, channelization, barriers, new or improved traffic signalization, signs, curbs, sidewalks, trees, other improvements uncovered elsewhere, the construction or reconstruction of new or existing streets, and other associated street or traffic improvements shall be as follows:

      i. The Applicant shall provide the County Engineer with the existing and reasonably anticipated future peak hour flows for the off tract improvements.

      ii. The applicant shall furnish a plan for the proposed off tract improvement, which shall include the estimated peak hour traffic generated by the proposed development and the proportion thereof which is to be accommodated by the proposed off¬tract improvement. The ratio of peak hour traffic generated by the proposed development which is to be accommodated by the off tract improvement to the future additional peak hour traffic anticipated to impact the proposed off tract improvement shall form the basis of the proportionate share. The proportionate share shall be computed as follows:

$$\frac{\text{Total cost of enlargement or improvement}}{\text{Developer's Cost}} = \frac{\text{Capacity of enlargement or improvement (peak hour traffic)}}{\text{Development peak hour traffic to be accommodated by the enlargement or improvement}}$$

   b. Drainage

      The applicant's proportionate share of storm water and drainage improvements including the installation, relocation, or replacement of storm drains, culverts, catch basins, manholes, rip rap, improved drainage ditches and appurtenances thereto, and relocation and replacement of other storm drainage facilities or appurtenances associated therewith, shall be determined as follows

      i. The capacity and the design of the drainage system to accommodate storm water runoff shall be based on the standards specified in article six of this Resolution, computed by the developer's engineer and approved by the County Engineer.

      ii. The capacity of the enlarged, extended, or improved system required for the subdivision and areas outside of the developer's tributary to the drainage system shall be determined by the developer's engineer subject to the approval of the municipal engineer. The plans for the improved system shall be prepared by the developer's engineer and the estimated cost of

the enlarged system calculated by the County Engineer. The prorated share for the proposed improvement shall be computed as follows:

(a) Capacity of enlargement or improvement (total capacity expressed in cubic feet per second) Development generated peak rate of runoff expressed in cubic feet per second to be accommodated by the enlargement or improvement

(b) Total cost of enlargement or improvement Developer's Cost

F. Escrow Accounts

Where the proposed off tract improvement is to be undertaken at some future date, the monies required for the improvement shall be deposited in an interest bearing account to the credit of the County in a separate account until such time as the improvement is constructed. If the off tract improvement is not begun within two years of deposit, all monies and interest shall be returned to the applicant.